MAISY 2018 Utility Customer State and Service Area Databases Summary Characteristics

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Database Options/Features: State and service area databases are available for residential and commercial sectors for each state and service area in the US and for each Canadian province. Unique database features include:

- Large utility customer databases for each state and service area
- Access to individual customer record energy use including hourly 8760 and 15-minute electric loads
- Twenty+ general business categories and SIC/NAICS codes for each commercial record
- Income and other data items that are not available from other residential customer sources
- Database are comprised of individual utility customer records
- The most comprehensive, up-to-date utility customer energy use and characteristics data available
- Detailed segmentation and deep drill-down capabilities
- Excel workbook format for easy access and analysis
- Vetted/applied by over 100 organizations for technology and energy-related market analysis, product development and assessment, cost-of-service studies, energy efficiency, smart grid analysis and more

Database Structure: Each state or utility database typically includes information on between 3,000 and 20,000 individual utility customers, though larger databases can be provided. Each customer record contains a population weight that reflects the number of customers it represents in the state or utility population.

Application Options. MAISY databases may be licensed for in-house use or clients may use Jackson Associates (JA) services to apply database analysis providing client-specified results.

Applying MAISY Databases in Your Organization

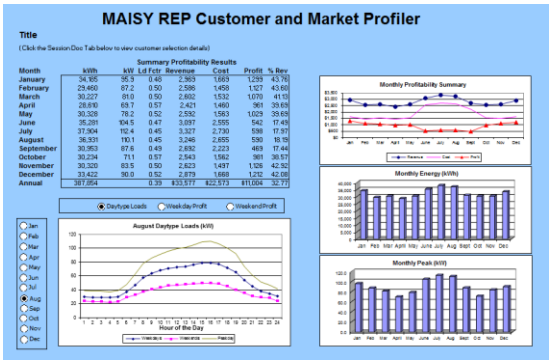
Retail Energy Marketers, Utilities. Evaluate customer segments to target profitable customers, evaluate differences in cost of service, develop more profitable pricing products, improve deposit requirements, etc. A sample of REP and utility applications includes Reliant Energy, Duke Energy, and Consolidated Edison.

Equipment Manufacturers/Suppliers. Determine market segment size, apply energy use and hourly load characteristics for product design and offerings and to target potential customers. Sample clients include United Technologies, Carrier Corporation, Sharp Electronics, Ice Energy.

Others. MAISY databases have been used by electric utilities, demand response companies, retail energy providers, and many other energy related organizations. See below for a sample of MAISY clients.

MAISY Profiler

MAISY databases are provided in Excel workbooks. Jackson Associates also develops custom database interfaces for clients to facilitate and automate client-specific analysis needs. MAISY Profilers provide analysis based on user-specified customer segment characteristics of interest such as SIC/NAICS code, floor space, operating hours, ZIP codes etc. (Commercial) or income, demographics,



ZIP codes, etc. (residential) along with application detail such as cost of service characteristics, pricing products, etc. MAISY Profilers are available to support REP, ESCO, combined heat and power analysis, demand response, energy efficiency, battery and PV systems and other applications.

Other Database Products

Jackson Associates (JA) provides client-specific database products to meet special REP and energy technology company needs. JA works with clients to ensure that MAISY deliverables match client information needs. JA provides custom database extracts and analysis to meet individual client needs.

Support for Client Applications

Consulting Support. JA provides MAISY database analysis on a consulting basis to support client in-house marketing initiatives. An example application includes:

1. Working with a client to identify SIC code-employment-square feet combinations that meet seasonal and monthly kWh and kW targets
2. Working with the client list provider to extract customer contact list information for qualifying contacts
3. Appending customer monthly and peak kW using statistical models estimated with MAISY Utility Customer Energy Use and Hourly Loads Database information
4. Identifying a sample of customers to pretest a marketing campaign
5. Estimating response models to categorize and score market segments and individual customers

EnergyID. Energy ID is a service that appends customer energy use data to each customer record obtained from a commercial list providers based on NAICS/SIC codes, ZIP code and employment for commercial customers (income, demographics, ZIP codes for residential customers) along with other customer list variables that may be available. Appended energy data can include annual and monthly electricity; natural gas, fuel oil uses, monthly peak demand, and estimated monthly and estimated 8760 hourly loads.

Clients can provide existing contact lists or JA will conduct supporting analysis to identify appropriate contact list specifications to obtain targeted contacts, reducing customer contact list costs. Reductions in contact list and direct marketing costs can more than pay for the EnergyID service.

Limited database extractions. Database extractions can be provided for clients whose data needs are more limited. These data extractions range from aggregate customer profiles for a state or service area to hourly loads profiles for client-specified customer segments.

Additional MAISY Information

Customers Versus Buildings. MAISY database records typically reflect individual utility customers. Many small commercial customers rent or own space in multi-establishment buildings. Consequently building-based data understates the number of utility customers and overstates customer size. The MAISY database utility customer focus is designed to avoid this problem.

Data Sources and Reconciliation. MAISY databases are compiled from many data sources including:

- Individual customer data sources
  - Information on millions of individual utility customers
  - Customer records from national, state and utility surveys
  - Psychographic and firmographic data from public and proprietary sources
  - Proprietary data collected by Jackson Associates
- Population and segment data
  - Dozens of federal, state and local government data sources
  - Utility customer-class and rate-class energy use and hourly load data

The reconciliation process recognizes and adjusts for weather differences, data collection strategies and sample designs, sampling error and other issues that arise in integrating multiple data sources.

Energy Use and Hourly Loads Detail. All customer records in MAISY Databases reflect reported electric and natural gas billing data. Hourly and 15-minute load data are provided for each customer record. End-use energy uses (e.g., air conditioning, space heating, etc.) is available for each customer record as an option. Weather-sensitive loads are weather-adjusted with typical meteorological year weather data.

Comparison with Other Utility Customer Data Sources. While some utility customer-specific data is available from other sources, small sample sizes, large standard errors, lack of geographic detail, use of modeled energy use data, dated information, and limited coverage provide a questionable basis for using these data sources for most market and sales analysis, product development and design and other applications.

For example, While the Department of Energy's CBECS survey documentation reports 95% confidence intervals of +/- 8 percent for total US commercial buildings electricity consumption for its 2003 survey; drilling down to individual buildings (e.g., office, retail, etc.) yields 95% confidence intervals greater than +/- 25 percent for half of the sixteen building types. Drilling down to smaller geographic areas provides even less accuracy. For example, the 95% confidence interval for major fuels consumption in the West census region is +/- 67% for more than half the sixteen building types (e.g. food sales is +/ 84%).

By reconciling and integrating a variety of customer data sources, determining population characteristics (e.g., number of retail establishments by size category), and applying a robust sample design, MAISY state-level and service area utility customer databases are able to deliver reliable detailed utility customer energy use and characteristics for small geographic areas and detailed customer specifications.

MAISY Customer Diversity. MAISY databases use a sample design that ensures each database will provide a representative sample of customers for a particular state or service area. This characteristic is important for providing accurate information on diverse customers throughout the geographic area. For example, instead of relying on average estimates of customer segment energy use, MAISY individual record data permits users to evaluate and target customers based on energy use and hourly load characteristics or other variables of interest.

Customer Contact Information. Jackson Associates (JA) provides customer contact lists including annual, monthly, hourly and 15-minute electricity use.

The Database Development Process. Each database development includes four steps:

1. Develop current population characteristics and a sample design for the state or service area. This step determines the number of utility customers within segment stratum categories such as building type, space heating fuel type, building age, and so on and identifies sample requirements for each stratum required to support deep drill-downs.

2. Extract a sample of utility customers from the master MAISY database file to populate each survey stratum. Individual record energy use is updated to reflect current energy use characteristics including weather-adjustment to reflect typical weather in the state or utility service area.

3. Each record contains a population weight that reflects the number of customers it represents in the state or service area population (i.e., a weight of 25 means that particular customer represents 25 customers in the state, or service area, with the same customer characteristics). Summing weights for a particular segment provides the total number of customers in that segment. The Excel sumproduct formula can be applied to the weight column and other data columns to develop segment totals for that data item. For example applying a sumproduct formula to the weight and annual kWh column provides total electricity used in the customer segment.

4. Validate the database with state and utility-provided energy use and customer data.

MAISY database are continuously updated as new data become available

How Current Are The Data? The master MAISY database includes millions of individual utility customer records developed from a variety of public and proprietary sources that are continuously updated. Energy use data are weather-adjusted to reflect typical meteorological year (TMY) weather data in the state or service area. 2018 MAISY Utility Customer Databases reflect January 2018 customer counts.

Drilling Down. MAISY databases are developed specifically to support energy use and related analysis of user-specified, detailed customer segments (e.g., households in single family dwelling units with incomes less than $25,000, small office buildings with electric space heating built before 1980, etc.). This deep drill-down capability reflects knowledge of our clients' applications. For example, if the population of customers includes a 10 percent electric space heating saturation, a random sample of 2000 would provide only about 200 electric space heating customers. We know that electric space heating customers are of interest to our clients' applications so we boost the number of electric space heating customers pulled from the master MAISY database to ensure that users can conduct multiple drill downs on electric space heating customers. The same criteria are applied with other important customer variables. MAISY record weights adjust for this sampling so that segment averages and totals reflect population values.

MAISY Accuracy. It is not possible to calculate multi-source data accuracy with classical statistical approaches; however, our experience indicates that variables of primary interest to our clients are typically within a (+/-) 5 to 10 percent confidence interval. These observations are based on

applications for utilities where MAISY data were evaluated against actual utility customer. MAISY databases are validated against a variety of sources including utility load data, load research data and studies, FERC and EIA filings and more.

Individual Customer Data. All data for each individual utility customer record is accessible in MAISY Excel workbooks.

MAISY Applications: http://www.maisy.com/anal.htm
Database Variables http://www.maisy.com/cvar.htm and http://www.maisy.com/rvar.htm

MAISY Clients. MAISY clients include more than 100 electric utilities, manufacturers, retail electricity providers, ESCOs, research laboratories, federal and state government agencies and more.

Partial List of MAISY Database Clients and MAISY Applications

Airtricity	Florida Power and Light Energy Services	Orange and Rockland Utilities
Aisin	Gainesville Regional Utilities	PA Consulting
Arkansas Power and Light	GDF Suez North America	PG&E Energy Services
Austin Electric Utility	Geostellar	Pennsylvania Power and Light
Bandera Electric Coop	Gulf States Utilities	Pedernales Electric Coop
Bastrop Power and Light	Hamilton Sunstrand	PECO Energy Company
Bermuda Electric Company	Houston County Electric Coop	Pratt and Whitney
Bloom Energy	Ice Energy	Puget Sound Power and Light
Bluebonnet, Electric Coop	IdaTech	Reliant Energy
Bonneville Power Administration	Illinois Power Company	Rochester Gas and Electric
Boston Edison Company	Indiana Gas	Rocky Mountain Institute
Capitol One	Independence Power and Light	Sharp Laboratories of America
Carrier Corporation	Ingersoll-Rand	Southern Louisiana Electric Company
Centerpoint Energy	Kerrville Utility Board	Spark Energy
Central Hudson Gas and Electric	Kentucky Utilities	State of California
Central and Southwest Services, Inc.	Lawrence Berkeley National Lab (US DOE)	State of Colorado
Central Maine Power Company	Lawrenceburg Utility Systems	State of Indiana
Cinergy Corp.	Louisiana Power and Light	State of Michigan
Citizens Gas	Lower Colorado River Authority	State of New York
City of Wilson Electric Utility	Southern Company	State of Pennsylvania
Coda Energy	Midwest Energy Cooperative	State of Texas
Commonwealth Edison Company	Mississippi Power and Light	State of Washington
Commonwealth Electric Company	New Orleans Public Service	Sungevity
CoServ Electric Utility	Niagara Mohawk Power Corporation	Sun Edison
Consolidated Edison Company	Nebraska Public Power District	Sun Run
CPS Energy (San Antonio municipal	New Braunfels Electric Utility	Tampa Electric Company
Deloitte Consulting	New Brunswick Public Utility Commission	Tanger Outlets
Direct Energy	New Energy Ventures	Tennessee Valley Authority
Duke Solutions	New England Power Pool	Texas Utilities
EDMPro.com	New York Power Authority	Tiax (Formerly part of Arthur D. Little)
Electric Power Research Institute	New York Power Pool	Toyota
ENERNOC	New York State Electric and Gas	Toyota Motor Sales
Entergy Corp	Northeast Utilities	TXU Energy Services
Entergy Integrated Solutions	Northern Indiana Public Service Company	United Technology Research Center
Entergy, Inc.	Northwest Power Planning Council	UTC Fuel Cells
Eastern Utilities Associates	Oak Ridge National Laboratory (US DOE)	US Department of Energy
Evionyx	Omaha Public Power District	Viron
Florida Power and Light	Ontario Hydro	Washington Water Power
		Xcel Energy