

Nuclear Energy

AFRY is a pioneer in consultancy services for the Swiss nuclear industry since the late 1950s. We have a long tradition as a leading consultant with an extensive portfolio in supporting, managing, design review and upgrading various plants, including all sizes and types of power reactors both in Switzerland and worldwide.

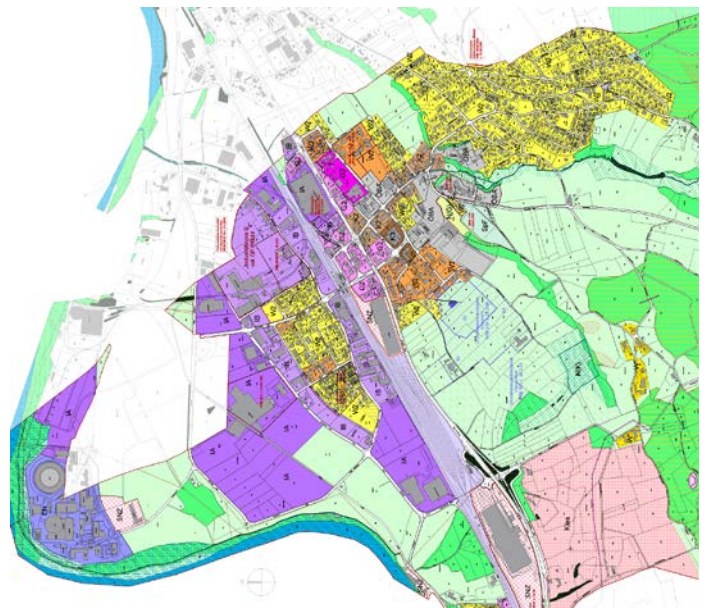
Our team consists of independent engineers and scientists experienced in practically all aspects of nuclear power. Their knowledge has been acquired nationally and internationally in the nuclear industry and in nuclear regulatory bodies through their continuing engagement in many nuclear projects and through their regular contacts with many manufacturing, governmental and utility organizations.

Our portfolio covers services in various nuclear fields:

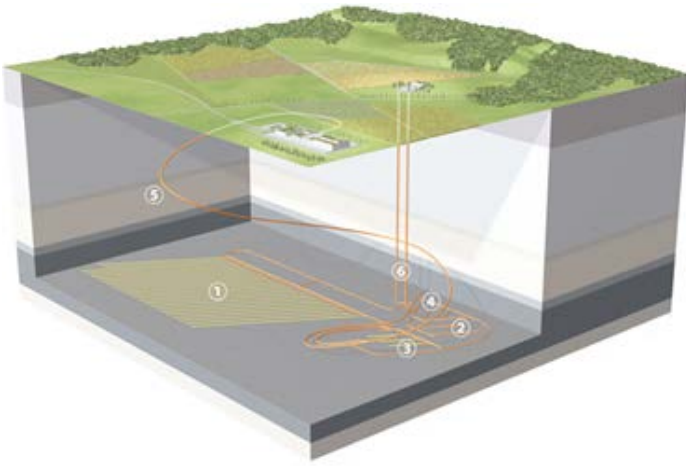
- Operation of nuclear facilities: Preparation and update of safety analysis reports, operational manuals, periodic safety reviews, ageing management, cost analyses/ cost reductions, project management support in system technology, mechanical engineering, electrical engineering, control systems
- Nuclear reactor design and control: Reactor thermal-hydraulic, transient and accident analysis, nuclear data and data base generation, reactor statics and dynamics
- Technical and project management support during construction/upgrading of nuclear power plants: Feasibility assessment and design review, procurement and project management
- Radiation protection and shielding
- Spent fuel cask technology: Safety analysis, thermal, shielding and criticality calculations, feasibility studies
- Decommissioning and waste management
- Hydrogeology: Site management, groundwater modelling
- Non-destructive tests (methodology, quality control, supplier qualification, test execution)
- Data analysis (eg. extreme weather analysis, overflight calculations)



Aerial view of NPP Beznau with the AUTANOVE diesel building



Building zone plan in Däniken around NPP Gösgen



Final waste repository (Image: Infel AG)

Review of Safety Assessment Report (NPP Gösgen, 2015-2017)

In the last 20 years, AFRY has reviewed the safety assessment report for NPP Gösgen every 2-4 years. The work includes the update of all reactor systems, safety assessments and accident analyses.

In 2017, the entire safety assessment report was updated according to the new ENSI guidelines. An IT concept was also established using state-of-the-art solutions. The work includes:

- New chapters for safety management, design principles, radiation protection, emergency preparedness, environmental influences and radiological waste
- Revision of the chapters, introduction, plant overview, site conditions, power plant systems, incident analysis, operational aspects

Professional Services – AUTANOVE (NPP Beznau, 2015)

AFRY offers professional services to support ongoing maintenance or operational projects. One reference is our participation in the AUTANOVE project at the NPP Beznau.

For a new emergency power supply of NPP Beznau, two identical buildings, each with two diesel generators, were built and integrated into the existing power plant systems. The entire emergency power supply system was designed to withstand flooding following a dam damage and the design earthquake of Beznau.

AFRY provided the technical project management, which involved project schedule planning and monitoring; negotiations and technical discussions with the general contractor; coordination with the sub-project managers, the project management, the approval authority and the experts involved.

Generic Design for the Final Repository for High- and Intermediate-Level Radioactive Waste (Nagra, Switzerland, 2019-ongoing)

Spent fuel from Swiss nuclear power plants and vitrified fission product solutions from reprocessing will be disposed of in the high-level waste (HLW) repository. The repository will also have tunnels for long-lived intermediate-level waste (ILW). The existing conceptual design will be refined for a site independent repository. The scope of services involves:

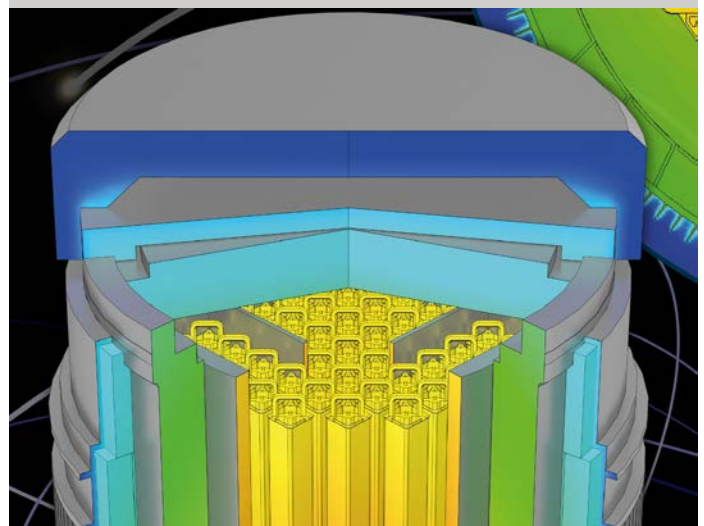
- Design of systems and components
- Requirements of underground works
- Design of above surface facilities
- Preparation of general license application
- Optional: Licensing follow up

Thermal and Shielding Calculation of a Spent Fuel Cask (Axpo Power AG, 2015-2018)

3D CFD heat transfer and flow calculations were performed using a suitable numerical method to determine temperature distribution in a spent fuel cask for different loading scenarios.

In the continuation of this project, AFRY used the SCALE and the MCNP codes to do the shielding analysis. Radiological source terms were calculated using the SCALE/ORIGAMI modules. These source terms were used for the full geometry MCNP calculation to determine the dose rate during normal conditions of storage.

The loading was analyzed for replacing several fuel assembly positions with quivers storing defected fuel pins. The source terms of the quivers were calculated using SCALE/ORIGAMI for higher burnup levels.



Temperature distribution inside of a spent fuel cask

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