

Overview of EPRI's Load Management DataBase, Ver. 1

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The emergence of customer choice, competitive generation, and capacity shortages in the electric power industry have created renewed interest in load management (LM). While LM has been around for many years, current interest is expanding the concept from relying primarily on interruptible rates and direct control to more price-based mechanisms such as demand bidding and real-time pricing.

These new price-based approaches are more consistent with emerging power markets and promise to help these markets achieve a greater degree of supply-demand balance. They also provide consumers with additional opportunities to control their power costs.

To assist those involved in LM programs and those developing technologies to implement them, EPRI has developed the Load Management DataBase (LMDB). This web-based system (available through the www.epri.com website) synthesizes a wide range of available information on LM and consists of a pair of linked databases. One database focuses on a selection of the LM programs that have been implemented in the US and around the world, while the other focuses on the many types of technologies used in implementing LM programs. Both databases are accessible through a user-friendly interface and provide direct links to the program and technology websites that can often provide additional information. The information contained in Version 1 of the LMDB was collected during 2001.

This paper presents just a brief overview (including some abbreviated examples) of the data found in the LMDB's Program and Technology Databases. For further information about the database, contact Dr. William M. Smith of EPRI at 650/855-2415 (wmsmith@epri.com) or Paul C. Meagher of EPRI Worldwide at 650/855-2420 (pmeagher@epriww.com).

PROGRAM DATABASE

The Program Database contains a wide assortment of LM programs from around the world. Almost 100 programs are included, and 89 of these are currently being offered. For the others, some programs have been included for historical interest and some are still in the planning stage. Twenty-three percent of the programs are from outside North America, with the majority of those being from Asia. Attachment A provides a listing of the programs in the database.

EPRI intentionally included all of the major types of programs being offered, including the price-based programs that are among the newest LM approaches, as well as the more traditional program types.

For the purposes of this overview, the programs in the Program Database have been segmented by their primary Operational Objective. Three such objectives are discussed in this overview:

- *Price Response*, where the end-user controls loads in response to price signals that reflect current market conditions.
- *Peak Clipping*, where the program’s sponsor or end-user controls the load in response to either prescheduled or real-time system peak load or peak price conditions.
- *Load Shifting*, where the end-user controls the load in response to either prescheduled or real-time system load conditions, to shift usage to periods of lower load or lower price.

Table 1 presents an overview of the number of programs that fall into each of these categories for the major types of programs. It also presents the coverage by customer class associated with the programs. Note that many programs allow participation by more than one customer class.

Table 1
LM Program Coverage by Operational Objective and Program Type

Operational Objective	Program Type	# of Programs	# of Programs Covering the Sector			
			Res.	Comml.	Indust.	Other*
Price Response	Demand Bidding	31	0	28	29	8
	Real-Time Pricing	9	3	4	7	1
Peak Clipping	Appliance Cycling	28	22	8	3	2
	Interruptible Rates	18	0	10	17	4
Load Shifting	Time-of-Use Rates	5	3	2	2	1
	Thermal Energy Storage	5	3	2	3	2

* “Other” includes the agricultural and government/municipal sectors.

The next three subsections summarize the information included in the Program Database, organized by Operational Objective.

Price Response

Price response programs, which are driven by time-varying deregulated prices instead of by reliability considerations (which is the focus of most traditional LM programs), represent the newest and most dynamic form of LM. These programs offer customers

new types of service options, and from a system viewpoint, they provide valuable price links between wholesale and retail power markets.

The Program Database contains two types of programs that focus on price-response as their primary Operational Objective – demand bidding programs and real-time pricing (RTP) programs.

Demand Bidding

In demand bidding programs, medium and large customers are offered economic incentives to reduce loads when wholesale power costs are high. Generally, the incentives are a share of the power supplier’s avoided power-purchase costs, and in most cases the customer is under no obligation to offer a bid to reduce its load for any particular notification period.

In some programs, customers are provided a single incentive amount (on a cents/kWh basis) that they will receive for each kWh of curtailed energy during a notification period. Customers then bid the amount of energy they are willing to curtail during the specified times at that incentive amount. In other cases, customers can select both the specific price and the specific energy amount that they wish to bid. Once a bid is accepted, the customer is then generally obligated to perform the load reduction or face penalties.

The average per-customer potential load reduction for demand-bidding programs contained in the Program Database is 7.7MW. However, most of the programs have values in the range of .6MW to 4.5MW. Table 2 presents an example demand bidding program from the database.

Table 2
Example Demand Bidding Program

Program Description	Through this program, the sponsor posts prices by 9:00AM in order for participants to make pledges. Posted pricing is not a commitment until confirmed by the sponsor by 5:00PM the day before an event. Customer incentive offers are based on not less than 66% of the day-ahead market price. Customers must be able to reduce loads at least 100 kW for at least one hour at its service location. Customers are required to have an interval meter, Internet accessibility, and an available phone line to transmit load data.
Applicable Season	All Year
End-User Class(es)	Commercial & Industrial
Number of Participants	18
Estimated Load Reduction Potential	21MW
Incentives	Payment not less than 66% of the day-ahead market price

Real-Time Pricing

RTP is another form of price response program that can help to link wholesale and retail power markets. They suppress demand during high-price periods and can encourage consumption during low-price periods. Non-residential RTP programs have been implemented in many areas throughout the US and in some cases have involved very large numbers of participants.

Program participants normally receive day-ahead notification of the real-time prices and these communications are most often provided through the Internet. The average estimated per-customer load impact of the non-residential RTP programs in the Program Database is 600kW. Table 3 presents an example RTP program.

Table 3
Example Real-Time Pricing Program

Program Description	This program allows participants to manage electric costs by shifting energy usage from higher cost to lower cost pricing periods and adding new load during lower cost pricing periods. Internet is used to convey RTP prices and individual customer load data. Customer is responsible for interval meter and phone line if not already installed as part of standard tariff.
Applicable Season	All Year
End-User Class(es)	Commercial & Industrial
Number of Participants	170
Estimated Load Impact	45MW
Incentives	Special Tariff

While the residential sector is not well represented with respect to the traditional approaches for implementing RTP, the Program Database includes several programs that offer residential customers a form of RTP. These might be called “dispatched time-of-use” programs in which pre-arranged TOU rate schedules are arranged for different types of days (e.g., normal, high load, and critical load). Customers are notified that a particular rate schedule will be in effect on the following day and a communication link with the customers’ meters is activated to modify the daily rate structure.

The TEMPO program of Electricite de France (EdF) is based on this concept. Using a power line carrier, EdF can signal the customer’s meter to charge high-load prices on up to 43 days and critical-load prices on up to 22 days. EdF has measured a load impact of 1kW per customer for this program. These types of approaches, which are based on fairly inexpensive technologies, may offer a cost-effective mechanism for tapping the price-response potential for the residential sector.

Peak Clipping

Peak clipping has been the major focus of traditional LM efforts and it is the most-often reported objective in the Program Database. Appliance cycling programs represent the

majority of the programs falling under this objective, while interruptible rates account for most of the remaining programs.

Appliance Cycling

Appliance cycling has traditionally been an important part of LM in the US and elsewhere around the world. These programs have often provided residential customers with one of the few opportunities to participate in LM programs.

While many programs have been discontinued or scaled back, some large-scale programs continue to play a significant role today. Some programs in the Southeast US, for example, continue to have as many as 450,000 participants and have the capability to reduce hundreds of megawatts. The average per-participant summer load reduction reported for residential appliance cycling programs is .85kW. Incentives for these types of programs average about \$7/month. An example appliance cycling program is presented in Table 4.

Table 4
Example Appliance Cycling Program

Program Description	Program allows for cycling of a participant’s heat pump or central air conditioner on and off in 15 minute intervals during periods of high demand for electricity. Participants may receive up to \$40 annually through the program (\$10 for each of the billing months June-September).
Applicable Season	Summer
End-User Class(es)	Residential
Number of Participants	243,990
Measured Load Impact	239MW
Incentives	\$10/month for four summer months

Interruptible Rates

Interruptible rate programs represent another traditional form of LM that continues to be important. Many of these programs were called into service around the US during capacity-short periods in recent years and provided large amounts of load relief.

Data reported in the Program Database indicate an average load reduction of 1.4 MW/participant for the traditional types of interruptible rate programs based on customer action to reduce loads. An example interruptible rate program is shown in Table 5.

One program reported in the database that uses underfrequency relays to trip off customers during load emergencies reported a load impact of 73MW/customer.

Table 5
Example Interruptible Rate Program

Program Description	Participants agree to reduce load a minimum of 200kW after receiving a call from the sponsor. Calls will take place on maximum capacity days between 12 noon and 10 pm. The sponsor will only call 25 times or a maximum of 120 hours between mid May and mid September. If a participant fails to reduce load, a penalty is charged. If the sponsor does not call a participant, the incentive is still provided.
Applicable Season	Summer
End-User Class(es)	Commercial & Industrial
Number of Participants	21
Reported Load Impact	24MW
Incentives	\$40/kW annually

The largest load impact of any interruptible rate program included in the Program Database is from Taiwan Power Company. That company's program involves more than 550 customers and produces 1,160 MW of load relief during curtailment periods. To achieve this market penetration, Taiwan Power offers seven different variants of interruptible rates to match the needs of different types of customers.

Load Shifting

The programs in the database with the primary objective of Load Shifting fall into two categories: TOU Rates and Thermal Energy Storage.

Several of the TOU programs in the database include the residential sector, a sector that has not traditionally been the focus of TOU programs. One utility has implemented a program involving 300,000 residential customers on TOU pricing.

Of the five thermal energy storage programs in the database, three involve incentives to either purchasers or manufacturers of ice storage systems. The remaining two programs focus on the promotion of residential-sector storage water heating systems.

Summary

Databases previously developed by EPRI have documented the evolution of traditional LM programs such as appliance cycling, interruptible rates, and TOU rates. These program types, which have largely focused on improving system reliability, continue to form the backbone of the programs currently in place and are included in the Program Database. This new database also describes many of the commercial/industrial price-based demand response programs that have been developed in recent years. These programs are more consistent with evolving power markets and are helping to level the playing field between supply-side and demand-side resources.

Unlike the more-mature traditional LM programs, the price-based programs are still in a relatively early stage of development. For example, almost all the demand bidding programs in the database were initiated in 2000 or early 2001. By contrast, many of the appliance cycling and interruptible rate programs in the database were initiated in the 1980s.

Generation capacity shortages and warm summer weather were responsible for the development of many of the demand bidding programs. During the summer of 2001, however, cool weather left these programs with relatively little operational experience to report. Future additions to the database will hopefully include more information on actual load impacts achieved through these programs.

The price-based programs have also been slowed by regulatory and market uncertainties. In some areas, sponsors have faced challenging and changing regulatory policies that have complicated program planning and implementation. In addition, questions about future generation capacity, load forecasts, and regional market prices have presented additional uncertainties for both program sponsors and program participants.

The Program Database also reflects the increased importance of new types of LM sponsors. For example, the new database includes 10 programs sponsored by organizations such as ISOs and demand-response aggregators. Given current regulatory directions and the continued evolution of power markets, it is likely that a further expansion of involvement by these types of sponsors will be seen in the future.

The expansion of price-based programs is opening LM opportunities not only for larger customers, but for medium-sized C/I customers and for smaller customers as well. Ubiquitous communication structures/backbones and cheaper metering systems have extended the scope of customers that can be cost-effectively included in such programs. Many of the demand bidding programs shown in the Program Database, for example, have minimum load reduction requirements of 100kW or less. In addition, as noted earlier, “dispatched TOU” programs are providing a simplified form of price-based LM for the residential sector.

LM TECHNOLOGY DATABASE

Technologies involving communications, meters, load control, and/or computer software are essential to the operation of virtually all types of LM programs. For example, a demand bidding program requires several of these types of technologies. Interval metering is needed for the verification of load reductions. A communication system is required for customer notification and response to the bid offer (and also sometimes for transmittal of load data during and/or after curtailments). Software is needed for handling various components of a program, including the bidding process, verification of load response, calculation of incentives, etc.

To help those involved in the design and implementation of LM efforts, the LMDB includes a database on available technology products. This database provides information on more than 45 products that can be employed in a variety of LM-related applications. Attachment provides a listing of these products.

Table 6 presents the numbers of products included in the database, sorted by Technology Type, that are associated with specific applications. For example, 18 of the communication products are associated with metering applications. Note that many products in the database fall into more than one Technology Type and are associated with more than one application.

Table 6
Applications of LM Technologies Covered in the Database

Application	Number of Technology Products in the Database Associated with the Technology Type and Application			
	Commun. Technology	Meter Technology	Control Device Technology*	Software Technology
Metering	18	11		1
AMR	18	11		2
Interruptible Rates	4	1	2	6
Demand Bidding	6		1	4
Backup Generation	2	1		1
RTP	7	1	5	4
TOU Rates	9	4	8	2
Appliance Cycling	5		11	1
Energy Analysis	1			6
Equipment Monitoring	1			
Process Control				1
Conservation	1		1	

* Includes programmable controllers, cycling controllers, and thermostats.

The next four subsections summarize the information included in the Technology Database, organized by Technology Type.

Communication Technology

As demonstrated by Table 6, communication technology is an important aspect of many different LM applications. Reliable communication to customers of price signals, curtailment notifications, and control commands is crucial. Similarly, communication of energy usage data, acknowledgements, etc. back from the customer is also important for many types of programs.

The Technology Database includes systems employing various types of communication vehicles such as the Internet, paging, radio, phone lines, power line carrier, cellular, etc. Of these, radio is the most-often cited form of communication, but power line carrier and the Internet are also frequently mentioned in the database.

The communication technologies included in the database are associated with up to five communication functions. Table 7 shows the number of entries associated with each function.

Table 7
Functions Associated with the Database’s Communication Technologies

Function	# of Entries
Data Collection	31
Monitoring	26
Control	21
Notification	13
Data Presentation	12

The benefits of many of the communication technologies in the database go beyond just the implementation of the LM program at hand. Those associated with data collection and monitoring can help energy providers and LM program sponsors to better understand their customers’ energy usage patterns. This, in turn, can lead to more-effective LM programs and greater customer satisfaction with the programs.

Table 8 includes a communication technology example from the database.

Table 8
Example Communication Technology

Product Description	Provides utilities and their commercial energy customers full two-way secure communication and continuous access to meter data via the Internet. The site unit can be queried from any computer with an Internet connection using a standard browser. Using the Internet reduces costs, making Automated Meter Reading (AMR) and its associated services more economically viable for commercial accounts. The unit acquires pulse output
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	via three standard channels from either single-phase or poly-phase meters in various formats. The system's software functions by accessing the meters in a predetermined, programmable order via the Internet, to collect specified data.
End-User Class(es)	Commercial & Industrial
Application Types	Metering, AMR, TOU Rates, Real-Time Pricing
Communication Medium to User	Dial-Up Internet
Communication Medium from User	Dial-Up Internet
Commun. Function	Data Collection

Meter Technology

Metering approaches, such as interval metering, are key elements in the implementation of various types of LM programs. While the cost of interval metering has hampered the implementation of LM, efforts are underway in certain parts of the country to expand the number of interval meters among medium-sized customers. In addition, improvements in metering and communication technologies and the broader application of these technologies will help to bring down costs.

The meter-related products in the Technology Database cover a wide range of types, from specific meters to complete systems with modular designs that include integral communications & software components. Table 9 includes an example meter technology from the database.

Table 9
Example Meter Technology

Product Description	Load profile meter displays kWh, kW with peak date and time, real-time kW, amps per phase, and volts per phase. The meter is capable of interfacing with other types of utility meters including water, gas, etc. An energy monitoring systems allows users to read and monitor energy consumption via on-site or off-site non-dedicated computers and generate graphs and profiles of usage for demand analysis and usage reduction.
End-User Class(es)	Commercial & Industrial
Application Types	Metering & AMR
Communication Medium to User	Phone, Dial-Up Internet, & Wireless Internet
Communication Medium from User	Phone, Dial-Up Internet, & Wireless Internet
Commun. Function	Monitoring & Data Collection

Control Device Technology

The Technology Database includes three forms of load control devices -- programmable controllers, cycling controllers, and thermostats. As can be seen in Table 6, many of

these devices can be applied to appliance cycling programs. These devices are generally not, however, the simple radio switches of traditional residential direct load control programs. Many incorporate a greater level of local intelligence and allow greater functionality than the traditional systems.

Also as noted in Table 6, many of the load control devices are associated with applications in TOU or RTP programs. When used in conjunction with one of these types of programs, a control device can help to leverage the program's impacts beyond what would normally be available with just human interaction to reduce load. Table 10 presents an example of this type of device from the database.

Table 10
Example Control Device Technology

Product Description	A full featured Internet programmable thermostat with various built-in load control features. It is custom manufactured to fit into the LM program design. The sponsors of LM programs using this technology may remotely control each customer's HVAC equipment via a paging system in the event of high demand in a particular territory. This device also allows customers to remotely program a thermostat via the Internet & a user-friendly interface.
End-User Class(es)	Residential, Commercial, & Industrial
Application Types	Appliance Cycling & TOU Rates
Control Type	Direct & Indirect
Control Activation Method	Sponsor Activated & User Programmable
Communication Medium to User	Pager & Internet
Communication Medium from User	None
Commun. Function	Control

Computer Software Technology

With increases in the amount of load, price, and other data that need to be processed, the need for tools that can transform volumes of data into useful information has become crucial. To help meet this need, a variety of modular software systems have been developed and are commercially available. Some of these can perform a wide range of energy analysis, load forecasting, energy management, reporting, and other functions. Other software systems focus on narrower tasks such as process control within a facility or managing the operation of an appliance control program.

The Technology Database contains a sampling of software systems that relate to LM applications. Table 11 presents an example of one such system.

Table 11
Example Software Technology

Product Description	A complete set of software for metering and managing demand on the distribution system. It can be used by an energy service company to collect meter data and control peaks or by corporate customers and meter data companies to aggregate and control load across multiple facilities. The system can be purchased in four ways: stand-alone, server, enterprise, or through subscription to an e-business service. The system supports a variety of communications technologies, including radio, paging, power line carrier, dial up meters, and telephone. Multiple communications channels can be distributed on a LAN, WAN, intranet, or Internet using terminal services.
End-User Class(es)	Commercial & Industrial
Application Types	Metering, AMR, Interruptible Rates, Demand Bidding, & Energy Analysis
Communication Medium to User	Various
Communication Medium from User	Various
Commun. Function	Various

Summary

The various types of LM programs found around the world require a wide range of technologies. Manufacturers and software developers have responded to these needs with a broad range of enabling technologies and systems, and a sampling of these are included in the Technology Database. These include enterprise-wide energy management systems, metering technologies, communication approaches, smart load control devices, and others.

The new technologies have made it feasible to implement LM programs for a broader range of customers. Widely available and cheaper communication systems, for example, have been especially helpful in opening new markets for LM. Many of the communication technologies included in the database use the Internet, which offers an inexpensive and widely available medium. In addition, AMR technology can be used to implement the metering needed for residential TOU rates and could also be used to collect data for “dispatched TOU” approaches for the residential sector.

At a customer’s site, intelligent devices can be a substantial benefit to LM programs. Systems that can be programmed to respond automatically to changing conditions can help to improve a program’s performance and enhance customer satisfaction.

Future updates of the LMDB’s Technology Database will likely include new types of systems that offer LM program sponsors even greater flexibility with their program designs and implementation approaches.

Attachment A

Listing of Programs in the LMDB's Program Database

Program Sponsor	Program Name	Program Type
Alaska Electric Light and Power Company	The Great Rebate	Appliance Cycling
Ameren	Customer Energy Exchange	Demand Bidding
Baltimore Gas and Electric	Energy Saver Switch	Appliance Cycling
Baltimore Gas and Electric	Controlled Water Heating Service	Appliance Cycling
Baltimore Gas and Electric	Load Response Program	Demand Bidding
Black Hills Power	Residential Demand Controller Program	Appliance Cycling
Bonneville Power Administration	Demand Exchange Program	Demand Bidding
Buckeye Power	Load Management Program	Appliance Cycling
California ISO	Demand Relief Program	Demand Bidding
California ISO	Discretionary Load Curtailment Program	Interruptible Rate
California ISO	Voluntary Load Curtailment Program	Interruptible Rate
California ISO	Participating Load Program	Demand Bidding
Cinergy	Real Time Pricing Program	Real-time Pricing
Cinergy	PowerShare	Demand Bidding
ComEd	Nature First	Appliance Cycling
ComEd	Voluntary Load Reduction	Demand Bidding
Detroit Edison	Air Share	Appliance Cycling
Dominion Virginia Power	Economic Load Curtailment	Demand Bidding
Duke Power	Residential Load Control	Appliance Cycling
Duke Power	Curtailable Service Pilot	Interruptible Rate
Electricite de France	TEMPO	Real-time Pricing
Electricite de France	EJP	Real-time Pricing
Electrobras	Demand Controller	Appliance Cycling
Entergy Gulf States, Louisiana, and Arkansas	Market Valued Call Option	Demand Bidding
Entergy Gulf States, Louisiana, and Arkansas	Market Valued Energy Reduction	Demand Bidding
Entergy Gulf States, Louisiana, and Arkansas	Experimental Energy Reduction	Demand Bidding
Eskom	Real Time Pricing Option for Industrial Customers	Real-time Pricing
Eskom	Hot Water Cylinder Load Control using Local Municipalities	Thermal Energy Storage
Fingrid System Oy	Disconnectable Loads	Interruptible Rate
Florida Power	Energy Management	Appliance Cycling
Florida Power and Light	Business On Call	Appliance cycling
Florida Power and Light	Residential On Call	Appliance cycling
Georgia Power	Daily Energy Credit	Demand Bidding

GPU Energy	Morning Ahead Volunteer Load Reduction	Demand Bidding
GPU Energy	Afternoon Ahead Volunteer Load Reduction	Demand Bidding
GPU Energy	Day-of Voluntary Load Reduction	Demand Bidding
Gulf Power	Good Cents Select	Real-time Pricing
Idaho Power	Energy Exchange	Demand Bidding
ISO New England	Demand Response Program	Demand Bidding
ISO New England	Price Response Program	Demand Bidding
Kansas City Power and Light	Voluntary Load Reduction	Demand Bidding
Kansas City Power and Light	Peak Load Curtailment	Interruptible Rate
Kansas City Power and Light	Real Time Pricing	Real-time Pricing
Korea Electric Power Company	Air Conditioner Direct Load Control Program	Appliance Cycling
Korea Electric Power Company	Summer Vacation and Repair Program	Interruptible Rate
Korea Electric Power Company	Distribution of Ice Storage Cooling System	Thermal Energy Storage
Kyushu Electric Power Company	Centralized Load Control Test	Appliance Cycling
Louisville Gas & Electric	DSM Demand Conservation Program	Appliance Cycling
Minnesota Power	Dual Fuel	Dual Fuel Heating
Minnesota Power	Storage/Off-Peak Heating	Thermal Energy Storage
Otter Tail Power	REAP	Demand Bidding
Pacific Gas and Electric	Demand Bidding Program	Demand Bidding
Pacific Gas and Electric	Base Interruptible Program	Interruptible Rate
Pacific Gas and Electric	Optional Binding Mandatory Curtailment Plan	Interruptible Rate
Pacific Gas and Electric	Scheduled Load Reduction Program	Interruptible Rate
PacifiCorp	Energy Exchange	Demand Bidding
Pepco	Kilowatchers Club	Appliance Cycling
Pepco	Kilowatchers Plus	Appliance Cycling
Pepco	MMA Kilowatchers	Appliance Cycling
Pepco	Kilowatchers Water Heater Program	Appliance Cycling
Planergy International Inc.	Demand Response Program	Demand Bidding
Portland General Electric	Demand Buy Back Program	Demand Bidding
PPL	Demand Side Initiative Rider	Real-time Pricing
Public Service of New Hampshire	Heat Smart	Appliance Cycling
Puget Sound Energy	Voluntary Load Curtailment Service	Demand Bidding
Puget Sound Energy	Time of Day Pricing	Time of Use Rate
Red Electrica de Espana	Interruptible Rates	Interruptible Rate
Reliant Energy	Hourly Variable Pricing Program	Real-time Pricing
San Diego Gas and Electric	Demand Bidding Program	Demand Bidding
San Diego Gas and Electric	Scheduled Load Reduction Program	Interruptible Rate
San Diego Gas and Electric	Optional Binding Mandatory Curtailment Program	Interruptible Rate
San Diego Gas and Electric	Base Interruptible Program	Interruptible Rate
SINTEF Energy Research	Residential EBox	Appliance Cycling

Southern California Edison	Air Conditioning Cycling Program	Appliance Cycling
Southern California Edison	Voluntary Demand Response Program	Demand Bidding
Southern California Edison	Beat the Peak	Interruptible Rate
Statnett	Reservation of Reserves in the Regulating Power Market	Interruptible Rate
Swedish National Grid Company	Industribud (Industrial Bids)	Demand Bidding
Taiwan Power Company	Central Air Conditioning and Packaged Air Conditioning Duty Cycling Control	Appliance Cycling
Taiwan Power Company	Paging System in Central Air Conditioner Duty Cycle Control in Northern Taiwan Area	Appliance Cycling
Taiwan Power Company	Interruptible Rates	Interruptible Rate
Taiwan Power Company	Mobile on-peak TOU rate	Real-time Pricing
Taiwan Power Company	Ice Storage Central Air-Conditioning System	Thermal Energy Storage
Tampa Electric	Load Management Program	Appliance cycling
Tennessee Valley Authority	Variable Price Interruptible	Interruptible Rate
Tokyo Electric Power Company	Large Customer Interruptible Program	Interruptible Rate
Tokyo Electric Power Company	Incentive Payment for Popularization of Ice Storage Air-conditioning System	Thermal Energy Storage
Tucson Electric Power	Time of Use Rate	Time of Use Rate
Wisconsin Electric	Dollars for Power	Demand Bidding
Wisconsin Electric	Power Market Incentives	Demand Bidding
Wisconsin Electric	PMI Pool	Demand Bidding
Wisconsin Public Service Corporation	HELP	Appliance Cycling
Wisconsin Public Service Corporation	Time of Use Electric Savings Option-Business	Time of Use Rate
Wisconsin Public Service Corporation	Time of Use Electric Savings Option-Farm	Time of Use Rate
Wisconsin Public Service Corporation	Time of Use Electric Savings Option - Residential	Time of Use Rate
Xcel Energy	Saver's Switch-Residential	Appliance Cycling
Xcel Energy	Saver's Switch-Business	Appliance Cycling

Attachment B	
Listing of Products in the LMDB's Technology Database	
Technology Supplier	Technology Product Name
ABB	Energy Profiler
ABB	DartNet
Cannon Technologies	Traditional Load Management
Cannon Technologies	Automated Metering & Aggregation
Cannon Technologies	Yukon
Carrier	Chillervisor
Comverge Technologies	MainGate
Comverge Technologies	EPSM
Comverge Technologies	DCUS
Comverge Technologies	CDC II
Comverge Technologies/Honeywell	SuperStat
Echelon Corporation	LonWorks
Electro Industries, Inc.	Peak Interrupter Panel
E-MON Corpotation	E-MON Meters
EnerLink, A Division of SCT	Enerlink
Hexagram Inc.	STAR AMR
Innovatec Communications LLC	Axis Path
Itron	Telephone-based Meter Modules
Itron	ERT Radio-based Meter Modules
Itron	Fixed Network AMR
Itron	MicroNetwork AMR
Itron	C&I Network
Itron	Telephone AMR
Lightstat Inc.	RTPstat
Lightstat Inc.	i-stat
muNet Inc.	WebGate iRIS
muNet Inc.	WebGate™ iCIS
NERTEC Inc.	AMR Station
NERTEC Inc.	RM 100 ARM Modem
NERTEC Inc.	Gateway Modem TR 800 Family
NERTEC Inc.	CellReader
NERTEC Inc.	TELEREADER
NexusData, Inc.	Fixnet

Notifact	The Notifact Monitoring System
RETX	Load Management Dispatcher
Sage Systems	Aladn
Schlumberger	UtiliNet
Schlumberger	CellNet
Scientific Atlanta	Digital Control Unit
Siemens Power Transmission & Distribution LLC	Spectrum PowerCC EC
Silicon Energy Corp.	EEM Suite
Silicon Energy Corp.	Curtailement Manager
Silicon Energy Corp.	Energy Analyst
Silicon Energy Corp.	Forecasting
Sixth Dimension	Intelligent Network
SmartSync Inc.	SmartMeter
SmartSynch, Inc.	SmartSynch