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ENERGY EFFICIENCY TECHNOLOGY IMPACT - APPLIANCES

VOLUME 2
APPENDICES

Submitted to:

Canada Mortgage and Housing Corporation
Research Division

700 Montreal Road
Ottawa, Ontario
K1A 0P7

Submitted by:

Thermal Engineering

July 1996

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Appendix 1
Interim Report #1

Thermal Engineering

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INTERIM REPORT NO.1

ENERGY EFFICIENCY TECHNOLOGY IMPACT - APPLIANCES

SUBMITTED TO:

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Canada Mortgage and Housing Corporation
700 Montreal Road
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May 1993

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1. DEVELOPMENT OF A CONSISTENT CLASSIFICATION OF APPLIANCES

Household electrical energy consumption is typically studied in two categories: a) energy consumption for familiar end uses, and b) energy consumption for miscellaneous (other or residual) end use. Assignment of the different electrical energy uses to these two categories is not standardized, with different research groups using different assignments. Familiar end uses generally include space heating, air conditioning, water heating, refrigeration, cooking, clothes drying, dish washing, lighting, television, and furnace fans. Miscellaneous end use includes all other end uses such as audio system, humidifier, microwave, vacuum cleaner, well pump, etc.

Since a standard classification of appliances that can be used in energy studies does not exist, and the energy consumption of appliances in the "miscellaneous" category can be significant, a classification of appliances is developed below based on:
i) the results of studies reported in the literature,
ii) available Statistics Canada data,
iii) estimates and engineering calculations.
This classification reflects estimated energy consumption and market saturation, and will be the basis for the survey protocols that will be developed.

1.1. Review of Literature

To identify energy consumption estimates and market saturation values for appliances studies reported in the literature were reviewed, and the relevant information is summarized below.

1.1.1. "Patterns of Energy Use by Electrical Appliances", EPRI, 1979.
One of the earliest and most comprehensive studies on energy use by electrical appliances was carried out by Midwest Research Institute for EPRI (EPRI, 1979). For this study, a survey of 2,000 households in 16 U.S. cities were conducted through interviews, and close to 600 major appliances were metered in 150 of the 2000 households from August 1976 to July 1977 to study appliance electricity use in a one year period. For the same period, monthly electric utility bills from all, and gas bills from a portion of the 2000 households were obtained directly from the suppliers with the consent of resident. All of the data collected came from urban and suburban areas of eight large (with population more than 1,000,000) and eight small (with population less than 1,000,000) cities. Due to difficulties in installing kWh-meters in multi-family dwellings, these were not included in the study.

In this study, electrical appliances were divided into two categories: (i) major, and (ii) minor. The appliances categorized as 'Major' are given in Table 1, and those categorized as 'Minor' are given in Table 3. Only the major appliances were metered. The type and number of electric appliances metered for a full year, and the annual electricity usage for these are also given in Table 1.

The market saturation levels for the major and minor appliances are given in Tables 2 and 3. A detailed review of the data on saturation levels and electrical consumption indicate that:
i) There is a variation in both market saturation levels and annual electrical consumptions of different appliances from one geographical region to another,
ii) There is a month-to-month variation in the daily electrical consumptions of most major appliances,
iii) In refrigerators and freezers, the method of defrost (manual, automatic, and frost-free) makes a significant difference in annual power consumption,

TABLE 1. Appliances metered in the EPRI (1979) study

Appliance	Number Metered	Annual Electrical Usage (kWh)
Refrigerator and refrigerator/freezer	118	1,665
Freezer	55	1,342
Electric range (free standing)	56	782
Electric cooktop (built-in)	13	553
Electric oven (built-in)	11	401
Electric water heater	17	4,046
Dishwasher	29	149
Clathes washer	115	88
Electric clothes dryer	67	1,032
Room air-conditioner	51	3,573
Central air-conditioner	41	978
Central electric furnace	3	2,558
Swimming pool pump	3	1,307
TOTAL	579	

(About 120 more were monitored for less than a year)

Correlations were developed relating energy consumption to parameters such as number of people in the dwelling, annual family income, etc., and saturation levels for households with different number of occupants, family income, resident characteristics, age of head of family, etc. were identified.

An extensive list of home appliance products, and annual energy consumption values compiled in the EPRI study from data reported by various organizations are given in Table 4.

1.1.2 A Case Study: Energy Consumption Labelling Requirements for Refrigerators (Hirshhorn, 1979)

This report was prepared to review the potential benefits of introducing energy efficiency labels for refrigerators. Based on the estimated number of new refrigerators to be purchased in a 10 year horizon starting 1978, and estimated energy consumption reductions due to labelling, the potential savings over the 10 year period was estimated to be $400 million.

1.1.3 The Energy Label A Means of Energy Conservation (OECD, 1976)

This report was prepared to review the potential benefits of introducing energy efficiency labels for household appliances. The annual energy consumption estimates for a number of household appliances were taken from US Statistical Abstracts. These values are given in Table 5.

1.1.4 Household Energy Consumption and Expenditures (DOE/EIA, 1990 and 1989)

On a triennial basis, U.S. Department of Energy conducts Residential Energy Consumption Surveys (RECS). The RECS is a two-stage survey, in which data are collected from a randomly selected set of housing units that includes single-family detached homes, townhouses, apartment buildings, condominiums, and mobile homes. In the first stage, household characteristics data are collected via a personal interview, and in the second stage energy consumption and expenditures data are directly obtained from energy suppliers with the consent of the resident.

The survey findings relevant to the present study can be summarized as follows:

i) The per household energy consumption in the U.S. was 100.8 million Btu (29,540 kWh) in 1987, with an estimated 54% used for space heating, 23% for appliances, 18% for water heating, and 5% for air conditioning.

ii) Out of the 90.5 million households in the U.S., 57.1 million used electric air-conditioning. Households that cooled with central air-conditioning used close to three times as much as those

TABLE 2.

MAJOR APPLIANCES

HOUSEHOLD SCREEN AND OWNERSHIP

NATIONAL SUMMARY

MAJOR APPLIANCES	UNITS	H AVG	R AVG	HOUSE	% H
REFRIGERATOR	200	0.10	1.03	193	9.72
REFRIGERATOR/FREEZER	2,136	1.07	1.12	1,897	95.56
FREEZER	754	0.37	1.03	732	36.87
RANGE AND OVEN	660	0.33	1.00	656	33.04
COOKTOP RANGE	238	0.11	1.00	238	11.98
SEPERATE OVEN	250	0.12	1.00	249	12.54
DISHWASHER	790	0.39	1.00	789	39.74
CLOTHES WASHER	1,736	0.87	1.00	1,735	87.40
CLOTHES DRYER	855	0.43	1.00	853	42.97
WATER HEATER	258	0.12	1.01	254	12.79
CENTRAL AIR CONDIT.	520	0.26	1.00	516	25.99
ROOM AIR CONDITIONERS	1,310	0.65	1.58	826	41.61
SWIMMING POOL PUMP	86	0.04	1.00	86	4.33
TOTAL MAJOR APP.	9,793	4.93			
TOTAL HOUSEHOLDS				1,985	100.00

H AVG = Average number of units per household for entire sample.
R AVG = Average number of units per household having appliance.
HOUSE = Households having appliance.
% H = Percentage of households having appliance.

TABLE 3.

MINOR APPLIANCES

PART 1 OF 2

HOUSEHOLD SCREEN AND OWNERSHIP

NATIONAL SUMMARY

MINOR APPLIANCES	UNITS	H AVG	R AVG	HOUSE	% H
KITCHEN:					
TOASTER	1,777	0.89	1.01	1,752	88.26
WAFFLE IRON	667	0.33	1.01	657	33.09
GRIDDLE	206	0.10	1.00	204	10.27
SKILLET	1,106	0.55	1.05	1,050	52.89
MIXER - PORTABLE	1,386	0.69	1.00	1,375	69.26
MIXER - REGULAR	686	0.34	1.00	681	34.30
COFFEEPOT	1,486	0.74	1.11	1,328	66.90
BLENDER	1,287	0.64	1.00	1,275	64.23
JUICER	108	0.05	1.01	106	5.34
CAN OPENER	679	0.34	1.00	675	34.00
OPENER/SHARPENER	661	0.33	1.00	657	33.09
KNIFE SHARPENER	95	0.04	1.00	95	4.78
CROCK POT	644	0.32	1.01	637	32.09
FONDUE SET / WOK	113	0.05	1.02	110	5.54
BROILER/ROASTER	369	0.18	1.03	356	17.93
TOASTER OVEN	430	0.21	1.00	429	21.61
HOT TRAYS	368	0.18	1.20	305	15.36
ELECTRIC KNIFE	779	0.39	1.00	774	38.99
FOOD GRINDER	95	0.04	1.00	95	4.78
POPCORN POPPER	660	0.33	1.01	650	32.74
ICE CRUSHER	138	0.06	1.00	138	6.95
ICE CREAM MAKER	197	0.09	1.00	196	9.87
PRESSURE COOKER	54	0.02	1.03	52	2.61
MICRO-WAVE OVEN	76	0.03	1.11	68	3.42
ELECTRIC CLOCK	4,279	2.15	2.39	1,786	89.97
ELECTRIC OVEN	1,986	1.00	1.05	1,881	94.76
GARBAGE DISPOSAL	133	0.06	1.00	132	6.64
TRASH COMPACTOR	19	0.00	1.00	19	0.95
MISC. KITCHEN	44	0.02	1.07	41	2.06

MINOR APPLIANCES	UNITS	H AVG	R AVG	HOUSE	% H
LIVING ROOM:					
BLACK AND WHITE TV	1,661	0.83	1.34	1,239	62.41
COLOR TV	1,864	0.93	1.19	1,563	78.74
TABLE RADIO	3,036	1.52	1.85	1,636	82.41
CONSOLE STEREO, HI FI	1,626	0.81	1.22	1,332	67.10
HOME ENTERTAINMENT CTR.	149	0.07	1.02	146	7.35
AMPLIFIER (GUITAR/ORGAN)	165	0.08	1.08	152	7.65
TAPE DECK(S)	91	0.04	1.24	73	3.67
BEDROOM:					
ELECTRIC BLANKET	745	0.37	1.36	545	27.45
VAPORIZER	632	0.31	1.06	591	29.77
MASSAGER/VIBRATOR	28	0.01	1.07	26	1.30
HEATING PAD	118	0.05	1.03	114	5.74
BATHROOM:					
ELECTRIC SAUNA	6	0.00	1.00	6	0.30
SUN LAMP	159	0.08	1.11	143	7.20
SHAVER	989	0.49	1.15	857	43.17
HOT COMB	1,112	0.56	1.22	907	45.69
HAIR DRYER	1,140	0.57	1.10	1,033	52.04
TOOTHBRUSH	217	0.10	1.08	200	10.07
WATER PIC	161	0.08	1.03	156	7.85
CURLER	514	0.25	1.02	500	25.18
CURLING IRON	443	0.22	1.03	426	21.45
TOTAL MINOR APP.	50,919	25.65			
TOTAL HOUSEHOLDS				1,985	100.00

TABLE 3. CONCLUDED.

MINOR APPLIANCES

PART 2 OF 2

HOUSEHOLD SCREEN AND OWNERSHIP

NATIONAL SUMMARY

MINOR APPLIANCES	UNITS	H AVG	R AVG	HOUSE	% H
SHOP AND HOBBY:					
LAWN MOWER	152	0.07	1.02	148	7.45
GOLF CART	3	0.00	1.00	3	0.15
WATER PUMPS	253	0.12	1.11	226	11.38
SLIDE/MOVIE PROJECTOR	636	0.32	1.11	570	28.71
PHOTOGRAPHIC EQUIP.	52	0.02	1.30	40	2.01
RADIO/SW HOBBY	25	0.01	1.13	22	1.10
SEWING MACHINE	1,411	0.71	1.04	1,347	67.85
CHARCOAL LIGHTER	144	0.07	1.01	142	7.15
GARDEN TOOLS	623	0.31	1.22	509	25.64
WELDER	92	0.04	1.12	82	4.13
PORTABLE WOOD WORKING	2,792	1.40	2.56	1,089	54.86
STATIONARY WOOD WORK	338	0.17	1.37	245	12.34
PORTABLE METAL WORKING	381	0.19	1.38	276	13.90
STATIONARY METAL WORK	63	0.03	1.40	45	2.26
OTHER SHOP TOOLS	411	0.20	1.81	226	11.38

MINOR APPLIANCES	UNITS	H AVG	R AVG	HOUSE	% H
MISCELLANEOUS:					
PORTABLE HEATER	546	0.27	1.22	445	22.41
ATTIC/EXHAUST FAN	1,118	0.56	1.35	825	41.55
PORTABLE FANS	1,531	0.77	1.53	1,000	50.37
HUMIDIFIER/DEHUMIDIFIER	670	0.33	1.20	556	28.01
EVAPORATOR COOLER	33	0.01	1.13	29	1.46
VACUUM SWEEPER	2,404	1.21	1.28	1,873	94.35
WATER SOFTENER	17	0.00	1.00	17	0.85
FLOOD LIGHTS -MANUAL	910	0.45	1.86	489	24.63
FLOOD LIGHTS -TIMER	170	0.08	2.39	71	3.57
DECORATIVE LIGHTS	490	0.24	2.16	226	11.38
SPECIAL LIGHTING	9	0.00	1.28	7	0.35
GARAGE DOOR OPENER	142	0.07	0.62	132	6.65
MISC. NOT CLASS.	119	0.05	1.25	95	4.78
TOTAL MINOR APP.	50,919	25.65			
TOTAL HOUSEHOLDS				1,985	100.00

TABLE 4.

ANNUAL ENERGY CONSUMPTION IN CONSUMER PRODUCTS
(in kw-hr)

Consumer Product Category \ Energy Consumption	Merchandising Week[1]	Potomac Electric Power Company[2]	Citizens Advisory Committee on Environmental Quality[3]	Energy Facts Library of Congress[4]	University of Illinois[5]	Electric Energy Association[6]*	Association of Home Appliance Manufacturers
1. Refrigerators and Refrigerator Freezers							
Refrigerators	--	460	750 (12 ft^3)	728 (12 ft^3)[a] 1,217 (12 ft^3)[b]	726 (12 ft^3)[a] 1,210 (12 ft^3)[b]	728 (12 ft^3)[a] 1,217 (12 ft^3)[b]	-- --
Refrigerator/Freezer (Standard)	1,220	1,085 (10 ft^3) 1,330 (14 ft^3)	--	1,137 (14 ft^3)	--	1,137 (14 ft^3)	--
Refrigerator/Freezer (Frostless)		1,505 (14 ft^3)	--	1,829 (14 ft^3)	--	1,829 (14 ft^3)	--
2. Freezers							
Freezers (Standard)	1,480	1,560	1,200 (16 ft^3)	1,195 (15 ft^3)	1,210 (15 ft^3)	1,195 (15 ft^3)	--
Freezers (Frostless)		1,760	--	1,795 (15 ft^3)	1,739 (15 ft^3)	1,761 (15 ft^3)	--
3. Dishwashers (Electric)	363	340	350	363	378	363	--
4. Clothes Dryers (Electric)	993	1,100	1,200	993	980	993	--
Clothes Dryers (Gas)	1,197[c] 1,758[d]	--	--	--	1,754	--	--
5. Water Heaters (Electric)	4,515	5,400	--	4,219[a] 4,811[c]	4,233	4,219[a] 4,811[c]	-- --
Water Heaters (Gas)	--	--	--	--	2,797	1,359	--
6. Room Air Conditioners	1,389	1,265	2,000	1,389	--	--	--
7. Home Heating Equipment	--	--	--	--	--	--	--
8. Television Sets							
Color	502	450	540	--	--	660[f] 440[g]	-- --
Black and White	362	345	400	--	--	350[f] 120[g]	-- --
9. Kitchen Ovens and Ranges							
Ranges (Electric)	2,071	1,225	1,550	1,175 1,205[h]	1,210	1,175 1,205[h]	-- --
Ranges (Gas)	3,076[i] 2,578[j]	--	--	--	907	--	--
Ovens (Microwave)	300	--	--	190	--	190	--
10. Clothes Washers	90	65	100	76[k] 103[l]	98	76[k] 103[l]	-- --
11. Humidifiers and Dehumidifiers							
Humidifiers	--	--	--	136	--	163	--
Dehumidifiers	--	380	--	377	--	377	--
12. Central Air Conditioning	--	--	--	--	--	--	--
13. Furnaces	--	--	--	--	--	--	--

TABLE 4. CONT'D.

Consumer Product Category / Energy Consumption	Merchandising Week[1/]	Potomac Electric Power Company[2/]	Citizens Advisory Committee on Environmental Quality[3/]	Energy Facts Library of Congress[4/]	University of Illinois[5/]	Electric Energy* Association[6/]	Association of Home Appliance Manufacturers
14. Other							
Kitchen							
Toaster	39	35	40	39	39	39	39
Waffle iron	22	--	--	22	22	22	20
Griddle	--	--	--	--	--	--	46
Skillet (elec. fry pan)	186	190	240	186	189	186	100
Mixer - portable	13	--	10	13	13	13	1
Mixer - regular		--					2
Coffee maker	106	95	100	106	76	106	138
Coffee maker urn	--	--	--	--	--	--	15
Blender	15	--	--	15	15	15	0.9
Juicer	--	--	--	--	--	--	0.6
Can opener	10	--	0.3	--	5	--	0.3
Opener/sharpener	--	--	--	--	--	--	0.2
Knife sharpener	--	--	--	--	--	--	0.2
Crockpot	--	--	--	--	--	--	139
Fondue set/wok (elec.)	--	--	--	--	--	--	9
Broiler/roaster	100[n/]	--	--	205 - roaster[m/] 100 - broiler[n/]	--	205 - roaster[m/] 100 - broiler[n/]	60 - roaster[m/] 85 - broiler[m/]
Toaster oven	--	--	--	--	--	--	93
Hot trays/plates/warmup dish	90	--	100	90	91	90	--
Electric knife/slicer	--	--	--	8	8	8	0.8
Food grinder/chopper	--	--	--	--	--	--	--
Popcorn popper	--	--	--	--	--	--	--
Ice crusher	--	--	--	--	--	--	0.5
Ice cream maker	--	--	--	--	--	--	0.7
Pressure cooker	--	--	--	--	--	--	--
Electric clock	17	18	17	--	--	17	--
Garbage disposal	30	--	30	30	30	30	--
Trash compactor	--	--	--	50	--	50	--
Deep fryer	--	--	--	83	--	83	--
Egg cooker	--	--	--	14	--	14	13
Sandwich grill	--	--	--	33	--	33	20
Kettle	--	--	--	--	--	--	75
Rotisserie	--	--	--	--	--	--	73
Baby food warmer	--	--	--	--	--	--	22
Bottle warmer	--	--	--	--	--	--	--
Cooker/fryer (dutch oven)	--	--	--	--	--	--	23
Yogurt maker	--	--	--	--	--	--	--
Elec. bag sealer	--	--	--	--	--	--	--

TABLE 4. CONT'D.

Consumer Product Category \ Energy Consumption	Merchandising Week[1]	Potomac Electric Power Company[2]	Citizens Advisory Committee on Environmental Quality[3]	Energy Facts Library of Congress[4]	University of Illinois[5]	Electric Energy* Association[6]	Association of Home Appliance Manufacturers
Peanut butter maker	--	--	--	--	--	--	--
Elec. crepe maker	--	--	--	--	--	--	--
Elec. baconer	--	--	--	--	--	--	--
Bun warmer	--	--	--	--	--	--	--
Electric timer	--	--	--	--	--	--	--
Living Room							
Table radio	86	90	70	--	--	86	--
Console stereo, Hi-Fi	--	--	--	--	--	--	--
Home entertainment ctr.	--	--	radio/phono 40	--	--	109	--
Amplifier (guitar/organ)	--	--	--	--	--	--	--
Tape deck(s)	--	--	--	--	--	--	--
TV video games	--	--	--	--	--	--	--
Video tape (disc) recorder	--	--	--	--	--	--	--
Tape recorder (cassette or disc)	--	--	--	--	--	--	--
Electric chair	--	--	--	--	--	--	--
Heated footstool	--	--	--	--	--	--	--
Bedroom							
Electric blanket	147	140	150	147	--	147	--
Vaporizer	--	--	--	--	--	--	--
Massager/vibrator	--	--	--	--	--	7	0.3
Heating pad	10	9	--	10	--	10	3
Lint remover	--	--	--	--	--	--	--
Bathroom							
Electric sauna	--	--	--	--	--	--	--
Sun lamp/heat lamp	--	--	--	--	--	16/13	--
Shaver	--	2	0.6	--	--	1.6	0.5
Hot comb	--	--	--	--	--	--	--
Hair dryer	14	7	15	--	--	14	25
Toothbrush	--	--	--	--	--	0.5	10
Water pic	--	--	--	--	--	--	--
Curler (hair setter)	--	--	--	--	--	--	14
Curling iron	--	--	--	--	--	--	1.6
Makeup mirror	--	--	--	--	--	--	2
Hair clippers	--	--	--	--	--	--	0.3
Shaving cream heater	--	--	--	--	--	--	0.4
Heat lamp	--	--	--	--	--	--	--
Facial sauna	--	--	--	--	--	--	--
Ultrasonic cleaner	--	--	--	--	--	--	--
Elec. manicure	--	--	--	--	--	--	--

TABLE 4. CONT'D.

Consumer Product Category	Merchandising Week[1]	Potomac Electric Power Company[2]	Citizens Advisory Committee on Environmental Quality[3]	Energy Facts Library of Congress[4]	University of Illinois[5]	Electric Energy Association[6]	Association of Home Appliance Manufacturers
Shop and Hobby							
Lawn mower							
Hand (elec.)	--	--	--	--	--	--	--
Hand (gas)	--	--	--	--	--	--	--
Riding (gas)	--	--	--	--	--	--	--
Radio/aw hobby	--	--	--	--	--	--	--
Sewing machine	--	--	10	--	--	11	--
Charcoal lighter	--	--	--	--	--	--	--
Garden tools	--	--	--	--	--	--	--
Edger/trimmer	--	--	--	--	--	--	--
Shrub trimmer	--	--	--	--	--	--	--
Grass shears	--	--	--	--	--	--	--
Leaf vacuums	--	--	--	--	--	--	--
Welder	--	--	--	--	--	--	--
Portable woodworking	--	--	--	--	--	--	--
Power planar	--	--	--	--	--	--	--
Power saw - circular	--	--	--	--	--	--	--
- sabre	--	--	--	--	--	--	--
- reciprocating	--	--	--	--	--	--	--
Router	--	--	--	--	--	--	--
Stationary woodworking	--	--	--	--	--	--	--
Drill press	--	--	--	--	--	--	--
Sander - belt	--	--	--	--	--	--	--
Sander/grinder	--	--	--	--	--	--	--
Table saw - band	--	--	--	--	--	--	--
- jointer	--	--	--	--	--	--	--
- miter box	--	--	--	--	--	--	--
- radial	--	--	--	--	--	--	--
Portable metalworking	--	--	--	--	--	--	--
Elec. drills	--	--	--	--	--	--	--
Elec. engraver	--	--	--	--	--	--	--
Stationary metalworking	--	--	--	--	--	--	--
Bench grinders	--	--	--	--	--	--	--
Sander - polisher	--	--	--	--	--	--	--
Motor tillers	--	--	--	--	--	--	--
Shredder/grinders	--	--	--	--	--	--	--
Snow throwers	--	--	--	--	--	--	--
Torch kits - elec.	--	--	--	--	--	--	--
- propane	--	--	--	--	--	--	--
Soldering gun	--	--	--	--	--	--	--
Outboard motor	--	--	--	--	--	--	--
Trolling motor	--	--	--	--	--	--	--
Auto oil - warmer	--	--	--	--	--	--	--
Auto battery chargers	--	--	--	--	--	--	--
Air compressor	--	--	--	--	--	--	--
Glue gun	--	--	--	--	--	--	--
Metal locators	--	--	--	--	--	--	--
Rock tumbler	--	--	--	--	--	--	--

TABLE 4. CONT'D.

Consumer Product Category / Energy Consumption	Merchandising Week[1]	Potomac Electric Power Company[2]	Citizens Advisory Committee on Environmental Quality[3]	Energy Facts Library of Congress[4]	University of Illinois[5]	Electric Energy* Association[6]	Association of Home Appliance Manufacturers
Miscellaneous							
Portable heater*	--	--	--	176	--	170	--
Exhaust fan	--	--	--	--	--	--	--
Attic	--	310	270	291	--	291	--
Circulating	--	--	--	43	--	43	--
Furnace	--	--	480	--	--	--	--
Kitchen	--	--	--	--	--	--	--
Rollaway	--	--	--	138	--	138	--
Window	--	--	--	170	--	170	--
Portable fans	--	145	--	--	--	--	--
Vacuum sweeper	46	40	45	--	46	46	--
Floodlights	--	--	--	--	--	--	--
Decorative/special lighting	--	--	--	--	--	--	--
Lawn lights (elec.)	--	--	--	--	--	--	--
Lawn lights (gas)	--	--	--	--	--	--	--
Nightlights	--	--	--	--	--	--	--
Garage door opener	--	--	--	--	--	--	--
Adding machine	--	--	--	--	--	--	--
Burglar alarm	--	--	--	--	--	--	--
Calculator (battery)	--	--	--	--	--	--	--
Charcoal light	--	--	--	--	--	--	---
Fireplace	--	--	--	--	--	--	--
Germicidal lamp	--	--	--	--	--	--	--
Golf cart	--	--	--	--	--	--	--
Home intercom	--	--	--	--	--	--	--
Iron	144	135	150	144	144	144	60
Lights	--	--	--	--	--	--	--
Incandescent	--	--	1,870	--	--	--	--
Fluorescent	--	--	260	--	--	--	--
Opaque projectors	--	--	--	--	--	--	--
Pencil sharpener	--	--	--	--	--	--	--
Photographic Equip.	--	--	--	--	--	--	--
Portable steam press	--	--	--	--	--	--	--
Scissors, elec.	--	--	--	--	--	--	--
Slide/movie projector	--	--	--	--	--	--	--
Smoke/fume detector	--	--	--	--	--	--	--
Typewriter, elec.	--	--	--	--	--	--	--
Water pump	--	--	--	--	--	--	--
Whirlpool	--	--	--	--	--	--	--
Air cleaner	--	--	--	216	--	216	--
Floor polisher	--	--	--	--	--	15	--
Sewer snake	--	--	--	--	--	--	--
Shoe polisher	--	--	--	--	--	--	
Elec. card shuffler	--	--	--	--	--	--	
Hearing aid	--	--	--	--	--	--	--
Rug shampooer	--	--	--	--	--	--	--
Electric socks	--	--	--	--	--	--	--
[illegible]	--	--	--	--	--	--	--

TABLE 4. CONCLUDED.

Energy Consumption Consumer Product Category	Merchandising Week[1/]	Potomac Electric Power Company[2/]	Citizens Advisory Committee on Environmental Quality[3/]	Energy Facts Library of Congress[4/]	University of Illinois[5/]	Electric Energy* Association[6/]	Association of Home Appliance Manufacturers
Motorized Vehicles (non-automotive)							
Airplanes (jet-propelled)	--	--	--	--	--	--	--
Airplanes (prop)	--	--	--	--	--	--	--
Helicopters	--	--	--	--	--	--	--
Yachts-	--	--	--	--	--	--	--
Airboats	--	--	--	--	--	--	--
Hovercraft	--	--	--	--	--	--	--
Inboard motor boats	--	--	--	--	--	--	--
Motorcycles	--	--	--	--	--	--	--
Mo-peds	--	--	--	--	--	--	--
Scooters	--	--	--	--	--	--	--
Sduba diver propellers	--	--	--	--	--	--	--
Go carts	--	--	--	--	--	--	--
Snowmobile	--	--	--	--	--	--	--
Golf cart	--	--	--	--	--	--	--

* Now part of Edison Electric Institute.

a/ Standard
b/ Frostless
c/ Gas pilot
d/ Electric pilot
e/ Quick-recovery
f/ Tube
g/ Solid state
h/ Self-cleaning oven
i/ Residential
j/ Apartment
k/ Non-automatic
l/ Automatic
m/ Roaster
n/ Broiler
o/ Attic
p/ Window
q/ Circulating
r/ Rollaway
s/ Exhaust

TABLE 5.

UNITED STATES (1)

ANNUAL ENERGY REQUIREMENTS OF ELECTRIC HOUSEHOLD APPLIANCES

Type of appliance	Estimated kilowatt hours consumed
Food preparation :	
Blender	15
Broiler	100
Carving knife	8
Coffee maker	106
Deep fryer	83
Dishwasher	363
Egg cooker	14
Frying pan	186
Hot plate	90
Mixer	13
Oven, microwave	190
Range :	
- with oven	1,175
- with self-cleaning oven	1,205
Roaster	205
Sandwich grill	33
Toaster	39
Trash compactor	50
Waffle iron	22
Waste disposer	30
Food preservation :	
Freezer (15 cu. ft.)	1,195
Frostless	1,761
Refrigerator (12 cu. ft.)	728
Frostless	1,217
Refrigerator/freezer (14 cu. ft.)	1,137
Frostless	1,829
Laundry :	
Clothes dryer	993
Iron (hand)	144
Washing machine :	
Automatic	103
Non-automatic	76
Water heater	4,219
Quick-recovery	4,811
Comfort conditioning :	
Air cleaner	216
Air conditioner, room	1,889
Bed covering	147
Dehumidifier	377
Fan :	
- Attic	291
- Circulating	43
- Rollaway	133
- Window	170
Heater, portable	176
Heating pad	10
Humidifier	136

1) Source : "The Library of Congress, Energy Facts, Novembre 1973", extract from Statistical Abstract of the United States, 1974.

that cooled with window units (10.8 million Btu vs. 4.0 million Btu). The power consumption for air-conditioning varied as a function of climate and usage as shown in Figure 1.

iii) The per household amount of electricity used by appliances was 19 million Btu. Respondents living in single-family housing units used twice as much electricity for appliances than those living in buildings of two or more housing units (22.3 million Btu and 11.5 million Btu, repectively).

iv) Refrigerators use close to one-fifth (19.8%) of all household electricity (14.5% for frost free and 5.3% for non-frost free refrigerators). Of total electricity consumption, refrigerators use a greater proportion than that is used for either space heating (10.2%), water heating (11.5%) or air-conditioning (15.7%) even though these end uses are more energy intensive than refrigerators. The reason for this high electricity consumption by refrigerators is because of their prevelance. Almost every home has an electric refrigerator, with 14% having more than one.

v) The second major consumers of electricity amongst appliances are clothes dryers (5.6%), color TVs (5.2%), freezers - manual or automatic - (5.1%), range and oven (3.8%) and waterbed heaters (2.5%).

vi) The share of electricity consumption of appliances are shown in Table 6, with 10.7% of the total electricity consumption is 'residual', i.e. that consumed by other minor appliances and lighting. The estimates of appliance electricity consumption and percent of total electricity consumption given in this table have an unknown level of error; however, these estimates are useful as they provide a broad ranking of the consumption of electric appliances based on both prevelance of the appliance and on the average consumption of the appliance.

1.1.4 Miscellaneous Electrical Energy Use in Homes (Meier, et al., 1992)

Miscellaneous end use is loosely defined as electricity not consumed by familiar end uses. Since there is no uniform classification of appliances, the authors make their list of miscellaneous end use. Based on the results of other studies, measurements and engineering calculations, they estimated U.S. national saturation values and annual electricity consumption for miscellaneous end uses. These are given in Tables 7 and 8. The results indicate that certain appliances (such as waterbed heaters, humidifiers, dehumidifiers, pool pumps, hot tubs) may have a small contribution to the national electricity consumption by appliances, but they may be responsible of the highest share of energy consumption in some homes. Therefore, they should not be ignored in energy conservation studies.

1.1.5 Conservation Report (CEC, 1988)

According to the California Energy Commission data, refrigerators and freezers are responsible of 26% of residential electrical use, while lighting and small appliances consume 25% as shown in Figure 2.

1.1.6 Description of Electric Energy Use in Single-Family Residences in the Pasific Northwest (DOE/BP, 1989)

Bonneville Power Administration carries out the 'End-Use Load and Consumer Assessment Program' (ELCAP) as part of their on-going program to provide information for demand-side planning, program development, and delivery, and load forcasting efforts. The residential portion of ELCAP included metering of the amount of electricity consumed for various end uses in 499 residences. Metered data collected from September 1984 through May 1988 are analyzed and presented. End uses and their descriptions used in ELCAP are given in Table 9. In this table, the term 'pure' refers to metering of an appliance without contamination by any other small loads or outlets. 'Mixed refrigerator' is used when the same circuit powers the refrigerator and other appliances. The 'Lights/Convenience' end use includes such appliances as, lights, microwave ovens, miscellaneous kitchen equipment, small appliances, some air-conditioning units, portable

FIGURE 1.

Electricity Consumption per U.S. Household for Air Conditioning by Operating Time and Climate Zones, 1987

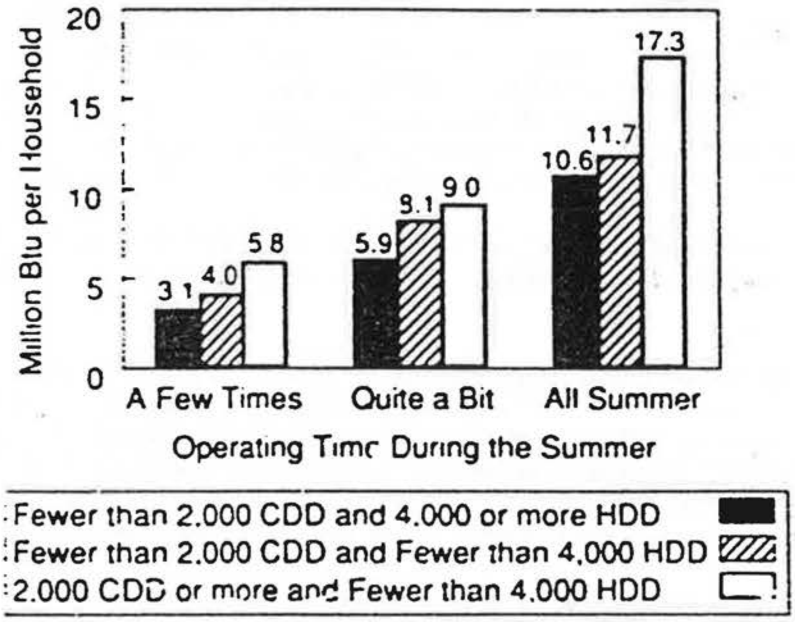


TABLE 6.

U.S. End-Use Consumption of Electricity for Selected Appliances, 1987

Appliances	Million Units	Annual kWh	Total Electric Appliance Consumption (billion kWh)	Total Electric Appliance Consumption (trillion Btu)	Percent of Total Electric Appliance Consumption	Percent of Total Electricity Consumption
Total	NA	NA	504.0	1,719.6	100.0	62.4
Frost-free Refrigerator*	73.7	1,591	117.3	400.1	23.3	14.5
Clothes Dryer	45.9	993	45.6	155.6	9.0	5.6
Non Frost-Free Refrigerator*	28.5	1,500	42.8	145.9	8.5	5.3
Color TV*	131.5	320	42.1	143.6	8.4	5.2
Range/Oven	51.4	596	30.7	104.6	6.1	3.8
Furnace Fan	46.8	650	30.4	103.8	6.0	3.8
Manual Freezer	20.8	1,050	21.8	74.5	4.3	2.7
Water-bed Heater	12.5	1,600	20.0	68.2	4.0	2.5
Frost-free Freezer	10.6	1,820	19.3	65.8	3.8	2.4
Ceiling Fan	41.8	170	7.1	24.2	1.4	.9
Clothes Washer	66.4	103	6.8	23.3	1.4	.8
Dishwasher	39.0	165	6.4	22.0	1.3	.8
Microwave Oven*	55.0	100	5.5	18.8	1.1	.7
Blanket	27.2	147	4.0	13.6	.8	.5
Black/White TV*	39.4	100	3.9	13.4	.8	.5
Dehumidifier	9.0	377	3.4	11.6	.7	.4
Well Pump	4.7	500	2.4	8.0	.5	.3
Humidifier	13.2	163	2.2	7.3	.4	.3
Swimming Pool Pump	2.0	1,000	2.0	6.8	.4	.2
Swimming Pool Heater	.6	3,000	1.8	6.1	.4	.2
Whole-house Fan	8.6	200	1.7	1.9	.3	.2
Residual	NA	NA	86.8	296.2	17.2	10.7

* Counts of individual appliances within the household. Other units are counts of households that may have one or more indicated appliances.

NA = Data not available.

Notes: • Electricity consumption for central and room air conditioning, space heating, water heating, and portable heaters is excluded. • Total electricity consumption in the 1987 RECS was 808 billion kWh. • Total electricity consumption for appliances in the 1987 RECS was 504 billion kWh. • "Residual" includes appliances not listed such as lighting, small cooking appliances, computers, and electric tools. It also includes the error term in estimating the energy consumption of the listed appliances. See "Glossary" for definition of Btu conversion.

Sources: • Energy Information Administration, Office of Energy Markets and End Use, Energy End Use Division, the 1987 Residential Energy Consump-

TABLE 7.

The estimated average electricity use and saturations of appliances in the miscellaneous category.

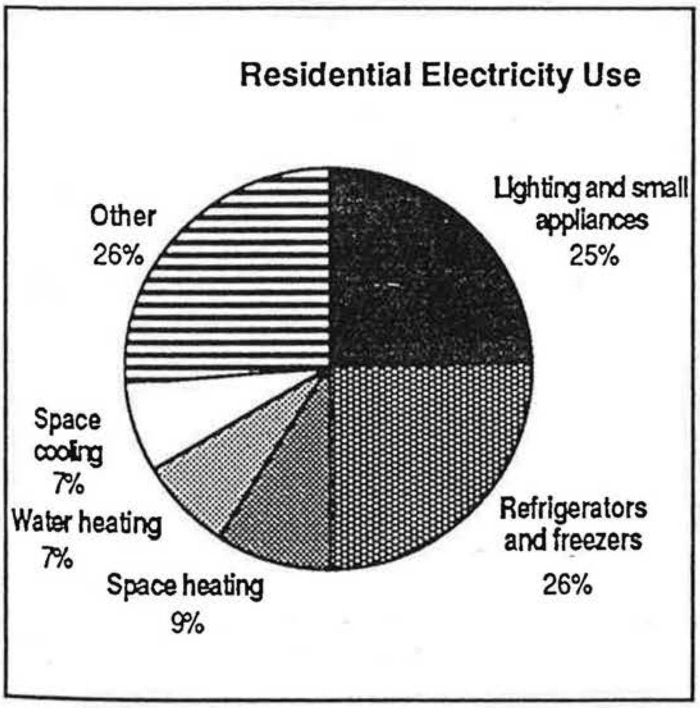
End Use	Stock (millions)	UEC (kWh/year)	National Consumption (TWh/year)	Percent of Total Household
Furnace Fan	45	500	22.5 ✓	2.78
Color TV	87	250	21.8 ✓	2.69
Waterbed Heater	14	900	12.6	1.56
Microwave Oven	72	120	8.6	1.07
Dishwasher	36	200	7.2	0.89
Pool Pump	4	1500	6.0	0.74
Aquarium / Terrarium	10	548	5.5	0.68
Crankcase Heater	27	200	5.4	0.67
Spa / Hot Tub	2	2300	4.6	0.57
Clock	180	25	4.5	0.56
Well Pump	11	400	4.4	0.54
Dehumidifier	11	400	4.4	0.54
Toaster / Toaster Oven	86	50	4.3	0.53
Audio System	81	50	4.1	0.50
Hair Dryer	85	40	3.4	0.42
Blanket	27	120	3.2	0.40
Vacuum Cleaner	90	30	2.7	0.33
Ceiling Fan	54	50	2.7	0.33
Grow-Lights and Acc.	3	800	2.4	0.30
VCR	59	40	2.4	0.29
Coffee Maker	36	50	1.8	0.22
Black & White TV	45	40	1.8	0.22
Computer	13	130	1.7	0.21
Iron	32	50	1.6	0.20
Humidifier	11	100	1.1	0.14
Engine Heater	4	250	1.0	0.12
Exhaust Fan	54	15	0.8	0.10
Whole House Fan	8	80	0.6	0.08
Sump/Sewage Pump	13	40	0.5	0.06
Garbage Disposer	40	10	0.4	0.05
Heat Tape	3	100	0.3	0.04
Bottled Water Disp.	1	300	0.3	0.04
Window Fan	9	20	0.2	0.02
Mower	5	10	0.1	0.01
Instant Hot Water	0.5	160	0.1	0.01
Total Miscellaneous	–	1610	145	18
Total Household	90	8978	808	100

TABLE 8.

Ranges in saturation and energy use for appliances in the miscellaneous category.

End Use	National Saturation, Min.-Max.	UEC (kWh/year) Min.-Max.
Aquarium / Terrarium	0.05 - 0.15	200 - 1000
Audio Systems	0.70 - 0.90	10 - 100
Black & White TV	0.50 - 0.60	10 - 100
Blanket	0.25 - 0.35	70 - 200
Bottled Water Disp.	0.01 - 0.02	200 - 400
Ceiling Fan	0.20 - 0.40	10 - 150
Clock	1.00	17 - 50
Coffee Maker	0.30 - 0.50	20 - 300
Color TV	0.96 - 0.99	75 - 1000
Computer	0.10 - 0.20	25 - 400
Crankcase Heater	0.25 - 0.35	100 - 400
Dehumidifier	0.10 - 0.13	200 - 1000
Dishwasher	0.38 - 0.45	75 - 500
Exhaust Fan	0.30 - 0.60	2 - 70
Engine Heater	0.02 - 0.06	150 - 800
Furnace Fan	0.45 - 0.60	300 - 1500
Garbage Disposer	0.40 - 0.50	20 - 50
Grow-Lights and Acc.	0.02 - 0.05	200 - 1500
Hair Dryers	0.70 - 1.00	10 - 80
Humidifier	0.08 - 0.15	20 - 1500
Instant Hot Water	0.005 - 0.02	100 - 300
Iron	0.20 - 0.40	20 - 150
Microwave Oven	0.70 - 0.90	50 - 300
Mower	0.05 - 0.08	5 - 50
Heat Tape	0.02 - 0.05	30 - 500
Pool Pump	0.04 - 0.06	500 - 4000
Spa/Hot Tub	0.01 - 0.02	1500 - 4000
Sump/Sewage Pump	0.10 - 0.20	20 - 200
Toaster / Toaster Oven	0.90 - 1.00	25 - 120
Vacuum Cleaners	0.90 - 1.20	5 - 50
VCR	0.60 - 0.70	10 - 70
Waterbed Heater	0.12 - 0.20	500 - 2000
Well Pump	0.05 - 0.20	200 - 800
Whole House Fan	0.08 - 0.10	20 - 500
Window Fan	0.05 - 0.15	5 - 100

FIGURE 2.



Energy Trends in California

TABLE 9.

END-USE DESCRIPTIONS FOR ELCAP
RESIDENTIAL STUDIES a/

ELCAP End Uses	Notes on ELCAP End Uses
Hot Water	End use is pure
Heating	Used when pure (76% of sites) b/ c/
Cooling	Used when pure b/ c/ d/
Refrigerator	Used when pure (25% of homes)
Mixed Refrigerator	Used when primary refrigerator is mixed with a plug circuit (75% of homes)
Lights/ Convenience	Used for all other plug circuits not dedicated to a single end use
Freezer	Used when appliance is present and load is pure (10% of homes) e/
Range	End use is pure (a combination of ranges, stove tops & ovens)
Dryer	End use is pure
Clothes Washer	Used when appliance is present and load is pure (36% of homes) e/
Dishwasher	Used when appliance is present and load is pure (33% of homes) e/
Special Major Appliances	Used for hot tubs, kilns, workshops, etc.

ELCAP Triple-Metered Categories	Notes on Triple-Metered End-Use Categories
Heating, Ventilating Air Conditioning (HVAC)	The sum of Heating and Cooling, also used for mixed heating and cooling when not pure (primarily heat pumps, 24% of homes)
Hot Water	Same as the Hot Water end use above
Other	The sum of all loads except HVAC and Hot Water
Total	The sum of HVAC, Hot Water, and Other

a/ Percentages of homes with pure end uses are for the Base Study only.
b/ Includes circulation fans.
c/ Heat pump loads appear on HVAC end-use category only.
d/ Many window-unit air conditioner loads appear on the Lights/ Convenience end use.
e/ Load appears on Lights/Convenience end use when load is not pure.

heaters, most bathroom heaters, ventilation fans, and in some cases, clothes washers and freezers. The mean annual unit energy consumption (UEC) values from ELCAP data are given in Figure 3. In this figure, the difference of 120W between mixed refrigerator and refrigerator represents the miscellaneous loads included in the mixed refrigerator circuit. These data were then adjusted taking into consideration appliance saturation data given in Table 10, and regional values of energy consumption and demand were estimated which are given in Figure 4 (for all-electric homes) and Figure 5 (for non all-electric homes).

To show the range of the loads across the homes, and the degree to which these distributions are skewed, box-and-whisker plots are used (see for example Figure 6). In addition, hourly and seasonal trends such as those given in Figures 7-9 are also developed for most end uses.

1.1.7 "Residential Building Monitoring Project - Report to the Legislature" (CEC, 1990)
California Energy Commission undertook a three-phase pilot project to collect data from households in California to validate assumptions made in developing energy conservation standards. The first phase of the project consisted of a mail survey to 7,477 new home occupants throughout California, which had a 38% response rate. The survey data base consisted of data on 150 variables, such as hours of occupancy, thermostat behavior, appliance holdings, number and age of occupants, family income, how often they used different appliances, and how frequently they opened windows. In the second phase, on-site audits of randomly selected 299 houses amongst the respondents were completed. The collected data included detailed measurements building envelope areas/insulation, identification of conservation measures and appliance efficiencies. Building simulation models were used with these data, and 12 month historical utility bills were compared with the predicted energy usage. The final phase of the study included the installation of measurement devices to track indoor temperatures, thermostat settings, heating, cooling and DHW system operation, and equipment use in 40 homes every five minutes for a five week period. Air change rates were measured using blower door tests.

The electricty consumption data gathered from this study are summarized in Figure 10.

1.1.8 "Household Facilities and Equipment" (Statistics Canada 1992)
Statistics Canada conducted a survey in May 1992 on 41,077 households to represent virtually all households, including single detached and single attached dwellings, apartments or flats, condominiums and mobile homes in Canada. The response rate was 86.2%. In this survey data were collected on the type of dwelling, tenure, repairs, principal heating equipment and fuel, air conditioning, fuel for cooking and appliance saturation. The data are tabulated in a series of tables for all of Canada and according to provinces. The summary results for Canada for 1982, 1987, 1990, 1991 and 1992 showing saturation data are given in Table 11.

1.1.9 "Energuide Directory" (EMR, 1992)
Test results on energy consumption of six major appliances (clothes washers and dryers, combination washer-dryers, ranges, refrigerators, dishwashers and freezers) are published by Energy, Mines and Resources Canada for most makes and models available in the Canadian market.

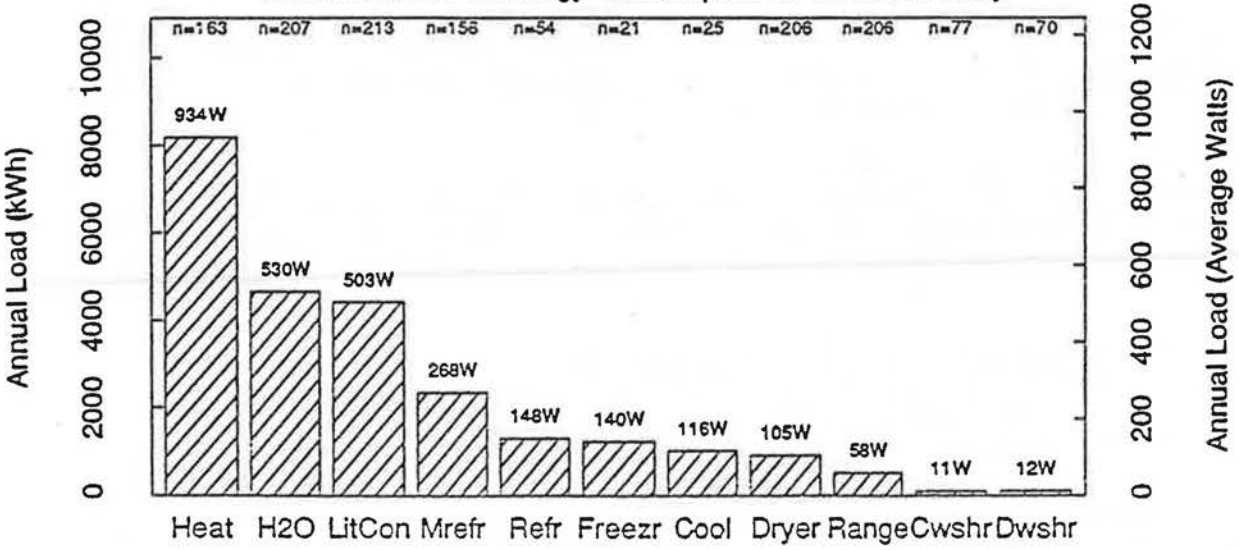
1.1.10 "Major Home Appliance Industry Fact Book" (AHAM, 1993)
In the annual Fact Book, Association of Home Appliance Manufacturers (AHAM) publishes statistical data on many aspects of the U.S. appliance industry. Data on saturation levels of major appliances in the U.S. is given in Table 12. According to AHAM, the energy consumption of all major appliances reduced significantly during the past two decades as shown in Figure 11. Detailed trend data on energy consuption of major appliances over the years, and the National Appliance Energy Conservation Act standards for major appliances are also included in the Fact Book.

FIGURE 3.

END-USE ABBREVIATIONS USED IN
BASE STUDY SUMMARY FIGURES

Abbreviation	End Use
Heat	Heating
Cool	Cooling
H2O	Hot Water
Range	Food Preparation
Dryer	Clothes Drying
Refr	Refrigerator
Mrefr	Mixed Refrigerator
Cwshr	Clothes Washer
Dwshr	Dishwasher
Freezr	Freezer
LitCon	Lights/Convenience
MixGen	Mixed General

Mean Annual Unit Energy Consumption for the Base Study



Data: ELCAP RES PADS Sept '84 - May '88 RES EU Tables - October 1988

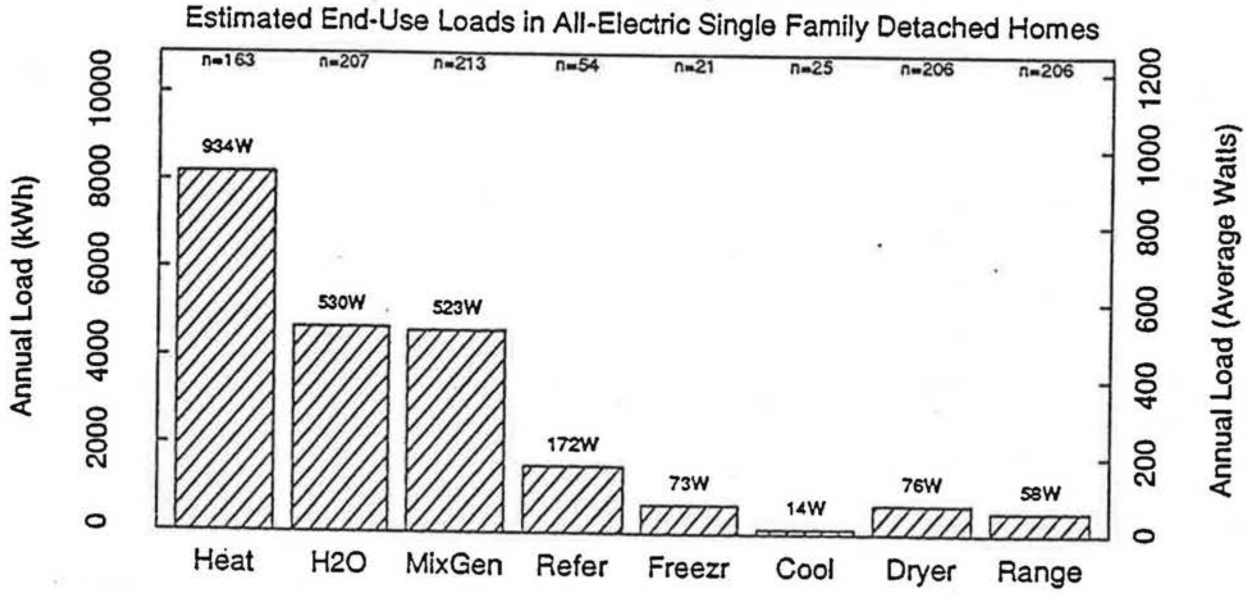
TABLE 10.

Regional Electric Appliance Saturations in Single-Family Dwellings (SFDs) and Share of Regional SFDs, for the Region and by Utility Type

End Use	Publicly Owned Utility	Privately Owned Utility	All Regional SFDs	Regional All-Electric SFDs (Assumed)
Heat	0.581	0.327	0.433	1.000
Hot Water	0.901	0.811	0.849	1.000
MixGen	1.000	1.000	1.000	1.000
Refr	1.164	1.155	1.159	1.159
Freezr	0.527	0.523	0.525	0.525
A/C	0.100	0.130	0.117	0.117
Dryer	0.718	0.704	0.710	0.725
Range	0.951	0.950	0.950	1.000
Share SFDs	0.417	0.583	1.000	1.000

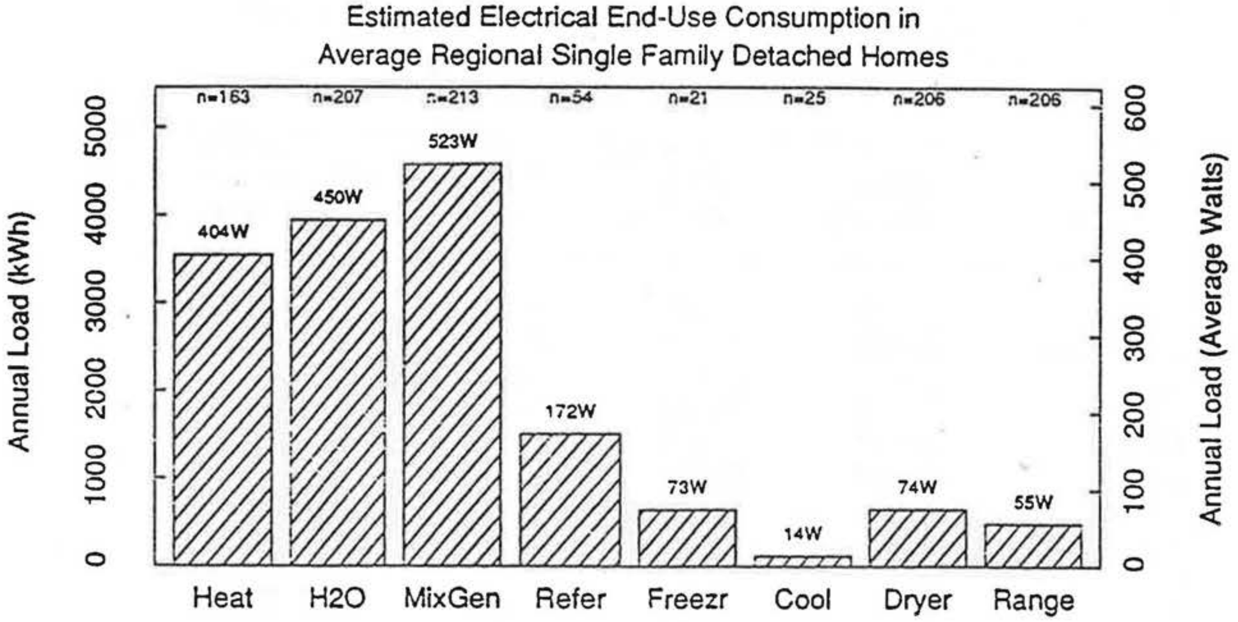
Data for all SFDs: 1985 BPA Forecast Saturations for 1987

FIGURE 4.



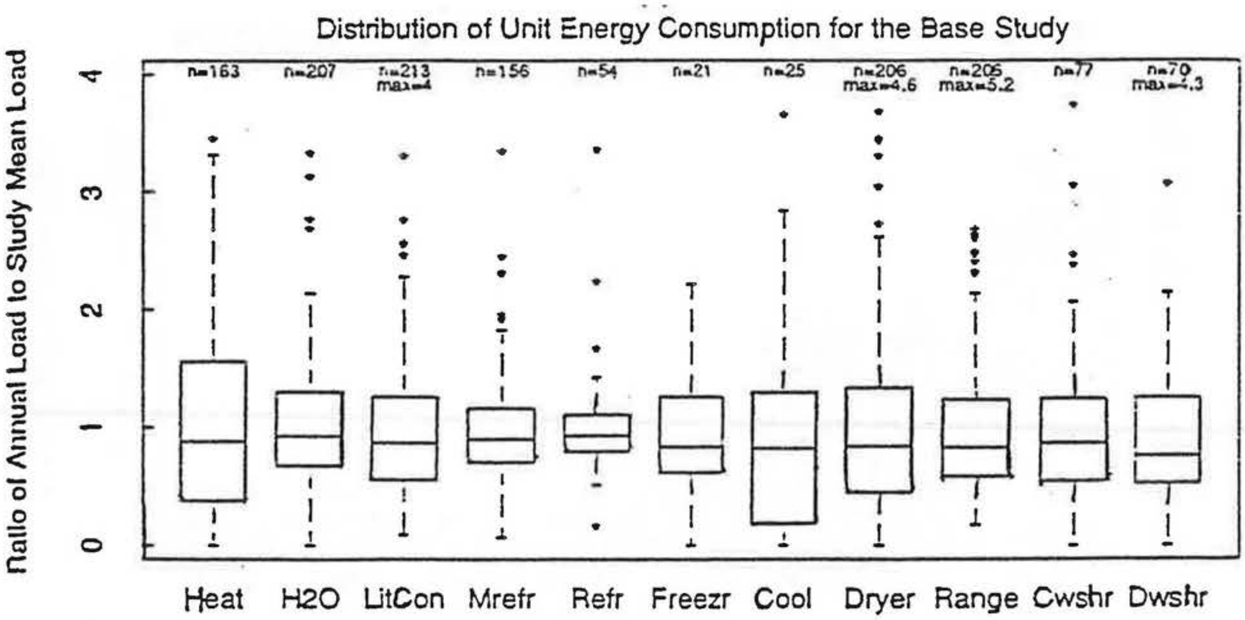
Data: ELCAP RES PADS Sept '84 - May '88 RES EU Tables - October 1988

FIGURE 5.



Data: ELCAP RES PADS Sept '84 - May '88 RES EU Tables - October 1988

FIGURE 6.



Data: ELCAP RES PADS Sept '84 - May '88 RES EU Tables - October 1988

FIGURE 7.

Mean Annual Total, Heating, Cooling. and HVAC
Load Shapes for the Base Study

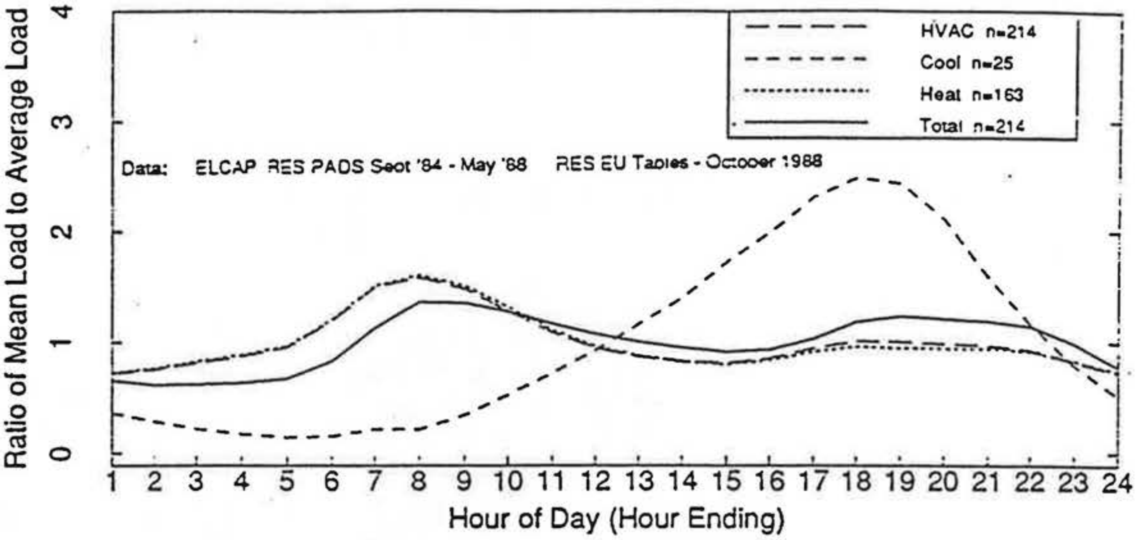


FIGURE 8.

Mean Annual Refrigerator, Mixed Refrigerator, Freezer
and 'Other' Load Shapes for the Base Study

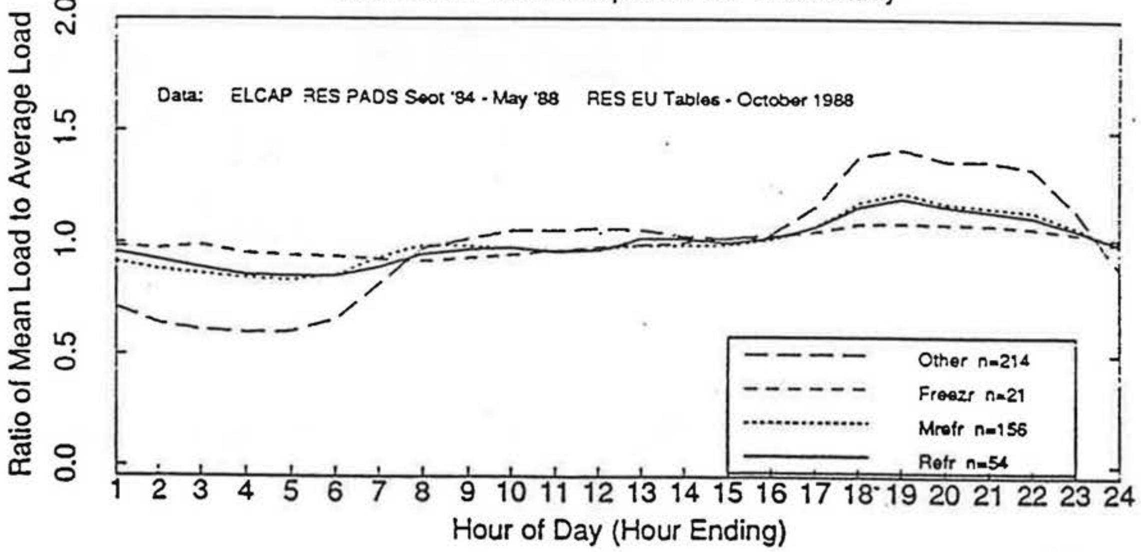


FIGURE 9.

Seasonal Variation of Refrigerator, Mixed Refrigerator,
Freezer and 'Other' Loads for the Base Study

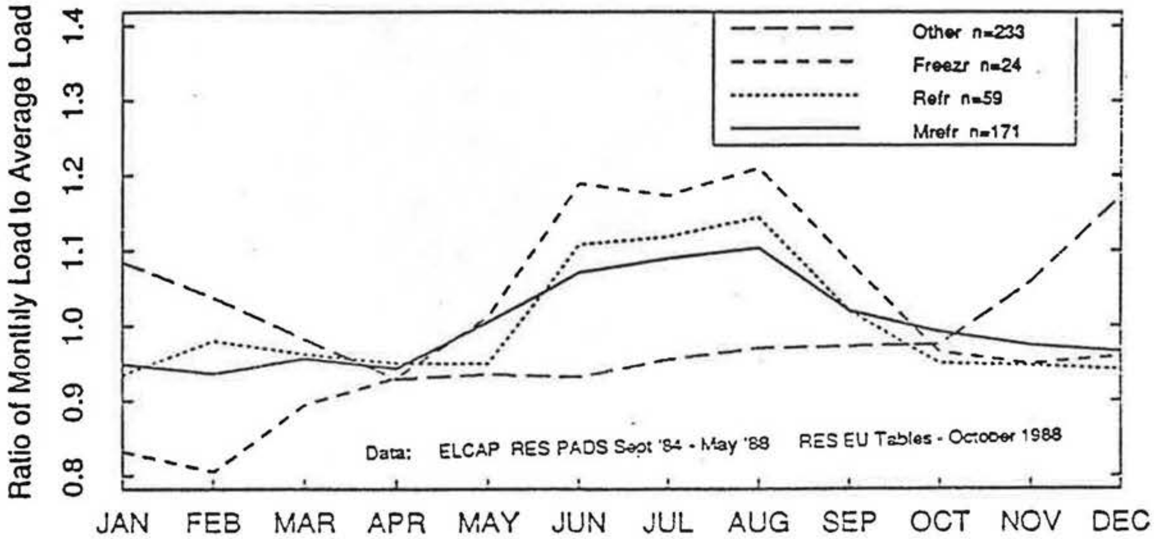
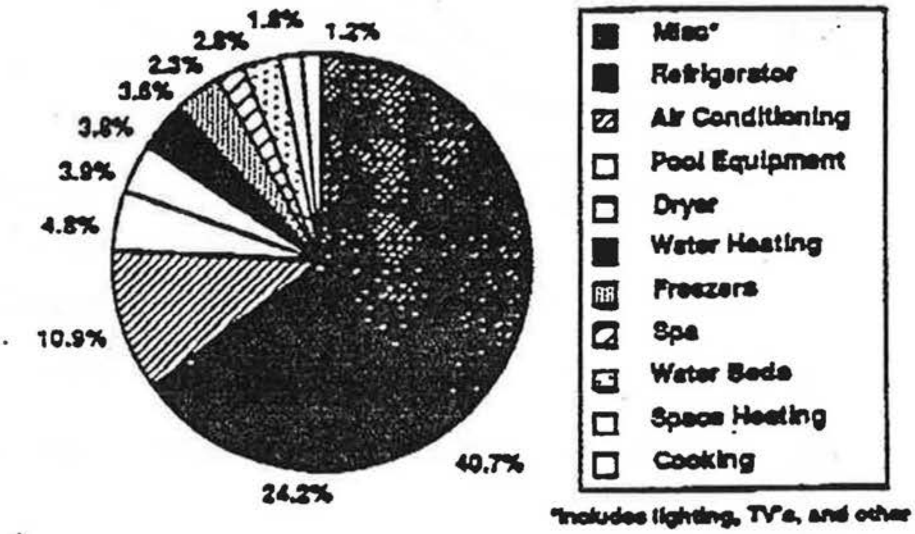


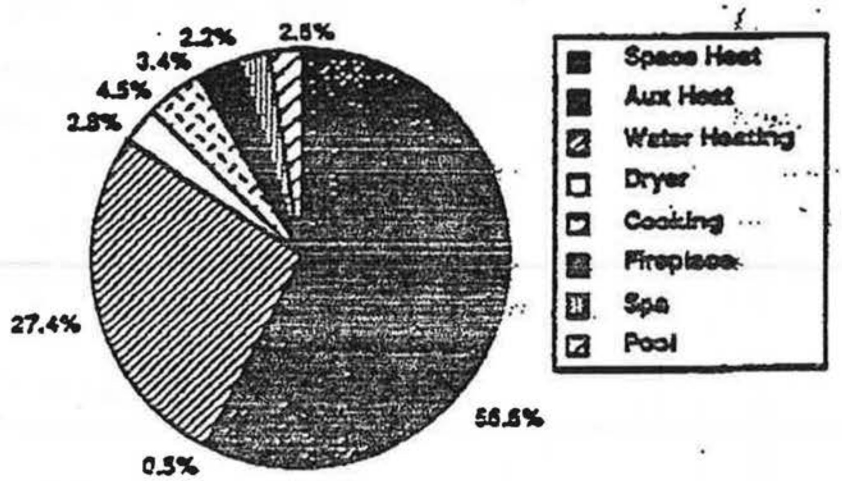
FIGURE 10.

Statewide Average Electricity Use in New Homes
(kWh/Yr)



Average Use = 7,450 kWh/Yr

Statewide Average Gas Use in New Homes
(Therms/Yr)



Average Gas Use = 530 Therms/Yr

TABLE 11.

TEXT TABLE L Percentage Distribution of Households by Dwelling Characteristics, and Household Facilities and Equipment for Selected Years

TABLEAU EXPLICATIF L Répartition en pourcentage des ménages selon les caractéristiques du logement et l'équipement ménager pour certaines années

	1992	1991	1990	1987	1982
Total households - Nombre de ménages ('000)	10,056	9,873	9,624	9,082	8,336
Average number of - Nombre moyen de					
Persons per household - Personnes par ménages	2.63	2.64	2.66	2.73	2.85
Rooms per dwelling - Pièces par logements	5.90	5.92	5.90	5.79	5.58
	per cent - pourcentage				
Dwelling type - Genre de logement					
Single detached - Individuel non attenant	56.6	57.0	57.3	56.6	57.0
Single attached - Individuel attenant	9.3	8.5	8.2	7.9	8.5
Apartment or flat - Appartement	31.9	32.1	32.5	33.3	32.3
Mobile home - Maison mobile	2.2	2.3	2.0	2.2	2.1
Tenure - Mode d'occupation					
Owned - Possédé	63.1	63.7	63.7	62.8	63.5
With mortgage - Avec emprunt hypothécaire	*31.2*	*31.0*	*31.2*	*31.5*	*34.4*
Without mortgage - Sans emprunt hypothécaire	*32.0*	*32.7*	*32.5*	*31.3*	*29.1*
Rented - Loué	36.9	36.3	36.3	37.2	36.5
Dwelling repairs - Réparations aux logements					
Repairs needed - Réparations requises	26.7	24.5	26.6	26.5	27.8
Major - Majeures	*10.3*	*9.8*	*10.5*	*10.5*	*12.9*
Minor - Mineures	*16.4*	*14.7*	*16.1*	*16.0*	*14.9*
No repairs needed - Aucune réparation requise	73.3	75.5	73.4	73.5	72.2
Principal heating equipment - Principal système de chauffage					
Steam or hot water furnaces - Systèmes à vapeur ou à eau chaude	15.8	16.1	16.4	17.4	20.4
Hot air furnaces - Systèmes à air chaud	51.8	50.3	51.1	51.9	53.6
Forced - Pulsé	*50.5*	*48.9*	*49.5*	*50.4*	*50.7*
Other - Autre	*1.4*	*1.5*	*1.5*	*1.5*	*2.8*
Heating stoves - Poêles de chauffage	3.1	3.4	3.6	3.5	5.0
Electric heating - Chauffage à l'électricité	28.8	29.8	28.7	26.9	20.2
Principal heating fuel - Principal combustible de chauffage					
Oil or other liquid fuel - Huile ou autre combustible liquide	16.0	16.9	17.6	19.2	31.0
Piped gas - Gaz canalisé	45.3	44.2	43.9	44.9	42.2
Electricity - Électricité	33.9	33.5	33.1	30.6	21.4
Wood - Bois	3.9	4.4	4.5	4.3	4.3
Air conditioners - Appareils de climatisation	26.7	26.7	24.4	19.9	16.0
Window - Fenêtre	10.6	11.1	10.6	9.8	9.9
Central - Central	16.1	15.6	13.8	10.0	6.1
Fuel for cooking - Combustible pour la cuisson					
Electricity - Électricité	94.2	94.1	93.8	92.9	90.5
Piped gas - Gaz canalisé	4.3	4.3	4.5	4.9	6.3
Microwave ovens - Fours à micro-ondes	76.0	73.5	68.2	43.3	10.3
Gas barbecues - Barbecues à gaz	50.5	48.1	45.9	32.2[c]	19.9[b]
Refrigerators - Réfrigérateurs	99.4	99.7	99.5	99.1	99.7
One - Un	80.4	80.9	80.8	82.7	84.2
Two or more - Deux ou plus	19.0	18.7	18.7	16.4	15.4
Freezers - Congélateurs	57.9	58.2	57.6	57.4	54.4
Automatic dishwashers - Lave-vaisselles automatiques	44.2	43.7	42.0	39.7	33.7[a]
Built-in - Encastrés	35.5	34.1	31.7	28.4	21.5[a]
Portable - Mobiles	8.8	9.5	10.3	11.4	12.2[a]
Electric washing machines - Machines à laver électriques	78.6	78.4	78.6	76.5	77.4
Automatic - Automatiques	75.8	75.2	75.1	71.0	66.6
Other - Autres	2.7	3.2	3.5	5.5	10.8
Clothes dryers - Sécheuses	74.0	73.4	73.4	69.3	66.3

TABLE 11. CONCLUDED

TEXT TABLE I. Percentage Distribution of Households by Dwelling Characteristics, and Household Facilities and Equipment for Selected Years

TABLEAU EXPLICATIF I. Répartition en pourcentage des ménages selon les caractéristiques du logement et l'équipement ménager pour certaines années

	1992	1991	1990	1987	1982
	per cent - pourcentage				
Telephones - Téléphones	98.7	98.1	98.5	98.5	97.9
One - Un	28.4	30.5	31.2	41.0	59.3
Two - Deux	36.6	35.9	36.9	35.0	30.9
Three or more - Trois ou plus	33.8	31.7	30.5	22.4	7.6
Radios	98.8	98.9	99.1	98.8	98.7
One - Une	21.8	21.7	18.7	23.3	29.3
Two - Deux	28.1	28.8	27.6	29.7	31.3
Three or more - Trois ou plus	48.9	48.4	52.7	45.8	38.1
Colour televisions - Téléocouleurs	97.5	97.2	96.9	94.4	84.8
One - Un	54.8	56.6	57.5	66.2	72.5
Two or more - Deux ou plus	42.7	40.6	39.4	28.2	12.3
Cable television - Télédistribution	71.4	70.8	71.4	67.7	58.9
Video cassette recorders - Magnétoscopes	73.8	68.6	66.3	45.2	6.4[a]
One - Un	64.0	61.1	60.6	..	..
Two or more - Deux ou plus	9.8	7.5	5.7	..	..
Camcorders - Caméscopes	10.2	-	5.6	2.8[d]	-
Cassette or tape recorders - Magnétocassettes ou magnétophones	72.8	72.7	67.4	60.9[c]	54.2[a]
Compact disc players - Lecteurs de disque compact	26.9	20.9	15.4	7.9[d]	-
Home Computers - Ordinateurs personnels	20.0	18.6	16.3	10.4[c]	-
Smoke detectors - Détecteurs de fumée	90.0	87.9	86.3	76.8	65.2[b]
Owner-occupied dwellings - Logements occupés par leur propriétaire	93.3	91.3	90.2	83.8	74.4[b]
Tenant-occupied dwellings - Logements occupés par un locataire	84.3	82.1	79.5	65.1	49.4[b]
Portable fire extinguishers - Extincteurs portatifs d'incendie	49.2	46.3	45.1	40.1	-
Owner-occupied dwellings - Logements occupés par leur propriétaire	62.3	58.7	56.8	52.2	-
Tenant-occupied dwellings - Logements occupés par un locataire	26.7	24.5	24.5	19.8	-
Households with owned vehicles - Ménages avec véhicules possédés	83.0	82.6	83.3	83.2	-
Automobiles	76.4	77.6	77.8	78.6	80.2
One - Une	*51.9*	*52.5*	*53.1*	*53.2*	*52.0*
Two or more - Deux ou plus	*24.6*	*25.1*	*24.7*	*25.5*	*28.3*
Vans and trucks - Fourgonnettes et camions	26.8	22.2	23.4	23.3	..
Vacation homes in Canada - Maisons de villégiature au Canada	6.0	5.7	5.8	5.8	6.3
Adult-size bicycles - Bicyclettes pour adultes	51.4	..	51.6[e]	49.3	47.2
One - Une	22.0	..	22.9[e]	22.4	24.3
Two or more - Deux ou plus	29.4	..	28.8[e]	27.0	23.0
Downhill skis - Skis de descente	20.2	-	20.0[e]	18.8	16.6
Cross-country skis - Skis de randonnée	24.9	-	26.3[e]	26.7	25.3
Boats - Embarcations	14.8	-	14.5	15.2	16.1
Overnight camping equipment - Matériel de camping pour une nuit	28.6	-	27.1[e]	27.0	28.3

[a] Data shown are for 1983. - Les données présentées réfèrent à l'année 1983.
[b] Data shown are for 1984. - Les données présentées réfèrent à l'année 1984.
[c] Data shown are for 1986. - Les données présentées réfèrent à l'année 1986.
[d] Data shown are for 1988. - Les données présentées réfèrent à l'année 1988.
[e] Data shown are for 1989. - Les données présentées réfèrent à l'année 1989.

TABLE 12.

Major Appliance Ownership
Number (in millions) & Percentage of United States Households with Product

Product	1970*		1982**		1990***	
	Number	%	Number	%	Number	%
Refrigerators	63.3	99.8#	83.4	99.9	92.1	97.7
Washers	45.1	71.1	61.5	73.6	80.9	85.9
Wringers	7.1	11.2	NA	NA	NA	NA
Automatic & Semi-Automatic	38.0	59.9	NA	NA	NA	NA
Dryers	26.4	41.6	54.6	65.3	75.9	80.6
Electric	18.6	29.3	42.3	50.6	56.6	60.1
Gas	7.8	12.3	12.3	14.7	19.3	20.5
Electric Ranges/Cooktops##	25.8	40.6	48.4	58.0	59.5	63.2
Disposers	16.3	25.7#	41.5	49.7	37.2	39.5
Dishwashers	12.0	18.9	37.2	44.5	50.8	53.9
Freezers	17.9	28.2	35.7	42.8	42.8	45.4
Gas Ranges/Cooktops##	36.6	57.7	35.7	42.7	37.1	39.4
Room Air Conditioners	16.9	25.0	22.6	27.0	30.5	32.4
Microwave Ovens	NEG.	NEG.	21.4	25.6	77.9	82.7
Dehumidifiers	NA	NA	9.2	11.0	15.7	16.7
Compactors	NEG.	NEG.	2.6	3.1	4.1	4.3

*1970 appliance saturation data, 1970 Census of Housing Series HC(S1)-6 except those products marked with # (see separate footnote).

**1982 appliance saturation data, *Appliance Magazine*, September 1993

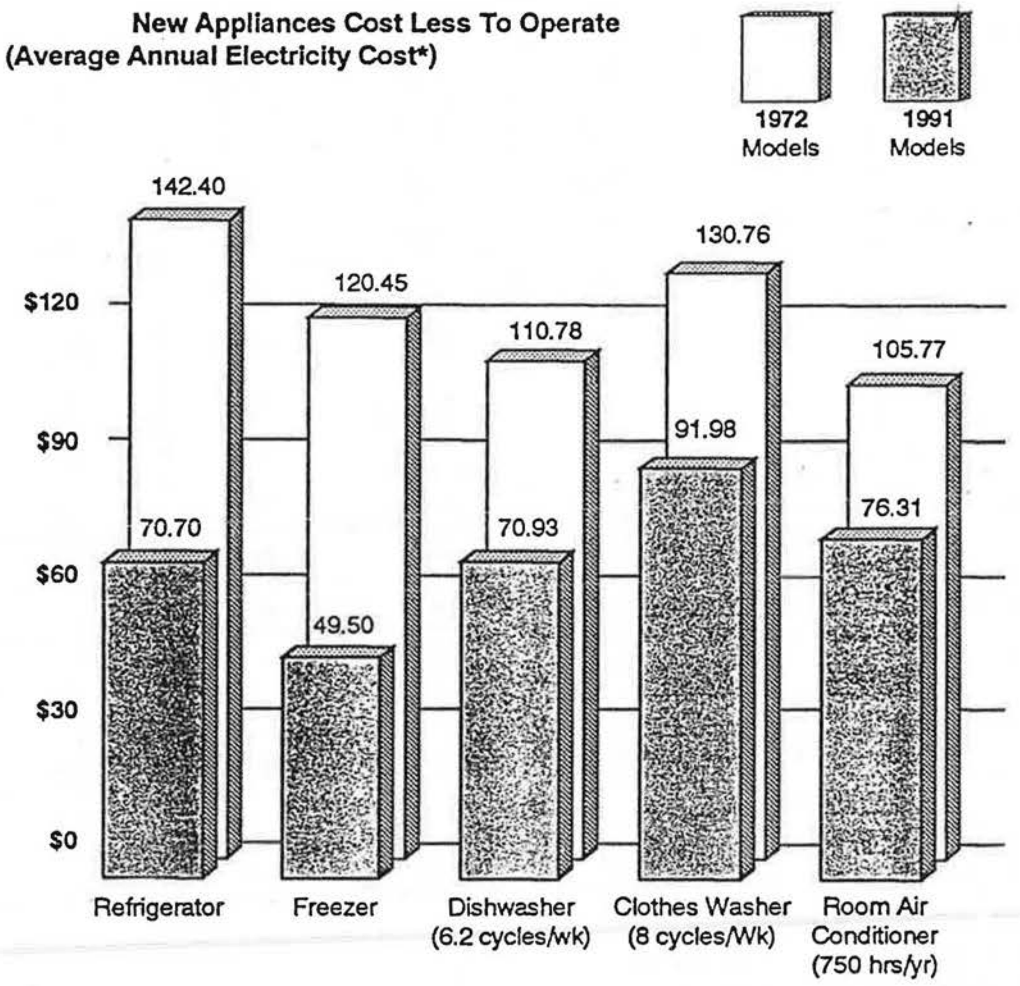
***1990 appliance saturation data, *Home Appliance Saturation and Length of First Ownership Study*, 1991, NFO Research, Inc.

#*Merchandising Week* data

##Cooktops not included in 1970 or 1982 data

Note: Number of households with product based on Census Bureau estimates of occupied housing units in relevant year (94,224,000 in 1990).

FIGURE 11.



*Based on average residential cost of 8.25 cents/kilowatt-hour and 58 cents/therm, established Feb. 14, 1992

Data Based on weighted averages

Source: AHAM

1.1.11 "Special Refrigerator Issue" (Home Energy, 1993)

Results from several sudies done on refrigerators are presented in this issue. Findings relevant to the present study can be summarized as follows:

- Rochester Gas and Electric (RG&E) conducted a detailed monitoring study to investigate the effectiveness of maintenance measures such as coil cleaning and gasket replacement on energy consumption of refrigetrators. For this purpose, energy consumption of 70 refrigerators were monitored for eight months, then a contractor performed maintenance measures on 27 of them and monitoring continued for another 11 months. The study found that maintenance measures are not effective in reducing energy consumption of refrigerators in general. Although some units showed improvement, there was no conclusive evidence indicating a significant reduction in energy consumption of the aggragate of refrigerators monitored. This was probably due to the variations in the original condition of the refrigerators monitored (17 of the 27 units (which had an average age of 16) did not require coil cleaning, some had plugged condensers, etc.). Philadelphia Electric Co. (PECO) reached similar conclusions from a less detailed study. Thus, it is suggested that replacing old refrigerators with new more efficient ones is a more effective way for energy conservation.
- Sacramento Municipal Utility District (SMUD) conducted a testing study on 79 old refrigerators collected from a trade-in program. It was found that 70% had substantial dirt accumulation on condenser coils, 34% had over or under charged refrigerant, and 18% seal or cabinet damage. To assess the effect of coil cleaning, coils of 28 refrigerators were cleaned and tests were conducted. It was found that energy consumption was reduced by an average of 6% (150 kWh). Due to the limitations of the testing procedure, it is suggested that a more realistic value would be 3%.[1]
- Florida Solar Energy Center monitored an 18 year old refrigerator for a year, including energy consumption, inside temperatures, door and freezer openings. Contrary to the general assumption that refrigerator demand curves are relatively flat, it was found that mainly due to door openings, electrical demand varied by 49% between the peak (295 W at 7-8 p.m.) and lowest demand (198 W at 4-5 a.m.). The refrigerator was responsible for 25% of the annual electrical use. With an average 42 door openings per day, door openings were responsible for 7% of refrigerator energy consumption. The old refrigerator was replaced after one year of monitoring with a 1991 model unit. This unit was also monitored for one year, and it was found that the new unit consumed about 60% less electricity (740 kWh vs 1963 kWh), and the peak demand was reduced by an equal amount. Its demand was found to be less sensitive to ambient temperature, and showed less variation in general compared to the old unit.
- A study conducted by Pacific Gas and Electric Co. (PG&E) indicated that 90% of the variation in refrigerator energy use can be attributed to ambient temerature as shown in Figure 12. Similar results were obtained from a study conducted in Rochester, N.Y. as shown in Figure 12.B indicating that keeping the kitchen as cool as possible (without air-conditioning) is a good practice for energy conservation.
- Through-the-door conveniences such as cold water and ice dispensers result in an increase in energy consumption of about 10% mainly due to thermal short circuits and increased usage. In addition, malfunctioning conveniences such as ice-makers could increase energy consumtion by 40-60%.

The energy consumption of 1992 model refrigerators and the National Appliance Energy Conservation Act standards (U.S.) for 1990 and 1993 given in Home Energy is shown in Figure 13.

1.1.12 "The Saturation Picture", (Appliance, 1992)

The Appliance Magazine publishes the saturation levels for certain appliances in the U.S. based on the information gathered from appliance manufacturers. In addition to aggregate saturation data, the market shares of major manufacturers are also provided. The last data set published is given in Table 13.

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[1] Thus, the findings of RG&E and SMUD are not in full agreement.

FIGURE 12. A.

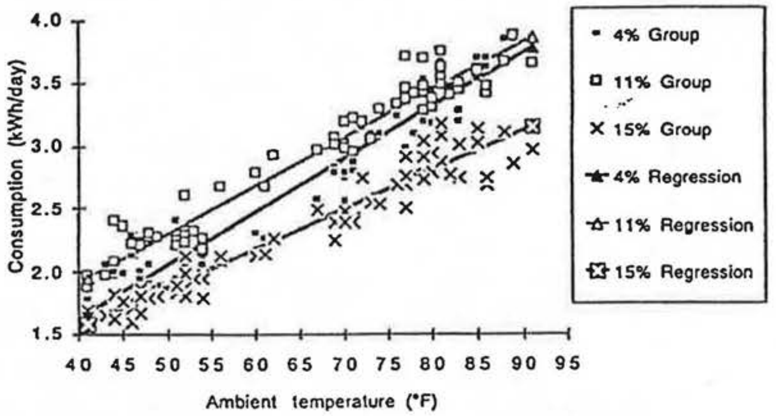
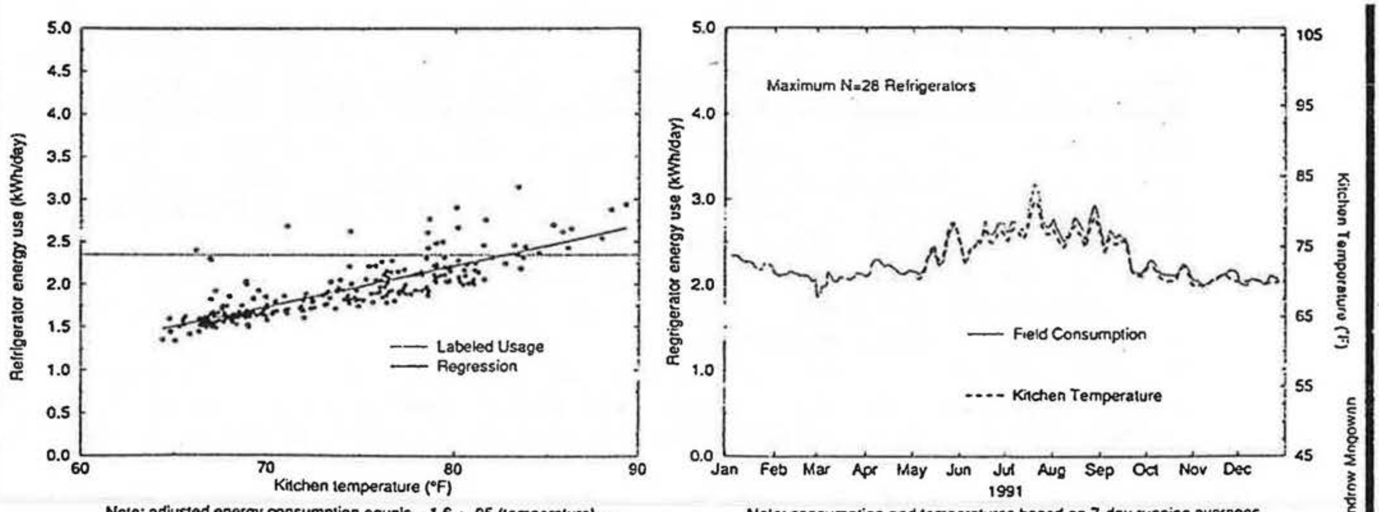


Figure 1. Refrigerator Energy Consumption versus Outside Temperature

Note: For regression lines, estimated daily consumption = constant + outside temperatures × coefficient of determination (R = .9).

FIGURE 12. B.



Note: adjusted energy consumption equals – 1.6 + .05 (temperature).

Note: consumption and temperatures based on 7-day running averages.

Kitchen Temperature versus Energy Usage **Figure 3. One Year of Energy Consumption and Kitchen Temperature**

FIGURE 13.

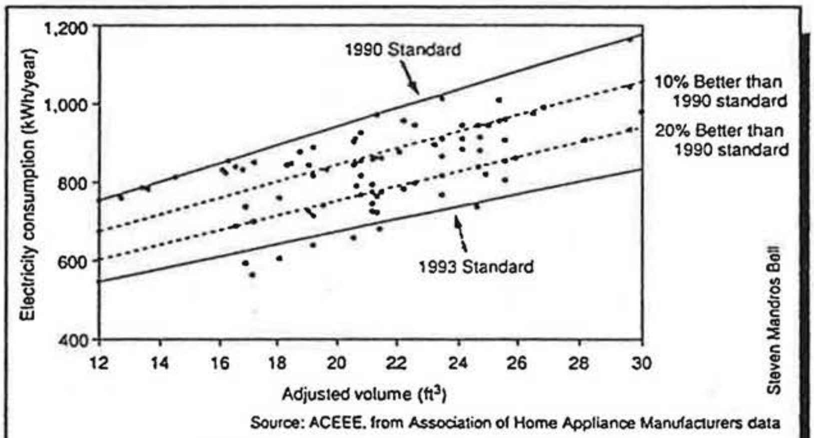
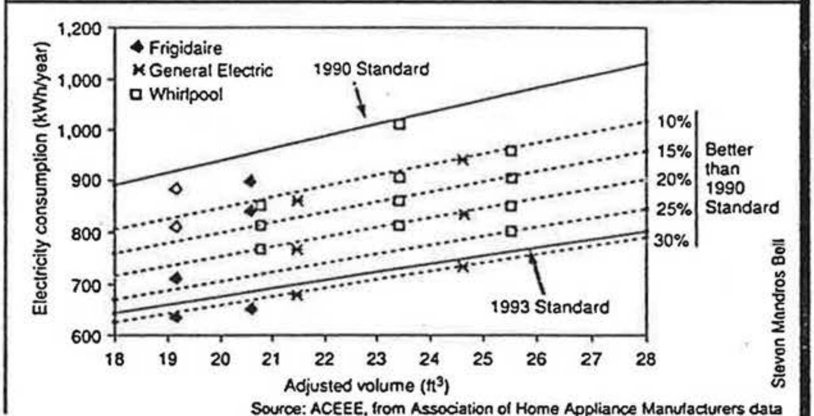


Figure 1. 1992 Refrigerator Efficiencies



Something for Everyone's Rebate Offer

TABLE 13.

The Saturation Picture

The following shows saturation levels for certain appliances in the United States. This information was gathered from those companies producing these products. In most cases, there was very little variance between the figures provided by the various producers; consequently, we believe the data to be good, well-weighted figures. Bear in mind that these figures represent the percentage of U.S. households with a particular type of appliance, and do not reflect households with more than one of a particular appliance.

	1973	1978	1983	1988	1989	1990	1991
Major Appliances							
Dishwashers	34.3%	41.9%	45.0%	49.5%	50.9%	51.8%	47.7%
Disposers	35.3%	42.9%	50.0%	50.0%	50.8%	52.0%	47.0%
Dryers (Electric)	41.0%	45.1%	49.0%	45.0%	46.0%	49.0%	50.6%
Dryers (Gas)	8.0%	12.1%	15.0%	16.5%	17.3%	17.3%	16.1%
Freezers	31.0%	40.0%	42.8%	42.0%	42.0%	44.0%	33.0%
Microwave Ovens	1.2%	7.2%	33.3%	76.0%	80.0%	83.7%	85.2%
Ranges (Electric)	47.0%	51.0%	58.0%	60.0%	60.0%	61.0%	56.7%
Ranges (Gas)	52.0%	48.0%	42.7%	42.8%	42.8%	45.0%	45.7%
Refrigerators	99.9%	99.9%	99.9%	99.9%	99.9%	99.9%	99.9%
Washers	67.8%	68.9%	73.6%	72.0%	72.8%	72.8%	73.0%
Water Heaters (Electric)	45.7%	47.8%	47.2%	47.0%	47.0%	46.0%	45.0%
Water Heaters (Gas)	53.2%	52.1%	52.7%	53.0%	53.4%	54.0%	55.0%
Electric Housewares							
Blenders	42.9%	51.2%	60.0%	64.0%	69.0%	77.7%	77.5%
Clocks (Including Battery Operated)	—	—	—	—	—	97.0%	97.0%
Coffeemakers (Automatic Drip)	1.6%	31.6%	57.0%	69.0%	69.0%	72.6%	73.5%
Convection Ovens (Countertop)	—	—	—	—	—	20.0%	18.0%
Food Processors	—	—	22.0%	49.0%	53.4%	49.0%	48.0%
Frypans	60.6%	68.3%	65.0%	63.6%	63.0%	60.0%	60.0%
Irons	93.3%	98.6%	98.9%	98.5%	95.0%	89.5%	89.0%
Mixers	87.3%	92.2%	89.1%	85.0%	85.6%	83.7%	84.0%
Toasters	96.5%	99.9%	99.9%	99.9%	85.4%	85.0%	89.0%
Personal Care							
Hair Dryers (Hand Held)	9.1%	35.8%	70.0%	88.0%	90.1%	87.0%	96.0%
Hair Setters	36.5%	41.8%	49.0%	55.0%	57.8%	60.0%	50.0%
Shavers (Men's)	—	—	65.0%	67.0%	60.0%	60.0%	55.0%
Shavers (Women's)	—	—	40.0%	40.0%	30.0%	23.3%	25.0%
Toothbrushes	—	—	—	—	—	5.0%	7.0%
Home Care Appliances							
Floor Polishers	—	—	15.0%	15.0%	10.0%	8.0%	6.0%
Vacuum Cleaners	94.0%	98.0%	99.1%	98.0%	98.0%	97.2%	97.2%
Comfort Conditioning Appliances							
Air-Conditioners (Room)	30.0%	28.0%	27.0%	25.0%	25.4%	29.7%	29.0%
Air-Conditioners (Unitary)	15.0%	24.0%	30.0%	40.0%	41.3%	40.0%	41.0%
Dehumidifiers	—	8.5%	11.0%	11.5%	11.5%	13.0%	12.0%
Fans (All Except Ceiling)	—	—	45.0%	52.0%	56.0%	60.0%	65.0%
Fans (Ceiling)	—	1.0%	26.0%	32.0%	32.5%	33.2%	34.0%
Furnaces (Gas)	—	—	—	55.0%	60.1%	63.0%	64.0%
Heat Pumps	—	—	—	16.5%	16.6%	17.5%	18.0%
Consumer Electronics							
Audio Systems, Compact	—	—	—	56.0%	56.0%	62.0%	63.0%
Audio Systems, Component	—	—	—	47.0%	47.4%	54.0%	54.0%
Calculators	26.2%	98.4%	99.5%	99.0%	99.0%	95.0%	96.0%
Camcorders	—	—	—	7.0%	8.4%	15.0%	17.0%
Compact Disc Players	—	—	—	18.0%	20.8%	28.0%	35.0%
Electronic Organizers	—	—	—	—	—	—	3.0%
Home Security Systems	—	—	—	11.0%	11.4%	15.0%	16.0%
Home Computers	—	—	—	21.0%	21.5%	27.4%	33.0%
Home Copiers	—	—	—	—	4.1%	5.8%	3.0%
Home Facsimile Machines	—	—	—	—	—	—	1.0%
Home Satellite Earth Stations	—	—	—	—	—	—	3.0%
Radios	97.9%	99.9%	99.1%	98.7%	98.6%	98.0%	98.0%
Telephone Answering Devices	—	—	6.5%	24.0%	28.9%	43.0%	46.0%
Televisions, Black & White	94.0%	94.5%	93.3%	60.0%	58.0%	43.0%	52.0%
Televisions, Color	67.1%	85.2%	88.0%	97.0%	97.1%	97.2%	97.0%
Televisions, Color, with MTS	—	—	—	15.0%	19.0%	28.0%	31.0%
Televisions, Projection	—	—	0.1%	5.0%	5.0%	7.0%	8.0%
Video Cassette Recorders/Players	—	2.0%	9.0%	61.0%	65.8%	72.0%	77.0%
Video Disc Players	—	—	—	1.4%	2.9%	6.6%	8.0%
Outdoor Appliances							
Outdoor Grills (Charcoal)	—	—	72.0%	76.0%	76.5%	76.0%	76.0%
Outdoor Grills (Electric)	—	—	2.0%	4.0%	4.0%	4.0%	4.0%
Outdoor Grills (Gas)	—	—	17.0%	34.0%	36.5%	38.2%	38.2%
Power Mowers (Gasoline)	—	—	57.2%	62.0%	63.0%	65.7%	60.0%
Riding Mowers	—	—	—	—	—	10.0%	15.0%
Snowthrowers (Gasoline)	—	—	19.5%	20.0%	18.0%	14.0%	20.0%

Source: APPLIANCE Surveys, APPLIANCE Estimates, Electronic Industries Association

1.2 Comparative Evaluation of Reported Data

To develop a consistent categorization of appliances, it is necessary to conduct a comparative evaluation of the reported data on electrical consumption and saturation of appliances. For this purpose, the reported data from different sources are tabulated in four tables. Table 14 shows the data on appliance power consumption, and Table 15 shows the data on saturation. In both tables, the maximum, minimum and average values of reported data are included for comparison. Tables 14/2 and 15/2 are essentially the same, except the data are sorted in descending order.

It can be seen from these tables that there are large variations in the data for both the annual energy consumption and saturation reported by different researchers. In addition, there are significant regional variations which make it difficult to apply data from one region to another. Another important factor is the age of the data. Especially for certain appliances (for example VCR's, microwave ovens, computers, waterbeds), the saturation values changed rapidly over the recent years.

The data given in Tables 13 and 14 were amalgamated to identify appliances according to their electricity consumption and saturation. For this purpose, Table 16 was constructed showing the average consumption and saturation data. In prepareing this table, the consumption data for standard and frostless refrigerators were averaged and used for refrigerators since saturation data are not available separately for standard and frostless refrigerators. For the same reason average values were used for refrigerator/freezers and freezers.

Appliances in Table 16 are categorized into eight classes as follows:

Class A: Consumption > 200 kWh/yr and Saturation > 40%
Class B: Consumption > 200 kWh/yr and Saturation < 40%
Class C: Consumption < 200 kWh/yr and Saturation > 40%
Class D: Consumption < 200 kWh/yr and Saturation < 40%
Class ABK: Consumption data not reported and Saturation > 40%
Class CDK: Consumption data not reported and Saturation < 40%
Class KAB: Consumption > 200 kWh/yr and Saturation data not reported
Class KCD: Consumption < 200 kWh/yr and Saturation data not reported

Appliances are sorted in descending order according to their classification in Table 16/2.

1.3 Conclusions

From the review and evaluation of the data available in the literature, the following conclusions can be reached:

i) The most energy intensive and widely used household appliances are water heaters, cold food storage equipment (freezers, refrigerator/freezers, refrigerators), primary cooking equipment (ranges, ovens, cooktops), clothes dryers, furnace and attic fans, TV's and dishwashers. Thus, their energy consumption have a significant impact on the overall national residential energy consumption, and any improvement of the energy efficiency of these appliances should be studied in detail.

ii) Energy intensive, but less commonly used appliances are spa/hot tubs, room/central air conditioners, waterbed heaters, grow lights, aquarium/terrariums and dehumidifiers. These appliances may not have a high impact on national residential energy consumption, but they have a high impact to the energy consumption of the individual residences in which they are present.

Table 14 - Electricity Consumption Data (kWh/yr) Pg. 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1			REFERENCE NUMBER (Notes in parantheses explained at the bottom of table)													
2	App.#	Electric appliance	8	8 (1)	8(2)	8(3)	8(4)	8(5)	8(6)	12	4,5	11	6	Maximum	Minimum	Average
3	1	Refrigerator (7)														
4	2	Standard	1665.0		460.0	750.0	726.0	728.0		728.0	1500.0		1500.0	1665.0	460.0	1007.1
5	3	Frostless					1210.0	1217.0		1217.0	1591.0			1591.0	1210.0	1308.8
6	4	Refrigerator/freezer														
7	5	Standard		1228.0	1085-1330		1137.0	1137.0		1137.0				1228.0	1137.0	1159.8
8	6	Frostless			1505.0			1829.0		1829.0				1829.0	1505.0	1721.0
9	7	Freezer														
10	8	Standard	1342.0	1480.0	1560.0	1200.0	1210.0	1195.0		1195.0	1050.0		1450.0	1560.0	1050.0	1298.0
11	9	Frostless			1760.0		1739.0	1761.0		1761.0	1820.0			1820.0	1739.0	1768.2
12	10	Range	782.0	2071.0	1225.0	1550.0	1210.0	1175-1205		1175-1205	596.0		600.0	2071.0	596.0	1147.7
13	11	Cooktop	553.0											553.0	553.0	553.0
14	12	Conv'n Oven	401.0											401.0	401.0	401.0
15	13	Microwave		300.0				190.0		190.0	100.0	120.0		300.0	100.0	180.0
16	14	Water heater	4046.0	4515.0	5400.0		4233.0	4219.0		4219.0			4800.0	5400.0	4046.0	4490.3
17	15	Dishwasher	149.0	363.0	340.0	350.0	378.0	362.0		363.0	185.0	200.0	120.0	378.0	120.0	281.0
18	16	Clothes washer	88.0	90.0	65.0	100.0	98.0	76-103		76-103	103.0		100.0	103.0	65.0	92.0
19	17	Clothes dryer	1032.0	993.0	1100.0	1200.0	980.0	993.0		993.0	993.0		1200.0	1200.0	980.0	1053.8
20	18	Room air-cond'r	3573.0	1389.0	1265.0	2000.0		1389.0		1889.0			1300.0	3573.0	1265.0	1829.3
21	19	Central air-cond'r	978.0											978.0	978.0	978.0
22	20	Central furnace	2558.0											2558.0	2558.0	2558.0
23	21	Swim'g pool pump	1307.0								1000.0	1500.0		1500.0	1000.0	1269.0
24	22	TV Sets														
25	23	Color		502.0	450.0	540.0		660-440			320.0	250.0		540.0	250.0	412.4
26	24	B&W		362.0	345.0	400.0		350-120			100.0	40.0		400.0	40.0	249.4
27	25	VCR										40.0		40.0	40.0	40.0
28	26	Computer										130.0		130.0	130.0	130.0
29	27	Humidifier						163.0		136.0	163.0	100.0		163.0	100.0	140.5
30	28	Dehumidifier			380.0			377.0		377.0	377.0	400.0		400.0	377.0	382.2
31	29	Aquarium/terrarium										548.0		548.0	548.0	548.0
32	30	Toaster		39.0	35.0	40.0	39.0	39.0	39.0	39.0		50.0		50.0	35.0	40.0

Table 14 - Electricity Consumption Data (kWh/yr) Pg. 2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
33	31	Waffle iron		22.0			22.0	22.0	20.0	22.0				22.0	20.0	21.6
34	32	Griddle							46.0					46.0	46.0	46.0
35	33	Fry pan (skillet)		186.0	190.0	240.0	189.0	186.0	100.0	186.0				240.0	100.0	182.4
36	34	Mixer		13.0		10.0	13.0	13.0	2.0	13.0				13.0	2.0	10.7
37	35	Coffee maker		106.0	95.0	100.0	76.0	106.0	138.0	106.0		50.0		138.0	50.0	97.1
38	36	Blender		15.0			15.0	15.0	0.9	15.0				15.0	0.9	12.2
39	37	Juicer							0.6					0.6	0.6	0.6
40	38	Can opener		10.0		0.3	5.0		0.3					10.0	0.3	3.9
41	39	Opener/sharpener								0.2				0.2	0.2	0.2
42	40	Sharpener								0.2				0.2	0.2	0.2
43	41	Crockpot							139.0					139.0	139.0	139.0
44	42	Wok/fondue set							9.0					9.0	9.0	9.0
45	43	Broiler		100.0				100.0	85.0	100.0				100.0	85.0	96.3
46	44	Roaster						205.0	60.0	205.0				205.0	60.0	156.7
47	45	Toaster oven							93.0					93.0	93.0	93.0
48	46	Plate warmer		90.0		100.0	91.0	90.0		90.0				100.0	90.0	92.2
49	47	Knife/slicer					8.0	8.0	0.8	8.0				8.0	0.8	6.2
50	48	Food grinder														
51	49	Popcorn popper														
52	50	Ice crusher							0.5					0.5	0.5	0.5
53	51	Ice cream maker							0.7					0.7	0.7	0.7
54	52	Instant hot water										160.0		160.0	160.0	160.0
55	53	Clock		17.0	18.0	17.0		17.0				25.0		25.0	17.0	18.8
56	54	Garbage disposal		30.0		30.0	30.0	30.0		30.0		10.0		30.0	10.0	26.7
57	55	Trash compactor						30.0		50.0				50.0	30.0	40.0
58	56	Deep fryer						83.0		83.0				83.0	83.0	83.0
59	57	Egg cooker						14.0	13.0	14.0				14.0	13.0	13.7
60	58	Sandwich grill						33.0	20.0	33.0				33.0	20.0	28.7
61	59	Kettle							75.0					75.0	75.0	75.0
62	60	Rotisserie							73.0					73.0	73.0	73.0
63	61	Baby food warmer							22.0					22.0	22.0	22.0
64	62	Cooker/fryer							23.0					23.0	23.0	23.0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
65	63	Table radio		86.0	90.0	20.0		86.0						90.0	20.0	70.5
66	64	Audio system										50.0		50.0	50.0	50.0
67	65	Amp'r (guitar/organ)														
68	66	CD player														
69	67	Tape deck														
70	68	Slide/movie projector														
71	69	Blanket		147.0	140.0	150.0		147.0		147.0	147.0	120.0		150.0	120.0	142.6
72	70	Waterbed heater									1600.0	900.0		1600.0	900.0	1250.0
73	71	Massager						2.0	0.3					2.0	0.3	1.2
74	72	Heating pad		10.0	9.0			10.0	3.0	10.0				10.0	3.0	8.4
75	73	Heat tape										100.0		100.0	100.0	100.0
76	74	Heat lamp						15.0						15.0	15.0	15.0
77	75	Grow lights & acc.										800.0		800.0	800.0	800.0
78	76	Shaver			2.0	0.6		1.8	0.5					2.0	0.5	1.2
79	77	Hair dryer		14.0	7.0	15.0		14.0	25.0			40.0		40.0	7.0	19.2
80	78	Curling iron														
81	79	Curler														
82	80	Hot comb														
83	81	Tooth brush						0.5	10.0					10.0	0.5	5.3
84	82	Water pic														
85	83	Sewing machine						11.0						11.0	11.0	11.0
86	84	Portable heater						170.0		176.0				176.0	170.0	173.0
87	85	Exhaust fan														
88	86	Attic			310.0	270.0		291.0		291.0				310.0	270.0	290.5
89	87	Circulating						43.0		43.0	200.0	80.0		200.0	43.0	91.5
90	88	Furnace				480.0					650.0	500.0		650.0	480.0	543.3
91	89	Rollaway						138.0		133.0				138.0	133.0	135.5
92	90	Window						170.0		170.0		20.0		170.0	20.0	120.0
93	91	Ceiling									170.0	50.0		170.0	50.0	110.0
94	92	Exhaust										15.0		15.0	15.0	15.0
95	93	Vacuum cleaner		46.0	40.0	45.0	46.0	46.0				30.0		46.0	30.0	42.2
96	94	Iron		144.0	135.0	150.0	144.0	144.0	60.0	144.0		50.0		150.0	50.0	121.4

Table 14 - Electricity Consumption Data (kWh/yr) Pg. 4

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
97	95	Flood lights														
98	96	Fluorescent lights				1870.0								1870.0	1870.0	1870.0
99	97	Air cleaner						216.0		216.0				216.0	216.0	216.0
100	98	Floor polisher						15.0						15.0	15.0	15.0
101	99	Spa/hot tub										2300.0		2300.0	2300.0	2300.0
102	100	Sauna														
103	101	Lighting&conv.											4700.0	4700.0	4700.0	4700.0
104																
105		Notes:														
106		(1) Merchandising week data from Ref.8.														
107		(2) Potomac Electric Power Company from Ref.8														
108		(3) Citizens Advisory Committee on Environmental Quality from Ref. 8														
109		(4) University of Illinois from Ref. 8														
110		(5) Electric Energy Association/Energy Facts from Ref. 8														
111		(6) Association of Home Appliance Manufacturers from Ref. 8														
112		(7) Sizes ranging from 10 - 16 cubic feet														

Table 14/2 - Electricity Consumption Data (kWh/yr) - Sorted

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1			REFERENCE NUMBER (Notes in parantheses explained at the bottom of table)													
2	App.#	Electric appliance	8	8 (1)	8(2)	8(3)	8(4)	8(5)	8(6)	12	4,5	11	6	Maximum	Minimum	Average
3	101	Lighting&conv.											4700.0	4700.0	4700.0	4700.0
4	14	Water heater	4046.0	4515.0	5400.0		4233.0	4219.0		4219.0			4800.0	5400.0	4046.0	4490.3
5	20	Central furnace	2558.0											2558.0	2558.0	2558.0
6	99	Spa/hot tub										2300.0		2300.0	2300.0	2300.0
7	96	Fluorescent lights				1870.0								1870.0	1870.0	1870.0
8	18	Room air-cond'r	3573.0	1389.0	1265.0	2000.0		1389.0		1889.0			1300.0	3573.0	1265.0	1829.3
9	9	Frostless - Frz			1760.0		1739.0	1761.0		1761.0	1820.0			1820.0	1739.0	1768.2
10	6	Frostless - R/F			1505.0			1829.0		1829.0				1829.0	1505.0	1721.0
11	3	Frostless - Ref.					1210.0	1217.0		1217.0	1591.0			1591.0	1210.0	1308.8
12	8	Standard - Frz	1342.0	1480.0	1560.0	1200.0	1210.0	1195.0		1195.0	1050.0		1450.0	1560.0	1050.0	1298.0
13	21	Swim'g pool pump	1307.0								1000.0	1500.0		1500.0	1000.0	1269.0
14	70	Waterbed heater									1600.0	900.0		1600.0	900.0	1250.0
15	5	Standard - R/F		1228.0	1085-1330		1137.0	1137.0		1137.0				1228.0	1137.0	1159.8
16	10	Range	782.0	2071.0	1225.0	1550.0	1210.0	1175-1205		1175-1205	596.0		600.0	2071.0	596.0	1147.7
17	17	Clothes dryer	1032.0	993.0	1100.0	1200.0	980.0	993.0		993.0	993.0		1200.0	1200.0	980.0	1053.8
18	2	Standard - Ref.	1665.0		460.0	750.0	726.0	728.0		728.0	1500.0		1500.0	1665.0	460.0	1007.1
19	19	Central air-cond'r	978.0											978.0	978.0	978.0
20	75	Grow lights & acc.										800.0		800.0	800.0	800.0
21	11	Cooktop	553.0											553.0	553.0	553.0
22	29	Aquarium/terrarium										548.0		548.0	548.0	548.0
23	88	Furnace - fan				480.0					650.0	500.0		650.0	480.0	543.3
24	23	Color - TV		502.0	450.0	540.0		660-440			320.0	250.0		540.0	250.0	412.4
25	12	Conv'n Oven	401.0											401.0	401.0	401.0
26	28	Dehumidifier			380.0			377.0		377.0	377.0	400.0		400.0	377.0	382.2
27	86	Attic - Fan			310.0	270.0		291.0		291.0				310.0	270.0	290.5
28	15	Dishwasher	149.0	363.0	340.0	350.0	378.0	362.0		363.0	185.0	200.0	120.0	378.0	120.0	281.0
29	24	B&W - TV		362.0	345.0	400.0		350-120			100.0	40.0		400.0	40.0	249.4
30	97	Air cleaner						216.0		216.0				216.0	216.0	216.0
31	33	Fry pan (skillet)		186.0	190.0	240.0	189.0	186.0	100.0	186.0				240.0	100.0	182.4
32	13	Microwave		300.0				190.0		190.0	100.0	120.0		300.0	100.0	180.0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
33	84	Portable heater						170.0		176.0				176.0	170.0	173.0
34	52	Instant hot water										160.0		160.0	160.0	160.0
35	44	Roaster						205.0	60.0	205.0				205.0	60.0	156.7
36	69	Blanket		147.0	140.0	150.0		147.0		147.0	147.0	120.0		150.0	120.0	142.6
37	27	Humidifier						163.0		136.0	163.0	100.0		163.0	100.0	140.5
38	41	Crockpot							139.0					139.0	139.0	139.0
39	89	Rollaway - Fan						138.0		133.0				138.0	133.0	135.5
40	26	Computer										130.0		130.0	130.0	130.0
41	94	Iron		144.0	135.0	150.0	144.0	144.0	60.0	144.0		50.0		150.0	50.0	121.4
42	90	Window - Fan						170.0		170.0		20.0		170.0	20.0	120.0
43	91	Ceiling - Fan									170.0	50.0		170.0	50.0	110.0
44	73	Heat tape										100.0		100.0	100.0	100.0
45	35	Coffee maker		106.0	95.0	100.0	76.0	106.0	138.0	106.0		50.0		138.0	50.0	97.1
46	43	Broiler		100.0				100.0	85.0	100.0				100.0	85.0	96.3
47	45	Toaster oven							93.0					93.0	93.0	93.0
48	46	Plate warmer		90.0		100.0	91.0	90.0		90.0				100.0	90.0	92.2
49	16	Clothes washer	88.0	90.0	65.0	100.0	98.0	76-103		76-103	103.0		100.0	103.0	65.0	92.0
50	87	Circulating - fan						43.0		43.0	200.0	80.0		200.0	43.0	91.5
51	56	Deep fryer						83.0		83.0				83.0	83.0	83.0
52	59	Kettle							75.0					75.0	75.0	75.0
53	60	Rotisserie							73.0					73.0	73.0	73.0
54	63	Table radio		86.0	90.0	20.0		86.0						90.0	20.0	70.5
55	64	Audio system										50.0		50.0	50.0	50.0
56	32	Griddle							46.0					46.0	46.0	46.0
57	93	Vacuum cleaner		46.0	40.0	45.0	46.0	46.0				30.0		46.0	30.0	42.2
58	25	VCR										40.0		40.0	40.0	40.0
59	30	Toaster		39.0	35.0	40.0	39.0	39.0	39.0	39.0		50.0		50.0	35.0	40.0
60	55	Trash compactor						30.0		50.0				50.0	30.0	40.0
61	58	Sandwich grill						33.0	20.0	33.0				33.0	20.0	28.7
62	54	Garbage disposal		30.0		30.0	30.0	30.0		30.0		10.0		30.0	10.0	26.7
63	62	Cooker/fryer							23.0					23.0	23.0	23.0
64	61	Baby food warmer							22.0					22.0	22.0	22.0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
65	31	Waffle iron		22.0			22.0	22.0	20.0	22.0				22.0	20.0	21.6
66	77	Hair dryer		14.0	7.0	15.0		14.0	25.0			40.0		40.0	7.0	19.2
67	53	Clock		17.0	18.0	17.0		17.0				25.0		25.0	17.0	18.8
68	74	Heat lamp						15.0						15.0	15.0	15.0
69	92	Exhaust - Fan										15.0		15.0	15.0	15.0
70	98	Floor polisher						15.0						15.0	15.0	15.0
71	57	Egg cooker						14.0	13.0	14.0				14.0	13.0	13.7
72	36	Blender		15.0			15.0	15.0	0.9	15.0				15.0	0.9	12.2
73	83	Sewing machine						11.0						11.0	11.0	11.0
74	34	Mixer		13.0		10.0	13.0	13.0	2.0	13.0				13.0	2.0	10.7
75	42	Wok/fondue set							9.0					9.0	9.0	9.0
76	72	Heating pad		10.0	9.0			10.0	3.0	10.0				10.0	3.0	8.4
77	47	Knife/slicer					8.0	8.0	0.8	8.0				8.0	0.8	6.2
78	81	Tooth brush						0.5	10.0					10.0	0.5	5.3
79	38	Can opener		10.0		0.3	5.0		0.3					10.0	0.3	3.9
80	76	Shaver			2.0	0.6		1.8	0.5					2.0	0.5	1.2
81	71	Massager						2.0	0.3					2.0	0.3	1.2
82	51	Ice cream maker							0.7					0.7	0.7	0.7
83	37	Juicer							0.6					0.6	0.6	0.6
84	50	Ice crusher							0.5					0.5	0.5	0.5
85	39	Opener/sharpener								0.2				0.2	0.2	0.2
86	40	Sharpener								0.2				0.2	0.2	0.2
87																
88		Notes:														
89		(1) Merchandising week data from Ref.8.														
90		(2) Potomac Electric Power Company from Ref.8														
91		(3) Citizens Advisory Committee on Environmental Quality from Ref. 8														
92		(4) University of Illinois from Ref. 8														
93		(5) Electric Energy Association/Energy Facts from Ref. 8														
94		(6) Association of Home Appliance Manufacturers from Ref. 8														
95		(7) Sizes ranging from 10 - 16 cubic feet														
96		**Appliance numbers (App.#) as given in Table 14**														

Table 15 - Saturation Data Pg. 1

	A	B	C	D	E	F	G	H	I	J	K
1					REFERENCE NUMBER						
2	App.#	Electric appliance	8	11	6	14	1	13	Maximum	Minimum	Average
3	1	Refrigerator	9.72						9.72	9.72	9.72
4	2	Standard - Ref.									
5	3	Frostless - Ref.									
6	4	Refrigerator/freezer	95.56		100	99.9	97.7	99.4	100.00	95.56	98.51
7	5	Standard - R/F									
8	6	Frostless -R/F									
9	7	Freezer	36.87		52.5	33	45.4	57.9	57.90	33.00	45.13
10	8	Standard - Frz									
11	9	Frostless - Frz									
12	10	Range	33.04		95	56.7	63.2		95.00	33.04	61.99
13	11	Cooktop	11.98						11.98	11.98	11.98
14	12	Conv'n Oven	12.54			18			18.00	12.54	15.27
15	13	Microwave	3.42	80		85.2	82.7	76	85.20	3.42	65.46
16	14	Water heater	12.79		84.9	45			84.90	12.79	47.56
17	15	Dishwasher	39.74	42		47.7	53.9	44.2	53.90	39.74	45.51
18	16	Clothes washer	87.40			73	85.9	78.6	87.40	73.00	81.23
19	17	Clothes dryer	42.97		71	50.6	60.1	74	74.00	42.97	59.73
20	18	Room air-cond'r	41.61			29	32.4	10.6	41.61	10.60	28.40
21	19	Central air-cond'r	25.99		11.7	41		16.1	41.00	11.70	23.70
22	20	Central furnace									
23	21	Swim'g pool pump									
24	22	TV Sets									
25	23	Color - TV	78.74	98		97		97.5	98.00	78.74	92.81
26	24	B&W - TV	62.41	55		52			62.41	52.00	56.47
27	25	VCR		65		77		73.8	77.00	65.00	71.93
28	26	Computer		15		33		20	33.00	15.00	22.67
29	27	Humidifier	29.77	12					29.77	12.00	20.89
30	28	Dehumidifier	28.01	12		12	16.7		28.01	12.00	17.18
31	29	Aquarium/terrarium		10					10.00	10.00	10.00
32	30	Toaster	88.26	95		89			95.00	88.26	90.75
33	31	Waffle iron	33.09						33.09	33.09	33.09
34	32	Griddle	10.27						10.27	10.27	10.27
35	33	Fry pan (skillet)	52.89			60			60.00	52.89	56.45
36	34	Mixer	69.26			84			84.00	69.26	76.63
37	35	Coffee maker	66.90	40		73.5			73.50	40.00	60.13
38	36	Blender	64.23			77.5			77.50	64.23	70.87
39	37	Juicer	5.34						5.34	5.34	5.34
40	38	Can opener	34.00						34.00	34.00	34.00
41	39	Opener/sharpener	33.09						33.09	33.09	33.09
42	40	Sharpener	4.78						4.78	4.78	4.78
43	41	Crockpot	32.09						32.09	32.09	32.09
44	42	Wok/fondue set	5.54						5.54	5.54	5.54
45	43	Broiler	17.93						17.93	17.93	17.93

Table 15 - Saturation Data

	A	B	C	D	E	F	G	H	I	J	K
46	44	Roaster									
47	45	Toaster oven	21.61						21.61	21.61	21.61
48	46	Plate warmer	15.36						15.36	15.36	15.36
49	47	Knife/slicer	38.99						38.99	38.99	38.99
50	48	Food grinder	4.78			48			48.00	4.78	26.39
51	49	Popcorn popper	32.74						32.74	32.74	32.74
52	50	Ice crusher	6.95						6.95	6.95	6.95
53	51	Ice cream maker	9.87						9.87	9.87	9.87
54	52	Instant hot water		1					1.00	1.00	1.00
55	53	Clock	89.97	100		97			100.00	89.97	95.66
56	54	Garbage disposal	6.64	45		47	39.5		47.00	6.64	34.54
57	55	Trash compactor	0.95				4.3		4.30	0.95	2.63
58	56	Deep fryer									
59	57	Egg cooker									
60	58	Sandwich grill									
61	59	Kettle									
62	60	Rotisserie									
63	61	Baby food warmer									
64	62	Cooker/fryer									
65	63	Table radio	82.41		98.8	98			98.80	82.41	93.07
66	64	Audio system	67.10	0.8		54			67.10	0.80	40.63
67	65	Amplifier (guitar/organ)	7.65						7.65	7.65	7.65
68	66	CD player			26.9	35			35.00	26.90	30.95
69	67	Tape deck	3.67		72.8				72.80	3.67	38.24
70	68	Slide/movie projector	28.71						28.71	28.71	28.71
71	69	Blanket	27.49	30					30.00	27.49	28.75
72	70	Waterbed heater		16					16.00	16.00	16.00
73	71	Massager	1.33						1.33	1.33	1.33
74	72	Heating pad	5.74						5.74	5.74	5.74
75	73	Heat tape		4					4.00	4.00	4.00
76	74	Heat lamp	7.20						7.20	7.20	7.20
77	75	Grow lights & acc.		4					4.00	4.00	4.00
78	76	Shaver	43.17			55			55.00	43.17	49.09
79	77	Hair dryer	52.04	85		96			96.00	52.04	77.68
80	78	Curling iron	21.45						21.45	21.45	21.45
81	79	Curler	25.14			50			50.00	25.14	37.57
82	80	Hot comb	45.69						45.69	45.69	45.69
83	81	Tooth brush	10.07			7			10.07	7.00	8.54
84	82	Water pic	7.85						7.85	7.85	7.85
85	83	Sewing machine	67.85						67.85	67.85	67.85
86	84	Portable heater	22.41						22.41	22.41	22.41
87	85	Exhaust fan				65					
88	86	Attic - fan	41.55						41.55	41.55	41.55
89	87	Circulating - fan		9					9.00	9.00	9.00
90	88	Furnace - fan		53					53.00	53.00	53.00

	A	B	C	D	E	F	G	H	I	J	K
91	89	Rollaway - fan	50.37						50.37	50.37	50.37
92	90	Window - fan		10					10.00	10.00	10.00
93	91	Ceiling - fan		30		34			34.00	30.00	32.00
94	92	Exhaust - fan		45					45.00	45.00	45.00
95	93	Vacuum cleaner	94.35	100		97.2			100.00	94.35	97.18
96	94	Iron		30		89			89.00	30.00	59.50
97	95	Flood lights	28.20						28.20	28.20	28.20
98	96	Fluorescent lights									
99	97	Air cleaner									
100	98	Floor polisher				6			6.00	6.00	6.00
101	99	Spa/hot tub		1.5					1.50	1.50	1.50
102	100	Sauna	0.30						0.30	0.30	0.30
103	101	Lighting&convenience									

	A	B	C	D	E	F	G	H	I	J	K
1			REFERENCE NUMBER								
2	App.#	Electric appliance	8	11	6	14	1	13	Maximum	Minimum	Average
3	4	Refrigerator/freezer	95.56		100	99.9	97.7	99.4	100.00	95.56	98.51
4	93	Vacuum cleaner	94.35	100		97.2			100.00	94.35	97.18
5	53	Clock	89.97	100		97			100.00	89.97	95.66
6	63	Table radio	82.41		98.8	98			98.80	82.41	93.07
7	23	Color - TV	78.74	98		97		97.5	98.00	78.74	92.81
8	30	Toaster	88.26	95		89			95.00	88.26	90.75
9	16	Clothes washer	87.40			73	85.9	78.6	87.40	73.00	81.23
10	77	Hair dryer	52.04	85		96			96.00	52.04	77.68
11	34	Mixer	69.26			84			84.00	69.26	76.63
12	25	VCR		65		77		73.8	77.00	65.00	71.93
13	36	Blender	64.23			77.5			77.50	64.23	70.87
14	83	Sewing machine	67.85						67.85	67.85	67.85
15	13	Microwave	3.42	80		85.2	82.7	76	85.20	3.42	65.46
16	85	Exhaust fan				65			65.00	65.00	65.00
17	10	Range	33.04		95	56.7	63.2		95.00	33.04	61.99
18	35	Coffee maker	66.90	40		73.5			73.50	40.00	60.13
19	17	Clothes dryer	42.97		71	50.6	60.1	74	74.00	42.97	59.73
20	94	Iron		30		89			89.00	30.00	59.50
21	24	B&W - TV	62.41	55		52			62.41	52.00	56.47
22	33	Fry pan (skillet)	52.89			60			60.00	52.89	56.45
23	88	Furnace - fan		53					53.00	53.00	53.00
24	89	Rollaway - fan	50.37						50.37	50.37	50.37
25	76	Shaver	43.17			55			55.00	43.17	49.09
26	14	Water heater	12.79		84.9	45			84.90	12.79	47.56
27	80	Hot comb	45.69						45.69	45.69	45.69
28	15	Dishwasher	39.74	42		47.7	53.9	44.2	53.90	39.74	45.51
29	7	Freezer	36.87		52.5	33	45.4	57.9	57.90	33.00	45.13
30	92	Exhaust - fan		45					45.00	45.00	45.00
31	86	Attic - fan	41.55						41.55	41.55	41.55
32	64	Audio system	67.10	0.8		54			67.10	0.80	40.63
33	47	Knife/slicer	38.99						38.99	38.99	38.99
34	67	Tape deck	3.67		72.8				72.80	3.67	38.24
35	79	Curler	25.14			50			50.00	25.14	37.57
36	54	Garbage disposal	6.64	45		47	39.5		47.00	6.64	34.54
37	38	Can opener	34.00						34.00	34.00	34.00
38	31	Waffle iron	33.09						33.09	33.09	33.09
39	39	Opener/sharpener	33.09						33.09	33.09	33.09
40	49	Popcorn popper	32.74						32.74	32.74	32.74
41	41	Crockpot	32.09						32.09	32.09	32.09
42	91	Ceiling - fan		30		34			34.00	30.00	32.00
43	66	CD player			26.9	35			35.00	26.90	30.95
44	69	Blanket	27.49	30					30.00	27.49	28.75
45	68	Slide/movie projector	28.71						28.71	28.71	28.71

	A	B	C	D	E	F	G	H	I	J	K
46	18	Room air-cond'r	41.61			29	32.4	10.6	41.61	10.60	28.40
47	95	Flood lights	28.20						28.20	28.20	28.20
48	48	Food grinder	4.78			48			48.00	4.78	26.39
49	19	Central air-cond'r	25.99		11.7	41		16.1	41.00	11.70	23.70
50	26	Computer		15		33		20	33.00	15.00	22.67
51	84	Portable heater	22.41						22.41	22.41	22.41
52	45	Toaster oven	21.61						21.61	21.61	21.61
53	78	Curling iron	21.45						21.45	21.45	21.45
54	27	Humidifier	29.77	12					29.77	12.00	20.89
55	43	Broiler	17.93						17.93	17.93	17.93
56	28	Dehumidifier	28.01	12		12	16.7		28.01	12.00	17.18
57	70	Waterbed heater		16					16.00	16.00	16.00
58	46	Plate warmer	15.36						15.36	15.36	15.36
59	12	Conv'n Oven	12.54			18			18.00	12.54	15.27
60	11	Cooktop	11.98						11.98	11.98	11.98
61	32	Griddle	10.27						10.27	10.27	10.27
62	29	Aquarium/terrarium		10					10.00	10.00	10.00
63	90	Window - fan		10					10.00	10.00	10.00
64	51	Ice cream maker	9.87						9.87	9.87	9.87
65	1	Refrigerator	9.72						9.72	9.72	9.72
66	87	Circulating - fan		9					9.00	9.00	9.00
67	81	Tooth brush	10.07			7			10.07	7.00	8.54
68	82	Water pic	7.85						7.85	7.85	7.85
69	65	Amplifier (guitar/organ)	7.65						7.65	7.65	7.65
70	74	Heat lamp	7.20						7.20	7.20	7.20
71	50	Ice crusher	6.95						6.95	6.95	6.95
72	98	Floor polisher				6			6.00	6.00	6.00
73	72	Heating pad	5.74						5.74	5.74	5.74
74	42	Wok/fondue set	5.54						5.54	5.54	5.54
75	37	Juicer	5.34						5.34	5.34	5.34
76	40	Sharpener	4.78						4.78	4.78	4.78
77	73	Heat tape		4					4.00	4.00	4.00
78	75	Grow lights & acc.		4					4.00	4.00	4.00
79	55	Trash compactor	0.95				4.3		4.30	0.95	2.63
80	99	Spa/hot tub		1.5					1.50	1.50	1.50
81	71	Massager	1.33						1.33	1.33	1.33
82	52	Instant hot water		1					1.00	1.00	1.00
83	100	Sauna	0.30						0.30	0.30	0.30
84	2	Standard - Ref.									
85	3	Frostless - Ref.									
86	5	Standard - R/F									
87	6	Frostless -R/F									
88	8	Standard - Frz									
89	9	Frostless - Frz									
90	20	Central furnace									

	A	B	C	D	E	F	G	H	I	J	K
91	21	Swim'g pool pump									
92	22	TV Sets									
93	44	Roaster									
94	56	Deep fryer									
95	57	Egg cooker									
96	58	Sandwich grill									
97	59	Kettle									
98	60	Rotisserie									
99	61	Baby food warmer									
100	62	Cooker/fryer									
101	96	Fluorescent lights									
102	97	Air cleaner									
103	101	Lighting&convenience									

	A	B	C	D	E	F	G	H	I
1			SATURATION (%)			ELECT. CONS'N (kWh/yr)			
2	App.#	Electric appliance	Maximum	Minimum	Average	Maximum	Minimum	Average	CLASS'N
3	1	Refrigerator (1)	9.72	9.72	9.72	1628.0	835.0	1157.9	B
4	2	Standard - Ref				1665.0	460.0	1007.1	KAB
5	3	Frostless Ref				1591.0	1210.0	1308.8	KAB
6	4	Refrigerator/freez	100	95.56	98.51	1528.5	1321.0	1440.4	A
7	5	Standard - R/F				1228.0	1137.0	1159.8	KAB
8	6	Frostless - R/F				1829.0	1505.0	1721.0	KAB
9	7	Freezer	57.9	33	45.13	1690.0	1394.5	1533.1	A
10	8	Standard - Frz				1560.0	1050.0	1298.0	KAB
11	9	Frostless - Frz				1820.0	1739.0	1768.2	KAB
12	10	Range	95	33.04	61.99	2071.0	596.0	1147.7	A
13	11	Cooktop	11.98	11.98	11.98	553.0	553.0	553.0	B
14	12	Conv'n Oven	18	12.54	15.27	401.0	401.0	401.0	B
15	13	Microwave	85.2	3.42	65.46	300.0	100.0	180.0	C
16	14	Water heater	84.9	12.79	47.56	5400.0	4046.0	4490.3	A
17	15	Dishwasher	53.9	39.74	45.51	378.0	120.0	281.0	A
18	16	Clathes washer	87.4	73	81.23	103.0	65.0	92.0	C
19	17	Clothes dryer	74	42.97	59.73	1200.0	980.0	1053.8	A
20	18	Room air-cond'r	41.61	10.6	28.40	3573.0	1265.0	1829.3	B
21	19	Central air-cond'r	41	11.7	23.70	978.0	978.0	978.0	B
22	20	Central furnace				2558.0	2558.0	2558.0	KAB
23	21	Swim'g pool pump				1500.0	1000.0	1269.0	KAB
24	22	TV Sets							KCD
25	23	Color - TV	98	78.74	92.81	540.0	250.0	412.4	A
26	24	B&W - TV	62.41	52	56.47	400.0	40.0	249.4	A
27	25	VCR	77	65	71.93	40.0	40.0	40.0	C
28	26	Computer	33	15	22.67	130.0	130.0	130.0	D
29	27	Humidifier	29.77	12	20.89	163.0	100.0	140.5	D
30	28	Dehumidifier	28.01	12	17.18	400.0	377.0	382.2	B
31	29	Aquarium/terrariu	10	10	10.00	548.0	548.0	548.0	B
32	30	Toaster	95	88.26	90.75	50.0	35.0	40.0	C
33	31	Waffle iron	33.09	33.09	33.09	22.0	20.0	21.6	D
34	32	Griddle	10.27	10.27	10.27	46.0	46.0	46.0	D
35	33	Fry pan (skillet)	60	52.89	56.45	240.0	100.0	182.4	C
36	34	Mixer	84	69.26	76.63	13.0	2.0	10.7	C
37	35	Coffee maker	73.5	40	60.13	138.0	50.0	97.1	C
38	36	Blender	77.5	64.23	70.87	15.0	0.9	12.2	C
39	37	Juicer	5.34	5.34	5.34	0.6	0.6	0.6	D
40	38	Can opener	34	34	34.00	10.0	0.3	3.9	D
41	39	Opener/sharpene	33.09	33.09	33.09	0.2	0.2	0.2	D
42	40	Sharpener	4.78	4.78	4.78	0.2	0.2	0.2	D
43	41	Crockpot	32.09	32.09	32.09	139.0	139.0	139.0	D
44	42	Wok/fondue set	5.54	5.54	5.54	9.0	9.0	9.0	D
45	43	Broiler	17.93	17.93	17.93	100.0	85.0	96.3	D

Table 16 - Classification of Appliances Pg. 2

	A	B	C	D	E	F	G	H	I
46	44	Roaster				205.0	60.0	156.7	KCD
47	45	Toaster oven	21.61	21.61	21.61	93.0	93.0	93.0	D
48	46	Plate warmer	15.36	15.36	15.36	100.0	90.0	92.2	D
49	47	Knife/slicer	38.99	38.99	38.99	8.0	0.8	6.2	D
50	48	Food grinder	48	4.78	26.39				D
51	49	Popcorn popper	32.74	32.74	32.74				D
52	50	Ice crusher	6.95	6.95	6.95	0.5	0.5	0.5	D
53	51	Ice cream maker	9.87	9.87	9.87	0.7	0.7	0.7	D
54	52	Instant hot water	1	1	1.00	160.0	160.0	160.0	D
55	53	Clock	100	89.97	95.66	25.0	17.0	18.8	C
56	54	Garbage disposal	47	6.64	34.54	30.0	10.0	26.7	D
57	55	Trash compactor	4.3	0.95	2.63	50.0	30.0	40.0	D
58	56	Deep fryer				83.0	83.0	83.0	KCD
59	57	Egg cooker				14.0	13.0	13.7	KCD
60	58	Sandwich grill				33.0	20.0	28.7	KCD
61	59	Kettle				75.0	75.0	75.0	KCD
62	60	Rotisserie				73.0	73.0	73.0	KCD
63	61	Baby food warmer				22.0	22.0	22.0	KCD
64	62	Cooker/fryer				23.0	23.0	23.0	KCD
65	63	Table radio	98.8	82.41	93.07	90.0	20.0	70.5	C
66	64	Audio system	67.1	0.8	40.63	50.0	50.0	50.0	C
67	65	Amp'r (guitar/orga	7.65	7.65	7.65				D
68	66	CD player	35	26.9	30.95				D
69	67	Tape deck	72.8	3.67	38.24				D
70	68	Slide/movie proje	28.71	28.71	28.71				D
71	69	Blanket	30	27.49	28.75	150.0	120.0	142.6	D
72	70	Waterbed heater	16	16	16.00	1600.0	900.0	1250.0	B
73	71	Massager	1.33	1.33	1.33	2.0	0.3	1.2	D
74	72	Heating pad	5.74	5.74	5.74	10.0	3.0	8.4	D
75	73	Heat tape	4	4	4.00	100.0	100.0	100.0	D
76	74	Heat lamp	7.2	7.2	7.20	15.0	15.0	15.0	D
77	75	Grow lights & acc	4	4	4.00	800.0	800.0	800.0	B
78	76	Shaver	55	43.17	49.09	2.0	0.5	1.2	C
79	77	Hair dryer	96	52.04	77.68	40.0	7.0	19.2	C
80	78	Curling iron	21.45	21.45	21.45				D
81	79	Curler	50	25.14	37.57				D
82	80	Hot comb	45.69	45.69	45.69				C
83	81	Tooth brush	10.07	7	8.54	10.0	0.5	5.3	D
84	82	Water pic	7.85	7.85	7.85				D
85	83	Sewing machine	67.85	67.85	67.85	11.0	11.0	11.0	C
86	84	Portable heater	22.41	22.41	22.41	176.0	170.0	173.0	D
87	85	Exhaust fan							KCD
88	86	Attic - Fan	41.55	41.55	41.55	310.0	270.0	290.5	A
89	87	Circulating- Fan	9	9	9.00	200.0	43.0	91.5	D
90	88	Furnace- Fan	53	53	53.00	650.0	480.0	543.3	A

	A	B	C	D	E	F	G	H	I
91	89	Rollaway- Fan	50.37	50.37	50.37	138.0	133.0	135.5	C
92	90	Window- Fan	10	10	10.00	170.0	20.0	120.0	D
93	91	Ceiling- Fan	34	30	32.00	170.0	50.0	110.0	D
94	92	Exhaust- Fan	45	45	45.00	15.0	15.0	15.0	C
95	93	Vacuum cleaner	100	94.35	97.18	46.0	30.0	42.2	C
96	94	Iron	89	30	59.50	150.0	50.0	121.4	C
97	95	Flood lights	28.2	28.2	28.20				D
98	96	Fluorescent lights				1870.0	1870.0	1870.0	KAB
99	97	Air cleaner				216.0	216.0	216.0	KAB
100	98	Floor polisher	6	6	6.00	15.0	15.0	15.0	D
101	99	Spa/hot tub	1.5	1.5	1.50	2300.0	2300.0	2300.0	B
102	100	Sauna	0.3	0.3	0.30				D
103	101	Lighting&conv.				4700.0	4700.0	4700.0	KAB
104									
105	(1) The values for refrigerator, refrigerator/freezer, and freezer are								
106	the averages for standard and frostless models								

Table 16/2 - Classification of Appliances - Sorted Pg. 1

	A	B	C	D	E	F	G	H	I
1			SATURATION (%)			ELECT. CONS'N (kWh/yr)			
2	App.#	Electric appliance	Maximum	Minimum	Average	Maximum	Minimum	Average	CLASS'N
3	14	Water heater	84.9	12.79	47.56	5400.0	4046.0	4490.3	A
4	7	Freezer	57.9	33	45.13	1690.0	1394.5	1533.1	A
5	4	Refrigerator/freezer	100	95.56	98.51	1528.5	1321.0	1440.4	A
6	10	Range	95	33.04	61.99	2071.0	596.0	1147.7	A
7	17	Clothes dryer	74	42.97	59.73	1200.0	980.0	1053.8	A
8	88	Furnace- Fan	53	53	53.00	650.0	480.0	543.3	A
9	23	Color - TV	98	78.74	92.81	540.0	250.0	412.4	A
10	86	Attic - Fan	41.55	41.55	41.55	310.0	270.0	290.5	A
11	15	Dishwasher	53.9	39.74	45.51	378.0	120.0	281.0	A
12	24	B&W - TV	62.41	52	56.47	400.0	40.0	249.4	A
13	99	Spa/hot tub	1.5	1.5	1.50	2300.0	2300.0	2300.0	B
14	18	Room air-cond'r	41.61	10.6	28.40	3573.0	1265.0	1829.3	B
15	70	Waterbed heater	16	16	16.00	1600.0	900.0	1250.0	B
16	1	Refrigerator (7)	9.72	9.72	9.72	1628.0	835.0	1157.9	B
17	19	Central air-cond'r	41	11.7	23.70	978.0	978.0	978.0	B
18	75	Grow lights & acc.	4	4	4.00	800.0	800.0	800.0	B
19	11	Cooktop	11.98	11.98	11.98	553.0	553.0	553.0	B
20	29	Aquarium/terrarium	10	10	10.00	548.0	548.0	548.0	B
21	12	Conv'n Oven	18	12.54	15.27	401.0	401.0	401.0	B
22	28	Dehumidifier	28.01	12	17.18	400.0	377.0	382.2	B
23	33	Fry pan (skillet)	60	52.89	56.45	240.0	100.0	182.4	C
24	13	Microwave	85.2	3.42	65.46	300.0	100.0	180.0	C
25	89	Rollaway- Fan	50.37	50.37	50.37	138.0	133.0	135.5	C
26	94	Iron	89	30	59.50	150.0	50.0	121.4	C
27	35	Coffee maker	73.5	40	60.13	138.0	50.0	97.1	C
28	16	Clothes washer	87.4	73	81.23	103.0	65.0	92.0	C
29	63	Table radio	98.8	82.41	93.07	90.0	20.0	70.5	C
30	64	Audio system	67.1	0.8	40.63	50.0	50.0	50.0	C
31	93	Vacuum cleaner	100	94.35	97.18	46.0	30.0	42.2	C
32	25	VCR	77	65	71.93	40.0	40.0	40.0	C
33	30	Toaster	95	88.26	90.75	50.0	35.0	40.0	C
34	77	Hair dryer	96	52.04	77.68	40.0	7.0	19.2	C
35	53	Clock	100	89.97	95.66	25.0	17.0	18.8	C
36	92	Exhaust- Fan	45	45	45.00	15.0	15.0	15.0	C
37	36	Blender	77.5	64.23	70.87	15.0	0.9	12.2	C
38	83	Sewing machine	67.85	67.85	67.85	11.0	11.0	11.0	C
39	34	Mixer	84	69.26	76.63	13.0	2.0	10.7	C
40	76	Shaver	55	43.17	49.09	2.0	0.5	1.2	C
41	84	Portable heater	22.41	22.41	22.41	176.0	170.0	173.0	D
42	52	Instant hot water	1	1	1.00	160.0	160.0	160.0	D
43	69	Blanket	30	27.49	28.75	150.0	120.0	142.6	D
44	27	Humidifier	29.77	12	20.89	163.0	100.0	140.5	D
45	41	Crockpot	32.09	32.09	32.09	139.0	139.0	139.0	D

Table 16/2 - Classification of Appliances - Sorted Pg. 2

	A	B	C	D	E	F	G	H	I
46	26	Computer	33	15	22.67	130.0	130.0	130.0	D
47	90	Window- Fan	10	10	10.00	170.0	20.0	120.0	D
48	91	Ceiling- Fan	34	30	32.00	170.0	50.0	110.0	D
49	73	Heat tape	4	4	4.00	100.0	100.0	100.0	D
50	43	Broiler	17.93	17.93	17.93	100.0	85.0	96.3	D
51	45	Toaster oven	21.61	21.61	21.61	93.0	93.0	93.0	D
52	46	Plate warmer	15.36	15.36	15.36	100.0	90.0	92.2	D
53	87	Circulating- Fan	9	9	9.00	200.0	43.0	91.5	D
54	32	Griddle	10.27	10.27	10.27	46.0	46.0	46.0	D
55	55	Trash compactor	4.3	0.95	2.63	50.0	30.0	40.0	D
56	54	Garbage disposal	47	6.64	34.54	30.0	10.0	26.7	D
57	31	Waffle iron	33.09	33.09	33.09	22.0	20.0	21.6	D
58	74	Heat lamp	7.2	7.2	7.20	15.0	15.0	15.0	D
59	98	Floor polisher	6	6	6.00	15.0	15.0	15.0	D
60	42	Wok/fondue set	5.54	5.54	5.54	9.0	9.0	9.0	D
61	72	Heating pad	5.74	5.74	5.74	10.0	3.0	8.4	D
62	47	Knife/slicer	38.99	38.99	38.99	8.0	0.8	6.2	D
63	81	Tooth brush	10.07	7	8.54	10.0	0.5	5.3	D
64	38	Can opener	34	34	34.00	10.0	0.3	3.9	D
65	71	Massager	1.33	1.33	1.33	2.0	0.3	1.2	D
66	51	Ice cream maker	9.87	9.87	9.87	0.7	0.7	0.7	D
67	37	Juicer	5.34	5.34	5.34	0.6	0.6	0.6	D
68	50	Ice crusher	6.95	6.95	6.95	0.5	0.5	0.5	D
69	39	Opener/sharpener	33.09	33.09	33.09	0.2	0.2	0.2	D
70	40	Sharpener	4.78	4.78	4.78	0.2	0.2	0.2	D
71	80	Hot comb	45.69	45.69	45.69				ABK
72	67	Tape deck	72.8	3.67	38.24				CDK
73	79	Curler	50	25.14	37.57				CDK
74	49	Popcorn popper	32.74	32.74	32.74				CDK
75	66	CD player	35	26.9	30.95				CDK
76	68	Slide/movie projector	28.71	28.71	28.71				CDK
77	95	Flood lights	28.2	28.2	28.20				CDK
78	48	Food grinder	48	4.78	26.39				CDK
79	78	Curling iron	21.45	21.45	21.45				CDK
80	82	Water pic	7.85	7.85	7.85				CDK
81	65	Amp'r (guitar/organ)	7.65	7.65	7.65				CDK
82	100	Sauna	0.3	0.3	0.30				CDK
83	101	Lighting&conv.				4700.0	4700.0	4700.0	KAB
84	20	Central furnace				2558.0	2558.0	2558.0	KAB
85	96	Fluorescent lights				1870.0	1870.0	1870.0	KAB
86	9	Frostless - Frz				1820.0	1739.0	1768.2	KAB
87	6	Frostless - R/F				1829.0	1505.0	1721.0	KAB
88	3	Frostless Ref				1591.0	1210.0	1308.8	KAB
89	8	Standard - Frz				1560.0	1050.0	1298.0	KAB
90	21	Swim'g pool pump				1500.0	1000.0	1269.0	KAB

Table 16/2 - Classification of Appliances - Sorted Pg. 3

	A	B	C	D	E	F	G	H	I
91	5	Standard - R/F				1228.0	1137.0	1159.8	KAB
92	2	Standard - Ref				1665.0	460.0	1007.1	KAB
93	97	Air cleaner				216.0	216.0	216.0	KAB
94	44	Roaster				205.0	60.0	156.7	KCD
95	56	Deep fryer				83.0	83.0	83.0	KCD
96	59	Kettle				75.0	75.0	75.0	KCD
97	60	Rotisserie				73.0	73.0	73.0	KCD
98	58	Sandwich grill				33.0	20.0	28.7	KCD
99	62	Cooker/fryer				23.0	23.0	23.0	KCD
100	61	Baby food warmer				22.0	22.0	22.0	KCD
101	57	Egg cooker				14.0	13.0	13.7	KCD

iii) For the purposes of this study, were recommend that the following appliances be considered as "major appliances":

1. Water heaters,
2. Cold food storage equipment (freezers, refrigerator/freezers, refrigerators),
3. Primary cooking equipment (ranges, ovens, cooktops),
4. Clothes dryers,
5. Clothes washer (since they additionally impact on energy consumtion through hot water usage)
6. Room and central-air conditioners (since combined saturation is greater than 40%)
7. TV's,
8. Fans.
9. Spa/hot tub, and sauna
10. Waterbed heaters,
11. Grow lights,
12. Aquarium/terrariums,
13. Swimming pool heaters and pump.
   (Appliances no. 9-13 are included since they have a high impact on the house energy consumpion if they are present).

iv) Although there are significant amounts of data are available from U.S. sources, their applicability to Canada, and to regions within Canada is highly questionable. Therefore, it is necessary that a Canadian data base be developed which include the different regions of the country. This data base should have both the saturation and the energy consumption information on major and miscellaneous appliances.

Due to the relative importance of major appliances, it is desirable that a sufficient number of each type of the major appliances be monitored individually using power meters with data recording capability to collect power consumption data for small (e.g. 15 minute) time intervals over a long term (e.g. one year).

Since it is practically not possible to monitor miscellaneous appliances, a detailed survey should be conducted to collect data on the type, wattage, usage and saturation of these. In this survey, the same type of data should also be collected for major appliances since the monitoring program cannot be extended to the whole survey domain.

iv) A draft of survey protocol is presented in Section II below which addresses all of the data collection requirements for the present study.

2. DATA COLLECTION REQUIREMENTS

2.1 Overview

The collected data will be used in computer simulations of the houses in the expanded STAR data base using the building energy simulation model ENERPASS. ENERPASS can model appliance heat gains in two ways:

i) As "process loads" which are used to specify the amount of heat and moisture generated by processes or equipment,
ii) As "indoor receptacles load".

In addition, a separate "indoor lighting load" can be modelled in W/unit area. All three of these loads require a time-of-day profile reflecting the cumulative usage of the appliances in the house. Therefore, it is necessary to have (i) the rate of energy consumption, and (ii) usage profiles of appliances for all houses in the data base. From the usage profiles and energy consumption rates of the individual appliances, an overall usage profile will be developed which will reflect the cumulative of internal heat gains from appliances throughout the day.

The survey protocol presented in the following section can be developed into a survey questionnaire to collect the required data on appliance energy consumption and usage schedules.

2. 2 Recommendations on Survey Protocol:

Notes:
1. As it will be seen below, a number of questions from the "1992 Survey of Household Energy Use" are to be used unchanged. These questions are referred to with question numbers at the appropriate location.
2. The final survey questionnaire should be structured such that coding the data into a data file should be straight-forward and unambiguous.
3. Section I in the "1992 Survey" should be moved to the front of survey and be incorporated into "A. Qualifying (pre-screening) questions" section.
4. Section H in the "1992 Survey" should be moved to the front of survey and be incorporated into "B. Household classifying questions" section.

A. Qualifying (pre-screening) questions:

The qualifying questions are to determine the suitability of the household for participating in the survey. The suggested qualifying questions with justifications (given in parantheses) are as follows:

1. Is the household metered individually?
   If answer is yes, continue. If no, terminate.
   (Justification is clear.)

2. Do you receive and pay your own bills?
   If answer is yes, continue. If no, terminate.
   (This is to determine whether the resident has any incentive in participating in electricity/energy conservation studies/efforts. Also, if a second party is involved obtaining necessary consent may be more difficult)

3. How long have you lived at this same address?
   (This is to determine if the resident has lived here for at least a year. If not, terminate.)

4. Will you allow us to obtain your electricity bills directly from the utility company?
   Will you allow us to obtain your other fuel bills from your supplier - OR - will you provide us with the bills?
   If answers are yes, continue. If no, terminate.
   (Justification is clear.)

5. Are you prepared to fill out a rather lengthy survey form which will require several hours of your time and attention?
   If answer is yes, continue. If no, terminate.
   (Justification is clear.)

B. Household classifying questions:

These questions are designed to classify the residence according to a number of parameters for possible cross-correlations.

1. Respondent's name, address, postal code, telephone number.
2. Type of residential area (urban, suburban, rural).
3. Type of residence (bugalow, two-storey, two-storey with basement, side-by-side duplex, row-house).
4. Number of residents living in the residence most of the year.
5. Type of residents (Family: husband and wife, husband wife and child(ren), husband and child(ren), wife and child(ren), other - specify; Non-Family: single male, single female, two or more males, two or more females, other - specify).
6. Number and ages of children living with parents (in age groups 0-6, 6-12, 12-18).
7. The gross annual family income in last tax year (in brackets of $5,000).
8. Total living area of the residence:
   - Basement area:
   - Floor 1:
   - Floor 2:
   - Floor 3:
9. Number of rooms in the residence according to usage:
   Bedroom:
   Living room:
   Dining room:
   Kitchen:
   Full bathroom:
   1/2 bathroom:
   Rec. room:
   Workshop:
   Garage:
   Other (specify):
10. Primary heating fuel:
11. Other heating fuel:
    How often is it used:
12. Type of heating system(s):
13. Name of electric utility company:
14. Name of other fuel delivery company(ies):

<u>C. Questions on appliances:</u>

MAJOR APPLIANCES:

1. Refrigerator:
   (Use Q. 17-26 from 1992 survey)

2. Freezer:
   (Use Q. 27-34 from 1992 survey)

3. Electric range with built-in convection oven
(Use Q. 35-44 from 1992 survey)

- Usage, wattage and size of burner/oven elements:

Burner No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk			Wattage	Size
	Morning	Noon	Evening		(cm. or in.)
Oven htng elem. no.					

4. Electric cook-top range:
    - Manufacturer
    - Year and model no.
    - Range hood or exhaust fan with outdoor vent:
    - Usage, wattage and size of burners:

Burner No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk			Wattage	Size
	Morning	Noon	Evening		(cm. or in.)

5. Electric convection oven (separate unit):
    - Manufacturer
    - Year and model no.
    - Self-cleaning oven (yes or no)
      How often is self-cleaning feature used?
    - Usage, wattage and size of oven heating elements:

Htng. Elem. No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk			Wattage	Size
	Morning	Noon	Evening		(cm. or in.)

6. Gas range with built-in convection oven
   - Manufacturer
   - Year and model no.
   - Type of gas used:
   - Number and size of burners
   - Number and size of oven heating elements
   - Self-cleaning oven (yes or no)
     How often is self-cleaning feature used?
   - Usage and size of burner/oven elements:

Burner No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk Morning	Noon	Evening	Size (cm. / in.) (Btu)
Oven htng elem. no.				

7. Gas cook-top range:
   - Manufacturer
   - Year and model no.
   - Type of gas used:
   - Usage and size of burners:

Burner No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk Morning	Noon	Evening	Size (cm. / in.) (Btu)

8. Gas convection oven (separate unit):
   - Manufacturer
   - Year and model no.
   - Type of gas used:
   - Self-cleaning oven (yes or no)
     How often is self-cleaning feature used?
   - Usage and size of oven heating elements:

Htng. Elem. No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk Morning	Noon	Evening	Size (cm. / in.) (Btu)

9. Dishwasher
   (use Q. 48-53)
   - Wattage
   - Usage:

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

10. Electric clothes washer/dryer (combined)
    (Use Q. 55-62, 65 from 1992 survey)
    - Wattage
    - Usage - Summer (specify months):

	Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Washer	Morning		
	Noon		
	Evening		
Dryer	Morning		
	Noon		
	Evening		

- Usage - Winter (specify months):

	Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Washer	Morning		
	Noon		
	Evening		
Dryer	Morning		
	Noon		
	Evening		

11. Electric clothes washer
(Use Q. 55-62, 65 from 1992 survey)
- Wattage
- Usage - Summer (specify months):

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

- Usage - Winter (specify months):

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

12. Electric clothes dryer
(Use Q. 68, 69, 71, 72, 75, 76, 77)
- Wattage
- Usage: Summer (specify months)

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

Winter (specify months):

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

Note: To obtain approximate fan capacity, do the blower door test twice; once with the dryer fan running, and once with the fan not running, and report results.

13. Gas clothes dryer
(Use Q. 68, 69, 71, 72, 75, 76, 77)
- Usage:

Summer (specify months)

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

Winter (specify months):

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

14. Microwave oven:
(Use Q. 46 from 1992 survey)
    - Capacity (cu.ft.)
    - Manufacturer
    - Year and model no.
    - Wattage

Cooking Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		
Defrosting Usage	**(Time of day: xx:xx - yy:yy)**	**No. of times/wk**
Morning		
Noon		
Evening		

15. Domestic hot water heater **(also see Q. F.1-8 in 1992 Survey)**
    - Number
    - Fuel used

    For each of the above:
    - Capacity (Imp. gal. or L)
    - Manufacturer
    - Year and model no.
    - Number and wattage of heating elements (for electric)
    - Capacity in Btu's
    - Water temperature set-point
    - Insulating jacket - Yes or No
      If Yes, type and thickness:

16. Central air-conditioning **(also see Q. E.1-11 in 1992 Survey)**
    - Manufacturer
    - Year and model no.
    - Capacity (Tons or Btu/h)
    - Voltage and full load amps
    - Compressor HP
    - Number of months in use (specify):
    - Control scheme (mark yes or no):
        . Available always, thermostat controlled:
        . Turned on when needed:

17. Room air-conditioners
    - Number

    For each of the above:
    - Manufacturer
    - Year and model no.
    - Capacity (Tons or Btu/h)
    - Voltage and full load amps
    - Compressor HP
    - Number of months in use (specify):
    - Control scheme (mark yes or no):
        . Available always, thermostat controlled:
        . Turned on when needed:

18. Color and B/W TV
    - Number

    For each of the above:
    - Type
    - Manufacturer
    - Year and model no.
    - Size
    - Wattage
    - Usage (No. of hours/day, time of day)

19. Fans (include all fans used in the house, such as furnace, attic, circulating, rollaway (portable), ceiling, exhaust, etc.)
    - Number

    For each of the above:
    - Type
    - Manufacturer
    - Year and model no.
    - Size (CFM, Voltage, Amps)

      Note: Measure approximate CFM using blower door tests if the fan is used more than one hour per day. Do one test with the fan running, and another with the fan not running, and report results.
    - HP or wattage
    - Usage (No. of hours/day, time of day)

20. Spa/hot tub or sauna (specify)
    - Size
    - Wattage of heating elements
    - Wattage of pumps
    - Water temperature
    - Usage:
        . Is temperature maintained on a continuous basis?
        . How often is it used? For how long each time?

21. Waterbed
    - Number

    For each of the above:
    - Size
    - Wattage
    - Temperature setting
    - Is a blanket or comforter used at all times
    - Is the bed kept made during daytime?

22. Growlight
    - Total wattage
    - Usage: months of year, number of hours/day, number of days/week

23. Aquarium/terrarium (specify):
    - Size
    - Type of temperature control and temperature setting
    - Total wattage

24. Swimming pool heater and pump
    - Size of pool (LxWxD) m or ft
    - Pump size: GPM, HP, Volts, Amps, Wattage
    - Usage of pump: months, hours/day, days/wk

    - Heater type:
    - Size: kW or Btu/h
    - Months of year heater is on
    - Is water maintained at a constant temperature continuously? Give schedule.
    - Is a pool blanket used, give times of usage.

				Usage of Each		
						Time of Day
App.#	Appliance	Number	Wattage of Each	Hr/day	No. of times/wk	xx:xx - yy:yy
25	VCR					
26	Computer/peripherals					
27	Humidifier					
28	Dehumidifier					
63	Table radio					
64	Audio system					
65	Amp'r (guitar/organ)					
83	Sewing machine					
93	Vacuum cleaner					
94	Iron					
97	Air cleaner					
108	Elec. typewriter					
110	Video game					
111	Photo equipment					
112	Elect. piano/organ					
113	Ghetto blaster					
30	Toaster					
31	Waffle iron					
33	Fry pan (skillet)					
34	Mixer					
35	Coffee maker					
36	Blender					
37	Juicer					
38	Can opener					
39	Opener/sharpener					
40	Sharpener					
41	Crockpot (slow cooker)					
43	Broiler					
44	Roaster					
45	Toaster oven					
46	Plate warmer					
47	Knife/slicer					
48	Food grinder/processor					
49	Popcorn popper					
51	Ice cream maker					
52	Instant hot water					
53	Clock					
54	Garburator					
55	Trash compactor					
56	Deep fryer					
57	Egg cooker					
58	Sandwich grill					

59	Kettle					
61	Baby food warmer					
62	Cooker/fryer					
104	Pressure cooker					
105	Yogurt maker					
107	Water filter/soft'r					
69	Blanket					
72	Heating pad					
73	Heat tape					
74	Heat lamp					
77	Hair dryer					
78	Curling iron					
79	Curler					
80	Hot comb					
84	Portable heater					
115	Electr. mower					
116	Well pump					
118	Power Tools (specify)					
118.1						
118.2						
118.3						
118.4						
118.5						
118.6						
95	Flood lights					
101	Lighting (Specify room)	Type/No.				
101.1						
101.2						
101.3						
101.4						
101.5						
101.6						
101.7						
101.8						
101.9						
101.10						
101.11						
101.12						
101.13						
101.14						
101.15						
101.16						

D. Suitability for Metering:

If possible, collect metered data from 20-25 houses in addition to the survey. The level of metered data to be similar to Level B monitoring.

1. How many fuse boxes are there in this residence?
2. Are the fuse boxes surface mounted or recessed?
3. How many circuit breakers are there in this residence?
4. Which major appliances have separate circuit breakers?
5. Which major appliances share a common circuit breaker? Please specify.

E. Heating System, others:
(Use Questions in rest of 1992 survey)

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Appendix 2
Interim Report #2

Thermal Engineering

15 Hanover Court, Halifax, Nova Scotia, Canada, B3M 3K7

INTERIM REPORT NO.2

ENERGY EFFICIENCY TECHNOLOGY IMPACT - APPLIANCES

SUBMITTED TO:

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May 1993

INTRODUCTION

In this report, the procedure that will be used to convert STAR files into ENERPASS input files are described. For clarity, the data to be used in each Section (or menu) of ENERPASS User Manual[1] are described in detail with the STAR[2] file field designations that will be used in generating the required data.

Since some information (such as schedules, appliance loads, etc.) which are not available in STAR will be obtained from the home survey that will be carried out in summer of 1993, the average values from the survey data will be used in ENERPASS files. These are clearly identified where necessary.

STAR TO ENERPASS CONVERSION PROCEDURE

Section 3.2:

Current file : use same file name as in STAR (first letter of postal code+4 digit house ID no.)
Title : 4-digit ID no. + province name
Units : metric
Number of zones : main floors + basement + crawl space
Zone 1: main floors
Zone 2: basement or crawl space
Zone 3: crawl space
No. of floors: Record 2/FLN
NOTE: In some STAR files, there are discrepencies with respect to the number of floors given in 2/FLN and the floors for which an area, volume, and perimeter are given; i.e. in 2/FLN the number of floors declared may be different than the number of floor areas declared in Record 7, and the floor volumes declared in Record 8, and the floor perimeters declared in Record 3. Example: in house no. 4664, the number of floors is declared as two, but there are three floor areas, three volumes, and three perimeters given in the subsequent records. Therefore, a cross referencing will be done as follows:
The number of floor areas, volumes and perimeters given will be checked and this value will be compared to number of floors. If there is a difference, a message will be stored in a "Remarks" file, and the number of floors determined based on number of floor areas given will be used.
Basement: check existence, Rec. 3/SB or Rec. 3/FB if not = 0
Crawl space: check existence, Rec. 3/CR if not = 0
System type : STAR files do not have information on type of heating system. Therefore:
If fuel is electric: use baseboard
If fuel is other: use forced air
Fuel info from Rec. 4/SPF(I)
If more than 1 fuel is used, check measured energy usage for fuels, base it on major fuel. (fuel usage from: Rec.4/MJS(I))

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[1] ENERPASS User Manual for Version 3.1, Enermodal Engineering, 1992.

[2] Described in "Environmental Impact Study, Phase 1- Development of a Database on Housing Characteristics Representative of the Canadian Stock, Final Report", Scanada Consultants Ltd., 1992.

System option : Here, out of the options that ENERPASS provides, only the 'exhaust heat recovery' option could be applicable. However, houses in STAR do not have HRV's. Therefore, no options apply.

Section 3.3: Building Menu

Zone names : If Crawl Space exists: Zone 3 is crawl space
If Basement exists: Zone 2 is basement
If floors 1-3 exist: Zone 1 is all main floors,
If any do not exist - name zones accordingly

Section 3.3.1: Wall and window menu

For All Zones:
Above Grade Walls - for Main Floors:

Link : no walls are linked

Area : Take main wall area (29/W1(I,1)), add to this door area (30/D1(I,1)) and window area (33/GL1(I,1)). Divide this total area by four and assign each to each direction given in Record 33. (door and window areas are added since gross wall area is required in ENERPASS).

Wall Con.Code: From building thermal mass (Rec. 9/MASS in STAR) decide on wall construction (values to be determined). All wall construction will be assumed to be one of the following three (i) brick outside, brick inside, (ii) brick outside gypsum inside, (iii) siding outside, gypsum inside, (iv) siding outside brick inside. The thicknesses and capacitances will be the same as used in ENERPASS (App. C).

Using these values, new custom walls will be defined with a range of RSI values. Example:

31. RSI: 4.00, Thick1: 100 (brick), C1: 8, ABS1: 0.7, Thick2: 100 (brick), C2: 8.

The conversion program will look at Rec. 9/MASS in STAR, and wall RSI (29/W1(I,2) and decide which code to assign.

Direction : As explained in area.

Windows:

Area : For each direction, the window area is given in STAR 33/GL1(I,1) where I=1 is N, I=2 is S, I=3 is E, I=4 is W, I=5 is NE, I=6 is NW, I=7 is SE, I=8 is SW.

Frame code: No information is given on frame construction in STAR. Therefore, it will be assumed that all frames are 10% of window area, and U=2.3 (Code# 1 in ENERPASS).

Glazing code: Custom glazing descriptions will be developed based on Transmission coefficient (33/GL2(I,2) and RSI (GL1(I,2)) [Note: In STAR 'Transmission Coefficient' term is used to mean 'Shading Coefficient'.]

Ucgl = Uedg = RSI glazing (several steps of RSI)
SHADE = transmission coeff. in STAR (several steps)
Tvis = 0.8 always [This is the 'Visible transmission coefficient, which is 0.8 for clear double glazed windows as given in ENERPASS manual.]

Doors:

Area : put all door area (D1(I,1)) in the first direction since direction is not given in STAR and not critical.

RSI : from D1(I,2).

Above Grade Walls - for Basement:

Link : no walls are linked

Area : Take basement exposed wall area (31/G1(I,1)), add window area (34/BG1(I,1)). Divide this total area by four and assign each to each direction. (door and window areas are added since gross wall area is required in ENERPASS).

Wall Con.Code: From building thermal mass (Rec. 9/MASS in STAR) decide on wall construction (values to be determined). All wall construction will be assumed to be one of the following three (i) brick outside, brick inside, (ii) brick outside gypsum inside, (iii) siding outside, gypsum inside, (iv) siding outside brick inside. The thicknesses and capacitances will be the same as used in ENERPASS (App. C).

Using these values, new custom walls will be defined with a range of RSI values. Example:

31. RSI: 4.00, Thick1: 100 (brick), C1: 8, ABS1: 0.7, Thick2: 100 (brick), C2: 8.

The conversion program will look at Rec. 9/MASS in STAR, and wall RSI (31/G1(I,2) and decide which code to assign.

Direction : As explained in area.

Windows:

Area : For each direction, the window area is given in STAR 34/BG1(I,1) where I=1 is N, I=2 is S, I=3 is E, I=4 is W, I=5 is NE, I=6 is NW, I=7 is SE, I=8 is SW.

Frame code: No information is given on frame construction in STAR. Therefore, it will be assumed that all frames are 10% of window area, and U=2.3 (Code# 1 in ENERPASS).

Glazing code: Custom glazing descriptions will be developed based on Transmission coefficient (34/BG2(I,2) and RSI (BG1(I,2)) [Note: In STAR 'Transmission Coefficient' term is used to mean 'Shading Coefficient'.]

Ucgl = Uedg = RSI glazing (several steps of RSI)

SHADE = transmission coeff. in STAR (several steps)

Tvis = 0.8 always [This is the 'Visible transmission coefficient, which is 0.8 for clear double glazed windows as given in ENERPASS manual.]

Doors:

No doors in basement.

Above Grade Walls - for Crawl Space:

Link : no walls are linked

Area : Take crawl space exposed wall area (22/CRW1) and assign it to first direction.

Wall Con.Code: From building thermal mass (Rec. 9/MASS in STAR) decide on wall construction (values to be determined). All wall construction will be assumed to be one of the following three (i) brick outside, brick inside, (ii) brick outside gypsum inside, (iii) siding outside, gypsum inside, (iv) siding outside brick inside. The thicknesses and capacitances will be the same as used in ENERPASS (App. C).

Using these values, new custom walls will be defined with a range of RSI values. Example:

31. RSI: 4.00, Thick1: 100 (inside brick), C1: 8, ABS1: 0.7, Thick2: 100 (brick inside), C2: 8.
The conversion program will look at Rec. 9/MASS in STAR, and wall RSI (22/CRW2) and decide which code to assign.

Direction : As explained in area.

Windows:

No windows in crawl space

Doors:

No doors in crawl space.

Section 3.3.2: Ceilings, floors and below grade menu:

For Main Floor (Above-Grade) Zones:

Above grade floor:

Link : (i) to basement zone (zone 2) if there is basement
(ii) to crawl space (zone 2 : this is because if there is no basement crawl space becomes zone 2) if there is crawl space
(iii) to both if there is both (use respective areas) (zone 2 is basement, zone 3 is crawl space)

Area : if (i) = basement floor area : (07/BMFA)
if (ii) = crawl space floor area : (07/CRRFA)
if (iii) = one part is basement floor area (07/BMFA) and other part is crawl space floor area (07/CRRFA)

Construction code: Since no information on the main floor construction is available from STAR, floor construction type No. 10 (Lino or carpet/wood frame/gypsum) is used from ENERPASS.

Height to ceiling: Since all upper floors (i.e. other than basement and crawl space) are modelled as one zone (Zone #1), the 'height to ceiling' should be taken as the whole height of the floors making up the zone corrected for first floor area. Thus, the 'height to ceiling (HTC)' will be calculated as follows:
HTC = $\sum$ floor volumes (8/FLMV+FL2V+FL3V) / First floor area (7/FLMA)
This way, the zone volume can be calculated correctly in ENERPASS.

Ceiling:

Area : Value can be directly transferred from STAR (27/CL1).

Construction code: Since no ceiling assembly code is available, RSI value (27/CL2) is used to define the ceiling construction code in ENERPASS.The value of ceiling RSI value is checked and the construction code is categorized into different customized construction code according to its RSI value. Ceiling construction of gypsum/wood frame & RSIXXX/shingles (ceiling code No. 1 to 4) in ENERPASS is used.

Skylight:

Area : Value can be directly transferred from (32/SK1(I,1)).

Frame code: No information is given on frame construction in STAR. Therefore, it will be assumed that all frames are 10% of window area, and U=2.3 (Code# 1 in ENERPASS).

Glazing code: Custom glazing descriptions will be developed based on RSI (32/SK1(I,2)). [Note: In STAR 'Transmission Coefficient' term is used to mean 'Shading Coefficient'.] The same transmission coefficient from window record (33/GL2(I,2)) is used.

Ucgl = Uedg = RSI glazing (several steps of RSI)

SHADE = transmission coeff. in STAR (several steps)
Tvis = 0.8 always [This is the 'Visible transmission coefficient, which is 0.8 for clear double glazed windows as given in ENERPASS manual.]

Below-grade walls:
No below-grade walls for main-floor zones.

Below-grade/Slab-on-grade floor:
First check if 'slab on grade': If (03/SG = 1, then it is slab on grade)
Then use Record 23 to get areas and R values:
Insul. area : 23/SLP1 (perimeter floor area)
Uninsul. area: 23/SLC1 (center floor area)
Costr. code : generate own categories based on ENERPASS categories, use RSI categories from STAR, and use the following for other parameters for all floors:
Loc: 0
Thick1: 15
C1: 12
ABS1: 0.65
RSIi : 23/SLP2 (in several steps)
RSIu : 23/SLC2 (in several steps)

For Basement (Below-Grade) Zones:

Above grade floor:
No data is needed since the basement floor is bulit either on-grade or below-grade.

Ceiling:
No data is needed since the ceiling of the basement is already defined as a floor in the main floor zone above.

Skylight:
No data is needed since there is no skylight in the basement.

Below-grade walls:
Area : First check type of basement:
If 03/SB = 1 shallow basment
If 03/FB = 1 full basement
Values can be transferred directly either from full basement (18/FBG1+18/FLG1) or shallow basement (20/SLG1).
Construction code: No data other than RSI is given in STAR. Therefore, take weighted average (parallel heat flow) of the U value (1/R) for upper and lower wall. Other variables in Const. Code def'n to be:
Thick1 = 12.7
C1 = 11
ABS1 = 0.3
Thick2 = 200
C2 = 5

Below-grade/Slab-on-grade floor:
Since whether a full basement or shallow basement is defined earlier, the values of area and RSI can be taken from either Record 19 or 20.

Then use Record 19 or 20 to get areas and R values:
Insul. area : 19/FP1 for full basement and 20/SP1 for shallow basement.
Uninsul. area: 19/FC1 for full basement 20/SC1 for shallow basement
Costr. code : generate own categories based on ENERPASS categories, use RSI categories from STAR (19/FP2 and 19/FC2) for full basement and (20/SP2 and 20/SC2) for shallow basement), and use the following for other parameters for all floors:

Loc: 0
Thick1: 15
C1: 12
ABS1: 0.65
RSIi : 19/FP2 for full basment and 20/SP2 for shallow basement (in several steps)
RSIu : 19/FC2 for full basement and 20/SC2 for shallow basement (in several steps)

3.3.3 Environment Menu:

Soil type : check for value of 09/S1
1 if S1=2
3 if S1=1
1 if S1=3 [Note: In STAR type 3 soil refers to permafrost soil; however, none of the houses are on permafrost soil. Therefore, this option will never be exercised.]

Building orientation: value can be transferred directly from 09/DEG. (due south is 0, +ve towards west, -ve towards east)

Slope of skylight: value can be transferred directly from 32/SK1(I,4). [Note: If the angle is not given in STAR then use 45° as default.]

Infiltration type: 0 (use ELA) [Note: The ELA values given in the Appendix B of the final report of Scanada on STAR will be used. These values are for 10 Pascal. Since ENERPASS requires ELA at 4 Pascal, the following equation will be used for conversion:

$$ELA_4 = 0.6325\ ELA_{10}$$]

Infiltration : Zone: 1, 2, ...
The total ELA for the house will be allocated to the main floor zone, basement and crawl space according to the respective exposed areas:

Main floor exposed area (MFEA) =
29/W1(I,1)+30/D1(I,1)+∑[33/GL1(I,1)]+27/CL1
Basement exposed area (BEA) = 31/G1(I,1)+∑[34/BG1(I,1)]
Crawl space exposed area (CSEA) = 22/CRW1
Total house exposed area (THEA) = MFEA+BEA+CSEA

ELA for main floor zone = (Total ELA)(MFEA/THEA)
ELA for basement zone = (Total ELA)(BEA/THEA)
ELA for crawl space zone = (Total ELA)(CSEA/THEA)

3.4 Schedule Menu:

Up to nine (9) different schedules can be used in ENERPASS. The electrical appliance usage schedules will be determined from the new house monitoring program results. The assignment of schedules will be done as follows:

Schedule (1): Heating temperature schedule
In STAR the Daytime Set-point (06/T_SP1) and Nighttime Set-point (06/T_SP3) are given for some houses. If these two temperatures are different, then it will be assumed that there is night setback between 23:00 and 07:00. [Note: In STAR there is an entry for 'hours of low temp. setpoint' (06/H_SP1), but there is no value in this field in the data base.]

Schedule (2): Constant 24 hour operation
Assignments to this schedule:
- Cooling temperature schedule

Schedule (3): DHW usage schedule
This schedule will be developed from ASHRAE Data given in Figure 1 (Ch. 44, Figure 9 in 1991 Applications Handbook). The data for 'All Familes' will be used. This schedule will be compared with the actual data collected from the seven houses monitored by EMR at Level B.

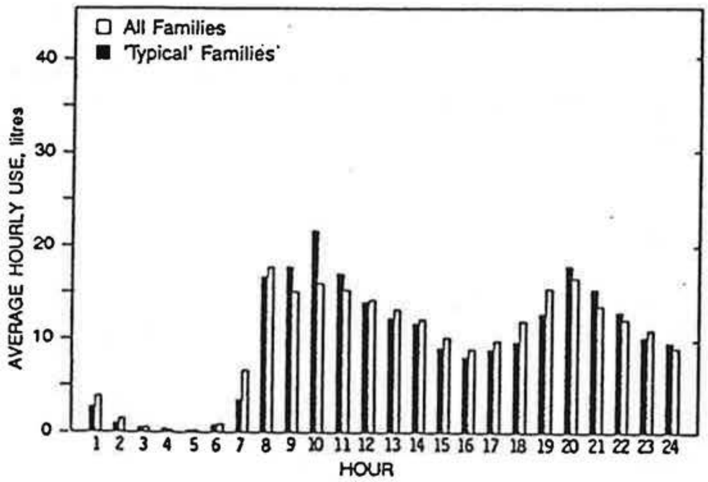

Figure 1. Average hourly hot water use.

Schedule (4): Occupancy schedule
Since no information is available in STAR, the occupancy schedule will be assumed to be as follows:
25% of maximum between 08:00 and 17:00
100% of maximum between 17:00 and 08:00.

Schedule (5): 'Maximum Hourly Process Load' usage schedule - For Main Floor Zone
This category of interior loads will include only the cooking appliances (cooktops, ovens, etc.) which are in Main Floor Zone. Sensible and latent heat gains will be assigned to these.
This schedule will be developed from the survey results.

Schedule (6): 'Indoor receptacle load' usage schedule - For Main Floor Zone
This category of interior loads will include all appliances except water heater, cooking appliances, clothes washer and dryer (which are assumed to be in the basement), and air-conditioners.

Schedule (7): Indoor lighting schedule
This schedule will be developed from the survey results.

Schedule (8): 'Maximum Hourly Process Load' usage schedule - For Basement Zone
This category of interior loads will include the clothes washer and freezer (which are assumed to be in the basement). Sensible heat gain will be assigned to these.
This schedule will be developed from the survey results.

Schedule (9): 'Indoor receptacle load' usage schedule - For Basement Zone
This category of interior loads will include the clothes dryer (which is assumed to be in the basement), and air-conditioners.
This schedule will be developed from the survey results.

Note 1: The dryer will be assigned a sensible heat gain to the basement, and an exhaust fan will also be assigned to the basement which will have the same capacity as the dryer exhaust fan capacity.

Note 2: Commonly, the washer and dryer are used one or two days a week. To deal with this situation the 'Weekends/weekdays ratio' in ENERPASS will be used to allocate the heat gains to two days, i.e. weekends. The Weekends/weekdays ratio of 9.99 will be used. Therefore, 1/10th of the heat gain will be assigned to 100% load for weekdays. This way, during weekends, the actual load will have been used.

3.5 Equipment Menu:

Use one furnace for the whole house.
Use one air-conditioner (if applies - no houses in STAR have air-conditioning)

3.5.1. Boiler, Furnace and Make-Up Air Heater Menus

FURNACE FOR SPACE HEATING (#1) : Since more than one type of heating fuel is possible in STAR database, Record 04 is checked and main heating fuel is defined based on the highest value of 04/MJS(I) in association to fuel type given in 04/SPF(I). In ENERPASS, only one type of fuel can be used for each zone, i.e. it is not possible to have "occasional" use of a fuel. Therefore, the fuel which is used as the major fuel will be assumed to be the only fuel used in the house.

Fuel:
- 0 for electric
- 1 for natural gas
- 2 for No. 2 oil
- 3 for wood *
- 4 for propane
- 5 for coal **

* ENERPASS does not support wood. Therefore, #6 oil (which is normally not used for single family/small residential space heating) in ENERPASS will be

used for wood. For this purpose, the total amount of no. of liters of #6 oil will manually be converted after the simulation to equivalent amount of wood used.

** ENERPASS does not support coal. Therefore, district steam (which is normally not used for single family/small residential space heating) in ENERPASS will be used for coal. For this purpose, For this purpose, the total amount of steam usage will manually be converted after the simulation to equivalent amount of coal used.

Maximum Rated kW heat input: value can be transferred directly from 04/SPC(I). However, this entry is zero for all house files in ENERPASS. Therefore, the following approach will be used to estimate this value:

The 'Design Heating Load' estimated by the Hot-2000 program (given in the Excel spreadsheet) will be multiplied by 1.20, and divided by the efficiency (04/SPE(I)), and this value will be assumed to be the Maximum Rated kW heat input.

Furnace performance: Since part load efficiency is not given in STAR, rated boiler/furnace efficiency (04/SPE(I)) will be adjusted using the default curves given in ENERPASS for different fuel fired furnaces.

BOILER FOR DHW HEATING (#1): Since more than one type of heating fuel is possible in STAR database, the primary DHW heating fuel is checked (05/DWF(1)) and if this fuel is not electricity, then boiler will be used for DHW.

Fuel:
1 for natural gas
2 for No. 2 oil
3 for wood *
4 for propane
5 for coal **

* ENERPASS does not support wood. Therefore, #6 oil (which is normally not used for single family/small residential space heating) in ENERPASS will be used for wood. For this purpose, the total amount of no. of liters of #6 oil will manually be converted after the simulation to equivalent amount of wood used.

** ENERPASS does not support coal. Therefore, district steam (which is normally not used for single family/small residential space heating) in ENERPASS will be used for coal. For this purpose, For this purpose, the total amount of steam usage will manually be converted after the simulation to equivalent amount of coal used.

Maximum Rated kW heat input: value can be transferred directly from 05/DWC(I). However, this entry is zero for all house files in ENERPASS. Therefore, a large rated kW will be used (i.e. 20kW) with the constant efficiency given in 05/DWE(1) will be used for DHW heating

Boiler performance: Use constant boiler efficiency (05/DWE(1)) given in STAR.

3.5.2 Heat Pump:
No house in the STAR database has a heat pump

3.5.3 Heat Recovery Unit:
No house in the STAR database has a heat recovery unit.

3.5.4 Chiller Menu:
No house in the STAR database has a chiller.

3.6 HVAC System Menu

The HVAC systems will be modelled as:

1. Single-zone forced air if the fuel is other than electricity,
2. Electric baseboard if the fuel is electricity.

No 'Options' in ENERPASS will be used.

SKIP OVER: 3.6.1, 3.6.2, 3.6.3

3.6.4 Electric Baseboard System Menu:

For each zone, use:
A: Electric Baseboards
Capacity : 100 kW [Note: since the efficiency of baseboard heaters is 100% at any load, the capacity of heaters is not important at all. Therefore, to ensure sufficient capacity will be available at all times, a high value will be used.]

B: Cooling System
Cooling system source: 0 (denoting none available)

SKIP OVER 3.6.5

3.6.6 SINGLE-ZONE FORCED AIR MENU

A: Central Heating System
Source : 2 (denoting forced air furnace)
Unit ID# : 1 (always, since there is only one furnace)
T'stat location : 1 (always in the main floor zone)

B: Central cooling system
Source: 0 (denoting none available since no house in STAR has air-conditioning)

SKIP OVER 3.6.7, 3.6.8, 3.6.9 (no options used, all 0)

3.6.10 Air Handling System Menu:

C: Air Handling System

For main floor zone:
AIR FLOW (l/s)
Zone : 1
Infil : calculated by ENERPASS automatically
Exfil : calculated by ENERPASS automatically
* Supply : value will be calculated based on the design heat loss (given in the HOT-2000 input/output Excel spreadsheet) and an assumed supply-return air temperature difference of 50°C [3]

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* Only for Single-zone forced air sytem
[3] Calculation for Supply air for each zone:

*Recirc : same value as in Supply
*Outdoor : 0 (since no houses in STAR have mechanical ventilation)
Exhaust : 0 (since no houses in STAR have mechanical ventilation)
Trans : 0 (assume no air transmission between zones)
Zone : 0 (since Trans=0, the value here is not important)
Trans out : 0 (calculated by ENERPASS automatically)

SCHEDULES
Exhaust : Schedule (2) (value is not important since no Exhaust in this zone)
Trans : Schedule (2) (value is not important since no Trans in this zone)

FAN POWER (W)
Exhaust : 0 (since no houses in STAR have mechanical ventilation)

For basement zone:
AIR FLOW (l/s)
Zone : 2
Infil : calculated by ENERPASS automatically
Exfil : calculated by ENERPASS automatically
*Supply : value will be calculated based on the design heat loss (given in the HOT-2000 input/output Excel spreadsheet) and an assumed supply-return air temperature difference of 50°C
*Recirc : same value as in Supply
*Outdoor : 0 (since no houses in STAR have mechanical ventilation)
Exhaust : an average exhaust flow rate for clothes dryer exhaust fan will be developed based on the data that will be collected from the houses in the new survey to be conducted by EMR
Trans : 0 (assume no air transmission between zone)
Zone : 0 (since Trans=0, the value here is not important)
Trans out : 0 (calculated by ENERPASS automatically)

SCHEDULES
Exhaust : Schedule (9) (clothes dryer schedule)
Trans : Schedule (2) (value is not important since no Trans in this zone)

FAN POWER (W)
Exhaust : 0

$$\text{Suppy (l/s)} = \frac{\text{Heating requirement (kW)}}{1.2\text{x}1.005\text{x}50} \text{ x } 1000$$

where Heating requirement =

$$1.2(\text{Design heat loss}) \frac{\text{Outside surface area of each zone}}{\text{Total outside surface area of the house}}$$

For crawl space zone:

AIR FLOW (l/s)

Zone	: 3 if there basement exists, 2 if basement does not exits
Infil	: calculated by ENERPASS automatically
Exfil	: calculated by ENERPASS automatically
*Supply	: value will be calculated based on the design heat loss (given in the HOT-2000 input/output Excel spreadsheet) and an assumed supply-return air temperature difference of 50°C
*Recirc	: same value as in Supply
*Outdoor	: 0 (since no houses in STAR have mechanical ventilation)
Exhaust	: 0 (since no houses in STAR have mechanical ventilation)
Trans	: 0 (assume no air transmission between zone)
Zone	: 0 (since Trans=0, the value here is not important)
Trans out	: 0 (calculated by ENERPASS automatically)

SCHEDULES

Exhaust	: Schedule (2) (value is not important since no exhaust in this zone)
Trans	: Schedule (2) (value is not important since no Trans in this zone)

FAN POWER (W)

Exhaust	: 0 (since no houses in STAR have mechanical ventilation)

For Total (all zones together): Only for Single-zone forced air system

SCHEDULES

Supply	: Schedule (2), 24-hour operation
Outdoor	: Schedule (2) (value is not important since no mech. ventilation)

FAN POWER (W)

Supply	: 0 (since no info is given in STAR for mechanical ventilation)
Recirc	: 0 (since no info is given in STAR for mechanical ventilation)

3.7 OPERATING MENU

For main floor zone:

Maximum occupancy: get from 10/OCC

Activity level: use 2 for seated very light work (sensible 230 Btu/h, latent 190 Btu/h)

Occupancy schedule : 4 (from menu 3.4 above)

Maximum hourly process load: Heat (W): to be determined from survey results
Moisture (kg/h): to be determined from survey results

Process schedule: 5 (from menu 3.4 above)

T'stat heating setpoint: use 06/T_SP1

Degrees of heating setback: use (06/T_SP1 - 06/T_SP3)

T'stat heating schedule: 1 (from menu 3.4 above)

T'stat cooling setpoint: use 30°C for all houses since there is no air-conditioning available

Degrees of coolin setup: 0°C

T'stat cooling schedule: 2 (from menu 3.4 above)

For basement zone:

Maximum occupancy: 0 (assume no one in basement on a regular basis)

Activity level: use 2 for seated very light work (sensible 230 Btu/h, latent 190 Btu/h)

Occupancy schedule : 4 (from menu 3.4 above)

Maximum hourly process load: Heat (W): to be determined from survey results
Moisture (kg/h): to be determined from survey results

Process schedule: 8 (from menu 3.4 above)

For crawl space zone:
Maximum occupancy: 0 (assume no one in crawl space on a regular basis)
Activity level: use 2 for seated very light work (sensible 230 Btu/h, latent 190 Btu/h)
Occupancy schedule : 4 (from menu 3.4 above)
Maximum hourly process load: Heat (W): 0
Moisture (kg/h): 0
Process schedule: 2 (from menu 3.4 above)

3.8 WATER HEATING MENU

Daily hot water load: use 11/DHWL
Hourly hot water demand schedule: 3 (from menu 3.4 above)
Heat source: 2 if heat source is electricity (found from 05/DWF1)
1 if heat source is not electricity (found from 05/DWF1)
Desired hot water temp: since no value in STAR, use 55°C for all houses
Volume of aux. tank: since there is no data in STAR, use 272L (60 ImpGal) for all houses
Height of aux. tank: since there is no data in STAR, use 1.2 m
RSI value of tank: since there is no data in STAR, use 1.8 $m^2C°/W$
Zone location: if there is basement: 2
if no basement: 1
Boiler unit #: 1

3.9 LIGHTING AND ELECTRICAL MENU

Main floor zone:
Indoor receptacles:
Load: Total load from survey (as described in Sch.6 in Section 3.4) divided by main floor area (given in Section 3.2.2)
Schedule: Sch.6 in Section 3.4
Daylighting control: 1 (according to the schedule)
Indoor lighting load: to be obtained from survey (average value)
Schedule: Sch. 7 in Section 3.4

Basement:
Indoor receptacles:
Load: Estimate dryer heat loss though skin and divide it by basement area
Schedule: Sch.8 in Section 3.4
No lights in basement.

Crawl Space:
No receptacle load or lights.

Outdoor receptacle and lights: None

Appendix 3
Interim Report #3

Thermal Engineering

15 Hanover Court, Halifax, Nova Scotia, Canada, B3M 3K7

INTERIM REPORT NO.3

ENERGY EFFICIENCY TECHNOLOGY IMPACT - APPLIANCES

SUBMITTED TO:

Tom Hamlin
Housing Technology Group
Research Division
Canada Mortgage and Housing Corporation
700 Montreal Road
Ottawa, Ontario
K1A 0P7

July 1993

Table of Contents:

Section 1

Description of mistakes in STAR database and Hot-2000 Excel file

The following are the discrepancies found in the STAR database compared with the original HEAT database faxed by Mr. Tom Hamlin on May 31, 1993. These discrepencies were identified after checking and tracing all the materials that we have gathered through Mr. Tom Hamlin. These materials include the original HEAT data files (14 different files with different postal codes), the original STAR database, the HOT-2000 input data files (including those with and without average airtightness data), the EXCEL spreadsheet that contains all the valid HOT-2000 house files, six sample HEAT data files, and the report and list of the BASIC programs from SCANADA for the "Environmental Impact Study: Phase I - Development of a Database on Housing Characteristics Representative of the Canadian Housing Stock [CMHC STAR-HOUSING Database]".

Discrepancy in STAR Database Variable Descriptions:

Record 03: PERB should be "foundation perimeter" instead of "basement perimeter". CRPER should be "crawl space perimeter" instead of "basement perimeter area".

Record 04: the fuel type should be "Oil=1, Natural Gas=2, Electric=3, Propane=4, and Wood=5" instead of "Oil=1, Natural Gas=3, Electric=2, Propane=?, Wood=4, and Coal=5".

Record 06: there should be another additional entry after the last entry (CSWING), it should be MC$ which stands for the "mass type of the house construction". This variable should be either "A" or "B" as per in HOT-2000.

Record 07: BMTA should be "foundation area" instead of "basement and crawl floor area".

Record 08: BMTV should be "foundation volume" instead of basement volume".

Record 09: The description of the house orientation from HEAT is *supposed to be* (we are not 100% sure) based on due north. Since the original HEAT data files and the STAR data files have the same value for the house orientation, DEG should be measured from due north (due north is 0°) instead of measured from due south. <u>However</u>, since the house orientation is not cricial to the accuracy of the simulation so long as the correct window orientation is provided, the description of the house orientation from STAR (measured from due south) will be used in all the data file conversions in this project.
An additional variable called SABS should be placed in between S1 and SOLAIR.

Record 11: QDHW (DHW input energy) has the same value of DHW output from HEAT. Therefore, QDHW should be "DHW output energy".

Record 12: FAN(1) should be "HRV fan power at 5°C" instead of "fan power".
FAN(2) should be "HRV fan power at -25°C" instead of "fan power".
FAN(3) should be "ventilator fan power" instead of "fan power".
EFF(1) should be "HRV fan efficiency at 5°C" instead of "fan efficiency".
EFF(2) should be "HRV fan efficiency at -25°C" instead of "fan efficiency".
EFF(3) should be "ventilator fan efficiency" instead of "fan efficiency".

Record 26: FBA should be "full basement attachment code" instead of "basement attachment code".
SBA should be "shallow basement attachment code" instead of "below grade slab attachment code".

Record 33: The window orientation is defined by I. I=1 for N, I=2 for S, I=3 for E, I=4 for W, I=5 for NE, I=6 for NE, I=7 for SE, I=8 for SW, and I=9 is for no direction is available.

Missing Information in STAR Database:
In all the STAR database files that contain shallow basement and slab-on-grade, data are missing for the floor RSI values, i.e., SP2 and SC2 are all zero for shallow basement, and SLP2 and SLC2 are all zero for slab-on grade. This appeas to be due to two invalid BASIC statements used in the BASIC program called "FILE.pgm". These statements can be found in the program "FILE.pgm" at line 6535 and 6630 (page 9). However, all of the missing floor RSI values for shallow basement and slab-on-grade were put into STAR database manually from the original HEAT data files (since we do not have the original MegaBasic source file for the HEAT-to-STAR file conversion from SCANADA). (See Section 2 for sample files.)

Negative Slab-on-Grade Center Floor Area Values:
In STAR and HEAT files, the slab-on-grade center area is a negative value (see Section 3 for sample files). Since we do not know why these negatives appear, we have not done any modifications so far. We will eventually remove the negatives if no other instruction is given to us.

Discrepancy in Hot-2000 EXCEL file Variable Descriptions:
The window overhang descriptions for S, SE, and SW windows in EXCEL file are misplaced. The description should be as follows:

Column DS: height of window for S.
Column DT: overhang height from window for S.
Column DU: depth of the header for S.
Column DV: height of window for SE.
Column DW: overhang height from window for SE.
Column DX depth of the header for SE.
Column DY: height of window for SW.
Column DZ: overhang height from window for SW.
Column EA: depth of the header for SW.

Section 2

Sample of revised and original STAR files with missing floor RSI values

SAMPLE REVISED STAR FILE

```
1005,HEAT,R,,ST. JOHN'S,A1A2M3,NFLD,2,SAINT JOHN'S
, 2 , 1 , 2 , 4 , 24 , 1967 , 1
 1 , 0 , 0 , 0 , 22.5 , 24.3 , 29.7 , 0 , 0 , 22.5 , 0 , 1 , 0 , 0
 3 , 0 , 0 , 100 , 108351 , 73945 ,
 0 , 0 , 0 , 0 , 0 , 0 ,
 0 , 0 , 0 , 0 , 0 , 0 ,
 0 , 0 , 0 , 0 , 0 , 0 ,
 0 , 0 , 0 , 0 , 0 , 0 ,
 3 , 0 , 0 , .93 ,
 0 , 0 , 0 , 0 ,
 19.5 , 15 , 0 , 19.5 , 15 , 0 , 0 , 0 , 0 , 0 , 3.5 , 0 ,A
 103.54 , 51.27 , 52.27 , 0 , 50.37 , 0 , 55.48 , 0
 405.76 , 115.85 , 143.56 , 146.36 , 0 , .4 , 0 , 0 ,, 3 ,, 0 ,, 0 , 0 , 0
-25 , 9.63 , 0 , 1 , .43 , 0 , 1 , 0 , 0 , 0
 1.044 , 5340.11 , 6295.55 , 76.93 , 4 , 0 , 0
 0 , 20965.57 , 15.95553 , 2.4 , 0 , 0 , 150 , 13548.51
0,0,0, 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 2.800077 , 0 , 0 , 0 , 0 , 58.56 , 3.18 , 0 , 3.08 , 2.71 , 0
 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 18 , .86 , 0 , 18.5 , .63 , 0 , 36.98 , .63 , 0 , 0 , 0 , 1 , 2.755556 , 0
 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 125.44 , 1.9 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 3.77 , .36 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 33.75 , .94 , 0
 0 , 0 , 0 , 0
 0 , 0 , 0 , 0
```

SHALLOW BASEMENT WITH RSI VALUES ADDED

SAMPLE ORIGINAL STAR FILE

```
1005,HEAT,R,          ,ST. JOHN'S                    ,A1A2M3,NFLD,2,SAINT JOHN'S
  ,2,1, 2, 4, 24, 1967,1
1, 0, 0, 0, 22.5, 24.3, 29.7, 0, 0, 22.5, 0, 1, 0, 0
3, 0, 0, 100, 108351, 73945,
 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0,
 3, 0, 0, .93,
 0, 0, 0, 0,
 19.5, 15, 0, 19.5, 15, 0, 0, 0, 0, 0, 3.5, 0,A
 103.54, 51.27, 52.27, 0, 50.37, 0, 55.48, 0
 405.76, 115.85, 143.56, 146.36, 0, .4, 0, 0, ,3, , 0, , 0, 0, 0
 -25, 9.63, 0, 1, .43, 0, 1, 0, 0, 0
 1.044, 5340.11, 6295.55, 76.93, 4, 0, 0
 0, 20965.57, 15.955533, 2.4, 0, 0, 150, 13548.51
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0
 2.8000773, 0, 0, 0, 0, 58.56, 3.18, 0, 3.08, 2.71, 0
 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 18, .86, 0, 18.5, 0, 0, 36.98, 0, 0, 0, 0, 1, 2.7555556, 0
 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 125.44, 1.9, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 3.77, .36000001, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 33.75, .94, 0
 0, 0, 0, 0
 0, 0, 0, 0
```

MISSING SHALLOW BASEMENT RSI VALUES.

SAMPLE REVISED STAR FILE

```
3083,HEAT,R,,MONTREAL,H3Y1K5,QUE,1,MONTREAL
, 2 , 1 , 2 , 2 , 62 , 1929 , 3
 1 , 0 , 0 , 1 , 32.1 , 34.9 , 34.2 , 0 , 0 , 32.1 , 0 , 1 , 0 , 2
 1 , 0 , 0 , 76 , 248188 , 248188 ,
 0 , 0 , 0 , 100 , 63698 , 0 ,
 5 , 0 , 0 , 25 , 23000 , 0 ,
 0 , 0 , 0 , 0 , 0 , 0 ,
 0 , 0 , 0 , 0 , 0 , 0 ,
 3 , 0 , 0 , .93 ,
 0 , 0 , 0 , 0 ,
 22 , 18 , 0 , 22 , 18 , 0 , 0 , 0 , 0 , 0 , 3.5 , 0 ,A
 230.86 , 117.06 , 113.8 , 0 , 104.16 , 0 , 116.1 , 11.1
 887.66 , 229.15 , 336.34 , 322.17 , 0 , .9 , 0 , 0 ,, 2 ,, 0 ,, 0 , 0 , 0
 15 , 21.47 , 0 , 1 , .46 , 0 , 2 , 0 , 0 , 0
 1.064 , 5668.74 , 5860.43 , 136.17 , 5 , 0 , 0
 4147.2 , 36921.02 , 28.09819 , 2.8 , 0 , 0 , 285 , 29148.98
0,0,0, 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 2.852421 , 0 , 0 , 0 , 0 , 124.92 , 3.44 , 0 , 1.54 , .78 , 0
 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 22.4 , .91 , 0 , 28.1 , .36 , 0 , 88 , .36 , 0 , 0 , 0 , 1 , 2.583178 , 0
 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0
 30.9 , .36 , 1 , -19.8 , .36 , 0 , 1 , 2 , 0
 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 200.39 , 1.3 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 12.49 , .3405949 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 0 , 0 , 0
 48 , 1.07 , 0
 0 , 0 , 0 , 0
 0 , 0 , 0 , 0
```

NEGATIVE SLAB-ON-GRADE CENTER FLOOR AREA (SEE ALSO SECTION 3)

SLAB-ON-GRADE WITH RSI ADDED

```
3083,HEAT,R,          ,MONTREAL                    ,H3Y1K5,QUE,1,MONTREAL
 ,2,1, 2, 2, 62, 1929,3
 1, 0, 0, 1, 32.1, 34.9, 34.2, 0, 0, 32.1, 0, 1, 0, 2
 1, 0, 0, 76, 248188, 248188,
 0, 0, 0, 100, 63698, 0,
 5, 0, 0, 25, 23000, 0,
 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0,
 3, 0, 0, .93,
 0, 0, 0, 0,
 22, 18, 0, 22, 18, 0, 0, 0, 0, 0, 3.5, 0,A
 230.86, 117.06, 113.8, 0, 104.16, 0, 116.1, 11.1
 887.66, 229.15, 336.34, 322.17, 0, .9, 0, 0, ,2, , 0, , 0, 0, 0
 15, 21.47, 0, 1, .46, 0, 2, 0, 0, 0
 1.064, 5668.74, 5860.43, 136.17, 5, 0, 0
 4147.2, 36921.02, 28.098189, 2.8, 0, 0, 285, 29148.98
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0
 2.8524214, 0, 0, 0, 0, 124.92, 3.44, 0, 1.54, .78, 0
 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 22.4, .91, 0, 28.1, 0, 0, 88, 0, 0, 0, 0, 1, 2.5831776, 0
 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0
 30.9, 0, 1, -19.8, 0, 0, 1, 2, 0
 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 200.39, 1.3, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 12.49, .34059495, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 0, 0, 0
 48, 1.07, 0
 0, 0, 0, 0
 0, 0, 0, 0
```

SAMPLE ORIGINAL STAR FILE

MISSING SLAB-ON-GRADE RSI

Section 3

Sample of Hot-2000 file with negative slab-on-grade center floor area

```
                         0      OMMONTREAL            H3083.v20
MONTREAL
QUE        H3Y1K5
1MAR OI 0210Y            22.0 18.0        3.5S    E    N    W     0 0 0 0 0
L    124.92        3.44
L    200.39        1.30
L     12.49         .34
L      1.54         .78
L     30.90         .00
L    -19.80         .00
L     48.00        1.07
L     22.40         .91
L     28.10         .00
L     88.00         .00
        .76        1.0          .420 0.0                .76        .00        .00       .0
L     30.38        1.0          .390 0.0                .76        .00        .00       .0
        .50        1.0          .420 0.0                .76        .00        .00       .0
L      3.15        1.0          .400 0.0                .76        .00        .00       .0
        .75        1.0          .420 0.0                .76        .00        .00       .0
L      8.49        1.0          .380 0.0                .76        .00        .00       .0
        .96        1.0          .240 0.0                .85        .00        .00       .0
L      5.39        1.0          .390 0.0                .76        .00        .00       .0
NN  A  ON  NN340        887.66  .900 .000          28.1285.0  2.8 3.51 1247
Space Heating Manufacturer     Space Heating Model No.                .00
DHW #1 Manufacturer            DHW #1 Model No.                       .0 ,   93
```

NEGATIVE: SLAB-ON-GRADE CENTER AREA

HOUSE NO. 3083 (SAME HOUSE AS IN SECTION 2 WHOSE STAR-FILE WAS GIVEN) WITH NEGATIVE SLAB-ON-GRADE CENTER AREA.

Section 4A

Hot-2000 to STAR Database Input File Conversion Procedure

The following procedure description for converting Hot-2000 data files to STAR database is based on the information given in the EXCEL file provide by Tom Hamlin of CMHC. For clarity, every column description refers to the original EXCEL file description.

Record 01(Record Identification):

A$	: Column C (I.D.)
B$	: Column D (Description)
RS$	: "R" (for real)
C$	: Blank (no info is available)
L$	: Column HG (City Name) [This column was created based on the city name used in the actual HOT-2000 files since the city name is not provided in the EXCEL file]
R$	: Blank (no info is available)
P$	: Column A (Prov)
U$	: "U"
WF$	: Column HF (Weather File Name) [This column was created based on the weather file name used in the actual HOT-2000 files since the weather file name is not provided in the EXCEL file]

Record 02 (Typology):

O$	: Refer to Record 09/DEG for the definition of house orientation.
HT$	: 0 (no info is available)
HS$	: 0 (no info is available)
HSPE	: 0 (no info is available)
FLN	: 0 (no info is available)
A2	: 1991-Column B (Date) (As of 1991; to be consistent with original STAR)
Year	: Column B (Date) if value is given, or 0 if value is not given
CT$	: 0 (no info is available)

Record 03 (Basement, Crawlspace and Perimeters):

SB	: 1 if I or O in Column I (Ilsbsmt)
FB	: 1 if I or O in Coulmn J (Ilfbsmt)
CR	: 1 if I or O in Column G (Ilcs)
SG	: 1 if I or O in Column H (Ilslab)
PERB	: If full basement exists, PERB = Column BR (ABsmt9) + 4. If shallow basement exists, PERB = Column BN (ABsmt5) + 4. If basement and crawl space exist, PERB = [Column BN (ABsmt5) + 2] + [Column BH (Acsper) + 2] for shallow basement, and PERB = [Column BR (ABsmt9) + 2] + [Column BH (Acsper)+ 2] for full basement. This assumption is based on both basement and crawl space have a common edge.
PERM	: 0 (no info is available)
PER2	: 0 (no info is available)
PER3	: 0 (no info is available)
CRPER	: If basement and crawl space exist, three exposed crawl space sides is assumed, CRPER = Column BH (Acsper) + 2. If only crawl space exists, four exposed sides is assumed, CRPER = Column BH (Acsper) + 4.

BMPER : If full basement exists, BMPER = Column BR (ABsmt9) + 4. If shallow basement exists, BMPER = Column BN (ABsmt5) + 4. If basement and crawl space exist, BMPER = Column BR (ABsmt9) or Column BN (ABsmt5) + 2. This assumption is based on both basement and crawl space have a common edge.

Record 04 (Heating System and Energy Use Records for Five Different Fuels):
For I = 1 to 5

SPF(I) : From Column N (G=Natural Gas, E=Electric, etc.)
SPT(I) : 0 (no info is available)
SPC(I) : Assume 1.2 times of design heat loss; 1.2*[Column FD]/1000.
SPE(I) : First check whether seasonal or steady state efficiency is used from Column AK (EffType). Then appropriate default Hot-2000 seasonal efficiency is assigned based on different furnace type from Column AL (Ftype) if the seasonal efficiency is used. However, if steady state efficiency is used, a steady-state efficiency adjustment factor will be added to the Hot-2000's default seasonal efficiency.
MJ(I) : ColumnGL+GM/GP+GQ/GT+GU/GX+GY/HB+HC for electricity, gas, oil, propane and wood. Note that the value will be converted to MJ from different fuel measuring units.
MJS(I) : Column GL/GP/GT/GX/HB for electricity, gas, oil, propane and wood. Note that the value will be converted to MJ from different fuel measuring units.

* 1 - Oil (O)
2 - Natural Gas (G)
3 - Electric (E)
4 - Propane
5 - Wood
6 - Coal

Record 05 (Domestic Hot Water System):
For I = 1 to 2

DWF(I) : Check Column AH (DHW1) for DHW system type and then determine the fuel type based on system type as in HOT-2000. However, if system type No. 7 to 11 is used, the fuel type will be assigned according to the space heating fuel type.
DWT(I) : Column AH/AI (DHW1/DHW2)
DWC(I) : 0 (no info is available)
DWE(I) : Check Column AH (DHW1) for DHW system type and then determine the fuel efficiency based on system type as in HOT-2000.

Record 06 (Set Point Temperatures):

T1 : Column AN (Tmain)
T2 : Column AO (Tbsmt)
T3 : Column AP (Tcrwl)
T_SP1 : T1 if T1≥21, 21 if T1<21.
T_SP3 : Refer to the assumption below.
T_SP2 : Same as T_SP3
T_PCH : 0 (unheated)
T_CL : 0 (uncooled)
T_DP : 0 (no info is available)
H_SP1 : 12 (see assumption below)
TSWING : Column AQ (delta T)

CSWING	: 0 (no info is available)
MC$	: Column Q (mass) **[This entry is not listed in STAR report]**

Assumption: Since Hot-2000 does not provide the temperature set-back, the following equation will be used to determine the set back temperature if the main floor temperature is below 21°C; Column AN (Tmain), i.e., temperature set-back is used. This equation is based on the assumption of 12 hours of temperature set-back.

$T_{main} * 24 = (21 * 12) + (T\_SP3 * 12).$

Record 07 (Floor Area):

FLA	: Column AR (FlrArea)
FLMA	: 0 (no info is available)
FL2A	: 0 (no info is available)
FL3A	: 0 (no info is available)
BMTA	: Column BR (ABsmt9) + Column BS (ABsmt10) if full basement. Column BN (ABsmt5)+ Column BO (ABsmt6) if shallow basement. [Column BN (ABsmt5)+ Column BO (ABsmt6)] or [Column BR (ABsmt9) + Column BS (ABsmt10)] + [Column BH (Acsper) + Column BI (Acsctr)] if shallow or full basement and crawl space exist.
CRRFA	: Column BH (Acsper) + Column BI (Acsctr)
BMFA	: Column BR (ABsmt9) + Column BS (ABsmt10) if full basement. Column BN (ABsmt5)+ Column BO (ABsmt6) if shallow basement.
SLBA	: Column BJ (ABsmt1) + Column BK (ABsmt2)

Record 08 (Air Infiltration):

V	: Coulmn AS (Volume)
BMTV	: 0 (no info is available)
FLMV	: 0 (no info is available)
FL2V	: 0 (no info is available)
FL2V	: 0 (no info is available)
AC/H	: Column AT (Nat.)
ELA	: Column AZ (ELA) **[All Hydro files and some Mrch files do not have ELA and A50].** Average ELA values will be calculated based on the normalized ELA values from report "Ventilation and Airtightness in New Detached Canadian Housing" by CMHC (1990). For example, ELA = NLA*Envelope Area.
A50	: Column AY (ACH) **[The suggestion for converting nominal leakage rate (AC/H) to ACH at 50 Pa from ENERPASS manual (pg. 22) is used for this conversion, i.e., A50=8*AC/H.]**
F$	: 0 (for "NO")
WS$	: Column T (Shelt) [1 if Shelt ="Y", 4 if Shelt="N"]
VB$	: Column V (Bal); 0 if "U" and 1 if "B". ("U" or "B")
V5	: Column AU (Forced); values of ACH will be converted to l/s used in STAR
V$	: 0 (no info is available)
VT	: Column AM (Vtype). [2 for HRV, 1 for ventilator, and 0 for none]
FLOWC	: 0 (no info is available)
FLOWE	: 0 (no info is available)

Record 09 (Climate and Orientation):

DEG	: Since no house orientation is available from Hot-2000, the house orientation will be assigned based on the direction in which largest window area is provided. That is, the hourse orientation will be 0, 45, 90, 135,

180, -45, -90, and -135° for S, SW, W, NW, N, SE, E, and NE respectively.

MASS	: 0 (no info is available)
MC	: 0 (no info is available) [Column Q (mass), this entry is not in STAR file and the proper location is in Record 6.]
S1	: Column AA (Soil)
SABS	: 0 (no info is available) **[This entry is not listed in STAR report]**
SOLAIR	: 0 (no info is available)
COL	: 0 (no info is available)
MICROCL	: 0 (no info is available)
WSOURCE	: 0 (no info is available)
SOIL	: 0 (no info is available)

Record 10 (Degree Days):

DDN	: 0 (no info is available)
DDC	: 0 (no info is available)
DDW	: 0 (no info is available)
TIHG	: Column AV (EUtil) + Column AX (Occ) [Note: the unit will be converted back to MJ/day]
OCC	: From Column AX (Occ). OCC=1 if Column AX $\leq$ 0.8, OCC=2 if 0.8 < Column AX $\leq$ 1.6, OCC=$\frac{(\text{Column AX - 1.6})}{0.4}$ + 2 if OCC > 1.6. This is based on the assumption used in report "Environmental Impact Study: Phase I - Development of a Database on Housing Characteristics Representative of the Canadian Housing Stock [CMHC STAR-HOUSING Database]" by Scanada, 1992.
OCC_D	: 0 (no info is available)
OCC_WA	: 0 (no info is available)

Record 11 (Auxillary Systems):

ESEAS	: Column GL (Space-Elec) if electricity is not the main fuel for space heating. Note: Values in Column GL will be converted from kWh to MJ by multiplying by 3.6.
EAPP	: Column GD (Based Load)
E1	: Column AV (EUtil)
E3	: Column AX (Occ)
U_W	: 0 (no info is available)
E_EA	: 0 (no info is available)
DHWL	: Column AW (Qdhw)
QDHW	: Column FW (DHW Consumption)

Record 12 (Heat Pump System):

IMP1	: from Column P; 0 if "N" (all are zero in EXCEL data), 1 if else. ("Y" or "N")
IMP2	: From Column AH (DHW1). IMP2=1 if DHW type is "2", else is 0.
LTA	: 0 (no info is available)
PREH	: Column EN (Cap)
VT	: Column AM (Vtype) [0, 1, 2]
IFLOW	: 0 (no info is available)
FAN(1)	: Column EL (@0°C)
FAN(2)	: Column EM (@-25°C)
FAN(3)	: 0 (no info is available)
EFF(1)	: Column EQ (@0°C)

EFF(2)	: Column ER (@-25°C)
EFF(3)	: 0 (no info is available)

Record 13 (Type of Rooms):

RM(1)	: 0 (no info is available in data)
RM(2)	: 0 (no info is available in data)
RM(3)	: 0 (no info is available in data)
RM(4)	: 0 (no info is available in data)
RM(5)	: 0 (no info is available in data)
RM(6)	: 0 (no info is available in data)
RM(7)	: 0 (no info is available in data)

Record 14 (CMHC2 Data Codes):

PBCODE	: 0 (no info is available)
EOCODE	: 0 (no info is available)
ACDUCT	: 0 (no info is available)
AACODE	: 0 (no info is available)
XODRY	: 0 (no info is available)
XOWASH	: 0 (no info is available)
XOKIT	: 0 (no info is available)
SH_LOC	: 0 (no info is available)
INTRP	: 0 (no info is available)
ATTCV	: 0 (no info is available)

Record 15 (Heat Pump):

HP	: 0 (no houses with heat pump in data)
HPT	: 0 (no houses with heat pump in data)
HPCUT	: 0 (no houses with heat pump in data)
HPN	: 0 (no houses with heat pump in data)
HPCAP	: 0 (no houses with heat pump in data)
HPCOP	: 0 (no houses with heat pump in data)
HPTEMP	: 0 (no houses with heat pump in data)
HPGCAP	: 0 (no houses with heat pump in data)
HPGCOP	: 0 (no houses with heat pump in data)
HPGECAP	: 0 (no houses with heat pump in data)

Record 16 (Air Conditioning):

ACAP	: 0 (no info is available)
ACOP	: 0 (no info is available)
ASHR	: 0 (no info is available)
AVOL	: 0 (no info is available)
SWET	: 0 (no info is available)
SDRY	: 0 (no info is available)
RWET	: 0 (no info is available)
RDRY	: 0 (no info is available)

Record 17 (Floor):

FLH	: 0 (no info is available)
FLC	: 0 (no info is available)
PW1	: 0 (no info is available)
PW2	: 0 (no info is available)
PW3	: 0 (no info is available)

Record 18 (Full Basement):

FBG1	: Column BP (ABsmt7)
FBG2	: Column CP (RBsmt7)
FBG3	: 0 (no info is available)
FLG1	: Column BQ (ABsmt8)
FLG2	: Column CQ (RBsmt8)
FLG3	: 0 (no info is available)

Record 19 (Full Basement):

FP1	: Column BR (ABsmt9)
FP2	: Column CR (RBsmt9)
FP3	: 0 (no info is available)
FC1	: Column BS (ABsmt10)
FC2	: Column CS (RBsmt10)
FC3	: 0 (no info is available)
FD	: 0 (no info is available)
FID	: 0 (no info is available)
FPL	: 0 (no info is available)
FH	: 0 (no info is available)
FHT	: 0 (no info is available)

Record 20 (Shallow Basement):

SLG1	: Column BM (ABsmt4)
SLG2	: Column CM (RBsmt4)
SLG3	: 0 (no info is available)
SP1	: Column BN (ABsmt5)
SP2	: Column CN (RBsmt5)
SP3	: 0 (no info is available)
SC1	: Column BO (ABsmt6)
SC2	: Column CO (RBsmt6)
SC3	: 0 (no info is available)
SD	: 0 (no info is available)
SID	: 0 (no info is available)
SPL	: 0 (no info is available)
SH	: 0 (no info is available)
SHT	: 0 (no info is available)

Record 21 (Crawlspace):

CRP1	: Column BH (Acsper)
CRP2	: Column CH (Rcsper)
CRP3	: 0 (no info is available)
CRC1	: Column BI (Acsctr)
CRC2	: Column CI (Rcsctr)
CRC3	: 0 (no info is available)

Record 22 (Crawlspace):

CRH	: 1 (for YES) if Coulmn K is H, 2 for "Unheated", 0 for else.
CRV	: 2 (for YES) if Column L is V, 1 for "Closed", 0 for else.
CRPL	: Column M (CSinsul) [1 for "F", 2 for "G", 0 for else]
CRW1	: Column BG (Acswall)
CRW2	: Column CG (Rcswall)
CRW3	: 0 (no info is available)
HT_CR	: 0 (no info is available)

Record 23 (Below Grade Slab):

SLP1	: Column BJ (ABsmt1)
SLP2	: Column CJ (RBsmt1)
SLP3	: 0 (no info is available)
SLC1	: Column BK (ABsmt2)
SLC2	: Column CK (RBsmt2)
SLC3	: 0 (no info is available)
SLE	: Column S (Sledge) [1 for "YES", 0 for "NO"]
SLPL	: From Column H (Ilslab). 1 if "I", 2 if "O".
D_SL	: 0 (no info is available)

Record 24 (Living Area):

AF_P	: 0 (no info is available)
HT_P	: 0 (no info is available)
AF_PCH	: 0 (no info is available)
HT_PCH	: 0 (no info is available)
AF_B	: 0 (no info is available)
HT_B	: 0 (no info is available)

Record 25 (Crawlspace):

AF_CR	: Column BH (Acsper) + Column BI (Acsctr).
PHS_G	: 0 (no info is available)
PHS_P	: 0 (no info is available)
B_THST	: Column AO (Tbsmt)
L_PI	: 0 (no info is available)
HT_PI	: 0 (no info is available)

Record 26 (Foundation Attachment Code):

FBA	: Column Z (Attbsmt)
SBA	: Column Y (Attsbsmt)
CRA	: Column W (Attcs)
SLA	: Column X (Attslab)

Record 27 (Ceiling):

CL1	: Column BC (Acling)
CL2	: Column CC (Rclng)
CL3	: 0 (no info is available)
EXFA	: Column BF (Aoflr)
EXFR	: Column CF (Roflr)
EXFC	: 0 (no info is available)

Record 28 (Costing):

AMOPT	: 0 (no info is available)
CSTS_LAND	: 0 (no info is available)
CSTS_CC	: 0 (no info is available)
CSTS_DSGN	: 0 (no info is available)
CSTS_SSI	: 0 (no info is available)
CSTS_INS	: 0 (no info is available)
UM_DE	: 0 (no info is available)
UM_RP	: 0 (no info is available)
DC_UW	: 0 (no info is available)
DC_UE	: 0 (no info is available)

Record 29 (Main Walls):
For I = 1 t o 9

W1(I,1)	: Column BD (Awall) [only for I = 9]
W1(I,2)	: Column CD (Rwall) [only for I = 9]
W1(I,3)	: 0 (no info is available)

Note: Since the direction of main wall is not given, only I=9 will have entries and the rest (I=1 to 8) will have all zero entries.

Record 30 (Door):
For I = 1 to 9

D1(I,1)	: Column BE (Adoor) [only for I=9]
D1(I,2)	: Column CE (Rdoor) [only for I=9]
D1(I,3)	: 0 (no info is available)

Note: Since the direction of door is not given, only I=9 will have entries and the rest (I=1 to 8) will have all zero entries.

Record 31 (Basement Exposed Walls):
For I = 1 to 9

G1(I,1)	: Column BL (ABsmt3)
G1(I,2)	: Column CL (RBsmt3)
G1(I,3)	: 0 (no info is available)

Note: Since the direction of basement exposed wall is not given, only I=9 will have entries and the rest (I=1 to 8) will have all zero entries.

Record 32 (Skylight):
For I = 1 to 9

SK1(I,1)	: 0 (no info is available)
SK1(I,2)	: 0 (no info is available)
SK1(I,3)	: 0 (no info is available)
SK1(I,4)	: 0 (no info is available)

Record 33 (Windows - Above Ground):
For I = 1 to 9
For simplicity, only the south (I=2) facing windows are listed here as an example. Similar procedures are used in other window directions.

GL1(I,1)	: Column BT (Aws) [for south (I=2)]
GL1(I,2)	: Column CT (Rws) [for south (I=2)]
GL1(I,3)	: 0 (no info is available)
GL1(I,4)	: 0 (no info is available)
GL2(I,1)	: Refer to Note on window direction below.
GL2(I,2)	: Column DK (Sws) [for south (I=2)] **Note:** In Hot-2000, this variable is referred to as "shading coefficient" as opposed to "transmission coefficient".
GL2(I,3)	: Column DS [for south (I=2)]. Note: only for S, SE and SW.
GL3(I,1)	: Column DT [for south (I=2)]. Note: only for S, SE and SW.
GL3(I,2)	: Column DU [for south (I=2)]. Note: only for S, SE and SW. Note: Column DS to EA in the EXCEL files for window overhang dimension are mislabeled. The correct descriptions are: Column DS: height of window for S.

Column DT: overhang height from window for S.
Column DU: depth of the header for S.
Column DV: height of window for SE.
Column DW: overhang height from window for SE.
Column DX depth of the header for SE.
Column DY: height of window for SW.
Column DZ: overhang height from window for SW.
Column EA: depth of the header for SW.

GL3(I,3) : 0 (no info is available)

Note I=1 for N
I=2 for S
I=3 for E
I=4 for W
I=5 for NE
I=6 for NW
I=7 for SE
I=8 for SW
I=9 for no direction specified

Record 34 (Windows - Basement):

For I = 1 to 9

BG1(I,1)	: 0 (no separate entries for basement windows in Hot-2000)
BG1(I,2)	: 0 (no separate entries for basement windows in Hot-2000)
BG1(I,3)	: 0 (no separate entries for basement windows in Hot-2000)
BG1(I,4)	: 0 (no separate entries for basement windows in Hot-2000)
BG2(I,1)	: 0 (no separate entries for basement windows in Hot-2000)
BG2(I,2)	: 0 (no separate entries for basement windows in Hot-2000)
BG2(I,3)	: 0 (no separate entries for basement windows in Hot-2000)
BG3(I,1)	: 0 (no separate entries for basement windows in Hot-2000)
BG3(I,2)	: 0 (no separate entries for basement windows in Hot-2000)
BG3(I,3)	: 0 (no separate entries for basement windows in Hot-2000)

Section 4B

Hot-2000 to STAR Database File Conversion BASIC Program

```
REM Program HOT2000-TO-STAR DATA FILE TRANSFER PROGRAM
REM ************************************************************************
REM   This program is written for converting the HOT-2000 house files from
REM   Ontario Hydro and Merchant into STAR Database house input files. A
REM   comma-separated data file created from an EXCEL STAR Database is used
REM   for the conversion.
REM
REM   Written for: Mr. Tom Hamlin (CMHC)
REM   Written by : Alan Fung (Thermal Engineering of Halifax)
REM   Language   : MS QuickBasic 4.5
REM   Date       : JUNE 20, 1993
REM ************************************************************************

REM Variable declaration
DIM SPF%(5), SPT%(5), SPCC!(5), SPE(5), MJ!(5), MJS!(5)
DIM DWF%(2), DWT%(2), DWC!(2), DWE!(2)
DIM W11!(9), W12!(9), W13%(9)
DIM D11!(9), D12!(9), D13%(9)
DIM G11!(9), G12!(9), G13%(9)
DIM SK11!(9), SK12!(9), SK13%(9), SK14!(9)
DIM GL11!(9), GL12!(9), GL13%(9), GL14!(9), GL21$(9), GL22!(9), GL23!(9)
DIM GL31!(9), GL32!(9), GL33!(9)
DIM BG11!(9), BG12!(9), BG13%(9), BG14!(9), BG21$(9), BG22!(9), BG23!(9)
DIM BG31!(9), BG32!(9), BG33!(9)

REM Open "HYMH-AB.CSV" data file
datfile1$ = "c:\cmhc\HYMH-AB.csv"
OPEN datfile1$ FOR INPUT AS #1
REM Open "HYMH-CD.CSV" data file
datfile2$ = "c:\cmhc\HYMH-CD.csv"
OPEN datfile2$ FOR INPUT AS #2
REM Open "HYMH-EF.CSV" data file
datfile3$ = "c:\cmhc\HYMH-EF.csv"
OPEN datfile3$ FOR INPUT AS #3
REM Open "HYMH-GH.CSV" data file
datfile4$ = "c:\cmhc\HYMH-GH.csv"
OPEN datfile4$ FOR INPUT AS #4


WHILE NOT EOF(1)
REM Reading Hot-2000 data file variables from four comma-separated files
INPUT #1, na$, nb, nc$, d$, e$, nf$, g$, h$, ii$, j$, k$, nl$, m$, n$, no$,
INPUT #2, ca, cb$, cc, cd, ce, cf, cg, ch, ci, cj, ck, cl, cm, cn, co, cp, c
INPUT #3, ea, eb$, ec, ed, ee, ef, eg, eh, ei, ej, ek, el, em, en, eo, ep, eq,
INPUT #4, ga, gb$, gc, gd, ge, gf, gg, gh, gi, gj, gk, gl, gm, gn, ngo, gp,
source$ = "Hydr"
IF (d$ <> "Ontario Hydro") THEN source$ = "Mrch"

REM opening a new STAR file
DFNAME$ = "c:\cmhc\moddata\" + source$ + "-s\" + nc$ + ".chp"
OPEN DFNAME$ FOR OUTPUT AS #5
PRINT DFNAME$

REM Reading Record 01 (Record Identification)
A$ = nc$: B$ = d$: RS$ = "R": C$ = " ": L$ = hg$: R$ = " "
P$ = na$: U$ = "1": WF$ = hf$
PRINT #5, A$; ","; B$; ","; RS$; ","; C$; ","; L$; ","; R$; ","; P$; ","; U$;

REM Reading Record 02 (Typology)
REM Determining the house orientation
```

```
Max = bt
O$ = "S"
DEG! = 0
IF (bu > Max) THEN
Max = bu
O$ = "SE"
DEG! = -45
END IF
IF (bv > Max) THEN
Max = bv
O$ = "E"
DEG! = -90
END IF
IF (bw > Max) THEN
Max = bw
O$ = "NE"
DEG! = -135
END IF
IF (bx > Max) THEN
Max = bx
O$ = "N"
DEG! = 180
END IF
IF (by > Max) THEN
Max = by
O$ = "NW"
DEG! = 135
END IF
IF (bz > Max) THEN
Max = bz
O$ = "W"
DEG! = 90
END IF
IF (ca > Max) THEN
Max = ca
O$ = "SW"
DEG! = 45
END IF
HT% = 0: HS% = 0: HSPE% = 0: FLN% = 0: A2% = 1991 - nb: Year% = nb: CT% = 0
PRINT #5, O$; ","; HT%; ","; HS%; ","; HSPE%; ","; FLN%; ","; A2%; ","; Year

REM Reading Record 03 (Basement, Crawlspace and Perimeters)
REM Determining the existence of basement/crawlspace/slab on grade
SB% = 0: FB% = 0: CR% = 0: SG% = 0
PERB! = 0: PERM! = 0: PER2! = 0: PER3! = 0: CRPER! = 0: BMPER! = 0
FBA% = 0: SBA% = 0: CRA% = 0: SLA% = 0
IF ((ii$ = "i") OR (ii$ = "o") OR (ii$ = "I") OR (ii$ = "O")) THEN SB% = 1
IF ((j$ = "i") OR (j$ = "o") OR (j$ = "I") OR (j$ = "O")) THEN FB% = 1
IF ((g$ = "i") OR (g$ = "o") OR (g$ = "I") OR (g$ = "O")) THEN CR% = 1
IF ((h$ = "i") OR (h$ = "o") OR (h$ = "I") OR (h$ = "O")) THEN SG% = 1
REM Defining foundation, basement and crawlspace perimeters
IF ((FB% = 1) AND (CR% = 1)) THEN
PERB! = 4 + br + bh
CRPER! = 2 + bh
BMPER! = 2 + br
BMTA! = br + bs + bh + bi
CRRFA! = bh + bi
BMFA! = br + bs
ELSEIF ((SB% = 1) AND (CR% = 1)) THEN
PERB! = 4 + bn + bh
```

```
CRPER! = 2 + bh
BMPER! = 2 + bn
BMTA! = bn + bo + bh + bi
CRRFA! = bh + bi
BMFA! = bn + bo
ELSEIF ((FB% = 1) AND (SB% = 0) AND (CR% = 0)) THEN
PERB! = 4 + br
BMPER! = 4 + br
BMTA! = br + bs
BMFA! = br + bs
ELSEIF ((FB% = 0) AND (SB% = 1) AND (CR% = 0)) THEN
PERB! = 4 + bn
BMPER! = 4 + bn
BMTA! = bn + bo
ELSEIF ((FB% = 0) AND (SB% = 0) AND (CR% = 1)) THEN
PERB! = 4 + bh
CRPER! = 4 + bh
BMTA! = bh + bi
CRRFA! = bh + bi
END IF
REM Assigning values for Record 26 (Foundation Attachment Code)
FBA% = z: SBA% = y: CRA% = w: SLA% = x
PRINT #5, SB%; ","; FB%; ","; CR%; ","; SG%; ","; PERB!; ","; PERM!; ","; PER

REM Reading Record 04 (Heating System and Energy Use Records for Five Differ
REM Declaring fuel type
IF (n$ = "O" OR n$ = "o") THEN SPF%(1) = 1
IF (n$ = "G" OR n$ = "g") THEN SPF%(1) = 2
IF (n$ = "E" OR n$ = "e") THEN SPF%(1) = 3
IF (n$ = "P" OR n$ = "p") THEN SPF%(1) = 4
IF (n$ = "W" OR n$ = "w") THEN SPF%(1) = 5
IF (n$ = "C" OR n$ = "c") THEN SPF%(1) = 6
SPT%(1) = 0

REM Determining fuel efficiency
SPE(1) = 100 * fe / ge

REM Determining fuel usage
REM Oil
IF (SPF%(1) = 1) THEN
MJS!(1) = gt * 38.54
MJ!(1) = (gt + gu) * 38.54
END IF
REM Natural Gas
IF (SPF%(1) = 2) THEN
MJS!(1) = gp * 37.27
MJ!(1) = (gp + gq) * 37.27
END IF
REM Electric
IF (SPF%(1) = 3) THEN
MJS!(1) = gl * 3.6
MJ!(1) = (gl + gm) * 3.6
END IF
REM Propane (Check heating value)
IF (SPF%(1) = 4) THEN
MJS!(1) = gx * 38.5
MJ!(1) = (gx + gy) * 38.5
END IF
REM Wood (Checking heating value)
IF (SPF%(1) = 5) THEN
```

```
MJS!(1) = hb * 38.5
MJ!(1) = (hb + hc) * 38.5
END IF
REM Coal  (No entry for coal as space heating fuel)
SPCC!(1) = (1.2 * nfd) / (1000)
FOR I = 1 TO 5
PRINT #5, SPF%(I); ","; SPT%(I); ","; SPCC!(I); ","; SPE(I); ","; MJ!(I); ",
NEXT I

REM Reading Record 05 (Domestic Hot Water System)
DWT%(1) = ah
DWC!(1) = 0
REM Determining the DHW efficiency
IF (ah = 1) THEN
DWF%(1) = 3
DWE!(1) = 93
END IF
IF ((ah = 2) OR (ah = 3) OR (ah = 4)) THEN
DWF%(1) = 3
DWE!(1) = 100
END IF
IF (ah = 5) THEN
DWF%(1) = 1
DWE!(1) = 45
END IF
IF (ah = 6) THEN
DWF%(1) = 1
DWE!(1) = 55
END IF
IF (ah = 7) THEN
  IF (SPF%(1) = 2) THEN DWF%(1) = 2
  IF (SPF%(1) = 4) THEN DWF%(1) = 4
DWE!(1) = 45
END IF
IF ((ah = 8) OR (ah = 9)) THEN
  IF (SPF%(1) = 2) THEN DWF%(1) = 2
  IF (SPF%(1) = 4) THEN DWF%(1) = 4
DWE!(1) = 50
END IF
IF ((ah = 10) OR (ah = 11)) THEN
  IF (SPF%(1) = 2) THEN DWF%(1) = 2
  IF (SPF%(1) = 4) THEN DWF%(1) = 4
DWE!(1) = 58
END IF
IF (ah = 12) THEN
DWF%(1) = 5
DWE!(1) = 30
END IF
FOR I = 1 TO 2
PRINT #5, DWF%(I); ","; DWT%(I); ","; DWC!(I); ","; DWE!(I); ","
NEXT I

REM Reading Record 06 (Set Point Temperatures)
T1! = an: T2! = ao: T3! = ap: TSP1! = T1!
HSP1! = 0: TSP2! = 0: TSP3! = 0
REM Determining whether temp set-back is used
IF (T1! < 21!) THEN
TSP1! = 21!
TSP3! = (an * 24 - 21 * 12) / 12
TSP2! = TSP3!
```

```
HSP1! = 12
END IF
TPCH! = 0: TCL! = 0: TDP! = 0: CSWING! = 0
TSWING! = aq
MC$ = q$
PRINT #5, T1!; ","; T2!; ","; T3!; ","; TSP1!; ","; TSP3!; ","; TSP2!; ","; Tr

REM Reading Record 07 (Floor Area)
FLA! = ar: FLMA! = 0: FL2A! = 0: FL3A! = 0
SLBA! = 0
IF (SG% = 1) THEN SLBA! = bj + bk
PRINT #5, FLA!; ","; FLMA!; ","; FL2A!; ","; FL3A!; ","; BMTA!; ","; CRRFA!;

REM Reading Record 08 (Air Infiltration)
V! = nas: BMTV! = 0: FLMV! = 0: FL2V! = 0: FL3V! = 0
REM Determining the ELA, ACH and ACH@50
IF ((at <> 0) AND (ay <> 0) AND (az <> 0)) THEN
ACH! = at
ACH50! = ay
ELA! = az
END IF
IF ((at = 0) AND (ay <> 0) AND (az <> 0)) THEN
ACH50! = ay
ELA! = az
ACH! = ACH50! / 14.78
END IF
IF ((at <> 0) AND (ay = 0) AND (az = 0)) THEN
ACH! = at
ACH50! = 14.78 * ACH!
   IF (P$ = "NFL") THEN
   ELA! = 1.75 * ba
   END IF
   IF (P$ = "NS") THEN
   ELA! = 1.36 * ba
   END IF
   IF (P$ = "NB") THEN
   ELA! = 1.49 * ba
   END IF
   IF (P$ = "QUE") THEN
   ELA! = 1.24 * ba
   END IF
   IF (P$ = "ONT") THEN
   ELA! = 1.995 * ba
   END IF
   IF (P$ = "MAN") THEN
   ELA! = .91 * ba
   END IF
   IF (P$ = "SAS") THEN
   ELA! = 1.125 * ba
   END IF
   IF (P$ = "ALT") THEN
   ELA! = 1.32 * ba
   END IF
   IF (P$ = "BC") THEN
   ELA! = 2.87 * ba
   END IF
END IF
IF ((at <> 0) AND (ay = 0) AND (az <> 0)) THEN
ELA! = az
ACH! = at
```

```
ACH50! = 14.78 * ACH!
END IF
F$ = "0": WS% = 0: VB$ = " ": V5! = au * nas / 3.6: VTS% = 0: VT% = am
FLOWC! = 0: FLOWE! = 0
REM Determining whether the house is sheltered
IF ((t$ = "N") OR (t$ = "n")) THEN
WS% = 4
END IF
IF ((t$ = "Y") OR (t$ = "y")) THEN
WS% = 1
END IF
REM Determining whether the house is balanced
IF ((nv$ = "B") OR (nv$ = "b")) THEN
VB$ = "B"
END IF
IF ((nv$ = "U") OR (nv$ = "u")) THEN
VB$ = "U"
END IF

PRINT #5, V!; ","; BMTV!; ","; FLMV!; ","; FL2V!; ","; FL3V!; ","; ACH!; ","

REM Reading Record 09 (Climate and Orientation)
MASS! = 0: MC% = 0: S1% = aa: SABS! = 0: SOLAIR! = 0: COL% = 0
MICROCL% = 0: WSOURCE% = 0: SOIL% = 0
PRINT #5, DEG!; ","; MASS!; ","; MC%; ","; S1%; ","; SABS!; ","; SOLAIR!; ",

REM Reading Record 10 (Degree Days)
DDN! = 0: DDC! = 0: DDW! = 0: TIHG! = 0: OCCD! = 0: OCCWA! = 0
REM Determining the number of occupancy
IF (ax <= .8) THEN
OCC! = 1
END IF
IF ((ax > .8) AND (ax <= 1.6)) THEN
OCC! = 2
END IF
IF (ax > 1.6) THEN
OCC! = ((ax - 1.6) / .4) + 2
END IF
PRINT #5, DDN!; ","; DDC!; ","; DDW!; ","; TIHG!; ","; OCC!; ","; OCCD!; ","

REM Reading Record 11 (Auxillary Systems)
ESEAS! = 0
IF (SPF%(1) <> 3) THEN
ESEAS! = gl * 3.6
END IF
EAPP! = gd: E1! = av: E3! = ax: UW! = 0: EEA! = 0
DHWL! = aw: QDHW! = fw
PRINT #5, ESEAS!; ","; EAPP!; ","; E1!; ","; E3!; ","; UW!; ","; EEA!; ",";

REM Reading Record 12 (Heat Pump System)
IMP1$ = np$: IMP2$ = "0": LTA$ = "0": PREH! = en: VT% = am: IFLOW! = 0
FAN1! = el: FAN2! = em: FAN2! = 0: EFF1! = eq: EFF2! = er: EFF3! = 0
IF (ah = 2) THEN IMP2$ = "1"
PRINT #5, IMP1$; ","; IMP2$; ","; LTA$; ","; PREH!; ","; VT%; ","; IFLOW!; "

REM Reading Record 13 (Type of Rooms)
RM1% = 0: RM2% = 0: RM3% = 0: RM4% = 0: RM5% = 0: RM6% = 0: RM7% = 0
PRINT #5, RM1%; ","; RM2%; ","; RM3%; ","; RM4%; ","; RM5%; ","; RM6%; ",";

REM Reading Record 14 (CMHC2 Data Code)
```

```
PBCODE% = 0: ECODE% = 0: ACDUCT% = 0: AACODE% = 0: XODRY! = 0: XOWASH! = 0
XOKIT! = 0: SHLOX% = 0: INTRP% = 0: ATTCV% = 0
PRINT #5, PBCODE%; ","; ECODE%; ","; ACDUCT%; ","; AACODE%; ","; XODRY!; ",";

REM Reading Record 15 (Heat Pump)
HP% = 0: HPT% = 0: HPCUT! = 0: HPN% = 0: HPCAP! = 0: HPCOP! = 0
HPTEMP! = 0: HPGCAP! = 0: HPGCOP! = 0: HPGECAP! = 0
PRINT #5, HP%; ","; HPT%; ","; HPCUT!; ","; HPN%; ","; HPCAP!; ","; HPCOP!;

REM Reading Record 16: (Airconditioning)
ACAP! = 0: ACOP! = 0: ASHR! = 0: AVOL! = 0: SWET! = 0
SDRY! = 0: RWET! = 0: RDRY! = 0
PRINT #5, ACAP!; ","; ACOP!; ","; ASHR!; ","; AVOL!; ","; SWET!; ","; SDRY!;

REM Reading Record 17 (Floor) and 27 (Ceiling)
FLH! = 0: FLC% = 0: PW1! = 0: PW2! = 0: PW3% = 0
CL1! = bc: CL2! = cc: CL3% = 0: EXFA! = bf: EXFR! = cf: EXFC% = 0
PRINT #5, FLH!; ","; FLC%; ","; PW1!; ","; PW2!; ","; PW3%; ","; CL1!; ",";

REM Reading Record 18 (Full Basement)
FBG1! = bp: FBG2! = cp: FBG3% = 0: FLG1! = bq: FLG2! = cq: FLG3% = 0
PRINT #5, FBG1!; ","; FBG2!; ","; FBG3%; ","; FLG1!; ","; FLG2!; ","; FLG3%

REM Reading Record 19 (Full Basement)
FP1! = br: FP2! = CR: FP3% = 0: FC1! = bs: FC2! = cs: FC3% = 0
fd! = 0: FID! = 0: FPL% = 0: FH! = 0: FHT% = 0
PRINT #5, FP1!; ","; FP2!; ","; FP3%; ","; FC1!; ","; FC2!; ","; FC3%; ","; f

REM Reading Record 20 (Shallow Basement)
SLG1! = bm: SLG2! = cm: SLG3% = 0: SP1! = bn: SP2! = cn: SP3% = 0
SC1! = bo: SC2! = co: SC3% = 0: SD! = 0: SID! = 0: SPL% = 0: SH! = 0: SHT% = (
PRINT #5, SLG1!; ","; SLG2!; ","; SLG3%; ","; SP1!; ","; SP2!; ","; SP3%; ",

REM Reading Record 21 (Crawlspace)
CRP1! = bh: CRP2! = ch: CRP3% = 0: CRC1! = bi: CRC2! = ci: CRC3% = 0
PRINT #5, CRP1!; ","; CRP2!; ","; CRP3%; ","; CRC1!; ","; CRC2!; ","; CRC3%

REM Reading Record 22 (Crawlspace)
CRH% = 0: CRV% = 0: CRPL% = 0
IF ((k$ = "H") OR (k$ = "h")) THEN
CRH% = 1
END IF
IF ((nl$ = "V") OR (nl$ = "v")) THEN
CRV% = 2
END IF
IF ((nl$ = "C") OR (nl$ = "c")) THEN
CRV% = 1
END IF
IF ((m$ = "G") OR (m$ = "g")) THEN
CRPL% = 2
END IF
IF ((m$ = "F") OR (m$ = "f")) THEN
CRPL% = 1
END IF
CRW1! = bg: CRW2! = cg: CRW3% = 0: HTCR! = 0
PRINT #5, CRH%; ","; CRV%; ","; CRPL%; ","; CRW1!; ","; CRW2!; ","; CRW3%; " "

REM Reading Record 23 (Below Grade Slab)
SLP1! = bj: SLP2! = cj: SLP3% = 0: SLC1! = bk: SLC2! = ck: SLC3% = 0
SLE%!= 0: SLPL% = 0: DSL! = 0
```

```
IF ((s$ = "Y") OR (s$ = "y")) THEN
SLE% = 1
END IF
IF ((h$ = "I") OR (h$ = "i")) THEN
SLPL% = 1
END IF
IF ((h$ = "O") OR (h$ = "o")) THEN
SLPL% = 2
END IF
PRINT #5, SLP1!; ","; SLP2!; ","; SLP3%; ","; SLC1!; ","; SLC2!; ","; SLC3%;

REM Reading Record 24 (Living Area)

PRINT #5, AFP!; ","; HTP!; ","; AFPCH!; ","; HTPCH!; ","; AFB!; ","; HTB!

REM Reading Record 25 (Crawlspace)

PRINT #5, AFCR!; ","; PHSG!; ","; PHSP!; ","; BTHST!; ","; LPI!; ","; HTPI!

REM Reading Record 26 (Foundation Attatchment Code)
REM Reading is done in Record 03
REM print #5, FBA%;","; SBA%;","; CRA%;","; SLA%
REM PRINT FBA%; ","; SBA%; ","; CRA%; ","; SLA%
REM Reading Record 27 (Ceiling)
REM Reading is done in Record 17
REM PRINT CL1!; ","; CL2!; ","; CL3%; ","; EXFA!; ","; EXFR!; ","; EXFC%
REM print #5, CL1!;","; CL2!;","; CL3%;","; EXFA!;","; EXFR!;","; EXFC%

REM Reading Record 28 (Costing)
AMOPT% = 0: CSTSLAND! = 0: CSSTSCC! = 0: CSTSDSGN! = 0: CSTSSSI! = 0
CSTSINS! = 0: UMDE% = 0: UMRP% = 0: DCUW% = 0: DCUE% = 0
PRINT #5, AMOPT%; ","; CSTSLAND!; ","; CSSTSCC!; ","; CSTSDSGN!; ","; CSTSSS

REM Reading Record 29 (Main Walls)
FOR I = 1 TO 8
W11!(I) = 0: W12!(I) = 0: W13%(I) = 0
NEXT I
W11!(9) = bd: W12!(9) = cd: W13%(9) = 0
FOR I = 1 TO 9
PRINT #5, W11!(I); ","; W12!(I); ","; W13%(I)
NEXT I

REM Reading Record 30 (Door)
FOR I = 1 TO 8
D11!(I) = 0: D12!(I) = 0: D13%(I) = 0
NEXT I
D11!(9) = be: D12!(9) = ce: D13%(9) = 0
FOR I = 1 TO 9
PRINT #5, D11!(I); ","; D12!(I); ","; D13%(I)
NEXT I

REM Reading Record 31 (Basement Exposed Walls)
FOR I = 1 TO 8
G11!(I) = 0: G12!(I) = 0: G13%(I) = 0
NEXT I
G11!(9) = bl: G12!(9) = cl: G13%(9) = 0
FOR I = 1 TO 9
PRINT #5, G11!(I); ","; G12!(I); ","; G13%(I)
NEXT I
```

```
REM Reading Record 32 (Skylight)
FOR I = 1 TO 9
SK11!(I) = 0: SK12!(I) = 0: SK13%(I) = 0: SK14!(I) = 0
NEXT I
FOR I = 1 TO 9
PRINT #5, SK11!(I); ","; SK12!(I); ","; SK13%(I); ","; SK14!(I)
NEXT I

REM Reading Record 33 (Windows - Above Ground)
REM North-side windows (I=1)
GL11!(1) = bx: GL12!(1) = cx: GL13%(1) = 0: GL14!(1) = 0: GL21$(1) = "N"
GL22!(1) = ndo: GL23!(1) = 0: GL31!(1) = 0: GL32!(1) = 0: GL33!(1) = 0
REM South-side windows (I=2)
GL11!(2) = bt: GL12!(2) = nct: GL13%(2) = 0: GL14!(2) = 0: GL21$(2) = "S"
GL22!(2) = dk: GL23!(2) = ds: GL31!(2) = du: GL32!(2) = dt: GL33!(2) = 0
REM East-side windows (I=3)
GL11!(3) = bv: GL12!(3) = cv: GL13%(3) = 0: GL14!(3) = 0: GL21$(3) = "E"
GL22!(3) = dm: GL23!(3) = 0: GL31!(3) = 0: GL32!(3) = 0: GL33!(3) = 0
REM West-side windows (I=4)
GL11!(4) = bz: GL12!(4) = cz: GL13%(4) = 0: GL14!(4) = 0: GL21$(4) = "W"
GL22!(4) = dq: GL23!(4) = 0: GL31!(4) = 0: GL32!(4) = 0: GL33!(4) = 0
REM North-East-side windows (I=5)
GL11!(5) = bw: GL12!(5) = cw: GL13%(5) = 0: GL14!(5) = 0: GL21$(5) = "NE"
GL22!(5) = dn: GL23!(5) = 0: GL31!(5) = 0: GL32!(5) = 0: GL33!(5) = 0
REM North-West-side windows (I=6)
GL11!(6) = by: GL12!(6) = cy: GL13%(6) = 0: GL14!(6) = 0: GL21$(6) = "NW"
GL22!(6) = dp: GL23!(6) = 0: GL31!(6) = 0: GL32!(6) = 0: GL33!(6) = 0
REM South-East-side windows (I=7)
GL11!(7) = bu: GL12!(7) = cu: GL13%(7) = 0: GL14!(7) = 0: GL21$(7) = "SE"
GL22!(7) = dl: GL23!(7) = dv: GL31!(7) = dx: GL32!(7) = dw: GL33!(7) = 0
REM South-West-side windows (I=8)
GL11!(8) = ca: GL12!(8) = da: GL13%(8) = 0: GL14!(8) = 0: GL21$(8) = "SW"
GL22!(8) = dr: GL23!(8) = dy: GL31!(8) = ea: GL32!(8) = dz: GL33!(8) = 0
REM No-direction windows (I=9)
GL11!(9) = 0: GL12!(9) = 0: GL13%(9) = 0: GL14!(9) = 0: GL21$(9) = "0"
GL22!(9) = 0: GL23!(9) = 0: GL31!(9) = 0: GL32!(9) = 0: GL33!(9) = 0
REM If no R-value for windows, assume standard double-glazed windows
FOR I = 1 TO 9
IF ((GL11!(I) <> 0) AND (GL12!(I) = 0)) THEN
GL12!(I) = .36
END IF
NEXT I
FOR I = 1 TO 9
PRINT #5, GL11!(I); ","; GL12!(I); ","; GL13%(I); ","; GL14!(I); ","; GL21$(I)
NEXT I

REM Reading Record 34 (Windows - Basement)
FOR I = 1 TO 9
BG11!(I) = 0: BG12!(I) = 0: BG13%(I) = 0: BG14!(I) = 0: BG21$(I) = "0"
BG22!(I) = 0: BG23!(I) = 0: BG31!(I) = 0: BG32!(I) = 0: BG33!(I) = 0
NEXT I
FOR I = 1 TO 9
PRINT #5, BG11!(I); ","; BG12!(I); ","; BG13%(I); ","; BG14!(I); ","; BG21$(I)
NEXT I

REM Extra Record for Design Heat loss
REM DHL! = nfd / 1000!
REM PRINT #5, DHL!

REM Extra Record for HRV
```

```
REM HRV$ = no$
REM PRINT #5, HRV$
CLOSE #5

WEND

CLOSE #1
CLOSE #2
CLOSE #3
CLOSE #4

END
```

Section 4C

Sample Hot-2000 files, Hot-2000 Excel files, and Corresponding Newly Created STAR Files

42 5 0 4 TORONTO cene5986

Ontario Hydro

Newmarket

1MAR I 0010N		22.0 16.5	.0	3.5S	E	N	W	0 0 0 0 0		
L 113.62	3.790									
76.95	1.700									
L 14.00	1.700									
L 1.67	.800									
L 25.10	4.490									
L 63.85	1.690									
L 39.73	1.570									
L 37.96	.370									
L 50.57	.370									
L 2.70	1.000	.200	.000	.940	1.524	.610	.20:			
L 2.70	1.000	.200	.000	.940						
L 2.70	1.000	.200	.000	.940						
L 2.70	1.000	.200	.000	.940						
NN UA NE NN140	100	513.89	.37	.00	16.0236.0	2.0	.00	0.		
							.00			
							.00	93		

HOT-2000 FILE

EXCEL HOT-2000 FILE

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	
1	ONT	1989	cene5986	Ontario Hydro	ONT	M			I					E	N	N	A	R	N	N		U	0	0	1	0	1	42	0	0	0	0	0	1	0	100	4	1	0	22	
2	ONT	1989	cene6026	Ontario Hydro	ONT	M			I					E	N	N	A	R	N	N		U	0	0	1	0	1	42	0	0	0	0	0	1	0	100	4	1	0	20	
3	ONT	1989	cene6046	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	21	
4	ONT	1989	cene6050	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	25	
5	ONT	1989	cene6056	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	23	
6	ONT	1989	cene6076	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	16	
7	ONT	1989	cene6086	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	23	
8	ONT	1989	cene6090	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	18.5	16
9	ONT	1989	cene6096	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	20	
10	ONT	1989	cene6116	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	20	
11	ONT	1989	cene6126	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	20	
12	ONT	1989	cene6146	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	19	
13	ONT	1989	cene6216	Ontario Hydro	ONT	M			I					E	N	N	A	R	N	N		U	0	0	1	0	1	42	0	0	0	0	0	1	0	100	4	1	0	24	
14	ONT	1989	cene6236	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	21	
15	ONT	1989	cene6266	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	23	
16	ONT	1989	cene6276	Ontario Hydro	ONT	M			I					E	N	N	A	R	N	N		U	0	0	1	0	1	42	0	0	0	0	0	1	0	100	4	1	0	18	
17	ONT	1989	ceny5658	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	20	
18	ONT	1989	ceny5758	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	21	
19	ONT	1989	ceny5770	Ontario Hydro	ONT	M			I					E	N	N	A	R	N	N		U	0	0	1	0	1	42	0	0	0	0	0	1	0	100	4	1	0	24	
20	ONT	1989	ceny5814	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	20	
21	ONT	1989	ceny5816	Ontario Hydro	ONT	M		O		I				E	N	N	A	R	N	N		U	0	2	0	2	1	42	0	0	0	0	0	1	0	100	4	1	0	18	15
22	ONT	1989	ceny5886	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	22	
23	ONT	1989	ceoa7678	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	21	
24	ONT	1989	ceoa7682	Ontario Hydro	ONT	M		O		I				E	N	N	A	R	N	N		U	0	2	0	2	1	42	0	0	0	0	0	1	0	100	4	1	0	23	
25	ONT	1989	ceoa7738	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	2	0	21	
26	ONT	1989	ceoa7828	Ontario Hydro	ONT	M	I			I	U	V	F	E	N	N	A	R	N	N		U	2	0	0	2	1	42	0	0	0	0	0	1	0	100	4	1	0	18	
27	ONT	1989	ceoa7838	Ontario Hydro	ONT	M		O		I				E	N	N	A	R	N	N		U	0	2	0	2	1	42	0	0	0	0	0	1	0	100	4	2	0	21	
28	ONT	1989	ceoa7858	Ontario Hydro	ONT	M	I			I	U	V	G	E	N	N	A	R	N	N		U	2	0	0	2	1	42	0	0	0	0	0	1	0	100	4	2	0	21	
29	ONT	1989	ceoa7868	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	2	0	20	
30	ONT	1989	ceoa7878	Ontario Hydro	ONT	M	I			I	U	V	G	E	N	N	A	R	N	N		U	2	0	0	2	1	42	0	0	0	0	0	1	0	100	4	2	0	22	
31	ONT	1989	ceoa7898	Ontario Hydro	ONT	M	I			I	U	V	G	E	N	N	A	R	N	N		U	2	0	0	2	1	42	0	0	0	0	0	1	0	100	4	2	0	23	
32	ONT	1989	ceto6382	Ontario Hydro	ONT	M		O	I					E	N	N	A	R	N	N		U	0	2	2	0	1	42	0	0	0	0	0	1	0	100	4	1	0	23	
33	ONT	1989	ceto6584	Ontario Hydro	ONT	M			I					E	N	N	A	R	N	N		U	0	0	1	0	1	42	0	0	0	0	0	1	0	100	4	2	0	23	
34	ONT	1989	ceto6632	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	42	0	0	0	0	0	1	0	100	4	1	0	21	
35	ONT	1989	caot4554	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	22	
36	ONT	1989	caot4556	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	21	
37	ONT	1989	caot4564	Ontario Hydro	ONT	M		O	I					E	N	N	A	R	N	N		U	0	2	2	0	1	36	0	0	0	0	0	1	0	100	4	2	0	22	
38	ONT	1989	caot4574	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	21	
39	ONT	1989	caot4584	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	22	
40	ONT	1989	caot4586	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	24	
41	ONT	1989	caot4634	Ontario Hydro	ONT	M		I						E	N	N	A	R	N	N		U	0	1	0	0	1	36	0	0	0	0	0	1	0	100	4	1	0	20	
42	ONT	1989	caot4696	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	16.5	12
43	ONT	1989	caot4746	Ontario Hydro	ONT	M			I					E	N	N	A	R	N	N		U	0	0	1	0	1	36	0	0	0	0	0	1	0	100	4	2	0	20	
44	ONT	1989	caot4774	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	20	
45	ONT	1989	caot4804	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	19	17
46	ONT	1989	caot4824	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	21	
47	ONT	1989	caot4834	Ontario Hydro	ONT	M				I				E	N	N	A	R	N	N		U	0	0	0	1	1	36	0	0	0	0	0	1	0	100	4	2	0	22	
48	ONT	1989	caot4844	Ontario Hydro	ONT	M	I			I	U	V	G	E	N	N	A	R	N	N		U	2	0	0	2	1	36	0	0	0	0	0	1	0	100	4	2	0	22	
49	ONT	1989	caot4846	Ontario Hydro	ONT	M			I					E	N	N	A	R	N	N		U	0	0	1	0	1	36	0	0	0	0	0	1	0	100	4	2	0	20	19

	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV
1	16.5	0	3.5		513.9	0.37	0	16	236	2	0	0	434.3	cene5986	113.6	90.9	1.7	25.1	0	0	0	0	0	63.8	39.7	38	50.6	0	0	0	0	2.7	0	2.
2	15.8	0	3.5		499.6	0.41	0	16	236	2	0	0	464.8	cene6026	120.2	96.8	1.6	38.3	0	0	0	0	0	68.5	44.7	29.9	52	0	0	0	0	3.2	0	3.
3	16.4	0	3.5		409.1	0.31	0	16	236	2	0	0	333.5	cene6046	55.3	137.3	3.3	0	0	0	0	0	0	17	0	0	0	30.4	25.1	26.4	29	2.4	0	2.
4	20.1	0	3.5		564.3	0.37	0	16	236	2	0	0	411	cene6050	75	153.4	3.3	0	0	0	0	0	0	12.1	0	0	0	35	41.1	31	44	4	0	[illegible]
5	18.5	0	3.5		465.6	0.32	0	16	236	2	0	0	369.1	cene6056	62.1	151.3	3.4	0	0	0	0	0	0	10	0	0	0	29.5	39	33.5	29.4	2.7	0	2.
6	12.9	0	3.5		475.5	0.34	0	16	236	2	0	0	375.2	cene6076	66.9	143.4	3.3	4.9	0	0	0	0	0	10.2	0	0	0	32.7	37.8	28.7	33.2	3.5	0	3.
7	17.3	0	3.5		478.3	0.35	0	16	236	2	0	0	374.7	cene6086	66.4	145.5	3.3	5	0	0	0	0	0	12.9	0	0	0	32.6	37.3	28.6	28.9	3.5	0	3.
8	13.4	0	3.5		460.8	0.31	0	16	236	2	0	0	370.9	cene6090	65.3	145.6	3.3	6.7	0	0	0	0	0	13.9	0	0	0	32.3	35.4	28.3	30.3	2.5	0	2.
9	16.1	0	3.5		579.2	0.13	0	16	236	2	0	0	413.1	cene6096	76	154.1	3.3	1.1	0	0	0	0	0	12.9	0	0	0	35	40.2	31	43.9	3.9	0	3.
10	15.8	0	3.5		462.1	0.28	0	16	236	2	0	0	368.8	cene6116	60.4	150.8	3.3	0	0	0	0	0	0	18.6	0	0	0	32.7	33.3	28.7	31.7	2.3	0	2.
11	15.3	0	3.5		582.1	0.27	0	16	236	2	0	0	422.2	cene6126	79.9	157	3.3	4	0	0	0	0	0	13.9	0	0	0	35	38.1	31	45	3.8	0	3.
12	15.3	0	3.5		426.8	0.32	0	16	236	2	0	0	343.5	cene6146	56.5	143	3.3	0	0	0	0	0	0	10.6	0	0	0	31.5	32	27.4	29	2.6	0	2.
13	17	0	3.5		563.8	0.2	0	16	236	2	0	0	677	cene6216	118.6	131.9	4.9	0	0	0	0	0	0	243.1	49.3	41.7	75.3	0	0	0	0	3.1	0	3.
14	17.1	0	3.5		543.8	0.56	0	16	236	2	0	0	419.7	cene6236	86.4	146.8	3.3	12.3	0	0	0	0	0	12.7	0	0	0	34.4	36.3	30.4	43.7	3.4	0	3.
15	18.1	0	3.5		1062	0.37	0	16	236	2	0	0	699.5	cene6266	156.6	209.1	7	0	0	0	0	0	0	49.8	0	0	0	56.7	29.2	52.7	104	8.6	0	8.
16	12.8	0	3.5		554.8	0.58	0	16	236	2	0	0	493	cene6276	120.9	140.8	5.2	39.2	0	0	0	0	0	44.5	54.1	30.3	45.4	0	0	0	0	3.1	0	3.
17	15.5	0	3.5		548.5	0.36	0	16	236	2	0	0	428.2	ceny5658	113	83.7	1.8	0	0	0	0	0	0	35.2	0	0	0	42.9	20.8	38.9	74.1	4.5	0	4.
18	16	0	3.5		434	0.49	0	16	236	2	0	0	353.8	ceny5758	84.1	79.9	5.1	0	0	0	0	0	0	24.3	0	0	0	37.3	27.6	33.3	50.8	2.8	0	2.
19	18.7	0	3.5		375.2	0.27	0	16	236	2	0	0	328.3	ceny5770	81.8	77.8	3.4	0	0	0	0	0	0	26.4	48.6	32.7	49.1	0	0	0	0	2.1	0	2.
20	17.2	0	3.5		891.2	0.49	0	16	236	2	0	0	650.4	ceny5814	149.1	195.5	1.9	0	0	0	0	0	0	16.7	0	0	0	49	51.2	59	77.1	12.8	0	1
21	14.2	0	3.5		1343	0.28	0	16	236	2	0	0	859.6	ceny5816	187.4	283.8	14	0	0	0	0	18	30	16.4	0	0	0	53.6	72.6	49.6	89.5	11.1	0	1
22	18.7	0	3.5		747.7	0.36	0	16	236	2	0	0	606.7	ceny5886	133.2	204.9	3.4	36.8	0	0	0	0	0	15.8	0	0	0	46.5	47.5	42.5	54	5.5	0	5.
23	16.3	0	3.5		1096	0.55	0	16	236	2	0	0	723.4	ceoa7678	154.9	217	6.8	0	0	0	0	0	0	39.6	0	0	0	65.8	41.4	56.3	98.6	10.8	0	1
24	18.3	0	3.5		844.2	0.29	0	16	236	2	0	0	556.9	ceoa7682	113.8	197	3.6	0	0	0	0	5.7	5.6	19.6	0	0	0	40.5	49.5	36.5	65.9	4.8	0	4.
25	12	0	0		670.6	0.29	0	16	236	2	0	0	604.3	ceoa7738	91.9	258.1	3.4	10.9	0	0	0	0	0	25.8	0	0	0	59.7	50	46.8	34.2	5.9	0	5.
26	15.1	0	0		529.9	0.37	0	16	236	2	0	0	524.9	ceoa7828	112.9	203.6	3.4	23	11	25	9.3	0	0	25.5	0	0	0	42.7	10	19	36.6	3.5	0	3.
27	14.1	0	0		578.3	0.32	0	16	236	2	0	0	592.7	ceoa7838	117.8	239.2	5	22	0	0	0	15	3.4	25.1	0	0	0	43.3	25.2	39.3	34.5	5.8	0	5.
28	17.3	0	0		542.5	0.2	0	16	236	2	0	0	430.8	ceoa7858	94.7	141.9	3.3	0	12	15	29	0	0	23.9	0	0	0	39.9	7.5	17.1	33.6	3.4	0	3.
29	15.5	0	0		520.4	0.28	0	16	236	2	0	0	422.2	ceoa7868	87.6	145.1	3.5	23.5	0	0	0	0	0	12.7	0	0	0	32.3	39	28.3	35.8	3.6	0	3.
30	19.2	0	3.5		543	0.28	0	16	236	2	0	0	428.9	ceoa7878	94.5	142.9	1.8	0	2.5	15	28	0	0	21.3	0	0	0	40.1	15.9	17.1	34.3	3.8	0	3.
31	20.1	0	3.5		517.7	0.31	0	16	236	2	0	0	436.1	ceoa7898	111.5	100	3.4	0	7.2	16	33	0	0	26	0	0	0	44.8	17.3	20.4	41.6	3.6	0	3.
32	13.7	0	3.5		468.3	0.48	0	16	236	2	0	0	403.3	ceto6382	62.9	192.2	3.3	0	0	0	0	14	9.8	31.3	29.8	21.1	17.4	0	0	0	0	5.3	0	5.
33	18.3	0	3.5		385.3	0.46	0	16	236	2	0	0	337.6	ceto6584	81.2	80.6	3.2	0	0	0	0	0	0	37.2	43.5	34	47.2	0	0	0	0	2.7	0	2.
34	14.5	0	3.5		613.7	0.65	0	16	236	2	0	0	454.3	ceto6632	79.7	187.3	3.1	0	0	0	0	0	0	22.1	0	0	0	39	19.4	35	44.7	6	0	[illegible]
35	17.1	0	3.5		458.6	0.44	0	16	236	2	0	0	358.4	eaot4554	60.7	139.1	5.1	2.4	0	0	0	0	0	19	0	0	0	31.2	26.2	27.2	31.1	4.1	0	4.
36	17.6	0	3.5		565.1	0.12	0	16	236	2	0	0	439.6	eaot4556	114.6	83.6	5.1	0	0	0	0	0	0	26.5	0	0	0	43.5	31.1	39.5	75.1	5.1	0	5.
37	14.9	0	3.5		496	0.46	0	16	236	2	0	0	480.7	eaot4564	124.3	143.9	5	48.3	0	0	0	15	11	23.4	37.8	17.3	32.9	0	0	0	0	5.5	0	5.
38	16.5	0	3.5		632.4	0.27	0	16	236	2	0	0	538.2	eaot4574	123.8	117.4	1.6	0	0	0	0	0	0	34.2	0	0	0	57.7	56.5	49.7	74.1	5.8	0	5.
39	15.7	0	3.5		577.7	0.14	0	16	236	2	0	0	452.6	eaot4584	116.8	93.1	3.4	0	0	0	0	0	0	23.5	0	0	0	45.8	38.2	41.8	75	3.7	0	3.
40	17	0	3.5		581.3	0.15	0	16	236	2	0	0	451.7	eaot4586	117.7	92.6	3.3	0	0	0	0	0	0	30.4	0	0	0	44.7	33.4	40.7	77	3	0	[illegible]
41	20	0	3.5		374.8	0.33	0	16	236	2	0	0	223.1	eaot4634	47.4	114.9	1.8	0	0	0	0	24	23	0	0	0	0	0	0	0	0	2.9	0	2.
42	12	0	3.5		459.6	0.32	0	16	236	2	0	0	377.4	eaot4696	96.1	81.4	3.4	0	0	0	0	0	0	30.5	0	0	0	39.6	18.8	35.6	60.5	2.9	0	2.
43	14.7	0	3.5		339.4	0.3	0	16	236	2	0	0	310	eaot4746	72.9	74	3.3	0	0	0	0	0	0	31.1	46.7	32.5	40.5	0	0	0	0	2.3	0	2.
44	12.7	0	3.5		655.5	0.44	0	16	236	2	0	0	449.1	eaot4774	76.8	173.6	3.3	0	0	0	0	0	0	43.3	0	0	0	35.3	23.9	31.3	45.5	4	0	[illegible]
45	12.2	0	3.5		393.3	0.46	0	16	236	2	0	0	321.4	eaot4804	50.8	133	3.3	0	0	0	0	0	0	25.9	0	0	0	29	16.4	25	25.8	3.1	0	3.
46	15.7	0	3.5		349.6	0.39	0	16	236	2	0	0	303.4	eaot4824	61.7	101.9	3.4	0	0	0	0	0	0	20.3	0	0	0	29.9	16.4	25.9	30	3.5	0	3.
47	14.5	0	3.5		556.5	0.89	0	16	236	2	0	0	467.6	eaot4834	94.5	171.4	4.7	0	0	0	0	0	0	26.2	0	0	0	44.4	18	40.4	54	3.5	0	3.
48	17.5	0	3.5		550.4	0.39	0	16	236	2	0	0	446.8	eaot4844	81.1	178.6	3.5	2.7	13	9.3	13	0	0	21.5	0	0	0	30.6	13.8	20.7	35.8	5.8	0	5.
49	16.2	0	3.5		594.1	0.52	0	16	236	2	0	0	450.4	eaot4846	90.4	164.4	3.1	6.3	0	0	0	0	0	38.8	42.3	29.6	54.5	0	0	0	0	5.3	0	5.

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF
1	0	2.7	0	2.7	0	cene5986	3.79	1.7	0.8	4.49	0	0	0	0	0	1.7	1.6	0.4	0.4	0	0	0	0	0	0	0	0	0	0	0	0	cene5986	1	0	1	0
2	0	3.2	0	3.2	0	cene6026	8.21	2.27	1.42	3.77	0	0	0	0	0	2.1	2.1	0.4	0.4	0	0	0	0	0.3	0	0.3	0	0.3	0	0.3	0	cene6026	1.9	0	1.9	0
3	0	2.4	0	2.4	0	cene6046	8.21	2.3	1.32	0	0	0	0	0	0	1.7	0	0	0	1.6	1.6	0.4	0.4	0.4	0	0.4	0	0.4	0	0.4	0	cene6046	2	0	2	0
4	0	4	0	4	0	cene6050	6.6	2.33	1.32	0	0	0	0	0	0	1.8	0	0	0	1.8	1.8	0.4	0.4	0.3	0	0.3	0	0.3	0	0.3	0	cene6050	1.7	0	1.7	0
5	0	2.7	0	2.7	0	cene6056	4.95	2.31	1.37	0	0	0	0	0	0	1.8	0	0	0	2.5	0.4	0	0	0.4	0	0.4	0	0.4	0	0.4	0	cene6056	1.9	0	1.9	0
6	0	3.5	0	3.5	0	cene6076	7.32	2.31	1.32	4.58	0	0	0	0	0	1.8	0	0	0	1.8	1.8	0.4	0.4	0.4	0	0.4	0	0.4	0	0.4	0	cene6076	2	0	2	0
7	0	3.5	0	3.5	0	cene6086	7.28	2.21	1.32	3.57	0	0	0	0	0	1.7	0	0	0	1.6	1.6	0	0	0	0	0	0	0	0	0	0	cene6086	1	0	1	0
8	0	2.5	0	2.5	0	cene6090	7.09	2.3	1.32	3.84	0	0	0	0	0	1.7	0	0	0	1.6	1.6	0	0	0.3	0	0.3	0	0.3	0	0.3	0	cene6090	1.6	0	1.6	0
9	0	3.9	0	3.9	0	cene6096	3.79	2.33	1.32	3.36	0	0	0	0	0	1.8	0	0	0	1.9	1.8	0.4	0.4	0.4	0	0.4	0	0.4	0	0.4	0	cene6096	2	0	2	0
10	0	2.3	0	2.3	0	cene6116	7.42	1.96	1.32	0	0	0	0	0	0	1.8	0	0	0	1.7	1.7	0.4	0.4	0.4	0	0.4	0	0.4	0	0.4	0	cene6116	2	0	2	0
11	0	3.8	0	3.8	0	cene6126	9.65	2.16	1.32	3.36	0	0	0	0	0	1.7	0	0	0	1.6	1.6	0	0	0.4	0	0.4	0	0.4	0	0.4	0	cene6126	2	0	2	0
12	0	2.6	0	2.6	0	cene6146	3.79	2.31	1.32	0	0	0	0	0	0	1.7	0	0	0	1.6	1.6	0.4	0.4	0	0	0	0	0	0	0	0	cene6146	1	0	1	0
13	0	3.1	0	3.1	0	cene6216	4.79	2.37	0.8	0	0	0	0	0	0	2.1	2.3	0.4	0.4	0	0	0	0	0.3	0	0.3	0	0.3	0	0.3	0	cene6216	2	0	2	0
14	0	3.4	0	3.4	0	cene6236	4.8	2.3	0.95	3.52	0	0	0	0	0	1.7	0	0	0	1.6	1.6	0.7	0.7	0.3	0	0.3	0	0.3	0	0.3	0	cene6236	2	0	2	0
15	0	8.6	0	8.6	0	cene6266	7.12	2.25	1.15	0	0	0	0	0	0	2.1	0	0	0	2.2	2.2	0	0	0.4	0	0.4	0	0.4	0	0.4	0	cene6266	2	0	2	0
16	0	3.1	0	3.1	0	cene6276	2.14	2.29	0.78	3.6	0	0	0	0	0	0.7	0.6	0.4	0.4	0	0	0	0	0.4	0	0.4	0	0.4	0	0.4	0	cene6276	2	0	2	0
17	0	4.5	0	4.5	0	ceny5658	6.33	0.95	0.74	0	0	0	0	0	0	0.6	0	0	0	0.6	0.6	0.4	0.4	0.5	0	0.5	0	0.5	0	0.5	0	ceny5658	2.8	0	2.8	0
18	0	2.8	0	2.8	0	ceny5758	3.88	1.01	0.84	0	0	0	0	0	0	0.8	0	0	0	0.7	0.6	0	0	0.4	0	0.4	0	0.4	0	0.4	0	ceny5758	2	0	2	0
19	0	2.1	0	2.1	0	ceny5770	6.06	0.95	0.86	0	0	0	0	0	0	0.9	1.4	0.4	0.4	0	0	0	0	0.3	0	0.3	0	0.3	0	0.3	0	ceny5770	2.1	0	2.1	0
20	0	13	0	13	0	ceny5814	2.25	1.04	0.8	0	0	0	0	0	0	1	0	0	0	2.2	0.4	0	0	0.3	0	0.3	0	0.3	0	0.3	0	ceny5814	2.5	0	2.5	0
21	0	11	0	11	0	ceny5816	3.57	1.77	0.61	0	0	0	0	0.3	0.3	0.7	0	0	0	0.5	0.5	0	0	0.4	0	0.4	0	0.4	0	0.4	0	ceny5816	2	0	2	0
22	0	5.5	0	5.5	0	ceny5886	6.13	2.29	0.8	4.72	0	0	0	0	0	2.1	0	0	0	3.1	3.1	0.4	0.4	0.4	0	0.4	0	0.4	0	0.4	0	ceny5886	2	0	2	0
23	0	11	0	11	0	ceoa7678	3.01	1.7	0.8	0	0	0	0	0	0	2	0	0	0	1.6	1.6	0	0	0.4	0	0.4	0	0.4	0	0.4	0	ceoa7678	2	0	2	0
24	0	4.8	0	4.8	0	ceoa7682	3.52	1.7	0.62	0	0	0	0	0.4	0.4	1.8	0	0	0	2.2	0.4	0	0	0.4	0	0.4	0	0.4	0	0.4	0	ceoa7682	2	0	2	0
25	0	5.9	0	5.9	0	ceoa7738	5.69	1.98	0.93	4.58	0	0	0	0	0	1.9	0	0	0	1.7	1.7	0.4	0.4	0.4	0	0.4	0	0.4	0	0.4	0	ceoa7738	2	0	2	0
26	0	3.5	0	3.5	0	ceoa7828	2.81	1.7	0.8	2.11	1.6	0	0	0	0	1.8	0	0	0	1.7	1.7	0.4	0.4	0	0	0	0	0	0	0	0	ceoa7828	1	0	1	0
27	0	5.8	0	5.8	0	ceoa7838	4.76	1.58	0.8	2.44	0	0	0	0.4	0.4	0.7	0	0	0	0.6	0.6	0	0	0.4	0	0.4	0	0.4	0	0.4	0	ceoa7838	2	0	2	0
28	0	3.4	0	3.4	0	ceoa7858	5.29	2.33	0.95	0	0.2	0	0	0	0	2	0	0	0	2.1	0.7	0.5	0.5	0.4	0	0.4	0	0.4	0	0.4	0	ceoa7858	2	0	2	0
29	0	3.6	0	3.6	0	ceoa7868	6	3.16	0.7	3.36	0	0	0	0	0	1.7	0	0	0	1.6	1.6	0	0	0.4	0	0.4	0	0.4	0	0.4	0	ceoa7868	2	0	2	0
30	0	3.8	0	3.8	0	ceoa7878	4.88	2.28	0.74	0	1.7	0	0	0	0	1.8	0	0	0	1.7	1.7	0.4	0.4	0.4	0	0.4	0	0.4	0	0.4	0	ceoa7878	2	0	2	0
31	0	3.6	0	3.6	0	ceoa7898	4.61	2.15	0.8	0	3.2	0	0	0	0	2.1	0	0	0	2.2	2.2	0.4	0.4	0.4	0	0.4	0	0.4	0	0.4	0	ceoa7898	2	0	2	0
32	0	5.3	0	5.3	0	ceto6382	2.86	2.18	0.62	0	0	0	0	2.7	2.7	0.6	0.4	0	0	0	0	0	0	0.4	0	0.4	0	0.4	0	0.4	0	ceto6382	2	0	2	0
33	0	2.7	0	2.7	0	ceto6584	7.28	0.95	1.32	0	0	0	0	0	0	1.8	2.3	0	0	0	0	0	0	0.3	0	0.3	0	0.3	0	0.3	0	ceto6584	2	0	2	0
34	0	6	0	6	0	ceto6632	8.26	1.97	0.69	0	0	0	0	0	0	0.5	0	0	0	0.4	0.4	0	0	0.4	0	0.4	0	0.4	0	0.4	0	ceto6632	2	0	2	0
35	0	4.1	0	4.1	0	eaot4554	5.46	2.29	0.74	1.12	0	0	0	0	0	1.6	0	0	0	2.3	2.3	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4554	2	0	2	0
36	0	5.1	0	5.1	0	eaot4556	4.68	0.95	0.94	0	0	0	0	0	0	1.7	0	0	0	1.7	1.7	0	0	0.5	0	0.4	0	0.4	0	0.4	0	eaot4556	2.5	0	2.5	0
37	0	5.5	0	5.5	0	eaot4564	4.28	2.47	0.87	4.63	0	0	0	0.3	0.3	0.7	0.4	0	0	0	0	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4564	2	0	2	0
38	0	5.8	0	5.8	0	eaot4574	4.51	2.43	0.8	0	0	0	0	0	0	1.3	0	0	0	1.5	1.1	0.3	0.3	0.4	0	0.4	0	0.4	0	0.4	0	eaot4574	2	0	2	0
39	0	3.7	0	3.7	0	eaot4584	3.89	2.08	0.8	0	0	0	0	0	0	0.6	0	0	0	0.7	0.7	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4584	2	0	2	0
40	0	3	0	3	0	eaot4586	3.63	2.18	0.77	0	0	0	0	0	0	0.7	0	0	0	0.4	0.4	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4586	2	0	2	0
41	0	2.9	0	2.9	0	eaot4634	7.28	2.13	0.84	0	0	0	0	0.3	0.3	0	0	0	0	0	0	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4634	2	0	2	0
42	0	2.9	0	2.9	0	eaot4696	3.04	1.5	0.8	0	0	0	0	0	0	0.8	0	0	0	0.6	0.6	0.4	0.3	0.4	0	0.4	0	0.4	0	0.4	0	eaot4696	2	0	2	0
43	0	2.3	0	2.3	0	eaot4746	4.09	1.33	0.8	0	0	0	0	0	0	0.9	0.6	0.4	0.4	0	0	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4746	2	0	2	0
44	0	4	0	4	0	eaot4774	5.33	3.19	1.15	0	0	0	0	0	0	1.7	0	0	0	1.6	1.6	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4774	2	0	2	0
45	0	3.1	0	3.1	0	eaot4804	4.62	0.96	0.78	0	0	0	0	0	0	0.5	0	0	0	0.8	0.8	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4804	2	0	2	0
46	0	3.5	0	3.5	0	eaot4824	2.83	1.76	0.7	0	0	0	0	0	0	1.1	0	0	0	1.3	0.4	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4824	2	0	2	0
47	0	3.5	0	3.5	0	eaot4834	3.05	2.22	0.76	0	0	0	0	0	0	0.7	0	0	0	0.6	0.2	0	0	0.4	0	0.4	0	0.4	0	0.4	0	eaot4834	2	0	2	0
48	0	5.8	0	5.8	0	eaot4844	7.21	1.81	0.94	1.12	1.7	0	0	0	0	1.6	0	0	0	0.7	0.4	0.4	0.4	0.4	0	0.4	0	0.4	0	0.4	0	eaot4844	2	0	2	0
49	0	5.3	0	5.3	0	eaot4846	2.77	2.11	0.62	3.28	0	0	0	0	0	1.3	1.4	0.2	0.2	0	0	0	0	0.4	0	0.4	0	0.4	0	0.3	0	eaot4846	2.5	0	2.5	0

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG	EH	EI	EJ	EK	EL	EM	EN	EO	EP	EQ	ER	ES	ET
1	1	0	1	0	0.9	0	0.9	0	0.9	0	0.9	0	1.5	0.6	0.2	0	0	0	0	0	0	cene5986	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1.9	0	1.9	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6026	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6046	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1.7	0	1.7	0	0.9	0	0.9	0	0.9	0	0.9	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6050	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1.9	0	1.9	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6056	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6076	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1	0	1	0	0.9	0	0.9	0	0.9	0	0.9	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6086	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1.6	0	1.6	0	0.9	0	0.9	0	0.9	0	0.9	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6090	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6096	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6116	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6126	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1	0	1	0	0.9	0	0.9	0	0.9	0	0.9	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6146	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6216	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6236	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6266	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	cene6276	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	2.8	0	2.8	0	0.7	0	0.7	0	0.7	0	0.7	0	1.5	0.6	0.2	0	0	0	0	0	0	ceny5658	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceny5758	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	2.1	0	2.1	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceny5770	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceny5814	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceny5816	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceny5886	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceoa7678	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceoa7682	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceoa7738	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	1	0	1	0	0.9	0	0.9	0	0.9	0	0.9	0	1.5	0.6	0.2	0	0	0	0	0	0	ceoa7828	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceoa7838	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceoa7858	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceoa7868	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceoa7878	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceoa7898	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceto6382	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceto6584	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	ceto6632	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4554	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	2.5	0	2.5	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4556	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4564	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4574	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4584	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4586	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4634	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4696	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4746	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4774	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4804	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4824	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4834	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4844	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	2.5	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.6	0.2	0	0	0	0	0	0	eaot4846	1	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	EU	EV	EW	EX	EY	EZ	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV
1	0	0	0	0	0	0	0	0	cene5986	9825	82477	22377	14294	1E+05	0.188	0.12	0	0	0	0	0	29073	0	0	0	104662	0	17132
2	0	0	0	0	0	0	0	0	cene6026	8244	56076	20320	12506	88902	0.229	0.141	0	0	0	0	0	27477	0	0	0	98918	0	17132
3	0	0	0	0	0	0	0	0	cene6046	6137	41626	20734	9720	72080	0.288	0.135	0	0	0	0	0	18184	0	0	0	65463	0	17132
4	0	0	0	0	0	0	0	0	cene6050	8878	87640	23992	22125	1E+05	0.179	0.165	0	0	0	0	0	38157	0	0	0	137365	0	17132
5	0	0	0	0	0	0	0	0	cene6056	7217	62815	23316	13551	99682	0.234	0.136	0	0	0	0	0	24241	0	0	0	87266	0	17132
6	0	0	0	0	0	0	0	0	cene6076	6997	30598	16719	10713	58030	0.288	0.185	0	0	0	0	0	16337	0	0	0	58813	0	17132
7	0	0	0	0	0	0	0	0	cene6086	8823	75524	23361	18805	1E+05	0.198	0.16	0	0	0	0	0	27236	0	0	0	98051	0	17132
8	0	0	0	0	0	0	0	0	cene6090	6885	39603	18413	9715	67732	0.272	0.143	0	0	0	0	0	17286	0	0	0	62230	0	17132
9	0	0	0	0	0	0	0	0	cene6096	6817	41634	20664	14152	76450	0.27	0.185	0	0	0	0	0	10101	0	0	0	36362	0	17132
10	0	0	0	0	0	0	0	0	cene6116	6875	45742	20111	9465	75318	0.267	0.126	0	0	0	0	0	17357	0	0	0	62484	0	17132
11	0	0	0	0	0	0	0	0	cene6126	7793	51245	20905	14644	86794	0.241	0.169	0	0	0	0	0	21084	0	0	0	75903	0	17132
12	0	0	0	0	0	0	0	0	cene6146	7482	46575	19662	10985	77222	0.255	0.142	0	0	0	0	0	17114	0	0	0	61610	0	17132
13	0	0	0	0	0	0	0	0	cene6216	10545	97437	22512	14828	1E+05	0.167	0.11	0	0	0	0	0	19470	0	0	0	70093	0	17132
14	0	0	0	0	0	0	0	0	cene6236	9862	78578	22495	15454	1E+05	0.193	0.133	0	0	0	0	0	43663	0	0	0	157187	0	17132
15	0	0	0	0	0	0	0	0	cene6266	15088	1E+05	24048	42243	2E+05	0.118	0.208	0	0	0	0	0	63914	0	0	0	230091	0	17132
16	0	0	0	0	0	0	0	0	cene6276	13482	91008	17645	12376	1E+05	0.146	0.102	0	0	0	0	0	37593	0	0	0	135333	0	17132
17	0	0	0	0	0	0	0	0	ceny5658	10840	79294	20397	16232	1E+05	0.176	0.14	0	0	0	0	0	26488	0	0	0	95358	0	17132
18	0	0	0	0	0	0	0	0	ceny5758	10036	82510	21885	12727	1E+05	0.187	0.109	0	0	0	0	0	30488	0	0	0	109757	0	17132
19	0	0	0	0	0	0	0	0	ceny5770	7949	75487	23276	11104	1E+05	0.212	0.101	0	0	0	0	0	17492	0	0	0	62970	0	17132
20	0	0	0	0	0	0	0	0	ceny5814	22969	2E+05	23704	54709	3E+05	0.093	0.215	0	0	0	0	0	58581	0	0	0	210892	0	17132
21	0	0	0	0	0	0	0	0	ceny5816	21116	1E+05	21423	42220	2E+05	0.104	0.204	0	0	0	0	0	43941	0	0	0	158187	0	17132
22	0	0	0	0	0	0	0	0	ceny5886	11403	95050	23590	25587	1E+05	0.164	0.177	0	0	0	0	0	41157	0	0	0	148164	0	17132
23	0	0	0	0	0	0	0	0	ceoa7678	21103	2E+05	23874	48763	2E+05	0.096	0.197	0	0	0	0	0	86456	0	0	0	311241	0	17132
24	0	0	0	0	0	0	0	0	ceoa7682	12571	1E+05	23993	25669	2E+05	0.141	0.151	0	0	0	0	0	39828	0	0	0	143381	0	17132
25	0	0	0	0	0	0	0	0	ceoa7738	11774	87847	20609	21262	1E+05	0.159	0.164	0	0	0	0	0	27880	0	0	0	100368	0	17132
26	0	0	0	0	0	0	0	0	ceoa7828	19272	90550	20106	14971	1E+05	0.16	0.119	0	0	0	0	0	22904	0	0	0	82454	0	17132
27	0	0	0	0	0	0	0	0	ceoa7838	14489	1E+05	21768	23315	2E+05	0.133	0.143	0	0	0	0	0	26534	0	0	0	95521	0	17132
28	0	0	0	0	0	0	0	0	ceoa7858	8165	66407	22331	14051	1E+05	0.217	0.137	0	0	0	0	0	15557	0	0	0	56005	0	17132
29	0	0	0	0	0	0	0	0	ceoa7868	7033	45919	20796	12525	79240	0.262	0.158	0	0	0	0	0	19548	0	0	0	70375	0	17132
30	0	0	0	0	0	0	0	0	ceoa7878	8218	66784	23184	17510	1E+05	0.216	0.163	0	0	0	0	0	23246	0	0	0	83686	0	17132
31	0	0	0	0	0	0	0	0	ceoa7898	7991	71021	23698	17921	1E+05	0.21	0.159	0	0	0	0	0	26107	0	0	0	93985	0	17132
32	0	0	0	0	0	0	0	0	ceto6382	11974	1E+05	22185	22798	1E+05	0.151	0.155	0	0	0	0	0	36569	0	0	0	131647	0	17132
33	0	0	0	0	0	0	0	0	ceto6584	8673	78144	23260	13530	1E+05	0.202	0.118	0	0	0	0	0	28834	0	0	0	103803	0	17132
34	0	0	0	0	0	0	0	0	ceto6632	14154	1E+05	21542	24670	2E+05	0.136	0.155	0	0	0	0	0	57191	0	0	0	205886	0	17132
35	0	0	0	0	0	0	0	0	eaot4554	9816	69901	22507	18996	1E+05	0.202	0.171	0	0	0	0	0	33979	0	0	0	122326	0	17132
36	0	0	0	0	0	0	0	0	eaot4556	10112	68068	22473	21588	1E+05	0.2	0.193	0	0	0	0	0	10772	0	0	0	38778	0	17132
37	0	0	0	0	0	0	0	0	eaot4564	13302	99732	22086	25118	1E+05	0.15	0.171	0	0	0	0	0	38422	0	0	0	138321	0	17132
38	0	0	0	0	0	0	0	0	eaot4574	11268	76116	22150	25069	1E+05	0.18	0.203	0	0	0	0	0	27120	0	0	0	97631	0	17132
39	0	0	0	0	0	0	0	0	eaot4584	9284	66527	21417	16896	1E+05	0.204	0.161	0	0	0	0	0	13619	0	0	0	49029	0	17132
40	0	0	0	0	0	0	0	0	eaot4586	9665	82794	22943	15874	1E+05	0.189	0.131	0	0	0	0	0	16408	0	0	0	59068	0	17132
41	0	0	0	0	0	0	0	0	eaot4634	6551	35512	20266	11732	67510	0.3	0.174	0	0	0	0	0	18502	0	0	0	66609	0	17132
42	0	0	0	0	0	0	0	0	eaot4696	9967	50439	16464	10601	77504	0.212	0.137	0	0	0	0	0	17658	0	0	0	63567	0	17132
43	0	0	0	0	0	0	0	0	eaot4746	8517	54272	18164	9615	82050	0.221	0.117	0	0	0	0	0	15228	0	0	0	54822	0	17132
44	0	0	0	0	0	0	0	0	eaot4774	11078	69707	19260	17004	1E+05	0.182	0.16	0	0	0	0	0	43141	0	0	0	155309	0	17132
45	0	0	0	0	0	0	0	0	eaot4804	13722	87389	17831	13282	1E+05	0.15	0.112	0	0	0	0	0	25450	0	0	0	91619	0	17132
46	0	0	0	0	0	0	0	0	eaot4824	9018	59253	20869	15047	95169	0.219	0.158	0	0	0	0	0	21654	0	0	0	77953	0	17132
47	0	0	0	0	0	0	0	0	eaot4834	16846	1E+05	22591	18264	2E+05	0.123	0.099	0	0	0	0	0	83408	0	0	0	300268	0	17132
48	0	0	0	0	0	0	0	0	eaot4844	13069	98351	23091	27627	1E+05	0.155	0.185	0	0	0	0	0	36149	0	0	0	130136	0	17132
49	0	0	0	0	0	0	0	0	eaot4846	14469	99924	21224	22083	1E+05	0.148	0.154	0	0	0	0	0	46206	0	0	0	166343	0	17132

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	FW	FX	FY	FZ	GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT	GU
1	18421	0	18421	100898	49753	203%	21024	21024	82477	18421	0	0	0	0	0	22910	5117	5839	33867	0	0	0	0	0	0
2	18421	0	18421	74497	48877	152%	21024	21024	56075	18421	0	0	0	0	0	15576	5117	5839	26533	0	0	0	0	0	0
3	18421	0	18421	60047	43354	139%	21024	21024	41626	18421	0	0	0	0	0	11562	5117	5839	22519	0	0	0	0	0	0
4	18421	0	18421	106061	52829	201%	21024	21024	87640	18421	0	0	0	0	0	24344	5117	5839	35301	0	0	0	0	0	0
5	18421	0	18421	81236	46805	174%	21024	21024	62815	18421	0	0	0	0	0	17448	5117	5839	28405	0	0	0	0	0	0
6	18421	0	18421	49019	47408	103%	21024	21024	30597	18421	0	0	0	0	0	8499	5117	5839	19456	0	0	0	0	0	0
7	18421	0	18421	93946	47581	197%	21024	21024	75524	18421	0	0	0	0	0	20978	5117	5839	31935	0	0	0	0	0	0
8	18421	0	18421	58025	46510	125%	21024	21024	39603	18421	0	0	0	0	0	11000	5117	5839	21957	0	0	0	0	0	0
9	18421	0	18421	60055	53740	112%	21024	21024	41633	18421	0	0	0	0	0	11564	5117	5839	22521	0	0	0	0	0	0
10	18421	0	18421	64163	46587	138%	21024	21024	45742	18421	0	0	0	0	0	12706	5117	5839	23663	0	0	0	0	0	0
11	18421	0	18421	69666	53919	129%	21024	21024	51245	18421	0	0	0	0	0	14234	5117	5839	25191	0	0	0	0	0	0
12	18421	0	18421	64996	44436	146%	21024	21024	46575	18421	0	0	0	0	0	12937	5117	5839	23894	0	0	0	0	0	0
13	18421	0	18421	115858	52803	219%	21024	21024	97436	18421	0	0	0	0	0	27065	5117	5839	38022	0	0	0	0	0	0
14	18421	0	18421	97000	51582	188%	21024	21024	78578	18421	0	0	0	0	0	21827	5117	5839	32784	0	0	0	0	0	0
15	18421	0	18421	155160	83220	186%	21024	21024	136738	18421	0	0	0	0	0	37982	5117	5839	48939	0	0	0	0	0	0
16	18421	0	18421	109429	52252	209%	21024	21024	91008	18421	0	0	0	0	0	25280	5117	5839	36237	0	0	0	0	0	0
17	18421	0	18421	97715	51865	188%	21024	21024	79294	18421	0	0	0	0	0	22026	5117	5839	32983	0	0	0	0	0	0
18	18421	0	18421	100931	44872	225%	21024	21024	82510	18421	0	0	0	0	0	22919	5117	5839	33876	0	0	0	0	0	0
19	18421	0	18421	93908	41282	227%	21024	21024	75486	18421	0	0	0	0	0	20968	5117	5839	31925	0	0	0	0	0	0
20	18421	0	18421	193994	72798	266%	21024	21024	175572	18421	0	0	0	0	0	48770	5117	5839	59727	0	0	0	0	0	0
21	18421	0	18421	161326	100415	161%	21024	21024	142905	18421	0	0	0	0	0	39695	5117	5839	50652	0	0	0	0	0	0
22	18421	0	18421	113471	64034	177%	21024	21024	95050	18421	0	0	0	0	0	26402	5117	5839	37359	0	0	0	0	0	0
23	18421	0	18421	193358	85334	227%	21024	21024	174936	18421	0	0	0	0	0	48593	5117	5839	59550	0	0	0	0	0	0
24	18421	0	18421	139097	69928	199%	21024	21024	120675	18421	0	0	0	0	0	33520	5117	5839	44477	0	0	0	0	0	0
25	18421	0	18421	106268	59322	179%	21024	21024	87846	18421	0	0	0	0	0	24401	5117	5839	35358	0	0	0	0	0	0
26	18421	0	18421	108971	50729	215%	21024	21024	90550	18421	0	0	0	0	0	25152	5117	5839	36109	0	0	0	0	0	0
27	18421	0	18421	136605	53690	254%	21024	21024	118183	18421	0	0	0	0	0	32828	5117	5839	43785	0	0	0	0	0	0
28	18421	0	18421	84828	51503	165%	21024	21024	66407	18421	0	0	0	0	0	18446	5117	5839	29403	0	0	0	0	0	0
29	18421	0	18421	64340	50152	128%	21024	21024	45918	18421	0	0	0	0	0	12755	5117	5839	23712	0	0	0	0	0	0
30	18421	0	18421	85205	51529	165%	21024	21024	66783	18421	0	0	0	0	0	18551	5117	5839	29508	0	0	0	0	0	0
31	18421	0	18421	89442	49983	179%	21024	21024	71020	18421	0	0	0	0	0	19728	5117	5839	30685	0	0	0	0	0	0
32	18421	0	18421	120445	46967	256%	21024	21024	102023	18421	0	0	0	0	0	28339	5117	5839	39296	0	0	0	0	0	0
33	18421	0	18421	96565	41898	230%	21024	21024	78143	18421	0	0	0	0	0	21706	5117	5839	32663	0	0	0	0	0	0
34	18421	0	18421	130995	55849	235%	21024	21024	112574	18421	0	0	0	0	0	31270	5117	5839	42227	0	0	0	0	0	0
35	18421	0	18421	88322	49953	177%	21024	21024	69901	18421	0	0	0	0	0	19416	5117	5839	30373	0	0	0	0	0	0
36	18421	0	18421	86489	57292	151%	21024	21024	68068	18421	0	0	0	0	0	18907	5117	5839	29864	0	0	0	0	0	0
37	18421	0	18421	118154	52531	225%	21024	21024	99732	18421	0	0	0	0	0	27703	5117	5839	38660	0	0	0	0	0	0
38	18421	0	18421	94537	61924	153%	21024	21024	76115	18421	0	0	0	0	0	21143	5117	5839	32100	0	0	0	0	0	0
39	18421	0	18421	84948	58157	146%	21024	21024	66526	18421	0	0	0	0	0	18479	5117	5839	29436	0	0	0	0	0	0
40	18421	0	18421	101216	58402	173%	21024	21024	82794	18421	0	0	0	0	0	22998	5117	5839	33955	0	0	0	0	0	0
41	18421	0	18421	53933	44183	122%	21024	21024	35511	18421	0	0	0	0	0	9864	5117	5839	20821	0	0	0	0	0	0
42	18421	0	18421	68861	50024	138%	21024	21024	50439	18421	0	0	0	0	0	14010	5117	5839	24967	0	0	0	0	0	0
43	18421	0	18421	72693	41739	174%	21024	21024	54271	18421	0	0	0	0	0	15075	5117	5839	26032	0	0	0	0	0	0
44	18421	0	18421	88129	63516	139%	21024	21024	69707	18421	0	0	0	0	0	19363	5117	5839	30320	0	0	0	0	0	0
45	18421	0	18421	105811	45454	233%	21024	21024	87389	18421	0	0	0	0	0	24274	5117	5839	35231	0	0	0	0	0	0
46	18421	0	18421	77675	42442	183%	21024	21024	59253	18421	0	0	0	0	0	16459	5117	5839	27416	0	0	0	0	0	0
47	18421	0	18421	161277	56699	284%	21024	21024	142856	18421	0	0	0	0	0	39682	5117	5839	50639	0	0	0	0	0	0
48	18421	0	18421	116772	56279	207%	21024	21024	98351	18421	0	0	0	0	0	27319	5117	5839	38276	0	0	0	0	0	0
49	18421	0	18421	118345	59284	200%	21024	21024	99923	18421	0	0	0	0	0	27756	5117	5839	38713	0	0	0	0	0	0

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	GV	GW	GX	GY	GZ	HA	HB	HC	HD	HE	HF	HG
1	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
2	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
3	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
4	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
5	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
6	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
7	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
8	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
9	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
10	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
11	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
12	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
13	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
14	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
15	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
16	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
17	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
18	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
19	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
20	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
21	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
22	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
23	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
24	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
25	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
26	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
27	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
28	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
29	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
30	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
31	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
32	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
33	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
34	0	0	0	0	0	0	0	0	0	0	TORONTO	TORONTO
35	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
36	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
37	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
38	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
39	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
40	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
41	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
42	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
43	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
44	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
45	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
46	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
47	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
48	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA
49	0	0	0	0	0	0	0	0	0	0	OTTAWA	OTTAWA

```
cene5986,Ontario Hydro,R, ,TORONTO, ,ONT,1,TORONTO
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 0 , 0 , 0 , 0 , 0 , 0 ,
 0 , 0 , 0 , 0 , 0 , 0 ,
 0 , 0 , 0 , 0 , 0 , 0 ,
 3 , 1 , 0 , 93 ,
 0 , 0 , 0 , 0 ,
 22 , 16.5 , 0 , 22 , 0 , 0 , 0 , 0 , 0 , 0 , 3.5 , 0 ,A
 0 , 0 , 0 , 0 , 88.6 , 0 , 0 , 0
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 0 , 0 , 0 , 0 , 3 , 0 , 0
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 0 , 0 , 0 , 0
 0 , 0 , 0 , 0
```

NEW STAR FILE

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0 , 0 , 0 , 0
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2.7 , .36 , 0 , 0 ,N, .94 , 0 , 0 , 0 , 0
2.7 , .36 , 0 , 0 ,S, .94 , 1.52 , .2 , .61 , 0
2.7 , .36 , 0 , 0 ,E, .94 , 0 , 0 , 0 , 0
2.7 , .36 , 0 , 0 ,W, .94 , 0 , 0 , 0 , 0
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0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
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0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
```

```
                30  4  0      4MWINNIPEG           WPG01
Greentree
2500 Burrows Winnipeg
1MAS    I0001N         21.0 20.0   .0  3.5S    E    N    W    3 3 1 0 0
L    102.01     7.044
L     87.79     3.522
L      3.70     1.233
X       .00
L     18.02     1.761
L     25.27     1.761
L     67.35     1.761
L     37.63      .200
L     64.38      .200
L      1.05     3.000    12.700      .000      .720     1.067      .305      .20
       3.27     3.000    12.700      .000      .720
L      1.05     3.000    12.700      .000      .720
       1.65     3.000    12.700      .000      .720
L       .33     2.000    17.000      .000      .890
       1.52     3.000    12.700      .000      .720
       1.05     3.000    12.700      .000      .720
L       .65     2.000    17.000      .000      .890
NN UG NGY  NN130  76     524.97  .00  .00           16.0236.4  2.0 2.20 381.
Keeprite                       HGF 090NS-1                          20.05
GSW                                                                109.11   45
```


HOT-2000 FILE

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN
197	NFL	1989	STJ02	Protech Energy (Bruc	MA	M				I				E	Y	N	A	S	N	Y		U	0	0	0	1	1	67	0	0	0	0	0	1	0	100	4	3	1	21
198	NFL	1989	STJ04	Lakeshore Homes (Ge	MA	M			I					E	Y	N	A	S	N	Y		B	0	0	1	0	1	67	0	0	0	0	0	1	0	100	4	1	2	21
199	NFL	1989	STJ05	Lakeshore Homes (Ro	MA	M			I					E	Y	N	A	S	N	Y		U	0	0	1	0	1	67	0	0	0	0	0	1	0	100	4	3	1	21
200	NFL	1989	STJ06	BOLEN HOMES (Ed	MA	M				I				E	Y	N	A	S	N	Y		U	0	0	0	2	1	67	0	0	0	0	0	1	0	100	4	1	1	21
201	NFL	1989	STJ08	K & P Contracting (K	MA	M				I				E	Y	N	A	S	N	Y		U	0	0	0	1	1	67	0	0	0	0	0	1	0	100	4	1	1	21
202	NFL	1989	STJ09	K & P Contracting (M	MA	M				I				E	Y	N	A	S	N	Y		B	0	0	0	1	1	67	0	0	0	0	0	1	0	100	4	1	2	21
203	BC	1989	VAN01	6756 1A AVE	BC	M		I						G	N	N	A	R	Y	N		U	0	1	0	0	1	11	3	4	4	0	2	7	0	60	4	1	0	21.1
204	BC	1989	VAN02	16268 79A AVE	BC	M	I				H	C	G	E	N	N	A	R	N	N		U	1	0	0	0	1	11	3	3	3	1	3	1	0	100	4	2	0	21.1
205	BC	1989	VAN03	9442 - 160 A ST	BC	M	I	I			H	C	G	G	N	N	A	R	N	N		U	1	1	0	0	1	11	3	3	3	1	1	7	0	60	4	1	0	21.1
206	BC	1989	VAN04	2125 - A3AB ST	BC	M		I		I				G	N	N	A	R	Y	N		U	0	2	0	2	1	11	3	3	3	1	1	7	0	60	4	1	0	21.1
207	BC	1989	VAN05	2237 LONDON ST	BC	M		I		I				G	N	N	A	R	Y	N		U	0	1	0	1	1	11	3	4	3	1	3	7	0	60	4	1	0	21.1
208	BC	1989	VAN06	8895 143 AVE	BC	M				I				G	N	N	A	R	Y	N		U	0	0	0	1	1	11	3	4	3	1	1	7	0	60	4	1	0	21.1
209	BC	1989	VAN07	12240 PARK TREES	BC	M	I				U	V	F	G	N	N	A	R	Y	N		U	1	0	0	0	1	11	3	4	3	1	3	7	0	60	4	1	0	21.1
210	BC	1989	VAN08	12467 205 ST	BC	M	I				U	V	F	G	N	N	A	R	Y	N		U	1	0	0	0	1	11	3	3	3	1	2	7	0	60	4	1	0	21.1
211	BC	1989	VAN09	21444 - 126 AVE	BC	M		I		I				E	N	N	A	R	Y	N		U	0	1	0	1	1	11	3	4	4	1	4	7	0	100	4	3	0	21.1
212	BC	1989	VAN10	615 EAST 51 AVE	BC	M		I						G	N	N	A	R	N	N		U	0	1	0	0	1	11	3	4	3	1	3	7	0	60	4	1	0	21.1
213	BC	1989	VAN11	3129 RALEIGH	BC	M		I						G	N	N	A	R	N	N		U	0	1	0	0	1	11	3	3	2	0	0	7	0	60	4	1	0	21.1
214	BC	1989	VAN12	10552 ARBUTUS W	BC	M	I				H	C	G	G	N	N	A	R	Y	N		U	1	0	0	0	1	11	3	3	3	1	2	7	0	80	4	4	0	21.1
215	BC	1989	VAN13	2783 WESTLAKE D	BC	M	I				U	V	F	G	N	N	A	R	Y	N		U	1	0	0	0	1	11	3	4	3	1	1	7	0	60	4	1	0	21.1
216	BC	1989	VAN14	2936 DELAHAYE D	BC	M				I				G	N	N	A	R	Y	N		U	0	0	0	1	1	11	3	4	3	1	1	7	0	60	4	1	0	21.1
217	BC	1989	VAN15	2965 LOTUS CT	BC	M				I				G	N	N	A	R	Y	N		U	0	0	0	1	1	11	3	4	3	1	1	7	0	60	4	1	0	21.1
218	BC	1989	VAN16	12328 56 AVE	BC	M	I				H	C	G	G	N	N	A	R	Y	N		U	1	0	0	0	1	11	3	3	3	1	2	7	0	60	4	1	0	21.1
219	BC	1989	VAN17	3123 RALEIGH ST	BC	M		I						G	N	N	A	R	N	N		U	0	1	0	0	1	11	3	3	2	0	0	7	0	60	4	1	0	21.1
220	BC	1989	VAN18	12380 56 AVE	BC	M	I				H	C	G	G	N	N	A	R	Y	N		U	1	0	0	0	1	11	3	4	3	1	2	7	0	60	4	1	0	21.1
221	BC	1989	VAN19	2991 DELAHAYE D	BC	M				I				G	N	N	A	R	Y	N		U	0	0	0	1	1	11	3	4	3	1	1	7	0	60	4	1	0	21.1
222	BC	1989	VAN20	2987 DELAHAYE D	BC	M	I				U	V	G	G	N	N	A	R	Y	N		U	1	0	0	0	1	11	3	4	3	1	1	7	0	60	4	1	0	21.1
223	MAN	1989	WPG01	Greentree	PR	M				I				G	N	N	A	S	N	N		U	0	0	0	1	1	30	3	3	1	0	0	7	0	76	3	1	0	21
224	MAN	1989	WPG02	Pine Valley Homes	PR	M				I				G	N	N	A	S	N	N		U	0	0	0	1	1	30	3	4	2	1	1	7	0	82	3	4	0	21
225	MAN	1989	WPG03	Hilton Homes	PR	M				I				G	N	N	A	S	N	N		U	0	0	0	1	1	30	3	3	1	0	0	7	0	76	3	1	0	21
226	MAN	1989	WPG04	Randall two storey	PR	M				I				G	N	N	A	S	N	N		U	0	0	0	1	1	30	3	3	2	0	1	7	0	76	3	1	0	21
227	MAN	1989	WPG05	Randall Bungalow	PR	M				I				G	N	N	A	S	N	N	C	U	0	0	0	1	1	30	3	3	1	0	0	7	0	76	3	1	0	21
228	MAN	1989	WPG06	Qualico 53 898 DG	PR	M				I				G	N	N	A	S	N	N	C	U	0	0	0	1	1	30	3	3	2	1	0	7	0	76	3	1	0	21
229	MAN	1989	WPG07	Qualico 41 89A DG	PR	M			I					G	N	N	A	S	N	N	C	U	0	0	1	0	1	30	3	3	1	0	0	7	0	76	3	1	0	21
230	MAN	1989	WPG08	Qualico 55 88 DG	PR	M				I				G	N	N	A	S	N	N	C	U	0	0	0	1	1	30	3	4	2	1	0	7	0	76	3	1	0	21
231	MAN	1989	WPG10	Qualico 41 90B DG	PR	M			I					G	N	N	A	S	N	N	C	U	0	0	1	0	1	30	3	3	2	0	0	7	0	76	3	1	0	21
232	MAN	1989	WPG11	Qualico 41 90C DG	PR	M			I					G	N	N	A	S	N	N	C	U	0	0	1	0	1	30	0	0	0	0	0	7	0	76	3	1	0	21
233	MAN	1989	WPG12	Arborlea Homes Ltd	PR	M	I			I	H	C	F	G	N	N	A	S	N	N		U	2	0	0	1	1	30	3	4	3	1	1	7	0	81	3	4	0	21
234	MAN	1989	WPG13	Flair 1601	PR	M				I				G	N	N	A	S	N	N	C	U	0	0	0	1	1	30	0	0	0	0	0	7	0	72	3	1	0	21
235	MAN	1989	WPG14	Tiffany 6738	PR	M			I					G	N	N	A	S	N	N	C	U	0	0	1	0	1	30	3	4	2	1	0	7	0	76	3	1	0	21
236	MAN	1989	WPG14	Designer 7741	PR	M				I				G	N	N	A	S	N	N		U	0	0	0	1	1	30	3	4	2	1	0	7	0	76	3	1	0	21
237	MAN	1989	WPG16	Flair Petit	PR	M				I				G	N	N	A	S	N	N	C	U	0	0	0	1	1	30	3	3	1	0	0	7	0	76	3	1	0	21
238	MAN	1989	WPG17	Flair 1823	PR	M				I				G	N	N	A	S	N	N	C	U	0	0	0	1	1	30	3	3	1	0	0	7	0	76	3	1	0	21
239	MAN	1989	WPG19	D and E Builders	PR	M	I		I		H	C	F	G	N	N	A	S	N	N		U	2	0	2	0	1	30	0	0	0	0	0	7	0	76	3	1	0	21

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV
197	17.8	0	3.5		464.2	0	0.2	16	236.4	2	3	##	384.1	STJ02	91.4	98.1	4.1	0	0	0	0	0	0	18.1	0	0	0	24.2	50.3	32.9	58.5	2.7	0	[illegible]
198	21	0	3.5		423.3	0	0.3	32	472.8	3	3	##	360.4	STJ04	85.9	124.9	3.8	3.4	0	0	0	0	0	7.5	37.9	30.7	51.8	0	0	0	0	0	6.3	[illegible]
199	18	0	3.5		499.9	0	0.1	16	236.4	2	3	##	405.4	STJ05	99.7	143.8	3.4	3.4	0	0	0	0	0	12.1	32.1	32.9	64.1	0	0	0	0	0	4.2	[illegible]
200	17.8	0	3.5		793.3	0	0.1	16	236.4	2	4	##	557.6	STJ06	106.1	210.8	4.9	0	0	0	0	0	0	14.3	0	0	0	28.6	66.7	39.6	66.5	0	11	[illegible]
201	17.8	0	3.5		680.7	0	0.1	16	236.4	2	3	##	533.9	STJ08	132.9	135.6	3.5	1.3	0	0	0	0	0	29.2	0	0	0	33.2	43.5	45.1	85	7.4	0	[illegible]
202	17.8	0	3.5		701	0	0.2	16	236.4	2	3	##	549.4	STJ09	130.9	152.3	2.5	0	0	0	0	0	0	46.5	0	0	0	27.7	44.3	41.5	75.3	17.4	0	[illegible]
203	20	0	3.3		734.8	0	0.4	16	236	2	9	##	647.7	BC01	153.5	281.6	10.5	9	0	0	0	56	80	0	0	0	0	0	0	0	0	23	0	12
204	20	15	3.3		797.3	0	0.4	16	236	2	5	##	711.4	BC02	212.2	232.7	9	42.1	53	53	76	0	0	0	0	0	0	0	0	0	0	10.5	2.9	27
205	20	15	3.3		476.7	0	0.5	16	236	2	0	##	486.2	BC03	116.2	199.4	3.5	17.7	25	18	39	19	28	0	0	0	0	0	0	0	0	0.8	0	[illegible]
206	20	0	3.3		829.9	0	0.4	16	236	2	4	##	768.2	BC04	220.6	171.4	5.6	0	0	0	0	49	152	28.8	0	0	0	10.9	14.8	18.4	63.7	10.8	5.2	[illegible]
207	20	0	3.3		892.8	0	0.4	16	236	2	5	##	638.9	VAN05	141.6	198.1	5.4	45.7	0	0	0	0.8	0.1	35.9	0	0	0	26.4	52.1	36.2	64.4	8.2	1.6	[illegible]
208	20	0	3.3		740.9	0	0.4	16	236	2	5	##	583.3	BC06	131.1	176.5	5.4	38.4	0	0	0	0	0	18.8	0	0	0	25.9	64.8	35.2	56.2	0.6	0	[illegible]
209	20	0	3.3		647.7	0	0.4	16	236	2	8	##	555.9	BC07	155.2	212.8	3.5	28.5	31	44	76	0	0	0	0	0	0	0	0	0	0	14	1.9	4.6
210	20	0	3.3		501.9	0	0.5	16	236	2	8	##	447	BC08	104.6	203.4	3.5	7.2	33	40	56	0	0	0	0	0	0	0	0	0	0	1.9	3	6.1
211	20	0	3.3		963.2	0	0.4	16	236	2	5	##	753.1	VAN09	162.5	232.2	5.1	37.8	0	0	0	4.4	0.1	41.4	0	0	0	33.5	68.7	40	75.9	3.5	2.3	0
212	20	0	3.3		609.4	0	0.4	16	236	2	3	##	498	BC10	121.4	220.4	4.6	1.2	0	0	0	44	78	0	0	0	0	0	0	0	0	9.1	0	3.9
213	20	0	3.3		456.8	0	0.4	16	236	2	8	##	314.4	BC11	97.9	90.3	4.6	18.7	0	0	0	34	47	0	0	0	0	0	0	0	0	0	0.8	8.9
214	20	15	3.3		718.7	0	0.4	16	236	2	5	##	590.4	BC12	159.4	170	5.2	9.2	59	48	101	0	0	0	0	0	0	0	0	0	0	9.5	1	12
215	20	0	3.3		543.2	0	0.4	16	236	2	7	##	464.8	BC13	128.8	180	4.6	36	24	37	55	0	0	0	0	0	0	0	0	0	0	2.2	2.6	0
216	20	0	3.3		808.8	0	0.4	16	236	2	6	##	594.2	BC14	130	188.2	4.6	36	0	0	0	0	0	20.6	0	0	0	25.7	64.9	39.3	54.8	9.2	2.6	3.7
217	20	0	3.3		836.9	0	0.4	16	236	2	6	##	607.4	BC15	130	188.2	4.6	36	0	0	0	0	0	23	0	0	0	25.7	77.7	39.3	54.8	8.6	0.1	21
218	20	15	3.3		770.3	0	0.4	16	236	2	7	##	563.7	BC16	153.5	158.3	5.6	19	60	44	87	0	0	0	0	0	0	0	0	0	0	1.4	16	29
219	20	0	3.3		456.8	0	0.4	16	236	2	8	##	314.6	BC17	97.8	90.6	4.6	18.7	0	0	0	34	47	0	0	0	0	0	0	0	0	0	0.8	8.9
220	20	15	3.3		702.2	0	0.4	16	236	2	5	##	525.5	BC18	120.7	203.5	3.7	0	51	42	81	0	0	0	0	0	0	0	0	0	0	12.6	0.8	21
221	20	0	3.3		808.3	0	0.4	16	236	2	4	##	594.5	BC19	130	188.5	4.6	36	0	0	0	0	0	20.6	0	0	0	25.7	64.9	39.3	54.8	9.7	0.1	21
222	20	0	3.3		543.2	0	0.4	16	236	2	6	##	537.7	BC20	128.8	180	4.6	36	73	37	55	0	0	0	0	0	0	0	0	0	0	1.3	2.2	6.7
223	20	0	3.5		525	0	0.4	16	236.4	2	2	##	416.7	WPG01	102	87.8	3.7	0	0	0	0	0	0	18	0	0	0	25.3	67.3	37.6	64.4	1	0	4.3
224	20	0	3.5		920.6	0	0.4	16	236.4	2	2	##	636.6	WPG02	132.9	213.8	2.8	5.8	0	0	0	0	0	34.4	0	0	0	28.2	56.5	42.7	84.4	14.1	0	1.6
225	20	0	3.5		551.6	0	0.4	16	236.4	2	1	##	439.3	WPG03	107.8	101.6	3.7	3.1	0	0	0	0	0	18.9	0	0	0	26	65	39	65	1.3	0	4
226	20	0	3.5		469.9	0	0.4	16	236.4	2	2	##	394.3	WPG04	69.7	154.5	1.9	1.7	0	0	0	0	0	20.1	0	0	0	22.3	44.6	32.5	35.6	6.3	0	0.3
227	20	0	3.5		551.9	0	0.4	16	236.4	2	2	##	443	WPG05	106.8	107.4	3.7	0	0	0	0	0	0	24.8	0	0	0	26.9	53.9	40.1	66.5	2.8	0	0.9
228	20	0	3.5		710.5	0	0.4	16	236.4	2	2	##	530.5	WPG06	101.3	191.1	3.2	2.8	0	0	0	0	0	32.6	0	0	0	26.8	53.5	39.9	58.8	0	5.2	0
229	20	0	3.5		554.6	0	0.4	16	236.4	2	1	##	438.9	WPG07	108.7	147.2	1.3	1.7	0	0	0	0	0	6.3	50.5	37.6	69.2	0	0	0	0	4.5	0	2.6
230	20	0	3.5		726.3	0	0.4	16	236.4	2	2	##	551.4	WPG08	111.5	181.2	1.8	0	0	0	0	0	0	37.5	0	0	0	30.5	60.9	46	64.6	3	0	5.3
231	20	0	3.5		552.9	0	0.4	16	236.4	2	1	##	437.9	WPG10	108.7	144.5	1.3	0.7	0	0	0	0	0	6.3	50.5	37.6	69.2	0	0	0	0	2.6	0	6.1
232	20	0	3.5		552.9	0	0	16	236.4	2	2	##	437	WPG11	107.8	144.5	1.8	0.7	0	0	0	0	0	6.3	50.5	37.6	69.2	0	0	0	0	2.6	0	6.1
233	20	20	3.5		1035	0	0.4	16	236.4	2	2	##	736.5	WPG12	175.7	251.3	2	27.7	12	9.2	4.2	0	0	1	0	0	0	27.6	57.2	42.8	87.6	6.3	1.2	9.1
234	20	0	3.5		459.4	0	0	16	236.4	2	2	##	396.3	WPG13	96.6	83.7	3.7	1.9	0	0	0	0	0	18.4	0	0	0	24.5	61.3	36.4	59.1	6.6	0	1
235	20	0	3.5		533.1	0	0.4	16	236.4	2	3	##	478.1	WPG14	105.6	173.4	1.9	12.1	0	0	0	0	0	27.9	49.8	36.8	54.3	0	0	0	0	4.5	0	3
236	20	0	3.5		608.4	0	0.4	16	236.4	2	3	##	510.6	WPG14	107	165.6	1.9	21.5	0	0	0	0	0	30.9	0	0	0	25.3	50.5	37.4	49	0	0	9
237	20	0	3.5		320	0	0.5	16	236.4	2	3	##	295.2	WPG16	64.1	73.9	1.9	0.9	0	0	0	0	0	42.2	0	0	0	20.1	20.1	28.9	34.3	0	0	1.7
238	20	0	3.5		394.3	0	0.4	16	236.4	2	2	##	358	WPG17	80.4	89.9	1.9	3.1	0	0	0	0	0	50.7	0	0	0	23.4	23.4	34.4	42.1	1	0	2
239	20	20	3.5		567	0	0	16	236.4	2	1	##	472.9	WPG19	123.9	130.4	0.9	1.1	40	24	37	0	0	1	26.5	20.5	40.8	0	0	0	0	7.4	2.2	2.3

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF
197	0	0	0	3.4	0	STJ02	7.04	3.52	2.47	0	0	0	0	0	0	0.3	0	0	0	0.3	0.3	0	0	0.4	0	0.4	0	0	0	0.4	0	STJ02	2	0	2	0
198	0	0	8.2	0	0	STJ04	3.52	3.52	2.47	3.52	0	0	0	0	0	2.3	2.3	0	0	0	0	0	0	0	0.4	0	0	0	0.4	0	0	STJ04	0	2	0	0
199	0	0	8	0	1.6	STJ05	5.46	3.52	2.47	3.52	0	0	0	0	0	1.8	1.8	0	0	0	0	0	0	0	0.4	0	0	0	0.4	0	0.4	STJ05	0	2	0	0
200	0.5	0	8.5	0	0.5	STJ06	5.46	3.52	2.47	0	0	0	0	0	0	3.5	0	0	0	3.5	3.5	0	0	0	0.4	0	0.4	0	0.4	0	0.4	STJ06	0	2	0	2
201	0	11	0	3.1	0	STJ08	7.04	3.52	2.47	5.46	0	0	0	0	0	3.5	0	0	0	0.4	0.3	0	0	0.4	0	0.4	0	0.4	0	0.4	0	STJ08	2	0	2	0
202	0	10	0	0	0	STJ09	6.42	3.52	2.47	0	0	0	0	0	0	3.5	0	0	0	1.8	1.8	0	0	0.4	0	0.4	0	0.4	0	0	0	STJ09	2	0	2	0
203	0	13	0	9.7	0	BC01	2.78	3.52	1.41	4.93	0	0	0	2.8	2.8	0	0	0	0	0	0	0	0	0.4	0	0.4	0	0.4	0	0.4	0	BC01	2.3	0	2	0
204	1.2	13	0	0	2.6	BC02	4.31	2.11	1.41	3.52	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0.4	0.4	0	0	0.4	BC02	2	2	2	2
205	0	2.8	0.3	5.3	0.3	BC03	4.62	2.11	1.41	3.52	2.1	0	0	0.4	0	0	0	0	0	0	0	0	0	0.4	0	0.4	0	0.4	0.4	0.4	0.4	BC03	2	0	2	0
206	0	10	0	3.2	0	BC04	5.24	3.52	1.41	0	0	0	0	0.2	0	1.1	0	0	0	0	0	0	0	0.4	0.4	0.4	0	0.4	0	0.4	0	BC04	2	2	2	0
207	0.6	10	0.6	5.4	1.6	VAN05	4.8	2.11	1.41	3.52	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	VAN05	2	2	2	2
208	0	6.2	0.6	14	0.6	BC06	4.41	2.11	1.41	3.52	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.4	0	0.4	0	0.4	0.4	0.4	0.4	BC06	2	0	2	0
209	1.8	6.2	1.8	2.8	3	BC07	4.46	2.11	1.41	3.52	1	2.1	2.1	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	BC07	2	2	2	2
210	3	0.8	0.9	16	0.9	BC08	4.93	2.11	1.41	3.52	0	3.5	3.5	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	BC08	2	2	2	2
211	14	0.8	0.9	16	14	VAN09	4.78	2.11	0.85	3.52	0	0	0	0	0	1.5	0	0	0	1.3	1.3	0	0	0.4	0.4	0	0.4	0.4	0.4	0.4	0.4	VAN09	2	2	0	2
212	0.9	9.4	0.9	4.3	0	BC10	4.57	2.11	1.41	3.52	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0.4	0.4	0.4	0.4	0.4	0	BC10	2	0	2	2
213	0.8	0	0	12	0	BC11	4.87	2.11	1.41	3.52	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0	0	0.4	0	BC11	0	2	2	2
214	0	5.7	0	9.6	1	BC12	4.48	3.14	1.41	3.52	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0	0.4	0	0.4	0.4	BC12	2	2	2	0
215	9.1	0.1	1.1	2.2	6.7	BC13	4.76	2.11	1.41	3.52	0	2.1	2.1	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0	0.4	0.4	0.4	0.4	0.4	BC13	2	2	0	2
216	0	9.7	0.1	2.1	-2.6	BC14	4.12	2.11	1.41	3.52	0	0	0	0	0	0.4	0	0	0	2.1	2.1	0	0	0.4	0.4	0.4	0	0.4	0.4	0.4	0.4	BC14	2	2	2	0
217	2.6	8.2	2.6	3.7	0	BC15	4.12	2.11	1.41	3.52	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0	BC15	2	2	2	2
218	3.8	0	6.8	0	5.1	BC16	4.36	2.11	1.41	3.52	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0.4	0	0.4	0	0.4	BC16	2	2	2	2
219	0.8	0	0	12	0	BC17	4.93	2.08	1.41	3.52	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0	0	0.4	0	BC17	0	2	2	2
220	0	5.8	0	2.8	0	BC18	4.19	1.92	1.41	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0	0.4	0	0.4	0	BC18	2	2	2	0
221	2.6	9.2	2.6	3.7	0	BC19	4.12	2.07	1.41	3.52	0	0	0	0	0	0.4	0	0	0	2.1	2.1	0	0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0	BC19	2	2	2	2
222	2.2	2.6	0	9.1	0.1	BC20	4.76	2.11	1.41	3.52	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0.4	0.4	0.4	0.4	0	0.4	0.4	BC20	2	2	2	2
223	0	2	0	3.2	0	WPG01	7.04	3.52	1.23	0	0	0	0	0	0	1.8	0	0	0	1.8	1.8	0	0	0.6	0	0.6	0	0.5	0	0.5	0	WPG01	3	0	3	0
224	0	16	0	2.9	0	WPG02	8.81	3.52	1.76	3.52	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0.6	0	0.6	0	0.6	0	0.5	0	WPG02	3	0	3	0
225	0	1	0	2.8	0	WPG03	7.04	3.52	1.76	3.52	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0.5	0	0.6	0	0.6	0	0.5	0	WPG03	2.8	0	3	0
226	0	4.1	0	0.9	0	WPG04	7.04	3.52	1.76	3.52	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0.6	0	0.4	0	0.6	0	0.6	0	WPG04	3	0	2	0
227	0	4.8	0	4.4	0	WPG05	7.04	3.52	1.76	0	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0.6	0	0.6	0	0.6	0	0.6	0	WPG05	3	0	3	0
228	1.4	1.3	6.9	1.3	4.6	WPG06	6.69	3.52	1.76	3.52	0	0	0	0	0	1.8	0	0	0	1.8	1.8	0	0	0	0.6	0	0.6	0.6	0.6	0.6	0.6	WPG06	0	3	0	3
229	0	6.1	0	3.2	0	WPG07	6.69	3.52	1.76	3.52	0	0	0	0	0	1.8	1.8	0	0	0	0	0	0	0.6	0	0.6	0	0.6	0	0.6	0	WPG07	3	0	3	0
230	0	4.7	0	4.6	0	WPG08	6.69	3.52	1.76	0	0	0	0	0	0	1.8	0	0	0	1.8	1.8	0	0	0.6	0	0.6	0	0.6	0	0.6	0	WPG08	3	0	3	0
231	0	3.2	0	7.2	0	WPG10	6.69	3.52	1.76	3.52	0	0	0	0	0	1.8	1.8	0	0	0	0	0	0	0.6	0	0.6	0	0.6	0	0.6	0	WPG10	3	0	3	0
232	0	3.2	0	6.7	0	WPG11	6.69	3.52	1.76	3.52	0	0	0	0	0	1.8	1.8	0	0	0	0	0	0	0.6	0	0.6	0	0.6	0	0.6	0	WPG11	3	0	3	0
233	1.2	4.4	0	16	0	WPG12	7.93	3.52	1.76	7.04	3.5	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0.6	0.6	0.6	0.6	0.5	0	0.6	0	WPG12	3	3	3	3
234	0	2	0	1	0	WPG13	7.04	3.52	1.76	3.52	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0.6	0	0.6	0	0.6	0	0.6	0	WPG13	3	0	3	0
235	0	8.2	0	0.6	0	WPG14	7.04	3.52	1.76	3.52	0	0	0	0	0	2.1	2.1	0	0	0	0	0	0	0.6	0	0.6	0	0.6	0	0.7	0	WPG14	3	0	3	0
236	0	2.7	0	9.7	0	WPG14	7.04	3.52	1.76	5.28	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0	0	0.6	0	0.5	0	0.6	0	WPG14	0	0	3	0
237	0	0	0	7.3	0	WPG16	7.04	3.52	1.76	3.52	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0	0	0.6	0	0	0	0.6	0	WPG16	0	0	3	0
238	0	0	0	5.7	0	WPG17	7.04	3.52	1.76	3.52	0	0	0	0	0	2.1	0	0	0	2.1	2.1	0	0	0.6	0	0.6	0	0	0	0.6	0	WPG17	3	0	3	0
239	0	7.4	1.9	2.8	2.2	WPG19	7.04	3.52	1.76	3.52	0.3	0	0	0	0	3.5	3.5	0	0	0	0	0	0	0.6	0.6	0.6	0	0.6	0.6	0.6	0.6	WPG19	3	3	3	0

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG	EH	EI	EJ	EK	EL	EM	EN	EO	EP	EQ	ER	ES	ET
197	0	0	2	0	0.8	0	0.8	0	0	0	0.8	0	1.5	0.5	0.3	0	0	0	0	0	0	STJ02	1	0	0	93	0	182	0	0	0	120	120	0	0	0	0	0	0	0
198	0	2	0	0	0	0.8	0	0	0	0.8	0	0	0	0	0	1.5	0.5	0.3	0	0	0	STJ04	1	0	0	93	0	273	0	0	0	69	69	0	0	0	67	58	4	0
199	0	2	0	2	0	0.8	0	0	0	0.8	0	0.8	0	0	0	1.5	0.5	0.3	1.5	0.5	0.3	STJ05	1	0	0	93	0	182	0	0	0	69	69	0	0	0	0	0	0	0
200	0	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	0	0	1.5	0.5	0.3	1.5	0.5	0.3	STJ06	1	0	0	93	0	273	0	0	0	125	125	0	0	0	0	0	0	0
201	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	0.5	0.3	0	0	0	0	0	0	STJ08	1	0	0	93	0	0	0	0	0	120	120	0	0	0	0	0	0	0
202	2	0	0	0	0.8	0	0.8	0	0.8	0	0	0	1.5	0.5	0.3	0	0	0	0	0	0	STJ09	1	0	0	93	0	182	0	0	0	69	69	0	0	0	67	58	4	0
203	2	0	2	0	0.8	0	0.8	0	0.8	0	0.8	0	1.5	1.3	1	0	0	0	0	0	0	BC01	1	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	4	0
204	2	0	0	2	0.8	0.8	0.8	0.8	0.8	0	0	0.8	1.4	0.3	0	1.5	0.3	0	1.5	0.6	0	BC02	1	0	0	93	0	0	0	0	31	0	0	0	0	0	0	0	4	0
205	2	2	2	2	0.8	0	0.8	0	0.8	0.8	0.8	0.8	1	0.6	0.2	0	0	0	1.5	0.6	0.2	BC03	1	0	0	45	0	0	0	0	29	0	0	0	0	0	0	0	4	0
206	2	0	2	0	0.8	0.8	0.8	0	0.8	0	0.8	0	1.4	0.8	0.1	1.4	1	0.2	0	0	0	BC04	1	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	4	0
207	2	2	2	2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.2	0.4	0.3	1.5	1.4	0.1	1.5	1.2	0.1	VAN05	1	0	0	45	0	182	0	0	0	0	0	0	0	0	0	0	4	0
208	2	2	2	2	0.8	0	0.8	0	0.8	0.8	0.8	0.8	0.3	0	0	0	0	0	1.5	0.2	0.3	BC06	1	0	0	45	0	182	0	0	26	0	0	0	0	0	0	0	4	0
209	2	2	2	2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.5	0.6	0.2	1.1	0.3	0	1.1	0.2	0	BC07	1	0	0	45	0	182	0	0	35	0	0	0	0	0	0	0	4	0
210	2	2	2	2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.1	0.6	0	1.3	0.6	0	1.1	0.6	0	BC08	1	0	0	45	0	182	0	0	31	0	0	0	0	0	0	0	4	0
211	2	2	2	2	0.8	0.8	0	0.8	0.8	0.8	0.8	0.8	1.2	0.6	0	1.3	0.6	2.3	1.6	0.9	0	VAN09	1	0	0	45	0	182	0	0	0	0	0	0	0	0	0	0	4	0
212	2	2	2	0	0.8	0	0.8	0.8	0.8	0.8	0.8	0	1.5	0.3	0.1	0	0	0	0	0	0	BC10	1	0	0	45	0	182	0	0	25	0	0	0	0	0	0	0	4	0
213	0	0	2	0	0	0.8	0.8	0.8	0	0	0.8	0	0	0	0	1.5	0.6	0.1	0	0	0	BC11	1	0	0	45	0	182	0	0	20	0	0	0	0	0	0	0	4	0
214	2	0	2	2	0.8	0.8	0.8	0	0.8	0	0.8	0.8	1.6	0.5	0	1.1	0.5	0	1.1	0.5	0	BC12	1	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	4	0
215	2	2	2	2	0.8	0.8	0	0.8	0.8	0.8	0.8	0.8	1.3	0.3	0.1	0.9	0.4	0.1	1.6	0.1	0	BC13	1	0	0	45	0	182	0	0	0	0	0	0	0	0	0	0	4	0
216	2	2	2	2	0.8	0.8	0.8	0	0.8	0.8	0.8	0.8	1.3	0.1	0	1.2	0.3	0	1.2	0.3	0	BC14	1	0	0	45	0	0	0	0	22	0	0	0	0	0	0	0	4	0
217	2	2	2	0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0	1.7	0.6	1	1.2	1.8	0	0	0	0	BC15	1	0	0	45	0	182	0	0	0	0	0	0	0	0	0	0	4	0
218	0	2	0	2	0.8	0.8	0.8	0.8	0	0.8	0	0.8	1.5	0.5	0	1.6	0.4	0.3	1.2	0.5	0	BC16	1	0	0	45	0	182	0	0	29	0	0	0	0	0	0	0	4	0
219	0	0	2	0	0	0.8	0.8	0.8	0	0	0.8	0	0	0	0	1.5	0.6	0.1	0	0	0	BC17	1	0	0	45	0	182	0	0	20	0	0	0	0	0	0	0	4	0
220	2	0	2	0	0.8	0.8	0.8	0	0.8	0	0.8	0	1.5	0.5	0.6	1.5	0.3	0.2	0	0	0	BC18	1	0	0	45	0	182	0	0	29	0	0	0	0	0	0	0	4	0
221	2	2	2	0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0	1.6	0.5	0.8	1.2	1.8	0.2	0	0	0	BC19	1	0	0	45	0	182	0	0	22	0	0	0	0	0	0	0	4	0
222	2	0	2	2	0.8	0.8	0.8	0.8	0.8	0	0.8	0.8	1	0.3	1.1	1.4	0.6	1.5	1.2	1.8	0.3	BC20	1	0	0	45	0	182	0	0	22	0	0	0	0	0	0	0	4	0
223	2.8	0	2.8	0	0.7	0	0.7	0	0.8	0	0.8	0	1.1	0.3	0.2	0	0	0	0	0	0	WPG01	1	0	0	45	0	109	0	0	20	0	0	0	0	0	0	0	4	0
224	3	0	2.9	0	0.7	0	0.7	0	0.7	0	0.7	0	1.5	0.6	0.2	0	0	0	0	0	0	WPG02	1	0	0	45	0	273	0	0	38	0	0	0	0	0	0	0	4	0
225	3	0	2.9	0	0.7	0	0.7	0	0.7	0	0.7	0	1	0.6	0.8	0	0	0	0	0	0	WPG03	1	0	0	45	0	150	0	0	20	0	0	0	0	0	0	0	4	0
226	3	0	3	0	0.7	0	0.8	0	0.7	0	0.7	0	1.8	0.6	0.7	0	0	0	0	0	0	WPG04	1	0	0	45	0	150	0	0	20	0	0	0	0	0	0	0	4	0
227	3	0	3	0	0.7	0	0.7	0	0.7	0	0.7	0	1.4	0.6	0.2	0	0	0	0	0	0	WPG05	1	0	0	45	0	150	0	0	20	0	0	0	0	0	0	0	4	0
228	3	3	3	3	0	0.7	0	0.7	0.7	0.7	0.7	0.7	0	0	0	1.8	0.6	0.5	1.4	0	0.2	WPG06	1	0	0	45	0	150	0	0	27	0	0	0	0	0	0	0	4	0
229	3	0	3	0	0.7	0	0.7	0	0.7	0	0.7	0	1.8	0.6	0.2	0	0	0	0	0	0	WPG07	1	0	0	45	0	150	0	0	20	0	0	0	0	0	0	0	4	0
230	3	0	3	0	0.7	0	0.7	0	0.7	0	0.7	0	1.2	0.6	3.1	0	0	0	0	0	0	WPG08	1	0	0	45	0	150	0	0	27	0	0	0	0	0	0	0	4	0
231	3	0	3	0	0.7	0	0.7	0	0.7	0	0.7	0	1.2	0.6	2.4	0	0	0	0	0	0	WPG10	1	0	0	45	0	150	0	0	20	0	0	0	0	0	0	0	4	0
232	3	0	3	0	0.7	0	0.7	0	0.7	0	0.7	0	1.2	0.6	2.4	0	0	0	0	0	0	WPG11	1	0	0	45	0	150	0	0	20	0	0	0	0	0	0	0	4	0
233	2.8	0	3	0	0.7	0.7	0.7	0.7	0.7	0	0.7	0	1.3	0.6	0.7	1.5	0.6	0.5	0	0	0	WPG12	1	0	0	45	0	300	0	0	30	0	0	0	0	0	0	0	4	0
234	3	0	3	0	0.7	0	0.7	0	0.7	0	0.7	0	1.5	0.6	0.2	0	0	0	0	0	0	WPG13	1	0	0	45	0	150	0	0	20	0	0	0	0	0	0	0	4	0
235	3	0	3	0	0.7	0	0.7	0	0.7	0	0.7	0	1.8	0.6	0.2	0	0	0	0	0	0	WPG14	1	0	0	45	0	150	0	0	23	0	0	0	0	0	0	0	4	0
236	2.8	0	3	0	0	0	0.7	0	0.7	0	0.7	0	0	0	0	0	0	0	0	0	0	WPG14	1	0	0	45	0	150	0	0	27	0	0	0	0	0	0	0	4	0
237	0	0	3	0	0	0	0.7	0	0	0	0.7	0	0	0	0	0	0	0	0	0	0	WPG16	1	0	0	45	0	114	0	0	20	0	0	0	0	0	0	0	4	0
238	0	0	3	0	0.7	0	0.7	0	0	0	0.7	0	0.8	0.3	1.8	0	0	0	0	0	0	WPG17	1	0	0	45	0	114	0	0	20	0	0	0	0	0	0	0	4	0
239	3	3	3	3	0.7	0.7	0.7	0	0.7	0.7	0.7	0.7	1.8	0.6	0.2	1.8	0.6	0.2	1.8	0.6	0.2	WPG19	1	0	0	45	0	114	0	0	20	0	0	0	0	0	0	0	4	0

EXCEL data file of Hot-2000 files for Merchant and Hydro Houses

	EU	EV	EW	EX	EY	EZ	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV
197	0	0	0	0	0	0	0	0	STJ02	6971	70560	23918	10721	1E+05	0.227	0.102	0	0	0	0	0.6	18061	0	3725	59	65020	1863	17161
198	0	0	0	0	0	0	0	0	STJ04	6271	29819	42427	13944	86190	0.492	0.162	0	0	0	0	0.6	25652	66	2142	34	47172	1071	34322
199	0	0	0	0	0	0	0	0	STJ05	5682	46886	23822	15940	86648	0.275	0.184	0	0	0	0	0.6	16750	0	2142	34	60299	1071	17161
200	0	0	0	0	0	0	0	0	STJ06	8233	72456	24053	25625	1E+05	0.197	0.21	0	0	0	0	0.6	34441	0	3880	61	123989	1940	17161
201	0	0	0	0	0	0	0	0	STJ08	10228	95063	24057	29028	1E+05	0.162	0.196	0	0	0	0	0.6	47686	0	3725	59	171668	1863	17161
202	0	0	0	0	0	0	0	0	STJ09	8373	57705	24053	34458	1E+05	0.207	0.296	0	0	0	0	0.6	29932	66	2142	34	62857	1071	17161
203	0	0	0	0	0	0	0	0	BC01	11446	76275	24056	45981	1E+05	0.164	0.314	65	90	0.44	0	0.6	34070	0	0	0	122652	0	17132
204	0	0	0	0	0	0	0	0	BC02	12166	84949	23905	31626	1E+05	0.17	0.225	70	95	0.48	0	0.6	29682	0	0	0	106855	0	17132
205	0	0	0	0	0	0	0	0	BC03	8221	59255	23752	19210	1E+05	0.232	0.188	60	85	0.69	0	0.6	28157	0	0	0	101365	0	17132
206	0	0	0	0	0	0	0	0	BC04	10110	81960	24056	35907	1E+05	0.17	0.253	70	95	0.41	0	0.6	34214	0	0	0	123171	0	17132
207	0	0	0	0	0	0	0	0	VAN05	10491	80847	24056	33716	1E+05	0.174	0.243	85	110	0.44	0	0.6	36806	0	0	0	132500	0	17132
208	0	0	0	0	0	0	0	0	BC06	11618	1E+05	24054	30623	2E+05	0.155	0.197	75	100	0.49	0	0.6	31802	0	0	0	114488	0	17132
209	0	0	0	0	0	0	0	0	BC07	10951	66659	24033	37045	1E+05	0.188	0.29	75	100	0.56	0	0.6	32022	0	0	0	115280	0	17132
210	0	0	0	0	0	0	0	0	BC08	8837	58894	23907	26281	1E+05	0.219	0.241	65	90	0.65	0	0.6	27562	0	0	0	99223	0	17132
211	0	0	0	0	0	0	0	0	VAN09	13494	1E+05	24056	50497	2E+05	0.135	0.283	95	120	0.45	0	0.6	40283	0	0	0	145018	0	17132
212	0	0	0	0	0	0	0	0	BC10	9467	73023	24048	30127	1E+05	0.189	0.237	75	100	0.59	0	0.6	31802	0	0	0	114488	0	17132
213	0	0	0	0	0	0	0	0	BC11	5637	34769	23533	17248	75551	0.311	0.228	40	65	0.51	0	0.6	19094	0	0	0	68740	0	17132
214	0	0	0	0	0	0	0	0	BC12	10212	62317	23668	31148	1E+05	0.202	0.266	65	90	0.51	0	0.6	27562	0	0	0	99223	0	17132
215	0	0	0	0	0	0	0	0	BC13	8727	57815	23888	23901	1E+05	0.226	0.226	65	90	0.6	0	0.6	27562	0	0	0	99223	0	17132
216	0	0	0	0	0	-0	0	0	BC14	10924	84576	24056	34811	1E+05	0.168	0.243	75	100	0.45	0	0.6	33320	0	0	0	119952	0	17132
217	0	0	0	0	0	0	0	0	BC15	9725	75696	24051	29486	1E+05	0.186	0.228	75	100	0.43	0	0.6	34501	0	0	0	124204	0	17132
218	0	0	0	0	0	0	0	0	BC16	11188	69683	23710	33625	1E+05	0.187	0.265	65	90	0.47	0	0.6	32840	0	0	0	118224	0	17132
219	0	0	0	0	0	0	0	0	BC17	5651	35003	23536	17274	75813	0.31	0.228	40	65	0.51	0	0.6	19206	0	0	0	69141	0	17132
220	0	0	0	0	0	0	0	0	BC18	10117	65240	23614	26817	1E+05	0.204	0.232	70	95	0.54	0	0.6	29682	0	0	0	106855	0	17132
221	0	0	0	0	0	0	0	0	BC19	10974	87536	24056	32433	1E+05	0.167	0.225	75	100	0.45	0	0.6	33320	0	0	0	119952	0	17132
222	0	0	0	0	0	0	0	0	BC20	9479	82614	24052	26428	1E+05	0.181	0.199	65	90	0.6	0	0.6	27562	0	0	0	99223	0	17132
223	0	0	0	0	0	0	0	0	WPG01	8345	68523	23707	14590	1E+05	0.222	0.137	45	70	0.48	0	0.6	35922	0	0	0	129318	0	17161
224	0	0	0	0	0	0	0	0	WPG02	15474	1E+05	24020	43828	2E+05	0.13	0.237	70	95	0.37	0	0.6	62992	0	0	0	226771	0	17161
225	0	0	0	0	0	0	0	0	WPG03	8486	69548	23704	14113	1E+05	0.221	0.131	45	70	0.46	0	0.6	37741	0	0	0	135868	0	17161
226	0	0	0	0	0	0	0	0	WPG04	8995	67345	23389	18345	1E+05	0.214	0.168	55	80	0.61	0	0.6	38710	0	0	0	139355	0	17161
227	0	0	0	0	0	0	0	0	WPG05	8978	72442	23734	16729	1E+05	0.21	0.148	45	70	0.46	0	0.6	37764	0	0	0	135952	0	17161
228	0	0	0	0	0	0	0	0	WPG06	12413	98448	23885	27269	1E+05	0.16	0.182	60	85	0.43	0	0.6	48619	0	0	0	175028	0	17161
229	0	0	0	0	0	0	0	0	WPG07	9608	74702	23619	20076	1E+05	0.199	0.17	45	70	0.45	0	0.6	37946	0	0	0	136607	0	17161
230	0	0	0	0	0	0	0	0	WPG08	12356	1E+05	23941	23351	2E+05	0.159	0.155	65	90	0.45	0	0.6	49700	0	0	0	178920	0	17161
231	0	0	0	0	0	0	0	0	WPG10	9803	74359	23640	22892	1E+05	0.196	0.189	50	75	0.49	0	0.6	37830	0	0	0	136189	0	17161
232	0	0	0	0	0	0	0	0	WPG11	7788	54870	23369	20877	99116	0.236	0.211	0	0	0	0	0.6	16239	0	0	0	58460	0	17161
233	0	0	0	0	0	0	0	0	WPG12	16993	1E+05	24047	48915	2E+05	0.118	0.24	75	100	0.35	0	0.6	70275	0	0	0	252989	0	17161
234	0	0	0	0	0	0	0	0	WPG13	5883	38115	23245	16894	78254	0.297	0.216	0	0	0	0	0.6	12351	0	0	0	44462	0	17161
235	0	0	0	0	0	0	0	0	WPG14	11175	90580	23639	19427	1E+05	0.177	0.145	65	90	0.61	0	0.6	45748	0	0	0	164692	0	17161
236	0	0	0	0	0	0	0	0	WPG14	11639	92102	23790	24155	1E+05	0.17	0.172	65	90	0.53	0	0.6	45748	0	0	0	164692	0	17161
237	0	0	0	0	0	0	0	0	WPG16	7193	54215	22945	10745	87905	0.261	0.122	45	70	0.79	0	0.6	31672	0	0	0	114018	0	17161
238	0	0	0	0	0	0	0	0	WPG17	7890	61559	23261	12214	97034	0.24	0.126	45	70	0.64	0	0.6	31672	0	0	0	114018	0	17161
239	0	0	0	0	0	0	0	0	WPG19	16332	1E+05	23862	35392	2E+05	0.128	0.189	0	0	0	0	0.6	11145	0	0	0	40123	0	17161

	FW	FX	FY	FZ	GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT	GU
197	18452	0	18452	90875	51142	178%	21024	21024	68697	18452	0	3725	58	0	0	20117	5125	5856	31099	0	0	0	0	0	0
198	36905	0	36905	67795	48254	140%	42048	42048	28748	36904	0	2141	33	0	0	8580	10251	11689	30521	0	0	0	0	0	0
199	18452	0	18452	66409	53663	124%	21024	21024	45814	18452	0	2141	33	0	0	13321	5125	5849	24296	0	0	0	0	0	0
200	18452	0	18452	92849	74383	125%	21024	21024	70515	18452	0	3880	61	0	0	20665	5125	5857	31648	0	0	0	0	0	0
201	18452	0	18452	115378	66432	174%	21024	21024	93200	18452	0	3725	58	0	0	26923	5125	5856	37905	0	0	0	0	0	0
202	18452	0	18452	77229	67863	114%	21024	21024	56634	18452	0	2141	33	0	0	16326	5125	5849	27301	0	0	0	0	0	0
203	38071	0	38071	165196	77234	214%	21024	21024	127125	38070	0	0	0	0	0	0	0	5839	5839	3410	1021	0	4432	0	0
204	18421	0	18421	103370	55749	185%	21024	21024	84948	18421	0	0	0	0	0	23596	5117	5839	34553	0	0	0	0	0	0
205	38071	0	38071	136828	62108	220%	21024	21024	98757	38070	0	0	0	0	0	0	0	5839	5839	2649	1021	0	3670	0	0
206	38071	0	38071	174671	82811	211%	21024	21024	136600	38070	0	0	0	0	0	0	0	5839	5839	3664	1021	0	4686	0	0
207	38071	0	38071	172816	86496	200%	21024	21024	134745	38070	0	0	0	0	0	0	0	5839	5839	3615	1021	0	4636	0	0
208	38071	0	38071	205773	77595	265%	21024	21024	167702	38070	0	0	0	0	0	0	0	5839	5839	4499	1021	0	5520	0	0
209	38071	0	38071	149169	72130	207%	21024	21024	111098	38070	0	0	0	0	0	0	0	5839	5839	2980	1021	0	4002	0	0
210	38071	0	38071	136228	63584	214%	21024	21024	98157	38070	0	0	0	0	0	0	0	5839	5839	2633	1021	0	3654	0	0
211	38071	0	38071	141811	79329	179%	21024	21024	103740	38070	0	0	0	0	0	28816	0	5839	34656	0	1021	0	1021	0	0
212	38071	0	38071	159776	69883	229%	21024	21024	121705	38070	0	0	0	0	0	0	0	5839	5839	3265	1021	0	4286	0	0
213	38071	0	38071	96019	60937	158%	21024	21024	57948	38070	0	0	0	0	0	0	0	5839	5839	1554	1021	0	2576	0	0
214	38071	0	38071	115966	76290	152%	21024	21024	77895	38070	0	0	0	0	0	0	0	5839	5839	2089	1021	0	3111	0	0
215	38071	0	38071	134429	66002	204%	21024	21024	96358	38070	0	0	0	0	0	0	0	5839	5839	2585	1021	0	3606	0	0
216	38071	0	38071	179030	81540	220%	21024	21024	140959	38070	0	0	0	0	0	0	0	5839	5839	3781	1021	0	4803	0	0
217	38071	0	38071	164231	83219	197%	21024	21024	126160	38070	0	0	0	0	0	0	0	5839	5839	3384	1021	0	4406	0	0
218	38071	0	38071	154210	79313	194%	21024	21024	116139	38070	0	0	0	0	0	0	0	5839	5839	3115	1021	0	4137	0	0
219	38071	0	38071	96409	60937	158%	21024	21024	58338	38070	0	0	0	0	0	0	0	5839	5839	1565	1021	0	2586	0	0
220	38071	0	38071	146804	75324	195%	21024	21024	108733	38070	0	0	0	0	0	0	0	5839	5839	2917	1021	0	3938	0	0
221	38071	0	38071	183964	81540	226%	21024	21024	145893	38070	0	0	0	0	0	0	0	5839	5839	3914	1021	0	4935	0	0
222	38071	0	38071	175761	66002	266%	21024	21024	137690	38070	0	0	0	0	0	0	0	5839	5839	3694	1021	0	4715	0	0
223	38135	0	38135	150468	89899	167%	21024	21024	112333	38135	0	0	0	0	0	0	0	5839	5839	3013	1023	0	4036	0	0
224	38135	0	38135	182597	131901	138%	21024	21024	144462	38135	0	0	0	0	0	0	0	5839	5839	3875	1023	0	4898	0	0
225	38135	0	38135	152149	92722	164%	21024	21024	114013	38135	0	0	0	0	0	0	0	5839	5839	3058	1023	0	4081	0	0
226	38135	0	38135	148537	84055	177%	21024	21024	110402	38135	0	0	0	0	0	0	0	5839	5839	2961	1023	0	3985	0	0
227	38135	0	38135	156893	92758	169%	21024	21024	118757	38135	0	0	0	0	0	0	0	5839	5839	3186	1023	0	4209	0	0
228	38135	0	38135	199525	109600	182%	21024	21024	161389	38135	0	0	0	0	0	0	0	5839	5839	4329	1023	0	5353	0	0
229	38135	0	38135	160597	93041	173%	21024	21024	122461	38135	0	0	0	0	0	0	0	5839	5839	3285	1023	0	4308	0	0
230	38135	0	38135	208073	111277	187%	21024	21024	169937	38135	0	0	0	0	0	0	0	5839	5839	4559	1023	0	5582	0	0
231	38135	0	38135	160034	92860	172%	21024	21024	121899	38135	0	0	0	0	0	0	0	5839	5839	3270	1023	0	4293	0	0
232	38135	0	38135	128085	92860	138%	21024	21024	89950	38135	0	0	0	0	0	0	0	5839	5839	2413	1023	0	3436	0	0
233	38135	0	38135	201765	144053	140%	21024	21024	163629	38135	0	0	0	0	0	0	0	5839	5839	4390	1023	0	5413	0	0
234	38135	0	38135	105004	82939	127%	21024	21024	66869	38135	0	0	0	0	0	0	0	5839	5839	1794	1023	0	2817	0	0
235	38135	0	38135	186626	90765	206%	21024	21024	148491	38135	0	0	0	0	0	0	0	5839	5839	3983	1023	0	5006	0	0
236	38135	0	38135	189122	98753	192%	21024	21024	150986	38135	0	0	0	0	0	0	0	5839	5839	4050	1023	0	5073	0	0
237	38135	0	38135	127012	68136	186%	21024	21024	88876	38135	0	0	0	0	0	0	0	5839	5839	2384	1023	0	3407	0	0
238	38135	0	38135	139052	76022	183%	21024	21024	100916	38135	0	0	0	0	0	0	0	5839	5839	2707	1023	0	3730	0	0
239	38135	0	38135	247467	94364	262%	21024	21024	209332	38135	0	0	0	0	0	0	0	5839	5839	5616	1023	0	6639	0	0

	GV	GW	GX	GY	GZ	HA	HB	HC	HD	HE	HF	HG
197	0	0	0	0	0	0	0	0	0	0	ST. JOHN'S	ST. JOHN'S
198	0	0	0	0	0	0	0	0	0	0	ST. JOHN'S	ST. JOHN'S
199	0	0	0	0	0	0	0	0	0	0	ST. JOHN'S	ST. JOHN'S
200	0	0	0	0	0	0	0	0	0	0	ST. JOHN'S	ST. JOHN'S
201	0	0	0	0	0	0	0	0	0	0	ST. JOHN'S	ST. JOHN'S
202	0	0	0	0	0	0	0	0	0	0	ST. JOHN'S	ST. JOHN'S
203	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
204	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
205	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
206	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
207	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
208	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
209	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
210	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
211	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
212	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
213	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
214	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
215	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
216	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
217	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
218	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
219	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
220	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
221	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
222	0	0	0	0	0	0	0	0	0	0	VANCOUVE	VANCOUVE
223	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
224	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
225	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
226	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
227	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
228	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
229	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
230	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
231	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
232	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
233	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
234	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
235	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
236	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
237	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
238	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG
239	0	0	0	0	0	0	0	0	0	0	WINNIPEG	WINNIPEG

NEW STAR FILE


```
WPG01,Greentree,R, ,WINNIPEG, ,MAN,1,WINNIPEG
E, 0 , 0 , 0 , 0 , 2 , 1989 , 0
0 , 1 , 0 , 0 , 41.6 , 0 , 0 , 0 , 0 , 41.6 , 1 , 0 , 0 , 0
2 , 0 , 10.014 , 60.99989 , 150421.7 , 112294.5 ,
0 , 0 , 0 , 0 , 0 , 0 ,
0 , 0 , 0 , 0 , 0 , 0 ,
0 , 0 , 0 , 0 , 0 , 0 ,
0 , 0 , 0 , 0 , 0 , 0 ,
2 , 7 , 0 , 45 ,
0 , 0 , 0 , 0 ,
21 , 20 , 0 , 21 , 0 , 0 , 0 , 0 , 0 , 0 , 3.5 , 0 ,A
0 , 0 , 0 , 0 , 102 , 91.3 , 102 , 0
525 , 0 , 0 , 0 , 0 , .1488498 , 381 , 2.2 ,0, 4 ,U, 51.04167 , 0 , 0 , 0 , 0
-90 , 0 , 0 , 1 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 3 , 0 , 0
0 , 21024 , 16 , 2 , 0 , 0 , 236 , 38135
N,0,0, 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 102 , 7.04 , 0 , 0 , 0 , 0
25.3 , 1.76 , 0 , 67.3 , 1.76 , 0
37.6 , 0 , 0 , 64.4 , 0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
87.8 , 3.52 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
3.7 , 1.23 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
0 , 0 , 0
18 , 1.76 , 0
0 , 0 , 0 , 0
0 , 0 , 0 , 0
```

```
0 , 0 , 0 , 0
0 , 0 , 0 , 0
0 , 0 , 0 , 0
0 , 0 , 0 , 0
0 , 0 , 0 , 0
0 , 0 , 0 , 0
0 , 0 , 0 , 0
2 , .54 , 0 , 0 ,N, .75 , 0 , 0 , 0 , 0
1 , .56 , 0 , 0 ,S, .72 , 1.07 , .2 , .31 , 0
4.3 , .56 , 0 , 0 ,E, .72 , 0 , 0 , 0 , 0
3.2 , .53 , 0 , 0 ,W, .75 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
0 , 0 , 0 , 0 ,0, 0 , 0 , 0 , 0 , 0
```

Appendix 4
Interim Report #4

Thermal Engineering

15 Hanover Court, Halifax, Nova Scotia, Canada, B3M 3K7

INTERIM REPORT NO. 4

ENERGY EFFICIENCY TECHNOLOGY IMPACT - APPLIANCES

SUBMITTED TO:

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Housing Technology Group
Research Division
Canada Mortgage and Housing Corporation
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K1A 0P7

January 1994

1. INTRODUCTION

When this project was conceived, CMHC expected that new data on appliance energy consumption, saturation and usage for single-family residences were going to be available from new surveys to be conducted by Hydro Quebec, and EMR in cooperation with CMHC. This was indicated in the Request for Proposals for the project [8]. As a result, in the proposal submitted to CMHC by Thermal Engineering to carry out the work, a large portion of the proposed methodology relied on the anticipated new data. However, several months after the project was started, it was found out that these data were not to be available. As a result, it is now necessary to modify the methodology that was proposed by Thermal Engineering and accepted by CMHC so that the project can succesfully be completed.

This report was prepared to propose a modified methodology to deal with the unavailability of survey data on appliance energy consumption, saturation and usage for single-family residences. Thus, this report contains the following:

- a review the work done on the project,
- a review of the data available in the literature on appliance usage (end-use load shape data),
- proposed changes to the methodology to be used.

2. REVIEW OF WORK DONE ON THE PROJECT

The review of the work done on the project is presented below with reference to the Task Numbers and Descriptions given in Section 5 of the Project Proposal.

Task No.	Task Description:
3.1	**Development of a Consistent Classification of Appliances**
3.1.1	Literature search and review
3.1.2	Classify and select appliances to be included in the project
3.1.3	Prepare interim report, and submit to CMHC
3.1.4	Receive comments from CMHC on submission
3.1.5	Incorporate modifications and prepare final list.

Current Status: This task was completed in May 1993. The results were presented in Section 1 of our Interim Report No.1.

Task No.	Task Description:
3.2	**Suggestions for Development of Data Collection Protocol**
3.2.1	Receive detailed information on the nature of ongoing and planned data collection programs, and receive existing data collection protocols,
3.2.2	Review literature on appliances, appliance usage, and future trends,
3.2.3	Contact appliance manufacturers, CMHC and EMR to determine future trends
3.2.4	Develop suggestions for data collection requirements on appliances and appliance usage,
3.2.5	Develop suggestions for data collection requirements on house measurements,
3.2.6	Prepare and submit interim report on suggestions for data collection
3.2.7	Receive comments from CMHC on submission,
3.2.8	Incorporate modifications and prepare final protocols.

Current Status - Task 3.2: This task was completed in August, 1993. A data collection questionnaire/protocol was presented in Section 2 of our Interim Report No.1. Upon the request of the CMHC Project Manager, this protocol was later shortened by removing some questions and certain appliances from the questionnaire. The modified questionnaire was submitted to CMHC with our August 20, 1993 letter.

3.3 Expansion of the CMHC STAR-HOUSING Data Base

3.3.1 Receive Hot2000 and Foxbase data files on computer diskettes from houses in the new data collection programs

Current Status - Task 3.3.1: No new data has been received from CMHC. We were informed that no monitoring of appliances was to be possible (note received from CMHC Project Manager dated July 27, 1993). We were later informed that the questionnaires (see above) were not be administered (letter received from CMHC Project Manager dated October 15, 1993).

3.3.2 Develop conversion procedures for Hot2000 and Foxbase data files into CMHC STAR-HOUSING Data Base files

3.3.3 Prepare and submit interim report on suggestions for data conversion

3.3.4 Receive comments from CMHC on submission,

3.3.5 Write necessary programs and convert Hot2000 data into CMHC STAR-HOUSING Data Base format

Current Status - Tasks 3.3.2 - 3.3.5: Instead of data from new surveys, we received Hot2000 data for 239 houses in EXCEL spread sheet format from Ken Cooper of SAR Engineering Ltd. of Burnaby, B.C. We developed a procedure to convert the Hot2000 data files into STAR files. This proposed procedure and the computer program (in Basic) written for the conversion were submitted to CMHC in our Interim Report No.3. Upon approval of the procedure, the 239 Hot2000 data files were converted into STAR files.

3.3.6 Write necessary programs and convert auxiliary information on Foxbase into a format suitable for energy analysis

Current Status: No new data files were received as stated above.

3.4 Analysis of Energy Efficiency Technology Impacts of Appliances

3.4.1 Conduct statistical analysis on appliance data from new data collection programs to generate typical values that can be used with existing CMHC STAR-HOUSING Data Files

Current Status - Task 3.4.1: Since no data will be available on appliance usage, saturation or energy consumption from new surveys as stated above, we compiled published data from the literature, and developed the necessary data to be used in the analysis (see Sections 3 and 4 of this report).

3.4.2 Prepare procedures for converting CMHC STAR-HOUSING Data Files into ENERPASS input files

Current Status - Task 3.4.2: Procedures for converting STAR files into ENERPASS files were done and presented to CMHC in May 1993 in our Interim Report No.2.

3.4.3 Prepare requirements for ENERPASS output file format modifications

Current Status - Task 3.4.3: Requirements for ENERPASS output file format modifications were prepared and submitted to CMHC in our August 27, 1993 letter.

3.4.4 Prepare and submit interim report on data conversion procedures and file format modifications

Current Status - Task 3.4.4: Report and letter submitted to CMHC as stated above.

3.4.5 Receive comments from CMHC on submission

3.4.6 Write necessary programs and convert CMHC STAR-HOUSING Data Files into ENERPASS input files

3.4.7 Send requirements for ENERPASS output file format modifications to Enermodal Engineering

3.4.8 Receive modified ENERPASS program from Enermodal Engineering

Current Status - Tasks 3.4.5 - 3.4.8: Comments were received and incorporated into requirements. The modified requirements were sent to Enermodal Engineering along with requirements for incorporating 'batch' processing capability into ENERPASS. Modified ENERPASS program was received from Enermodal Engineering, and it was tested.

3.4.9 Conduct simulation/parametric studies as described in Section 3.4.3

Current Status - Task 3.4.9: This task will be completed once the modified methodology presented in Sections 4 and 6 of this report is approved by CMHC.

3.5 Finalization of project

3.5.1 Prepare and submit draft of final report, data files and data file descriptions (for ENERPASS input and CMHC STAR-HOUSING - as described in deliverables)

3.5.2 Receive comments from CMHC on submission

3.5.3 Incorporate comments and submit final report

Current Status - Task 3.5: To be completed.

Other Work Done:

1. A number of mistakes were found in the STAR files and Hot2000 Excel files. These were documented and presented to CMHC in our May 24, 1993 letter to CMHC and Interim Report No.3. All of the files with mistakes were identified, and they were correceted as described in the Interim Report No.3.

2. The houses in the STAR and Hot2000 data bases are located in different cities in Canada. Since it is not possible to obtain ENERPASS weather files for all of these cities, it was necessary to identify for each house file the appropriate ENERPASS weather file available. This was done, and a list showing the matching of house and weather files is presented in Appendix A of this report.

3. 275 of the STAR files were found to have missing floor RSI values for shallow basement and below-grade slab, although these values were in the original HEAT files from which the STAR files were generated. Therefore, the correct values were extracted from HEAT files and inputted into the STAR files manually for these 275 files. The list of the house file names that were corrected is given in Appendix B.1 (saved under file name NORSIB.XLS).

4. A simple statistical analysis of the data in STAR data base was carried out to identify the maximum, minimum and average values of some of the variables. This information was needed to modify files with missing data. The results are given in Appendix B.2.

5. In the process of program development and test running of the STAR-to-ENERPASS file conversion program, some STAR data files (both original STAR files and converted STAR files from Hot2000 files) were found to have missing variables. These variables included floor RSI values for full and shallow basement and crawlspace (FP2!, SP2!, and CRP2!), RSI values for full basement lower wall (FLG2!), RSI values for full basement upper wall (FBG2!), RSI values for basement exposed wall (G1!(I,2)), RSI values for below-grade-slab center and perimeter floors (SLC2! and SLP2!), and RSI values for crawlspace wall (CRW2!). These missing variables were assigned the calculated average values that were evaluated earlier from a statistical analysis based on the original STAR data files (see Item 4 above). A list of

these file names and their missing variables is given in Appendix B.3 (saved under file name ERROR.XLS).

6. Three STAR data files (H3239.chp, G3367.chp and S6092.chp) were found to have very low RSI values in certain fields which made the ENERPASS Batch program to become very unstable and eventually quit. To avoid this problem, these RSI values were replaced with the calculated average values. The changed variables were:
   House file: H3239.chp:
      Wall RSI (W1(I,2)), from 1.11 to 2.01
      Ceiling RSI (CL2), from 0.78 to 3.58
      Basement exposed wall RSI (G1(I,2)), from 0.39 to 1.05
   House file: G3367.chp:
      Basement exposed wall RSI (G1(I,2)), from 0.4 to 1.05
   House file: S6092.chp:
      Ceiling RSI (CL2), from 0.02 to 3.58

7. Revisions to the ENERPASS Conversion Procedure: Some minor revisions were made to the procedure that was submitted in our Interim Report No. 2. These are presented in Appendix B.4.

Thus, the present status of the project can be summarized as follows:

1. All of the STAR (698 in total) and Hot2000 (239 in total) files are reviewed and mistakes are identified. The mistakes in STAR files are corrected and new files are saved on disk. These will be made available to CMHC.
2. All of the Hot2000 files are converted to STAR files. After the conversion was done, the mistakes were corrected. These corrected STAR files will be made available to CMHC.
3. All of the STAR and Hot2000 files are converted to ENERPASS files. These files will be made available to CMHC (as mentined before, first Hot2000 files were converted to STAR files, then these were converted to ENERPASS files).
4. ENERPASS house files are matched with weather files, and the list is attached to this report.
5. Modifications to ENERPASS are completed (by Enermodal Engineering under sub-contract from Thermal Engineering) according to specifications prepared by Thermal Engineering and approved by CMHC. The new version of ENERPASS for 'batch' runs is tested with all ENERPASS data files created, and is ready for use. This version of the program can be made available to CMHC provided that Enermodal Engineering and CMHC are in agreement on this issue.

3. REVIEW OF THE DATA AVAILABLE IN THE LITERATURE ON APPLIANCE USAGE (END-USE LOAD SHAPE DATA)

Since data on appliance usage, saturation, and energy consumption will not be available from new surveys, a literature search and review was conducted to develop the necessary data to conduct the analysis described in the Project Contract. The results of the literature review on saturation and energy consumption were presented to CMHC in our Interim Report No.1. Below is a summary of the literature review on appliance usage patterns.

3.1 Appliance Usage Patterns (End-Use Load Shape Data)

To model the energy consumption of appliances, data on typical usage patterns, i.e. end-use load shape data, are needed. However, these data are scarce since it is expensive to obtain them. A data collection project involving a detailed all end-use protocol costs between $4,000-$9,000 per house

[5]. As a result, there are few projects conducted to obtain metered data on appliance usage from houses. These studies studies are summarized in Table 1[1] [5]. However, data from most of these projects are not widely available due to confidentiality and propriety of the data although efforts are underway towards increased institutional data sharing. The most important reports published on load shape data are from Lawrence Berkeley Laboratory [1], Bonneville Power Authority [6], and EPRI [3]. A review of the relevant findings of these studies and others that were obtained by Thermal Engineering are given below:

3.1.1. Residential End-Use Load Shape Data Analysis, (LBL, 1989, [1]):
The objective of this work conducted at Lawrence Berkeley Laboratory (LBL) was to develop new load shapes for the California Energy Commission (CEC) residential peak model which is used to forecast electrical load growth. The load shapes previously used by CEC were derived from 15-20 year old monitored data, and engineering estimates and staff judgement which were largely never been validated with measured data. The new load shapes developed in this work were also used to modify the peak load model into an hourly load forecasting model.

The data used in developing the load shapes are from load metering projects conducted by three utility companies: Pacific Gas & Electric (PG&E), Sothern California Edison (SCE) and San Diego Gas & Electric (SDG&E). The PG&E data span 1985-86, SCE data span 1986, and SDG&E data span 1982-85. The annual Unit Energy Consumption (UEC) data along with the seasonal adjustment factors for the different appliances monitored are given in Table 2. These are from PG&E and SCE data only since the SDG&E data were not sufficient to generate seasonal adjustment factors. Only an average water heater load shape was generated from the SDG&E data. Included in Table 2 are the values used by CEC prior to the study. The daily load curves for the appliances are given in Figures 1-7. The data used to plot the load curves are given in Appendix D. As can be seen from Table 2, major end uses such as lighting, TV, and other miscellenous were not included in the study since data were not available.

3.1.2. Description of Electric Energy Use in Single-Family Residences in Pacific Northwest, (DOE/BPA, 1989, [6])

Bonneville Power Authority (BPA) has produced a compilation of end-use load shape data from its End-Use Load and Consumer Assessment Program (ELCAP) as part of their on-going program to provide information for demand-side planning, program development, and delivery, and load forcasting efforts. The residential portion of ELCAP included metering of the amount of electricity consumed for various end uses in 499 residences, 288 of which is from single-family detached, electrically heated houses. These constitute the 'Base Study Sample'. Metered data collected from September 1984 through May 1988 are analyzed and presented. End uses and their descriptions used in ELCAP are given in Table 3. In this table, the term 'pure' refers to metering of an appliance without contamination by any other small loads or outlets. 'Mixed refrigerator' is used when the same circuit powers the refrigerator and other appliances. The 'Lights/Convenience' end use includes such appliances as lights, microwave ovens, miscellaneous kitchen equipment, small appliances, some air-conditioning units, portable heaters, most bathroom heaters, ventilation fans, and in some cases, clothes washers and freezers. The mean annual load shapes from ELCAP data for the metered end-uses are given in Figures 8-10. The seasonal variations in the loads are given in Figures 11 and 12. The annual weekday/weekend load profiles for the end-uses are given in Figures 13-22.

[1] Due to their large number, all tables and figures are given in Appendix C.

3.1.3. DSM Customer Response, Volume 1: Residential and Commercial Reference Load Shapes and DSM Impacts", (EPRI, 1988 [3])

A reference data base of end use load shapes for different climate zones and technology alternatives, as well as a number of models and methods to adjust load shapes were developed. These are available as a PC software/data base library called RELOAD from EPRI. Included in the load shape data base are load shapes for water heaters, dishwashers, dryers, ranges and refirgerators. However, no typical or average load shapes for these appliances were published from the data base. Thus, for the purposes of this project, there is no usable data from the report. Obtaining the software and conducting a detailed analysis of the data base is clearly beyond the scope of this project.

3.1.4. Residential End-Use Load-Shape Estimation, Volume 1: Methodology and Results of Statistical Disaggregation from Whole-House Metered Loads, (EPRI, 1986, [4])

A methodology for estimating end-use load shapes using hourly whole-house metered load data, household demographic survey data, and weather data is presented. Weather independent loads (refrigerator, freezer, washer, dryer, dishwasher) are modeled with Fourier-like terms (sine and cosine functions) and dummy variables, whereas weather dependent loads (air-conditioner, space heating, water heating, etc.) are represented by a thermodynamics based model. Similar to the previous study, no usable typical load shapes are presented in the report. However, samples of load curves presented in the report are similar to those given in Ref. 1 (see Figures 23-26).

3.1.5 Final Report: Development of OH-RES, the Ontario Hydro Residential DSM Analysis Tool, (Ontario Hydro, 1992 [7])

ewave Engineering developed a DSM analysis tool called OH-RES built around DOE2 for Ontario Hydro. The load curves used in this model were assembled from a variety of sources including the report by Ruderman, et al. [1] reviewed above. The load curves used in OH-RES are given in Figures 27 and 28.

3.2 Comparison of Appliance Load Curves

3.2.1 Refrigerators

A comparison of the three refrigerator load curves given in the LBL report [1] (see Figure 1) indicate that they are very close to each other although there is a three-to-one difference in the number of refrigerators monitored in the two studies. Similarly, the refrigerator and mixed refrigerator load curves given in the BPA report [6] (see Figure 8) exhibit the same shape and magnitudes. All of these load curves agree favorably with the data on the 'frequency of refrigerator door openings' published in Home Energy as shown in Figure 29 [2]. Thus, the PG&E curve will be used in the annual simulations that will be done in this work.

3.2.2 Freezers

The freezer load curve developed from the SCE data in the LBL report [1] exhibits a large diurnal fluctuation compared to that used by CEC as shown in Figure 2, and also compared to the BPA data [6] as shown in Figure 8. The EPRI load curves [4] given in Figure 23 appear to be in agreement with the SCE data as well. Considering the usage of freezers, the occurance of the peak four hours earlier compared to that of the refrigerator reflects the removal of frozen foods from the freezer for thawing. Thus, it is probably more appropriate to use the SCE curve in the annual simulations that will be done in this work.

3.2.3 Cooking
The three load curves in the LBL report [1] for cooking (which include stove-range top, stove-range/oven, stove-oven, and stove-range/oven/microwave) are quite similar as shown in Figure 3, with the curve from PG&E data peaking slightly higher and later than the other two. The BPA [6] load curve for the range (see Figure 10), which reflects the cooking load, is also very similar to the PG&E curve. Thus, the PG&E curve will be used in the annual simulations that will be done in this work.

3.2.4 Dishwasher
The dishwasher curve from the SCE data [1] is significantly different than the CEC curve as shown in Figure 4. The SCE curves are quite fluctuating with large variations from one season to another. The 'jaggedness' of the SCE curves is probably a result of the small number of samples in the SCE data. Thus, the confidence level for the SCE curve is not very high. On the other hand, the BPA [6] load curve for the dishwasher (see Figure 10) exhibits a pattern somewhat similar to the winter pattern of the CEC curve, with a small peak in the morning and a larger one in the evening. The EPRI [4] curve given in Figure 25 for weekdays has two peaks as well, but the morning peak is larger than the evening peak. Since there is not a general agreement amongst the curves from the four sources, it is probably more appropriate to use the BPA curve in the annual simulations that will be done in this work since it is based on a relatively large sample size of 70.

3.2.5 Clothes Washer
The clothes washer curves from the SCE data [1] and the BPA [6] data are very similar to each other, while they are significantly different from the CEC curve as shown in Figures 5 and 9. Thus, the SCE curve can be used in the annual simulations that will be done in this work.

3.2.6 Clothes Dryer
The clothes dryer curves from the SCE, PG&E [1] and the BPA [6] data are very similar to each other, while they are significantly different from the CEC curve as shown in Figures 6 and 9. The peak usage for the dryer is about an hour after the peak for the washer in the SCE, PG&E and BPA data, compared to the much sharper peak at 09:00 for both the washer and dryer curves used by CEC. Thus, the SCE, PG&E and BPA curves are more realistic, and the PG&E curve can be used in the annual simulations that will be done in this work.

3.2.7 Hot Water Heating
The domestic hot water heating curves from PG&E, SDG&E [1] and BPA [6] data are in general agreement with each other and the CEC curves with clearly defined morning and evening peaks as shown in Figures 7 and 9. The difference among the three curves is that the PG&E curve has a more pronounced morning peak compared to the other curves. This is in agreement with the weekday curve of EPRI [4] given in Figure 26. Considering general similarity of all curves, and the larger sample size of the BPA data, the BPA curve can be used in the annual simulations that will be done in this work.

3.2.8 Lighting
The load shape for lighting is not included in any one of the reports reviewed. The lighting load shape used in the OH-RES model is given in Figure 28, which has two equal size peaks for the morning and the evening. This load curve appears to be reasonable for winter, but not for the whole year. A more realistic average annual curve would have a lower morning peak compared to the evening peak. In the BPA [6] study, the category for 'lights and convenience' includes lights, as well as microwave ovens and miscellenous kitchen equipment, small appliances, some window air-conditioning units, portable heaters, most bathroom heaters, clothes washers, ventilation fans and freezers. Thus, it is quite an 'ambiguous' collection of end-uses for which the load curve is given in Figure 10. In the absence of a load curve for lighting based on actual data, a curve similar

to the one used in the OH-RES model can be used in the annual simulations that will be done in this work.

3.2.9 Seasonal Variations in Load Curves
The seasonal variations in the load curves for the various appliances in the LBL report are shown in Figures 1-7 [1] (the values are given in the tables in Appendix D). The variations in the BPA data are given in Figures 11 and 12.

The seasonal variations are different for each type of appliance. For example, the ratio of the largest monthly load to mean annual load for the refrigerator is 1.12, while the ratio for the freezer is 1.2 in the BPA data. For both, the maximum occurs in August. The variation of the LBL curves is similar. For other appliances, the seasonal variations are of similar magnitude, however the peak is generally in winter.

3.2.10 Weekday-Weekend Variations in Load Curves
The weekday-weekend variations are given in the BPA [6] data (see Figures 13-22), as well as in the sample curves from EPRI [4] (see Figures 23-26).With the exception of the dishwasher, clothes washer and dryer, and hot water, the weekday-weekend variations are less than 10%. For the dishwasher, clothes washer and dryer, and hot water, the variation is significant.

4. PROPOSED CHANGES TO THE METHODOLOGY

The proposed changes to the methodology are to achieve the objective of the project using the available data in the literature on appliance usage, saturation and energy consumption. The proposed methodology is described below:

4.1 Distribution Of Appliances Among The Houses In The Data Base
The appliances given in Table 16/2 of Interim Report No.1 that have a Classification Letter of A, B, C, or D will be included in the analysis. The distribution of the appliances among the houses in the data base will be done randomly based on the saturation level. The average saturation level for each appliance was given in Tables 15 and 16/2. For those appliances for which Statistics Canada saturation data exist, the Statistics Canada data will be used[2]; for other appliances, the average value in Table 15 will be used. For DHW heaters, the value in STAR data base will be used. The following procedure will be used to distribute the appliances among the houses in the data base:

The average or, if it exists, Statistics Canada saturation level of each appliance will be obtained from Table 15 of Interim Report No.1. Then, this percentage of houses in the data base will randomly be selected and assigned that appliance. This procedure will be applied to assign every appliance. Thus, at the end of this procedure, each house in the data base will have been assigned a random set of appliances, and the occurance of the appliances in the data base will be the same as its saturation. For example, the 'clothes dryer' (Appl. No. 17) saturation from Statistics Canada is 74%. Thus, 74% of the houses in the data base will randomly be selected, and these will be assigned an electric clothes dryer. Then, the next appliance, i.e. 'freezer' (Appl. No. 7) will be checked. The Statistic Canada saturation for freezer is 57.9%. Thus, 57.9% of the houses in the data base will randomly be selected, and these will be assigned a freezer. This procedure will be repeated for each appliance in the list.

4.2 Proposed Appliance Load Curves
It is proposed to use one load curve for each appliance for the whole year. Since the load curves reviewed in Sections 3.1 and 3.2 were not developed from Canadian data, and since the

[2] The Statistics Canada data were given in Column H of Table 15 in Interim Report No.1

differences between seasons, and weekdays/weekends are not substantial, the margin of error that will be introduced is not expected to be more than that is already there. Therefore, the following appliance load curves obtained from the literature or proposed by Thermal Engineering are proposed to be used in the annual simulations:

1. Refrigerators: PG&E summer curve (Figure 1)
2. Freezeers: SCE summer curve (Figure 2)
3. Cooking appliances (which include stove-range top, stove-range/oven, stove-oven, and stove-range/oven/microwave): PG&E summer curve (Figure 3)
4. Dishwasher: BPA mean annual curve (Figure 10)
5. Clothes washer: SCE spring curve (Figure 5)
6. Clothes dryer: PG&E spring curve (Figure 6)
7. Hot water heating: BPA mean annual curve (Figure 9)
8. Lighting: Assume that maximum amount of lights in a house are on from 19:00 - 22:00, and the load curve is as follows (similar to OH-RES curve, Figure 28):

Hour	1-4	6	7	8	9	10	11-16	17	18	19-22	23	24
% of max. lights	10	21	40	60	40	21	5	20	70	100	40	21
% of tot. energy	1.23	2.63	4.94	7.41	4.94	2.63	0.62	2.63	8.64	12.34	4.94	2.63

For the other appliances, for which there are no available load curves derived from field data, the following curves will be used:

1. TV: Assume 7 hours of total viewing, regardless of number of TVs in the house, and the load curve is as follows:

Hour	1	2-6	7-8	9-12	13-16	17-18	19-22	23	24
% of each hour	10	5	25	10	20	50	80	50	25
% of tot. energy	1.42	0.71	3.57	1.42	2.84	7.14	11.43	7.14	3.57

2. Air-conditioners: these are not included as appliances, since they will be simulated by ENERPASS.

3. All other appliances in the list (categories A-D in Table 16/2 in Interim Report No.1): Since it is not practical to assign an assumed load curve for each one of these appliances, a common load curve will be used for all of them. The proposed step function load curve is as follows:

Hour	1-8	9-20	21-24
% of each hour	20	100	20
% of tot. energy	1.39	6.94	1.39

4.3 Proposed Values of Appliance Energy Consumption

Appliance energy consumption data from the literature were reviewed in Interim Report No.1 (Tables 14 and 14/2). Since the preparation of Interim Report No.1, some additional reports have been obtained, and the appliance energy consumption data from these reports are included in Table 4.

Considering the various styles and models of each type of appliance in the Canadian housing stock, it appears that using the average values of the reported data is a reasonable approach. Therefore, it is proposed that the average energy consumption values from Table 4 be used in the simulations.

4.4 Appliance Power

To model the appliances in ENERPASS, the maximum houry load is needed. The maximum hourly load for each appliance will be calculated from its load curve and annual energy consumption.

For lights, it will be assumed that the maximum load is 400 W. The annual energy consumption calculated using this load and the load curve given in Section 4.2 is 1,172 kWh which is very close to the values given in References 9 and 10 (see Table 4).

4.5 Assumptions

In ENERPASS, appliance energy consumption can be entered as two separate inputs:
1. Process loads (latent and sensible)
2. Receptacle load (sensible only)

The following assumptions will be used in the simulations conducted:
- The clothes washer, dryer, freezer and hot water heater are located in the basement zone. All other appliances are in the upper floor zones. Some houses in the data base do not have basements; in that case, all appliances will be placed in the main floor.
- 20% of the lights are in the basement zone.
- Since the dryer is normally exhausted to outdoors, it will be assumed that only 2% of the energy consumption will actually become a heat gain to the basement (heat loss from the dryer envelope).
- The hot water tank heat loss is constant at 70 W, all of which is a heat gain to the basement.
- 0.5% of the energy used for domestic hot water heating is a latent heat gain to the house through moisture leakage from the dishwasher, clothes washer, and showers/baths, etc. 10% of this is to the basement and the rest to the upper floors.
- 35% of the energy used for cooking is latent heat gain.
- All appliances with latent heat gain are simulated as "process load", whereas all others are simulated as receptacle load.
- clothes dryer exhaust will be simulated in ENERPASS as an exhaust fan with a capacity of 40 CFM.

4.6 Construction of Composite Load Curves

Since more than one appliance will be included into the "process' and "receptacle" load inputs, it is necessary to generate Composite Load Curves for these two inputs. The method to construct a composite load curve can be explained by giving an example showing the construction of a composite curve for two appliances:

Example: Appliance A has a maximum load of 100 W, and Appliance B has a maximum load of 200 W. The load curves are as follows

Appliance A			
Hour	1-8	9-20	21-24
% of max. load	25	100	50
Appliance B			
Hour	1-4	5-18	19-24
% of max. load	100	50	25

Step 1: Calculate total load of appliances A and B for each discrete period:
Total load for period 1-4 = (0.25 x 100) + (1 x 200) = 225 W
Total load for period 4-8 = (0.25 x 100) + (0.5 x 200) = 125 W
Total load for period 8-18 = (1 x 100) + (0.5 x 200) = 200 W
Total load for period 18-20 = (1 x 100) + (0.25 x 200) = 150 W

Total load for period 20-24 = (0.5 x 100) + (0.25 x 200) = 100 W

Step 2: Identify maximum load, and calculate relative percentages of other loads for each discrete period:
Maximum load = 225 W
% load for period 1-4: (225/225) x 100 = 100%
% load for period 4-8: (125/225) x 100 = 55.56%
% load for period 8-18: (200/225) x 100 = 88.89%
% load for period 18-20: (150/225) x 100 = 66.67%
% load for period 20-24: (100/225) x 100 = 39.51%

Thus, the load curve for the composite appliance (A+B) which has a maximum load of 225W is as follows:

Composite Appliance (A+B)					
Hour	1-4	5-8	9-18	19-20	21-24
% of max. load	100	55.6	88.9	66.7	39.5

This is shown graphically in Figure 30.

4.7 Air-Conditioners

No houses in the STAR data base and in the Hot2000 files have air-conditioning. Therefore, air-conditioners (room and central) will be assigned randomly (as described in Section 4.1) to the houses according to the Statistics Canada data (see Table 15). Since it is not possible to simulate room air-conditioners in ENERPASS without increasing the number of zones used in the simulation, all houses assigned air-conditioning will be simulated with central air-conditioning for the main floor zone. Those houses without a basement will be assumed to have central air-conditioning in the whole house (i.e. the main floor).

To simulate the performance of air-conditioners in ENERPASS, the following performance data are necessary:
- For a range entering wet bulb temperatures: total cooling, sensible cooling, and compressor power,
- Design ambient temperature,
- Condenser fan power (outdoor unit fan)

The following performance characteristics, which are the default values in ENERPASS, will be assumed to apply to all existing air-conditioners as baseline:

```
Cooling Performance [kW] vs. Indoor Wet Bulb Temp. (fixed outdoor)
Entering WBT......:   15.00    17.20    19.40    21.70    24.00
Total Cooling.....:   10.40    10.40    11.00    11.80    11.80
Sens Cooling......:    8.63     8.63     7.04     5.55     5.55
Compress Power(kW):    2.96     2.96     3.03     3.10     3.10

Design Ambient Temperature (C)..................:         24.00
Condenser Fan Power (kW)........................:          0.24
```

5. POTENTIAL FOR ENERGY EFFICIENCY IMPROVEMENT OF APPLIANCES

The objective of this project is to study the overall effect of appliance efficiency on the energy consumption in the residential sector. Therefore, simulation runs will be conducted for different levels of energy efficiency of appliances. There are a number of reports in the literature on appliance energy efficiency, and the potential for improving energy efficiency of appliances [9-17]. The most useful and recent of these are by Nadel, et al. (1993) [17], and Koomey, et al. (1991) [9].

From these references, the potential for energy efficiency improvements for various appliances can be summarized as follows:

A. Refrigerators:
1. 1990 standard for top mount automatic defrost refirgerator: <u>893 kWh/yr</u>, [9, pg. 185][3]
2. Refrigerator energy consumption at the level of that required by the National Appliance Energy Conservation Act (NAECA) of U.S. for 1993: <u>704 kWh/yr</u>, [17, pg. 17]
3. Golden Carrot Refrigerator: Super Efficient Refrigerator Program (SERP), Inc. Request for Proposals induces manufacturers to produce a refrigerator using 40% less than NAECA requirements: <u>422 kWh/yr</u>, [17, pg. 17]
4. 200-300 kWh Refrigerator: Additional improvements beyond Golden Carrot Refrigerator including new cycles and insulation: <u>250 kWh/yr</u>, [17, pg. 19]

B. Freezer::
1. 1990 standard for average of upright and chest, manual defrost freezer: <u>568 kWh/yr</u>, [9, pg. 132]
2. Freezer energy consumption at the level of that required by the National Appliance Energy Conservation Act (NAECA) of U.S. for 1993: <u>526 kWh/yr</u>, [17, pg. 21]
3. Improved freezer to 1993 DOE standard: <u>468 kWh/yr</u>, [9, pg. 133]
4. Advanced freezer with improved compressor and insulation: <u>284 kWh/yr</u>, [17, pg. 21]

C. Cooking:
No energy saving features (except induction cooktop [9, pg. 105]) for cooking appliances are cited in the references revived. Therefore, the following will be considered for cooking appliances:
1. Reduce energy consumption by 15% as a result of more efficient (better insulated) ovens, induction cooktops, and more frequent use of microwave compared to resistance heat for cooking.

D. Dishwasher:
1. Improve dishwasher motor to 1994 standard: <u>232 kWh/yr</u>, (Unit Energy Savings (UES) of 23.4 kWh/yr [9, pg. 137] deducted from base energy consumption of 256 kWh given in Table 4)[4]

E. Clothes wahers:
1. Horizontal axis clothes washer with high efficiency motor, <u>26 kWh/yr</u>, (UES of 64.6 kWh/yr [9, pg. 137] deducted from base energy consumption of 92 kWh given in Table 4)

F. Clothes Dryer:
1. Clothes dryer energy consumption at the level of that required by the National Appliance Energy Conservation Act (NAECA) of U.S. for 1993: <u>834 kWh/yr</u>, [17, pg. 35]

---

[3] Please see original reference cited for description of the various types of improved appliances.

[4] Data from Ref. 17 is not used because it applies to DHW savings only.

2. Microwave clothes dryer using microwave rather than electric resistance heat: 617 kWh/yr, [17, pg.35]
3. High speed spin clothes washer/electric dryer (high spin speed removes more water, leaving less water to be removed by dryer): 521 kWh/yr, [17, pg. 27]
4. Heat pump clothes dryer using heat pump rather than electric resistance heat: 292 kWh/yr, [17, pg. 37]

G. Hot Water Heating

1. Automatic clothes washer controls which sense type of fabric, dirtiness and other factors and adjusts wash parameters accordingly: 4094 kWh/yr, (UES of 135 kWh/yr [17, pg. 31] deducted from base energy consumption of 4229 kWh given in Table 4)[5]
2. Bubble action washing machine with scrubbing bubbles and advanced computer design which reduces water use by 30%: 4047 kWh/yr, (UES of 185 kWh/yr [17, pg. 33] deducted from base energy consumption of 4229 kWh given in Table 4)
3. Horizontal axis clothes washer which uses less than 50% hot water compared to a standard vertical axis washer (washtubparially filled): 3817 kWh/yr, (UES of 412 kWh/yr [17, pg. 24] deducted from base energy consumption of 4229 kWh given in Table 4)
4. Low energy and water use dishwasher: 4098 kWh/yr, (UES of 131 kWh/yr [17, pg. 39] deducted from base energy consumption of 4229 kWh given in Table 4)
5. Low temperature dishwashing detergent: 3696 kWh/yr, (UES of 533 kWh/yr [17, pg. 43] deducted from base energy consumption of 4229 kWh given in Table 4)
6. Reduce hot water consumption by installing faucet aerators and low-flow showerheads: 3356 kWh/yr, (UES of 873 kWh/yr [9, pg. 127] deducted from base energy consumption of 4229 kWh given in Table 4)
7. Reduce standby losses by using highly insulated tanks, pipes and heat traps: 3804 kWh/yr, (UES of 425 kWh/yr [9, pg. 128] deducted from base energy consumption of 4229 kWh given in Table 4)
8. Switch to heat pump water heater: 3153 kWh/yr, (UES of 1076 kWh/yr [9, pg. 129] deducted from base energy consumption of 4229 kWh given in Table 4)

H. TV Sets:

1. 1990 standard for average color TV: 164 kWh/yr, (141 kWh/yr for 6 hours/day of viewing [17, pg. 47] is prorated to 7 hourrs/day of viewing)
2. Low powered color TV: 135 kWh/yr, (116 kWh/yr for 6 hours/day of viewing [17, pg. 47] is prorated to 7 hourrs/day of viewing)

I. Lights:

1. Convert from general service (75 W) incandescent lamps to general service halogen lamp with IR coating (55W) for higher efficiency [17, pg. 49]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 75 W] (75 - 55) W = 53 W
2. Convert from general service (75 W) incandescent lamps to Hafnium Carbide single crystal filament lamps (38 W) for higher efficiency [17, pg. 53]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 75 W] (75 - 38) W = 99 W
3. Convert from general service (75 W) incandescent lamps to general service coated filament incandescent (24W) for higher efficiency [17, pg. 51]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 75 W] (75 - 24) W = 136 W

[5] The UES values in Ref. 17 are in reference to 1994 NAECA level, therefore they are probably conservative in our case. However, since we do not have a separate DHW usage base for each end use, we have no way of modifying the UES values. (This comment applies to all eight DHW saving measures presented here.)

4. Convert from general service (90 W) incandescent lamps to compact fluorescent floor and table lamps (25W) for higher efficiency [17, pg. 57]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 75 W] (90 - 25) W = 173 W
5. Convert from general service (90 W) incandescent lamps to screw-in fluorescent (23 W) for higher efficiency [17, pg. 55]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 90 W] (90 - 23) W = 179 W

J. Air-Conditioners:
1. Improve central air-conditioner efficiency from a SEER of 9.96 to 10.5 [9, pg. 168][6]. This represents an average improvement of 5% in energy consumption.
2. Improve central air-conditioner efficiency from a SEER of 10.5 to 13.3 [9, pg. 168]. This represents an additional average improvement of 21% in energy consumption.
3. Improve central air-conditioner efficiency from a SEER of 13.3 to 14.87 [9, pg. 169]. This represents an additional average improvement of 10% in energy consumption.

6. SIMULATIONS TO BE CONDUCTED

The effects of energy efficiency improvements on residential consumption will be studied by running annual simulations of all of the 937 houses in the ENERPASS input file data base that was generated from the STAR and Hot2000 data bases (see Section 2). It is proposed that four sets of simulations will be carried out:

Set 1: To reflect the existing energy efficiency standards
These simulations will be carried out using the base line energy consumption data. (Data on the heating system efficiency of the houses are included in the database. Therefore, these existing efficiencies will be used as the baseline heating system efficiency in the simulations.)

Set 2. Energy efficiency improvement - level 1:
These simulations will be carried out using the following efficiency improvements:
A. Refrigerators:
1990 standard for top mount automatic defrost refirgerator: 893 kWh/yr,
B. Freezers:
1990 standard for average of upright and chest, manual defrost freezer: 568 kWh/yr,
C. Cooking:
Reduce energy consumption by 5% from base line,
D. Dishwasher:
Improve dishwasher motor to 1994 standard: 232 kWh/yr,
E. Clothes wahers:
Automatic clothes washer controls which sense type of fabric, dirtiness and other factors and adjusts wash parameters accordingly, indirect savings in DHW energy consumption,
F. Clothes Dryer:
Clothes dryer energy consumption at the level of that required by the National Appliance Energy Conservation Act (NAECA) of U.S. for 1993: 834 kWh/yr,
G. Hot Water Heating
Use annual energy consumption of 3090 kWh/yr (reflects a total UES of 1139 kWh/yr corresponding to Items G. 1, 4, 6 in Section 5),
H. TV Sets:
1990 standard for average color TV: 164 kWh/yr,

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[6] The % savings given are probably conservative estimates for the base line air-conditioner that will be used here.

I. Lights:

- Convert from general service (75 W) incandescent lamps to general service halogen lamp with IR coating (55W) for higher efficiency [17]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 75 W] (75 - 55) W = 53 W,
- Convert from general service (90 W) incandescent lamps to compact fluorescent floor and table lamps (25W) for higher efficiency [17, pg. 57]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 75 W] (90 - 25) W = 173 W

J. Air-Conditioners:

Improve central air-conditioner efficiency by 5% over baseline,

K. All Other Appliances:

Since this category includes all other appliances, it is not practical or necessary to deal with each appliance individually. Therefore, increase global efficiency by 5% over baseline,

L. Heating System Efficiency:

Increase heating season efficiency by 5% over baseline if possible (i.e. not to exceed 100%).

Set 3. Energy efficiency improvement - level 2:

These simulations will be carried out using the following efficiency improvements:

A. Refrigerators:

Refrigerator energy consumption at the level of that required by the National Appliance Energy Conservation Act (NAECA) of U.S. for 1993: 704 kWh/yr,

B. Freezers:

Improved freezer to 1993 DOE standard: 468 kWh/yr,

C. Cooking:

Reduce energy consumption by 10% from baseline,

D. Dishwasher:

Same as in Set 2.

E. Clothes wahers:

Bubble action washing machine with scrubbing bubbles and advanced computer design, indirect savings in DHW energy consumption,

F. Clothes Dryer:

Microwave clothes dryer using microwave rather than electric resistance heat: 617 kWh/yr,

G. Hot Water Heating

Use annual energy consumption of 2082 kWh/yr (reflects a total UES of 2147 kWh/yr corresponding to Items G. 2, 4, 5, 6, 7 in Section 5),

H. TV Sets:

Low powered color TV: 135 kWh/yr,

I. Lights:

- Convert from general service (75 W) incandescent lamps to Hafnium Carbide single crystal filament lamps (38 W) for higher efficiency [17]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 75 W] (75 - 38) W = 99 W
- Convert from general service (90 W) incandescent lamps to screw-in fluorescent (23 W) for higher efficiency [17]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 90 W] (90 - 23) W = 179 W

J. Air-Conditioners:

- Improve central air-conditioner efficiency by 25% over baseline.

K. All Other Appliances:

Increase global efficiency by 10% over baseline,

L. Heating System Efficiency:

Increase heating season efficiency by 10% over baseline if possible (i.e. not to exceed 100%).

Set 4. Energy efficiency improvement - level 3:

These simulations will be carried out using the following efficiency improvements:

A. Refrigerators:
Golden Carrot Refrigerator: 422 kWh/yr,
B. Freezers:
Advanced freezer with improved compressor and insulation: 284 kWh/yr,
C. Cooking:
Reduce energy consumption by 15% from baseline,
D. Dishwasher:
Same as in Set 3,
E. Clothes wahers:
Horizontal axis clothes washer with high efficiency motor, 26 kWh/yr,
F. Clothes Dryer:
High speed spin clothes washer/electric dryer (high spin speed removes more water, leaving less water to be removed by dryer): 521 kWh/yr, [17]
G. Hot Water Heating
Use annual energy consumption of 1855 kWh/yr (reflects a total UES of 2374 kWh/yr corresponding to Items G. 3, 4, 5, 6, 7 in Section 5),
H. TV Sets:
Same as in Set 3,
I. Lights:
- Convert from general service (75 W) incandescent lamps to general service coated filament incandescent (24W) for higher efficiency [17]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 75 W] (75 - 24) W = 136 W
- Convert from general service (90 W) incandescent lamps to screw-in fluorescent (23 W) for higher efficiency [17]. Assume 50% of all lights are replaced, savings in load will be: [(400 W) x (0.5) / 90 W] (90 - 23) W = 179 W

J. Air-Conditioners:
- Improve central air-conditioner efficiency by 33% over baseline.

K. All Other Appliances:
Increase global efficiency by 15% over baseline,
L. Heating System Efficiency:
Increase heating season efficiency by 15% over baseline if possible (i.e. not to exceed 100%).

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APPENDICES

APPENDIX A

Matching of House Files with Weather Files

Nomenclature:

ID	: House ID number
Dir	: The directory in which the house file resides
Post	: First letter of the postal code
Prov	: Province where the house is located
City Name	: City where the house is located
Weather City (Hot)	: Weather file to be used in Hot-2000 simulations
Weather City (ENE)	: Weather file to be used in ENERPASS simulations

Proposed Weather City Files for use in ENERPASS

	A	B	C	D	E	F	G
1	ID	Dir	Post	Prov	City Name	Weather City (Hot)	Weather City (ENE)
2	1002	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
3	1005	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
4	1009	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
5	1011	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
6	1028	NFL	A	NFLD	GLENWOOD	GANDER	SAINT JOHN'S
7	1039	NFL	A	NFLD	GLENWOOD	GANDER	SAINT JOHN'S
8	1045	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
9	1047	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
10	1049	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
11	1051	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
12	1052	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
13	1056	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
14	1059	NFL	A	NFLD	HEART'S DESIRE	SAINT JOHN'S	SAINT JOHN'S
15	1074	NFL	A	NFLD	ST. MARY'S	SAINT JOHN'S	SAINT JOHN'S
16	1097	NFL	A	NFLD	ST. LUNAIRE-GRIQUET	SEPT ILES	SAINT JOHN'S
17	1101	NFL	A	NFLD	HAMPDEN	GANDER	SAINT JOHN'S
18	1109	NFL	A	NFLD	LEWISPORTE	GANDER	SAINT JOHN'S
19	1110	NFL	A	NFLD	LEWISPORTE	GANDER	SAINT JOHN'S
20	1111	NFL	A	NFLD	LEWISPORTE	GANDER	SAINT JOHN'S
21	1114	NFL	A	NFLD	GANDER	GANDER	SAINT JOHN'S
22	1137	NFL	A	NFLD	PLUM POINT	SEPT ILES	SAINT JOHN'S
23	1138	NFL	A	NFLD	PLUM POINT	SEPT ILES	SAINT JOHN'S
24	1148	NFL	A	NFLD	GLENWOOD	GANDER	SAINT JOHN'S
25	1154	NFL	A	NFLD	STEPHENVILLE	STEPHENVILLE	SAINT JOHN'S
26	1158	NFL	A	NFLD	CHANNEL-PORT-AUX-B	STEPHENVILLE	SAINT JOHN'S
27	1182	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
28	1188	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
29	1190	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
30	1192	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
31	1194	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
32	1195	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
33	1205	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
34	1209	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
35	1216	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
36	1217	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
37	1228	NFL	A	NFLD	PORTUGAL COVE	SAINT JOHN'S	SAINT JOHN'S
38	1233	NFL	A	NFLD	WINDSOR	GANDER	SAINT JOHN'S
39	1235	NFL	A	NFLD	WINDSOR	GANDER	SAINT JOHN'S
40	1253	NFL	A	NFLD	DUNVILLE	SAINT JOHN'S	SAINT JOHN'S
41	1298	NFL	A	NFLD	CORNER BROOK	STEPHENVILLE	SAINT JOHN'S
42	1325	NFL	A	NFLD	HEART'S DESIRE	SAINT JOHN'S	SAINT JOHN'S
43	1331	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
44	1332	NFL	A	NFLD	SHEA HEIGHTS	SAINT JOHN'S	SAINT JOHN'S
45	1335	NFL	A	NFLD	SHEA HEIGHTS	SAINT JOHN'S	SAINT JOHN'S
46	1338	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
47	1343	NFL	A	NFLD	SHEA HEIGHTS	SAINT JOHN'S	SAINT JOHN'S

	A	B	C	D	E	F	G
48	1344	NFL	A	NFLD	SHEA HEIGHTS	SAINT JOHN'S	SAINT JOHN'S
49	1346	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
50	1350	NFL	A	NFLD	UPPER ISLAND COVE	SAINT JOHN'S	SAINT JOHN'S
51	1359	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
52	1361	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
53	1374	NFL	A	NFLD	TOPSAIL	GANDER	SAINT JOHN'S
54	1376	NFL	A	NFLD	TOPSAIL	GANDER	SAINT JOHN'S
55	1378	NFL	A	NFLD	ST. JOHN'S	SAINT JOHN'S	SAINT JOHN'S
56	1381	NFL	A	NFLD	PETTY HARBOUR	GOOSE BAY	SAINT JOHN'S
57	1388	NFL	A	NFLD	STEPHENVILLE	STEPHENVILLE	SAINT JOHN'S
58	1398	NFL	A	NFLD	TORBAY	SAINT JOHN'S	SAINT JOHN'S
59	1404	NFL	A	NFLD	DUNVILLE	SAINT JOHN'S	SAINT JOHN'S
60	1412	NFL	A	NFLD	PORTUGAL COVE	SAINT JOHN'S	SAINT JOHN'S
61	1418	NFL	A	NFLD	STEPHENVILLE	STEPHENVILLE	SAINT JOHN'S
62	1422	NFL	A	NFLD	UPPER ISLAND COVE	SAINT JOHN'S	SAINT JOHN'S
63	1425	NFL	A	NFLD	UPPER ISLAND COVE	SAINT JOHN'S	SAINT JOHN'S
64	2348	NB	E	NB	CAMPBELLTON	CHATHAM	FREDERICTON
65	2349	NB	E	NB	EDMUNSTON	CHATHAM	FREDERICTON
66	2360	NB	E	NB	WOODSTOCK	MONCTON	FREDERICTON
67	2371	NB	E	NB	WOODSTOCK	MONCTON	FREDERICTON
68	2380	NB	E	NB	BATHURST	CHATHAM	FREDERICTON
69	2386	NB	E	NB	MONCTON	MONCTON	FREDERICTON
70	2391	NB	E	NB	MONCTON	MONCTON	FREDERICTON
71	2392	NB	E	NB	MONCTON	MONCTON	FREDERICTON
72	2410	NB	E	NB	MONCTON	MONCTON	FREDERICTON
73	2416	NB	E	NB	MONCTON	MONCTON	FREDERICTON
74	2417	NB	E	NB	FREDERICTON	FREDERICTON	FREDERICTON
75	2419	NB	E	NB	MONCTON	MONCTON	FREDERICTON
76	2428	NB	E	NB	MONCTON	MONCTON	FREDERICTON
77	2432	NB	E	NB	MONCTON	MONCTON	FREDERICTON
78	2436	NB	E	NB	WOODSTOCK	MONCTON	FREDERICTON
79	2440	NB	E	NB	MONCTON	MONCTON	FREDERICTON
80	2457	NB	E	NB	EDMUNSTON	CHATHAM	FREDERICTON
81	3008	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
82	3009	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
83	3010	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
84	3012	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
85	3013	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
86	3015	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
87	3017	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
88	3018	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
89	3037	QUE	J	QUE	ST. HUBERT	MONTREAL	MONTREAL
90	3043	QUE	J	QUE	ST. HUBERT	MONTREAL	MONTREAL
91	3057	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
92	3059	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
93	3070	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
94	3071	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL

	A	B	C	D	E	F	G
95	3073	QUE	G	QUE	MONT JOLI	CHATHAM	QUEBEC
96	3083	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
97	3085	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
98	3097	QUE	G	QUE	MONT JOLI	CHATHAM	QUEBEC
99	3098	QUE	G	QUE	MONT JOLI	CHATHAM	QUEBEC
100	3103	QUE	J	QUE	ST. JEAN	MONTREAL	MONTREAL
101	3109	QUE	J	QUE	ST. THERESE	MONTREAL	MONTREAL
102	3110	QUE	J	QUE	ST. THERESE	MONTREAL	MONTREAL
103	3124	QUE	J	QUE	ST. THERESE	MONTREAL	MONTREAL
104	3125	QUE	J	QUE	ST. THERESE	MONTREAL	MONTREAL
105	3134	QUE	G	QUE	CHICOUTIMI	BAGOTVILLE	QUEBEC
106	3135	QUE	G	QUE	CHICOUTIMI	BAGOTVILLE	QUEBEC
107	3136	QUE	G	QUE	CHICOUTIMI	BAGOTVILLE	QUEBEC
108	3138	QUE	G	QUE	CHICOUTIMI	BAGOTVILLE	QUEBEC
109	3139	QUE	G	QUE	CHICOUTIMI	BAGOTVILLE	QUEBEC
110	3141	QUE	G	QUE	CHICOUTIMI	BAGOTVILLE	QUEBEC
111	3144	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
112	3145	QUE	G	QUE	MONT JOLI	CHATHAM	QUEBEC
113	3146	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
114	3151	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
115	3153	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
116	3158	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
117	3166	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
118	3169	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
119	3170	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
120	3174	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
121	3178	QUE	J	QUE	LONGUEUIL	MONTREAL	MONTREAL
122	3183	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
123	3186	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
124	3189	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
125	3190	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
126	3196	QUE	J	QUE	LONGUEUIL	MONTREAL	MONTREAL
127	3197	QUE	J	QUE	LONGUEUIL	MONTREAL	MONTREAL
128	3198	QUE	J	QUE	LONGUEUIL	MONTREAL	MONTREAL
129	3205	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
130	3206	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
131	3208	QUE	G	QUE	PORT CARTIER	SEPT ILES	QUEBEC
132	3209	QUE	G	QUE	PORT CARTIER	SEPT ILES	QUEBEC
133	3210	QUE	G	QUE	PORT CARTIER	SEPT ILES	QUEBEC
134	3212	QUE	G	QUE	PORT CARTIER	SEPT ILES	QUEBEC
135	3213	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
136	3224	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
137	3233	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
138	3239	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
139	3243	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
140	3247	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
141	3255	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC

	A	B	C	D	E	F	G
142	3256	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
143	3257	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
144	3259	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
145	3260	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
146	3261	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
147	3263	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
148	3264	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
149	3266	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
150	3278	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
151	3281	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
152	3293	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
153	3294	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
154	3295	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
155	3301	QUE	J	QUE	DRUMMONDVILLE	SHERBROOKE	MONTREAL
156	3312	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
157	3317	QUE	J	QUE	ST. JEROME	MONTREAL	MONTREAL
158	3322	QUE	J	QUE	SHERBROOKE	SHERBROOKE	MONTREAL
159	3323	QUE	J	QUE	SHERBROOKE	SHERBROOKE	MONTREAL
160	3324	QUE	G	QUE	TROIS RIVIERES	QUEBEC	QUEBEC
161	3328	QUE	J	QUE	SOREL	SHERBROOKE	MONTREAL
162	3329	QUE	J	QUE	DRUMMONDVILLE	SHERBROOKE	MONTREAL
163	3333	QUE	G	QUE	TROIS RIVIERES	QUEBEC	QUEBEC
164	3337	QUE	J	QUE	DRUMMONDVILLE	SHERBROOKE	MONTREAL
165	3344	QUE	G	QUE	TROIS RIVIERES	QUEBEC	QUEBEC
166	3348	QUE	G	QUE	TROIS RIVIERES	QUEBEC	QUEBEC
167	3349	QUE	J	QUE	DRUMMONDVILLE	SHERBROOKE	MONTREAL
168	3357	QUE	J	QUE	SHERBROOKE	SHERBROOKE	MONTREAL
169	3361	QUE	J	QUE	SHERBROOKE	SHERBROOKE	MONTREAL
170	3366	QUE	G	QUE	CAP-AUX-MEULES	CHATHAM	QUEBEC
171	3367	QUE	G	QUE	TROIS RIVIERES	QUEBEC	QUEBEC
172	3369	QUE	G	QUE	TROIS RIVIERES	QUEBEC	QUEBEC
173	3370	QUE	G	QUE	RIMOUSKI	CHATHAM	QUEBEC
174	3374	QUE	G	QUE	TROIS RIVIERES	QUEBEC	QUEBEC
175	3377	QUE	G	QUE	CAP-AUX-MEULES	CHATHAM	QUEBEC
176	3380	QUE	G	QUE	TROIS RIVIERES	QUEBEC	QUEBEC
177	3386	QUE	G	QUE	RIMOUSKI	CHATHAM	QUEBEC
178	3392	QUE	G	QUE	CAP-AUX-MEULES	CHATHAM	QUEBEC
179	3394	QUE	G	QUE	CAP-AUX-MEULES	CHATHAM	QUEBEC
180	3395	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
181	3399	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
182	3402	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
183	3405	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
184	3408	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
185	3411	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
186	3412	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
187	3413	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
188	3416	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC

	A	B	C	D	E	F	G
189	3423	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
190	3427	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
191	3430	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
192	3432	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
193	3433	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
194	3434	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
195	3436	QUE	G	QUE	TROIS RIVIERES	QUEBEC	QUEBEC
196	3439	QUE	G	QUE	RIMOUSKI	CHATHAM	QUEBEC
197	3443	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
198	3445	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
199	3448	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
200	3449	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
201	3609	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
202	3613	QUE	G	QUE	RIVIERE DU LOUP	CHATHAM	QUEBEC
203	3617	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
204	3642	QUE	G	QUE	QUEBEC NORD	CHATHAM	QUEBEC
205	3649	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
206	3656	QUE	G	QUE	SHAWINIGAN	QUEBEC	QUEBEC
207	3666	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
208	3668	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
209	3669	QUE	G	QUE	LAC MEGANTIC	SHERBROOKE	MONTREAL
210	3680	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
211	3681	QUE	G	QUE	GRAND'MERE	QUEBEC	QUEBEC
212	3689	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
213	3709	QUE	J	QUE	SHERBROOKE	SHERBROOKE	MONTREAL
214	3710	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
215	3712	QUE	J	QUE	GRANBY	SHERBROOKE	MONTREAL
216	3745	QUE	J	QUE	DORION	MONTREAL	MONTREAL
217	3762	QUE	J	QUE	BOUCHERVILLE	MONTREAL	MONTREAL
218	3763	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
219	3764	QUE	J	QUE	SHERBROOKE	SHERBROOKE	MONTREAL
220	3765	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
221	3789	QUE	J	QUE	DRUMMONDVILLE	SHERBROOKE	MONTREAL
222	3793	QUE	H	QUE	MONTREAL	MONTREAL	MONTREAL
223	3797	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
224	3817	QUE	G	QUE	QUEBEC	QUEBEC	QUEBEC
225	3820	QUE	J	QUE	MONTREAL	MONTREAL	MONTREAL
226	3840	QUE	G	QUE	RIVIERE DU LOUP	CHATHAM	QUEBEC
227	4002	ONT	L	ONT	AJAX	TORONTO	TORONTO
228	4004	ONT	L	ONT	AJAX	TORONTO	TORONTO
229	4008	ONT	M	ONT	TORONTO	TORONTO	TORONTO
230	4012	ONT	L	ONT	AJAX	TORONTO	TORONTO
231	4014	ONT	L	ONT	AJAX	TORONTO	TORONTO
232	4018	ONT	N	ONT	KITCHENER	TORONTO	TORONTO
233	4020	ONT	N	ONT	KITCHENER	TORONTO	TORONTO
234	4025	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
235	4026	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY

	A	B	C	D	E	F	G
236	4027	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
237	4028	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
238	4029	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
239	4030	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
240	4031	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
241	4032	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
242	4037	ONT	M	ONT	SCARBOROUGH	TORONTO	TORONTO
243	4043	ONT	M	ONT	SCARBOROUGH	TORONTO	TORONTO
244	4044	ONT	L	ONT	OSHAWA	TORONTO	TORONTO
245	4048	ONT	L	ONT	OSHAWA	TORONTO	TORONTO
246	4052	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
247	4056	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
248	4059	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
249	4060	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
250	4061	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
251	4062	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
252	4065	ONT	L	ONT	OSHAWA	TORONTO	TORONTO
253	4067	ONT	M	ONT	TORONTO	TORONTO	TORONTO
254	4075	ONT	M	ONT	TORONTO	TORONTO	TORONTO
255	4076	ONT	M	ONT	TORONTO	TORONTO	TORONTO
256	4080	ONT	K	ONT	LINDSAY	MUSKOKA	MUSKOKA
257	4082	ONT	K	ONT	LINDSAY	MUSKOKA	MUSKOKA
258	4083	ONT	K	ONT	LINDSAY	MUSKOKA	MUSKOKA
259	4085	ONT	L	ONT	MIDLAND	MUSKOKA	MUSKOKA
260	4087	ONT	L	ONT	MIDLAND	MUSKOKA	MUSKOKA
261	4103	ONT	N	ONT	DUNNVILLE	SIMCOE	TORONTO
262	4108	ONT	N	ONT	DUNNVILLE	SIMCOE	TORONTO
263	4110	ONT	N	ONT	DUNNVILLE	SIMCOE	TORONTO
264	4112	ONT	N	ONT	WINDSOR	WINDSOR	WINDSOR
265	4116	ONT	N	ONT	WINDSOR	WINDSOR	WINDSOR
266	4117	ONT	N	ONT	WINDSOR	WINDSOR	WINDSOR
267	4119	ONT	N	ONT	WINDSOR	WINDSOR	WINDSOR
268	4121	ONT	N	ONT	WINDSOR	WINDSOR	WINDSOR
269	4123	ONT	K	ONT	TRENTON	KINGSTON	TRENTON
270	4124	ONT	K	ONT	TRENTON	KINGSTON	TRENTON
271	4125	ONT	K	ONT	TRENTON	KINGSTON	TRENTON
272	4127	ONT	K	ONT	TRENTON	KINGSTON	TRENTON
273	4128	ONT	K	ONT	TRENTON	KINGSTON	TRENTON
274	4134	ONT	K	ONT	TRENTON	KINGSTON	TRENTON
275	4135	ONT	K	ONT	TRENTON	KINGSTON	TRENTON
276	4138	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
277	4139	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
278	4141	ONT	M	ONT	DON MILLS	TORONTO	TORONTO
279	4143	ONT	M	ONT	DON MILLS	TORONTO	TORONTO
280	4144	ONT	M	ONT	TORONTO	TORONTO	TORONTO
281	4146	ONT	M	ONT	TORONTO	TORONTO	TORONTO
282	4147	ONT	M	ONT	TORONTO	TORONTO	TORONTO

	A	B	C	D	E	F	G
283	4161	ONT	M	ONT	WESTON	TORONTO	TORONTO
284	4162	ONT	M	ONT	WESTON	TORONTO	TORONTO
285	4163	ONT	M	ONT	WESTON	TORONTO	TORONTO
286	4164	ONT	M	ONT	WESTON	TORONTO	TORONTO
287	4169	ONT	M	ONT	ETOBICOKE	TORONTO	TORONTO
288	4170	ONT	M	ONT	ETOBICOKE	TORONTO	TORONTO
289	4171	ONT	M	ONT	ETOBICOKE	TORONTO	TORONTO
290	4176	ONT	M	ONT	WESTON	TORONTO	TORONTO
291	4177	ONT	M	ONT	TORONTO	TORONTO	TORONTO
292	4182	ONT	N	ONT	KITCHENER	TORONTO	TORONTO
293	4186	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
294	4188	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
295	4190	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
296	4195	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
297	4197	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
298	4205	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
299	4208	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
300	4210	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
301	4222	ONT	M	ONT	ETOBICOKE	TORONTO	TORONTO
302	4224	ONT	L	ONT	ACTON	TORONTO	TORONTO
303	4226	ONT	M	ONT	TORONTO	TORONTO	TORONTO
304	4230	ONT	L	ONT	MIDLAND	MUSKOKA	MUSKOKA
305	4232	ONT	L	ONT	MIDLAND	MUSKOKA	MUSKOKA
306	4236	ONT	L	ONT	ACTON	TORONTO	TORONTO
307	4237	ONT	L	ONT	ACTON	TORONTO	TORONTO
308	4238	ONT	L	ONT	ACTON	TORONTO	TORONTO
309	4243	ONT	N	ONT	WINDSOR	WINDSOR	WINDSOR
310	4245	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
311	4246	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
312	4249	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
313	4256	ONT	K	ONT	BROCKVILLE	KINGSTON	OTTAWA
314	4257	ONT	K	ONT	BROCKVILLE	KINGSTON	OTTAWA
315	4258	ONT	K	ONT	BROCKVILLE	KINGSTON	OTTAWA
316	4261	ONT	K	ONT	BROCKVILLE	KINGSTON	OTTAWA
317	4262	ONT	K	ONT	BROCKVILLE	KINGSTON	OTTAWA
318	4263	ONT	K	ONT	BROCKVILLE	KINGSTON	OTTAWA
319	4264	ONT	K	ONT	BROCKVILLE	KINGSTON	OTTAWA
320	4265	ONT	K	ONT	BROCKVILLE	KINGSTON	OTTAWA
321	4266	ONT	N	ONT	OWEN SOUND	TORONTO	WIARTON
322	4273	ONT	M	ONT	DON MILLS	TORONTO	TORONTO
323	4274	ONT	M	ONT	DON MILLS	TORONTO	TORONTO
324	4276	ONT	M	ONT	DON MILLS	TORONTO	TORONTO
325	4278	ONT	M	ONT	TORONTO	TORONTO	TORONTO
326	4284	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
327	4287	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
328	4289	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
329	4292	ONT	L	ONT	BURLINGTON	TORONTO	TORONTO

	A	B	C	D	E	F	G
330	4293	ONT	N	ONT	LONDON	LONDON	LONDON
331	4294	ONT	N	ONT	LONDON	LONDON	LONDON
332	4296	ONT	N	ONT	LONDON	LONDON	LONDON
333	4297	ONT	N	ONT	LONDON	LONDON	LONDON
334	4299	ONT	N	ONT	LONDON	LONDON	LONDON
335	4300	ONT	N	ONT	LONDON	LONDON	LONDON
336	4311	ONT	L	ONT	BURLINGTON	TORONTO	TORONTO
337	4312	ONT	L	ONT	BURLINGTON	TORONTO	TORONTO
338	4314	ONT	L	ONT	BURLINGTON	TORONTO	TORONTO
339	4316	ONT	L	ONT	BURLINGTON	TORONTO	TORONTO
340	4317	ONT	L	ONT	BURLINGTON	TORONTO	TORONTO
341	4318	ONT	L	ONT	BURLINGTON	TORONTO	TORONTO
342	4319	ONT	N	ONT	LONDON	LONDON	LONDON
343	4323	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
344	4336	ONT	M	ONT	DON MILLS	TORONTO	TORONTO
345	4338	ONT	M	ONT	DON MILLS	TORONTO	TORONTO
346	4339	ONT	M	ONT	DON MILLS	TORONTO	TORONTO
347	4345	ONT	L	ONT	RICHMOND HILL	TORONTO	TORONTO
348	4346	ONT	L	ONT	RICHMOND HILL	TORONTO	TORONTO
349	4347	ONT	L	ONT	RICHMOND HILL	TORONTO	TORONTO
350	4348	ONT	L	ONT	RICHMOND HILL	TORONTO	TORONTO
351	4350	ONT	L	ONT	MARKHAM	TORONTO	TORONTO
352	4353	ONT	L	ONT	MARKHAM	TORONTO	TORONTO
353	4360	ONT	M	ONT	TORONTO	TORONTO	TORONTO
354	4361	ONT	L	ONT	RICHMOND HILL	TORONTO	TORONTO
355	4362	ONT	L	ONT	RICHMOND HILL	TORONTO	TORONTO
356	4363	ONT	L	ONT	RICHMOND HILL	TORONTO	TORONTO
357	4365	ONT	L	ONT	RICHMOND HILL	TORONTO	TORONTO
358	4367	ONT	L	ONT	MARKHAM	TORONTO	TORONTO
359	4368	ONT	L	ONT	MARKHAM	TORONTO	TORONTO
360	4369	ONT	L	ONT	MARKHAM	TORONTO	TORONTO
361	4377	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
362	4378	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
363	4379	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
364	4383	ONT	M	ONT	DOWNSVIEW	TORONTO	TORONTO
365	4390	ONT	M	ONT	TORONTO	TORONTO	TORONTO
366	4396	ONT	M	ONT	TORONTO	TORONTO	TORONTO
367	4397	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
368	4398	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
369	4403	ONT	M	ONT	TORONTO	TORONTO	TORONTO
370	4408	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
371	4413	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
372	4414	ONT	K	ONT	BELLEVILLE	KINGSTON	TRENTON
373	4420	ONT	L	ONT	BARRIE	MUSKOKA	MUSKOKA
374	4422	ONT	L	ONT	BARRIE	MUSKOKA	MUSKOKA
375	4423	ONT	L	ONT	BARRIE	MUSKOKA	MUSKOKA
376	4429	ONT	L	ONT	BARRIE	MUSKOKA	MUSKOKA

	A	B	C	D	E	F	G
377	4448	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
378	4449	ONT	M	ONT	DOWNSVIEW	TORONTO	TORONTO
379	4451	ONT	N	ONT	BRANTFORD	SIMCOE	LONDON
380	4454	ONT	N	ONT	BRANTFORD	SIMCOE	LONDON
381	4455	ONT	N	ONT	BRANTFORD	SIMCOE	LONDON
382	4625	ONT	L	ONT	TORONTO	TORONTO	TORONTO
383	4644	ONT	M	ONT	TORONTO	TORONTO	TORONTO
384	4652	ONT	M	ONT	ETOBICOKE	TORONTO	TORONTO
385	4653	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
386	4664	ONT	P	ONT	SAULT STE. MARIE	NORTH BAY	SAULT STE. MARIE
387	4671	ONT	M	ONT	DON MILLS	TORONTO	TORONTO
388	4684	ONT	P	ONT	SUDBURY	SUDBURY	SUDBURY
389	4701	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
390	4706	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
391	4714	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
392	4716	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
393	4720	ONT	N	ONT	KITCHENER	TORONTO	TORONTO
394	4755	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
395	4765	ONT	L	ONT	HAMILTON	SIMCOE	TORONTO
396	4787	ONT	M	ONT	ETOBICOKE	TORONTO	TORONTO
397	4808	ONT	N	ONT	LONDON	LONDON	LONDON
398	4810	ONT	N	ONT	KITCHENER	TORONTO	TORONTO
399	4822	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
400	4846	ONT	K	ONT	OTTAWA	OTTAWA	OTTAWA
401	5002	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
402	5004	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
403	5031	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
404	5033	MAN	R	MAN	WINNIEPG	WINNIPEG	WINNIPEG
405	5035	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
406	5037	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
407	5053	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
408	5065	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
409	5072	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
410	5076	MAN	R	MAN	PORTAGE LA PRAIRIE	WINNIPEG	WINNIPEG
411	5098	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
412	5112	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
413	5116	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
414	5119	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
415	5123	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
416	5126	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
417	5134	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
418	5138	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
419	5147	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
420	5150	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
421	5154	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
422	5156	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
423	5160	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG

	A	B	C	D	E	F	G
424	5169	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
425	5175	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
426	5184	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
427	5188	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
428	5189	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
429	5201	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
430	5220	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
431	5229	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
432	5230	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
433	5234	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
434	5235	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
435	5242	MAN	R	MAN	DAUPHIN	BRANDON	WINNIPEG
436	5243	MAN	R	MAN	DAUPHIN	BRANDON	WINNIPEG
437	5254	MAN	R	MAN	DAUPHIN	BRANDON	WINNIPEG
438	5261	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
439	5266	MAN	R	MAN	DAUPHIN	BRANDON	WINNIPEG
440	5268	MAN	R	MAN	DAUPHIN	BRANDON	WINNIPEG
441	5275	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
442	5281	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
443	5285	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
444	5325	MAN	R	MAN	DAUPHIN	BRANDON	WINNIPEG
445	5331	MAN	R	MAN	DAUPHIN	BRANDON	WINNIPEG
446	5341	MAN	R	MAN	BRANDON	BRANDON	WINNIPEG
447	5354	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
448	5362	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
449	5370	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
450	5376	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
451	5378	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
452	5382	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
453	5388	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
454	5390	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
455	5391	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
456	5394	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
457	5406	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
458	5421	MAN	R	MAN	WINNIPEG	WINNIPEG	WINNIPEG
459	5456	MAN	R	MAN	DAUPHIN	BRANDON	WINNIPEG
460	6001	SAS	S	SASK	REGINA	REGINA	REGINA
461	6006	SAS	S	SASK	REGINA	REGINA	REGINA
462	6015	SAS	S	SASK	REGINA	REGINA	REGINA
463	6022	SAS	S	SASK	REGINA	REGINA	REGINA
464	6026	SAS	S	SASK	WEYBURN	ESTEVAN	REGINA
465	6035	SAS	S	SASK	MOOSE JAW	REGINA	REGINA
466	6052	SAS	S	SASK	REGINA	REGINA	REGINA
467	6056	SAS	S	SASK	REGINA	REGINA	REGINA
468	6070	SAS	S	SASK	YORKTON	REGINA	REGINA
469	6076	SAS	S	SASK	REGINA	REGINA	REGINA
470	6079	SAS	S	SASK	REGINA	REGINA	REGINA

	A	B	C	D	E	F	G
471	6081	SAS	S	SASK	REGINA	REGINA	REGINA
472	6087	SAS	S	SASK	LLOYDMINSTER	SASKATOON	SASKATOON
473	6092	SAS	S	SASK	LLOYDMINSTER	SASKATOON	SASKATOON
474	6105	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
475	6112	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
476	6119	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
477	6130	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
478	6132	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
479	6135	SAS	S	SASK	REGINA	REGINA	REGINA
480	6147	SAS	S	SASK	REGINA	REGINA	REGINA
481	6150	SAS	S	SASK	REGINA	REGINA	REGINA
482	6152	SAS	S	SASK	SWIFT CURRENT	SWIFT CURRENT	REGINA
483	6164	SAS	S	SASK	WEYBURN	ESTEVAN	REGINA
484	6173	SAS	S	SASK	REGINA	REGINA	REGINA
485	6186	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
486	6201	SAS	S	SASK	REGINA	REGINA	REGINA
487	6221	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
488	6227	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
489	6235	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
490	6240	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
491	6243	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
492	6267	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
493	6272	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
494	6281	SAS	S	SASK	REGINA	REGINA	REGINA
495	6285	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
496	6290	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
497	6291	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
498	6294	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
499	6295	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
500	6298	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
501	6305	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
502	6307	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
503	6314	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
504	6323	SAS	S	SASK	YORKTON	REGINA	REGINA
505	6326	SAS	S	SASK	YORKTON	REGINA	REGINA
506	6332	SAS	S	SASK	YORKTON	REGINA	REGINA
507	6345	SAS	S	SASK	YORKTON	REGINA	REGINA
508	6354	SAS	S	SASK	YORKTON	REGINA	REGINA
509	6360	SAS	S	SASK	REGINA	REGINA	REGINA
510	6377	SAS	S	SASK	SWIFT CURRENT	SWIFT CURRENT	REGINA
511	6378	SAS	S	SASK	SWIFT CURRENT	SWIFT CURRENT	REGINA
512	6383	SAS	S	SASK	MOOSE JAW	REGINA	REGINA
513	6394	SAS	S	SASK	REGINA	REGINA	REGINA
514	6403	SAS	S	SASK	REGINA	REGINA	REGINA
515	6445	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
516	6449	SAS	S	SASK	SASKATOON	SASKATOON	SASKATOON
517	6451	SAS	S	SASK	MOOSE JAW	REGINA	REGINA

	A	B	C	D	E	F	G
518	7001	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
519	7002	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
520	7017	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
521	7018	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
522	7040	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
523	7045	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
524	7050	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
525	7051	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
526	7058	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
527	7062	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
528	7071	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
529	7077	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
530	7080	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
531	7086	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
532	7093	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
533	7095	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
534	7097	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
535	7104	ALT	T	ALTA	RED DEER	ROCKY MOUNTAIN HO	EDMONTON
536	7105	ALT	T	ALTA	RED DEER	ROCKY MOUNTAIN HO	EDMONTON
537	7124	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
538	7127	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
539	7137	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
540	7140	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
541	7151	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
542	7157	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
543	7163	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
544	7182	ALT	T	ALTA	MEDICINE HAT	LETHBRIDGE	MEDICINE HAT
545	7197	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
546	7201	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
547	7206	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
548	7209	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
549	7231	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
550	7236	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
551	7241	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
552	7254	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
553	7258	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
554	7261	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
555	7280	ALT	T	ALTA	FORT SASKATCHEWAN	EDMONTON	EDMONTON
556	7281	ALT	T	ALTA	GRAND PRAIRIE	FORT ST. JOHN	EDMONTON
557	7285	ALT	T	ALTA	GRAND PRAIRIE	FORT ST. JOHN	EDMONTON
558	7290	ALT	T	ALTA	GRAND PRAIRIE	FORT ST. JOHN	EDMONTON
559	7293	ALT	T	ALTA	GRAND PRAIRIE	FORT ST. JOHN	EDMONTON
560	7303	ALT	T	ALTA	CALGARY	CALGARY	CALGARY
561	7320	ALT	T	ALTA	LETHBRIDGE	LETHBRIDGE	MEDICINE HAT
562	7321	ALT	T	ALTA	LETHBRIDGE	LETHBRIDGE	MEDICINE HAT
563	7330	ALT	T	ALTA	LETHBRIDGE	LETHBRIDGE	MEDICINE HAT
564	7355	ALT	T	ALTA	CALGARY	CALGARY	CALGARY

	A	B	C	D	E	F	G
565	7369	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
566	7385	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
567	7397	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
568	7406	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
569	7409	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
570	7418	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
571	7420	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
572	7421	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
573	7425	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
574	7427	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
575	7432	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
576	7440	ALT	T	ALTA	EDMONTON	EDMONTON	EDMONTON
577	7459	ALT	T	ALTA	FORT SAKATCHEWAN	EDMONTON	EDMONTON
578	8005	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
579	8012	BC	V	BC	PENTICTON	CASTLEGAR	PENTICTON
580	8013	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
581	8019	BC	V	BC	PORT ALBERNI	VANCOUVER	VANCOUVER
582	8035	BC	V	BC	NELSON	CASTLEGAR	PENTICTON
583	8037	BC	V	BC	NELSON	CASTLEGAR	PENTICTON
584	8038	BC	V	BC	NELSON	CASTLEGAR	PENTICTON
585	8042	BC	V	BC	COURTENAY	VANCOUVER	VANCOUVER
586	8044	BC	V	BC	COURTENAY	VANCOUVER	VANCOUVER
587	8056	BC	V	BC	KAMLOOPS	KAMLOOPS	PENTICTON
588	8060	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
589	8066	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
590	8070	BC	V	BC	PENTICTON	CASTLEGAR	PENTICTON
591	8086	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
592	8090	BC	V	BC	PORT MOODY	VANCOUVER	VANCOUVER
593	8094	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
594	8100	BC	V	BC	NEW WESTMINSTER	VANCOUVER	VANCOUVER
595	8101	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
596	8124	BC	V	BC	VERNON	KAMLOOPS	PENTICTON
597	8126	BC	V	BC	KAMLOOPS	KAMLOOPS	PENTICTON
598	8131	BC	V	BC	VERNON	KAMLOOPS	PENTICTON
599	8133	BC	V	BC	PRINCE GEORGE	PRINCE GEORGE	PENTICTON
600	8139	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
601	8145	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
602	8158	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
603	8163	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
604	8170	BC	V	BC	PRINCE GEORGE	PRINCE GEORGE	PENTICTON
605	8179	BC	V	BC	PRINCE GEORGE	PRINCE GEORGE	PENTICTON
606	8194	BC	V	BC	DUNCAN	VICTORIA	VICTORIA
607	8200	BC	V	BC	VERNON	KAMLOOPS	PENTICTON
608	8201	BC	V	BC	VERNON	KAMLOOPS	PENTICTON
609	8202	BC	V	BC	VERNON	KAMLOOPS	PENTICTON
610	8207	BC	V	BC	KAMLOOPS	KAMLOOPS	PENTICTON
611	8221	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER

	A	B	C	D	E	F	G
612	8233	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER
613	8239	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
614	8240	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
615	8246	BC	V	BC	NANAIMO	VANCOUVER	VANCOUVER
616	8247	BC	V	BC	NANAIMO	VANCOUVER	VANCOUVER
617	8248	BC	V	BC	NANAIMO	VANCOUVER	VANCOUVER
618	8250	BC	V	BC	KELOWNA	SUMMERLAND	PENTICTON
619	8251	BC	V	BC	NANAIMO	VANCOUVER	VANCOUVER
620	8253	BC	V	BC	CASTLEGAR	CASTLEGAR	PENTICTON
621	8257	BC	V	BC	CASTLEGAR	CASTLEGAR	PENTICTON
622	8258	BC	V	BC	CASTLEGAR	CASTLEGAR	PENTICTON
623	8267	BC	V	BC	LANGLEY	VANCOUVER	VANCOUVER
624	8269	BC	V	BC	SURREY	VANCOUVER	VANCOUVER
625	8271	BC	V	BC	SURREY	VANCOUVER	VANCOUVER
626	8278	BC	V	BC	SURREY	VANCOUVER	VANCOUVER
627	8280	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
628	8281	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
629	8282	BC	V	BC	TERRACE	PRINCE RUPERT	VANCOUVER
630	8288	BC	V	BC	NANAIMO	VANCOUVER	VANCOUVER
631	8292	BC	V	BC	TERRACE	PRINCE RUPERT	VANCOUVER
632	8302	BC	V	BC	NANAIMO	VANCOUVER	VANCOUVER
633	8308	BC	V	BC	DAWSON CREEK	FORT ST. JOHN	EDMONTON
634	8310	BC	V	BC	DAWSON CREEK	FORT ST. JOHN	EDMONTON
635	8311	BC	V	BC	DAWSON CREEK	FORT ST. JOHN	EDMONTON
636	8316	BC	V	BC	DAWSON CREEK	FORT ST. JOHN	EDMONTON
637	8318	BC	V	BC	KAMLOOPS	KAMLOOPS	PENTICTON
638	8323	BC	V	BC	KAMLOOPS	KAMLOOPS	PENTICTON
639	8337	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
640	8338	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
641	8341	BC	V	BC	PORT MOODY	VANCOUVER	VANCOUVER
642	8345	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
643	8346	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
644	8351	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
645	8371	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
646	8395	BC	V	BC	PORT ALBERNI	VANCOUVER	VANCOUVER
647	8397	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
648	8398	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
649	8400	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
650	8402	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER
651	8407	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
652	8408	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
653	8411	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
654	8413	BC	V	BC	PORT MOODY	VANCOUVER	VANCOUVER
655	8434	BC	V	BC	CASTLEGAR	CASTLEGAR	PENTICTON
656	8436	BC	V	BC	PORT ALBERNI	VANCOUVER	VANCOUVER
657	8438	BC	V	BC	PORT ALBERNI	VANCOUVER	VANCOUVER
658	8450	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER

	A	B	C	D	E	F	G
659	8456	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER
660	8458	BC	V	BC	SURREY	VANCOUVER	VANCOUVER
661	8459	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER
662	8601	BC	V	BC	KITIMAT	PRINCE RUPERT	VANCOUVER
663	8606	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
664	8607	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER
665	8610	BC	V	BC	CASTLEGAR	CASTLEGAR	PENTICTON
666	8612	BC	V	BC	WHITE ROCK	KAMLOOPS	PENTICTON
667	8622	BC	V	BC	WHITE ROCK	KAMLOOPS	PENTICTON
668	8623	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
669	8633	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER
670	8635	BC	V	BC	CASTLEGAR	CASTLEGAR	PENTICTON
671	8637	BC	V	BC	SURREY	VANCOUVER	VANCOUVER
672	8641	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
673	8643	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
674	8647	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
675	8650	BC	V	BC	DAWSON CREEK	FORT ST. JOHN	EDMONTON
676	8654	BC	V	BC	RICHMOND	VANCOUVER	VANCOUVER
677	8657	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
678	8667	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
679	8668	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
680	8688	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
681	8689	BC	V	BC	PENTICTON	CASTLEGAR	PENTICTON
682	8712	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
683	8715	BC	V	BC	TERRACE	PRINCE RUPERT	VANCOUVER
684	8725	BC	V	BC	RICHMOND	VANCOUVER	VANCOUVER
685	8735	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER
686	8745	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
687	8784	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
688	8786	BC	V	BC	KELOWNA	SUMMERLAND	PENTICTON
689	8788	BC	V	BC	RICHMOND	VANCOUVER	VANCOUVER
690	8795	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
691	8825	BC	V	BC	VERNON	KAMLOOPS	PENTICTON
692	8838	BC	V	BC	COURTENAY	VANCOUVER	VANCOUVER
693	8842	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER
694	8843	BC	V	BC	CRANBROOK	LETHBRIDGE	PENTICTON
695	8849	BC	V	BC	VICTORIA	VICTORIA	VICTORIA
696	8852	BC	V	BC	VANCOUVER	VANCOUVER	VANCOUVER
697	8854	BC	V	BC	PORT COQUITLAM	VANCOUVER	VANCOUVER
698	8859	BC	V	BC	KIMBERLEY	CASTLEGAR	PENTICTON
699	8862	BC	V	BC	CASTLEGAR	CASTLEGAR	PENTICTON
700	cene59	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
701	cene60	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
702	cene60	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
703	cene60	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
704	cene60	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
705	cene60	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO

	A	B	C	D	E	F	G
706	cene60	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
707	cene60	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
708	cene60	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
709	cene61	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
710	cene61	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
711	cene61	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
712	cene62	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
713	cene62	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
714	cene62	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
715	cene62	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
716	ceny56	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
717	ceny57	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
718	ceny57	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
719	ceny58	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
720	ceny58	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
721	ceny58	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
722	ceoa76	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
723	ceoa76	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
724	ceoa77	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
725	ceoa78	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
726	ceoa78	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
727	ceoa78	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
728	ceoa78	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
729	ceoa78	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
730	ceoa78	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
731	ceto638	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
732	ceto658	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
733	ceto66	ONT	hydr	ONT	TORONTO	TORONTO	TORONTO
734	eaot45	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
735	eaot45	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
736	eaot45	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
737	eaot45	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
738	eaot458	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
739	eaot458	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
740	eaot46	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
741	eaot46	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
742	eaot47	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
743	eaot47	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
744	eaot48	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
745	eaot48	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
746	eaot48	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
747	eaot48	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
748	eaot48	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
749	eaot48	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
750	eaot488	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
751	eaot49	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
752	eawc06	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA

	A	B	C	D	E	F	G
753	eawc08	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
754	eawc08	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
755	eawc09	ONT	hydr	ONT	OTTAWA	OTTAWA	OTTAWA
756	gbba90	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
757	gbba90	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
758	gbba90	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
759	gbba90	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
760	gbba90	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
761	gbba90	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
762	gbba91	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
763	gbba91	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
764	gbba91	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
765	gbba91	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
766	gbba91	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
767	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
768	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
769	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
770	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
771	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
772	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
773	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
774	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
775	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
776	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
777	gbba92	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
778	gbba93	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
779	gbba93	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
780	gbba93	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
781	gbba93	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
782	gbba95	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
783	gbba95	ONT	hydr	ONT	BARRIE	OTTAWA	WIARTON
784	EDM01	ALT	mrch	ALT	EDMONTON	EDMONTON	EDMONTON
785	EDM02	ALT	mrch	ALT	EDMONTON	EDMONTON	EDMONTON
786	EDM03	ALT	mrch	ALT	EDMONTON	EDMONTON	EDMONTON
787	EDM04	ALT	mrch	ALT	EDMONTON	EDMONTON	EDMONTON
788	EDM06	ALT	mrch	ALT	EDMONTON	EDMONTON	EDMONTON
789	EDM07	ALT	mrch	ALT	EDMONTON	EDMONTON	EDMONTON
790	EDM09	ALT	mrch	ALT	EDMONTON	EDMONTON	EDMONTON
791	EDM10	ALT	mrch	ALT	EDMONTON	EDMONTON	EDMONTON
792	HAL02	NS	mrch	NS	HALIFAX	HALIFAX	HALIFAX
793	HAL06	NS	mrch	NS	HALIFAX	HALIFAX	HALIFAX
794	HAL07	NS	mrch	NS	HALIFAX	HALIFAX	HALIFAX
795	HAL08	NS	mrch	NS	HALIFAX	HALIFAX	HALIFAX
796	HAL10	NS	mrch	NS	HALIFAX	HALIFAX	HALIFAX
797	HAL11	NS	mrch	NS	HALIFAX	HALIFAX	HALIFAX
798	HAL12	NS	mrch	NS	HALIFAX	HALIFAX	HALIFAX
799	HAL13	NS	mrch	NS	HALIFAX	HALIFAX	HALIFAX

Proposed Weather City Files for use in ENERPASS

	A	B	C	D	E	F	G
800	QUE01	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
801	QUE02	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
802	QUE03	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
803	QUE04	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
804	QUE05	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
805	QUE06	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
806	QUE07	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
807	QUE08	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
808	QUE09	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
809	QUE10	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
810	QUE14	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
811	QUE15	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
812	QUE16	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
813	QUE17	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
814	QUE18	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
815	QUE19	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
816	QUE20	QUE	mrch	QUE	QUEBEC	QUEBEC	QUEBEC
817	OTT01	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
818	OTT02	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
819	OTT03	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
820	OTT04	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
821	OTT05	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
822	OTT06	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
823	OTT07	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
824	OTT08	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
825	OTT09	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
826	OTT10	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
827	OTT18	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
828	OTT19	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
829	OTT20	ONT	mrch	ONT	OTTAWA	OTTAWA	OTTAWA
830	MON0	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
831	MON0	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
832	MON0	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
833	MON0	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
834	MON0	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
835	MON0	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
836	MON0	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
837	MON0	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
838	MON0	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
839	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
840	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
841	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
842	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
843	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
844	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
845	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
846	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL

	A	B	C	D	E	F	G
847	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
848	MON1	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
849	MON2	QUE	mrch	QUE	MONTREAL	MONTREAL	MONTREAL
850	RCD01	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
851	RCD02	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
852	RCD03	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
853	RCD04	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
854	RCD05	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
855	RCD06	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
856	RCD07	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
857	RCD08	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
858	RCD09	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
859	RCD10	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
860	RCD11	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
861	RCD12	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
862	RCD13	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
863	RCD14	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
864	RCD15	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
865	RCD16	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
866	RCD17	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
867	RCD18	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
868	RCD19	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
869	RCD20	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
870	RCD21	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
871	RCD22	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
872	RCD23	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
873	RCD24	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
874	RCD25	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
875	RCD26	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
876	RCD27	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
877	RCD28	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
878	RCD29	ONT	mrch	ONT	TORONTO	TORONTO	TORONTO
879	REG03	SAS	mrch	SAS	REGINA	REGINA	REGINA
880	REG04	SAS	mrch	SAS	REGINA	REGINA	REGINA
881	REG05	SAS	mrch	SAS	REGINA	REGINA	REGINA
882	REG06	SAS	mrch	SAS	REGINA	REGINA	REGINA
883	REG09	SAS	mrch	SAS	REGINA	REGINA	REGINA
884	REG10	SAS	mrch	SAS	REGINA	REGINA	REGINA
885	SAS01	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON
886	SAS02	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON
887	SAS03	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON
888	SAS04	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON
889	SAS05	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON
890	SAS06	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON
891	SAS07	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON
892	SAS08	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON
893	SAS09	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON

	A	B	C	D	E	F	G
894	SAS10	SAS	mrch	SAS	SASKATOON	SASKATOON	SASKATOON
895	STJ01	NFL	mrch	NFL	ST. JOHN'S	ST. JOHN'S	ST. JOHN'S
896	STJ02	NFL	mrch	NFL	ST. JOHN'S	ST. JOHN'S	ST. JOHN'S
897	STJ04	NFL	mrch	NFL	ST. JOHN'S	ST. JOHN'S	ST. JOHN'S
898	STJ05	NFL	mrch	NFL	ST. JOHN'S	ST. JOHN'S	ST. JOHN'S
899	STJ06	NFL	mrch	NFL	ST. JOHN'S	ST. JOHN'S	ST. JOHN'S
900	STJ08	NFL	mrch	NFL	ST. JOHN'S	ST. JOHN'S	ST. JOHN'S
901	STJ09	NFL	mrch	NFL	ST. JOHN'S	ST. JOHN'S	ST. JOHN'S
902	VAN01	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
903	VAN02	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
904	VAN03	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
905	VAN04	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
906	VAN05	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
907	VAN06	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
908	VAN07	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
909	VAN08	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
910	VAN09	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
911	VAN10	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
912	VAN11	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
913	VAN12	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
914	VAN13	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
915	VAN14	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
916	VAN15	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
917	VAN16	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
918	VAN17	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
919	VAN18	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
920	VAN19	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
921	VAN20	BC	mrch	BC	VANCOUVER	VANCOUVER	VANCOUVER
922	WPG01	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
923	WPG02	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
924	WPG03	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
925	WPG04	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
926	WPG05	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
927	WPG06	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
928	WPG07	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
929	WPG08	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
930	WPG10	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
931	WPG11	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
932	WPG12	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
933	WPG13	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
934	WPG14	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
935	WPG15	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
936	WPG16	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
937	WPG17	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG
938	WPG19	MAN	mrch	MAN	WINNIPEG	WINNIPEG	WINNEPEG

APPENDIX B

Errors Corrected/Revisions

Appendix B.1

List of Files with Corrected RSI values for Shallow Basement and Below-Grade Slab

	A	B	C	D
1	**Basement**	**STAR File Name**	**Area**	**RSI**
2	shallow	c:\cmhc\util\star\NFL-s\A1005.chp	55.48	0.63
3	shallow	c:\cmhc\util\star\NFL-s\A1009.chp	135.70	1.92
4	shallow	c:\cmhc\util\star\NFL-s\A1028.chp	91.84	0.23
5	shallow	c:\cmhc\util\star\NFL-s\A1052.chp	128.62	0.32
6	shallow	c:\cmhc\util\star\NFL-s\A1056.chp	54.40	0.41
7	shallow	c:\cmhc\util\star\NFL-s\A1059.chp	110.13	0.26
8	shallow	c:\cmhc\util\star\NFL-s\A1097.chp	36.40	0.23
9	shallow	c:\cmhc\util\star\NFL-s\A1114.chp	87.00	0.23
10	Below	c:\cmhc\util\star\NFL-s\A1137.chp	53.36	0.65
11	shallow	c:\cmhc\util\star\NFL-s\A1138.chp	104.96	0.40
12	shallow	c:\cmhc\util\star\NFL-s\A1148.chp	94.62	0.26
13	shallow	c:\cmhc\util\star\NFL-s\A1158.chp	86.33	0.16
14	shallow	c:\cmhc\util\star\NFL-s\A1190.chp	81.60	0.81
15	shallow	c:\cmhc\util\star\NFL-s\A1192.chp	48.45	0.40
16	shallow	c:\cmhc\util\star\NFL-s\A1205.chp	90.80	0.40
17	shallow	c:\cmhc\util\star\NFL-s\A1216.chp	85.84	0.81
18	shallow	c:\cmhc\util\star\NFL-s\A1233.chp	48.14	0.49
19	shallow	c:\cmhc\util\star\NFL-s\A1253.chp	82.52	0.23
20	shallow	c:\cmhc\util\star\NFL-s\A1325.chp	116.48	0.56
21	shallow	c:\cmhc\util\star\NFL-s\A1332.chp	113.36	0.23
22	shallow	c:\cmhc\util\star\NFL-s\A1335.chp	86.58	0.20
23	shallow	c:\cmhc\util\star\NFL-s\A1343.chp	101.64	0.40
24	shallow	c:\cmhc\util\star\NFL-s\A1344.chp	80.73	0.43
25	shallow	c:\cmhc\util\star\NFL-s\A1350.chp	66.30	0.16
26	shallow	c:\cmhc\util\star\NFL-s\A1361.chp	102.12	0.28
27	shallow	c:\cmhc\util\star\NFL-s\A1376.chp	73.32	0.23
28	shallow	c:\cmhc\util\star\NFL-s\A1404.chp	42.56	0.23
29	shallow	c:\cmhc\util\star\NFL-s\A1412.chp	84.68	0.65
30	shallow	c:\cmhc\util\star\NFL-s\A1422.chp	84.05	0.23
31	shallow	c:\cmhc\util\star\NB-s\E2416.chp	108.00	0.23
32	shallow	c:\cmhc\util\star\NB-s\E2428.chp	103.20	0.77
33	shallow	c:\cmhc\util\star\NB-s\E2457.chp	10.50	0.23
34	shallow	c:\cmhc\util\star\QUE-s\H3008.chp	121.77	0.48
35	shallow	c:\cmhc\util\star\QUE-s\H3010.chp	101.01	0.27
36	shallow	c:\cmhc\util\star\QUE-s\H3012.chp	124.05	0.59
37	shallow	c:\cmhc\util\star\QUE-s\H3015.chp	95.12	0.23
38	shallow	c:\cmhc\util\star\QUE-s\H3018.chp	100.29	0.23
39	shallow	c:\cmhc\util\star\QUE-s\J3070.chp	93.90	0.23
40	shallow	c:\cmhc\util\star\QUE-s\G3073.chp	62.32	0.16
41	shallow	c:\cmhc\util\star\QUE-s\H3083.chp	116.10	0.33
42	Below	c:\cmhc\util\star\QUE-s\H3083.chp	11.10	0.36
43	shallow	c:\cmhc\util\star\QUE-s\J3110.chp	58.46	0.37
44	shallow	c:\cmhc\util\star\QUE-s\G3134.chp	84.70	0.71
45	shallow	c:\cmhc\util\star\QUE-s\G3136.chp	80.08	0.49
46	shallow	c:\cmhc\util\star\QUE-s\G3141.chp	67.90	0.31
47	shallow	c:\cmhc\util\star\QUE-s\G3145.chp	102.85	0.39

	A	B	C	D
48	Below	c:\cmhc\util\star\QUE-s\J3151.chp	14.57	0.57
49	shallow	c:\cmhc\util\star\QUE-s\J3153.chp	94.17	0.23
50	shallow	c:\cmhc\util\star\QUE-s\J3166.chp	126.00	0.45
51	shallow	c:\cmhc\util\star\QUE-s\J3178.chp	103.70	0.23
52	shallow	c:\cmhc\util\star\QUE-s\J3186.chp	43.71	0.23
53	shallow	c:\cmhc\util\star\QUE-s\J3189.chp	95.76	1.63
54	shallow	c:\cmhc\util\star\QUE-s\J3196.chp	140.32	0.20
55	shallow	c:\cmhc\util\star\QUE-s\J3197.chp	105.40	0.39
56	shallow	c:\cmhc\util\star\QUE-s\J3198.chp	62.37	0.23
57	shallow	c:\cmhc\util\star\QUE-s\G3206.chp	45.59	0.23
58	shallow	c:\cmhc\util\star\QUE-s\H3239.chp	78.11	0.23
59	shallow	c:\cmhc\util\star\QUE-s\H3243.chp	77.10	0.23
60	Below	c:\cmhc\util\star\QUE-s\H3243.chp	29.40	0.26
61	shallow	c:\cmhc\util\star\QUE-s\H3247.chp	80.16	0.23
62	shallow	c:\cmhc\util\star\QUE-s\H3259.chp	81.32	0.60
63	shallow	c:\cmhc\util\star\QUE-s\G3293.chp	122.40	0.34
64	shallow	c:\cmhc\util\star\QUE-s\G3294.chp	94.80	0.42
65	shallow	c:\cmhc\util\star\QUE-s\G3295.chp	94.30	0.24
66	shallow	c:\cmhc\util\star\QUE-s\J3312.chp	130.15	0.42
67	shallow	c:\cmhc\util\star\QUE-s\J3317.chp	87.02	0.35
68	shallow	c:\cmhc\util\star\QUE-s\J3323.chp	90.16	0.23
69	shallow	c:\cmhc\util\star\QUE-s\G3333.chp	129.96	0.23
70	shallow	c:\cmhc\util\star\QUE-s\G3348.chp	6.82	0.16
71	Below	c:\cmhc\util\star\QUE-s\G3367.chp	65.36	0.43
72	shallow	c:\cmhc\util\star\QUE-s\G3369.chp	103.70	0.40
73	shallow	c:\cmhc\util\star\QUE-s\G3370.chp	77.25	0.23
74	shallow	c:\cmhc\util\star\QUE-s\G3386.chp	59.20	0.23
75	shallow	c:\cmhc\util\star\QUE-s\H3395.chp	45.44	0.60
76	Below	c:\cmhc\util\star\QUE-s\H3395.chp	49.70	0.36
77	shallow	c:\cmhc\util\star\QUE-s\G3399.chp	61.50	0.23
78	shallow	c:\cmhc\util\star\QUE-s\G3402.chp	106.86	0.69
79	shallow	c:\cmhc\util\star\QUE-s\G3411.chp	88.33	0.23
80	shallow	c:\cmhc\util\star\QUE-s\G3416.chp	67.08	0.23
81	shallow	c:\cmhc\util\star\QUE-s\J3434.chp	52.54	0.40
82	shallow	c:\cmhc\util\star\QUE-s\G3439.chp	78.48	0.16
83	shallow	c:\cmhc\util\star\QUE-s\H3617.chp	59.50	0.23
84	shallow	c:\cmhc\util\star\QUE-s\G3668.chp	99.76	0.63
85	shallow	c:\cmhc\util\star\QUE-s\G3680.chp	103.23	0.23
86	shallow	c:\cmhc\util\star\QUE-s\J3710.chp	60.59	0.23
87	shallow	c:\cmhc\util\star\QUE-s\J3712.chp	115.63	0.80
88	shallow	c:\cmhc\util\star\QUE-s\J3745.chp	41.80	0.79
89	shallow	c:\cmhc\util\star\QUE-s\J3763.chp	110.00	0.23
90	shallow	c:\cmhc\util\star\QUE-s\H3765.chp	104.55	0.41
91	shallow	c:\cmhc\util\star\QUE-s\J3789.chp	92.56	0.23
92	shallow	c:\cmhc\util\star\QUE-s\G3817.chp	101.20	0.23
93	shallow	c:\cmhc\util\star\QUE-s\G3840.chp	117.12	0.23
94	shallow	c:\cmhc\util\star\ONT-s\L4014.chp	84.20	0.36

	A	B	C	D
95	Below	c:\cmhc\util\star\ONT-s\L4014.chp	17.16	0.81
96	Below	c:\cmhc\util\star\ONT-s\N4020.chp	148.48	0.49
97	shallow	c:\cmhc\util\star\ONT-s\P4025.chp	89.06	0.23
98	Below	c:\cmhc\util\star\ONT-s\P4027.chp	27.74	0.23
99	shallow	c:\cmhc\util\star\ONT-s\P4032.chp	87.20	0.23
100	shallow	c:\cmhc\util\star\ONT-s\L4056.chp	57.06	0.23
101	shallow	c:\cmhc\util\star\ONT-s\L4061.chp	76.24	0.33
102	shallow	c:\cmhc\util\star\ONT-s\M4076.chp	48.64	0.23
103	shallow	c:\cmhc\util\star\ONT-s\K4080.chp	98.79	0.24
104	shallow	c:\cmhc\util\star\ONT-s\N4103.chp	93.99	0.35
105	shallow	c:\cmhc\util\star\ONT-s\N4119.chp	110.94	0.43
106	Below	c:\cmhc\util\star\ONT-s\N4119.chp	7.82	0.24
107	shallow	c:\cmhc\util\star\ONT-s\N4121.chp	43.68	0.23
108	shallow	c:\cmhc\util\star\ONT-s\K4123.chp	127.81	0.19
109	shallow	c:\cmhc\util\star\ONT-s\K4127.chp	86.27	0.27
110	shallow	c:\cmhc\util\star\ONT-s\K4128.chp	70.14	0.29
111	Below	c:\cmhc\util\star\ONT-s\K4135.chp	27.08	0.40
112	shallow	c:\cmhc\util\star\ONT-s\K4138.chp	27.04	0.23
113	shallow	c:\cmhc\util\star\ONT-s\K4139.chp	27.04	0.23
114	Below	c:\cmhc\util\star\ONT-s\K4139.chp	199.09	0.67
115	shallow	c:\cmhc\util\star\ONT-s\M4144.chp	68.08	0.23
116	shallow	c:\cmhc\util\star\ONT-s\M4162.chp	103.36	0.40
117	shallow	c:\cmhc\util\star\ONT-s\M4170.chp	55.82	0.23
118	shallow	c:\cmhc\util\star\ONT-s\M4171.chp	55.82	0.23
119	Below	c:\cmhc\util\star\ONT-s\M4171.chp	115.20	0.37
120	shallow	c:\cmhc\util\star\ONT-s\M4176.chp	55.82	0.23
121	Below	c:\cmhc\util\star\ONT-s\M4176.chp	110.65	0.29
122	shallow	c:\cmhc\util\star\ONT-s\L4186.chp	139.48	0.35
123	shallow	c:\cmhc\util\star\ONT-s\L4197.chp	30.80	0.23
124	shallow	c:\cmhc\util\star\ONT-s\L4205.chp	80.15	0.23
125	shallow	c:\cmhc\util\star\ONT-s\L4224.chp	95.09	0.28
126	Below	c:\cmhc\util\star\ONT-s\L4224.chp	7.92	3.74
127	shallow	c:\cmhc\util\star\ONT-s\L4230.chp	54.29	0.16
128	shallow	c:\cmhc\util\star\ONT-s\L4236.chp	77.77	0.35
129	shallow	c:\cmhc\util\star\ONT-s\L4238.chp	77.58	0.23
130	shallow	c:\cmhc\util\star\ONT-s\N4243.chp	96.70	0.23
131	shallow	c:\cmhc\util\star\ONT-s\K4245.chp	124.95	0.29
132	shallow	c:\cmhc\util\star\ONT-s\K4246.chp	83.24	0.23
133	shallow	c:\cmhc\util\star\ONT-s\K4256.chp	86.40	0.40
134	shallow	c:\cmhc\util\star\ONT-s\K4257.chp	50.16	0.30
135	shallow	c:\cmhc\util\star\ONT-s\K4261.chp	86.40	0.25
136	shallow	c:\cmhc\util\star\ONT-s\K4264.chp	97.60	0.26
137	shallow	c:\cmhc\util\star\ONT-s\K4265.chp	49.40	0.23
138	shallow	c:\cmhc\util\star\ONT-s\N4266.chp	58.59	0.16
139	shallow	c:\cmhc\util\star\ONT-s\M4278.chp	63.25	0.23
140	shallow	c:\cmhc\util\star\ONT-s\K4284.chp	96.04	0.11
141	shallow	c:\cmhc\util\star\ONT-s\K4287.chp	51.23	0.23

	A	B	C	D
142	shallow	c:\cmhc\util\star\ONT-s\K4289.chp	40.11	0.16
143	shallow	c:\cmhc\util\star\ONT-s\L4292.chp	77.64	0.27
144	Below	c:\cmhc\util\star\ONT-s\N4293.chp	21.00	0.66
145	shallow	c:\cmhc\util\star\ONT-s\L4311.chp	97.20	0.27
146	shallow	c:\cmhc\util\star\ONT-s\L4312.chp	89.69	0.23
147	Below	c:\cmhc\util\star\ONT-s\L4314.chp	49.84	0.49
148	shallow	c:\cmhc\util\star\ONT-s\L4316.chp	12.24	0.26
149	Below	c:\cmhc\util\star\ONT-s\L4316.chp	58.67	0.63
150	shallow	c:\cmhc\util\star\ONT-s\L4317.chp	28.86	0.23
151	shallow	c:\cmhc\util\star\ONT-s\L4318.chp	74.62	0.43
152	shallow	c:\cmhc\util\star\ONT-s\L4362.chp	44.16	0.31
153	Below	c:\cmhc\util\star\ONT-s\L4362.chp	47.74	0.63
154	shallow	c:\cmhc\util\star\ONT-s\L4369.chp	53.20	0.25
155	shallow	c:\cmhc\util\star\ONT-s\K4378.chp	89.44	0.23
156	shallow	c:\cmhc\util\star\ONT-s\K4379.chp	51.00	0.22
157	shallow	c:\cmhc\util\star\ONT-s\M4383.chp	81.69	0.30
158	shallow	c:\cmhc\util\star\ONT-s\M4403.chp	83.60	0.23
159	shallow	c:\cmhc\util\star\ONT-s\K4408.chp	96.25	0.21
160	shallow	c:\cmhc\util\star\ONT-s\K4413.chp	54.37	0.27
161	Below	c:\cmhc\util\star\ONT-s\K4413.chp	28.08	0.40
162	shallow	c:\cmhc\util\star\ONT-s\M4644.chp	47.88	0.29
163	shallow	c:\cmhc\util\star\ONT-s\L4755.chp	87.40	0.24
164	shallow	c:\cmhc\util\star\ONT-s\N4810.chp	57.72	0.23
165	shallow	c:\cmhc\util\star\ONT-s\K4846.chp	46.90	0.21
166	shallow	c:\cmhc\util\star\MAN-s\R5004.chp	48.36	0.30
167	Below	c:\cmhc\util\star\MAN-s\R5112.chp	36.26	0.23
168	shallow	c:\cmhc\util\star\MAN-s\R5184.chp	57.34	0.23
169	shallow	c:\cmhc\util\star\MAN-s\R5189.chp	50.22	0.23
170	shallow	c:\cmhc\util\star\MAN-s\R5230.chp	54.06	0.37
171	Below	c:\cmhc\util\star\MAN-s\R5234.chp	98.40	0.60
172	shallow	c:\cmhc\util\star\MAN-s\R5242.chp	124.89	0.25
173	shallow	c:\cmhc\util\star\MAN-s\R5254.chp	53.46	0.23
174	Below	c:\cmhc\util\star\MAN-s\R5266.chp	48.00	0.46
175	shallow	c:\cmhc\util\star\MAN-s\R5421.chp	45.75	0.23
176	shallow	c:\cmhc\util\star\SAS-s\S6035.chp	70.55	0.40
177	Below	c:\cmhc\util\star\SAS-s\S6056.chp	1.15	0.89
178	shallow	c:\cmhc\util\star\SAS-s\S6081.chp	89.06	0.40
179	shallow	c:\cmhc\util\star\SAS-s\S6105.chp	98.23	0.23
180	shallow	c:\cmhc\util\star\SAS-s\S6227.chp	24.21	0.23
181	shallow	c:\cmhc\util\star\SAS-s\S6267.chp	77.70	0.36
182	shallow	c:\cmhc\util\star\SAS-s\S6332.chp	21.60	0.29
183	shallow	c:\cmhc\util\star\SAS-s\S6345.chp	45.88	0.22
184	shallow	c:\cmhc\util\star\SAS-s\S6360.chp	108.00	0.31
185	shallow	c:\cmhc\util\star\SAS-s\S6383.chp	25.85	0.46
186	shallow	c:\cmhc\util\star\SAS-s\S6449.chp	120.17	0.23
187	shallow	c:\cmhc\util\star\ALT-s\T7017.chp	108.36	0.23
188	Below	c:\cmhc\util\star\ALT-s\T7045.chp	103.82	0.23

	A	B	C	D
189	shallow	c:\cmhc\util\star\ALT-s\T7124.chp	153.45	0.20
190	shallow	c:\cmhc\util\star\ALT-s\T7127.chp	63.00	0.16
191	shallow	c:\cmhc\util\star\ALT-s\T7157.chp	97.91	0.23
192	shallow	c:\cmhc\util\star\ALT-s\T7231.chp	121.55	0.23
193	shallow	c:\cmhc\util\star\ALT-s\T7320.chp	69.27	0.23
194	shallow	c:\cmhc\util\star\ALT-s\T7330.chp	79.32	0.23
195	Below	c:\cmhc\util\star\ALT-s\T7440.chp	133.59	2.75
196	shallow	c:\cmhc\util\star\BC-s\V8005.chp	107.64	0.25
197	shallow	c:\cmhc\util\star\BC-s\V8012.chp	16.64	0.23
198	shallow	c:\cmhc\util\star\BC-s\V8013.chp	121.25	0.23
199	shallow	c:\cmhc\util\star\BC-s\V8019.chp	122.34	0.23
200	shallow	c:\cmhc\util\star\BC-s\V8037.chp	56.00	0.74
201	shallow	c:\cmhc\util\star\BC-s\V8042.chp	78.50	0.27
202	shallow	c:\cmhc\util\star\BC-s\V8066.chp	55.83	0.41
203	shallow	c:\cmhc\util\star\BC-s\V8086.chp	102.98	0.33
204	shallow	c:\cmhc\util\star\BC-s\V8100.chp	111.76	0.26
205	shallow	c:\cmhc\util\star\BC-s\V8101.chp	124.20	0.23
206	shallow	c:\cmhc\util\star\BC-s\V8139.chp	103.05	0.23
207	Below	c:\cmhc\util\star\BC-s\V8158.chp	98.55	0.40
208	Below	c:\cmhc\util\star\BC-s\V8163.chp	87.88	0.40
209	shallow	c:\cmhc\util\star\BC-s\V8179.chp	107.46	0.23
210	shallow	c:\cmhc\util\star\BC-s\V8194.chp	70.14	0.23
211	shallow	c:\cmhc\util\star\BC-s\V8200.chp	70.14	0.23
212	shallow	c:\cmhc\util\star\BC-s\V8201.chp	125.12	0.23
213	shallow	c:\cmhc\util\star\BC-s\V8221.chp	82.02	0.23
214	shallow	c:\cmhc\util\star\BC-s\V8233.chp	121.44	0.23
215	shallow	c:\cmhc\util\star\BC-s\V8239.chp	88.74	0.33
216	shallow	c:\cmhc\util\star\BC-s\V8240.chp	84.84	0.23
217	shallow	c:\cmhc\util\star\BC-s\V8246.chp	105.61	0.23
218	shallow	c:\cmhc\util\star\BC-s\V8247.chp	72.56	0.23
219	shallow	c:\cmhc\util\star\BC-s\V8248.chp	96.46	0.16
220	shallow	c:\cmhc\util\star\BC-s\V8250.chp	50.82	0.23
221	shallow	c:\cmhc\util\star\BC-s\V8251.chp	92.96	0.23
222	shallow	c:\cmhc\util\star\BC-s\V8253.chp	117.68	0.23
223	shallow	c:\cmhc\util\star\BC-s\V8280.chp	99.84	0.36
224	shallow	c:\cmhc\util\star\BC-s\V8281.chp	110.10	0.23
225	shallow	c:\cmhc\util\star\BC-s\V8282.chp	93.94	0.23
226	shallow	c:\cmhc\util\star\BC-s\V8288.chp	99.16	0.23
227	shallow	c:\cmhc\util\star\BC-s\V8302.chp	95.04	0.29
228	shallow	c:\cmhc\util\star\BC-s\V8310.chp	75.90	0.29
229	shallow	c:\cmhc\util\star\BC-s\V8311.chp	63.64	0.29
230	shallow	c:\cmhc\util\star\BC-s\V8316.chp	63.64	0.23
231	shallow	c:\cmhc\util\star\BC-s\V8337.chp	111.84	0.27
232	shallow	c:\cmhc\util\star\BC-s\V8338.chp	91.74	0.23
233	shallow	c:\cmhc\util\star\BC-s\V8341.chp	95.20	0.40
234	shallow	c:\cmhc\util\star\BC-s\V8345.chp	83.62	0.24
235	shallow	c:\cmhc\util\star\BC-s\V8346.chp	115.16	0.46

	A	B	C	D
236	shallow	c:\cmhc\util\star\BC-s\V8351.chp	97.63	0.59
237	shallow	c:\cmhc\util\star\BC-s\V8371.chp	53.31	0.26
238	shallow	c:\cmhc\util\star\BC-s\V8397.chp	79.35	0.23
239	shallow	c:\cmhc\util\star\BC-s\V8398.chp	112.34	0.23
240	shallow	c:\cmhc\util\star\BC-s\V8400.chp	117.39	0.62
241	shallow	c:\cmhc\util\star\BC-s\V8402.chp	68.96	0.40
242	shallow	c:\cmhc\util\star\BC-s\V8407.chp	101.89	0.37
243	shallow	c:\cmhc\util\star\BC-s\V8408.chp	90.57	0.67
244	shallow	c:\cmhc\util\star\BC-s\V8411.chp	128.48	0.47
245	shallow	c:\cmhc\util\star\BC-s\V8413.chp	110.48	0.27
246	shallow	c:\cmhc\util\star\BC-s\V8434.chp	76.50	0.40
247	Below	c:\cmhc\util\star\BC-s\V8434.chp	73.94	0.40
248	shallow	c:\cmhc\util\star\BC-s\V8436.chp	111.02	0.28
249	shallow	c:\cmhc\util\star\BC-s\V8450.chp	109.17	0.28
250	shallow	c:\cmhc\util\star\BC-s\V8456.chp	116.33	0.40
251	shallow	c:\cmhc\util\star\BC-s\V8458.chp	118.87	0.41
252	shallow	c:\cmhc\util\star\BC-s\V8459.chp	91.00	0.40
253	shallow	c:\cmhc\util\star\BC-s\V8610.chp	87.32	0.23
254	shallow	c:\cmhc\util\star\BC-s\V8612.chp	85.54	0.33
255	shallow	c:\cmhc\util\star\BC-s\V8623.chp	68.29	0.25
256	shallow	c:\cmhc\util\star\BC-s\V8633.chp	63.64	0.25
257	shallow	c:\cmhc\util\star\BC-s\V8637.chp	50.02	0.23
258	shallow	c:\cmhc\util\star\BC-s\V8641.chp	82.15	0.23
259	shallow	c:\cmhc\util\star\BC-s\V8643.chp	67.52	0.27
260	shallow	c:\cmhc\util\star\BC-s\V8647.chp	103.96	0.23
261	shallow	c:\cmhc\util\star\BC-s\V8654.chp	97.81	0.40
262	shallow	c:\cmhc\util\star\BC-s\V8667.chp	63.64	0.25
263	shallow	c:\cmhc\util\star\BC-s\V8668.chp	100.11	0.23
264	shallow	c:\cmhc\util\star\BC-s\V8688.chp	99.19	0.23
265	shallow	c:\cmhc\util\star\BC-s\V8715.chp	67.32	0.23
266	shallow	c:\cmhc\util\star\BC-s\V8735.chp	113.27	0.28
267	shallow	c:\cmhc\util\star\BC-s\V8745.chp	92.42	0.23
268	shallow	c:\cmhc\util\star\BC-s\V8784.chp	102.75	0.62
269	shallow	c:\cmhc\util\star\BC-s\V8786.chp	79.20	0.23
270	shallow	c:\cmhc\util\star\BC-s\V8795.chp	124.10	0.29
271	shallow	c:\cmhc\util\star\BC-s\V8838.chp	64.00	0.23
272	shallow	c:\cmhc\util\star\BC-s\V8842.chp	71.44	0.23
273	shallow	c:\cmhc\util\star\BC-s\V8849.chp	80.01	0.23
274	shallow	c:\cmhc\util\star\BC-s\V8852.chp	80.01	0.23
275	shallow	c:\cmhc\util\star\BC-s\V8854.chp	58.32	0.26
276	shallow	c:\cmhc\util\star\BC-s\V8862.chp	12.96	0.23

Appendix B.2

Maximum, Minimum and Average Values of Some Variables in the STAR Database

TOTAL NUMBER OF FILES READ IS 698

VARIABLE NAME	MAX	MIN	AVERAGE
MASS	39.41	4.32	11.3114
FBG2	0.51	0.19	0.770531
FLG2	3.13	0.19	0.770531
FP2	1.15	0.16	0.3073673
FC2	1.15	0.16	0.3073673
SLG2	3.42	0.18	0.7534553
SP2	3.74	0.11	0.3354472
SC2	3.74	0.11	0.3354472
CRP2	2.59	0.16	0.2078182
CRC2	2.59	0.16	0.2078182
CRW2	3.756244	0.25	0.5054469
SLP2	3.74	0.23	0.6565517
SLC2	3.74	0.23	0.6565517
CL2	9.99	0.02	3.579599
EXFR	5.87	0.67	2.71183
W1(I2)	5.56	0.66	2.012564
D1(I2)	1.12	0.2339042	0.5107639
G1(I2)	5.22	0.21	1.047178
SK1(I2)	0	0	0
GL1(I2)	0.59	0.2	0.3551436
GL2(I2)	0.85	0.59	0.770664
BG1(I2)	0.57	0.2	0.3420188
BG2(I2)	0.85	0.67	0.7832258
CHECKSG	29		
AREASG	1771.55		
CHECKSB	246		
AREASB	20412.1		
HOUSET(1)	640		
HOUSET(2)	41		
HOUSET(3)	14		
HOUSET(4)	1		
No Crawlspace	110		
crawlfloorarea	53.64491		
crawlwallarea	31.42154		
crawlheight	1.580073		

Appendix B.3

List of File Names with Missing Variables

	A	B
1	**File Name**	**Missing Variable**
2	c:\cmhc\moddata\Hydr-s\ceny5816.chp	FP2!
3	c:\cmhc\moddata\Hydr-s\ceoa7682.chp	FP2!
4	c:\cmhc\moddata\Hydr-s\ceoa7838.chp	FP2!
5	c:\cmhc\moddata\Hydr-s\ceto6382.chp	SP2!
6	c:\cmhc\moddata\Hydr-s\eaot4564.chp	SP2!
7	c:\cmhc\moddata\Hydr-s\gbba9070.chp	CRP2!
8	c:\cmhc\moddata\Hydr-s\gbba9082.chp	FP2!
9	c:\cmhc\moddata\Hydr-s\gbba9186.chp	SP2!
10	c:\cmhc\moddata\Hydr-s\gbba9186.chp	CRP2!
11	c:\cmhc\moddata\Hydr-s\gbba9240.chp	FP2!
12	c:\cmhc\moddata\Hydr-s\gbba9244.chp	FP2!
13	c:\cmhc\moddata\Hydr-s\gbba9246.chp	FP2!
14	c:\cmhc\moddata\Hydr-s\gbba9326.chp	FLG2!
15	c:\cmhc\moddata\Mrch-s\HAL07.chp	FP2!
16	c:\cmhc\moddata\Mrch-s\HAL10.chp	FLG2!
17	c:\cmhc\moddata\Mrch-s\HAL11.chp	FLG2!
18	c:\cmhc\moddata\Mrch-s\HAL12.chp	FLG2!
19	c:\cmhc\moddata\Mrch-s\HAL13.chp	FLG2!
20	c:\cmhc\moddata\Mrch-s\OTT01.chp	FLG2!
21	c:\cmhc\moddata\Mrch-s\OTT02.chp	FLG2!
22	c:\cmhc\moddata\Mrch-s\OTT03.chp	FLG2!
23	c:\cmhc\moddata\Mrch-s\OTT04.chp	FLG2!
24	c:\cmhc\moddata\Mrch-s\OTT05.chp	FLG2!
25	c:\cmhc\moddata\Mrch-s\OTT06.chp	FLG2!
26	c:\cmhc\moddata\Mrch-s\OTT07.chp	FLG2!
27	c:\cmhc\moddata\Mrch-s\OTT08.chp	FLG2!
28	c:\cmhc\moddata\Mrch-s\OTT09.chp	FLG2!
29	c:\cmhc\moddata\Mrch-s\OTT18.chp	FLG2!
30	c:\cmhc\moddata\Mrch-s\OTT19.chp	FLG2!
31	c:\cmhc\moddata\Mrch-s\MON03.chp	FLG2!
32	c:\cmhc\moddata\Mrch-s\MON04.chp	FLG2!
33	c:\cmhc\moddata\Mrch-s\MON05.chp	FLG2!
34	c:\cmhc\moddata\Mrch-s\MON20.chp	FLG2!
35	c:\cmhc\moddata\Mrch-s\RCD01.chp	FLG2!
36	c:\cmhc\moddata\Mrch-s\RCD02.chp	FLG2!
37	c:\cmhc\moddata\Mrch-s\RCD03.chp	FLG2!
38	c:\cmhc\moddata\Mrch-s\RCD04.chp	FLG2!
39	c:\cmhc\moddata\Mrch-s\RCD05.chp	FLG2!
40	c:\cmhc\moddata\Mrch-s\RCD06.chp	FLG2!
41	c:\cmhc\moddata\Mrch-s\RCD07.chp	FLG2!
42	c:\cmhc\moddata\Mrch-s\RCD08.chp	FLG2!
43	c:\cmhc\moddata\Mrch-s\RCD09.chp	FLG2!
44	c:\cmhc\moddata\Mrch-s\RCD10.chp	FLG2!
45	c:\cmhc\moddata\Mrch-s\RCD11.chp	FLG2!
46	c:\cmhc\moddata\Mrch-s\RCD12.chp	FLG2!
47	c:\cmhc\moddata\Mrch-s\RCD13.chp	FLG2!

	A	B
48	c:\cmhc\moddata\Mrch-s\RCD14.chp	FLG2!
49	c:\cmhc\moddata\Mrch-s\RCD16.chp	FLG2!
50	c:\cmhc\moddata\Mrch-s\RCD17.chp	FLG2!
51	c:\cmhc\moddata\Mrch-s\RCD18.chp	FLG2!
52	c:\cmhc\moddata\Mrch-s\RCD19.chp	FLG2!
53	c:\cmhc\moddata\Mrch-s\RCD20.chp	FLG2!
54	c:\cmhc\moddata\Mrch-s\RCD21.chp	FLG2!
55	c:\cmhc\moddata\Mrch-s\RCD22.chp	FLG2!
56	c:\cmhc\moddata\Mrch-s\RCD23.chp	FLG2!
57	c:\cmhc\moddata\Mrch-s\RCD24.chp	FLG2!
58	c:\cmhc\moddata\Mrch-s\RCD25.chp	FLG2!
59	c:\cmhc\moddata\Mrch-s\RCD26.chp	FLG2!
60	c:\cmhc\moddata\Mrch-s\RCD27.chp	FLG2!
61	c:\cmhc\moddata\Mrch-s\RCD28.chp	FLG2!
62	c:\cmhc\moddata\Mrch-s\RCD29.chp	FLG2!
63	c:\cmhc\moddata\Mrch-s\REG03.chp	SLG2!
64	c:\cmhc\moddata\Mrch-s\REG03.chp	G12!(9)
65	c:\cmhc\moddata\Mrch-s\REG04.chp	G12!(9)
66	c:\cmhc\moddata\Mrch-s\REG05.chp	G12!(9)
67	c:\cmhc\moddata\Mrch-s\REG06.chp	G12!(9)
68	c:\cmhc\moddata\Mrch-s\REG09.chp	G12!(9)
69	c:\cmhc\moddata\Mrch-s\REG10.chp	SLG2!
70	c:\cmhc\moddata\Mrch-s\VAN03.chp	CRP2!
71	c:\cmhc\moddata\Mrch-s\VAN04.chp	FBG2!
72	c:\cmhc\moddata\Mrch-s\VAN04.chp	FLG2!
73	c:\cmhc\moddata\Mrch-s\VAN04.chp	FP2!
74	c:\cmhc\moddata\Mrch-s\VAN05.chp	FP2!
75	c:\cmhc\moddata\Mrch-s\VAN05.chp	SLP2!
76	c:\cmhc\moddata\Mrch-s\VAN05.chp	SLC2!
77	c:\cmhc\moddata\Mrch-s\VAN06.chp	FBG2!
78	c:\cmhc\moddata\Mrch-s\VAN06.chp	FLG2!
79	c:\cmhc\moddata\Mrch-s\VAN08.chp	CRW2!
80	c:\cmhc\moddata\Mrch-s\VAN09.chp	FP2!
81	c:\cmhc\moddata\Mrch-s\VAN09.chp	SLP2!
82	c:\cmhc\moddata\Mrch-s\VAN09.chp	SLC2!
83	c:\cmhc\moddata\Mrch-s\VAN10.chp	SLP2!
84	c:\cmhc\moddata\Mrch-s\VAN10.chp	SLC2!
85	c:\cmhc\moddata\Mrch-s\VAN13.chp	CRW2!
86	c:\cmhc\util\star\QUE-s\G3135.chp	CRW1!
87	c:\cmhc\util\star\QUE-s\G3135.chp	CRW2!
88	c:\cmhc\util\star\QUE-s\G3367.chp	FC1!
89	c:\cmhc\util\star\ALT-s\T7040.chp	CRW1!
90	c:\cmhc\util\star\ALT-s\T7040.chp	CRW2!

Appendix B.4

Revised STAR to ENERPASS Conversion Procedure

(Note: The revised sections are typed in *italics*. The rest is unchanged from the version given in Interim Report No. 2.)

REVISED STAR TO ENERPASS CONVERSION PROCEDURE

Section 3.2:

Current file : use same file name as in STAR (first letter of postal code+4 digit house ID no.)
Title : 4-digit ID no. + province name
Units : metric
Number of zones : main floors + basement + crawl space
Zone 1: main floors
Zone 2: basement or crawl space
Zone 3: crawl space
No. of floors: Record 2/FLN
NOTE: In some STAR files, there are discrepencies with respect to the number of floors given in 2/FLN and the floors for which an area, volume, and perimeter are given, i.e. in 2/FLN the number of floors declared may be different than the number of floor areas declared in Record 7, and the floor volumes declared in Record 8, and the floor perimeters declared in Record 3. Example: in house no. 4664, the number of floors is declared as two, but there are three floor areas, three volumes, and three perimeters given in the subsequent records. Therefore, a cross referencing will be done as follows:
The number of floor areas, volumes and perimeters given will be checked and this value will be compared to number of floors. If there is a difference, a message will be stored in a file, and the number of floors determined based on number of floor areas given will be used.
Basement: check existence, Rec. 3/SB or Rec. 3/FB if not = 0
Crawl space: check existence, Rec. 3/CR if not = 0

System type : STAR files do not have info on type of htng system. Therefore:
If fuel is electric: use baseboard
If fuel is other: use forced air
Fuel info from Rec. 4/SPF(I)
If more than 1 fuel is used, check measured energy usage for fuels, base it on major fuel. (fuel usage from: Rec.4/MJS(I))

System option : Here, out of the options that ENERPASS provides, only the 'exhaust heat recovery' option could be applicable. However, houses in STAR do not have HRV's. Therefore, no options apply.

On the other hand, some houses from Hydro and Merchant Studies contain HRV. In these houses, HRV and Make-up Air Unit option are used if the main heating fuel is electricity. This extra Make-up Air Unit option is necessary in order to model HRV with electric baseboard heating in ENERPASS. However, if other heating fuel is used, only HRV option is used.

Section 3.3: Building Menu

Zone names : If Crawl Space exists: Zone 3 is crawl space
If Basement exists: Zone 2 is basement
If floors 1-3 exist: Zone 1 is all main floors,
If any do not exist - name zones accordingly

Section 3.3.1: Wall and window menu

For All Zones:

Above Grade Walls - for Main Floors:

Link : no walls are linked

Area : Take main wall area (29/W1(I,1), add to this door area (30/D1(I,1) and window area (33/GL1(I,1). Divide this total area by four and assign each to each direction given in Record 33. (door and window areas are added since gross wall area is required in ENERPASS).

Wall Con.Code: From building thermal mass classification (Rec. 6/MC in STAR) decide on wall construction according to Hot2000 User Manual. The thicknesses and capacitances will be the same as used in Hot2000 according to the thermal mass classification. The most common thermal mass type for housing are type A, B, and C. Note that (Rec. 6/MC) is not listed in the report from Scanada.

Using this thermal mass classification, new custom walls will be defined with the actual RSI values from each house with the appropriate construction for each type of thermal mass.

Example: Type A thermal mass with RSI value of 4.00

-1. RSI: 4.00, Thick1: 12.7 (inside drywall), C1: 11, ABS1: 0.3, Thick2: 10 (outside siding), C2: 2, ABS2:0.3.

Example: Type B thermal mass with RSI value of 4.00

-1. RSI: 4.00, Thick1: 50 (inside drywall), C1: 11, ABS1: 0.3, Thick2: 10 (outside siding), C2: 2, ABS2:0.3.

Example: Type C thermal mass with RSI value of 4.00

-1. RSI: 4.00, Thick1: 100 (inside brick), C1: 8, ABS1: 0.7, Thick2: 10 (outside siding), C2: 2, ABS2:0.3.

Direction : As explained in area.

Windows:

Area : For each direction, the window area is given in STAR 33/GL1(I,1) where I=1 is N, I=2 is S, I=3 is E, I=4 is W, I=5 is NE, I=6 is NW, I=7 is SE, I=8 is SW.

Frame code: No information is given on frame construction in STAR. Therefore, it will be assumed that all frames are 10% of window area, and U=2.3 (Code# 1 in ENERPASS).

Glazing code: Custom glazing descriptions will be developed based on Transmission coefficient (33/GL2(I,2) and RSI (GL1(I,2)) [Note: In STAR 'Transmission Coefficient' term is used to mean 'Shading Coefficient'.]

Ucgl = Uedg = RSI glazing (several steps of RSI)

SHADE = transmission coeff. in STAR (several steps)

Tvis = 0.8 always [This is the 'Visible transmission coefficient, which is 0.8 for clear double glazed windows as given in ENERPASS manual.]

Doors:

Area : put all door area (D1(I,1)) in the first direction since direction is not given in STAR and not critical.

RSI : (D1(I,2)).

Above Grade Walls - for Basement:

Link : no walls are linked

Area : Take basement exposed wall area (31/G1(I,1), add window area (34/BG1(I,1). Divide this total area by four and assign each to each direction. (door and window areas are added since gross wall area is required in ENERPASS).

*Wall Con.Code: From building thermal mass classification (Rec. 6/MC in STAR) decide on wall construction *** according to Hot2000 User Manual. The thicknesses and capacitances will be the same as used in Hot2000 according to the thermal mass classification. The most common thermal mass type for housing are type A, B, and C. *** Note that (Rec. 6/MC) is not listed in the report from Scanada.*

Using these thermal mass classification, new custom walls will be defined with the actual RSI values from each house with the appropriate construction for each type of thermal mass.

Example: Type A thermal mass with RSI value of 4.00

-2. RSI: 4.00, Thick1: 12.7 (inside drywall), C1: 11, ABS1: 0.3, Thick2: 10 (outside siding), C2: 2, ABS2:0.3.

Example: Type B thermal mass with RSI value of 4.00

-2. RSI: 4.00, Thick1: 50 (inside drywall), C1: 11, ABS1: 0.3, Thick2: 10 (outside siding), C2: 2, ABS2:0.3.

Example: Type C thermal mass with RSI value of 4.00

-2. RSI: 4.00, Thick1: 100 (inside brick), C1: 8, ABS1: 0.7, Thick2: 10 (outside siding), C2: 2, ABS2:0.3.

Direction : As explained in area.

Windows:

Area : For each direction, the window area is given in STAR 34/BG1(I,1) where I=1 is N, I=2 is S, I=3 is E, I=4 is W, I=5 is NE, I=6 is NW, I=7 is SE, I=8 is SW.

Frame code: No information is given on frame construction in STAR. Therefore, it will be assumed that all frames are 10% of window area, and U=2.3 (Code# 1 in ENERPASS).

Glazing code: Custom glazing descriptions will be developed based on Transmission coefficient (34/BG2(I,2) and RSI (BG1(I,2)) [Note: In STAR 'Transmission Coefficient' term is used to mean 'Shading Coefficient'.]

Ucgl = Uedg = RSI glazing (several steps of RSI)

SHADE = transmission coeff. in STAR (several steps)

Tvis = 0.8 always [This is the 'Visible transmission coefficient, which is 0.8 for clear double glazed windows as given in ENERPASS manual.]

Doors:

No doors in basement.

Above Grade Walls - for Crawl Space:

Link : no walls are linked

Area : Take crawl space exposed wall area (22/CRW1) and assign it to first direction.

*Wall Con.Code: From building thermal mass classification (Rec. 6/MC in STAR) decide on wall construction *** according to Hot2000 User Manual. The thicknesses and capacitances will be the same as used in Hot2000 according to the thermal* *mass classification. The most common thermal mass type for housing are type A, B, and C. *** Note that (Rec. 6/MC) is not listed in the report from Scanada.*

Using these thermal mass classification, new custom walls will be defined with the actual RSI values from each house with the appropriate construction for each type of thermal mass.

Example: Type A thermal mass with RSI value of 4.00

-3. RSI: 4.00, Thick1: 12.7 (inside drywall), C1: 11, ABS1: 0.3, Thick2: 10 (outside siding), C2: 2, ABS2:0.3.

Example: Type B thermal mass with RSI value of 4.00

-3. RSI: 4.00, Thick1: 50 (inside drywall), C1: 11, ABS1: 0.3, Thick2: 10 (outside siding), C2: 2, ABS2:0.3.

Example: Type C thermal mass with RSI value of 4.00

-3. RSI: 4.00, Thick1: 100 (inside brick), C1: 8, ABS1: 0.7, Thick2: 10 (outside siding), C2: 2, ABS2:0.3.

Direction : As explained in area.

Windows:

No windows in crawl space

Doors:

No doors in crawl space.

<u>Section 3.3.2: Ceilings, floors and below grade menu:</u>

For Main Floor (Above-Grade) Zones:

Above grade floor:

Link : (i) to basement zone (zone 2) if there is basement
(ii) to crawl space (zone 2 : this is because if there is no basement crawl space becomes zone 2) if there is crawl space
(iii) to both if there is both (use respective areas) (zone 2 is basement, zone 3 is crawl space)

Area : if (i) = basement floor area : (07/BMFA)
if (ii) = crawl space floor area : (07/CRRFA)
if (iii) = one part is basement floor area (07/BMFA) and other part is crawl space floor area (07/CRRFA)

Construction code: Since no information on the main floor construction is available from STAR, floor construction type NO. 10 (Lino or carpet/wood frame/gypsum) is used from ENERPASS.

Height to ceiling: Since all upper floors (i.e. other than basement and crawl space) are modelled as one zone (Zone #1), the 'height to ceiling' should be taken as the whole height of the floors making up the zone corrected for first floor area. Thus, the 'height to ceiling (HTC)' will be calculated as follows:
HTC = $\sum$ floor volumes (8/FLMV+FL2V+FL3V) / First floor area (7/FLMA)
This way, the zone volume can be calculated correctly.

Ceiling:

Area : Value can be directly transferred from STAR (27/CL1).

Construction code: Since no ceiling assembly code is available, RSI value (27/CL2) and the similar thermal mass classification used in wall construction is used. Again, the ceiling construction will be based on 3 thermal mass classifications; A, B, and C.

Example: Type A thermal mass with RSI=5.0

-1. RSI:5.0, Thick1: 12.7(inside gypsum), C1:11, ABS1:0.3, ABS2:0.8
Example: Type B thermal mass with RSI=5.0
-1. RSI:5.0, Thick1: 25.4(inside gypsum), C1:11, ABS1:0.3, ABS2:0.8

Skylight:

Area : Value can be directly transferred from (32/SK1(I,1)).

Frame code: No information is given on frame construction in STAR. Therefore, it will be assumed that all frames are 10% of window area, and U=2.3 (Code# 1 in ENERPASS).

Glazing code: Custom glazing descriptions will be developed based on RSI (32/SK1(I,2)). [Note: In STAR 'Transmission Coefficient' term is used to mean 'Shading Coefficient'.] The same transmission coefficient from window record (33/GL2(I,2)) is used.

Ucgl = Uedg = RSI glazing (several steps of RSI)
SHADE = transmission coeff. in STAR (several steps)
Tvis = 0.8 always [This is the 'Visible transmission coefficient, which is 0.8 for clear double glazed windows as given in ENERPASS manual.]

Below-grade walls:

No below-grade walls for main-floor zones.

Below-grade/Slab-on-grade floor:

First check if 'slab on grade': If (03/SG = 1, then it is slab on grade)
Then use Record 23 to get areas and R values:
Insul. area : 23/SLP1 (perimeter floor area)
Uninsul. area: 23/SLC1 (center floor area)
Costr. code : generate own categories based on ENERPASS categories, use RSI categories from STAR, and use the following for other parameters for all floors:

Loc: 0
Thick1: 15
C1: 12
ABS1: 0.65
RSIi : 23/SLP2
RSIu : 23/SLC2

For Basement (Below-Grade) Zones:

Above grade floor:

No data is needed since the basement floor is bulit either on-grade or below-grade.

Ceiling:

No data is needed since the ceiling of the basement is already defined as a floor in the main floor zone above.

Skylight:

No data is needed since there is no skylight in the basement.

Below-grade walls:

Area : First check type of basement:

If 03/SB = 1 shallow basment
If 03/FB = 1 full basement
Values can be transferred directly either from full basement (18/FBG1+18/FLG1) or shallow basement (20/SLG1).

Construction code: No data other than RSI is given in STAR. Therefore, take weighted average (parallel heat flow) of the U value (1/R) for upper and lower wall. Other variables in Const. Code def'n to be:

Thick1 = 12.7
C1 = 11
ABS1 = 0.3
Thick2 = 200
C2 = 5

Below-grade/Slab-on-grade floor:

Since whether a full basement or shallow basement is defined earlier, the values of area and RSI can be taken from either Record 19 or 20.

Then use Record 19 or 20 to get areas and R values:

Insul. area : 19/FP1 for full basement and 20/SP1 for shallow basement.
Uninsul. area: 19/FC1 for full basement 20/SC1 for shallow basement
Costr. code : generate own categories based on ENERPASS categories, use RSI categories from STAR (19/FP2 and 19/FC2) for full basement and (20/SP2 and 20/SC2) for shallow basement), and use the following for other parameters for all floors:

Loc: 0
Thick1: 15
C1: 12
ABS1: 0.65
RSIi : 19/FP2 for full basment and 20/SP2 for shallow basement (in several s steps)
RSIu : 19/FC2 for full basement and 20/SC2 for shallow basement (in several steps)

3.3.3 Environment Menu:

There are no changes to the original text presented in Interim Report 2 below this point.

APPENDIX C

Tables and Figures

Table 1. Recent major end-use metering projects.

Sponsor	Geographic Area	Project Name	Sector[a]	Sample Type[b]	# of Bldgs.	EU/ Bldg.[c]	Total EUs	Protocol Type[d]	Quality Control[e]	Time Resol.	Dur. (Yrs.)	Status
Bonneville Power Administration	Hood R., Ore.	Hood River	RES	Retro/Stat	314	3	942	All EU-Sub	Limit	15 min.	5	Completed
	Pacific NW	RSDP	RES	Exp/Ctrl	422	3	1,266	All EU-Sub	Limit	Weekly	2	Completed
	Pacific NW	ELCAP-Base	RES	Statistical	288	8	2,304	All EU	Sumcheck	Hourly	5	Ongoing
	Pacific NW	-Case	RES	Special	56	8	448	All EU	Sumcheck	Hourly	5	Ongoing
	Pacific NW	-RSDP	RES/MF	Exp/Ctrl	155	8	1,240	All EU	Sumcheck	Hourly	6	Ongoing
	Seattle, Wash.	-Base	COM	Statistical	103	12	1,236	All EU	Sumcheck	Hourly	4	Ongoing
	Pacific NW	-CREUS	COM	Retrofit	40	12	480	All EU	Sumcheck	Hourly	4	Ongoing
	Pacific NW	Energy Edge	COM	Experimental	28	7	196	All EU	Sumcheck	Hourly		Start-up
Seattle City Light	Seattle, Wash.	CHEUS	COM	Retro/Stat	7	3	21	All EU-Sub	Limit	Hourly	6	Completed
Tacoma City Light	Tacoma, Wash.	Multifamily	MF	Exp/Ctrl	100	3	300	All EU	Sumcheck	Hourly	–	Start-up
DOE & EPRI	National	MRI	RES	Statistical	150	6	900	Select EU	?	Monthly	1	Completed
Pacific Gas & Electric	N. Calif.	AMP	RES	Statistical	750	3	2,250	Select EU	Visual	30 min.	2+	?
	N. Calif.	MYCE	COM	Statistical	45	5	225	All EU	Sumcheck	30 min.	–	Start-up
So. Calif. Edison	So. Calif.		RES	Special	124	4	496	Select EU	Visual	5 min.	2+	?
	So. Calif.		RES	Geographical	100	4	400	Select EU	Lim/Vis	5 min.	–	Start Up
	So. Calif.	RESA	COM	Geographical	53	4	212	All EU-Sub	Lim/Vis	15 min.	2	Ongoing
Sierra Pacific	Nev., E. Calif.	EIP-Res	RES/MF	Statistical	105	4	420	Select EU	Visual	?	?	?
		-Com	COM	Statistical	105	4	420	Select EU	Visual	?	?	?
Wisconsin Electric	Milwaukee		COM	Statistical	50	4	200	Select EU	Visual	15 min.		Start-up
Northeast Utilities	Connecticut		RES	Exp/Ctrl	250	4	1,000	Select EU	Visual	15 min.		Start-up
	Connecticut		COM	Exp/Ctrl	75	5	375	Select EU	Visual	15 min.		Start-up
Several utilities	Massachusetts	JUMP	RES	Statistical	28	3	84	Select EU	Visual	?	2+	?
Ariz. Public Service	Arizona	LCEP	RES	Exp/Ctrl	100	3	300	Select EU	Visual	15 min.	2	?
Gulf States Utilities Co.	?		RES	Special	232	4	928	All EU-Sub	Lim/Vis	?	?	?
Consolidated Edison	New York		RES	Statistical	396	2+	792+	Select EU	Visual	?	?	Completed
State of Texas	Texas		COM	Retrofit								Start-up
Penn. Power & Light	Pennsylvania		COM	Statistical	49	3	147	All EU-Sub	Lim/Vis	?	1	Completed

[a] Sectors abbreviations: RES = Residential; MF = Multifamily; COM = Commercial. [b] Sample Type Abbreviations: Retro/Stat = Retrofit/Statistical; Exp/Ctrl = Experimental and Control (see text). [c] Average number of end uses per building (approximate): one may be by end use by subtraction for All EU-Sub. [d] End-use protocol type: All EU = separately metered; All EU-Sub = one by subtraction; Select EU = selected end uses/appliances only (see text). [e] Quality control abbreviation: Lim/Vis = Building total limit and visual reasonableness checks (see text)

Table 2. Comparison of Seasonal Adjustment Factors

Appliance	Winter Dec-Feb	(%)[1]	Spring Mar-May	(%)	Summer Jun-Sep	(%)	Fall Oct-Nov	(%)	Annual UEC[2] (kWh/yr)	Households Metered
Refrigerator										
CEC	0.96		0.97		1.13		0.92			
LBL-PG&E	0.88	*-8.3*	0.94	*-3.1*	1.13	*0.0*	0.99	*7.6*	1924	21
LBL-SCE	0.84	*-12.5*	1.08	*11.3*	1.09	*-3.5*	0.93	*1.1*	1691	62
Freezer										
CEC	0.96		0.97		1.13		0.92			
LBL-SCE	0.92	*-4.2*	0.93	*-4.1*	1.09	*-3.5*	1.05	*14.1*	1247	28
Cooking										
CEC	1.06		1.05		0.89		0.97			
LBL-PG&E	1.10	*3.8*	0.99	*-5.7*	0.89	*0.0*	1.08	*11.3*	381	338
LBL-SCE	0.95	*-10.4*	1.07	*1.9*	1.02	*14.6*	0.94	*-3.1*	226	19
Clothes Washer										
CEC	0.99		1.01		0.97		1.03			
LBL-SCE	1.01	*2.0*	1.02	*1.0*	1.00	*3.1*	0.96	*-6.8*	78	59
Clothes Dryer										
CEC	1.15		1.01		0.97		0.79			
LBL-PG&E	1.15	*0.0*	1.01	*0.0*	0.88	*-9.3*	1.01	*27.8*	892	373
LBL-SCE	1.05	*-8.7*	1.02	*1.0*	0.97	*0.0*	0.97	*22.8*	922	30
Dishwasher										
CEC	1.06		1.05		0.89		0.97			
LBL-SCE	1.14	*7.5*	1.00	*-4.8*	0.82	*-7.9*	1.15	*18.6*	81	17
Water Heating										
CEC(PG&E)	1.11		1.03		0.88		0.96			
LBL-PG&E	1.20	*8.1*	1.04	*1.0*	0.80	*-9.1*	1.04	*8.3*	4012	72
Television Set										
CEC	1.14		0.97		1.00		0.87			
LBL-SCE	1.11	*-2.6*	1.29	*33.0*	0.79	*-21.0*	0.81	*-6.9*	215	16
Pool Pump										
CEC	0.84		0.84		1.33		0.84			
LBL-SCE	1.06	*26.2*	0.94	*11.9*	0.83	*-37.6*	1.33	*58.3*	401	9

1. Percentage differences are expressed relative to the current values used by the CEC Residential Peak Model.

2. Unweighted annual UECs developed from integration of the metered data have been presented for purposes of comparison; they should not be confused with systemwide UECs applicable for forecasting.

TABLE 3

END-USE DESCRIPTIONS FOR ELCAP RESIDENTIAL STUDIES a/

ELCAP End Uses	Notes on ELCAP End Uses
Hot Water	End use is pure
Heating	Used when pure (76% of sites) b/ c/
Cooling	Used when pure b/ c/ d/
Refrigerator	Used when pure (25% of homes)
Mixed Refrigerator	Used when primary refrigerator is mixed with a plug circuit (75% of homes)
Lights/ Convenience	Used for all other plug circuits not dedicated to a single end use
Freezer	Used when appliance is present and load is pure (10% of homes) e/
Range	End use is pure (a combination of ranges, stove tops & ovens)
Dryer	End use is pure
Clothes Washer	Used when appliance is present and load is pure (36% of homes) e/
Dishwasher	Used when appliance is present and load is pure (33% of homes) e/
Special Major Appliances	Used for hot tubs, kilns, workshops, etc.

ELCAP Triple-Metered Categories	Notes on Triple-Metered End-Use Categories
Heating, Ventilating Air Conditioning (HVAC)	The sum of Heating and Cooling, also used for mixed heating and cooling when not pure (primarily heat pumps, 24% of homes)
Hot Water	Same as the Hot Water end use above
Other	The sum of all loads except HVAC and Hot Water
Total	The sum of HVAC, Hot Water, and Other

a/ Percentages of homes with pure end uses are for the Base Study only.
b/ Includes circulation fans.
c/ Heat pump loads appear on HVAC end-use category only.
d/ Many window-unit air conditioner loads appear on the Lights/ Convenience end use.
e/ Load appears on Lights/Convenience end use when load is not pure.

Table 4 - Electricity Consumption Data (kWh/yr) Pg. 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1			REFERENCE NUMBER (Notes in parantheses explained at the bottom of table)												(8)											
2	App.#	Electric appliance	8	8 (1)	8(2)	8(3)	8(4)	8(5)	8(6)	12	4,5	11	6	1(13)	1(14)	9(15)	9(16)	10[9]	10[10]	11(11)	11(12)	12	7	Maximum	Minimum	Average
3	1	Refrigerator (7)																								
4	2	Standard	1665		460	750	726	728		728	1500		1500											1665	460	1007
5	3	Frostless					1210	1217		1217	1591													1591	1210	1309
6	4	Refrigerator/freezer																						0	0	
7	5	Standard		1228	1085-1330		1137	1137		1137														1228	1137	1160
8	6	Frostless			1505			1829		1829				1691	1924	1226	893	1450	1100	1200	900	950	1200	1924	893	1361
9	7	Freezer																						0	0	
10	8	Standard	1342	1480	1560	1200	1210	1195		1195	1050		1450											1560	1050	1298
11	9	Frostless			1760		1739	1761		1761	1820				1247	1104	568	1050	750	810	600	700	900	1820	568	1184
12	10	Range	782	2071	1225	1550	1210	1175-1205		1175-1205	596		600			1010	944	800	750	770	740			2071	596	1004
13	11	Cooktop	553																					553	553	553
14	12	Conv'n Oven	401																					401	401	401
15	13	Microwave		300				190		190	100	120												300	100	180
16	14	Water heater	4046	4515	5400		4233	4219		4219			4800	4012		3850	3539	4000	3500	3800	3300	5500	4725	5500	3300	4229
17	15	Dishwasher	149	363	340	350	378	362		363	185	200	120		81								175	378	81	256
18	16	Clothes washer	88	90	65	100	98	76-103		76-103	103		100		78								110	110	65	92
19	17	Clothes dryer	1032	993	1100	1200	980	993		993	993		1200	892	922	904	880	1000	900	1090	1060	1050	1000	1200	880	1010
20	18	Room air-cond'r	3573	1389	1265	2000		1389		1889			1300											3573	1265	1829
21	19	Central air-cond'r	978																					978	978	978
22	20	Central furnace	2558																					2558	2558	2558
23	21	Swim'g pool pum	1307								1000	1500												1500	1000	1269
24	22	TV Sets																						0	0	
25	23	Color		502	450	540		660-440			320	250			215	205	205					200		540	200	321
26	24	B&W		362	345	400		350-120			100	40				50	50							400	40	192
27	25	VCR										40												40	40	40
28	26	Computer										130												130	130	130
29	27	Humidifier						163		136	163	100												163	100	141
30	28	Dehumidifier			380			377		377	377	400												400	377	382
31	29	Aquarium/terrarium										548												548	548	548
32	30	Toaster		39	35	40	39	39	39	39		50												50	35	40
33	31	Waffle iron		22			22	22	20	22														22	20	22
34	32	Griddle							46															46	46	46
35	33	Fry pan (skillet)		186	190	240	189	186	100	186														240	100	182
36	34	Mixer		13		10	13	13	2	13														13	2	11
37	35	Coffee maker		106	95	100	76	106	138	106		50												138	50	97
38	36	Blender		15			15	15	1	15														15	1	12
39	37	Juicer							1															1	1	1
40	38	Can opener		10		0	5		0															10	0	4
41	39	Opener/sharpener								0														0	0	0
42	40	Sharpener								0														0	0	0
43	41	Crockpot							139															139	139	139

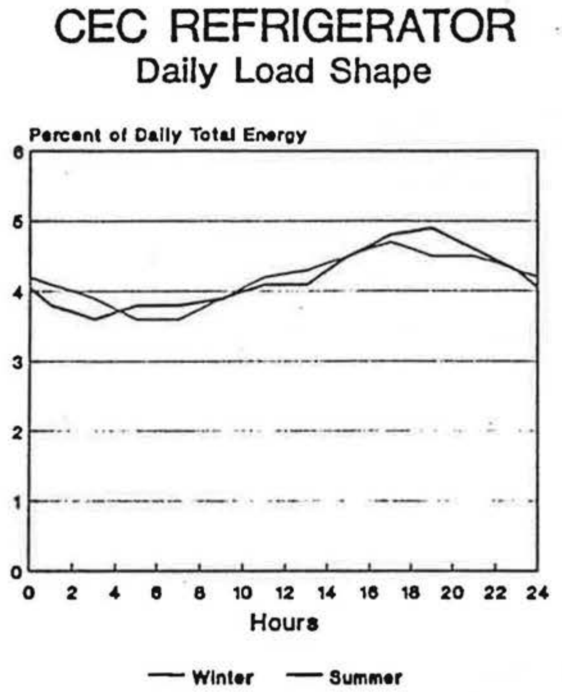
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
44	42	Wok/fondue set							9															9	9	9
45	43	Broiler		100				100	85	100														100	85	96
46	44	Roaster						205	60	205														205	60	157
47	45	Toaster oven							93															93	93	93
48	46	Plate warmer		90		100	91	90		90														100	90	92
49	47	Knife/slicer					8	8	1	8														8	1	6
50	48	Food grinder																						0	0	
51	49	Popcorn popper																						0	0	
52	50	Ice crusher							1															1	1	1
53	51	Ice cream maker							1															1	1	1
54	52	Instant hot water										160												160	160	160
55	53	Clock		17	18	17		17				25												25	17	19
56	54	Garbage disposal		. 30		30	30	30		30		10												30	10	27
57	55	Trash compactor						30		50														50	30	40
58	56	Deep fryer						83		83														83	83	83
59	57	Egg cooker						14	13	14														14	13	14
60	58	Sandwich grill						33	20	33														33	20	29
61	59	Kettle							75															75	75	75
62	60	Rotisserie							73															73	73	73
63	61	Baby food warmer							22															22	22	22
64	62	Cooker/fryer							23															23	23	23
65	63	Table radio		86	90	20		86																90	20	71
66	64	Audio system										50												50	50	50
67	65	Amp'r (guitar/organ)																						0	0	
68	66	CD player																						0	0	
69	67	Tape deck																						0	0	
70	68	Slide/movie projector																						0	0	
71	69	Blanket		147	140	150		147		147	147	120												150	120	143
72	70	Waterbed heater									1600	900												1600	900	1250
73	71	Massager						2	0															2	0	1
74	72	Heating pad		10	9			10	3	10														10	3	8
75	73	Heat tape										100												100	100	100
76	74	Heat lamp						15																15	15	15
77	75	Grow lights & acc.										800												800	800	800
78	76	Shaver			2	1		2	1															2	1	1
79	77	Hair dryer		14	7	15		14	25			40												40	7	19
80	78	Curling iron																						0	0	
81	79	Curler																						0	0	
82	80	Hot comb																						0	0	
83	81	Tooth brush						1	10															10	1	5
84	82	Water pic																						0	0	
85	83	Sewing machine						11																11	11	11
86	84	Portable heater						170		176														176	170	173

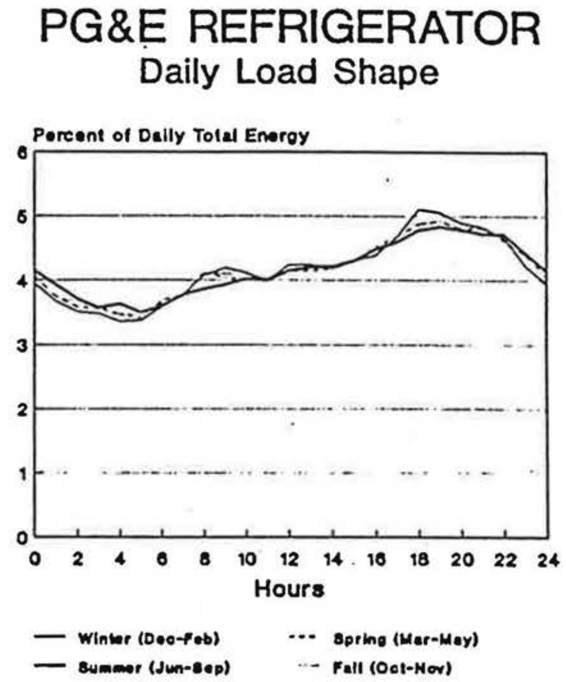
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
87	85	Exhaust fan																						0	0	
88	86	Attic			310	270		291		291														310	270	291
89	87	Circulating						43		43	200	80												200	43	92
90	88	Furnace				480					650	500												650	480	543
91	89	Rollaway						138		133														138	133	136
92	90	Window						170		170		20												170	20	120
93	91	Ceiling									170	50												170	50	110
94	92	Exhaust										15												15	15	15
95	93	Vacuum cleaner		46	40	45	46	46				30												46	30	42
96	94	Iron		144	135	150	144	144	60	144		50												150	50	121
97	95	Flood lights																						0	0	
98	96	Fluorescent lights				1870																		1870	1870	1870
99	97	Air cleaner						216		216														216	216	216
100	98	Floor polisher						15																15	15	15
101	99	Spa/hot tub										2300												2300	2300	2300
102	100	Sauna																						0	0	
103	101	Lighting&conv.											4700			1060	1060	1000	1000					4700	1000	1764

Notes:

(1) Merchandising week data from Ref.8.
(2) Potomac Electric Power Company from Ref.8
(3) Citizens Advisory Committee on Environmental Quality from Ref. 8
(4) University of Illinois from Ref. 8
(5) Electric Energy Association/Energy Facts from Ref. 8
(6) Association of Home Appliance Manufacturers from Ref. 8
(7) Sizes ranging from 10 - 16 cubic feet
[8] References after column "N" are from Interim Report 4
[9] 1986 stock data (typical)
[10] 1986 new equipment (typical)
(11) 1991 stock data (typical)
(12) 1991 new equipment (typical)
(13) PG&E Data
(14) SCE data

Figure 1. **Load Shape Comparison - Refrigerator.** Comparison of LBL's analysis of metered data (gathered by PG&E and SCE) to the daily load shapes currently used by the CEC Residential Peak Model. The PG&E daily load shape was developed from an analysis of 21 households. The SCE daily load shape was developed from an analysis of 62 households.





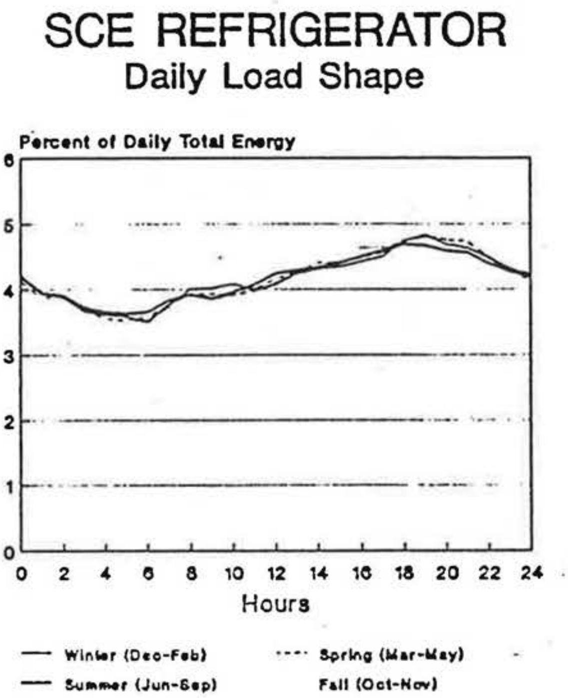
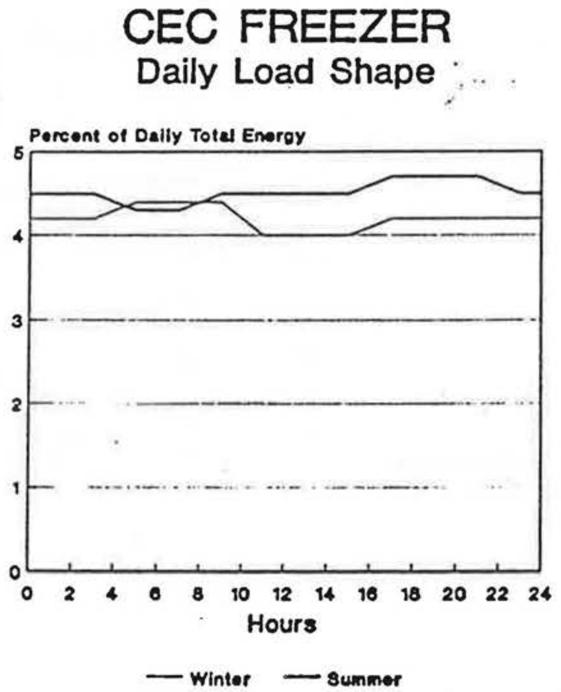


Figure -2. **Load Shape Comparison - Freezer.** Comparison of LBL's analysis of metered data gathered by SCE to the daily load shapes currently used by the CEC Residential Peak Model. The SCE daily load shape was developed from an analysis of 28 households.



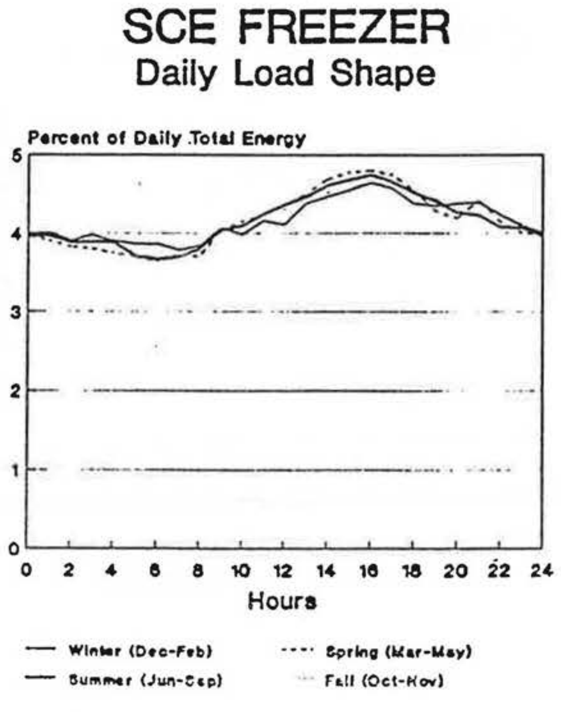
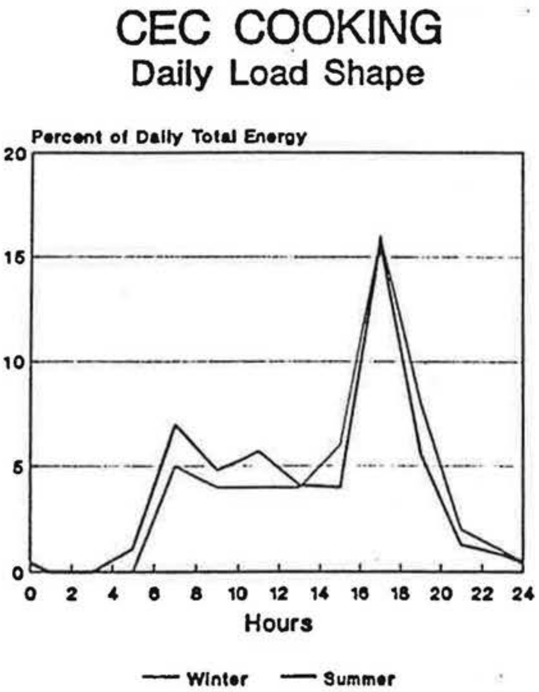
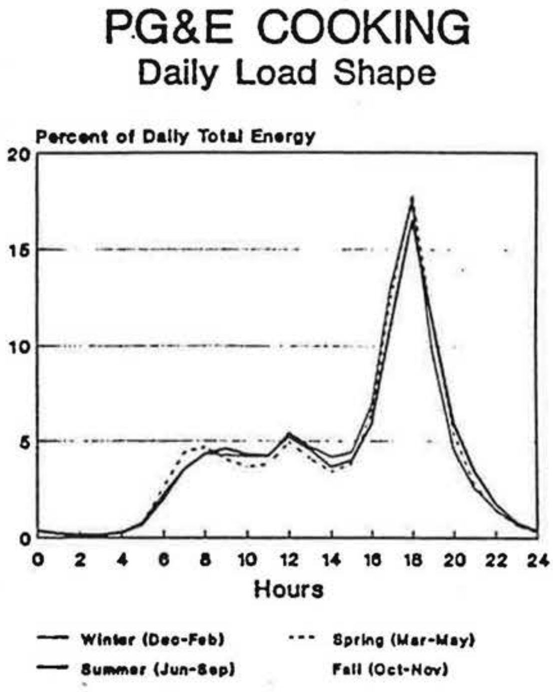


Figure - .3. **Load Shape Comparison - Cooking.** Comparison of LBL's analysis of metered data gathered by PG&E and SCE to the daily load shapes currently used by the CEC Residential Peak Model. The PG&E daily load shape was developed from an analysis of 338 households. The SCE daily load shape was developed from an analysis of 19 households.





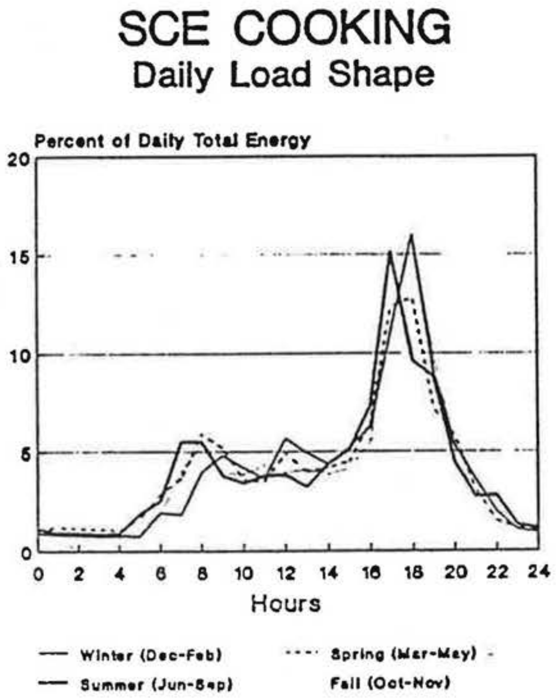
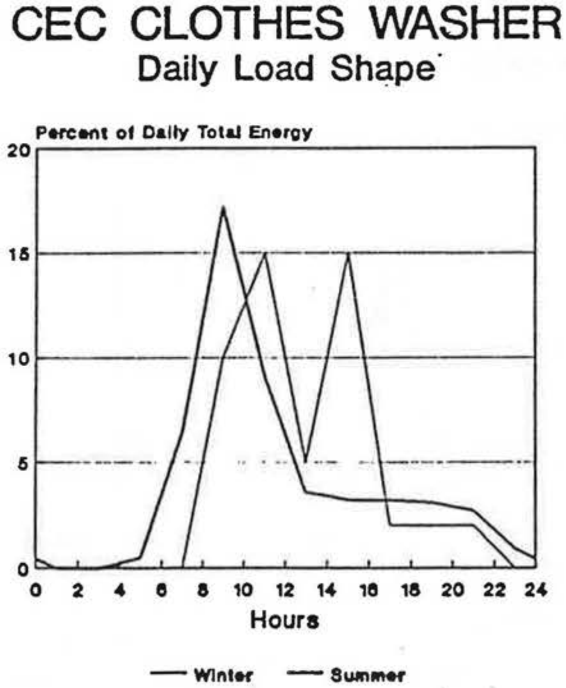


Figure 4. **Load Shape Comparison - Clothes Washer.** Comparison of LBL's analysis of metered data gathered by SCE to the daily load shapes currently used by the CEC Residential Peak Model. The SCE daily load shape was developed from an analysis of 59 households.



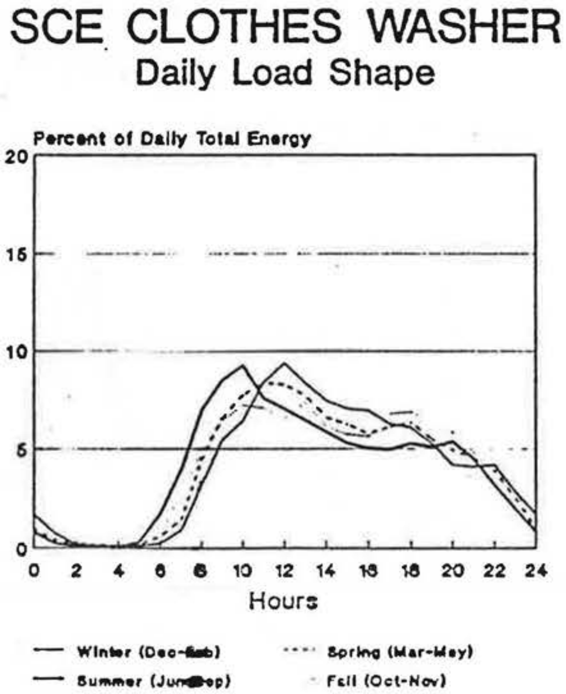
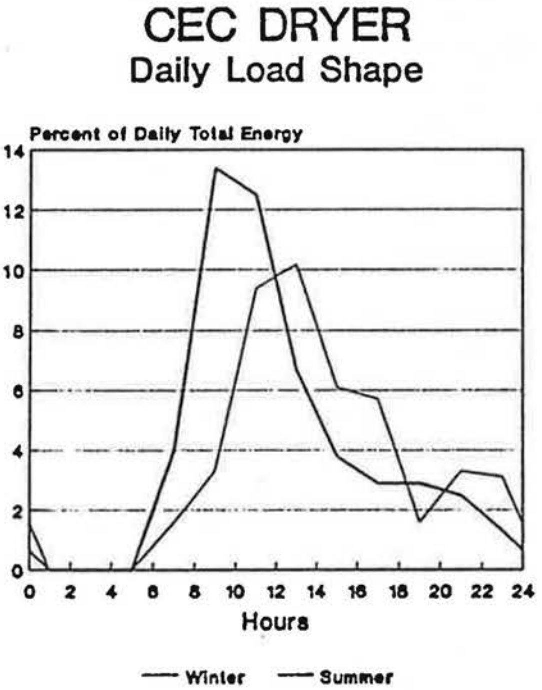
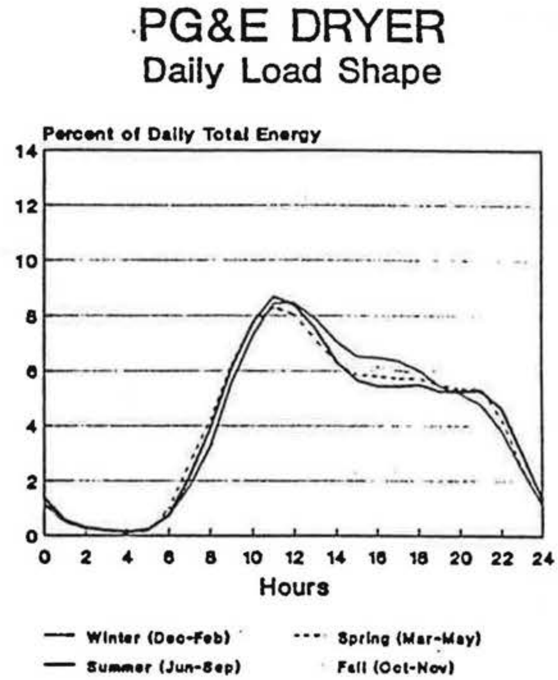


Figure 5. Load Shape Comparison - Clothes Dryer. Comparison of LBL's analysis of metered data gathered by PG&E and SCE to the daily load shapes currently used by the CEC Residential Peak Model. The PG&E daily load shape was developed from an analysis of 373 households. The SCE daily load shape was developed from an analysis of 30 households.





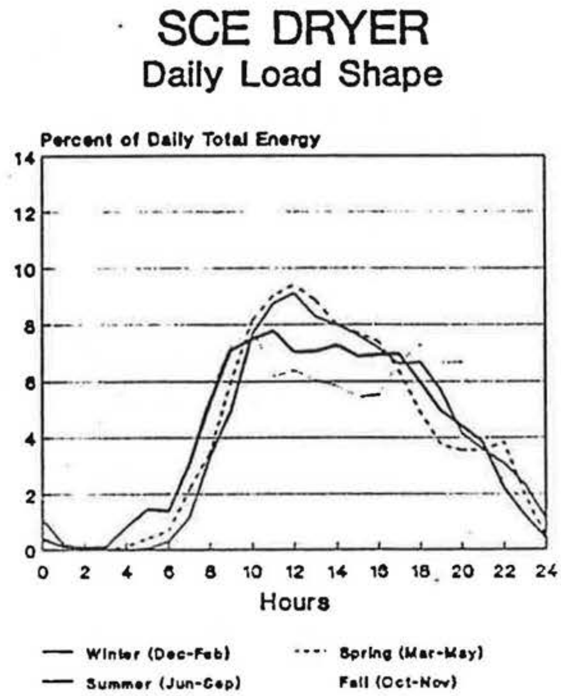
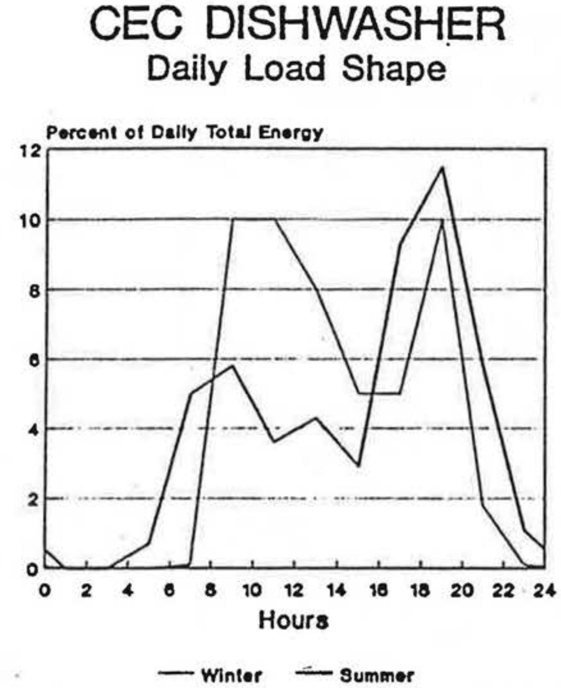


Figure 5. Load Shape Comparison - Dishwasher. Comparison of LBL's analysis of metered data gathered by SCE to the daily load shapes currently used by the CEC Residential Peak Model. The SCE daily load shape was developed from an analysis of 17 households.



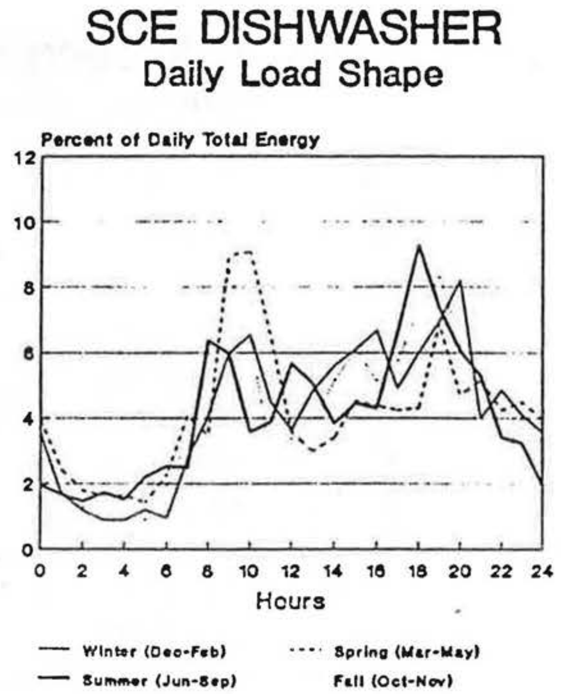
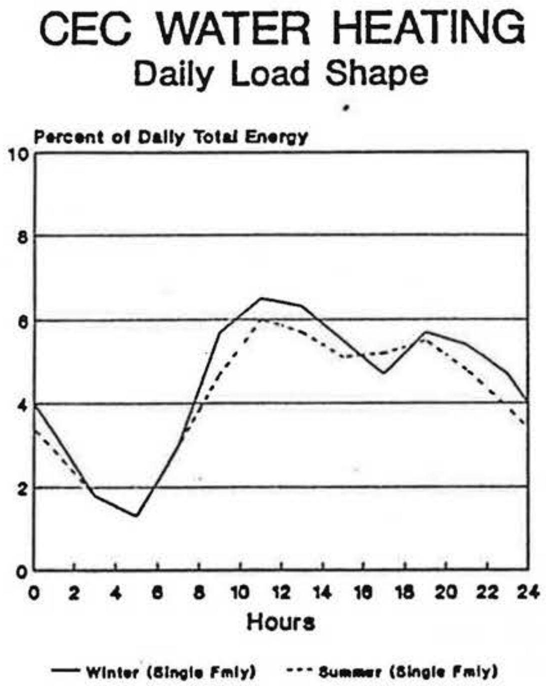
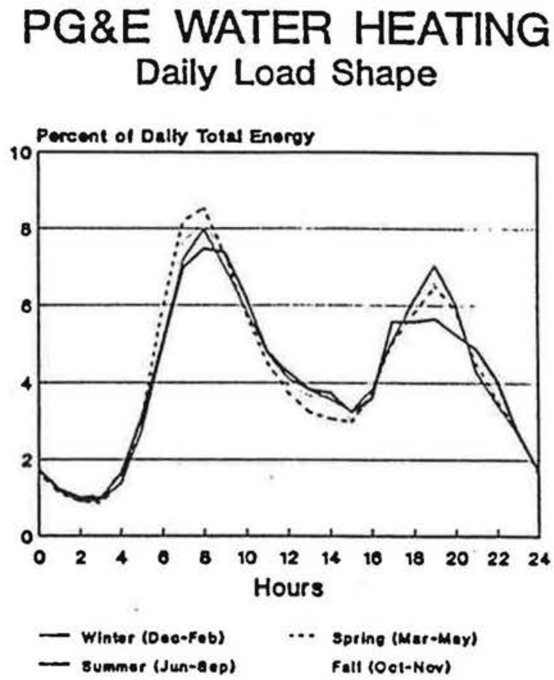


Figure 7. **Load Shape Comparison - Water Heating.** Comparison of LBL's analysis of metered data gathered by PG&E and SDG&E to the daily load shapes currently used by the CEC Residential Peak Model. The PG&E daily load shape was developed from an analysis of 72 households. The SDG&E daily load shape was developed from an analysis of 50 households.





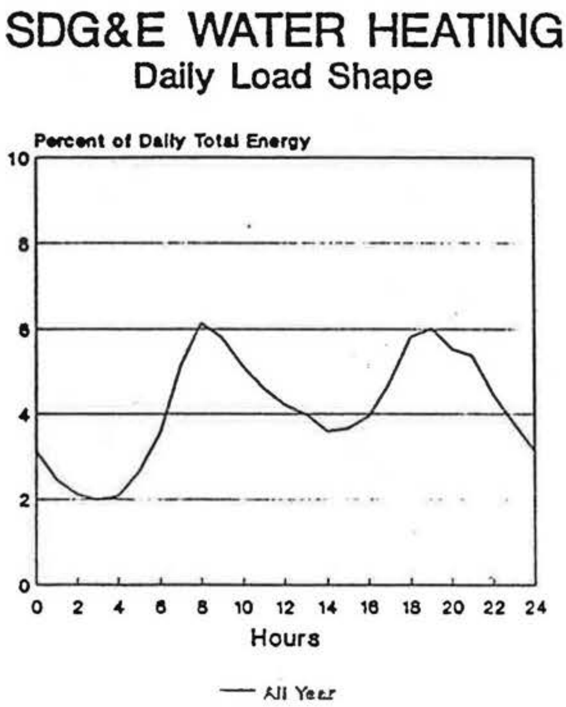
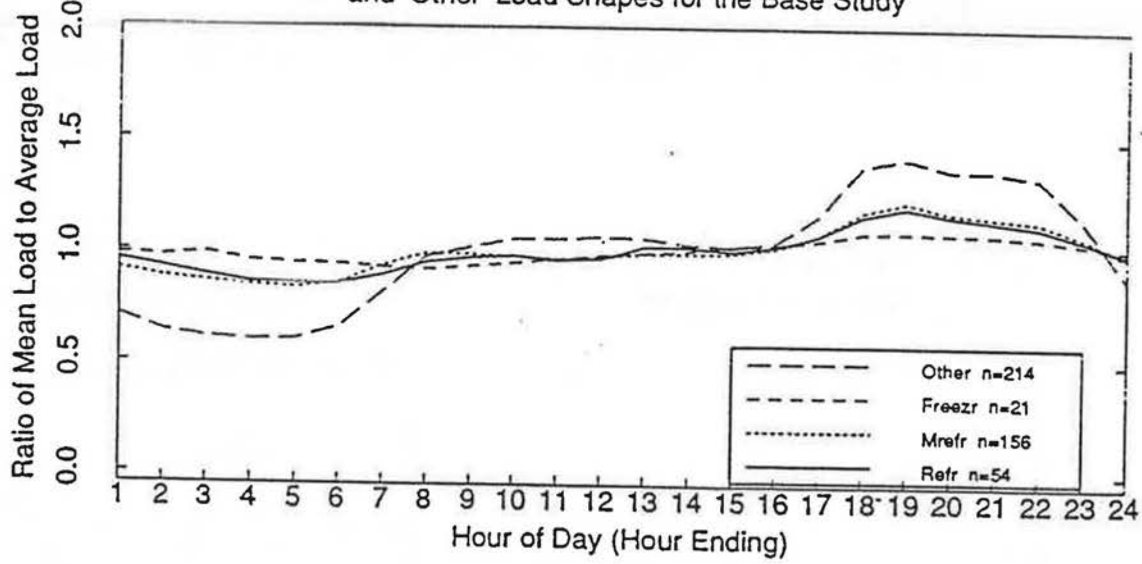


FIGURE 8

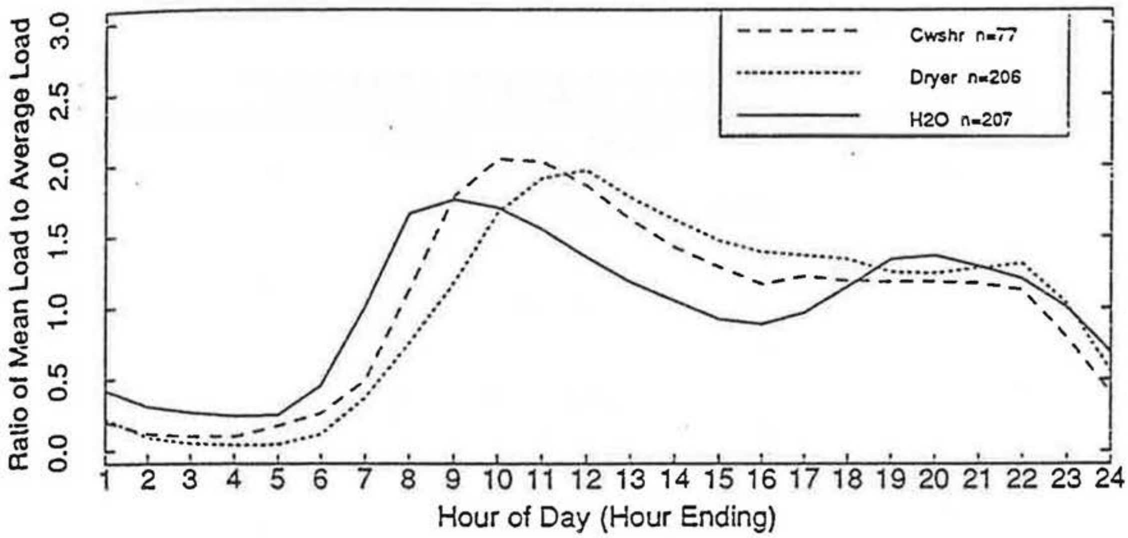
Mean Annual Refrigerator, Mixed Refrigerator, Freezer and 'Other' Load Shapes for the Base Study



Data: ELCAP RES PADS Sept '84 - May '88 RES EU Tables - October 1988

FIGURE 9

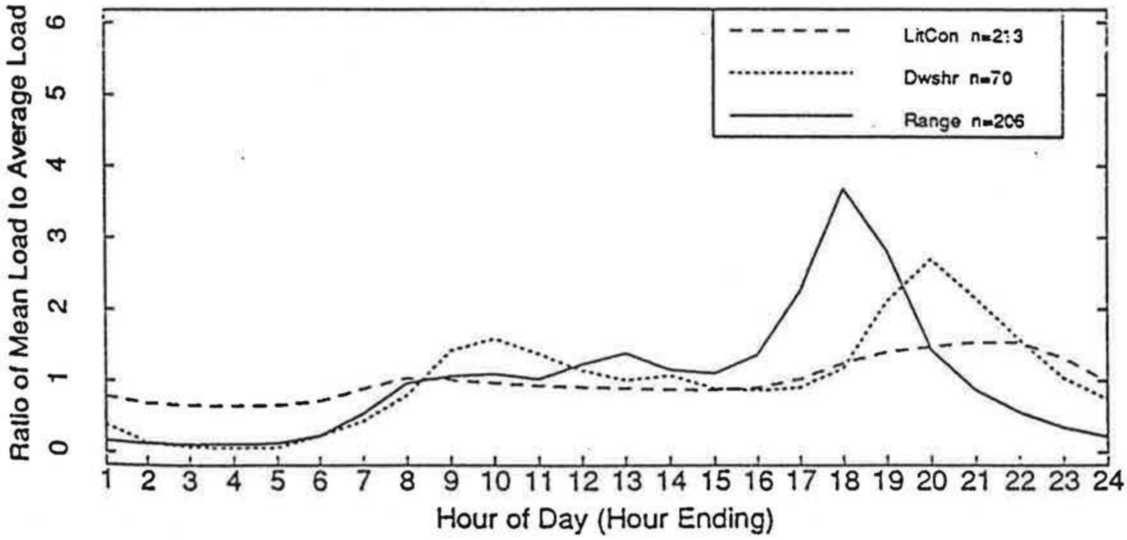
Mean Annual Hot Water, Dryer and Clothes Washer Load Shapes for the Base Study



Data: ELCAP RES PADS Sept '84 - May '88 RES EU Tables - October 1988

FIGURE 10

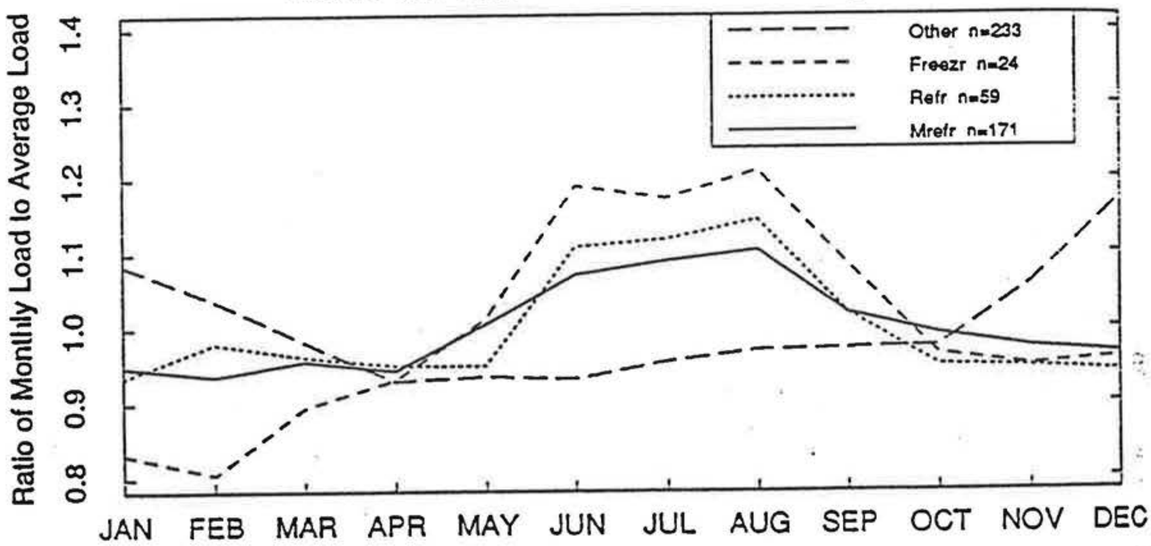
Mean Annual Range, Dishwasher, and Lights and Convenience Load Shapes for the Base Study



Data: ELCAP RES PADS Sept '84 - May '88 RES EU Tables - October 1988

FIGURE 11

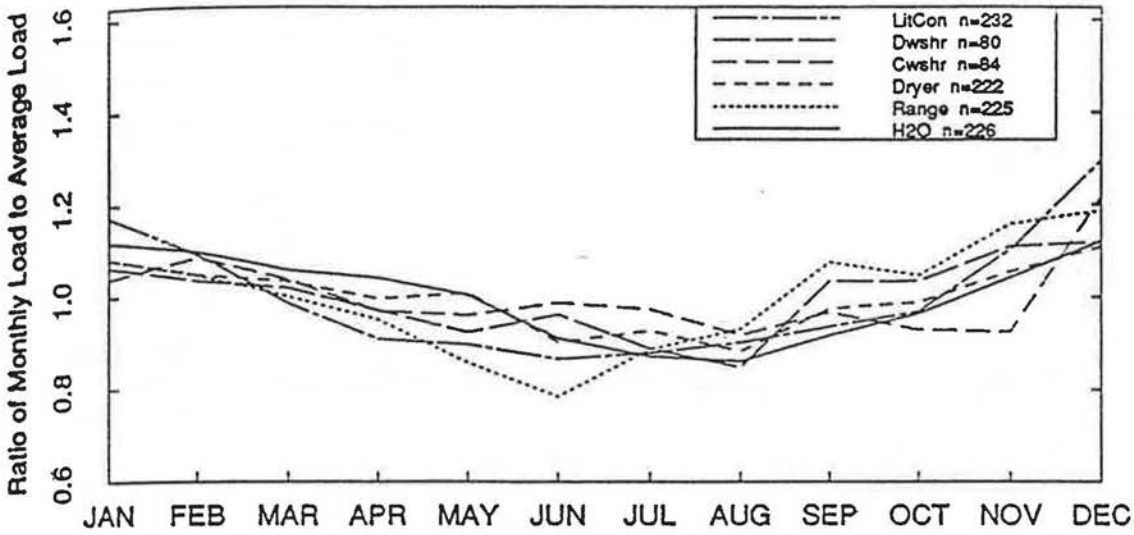
Seasonal Variation of Refrigerator, Mixed Refrigerator, Freezer and 'Other' Loads for the Base Study



Data: ELCAP RES PADS Sept '84 - May '88 RES EU Tables - October 1988

FIGURE 12

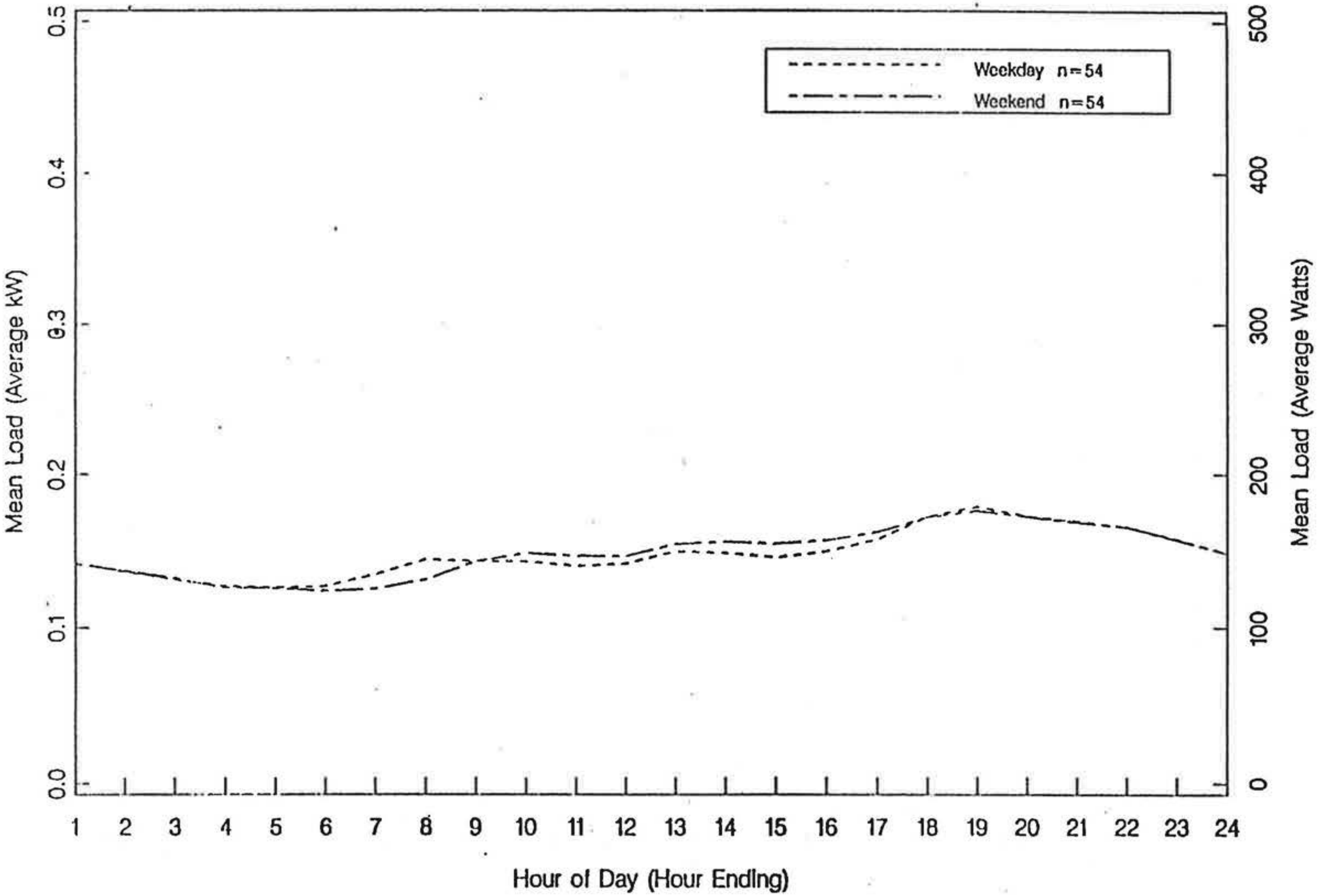
Seasonal Variation of Hot Water, Range, Dryer, Clothes Washer, Dishwasher, and Lights and Convenience Loads for the Base Study



Data: ELCAP RES PADS Sept '84 - May '88 RES EU Tables - October 1988

FIGURE 13

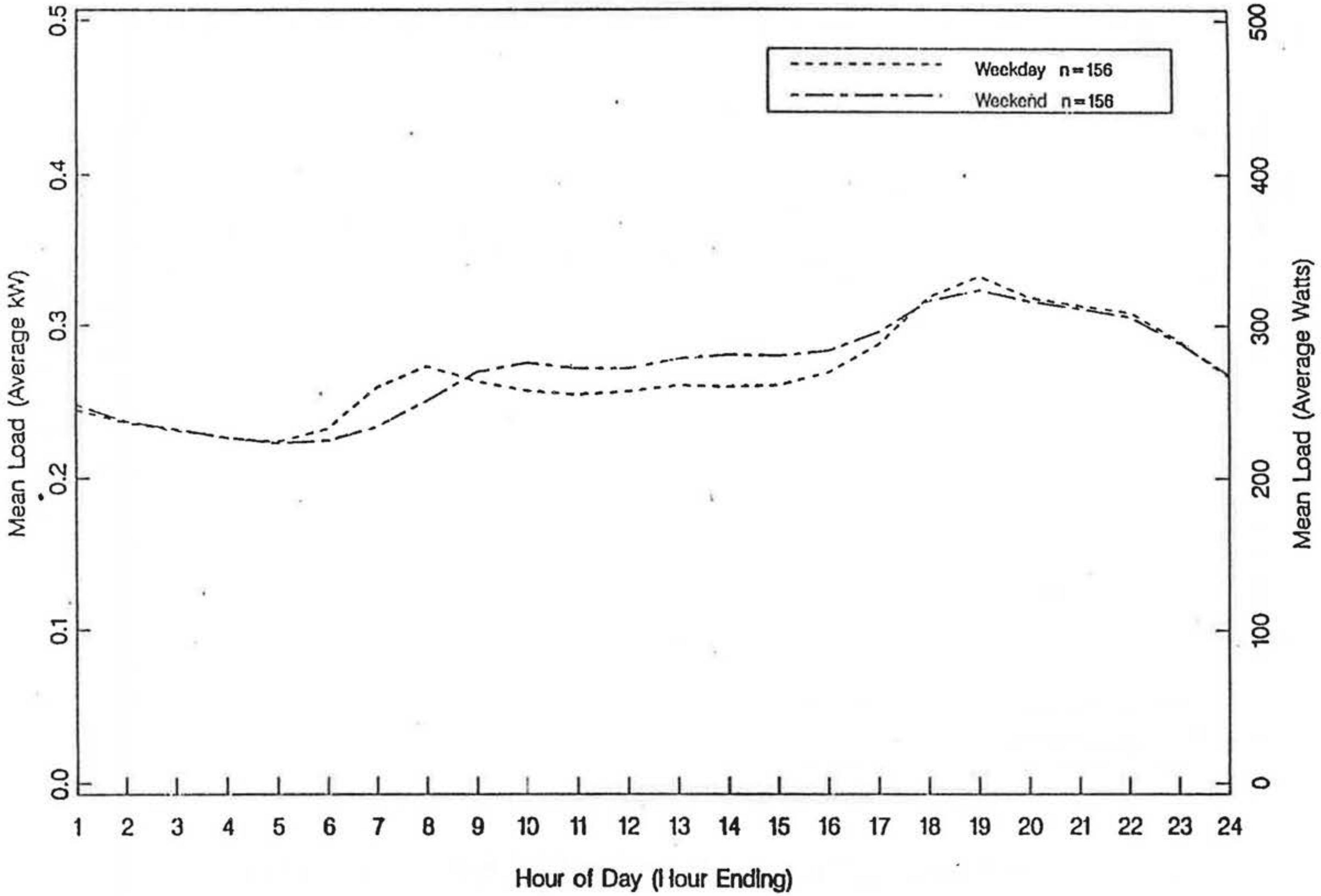
Refrigerator Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84 – Mar '88 SAS/PADS November 1988

FIGURE 14

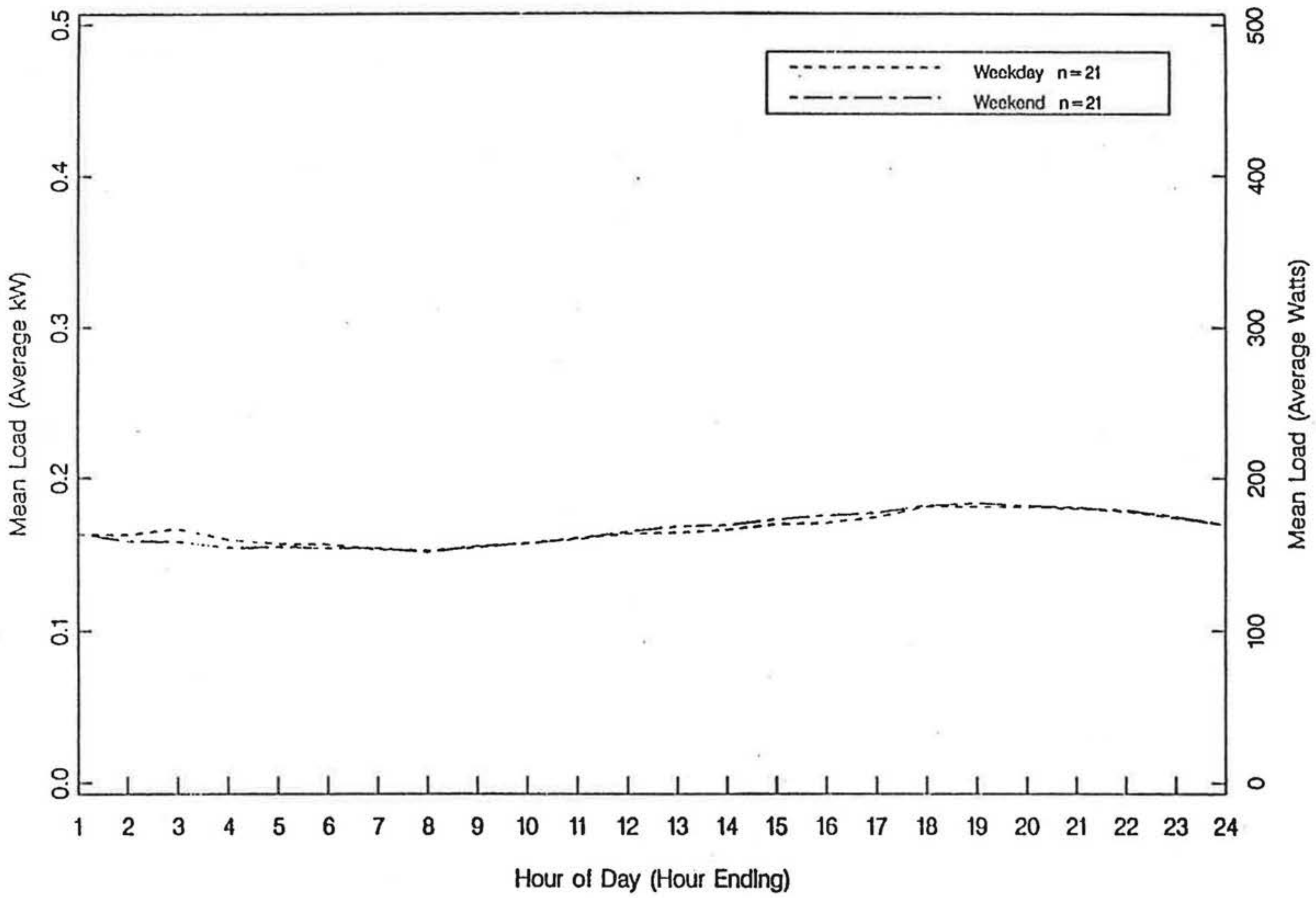
Mixed Refrigerator Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84 – Mar '88 SAS/PADS November 1988

FIGURE 15

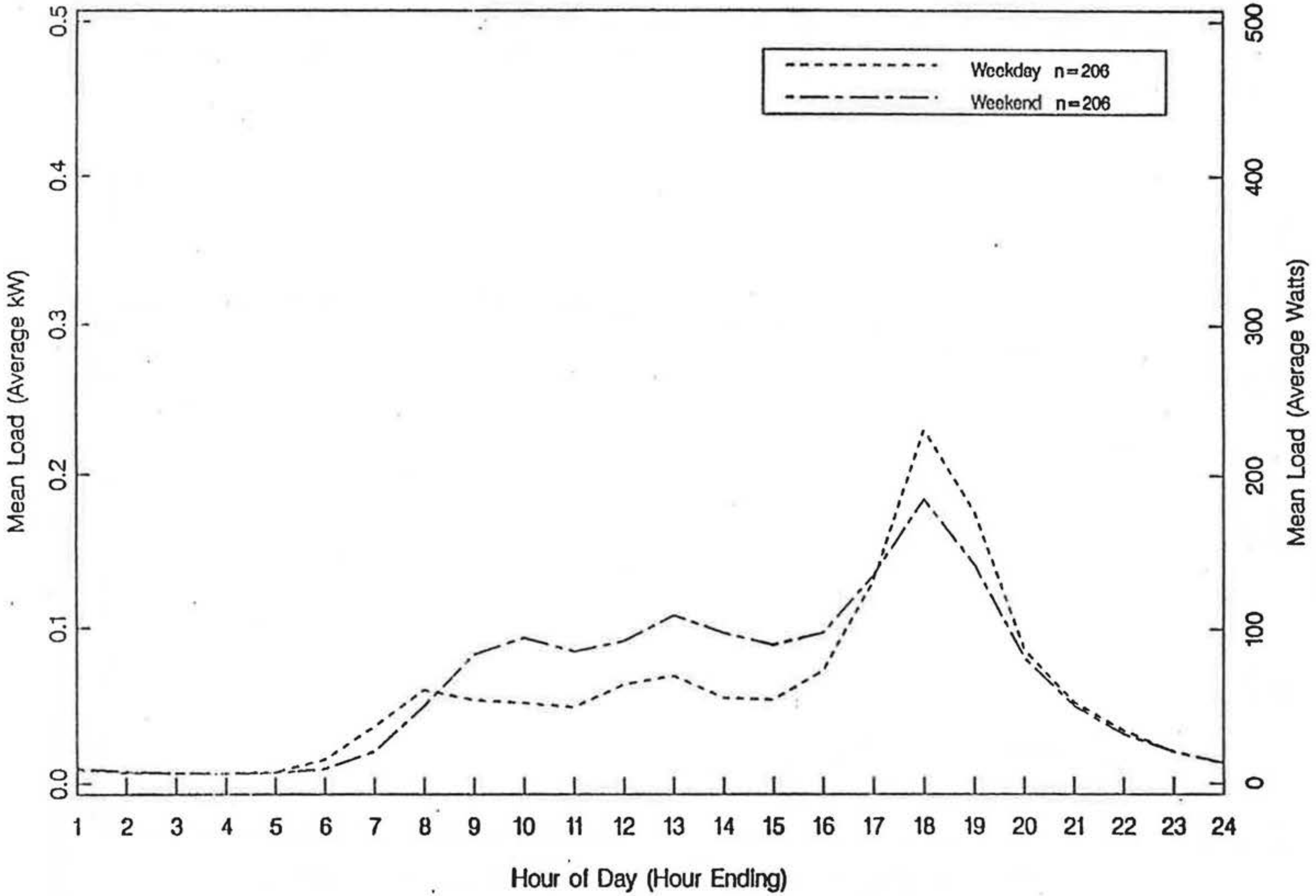
Freezer Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84–Mar '88 SAS/PADS November 1988

FIGURE 16

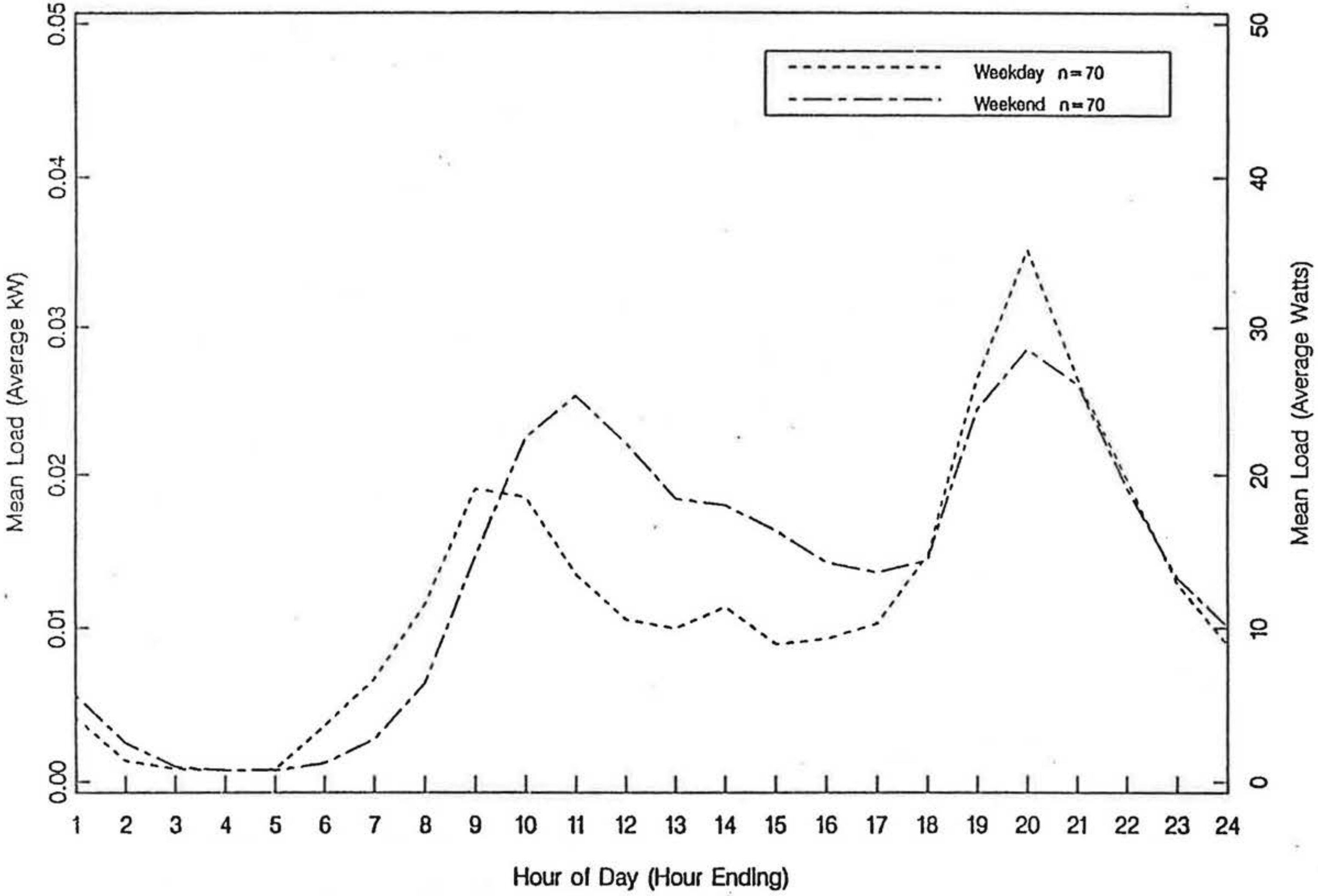
Range Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84 – Mar '88 SAS/PADS November 1988

FIGURE 17

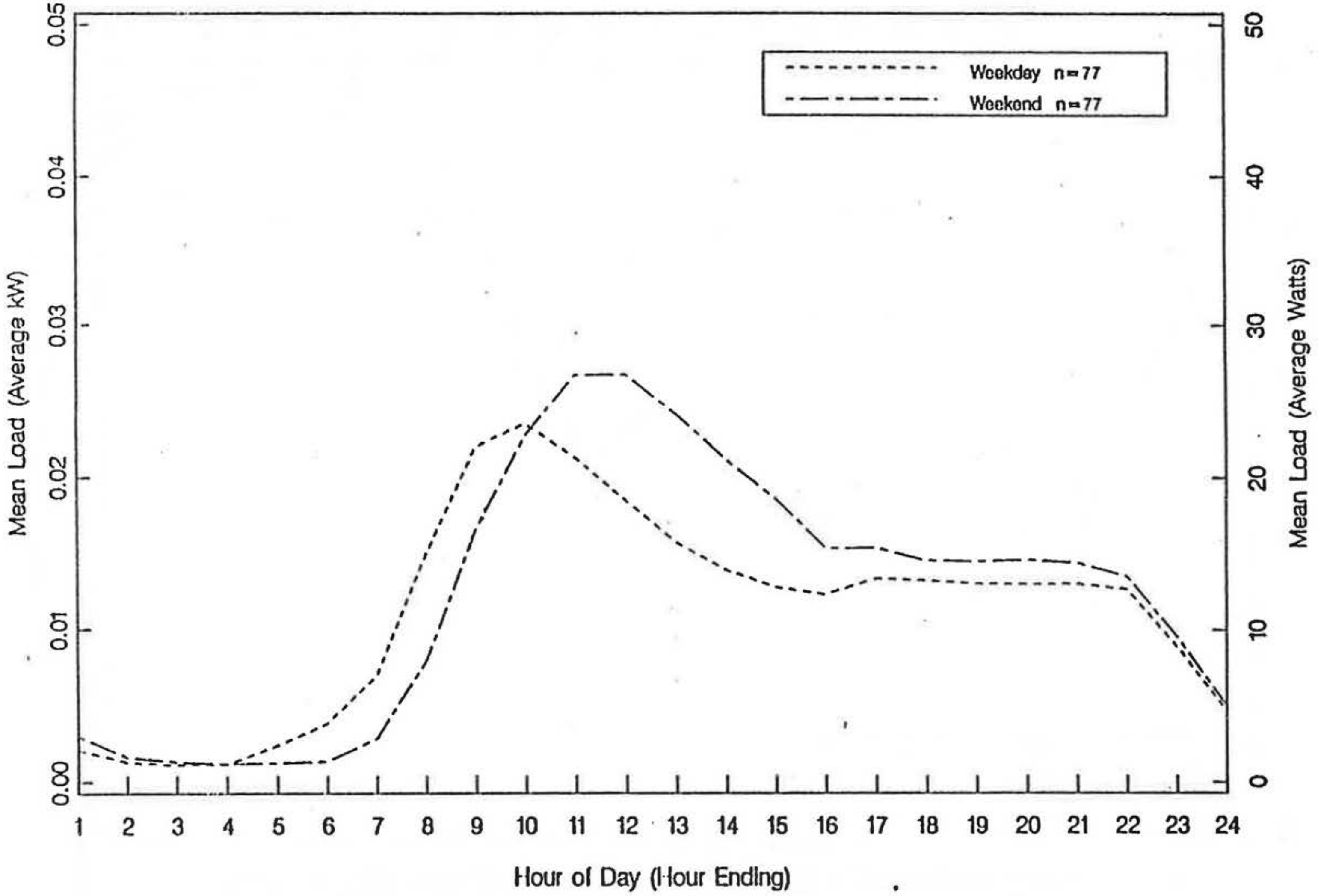
Dishwasher Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84 – Mar '88 SAS/PADS November 1988

FIGURE 18

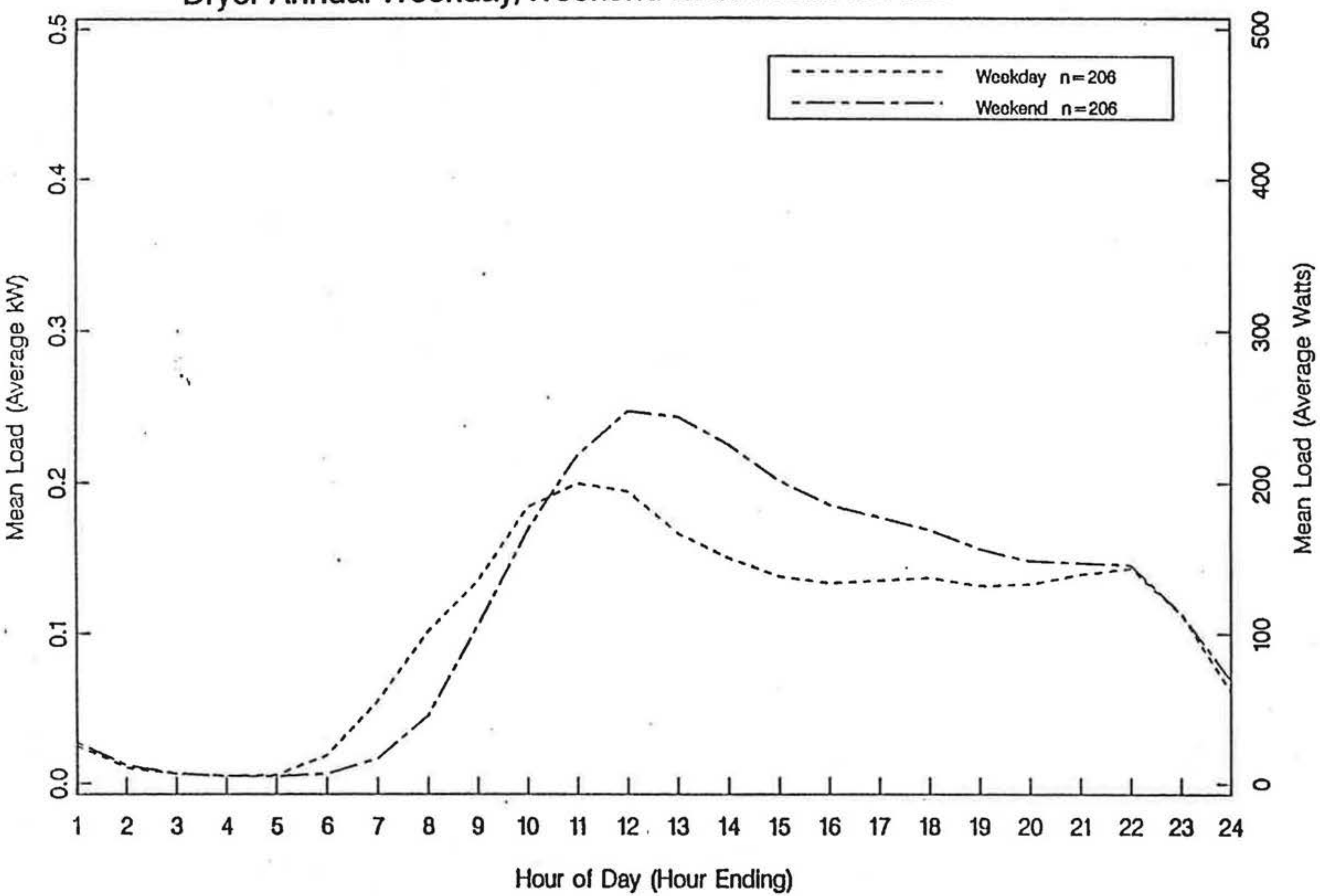
Clothes Washer Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84 – Mar '88 SAS/PADS November 1988

FIGURE 19

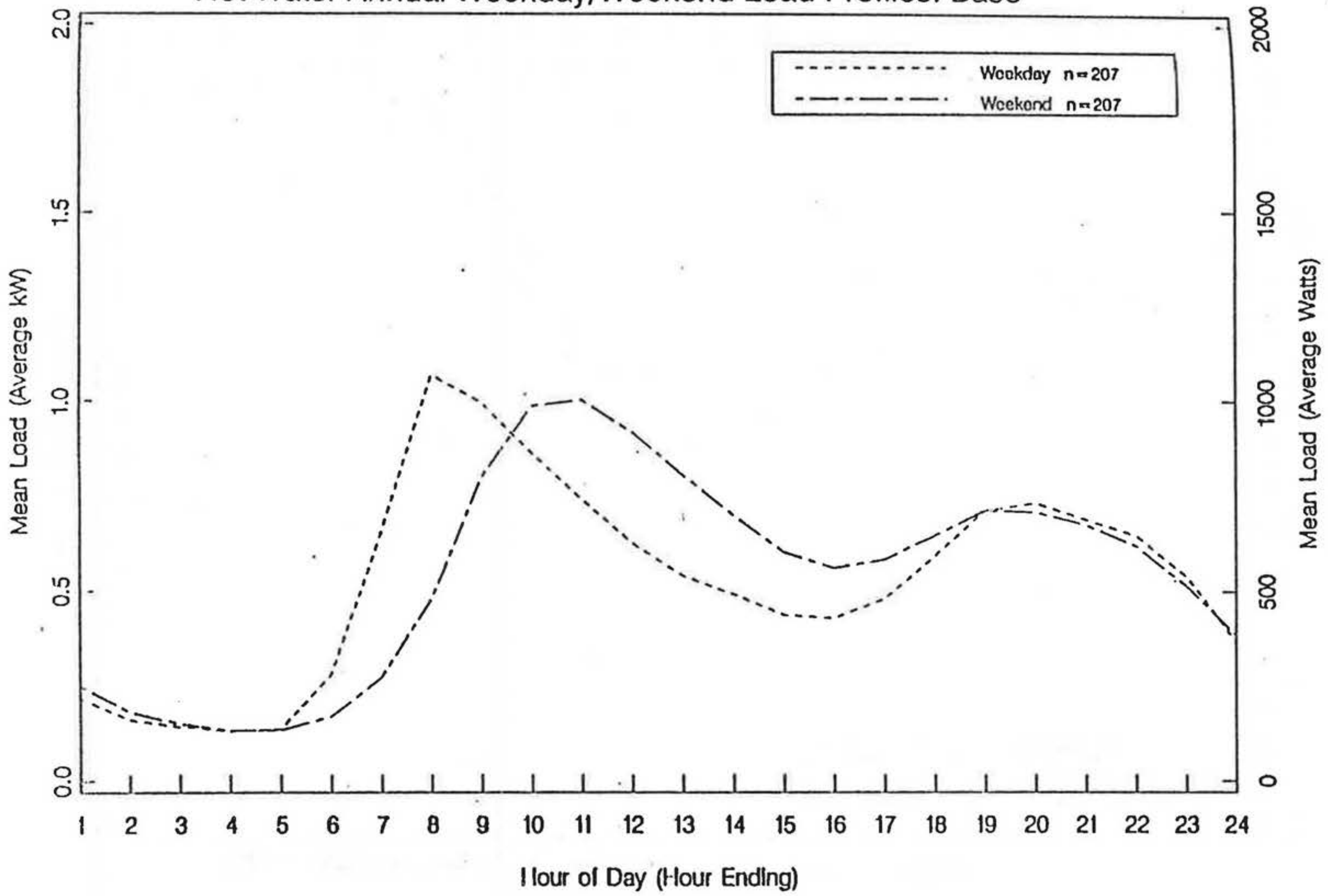
Dryer Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84 – Mar '88 SAS/PADS November 1988

FIGURE 20

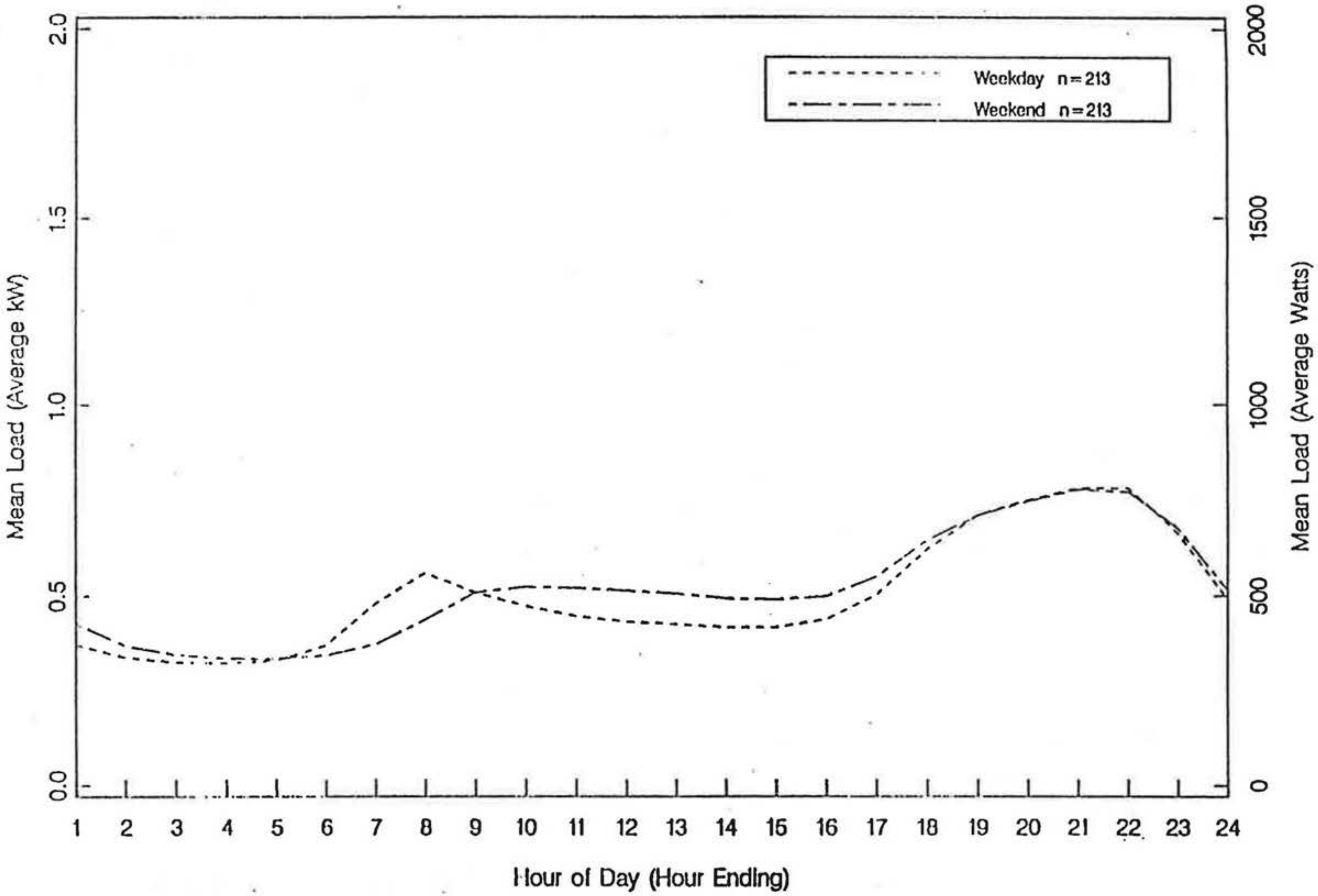
Hot Water Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84 – Mar '88 SAS/PADS November 1988

FIGURE 21

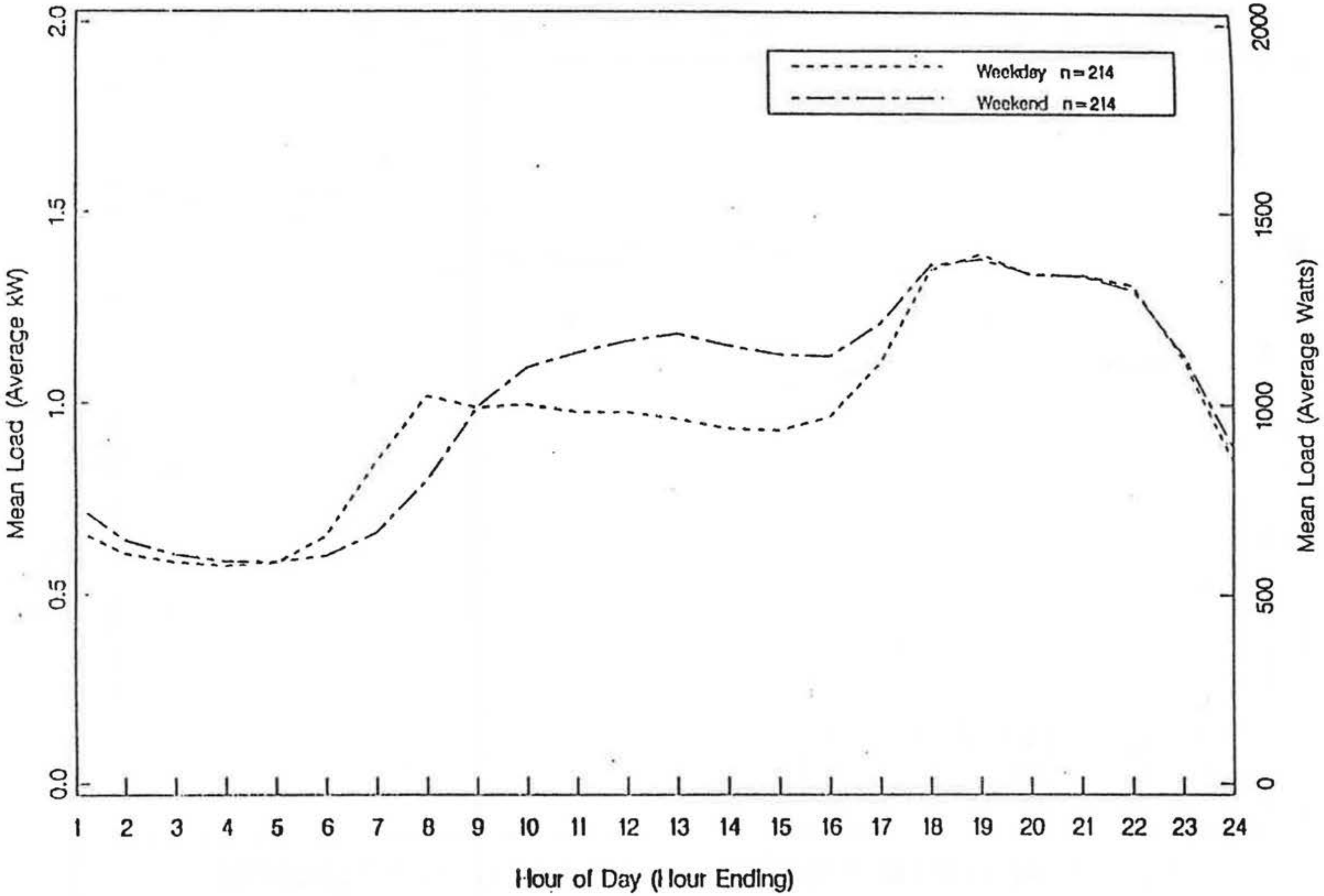
Lights/Conveniences Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84 – Mar '88 SAS/PADS November 1988

FIGURE 22

Other Annual Weekday/Weekend Load Profiles: Base



Data: ELCAP RES PADS Sept'84 – Mar '88 SAS/PADS November 1988

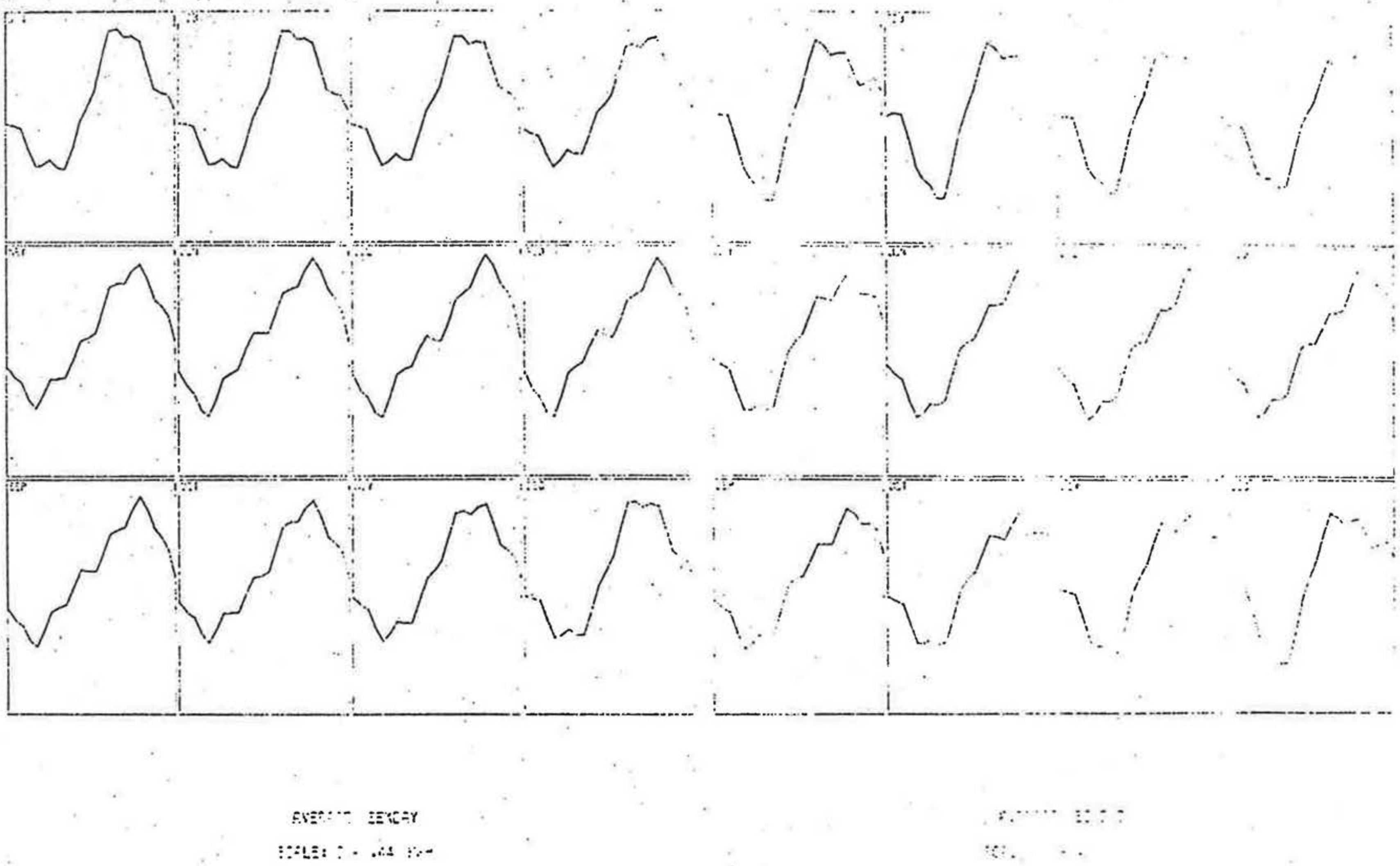


Figure 2.3 **Monthly weekday (left) and weekend (right) averages for estimated freezer load shape.**

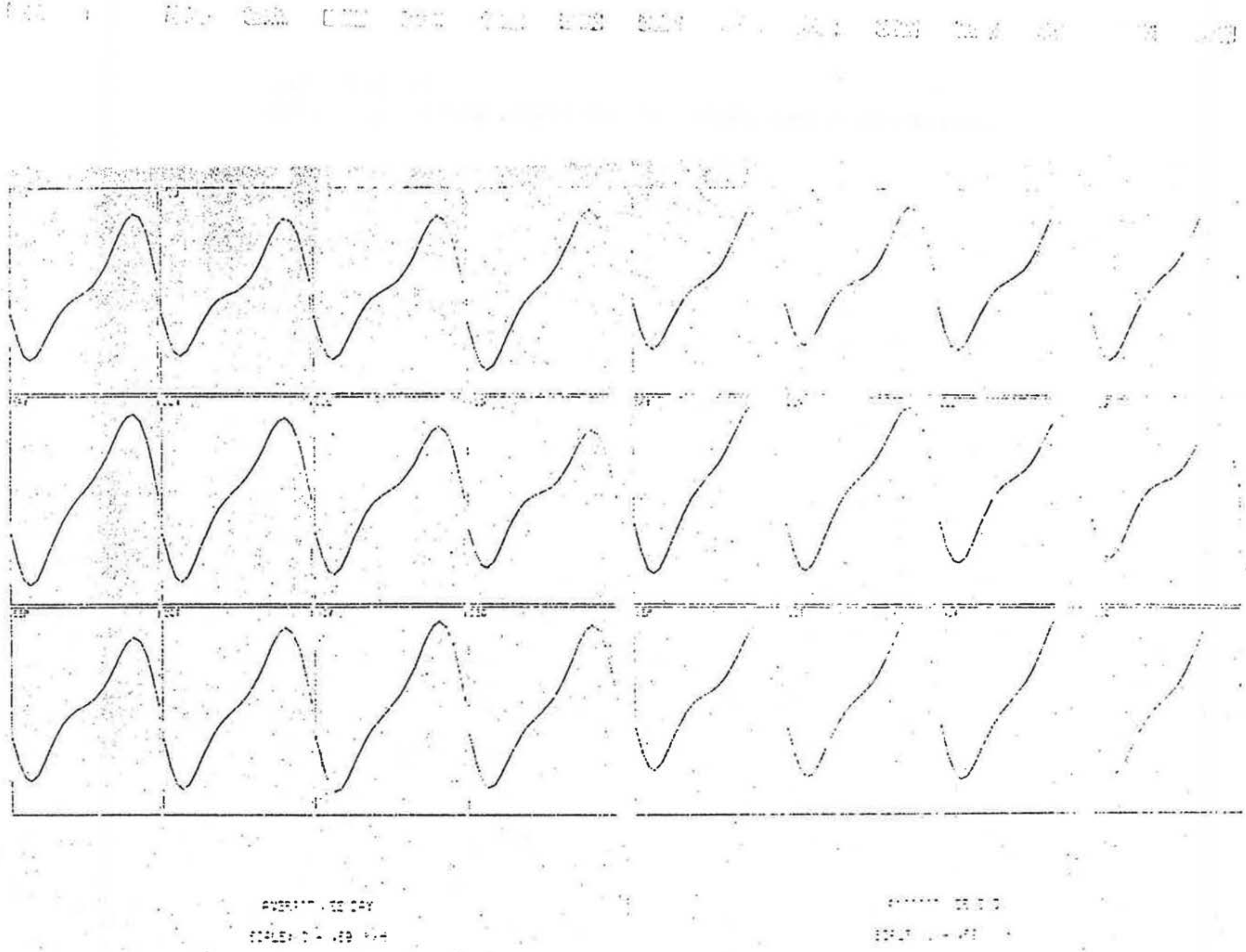


Figure 24 Monthly weekday (left) and weekend (right) averages for estimated clothes dryer load shape.

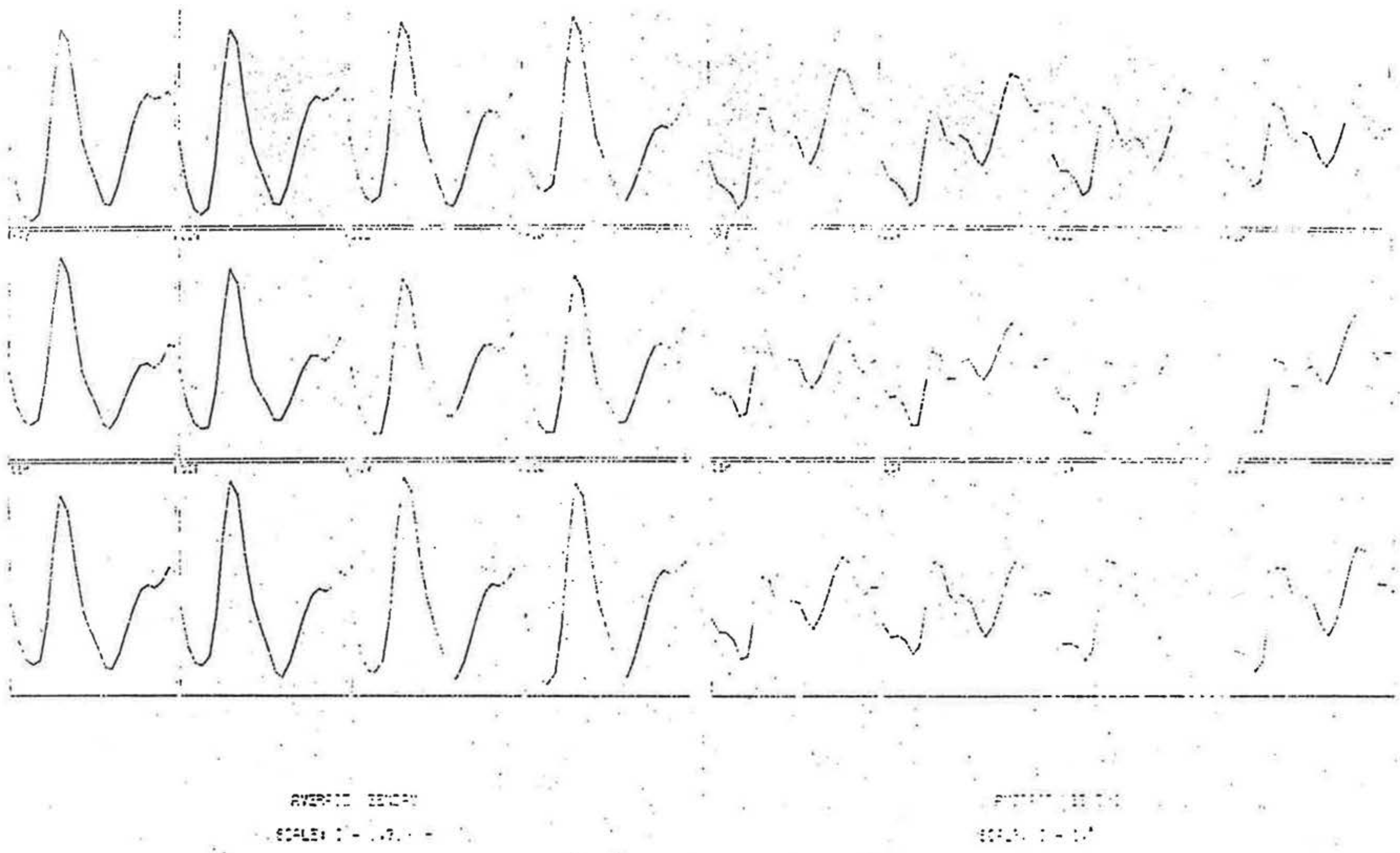


Figure 25 Monthly weekday (left) and weekend (right) average for estimated dishwasher load shape.

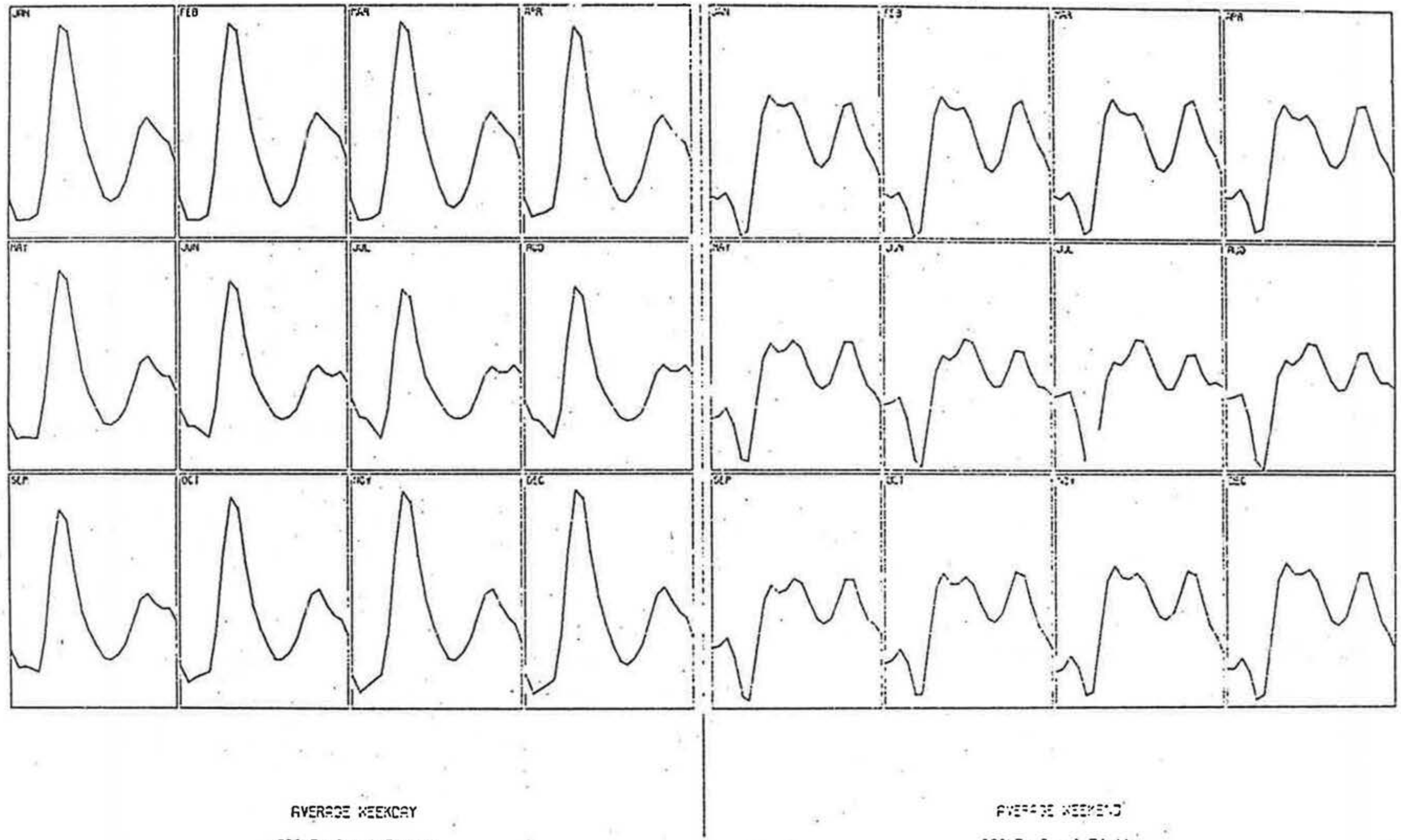


Figure 26 Monthly weekday (left) and weekend (right) averages for the estimated electric water heater load shape.

FIGURE 27. **RELATIVE LOAD SHAPES**

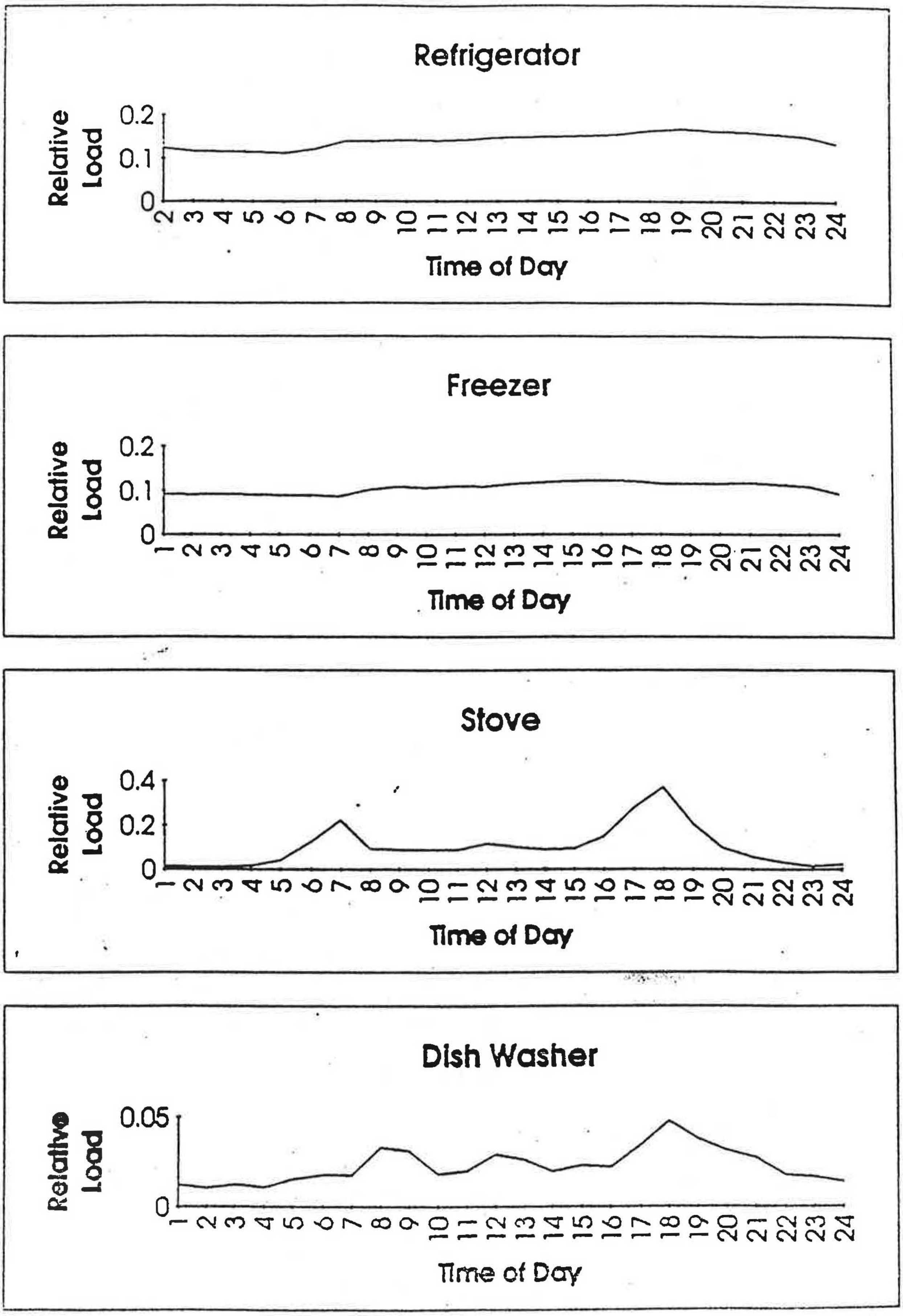
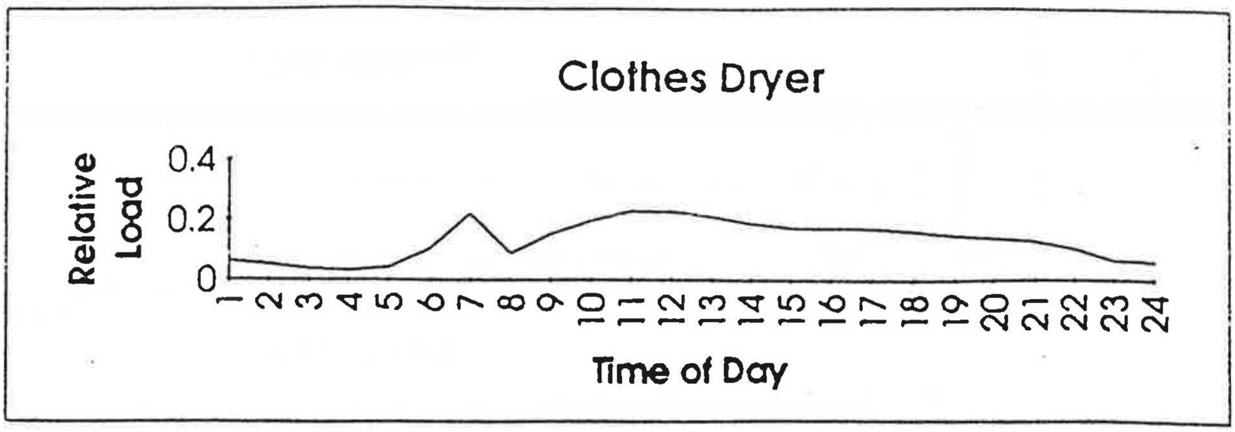
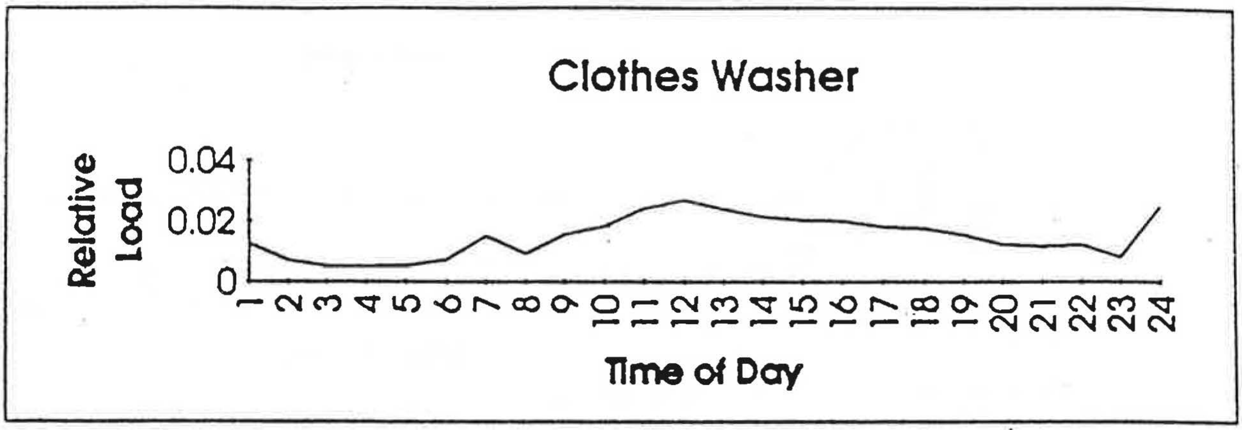
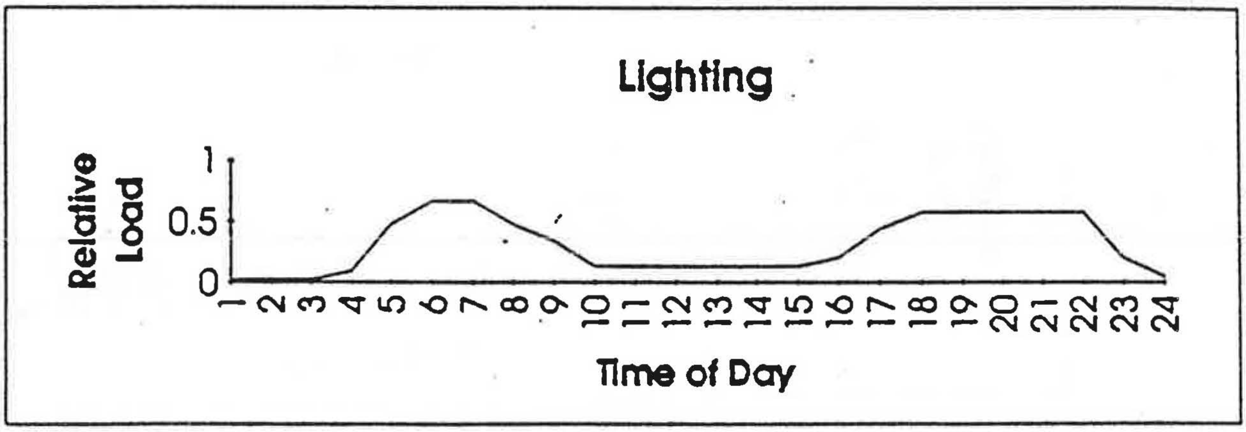
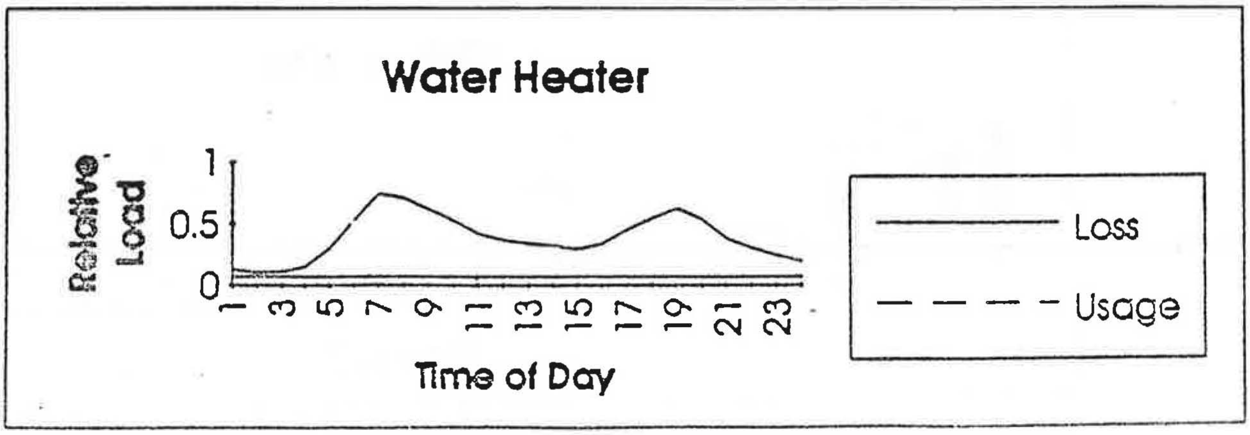


FIGURE 28. RELATIVE LOAD SHAPES









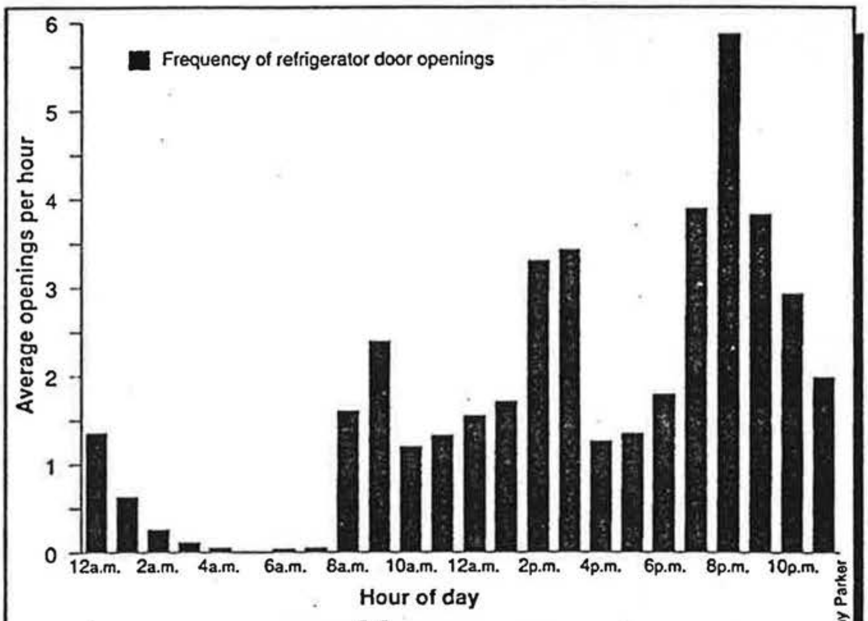


Figure 29 Door openings

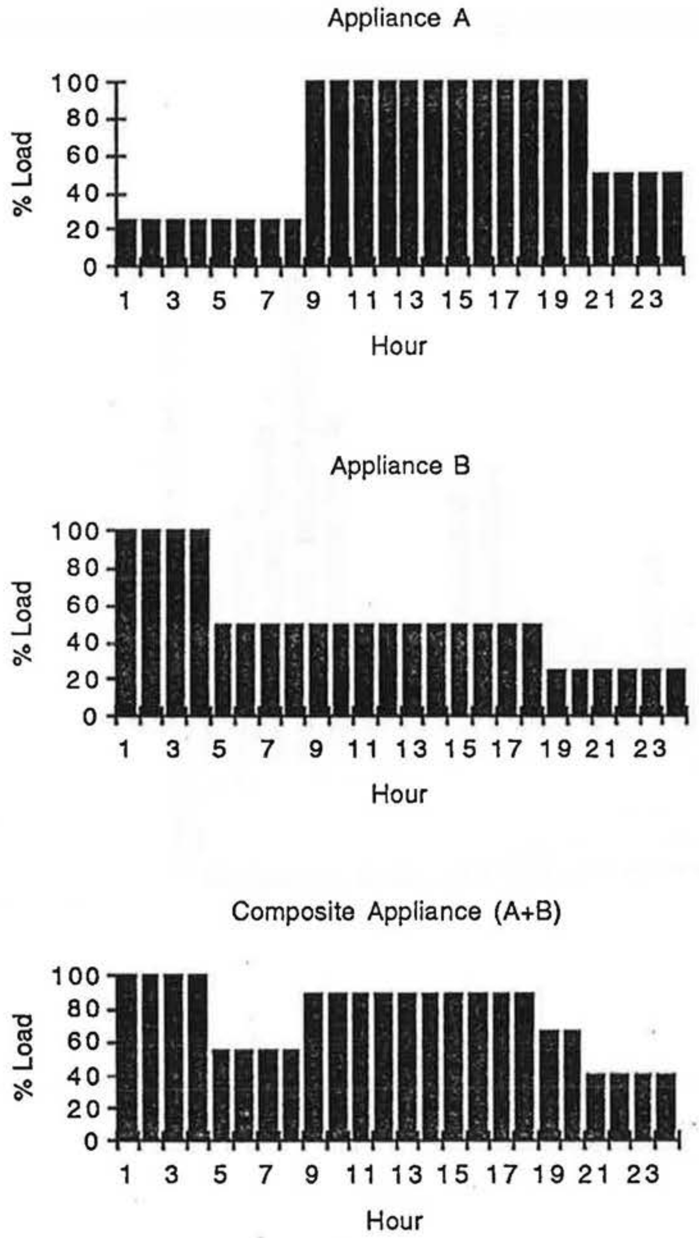


Figure 30. Composite load curvc for two appliances

APPENDIX D

LBL Load Curve Data

Table D-1. PG&E Refrigerator - Daily Load Shape

	Percent of Total Daily Energy			
	Winter	Spring	Summer	Fall
Hour	Dec-Feb	Mar-May	Jun-Sep	Oct-Nov
1	3.68	3.75	3.94	3.76
2	3.51	3.59	3.71	3.64
3	3.48	3.56	3.58	3.59
4	3.36	3.47	3.63	3.45
5	3.38	3.42	3.50	3.50
6	3.59	3.69	3.60	3.64
7	3.78	3.78	3.78	3.94
8	4.08	4.12	3.87	4.12
9	4.19	4.04	3.94	4.10
10	4.12	4.01	4.02	4.08
11	4.00	4.02	4.00	4.02
12	4.24	4.17	4.16	4.11
13	4.25	4.15	4.21	4.19
14	4.19	4.18	4.21	4.27
15	4.31	4.31	4.31	4.33
16	4.39	4.53	4.50	4.45
17	4.69	4.69	4.60	4.63
18	5.11	4.89	4.78	4.87
19	5.06	4.93	4.84	4.94
20	4.90	4.81	4.78	4.81
21	4.83	4.82	4.73	4.69
22	4.67	4.62	4.72	4.60
23	4.23	4.40	4.43	4.31
24	3.95	4.07	4.16	3.96

Table D-2. PG&E Water Heater - Daily Load Shape

	Percent of Total Daily Energy			
Hour	Winter Dec-Feb	Spring Mar-May	Summer Jun-Sep	Fall Oct-Nov
1	1.17	1.10	1.22	1.15
2	0.91	0.89	1.00	1.02
3	0.95	0.86	1.00	1.12
4	1.38	1.39	1.63	1.71
5	2.74	3.09	3.08	3.05
6	4.96	5.92	5.03	5.05
7	7.18	8.19	6.98	7.64
8	7.99	8.55	7.48	8.14
9	6.99	7.33	7.39	7.30
10	5.86	5.75	6.20	5.64
11	4.75	4.53	4.80	4.41
12	4.10	3.73	4.26	3.91
13	3.80	3.23	3.84	3.64
14	3.57	3.06	3.74	3.64
15	3.27	2.98	3.23	3.02
16	3.83	3.75	3.60	3.59
17	5.09	5.02	5.60	5.26
18	6.14	5.80	5.60	6.19
19	7.06	6.50	5.68	6.58
20	6.05	5.88	5.26	5.93
21	4.31	4.53	4.90	4.25
22	3.44	3.58	4.06	3.51
23	2.70	2.72	2.69	2.59
24	1.76	1.62	1.73	1.69

Table D-3. PG&E Clothes Dryer - Daily Load Shape

	Percent of Total Daily Energy			
Hour	Winter Dec-Feb	Spring Mar-May	Summer Jun-Sep	Fall Oct-Nov
1	0.51	0.45	0.58	0.47
2	0.28	0.27	0.30	0.25
3	0.18	0.15	0.20	0.16
4	0.13	0.11	0.16	0.13
5	0.21	0.19	0.25	0.30
6	0.71	0.97	0.74	0.79
7	1.80	2.64	2.13	2.33
8	3.23	4.22	3.91	3.92
9	5.54	6.26	6.07	6.11
10	7.28	7.72	7.76	7.64
11	8.45	8.30	8.69	8.27
12	8.48	8.05	8.40	8.35
13	7.89	7.14	7.54	7.34
14	7.07	6.27	6.34	6.66
15	6.52	5.85	5.67	6.10
16	6.47	5.82	5.44	6.14
17	6.38	5.73	5.44	6.05
18	6.04	5.73	5.50	5.80
19	5.45	5.48	5.27	5.62
20	5.17	5.37	5.26	5.23
21	4.79	5.36	5.31	4.95
22	3.84	4.28	4.66	3.83
23	2.43	2.52	3.02	2.36
24	1.16	1.12	1.37	1.22

Table D-4. PG&E Cooking - Daily Load Shape

	Percent of Total Daily Energy			
Hour	Winter Dec-Feb	Spring Mar-May	Summer Jun-Sep	Fall Oct-Nov
1	0.23	0.19	0.23	0.25
2	0.17	0.14	0.17	0.20
3	0.17	0.14	0.15	0.19
4	0.26	0.30	0.32	0.23
5	0.66	0.82	0.80	0.74
6	1.97	2.62	2.25	2.32
7	3.52	4.40	3.54	4.11
8	4.33	4.72	4.34	4.64
9	4.27	4.07	4.64	4.36
10	4.17	3.68	4.31	4.18
11	4.24	3.81	4.25	4.28
12	5.49	4.95	5.27	5.35
13	4.75	4.13	4.58	4.63
14	4.17	3.41	3.69	4.00
15	4.43	3.84	4.03	4.41
16	6.99	6.54	5.93	6.80
17	13.16	12.30	11.10	12.99
18	17.59	17.87	16.53	17.13
19	9.71	11.42	11.34	9.78
20	4.63	5.45	6.04	4.46
21	2.59	2.81	3.48	2.48
22	1.50	1.43	1.79	1.43
23	0.68	0.65	0.83	0.70
24	0.34	0.28	0.37	0.35

Table D-5. SCE Refrigerator - Daily Load Shape

	Percent of Total Daily Energy			
Hour	Winter Dec-Feb	Spring Mar-May	Summer Jun-Sep	Fall Oct-Nov
1	3.97	3.87	3.95	3.90
2	3.87	3.91	3.91	3.90
3	3.66	3.68	3.73	3.67
4	3.61	3.55	3.65	3.58
5	3.59	3.54	3.63	3.49
6	3.50	3.58	3.66	3.55
7	3.78	3.78	3.84	3.73
8	4.01	3.94	3.93	4.04
9	4.03	3.94	3.86	3.86
10	4.09	3.92	3.97	3.92
11	4.00	4.00	4.08	3.97
12	4.08	4.17	4.25	4.11
13	4.24	4.27	4.30	4.26
14	4.32	4.41	4.34	4.35
15	4.35	4.41	4.41	4.46
16	4.43	4.49	4.51	4.64
17	4.51	4.56	4.60	4.65
18	4.75	4.76	4.70	4.75
19	4.84	4.81	4.67	4.79
20	4.69	4.76	4.59	4.76
21	4.64	4.74	4.56	4.59
22	4.50	4.50	4.40	4.46
23	4.33	4.30	4.28	4.31
24	4.22	4.13	4.19	4.25

Table D-6. SCE Freezer - Daily Load Shape

	Percent of Total Daily Energy			
Hour	Winter Dec-Feb	Spring Mar-May	Summer Jun-Sep	Fall Oct-Nov
1	4.01	3.91	3.97	3.89
2	3.91	3.83	3.88	3.96
3	3.98	3.80	3.89	3.98
4	3.91	3.75	3.89	3.83
5	3.87	3.70	3.72	3.77
6	3.87	3.64	3.67	3.88
7	3.78	3.73	3.70	3.81
8	3.85	3.70	3.80	3.76
9	4.07	4.05	4.04	3.93
10	3.99	4.15	4.10	3.97
11	4.16	4.24	4.25	4.18
12	4.11	4.37	4.37	4.31
13	4.38	4.51	4.47	4.45
14	4.47	4.69	4.61	4.52
15	4.55	4.78	4.68	4.59
16	4.64	4.80	4.75	4.64
17	4.57	4.75	4.66	4.62
18	4.38	4.55	4.52	4.44
19	4.35	4.29	4.41	4.45
20	4.38	4.19	4.26	4.26
21	4.40	4.42	4.23	4.39
22	4.24	4.15	4.08	4.23
23	4.10	4.01	4.07	4.13
24	4.00	3.96	3.97	4.02

Table D-7. SCE Cooking - Daily Load Shape

	Percent of Total Daily Energy			
Hour	Winter Dec-Feb	Spring Mar-May	Summer Jun-Sep	Fall Oct-Nov
1	0.83	1.21	0.92	0.78
2	0.82	1.14	0.92	0.73
3	0.74	1.10	0.86	0.75
4	0.78	1.05	0.90	0.70
5	0.75	1.62	1.86	1.11
6	1.93	2.87	2.53	1.92
7	1.83	3.69	5.51	3.98
8	3.99	5.90	5.53	5.37
9	4.83	5.19	3.80	3.97
10	4.17	3.59	3.42	3.86
11	3.69	3.48	3.81	4.31
12	5.69	4.90	3.83	3.96
13	4.96	3.99	3.23	4.10
14	4.38	4.22	4.40	3.88
15	5.19	4.51	5.10	4.15
16	6.26	6.48	7.31	5.49
17	11.16	12.34	15.14	13.90
18	16.01	12.80	9.62	15.90
19	9.00	7.17	8.82	9.81
20	5.35	5.82	4.47	5.18
21	3.63	3.12	2.77	2.61
22	1.99	1.53	2.80	1.50
23	1.08	1.16	1.33	1.11
24	0.92	1.11	1.13	0.93

Table D-8. SCE Clothes Dryer - Daily Load Shape

Hour	Percent of Total Daily Energy Winter Dec-Feb	Spring Mar-May	Summer Jun-Sep	Fall Oct-Nov
1	0.23	0.14	0.13	0.29
2	0.03	0.01	0.09	0.04
3	0.00	0.01	0.12	0.04
4	0.00	0.13	0.82	0.48
5	0.04	0.41	1.46	1.47
6	0.31	0.69	1.39	2.04
7	1.18	2.17	3.09	2.95
8	3.33	3.46	5.27	5.67
9	4.95	5.96	7.11	7.23
10	7.68	8.16	7.50	7.92
11	8.76	9.03	7.80	6.16
12	9.11	9.43	7.03	6.39
13	8.30	8.88	7.05	6.03
14	7.98	8.02	7.29	5.82
15	7.64	7.71	6.87	5.44
16	7.20	7.41	6.95	5.52
17	6.61	6.37	6.97	6.65
18	6.69	4.90	5.96	7.31
19	5.68	3.74	4.95	6.66
20	4.15	3.55	4.42	6.69
21	3.59	3.55	3.87	4.45
22	3.09	3.83	2.23	2.48
23	2.32	1.96	1.23	1.60
24	1.12	0.47	0.40	0.68

Table D-9. SCE Clothes Washer - Daily Load Shape

	Percent of Total Daily Energy			
Hour	Winter Dec-Feb	Spring Mar-May	Summer Jun-Sep	Fall Oct-Nov
1	0.76	0.45	0.27	0.18
2	0.24	0.23	0.12	0.11
3	0.12	0.19	0.09	0.07
4	0.11	0.17	0.07	0.10
5	0.13	0.19	0.31	0.14
6	0.25	0.61	1.77	0.84
7	0.92	1.46	3.99	2.79
8	3.23	4.49	7.01	4.95
9	5.46	6.55	8.50	6.39
10	6.43	7.74	9.25	7.22
11	8.40	8.37	7.57	7.08
12	9.39	8.28	7.03	6.52
13	8.36	7.75	6.46	7.40
14	7.44	6.59	5.87	6.13
15	7.04	6.25	5.31	5.73
16	6.93	5.76	5.03	5.65
17	6.28	6.13	4.98	6.78
18	6.08	6.35	5.30	6.88
19	5.29	5.51	5.10	6.35
20	4.22	4.96	5.40	5.87
21	4.11	4.57	4.53	4.85
22	4.23	3.89	3.21	4.04
23	2.87	2.54	2.01	2.86
24	1.70	0.96	0.84	1.08

Table D-10. SCE Dishwasher - Daily Load Shape

Hour	Percent of Total Daily Energy Winter Dec-Feb	 Spring Mar-May	 Summer Jun-Sep	 Fall Oct-Nov
1	1.69	2.43	1.68	1.78
2	1.18	1.78	1.47	1.26
3	0.89	1.66	1.74	1.46
4	0.90	1.64	1.52	1.50
5	1.19	1.42	2.20	0.88
6	0.96	2.26	2.53	1.93
7	2.75	4.07	2.50	3.36
8	4.05	3.46	6.38	6.00
9	5.98	8.98	5.99	8.52
10	6.55	9.07	3.58	6.38
11	4.48	6.45	3.89	2.90
12	3.63	3.58	5.66	3.37
13	4.81	2.99	5.06	3.87
14	5.59	3.38	3.83	5.14
15	6.10	4.52	4.46	6.10
16	6.67	4.37	4.30	5.11
17	4.91	4.25	6.62	5.75
18	5.99	4.30	9.29	7.30
19	6.94	6.87	7.36	8.31
20	8.21	4.70	6.04	6.27
21	4.00	5.15	5.28	3.14
22	4.86	4.24	3.40	2.38
23	4.10	4.48	3.24	4.03
24	3.56	3.95	1.96	3.25

Table D-11. SDG&E Water Heating - Daily Load Shape

Hour	Percent of Total Daily Energy
1	2.47
2	2.12
3	1.99
4	2.08
5	2.67
6	3.59
7	5.14
8	6.14
9	5.80
10	5.11
11	4.60
12	4.23
13	4.01
14	3.60
15	3.67
16	3.94
17	4.73
18	5.83
19	6.01
20	5.53
21	5.37
22	4.45
23	3.79
24	3.13

Appendix 5
Letter and attached survey questionnaire/protocol to CMHC Project Manager

Thermal Engineering

15 Hanover Court, Halifax, Nova Scotia, Canada, B3M 3K7

August 20, 1993

Mr. Tom Hamlin
Residential Technologies Group
Research Division
Canada Mortgage and Housing Corporation
700 Montreal Road
Ottawa, Ontario
K1A 0P7

BY FAX: 613 748 2402

Dear Tom:

Re: Energy Efficiency Technology Impact - Appliances (CR File No. 6716-17-2)

As we had discussed in our telephone conversation on Friday, Aug. 13, Alan and I went over the 'time of day usage' data that we wish to be collected in the survey with the objective to reduce the number of questions and time required to conduct the survey. Attached to this letter, you will find the new forms we generated (which are based on the form in our Interim Report No.1, pgs. 10-18).

I will call you Monday and ask your opinion on this matter.

Best regards,

Ismet Ugursal

V. Ismet Ugursal

P.S. We still haven't received the hourly files for the seven houses from Ken Cooper yet.

TIME OF DAY USAGE DATA:

1. Electric range with built-in convection oven

Burner No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk			Wattage	Size (cm. or in.)
	Morning	Noon	Evening		
Oven htng elem. no.					

2. Electric cook-top range:

Burner No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk			Wattage	Size (cm. or in.)
	Morning	Noon	Evening		

3. Electric convection oven (separate unit):

Htng. Elem. No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk			Wattage	Size (cm. or in.)
	Morning	Noon	Evening		

4. Gas range with built-in convection oven

Burner No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk Morning	Noon	Evening	Size (cm. / in.) (Btu)
Oven htng elem. no.				

5. Gas cook-top range:

Burner No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk Morning	Noon	Evening	Size (cm. / in.) (Btu)

6. Gas convection oven (separate unit):

Htng. Elem. No.	Usage (Time of day: xx:xx - yy:yy)/No. of times/wk Morning	Noon	Evening	Size (cm. / in.) (Btu)

7. Dishwasher (Wattage:__________)

	Usage (Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

8. Electric clothes washer/dryer (combined) (Wattage:__________)

- Usage - Summer (specify months):

	Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Washer	Morning		
	Noon		
	Evening		
Dryer	Morning		
	Noon		
	Evening		

- Usage - Winter (specify months):

	Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Washer	Morning		
	Noon		
	Evening		
Dryer	Morning		
	Noon		
	Evening		

Important Note: It will be very useful to get the fan capacity of the dryers that exhaust to outdoors. Therefore, if possible, to obtain approximate fan capacity, do the blower door test twice; once with the dryer fan running, and once with the fan not running, and report results.

9. Electric clothes washer (Wattage:__________)

- Usage - Summer (specify months):

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

- Usage - Winter (specify months):

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

10. Electric clothes dryer (Wattage:__________)

- Usage: Summer (specify months)

Usage	(Time of day: xx:xx - yy:yy)	No. of times/wk
Morning		
Noon		
Evening		

Winter (specify months):

Usage (Time of day: xx:xx - yy:yy)		No. of times/wk
Morning		
Noon		
Evening		

Important Note: It will be very useful to get the fan capacity of the dryers that exhaust to outdoors. Therefore, if possible, to obtain approximate fan capacity, do the blower door test twice: once with the dryer fan running, and once with the fan not running, and report results.

11. Gas clothes dryer
   - Usage: Summer (specify months)

Usage (Time of day: xx:xx - yy:yy)		No. of times/wk
Morning		
Noon		
Evening		

   - Usage: Winter (specify months):

Usage (Time of day: xx:xx - yy:yy)		No. of times/wk
Morning		
Noon		
Evening		

Important Note: It will be very useful to get the fan capacity of the dryers that exhaust to outdoors. Therefore, if possible, to obtain approximate fan capacity, do the blower door test twice: once with the dryer fan running, and once with the fan not running, and report results.

12. Microwave oven:
   - Capacity (cu.ft.)
   - Manufacturer
   - Year and model no.
   - Wattage

Cooking Usage (Time of day: xx:xx - yy:yy)		No. of times/wk
Morning		
Noon		
Evening		
Defrosting Usage (Time of day: xx:xx - yy:yy)		No. of times/wk
Morning		
Noon		
Evening		

13. Televisions

No	Color or BW?	Size (in)	Age	Wattage	Usage (Time of day: xx:xx - yy:yy)

14. Fans (include all fans used in the house, such as furnace, attic, circulating, rollaway (portable), ceiling, exhaust, etc.)

No	Type	CFM	Amps/Volts	Wattage	Usage (Time of day: xx:xx - yy:yy)

15. Waterbed
- Number

For each of the above:
- Size
- Wattage
- Temperature setting
- Is a blanket or comforter used at all times
- Is the bed kept made during daytime?

				Usage of Each		Time of Day
App.#	Appliance	Number	Wattage of Each	Hr/day	No. of times/wk	xx:xx - yy:yy
25	VCR					
26	Computer/peripherals					
27	Humidifier					
28	Dehumidifier					
35	Coffee maker					
45	Toaster oven					
62	Cooker/fryer					
64	Audio system					
69	Electric blanket					
74	Heat lamp					
77	Hair dryer					
78	Curling iron					
84	Portable heater					
94	Iron					
95	Indoor flood lights					
96	Fluorescent lights					
97	Air cleaner					
104	Pressure cooker					
110	Video game					
114	~~Portable elect. htr.~~ Kettle					
115	Electr. mower					
116	Well pump					
117	Pool heater					
119	Outside flood lights					
101	Lighting (Specify room)	Type/No.				
101.1						
101.2						
101.3						
101.4						
101.5						
101.6						
101.7						
101.8						
101.9						
101.10						
101.11						
101.12						
101.13						
101.14						
101.15						
101.16						

Thermal Engineering

15 Hanover Court, Halifax, Nova Scotia, Canada, B3M 3K7

May 24, 1993

Mr. Tom Hamlin
Residential Technologies Group
Research Division
Canada Mortgage and Housing Corporation
700 Montreal Road
Ottawa, Ontario
K1A 0P7

Dear Mr. Hamlin:

Re: Energy Efficiency Technology Impact - Appliances (CR File No. 6716-17-2)

We are pleased to send enclosed the final copy of our first interim report for the research project on "Energy Efficiency Technology Impact - Appliances". We included the revisions that we have agreed upon during our meeting in Halifax regarding the data collection protocol.

Also enclosed is draft of our second interim report for your review and comments. The second interim report describes the proposed procedure for coverting the STAR files into ENERPASS input files (Task No. 3.4.2 in our proposal). We made several modifications to the first version as we agreed during our meeting in Halifax. We will appreciate it if you could review the procedure and let us know if you have any questions.

As we discussed, we will use only those files in the STAR data base that appear in the Excel spreadsheet you gave us, as some of the files in STAR have missing information. As we have pointed out during our meeting, there are some peculiarities in some STAR files. These we have marked on hard copies of two sample files attached to this letter.

Also, I would like to remind you that you were going to find out the description of the MASS entry (9/MASS) in the STAR files. As I mentioned yo you, I will be away between June 2 - July 9. During this time, please communicate with Alan Fung (Tel. 902 420 7967, Fax. 902 423 6711).

In closing, I would like to thank you for coming and meeting with us in Halifax on June 11-13. This meeting was extremely valuable and helpful for the successful continuation of the project.

Best regards,

V. Ismet Ugursal

HOUSE#

no. of floors

2nd & 3rd floor perimeters in a 2-floor house

1- 4664,HEAT,R, ,SAULT STE. MARIE ,P6A3X5,ONT,1,NORTH BAY
2- ,1,1, 2, 2, 33, 1958,1
3- 0, 1, 0, 0, 39, 39, 34.6, 34.6, 0, 39, 1, 0, 0, 0 this is RECORD 26 (should not be here)
4- 1, 0, 0, 79, 137469, 137469,
0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0,

this is only Basement + 1st + 2nd

5- 3, 0, 0, .93,
0, 0, 0, 0,

night temp.

∅ setback hours although there is night setback to 15°C

what is this - not in report

6- 18.5, 15, 0, 18.5, 15, 0, 0, 0, 0, 0, 3.5, 0, A
7- 155.94, 80.46, 43.99, 31.49, 82.32, 0, 89.96, 0 should be equal
8- 515.67, 189.34, 217.24, 109.09, 71.56, .6, 0, 0, ,2, , 0, , 0, 0, 0
9- 4, 11.57, 0, 1, .56, 0, 3, 0, 0, 0 3rd floor area
10- 1.0791, 4132.12, 4323.82, 67.52, 1, 0, 0
11- 3974.4, 22386.16, 17.036651, 1.6, 0, 0, 55, 6824.79 interpretation?
12- 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
13- 0, 0, 0, 0, 0, 0, 0
14- 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
15- 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
16- 0, 0, 0, 0, 0, 0, 0, 0

This is SABS according to the STAR - Hot2000 input conversion program. However, it is not given in the STAR report.

17- 2.5515583, 0, 0, 0, 0, 90.68, 2.49, 0, 0, 0, 0 this is RECORD 27 (should not be here)
18- 23.4, .2, 0, 35.1, .2, 0 shouldn't be ∅ since there is upper/lower wall area in Rec.18
19- 35, .23, 0, 54.96, .23, 0, 0, 0, 1, 2.374359, 0
20- 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0 What is this?
21- 0, 0, 0, 0, 0, 0
22- 0, 0, 0, 0, 0, 0, 0
23- 0, 0, 0, 0, 0, 0, 0, 0, 0
24- 0, 0, 0, 0, 0, 0
25- 0, 0, 0, 0, 0, 0 26 & 27 should have been here.
28- 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
29- 0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
128.42, 1.87, 0
30 0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
1.46, .41, 0
31 0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
31.2, .28, 0
0, 0, 0, 0
0, 0, 0, 0

```
0, [illegible], 0, [illegible]
0, [illegible], 0, 0
0, [illegible], 0, 0
0, [illegible], 0, 0
0, [illegible], 0, 0
.87. .39, 0, 0, 0, .76, 0, 0, 0, 0
2.5[illegible], .39, 0, 0, 0, .76, 0, 0, 0, 0
3.[illegible], .39, 0, 0, 0, .76, 0, 0, 0, 0
4.9[illegible], .39, 0, 0, 0, .76, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
.2[illegible], .4, 0, 0, 0, .76, 0, 0, 0, 0
.66, .4, 0, 0, 0, .76, 0, 0, 0, 0
.66. .4, 0, 0, 0, .76, 0, 0, 0, 0
.86. .39, 0, 0, 0, .76, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
0, [illegible], 0, 0, 0, 0, 0, 0, 0, 0
```

File # ⇒ This is the same house file printed in the STAR Report

```
1002,HEAT,R.            ,ST. JOHN'S                        ,A1A2V7,NFLD,2,SAINT JOHN'S
 ,2,1, 3, 3, 23, 1968,1
0, 1, 1, 0, 40.6, 40.6, 23.3, 0, 23.547611, 17.052389, 2, 0, 2, 0
1, 1, 0, 71, 195023, 151772,
0, 4, 0, 100, 24101, 0,
5, 1, 0, 25, 23000, 0,
0, 0, 0, 0, 0, 0,
0, 1, 0, 0, 0, 0,
1, 0, 0, 65.478717,
0, 0, 0, 0,
20.5, 18, 0, 20.5, 18, 0, 0, 0, 0, 0, 3.5, 0,A
167.18, 117.9, 49.28, 0, 107.72, 61.61, 55.61, 0
525.31, 173.92, 318.33, 133.06, 0, .6, 0, 0, ,3, , 0, , 0, 0, 0
-25, 15.55, 0, 1, .56, 0, 2, 0, 0, 0
1.044, 5705.25, 6660.69, 118.44, 5, 0, 0
0, 32355.15, 24.623402, 2.8, 0, 0, 285, 28320.2
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0
2.7000239, 0, 0, 0, 0, 123.28, 2.82, 0, 0, 0, 0
10.231433, 1.68, 0, 36.768567, 1.68, 0
13.052389, .66, 0, 42.557611, .66, 0, 0, 0, 1, 3.6546199, 0
0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
21.547611, .23, 0, 40.062389, .23, 0
2, 2, 1, 11.97, .33, 0, .50833182
0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
172.53, 1.97, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
0, 0, 0
9.4, 1.75, 0
0, 0, 0, 0
0, 0, 0, 0
```

Record 26

In the file printed in the STAR REPORT there are Records 26 & 27 here (see photocopy). However, record 26 has the form 1,0,1,0.

Missing data: according to the printout in STAR REPORT, this record should be 3.9, 0.7, 0

0, 0, 0, 0
0, 0, 0, 0
0, 0, 0, 0
0, 0, 0, 0
3.66, .24, 0, 0, 0, .83, 0, 0, 0, 0
.94, .34, 0, 0, 0, .76, 0, 0, 0, 0
2.25, .34, 0, 0, 0, .76, 0, 0, 0, 0
10.01, .38, 0, 0, 0, .76, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
.42, .22, 0, 0, 0, .85, 0, 0, 0, 0
1.1, .38, 0, 0, 0, .76, 0, 0, 0, 0
3.93, .35, 0, 0, 0, .76, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0

Figure 2: Sample STAR Data File.

Type of Record		*Data*	
Record Type 01:	Record Identification	1002,HEAT,R, ST. JOHN'S .A1A2V7,NFLD,2	
Record Type 02:	Typology	,2,1, 3, 3, 23, 1968,1	
Record Type 03:	Basement, Crawlspace and Perimeters	0, 1, 1, 0, 40.6, 40.6, 23.3, 0, 23.547611, 17.052389, 2, 0, 2, 0	
Record Type 04:	Heating System and Energy Use Records	1, 0, 0, 71, 195023, 151772	
		0, 0, 0, 100, 24101, 0	
		5, 0, 0, 25, 23000, 0	Record 26
		0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0	
Record Type 05:	Domestic Hot Water System	1, 0, 0, 65.478717	
		0, 0, 0, 0	
Record Type 06:	Set Point Temperatures	20.5, 18, 0, 20.5, 18, 0, 0, 0, 0, 0, 3.5, 0,A	
Record Type 07:	Floor Area	167.18, 117.9, 49.28, 0, 107.72, 61.61, 55.61, 0	
Record Type 08:	Air Infiltration	625.31, 173.92, 318.33, 133.06, 0, .6, 0, 0, .3, . 0, . 0, 0, 0	
Record Type 09:	Climate and Orientation	-25, 15.55, 0, 1, .56, 0, 2, 0, 0, 0	
Record Type 10:	Degree Days	1.044, 5705.25, 6660.69, 118.44, 5, 0, 0	
Record Type 11:	Auxiliary System	0, 32355.15, 24.623402, 2.8, 0, 0, 285, 28320.2	
Record Type 12:	Heat Pump System	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
Record Type 13:	Type of Rooms	0, 0, 0, 0, 0, 0, 0	
Record Type 14:	CMHC-2 Data Codes	0, 0, 0, 0, 0, 0, 0, 0, 0, 0	Record 27
Record Type 15:	Heat Pump	0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
Record Type 16:	Airconditioning	0, 0, 0, 0, 0, 0, 0, 0	
Record Type 17:	Floor	2.7000239, 0, 0, 0, 0, 123.28, 2.82, 0, 0, 0, 0	
Record Type 18:	Full Basement	10.231433, 1.68, 0, 36.768567, 1.68, 0	
Record Type 19:	Full Basement	13.052389, .66, 0, 42.557611, .66, 0, 0, 0, 1, 3.6546199, 0	
Record Type 20:	Shallow Basement	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
Record Type 21:	Crawlspace	21.547611, .23, 0, 40.062389, .23, 0	
Record Type 22:	Crawlspace	2, 2, 1, 11.97, .33, 0, .50833182	
Record Type 23:	Below Grade Slab	0, 0, 0, 0, 0, 0, 0, 0, 0	
Record Type 24:	Living Area	0, 0, 0, 0, 0, 0	
Record Type 25:	Crawlspace	0, 0, 0, 0, 0, 0	Record 26
Record Type 26:	Foundation Attachment Code	1, 0, 1, 0	
Record Type 27:	Ceiling	123.28, 2.82, 0, 0, 0, 0	Rec. 27
Record Type 28:	Costs	0, 0, 0, 0, 0, 0, 0, 0, 0, 0	This record doesn't appear here in files. They are different!
Record Type 29:	Main Walls	0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		172.53, 1.97, 0	
Record Type 30:	Door	0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		3.9, 0.7, 0	These data are not on the file.
Record Type 31:	Basement Exposed Walls	0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		0, 0, 0	
		9.4, 1.75, 0	
Record Type 32:	Skylight	0, 0, 0, 0	
		0, 0, 0, 0	
		0, 0, 0, 0	
		0, 0, 0, 0	
		0, 0, 0, 0	
		0, 0, 0, 0	
		0, 0, 0, 0	
		0, 0, 0, 0	
		0, 0, 0, 0	
Record Type 33:	Windows Above Ground	3.66, .24, 0, 0, 0, .83, 0, 0, 0, 0	
		.94, .34, 0, 0, 0, .76, 0, 0, 0, 0	
		2.25, .34, 0, 0, 0, .76, 0, 0, 0, 0	
		10.01, .38, 0, 0, 0, .76, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
Record Type 34:	Windows - Basement	.42, .22, 0, 0, 0, .85, 0, 0, 0, 0	
		1.1, .38, 0, 0, 0, .76, 0, 0, 0, 0	
		3.93, .35, 0, 0, 0, .76, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	
		0, 0, 0, 0, 0, 0, 0, 0, 0, 0	

Thermal Engineering

15 Hanover Court, Halifax, Nova Scotia, Canada, B3M 3K7

August 27, 1993

Mr. Tom Hamlin
Residential Technologies Group
Research Division
Canada Mortgage and Housing Corporation
700 Montreal Road
Ottawa, Ontario
K1A 0P7

BY FAX: 613 748 2402

Dear Tom:

Re: Energy Efficiency Technology Impact - Appliances (CR File No. 6716-17-2)

Enclosed, I am sending "ENERPASS Input/Output Modification Requirements" that we intend to send to ENERMODAL. I will appreciate it if you could take a look at it and let me know what you think. Thank you.

Regards,

Ismet Ugursal

Ismet Ugursal

Detailed ENERPASS Input/Output Modification Requirements:

Detailed description of ENERPASS input/output modifications that are required for our batch simulation purpose is given below.

Input Requirements:

The modified ENERPASS program must have a function to read a datafile that contains the names of the individual house data files that will be included in the simulation run, and the output file name that will contain the results of the simulation runs for the houses included. This output file will be created and the simulation results will be written into it as it will be specified later.

Let's called this file as "LIST" file. This file would have the following format:

- the output file name would occupy the first line,
- followed by the house data file names.

The number of the house data files to be read should not be specified.

A sample format of the LIST file would be:

C:\CMHC\Simulation\Testout.out	(Output file name)
C:\CMHC\Data\BC-E\V8993.v30	(House data file name)
C:\CMHC\Data\BC-E\V8995.v30	(House data file name)
.....	
....	
.....	
C:\CMHC\Data\NFL-E\A1003.v30	(House data file name)
end	(Notification of end of file)

Once ENERPASS reads LIST file, it should open the first house data file in the list and do its simulation run. After the simulation run is completed, it should write the results in the output file (as described below). This procedure is then to be repeated until all of the runs are completed.

Output Requirements:

Within each batch simulation (i.e. simulation of a series of houses), the modified ENERPASS program should produce an output file that contains the following variables in the following formats:

- The name of the output file should be the same name from the first line of the LIST file.
- In the output file, all variables should be comma-separated so that the output file can easily be converted to a spreadsheet data file. MS EXCEL will be used for the purpose.
- All output data from one house file (i.e. each individual house run) should contain one (1) line in the output file. If data is not available for the variable, a blank space should be used so that the same output file format can be maintained for all houses.
- The required output variables are (in the same order as in ENERPASS Manual Version 3.1, starting pg. 13):

General Information:

- House data file name (e.g. V8993.v30), Date, Time, Location (e.g.. Toronto), Year, 99% Outdoor Design Temperature, Ground Design temperature.
- Total of 7 comma separated columns.

Design Day Heat Load Percentages:

- For each zone[1] (total of 3), the file should contain %s for Walls, Windows, Doors, Roof, Infilt., Ventil., B/G Walls, B/G Floor, Total, and Load.
- Total of 30 comma separated columns.

Fuel Consumption Over Simulation Period:

- Since there are six different fuel types available in ENERPASS, for each of the six fuel types there should be an output for: Space Heat, Hot Water, Process Energy, Lighting, Air Conditioning, Fan Energy and Total.
- Total of 42 comma separated columns.

Degree-Day Total:

- For each month (total of 12), the file should contain both the Heating and Cooling degree-day totals.
- Total of 24 comma separated columns.

Monthly Peak Electricity Demand:

- For each month (total of 12), it should contain KW, Day, and Hour.
- Total of 36 comma separated columns.

Energy Summary:

- It should contain Energy Consumption Per unit Floor Area
- Total of one comma separated column.

per unit volume as well

[1] The most number of zones in a house model will be three: crawl space, basement and main floor(s).

Energy Analysis Summary (part 1 - heat gains and space heating):

- For each zone (total of 3 zones) and each month (total of 12 months), the output file should contain Solar Trans., Occupant Ht. Gain, Process Sensible Ht. Gain (New), Process Latent Ht. Gain (New), Lighting Ht. Gain, Electrical Receptacle Load (New), Heat Load, % Load Sensible, Central Ht. Supp.[2]
- Total of 324 comma separated columns.

Note: 1. Instead of having a summary for the whole building, it is desirable for us to have a summary for each zone, if this is not exteremely inconvenient to modify the program for this. If it is, then the number of columns will be 324/3=108.

2. 'pre-heat energy' and 'reheat energy' are removed from the original list.

Peak Heating Supply:

- For each zone (total of 3), it should contain KW, Day, and Hour.
- Average Heat Conversion Efficiency.
- Maximum Humidification Rate.
- Total of 11 comma separated columns.

Energy Analysis Summary (part 2 - space cooling and fan):

- For each zone (total of 3 zones) and each month (total of 12 months), it should contain Cooling Ld. Sens., Cooling Ld Lat., Air Con. Energy, Fan Energy, Ventil. Rate.
- Total of 180 comma separated columns.

Note: 1. Instead of having a summary for the whole building, it is desirable for us to have a summary for each zone, if this is not exteremely inconvenient to modify the program for this. If it is, then the number of columns will be 180/3=60.

free cooling by opening window

[2] The houses will be simulated using "multiple zone" systems, with each system serving one zone. The reason for selecting the multiple zone system is as follows: Although there is a single thermostat to control the temperature in the whole house, house owners keep the main floor(s), basement and crawl space at different temperatures by manually adjusting the air (or water) flow to each zone. Since it is not possible to reflect this mode of operation in a "single-zone" model, multiple zone model will be used with different set point temperatures for each zone. In the STAR and HOT-2000 house data files, the temperatures for the three zones are supplied for each house, therefore these temperatures will be used. As a result of using multiple-zone model, there will be no reheat energy. Similarly, we are not interested in the pre-heat energy because it is not common to have pre-heat coils in the fresh air duct (assume the ducts are insulated against condensation).

Energy Analysis (part 3 - DHW) for each month.

- Heating Load, Energy Supply (Note that 'h/pump input' is deleted from the original list since no house in the database has it.)
- Total of 24 comma separated columns.

Energy Analysis (part 4 - Total Energy) for each month.

- Toal Energy
- Total of 12 comma separated columns

Peak Cooling Supply:

- For each zone (total of 3), it should contain Peak Cooling Supply, Day and Hour.
- Average Cooling C.O.P.
- Total of 10 comma separated columns.

Note: There are total 701 columns of output data for each house run, if it is impossible to accommodate 701 columns in one output file, then 2 or 3 or even more output files are acceptable as long as the data format and location are maintained in each output file. If multiple output files are used, name the output file according to Filename1, Filename2,...., FilenameN with the house data file name in the first column in each output file.

Appendix 6
List of Houses that are Assigned
"Medium Insulation Level"

Appendix 1: List of Houses that were Assigned for Wall and Roof RSI Values According to "Medium Insulation Level"

No.	House Name	Old Wall RSI	New Wall RSI	Old Roof RSI	New Roof RSI
1	1002	1.97	2.52	2.82	4.39
2	1005	1.9	2.52	3.18	4.39
3	1009	2.21	2.52	3.77	4.39
4	1011	2.31	2.52	2.43	4.39
5	1028	2.34	2.52	3.42	4.39
6	1039	2.25	2.52	3.3	4.39
7	1045	1.79	2.52	2.74	4.39
8	1047	1.97	2.52	2.43	4.39
9	1049	1.97	2.52	2.78	4.39
10	1051	2.31	2.52	2.43	4.39
11	1052	1.01	2.52	0	5.78
12	1059	2.31	2.52	3.99	4.39
13	1074	1.91	2.52	1.87	4.39
14	1097	0.68	2.52	2.31	4.39
15	1101	2.25	2.52	3.33	4.39
16	1109	1.27	2.52	1.08	4.39
17	1110	2.11	2.52	3.3	4.39
18	1111	1.97	2.52	2.15	4.39
19	1114	2.25	2.52	2.35	4.39
20	1137	0	3.34	3.3	4.39
21	1138	2.25	2.52	2.15	4.39
22	1148	2.25	2.52	3.42	4.39
23	1154	1.96	2.52	2.49	4.39
24	1158	0.98	2.52	3.7	4.39
25	1182	2.25	2.52	2.43	4.39
26	1188	2.24	2.52	2.15	4.39
27	1190	2.29	2.52	3.56	4.39
28	1192	2.25	2.52	2.15	4.39
29	1194	0.83	2.52	2.22	4.39
30	1195	2.25	2.52	2.34	4.39
31	1205	1.74	2.52	4.22	4.39
32	1209	2.31	2.52	0	4.86
33	1216	2.31	2.52	2.99	4.39
34	1217	2.29	2.52	3.46	4.39
35	1228	2.27	2.52	3.63	4.39
36	1233	2.27	2.52	3.3	4.39
37	1235	2.25	2.52	3.08	4.39
38	1253	2.4	2.52	3.4	4.39
39	1298	2.34	2.52	2.15	4.39
40	1325	2.4	2.52	2.15	4.39
41	1331	2.31	2.52	2.15	4.39
42	1332	2.31	2.52	0	5.32
43	1335	1.98	2.52	2.15	4.39
44	1338	2.25	2.52	1.79	4.39
45	1343	2.25	2.52	2.27	4.39
46	1344	2.31	2.52	0	5.97
47	1346	2.31	2.52	2.74	4.39
48	1350	1.03	2.52	0.8	4.39
49	1359	2.25	2.52	2.43	4.39
50	1361	2.31	2.52	2.43	4.39
51	1374	1.93	2.52	1.8	4.39
52	1376	2.33	2.52	3.3	4.39
53	1378	0.88	2.52	1.79	4.39
54	1381	2.18	2.52	0	4.68
55	1388	0.92	2.52	2.26	4.39
56	1398	2.4	2.52	2.72	4.39
57	1404	2.3	2.52	4.29	4.39
58	1412	2.22	2.52	2.75	4.39
59	1418	0.92	2.52	2.32	4.39
60	1422	1.35	2.52	2.36	4.39
61	1425	1.25	2.52	2.1	4.39

No.	House Name	Old Wall RSI	New Wall RSI	Old Roof RSI	New Roof RSI
398	5154	2.22	2.52	3.8	4.39
399	5156	1.61	2.52	0	4.76
400	5160	2.11	2.52	3.2	4.39
401	5169	1.42	2.52	2.68	4.39
402	5175	1.79	2.52	0	7.34
403	5184	1.84	2.52	3.69	4.39
404	5188	2.16	2.52	3.59	4.39
405	5189	1.69	2.52	2.8	4.39
406	5201	2.35	2.52	2.49	4.39
407	5220	2.09	2.52	2.18	4.39
408	5229	1.96	2.52	2.49	4.39
409	5230	0	2.99	1.29	4.39
410	5234	1.92	2.52	1.66	4.39
411	5235	1.84	2.52	0	6.21
412	5242	2.17	2.52	3.52	4.39
413	5243	1.87	2.52	3.01	4.39
414	5254	2.36	2.52	2.82	4.39
415	5261	2.08	2.52	0	4.53
416	5266	2.49	2.52	4.3	4.39
417	5268	2.33	2.52	2.08	4.39
418	5275	2.39	2.52	3.2	4.39
419	5281	2.51	2.52	1.98	4.39
420	5285	1.74	2.52	0	8.46
421	5325	2.06	2.52	0	6.12
422	5331	2.31	2.52	3.33	4.39
423	5341	2.4	2.52	2.82	4.39
424	5362	2.11	2.52	2.62	4.39
425	5370	1.82	2.52	3.81	4.39
426	5376	1.65	2.52	2.85	4.39
427	5378	1.78	2.52	3.51	4.39
428	5382	2.14	2.52	3.98	4.39
429	5388	0	2.67	2.36	4.39
430	5390	1.78	2.52	0	5.49
431	5391	2.18	2.52	2.75	4.39
432	5394	2.38	2.52	0	8.48
433	5406	1.72	2.52	2.01	4.39
434	5421	0	3.04	3.64	4.39
435	5456	2.4	2.52	2.39	4.39
436	6001	0	2.68	2.36	4.39
437	6006	2.42	2.52	3.99	4.39
438	6015	1.67	2.52	1.89	4.39
439	6022	2.38	2.52	2.72	4.39
440	6026	2.06	2.52	2.29	4.39
441	6035	1.73	2.52	1.67	4.39
442	6052	1.93	2.52	2.63	4.39
443	6056	2.11	2.52	0.9	4.39
444	6070	2.37	2.52	3.2	4.39
445	6076	2.16	2.52	0	7.31
446	6079	2.2	2.52	0	4.52
447	6081	1.73	2.52	2.05	4.39
448	6087	2.1	2.52	2.29	4.39
449	6092	2.34	2.52	0.02	4.39
450	6112	1.93	2.52	4.31	4.39
451	6119	1.97	2.52	1.76	4.39
452	6130	2.21	2.52	0	8.56
453	6132	1.94	2.52	0	4.72
454	6135	2.16	2.52	1.94	4.39
455	6147	2.16	2.52	4.23	4.39
456	6150	2.15	2.52	3.56	4.39
457	6152	1.64	2.52	2.35	4.39
458	6164	0	2.75	2.5	4.39

Appendix 1: List of Houses that were Assigned for Wall and Roof RSI Values According to "Medium Insulation Level"

62	2348	2.45	2.52	3.63	4.39
63	2349	0	3.2	2.49	4.39
64	2360	2.08	2.52	0	4.91
65	2371	1.82	2.52	2.35	4.39
66	2380	2.51	2.52	2.18	4.39
67	2386	2.43	2.52	3.42	4.39
68	2391	2.33	2.52	2.6	4.39
69	2392	2.14	2.52	1.11	4.39
70	2410	0	2.61	1.99	4.39
71	2416	2.35	2.52	2.62	4.39
72	2417	0	2.55	1.87	4.39
73	2428	2.31	2.52	3.48	4.39
74	2432	2.38	2.52	0	4.84
75	2436	2.43	2.52	2.33	4.39
76	2440	1.77	2.52	1.54	4.39
77	2457	2.46	2.52	3.31	4.39
78	3008	1.21	2.52	0	4.57
79	3009	1.86	2.52	2.89	4.39
80	3010	1.67	2.52	3.17	4.39
81	3013	1.03	2.52	0	4.93
82	3015	0.78	2.52	0	5.28
83	3017	2.27	2.52	1.89	4.39
84	3018	0.99	2.52	2.07	4.39
85	3037	2.13	2.52	3.58	4.39
86	3043	1.93	2.52	2.55	4.39
87	3059	2.39	2.52	3.75	4.39
88	3070	1.41	2.52	1.23	4.39
89	3071	2.16	2.52	2.36	4.39
90	3073	1.42	2.52	4.18	4.39
91	3083	1.3	2.52	3.44	4.39
92	3085	0	2.62	2.12	4.39
93	3097	0	3.04	2.67	4.39
94	3098	2.38	2.52	3.37	4.39
95	3103	2.01	2.52	2.59	4.39
96	3109	0	2.6	2.88	4.39
97	3110	2.41	2.52	2.88	4.39
98	3124	2.44	2.52	3.55	4.39
99	3134	0	2.82	3.47	4.39
100	3135	0	2.61	1.94	4.39
101	3136	1.92	2.52	1.38	4.39
102	3138	2.44	2.52	0	4.83
103	3141	2.43	2.52	0	5.97
104	3144	2.12	2.52	0	6.57
105	3145	0	5.56	3.62	4.39
106	3146	2.43	2.52	2.69	4.39
107	3151	0	2.64	2.86	4.39
108	3153	2.13	2.52	2.1	4.39
109	3166	2.28	2.52	3.73	4.39
110	3169	2.48	2.52	3.73	4.39
111	3170	1.13	2.52	4.26	4.39
112	3174	2.46	2.52	2.97	4.39
113	3178	2.28	2.52	0	4.88
114	3183	0.89	2.52	0	4.64
115	3186	2.2	2.52	0	5.56
116	3189	2.48	2.52	3.73	4.39
117	3190	2.25	2.52	3.73	4.39
118	3196	0	2.52	0.67	4.39
119	3197	2.01	2.52	4.28	4.39
120	3198	2.09	2.52	4.31	4.39
121	3205	0	2.68	1.75	4.39
122	3206	2.2	2.52	2.09	4.39
123	3208	0	2.62	2.38	4.39
124	3209	0	2.75	2.35	4.39

459	6173	2.4	2.52	0	6.8
460	6186	2.22	2.52	2.15	4.39
461	6201	2.22	2.52	4.23	4.39
462	6221	0	2.57	2.24	4.39
463	6227	2.28	2.52	3.93	4.39
464	6235	2.08	2.52	0	4.43
465	6240	1.27	2.52	0	4.52
466	6243	2.4	2.52	3.52	4.39
467	6267	1.41	2.52	2.12	4.39
468	6272	1.72	2.52	3.61	4.39
469	6281	1.77	2.52	0	4.48
470	6285	2.07	2.52	1.8	4.39
471	6290	2.01	2.52	3.29	4.39
472	6291	2.34	2.52	2.35	4.39
473	6294	1.9	2.52	2.15	4.39
474	6295	2.14	2.52	0	5.95
475	6298	1.83	2.52	1.8	4.39
476	6305	1.82	2.52	0	6.9
477	6307	2.22	2.52	1.79	4.39
478	6323	1.9	2.52	2.39	4.39
479	6326	2.18	2.52	3.54	4.39
480	6332	2.5	2.52	3	4.39
481	6345	1.86	2.52	2.04	4.39
482	6354	1.77	2.52	2.58	4.39
483	6360	2.08	2.52	2.09	4.39
484	6377	1.78	2.52	3.54	4.39
485	6378	1.73	2.52	2.22	4.39
486	6383	1.98	2.52	3.47	4.39
487	6394	2.07	2.52	2.15	4.39
488	6403	2.5	2.52	2.35	4.39
489	6445	2.03	2.52	3.13	4.39
490	6451	2.5	2.52	2.35	4.39
491	7001	1.92	2.52	2.38	4.39
492	7017	0	2.77	2.33	4.39
493	7018	2.26	2.52	2.51	4.39
494	7040	1.62	2.52	2.06	4.39
495	7045	1.54	2.52	0	4.69
496	7050	1.79	2.52	2.38	4.39
497	7051	1.75	2.52	3.92	4.39
498	7058	2.21	2.52	3.52	4.39
499	7062	2.1	2.52	2.49	4.39
500	7071	2.29	2.52	2.94	4.39
501	7077	1.65	2.52	3.22	4.39
502	7080	1.59	2.52	0	6.55
503	7086	2.4	2.52	1.78	4.39
504	7093	1.94	2.52	0	5.97
505	7095	1.73	2.52	3.82	4.39
506	7097	2.27	2.52	4.13	4.39
507	7104	1.09	2.52	2.42	4.39
508	7105	2.21	2.52	3.61	4.39
509	7124	2.38	2.52	1.31	4.39
510	7137	2.25	2.52	2.48	4.39
511	7140	2.34	2.52	2.74	4.39
512	7151	2.22	2.52	2.49	4.39
513	7157	1.93	2.52	1.67	4.39
514	7163	2.41	2.52	1.8	4.39
515	7182	2.39	2.52	0	5.79
516	7197	2.2	2.52	0	5.88
517	7201	2.31	2.52	0	6.28
518	7206	1.87	2.52	2.25	4.39
519	7209	1.08	2.52	3.52	4.39
520	7231	2.42	2.52	1.78	4.39
521	7236	2.32	2.52	2.44	4.39

Appendix 1: List of Houses that were Assigned for Wall and Roof RSI Values According to "Medium Insulation Level"

125	3210	2.48	2.52	0	4.66
126	3212	2.47	2.52	2.14	4.39
127	3213	0	2.59	2.51	4.39
128	3224	2.45	2.52	4.2	4.39
129	3233	2.41	2.52	2.35	4.39
130	3239	1.11	2.52	0.78	4.39
131	3243	0.97	2.52	2.88	4.39
132	3247	2.07	2.52	2.94	4.39
133	3255	0.85	2.52	3.56	4.39
134	3256	2.22	2.52	0	4.79
135	3257	1.87	2.52	2.24	4.39
136	3259	1.91	2.52	2.06	4.39
137	3260	2.27	2.52	3.46	4.39
138	3261	2.24	2.52	0	4.86
139	3263	1.9	2.52	1.8	4.39
140	3264	0	2.55	3.36	4.39
141	3266	1.73	2.52	0	4.68
142	3278	0	2.58	2.12	4.39
143	3281	1.87	2.52	2.42	4.39
144	3293	1.82	2.52	0	6.9
145	3295	2.05	2.52	2.33	4.39
146	3301	2.18	2.52	3.92	4.39
147	3312	0.88	2.52	2.82	4.39
148	3317	2.2	2.52	2.39	4.39
149	3322	2.06	2.52	0	6.08
150	3323	1.61	2.52	3.98	4.39
151	3324	0	3.04	3.09	4.39
152	3329	2.39	2.52	3.93	4.39
153	3333	2.16	2.52	3.58	4.39
154	3337	0	2.84	3.33	4.39
155	3344	1.74	2.52	2.15	4.39
156	3348	1.46	2.52	4.25	4.39
157	3349	2.3	2.52	0	5.24
158	3357	0.95	2.52	2.12	4.39
159	3361	2.31	2.52	0	7
160	3367	2.44	2.52	3.43	4.39
161	3369	2.43	2.52	2.24	4.39
162	3370	1.25	2.52	4.33	4.39
163	3374	1.68	2.52	0	5.18
164	3377	2.34	2.52	0	5.28
165	3380	0.96	2.52	4.01	4.39
166	3386	1.97	2.52	0	5.87
167	3392	2.19	2.52	0	5
168	3394	2.43	2.52	2.51	4.39
169	3395	1.07	2.52	4.16	4.39
170	3399	0	2.91	2.41	4.39
171	3405	0	3.93	2.63	4.39
172	3408	2.5	2.52	1.94	4.39
173	3411	1.77	2.52	2.38	4.39
174	3412	0	2.75	3.33	4.39
175	3413	0	3.11	3.68	4.39
176	3416	2.07	2.52	3.22	4.39
177	3423	2.37	2.52	2.69	4.39
178	3427	2.46	2.52	0	4.63
179	3430	0	3.09	3.46	4.39
180	3432	0	2.59	2.7	4.39
181	3433	2.19	2.52	0	4.68
182	3436	0.7	2.52	4.32	4.39
183	3439	2	2.52	0.96	4.39
184	3443	2.41	2.52	3.98	4.39
185	3445	1.99	2.52	2.43	4.39
186	3448	1.82	2.52	0	4.68
187	3449	2.12	2.52	0	7.08

522	7241	1.83	2.52	2.54	4.39
523	7254	2.28	2.52	1.8	4.39
524	7258	2.1	2.52	2.51	4.39
525	7261	1.87	2.52	2.49	4.39
526	7280	2.04	2.52	0	5.24
527	7281	2.42	2.52	1.92	4.39
528	7285	2.4	2.52	3.52	4.39
529	7290	2.44	2.52	2.29	4.39
530	7293	2.4	2.52	2.22	4.39
531	7303	2.39	2.52	2.77	4.39
532	7320	1.16	2.52	3.45	4.39
533	7321	0	2.81	4.24	4.39
534	7330	2.46	2.52	0	5.09
535	7355	2.34	2.52	2.26	4.39
536	7369	2.22	2.52	2.28	4.39
537	7385	2.3	2.52	2.74	4.39
538	7397	2.01	2.52	0	5.64
539	7406	2.15	2.52	2.41	4.39
540	7409	2.15	2.52	1.87	4.39
541	7418	1.9	2.52	3.57	4.39
542	7420	2.26	2.52	2.36	4.39
543	7421	2.22	2.52	0	4.44
544	7425	2.31	2.52	0	5.78
545	7427	2.4	2.52	2.44	4.39
546	7432	2.22	2.52	3.3	4.39
547	7440	2.46	2.52	2.53	4.39
548	7459	1.77	2.52	1.43	4.39
549	8005	0.83	2.52	3.66	4.39
550	8012	0.85	2.52	1.34	4.39
551	8013	0.88	2.52	0.64	4.39
552	8019	1.06	2.52	0	4.76
553	8035	2.34	2.52	1.92	4.39
554	8037	2.38	2.52	3.44	4.39
555	8038	1.13	2.52	1.61	4.39
556	8042	0.9	2.52	1.09	4.39
557	8044	1.17	2.52	2.78	4.39
558	8056	2	2.52	2.27	4.39
559	8060	0.68	2.52	1.07	4.39
560	8066	0.8	2.52	2.21	4.39
561	8070	1.73	2.52	3.13	4.39
562	8086	0.72	2.52	2.48	4.39
563	8090	0.86	2.52	1.96	4.39
564	8094	2.31	2.52	3.39	4.39
565	8100	1.61	2.52	4.07	4.39
566	8101	2.16	2.52	4.25	4.39
567	8124	0	3.4	0	5.8
568	8126	2.06	2.52	2.15	4.39
569	8131	2.02	2.52	0	4.63
570	8133	1.97	2.52	2.15	4.39
571	8139	1.72	2.52	2.15	4.39
572	8145	0.99	2.52	2.6	4.39
573	8158	2.22	2.52	0	5.75
574	8163	2.1	2.52	3.57	4.39
575	8170	2.14	2.52	0	7.74
576	8179	2.31	2.52	2.15	4.39
577	8194	0.8	2.52	1.8	4.39
578	8200	2.27	2.52	0	5.74
579	8201	2.29	2.52	3.22	4.39
580	8202	2.22	2.52	0	5.8
581	8207	1.7	2.52	2.6	4.39
582	8221	2.1	2.52	0	4.71
583	8233	2.07	2.52	0	5.1
584	8239	1.11	2.52	1.12	4.39

Appendix 1: List of Houses that were Assigned for Wall and Roof RSI Values According to "Medium Insulation Level"

188	3609	1.21	2.52	3.95	4.39
189	3613	0	2.57	3.8	4.39
190	3617	1.02	2.52	0	4.41
191	3649	2.33	2.52	2.34	4.39
192	3656	2.47	2.52	3.7	4.39
193	3666	1.52	2.52	0	5.51
194	3668	2.43	2.52	0	4.64
195	3680	1.46	2.52	2.86	4.39
196	3681	0	2.62	3.22	4.39
197	3689	1.67	2.52	0	4.8
198	3709	1.82	2.52	0	5.51
199	3710	1.59	2.52	0	5.87
200	3712	1.76	2.52	0	7.9
201	3745	2.42	2.52	3.62	4.39
202	3762	2.26	2.52	2.77	4.39
203	3763	2.1	2.52	1.58	4.39
204	3764	2.24	2.52	0	6.47
205	3765	2.11	2.52	0	4.77
206	3789	1.72	2.52	3.35	4.39
207	3797	0	2.7	3.45	4.39
208	3817	2.39	2.52	0	5.06
209	3820	1.77	2.52	2.3	4.39
210	3840	1.99	2.52	0	5.16
211	4002	0.97	2.52	3.78	4.39
212	4004	2.1	2.52	3.96	4.39
213	4008	1.01	2.52	3.79	4.39
214	4012	0.91	2.52	0	7.13
215	4014	0.95	2.52	0	5.26
216	4018	1.87	2.52	1.67	4.39
217	4020	1.04	2.52	2.86	4.39
218	4025	2.3	2.52	2.45	4.39
219	4026	1.65	2.52	0	8.24
220	4027	1.06	2.52	0	5
221	4028	2.31	2.52	3.57	4.39
222	4029	1.92	2.52	3.64	4.39
223	4030	2.25	2.52	3.73	4.39
224	4031	2.43	2.52	0	4.45
225	4032	2.25	2.52	0	7.09
226	4037	2.35	2.52	2.68	4.39
227	4043	0.89	2.52	4.05	4.39
228	4044	2.27	2.52	0	5.01
229	4048	1.93	2.52	2.31	4.39
230	4052	1.88	2.52	1.67	4.39
231	4056	1.87	2.52	0.93	4.39
232	4059	1.76	2.52	0	4.5
233	4060	0	2.56	1.72	4.39
234	4061	2.39	2.52	0	5.26
235	4062	1.75	2.52	0	5.19
236	4065	2.5	2.52	2.25	4.39
237	4067	2.08	2.52	1.4	4.39
238	4075	0.91	2.52	0	5.26
239	4076	1.01	2.52	2.89	4.39
240	4080	2.48	2.52	2.53	4.39
241	4082	0	3.03	2.57	4.39
242	4083	0	2.66	3.94	4.39
243	4085	0.8	2.52	3.2	4.39
244	4087	1.13	2.52	0.83	4.39
245	4103	1.9	2.52	3.27	4.39
246	4108	1.97	2.52	3.52	4.39
247	4110	1.95	2.52	3.52	4.39
248	4112	1.95	2.52	2.6	4.39
249	4116	1.94	2.52	0	4.66
250	4117	1.91	2.52	2.35	4.39

585	8240	0.68	2.52	0.64	4.39
586	8246	0.85	2.52	0.71	4.39
587	8247	2.14	2.52	2.26	4.39
588	8248	1.86	2.52	2.3	4.39
589	8250	1.58	2.52	0	4.46
590	8251	0.74	2.52	0.64	4.39
591	8253	2.22	2.52	3.3	4.39
592	8257	2.09	2.52	2.43	4.39
593	8258	2.14	2.52	1.79	4.39
594	8267	2.22	2.52	2.51	4.39
595	8269	1.95	2.52	2.13	4.39
596	8271	2.13	2.52	2.95	4.39
597	8278	2.38	2.52	2.15	4.39
598	8280	1.97	2.52	3.11	4.39
599	8281	2.06	2.52	2.15	4.39
600	8282	1.77	2.52	1.94	4.39
601	8288	2.15	2.52	2.25	4.39
602	8292	2.22	2.52	4.23	4.39
603	8302	0	2.77	2.1	4.39
604	8308	2.12	2.52	3.3	4.39
605	8310	2.16	2.52	2.95	4.39
606	8311	2.03	2.52	3.3	4.39
607	8316	2.43	2.52	4.22	4.39
608	8318	2.07	2.52	3.16	4.39
609	8323	1.99	2.52	2.47	4.39
610	8337	1.72	2.52	2.49	4.39
611	8338	0.78	2.52	0.67	4.39
612	8341	1.88	2.52	2.15	4.39
613	8345	1.81	2.52	3.67	4.39
614	8346	2.02	2.52	2.52	4.39
615	8351	2.06	2.52	3.04	4.39
616	8371	0.88	2.52	3.03	4.39
617	8395	2.06	2.52	1.54	4.39
618	8397	2.25	2.52	0	6.05
619	8398	2.06	2.52	2.41	4.39
620	8400	1.72	2.52	1.98	4.39
621	8402	1.9	2.52	2.67	4.39
622	8407	1.75	2.52	3.54	4.39
623	8408	2.11	2.52	0	4.81
624	8411	2.06	2.52	3.54	4.39
625	8413	1.92	2.52	3.55	4.39
626	8434	2.25	2.52	3.3	4.39
627	8436	2.31	2.52	2.15	4.39
628	8438	0	3.15	0	4.48
629	8450	0.68	2.52	4.12	4.39
630	8456	2.25	2.52	3.05	4.39
631	8458	1.71	2.52	4.23	4.39
632	8459	0.68	2.52	1.97	4.39
633	8601	0	2.56	0	5.56
634	8606	0.69	2.52	0	4.5
635	8607	1.87	2.52	3.03	4.39
636	8610	0	3.17	2.75	4.39
637	8612	1.97	2.52	0	6.06
638	8622	2.01	2.52	3.19	4.39
639	8623	1.89	2.52	3.96	4.39
640	8633	0.88	2.52	1.6	4.39
641	8637	1.68	2.52	3.09	4.39
642	8641	2.15	2.52	3.33	4.39
643	8643	1.65	2.52	0	6.55
644	8647	1.81	2.52	0	4.7
645	8650	1.86	2.52	0	8.22
646	8654	1.78	2.52	2.19	4.39
647	8657	1.65	2.52	4.13	4.39

Appendix 1: List of Houses that were Assigned for Wall and Roof RSI Values According to "Medium Insulation Level"

251	4119	1.93	2.52	1.62	4.39
252	4121	2.48	2.52	0	4.81
253	4123	1.19	2.52	3.6	4.39
254	4124	2.48	2.52	3.3	4.39
255	4125	2.27	2.52	0	5.19
256	4127	0	2.76	3.73	4.39
257	4128	0	2.53	4.01	4.39
258	4134	0	2.58	3.3	4.39
259	4135	0	2.67	3.57	4.39
260	4138	0.84	2.52	2.32	4.39
261	4139	1.56	2.52	4.36	4.39
262	4141	1.25	2.52	1.67	4.39
263	4143	1.52	2.52	3.74	4.39
264	4144	1.03	2.52	0	6.63
265	4146	0.87	2.52	0	6.68
266	4147	0.91	2.52	2.47	4.39
267	4161	0.95	2.52	4.27	4.39
268	4162	1.3	2.52	2.51	4.39
269	4163	0.88	2.52	3.57	4.39
270	4164	1.84	2.52	3.3	4.39
271	4169	0.96	2.52	0.65	4.39
272	4170	0.87	2.52	3.36	4.39
273	4171	1.26	2.52	3.26	4.39
274	4176	0.88	2.52	4	4.39
275	4177	0.79	2.52	0	6.8
276	4182	1.87	2.52	3.3	4.39
277	4186	1.84	2.52	0	4.5
278	4188	1.93	2.52	0	5.1
279	4190	0	2.52	3.23	4.39
280	4195	2.43	2.52	2.6	4.39
281	4197	1.68	2.52	1.4	4.39
282	4205	1.82	2.52	0	4.7
283	4208	0.9	2.52	3.96	4.39
284	4210	1.89	2.52	0	7
285	4222	1.78	2.52	2.7	4.39
286	4224	0	2.62	2.43	4.39
287	4226	2.42	2.52	2.43	4.39
288	4230	1.59	2.52	2.68	4.39
289	4232	1.88	2.52	3.77	4.39
290	4236	2.22	2.52	0	5.78
291	4238	1.99	2.52	0	4.66
292	4243	2.06	2.52	0	4.44
293	4245	1.68	2.52	3.33	4.39
294	4249	1.83	2.52	3.22	4.39
295	4256	2.47	2.52	3.3	4.39
296	4257	2.5	2.52	3.3	4.39
297	4258	2.45	2.52	3.3	4.39
298	4261	2.45	2.52	0	7.05
299	4262	0	2.58	3.48	4.39
300	4263	0	2.66	3.3	4.39
301	4265	2.46	2.52	3.3	4.39
302	4266	1.41	2.52	4.15	4.39
303	4273	0.9	2.52	0	6.43
304	4274	1.07	2.52	3.3	4.39
305	4276	1.2	2.52	2.23	4.39
306	4278	1.04	2.52	3.58	4.39
307	4284	2.31	2.52	0	6.95
308	4287	1	2.52	2.79	4.39
309	4289	1.01	2.52	0	4.51
310	4292	0.92	2.52	0	5.19
311	4293	1.53	2.52	2.58	4.39
312	4296	1.99	2.52	2.42	4.39
313	4297	1.68	2.52	0	5.65

648	8667	0.88	2.52	1.14	4.39
649	8668	2.06	2.52	3.75	4.39
650	8688	2.09	2.52	0	4.74
651	8689	1.94	2.52	0	5.13
652	8712	0.74	2.52	0	4.77
653	8725	2.36	2.52	2.58	4.39
654	8735	1.88	2.52	0	6.48
655	8745	2.13	2.52	2.93	4.39
656	8784	0	2.87	4.05	4.39
657	8786	1.62	2.52	3.55	4.39
658	8788	1.72	2.52	2.9	4.39
659	8795	1.09	2.52	2.21	4.39
660	8825	1.71	2.52	0	5.42
661	8838	1.44	2.52	1.22	4.39
662	8842	0	2.57	3.73	4.39
663	8849	2.15	2.52	0	5.42
664	8852	1.97	2.52	0	4.46
665	8854	1.81	2.52	3.88	4.39
666	8859	1.64	2.52	0	7.45
667	8862	1.55	2.52	0	5.64
668	cene5986	1.7	2.52	3.79	4.39
669	cene6026	2.27	2.52	0	8.21
670	cene6046	2.3	2.52	0	8.21
671	cene6050	2.33	2.52	0	6.6
672	cene6056	2.31	2.52	0	4.95
673	cene6076	2.31	2.52	0	7.32
674	cene6086	2.21	2.52	0	7.28
675	cene6090	2.3	2.52	0	7.09
676	cene6096	2.33	2.52	3.79	4.39
677	cene6116	1.96	2.52	0	7.42
678	cene6126	2.16	2.52	0	9.65
679	cene6146	2.31	2.52	3.79	4.39
680	cene6216	2.37	2.52	0	4.79
681	cene6236	2.3	2.52	0	4.8
682	cene6266	2.25	2.52	0	7.12
683	cene6276	2.29	2.52	2.14	4.39
684	ceny5658	0.95	2.52	0	6.33
685	ceny5758	1.01	2.52	3.88	4.39
686	ceny5770	0.95	2.52	0	6.06
687	ceny5814	1.04	2.52	2.25	4.39
688	ceny5816	1.77	2.52	3.57	4.39
689	ceny5886	2.29	2.52	0	6.13
690	ceoa7678	1.7	2.52	3.01	4.39
691	ceoa7682	1.7	2.52	3.52	4.39
692	ceoa7738	1.98	2.52	0	5.69
693	ceoa7828	1.7	2.52	2.81	4.39
694	ceoa7838	1.58	2.52	0	4.76
695	ceoa7858	2.33	2.52	0	5.29
696	ceoa7878	2.28	2.52	0	4.88
697	ceoa7898	2.15	2.52	0	4.61
698	ceto6382	2.18	2.52	2.86	4.39
699	ceto6584	0.95	2.52	0	7.28
700	ceto6632	1.97	2.52	0	8.26
701	eaot4554	2.29	2.52	0	5.46
702	eaot4556	0.95	2.52	0	4.68
703	eaot4564	2.47	2.52	4.28	4.39
704	eaot4574	2.43	2.52	0	4.51
705	eaot4584	2.08	2.52	3.89	4.39
706	eaot4586	2.18	2.52	3.63	4.39
707	eaot4634	2.13	2.52	0	7.28
708	eaot4696	1.5	2.52	3.04	4.39
709	eaot4746	1.33	2.52	4.09	4.39
710	eaot4804	0.96	2.52	0	4.62

Appendix 1: List of Houses that were Assigned for Wall and Roof RSI Values According to "Medium Insulation Level"

314	4299	1.88	2.52	2.91	4.39
315	4300	1.98	2.52	0	4.95
316	4311	1.96	2.52	2.6	4.39
317	4312	2.51	2.52	0	4.5
318	4314	1.77	2.52	0	5.42
319	4316	1.53	2.52	0	4.87
320	4317	0	2.66	0	4.5
321	4318	1.7	2.52	3.9	4.39
322	4319	0	2.55	1.78	4.39
323	4323	1.94	2.52	3.3	4.39
324	4336	1.75	2.52	3.22	4.39
325	4338	2.4	2.52	4.06	4.39
326	4339	2.29	2.52	3.93	4.39
327	4345	2	2.52	0	7.11
328	4346	1.45	2.52	3.11	4.39
329	4347	1.54	2.52	0	6.15
330	4348	1.1	2.52	3.68	4.39
331	4350	2	2.52	0	7.05
332	4353	2.2	2.52	0	6.95
333	4360	1.06	2.52	0.47	4.39
334	4361	1.14	2.52	2.85	4.39
335	4362	2.41	2.52	0	6.63
336	4363	1.46	2.52	4.17	4.39
337	4365	1.74	2.52	2.33	4.39
338	4367	0	2.61	4.01	4.39
339	4368	2.01	2.52	3.59	4.39
340	4369	1.92	2.52	3.35	4.39
341	4377	2.06	2.52	0	9.99
342	4378	0.84	2.52	0	4.99
343	4379	1.2	2.52	1.02	4.39
344	4383	0.66	2.52	0	5.47
345	4390	0.86	2.52	2.31	4.39
346	4396	0.85	2.52	3.59	4.39
347	4397	0	2.64	2.44	4.39
348	4398	0	2.58	4.38	4.39
349	4403	0.88	2.52	0.58	4.39
350	4408	0	2.55	1.77	4.39
351	4413	2.09	2.52	3.16	4.39
352	4414	1.95	2.52	2.99	4.39
353	4420	0	2.68	3.3	4.39
354	4422	2.22	2.52	2.39	4.39
355	4423	1.18	2.52	2.02	4.39
356	4429	2.11	2.52	1.81	4.39
357	4448	2.26	2.52	0	4.41
358	4449	0.72	2.52	3.44	4.39
359	4451	1.91	2.52	3.85	4.39
360	4454	2.25	2.52	0	6.22
361	4455	1.93	2.52	1.67	4.39
362	4625	1.5	2.52	1.82	4.39
363	4644	0	2.85	3.74	4.39
364	4652	0.98	2.52	0	6.54
365	4653	0	2.82	3.8	4.39
366	4664	1.87	2.52	2.49	4.39
367	4671	2.27	2.52	0	4.66
368	4684	1.69	2.52	3.02	4.39
369	4701	1.9	2.52	0	5.78
370	4706	0	3.18	1.24	4.39
371	4716	1.93	2.52	0	5.3
372	4755	1.13	2.52	0	5.92
373	4765	1.17	2.52	2.76	4.39
374	4787	1.5	2.52	0	6.63
375	4808	1.15	2.52	3.49	4.39
376	4810	1.76	2.52	3.73	4.39

711	eaot4824	1.76	2.52	2.83	4.39
712	eaot4834	2.22	2.52	3.05	4.39
713	eaot4844	1.81	2.52	0	7.21
714	eaot4846	2.11	2.52	2.77	4.39
715	eaot4854	2.07	2.52	2.77	4.39
716	eaot4884	1.79	2.52	2.19	4.39
717	eaot4904	2.22	2.52	0	6.16
718	eawc0634	2.22	2.52	2.67	4.39
719	gbba9070	1.93	2.52	4.05	4.39
720	gbba9076	2.26	2.52	3.52	4.39
721	gbba9082	2.19	2.52	0	4.91
722	gbba9090	2.3	2.52	1.7	4.39
723	gbba9092	2.22	2.52	0	6.28
724	gbba9096	2.15	2.52	4.22	4.39
725	gbba9120	2.28	2.52	0	5.34
726	gbba9128	2.11	2.52	0	4.91
727	gbba9182	2.13	2.52	0	4.48
728	gbba9186	1.5	2.52	2.38	4.39
729	gbba9196	2.3	2.52	0	4.88
730	gbba9214	2.22	2.52	3.14	4.39
731	gbba9230	2.16	2.52	3.71	4.39
732	gbba9238	2.2	2.52	3.71	4.39
733	gbba9240	2.19	2.52	0	5.77
734	gbba9244	2.19	2.52	0	5.69
735	gbba9246	2.21	2.52	0	4.57
736	gbba9250	2.25	2.52	0	5.55
737	gbba9256	2.15	2.52	0	5.51
738	gbba9262	2.25	2.52	4.05	4.39
739	gbba9272	2.22	2.52	0	7.05
740	gbba9298	1.7	2.52	3.63	4.39
741	gbba9302	2.21	2.52	0	6.37
742	gbba9326	2.29	2.52	0	7.12
743	gbba9398	2.33	2.52	0	7.44
744	gbba9506	2.18	2.52	0	7.28
745	gbba9590	2.14	2.52	0	4.91
746	EDM06	2.1	2.52	0	6
747	RCD01	2.11	2.52	0	5.64
748	RCD02	2.11	2.52	0	5.64
749	RCD03	2.11	2.52	0	5.6
750	RCD04	2.11	2.52	0	4.88
751	RCD05	2.11	2.52	0	5.6
752	RCD06	2.11	2.52	0	5.6
753	RCD07	2.11	2.52	0	5.64
754	RCD08	2.11	2.52	0	5.64
755	RCD09	2.11	2.52	0	5.6
756	RCD10	2.11	2.52	0	5.6
757	RCD11	2.11	2.52	0	5.6
758	RCD12	2.11	2.52	0	5.64
759	RCD13	2.11	2.52	0	5.32
760	RCD14	2.11	2.52	0	5.64
761	RCD15	2.47	2.52	0	5.64
762	RCD16	2.11	2.52	0	5.6
763	RCD17	2.11	2.52	0	5.6
764	RCD18	2.11	2.52	0	5.64
765	RCD19	2.11	2.52	0	7.04
766	RCD20	2.11	2.52	0	5.6
767	RCD21	2.1	2.52	0	5.64
768	RCD22	2.1	2.52	0	5.64
769	RCD23	2.1	2.52	0	5.64
770	RCD24	2.11	2.52	0	5.64
771	RCD25	2.11	2.52	0	5.64
772	RCD26	2.1	2.52	0	5.64
773	RCD27	2.1	2.52	0	5.64

Appendix 1: List of Houses that were Assigned for Wall and Roof RSI Values According to "Medium Insulation Level"

377	4822	1.95	2.52	0	7.9
378	4846	0	2.87	3.35	4.39
379	5002	2.27	2.52	0	7.28
380	5004	2.35	2.52	1.8	4.39
381	5031	2.19	2.52	0	9.47
382	5033	2.38	2.52	0	5.01
383	5035	2.06	2.52	2.51	4.39
384	5037	1.84	2.52	0	4.97
385	5065	2.15	2.52	2.84	4.39
386	5072	2.1	2.52	2.84	4.39
387	5076	0	2.58	0	6.44
388	5098	2.15	2.52	2.78	4.39
389	5112	1.54	2.52	0	5.01
390	5116	1.74	2.52	0	6.18
391	5119	2.22	2.52	2.49	4.39
392	5123	2.05	2.52	3.61	4.39
393	5126	1.75	2.52	0	6.47
394	5134	2.35	2.52	0	5.86
395	5138	2.36	2.52	4.25	4.39
396	5147	2.24	2.52	2.84	4.39
397	5150	2.39	2.52	2.78	4.39

774	RCD28	2.1	2.52	0	5.64
775	RCD29	2.1	2.52	0	5.64
776	STJ04	0	3.52	3.52	4.39
777	VAN01	0	3.52	2.78	4.39
778	VAN02	2.11	2.52	4.31	4.39
779	VAN03	2.11	2.52	0	4.62
780	VAN05	2.11	2.52	0	4.8
781	VAN06	2.11	2.52	0	4.41
782	VAN07	2.11	2.52	0	4.46
783	VAN08	2.11	2.52	0	4.93
784	VAN09	2.11	2.52	0	4.78
785	VAN10	2.11	2.52	0	4.57
786	VAN11	2.11	2.52	0	4.87
787	VAN13	2.11	2.52	0	4.76
788	VAN14	2.11	2.52	4.12	4.39
789	VAN15	2.11	2.52	4.12	4.39
790	VAN16	2.11	2.52	4.36	4.39
791	VAN17	2.08	2.52	0	4.93
792	VAN18	1.92	2.52	4.19	4.39
793	VAN19	2.07	2.52	4.12	4.39
794	VAN20	2.11	2.52	0	4.76

*** 0 RSI value means the RSI value is higher than the "medium insulation level"

Appendix 7
List of Houses that are Assigned "High Insulation Level"

Appendix 2: List of House that were Assigned Wall and Roof RSI Values According to "High Insulation Level"

No.	Nouse Name	Old Wall RSI	New Wall RSI	Old Roof RSI	New Roof RSI
1	1002	1.97	3.8	2.82	6.49
2	1005	1.9	3.8	3.18	6.49
3	1009	2.21	3.8	3.77	6.49
4	1011	2.31	3.8	2.43	6.49
5	1028	2.34	3.8	3.42	6.49
6	1039	2.25	3.8	3.3	6.49
7	1045	1.79	3.8	2.74	6.49
8	1047	1.97	3.8	2.43	6.49
9	1049	1.97	3.8	2.78	6.49
10	1051	2.31	3.8	2.43	6.49
11	1052	1.01	3.8	5.78	6.49
12	1056	2.94	3.8	5.58	6.49
13	1059	2.31	3.8	3.99	6.49
14	1074	1.91	3.8	1.87	6.49
15	1097	0.68	3.8	2.31	6.49
16	1101	2.25	3.8	3.33	6.49
17	1109	1.27	3.8	1.08	6.49
18	1110	2.11	3.8	3.3	6.49
19	1111	1.97	3.8	2.15	6.49
20	1114	2.25	3.8	2.35	6.49
21	1137	3.34	3.8	3.3	6.49
22	1138	2.25	3.8	2.15	6.49
23	1148	2.25	3.8	3.42	6.49
24	1154	1.96	3.8	2.49	6.49
25	1158	0.98	3.8	3.7	6.49
26	1182	2.25	3.8	2.43	6.49
27	1188	2.24	3.8	2.15	6.49
28	1190	2.29	3.8	3.56	6.49
29	1192	2.25	3.8	2.15	6.49
30	1194	0.83	3.8	2.22	6.49
31	1195	2.25	3.8	2.34	6.49
32	1205	1.74	3.8	4.22	6.49
33	1209	2.31	3.8	4.86	6.49
34	1216	2.31	3.8	2.99	6.49
35	1217	2.29	3.8	3.46	6.49
36	1228	2.27	3.8	3.63	6.49
37	1233	2.27	3.8	3.3	6.49
38	1235	2.25	3.8	3.08	6.49
39	1253	2.4	3.8	3.4	6.49
40	1298	2.34	3.8	2.15	6.49
41	1325	2.4	3.8	2.15	6.49
42	1331	2.31	3.8	2.15	6.49
43	1332	2.31	3.8	5.32	6.49
44	1335	1.98	3.8	2.15	6.49
45	1338	2.25	3.8	1.79	6.49
46	1343	2.25	3.8	2.27	6.49
47	1344	2.31	3.8	5.97	6.49
48	1346	2.31	3.8	2.74	6.49
49	1350	1.03	3.8	0.8	6.49
50	1359	2.25	3.8	2.43	6.49
51	1361	2.31	3.8	2.43	6.49
52	1374	1.93	3.8	1.8	6.49
53	1376	2.33	3.8	3.3	6.49
54	1378	0.88	3.8	1.79	6.49
55	1381	2.18	3.8	4.68	6.49
56	1388	0.92	3.8	2.26	6.49
57	1398	2.4	3.8	2.72	6.49
58	1404	2.3	3.8	4.29	6.49
59	1412	2.22	3.8	2.75	6.49
60	1418	0.92	3.8	2.32	6.49
61	1422	1.35	3.8	2.36	6.49

No.	Nouse Name	Old Wall RSI	New Wall RSI	Old Roof RSI	New Roof RSI
468	6076	2.16	3.8	0	7.31
469	6079	2.2	3.8	4.52	6.49
470	6081	1.73	3.8	2.05	6.49
471	6087	2.1	3.8	2.29	6.49
472	6092	2.34	3.8	0.02	6.49
473	6105	3.13	3.8	0	6.92
474	6112	1.93	3.8	4.31	6.49
475	6119	1.97	3.8	1.76	6.49
476	6130	2.21	3.8	0	8.56
477	6132	1.94	3.8	4.72	6.49
478	6135	2.16	3.8	1.94	6.49
479	6147	2.16	3.8	4.23	6.49
480	6150	2.15	3.8	3.56	6.49
481	6152	1.64	3.8	2.35	6.49
482	6164	2.75	3.8	2.5	6.49
483	6173	2.4	3.8	0	6.8
484	6186	2.22	3.8	2.15	6.49
485	6201	2.22	3.8	4.23	6.49
486	6221	2.57	3.8	2.24	6.49
487	6227	2.28	3.8	3.93	6.49
488	6235	2.08	3.8	4.43	6.49
489	6240	1.27	3.8	4.52	6.49
490	6243	2.4	3.8	3.52	6.49
491	6267	1.41	3.8	2.12	6.49
492	6272	1.72	3.8	3.61	6.49
493	6281	1.77	3.8	4.48	6.49
494	6285	2.07	3.8	1.8	6.49
495	6290	2.01	3.8	3.29	6.49
496	6291	2.34	3.8	2.35	6.49
497	6294	1.9	3.8	2.15	6.49
498	6295	2.14	3.8	5.95	6.49
499	6298	1.83	3.8	1.8	6.49
500	6305	1.82	3.8	0	6.9
501	6307	2.22	3.8	1.79	6.49
502	6314	3	3.8	5.85	6.49
503	6323	1.9	3.8	2.39	6.49
504	6326	2.18	3.8	3.54	6.49
505	6332	2.5	3.8	3	6.49
506	6345	1.86	3.8	2.04	6.49
507	6354	1.77	3.8	2.58	6.49
508	6360	2.08	3.8	2.09	6.49
509	6377	1.78	3.8	3.54	6.49
510	6378	1.73	3.8	2.22	6.49
511	6383	1.98	3.8	3.47	6.49
512	6394	2.07	3.8	2.15	6.49
513	6403	2.5	3.8	2.35	6.49
514	6445	2.03	3.8	3.13	6.49
515	6449	3.07	3.8	4.68	6.49
516	6451	2.5	3.8	2.35	6.49
517	7001	1.92	3.8	2.38	6.49
518	7002	2.52	3.8	0	8.53
519	7017	2.77	3.8	2.33	6.49
520	7018	2.26	3.8	2.51	6.49
521	7040	1.62	3.8	2.06	6.49
522	7045	1.54	3.8	4.69	6.49
523	7050	1.79	3.8	2.38	6.49
524	7051	1.75	3.8	3.92	6.49
525	7058	2.21	3.8	3.52	6.49
526	7062	2.1	3.8	2.49	6.49
527	7071	2.29	3.8	2.94	6.49
528	7077	1.65	3.8	3.22	6.49

Appendix 2: List of House that were Assigned Wall and Roof RSI Values According to "High Insulation Level"

62	1425	1.25	3.8	2.1	6.49
63	2348	2.45	3.8	3.63	6.49
64	2349	3.2	3.8	2.49	6.49
65	2360	2.08	3.8	4.91	6.49
66	2371	1.82	3.8	2.35	6.49
67	2380	2.51	3.8	2.18	6.49
68	2386	2.43	3.8	3.42	6.49
69	2391	2.33	3.8	2.6	6.49
70	2392	2.14	3.8	1.11	6.49
71	2410	2.61	3.8	1.99	6.49
72	2416	2.35	3.8	2.62	6.49
73	2417	2.55	3.8	1.87	6.49
74	2419	3.06	3.8	0	7.26
75	2428	2.31	3.8	3.48	6.49
76	2432	2.38	3.8	4.84	6.49
77	2436	2.43	3.8	2.33	6.49
78	2440	1.77	3.8	1.54	6.49
79	2457	2.46	3.8	3.31	6.49
80	3008	1.21	3.8	4.57	6.49
81	3009	1.86	3.8	2.89	6.49
82	3010	1.67	3.8	3.17	6.49
83	3012	2.52	3.8	5.03	6.49
84	3013	1.03	3.8	4.93	6.49
85	3015	0.78	3.8	5.28	6.49
86	3017	2.27	3.8	1.89	6.49
87	3018	0.99	3.8	2.07	6.49
88	3037	2.13	3.8	3.58	6.49
89	3043	1.93	3.8	2.55	6.49
90	3057	2.75	3.8	5.62	6.49
91	3059	2.39	3.8	3.75	6.49
92	3070	1.41	3.8	1.23	6.49
93	3071	2.16	3.8	2.36	6.49
94	3073	1.42	3.8	4.18	6.49
95	3083	1.3	3.8	3.44	6.49
96	3085	2.62	3.8	2.12	6.49
97	3097	3.04	3.8	2.67	6.49
98	3098	2.38	3.8	3.37	6.49
99	3103	2.01	3.8	2.59	6.49
100	3109	2.6	3.8	2.88	6.49
101	3110	2.41	3.8	2.88	6.49
102	3124	2.44	3.8	3.55	6.49
103	3125	2.62	3.8	4.66	6.49
104	3134	2.82	3.8	3.47	6.49
105	3135	2.61	3.8	1.94	6.49
106	3136	1.92	3.8	1.38	6.49
107	3138	2.44	3.8	4.83	6.49
108	3139	2.61	3.8	4.85	6.49
109	3141	2.43	3.8	5.97	6.49
110	3144	2.12	3.8	0	6.57
111	3145	0	5.56	3.62	6.49
112	3146	2.43	3.8	2.69	6.49
113	3151	2.64	3.8	2.86	6.49
114	3153	2.13	3.8	2.1	6.49
115	3158	3.64	3.8	5.29	6.49
116	3166	2.28	3.8	3.73	6.49
117	3169	2.48	3.8	3.73	6.49
118	3170	1.13	3.8	4.26	6.49
119	3174	2.46	3.8	2.97	6.49
120	3178	2.28	3.8	4.88	6.49
121	3183	0.89	3.8	4.64	6.49
122	3186	2.2	3.8	5.56	6.49
123	3189	2.48	3.8	3.73	6.49
124	3190	2.25	3.8	3.73	6.49
529	7080	1.59	3.8	0	6.55
530	7086	2.4	3.8	1.78	6.49
531	7093	1.94	3.8	5.97	6.49
532	7095	1.73	3.8	3.82	6.49
533	7097	2.27	3.8	4.13	6.49
534	7104	1.09	3.8	2.42	6.49
535	7105	2.21	3.8	3.61	6.49
536	7124	2.38	3.8	1.31	6.49
537	7127	3.53	3.8	4.72	6.49
538	7137	2.25	3.8	2.48	6.49
539	7140	2.34	3.8	2.74	6.49
540	7151	2.22	3.8	2.49	6.49
541	7157	1.93	3.8	1.67	6.49
542	7163	2.41	3.8	1.8	6.49
543	7182	2.39	3.8	5.79	6.49
544	7197	2.2	3.8	5.88	6.49
545	7201	2.31	3.8	6.28	6.49
546	7206	1.87	3.8	2.25	6.49
547	7209	1.08	3.8	3.52	6.49
548	7231	2.42	3.8	1.78	6.49
549	7236	2.32	3.8	2.44	6.49
550	7241	1.83	3.8	2.54	6.49
551	7254	2.28	3.8	1.8	6.49
552	7258	2.1	3.8	2.51	6.49
553	7261	1.87	3.8	2.49	6.49
554	7280	2.04	3.8	5.24	6.49
555	7281	2.42	3.8	1.92	6.49
556	7285	2.4	3.8	3.52	6.49
557	7290	2.44	3.8	2.29	6.49
558	7293	2.4	3.8	2.22	6.49
559	7303	2.39	3.8	2.77	6.49
560	7320	1.16	3.8	3.45	6.49
561	7321	2.81	3.8	4.24	6.49
562	7330	2.46	3.8	5.09	6.49
563	7355	2.34	3.8	2.26	6.49
564	7369	2.22	3.8	2.28	6.49
565	7385	2.3	3.8	2.74	6.49
566	7397	2.01	3.8	5.64	6.49
567	7406	2.15	3.8	2.41	6.49
568	7409	2.15	3.8	1.87	6.49
569	7418	1.9	3.8	3.57	6.49
570	7420	2.26	3.8	2.36	6.49
571	7421	2.22	3.8	4.44	6.49
572	7425	2.31	3.8	5.78	6.49
573	7427	2.4	3.8	2.44	6.49
574	7432	2.22	3.8	3.3	6.49
575	7440	2.46	3.8	2.53	6.49
576	7459	1.77	3.8	1.43	6.49
577	8005	0.83	3.8	3.66	6.49
578	8012	0.85	3.8	1.34	6.49
579	8013	0.88	3.8	0.64	6.49
580	8019	1.06	3.8	4.76	6.49
581	8035	2.34	3.8	1.92	6.49
582	8037	2.38	3.8	3.44	6.49
583	8038	1.13	3.8	1.61	6.49
584	8042	0.9	3.8	1.09	6.49
585	8044	1.17	3.8	2.78	6.49
586	8056	2	3.8	2.27	6.49
587	8060	0.68	3.8	1.07	6.49
588	8066	0.8	3.8	2.21	6.49
589	8070	1.73	3.8	3.13	6.49
590	8086	0.72	3.8	2.48	6.49
591	8090	0.86	3.8	1.96	6.49

Appendix 2: List of House that were Assigned Wall and Roof RSI Values According to "High Insulation Level"

125	3196	2.52	3.8	0.67	6.49
126	3197	2.01	3.8	4.28	6.49
127	3198	2.09	3.8	4.31	6.49
128	3205	2.68	3.8	1.75	6.49
129	3206	2.2	3.8	2.09	6.49
130	3208	2.62	3.8	2.38	6.49
131	3209	2.75	3.8	2.35	6.49
132	3210	2.48	3.8	4.66	6.49
133	3212	2.47	3.8	2.14	6.49
134	3213	2.59	3.8	2.51	6.49
135	3224	2.45	3.8	4.2	6.49
136	3233	2.41	3.8	2.35	6.49
137	3239	1.11	3.8	0.78	6.49
138	3243	0.97	3.8	2.88	6.49
139	3247	2.07	3.8	2.94	6.49
140	3255	0.85	3.8	3.56	6.49
141	3256	2.22	3.8	4.79	6.49
142	3257	1.87	3.8	2.24	6.49
143	3259	1.91	3.8	2.06	6.49
144	3260	2.27	3.8	3.46	6.49
145	3261	2.24	3.8	4.86	6.49
146	3263	1.9	3.8	1.8	6.49
147	3264	2.55	3.8	3.36	6.49
148	3266	1.73	3.8	4.68	6.49
149	3278	2.58	3.8	2.12	6.49
150	3281	1.87	3.8	2.42	6.49
151	3293	1.82	3.8	0	6.9
152	3294	2.59	3.8	4.83	6.49
153	3295	2.05	3.8	2.33	6.49
154	3301	2.18	3.8	3.92	6.49
155	3312	0.88	3.8	2.82	6.49
156	3317	2.2	3.8	2.39	6.49
157	3322	2.06	3.8	6.08	6.49
158	3323	1.61	3.8	3.98	6.49
159	3324	3.04	3.8	3.09	6.49
160	3328	3.09	3.8	4.4	6.49
161	3329	2.39	3.8	3.93	6.49
162	3333	2.16	3.8	3.58	6.49
163	3337	2.84	3.8	3.33	6.49
164	3344	1.74	3.8	2.15	6.49
165	3348	1.46	3.8	4.25	6.49
166	3349	2.3	3.8	5.24	6.49
167	3357	0.95	3.8	2.12	6.49
168	3361	2.31	3.8	0	7
169	3366	2.86	3.8	4.62	6.49
170	3367	2.44	3.8	3.43	6.49
171	3369	2.43	3.8	2.24	6.49
172	3370	1.25	3.8	4.33	6.49
173	3374	1.68	3.8	5.18	6.49
174	3377	2.34	3.8	5.28	6.49
175	3380	0.96	3.8	4.01	6.49
176	3386	1.97	3.8	5.87	6.49
177	3392	2.19	3.8	5	6.49
178	3394	2.43	3.8	2.51	6.49
179	3395	1.07	3.8	4.16	6.49
180	3399	2.91	3.8	2.41	6.49
181	3402	2.63	3.8	4.66	6.49
182	3405	0	3.93	2.63	6.49
183	3408	2.5	3.8	1.94	6.49
184	3411	1.77	3.8	2.38	6.49
185	3412	2.75	3.8	3.33	6.49
186	3413	3.11	3.8	3.68	6.49
187	3416	2.07	3.8	3.22	6.49

592	8094	2.31	3.8	3.39	6.49
593	8100	1.61	3.8	4.07	6.49
594	8101	2.16	3.8	4.25	6.49
595	8124	3.4	3.8	5.8	6.49
596	8126	2.06	3.8	2.15	6.49
597	8131	2.02	3.8	4.63	6.49
598	8133	1.97	3.8	2.15	6.49
599	8139	1.72	3.8	2.15	6.49
600	8145	0.99	3.8	2.6	6.49
601	8158	2.22	3.8	5.75	6.49
602	8163	2.1	3.8	3.57	6.49
603	8170	2.14	3.8	0	7.74
604	8179	2.31	3.8	2.15	6.49
605	8194	0.8	3.8	1.8	6.49
606	8200	2.27	3.8	5.74	6.49
607	8201	2.29	3.8	3.22	6.49
608	8202	2.22	3.8	5.8	6.49
609	8207	1.7	3.8	2.6	6.49
610	8221	2.1	3.8	4.71	6.49
611	8233	2.07	3.8	5.1	6.49
612	8239	1.11	3.8	1.12	6.49
613	8240	0.68	3.8	0.64	6.49
614	8246	0.85	3.8	0.71	6.49
615	8247	2.14	3.8	2.26	6.49
616	8248	1.86	3.8	2.3	6.49
617	8250	1.58	3.8	4.46	6.49
618	8251	0.74	3.8	0.64	6.49
619	8253	2.22	3.8	3.3	6.49
620	8257	2.09	3.8	2.43	6.49
621	8258	2.14	3.8	1.79	6.49
622	8267	2.22	3.8	2.51	6.49
623	8269	1.95	3.8	2.13	6.49
624	8271	2.13	3.8	2.95	6.49
625	8278	2.38	3.8	2.15	6.49
626	8280	1.97	3.8	3.11	6.49
627	8281	2.06	3.8	2.15	6.49
628	8282	1.77	3.8	1.94	6.49
629	8288	2.15	3.8	2.25	6.49
630	8292	2.22	3.8	4.23	6.49
631	8302	2.77	3.8	2.1	6.49
632	8308	2.12	3.8	3.3	6.49
633	8310	2.16	3.8	2.95	6.49
634	8311	2.03	3.8	3.3	6.49
635	8316	2.43	3.8	4.22	6.49
636	8318	2.07	3.8	3.16	6.49
637	8323	1.99	3.8	2.47	6.49
638	8337	1.72	3.8	2.49	6.49
639	8338	0.78	3.8	0.67	6.49
640	8341	1.88	3.8	2.15	6.49
641	8345	1.81	3.8	3.67	6.49
642	8346	2.02	3.8	2.52	6.49
643	8351	2.06	3.8	3.04	6.49
644	8371	0.88	3.8	3.03	6.49
645	8395	2.06	3.8	1.54	6.49
646	8397	2.25	3.8	6.05	6.49
647	8398	2.06	3.8	2.41	6.49
648	8400	1.72	3.8	1.98	6.49
649	8402	1.9	3.8	2.67	6.49
650	8407	1.75	3.8	3.54	6.49
651	8408	2.11	3.8	4.81	6.49
652	8411	2.06	3.8	3.54	6.49
653	8413	1.92	3.8	3.55	6.49
654	8434	2.25	3.8	3.3	6.49

Appendix 2: List of House that were Assigned Wall and Roof RSI Values According to "High Insulation Level"

188	3423	2.37	3.8	2.69	6.49
189	3427	2.46	3.8	4.63	6.49
190	3430	3.09	3.8	3.46	6.49
191	3432	2.59	3.8	2.7	6.49
192	3433	2.19	3.8	4.68	6.49
193	3434	2.85	3.8	4.82	6.49
194	3436	0.7	3.8	4.32	6.49
195	3439	2	3.8	0.96	6.49
196	3443	2.41	3.8	3.98	6.49
197	3445	1.99	3.8	2.43	6.49
198	3448	1.82	3.8	4.68	6.49
199	3449	2.12	3.8	0	7.08
200	3609	1.21	3.8	3.95	6.49
201	3613	2.57	3.8	3.8	6.49
202	3617	1.02	3.8	4.41	6.49
203	3642	3.62	3.8	0	6.68
204	3649	2.33	3.8	2.34	6.49
205	3656	2.47	3.8	3.7	6.49
206	3666	1.52	3.8	5.51	6.49
207	3668	2.43	3.8	4.64	6.49
208	3669	2.57	3.8	6.3	6.49
209	3680	1.46	3.8	2.86	6.49
210	3681	2.62	3.8	3.22	6.49
211	3689	1.67	3.8	4.8	6.49
212	3709	1.82	3.8	5.51	6.49
213	3710	1.59	3.8	5.87	6.49
214	3712	1.76	3.8	0	7.9
215	3745	2.42	3.8	3.62	6.49
216	3762	2.26	3.8	2.77	6.49
217	3763	2.1	3.8	1.58	6.49
218	3764	2.24	3.8	6.47	6.49
219	3765	2.11	3.8	4.77	6.49
220	3789	1.72	3.8	3.35	6.49
221	3793	2.58	3.8	0	7.16
222	3797	2.7	3.8	3.45	6.49
223	3817	2.39	3.8	5.06	6.49
224	3820	1.77	3.8	2.3	6.49
225	3840	1.99	3.8	5.16	6.49
226	4002	0.97	3.8	3.78	6.49
227	4004	2.1	3.8	3.96	6.49
228	4008	1.01	3.8	3.79	6.49
229	4012	0.91	3.8	0	7.13
230	4014	0.95	3.8	5.26	6.49
231	4018	1.87	3.8	1.67	6.49
232	4020	1.04	3.8	2.86	6.49
233	4025	2.3	3.8	2.45	6.49
234	4026	1.65	3.8	0	8.24
235	4027	1.06	3.8	5	6.49
236	4028	2.31	3.8	3.57	6.49
237	4029	1.92	3.8	3.64	6.49
238	4030	2.25	3.8	3.73	6.49
239	4031	2.43	3.8	4.45	6.49
240	4032	2.25	3.8	0	7.09
241	4037	2.35	3.8	2.68	6.49
242	4043	0.89	3.8	4.05	6.49
243	4044	2.27	3.8	5.01	6.49
244	4048	1.93	3.8	2.31	6.49
245	4052	1.88	3.8	1.67	6.49
246	4056	1.87	3.8	0.93	6.49
247	4059	1.76	3.8	4.5	6.49
248	4060	2.56	3.8	1.72	6.49
249	4061	2.39	3.8	5.26	6.49
250	4062	1.75	3.8	5.19	6.49

655	8436	2.31	3.8	2.15	6.49
656	8438	3.15	3.8	4.48	6.49
657	8450	0.68	3.8	4.12	6.49
658	8456	2.25	3.8	3.05	6.49
659	8458	1.71	3.8	4.23	6.49
660	8459	0.68	3.8	1.97	6.49
661	8601	2.56	3.8	5.56	6.49
662	8606	0.69	3.8	4.5	6.49
663	8607	1.87	3.8	3.03	6.49
664	8610	3.17	3.8	2.75	6.49
665	8612	1.97	3.8	6.06	6.49
666	8622	2.01	3.8	3.19	6.49
667	8623	1.89	3.8	3.96	6.49
668	8633	0.88	3.8	1.6	6.49
669	8635	2.52	3.8	0	6.51
670	8637	1.68	3.8	3.09	6.49
671	8641	2.15	3.8	3.33	6.49
672	8643	1.65	3.8	0	6.55
673	8647	1.81	3.8	4.7	6.49
674	8650	1.86	3.8	0	8.22
675	8654	1.78	3.8	2.19	6.49
676	8657	1.65	3.8	4.13	6.49
677	8667	0.88	3.8	1.14	6.49
678	8668	2.06	3.8	3.75	6.49
679	8688	2.09	3.8	4.74	6.49
680	8689	1.94	3.8	5.13	6.49
681	8712	0.74	3.8	4.77	6.49
682	8715	2.78	3.8	6	6.49
683	8725	2.36	3.8	2.58	6.49
684	8735	1.88	3.8	6.48	6.49
685	8745	2.13	3.8	2.93	6.49
686	8784	2.87	3.8	4.05	6.49
687	8786	1.62	3.8	3.55	6.49
688	8788	1.72	3.8	2.9	6.49
689	8795	1.09	3.8	2.21	6.49
690	8825	1.71	3.8	5.42	6.49
691	8838	1.44	3.8	1.22	6.49
692	8842	2.57	3.8	3.73	6.49
693	8843	2.79	3.8	0	7.26
694	8849	2.15	3.8	5.42	6.49
695	8852	1.97	3.8	4.46	6.49
696	8854	1.81	3.8	3.88	6.49
697	8859	1.64	3.8	0	7.45
698	8862	1.55	3.8	5.64	6.49
699	cene5986	1.7	3.8	3.79	6.49
700	cene6026	2.27	3.8	0	8.21
701	cene6046	2.3	3.8	0	8.21
702	cene6050	2.33	3.8	0	6.6
703	cene6056	2.31	3.8	4.95	6.49
704	cene6076	2.31	3.8	0	7.32
705	cene6086	2.21	3.8	0	7.28
706	cene6090	2.3	3.8	0	7.09
707	cene6096	2.33	3.8	3.79	6.49
708	cene6116	1.96	3.8	0	7.42
709	cene6126	2.16	3.8	0	9.65
710	cene6146	2.31	3.8	3.79	6.49
711	cene6216	2.37	3.8	4.79	6.49
712	cene6236	2.3	3.8	4.8	6.49
713	cene6266	2.25	3.8	0	7.12
714	cene6276	2.29	3.8	2.14	6.49
715	ceny5658	0.95	3.8	6.33	6.49
716	ceny5758	1.01	3.8	3.88	6.49
717	ceny5770	0.95	3.8	6.06	6.49

Appendix 2: List of House that were Assigned Wall and Roof RSI Values According to "High Insulation Level"

251	4065	2.5	3.8	2.25	6.49
252	4067	2.08	3.8	1.4	6.49
253	4075	0.91	3.8	5.26	6.49
254	4076	1.01	3.8	2.89	6.49
255	4080	2.48	3.8	2.53	6.49
256	4082	3.03	3.8	2.57	6.49
257	4083	2.66	3.8	3.94	6.49
258	4085	0.8	3.8	3.2	6.49
259	4087	1.13	3.8	0.83	6.49
260	4103	1.9	3.8	3.27	6.49
261	4108	1.97	3.8	3.52	6.49
262	4110	1.95	3.8	3.52	6.49
263	4112	1.95	3.8	2.6	6.49
264	4116	1.94	3.8	4.66	6.49
265	4117	1.91	3.8	2.35	6.49
266	4119	1.93	3.8	1.62	6.49
267	4121	2.48	3.8	4.81	6.49
268	4123	1.19	3.8	3.6	6.49
269	4124	2.48	3.8	3.3	6.49
270	4125	2.27	3.8	5.19	6.49
271	4127	2.76	3.8	3.73	6.49
272	4128	2.53	3.8	4.01	6.49
273	4134	2.58	3.8	3.3	6.49
274	4135	2.67	3.8	3.57	6.49
275	4138	0.84	3.8	2.32	6.49
276	4139	1.56	3.8	4.36	6.49
277	4141	1.25	3.8	1.67	6.49
278	4143	1.52	3.8	3.74	6.49
279	4144	1.03	3.8	0	6.63
280	4146	0.87	3.8	0	6.68
281	4147	0.91	3.8	2.47	6.49
282	4161	0.95	3.8	4.27	6.49
283	4162	1.3	3.8	2.51	6.49
284	4163	0.88	3.8	3.57	6.49
285	4164	1.84	3.8	3.3	6.49
286	4169	0.96	3.8	0.65	6.49
287	4170	0.87	3.8	3.36	6.49
288	4171	1.26	3.8	3.26	6.49
289	4176	0.88	3.8	4	6.49
290	4177	0.79	3.8	0	6.8
291	4182	1.87	3.8	3.3	6.49
292	4186	1.84	3.8	4.5	6.49
293	4188	1.93	3.8	5.1	6.49
294	4190	2.52	3.8	3.23	6.49
295	4195	2.43	3.8	2.6	6.49
296	4197	1.68	3.8	1.4	6.49
297	4205	1.82	3.8	4.7	6.49
298	4208	0.9	3.8	3.96	6.49
299	4210	1.89	3.8	0	7
300	4222	1.78	3.8	2.7	6.49
301	4224	2.62	3.8	2.43	6.49
302	4226	2.42	3.8	2.43	6.49
303	4230	1.59	3.8	2.68	6.49
304	4232	1.88	3.8	3.77	6.49
305	4236	2.22	3.8	5.78	6.49
306	4237	2.58	3.8	5.32	6.49
307	4238	1.99	3.8	4.66	6.49
308	4243	2.05	3.8	4.44	6.49
309	4245	1.68	3.8	3.33	6.49
310	4246	3.31	3.8	0	7.12
311	4249	1.83	3.8	3.22	6.49
312	4256	2.47	3.8	3.3	6.49
313	4257	2.5	3.8	3.3	6.49

718	ceny5814	1.04	3.8	2.25	6.49
719	ceny5816	1.77	3.8	3.57	6.49
720	ceny5886	2.29	3.8	6.13	6.49
721	ceoa7678	1.7	3.8	3.01	6.49
722	ceoa7682	1.7	3.8	3.52	6.49
723	ceoa7738	1.98	3.8	5.69	6.49
724	ceoa7828	1.7	3.8	2.81	6.49
725	ceoa7838	1.58	3.8	4.76	6.49
726	ceoa7858	2.33	3.8	5.29	6.49
727	ceoa7868	3.16	3.8	6	6.49
728	ceoa7878	2.28	3.8	4.88	6.49
729	ceoa7898	2.15	3.8	4.61	6.49
730	ceto6382	2.18	3.8	2.86	6.49
731	ceto6584	0.95	3.8	0	7.28
732	ceto6632	1.97	3.8	0	8.26
733	eaot4554	2.29	3.8	5.46	6.49
734	eaot4556	0.95	3.8	4.68	6.49
735	eaot4564	2.47	3.8	4.28	6.49
736	eaot4574	2.43	3.8	4.51	6.49
737	eaot4584	2.08	3.8	3.89	6.49
738	eaot4586	2.18	3.8	3.63	6.49
739	eaot4634	2.13	3.8	0	7.28
740	eaot4696	1.5	3.8	3.04	6.49
741	eaot4746	1.33	3.8	4.09	6.49
742	eaot4774	3.19	3.8	5.33	6.49
743	eaot4804	0.96	3.8	4.62	6.49
744	eaot4824	1.76	3.8	2.83	6.49
745	eaot4834	2.22	3.8	3.05	6.49
746	eaot4844	1.81	3.8	0	7.21
747	eaot4846	2.11	3.8	2.77	6.49
748	eaot4854	2.07	3.8	2.77	6.49
749	eaot4884	1.79	3.8	2.19	6.49
750	eaot4904	2.22	3.8	6.16	6.49
751	eawc0634	2.22	3.8	2.67	6.49
752	eawc0814	3.12	3.8	0	6.95
753	eawc0818	3.24	3.8	6.12	6.49
754	eawc0918	0	4.28	0	7.28
755	gbba9070	1.93	3.8	4.05	6.49
756	gbba9076	2.26	3.8	3.52	6.49
757	gbba9082	2.19	3.8	4.91	6.49
758	gbba9090	2.3	3.8	1.7	6.49
759	gbba9092	2.22	3.8	6.28	6.49
760	gbba9096	2.15	3.8	4.22	6.49
761	gbba9120	2.28	3.8	5.34	6.49
762	gbba9128	2.11	3.8	4.91	6.49
763	gbba9182	2.13	3.8	4.48	6.49
764	gbba9186	1.5	3.8	2.38	6.49
765	gbba9196	2.3	3.8	4.88	6.49
766	gbba9214	2.22	3.8	3.14	6.49
767	gbba9230	2.16	3.8	3.71	6.49
768	gbba9238	2.2	3.8	3.71	6.49
769	gbba9240	2.19	3.8	5.77	6.49
770	gbba9244	2.19	3.8	5.69	6.49
771	gbba9246	2.21	3.8	4.57	6.49
772	gbba9250	2.25	3.8	5.55	6.49
773	gbba9256	2.15	3.8	5.51	6.49
774	gbba9262	2.25	3.8	4.05	6.49
775	gbba9272	2.22	3.8	0	7.05
776	gbba9298	1.7	3.8	3.63	6.49
777	gbba9302	2.21	3.8	6.37	6.49
778	gbba9326	2.29	3.8	0	7.12
779	gbba9346	3.11	3.8	6.28	6.49
780	gbba9398	2.33	3.8	0	7.44

Appendix 2: List of House that were Assigned Wall and Roof RSI Values According to "High Insulation Level"

314	4258	2.45	3.8	3.3	6.49
315	4261	2.45	3.8	0	7.05
316	4262	2.58	3.8	3.48	6.49
317	4263	2.66	3.8	3.3	6.49
318	4264	2.56	3.8	0	8.35
319	4265	2.46	3.8	3.3	6.49
320	4266	1.41	3.8	4.15	6.49
321	4273	0.9	3.8	6.43	6.49
322	4274	1.07	3.8	3.3	6.49
323	4276	1.2	3.8	2.23	6.49
324	4278	1.04	3.8	3.58	6.49
325	4284	2.31	3.8	0	6.95
326	4287	1	3.8	2.79	6.49
327	4289	1.01	3.8	4.51	6.49
328	4292	0.92	3.8	5.19	6.49
329	4293	1.53	3.8	2.58	6.49
330	4294	2.53	3.8	6.16	6.49
331	4296	1.99	3.8	2.42	6.49
332	4297	1.68	3.8	5.65	6.49
333	4299	1.88	3.8	2.91	6.49
334	4300	1.98	3.8	4.95	6.49
335	4311	1.96	3.8	2.6	6.49
336	4312	2.51	3.8	4.5	6.49
337	4314	1.77	3.8	5.42	6.49
338	4316	1.53	3.8	4.87	6.49
339	4317	2.66	3.8	4.5	6.49
340	4318	1.7	3.8	3.9	6.49
341	4319	2.55	3.8	1.78	6.49
342	4323	1.94	3.8	3.3	6.49
343	4336	1.75	3.8	3.22	6.49
344	4338	2.4	3.8	4.06	6.49
345	4339	2.29	3.8	3.93	6.49
346	4345	2	3.8	0	7.11
347	4346	1.45	3.8	3.11	6.49
348	4347	1.54	3.8	6.15	6.49
349	4348	1.1	3.8	3.68	6.49
350	4350	2	3.8	0	7.05
351	4353	2.2	3.8	0	6.95
352	4360	1.06	3.8	0.47	6.49
353	4361	1.14	3.8	2.85	6.49
354	4362	2.41	3.8	0	6.63
355	4363	1.46	3.8	4.17	6.49
356	4365	1.74	3.8	2.33	6.49
357	4367	2.61	3.8	4.01	6.49
358	4368	2.01	3.8	3.59	6.49
359	4369	1.92	3.8	3.35	6.49
360	4377	2.06	3.8	0	9.99
361	4378	0.84	3.8	4.99	6.49
362	4379	1.2	3.8	1.02	6.49
363	4383	0.66	3.8	5.47	6.49
364	4390	0.86	3.8	2.31	6.49
365	4396	0.85	3.8	3.59	6.49
366	4397	2.64	3.8	2.44	6.49
367	4398	2.58	3.8	4.38	6.49
368	4403	0.88	3.8	0.58	6.49
369	4408	2.55	3.8	1.77	6.49
370	4413	2.09	3.8	3.16	6.49
371	4414	1.95	3.8	2.99	6.49
372	4420	2.68	3.8	3.3	6.49
373	4422	2.22	3.8	2.39	6.49
374	4423	1.18	3.8	2.02	6.49
375	4429	2.11	3.8	1.81	6.49
376	4448	2.26	3.8	4.41	6.49

781	gbba9506	2.18	3.8	0	7.28
782	gbba9590	2.14	3.8	4.91	6.49
783	EDM01	3.52	3.8	0	7.04
784	EDM02	3.52	3.8	0	7.04
785	EDM03	3.52	3.8	0	7.04
786	EDM04	3.5	3.8	0	7
787	EDM06	2.1	3.8	6	6.49
788	EDM07	3.5	3.8	0	7
789	EDM09	3.52	3.8	0	7.04
790	EDM10	3.52	3.8	0	7.04
791	HAL02	0	4.23	0	7.04
792	HAL06	0	4.23	0	7.04
793	HAL07	3.52	3.8	0	7.04
794	HAL08	3.52	3.8	0	7.04
795	HAL10	3.52	3.8	5.64	6.49
796	HAL11	3.52	3.8	5.1	6.49
797	HAL12	3.52	3.8	5.64	6.49
798	HAL13	3.52	3.8	5.64	6.49
799	QUE01	3.52	3.8	5.99	6.49
800	QUE02	3.52	3.8	5.46	6.49
801	QUE03	3.52	3.8	5.46	6.49
802	QUE04	3.52	3.8	5.99	6.49
803	QUE05	3.29	3.8	5.46	6.49
804	QUE06	3.52	3.8	5.99	6.49
805	QUE07	3.52	3.8	5.99	6.49
806	QUE08	3.29	3.8	5.46	6.49
807	QUE09	3.52	3.8	5.46	6.49
808	QUE10	3.52	3.8	5.46	6.49
809	QUE14	3.52	3.8	0	6.58
810	QUE15	3.52	3.8	5.46	6.49
811	QUE16	3.52	3.8	5.46	6.49
812	QUE17	3.52	3.8	5.46	6.49
813	QUE18	3.52	3.8	5.46	6.49
814	QUE19	2.89	3.8	5.46	6.49
815	QUE20	2.89	3.8	5.46	6.49
816	OTT01	3.5	3.8	5.6	6.49
817	OTT02	3.5	3.8	5.6	6.49
818	OTT03	3.5	3.8	5.6	6.49
819	OTT04	3.5	3.8	5.6	6.49
820	OTT05	3.5	3.8	5.6	6.49
821	OTT06	3.5	3.8	5.6	6.49
822	OTT07	3.5	3.8	5.6	6.49
823	OTT08	3.5	3.8	5.6	6.49
824	OTT09	3.5	3.8	5.6	6.49
825	OTT10	3.5	3.8	0	7
826	OTT18	3.5	3.8	5.6	6.49
827	OTT19	3.5	3.8	5.6	6.49
828	OTT20	3.5	3.8	0	7
829	MON01	3.52	3.8	5.46	6.49
830	MON02	3.52	3.8	5.46	6.49
831	MON03	3.52	3.8	6.16	6.49
832	MON04	3.52	3.8	6.16	6.49
833	MON05	3.52	3.8	0	7.04
834	MON06	3.52	3.8	5.64	6.49
835	MON07	3.52	3.8	5.46	6.49
836	MON08	0	4.58	6.16	6.49
837	MON09	0	4.58	6.16	6.49
838	MON10	0	4.58	6.16	6.49
839	MON11	0	4.58	6.16	6.49
840	MON12	3.52	3.8	5.64	6.49
841	MON13	3.52	3.8	0	7.04
842	MON14	3.52	3.8	0	7.04
843	MON15	3.52	3.8	5.64	6.49

Appendix 2: List of House that were Assigned Wall and Roof RSI Values According to "High Insulation Level"

377	4449	0.72	3.8	3.44	6.49
378	4451	1.91	3.8	3.85	6.49
379	4454	2.25	3.8	6.22	6.49
380	4455	1.93	3.8	1.67	6.49
381	4625	1.5	3.8	1.82	6.49
382	4644	2.85	3.8	3.74	6.49
383	4652	0.98	3.8	0	6.54
384	4653	2.82	3.8	3.8	6.49
385	4664	1.87	3.8	2.49	6.49
386	4671	2.27	3.8	4.66	6.49
387	4684	1.69	3.8	3.02	6.49
388	4701	1.9	3.8	5.78	6.49
389	4706	3.18	3.8	1.24	6.49
390	4714	2.72	3.8	0	6.55
391	4716	1.93	3.8	5.3	6.49
392	4720	2.59	3.8	5.01	6.49
393	4755	1.13	3.8	5.92	6.49
394	4765	1.17	3.8	2.76	6.49
395	4787	1.5	3.8	0	6.63
396	4808	1.15	3.8	3.49	6.49
397	4810	1.76	3.8	3.73	6.49
398	4822	1.95	3.8	0	7.9
399	4846	2.87	3.8	3.35	6.49
400	5002	2.27	3.8	0	7.28
401	5004	2.35	3.8	1.8	6.49
402	5031	2.19	3.8	0	9.47
403	5033	2.38	3.8	5.01	6.49
404	5035	2.06	3.8	2.51	6.49
405	5037	1.84	3.8	4.97	6.49
406	5053	3.33	3.8	4.54	6.49
407	5065	2.15	3.8	2.84	6.49
408	5072	2.1	3.8	2.84	6.49
409	5076	2.58	3.8	6.44	6.49
410	5098	2.15	3.8	2.78	6.49
411	5112	1.54	3.8	5.01	6.49
412	5116	1.74	3.8	6.18	6.49
413	5119	2.22	3.8	2.49	6.49
414	5123	2.05	3.8	3.61	6.49
415	5126	1.75	3.8	6.47	6.49
416	5134	2.35	3.8	5.86	6.49
417	5138	2.36	3.8	4.25	6.49
418	5147	2.24	3.8	2.84	6.49
419	5150	2.39	3.8	2.78	6.49
420	5154	2.22	3.8	3.8	6.49
421	5156	1.61	3.8	4.76	6.49
422	5160	2.11	3.8	3.2	6.49
423	5169	1.42	3.8	2.68	6.49
424	5175	1.79	3.8	0	7.34
425	5184	1.84	3.8	3.69	6.49
426	5188	2.16	3.8	3.59	6.49
427	5189	1.69	3.8	2.8	6.49
428	5201	2.35	3.8	2.49	6.49
429	5220	2.09	3.8	2.18	6.49
430	5229	1.96	3.8	2.49	6.49
431	5230	2.99	3.8	1.29	6.49
432	5234	1.92	3.8	1.66	6.49
433	5235	1.84	3.8	6.21	6.49
434	5242	2.17	3.8	3.52	6.49
435	5243	1.87	3.8	3.01	6.49
436	5254	2.36	3.8	2.82	6.49
437	5261	2.08	3.8	4.53	6.49
438	5266	2.49	3.8	4.3	6.49
439	5268	2.33	3.8	2.08	6.49
844	MON16	3.52	3.8	0	7.04
845	MON17	3.52	3.8	5.64	6.49
846	MON18	3.52	3.8	5.64	6.49
847	MON19	3.52	3.8	5.64	6.49
848	MON20	3.52	3.8	0	7.04
849	RCD01	2.11	3.8	5.64	6.49
850	RCD02	2.11	3.8	5.64	6.49
851	RCD03	2.11	3.8	5.6	6.49
852	RCD04	2.11	3.8	4.88	6.49
853	RCD05	2.11	3.8	5.6	6.49
854	RCD06	2.11	3.8	5.6	6.49
855	RCD07	2.11	3.8	5.64	6.49
856	RCD08	2.11	3.8	5.64	6.49
857	RCD09	2.11	3.8	5.6	6.49
858	RCD10	2.11	3.8	5.6	6.49
859	RCD11	2.11	3.8	5.6	6.49
860	RCD12	2.11	3.8	5.64	6.49
861	RCD13	2.11	3.8	5.32	6.49
862	RCD14	2.11	3.8	5.64	6.49
863	RCD15	2.47	3.8	5.64	6.49
864	RCD16	2.11	3.8	5.6	6.49
865	RCD17	2.11	3.8	5.6	6.49
866	RCD18	2.11	3.8	5.64	6.49
867	RCD19	2.11	3.8	0	7.04
868	RCD20	2.11	3.8	5.6	6.49
869	RCD21	2.1	3.8	5.64	6.49
870	RCD22	2.1	3.8	5.64	6.49
871	RCD23	2.1	3.8	5.64	6.49
872	RCD24	2.11	3.8	5.64	6.49
873	RCD25	2.11	3.8	5.64	6.49
874	RCD26	2.1	3.8	5.64	6.49
875	RCD27	2.1	3.8	5.64	6.49
876	RCD28	2.1	3.8	5.64	6.49
877	RCD29	2.1	3.8	5.64	6.49
878	REG03	3.5	3.8	0	7
879	REG04	3.52	3.8	0	6.58
880	REG05	3.52	3.8	0	7.04
881	REG06	3.52	3.8	0	6.58
882	REG09	3.52	3.8	0	7.04
883	REG10	3.52	3.8	0	7.04
884	SAS01	3.52	3.8	0	7.04
885	SAS02	3.52	3.8	0	7.04
886	SAS07	3.5	3.8	0	7
887	SAS08	3.5	3.8	0	7
888	SAS09	3.52	3.8	0	6.53
889	SAS10	3.52	3.8	6.38	6.49
890	STJ01	0	4.84	0	7.04
891	STJ02	3.52	3.8	0	7.04
892	STJ04	3.52	3.8	3.52	6.49
893	STJ05	3.52	3.8	5.46	6.49
894	STJ06	3.52	3.8	5.46	6.49
895	STJ08	3.52	3.8	0	7.04
896	STJ09	3.52	3.8	6.42	6.49
897	VAN01	3.52	3.8	2.78	6.49
898	VAN02	2.11	3.8	4.31	6.49
899	VAN03	2.11	3.8	4.62	6.49
900	VAN04	3.52	3.8	5.24	6.49
901	VAN05	2.11	3.8	4.8	6.49
902	VAN06	2.11	3.8	4.41	6.49
903	VAN07	2.11	3.8	4.46	6.49
904	VAN08	2.11	3.8	4.93	6.49
905	VAN09	2.11	3.8	4.78	6.49
906	VAN10	2.11	3.8	4.57	6.49

Appendix 2: List of House that were Assigned Wall and Roof RSI Values According to "High Insulation Level"

440	5275	2.39	3.8	3.2	6.49
441	5281	2.51	3.8	1.98	6.49
442	5285	1.74	3.8	0	8.46
443	5325	2.06	3.8	6.12	6.49
444	5331	2.31	3.8	3.33	6.49
445	5341	2.4	3.8	2.82	6.49
446	5354	3.09	3.8	0	6.92
447	5362	2.11	3.8	2.62	6.49
448	5370	1.82	3.8	3.81	6.49
449	5376	1.65	3.8	2.85	6.49
450	5378	1.78	3.8	3.51	6.49
451	5382	2.14	3.8	3.98	6.49
452	5388	2.67	3.8	2.36	6.49
453	5390	1.78	3.8	5.49	6.49
454	5391	2.18	3.8	2.75	6.49
455	5394	2.38	3.8	0	8.48
456	5406	1.72	3.8	2.01	6.49
457	5421	3.04	3.8	3.64	6.49
458	5456	2.4	3.8	2.39	6.49
459	6001	2.68	3.8	2.36	6.49
460	6006	2.42	3.8	3.99	6.49
461	6015	1.67	3.8	1.89	6.49
462	6022	2.38	3.8	2.72	6.49
463	6026	2.06	3.8	2.29	6.49
464	6035	1.73	3.8	1.67	6.49
465	6052	1.93	3.8	2.63	6.49
466	6056	2.11	3.8	0.9	6.49
467	6070	2.37	3.8	3.2	6.49

907	VAN11	2.11	3.8	4.87	6.49
908	VAN12	3.14	3.8	4.48	6.49
909	VAN13	2.11	3.8	4.76	6.49
910	VAN14	2.11	3.8	4.12	6.49
911	VAN15	2.11	3.8	4.12	6.49
912	VAN16	2.11	3.8	4.36	6.49
913	VAN17	2.08	3.8	4.93	6.49
914	VAN18	1.92	3.8	4.19	6.49
915	VAN19	2.07	3.8	4.12	6.49
916	VAN20	2.11	3.8	4.76	6.49
917	WPG01	3.52	3.8	0	7.04
918	WPG02	3.52	3.8	0	8.81
919	WPG03	3.52	3.8	0	7.04
920	WPG04	3.52	3.8	0	7.04
921	WPG05	3.52	3.8	0	7.04
922	WPG06	3.52	3.8	0	6.69
923	WPG07	3.52	3.8	0	6.69
924	WPG08	3.52	3.8	0	6.69
925	WPG10	3.52	3.8	0	6.69
926	WPG11	3.52	3.8	0	6.69
927	WPG12	3.52	3.8	0	7.93
928	WPG13	3.52	3.8	0	7.04
929	WPG14	3.52	3.8	0	7.04
930	WPG15	3.52	3.8	0	7.04
931	WPG16	3.52	3.8	0	7.04
932	WPG17	3.52	3.8	0	7.04
933	WPG19	3.52	3.8	0	7.04

*** 0 RSI value indicates that the original RSI value is higher than "high insulation level"

Appendix 8
List of Houses that have Mechanical Ventilation Systems or HRV's

Appendix 3: List of Houses that Have Mechanical Ventilation

No.	House Name	Ventilation Rate	HRV Option *
1	HAL02	60.3	2
2	HAL06	54.0	2
3	HAL07	45.2	2
4	HAL08	60.5	2
5	HAL10	96.9	2
6	HAL11	74.2	2
7	HAL12	121.9	2
8	HAL13	65.1	2
9	OTT10	70.6	0
10	RCD02	75.2	0
11	RCD03	89.5	0
12	RCD04	89.5	0
13	RCD07	85.4	0
14	RCD08	85.4	0
15	REG03	40.3	0
16	REG04	75.9	0
17	REG05	50.6	0
18	REG06	75.9	0
19	SAS01	64.0	0
20	SAS02	58.1	0
21	SAS03	70.6	0
22	SAS04	59.7	0
23	SAS05	55.6	0
24	SAS06	39.5	0
25	SAS07	55.2	0
26	SAS08	55.4	0
27	SAS09	62.8	0
28	SAS10	76.5	0
29	STJ01	60.2	2
30	STJ02	19.3	2
31	STJ04	29.4	2
32	STJ05	13.9	2
33	STJ06	22.0	2
34	STJ08	18.9	2
35	STJ09	29.2	2
36	VAN01	71.5	0
37	VAN02	77.5	0
38	VAN03	64.9	0
39	VAN04	80.7	0
40	VAN05	86.8	0
41	VAN06	74.1	0
42	VAN07	75.6	0
43	VAN08	65.5	0
44	VAN09	96.3	0
45	VAN10	74.4	0
46	VAN11	44.4	0
47	VAN12	73.9	0
48	VAN13	64.9	0
49	VAN14	78.6	0
50	VAN15	81.4	0
51	VAN16	74.9	0
52	VAN17	44.4	0
53	VAN18	78.0	0
54	VAN19	78.6	0
55	VAN20	64.9	0
56	WPG01	51.0	0
57	WPG02	89.5	0
58	WPG03	53.7	0
59	WPG04	54.8	0
60	WPG05	53.7	0
61	WPG06	69.1	0
62	WPG07	54.0	0
63	WPG08	70.6	0
64	WPG10	53.8	0
65	WPG12	100.6	0
66	WPG14	65.1	0
67	WPG15	64.2	0
68	WPG16	45.3	0
69	WPG17	44.9	0

* 2 = HRV option is used

Appendix 9
List of Houses which are Assigned Temperature Setback

Appendix 4: List of Houses that were Assigned 3 Degrees Night-time Temperature Setback

No.	House Name	Day-time Temperature	Night-time Temperature
1	1039	18	15
2	1188	15	12
3	1338	15	12
4	3037	18	15
5	3259	18	15
6	5230	15	12
7	6449	18	15
8	7105	18	15
9	7124	18	15
10	8131	15	12
11	8139	18	15
12	8623	18	15
13	8668	15	12
14	cene5986	22	19
15	cene6046	21	18
16	cene6050	25	22
17	cene6056	23	20
18	cene6086	23	20
19	cene6216	24	21
20	cene6236	21	18
21	cene6266	23	20
22	ceny5758	21	18
23	ceny5770	24	21
24	ceny5886	22	19
25	ceoa7678	21	18
26	ceoa7682	23	20
27	ceoa7738	21	18
28	ceoa7838	21	18
29	ceoa7858	21	18
30	ceoa7878	22	19
31	ceoa7898	23	20
32	ceto6382	23	20
33	ceto6584	23	20
34	ceto6632	21	18
35	eaot4554	22	19
36	eaot4556	21	18
37	eaot4564	22	19
38	eaot4574	21	18
39	eaot4584	22	19
40	eaot4586	24	21
41	eaot4824	21	18
42	eaot4834	22	19
43	eaot4844	22	19
44	eaot4854	21	18
45	eaot4884	24	21
46	eaot4904	24	21
47	eawc0634	21	18
48	eawc0818	22	19
49	gbba9076	22	19
50	gbba9090	22	19
51	gbba9196	25	22
52	gbba9214	21	18
53	gbba9230	22	19
54	gbba9238	21	18

No.	House Name	Day-time Temperature	Night-time Temperature
108	MON03	21	18
109	MON04	21	18
110	MON05	21	18
111	MON06	21	18
112	MON07	21	18
113	MON08	21	18
114	MON09	21	18
115	MON10	21	18
116	MON11	21	18
117	MON12	21	18
118	MON13	21	18
119	MON14	21	18
120	MON15	21	18
121	MON16	21	18
122	MON17	21	18
123	MON18	21	18
124	MON19	21	18
125	MON20	21	18
126	RCD01	21	18
127	RCD02	21	18
128	RCD03	21	18
129	RCD04	21	18
130	RCD05	21	18
131	RCD06	21	18
132	RCD07	21	18
133	RCD08	21	18
134	RCD09	21	18
135	RCD10	21	18
136	RCD11	21	18
137	RCD12	21	18
138	RCD13	21	18
139	RCD14	21	18
140	RCD15	21	18
141	RCD16	21	18
142	RCD17	21	18
143	RCD18	21	18
144	RCD19	21	18
145	RCD20	21	18
146	RCD21	21	18
147	RCD22	21	18
148	RCD23	21	18
149	RCD24	21	18
150	RCD25	21	18
151	RCD26	21	18
152	RCD27	21	18
153	RCD28	21	18
154	RCD29	21	18
155	REG03	21	18
156	REG04	21	18
157	REG05	21	18
158	REG06	21	18
159	REG09	21	18
160	REG10	21	18
161	SAS01	21	18

Appendix 4: List of Houses that were Assigned 3 Degrees Night-time Temperature Setback

55	gbba9256	22	19
56	gbba9302	21	18
57	gbba9326	21	18
58	gbba9346	23	20
59	gbba9398	24	21
60	EDM01	21	18
61	EDM02	21	18
62	EDM03	21	18
63	EDM04	21	18
64	EDM06	21	18
65	EDM07	21	18
66	EDM09	21	18
67	EDM10	21	18
68	HAL02	21	18
69	HAL06	21	18
70	HAL07	21	18
71	HAL08	21	18
72	HAL10	21	18
73	HAL11	21	18
74	HAL12	21	18
75	HAL13	21	18
76	QUE01	21	18
77	QUE02	21	18
78	QUE03	21	18
79	QUE04	21	18
80	QUE05	21	18
81	QUE06	21	18
82	QUE07	21	18
83	QUE08	21	18
84	QUE09	21	18
85	QUE10	21	18
86	QUE14	21	18
87	QUE15	21	18
88	QUE16	21	18
89	QUE17	21	18
90	QUE18	21	18
91	QUE19	21	18
92	QUE20	21	18
93	OTT01	21	18
94	OTT02	21	18
95	OTT03	21	18
96	OTT04	21	18
97	OTT05	21	18
98	OTT06	21	18
99	OTT07	21	18
100	OTT08	21	18
101	OTT09	21	18
102	OTT10	21	18
103	OTT18	21	18
104	OTT19	21	18
105	OTT20	21	18
106	MON01	21	18
107	MON02	21	18

162	SAS02	21	18
163	SAS03	21	18
164	SAS04	21	18
165	SAS05	21	18
166	SAS06	21	18
167	SAS07	21	18
168	SAS08	21	18
169	SAS09	21	18
170	SAS10	21	18
171	STJ01	21	18
172	STJ02	21	18
173	STJ04	21	18
174	STJ05	21	18
175	STJ06	21	18
176	STJ08	21	18
177	STJ09	21	18
178	VAN01	21.1	18.1
179	VAN02	21.1	18.1
180	VAN03	21.1	18.1
181	VAN04	21.1	18.1
182	VAN05	21.1	18.1
183	VAN06	21.1	18.1
184	VAN07	21.1	18.1
185	VAN08	21.1	18.1
186	VAN09	21.1	18.1
187	VAN10	21.1	18.1
188	VAN11	21.1	18.1
189	VAN12	21.1	18.1
190	VAN13	21.1	18.1
191	VAN14	21.1	18.1
192	VAN15	21.1	18.1
193	VAN16	21.1	18.1
194	VAN17	21.1	18.1
195	VAN18	21.1	18.1
196	VAN19	21.1	18.1
197	VAN20	21.1	18.1
198	WPG01	21	18
199	WPG02	21	18
200	WPG03	21	18
201	WPG04	21	18
202	WPG05	21	18
203	WPG06	21	18
204	WPG07	21	18
205	WPG08	21	18
206	WPG10	21	18
207	WPG11	21	18
208	WPG12	21	18
209	WPG13	21	18
210	WPG14	21	18
211	WPG15	21	18
212	WPG16	21	18
213	WPG17	21	18
214	WPG19	21	18

Appendix 10
Description of Contents of Computer Data Storage Tapes

DESCRIPTION OF CONTENTS OF COMPUTER DATA STORAGE TAPES

All data files related to this project are stored in two 120MB formatted Colorado tapes under version 2.04e PKZIP format. The data files are saved in six subdirectories which are under the main directory called DATA. The six subdirectories are: STAR, ENE-IN, ENE-OUT, ENE-FUS, H2K-IN, and H2K-OUT.

Subdirectory STAR contains the Expanded STAR-HOUSING database (the 937 STAR house files).

Subdirectory ENE-IN contains the Enerpass input files for all scenarios that were investigated in this project.

Subdirectory ENE-OUT contains Batch Enerpass output files for all scenarios.

Subdirectory ENE-FUS contains all fuel consumption summary files for all scenarios.

Subdirectory H2K-IN contains the Hot-2000 input files for all scenarios as in ENERPASS simulations except the Series 9 (i.e., the different appliance load profiles).

Subdirectory H2K-OUT contains all fuel consumption summary output files for all scenarios in Hot-2000 runs.

Detailed file descriptions:

Files under DATA directory

1)	Appele.zip	Appliances allocation for all 937 houses.
2)	Prof-0.zip	Main floor, basement, and outdoor receptacle load profiles for baseline appliance efficiency for all 937 houses.
3)	Prof-1.zip	Main floor, basement, and outdoor receptacle load profiles for level 1 appliance efficiency for all 937 houses.
4)	Prof-2.zip	Main floor, basement, and outdoor receptacle load profiles for level 2 appliance efficiency for all 937 houses.
5)	Prof-3.zip	Main floor, basement, and outdoor receptacle load profiles for level 3 appliance efficiency for all 937 houses.
6)	Med-RSI.zip	List of houses that have insulation level below the "medium insulation level"
7)	Hi-RSI.zip	List of houses that have insulation level below the "high insulation level"
8)	HRV-list.zip	List of houses that have forced ventilation.
9)	Set-back.zip	List of houses that do not have temperature setback.

Files under STAR directory:

1)	Star-NF.zip	Expanded STAR database for Newfoundland.

2) Star-NB.zip Expanded STAR database for New Brunswick.

3) Star-QUE.zip Expanded STAR database for Quebec.

4) Star-ONT.zip Expanded STAR database for Ontario.

5) Star-MAN.zip Expanded STAR database for Manitoba.

6) Star-SAS.zip Expanded STAR database for Saskatchewan.

7) Star-ALT.zip Expanded STAR database for Alberta.

8) Star-BC.zip Expanded STAR database for British Columbia.

9) Star-HYD.zip Expanded STAR database for Hydro files.

10) Star-MRC.zip Expanded STAR database for Merchant files.

Files under ENE-IN directory:

1) EnInBL.zip 937 Enerpass input data files for baseline appliance efficiency.

2) EnIn1A.zip 937 Enerpass input data files for simulation series 1A.

3) EnIn1B.zip 937 Enerpass input data files for simulation series 1B.

4) EnIn1C.zip 937 Enerpass input data files for simulation series 1C.

5) EnIn2A.zip 937 Enerpass input data files for simulation series 2A.

6) EnIn2B.zip 937 Enerpass input data files for simulation series 2B.

7) EnIn2C.zip 937 Enerpass input data files for simulation series 2C.

8) EnIn3A.zip 937 Enerpass input data files for simulation series 3A.

9) EnIn3B.zip 937 Enerpass input data files for simulation series 3B.

10) EnIn3C.zip 937 Enerpass input data files for simulation series 3C.

11) EnIn4A.zip 937 Enerpass input data files for simulation series 4A.

12) EnIn4B.zip 937 Enerpass input data files for simulation series 4B.

13) EnIn4C.zip 937 Enerpass input data files for simulation series 4C.

14) EnIn5A.zip 937 Enerpass input data files for simulation series 5A.

15) EnIn6A.zip 937 Enerpass input data files for simulation series 6A.

16) EnIn6B.zip 937 Enerpass input data files for simulation series 6B.

17) EnIn6C.zip 937 Enerpass input data files for simulation series 6C.

18) EnIn6D.zip 937 Enerpass input data files for simulation series 6D.

19) EnIn7A.zip 937 Enerpass input data files for simulation series 7A.

20) EnIn7B.zip 937 Enerpass input data files for simulation series 7B.

21) EnIn7C.zip 937 Enerpass input data files for simulation series 7C.

22) EnIn8A.zip 937 Enerpass input data files for simulation series 8A.

23) EnIn8B.zip 937 Enerpass input data files for simulation series 8B.

24) EnIn8C.zip 937 Enerpass input data files for simulation series 8C.

25) EnIn9A.zip 937 Enerpass input data files for simulation series 9A.

26) EnIn9B.zip 937 Enerpass input data files for simulation series 9B.

27) EnIn9C.zip 937 Enerpass input data files for simulation series 9C.

28) EnIn9D.zip 937 Enerpass input data files for simulation series 9D.

29) EnIn9E.zip 937 Enerpass input data files for simulation series 9E.

30) EnIn9F.zip 937 Enerpass input data files for simulation series 9F.

31) EnIn10A.zip 937 Enerpass input data files for simulation series 10A.

Files under ENE-OUT directory:

1) EnOutBL.zip Enerpass batch output files (five) for baseline appliance efficiency.

2) EnOut1A.zip Enerpass batch output files (five) for simulation series 1A.

3) EnOut1B.zip Enerpass batch output files (five) for simulation series 1B.

4) EnOut1C.zip Enerpass batch output files (five) for simulation series 1C.

5) EnOut2A.zip Enerpass batch output files (five) for simulation series 2A.

6) EnOut2B.zip Enerpass batch output files (five) for simulation series 2B.

7) EnOut2C.zip Enerpass batch output files (five) for simulation series 2C.

8) EnOut3A.zip Enerpass batch output files (five) for simulation series 3A.

9) EnOut3B.zip Enerpass batch output files (five) for simulation series 3B.

10) EnOut3C.zip Enerpass batch output files (five) for simulation series 3C.

11) EnOut4A.zip Enerpass batch output files (five) for simulation series 4A.

12) EnOut4B.zip Enerpass batch output files (five) for simulation series 4B.

13) EnOut4C.zip Enerpass batch output files (five) for simulation series 4C.

14) EnOut5A.zip Enerpass batch output files (five) for simulation series 5A.

15) EnOut6A.zip Enerpass batch output files (five) for simulation series 6A.

16) EnOut6B.zip Enerpass batch output files (five) for simulation series 6B.

17) EnOut6C.zip Enerpass batch output files (five) for simulation series 6C.

18) EnOut6D.zip Enerpass batch output files (five) for simulation series 6D.

19) EnOut7A.zip Enerpass batch output files (five) for simulation series 7A.

20) EnOut7B.zip Enerpass batch output files (five) for simulation series 7B.

21) EnOut7C.zip Enerpass batch output files (five) for simulation series 7C.

22) EnOut8A.zip Enerpass batch output files (five) for simulation series 8A.

23) EnOut8B.zip Enerpass batch output files (five) for simulation series 8B.

24) EnOut8C.zip Enerpass batch output files (five) for simulation series 8C.

25) EnOut9A.zip Enerpass batch output files (five) for simulation series 9A.

26) EnOut9B.zip Enerpass batch output files (five) for simulation series 9B.

27) EnOut9C.zip Enerpass batch output files (five) for simulation series 9C.

28) EnOut9D.zip Enerpass batch output files (five) for simulation series 9D.

29) EnOut9E.zip Enerpass batch output files (five) for simulation series 9E.

30) EnOut9F.zip Enerpass batch output files (five) for simulation series 9F.

31) EnOut10A.zip Enerpass batch output files (five) for simulation series 10A.

Files under ENE-FUS directory:

1) FUS-BL.zip Fuel use summary file for baseline appliance efficiency.

2) FUS-1A.zip Fuel use summary file for simulation series 1A.

3) FUS-1B.zip Fuel use summary file for simulation series 1B.

4) FUS-1C.zip Fuel use summary file for simulation series 1C.

5) FUS-2A.zip Fuel use summary file for simulation series 2A.

6) FUS-2B.zip Fuel use summary file for simulation series 2B.

7) FUS-2C.zip Fuel use summary file for simulation series 2C.

8) FUS-3A.zip Fuel use summary file for simulation series 3A.

9) FUS-3B.zip Fuel use summary file for simulation series 3B.

10) FUS-3C.zip Fuel use summary file for simulation series 3C.

11) FUS-4A.zip Fuel use summary file for simulation series 4A.

12) FUS-4B.zip Fuel use summary file for simulation series 4B.

13) FUS-4C.zip Fuel use summary file for simulation series 4C.

14) FUS-5A.zip Fuel use summary file for simulation series 5A.

15) FUS-6A.zip Fuel use summary file for simulation series 6A.

16) FUS-6B.zip Fuel use summary file for simulation series 6B.

17) FUS-6C.zip Fuel use summary file for simulation series 6C.

18) FUS-6D.zip Fuel use summary file for simulation series 6D.

19) FUS-7A.zip Fuel use summary file for simulation series 7A.

20) FUS-7B.zip Fuel use summary file for simulation series 7B.

21) FUS-7C.zip Fuel use summary file for simulation series 7C.

22) FUS-8A.zip Fuel use summary file for simulation series 8A.

23) FUS-8B.zip Fuel use summary file for simulation series 8B.

24) FUS-8C.zip Fuel use summary file for simulation series 8C.

25) FUS-9A.zip Fuel use summary file for simulation series 9A.

26) FUS-9B.zip Fuel use summary file for simulation series 9B.

27) FUS-9C.zip Fuel use summary file for simulation series 9C.

28) FUS-9D.zip Fuel use summary file for simulation series 9D.

29) FUS-9E.zip Fuel use summary file for simulation series 9E.

30) FUS-9F.zip Fuel use summary file for simulation series 9F.

31) FUS-10A.zip Fuel use summary file for simulation series 10A.

Files under H2K-IN directory:

1) H2KINBL.zip 937 Hot-2000 input data files for baseline appliance efficiency.

2) H2KIN1A.zip 937 Hot-2000 input data files for simulation series 1A.

3) H2KIN1B.zip 937 Hot-2000 input data files for simulation series 1B.

4) H2KIN1C.zip 937 Hot-2000 input data files for simulation series 1C.

5) H2KIN2A.zip 937 Hot-2000 input data files for simulation series 2A.

6) H2KIN2B.zip 937 Hot-2000 input data files for simulation series 2B.

7) H2KIN2C.zip 937 Hot-2000 input data files for simulation series 2C.

8) H2KIN3A.zip 937 Hot-2000 input data files for simulation series 3A.

9) H2KIN3B.zip 937 Hot-2000 input data files for simulation series 3B.

10) H2KIN3C.zip 937 Hot-2000 input data files for simulation series 3C.

11) H2KIN4A.zip 937 Hot-2000 input data files for simulation series 4A.

12) H2KIN4B.zip 937 Hot-2000 input data files for simulation series 4B.

13) H2KIN4C.zip 937 Hot-2000 input data files for simulation series 4C.

14) H2KIN5A.zip 937 Hot-2000 input data files for simulation series 5A.

15) H2KIN6A.zip 937 Hot-2000 input data files for simulation series 6A.

16) H2KIN6B.zip 937 Hot-2000 input data files for simulation series 6B.

17) H2KIN6C.zip 937 Hot-2000 input data files for simulation series 6C.

18) H2KIN6D.zip 937 Hot-2000 input data files for simulation series 6D.

19) H2KIN7A.zip 937 Hot-2000 input data files for simulation series 7A.

20) H2KIN7B.zip 937 Hot-2000 input data files for simulation series 7B.

21) H2KIN7C.zip 937 Hot-2000 input data files for simulation series 7C.

22) H2KIN8A.zip 937 Hot-2000 input data files for simulation series 8A.

23) H2KIN8B.zip 937 Hot-2000 input data files for simulation series 8B.

24) H2KIN8C.zip 937 Hot-2000 input data files for simulation series 8C.

25) H2KIN10A.zip 937 Hot-2000 input data files for simulation series 10A.

Files under H2K-OUT directory:

1) H2KFUBL.zip Hot-2000 fuel use summary file for baseline appliance efficiency.

2) H2KFU1A.zip Hot-2000 fuel use summary file for simulation series 1A.

3) H2KFU1B.zip Hot-2000 fuel use summary file for simulation series 1B.

4) H2KFU1C.zip Hot-2000 fuel use summary file for simulation series 1C.

5) H2KFU2A.zip Hot-2000 fuel use summary file for simulation series 2A.

6) H2KFU2B.zip Hot-2000 fuel use summary file for simulation series 2B.

7) H2KFU2C.zip Hot-2000 fuel use summary file for simulation series 2C.

8) H2KFU3A.zip Hot-2000 fuel use summary file for simulation series 3A.

9) H2KFU3B.zip Hot-2000 fuel use summary file for simulation series 3B.

10) H2KFU3C.zip Hot-2000 fuel use summary file for simulation series 3C.

11) H2KFU4A.zip Hot-2000 fuel use summary file for simulation series 4A.

12) H2KFU4B.zip Hot-2000 fuel use summary file for simulation series 4B.

13) H2KFU4C.zip Hot-2000 fuel use summary file for simulation series 4C.

14) H2KFU5A.zip Hot-2000 fuel use summary file for simulation series 5A.

15) H2KFU6A.zip Hot-2000 fuel use summary file for simulation series 6A.

16) H2KFU6B.zip Hot-2000 fuel use summary file for simulation series 6B.

17) H2KFU6C.zip Hot-2000 fuel use summary file for simulation series 6C.

18) H2KFU6D.zip Hot-2000 fuel use summary file for simulation series 6D.

19) H2KFU7A.zip Hot-2000 fuel use summary file for simulation series 7A.

20) H2KFU7B.zip Hot-2000 fuel use summary file for simulation series 7B.

21) H2KFU7C.zip Hot-2000 fuel use summary file for simulation series 7C.

22) H2KFU8A.zip Hot-2000 fuel use summary file for simulation series 8A.

23) H2KFU8B.zip Hot-2000 fuel use summary file for simulation series 8B.

24) H2KFU8C.zip Hot-2000 fuel use summary file for simulation series 8C.

25) H2KFU10A.zip Hot-2000 fuel use summary file for simulation series 10A.

Appendix 11
Tables of Sample File Output

Table 9. Sample ENERPASS output file (partial)

House Name	Space Heating Fuel Type *	DHW Fuel Type *	Electrical Space Heat Usage (Kwh)	Primary Space Heat Fuel Usage	Secondary Space Heat Fuel Usage	Electrical Space Heat Usage (Kwh)	Natural Gas Space Heat Usage (m^3)	Oil Space Heat Usage (L)	Wood ** Space Heat Usage (L)	Propane Space Heat Usage (L)	Electrical DHW Usage (Kwh)	Primary DHW Fuel Usage	Secondary DHW Fuel Usage	Electrical DHW Usage (Kwh)	Natural Gas DHW Usage (m^3)
A1002 .V30	2	2	0.00	3746.80	0.00	0.00	0.00	3746.80	0.00	0.00	0.00	680.40	0.00	0.00	0.00
A1005. V30	0	0	12077.10	0.00	0.00	12077.10	0.00	0.00	0.00	0.00	4803.80	0.00	0.00	4803.80	0.00
A1009 .V30	0	0	18060.40	0.00	0.00	18060.40	0.00	0.00	0.00	0.00	4808.90	0.00	0.00	4808.90	0.00
A1011 .V30	2	0	0.00	1612.80	0.00	0.00	0.00	1612.80	0.00	0.00	4809.40	0.00	0.00	4809.40	0.00
A1028 .V30	2	0	0.00	2057.10	0.00	0.00	0.00	2057.10	0.00	0.00	4794.80	0.00	0.00	4794.80	0.00
A1039 .V30	2	0	0.00	1900.90	0.00	0.00	0.00	1900.90	0.00	0.00	4787.10	0.00	0.00	4787.10	0.00
A1045 .V30	2	2	0.00	3156.60	0.00	0.00	0.00	3156.60	0.00	0.00	0.00	687.50	0.00	0.00	0.00
A1047 .V30	2	0	0.00	2794.50	0.00	0.00	0.00	2794.50	0.00	0.00	4819.10	0.00	0.00	4819.10	0.00
A1049 .V30	2	0	0.00	3008.50	0.00	0.00	0.00	3008.50	0.00	0.00	4812.20	0.00	0.00	4812.20	0.00
A1051 .V30	2	0	0.00	1307.10	0.00	0.00	0.00	1307.10	0.00	0.00	4808.00	0.00	0.00	4808.00	0.00
A1052 .V30	2	0	0.00	2602.80	0.00	0.00	0.00	2602.80	0.00	0.00	4811.80	0.00	0.00	4811.80	0.00
A1056 .V30	2	0	0.00	1112.30	0.00	0.00	0.00	1112.30	0.00	0.00	4807.40	0.00	0.00	4807.40	0.00
A1059 .V30	0	0	13043.80	0.00	0.00	13043.80	0.00	0.00	0.00	0.00	4835.00	0.00	0.00	4835.00	0.00
A1074 .V30	2	2	0.00	1951.20	0.00	0.00	0.00	1951.20	0.00	0.00	0.00	685.40	0.00	0.00	0.00
A1097 .V30	2	0	0.00	3420.30	0.00	0.00	0.00	3420.30	0.00	0.00	4844.90	0.00	0.00	4844.90	0.00
A1101 .V30	3	0	0.00	2730.90	0.00	0.00	0.00	0.00	2730.90	0.00	4843.00	0.00	0.00	4843.00	0.00
A1109 .V30	2	2	0.00	5870.40	0.00	0.00	0.00	5870.40	0.00	0.00	0.00	1003.20	0.00	0.00	0.00
A1110 .V30	2	0	0.00	2853.90	0.00	0.00	0.00	2853.90	0.00	0.00	4836.40	0.00	0.00	4836.40	0.00
A1111 .V30	2	0	0.00	3054.60	0.00	0.00	0.00	3054.60	0.00	0.00	4837.90	0.00	0.00	4837.90	0.00
A1114 .V30	0	0	23363.40	0.00	0.00	23363.40	0.00	0.00	0.00	0.00	4793.40	0.00	0.00	4793.40	0.00
A1137 .V30	2	0	0.00	1290.10	0.00	0.00	0.00	1290.10	0.00	0.00	4844.70	0.00	0.00	4844.70	0.00
A1138 .V30	2	2	0.00	2105.00	0.00	0.00	0.00	2105.00	0.00	0.00	0.00	993.00	0.00	0.00	0.00
A1148 .V30	2	0	0.00	2853.80	0.00	0.00	0.00	2853.80	0.00	0.00	4791.30	0.00	0.00	4791.30	0.00
A1154 .V30	0	0	24657.30	0.00	0.00	24657.30	0.00	0.00	0.00	0.00	4822.10	0.00	0.00	4822.10	0.00
A1158 .V30	2	2	0.00	2091.40	0.00	0.00	0.00	2091.40	0.00	0.00	0.00	1005.10	0.00	0.00	0.00
A1182 .V30	0	0	5319.50	0.00	0.00	5319.50	0.00	0.00	0.00	0.00	4792.80	0.00	0.00	4792.80	0.00
A1188 .V30	0	0	6370.70	0.00	0.00	6370.70	0.00	0.00	0.00	0.00	4791.20	0.00	0.00	4791.20	0.00
A1190 .V30	0	0	8891.40	0.00	0.00	8891.40	0.00	0.00	0.00	0.00	4815.40	0.00	0.00	4815.40	0.00
A1192 .V30	0	0	9943.90	0.00	0.00	9943.90	0.00	0.00	0.00	0.00	4775.00	0.00	0.00	4775.00	0.00
A1194 .V30	2	2	0.00	2839.20	0.00	0.00	0.00	2839.20	0.00	0.00	0.00	999.40	0.00	0.00	0.00
A1195 .V30	2	0	0.00	558.00	0.00	0.00	0.00	558.00	0.00	0.00	4804.10	0.00	0.00	4804.10	0.00
A1205 .V30	2	0	0.00	2179.70	0.00	0.00	0.00	2179.70	0.00	0.00	4821.30	0.00	0.00	4821.30	0.00
A1209 .V30	0	0	6779.50	0.00	0.00	6779.50	0.00	0.00	0.00	0.00	4812.40	0.00	0.00	4812.40	0.00
A1216 .V30	2	0	0.00	2187.50	0.00	0.00	0.00	2187.50	0.00	0.00	4782.00	0.00	0.00	4782.00	0.00
A1217 .V30	2	0	0.00	1424.70	0.00	0.00	0.00	1424.70	0.00	0.00	4841.70	0.00	0.00	4841.70	0.00

Legend: * Fuel Type Code is According to ENERPASS

0: Electric
1: Natural Gas
2: No. 2 Oil
3: No. 6 Oil (Use it as Wood)
4: Propane

** In Equivalent of Litres of No. 6 Oil

*** Total Electrical Usage Excluding the Process (Appliance) Electrical Usage

Table 9 (continued). Sample ENERPASS output file (partial)

Oil DHW Usage (L)	Wood ** DHW Usage (L)	Propane DHW Usage (L)	Electrical Usage for Process(Kwh)	Electrical Usage for Lighting(Kwh)	Electrical Usage for Air-Con(Kwh)	Electrical Usage for Fan (Kwh)	Total *** Electrical Usage (Kwh)	Total Primary Fuel Usage	Total Secondary Fuel Usage	Average Energy Usage Per Floor Area (MJ/m^2)	Average Energy Usage Per Volume (MJ/m^3)	Total Electrical Appliance Energy(GJ)	Total Space Heat Energy (GJ)	Total DHW Energy (GJ)	Total Energy Usage (GJ)
680.40	0.00	0.00	7594.44	4694.00	0.00	0.00	4694.00	4427.20	0.00	254.90	86.80	44.24	144.60	26.26	215.09
0.00	0.00	0.00	5863.89	4699.10	0.00	0.00	21580.00	0.00	0.00	240.60	63.60	38.03	43.48	17.29	98.80
0.00	0.00	0.00	6380.56	4696.20	0.00	0.00	27565.60	0.00	0.00	125.10	52.10	39.88	65.02	17.31	122.21
0.00	0.00	0.00	5333.33	4699.20	0.00	0.00	9508.60	1612.80	0.00	170.90	65.70	36.12	62.24	17.31	115.67
0.00	0.00	0.00	4188.89	4692.20	201.60	0.00	9688.60	2057.10	0.00	195.70	76.70	32.70	79.39	17.26	129.35
0.00	0.00	0.00	4838.89	4696.40	0.00	0.00	9483.50	1900.90	0.00	162.80	66.40	34.33	73.36	17.23	124.92
687.50	0.00	0.00	4883.33	4696.90	391.70	0.00	5088.50	3844.10	0.00	241.70	94.80	35.90	121.82	26.53	184.25
0.00	0.00	0.00	8011.11	4699.40	0.00	0.00	9518.50	2794.50	0.00	241.50	94.70	45.76	107.85	17.35	170.95
0.00	0.00	0.00	4883.33	4697.60	0.00	0.00	9509.80	3008.50	0.00	167.30	65.60	34.49	116.10	17.32	167.92
0.00	0.00	0.00	5930.56	4698.60	0.00	0.00	9506.60	1307.10	0.00	251.70	69.00	38.26	50.44	17.31	106.02
0.00	0.00	0.00	10502.78	4697.00	0.00	0.00	9508.80	2602.80	0.00	184.80	87.90	54.72	100.45	17.32	172.49
0.00	0.00	0.00	5500.00	4697.00	0.00	0.00	9504.40	1112.30	0.00	247.50	67.80	36.71	42.93	17.31	96.94
0.00	0.00	0.00	5322.22	4694.60	0.00	0.00	22573.30	0.00	0.00	126.70	51.70	36.06	46.96	17.41	100.42
685.40	0.00	0.00	7361.11	4695.00	0.00	0.00	4695.00	2636.50	0.00	216.30	88.30	43.40	75.30	26.45	145.15
0.00	0.00	0.00	6213.89	4693.10	0.00	0.00	9538.00	3420.30	0.00	364.50	137.50	39.27	132.00	17.44	188.70
0.00	0.00	0.00	8144.44	4696.50	0.00	0.00	9539.50	2730.90	0.00	195.40	103.80	46.23	113.75	17.43	177.41
1003.20	0.00	0.00	6083.33	4695.20	0.00	0.00	4695.20	6873.60	0.00	251.70	126.40	38.80	226.55	38.72	304.07
0.00	0.00	0.00	8144.44	4697.00	0.00	0.00	9533.50	2853.90	0.00	187.40	88.50	46.23	110.14	17.41	173.78
0.00	0.00	0.00	6830.56	4696.80	0.00	0.00	9534.70	3054.60	0.00	180.80	97.50	41.50	117.88	17.42	176.80
0.00	0.00	0.00	4969.44	4696.10	299.00	0.00	33151.90	0.00	0.00	219.10	89.40	35.87	84.11	17.26	137.24
0.00	0.00	0.00	7594.44	4698.30	96.70	0.00	9639.80	1290.10	0.00	161.30	86.40	44.60	49.79	17.44	111.83
993.00	0.00	0.00	3702.78	4697.30	0.00	0.00	4697.30	3098.00	0.00	198.20	86.20	30.24	81.24	38.32	149.80
0.00	0.00	0.00	3825.00	4695.70	0.00	0.00	9487.00	2853.80	0.00	232.10	103.20	30.67	110.13	17.25	158.06
0.00	0.00	0.00	6911.11	4694.90	0.00	0.00	34174.30	0.00	0.00	213.20	81.00	41.78	88.77	17.36	147.91
1005.10	0.00	0.00	9422.22	4694.00	0.00	0.00	4694.00	3096.50	0.00	274.10	116.70	50.82	80.71	38.79	170.32
0.00	0.00	0.00	7030.56	4700.10	0.00	0.00	14812.40	0.00	0.00	214.00	57.80	42.23	19.15	17.25	78.63
0.00	0.00	0.00	8541.67	4700.60	0.00	0.00	15862.50	0.00	0.00	212.60	60.70	47.67	22.93	17.25	87.86
0.00	0.00	0.00	4241.67	4696.20	439.80	0.00	18842.80	0.00	0.00	141.40	56.60	33.76	32.01	17.34	83.10
0.00	0.00	0.00	7494.44	4692.00	0.00	0.00	19410.90	0.00	0.00	278.00	78.30	43.87	35.80	17.19	96.86
999.40	0.00	0.00	5886.11	4696.70	279.10	0.00	4975.80	3838.60	0.00	524.90	143.20	39.10	109.57	38.57	187.24
0.00	0.00	0.00	8561.11	4693.00	562.20	0.00	10059.30	558.00	0.00	202.30	80.90	49.74	21.53	17.29	88.57
0.00	0.00	0.00	3869.44	4695.00	0.00	0.00	9516.30	2179.70	0.00	179.30	74.70	30.83	84.12	17.36	132.31
0.00	0.00	0.00	5886.11	4696.10	632.80	0.00	16920.80	0.00	0.00	131.10	52.40	40.37	24.41	17.32	82.10
0.00	0.00	0.00	4936.11	4694.80	0.00	0.00	9476.80	2187.50	0.00	217.90	83.80	34.67	84.42	17.22	136.31
0.00	0.00	0.00	8211.11	4697.20	0.00	0.00	9538.90	1424.70	0.00	191.00	74.90	46.47	54.98	17.43	118.88

Table 10 Sample ENERPASS summary output file (partial) (all values in GJ)

SERIES 1.A

	No. of Houses	Space Heat	DHW(Elec.)	DHW(NG)	DHW(Oil)	DHW(Wood)	DHW(Prop)	Process(e)	Lighting(e)	Air cond.(e)	Fan(elect)	Total(e)-app	Total (GJ)
	Newfoundland												
Electricity	33.00	1833.94	439.97	0.00	0.00	0.00	0.00	593.82	242.10	14.96	43.52	894.40	3168.31
Nat. Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oil	35.00	3739.87	294.71	0.00	340.11	0.00	0.00	567.06	256.68	5.23	0.00	828.97	5203.65
Wood	1.00	121.78	13.49	0.00	0.00	0.00	0.00	21.66	7.34	0.00	0.00	29.00	164.27
Propane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	69.00	5695.59	748.17	0.00	340.11	0.00	0.00	1182.54	506.12	20.19	43.52	1752.36	8536.23
	Nova Scotia												
Electricity	8.00	610.12	102.05	0.00	0.00	0.00	0.00	146.60	58.67	2.87	61.94	270.08	982.25
Nat. Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	8.00	610.12	102.05	0.00	0.00	0.00	0.00	146.60	58.67	2.87	61.94	270.08	982.25
	New Brunswick												
Electricity	8.00	498.45	91.20	0.00	5.54	0.00	0.00	143.62	58.69	7.28	0.00	209.59	804.78
Nat. Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oil	9.00	1055.77	78.30	0.00	69.28	0.00	0.00	146.83	66.04	3.21	0.00	216.08	1419.42
Wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	17.00	1554.21	169.51	0.00	74.82	0.00	0.00	290.45	124.73	10.49	0.00	425.67	2224.20
	Quebec												
Electricity	107.00	6364.76	1364.78	0.00	18.25	0.00	0.00	1928.52	784.91	66.50	0.00	2779.93	10527.72
Nat. Gas	7.00	684.16	12.74	120.07	0.00	0.00	0.00	113.93	51.36	13.43	0.00	178.72	995.68
Oil	68.00	7033.58	557.34	0.00	546.67	0.00	0.00	1189.32	498.79	41.41	0.00	1729.53	9867.11
Wood	1.00	109.96	0.00	0.00	0.00	22.08	0.00	14.72	7.34	0.00	0.00	22.06	154.09
Propane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	183.00	14192.45	1934.86	120.07	564.92	22.08	0.00	3246.49	1342.40	121.34	0.00	4710.24	21544.60

Table 10. Continued

	No. of Houses	Space Heat	DHW(Elec.)	DHW(NG)	DHW(Oil)	DHW(Wood)	DHW(Prop)	Process(e)	Lighting(e)	Air cond.(e)	Fan(elect)	Total(e)-app	Total (GJ)
	Ontario												
Electricity	102.00	7443.95	1302.99	0.00	0.00	0.00	0.00	1805.18	748.22	127.90	0.00	2681.30	11428.24
Nat. Gas	134.00	14545.31	140.95	2839.35	0.00	0.00	0.00	2416.74	983.01	154.51	0.00	3554.26	21079.87
Oil	64.00	6743.10	718.86	0.00	179.65	0.00	0.00	1102.96	469.52	52.30	0.00	1624.79	9266.39
Wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	300.00	28732.36	2162.79	2839.35	179.65	0.00	0.00	5324.88	2200.75	334.72	0.00	7860.35	41774.50
	Manitobia												
Electricity	12.00	924.22	162.24	0.00	0.00	0.00	0.00	200.52	88.06	9.00	0.00	297.57	1384.03
Nat. Gas	60.00	6296.04	94.76	1283.12	0.00	0.00	0.00	1071.26	440.14	23.82	0.00	1535.22	9209.14
Oil	4.00	487.68	26.99	0.00	60.11	0.00	0.00	64.94	29.36	0.00	0.00	94.30	669.07
Wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	76.00	7707.93	283.98	1283.12	60.11	0.00	0.00	1336.72	557.56	32.82	0.00	1927.09	11262.24
	Saskatchewan												
Electricity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nat. Gas	63.00	7585.26	68.37	1352.45	0.00	0.00	0.00	1142.43	462.14	30.15	0.00	1634.72	10640.81
Oil	10.00	1211.33	68.43	0.00	142.16	0.00	0.00	180.31	73.35	2.78	0.00	256.45	1678.36
Wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propane	1.00	106.20	13.77	0.00	0.00	0.00	0.00	16.75	7.34	0.00	0.00	24.09	144.07
Total	74.00	8902.79	150.58	1352.45	142.16	0.00	0.00	1339.49	542.84	32.94	0.00	1915.26	12463.24
	Alberta												
Electricity	1.00	98.69	0.00	13.80	0.00	0.00	0.00	8.73	7.34	0.00	0.00	16.07	128.55
Nat. Gas	63.00	7121.77	94.94	1255.24	0.00	0.00	0.00	1149.70	462.15	35.76	0.00	1647.62	10119.57
Oil	3.00	448.36	13.71	0.00	60.52	0.00	0.00	50.50	22.00	0.00	0.00	72.50	595.09
Wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propane	1.00	107.07	13.74	0.00	0.00	0.00	0.00	16.10	7.33	0.00	0.00	23.43	144.24
Total	68.00	7775.89	122.40	1269.03	60.52	0.00	0.00	1225.03	498.83	35.76	0.00	1759.62	10987.45

Table 10. Continued

	No. of Houses	Space Heat	DHW(Elec.)	DHW(NG)	DHW(Oil)	DHW(Wood)	DHW(Prop)	Process(e)	Lighting(e)	Air cond.(e)	Fan(elect)	Total(e)-app	Total (GJ)
	British Columbia												
Electricity	25.00	1798.19	289.81	26.72	0.00	0.00	0.00	435.87	183.37	32.11	0.00	651.35	2766.08
Nat. Gas	79.00	8202.49	120.72	1509.18	0.00	0.00	0.00	1360.40	579.48	68.66	0.00	2008.54	11840.94
Oil	36.00	2664.95	351.88	0.00	143.46	0.00	0.00	636.14	263.99	17.48	0.00	917.62	4077.91
Wood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propane	2.00	100.98	24.07	0.00	0.00	0.00	0.00	39.68	14.68	0.00	0.00	54.36	179.41
Total	142.00	12766.61	786.49	1535.91	143.46	0.00	0.00	2472.09	1041.52	118.25	0.00	3631.86	18864.33

Total (GJ)	128639.04
Average (GJ)	137.29

	Space Heat	DHW	Appliance	SH+DHW
Electricity	19572.31	6460.82	7800.30	26033.13
Nat. Gas	44435.03	8399.92	10559.08	52834.95
Oil	23384.62	1565.74	5740.22	24950.36
Wood	231.74	22.08	51.06	253.81
Propane	314.25	0.00	101.88	314.25
Total	87937.95	16448.56	24252.53	104386.50

Total (GJ)	128639.04
Average(GJ)	137.29

Legend:

Space Heat: Energy consumption for space heating

DHW(Elec.): Electrical energy consumption for DHW heating

DHW(NG): Natural gas consumption for DHW heating

DHW(Oil): Oil consumption for DHW heating

DHW(Wood): Wood consumption for DHW heating

DHW(Prop): Propane consumption for DHW heating

Process(e): Electricity consumption for process, in these simulations this is electricity consumption by appliances

Lighting(e): Electricity consumption for lighting

Air cond.(e): Electricity consumption for air-conditioning

Fan (elect): Electricity consumption by furnace fan

Total(e)-app: Total electricity consumption by appliances

Total (GJ): Total energy consumption

Appendix 12
Effect of Variations in Load Curves on Appliance Energy Consumption

A series of simulations were conducted to study the effect of variations in load curves on energy consumption. The objective is to understand whether use of highly accurate load curves are necessary to obtain meaningful results in simulation studies such as this one. Thus, six different arbitrarily defined load curves shown in Table A6.1 are used with the baseline level of appliance lighting and furnace/boiler efficiencies:

Series 9.A: Arbitrary Load Curve (ALC) #1 is used for appliances, lighting and DHW usage
ALC #1 is a flat load curve which can be considered as a baseline against which actual and arbitrary load curves can be compared to evaluate the effect of variations in load curves. In this load curve, the energy consumption in each hour is 4.17% of the daily total (100 / 24 = 4.17).

Series 9.B: ALC #2 is used for appliances, lighting and DHW usage
ALC #2 is different for each appliance group. These are arbitrary load curves which are relatively realistic.

Series 9.C: ALC #3 is used for appliances, lighting and DHW usage
ALC #3 is developed based on ALC #2 by adding 2% to the values between hours 07:00 and 14:00, and by subtracting 2% from the values between hours 15:00 and 22:00.

Series 9.D: ALC #4 is used for appliances, lighting and DHW usage
ALC #4 is developed based on ALC #2 by subtracting 2% from the values between hours 07:00 and 14:00, and by adding 2% to the values between hours 15:00 and 22:00.

Series 9.E: ALC #5 is used for appliances, lighting and DHW usage
ALC #5 is a completely unrealistic load curve (used as an extreme case), which has a concentrated consumption of 20% between hours 01:00 and 05:00, and no consumption during the rest of the day.

Series 9.F: ALC #6 is used for appliances, lighting and DHW usage
ALC #6 is another completely unrealistic load curve (used as an extreme case), which has a concentrated consumption of 20% between hours 13:00 and 17:00, and no consumption during the rest of the day.

The results of the simulations are given in Table A6.2 and Figure A6.1.

These results indicate that the change in total energy consumption is not largely affected by varying the appliance load curves. The largest difference (close to 4%) between the baseline energy consumption occurs when ALC #6 is used. Considering that this load curve is very unrealistic (all of the appliance load is concentrated between hours 13:00 and 17:00), the change in energy consumption is not considered significant.

It should however be noted that the total energy consumption results may be misleading. The effect of load curve variation depends largely on the house characteristics and whether or not the house has air conditioning. For example, the results of simulations for a house in Expanded STAR first with air conditioning and then without air conditioning are given in Tables A6.3 and A6.4. It can clearly be seen that when the house has air conditioning, the effect of the appliance load curve on energy consumption is greater.

Table A6.1. Baseline and arbitrary appliance load curves

REFRIGERATOR & FREEZER								
Hour	BSLN/REF	BSLN/FRZ	ALC 1	ALC 2	ALC 3	ALC 4	ALC 5	ALC 6
1	3.94	3.97	4.17	3.85	3.85	3.85	20.00	0.00
2	3.71	3.88	4.17	3.85	3.85	3.85	20.00	0.00
3	3.58	3.89	4.17	3.85	3.85	3.85	20.00	0.00
4	3.63	3.89	4.17	3.85	3.85	3.85	20.00	0.00
5	3.50	3.72	4.17	3.85	3.85	3.85	20.00	0.00
6	3.60	3.67	4.17	3.85	3.85	3.85	0.00	0.00
7	3.78	3.70	4.17	5.00	7.00	3.00	0.00	0.00
8	3.87	3.80	4.17	3.85	5.85	1.85	0.00	0.00
9	3.94	4.04	4.17	3.85	5.85	1.85	0.00	0.00
10	4.02	4.10	4.17	3.85	5.85	1.85	0.00	0.00
11	4.00	4.25	4.17	3.85	5.85	1.85	0.00	0.00
12	4.16	4.37	4.17	5.00	7.00	3.00	0.00	0.00
13	4.21	4.47	4.17	3.85	5.85	1.85	0.00	20.00
14	4.21	4.61	4.17	3.85	5.85	1.85	0.00	20.00
15	4.31	4.68	4.17	3.85	1.85	5.85	0.00	20.00
16	4.50	4.75	4.17	3.85	1.85	5.85	0.00	20.00
17	4.60	4.66	4.17	6.50	4.50	8.50	0.00	20.00
18	4.78	4.52	4.17	6.50	4.50	8.50	0.00	0.00
19	4.84	4.41	4.17	3.85	1.85	5.85	0.00	0.00
20	4.78	4.26	4.17	3.85	1.85	5.85	0.00	0.00
21	4.73	4.23	4.17	3.85	1.85	5.85	0.00	0.00
22	4.72	4.08	4.17	3.85	1.85	5.85	0.00	0.00
23	4.43	4.07	4.17	3.85	3.85	3.85	0.00	0.00
24	4.16	3.97	4.17	3.85	3.85	3.85	0.00	0.00

DISHWASHER						
BSLN	ALC 1	ALC 2	ALC 3	ALC 4	ALC 5	ALC 6
1.04	4.17	0.50	0.50	0.50	20.00	0.00
0.50	4.17	0.50	0.50	0.50	20.00	0.00
0.26	4.17	0.50	0.50	0.50	20.00	0.00
0.26	4.17	0.50	0.50	0.50	20.00	0.00
0.26	4.17	0.50	0.50	0.50	20.00	0.00
0.78	4.17	2.18	2.18	2.18	0.00	0.00
1.82	4.17	2.18	4.18	0.18	0.00	0.00
3.39	4.17	7.00	9.00	5.00	0.00	0.00
6.17	4.17	7.00	9.00	5.00	0.00	0.00
6.79	4.17	7.00	9.00	5.00	0.00	0.00
5.75	4.17	2.18	4.18	0.18	0.00	0.00
4.71	4.17	2.18	4.18	0.18	0.00	0.00
4.17	4.17	2.18	4.18	0.18	0.00	20.00
4.43	4.17	2.18	4.18	0.18	0.00	20.00
3.65	4.17	2.18	0.18	4.18	0.00	20.00
3.65	4.17	2.18	0.18	4.18	0.00	20.00
3.65	4.17	2.18	0.18	4.18	0.00	20.00
4.95	4.17	13.00	11.00	15.00	0.00	0.00
9.17	4.17	13.00	11.00	15.00	0.00	0.00
11.46	4.17	13.00	11.00	15.00	0.00	0.00
9.27	4.17	13.00	11.00	15.00	0.00	0.00
6.51	4.17	2.18	0.18	4.18	0.00	0.00
4.17	4.17	2.18	2.18	2.18	0.00	0.00
3.13	4.17	0.50	0.50	0.50	0.00	0.00

CLOTHES WASHER & DRYER								
Hour	BSLN/WSH	BSLN/DRY	ALC 1	ALC 2	ALC 3	ALC 4	ALC 5	ALC 6
1	0.45	0.45	4.17	0.86	0.86	0.86	20.00	0.00
2	0.23	0.27	4.17	0.86	0.86	0.86	20.00	0.00
3	0.19	0.15	4.17	0.86	0.86	0.86	20.00	0.00
4	0.17	0.11	4.17	0.86	0.86	0.86	20.00	0.00
5	0.19	0.19	4.17	0.86	0.86	0.86	20.00	0.00
6	0.61	0.97	4.17	0.86	0.86	0.86	0.00	0.00
7	1.46	2.64	4.17	6.00	8.00	4.00	0.00	0.00
8	4.49	4.22	4.17	6.00	8.00	4.00	0.00	0.00
9	6.55	6.26	4.17	6.00	8.00	4.00	0.00	0.00
10	7.74	7.72	4.17	6.00	8.00	4.00	0.00	0.00
11	8.37	8.30	4.17	4.00	6.00	2.00	0.00	0.00
12	8.28	8.05	4.17	4.00	6.00	2.00	0.00	0.00
13	7.75	7.14	4.17	4.00	6.00	2.00	0.00	20.00
14	6.59	6.27	4.17	4.00	6.00	2.00	0.00	20.00
15	6.25	5.85	4.17	4.00	2.00	6.00	0.00	20.00
16	5.76	5.82	4.17	4.00	2.00	6.00	0.00	20.00
17	6.13	5.73	4.17	2.00	0.00	4.00	0.00	20.00
18	6.35	5.73	4.17	2.00	0.00	4.00	0.00	0.00
19	5.51	5.48	4.17	2.00	0.00	4.00	0.00	0.00
20	4.96	5.37	4.17	10.00	8.00	12.00	0.00	0.00
21	4.57	5.36	4.17	10.00	8.00	12.00	0.00	0.00
22	3.89	4.28	4.17	10.00	8.00	12.00	0.00	0.00
23	2.54	2.52	4.17	10.00	10.00	10.00	0.00	0.00
24	0.96	1.12	4.17	0.86	0.86	0.86	0.00	0.00

LIGHTS						
BSLN	ALC 1	ALC 2	ALC 3	ALC 4	ALC 5	ALC 6
1.23	4.17	2.00	2.00	2.00	20.00	0.00
1.23	4.17	2.00	2.00	2.00	20.00	0.00
1.23	4.17	2.00	2.00	2.00	20.00	0.00
1.23	4.17	2.00	2.00	2.00	20.00	0.00
2.63	4.17	2.00	2.00	2.00	20.00	0.00
4.94	4.17	4.00	4.00	4.00	0.00	0.00
7.41	4.17	4.00	6.00	2.00	0.00	0.00
4.94	4.17	2.20	4.20	0.20	0.00	0.00
2.63	4.17	2.20	4.20	0.20	0.00	0.00
0.62	4.17	2.20	4.20	0.20	0.00	0.00
0.62	4.17	2.20	4.20	0.20	0.00	0.00
0.62	4.17	2.20	4.20	0.20	0.00	0.00
0.62	4.17	2.20	4.20	0.20	0.00	20.00
0.62	4.17	2.20	4.20	0.20	0.00	20.00
0.62	4.17	2.20	0.20	4.20	0.00	20.00
0.62	4.17	2.20	0.20	4.20	0.00	20.00
2.63	4.17	2.20	0.20	4.20	0.00	20.00
8.64	4.17	10.00	8.00	12.00	0.00	0.00
12.34	4.17	10.00	8.00	12.00	0.00	0.00
12.34	4.17	10.00	8.00	12.00	0.00	0.00
12.34	4.17	10.00	8.00	12.00	0.00	0.00
12.34	4.17	10.00	8.00	12.00	0.00	0.00
4.94	4.17	5.00	5.00	5.00	0.00	0.00
2.63	4.17	5.00	5.00	5.00	0.00	0.00

Table A6.1. (Continued) Baseline and arbitrary appliance load curves

COOKING								DHW						
Hour	BSLN	ALC 1	ALC 2	ALC 3	ALC 4	ALC 5	ALC 6	BSLN	ALC 1	ALC 2	ALC 3	ALC 4	ALC 5	ALC 6
1	0.23	4.17	0.50	0.50	0.50	20.00	0.00	1.81	4.17	1.83	1.83	1.83	20.00	0.00
2	0.17	4.17	0.50	0.50	0.50	20.00	0.00	1.54	4.17	1.83	1.83	1.83	20.00	0.00
3	0.15	4.17	0.50	0.50	0.50	20.00	0.00	1.17	4.17	1.83	1.83	1.83	20.00	0.00
4	0.32	4.17	0.50	0.50	0.50	20.00	0.00	1.04	4.17	1.83	1.83	1.83	20.00	0.00
5	0.80	4.17	0.50	0.50	0.50	20.00	0.00	1.04	4.17	1.83	1.83	1.83	20.00	0.00
6	2.25	4.17	7.00	7.00	7.00	0.00	0.00	1.95	4.17	8.00	8.00	8.00	0.00	0.00
7	3.54	4.17	7.00	9.00	5.00	0.00	0.00	4.17	4.17	8.00	10.00	6.00	0.00	0.00
8	4.34	4.17	2.64	4.64	0.64	0.00	0.00	7.02	4.17	4.00	6.00	2.00	0.00	0.00
9	4.64	4.17	2.64	4.64	0.64	0.00	0.00	7.54	4.17	4.00	6.00	2.00	0.00	0.00
10	4.31	4.17	2.64	4.64	0.64	0.00	0.00	7.13	4.17	4.00	6.00	2.00	0.00	0.00
11	4.25	4.17	2.64	4.64	0.64	0.00	0.00	6.50	4.17	4.00	6.00	2.00	0.00	0.00
12	5.27	4.17	9.00	11.00	7.00	0.00	0.00	5.71	4.17	4.00	6.00	2.00	0.00	0.00
13	4.58	4.17	9.00	11.00	7.00	0.00	20.00	4.92	4.17	4.00	6.00	2.00	0.00	20.00
14	3.69	4.17	2.64	4.64	0.64	0.00	20.00	4.42	4.17	4.00	6.00	2.00	0.00	20.00
15	4.03	4.17	2.64	0.64	4.64	0.00	20.00	3.90	4.17	4.00	2.00	6.00	0.00	20.00
16	5.93	4.17	2.64	0.64	4.64	0.00	20.00	3.50	4.17	4.00	2.00	6.00	0.00	20.00
17	11.10	4.17	12.00	10.00	14.00	0.00	20.00	4.08	4.17	4.00	2.00	6.00	0.00	20.00
18	16.53	4.17	12.00	10.00	14.00	0.00	0.00	4.79	4.17	4.00	2.00	6.00	0.00	0.00
19	11.34	4.17	12.00	10.00	14.00	0.00	0.00	5.58	4.17	4.00	2.00	6.00	0.00	0.00
20	6.04	4.17	2.64	0.64	4.64	0.00	0.00	5.71	4.17	4.00	2.00	6.00	0.00	0.00
21	3.48	4.17	2.64	0.64	4.64	0.00	0.00	5.46	4.17	7.00	5.00	9.00	0.00	0.00
22	1.79	4.17	2.64	0.64	4.64	0.00	0.00	5.06	4.17	7.00	5.00	9.00	0.00	0.00
23	0.83	4.17	2.64	2.64	2.64	0.00	0.00	4.08	4.17	7.00	7.00	7.00	0.00	0.00
24	0.37	4.17	0.50	0.50	0.50	0.00	0.00	2.83	4.17	1.83	1.83	1.83	0.00	0.00

TELEVISION								ALL OTHER MISC. APPLIANCES						
Hour	BSLN	ALC 1	ALC 2	ALC 3	ALC 4	ALC 5	ALC 6	BSLN	ALC 1	ALC 2	ALC 3	ALC 4	ALC 5	ALC 6
1	1.42	4.17	2.00	2.00	2.00	20.00	0.00	1.39	4.17	2.22	2.22	2.22	20.00	0.00
2	0.71	4.17	2.00	2.00	2.00	20.00	0.00	1.39	4.17	2.22	2.22	2.22	20.00	0.00
3	0.71	4.17	2.00	2.00	2.00	20.00	0.00	1.39	4.17	2.22	2.22	2.22	20.00	0.00
4	0.71	4.17	2.00	2.00	2.00	20.00	0.00	1.39	4.17	2.22	2.22	2.22	20.00	0.00
5	0.71	4.17	2.00	2.00	2.00	20.00	0.00	1.39	4.17	2.22	2.22	2.22	20.00	0.00
6	0.71	4.17	3.00	3.00	3.00	0.00	0.00	1.39	4.17	2.22	2.22	2.22	0.00	0.00
7	3.57	4.17	3.00	5.00	1.00	0.00	0.00	1.39	4.17	10.00	12.00	8.00	0.00	0.00
8	3.57	4.17	2.60	4.60	0.60	0.00	0.00	1.39	4.17	10.00	12.00	8.00	0.00	0.00
9	1.42	4.17	2.60	4.60	0.60	0.00	0.00	6.94	4.17	2.22	4.22	0.22	0.00	0.00
10	1.42	4.17	2.60	4.60	0.60	0.00	0.00	6.94	4.17	2.22	4.22	0.22	0.00	0.00
11	1.42	4.17	2.60	4.60	0.60	0.00	0.00	6.94	4.17	2.22	4.22	0.22	0.00	0.00
12	1.42	4.17	2.60	4.60	0.60	0.00	0.00	6.94	4.17	2.22	4.22	0.22	0.00	0.00
13	2.84	4.17	2.60	4.60	0.60	0.00	20.00	6.94	4.17	2.22	4.22	0.22	0.00	20.00
14	2.84	4.17	2.60	4.60	0.60	0.00	20.00	6.94	4.17	2.22	4.22	0.22	0.00	20.00
15	2.84	4.17	2.60	0.60	4.60	0.00	20.00	6.94	4.17	2.22	0.22	4.22	0.00	20.00
16	2.84	4.17	2.60	0.60	4.60	0.00	20.00	6.94	4.17	2.22	0.22	4.22	0.00	20.00
17	7.14	4.17	2.60	0.60	4.60	0.00	20.00	6.94	4.17	10.00	8.00	12.00	0.00	20.00
18	7.14	4.17	10.00	8.00	12.00	0.00	0.00	6.94	4.17	10.00	8.00	12.00	0.00	0.00
19	11.43	4.17	10.00	8.00	12.00	0.00	0.00	6.94	4.17	10.00	8.00	12.00	0.00	0.00
20	11.43	4.17	10.00	8.00	12.00	0.00	0.00	6.94	4.17	10.00	8.00	12.00	0.00	0.00
21	11.43	4.17	10.00	8.00	12.00	0.00	0.00	1.39	4.17	2.22	0.22	4.22	0.00	0.00
22	11.43	4.17	10.00	8.00	12.00	0.00	0.00	1.39	4.17	2.22	0.22	4.22	0.00	0.00
23	7.14	4.17	4.00	4.00	4.00	0.00	0.00	1.39	4.17	2.22	2.22	2.22	0.00	0.00
24	3.57	4.17	4.00	4.00	4.00	0.00	0.00	1.39	4.17	2.22	2.22	2.22	0.00	0.00

Table A6.2. Series 9 simulation results

All Values in GJ

Electricity

	Space Heat	DHW	Appliance	TOTAL
BASELINE	16878	8368	12539	37785
Series 9.A	17515	8373	12540	38428
Series 9.B	16709	8307	12622	37699
Series 9.C	16783	8367	12574	37724
Series 9.D	16694	8367	12575	37635
Series 9.E	17287	8365	12484	38137
Series 9.F	18112	8360	12666	39158

Natural Gas

	Space Heat	DHW	Appliance	TOTAL
BASELINE	42182	10894	16967	70043
Series 9.A	43441	10898	16966	71306
Series 9.B	41832	10894	17079	69805
Series 9.C	41973	10894	17007	69874
Series 9.D	41798	10893	17014	69705
Series 9.E	42493	10893	16856	70241
Series 9.F	44767	10885	17145	72797

Oil

	Space Heat	DHW	Appliance	TOTAL
BASELINE	21997	2029	9381	33407
Series 9.A	22683	2029	9385	34098
Series 9.B	21850	2028	9441	33319
Series 9.C	21899	2028	9407	33334
Series 9.D	21856	2028	9409	33293
Series 9.E	22635	2028	9343	34006
Series 9.F	23395	2027	9455	34876

Wood

	Space Heat	DHW	Appliance	TOTAL
BASELINE	220	29	81	330
Series 9.A	225	29	81	335
Series 9.B	218	29	82	329
Series 9.C	219	29	82	329
Series 9.D	219	29	82	330
Series 9.E	233	29	81	343
Series 9.F	239	29	81	348

Propane

	Space Heat	DHW	Appliance	TOTAL
BASELINE	288	0	166	453
Series 9.A	301	0	166	467
Series 9.B	285	0	167	452
Series 9.C	286	0	166	452
Series 9.D	284	0	166	451
Series 9.E	294	0	165	459
Series 9.F	310	0	165	475

Total

	Space Heat	DHW	Appliance	TOTAL
BASELINE	81565	21319	39135	142019
Series 9.A	84166	21329	39139	144634
Series 9.B	80893	21318	39391	141603
Series 9.C	81159	21318	39235	141712
Series 9.D	80852	21317	39245	141414
Series 9.E	82942	21314	38929	143184
Series 9.F	86822	21300	39532	147654

	Ave. House
BASELINE	152
Series 9.A	154
Series 9.B	151
Series 9.C	151
Series 9.D	151
Series 9.E	153
Series 9.F	158

Relative Values

Electricity

	Space Hea	DHW	Appliance	TOTAL
BSLN	100	100	100	100
9.A	104	100	100	102
9.B	99	100	101	100
9.C	99	100	100	100
9.D	99	100	100	100
9.E	102	100	100	101
9.F	107	100	101	104

Natural Gas

	Space Hea	DHW	Appliance	TOTAL
BSLN	100	100	100	100
9.A	103	100	100	102
9.B	99	100	101	100
9.C	100	100	100	100
9.D	99	100	100	100
9.E	101	100	99	100
9.F	106	100	101	104

Oil

	Space Hea	DHW	Appliance	TOTAL
BSLN	100	100	100	100
9.A	103	100	100	102
9.B	99	100	101	100
9.C	100	100	100	100
9.D	99	100	100	100
9.E	103	100	100	102
9.F	106	100	101	104

Wood

	Space Hea	DHW	Appliance	TOTAL
BSLN	100	100	100	100
9.A	102	100	100	102
9.B	99	100	101	100
9.C	99	100	100	100
9.D	100	100	100	100
9.E	106	100	100	104
9.F	108	100	100	106

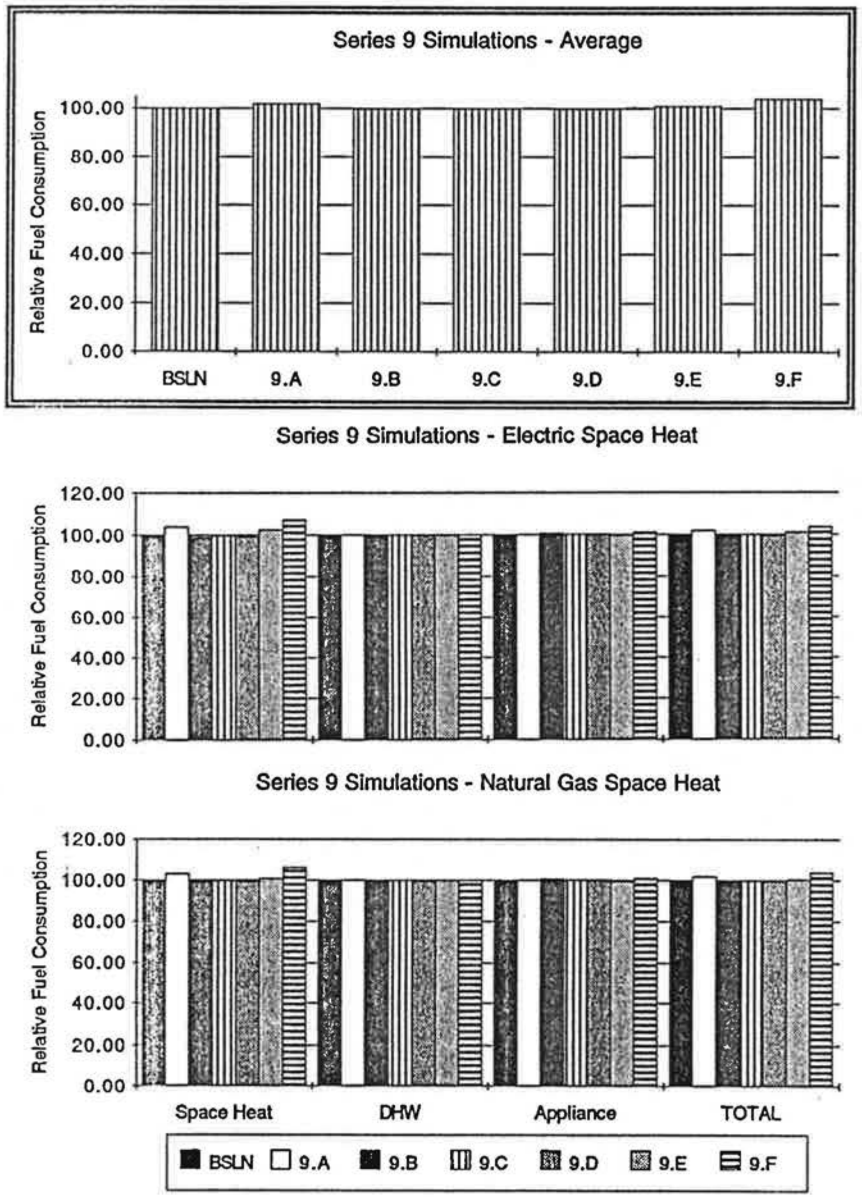
Propane

	Space Hea	DHW	Appliance	TOTAL
BSLN	100	N/A	100	100
9.A	105	N/A	100	103
9.B	99	N/A	101	100
9.C	99	N/A	100	100
9.D	99	N/A	100	99
9.E	102	N/A	99	101
9.F	108	N/A	99	105

Total

	Space Hea	DHW	Appliance	TOTAL
BSLN	100	100	100	100
9.A	103	100	100	102
9.B	99	100	101	100
9.C	100	100	100	100
9.D	99	100	100	100
9.E	102	100	99	101
9.F	106	100	101	104

	Average
BSLN	100
9.A	102
9.B	100
9.C	100
9.D	100
9.E	101
9.F	104



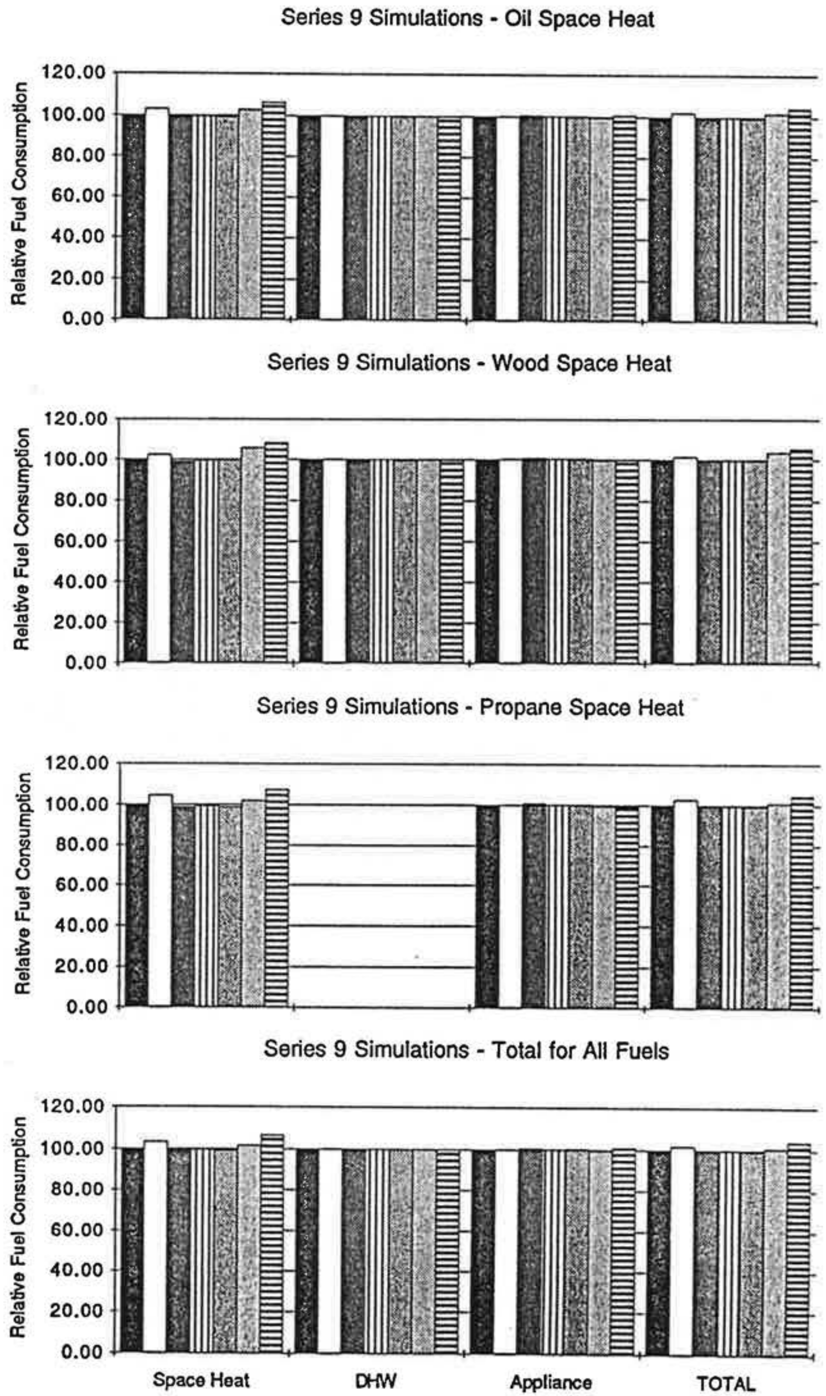


Figure A6.1 Series 9 simulation results

Table A6.3. Effect of load curves on heating and cooling energy consumption

House P4030 (Located in Subury, Ontario with Electric Heat and DHW)

	Baseline		ALC 1		ALC 3		ALC 5		ALC 6		Baseline w/o Appliances	
(KWh)	w/ A/C	w/o A/C	w/ A/C	w/o A/C	w/ A/C	w/o A/C	w/ A/C	w/o A/C	w/ A/C	w/o A/C	w/ A/C	w/o A/C
Space Heat	12156	12099	13140	13099	11955	11921	13005	12681	14395	13056	19031	18986
Hot Water	4904	4890	4904	4892	4903	4890	4904	4889	4905	4886	4911	4907
Proc. Energy	7638	7638	7644	7644	7657	7657	7641	7641	7641	7641	0	0
Lighting	4696	4696	4709	4709	4728	4728	4705	4705	4705	4705	0	0
Air Con.	1294	0	1196	0	1245	0	1306	0	2113	0	399	0
Fan Energy	0	0	0	0		0	0	0	0	0	0	0
Total	30688	29323	31593	30344	30488	29196	31561	29916	33759	30288	24341	23893
% diff from baseline	0.00		2.95		-0.65		2.84		10.01		-20.68	
% diff from baseline		0.00		3.48		-0.43		2.02		3.29		-18.52

Table A6.4. Effect of load curves on heating and cooling energy consumption - monthly results

House (P4030) simulated with air-conditioning										
	Heating Supplied (GJ)					Cooling Supplied (GJ)				
	Baseline	ALC 1	ALC 3	ALC 5	ALC 6	Baseline	ALC 1	ALC 3	ALC 5	ALC 6
Jan	9.5	10.2	9.4	9.7	9.9	0	0	0	0	0
Feb	9.1	9.8	9	9.1	9.6	0	0	0	0	0
Mar	6	6.6	5.9	6.2	7.2	0	0	0	0	0
Apr	2.2	2.5	2.1	2.6	3.7	0	0	0	0	0
May	0.5	0.6	0.5	0.9	1.4	0.4	0.4	0.4	0.4	0.3
Jun	0	0	0	0	0.3	1	0.9	0.9	0.9	0.4
Jul	0	0	0	0	0	1.3	1.2	1.2	1.2	0.8
Aug	0	0	0	0	0	1.2	1.1	1.2	1.1	1.2
Sept	0.4	0.4	0.3	0.7	1.2	0.5	0.5	0.5	0.6	1.5
Oct	1.4	1.6	1.4	2	2.6	0.2	0.2	0.2	0.3	1.4
Nov	4.9	5.4	4.9	5.6	5.9	0	0	0	0	0.9
Dec	9.7	10.4	9.6	9.9	10	0	0	0	0	0
Total	43.7	47.5	43.1	46.7	51.8	4.6	4.3	4.4	4.5	6.5

House (P4030) simulated without air-conditioning					
	Heating Supplied (GJ)				
	Baseline	ALC 1	ALC 3	ALC 5	ALC 6
Jan	9.5	10.2	9.4	9.7	9.7
Feb	9.1	9.8	9	9.1	9.3
Mar	6	6.6	5.9	6.1	6.5
Apr	2.1	2.4	2.1	2.4	2.8
May	0.5	0.5	0.4	0.7	0.9
Jun	0	0	0	0	0
Jul	0	0	0	0	0
Aug	0	0	0	0	0
Sept	0.3	0.3	0.3	0.5	0.7
Oct	1.4	1.6	1.3	1.8	1.9
Nov	4.9	5.4	4.9	5.5	5.4
Dec	9.7	10.4	9.6	9.8	9.8
Total	43.5	47.2	42.9	45.6	47

Appendix 13
Tables of CO_2/Energy Reductions for Fuel Substitutions

Table 32. Energy requirement (= fuel energy consumed x efficiency of heating system
Unit: Terajoule

Simulation	Electricity	Natural Gas	Oil	Wood	Propane
Baseline	471,862	380,685	97,046	43,503	10,969
1.A	368,558	378,954	100,782	44,392	11,982
1.B	330,725	351,438	95,973	41,152	11,700
1.C	305,633	337,806	92,864	39,105	11,469
2.A	368,558	402,660	107,560	48,896	12,761
2.B	330,725	397,095	109,074	49,665	13,221
2.C	305,633	403,962	111,921	51,267	13,705
3.A	349,232	331,941	80,649	40,515	9,517
3.B	311,237	307,102	76,989	37,600	9,356
3.C	286,008	295,849	74,903	35,825	9,235
4.A	318,588	272,398	63,866	33,399	7,812
4.B	280,148	250,901	61,111	31,048	7,728
4.C	254,563	242,613	59,837	29,763	7,678
5	471,419	362,697	97,046	43,503	10,969
6.A	468,425	372,423	97,000	43,503	10,810
6.B	366,317	372,705	100,732	44,392	11,802
6.C	327,068	343,835	95,925	41,152	11,524
6.D	301,931	330,609	92,818	39,105	11,296
7.A	345,514	308,515	80,609	40,515	9,359
7.B	307,473	285,121	76,949	37,600	9,201
7.C	282,197	275,133	74,865	35,825	9,082
8.A	315,648	250,641	63,839	33,399	7,699
8.B	277,162	230,453	61,084	31,048	7,615
8.C	251,531	223,313	59,810	29,763	7,564

Table 33. Savings in fuel consumption with fuel switching scenario no.1 (negative values indicate increases)

	Electricity (GWh)	Natural Gas (GL)	Oil (ML)	Wood (Cord)	Propane (ML)
Canada 199:	131,073	14,607	3,569	5,823,033	558
Simulation			SAVINGS		
Baseline	0	-713	714	0	112
1.A	28,696	-678	604	-118,963	70
1.B	39,205	412	745	314,764	82
1.C	46,175	957	837	588,671	91
2.A	28,696	-1,637	404	-721,773	39
2.B	39,205	-1,437	360	-824,744	20
2.C	46,175	-1,722	276	-1,039,169	0
3.A	34,064	1,275	1,196	399,988	171
3.B	44,618	2,254	1,304	790,225	177
3.C	51,626	2,700	1,365	1,027,760	182
4.A	42,576	3,682	1,690	1,352,470	240
4.B	53,254	4,526	1,771	1,667,137	244
4.C	60,361	4,852	1,808	1,839,243	246
5	123	-23	714	0	112
6.A	955	-395	715	0	118
6.B	29,318	-436	605	-118,963	78
6.C	40,221	705	747	314,764	89
6.D	47,203	1,234	838	588,671	98
7.A	35,097	2,175	1,197	399,988	177
7.B	45,664	3,098	1,305	790,225	184
7.C	52,685	3,496	1,366	1,027,760	188
8.A	43,393	4,518	1,691	1,352,470	245
8.B	54,083	5,311	1,772	1,667,137	248
8.C	61,203	5,594	1,809	1,839,243	250

Table 34. Reductions in CO2 emissions with fuel switching scenario no.1
(negative values indicate increases)
Unit: Tonnes of CO2

Simulation	Electricity	Natural Gas	Oil	Wood	Propane	Total	% of Total
Canada 1992	2.89E+07	2.75E+07	1.01E+07	7.88E+06	8.52E+05	7.52E+07	100
	REDUCTION						
Baseline	0.00E+00	-1.34E+06	2.02E+06	0.00E+00	1.70E+05	8.47E+05	1.13
1.A	6.33E+06	-1.28E+06	1.71E+06	-1.61E+05	1.07E+05	6.71E+06	8.92
1.B	8.65E+06	7.75E+05	2.11E+06	4.26E+05	1.25E+05	1.21E+07	16.07
1.C	1.02E+07	1.80E+06	2.37E+06	7.97E+05	1.39E+05	1.53E+07	20.34
2.A	6.33E+06	-3.08E+06	1.14E+06	-9.77E+05	5.91E+04	3.48E+06	4.62
2.B	8.65E+06	-2.70E+06	1.02E+06	-1.12E+06	3.05E+04	5.88E+06	7.82
2.C	1.02E+07	-3.24E+06	7.81E+05	-1.41E+06	4.18E+02	6.32E+06	8.41
3.A	7.52E+06	2.40E+06	3.38E+06	5.41E+05	2.61E+05	1.41E+07	18.75
3.B	9.85E+06	4.24E+06	3.69E+06	1.07E+06	2.71E+05	1.91E+07	25.42
3.C	1.14E+07	5.08E+06	3.86E+06	1.39E+06	2.78E+05	2.20E+07	29.26
4.A	9.40E+06	6.93E+06	4.78E+06	1.83E+06	3.67E+05	2.33E+07	30.99
4.B	1.18E+07	8.52E+06	5.01E+06	2.26E+06	3.72E+05	2.79E+07	37.11
4.C	1.33E+07	9.14E+06	5.11E+06	2.49E+06	3.75E+05	3.04E+07	40.47
5	2.71E+04	-4.27E+04	2.02E+06	0.00E+00	1.70E+05	2.17E+06	2.89
6.A	2.11E+05	-7.43E+05	2.02E+06	0.00E+00	1.80E+05	1.67E+06	2.22
6.B	6.47E+06	-8.22E+05	1.71E+06	-1.61E+05	1.19E+05	7.32E+06	9.73
6.C	8.88E+06	1.33E+06	2.11E+06	4.26E+05	1.36E+05	1.29E+07	17.12
6.D	1.04E+07	2.32E+06	2.37E+06	7.97E+05	1.50E+05	1.61E+07	21.35
7.A	7.75E+06	4.10E+06	3.39E+06	5.41E+05	2.70E+05	1.60E+07	21.33
7.B	1.01E+07	5.83E+06	3.69E+06	1.07E+06	2.80E+05	2.09E+07	27.86
7.C	1.16E+07	6.58E+06	3.86E+06	1.39E+06	2.88E+05	2.38E+07	31.58
8.A	9.58E+06	8.51E+06	4.78E+06	1.83E+06	3.74E+05	2.51E+07	33.33
8.B	1.19E+07	1.00E+07	5.01E+06	2.26E+06	3.79E+05	2.96E+07	39.33
8.C	1.35E+07	1.05E+07	5.12E+06	2.49E+06	3.82E+05	3.20E+07	42.58

Table 35. Savings in fuel consumption with fuel switching scenario no.2 (negative values indicate increases)

	Electricity (GWh)	Natural Gas (GL)	Oil (ML)	Wood (Cord)	Propane (ML)
Canada 199	131,073	14,607	3,569	5,823,033	558
Simulation			SAVINGS		
Baseline	-6,001	0	714	0	112
1.A	22,431	66	604	-118,963	70
1.B	33,223	1,122	745	314,764	82
1.C	40,379	1,645	837	588,671	91
2.A	22,011	-843	404	-721,773	39
2.B	32,410	-630	360	-824,744	20
2.C	39,196	-893	276	-1,039,169	0
3.A	29,055	1,870	1,196	399,988	171
3.B	39,821	2,823	1,304	790,225	177
3.C	46,952	3,255	1,365	1,027,760	182
4.A	38,594	4,155	1,690	1,352,470	240
4.B	49,430	4,980	1,771	1,667,137	244
4.C	56,610	5,298	1,808	1,839,243	246
5	-5,878	690	714	0	112
6.A	-5,035	317	715	0	118
6.B	23,066	306	605	-118,963	78
6.C	34,251	1,414	747	314,764	89
6.D	41,419	1,921	838	588,671	98
7.A	30,099	2,769	1,197	399,988	177
7.B	40,878	3,667	1,305	790,225	184
7.C	48,021	4,050	1,366	1,027,760	188
8.A	39,418	4,990	1,691	1,352,470	245
8.B	50,267	5,765	1,772	1,667,137	248
8.C	57,460	6,039	1,809	1,839,243	250

Table 36. Reductions in CO2 emissions with fuel switching scenario no.2
(negative values indicate increases)
Unit: Tonnes of CO2

Simulation	Electricity	Natural Gas	Oil	Wood	Propane	Total	% of Total
Canada 1992	2.89E+07	2.75E+07	1.01E+07	7.88E+06	8.52E+05	7.52E+07	100
	REDUCTION						
Baseline	-1.32E+06	0.00E+00	2.02E+06	0.00E+00	1.70E+05	8.64E+05	1.15
1.A	4.95E+06	1.25E+05	1.71E+06	-1.61E+05	1.07E+05	6.73E+06	8.95
1.B	7.33E+06	2.11E+06	2.11E+06	4.26E+05	1.25E+05	1.21E+07	16.09
1.C	8.91E+06	3.10E+06	2.37E+06	7.97E+05	1.39E+05	1.53E+07	20.36
2.A	4.86E+06	-1.59E+06	1.14E+06	-9.77E+05	5.91E+04	3.50E+06	4.65
2.B	7.15E+06	-1.19E+06	1.02E+06	-1.12E+06	3.05E+04	5.90E+06	7.84
2.C	8.65E+06	-1.68E+06	7.81E+05	-1.41E+06	4.18E+02	6.34E+06	8.44
3.A	6.41E+06	3.52E+06	3.38E+06	5.41E+05	2.61E+05	1.41E+07	18.77
3.B	8.79E+06	5.32E+06	3.69E+06	1.07E+06	2.71E+05	1.91E+07	25.44
3.C	1.04E+07	6.13E+06	3.86E+06	1.39E+06	2.78E+05	2.20E+07	29.28
4.A	8.52E+06	7.82E+06	4.78E+06	1.83E+06	3.67E+05	2.33E+07	31.00
4.B	1.09E+07	9.38E+06	5.01E+06	2.26E+06	3.72E+05	2.79E+07	37.13
4.C	1.25E+07	9.97E+06	5.11E+06	2.49E+06	3.75E+05	3.04E+07	40.48
5	-1.30E+06	1.30E+06	2.02E+06	0.00E+00	1.70E+05	2.19E+06	2.91
6.A	-1.11E+06	5.97E+05	2.02E+06	0.00E+00	1.80E+05	1.69E+06	2.24
6.B	5.09E+06	5.76E+05	1.71E+06	-1.61E+05	1.19E+05	7.34E+06	9.76
6.C	7.56E+06	2.66E+06	2.11E+06	4.26E+05	1.36E+05	1.29E+07	17.15
6.D	9.14E+06	3.62E+06	2.37E+06	7.97E+05	1.50E+05	1.61E+07	21.38
7.A	6.64E+06	5.21E+06	3.39E+06	5.41E+05	2.70E+05	1.61E+07	21.35
7.B	9.02E+06	6.90E+06	3.69E+06	1.07E+06	2.80E+05	2.10E+07	27.88
7.C	1.06E+07	7.62E+06	3.86E+06	1.39E+06	2.88E+05	2.38E+07	31.60
8.A	8.70E+06	9.39E+06	4.78E+06	1.83E+06	3.74E+05	2.51E+07	33.35
8.B	1.11E+07	1.09E+07	5.01E+06	2.26E+06	3.79E+05	2.96E+07	39.35
8.C	1.27E+07	1.14E+07	5.12E+06	2.49E+06	3.82E+05	3.20E+07	42.60

Table 37. Savings in fuel consumption with fuel switching scenario no.1 and 20% penetration of energy saving measures
(negative values indicate increases)

	Electricity (GWh)	Natural Gas (GL)	Oil (ML)	Wood (Cord)	Propane (ML)
Canada 199	131,073	14,607	3,569	5,823,033	558
Simulation			SAVINGS		
Baseline	0	-713	714	0	112
1.A	5,739	-706	692	-23,793	103
1.B	7,841	-488	720	62,953	106
1.C	9,235	-379	738	117,734	108
2.A	5,739	-898	652	-144,355	97
2.B	7,841	-858	643	-164,949	93
2.C	9,235	-915	626	-207,834	89
3.A	6,813	-315	810	79,998	123
3.B	8,924	-120	832	158,045	125
3.C	10,325	-30	844	205,552	126
4.A	8,515	166	909	270,494	137
4.B	10,651	335	925	333,427	138
4.C	12,072	400	933	367,849	138
5	25	-575	714	0	112
6.A	191	-649	714	0	113
6.B	5,864	-658	692	-23,793	105
6.C	8,044	-429	720	62,953	107
6.D	9,441	-323	739	117,734	109
7.A	7,019	-135	811	79,998	125
7.B	9,133	49	832	158,045	126
7.C	10,537	129	844	205,552	127
8.A	8,679	333	909	270,494	138
8.B	10,817	492	925	333,427	139
8.C	12,241	548	933	367,849	139

Table 38. Reductions in CO_2 emissions with fuel switching scenario no.1
and 20% penetration of energy saving measures
Unit: Tonnes of CO_2 (negative values indicate increases)

Simulation	Electricity	Natural Gas	Oil	Wood	Propane	Total	% of Total
Canada 1992	2.89E+07	2.75E+07	1.01E+07	7.88E+06	8.52E+05	7.52E+07	100
	REDUCTION						
Baseline	0.00E+00	-1.34E+06	2.02E+06	0.00E+00	1.70E+05	8.47E+05	1.13
1.A	1.27E+06	-1.33E+06	1.96E+06	-3.22E+04	1.58E+05	2.02E+06	2.69
1.B	1.73E+06	-9.19E+05	2.04E+06	8.52E+04	1.61E+05	3.09E+06	4.11
1.C	2.04E+06	-7.13E+05	2.09E+06	1.59E+05	1.64E+05	3.74E+06	4.97
2.A	1.27E+06	-1.69E+06	1.84E+06	-1.95E+05	1.48E+05	1.37E+06	1.83
2.B	1.73E+06	-1.61E+06	1.82E+06	-2.23E+05	1.42E+05	1.85E+06	2.46
2.C	2.04E+06	-1.72E+06	1.77E+06	-2.81E+05	1.36E+05	1.94E+06	2.58
3.A	1.50E+06	-5.94E+05	2.29E+06	1.08E+05	1.88E+05	3.50E+06	4.65
3.B	1.97E+06	-2.25E+05	2.35E+06	2.14E+05	1.90E+05	4.50E+06	5.98
3.C	2.28E+06	-5.71E+04	2.39E+06	2.78E+05	1.92E+05	5.08E+06	6.75
4.A	1.88E+06	3.13E+05	2.57E+06	3.66E+05	2.10E+05	5.34E+06	7.10
4.B	2.35E+06	6.30E+05	2.62E+06	4.51E+05	2.11E+05	6.26E+06	8.32
4.C	2.66E+06	7.53E+05	2.64E+06	4.98E+05	2.11E+05	6.76E+06	8.99
5	5.43E+03	-1.08E+06	2.02E+06	0.00E+00	1.70E+05	1.11E+06	1.48
6.A	4.21E+04	-1.22E+06	2.02E+06	0.00E+00	1.72E+05	1.01E+06	1.34
6.B	1.29E+06	-1.24E+06	1.96E+06	-3.22E+04	1.60E+05	2.14E+06	2.85
6.C	1.78E+06	-8.08E+05	2.04E+06	8.52E+04	1.63E+05	3.25E+06	4.33
6.D	2.08E+06	-6.09E+05	2.09E+06	1.59E+05	1.66E+05	3.89E+06	5.17
7.A	1.55E+06	-2.55E+05	2.29E+06	1.08E+05	1.90E+05	3.88E+06	5.17
7.B	2.02E+06	9.29E+04	2.35E+06	2.14E+05	1.92E+05	4.87E+06	6.47
7.C	2.33E+06	2.43E+05	2.39E+06	2.78E+05	1.94E+05	5.43E+06	7.22
8.A	1.92E+06	6.27E+05	2.57E+06	3.66E+05	2.11E+05	5.69E+06	7.57
8.B	2.39E+06	9.26E+05	2.62E+06	4.51E+05	2.12E+05	6.59E+06	8.77
8.C	2.70E+06	1.03E+06	2.64E+06	4.98E+05	2.13E+05	7.08E+06	9.42

Table 39. Savings in fuel consumption with fuel switching scenario no.2 and 20% penetration of energy saving measures
(negative values indicate increases)

	Electricity (GWh)	Natural Gas (GL)	Oil (ML)	Wood (Cord)	Propane (ML)
Canada 199	131,073	14,607	3,569	5,823,033	558
Simulation			SAVINGS		
Baseline	-6,001	0	714	0	112
1.A	-314	13	692	-23,793	103
1.B	1,844	224	720	62,953	106
1.C	3,275	329	738	117,734	108
2.A	-398	-169	652	-144,355	97
2.B	1,681	-126	643	-164,949	93
2.C	3,038	-179	626	-207,834	89
3.A	1,010	374	810	79,998	123
3.B	3,164	565	832	158,045	125
3.C	4,590	651	844	205,552	126
4.A	2,918	831	909	270,494	137
4.B	5,085	996	925	333,427	138
4.C	6,521	1,060	933	367,849	138
5	-5,976	138	714	0	112
6.A	-5,808	63	714	0	113
6.B	-187	61	692	-23,793	105
6.C	2,050	283	720	62,953	107
6.D	3,483	384	739	117,734	109
7.A	1,219	554	811	79,998	125
7.B	3,375	733	832	158,045	126
7.C	4,804	810	844	205,552	127
8.A	3,083	998	909	270,494	138
8.B	5,253	1,153	925	333,427	139
8.C	6,691	1,208	933	367,849	139

Table 40. Reductions in CO2 emissions with fuel switching scenario no.2
and 20% penetration of energy saving measures
Unit: Tonnes of CO2 (negative values indicate increases)

Simulation	Electricity	Natural Gas	Oil	Wood	Propane	Total	% of Total
Canada 1992	2.89E+07	2.75E+07	1.01E+07	7.88E+06	8.52E+05	7.52E+07	100
	REDUCTION						
Baseline	-1.32E+06	0.00E+00	2.02E+06	0.00E+00	1.70E+05	8.64E+05	1.15
1.A	-6.94E+04	2.50E+04	1.96E+06	-3.22E+04	1.58E+05	2.04E+06	2.71
1.B	4.07E+05	4.23E+05	2.04E+06	8.52E+04	1.61E+05	3.11E+06	4.14
1.C	7.23E+05	6.19E+05	2.09E+06	1.59E+05	1.64E+05	3.75E+06	4.99
2.A	-8.79E+04	-3.17E+05	1.84E+06	-1.95E+05	1.48E+05	1.39E+06	1.85
2.B	3.71E+05	-2.37E+05	1.82E+06	-2.23E+05	1.42E+05	1.87E+06	2.49
2.C	6.71E+05	-3.36E+05	1.77E+06	-2.81E+05	1.36E+05	1.96E+06	2.61
3.A	2.23E+05	7.04E+05	2.29E+06	1.08E+05	1.88E+05	3.51E+06	4.67
3.B	6.98E+05	1.06E+06	2.35E+06	2.14E+05	1.90E+05	4.52E+06	6.01
3.C	1.01E+06	1.23E+06	2.39E+06	2.78E+05	1.92E+05	5.10E+06	6.78
4.A	6.44E+05	1.56E+06	2.57E+06	3.66E+05	2.10E+05	5.35E+06	7.12
4.B	1.12E+06	1.88E+06	2.62E+06	4.51E+05	2.11E+05	6.28E+06	8.34
4.C	1.44E+06	1.99E+06	2.64E+06	4.98E+05	2.11E+05	6.78E+06	9.02
5	-1.32E+06	2.60E+05	2.02E+06	0.00E+00	1.70E+05	1.13E+06	1.50
6.A	-1.28E+06	1.19E+05	2.02E+06	0.00E+00	1.72E+05	1.03E+06	1.37
6.B	-4.14E+04	1.15E+05	1.96E+06	-3.22E+04	1.60E+05	2.16E+06	2.87
6.C	4.52E+05	5.32E+05	2.04E+06	8.52E+04	1.63E+05	3.27E+06	4.35
6.D	7.69E+05	7.23E+05	2.09E+06	1.59E+05	1.66E+05	3.91E+06	5.19
7.A	2.69E+05	1.04E+06	2.29E+06	1.08E+05	1.90E+05	3.90E+06	5.19
7.B	7.45E+05	1.38E+06	2.35E+06	2.14E+05	1.92E+05	4.88E+06	6.49
7.C	1.06E+06	1.52E+06	2.39E+06	2.78E+05	1.94E+05	5.44E+06	7.24
8.A	6.80E+05	1.88E+06	2.57E+06	3.66E+05	2.11E+05	5.71E+06	7.59
8.B	1.16E+06	2.17E+06	2.62E+06	4.51E+05	2.12E+05	6.61E+06	8.79
8.C	1.48E+06	2.27E+06	2.64E+06	4.98E+05	2.13E+05	7.10E+06	9.44

Appendix 14
Comparison of Results from ENERPASS and HOT-2000 Simulations

A7.1 General Comments

One of the objectives of this work is to determine whether the Hot-2000 program would be suitable to conduct the same study. To investigate this, Version 5.04.F of the batch Hot-2000 program [Unisys, 1993] was used to conduct the same series of simulations conducted using ENERPASS. The predictions from Hot-2000 program are compared with the predictions from Hot-2000 program in the following section.

Hot-2000 program is a bin-type program, and as such it is simpler than the ENERPASS program which conducts hour-by-hour simulations. The simplicity of Hot-2000 presents advantages and disadvantages.

The main advantages of Hot-2000 over ENERPASS are:

1. Hot-2000 requires fewer input data, therefore, data preparation is simpler and faster.
2. Since the number of computations are significantly less, and since it is a bin-type program, the run time of Hot-2000 is several orders of magnitude less than the run time of ENERPASS program for the same house. In this work, a simulation run for the whole data base of 937 houses on a 50 MHz 486 machine took about 15 hours using ENERPASS, whereas the same simulation run took less than fifteen minutes using Hot-2000.

The main disadvantages of Hot-2000 in comparison to ENERPASS are:

1. Hot-2000 can conduct only steady state simulations, thus the dynamic effects of thermal mass of a building cannot be simulated.
2. Temperature set-back cannot be realistically simulated with Hot-2000.
3. Appliance load curves, or any other scheduling effects (such as occupancy) cannot be realistically simulated in Hot-2000 as it is not possible to define load curves in Hot-2000.
4. In Hot-2000, it is not possible to allocate part of the appliance energy consumption directly to outside, thus deducting this effect ~~from internal heat gain.~~ This is important in the simulation of the clothes dryer. In ENERPASS, part of the electricity consumption of the dryer was assigned to an external receptacle; this way part of the heat gain from the dryer did not enter the house (this is realistic, since dryers are vented outside). This could not be done in Hot-2000.
5. The heat loss from the DHW tank is not directly calculated in Hot-2000, but it is indirectly reflected in the DHW heating efficiency. In ENERPASS, the heat loss (which becomes heat gain to the house) is calculated based on the surface area, R-value, and hot water-ambient temperature difference. The Hot-2000 approach results in an inaccuracy, especially when the effect of reducing DHW consumption is considered.

A7.2 Comments on Hot-2000 Simulations

While conducting Hot-2000 simulations, it was found that the DHW heating system efficiencies in the Hot-2000 files and STAR files were different. It was therefore necessary to modify DHW heating efficiencies in Hot-2000 files according to the values in STAR database.

It should also be noted that since the air-conditioning subroutines in the Hot-2000 program that was used in the simulations were in Beta release version, it was not possible to simulate air-conditioning in any of the houses in Hot-2000 runs.[1] To be able to make a valid comparison, ENERPASS and Hot-2000 predictions for only those houses which do not ~~have air~~-conditioning

[1] The air-conditioning option in Hot-2000 Version 5.04.F is very sensitive to the input data. The subroutines function properly only when the data input for air-conditioning equipment are in a narrow range. Thus, it is very difficult to get the air-conditioning subroutines operate properly in batch simulations of more than 200 houses as in this case.

are compared. The number of houses which were not assigned air-conditioning is 723 out of the 937 houses in Expanded STAR.

The input data used in the simulations and the detailed output files are saved on the Data Tapes as described in Appendix 5.

It was not possible to conduct Series 9 simulations using Hot-2000 program because Hot-2000 does not allow input of load curves. (Series 9 simulations were conducted in ENERPASS to investigate the effect of different load curves on energy consumption - see Section 3.2.10).

In Series 10 Simulations, where all appliances were removed from the files (see Section 3.2.11), it was necessary to input a very small appliance energy consumption (0.1 kWh/day) in Hot-2000 simulatios because the program does not work properly with zero input in this field. For this reason, small values, rather than zero appear in appliance energy consumption in Hot-2000 results. (In ENERPASS results for Series 10 simulations, appliance energy consumption of 76 GJ appears in electrically heated houses. This is from the houses which have a mechanical ventilation system, i.e. the 76 GJ is the electrical energy to run the fan. In Hot-2000 simulations, the fan energy is not calculated separately.)

A7.3 Comparison of Hot-2000 and ENERPASS Predictions

The predictions for space heating, DHW heating, and appliance energy consumption from Hot-2000 and ENERPASS simulations are presented in Table A7.1 for all of the simulations conducted originally in ENERPASS except Series 9 simulations. As noted above, these results are for the 723 houses which do not have air-conditioning.

The last three columns of Table A7.1, titled COMP'N (%), show the percent difference between Hot-2000 and ENERPASS predictions. The values in these three columns are calculated as follows:

COMP'N(%) = {[Hot-2000 Prediction - ENERPASS Prediction] / ENERPASS Prediction} x 100

A review of the results presented in Table A7.1 indicate the following:

1. Since the same appliance energy consumption values are used as input in both simulation programs, the Hot-2000 and ENERPASS predictions for appliance energy consumption are very close (within 3%).

2. The space heating energy consumption predictions from Hot-2000 are consistently higher than that predicted by ENERPASS. The difference is as high as 14.5%. Only in some simulations the Hot-2000 predictions are less than the ENERPASS predictions.

3. The DHW heating predictions from Hot-2000 are consistently lower than that predicted by ENERPASS by as much as 17%. It is suspected that this difference is partly due to the fact that the DHW tank heat losses are not calculated in Hot-2000.

4. Since the DHW energy predictions are lower, space heating energy predictions are higher, and appliance energy predictions are very close to those predicted by ENERPASS, the total energy consumption estimates from the two programs for all houses are close in all scenarios investigated. The difference is always less than 5%.

5. It can thus be concluded that if one is interested in just the bottom line values of energy consumption (i.e. total energy consumption, or average energy consumption per house),

then using Hot-2000 may be acceptable. However, if more detailed evaluations are to be conducted, then ENERPASS is a more suitable program to conduct a study of this nature.

Table A7.1 Comparison of Hot-2000 and ENERPASS predictions - houses with only heating

	HOT2000	HOT2000	HOT2000	ENERPASS	ENERPASS	ENERPASS	COMP'N (%)	COMP'N (%)	COMP'N (%)
BASELINE	BASELINE	BASELINE	BASELINE	BASELINE	BASELINE	BASELINE	BASELINE	BASELINE	BASELINE
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	13123	6370	8950	12410	6411	9046	5.75	-0.64	-1.05
Nat. Gas	32924	7761	12699	32200	8435	12686	2.25	-7.99	0.11
Oil	20060	1550	7456	17897	1643	7464	12.09	-5.67	-0.10
Wood	222	26	81	220	29	81	0.71	-7.40	-0.10
Propane	329	#DIV/0!	166	288	#DIV/0!	166	14.20	N/A	0.00
Total	111719			108975			2.52		
Average	155			151			2.52		

Series 1a	Series 1a	Series 1a	Series 1a	Series 1a	Series 1a	Series 1a	Series 1a	Series 1a	Series 1a
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	15189	4747	5506	14406	4950	5612	5.44	-4.09	-1.89
Nat. Gas	34724	5783	7871	33921	6504	7879	2.37	-11.08	-0.10
Oil	21147	1155	4532	19031	1268	4544	11.12	-8.92	-0.27
Wood	235	20	51	232	22	51	1.20	-10.66	-0.41
Propane	353	#DIV/0!	102	314	#DIV/0!	102	12.47	N/A	-0.31
Total	101414			98836			2.61		
Average	140			137			2.61		

Series 1b	Series 1b	Series 1b	Series 1b	Series 1b	Series 1b	Series 1b	Series 1b	Series 1b	Series 1b
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	15791	3306	4571	14927	3647	4676	5.79	-9.35	-2.25
Nat. Gas	33614	4026	6546	32690	4785	6555	2.82	-15.85	-0.14
Oil	20471	804	3752	18398	934	3763	11.27	-13.98	-0.29
Wood	223	14	43	219	16	43	1.70	-15.46	-0.41
Propane	346	#DIV/0!	84	307	#DIV/0!	85	12.70	N/A	-0.32
Total	93590			91045			2.79		
Average	129			126			2.79		

Series 1c	series 1c	Series 1c	Series 1c	Series 1c	Series 1c	Series 1c	Series 1c	Series 1c	Series 1c
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	16353	3002	3708	15457	3356	3812	5.79	-10.54	-2.72
Nat. Gas	32570	3654	5331	31621	4400	5343	3.00	-16.95	-0.22
Oil	19833	730	3026	17847	860	3036	11.13	-15.08	-0.33
Wood	212	12	35	209	15	35	1.76	-16.81	-0.18
Propane	338	#DIV/0!	66	301	#DIV/0!	68	12.32	N/A	-0.44
Total	88872			86358			2.91		
Average	123			119			2.91		

Series 2a	Series 2a	Series 2a	Series 2a	Series 2a	Series 2a	Series 2a	Series 2a	Series 2a	Series 2a
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	15202	4747	5506	14406	4950	5612	5.53	-4.09	-1.89
Nat. Gas	37294	5783	7871	36445	6504	7879	2.33	-11.08	-0.10
Oil	22665	1155	4532	20397	1268	4544	11.12	-8.92	-0.27
Wood	261	20	51	257	22	51	1.19	-10.66	-0.41
Propane	376	#DIV/0!	102	335	#DIV/0!	102	12.47	N/A	-0.31
Total	105510			102700			2.74		
Average	146			142			2.74		

Table A7.1 Continued

	HOT2000	HOT2000	HOT2000	ENERPASS	ENERPASS	ENERPASS	COMP'N (%)	COMP'N (%)	COMP'N (%)
Series 2b	**Series 2b**	**Series 2b**	**Series 2b**	**Series 2b**	**Series 2b**	**Series 2b**	**Series 2b**	**Series 2b**	**Series 2b**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	15810	3306	4571	14927	3647	4676	5.91	-9.35	-2.25
Nat. Gas	38587	4026	6546	37550	4785	6555	2.76	-15.85	-0.14
Oil	23409	804	3752	21037	934	3763	11.27	-13.98	-0.29
Wood	272	14	43	268	16	43	1.66	-15.46	-0.41
Propane	391	#DIV/0!	84	347	#DIV/0!	85	12.68	N/A	-0.32
Total	101503			98501			3.05		
Average	140			136			3.05		

Series 2c	**Series 2c**	**Series 2c**	**Series 2c**	**Series 2c**	**Series 2c**	**Series 2c**	**Series 2c**	**Series 2c**	**Series 2c**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	16378	3002	3708	15457	3356	3812	5.95	-10.54	-2.72
Nat. Gas	39778	3654	5331	38664	4400	5343	2.88	-16.95	-0.22
Oil	24101	730	3026	21686	860	3036	11.14	-15.08	-0.33
Wood	283	12	35	278	15	35	1.79	-16.81	-0.18
Propane	404	#DIV/0!	68	359	#DIV/0!	68	12.31	N/A	-0.44
Total	100340			97177			3.25		
Average	139			134			3.25		

Series 3a	**Series 3a**	**Series 3a**	**Series 3a**	**Series 3a**	**Series 3a**	**Series 3a**	**Series 3a**	**Series 3a**	**Series 3a**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	13666	4747	5506	12464	4947	5613	9.65	-4.05	-1.91
Nat. Gas	29466	5783	7871	28920	6501	7882	1.89	-11.04	-0.14
Oil	16443	1155	4532	14975	1268	4543	9.80	-8.87	-0.26
Wood	209	20	51	210	22	51	-0.08	-10.59	-0.41
Propane	279	#DIV/0!	102	250	#DIV/0!	102	11.96	N/A	-0.31
Total	89943			87877			2.35		
Average	124			122			2.35		

Series 3b	**Series 3b**	**Series 3b**	**Series 3b**	**Series 3b**	**Series 3b**	**Series 3b**	**Series 3b**	**Series 3b**	**Series 3b**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	14254	3306	4571	12972	3645	4676	9.89	-9.31	-2.25
Nat. Gas	28649	4026	6546	27973	4782	6556	2.42	-15.81	-0.16
Oil	16032	804	3752	14573	934	3762	10.01	-13.94	-0.26
Wood	200	14	43	199	16	43	0.51	-15.39	-0.41
Propane	275	#DIV/0!	84	245	#DIV/0!	85	12.17	N/A	-0.32
Total	82665			80572			2.60		
Average	114			111			2.60		

Series 3c	**Series 3c**	**Series 3c**	**Series 3c**	**Series 3c**	**Series 3c**	**Series 3c**	**Series 3c**	**Series 3c**	**Series 3c**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	14802	3002	3708	13489	3354	3812	9.73	-10.49	-2.71
Nat. Gas	27864	3654	5331	27157	4398	5343	2.61	-16.91	-0.22
Oil	15632	730	3026	14228	859	3035	9.86	-15.03	-0.27
Wood	191	12	35	190	15	35	0.69	-16.74	-0.18
Propane	271	#DIV/0!	68	242	#DIV/0!	68	11.81	N/A	-0.44
Total	78433			76323			2.76		
Average	108			106			2.76		

Table A7.1 Continued

Series 4a	HOT2000	HOT2000	HOT2000	ENERPASS	ENERPASS	ENERPASS	COMP'N (%)	COMP'N (%)	COMP'N (%)
	Series 4a	Series 4a	Series 4a	Series 4a	Series 4a	Series 4a	Series 4a	Series 4a	Series 4a
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	9769	4747	5506	9354	4943	5628	4.44	-3.96	-2.17
Nat. Gas	23105	5783	7871	22588	6495	7899	2.29	-10.96	-0.36
Oil	12679	1155	4532	11595	1267	4549	9.35	-8.80	-0.38
Wood	163	20	51	169	22	51	-3.69	-10.44	-0.41
Propane	229	#DIV/0!	102	205	#DIV/0!	102	11.66	N/A	-0.31
Total	75738			75029			0.94		
Average	105			104			0.94		

Series 4b	Series 4b	Series 4b	Series 4b	Series 4b	Series 4b	Series 4b	Series 4b	Series 4b	Series 4b
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	10317	3306	4571	9828	3640	4687	4.97	-9.20	-2.46
Nat. Gas	22628	4026	6546	21996	4777	6568	2.87	-15.72	-0.33
Oil	12469	804	3752	11375	933	3765	9.62	-13.85	-0.35
Wood	156	14	43	161	16	43	-3.09	-15.20	-0.41
Propane	227	#DIV/0!	84	203	#DIV/0!	85	12.02	N/A	-0.32
Total	68970			68203			1.12		
Average	95			94			1.12		

Series 4.c	Series 4c	Series 4c	Series 4c	Series 4c	Series 4c	Series 4c	Series 4.c	Series 4.c	Series 4.c
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	10831	3002	3708	10315	3350	3819	5.00	-10.39	-2.91
Nat. Gas	22154	3654	5331	21494	4393	5351	3.07	-16.83	-0.38
Oil	12253	730	3026	11193	858	3037	9.47	-14.96	-0.35
Wood	151	12	35	155	15	35	-2.65	-16.56	-0.18
Propane	225	#DIV/0!	68	201	#DIV/0!	68	11.86	N/A	-0.44
Total	65205			64391			1.26		
Average	90			89			1.26		

Series 5	Series 5	Series 5	Series 5	Series 5	Series 5	Series 5	Series 5	Series 5	Series 5
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	13040	6370	8950	12362	6411	9046	5.49	-0.64	-1.05
Nat. Gas	32924	7761	12699	30287	8433	12689	8.71	-7.97	0.08
Oil	20060	1550	7456	17897	1643	7464	12.09	-5.67	-0.10
Wood	222	26	81	220	29	81	0.71	-7.40	-0.10
Propane	329	#DIV/0!	166	288	#DIV/0!	166	14.20	N/A	0.00
Total	111631			107004			4.32		
Average	154			148			4.32		

Series 6a	Series 6a	Series 6a	Series 6a	Series 6a	Series 6a	Series 6a	Series 6a	Series 6a	Series 6a
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	12311	6370	8951	12069	6412	9043	2.00	-0.65	-1.01
Nat. Gas	31165	7761	12699	31318	8438	12684	-0.49	-8.03	0.13
Oil	19147	1550	7456	17888	1643	7464	7.04	-5.67	-0.10
Wood	214	26	81	220	29	81	-2.75	-7.40	-0.10
Propane	325	#DIV/0!	166	284	#DIV/0!	166	14.52	N/A	0.00
Total	108199			107719			0.45		
Average	150			149			0.45		

Table A7.1 Continued

	HOT2000	HOT2000	HOT2000	ENERPASS	ENERPASS	ENERPASS	COMP'N (%)	COMP'N (%)	COMP'N (%)
Series 6b	**Series 6b**	**Series 6b**	**Series 6b**	**Series 6b**	**Series 6b**	**Series 6b**	**Series 6b**	**Series 6b**	**Series 6b**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	14307	4747	5507	14181	4950	5611	0.89	-4.10	-1.86
Nat. Gas	32952	5783	7871	33256	6503	7880	-0.91	-11.08	-0.11
Oil	20240	1155	4532	19021	1268	4544	6.41	-8.92	-0.27
Wood	227	20	51	232	22	51	-2.01	-10.66	-0.41
Propane	349	#DIV/0!	102	310	#DIV/0!	102	12.88	N/A	-0.31
Total	97818			97918			-0.10		
Average	135			135			-0.10		
Series 6c	**Series 6c**	**Series 6c**	**Series 6c**	**Series 6c**	**Series 6c**	**Series 6c**	**Series 6c**	**Series 6c**	**Series 6c**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	14889	3306	4572	14562	3648	4675	2.25	-9.38	-2.20
Nat. Gas	31919	4026	6546	31877	4789	6553	0.13	-15.92	-0.12
Oil	19605	804	3752	18388	934	3763	6.62	-13.98	-0.29
Wood	216	14	43	219	16	43	-1.46	-15.46	-0.41
Propane	342	#DIV/0!	84	302	#DIV/0!	85	13.03	N/A	-0.32
Total	90094			89834			0.29		
Average	125			124			0.29		
Series 6d	**Series 6d**	**Series 6d**	**Series 6d**	**Series 6d**	**Series 6d**	**Series 6d**	**Series 6d**	**Series 6d**	**Series 6d**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	15432	3002	3709	15087	3357	3811	2.29	-10.56	-2.67
Nat. Gas	30942	3654	5331	30851	4404	5341	0.30	-17.03	-0.19
Oil	19006	730	3026	17837	860	3036	6.55	-15.08	-0.33
Wood	206	12	35	209	15	35	-1.31	-16.81	-0.18
Propane	334	#DIV/0!	68	296	#DIV/0!	68	12.69	N/A	-0.44
Total	85465			85186			0.33		
Average	118			118			0.33		
Series 7a	**Series 7a**	**Series 7a**	**Series 7a**	**Series 7a**	**Series 7a**	**Series 7a**	**Series 7a**	**Series 7a**	**Series 7a**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	12776	4747	5507	12092	4948	5611	5.66	-4.07	-1.86
Nat. Gas	27888	5783	7871	26424	6504	7882	5.54	-11.08	-0.14
Oil	15706	1155	4532	14967	1268	4543	4.94	-8.87	-0.26
Wood	203	20	51	210	22	51	-3.26	-10.59	-0.41
Propane	276	#DIV/0!	102	245	#DIV/0!	102	12.47	N/A	-0.31
Total	86698			84967			2.04		
Average	120			118			2.04		
Series 7b	**Series 7b**	**Series 7b**	**Series 7b**	**Series 7b**	**Series 7b**	**Series 7b**	**Series 7b**	**Series 7b**	**Series 7b**
	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)	SH (GJ)	DHW (GJ)	App(GJ)
Electricity	13343	3306	4572	12594	3646	4675	5.94	-9.33	-2.20
Nat. Gas	27135	4026	6546	25631	4785	6556	5.87	-15.86	-0.16
Oil	15329	804	3752	14565	934	3762	5.24	-13.94	-0.26
Wood	194	14	43	199	16	43	-2.58	-15.39	-0.41
Propane	272	#DIV/0!	84	241	#DIV/0!	85	12.79	N/A	-0.32
Total	79498			77811			2.17		
Average	110			108			2.17		

Table A7.1 Continued

Series 7c	HOT2000 Series 7c SH (GJ)	HOT2000 Series 7c DHW (GJ)	HOT2000 Series 7c App(GJ)	ENERPASS Series 7c SH (GJ)	ENERPASS Series 7c DHW (GJ)	ENERPASS Series 7c App(GJ)	COMP'N (%) Series 7c SH (GJ)	COMP'N (%) Series 7c DHW (GJ)	COMP'N (%) Series 7c App(GJ)
Electricity	13873	3002	3709	13107	3355	3810	5.85	-10.52	-2.66
Nat. Gas	26412	3654	5331	24948	4401	5343	5.87	-16.97	-0.22
Oil	14957	730	3026	14221	859	3035	5.18	-15.03	-0.27
Wood	186	12	35	190	15	35	-2.28	-16.74	-0.18
Propane	268	#DIV/0!	68	238	#DIV/0!	68	12.34	N/A	-0.44
Total	75339			73692			2.23		
Average	104			102			2.23		

Series 8a	Series 8a SH (GJ)	Series 8a DHW (GJ)	Series 8a App(GJ)	Series 8a SH (GJ)	Series 8a DHW (GJ)	Series 8a App(GJ)	Series 8a SH (GJ)	Series 8a DHW (GJ)	Series 8a App(GJ)
Electricity	9088	4747	5507	9060	4943	5625	0.32	-3.97	-2.11
Nat. Gas	21808	5783	7871	20271	6497	7900	7.58	-10.99	-0.37
Oil	12093	1155	4532	11589	1267	4549	4.35	-8.80	-0.38
Wood	158	20	51	169	22	51	-6.50	-10.44	-0.41
Propane	226	#DIV/0!	102	202	#DIV/0!	102	12.04	N/A	-0.31
Total	73143			72382			1.05		
Average	101			100			1.05		

Series 8b	Series 8b SH (GJ)	Series 8b DHW (GJ)	Series 8b App(GJ)	Series 8b SH (GJ)	Series 8b DHW (GJ)	Series 8b App(GJ)	Series 8b SH (GJ)	Series 8b DHW (GJ)	Series 8b App(GJ)
Electricity	9617	3306	4572	9529	3641	4684	0.92	-9.22	-2.41
Nat. Gas	21381	4026	6546	19817	4780	6568	7.89	-15.76	-0.34
Oil	11908	804	3752	11370	933	3765	4.74	-13.85	-0.35
Wood	152	14	43	161	16	43	-5.77	-15.20	-0.41
Propane	225	#DIV/0!	84	200	#DIV/0!	85	12.47	N/A	-0.32
Total	65454			65691			-0.36		
Average	91			91			-0.36		

Series 8c	Series 8c SH (GJ)	Series 8c DHW (GJ)	Series 8c App(GJ)	Series 8c SH (GJ)	Series 8c DHW (GJ)	Series 8c App(GJ)	Series 8c SH (GJ)	Series 8c DHW (GJ)	Series 8c App(GJ)
Electricity	10114	3002	3709	10011	3351	3817	1.02	-10.41	-2.85
Nat. Gas	20950	3654	5331	19437	4396	5351	7.79	-16.88	-0.38
Oil	11714	730	3026	11188	858	3037	4.70	-14.96	-0.35
Wood	147	12	35	155	15	35	-5.38	-16.56	-0.18
Propane	223	#DIV/0!	68	198	#DIV/0!	68	12.37	N/A	-0.44
Total	62716			61997			1.16		
Average	87			86			1.16		

Series 10	Series 10 SH (GJ)	Series 10 DHW (GJ)	Series 10 App(GJ)	Series 10 SH (GJ)	Series 10 DHW (GJ)	Series 10 App(GJ)	Series 10 SH (GJ)	Series 10 DHW (GJ)	Series 10 App(GJ)
Electricity	18449	6370	29	17301	6430	76	6.63	-0.93	-61.64
Nat. Gas	44182	7761	41	42611	8453	0	3.69	-8.19	#DIV/0!
Oil	26551	1550	24	24031	1647	0	10.48	-5.89	#DIV/0!
Wood	326	26	0	322	29	0	1.21	-7.88	#DIV/0!
Propane	452	#DIV/0!	1	401	#DIV/0!	0	12.58	N/A	#DIV/0!
Total	105601			100758			4.81		
Average	146			139			4.81		

In summary, the following conclusions can be made from the comparisons:

1. A full comparison of Hot-2000 and ENERPASS predictions for houses with only heating (no air-conditioning) indicates that for all of the scenarios investigated, the Hot-2000 predictions for space heating are up to 14.5% lower than ENERPASS predictions. For DHW heating, Hot-2000 predictions are up to 17% lower. Appliance energy consumption predictions are very close to each other. As a result, when total energy consumption values are compared, predictions from the two programs are in good agreement.

2. If the primary focus of a study is to obtain overall energy consumption figures for all of Canada under different scenarios, then the use of Hot-2000 program would yield reasonable estimates. However, for more detailed analyses use of ENERPASS program is more suitable as it carries out simulations which are more realistic, and thus its predictions are more representative of what would be expected in actual performance of houses.