Effectively Harnessing Data Analytics to Maximize Utility and Customer Benefit

Gregg Borachok, Duke Energy
Electricity Symposium, Purdue University
August 28, 2013
Duke Energy

- Electric Retail Customers – 7.2 million
- Gas Customers – 500,000
- Market Cap – $45 billion
- Employees – 27,775
- Service Territory – 104,000 square miles
- Total US Generation Capacity – 57,700 MWs
- Transmission Lines – 32,200 miles
- Distribution Lines – 289,900 miles
- Duke Energy International owns, operates or has interest in approximately 4,900 MWs of generation
Data Analytics – a Vision of Tomorrow

**Today**
- Localized and isolated analytics
- Challenges in acquiring data
- Insufficient expertise and skill sets to perform meaningful analytics
- Lack of well-organized, high quality data to use for analytical purposes
- Frequent use of intuition-based judgment or “it’s always been done this way” decision making

**Tomorrow**
- Analytics are a central input to most decisions
- Analytics are applied not just to our core capabilities, but also to a range of non-core functions
- Analytics becomes part of the culture of the company and its value is continually reinforced by leadership
- Resources are developed and hired with analytics skills at all levels and are viewed as keys to success
- Data and systems are readily available to complete analyses as needed

**Focused effort to define and execute a data analytics strategy**
Key Elements Required to Successfully Create Value from Analytics

Data Governance
Making decisions about how we define, collect, distribute, access, and dispose of our data assets

Technology
Tools and systems that allow users to access and analyze the data

Skills
Employees at all levels who can use the technology and data to drive insights from analysis

Culture
Company wide respect for measuring, testing and evaluating quantitative evidence

Business Process Redesign
New processes to support new ways of doing business

The Data Analytics Strategy will need to address each of these key areas

More value add opportunities are identified through continued Use Case / Prototype efforts.
## Key Success Factors

**Grid Mod – “Analytics & Insight Incubator”**

<table>
<thead>
<tr>
<th>Data Management</th>
<th>Computational Models / Analytics</th>
<th>Insights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data integration</td>
<td>Computational models</td>
<td>Decision support tools</td>
</tr>
<tr>
<td>Data cleanse &amp;</td>
<td>Propensity models</td>
<td>Scenario modelling</td>
</tr>
<tr>
<td>transformation</td>
<td>Stochastic risk models</td>
<td>Target lists</td>
</tr>
<tr>
<td>System integration</td>
<td>Customer value / segmentation models</td>
<td>Query / report visualization tools</td>
</tr>
<tr>
<td>(e.g. interfaces)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data operations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Distribution – “Process Transformation”**

<table>
<thead>
<tr>
<th>Roles</th>
<th>Process</th>
<th>Operating Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised roles</td>
<td>Change in operating practices</td>
<td>Organizing structure</td>
</tr>
<tr>
<td>Revised decision</td>
<td>Process changes</td>
<td>Leadership roles &amp; accountabilities</td>
</tr>
<tr>
<td>models</td>
<td>New ways to work</td>
<td>Value Metrics</td>
</tr>
<tr>
<td>Revised performance</td>
<td>New process performance metrics</td>
<td>Governance</td>
</tr>
<tr>
<td>criteria</td>
<td></td>
<td>Behaviours / Culture</td>
</tr>
<tr>
<td>New skills</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Analytics-enabled Projects**

**Key Success Factors**: speed to market, skill building, rapid learning / refining

**Value Metrics**

- Behaviour / Culture
- Governance
- Value Metrics
- Organizing structure
- Leadership roles & accountabilities

**DUKE ENERGY**
## Value of Analytics Through Nine Specific Propositions

<table>
<thead>
<tr>
<th>Area</th>
<th>Propositions</th>
<th>Value Driver / Scenarios</th>
<th>Duke Value</th>
</tr>
</thead>
</table>
| Asset Effectiveness       | 1. Investment Planning            | • Revise priority of asset investments based on analysis of asset risk, value and customer impact:  
  • Replacements (timing)  
  • Upgrade / reinforcements (timing and scoping)  
  • Customer connections (scoping)              | Capex / Investment Plan           |
|                           | 2. Maintenance Strategies         | • Revise strategies, policies, and programs based on condition and risk analytics (e.g., inspections, veg, periodic programs) | Opex / Maintenance              |
|                           | 3. Outage Prevention              | • Reduce equipment outages through focused replacement of high risk assets based on condition (reduced overtime, reduce outage impact) | Opex / Outage Costs             |
|                           | 4. Planning and Forecasting       | • Improve long-term investment planning based on actual demand and asset load & condition indexes | Capex                           |
| Grid Optimization         | 5. Outage Detection & Response    | • Reduce costs from enhanced response to equipment-based outages (advanced prediction, detection, isolation and restoration) | Opex / Outage Costs             |
|                           | 6. Voltage Control & Optimization | • Use real time asset condition models to operate transformer load tap, voltage regulators, and location of capacity banks to reduce system average voltage (1-3V) and power factor  
  • Voltage and load power factor adjustment  
  • Reduction in line losses  
  • Conservation voltage reduction | Opex / Cost of Energy             |
| Consumption & Efficiency  | 7. Demand Response Effectiveness  | • Target customers to increase DR participation, improve load control and reduce cost to acquire DR participants | Opex / Marketing, Generation    |
|                           | 8. Revenue protection & recovery (theft) | • Detect unauthorized use and revenue recovery (usage anomalies, meter events, power imbalance) | Revenue                         |
|                           | 9. Energy Services                | • Target customers for services to improve value from energy:  
  • Energy conservation  
  • Support for distributed generation, backup and storage  
  • Services (e.g., energy management, efficiency) | Revenue, Opex (customer)         |

Focus of prototype activities