STEAG Energy Services

Introducing the Nuclear Technologies Division

www.steag-energyservices.com

steag

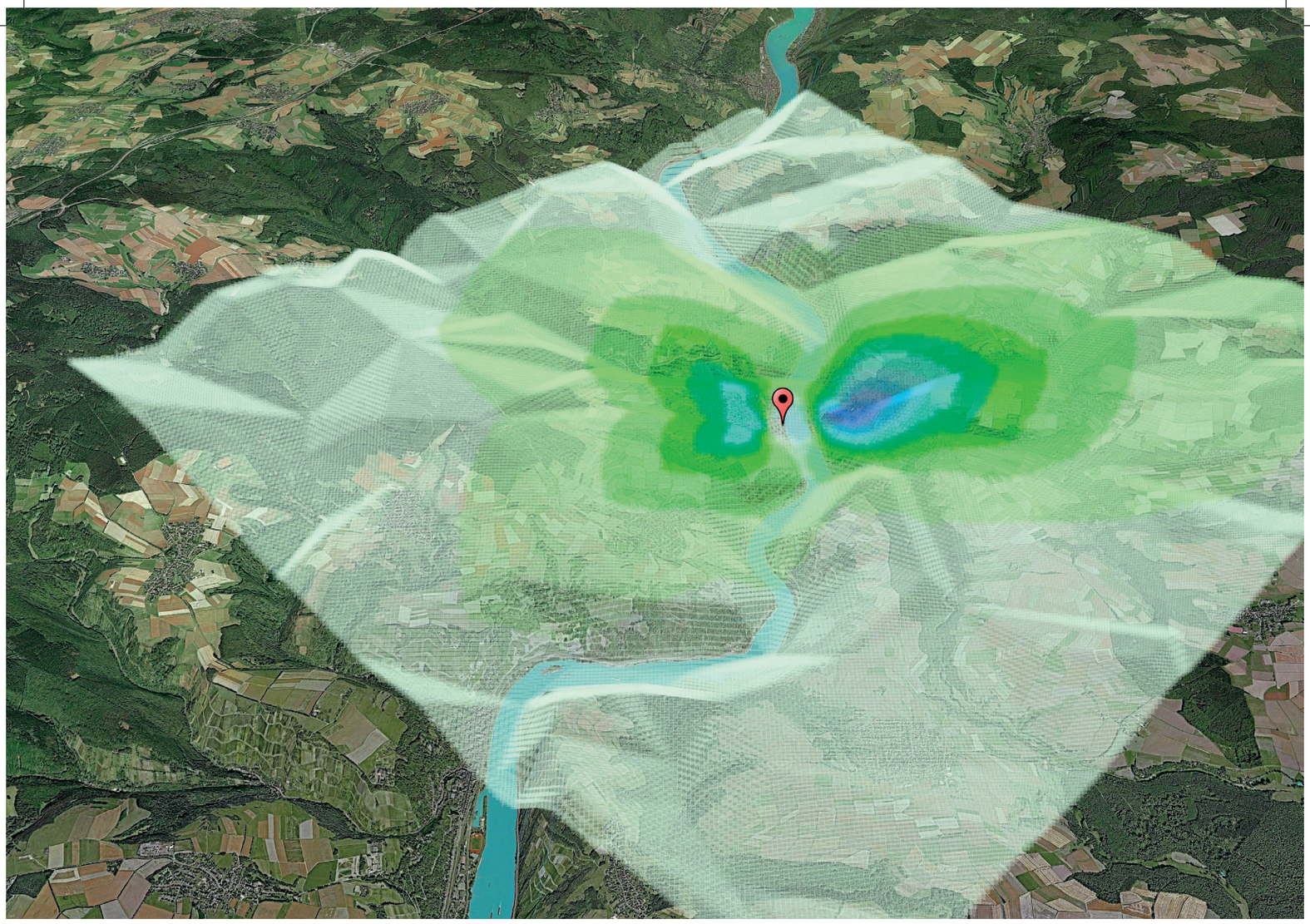
The implementation of engineering projects in almost all areas of nuclear technology, while duly considering safety and economic aspects, has been the main field of activity of the Nuclear Technologies Division for over 40 years.

Nuclear Technologies

The services especially include the design, planning and construction of nuclear facilities, including the provision of the necessary engineering services from the following fields:

- nuclear concepts and plant engineering,
- mechanical and process engineering,
- electrical engineering, instrumentation and control (I&C) and communications technology,
- structural engineering,
- plant security,
- radiation protection and incident analyses, and
- static, dynamic and nuclear calculations.

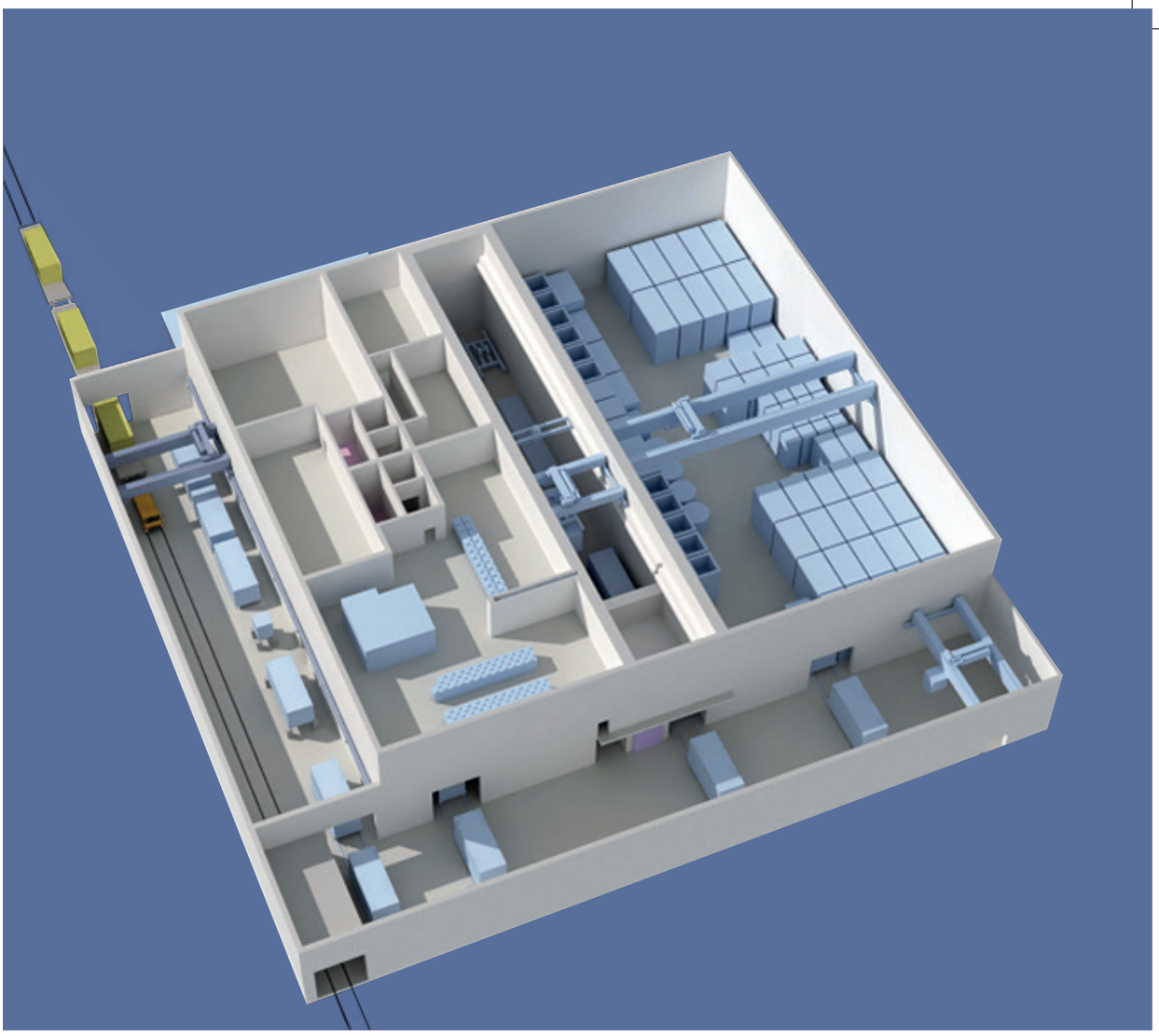
Complementing these services, solutions with licensability in mind are worked out, licensing documents are prepared and support during licensing procedures is provided in cooperation with the customers.



With comprehensive services ranging from conceptual studies through planning and engineering to practical implementation, the Nuclear Technologies Division offers the customer ideal solutions from one source while observing the applicable national and international quality and safety standards.

The expertise and the accumulated experience of Nuclear Technologies are the product of systematic initial and further training of our personnel and a variety of successfully completed projects. Comprehensive key skills and longstanding experience in the implementation of projects at the national and international levels add up to optimum positioning in the market for nuclear services and delivery transactions.

Safety analyses and physical calculations with international, established software are one focus of the range of services of Nuclear Technologies and are being specifically extended with regard to radiological topics, structural dynamics



and thermodynamics. The service portfolio of the Nuclear Technology Division additionally comprises analyses and optimization of fluidic and combustion processes and handling of questions arising therefrom, not only for STEAG's conventional power plants.

The certification to KTA 1401 reflects the competence of the Nuclear Technologies Division as a reliable developer and supplier of special nuclear components and safety systems.

Regardless of the customer-specific assignment of tasks from the wide range of nuclear technology, we consistently pursue two objectives:

- being a competent and reliable partner to our customers in the implementation of their projects, and
- having expert knowledge at the cutting edge of science and technology and continuously developing this knowledge at the highest level.

Nuclear Engineering

Nuclear Engineering sees the planning, construction and commissioning of nuclear facilities as the main focus of its service portfolio. According to their particular use, nuclear facilities require specific solutions for their structural and mechanical engineering while observing applicable national and international regulations and the high requirements regarding safety and engineering.

Nuclear Engineering not only designs, plans and constructs nuclear facilities, but also works out specific concepts for these facilities, taking into account aspects of safety, functionality and efficiency. The department develops processes and technical solutions, from conceptual engineering to practical implementation. Nuclear Engineering also supports the customer up to the turnkey handover of the facility and provides technical support to the customer in licensing procedures.

Nuclear Engineering assists its customers in the selection of suppliers and also functions as a supplier of components and complete systems itself. The procurement of components and complete systems from the development to the delivery through to the installation and commissioning is supported.

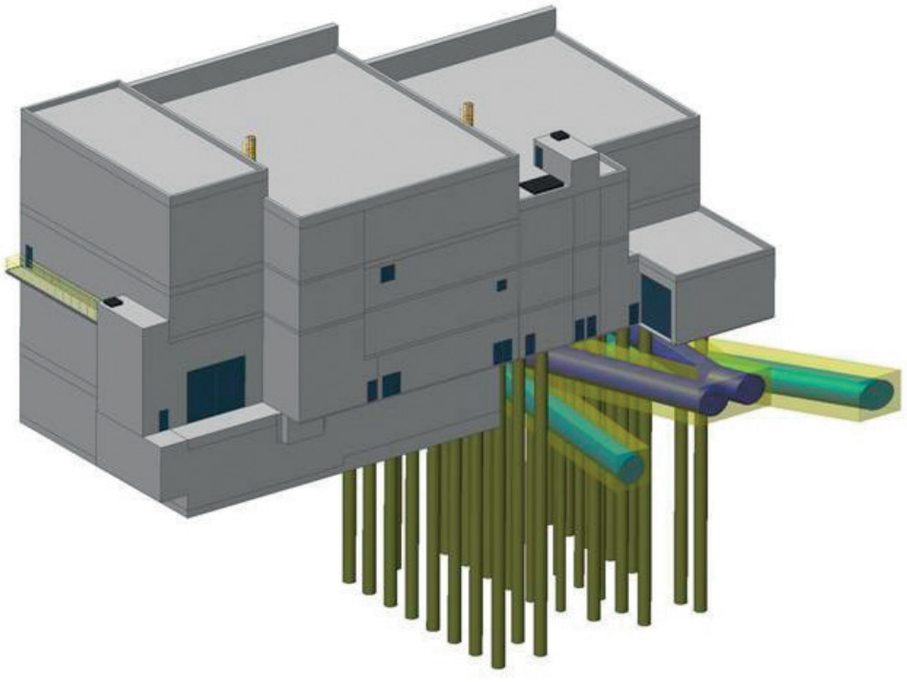
The Components group plans and develops mechanical engineering solutions based on the current state of the art and in particular according to the KTA safety standards. In addition to conceptual planning, the Components group performs the complete structural and mechanical calculations as well as the design-related engineering and implementation, especially the design of lifting gear in nuclear power plants as well as shielding doors, transport vehicles, maintenance stations and radiation protection gates.

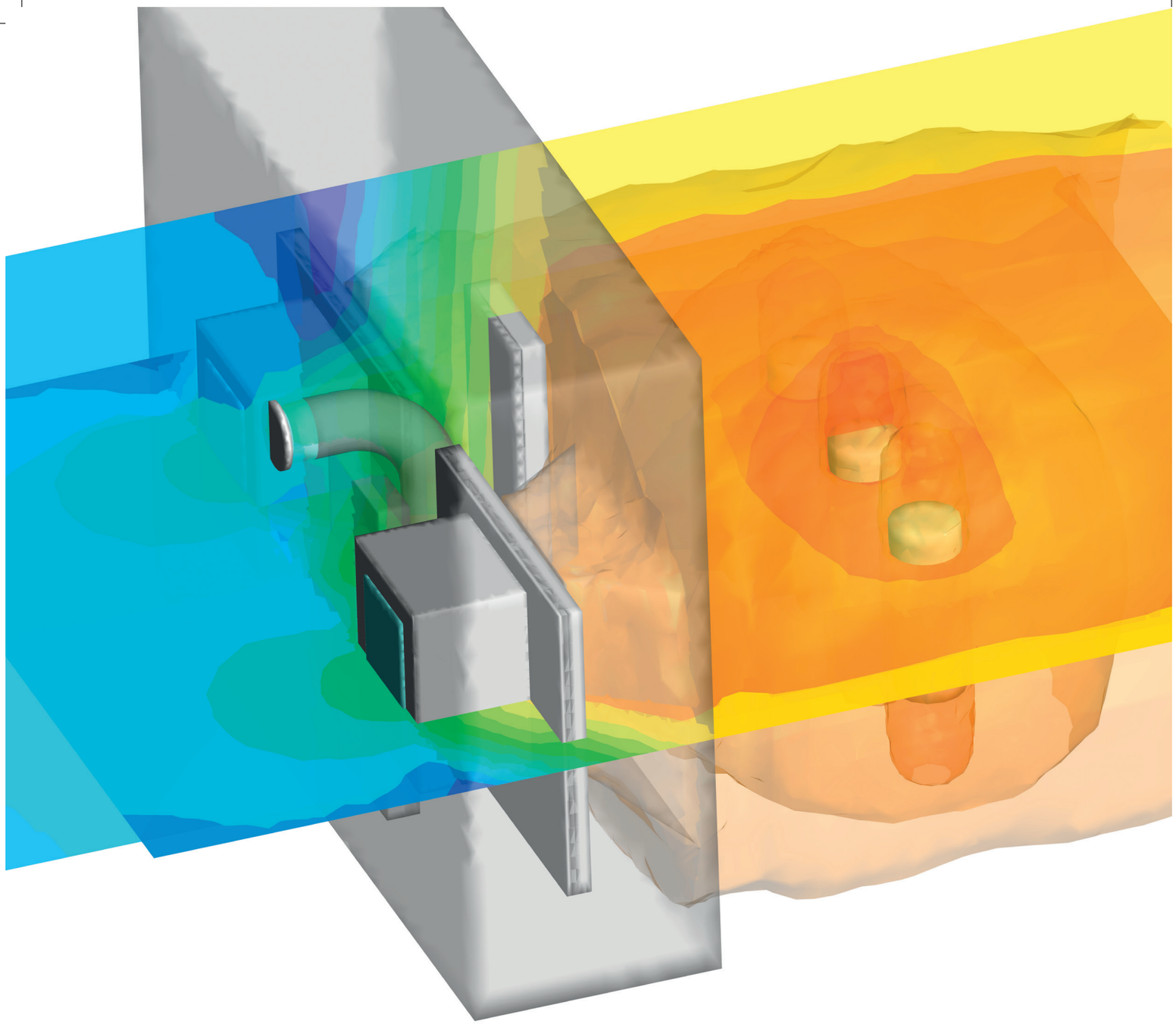
During the construction phase, in addition to project monitoring and control, Nuclear Engineering performs the site and erection management along with documentation and quality management tasks.

During the commissioning phase the activities focus on the timely implementation of commissioning, including comprehensive quality assurance. Thus, services during commissioning include functional testing and acceptance inspections as well as the preparation of operating manuals, testing instructions and maintenance specifications.

The Dynamic Analysis group develops construction and plant engineering solutions designed to protect against exterior impacts according to international standards, and thus rounds off the service portfolio offered by Nuclear Engineering. Along with providing proof of resistance to explosion shock waves and airplane crashes, calculations of seismic impacts according to the response spectra and time-history method (linear and non-linear) are provided.

In recent years, Nuclear Engineering has successfully been in charge of the planning and erection of interim storage facilities for radioactive materials and hot cell systems. In addition, Nuclear Engineering acts as general planner in various national and international repository projects.





Nuclear Physics

The planning & construction as well as the decommissioning & dismantling of nuclear facilities require specific know-how and expertise in the area of safety and radiation protection in all phases of a project. Nuclear Physics prepares studies, concepts, licensing documentation and safety analyses for customers at home and abroad already during the planning and licensing phases.

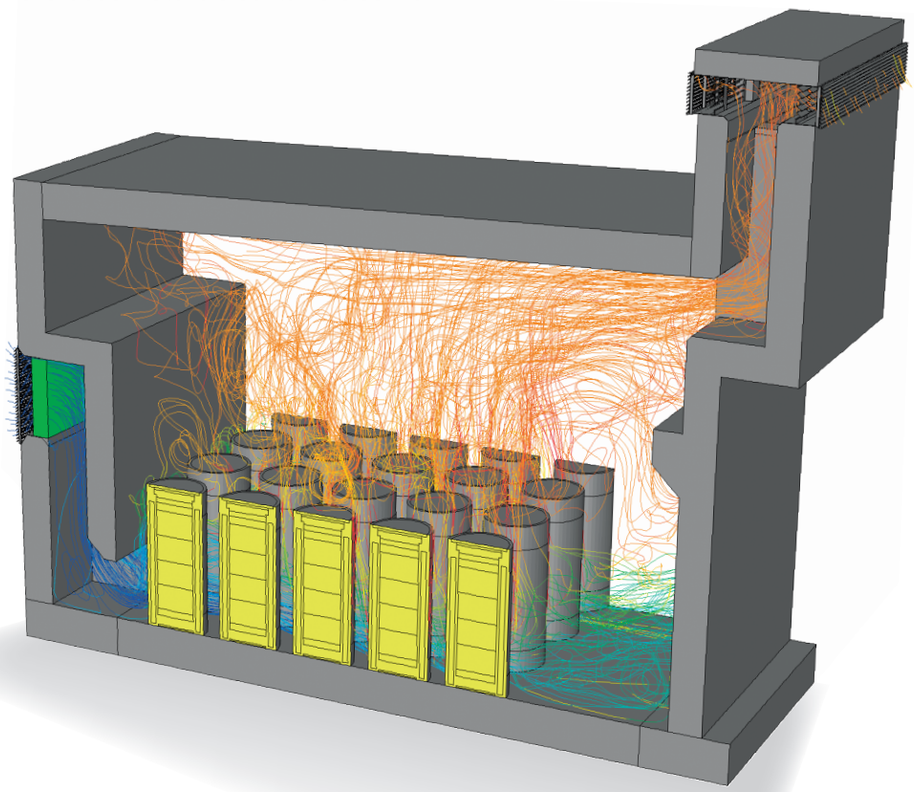
Nuclear Physics supplements the range of services of Nuclear Technologies with studies and radiological analyses in the context of planning work, release scenario studies and safety analyses, which have to be submitted in licensing procedures, for example. Issues in the area of radiation protection and nuclear safety regularly arise in this connection and can only be addressed with the help of special software solutions. Criticality, burn-up, shielding and dispersion calculations and the calculation of residual heat removal are examples of the application of special software.

Besides the use of international, established software, proprietary software solutions are developed in parallel to calculate airborne pollutant dispersion, maximum pollutant concentrations and ambient dose rates at ground level.

The activities of Nuclear Physics also include preparing zone and radiation protection concepts as well as hazardous incident analyses, malfunction analyses and shielding reports. Nuclear Physics takes on planning tasks in relation to fire protection and provides safety review services. In addition, problems of earthquake safety and stability calculations as a consequence of incidents are addressed. That also includes crash simulations on hazardous materials containers as well as earthquake damage analyses on buildings and systems. The range of services of Nuclear Physics is rounded off by support to the customer in administrative and engineering radiation protection during operation or in retrofitting and decommissioning projects.

Nuclear Physics also offers engineering services outside the scope of nuclear technology and is an expert partner for conventional projects, too. The main focus of the conventional calculations is on flow simulation, temperature field calculation, combustion analyses, and stress analyses for the purpose of optimizing components and structural works.

The projects of Nuclear Physics include safety reviews, performed with the assistance of staff from other departments. Moreover, extensive radiological analyses and optimization are carried out on a regular basis both for customers and as a service for the projects of other departments of Nuclear Technologies.

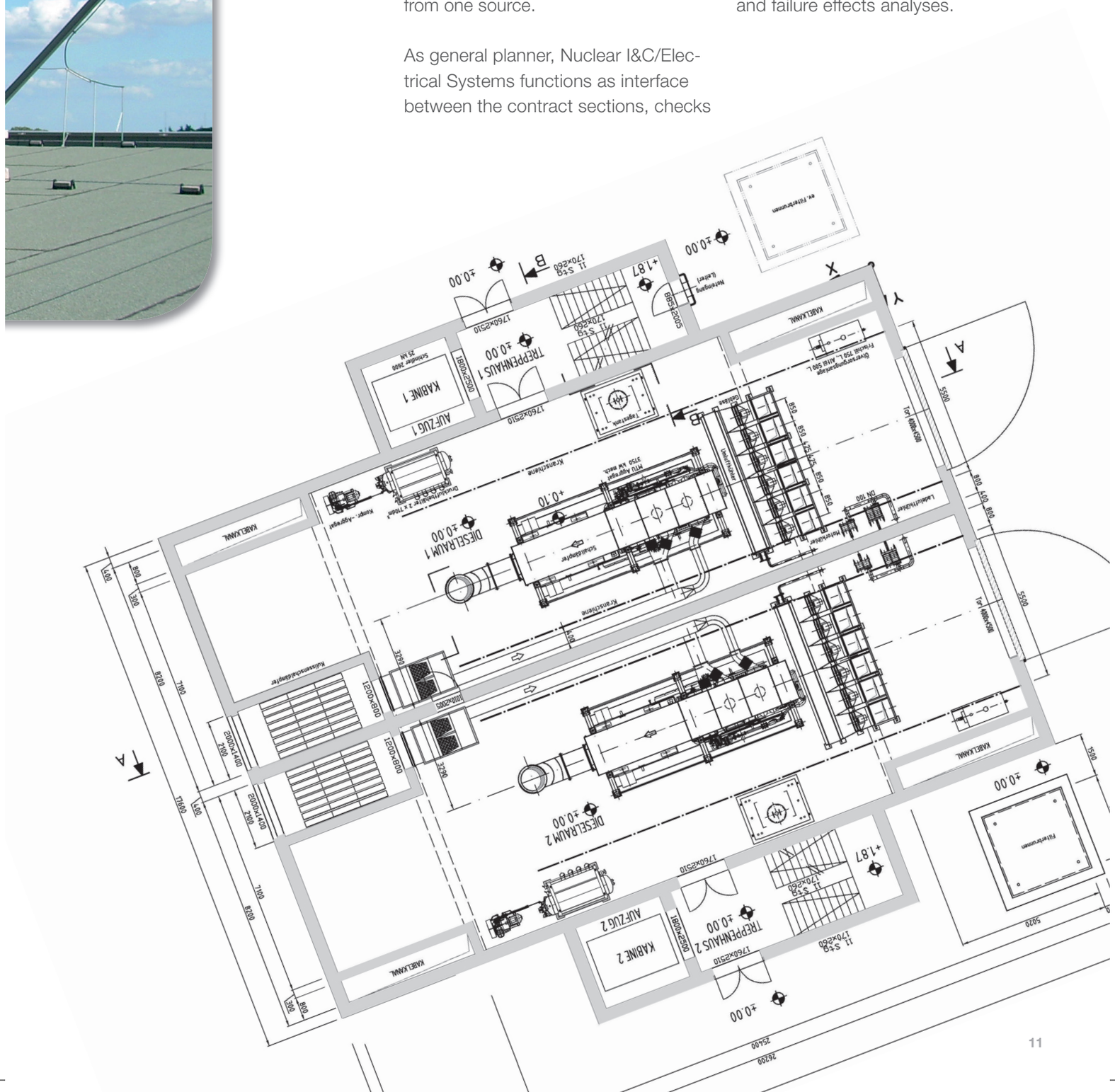


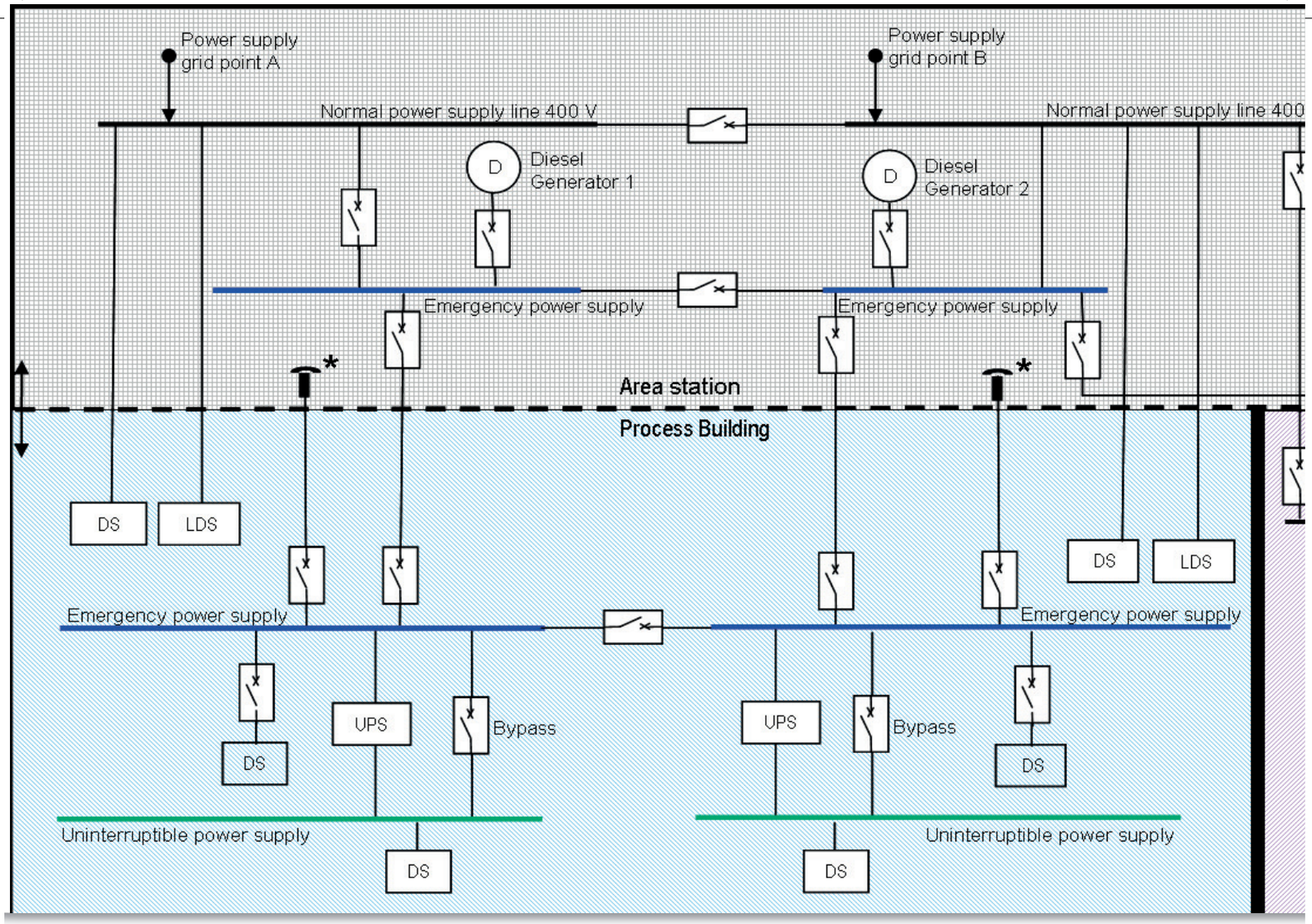
Nuclear I&C/ Electrical Systems

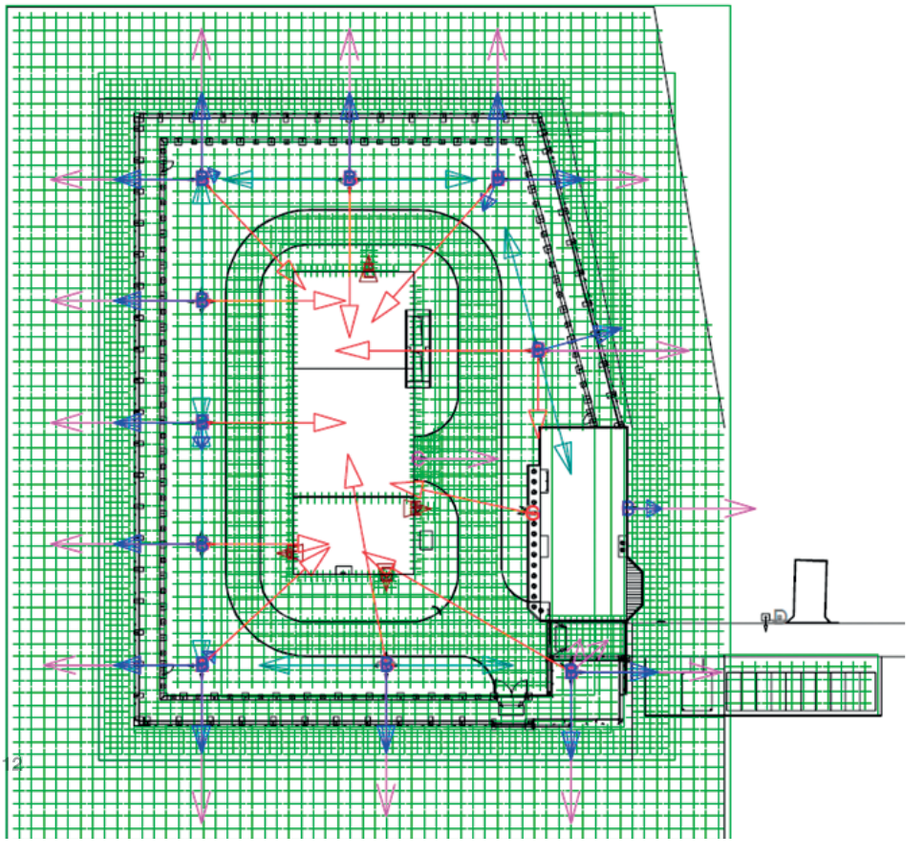
To ensure the supply of energy and the function of instrumentation and control in nuclear facilities, electrical and I&C is – as a cross-cutting function – of major importance since the availability of the technical processes and mechanical systems depends on it. Nuclear I&C/Electrical Systems focuses mainly on the design, planning, supply and installation of electrical and I&C systems and components as well as plant security systems.

The development of an ideal concept for the electrical supply system, the integration of the process management technology of a nuclear facility, and the communications and information systems, as well as the planning of plant security systems, are among the services provided by Nuclear I&C/ Electrical Systems. From the concept phase to the implementation phase and the site management for a project, all necessary engineering is offered from one source.

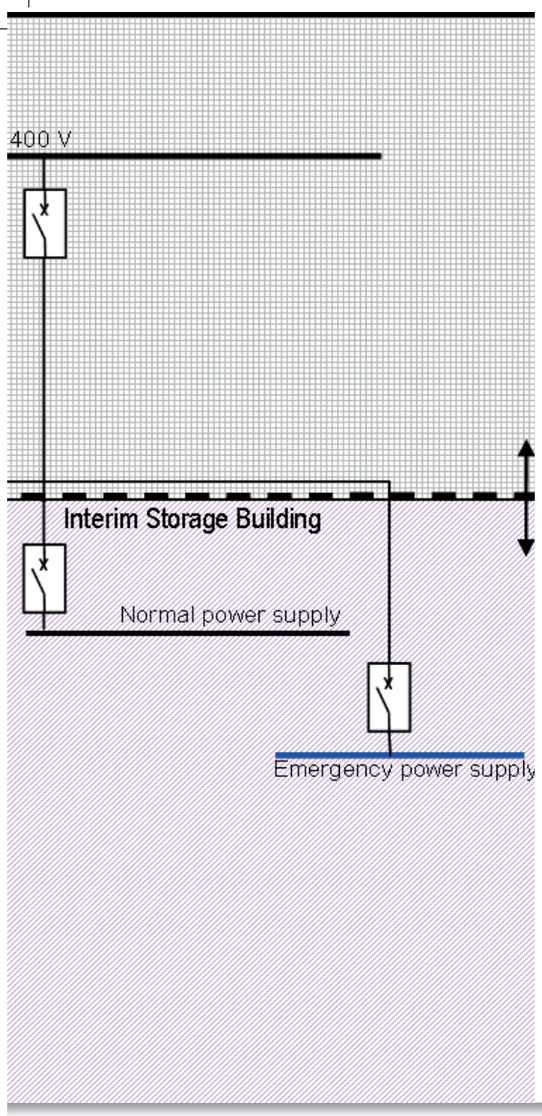
As general planner, Nuclear I&C/Electrical Systems functions as interface between the contract sections, checks adherence to the stipulated technical design and joins the individual contract sections in one entire workable system. Another focus of the services of Nuclear I&C/Electrical Systems is the preparation of concepts and analyses of various kinds for the operators of nuclear facilities. This includes – among others – threat analyses and theft and diversion incident analyses, weakness analyses including IT security review, as well as incident and failure effects analyses.







The department's technical scope covers the complete energy supply network of a facility, from power transmission, backup and auxiliary power supply and uninterruptible power supply (UPS) systems to the actuating and protection technology, according to the currently applicable codes, standards and regulations, with



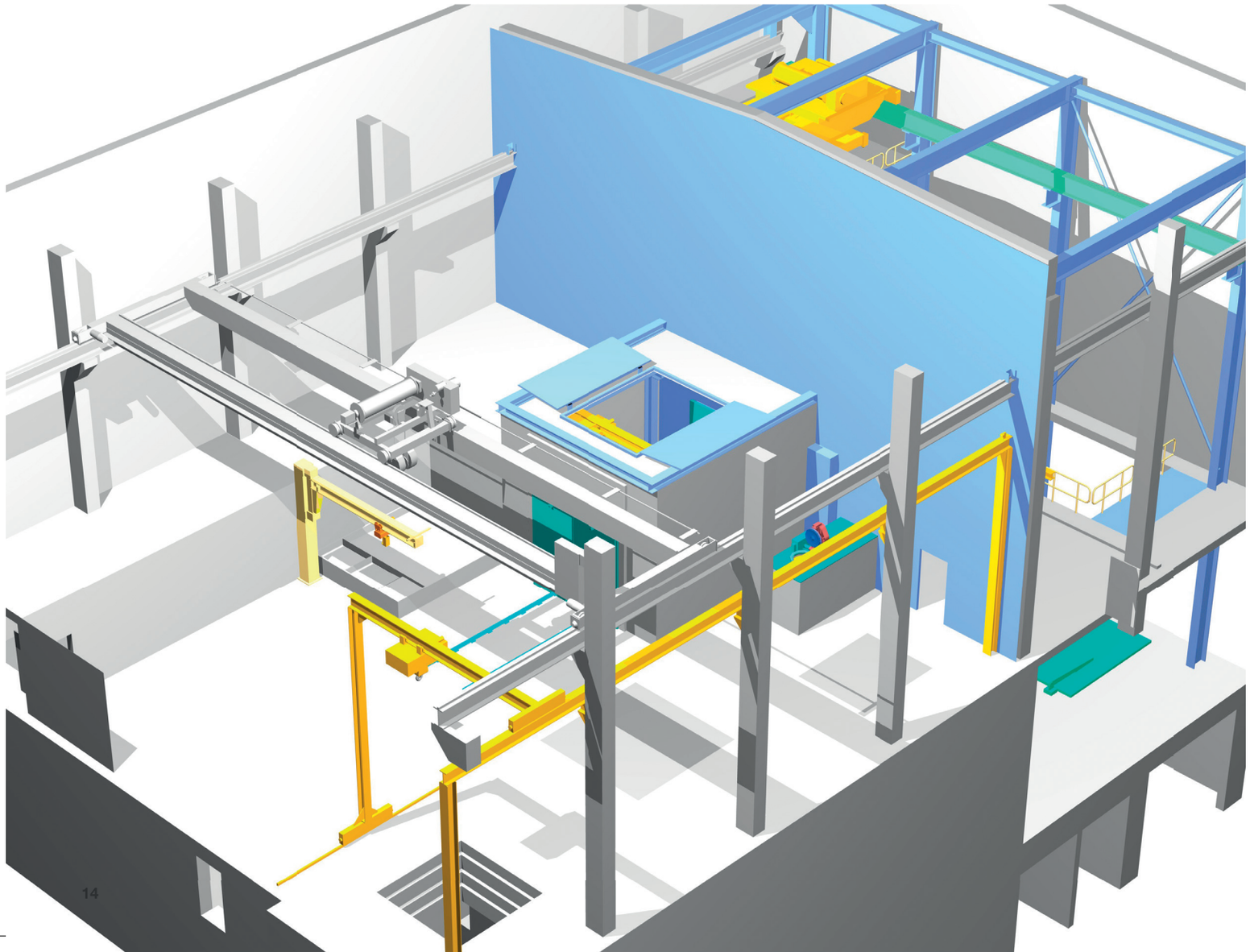
the site-specific parameters. The spectrum furthermore includes all aspects of radiation protection instrumentation.

Moreover, Nuclear I&C/Electrical Systems has extensive experience with new-build facilities as well as the rehabilitation and optimization of instrumentation and control systems.

The success of the planning and implementation services of Nuclear I&C/Electrical Systems is reflected in a large number of completed projects, in particular in the delivery of alternative standby power systems and UPS systems for existing nuclear facilities.

Nuclear International/ Decontamination & De

The decommissioning and dismantling of nuclear systems and facilities can also be termed reverse construction; the safety and protection objectives enjoy the same priority and therefore require the same highly qualified approach as new installations. Moreover, the safe disposal of contaminated and activated residues involves special engineering requirements, which Nuclear International/Decontamination & Decommissioning can manage.



commissioning

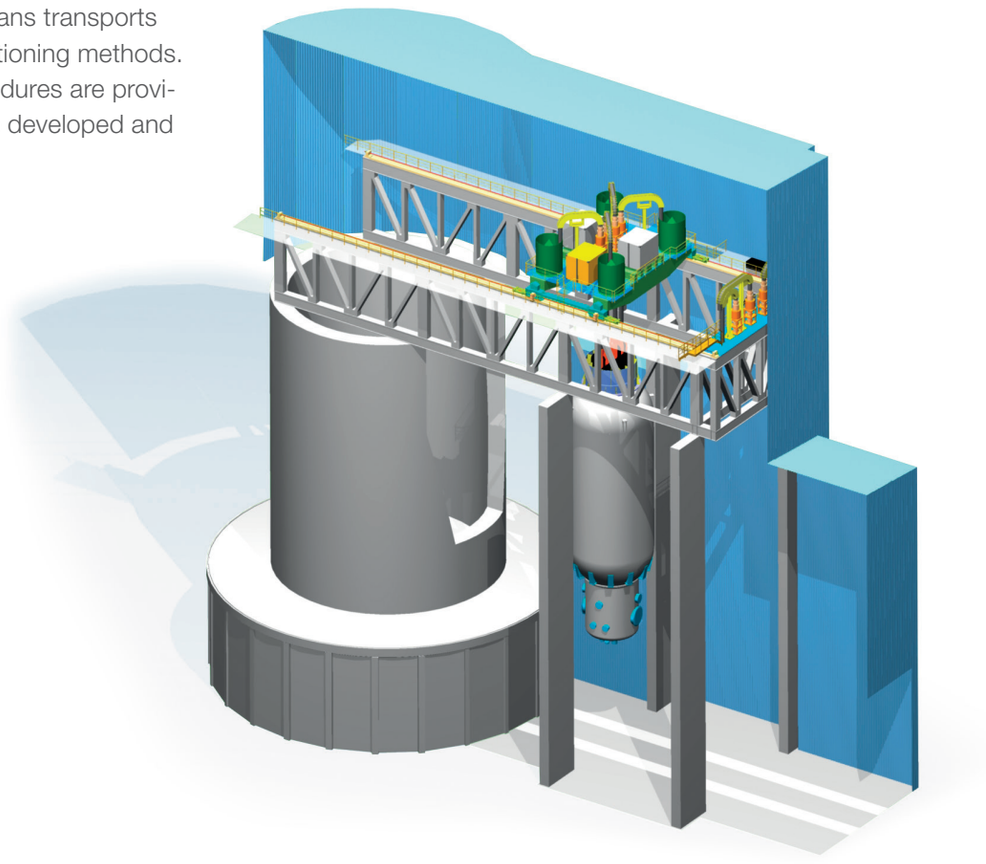
Nuclear International/D&D plans and performs the decontamination, dismantling, decommissioning and disposal of nuclear facilities at home and abroad and pursues the objective of providing safe, technically optimized, economically attractive solutions. The services range extends from the development of specific concepts, through conceptual engineering, licensing studies and implementation planning, to supporting the owner during the implementation.

For takedown and disassembly, Nuclear International/D&D provides technical site management in the areas of radiation protection, mechanical engineering, electrical/I&C and fire protection and develops the required tools and equipment. Supplementing this, supervisory services in the area of radiation protection, fire prevention and industrial safety are offered.

Disposing of radioactive waste material or putting it to an alternative use is also one of the main services of Nuclear International/D&D; for this purpose, it draws up concepts for the disposal of radioactive wastes, plans transports and determines the treatment and conditioning methods. Furthermore, services for approval procedures are provided, release measurement programs are developed and release measurements are performed.

Safety studies, documentation and supervision, in addition to planning work, are important prerequisites for the licensability and the successful performance of projects.

Striking examples of projects by Nuclear International/Decontamination & Decommissioning include the dismantling of hot cells and research reactors as well as the erection of vitrification plants for liquid radioactive wastes. In these projects, STEAG Energy Services is responsible for the planning and supply of, for example, key mechanical components, crane systems, remote manipulators, track-bound transport systems and shielding bulkheads.



STEAG Energy Services GmbH
Nuclear Technologies
Rüttenscheider Straße 1 - 3
45128 Essen
Germany
Phone: +49 201 801-6458
Fax: +49 201 801-2349
www.steag-energyservices.com

SES, Stand 02/2013

steag