BALTSO

ANNUAL REPORT 2008

LIETUVOS ENERGIJA

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ABOUT BALTSO

History and Main Objectives

On 30 March 2006, the three Baltic Transmissions System Operators (TSO) – OÜ Põhivõrk from Estonia, Augstsprieguma tīkls AS from Latvia and Lietuvos Energija AB from Lithuania signed an Agreement to establish the Foundation of Estonian, Latvian and Lithuanian Transmission Systems Cooperation and Organization, to be named BALTSO. The main objectives of BALTSO are to:

- create conditions for the reliable operation of Estonian, Latvian and Lithuanian Power Systems;
- develop necessary interconnections between Estonian, Latvian and Lithuanian Power Systems;
- implement conditions to ensure the safety of electrical energy markets acting in Estonia, Latvia and Lithuania;
- initiate cooperation and develop relations between the Organization and its Members, between energy companies from non-Member countries and other institutions in the Baltic States, Europe and the rest of the world.

Governing Bodies

BALTSO Leaders' Meeting

The highest governing body of the BALTSO organization is the Leaders' Meeting, which adopts various resolutions and recommendations. It meets annually no later than 30th of June in each member country, following a system of rotation. The main functions of the Leaders' Meeting are to:

- approve the organization's annual reports;
- make decisions on any questions, problems or issues raised by the Committee, the Secretariat or the Working Groups.

Recommendations given by the Leaders' Meeting are only advisory, but resolutions are binding. As regards resolutions, it is necessary that each Leader member is represented. Each member has one vote. Representatives may be part of its delegation.

BALTSO Committee

The executive body of the organization BALTSO is the Committee. It consists of two representatives from each Leader member. The Committee meets as frequently as possible in each member country (on a rotational basis) and is convened by the Secretariat.

The 2008 Committee members were:

- Daivis Virbickas and Ramūnas Bikulčius from Lietuvos Energija AB;
- Imants Zviedris and Varis Boks from Augstsprieguma tīkls AS;
- Valeri Peterson and Mart Landsberg from OÜ Põhivõrk.

The main functions of the Committee are to:

- prepare the annual report of the BALTSO organization;
- prepare resolutions for the Leaders' Meeting and adopt recommendations given in the meetings;
- establish Working Groups to research and analyze specific issues which may arise;
- approach third-party consultants for specific research or other tasks on behalf of BALTSO (the costs of which are divided equally among the members);
- review and consider reports made by Working Groups.

All management representatives need to be present for decisions to be made; in total, three Committee Meetings were held during the reporting period (from June 2008 until June 2009).

BALTSO Secretariat

The permanent body of the BALTSO organization is the Secretariat, which ensures day-to-day operations. Members perform the functions of the Secretariat on a rotational basis for one reporting period, while taking responsibility for the Secretariat's expenses during that period. The functions of the Secretariat:

- to convene annual meetings and Committee meetings;
- to perform secretarial, administrative, record keeping, accounting and other auxiliary clerical functions;
- to handle the Organization's external communications;
- to ensure proper maintenance of the permanent and current archives of the organization.

The function of BALTSO Secretariat was performed by Ramūnas Bikulčius as Secretary and a staff member from Lietuvos Energija AB.

BALTSO Working Groups

In 2008 BALTSO had three working groups (WG):

- Operations & Security Working Group (Convener: Voldemars Lapinskis from Augstsprieguma tīkls AS);
- Development Working Group (Convener: Mart Landsberg from OÜ Põhivõrk);
- Information Technology & Communications (Convener: Ramūnas Maksimovas from Lietuvos Energija AB).

All working groups have had their plans for each reporting period approved by the Committee.

FOREWORD FROM THE SECRETARIAT COMPANY

The three Baltic power systems – in Lithuania, Latvia and Estonia, have been working in unison to secure the reliable supply of electricity to consumers as well as the stable operation of power systems in the region. The year 2008 was marked by numerous achievements and newly devised targets for the BALTSO organization:

- By assigning top priority for the integration of the Baltic States' power systems with the Western European electricity market, feasibility studies were carried out for establishing the interconnection.
- A "Baltic Grid" study for 2012 evaluating power transfer possibilities from the three power systems of Estonia, Latvia and Lithuania, in cooperation with UPS and integration to UCTE and NORDEL, was completed. However, the study illustrated the necessity of pushing back the time horizon to 2025 and a new study "BALTIC GRID 2025" was finished.
- Lithuanian and Polish TSOs signed articles of association for a new joint venture, LitPol Link, which will run the interconnection project between the Lithuanian and Polish power systems. LitPol Link will prepare the technical project, environmental assessment, address questions of land acquisition and perform other associated tasks.
- With regard to the requirements set for the reliability of supply, quality, management and environmental protection, the long-term development of the electric power system was planned in line with scientific research achievements.

By the end of 2009 Lithuania's Ignalina nuclear power plant (NPP) will be shut down. It is clear that in order to satisfy the growing demand for electricity in the region, this reduction in production capacity will have to be replaced by new power sources. Consequently, a joint project being carried out by Lithuania, Latvia, Estonia and Poland to construct a new nuclear facility in Lithuania will assume vital importance. An important example of the BALTSO organization's joint achievement is the successful completion of the Estlink interconnection cable, linking the power systems of Finland and Estonia as of 2007. The main target of BALTSO is to achieve the reliable integration of the Baltic power system into a single European market, primarily by interconnecting the transmission grids of Lithuania and Poland. Additionally, completing the feasibility study for establishing an interconnection between Sweden and the Baltics is another target. These new interconnecting lines will enable the Baltic States to significantly reduce their energy dependence, enhance the reliability of electricity supply, and satisfy a major precondition for entry into the European electricity market. In 2008 European TSO companies from 31 countries signed a Declaration of Intent in a proactive step forward in drafting the Third Legislative Package; this created a new association, the European Network of Transmission System Operators for Electricity (ENTSO-E). The establishment of ENTSO-E will further strengthen TSO cooperation in a number of key areas, including the development of technical and market-related network codes. The coordination of system operations and grid development, with the aim of enhancing the integration of the European electricity market, will contribute to a sustainable energy environment while ensuring the secure and reliable operation of the European power transmission system. The Chief Executive Officers (CEOs) of the TSO companies have agreed to propose to the Presidents of current TSO associations (i.e. European Transmission System Operators (ETSO), Union for the Co-ordination of Transmission of Electricity (UCTE), Nordel, UKTSOA (UK), BALTSO (Baltics) and Ireland and Northern Ireland (ATSOI) the initiation of procedures necessary for transferring their activities to the new TSO body and retiring their respective associations as soon as ENTSO-E is established and the transfer of activities has been accomplished. Despite the fact that the new association ENTSO-E has been established, the BALTSO organization will continue working until June 2009 in resolving the problems of power companies in the Baltic States. Additionally, the organization will continue facilitating technical solutions for system development and the joint operation of Baltic power companies, also by representing the industry in international organizations and taking part in their activities as an equal partner.

Darius Masionis
Chief Executive Officer, Lietuvos Energija AB
BALTSO Secretariat Company 2008

REPORT OF THE BALTSO COMMITTEE

Main Operational Indicators of the Baltic Interconnected Power System in 2008

TSO	Measure	Estonia	Latvia	Lithuania	Baltic IPS
Installed capacity as at 01.01.2009 (net)	MW	2258	2476.4	4605**	9339
Share of Baltic IPS	%	25.57	26.03	48.40	100
Peak load	MWh	1479	1419*	1843	4741
Net consumption in 2008	GWh	8036	7573	11491	27099
Net consumption in 2007	GWh	7933	7533	10066	25532
Change compared to 2007	%	1.28	0.53	12.40	5.79
Total net generation in 2008	GWh	9103	5053	13887	28043
Nuclear PP	GWh			9890	9890
Thermal PP	GWh	8985	1718	2550	13253
Hydro PP	GWh		3078	400	3478
HPSPP (gen)				586	586
Wind PP	GWh	110	58	131	299
Other	GWh	8	199	330	537
Total net generation in 2007	GWh	10519	4533	14000	29053
Change compared to 2007	%	-15.55	10.28	-0.81	-3.60
Population	thousand	1340	2261	3350	6951
Consumption per capita	kWh	5997	3349	3430	12777
Export of electric power	GWh	4108	2123	2635	
Import of electric power	GWh	3041	4643	1677	
System saldo	GWh	1067	-2520	957	
Output to grid	GWh	12158	9695	12317	
Losses in main grid 2008	GWh	385	288	335	1008
	% of output	3.17	2.97	2.72	
Losses in main grid 2007	GWh	369	292	330	991
Change compared to 2007	%	4.34	-1.35	1.49	1.77

* - gross
** - transmission system operator (without distribution system operators)

Operation and Control of Baltic Power Systems

During 2008, dispatch control of the transmission grids in the Baltic States was carried out from three dispatch centres run by the following TSOs:

- OÜ Põhivõrk (Estonia);
- Augstprieguma tīkls AS (Latvia);
- Lietuvos Energija AB (Lithuania).

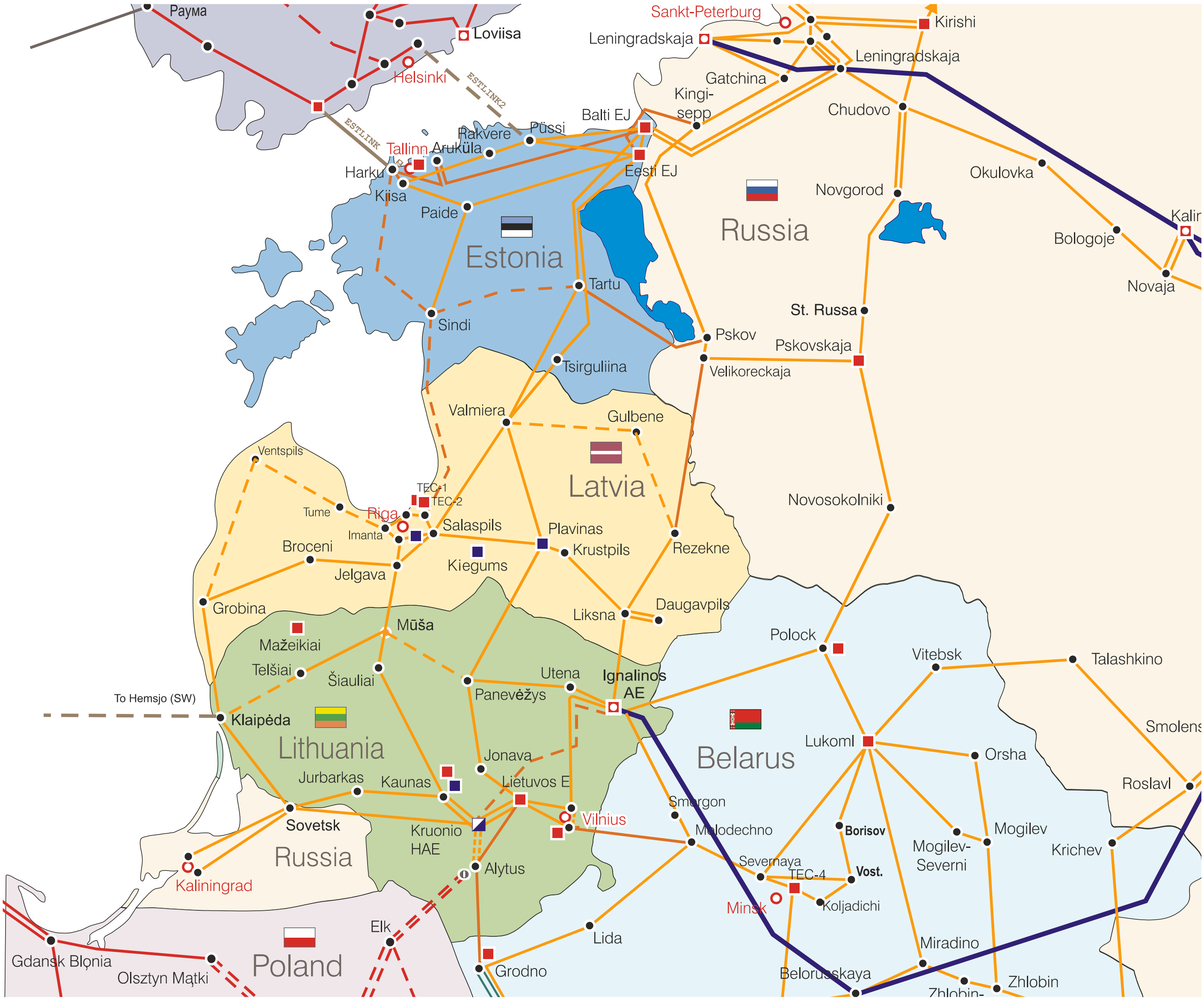
The transmission system operator performs:

- real time power system monitoring;
- the readiness to perform power system restoration after widespread disturbances;
- interchange security assessment of the BRELL (Belarus, Russia, Estonia, Latvia, Lithuania) transmission system network for the following day or month;
- power system interchange balance settlements;
- calculations and reporting on transited energy through the power systems networks;
- calculations of the common disturbance generation reserves and reports on their activities.

Baltic TSOs, according to the BRELL agreement, coordinate with Russia and Belarus:

- the determination of normative emergency reserves – Lietuvos Energija AB;
- Lithuanian, Estonian and Latvian power systems disconnection from IPS/UPS to work autonomicaly in the case of huge disturbances – OÜ Põhivõrk;
- monthly overhead lines (OHL) maintenance schedules – Augstprieguma tīkls AS.

Baltic Interconnected Power System in 2008



Exchanges of Electricity in 2008, GWh

Security of Supply in the Baltic Transmission grid

Ensuring safe and quality electricity supply is the primary operational goal of the interconnected transmission grid. The Baltic States operate synchronously with the power systems of Russia and Belarus. The large scale of the nuclear units (with the productive capacity of 1000 and 1300 MW) necessitates tremendous responsibility for providing a reliable and efficient transmission system. Consequently, the operators utilize different emergency automatic devices. First, the automatic start-up of selected reserve hydro power units or automatic thermal power plants load reduction is designed to prevent the operation of the load shedding devices. This means that the power system's security criterion N–1 (in cases of particularly severe disturbances) is provided by special emergency protection systems, which are comprised of devices in several power systems e. g. starting up the hydro generators of Daugava Cascade and Kruonio pumped storage plant (PSP) from outage signals of Ignalina nuclear power plant or 330 kV overhead lines. The most significant bottleneck in the region is in fact outside the Baltic States, namely at the border between Russia and Belarus. In case of an emergency in this area, extremely negative consequences are possible: the instability of the system operating, a long-term shortage of electricity, failure of electrical equipment and a low level (frequency, voltage) of available power. The most significant loading of this section, crucial for operation, will be after the closure of the Ignalina NPP in 2010. In order to prevent asynchronous operation in different parts of the interconnected power systems in the case of an emergency, protective devices, called ALAR, have been installed to detect asynchronous operation over selected lines and to separate network parts. In the case of significant frequency or voltage deviation, immediate emergency disconnection of the selected load is performed by respective load-shedding automatic devices that are intended to maintain an acceptable frequency level (49.2-49.8 Hz) in the power systems. In the Baltic power systems, the total amount of the load connected to these devices is approximately 50 % of the peak load. However, emergency disconnection of the load is performed in stages with different frequency and time settings for each stage. In order to stabilize the frequency, a hydro generator start-up and stopping system is used in addition to the load shedding automatic devices. In a number of cases, the emergency automatic devices are considered to be the last chance to avoid a power system blackout, and its activation should not occur under normal operation or rated N–1 outages (except the loss of a generator or unit in Ignalina NPP). However, with the constant load growth and predicted generation deficit in the Baltic region, the importance of emergency automatic devices should not be understated. Operation in a synchronously interconnected network allows the generators of the Baltic power system to operate under a primary control using a dead band of 0.1–0.25 Hz and droop of 2–7 %, while centralized frequency control is performed by a central controller by the UPS of EES Russia hydro power plants operating on the Volga River. Relay protection in the Baltic power systems is comprised of a variety of relay protection devices and the functioning methods of different kinds of relay protection (remote backup protection, tele-acceleration principles of the distance protection and zero sequence current protection, etc.). This provides a high level of reliability, selectivity and operational speed for the relay protection devices.

International Cooperation

ETSO – ENTSO-E

Cooperation among the Baltic TSOs within BALTSO is useful for collaboration with ETSO, specifically in preparing ETSO reports and position papers. BALTSO has played an important role in the creation of an inter-TSO compensation mechanism within ETSO for 2008–2009. On 27 June 2008 in Prague, the Chief Executive Officers (CEOs) of 36 European TSO companies from 31 countries signed a Declaration of Intent, as a proactive step forward in drafting the Third Legislative Package. This would create a new association, the European Network of Transmission System Operators for Electricity, by the end of 2008. The new TSO-body is being established for the needs of the TSO community and in accordance with the principles set out by the draft Third Legislative Package of the Internal Electricity Market. On 19 December 2008 the Chief Executive Officers of 42 European TSO companies from 34 countries met in Brussels to create a new association – ENTSO-E. The CEOs of the TSO companies proposed to the Presidents of current TSO associations, i.e. European Transmission System Operators, Union for the Co-ordination of Transmission of Electricity, Nordel, UKTSOA, BALTSO and ATSOI, the transfer of their activities to ENTSO-E and the retirement of their respective associations within six months. BALTSO is now focused on the transferring of its activities to the ENTSO-E new bodies, and to winding up the organization on the 1 July 2009.

Baltic States Toward the UCTE

On 11 June 2007 the Prime Ministers of the Baltic States signed a Communiqué calling TSOs from Estonia, Latvia and Lithuania to carry out a full feasibility study on the synchronization of the Baltic electricity transmission system with the UCTE synchronous area. PSE Operator S.A. as UCTE TSO adjoining the Baltic TSOs was invited to participate. On 30 October 2007, a Cooperation Agreement among three Baltic TSOs and the PSE Operator was signed with the aim of working together within the framework of the TSO's scope of activities, competences and responsibilities with the aim of analyzing, investigating, assessing and evaluating all possible scenarios of integrating the Baltic electrical systems and market into the CEE region. The Task Force was under the obligation to perform preliminary calculations based on simplified assumptions and to deliver its conclusions and recommendations concerning the investigated scenario of synchronous interconnection. In January 2008, as a first step in this cooperative venture, the Task Force and representatives of OÜ Põhivõrk, Augstsprieguma tīkls AS, Lietuvos Energija AB and PSE Operator S.A. conducted a pre-feasibility study. According to the preliminary calculations provided by the Task Force members, the costs, associated with the necessary investments in Baltic and Polish power systems (which are identified so far as the minimal preconditions for synchronous operation with the UCTE) total up to 2.5 billion EUR. To assess the full scale of necessary investments and actions related to achieve synchronous interconnection, the following next steps are required:

- dynamic stability analysis – necessary in order to evaluate system behaviour in the case of frequency disturbance and to identify the inter-area oscillations in the extended interconnected system of UCTE;

- evaluation of the costs related to disconnecting Baltic power systems from the IPS/UPS interconnection, based on agreements with eastern neighbours Russia and Belarus.

A full scope feasibility study must be performed by the UCTE, based on UCTE requirements; the preparation phase started in December 2008 and the study is planned to start in mid 2009.

Cooperation of Transmission System Operators in the Baltic States, Russia and Belarus (BRELL)

The Baltics operate synchronously with the UPS of the CIS via 330 kV and 750 kV high voltage transmission grids. On the 7 February 2001, the organizations Belenergo, UPS of Russia (RAO EES Rossii), Eesti Energia AS, Latvenergo AS and Lietuvos Energija AB, concluded an Agreement on Parallel Operations of Power Systems and established BRELL. This is a body for cooperation between transmission system operators in Belarus – Belenergo, Russia – OAO ФСК ЕЭС and OAO CO ЕЭС, Estonia – OÜ Põhivõrk, Latvia – Augstsprieguma tīkls AS and Lithuania – Lietuvos Energija AB. In the 2008 reporting period, the functions of the Secretariat of BRELL were performed by OÜ Põhivõrk and OAO CO ЕЭС will perform the task of Secretariat of BRELL Committee as of 1 January 2009.

The BRELL organization shall maintain conditions necessary for the reliable operation and interconnection of the power systems of Belarus, Russia, Estonia, Latvia and Lithuania and deal with:

- coordination in the area of System Design Criteria and Operational Standards;
- coordination in the area of development of the BRELL transmission system's long-term planning of the 220–330–750 kV network;
- modelling of the BRELL`s 220–330–750 kV network;
- developing and maintaining relations with other relevant organizations and institutions in the BRELL states;
- O&C (incl. short-term planning of maintenance and performing switches of cross-border lines, information exchange, and coordination between control centres in normal and emergency situations etc.);
- developing and maintaining conditions regarding Inter-TSO Compensation;
- good collaboration within BRELL provides the technical prerequisites for trading, taking into account the conditions prevailing in each country. The committee shall contribute to international co-operation and information exchange pertaining to the power system and the electricity market. An international seminar on congestion management was held in Minsk in September 2008.

The liquidation of DC Baltija on the 1 October 2006 resulted in several changes from the standpoint of operations and control as well as short-term planning of the parallel operations of BRELL Power Systems: since the 1 July 2008 some planning and control functions in BRELL have been decentralized.

Cooperation of Transmission System Operators of Baltic States, Poland and NORDEL

In February 2008, the TSOs of the Baltic States, Poland, Finland and Sweden decided to start cooperating in order to improve multiregional system planning and coordination in the Baltic Sea Region. With this goal in mind, they signed a Memorandum of Understanding (MoU). The aim and purpose of this MoU is to develop mutual understanding between parties and agree to a set of principles for system planning cooperation around the Baltic Sea. The MoU was signed by the following TSOs: PSE Operator S.A. of Poland (UCTE), Svenska Kraftnät (NORDEL) of Sweden, Fingrid OYJ (NORDEL) of Finland, Lietuvos Energija AB (BALTSO) of Lithuania, Augstsprieguma tīkls AS (BALTSO) of Latvia and OÜ Põhivõrk (BALTSO) of Estonia.

The strategic objective of the Baltic power systems is to integrate local power markets into the European power market area and increase the security of power supply in the whole region. The goal of Nordic and Polish TSOs is to promote the development of the electricity market and enhance the coordination of planned interconnections. By reaching these goals, the entire Baltic Sea market region would become more strongly integrated into the European electrical market. This co-operation is being launched to establish a coordinated and transparent planning relationship between NORDEL, BALTSO and UCTE (Polish TSO) while also developing a coordinated extension plan of interconnections from the Baltic to the NORDEL area and Poland in order to satisfy transmission needs between these areas. Another objective is to create a continuous discussion forum for power system planning experts working in the Baltic Sea area. The results of their analyses will be coordinated into a long-term development plan for developing interconnections between the regions through the following processes:

- establishing harmonized planning criteria and technical requirements in each synchronous region;
- combining regional scenarios and hypotheses for power exchange and the adequacy of power supply during different seasons of the year;
- developing a regional power system model and analysis;
- ensuring socio-economic benefits for the whole Baltic Sea region.

The MoU arranges the organizational structure for cooperation, which includes a steering group (consisting of the heads of the planning departments and working groups to be set). If needed, additional experts shall also become involved. The working group shall be chaired by the head of the first development plan, i.e. Fingrid OYJ. This chairmanship will rotate between parties on an annual basis in the following order: Fingrid OYJ, OÜ Põhivõrk, Augstprieguma tīkls AS, Lietuvos Energija AB, PSE Operator and Svenska Kraftnät. The final report will be finished by the beginning of 2009. The next step is planned for the beginning of 2009 to analyze the security of supply in the whole region, with a special focus on the security of energy supply for the Baltic power systems.

ACTIVITIES OF BALTSO

Operational and Security Working Group

The year 2008 was fairly busy for the operations and security working group members, since a decision was made to transfer operations to the new system of de-centralized operative dispatch interactions in the BRELL Electric Ring, starting from 1 July 2008. In order to fulfil the given task of the dispatch control function de-centralization, members of the WG took part in the revision, correction and harmonization of the operative dispatch documentation; preparation and administration of the two international dispatcher training simulations on 4 June and 19 June 2008 took place in the training centres of OAO CO ЕЭС in Moscow and St. Petersburg. The above set of technical and organization measures were carried out to provide for the successful transfer to the new principles of operation and eventless power system operation during the second half of 2008. In 2008 the WG prepared and the BALTSO Committee officially signed a regulation of coordination planning for normative emergency power reserves in the BALTSO power systems. Development of "Regulations for remedial actions after total blackouts within the power systems of BALTSO" and the "Requirements for the organization of the island-operation of the BALTSO power systems" was commenced. In 2008 the following documents came into force: the regulation for policies for the power systems of Belarus, Russia, Estonia, Latvia and Lithuania; regulations for the organization of Operative-Dispatch Control in the synchronous operation of IPS* of Belarus, UPS* of Russia, PS* of Estonia, PS of Latvia and PS of Lithuania; instructions for contingency localization and elimination in the electricity ring of the Belarusian, Russian, Estonian, Latvian and Lithuanian power systems (ER BRELL**); regulation for development, changing and actualization of the calculation model of power systems of ER BRELL. Apart from these documents, members of WG have been working on a wide range of BRELL documents, to be signed in 2009. In 2009 WG is planning to develop documentation concerning the following topics: Baltic TSOs Communication Policy; power system restoration after blackouts and separation of the Baltic power systems for island operation.

Development Working Group

Two new studies were finished in December 2008. The first study, "Demand Forecasts for BALTSO Power Systems (2008 - 2030)", summarized energy demand and peak load forecasts in Estonia, Latvia and Lithuania for the period of 2008 - 2030. Energy demand forecasts for the Baltics are based on long-term economic development prognoses and presented in three demand growth scenarios:

- Optimistic scenario – considered to prove the power system's ability to supply the maximum demand growth, starting from 3.6 % annual energy demand growth in 2009 to 2.7 % in 2030;
- Base scenario – presumes the most probable energy demand growth, starting from 2.4 % annual energy demand growth in 2009 to 1.6 % in 2030;
- Pessimistic scenario – presumes the slowest energy demand growth, starting from 1.4 % annual energy growth in 2009 to 1.0 % in 2030.

The most important transmission system planning task is to make proper electricity demand forecasts. Transmission grid development plans and generation adequacy plans depend on demand forecasts, in order to timely predict system needs and make proper decisions.

The second study, "Generation Adequacy: Assessment of Baltic Power Systems 2009–2030", outlines the results of the generation adequacy of the Baltic power systems for the period of 2009 to 2030. It examines the potential development of electrical demand and installed generation capacity and assesses, on this basis, the extent to which generation capacity is adequate to meet demand in the short and long term. In this report, the analysis of adequacy proposes two scenarios for the evolution of generation capacity:

- Scenario A – "Conservative": only new generation projects known to be firm are integrated;
- Scenario B – "Best estimate": this takes into account future power plants whose commissioning is considered to be reasonably likely according to information available to the Transmission System Operators.

The adequacy analysis was conducted according to methodology worked out by the Union for the Co-ordination of the Transmission of Electricity (UCTE). To keep the power system adequate for the Baltic States (Estonia, Latvia, and Lithuania) in the period of 2009 to 2030, new units should be constructed. According to Scenario A, a winter peak load in Baltic States will be met with a negative adequacy level. Baltic States will be forced to import a significant amount of electricity for all of the investigated period. According to Scenario B, a winter peak load in Baltic States will be met with a positive adequacy level. In the Baltic States, there will be a surplus of electricity during the whole period of 2012-2030; this is contingent on the timely construction of all power plants which were scheduled in Scenario B.

Information Technology & Communication Working Group

Activities on the agreed plan for the Information technology and communication WG for 2008 were suspended.

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* PS – Power System, IPS – Interconnected Power Systems, UPS – Unity of Power Systems.
** ER BRELL – Electric Ring of power systems of Belarus, Russia, Estonia, Latvia and Lithuania.

DEVELOPMENT OF BALTSO

Estonia

Estonian Electricity Market

The market structure has similarities to the Scandinavian model, with System responsibility given to a transmission systems operator. All market participants are obligated to have an open delivery contract, while balance providers need a balance agreement with the system operator. There are currently four active balance providers working in Estonia. Market trading is carried out by bilateral contracts, not spot-market. Starting from January 2009, 35 % of the market must be opened to competition. Customers with consumption levels of over 2 GWh per year become eligible customers, and have the right to choose a supplier. They also have the right to apply for an import license, to be issued by the Electrical Market Regulator. However, at the same time eligible customers have the right to buy electricity protected under regulated tariffs. The opening of the market is planned to be completed by 2013. Non-eligible customers can purchase their electricity from the grid company they are physically connected to, or from a seller named by that grid company. Grid companies and sellers providing energy to non-eligible customers can purchase electricity (generated from oil shale mined in Estonia, generated by a small producer, generated from renewable energy sources or generated in a combined heat and power production regime) from an Estonian producer possessing generating installations with a total net capacity of at least 500 MW. As regards production, all generators producing electricity from renewable energy sources or producers generating electricity in an efficiently combined heat and power production regime can sell their electricity following current market rules.

Support schemes for RES-electricity and efficiently co-generated electricity

There are two support options for RES-electricity and electricity generated in an efficient cogeneration regime:

- purchase obligation (feed-in tariffs);
- a premium tariff for electricity sold following market rules.

The feed-in tariff for electricity, which is produced from the following:

- RES with the generator, which does not exceed 100 MW is 115 s/kWh (7.4 €cent/kWh);
- waste, peat or oil-shale gas in the process of a high efficiency combined heat and power plant is 81 s/kWh (5.2 €cent/kWh).

The premium tariffs for electricity, which is produced and sold by the producer, are from the following:

- RES with the generator, which does not exceed 100 MW - 84 s/kWh (5.4 €cent/kWh);
- waste, peat or oil-shale gas in the process of high efficiency CHP - 50 s/kWh (3.2 €cent/kWh).

Pursuant to the Electrical Market Act, Estonia may have only one transmission system operator. The Energy Market Inspectorate issued a corresponding license to OÜ Põhivõrk (the Transmission System Operator), which is a national grid company in the electrical market. The main functions of the TSO are as follows:

- transmitting bulk electricity at voltages of 6–330 kV to distribution networks, large consumers and neighbouring power systems;
- developing, operating and maintaining a 110–330 kV electrical network, covering all Estonian territory;
- ensuring the reliability of the Estonian electrical system's operation in cooperation with neighbouring electrical systems;
- the creation and application of a harmonized set of rules and design for the integration of physical markets in all timeframes;
- ensuring Estonian energy balance and operating a balance settlement for the balance providers.

OÜ Põhivõrk was created by the 1998 decision of Eesti Energia AS to merge five regional electricity networks and then divide them into two structural units – OÜ Põhivõrk (the TSO) and OÜ Jaotusvõrk the distribution network. OÜ Põhivõrk then started operating electrical devices at a voltage of 110–330 kV (including 110 kV transformers). With the creation of the new structural units, the OÜ Põhivõrk also became responsible for the accounting of its economic activities and auditing its records.

The task of electrical distribution is handled by distribution network companies, of which there are 40 in Estonia. Suppliers buy electricity from producers, and the electrical transport service (the network service) buy electricity from distribution networks. Together they establish suitable price packages for Estonian consumers, selling both electricity and network service together. Nevertheless, a handful of large consumers prefer to buy electricity and network services directly from producers and electricity networks.

Estonian Energy Policy

The fuel and energy sector is a strategic state infrastructure, which must ensure that Estonia has an uninterrupted supply of high-quality fuel, electrical energy and heat at optimal prices. At the same time, the fuel and energy sector must be as efficient as possible and comply with safety and environmental requirements. Consequently, a sustainable fuel and energy sector is one of the bases for Estonian national security. In the present, and continuing into the future, the main strategic objectives of the Estonian fuel and energy sector are to:

- ensure fuel and energy supply at the required quality and optimal prices;
- ensure the existence of locally generated power to cover domestic electricity consumption needs and the supply of liquid fuel in compliance with the law;
- ensure that by 2010 renewable electricity forms 5.1 % of gross consumption;

- ensure that by 2020 electricity produced in combined heat and power production stations forms 20 % of gross consumption;
- ensure that the power network is completely modernized in approximately thirty years;
- ensure that, under open market conditions, the competitiveness of the domestic market of oil shale production is preserved and its efficiency is increased. Additionally, modern technological developments should be applied in order to reduce harmful effects on the environment;
- ensure compliance with the environmental requirements established by the state;
- increase the efficiency of energy consumption in the heat, energy and fuel sector;
- develop measures which enable the use of renewable liquid fuels, particularly – biodiesel, in the transport sector;
- establish preconditions for establishing connections with the energy systems of the Nordic countries and Central European countries.

Future Development of Estonian Energy Policy

On 26 February the Estonian Government approved the new Energy Sector National Development Plan lasting until 2020 and the Estonian Electricity Development Plan for 2008-2018.
The main objective of those two measures is to:

- ensure the reliability of the Estonian electrical system and the security of supply to Estonian consumers;
- stimulate power consumption efficiency;
- ensure electricity supply at reasonable prices.

The energy sector development plan contains the following key decisions for the future:

- diversification of energy sources used in the generation sector, including construction of the Estonian nuclear power plant by 2023 and decreasing the dependency on oil-shale generation;
- by 2010, renewable electricity will form 5.1 % of gross consumption;
- by 2020, electricity produced in combined heat and power production stations will account for 20 % of gross consumption;
- the limitation of energy consumption;
- preconditions will be established for connecting with the energy systems of the Nordic and Central European countries, including the new interconnection Estlink 2 between Estonia and Finland;
- the decisions to open the market, including the introduction of Nord Pool PEX in Estonia;
- creation of the Estonian Energy Agency, with the purpose of ensuring the efficient application of the national energy strategy in Estonia.

Current Situation of Transmission Grid

The transmission system operator of the Estonian power system owns a network containing 110, 220 and 330 kV lines, substations and most of the 110 kV power transformers. However, according to the new Grid Code, new grid connections with OÜ Põhivõrk can be made only at the voltage of 110 or 330 kV. The Estonian power system is interconnected with neighbouring countries through five 330 kV transmission lines. Estonia has two 330 kV lines with Latvia – one from Tartu, another from the Tsirguliina substation. Estonia has three 330 kV interconnection lines with Russia – one from Balti PP, a second from Eesti PP and a third from Tartu TS. The Estonian network has been connected to Finland's network since 2006, via a 350 MW DC submarine cable (Estlink).

The main events of 2008:

- reconstruction of the 110 kV Aseri transformer substation (TS) for a 24 MW wind park connection;
- commissioning of the 110 kV Aulepa TS for a 56.6 MW wind park connection;
- reconstruction of four 110 kV substations with a total transformer capacity of 88 MVA;
- completion of the extension of the IRU 110 kV substation for the new 25 MVA CHP connection.

Development of Transmission Grid

Harku-Sindi-Tartu

According to the Estonian grid development plan, the establishment of new 330 kV connections between Tartu–Viljandi–Sindi–Harku substations is foreseen. The new 330 kV transmission lines in Tartu-Viljandi-Sindi-Harku will reinforce connections between the northern and southern 330 kV networks while providing increased reliability in the Tallinn and Pärnu regions. Additionally, the new transmission lines provide better opportunities for connecting the new wind parks to the transmission grid. The connection is planned for construction in the following sections:

- Tartu-Viljandi section in 2012;
- Viljandi-Sindi section in 2014;
- Sindi-Harku section (after 2018 approximately).

Aruküla 330 kV Substation

The existing 220/110 kV Aruküla substation will be transferred to the voltages of 330/110 kV in 2013. There will be a new 12 km 330 kV overhead double circuit line lead-in from the previously built 330 kV Balti-Harku overhead line, using the existing Aruküla 220 kV overhead line's right-of-way. Also, there will be two new 330/110 kV transformers, both with a capacity of 200 MVA and two 330 kV lines, Balti-Aruküla and Aruküla-Harku, each with a duplex-connection. At the same time, a new 110 kV two-busbar system will be built to replace the existing one.

Reinforcement of Harku Substation

In the case of imports from ESTLINK1, there is an existing bottleneck, caused by a weak interconnection between 330 and 110 kV grids in the Harku substation. With some reinforcement, there will be an additional 330/110 kV transformer installed, with a capacity of 200 MVA and to assure transmission from a 330/110 kV transformer to a 110 kV grid; the existing Kiisa–Veskimetsa overhead line will be connected to the Harku substation.

Interconnections

ESTONIA-LATVIA Third Interconnection

According to the BALTSO Report "Baltic Grid 2025", a third connection between Estonia and Latvia has been proposed. The analysis of the interconnection between Estonia and Latvia has become a part of the feasibility study organized by the Estonian TSO OÜ Põhivõrk, together with Latvian TSO AS Augstsprieguma tīkls. Alternative routes (right-of-ways) are being investigated and compared economically for the Harku-Sindi-Riga 330 kV corridor. The results will be prepared by the end of March 2009. Concurrently, a complete estimation of the socio-economic benefits (market analyses) has started and will be completed by the end of April 2009. The final investment decision will be taken after completing an economic and technical analysis of the interconnector. The benefits of the line can be quantified in terms of the socio-economic benefits deriving from a larger NTC. The earliest possible completion date is 2018, considering time necessary for selecting the right-of-way, the authorisation process and construction.

ESTONIA-FINLAND Second Interconnection

The transmission system operators in the Baltic Sea region from NORDEL, UCTE (Poland) and BALTSO developed a framework for a Multiregional Planning Project coordinating the extension plan of interconnecting the Baltic States to Poland and the Nordel area in order to satisfy the transmission needs between regions. According to this study, the ideal market-based solution (without Security of Supply considerations) is to implement two interconnections: Finland–Estonia and Lithuania–Poland. This plan would result in socio-economic benefits for the countries involved while also improving the security of supply and integration of the Nordic-Baltic-European electricity market. A second connection between Estonia and Finland – Estlink-2 (from Pussi s/s to Anttila s/s in Finland with capacity in the range of 650-800 MW) is planned to be completed by 2014. This additional interconnection should increase the reliability of the Baltic power systems, while decreasing their dependency on Russia as well as the other BALTSO countries. In emergency situations, it will thus be possible to import a greater amount of power from the Nordic countries. Furthermore, the enhancement of the interconnection capacity will be helpful for integrating the future power market of the BALTSO area with Nord Pool. At the moment, the right-of-way selection of the Estlink-2 is in progress on the Estonian side. The arrangement for selecting the right-of-way for the new HVDC submarine cables has also started.

Latvia

Latvian Electricity Market

By 1 July 2007, all the consumers were granted a right to become eligible customers. The rights and obligations of market participants are described in Electricity Trading Rules while balancing principles are described in the new Grid Code. The TSO is responsible for the provision of balancing services to market participants and distributions system operators (DSOs) at the transmission level, while DSOs provide services at the distribution level. Customers can delegate the balance responsibility for balance settlement to traders who work on their behalf with the TSO or DSO respectively. The DSO can delegate to the TSO the provision of balancing services directly to the DSO customers. The gate closure for market participants is two working days (in advance) while the last scheduled adjustments can be done one working day in advance until 12 PM. The Public Trader provides services for all consumers who are not in the free electricity market and is obligated to purchase public service obligations, specifically supported generation (cogeneration and renewable) at regulated feed-in tariffs, which are higher than prices in wholesale markets. All consumers of Latvian power system compensate the Public Trader's expenses associated with these obligations via additional payment component collected by system operators. There is no spot-market or market place, while trade is performed on a bilateral basis. If power exchanges are planned between traders in two countries, the sum of these power exchanges have to be accepted by the TSOs in both countries. As of 15 May 2008, the Electricity Market Act established that any company with a turnover of over LVL 7 000 000 (EUR 10 000 000 or more than 50 employees is obliged to buy electricity on the free market. That constitutes about 55 % of Latvian electricity demand. The main generators remain Plavinas HPP, Kegums HPP and Riga HPP, with a total installed capacity of 1535 MW. Additionally, Riga 1 CHP has been commissioned with 150 CCGT and a new 400 MW unit with 270 MW GT plus 150 MW ST at Riga 2 CHP. The largest distribution company is Sadales tīkls AS. It was created on 1 July 2007 by merging seven regional distribution subsidiaries of Latvenergo AS. Sadales tīkls AS is legally separated from Latvenergo AS. A few small distribution network companies are also operating, e.g., Vats and Latvijas Dzelzscels. The main trader is Latvenergo AS, who at present also operates as a Public trader, supplying power to active users. Latvenergo AS has a 25 % share in the Estlink (Nordlink OU – the merchandiser cable owner and operator) DC cable. The Eesti Energia AS subsidiary E.Energy SIA and Energijas Avots SIA are also increasing their market share. Tariff for the service:

Type of tariff	Network charge	110 kV	6-10kV substation	Distribution network
Energy	€/MWh	2.06	2.36	2.71
Capacity	€/kW/Year	5.84	7.25	7.66

Latvian Energy Policy

On 16 January 2008, an updated version of the Grid Code version was approved by the Regulator. This new version was developed in order to supplement the requirements of the Electrical Market Act of 2005 as well as the general Electricity Trading Rules.

On the basis of the annual statement of the transmission system operator Augstsprieguma tīkls AS, the Ministry of Economy will announce the Public Obligation tender for the construction of a 400MW base load (coal or gas fired) power plant in Liepaja. This will reduce Latvian dependency on electricity imports while also diversifying power production and supply.

The construction of another 400 MW unit at Riga CHP2 is still under consideration. If it is implemented, the existing old units of 220 MW in total will be decommissioned, providing a 200 MW total increase in the power plant's installed capacity.

By 2020 the following projects for transmission system will be considered:

- an 330 kV AC (alternating current) line or dirrect current (DC) cable between Latvia–Estonia;
- a new 330 kV transmission line loop in the Western part of Latvia;
- a HVDC (high voltage dirrect current) link between Latvia and Sweden;
- a new 110 kV substations in the Riga area.

A HVDC submarine interconnection between Latvia and Sweden (as an alternative to a Lithuania-Sweden cable) is currently under discussion as part of the overall Baltic network and the development of a security of supply plan. A new connection between Estonia and Latvia is currently being considered, perhaps as a alternating current or direct current line and a cable connection from Sindi (Estonia) via Saarema island (Estonia) to Ventspils (Latvia), instead of a 330 kV land line from Sindi (Estonia) to Riga (Latvia); this will require strengthening of the existing 110 kV network in the western part of Latvia, creating a 330 kV transmission grid and thus providing the back-bone for a possible cable connection to Sweden.

Current Situation of Transmission Grid

The existing transmission grid in Latvia consists of 110 and 330 kV power lines and substations. The 330 kV transmission grid includes 23 power lines, with a total length of 1249.3 km, and 15 substations. The 110 kV transmission grid includes 130 substations and 117 power lines, with total length of 3907.6 km. The total number of transmission grid transformers is 20, with a 3075 MVA capacity. The Latvian transmission grid is connected to neighbouring countries via seven 330 kV OHLs: two OHLs with Estonia, one OHL with Russia and one OHL with Lithuania. The capacity of this transmission grid is currently sufficient in order to ensure the safe operation of the power system. Latvia has always tried to increase its generation capacity and reduce dependence on electricity imports. The new 442 MW unit at Riga CHP–2 was commissioned at the end of 2008. This power station will considerably increase the capital's security of supply and heating supply. In the future, another unit of such type is planned for construction in Riga CHP–2. A new solid fuel power station (400 MW) is considered be constructed in Latvia's western region near Liepaja. Considering the government's support for the production of electricity from renewable energy sources, there is considerable activity in the development of new wind power stations in the western region of Latvia; on the coastline and offshore in the Baltic Sea. Currently, this activity is confined to research and licensing. According to some estimates, the wind power stations' capacity could reach up to 1500 MW. Construction of a new 330 kV substation in Riga CHP–2 and reconstruction of a 330 kV substation at Aizkraukle for Plavinas HPP have been completed. It was constructed with a reliable primary scheme as well as modern HV equipment, which can be controlled and monitored remotely from the dispatch centre. The Valmiera substation is still under reconstruction, as it is an important 330 kV transit substation. Taking into consideration that by the end of 2009, the 2nd Ignalina NPP unit will have been closed (according to current plans), the Valmiera 330 kV substation reconstruction project is also scheduled for completion by the end of 2009 (prior to the shutdown of Ignalina NPP). The 110 kV substation switchyard reconstructions will continue in 2010. The 110 kV network development plan includes the construction of 2 new substations ("Matiss" and "Zolitude") in Riga and the construction of a 110 kV substation "Liepajas metalurgs" with two new cable lines in Liepaja. The new 110 kV overhead line (Broceni-Cemeks), and cable line (Salamandra-Juglas Jauda) were finished in 2008.

Reconstruction of three 110 kV substations in Cesis, Jekabpils and Riga were finished in 2008.

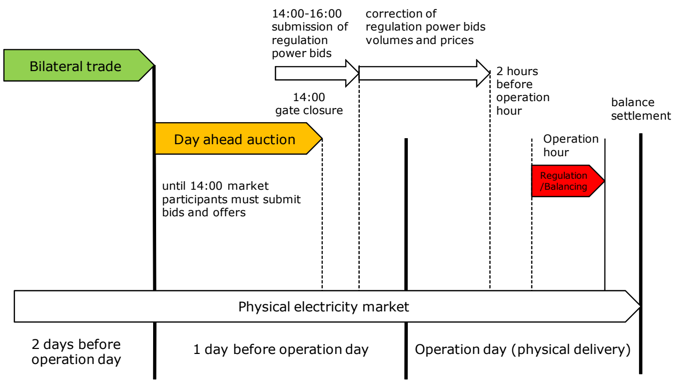
Development of Transmission Grid and Interconnections

New 330 kV connectors will be constructed to increase the security of supply in the Latvian power system. The RTEC-1 – Imanta 330 kV cable line design has begun. This power line will complete Riga 330 kV ring and increase Riga's security of supply. The Kurzeme Ring development includes the construction of 330 kV lines on the Liepaja–Ventspils–Riga route. This project will be completed by 2018, and will provide the back bone for the wind park and Liepaja's power connection. Construction of the Kurzeme ring and a large power plant in Liepaja together constitute the preconditions for building a DC interconnection with Sweden (from Ventspils to the Stockholm region) and Estonia (from Ventspils to Sindi). The Latvian TSO Augstsprieguma Tīkls, together with the Estonian TSO Pohivork, have carried out a feasibility study on a 330 kV interconnection from Sindi (Pärnu)–Ventspils (West–Baltic Link), which will increase the transfer capacity and security of supply in the region. The first project phase (a 330 kV overhead line from Liepaja–Ventspils, with two substations in Ventspils and Liepaja) is planned for construction by 2015. The next phase, finishing a 330 kV power line from Ventspils-Riga, will be completed by 2017; the third phase will be a Ventspils–Sindi and Ventspils–Sweden DC cable construction.

Lithuania

Lithuanian Electricity Market

The Lithuanian electricity market has been operating since 1 January 2002 when consumers obtained the right to use their eligibility on the basis of the adopted Law on Electricity. Consumers became free to choose their supplier or become independent suppliers themselves. Generators have used this possibility to enter the market and exploit its advantages. Strong regulation of the electricity market is necessary due to the unique situation in the Lithuanian electricity sector. Regulatory measures were adopted for the dominant market producers, Ignalina nuclear power plant and Kruonis pumped storage power plant by defining price caps for electricity sold on the market. An auction system was built under the principle "pay as a bid", which supported a price fixing mechanism for dominant market participants. Competition among producers was facilitated by adopting market-based support schemes suitable for the domestic Lithuanian market. The peculiarities of the electricity market have encouraged the withholding of energy production, ensuring that the need for electricity production will increase after the closure of the Ignalina nuclear power plant. Electricity trading in the wholesale market is performed by bilateral agreements and trading on the open market through auctions. Suppliers are entitled to conclude a direct contract for electricity supply with the producers for volumes not exceeding more than 70 % of the total consumption of the supplier's clients, in accordance with electricity trade regulations applicable to the wholesale market. The remaining volume is obtained through the auctioning system according to the market price. Bilateral trade, auctioning, regulation of the power market and balancing responsibility are clearly defined in the secondary legislation. Presently, 8 power plants, 19 independent suppliers and 4 public suppliers are active participants in the wholesale market in Lithuania. Eesti Energia, Latvenergo, ATEL Polska, Baltic Partners and Inter RAO have established trading representative companies in Lithuania and obtained independent suppliers licenses. The wholesale market in Lithuania is operated by a Market operator. The electricity trade is performed as illustrated in time line below:



Lietuvos Energija AB has completed two projects on the electricity market and system services design with Elkraft and Fingrid. As a result of their common work and cooperation, the Lithuanian market's design was built similar to the Nordic model. Regulation of the power market was designed identically to the Nordic TSOs experience and has successfully performed since the first half of 2003 as a tool for TSOs and balancing purposes.

Market participants are free to conclude a bilateral agreement no later than 2 days before the operation day. The terms and conditions for such contracts are confidential, and only the volume information is provided to the market operator for a final balance settlement. The gate closure of free market trading at the auction is 2:00 p.m. on the day before the operational day (the day of actual production and consumption). For the time being, the market-based price for production and consumption is not the same. Lietuvos Energija AB is the sole provider of balancing for producers and suppliers. Lietuvos Energija AB provides planning and balancing services for suppliers under a common agreement as the trading representative. The unique framework of the electricity trading market allows the aggregation of all other types of electricity (balancing, purchased at a day-ahead auction, imported or exported electricity) and providing one price for both independent and public suppliers; at the same time, it represents the whole supply on an hourly basis on the open market. The separation of the imbalance settlement for demand and supply has already been implemented in the Lithuanian power system. The price of electricity for suppliers changes on a monthly basis, subject to the real costs of purchases. Trade at the day-ahead auction is carried out on a competitive basis between the producers, exporters, importers and two suppliers hourly. Therefore, one may draw the conclusion that the level of competitive wholesale electrical energy trading is 30 % of the total level of consumption.

After the gate closure of day-ahead market, participating producers are entitled to bid for sales or the purchase of regulating power. Bids for up and down regulating power are sorted according to prices; priority is given to market participants who propose the lowest prices for regulation, should it be necessary for balancing the system during the operational hour.

Electricity sold under public service obligations is electricity purchased from power plants operating with renewable energy resources (water, sun, wind, etc.), electricity produced by cogeneration plants (co-production of heating for municipal needs and electrical energy) and electricity generated at a power plant which is the main reserve for the Ignalina nuclear power plant. The National Control Commission for Prices and Energy defines the electricity price cap for electricity generated by supported producers.

Consumers and distribution networks, who are users of electrical energy transmission services, pay the system operator for the service of reservation and services of electrical energy transmission at the same level. The service of reservation means the costs incurred by the system operator for maintaining the necessary power reserves. Power reserves are at the disposal of electrical power plants and/or operators of the neighbouring energy system.

Tariff for the service of the transmission grid is divided into the following components:

Differentiated two-component prices charged by the transmission system operator:	
capacity component, when the ownership boundary is between 330-110 kV voltage equipment	6.35 LTL/kW per month
capacity component, when the ownership boundary is between 35-6 kV voltage equipment	10.98 LTL/kW per month
energy component, when the ownership boundary is between 330-110 kV voltage equipment	1.23 LTC/kWh
energy component, when the ownership boundary is between 35-6 kV voltage equipment	1.68 LTC/kWh
Differentiated price for the capacity reserve service – capacity component	7.69 LTL/kW per month
Public service obligations	6.58 LTC/kWh

The amount payable for reserves and power is estimated as a multiplication of average hourly power of an hour of maximal use per month by a corresponding tariff.

The amount payable for electrical energy is estimated as a multiplication of the quantity of electrical energy consumed per month by a corresponding tariff.

Lithuanian Energy Policy

The National Energy Strategy (Approved by Resolution No X-1046 of the Seimas of the Republic of Lithuania on 18 January 2007) defines the main targets set by the State and directions for their implementation before 2025 by fully adjusting these targets and directions to growing state needs and the most recent international requirements, with regard to aspects of efficiency, energy security, environmental and management improvement. The following provisions for the development of Lithuania's energy sector are as follows:

1) paying particular attention to the countries and regions largely isolated from the EU energy market;
2) delegating the European Commission with developing a priority Interconnection Plan and facilitating the implementation of priority infrastructure projects;
3) speeding up the diversification of supplied energy resources;
4) presenting a Strategic EU Energy Review on a regular basis;
5) drafting proposals regarding a common EU energy strategy, in particular maintaining a dialogue with Russia;
6) aiming at making the EU-Russia dialogue more effective and transparent, obtaining Russia's ratification of the Energy Charter Treaty of 17 December 1994 and the conclusion of the Energy Charter's Transit Protocol.

In compliance with the requirements and provisions of Europe's sustainable, competitive and secure energy, as formulated in Lithuania's Treaty of Accession (Official Gazette (Valstybės žinios), No 1-1, 2004), the Energy Charter Treaty of 17 December 1994, EU legal acts and the Green Paper, the following strategic objectives for the Lithuanian energy sector, common to all EU states, shall be set as follows:

- energy security;
- sustainable development of the energy sector;
- competitiveness;
- the efficient use of energy.

Pursuant to common strategic objectives of the energy sector and the substantial strengthening of Lithuania's energy security, the following development objectives for the national energy sector shall be set:

- to seek comprehensive integration of Lithuania's energy systems, especially the electricity and gas supply sectors, into EU systems and the EU energy market;
- to diversify the sources of primary energy supply by reviving nuclear energy and to rapidly increase the relative weight of renewable and indigenous energy resources, ensuring that the share of the natural gas supplied from a single country and used for the generation of energy would not exceed 30 % in Lithuania's annual fuel balance;
- to improve the efficient use of energy and save energy consumption.

Current Situation of Transmission Grid

The integration of the Lithuanian power system with the Western European market and the development of regional co-operation are among the main goals of Lietuvos Energija AB. The transmission grid is projected to develop by interconnecting the Lithuanian power system with the Polish power system. Efforts are being made to establish a common electricity market in the Baltic States by using the productive potential of these power systems for integrating with the markets of Western Europe and Scandinavia.

The major investments trends are the rehabilitation and development of the transmission grid, the implementation of new technology and the rehabilitation and development of power plants. The rehabilitation projects are one of the most important areas of the transmission grid.

The construction of the following substations was completed:

110/10 kV Ąžuolynė TS (II stage);
110/10 kV Nemunas TS (I stage).

The reconstruction of the following substations was in progress:

110/10 kV Nemunas TS (II stage).

The reconstruction of the following substations was completed:

110/10 kV Gedminai TS;
110/35/10 kV Ukmergė TS.

The reconstruction of the following substations was in progress:

330/110/10 kV Vilnius TS;
110/10 kV Centras TS;
110/10 kV Šilkas TS;
110/10 kV Noreikiškės TS;
110/10 kV Migla TS;
330/110/10 kV Panevėžys TS;
330/110/10 kV Šiauliai TS;
110/35/10 kV N. Akmenė TS;
110/35/10 kV Šakiai TS;
110/35/10 kV Pabradė TS;
110/10 kV Ignalina TS;
110/10 kV Gargždai TS;
110/35/10 kV Kuršėnai TS;
110/10 kV Merkinė TS;
330/110/10 kV Klaipėda TS;
110/10 kV Savitiškis TS.

The construction of the following substations was in progress:

110/10 kV Šventininkai TS;
110/20 kV Sūdėnai TS.

The following electricity transmission line was rehabilitated and the communication line reconstructed:

110 kV overhead line Vidiškiai–Skiemonys.

The following electricity transmission lines are currently being rehabilitated:

110 kV overhead line Kaunas–Jonava–Kėdainiai–Panevėžys;
110 kV overhead line Jurbarkas–Raseiniai–Kelmė–Šiauliai.

The investments totalled LTL 160 m.

Development of Transmission Grid

By 2020 Lietuvos Energija AB intends to construct five new 330 kV transmission lines in Lithuania:

Klaipėda – Telšiai (~ 82 km);
Panevėžys – Mūša (~ 72 km);
Kruonis – Alytus (double-circuit 53 km);
Vilnius – Neris (~80 km);
Visagino nucler power plant (VNPP) – Kruonis (~200 km).

Majority of these lines are necessary for strengthening the northern part of the 330 kV transmission grid and for the transfer of greater power flows from the prospective new nuclear power plant.

Interconnections

The national power company LEO LT AB, established on 20 May, 2008, controls through its subsidiaries the key part of the Lithuanian electrical power system – the electricity transmission grid and distribution networks. The company is currently implementing a series of strategic projects, specified in the National electricity strategy, including the establishment of interconnections between the Lithuanian, Polish and Swedish power systems, as well as the construction of a new nuclear power plant in Lithuania.

The company InterLinks, established on 29 July, 2008, is responsible for the development and implementation of the Lithuanian interconnection projects. InterLinks is in charge of feasibility studies, strategic planning and risk management, investment planning, implementation of preparatory tasks and the construction of power infrastructure supervision as well as the coordination of companies implementing the respective projects.

Lithuania–Poland

On 19 May 2008 Lietuvos Energija AB and PSE-Operator established a joint company named LitPolLink, responsible for the development and implementation of the interconnection project. A double circuit 400 kV line is planned to connect Lithuania to Poland via Alytus (LT)–Ełk (PL), with a projected transfer capability of 1000 MW. The project is expected to be completed by 2015. For the implementation of this project, a converter station is required near the Alytus substation as well as an additional 330 kV double-circuit transmission line Kruonis-Alytus.

Lithuania–Sweden

On 14 January 2008 SWECO International announced the second stage in the report of the feasibility study. On 5 February 2008 finalization of the feasibility study was approved. The study results showed that project was feasible, with a capacity of interconnection of 700-1000 MW, length – ~ 350 km, and required investments of approximately EUR 516–637 m (depending on the chosen technology and capacity). It is expected that the project will be completed by 2016. After decommissioning of the Ignalina Nuclear PP, the Baltic region will lose its biggest and cheapest power generation unit and remain highly dependent on Russian energy. Interconnection between Lithuania and Sweden is important, as is the integration project of the Baltic power systems into the Nordel electricity market to ensure the security of supply for all the Baltic counties (Lithuania, Latvia and Estonia). This interconnection would also allow for the better use of power resources in the Baltics and Nordel.

VAE–Liksna

Based on the results of the common Study prepared by the Baltic States ("BALTIC GRID 2025" Eesti Energia, Latvenergo, Lietuvos Energija AB; 2007), it is necessary to build an additional 330 kV line VNPP–Liksna between Lithuania and Latvia (about 18 km in the territory of Lithuania). This necessity is related to the construction of new nuclear power plant in Visaginas. In order to ensure the possibility of transferring capacity to Estonia and Latvia, it is necessity to construct an additional 330 kV line between Lithuania and Latvia.

New Generation

Presently, the total installed capacity of the power plants operating in the Lithuanian power system equals 5070 MW. Taking into consideration that a part of this capacity is used for the internal needs of the power plants, the maximum available capacity (adjusted) equals approximately 4648 MW. The Unit 1 of the Ignalina nuclear power plant was closed down on 31 December, 2004; Unit 2 will be closed by end of 2009. After the full closure of Ignalina NPP, Lietuvos PP will become the main source of power generation. To compensate for the lost capacity following the closure of Ignalina NPP, and to increase the competitive ability of electricity generation at Lietuvos PP, the feasibility of installing two new combined cycle gas turbine units at Lietuvos power plant has been analyzed. The capacity of each unit would be about 420 MW. Two new generating units, with a total installed capacity of about 350 MW, will be constructed at Kaunas CHP by 2013. Connecting to the system of 50 MW units at Mažeikiai CHP is currently under investigation. A new combined cycle (heat and electricity) power plant with gas turbines will be constructed in Panevėžys. Operation of the first 35 MW unit started at the end of 2007. This power plant's second unit should be launched around 2015. Construction of a new combined cycle power plant in Klaipėda is being considered, which would be operated by burning local fuel and waste. The construction of this power plant should be finalized by 2012. Its capacity should be approximately 20 MW. The laws of the Republic of Lithuania regulate and promote the construction of new renewable energy sources. By 2010, the quantity of electrical energy produced by using renewable energy sources should constitute 7 % of the total amount of annually consumed electricity. For this purpose, the capacities of wind parks should reach approximately 200 MW.

New Nuclear Power Plant Project in Lithuania

On 4 February 2008, Lietuvos Energija AB concluded a contract with the consortium regarding the fulfilment of the Environmental Impact Assesment (EIA) study and the preparation of the EIA report. The group of experts that won an open international tender consists of specialists from the Finnish company Pöyry Energy Oy as well as scientists from the Lithuanian Energy Institute. In addition to the members of this consortium, the following subcontractors, both Lithuanian and international, will participate in the EIA study:

- The Environmental Impact Assessment Centre of Finland, Ltd (Finland);
- UAB RAIT (Lithuania);
- The National Public Health Research Centre (Lithuania);
- The Finnish Meteorological Institute (Finland);
- The Institute of Botany (Lithuania);
- The Institute of Ecology (Lithuania);
- The Society of Metal Ecologists (Lithuania).

On 27 August 2008, the Environmental Impact Assessment Report on the Visaginas nuclear power plant was prepared.

This report has provided an answer to a crucial question: it has concluded that a new nuclear power plant in Lithuania is both feasible and acceptable. The final decision on the establishment of a new nuclear power plant operation will be taken by the Ministry of the Environment of the Republic of Lithuania during the first quarter of 2009, after the EIA report has been submitted for consideration to the public, both in Lithuania and abroad. On 28 August 2008, Visagino Atominė Elektrinė UAB, the project development company responsible for the construction of the new nuclear power plant, was established. July 2008 was marked by the end of a Technology Acknowledgment Project that had been under implementation for more than a year. The project achieved its key goals, which were specifically:

- building relations with potential manufacturers / suppliers of nuclear power plants;
- preparing a scheme for cooperation and establishing methods of cooperation between potential manufacturers / suppliers and project partners;
- identifying reactor designs of generation III (III+) available on the market, and assessing the readiness of manufacturers to implement the Visaginas NPP Project in Lithuania.

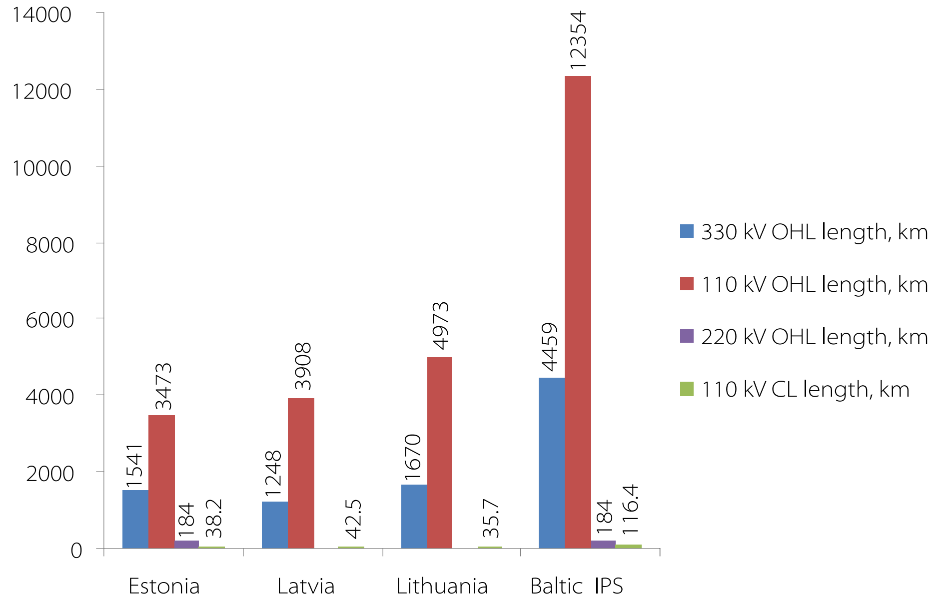
In order to use the current infrastructure to its maximum benefit without obstructing the regular flow of traffic, it is absolutely essential to plan traffic flows to the construction site of the Nuclear Power Plant well before actual construction begins. Consequently, a Transportation Study Project was launched in 2008. The Project consists of two stages – the study of possible transportation routes and a technical and economic assessment of the routes.

On 20 October 2008, Visagino Atominė Elektrinė UAB signed a contract to form a partnership with Transvelas UAB, Transmitto UAB and Maretas UAB in order to study practical transportation route(s) for heavyweight and bulky cargo (and other cargo) to the Visaginas nuclear power plant.

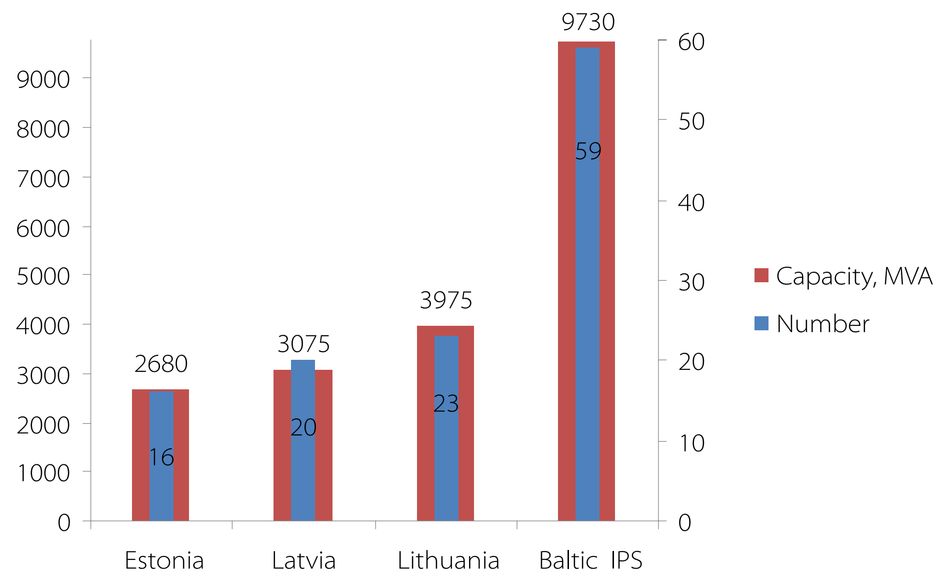
STATISTICS

The Transmission Grid in the BALTSO Countries

Length of Overhead and Cable Power Transmission Lines in the Baltic States



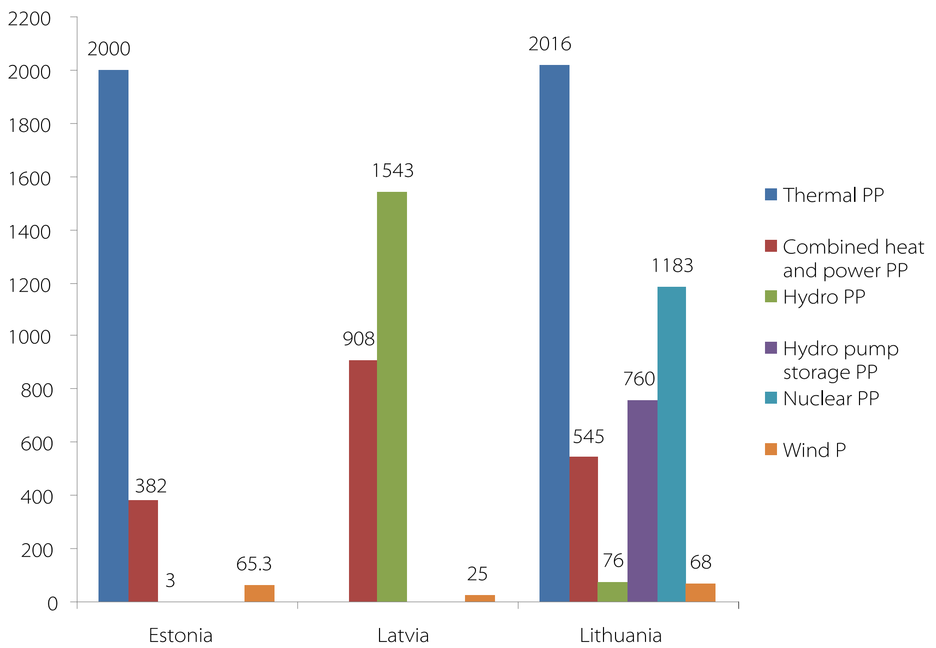
Number and Capacity of Transformers in the Baltic States



Capacity of Different Types of Plants in the Baltic States

Installed capacity (Net), MW	Estonia	Latvia	Lithuania	Baltics IPS
TOTAL	2258	2476	4648	9544
Thermal PP	2000*		2016	4016
Combined heat and power PP	382*	908	545	1799
Hydro PP	3	1543	76	1624
Hydro pump storage PP			760	760
Nuclear PP			1183	1183
Wind PP	65.3	25	68.3	163

* Unit 11 on Eesti PP with installed capacity 192 MW is operated in both cogeneration and condensation cycles

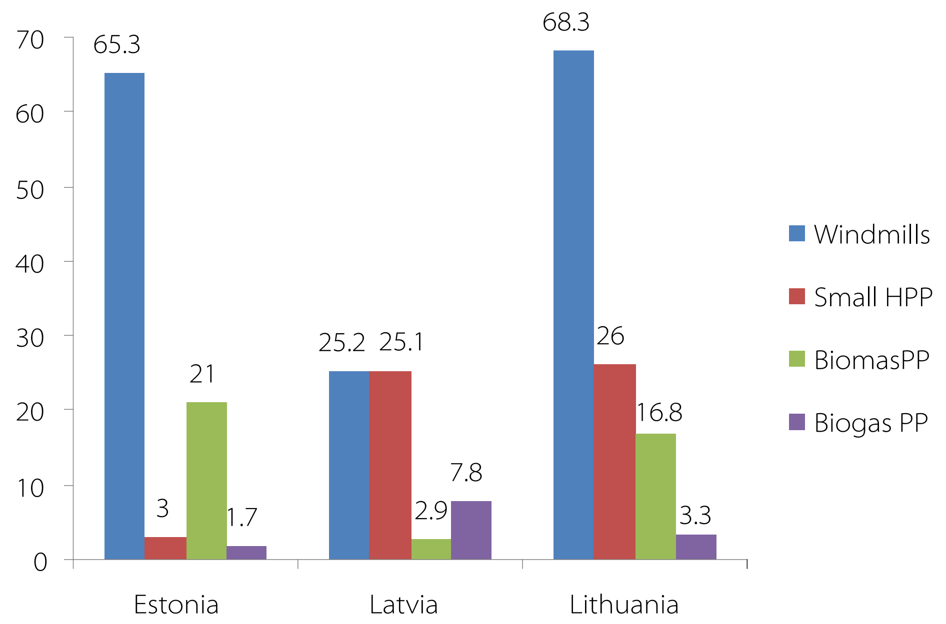


Installed Capacity of Power Plants, MW

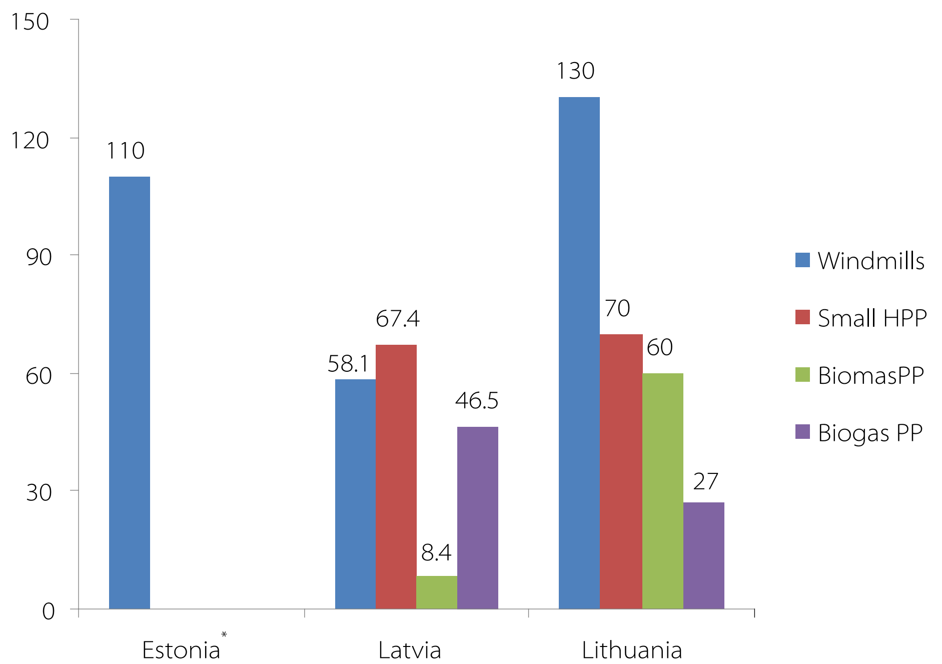
TSO	Installed capacity (gross)		Installed capacity (net)	
	01.01.2008	01.01.2009	01.01.2008	01.01.2009
ESTONIA	2707	2738	2185	2258
BALTI PP	765	765	654	654
EESTI PP	1615	1615	1346	1346
IRU CHP	176	176	104	104
Windmill	34	65	34	65
Small PP	112	112	44	86
Hydro PP	5	5	3	3
LATVIA	2233	2566	2179	2476
PIAVINAS HPP	869	869	860	860
KEGUMS HPP	264	264	261	261
RIGAS HPP	402	402	397	397
RCHP-1	144	144	139	139
RCHP-2	330	662	300	597
Imanta CHP	45	45	42	42
Windmill	25	25	25	25
Small PP	154	155	154	155
LITHUANIA	5030	5070	4608	4648
IGNALINA NPP	1300	1300	1183	1183
LIETUVOS PP	1800	1800	1732	1732
VILNIUS CHP	372	372	355	355
MAŽEIKIAI CHP	160	160	148	148
KAUNAS TPP	170	170	161	161
KAUNAS HPP	101	101	50.4*	50.4*
KRUONIS PSP	900	900	760	760
Small PP	26	26	26	26
Windmill	52	68.3	52	68.3
PETRAŠIŪNAI TPP	8	8	7	7
KLAIPĖDA CHP	11	11	9	9
PANEVĖŽIO CHP	35	35	33.5	33
Biomass	19	21	18	20
Auto producers	75	98	73	96

* By 2010 only second unit of Kaunas HPP will be operation

Subsidized Energy Installed Capacity in the Baltic States, MW

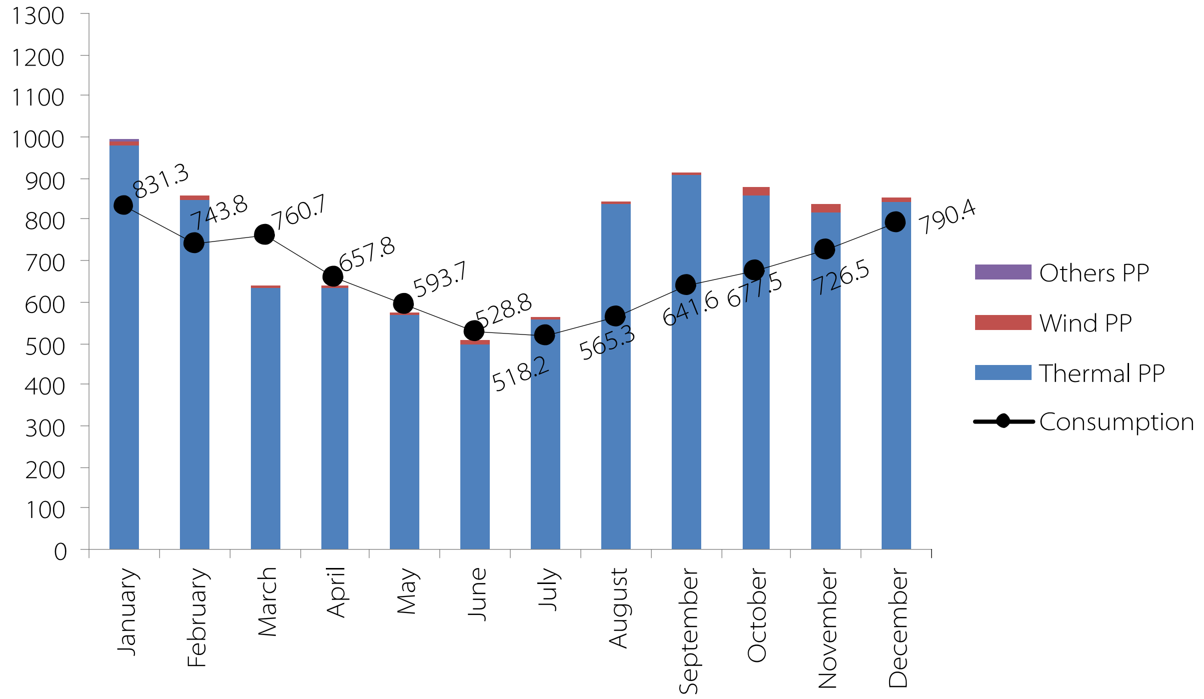


Subsidized Energy Production in the Baltic States, GWh

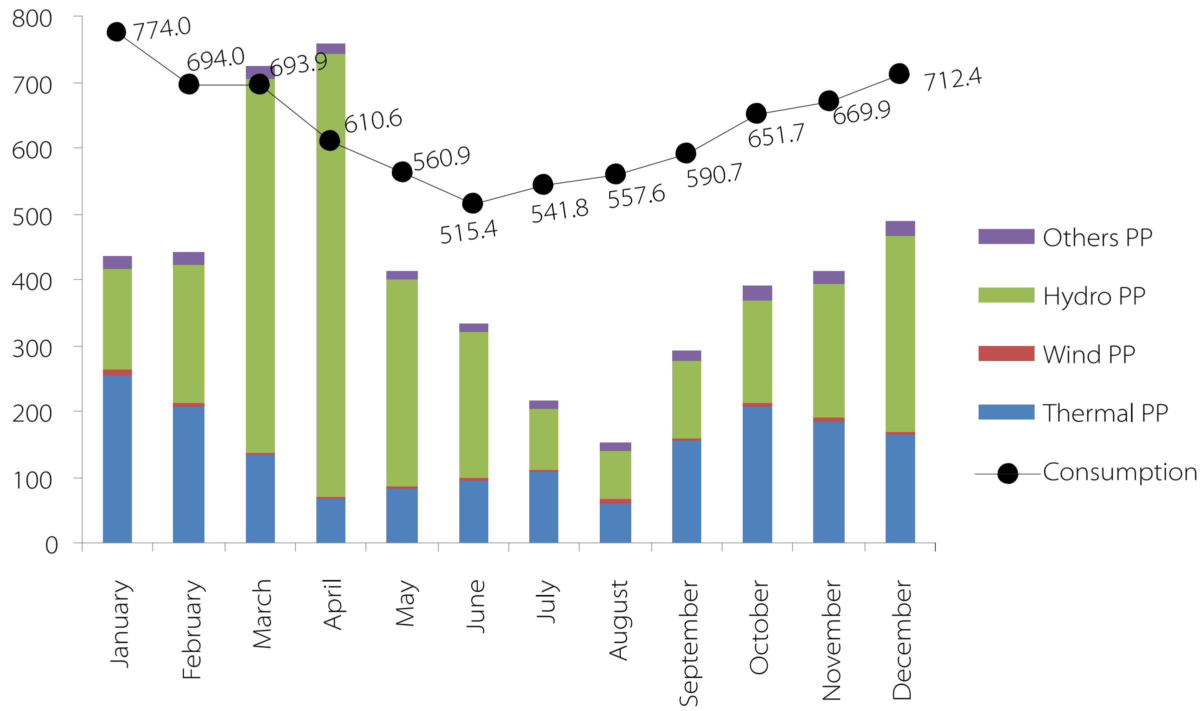


* Production of windmills connected with TSO

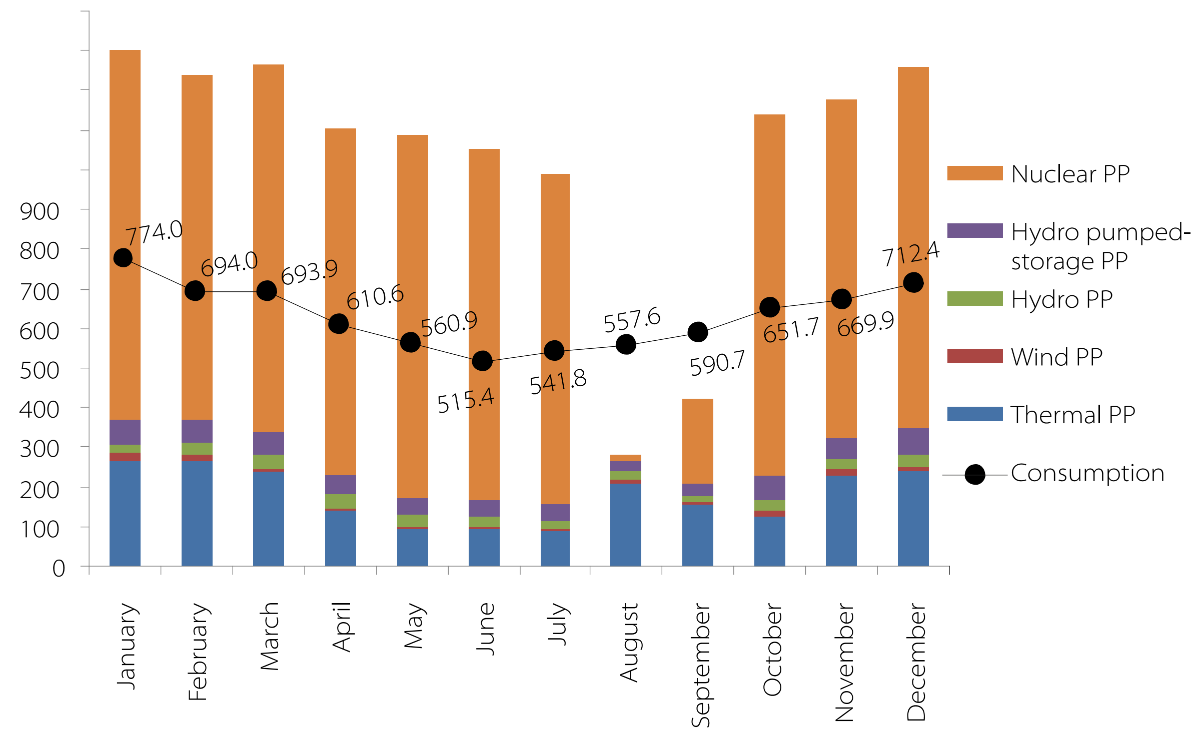
Net Consumption and Production by Month in Estonia, GWh



Net Consumption and Production by Month in Latvia, GWh



Net Consumption and Production by Month in Lithuania, GWh



Peak Load in the Baltic States and Baltic IPS

TSO	Peak load, MWh	Date	Time	Temperature at the time of max, °C	Generation, MW					
					Thermal PP	Nuclear PP	Kruonis HPSPP	Hydro PP	Windmills	Small PP
Estonia (net)	1479	2008.01.07	16÷17	-5.4	1608				15	8
Latvia (gross)	1419	2008.01.07	17÷18	-4.1	364			179	5	20
Lithuania (net)	1843	2008.01.07	17÷18	-4.6	350	1249	205	21	7	21
Baltic IPS	4741			-4.7	2322	1249	205	200	27	49

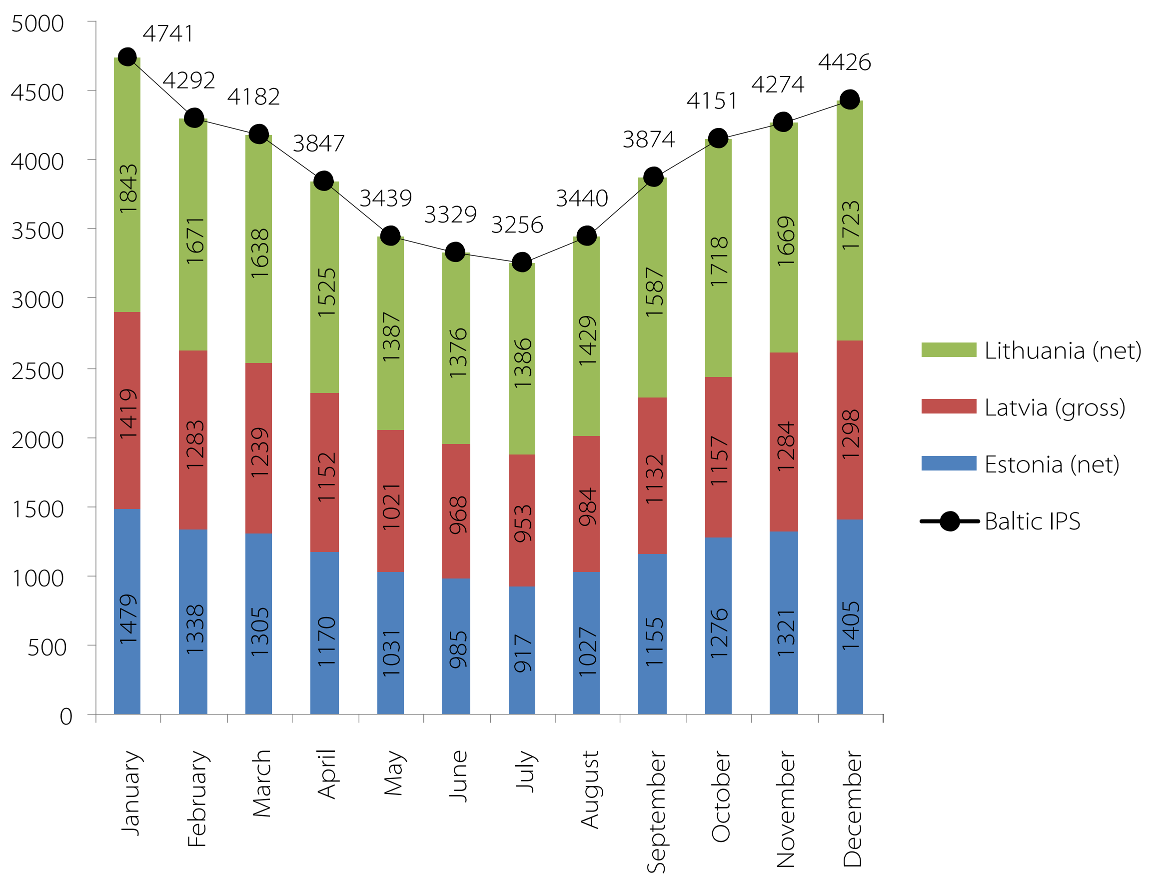
Minimum Load in the Baltic States and Baltic IPS

TSO	Peak load, MWh	Date	Time	Temperature at the time of min, °C	Generation, MW					
					Thermal PP	Nuclear PP	Kruonis HPSPP	Hydro PP	Windmills	Small PP
Estonia (net)	431	2008.07.27	05÷06	15.4	471				5	2
Latvia (gross)	412	2008.06.24	05÷06	14.8	131			0	19	11
Lithuania (net)	700	2008.06.24	05÷06	13.5	77	1231	-218	22	43	39
Baltic IPS	1543			15.1	679	1231	-218	22	67	52

Peak Load and Average Temperatures in the Baltic States by Month

	January	February	March	April	May	June	July	August	Septem-ber	October	November	December	Average of year
Estonian peak load (net), MWh	1479	1338	1305	1170	1031	985	917	1027	1155	1276	1321	1405	
Average ambient temperature	-0.5	1.3	0.7	6.4	10.2	14.3	16.7	15.4	10.5	8.9	3.1	0.4	7.3
Normal temperature	-5.5	-5.7	-2.1	3.4	9.8	14.5	16.4	15.5	11.1	6.5	1.4	-2.8	5.2
Latvian peak load (gross), MWh	1419	1283	1239	1152	1021	968	953	984	1132	1157	1284	1298	
Average ambient temperature	-0.6	1.7	1.4	7.2	10.8	14.7	17.1	16.9	10.9	8.7	2.9	0.2	8
Normal temperature	-5.3	-4.9	-1.3	4.5	10.9	14.9	16.4	15.7	11.4	6.8	1.6	-2.7	6
Lithuanian peak load (net), MWh	1843	1671	1638	1525	1387	1376	1386	1429	1587	1718	1669	1723	
Average ambient temperature	-0.1	2,3	2.6	9.1	12.6	13.7	14.1	17.6	12.3	9.1	3.6	0.6	8.1
Normal temperature	-5.1	-4.6	-0.7	5.4	11.9	15.4	16.7	16.2	11.9	7.2	2.0	-2.0	6.2

Peak Load by Month in the Baltic States and Baltic IPS



Estonian Net Consumption and Production on Day of Peak Load (Net), MW (7 January 2008)

Hour	Consumption	Generation	BALTI PP	EESTI PP	IRU CHP	Windmill	Small PP	ESTLINK
1	1015	1324.1	312.6	995.3	0.0	8.4	7.9	368.5
2	976	1284.4	317.3	952.8	0.0	7.0	7.3	364.3
3	957	1259.0	312.7	933.4	0.0	6.4	6.5	382.0
4	950	1260.7	318.2	927.1	0.0	9.0	6.4	382.6
5	961	1254.1	316.9	920.3	0.0	10.1	6.7	382.8
6	999	1295.7	319.8	958.4	0.0	11.0	6.5	380.9
7	1126	1406.9	326.2	1063.4	0.0	11.3	6.1	367.2
8	1292	1518.6	357.8	1142.5	0.0	10.5	7.7	355.2
9	1410	1573.2	379.9	1173.9	0.0	12.0	7.4	379.2
10	1425	1631.3	431.9	1180.6	0.0	11.4	7.4	366.8
11	1429	1628.1	432.1	1178.6	0.0	9.5	7.8	353.5
12	1422	1630.2	431.1	1179.7	0.0	11.5	8.0	362.2
13	1401	1633.4	431.2	1180.8	0.0	13.4	8,0	383.5
14	1418	1630.9	429.5	1181.1	0.0	12.5	7.7	384.5
15	1419	1633.2	428.6	1183.7	0.0	12.6	8.2	384.5
16	1437	1632.7	427.4	1184.4	0.0	12.8	8.2	383.7
17	1479	1631.0	423.9	1184.5	0.0	14.9	7.7	368.0
18	1464	1625.5	420.8	1180.7	0.0	16.5	7.5	341.9
19	1433	1628.2	417.7	1183.6	0.0	18.8	8.1	363.3
20	1396	1633.0	416.6	1188.2	0.0	20.1	8.0	379.0
21	1354	1635.5	416.1	1191.3	0.0	20.1	8.1	372.6
22	1293	1627.2	410.7	1189.5	0.0	19.7	7.3	373.1
23	1210	1552.6	343.0	1183.3	0.0	18.6	7.7	379.6
24	1120	1458.1	341.1	1095.3	0.0	15.2	6.5	377.1

Estonian Net Consumption and Production on Day of Minimum Load (Net), MW (27 July 2008)

Hour	Consumption	Generation	BATLI PP	EESTI PP	IRU CHP	Windmill	Small PP	ESTLINK
1	586.3	647.2	0.0	644.5	0.0	1.3	1.4	364.5
2	549.2	615.2	0.0	612.0	0.0	1.8	1.5	296.3
3	500.6	489.3	0.0	484.8	0.0	3.0	1.5	150.4
4	485.5	477.4	0.0	471.9	0.0	4.0	1.5	99.1
5	452.9	475.6	0.0	471.2	0.0	3.1	1.3	55.7
6	430.7	477.8	2.5	468.8	0.0	4.8	1.7	55.2
7	449.0	486.4	11.5	465.8	0.0	6.8	2.2	55.2
8	492.2	485.9	30.4	447.3	0.0	6.1	2.1	75.4
9	552.1	477.4	32.6	436.7	0.0	6.7	1.4	87.8
10	609.4	509.3	31.7	467.8	0.0	8.7	1.1	106.1
11	637.9	555.5	27.9	514.1	0.0	12.5	1.0	106.3
12	645.1	696.2	37.4	642.1	0.0	15.6	1.1	339.9
13	642.8	730.8	70.9	645.9	0.0	13.2	0.8	348.1
14	636.0	717.9	75.6	631.2	0.0	10.1	1.1	351.3
15	622.1	719.6	75.2	632.0	0.0	11.3	1.1	281.6
16	614.4	713.8	75.4	627.6	0.0	9.8	1.1	285.5
17	613.1	706.2	75.4	623.1	0.0	6.7	1.0	286.6
18	615.0	700.5	75.1	618.7	0.0	5.7	1.0	294.0
19	617.5	706.1	75.5	624.9	0.0	4.6	1.1	291.9
20	619.3	704.2	75.6	625.2	0.0	2.4	1.0	362.9
21	620.6	702.7	75.5	624.9	0.0	1.3	1.0	361.0
22	615.7	704.4	75.4	626.0	0.0	1.9	1.0	356.8
23	625.3	704.0	74.6	626.8	0.0	1.8	0.8	281.7
24	602.3	690.6	74.2	614.1	0.0	1.3	1.0	365.5

Latvian Net Consumption and Production on Day of Peak Load (Gross), MW (7 January 2008)

Hour	Consumption	Generation	PIAVINAS HPP	KEGUMS HPP	RIGAS HPP	RCHP-1	RCHP-2	Imanta CHP	Windmill	Small PP
1	899	401	0	0	0	141	200	38	2	20
2	843	401	0	0	0	141	200	38	2	20
3	818	401	0	0	0	141	200	38	2	20
4	810	400	0	0	0	141	200	38	2	20
5	816	399	0	0	0	140	199	38	1	20
6	858	398	0	0	0	140	199	38	1	20
7	1000	401	0	0	0	140	201	38	2	20
8	1199	401	0	0	0	141	200	38	2	20
9	1324	447	45	1	0	141	200	38	2	20
10	1359	496	90	5	0	142	200	38	3	20
11	1381	493	90	0	0	142	200	38	3	20
12	1371	490	87	0	0	142	200	38	3	20
13	1332	403	0	0	0	142	201	38	3	20
14	1347	402	0	0	0	141	201	38	3	20
15	1351	403	0	0	0	142	201	38	3	20
16	1360	437	33	0	0	142	201	38	3	20
17	1413	541	90	20	26	142	202	38	4	20
18	1419	586	90	37	52	142	202	38	5	20
19	1394	586	90	37	52	142	202	38	5	20
20	1348	586	90	37	52	142	201	38	6	20
21	1310	510	15	37	52	142	201	38	5	20
22	1250	442	0	15	25	142	200	38	2	20
23	1138	404	0	0	0	142	200	38	4	20
24	1017	407	0	0	0	142	200	38	7	20

Latvian Net Consumption and Production on Day of Minimum Load (Gross), MW (24 June 2008)

Hour	Consumption	Generation	PIAVINAS HPP	KEGUMS HPP	RIGAS HPP	RCHP-1	RCHP-2	Imanta CHP	Windmill	Small PP
1	544	127	0	0	0	71	0	28	18	11
2	513	116	0	0	0	66	0	22	17	11
3	483	117	0	0	0	64	0	23	18	11
4	455	125	0	0	0	72	0	24	18	11
5	419	127	0	0	0	71	0	26	19	11
6	412	150	0	0	0	88	0	33	19	11
7	421	225	72	0	0	91	0	33	19	11
8	440	328	177	0	0	88	0	33	19	11
9	478	335	182	0	0	91	0	33	19	11
10	519	339	182	0	0	95	0	33	19	11
11	560	327	104	51	14	96	0	33	19	11
12	582	305	90	55	0	98	0	33	18	11
13	589	352	91	55	46	99	0	33	18	11
14	595	270	90	12	6	99	0	33	19	11
15	596	249	90	0	0	97	0	33	18	11
16	595	248	90	0	0	98	0	33	16	11
17	603	252	90	0	0	103	0	33	16	11
18	612	257	90	0	0	110	0	33	13	11
19	630	264	90	0	0	115	0	33	15	11
20	654	264	90	0	0	117	0	34	12	11
21	671	299	90	30	0	123	0	34	10	11
22	671	295	90	37	0	117	0	34	5	11
23	656	214	9	37	0	118	0	34	5	11
24	614	164	0	6	0	109	0	33	5	11

Lithuanian Net Consumption and Production on Day of Peak Load (Net), MW (7 January 2008)

Hour	Consumption	Generation	Ignalina NPP	Lietuvos PP	Vilnius CHP 3	Kaunas CHP	Mazeikai CHP	Kaunas HPP	Kruonio HPSPP	Windmill	SmallPP
1	1154	1651	1253	63	148	140	0	21	-453	6	20
2	1094	1651	1253	64	148	140	0	21	-453	5	20
3	1066	1649	1253	63	147	140	0	21	-452	5	20
4	1052	1649	1253	64	147	140	0	21	-459	4	20
5	1069	1645	1251	63	147	140	0	21	-678	3	20
6	1145	1649	1256	61	147	141	0	21	-676	3	20
7	1377	1644	1251	60	148	141	0	21	-165	3	20
8	1606	1654	1252	62	148	140	0	21	7	4	20
9	1750	1854	1248	63	148	140	0	21	206	7	21
10	1776	1901	1250	62	148	140	0	21	250	10	20
11	1775	1946	1251	63	148	140	0	21	292	10	21
12	1772	1918	1247	63	147	140	0	21	271	8	21
13	1744	1926	1252	62	147	140	0	21	276	7	21
14	1758	1912	1251	63	147	140	0	21	263	6	21
15	1751	1918	1251	63	147	140	0	21	260	5	31
16	1762	1914	1250	63	148	140	0	21	248	5	39
17	1810	1939	1249	63	147	140	0	21	273	6	40
18	1843	1853	1249	63	147	140	0	21	205	7	21
19	1803	1857	1253	63	147	140	0	21	204	8	21
20	1753	1859	1254	63	148	140	0	21	203	9	21
21	1690	1853	1250	63	148	140	0	21	202	8	21
22	1595	1851	1248	63	148	140	0	21	201	11	19
23	1421	1717	1249	63	148	140	0	21	61	16	19
24	1279	1656	1249	63	149	140	0	21	-232	15	19

Lithuanian Net Consumption and Production on Day of Minimum Load (Net), MW (24 June 2008)

Hour	Consumption	Generation	Ignalina NPP	Lietuvos PP	Vilnius CHP 3	Kaunas CHP	Mazeikai CHP	Kaunas HPP	Kruonio HPSPP	Windmill	SmallPP
1	887	1404	1228	53	0	24	0	22	-219	42	35
2	821	1404	1226	53	0	24	0	22	-219	42	37
3	782	1407	1228	54	0	24	0	22	-219	42	37
4	754	1413	1232	54	0	24	0	22	-219	43	38
5	714	1411	1233	53	0	24	0	22	-218	42	37
6	700	1412	1231	53	0	24	0	22	-218	43	39
7	736	1434	1232	75	0	24	0	22	-362	42	39
8	797	1452	1231	93	0	24	0	22	-370	43	39
9	864	1471	1232	113	0	24	0	22	-217	43	37
10	943	1472	1232	114	0	24	0	22	-77	43	37
11	1002	1500	1236	114	0	24	0	22	25	43	36
12	1017	1585	1232	110	0	25	0	22	117	42	37
13	1025	1581	1228	104	0	26	0	22	122	44	35
14	1018	1638	1229	104	0	26	0	22	179	42	36
15	1013	1638	1230	104	0	26	0	22	178	43	35
16	1004	1634	1226	104	0	26	0	22	178	43	35
17	1000	1642	1224	104	0	26	0	22	188	42	36
18	1002	1615	1226	104	0	27	0	22	159	41	36
19	999	1567	1227	104	0	28	0	22	110	39	37
20	1014	1595	1230	106	0	30	0	22	132	39	36
21	1015	1656	1232	142	0	31	0	22	159	35	35
22	1011	1589	1231	213	0	31	0	22	25	31	36
23	1006	1597	1232	248	0	31	0	22	0	28	36
24	953	1564	1233	223	0	29	0	22	-57	23	34

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