
Idaho Site Lessons Learned from the Fukushima Dai-ichi Nuclear Power Plant Earthquake/Tsunami Event

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Background

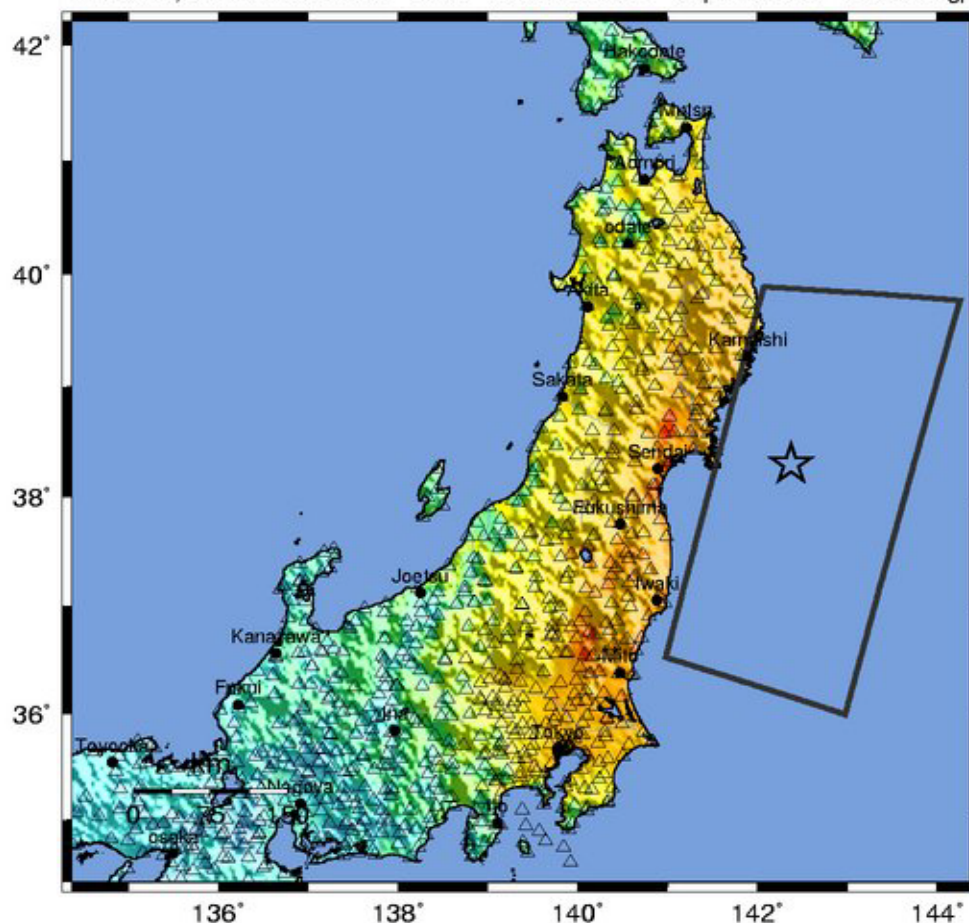
- On March 11, 2011, a major earthquake, magnitude 9.0, occurred off the eastern shore of Japan



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USGS ShakeMap : NEAR THE EAST COAST OF HONSHU, JAPAN

Fri Mar 11, 2011 05:46:24 GMT M 9.0 N38.30 E142.37 Depth: 30.0km ID:c0001xgp



Map Version 12 Processed Fri Apr 22, 2011 02:42:15 PM MDT – NOT REVIEWED BY HUMAN

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	< 0.17	0.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Background (Cont'd)

- The earthquake resulted in the automatic shutdown of three operating reactors at the Fukushima Dai-ichi (“Fukushima”) Nuclear Power Station
 - The earthquake resulted in the loss of all commercial power to the station
 - All backup electrical generators at the station automatically came online and provided power for essential equipment



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Source: asiaworldnews.blogspot.com

Background (Cont'd)

- The earthquake caused a very large tsunami, which overwhelmed the Fukushima station within an hour of the earthquake
 - Backup electrical generators were lost (diesel generators were flooded, as was the fuel supply)
 - Battery powered systems remained functional until exhausted
 - Defenses in place to protect against a 19 ft high tsunami were useless against the actual tsunami wave which was greater than 46 ft high





Source: ibtimes.com

Background (Cont'd)

- The complete loss of electrical power resulted in:
 - The loss of reactor and spent fuel pool cooling systems, causing:
 - Fuel damage or meltdown in reactors and spent fuel storage pools
 - Hydrogen generation and explosions in the reactor buildings and one spent fuel pool



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Source: guardian.co.uk

DOE Response for DOE Nuclear Facilities

- On March 23, 2011, the Secretary of Energy issued Safety Bulletin 2011-01:
 - Evaluate facility vulnerabilities for “beyond design basis events”
 - Ensure appropriate provisions are in place to address them
 - Specifically, the Safety Bulletin required DOE sites to:
 - Review how design basis events have been analyzed and considered
 - Evaluate the ability to safely manage a total loss of power event
 - Confirm safety systems are maintained operable in accordance with requirements
 - Confirm emergency plans, procedures and equipment are current, functional, and tested
 - Including plans and procedures in response to “natural phenomena events”
 - DOE-ID reported the results of the reviews to the DOE Headquarters Office of Health, Safety and Security by May 13, 2011



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Definitions

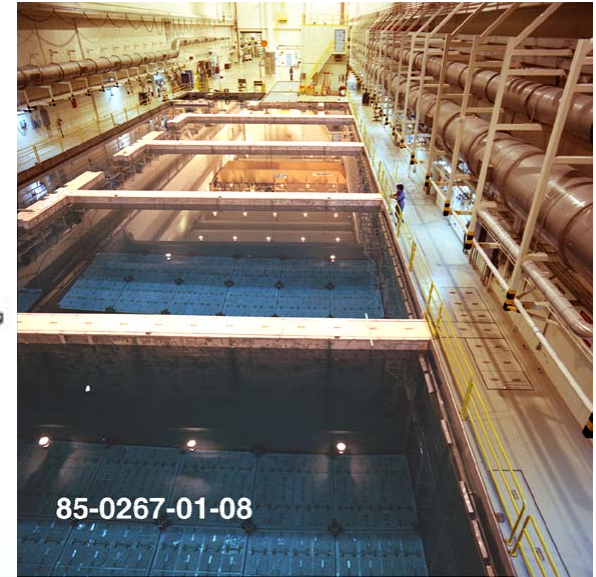
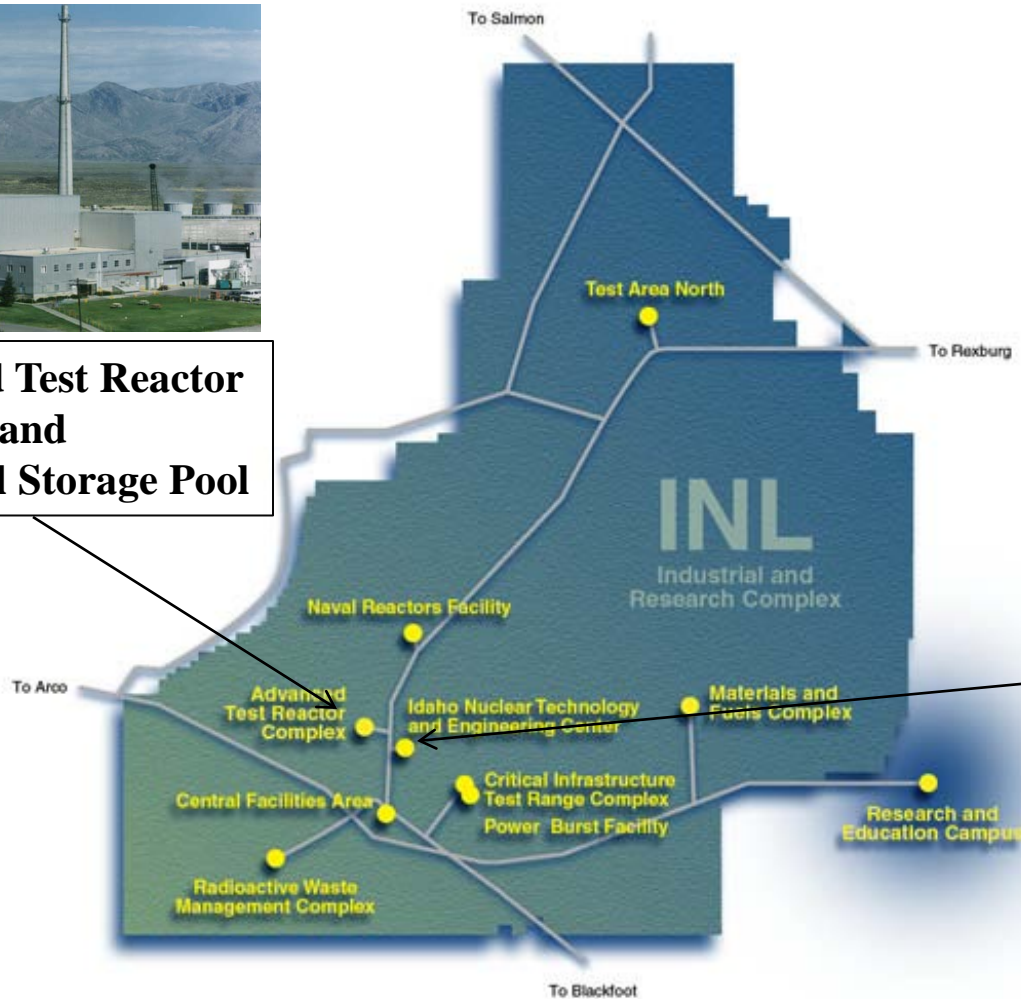
- **Design Basis Event:** Major accidents that can either cause releases at the facility or have a major impact on facility operations. The major categories are:
 - internally initiated operational accidents (e.g., fires, explosions, spills, criticality);
 - natural events for the site (e.g., earthquakes, tornadoes) that could affect the facility;
 - man- made externally initiated events such as airplane crashes, transportation accidents, adjacent facility events, etc.
- **Beyond Design Basis Event:** An accident of the same type as a design basis accident (e.g., fire, earthquake, spill, explosion, etc.) but defined by parameters that exceed in severity the parameters defined for the design basis accident.



Idaho Site Reactor and Spent Fuel Storage Pools



**Advanced Test Reactor
and
Spent Fuel Storage Pool**



Fuel Storage Area Pool



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Results and Lessons Learned

- There are no beyond design basis conditions similar to those that occurred at the Fukushima plant that could occur at the Idaho site:
 - Earthquakes less severe (based on history and modeling)
 - Tsunami's not possible
- Other notable differences:
 - Advanced Test Reactor operates at low temperature, low power, short durations
 - Spent fuel in Advanced Test Reactor fuel pools generate much less heat than commercial reactor spent fuel
 - Advanced Test Reactor fuel is aluminum clad (much less probability to generate hydrogen)
 - All spent fuel stored at the INTEC Fuel Storage Area pool has been out of a reactor > 3 years (very little heat generation)



Results and Lessons Learned (cont'd)

- Evaluations went beyond the specific nature of the event at Fukushima
 - Considered the following natural phenomena hazards:
 - Earthquake
 - Extreme wind
 - Flooding
 - Also included the following hazards:
 - Snow (loading issues)
 - Volcanic activity
 - Lightning



Results and Lessons Learned (cont'd)

- The existing safety bases and emergency plans are adequate
 - Emergency drill programs are in place and adequately exercise emergency response capabilities
 - Advanced Test Reactor has developed and implemented simulator training on extended loss of power scenarios
- Improvements are being considered in some safety basis documents to:
 - Better describe some beyond design basis events, including event causes
 - Include discussion of event mitigation based on existing emergency plans and facility design
- Improvements are being considered in emergency planning
 - Evaluate the need for additional portable electrical generators, etc.
 - Planning for multiple events at multiple facilities



Conclusion

- The existing safety bases and emergency plans are adequate
- Improvements are being considered
- Industry lessons learned are regularly reviewed by DOE as part of our continuous improvement processes
- More lessons learned from the Japanese disaster are expected in the future

Questions?



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