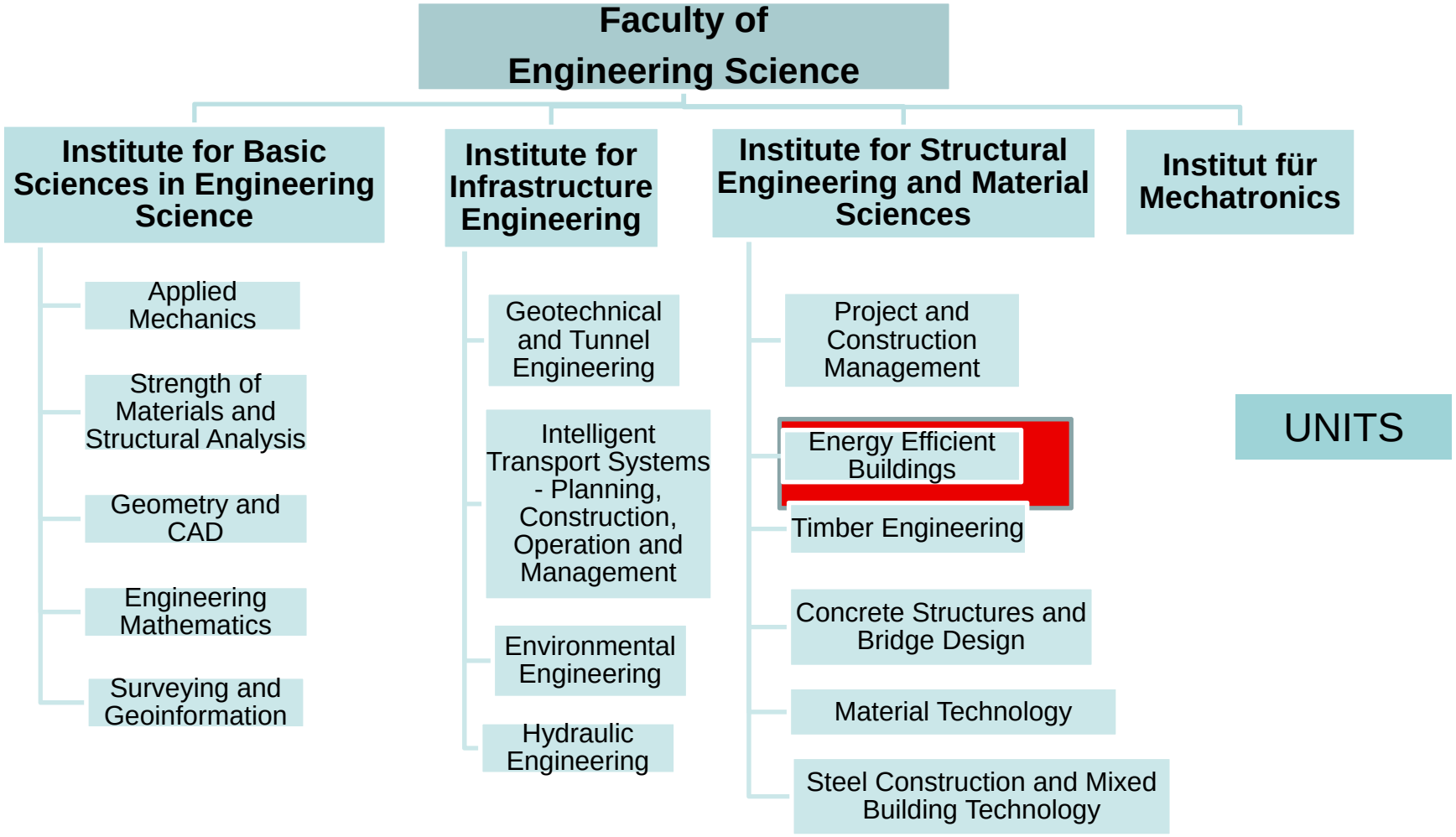
UNIT
Energy Efficient Buildings

Univ.-Prof. Wolfgang Feist
Univ.-Prof. Wolfgang Streicher (Head)
Universität Innsbruck
Institute for Structural Engineering and Material Sciences

June 2013

Organisation of the Faculty of Engineering Science



Building Physics

Univ.- Prof. Wolfgang Feist

15 employees

since 2008

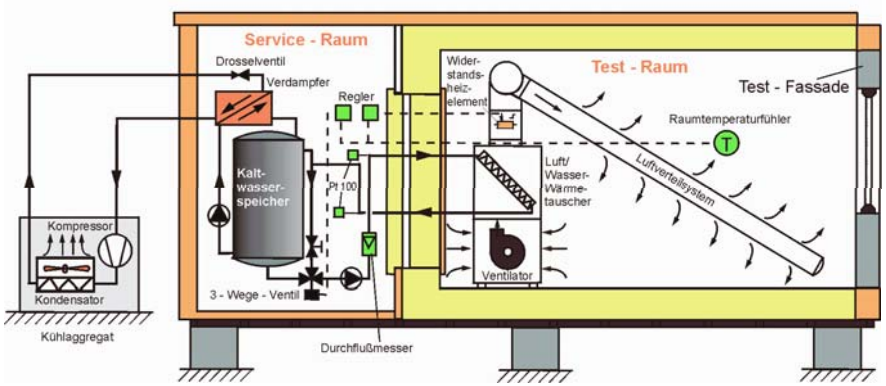
Heating Ventilation Air Conditioning and Renewable Energy

Univ.- Prof. Wolfgang Streicher,
Haed of UNIT, 12 employees
since 2009

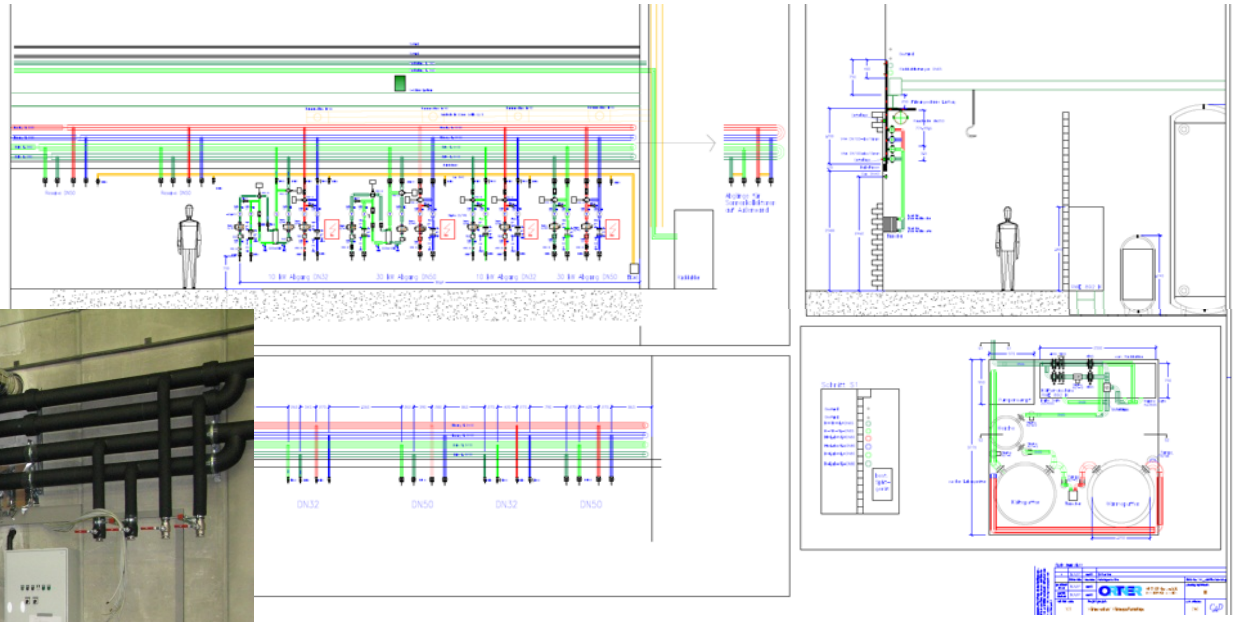
Kainz Monika (Secretary)
Bianchi Janetti Michele
Längle Kai,
Ochs Fabian
Pfluger Rainer,
Dermentzis Georgios
Rojas Kopeinig Gabriel,
Rothbacher Mattias
Sibille Elisabeth,
Werner Matthias
Speer Christoph
Aigner Gerhard, Siegele Dietmar
Müller Marc, Gritzer Florian

Habel Silke (Secretary)
Brychta Markus
Hauer Martin,
Hauer Norbert
Hintringer Claudia,
Neyer Daniel
Neyer Jacqueline (Karenz)
Richtfeld Alexander,
Thür Alexander
Steiner Hubert
Plörer Daniel,
Pfeifer Dominik
Keuschnig Martin

Passys Boxes and Acoustic Test Facility for testing Facade Elements (2.75 x 2.75 m) with defined ambient conditions, light distribution inside

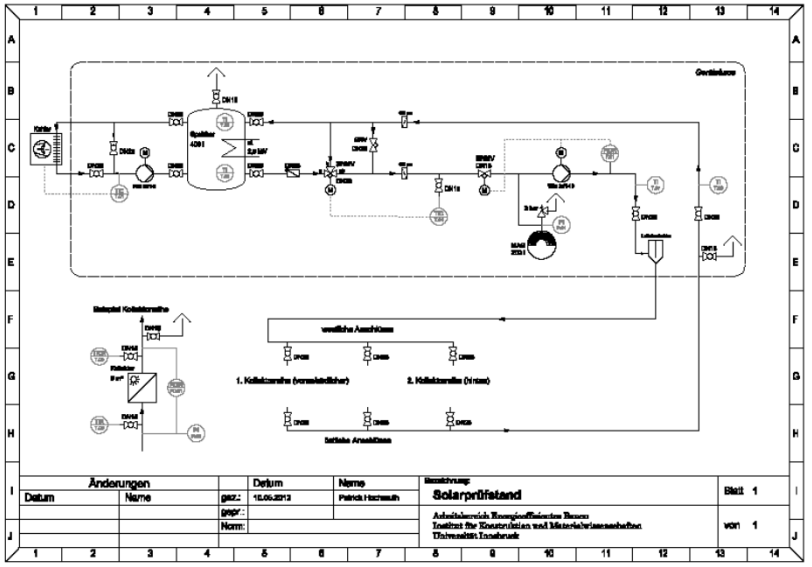


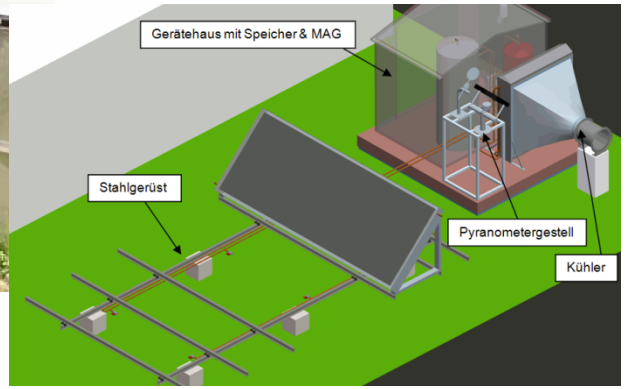
Laboratory with heat source / heat sink



4 Test benches:
2 x 10 kW, 2 x 30 kW
-10°C to 90 °C
„Hardware in the Loop“

Outdoor Collector Test Facility





Current Research Projects
(mostly with Partners from Industry and Science

Solar thermal, Solar Cooling

SolPol-1, SolPol -2	Polymer based solar thermal systems
GIST Tisun, Water:solution- GAP	Solar Collectors in prefabricated concrete wall
AKTIFAS	Aktive Solar Thermal Facades, Joint Project with Fhg ISE Freiburg
Solar Cooling Monitor (finished)	Monitoring of Solar Cooling applications
Solar CoolingOpt	Optimization of Solar Cooling applications
DAKTris	Development of optimized Absorption Cooler
IEA_SHC Task48	Solar Cooling, International Cooperation
IEA SHC Task39	Polymer Solar Thermal Collectors Int. Coop.

The building as a thermal-electrical interface enabling Demand Side Management

Project: THE BAT

IEA SHC
Task 53 Kick Off Meeting
Vienna, March 18th 2014

THE BAT - Objectives

- Development of strategies to **optimize interaction**:
  Heat pump, PV, Thermal Energy Storages (building structure, HVAC)
- Development and implementation of **Model Predictive Control** (MPC)
- Optimization of the **heat pump design** with respect to Demand Side Management
- Experimental investigation of a test system in a **Hardware In the Loop** (HiL) environment
- **Modeling and simulation** of the above mentioned systems and domains

Project fact sheet

- Duration: End of 2012 to 2015, funded by FFG/bmvit Austria
- Status: First interim report was submitted end of Oct. 2013

Heliotherm

- Heat pump design
- Heat pump controller
- Experiments: Coupling of PV & heat pump

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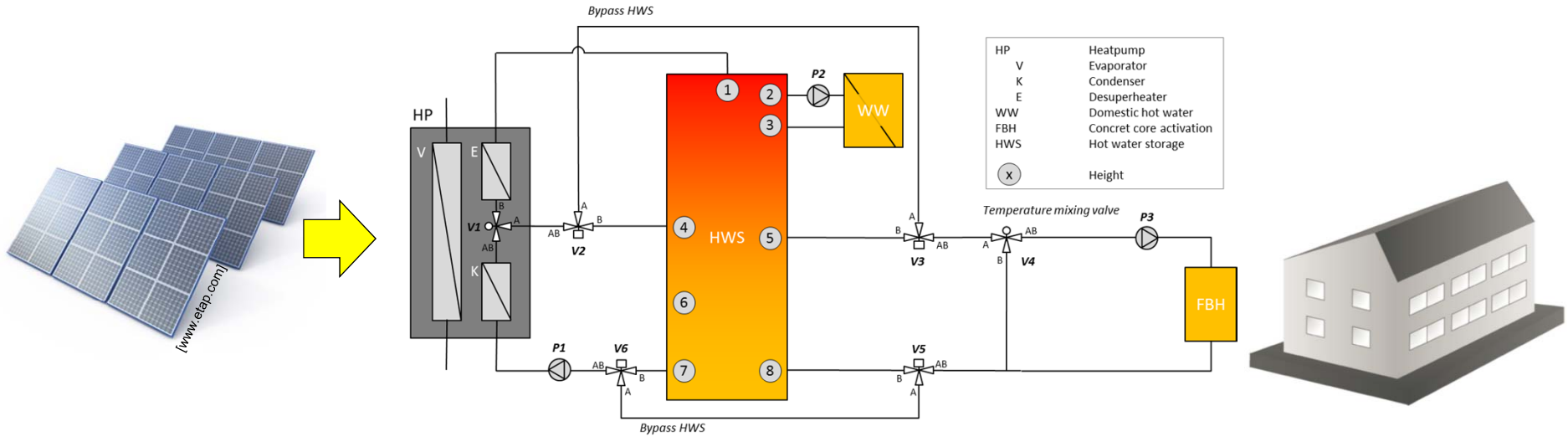
- Modelling and simulation (PV, heat pump, building,…)
- Hardware in the Loop: Coupling of simulation tool with heat pump in the lab

Graz University of Technology, Institute of Thermal Engineering

- Model Predictive Control (MPC) algorithm
- Further improvement of detailed simulation model for heat pumps including dynamic phenomena

System design

- Building: Reference building ex Task 44
- HVAC system:
  - Production: PV, HP
  - Storage: HWS (incl. bypass), building structure
  - Demand: DHW, floor heating
  - Controls: conventional, MPC



Dynamic Operation of an Absorption-Chiller in Tri-Generation Systems

Project: DAKTris

IEA SHC
Task 53 Kick Off Meeting
Vienna, March 18th 2014

Project fact sheet

- Duration: Mid of 2013 to end of 2015, funded by FFG/bmvit Austria
- Status: on going

Pink

- Chiller design
- Chiller controller
- Functionality tests in the laboratory

University of Innsbruck, Unit Energy Efficient Buildings

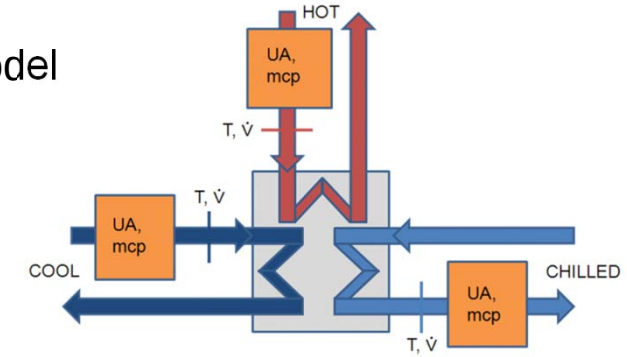
- Modelling and system simulation (CHP, Chiller, Load Profile,…)
- Hardware in the Loop: Coupling of simulation tool with chiller in the lab
- Economic, energetic and ecologic validation

Graz University of Technology, Institute of Thermal Engineering

- Detailed calculations of the chiller, adaptations for coupling with CHP
- Further improvement of detailed simulation model
  for the chiller including dynamic phenomena

DAKTris - Objectives

- Identify system configurations for Tri-Generation and use of waste heat
- Improvement and adaption of the NH3-chiller to be powered by CHP-plant
- Laboratory tests and updating of the TRNSYS-model



- Set-up of system simulation models for most promising applications
- Laboratory Hardware in the Loop (HiL) tests for dynamic operation strategies.
- Validation based on economic, energetic and ecologic key figures

Solar-Hybrid Systems for Heating and Cooling

Project: SolarHybrid

IEA SHC
Task 53 Kick Off Meeting
Vienna, March 18th 2014

Project fact sheet

- Duration: 2014 to end of 2016, funded by FFG/bmvit Austria
- Status: just started

Pink

- Absorption Chiller design, controller

Cofely

- Compression Chiller, applications

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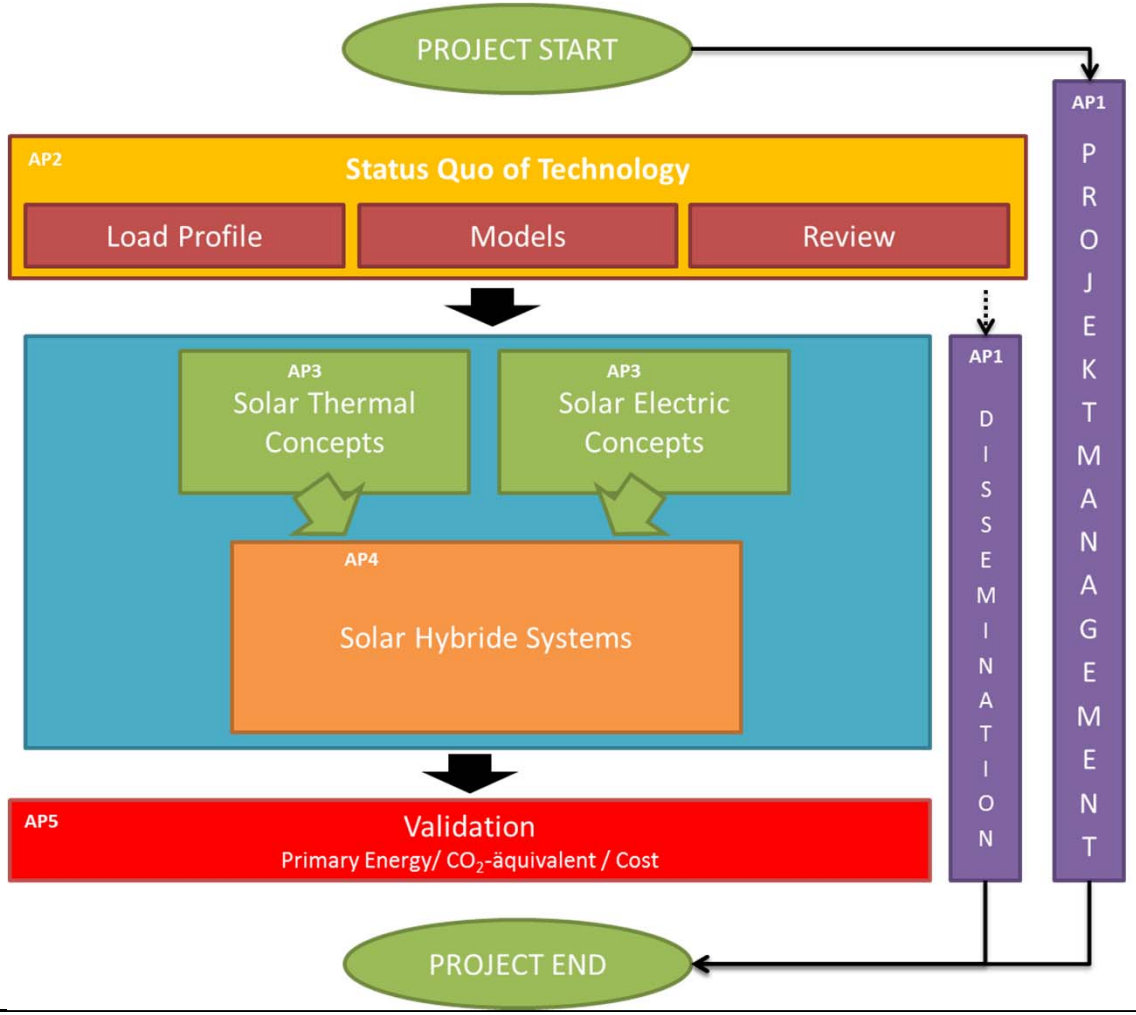
- Modelling and system simulation: solar thermal and hybrid systems
- Hardware in the Loop: Coupling of simulation tool with chiller‘s in the lab
- Economic, energetic and ecologic validation

Austrian Solar Innovation Centre - ASiC

- Modelling and system simulation: solar electric systems
- Controller development on component and system level

Solar-Hybrid - Objectives



Solar-Hybrid - Objectives

- Identify system configurations for Solar-Hybrid systems
- Improvement and adaption of the NH3-chiller and compression chiller for hybrid system integration
- Develop control concepts on component and system level
- Set-up of system simulation models for most promising applications
- Laboratory Hardware in the Loop (HiL) tests for dynamic operation strategies.
- Validation based on economic, energetic and ecologic key figures

THANK YOU FOR YOUR ATTENTION!