The Database for Energy Efficient Resources (DEER)

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ABSTRACT

The Database for Energy Efficiency Resources (DEER) provides estimates of the energy savings potential for energy efficient technologies in residential and nonresidential applications. The database contains information on measures commonly installed in the marketplace as well as data on the costs and benefits of more energy efficient measures.

The 2004-05 DEER update was commissioned jointly by the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC). The purpose of the project was to update the energy impact estimates from the original 1994 DEER study (conducted by the NEOS Corporation) and the subsequent 2001 DEER update (conducted by Xenergy). Additionally, the 2004-05 DEER update sought to review and expand on the residential single family and multifamily measures, add mobile homes to the set of building types, add additional nonresidential measures and building types, and add data for the agricultural segment. A separate project updated the measure costs within DEER and this cost information was merged with the energy impact estimates developed by this project.

The energy impact estimates were developed by a team led by Itron and supported by three energy consulting firms: James J. Hirsch & Associates, Synergy Consulting, and Quantum Consulting. The team conducted the project in two phases. The first phase was managed by San Diego Gas & Electric and included the development of estimates for non-weather-sensitive data, creation of an interactive website for accessing DEER data, and software for estimating impacts from weather-sensitive demand-side management programs. Managed by Southern California Edison, phase two began in late 2004. It expanded on the non-weather-sensitive measure analysis, created estimates of demand-side management potential from both weather-sensitive and non-weather-sensitive measures, and populated the DEER website with both weather and non-weather sensitive data. The measure cost portion of DEER was updated by a team led by Summit Blue Consulting and supported by the Heschong Mahone Group.

Approach and Scope

The 2004-05 DEER project updated aspects of the 1994 and 2001 database versions, adhering to the methodologies used in previous updates where possible, but using different methodologies where advances in modeling technologies or data availability provided greater accuracy. The 2004-05 update also expanded DEER to include building prototypes created with the eQUEST building simulation wizard, current CEC Title 24 building standard climate zones (expanding DEER from five to 16 zones), and full integration of measure costs. The 2004-05 update also fully incorporates effective useful life estimates for all measures for the first time. Finally, the DEER website provides Internet access to the database and supporting documentation.

Non-Weather-Sensitive Measures

Energy impacts from conservation measures were estimated for the residential, nonresidential, and agricultural non-weather-sensitive measures. For example, residential non-weather-sensitive energy impacts include compact fluorescent lamps and high-efficiency appliances such as refrigerators, clothes washers, clothes dryers, dishwashers, and water heaters. Nonresidential measures include exterior lighting, high-efficiency copiers, commercial cooking appliances, and domestic hot water measures such as high-efficiency gas heaters, circulation pump time clocks, and water tank insulation blankets. Agricultural sector measures include irrigation equipment, greenhouses, ventilation, pumps, livestock waterers, and heat exchangers for milk cooling. Where possible, the methodology used by previous updates to calculate energy impacts was carried forward in the 2004-05 update. However, modifications were made in some cases and expanded in other cases. Detailed methodologies for each impact measure are described in the report "2004-05 Update of the Database for Energy Efficiency Resources" available on the DEER website (http://eega.cpuc.ca.gov/deer).

Weather-Sensitive Measures

James J. Hirsch & Associates led the development of the weather-sensitive savings estimates. Energy savings for weather-sensitive demand-side management measures have traditionally been calculated using prototype building descriptions batch-processed using the DOE-2 building energy simulation engine. The 2004-05 DEER update uses the latest DOE-2 simulation engine via eQUEST, a sophisticated, yet easy-to-use building energy use analysis tool that serves as an interface to the DOE-2 simulation engine. DEER prototype and measure characteristics are defined in the form of eQUEST wizard project files, look-up tables, and defaulting rules that are referenced at runtime to perform either single-run or batch analysis.

Building prototypes. The DEER building prototypes consist of 34 individual eQUEST project files, up to three for each of the 26 DEER building types. Each building prototype describes a single site configuration, including either one or multiple building shells served by one or more HVAC system types. Prototype characteristics correspond to eQUEST building creation wizard inputs, but some characteristics were developed specifically for the DEER analysis.

Measure descriptions. Each measure was modeled for all building types. The 2004-05 update final report details the methodologies used for each measure as well as how specific primary parameters, such as climate zone and building vintage, were altered from the base case for each measure. The final report also details the rule set that manipulates the DEER baseline and measure building descriptions. The rules are organized into 295 lists containing 13,283 rules. The rule set also includes 95 look-up tables of data containing 20,480 rows of data.

Climate zones. The 1994 DEER divided the state into five climate zones. The subsequent Xenergy 2001 DEER update used the CEC forecasting model climate zones, 16 zones that are largely based on utility service territories. For the 2004-05 DEER update, the project team adopted the CEC Title 24 building standard climate zones (also 16 zones) in order to provide greater breadth of climate diversity by reducing dependence on utility service boundaries.

Effective Use of Life Estimates

The 2004-05 DEER is the first version to integrate effective use of life (EUL) estimates for each measure. A previous update by the CEC in 1996 incorporated the measure life estimates used by each utility to value each measure or measure family, but it did not provide single-point estimates. For the 2004-05 update, EUL estimates for weather- and non-weather-sensitive measures were gathered from multiple sources with emphasis on EUL data from retention and persistence studies sponsored by the CPUC.

Measure Costs

Summit Blue Consulting contracted separately to update the measure cost dataset, but worked closely with the Itron measure impact team to ensure that the point estimates for impacts and costs were based on the same measure characteristics. Summit Blue updated measure costs from the 2001 study and collected costs for new measures characterized by the 2004-05 DEER update. Cost data available from the DEER website include:

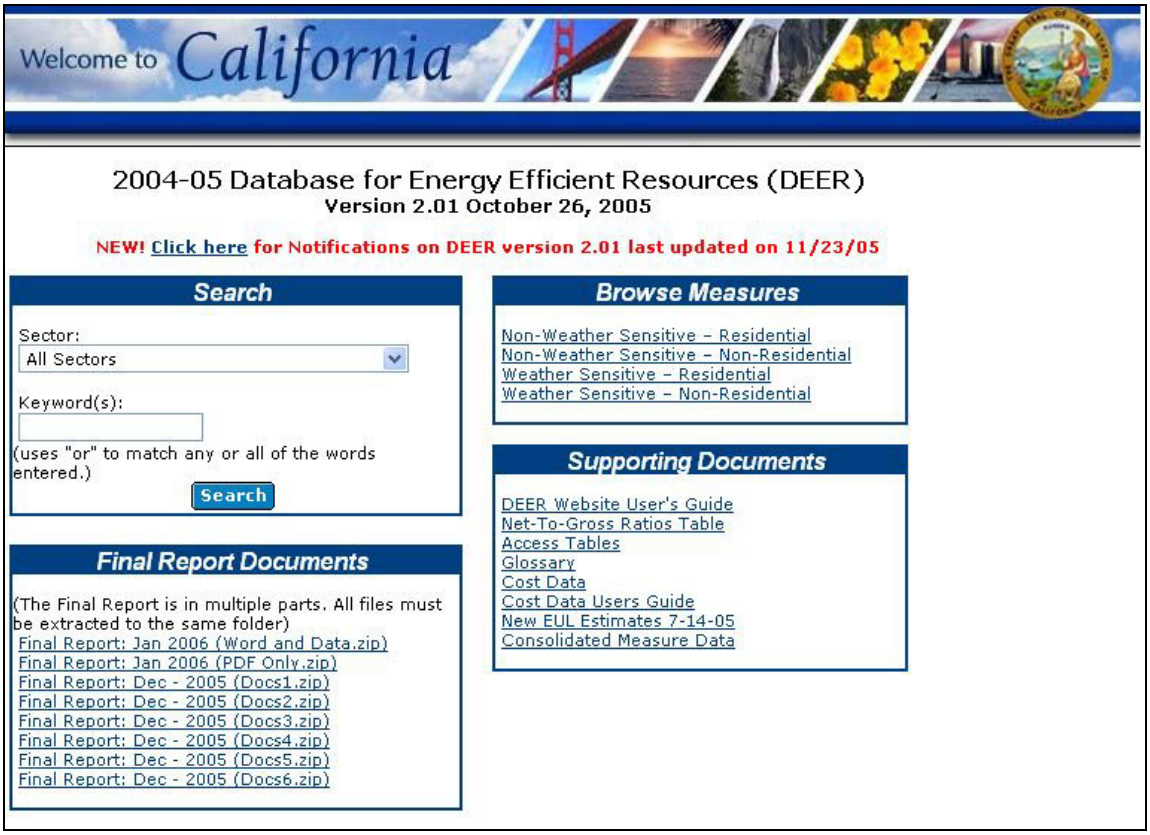
- Measure equipment cost—the cost of the energy-efficient technology.
- Base equipment cost—the cost of the baseline efficiency technology.
- Incremental cost—the difference between the measure equipment cost and the base equipment cost.
- Labor cost—the installation cost of the measure including contractor overhead and profit.
- Installed cost—the sum of the measure equipment cost and the labor cost.

DEER Website

Previous versions of DEER were available on floppy disks or as a downloadable dataset from the CEC website. As part of the 2004-05 project, a new DEER Internet interface was developed by Synergy Consulting to provide online read-only access to DEER. Website users can also download the entire dataset as a Microsoft® Access database, download portions of the dataset as Microsoft Excel spreadsheets, or print measure-specific detailed information.

Figure 1 illustrates the DEER home page. The DEER home page provides quick access to four measure categories, DEER reports, and supporting documents.

Figure 1. DEER Website Opening Screen



The DEER report and website are designed to provide well-documented estimates of energy and peak demand savings values, measure costs, and EULs available within one data source. Target users consist of program planners, regulatory reviewers and planners, utility and regulatory forecasters, and consultants supporting utility and regulatory research and evaluation efforts. The website is easy to use with extensive supporting documents that include a website glossary and users' guides that document DEER and the measure cost data.

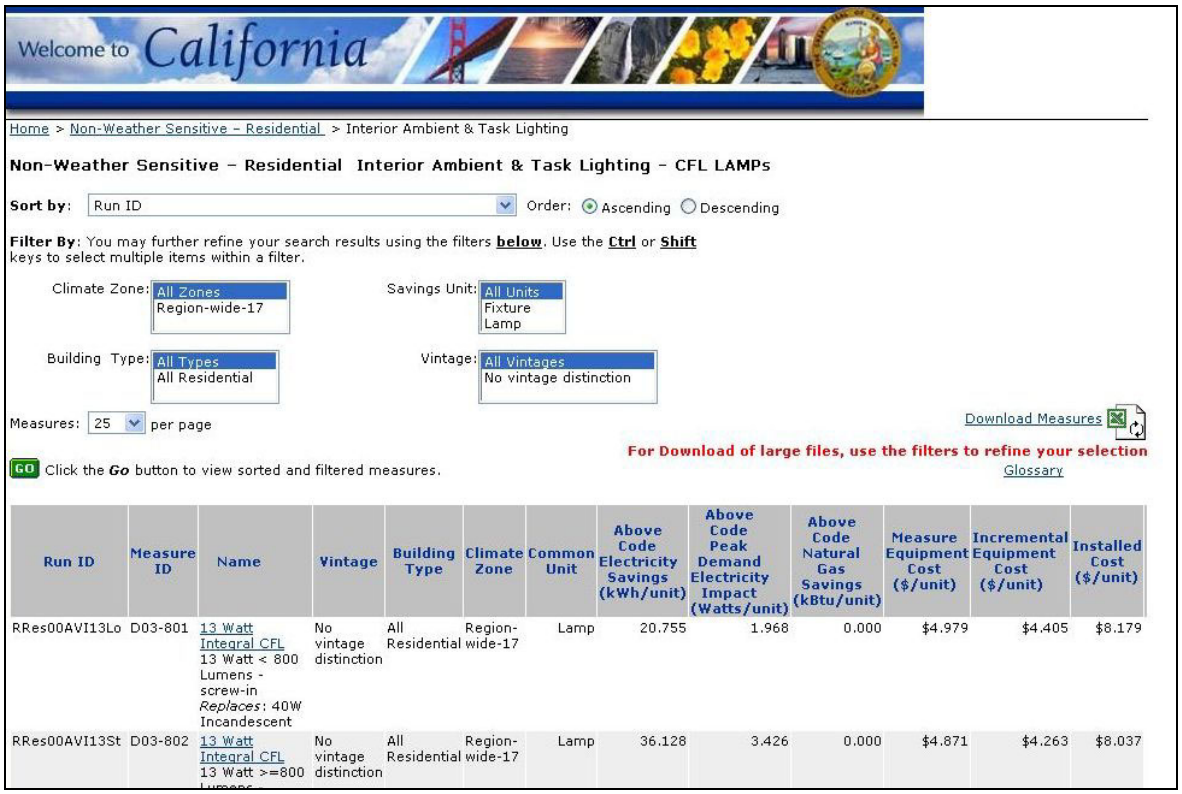
Figure 2 illustrates the screen for the measure category Residential Non-Weather-Sensitive Measures. Within this screen, measure subcategories are provided. Subcategories enable users to narrow the scope of their search to broad groups of measures or to a single measure.

Figure 2. DEER Website Residential Sector Non-Weather-Sensitive Screen

The DEER website displays selected measures in the browser window with additional filter options for refining the selection. Measures can then be downloaded in Microsoft Access or Excel.

Figure 3 illustrates selecting a measure group within a subcategory. Drilling down to the subcategory level, the website displays data for each measure in the category. Data can be further filtered by characteristics such as climate zone, building type, building vintage, and savings units. All results can be downloaded.

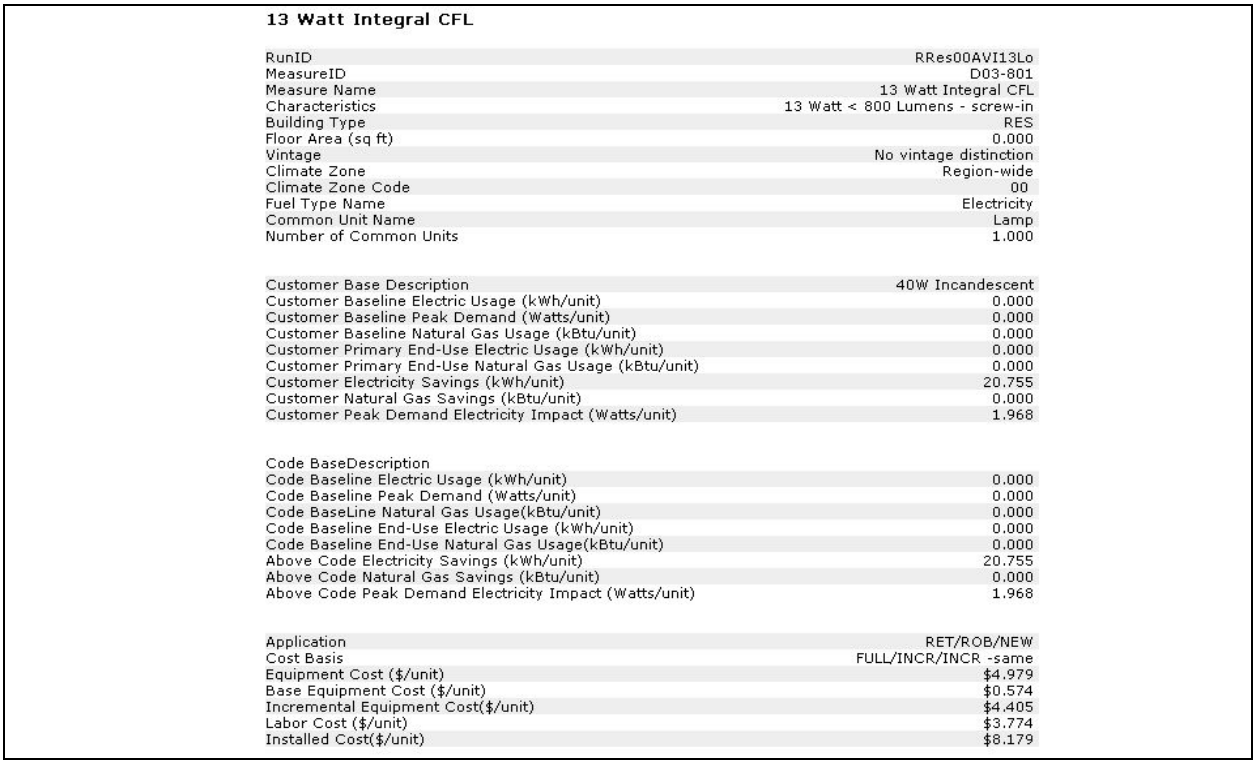
Figure 3. DEER Website Measure Summary Screen



Run ID	Measure ID	Name	Vintage	Building Type	Climate Zone	Common Unit	Above Code Electricity Savings (kWh/unit)	Above Code Peak Demand Electricity Impact (Watts/unit)	Above Code Natural Gas Savings (kBtu/unit)	Measure Equipment Cost ($/unit)	Incremental Equipment Cost ($/unit)	Installed Cost ($/unit)
RRes00AVI13Lo	D03-801	13 Watt Integral CFL 13 Watt < 800 Lumens - screw-in *Replaces*: 40W Incandescent	No vintage distinction	All Residential	Region-wide-17	Lamp	20.755	1.968	0.000	$4.979	$4.405	$8.179
RRes00AVI13St	D03-802	13 Watt Integral CFL 13 Watt >=800 Lumens -	No vintage distinction	All Residential	Region-wide-17	Lamp	36.128	3.426	0.000	$4.871	$4.263	$8.037

The final level of detail is illustrated in Figure 4. This figure illustrates the detailed information available for each specific measure in the database.

Figure 4. DEER Website Measure Detail Screen



13 Watt Integral CFL

RunID	RRes00AVI13Lo
MeasureID	D03-801
Measure Name	13 Watt Integral CFL
Characteristics	13 Watt < 800 Lumens - screw-in
Building Type	RES
Floor Area (sq ft)	0.000
Vintage	No vintage distinction
Climate Zone	Region-wide
Climate Zone Code	00
Fuel Type Name	Electricity
Common Unit Name	Lamp
Number of Common Units	1.000

Customer Base Description	40W Incandescent
Customer Baseline Electric Usage (kWh/unit)	0.000
Customer Baseline Peak Demand (Watts/unit)	0.000
Customer Baseline Natural Gas Usage (kBtu/unit)	0.000
Customer Primary End-Use Electric Usage (kWh/unit)	0.000
Customer Primary End-Use Natural Gas Usage (kBtu/unit)	0.000
Customer Electricity Savings (kWh/unit)	20.755
Customer Natural Gas Savings (kBtu/unit)	0.000
Customer Peak Demand Electricity Impact (Watts/unit)	1.968

Code BaseDescription	
Code Baseline Electric Usage (kWh/unit)	0.000
Code Baseline Peak Demand (Watts/unit)	0.000
Code BaseLine Natural Gas Usage(kBtu/unit)	0.000
Code Baseline End-Use Electric Usage (kWh/unit)	0.000
Code Baseline End-Use Natural Gas Usage(kBtu/unit)	0.000
Above Code Electricity Savings (kWh/unit)	20.755
Above Code Natural Gas Savings (kBtu/unit)	0.000
Above Code Peak Demand Electricity Impact (Watts/unit)	1.968

Application	RET/ROB/NEW
Cost Basis	FULL/INCR/INCR -same
Equipment Cost ($/unit)	$4.979
Base Equipment Cost ($/unit)	$0.574
Incremental Equipment Cost($/unit)	$4.405
Labor Cost ($/unit)	$3.774
Installed Cost($/unit)	$8.179

Future Updates

The 2004-05 update team paid considerable attention to recommendations for future DEER updates, addressing the inconsistent nature of previous updates and the need for more definitive update guidelines and criteria. This effort was led by Quantum Consulting. With regard to scheduling update projects, the team recommended that comprehensive updates be performed every three years with interim rolling updates occurring every six months or a year. The team also recommended that DEER maintain a clear orientation of savings development to guide its decision-making process. Future updates should continue to maximize the accuracy and consistency of per unit, ex ante savings data used in energy efficiency program planning and forecasting. The final DEER update report includes a detailed section addressing the DEER update plan.

References

NEOS Corporation, May 1994. *Final Report on Technology Energy Savings: Volumes I, II, and III*. California Energy Commission.

Xenergy Inc., August 2001. *2001 DEER Update Study Final Report*. California Energy Commission.