AMI Meter Data.....
So now what?

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Bryan Texas Utilities

- 4th largest municipally owned utility in Texas
  - Not-for-profit rates
  - Local control
  - No shareholders
- Vertically integrated
  - Generation
  - Transmission
  - Distribution
- Historical load of over 320 megawatts at peak
  - Two distribution systems one City and one Rural

- Diverse generation portfolio
  - Coal
  - Gas
  - Wind
  - Solar
- Two time RP3 Diamond Award Winner—American Public Power Association
Bryan Texas Utilities

Customer Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Customer Growth</th>
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<tr>
<td>2010</td>
<td>44,000</td>
</tr>
<tr>
<td>2011</td>
<td>46,000</td>
</tr>
<tr>
<td>2012</td>
<td>48,000</td>
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<td>2013</td>
<td>50,000</td>
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<td>2014</td>
<td>52,000</td>
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<tr>
<td>2015</td>
<td>54,000</td>
</tr>
<tr>
<td>2016</td>
<td>56,000</td>
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Before AMI

Moving to an Automated Metering Infrastructure system was an obvious choice.

- Prior to 2012 BTU had interval data on only a few large Commercial/Industrial customers. This data was not used for billing, but rather in load analytics.

- BTU utilized SCADA, transformer and load profile information for load growth modeling, but realized that in order to position the system for the future we would need interval data by rate segment to improve business efficiencies and rate design.

- During past Cost-of-Service studies surrogate load-shape data had to be used to make assumptions on load curves by rate class and we knew that those assumptions had inherent flaws that needed to be corrected.
AMI Project

- Formed a cross functional evaluation team of managers and technical staff
- Went through an RFP evaluation and selection process lasting about 18 months
- Vendor selection
  - Sensus AMI
  - Meter Sense MDMS
  - Meter Selections
  - Mass Meter Change-out
- Installation of meters, software integration, test-test-and retest ..... 18 months
Goals for AMI

- The collection of clean, accurate and reliable meter data for billing
- Collect data for the analytics of the BTU T&D system and for use in rate design for COS
- Consumer Dashboard for website
- Outage Management System capabilities
- Minimization of business processes for CNP and MI/MO – Remote Disconnect & Reconnect
Data is run through a Verification Editing and Estimation routine to validate
Specific MDMS parameters based on utility policies and processes
Validates that all interval data is in line with register data
Capture within 1% of meter count:
  - BTU has a 99.83% capture of register reads
  - BTU has a 99.25% capture of interval reads
Ability to monitor transformer loading, OMS integration, and GIS locations
We can outline the data based on the data sync from our CIS
The MDMS provides a visual tool of daily and interval usage for utility staff
Interval Data for Rate Design

- Coincident Peak (CP)
- Costs incurred by system to provide services at peak demand are allocated on class contribution to CP
- Demand Related Power Costs
- Wholesale Costs
- Transmission System Costs
- AMI data allows load research to be performed using actual class usage during system peak periods
More Functionality with Interval Data

- Totalized Virtual Meters—One meter with the summation from multiple meters and multipliers integrated into one interval
- Distribution Power Loss - calculation by Interval by system, substation, or feeder
- Linked Meters—multiple locations and multiple meters adding or subtracting from the main billing meter
- System usage accuracy—spikes in usage and accuracy between register reads
- Demand Profile—Coincident Peak at 15 minute or 60 minute intervals
- Solar Generation—large customers measuring solar generation by interval
TOU: 3 Tier Rate

Date of Consumption

9/18/16
9/17/16
9/16/16
9/15/16
9/14/16
9/13/16
9/12/16
9/11/16
9/10/16
9/9/16
9/8/16
9/7/16
9/6/16
9/5/16

Total kWh

TOU Rates

<table>
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<tr>
<th></th>
<th>M - F</th>
<th>M - F</th>
<th>Sat/Sun</th>
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</thead>
<tbody>
<tr>
<td>Base</td>
<td>12am to 12 pm</td>
<td>9pm to 12am</td>
<td>All day</td>
</tr>
<tr>
<td>Shoulder</td>
<td>12pm to 3pm</td>
<td>7pm to 9pm</td>
<td>N/A</td>
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<tr>
<td>Peak</td>
<td>N/A</td>
<td>3pm to 7pm</td>
<td>N/A</td>
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SHOULDER
PEAK
BASE
Expectations and Possibilities

- Identifying sources of Unaccounted For Energy (UFE) loss by substation and feeder
- Distribution structure of data – based on customer profile
- Voltage conservation analysis
- Electric energy efficiency monitoring