



## Learning from past accidents



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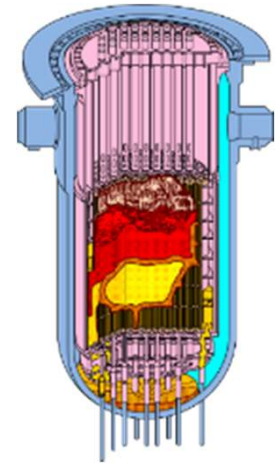
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# How we failed to learn

## Post-TMI accident

- Overconfidence in facility reliability and operator skills
- Belief that “severe accidents will never happen in Japan.”
- ➔ Minimal progress in tracking accident scenarios
- ➔ Stagnation in addressing PRA, AM, natural hazards



## Post-Chernobyl accident

- Reliance on design differences and rule compliance
- The mantra: “It will never happen here.”
- ➔ Lack of progress in continuous safety improvement mechanisms
- ➔ Inadequate emergency preparedness and response protocols

# TEPCO Fukushima Dai-ichi Accident

## Pre-accident

- ✓ Overconfidence: Safety myth
- ✓ Belief among industries, regulators, and academia in “sufficient knowledge of NPP risks”

## Reality revealed

- ✓ Critical gaps in knowledge and risk awareness
- ✓ Inability to take effective actions



## Post-accident global consensus

- ✓ Recognition of the need for enhanced safety measures
- ✓ Commitment to additional actions for strengthening NPP resilience

## How we responded

### New regulatory framework



- ✓ 2012 **NRA**, Nuclear Regulation Authority
  - Complete independence within the government
  - Encompassing safety, security and safeguards
  - Thorough transparency of licensing processes, etc.

### Industries' organizations

- ✓ 2012 **JANSI**, Japan Nuclear Safety Institute
- ✓ 2014 **NRRC**, Nuclear Risk Research Center in CRIEPI
- ✓ 2018 **ATENA**, Atomic Energy Association

## How we responded (cont'd)

New regulatory requirements, enhancements and backfitting were made for numerous points

- ✓ Re-evaluate external hazards, particularly natural phenomena, based not only on historical data but also on expert judgment to cover very rare events
- ✓ Reinforce specific requirements regarding internal fire and flooding
- ✓ Require design provisions against prolonged SBO and LUHS, ATWS, loss of core cooling, and loss of reactor depressurization
- ✓ Introduce various mobile safety equipment
- ✓ Implement backfitting, such as High Energy Arc Fire (HEAF) protection, procedure against tsunami caused by undersea landslide that gives no warning

# Challenges

## In Japan

- ✓ Strengthen the framework for continuous safety improvement
- ✓ Define safety goals, develop and implement a PRA guide, and pursue RIDM
- ✓ Promote stakeholder engagement in decision-making

## For advanced systems

- ✓ Establish a flexible yet robust framework for safety assessment
- ✓ Track accident sequences unique to each design
- ✓ Use and validate PRA prior to construction and operation
- ✓ Deal with invalidation of traditional concepts
- ✓ Define DiD with new defense layer classifications

# Innovation requires strong and independent regulatory body

## Under-regulation

- ✓ Cause fundamental threat to market stability
- ✓ Increase “Weakest link” risk

Devastate the entire industry due to a failure by a single poor competitor

## Strong and independent regulator

- ✓ Provide objective evaluation of diverse technologies
- ✓ Ensure a level playing field to foster healthy competition
- ✓ Enable the best concepts and companies to prevail

