

Improving Settlement Accuracy And Marketing Intelligence Inexpensively: How To Break Down Hourly System Loads Into Energy Retailer, Market Segment, and Program Group Profiles

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Why We Need Better Information About The Breakdown Of Hourly System Loads

A competitive electricity market environment requires reasonably accurate information about the hourly loads attributable to each energy retailer, customer-marketing segment, and energy program customer group. Ignorance about the breakdown of these hourly loads hinders energy competition by leading to inequitable system energy cost settlements across retailers and (consequently) their customers. Furthermore, if retailers are not charged accurately for their hourly loads, they have less motivation to offer rate incentives and cost-effective energy efficiency programs that lead to energy savings for expensive peak-hour consumption. In addition, state/regulatory social programs that encourage load efficiency have severe measurement/evaluation problems if the loads for participants and nonparticipants cannot be distinguished.

Because hourly metering is still generally scarce except for very large customers, accurate information about these cross-referenced segment hourly loads does not really exist. The relative scarcity of hourly interval metering is exacerbated by other measurement problems arising primarily from transmission/distribution line losses.

How We Can Estimate Electricity Market Segment Load Profile Breakdowns Inexpensively

Our approach is an innovative *Mixed Aggregation* econometric technique that takes account of the relationships among *all* of the energy consumption data sources typically available. By contrast, existing conventional approaches to market segmentation rely on separate analysis of some existing data sets without taking advantage of all the information inherent in the relationships among the data sets.

To take account of these relationships, we use all of the available load/consumption data *in the same analysis*. We do this by using the following principles as constraints in our analysis: 1. hourly loads for each customer during a billing month sum to his/her monthly billed kWh; 2. bills for all retailers' customers sum to the total system load for each billing cycle; 3. hourly loads for all retailers sum to the corresponding hourly total system load for all retailers apart from line losses (we also account for theft and metering errors); 4. line losses appear at the system level but not at the individually metered customer level (i.e., line losses occur between the system level meter and the individual customer meters). Using this orientation, we combine energy consumption information from hourly system data (including sub-distribution data), customer-level monthly billing data, and sampled customer-level hourly load data in one logically-consistent regression framework. This regression framework yields estimates of hourly loads for individual customers that sum properly to monthly billing energy use and to system level hourly loads, and line losses. Relevant econometric issues (serial correlation, heteroskedasticity) are addressed in a straightforward way. The great advantage of this approach is that the equations for the system-level loads, the customer-level monthly bills, and sampled customer-level hourly loads contain common terms because of the four estimation constraints. This means that we can use *monthly customer-level* billing data and hourly *system-level* data to help estimate *hourly customer-level* load profiles.

The Advantages Of This Load Profiling Breakdown Method For Program Evaluators/Managers And System Planners

The *Mixed Aggregation* technique allows evaluators to economize by using relatively plentiful and inexpensive data sources to provide greater precision for the hourly load estimates, or to substitute for some of the relatively scarce and expensive customer-level hourly meters. Combining the *Mixed Aggregation* estimation approach with customer-level segment identification information, and total segment population at the system level, allows evaluators to estimate segment-specific hourly load profiles. To provide more detailed segment information, the basic market segment information can be combined with census data and appliance saturation survey data to provide demographic information useful to energy efficiency program managers and also to marketing program managers. Further, the *Mixed Aggregation* approach can be used with the Parti-Parti *Conditional Demand* technique to yield relatively inexpensive estimates of segment-specific end-use load profiles. Finally, in addition to the segmented hourly load level estimates, the *Mixed Aggregation* estimation approach allows us to estimate changes in these hourly loads. This change information allows public and private policy makers to make better-informed cost-benefit calculations of energy efficiency programs and customer marketing programs.