For Electric Utilities
The Future is Here
USEA WEC North America Regional Energy Forum
8 October 2015

Richard McMahon
Vice President, Energy Supply and Finance
Edison Electric Institute
The Edison Electric Institute (EEI) is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for 220 million Americans, operate in all 50 states and the District of Columbia, and directly employ more than 500,000 workers.

With more than $85 billion in annual capital expenditures, the electric power industry is responsible for millions of additional jobs. Reliable, affordable, and sustainable electricity powers the economy and enhances the lives of all Americans.

EEI has 70 international electric companies as Affiliate Members, and 250 industry suppliers and related organizations as Associate Members.

Organized in 1933, EEI provides public policy leadership, strategic business intelligence, and essential conferences and forums.
Agenda

- Electric Utility Industry CAPEX and its Drivers
- Impacts on the Generation Fleet and the Grid
- Environment and CPP
- Cyber and Grid Security
- The Evolving Grid and Regulation
Industry Capital Expenditures

Notes:
- Total company spending of U.S. Investor-Owned Electric Utilities, consolidated at the parent or appropriate holding company.
- Projections based on publicly available information and extrapolated for companies reporting fewer than three projected years (11% and 12% of industry for 2016 and 2017).

Source: EEI Finance Department, company reports, SNL Financial (September 2015).
Projected Functional CapEx

2013P
as of October 2013

$95.2 B

2015P
as of September 2015

$108.6 B

Notes: Total company functional spending of U.S. Investor-Owned Electric Utilities. 2015P total does not sum to 100% due to rounding. Projections based on publicly available information and extrapolated for companies not reporting functional detail (1.3% of industry).

Source: EEI Finance Department, company reports (September 2015).
Drivers of Industry Investment

- Environmental regulations
- Low natural gas prices
- Declining technology costs
- State renewable energy policies
- Financial incentives
- Diversification
- Customer demand
Natural Gas Market
Low Prices and Growing Production

Henry Hub Spot Price

Natural Gas Production, tcf

U.S. Energy Information Administration, Annual Energy Outlook 2014 and Natural Gas Spot and Futures Prices
Solar PV Costs Have Declined

Solar PV costs decline

Cost of Solar PV ($/Watt)

Large-Scale Utility Solar PV is About Half The Cost of Residential Rooftop Solar

Cost of Solar ($/Watt in 2014)

Source: GTM/SEIA Solar Market Insight
Data is the average of quarterly data for each year.

Source: GTM/SEIA Solar Market Insight
Data is the average Q1-Q4 2014. Data only includes cost of PV technologies.
Utilities Lead the Way on Solar Power

60% of all installed solar capacity is large-scale utility solar capacity.

From 2010-2014, additions of new solar capacity have grown 82% per year on average.


In 2014, nearly 4 GW of large-scale solar capacity were installed.

Utilities represent 96% of all active & planned community solar capacity in the United States.

Large-scale utility solar PV had an average cost of $1.68 per watt in 2014.

Residential rooftop solar had an average cost of $3.66 per watt in 2014.

[Source: EEI]
Cleaner Fleet

New generating capacity is fueled by non-hydro renewables and natural gas

Generating Capacity Additions

Announcements of New Generating Capacity (2014)

Source: EEI; Ventyx Inc., The Velocity Suite. Data as of December 31, 2014
Agenda

Environment and CPP
Environmental Regulatory Challenges: 2015 and Beyond

**Air**
- Mercury & Air Toxics Standards (MATS)
- Interstate Transport (CAIR/CSAPR)
- Regional Haze/Visibility
- Multiple NAAQS
- New Source Review (NSR)

**Climate**
- NSPS- New Sources
- NSPS-Existing Sources
- BACT Permitting
- International Negotiations

**Water**
- 316(b)
- Effluent Limitation Guidelines
- Waters of the United States
- Total Maximum Daily Loads (TMDLs)
- Waterbody-Specific Standards

**Land & Natural Resources**
- Transmission Siting and Permitting
- Avian Protection
- Endangered Species
- Vegetation Management

**Waste & Chemical Management**
- Coal Ash
- PCBs in Electrical Equipment
- HazMat Transport
CO$_2$ Emissions and Intensity

Source: Developed from U.S. Energy Information Administration, Monthly Energy Review March 2014
The Final Clean Power Plan Structure

- Final CPP contains “guidelines” for states to regulate CO₂ emissions from existing fossil-based electric generating units
- Established uniform national emission rates for coal-based units and natural gas combined cycle (NGCC) units
  - Rates reflect EPA’s assessment of regional reductions from
    - Coal-based unit efficiency upgrades
    - Shifts in generation from existing coal-based units to existing NGCCs
    - Increased deployment of renewables
- Uniform national emission rates applied to state generation mixes in 2012 to create state goals
  - State goals are not enforceable against states
  - Compliance measured at the unit-level
Final Clean Power Plan: The Big Picture

- States’ main job is to design compliance plans
  - If states don’t file compliance plan, EPA will subject units in those states to less flexible federal plan

- State plans must:
  - Require units to make reductions
  - Decide whether to allow units to trade reductions to demonstrate compliance
  - Measure compliance in terms of rate or mass

- Units decide how and when to achieve reductions (or procure/buy reductions credits or allowances)

- EPA assumes that a national trading system will emerge
Agenda

Cyber and Grid Security
Grid Security Is a Top Priority

- The electric industry’s approach to protect critical assets is known as defense in depth which includes:
  - preparation
  - prevention
  - response and recovery

to address the wide variety of hazards to electric grid operations

- Effective infrastructure protection is protecting the most critical grid components against the most likely threats – man made or natural phenomena.

- Electric Subsector Coordinating Council – CEO driven
Agenda

-The Evolving Grid
Keys to Realizing Market Structure Objectives

Reliability
- Sufficient capacity the system can rely on
- Fuel diversity

Economic Sustainability
- Low cost/efficient system
- Reasonable return/ sustained investments

Environmental Sustainability
- Achieve carbon targets
- Reduce other pollutants

- Accurate Energy Price Formation
- Fair and Competitive Capacity Market Design
- Compensating Valuable Resource Attributes
If we properly compensate for attributes generators provide in the wholesale market, it would temporarily raise wholesale prices...

However, when low prices induce needed units to shutdown, total energy cost to customers would rise to reflect shortage/cost of new build.

Out-of-market intervention can suppress wholesale power prices and customer energy cost in the short term.

...However, it would minimize shutdowns and the need for new builds.
Changing Electric Distribution Grid: Centralized to Distributed

Today

Future

Integrated Grid Platform

Source graphs: EPRI
New Technologies and Residential Demand Charges Empower Consumers
Evolution of Rates: Three-Part Rates

Better reflect costs and eliminate cost-shift
Promote energy efficiency
Potentially lower costs for customers

<table>
<thead>
<tr>
<th>Three-Part Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volumetric Charge</strong></td>
</tr>
<tr>
<td>Variable. Based on consumer’s monthly electricity consumption (e.g. fuel costs)</td>
</tr>
<tr>
<td><strong>Fixed Charge</strong></td>
</tr>
<tr>
<td>Fixed. Based on fixed costs incurred by utility (e.g. like metering, poles)</td>
</tr>
<tr>
<td><strong>Demand Charge</strong></td>
</tr>
<tr>
<td>Fixed but can vary over time. Based on a customer’s maximum kW demand over a billing cycle (e.g. transmission and generation capacity)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Getting there</th>
</tr>
</thead>
<tbody>
<tr>
<td>The transition to three part rates should be carefully planned and gradual</td>
</tr>
<tr>
<td>The rate change will affect each customer differently</td>
</tr>
<tr>
<td>Changing to three part rate should be revenue neutral for utilities</td>
</tr>
<tr>
<td>Three part rates can result in lower electricity bills for consumers, promote reduction of peak demand</td>
</tr>
</tbody>
</table>

Conclusion

- The integrated grid is the backbone of our economy. Electric utilities are making needed investments in the integrated grid to meet the growing demands of our digital society.
- Electric utilities are empowering customers with more choices and control, while ensuring that our electric supply is reliable, affordable and clean.
- Regulation is evolving to ensure a diverse and resilient integrated electric grid, as well as the deployment of new technology and innovation that will benefit ALL customers.
Questions?

Richard F. McMahon, Jr
Vice President, Energy Supply & Finance
Edison Electric Institute
rmcmahon@eei.org