Delivering the Nuclear Promise

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NCSL Legislative Summit
Chicago, IL
August 7, 2016
Today’s Agenda

• Why are nuclear power plants closing?
• What is being done to prevent more closures?
• What should you know about plant closures?
Nuclear – Ready to Deliver

- U.S. reactors set record 92% capacity factor in 2015
  - 798 billion kWh
  - 62.9% of U.S. carbon free electricity
- 4 new reactors being built
- 81 licenses extended to 60 yrs.
- 1st application for extension to 80 years submitted (Surry in VA)

*Source: Energy Information Administration*
## Premature Nuclear Plant Shutdowns

<table>
<thead>
<tr>
<th>Plant</th>
<th>MWe</th>
<th>Reason</th>
<th>Closure Year</th>
<th>Latest Electricity Generated (billion kWh per year)</th>
<th>Latest CO2 Emissions Avoided (million tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal River 3</td>
<td>860</td>
<td>Mechanical</td>
<td>2013</td>
<td>7.0</td>
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<td>San Onofre 2 &amp; 3</td>
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<td>Mechanical</td>
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<td>18.1</td>
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<td>Kewaunee</td>
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<td>2013</td>
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<tr>
<td>Vermont Yankee</td>
<td>620</td>
<td>Market</td>
<td>2014</td>
<td>5.1</td>
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<td>FitzPatrick</td>
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<td>2016-17</td>
<td>5.8</td>
<td>3.2</td>
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<tr>
<td>Pilgrim</td>
<td>677</td>
<td>Market</td>
<td>By 2019</td>
<td>5.8</td>
<td>3.1</td>
</tr>
<tr>
<td>Oyster Creek</td>
<td>615</td>
<td>Policy</td>
<td>2019</td>
<td>4.9</td>
<td>3.9</td>
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- 6,336 MWe of baseload capacity
- 35.1 million short tons of CO₂ avoided
- 8.5% of Clean Power Plan’s 2030 414-million-ton target
- Approximately 6,000 direct jobs
Average generating costs have decreased from peak of $39.75/MWh in 2012 to $35.50/MWh in 2015.
Average generating costs have decreased 2.4% from 2014.
Capital spending down 3% from 2014, and 26% from 2012 peak.
$6.25 billion in 2015 capex.

**2015 Generating Cost**

Total generating cost = fuel + capital + operating.

*Source: Electric Utility Cost Group.*
Declining Wholesale Electricity Prices

$45-75/MWh Price Range

$30-50/MWh Price Range

$30-42/MWh Price Range

Forward Prices
Market Stresses ... In Brief

• Low growth (in some cases, no growth) in electricity demand
• Continuing surge in supply of low-cost shale gas
• Market design issues
  - Fuel/technology diversity taken for granted and undervalued
  - State and federal mandates and subsidies for renewables
  - Lack of recognition of valuable attributes of nuclear
  - Price suppression in energy markets
• Transmission constraints
Losing Nuclear = Higher Prices to Customers

- Pilgrim announcement met with $2.30/MWh increase in futures price for New England
  - ~$330 million in additional costs to consumers in one year
- Market reaction to Vermont Yankee similar to Pilgrim
- PJM estimated losing three at-risk Illinois plants would raise prices $2.70 - $3.80/MWh in ComEd zone

Sources: Platts Mass Hub average forward power prices; 2020 New England Energy Demand: 145 GWh; ISONE 2015 CELT Report
Solutions Emerging Among the States

- **New York** – Clean Energy Standard approved by Public Service Commission
- **Ohio** – Public Utility Commission approved Power Purchas Agreement with FirstEnergy including Davis-Besse
- **Illinois** – Evaluating legislative proposal similar to New York
- **Connecticut** – Legislation including Millstone cleared Senate

**New York’s Visionary Clean Energy Standard Values Nuclear Plants**

- Use of zero-emission credits values carbon-free nuclear power plants
- Timely intervention should preserve state’s at-risk nuclear facilities
- Support voiced by AFL-CIO, Columbia University’s Hansen, ex-EPA’s Carol Browner

August 2, 2016—The New York Public Service Commission today unanimously approved the state’s first-ever Clean Energy Standard (CES), a policy championed by Gov. Andrew Cuomo explicitly recognizing the role nuclear plants play as carbon-free sources of power.

“New York’s visionary Clean Energy Standard blazes a vitally important public policy path. It establishes an important state policy precedent for efforts to achieve significant carbon reductions from all clean energy sources while maintaining a healthy economy,” NEI President and Chief Executive Officer Marvin Fertel said.
Genesis of the Nuclear Promise

• Our industry is operating in electricity markets that are deluged with natural gas at historically low prices

• Nuclear industry capability factor and reliability is at extraordinary levels...but total generating costs at nuclear plants have increased 28% in the last 12 years.

• “Business as usual” approach will not successfully address the challenges of rising costs and inadequate revenue

• Advance safety, reliability and economic performance together.
Delivering the Nuclear Promise:
Advancing Safety, Reliability and Economic Performance

• Sustain high levels of safety and reliability
• Identify opportunities to re-design plant processes, drive innovation to improve efficiency and effectiveness
• Gain greater value for nuclear energy in electricity markets

The goal: $12 per megawatt-hour cost reduction industrywide
Industry Goals

• Continue to enhance the already high levels of safety and reliability

• Identify opportunities and re-design fundamental plant processes to improve efficiency and effectiveness

• Use innovative technology to increase efficiency across the industry

• Educate and drive awareness of the value of nuclear energy – particularly the economic and environmental benefits
Four Building Blocks

**Building Block 1: Analysis and Monitoring**
Objective: Analyze plant cost drivers and identify opportunities to improve efficiency.

**Building Block 2: Value Recognition**
Objective: Leverage federal and state policies to ensure greater recognition of nuclear energy’s value.

**Building Block 3: Process and Program Redesign**
Objective: Re-design nuclear plant processes to improve efficiency while advancing the fundamentals of safe, reliable operation.

**Building Block 4: Strategic Communications**
Objective: Implement a communications strategy to ensure industry engagement.
Im​provement Opportunities Identified

• Based on analysis of costs, Chief Nuclear Officer (CNO) led teams produced over 180 ideas (Improvement Opportunities or IOs)

• These were ranked until 53 initial ideas were identified for pursuit in 2016
NEI Efficiency Bulletins

• Vehicle for deploying efficiency ideas to fleet
  - 4 issued 02/08/16
  - 6 issued 03/17/16
  - 3 issued 04/29/16
  - 1 issued 06/03/16
  - 7 issued 7/12/16

• Value proposition - explains how idea advances safety, reliability and efficiency; Points to applicable guidance

• Levels of Commitment:
  - Mandatory Initiative
    - All must implement if approved by 80% vote of industry CNOs
  - All expected to implement
  - Utility discretion
Progress Report

• The industry has issued 21 efficiency bulletins to date in 2016
• 24 more efficiency bulletins scheduled for completion this year
• The program will run through 2018 and will be institutionalized
Examples of Completed Efficiency Bulletins

• EB 16-02: Implement Graded Approach to Walk-downs
• EB 16-03: Align Personnel Contamination Event Response to Industry Guidance
• EB 16-04: Source Checking Personnel and Tool Contamination Monitors
• EB 16-05: Non-Licensed Operator/Maintenance and Tech Continuing Training
EB Implementation (61 Sites) as of 8/2/16

Sites Implemented out of 61 Sites (as of 8/2/16)

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<tr>
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<th>Sites Implemented</th>
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Outreach to Key Stakeholders

- Unions
- Employees at plant sites
- Suppliers
- U.S. Nuclear Regulatory Commission
- Other Federal, State, & Local Officials
What Have We Accomplished So Far?

- 12 teams—led by chief nuclear officers—are identifying areas where efficiencies or process improvements may be gained
  • Efficiency bulletins are being distributed to nuclear plant operators to clearly identify, characterize and standardize improvement opportunities
  • Implementation has begun. In most cases, the pace and scope of implementation will be determined by each company
What’s Next?

• Future efficiency bulletins will enable more savings
  – Dozens of efficiency bulletins are expected to be issued in the next two years
  – Improving efficiency must become part of the culture of the nuclear industry
  – We must constantly maintain safety, ensure reliability and look for opportunities to enhance efficiency
Links for Additional Information

NEI Website (Public Side)


NEI Website (Member Side)

- http://www.nei.org/Member-Center/Delivering-the-Nuclear-Promise

INPO Website

- https://web.inpo.org/Pages/Nuclear-Promise-Issues.aspx
Decommissioning Landscape

- NRC has a proven regulatory framework for decommissioning activities
- 10 plants have safely completed decommissioning
- 18 plants are in the process of decommissioning
- 7 plants* planning near term shutdown
- There currently is no regulatory framework to govern the transition from operations to decommissioning
  - The process of transitioning from operations to decommissioning is highly inefficient
  - NRC rulemaking needed

*Pilgrim, Fitzpatrick, Oyster Creek, Ft. Calhoun, Quad Cities 1&2, Clinton
Conclusion

• The future of nuclear energy in the U.S.

Growth?  Decline?

• Industry’s *Delivering the Nuclear Promise* initiative seeks to keep nuclear in the mix

• How states interact with electricity markets will significantly affect the outcome
Questions?

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