ELECTRIC POWER RESEARCH INSTITUTE

Load Shape Library

Version 3.0

3002005809

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Technical Update, December 2015

EPRI Project Manager

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NOTE

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ABSTRACT

This report describes the Electric Power Research Institute's (EPRI's) continuing research to develop an analytical framework composed of a load database and a web-accessible repository of end-use, whole-premise, and efficient technology measures data for use by the utility industry, regulators, researchers, and the general public. The tool provides access to the best available end-use, efficient technologies, and whole-premise data by sector, city, climate zone, and building type. Improved end-use load research data will benefit load forecasters, system planners, energy efficiency program managers, and rate design analysts by facilitating integration of supply and demand options.

Keywords
Advanced metering infrastructure (AMI)
Diversified load shape
End-use load
Load research
Load shape
Whole-premise load

Product ID: 3002005809

Load Shape Library: Version 3.0

PRIMARY AUDIENCE: Utility engineers and managers, load researchers, load forecasters, system planners, EE program managers, and rate design analysts.
SECONDARY AUDIENCE: Academia, regulators, and the general public.

KEY RESEARCH QUESTION

The regulated U.S. utility industry relies on customer load shapes and class load profile data for the recovery of their fixed costs, estimated at US$165 billion in 2010. Understanding class load shapes requires end-use data for gaining insights into drivers, uncertainties, and behaviors of customer loads. End-use load data currently available to the industry was developed 20 years ago by a few utilities and EPRI. End-use energy consumption patterns have changed significantly over the years due to efficient technologies, new loads, new building codes, customer behaviors, and preferences for the use of electricity. This fundamental change has created a challenge to the industry for acquiring and compiling recent and representative load data. How can utilities acquire or gain access to recent load data through EPRI's research or through other collaborative efforts? How can utilities deploy EPRI's analytical framework to develop their own representative end-use and whole-premise load data libraries by attributes such as region, climate zone, sector, and building type?

RESEARCH OVERVIEW

To facilitate the collection, use, and functionality of a library of electric load shapes, EPRI has developed an analytical framework with a web-accessible database of best-available U.S. load data. The database includes end-use data aggregated over NERC regions, whole-premise data aggregated over major cities, and residential efficient technology measures aggregated by city, utility region, and climate zone. The data were acquired through either EPRI's field pilots, regional utility studies, or historical collaborative activities such as the EPRI CEED (Center for End-Use Energy Data) PowerShape data of 2000–2001. Until a nationwide utility baselining collaborative study is commissioned to acquire statistically valid, representative load data by climate zone, class, and building type, EPRI continues to revise the framework annually and populate the library with newer load data as available.

KEY FINDINGS

- The Load Shape Library (LSL) presents best-available data, which does not represent statistically valid usage.
- Accuracy and vintage of load data determine the value and risk for use in utility applications. Users should treat the LSL data as a sample reference. Confidence and precision levels of the data are unknown.
- End-use data from engineering models does not capture behavioral and other unobservable effects, thus rendering metered data as the preferred choice of the industry.
- End-use metered data acquired through a statistical sampling frame is widely preferred. High cost sand intrusive nature of submetering on customers continue to be key deterrents to broader utility efforts.

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- EPRI's collaborative research is focused on driving down the cost of end-use metering through innovative, nonintrusive metering alternatives. Disaggregation techniques such as nonintrusive load monitoring (NILM)) and conditional demand analysis using advanced metering infrastructure data are under research and pilot testing.
- Other low-cost intrusive metering methods such as smart breaker panels and distributed sensors are also being researched.

VALUE STATEMENT

Efficient and conventional end-use and whole-premise load shapes find utility applications in load forecasting, integrated resource planning (IRP), and demand-side management (DSM) evaluations. Some utilities are required to submit predicted load growth and future capacity needs to a public utility commission (PUC), considering factors such as the current base load; expected change in the number of residential, commercial, and industrial establishments; and change in equipment efficiencies over time. Several PUCs require that DSM evaluations be performed to determine the true savings and the program costs, respectively known as impact evaluation and process evaluation. Such approaches can use end-use load shapes and/or whole-premise load data to capture the change in energy use patterns resulting from energy efficiency and demand response programs.

HOW TO APPLY RESULTS

Users can use the Load Shape Library data as a sample reference to assess model outputs used for various applications. Whole-premise, end-use, and efficient technology measure data can be downloaded as annual hourly 8760s in CSV format and processed offline for adjustments, normalizations, or aggregation as needed. Base load energy, coincident peak, and impact of equipment efficiencies can be quantified by sector and over specific durations of time using end-use, whole-premise, and efficient technology measure load shapes.

LEARNING AND ENGAGEMENT OPPORTUNITIES

- Users of this report may be interested in periodic updates to the web tool at http://loadshape.epri.com/
- Users may be interested in the following reports on EPRI's end-use load research :
  - Load Shape Library and Customer Load Insights Interest Group Workshop, Dallas TX, May 2, 2012.
  - PowerShape Market Profiles, EPRICSG, Palo Alto, CA: 1999. TR-111998.
- For nonintrusive load monitoring research users may be interested in:
  - Nonintrusive Load Monitoring (NILM) Industry Update, A State of the Art Assessment, EPRI, Palo Alto, CA: 2014. 3002003316.
  - Nonintrusive Load Monitoring (NILM) Technologies for End-Use Load Disaggregation, Laboratory Evaluation I. EPRI, Palo Alto, CA: 2013. 3002001526

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1 INTRODUCTION

Utilities continue to express the need for more recent end use and whole premise data .Such data is generally believed to be prohibitively expensive to acquire and process. The wide-spread deployment of AMI (Advanced metering infrastructure) meters creates both opportunities and challenges for collection, management and storage of large volumes of data. The opportunity that AMI meters present is that whole-premise load shapes can be measured without the need for special additional metering. The challenge is that the quantities of data being collected are very large (terabytes) needing enormous data storage resources and investment decisions for establishing processing and rigorous sampling structures. Additional resource and cost challenges exist for retention of adequate amounts of data for extended periods of time[1].

AMI meters installed at the premise, however, will not provide end-use level load shapes, which can be very important to understanding how new technologies impact the overall load shape over time, as well as how customers respond to dynamic pricing, information feedback, and demand response program options. Limited research has been conducted till date to determine whether low cost techniques such as statistical estimation of end use load consumption using survey information and whole premise load data, yield accurate estimates. More research is needed to determine the accuracy of these lower-cost techniques or whether collaborative approaches to funding alternative end-use load research measurement methods would be the desirable next step.

Rationale

In a 2010 EPRI survey, utilities and ISOs mentioned the increasing need for acquiring high-quality load research data. Utility representatives mentioned that the utility industry as a whole are using “antique” load shape data for forecasting, planning, and program design purposes — load shapes that the industry and EPRI developed more than 20 years ago. The industry is concerned about the accuracy of load forecasts as the forecasts are based on these “antique” load shapes.[2]

In May 2012, EPRI conducted a workshop for utilities and non-utility stake holders interested in load research and in collecting load data. Participants reiterated the need for more recent load data to improve load forecasting accuracy, energy efficiency program design and for integrating energy efficiency and demand response into resource planning. There was unanimous consensus for the creation of a framework for the development of a load shape library or repository for storing, processing and navigating end-use and whole-premise load data.

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[1] Curtis. A., AMI + MDMS: A Data Storage Conundrum, SCANA Energy, AEIC Load Research Workshop, Orlando, Florida, March 20 – 23, 2011

[2] *End-Use Load Research in a Smart Grid World: Conference Proceedings*. EPRI, Palo Alto, CA: 2010. 1020122

Objectives

The objectives of the load shape library effort are as follows:

- Develop a preliminary framework 1.0 (database and a secure web portal) with best-available end use and whole-premise load data by region, sector and building type to demonstrate the design and basic functionality of the repository. Continue to revise the framework annually and populate the library with newer end use and whole premise data as available from EPRI research and or from external agencies such as utilities and others.
- Establish a "Load Data Users Group" with member funders and interested utilities as participants to advice and guide on the repository structure and data format on an annual basis.

Applications, Value, and Use

Efficient and conventional end-use and whole-premise load shapes find utility applications in load forecasting, integrated resource planning (IRP) and demand-side management (DSM) evaluations. Some utilities are required to submit predicted load growth and future capacity needs to the public utility commission (PUC), considering factors such as the current base load, expected change in the number of residential, commercial and industrial establishments and change in equipment efficiencies over time. Base load energy, coincident peak and impact of equipment efficiencies can be quantified by sector and over specific durations of time using end-use and whole-premise load shapes. When DSM programs are selected and implemented it is because they have been determined to be cost effective based on assumed energy and/or demand savings and program administrative costs. In order to improve these assumptions, several PUCs require that evaluations be performed to determine the true savings and the program costs, respectively known as impact evaluation and process evaluation. Impact evaluations can be performed using one of many approaches namely end-use metered data, whole premise load research data, billing history analysis, building simulation and other statistical methods. Such approaches can use end-use load shapes and/or whole-premise load data to capture the change in energy use patterns resulting from DSM programs.

2
LOAD SHAPE LIBRARY VERSION 3.0

This section describes the load shape library 3.0 developed during the year 2015. The library comprises of the following two component databases containing hourly load data, both of which are accessible through a single secure web portal[3]:

- End-use
- Whole-premise
- Residential technology measures

End-Use Load Shapes

The end-use load shape data contained in the tool is derived from simulations using the EPRI NESSIE (National Electric System Simulation Integrated Evaluator) model platform. The inputs to NESSIE are derived from data estimated by the U.S. Energy Information Agency's (EIA) National Energy Modeling System (NEMS) as well as from data collected by EPRI through its laboratory testing and research[4].

Data Format

The end use load data available in the tool are average hourly demand values unitized to the respective end-use peak. The unitized end use peak value is the maximum value of 1.0 for the season (peak/off-peak) and for the day type (peak day, average weekday, and average weekend) selected by the user. The tool allows scaling the unitized end use load data based on the user's input of peak end use kW or annual end use kWh.

Regions

The EPRI NESSIE model simulated unitized hourly demand values for thirteen (13) North American Electric Reliability Corporation (NERC) regions and sub-regions according to the NERC pre-2006 regional designations excluding Alaska and Hawaii. Figure 2-1 illustrates the geographic distinctions of the thirteen NERC regions for which data is available in the end-use load shape library. Table 2-1 enlists the names of the thirteen NERC regions and sub-regions and the abbreviations used.

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3 The load shape library web portal will be accessible to funder utilities beginning February 2014. Go to http://loadshape.epri.com and log in with EPRI member login credentials.
4 *Translating Energy Efficiency into CO_2 Emissions Reduction*, EPRI, Palo Alto, CA:2011.1023185

Figure 2-1
Geographic depiction of pre-2006 North American Electric Reliability Corporation control regions

Table 2-1
Pre-2006 North American Electric Reliability Corporation regions and subregions represented in the end-use load shape data

NERC Region/Subregion	Abbreviation
East Central Reliability Coordination Agreement	ECAR
Electric Reliability Council of Texas	ERCOT
Mid-Atlantic Area Council	MAAC
Mid-America Interconnected Network	MAIN
Mid-Continent Area Power Pool	MAPP
Northeast Power Coordinating Council – New York	NPCC/NY
Northeast Power Coordinating Council – New England	NPCC/NE
Southeast Reliability Council (non-Florida)	SERC/STV
Southeast Reliability Council (Florida)	SERC/FL
Southwest Power Pool	SPP
Western States Coordinating Council – Northwest	WSCC/NWP
Western States Coordinating Council – Rocky Mountain Area	WSCC/RA
Western States Coordinating Council – California/Nevada	WSCC/CNV

Sectors and End-Uses

Unitized hourly demand values available in the database pertain to end-uses of three sectors namely residential, commercial, and industrial corresponding to each of the 13 NERC regions and sub-regions described above. To generate the end use load data in each case, regional prototypes were used to represent different building or business types. Auxiliary data sources were used to find the saturation of the selected building or business types by state and mapping back to the appropriate NERC region. The frequency counts of saturation were then used as weights to calculate a weighted average load shape for each end-use for the specific NERC region. A total of twenty-two (22) major end use load categories across residential, commercial, and industrial sectors for each NERC region and sub-region were developed as shown in Table 2-2.

Table 2-2
Twenty-two end-uses included in the load shape library

Residential End-uses (9)	
Central Air Conditioning (CAC) Clothes Dryer Clothes Washer Dishwasher	Heating Lighting Refrigerator Television & Personal Computing (TV & PC) Water Heating
Commercial End-uses (8)	
Cooling Heating Lighting, External Lighting, Internal	Office Equipment5 Refrigeration Ventilation Water Heating
Industrial End-uses (5)	
HVAC Lighting Machine Drives	Other Process Heating

Season and Day Type

The load shapes were condensed into two season types and four day types each consisting of twelve (12) two-hour blocks of energy use. Extrapolations were used to convert the values into twenty-four (24) hour format. The season and day type definitions are as follows -

- Peak season: Months of May through September.
- Off-peak season: Months of October through April.
- Peak weekday in the peak season: Ten hottest weekdays that are not holidays two in each of the months for the peak season namely May through September.

[5] Office equipment includes personal computers and related information technology (IT) equipment

- Peak weekday in the off-peak season: Ten coldest (or hottest weekdays depending on region) that are not holidays, for the months of the off-peak season namely October through April.
- Average weekday/weekend in the peak season: all other weekdays/weekends in May through September.
- Average weekday/weekend in the off-peak season: all other weekdays/weekends in October through April.[6]

Whole Premise Load Shapes

The whole-premise load shape data is obtained from the PowerShape™ database of load shapes developed by EPRI's Center for End-Use Energy Data (CEED)[7]. The data was produced using statistical models using step-wise linear regression techniques, metered end-use data, and the corresponding historic weather data. Typically 5 to 15 validated (pre-screened for proper characteristics and data quality) sites are utilized to construct the shape. For instance in the regression process, the relationship between the donor sites' metered hourly HVAC energy consumption (using hourly metered end-use data) and the corresponding metered hourly temperature-humidity index (a function of dry bulb temperature and dew point) is statistically quantified.

Salient features of the CEED data are listed below:

- Data is presented as "total load" or "whole-premise" energy load shapes for various commercial and residential sector building types.
- Load shapes are diversified i.e. the shape represents a group of customers in a particular sector and not an individual customer.
- The load shapes are for the calendar year 2001 and make use of "normal"[8] and Typical Meteorological Year (TMY2)[9] weather data.
- The load shapes can be described as typical, weather-adjusted, load profiles for selected sectors, by state and city.
- The diversified load shapes are accompanied by attributes and tools that enable analysis to be conducted at both the individual customer and sector levels.

Data Format

The whole premise load shape data is presented in 8760 format i.e. one energy value (kWh for residential and Wh per square foot for commercial) for each hour of the calendar year 2001.

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[6] *Modeling CO_2 Emissions Impact of Energy Efficiency: Proof of Concept*. EPRI, Palo Alto, CA:2008.1016085
[7] *PowerShape Market Profiles*, EPRICSG, Palo Alto, CA: 1999. TR-111998
[8] For definition of "normal" weather data refer to definition of "normals" at http://www.ncdc.noaa.gov/oa/climate/normals/usnormals.html#WHATARENORMALS
[9] For definition of TMY2 weather data format see http://apps1.eere.energy.gov/buildings/energyplus/weatherdata_sources.cfm#TMY2

Sector and Building Types

The data consists of load shape data for residential and commercial sectors. Weather-adjusted data for nine (9) residential premise types (Table 2-3) and thirty (30) commercial building types (Table 2-4) for fifty-five (55) U.S. cities is included. The weather adjustments are based on hourly "normal" weather data for most cities and Typical Meteorological Year (TMY2) data for the others. The premise types are classified according to the use of electric and fossil fuel for heating. Therefore, a combined total of 4173 class load segment profiles are available for users in this tool.

Table 2-3
Nine weather-adjusted residential premise types

Residential Premise Type	Description
Single Family, Heat Pump AC	Heat Pump Heating and Cooling
Single Family, Central AC	Electric Heating (non- Heat Pump) with Central Air
Single Family, Large	Large All-electric Customer (large home, 2 or more children)
Single Family, Mixed Cooling	Fossil Heat with Mixed Cooling
Single Family, Central AC, Elec. WH	Fossil Heat with Central Air and with Electric Water Heater
Multi-Family, Mixed Cooling	Electric Heating and Mixed Cooling
Multi-Family, Room AC	Fossil Heating with Room Air
Manufactured Home, Mixed Cooling	Electric Heat and Mixed Cooling
Manufactured Home, Mixed Cooling	Fossil Heat and Mixed Cooling

Table 2-4
Thirty weather-adjusted commercial building types

Commercial Building Type	Description
Office	Small Offices - Electric Heat
Office	Medium Offices -Electric Heat
Office	Large Offices - Electric Heat
Office	Small Offices - Fossil Heat
Office	Medium Offices - Fossil Heat
Office	Large Offices - Fossil Heat
Education	Schools (K-12) - Electric Heat
Education	Schools (K-12) - Fossil Heat
Restaurant	Fast Food Restaurant – Typical
Restaurant	Fast Food Restaurant – Burgers & Breakfast
Restaurant	Sit-down Restaurant
Healthcare	Mixed Usage Healthcare - Hospitals & Nursing Homes
Retail	Small Retail - Electric Heat
Retail	Large Retail - Electric Heat
Retail	Small Retail - Fossil Heat
Retail	Large Retail - Fossil Heat
Lodging	Hotels/Motels - Electric Heat
Lodging	Hotels/Motels - Fossil Heat
Assembly	Churches – Electric Heat
Assembly	Churches - Fossil Heat
Entertainment	Movie Theaters – Fossil Heat
Warehouse	Warehouse – Fossil Heat
Services – Other	Banks – Financial Services – Electric Heat
Services – Other	Banks – Financial Services – Fossil Heat
Grocery	Supermarkets
Grocery	Convenience Stores: 24-hour Operation
Grocery	Convenience Stores: non 24-hour Op.
Retail	Malls – fossil heat
Transport-Public Utilities	Trucking - Distribution Center
Transport-Public Utilities	Communication Facilities – General

City, State

The tables below show the cities and respective states for which whole-premise load shapes are available. The cities and states are grouped by geographic region along with annual HDD (heating degree day) and annual CDD (cooling degree day) counts.

Midwest

A group of ten (10) cities from the Midwest region are included in the database (Table 2-5). These include two (2) cities from Illinois, (7) seven from Ohio and (1) one from Michigan.

Table 2-5
Midwest cities included in the whole-premise database

Region	State	City	Weather Station	Annual HDD	Annual CDD
Midwest	IL	Chicago	94846	6481	778
Midwest	IL	Springfield	93822	5846	1166
Midwest	MI	Lansing	14836	7110	552
Midwest	OH	Akron	14895	6176	641
Midwest	OH	Cleveland	14820	6132	655
Midwest	OH	Columbus	14821	5576	837
Midwest	OH	Dayton	93815	5818	818
Midwest	OH	Mansfield	14891	6248	686
Midwest	OH	Toledo	94830	6646	649
Midwest	OH	Youngstown	14852	6506	541

Northeast

A group of eleven (11) cities from the Northeast region are included in the database (Table 2-6). These include four (4) cities from Pennsylvania, two (2) cities each from New York and New Jersey and (1) one city each from Massachusetts, New Hampshire and Vermont.

Table 2-6
Northeast cities included in the whole-premise database

Region	State	City	Weather Station	Annual HDD	Annual CDD
Northeast	MA	Boston	14739	5768	699
Northeast	NH	Concord	14745	7601	416
Northeast	NJ	Atlantic City	93730	5221	908
Northeast	NJ	Newark	14734	4994	1138
Northeast	NY	Albany	14735	7003	539
Northeast	NY	Rochester	14768	6734	596
Northeast	PA	Harrisburg	14751	5469	1017
Northeast	PA	Philadelphia	13739	5005	1133
Northeast	PA	Pittsburgh	94823	5932	700
Northeast	PA	Wilkes-Barre	14777	6494	575
Northeast	VT	Burlington	14742	7843	438

South

A group of twenty-two (22) cities from the southern region are included in the database (Table 2-7). These include seventeen (17) cities from Texas two (2) cities from North Carolina and one (1) city each from Florida, Georgia, and Maryland.

Table 2-7
Southern cities included in the whole-premise database

Region	State	City	Weather Station	Annual HDD	Annual CDD
South	FL	Miami	12839	145	4206
South	GA	Atlanta	13874	2982	1690
South	MD	Baltimore	93721	4790	1177
South	NC	Charlotte	13881	3344	1560
South	NC	Greensboro	13723	3965	1282
South	TX	Abilene	13962	2621	2325
South	TX	Amarillo	23047	4475	1328
South	TX	Austin	13958	1644	2927
South	TX	Brownsville	12919	626	3720
South	TX	Corpus Christi	12924	907	3349
South	TX	El Paso	23044	2594	2091
South	TX	Fort worth	3927	2356	2523
South	TX	Houston	12960	1540	2827
South	TX	Lubbock	23042	3430	1641
South	TX	Lufkin	93987	1903	2517
South	TX	Midland	23023	2732	2051
South	TX	Port Arthur	12917	1496	2754
South	TX	San Angelo	23034	2351	2388
South	TX	San Antonio	12921	1627	2929
South	TX	Victoria	12912	1182	3066
South	TX	Waco	13959	2118	2679
South	TX	Wichita Falls	13966	3040	2371

West

Finally, twelve (12) cities from the western region are included in the database (Table 2-8). These include three (3) cities from Arizona, six (6) cities from California and one (1) city each from Montana, Nevada, and Oregon.

Table 2-8
Western states included in the whole-premise database

Region	State	City	Weather Station	Annual HDD	Annual CDD
West	AZ	Flagstaff	3103	7208	115
West	AZ	Phoenix	23183	1099	4020
West	AZ	Tucson	23160	1540	2852
West	CA	Fresno	93193	2510	1924
West	CA	Los Angeles	23174	1268	559
West	CA	Sacramento	23232	2641	1211
West	CA	San Diego	23188	1050	803
West	CA	San Francisco	23234	3046	97
West	CA	Santa Maria	23273	2957	76
West	MT	Helena	24144	7899	301
West	NV	Las Vegas	23169	2273	3087
West	OR	Medford	24225	4674	689

Residential Technology Measure Load Shapes

The technology measures load data is obtained from EPRI's Energy Efficiency Technology Demonstration 1.0 project conducted during 2009-2013. The data pertains to field installed residential efficient end-use technologies namely Heat Pump Water Heaters (HPWH) and Efficient Appliances (Washers, Dryers, and Refrigerators) deployed with extensive measurement instrumentation at multiple sites throughout the United States.

The objective of the Energy Efficiency Technology Demonstration were as follows:

- Examine the efficiency and performance of the technologies.
- Assess energy savings for different climatic regions and different building designs and constructions.
- Identify and quantify different qualities and effects when compared with traditional technology.
- Identify changes necessary in building designs and construction to attain optimal levels of energy performance and savings.
- Understand technical obstacles such as the possible impact that the technologies may have on the performance of the electric grid.
- Examine the feasibility of applying efficiency standards

EPRI designed the overall scope and managed the demonstration project hosted by multiple utilities. Within the scope of the project, EPRI identified and qualified the technologies for demonstration, worked with manufacturers to secure their availability, created the demonstration protocol, ran and executed tests, and performed an evaluation of the preliminary data[10]

Load data for two technology measures as described below is available in the current version 3.0 of the Load Shape Library. The data also consists of conventional or base technology data for each of the technology measures.

Heat Pump Water Heaters (HPWHs)

HPWHs use electricity to move heat from the ambient to the water heater storage tank to heat water. During cold ambient conditions the Heat pump water heater operates like a conventional water heater to directly heat water. The main diversity factors affecting technical performance are climate region and location of the heat pump water heater within the residential site. Data for two different HPWH models anonymized as "Manufacturer A" and Manufacturer B" is included in the database. Conventional water heaters included in the data include all manufacturers and brands available in customer sites during the period of the project.

Efficient Residential Appliances (ERAs)

Three residential standalone appliances namely refrigerators, washers and dryers are included. The efficient refrigerators use innovative technology, such as inverter-driven compressors and automatic ice-makers. The efficient washers use front-loaded designs and other features that reduce water consumption and electricity use. The efficient dryers use electronically controlled brushless motors and efficient air flow designs to reduce electric consumption. The key diversity factor for residential appliance performance is the usage of the device (how often and how long) which is driven by demographic characteristics such as number of occupants and the age of occupants.

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[10] *Energy Efficiency Demonstration: An Interim Report*. EPRI, Palo Alto, CA: 2011. 1024605

3
INSTRUCTIONS FOR USING THE LOAD SHAPE LIBRARY 3.0 WEB PORTAL

This section details a sample set of instructions for using the load shape library 2.0. The tool is self-explanatory in the selections and choices the user can opt.

Step 1

Log in to the web portal loadshape.epri.com from a web browser such as Internet Explorer version 8.0 or higher, Firefox, Google Chrome, Safari etc. The web portal is optimized for access using mobile devices such as Apple and Android based smart phones and tablets.

The user arrives at the home page of the Load Shape Library as shown in Figure 3-1.

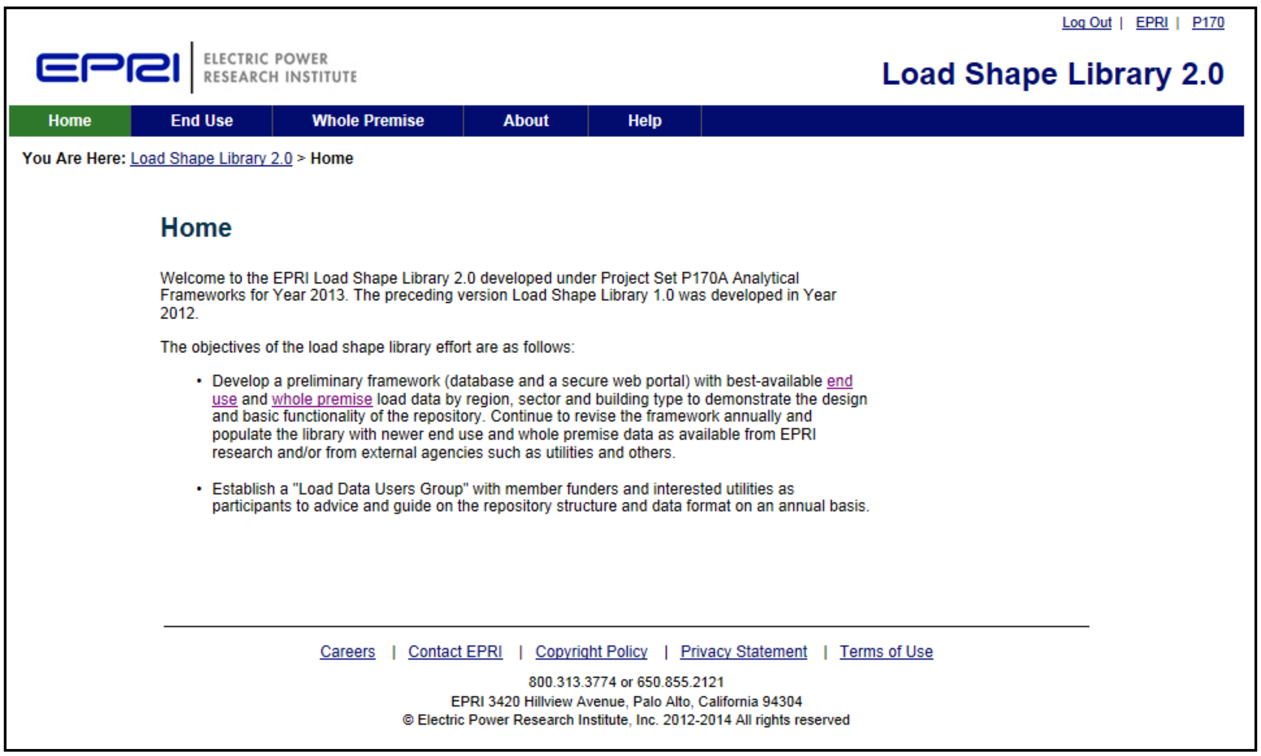

Figure 3-1
Load Shape Library 2.0 home page

Step 2

From the home page the user can chose either to access the end use load shape library or the whole premise load shape library as shown in Figure 3-2. The instructions below start with the assumption that the users chooses to access the end use load shape library.

Step 3

User selects the end use load shape library from the database options on the home page as shown highlighted in red (Figure 3-2).

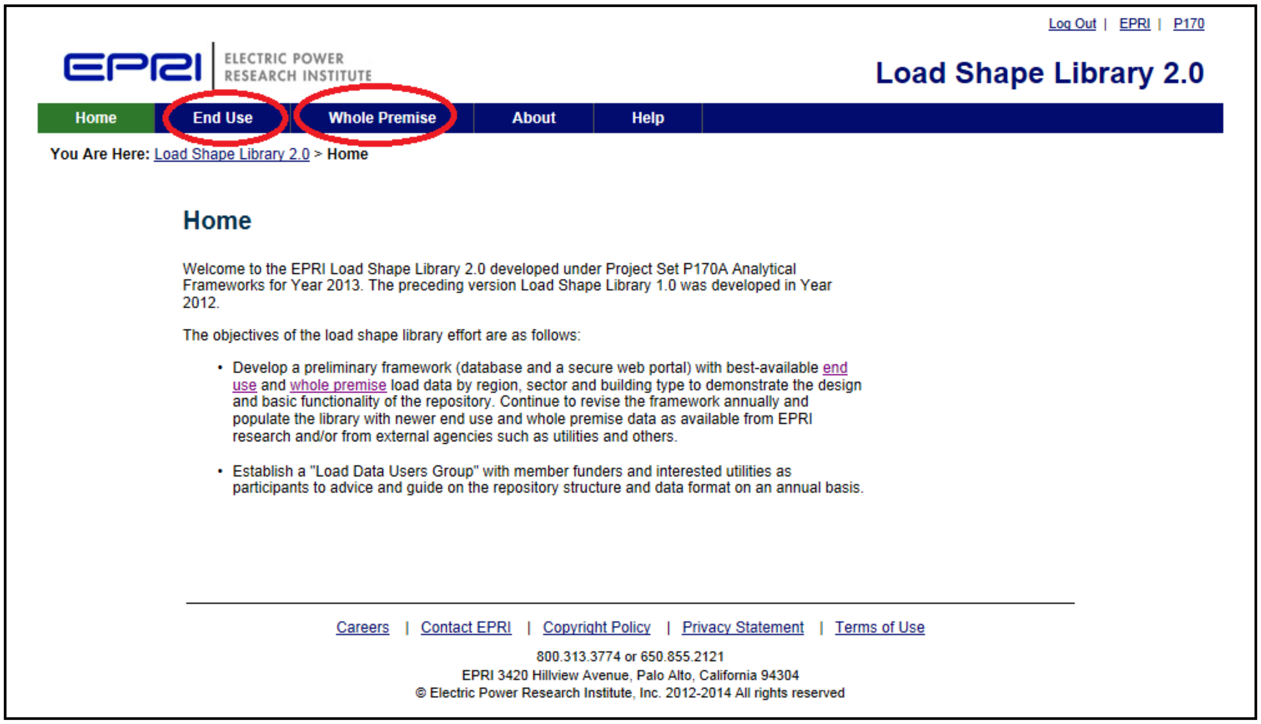

Figure 3-2
End-use and whole-premise database options

Step 4

Figure 3-3 shows the end use load shape library page and the selections available for the user to access, visualize and download the desired end use data.

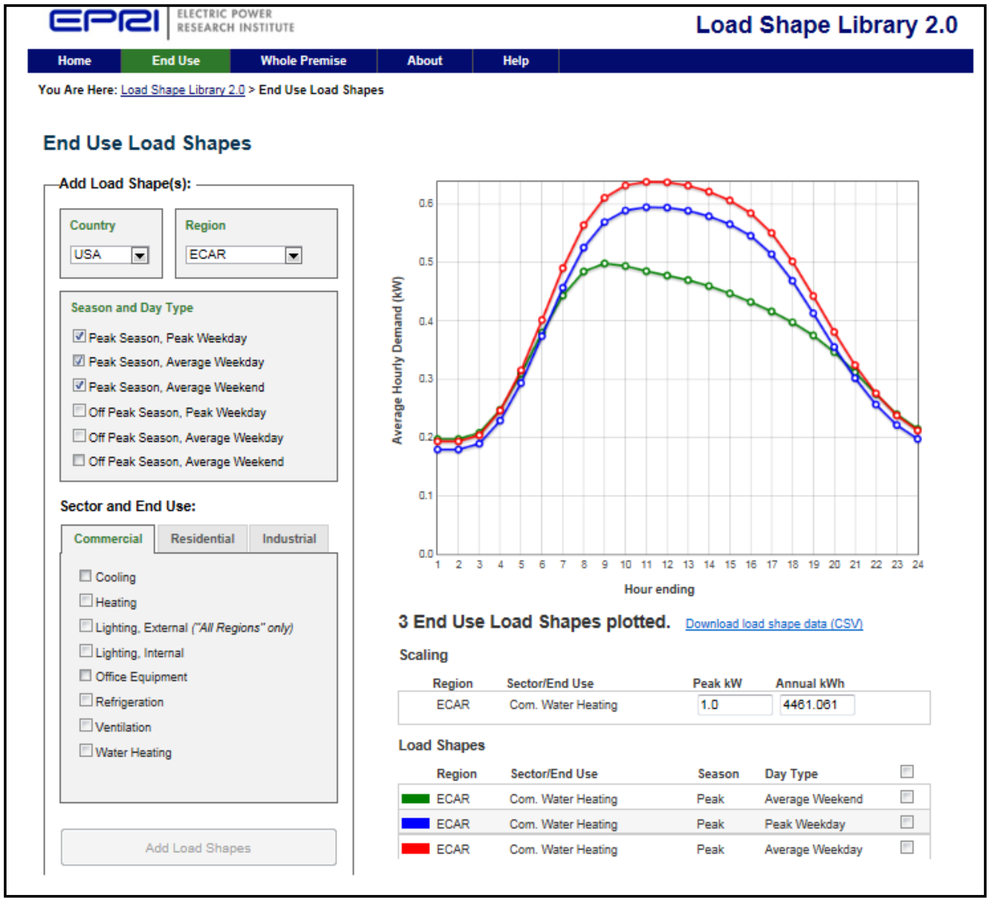

Figure 3-3
End-use load shape library and selection options

The user chooses the country, and region for which load data is desired. The user then selects the desired season and day type, followed by the sector and end use of interest. The user may select any combination of region, season, and day type for a maximum of sixteen (16) end use load shapes. User then clicks the "Add Load Shapes" button at the bottom left to display the unitized end use load shapes stacked one above the other as shown in Figure 3-3. The load shapes are displayed in different colors for contrasting and visualization. The user can enter one of the scaling factors namely peak kW or Annual kWh for the specific end use to obtain the desired load shape in kW values (y-axis) by hour (x-axis).

Below the plot is a displayed table which the user may use to remove one or more selections. The load shape plots can be removed by checking the appropriate check box(es) on the far right side of the label denoting the plot and clicking the "Remove Load Shapes" button.

The hyperlink in blue colored font "Download unitized load shape data (CSV)" available below the chart, allows the user to download the data displayed on the chart, along with the selection specifics such as region, sector, end use and day type associated with each plot.

Step 5

Figure 3-4 shows the whole premise load page and the selections available to the user for accessing desired whole premise load shape data. The menus and features available for the user are similar to the ones described above for the end use library. Additional filters to display load shapes for average day, week, month, year and single hour are provided. The default setting for demand values (displayed on the y-axis) is "average". For select menus the load shapes can be generated using maximum or minimum demand values.

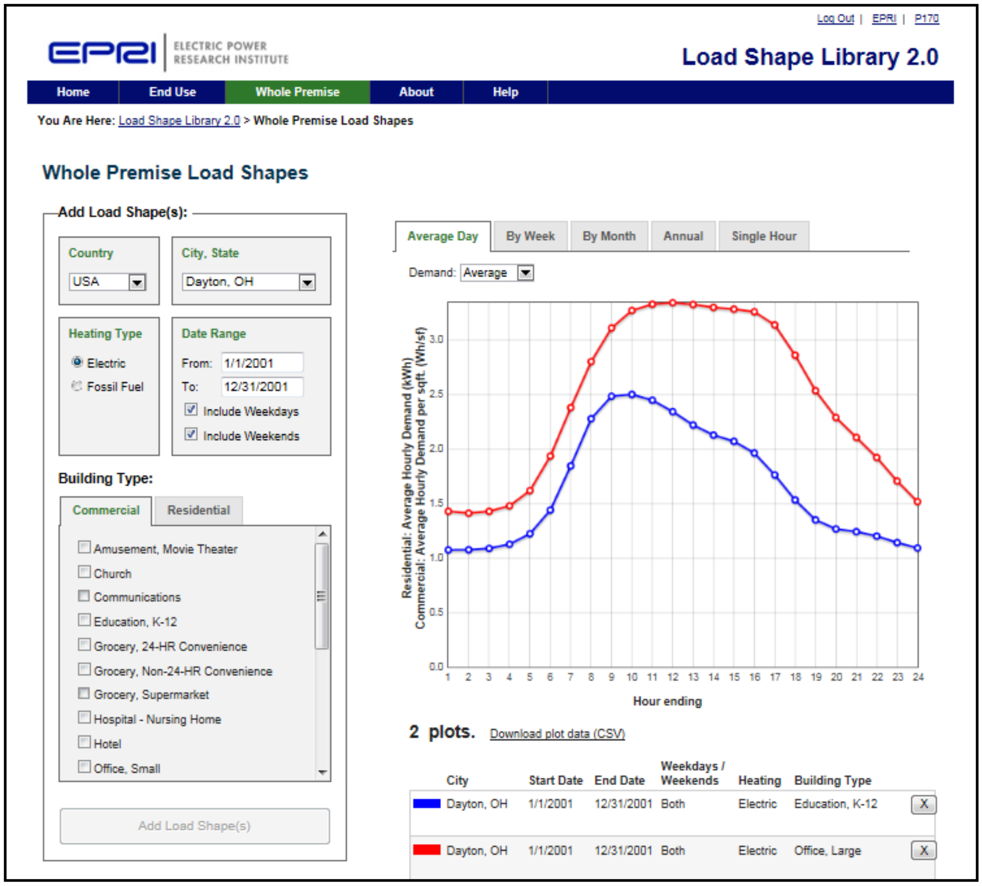

Figure 3-4
Whole-premise load shape library and selection options

Step 6

For any questions or help concerning the Load Shape Library the user may contact the personnel listed on the Help page shown in Figure 3-5.This page also displays the online help manual for the tool.

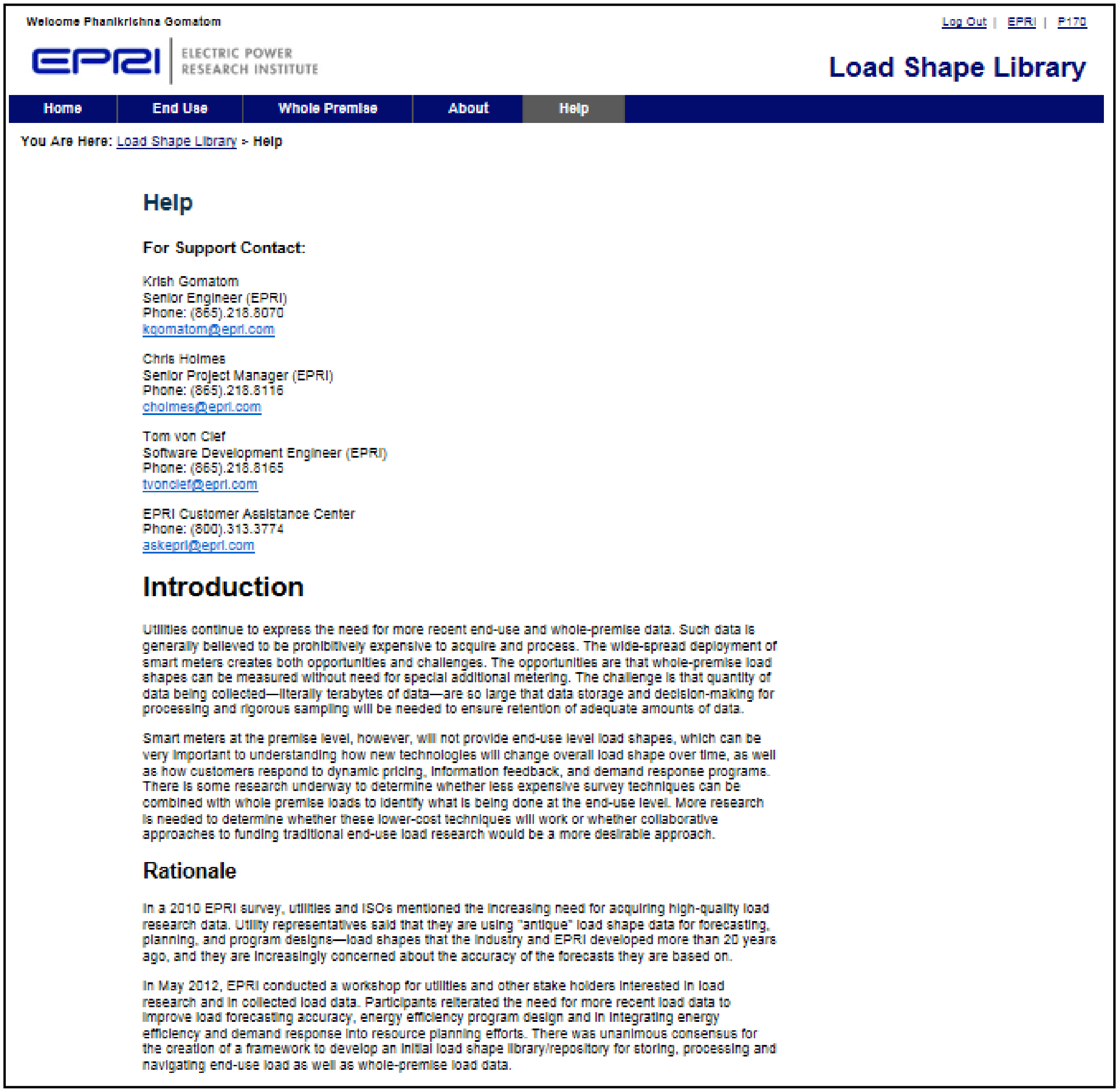

Figure 3-5
Load shape library help page

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