

Institute for Thermal Energy Technology and Safety

Structure and Activities of the Institute for Thermal Energy Technology and Safety (ITES)

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The Institute for Thermal Energy and Safety (ITES) is situated with its offices and research laboratories in Campus North of Karlsruhe Institute of Technology (KIT).

The research of ITES focuses on conversion from thermal power to electric power for future power systems without CO₂ emission including hydrogen technologies and on safety. In the past ITES concentrated on safety features and on methods to mitigate severe accidents for nuclear power plants. Nowadays, ITES uses these competences, gained from a profound experience in numerical simulation and in design and operation of large-scale experimental facilities to apply this knowledge mainly in the area of renewable energies.

The combination of science and technology with education and training is a systematic approach at KIT, and ITES is contributing accordingly to courses in mechanical engineering, supervises several bachelor and master theses each year and coordinates master programs in energy technologies. Compact courses on energy technologies are given also in executive master programs and in the Framatome Professional School, which is funded by industry and managed by ITES.

Resources

The employees of ITES contribute to the research-programs Renewable Energies (EE),

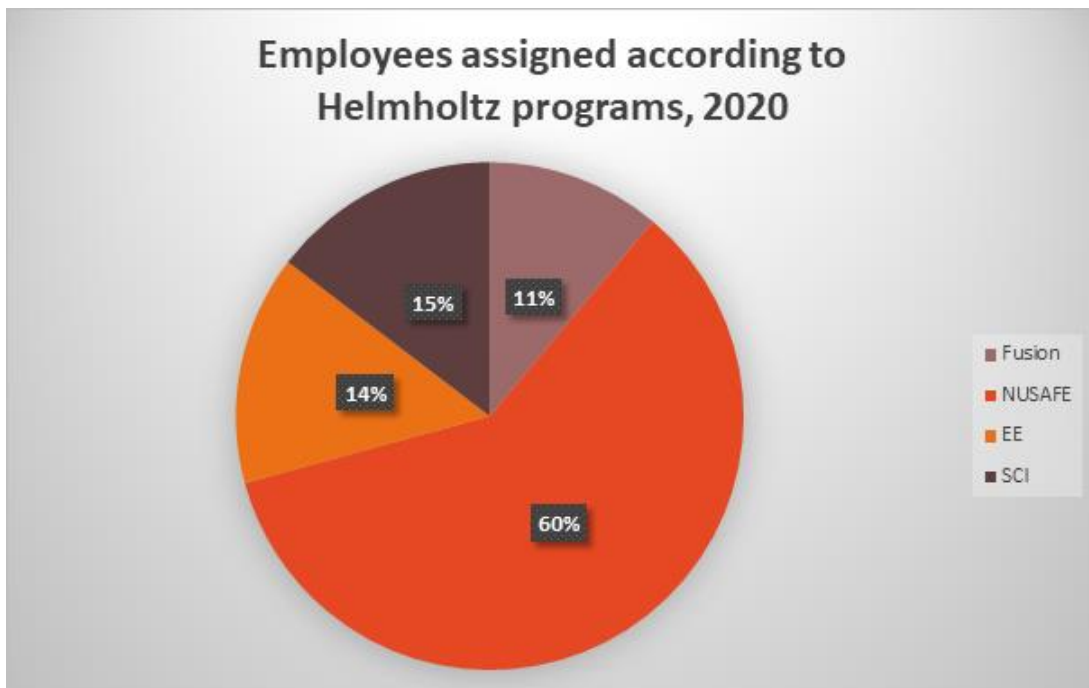


Fig. 1 Assignment of ITES personnel to helmholtz-programms

Storage and Cross-linked Infrastructures (SCI), Fusion (FUSION), and Nuclear Waste Management, Safety and Radiation Research (NUSAFE) in the research field energy of the Helmholtz Association (HGF). By the end of 2020, around 80 scientists, engineers and technicians have been working at ITES on this wide range of CO₂-free technologies for energy conversion. Fig. 1 illustrates that still about 60 % of the ITES employees were working for the NUSAFE program, but steadily reduced in recent years. Around two third of the employees were funded in 2020 by the Helmholtz Association (HGF), the others by third party funds of the European Commission, by industry, by German ministries or by other research funds. Doctoral students as well as students of the Baden-Wuerttemberg Cooperative State University (DHBW) were filling around 20% of these positions at ITES. In addition, students perform their bachelor or master theses or spend an internship in the research laboratories of ITES.

An overview of the structure of ITES is given by the organization chart, Fig. 2. Because all working groups are embedded in the research field energy of the Helmholtz association (HGF) a close collaboration within the groups is guaranteed.

Working groups on Severe Accident Research, on Multi-Phase Flow as well as the Framatome Professional School still concentrated in 2020 primarily on nuclear applications, whereas the Karlsruhe Liquid Metal Laboratory (KALLA) and the Hydrogen group were addressing nuclear as well as renewable energy technologies. The working group on Magneto-Hydrodynamics is primarily working on nuclear fusion applications, whereas the working group on Energy and Process Engineering is concentrating on geothermal energies. The working group Multiphase Flow is mainly experimentally investigating technically relevant, complex flow phenomena. The field of activity currently focuses on the build-up of the complex structure of the COSMOS-H high-pressure loop. The working group on Accident Management Systems continued to extend the application of

its simulation models to several critical infrastructures. Thus, the institute covers a wide field of different energy technologies and related safety investigations, and the share of personnel resources on the different research topics reflects the requirements of the Helmholtz Association's energy research field.

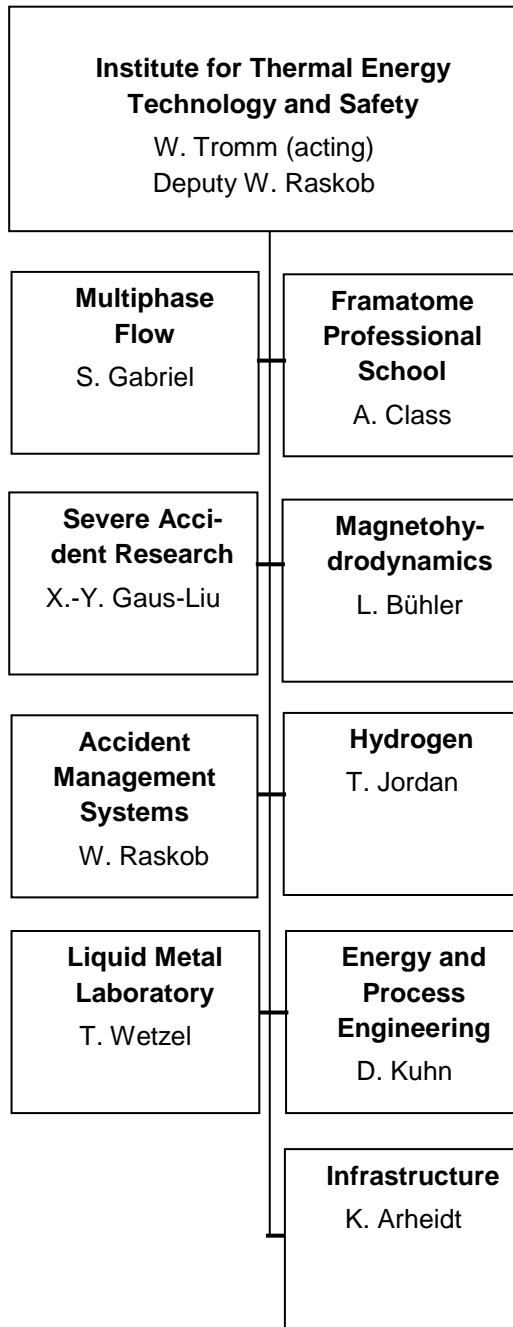


Fig. 2: Organization chart of the Institute for Thermal Energy Technology and Safety

They are all supported by a joint infrastructure, comprising a metal workshop, manufacturing urgent test components, a welding shop, and an electromechanical workshop. Other tasks of the infrastructure include the IT-administration, business administration and public website of the ITES. The Infrastructure team is active as well in education and training activities.

Every year, at least 4 students of the Baden-Württemberg Cooperative State University are employed by ITES, managed by the Infrastructure group, to work with the research teams as part of their educational program.

Working in a research area with industrial application ITES practices a Quality Management System appropriate to EN ISO 9001.