Media Release

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10 Years of Phasing out Nuclear Power: Dismantling Nuclear Power Plants

Green meadow instead of reactor dome: last German nuclear power plant will go offline in 2022. © Drees & Sommer SE.

Stuttgart, Germany, March 11, 2021. Ten years ago today, Japan was hit by a severe undersea quake. A tsunami rolled toward the coast at 800 kilometers per hour, with two 15-meter-high flood waves hitting the Fukushima One nuclear power plant and flooding its reactor blocks. The nuclear meltdown had devastating consequences for the environment. It also affected German energy policy: it was decided to phase out nuclear power, so next year the last German nuclear power plants will go offline. However, dismantling them is extremely costly. Because of this, Drees & Sommer SE, an international consulting company specializing in construction and real estate, is using a digital power plant twin to plan the dismantlement procedure.

A large number of laws, regulations and directives apply even to normal buildings. In Germany, these often vary from one federal state to another. In the case of nuclear power plants, there are also reusable materials, highly radioactive components and hazardous waste, the disposal of which must be carefully planned. Overall, several decades can pass between the time the power plant is taken offline and the end of decommissioning. The first German nuclear power plant in Kahl am Main near Aschaffenburg, for example, was operational for 25 years until it was shut down in 1985.

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Demolition then took longer than the period of operation and, at EUR 150 million, cost even more than construction. Decommissioning the Stade nuclear power plant, the first reactor to be taken offline as a result of the nuclear phase-out approved by the Red-Green government at the time, was somewhat faster, but still took 13 years.

A digital twin helps with power plant demolition

The reason for the long period between shut-down and complete decommissioning is that many radiation-contaminated components have to be dismantled and cleaned at great expense before they can be disposed of. And a nuclear power plant is big: at the Greifswald nuclear power plant, for example, 1.8 million metric tons of building material must be disposed of. The complex planning of shutdown and dismantling can be made easier by using a cutting-edge digital tool: Building Information Modeling (in short: BIM). This refers to a method of networked collaboration that brings together all relevant data in a model, enabling processes, products and participants to be digitally networked. In specific terms, this means that before the first stone is turned during dismantling, a digital model of the actual power plant and the technical equipment is constructed. 'This model has long since included not just the geometric data, but also all the information on materials and fire control systems, for example,' explained Peter Liebsch, Associate Partner at Drees & Sommer Group and expert for digital planning. This creates a digital twin with a depth of information down to the smallest detail.

High level of safety despite radiation contamination

All scheduling, (de)construction, material flow and logistics processes can then be simulated with the aid of this digital building model. Ideally, the model would be cloud-based, making it accessible to all project participants from any location. When BIM is used in planning the dismantling of a nuclear power plant, the entire power plant is first scanned with the appropriate equipment. 'In areas that are inaccessible due to high radiation contamination, robots are used for this purpose. It is also possible to make measurements of things such as the contamination of individual areas with radioactivity, asbestos or other hazardous materials,' Peter Liebsch continued. This method creates a faithful, virtual model of the power plant, including a contaminant register, which accurately represents the actual condition down to a few centimeters. In this model, the team plans the dismantling process and logistics, and adds critical information to it.

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This procedure may sound time-consuming at first, because enhancing the digital twin with all the necessary data naturally increases the time and effort initially required at the preparation stage. But it does mean that discrepancies are not first noticed during the dismantling process and at the construction logistics stage, where they could result in expensive delays. Instead, the digital model is used to check for conflicts and consistency, ensuring that the deconstruction process runs smoothly. In addition, several variants of the demolition planning can be run through the BIM model and compared with each other, both with regard to scheduling and costs.

All the cogs mesh together

BIM also brings several major advantages in relation to the practical processes involved in dismantling. Firstly, occupational safety is increased for every individual who will later work on the plant. After all, you can take a virtual walk through the power plant and, by doing so, protect yourself from unpleasant surprises in reality. In the interests of occupational health and safety together with radiation protection, this reduces the time-consuming procedure of passing through air-lock systems to get to the hot zone. Secondly, the dimensions generated from the BIM model can be used for precisely scheduled demolition planning. They are also useful for detailed tendering, work preparation and logistics, including complete verification management for surveyors and official bodies. The dismantling process is much faster as a result, because all the cogs mesh together. And then it will not be long before nuclear energy in Germany really is a thing of the past – and in those places where reactor domes still tower up today, only green meadows will remain.

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