Data analytics: How BGE is benefiting from AMI data

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Today’s Presenters

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• Building “value” cases
  • The importance of pilots

• Case studies
  • Theft analysis
  • DR targeting
  • Voltage analysis
  • Meter analysis
  • Future possibilities

• Lessons Learned
<table>
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<tr>
<th>Name</th>
<th>Background</th>
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<tbody>
<tr>
<td>Matt Comte</td>
<td>Senior Manager – Accenture</td>
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<td></td>
<td>• <strong>14 years of leadership experience</strong> across North America including utility operations, business transformation and IT</td>
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<td></td>
<td>• <strong>In-depth knowledge of smart meter installation and operation</strong>, work management, order fulfillment, supervisor enablement, customer operations, business transformation and complex program delivery.</td>
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<td>• BS degree in Management Information Services from Auburn University</td>
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Approach: Roadmap

The first stages encompass the vision, value proposition and proof of concept that lay the foundation for the development of the analytics capability.
Approach: Roadmap

Timeline (in months)

Vision and value proposition
- Initial business value
- Vision and capability demo
- Conceptual framework
- Proof of concept definition

Proof of concept
- Proof of concept of business analytics services (people, process, technology)
- Development of business case
- Initiation of a number of explorative “quick hit” projects
- Service delivery model for additional scope and scale

Analytics capability operations and refinement
- Expanded scope of services for businesses
- Expansion of analytics capabilities (process, people and technology)
- Sequencing plan for bringing on additional businesses/services
- Refined commercial model agreed

Expansion of analytics capability
- Value realization monitored
- Analytics services monitored and refined
- Iterative waves of analytic capabilities
Recommendation:
Begin with an analytics pilot program

Provide a prototyping mechanism where business units can begin to define value cases for improving business practices through predictive analytics.
**Recommendation:**
Begin with an analytics pilot program

With the huge volume of data available from smart meters, even with limited financial investment, an analytics pilot program can help explore and unlock capabilities to transform business practices and attain additional value in specific business units.

It can also help in targeted investment to operationalize analytics capability by identifying the most beneficial business areas to begin with.
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<td>• Responsible for BGE’s Advanced Meter Capabilities project</td>
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<td>• 40 years of diverse experience, including Electric Engineering, Energy</td>
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<td>Research (end-use), Industrial/Commercial Sales and Service, Credit &amp;</td>
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<td>Collections, Gas &amp; Appliance Service, Major Accounts, Business Planning &amp;</td>
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<td></td>
<td>Budgeting, Business Process Improvement Program (Six Sigma), Billing</td>
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<td>Services and Customer Care &amp; Billing System implementation.</td>
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<tr>
<td></td>
<td>• BS and ME degrees in Electric Power Engineering from Rensselaer Polytechnic</td>
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<tr>
<td></td>
<td>Institute and an MBA in Finance from Loyola College</td>
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Context

BGE background and statistics:

- **History**: Founded in 1816, the nation’s oldest gas utility and one of the oldest electric utilities
- **Service Area**: Electric: Approximately 2,300 square miles; gas: Approximately 800 square miles
- **Customers**: More than 1.2 million electric customers, more than 650,000 natural gas customers

AMI deployment plan and progress:

- More than 300,000 electric advanced meters and gas IMUs deployed since April 2012
- Target to complete all device installations by end of September 2014
Objective:
- Provide a prototyping mechanism where business units can begin to define value cases for improving business practices through predictive analytics

Process:
- Define and document analytics value cases
- Implement/deploy top-priority value cases in pilot by analytic partner Oracle|DataRaker
- Support business users, monitor and assess the pilot performance
- Quantify potential benefits and create recommendations for full scale/long-term analytics deployment

Timeline and key milestones:
- 107 value cases defined and documented, 60 value cases implemented/explored for implementation so far

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Pilot approach

- Research available products and capabilities – initial discussions with vendors, consultants and other utilities
- Executive invitation to the business
- Introductory session/orientation with the business and Accenture industry experts to explore the possibilities and generate ideas
- Demonstration of predictive analytics tool
- Individual value case discussions with the business
- Fit/Gap sessions with Oracle|DataRaker for identified value cases
- “Deep dive” value case discussions with the business and Oracle|DataRaker
- User training and kickoff of the Oracle|DataRaker system
- Design and implementation of value cases by analytic partner Oracle|DataRaker
- User forums to collect feedback and measure effectiveness
- Business case creation to justify analytics procurement
Based on initial results from pilot, a few business areas look more promising than others.

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<tr>
<th>Revenue Protection</th>
<th>Smart Grid Operations</th>
<th>Demand Response</th>
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<tr>
<td>Distribution System Planning - Electric</td>
<td>Smart Grid Engineering</td>
<td>Customer Planning</td>
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<td>Load Research</td>
<td>Customer Experience</td>
<td>Engineering Standards - Electric</td>
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<td>Load Forecasting</td>
<td>Engineering Standards - Gas</td>
<td>G &amp; E Meter Engineering &amp; Standards</td>
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<tr>
<td>Billing Services</td>
<td>Smart Grid Security</td>
<td>Distribution System Operations - Gas</td>
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<td>Distribution System Planning - Gas</td>
<td>Choice Program</td>
<td>Distribution System Operations - Electric</td>
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- **High benefit**
- **Medium benefit**
- **Further analysis in progress**
Questions?
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<td>Chandra Shekhar Raj</td>
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<td>• Accenture’s project manager for BGE’s smart grid data analytics pilot program</td>
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<td>• 10 years of experience working with electric and gas utilities around the world, including in the areas of utility operations, business transformation and IT</td>
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<td>• Extensive knowledge of smart meter installation and operation, data management, distribution network operations and maintenance and customer operations.</td>
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<tr>
<td></td>
<td>• Holds a BS degree in Electrical Engineering</td>
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Revenue protection: Theft analysis

- Value cases implemented
  - Identify theft by analyzing consumption on disconnected meters
  - Early identification of CIM
  - Identify theft where meter is frequently pulled out
  - Identify theft with partial/full bypass of the meter

- Results
  - 47 cases investigated, theft detected on 26 cases

- Qualified value proposition
  - Proactive identification of theft
  - Theft deterrent
  - Avoided field calls
  - Reduction in unbilled usage
    - Due to early detection of theft cases
    - Due to early detection of CIM cases
Revenue protection: Theft analysis

Theft on disconnected meter
Revenue protection: Theft analysis

Partial bypass

Bridge Install
Consumption Drop
Consumption Resumed
Field Visit
Revenue protection: Theft analysis

Theft by pulling out meter

Consumption Resumed After Field Visit

Theft by Pulling Out Meter
Demand response: PeakRewards (PR) target customers and non-operational PR device analysis

- **Value cases implemented**
  - Determination of central AC for residential customers
  - Determination of potential non-operational PR central AC devices
  - Determination of high energy customers for summer and winter periods
  - Determination of electric water heater for residential customers

- **Results**
  - ~4000 potential customers identified with central AC
  - 19 potential non-operational devices investigated, 11 non-operational devices confirmed
  - ~6000 potential customers identified with high consumption during summer and winter periods
  - ~300 potential customers identified with electric water heater

- **Qualified value proposition**
  - Reduced cost per enrollment for PR central AC and electric water heater programs
  - Reduced effort/time to identify and fix non-operational PR devices
  - Increased capacity and energy value gain for demand-response programs
Demand response: Non-operational PeakRewards (PR) device analysis

Non-operational PR device

No increase in consumption during ‘payback’ hour indicative of non-operational device.
Questions?
Customer planning: Voltage analysis

- **Value cases implemented**
  - Identify single phase meters with high voltage
  - Identify single phase meters with low voltage

- **Results**
  - Three cases investigated
    - One meter indicated high voltage, associated transformer got replaced
    - Two meters, connected to same feeder, indicated high voltage, associated capacitor voltage got corrected
  - One meter investigated, line voltage was ok, meter was replaced as incorrect meter type

- **Qualified value proposition**
  - Reduce claims due to customer device damage from high voltage
  - Improved customer satisfaction
  - Improved supply quality
Customer planning: Voltage analysis

Detecting high-/low-voltage Issues

High voltage

Found several meters on the same transformer with similar voltage profile

Low voltage

Incorrect meter type installed
Smart grid operations: Net meter and defective meter analysis

- Value cases implemented
  - Identify unknown net metering cases
  - Identify active meters showing no consumption for certain period of time (IMU mismatch)
  - Identify all the net meter premises with zero usage in the received channel
  - Identify malfunctioning meters by analyzing NIC Rebooter events

- Results
  - 196 cases investigated
    - Eight unknown net metering customers and five upside-down meters identified
    - 75 IMUs mismatch identified
    - Four net meters identified with wrong program
    - 104 FAs issued to replace malfunctioning meters

- Qualified value proposition
  - Reduced time/effort to identify unknown net metering customers, malfunctioning meters
  - Reduced unbilled usage due to early detection of defective/stopped meters
  - Improved customer satisfaction
  - Improved safety
Smart grid operations: Net meter and defective meter analysis

Identifying IMU mismatches

Static Register (IMU Mismatch Identified)
Value cases currently being explored

- Identify potential high temperature meters before they reach emergency condition
- Identify location mismatches (GPS coordinates vs. address)
- Construct an annual hourly load profile for transformers and feeders for use in asset management
- Detect abnormal gas usage spikes
- Improve CAIDI accuracy using AMI meter restoration time stamp

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Future possibilities

- Identify transformer to premise mismatch
- Predict system load and load curtailment during demand-response event by leveraging 15 minutes read data
- Develop weather normalized peak load contribution for individual customer based on interval data
- Aggregate hourly loads by supplier and customer class for use in settlements
- Identify customers who have installed tankless water heaters
Critical success factors and lessons learned

- **Business engagement**
  - Obtain program-level executive sponsorship early
  - Engage the business early and obtain buy-in from business leadership
  - Put the business (not technology) in the driver’s seat

- **Develop and maintain an analytics catalog**
  - Leverage industry leading practices from other utilities
  - Engage business units to define value cases and methods to derive value through analytics
  - Include measures of effectiveness, execution priority, required data elements and IT complexity

- **Do not underestimate start-up logistics**
  - Corporate IT security requirements
  - Procurement process
  - Technical installation, setup and initial data loads
Thank You!

You will receive a link to download a copy of the slides to the email you used to register.

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