Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Nuclear Regulatory Systems

Global Conference for a Nuclear Power Free World 2

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Nuclear Power in Germany

- Atomic Energy Act of 1959
  - promote Nuclear Power in Germany
- Since about 1970s:
  - Intense discussions about safety, final disposal of fuel and non-proliferations issues
- Amendment of the Atomic Energy Act in 2001/2002:
  - Phase out of Nuclear Power in Germany
  - Ensure safety for the remaining lifetimes
- Amendment of the Atomic Energy Act in 2010:
  - Still Phaseing out of Nuclear Energy
  - Prolongation of lifetimes for on average 12 years

Nuclear Power in Germany March 2011

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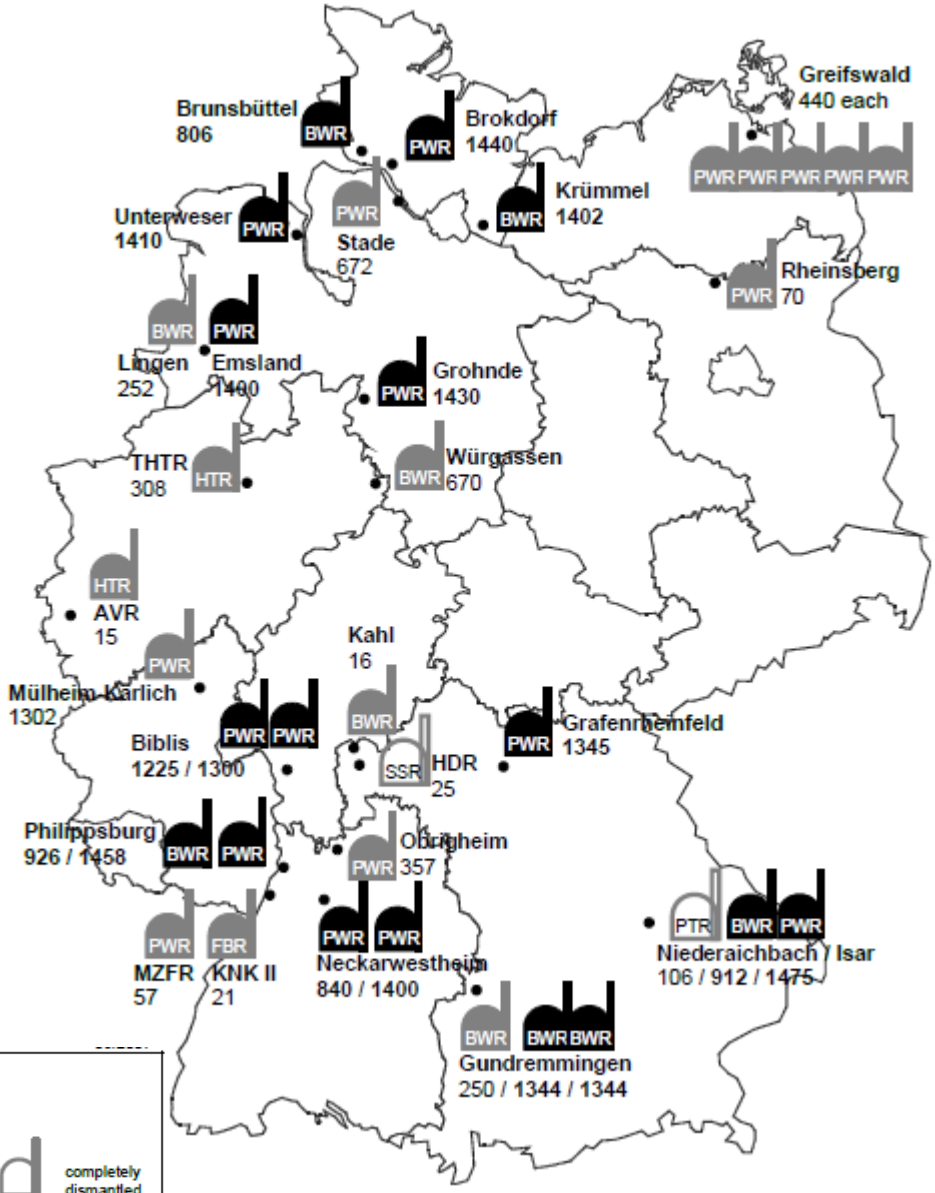

Legend

PWR	Pressurized Water Reactor
BWR	Boiling Water Reactor
FBR	Fast Breeder Reactor
HTR	High Temperature Reactor
PTR	Pressure Tube Reactor
SSR	Superheated Steam-Cooled Reactor

in operation

shut down

completely dismantled

Numbers indicate gross capacity [MWe]

Source: IRRS 2011

Nuclear Power in Germany

- Amendment of the Atomic Energy Act in 2011:
  - Immediate closure of 8 Nuclear power plants
  - Withdrawl of longer lifetimes from 2010 amendment
  - Set fixed closure dates for remaining plant until 2022

Shutdown dates according to 2011 Atomic energy law

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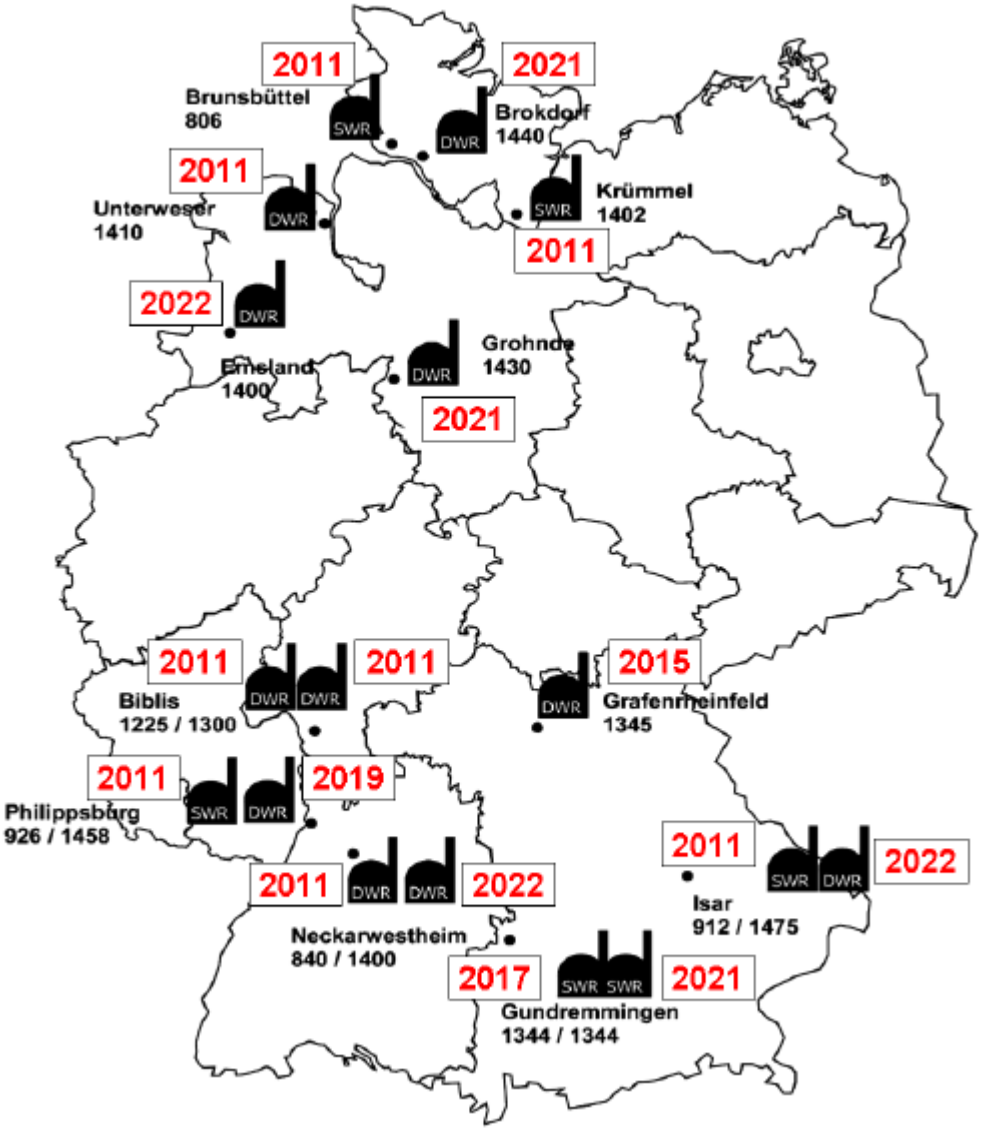
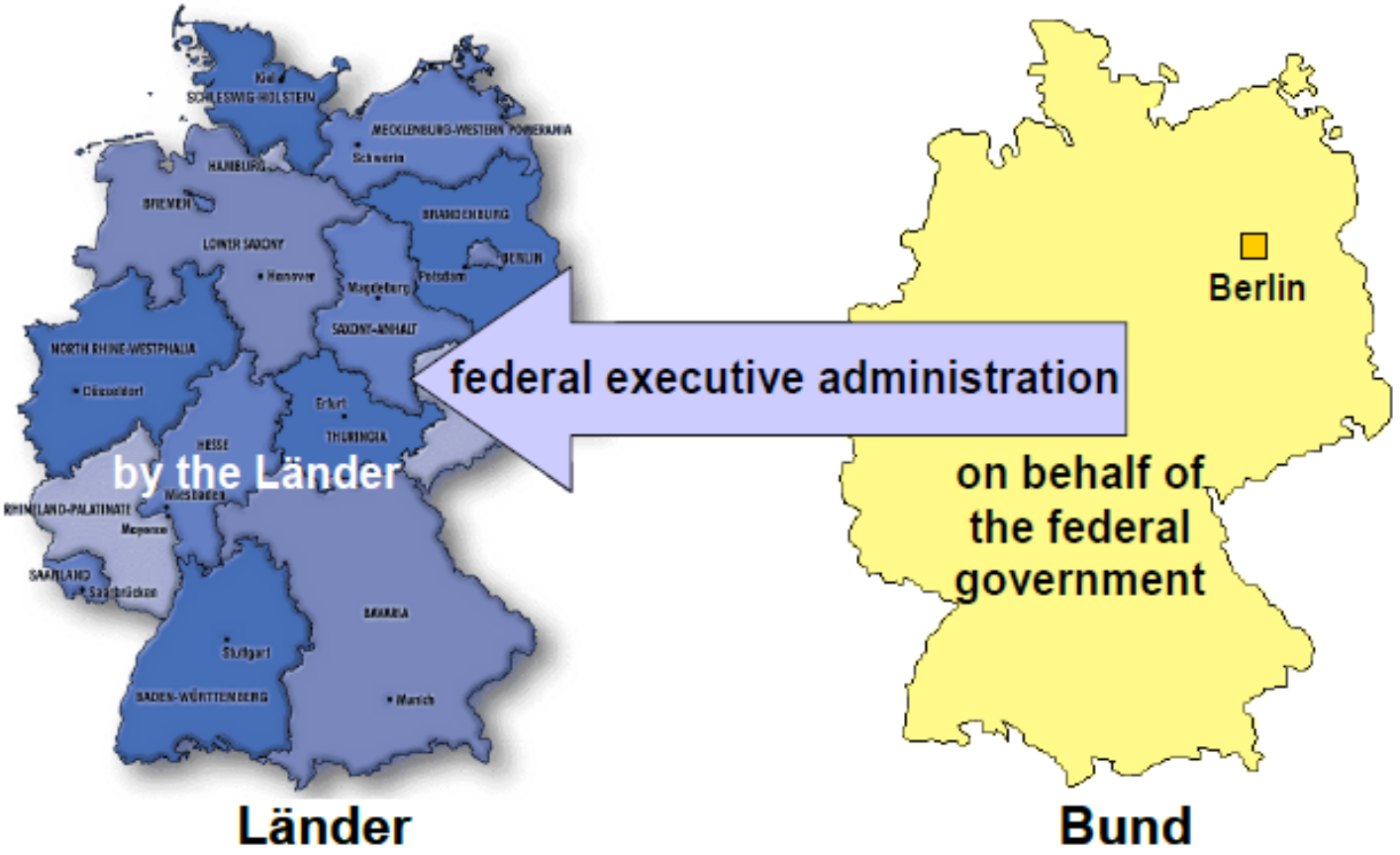


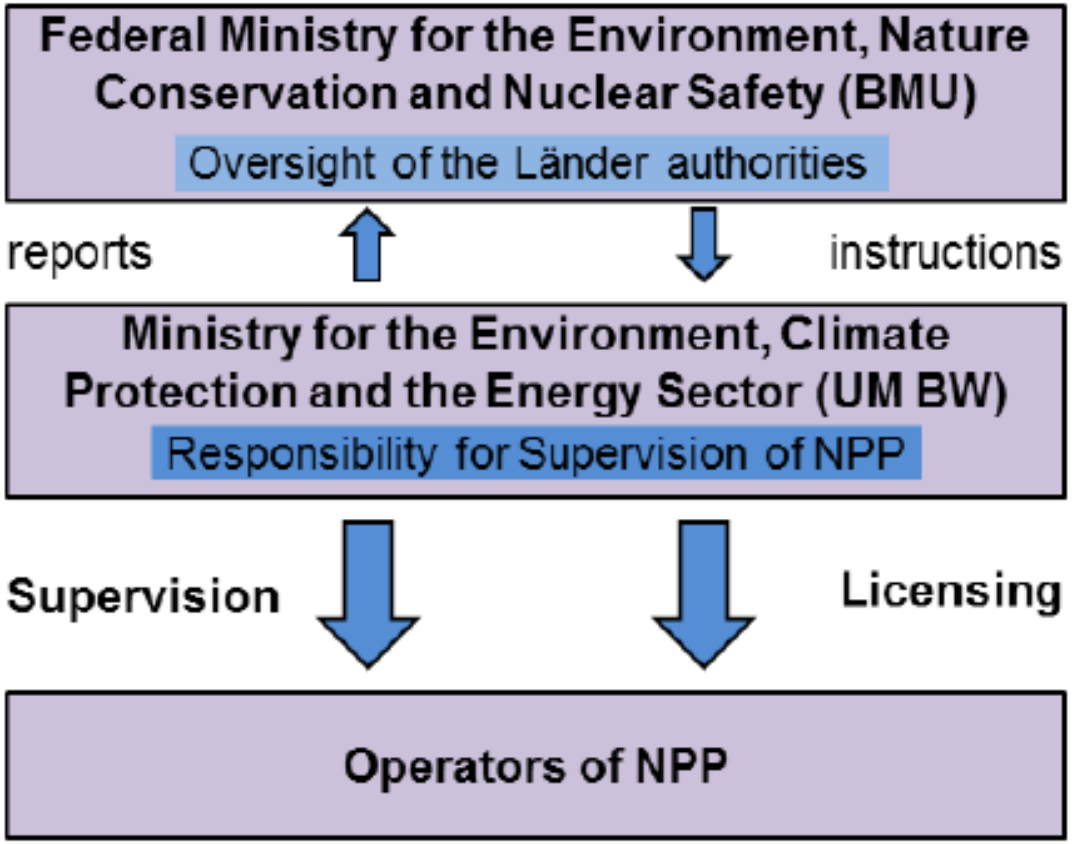
Source: IRRS 2011

The German Federal System



Source: IRRS 2011

The German Federal System



Source: IRRS 2011

Advisory Committees and Technical Expert Organizations

- Committees:
  - Reactor Safety Commission
  - Commission on Radiological Protection
  - Nuclear Waste Management Commission
- Expert Organizations
  - Gesellschaft für Anlagen- und Reaktorsicherheit (GRS)
  - technical service providers (TÜVs)
  - Other independent institutes (Oeko-Institut)

Countermeasures against Sever Accidents

- Measures to ensure integrity of reactor pressure vessel in BWRS (independent water injection and heat removal)
- Provisions for secondary and primary side bleed and feed in PWRs
- Electrical connections between neighboring units and increased battery supply
- BWRs: containment is filled with an inert atmosphere
- PWRs: passive recombiners
- filtered containment venting systems
- sampling system to analyze the containment atmosphere

Regulations with respect to Backfittings

- In Principle: safety according to the state of the art of science and technology
- But
- Regulatory process may take long time (10-15 years)
- Even the fulfillment of orders may take decades
- In 2010: New paragraph §7d
  - requesting nuclear power plant operators to realize safety provision beyond the necessary precautions against damages, according to the state of the art in science and technology
- But provisions are not necessary, if they are “not merely slightly relevant”

Limits to Backfitting - IAEA

- IAEA Safety fundamentals:
  - "The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation."
  - "Protection must be optimized to provide the highest level of safety that can reasonably be achieved."
- But:
  - The safety measures that are applied to facilities and activities that give rise to radiation risks are considered optimized if they provide the highest level of safety that can reasonably be achieved throughout the lifetime of the facility or activity, without unduly limiting its utilization.

Independence of the Regulatory Body

- Independent from politics
- Organizational independence of the regulator
- Financial independence
- Independence of the involved experts
  - organizational
  - individual

→ Need for Public involvement

Public Involvement in the regulatory process

- During legislative processes:
  - stakeholder groups have the possibility to comment on new regulations
- During licensing procedures:
  - hearings open to the public, possibilities for questions and appeals
- During operation:
  - system for reporting operational experience (events)
- Generally:
  - Rights to access environmental information based on the Aarhus-convention

Final Remarks

- Nuclear power plants are very complex technical systems
- Severe accidents with catastrophic consequences are possible
- Even with an optimized regulatory system, no absolute safety is achievable
- Society has to decide whether the risk of nuclear power is acceptable or not and how to phase out nuclear power