

## Services provided

- DEPLOYMENT OF SMART GRID TECHNOLOGIES IN POWER NETWORKS: STRATEGIES, SCOPE, PERFORMANCE, COSTS;
- ANALYSIS OF THE INTEGRATION OF ICT FOR THE CONTROL OF TRANSMISSION AND DISTRIBUTION GRIDS;
- MONITORING AND CONTROL ALGORITHMS FOR POWER SYSTEM, NETWORKS AND FACILITIES;
- DEVELOPMENT OF OPERATIONAL STRATEGIES AND AUTOMATION PLANS FOR TRANSMISSION / DISTRIBUTION NETWORKS
- INTEGRATION OF RES-BASED PLANTS AND DISTRIBUTED STORAGE UNITS FOR POWER SYSTEMS;
- SMART METERING, SMART CUSTOMERS AND DEMAND RESPONSE INTEGRATION INTO POWER NETWORKS;
- ENHANCEMENT OF NETWORK RELIABILITY AND SYSTEM STABILITY: MODELLING, SIMULATION, DEFENCE PLANS, RECOMMENDATIONS;
- SMART CITIES: APPROACH, PLANNING, ENERGY EFFICIENCY.



Litgrid



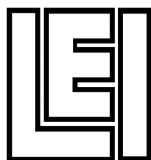
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Main clients – transmission and distribution system operators and business companies



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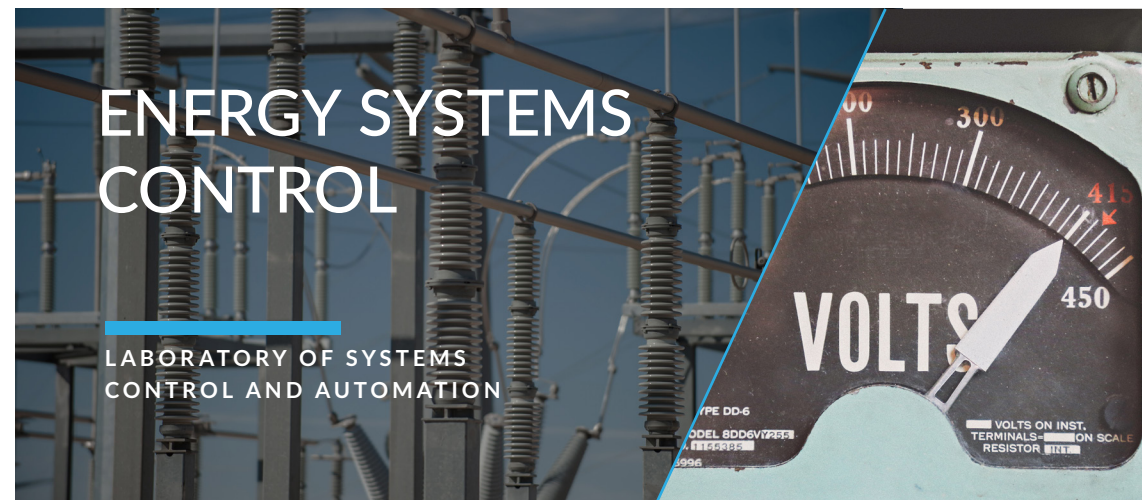


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LITHUANIAN  
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INSTITUTE



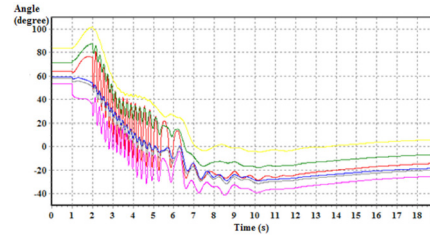
## Areas of research

- INVESTIGATION OF POWER SYSTEM (PS) CONTROL PROBLEMS; DEVELOPMENT OF RESPECTIVE MATHEMATICAL MODELS AND ALGORITHMS (LOAD-FREQUENCY AND VOLTAGE CONTROL, NETWORK STABILITY);
- ANALYSIS OF ADVANCED PS CONTROL METHODS AND THEIR APPLICATIONS IN NEW AUTOMATICS, CONTROLS, ICTS AND CYBER SECURITY;
- ANALYSIS OF PS RELIABILITY, SECURITY AND RISKS;
- ENHANCEMENT OF NETWORK SUPPORT FOR COMPETITIVE ENERGY MARKETS;
- EFFECTIVENESS AND RELIABILITY OF DISTRIBUTION NETWORKS;
- SMART GRIDS SOLUTIONS AND DEVELOPMENTS (DEMAND RESPONSE, LOAD AGGREGATION, ETC.);
- DIGITALIZATION AND BIG DATA SOLUTIONS FOR ENERGY SECTOR;
- GRID CONDITIONS FOR THE LARGE-SCALE INTEGRATION OF INTERMITTENT RENEWABLE ENERGY SOURCES (WIND, SOLAR);
- ENERGY EFFICIENCY OF END-USERS AND SMART CITIES.

## Selected activities

### ANALYSIS OF ASYNCHRONOUS OPERATION (SWINGS) IN CROSS-BORDER SECTIONS

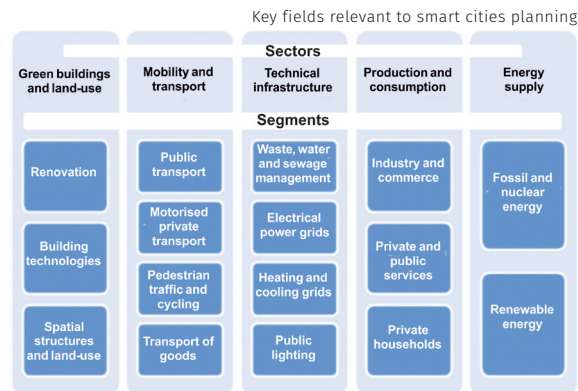
The research of rotor angle stability (out-of-step operation, swings) deals with transient process which, jeopardise the integrity of synchronous area. The robustness of Lithuanian PS against out-of-step events was examined in BRELL electricity ring model (Belarus, Russia, Estonia, Latvia and Lithuania) with the view to reinforce the grid, if necessary.



Transient processes on Lithuanian and Belarusian PS, when they are linked by one interconnection

### ENERGY EFFICIENT CITIES

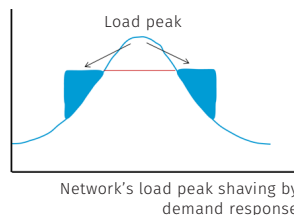
The experience gained from the international project PLEEC allows for application of smart city planning approach. It aims at the increase of energy efficiency of a city in the planning stage. The approach is centred on 174 advanced energy technologies, with the evaluation of their impact on energy efficiency indicators.



The technologies are supplemented by institutional/structural energy-efficiency measures and consumers' behaviour changing measures.

### DEMAND RESPONSE

Demand response is a prominent means on a way towards smart grids and consumer-centric PS. The research aims at developments of demand response in electricity grids related to eligible consumers, flexibility services, load aggregation patterns and contribution to reduction of peak loads in a long-term time scale.



## Project portfolio

### INTERNATIONAL PROJECTS

- **H2020, EnergyKeeper.** Keep the Energy at the right place! Ongoing.
- **7FP, PLEEC.** Planning for Energy Efficient Cities. 2013-2016.
- **7FP, DEMI.** Product and Process Design for Ambient Intelligence Supported Energy Efficient Manufacturing Installations 2010-2013.

### NATIONAL PROJECTS

- National state-funded project Operational planning of smart distribution grid.
- Analysis of Asynchronous Operation (Swings) in Cross-border Sections.
- Overview and Comparative Analysis of Lithuanian Power Reserve Market.
- Analysis of Transmission Network Stability and Voltage Levels after Connection of Large Wind Power Park.
- National state-funded project Possibilities of Lithuanian power system synchronous operation with ENTSO-E taking into account perspective development of generation sources.
- National state-funded project Research of application of small power wind power plants and solar energy systems and their extension possibilities in Lithuania.

## Open access centre

Laboratory provides the access to its software tools and related services for students and researchers via the National Open Access Scientific Centre for Future Energy Technologies:

- **PSS®E** (detailed research of electrical PS; modelling of physical processes in electrical power system; calculation of static and dynamic regimes).
- **PSS®SINCAL** (analysis of electrical and pipe networks with topological characteristics and reliability evaluation).
- **PowerWorld Simulator** (power flow solution; PV and QV curve tool; fault analysis; contingency analysis).
- **Matlab** (mathematical modelling and analysis of modelling results; modelling of technical systems with analysis of parameters and modelling results).
- **The TIMES Integrated Assessment Model** (sustainable harmonization of energy demand with energy use technologies and energy efficiency promotion measures).