U.S. Nuclear Energy and Its Future

Ray Furstenau
Associate Principal Deputy Assistant Secretary
Office of Nuclear Energy
U.S. Department of Energy

January 23, 2018
INMM Spent Fuel Management Seminar
New Administration, New Opportunities

• Recognition of the importance of nuclear – today and in the future
  • Energy Security
  • Economic Prosperity
  • Global Security
  • Environmental Sustainability

• Concern about the financial viability of some currently operating plants, yet benefits from keeping them running

• Increased interest in nuclear in some domestic and international markets

• Innovators and utilities looking at advanced nuclear as a way to move beyond electricity.

• Secretary Perry: Make Nuclear Energy Cool Again!

"If you really care about this environment that we live in... then you need to be a supporter of this [nuclear energy] amazingly clean, resilient, safe, reliable source of energy."

Secretary Rick Perry at Press conference, May 10th

• 20% of electricity (60% of non-emitting)
  • 90% capacity factor
  • Supports 475,000 jobs
  • $10B in federal & $2.2B in state taxes annually
Presidential and Departmental Nuclear Energy Priorities

- President Trump ordered review of nuclear energy policy:
  
  "[W]e will begin to revive and expand our nuclear energy sector... which produces clean, renewable and emissions-free energy. A complete review of U.S. nuclear energy policy will help us find new ways to revitalize this crucial energy resource."

- Commercialization of advanced SMRs crucial to future of US nuclear sector

- White House National Security Strategy:
  
  "We will improve America’s technological edge in energy, including nuclear technology, next-generation nuclear reactors..."

- Executive Order Promoting Energy Independence and Economic Growth

- Nuclear energy role as clean baseload power is key to environmental challenges:
  
  "If you really care about this environment that we live in... then you need to be a supporter of this [nuclear energy]... amazingly clean, resilient, safe, reliable source of energy."
  
  Secretary Rick Perry at Press conference, May 10th

- Make nuclear cool again and inform citizenry regarding nuclear energy’s attributes

- Waste Policy: Restarting Yucca process and developing interim storage capability
U.S. Civil Nuclear Status & Projected Outcomes

- COLs have taken an average of 7.6 years & $100s of millions
- Financing GW-class reactors extremely challenging
- Time and cost to complete major disincentive
- Market drivers: cheap gas and subsidized renewables
- Reactors are closing prematurely at historic levels
- Some state interventions occurring to save plants

U.S. Nuclear Goals

- Remove Regulatory Roadblocks
  - Collect industry feedback on regulatory challenges
  - Facilitate the evolution of NRC regulations

- Market Reform
  - Build on Grid Study Recommendations
  - Level the playing field
  - Encourage technology to meet market needs

- Private-Public Partnering and Financial Tools
  - Early stage R&D private-public partnering
  - EX/IM bank and other financial tools
  - Other innovative private-public approaches

Actual # and Projected Closures as of 2017

- Worst Case
- Recovery Case
- Growth Case

Planned Reactor Builds: 2009 – 17 NRC COLs for 26 units
2017 – 1 COL for 2 units under review
SMR Design Certifications: NuScale

Without a major wave of license extensions and/or new builds, nearly all U.S. reactors retired by 2050.
Office of Nuclear Energy Mission Pillars

- Existing Fleet
- Advanced Reactor Pipeline
- Fuel Cycle Infrastructure
Existing Fleet

• Extending the life through LWRS – joint R&D program with EPRI

• Improving Economics
  • Accident Tolerant fuel – cost-shared program with Industry
    • Westinghouse/General Atomics
    • General Electric
    • AREVA
  • Consortium for Adv. Simulation of LWRs (CASL) – Energy Innovation Hub

• State and Local Technical Assistance
  • Provide technical assistance via participation in meetings, workshops, webinars, etc. focused on state and local nuclear policy issues
Providing the nuclear energy industry with access to technical, regulatory and financial support necessary to move innovative nuclear energy technologies toward *commercialization* in an accelerated and cost-effective fashion.
Small Modular Reactors

• Greater affordability
  • Easier financing for public power entities
  • Lower capital investment
  • Factory fabrication, shorter construction times

• New standard of passive nuclear safety

• Energy and environmental benefits
  • Greenhouse gas and air pollution avoided
  • Grid benefits: stability, security, quality, availability, reliability
  • Siting flexibility
  • Hybrid energy systems and flexible integration with renewables

• Importance to National Security

• Economic development and job growth
  • Manufacturing jobs and supply chain opportunities in the United States
Micro Reactors

• Siting flexibility including near population centers
• Micro-grids
• Remote Operating Bases
• Data Centers
• Disaster Relief
• Specialized Non-electric Applications
Nuclear Beyond Electricity – Advanced Reactors

NOW
- Baseload Electricity Generation

FUTURE
- Flexible Generators
- Advanced Processes
- Revolutionary Design

- Large LWRs
- SMRs
- GEN IV Reactors
- Chemical Processes
- Hydrogen Production
- Clean Water
- Industrial Applications

Flexible Generators ❖ Advanced Processes ❖ Revolutionary Design
Versatile Advanced Test Reactor

Goal

• An Operational Versatile Advanced Test Reactor by 2026, to support accelerated development of advanced fuels and materials for U.S. advanced reactor vendors, as well as to provide the capability for testing those fuels and materials to support licensing by the Nuclear Regulatory Commission.

• A Versatile Advanced Test Reactor with a high fast neutron flux will revitalize our research infrastructure and remove a critical impediment for U.S. developers of advanced nuclear energy technologies.
Fuel Cycle Infrastructure – Fuel Cycle R&D

Uranium Supply
- Conventional Mining
- Seawater Extraction
- Other Advanced Techniques

Enrichment & Fuel Fabrication
- Conventional LWR Fuel Fabrication

Reactors
- Light Water Reactors

Recycle
- LWR Recycle
- Advanced Reactor Recycle

Interim Storage
- Interim Storage

Final Disposal
- Geologic Repository

Waste Forms
- Advanced Reactors
- Advanced Reactor Recycle

Product
- LWR Fuel with Improved Accident Tolerance

LLW Disposal

Advanced Reactor Fuel
Summary

• The demand for domestically-generated, reliable, resilient and clean sources of baseload electricity will continue to drive many countries toward nuclear energy as part of their energy security and national economic and environmental calculus.

• Profound opportunity for new nuclear growth exists:
  • Growing need for increased global access to electricity
  • Support energy security, economic and environmental goals
  • U.S. leadership to ensure safety & nonproliferation are as important as ever

• The Administration is committed to advancing nuclear energy in the U.S. and abroad.