Big Data in the Utilities Industry

Current status and future outlook

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Demand Side Analytics, Customer Energy Solutions
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Overview of Demand Side Analytics at PG&E

Analytics Development is an Ongoing Process

Examples of DSA work
Energy services to 15 MM people:
  • 5.1 MM Electric accounts
  • 4.3 MM Natural gas accounts

70,000 square miles with diverse topography and climate zones

20,000+ employees

A regulated, investor-owned utility
Demand Side Analytics Team Overview

Team Mission
- Provide strategic and analytical support for decision making within Customer Energy Solutions (CES) and other groups throughout PG&E
- To grow data-driven decision making as a discipline throughout PG&E

Works with Electric Operations and Energy Procurement to tackle cross-cutting strategic issues such as the ‘duck curve’ or deferral of distribution equipment investments

Problem Solving
- Scoping
- Project planning

Solution Development
- Business Case
- Data analysis

Impact Tracking
- Impact assessment
- Dashboards
Overview of Demand Side Analytics at PG&E

Analytics Development is an Ongoing Process

Examples of DSA work
Analytics Development is an Ongoing Process

- Potential Business Value
- Complexity

- Analytics and reporting not-integrated
  - Data Integration and Reporting

- Collaborative Analytics
  - Analytics teams work together

- Analytics removes silos
  - Drives Decisions and Long Term Strategy

TEAM HISTORY
- Started four years ago as a brainchild of a Senior Director in Customer Energy Solutions
Demand Side Analytics Team Overview

Enablers
- Teradata Platform
- Analytics Software skills (SAS)
- Automated Reporting (Tableau)
- Brand development and control of work we do
- Cross-functional expertise

Challenges
- Hiring and Retaining Analysts
- Data Siloes
- Organizational Siloes
- Access to data (historically)
- Ongoing requirements
- Fire drills
Utility is a Laggard Industry with Strong Analytics Potential

- Analytics Potential
- Current Analytics State
- Analytics Base

Source: Potential Business Value taken from McKinsey Global Institute study on Big Data: The next frontier for innovation, competition and productivity
Team Intro

Analytics Development is an Ongoing Process

Examples of DSA work

- Data Integration and Visualization
- Targeting
- Integration and Planning
Data Integration and Visualization
Metrics and Data have always been used at PG&E to drive decision making. Furthermore, executive leadership holds each organization accountable by tracking performance on specific data and metrics.

Data-Driven Decisions
Historically, Excel and PowerPoint were used to track performance.

Insight-Driven Decisions
Now, each organization in CES has a custom built performance dashboard, which tracks key metrics, finances, safety stats, etc.
Digging into the Energy Efficiency Portfolio

Analysis of historical portfolio performance, combined with market knowledge, provides for a systematic approach to EE portfolio management.

Question 1

Question 2

Question 3

Question 4
Targeting
Interval data allows demand response programs to be targeted such that participating customers will reliably respond to system operator needs.

<table>
<thead>
<tr>
<th>Likelihood to Enroll</th>
<th>Daily Usage</th>
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<tbody>
<tr>
<td>Customer #1</td>
<td>High, 33.4 kWh</td>
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<td></td>
<td>(Low Tier 3)</td>
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<td>Customer #2</td>
<td>High, 33.2 kWh</td>
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<td>(Low Tier 3)</td>
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Two potential SmartAC participants have similar overall usage….

…but a load shape based segmentation reveals one is a far better candidate for SmartAC.
Load Segmentation Adds Significant Value

40% of residential customers account for over 80% of load resource potential for SmartAC
Individual Heating Needs Sensitivity

Heating needs drive most winter usage for about 70% of customers. Since high usage is almost always due to heating, high sensitivity customers are also high usage customers.

**Low Sensitivity Customers**  
(Bottom 10%)

**High Sensitivity Customers**  
(Top 10%)

Other factors likely explain most gas use variance.  
Heating needs are a key driver of gas use variance.
Integration and Planning
**Goal:** Target demand side programs to defer distribution upgrades, freeing up capital dollars for projects with higher reliability and safety impacts.

**Solution:** Identify which customers provide the largest opportunity for local peak load reduction by combining SmartMeter data, customer insights, and previous program participation information.

Per recommendations of Distribution Planning, the following substations were targeted:

1) Atlantis
2) Camelot
3) Cibola
4) Valhalla
Feeder Load Duration Suggests DSM Opportunity

Aggregation of customer data enables new insights into T&D Infrastructure

**Camelot 9913**
Relatively flat load duration curve puts many hours at risk of overload, indicating that EE needs to be a focus

**Camelot 9914**
Steep load duration curve indicates demand response may be a viable option due to limited hours at risk of overload
### Top 100,000 SP IDs By Coincident Demand

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>Naics 2 Segment</th>
<th>Assigned Rep</th>
<th>Demand Response</th>
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### EE kW Savings By SA ID

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<th>Naics 2 Segment</th>
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<th>2010</th>
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