

Transportation, Aging, and Disposal (TAD) Canisters for Used Nuclear Fuel

The Bridge to System Integration

U.S. Nuclear Waste Technical Review Board

September 19, 2007

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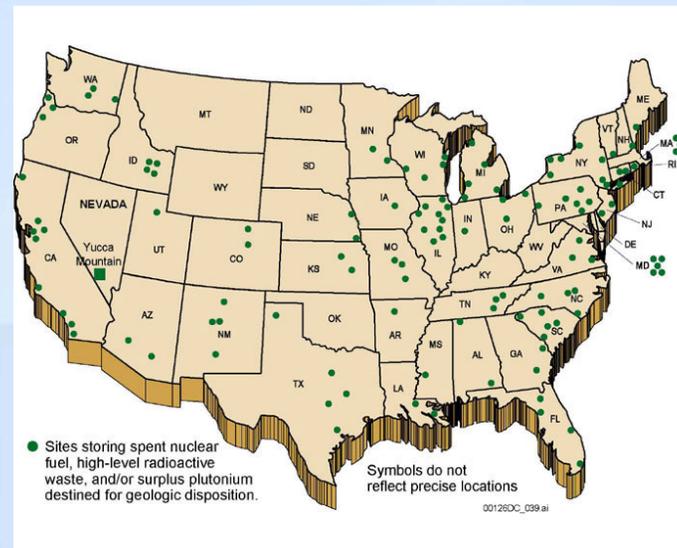
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Nuclear Facts

- **104 commercial nuclear plants at 64 sites in 31 states**
- **Most plants have received or are pursuing 20 year license extension**
- **Provide 20% of U.S. electricity generation, emits no controlled pollutants**
- **Average Production Costs – 1.68 cents/kWh, Coal – 1.9 cents, Oil – 5.39 cents, Natural Gas– 5.87 cents**
- **One uranium pellet equals 17,000 cubic feet of NG, 1,780 lbs. of coal or 149 gal. of oil**

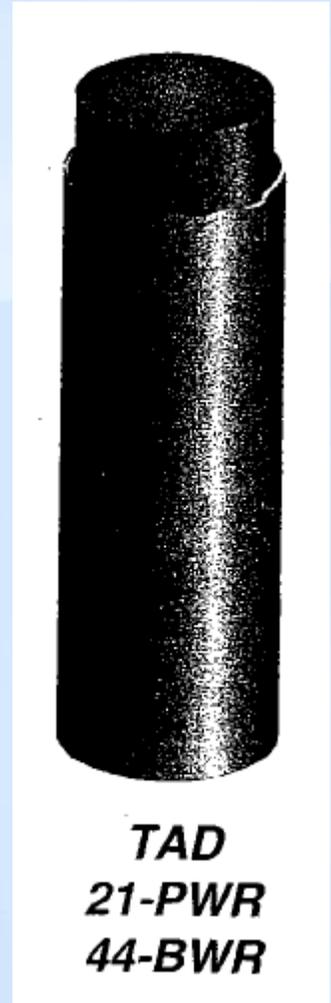
Used Nuclear Fuel Storage

- **Current used fuel inventory**
 - Approximately 56,000 MTU
- **Current dry storage inventory**
 - 9,600 MTU
 - 877 casks/canisters loaded
 - At 39 sites (6 add'l licensed)
- **Future dry storage inventory by 2017**
 - Estimating 22,300 MTU of 76,600 MTU total
 - 2,000 casks/canisters loaded
 - At 66 sites for 108 plants



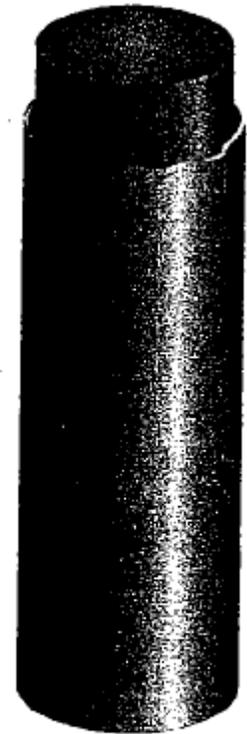
Transportation Aging & Disposal (TAD) Canisters

- **Industry supports DOE's TAD initiative**
 - Reduces fuel handling @ repository,
 - Simplifies design & improves licensability
 - Reduces disposal and waste acceptance uncertainty
 - Increases stakeholder confidence that on-site storage is *temporary*
- **TADs are the first step towards integrating the overall used nuclear fuel management system**



An Integrated Used Fuel Management System

- **Pool storage** → Load
- **On-site dry storage** → Store
- **Transportation** → Ship
- **Centralized off-site storage?** → Standardization
DOE Acceptance
Lessons Learned
- **Recycling facilities?** → Standardization
DOE Acceptance
Lessons Learned
- **Final disposal** → Approved for repository



**TAD
21-PWR
44-BWR**

TADs- What have we accomplished?

- **Technical issues resolved**
 - Extensive dialogue set foundation of integration process
- **TAD specification completed**
 - DOE able to produce quality product on schedule
- **Proof-of-concept designs completed**
 - Design feedback addressed in specification
- **NRC review of TAD specification completed**
 - Issues to be addressed in license applications identified

TAD Milestones

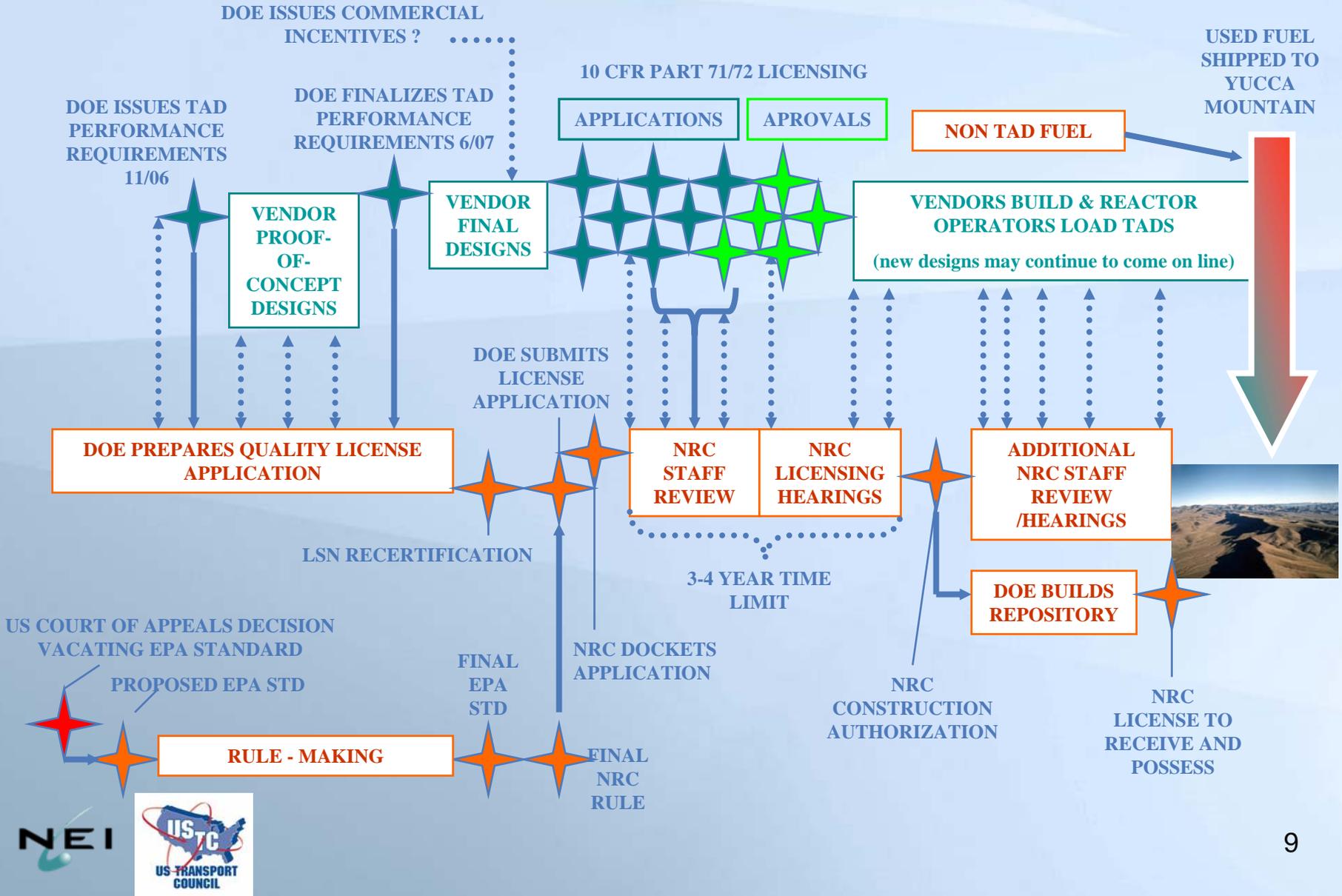
- **DOE/Industry interactions on TADs have been successful**
 - First significant Industry/DOE interaction, 1/06
 - DOE qualified vendors to design TADs, 4/06
 - DOE published TAD performance specification, 11/06
 - Vendors completed proof-of-concept designs, 2/07
 - DOE finalized performance specification, 6/07
 - Performance Specification is a key input to license application
 - DOE issued procurement for demonstration TADs, 7/07
 - Vendor proposals submitted on 8/24/07
 - Vendors to obtain NRC storage/transport licenses by 12/10
 - TAD demonstration to be complete by 7/12
- **Industry, DOE, and NRC agree on licensing path forward**
 - Need to effectively manage Part 63, 71, 72, 50 cross-cutting issues

TADs – What remains to be done?

- **DOE must move quickly to begin TAD development**
- **DOE must provide incentives sufficient to address additional TAD costs and marketplace priorities**
- **Utilities must commit to buying TADs**
- **TAD license applications must be developed, submitted, and reviewed**
- **TADs must be built, loaded and deployed**
- **Further system integration must occur (w/TADs as key input)**
- **TAD designs must continue to evolve to meet industry needs**

Yucca Mountain Licensing Process

(With TADs)



TADs – who will do what?

■ Vendors

- Design TADs
- Apply for Part 71 & 72 TAD licenses
- Build TADs

■ Utilities

- Buy TADs
- Load TADs and store on-site

■ NRC

- License TADs directly to Part 71, and 72 requirements
- Review TADs as part of repository in Part 63 licensing
- Regulate safe TAD deployment, transport, and disposal

■ DOE

- Specify TADs
- Procure TAD Demonstrations
- Include TAD specification in initial Part 63 license application
- Address additional costs and marketplace priorities with appropriate incentives
- Review and approve TAD designs
- Incorporate TAD designs into Part 63 license/license application as available
- Accept TADs and remove them from reactor sites
- Age TADs at repository or interim storage/recycling facility
- Dispose of TADs

Specific Utility TAD Perspectives

- **TADs must be compatible with existing systems**
- **TADs will require more storage space at utility sites**
- **TAD deployment must recognize that procurement decisions are made 5 years in advance**
 - Long range business planning windows even longer
- **TADs must be backed by proven design & manufacturing capabilities**
- **TAD operations must maintain radiation exposures ALARA**
- **Cost to utilities must be comparable with existing systems – support sound business decision-making**
- **TAD design will need to continue to evolve to meet customer needs**

Specific Vendor TAD Perspectives

- **DOE has been responsive to suggested changes**
 - Ni/Gd, Carbon Steel, Length, etc.
- **Large amount of work must be done in a short time**
 - Increased NRC workload mustn't hamper existing applications
- **DOE review time must be reasonable**
 - Start/stop of vendor process must be avoided
- **Lead times must be recognized**
- **Material suppliers must be engaged**
 - Multiple material suppliers are needed
- **Lessons learned have been valuable**
 - Additional lessons learned will be gained from demonstrations
- **Additional seismic requirements will be a challenge**
- **Licensable TAD design is achievable**
- **Transport/storage applications to NRC by Fall 2008 are achievable if contracts issued immediately**

TAD Transportability

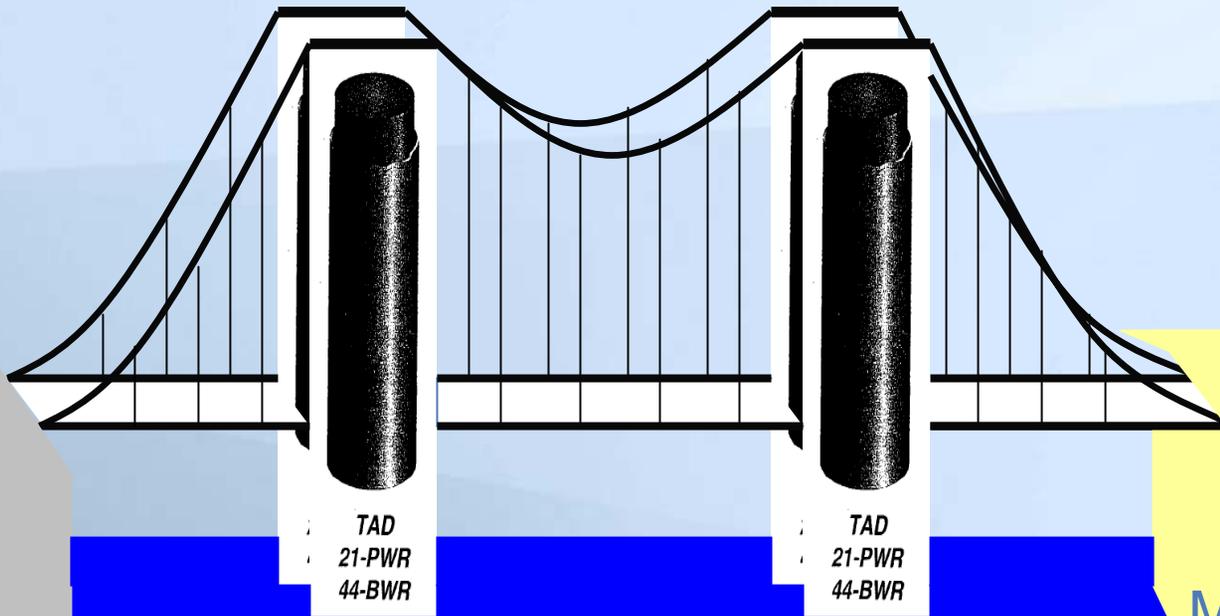
- **TAD physical dimensions are very similar to existing Dual Purpose Canister (DPC) dimensions**
- **Transportation cask designs will be similar**
- **Minimal burnup credit will be necessary for transportation due to reduced capacity**
- **TADs will require approximately 50% casks shipped, but not necessarily more shipments, than would existing DPCs**
 - Consolidation would minimize shipments
 - Transportation risk is minimal
 - This is not seen as a major barrier to TAD implementation
- **No truckable TAD design exists**
 - Consistent with DOE's "Mostly Rail" transportation decision
 - Could be developed as later addition

Summary

- **The TAD is an important initiative and the NWTRB's continued focus on this key component of the Yucca Mountain program is most welcome**
- **The TAD's potential to contribute to simplifying and integrating fuel cycle management – and increasing stakeholder confidence – remains considerable**
- **Tangible progress has been made in unleashing this potential by laying a solid foundation for design, licensing, and development of the TAD**
- **Much remains to be done and the clock is ticking**

Conclusion

Status Quo



Integrated Used Fuel Management