JOINT STOCK COMPANY
«SYSTEM OPERATOR
OF THE UNITED POWER SYSTEM»

SO UPS EXPERIENCE IN CROSS-BORDER PROJECTS REALIZATION

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Why cross-border projects?

Driving Forces

- Development of common power market place
- Political and economic integration in Europe
- Need to diversify energy supply
- Powerful grid infrastructure ready

Expected Results

- Creation of technological infrastructure for common power trading market place
- Mutual assistance in case of emergency and higher reliability of power supply
- Optimal use of generation capacity and primary resources

Joint realization of cross-border projects – important for the High North Region

Reasons for joint organization of the studies:

- Different jurisdictions (EU countries, Norway, Russia)
- Power systems with established standards and technical requirements
- Power systems with different market models
- Higher complexity of the projects realization related to High North conditions and environmental requirements

SO UPS experience in cross-border projects realization

SO UPS jointly with CIS, Baltic and West European partners accomplished the joint study on power systems synchronous interconnection

This presentation brings the said experience to the attention of possible participants of cross-border projects in the High North region

Previous Studies

STUDY	CONCLUSION
The TASIC and PHARE technical study of the interface between the extended West European power system and its Eastern neighbors, 1997	The synchronous interconnection is technically viable but several aspects need to be investigated in more detail: ▪ long-distance control power flows ▪ dynamic behavior, especially inter-area oscillations ▪ definition of common technical requirements at the interface
The TASIC and PHARE technical study of the conditions for joint operation of the extended UCPTE system and power systems of Oriental Europe and Central Asia, 1997	
TASIC-EREG 9601 Synchronous interconnection of the TESIS and UPS network, 1999	
UCTE Pre-feasibility study: Load flow analysis with respect to possible synchronous interconnection of networks of UCTE and IPS/UPS, 2003	European grids are operating already near the limits due to market development

! New detailed study is required!

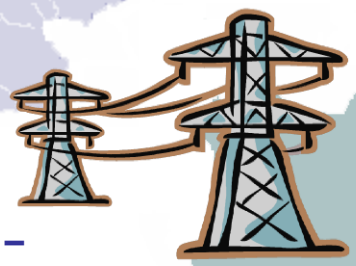
Political Support

EU-Russia Energy Dialogue, Joint Report September 2001	**Interconnection of EU and Russia electricity network is recognized as a project of common interest**
EU-Russia Summit October 2001	**Interconnection of EU and Russia electricity network is recognized as a project of common interest**
Joint Russia-France Statement on Energy Cooperation February 2003	**One of the best decisions for power systems interconnection in Europe is synchronous interconnection of the UCTE and the IPS/UPS**
European Council October 2003	**Development of energy infrastructure will ensure the full involvement of the new EU's neighbors and partner countries in the European market**
EU-Russia Summit October 2003	**With respect to the necessary interconnection of the two systems, the IPS/UPS and the UCTE are encouraged in their common efforts to continue all necessary investigations to define under which conditions interconnection of the two systems could be feasible**

Major Challenge

Connection of two huge synchronous systems with different:

- ❑ geographical extensions
- ❑ generation and network structures
- ❑ norms and standards
- ❑ rules and operation philosophies



UCTE

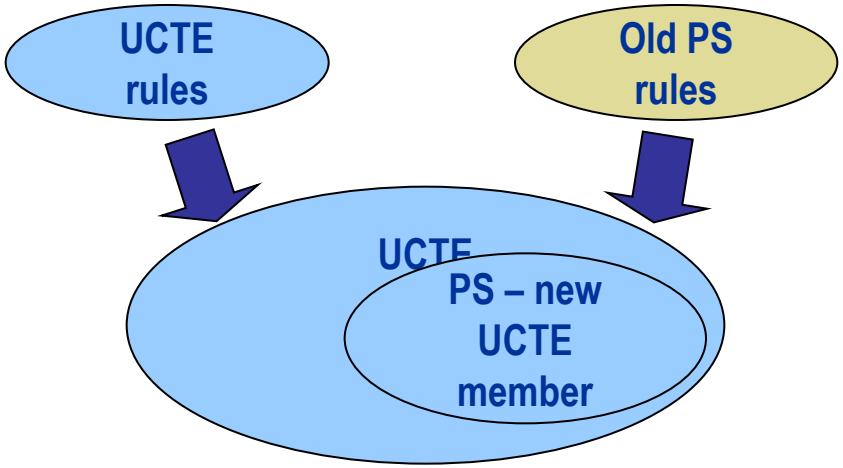
- ➢ HV transmission grid voltages: 220 kV, 400kV
- ➢ Highly meshed grid
- ➢ Significant wind generation capacity
- ➢ Common technical standards – UCTE OH

IPS/UPS

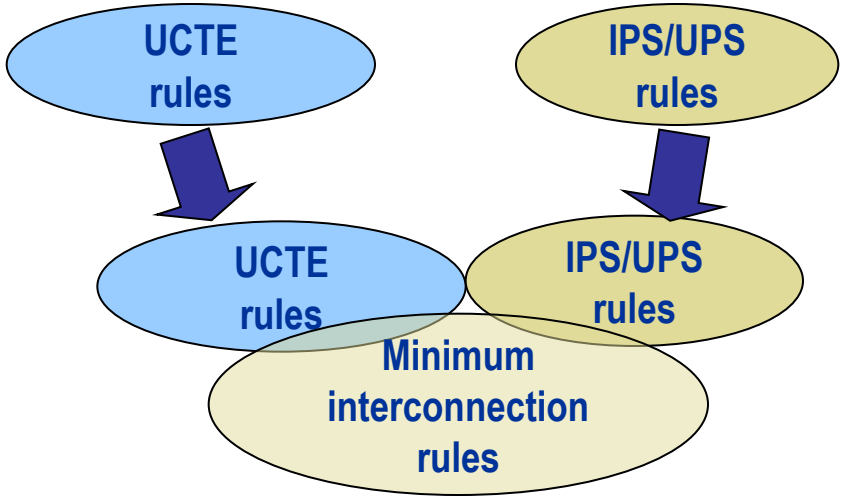
- ➢ HV transmission grid voltages: 220 kV, 330 kV, 500 kV, 750 kV, 1150 kV
- ➢ Vast territory – 8 time zones
- ➢ Long HVTLs connecting almost balanced power systems
- ➢ Extensive use of emergency control automation (ECA)
- ➢ Non-obligatory common technical standards

Two Concepts of Synchronous Interconnection with UCTE

Integration



Coupling



The study assumes "coupling" concept:

- Synchronous coupling of two synchronous areas without enforcing regulations and standards from one area to the other
- Maintaining the system security and reliability level in the systems concerned
- Development of the minimum set of common technical rules and regulations, generally, on the basis of UCTE OH

Objectives of the Study

UCTE IPSUPS study

Feasibility Study: Synchronous Interconnection of the IPS/UPS with the UCTE

Considering technical, operational, organizational and legal issues the study will answer the following questions:

1. Is a full synchronous interconnection of IPS/UPS with UCTE feasible?
2. What are the mandatory measures and requirements on both sides?
3. What are the associated costs?

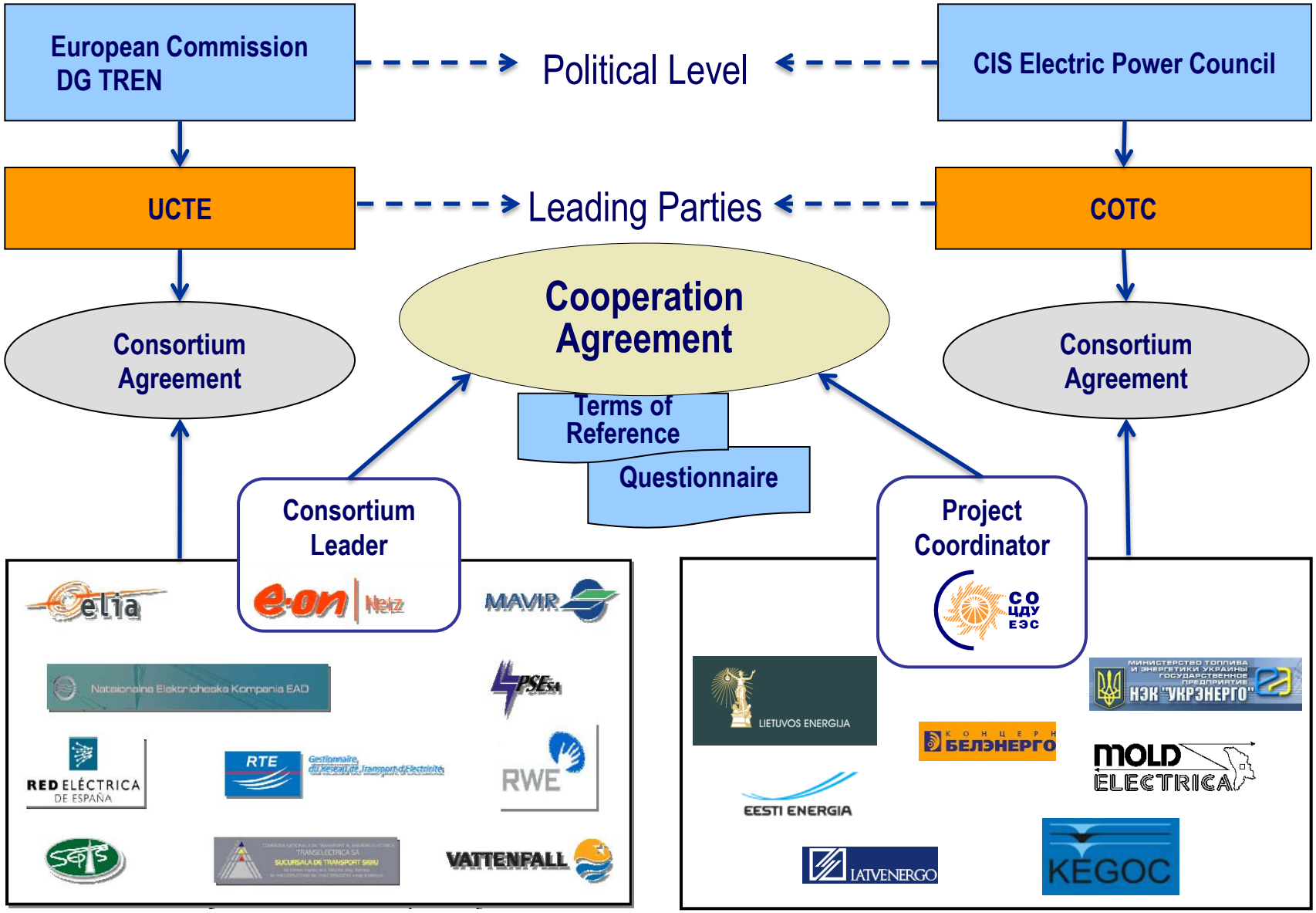
Initial priority:
Maintaining the present performance of the systems with respect to system security and reliability

Contents of the Study

UCTE IPSUPS study

- Steady-State Analysis: methods, models, results
- Power systems dynamics: modelling and verification
- Dynamic stability analysis
- Low-frequency oscillations
- Power/Frequency control
- Emergency control automatics: principle and volumes
- Dispatch control, electricity transmission operation
- Legal aspects of interconnection

Project Structure

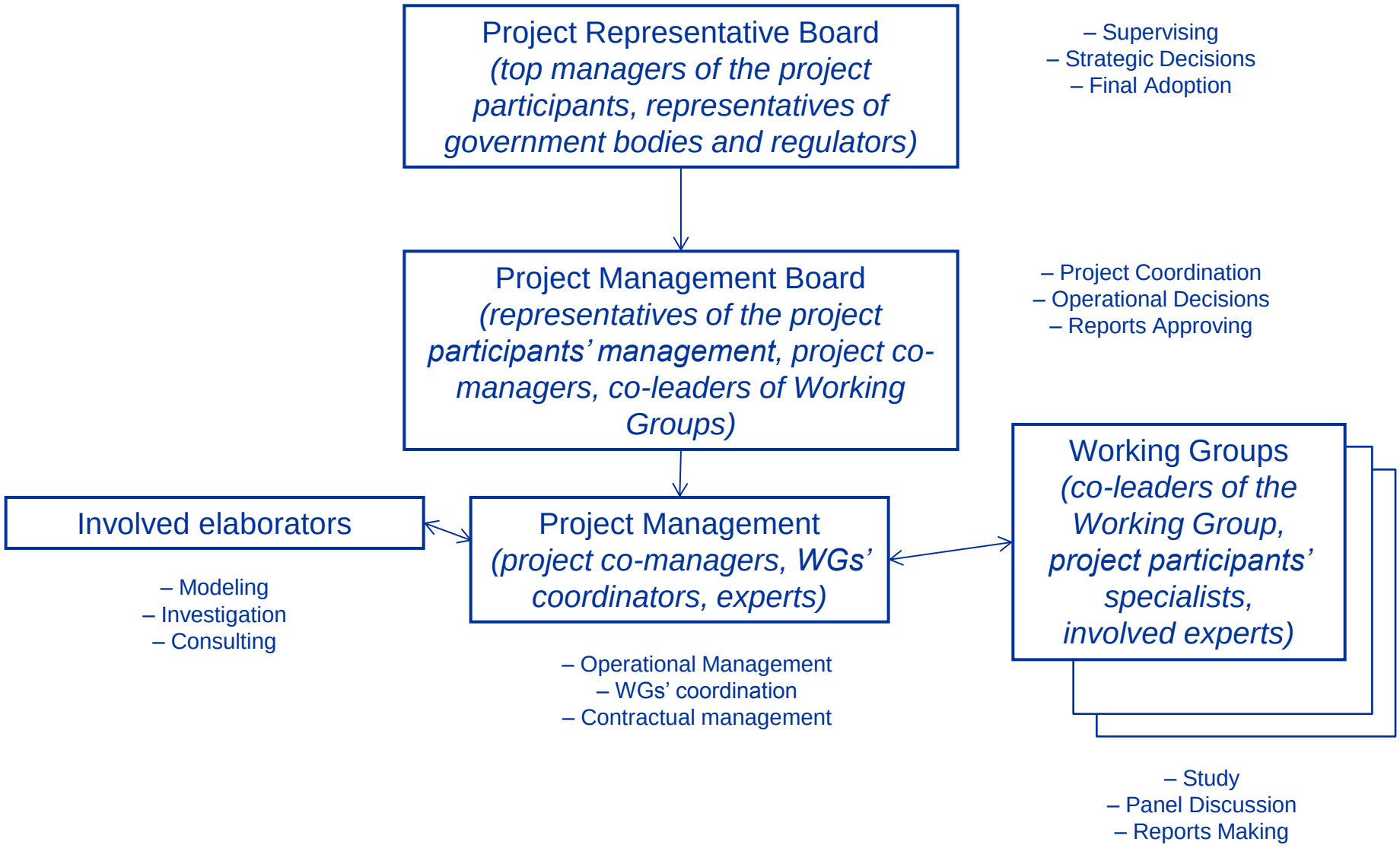


Cooperation Agreement's key conditions

Co-operation principles:

- Equal representation and parity of Parties in all project bodies governing project development
- Consensus-based decision making
- Reciprocity of data acquisition
- Complete distribution of costs between the Parties and independent funding by each Party of its expenses
- Working language – English
- Term on results approving and publication

Project management bodies organizational structure



Key Conclusions

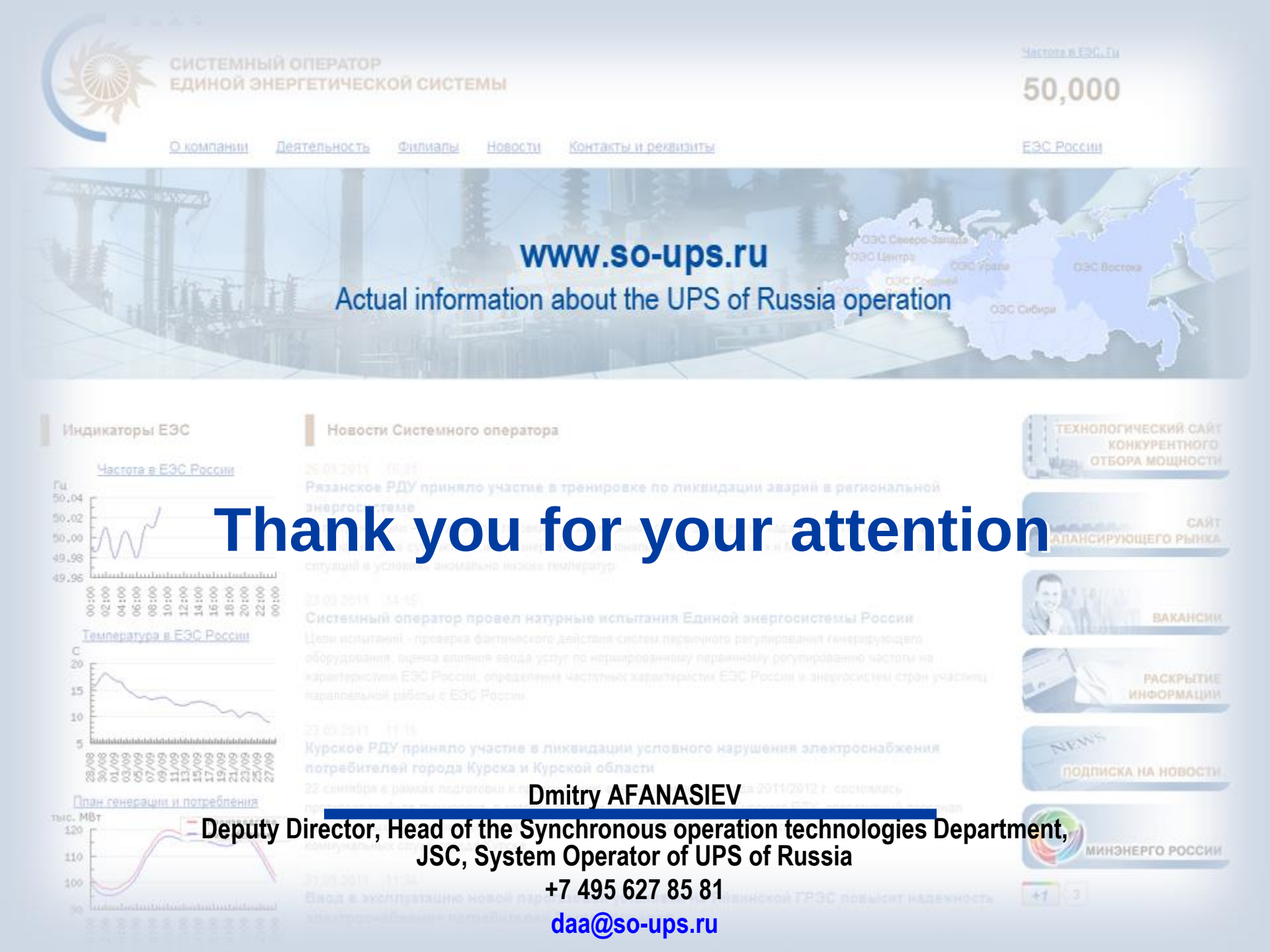
- Synchronous coupling between the UCTE and the IPS/UPS is feasible.
- Potential power exchanges between the UCTE and the IPS/UPS are limited by internal congestions.
- The overall complexity of the IPS/UPS and the UCTE synchronous interconnection when it comes to key organizational and legal aspects
- Synchronous interconnection is a long term perspective
- Electricity market platform between the UCTE and the IPS/UPS may be achieved through DC links. The construction of HVDC back-to-back links between the interface countries might be considered in the medium term

Final decisions on the project

CIS Electric Power Council 34-th Session October 2008	**To note the Project's Main Conclusions and to send the Final Report to CIS EPC members and associates**
EU-Russia Energy Dialogue 9-th Joint Report October 2008	**The Parties welcome the completion of the joint Feasibility Study of a synchronous interconnection of the CIS and Baltic countries power systems with the power systems of the UCTE and underline the fact that it is a success in terms of cooperation between the companies.**
CIS Electric Power Council 35-th Session May 2009	**Adopt the Project as fulfilled**

Main “consumers” of the results of the Study

- Government bodies – for undertaking strategic decisions
- Concerned parties (project promoters, developers, investors) – for undertaking decisions on the project investment and realization
- Other parties – as a basis for alternative projects realization



Thank you for your attention

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