APPENDIX 8-C. MARGINAL ENERGY PRICE FACTOR CALCULATIONS FOR FURNACE FANS

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APPENDIX 8-C. MARGINAL ENERGY PRICE FACTOR CALCULATIONS FOR FURNACE FANS

8-C.1 INTRODUCTION

Marginal energy prices are the prices consumers pay for the last unit of energy used. DOE used the marginal energy prices for each house for the cost of saved energy associated with the use of higher-efficiency equipment. Since marginal prices reflect a change in a consumer's bill associated with a change in energy consumed, such prices are appropriate for determining energy cost savings associated with possible change to efficiency standards.

EIA provided RECS 2005 billing data that had been gathered from a subset of RECS housing records. For each household with billing data, the following are provided for each billing cycle: the start and end date, the electricity consumption in kWh, the electricity cost in dollars, the natural gas bill in dollars, and the gas consumption in hundreds of cubic feet. This data was used to determine marginal energy price factors by census division and four large states that are then used to convert average monthly energy prices into marginal monthly energy prices. Since a furnace fan operates during both the heating and the cooling season, DOE determined summer and winter marginal price factors.

For oil-fired furnaces and boilers, DOE used the average oil prices for each house for both base case equipment and higher-efficiency equipment, as the data necessary for estimating marginal prices were not available. DOE used the same method for LPG-fired equipment.

8-C.2 MARGINAL PRICE FACTOR CALCULATION FOR ELECTRICITY AND NATURAL GAS

DOE used RECS 2005 billing data provided by EIA to calculate marginal energy prices. Deriving marginal energy prices by calculating energy bills based on even a detailed knowledge of a consumer's utility tariff is hampered by the lack of information on items that affect marginal energy prices but are not normally evident on utility tariffs. Taxes, special fees, and one-time surcharges or rebates included in the energy bill are examples of this type of item. Use of RECS billing data avoids having to estimate the effect of non-tariff items on consumer marginal energy prices.

DOE estimated average and marginal electricity and natural gas prices from the RECS monthly billing data. Marginal energy prices were calculated with a linear regression of monthly customer bills to monthly customer energy consumption for each household with billing data available. Household identifying features such as state, utility service area or zip code were not reported in the data preventing a localized aggregation. DOE therefore aggregated the energy prices into the available household identifying features (namely census division and four large states).

DOE interpreted the slope of the regression line for each household as the marginal energy price for that household. DOE kept the marginal energy prices only for sample housing records with regression values greater or equal to 85%. The 85% limit was chosen in order to get a close correlation between the cost and consumption data. Any higher limit excluded most of the housing records from the analysis; any lower limit lost the linearity of the relationship between the seasonal costs and consumption. The slopes of these regression lines are the estimate of the seasonal marginal prices for that household.

To determine the marginal price factor DOE divided the seasonal marginal and average electricity price for each household. DOE then aggregated the individual electricity and natural gas marginal price factors using the RECS household weights.

8-C.3 RESULTS

Table 8-C.3.1 and Table 8-C.3.2 show the resulting marginal electricity and natural gas marginal price factors.

Table 8-C.3.1 Marginal Electricity Price Factors using RECS 2005 billing data

Census Division and Four Large States	Winter	Summer
Division 1	0.68	0.89
Division 2	0.91	0.99
Division 3	0.90	0.93
Division 4	0.91	0.89
Division 5	0.90	0.96
Division 6	0.88	0.95
Division 7	0.70	0.96
Division 8	0.93	0.89
Division 9	0.91	0.91
New York	0.60	0.87
California	0.96	0.96
Texas	0.63	0.97
Florida	0.87	0.90

Table 8-C.3.2 Marginal Natural Gas Price Factors using RECS 2005 billing data

Census Division and Four Large States	Winter	Summer
Division 1	0.93	0.86
Division 2	0.96	0.83
Division 3	0.92	0.76
Division 4	0.89	0.70
Division 5	0.89	0.77
Division 6	0.94	0.74
Division 7	0.88	0.85
Division 8	0.87	0.65
Division 9	1.01	0.85
New York	0.85	0.78
California	0.98	0.88
Texas	0.85	0.55
Florida	1.00	0.92

DOE then applied the marginal price factors to the monthly energy prices in appendix 7-B to develop marginal monthly energy prices for 2010 (Table 8-C.3.3 and Table 8-C.3.4).

Table 8-C.3.3 Marginal Monthly Electricity Prices for 2010 Using Marginal Price Factors (2011$/kWh)

Geographical Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Connecticut, Maine, New Hampshire, Rhode Island, Vermont	0.119	0.120	0.121	0.158	0.160	0.161	0.160	0.160	0.160	0.124	0.123	0.122
Massachusetts	0.100	0.101	0.101	0.132	0.134	0.138	0.135	0.136	0.138	0.105	0.102	0.104
New York	0.109	0.110	0.110	0.163	0.167	0.174	0.176	0.176	0.176	0.116	0.114	0.112
New Jersey	0.145	0.146	0.147	0.160	0.165	0.179	0.183	0.183	0.179	0.150	0.150	0.150
Pennsylvania	0.111	0.111	0.113	0.127	0.133	0.139	0.140	0.138	0.136	0.123	0.118	0.114
Illinois	0.094	0.098	0.102	0.111	0.115	0.119	0.119	0.118	0.118	0.115	0.103	0.097
Indiana, Ohio	0.090	0.092	0.095	0.104	0.109	0.110	0.107	0.107	0.108	0.105	0.101	0.094
Michigan	0.113	0.113	0.113	0.117	0.118	0.123	0.124	0.125	0.122	0.114	0.114	0.114
Wisconsin	0.113	0.117	0.116	0.122	0.124	0.125	0.122	0.122	0.123	0.120	0.119	0.116
Iowa, Minnesota, North Dakota, South Dakota	0.088	0.090	0.091	0.093	0.098	0.102	0.102	0.102	0.099	0.097	0.094	0.091
Kansas, Nebraska	0.079	0.082	0.084	0.087	0.090	0.097	0.097	0.098	0.096	0.090	0.086	0.082
Missouri	0.072	0.073	0.077	0.080	0.091	0.099	0.097	0.097	0.088	0.082	0.080	0.074
Virginia	0.089	0.090	0.093	0.103	0.107	0.111	0.111	0.111	0.109	0.099	0.095	0.091
Delaware, District of Columbia, Maryland, West Virginia	0.109	0.110	0.112	0.123	0.133	0.143	0.142	0.142	0.140	0.123	0.117	0.114
Georgia	0.084	0.087	0.089	0.096	0.101	0.108	0.109	0.110	0.105	0.093	0.089	0.084
North Carolina, South Carolina	0.090	0.092	0.093	0.102	0.103	0.102	0.104	0.104	0.104	0.100	0.097	0.093
Florida	0.101	0.102	0.103	0.108	0.107	0.105	0.106	0.107	0.107	0.103	0.104	0.103
Alabama, Kentucky, Mississippi	0.082	0.084	0.086	0.098	0.099	0.099	0.098	0.099	0.098	0.091	0.089	0.085
Tennessee	0.081	0.082	0.083	0.092	0.094	0.092	0.091	0.091	0.091	0.087	0.087	0.085
Arkansas, Louisiana, Oklahoma	0.059	0.061	0.063	0.089	0.091	0.094	0.093	0.094	0.095	0.068	0.064	0.061
Texas	0.068	0.069	0.072	0.115	0.119	0.123	0.123	0.123	0.122	0.078	0.073	0.071
Colorado	0.101	0.102	0.103	0.100	0.104	0.104	0.103	0.103	0.103	0.108	0.106	0.104
Idaho, Montana, Utah, Wyoming	0.079	0.080	0.080	0.077	0.079	0.081	0.082	0.081	0.081	0.085	0.082	0.081
Arizona	0.091	0.094	0.097	0.097	0.107	0.107	0.105	0.105	0.105	0.110	0.098	0.098
Nevada, New Mexico	0.109	0.112	0.112	0.109	0.108	0.106	0.105	0.106	0.107	0.115	0.115	0.112
California	0.145	0.143	0.143	0.142	0.146	0.149	0.153	0.152	0.146	0.141	0.146	0.149
Oregon, Washington	0.077	0.078	0.078	0.077	0.077	0.078	0.079	0.079	0.080	0.080	0.080	0.080
Alaska	0.144	0.146	0.149	0.152	0.156	0.156	0.158	0.157	0.155	0.154	0.153	0.150
Hawaii	0.255	0.256	0.255	0.258	0.259	0.261	0.265	0.266	0.267	0.271	0.272	0.271
United States	0.110	0.112	0.115	0.118	0.122	0.124	0.125	0.125	0.124	0.122	0.118	0.114

Table 8-C.3.4 Marginal Monthly Natural Gas Prices for 2010 Using Marginal Price Factors (2011$/MMbtu)

Geographical Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Connecticut, Maine, New Hampshire, Rhode Island, Vermont	14.15	14.28	14.37	13.58	14.15	15.24	16.51	16.78	19.01	15.79	15.23	14.78
Massachusetts	13.55	13.66	13.55	12.96	11.77	12.26	13.44	14.17	15.97	12.85	14.22	14.10
New York	11.63	11.43	11.54	11.06	12.19	13.81	14.75	14.53	18.03	13.49	12.27	11.51
New Jersey	11.89	11.84	11.88	10.55	11.29	12.45	12.97	12.94	15.29	13.45	12.49	12.33
Pennsylvania	12.04	12.20	12.37	11.16	12.44	14.06	15.64	15.99	18.26	14.58	13.09	12.43
Illinois	8.93	9.05	8.94	7.80	9.21	10.55	11.13	11.29	13.84	10.28	9.30	8.86
Indiana, Ohio	10.47	10.53	10.72	9.38	10.28	11.66	12.50	12.59	15.65	11.85	10.81	10.62
Michigan	9.66	9.69	9.79	8.47	9.30	10.69	11.81	12.21	14.99	11.52	10.45	10.05
Wisconsin	9.94	9.72	9.81	8.21	8.18	9.24	9.51	9.66	11.90	9.33	10.21	10.00
Iowa, Minnesota, North Dakota, South Dakota	7.95	7.71	7.75	6.30	7.06	8.20	8.79	9.04	12.15	8.82	8.29	7.99
Kansas, Nebraska	9.25	9.27	9.25	7.83	8.75	10.15	10.78	11.22	15.58	12.12	10.08	9.53
Missouri	11.36	11.37	11.39	9.72	11.25	13.52	15.29	16.18	21.68	16.60	13.37	12.10
Virginia	11.78	11.43	11.12	10.65	12.44	14.44	15.65	15.52	20.07	14.73	12.26	11.83
Delaware, District of Columbia, Maryland, West Virginia	11.51	11.47	11.60	10.83	12.12	13.75	14.82	14.85	18.74	13.94	12.40	11.87
Georgia	13.07	13.83	14.34	13.57	16.57	18.41	19.32	19.15	23.37	18.62	14.62	13.75
North Carolina, South Carolina	13.09	12.97	13.19	12.11	13.78	16.27	17.26	18.01	22.39	16.78	14.32	13.84
Florida	16.17	16.49	17.48	17.04	18.57	19.69	20.26	20.70	22.14	22.05	20.25	17.91
Alabama, Kentucky, Mississippi	11.60	11.52	11.80	10.13	11.49	12.70	13.03	13.27	17.54	15.20	13.15	12.21
Tennessee	10.79	10.98	10.91	9.14	9.99	11.34	12.03	12.40	16.08	13.91	12.03	11.37
Arkansas, Louisiana, Oklahoma	10.46	10.40	10.58	11.10	13.20	14.49	15.30	15.73	18.15	14.99	12.79	11.16
Texas	8.81	8.89	9.09	6.59	7.55	8.33	8.56	8.74	15.96	12.32	10.25	9.12
Colorado	6.51	6.58	6.75	5.19	5.67	7.00	7.12	7.57	10.97	7.87	7.07	6.71
Idaho, Montana, Utah, Wyoming	7.31	7.34	7.49	5.46	5.69	6.13	6.63	6.91	10.02	7.81	7.67	7.47
Arizona	12.22	12.56	12.94	10.49	11.75	12.93	14.01	14.62	21.78	17.93	15.12	13.03
Nevada, New Mexico	8.75	8.94	9.18	7.35	8.32	9.53	9.41	9.79	14.64	11.44	9.76	8.88
California	9.88	9.76	9.37	8.30	8.78	9.22	9.24	9.07	10.18	10.06	9.56	9.68
Oregon, Washington	11.78	11.91	11.99	10.42	10.83	11.40	12.60	13.15	14.92	13.66	12.58	12.21
Alaska	8.76	8.82	8.90	7.62	7.95	8.23	8.87	8.76	9.54	9.13	8.82	9.01
Hawaii	43.36	43.73	43.40	36.91	37.63	37.88	38.72	39.67	46.45	46.74	46.80	46.00
United States	11.25	11.32	11.39	11.90	13.00	14.50	15.33	15.61	14.98	13.07	11.96	11.50