



U.S. DEPARTMENT OF  
**ENERGY**

Nuclear Energy

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# Status of Nuclear Energy Programs In the United States

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

**Nanonuclear Conference**  
**Gaithersburg, MD**  
**June 6, 2012**



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# President Obama's Nuclear 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



*"With rising oil prices and a warming climate, nuclear energy will only become more important. That's why, in the United States, we've restarted our nuclear industry as part of a comprehensive strategy to develop every energy source."*

Nuclear Security Summit-March 26, 2012



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- **Early Site Permits:** 4 early site permits approved for Clinton, Grand Gulf, North Anna sites, and Vogtle; additional permit applications filed.
- **License Applications:** 18 Construction and Operating License applications for 28 new reactors have been submitted for NRC review; Areva and USEC enrichment licenses filed; 72 reactor license renewals approved.
- **Reactor Design Certifications:** Four designs have been certified; three new designs (APWR, EPR, and ESBWR) are under review; ESBWR through ACRS; **AP1000 certified.**
- **New Plant Orders:** 4 plant construction contracts initiated; 9 power companies have placed large component forging orders.
- **Plant Construction:** TVA construction activities at Watts Bar 2, and reinstated construction permits for Bellefonte 1 and 2. LES enrichment plant operating. **Vogtle and Summer COL issued.**
- **Financial Incentives:** Conditional loan guarantees approved for Vogtle and Eagle Rock.
- **Small Modular Reactor Program:** Administration support for multiyear SMR Licensing and Deployment Program. \$67M in FY12. \$65M requested in FY13. Issued FOA April 22, 2012.



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# AP1000 Construction Sanmen and Vogtle



Sanmen- January 2012



Vogtle- March 2012



- **Fukushima Dai-ichi Accident**
- **Blue Ribbon Commission on America's Nuclear Future- Final Report Issued January 26, 2012**
- **Small Modular Reactor Program Approved**
- **AP 1000 Design Certification and Combined Construction and Operating License (COL) Issued**



# Fukushima Dai-ichi – U.S. Responses



- President Obama asked the NRC to *“do a comprehensive review of the safety of our domestic nuclear plants in light of the natural disaster that unfolded in Japan”*
- Secretary Chu stated, *“the Administration is committed to learning from Japan’s experience as we work to continue to strengthen America’s nuclear industry”*
- Marvin Fertel, President & CEO Nuclear Energy Institute: *“The industry’s highest priority is the safe operation of the 104 reactors in 31 states and we will incorporate lessons learned from this accident at American nuclear energy facilities”*



# DOE/NE Research Impacts: Post-Fukushima

- **Reducing the need for operator actions in accident response enhances overall safety.**
  - Passive Systems enhance safety
    - *AP1000, ESBWR, SMRs, HTGRs*
  - Better understanding of dry cask storage systems.
- **Re-engineering barriers can reduce complications.**
  - SiC cladding
  - Enhanced fuel properties
- **Re-evaluation of potential natural phenomena.**
  - Re-evaluation of U.S. seismic criteria
- **Targeted use of Modeling and Simulation.**
  - Improved modeling of operating reactors
- **Enlistment of the University Community.**



# Advanced LWR Fuels with Enhanced Accident Tolerance

## **Vision:**

LWR fleet with enhanced accident tolerance providing a substantial fraction of the national clean energy needs

## **Mission:**

Develop advanced fuels and non-intrusive reactor system components (e.g. instruments, auxiliary power sources) with improved performance, reliability and safety characteristics during normal operations and accident conditions

## **10-year Goals**

- Insert a LTA into a operating commercial reactor
- Demonstrate non-intrusive components that enhance safety (e.g. instrumentation with enhanced accident tolerance)

## **Must be acceptable to vendors/utilities**

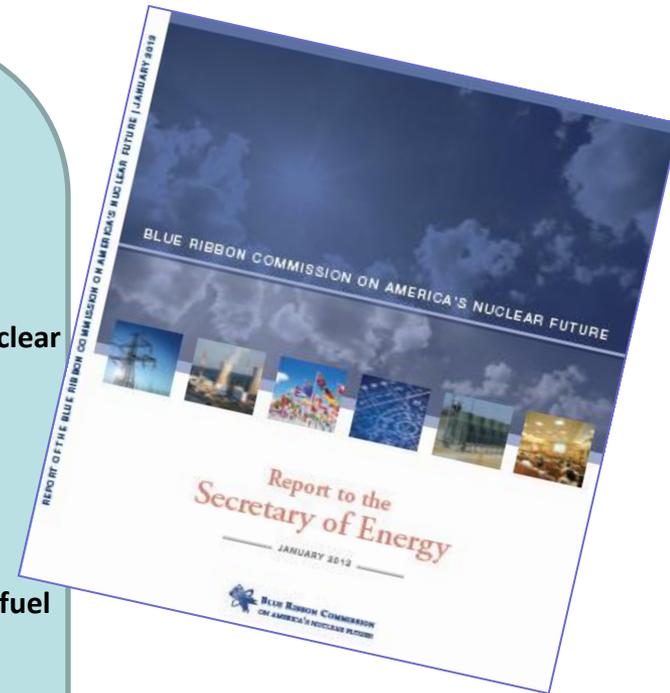
- Better safety performance (e.g. during normal, design basis accidents and beyond design basis accidents)
- Reliability and fuel configurations similar to current fleet
- Acceptable economics
- Favorable neutronics and licensing characteristics





# Blue Ribbon Commission Recommendations

1. A new, consent-based approach to siting future nuclear waste management facilities.
2. A new organization dedicated solely to implementing the waste management program and empowered with the authority and resources to succeed.
3. Access to the funds nuclear utility ratepayers are providing for the purpose of nuclear waste management.
4. Prompt efforts to develop one or more geologic disposal facilities.
5. Prompt efforts to develop one or more consolidated storage facilities.
6. Prompt efforts to prepare for the eventual large-scale transport of spent nuclear fuel and high-level waste to consolidated storage and disposal facilities when such facilities become available.
7. Support for continued U.S. innovation in nuclear energy technology and for workforce development.
8. Active U.S. leadership in international efforts to address safety, waste management, non-proliferation, and security concerns.





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# Secretary of Energy Dr. Steven Chu Statement on the BRC Recommendations



The Department recognizes that the BRC Report represents *“a critical step toward finding a sustainable approach to disposing used nuclear fuel and nuclear waste.”*

The Department acknowledges that *“the specifics of a new strategy for managing our nation’s used nuclear fuel will need to be addressed in partnership with Congress.”*

*-Administration strategy to Congress within 6 months*

The Department *“will work in parallel to begin implementing the new strategy”* by taking sensible steps toward the implementation of near-term recommendations.



## Where We Are Today

Global demand for energy and concerns about climate change has accelerated deployment of reactor and fuel cycle facilities worldwide

There is a continuing build up of nuclear waste from commercial nuclear plants and stockpile of DOE wastes stored across the country.

After Fukushima – new awareness as a country of the need for a waste management strategy

- Interim storage
- Fuel cycle alternatives
- Disposal options



The BRC conducted a comprehensive evaluation of policies for managing the back end of the nuclear fuel cycle, including advanced fuel cycle technologies

The Fuel Cycle Technology Program seeks to develop innovative technologies that represent significant advantages in terms of economics, proliferation resistance, resource utilization and waste management



- **Many potential benefits from SMRs:**
  - Enhanced safety from integral design
  - Significant job creation opportunities
  - Shorter construction time – less financial risk
  - Lower capital cost – less financing required
  - Could be air-cooled
  - Security advantages from underground siting
  - Could replace aging fossil plants – provide low-carbon energy to address GHG goals



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## Goal of SMR Licensing Technical Support Program

- Facilitate and accelerate the commercial development and deployment of U.S.-based SMR designs at domestic locations
- 5 year - \$452 M program
- Up to 2 SMR designs, consistent with FY12 budget
- FY12 Conference Report dictated that DOE should consider any SMR that can be “deployed expeditiously”
- Support only design certification and licensing for new designs – no construction



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# Global Demand for Nuclear Energy Continues

## Key Drivers:

- Long-term energy supply/energy security
- Clean, base-load source of energy
- Significant source of jobs and economic benefit



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# Benefits of Nanonuclear Advancement

- **Structural Materials**
- **Reactor fuels and cladding materials**
- **Separations**
- **Waste Forms**
- **Instrumental and Control**