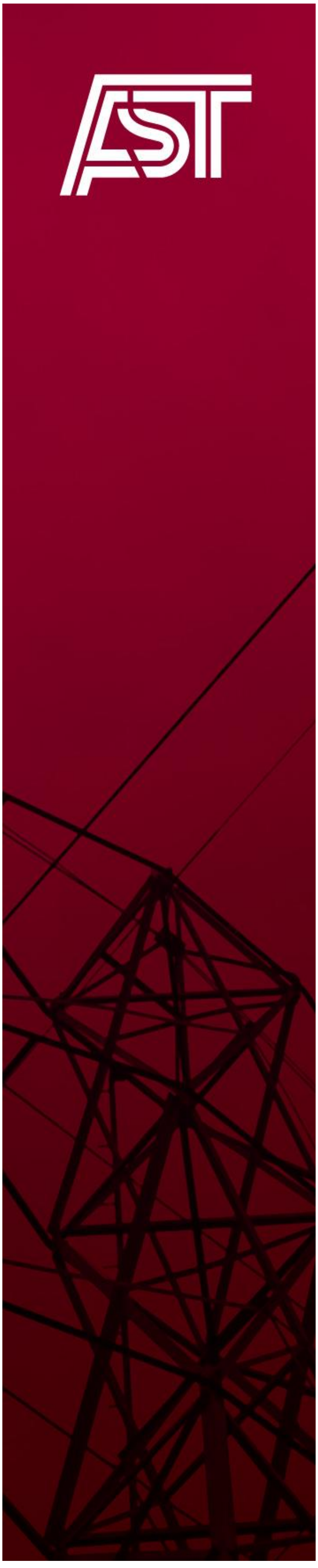

Annual statement of transmission system operator for the year 2016

Riga – 2017

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Most important

1. In the next decade, a generating capacity deficit is expected in Latvia and in the all Baltic countries as well. Nearly half of the large generation capacity of thermal power plants (2300 MW) generally in Lithuania and Estonia will be closed in the Baltic States.
2. Interconnections, reinforcements of the transmission network and closer integration of the Baltic power systems in the European electricity market will play an increasing role in covering the demand of electricity.
3. In order not to reduce the security of Latvia's electricity supply in the next decade it is important to ensure that the generation capacity of Latvia is not diminished.
4. Due to reduce of generating capacity in Latvia and in the Baltics, is necessary to stimulate the elasticity of electricity demand in order to ensure balancing resources in the power system to ensure continuous balance between supply and demand of electrical energy.
5. The share of large, conventional generating capacities will decrease in the coming years, but the role of small, decentralized generation and active consumers will increase, in Latvia it is necessary to introduce a national electricity data exchange platform in order to promote the digitization of the power system and ensure the involvement of decentralized generation and active consumers in balancing of energy systems and provision of reserves.

The Report is prepared in accordance with the Regulation No. 322 "Regulations on the TSO's annual statement" by Latvian Cabinet of Ministers from April 25, 2006, taking into account "Energy Development Guidelines for years 2007-2016 in Latvia" approved by the Latvian Cabinet of Ministers (Order No 571) on August 1, 2006, as well as taking into account "Energy Development Guidelines for years 2016-2020 in Latvia" approved by the Latvian Cabinet of Ministers (Order No. 129) on February 9, 2016, as well as taking into account informative report on Long Term Energy Strategy for year 2030.

1. Electricity and power demand in the country last year

1.1. Electricity consumption (net) (including losses) by week for year 2016.

Total annual energy consumption including losses equals 7 264 728 MWh.

Table 1

Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Consumption, MWh	174535	168345	167640	155444	151164	149844	151408	147695
Week	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Consumption, MWh	147185	146978	145710	139846	135246	133236	132594	132840
Week	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Consumption, MWh	131017	120338	124219	124728	125813	128135	121094	123208
Week	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
Consumption, MWh	116306	124061	120142	119923	120200	125189	123516	123735
Week	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Consumption, MWh	125394	125986	124150	125765	126282	130423	130441	135422
Week	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**
Consumption, MWh	139172	140441	142613	148328	153301	145383	149258	154308
Week	**49**	**50**	**51**	**52**	**53**			

Consumption, MWh	153443	155352	148420	121246	138266			

1.2. Maximum winter peak load and minimum summer load (control-measurement data, MWh/h).

Minimum load: 445 MW 24.06.2016.g. 06.00
Maximum load: 1308 MW 08.01.2016.g. 11.00

1.3. System load in control measurement days (24 hours).

Table 2

2016	June 24	January 8
h	**MWh**	**MWh**
01:00	568	870
02:00	546	825
03:00	522	813
04:00	493	806
05:00	461	808
06:00	445	852
07:00	476	982
08:00	504	1137
09:00	545	1244
10:00	592	1288
11:00	631	1308
12:00	651	1285
13:00	652	1258
14:00	651	1257
15:00	652	1239
16:00	654	1227
17:00	656	1276
18:00	667	1292
19:00	673	1261
20:00	669	1216
21:00	662	1174
22:00	659	1116
23:00	643	1028
00:00	638	937
KOPĀ	**14 310**	**26 499**

2. Electricity and power demand in the coming years (minimum forecast period - 10 years), including the annual electricity consumption and peak loads by scenarios.

Maximum power system load is calculated (normalized) based on GDP growth forecast submitted by the Latvian Ministry of Economics at the average regulated outdoor temperature during winter period (December-February) -3.5°C (Table 3). Changes in outdoor temperature also affect changes to the maximum load. Electricity consumption of the system is forecasted for three scenarios – conservative (A), base (B) and optimistic (EU2030).

Table 3

Year	Annual consumption for conservative scenario (A)	Annual consumption for base scenario (B)	Annual consumption for optimistic scenario (EU2030)	Peak load
	GWh	GWh	GWh	MW
2017	7242	7316	7353	1332
2018	7259	7357	7455	1356
2019	7288	7388	7556	1381
2020	7300	7434	7668	1409
2021	7318	7477	7781	1437
2022	7343	7539	7897	1466
2023	7381	7614	8012	1495
2024	7437	7709	8091	1529
2025	7473	7785	8175	1559
2026	7518	7872	8279	1593
2027	7552	7948	8345	1624

3. Supply and consumption compliance rating during the reporting period and forecast for the future years (minimum forecast period - 10 years)

3.1. Annual power consumption and possible sources of power supplies.

Electricity and electrical power balances as well as electricity consumption forecast is developed for three scenarios:

- **Scenario A "Conservative development".** Electricity system load forecast is based on the information on the load and electricity consumption forecast, supplied by distribution system operators. Forecast of the generation development is prepared, taking into account operation of the gas burning power stations in the energy market environment, operating mainly in co-generation mode during the winter periods. In conservative scenario development of wind power stations, bio-mass, bio-gas, small scale gas co-generation and solar generation stations is planned based on assumption, that development of each above mentioned generation type can be affected by possible changes in governmental support schemes. Due to the possible changes of support scheme for cogeneration power plants operated by natural gas starting from the year 2021 Riga CHP-1 is being shut down and is not taking part in energy balance.

- **Scenario B "Base scenario"** Electricity system load forecast is based on GDP growth forecast for Latvia, supplied by Ministry of Economy to the users involved in energy sector, as well as based on the information on the load and electricity consumption forecast, supplied by distribution system operators. Forecast of generation development takes into account power stations planned for commissioning or de-commissioning based on the information supplied by all power system users to the transmission system operator (TSO). In Base scenario (B) production of the Daugava HPP cascade and Riga CHP's is planned based on the annual average production. Development of the wind power stations, bio-mass and bio-gas stations, small gas co-generation stations and solar power stations is based on historical development tempo data for each type of generation in Latvia at moderate economy development tempo in the country.

- **Scenario EU2030 “Optimistic development”** Generation development forecast and electricity system load increase are based on GDP increase forecast for Latvia, submitted by the Ministry of Economy, taking into account desired generation and load increase tempos necessary to achieve the development goals for 2020 and 2030 by EU, based on "Energy Development Guidelines for years 2016-2020 in Latvia" approved by the Latvian Cabinet of Ministers (Order No. 129) on February 9, 2016. In this scenario, in addition to the development tempos from scenarios A and B, possible future power stations are taken into account, commissioning of which are deemed possible based on the information available at TSO. In this scenario forecasted development of wind, solar, bio-mass and bio-gas power stations is much faster, due to stronger governmental support and wider transmission system infrastructure development.

Note: *Power plant output is presented in net values and takes into account the power station planned annual maintenance schedules.*

Assumptions and explanations for the tables:

1) Daugava cascade hydropower plants (hereinafter - the Daugava HPP) multi-annual average net output according to the statistical data are 2700 GWh per year.

2) In 2010, a five-party agreement of BRELL ring between the Estonian, Latvian, Lithuanian, Russian and Belarusian TSO provides for the mutual provision of emergency reserves from the beginning of the realization and up to 12 hours. Emergency reserve for Latvia provides BRELL five-party agreement on common emergency reserve maintenance for each of the parties involved, maintaining 100 MW each, which consists of the sum of 500 MW. Taking into consideration the largest generating unit load in Latvia, Latvian power system needs of the emergency reserve is ensured according to the maximum generating units planned load, i.e. up to 442 MW (RigaCHP2 largest unit). The available power reserves in Latvia is 100MW, and other missing power amount 342MW from neighboring power systems can be received only 12 hours.

3) Necessary emergency and replacement reserve for provision of Latvian power system operational security according to planned load and generation development scenarios.

4) Power system regulation reserve assessed as 6% of the system peak load and 10% of the installed wind power station capacity for winter day peak load.

5) For power balance monthly assessment it is necessary to account water inflow for Daugava HPPs in Daugava river. For “Conservative scenario” (A) January least average inflow since 2000 has been in 2003 (150 m3/s, which corresponds to 270 MW of power for covering peak demand). In “Base scenario” (B) inflow for Daugava HPPs is assumed 200 m3/s, which corresponds to 350 MW power equivalent. In “Optimistic scenario” (EU2030) inflow for Daugava HPPs is assumed 230 m3/s, which corresponds to 400 MW power equivalent. For coverage of minimum load during the June the same inflow values are assumed for each scenario respectively.

6) Installed capacities of power stations in the tables are presented, including their own self-consumption (gross), but the rest of the tables are shown excluding self-consumption (net). Gross output is the total capacity of the power station developed by all main generator units and generators for self-consumption. Net power output is gross output minus the power of the self-consumption equipment required for feeding power and power losses in transformers.

7) Wind power installed capacity and net capacity for Conservative scenario (A) and Base Scenario (B) assumed on the basis of the information report "Latvian Republic Action for renewable energy in the European Parliament and of the Council of 23 April 2009 Directive 2009/28/EC on the promotion of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC by 2020", in the Optimistic Scenario (EU2030) – based on technical requirements for producers issued by Latvians transmission system operator "Augstsprieguma tikls" AS and Latvian distribution system operator "Sadales tikls" AS.

8) In the Conservative scenario (A) and in Base scenario (B), bio-mass and bio-gas power plant capacity assessed on the basis of the information presented in the report "Latvian Republic Action for renewable energy in the European Parliament and of the Council of 23 April 2009 Directive 2009/28/EC on the promotion of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC by 2020", but in the Optimistic scenario (EU2030) – based on technical requirements for producers issued by "Augstsprieguma tikls" AS and "Sadales tikls" AS.

9) In electricity balance tables for Conservative scenario (A) Riga CHP-1, Riga CHP-2 and Imanta CHP power generation is assessed based on market situation in the market area of "Nord Pool". In Base scenario (B) power generation in Riga CHP-1, Riga CHP-2 and Imanta CHP is assumed as long term annual average. In Optimistic scenario (EU) production of Riga CHP-1, Riga CHP-2 and Imanta CHP is assessed as maximum possible, irrelevant to the "NordPool" market situation, developing the maximum possible amount of electricity in annual terms. For possibility of co-generation stations to receive compulsory payment for installed capacity according to Cabinet of Ministers Regulations No 221 "Regulations on electricity production and pricing with cogeneration stations" the utilization time of co-generation power stations or separate equipment installed in them must be at least 1200 hours per year.

10) In the hourly load demand tables production in the power stations of Latvia is presented omitting possible emergency and replacement reserves (assumption 3). Emergency and replacement reserves for the needs of Latvian power system will be provided via market based reserve purchases from the users of Latvian or Baltic power systems

11) For conservative scenario (A) it is assumed that Riga CHP-2 can operate in co-generation mode only, when its output power reaches 803 MW net. In Base scenario (B) and Optimistic scenario (EU2030) it is assumed that Riga CHP-2 maximum net production can reach up to 850 MW with power plant operating in condensation mode.

12) Currently Baltic countries with the support from EU are investigating possible variants for synchronization of the power systems of Baltic countries with power systems of continental Europe or Nordic countries and separation from the power system of Russia. Above mentioned operational changes can take place not sooner than 2025. Since currently competent authorities have not yet decided on the possible synchronization variants, Latvian transmission system operator in this annual report has elaborated synchronous operation of Baltic countries power systems with continental Europe (CE) via LitPol link 1 and LitPol link 2 (total 2000 MW).

13) In Conservative scenario (A) operation of Riga CHP-1 after year 2020 is not considered due to end of operation caused by possible change of support scheme to cogeneration power plants and termination of Mandatory Purchase Component program.

Installed capacities (gross) of power stations, MW

Table 4

Years		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Power stations with installed capacity above 40 MW [6)]	**1**	**2653**	**2661**	**2661**	**2661**	**2661**	**2661**	**2661**	**2661**	**2661**	**2661**	**2661**
Including: Daugava HPPs	*1.1*	*1580*	*1588*	*1588*	*1588*	*1588*	*1588*	*1588*	*1588*	*1588*	*1588*	*1588*
Riga CHP-1	*1.2*	*144*	*144*	*144*	*144*	*144/0*	*144/0*	*144/0*	*144/0*	*144/0*	*144/0*	*144/0*
Riga CHP-2	*1.3*	*881*	*881*	*881*	*881*	*881*	*881*	*881*	*881*	*881*	*881*	*881*
Imanta CHP	*1.4*	*48*	*48*	*48*	*48*	*48*	*48*	*48*	*48*	*48*	*48*	*48*
Installed capacity of small power stations (conservative scenario A)	**2**	**383**	**395**	**407**	**419**	**431**	**443**	**476**	**499**	**523**	**546**	**570**
Including: Natural gas co-generation stations	*2.1*	*119*	*120*	*121*	*121*	*122*	*123*	*124*	*125*	*126*	*127*	*127*
Hydro power stations	*2.2*	*30*	*30*	*31*	*31*	*31*	*32*	*32*	*33*	*33*	*33*	*34*
Wind power stations [7)]	*2.3*	*80*	*86*	*91*	*96*	*102*	*107*	*133*	*149*	*166*	*183*	*200*
Onshore	*2.3.1.*	*80*	*86*	*91*	*96*	*102*	*107*	*113*	*118*	*123*	*129*	*134*
Offshore	*2.3.2.*	*0*	*0*	*0*	*0*	*0*	*0*	*20*	*31*	*43*	*54*	*66*
Biomass power stations [8)]	*2.4*	*86*	*89*	*92*	*94*	*97*	*100*	*102*	*105*	*108*	*110*	*113*
Biogas power stations [8)]	*2.5*	*65*	*68*	*70*	*73*	*75*	*78*	*80*	*83*	*85*	*88*	*90*
Solar power stations	*2.6*	*1.65*	*2.07*	*2.49*	*2.91*	*3.33*	*3.74*	*4.16*	*4.58*	*5.00*	*5.42*	*5.84*
Installed capacity of small power stations (base scenario B)	**3**	**391**	**412**	**434**	**456**	**477**	**499**	**546**	**585**	**624**	**663**	**703**
Including: Natural gas co-generation stations	*3.1*	*120*	*121*	*123*	*124*	*126*	*127*	*129*	*131*	*132*	*134*	*135*
Hydro power stations	*3.2*	*29*	*29*	*29*	*30*	*30*	*30*	*31*	*31*	*31*	*31*	*32*
Wind power stations [7)]	*3.3*	*84*	*93*	*102*	*111*	*120*	*129*	*163*	*189*	*216*	*243*	*270*
Onshore	*3.3.1.*	*84*	*93*	*102*	*111*	*120*	*129*	*138*	*146*	*155*	*164*	*173*
Offshore	*3.3.2.*	*0*	*0*	*0*	*0*	*0*	*0*	*25*	*43*	*61*	*79*	*96*
Biomass power stations [8)]	*3.4*	*88*	*92*	*97*	*101*	*105*	*110*	*114*	*118*	*123*	*127*	*131*
Biogas power stations [8)]	*3.5*	*69*	*75*	*80*	*86*	*92*	*98*	*104*	*109*	*115*	*121*	*127*
Solar power stations	*3.6*	*1.86*	*2.48*	*3.11*	*3.74*	*4.36*	*4.99*	*5.62*	*6.24*	*6.87*	*7.49*	*8.12*
Installed capacity of small power stations (optimistic scenario EU2030)	**4**	**414**	**457**	**501**	**544**	**587**	**661**	**723**	**785**	**848**	**910**	**972**
Including: Natural gas co-generation stations	*4.1*	*120*	*123*	*125*	*127*	*129*	*132*	*134*	*136*	*139*	*141*	*143*
Hydro power stations	*4.2*	*30*	*30*	*31*	*31*	*31*	*32*	*32*	*33*	*33*	*33*	*34*
Wind power stations [7)]	*4.3*	*98*	*121*	*145*	*168*	*191*	*244*	*286*	*328*	*371*	*413*	*455*
Onshore	*4.3.1.*	*98*	*121*	*145*	*168*	*191*	*214*	*238*	*261*	*284*	*307*	*330*

Offshore	*4.3.2.*	*0*	*0*	*0*	*0*	*0*	*30*	*49*	*68*	*87*	*106*	*124*
Biomass power stations [8)]	*4.4*	*91*	*98*	*106*	*113*	*120*	*128*	*135*	*142*	*150*	*157*	*164*
Biogas power stations [8)]	*4.5*	*72*	*81*	*90*	*100*	*109*	*118*	*127*	*136*	*145*	*154*	*163*
Solar power stations	*4.6*	*2.25*	*3.27*	*4.29*	*5.31*	*6.33*	*7.35*	*8.37*	*9.39*	*10.41*	*11.43*	*12.45*

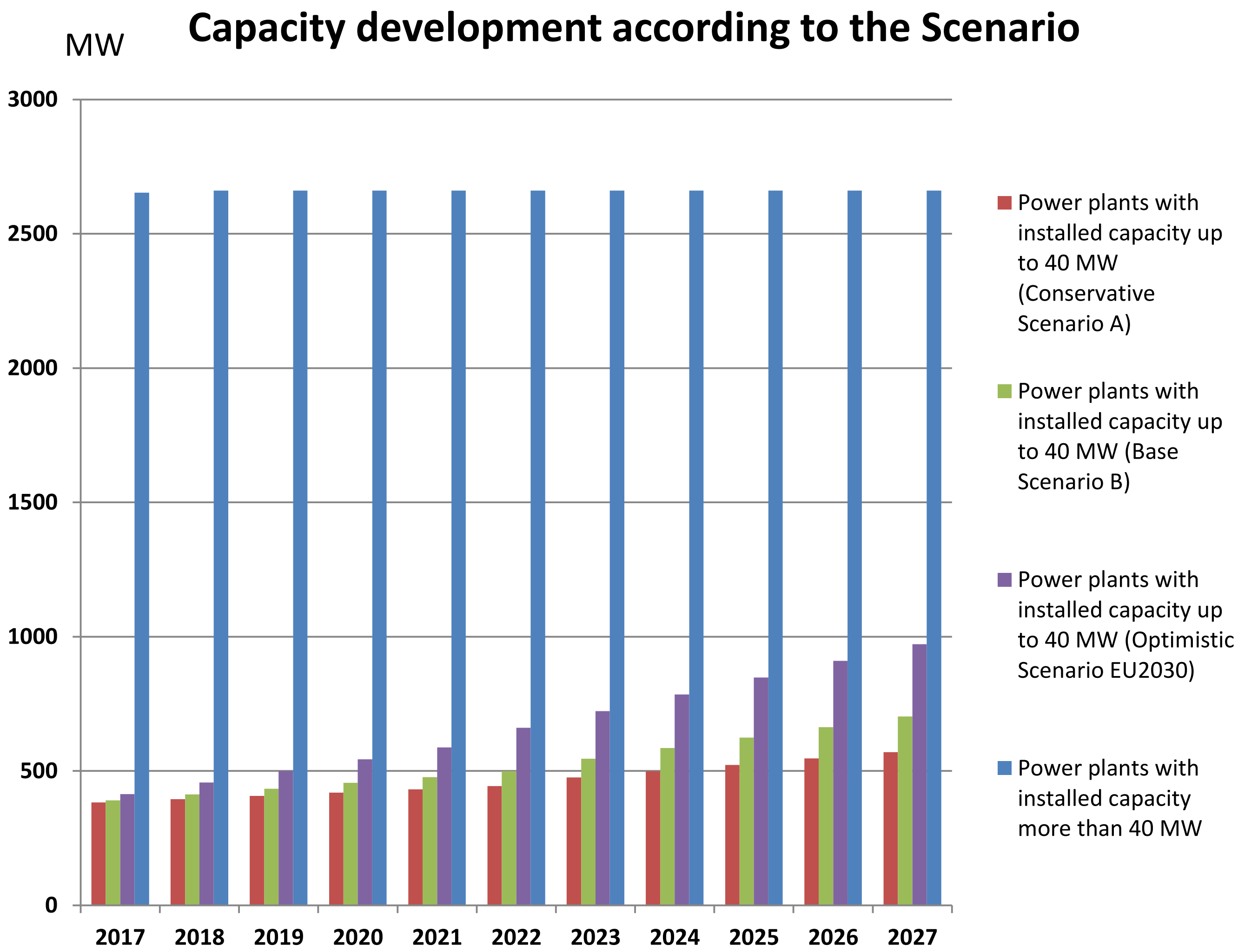

Fig. 1. Development of installed capacities in power stations (MW) in different scenarios

Latvian power system balance for Scenario A winter peak load hours, MW (nett)

Table 5

Years		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Maximum load	**1**	**1332**	**1356**	**1381**	**1409**	**1437**	**1466**	**1495**	**1529**	**1559**	**1593**	**1624**
Power stations with installed capacity above 40 MW	**2**	**2557**	**2565**	**2564**	**2564**	**2425**	**2425**	**2425**	**2425**	**2425**	**2425**	**2425**
Including: Daugava HPPs	*2.1*	*1572*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*
Riga CHP-1	*2.2*	*139*	*139*	*139*	*139*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Riga CHP-2	*2.3*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*
Imanta CHP	*2.4*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*
Small power stations	**3**	**356**	**367**	**379**	**390**	**402**	**413**	**444**	**467**	**490**	**513**	**536**
Including: Natural gas co-generation power stations	*3.1*	*108*	*109*	*110*	*110*	*111*	*112*	*113*	*114*	*114*	*115*	*116*
Hydro power stations	*3.2*	*28*	*29*	*29*	*30*	*30*	*30*	*31*	*31*	*31*	*32*	*32*
Wind power stations	*3.3*	*80*	*85*	*90*	*95*	*101*	*106*	*131*	*148*	*164*	*181*	*198*
Onshore	*3.3.1.*	*80*	*85*	*90*	*95*	*101*	*106*	*111*	*117*	*122*	*127*	*133*
Offshore	*3.3.2.*	*0*	*0*	*0*	*0*	*0*	*0*	*20*	*31*	*42*	*54*	*65*
Biomass power stations	*3.4*	*79*	*81*	*83*	*86*	*88*	*91*	*93*	*96*	*98*	*100*	*103*
Biogas power stations	*3.5*	*60*	*62*	*64*	*66*	*68*	*71*	*73*	*75*	*77*	*80*	*82*
Solar power stations	*3.6*	*1.48*	*1.86*	*2.24*	*2.62*	*2.99*	*3.37*	*3.75*	*4.12*	*4.50*	*4.88*	*5.26*
Available capacities for peak load and reserve guaranteeing	**4**	**1441**	**1445**	**1450**	**1455**	**1320**	**1325**	**1331**	**1337**	**1343**	**1348**	**1354**
Including: Daugava HPPs [5)]	*4.01*	*270*	*270*	*270*	*270*	*270*	*270*	*270*	*270*	*270*	*270*	*270*
Riga CHP-1	*4.02*	*139*	*139*	*139*	*139*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Riga CHP-2	*4.03*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*
Imanta CHP	*4.04*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*
Natural gas co-generation power stations	*4.05*	*76*	*76*	*77*	*77*	*78*	*78*	*79*	*79*	*80*	*81*	*81*
Hydro power stations	*4.06*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Wind power stations	*4.07*	*8*	*8*	*9*	*10*	*10*	*11*	*13*	*15*	*16*	*18*	*20*
Biomass power stations	*4.08*	*55*	*57*	*58*	*60*	*62*	*63*	*65*	*67*	*69*	*70*	*72*
Biogas power stations	*4.09*	*42*	*43*	*45*	*46*	*48*	*50*	*51*	*53*	*54*	*56*	*57*
Solar power stations	*4.10*	*0.59*	*0.74*	*0.90*	*1.05*	*1.20*	*1.35*	*1.50*	*1.65*	*1.80*	*1.95*	*2.10*
Power system emergency reserve [2)]	**5**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Power system regulating reserve [4)]	**6**	**88**	**90**	**92**	**94**	**96**	**99**	**103**	**106**	**110**	**114**	**117**
Total reserve in Latvia[3)]	**7=5+6**	**188**	**190**	**192**	**194**	**196**	**199**	**203**	**206**	**210**	**214**	**217**
Power surplus (+), deficit (-)	**8=4-1-7**	**-79**	**-100**	**-123**	**-148**	**-313**	**-340**	**-366**	**-398**	**-426**	**-458**	**-487**
Power adequacy	**9=(4-7)/1**	**94%**	**93%**	**91%**	**89%**	**78%**	**77%**	**75%**	**74%**	**73%**	**71%**	**70%**

Latvian power system balance for Scenario B winter peak load hours, MW (nett)

Table 6

Years		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Maximum load	**1**	**1332**	**1356**	**1381**	**1409**	**1437**	**1466**	**1495**	**1529**	**1559**	**1593**	**1624**
Power stations with installed capacity above 40 MW	**2**	**2557**	**2565**	**2564**	**2564**	**2564**	**2564**	**2564**	**2564**	**2564**	**2564**	**2564**
Including: Daugava HPPs	*2.1*	*1572*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*
Riga CHP-1	*2.2*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*
Riga CHP-2	*2.3*	*850*	*850*	*850*	*850*	*850*	*850*	*850*	*850*	*850*	*850*	*850*
Imanta CHP	*2.4*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*
Small power stations	**3**	**364**	**384**	**404**	**425**	**445**	**465**	**510**	**549**	**586**	**624**	**662**
Including: Natural gas co-generation power stations	*3.1*	*109*	*110*	*112*	*113*	*114*	*116*	*117*	*119*	*120*	*122*	*123*
Hydro power stations	*3.2*	*28*	*28*	*28*	*28*	*29*	*29*	*29*	*30*	*30*	*30*	*30*
Wind power stations	*3.3*	*83*	*92*	*101*	*110*	*118*	*127*	*161*	*187*	*214*	*240*	*267*
Onshore	*3.3.1.*	*83*	*92*	*101*	*110*	*118*	*127*	*136*	*145*	*154*	*163*	*171*
Offshore	*3.3.2.*	*0*	*0*	*0*	*0*	*0*	*0*	*25*	*42*	*60*	*78*	*95*
Biomass power stations	*3.4*	*80*	*84*	*88*	*92*	*96*	*100*	*104*	*108*	*112*	*116*	*119*
Biogas power stations	*3.5*	*63*	*68*	*73*	*78*	*84*	*89*	*94*	*99*	*105*	*110*	*115*
Solar power stations	*3.6*	*1.67*	*2.23*	*2.80*	*3.36*	*3.93*	*4.49*	*5.05*	*5.62*	*6.18*	*6.74*	*7.31*
Available capacities for peak load and reserve guaranteeing	**4**	**1525**	**1533**	**1541**	**1549**	**1557**	**1565**	**1576**	**1586**	**1596**	**1606**	**1616**
Including: Daugava HPPs [5)]	*4.01*	*350*	*350*	*350*	*350*	*350*	*350*	*350*	*350*	*350*	*350*	*350*
Riga CHP-1	*4.02*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*
Riga CHP-2	*4.03*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*
Imanta CHP	*4.04*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*
Natural gas co-generation power stations	*4.05*	*76*	*76*	*77*	*77*	*78*	*78*	*79*	*79*	*80*	*81*	*81*
Hydro power stations	*4.06*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Wind power stations	*4.07*	*8*	*9*	*10*	*11*	*12*	*13*	*16*	*19*	*21*	*24*	*27*
Biomass power stations	*4.08*	*56*	*59*	*62*	*64*	*67*	*70*	*73*	*75*	*78*	*81*	*84*
Biogas power stations	*4.09*	*44*	*47*	*51*	*55*	*59*	*62*	*66*	*70*	*73*	*77*	*81*
Solar power stations	*4.10*	*0.67*	*0.89*	*1.12*	*1.34*	*1.57*	*1.80*	*2.02*	*2.25*	*2.47*	*2.70*	*2.92*
Power system emergency reserve [2)]	**5**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Power system regulating reserve [4)]	**6**	**88**	**91**	**93**	**95**	**98**	**101**	**106**	**110**	**115**	**120**	**124**
Total reserve in Latvia[3)]	**7=5+6**	**188**	**191**	**193**	**195**	**198**	**201**	**206**	**210**	**215**	**220**	**224**
Power surplus (+), deficit (-)	**8=4-1-7**	**5**	**-14**	**-33**	**-55**	**-78**	**-101**	**-125**	**-153**	**-178**	**-206**	**-233**
Power adequacy	**9=(4-7)/1**	**100%**	**99%**	**98%**	**96%**	**95%**	**93%**	**92%**	**90%**	**89%**	**87%**	**86%**

Latvian power system balance for Scenario EU2030 winter peak load hours, MW (nett)

Table 7

Years		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Maximum load	**1**	**1332**	**1356**	**1381**	**1409**	**1437**	**1466**	**1495**	**1529**	**1559**	**1593**	**1624**
Power stations with installed capacity above 40 MW	**2**	**2557**	**2565**	**2564**	**2564**	**2564**	**2564**	**2564**	**2564**	**2564**	**2564**	**2564**
Including: Daugava HPPs	*2.1*	*1572*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*	*1580*
Riga CHP-1	*2.2*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*
Riga CHP-2	*2.3*	*850*	*850*	*850*	*850*	*850*	*850*	*850*	*850*	*850*	*850*	*850*
Imanta CHP	*2.4*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*
Small power stations	**3**	**384**	**424**	**465**	**506**	**546**	**617**	**676**	**735**	**794**	**853**	**913**
Including: Natural gas co-generation power stations	*3.1*	*109*	*110*	*112*	*113*	*114*	*116*	*117*	*119*	*120*	*122*	*123*
Hydro power stations	*3.2*	*28*	*28*	*28*	*28*	*29*	*29*	*29*	*30*	*30*	*30*	*30*
Wind power stations	*3.3*	*97*	*120*	*143*	*166*	*189*	*242*	*284*	*325*	*367*	*409*	*450*
Onshore	*3.3.1.*	*97*	*120*	*143*	*166*	*189*	*212*	*235*	*258*	*281*	*304*	*327*
Offshore	*3.3.2.*	*0*	*0*	*0*	*0*	*0*	*30*	*48*	*67*	*86*	*105*	*123*
Biomass power stations	*3.4*	*83*	*89*	*96*	*103*	*109*	*116*	*123*	*129*	*136*	*143*	*149*
Biogas power stations	*3.5*	*66*	*74*	*82*	*90*	*99*	*107*	*115*	*124*	*132*	*140*	*149*
Solar power stations	*3.6*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*9*	*10*	*11*
Available capacities for peak load and reserve guaranteeing	**4**	**1580**	**1594**	**1608**	**1621**	**1635**	**1652**	**1668**	**1683**	**1699**	**1714**	**1730**
Including: Daugava HPPs [5)]	*4.01*	*400*	*400*	*400*	*400*	*400*	*400*	*400*	*400*	*400*	*400*	*400*
Riga CHP-1	*4.02*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*	*139*
Riga CHP-2	*4.03*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*	*803*
Imanta CHP	*4.04*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*	*42*
Natural gas co-generation power stations	*4.05*	*76*	*76*	*77*	*77*	*78*	*78*	*79*	*79*	*80*	*81*	*81*
Hydro power stations	*4.06*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Wind power stations	*4.07*	*10*	*12*	*14*	*17*	*19*	*24*	*28*	*33*	*37*	*41*	*45*
Biomass power stations	*4.08*	*58*	*63*	*67*	*72*	*77*	*81*	*86*	*91*	*95*	*100*	*105*
Biogas power stations	*4.09*	*46*	*52*	*58*	*63*	*69*	*75*	*81*	*87*	*92*	*98*	*104*
Solar power stations	*4.10*	*0.82*	*1.19*	*1.56*	*1.93*	*2.30*	*2.67*	*3.04*	*3.42*	*3.79*	*4.16*	*4.53*
Power system emergency reserve [2)]	**5**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Power system regulating reserve [4)]	**6**	**90**	**93**	**97**	**101**	**105**	**112**	**118**	**124**	**130**	**136**	**142**
Total reserve in Latvia [3)]	**7=5+6**	**190**	**193**	**197**	**201**	**205**	**212**	**218**	**224**	**230**	**236**	**242**
Power surplus (+), deficit (-)	**8=4-1-7**	**59**	**45**	**29**	**11**	**-7**	**-26**	**-45**	**-70**	**-91**	**-114**	**-137**
Power adequacy	**9=(4-7)/1**	**104%**	**103%**	**102%**	**101%**	**100%**	**98%**	**97%**	**95%**	**94%**	**93%**	**92%**

Possible power balance for Scenario A (annual values), GWh

Table 8

Scenario A

Years		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Energy demand	**1**	**7242**	**7259**	**7288**	**7300**	**7318**	**7343**	**7381**	**7437**	**7473**	**7518**	**7552**
Output in power stations with installed capacity above 40 MW	**2**	**3728**	**3521**	**3524**	**3526**	**3077**	**3019**	**3019**	**3019**	**3019**	**3019**	**3019**
Including: Daugava HPPs [1)]	*2.1*	*2276*	*2284*	*2287*	*2289*	*2291*	*2293*	*2293*	*2293*	*2293*	*2293*	*2293*
Riga CHP-1 [9)]	*2.2*	*493*	*451*	*451*	*451*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Riga CHP-2 [9)]	*2.3*	*899*	*726*	*726*	*726*	*726*	*726*	*726*	*726*	*726*	*726*	*726*
Imanta CHP	*2.4*	*60*	*60*	*60*	*60*	*60*	*0*	*0*	*0*	*0*	*0*	*0*
Small power stations	**3**	**1659**	**1701**	**1744**	**1787**	**1830**	**1873**	**1966**	**2037**	**2107**	**2178**	**2249**
Including: Natural gas co-generation power stations	*3.1*	*648*	*653*	*658*	*662*	*667*	*672*	*676*	*681*	*686*	*690*	*695*
Hydro power stations	*3.2*	*72*	*72*	*73*	*74*	*75*	*75*	*76*	*77*	*77*	*78*	*78*
Wind power stations	*3.3*	*159*	*170*	*180*	*191*	*202*	*212*	*272*	*311*	*350*	*389*	*428*
Onshore	*3.3.1.*	*159*	*170*	*180*	*191*	*202*	*212*	*223*	*233*	*244*	*255*	*265*
Offshore	*3.3.2.*	*0*	*0*	*0*	*0*	*0*	*0*	*50*	*78*	*106*	*134*	*163*
Biomass power stations	*3.4*	*393*	*405*	*417*	*429*	*441*	*453*	*465*	*478*	*490*	*502*	*514*
Biogas power stations	*3.5*	*387*	*401*	*416*	*431*	*445*	*460*	*474*	*489*	*503*	*518*	*533*
Solar power stations	*3.6*	*0.45*	*0.56*	*0.67*	*0.78*	*0.90*	*1.01*	*1.12*	*1.2*	*1.4*	*1.5*	*1.6*
Possible annual export/import	**4=(2+3)-1**	**-1854**	**-2037**	**-2019**	**-1987**	**-2410**	**-2450**	**-2396**	**-2381**	**-2347**	**-2321**	**-2283**
Possible spring flood period export	**5**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**
Annual adequacy	**6=(2+3-5)/1**	**67%**	**65%**	**65%**	**66%**	**60%**	**60%**	**61%**	**61%**	**62%**	**62%**	**63%**

Possible power balance for Scenario B (annual values), GWh

Scenario B *Table 9*

Years		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Energy demand	**1**	**7316**	**7357**	**7388**	**7434**	**7477**	**7539**	**7614**	**7709**	**7785**	**7872**	**7948**
Output in power stations with installed capacity above 40 MW	**2**	**4336**	**4344**	**4347**	**4349**	**4351**	**4253**	**4253**	**4253**	**4253**	**4253**	**4253**
Including: Daugava HPPs [1)]	*2.1*	*2276*	*2284*	*2287*	*2289*	*2291*	*2293*	*2293*	*2293*	*2293*	*2293*	*2293*
Riga CHP-1 [9)]	*2.2*	*460*	*460*	*460*	*460*	*460*	*460*	*460*	*460*	*460*	*460*	*460*
Riga CHP-2 [9)]	*2.3*	*1500*	*1500*	*1500*	*1500*	*1500*	*1500*	*1500*	*1500*	*1500*	*1500*	*1500*
Imanta CHP	*2.4*	*100*	*100*	*100*	*100*	*100*	*0*	*0*	*0*	*0*	*0*	*0*
Small power stations	**3**	**1694**	**1770**	**1848**	**1925**	**2002**	**2080**	**2219**	**2341**	**2461**	**2582**	**2704**
Including: Natural gas co-generation power stations	*3.1*	*648*	*653*	*658*	*662*	*667*	*672*	*676*	*681*	*686*	*690*	*695*
Hydro power stations	*3.2*	*72*	*72*	*73*	*74*	*75*	*75*	*76*	*77*	*77*	*78*	*78*
Wind power stations	*3.3*	*166*	*184*	*202*	*219*	*237*	*255*	*334*	*396*	*458*	*520*	*582*
Onshore	*3.3.1.*	*166*	*184*	*202*	*219*	*237*	*255*	*272*	*290*	*308*	*325*	*343*
Offshore	*3.3.2.*	*0*	*0*	*0*	*0*	*0*	*0*	*62*	*106*	*150*	*194*	*239*
Biomass power stations	*3.4*	*400*	*420*	*440*	*459*	*479*	*499*	*518*	*538*	*558*	*578*	*597*
Biogas power stations	*3.5*	*407*	*441*	*475*	*509*	*544*	*578*	*612*	*646*	*681*	*715*	*749*
Solar power stations	*3.6*	*0.5*	*0.7*	*0.8*	*1.0*	*1.2*	*1.3*	*1.5*	*1.7*	*1.9*	*2.0*	*2.2*
Possible annual export/import	**4=(2+3)-1**	**-1286**	**-1243**	**-1193**	**-1159**	**-1124**	**-1205**	**-1142**	**-1115**	**-1071**	**-1037**	**-991**
Possible spring flood period export	**5**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**
Annual adequacy	**6=(2+3-5)/1**	**76%**	**76%**	**77%**	**78%**	**78%**	**77%**	**78%**	**79%**	**80%**	**80%**	**81%**

Possible power balance for Scenario EU2030 (annual values), GWh

Scenario EU2030 *Table 10*

Years		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Energy demand	**1**	**7353**	**7455**	**7556**	**7668**	**7781**	**7897**	**8012**	**8091**	**8175**	**8279**	**8345**
Output in power stations with installed capacity above 40 MW	**2**	**9012**	**9020**	**9023**	**9025**	**8837**	**8739**	**8739**	**8739**	**8739**	**8739**	**8739**
Including: Daugava HPPs [1)]	*2.1*	*2276*	*2284*	*2287*	*2289*	*2291*	*2293*	*2293*	*2293*	*2293*	*2293*	*2293*
Riga CHP-1 [9)]	*2.2*	*494*	*494*	*494*	*494*	*494*	*494*	*494*	*494*	*494*	*494*	*494*
Riga CHP-2 [9)]	*2.3*	*5952*	*5952*	*5952*	*5952*	*5952*	*5952*	*5952*	*5952*	*5952*	*5952*	*5952*
Imanta CHP	*2.4*	*290*	*290*	*290*	*290*	*100*	*0*	*0*	*0*	*0*	*0*	*0*
Small power stations	**3**	**1715**	**1841**	**1968**	**2095**	**2266**	**2421**	**2576**	**2731**	**2884**	**3039**	**3194**
Including: Natural gas co-generation power stations	*3.1*	*648*	*653*	*658*	*662*	*667*	*672*	*676*	*681*	*686*	*690*	*695*
Hydro power stations	*3.2*	*72*	*72*	*73*	*74*	*75*	*75*	*76*	*77*	*77*	*78*	*78*
Wind power stations	*3.3*	*146*	*180*	*215*	*249*	*328*	*391*	*453*	*516*	*578*	*641*	*704*
Onshore	*3.3.1.*	*146*	*180*	*215*	*249*	*284*	*318*	*353*	*387*	*422*	*456*	*491*
Offshore	*3.3.2.*	*0*	*0*	*0*	*0*	*45*	*73*	*101*	*129*	*157*	*185*	*213*
Biomass power stations	*3.4*	*455*	*492*	*529*	*565*	*602*	*639*	*675*	*712*	*749*	*785*	*822*
Biogas power stations	*3.5*	*393*	*443*	*493*	*543*	*593*	*643*	*692*	*742*	*792*	*842*	*892*
Solar power stations	*3.6*	*0.6*	*0.9*	*1.2*	*1.4*	*1.7*	*2.0*	*2.3*	*2.6*	*2.8*	*3.1*	*3.4*
Possible annual export/import	**4=(2+3)-1**	**3375**	**3406**	**3435**	**3452**	**3323**	**3264**	**3303**	**3379**	**3449**	**3499**	**3588**
Possible spring flood period export	**5**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**	**500**
Annual adequacy	**6=(2+3-5)/1**	**139%**	**139%**	**139%**	**138%**	**136%**	**135%**	**135%**	**136%**	**136%**	**136%**	**137%**

Power demand and possible sources of guaranteeing, hourly balance for Scenario A (peak load), MW

Power demand and possible sources for guaranteeing, hourly values.
Scenario A
Year 2018.January (working day, Wednesday of the third week, Peak load)

Table 11

Hour	Riga CHP-1	Riga CHP-2	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs 10)	Import	Load
01:00	139	522	42	53	40	75	6	8	0.00	16	0	902
02:00	139	477	42	53	40	75	6	8	0.00	15	0	855
03:00	139	464	42	53	40	75	6	8	0.00	15	0	843
04:00	139	446	42	53	40	75	6	8	0.00	25	0	835
05:00	139	433	42	53	40	75	6	8	0.00	41	0	837
06:00	139	410	42	53	40	75	6	8	0.00	109	0	883
07:00	139	468	42	53	40	75	6	8	0.00	186	0	1018
08:00	139	559	42	53	40	75	6	8	0.00	256	0	1179
09:00	139	666	42	53	40	75	6	8	0.59	259	0	1289
10:00	139	763	42	53	40	75	6	8	0.59	208	0	1335
11:00	139	803	42	53	40	75	6	8	0.59	160	28	1356
12:00	139	803	42	53	40	75	6	8	0.59	144	21	1332
13:00	139	779	42	53	40	75	6	8	0.59	161	0	1304
14:00	139	745	42	53	40	75	6	8	0.59	194	0	1303
15:00	139	705	42	53	40	75	6	8	0.59	215	0	1284
16:00	139	663	42	53	40	75	6	8	0.59	244	0	1272
17:00	139	689	42	53	40	75	6	8	0.00	270	0	1323
18:00	139	705	42	53	40	75	6	8	0.00	270	0	1339
19:00	139	673	42	53	40	75	6	8	0.00	270	0	1307
20:00	139	696	42	53	40	75	6	8	0.00	201	0	1260
21:00	139	724	42	53	40	75	6	8	0.00	129	0	1217
22:00	139	685	42	53	40	75	6	8	0.00	108	0	1157
23:00	139	638	42	53	40	75	6	8	0.00	64	0	1066
00:00	139	578	42	53	40	75	6	8	0.00	29	0	971

Power demand and possible sources for guaranteeing, hourly values.
Scenario A

Table 12

Year 2022. January (working day, Wednesday of the third week, Peak load)

Hour	Riga CHP-1	Riga CHP-2	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
01:00	0	718	42	60	46	77	6	10	0.00	16	0	975
02:00	0	669	42	60	46	77	6	10	0.00	15	0	924
03:00	0	655	42	60	46	77	6	10	0.00	15	0	911
04:00	0	637	42	60	46	77	6	10	0.00	25	0	903
05:00	0	623	42	60	46	77	6	10	0.00	41	0	905
06:00	0	605	42	60	46	77	6	10	0.00	109	0	955
07:00	0	673	42	60	46	77	6	10	0.00	186	0	1100
08:00	0	777	42	60	46	77	6	10	0.00	256	0	1274
09:00	0	803	42	60	46	77	6	10	1.20	259	90	1394
10:00	0	803	42	60	46	77	6	10	1.20	208	190	1443
11:00	0	803	42	60	46	77	6	10	1.20	160	260	1466
12:00	0	803	42	60	46	77	6	10	1.20	144	251	1440
13:00	0	803	42	60	46	77	6	10	1.20	161	203	1410
14:00	0	803	42	60	46	77	6	10	1.20	194	170	1409
15:00	0	803	42	60	46	77	6	10	1.20	215	128	1388
16:00	0	803	42	60	46	77	6	10	1.20	244	86	1375
17:00	0	803	42	60	46	77	6	10	0.00	270	116	1430
18:00	0	803	42	60	46	77	6	10	0.00	270	134	1448
19:00	0	803	42	60	46	77	6	10	0.00	270	99	1413
20:00	0	803	42	60	46	77	6	10	0.00	201	118	1363
21:00	0	803	42	60	46	77	6	10	0.00	129	142	1316
22:00	0	803	42	60	46	77	6	10	0.00	108	98	1251
23:00	0	803	42	60	46	77	6	10	0.00	64	44	1152
00:00	0	779	42	60	46	77	6	10	0.00	29	0	1050

Power demand and possible sources for guaranteeing, hourly values.

Scenario A

Year 2027. January (working day, Wednesday of the third week, Peak load) *Table 13*

Hour	Riga CHP-1	Riga CHP-2	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
01:00	0	797	42	69	54	80	6	16	0.00	16	0	1080
02:00	0	742	42	69	54	80	6	16	0.00	15	0	1025
03:00	0	728	42	69	54	80	6	16	0.00	15	0	1010
04:00	0	708	42	69	54	80	6	16	0.00	25	0	1001
05:00	0	695	42	69	54	80	6	16	0.00	41	0	1003
06:00	0	682	42	69	54	80	6	16	0.00	109	0	1058
07:00	0	766	42	69	54	80	6	16	0.00	186	0	1220
08:00	0	803	42	69	54	80	6	16	0.00	256	85	1412
09:00	0	803	42	69	54	80	6	16	1.95	259	214	1545
10:00	0	803	42	69	54	80	6	16	1.95	208	319	1600
11:00	0	803	42	69	54	80	6	16	1.95	160	391	1624
12:00	0	803	42	69	54	80	6	16	1.95	144	380	1596
13:00	0	803	42	69	54	80	6	16	1.95	161	329	1562
14:00	0	803	42	69	54	80	6	16	1.95	194	295	1561
15:00	0	803	42	69	54	80	6	16	1.95	215	252	1539
16:00	0	803	42	69	54	80	6	16	1.95	244	207	1524
17:00	0	803	42	69	54	80	6	16	0.00	270	244	1585
18:00	0	803	42	69	54	80	6	16	0.00	270	264	1604
19:00	0	803	42	69	54	80	6	16	0.00	270	225	1566
20:00	0	803	42	69	54	80	6	16	0.00	201	239	1510
21:00	0	803	42	69	54	80	6	16	0.00	129	259	1458
22:00	0	803	42	69	54	80	6	16	0.00	108	207	1386
23:00	0	803	42	69	54	80	6	16	0.00	64	142	1277
00:00	0	803	42	69	54	80	6	16	0.00	29	64	1164

Power demand and possible sources of guaranteeing, hourly balance for Scenario B (peak load), MW

Power demand and possible sources for guaranteeing, hourly values.
Scenario B
Year 2018. January (working day, Wednesday of the third week, Peak load)

Table 14

Hour	Riga CHP-1	Riga CHP-2[11)]	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
01:00	139	497	42	56	44	76	6	8	0.00	34	0	902
02:00	139	464	42	56	44	76	6	8	0.00	20	0	855
03:00	139	453	42	56	44	76	6	8	0.00	19	0	843
04:00	139	446	42	56	44	76	6	8	0.00	19	0	835
05:00	139	434	42	56	44	76	6	8	0.00	33	0	837
06:00	139	460	42	56	44	76	6	8	0.00	53	0	883
07:00	139	506	42	56	44	76	6	8	0.00	141	0	1018
08:00	139	567	42	56	44	76	6	8	0.00	241	0	1179
09:00	139	586	42	56	44	76	6	8	0.67	332	0	1289
10:00	139	629	42	56	44	76	6	8	0.67	335	0	1335
11:00	139	715	42	56	44	76	6	8	0.67	269	0	1356
12:00	139	753	42	56	44	76	6	8	0.67	208	0	1332
13:00	139	746	42	56	44	76	6	8	0.67	186	0	1304
14:00	139	723	42	56	44	76	6	8	0.67	209	0	1303
15:00	139	662	42	56	44	76	6	8	0.67	251	0	1284
16:00	139	622	42	56	44	76	6	8	0.67	278	0	1272
17:00	139	602	42	56	44	76	6	8	0.00	350	0	1323
18:00	139	619	42	56	44	76	6	8	0.00	350	0	1339
19:00	139	587	42	56	44	76	6	8	0.00	350	0	1307
20:00	139	630	42	56	44	76	6	8	0.00	260	0	1260
21:00	139	679	42	56	44	76	6	8	0.00	167	0	1217
22:00	139	646	42	56	44	76	6	8	0.00	140	0	1157
23:00	139	613	42	56	44	76	6	8	0.00	83	0	1066
00:00	139	563	42	56	44	76	6	8	0.00	38	0	971

Power demand and possible sources for guaranteeing, hourly values.
Scenario B
Year 2022. January (working day, Wednesday of the third week, Peak load)

Table 15

Hour	Riga CHP-1	Riga CHP-2[11)]	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
01:00	139	539	42	67	59	78	6	12	0.00	34	0	975
02:00	139	502	42	67	59	78	6	12	0.00	20	0	924
03:00	139	490	42	67	59	78	6	12	0.00	19	0	911
04:00	139	482	42	67	59	78	6	12	0.00	19	0	903
05:00	139	470	42	67	59	78	6	12	0.00	33	0	905
06:00	139	499	42	67	59	78	6	12	0.00	53	0	955
07:00	139	557	42	67	59	78	6	12	0.00	141	0	1100
08:00	139	631	42	67	59	78	6	12	0.00	241	0	1274
09:00	139	658	42	67	59	78	6	12	1.57	332	0	1394
10:00	139	704	42	67	59	78	6	12	1.57	335	0	1443
11:00	139	793	42	67	59	78	6	12	1.57	269	0	1466
12:00	139	828	42	67	59	78	6	12	1.57	208	0	1440
13:00	139	820	42	67	59	78	6	12	1.57	186	0	1410
14:00	139	796	42	67	59	78	6	12	1.57	209	0	1409
15:00	139	734	42	67	59	78	6	12	1.57	251	0	1388
16:00	139	693	42	67	59	78	6	12	1.57	278	0	1375
17:00	139	678	42	67	59	78	6	12	0.00	350	0	1430
18:00	139	696	42	67	59	78	6	12	0.00	350	0	1448
19:00	139	661	42	67	59	78	6	12	0.00	350	0	1413
20:00	139	700	42	67	59	78	6	12	0.00	260	0	1363
21:00	139	746	42	67	59	78	6	12	0.00	167	0	1316
22:00	139	708	42	67	59	78	6	12	0.00	140	0	1251
23:00	139	667	42	67	59	78	6	12	0.00	83	0	1152
00:00	139	610	42	67	59	78	6	12	0.00	38	0	1050

Power demand and possible sources for guaranteeing, hourly values.

Scenario B

Year 2027. January (working day, Wednesday of the third week, Peak load) *Table 16*

Hour	Riga CHP-1	Riga CHP-2 11)	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs 10)	Import	Load
01:00	139	597	42	81	77	81	6	24	0.00	34	0	1080
02:00	139	554	42	81	77	81	6	24	0.00	20	0	1025
03:00	139	541	42	81	77	81	6	24	0.00	19	0	1010
04:00	139	532	42	81	77	81	6	24	0.00	19	0	1001
05:00	139	521	42	81	77	81	6	24	0.00	33	0	1003
06:00	139	555	42	81	77	81	6	24	0.00	53	0	1058
07:00	139	628	42	81	77	81	6	24	0.00	141	0	1220
08:00	139	721	42	81	77	81	6	24	0.00	241	0	1412
09:00	139	760	42	81	77	81	6	24	2.70	332	0	1545
10:00	139	812	42	81	77	81	6	24	2.70	335	0	1600
11:00	139	850	42	81	77	81	6	24	2.70	269	53	1624
12:00	139	850	42	81	77	81	6	24	2.70	208	85	1596
13:00	139	850	42	81	77	81	6	24	2.70	186	73	1562
14:00	139	850	42	81	77	81	6	24	2.70	209	50	1561
15:00	139	835	42	81	77	81	6	24	2.70	251	0	1539
16:00	139	793	42	81	77	81	6	24	2.70	278	0	1524
17:00	139	785	42	81	77	81	6	24	0.00	350	0	1585
18:00	139	805	42	81	77	81	6	24	0.00	350	0	1604
19:00	139	766	42	81	77	81	6	24	0.00	350	0	1566
20:00	139	800	42	81	77	81	6	24	0.00	260	0	1510
21:00	139	841	42	81	77	81	6	24	0.00	167	0	1458
22:00	139	796	42	81	77	81	6	24	0.00	140	0	1386
23:00	139	744	42	81	77	81	6	24	0.00	83	0	1277
00:00	139	676	42	81	77	81	6	24	0.00	38	0	1164

Power demand and possible sources of guaranteeing, hourly balance for Scenario EU2030 (peak load), MW

Power demand and possible sources for guaranteeing, hourly values.
Scenario EU2030
Year 2018. January (working day, Wednesday of the third week, Peak load)

Table 17

Hour	Riga CHP-1	Riga CHP-2	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
01:00	139	487	42	58	46	76	6	10	0.00	39	0	902
02:00	139	456	42	58	46	76	6	10	0.00	23	0	855
03:00	139	445	42	58	46	76	6	10	0.00	22	0	843
04:00	139	438	42	58	46	76	6	10	0.00	22	0	835
05:00	139	424	42	58	46	76	6	10	0.00	38	0	837
06:00	139	447	42	58	46	76	6	10	0.00	61	0	883
07:00	139	481	42	58	46	76	6	10	0.00	161	0	1018
08:00	139	527	42	58	46	76	6	10	0.00	276	0	1179
09:00	139	533	42	58	46	76	6	10	0.82	379	0	1289
10:00	139	575	42	58	46	76	6	10	0.82	383	0	1335
11:00	139	671	42	58	46	76	6	10	0.82	308	0	1356
12:00	139	717	42	58	46	76	6	10	0.82	238	0	1332
13:00	139	714	42	58	46	76	6	10	0.82	213	0	1304
14:00	139	688	42	58	46	76	6	10	0.82	239	0	1303
15:00	139	621	42	58	46	76	6	10	0.82	287	0	1284
16:00	139	577	42	58	46	76	6	10	0.82	318	0	1272
17:00	139	547	42	58	46	76	6	10	0.00	400	0	1323
18:00	139	563	42	58	46	76	6	10	0.00	400	0	1339
19:00	139	531	42	58	46	76	6	10	0.00	400	0	1307
20:00	139	587	42	58	46	76	6	10	0.00	297	0	1260
21:00	139	650	42	58	46	76	6	10	0.00	191	0	1217
22:00	139	621	42	58	46	76	6	10	0.00	160	0	1157
23:00	139	595	42	58	46	76	6	10	0.00	94	0	1066
00:00	139	552	42	58	46	76	6	10	0.00	44	0	971

Power demand and possible sources for guaranteeing, hourly values.
Scenario EU2030
Year 2022. January (working day, Wednesday of the third week, Peak load)

Table 18

Hour	Riga CHP-1	Riga CHP-2	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
01:00	139	507	42	77	69	78	6	19	0.00	39	0	975
02:00	139	472	42	77	69	78	6	19	0.00	23	0	924
03:00	139	460	42	77	69	78	6	19	0.00	22	0	911
04:00	139	452	42	77	69	78	6	19	0.00	22	0	903
05:00	139	438	42	77	69	78	6	19	0.00	38	0	905
06:00	139	465	42	77	69	78	6	19	0.00	61	0	955
07:00	139	510	42	77	69	78	6	19	0.00	161	0	1100
08:00	139	569	42	77	69	78	6	19	0.00	276	0	1274
09:00	139	583	42	77	69	78	6	19	2.30	379	0	1394
10:00	139	628	42	77	69	78	6	19	2.30	383	0	1443
11:00	139	726	42	77	69	78	6	19	2.30	308	0	1466
12:00	139	770	42	77	69	78	6	19	2.30	238	0	1440
13:00	139	765	42	77	69	78	6	19	2.30	213	0	1410
14:00	139	738	42	77	69	78	6	19	2.30	239	0	1409
15:00	139	670	42	77	69	78	6	19	2.30	287	0	1388
16:00	139	625	42	77	69	78	6	19	2.30	318	0	1375
17:00	139	600	42	77	69	78	6	19	0.00	400	0	1430
18:00	139	618	42	77	69	78	6	19	0.00	400	0	1448
19:00	139	584	42	77	69	78	6	19	0.00	400	0	1413
20:00	139	636	42	77	69	78	6	19	0.00	297	0	1363
21:00	139	695	42	77	69	78	6	19	0.00	191	0	1316
22:00	139	661	42	77	69	78	6	19	0.00	160	0	1251
23:00	139	628	42	77	69	78	6	19	0.00	94	0	1152
00:00	139	577	42	77	69	78	6	19	0.00	44	0	1050

Power demand and possible sources for guaranteeing, hourly values.

Scenario EU2030

Table 19

Year 2027. January (working day, Wednesday of the third week, Peak load)

Hour	Riga CHP-1	Riga CHP-2	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
01:00	139	535	42	100	98	81	6	41	0.00	39	0	1080
02:00	139	494	42	100	98	81	6	41	0.00	23	0	1025
03:00	139	481	42	100	98	81	6	41	0.00	22	0	1010
04:00	139	472	42	100	98	81	6	41	0.00	22	0	1001
05:00	139	459	42	100	98	81	6	41	0.00	38	0	1003
06:00	139	491	42	100	98	81	6	41	0.00	61	0	1058
07:00	139	551	42	100	98	81	6	41	0.00	161	0	1220
08:00	139	629	42	100	98	81	6	41	0.00	276	0	1412
09:00	139	654	42	100	98	81	6	41	4.16	379	0	1545
10:00	139	705	42	100	98	81	6	41	4.16	383	0	1600
11:00	139	805	42	100	98	81	6	41	4.16	308	0	1624
12:00	139	847	42	100	98	81	6	41	4.16	238	0	1596
13:00	139	838	42	100	98	81	6	41	4.16	213	0	1562
14:00	139	811	42	100	98	81	6	41	4.16	239	0	1561
15:00	139	741	42	100	98	81	6	41	4.16	287	0	1539
16:00	139	695	42	100	98	81	6	41	4.16	318	0	1524
17:00	139	678	42	100	98	81	6	41	0.00	400	0	1585
18:00	139	698	42	100	98	81	6	41	0.00	400	0	1604
19:00	139	659	42	100	98	81	6	41	0.00	400	0	1566
20:00	139	706	42	100	98	81	6	41	0.00	297	0	1510
21:00	139	760	42	100	98	81	6	41	0.00	191	0	1458
22:00	139	719	42	100	98	81	6	41	0.00	160	0	1386
23:00	139	675	42	100	98	81	6	41	0.00	94	0	1277
00:00	139	613	42	100	98	81	6	41	0.00	44	0	1164

Power demand and possible sources of guaranteeing, hourly balance for Scenario A (minimum load), MW

Scenario A

Year 2018. June – minimum load

Table 20

Hour	Riga CHP-1	Riga CHP-2 [11)]	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
00:00	0	380	0	55	42	76	6	8	0.00	77	0	644
01:00	0	324	0	55	42	76	6	8	0.00	62	0	573
02:00	0	309	0	55	42	76	6	8	0.00	54	0	551
03:00	0	304	0	55	42	76	6	8	0.00	36	0	527
04:00	0	275	0	55	42	76	6	8	0.00	36	0	497
05:00	0	245	0	55	42	76	6	8	0.00	33	0	465
06:00	0	187	0	55	42	76	6	8	0.00	75	0	449
07:00	0	170	0	55	42	76	6	8	0.00	145	21	480
08:00	0	170	0	55	42	76	6	8	0.59	212	61	508
09:00	0	170	0	55	42	76	6	8	0.59	259	67	550
10:00	0	170	0	55	42	76	6	8	0.59	270	30	597
11:00	0	184	0	55	42	76	6	8	0.59	265	0	637
12:00	0	225	0	55	42	76	6	8	0.59	244	0	657
13:00	0	234	0	55	42	76	6	8	0.59	236	0	658
14:00	0	218	0	55	42	76	6	8	0.59	251	0	657
15:00	0	238	0	55	42	76	6	8	0.59	232	0	658
16:00	0	263	0	55	42	76	6	8	0.59	209	0	660
17:00	0	302	0	55	42	76	6	8	0.59	172	0	662
18:00	0	328	0	55	42	76	6	8	0.59	158	0	673
19:00	0	342	0	55	42	76	6	8	0.00	150	0	679
20:00	0	319	0	55	42	76	6	8	0.00	169	0	675
21:00	0	341	0	55	42	76	6	8	0.00	140	0	668
22:00	0	363	0	55	42	76	6	8	0.00	115	0	665
23:00	0	368	0	55	42	76	6	8	0.00	94	0	649

Scenario A
Year 2022. June – minimum load

Table 21

Hour	Riga CHP-1	Riga CHP-2 [11)]	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
00:00	0	403	0	62	48	78	6	10	0.00	77	0	684
01:00	0	344	0	62	48	77	6	10	0.00	62	0	609
02:00	0	327	0	62	48	77	6	10	0.00	54	0	585
03:00	0	320	0	62	48	77	6	10	0.00	36	0	559
04:00	0	289	0	62	48	77	6	10	0.00	36	0	528
05:00	0	258	0	62	48	77	6	10	0.00	33	0	494
06:00	0	198	0	62	48	77	6	10	0.00	75	0	477
07:00	0	179	0	62	48	77	6	10	0.00	145	17	510
08:00	0	170	0	62	48	77	6	10	1.20	212	46	540
09:00	0	170	0	62	48	77	6	10	1.20	259	50	584
10:00	0	170	0	62	48	77	6	10	1.20	270	10	634
11:00	0	207	0	62	48	77	6	10	1.20	265	0	676
12:00	0	249	0	62	48	77	6	10	1.20	244	0	697
13:00	0	258	0	62	48	77	6	10	1.20	236	0	699
14:00	0	242	0	62	48	77	6	10	1.20	251	0	697
15:00	0	263	0	62	48	77	6	10	1.20	232	0	699
16:00	0	287	0	62	48	77	6	10	1.20	209	0	701
17:00	0	326	0	62	48	77	6	10	1.20	172	0	703
18:00	0	353	0	62	48	77	6	10	1.20	158	0	715
19:00	0	368	0	62	48	77	6	10	0.00	150	0	721
20:00	0	345	0	62	48	77	6	10	0.00	169	0	717
21:00	0	366	0	62	48	77	6	10	0.00	140	0	709
22:00	0	388	0	62	48	77	6	10	0.00	115	0	706
23:00	0	392	0	62	48	77	6	10	0.00	94	0	689

Scenario A
Year 2027. June – minimum load

Table 22

Hour	Riga CHP-1	Riga CHP-2 11)	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs 10)	Import	Load
00:00	0	470	0	70	56	81	6	18	0.00	77	0	778
01:00	0	400	0	70	56	81	6	18	0.00	62	0	693
02:00	0	381	0	70	56	81	6	18	0.00	54	0	666
03:00	0	370	0	70	56	81	6	18	0.00	36	0	637
04:00	0	340	0	70	56	81	6	18	0.00	36	6	601
05:00	0	340	0	70	56	81	6	18	0.00	33	42	562
06:00	0	340	0	70	56	81	6	18	0.00	75	104	543
07:00	0	340	0	70	56	81	6	18	0.00	145	135	581
08:00	0	340	0	70	56	81	6	18	1.95	212	170	615
09:00	0	340	0	70	56	81	6	18	1.95	259	167	665
10:00	0	340	0	70	56	81	6	18	1.95	270	121	722
11:00	0	340	0	70	56	81	6	18	1.95	265	68	770
12:00	0	340	0	70	56	81	6	18	1.95	244	23	794
13:00	0	340	0	70	56	81	6	18	1.95	236	14	795
14:00	0	340	0	70	56	81	6	18	1.95	251	30	794
15:00	0	340	0	70	56	81	6	18	1.95	232	9	795
16:00	0	355	0	70	56	81	6	18	1.95	209	0	798
17:00	0	395	0	70	56	81	6	18	1.95	172	0	800
18:00	0	423	0	70	56	81	6	18	1.95	158	0	814
19:00	0	440	0	70	56	81	6	18	0.00	150	0	821
20:00	0	417	0	70	56	81	6	18	0.00	169	0	816
21:00	0	437	0	70	56	81	6	18	0.00	140	0	808
22:00	0	458	0	70	56	81	6	18	0.00	115	0	804
23:00	0	459	0	70	56	81	6	18	0.00	94	0	784

Power demand and possible sources of guaranteeing, hourly balance for Scenario B (minimum load), MW

Scenario B
Year 2018. June – minimum load

Table 23

Hour	Riga CHP-1	Riga CHP-2 [11)]	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
00:00	0	351	0	56	47	76	6	8	0.00	100	0	644
01:00	0	300	0	56	47	76	6	8	0.00	80	0	573
02:00	0	287	0	56	47	76	6	8	0.00	71	0	551
03:00	0	287	0	56	47	76	6	8	0.00	47	0	527
04:00	0	258	0	56	47	76	6	8	0.00	47	0	497
05:00	0	229	0	56	47	76	6	8	0.00	43	0	465
06:00	0	170	0	56	47	76	6	8	0.00	98	12	449
07:00	0	170	0	56	47	76	6	8	0.00	188	71	480
08:00	0	170	0	56	47	76	6	8	0.67	275	130	508
09:00	0	170	0	56	47	76	6	8	0.67	336	150	550
10:00	0	170	0	56	47	76	6	8	0.67	350	117	597
11:00	0	170	0	56	47	76	6	8	0.67	343	71	637
12:00	0	170	0	56	47	76	6	8	0.67	317	24	657
13:00	0	170	0	56	47	76	6	8	0.67	306	12	658
14:00	0	170	0	56	47	76	6	8	0.67	325	32	657
15:00	0	170	0	56	47	76	6	8	0.67	300	7	658
16:00	0	194	0	56	47	76	6	8	0.67	272	0	660
17:00	0	244	0	56	47	76	6	8	0.67	224	0	662
18:00	0	274	0	56	47	76	6	8	0.67	205	0	673
19:00	0	291	0	56	47	76	6	8	0.00	194	0	679
20:00	0	263	0	56	47	76	6	8	0.00	218	0	675
21:00	0	293	0	56	47	76	6	8	0.00	181	0	668
22:00	0	322	0	56	47	76	6	8	0.00	149	0	665
23:00	0	334	0	56	47	76	6	8	0.00	122	0	649

Scenario B
Year 2022. June – minimum load

Table 24

Hour	Riga CHP-1	Riga CHP-2 11)	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs 10)	Import	Load
00:00	0	363	0	67	59	78	6	12	0.00	100	0	684
01:00	0	307	0	67	59	78	6	12	0.00	80	0	609
02:00	0	293	0	67	59	78	6	12	0.00	71	0	585
03:00	0	291	0	67	59	78	6	12	0.00	47	0	559
04:00	0	260	0	67	59	78	6	12	0.00	47	0	528
05:00	0	230	0	67	59	78	6	12	0.00	43	0	494
06:00	0	170	0	67	59	78	6	12	0.00	98	12	477
07:00	0	170	0	67	59	78	6	12	0.00	188	69	510
08:00	0	170	0	67	59	78	6	12	1.57	275	128	540
09:00	0	170	0	67	59	78	6	12	1.57	336	145	584
10:00	0	170	0	67	59	78	6	12	1.57	350	109	634
11:00	0	170	0	67	59	78	6	12	1.57	343	60	676
12:00	0	170	0	67	59	78	6	12	1.57	317	12	697
13:00	0	170	0	67	59	78	6	12	1.57	306	1	699
14:00	0	170	0	67	59	78	6	12	1.57	325	20	697
15:00	0	175	0	67	59	78	6	12	1.57	300	0	699
16:00	0	206	0	67	59	78	6	12	1.57	272	0	701
17:00	0	256	0	67	59	78	6	12	1.57	224	0	703
18:00	0	287	0	67	59	78	6	12	1.57	205	0	715
19:00	0	305	0	67	59	78	6	12	0.00	194	0	721
20:00	0	277	0	67	59	78	6	12	0.00	218	0	717
21:00	0	307	0	67	59	78	6	12	0.00	181	0	709
22:00	0	336	0	67	59	78	6	12	0.00	149	0	706
23:00	0	346	0	67	59	78	6	12	0.00	122	0	689

Scenario B

Year 2027. June – minimum load *Table 25*

Hour	Riga CHP-1	Riga CHP-2 [11)]	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
00:00	0	410	0	81	77	81	6	24	0.00	100	0	778
01:00	0	344	0	81	77	81	6	24	0.00	80	0	693
02:00	0	327	0	81	77	81	6	24	0.00	71	0	666
03:00	0	321	0	81	77	81	6	24	0.00	47	0	637
04:00	0	286	0	81	77	81	6	24	0.00	47	0	601
05:00	0	251	0	81	77	81	6	24	0.00	43	0	562
06:00	0	176	0	81	77	81	6	24	0.00	98	0	543
07:00	0	170	0	81	77	81	6	24	0.00	188	46	581
08:00	0	170	0	81	77	81	6	24	2.70	275	102	615
09:00	0	170	0	81	77	81	6	24	2.70	336	113	665
10:00	0	170	0	81	77	81	6	24	2.70	350	69	722
11:00	0	170	0	81	77	81	6	24	2.70	343	15	770
12:00	0	206	0	81	77	81	6	24	2.70	317	0	794
13:00	0	218	0	81	77	81	6	24	2.70	306	0	795
14:00	0	198	0	81	77	81	6	24	2.70	325	0	794
15:00	0	223	0	81	77	81	6	24	2.70	300	0	795
16:00	0	255	0	81	77	81	6	24	2.70	272	0	798
17:00	0	305	0	81	77	81	6	24	2.70	224	0	800
18:00	0	338	0	81	77	81	6	24	2.70	205	0	814
19:00	0	358	0	81	77	81	6	24	0.00	194	0	821
20:00	0	329	0	81	77	81	6	24	0.00	218	0	816
21:00	0	357	0	81	77	81	6	24	0.00	181	0	808
22:00	0	386	0	81	77	81	6	24	0.00	149	0	804
23:00	0	394	0	81	77	81	6	24	0.00	122	0	784

Power demand and possible sources of guaranteeing, hourly balance for Scenario EU2030 (minimum load), MW

Scenario EU2030

Year 2018. June – minimum load

Table 26

Hour	Riga CHP-1	Riga CHP-2	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
00:00	0	335	0	58	46	76	6	10	0.00	114	0	644
01:00	0	287	0	58	46	76	6	10	0.00	91	0	573
02:00	0	275	0	58	46	76	6	10	0.00	81	0	551
03:00	0	279	0	58	46	76	6	10	0.00	53	0	527
04:00	0	249	0	58	46	76	6	10	0.00	53	0	497
05:00	0	221	0	58	46	76	6	10	0.00	49	0	465
06:00	0	170	0	58	46	76	6	10	0.00	112	28	449
07:00	0	170	0	58	46	76	6	10	0.00	214	99	480
08:00	0	170	0	58	46	76	6	10	0.82	314	172	508
09:00	0	170	0	58	46	76	6	10	0.82	384	200	550
10:00	0	170	0	58	46	76	6	10	0.82	400	169	597
11:00	0	170	0	58	46	76	6	10	0.82	393	122	637
12:00	0	170	0	58	46	76	6	10	0.82	362	71	657
13:00	0	170	0	58	46	76	6	10	0.82	350	58	658
14:00	0	170	0	58	46	76	6	10	0.82	371	81	657
15:00	0	170	0	58	46	76	6	10	0.82	343	51	658
16:00	0	170	0	58	46	76	6	10	0.82	310	16	660
17:00	0	210	0	58	46	76	6	10	0.82	256	0	662
18:00	0	243	0	58	46	76	6	10	0.82	234	0	673
19:00	0	262	0	58	46	76	6	10	0.00	222	0	679
20:00	0	230	0	58	46	76	6	10	0.00	250	0	675
21:00	0	266	0	58	46	76	6	10	0.00	207	0	668
22:00	0	299	0	58	46	76	6	10	0.00	171	0	665
23:00	0	314	0	58	46	76	6	10	0.00	139	0	649

Scenario EU2030
Year 2022. June – minimum load

Table 27

Hour	Riga CHP-1	Riga CHP-2	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs 10)	Import	Load
00:00	0	319	0	77	69	78	6	19	0.00	114	0	684
01:00	0	266	0	77	69	78	6	19	0.00	91	0	609
02:00	0	253	0	77	69	78	6	19	0.00	81	0	585
03:00	0	255	0	77	69	78	6	19	0.00	53	0	559
04:00	0	224	0	77	69	78	6	19	0.00	53	0	528
05:00	0	194	0	77	69	78	6	19	0.00	49	0	494
06:00	0	170	0	77	69	78	6	19	0.00	112	54	477
07:00	0	170	0	77	69	78	6	19	0.00	214	122	510
08:00	0	170	0	77	69	78	6	19	2.30	314	195	540
09:00	0	170	0	77	69	78	6	19	2.30	384	221	584
10:00	0	170	0	77	69	78	6	19	2.30	400	187	634
11:00	0	170	0	77	69	78	6	19	2.30	393	138	676
12:00	0	170	0	77	69	78	6	19	2.30	362	85	697
13:00	0	170	0	77	69	78	6	19	2.30	350	72	699
14:00	0	170	0	77	69	78	6	19	2.30	371	94	697
15:00	0	170	0	77	69	78	6	19	2.30	343	65	699
16:00	0	170	0	77	69	78	6	19	2.30	310	30	701
17:00	0	194	0	77	69	78	6	19	2.30	256	0	703
18:00	0	228	0	77	69	78	6	19	2.30	234	0	715
19:00	0	248	0	77	69	78	6	19	0.00	222	0	721
20:00	0	216	0	77	69	78	6	19	0.00	250	0	717
21:00	0	251	0	77	69	78	6	19	0.00	207	0	709
22:00	0	285	0	77	69	78	6	19	0.00	171	0	706
23:00	0	299	0	77	69	78	6	19	0.00	139	0	689

Scenario EU2030

Year 2027. June – minimum load

Table 28

Hour	Riga CHP-1	Riga CHP-2	Imanta CHP	Biomass	Biogas	Gas fueled co-generation	Small HPP	Wind power	Solar power	Daugava HPPs [10)]	Import	Load
00:00	0	339	0	100	98	81	6	41	0.00	114	0	778
01:00	0	276	0	100	98	81	6	41	0.00	91	0	693
02:00	0	259	0	100	98	81	6	41	0.00	81	0	666
03:00	0	258	0	100	98	81	6	41	0.00	53	0	637
04:00	0	222	0	100	98	81	6	41	0.00	53	0	601
05:00	0	187	0	100	98	81	6	41	0.00	49	0	562
06:00	0	170	0	100	98	81	6	41	0.00	112	65	543
07:00	0	170	0	100	98	81	6	41	0.00	214	130	581
08:00	0	170	0	100	98	81	6	41	4.16	314	200	615
09:00	0	170	0	100	98	81	6	41	4.16	384	219	665
10:00	0	170	0	100	98	81	6	41	4.16	400	178	722
11:00	0	170	0	100	98	81	6	41	4.16	393	123	770
12:00	0	170	0	100	98	81	6	41	4.16	362	68	794
13:00	0	170	0	100	98	81	6	41	4.16	350	55	795
14:00	0	170	0	100	98	81	6	41	4.16	371	77	794
15:00	0	170	0	100	98	81	6	41	4.16	343	48	795
16:00	0	170	0	100	98	81	6	41	4.16	310	13	798
17:00	0	215	0	100	98	81	6	41	4.16	256	0	800
18:00	0	250	0	100	98	81	6	41	4.16	234	0	814
19:00	0	273	0	100	98	81	6	41	0.00	222	0	821
20:00	0	240	0	100	98	81	6	41	0.00	250	0	816
21:00	0	274	0	100	98	81	6	41	0.00	207	0	808
22:00	0	307	0	100	98	81	6	41	0.00	171	0	804
23:00	0	319	0	100	98	81	6	41	0.00	139	0	784

3.2. Information on energy cross-border trade amounts for 2016, comparison to 2015.

Table 29

	Amounts of energy trade in 2015 (MWh)	Amounts of energy trade in 2016 (MWh)
Import	5 245 938	4 828 354
Export	3 424 478	3 794 883

Table 29 shows that in 2016 imports of electricity in comparison with 2015 has decreased by 8%, while the export from Latvian electricity system has increased by approximately 11% compared to the previous year. Such cross-border trading volumes indicate that in 2016 Latvian electricity system has imported 1 033 471 MWh to cover its domestic consumption, which is about 14% of the total load of Latvian electricity system, but 3 794 883 MWh has passed through Latvia as the energy transit to electricity systems of neighboring countries.

3.3. TSO evaluation for the time periods of insufficient power adequacy and suggestions for power supply guarantee in forthcoming years (i.e. generation development on certain locations, demand side management, new infrastructure creation).

Power system of Latvia is operating together with power systems of Estonia and Lithuania according to the principles of "Nord Pool Spot" electricity market of Nordic countries, where balance of energy demand and supply is regulated under the electricity market principles. Latvian TSO, as the institution responsible for the reliability in Latvian power system, provides the market transactions within the Latvian bidding area, the continuous power balance between the Latvian consumption and generation, as well as control and publishes the available interconnection capacity for trade with the neighboring power systems. Since the European Union's Energy Action Plan 2050 was adopted, which states that the generation development and national capacity adequacy should be focused on areas with renewable energy potential, to stimulate the reduction of CO2 emissions and greenhouse effect gas emission reduction, as well as contribute to a more efficient, competitive power generation development, the base capacity adequacy within the territory of one country is not necessarily an indication of adequacy of generating capacity, but it must be evaluated in complex with the available transmission capacities to/from the country or region (see paragraph 3.6.). In normal operation modes Latvian power system transfer capacities with neighboring power systems are sufficient for provision of forecasted electricity imports/exports, with the exception of the Estonian-Latvian cross-border where capacity is insufficient, and the cross-border for 31% of the time was loaded for 100% of its capacity during the 2016, creating additional restrictions on the power system parties. Even though the overall Estonia – Latvia interconnection loading has decreased for c.a. 36% since the commissioning of Lithuania – Sweden DC cable NordBalt (700 MW) in 2016, the Estonia-Latvia interconnection is still fully loaded for considerable amount of time. Nevertheless, operating under above mentioned conditions during the previous years there have not been situations where a Latvian consumers or regions has had to be restricted due to insufficient generating capacity or insufficient capacity on interconnectors with Lithuania, Estonia and Russia. Until now, working synchronously with the Russian Integrated power system / Unified power system (IPS/UPS) Latvian TSO in all operation modes has been able to provide the required power (consumption) transmission within the Latvian electricity transmission system, regardless of the operational status of generating units within the territory of the Latvia. At the same time, analyzing the adequacy of capacity on national and regional level, the generating capacity of the Latvian power system is not sufficient to cover the Latvian power system peak load and ensure Latvian power system operation regardless of external conditions, especially in emergency situations caused by the cross-border transfer capacity reductions. Taking into account the mentioned above and possible Baltic power systems future synchronization with electricity systems of continental Europe, the TSO has the opinion that the development of power generating capacities in Latvia's electricity system is desirable for providing the security of operation.

Analyzing the power adequacy for the forthcoming years, data from the power (MW) supply analysis tables in Conservative scenario (A) (Table 5) shows that generating capacities are insufficient to cover peak load in Latvia, provide restoration and replacement reserves, and to meet system regulation and safety requirements for winter months throughout the whole 10-year period studied. For the conservative scenario (A) very slow development of the Latvian electricity system is planned, since changes are expected in the state support scheme for renewable energy and cogeneration power plants, thus the operation of the natural gas fueled power plants, including Riga CHP-1 and Riga CHP-2 will be inefficient and less effective in conditions of electricity market. Due to possible changes in the support scheme of cogeneration power plants, starting from year 2021 Riga CHP-1 power plant could be put out of operation and therefore will not participate in the provision of the power balance. In the Conservative scenario (A), based on the generation development trend, the capacity deficit reaches 23% by year 2022 and 30% by 2027. It is planned that, by the year 2027, 65 MW of total net installed power of wind power plants could be covered by offshore wind farms, the real development rates of which are currently difficult to predict due to uncertainty in the regulatory legislation of the State support scheme for RES. Taking into account the slow pace of development of wind power plants, in the Conservative scenario (A) it has been assumed that the development of off-shore wind farms could start not earlier than by year 2023 (the minimum construction period for wind farms is ~ 5 years, with research and the permit granting process for the construction of wind farms could take about 2 years). Over the whole period (2017-2027), the capacity adequacy ranges from 70% to 94%, which indicates that the generation capacity is insufficient to cover the electricity consumption, and the capacity deficit will increase from 79 MW to 487 MW during analyzed period. The conservative scenario (A) clearly shows that is very important not to lose/decrease the existing Latvian big generation capacities (Daugava HPP cascade, Riga CHP-1 and Riga CHP-2) in order to ensure the electricity balance in the Latvian electricity system. In the conservative scenario (A), electricity adequacy in Latvia analyzed in case that Riga CHP-1, Riga CHP-2 and Imanta CHP are operating according to the free energy market conditions, where cogeneration power plants are less efficient and, in a circumstances of free competition, are able to produce only part of the maximum possible energy output. The electrical energy balance table (Table 8) shows that the electricity deficit in the Latvian electricity system in the Conservative scenario (A) varies from around 1800 GWh to 2300 GWh during analyzed period. Such power balance is assumed taking into account that during the high water inflow period (March, April, May), the Daugava HPPs are exporting about 500 GWh to neighboring power systems.

In the Base scenario (B) power (MW) adequacy analysis table (Table 6) shows, that the Latvian electricity system is able to cover the peak load in 2017 and the capacity deficit increases (1%-14%) in future. Similarly with Conservative scenario (A), the Base scenario (B) shows that it is essential not to lose/decrease the existing big power generation capacity in Latvia (Daugava HPP`s, Riga CHP-1 and Riga CHP-2). Is assumed that in Base scenario (B) the development of off-shore wind farms could be start from 2023, where, after the commissioning of last stage of Kurzeme Ring, it power could be connected to the transmission network, as well wind power stations development will be slightly faster than it has been planned in the Conservative scenario (A). The electricity balance table in Base scenario (Table 9) shows that electricity supply will not be sufficient for the whole analyzed period (76% - 81%), which means that Latvia will import electricity from neighboring electricity systems to guarantee electricity balance. In Base scenario (B) it has been assumed that Riga CHP-1, Riga CHP-2 and Imanta CHP are operating according to electricity market conditions ("Nord Pool"), and electricity production from such power plants calculated, based on average long-term production amounts. In order to ensure Latvia's electricity balance, it is assumed that 500 GWh of electricity is exported to neighboring electricity systems during the high water inflow period in Daugava river (March, April, May), because Latvia's consumption in these months is not able to consume all electricity produced by Daugava HPPs cascade. In the Base scenario (B), the increase of share of wind power plants in the Latvian electricity system will also slightly increase necessity of a regulation reserve in Latvian power system. The table of power (MW) adequacy in Optimistic scenario (EU2030) (Table 7) shows that the Latvian electricity system is able to cover the peak load during the period from year 2017 to 2021 (100% to 104%), but starting from year 2022 to 2027 there is a capacity deficit (2% to 8%). Surplus of power from 2017 to 2021 indicates that it is possible to export power to neighboring electricity systems to cover the peak load in neighboring electricity systems as well. In the Optimistic scenario (EU2030) is assumed that the development of off-shore wind farms could be gradually start from 2022, using the modern technologies of wind turbines with installed capacity of 8 MW, and faster development of these technologies is forecasted in the future. The electricity balance table (Table 10) shows that in the Optimistic scenario (EU2030) power adequacy will be sufficient during analyzed period (135% - 139%), which means that electricity import from neighboring countries to Latvia is not necessary, but instead Latvia will be able to export electricity to neighboring power systems. In the optimistic scenario (EU2030) is assumed that Riga CHP-1, Riga CHP-2 and Imanta CHP are operating outside of free electricity market conditions "Nord Pool" and are able to produce the maximum amount of electricity to ensure the security of the Latvian electricity system and electricity supply, taking into account the annual maintenance schedules of each power plant. In order to ensure power adequacy in Latvia is assumed that 500 GWh of electricity is exported to neighboring electricity systems during high water inflow (March, April, May) period in Daugava river, as Latvia's consumption in these months is not able to consume the all electricity amount produced in the Daugava HPPs cascade. In the optimistic scenario (EU2030), increase of share of wind power plants in the Latvian electricity system will also faster increase necessity of a regulation reserve in Latvian power system. The analysis of winter peak load balance during day-time period, TSO concludes that in the Conservative scenario (A) in 2018 Latvian electricity system will not be able to cover the daily load schedule and it will be necessary to import 49 MWh per day to cover the peak load (Table 11). The hourly imported electricity amount is expected between 20 and 30 MW.

In the conservative scenario in 2022 for cover of power system balance of Latvia the electricity import from neighboring countries till 2129 MWh is expected, where the hourly electricity import amount will be around 40 MW to 260 MW (Table 12), but by year 2027 import could increase till 4117 MWh during daily load profile, where the hourly power deficit will be around 400 MW. Starting from year 2021 in Conservative scenario the large power capacity deficit is expected in the Latvian power system, which is related with expected changes in support scheme for cogeneration power plants, where Riga CHP-1 operation is planned to shut down and this power plant will not participate in the provision of capacity balance. The capacity deficit and import of electricity are increasing. In the Base scenario (B), the Latvian TSO will be able to cover the daily load profile in 2018 (Table 14), in 2022 (Table 15), and small power deficit from 50 MW to 85 MW is expected in 2027 (Table 16). The amount of daily electricity imports will be around 261 MWh. In the Base scenario (B) the electricity export to neighboring countries is possible to help neighboring countries covering their peak loads in the winter months, if necessary. In the optimistic scenario (EU2030), the

Latvian TSO will be able to cover the daily load profile in 2018 (Table 17), in 2022 (Table 18) and in 2027 (Table 19). The supported development of renewable energy will provide the sufficient power plants capacity and reduce amounts of electricity import. In case of power adequacy during minimum load day profile in Conservative scenario (A) in 2018, Riga CHP-1 and Imanta CHP are not in operation (Table 20) and the balance of power is basically provided by renewable energy resources - biomass and biogas, wind power plants, Daugava HPPs, small HPPs, solar power plants and small natural gas co-generation power stations, while regulation of power system is provided only by Riga CHP-2. The minimum production of Riga CHP-2 is assumed to be 170 MW. In this scenario, the forced electricity export to neighboring countries is expected from 20 to 70 MW, depending on the time of day. In the conservative scenario (A) the electricity balance in 2022 is provided by biomass and biogas plants, small hydroelectric power stations, wind and solar power plants, Daugava HPPs, and small natural gas cogeneration power stations. The regulation is provided by Riga CHP-2 power plant (Table 21). The minimum production of the Riga CHP-2 is assumed to be 170 MW. In this scenario, the forced export of electricity to neighboring countries is expected from 10 MW to 50 MW, depending on the time of day. By 2027 the production of big power plants is not changed, only due to the increase of maximum load, the minimum production of Riga CHP-2 is increasing, because Riga CHP-2 has to be operated with two generation units of 170 MW each (total 340 MW) in order to cover the daily load profile in the minimum and maximum hours. Electricity export to neighboring countries is increasing around by 170 MW, depending on the time of day (Table 22). The amount of daily electricity exports is expected 889 MWh. The daily minimum load profile graphs in Base scenario (B) in 2018 shows that Riga CHP-1 and Imanta CHP are stopped of operation (Table 23) and the balance of power is basically ensured by renewable energy power plants – biomass and biogas, wind power plants, Daugava HPPs, small HPPs, solar power plants and small natural gas cogeneration stations, while power system regulation is provided only by Riga CHP-2. The minimum production of the Riga CHP-2 in such scenario is expected ~170 MW. In this scenario, the forced electricity export to neighboring countries is expected between 7 MW and 105 MW, depending on the time of day. The total daily electricity export is expected 625 MWh. In Base scenario (B) in 2022 the electricity production is provided by biomass and biogas power plants, small hydroelectric power stations, wind and solar power stations, Daugava HPPs, small natural gas cogeneration power stations and regulation is provided by Riga CHP-2 (Table 24). The minimum electricity production of the Riga CHP-2 is expected to be 170 MW. In this scenario, the forced electricity export to neighboring countries is expected up to 150 MW depending on the time of day. Total electricity export is expected up to 556 MWh, which is for 69 MWh less than in 2018. In 2026 the electricity production by main power plants will not be changed, but due to the increase of system load, the power export to neighboring electricity systems will be reduced to 113 MW (Table 25). For ensure of electricity balance in Latvia and secure operation of the electricity system is necessary to export 345 MWh during day.

In Optimistic scenario (EU2030), when the most rapid development of the renewable energy resources is planned, in 2018 Riga CHP-1 and Imanta CHP operation is stopped (Table 26) and electricity generation is basically provided by renewable energy resources - biomass and biogas, wind power plants, Daugava HPPs, small HPPs, solar power plants and small natural gas cogeneration stations, while only Riga CHP-2 is providing regulation for power system. The minimum electricity production of the Riga CHP-2 is planned 170 MW. In this scenario the total exports of electricity to neighboring countries is planned from 16 to 200 MW, depending on the time of day. Total electricity export is expected till 1066 MWh. In optimistic scenario (EU2030) in 2022, biomass and biogas plants, small hydro power plants, wind and solar power stations, Daugava HPP and small natural gas cogeneration stations are operating as base capacity power plants, while Riga CHP-2 is providing the regulation services (Table 27) to power system. The minimum generation capacity of the Riga CHP-2 is planned as 170 MW. In Optimistic scenario, the forced export of electricity to neighboring countries is planning from 30 MW to 221 MW, depending on the time of day. Due to rapid development of renewable energy resources in Latvia, forced electricity export to neighboring countries is increasing, in order to maximize the use of renewable energy resources and ensure a peak load at the required consumption hours. Total electricity export amount is expected till 1263 MWh, which is 197 MWh more than in 2018, in the same scenario. By the year 2027 the base capacity big power plants will not change, while hourly export of electricity to neighboring electricity systems will increase from 13 MW to 219 MW due to the increase of capacity of renewable energy resources (Table 28). For daily electricity balance profile and guaranteeing of security of electricity system it is necessary to export ~1175 MWh, which is very close to amounts necessary for year 2022. Increase of electricity production from renewable energy sources causes problems with minimal load and peak load coverage in Latvia. In order to provide system regulation services in minimum load modes it is necessary to operate of gas-fueled power plants (at the minimum power output mode), which could ensure coverage of the daily peak load. In this way, in order to ensure the power system operational reliability and power adequacy, is necessary to export electricity produced from renewable energy sources to neighboring countries at the minimum load mode, but at peak load modes is necessary additionally to operate of gas-fueled cogeneration power stations in order to provide the regulation services, since renewable energy resources cannot cover the daily peak load. With development of renewable energy, is necessary to guarantee of fast-regulated emergency (restoration) and replacement reserves that are able to regulate the power balance according to the needs of a daily load profile. To provide fast and controllable emergency and replacement reserves, the TSO could purchase regulation services from existing power plants in Latvia, or purchase these services from electricity producers in neighboring countries, or consider the possibility of building his own emergency reserve power plant to provide such service.

3.4. Information on required and available emergency reserve capacities, replacement reserves (MW) and amount of reserve utilisation (MWh) in 2016.

Table 30

Month	Max required reserve	Available reserve		Replacement reserve (replace BRELL emergency reserve after 12h)	Realized emergency reserve
		In Latvia	BRELL agreement, till 12h		
	MW	MW	MW	MW	MWh
January	275	100	175	100	0
February	275	100	175	100	233.333
March	275	100	175	100	25
April	275	100	175	100	0
May	275	100	175	100	1227.5
June	275	100	175	100	392.5
July	275	100	175	100	1573.001
August	275	100	175	100	456.666
September	275	100	175	100	0
October	275	100	175	100	0
November	275	100	175	100	0
December	275	100	175	100	0

3.5. TSO conclusions on generation capacity and power availability for the needs of power supply providing for Latvian consumers.

Energy Development Guidelines 2016-2020 in Latvia define directions of actions, taking into account the following climate and energy policy objectives set out at the European Council of 8 and of 9 March 2007, to be achieved by 2020:

- reduction of Green house gas (GHG) emissions by 20% compared to 1990 levels;
- increase of share of renewable energy in the total energy consumption up to 20%;
- increase of energy efficiency by 20%.

Power adequacy table (Table 5) shows that in year 2018, in the Conservative Scenario (A), the power adequacy of the Latvian electricity system will reach about 93% but energy adequacy (Table 8) – about 65%. In Conservative scenario (A) is expected to have the highest power deficit, since due to the expected changes changes in the support scheme, operation of the Riga CHP-1 is foreseen to stop from 2021. Due to the expected shut down of Riga CHP-1 and lack of available generation capacity, especially during the winter period, the power deficit from 2021 till 2027 will increase from 300 MW to 500 MW. In the Base scenario (B), the 100% power adequacy will be only untill 2017, but starting from 2018 to 2027 there will be a power deficit from 1% to 14%. In the optimistic scenario (EU2030), the amount of prodecued electrical energy in the time period from 2017 to 2027 will be 135-139%, which indicates that the Latvian electricity system will be able to cover the consumption during all analysing period. From the power adequacy table could conclude that in the Optimistic scenario (EU2030) power adequacy is enought during the time period from 2017 to 2021, and from 2022 until 2027 there is a power deficit (up to 8%). The commissioning of new large capacity power plants in Latvia is not foreseen until 2027 and according to the information available at the AS "Augstsprieguma tīkls" there are no decisions regarding the implementation of large-capacity power plant projects in the Baltic States (including the increase of capacity in big power plants) during the period till 2027. At the same time, the Ministry of Economics of Latvia pointed out that according to EU renewable energy targets 2030, it is believable that large off-shore wind farms projects could be implemented in Latvia till 2030.

According to the information provided by the Ministry of Economics of the Republic of Latvia, it is noted that, taking into account the infrastructure development tendences in Baltic States and neighboring countries, including the commissioning of new power transmission lines and interconnections, the future development of the Visaginas nuclear power plant project according Lithuanian Energy Policy guidelines from November 24, 2016, is clear that Visaginas project will not be realised till 2027. The construction of a nuclear power plant in the Kaliningrad region of Russia is also suspended, and now gas-fuelled cogeheration power plants are (CHPs) are using for electricity production, which has enough power to cover the electricity consumption for the whole Kaliningrad region. At present, active works are under way on the implementation of Ostrovec nuclear power plant in Belarus. The implementation of first unit of Nuclear power plant with installed capacity 1200MW is expected to be commissioned in 2018 and is necessary for needs of the Belarusian electricity consumers. Such big unit also having an impact on the regional IPS/UPS electricity supply system. Implementation of the second unit with similar installed capacity, mainly dedicated for electricity export needs and is expected to be commissioned in 2020. Implementation of second unit of NPP in Berorussia depends on dialogue between Belarus and the neighboring countries regarding reinforcement of the power transmission network and construction of new interconnections. Taking into account current situation and Lithuania negative position towards the Belarusian NPP, Baltic States electricity import reducing from third countries, as well as the possible desynchronization of electricity systems in the Baltic States from Russian and Belarusian electricity systems, implementation of second unit of Belarusian NPP looks doubtful. The potential future interest from renewable energy producers in Latvia is mainly related with potential off-shore wind farms development Baltic Sea shore in Kurzeme region. Taking into account the experience of previous years, the period of construction of wind power plant, the development of wind turbines technologies, the commissioning year of the final stage of Kurzeme Ring, the current situation with the issued technical requirements for electricity producers, as well as the current RES legislation in Latvia, the TSO has no reason to believe that submitted wind farm development applications will be implemented in full. Due to this reason, TSO plans that the more intensive development of new big capacity wind farms power plants is expected not sooner than after 5-7 years, but there are no criteria available based on which could objectively evaluate the construction of the planned winf power plants. Due to the potential development of off-shore wind farms in Kurzeme, AS Augstsprieguma tīkls as an energy sector expert participated in the elaboration of maritime spatial planning project led by the Ministry of Environmental Protection and Regional Development, assessing the potential amount of grid-connected wind farms and their potential connection points.

The Information bout development plans received from electricity consumers (both large scale - connected to the transmission network and small ones - connected to the distribution network) in Latvia shows greatly conservative development of consumption for the next ten years.

3.6. Conclusions of the TSO on the generation capacity adequacy and energy availability in the region of Baltic countries – Latvia, Lithuania and Estonia.

In December 2015, a cooperation agreement has been signed between TSOs of the Baltic States regarding power system operational security assessments on the Baltic level and this co-operation has been continued in 2016. The power adequacy for the Baltic States, possible imports to the Baltic countries and the peak load of Baltic States have been evaluated and studied under such cooperation agreement. The regional power adequacy assessment was performed by TSOs for three operational modes of electricity system: normal operation (N-0) (all elements of the system are in operation), unexpected disconnection of one critical element (N-1) and disconnection of two critical elements (N-2). The capacity adequacy assessment estimates the amount of available reserves for the primary, secondary and tertiary control reserves. For the assessment of 2016, the disconnections of two most critical elements are taken into account: NordBalt (700 MW) DC link between Lithuania and Sweden and the Estlink 2 (650 MW) DC link between Finland and Estonia. Power adequacy assessment is provided for the period until 2032.

3.6.1. Synchronous operation of the Baltic States with Russian and Belarussian electricity systems

This power adequacy assessment scenario is shown in Figure 2. Taking into account that in the Baltic power systems primary frequency regulation is provided by Russian electricity system, the Baltic States have to provide only a secondary reserve. Total amount of the secondary reserve provided by the electricity systems of the Baltic states is 750 MW. The figure shows that till 2022 the Baltic power systems will be able to provide both the reserve and the necessary capacities to cover the peak load, but starting from 2024, the Baltic electricity system will not be able to cover the peak load and power deficit will gradually increase till 2032. The main reason of decrease of generation capacityis possible reduce of electricity generation in the Estonian oil-shale thermal power plants. Accordingly, while maintaining the necessary power reserves the power deficit will increase but the available interconnection capacity (2200 MW) will be sufficient to import the missing capacity from neighboring electricity systems. Imported power in the Baltic States is estimated ~1350 MW till 2032.

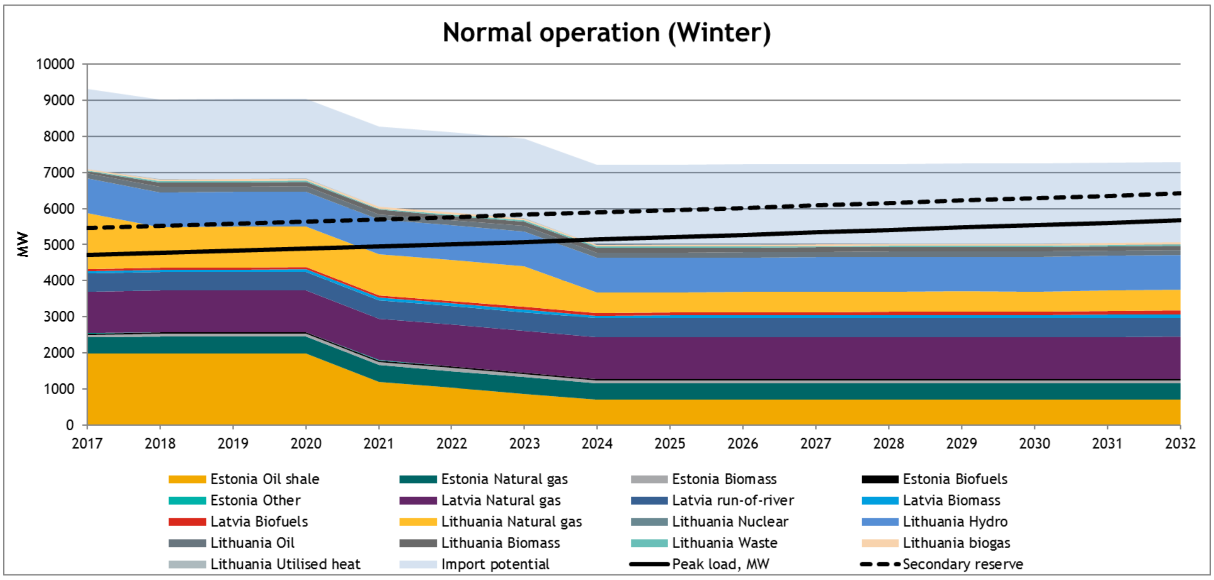

Fig. 2. Generation adequacy assessment for Baltic countries working synchronously with power systems of Russia and Belarus for winter peak load in normal operation conditions (N-0)

In scenario with NordBalt 700 MW disconnection (N-1), starting from 2024, the problems with available capacities to cover the reserves and peak load are expecting (see Fig. 3). The electricity deficit of Baltic States will be imported from neighboring countries and the available interconnection capacities will be able to provide necessary import amount.

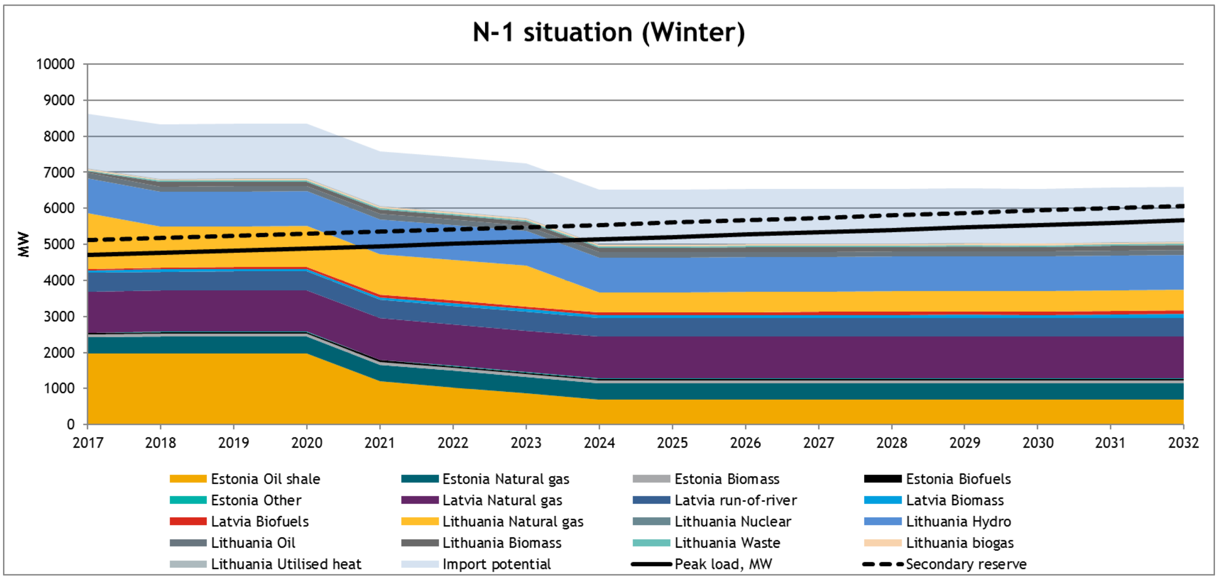

Fig. 3. Generation adequacy assessment for Baltic countries working synchronously with power systems of Russia and Belarus for winter peak load in operation conditions with NordBalt 700 MW outage (N-1)

In case of additional failure in the power grid (N-2), which will be Estlink 2 (650 MW), and together with NordBalt total disconnected capacity will be 1350 MW, starting from 2030 the Baltic electricity systems will not be able to provide the necessary power reserves and receive missing electricity through interconnections from neighboring countries. Starting from 2023, the missing deficit and necessary reserves in Baltic States will be imported from neighboring countries, which is why the development of regional interconnections in the future is very important in Baltic States.

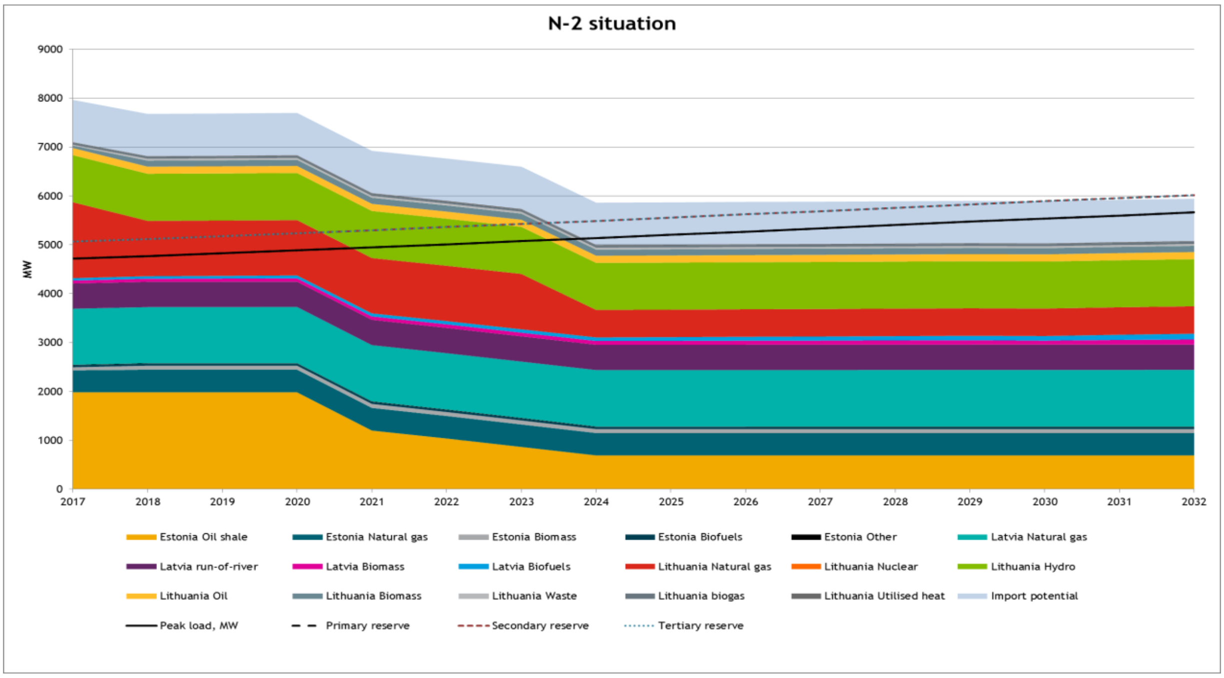

Fig. 4. Generation adequacy assessment for Baltic countries working synchronously with power systems of Russia and Belarus for winter peak load in operation conditions with NordBalt 700 MW and Estlink 2 650 MW outage (N-2)

3.6.2. Synchronous operation of the Baltic States with continental European electricity systems

Power adequacy forecast is prepared for the scenario when Baltic States are working synchronously with continental Europe networks through two Lithuanian-Polish interconnections LitPol link1 and LitPol link2 with total transmission capacity of 2500 MW. 2500 MW is a technical capacity for two double circuit lines that will be used for Baltic States synchronization with continental Europe. For this scenario, normal operation is shown in Figure 5. The such scenario has been evaluated, because according to conclusions of Baltic States possible synchronization variants technically-economical evaluation study, prepared by Join Research Centre (JRC) in 2016, the Baltic countries synchronization by two separate interconnections between Lithuania and Poland, is mentioned as best solution from technical and economical point of view. However, synchronizations variant is not approved yet, and decision is expected in nearest future. The Baltic States will be imported countries since 2023, because they will not be able to provide a secondary reserve, where the situation is similar to the scenario described in 3.6.1. The change in the power adequacy of the Baltic electricity systems will be started since 2025, when the Baltic power systems synchronization with continental Europe is planned. The Baltic electricity systems will depend on the electricity import from neighboring countries from 2024 till 2032. The power deficit will increase to around 1900 MW, and since interconnection capacities will be around 3350 MW, it will be possible to receive the required electricity import from neighboring countries.

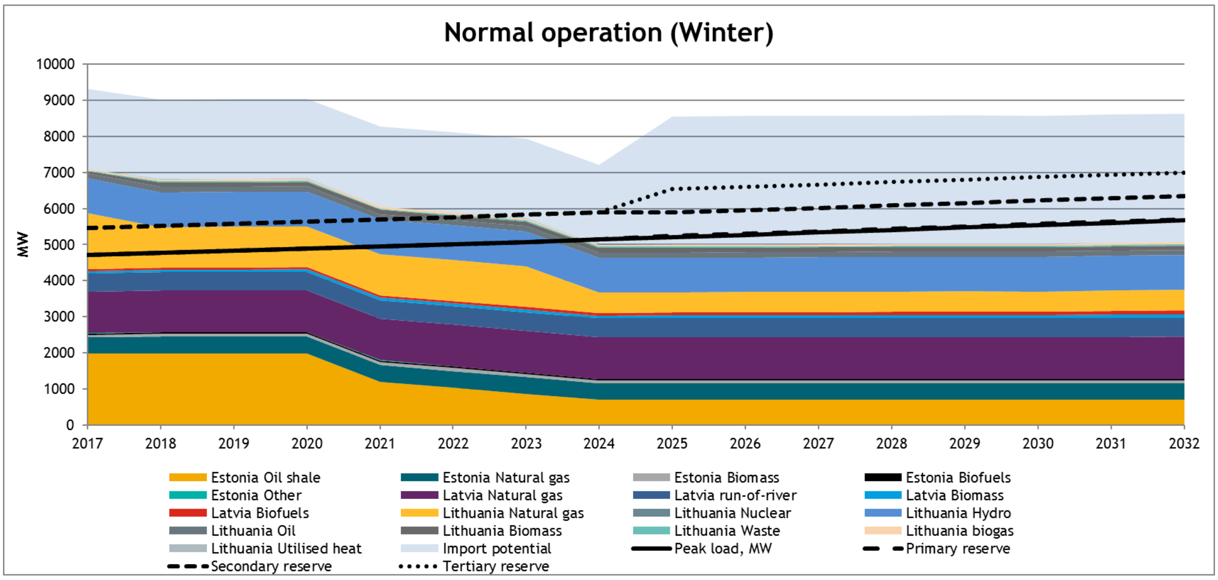

Fig. 5. Generation adequacy assessment for Baltic countries working synchronously with CE via Poland in normal operation conditions (N-0)

Figure 6 shows the power adequacy of the system in emergency mode when the NordBalt 700 MW DC cable between Lithuania and Sweden is switched off. In this scenario, the capacity reserves are kept in order for the Baltic electricity system to be ready for another unexpected contingency (N-2). Figure shows that the power deficit in the Baltic States will start in 2023, but the available interconnection capacities will be sufficient to cover electricity consumption by imports from neighboring countries.

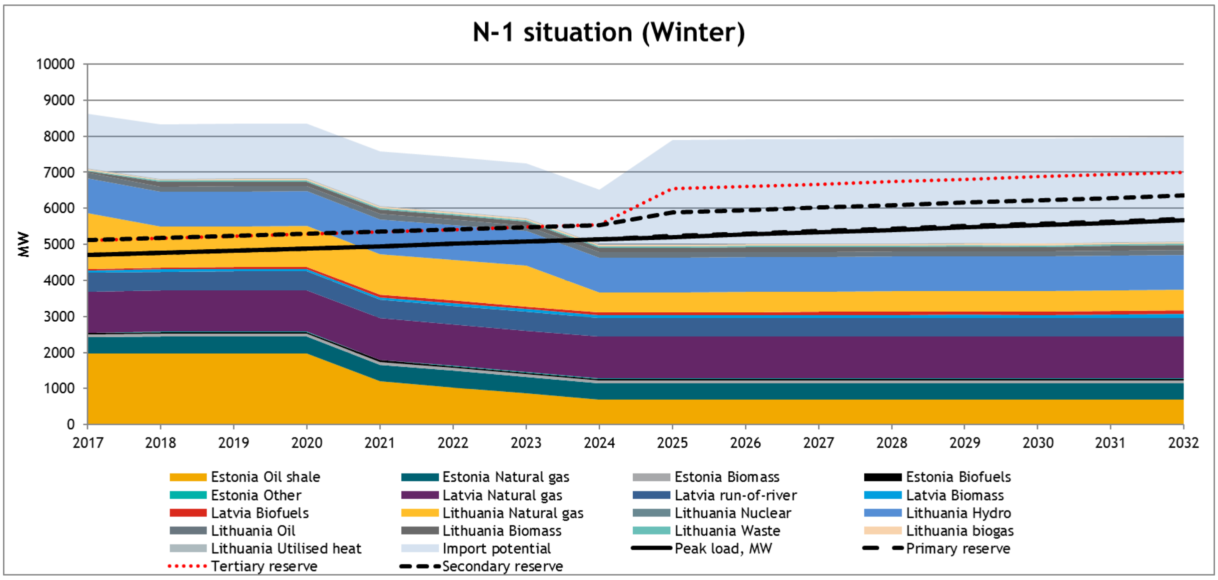

Fig. 6. Generation adequacy assessment for Baltic countries working synchronously with CE via Poland in operation conditions with NordBalt 700 MW outage (N-1)

In the power system mode, when another element of the electricity system of the Baltic States – Estlink 2 with 650 MW capacity trips unexpectedly and the power systems of Baltic States have lost 1350 MW, the Baltic power system does not have problems, as two stable interconnections with Poland (2000 MW) are sufficient to provide missing electrical energy to the power systems of the Baltic States. The operation of the Baltic power systems synchronously with the continental Europe through Poland via two links (about 2000 MW) will be able to provide the necessary power from the Poland, if such will be available in Polish side.

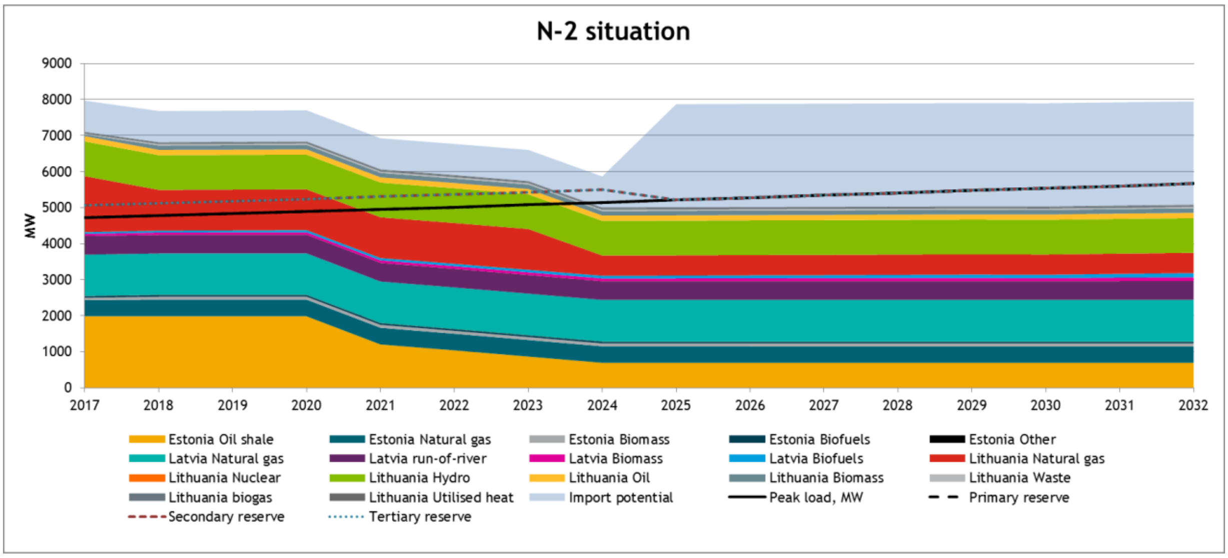

Fig. 7. Generation adequacy assessment for Baltic countries working synchronously with CE via Poland in operation conditions with NordBalt 700 MW and Estlink 2 650 MW outage (N-2)

After overall power adequacy analysis prepared by Baltic States TSOs is concluded that the power deficit will start from 2023, when the Estonian oil shale power stations are scheduled to be shut down. After 2023, the Baltic States will cover the peak load by import from neighboring countries, because the available capacity of interconnections will be sufficient to import missing electrical energy to Baltic countries. After analysis of power adequacy in Baltic States, the general conclusion is that development of a new base power station in the Baltic States from 2023 is advisable for cover of peak load of the region.

4. Transmission system adequacy for demand and maintenance quality

4.1. TSO conclusions on the power transmission system adequacy for the tasks of energy transmission and the ability to provide non-interrupted functioning of the power system in outage of one of the systems units and activities (individually and jointly with other transmission system operators) for the reliable operation of the transmission system for the coming years (minimum forecast period - 10 years).

At present, various operation modes of Baltic power networks are characterised by reduced transmission capacities on the Latvian - Estonian cross-border due to the introduced restrictions by AS "Elering" (Estonian TSO) on cross-border and internal 330 kV transmission lines. The situation has been improved in 2013 with introduction of second generation unit in Riga CHP-2 with an installed capacity of 450 MW but this unit operates mostly in co-generation mode in winter (heating season) season when there is a heat load demand in the Riga city and in other periods mentioned power station is not competitive in the electricity market. The transmitted energy amount through Latvian transmission network increased in October 2013, when the Estonian-Finnish second DC interconnection Estlink2 has been commissioned and Latvian and Lithuanian (mostly) traders have increased the electricity trading amounts from the Nordic countries. Now, after the commissioning of Lithuanian-Swedish (NordBalt) interconnection the operational situation in the Estonian-Latvian cross-border in normal modes slightly improved with overall loading decreased by c.a. 54%, but in emergency mode it still remains critical and transmission capacity of Estonia-Latvia cross-section still is limited. In order to eliminate these disadvantages till 2020 is planned to implements Estonian-Latvian third connection, but after the mentioned project will be commissioned during the period up to year 2030 AS "Elering" plans to start the internal 330 kV transmission line reconstructions and elimination of the dimensioning problems. This means that the Latvian - Estonian cross-border capacity congestion will continue until 2030, but constraints will be lighter than before 2020. As the result of such cross-border capacity congestion, during the emergency or maintenance modes it is not possible to provide Latvian power system secure operation and Latvian and Lithuanian consumers possibility of import from the Nordic regions with cheapest electricity prices are limited. In order to completely eliminate cross-border capacity constraints in the cross-section between Estonia and Latvia, the Latvian TSO till 2024 has planned the reconstruction of the two remaining 330 kV transmission lines from the 330 kV substation Valmiera in Latvian territory to 330 kV substations Tartu and Tsirgulina in Estonia.

The transmission capacity on Latvian-Lithuanian cross-section is sufficient and additional problems for electricity transportation in normal modes between Latvian and Lithuania are not expected, hence no additional measures are necessary to improve cross-border capacity between Latvia and Lithuania, expect the case of synchronization scenario with continental Europe.

Electricity transmission capacity in the cross-section between Latvia and Russia also is sufficient and in normal operation modes there are no additional problems for the transmission of electricity. Due to possible synchronization of the Baltic States with the continental Europe and desynchronization from power systems of Russia and Belarus, the development of the cross-section between Latvia and Russia is not planned.

4.2. Information about the planned system interconnections and internal power system infrastructure projects of strategic importance (minimum forecast period - 10 years).

4.2.1. Kurzeme Ring 3rd stage "Ventspils-Tume-Imanta"

Co-financed by the European Union
Connecting Europe Facility

The Latvian electricity transmission network 330 kV project Kurzeme Ring 3rd stage "Ventspils-Tume-Imanta" implementation activities have been continued in 2016. The Ventspils-Tume-Imanta electricity transmission line project is included in the following development documents of Latvia and Europe:

- Ten year development plan of transmission power system of Latvia,
- ENTSO-E ten year development plan of Pan European transmission network,
- List of projects of common interest (hereinafter - PCI) with Nr.4.4.1;
- In March 2015, the Cabinet of Ministers of the Republic of Latvia has allocated the status of a National Interest Object to the Kurzeme Ring project.

The whole Kurzeme Ring project will provide the necessary infrastructure for the development of wind farms in the Kurzeme region, will connect the two largest (western and central) production and consumption regions of Latvia, as well as provide additional capacity for full utilization of 700 MW DC link between Sweden and Lithuania (NordBalt project).

In 2016, the project implementation works are continuing using the 45% co-financing from Connecting Europe Facility (CEF) grants.

In April 2016, an agreement with constructors community “LEC, RECK and Empower” has been concluded, and the first pylons of the electricity transmission line were installed in July 2017. The 330 kV electricity transmission line is being constructed along the existing 110 kV transmission lines routes, constructed both 330 kV and 110 kV lines on the same pylons. In parallel the work of 110 kV substations reconstruction and such substation capacity increase is ongoing.

The planned project commissioning is the end of 2019.

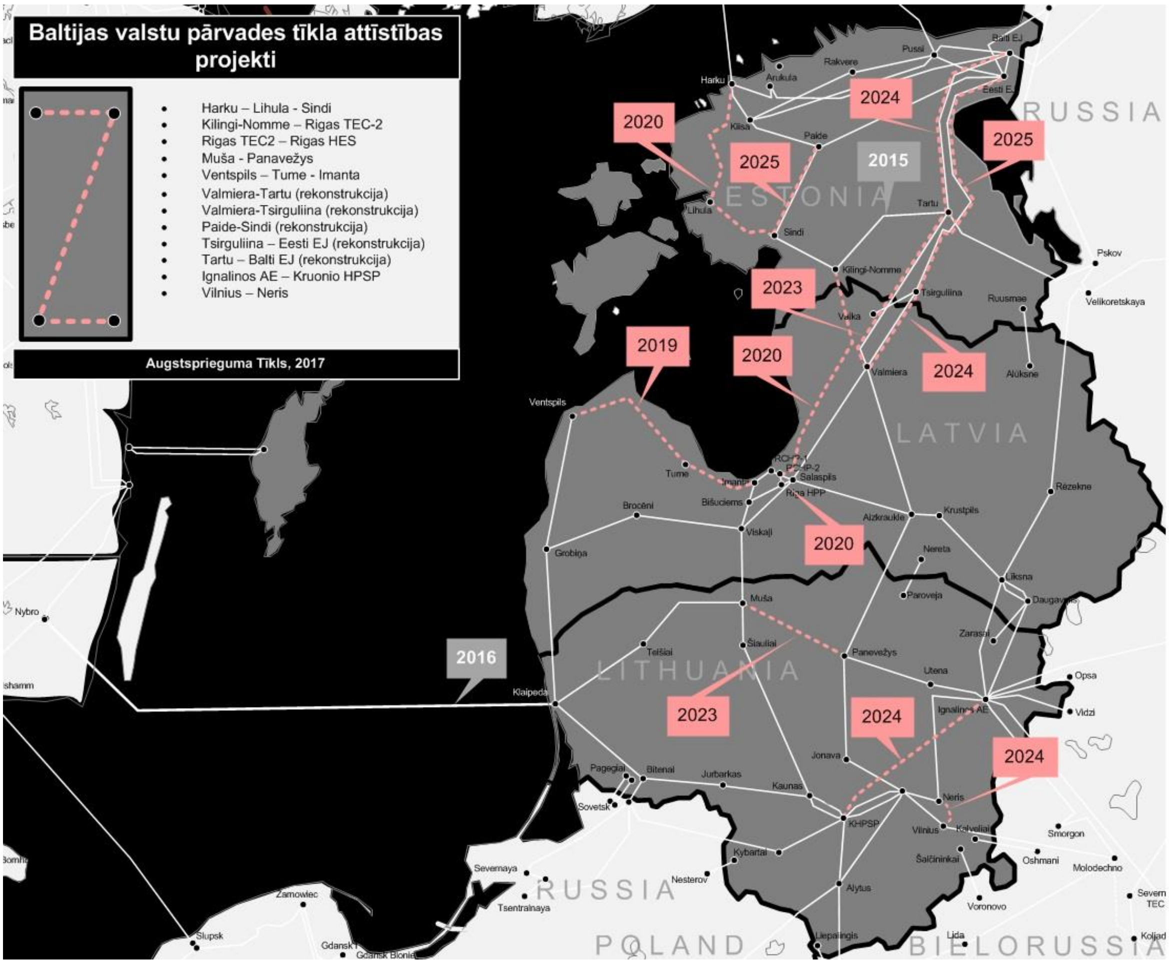

Fig. 8 Projects of the Baltic countries in accordance with the development plans of the TSOs of Baltic countries

<u>4.2.2. The third electricity interconnection between Latvia and Estonia</u>

Co-financed by the European Union
Connecting Europe Facility

In cooperation with the Estonian transmission system operator and the owner of Latvian transmission system, the development of the third Estonia-Latvia electricity interconnection between the 330 kV substations Riga CHP-2 in Latvia and Killingi-Nomme in Estonia is ongoing. The project is implemented using European Union 65% co-financing of the total project costs in Latvia and Estonia and co-financing is granted from Connecting Europe Facility funds. This interconnection will increase the available transmission capacity between Latvian and Estonian electricity systems and eliminate the congestion in the cross-section of Estonia-Latvia, which currently limits the volume of electricity trade between the Baltic and Nordic countries. The Estonian-Latvian third interconnection project is considered to be one of the most important projects for the whole Baltic Sea Region, as it will facilitate the increase of the transmission capacity of the Estonia-Latvia cross section by 500/600 MW in the normal operation modes and by 300/500 MW in isolated mode of operation. Estonian-Latvian third interconnection is also one of the backbone projects in the Baltic transmission network, preparing the Baltic States for synchronous operation with electricity networks of continental Europe. Consequently, the third Latvian-Estonian interconnection, just like the Kurzeme Ring project, is included in the following development documents in Latvia, Estonia and Europe:

- Ten year development plan of transmission power system in Latvia,
- Ten year development plan of transmission power system in Estonia,
- ENTSO-E ten year development plan of Pan European transmission network,
- List of projects of common interest with Nr. 4.2.1

In 2016 Environmental impact assessment (EIA) and Right-of-Way (RoW) activities, supported by the European Commission TEN-E co-financing, have been completed in Latvian territory. EIA report for the Latvian-Estonian third interconnection project was completed in February 2016 and on February 16 the final EIA report has been submitted to the Environment State Bureau (ESB). On June 10, 2016 ESB has published the Conclusion No7 on the environmental impact assessment report for Estonian-Latvian third interconnection, where announce that acceptable transmission line route from environmental and society point of view is option on existing 110 kV electricity transmission line and in the stage from Saulkrasti to Riga CHP-2 substations – via common route with "RailBaltica" project. On August 24, 2016 the Cabinet of Ministers has approved the EIA results and route variants for Latvian-Estonian third interconnection in the Latvian territory, and allocated the national interest object status for mentioned project. On November 9, 2016, a procurement procedure for the design and construction works for the Estonia-Latvia third interconnection project in Latvian territory has been announced by the end of 2017 it is planned to sign the turnkey agreement with contractor for the project implementation in the territory of Latvia.

On the territory of Estonia, the route variant is also approved by the national authorities and consists of two stages: 1) from the 330 kV substation Kilingi-Nomme to the Estonian-Latvian border and 2) an internal 330 kV line Harku-Sindi, which is an internal network reinforcement in Estonia for secure and reliable operation of interconnection. In September 2017, the Estonian TSO has sign the agreement with constructor on the implementation of the 330 kV electricity transmission line the Harku-Sindi. The Estonian-Latvian border crossing point has been selected and coordinated between Estonian and Latvian TSOs and responsible authorities. Due to the fact that the project is a common one for two European Union member countries, the Latvian TSO „Augstsprieguma tīkls" and the Estonian TSO "Elering" closely cooperate with each other during the project implementation process and in November 2016 an agreement between both TSOs has been signed on the principles and conditions for the implementation of third interconnection between Estonia and Latvia.

Commissioning date of Latvian-Estonian third interconnection project is expected until the end of 2020.

4.2.3. Electricity transmission line "Riga CHP-2 – Riga HPP"

Co-financed by the European Union
Connecting Europe Facility

The work on the Latvian electricity transmission network reinforcement project Riga CHP-2 – Riga HPP has been continued in 2016. Riga CHP-2 – Riga HPP project is internal reinforcement of Latvian electricity transmission network that will provide the full functionality of the third Estonia-Latvia interconnection during repair and maintenance modes in the transmission network of Riga region. In addition, the mentioned project, which is a direct interconnection between Riga CHP-2 and Riga HPP, will ensure the possibility of Riga CHP-2 emergency start-up from the Riga HPP. At the regional level, this network reinforcement will play an important role in increasing the transmission capacity of the Baltic region in the North-South direction, because after the Baltic States have interconnected into the Nordic and Polish electricity systems, the internal reinforcement of the Baltic electricity transmission network is necessary to provide possibility of power flows transmission in north-south direction.

Riga CHP-2 - Riga HPP project is included in following Latvian and European development documents:

- Ten year development plan of transmission power system in Latvia,
- ENTSO-E ten year development plan of Pan European transmission network,
- List of projects of common interest with Nr. 4.2.3

Taking into account the project significance not only for Latvia but also at the European level, at the beginning of 2017, the project has received 50% EU co-financing from the CEF funds, and in May 2017 an agreement with European Innovation and Network Executive Agency has been signed.

The selected route of project affects only one municipality (Salaspils municipality) in Latvian territory. In April 2017, a public consultation on the project took place in the municipality of Salaspils, where participated representatives of the TSO, representatives from the municipality of Salaspils and the land owners of the affected areas. The Salaspils municipality confirmed it support of project implementation and in July 2017 the Environmental State Bureau issued technical requirements for the implementation of the project in compliance with environmental protection requirements and regulations.

Based on the results of the public consultation and considering the importance of the project for Latvia, for the Baltic and for the whole Europe, on August 16, 2017, the Cabinet of Ministers allocated the status of the National Interest Object for the Riga CHP-2 – Riga HPP project.

By the end of 2017 is planned to announce a procurement procedure for design and construction works of the project.

The project is to be commissioned by the end of 2020, before the implementation of the Estonian-Latvian third interconnection.

4.2.4. Reconstruction of existing 330 kV interconnections between Latvia and Estonia.

The ten years development plan of Latvian electricity transmission system also reconstruction of existing 330 kV transmission lines Valmiera (Latvia) - Tartu (Estonia) and Valmiera (Latvia) - Tsirguliina (Estonia) is planned, increasing the transmission capacity in the cross-section between Latvia and Estonia. As mentioned in chapter 4.1 the modernization of these two interconnections will completely eliminate capacity constraints in the cross-section between Estonia and Latvia after 2020, when the third Estonian-Latvian interconnection will be commissioned. Additionally to mentioned above, both electricity transmission lines were built in the 60s and 70s of the last century (during the Soviet Union period), and building standards of these lines does not longer correspond to existing operational and maintenance requirements, for example, the differences between transmission capacities values on winter and summer seasons impose the optimal and efficient functioning of electricity market. These electricity transmission lines should be completely replaced by new, with high transmission capacity to provide a higher total electricity transmission capacity in the North-South direction in the Baltic region. The reconstruction of both lines is planned immediately after the commissioning of third 330 kV interconnector between Estonia and Latvia, and the commissioning of both projects is expected till 2024.

Both of these projects are included in the Latvian and European ten year development plans and are included in the list of projects of common interest with No.4.8.1 and No.4.8.3, which are candidates for EU co-financing in future.

4.2.5. Baltic networks synchronization with European transmission networks and de-synchronization from the Russian power system

Based on the results of the synchronization study completed in October 2013 about Baltic power systems integration into the European internal electricity market, work on the Baltic Synchronization project with continental Europe and desynchronization from the Russian power grid has been continued in 2016. The synchronization project is being developed in accordance to concluded Communiqué between Prime Ministers of the Baltic States of 11 June 2007, as well as roadmap approved by the TSO of the Baltic States in 2015, where was agreed about development synchronization scenario through Lithuania and Poland with two interconnections LitPol link1 and LitPol link2 with total transmission capacity of 2000 MW. The process of development and implementation of the second Lithuanian-Polish interconnection LitPol link 2 is not fully support now by Polish TSO and Latvian and Estonian TSOs offered the possibility to synchronize the electricity systems of the Baltic States with the Nordic electricity systems. In 2016 the technical-economic analysis for different synchronization variants for power systems of the Baltic States, prepared by European Joint Research Center (JRC) by request of the European Commission, under the framework of BEMIP Synchronization Working Group with participation of TSOs of the Baltic Sea Region and representatives of responsible Ministries. The technical-economic analysis has been prepared by JRC for following synchronization scenarios of Baltic power systems:

- Baltic power systems synchronization with continental European networks;
- Baltic power systems synchronization with Nordic power system;
- Isolated operation mode of the Baltic power systems.

In the beginning of 2017, the JRC announced that based on the study results, the most optimal option from technical-economic analysis point of view is the Baltic power systems synchronization with continental European networks with two separate Lithuania-Poland interconnections, and this option was recommended to the European Commission for decision. However, the Polish side announced that till 2025 it is not ready to implement LitPol link 2 projects in own territory and propose the Baltic States to synchronize via one interconnection between Lithuania and Poland Lit Pol link 1 with a total capacity of 1000 MW. This option is support by Lithuania, but not support by Latvia and Estonia, because they considers that option with one interconnection does not fulfill the electricity supply reliability criteria and reduce the security of electricity supply in the Baltic region. The European Commission supports the Baltic Synchronization project, providing that Baltic States will jointly agree on a synchronization option. Then European Commission plans to decide on the selection of synchronization option.

To realize the "Synchronization Roadmap" approved by Baltic TSOs, they in 2016 have launched study for preparing of isolated operation test, to check if the Baltic electricity systems will be able to operate in isolated mode. The study of the isolated operation of Baltic electricity systems started in the beginning of 2017 with 50% of European co-financing support from the Connecting Europe Facility funds. The study has been prepared by Belgian Energy Consultancy Company Tractebel Engineering. The study has been prepared during period from January till August 2017, and main conclusion from study has been isolation operation experiment is technically feasible, it takes at least two years' time for preparation and it will require additional investments for testing and possible upgrading of the electricity transmission and generation equipment.

Following the implementation of Baltic interconnection projects with the Nordic countries: 650 MW Estlink2 between Finland and Estonia implemented in 2013 and NordBalt 700 MW between Lithuania and Sweden implemented in 2015, as well as between the Baltic and continental Europe, i.e. Between Lithuania and Poland LitPol link 1 with 500 MW capacity has been commissioned, the Baltic States have more opportunities to buy or sell electricity from/to neighboring countries, but in different operational modes, the flow of power from the Nordic countries to continental Europe have increased, thus increasing the loading of transmission system and transit through Latvian electricity transmission networks.

4.3. TSO conclusions on the electricity transmission system reliability and adequacy of all consumers to provide secure power supply in the previous year and the following years (minimum forecast period - 10 years).

Implementation of the projects mentioned in paragraph 4.2 will provide secure and reliable operation of transmission network, the power consumption and generation adequacy, stable operation of power stations and electricity transit through Latvia and the Baltic countries, as well as eliminate Baltic countries' energy island operation and connecting it to the power transmission networks of Europe. Despite the fact that after the implementation of regional direct current interconnections with Finland, Sweden and Poland, the Baltic States interconnection transmission capacity has increased, as well as electricity transit through the Latvian electricity transmission networks has decreased insignificantly, the long term, one of the possible solutions is to encourage all Latvian and Lithuanian power plants to participate in the "Nord Pool" electricity market and promote the electricity market liquidity. Increased competition and the development of new capacity will reduce the price of electricity in the Baltic region, as well as reduce the impact on the import of electricity from Russia and third countries.

330 kV and 110 kV transmission network is planned to be reconstructed, modernized and developed, according to the electricity transmission system development plan, elaborated by "Augstsprieguma tikls" AS and approved by the Public Utilities Commission (PUC). Mentioned plan is published in the AST and PUC websites. In parallel with the development of 330 kV transmission network, the 110 kV transmission network has also to be developed, especially in places where the requirements of reliability n-1 criterion are not realized. In 110 kV network planned 110 kV substation reconstructions are proposed, as well as the planned replacement of aged transformers. In addition to the completed 330 kV loop network around Riga, in Riga region it is necessary to reconstruct the 110 kV substations and improve the 110 kV network in order to increase security of energy supply.

4.4. Existing generation capacities on January 1, 2017, greater than 1 MW

Latvian power system power stations with installed capacity above 1 MW are presented in the Table 31:

Table 31

No	Station name	Installed capacity (MW)
Natural gas co-generation stations		
1	B-Energo SIA	1.998
2	Biosil SIA	1.998
3	BK Enerģija	3.9
4	Daugavpils siltumtīkli PAS	5.955
5	Dienvidlatgales īpašumi SIA	1.998
6	DLRR Enerģija SIA	1.698
7	Energy & Communication, AS	3.9
8	LATNEFTEGAZ SIA	3.986
9	RB Vidzeme SIA	1.998
10	Rēzeknes siltumtīkli SIA	5.572
11	Dobeles enerģija SIA	1.5
12	Fortum Latvia, SIA	3.996
13	WINDAU, SIA	3.8
14	Elektro bizness SIA	3.6
15	Mārupes siltumnīcas SIA	1.99
17	Olainfarm enerģija AS	2
18	Olenergo AS	3.12
19	Residence Energy, AS	1.24
20	SABIEDRĪBA MĀRUPE, SIA	2
21	Sal-Energo, SIA	3.99
22	VANGAŽU SILDSPĒKS, SIA	2.746
23	Zaļā dārzniecība SIA	1.999
24	Biznesa centrs Tomo SIA	1
25	Rīgas siltums AS	2.4
26	RTU Enerģija SIA	1.56
27	Uni-enerkom, SIA	2.997
28	LIEPĀJAS ENERĢIJA, SIA	4
29	SALDUS SILTUMS, SIA	1.3
30	VALMIERAS ENERĢIJA, AS	4
31	Juglas jauda, SIA	14,9
Biomass and biogas power stations		
1	AD Biogāzes stacija, SIA	1.96
2	Agro Iecava, SIA	1.95
3	Conatus BIOenergy, SIA	1.96
4	Bioenerģija-08, SIA	1.98
5	Biodegviela, SIA	2
6	BIO ZIEDI, SIA	1.998
7	DAILE AGRO, SIA	1
8	Getliņi EKO, BO SIA	5.24
9	Grow Energy, SIA	1.996
10	KŅAVAS GRANULAS, SIA	1
11	LIEPĀJAS RAS, SIA	1

12	RIGENS, SIA	2.096
13	Zaļā Mārupe, SIA	1
14	GRAANUL INVEST, SIA	6.492
15	Krāslavas nami, SIA	1
16	Liepājas Enerģija, SIA	2.5
17	GAS STREAM	1
18	BIO FUTURE, SIA	1
19	Pampāļi, SIA	1
20	EcoZeta, SIA	1.4
21	Saldus enerģija,SIA	1.862
22	BIOEninvest, SIA	1
23	Priekules Bioenerģija, SIA	2.4
24	Piejūras energy, SIA	1.6
25	Agro Lestene, SIA	1.5
26	OŠUKALNS, SIA	1.4
27	EGG Energy SIA	1.996
28	Fortum Jelgava SIA	23,82
29	RĪGAS SILTUMS AS	4
30	Agrofirma Tērvete AS	1.5
31	Zaļās zemes enerģija SIA	1
32	International Investments SIA	1
33	SM Energo SIA	1.1
34	Enefit power un Heat Valka SIA	2.4
35	TURBO ENERĢIJA SIA	1.95
36	Betula Premium SIA	1.9
37	Incukalns Energy SIA	3.999
38	Graanul Pellets Energy SIA	3.99
39	PREIĻU ENERĢĒTIKA SIA	1.15
40	JE Enerģija SIA	1
41	ENERGY RESOURCES CHP RSEZ SIA	3.98
42	TUKUMS DH SIA	1.25
43	Pelikana SIA	1
44	Technological solutions SIA	1.950
45	DJF SIA	1.499
Wind power stations		
1	Baltnorvent, SIA, Alsungas VES	2
2	BK Enerģija, SIA	1.95
3	Enercom Plus, SIA	2.75
4	Impakt, SIA Užavas VES	1
5	Lenkas energo, SIA Lenkas VES	2.745
6	VĒJA PARKS 10, SIA	1.8
7	VĒJA PARKS 11, SIA	1.8
8	VĒJA PARKS 12, SIA	1.8
9	VĒJA PARKS 13, SIA	1.8
10	VĒJA PARKS 14, SIA	1.8
11	VĒJA PARKS 15, SIA	1.8
12	VĒJA PARKS 16, SIA	1.8
13	VĒJA PARKS 17, SIA	1.8

14	VĒJA PARKS 18, SIA	1.8
15	VĒJA PARKS 19, SIA	1.8
16	VĒJA PARKS 20, SIA	1.8
17	WINERGY, SIA	20.7
18	Silfs V SIA	1.1
19	Ainažu VES, Latvenergo AS	1
20	Vides enerģija SIA	6.9
21	W.E.S. SIA	4.750
Hydro power stations		
1	Spridzēnu HES, SIA	1.2
Latvenergo power stations		
1	Ķeguma HES	240.1
2	Rīgas HES	402
3	Pļaviņu HES	894
4	Rīgas TEC-1	144
5	Rīgas TEC-2	881

4.5. Actions during maximum demand or supply deficit periods.

In the event of the deficit of power and energy in Latvian territory and in the neighbouring countries to cover the consumption of the Latvian power system, the TSO will be forced to limited or disable from the network a certain number of consumers in order to balance the power consumption and the generation in Latvian power system. In this case, the TSO will act according to Latvian legislation and will inform the Ministry of Economy of the problem of ensuring the balance of power.

On behalf of AS „Augstsprieguma tīkls”

Chairman of the Board

V. Boks