



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

Past, Present, and Future of Nuclear Power in U.S.

Dr. Peter Lyons
Assistant Secretary for Nuclear Energy
U.S. Department of Energy

Federation of American Scientists and American Nuclear Society Luncheon
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President Obama's Energy Goals

"We can build the next-generation nuclear reactors that are smaller and safer and cleaner and cheaper."

Ohio State University, March 22, 2012



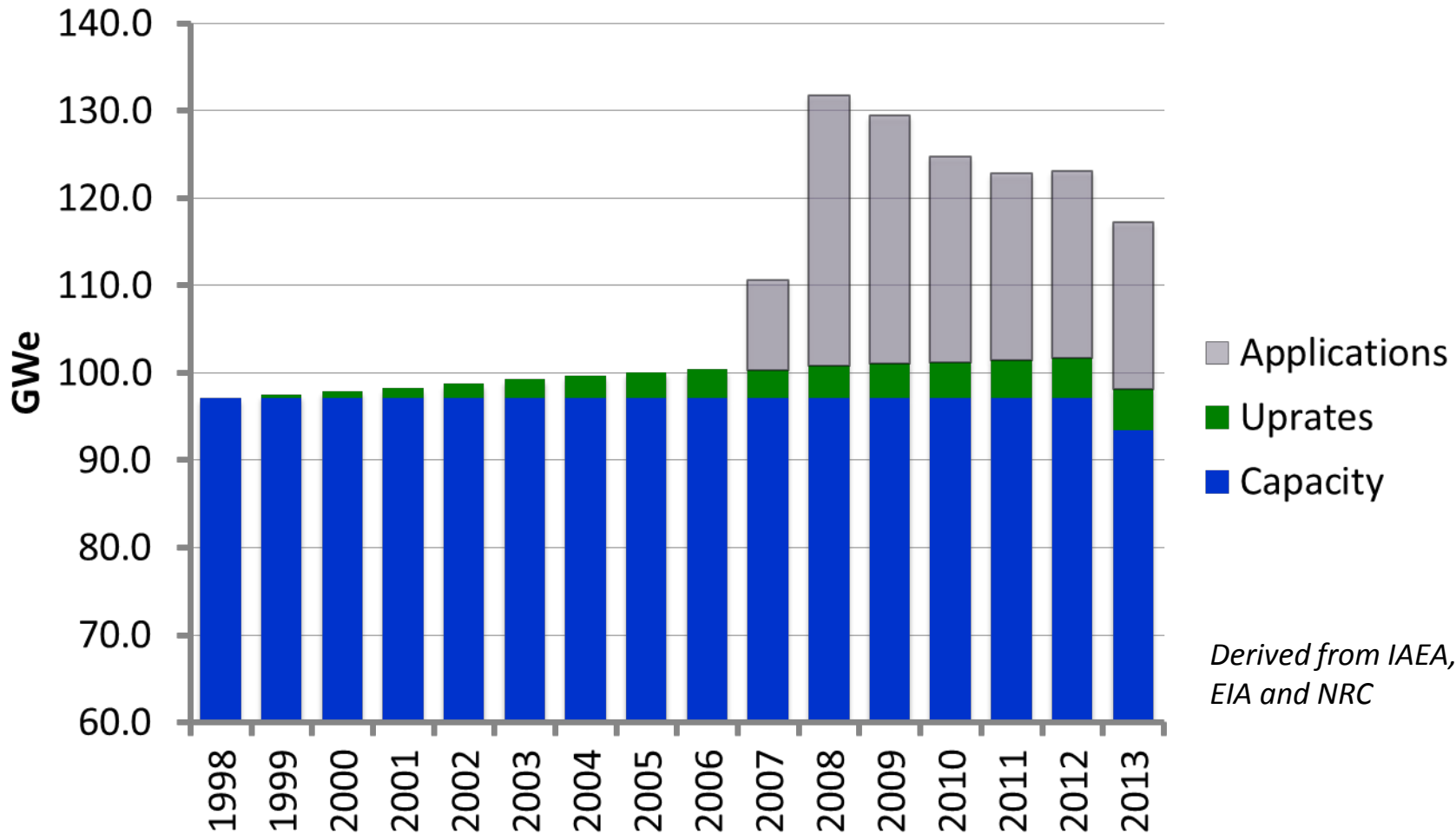
"...the debate is settled. Climate change is a fact. And when our children's children look us in the eye and ask if we did all we could to leave them a safer, more stable world, with new sources of energy, I want us to be able to say yes, we did."

President Obama's 2014 State of the Union Address



Recent History of U.S. Nuclear Fleet

Nuclear Energy



*Derived from IAEA,
EIA and NRC*



Secretary Moniz Announces \$6.5 Billion Vogtle Loan Guarantee



Construction of Vogtle Unit 3,
January 2014 ©Georgia Power Company

“The construction of new nuclear power facilities like this one - which will provide carbon-free electricity to well over a million American energy consumers - is not only a major milestone in the Administration’s commitment to jumpstart the U.S. nuclear power industry, it is also an important part of our all-of-the-above approach to American energy as we move toward a low-carbon energy future...

The innovative technology used in this project represents a new generation of nuclear power with advanced safety features and demonstrates renewed leadership from the U.S. nuclear energy industry.”

Light Water Reactor Sustainability Program

■ LWRS Program Goal

- Develop fundamental scientific basis to allow continued long-term safe operation of existing LWRs (beyond 60 years) and their long-term economic viability

■ LWRS program is developing technologies and other solutions to

- Enable long term operation of the existing nuclear power plants
- Improve reliability
- Sustain safety

■ LWRS focus areas

- Materials Aging and Degradation
- Advanced Instrumentation and Controls
- Risk-Informed Safety Margin Characterization
- Systems Analysis and Emerging Issues (includes research to support post-Fukushima lessons learned)



*Nine Mile Point
~ Courtesy Constellation Energy*

B&W mPower

- Cooperative Agreement established with team consisting of B&W, Bechtel, and TVA in April 2013
- Initial DOE commitment of \$101 M through March 2014
- DOE is working with B&W to establish a path forward for the mPower project



NuScale Power

- Selection of NuScale announced on December 12, 2013
- Cooperative Agreement signed May 27, 2014
- DOE to fund up to \$217 M for NuScale SMR development
- DCA submittal currently planned for 2nd half of 2016



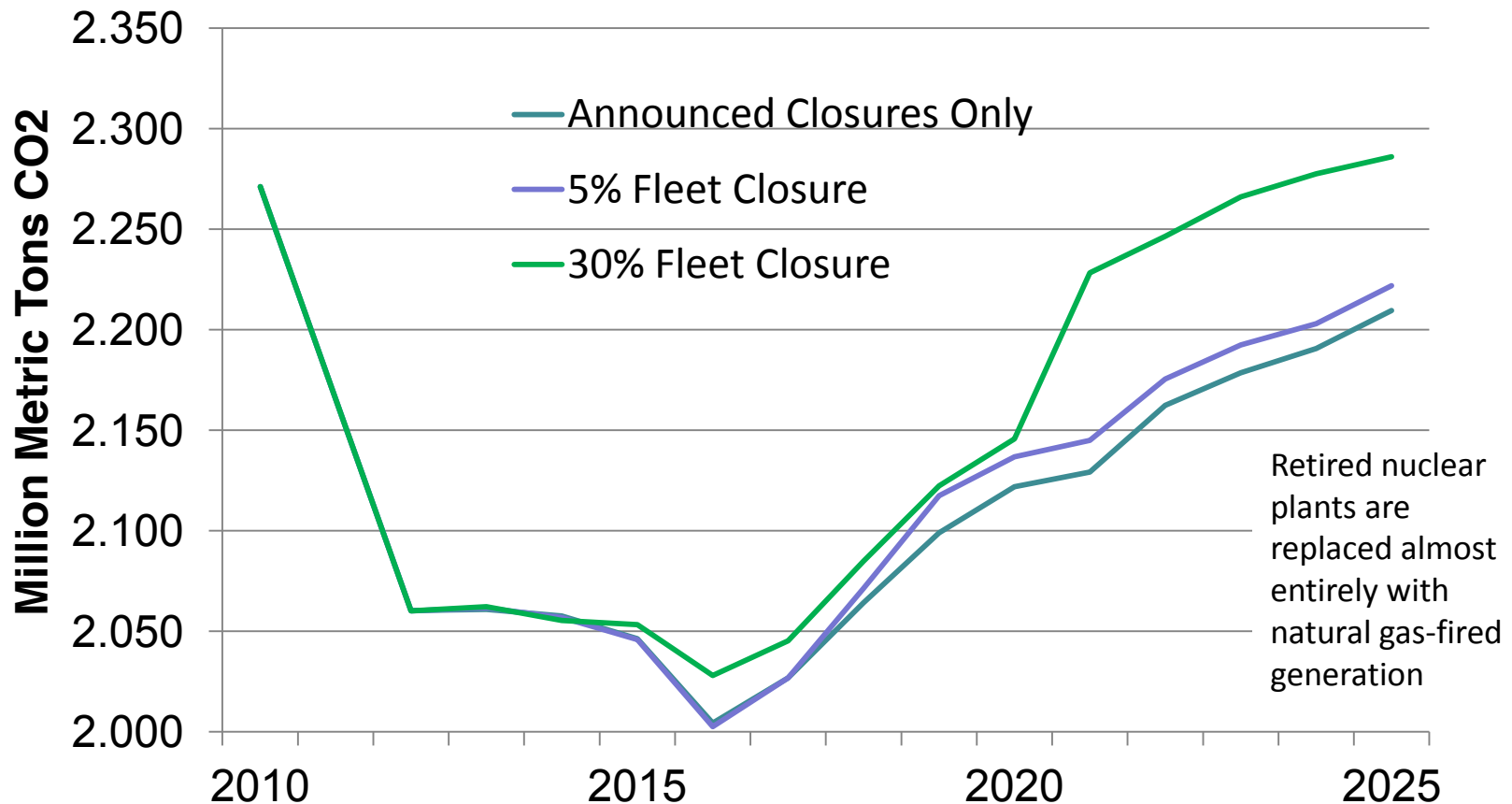
Drivers of Nuclear Electricity Cost Increases

- Capital expenditure on upgrades for license extension
- Capital expenditure on uprates
- Capital expenditure on safety-related upgrades (past: vessel-head replacement; future: hardened/filtered vents)
- Security-related upgrades
- Increased uranium prices



Carbon Implications of Retirements

Estimated Annual CO₂ Emissions from Power Sector



Benefits of Retaining Existing Nuclear Plants

- **Very low-carbon electricity**
- **Help mitigate risks associated with high reliance on a single fuel**
- **Nonproliferation/national security**

Arguably, these benefits are undervalued in the market; note these issues play differently depending on the market



Recognition of the Issue at FERC

■ Commissioner Norris (3/23)

- “These are carbon-free, baseload units, and additional plants are under increasing economic pressure to potentially retire. I’m not sure what yet, but I’m searching for ideas on what we can do to help address this issue.”
- “I encourage states to look at PPAs or some other form to get these plants that run in the \$30 – \$50 [per MWh] cost range to stay online.”

■ Acting Chairman Cheryl LaFleur (4/1)

- Need for markets to value fuel security and diversity – “two things that if the markets don’t do them, I don’t think we’ll have the markets 15 years from now.”
- “I don’t think this is beyond the imagining of man to solve this problem before it gets bigger than it is now.”

■ Commissioner Moeller (4/10)

- “Nuclear plants are under increasing economic pressure to close as a result of record low capacity prices. In addition to several announced nuclear plant closures, some utilities have predicted additional retirements if specific units are unable to operate profitably. Losing these plants has long-term implications both to the reliability of the system and on the nation’s emission profile.”



President Obama on Cutting Carbon Pollution



“We’ve got to do more. What we’re doing is not enough. And that’s why, a couple weeks ago, America proposed new standards to limit the amount of harmful carbon pollution that power plants can dump into the air. And we also have to realize, as hundreds of scientists declared last month, that climate change is no longer a distant threat, but “has moved firmly into the present.” That’s a quote. In some parts of the country, weather-related disasters like droughts, and fires, and storms, and floods are going to get harsher and they’re going to get costlier.”

**UC Irvine Commencement Ceremony
June 14, 2014**