



Itron Shapes Commercial End-Use Map of California

➤ Background

As California's primary energy policy and planning agency, the California Energy Commission (CEC) is responsible for ensuring Californians have electricity and gas energy choices that are affordable, reliable, diverse, safe and environmentally acceptable. In 2001, the CEC funded the Commercial End-Use Survey (CEUS)—a multi-year survey of commercial establishments throughout the state to gather valuable data related to building characteristics, equipment operation and energy consumption. The CEUS had three primary objectives:

- Collect data that can support the design and implementation of energy efficiency programs
- Collect consumption and hourly load profile data for commercial market segments to support the CEC demand forecasting process
- Develop a demand analysis model to estimate the hourly impact of resource management strategies such as energy efficiency measures, load management strategies, building standards, and alternative rate designs


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➤ Solution

The CEC contracted with Itron to conduct on-site surveys of 2,800 commercial establishments throughout the state and build a simulation model for commercial electricity and gas usage in California. Acting as the primary contractor for the project, Itron worked with leading experts in the field of building energy usage simulation to gather the necessary data and build a model for simulating usage, intensities and demand throughout the state.

The sample design for the on-site surveys used a stratified random sampling plan. The sample frame was based on commercial electricity billing data from four California utilities: Pacific Gas & Electric (PG&E), Southern California Edison (SCE), San Diego Gas & Electric (SDG&E) and Sacramento Municipal Utility District (SMUD). The data was then stratified by utility, CEC climate zones (16), building types (12) and annual consumption levels (4). Building types covered a wide range of commercial operations: schools, colleges, grocery stores, restaurants, refrigerated warehouse, small offices, large offices, retail spaces, lodging and healthcare facilities.

Energy consultants KEMA and ADM Associates, Inc. conducted approximately 2,800 on-site surveys, building a database of nearly 300 million square feet of commercial floor space. The surveyed data includes building shell characteristics, equipment inventories, operating



schedules, installed electric and gas meters. Additionally, the survey gathered data on activity areas (offices, conference rooms, kitchens, etc.) and detailed electric and gas end-use information such as space heating, cooling, ventilation, water heating, cooking, refrigeration, lighting, office equipment, motors, and air compressors.

Leveraging the raw survey data, Itron consultants developed the DrCEUS simulation model for electricity and gas using Itron SitePro™ load shape software. eQuest and DOE 2.2 building simulation software (from James J. Hirsch and Associates) provided energy modeling and reporting tools. DrCEUS also incorporates billing and meter data from utilities to calibrate electric consumption, electric demand and gas consumption information for the model.

➤ Results

Each DrCEUS building model includes whole-building electric and gas energy intensities, end-use electric and gas energy intensities, premise- and sector-level hourly load profiles, gas daily use profiles, and impact analyses for energy efficiency measures and demand forecasting.

The DrCEUS database contains raw and calculated information that is unprecedented in the energy industry. DrCEUS reports a wide range of useful simulation results:

- 16-day end-use and whole-building load profiles
- Whole-building and end-use level 8760 load shapes
- End-use connected loads
- Whole-building and end-use energy intensities
- Calendar-based monthly energy usage
- End-use non-coincident peak loads
- End-use conditioned square feet
- Premise-level square feet
- Predominant rate energy billing data

DrCEUS displays data and information using text and full-color graphics. Users can print and save simulation reports. Error-checking procedures are available for debugging common simulation problems and the model can be adapted easily to other areas.

➤ Benefits

Understanding how customers use energy not only improves load forecasting accuracy—it's critical for developing energy efficiency and demand response programs that can encourage, rather than discourage, customer participation. The DrCEUS robust modeling can be used to strategically target programs and evaluate results by region, commercial segment or end-use equipment. Because of the data stratification built into the original CEUS framework, DrCEUS is a flexible and effective building simulation tool that can support a wide array of energy efficiency analyses, rate designs, study baselines, and demand-side program designs.



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