

Fukushima Daiichi Accident

Presented by

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Acknowledgement

Photos, cartoons, schematic diagrams, and aerial maps included in this presentation are taken from news reports, public announcements, and TEPCO websites.



Nuclear Plants in Japan

- 54 operating nuclear reactors (49 gigawatts)
- Two nuclear plants under construction
- Tokyo Electric Power Co. produces 27% of Japan's electricity
- 12,000 MW of nuclear energy capacity shut down



Sequence of Events on March 11, 2011

- 9.0 magnitude earthquake caused automatic reactor shutdown and loss of offsite power
- Emergency diesel generators and other safety systems activated
- 46' tsunami wave (+56 min) disabled nearly all plant electrical and safety systems
- Reactor core cooling ended after several hours leading to uncovered fuel and containment over-pressurization
- Spent fuel pools heated up
- Explosions occurred during hydrogen venting



Plant Status Before March 11

- **Unit 1**: BWR-3 Mark I (1971); 460 MWe; 400 fuel rods in core; 292 fuel rods in SFP
- **Unit 2**: BWR-4 Mark I (1974); 784 MWe; 548 fuel rods in core; 587 fuel rods in SFP
- **Unit 3**: BWR-4 Mark I (1976); 784 MWe; 548 fuel rods in core; 514 fuel rods in SFP
- **Unit 4**: BWR-4 Mark I (1978); 784 MWe; **No** fuel rods in core; **1331** fuel rods in SFP
- **Unit 5**: BWR-4 Mark I (1978); 784 MWe; 548 fuel rods in core; 946 fuel rods in SFP
- **Unit 6**: BWR-5 Mark II (1979); 1100 MWe; 764 fuel rods in core; 876 fuel rods in SFP



Current Plant Status

- All 3 reactors and 4 spent fuel pools stabilized with core spraying and injection
- RPVs breached and accumulation of a large quantity of contaminated water
- Uncertainty in melted core/fuel locations
- Processing of highly contaminated water
- Defining cold shut down and reducing evacuation zone
- Construction of covers and debris removal



Near Term Milestones

- Accomplish cold shut down of reactors by November 18, 2011
- Reduce the evacuation zone from 20 kilometers to 3 kilometers to allow evacuees to return before winter begins
- Begin to decontaminate Fukushima areas to reduce exposure dose to the public by half in two years



Recent Activities

- **Government of Japan considers pay for cleanup of low level contamination (100 – 500 mrem/yr)**
- **Fukushima Prefecture plans to decontaminate 110,000 homes**
- **Government of Japan lift advisories for areas outside the evacuation zone (12- 19 miles)**



Reducing Evacuation Zone

- **September 19**
 - 26,600 families from Exclusion Zone
 - 78,000 people
 - 20 kilometers (12 miles)
 - 700 cars per week
- **Reducing Exclusion Zone**
 - 3 kilometers (1.7 miles)

Mixed Reactions Worldwide

Continuing with Nuclear Program

- France, South Korea, Finland, Russia, Turkey, United Arab Emirate

Evaluating Nuclear Program

- China, India, United Kingdom, Sweden, Mexico, Brazil, Argentina, Poland, Taiwan

Halting Nuclear Program

- Germany, Switzerland, Italy



Mixed Reactions Worldwide

International Atomic Energy Agency (IAEA)

- Developing an action plan based on lessons learned from Fukushima Daiichi to strengthen international nuclear safety, emergency preparedness and response and radiation protection of people and the environment.

World Association of Nuclear Operators (WANO)

- Developing an INPO-like approach to international nuclear power operation oversight

Impacts on US Plants

NRC 90-Day Task Force Review

..“a sequence of events like the Fukushima accident is unlikely to occur in the United States and that plants can be operated safely”

..“an accident involving core damage and uncontrolled release of radioactivity to the environment, even one without significant health consequences, is inherently unacceptable.”



Impacts on U.S. Nuclear Plants

NRC 90-Day Task Force Review

(12 recommendations, 34 actions)

- Seismic and flooding protection of SSCs
- Extended loss of AC power (SBO)
- Spent fuel pool reliability, instrumentation and cooling
- Hardened wetwell vents for Mark I & II containments
- Mitigation strategies (EOPs, SAMGs, EDMGs)
- Emergency response for multi-unit events

Near Term Impacts on U.S. New Builds

- **AP1000 and ESBWR DCAs on schedule**
 - Passive natural circulation in shutdown cooling
- **Combined License Applications**
 - Extend SBO coping capabilities
 - Enhance SFP makeup and instrumentation
- **Watts Bar and Bellefonte Nuclear Stations**
 - Strengthen onsite emergency response
 - Revise emergency plan for SBO and multi-unit events
 - Upgrade design basis seismic and flood protection of SSCs

