



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

Activities to Support Advanced Reactor Development

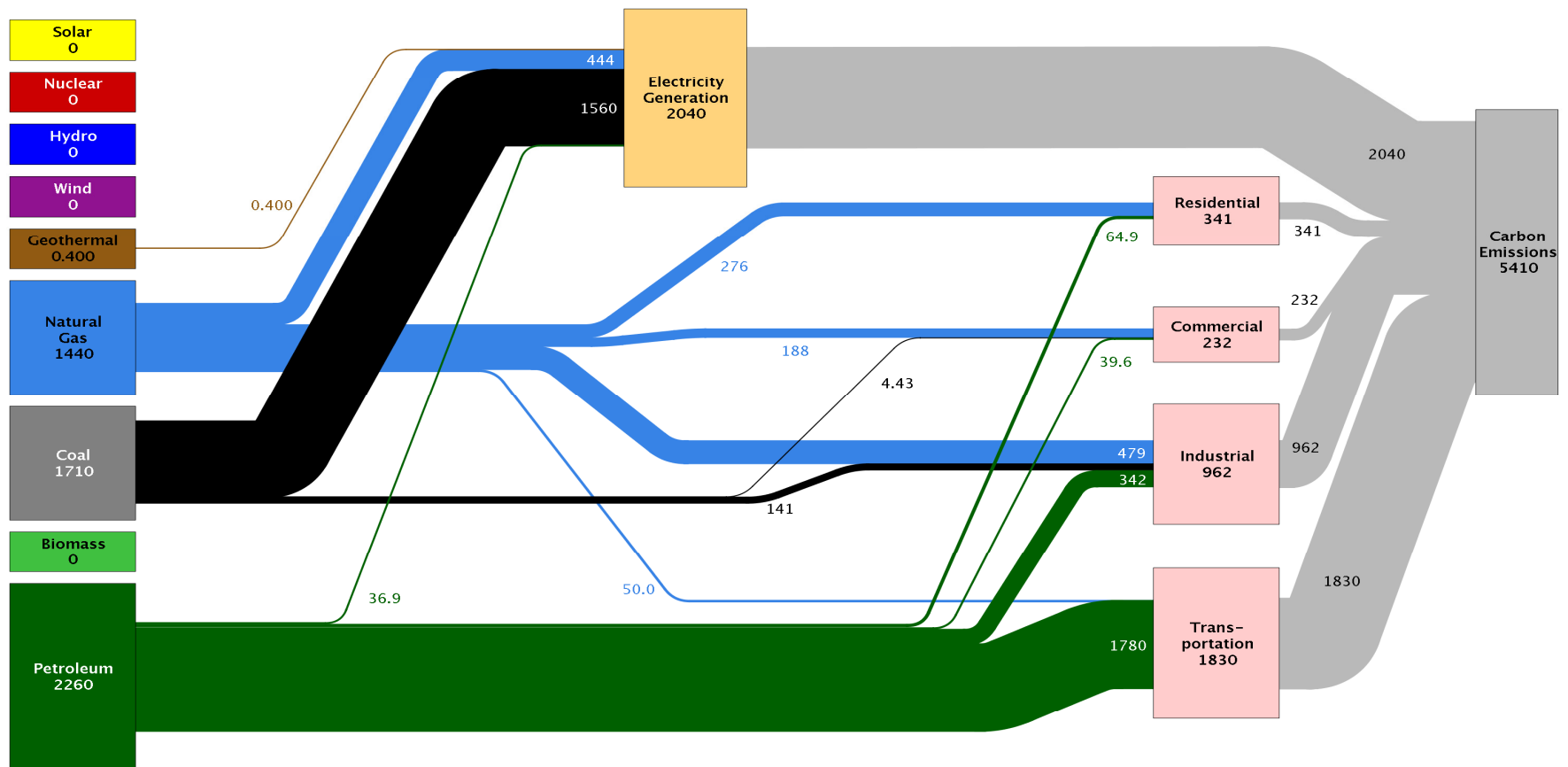
Thomas J. O'Connor
Office of Advanced Reactor Technologies
Office of Nuclear Energy
U.S. Department of Energy

February 10, 2016



Nuclear Energy Could Significantly Reduce Other CO2 Emissions

Estimated U.S. Carbon Emissions in 2014: ~5,410 Million Metric Tons



Source: LLNL 2015. Data is based on DOE/EIA-0035(2015-03), March, 2015. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Carbon emissions are attributed to their physical source, and are not allocated to end use for electricity consumption in the residential, commercial, industrial and transportation sectors. Petroleum consumption in the electric power sector includes the non-renewable portion of municipal solid waste. Combustion of biologically derived fuels is assumed to have zero net carbon emissions - the lifecycle emissions associated with producing biofuels are included in commercial and industrial emissions. Totals may not equal sum of components due to independent rounding errors. LLNL-MI-410527



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

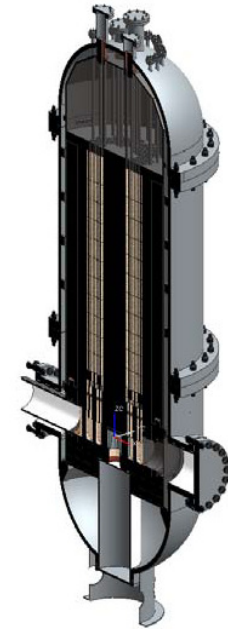
Role of DOE for Advanced Reactor Technologies

NE R&D Roadmap Goal:

Develop improvements in the affordability of new reactors to enable nuclear energy to help meet the Administration's energy security and climate change goals.

Conduct Research, Development, and Demonstration to:

- Reduce technical risk
- Reduce financial risk
- Reduce regulatory risk
- Engage in international collaboration
- Examine the need for a new test and/or demonstration reactor
- Work with Industry to further advanced reactor development



High Temperature
Test Facility Oregon
State University

Advanced reactors can provide safe, economical and clean energy when replacements are needed for the current light water reactors.



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

ART Technical Focus Areas

■ **Fast Reactor Technologies:**

- Mechanisms Engineering Test Laboratory (METL) for testing of small and intermediate scale components in liquid sodium
- Modernization of codes and knowledge preservation

■ **High Temperature Reactor Technologies:**

- Coated particle fuel development and nuclear grade graphite qualification
- High Temperature Test Facility at Oregon State University

■ **Advanced Reactor Generic Technologies:**

- Address design needs for advanced materials, including ASME code cases, energy conversion, decay heat removal systems and modeling methods

■ **Advanced Reactor Regulatory Framework:**

- Work with NRC to finalize advanced reactor design criteria and develop associated implementation guides

■ **Advanced Reactor System Studies**

- Hybrid Energy Studies with Energy Efficiency and Renewable Energy
- Advanced Test / Demonstration Reactor Planning Study



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

Industry

■ Interactions with various trade groups:

- Electric Power Research Institute (EPRI) including formal MOU
- Nuclear Energy Institute
- US Nuclear Infrastructure Council

■ Technical Review Panel (TRP) Process to inform R&D decisions

- Issue Request For Information to solicit R&D needs of Industry to influence programs at Labs and determine scope of Funding Opportunity Announcements for industry cost-share financial assistance
- Four awards in 2013 (\$3.5M) and five awards in 2014 (\$13M)

■ Recent Funding Opportunity Announcement

- Supports a broad scope including such areas as R&D, design analysis, scale testing or licensing
- Supports multi-year funding (up to \$100M, with 20% cost-share)
- Announced awards on January 15, 2016 to X-energy and Southern Company Services



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

Advanced Test/Demo Reactor Planning Study

- **FY15 Omnibus Spending Bill**
- **Nuclear Energy Advisory Council (NEAC) providing study advice.**
- **Study Objective:** Provide transparent, and defensible options to address need for, and technology of, a test and or demonstration reactor(s) to be built to support innovation and long term commercialization.
- **Four Strategic Objectives:**
 - Demonstrate process heat / high efficiency electricity application
 - Demonstrate actinide management
 - Increase maturity of technology concept
 - Provide an irradiation test bed
- **Recent Steps:**
 - Workshop held in April with stakeholders to develop criteria and metrics
 - Technology Assessment evaluation completed
 - Point Designs presented via webinar February 3, 2016
 - Point Design evaluations to be scored week of February 22nd
 - Schedule provides draft report in April 2016.