Setting Rates: Best Practices for Electric Cooperatives

PART 2

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INSIDE THIS ISSUE

Load Research – Determining Power and Energy Demand Causation to Allocate Service Costs

Editor's Note: *Part 1: "Introduction to Best Practices in Rate Setting," appeared in the April 30, 2007, Solutions News Bulletin. Additional articles in this series will appear in Solutions in the coming months.*

Overview of Part 2

This special Solutions insert is the second in a series, "Setting Rates: Best Practices for Electric Cooperatives." This series examines best practices that are most appropriate for electric cooperatives in their respective business situations.

Part 2 deals with load research and covers these topics:

- Role of load research in rate setting
- Three general load research methodologies
- Causes of changes in cooperative revenue requirements and their load research implications
- Suggested best practice process for conducting load research
- Glossary
- Additional resources

Load Research: Its Role in Setting Electric Rates

Rate setting is the process of establishing prices for electric service to different classes of consumers that reflects the respective costs of different functions. These functions include power and energy supply, transmission and distribution, metering and other activities. Electric cooperatives incur these costs in one or a multiple of three ways:

- Consumers create customer-related costs such as billings, service drops and other non-metered services.
- Demand (kilowatts) placed on the system causes investment costs. Much of the investment in generating capacity, or transmission and distribution, is attributable to demand placed on the system either on a coincident or non-coincident basis depending upon how the cooperative is billed by its wholesale power supplier.
- Electric cooperative costs are incurred based on energy consumption.

Load research identifies and measures the electric demand and energy placed on the system by different types of consumers. Those measurements (customers, kw demand—coincident and non-coincident—and kwh and other allocations) are then used to allocate costs by functions (e.g., power supply, transmission and distribution) to consumer classes.

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Load research provides the electric cooperative with information to properly allocate costs to consumer classes so that the following things can be done:

- The cooperative can fairly collect sufficient revenues from each member class to cover its operating expenses, depreciation, taxes, interest expense and adequate debt service coverage margins while satisfying equity management goals and equitably retiring capital credits.
- The cooperative can provide equitable, or fair, rates where inter-class subsidies can be identified and mitigated.
- The cooperative can motivate consumers to use power and energy more efficiently by sending appropriate price signals.
- The cooperative can comply with regulators' requirements, if any, to set rates fairly, and to effect rate unbundling, or real-time pricing and avoid cross-susidization from non-electric businesses.

Three Load Research Methodologies

The goal of load research may be simple. It is frequently complex, however, because direct-metered demand measures are often not available and require estimations.

Not all consumers are billed for demand. Indeed, in most electric cooperatives, the largest classes are residential and small commercial that are typically not metered for demand. Second, while they are becoming more common, recording meters are not typical. Additionally, existing recording meters are not placed according to sampling requirements.

Estimates, therefore, are frequently made to bridge data concerns. Establishing more automated meter reading should provide even more load data.

TEST-YEAR BILLING DETERMINANTS

The simplest form of load research is done using the cooperative's billing records. For residential consumers, total energy consumption is used. Monthly peak kw demand is used for industrial customers. For residential members, frequent billing determinants include the number of meters and the average annual kwh consumption.

Though data available from a cooperative's account billing system can provide some basis for allocating power, energy and other service costs among consumer classes, that approach has some obvious disadvantages:

- Grouping of consumers into billing classes may not allow analysis of cost causation in sufficient detail to fairly assign costs or to send accurate price signals to those consumers with the greatest impact on cost of service.
- Metering residential consumers only for their kwh energy use provides the cooperative with no direct basis for allocating its power generation and transmission costs.
- Lack of time-of-day or day-of-week consumption data limits the cooperative's ability to signal consumers about their respective responsibilities for power costs, which may change by the hour on some days.

TIME-OF-USE METERING

Time-of-Use (TOU) metering is used in the United States for some large industrial and commercial customers and requires recording meters. It involves billing customers for their power and/or energy consumption within specified hourly periods during weekdays and weekends as well as during different seasons of the year.

To the extent that such data is available, it can be used to develop load research-type information. Setting rates for TOU blocks requires an understanding of which consumer classes cause the cooperative's demand and energy loads—as well as how the cooperative's power supply cost components vary over time.

LOAD RESEARCH PROGRAM

Larger utilities frequently maintain a system of recording meters placed in each customer class in a stratified, valid sample. The meters are designed to measure demand and energy data by class. This data is collected, reduced to coincident and non-coincident monthly demands, and stored for subsequent cost allocation purposes.

Data acquired in load research studies are subject to errors of measurement, sampling choices and extrapolation of conclusions to consumers excluded from study samples. To mitigate these error risks, samples are typically designed to provide 90-percent assurance within confidence intervals of +/- 10-percent accuracy of peak demands by consumer classes and the entire system.

LOAD PROFILING

States that have deregulated their retail electricity markets—those with unbundled rates and retail competitive access—require distribution utilities to establish statistically reliable estimates of average energy consumption and demand by typical members of each consumer rate class (i.e., those without interval demand meters).

Such estimates are typically established by season (winter, spring, summer and fall), day of the week and periods within each day and period (perhaps every 15 minutes). These data are then used to set rates for consumers without interval demand meters and to pay their chosen retail competitive access suppliers.

In general, consumer class load profiles are developed as follows:

- The system's hourly load shape, less transmission losses, is determined.
- Hourly load shapes are estimated for each consumer class, based on statistical sample interval demand metering.
- Residual hourly profiles are derived from system and sample data for each consumer class. Rates for energy and other service functions are then set using these kwh and kw estimates. Consumers are billed these rates based on their usual monthly metering (in the case of residential consumers, conventional kwh meters are used).

Revenue Requirement Components and Cost Causality

The revenue requirements of a typical distribution cooperative can be grouped into purchased power costs, operation and maintenance (O&M) costs, and capital costs. Load research data is used to allocate revenue requirements to the individual member classes and may rely on sophisticated metering of sampled or real-time consumption—or just a comprehensive analysis of existing billing data.

PURCHASED POWER COSTS

Purchase Power costs in 2005 (the latest available year) comprised approximately 65 percent of operating revenues for the electric cooperative industry.[1] A typical monthly power bill may include:

- Energy costs, based on kwh metered at the cooperative's substations or other delivery points
- Power costs, based on maximum delivery point kw demand as measured for the month, prior 12 months or other agreed-upon period or basis (e.g., coincident or non-coincident)
- Adjustments (per kwh, kw or month) for changes in costs of generating fuels, purchased power and energy or power transmission
- Transmission and perhaps congestion charges
- Other monthly charges, such as metering and billing costs, by power delivery point
- Ancillary services, maintaining transmission system reliability such as spinning generation reserve and voltage support.

The basis on which the cooperative is billed for purchased power will determine its related load research needs. For example, if the distribution cooperative is billed at purchased power rates that change from hour-to-hour, it needs to know which consumers are causing it to incur those costs and when. That information is required to assure fairness among members (billing those that cause the cooperative's costs) and to transmit price signals (even if only after the fact of consumption).

OPERATION AND MAINTENANCE COSTS

An electric cooperative's expenses of distribution operation and maintenance, consumer accounts, general and administrative (G&A) functions are incurred as payroll, supplies, information system, rental, vehicle fuel and maintenance, office equipment and furniture, postage, insurance and other business costs. A number of those costs tend to change as they are influenced by alternative factors:

- O&M costs may vary directly with business activity indicators such as kwh sales or number of member-consumers served. For example, the kwh energy and kw power component of purchased power costs vary closely with, respectively, consumers' energy and power demand. Expenses such as consumer accounting, member services, vehicle maintenance and payroll often vary in close, direct relation to the number of member-consumers served. In addition, the cost of metering maintenance and reading can be directly related to the number of active meters.
- On the other hand, O&M expenses may vary in response to internal organizational decisions, such as which functions are performed in house or outsourced. Such costs are more likely to vary with those already allocated in proportion to business activity indicators. Therefore, A&G expenses may be largely a function of directly allocated payroll expenses.
- Finally, external drivers, such as unusual storm damage or emergency replacement power costs, may affect cooperative O&M expenses. Such expenses require a case-by-case analysis to logically associate them with distribution and other functions and, then, consumer classes.

In summary, load research with respect to operation expenses focuses first on understanding the primary causes and timing of each line item's variance, then measuring the causal factors. Those factors may be the cooperative's internal business processes and measured by their accounting costs.

CAPITAL COSTS

Capital costs include, but are not limited to, net plant, construction work in progress, certain deferred debits and cash working capital. Each of these categories must be allocated based on the most appropriate allocator in order to determine the cost to serve a particular class of consumer. The carrying costs (interest and equity) are frequently allocated based on the individual components—whether on a times-interest-earned-ratio (TIER) basis or return-on-rate basis.

Best Practice Process: Load Research

As more recording meters are placed in the field, it would be beneficial for electric cooperatives to consider instituting some form of load research to better support their efforts in measuring the cost of service and allocating costs appropriately. The chart on page 4 depicts a suggested process of best practices to the load research method most appropriate for an electric cooperative, given its unique situation.

RATE UNBUNDLING

Traditional electric cooperative residential tariff structures include an energy charge per kwh at declining block rates plus a fixed monthly distribution charge. The peak monthly kw demands of large commercial and industrial members are also frequently metered and billed.

FUNCTIONALIZATION

However, a cooperative may have compelling business reasons to study its revenue requirements and their causes in finer detail. For example, costs of self-generation, purchased power, transmission, metering, billing or other service functions may provide management with valuable information. Therefore, load research needs can be driven by rate unbundling requirements related to performance benchmarking or competitive analyses, as well as regulatory mandates for cost causation.

CONSUMER CLASS SPECIFICATION

Cost causation responsibility is the primary basis for specifying consumer classes, but marketing research needs and distribution system planning may also guide grouping of the cooperative's members for load research purposes. Member classification should be organized with sufficient detail to meet requirements functionalization, system planning and marketing research needs.

LOAD RESEARCH METHODOLOGY SELECTION

Regulatory mandates frequently determine the load research methodology an electric cooperative must use, e.g., load profiling. If so, that mandate should reasonably accommodate the realities of metering technology applicability and how the cooperative can communicate rates to member-consumers in advance of their usage.

continued on page 4

1. CFC's 2005 Key Ratio Trend Analysis (KRTA).

Best Practice Process: Load Research Flow-Chart

Rate Unbundling

- Consider performance benchmarking, outsourcing alternatives and other cost management initiatives.
- Consider requirements of regulators, including retail competiton preparation.
- Consider bases of competition with other forms of energy.

Specify service functions (e.g. energy, power, billing, metering, etc.)

Functionalization

- Identify revenue requirements subject to direct influence by measurable drivers.
- Develop rationales for allocating other revenue requirements to those directly allocated to service functions.

Specify functionalization bases to maximize sensitivity of co-op costs of service to changes in service usage.

Consumer Class Specification

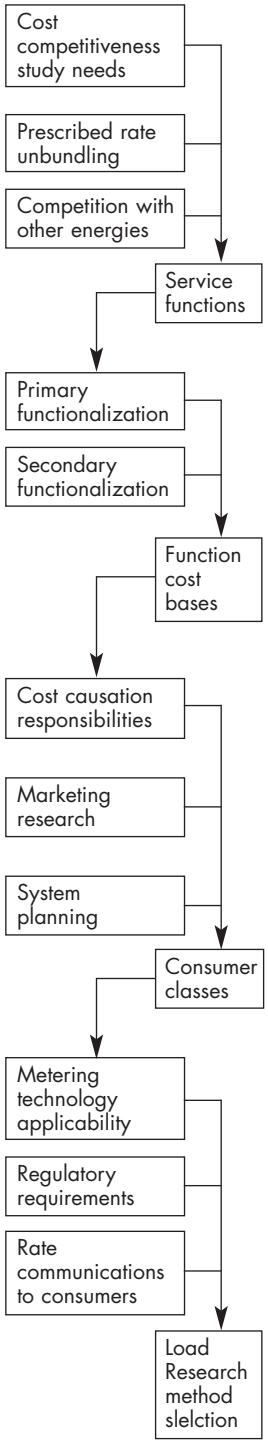
- Identify consumer groups responsible for influencing measureable revenue requirements drivers.
- Consider marketing research needs (e.g. identification of market segments likely to grow or vulnerable to competition).
- Consider distribution system planning needs for load research.

Specify consumer classes in sufficient detail to meet research needs.

Load Research Methodology Selection

- Consider practical availability of interval metering technologies, inlcuding cost effectiveness for each consumer class.
- Consider regulatory mandates (maybe, requiring load profiling).
- Consider the co-op's rate communications to consumers (ranging from posted tariffs to day-ahead notification of hourly rates).

Select load research methodology (ranging from analysis of historic billings to hourly metering of a sample or all members of consumer classes).



Glossary

Block Rates – A fixed charge per kwh for all energy consumption within a specified block, e.g., between 100 kwh and 350 kwh in a given month. Declining block rate structures may be used to collect period costs without separately billing a fixed monthly charge.

Cost-of-Service Study – An initial step in rate setting; analysis of electric utility costs by consumer class over time.

Customer Distribution Charge – A fixed amount, billed to all members of a given consumer rate class, to recover cooperative costs which do not vary with periodic kwh or kw consumption.

Demand Rates – Charges to member-consumers (usually large commercial and industrial members) based upon their respective peak kw consumption during the subject-billing period, e.g., 1,244 kw. Demand metering allows collection of fixed generation and transmission costs directly, rather than as part of kwh energy charges.

Electric Service Functions – Various productive activities required to create and deliver electricity as well as operate an electric cooperative, e.g., power generation and transmission, electric distribution, metering and billing.

Interruptible Rates – Electric service rates, usually to large industrial and commercial members owning standby generation that the cooperative can curtail or cease by agreement.

Lifeline Rates – Low rates charged for some minimum monthly kwh consumption by a specified rate class (perhaps low-income consumers or all residential consumers).

Load-Shaped Curve – A curve on a chart showing power supplied by time of occurrence.

Purchased Power Costs – Payments to suppliers for generation and transmission of power and energy to the purchasing distribution utility.

Revenue Requirements – Aggregate costs of service to be recovered each year from consumers (including power costs, depreciation, interest, operation and maintenance and other expenses) plus capital costs (margins for debt service coverage, in the case of cooperative) reduced by non-operating revenues.

Seasonal Rates – Rates that vary according to the season of consumption; for many cooperatives, summer rates tend to be higher because of the higher demand and related power costs.

Tariff – A document, approved by the cooperative's board and/or regulatory agency, listing the terms and conditions, including a schedule of prices, under which electric service will be provided.

Time-of-Use Rates – Electricity prices that vary according to the hour of their consumption and, therefore, can reflect the cooperative's costs of purchased power.

Unbundling – Disaggregating electric utility service into basic components (e.g. distribution, billing, etc.) and offering those components for sale separately, each with its own rate.

Additional Resources

Borenstein, Severin (2003). *Time-Varying Retail Electricity Prices: Theory and Practice.* www.ucei.berkeley.edu/PDF/rtpchap.pdf

Electric Power Research Institute (May 1984). *Selected Statistical Methods for Analysis of Load Research Data.*

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Regulatory Commission of Alaska. *Basic Ratemaking Primer.*