

# Research and Innovation from Baden-Württemberg and Bavaria



KW21 II – Research Initiative Power Plants for the 21st Century

## ENERGY FOR THE 21<sup>ST</sup> CENTURY



Gas turbine, Siemens AG (Source: Siemens AG)

The research initiative “Power Plants of the 21st Century” is a joint initiative of the federal states of Bavaria and Baden-Württemberg with 50% involvement on the part of industry partners. It started on 1 January 2009 in the second 4-year phase.

“KW21” (Power-Plant 21) is making an essential contribution to efforts to see that power plants will become more efficient, more reasonably priced, more flexible in their application and better in their reduction of emissions. KW21 addresses the core components of modern power plants, which are comprised of power plant systems and steam generators, fluid-dynamics and steam turbines, turbo-components for gas turbines and combustion chambers for gas turbines. Issues from the field of energy

economy, including market policies and economic aspects, complement the portfolio as well.

There exists worldwide a huge necessity for improvements in the utilisation of fossil energy

with immense potential for reductions in carbon-dioxide emissions. Many of the pre-existing power plants in Germany have been operating for a long time and have to be replaced, or at least brought up to state-of-the-art standards in

the near future. For example, an increase in the degree of efficiency of only one 600 MW power plant by 1% would assure that approximately 12,000 additional households could be provided with electricity.

The second phase of KW21 started against the background of a paradigm-change within the energy industry. The fluctuating supply-levels of renewable energies demand more and more storage facilities, gas power plants or manageable use. Liberalisation of the market as well has created demand for the latest methods for portfolio development and load forecasting for future consumption. Various options such as the pilot-controlled re-charging of electric vehicles are being examined and assessed in reference to energy production in power plants.

### Spokespersons:

Prof. Dr. Manfred Aigner  
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Prof. Dr. Thomas Sattelmayer  
(Technical University of Munich)

### Sponsors:

Funded by the Baden-Württemberg Ministry of Sciences, Research and the Arts; Bavarian Ministry of Sciences, Research and the Arts and Ministry of Economic Affairs, Infrastructure, Transport and Technology, in the framework of the Climate Programme Bavaria 2020

### Project volume:

12.2 Mio. euros (grants and private contributions) for four years.

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**Trial installation for experimental determination of rotor-dynamic characteristics of steam turbines (Source: Department of Energy Technology, Technical University of Munich)**



**Annular combustion chamber test station (Source: Institute of Thermodynamics, Technical University of Munich)**

## RESEARCH TOPICS

**23 research groups and 11 industry partners are working on 50 projects in the following workgroups:**

- Energy economy (E)
- Power-plant systems and steam producers (DE)
- Fluid dynamics and steam turbines (DT)
- Turbo machines for gas turbines (GT)
- Combustion chambers for gas turbines (GV)

### **Economic Applications:**

The results from the research involving component-level working projects are integrated into improvement of the industrial partners' development tools, as well as into new products in the context of industrial development projects. At a system level, KW21 provides insights into the improved operation of complex power plants.

Analyses of the economics of energy indicate in which direction the technology for power-plant complexes have to develop in order to be able to efficiently make electricity available in the future, in the required quantities, and with minimal repercussions for the environment.

### **Scientific Cooperations:**

German Aerospace Center (DLR) – Institute of Combustion Technology

Research Institute for Energy Economy

Technical University of Munich:

- Department of Energy Technology
- Institute for Energy Economy and Application Technology
- Institute of Fluid Mechanics
- Institute of Flight Propulsion
- Institute of Thermodynamics

University of Bayreuth:

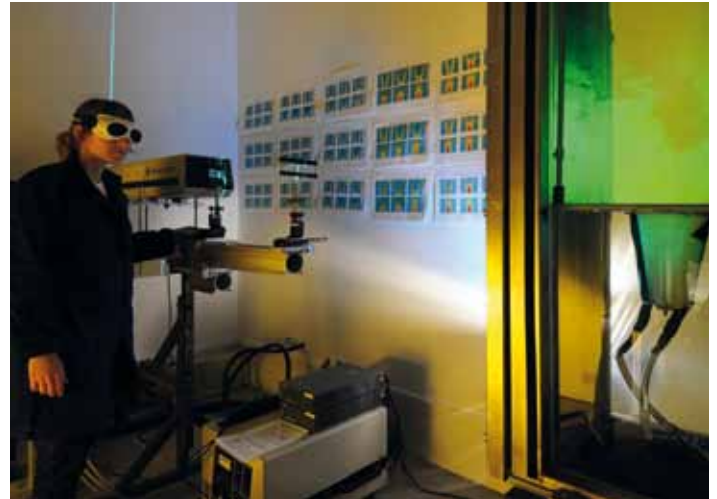
- Chair of Metals and Alloys
- Department of Ceramic Materials Engineering

University of Erlangen-Nuremberg:

- Department of Technical Thermodynamics
- Institute of Science and Technology of Metals (WTM)

Karlsruhe Institute of Technology:

- Engler-Bunte-Institute
- Institute of Thermal Turbo-machinery (IST)



**Assessment, by means of laser-induced fluorescence, of the quality of the blend for a pre-mix burner in the water canal (Source: Institute of Thermodynamics, Technical University of Munich)**

University of Stuttgart:

- Institute for Energy Economy and Rational Application
- Institute for Air Craft Propulsion Systems
- Institute of Thermal Turbo-machinery and Machinery Laboratory
- Institute of Aerospace Thermodynamics (ITLR)
- Institute of Combustion and Power plant technology (IFK)
- Materials Testing Institute (MPA)

### **Industrial Partners:**

ALSTOM Power Systems GmbH

Clariant Produkte (Deutschland) GmbH

E.ON Energie AG

EnBW Kraftwerke AG

Esytec Energie- & Systemtechnik GmbH

MAN Turbo AG

Martin GmbH für Umwelt- und Energietechnik

MTU Aero Engines GmbH

Siemens AG

UTP Schweißmaterial GmbH

Voith Hydro Holding GmbH & Co. KG