



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Generation IV: Looking Back

ANS Winter Meeting

***William D. Magwood, IV
Commissioner***

November 13, 2012



US Government Agencies Leading Technology Advances



*AEC Chair Glenn Seaborg and NASA
Administrator James Webb – July 1961*

The ARC of Success: AEC/DOE and NASA

1950s to 1970: - Historic Technological Achievements

1970 to 1990:
Consensus

- Fracturing Political

- Continued Progress amid Loss of
Momentum

1990 to Today:

- Reduced Public Enthusiasm

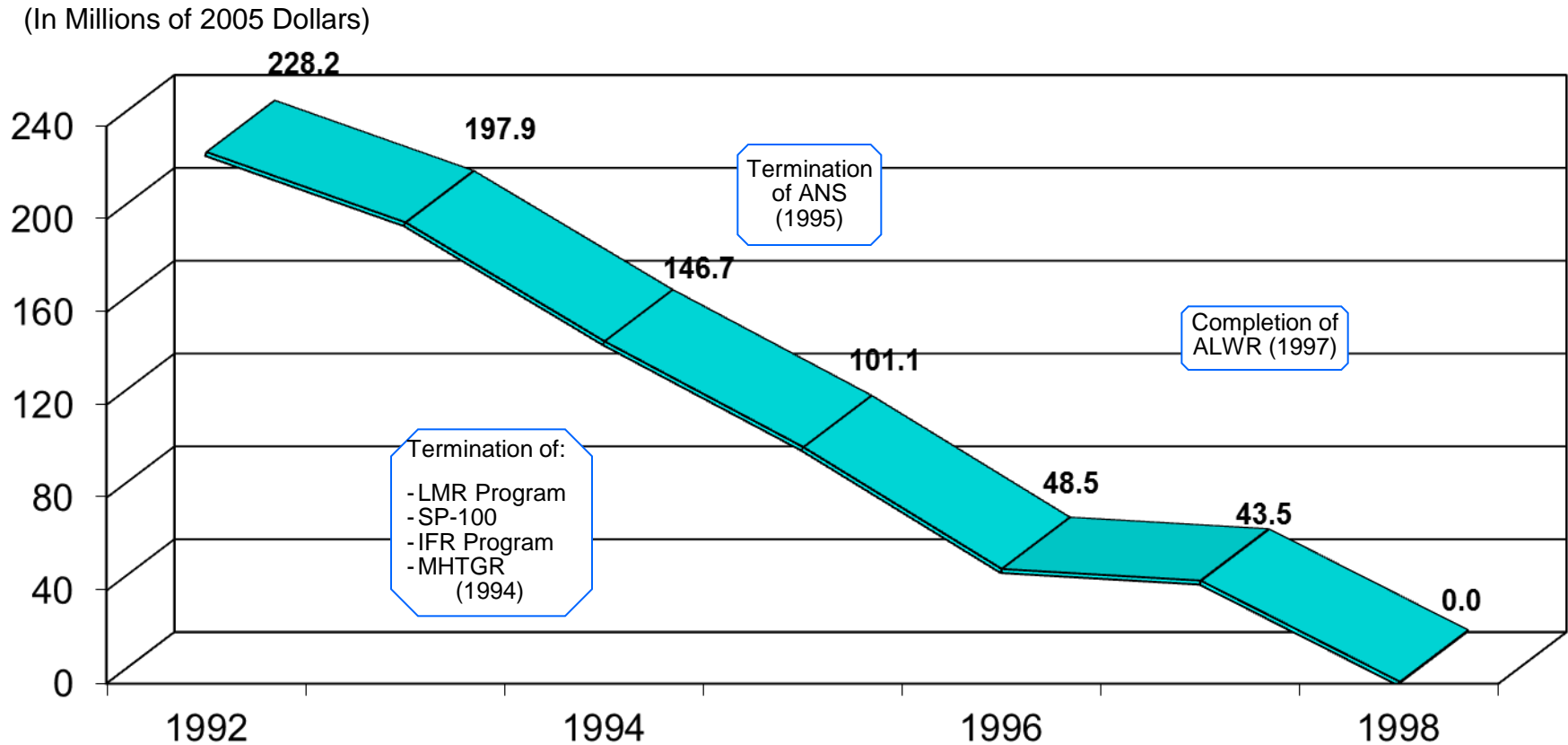
- Divergent Views Among
Policymakers

- Persistent Funding Challenges

- Shifting and Uncertain Strategies

- Canceled Technology Programs

Nuclear Energy Research and Development Budget History



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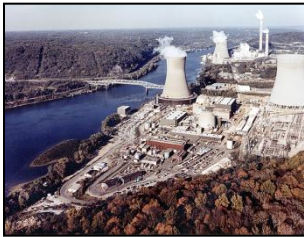




The Evolution of Nuclear Power

Generation I

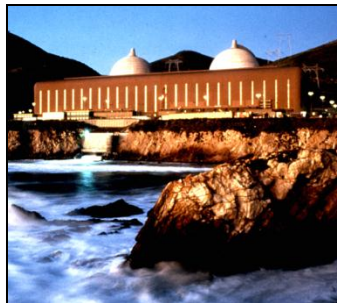
Early Prototype Reactors



- Shippingport
- Dresden, Fermi I
- Magnox

Generation II

Commercial Power Reactors



- LWR-PWR, BWR
- CANDU
- VVER/RBMK

Generation III

Advanced LWRs



- ABWR
- System 80+
- AP600
- EPR

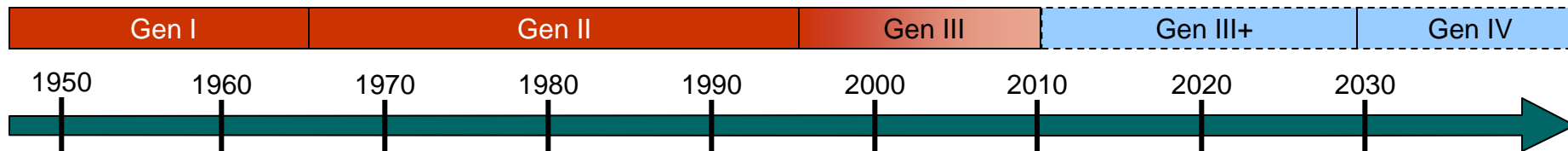
Generation III+

Generation III Evolutionary Designs Offering Improved Economics

- AP1000
- ACR700
- ESBWR

Generation IV

- Highly Economical
- Enhanced Safety
- Minimize Wastes
- Proliferation Resistant



January 2000 *Getting Started*



Generation IV

International Pursuit Of A New Generation of Nuclear Energy

- ◆ This international collaboration began in January 2000
- ◆ Its purpose: to bring next-generation nuclear energy system technology to a state of maturity allowing for commercial deployment
- ◆ Generation IV reactors will offer improvements in:
 - Reactor safety and reliability
 - Proliferation resistance and physical protection
 - Economic competitiveness
 - Sustainability
- ◆ The effort is led by the Generation IV International Forum



U.S.A.



United Kingdom



Switzerland



South Korea



South Africa



Japan



France



Canada



Brazil



Argentina

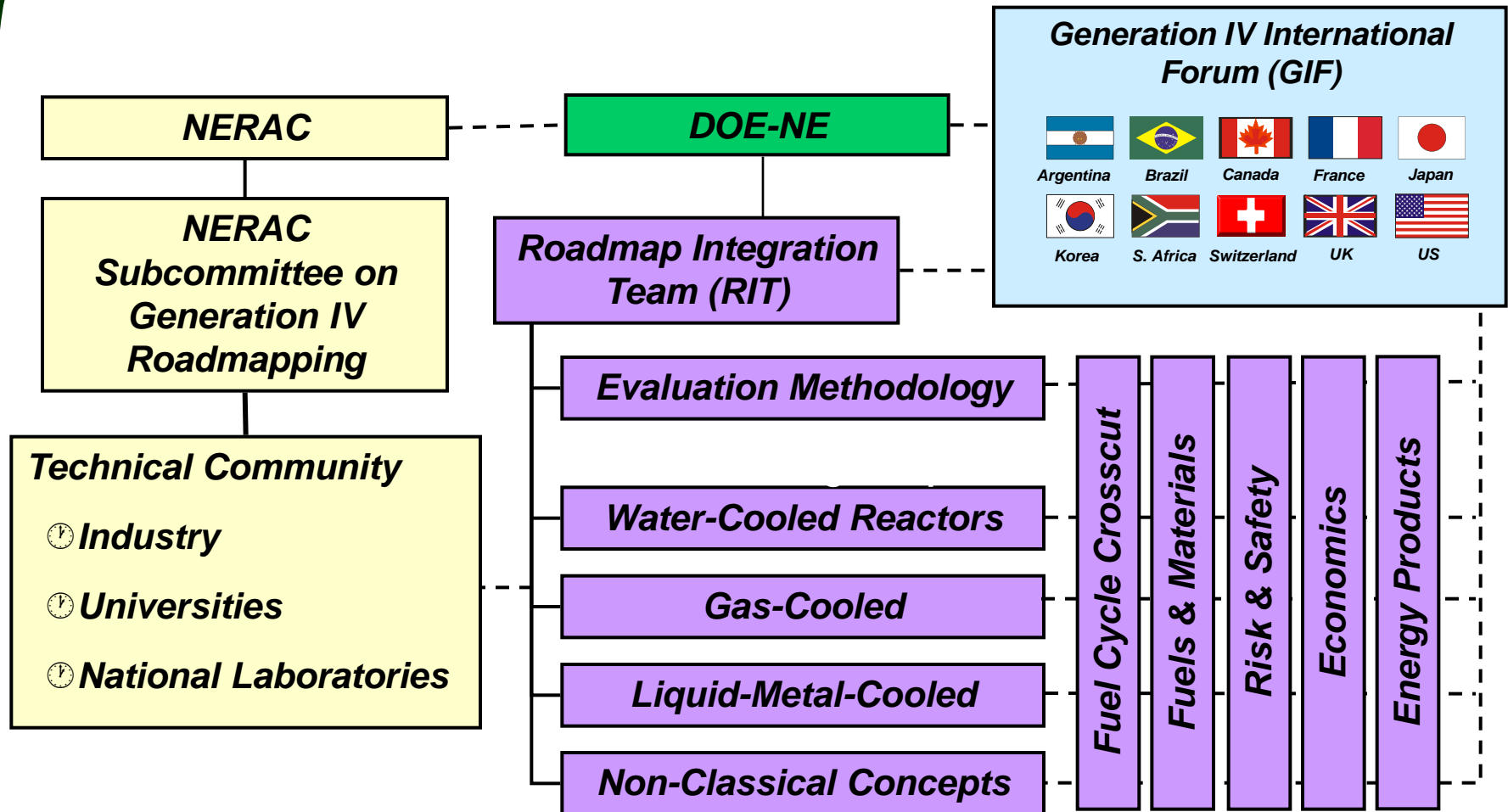


European Union



Generation IV

How We Did It



Generation IV Nuclear Energy Systems

Nuclear Power for a New Century

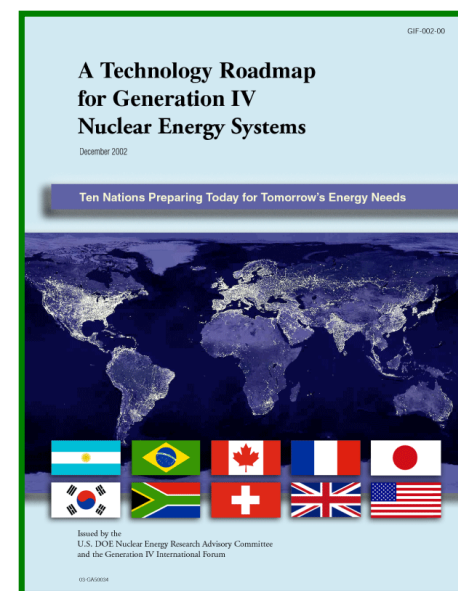
◆ In September 2002, the Generation IV International Forum selected six system concepts for further development:

- Very High Temperature Reactor
- Supercritical Water Cooled Reactor
- Gas Cooled Fast Reactor
- Lead Cooled Fast Reactor
- Sodium Cooled Fast Reactor
- Molten Salt Reactor

◆ In December 2002, the Generation IV Technology Roadmap was issued

- Summarizes and prioritizes the R&D activities necessary to develop the six system concepts

December 2002



<http://nuclear.gov/nerac/FinalRoadmapforNERACReview.pdf>



Developing A GIF Treaty

- **More than a year of negotiations and discussions**
- **Lawyers – Good, Bad, and Ugly**
- **International Agreement Working Group**
- **The French Problem**
- **The Japanese Problem**
- **The European Problem**

Signing the GIF Treaty



Signing the GIF Treaty



Signing the GIF Treaty



Signing the GIF Treaty



Signing the GIF Treaty



A Few Reflections

- 
- **An Assessment on the GIF**
 - **What Worked? What Didn't?**
 - **How We Were Successful**
 - **Advice for the Future**



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