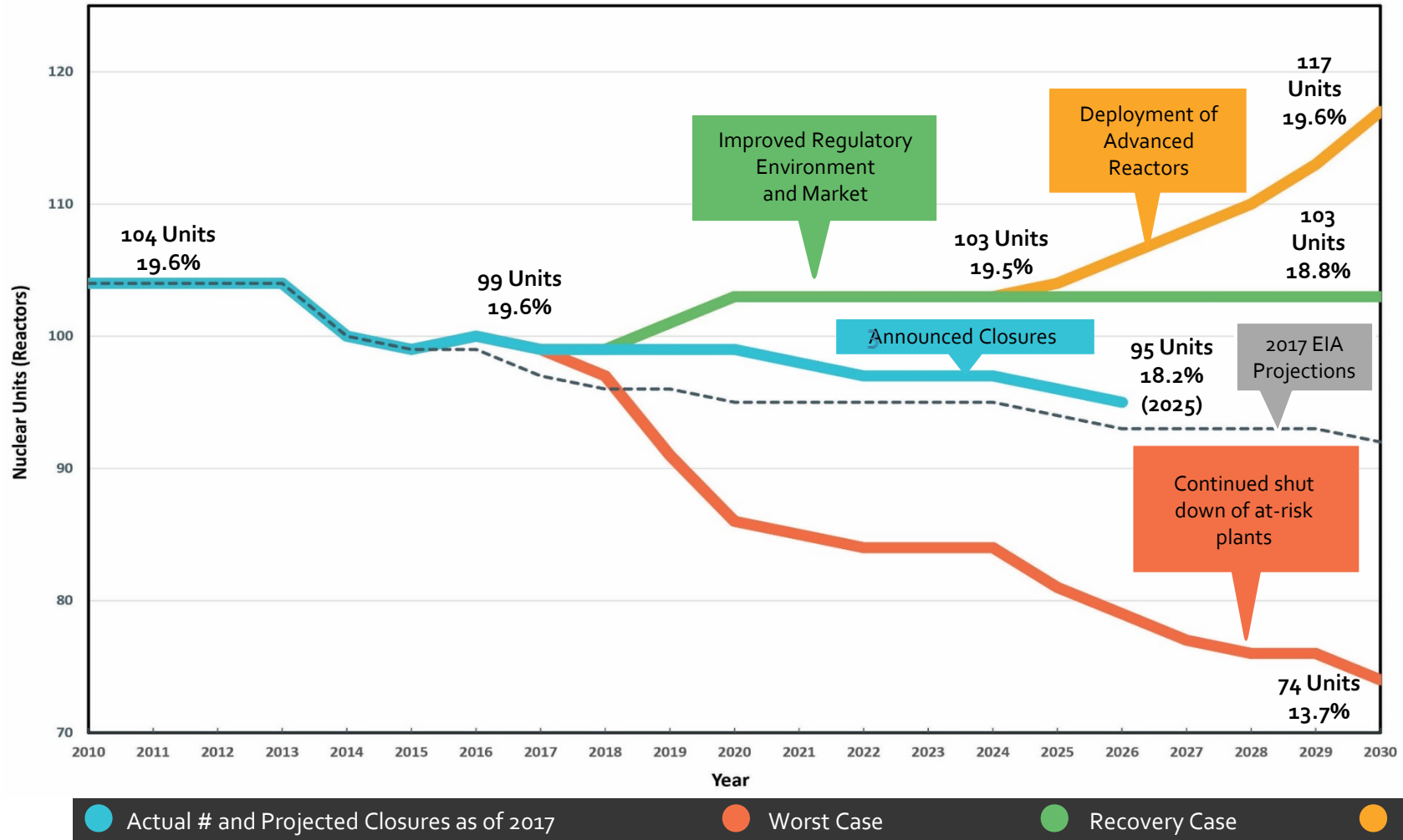


Office of Nuclear Energy Support to the Existing Nuclear Fleet

Office of Nuclear Technology
Demonstration and Deployment

October 13, 2017

U.S. Nuclear Outlook:



Mission Focus

Existing Fleet



Advanced
Reactor
Pipeline



Fuel Cycle
Infrastructure



Existing Nuclear Fleet Light Water Reactor Sustainability (LWRS)

	FY 2017 Omnibus	FY 2018 Request	FY 2018 House Mark	FY 2018 Senate Mark
Light Water Reactor Sustainability	40,000	20,000	40,000	40,000

■ LWRS Program Goal

- Develop fundamental scientific basis to allow continued long-term safe operation of existing LWRs (beyond 60 years), enhance their long-term economic viability, and promote U.S. electrical grid resiliency

■ LWRS program is developing technologies and other solutions to

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

■ LWRS focus areas

- Materials Aging and Degradation
- Advanced Instrumentation and Controls
- Risk-Informed Safety Margin Characterization
- Reactor Safety Technologies
- Systems Analysis and Emerging Issues



Nine Mile Point ~ Courtesy Constellation Energy

Light Water Reactor Sustainability – Federal Government Role

- National strategic interest in the long-term operation of existing plants
 - Supports the Administration’s grid reliability and resiliency priorities
 - Supports energy security
 - Avoids higher cost to ratepayers for new plant replacements
- Addresses fundamental scientific questions where private investment or capabilities are insufficient to make progress on broadly applicable technology issues
- Government (DOE and its national laboratories) holds a large theoretical, computational, and experimental expertise in nuclear R&D
- Benefits will extend to next generation of reactor technologies
- Federal program reduces uncertainty and risk to provide incentives for industry to make long-term investments
- Industry also has an incentive, so cost-sharing is being employed

LWRS Technical Focus Areas

- **Nuclear Materials Aging and Degradation** – Understand and predict long-term environmental degradation behavior of materials in nuclear power plants, including detecting and characterizing aging degradation
- **Advanced Instrumentation, Information, and Control Systems Technologies** – Address long-term aging and obsolescence of existing instrumentation and control technologies through a strategy for long-term modernization
- **Risk-Informed Safety Margin Characterization** – Develop significantly improved safety analysis tools (computer codes called RELAP-7 and Grizzly) and apply these tools to analyze the safety margin of aging plants
- **Systems Analysis and Emerging Issues** – Address high impact emerging issues such as flexible operations, chemistry control and water usage issues
- **Reactor Safety Technology** – Develop technologies to enhance the accident tolerance of current and future reactors
- **Hybrid Systems** – to help nuclear be profitable in a competitive energy market
- **Competitively-awarded cost-shared projects with industry** – to solve highest priority cost and technical problems threatening existing plants

University-led Research Supporting Existing Fleet

Multiple existing fleet focused work scopes planned for FY 2018 CINR FOA

- RC-5 involves applying the concept of “Big Data Analytics” to existing nuclear power plants. Existing plants have much data available, but often in different systems and formats. Fusing this information together to gain insights has been challenging. Big Data science and data analytics offers the potential to provide real benefits.
- RC-6 evaluates current LWRs for design enhancements such as evaluating accident tolerant fuel through a risk-informed lens to improve risk and economics
- RC-7 evaluates innovative methods for increasing passive safety response for existing plants.

NE Support for U.S. Industry Initiatives, Including Existing Fleet

- New **Industry-Focused Funding Opportunity Announcement (FOA)**
- Supports innovation and competitiveness of the **U.S. nuclear industry** by directly sharing costs on cross-cutting applied research and development activities, specifically:
 - All aspects of advanced reactor development
 - Methods to improve the cost and schedule for delivery of nuclear products, services and capabilities, and
 - Resolution of regulatory/certification issues.
- FOA to service **nuclear technology developers** from early concept to more mature designs. Low to mid-level technology readiness levels and/or first-of-a-kind engineering (FOAKE) development.

NE Support for U.S. Industry Initiatives:

Notional Framework for New Reactor Development and Existing Fleet Support FOA

Tier	Delineation of Tiers	Task Funding Range	Cost Share	Typical No. of Tasks	Length of Tasks
3	License Application with NRC and/or Contractual Arrangement w/ End User(s)	\$10M-\$100M	50/50	1-2	24-36 months
2	Reactor Technologies and/or Concepts at varying levels of technical and/or regulatory maturity	\$1M-\$10M	50/50 80/20	4-6	12-30 months
1	Technical and Regulatory Vouchers for work to be performed by DOE labs or licensing discussions w/ NRC	Less than \$1M	80/20	20+	6-18 months