



U.S. DEPARTMENT OF
ENERGY

OFFICE OF
**ENVIRONMENTAL
MANAGEMENT**

Overview of Office of Environmental Management's Technology Development Program

Presented to the
Secretary Energy Advisory Board Task Force on
Technology Development for Environmental Management

July 15, 2014

❖ Secretary Moniz

- *While the Department's Office of Environmental Management has made significant progress in closing a number of projects, many of the most challenging projects remain and will for decades to come.*

❖ Charter

- Task Force will examine and report on
 - Opportunities and barriers
 - Implementation strategies
 - Funding strategies

❖ EM cleanup has relied on technological innovations

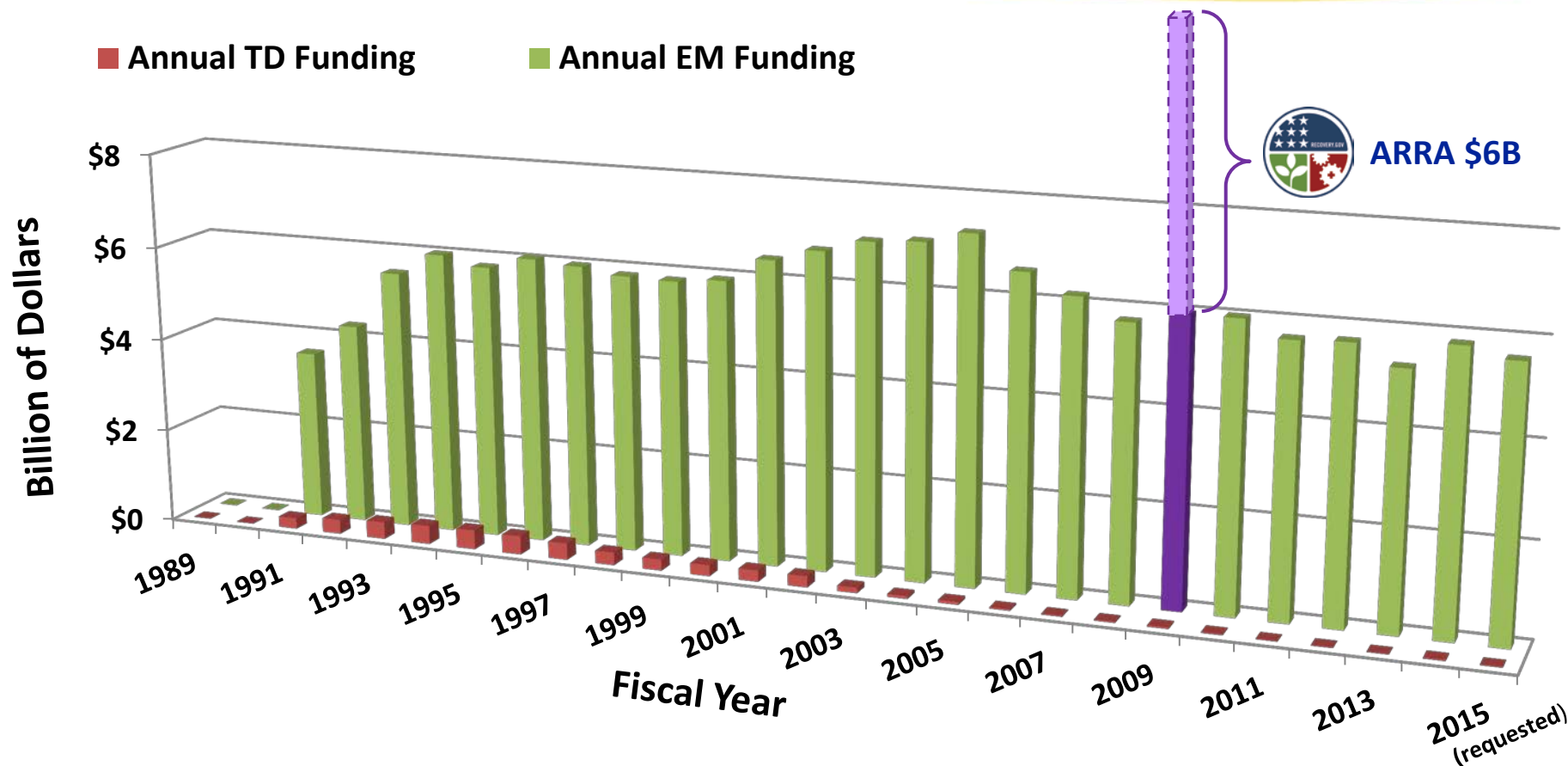
➤ Significant contributions

- Soil and groundwater cleanup
- Radioactive solid and liquid waste treatment, storage and disposal
- Site "closures"

➤ Many challenges

- Completion of radioactive liquid tank waste disposition
- Nuclear materials stewardship and disposition
- Facility deactivation and decommissioning

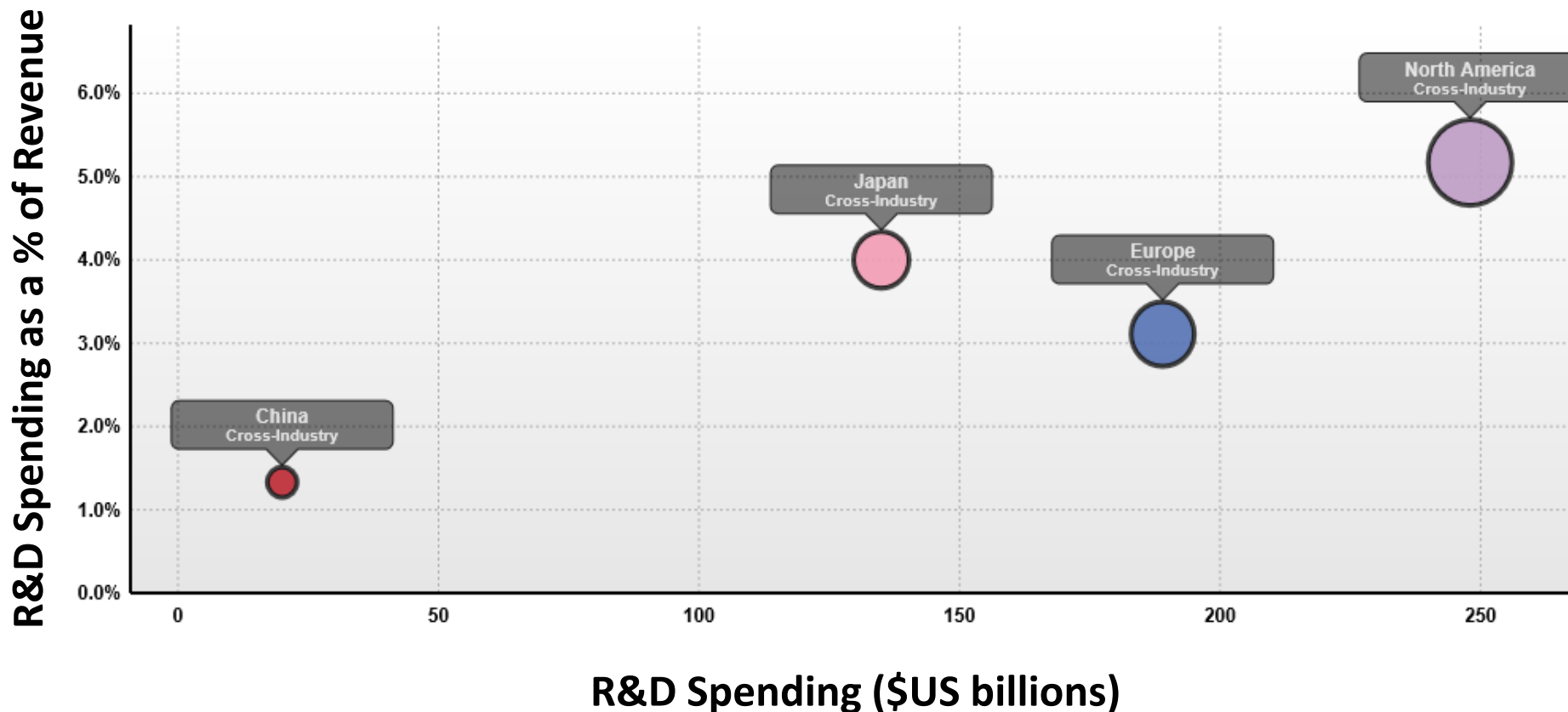
Historical Funding Profile



FY	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
%	3.1	8.0	6.4	7.1	6.6	6.6	7.1	6.5	5.9	4.6	4.1	4.0	3.8	3.5	1.6	0.9	0.8	0.4	0.3	0.4	0.5	0.3	0.2	0.2	0.2	0.4	0.3

Benchmark: How much is enough?

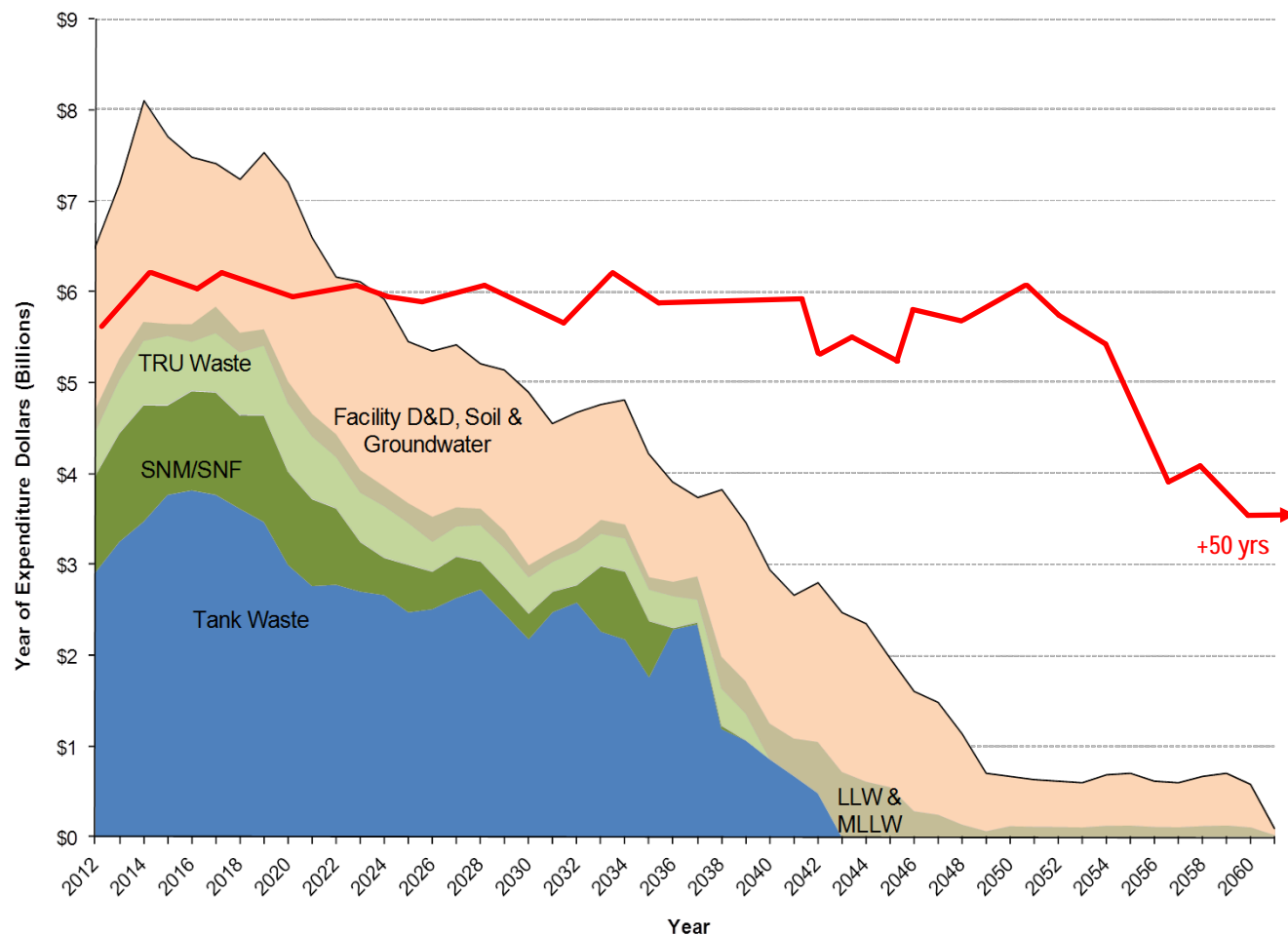
The Global Innovation 1000: Comparison of Cross-Industry R&D Spending in 2013



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Effect of Lifecycle Cost on Mission Duration

- As the EM cleanup schedule extends, maintenance and infrastructure consume increasing fraction of available funds.
- Over time, facilities and infrastructure will age and require even more funds to safely operate and maintain.
- Technological innovations play an even bigger role in our ability to balance those costs.



❖ EM mission demands advancing and using the state-of-the-art

➤ Operational safety

- ALARA → Worker and public exposure

➤ Cleanup effectiveness

- Environmental and ecological protection
- Utilization of best available technologies

➤ Operational efficiency

- Operating and maintenance demands
- Waste minimization

➤ Lifecycle costs

- DOE cleanup remains the third-largest federal financial liability
- Decades and over \$200 billion to complete

➤ Regulatory compliance

- CERCLA 5-year ROD remedy reviews
- RCRA hazardous waste 5-year permit renewals

- ❖ Radio-chemical waste processing
- ❖ Alternative waste and nuclear materials disposition systems
 - Treatment, stabilization
 - Disposal pathways
- ❖ Tooling
 - Sensors, measurement devices, instrumentation
 - Mathematical/computer modeling, data processing
 - Robotics and autonomous systems
- ❖ Integrated systems and process knowledge
- ❖ Work force development → maintaining “lifecycle” expertise

Recent Success: Enhanced Vitrification

❖ Innovations

- Improved Flow Sheets – process models improve operational efficiency
- Tailored Frit – Glass formers allow greater waste loading
- Bubblers – Improve mixing performance in melters

❖ Benefits

- More efficient operations, greater throughput
- Reduces number of glass canisters requiring interim storage and permanent disposal
- Reduces overall lifecycle costs



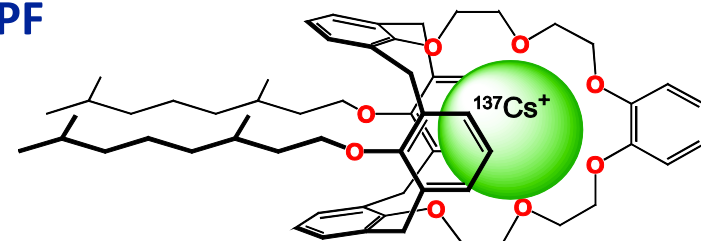
Recent Success: Improved Solvent

❖ Innovation

- Next Generation Solvent → Improved solvent allows greater cesium (Cs) removal from the waste process stream

❖ Benefits

- Significant improvement in Cs decontamination and overall performance
 - With NGS, interim salt processing facility at SRS has demonstrated a Cs decontamination factors equal to the design basis of full-scale Salt Waste Processing Facility
- Creates options for accelerating salt processing
 - Alternative processing options
 - Potential increased throughput in SWPF
 - Potential application at Hanford
- Reduces overall lifecycle costs



❖ Build Departmental synergies → *use what we already have*

➤ Benefit from cross-cutting innovations

➤ Piggy-back on existing programs

- Nuclear Safety and Research Development Program
- Nuclear Energy University Programs
- Advanced Research Projects Agency-Energy

➤ Leverage our own assets

- Expand engagement with DOE national laboratories
 - Office of Fossil Energy, National Engineering Technology Laboratory
 - Office of Science, Heavy Element Chemistry research

- ❖ **Leverage external expertise and know-how → *ask for help***
 - **Benchmark other federal technology programs**
 - **Form strategic collaborations**
 - **Other federal agencies and their programs**
 - **Defense Department**
 - Naval Research Laboratory
 - University Affiliated Research Centers
 - Defense Advanced Research Projects Agency
 - **Nuclear Regulatory Commission**
 - **National Aeronautics and Space Administration**
 - **Research institutions and university research centers**
 - **“Non-traditional” industry sectors**
 - **International agencies**

❖ Exploit technology transfer → *do not re-invent the wheel*

- Utilize commercial off-the-shelf technologies
- Adapt technologies from other federal agencies
 - Defense (military)
 - Deep space, aerospace
 - Deep ocean
- Learn from others



Credit: Baloo's Cartoon Blog

Managing the Technology Program

❖ Program management

- EM office/entity
- DOE-managed program (another DOE office)
- Externally managed program (outside of DOE)

❖ Funding

- Appropriations
- Leverage other DOE technology/research efforts
- Collaborate with other Federal agencies and programs

- ❖ **EM mission success = technology development and transfer**
 - **Technology is in the EM “DNA”**
 - **New and innovative solutions**
 - **Technology continuum**
 - **Defined path to deployment**
- ❖ **Continuing Federal budget constraints**
 - **Balancing competing priorities**
 - **Funding level**
 - **Demonstrating value (return on investment)**