

## **APPENDIX 7-A. RECS 2005 VARIABLES AND VALUES**

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## APPENDIX 7-A. RECS 2005 VARIABLES AND VALUES

### 7-A.1 INTRODUCTION

Using Microsoft ACCESS, DOE created a database containing a subset of the records and variables from DOE's Energy Information Administration (EIA)'s RECS 2005.<sup>1</sup> DOE used this RECS subset in the life-cycle cost (LCC) analysis of the Residential Water Heaters, Direct Heating Equipment, and Pool Heaters Rulemaking. This appendix explains the variable name abbreviations and provides definitions of the variable values. For the entire RECS 2005 dataset, refer to <http://www.eia.doe.gov/emeu/recs/recspubuse05/pubuse05.html>.

### 7-A.2 SAMPLE DETERMINATION

#### 7-A.2.1 Water Heaters

The subset of RECS records used for water heaters met all of the following criteria:

- 1) Used a water heater as the primary source of heated water,
- 2) Used one of four fuels (electricity, gas, LPG, or oil as a heating fuel),
- 3) Provided heated water for only one housing unit,
- 4) Had an indication of water heater size, including instantaneous for natural gas and LPG,
- 5) Had energy consumption greater than zero.

The RECS 2005 variables used to match the selection criteria are listed in Table 7-A.2.1.

**Table 7-A.2.1 Selection of RECS 2005 Records by Fuel Type: Water Heaters**

Product Class	Algorithm	# of Records	# of US Households Represented (million)
Natural Gas or LPG (Storage)	FUELH2O = 1 or 2 WHEATOTH = 0 WHEATSIZ = 1 or 2 or 3	2166	55.2
Electricity (Storage)	FUELH2O = 5 WHEATOTH = 0 WHEATSIZ = 1 or 2 or 3	1523	39.5
Fuel Oil (Storage)	FUELH2O = 3 WHEATOTH = 0 WHEATSIZ = 1 or 2 or 3	100	1.8
Natural Gas or LPG (Instantaneous)	FUELH2O = 1 or 2 WHEATOTH = 0 WHEATSIZ = 1 or 2 or 3 or 6	2180	55.5

**Table 7-A.2.2 List of RECS 2005 Variables Used for Water Heaters**

<b>Variable</b>	<b>Description</b>
<b>Location Variables</b>	
REGIONC	Census region
DIVISION	Census division
LRGSTATE	Large state designation
LRG+DIV*	Combined large state (LRGSTATE) and census division (DIVISION)
CD65	Cooling degree-days to base 65, 1-04 TO 12-04
HD65	Heating degree-days to base 65, 1-04 TO 12-04
<b>Household Characteristics Variables</b>	
DOEID	DOE 4-digit identification number
NWEIGHT	Final weight
TYPEHUQ	Type of housing unit as report by respondent
YEARMADE	Year residence built
NCOMBATH	Number of full bathrooms
FUElh2O	Fuel used most to heat water for washing or bathing
WHEATOTH	Does the main water heating equipment also heat water for other residences?
WHEATSIZ	Approximate size of household's main water heater tank
WHEATAGE	Approximate age of household's main water heater
NHSLDMEM	Number of household members
PRESCHOOLCHILDREN*	Number of household members between the ages of 0 and 5
SCHOOLCHILDREN*	Number of household members between the ages of 6 and 13
ADULTS*	Number of household members between the ages of 14 and 64
SENIORS*	Number of household members between the ages of 65 and 95
ATHOME	Is there a household member at home all day on a typical weekday?
POOR100	Household is below 100 percent of poverty
DISHWASH	Automatic dishwasher used in the home?
CWASHER	Clothes washer used in the home?

PGASHTWA	How is natural gas for water heating paid for?
LPGPAY	How is bottled gas paid for?
PELHOTWA	How is electricity for water heating paid for?
FOPAY	How if fuel oil paid for?
CELLAR	Home has a basement
BASEHEAT	Basement heated during winter months
BASECOOL	Basement air conditioned during summer months
PRKGPLC1	Home has an attached garage
CRAWL	Home has a crawl space
WELLPUMP	Electric pump for well water?
WEATHERLOCATIONCODE*	Not part of RECS, added to link to weather data (See App. 7-D)
TEMPHOME	Winter household temperature during the day when someone is home
TEMPGONE	Winter household temperature during the day when no one is home
TEMPNITE	Winter household temperature during sleeping hours

\* Not part of RECS 2005 variables.

### 7-A.2.2 Direct Heating Equipment

The subset of RECS households used for direct heating equipment met all of the following criteria:

- 1) Used wall fan, wall gravity or floor furnace, fireplace or room heater as the primary or secondary source of heat,
- 2) Used natural gas or liquefied petroleum gas (LPG) as home heating fuel,
- 3) Heated only one housing unit,
- 4) Had energy consumption greater than zero.

The RECS 2005 variables used to match the selection criteria are listed in Table 7-A.2.3.

**Table 7-A.2.3 Summary of Direct Heating Equipment Household Sample (RECS 2005)**

Category	Selection Criteria	Fuel Type	# of Records	# of US Households Represented (million)
Primary Equipment				
Floor Furnace	EQUIPM = 6 FUELHEAT = 1 or 2 HEATOTH = 0 FUELUSE > 0	Natural Gas	88	2.1
		LPG	7	0.2
Wall Fan/Gravity	EQUIPM = 6 FUELHEAT = 1 or 2 HEATOTH = 0 FUELUSE > 0	Natural Gas	88	2.1
		LPG	7	0.2
Room Heater*	EQUIPM = 7 FUELHEAT = 1 or 2 HEATOTH = 0 FUELUSE > 0	Natural Gas	77	1.8
		LPG	35	0.9
Fireplace**	EQUIPM = 9 FUELHEAT = 1 or 2 HEATOTH = 0 FUELUSE > 0	Natural Gas	4	0.1
		LPG	6	0.2
Secondary Equipment				
Wall Fan/Gravity	PIPELESS = 1 PIPEFUEL = 1 or 2 FUELUSE > 0	Natural Gas	3	0.1
		LPG	3	0.1
Room Heater*	ROOMHEAT = 1 RMHTFUEL = 1 or 2 FUELUSE > 0	Natural Gas	21	0.5
		LPG	23	0.6
Fireplace	CHIMNEY = 1 FPFUEL = 1 or 2 NGFPFLUE = 1 or 9 FUELUSE > 0	Natural Gas	93	2.3
		LPG	18	0.5

\* Includes three households which have both primary and secondary room heaters. For simplicity only the main heater is used in this analysis.

\*\*All households with the exception of two have thermostats.

**Table 7-A.2.4 List of RECS 2005 Variables Used in Direct Heating Equipment**

Variable	Description
<b>Location Variables</b>	
REGIONC	Census region
DIVISION	Census division
LRGSTATE	Large state designation
LRG+DIV*	Combined large state (LRGSTATE) and census division (DIVISION)
CD65	Cooling degree-days to base 65, 1-04 TO 12-04
HD65	Heating degree-days to base 65, 1-04 TO 12-04
<b>Household Characteristics Variables</b>	
DOEID	DOE 4-digit identification number
NWEIGHT	Final weight
YEARMADE	Year residence built
EQUIPAGE	Approximate age of household's main heating system
EQUIPM	Primary heating equipment
SENIORS	Number of household members between the ages of 65 and 95
NHSLDMEM	Number of household members
FUELUSE*	Primary or secondary DHE energy consumption
FUEL TYPE*	Primary or secondary DHE fuel type
SECONDARY EQP TYPE*	Is household DHE primary or secondary heating equipment?
ADJUSTMENT NEEDED?*	Energy adjustment required for household with secondary DHE?
EQMAMT	Amount of heat main heating equipment provides
HEATOTH	Does the main space heating equipment also heat other residences?
NGFPFLUE	Does the fireplace have a flue?
FPFUEL	Fireplace fuel
ROOMHEAT	Room heater used as secondary heating equipment
RMHTFUEL	Room heater fuel
PIPELESS	Pipeless furnace used as secondary heating equipment
PIPEFUEL	Pipeless furnace fuel

POOR100	Household is below 100 percent of poverty
CHIMNEY	Fireplace used as secondary heating equipment
FUELHEAT	Main fuel used for home heating

\* Not part of RECS 2005 variables.

### 7-A.2.3 Pool Heaters

The subset of records used to select a RECS household sample specific for pool heaters met all of the following criteria:

- The household had a swimming pool or spa.
- A pool heater was used to heat pool or spa water.
- The pool heater used natural gas or liquefied petroleum gas (LPG) as a heating fuel.

The combined RECS 2001 to 2005<sup>1, 2</sup> pool heater sample is weighted such that it represents the same number of households as in RECS 2005. Pool heaters used to heat spas only are assumed to represent 15% of the total spa/pool heater sample based on assumptions from the 1993 TSD.<sup>3</sup> Therefore, spa heaters sample is weighted to 24% of the original RECS weight. The RECS 2001-2005 variables used to match the selection criteria are listed in Table 7-A.2.5.

**Table 7-A.2.5 Criteria for Selection of Pool Heaters Household Sample (RECS 2001-2005)**

By Fuel Type	Selection Criteria	# of Records	# of US Households Represented ( <i>million</i> )
Natural Gas or LPG	FUELPOOL = 1 or 2 OR FUEL TUB = 1 or 2 FUEL USE > 0	165	1.7

All RECS 2005 variables extracted for pool heaters are listed in Table 7-A.2.6.

**Table 7-A.2.6 List of RECS 2005 Variables Used for Pool Heaters**

Variable	Description
<b>Location Variables</b>	
REGIONC	Census region
DIVISION	Census division
LRGSTATE	Large state designation
LRG+DIV*	Combined large state (LRGSTATE) and census division (DIVISION)
CD65	Cooling degree-days to base 65, 1-04 TO 12-04
HD65	Heating degree-days to base 65, 1-04 TO 12-04

<b>Household Characteristics Variables</b>	
DOEID	DOE 4-digit identification number
NWEIGHT	Final weight
TYPEHUQ	Type of housing unit as report by respondent
YEARMADE	Year residence built
SWIMPOOL	Does residence have a swimming pool with filtering system?
POOL	Is the pool heated?
FUELPOOL	Pool heater fuel
RECBATH	Does the home have a heated hot tub or spa?
FUELTUB	Hot tub/spa fuel
DRYRFUEL	Clothes dryer fuel
FUELFOOD	Primary cooking fuel
OTHER APPLIANCE TYPE*	Assigns whether a household has either gas cooking or gas clothes dryer appliances
BTUNGAPL	Natural gas usage for appliances
BTULPAPL	LPG usage for appliances
AVG. DRYER-COOKING USE	Assigns average gas cooking and/or dryer consumption
ADJUSTED FUEL USE	Calculated Pool Heater energy use

\* Not part of RECS 1993-2005 variables.

### 7-A.3 RECS 2005 DATABASE VARIABLE RESPONSE CODES

Table 7-A.3.1 provides the response codes for all RECS 2005 variables used in the Heating Products samples.

**Table 7-A.3.1 Definitions of RECS 2005 Variables Used in Life-Cycle Cost Analysis**

<b>Variable</b>	<b>Definition</b>
<b>Common Variables</b>	
REGIONC	Census region 1 = Northeast 2 = Midwest 3 = South 4 = West



DIVISION	Census division 1 = New England 2 = Middle Atlantic 3 = East North Central 4 = West North Central 5 = South Atlantic 6 = East South Central 7 = West South Central 8 = Mountain 9 = Pacific
LRGSTATE	Large state designation 0 = Other 1 = New York 2 = California 3 = Texas 4 = Florida
LRG+DIV*	Combined large state (LRGSTATE) and census division (DIVISION) 1 = New England 2 = Middle Atlantic (not including New York) 3 = East North Central 4 = West North Central 5 = South Atlantic (not including Florida) 6 = East South Central 7 = West South Central (not including Texas) 8 = Mountain 9 = Pacific (not including California) 10 = New York 11 = California 13 = Texas 14 = Florida
CD65	Cooling degree-days to base 65, 1-04 TO 12-04
HD65	Heating degree-days to base 65, 1-04 TO 12-04
DOEID	DOE 4-digit identification number
TYPEHUQ	Respondents reported type of home 1 = Mobile Home 2 = Single-family detached 3 = Single-family attached 4 = Apartment building with 2-4 units 5 = Apartment building with 5 or more units

YEARMADE	Year home built 1 = Before 1940 2 = 1940-49 3 = 1950-59 4 = 1960-69 5 = 1970-79 6 = 1980-84 7 = 1985-89 8 = 1990-94 9 = 1995-99 10 = 2000-2002 11 = 2003 12 = 2004 13 = 2005
NWEIGHT	Final weight
<b>Sample Variables (Alphabetical)</b>	
ADJUSTMENTNEEDED*	Adjustment for secondary heating equipment? 1 = Yes 0 = No
ADULTS*	Number of household members between the ages of 14 and 64
ATHOME	Is there a household member at home all day on a typical weekday? 1 = Yes 0 = No
AVG DRYER – COOKING USE	Subtracts cooking use to get accurate dryer energy use.
BASECOOL	Basement air conditioned during summer months 1 = Yes 0 = No 9 = Skip
BASEHEAT	Basement/crawl Space heated 1 = All 2 = Part 0 = None 9 = Skip
BTULPAPL	LPG appliance use estimated (thousands of BTU) 9999999=Not Applicable
BTULPSPH	LPG space heating use estimated (thousands of BTU) 9999999=Not Applicable
BTUNGAPL	Natural appliance use estimated (thousands of BTU) 9999999=Not Applicable
BTUNGSPH	Natural gas space heating use estimated (thousands of BTU) 9999999=Not Applicable
CELLAR	Home has a basement 1 = Yes 0 = No 9 = Skip
CHIMNEY	Fireplace used as secondary heating equipment 1 = Yes 0 = No 9 = Skip

CRAWL	Home has a crawl space 1 = Yes 0 = No 9 = Skip
CWASHER	Use a clothes washer in home? 1 = Yes 0 = No
DISHWASH	Use an automatic dishwasher in home? 1 = Yes 0 = No
DRYRFUEL	Clothes dryer fuel 1 = Natural gas from underground pipes 2 = Bottled Gas (LPG or Propane) 5 = Electricity 99 = No Answer/Not Applicable
EQMAMT	How much heat main heating equipment provides 1 = Almost all 2 = About three-fourths 3 = Closer to half 9 = Skip
EQUIPAGE	Age of main heating equipment 1 = Less than 2 years old 2 = 2 to 4 years old 3 = 5 to 9 years old 4 = 10 to 19 years old 5 = 20 years or older 6 = Don't know 9 = Skip
EQUIPM	Type of heating equipment provides the heat 4 = Heat pump 3 = Central warm-air furnace with ducts 2 = Steam/hot water system with radiators 5 = Built-in electric units installed in walls 6 = Built-in floor/wall pipeless furnace 7 = Built-in heater burning gas, oil, kerosene 8 = Heating stove burning wood, coal, coke 10 = Portable electric heaters 11 = Portable kerosene heaters 9 = Fireplace 12 = Cooking stove used to heat and cook 14 = Geothermal heat pump 21 = Equipment not listed 00 = No heating equipment used
FOPAY	Who pays fuel oil 1 = Household pays 2 = Rent/Fee 3 = Other 9 = Skip

FPFUEL	Fireplace fuel 1 = Natural gas from underground pipes 2 = Bottled gas (LPG or propane) 7 = Wood 21 = Other 99 = Skip
FUELTYPE*	Type of heating fuel used
FUELFOOD	Cooking fuel 1 = Natural gas from underground pipes 2 = Bottled gas (LPG or propane) 5 = Electricity 21 = Other 99 = Skip
FUELH2O	Fuel used for heating water 1 = Natural gas from underground pipes 2 = Bottled gas (LPG or propane) 3 = Fuel oil 4 = Kerosene 5 = Electricity 7 = Wood 8 = Solar 21 = Other 95 = Don't use hot water
FUELHEAT	Main fuel used for heating home 1 = Natural gas from underground pipes 2 = Bottled gas (LPG or propane) 3 = Fuel oil 4 = Kerosene 5 = Electricity 7 = Wood 8 = Solar 9 = District steam 10 = Coal 21 = Other 99 = Don't heat home
FUELPOOL	Fuel used most often to heat pool water 1 = Natural gas from underground pipes 2 = Bottled Gas (LPG or Propane) 5 = Electricity 8 = Solar 99 = No Answer/Not Applicable
FUELUB	Fuel used most often to heat spa/hot tub water 1 = Natural gas from underground pipes 2 = Bottled Gas (LPG or Propane) 3 = Fuel oil 5 = Electricity 8 = Solar 21 = Other 99 = Skip

FUELUSE*	Total fuel use
HEATOTH	Does the main space heating equipment also heat other residences? 1 = Yes 0 = No
LPGPAY	Who pays for bottled gas 1 = Household pays 2 = Rent/Fee 3 = Other 9 = Skip
NCOMBATH	Number of Complete Baths/full bathrooms
NGFPFLUEFUELH2O	Does the fireplace have a flue? 1 = Flue to the outside 2 = Flueless 9 = Skip
NHSLDMEM	Number of household members (1-15)
OTHERAPPLIANCETYPE*	Other household appliance type
PELHOTWA	Who pays electricity for hot water 1 = Household pays 2 = Rent/fee 3 = Other 9 = Skip
PGASHTWA	Who pays natural gas for hot water 1 = Household pays 2 = Rent/fee 3 = Other 9 = Skip
PIPEFUEL	What fuel used in secondary pipelines furnace 1 = Natural gas from underground pipes 2 = Bottled gas (LPG or propane) 4 = Kerosene 5 = Electricity 7 = Wood 21 = Other 99 = Skip
PIPELESS	Pipeless furnace used as secondary heating equipment 1 = Yes 0 = No 9 = Skip
POOL	Is the pool heated? 1 = Yes 0 = No 9 = Skip
POOR100	Household is below 100 percent of poverty
PRESCHOOLCHILDREN*	Number of household members between the ages of 0 and 5
PRKGPLC1	Home has Garage or Carport 1 = Yes 0 = No 9 = Skip

RECBATH	Does your home have a heated hot tub, spa 1 = Yes 0 = No 9 = Skip
RMHTFUEL	What fuel used in secondary room heater 1 = Natural gas from underground pipes 2 = Bottled gas (LPG or propane) 3 = Fuel oil 4 = Kerosene 99 = Skip
ROOMHEAT	Secondary Heating Equipment Built-in room heater burning 1 = Yes 0 = No 9 = Skip
SCHOOLCHILDREN*	Number of household members between the ages of 6 and 13
SECONDARYEQPTYPE*	Secondary heating equipment type
SENIORS*	Number of household members between the ages of 65 and 95
SWIMPOOL	Does residence have a swimming pool with filtering system? 1 = Yes 0 = No 9 = Skip
TEMPGONE	Winter household temperature during the day when no one is home 40-94 = degrees Fahrenheit 95 = Heat turned off 96 = Don't know 97 = Did not live in unit last winter 99 = Skip
TEMPHOME	Winter household temperature during the day when someone is home 40-94 = Temp when someone home 95 = Heat turned off 96 = Don't know 97 = Did not live in unit last winter 99 = Skip
TEMPNITE	Winter household temperature during sleeping hours 40-94 = Night temp 95 = Heat turned off 96 = Don't know 97 = Did not live in unit last winter 99 = No Answer/Not Applicable
WEATHERLOCATIONCODE*	Added to link to weather data (See App. 7-D)
WELLPUMP	Electric pump for well water 1 = Yes 0 = No

WHEATAGE	<p>How old is your household's main water heater</p> <p>0 = No separate water heater</p> <p>1 = Less than 2 years old</p> <p>2 = 2 to 4 years old</p> <p>3 = 5 to 9 years old</p> <p>4 = 10 to 19 years old</p> <p>5 = 20 years or older</p> <p>6 = Don't know</p> <p>9 = Don't use hot water</p>
WHEATOTH	<p>Main equipment also heat water for apartments</p> <p>1 = Yes</p> <p>0 = No</p> <p>9 = No Answer/Not Applicable Don't use hot water</p>
WHEATSIZ	<p>Size of household's main water heater tank</p> <p>0 = Don't have a separate water heater</p> <p>1 = Small (30 gallons or less)</p> <p>2 = Medium (31 to 49 gallons)</p> <p>3 = Large (50 gallons or more)</p> <p>5 = Two separate water heaters</p> <p>6 = Have a tankless water heater</p> <p>0 = Don't have a separate water heater</p> <p>6 = Don't know</p> <p>9 = No Answer/Not Applicable Don't use hot water</p>

\* Not part of RECS 2005 variables.

## REFERENCES

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3. U.S. Department of Energy-Office of Codes and Standards, *Technical Support Document: Energy Efficiency Standards for Consumer Products: Room Air Conditioners, Water Heaters, Direct Heating Equipment, Mobile Home Furnaces, Kitchen Ranges and Ovens, Pool Heaters, Fluorescent Lamp Ballasts & Television Sets*, 1993. Washington, DC Vol. 1 of 3. Report No. DOE/EE-0009.