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Fukushima – Response of a Manufacturer

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VGB Kongress
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Introduction

In the name of AREVA I wish to express my condolences to the Japanese people who have lost their relatives and friends when the earthquake and the tsunami hit Japan on March 11, 2011.
I also wish to express my deepest sympathy to all those having lost their livelihood after the severe accident in Fukushima.

AREVA, with the support of many European utilities provided first assistance by providing protective and measurement equipment as well as boric acid.

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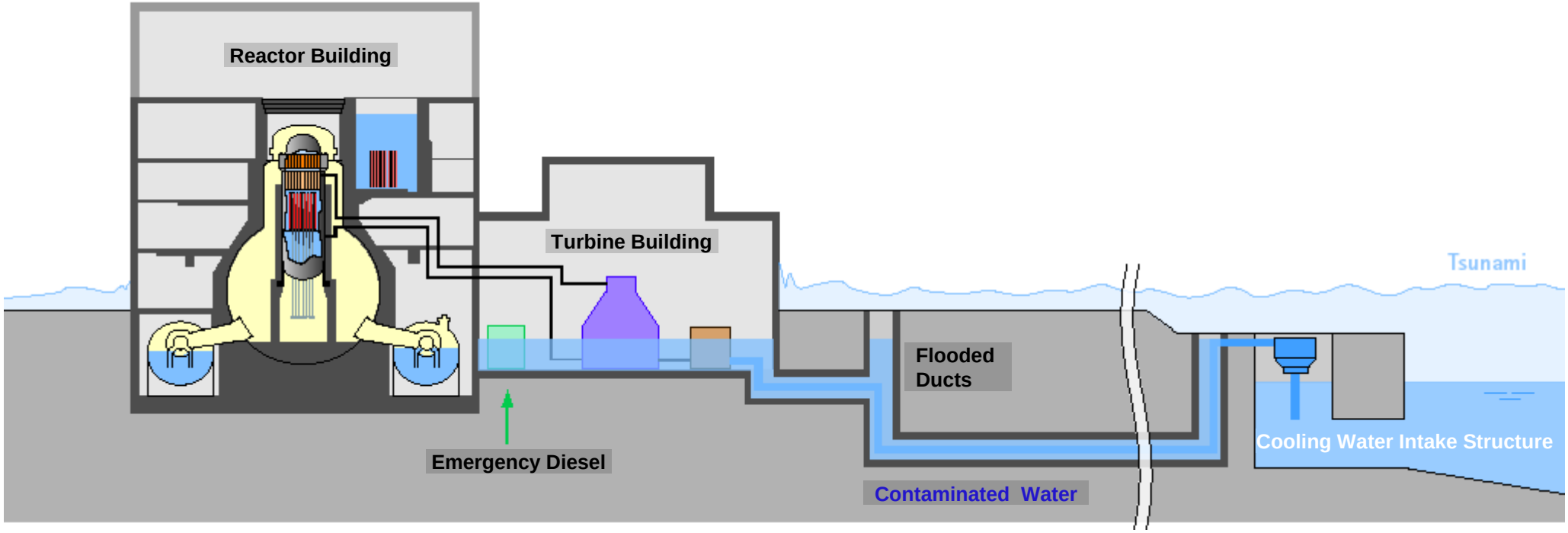
Impact of Tsunami on Fukushima Daiichi



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Chapter 2

What are the Results and Recommendations of the IAEA Fact Finding Mission?

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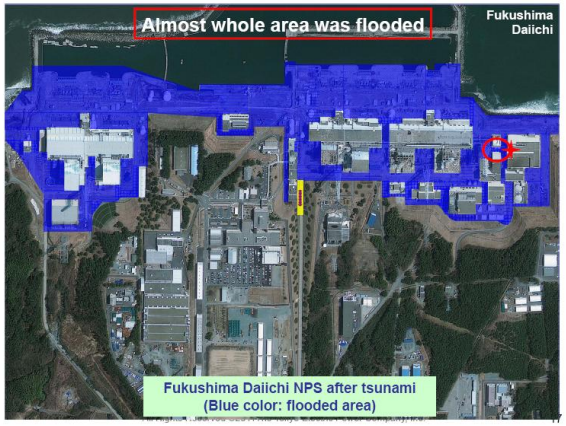
IAEA Report on Fukushima 1/3

Protection against the risks of all natural hazards

update assessments of all natural hazards.



Tsunami risk was known –
15m protection wall at Fudai

Safety Concept

Defense in depth requirements should be applied

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IAEA Report on Fukushima 2/3

Regulator

- address extreme external events adequately,
- regulatory independence

Combinations of External Events

Consideration of long term combinations of external events in design, operations, resourcing and emergency arrangements

Emergency Response Centers

Hardened on-site Emergency Response Centers

Availability of simple, effective, robust equipment to restore essential safety functions.

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IAEA Report on Fukushima 3/3

H_2
Provide mitigation systems

Emergency arrangements
Emergency arrangements designed to be robust in responding to severe accidents.

The IAEA mission urges the international nuclear community to … <u>seek to learn and improve worldwide nuclear safety.</u>

Source:
IAEA INTERNATIONAL FACT FINDING EXPERT MISSION OF THE NUCLEAR ACCIDENT FOLLOWING THE GREAT EAST JAPAN EARTHQUAKE AND TSUNAMI
http://www.iaea.org/newscenter/focus/fukushima/missionsummary010611.pdf

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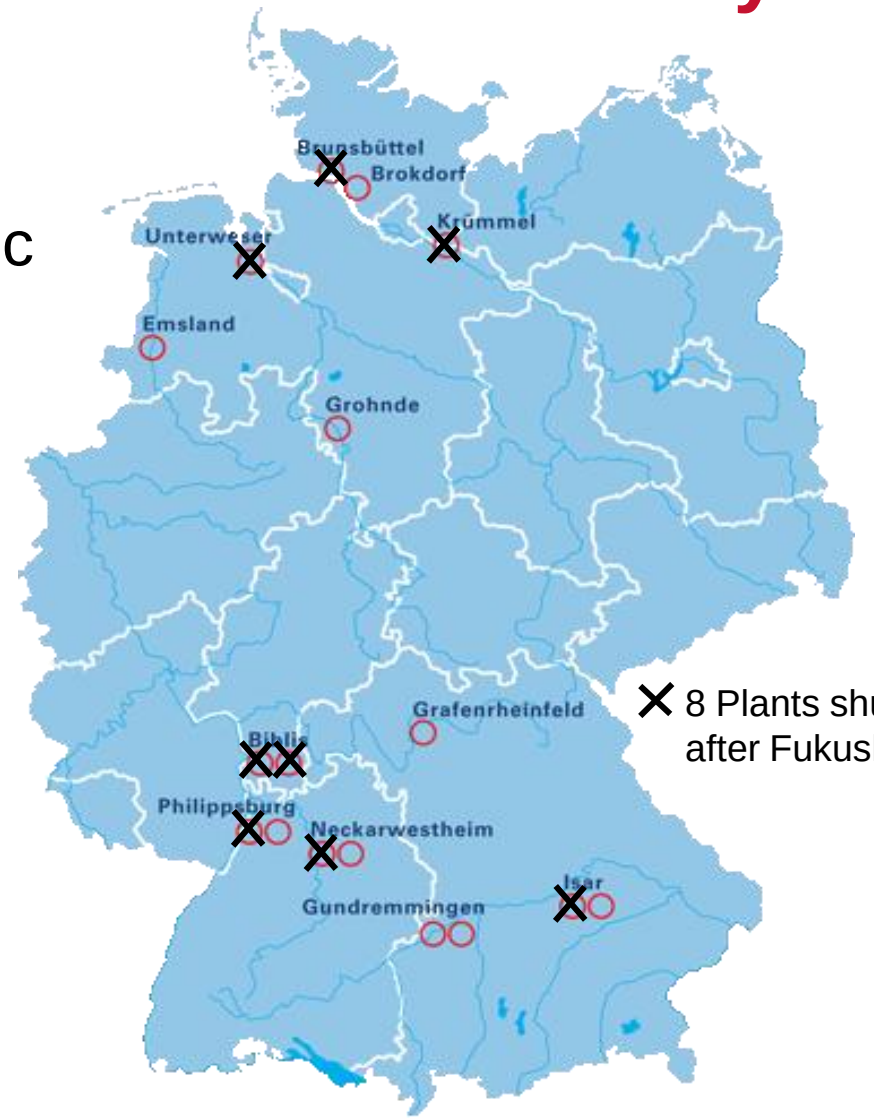
The German Way

IAEA recommendations largely fulfilled in all German plants – attested by RSK – however public opinion about nuclear has further suffered with the Fukushima accident.

Reason enough for politics in Germany to adopt an unparalleled "nuclear exit program"



✕ 8 Plants shut down after Fukushima

RSK: ReaktorSicherheitsKommission

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Chapter 3

What are the Resulting Global Reactions and Challenges for the Society, Politics and Authorities

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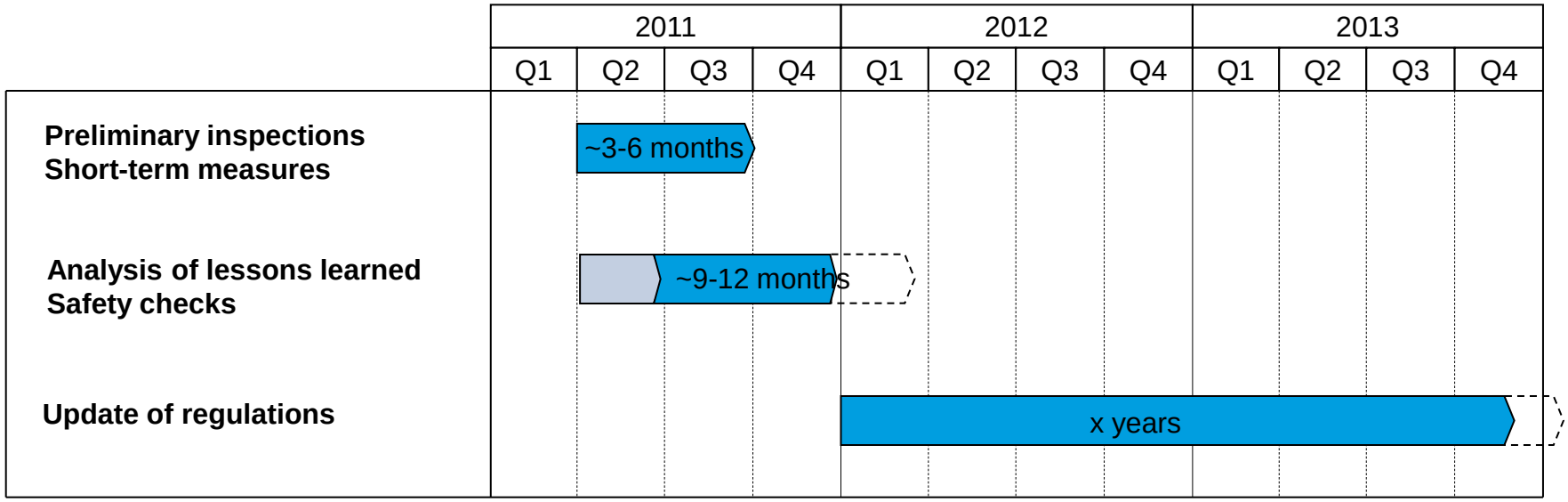
Regulatory Authorities Worldwide Launched 3 Types of Measures

Typical schedule



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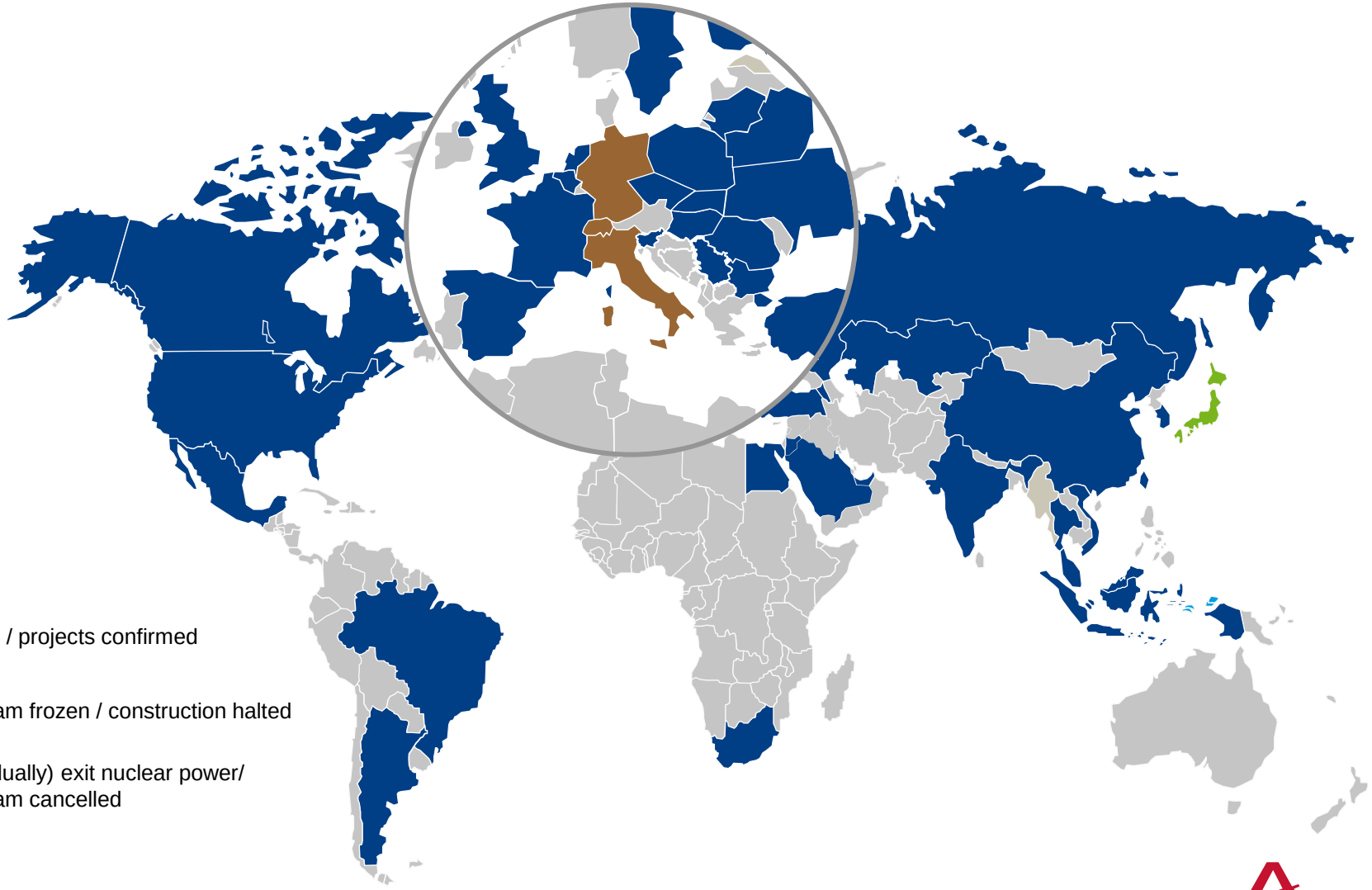
Governments take pragmatic approach
Most countries have not rushed decisions



Nuclear program / projects confirmed

New Build program frozen / construction halted

Decision to (gradually) exit nuclear power/
New Build program cancelled

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Chapter 4

What are the Resulting Global Reactions and Challenges for AREVA

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AREVA Program
Safety Alliance for Operating Plants

To meet (new) regulators requirements and IAEA recommendations AREVA has set up the **Safety Alliance** program for **operating plants.**

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Safety Alliance

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AREVA has set up the „SAFETY ALLIANCE“ Program for all Operating Plants:

1 Resistance to Major Hazards

Safety Analyses

- Safety Analyses
- Fire Protection/ Hazard Analysis

But If..

2 Robustness of Cooling Capability

Safety Analyses

- Safety Analyses
- Safety Margin Re-assessment
- Analyses of UPS & I&C Power Supply

Safety Upgrades

- Flooding Protection
- Flood Proof Motors
- Additional Connections for Mobile Power Sources
- Hardened EDG Systems
- Hardened 3rd Grid Connections
- Transport of Used Fuel
- Dry Storage at the NPP

But If..

3 Prevention of Environmental Damage

Safety Analyses

- Safety Analyses

Safety Upgrades

- Passive Autocatalytic Recombiners
- Containment Filtering & Venting Systems
- Post-Accident Sampling System PRONAS
- HERMETIS
- LOCA Proof cables ARENOPYR®
- Radiological Emergency Response
- Post-Accident Characterization and Response
- Real-time Continuous Environment Monitoring

Safety Procedures

- Severe Accident Management Guidelines – OSSA
- Nuclear Simulators

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Safety Alliance

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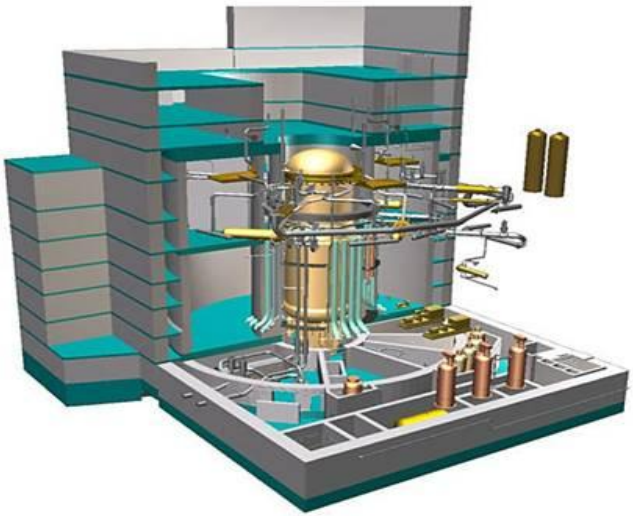
AREVA Program
New Build Reactors

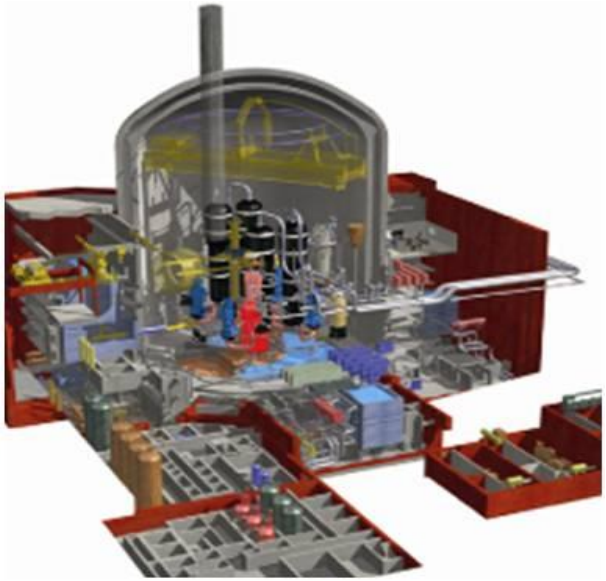


BWR 1,250 MWe

KERENA by AREVA

PWR 1,110 MWe

ATMEA
Developed in partnership with MHI



PWR 1,650 MWe

EPR by AREVA

Our Gen III type reactor models designed to prevent severe accidents and to limit the eventual consequences to the plant itself.

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e.g.
EPR Emergency Diesel Generators

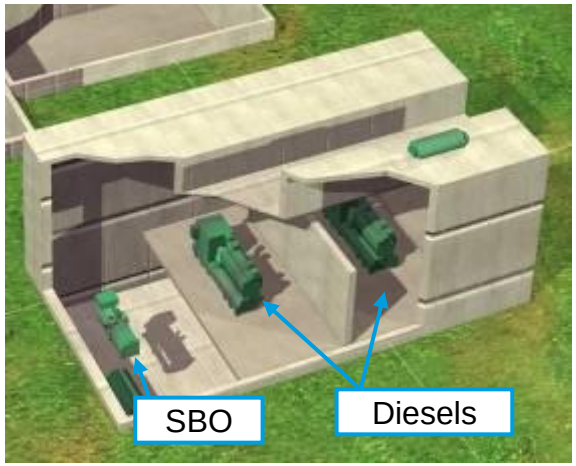
Building protection

- **Diesels & fuel tanks housed in reinforced concrete buildings**
  - Seismic resistant
  - Explosions resistant doors
  - Physical protection

Physical separation

- **2 separate buildings located on each side of the reactor building**

Redundancy & diversification



- **4 main 100% redundant diesels**
  - 3 days autonomy at full load
- **Two additional fully diversified station blackout diesel generators**
  - 24 hours autonomy for each

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Fukushima
Key Messages

- Fukushima accident was not “residual risk” but deficient basic design / authority requirement towards external hazards
- Basic design and compliance with safety standards to be revised, imposed and updated by independent and determined safety authorities
- Compliance with IAEA recommendations shall be a matter of course
- AREVA was and is committed to the highest safety standards
  - “Safety Alliance“ to analyze and eventually improve the plant safety
  - Our (new build) plants are designed according to the highest safety standards meeting the most stringent licensing requirements
- Under these conditions nuclear continues to be a safe, reliable, economical and CO_2 free source of electricity

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