Distribution System Operations for the Future

Anne Pramaggiore
President and Chief Executive Officer, ComEd
The World Has Changed

Declining Electric Load Growth and changing Electric/GDP Relationship

- Energy efficiency and conservation have become a part of the general culture – facilitated by new usage control technologies
  - Growth of customer self-generation
  - Low prices make natural gas more attractive electricity substitute in the U.S.

Need for Increased Investment

- Customer desire to ensure greater reliability and resiliency (post Superstorm Sandy, Hurricane Irene, use of disturbance sensitive equipment)
  - General aging infrastructure
- Usage control technologies (Smart Grid)
- Need for higher level of power quality
  - Cybersecurity

Disruptive Technologies

- Greater DG and lower costs
- Battery storage evolving and being piloted
- Alternative vehicle penetration is increasing
- Technology outpacing regulatory responses
  - Customization

Utilities are challenged under the existing regulatory model

Historical & Forecasted Electricity Growth

The utility industry today is characterized by challenges around grid quality, credit quality and customer satisfaction.

- Grid Quality: ASCE recently provided a D+ grade to the nation’s energy infrastructure.
- Credit Quality: Utility ratings were largely “A” level in 2000, versus largely “BBB” level today.
Electric industry is in midst of technology-driven transformation: lessons learned from other Industries

<table>
<thead>
<tr>
<th>Industry/Disruption</th>
<th>Incumbents</th>
<th>Strategic Response</th>
<th>Outcome</th>
</tr>
</thead>
</table>
| Photo/Digitalization | FUJIFILM | Three pronged strategic response, formulated in 1980s:  
  • Squeeze as much profit out of existing film business as possible  
  • Early investment in digital technology  
  • Development of new lines of business (JV with Xerox; leveraged chemical experience to enter cosmetics industry; LCD optical film) | • $13.6B market cap today  
  • Film now 3% of sales (previously 60% in 2000) |
|                      | Kodak      | While digital threat foreseen in 1980s, slower to respond (“complacent monopolist”):  
  • Refocused company on imaging (digital cameras), but fell prey to smartphone camera  
  • Other diversification into pharmaceutics and venture capital not successful | • 90% of film sales in US in 1976  
  • Peak revenues of $16B in 1996  
  • Filed for bankruptcy in 2012 |
| Telecom/Wireless     | Verizon    | • Full service provider: Bundled FiOS fiber optic TV and Internet services with traditional landline products  
  • Focused on being the best network operator first; leveraged reputation for customer satisfaction and network reliability to then grow product offering  
  • Responded to changing technologies by investing in network infrastructure ahead of customer sales (first mover) | • 66% of revenue today from wireless (33% in 2004) |
|                      | AT&T       | Former US telecom monopoly broken up in 1984; AT&T continued to operate long-distance  
  • Business strategy focused on diversification into tangent businesses (personal computing in 1980s and cable television acquisitions in 1990s) – but misaligned core competencies led to minimal success  
  • Minimal focus on network upgrades/infrastructure adaptation to evolving customer desires | • Purchased by SBC in 2005 for $16.9B |

Industry incumbents who successfully anticipate change, leverage core competencies and innovate the business model survive disruptive technologies
Utility Business Model Evolution

**Business Model and Functions**

**Enhanced Status Quo:**
Maintain low cost universal service. Provide some enhanced technology for reliability and resilience. Grid functions to deliver energy.

- Address aging infrastructure; build, maintain, operate distribution grid; provide moderate to high level of reliability/resiliency at low cost
- Invest in foundational automation technology, smart meters, remote monitoring and control and distribution automation
- Administer state-mandated EE
- Invest in security measures
- Interconnect DG on demand

**Network Commerce:**
Add new uses to network. Distribution operator functions like RTO managing 2-way power flows and myriad intermittent and dispatchable resources. Optimize communications network: metering functions, public lighting, charging stations.

- Incorporate technology for measurement, data capture and control related to management of hybrid grid
- Integrate DG resources into planning and operating of grid by sending correct price signals and managing two-way power flows
- Compensate customers for technologies that benefit the grid; charge customers for the value the grid provides, commensurate with usage profiles; potentially meter other utilities
- Potentially meter multiple utilities (e.g., electric, gas, water)

**Customer Full Service:**
Offer full array of generation and related services, including DG, energy efficiency services and financing options. Provides benefits to all consumer segments.

- Offer wide variety of customized, value-added products and services to customers (e.g., enhanced reliability, better power quality, usage management, network capabilities of smart grid, product bundling)
- Provide creative price structures for energy products and services
- Finance customer-owned resources, such as DG and energy efficiency

**Operational Needs**

- Address declining demand: decoupling, SFV formula rate, pricing structures, demand-based
- Address stranded cost risk: long-term planning with pre-approval
- Other: reduce/eliminate lag

**Regulatory Model Elements**

- Address innovation: fund shorter asset lives, shorter rate cases, innovation fund
- Outcome-based ratemaking, symmetrical earnings incentives
- Pricing structures for premium reliability services; redefine “standard service”, competitive tariffs, special contracts
- Regs allow for system balancing, control behind the meter

- Reassess structural model
- Address regulatory treatment of data

© 2014 Commonwealth Edison Company. All rights reserved.
## Snapshot of Regulatory Model Transformation Underway

|--------------------|-----------------|-----------------------|----------|
| New York           | Reforming the Energy Vision (REV) | **Goals**  
• Energy efficiency, deeper penetration of renewables, wider deployment of DER, including micro grids and storage on-site power supplies, and storage  
**Issues**  
• Resiliency, emergency preparedness and protection against severe weather events  
• Track One: Role of distribution utilities in enabling market-based deployment of DER  
• Track Two: Changes in current regulatory, tariff, and market designs and incentives | • Track One: Decision by end of 2014  
• Track Two: Decision by end of Q1, 2015 |
| California         | Assembly Bill 327  
• Retail Rate Redesign  
• More Than Smart | **Goals**  
• Redesign retail rates to achieve reasonable cost allocation among customers  
• Revise NEM rates beginning July 2017 to reflect commercial viability of solar  
• Integration of DER as a market and grid, especially growth in PV, DR and storage  
• Addressing impending retirement of once-thru-cooling generation units  
**Issues**  
• Retail Rate Redesign  
• Net Energy Metering restructuring, DER Integration  
• Distribution Planning, Integrated Grid design and operation  
• Differentiated Services | • On-going |
| Hawaii             | Future of Hawaii’s Electric Utilities | **Goals**  
• Creating a 21st Century Generation System and modern Transmission and Distribution Grid  
• Policy and Regulatory Reforms to Achieve Hawaii’s Clean Energy Future  
• Revaluate utility business model to align with DER/EE growth objectives  
**Issues**  
• Highest electricity rates in the nation  
• Pace of progress toward a modern grid and renewables integration | • Hawaiian Electric Company announced in March that it will begin installing smart grid technologies on Oahu – first phase of plan to develop smart grids across Oahu, in Maui County and on Hawaii Island by 2018. |
## Snapshot of Regulatory Model Transformation Underway

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
<th>Goals</th>
<th>Issues</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massachusetts</td>
<td>Grid Modernization Planning</td>
<td>- Reducing the effect of outages&lt;br&gt;- Optimizing Demand (time-varying rates)&lt;br&gt;- Integrating Distributed Resources&lt;br&gt;- Improving Workforce and Asset Management</td>
<td>- Cost Recovery (pre-authorization, future test year, capital expenditure tracker mechanism)&lt;br&gt;- Marketing, Education, and Outreach&lt;br&gt;- Metrics (infrastructure and performance)</td>
<td>DPU Order of June 2014: Electric distribution companies required to file 10-year grid modernization plans (Q4, 2014 (earliest))</td>
</tr>
<tr>
<td>Illinois</td>
<td>Energy Infrastructure Modernization Act (2011)</td>
<td>- Grid modernization through smart technologies</td>
<td>- Authorizes IOU investments in electric system upgrades, modernization projects, and training facilities&lt;br&gt;- Investments subject to performance-based ratemaking (formula-based); Metrics established for reliability, customer benefits, and job creation</td>
<td>On-going; provisions of EIMA sunset at end of 2017</td>
</tr>
<tr>
<td>Maryland</td>
<td>Utility 2.0</td>
<td>- Reliability and resiliency, aimed at ensuring continuous, high-quality service&lt;br&gt;- Residential customer optionality, centered on bringing smart grid information, analysis, control and savings to small customers&lt;br&gt;- Large customer optionality, optimizing costs and services for big customers</td>
<td>- Utility system upgrades, making the grid’s technical operations more visible, flexible, and able to convey and react to real-time information&lt;br&gt;- Utility business model changes, keeping utilities financially viable even if they deliver less electricity&lt;br&gt;- Regulatory model adjustments, adapting the mechanisms for public-interest oversight and consumer protection to new utility technologies</td>
<td>Pilot proposed by Governor’s 2013 Grid Resiliency Task Force</td>
</tr>
<tr>
<td>Connecticut</td>
<td>Utility of the Future</td>
<td>- Energy efficiency, deeper penetration of renewables, wider deployment of DER, including microgrids and storage on-site power supplies, and storage (scope similar to NY)</td>
<td>- Emergency preparedness, and protection against severe weather events&lt;br&gt;- Role of utility in building microgrid</td>
<td>Plan to open proceeding next month</td>
</tr>
</tbody>
</table>

© 2014 Commonwealth Edison Company. All rights reserved.
Process of transformation will be an uneven evolution; successful organizations will be mindful of critical principles

- **Culture of Flexibility and Innovation**: Ensure corporate culture that is positioned to take risks; potential to create firewalls for new endeavors (*Dayton Hudson/Target*)
- **Balance investment between existing and emerging infrastructure and position for optionality** (*Apple, Verizon*)
- **Customer differentiation and product customization** (*Verizon*)
- **Pricing restructuring and transparency**: migration from volume-based to service-based (*Verizon*)
- **Outcome vs. input-based regulatory restructuring**: Ken Costello asks “Did we get what we thought we were paying for versus did we pay the right amount for what we got?” (*RIIO, performance-based model in U.K*)
- **Strategic relationships** (*HP/Disney, Starbucks/Barnes & Noble, Drugstore.com/Rite Aid/E4X*)
- **Invest ahead of customer trend**: potentially with small bets until more information is available (*Apple, Verizon, Fuji Film*)
- **Deconstruction of universal service concepts**: information and pricing become customer, location and product-specific; grid operation becomes feeder specific
- **Focus on Qualitative vs. Quantitative, but never forget price** (*Toyota*)