

Smart Dismantling and Packaging

Calculations for high and intermediate level waste

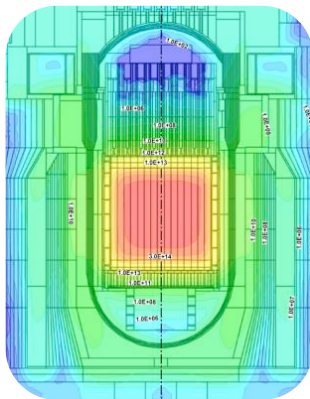


- Nuclear analyses determine the exact shielding required for spent fuel and nuclear waste
- Sophisticated calculations facilitate cost efficient dismantling and disposal campaigns
- Optimized packaging concepts minimize the number of casks and containers for transport, storage and disposal



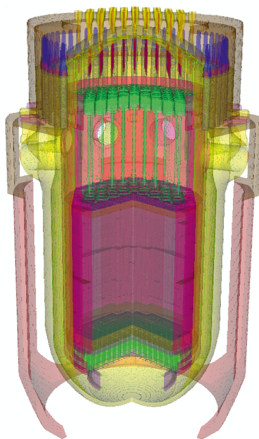
GNS optimizes dismantling and packaging solutions by using unique calculation methods. This significantly reduces packaging, transport, interim storage and final disposal space as well as necessary time, personnel and collective dose.

With its subsidiary WTI the GNS-Group covers the nuclear topics inventory determination, shielding, criticality safety, activity retention, thermodynamics, fluid dynamics and mechanics.



Determination of activation of RPV and structural components

- Determination of neutron flux densities and neutron spectra
- Calculation of build-up and decay of radioactive nuclides as basis for decommissioning and packaging concepts performed by GNS/WTI
- Sampling, analyses and dose rate measurements
- Comparison with analysed material samples and dose rate measurements
- The activation results are used for dismantling and decommissioning concepts of the utilities and are basis for the decommissioning licence process

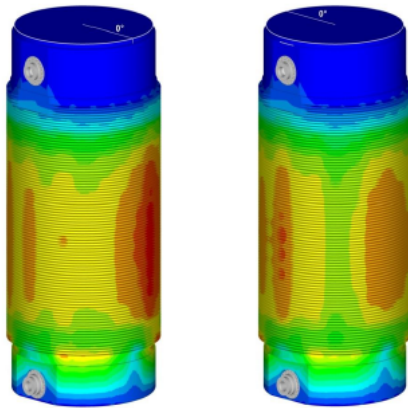


Development of packaging concepts for radioactive wastes

- Ideally suited for RPV-structures and -internals
- Assessment of waste packages for interim storage and final disposal as well as transport based on relevant regulations
- Calculations (radioactive inventory, shielding, criticality, thermodynamics, mechanics)
- Nuclear waste management, e.g. dismantling, packaging and disposal concepts packaging documentation

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Nuclear and thermal analyses for spent fuel and radioactive wastes

Prior to dismantling the spent nuclear fuel has to be removed from the nuclear power plant. To determine the activity, subcriticality, dose rate and temperatures of the fuel, WTI performs the necessary nuclear and thermal analyses, in particular the numerical simulation of neutron and radiation transport during reactor operation and finite element analyses or CFD simulations.

- Development of packaging concepts
- Shielding for casks and storage buildings
- Criticality safety analyses
- Determination of radioactive inventories
- Assessment of activation from neutron irradiation
- Radiological characterization
- Planning for optimised cask loadings
- Thermodynamics and CFD analyses

REFERENCES

Activation calculations:

- ILW-Taiwan – Calculation of basic data for packaging planning of all Taiwanese Nuclear power plants based on German decommissioning experience (customer: TPC).
- Calculation of radioactivities of German nuclear power plants:
 - PWR: GKN I and II, KKP 2
 - BWR: KKP 1, KWL, KKI
 - Customers: EnBW, PreussenElektra, RWE
- Calculation of radioactivities of Beznau NPP in Switzerland (customer: Nagra)
- Calculation of radioactivities of German research reactors (customer: public sector):
 - AVR (prototype pebble-bed reactor)
 - FRJ-2 (heavy-water reactor type)
 - Otto Hahn (nuclear reactor of a research ship)

Packaging planning:

- Dismantling of the reactor pressure vessels and the internals of all nuclear power plants of PreussenElektra (Projects ReaDi and ZerKon):
 - 1 BWR- and 4 PWR-units.
- All Taiwanese nuclear power plants owned by TPC
- All German nuclear power plants owned by RWE (4 BWR and 4 PWR)
- For the nuclear reactor of the research ship Otto Hahn

