



NPP Beznau



NPP Mühleberg

Operational risks of old nuclear power plants in Switzerland

Five nuclear power plants in Switzerland



Beznau seit 1969 in Betrieb



Mühleberg seit 1971 in Betrieb



Gösgen seit 1979 in Betrieb



Leibstadt seit 1984 in Betrieb

Design of the reactor pressure vessel

- The reactor pressure vessel have probably longitudinal welds. Longitudinal welds are especially susceptible for cracks and breaks.
- Complete testability of all welds is very limited.
- Steel type used has too low toughness.

Testability of the construction with nondestructive methods

- There are significant limitations of the testability, especially because of the partly high radioactive dosis and also because of the not accessibility of particular areas with appropriate measuring instruments.

Design of the pipes of the pressure boundary

- The pressure boundary consists partly from half shells for pipes. This means that also longitudinal welds with its high stresses and therefore greater risk of cracks and breaks exist.
- The thickness of the wall of the pipes have no or only little reserves for beyond design accidents.

Compliance with the break preclusion concept for important pipelines

- The criteria of the break preclusion concept are not or only partially met. It creates a higher risk for larger leaks and breaks in safety-related pipelines.

Emergency and residual heat removal systems

- The spatial separation of the individual lines is not realized consistently.
- The passive single failure is generally not mastered or its mastery has not been proven.

Safety containment

- The safety containment has partially only a thickness of 15 cm. So it is clear that a positive verification of complete mastery of design basis accidents is inconceivable.

30-minute concept

- The fulfillment of the 30 minute concept has not been proven for all design basis accidents, which have to be postulated.

Emergency power supply

- In the NPP Mühleberg only 3 diesel generators are available. One diesel generator supplies only the lines 1 and 2. Two diesel generators supply the lines 3 and 4.
- Additional emergency facilities for mastering external influences are not available.
- The emergency power supply facilities are not strictly separated (uncoupled) and are structurally and spatially not-separated.

Safety instrumentation and control systems (I & C)

- The multiple existing wires and cables of the safety instrumentation and control systems (I & C) are partly not structurally separated or not accommodated in different fire sections.

Seismic design

- The seismic design is not proved according to the current state of science and technology. A study conducted in Switzerland (Pegasos) shows, that the earthquake risks are much higher than the original assumptions.
- In the NPP Mühleberg safety systems are partly not earthquake-qualified even according to the outdated assumptions.

External flooding

- Flood design has not been proven. There are plenty of scientific papers, which show, that the risk of flooding by the nuclear authority is largely underestimated since years.

Airplane Crash

- Only a small part of the safety-related systems are protected against smaller aircrafts. Against the crash of large airliners (accidentally or forced) there is no sufficient protection.

Diversified heat removal

- For the NPP Mühleberg there is no heat sink other than the river Aare.

Flood tank

- The Beznau NPP has only one borated water storage tank per unit with a relative small volume of water.

Pressure Storage

- The NPP Beznau has only 2 pressure storages per unit.

Cracks in the core jacket of the NPP Mühlenberg

- The core jacket is located inside the reactor pressure vessel and it has in particular the function to stabilize the position of the fuel and the control rods. Since many years growing cracks are observed in the core jacket.

Inappropriate designed containment of Mühleberg nuclear power plant

- The MARK-I Containment has a free-standing part which is filled with water to reduce the overpressure in case of incidents. Unlike modern containment in boiling water reactors which have for pressure reduction pools, the water in the NPP Mühleberg can completely run out if a leakage occurs.

Signs of corrosion on primary containment of NPP Mühleberg and Beznau

- Significant corrosion on important parts of the containment.

Spent fuel pool NPP Mühleberg and NPP Beznau

- The Spent fuel pool of the NPP Mühleberg is located unprotected under the partly only 15 cm thick ceiling of the reactor building.
- The cooling system of the fuel pools do not have any earthquake verification.
- At high water the pool cooling system falls out.
- Required redundancies and single fault resistance are not given.

Particularity in Switzerland

- Only the state of the “upgrade technology” and not the state of science and technology is decisive for required upgrades.

Conclusions / Recommendations

- In particular, the plants in Beznau and Mühleberg are characterized by significant aging processes, which significantly jeopardize safety.
- The nuclear power plants have been continually removed from the state of science and technology.
- Improvements are only limited possible.
- The plants Mühleberg and Beznau should be switched off immediately.
- Operators and authorities in Switzerland should provide all safety-relevant documents concerning the systems available to the public.