# Completed Reports

### *Fast DR: Demand Response and Ancillary Services*

This report explores the relatively new concept of using of Fast-DR resources as an ancillary service which can be integrated into ISO and RTO wholesale markets on par with generation. We investigate the different types of ancillary services, and how Fast-DR can provide those services to the market. We also summarize the recent Participating Load Pilot in the CA ISO taking a close look at results, barriers, and lessons learned.

GEP-LAMS-007, September 2011 (38 pp)

### *Price Elasticity of Demand in Econometric Models*

The own-price elasticity of demand for electricity is notoriously difficult to estimate in econometric models outside of carefully structured studies. However, elasticity is often of interest, especially to management. In this report, we will explore why price elasticity is so difficult to estimate and suggest viable solutions for forecasters and modelers.

GEP-LAMS-006, August 2011 (43 pp)

### *The Brave New World — Developing and Evaluating Integrated DSM Programs*

Faced with options ranging from energy efficiency (EE) programs to demand response (DR) programs to new rate structures, how are consumers to decide what is best for their homes and businesses? From the utility perspective, the emerging world of smart grid technologies and devices all must work in an integrated fashion to incent appropriate customer behaviors and deliver reliable demand-side resources. In this emerging landscape, it no longer makes sense to think of energy efficiency separately from demand response, and utilities and their regulators are now moving toward integrating these programs to take advantage of synergies and better serve customers. We suggest ways the industry can address these obstacles, including modifying regulatory goals and structures, integrating programs and incentives, educating consumers, and implementing codes and standard that advance not only EE but DR as well.

GEP-LAMS-005, February 2011 (38 pp)

### *Integrating DSM into Energy Forecasts — Issues and Potential Solutions*

This report addresses the topic of integrating Demand Side Management (DSM) impacts into load forecasting models. In general, we consider the entire continuum of demand side activities part of DSM, including demand response (DR), energy efficiency (EE), and permanent load shifting. However, specific details presented here primarily focus on the more challenging task of integrating energy efficiency into forecasts. First, we explore the issues surrounding why it is important to integrate DSM impacts into load forecasting models. Second, we address the more traditional methods currently used in the industry to integrate DSM impacts and the pros and cons of each method. Finally, we look to those in the industry using new or innovative methods to integrate DSM impacts.

GEP-LAMS-004, November 2010 (36 pp)

### *Residential End-Use Metering — Can AMI Get In the Door?*

This report focuses on end-use metering in the residential sector and how the advent of AMI might enable more end-use studies in the future. We also address some of the technical challenges utilities face in end-use metering and how AMI may or may not address those challenges. We gathered information and opinions on end-use metering from both utilities and vendors through in-depth interviews. We also asked both vendors and utilities about the technical challenges that we will face integrating AMI and smart meters with end-use metering. Finally, we include two case studies of end-use metering projects currently being conducted in the industry.

GEP-LAMS-003, July 2010 (30 pp)

### *AMI Implementation Update: Load Research Using AMI Data — Are We There Yet?*

For this report we interviewed individuals at utilities that are in the process of – or have just completed – installing AMI systems throughout their service territories. We provide insight into their experiences installing and implementing their AMI systems, as well as their experiences collecting, validating, storing, and using interval data for load research purposes.

GEP-LAMS-002, July 2010 (32 pp)

### *Demand Response — It's a Resource, So Treat It Like One!*

This report focuses on demand response (DR) as a resource and how impacts should be counted. The primary focus of the report is how DR events are treated in cost-of-service allocation, but it also includes program design and load forecasting/resource planning for context and background. We talked with ten utilities across the country to explore their experiences and thoughts on the counting of DR impacts. We also used actual data to examine, through in-depth examples, the consequences to cost-of-service allocations of counting DR impacts in different ways.

GEP-LAMS-001, December 2009 (36 pp)

### *Business Strategy: Impact of PHEV's on Utility Load Analysis*

This report explores some of the many ways that the increasing number of plug-in hybrid electric vehicles (PHEVs) will affect the utility industry. As they become more prevalent, PHEVs will impact customer energy use, load shapes, and utility system operations. If increased electricity usage is not managed through pricing and grid control, PHEV charging has the potential to negatively impact system peaks. On the other hand, if managed appropriately, it can increase off-peak sales and load factors, which are both beneficial to utilities.

EI219034, June 2009 (11 pp)

### *Best Practices: OG&E Weather Normalization Case Study*

This report explores the hourly weather normalization model developed by OG&E and Itron to address a PUC mandate to use the system peak hour for cost allocation. Most of the time, daily or even monthly weather normalization is adequate; however; due to a mandate from the public utility commission (PUC) for a one coincident peak (1CP) allocator, OG&E chose to develop an hourly weather normalization model in record time.

EI218619, June 2009 (14 pp)

### *Putting the "Control" in Direct Load Control*

This report examines the results of five industry studies testing various curtailment strategies. Many residential direct load control (DLC) programs are operated via switches installed on customers' air conditioners, but with increasing acceptance of programmable communicating thermostats (PCTs), many utilities are offering PCTs as alternatives to switches. The utility industry sometimes looks at the load impacts of different curtailment technologies on DLC programs since both the magnitude and the shape of the impact will differ based on technology. We go one step further. We examine the impact on energy savings, customer comfort, and customer acceptance different cycling strategies, for switches, and reset strategies, for thermostats.

EI218289, May 2009 (27 pp)

### *Peak Time Rebate's Dirty Little Secret*

This report reveals Peak Time Rebate's (PTR's) potential "dirty little secret" — many customers will get paid for doing nothing, based on normal random variations in their electricity use. PTR programs are known as carrot-only or win-win programs and are more easily approved by commissions; but while the program is good for customers it can pose problems for utilities.

EI217001, March 2009 (22 pp)

### *Energy Efficiency Provisions in the American Recovery and Reinvestment Act of 2009*

This Perspective discusses the American Recovery and Reinvestment Act (ARRA) of 2009 signed into law by President Obama, which has created quite a buzz in the energy industry. Many are calling the bill the green new deal, which it may be, considering it contains more than a $40 billion investment in the energy industry geared toward clean, efficient, and independent energy for America. The spending is focused on renewables, energy efficiency, smart grid, and alternate fuels.

EI217117, February 2009 (10 pp)

### *Beyond the Bill: In-Home Displays Deliver Energy Savings*

The fourth in a series of reports on in-home displays, this report examines the impact on residential electricity consumption of in-home display units. We summarize the results of three industry pilots and look at the results achieved by a utility program that incorporates an IHD. We also address the implications of these findings to both the residential electricity market and to utility companies considering IHD programs.

EI215949, January 2009 (20 pp)

### *Permanent Load Shifting with Ice Bear*

This document looks at the Ice Bear technology and how it enables commercial customers to shift load to off-peak hours. It also takes a look at two utility programs that use the Ice Bear technology.

EI215521, December 2008 (8 pp)

### *Load Forecasting Workshop Highlights*

This Update presents highlights from our second annual Load Forecasting Workshop held October 6–7, 2008 in Boulder, Colorado. The theme of this year's workshop was integrating demand side management program impacts into energy and demand forecasts.

EI215031, October 2008 (14 pp)

### *Load Forecasting Salary Survey*

This Update and the accompanying PowerPoint document present the results of the Load Forecasting Salary Survey. Subscribers can use these results to benchmark salaries and see how they compare with other utilities.

EI214596, October 2008 (3 pp report and 43 slide ppt)

### *DR Policy, Planning, and Programs — Highlights from 2008 Spring/Summer Conferences*

This Update presents conference highlights related to demand response (DR) policy and program design and implementation. The industry conferences held during the spring and summer of 2008 included a wide variety of presentations. Instead of summarizing the presentations from each conference separately, we have chosen to group the conference highlights by topic, focusing on one area for this Update.

EI214606, October 2008 (13 pp)

### *Can't We All Just Get Along? IT and Load Research Departments Play Nicely in the Post-AMI World*

AMR and AMI implementations challenge utilities by changing the way meter data is collected and analyzed and by forcing changes in the data storage, retrieval, and archival processes. This report pays special attention to the way load research and IT departments interact to address the challenges presented by collecting, accessing, and validating the much larger quantities of interval data gathered by AMR and AMI systems.

EI213945, August 2008 (15 pp)

### *Residential EMP Update*

We have updated our Residential Energy Market Profiles (EMP). The EMP provide summary information about U.S. energy use for major customer segments by end use and fuel, and are a key resource for forecasting, marketing, and program planning. This report summarizes the information in annual spreadsheets for 2001-2007 delivered with the report.

EI212916, June 2008 (5 pp and attached spreadsheets)

### *To Call or Not to Call: When to Call Demand Response Events*

Residential demand response programs come in many types and sizes, but they all have one thing in common: targeting demand reduction on particular event days. It is vital to carefully consider how event days will be called to maximize the probability of calling on the highest load days and achieve the largest load impact. We examined seven fully deployed demand response programs and two pilot programs across the United States and Canada to uncover a variety of methods for calling and allocating event days or hours.

EI212937, June 2008 (22 pp)

### *Load Research Salary Survey*

This Update and the accompanying PowerPoint document present the results of the Load Research Salary Survey. Load research requires a unique set of skills and experience that are not typically required elsewhere within the utility or in industry in general. As a result, human resources departments frequently have a difficult time correctly assigning load research positions to a predetermined set of utility job descriptions or pay grades, or even to compare with similar positions in other industries.

EI211713, April 2008 (3 pp report and 50 slide ppt)

### *What's Up in Load Research*

This Update provides highlights from the Western Load Research Association (WLRA) biannual conference held in late September in San Francisco. This Update also provides commentary on the recent acquisition of LODESTAR Corp. by Oracle and how it will affect LODESTAR users and future customers.

EI210081, January 2008 (13 pp)

### *Who Has What? Predictive Modeling Using Customer Billing Data*

Predictive modeling uses information that is known for a sample, combined with information that is known for the population overall, to create a statistical model for predicting something about all members of the population. This report first discusses three approaches to predictive modeling. Then it provides two case studies involving utility residential customers and showing how this approach predicted the presence of central air-conditioning in one case and electric heat in another.

EI208062, August 2007 (26 pp)

### *What's New with Demand Response*

In this Update, we provide highlights and note trends emerging from the U.S. Demand Response Coordinating Committee's (DRCC's) fourth National Town Meeting on Demand Response, held in April 2007. We also discuss the growing use of backup generators to provide demand response (DR), including programs run by utilities and third-party aggregators. Finally, we summarize a couple of recent noteworthy reports on DR.

EI207696, July 2007 (18 pp)

### *Energy Efficiency and Demand Response: Separate Efforts or Two Ends of a Continuum?*

The typical approach to energy efficiency and demand response is to identify technologies and programs to pursue on a piecemeal basis. Utilities and regulators rarely assess how these programs interact with one another, which can limit opportunities and, hamstring implementers, and confuse customers. In this report, we advocate looking at these programs in an integrated fashion that considers energy company objectives, the customers' needs and wants, and how to achieve better outcomes.

EI206183, April 2007 (18 pp)

### *Managing AMI Data*

With the installation of automated meter reading (AMR) and advanced metering infrastructure (AMI) systems comes the promise of more and better customer information, particularly interval data. But are these systems delivering on those promises? We share insights gathered from utilities that have installed AMI systems and provide recommendations on how load researchers should get involved in the AMI decision-making and implementation process.

EI204967, January 2007 (10 pp)

### *Time-of-Use and Critical Peak Pricing: Considerations for Program Design*

This report identifies key considerations for residential time-of-use (TOU) and critical peak pricing (CPP) rate design. It discusses how enabling technologies such as programmable communicating thermostats can support these rates. It summarizes results of existing program evaluations and provides insights from interviews with 11 utilities that have implemented pilots or programs.

EI204569, December 2006 (20 pp)

### *FERC's Assessment of Demand Response and Advanced Metering*

This Perspective examines and summarizes the Federal Energy Regulatory Commission (FERC) report "Assessment of Demand Response and Advanced Metering," which the FERC prepared as mandated by The Energy Policy Act of 2005.

EI204026, October 2006 (15 pp)

### *National Town Meetings on Demand Response: Highlights and Analysis*

This Update provides highlights from a series of national "town meetings" on demand response (DR) to foster information sharing among the leading organizations involved in implementing DR programs. This report focuses on the third town meeting but also includes related insights from the earlier sessions.

EI204002, October 2006 (17 pp)

### *Energy Market Profiles 2006*

The Energy Market Profiles (EMP) provide a snapshot of annual energy use by end use and fuel and region for major customer segments in the commercial, residential, and manufacturing segments. These spreadsheets are both a valuable reference for quickly defining energy-use patterns for individual customer segments and provide a solid foundation for a variety of market analysis tasks, including program planning and evaluation.

EI203651, September 2006 (.xls spreadsheet files)

### *WLRA and AEIC Conference Summaries*

This Update shares our insights from the Western Load Research Association Spring 2006 conference and the Load Research Committee of the Association of Edison Illuminating Companies Annual Workshop, where presentations highlighted load research practices and policies, demand response, pricing, and weather analysis.

EI203423, September 2006 (11 pp)

# Completed Reports

### *Gas Load Forecasting*

How can gas load forecasters overcome challenges due to volatile prices, "demand destruction," and insufficient historical data for modeling price elasticity? This report offers insights garnered from discussions with forecasters, as well as suggestions for improving business processes.

EU-PP-20-06, July 2006 (14 pp)

### *How Hot Was It?*

“How hot was it?”—or more appropriately perhaps, “How hot will it be?”—is more than a rhetorical question when it comes to forecasting energy use or developing load shapes. This report reviews the various methods analysts use to develop typical and extreme weather year data and provides insights on their pros, cons, and applications.

EU-SR-17-05, March 2006 (36 pp)

### *Load Impacts of Distributed Energy*

New applications for distributed energy have been emerging in both the residential and C/I sectors. This report reviews these technologies and analyzes how their increased use could affect individual and system loads.

EU-SR-16-05, January 2006 (38 pp)

### *Planning and Design Issues for Residential Direct Load Control Programs*

Ensuring a new demand response program will cost-effectively deliver sustainable savings requires methodical planning. This report details steps for successful program design, using four load control programs as case studies.

EU-PP-19-05, December 2005 (25 pp)

### *The Impact of Tankless Water Heaters*

Tankless water heaters are growing in popularity, thanks to their greater efficiency, compact size, and promise of “never running out of hot water.” However, the high demand of some electrical units raises potential issues for utility distribution systems.

EU-SR-15-05, November 2005 (32 pp)

### *Distribution Equipment Sizing*

Applying load research data—beyond just the peak load—enables properly sizing distribution system equipment to reduce costs and insure reliability.

EU-PP-18-05, October 2005 (21 pp)

### *Energy Use Update: Smart Metering Mandates in the Energy Policy Act of 2005*

This Update investigates the implications of Section 1252 of the Energy Policy Act of 2005, including the requirement that, within 18 months of the law's enactment, utilities must offer customers the option of being on a time-based rate.

EI202743, September 2005 (8 pp)

### *Load Research Sample Design*

By making informed decisions during the sample design process, load researchers can help ensure that a study achieves its objectives and cost-effectively provides valid results. This report discusses the issues affecting sample design and includes illustrated, step-by-step procedures, based on an actual load research sample design.

EU-SR-14-05, August 2005 (29 pp)

### *Energy Use Update: Real Time Energy Feedback, Enabling Technology for Demand Response*

This Update provides highlights from a recent conference on the effects of providing energy use feedback to customers, available technologies for doing so, and pilot programs that are putting feedback to work. We also look at the role of enabling technology in demand response programs for small businesses.

EI202739, July 2005 (10 pp)

### *Comparing Load Shapes*

Two load shapes may appear different, but from a statistical point of view, are they really different? How much of a difference matters?

EU-PP-17-04, June 2005 (16 pp)

### *Demand-Side Options for T&D Relief*

Faced with high costs for expanding T&D assets in certain locations, utilities are experimenting with using demand-side resources to provide targeted relief to constrained T&D systems.

EU-SR-13-04, June 2005 (35 pp)

### *Trends in Residential Energy Use*

Spurred by ongoing population growth and new electricity-consuming appliances, U.S. residential energy use continues to climb upward. This report drills down through the data to understand the trends over the past 20 years, and how energy use is likely to change between now and 2010.

EU-SR-12-04, April 2005 (31 pp)

# Completed Reports

### *New Options for Interval Load Data Collection*

New choices are emerging for interval data collections tools. This report reports on the evolution of these tools and shares insights from interviews with the major companies offering products for the North American market.

EU-PP-16-04, March 2005 (26 pp)

### *Residential Air Conditioning: Impacts and Responses*

U.S. air conditioning use continues to rise, with repercussions upon load shapes, peak demands, load forecasting, and distribution systems. What options do utilities have for addressing this trend?

EU-SR-11-04, January 2005 (43 pp)

### *Interval Data Over AMR*

Automated meter reading (AMR) has the potential to allow cost-effectively collecting interval data, but can also create problems for load researchers. This report outlines how to take advantage of AMR's potential benefits while avoiding its pitfalls.

EU-PP-15-04, September 2004 (18 pp)

### *Building Simulation Tools*

Today's building simulation tools, with user-friendly interfaces and dynamic defaulting, can be applied to a wide range of load research and forecasting functions.

EU-PP-14-04, June 2004 (25 pp)

### *Elasticity and Time-of-Use Pricing*

We consider the economic concept of elasticity, which describes how changing prices affect product demand, and discuss its application to energy use, particularly time-of-use and critical peak pricing programs.

EU-PP-13-03, May 2004 (24 pp)

### *Education Sector Energy Use and Characteristics*

This reference provides data on energy use and market characteristics for primary / secondary schools and colleges/universities. It includes information on facility characteristics and age, load shapes, decision making, and interest in energy services.

EU-SR-10-03, April 2004 (54 pp)

### *Characteristics and Energy Use of Restaurants*

This report is a reference guide to the restaurant segment, with data on market characteristics, energy use, load shapes, and end-use equipment.

EU-SR-09-03, December 2003 (65 pp)

### *Customer Prioritization*

How can you identify your company's most valuable customers? We describe a model for prioritizing customers and consider a case study.

EU-SR-08-03, December 2003 (46 pp)

### *Best Practices in Load Research*

We summarize load research practices, used to support regulated cost-of-service based ratemaking, and highlight activities at utilities that represent a cross-section of the industry.

EU-SR-07-03, November 2003 (59 pp)

### *My Meters Can Do That?*

With recent technological advances in metering and communications, load research samples are an untapped goldmine of valuable data and corporate innovation. In this report we investigate how—with no additional cost or with a relatively small additional investment in new meter technology—the load research unit can provide information to support system management, customer relations, and regulatory obligations.

EU-SR-06-03, September 2003 (34 pp)

### *Gas Prices — What to Do?*

After a wild ride since February, natural gas prices have dropped somewhat, but are still well above the level of the last few years. How will this affect energy end users? And what does this mean for energy utilities? This perspective synthesizes information from a wide range of sources to examine impacts and discuss what utilities can do.

EU-PP-12-03, August 2003 (14 pp)

### *Load Shapes for Small Commercial Customers*

This report draws on our EnergyShape™ database to provide typical-day load shapes and related information by segment and region for small commercial customers.

EU-PP-11-03, August 2003 (52 pp)

### *The Load Profiling Forum — What Have We Learned?*

This report is a retrospective of the Load Profiling Forum, which covers what the industry has learned about load profiling topics ranging from segmentation to benchmarking—and how we can apply this information to the broader practice of load research.

EU-LPF-03-02, May 2003 (23 pp)

# Completed Reports

### *Energy Market Profiles — A Reference Guide*

This report provides an overview of the Energy Market Profiles for each sector and describes the sources and method for data development. It provides an introduction to the Energy Market Profile Viewer, an online application that provides convenient access to all the EMP data.

EU-SR-05-02, March 2003 (56 pp)

### *Measurement and Verification for Demand Response*

This report introduces the types of demand response programs in the industry, contrasts demand response with traditional load management and demand-side management programs, and provides an in-depth study of measurement and verification for demand response.

EU-SR-04-03, February 2003 (49 pp)

### *Puget Sound Energy and Residential Time-of-Use Rates — What Happened?*

In this report, we explore what went wrong, what went right, and what we can learn from Puget Sound Energy's residential time-of-use rate, which was offered to customers from May 2001 to November 2002.

EU-PP-10-02, December 2002 (9 pp)

### *Conference Summaries*

This report highlights selected presentations from the AEIC Load Research conference held in July 2002 in Las Vegas, NV, and the WLRA Fall meeting, held in September 2002 in Portland, OR.

EU-PP-09-02, November 2002 (16 pp)

### *Benchmarking the Load Profiling Process*

Across the U.S., many utilities are engaged in load profiling for settlement and reconciliation in open energy markets. This Technical Brief summarizes what processes and systems they're using.

EU-LPF-02-02, October 2002 (15 pp)

### *The Impact of Consumer Electronics on Household Electricity Use*

Residential electricity use per household continues to increase despite stringent efficiency standards for many major household appliances. How much energy do consumer electronics use and how much will they use in the future? We believe this is an important question so we set out to answer it in this report.

EU-PP-07-02, September 2002 (14 pp)

### *Using U.S. National Energy Forecasts to Supplement Utility Forecasts*

In this report, we summarize the results of the AEO 2002 forecast and several key issues facing energy markets. Also included is a guide to information resources.

EU-PP-06-02, July 2002 (19 pp)

### *You've Got a Great Product! Now Who's Going to Buy It?*

Market research and market assessment are necessary for new product development. Learn how targeted market research provides both qualitative insights into customer response and quantitative information for market assessment.

EU-PP-04-02, June 2002 (11 pp)

### *A Visual Overview of U.S. Commercial-Sector Energy Use*

This report graphically summarizes U.S. commercial-sector energy use by region and customer segment.

EU-PP-02-02, April 2002 (26 pp)

### *Sample Design for Load Profiling*

This Technical Brief describes the sample design process for data collection studies to support load profiling.

EU-LPF-07-02, January 2002 (25 pp)

### *Energy Use Outlook 2001*

At the Energy Use Outlook Conference 2001, major energy players offered diverse views on the future of energy-use analysis and information. This report summarizes the conference presentations and the lively roundtable discussion on load profiling.

EU-LPF-06-01, January 2002 (10 pp)

### *The Role of Load Profiling in Load Curtailment for Mass Markets*

Learn about load profiling and load curtailment for residential customers in regulated and deregulated environments. This Technical Brief details the situation.

EU-LPF-05-01, December 2001 (15 pp)

### *Load Profiling During Extreme Conditions*

Industry experts give their perspectives on load profiling for extreme conditions.

EU-LPF-04-01, December 2001 (23 pp)

## Summary Briefs

***Spring 2011 WLRA-AEIC Conference Summaries***
(GEP-LAMS-M-001)

***Google PowerMeter Memo***
(GEP-LAMS-M-002)

***Summary of IEE Whitepaper: Assessment of Electricity Savings in the US Achievable through new Appliance/Equipment Efficiency Standards and Building Efficiency Codes – 2010-2025***
(GEP-LAMS-M -003)

## Planned Topics for 2011-2012

***Innovative Uses for Daily AMI Data – Load Research and Load Forecasting Applications***

Many AMI or smart metering systems collect daily energy use for all customers, even though interval data is still only being collected for a sample. This daily information is an underutilized resource that can be useful for a variety of applications. We'll look at what some utilities are doing for weather normalization, sample expansion, and unbilled revenues using daily consumption data. We'll also describe the challenges that some have had accessing and using these data.

***Combining/Changing Rate Classes using Domains Analysis***

Many times, due to mergers or tariff changes, load researchers end up with separate samples representing rate classes that have to be merged into one rate class, without time to select a new sample for the combined class. We'll first lay out the process needed to combine samples and populations keeping statistical validity intact, and then we will walk through an example using actual utility data to combine two separate rate classes from two different geographic areas into one, showing results and identifying potential problems that can come up along the way.

***Energy Market Profile Update***

The Energy Market Profiles (EMP) provide a snapshot of annual energy use by end use and fuel and region for major customer segments in the commercial, residential, and manufacturing segments. These spreadsheets are both a valuable reference for quickly defining energy-use patterns for individual customer segments and provide a solid foundation for a variety of market analysis tasks, including program planning and evaluation.

# Potential Future Topics

### *Long-Run Savings from Energy Efficiency Measures*

Forecasting energy efficiency savings can be a tricky business. It is unclear past 2020 if the market will be technologically saturated and annual EE savings will start to get smaller, or if there will be new technology, or new programs to modify consumers' behavior that will allow for continue growth in EE savings. We will talk with industry forecasters and vendors to get an idea of how EE technologies are likely to evolve in the future.

### *How Well do Enabling Technologies Enable?*

Many utilities are now using various technologies to enable price based DR programs like dynamic pricing, and demand/capacity bidding. We will investigate the logistics of these technologies and review current pilot programs to uncover both effects on load impacts and best practices in this evolving area.

### *Analysis and Expansion Primer*

As a sequel to our 2005 Load Research Sample Design Primer, we'll provide a detailed description of analysis and expansion methods to use once data collection begins. We'll again include a step-by-step example, walking you through the process of estimating class load shapes from a stratified sample.

### *Phantom Loads*

Our society has seen a digital explosion recently, with more and more equipment falling under the umbrella of "digital loads." Many of these appliances and devices have power supplies or other components that are always on. What impact does this have on residential customer energy use and load shapes? In one anecdotal study, the set-top box used half the energy over time that a large-screen television used, simply because it was "always on."

### *Load Forecasting Analysis Software*

There are now several options for software tools to perform forecasts and other econometric analyses. We'll take a look at what is available in the market, check in with the vendors of these products, and talk to users to get a sense of the real capabilities of the tools and their ease of use. Based on this feedback and our experience, we'll provide unbiased reporting on the strengths and weaknesses of each of the tools.

### *Understanding Power Quality*

Beyond simply understanding how much apparent power (kWh) is consumed by a customer, utilities are also interested in understanding more about other aspects of power quality, including power factor, real power, harmonics, and the like. We'll look at what some utilities are doing to measure interval data beyond kW and kWh, why they are measuring it, and what they are doing with the results.

### *Load Data Editing Methods — Analysis and Validation*

Almost everyone doing load research does some load data editing, usually filling gaps in the data or correcting clearly erroneous intervals. Some practices and methods are generally accepted, but we don't really understand how these methods perform in a variety of circumstances. For this report, using actual load data, we will artificially create random missing data and then implement a variety of methods for correcting the data. Because we will have the original data for the missing intervals, we'll be able to analyze how the methods perform and determine which ones result in the lowest variance and bias across multiple situations.

### *Hourly Impacts for DSM Planning*

Many utilities, including several subscribers to Load Analysis Strategies, have used DSManager, an Electric Power Research Institute (EPRI) software tool, to investigate hourly impacts for DSM planning and evaluation, but EPRI no longer supports this tool. What are the alternatives? We'll take a look at the marketplace to investigate what is available and talk with users across the industry.

### *Probabilistic Forecasts*

The goal of a utility forecast is to estimate, as accurately as possible, future sales and load. Often, this involves a single "base case" prediction, potentially with "high-growth" and "low-growth" alternates. This type of forecast is easy to use and understand, but doesn't provide much insight into the possible variation or uncertainty in future outcomes. Instead of saying "next year's peak demand will be X MW," we can provide a probability distribution that recognizes the uncertainty of all the inputs to the forecast (weather, economics, etc.) and the uncertainty of the forecast model itself. This distribution can be used to consider the risk associated with various future resource options. We'll take a look at what those who integrate probability distributions into their forecasts are doing, both at utilities and in other industries, and discuss methods to create probabilistic forecasts.

# Potential Future Topics

### *Low-Income Customer Energy Use and Load Shapes*

Many utilities offer baseline or lifeline rates, which offer lower prices for the first block of electricity and/or natural gas for some or all customers. Other utilities discount prices offered to qualifying low-income customers. But how do energy use and load shapes for low-income customers compare with the rest of the residential population? Policymakers don't generally consider these factors when implementing income-based rates, but perhaps they should.

### *Forecasting for Transmission and Distribution Planning*

Load forecasts are important inputs when sizing future transmission and distribution systems and can be used to evaluate the need for improvements to current infrastructure. In this report we will take a closer look at the role of load forecasting in transmission and distribution planning. We will look at different models being used and possible new applications of forecasting techniques specific to T&D.

### *Can High Energy Prices Significantly Change Consumer Behavior in the Long-Run?*

The current economy is experiencing extremely high energy prices. New words like "staycation" are popping up on the radio and in TV ads, NPR recently ran a story on "car shame" but what does this really mean to the American consumer? What implications does it have for long term energy and demand forecasts? We will look at recent trends in energy consumption and talk to others in the industry to find out how these behavioral changes might affect assumptions about long-run elasticities and how to integrate changes into a forecasting model.

### *Sample Rotation – How Important Is It?*

While industry best practices call for replacing load research samples frequently, about every three years or so, most load researchers are unable to do so because of budgetary or time restrictions. We know that the accuracy of samples degrades over time, and the potential for bias exists because new homes don't have the same load characteristics as older homes. But what is the impact of leaving samples in the field longer? What are the benefits and limitations of techniques like post-stratification and reweighting? And how do developments such as AMI/AMR impact this question?

### *Can DR Fill in the Gaps? Addressing the Variability of Renewable Generation*

Renewable energy is becoming a larger part of the utility generation portfolio, driven by regulatory mandates and global climate change concerns. A primary challenge to the adoption of two of the leading renewable sources, wind and solar, is their variability. One potential solution to fluctuating output is demand response. Can DR act as a reliability tool and potentially supplant the need for fossil fuel generation to back up wind and solar? How large a role can demand response programs play in the integration of variable renewables into the grid?

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## ABOUT GLOBAL

Global Energy Partners is a premier provider of energy and environmental engineering and technical services to utilities, energy companies, research organizations, government/regulatory agencies and private industry.

Global's offerings range from strategic planning to turn-key program design and implementation and technology applications.

Global is a wholly-owned subsidiary of EnerNOC, Inc committed to helping its clients achieve strategic business objectives with a staff of world-class experts, state of the art tools, and proven methodologies.

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