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CEP Regular Meeting

SONGS Decommissioning Update

&

Current Practices for Used Fuel Transportation

Thursday, Aug. 9, 2018

5:30 - 8:30 p.m.

Oceanside, California

SAN ONOFRE COMMUNITY ENGAGEMENT PANEL

Agenda

Topic	Presenter
Welcome & Opening Comments	David Victor
CEP General Updates • Offsite Storage and Appropriations • Addressing Questions from Communities	David Victor
SONGS • Decommissioning Updates • Introduction to Used Fuel Transportation	Tom Palmisano
Current Practices for Used Fuel Transportation	Gary Lanthrum
Follow-up to Questions from Communities	Tom Palmisano
Break	--
Public Comment	General Public
Facilitated Public Dialogue	Dan Stetson

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Public comment?

Write to:

nuccomm@songs.sce.com

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CEP General Updates

David Victor

Offsite Storage & Addressing Questions from Local Communities

Holtec

CIS and NRC License Application

- On 7/18, NRC announced opportunity for public to request adjudicatory hearing on Holtec's application (deadline 9/14)
- Proposed CIS facility between Carlsbad & Hobbs, NM
- NRC license application filed March 2017
- NRC preliminary schedule shows license issuance July 2020

Decommissioning

- On 7/31, Holtec announced purchase of subsidiaries that own Pilgrim (MA), Palisades (MI), and Oyster Creek (NJ) power plants to acquire licenses, title to spent fuel, and perform decommissioning
- Holtec also acquiring decommissioned Big Rock (MI) ISFSI

Appropriations

- **Rep. Shimkus** proposes $268M in fiscal 2018 omnibus spending package
- Aligns with **President Trump**'s 2018 and 2019 budget request for $120M for DOE Yucca licensing
- **House** added $30M for NRC
- House Energy & Water Appropriations bill passed 235-179 on June 8, 2018
- **Senate** removed all funding for Yucca Mountain in its energy appropriations measure
  - Restoring funding largely up to **Sen. McConnell** (R-KY)
- Congress currently in recess

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Questions from Local Communities to be Addressed

Today

- Heat removal from canisters
- Defense-in-depth evergreen slide deck
- Radiation monitoring and reporting
- Discharges via ocean conduits
- AREVA/Holtec warranties
- Extreme events workshop planning

Future

- Notes from Holtec factory visit
- Interim Storage Partners (CIS)
- NRC conclusions on spent fuel
- Links to follow-up topics on SONGScommunity.com

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Decommissioning
San Onofre
Nuclear Generating Station

SONGS Decommissioning Update

Tom Palmisano

Vice President Decommissioning &
Chief Nuclear Officer

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Decommissioning San Onofre Nuclear Generating Station

Decommissioning Principles

Safety

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For more information on SONGS visit

www.SONGScommunity.com

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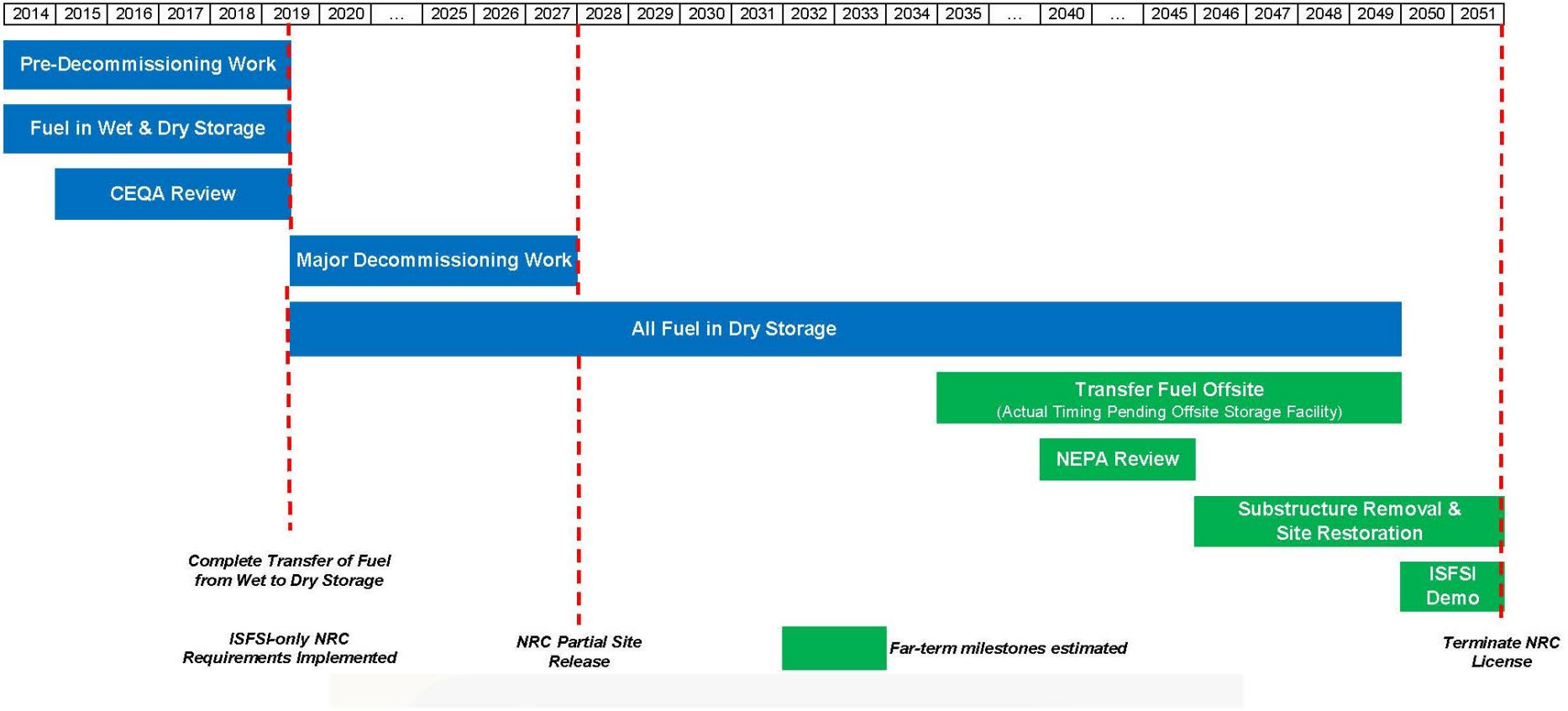
Decommissioning San Onofre Nuclear Generating Station

Decommissioning Plan

Subject to Change



FUEL TRANSFER
TO PASSIVE DRY CASK STORAGE

On-site Used Fuel Storage

CURRENT STATE

Spent Fuel Pools

1595

~~2668~~ fuel assemblies

Existing ISFSI

50 canisters (1187 fuel assemblies)

EXPANDED ISFSI

73 canisters (2668 fuel assemblies)

+

Existing 50 canisters (1187 fuel assemblies)

FUTURE STATE

3855 fuel assemblies in 123 canisters

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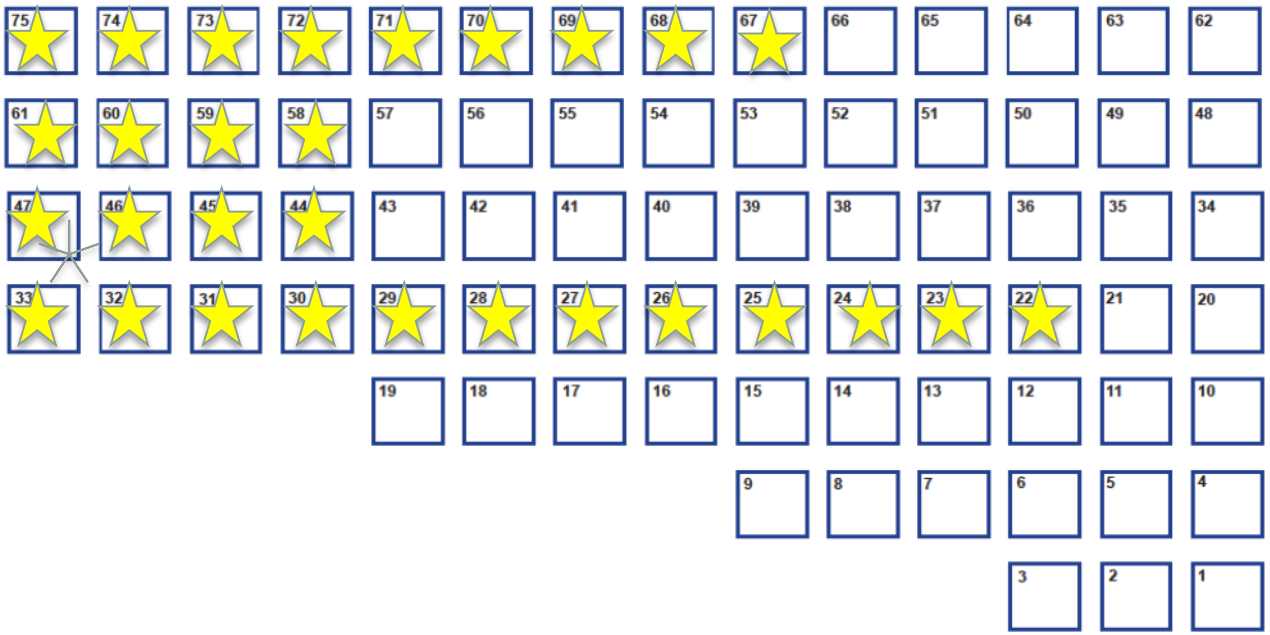
Decommissioning San Onofre Nuclear Generating Station

Transfer Status



- Gold stars show cavity enclosure containers (CECs) that have been loaded, to date, with spent fuel.
- Each CEC can hold up to 37 fuel assemblies.

Forecast Complete by June 2019

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Decommissioning
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Nuclear Generating Station

ENVIRONMENTAL PERMITTING UPDATE

California Environmental Quality Act (CEQA)

- Start of major decommissioning requires:
  - Certification of EIR* by California State Lands Commission (CSLC) under CEQA,

    and
  - Issuance of CDP** by California Coastal Commission (CCC), relying upon EIR* by CSLC

* Environmental impact report
** Coastal development permit

Environmental Permitting

- CA State Lands Commission (CSLC) published the Draft Environmental Impact Report (EIR) for public review on July 27, 2018
- Draft EIR comments period closes on August 28, 2018
- CSLC has confirmed two public hearings
  - 8/7/18: Oceanside Public Library
  - 8/8/18: San Clemente Holiday Inn Express
- SCE anticipates CSLC will consider the Final EIR on December 11, 2018 in San Diego

SONGS Experts Team Update

- Chairman Tom Isaacs attending CEP meeting to observe
- Transportation expert Gary Lanthrum serving as guest speaker

Team Member	Expertise
Kris Cummings	Nuclear engineering
Tom Isaacs	Siting and licensing
Gary Lanthrum	Transportation
Allison Macfarlane	Siting and licensing
Rick Moore	Transportation
Dr. Josie Piccone	Radiation monitoring and detection

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San Onofre
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Spent Fuel Transportation

Tom Palmisano

Vice President Decommissioning &
Chief Nuclear Officer

SONGS Transportation Preparatory Efforts

- NRC-approved transportation casks available for SONGS canisters
  - Transnuclear Transportation Cask MP-187 (not used for high burnup fuel)
  - Transnuclear Transportation Cask MP-197HB (approved for high burnup fuel)
  - Holtec HI-STAR 190 (approved for high burnup fuel)
- Transportation requirements included in canister loading plans
- On-site rail spur provides access to Pacific Sun, BNSF railroads
- More than 100 canisters qualify for transportation by year-end 2020

Used Fuel Readiness for Transportation

- Some fuel qualified for transport now
- Remaining fuel qualifies over time

	NOW	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	TOTAL
Units 2/3 AREVA NUHOMS 24PT4	27	6												33
Unit 1 AREVA NUHOMS 24PT1	2					1					5		9	17
Units 2/3 HOLTEC MPC-37			67		2	2		1			1			73

Transportation Preparatory Efforts

- DOE site visit, June 2-5, 2015
  - Review fuel inventory
  - Confirm licensed transportation cask for all canisters
  - Evaluate site infrastructure, such as rail access
  - Documented in *Preliminary Evaluation of Removing Used Nuclear Fuel from Shutdown Sites:* https://www.energy.gov/ne/downloads/preliminary-evaluation-removing-used-nuclear-fuel-shutdown-sites

Decommissioning San Onofre Nuclear Generating Station

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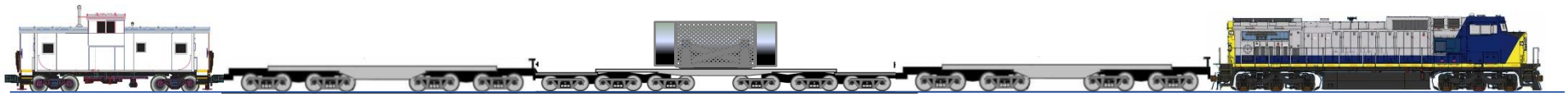
Gary Lanthrum

Radioactive Material Transportation and Energy Consulting

RAMTASC

GUEST SPEAKER INTRODUCTION



Background, Perspective and Context for Spent Nuclear Fuel Shipments

Information for SONGS
CEP Meeting, Q3
August 9, 2018

Presented by:

Gary Lanthrum
Principal Engineer
AMTASC
Radioactive Material Transportation and Storage Consulting

Why Is Spent Fuel Transportation Important to You?

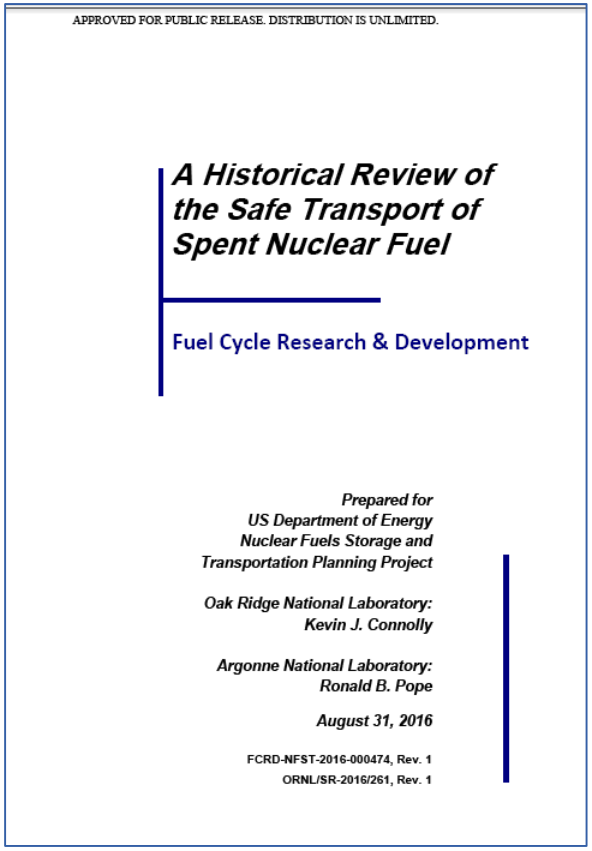
Spent Nuclear Fuel (SNF) was never intended to stay where it was produced indefinitely

- SONGS' stakeholders have expressed interest in moving SNF away from San Clemente and the Pacific Coast;
- After years of federal delays, private sector options for consolidated storage of SNF are going through the licensing process;
- SONGS is actively engaged in long-range planning for potential shipments of its SNF to an off-site location;
- SNF is included in one of nine classes of hazardous material (Class 7). Stakeholders should be aware of the safety provisions and relative risks of hazardous material transportation through their communities.

U.S Record for Spent Fuel Shipping Safety

➢ Spent Nuclear Fuel Transportation has an enviable safety record

- ➢ 4,336 casks of spent nuclear fuel were shipped from power plants and research reactors between 1964 and 2010[1].
- ➢ Internationally, there have been more than 25,000 shipments of used fuel (over 87,000 metric tons) by land and sea.
- ➢ Although there have been accidents, none of those shipments have ever released any of their radioactive cargo, and there have been no injuries, fatalities or environmental damage as a result of the SNF being shipped.


APPROVED FOR PUBLIC RELEASE. DISTRIBUTION IS UNLIMITED.

A Historical Review of the Safe Transport of Spent Nuclear Fuel

Fuel Cycle Research & Development

Prepared for
US Department of Energy
Nuclear Fuels Storage and
Transportation Planning Project

Oak Ridge National Laboratory:
Kevin J. Connolly

Argonne National Laboratory:
Ronald B. Pope

August 31, 2016

FCRD-NFST-2016-000474, Rev. 1
ORNL/SR-2016/261, Rev. 1

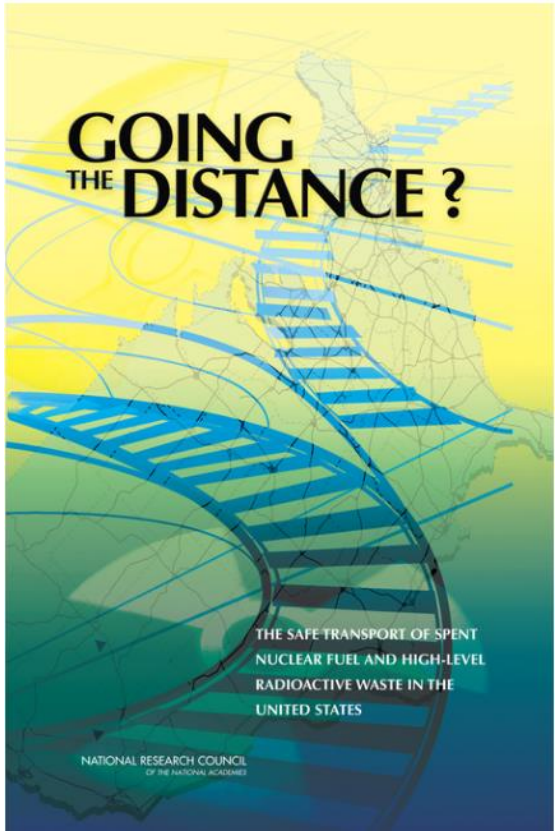
[1] This data comes from the 2016 report: ***Historical Review of the Safe Transport of Spent Nuclear Fuel*** published by Oak Ridge national Laboratory. The full report is available at: https://www.energy.gov/sites/prod/files/2017/03/f34/Enhanced%20safety%20record%20report%20-%20final%20public%20release_0.pdf

Background Information

Pictures of Past shipments of SNF

In 2006, The National Research Council's Committee on Transportation of Radioactive Waste found:[2]

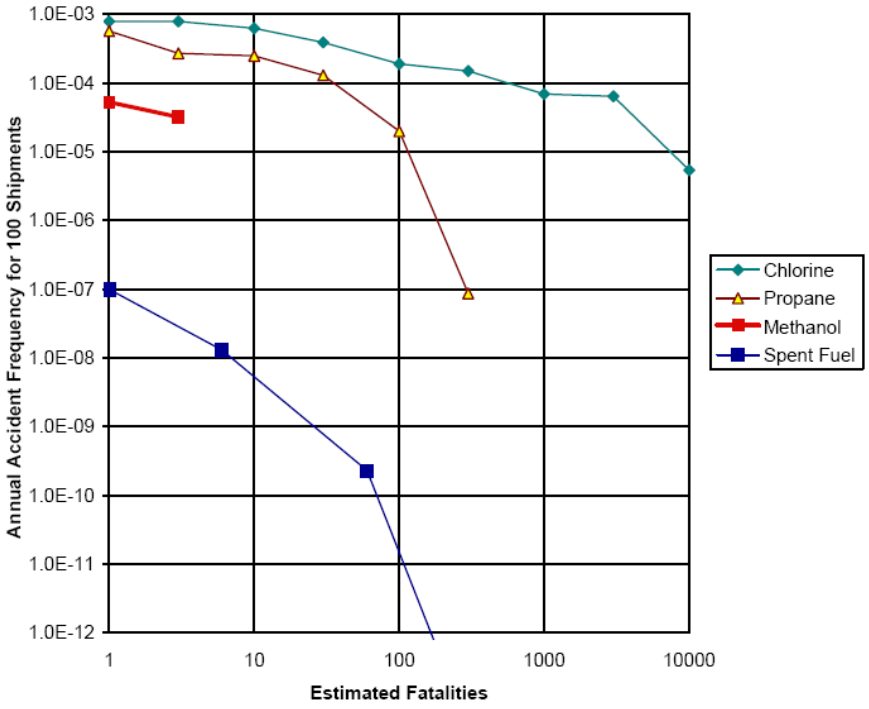
- There is no fundamental technical barrier to the safe transport of spent fuel in the U.S.
- U.S. regulations are adequate to ensure package containment effectiveness over a wide range of transport conditions
- The accident fatality risk associated with spent fuel shipments is more than three orders of magnitude less than for some other common hazardous materials.

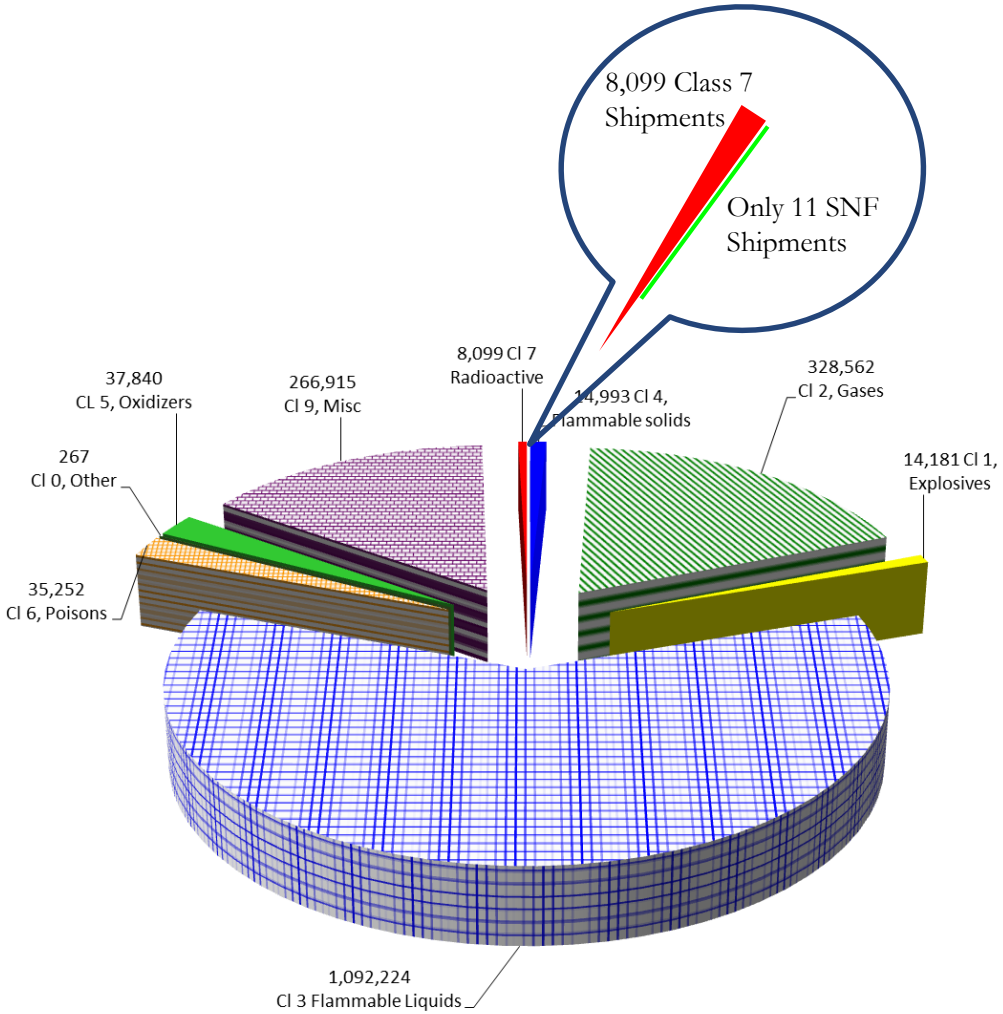


[2] The report on this study was published as a book titled: "***Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States***". This report is available at http://www.nap.edu/catalog/11538/going-the-distance-the-safe-transport-of-spent-nuclear-fuel

National Academy of Sciences Study & AAR Data

Shipments of SNF are lower risk than other hazardous material shipments, and there are far fewer of them.





WHAT IS SNF SHIPMENT SAFETY BASED ON?

There are 3 pillars for SNF shipment safety:

1. Stringent & Effectively Enforced Regulations Focused on Public Safety;
2. Robust Transport Package designs that are required to survive severe transportation accidents intact;
3. Enhanced Personnel Requirements and the NRC monitored safety conscious work environment.

WHAT IS SNF SHIPMENT SAFETY BASED ON?

Pillar 1, Stringent & Effective Regulations Focused on Public Safety.

a) Unique to all hazardous material shipments, SNF shipments are required to withstand severe accident conditions;

b) Notification of state and tribal public safety officials before each shipment through their jurisdictions. In addition, SNF Shipments are required to have a security force escort and real time tracking;

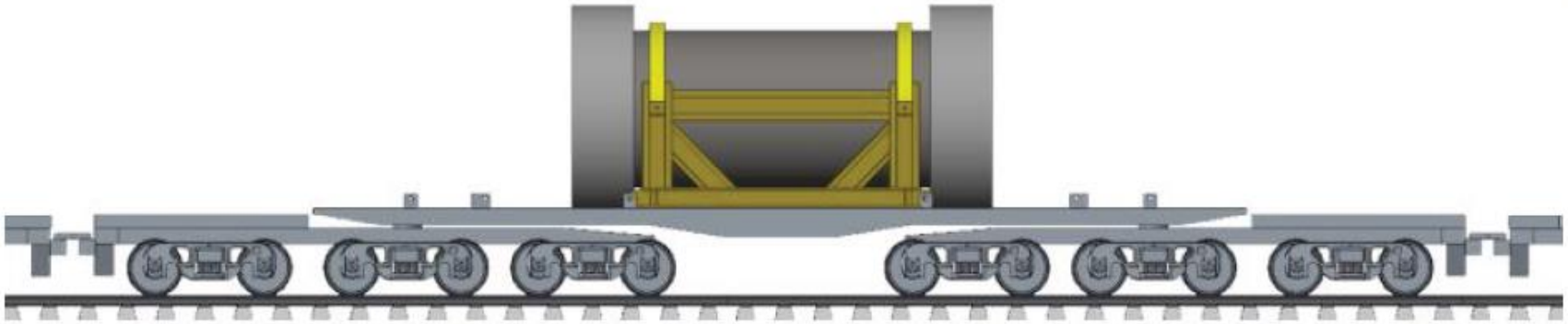
c) Rail Shipments of SNF are Speed Limited and Special Rail Cars are Required for These Shipments;

d) DOT requires rail shipment routes for SNF to be established based on a railroad safety and security review that considers 27 explicit criteria.

e) The regulator reviews and approves the transportation plan for security prior to allowing the shipment to proceed.

WHAT IS SNF SHIPMENT SAFETY BASED ON?

Pillar 1d: Rail Shipments of SNF are Speed Limited and the AAR Requires Special Rail Cars for These Shipments



The Association of American Railroads (AAR) has implemented special operating standards (AAR S-2043) for rail cars carrying SNF & HLW.

- Special modeling and on-track testing to demonstrate stability and resistance to derailment before use. 100,000 miles of operations are required to fully qualify a rail car to this standard.
- Enhanced performance “trucks” (a railroad term for suspension)
- Reduced stopping distance;
- Real-time monitoring of truck hunting, bearing temperature, acceleration, wheel flats, and ride quality.

WHAT IS SNF SHIPMENT SAFETY BASED ON?

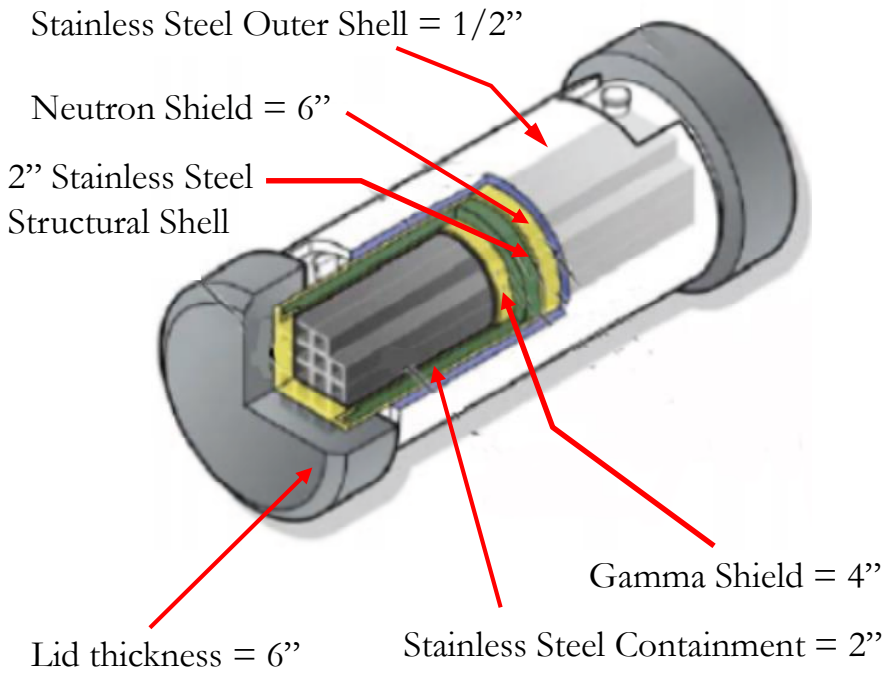
Pillar 2: Robust package designs required to survive severe transportation accidents. In both an 84 MPH crash into a concrete wall & an 81 MPH impact of a locomotive with a truck cask parked across the tracks, the transport casks survived intact, without leakage.

https://archive.org/details/nuccasktest1

WHAT IS SNF SHIPMENT SAFETY BASED ON?

Pillar 2: Robust package designs for SNF shipments are significantly better able to withstand accidents than other hazardous material shipping containers. The cost/benefit calculation is different for SNF transportation.

Generic 150 Ton Cask for SNF Transport



Overall wall thickness 14.5”
8.5” metal thickness

Generic 90 Ton Chlorine Tanker Car

The pressure tank side walls are 0.787” thick steel
The pressure tank head uses 0.8125” thick steel
~ 4” of ceramic & fiberglass insulation
The insulation jacket is 11 gage steel (0.1796”)

AAR’s Casualty Prevention Circular 1187 only requires tanker cars to withstand a 9 MPH rollover without breaching!

WHAT IS SNF SHIPMENT SAFETY BASED ON?

Pillar 3, Enhanced Personnel Requirements & Training

- Training and qualification of all nuclear workers is done under a safety conscious work environment;
- The security escorts travelling with the train also receive training on emergency response procedures;
- Alcohol and drug testing for railroad engineers and truck drivers transporting these shipments;
- Enhanced training on spent nuclear fuel shipments is available through the Department of Energy's Transportation Emergency Preparedness Program, TEPP[3].

[3] Information on TEPP can be found at: https://www.energy.gov/em/services/waste-management/packaging-and-transportation/transportation-emergency-preparedness

Current Status of SNF Transportation Development

- A licensed site is required to receive the SNF. Two private storage facilities are being developed. 2022 is the earliest date for initial operations;
- Special rail cars that meet the S-2043 standard are being developed. Procurement of these rail cars takes 2-3 years once they are certified;
- Special transportation casks are licensed by the NRC. Lead time for procuring a transportation cask is 2-3 years.
- Approval of transportation routes depends on the mode of transportation (rail, truck, barge or a combination of the three). Route approvals can take from 6 months to 2 years.
- Who will own the fuel when it leaves the power plant is an issue that needs to be resolved.
- SONGS is developing plans that will help it prepare to ship SNF when a commercially reasonable opportunity arises.

Conclusions

As the National Academy of Sciences' Research Council aptly noted in 2006, there are no fundamental technical barriers to the safe transport of spent fuel in the U.S.

- The unparalleled safety record for spent fuel transport is not a fluke. It is the result a a carefully constructed set of requirements;
- SNF is currently shipped safely every year by truck and by rail;
- SONGS is positioning itself to ship SNF offsite when a commercially reasonable opportunity arises.

Questions?

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Follow-up to Questions from Communities

Tom Palmisano

Vice President Decommissioning &
Chief Nuclear Officer

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Decommissioning San Onofre Nuclear Generating Station

Follow-Up Topics

Today

- Heat removal from canisters
- Defense-in-depth evergreen slide deck
- Radiation monitoring and reporting
- Discharges via ocean conduits
- AREVA/Holtec warranties
- Extreme events workshop planning

Future

- Notes from Holtec factory visit
- Interim Storage Partners (CIS)
- NRC conclusions on spent fuel
- Links to follow-up topics on SONGScommunity.com

Temperature Monitoring and Heat Removal

- Monitoring outlet vent temperature and ensuring ventilation openings are free of obstruction is sufficient
  - Industry has over 30 years of experience monitoring canister performance
  - SONGS has 15 years of experience monitoring AREVA ISFSI
- Direct shell temperature monitoring would not provide a valid indication of leak detection

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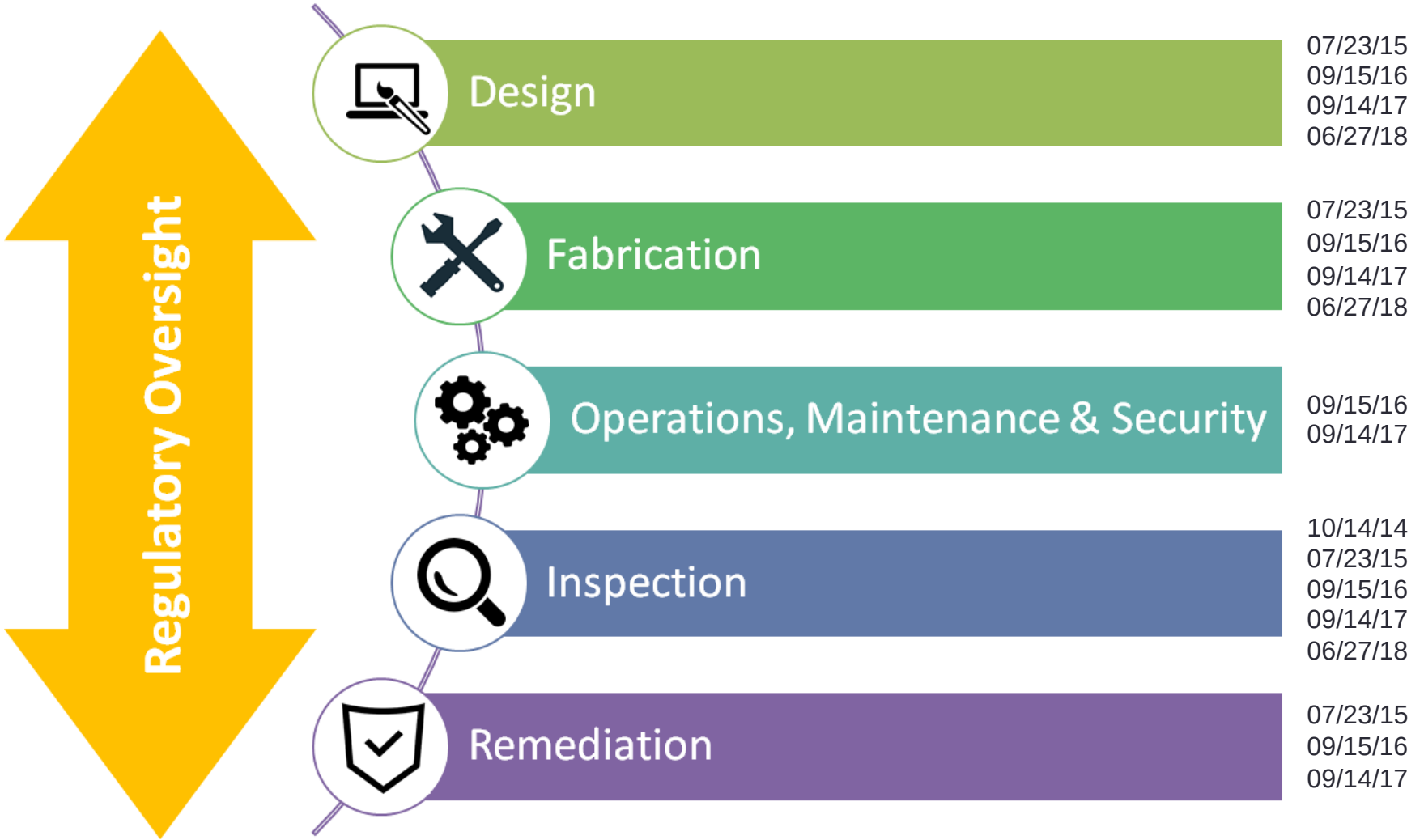
D-I-D Evergreen Slide Deck Now on Website



RADIATION MONITORING AND REPORTING

Current ISFSI Monitoring

- Continuous security monitoring
- Daily visual inspections of ISFSI and air vents
- Currently, 24/7 radiological monitoring of ISFSI
- Surveys are performed throughout fuel transfer process by trained personnel
- Temperature monitoring
- Bi-weekly closure lid radiological survey for each loaded module
- Quarterly radiological surveys performed by trained personnel
- Thermal luminescent dosimeters surround ISFSI with data pulled monthly
- Additional radiological surveys, as needed

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Current Radiological Reports

- Annual Radioactive Effluent Release Report
  - Covers liquid and gaseous effluent releases
- Annual Radiological Environmental Operating Report
  - Covers impact on environment by sampling air, water, soil, kelp, marine life
- Filed annually with NRC
  - Available on NRC and SONGS websites

    https://www.songscommunity.com/stewardship/responsible-stewardship
  - Not written for a general audience

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Additional Monitoring & Reporting Under Consideration

- Radiation monitoring
  - Considering 24/7 monitoring of ISFSI area as long as fuel is on site
  - If done, equipment would be per NRC specifications with periodic calibration
  - Potential real-time feed of data to offsite agency with radiological expertise

- Reporting
  - Near term – SCE will simplify NRC reports for general audience
  - Mid-term – SCE considering working with third party that could
    - Receive real-time data from SONGS
    - Produce regular data reports
    - Notify the public in the event of a release beyond regulatory limits

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Discharges Via Ocean Conduits

- Liquid releases conducted in compliance with regulations, license and permit requirements
  - Federal:
    - Clean Water Act – federal law governing water pollution
    - NRC - Offsite Dose Calculation Manual (ODCM)
    - Environmental Protection Agency (EPA)
  - State: The State Water Board
  - Local: San Diego Region - California Regional Water Quality Control Board
- All waste water monitored for radioactivity to ensure compliance with applicable limits; radioactivity evaluated per NRC and EPA
- Radioactive releases now at ~1% of levels during operation
- Dose to hypothetical member of public remains ~0.003 millirem/year
  - 100,000 times less than national avg. of ~300 millirem/year from natural sources

ISFSI Warranties

- Holtec HI-STORM UMAX System
  - 30-year warranty against defects
    - Includes 5-year extension due to peening canister welds
  - Warranty period begins at end of fuel transfer (mid-2019)
- AREVA NUHOMS (Transnuclear West) System
  - 2-year warranty against defects
  - Canisters manufactured in early 2000s

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BREAK

Information Booths Available

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Public Comment

Submit written comments to:

nuccomm@songs.sce.com

Upcoming CEP Meetings

Subject to Change

CEP Meeting Topics	
Consolidated Interim Storage	Nov. 29
Defense-in-Depth	1Q 2019

Likely topics to be integrated

- Understanding Radiation
- Extreme Events & Emergency Response
- Real Time Radiation Monitoring & Reporting Workshop
- SONGS Decommissioning*Solutions* (general contractor)
  - Energy*Solutions* experience at Zion, SONGS plans, local jobs
- Interim Storage Partners
  - Joint venture of Orano USA & Waste Control Specialists

Extreme Events Workshop Update

- Focus: Extreme events and emergency response
- Pre-planning scoping meeting with stakeholders
- Gathering expert-informed data / reports
- Guest speakers pending
- Workshop date to be announced

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Meeting material posted to:

www.SONGScommunity.com

APPENDIX

Background Information

Number of Cask Shipments	Nuclear Power Plant Shipments of SNF	DOE Shipments of Research Domestic Reactor SNF	DOE Shipments of Research Foreign Reactor SNF	Navy Shipments of SNF from Nuclear Powered Ships
1964-1978	1691	0	0	Classified
1979 - 2007	2470		0	Classified
1977 - 2007	0	0	>175	Classified
2007 - 2018	N/A	N/A	N/A	Classified

SNF Cask Shipment Accident Data	
1949 - 1969	14 accidents involving "AEC licensed material" (more than SNF) occurred. No details were available.
12/8/1971	A truck shipment of SNF veered off of the road to avoid a head-on collision with a semi-truck. The truck was destroyed in the resulting crash and the driver was killed by the impact. The cask remained intact and was able to be used to complete the shipment to Oak Ridge. The cask remained in service after this shipment.
3/29/1974	A derailed tank railcar struck a flatcar carrying an empty SNF cask; the cask was not damaged, and the accident did not lead to contamination.
2/9/1978	A trailer carrying spent mixed oxide fuel buckled under the weight of the cask; there was no damage to the cask and no release.
8/13/1978	An empty SNF cask broke through a trailer bed while traveling; there was no injury or contamination. The overpack and base plate of the cask were damaged but the accident report does not mention whether any contamination occurred.

Background Information

SNF Cask Shipment Accident Data (continued)	
12/9/1983	A truck carrying a loaded SNF cask was involved in an accident when the tractor separated from its intermediate axles but remained connected to the trailer; there was no damage to the cask.
3/24/1987	A train carrying core debris from the Three Mile Island-2 reactor struck an automobile at a crossing. The driver of the automobile was injured and taken to a hospital, the locomotive suffered minor damage, the train was delayed 45 minutes, but the casks were not damaged and did not release any of the contents.
1/9/1988	A rail track switch in the wrong position caused a set of wheels to derail while a railcar was being moved. An empty cask being transported by the railcar was not affected.
12/14/1995	A railcar on a train carrying two empty SNF casks derailed; no damage or injuries resulted.
9/22/2005	A railcar carrying an empty SNF cask derailed and tipped over after it was hit by another railcar in a railyard in a low speed collision (WBFO 2005). The railcar was righted after approximately 36 hours. No damage to the cask.
10/25/2007	The caboose and buffer car of a train carrying SNF derailed while moving at 4 or 5 mph at the Shearon Harris nuclear power plant in Wake County, North Carolina (WRAL, 2007). The casks were not damaged and there were no leaks. Once placed back on the rails the shipoment was able to continue.
8/9/2008	A trailer carrying a new empty SNF transportation cask jackklnifed to avoid leaving the road in California en route to the Humboldt Bay shutdown nuclear power plant. There were no injuries. The road was blocked more than 24 hours while the cask was recovered and the trailer was removed from the road. The cask was not damaged
5/6/2014	A truck and a train carrying an empty SNF cask collided at a grade crossing. There were no injuries, and the cask was not damaged, but the truck, which was carrying a cargo of pineapples, became stuck on the tracks and its cargo was scattered.

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Decommissioning San Onofre Nuclear Generating Station

Acronyms

AMP	Aging Management Program
C&D	Cold & Dark
CCC	California Coastal Commission
CDP	Coastal Development Permit
CEC	Cavity Enclosure Container
CEP	Community Engagement Panel
CEQA	California Environmental Quality Act
CIS	Consolidated Interim Storage
CISCC	Chloride-Induced Stress Corrosion Cracking
CPUC	California Public Utilities Commission
CSLC	California State Lands Commission
D&D	Decontamination & Dismantlement
DA	Decommissioning Agreement; Decommissioning Agent
DCE	Decommissioning Cost Estimate
DDT	Decommissioning & Dismantlement Team
DGC	Decommissioning General Contractor
DID	Defense-in-Depth
DOD	Department of Defense
DOE	Department of Energy
DON	Department of Navy
DSAR	Defueled Safety Analysis Report (replaces FSAR)
DSC	Dry Storage Canister
D-SEIS	Draft Supplemental Environmental Impact Statement
D-SER	Draft Safety Evaluation Report
DTF	Decommissioning Trust Fund
EIR	Environmental Impact Report
EP	Emergency Plan
EPRI	Electric Power Research Institute
GEIS	Generic Environmental Impact Statement
IFMP	Irradiated Fuel Management Plan
ISFSI	Independent Spent Fuel Storage Installation
LAR	License Amendment Request
LOED	Large Organism Exclusion Device
MAPS	Managing Aging Programs in Storage

MARSSIM	Multi-Agency Radiation Survey Site & Investigation Manual
MOU	Memorandum of Understanding
NAHC	Native American Heritage Commission
NDCTP	Nuclear Decommissioning Cost Triennial Proceeding
NDE	Non Destructive Examination
NDTF	Nuclear Decommissioning Trust Fund
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NGS	Nuclear Generating Station
NOP	Notice of Preparation
NPP	Nuclear Power Plant
NRC	Nuclear Regulatory Commission
OC	Orange County
PDEP	Permanently Defueled Emergency Plan
PDTS	Permanently Defueled Technical Specifications
PSDAR	Post-Shutdown Decommissioning Activities Report
REIR	Request for Environmental Impact Review
SCE	Southern California Edison
SD	San Diego
SDG&E	San Diego Gas & Electric
SDS	SONGS Decommissioning Solutions
SFP	Spent Fuel Pool
SFPI	Spent Fuel Pool Island
SLC	State Lands Commission (CA)
SLR	Sea Level Rise
SONGS	San Onofre Nuclear Generating Station
VCT	Vertical Canister Transporter
ZCAP	Zion Community Advisor Panel