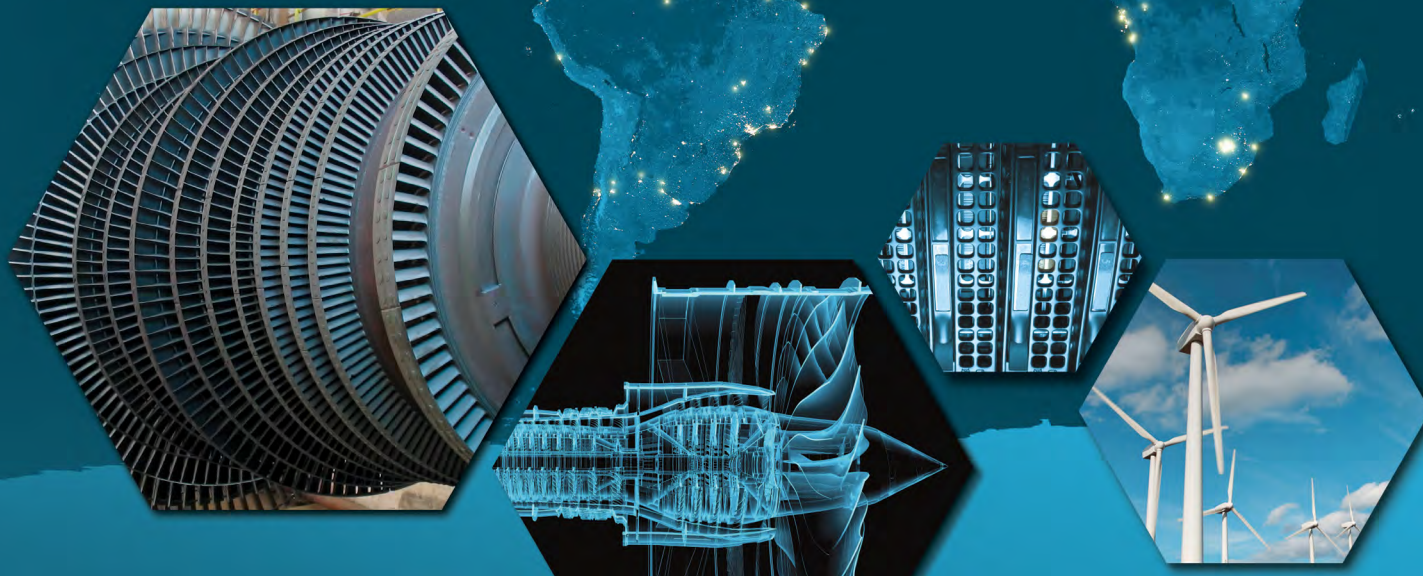


Laboratory for Energy Conversion Science and Technology to Power & Develop the World



Laboratory for Energy Conversion

In applications ranging from transportation to electricity production to energy consumption society is powered by energy conversion devices. Having fundamental expertise in applied fluid dynamics, the Laboratory for Energy Conversion (LEC) engages in result-oriented scientific and technological explorations that improve the efficient use of natural resources, while minimizing the environmental impact of these systems, as well as developing renewable energy sources.



Some facts about the Laboratory for Energy Conversion

Founded in **1892**



Number of Ongoing Projects: 20-22

Number of Peer-Reviewed, Archival

Publications: approx. 25/year

Number of Recent Outstanding

Publication Awards: 4

Number of Spin-Off Companies: 3

Cutting Edge Research at LEC

Turbomachinery

Experiments in axial turbine, radial compressor and film cooling facilities have resulted in the development of advanced designs that improve efficiency, and consequently lower emissions, of turbomachinery used for power generation and mobility. These experiments are complemented with the in-house CFD tool, MULTI3, that is used to simulate the complex, three-dimensional unsteady flows. A GPU-version of MULTI3 provides approximately two orders of magnitude speed up compared to its CPU predecessor.



- Endwall contouring
- Flow control
- Forced response
- Low solidity airfoils
- Radial compressor
- Thermal management
- Turbine leakage management

lec.ethz/turbomachinery



Wind Energy

Experiments using a mobile laboratory with LIDAR, autonomous drones and kites, and turbine test facility promote the development of efficient wind power plants. Micro and mesoscale wind simulation tools and GIS-based analytics complement the experiments.

- Full-scale experiments
- Dynamically scaled experiments
- Computational modeling
- Instrumentation
- Econometric analysis
- Social Impact

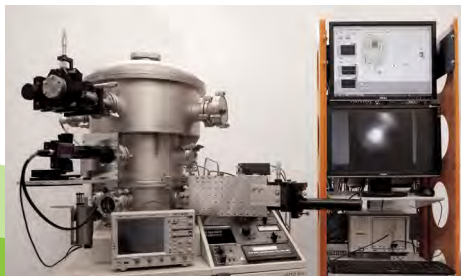
lec.ethz/wind



Laser Plasma

The facilities include the droplet dispenser, a high energy laser with laser focusing optics, a debris mitigation system, triggering and droplet tracking systems, in-situ plasma diagnostics, and a control system. A high temperature FRAP has been developed to provide real-time monitoring of the EUV light source.

lec.ethz/plasma



- EUV light source
- Lithography
- Meteorology
- Laser-materials interaction



Instrumentation

Fast response probes, which are designed, manufactured and calibrated in LEC, are widely used in a broad range of unsteady, turbulent, three dimensional flows.

- Fast Response Aerodynamic Probes
- Advanced fast response entropy probe
- Large bandwidth data acquisition and control systems
- Infrared thermography
- PIV

lec.ethz/instrumentation

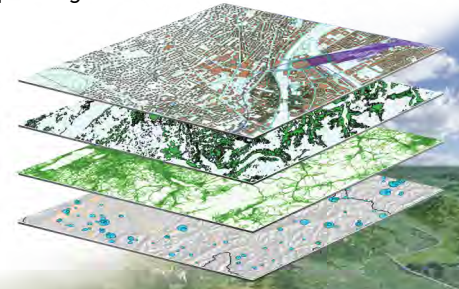


Energy & Policy

Technical, economic and social impacts of renewable energy power plants are assessed within our GIS-based framework. Different scenarios can be rapidly evaluated in order to support decision-making and policy planning.

- Mesoscale weather model
- Transmission grid model
- Visual impact simulation
- Energy storage
- Life cycle cost assessment

lec.ethz/energypolicy



Computational Science

The in-house CFD tool, MULTI3 is used to simulate complex, three-dimensional unsteady turbomachinery and atmospheric flows. A suite of physics codes is used to simulate the processes in laser produced plasma.

- CPU & GPU codes
- Turbomachinery flows
- Microscale & mesoscale atmospheric flows
- Direct simulation Monte Carlo
- Particle-in-cell

lec.ethz/computation





ALPS II



ALPS I



Frap Probe



WindRover II



WindRover I



LISA Axial Turbine



WEST Test Facility

RIGI Test Facility



WindFlyer II



Laboratory for Energy Conversion

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