Slovenská elektrizačná prenosová sústava, a. s.

TEN-YEAR NETWORK DEVELOPMENT PLAN FOR THE YEARS 2016 – 2025

November 2015

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1. Introduction

Slovenská elektrizačná prenosová sústava, a. s., (hereinafter referred to as “SEPS”), as a transmission system operator (hereinafter referred to as “TSO”) of the Slovak Republic (hereinafter referred to as “SR”), processes this document, the Ten-Year Network Development Plan for the Period 2016 – 2025 (hereinafter referred to as “TYNDP 2025”), under Art. 28, par. 3, subpar. b) of Act No. 251/2012 Coll. on Energy. This paragraph prescribes that every year the transmission system operator shall be obliged to process the transmission system development plan including the development plan for the interconnectors for the period of the following ten years and to hand it over to the Ministry of Economy of SR and the National Regulatory Authority always by 30th November of the respective calendar year including the report on fulfilment of the previous Ten-Year Network Development Plan. It is an obligation incorporated in the legislation of the Slovak Republic within harmonization of the relevant legislative regulations of the European Union (hereinafter referred to as “EU”), in particular the European Parliament and Council Regulation (EC) No. 714/2009 on Conditions for Access to the Network for Cross-Border Exchanges in Electricity.

Pursuant to Art. 29 of Act No. 251/2012 Coll., TYNDP 2025 shall be based mainly on the present and estimated future condition of the offer and demand for the system capacity, from the appropriate assumptions for electricity production, electricity supply, electricity consumption, and exchanges in electricity with other countries where it takes the system development plan for the whole European Union and regional investment plans into consideration. Moreover, TYNDP 2025 stems also from the SEPS Development Programme and from the SEPS respective approved investment plans and the approved previous TYNDP.

Pursuant to Art. 29 of Act No. 251/2012 Coll., the Ten-Year Network Development Plan shall contain effective measures to ensure the system appropriateness and safety of electricity supplies while providing especially:

a) The main parts of the transmission system which are to be built or upgraded in the following ten years including their assumed implementation dates,

b) All investments in the transmission system related to building new capacities or upgrade of the transmission system the implementation of which was already decided upon by the transmission system operator or which will have to be implemented in the following three years including implementation dates of such investments.

All these assumptions have been considered in this TYNDP 2025 appropriately in terms of the current knowledge and information available to SEPS at the time of processing this document.

2. Description of the Current Condition of the Slovak Transmission System

The transmission system of SR is consisted from electrically interconnected 400 kV, 220 kV and selected 110 kV technological facilities via which the electrical energy is transmitted from the producers to individual consumers connected to the transmission system of SR. Cross-border electricity transmission is allowed as well. The Slovak transmission system include the following technological facilities:

- national and cross-border 400 kV, 220 kV and selected 110 kV lines,
- transformers 400/220 kV, 220/110 kV and 400/110 kV,
- 400 kV, 220 kV and selected 110 kV switchyards,
- compensation equipment.

The Slovak transmission system includes also respective supportive, so called secondary facilities enabling electricity transmission and electricity system control. These are e.g. information control system (hereinafter referred to as "ICS"), billing system, protection and automatic control system, telecommunications transmission facilities, etc.

There are also users directly connected to the Slovak transmission system through their facilities and these users currently include:

- three regional distribution system operators (hereinafter referred to as "DSO"),
- six electricity consumers,
- four electricity producers.

Transmission system of Slovakia is also synchronously interconnected with the neighbouring transmission systems in the following extent:

- two single circuit 220 kV lines and three single circuit 400 kV lines towards the Czech Republic (hereinafter referred to as "CZ")
- one double circuit 400 kV interconnection towards Poland (hereinafter referred to as "PL"),
- one single circuit 400 kV line towards the Ukraine (hereinafter referred to as "UA"),
- two single circuit 400 kV lines towards Hungary (hereinafter referred to as "HU"),

These interconnections allow for synchronous interconnections of the electricity system of SR (hereinafter referred to as "ES SR") with other transmission systems in Europe the operators of which are associated together with SEPS in the ENTSO-E association.

The topology of the Slovak transmission system, i.e. a scheme of mutual interconnection of the main technological facilities of the Slovak transmission system including interconnectors towards the neighbouring transmission systems as at time of preparation of this document, is shown in the following picture.

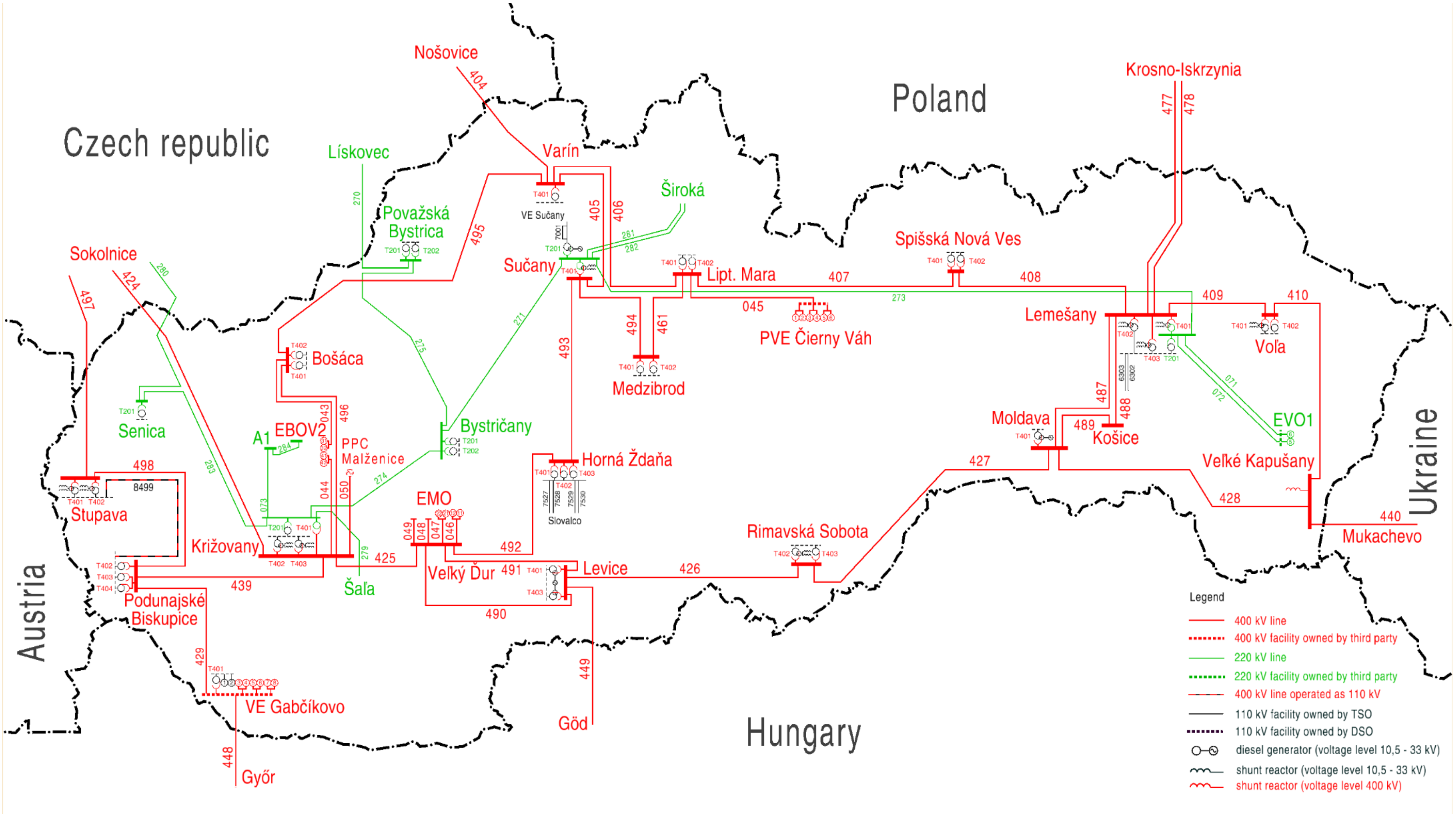


Figure No. 1 Topology of the Slovak Transmission System

2.1 Current Condition of the Main Transmission Assets of the Transmission System of SR

2.1.1 Substations

At present, the transmission system of SR operates twenty-one substations of which:

- three substations with both 400 kV and 220 kV switchyards including transmission system/transmission system transformations and transmission system/distribution system transformations,
- twelve substations with 400 kV switchyards and transmission system/distribution system transformation,
- three substations with 220 kV switchyards and transmission system/distribution system transformation,
- three substations include built 400 kV switchyards without TS/DS transformation.

Within the renovation and upgrade, the Slovak transmission system substations are gradually switched to the remote control mode which means that the substations are operated without personnel and all relevant facilities are controlled remotely from the dispatch centre of TSO. The following table and graph provide the view of substations connected to the Slovak transmission system which are operated in the remote control mode, in remote manipulation mode, and in local control mode (substation permanently controlled by personnel). Currently, SEPS has thirteen remotely controlled substations.

Table No. 1 List of SEPS substations

Substation	Remote control mode (CM)	Remote manipulation mode (MM)	Local control mode (LC)
Bošáca	✓	-	-
Bystričany	-	-	✓
Horná Ždaňa	-	✓	-
Košice	✓	-	-
Križovany	✓	-	-
Lemešany	✓	-	-
Levice	✓	-	-
Liptovská Mara	-	-	✓
Medzibrod	✓	-	-
Moldava	✓	-	-
Podunajské Biskupice	-	✓	-
Považská Bystrica	-	-	✓
Rimavská Sobota	✓	-	-
Senica	✓	-	-
Spišská Nová Ves	-	-	✓
Stupava	✓	-	-
Sučany	-	-	✓
Varín	-	-	✓
Veľké Kapušany	✓	-	-
Veľký Ďur	✓	-	-
Voľa	✓	-	-
Total	**13**	**2**	**6**

2.1.2 Transmission Lines

Substations are electrically interconnected via forty-two 400 kV transmission lines with total length of 1,953 km, seventeen 220 kV transmission lines with total length of 826 km and seven 110 kV transmission lines with total length of 80 km owned by SEPS. Out of the total number of 400 kV and 220 kV transmission lines, the Slovak transmission system operates eight 400 kV and two 220 kV international cross-border transmission lines which connect the Slovak transmission system with the neighbouring transmission systems of CZ, HU, PL, and UA on the respective cross-border profiles. The total length is approx. 444 km on the territory of the Slovak Republic.

The following tables include a list of 110 kV, 220 kV, and 400 kV lines owned by TSO, together with the respective substations in which those lines end.

Table No. 2 List of 110 kV lines operated by SEPS

Line No.	Substation 1	Substation 2
V6302[1]	Tower No. 76	Tower No. 139
V6303[1]	Tower No. 76	Tower No. 139
V7001	HPP Sučany	Sučany
V7527[2]	Horná Ždaňa	Slovalco
V7528[2]	Horná Ždaňa	Slovalco
V7529[2]	Horná Ždaňa	Slovalco
V7530[2]	Horná Ždaňa	Slovalco

Table No. 3 List of 220 kV lines operated by SEPS

Line No.	Substation 1	Substation 2
V071[2]	EVO 1	Lemešany
V072[2]	EVO 1	Lemešany
V073[2]	EBO A1	Križovany
V074[2,3]	EBO V1	Križovany
V075[2,3]	EBO V1	Križovany
V270	Lískovec (CZ)	Považská Bystrica
V271	Sučany	Bystričany
V273	Sučany	Lemešany
V274	Križovany	Bystričany
V275	Považská Bystrica	Bystričany
V276[3]	EBO A1	EBO V1
V279	Križovany	Šaľa
V280	Sokolnice (CZ)	Senica
V281	Sučany	Široká
V282	Sučany	Široká
V283	Senica	Križovany
V284[2]	EBO A1	EBO V2

Table No. 4 List of 400 kV lines operated by SEPS

Line No.	Substation 1	Substation 2
V041[2]	EVO2	Veľké Kapušany
V042[2]	EVO2	Veľké Kapušany
V043[2]	EBO V2	Bošáca
V044[2]	EBO V2	Križovany
V045[2]	Pumping HPP Čierny Váh	Liptovská Mara

[1] The multi-circuit line 2x400 kV and 2x110 kV from 110 kV substation Lemešany to Bukovec

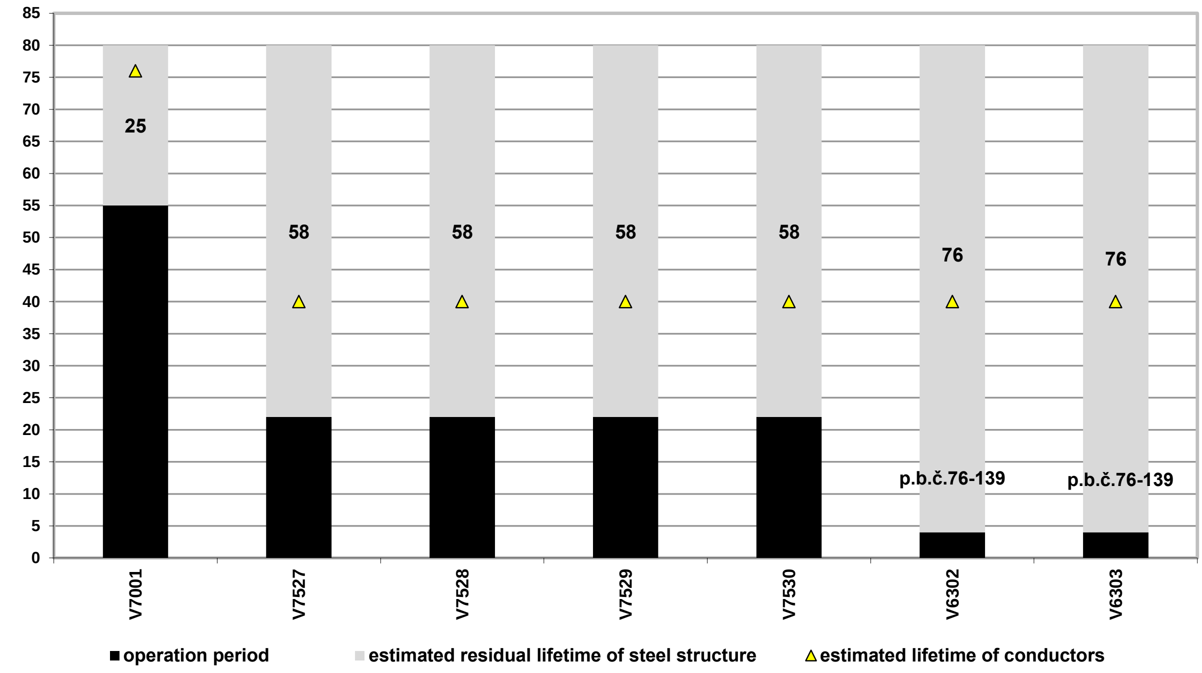
[2] Dedicated technical facility

[3] At present, the lines V074, V075 and V276 are not connected to transmission

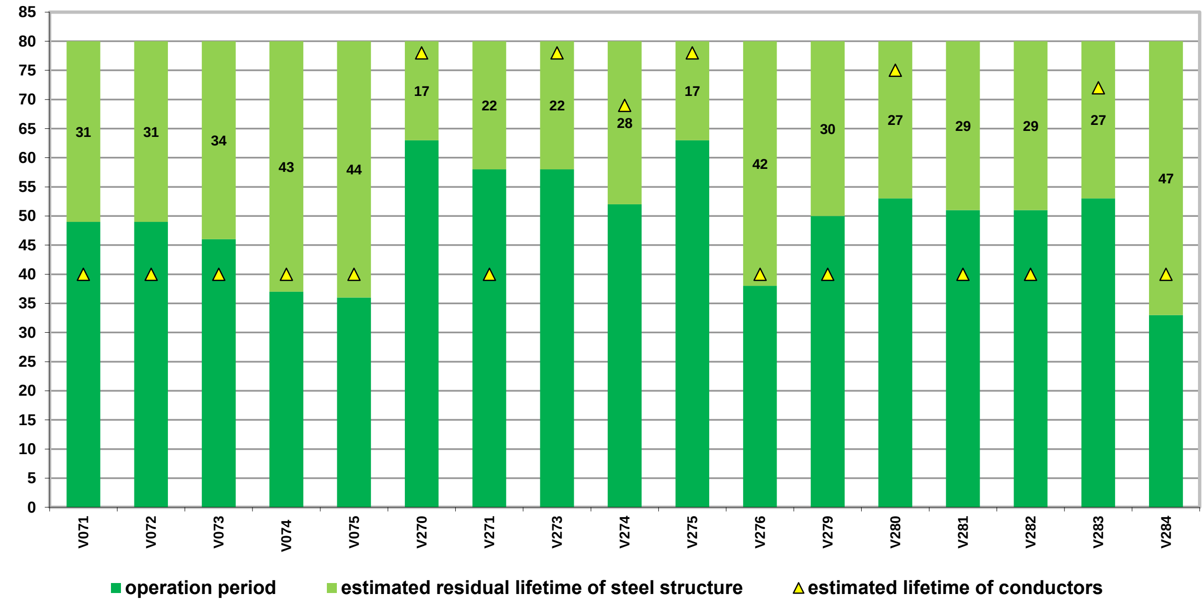
Line No.	Substation 1	Substation 2
V046[2]	Veľký Ďur	EMO
V047[2]	Veľký Ďur	EMO
V048[2]	Veľký Ďur	EMO
V049[2]	Veľký Ďur	EMO
V404	Nošovice (CZ)	Varín
V405	Varín	Sučany
V406	Liptovská Mara	Varín
V407	Liptovská Mara	Spišská Nová Ves
V408	Spišská Nová Ves	Lemešany
V409	Lemešany	Voľa
V410	Voľa	Veľké Kapušany
V424	Sokolnice (CZ)	Križovany
V425	Križovany	Veľký Ďur
V426	Levice	Rimavská Sobota
V427	Rimavská Sobota	Moldava
V428	Moldava	Veľké Kapušany
V429	Podunajské Biskupice	HPP Gabčíkovo
V439	Podunajské Biskupice	Križovany
V440	Veľké Kapušany	Mukachevo (UA)
V448	Győr (HU)	HPP Gabčíkovo
V449	Göd (HU)	Levice
V461	Medzibrod	Liptovská Mara
V477	Lemešany	Krosno (PL)
V478	Lemešany	Krosno (PL)
V487	Moldava	Lemešany
V488	Košice	Lemešany
V489	Moldava	Košice
V490	Levice	Veľký Ďur
V491	Levice	Veľký Ďur
V492	Veľký Ďur	Horná Ždaňa
V493	Horná Ždaňa	Sučany
V494	Sučany	Medzibrod
V495	Bošáca	Varín
V496	Križovany	Bošáca
V497	Sokolnice (CZ)	Stupava
V498	Stupava	Podunajské Biskupice
V8499*	Podunajské Biskupice	Stupava

* line 400 kV operated as 110 kV line

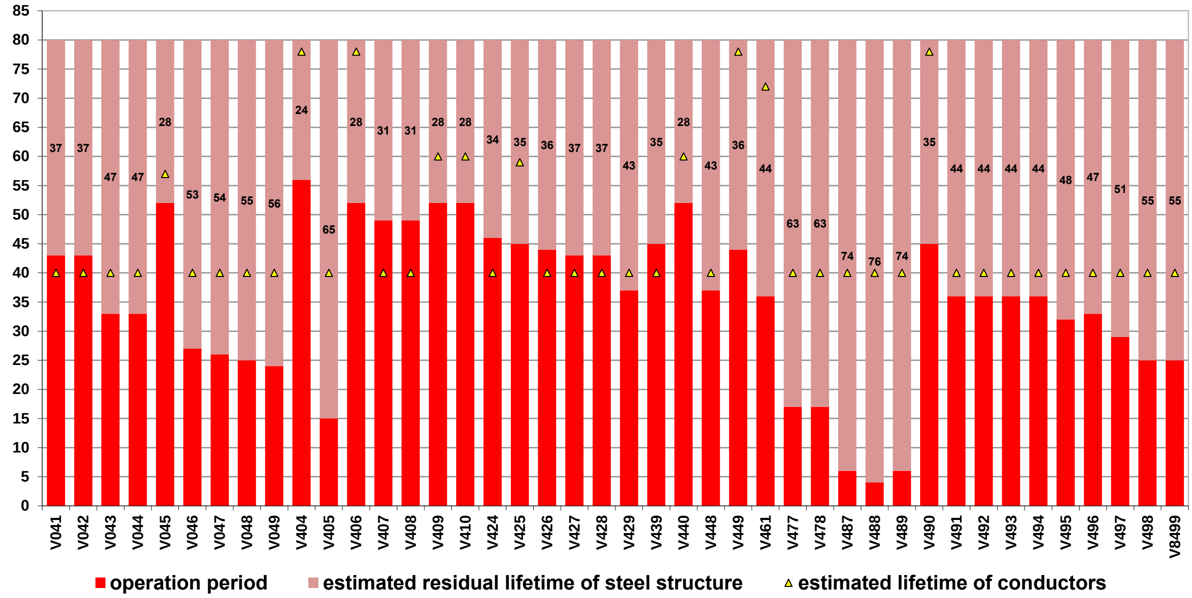
The following three graphs show the operation time of individual 110 kV, 220 kV, and 400 kV lines, estimated lifetime of the conductors (yellow label) and estimated residual lifetime of the pylons. The estimated life of the transmission line in the SEPS conditions is considered in fact equal to the estimated lifetime of the transmission line pylons (its metal parts). The provided information is important regarding the future SEPS technical-investment planning.



Graph No. 2 Overview of Operation Period and Estimated Lifetime of 110 kV Lines of SEPS (in years)



Graph No. 3 Overview of Operation Period and Estimated Lifetime of 220 kV Lines of SEPS (in years)

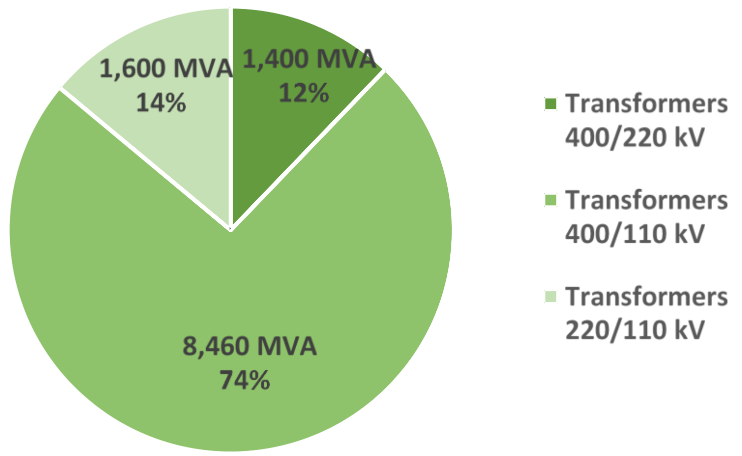


Graph No. 4 Overview of Operation Period and Estimated Lifetime of 400 kV Lines of SEPS (in years)

The yellow label in all three above mentioned graphs means that after reaching the line age of 40 years, conductors' replacement including insulator suspensions on the respective line is being considered by SEPS for the first time. If required so by the condition of conductors and insulator suspensions, their replacement shall be performed sooner or later, as necessary.

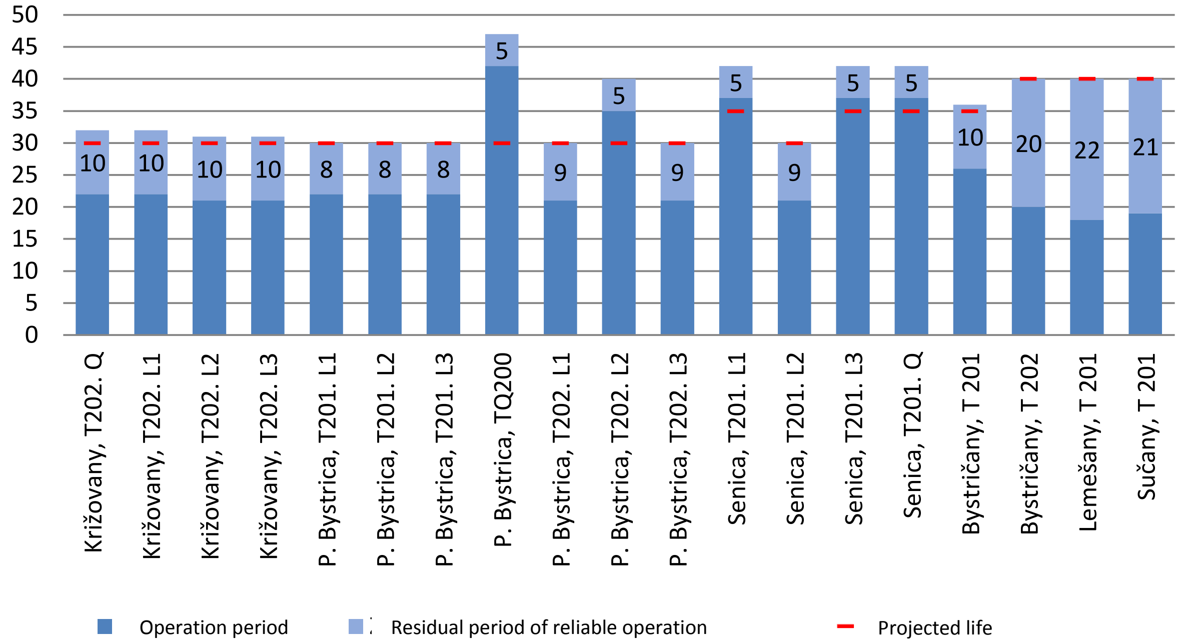
2.1.3 Transformers 400/110 kV, 400/220 kV and 220/110 kV

Power transformers transmission system/transmission system and/or transmission system/distribution system are installed in almost all substations operated by SEPS (except for Veľký Ďur, Veľké Kapušany and Košice).The total installed capacity of these transformers reaches the level of 11,460 MVA. The graph bellow shows the percentage division of the total installed capacity of the power transformers according to the voltage level.

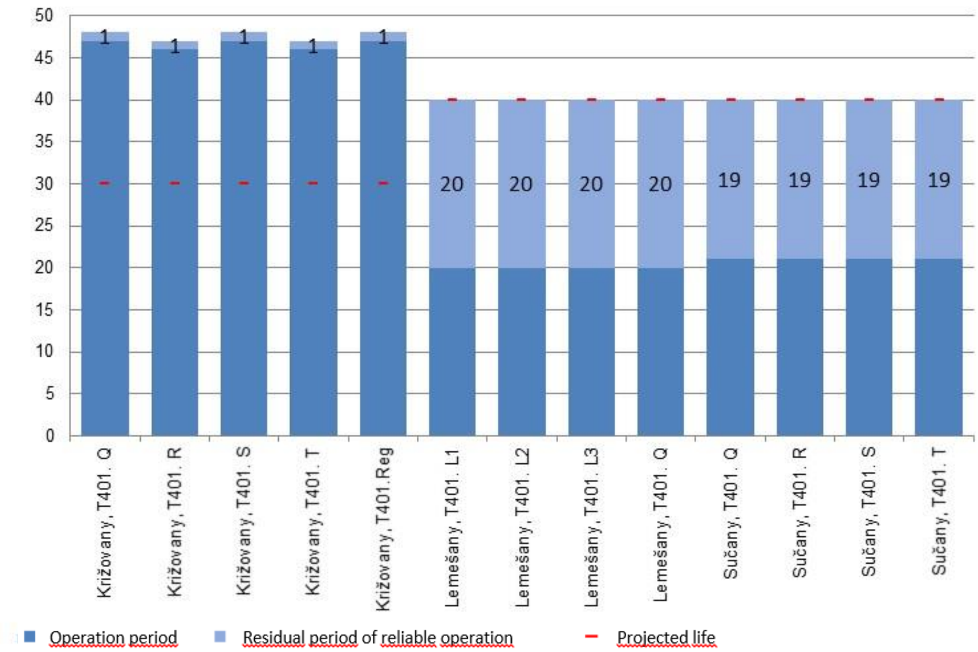


Graph No. 5 Percentage Division of SEPS Transformers According to the Size of the Total Installed Capacity

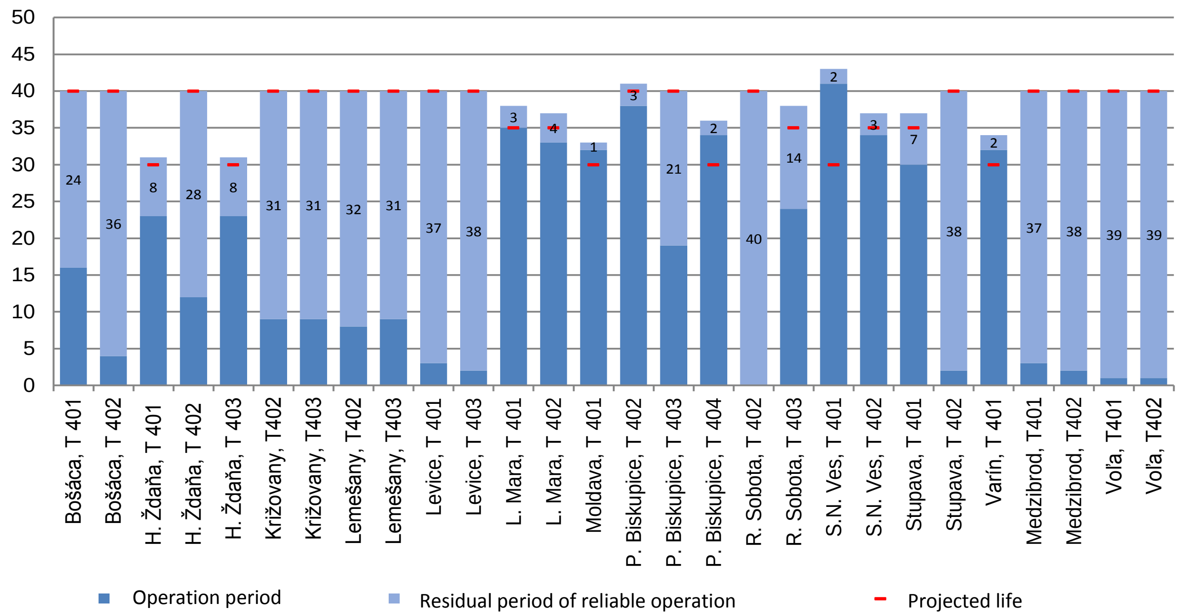
As regards the needs for the future SEPS planning, especially important are the transmission system facilities operational data, the lifetime as well as the residual lifetime of the reliable operation period. The graphs below include the operation period, the residual period of the reliable operation, and the design lifetime of individual transformers. The design lifetime is marked with a red label. The residual period of the reliable operation of SEPS transformers is identified based on the results of their regular diagnostic inspections.



Graph No. 6 Overview of Operation Period and Estimated Residual Period of Reliable Operation of SEPS 220/110 kV Transformers



Graph No. 7 Overview of Operation Period and Estimated Residual Period of Reliable Operation of SEPS 400/220 kV Transformers



Graph No. 8 Overview of Operation Period and Estimated Residual Period of Reliable Operation of TSO 400/110 kV Transformers

2.1.4 Compensation equipment

SEPS uses shunt reactors to compensate the capacitive reactive power and so helps to reduce high voltage in the transmission system. Installation of compensation capacitors to increase voltage in the transmission system is not necessary at present. Installation and reactive power range of the compensation equipment is exclusively in the competence of SEPS, as Slovak TSO.

The only oil immersed shunt reactor is directly connected to transmission system at the 400 kV level in substation Veľké Kapušany. The basic information on this shunt reactor is shown in the following table.

Table No. 5 Overview of the Operation Period and Estimated Residual Period of Reliable Operation of Compensation Reactors at 400 kV Voltage Level

Substation	Production year	Type	Operation period [years]	Q_n [MVAr]	Residual period of reliable operation [years]
Veľké Kapušany, TL1. L1	1972	Oil	43	50	1
Veľké Kapušany, TL1. L2	1991	Oil	24	50	1
Veľké Kapušany, TL1. L3	1972	Oil	43	50	1
Veľké Kapušany, TL1. Q	1971	Oil	44	50	1

In all other cases, dry-type air-core shunt reactors are connected to tertiary windings of SEPS power transformers with the rating up to 45 MVAr (3x15 MVAr), 60 MVAr (3x20 MVAr) and 90 MVAr (3x30 MVAr). The overview of these shunt reactors is provided in the following table. Since the dry-type air-core shunt reactors are maintenance-free devices and thus no diagnostics is carried out unlike the oil shunt reactors or transformers the remaining period of reliable operation in case of is not specified.

Table No. 6 Overview of Compensation Reactors Connected to Tertiary Windings of Transformers

Transformer	Production year	Type	Operation period [years]	Q_n [MVAr]
Nominal voltage of the system = 33 kV				
Križovany T402	2006	dry	9	2x45
Križovany T403	2006	dry	9	2x45
Lemešany T401	2003	dry	12	2x90
Lemešany T402	2007	dry	8	2x45
Lemešany T403	2007	dry	8	2x45
Stupava T402	2013	dry	2	2x45
Sučany T401	1994	dry	21	2x60
Rimavská Sobota T402	2015	dry	0	2x45
Nominal voltage of the system = 10 kV				
Stupava T401	2005	dry	10	2x45

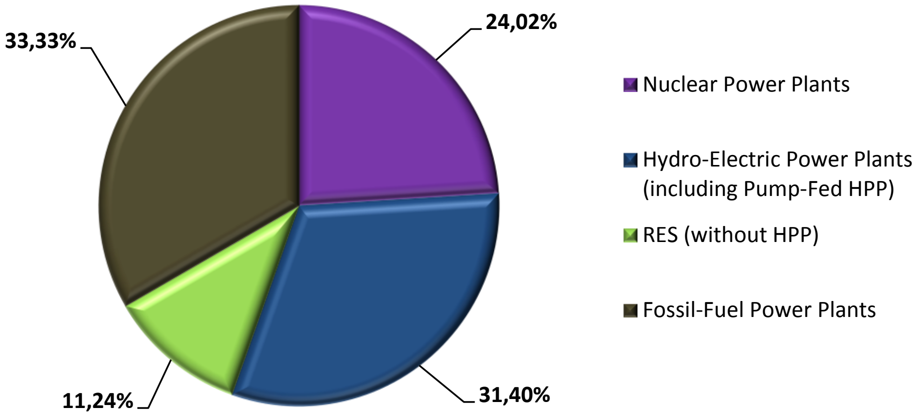
Some basic information on SEPS and the Slovak transmission or power system is available also on the SEPS website (www.sepsas.sk).

2.2 Current Situation of Power Generator Installed Capacity and Electricity Production

In terms of the generation mix the Slovak power system is balanced. The biggest share in the installed capacity shall be attributed to fossil power plants. Further two-thirds of the installed capacity are attributed to hydro-electric power plants, nuclear power plants and renewable energy sources (hereinafter referred to as “RES”) i.e. the sources based on the carbon-free technology. Particular values of the installed capacity for individual technologies and their percentage representation in the generation mix of Slovakia as at 31.12.2014 are provided in the following table and graph.

Table No. 7 Installed Capacity of the Slovak Power System Power Plants According to the Used Primary Energy (State as at 31.12.2014)

Division by fuel	Installed Capacity [MW]
Nuclear power plants	1,940
Hydro-electric power plants (including pumping storage power plants)	2,536
RES (without hydro)	908
Fossil-fuel power plants	2,692
Total	**8,076**



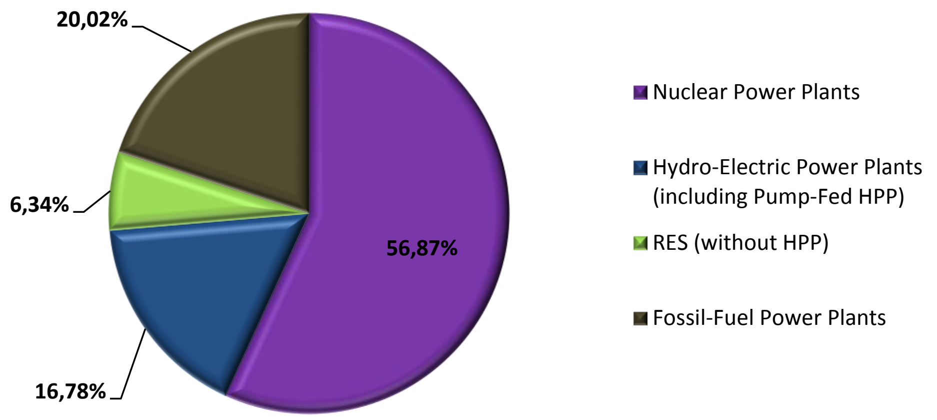
Graph No. 9 Percentage Share of the Installed Capacity of the Slovak Power System Power Plants According to the Technology Type (State as at 31.12.2014)

The category of the "fossil-fuel power plants" includes also heat stations combusting black coal, lignite, natural gas, crude oil residues and fuel mix or co-combusting with prevalence of fossil fuels.

The above-mentioned electricity generators located in Slovakia produced the total energy volume of 27,254 GWh in 2014. Particular values of production of individual technologies and percentage share of individual technologies in total electricity production in Slovakia in 2014 is illustrated in the following table and graph.

Table No. 8 Overview of Production of the Slovak Power System Electricity Generators According to the Technology Type in 2014

Source Technology	Production [GWh]
Nuclear power plants	15,499
Hydro-electric power plants (including pumping storage power plants)	4,572
RES (without hydro)	1,727
Fossil-fuel power plants	5,456
Total	27,254



Graph No. 10 Share of Electricity Production from Individual Types of Technologies of the Slovak Power System Electricity Generators in 2014

As it is obvious from the graph showing comparison of the total electricity production and consumption provided in the following chapter, the decrease of the total electricity production was from the year 2005 caused by gradual decommissioning of the two units of the nuclear power plant in Jaslovské Bohunice (2006 and 2008). Though the decrease in the electricity production in SR was partially compensated by other technologies (CCGT and RES), the 2005 level of electricity production, however, has not been achieved yet also with regard to the reduced demand for electricity or reduction of electricity consumption growth due to world-wide economic crisis (2009). The year-on-year decrease of the total production in the period 2013-2014 was caused especially by decommissioning or the failure to operate the CCGT Malženice and CCGT Bratislava due to their unfavourable operation from economic point of view (fuel price, high production costs, and electricity price)[4].

2.3 Current Situation of Electricity Consumption and Load in the Slovak Power System

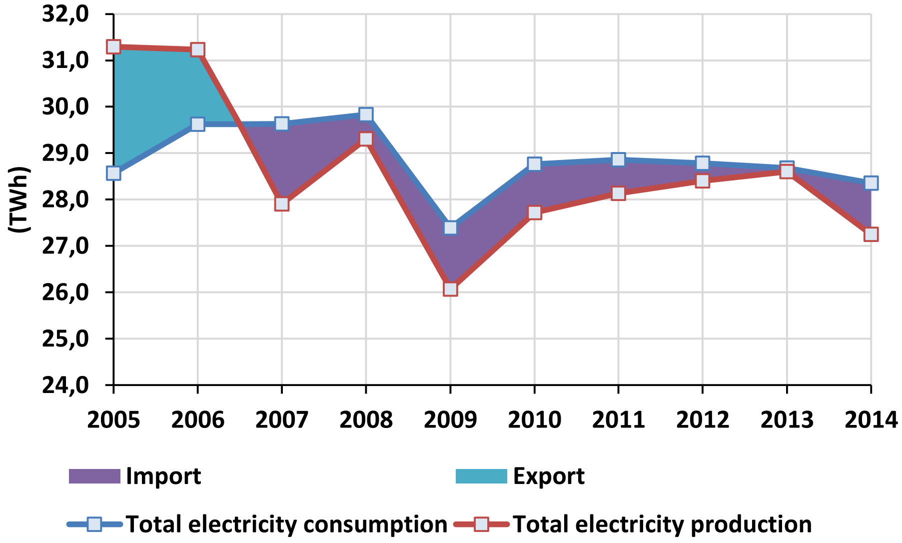
The total electricity consumption in the Slovak Republic on the level of 28,355 GWh in 2014 was higher than the electricity produced from the generators in the Slovak Republic in the same period. The deficit was covered by electricity imported from abroad within the cross-border electricity exchanges. The electricity import balance of Slovakia in 2014 was 1,101 GWh, i.e. approx. 3.9 % share of electricity consumption in SR.

This status, however, does not mean there is not sufficient generating capacity installed in the Slovak Republic which could cover the expected electricity consumption but the electricity import from abroad is probably influenced by the price of this commodity on European electricity markets. Electricity traders profit more from purchasing electricity outside the Slovak Republic and its import to the Slovak Republic than from purchasing electricity from the generators located in Slovakia.

The following graph illustrates the development of the total electricity production and consumption in SR from 2005 to 2014. In 2014, compared to year 2013, the consumption dropped by 326 GWh what means drop by 1.13 %. The trend of electricity consumption development in SR from 2010 to 2014 can be referred to as stagnation. The period from 2008 to 2010, especially the year 2009, was designated by a significant drop in the electricity consumption. The aforementioned decrease was caused especially by the culminating world-wide financial crisis. The below recorded and shown stagnation of the electricity consumption in SR can be attributed to the ongoing consequences of this crisis, increase of efficiency of electricity facilities and increase of the share of incorporated, decentralized production of electricity generators connected to distribution systems. These are mostly RES on the low-voltage level which is

[4] Operation of CCGT Malženice and CCGT Bratislava or of their technological parts is restricted only for provision of supporting services in the minimum volume.

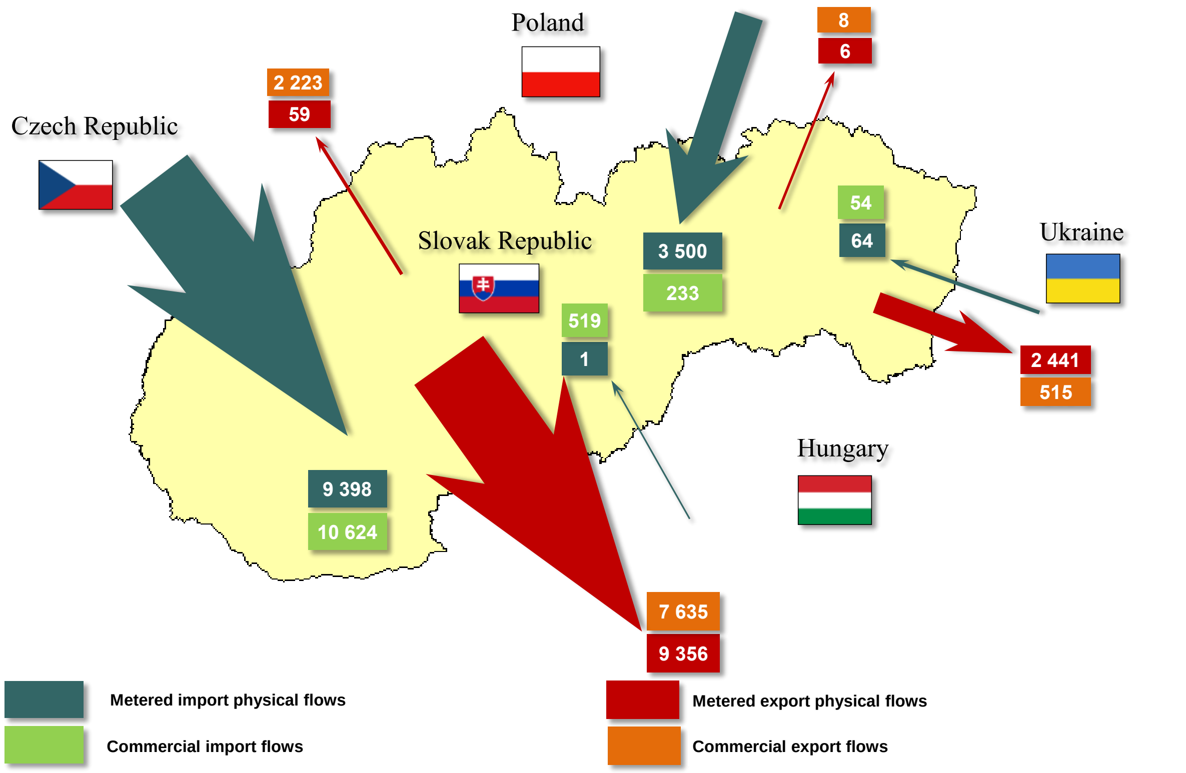
not directly measured but which is reflected in reduction of the consumption balance directly at individual electricity consumers of customers.



Graph No. 11 Development of Total Electricity Production and Consumption in the Slovak Republic in the Period 2005 to 2014

2.4 Current Situation of Electricity Transmission on the Slovak Cross-Border Transmission Lines

SEPS has several joint cross-border interconnections with the neighbouring transmission system operators, but for Austria (hereinafter referred to as "AT"). The following picture shows cumulative annual commercial flows among the Slovak Republic and the neighbouring countries and actual cumulative physical cross-border electricity transmission flows. The dominating direction of power flows is usually from north or north-west to south and south-east. The exporting countries are mostly the countries with the surplus production balance and geographical location north-west and north of the Slovak Republic and importing countries are HU and UA or importing Balkan countries south of the Slovak Republic.



Metered physical flows: Σ Import: 11 430 GWh, Σ Export: 10 381 GWh, Balance: Import 1 049 GWh

Commercial flows: Σ Import: 12 963 GWh, Σ Export: 11 862 GWh, Balance: Import 1 101 GWh

Figure No. 2 Commercial and Physical Cross-Border Electricity Transmission Flows of the Slovak Power System in 2014

Commercial flows of electricity usually differ from physical transmission flows. Commercial flows are in fact commercially agreed electricity transmission flows among individual market zones or countries within the interconnected ENTSO-E system. These commercially agreed electricity transmission flows shall be reflected in the actual operation in the form of physical flows of electricity on individual cross-border transmission profiles. In some hours, physical flows exceed the planned commercial exchanges even by more than 100%. In these trading hours then the basic safety criterion (N-1) might not be met. The reason is the fact that at allocation of business capacities on individual cross-border profiles the topology and impedance of internal transmission systems of individual control areas are not respected.

Compared to the previous years, the import of electricity to SR increased significantly. This reality is a result of economic aspects, especially the disharmony between the price of electricity and price of primary resources for its production or amount of operating costs on the side of the generators for electricity production in SR. The high share of the subsidized electricity produced from RES reduced its price on the market. It resulted in decommissioning or restriction of the common level of zonal electricity production of some power plants combusting natural gas (CCGT Malženice and CCGT Bratislava[4]) and other fossil fuels on the Slovak territory. The concerned market participants in SR thus probably increasingly used the possibility to purchase electricity abroad at more favourable prices for which electricity could not be efficiently produced in SR from economic point of view.

The following table evaluates functioning of the multilateral Market Coupling “4M MC” among CZ-SK-HU-RO for the period from 2012 to 2014. The percentage share of business hours with different prices from the total amount of business hours in a year is growing year by year. Different prices between two control areas with the joint cross-border profile indicate insufficient business transmission capacity on the respective cross-border profile and Market Coupling then ceases to fulfil the basic functions of the single market in electricity. The absolute values of the percentage ratio prove exposure of especially the SK-HU cross-border profile where from 2012 to 2014 increase of different prices from 23% to 50% occurred what indicates high demand for tradeable capacity. Also due to this reason SEPS plans strengthening of this cross-border profile with new cross-border lines.

Table No. 9 Comparison of the Monitored Indicators of Functionality of the Market Coupling in Electricity on the Slovak Cross-Border Profiles Which are a Part of the Market Coupling 4M MC Acquired Based on the Data Published on the Website of the Slovak Short-term electricity Market Operator (OKTE, a.s.) in the Period 2012 - 2014

Year	Monitored quantities	Cross-Border profiles v 4M MC	
		CZ-SK	**SK-HU**
2014	Total number of business hours in a year	8760	8760
	Number of business hours in a year with different prices	396	4373
	Percentage share of business hours with different prices and total number of business hours in a year	**5%**	**50%**
2013	Total number of business hours in a year	8760	8760
	Number of business hours in a year with different prices	182	2475
	Percentage share of business hours with different prices and total number of business hours in a year	**2%**	**28%**
2012	Total number of business hours in a year	2665	2665
	Number of business hours in a year with different prices	30	601
	Percentage share of business hours with different prices and total number of business hours in a year	**1%**	**23%**

Note: in the year 2012, there are only 2,665 business hours because the Market Coupling with Hungary was triggered from 12.09.2012. Thus on SK-CZ profile there are only 2,665 business hours in the year so as to maintain the same time windows and the comparable values.

At present, the Central East Europe region (hereinafter referred to as "CEE"; the region defined for the needs of CAO) is developing the methodology of the flow-based calculation of transmission capacities in several working groups. Termination of the development of methodology for the flow-based calculations of the transmission capacities is expected at the end of the year 2017 and the launch of the flow-based Market Coupling for the day-ahead market in the CEE region is expected in the half of the year 2018.

The basis of the idea for the flow-based allocation of capacities is effort to include the actual topology of the transmission systems in the process of capacity allocation and consider actual division of physical flows of power on individual profiles. In other words it means elimination of differences between commercial and physical flows of electricity.

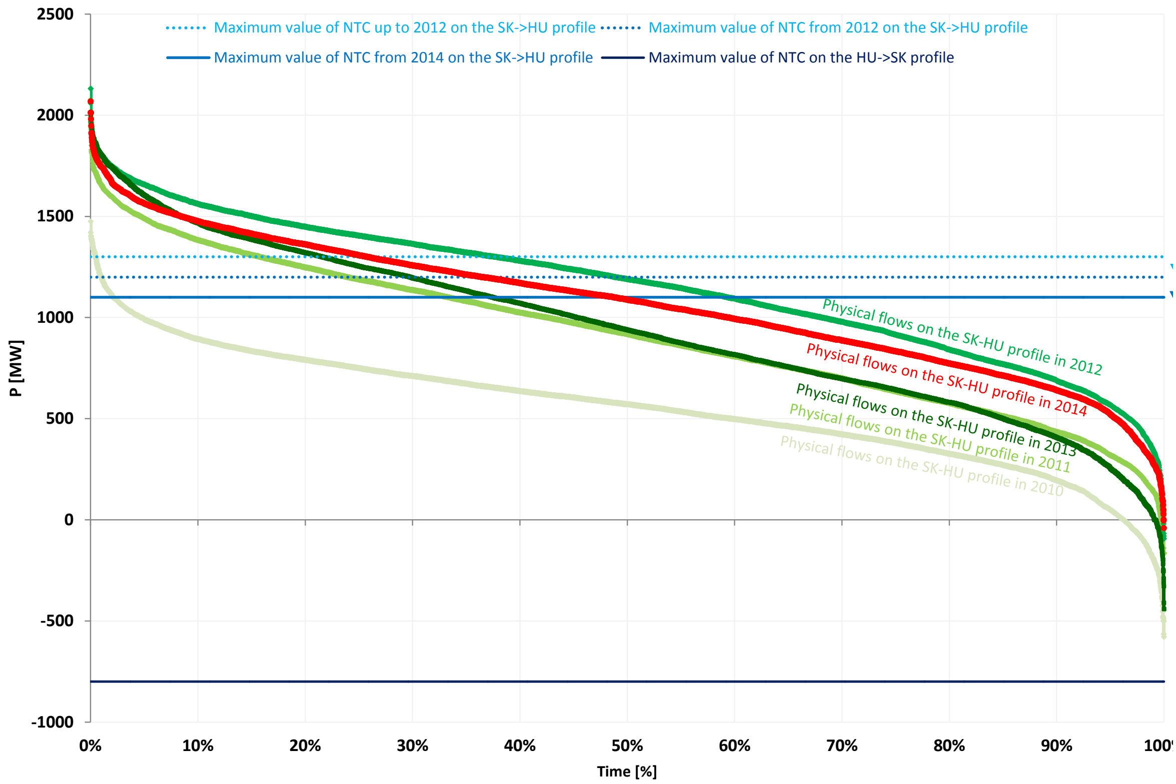
The ongoing complications in the Central European Region are caused by the joint market zone of Germany (hereinafter referred to as "DE") and Austria. Introduction of free trade between these two countries without allocation of cross-border capacity via auctions but with commercial exchanges in electricity limited only by “maximum capacity” of cross-border profile between DE and AT has, apart from advantages also its pitfalls, especially for transmission systems of the surrounding countries. The biggest problem is obviously insufficient transmission capacity of the internal transmission system in Germany which is due to capacity reasons unable to cover big consumption needs in the south of Germany, and thus a part of exchanges in electricity between AT and DE is implemented via cross-border profiles of the neighbouring countries (especially CZ and PL). High impedance of the AT internal transmission system plays its role here as well.

Transition flows of electricity through Slovakia leading to complicated up to dangerous operational situations in the Slovak transmission system are caused by accumulation of several factors such as:

a) high fluctuation of electricity production and, currently, still markedly export character in Germany,
b) gradual strengthening of the transmission infrastructure especially on the cross-border profiles in the Continental Central East region (hereinafter referred to as “CCE”),
c) mentioned joint market zone DE–AT,
d) insufficient transmission capacity of internal transmission system in Germany.

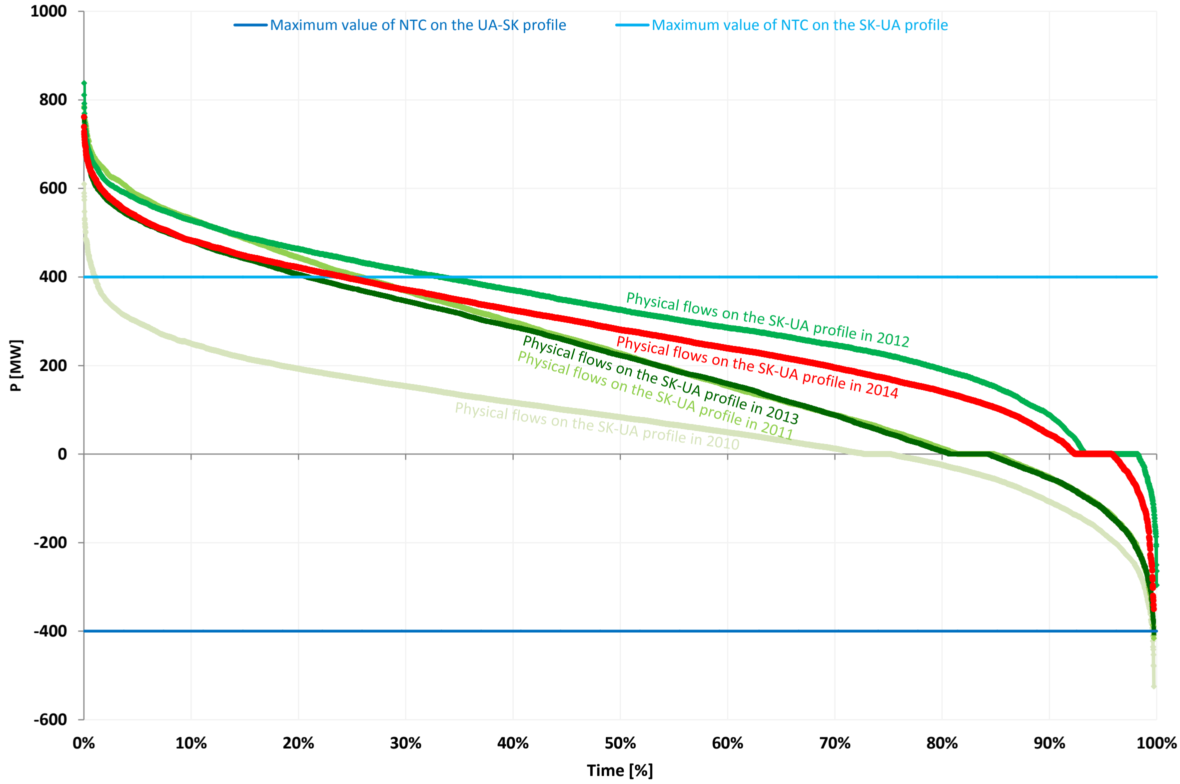
SEPS shall deal with these conditions via operating measures resulting not only in reduction of the transition flows through Slovakia, but they, concurrently, cause increase of losses in the Slovak power system and some other operating restrictions.

Most frequently such conditions in transmission system exist on the cross-border profiles SK–HU and SK–UA. This is being illustrated by the following graphs. An hourly resolution includes use of cross-border profiles of SK with HU and UA in the period from 2010 to 2014, as well as overreaching the maximum value of the total transmission capacity (TTC) and net transmission capacity (NTC) of the profile in a year.



Graph No. 12 Aligned Hourly Physical Electricity Flows on the Slovak – Hungarian Profile Compared to Maximum Trading Values of NTC_{max} in the Period from 2010 to 2014

An arrow on the upper right side of this graph indicates reduction or decrease of the maximum net transmission capacity (NTC_{max}) on the SK-HU profile what meant one of the possible operational measures of how to restrict increasing transit flows via the Slovak transmission system (including maximum values) and the resulting increased physical flows on the SK-HU profile in the period 2010 - 2012. The result of the restriction of the trading transmission capacities on the SK–HU profile was decrease of physical flows on this profile to the level of 2011 values. In 2014, compared to the previous year 2013, even despite further reduction of the maximum net commercial capacity (see the graph above - dark blue arrow), the physical flows of electricity on the SK-HU profile grew, what could be caused by unsuitably set configuration of the market zones on the market in electricity in the Central European Region or north-west from SR, combined with the import balance in the Balkan region.

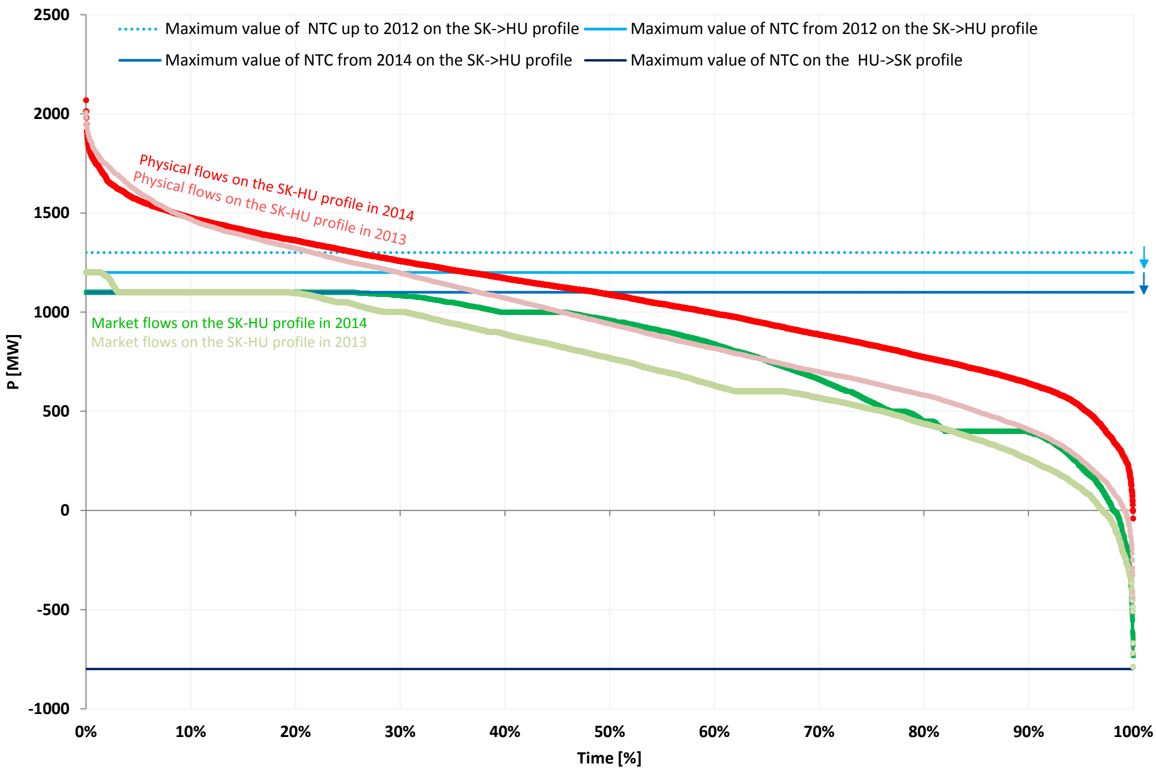


Graph No. 13 Aligned Hourly Physical Electricity Flows on the Slovak – Ukrainian Profile Compared to Maximum Trading Values of NTC_{max} in the Period from 2010 to 2014

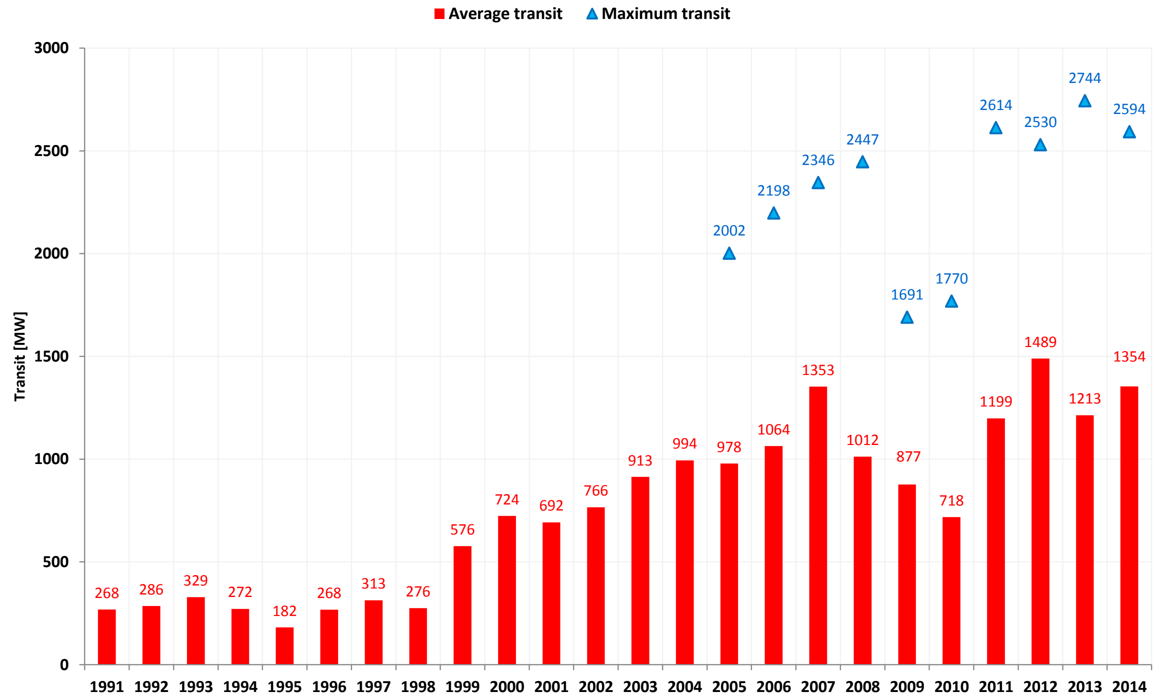
The above-provided graphs show obvious reduction or drop of physical flows on the Slovak - Ukrainian (hereinafter referred to as "SK-UA") profile in 2013 to the 2011 values what was a result of reduction in trading transmission capacities on the SK-HU profile. This is a result of cohesion of the SK–HU and SK–UA profiles since Ukrainian transmission system has strong interconnections with Hungary.

The SEPS development documents often evaluate both profiles together as Slovakia - Hungary and the Ukraine (hereinafter referred to as "SK-HU+UA"), what is being illustrated in the following graphs. As in case of the SK-HU profile, similarly on the SK-UA profile in 2014, compared to the previous year 2013, the volume of physical flows of electricity increased due to the same reasons as with the SK-HU profile.

This chapter includes the information on the method of allocation of capacities, configurations of market zones in Central Europe and other further factors which cause differences between commercial and physical or real flows of power via interconnected transmission systems in Central Europe which may cause threat to their safe and reliable operation. The following graph thus includes real data of commercial and physical electricity flows on the exposed cross-border SK-HU profile in the years 2013 and 2014. The graph clearly proves that the values of commercial flows are smaller than of physical ones and they never exceed the maximum commercial NTC on the profile compared to the physical flows which often exceed this value.



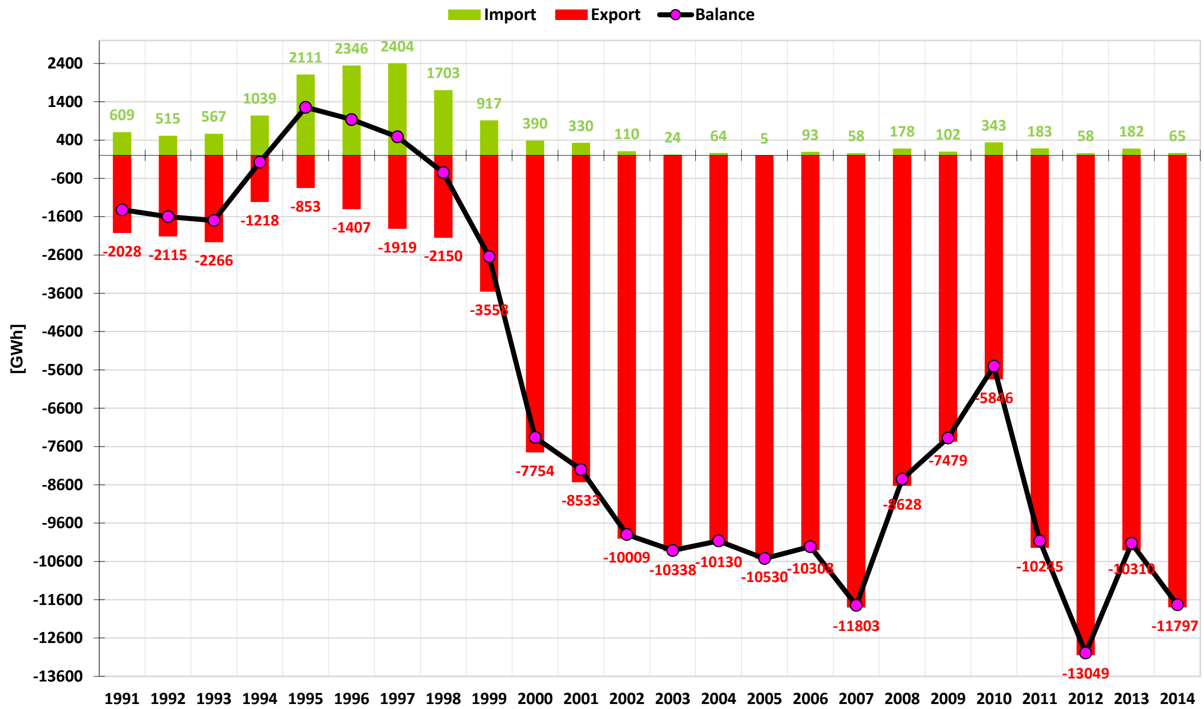
Graph No. 14 Aligned Hourly Commercial and Physical Flows on the SK-HU Profile Compared to Maximum Trading Values of NTC_{max} in the Years 2013 and 2014



Graph No. 15 Average and Maximum (where available) Annual Values of Electricity Transits via the Slovak Power System in the Period 1991 to 2014

The electricity transit flows are in SEPS determined as a minimum value from absolute values of individual sums of export and import power flows on cross-border transmission lines. Quarter-hour values of transit flow shall serve as a basis for the calculation of the average annual value of electricity transit flows through Slovakia.

Also in 2014 the Slovak transmission system was loaded by the increased cross-border electricity transmission which resulted in increase of demands to ensure safe and reliable operation of transmission system, increase of losses in it and non-fulfilment of basic functions of the Market Coupling CZ-SK-HU-RO. These increased flows were initiated especially by the operation of big number of RES with high installed capacity in north-west Europe, high import of electricity in the south-east part of Europe, aforementioned inappropriate configuration of market zones, high export of electricity from the neighbouring countries of SR and topology of individual transmission systems of Europe. To provide for operational safety of the Slovak transmission system at increased cross-border electricity transmissions and their impacts on power system of Slovakia, reconfiguration of the Slovak transmission system is one of the extreme dispatcher measures. It is a temporary operative change of the transmission system topology in order to renew the state of safe operation of the system or remove overload of the transmission system elements. In certain phases of the transmission system operation, in terms of ensuring its safety, such dispatcher measures may be highly risky and thus TSO works also on the long-term conceptual solutions and measures via investment events consisting in strengthening internal and cross-border transmission infrastructure (see Chapter 4.)



Graph No. 16 Total Annual Transmitted Electricity on the Joint SK–(HU+UA) Profile in the Period 1991 to 2014

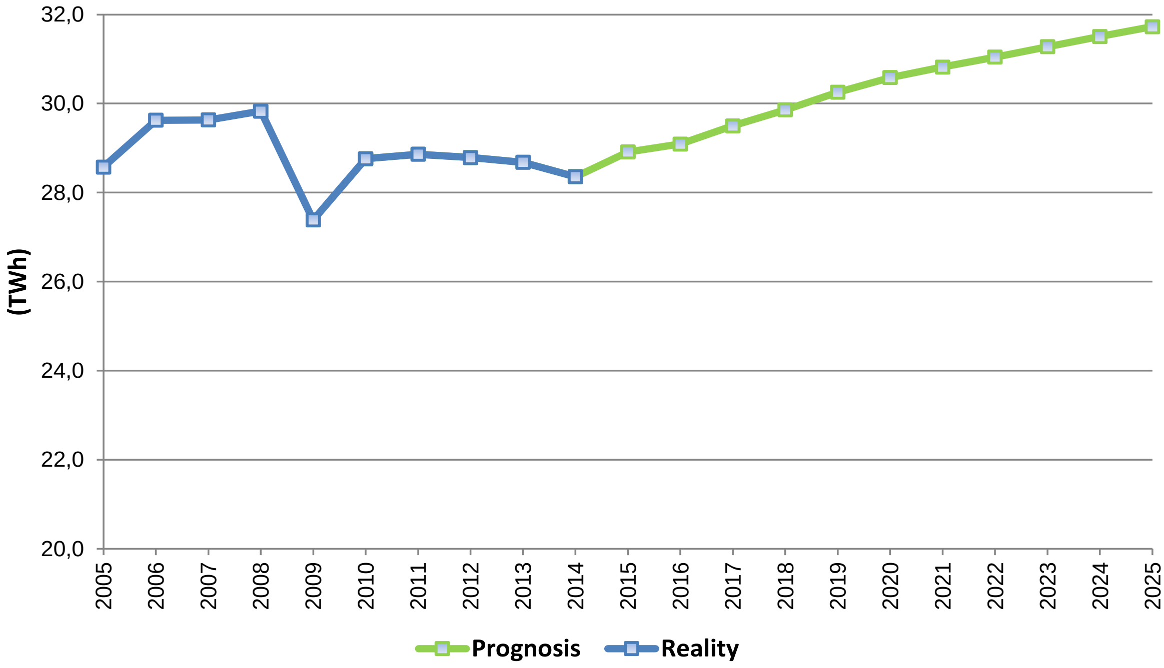
3. Assumed Future Situation of Offer and Demand for Transmission Capacity

3.1 Assumptions for Electricity Consumption in the Slovak Power System

The average annual growth of electricity consumption in SR in the period by 2025 is expected to reach the level of 1.03 %. Based on this assumption, it means increase by 3.4 TWh in electricity consumption by 2025 what is almost 12 % growth compared to the year 2014. In 2015, based on the data acquired by the date of this TYNDP processing, the total electricity consumption could reach 28.9 TWh, in 2020 the level of 30.6 TWh is assumed and in 2025 it is 31.7 TWh.

Compared to the prognosis of electricity consumption according to the approved national strategic document "Proposal of Energy Policy of SR" (2014), the assumed consumption increase is lower in 2020 by 0.4 TWh and in 2025 by 1 TWh.

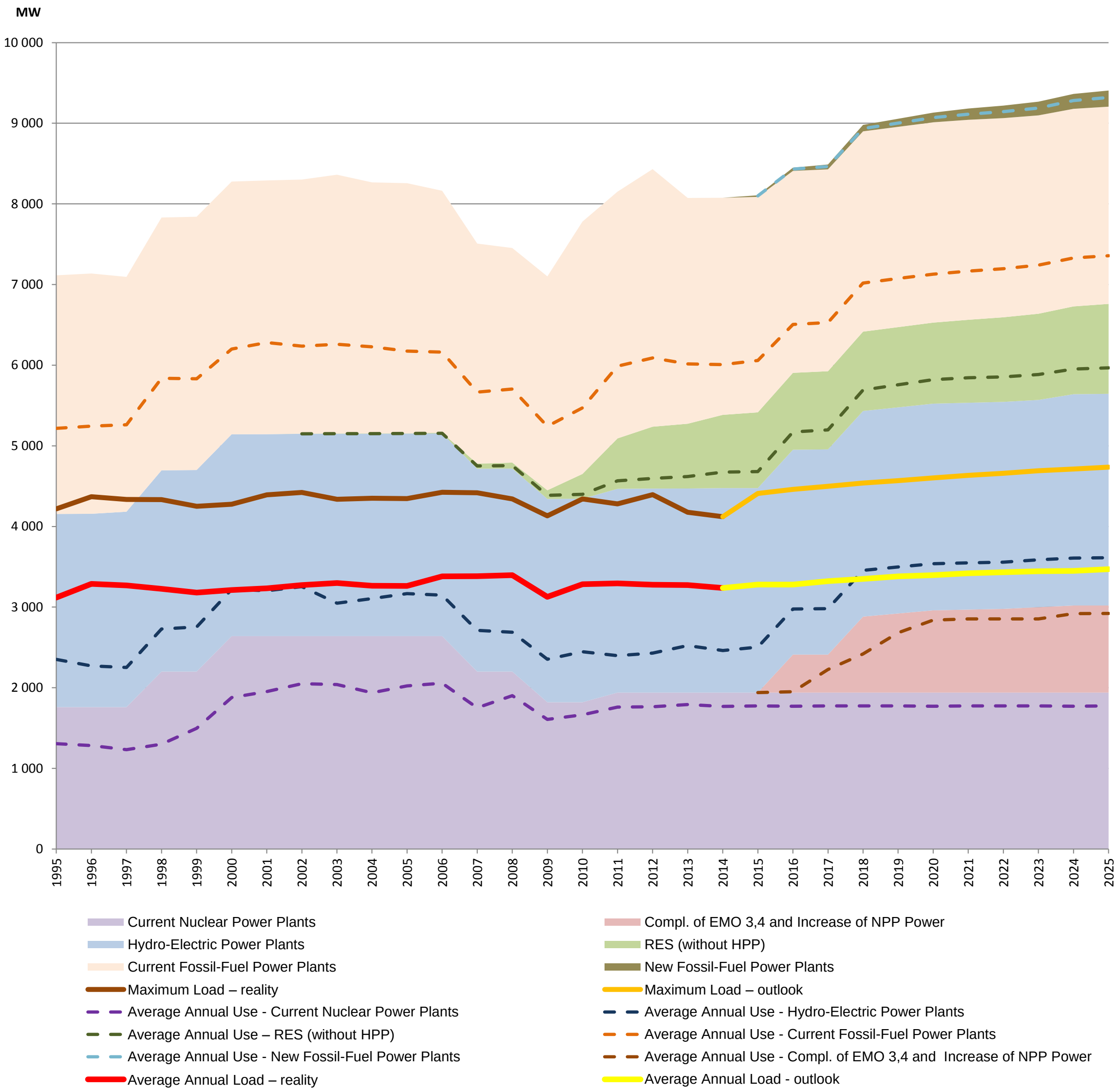
The considered scenario of the consumption development expects the economy growth with decreasing energy intensity what is in compliance with the priorities of the valid energy policy of SR and the EU. The economy development scenarios also include assumptions created to naturally save the energy resulting from the change of the industry structure and influences of the competitive market environment. They also consider development of GDP, economy, and demography as well as new assumed consumption types (electro-mobility, smart technologies on the demand side, etc.). The following graph includes real measured data and prognosis of the total electricity consumption by 2025.



Graph No. 17 Prognosis of the Total Electricity Consumption in Slovakia

3.2 Assumptions for Electricity Production in the Slovak Power System

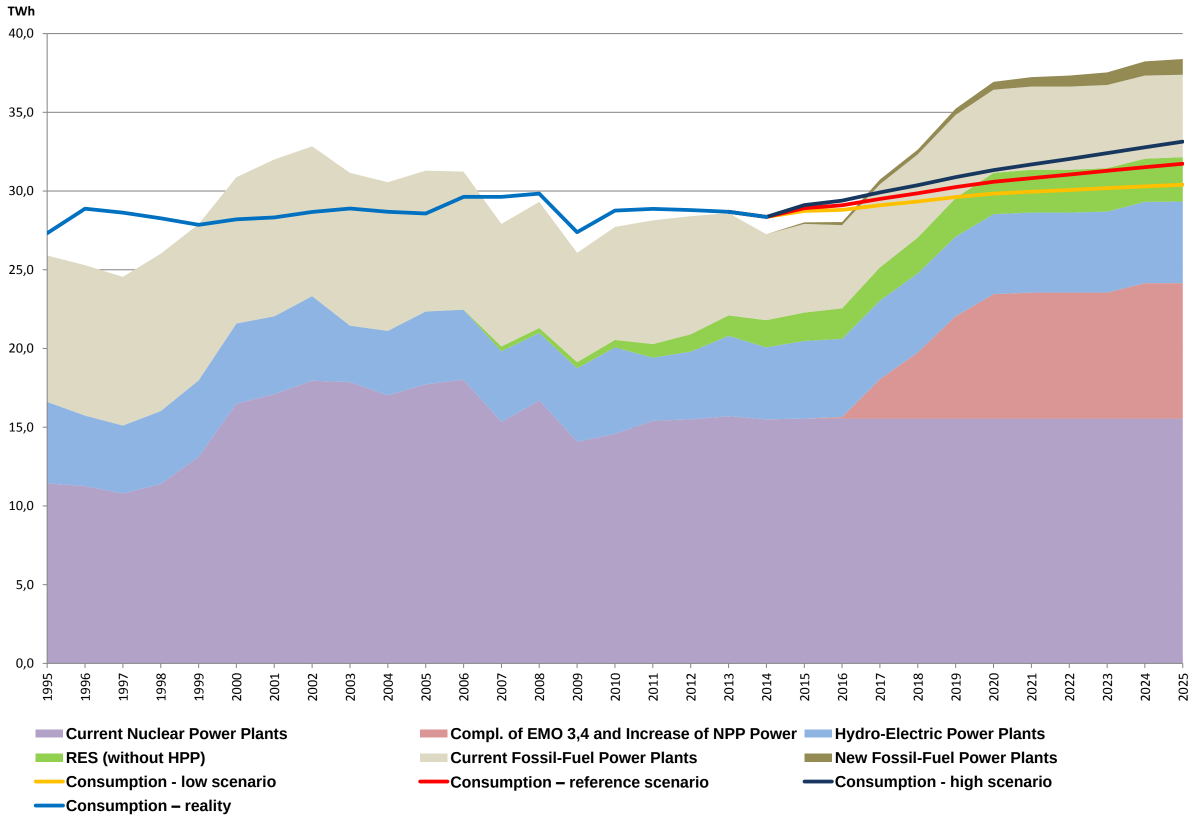
The volumes of current and notified installed capacities of electricity generators divided into nuclear, hydro-electric, renewable (without HPP) and fossil-fuel power plants which were taken into consideration at creation of the assumed development of installed capacities, average and maximum load of the Slovak power system by 2025 and prognoses for development of available electricity production and electricity consumption in SR by 2025 are illustrated in the following graphs. Within the monitored period, even despite decommissioning of the existing production capacities due to emission limits, the increase of the installed capacity of electricity generators in SR by more than 1,000 MW is expected, what in electricity production means increase by approx. 10 TWh. It is especially the notified completion and commissioning of units 3 and 4 of EMO with gradual increase of the installed capacity to 2x530 MW and annual electricity production up to the level of 8.6 TWh. The remaining increase of the installed capacity is assumed in RES and in new fossil-fuel power plants.



Graph No. 18 Assumed Development of Installed Capacity of Power Plants and Average and Maximum Load of Electricity by 2025

The aforementioned graph shows average annual use of the installed capacity of generators according to the technology type of electricity production (dotted line) disregarding the fact whether it is the existing generator for electricity production or a considered new generator. While the NPP installed capacity usage achieves almost 90%, the use of other types of technologies is relatively low. In case of HPP and RES (in case of RES the data are available from 2002, when the first wind turbines were installed in SR) their use strongly depends on the current hydrological and meteorological conditions. The total average use of the installed capacity of generators in Slovakia is sufficient only to cover average load which copies the electricity consumption in SR shown in the following graph.

To ensure adequacy of the electricity generating units in the Slovak power system, however, the conditions have to be created so that the use of especially flexible fossil-fuel units can be markedly higher for safe power system operation. The coverage of maximum load and thus also balance in hours of maximum load of the Slovak power system shall depend mainly on the use of flexible fossil-fuel sources the operation of which strongly depends on economic indicators and emission limits. The operation of fossil sources is inevitable in certain volume to cover the required volumes of ancillary services through which TSO provides for system services for all ES SR users.



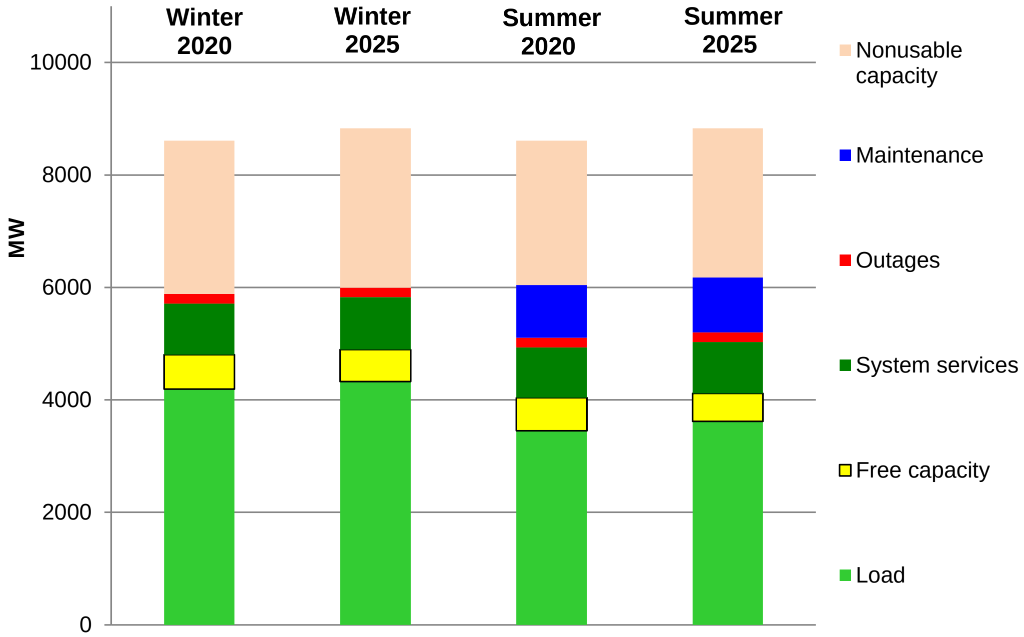
Graph No. 19 Assumed Electricity Production and Consumption in SR by 2025

The described development in electricity production on the generators located in the SR shall be significantly influenced in the future by electricity generation prices development on the markets and by the regulatory framework which significantly influence operation economy of individual technologies for electricity production.

Based on the found facts on operation of the existing fossil fuels power plants, the lower volume of the total production is assumed in 2020 by 1.5 TWh and in 2025 by 0.9 TWh compared to the assumptions of development in the electricity production according to the approved national strategic document "Proposal of the Energy Policy of SR" and previous TYNDP.

Securing sufficient generator basis to cover different electricity consumption scenarios in SR (so called Generation Adequacy) and securing optimal generator mix in terms of ensuring reliable and safe operation of power system (so called System Adequacy), is a complex task. The role plays also uncertainty of invested costs return into power plants caused especially by the negative development of the ratio of market prices of fuels for electricity production and electricity itself.

The following graph illustrates a simple analysis of the Slovak Generating Adequacy according to the ENTSO-E methodology for the assumed variants of winter and summer maximum load in the important years 2020 and 2025. After completion of EMO 3, 4 the power system is safe even in case of ensuring generation of electricity and also in case of non-operation of fossil fuel power plants CCGT Malženice, CCGT Bratislava, Nováky B units 3 and 4, and EVO 1 units 1 and 2. In terms of ensuring inevitable volume of the system services the situation in case of decommissioning or non-operation of these generators remains tense. The control area of SR shall actually miss approximately 30 to 40% of the required volume of the regulation reserves (especially secondary active power regulation).



Graph No. 20 Generating Adequacy of ES SR in 2020 and 2025

Covering of electricity consumption increase and replacement of important production capacities should be resolved in the future by achieving appropriate and balanced development of new capacities with nuclear, fossil, and renewable sources for electricity production.

3.3 Assumptions for Electricity Exchanges with Other Countries

Assumed cross-border electricity exchanges in the long-term horizon cannot be forecasted unambiguously. Such prognosis may be performed only under certain assumptions for electricity production and consumption development and available tradeable capacities what includes substantial uncertainty which shall be taken into consideration. In case of the following considerations the allocated market transactions in 2014 and two possible scenarios of future development of generation mix, electricity consumption and development of commercial capacities in the entire area of the ENTSO-E countries, which is documented in the ENTSO-E database for the purpose of processing the ENTSO-E documents "Ten Year Network Development Plan" (hereinafter referred to as "ENTSO-E TYNDP") 2012 and ENTSO-E TYNDP 2014. It is so called "EU 2020" scenario of TSOs for the year 2020 and "Vision 1" scenario for the year 2030.

The "EU 2020" scenario stems from the national renewable energy action plans of individual EU member states or similar documents in case of the ENTSO-E members which are not EU members. The "Vision 1" scenario is characteristic by reflecting the best possible estimate of individual TSOs associated in ENTSO-E as for development of the generation mix, transmission capacities, and consumption for the year 2030.

The following picture shows prognosis of market cross-border exchanges in electricity among the SR and the neighbouring countries (but for AT) for the year 2025. The data were acquired by extrapolation of values for available and modelled years 2014, 2020 and 2030. From the Slovak point of view, compared to present, no substantial differences occurred and the estimated annual volumes of market power flows for the year 2025 correspond in fact to the present situation. According to the simulation for this time horizon, the market electricity export to HU and UA will grow as well as import from CZ.

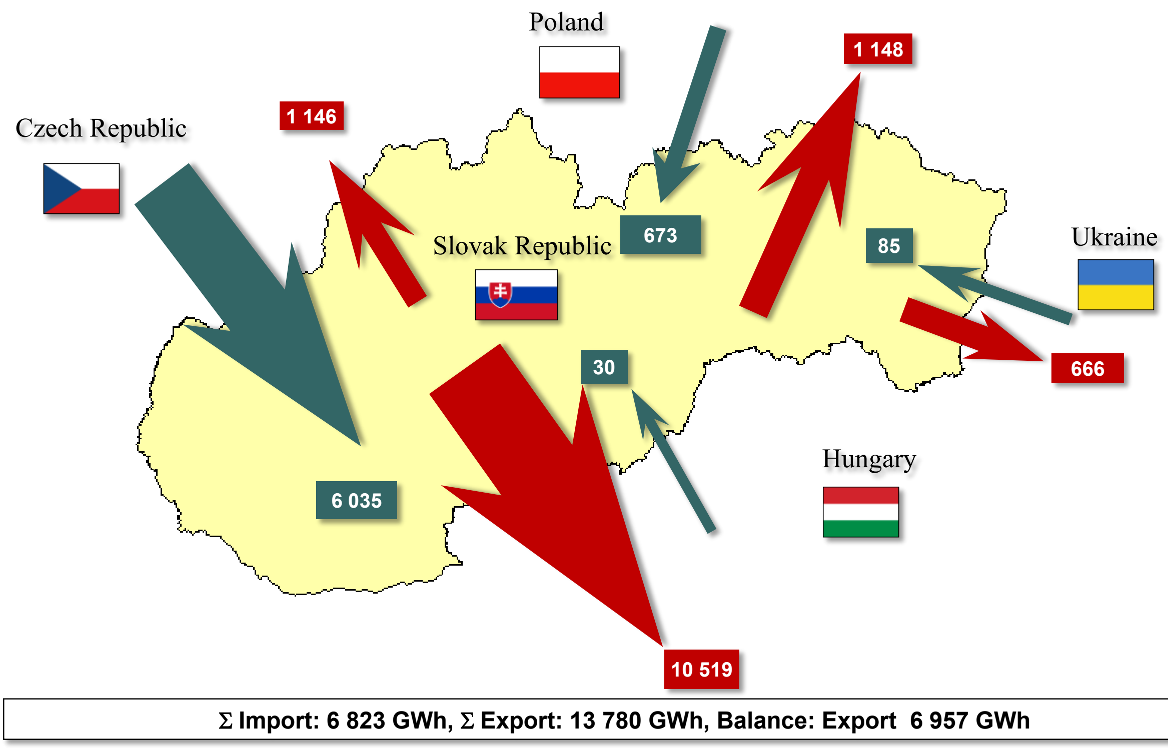


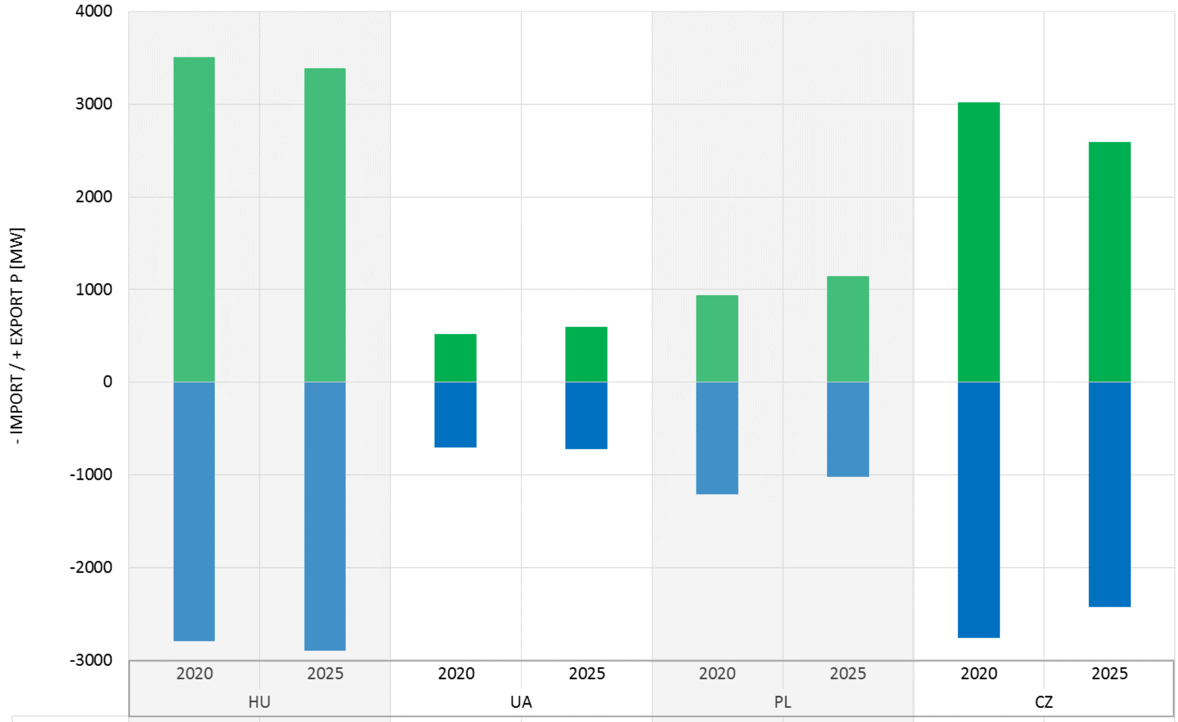
Figure No. 3 Assumed (Modelled) Annual Market Cross-Border Transmission Flows of Electricity in the Slovak Power System for the Perspective Time Horizon 2024 (Without Consideration of Transit and Loop Flows)

Regarding the current investment decisions by SEPS to increase the cross-border transmission capacities, the planned erection of new cross-border interconnections between SK and HU proves to be reasonable (they were considered in the above-mentioned ENTSO-E scenarios). It can be expected that based on the above-mentioned considerations the volume and direction of physical power flows along the transmission cross-border lines on this profile will be comparable. However, the change of ratio between transit and export to HU may occur.

Transit flows of electricity through the Slovak transmission system can be expected further mostly in the north-south direction and in the approximately identical volume as at present. Already in 2017, prevailingly export character of the Slovak power system can be expected with comparable volumes of electricity transits as in 2014. This is confirmed also by assumptions in Chapters 3.1 and 3.2.

It can be stated that the mentioned assumptions for volume and direction of electricity flows from SR or via SR confirm the proposed solutions for strengthening the Slovak cross-border transmission infrastructure. Moreover, it is obvious that the volume and direction of power flows depend on development of the transmission infrastructure, generation mix as well as on the political decisions not only in SR but also in the countries within synchronously interconnected ENTSO-E system. The current and expected development of cross-border electricity flows is the main driver of decisions on construction of a new transmission cross-border line what is considered also in Chapter 4.3.

The values of maximum transmission capacities on individual Slovak cross-border profiles were calculated for future time horizons 2020 and 2025 both for import and export direction considering N-1 network restrictions only in Slovakia (see the following graph). The maximum transmission capacities of cross-border profiles depend especially on the system configuration, location of power plants and their actual committed capacity, and permitted loading of cross-border lines. On the other hand, the hourly values of net transmission capacities for the coming year consider also inevitable safety reserves for the case of maintenance conditions (almost 70% of time in a year), in case of unexpected events, for case of big differences between market and physical flows (so called loop flows). Along with consideration of the aforementioned conditions, the quantification of which is difficult to estimate for the future, the calculated values of the net transmission capacities for the time horizon 2020 and 2025 would be lower compared to the provided values of the maximum transmission capacities. Another important factor significantly reducing the values of the net transmission capacities are restrictions in internal networks of the neighbouring transmission systems.



	HU 2020	HU 2025	UA 2020	UA 2025	PL 2020	PL 2025	CZ 2020	CZ 2025
TTC EXPORT	3500	3379	512	592	930	1139	3012	2589
TTC IMPORT	-2790	-2891	-700	-718	-1210	-1017	-2760	-2420

Graph No. 21 Development of Maximum Transmission Capacity Values on the Slovak Transmission Cross-Border Profiles (in MW)

Increase of maximum transmission capacities (approximately by 100%) within the time horizon of the year 2020 against present is assumed on the SK-HU cross-border profile. It is caused by commissioning new cross-border lines to Hungary in 2018 (see Chapter 4). This topological change in the Slovak transmission system proves negligible influence on the values of maximum transmission capacities of other cross-border profiles.

The planned gradual decommissioning of the 220 kV transmission system in Central and Western Slovakia regions within the time horizon of the year 2025 including decommissioning of the 220 kV cross-border lines V270 Považská Bystrica - Lískovec and V280 Senica - Sokolnice on the SK-CZ profile has the biggest influence on the values of the maximum transmission capacity on the SK-CZ cross-border profile against the time horizon of the year 2020. These topological changes may reduce the maximum transmission capacity in both import and export directions on this profile within the range from 9% to 13%. The final impact including the assumed measures to eliminate reduction of maximum transmission capacity on the CZ-SK profile shall be known after termination of analysis on which SEPS and the Czech operator are working on the bilateral basis. The described topological changes in 220 kV transmission system prove negligible influence on the values of maximum transmission capacities of other cross-border profiles.

With other cross-border profiles no significant change of values of the maximum transmission capacities within the horizon of the year 2025 is expected both in export and import directions.

All considerations and assumptions on the development of maximum transmission capacities of individual cross-border profiles of the Slovak transmission system in the time horizons of the years 2020 and 2025 described above stem from the SEPS and ENTSO-E analyses and assumptions. The provided values of maximum transmission capacities of future time horizons of the years 2020 and 2025 shall thus be understood only as informative, non-binding annual values and they are applicable exclusively to the analysed variants of the transmission system development without considering the aforementioned restricting influences. The values of net transmission capacities for the upcoming period are or will be specified by the SEPS dispatch centre.

3.4 The System Development Plan for the Entire EU and Regional Investment Plans

The transmission system of SR is a part of the synchronously connected European transmission system ENTSO-E. Within ENTSO-E, a ten-year network development plan describing possibilities and possible direction of development of the entire ENTSO-E transnational transmission system for the coming ten years is being elaborated. In December 2014, the third ENTSO-E TYNDP document was published. The process of the 2016 ENTSO-E TYNDP preparation started in September 2014.

ENTSO-E TYNDP is a non-binding document for publishing of which ENTSO-E provides a mandate, so called third liberalization package. Pursuant to the Regulation of the European Parliament and of the Council (EC) No. 714/2009 on Conditions for Access to the Network for Cross-Border Exchanges in Electricity it is required so that ENTSO-E can adopt its TYNDP document in order to ensure bigger transparency regarding investments in the entire European interconnected system as well as support in decision-making processes on the national, regional, and European level.

According to the Regulation of the European Parliament and of the Council No. 347/2013 on Guidelines for the Trans-European Energy Infrastructure, ENTSO-E TYNDP performs a double role. In addition to the aforementioned, pursuant to Regulation No. 714/2009 it is a fact that a list of the transmission infrastructure investment projects within ENTSO-E having a status of the European interest projects attributed to them within ENTSO-E TYNDP shall form the basis for selection of the priority European projects referred to as “Projects of Common Interest” (hereinafter referred to as “PCI”).

A list of the SEPS investment projects of the trans-European importance in the ENTSO-E 2014 TYNDP document is as follows:

- 2x400 kV line Gabčíkovo - Gönyű (HU) including construction of a new switching station in Gabčíkovo[5],
- 2x400 kV line Rimavská Sobota – Sajóivánka (HU),
- 2x400 kV line Veľké Kapušany – area of Kisvárda (HU).

Pursuant to the Regulation of the European Parliament and of the Council No. 347/2013, the European Commission is authorized to introduce the Union-wide lists of projects of common interest. The union-wide lists of PCI projects are adopted by the delegated regulation of EC. A list of the PCI projects for the European Union always stems from the last valid ENTSO-E TYNDP in the year following the year in which a list of projects of trans-European importance in the ENTSO-E TYNDP document was issued. The current and still valid List of PCI Project for the Union is based on ENTSO-E 2012 TYNDP and it includes the following PCI projects with SEPS being their promoter or a co-promoter.

- 2x400 kV line Gabčíkovo - Gönyű (HU) including construction of a new switching station in Gabčíkovo,
- 2x400 kV line Rimavská Sobota – Sajóivánka (HU),
- 2x400 kV line Veľké Kapušany – area of Kisvárda (HU).

It is assumed that in November 2015, the European Commission is to issue already second Union-Wide List based on the list of projects included in 2014 TYNDP.

The PCI status is to help to the concerned projects and their promoters especially in acquiring the required permissions for the project implementation and to ensure so that the national regulator weighted these projects adequately upon forming a regulatory framework regarding the all-European character of the PCI projects. The PCI status can also be used to acquire financial support dedicated to the area of energy infrastructure for the trans-European energy projects for the period 2014 – 2020 from so called Connecting Europe Facility framework established by the Regulation of the European Parliament and of the Council (EU) No. 1316/2013. It is, however, necessary to meet the strict criteria for this purpose, while the financial support amount need not be motivating for the system operators and project promoters.

The TYNDP report within ENTSO-E is being processed by the System Development Committee (hereinafter referred to as "SDC") and it consists of a set of several substantial documents such as "Scenario Outlook and Adequacy Forecast" and six regional investment plans. The Slovak Republic or SEPS as the transmission system operator in Slovakia in regard to the geographical layout belongs to

[5] Currently considered as "2x400 kV line Gabčíkovo – Gönyű (HU) – Veľký Ďur"

the CCE Region. The CCE Region consists of nine countries within which there are ten transmission system operators established what is shown in the following picture.

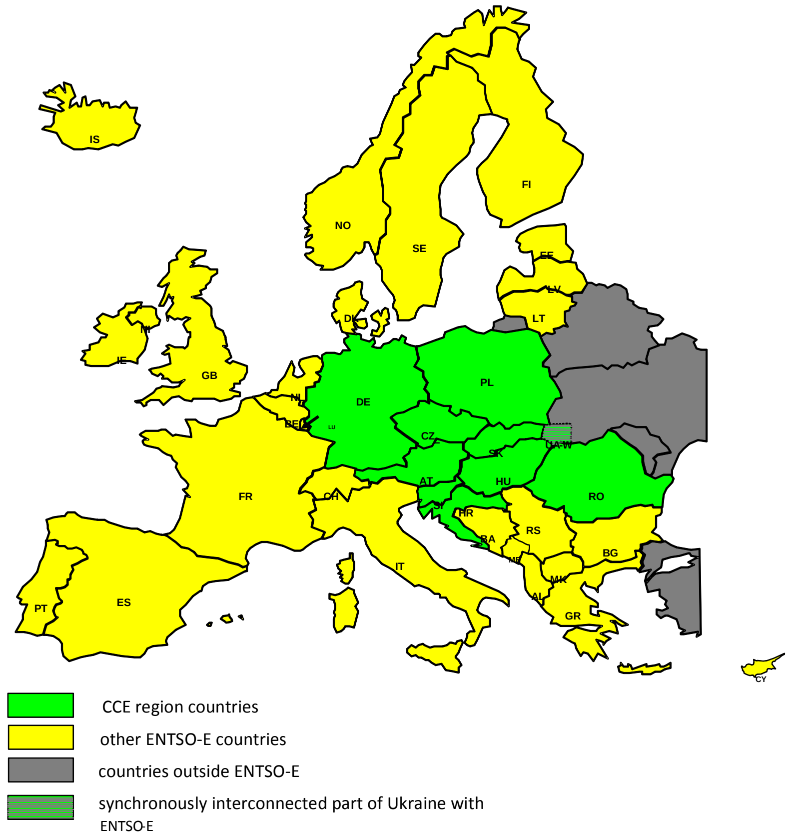


Fig. No. 4 Map of the CCE Region and Other ENTSO-E Countries

As mentioned above, there is also a regional investment plan[6] (hereinafter referred to as "RgIP CCE") being elaborated within the CCE region including the ENTSO-E TYNDP report. The RgIP CCE document identifies the Projects of Regional and National Significance. RgIP CCE thus includes the projects which are not or will not be a part of the ENTSO-E TYNDP document since they fail to meet the status of projects of the European interest and finally they do not correspond to the PCI importance.

In 2014 RgIP CCE, SEPS has the following investment projects:

- Set of investment items R400 kV Medzibrod[7],
- 2x400 kV line Križovany – Horná Ždaňa (with looping one circuit to new 400 kV switching yard Bystričany),
- Doubling of 400 kV line Lemešany – Veľké Kapušany including extension of 400 kV Lemešany and Veľké Kapušany switchyards,
- 2x400 kV line Gabčíkovo – Veľký Ďur including extension of the 400 kV Veľký Ďur switchyard.

4. The Ten-Year Network Development Plan for the Period 2016-2025

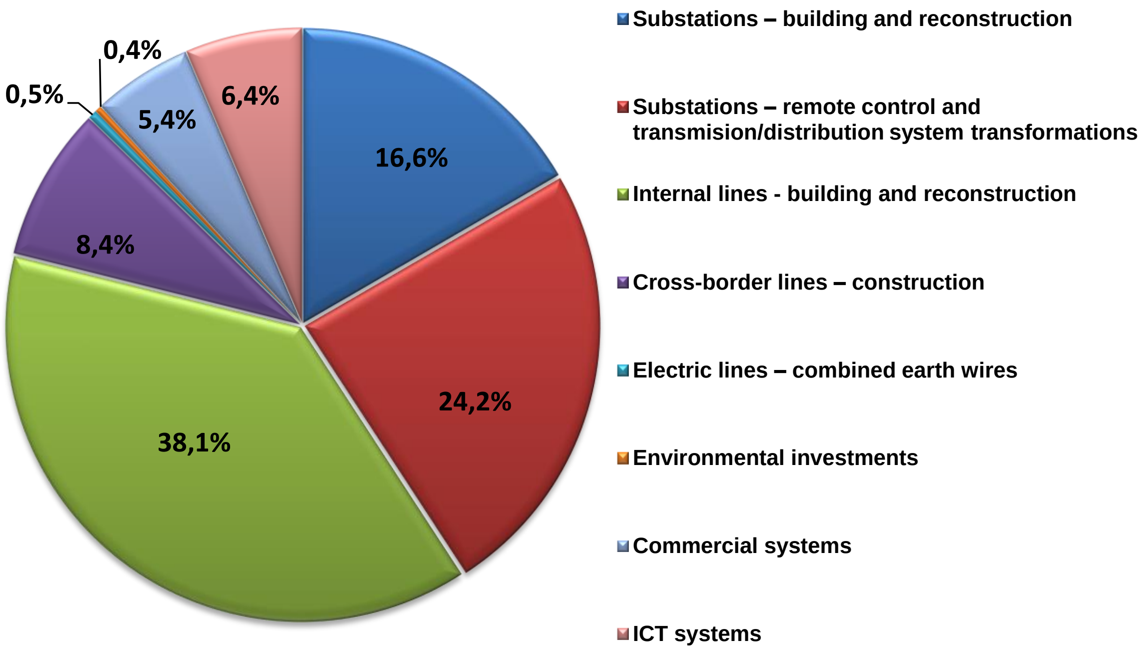
The Ten-Year Network Development Plan prepared to the year 2025 contains effective investment measures to ensure appropriateness of the transmission system, to ensure its safe and reliable operation and to ensure safety of electricity supply. The document also mentions the parts of the transmission system which shall be built and upgraded. Many from the investment projects are verified by the SEPS network calculations for the considered power system development scenarios and variants

[6] http://www.sepsas.sk/seps/RegInvPlan.asp?kod=550

[7] The set of investment items was completed and commissioned at the end of the year 2013, however, with regard to the process of the 2014 RgIP ENTSO-E preparation it is still included in this ENTSO-E document.

for the time horizon of the year 2025 via mathematical models. These models cover the Slovak power system or ENTSO-E, in relation to various variants of development of the announced new electricity generating units and variants of the electricity consumption development in SR. The remaining investment projects are included in the ten-year investment plan due to expiry of the projected life of facilities, unfavourable results of diagnostic tests, changes of the respective legislation and technical standards due to fast technological progress etc.

SEPS intends to invest approx. EUR 668 mil. via investment projects mentioned in the Ten-Year Investment Plan. That means approx. EUR 66,8 mil. annual average to ensure inevitable increase of the existing capacities and inevitable upgrade of the main parts of the transmission system. The distribution of SEPS investments in individual categories pursuant to the Ten-Year Investment Plan is illustrated in the following graph.



Graph No. 22 Distribution of SEPS Investment Needs by 2025

4.1 The Transmission System Development and Requirements of Transmission System Users

The transmission system development and the related need of planning individual investments is inter alia induced by the requirements of both existing and potential new transmission system users.

The requirements of new Users of the distribution system operator type, direct electricity consumer or producer leading to the need of transmission system development are usually submitted “directly” via an application for connection or via the request for the SEPS opinion on issuance of the certificate for construction of energy facility pursuant to Act No. 251/2012 Coll. (hereinafter referred to as “Requests for TSO Opinion”). These requirements shall be incorporated in the next elaborated SEPS Development Programme for the purposes of complex assessment.

The need to extend transmission system, however, may also stem from the conclusions of the SEPS Development Programme since pursuant to Act No. 251/2012 Coll. and the SEPS Network Code (Document A, Chapter A3) all transmission system users shall be obliged to submit inputs to process the SEPS Development Programme.

As for the requirements of the existing DSOs, these have an option to ask SEPS to strengthen the transmission system directly, in compliance with the document “Operation Rules of the Transmission System Operator Slovenská elektrizačná prenosová sústava, a. s.” Electricity consumers and producers connected to transmission system intending to change the technical parameters of their facilities due to which the adjustment on the transmission system part is required shall follow the Operation Rules as well.

The principal decision of TSO in terms of the future development of transmission system includes building of new facilities only on the 400 kV voltage level since the 220 kV voltage level especially due to decommissioning of the nuclear power plant in Jaslovské Bohunice V1 (880 MW) gradually loses its importance and thus causing reduction of importance of further investments in this system. Another factor is that 220 kV transmission system was built already from 50's of 20th century and despite the fact that due to SEPS maintenance programme this part of transmission system is operated nowadays still in the satisfactory condition, it is gradually and naturally reaching the end of its lifetime. This cannot be prevented even by maintenance interventions by SEPS.

Based on several analyses by SEPS, it is proved it would be inefficient to automatically replace existing 220 kV facilities after reaching their lifetime by similar new facilities again on the same voltage level. In the Slovak transmission system there currently continues a process of gradual complex and managed attenuation and replacement of 220 kV transmission facilities by the 400 kV facilities, where appropriate. It is a long-term strategic goal of SEPS. At present, a time schedule of this gradual controlled attenuation of 220 kV transmission system is being processed in a way so as to prevent the negative operational or economic impact on the SEPS activity.

The following tables document an overview of the assumed decommissioning of the operated 220 kV lines and 220 kV switchyards in individual substations.

Table No. 10 Overview of Decommissioning of 220 kV Lines

Line	Assumed Year of Decommissioning
V071, V072, V073 and V284	2016
V273 and V274	2021
V280 and V283	2023
V270, V271 and V275	2025

Note: *Decommissioning of V073 and V284 in the year 2016 is conditioned by securing reserve supply of EBO V2 only from the 110 kV ZSD system*

Table No. 11 Overview of Decommissioning of 220 kV Substations

Name of substation with respective 220 kV switchyard	Assumed Year of Decommissioning
Lemešany	2021
Bystričany	2022
Križovany, Senica	2023
Považská Bystrica	2025

Full termination of the 220 kV transmission system operation is expected in this way but for several exceptions approx. in 2025. However, not in all cases, automatic direct replacement of the decommissioned 220 kV facility by the similar 400 kV facility occurs. The thing is that if importance of such replacement is not proved, the use of some 220 kV facilities on the distribution system (DS) level may be considered.

It shall be emphasized here, this controlled attenuation of 220 kV transmission system is carried out in close coordination with all concerned transmission system users. SEPS arranges regular discussions of this topic with the concerned entities in the form of joint bilateral meetings. There is a discussion with SE concerning transition of units No. 5 and 6 EVO 1 to 400 kV voltage level what enables gradual decommissioning of the entire east part of transmission system on the 220 kV voltage level up to substation Sučany. Potential transition of substation Senica to the 400 kV level is described below. The future of the 220 kV part of the system in the Central Slovakia region where Stredoslovenská energetika – Distribúcia, a. s., (hereinafter referred to as "SSE-D") operates is subject to the joint technical-economic study "Supply of Node Areas of Považská Bystrica, Varín, Sučany, Liptovská Mara and the Consumer OFZ, a.s., After 2025" (hereinafter referred to as "Study"). Within the Study process, the time-demanding phase of entry and approval of input data and assumptions by both parties was successfully completed with recording all substantiated variants and possible future uncertainties which shall be analyzed in detail in further phases of the Study. At the time of processing of this TYNDP, the Study is in phase of evaluation of preliminary calculations and results by every party independently.

Subsequently, the synthesis and approval of the results by both parties will be carried out. The official results and conclusions of the Study are expected no later than at the end of the year 2015. The subject-matter of the Study does not cover substation Bystričany the transition of which to the 400 kV voltage level is reasoned below. SEPS assumes that by 2025, only V281/282 lines and the T401, 400/220 kV transformer in Sučany (supplying OFZ, a. s.) are in operation in the Slovak power system on the 220 kV voltage level as the last ones. The future of connection of direct consumers DUSLO, a. s., and OFZ, a. s. to transmission system is subject to the repeated negotiations. In both cases it is jointly being searched for mutually satisfying solution for maintaining supply for these consumers from transmission system.

The controlled attenuation of 220 kV transmission system can also be included in the SEPS measure related to ensuring management of energy efficiency of the transmission system. In this way, SEPS decommissions old and often energy-demanding 220 kV facilities and replaces them by up-to-date 400 kV facilities. It is cost-effective measure to improve energy efficiency and reaching savings of SEPS own electricity infrastructure. Moreover, such investments include e.g. replacement of transformers since current transformers comply with much stricter criteria as for amount of losses at electricity transformation. This can also be stated in regard to new types of wires of transmission lines. When increase of the transmission capability of lines is recommended, it is possible to manage it also without the need to break down the whole line and build new one (including towers) over-dimensioned to higher transmission capacity. It is because of new types of wires meet the condition of higher transmission capability at use of original towers. Energy efficiency of the transmission is being improved by every implemented investment action of SEPS.

4.2 Internal Investment Projects

Regarding the physical age and the current technical state of the 220 kV system facilities in the central part of the Slovak transmission system (especially in the area of the Bystričany substation and also in the very node of Bystričany), and in compliance with gradual decommissioning of 220 kV system also in this part of transmission system, a set of investment items **"Transformation of 400/110 kV Bystričany"** is being implemented. This set of investment items shall be co-financed from the BIDSF supporting fund administered by the European Bank for Reconstruction and Development which is intended for elimination of consequences of EBO V1 nuclear power plant premature decommissioning. This set of investment items includes the following investments:

- 400 kV switchyard Bystričany,
- 2x400 kV line Horná Ždaňa – Oslany area,
- 400 kV switchyard Horná Ždaňa – extension,
- 2x400 kV line Bystričany – Križovany,
- 400 kV switchyard Križovany – extension,
- Transformation 400/110 kV Bystričany – (T401 and T402).

Implementation of this project is specific due to the fact that one circuit of the 2x400 kV line Križovany – Bystričany shall be temporarily operated as the existing 220 kV line Križovany – Bystričany while for this new line the corridor of the original 220 kV line V274 Križovany – Bystričany will be used. The second circuit shall be operated as new 400 kV line Križovany – Bystričany. This new 400 kV line shall be interrupted in the vicinity of village Oslany and connected to 400 kV switchyard Horná Ždaňa. The mentioned condition is a temporary condition before the decommissioning of the transformation 220/110 kV in Bystričany with regard to the time-limited drawdown of finances from the BIDSF fund for this set of investment items.

To ensure the increased safety of power evacuation from two new units No. 3 and No. 4 of the Mochovce nuclear power plant as well as to increase the total safety and reliability of the transmission system operation in its western part, the implementation of set of investment items **"2x400 kV line Gabčíkovo - Veľký Ďur"** is being realised. Concurrently, the assumptions for further intentions of development in this part of transmission system in the future are being created. This set of investment items consists of the following investments:

- 400 kV Veľký Ďur switching station – extension,
- 400 kV Gabčíkovo switching station,
- 2x400 kV line switching station Gabčíkovo - Veľký Ďur.

In the western part of transmission system, in cooperation with ZSD, one of the Slovak DSOs, SEPS looks for optimal solution how to ensure the long-term safe supply of the node area Senica from transmission system after installation of the second transformer in substation Stupava and substation

Bošáca. For this purpose the joint technical-economic study aimed at comparison and evaluation of possible ways of supply of electricity end consumers in node area Senica was elaborated. Aim of the study was to search for the optimum technical solution on the level of the transmission and distribution system with emphasis on ensuring safe and reliable electricity supply and on minimizing total investment and operating costs of SEPS and ZSD. The most advantageous solution for this node area from both technical and economic point of view is its transition from the 220 kV voltage level to 400 kV in substation Senica. It means decommissioning of the existing 220 kV switchyard and 220/110 kV transformation and construction of new 400 kV switchyard and 400/110 kV transformation. This investment plan shall be implemented as a set of investment items named **“Transformation 400/110 kV Senica“** which shall include two investment projects:

- 400/110 kV substation Senica,
- Looping of existing 400 kV line V424 to substation Senica.

In the course of the year 2015, in cooperation with SSE-D, another DSO in Slovakia, the technical-economic Study is being processed (see Chapter 4.1). The Study shall be a relevant document for deciding on further necessary investment development in the north-west and north area of the transmission and distribution system. As for location of Považská Bystrica, if confirmed by the Study, construction of new transformation 400/110 kV in a new location can be considered. It is a set of investment items of SEPS **"400/110 kV transformation in Považská Bystrica"** consisting of the investment item of the 400/110 kV transformation and looping the line V495 (Bošáca - Varín) into it, eventually with other new 400 kV lines which can be connected to this new substation. The existing 110 kV switchyard owned by SSE-D would remain in the original location. Prior to the implementation, however, an agreement on joint proceeding in this matter between SEPS and SSE-D shall be concluded.

In substation Sučany, SEPS considers installation of the second transformer T402, 400/110 kV which shall increase safety of supply for OFZ, a. s., and SSE-D from transmission system at the times of the planned maintenance of the V271 line or the T401, 400/220 kV transformer, as well as at the times of unplanned failure of these two elements. The way of connection the T402 transformer into the power system as well as installed capacity of it shall be specified after completion of the feasibility study of this project by SEPS.

One of the SEPS projects in 2014 TYNDP is a set of investment items **"2x400 kV line Veľké Kapušany - Voľa - Lemešany"** which shall continue in the already implemented set of investment items "400/110 kV transformation in Voľa“. The implementation of the set of investment items **"2x400 kV line Veľké Kapušany - Voľa - Lemešany"** is – in contrast to 2014 ENTSO-E TYNDP – expected after the year 2025. The need of doubling of this 400 kV interconnection has not been proved, even based on the network calculations, as inevitable and it could be considered potentially only after doubling of the Veľké Kapušany – Mukačevo (UA) cross-border line or after building a new double cross-border line Veľké Kapušany – Kisvárda (HU). Doubling of only the line in the route Lemešany – Voľa – Veľké Kapušany would be inefficient regarding the bottleneck of the SK – UA cross-border transmission profile. In 2014 ENTSO-E RgIP, this project is incorporated in the time horizon of the year 2018, however, during next update of RgIP ENTSO-E in 2016 it shall be shifted beyond the horizon of the year 2025.

Within this TYNDP, there is an installation of new or replacement of the existing combined earth wires including optical underground cables planned on the selected lines of the transmission system. In order to ensure continuous trouble-free transmission system operation it is necessary to implement the replacement of the original conductors together with the total new insulation of the line. Concurrently, these measures result also in increase of the transmission capacity of the respective lines.

By the end of the year 2025, replacement of physically obsolete transformers is being assumed in the following substations (the list below). They are transformers with which it is assumed their technical condition after their expected life expiry shall not allow their further safe and reliable operation:

- Replacement of T401 in substation Moldava,
- Replacement of T401 in substation Stupava,
- Replacement of T404 and T402 in substation Podunajské Biskupice,
- Replacement of T401 and T402 in substation Spišská Nová Ves,
- Replacement of T401 in substation Varín,
- Replacement of T401 and T402 in substation Liptovská Mara,
- Replacement of T401 and T403 in substation Horná Ždaňa.

Further important part of internal investment projects is a remote control of substations. By 2025, the implementation of the remote control in the following substations is considered:

- Podunajské Biskupice,
- Spišská Nová Ves,
- Gabčíkovo,
- Bystričany,
- Senica,
- Varín.

After 2025, all substations owned by SEPS shall be operated in the mode of remote control, but for substations Liptovská Mara, Považská Bystrica, and Sučany. The future construction of new substation Považská Bystrica shall be decided upon in further updates of SEPS TYNDP based on the aforementioned joint Study of SEPS and SSE-D.

Apart from the mentioned investment projects, the Ten-Year Investment Plan, , as a part of this TYNDP, includes also innovations and renewal of inevitable supporting systems such as commercial systems and information-communication systems. The requirements for innovation and renewal of those facilities result from the continuously growing requirements to increase the volume for the provided data, reduction of time for their collection, processing and evaluation as well as from fast development of technologies in this area with fast obsolescence of the used technology as a result. Moreover, SEPS systemically invests in greening of its operations and changes facilities of environmental management in individual substations on regular basis.

4.3 Cross-Border Investment Projects

Building of new cross-border lines is conditioned by close cooperation of neighbouring TSOs which is, in many cases, derived from individual national energy policies, national political decisions and from the existing condition, and the planned internal development of the power systems in the concerned countries.

4.3.1 The Slovak – Hungarian Cross-Border Profile

The operators of the Slovak and Hungarian transmission systems have been negotiating the construction of the following lines for long time already:

- 2x400 kV line Gabčíkovo – Gönyű (HU) – Veľký Ďur,
- 2x400 kV line Rimavská Sobota – Sajóivánka (HU) on the Slovak side with equipped with both circuits connected to a single field in Rimavská Sobota substation

As for the first from the mentioned projects, originally, construction of the 400 kV double line from Gabčíkovo was considered. However, after recent joint negotiations between SEPS and the Hungarian TSO (hereinafter referred to as "MAVIR"), the variant covering connection of one circuit of the prepared SEPS project 2x400 kV Gabčíkovo – Veľký Ďur line to substation Gönyű (HU) seems to be the best solution from the technical and economic point of view. This solution shall prevent the risk of further delay in implementation of this interconnection due to environmental reasons on the Hungarian side since the route survey of the double line from Gabčíkovo crossed the environmentally protected areas. This change shall be considered also in the next possible update of the ENTSO-E TYNDP as well as in the European List of PCI Projects.

Building of the cross-border line Rimavská Sobota – Sajóivánka (HU) shall mean contribution for both Slovak and Hungarian TSOs where with MAVIR the construction of this line shall result in increase of supply reliability of 400 kV substation Sajóivánka (HU). In case of SEPS after commissioning new units No. 3 and No. 4 of the Mochovce nuclear power plant this interconnection shall contribute to the increase of the transmission system operational safety and reliability in the concerned Slovak – Hungarian profile and in certain operational conditions it may help relieve load from the SK - UA cross-border profile as well.

Both aforementioned investment projects between SK and HU are included in the European List of PCI Projects. Preparation of these projects proceeds in compliance with the agreements between SEPS and MAVIR[8]. More detail information on PCI projects of SEPS shall be further published pursuant to the Regulation of the European Parliament and Council No. 347/2013, Art. 9.

4.3.2 The Slovak – Polish Cross-Border Profile

At present, no joint project of mutual interconnection of transmission systems of both countries is planned. The project covering the cross-border interconnection of Slovakia and Poland via the 2x400 kV line Varín – Byczyna (PL) is still in the phase of potential investment plan behind the time horizon of this TYNDP 2025. This future possible investment project, however, has not been definitely confirmed on the bilateral level between SEPS and Polish TSO.

4.3.3 The Slovak – Austrian Cross-Border Profile

Since the need of the cross-border interconnection between SK and AT is not confirmed neither by network calculations, nor other analyses, SEPS does not consider erection of any international lines between SK nor AT till the end of 2025.

4.3.4 The Slovak – Czech Cross-Border Profile

Regarding sufficient existing transmission capacity of the Slovak – Czech profile and regarding the expected needs of electricity transmission via this profile, construction of any new international lines between SR and CZ is considered by the end of 2025. The project of doubling the existing line 1x400 kV Varín – Nošovice is in the phase of the potential investment decision beyond the time horizon of this TYNDP. Until 2025, however, a mild reduction in capacity on this cross-border profile occurs due to decommissioning of the 220 kV system in the west and north-west part of the Slovak transmission system (220 kV cross-border lines V283 Senica – Sokolnice (CZ) and V270 Považská Bystrica – Lískovec (CZ)). There are, however, preliminary agreements between SEPS and the Czech TSO (on the level of zoning and planning documentation) upon the fact the construction of the 400 kV interconnection from Czech substation Lískovec to substation Považská Bystrica can be taken into consideration.

4.3.5 The Slovak – Ukrainian Cross-Border Profile

At present, SR and UA are interconnected by one single 400 kV line Veľké Kapušany – Mukachevo (UA), the operation of which is considered up to approx. 2030. At this time horizon its reconstruction or doubling is cinsidered on the SR side. It is a significant cross-border line since it is one of just a few lines interconnecting the ENTSO-E power system with the selected part of the Ukrainian power system (so called Burstyn Island) which synchronously cooperates with the European transmission system. The future inevitable solution is replacement of the existing line Veľké Kapušany – Mukachevo (UA) by a new double circuit 400 kV line. But since the binding opinion of the Ukrainian representatives on the common strategic approach towards development of this area has not been acquired yet, no construction of new international lines between SR and UA is considered by the end of 2025.

4.4 Investments in the Transmission System for the period 2016 to 2025

The investment projects to create new capacities or upgrade of the Slovak transmission system are documented in the table below and the principal national and cross-border investment projects are illustrated in the following picture.

[8] Further PCI project by SEPS from the 2013 EU PCI List progresses successfully – 2x400 kV line Gabčíkovo – Veľký Ďur which is currently under construction

Table No. 12 Overview of Implementation of Investment in the Transmission System for the Period 2016 to 2025

Order No.	Investment projects	Start and end of investment projects		Assumed costs [EUR mil.]	Incurred costs by 31.12.2014 [EUR mil.]
Substations - building and reconstruction					
1	Substation 400 kV Gabčíkovo – new switching substation [code RGI: 214] [code TYNDP: 48.214] [code PCI: 3.16]	2008	2016	28.761	2.786
2	Adjustments in related facilities in switching substation Gabčíkovo and Veľký Ďur [code RGI: 214] [code TYNDP: 48.214] [code PCI: 3.16]	2018	2018	0.149	
3	Switchyard Bystričany – new 400 kV switchyard [code RGI: 297]	2014	2019	14.384	0.016
4	Switchyard Horná Ždaňa – extension of existing 400kV switchyard [code RGI: 845]	2014	2019	6.602	0.016
5	Switchyard Križovany – extension of existing 400kV switchyard [code RGI: 845]	2015	2019	7.165	
6	Switchyard Rimavská Sobota – extension of existing 400kV switchyard code RGI: 695] [code TYNDP: 48.214] [code PCI: 3.17]	2017	2018	4.060	
7	Automatic Decay in substation Veľký Ďur	2016	2016	0.250	
8	Replacement of bus bar wires in substation Stupava	2014	2017	0.800	0.010
9	Replacement of bus bar wires in substation Veľký Ďur	2016	2016	1.959	
10	Replacement of bus bar wires in substation Bošáca	2015	2016	1.175	
11	Replacement of bus bar wires in substation Levice	2016	2017	1.463	
12	Replacement of 400 kV disconnectors substation Sučany	2013	2016	1.900	
13	Reconstruction of 220kV switchyard in substation Bystričany	2016	2016	1.100	
14	Reconstruction of 220kV switchyard in substation Sučany	2016	2017	4.600	
15	Innovation of ICS facilities for control of 220 kV switchyard in substation Lemešany	2019	2019	0.500	
16	Innovation of ICS facilities for control of 110 kV switchyard in substation Horná Ždaňa	2016	2017	1.500	
17	Innovation of ICS switchboard in 400 kV substation Lemešany	2017	2017	0.550	
18	Innovation of ICS in substation Bošáca	2017	2018	1.380	
19	Innovation of ICS switchboard in substation Košice	2018	2018	0.420	
20	Innovation of ICS switchboard in substation Veľké Kapušany	2018	2018	0.480	
21	Innovation of ICS switchboard in substation Horná Ždaňa 400 kV	2019	2019	0.480	
22	Innovation of ICS in substation Križovany 400 kV	2019	2020	2.550	
23	Innovation of ICS switchboard in substation Veľký Ďur	2021	2021	0.550	
24	Innovation of ICS switchboard in substation Levice	2021	2021	0.430	
25	Innovation of ICS – switchboard in substation Medzibrod	2022	2022	0.420	
26	Innovation of ICS switchboard in substation Voľa	2022	2022	0.480	
27	Innovation of ICS in substation Veľké Kapušany	2024	2024	1.180	
28	Innovation of ICS in substation Lemešany at 400 kV voltage level	2023	2024	1.750	
29	Innovation of ICS in substation Moldava	2024	2025	1.180	
30	Innovation of ICS in substation Horná Ždaňa	2025	2026	1.180	
31	Refurbishment of secondary technology in substation Sučany	2017	2017	1.080	
32	Refurbishment of secondary technology in substation Lemešany 400 kV	2017	2017	0.580	
33	Refurbishment of secondary technology in substation Lemešany 400 kV	2019	2019	0.180	
34	Refurbishment of secondary technology in substation Križovany 400 kV	2018	2018	0.350	
35	Refurbishment of secondary technology in substation Horná Ždaňa 400 kV	2019	2019	0.390	
36	Refurbishment of secondary technology in substation Horná Ždaňa 110 kV	2020	2020	0.360	

investments to be implemented in the following three years

investments already decided upon by SEPS

other investments related to the transmission system upgrade

[code PCI: x.xx]- PCI projects [code RGI: x.xx] - regional projects [code TYNDP: xx.xxx] - TYNDP projects

Order No.	Investment projects	Beginning and end of investment projects		Assumed costs [EUR mil.]	Incurred costs by 31.12.2014 [EUR mil.]
Substations - construction and reconstruction					
37	Innovation of Technological information system in substations	2020	2020	0.193	
38	Refurbishment of secondary technology in substation Liptovská Mara	2020	2020	0.140	
39	Refurbishment of secondary technology in substation Križovany 400 kV	2021	2021	2.100	
40	Refurbishment of secondary technology in substation Stupava	2021	2021	0.360	
41	Refurbishment of secondary technology in substation Horná Ždaňa 110 kV	2024	2024	1.350	
42	Refurbishment of secondary technology in substation Lemešany 400 kV	2024	2024	1.080	
43	Refurbishment of secondary technology in substation Varín	2024	2024	0.150	
44	Refurbishment of secondary technology in substation Veľké Kapušany	2024	2024	1.350	
45	Refurbishment of secondary technology in substation Moldava	2024	2025	0.820	
46	Refurbishment of secondary technology in substation Rimavská Sobota	2025	2025	0.140	
47	Refurbishment of secondary technology in substation Spišská Nová Ves	2025	2025	0.140	
48	Refurbishment of secondary technology in substation Levice	2025	2025	0.150	
49	Transfer of compensation reactors from substation Sučany to substation Voľa for T402 and connection of new compensation reactors to T401 Voľa	2014	2017	1.374	0.069
50	Increase of the compensation output in ST Sučany	2016	2018	1.090	
51	Automatic Decay in substation Veľký Ďur	2016	2016	0.250	
52	Replacement of differential protection the bus bar in 400 kV switchyard Lemešany	2015	2016	0.158	
53	Refurbishment of secondary technology in substation Bošáca	2017	2018	1.300	
54	New reserve transformer stand in substation Varín	2015	2016	0.400	
55	400 kV switchyard Senica - transition from 220 kV voltage level to 400 kV voltage level	2017	2021	12.439	
56	400 kV switchyard Veľký Ďur – extension	2024	2026	4.249	
57	400 kV switchyard Levice – extension	2024	2026	4.648	
Substations - remote control and transformation TS/DS					
58	Remote control mode and replacement of transformer T404 in substation Podunajské Biskupice	2004	2019	37.465	0.882
59	Remote control mode and replacement of transformers T401 and T402 in substation Spišská Nová Ves	2006	2019	28.207	0.778
60	Remote control mode in substation Sučany	2025	2029	9.005	
61	Remote control mode and replacement of transformers T401 and T402 in substation Liptovská Mara	2021	2026	14.340	
62	Remote control mode, replacement of transformer T401 and new compensation reactors in substation Varín	2012	2022	17.385	0.069
63	Replacement of transformer T401 and new household transformer in substation Moldava	2014	2017	9.152	0.171
64	Replacement of transformer T402 in substation Podunajské Biskupice	2017	2020	5.311	
65	Replacement of transformers T401, T403 and household transformer in substation Horná Ždaňa	2020	2023	10.622	
66	Voltage transformation 400/110 kV in substation Bystričany – T401	2016	2019	13.200	
67	Voltage transformation 400/110 kV in substation Bystričany – T402	2017	2021	11.500	
68	Replacement of transformer T401 in substation Stupava	2020	2022	5.311	
69	Transformer T402 400/110 kV in substation Sučany	2019	2021	9.500	
70	Voltage transformation 400/110 kV in substation Senica	2018	2021	5.311	

investments to be implemented in the following three years

investments already approved by SEPS

other investments related to the transmission system upgrade

[code PCI: x.xx] - PCI projects [code RgI: x.xx] - regional projects [code TYNDP: xx.xxx] - TYNDP projects

Order No.	Investment projects	Beginning and end of investment projects		Assumed costs [EUR mil.]	Incurred costs by 31.12.2014 [EUR mil.]
Internal electric lines - building and reconstruction					
71	Gabčíkovo - Veľký Ďur – new 400 kV double circuit line [**code RGI: 298**]	2007	2016	96.302	23.654
72	Bystričany – Križovany – new 400 kV double circuit line [**code RGI: 845**]	2012	2019	74.140	1.627
73	Horná Ždaňa – Oslany – new 400 kV double circuit line [**code RGI: 845**]	2012	2019	34.060	0.242
Internal transmission lines - building and reconstruction					
74	Levice - Rimavská Sobota – transmission towers reconstruction	2016	2016	3.000	
75	Rimavská Sobota – Moldava – insulators replacement	2019	2020	5.000	
76	Križovany - Veľký Ďur – insulators and conductors replacement	2019	2021	9.200	
77	Moldava - Veľké Kapušany – insulators and conductors replacement	2021	2022	5.000	
78	Križovany – Sokolnice – insulators and conductors replacement	2020	2022	10.200	
79	Stupava – Podunajské Biskupice – insulators and conductors replacement	2017	2017	1.300	
80	Podunajské Biskupice – VE Gabčíkovo – insulators and conductors replacement	2022	2023	6.000	
81	VE Gabčíkovo – Györ – insulators and conductors replacement	2021	2023	1.700	
82	Križovany – EBO V2 – insulators replacement	2021	2022	1.000	
83	EBO V2 - Bošáca – insulators replacement	2021	2022	3.000	
84	Križovany - Bošáca – insulators replacement	2021	2023	3.200	
85	EVO 2 – Veľké Kapušany – insulators and conductors replacement	2020	2020	0.700	
86	EVO 2 – Veľké Kapušany – insulators and conductors replacement	2020	2020	0.700	
87	Spišská Nová Ves – Lemešany – reconstruction	2022	2024	36.000	
88	Veľký Ďur – Levice – insulators and conductors replacement	2023	2023	0.200	
89	Liptovská Mara – Spišská Nová Ves – reconstruction	2023	2025	32.000	
90	Medzibrod – Liptovská Mara – insulators and conductors replacement	2024	2025	4.500	
91	Connection of the line V424 switchyard 400 kV in substation Senica	2018	2021	6.910	
92	Veľký Ďur – Levice – new 400 kV single circuit line	2025	2026	9.945	
Cross-border transmission lines – building					
93	Gabčíkovo - Gönyű (HU) - Veľký Ďur (the part Veľký Meder – state border with HU) – new 400 kV double circuit line [**code RGI: 214**] [**code TYNDP: 48.214**] [**code PCI: 3.16**]	2015	2018	22.344	
94	Rimavská Sobota – Sajóivánka (HU) (the part up to the state border with HU) – new 400 kV double circuit line [code RGI: **495**] [**code TYNDP: 48.495**] [**code PCI: 3.17**]	2015	2018	33.963	
Electric lines – combined earth wires					
95	New combined earth wire/optical cable between substation Moldava and Veľké Kapušany	2015	2016	3.100	
96	Optical interconnection between substation Varín and SED Žilina	2014	2016	0.395	0.055
Environmental Investments					
97	Substation Bošáca - wastewater treatment plant	2018	2018	0.310	
98	Substation Veľké Kapušany - wastewater treatment plant	2017	2017	0.390	
99	Substation Lemešany - wastewater treatment plant	2018	2018	0.400	
100	Substation Liptovská Mara - wastewater treatment plant	2021	2021	0.420	
101	Substation Križovany - wastewater treatment plant	2021	2021	0.420	

(blue) investments to be implemented in the following three years

(light green) investments already approved upon by SEPS

(magenta) other investments related to the transmission system upgrade

[code PCI: x.xx] - PCI projects [code RgI: x.xx] - regional projects [code TYNDP: xx.xxx] - TYNDP projects

Order No.	Investment projects	Beginning and end of investment projects		Assumed costs [EUR mil.]	Incurred costs by 31.12.2014 [EUR mil.]
102	Substation Moldava - wastewater treatment plant	2022	2022	0.420	
Commercial systems					
103	Innovation of the ADS system	2015	2017	5.900	
104	Innovation of the information billing system	2017	2018	1.500	
Commercial systems					
105	Modification of ADC System according to the requirements of legislation and users	2018	2020	4.000	
106	Innovation of the quality measurement system	2018	2020	2.600	
107	Innovation of measurement sets	2018	2020	2.000	
108	Upgrade of the DaE system	2013	2020	4.240	1.496
109	Upgrade of the DaE system	2020	2021	8.000	
110	Upgrade of the DaE system	2022	2030	2.300	
111	Innovation of the ADC system	2021	2023	6.000	
112	Modification ADC System according to the requirements of legislation and users	2023	2024	4.000	
113	Innovation of the information billing system	2023	2024	1.500	
ICT systems					
114	Upgrade of ICS in SEPS Control Centre	2012	2017	17.867	0.125
115	Upgrade of load-bearing telecommunication network of SDH	2016	2017	1.700	
116	Upgrade of F-MUX facilities	2017	2017	1.800	
117	Implementation of the new security system	2015	2017	1.600	
118	Upgrade of existing security systems	2015	2017	0.800	
119	New software for data exchange on the system deviation of SEPS and ČEPS, a. s.	2019	2021	0.524	
120	Innovation of ICS in SEPS Control Centre	2023	2025	20.000	
TOTAL Investment Projects				795.080	31.995

investments to be implemented in the following three years

investments already approved by SEPS

other investments related to the transmission system upgrade

[code PCI: x.xx] - PCI projects [code RgI: x.xx] - regional projects [code TYNDP: xx.xxx] - TYNDP projects

Notes:

1. The abovementioned investment costs are set up by the qualified estimate of the SEPS employees while considering the price level at the time of incorporation of investments in the investment plan, free of inflation impact and eventual change of the technical solution at the time of the investment implementation. In case of further TYNDP processing, the investment costs shall be updated.
2. A list of investments in the transmission system for the period 2016 to 2025 does not consider all SEPS investment needs in the next ten-year horizon, but only the investment projects related to ensuring inevitable increase of the existing transmission capacities and necessary upgrade of the main parts of the Slovak transmission system.

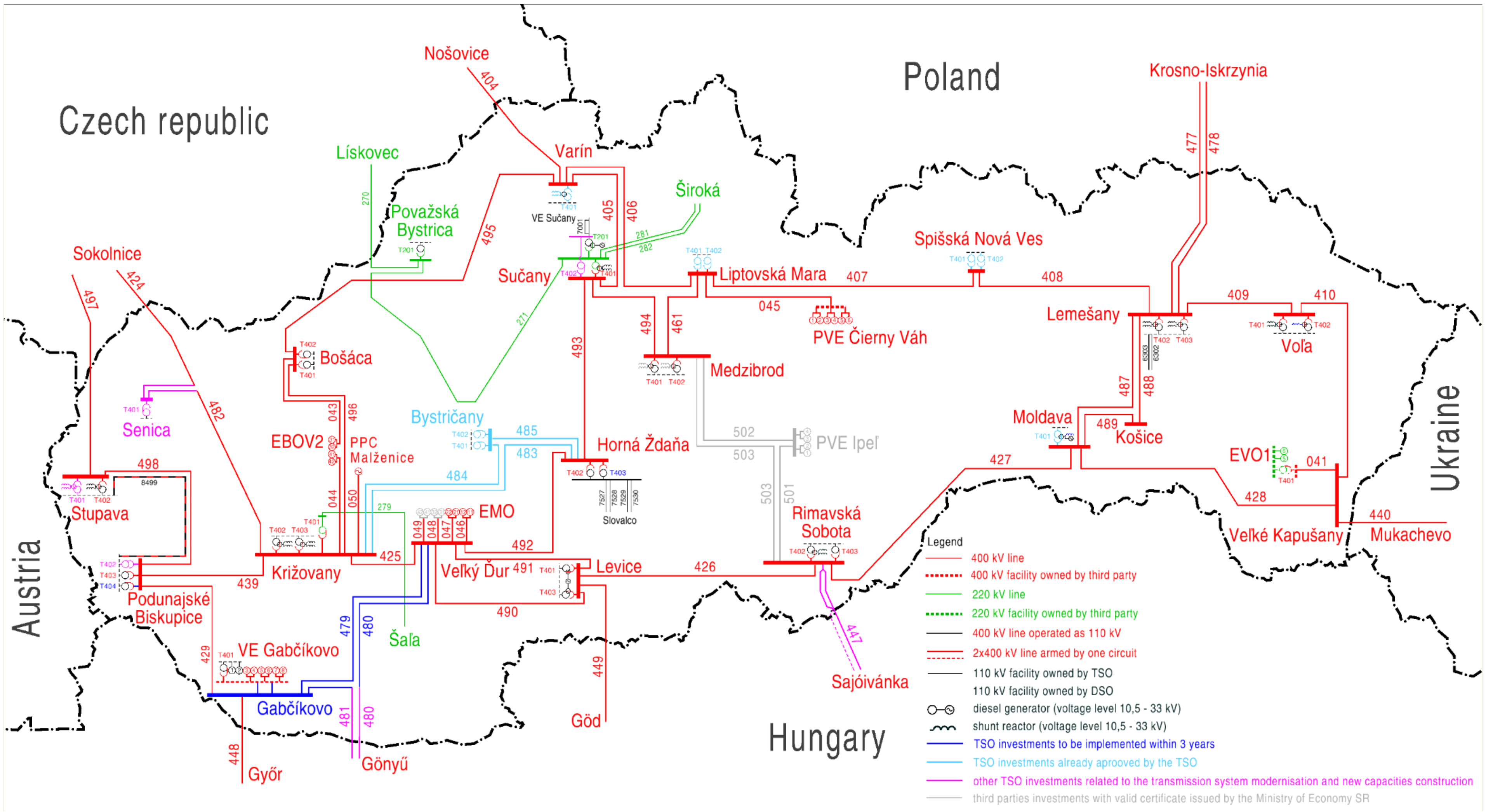


Figure No. 5 Assumed Status of the Slovak Transmission System in 2025

5 Conclusion

SEPS has created and published this 2025 TYNDP under Art. 28, par. 3, subpar. b) of Act No. 251/2012 Coll. At preparation of this document SEPS stemmed from the current and expected future condition of offer and demand for the system capacity, from the assumptions of future electricity production, electricity consumption, and electricity exchanges with other countries while taking the system development plan for the whole European Union and regional investment plans processed by the ENTSO-E association into consideration (in particular the ENTSO-E TYNDP document including the regional investment plan for the CCE region). Moreover, this SEPS TYNDP also stems from the SEPS Development Programme and from the SEPS respective approved investment plans and the approved 2024 TYNDP. All these assumptions and starting points have been described and considered in this 2025 TYNDP document appropriately in terms of the current knowledge and information available to SEPS as the Slovak transmission system operator.

This document includes the main parts of the transmission system which shall be built, or upgraded in the following ten years together with their assumed implementation dates. It includes also all investments in the transmission system related to building new capacities or upgrade of the transmission system the implementation of which was already decided upon by SEPS or which will have to be implemented in the next three years including the implementation dates of these investments.

In terms of perspective of transmission system development and use, one of the SEPS key decision is building new transmission facilities only on the 400 kV voltage level since the system on the 220 kV voltage level due to gradual decommissioning of power plants connected to this voltage level and with regard to its age and worsening technical condition is not reasonable any more. It means that gradually with decommissioning and dismantling of 220 kV transmission system parts these shall not be replaced by similar facilities of the same voltage level but only with 400 kV facilities. And it must be based on thorough consideration it is inevitable in terms of transmission system safety and reliability. This SEPS approach is reflected in 2025 TYNDP as a whole, especially in Chapter 4.

The 2025 TYNDP priorities in the next ten years shall include investment projects which shall serve to ensure:

- replacement of gradually decommissioned parts of the 220 kV transmission system,
- transition of remaining substations from local and remote manipulation mode to remote control mode,
- increase of the transmission capacity of the existing SK-HU transmission profile.

The major SEPS investment projects provided in this 2025 TYNDP are in compliance with the 2014 TYNDP document which is the recent valid and current plan of the system development for the entire European Union. Moreover, a list of investment projects was within confirmation of the main SEPS investment decisions, verified by the network calculations within processing the SEPS Development Programme for the Period 2017 – 2026 with the use of the inputs from the concerned entities within SR sent by 30.11.2014 according to the SEPS Network Code.

6 List of used abbreviations

2025 TYNDP	-	The Ten-Year Network Development Plan for the period 2016-2025
ADC	-	Automated Data Collection
AT		Austria (ISO code)
BIDSF	-	Bohunice International Decommissioning Support Fund (International fund of the European Bank for Reconstruction and Development
CAO	-	Central Allocation Office GmbH
CCE	-	Continental Central East
CCGT	-	Combined cycle gas turbine
CEE	-	Central East Europe
CEW	-	Combined Earth Wire
CZ	-	the Czech Republic (ISO code)
DaE	-	Damas Energy (complex information system for commercial management of the transmission system)
DE	-	Germany (ISO code)
DS	-	Distribution system
DSO		Distribution system operator
EBO	-	Jaslovské Bohunice Nuclear Power Plant
EMO	-	Mochovce Nuclear Power Plant
ENTSO-E	-	European Network of Transmission System Operators for Electricity
ENTSO-E TYNDP	-	ENTSO-E Ten-Year Network Development Plan
ES SR	-	Electricity System of SR
ESt	-	Substation
EU	-	European Union
EVO 1	-	Vojany 1 Power Plant
GDP	-	Gross Domestic Product
HPP	-	Hydroelectric power plant
HU	-	Hungary (ISO code)
ICS	-	Information Control System
MAVIR	-	Hungarian transmission system operator
N		Number of the system elements in basic load
NTC	-	Net Transfer Capacity
OUC	-	Optical Underground Cable
PCI	-	Projects of Common Interest
PL	-	Poland (ISO code)
PQM	-	Power Quality Meter
R	-	Switchyard
RES	-	Renewable Energy Sources
RgIP	-	Regional Investment Plan
RKS	-	Management and control on the station level
RO	-	Romania (ISO code)

SDC	-	System Development Committee
SDH	-	Synchronous digital hierarchy
SE	-	Company "Slovenské elektrárne, a. s."
SEPS	-	Company "Slovenská elektrizačná prenosová sústava, a. s." (TSO)
SK	-	the Slovak Republic (ISO code)
SR	-	the Slovak Republic
SSE-D	-	Company "Stredoslovenská energetika – Distribúcia, a. s." (DSO)
SSt	-	Switching station
T	-	Transformer
TL	-	Shunt reactor
TR	-	Transformer station
TRM	-	Transmission Reliability Margin (safety reserve on the transmission profile)
TSO	-	Transmission system operator
TTC	-	Total Transfer Capacity; total transmission capacity of the profile consisting of NTC and safety margin (TTC = NTC + safety margin)
UA	-	the Ukraine (ISO code)
V	-	Line (ISO code)
ZSD	-	Company "Západoslovenská distribučná, a. s." (DSO)