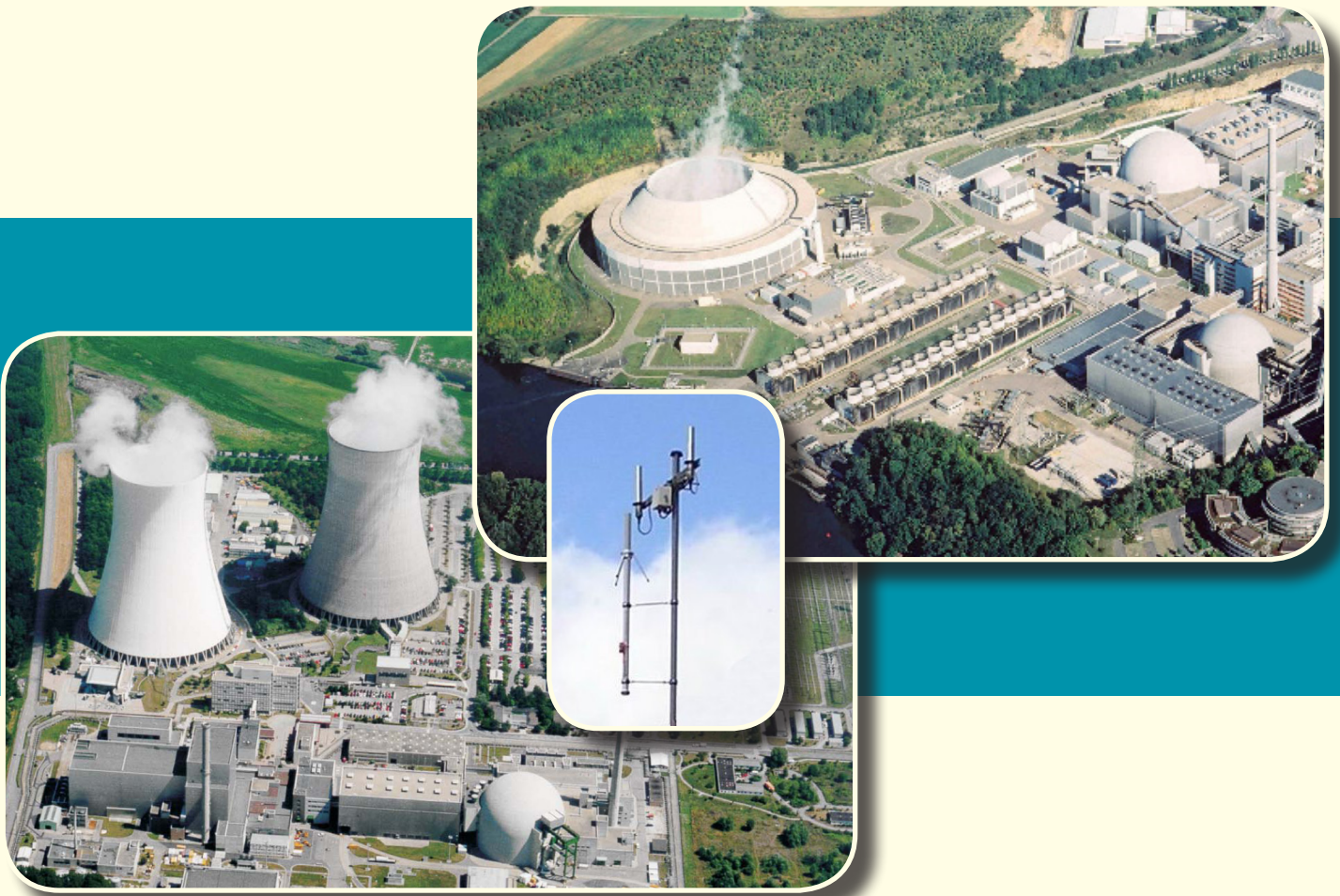



KFÜ

Remote Monitoring of Nuclear Power Plants Baden-Württemberg



...T...Systems...

 **Fraunhofer**
IOSB

 Universität Stuttgart

 **UIS BW**
Umweltinformationssystem
Baden-Württemberg

 **LUBW**



Baden-Württemberg

MINISTERIUM FÜR UMWELT, KLIMA UND ENERGIEWIRTSCHAFT

The KFÜ Baden-Württemberg



As part of its responsibilities as nuclear supervisory authority, the Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg (UM) operates a computer-based system for remote monitoring of nuclear power plants (KFÜ) as part of the Environmental Information System Baden-Württemberg (UIS BW). In addition to the Baden-Wuerttemberg nuclear power plants Philippsburg, Neckarwestheim and the disused Obrigheim, also the foreign locations close to the border area, i.e. Fessenheim in France and Leibstadt and Beznau in Switzerland, are monitored.

DATA COLLECTION

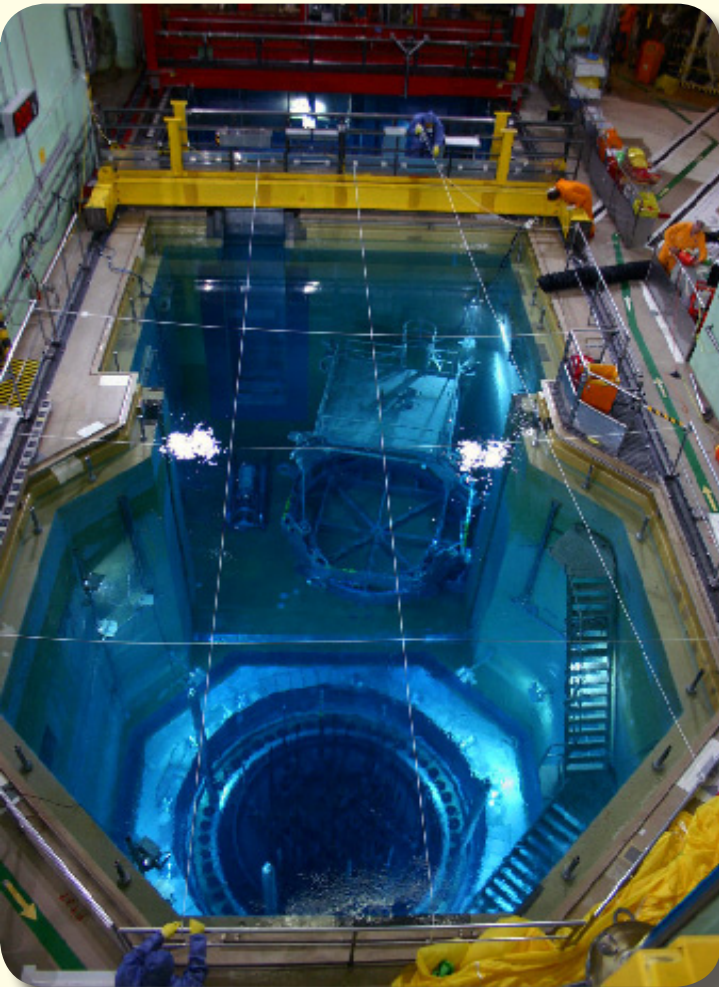
The KFÜ is a complex measurement and information system, which daily records and monitors more than 800,000 daily measurements. Around the clock and completely independent from the operators of nuclear power plants,

the current state of the plant is supervised, including the emissions of radioactive particles to air and water. To perform realistic dispersion calculations, which in turn are used for decision support tasks, various meteorological data at the plant site and in its vicinity are included.

EVALUATION

The KFÜ-system provides several methods to evaluate and present the measured data as well as to ensure compliance of threshold limits and safety objectives. For the UM, it serves as an instrument of the nuclear supervision. In the unlikely case of a radioactive release, the authorities responsible for civil protection can use model calculations (dispersion calculation see p. 4) in order to identify potentially affected areas and to initiate protective measures for the population.

The KFÜ as a supervisory tool



monitoring of operation dates

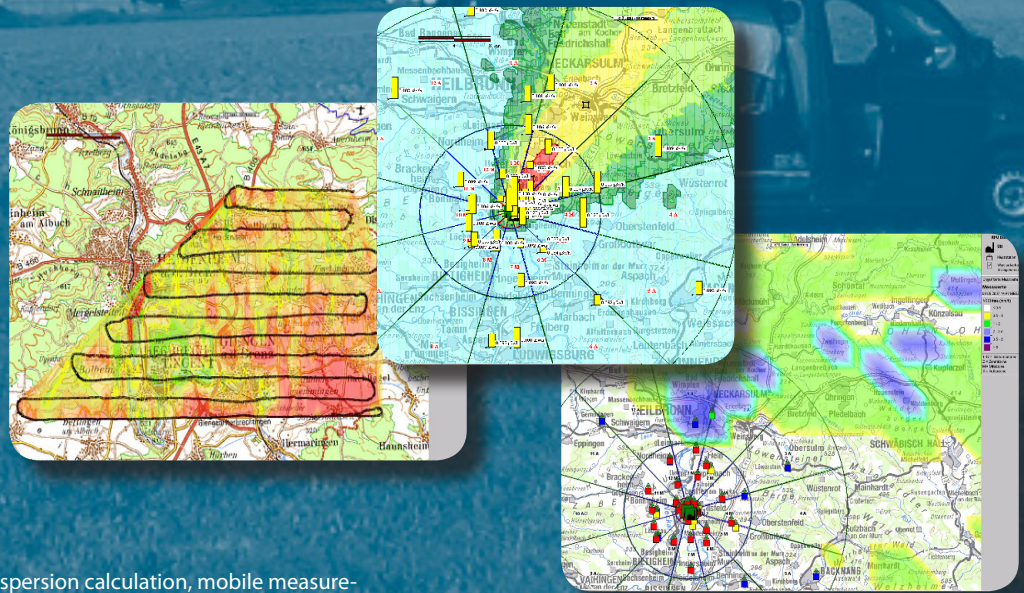
CONTINUOUS MONITORING OF REACTORS

The main operating parameters in the Baden-Wuerttemberg Nuclear power plants, such as neutron flux, pressures, temperatures, water levels in the primary circuit, dose rates in different locations and radioactivity levels in air and water are monitored online and stored independently from the operator. The most important data is checked daily by the UM. If irregularities - also well below threshold values - are detected, the KFÜ is used to determine the origin. In order to avoid incidents being unnoticed, an automatic alerting of the supervisory authority is implemented whenever threshold violations are detected by the system.

RADIOACTIVITY MEASURING NETWORKS

Beyond the data collected at the plant site, various radiation level measurements are integrated in the KFÜ. The State Institute for Environment, Measurements and Nature Protection (LUBW) operates a special monitoring network for dose rates and nuclide specific activity concentration measurements in the vicinity of each nuclear power plant (at the foreign plants semicircular domestic). To overview the radiological situation in the outer region of the plants, data of the nationwide ODL-monitoring network is integrated as well. The LUBW daily checks the origin of all irregularly increased values, so that any radiological relevant charges from the plants can be reliably detected. In addition, the data is subject to an automatic control, which triggers alerts when predefined thresholds are exceeded.

The KFÜ in emergency protection



Example for a radiological dispersion calculation, mobile measurement and meteorological data

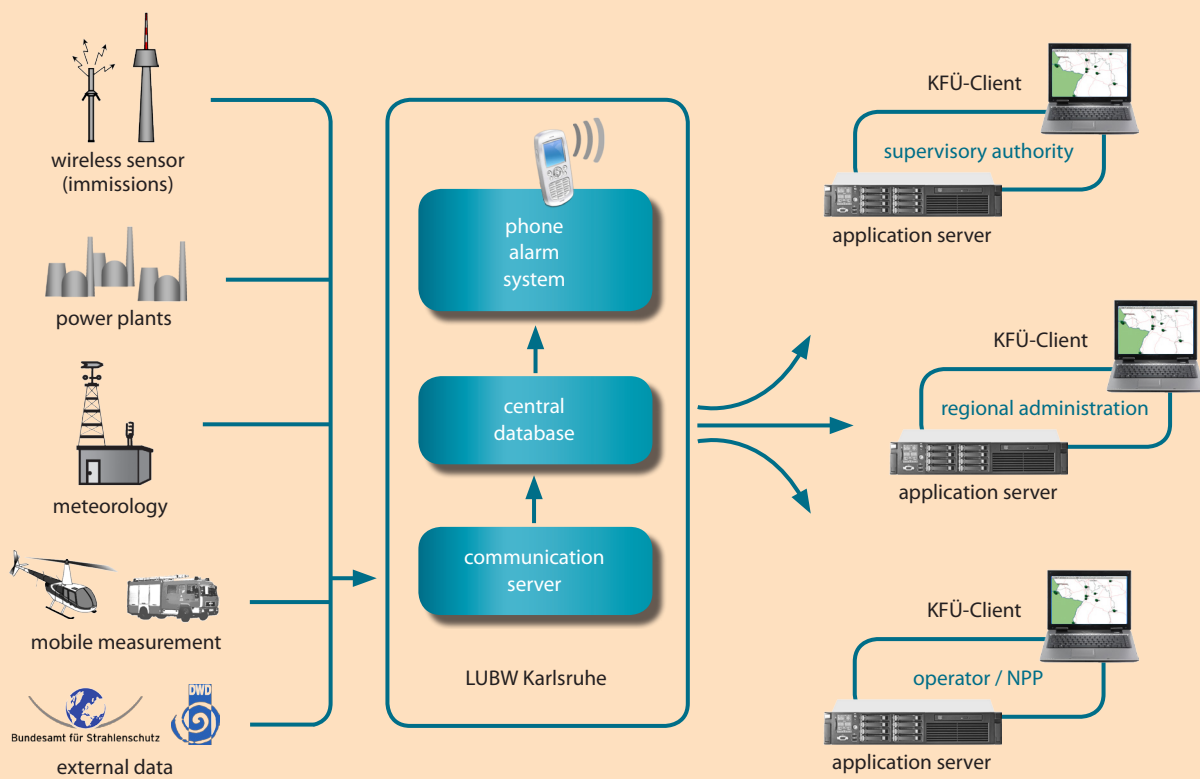
Although the risk of an accident with catastrophic consequences in a German nuclear power plant is almost negligible, authorities and operators are obligated to plan for nuclear emergencies. The KFÜ provides numerous tools to assess the consequences of such an event already in the prerelease-phase in order to take appropriate measures (e.g. intake of iodine tablets, recommendation to remain in the home or evacuation) to soften the consequences for the inhabitants. For this purpose, in addition to the UM, the LUBW and operating companies, the chief district-authority agencies in Freiburg, Karlsruhe and Stuttgart being responsible for emergency protection are connected to the KFÜ.

An important task of preventive civil protection is to determine the potentially affected areas caused by the release of radioactive materials using a radiological dispersion calculation. The necessary meteorological data are retrieved automatically from monitoring stations of the operating company, the LUBW and the German Weather Service

(DWD) and supplemented by available forecasts and radar data from the DWD.

In the region of nuclear power stations many immission measurements track the actual course of a possible release and allow for immediate adjustments of possible measures. After the release, mobile measuring teams of LUBW, the operating company, the Federal Office for Radiation Protection (BfS) and the Fire Department are gathering detailed radiological data in and around the affected area in order to create the data base for appropriate decisions to protect the population. This data is processed in the KFÜ and analyzed together with the stationary online-measurements providing a complete overview of the radiological situation. The KFÜ also provides a realistic simulation environment to support regular exercises in which the interaction of the systems and organizations involved is trained.

Technical components of the KFÜ



SAFETY FIRST

In all parts of the central data centers, the data acquisition and networking of the nuclear reactor remote monitoring is designed redundantly. The computer clusters for the central data management and all key components in power plants and at the participating authorities are equipped with an emergency power supply to ensure continued operational availability. To avoid an overload or breakdown of the central servers in case of emergency, the architecture of KFÜ provides a regular distribution of centrally stored data to all locations, enabling faster data access for the users.

In the power plants locations, the data is acquired by KFÜ-own signal processors and transferred to the central data center in Karlsruhe using dedicated data connections. In case of the immission measurement stations, which are arranged in a radius of up to 10 kilometers around the nu-

clear power plants, a circuit-independent wireless sensor system with redundant receivers on the Königstuhl and the Feldberg is used.

SOFTWARE ERGONOMY

For the evaluation of measured data, special software - the client KFÜ – has been developed. This tool allows for the necessary database queries and the presentation of the results in curves, tables or maps. In addition, it also serves for system administration tasks. In the last years, the KFÜ increasingly exploits modern Internet technologies to optimize workflows and collaborations of all users and organizations involved. For this purpose, a central KFÜ portal provides the specific information for the relevant users at the different locations. Moreover, for training purposes, an application for mobile devices has been developed using cellular phone network.

KFÜ partners

The KFÜ is an example of a successful IT cooperation with the participation of many partners from government, business and science. The costs are covered predominantly by the operator of the Baden-Wuerttemberg nuclear power plants. With respect to the monitoring of foreign plant sites part of the costs is covered also by the federal government.

The Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg (UM) is the highest authority for nuclear supervision. In case of a release of radioactive materials from nuclear facilities (incidents or accidents), the UM identifies and assesses the situation, prepares recommendations for the appropriate Regional Council for Civil Protection. With respect to nuclear facilities near the border, the UM also cooperates with foreign authorities.

The State Agency for Environment, Measurements and Nature Conservation (LUBW) is responsible for the technical operation of the KFÜ as well as for the official immission measurements on the territory. The LUBW also advises the state agencies for radiological issues.

The chief district-authority agencies in the country are responsible for the disaster response plans for nuclear facilities. They conduct an appropriate action at events, which require civil protection measures.

The company T-Systems has developed the KFÜ on behalf of the UM and performs the necessary maintenance and ongoing adaptation to the latest technological developments.

The Institute of Nuclear Technology and Energy Systems (IKE), of the University of Stuttgart is responsible for the development and maintenance of the dispersion calculation.

The Fraunhofer Institute for Optronics, systems engineering and image analysis (IOSB) supports the UM in the development and operation of emergency and knowledge management systems within KFÜ.

ACTUAL MEASUREMENTS OF KFÜ

Teletext SWR Table 196

Data and map services LUBW:

<http://www.brsweb.lubw.baden-wuerttemberg.de>

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