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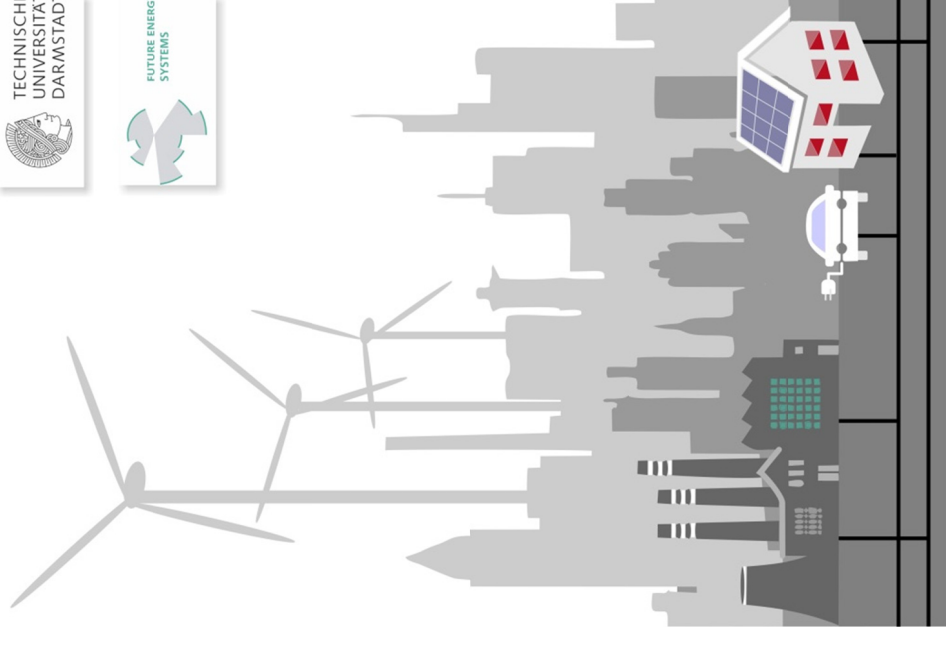
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## Profile Area

# Future Energy Systems

The Interdisciplinary Network for Energy-related Research at Technische Universität Darmstadt



## Energy Research at TU Darmstadt

Energy research is a highly cross-interdisciplinary field and a topic of immense and worldwide relevance. Therefore, scientists from 10 departments of Technische Universität Darmstadt have formed a network to address this topic comprehensively in order to provide solutions for the development of our future energy systems.

Our researchers not only address the basic technical challenges but also the integration of advanced solutions into existing technologies and the overall integration into the complete system. Especially the latter involves not only technical aspects but also economic considerations and ecological assessment as well as governance and public participation.

At Technische Universität Darmstadt, energy scientists have excellent structural conditions to contribute to interdisciplinary collaborative research projects with their individual expertise.

**TU Darmstadt Energy Center** serves as an institution of Technische Universität Darmstadt to link all energy research within the university and to cross-link this network with politics and industry.



**Graduate School of Energy Science and Engineering** at Technische Universität Darmstadt is not only a research institution but also a teaching facility with high international visibility for the education of tomorrow's energy scientists on the PhD and master level.

## Research Topics



### Solar Fuels

- Efficient production of H<sub>2</sub> from discontinuously available primary energy carriers
- Efficient conversion of CO<sub>2</sub> with H<sub>2</sub> to methanol and related hydrocarbons
- Development of adapted combustion and converter



### Building Integration and Self-Sufficient Settlements

- Integrating existing energy sources and innovative energy systems in urban environments
- Development and integration of renewable energies for buildings and residential areas
- Development and integration of local storage technologies



### Smart Energy Networks

- Development of systems and components for high-voltage direct current transmission and high-voltage direct current grids
- System integration of renewable energy converters and storage devices
- Monitoring and optimizing smart grids



### Flexible Energy Conversion with reduced CO<sub>2</sub>-Emissions

- Increased system performance of converters
- Unsteady operation of converters
- Characteristics of mixed fuel supply including designer fuels based on biomass or solar fuels
- Efficient CCS removal technologies

## Research Topics



### Energy Efficiency and Demand-Side-Management for Industrial Applications

With the ETA factory, TU Darmstadt presents a model factory built on campus, in which the reduction of the energy consumption as well as the CO<sub>2</sub>-emissions of industrial production processes are realised by several interdisciplinary approaches.



### Assessment & Modelling

Development of methods for analysis of different technology options in order to reach a minimisation of energy losses and to assess the sustainability of a certain technology



### Governance & Economy

The successful introduction of novel technology-based solutions requires understanding the policy framework of energy governance and the interaction of technology and society. Common norms that regulate sustainability, climate justice and energy security need to be developed.



### System Integration

To obtain a reasonable energy system and to achieve synergies, it is required to combine single technological achievements and improvements from all disciplines in an intelligent and overarching way.

## Spokespersons of the Profile Area



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