Slovenská elektrizačná prenosová sústava, a. s.

TEN-YEAR NETWORK DEVELOPMENT PLAN FOR THE PERIOD 2014 - 2023

June 2014

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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"), processes this document, the Ten-Year Network Development Plan for the Period 2014 – 2023 (hereinafter referred to as "TYNDP 2023"), under Art. 28, par. 3, subpar. b) of Act No. 251/2012 Coll. on Power Engineering and on amendment and supplementation of some acts. This paragraph prescribes that every year the TSO 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 the SR (hereinafter referred to as "MoE") and the Regulatory Office for Network Industries (hereinafter referred to as "RONI") always by 30th November of the respective calendar year including the report on fulfilment of the 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.

The transmission system development plan including the development plan of interconnectors for the period of the following ten years, i.e. also this TYNDP 2023 shall pursuant to Art. 29 of Act No. 251/2012 Coll. stem especially from the current and assumed 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 2023 stems also from the SEPS Development Programme and from the SEPS respective approved investment plans.

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 TSO 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 2023 appropriately in terms of the current knowledge and information available to SEPS.

2. Description of the Current Condition of TS SR

The transmission system of the SR (hereinafter "TS SR") is first of all a set of mutually galvanically connected 400kV, 220kV technological facilities and selected 110kV facilities via which the electricity transmission from its producers to individual customers from TS SR, as well as cross-border electricity transmission is carried out. These include the following technological facilities:

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

TS SR, however, includes also respective supportive – secondary facilities enabling electricity transmission and management of the electricity system of the SR. These are e.g. Information Control System (hereinafter referred to as "ICS"), trading measurement systems (electricity measurement for invoicing purposes), protections and automations and telecommunications transmission facilities etc.

There are also users of TS SR directly connected to TS SR trough their electro-energy facilities and these users currently include:

- three distribution system (hereinafter referred to as "DS") operators,
- five electricity consumers,
- three electricity producers.

Moreover, TS SR is synchronously interconnected also with the neighbouring transmission systems:

- five simple interconnections in the direction to the Czech Republic
- one double interconnection in the direction to Poland
- one simple interconnection in the direction to Ukraine
- two simple interconnections in the direction to Hungary

These interconnections allow for synchronous interconnections of ES SR with other countries in Europe associated together with the SEPS in the ENTSO-E association.

Topology of TS SR, i.e. the diagram of mutual interconnection of the main technological facilities of TS SR including interconnections in the direction to neighbouring transmission systems as at the publishing date of this TYNDP 2023, is demonstrated in Fig. No. 1.

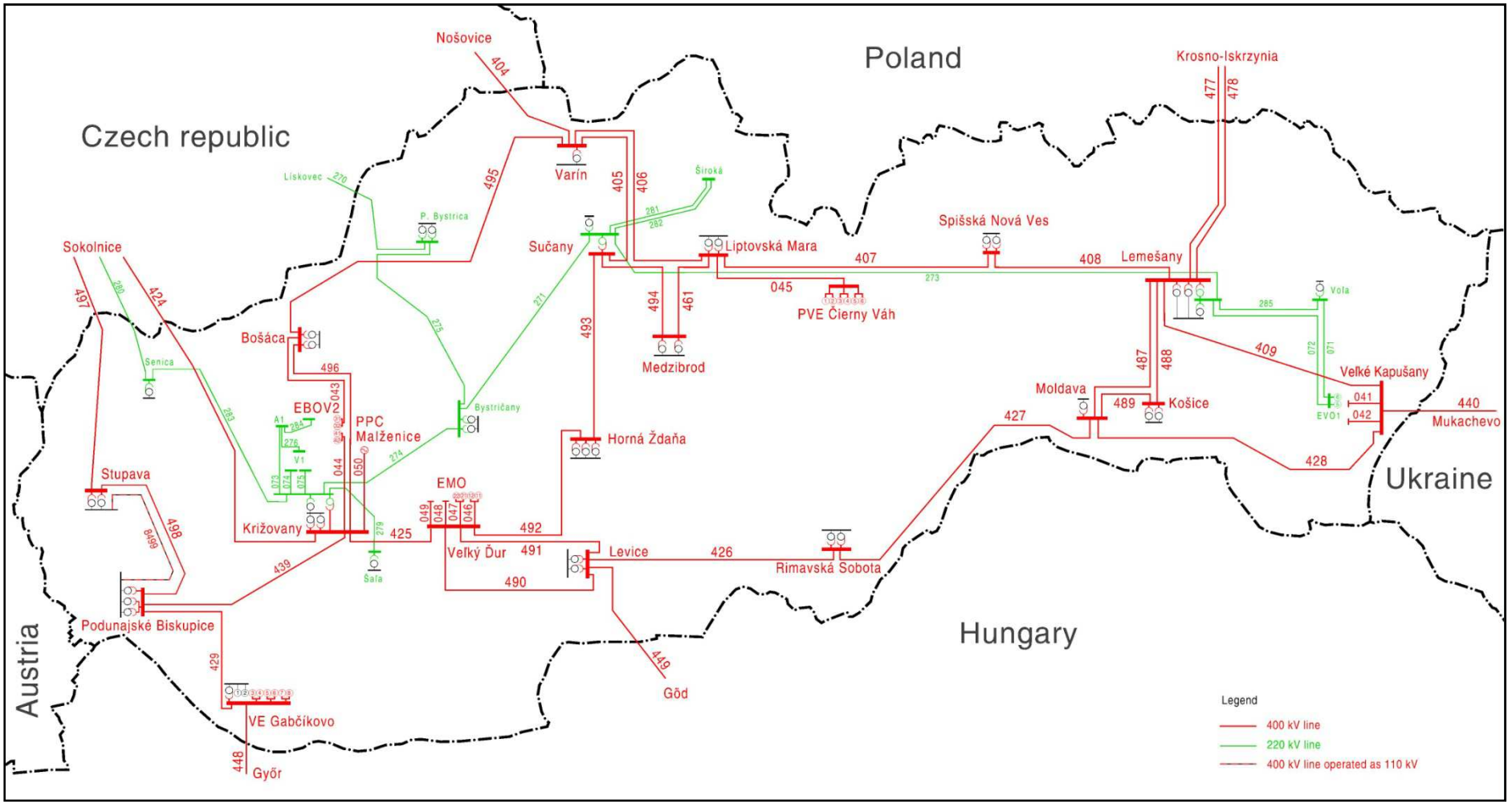


Fig. 1 Topology of TS SR as at the Publishing Date of TYNDP 2023

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

2.1.1 Substations

At present, the TS SR disposes of twenty-one substations (hereinafter referred to as “ST”) of which:

- three ST include 400kV and 220kV switching yard including TS/TS and TS/DS transformations
- eleven ST include 400kV switching yard including TS/DS transformation
- four ST include 220kV switching yard including TS/DS transformation
- three ST include 400kV switching yard without TS/DS transformation

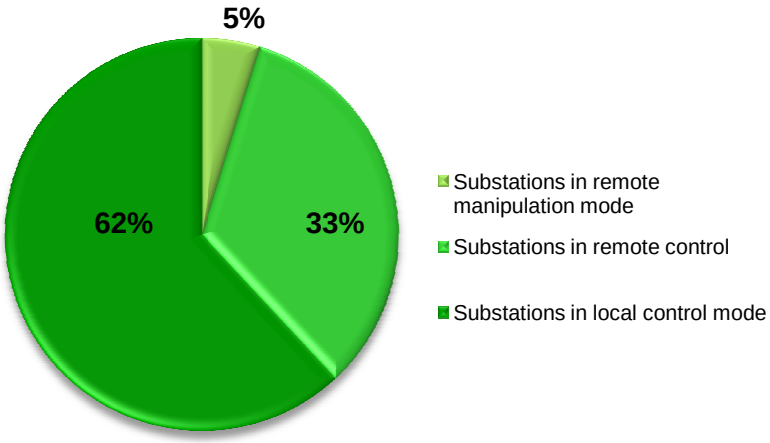
Within TS SR renewal and upgrade, the TS SR substations are transferred to the remote control mode what means local operators need not be present for their operation and all acts concerning control of the ST electro-energy facilities are being controlled remotely from the dispatching of the TSO. The following Table No. 1 and Graph No. 1 provide the view of ST in TS SR and their substations which are today in the remote control mode and in local control mode (operation and control of ST with the operator presence).

There are seven ST under the remote control mode.

Substations	Remote Control Mode	Remote Manipulation Mode	Local Control Mode
Križovany	✓	-	-
Veľké Kapušany	✓	-	-
Lemešany	✓	-	-
Moldava	✓	-	-
Bošáca	✓	-	-
SSt Košice	✓	-	-
Medzibrod	-	-	✓*
Stupava	-	-	✓
Veľký Ďur	-	-	✓
Horná Ždaňa	-	-	✓
Levice	-	-	✓
Sučany	-	-	✓
Varín	-	-	✓
Rimavská Sobota	-	-	✓
Liptovská Mara	-	-	✓
Spišská Nová Ves	-	-	✓
Podunajské Biskupice	-	✓	-
Senica	✓	-	-
Bystričany	-	-	✓
Považská Bystrica	-	-	✓
Voľa	-	-	✓

* ST Medzibrod shall be in the remote control mode from 2014

Tab. 1 List of ST in TS SR as at the TYNDP 2023 Publishing Date



Graph No. 1 Overview of ST in TS SR in the Remote Control Mode, Remote Manipulation and Local Control Mode as at the TYNDP 2023 Publishing Date

2.1.2 Electric Lines

Individual 400kV and 220kV ST in TS SR are mutually galvanically interconnected by forty 400kV transmission lines with length of 1,870km and eighteen 220kV transmission lines with total length of 867km. Out of the total number of 400 and 220kV transmission lines, TS SR disposes of eight 400kV and two 220kV international cross-border electric lines jointly with total length of approx. 444km on the territory of the Slovak Republic which connect TS SR with the neighbouring foreign transmission systems of the Czech Republic (hereinafter referred to as "CZ"), Hungary (hereinafter referred to as "HU"), Poland (hereinafter referred to as "PL") and Ukraine (hereinafter referred to as "UA") on the respective cross-border transmission profiles. Tables No. 2 and 3 include a list of 220kV and 400kV lines of TS SR, together with the respective substations in which those lines are connected as at the publishing date of this TYNDP 2023.

Line No.	Substation 1	Substation 2
V071	EVO 1	Voľa
V072	EVO 1	Lemešany
V073	EBO A1	Križovany
V074	EBO V1	Križovany
V075	EBO V1	Križovany
V270	Lískovec (CZ)	Považská Bystrica
V271	Sučany	Bystričany
V273	Sučany	Lemešany
V274	Križovany	Bystričany
V275	Považská Bystrica	Bystričany
V276	EBO A1	EBO V1
V279	Križovany	Šaľa
V280	Sokolnice (CZ)	Senica
V281	Sučany	Široká
V282	Sučany	Široká
V283	Senica	Križovany
V284	EBO A1	EBO V2
V285	Voľa	Lemešany

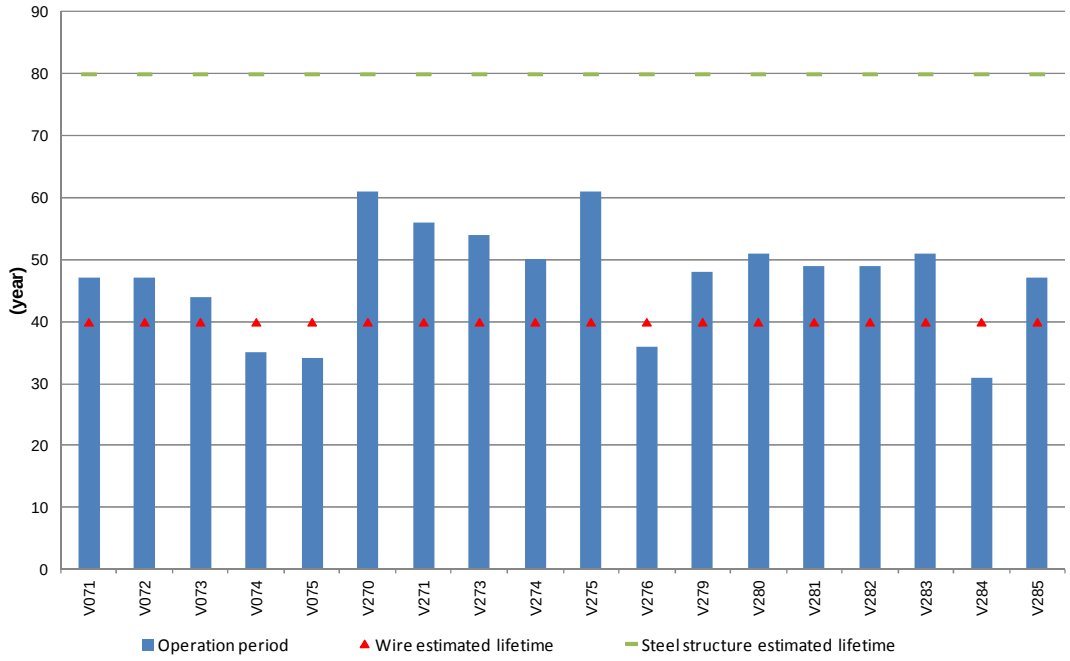
Tab. 2 List of 220kV lines of TS SR as at the Publishing Date of TYNDP 2023

Line No.	Substation 1	Substation 2
V041	EVO2	Veľké Kapušany
V042	EVO2	Veľké Kapušany
V043	EBO V2	Bošáca
V044	EBO V2	Križovany
V045	Pump Storage Hydro Power Plant Čierny Váh	Liptovská Mara
V046	Veľký Ďur	EMO
V047	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	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	VE Gabčíkovo
V439	Podunajské Biskupice	Križovany
V440	Veľké Kapušany	Mukachevo (UA)
V448	Győr (HU)	VE Gabčíkovo
V449	Göd (HU)	Levice
V477	Lemešany	Krosno (PL)
V478	Lemešany	Krosno (PL)
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
V487	Moldava	Lemešany
V489	Moldava	Košice
V488	Košice	Lemešany
V050	Malženice	Križovany
V461	Liptovská Mara	Medzibrod
V8499*	Podunajské Biskupice	Stupava

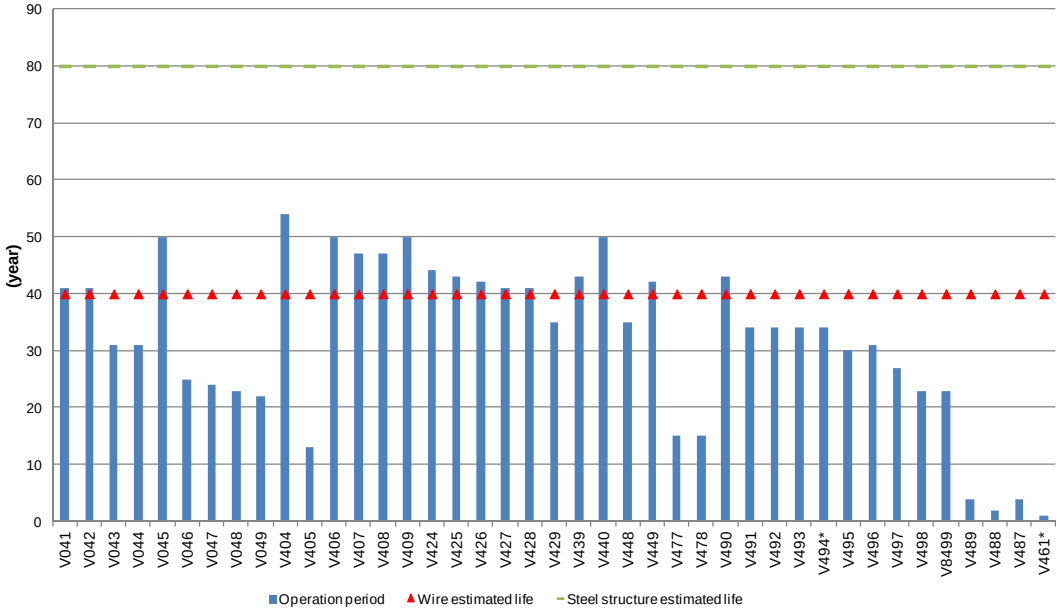
* 400kV line operated as 110kV line

Tab. 3 List of 400kV lines of TS SR as at the Publishing Date of TYNDP 2023

The following two Graphs No. 2 and No. 3 demonstrate the operation period of individual 400kV and 220kV lines as well as their estimated lifetime in terms of estimated lifetime of the very wire ropes (red label) and pole steel structure (green label). The estimated life of electric line equals in fact the estimate life of the line pole steel structure. The provided information is important regarding the needs for future SEPS technical-investment planning.



Graph No. 2 Overview of Operation Period and Estimated Lifetime of 220kV Lines



*V494: Medzibrod - a part of the line from ESt Medzibrod to the Ružomberok crossing is newly built and connected to the original part of V494 of the Ružomberok - Sučany crossing

*V461: Medzibrod - L.Mara - a part of the line from ESt Medzibrod to the Ružomberok crossing newly built and connected to the oroginal part of the Ružomberok - L. Mara crossing

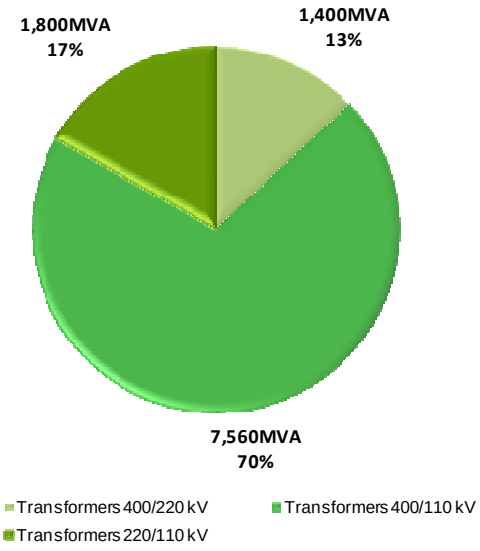
Graph No. 3 Overview of the Operation Period and Estimated Lifetime of 400kV Lines

The red label in both pictures means that after reaching the line age of 40 years, the line replacement including insulator suspensions on the respective line is being considered in SEPS for the first time. If required so by the condition of wires and insulator suspensions, their replacement shall be performed sooner or later, as necessary.

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

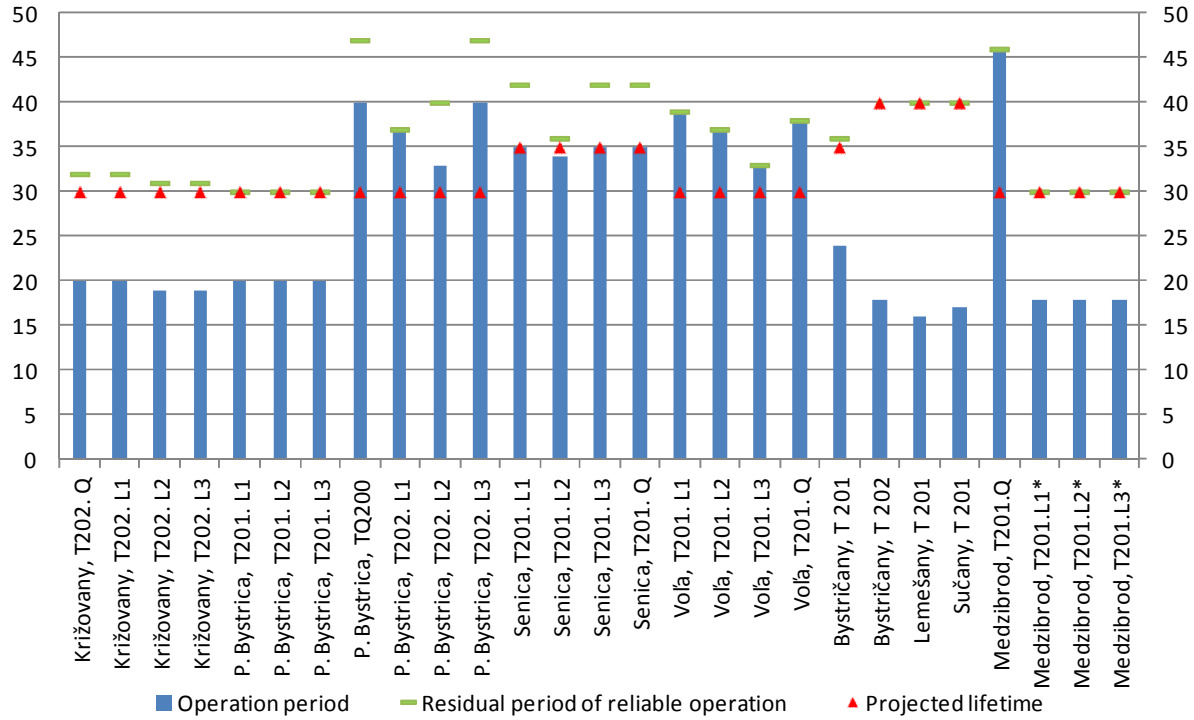
Almost in all ST (but for ST Veľký Ďur, ST Veľké Kapušany and ST Košice) there are power transformers TS/PS and/or TS/DS installed the total installed capacity of which as at the publishing

date of this TYNDP 2023 reaches the level of 10,760MVA. The Graph No. 4 below demonstrates percentage division of the total installed capacity of power transformers according to the voltage level.



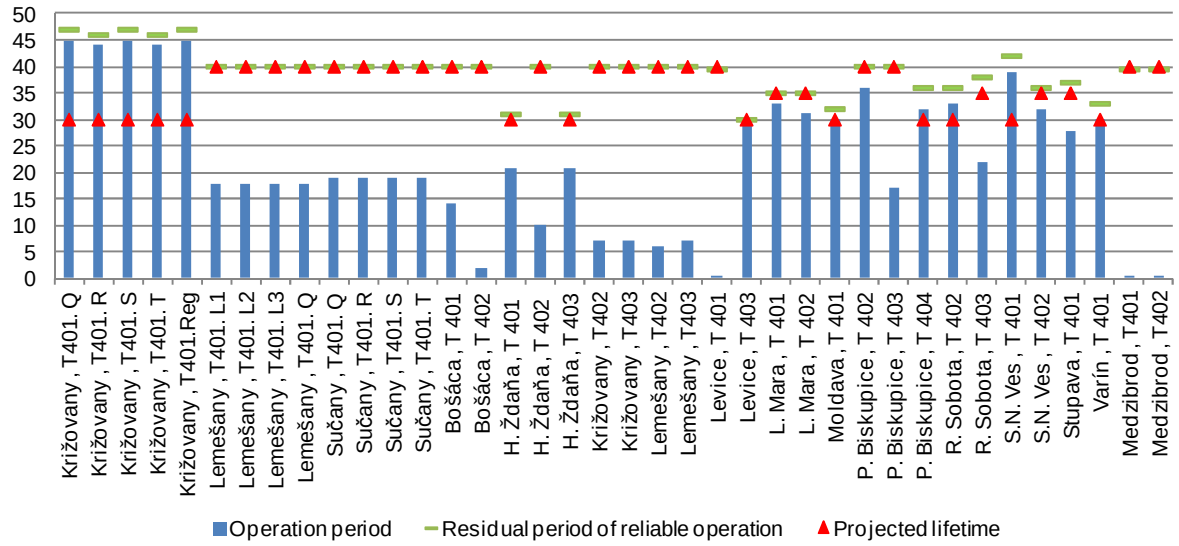
Graph No. 4 Division of Transformers According to the Size of Total Installed Capacity

As regards as the needs for the future SEPS technical-investment planning, the information covering operation period, lifetime as well as the reliable operation period of TS SR facilities is especially important. Graphs No. 5 and 6 include operation periods of individual transformers, projected lifetime (red label; determined by transformer's manufacturer) and residual period of their reliable operation (green label; identified by diagnostic inspections of SEPS).



*** unit T201.L1 Medzibrod shall be shifted to St Považská Bystrica instead of unit T202.L1**
*** unit T201.L2 Medzibrod shall be shifted to St Senica instead of unit T201.L2**
*** unit T201.L3 Medzibrod shall be shifted to St Považská Bystrica instead of unit T202.L3**

Graph No.5 Overview of the Operation Period and Estimated Residual Period of Reliable Operation of 220kV Transformers



Graph No. 6 Overview of Operation Period and Estimated Residual Period of Reliable Operation of 400kV Transformers

2.1.4 Compensation Equipment

To compensate reactive power, only shunt reactors which help to reduce voltage in the transmission system are currently used in TS SR. Use and installation of compensation condensers to increase voltage in TS SR is not necessary at present.

Directly on the 400kV level, the shunt reactor only in ST Veľké Kapušany is connected in TS SR. The basic information on this choke is in Table No. 4.

Substation	Production year	Type	Year in operation	Projected lifetime (years)	Residual period of reliable operation
Veľké Kapušany, TL1. L1	1972	Oil	41	30	2014
Veľké Kapušany, TL1. L2	1991	Oil	22	30	2014
Veľké Kapušany, TL1. L3	1972	Oil	41	30	2014
Veľké Kapušany, TL1. Q	1971	Oil	42	30	2014

Tab. 4 Overview of Operation Period and Estimated Residual Period of Reliable Operation of Shunt reactors

In all other cases, the shunt reactors in TS SR are connected in tertiary windings of TS/TS or TS/DS power transformers. Especially power series, in particular 45MVAr are used but there are also power series 60 and 90MVAr installed. The overview of such shunt reactors in TS SR is provided in the following Table No. 5.

Name	Production year	Type	Nominal voltage (kV)	Number (pcs)	Q_n (MVAr)
Križovany T402	2006	dry	33	2	2x45
Križovany T403	2006	dry	33	2	2x45
Lemešany T401	2003	dry	34	2	2x90
Lemešany T402	2007	dry	33	2	2x45
Lemešany T403	2007	dry	33	2	2x45
Stupava T401	2005	dry	10.5	2	2x45

Sučany T401	1994	dry	34	2	2x60

Tab. 5 Overview of Shunt reactors Connected to Tertiary Windings of Transformers

2.2 Current Status of Installed Capacity of Electricity Sources and Current Condition in Electricity Production

In terms of the Generation mix, the electricity system of the SR (hereinafter referred to as "ES SR") is balanced. At present, the biggest share of the installed capacity shall be attributed to hydro-electric power plants, followed by nuclear power plants and natural gas power stations. The mentioned technologies represent almost two thirds of the installed capacity, the remaining one third covers coal-fired generating units, renewable energy sources (hereinafter referred to as "RES"), in addition to hydro power plants and power plants combusting several types of fuel. Particular values of the installed capacity for individual technologies and their percentage representation in the generation mix of the Slovak Republic as at 31.12.2012 are provided in Tab. No. 6 and Graph No. 7.

Division by fuel	Installed capacity (MW)
Nuclear Power Plants (NPP)	1,940
Hydro Power Plants (HPP)	2,534
RES (without HPP)	767
Fossil Fuels Power Plants	3,190
Total	**8,431**

Tab. 6 Installed Capacity of ES SR Power Plants According to the Used Primary Energy Source (State as at 31.12.2012)

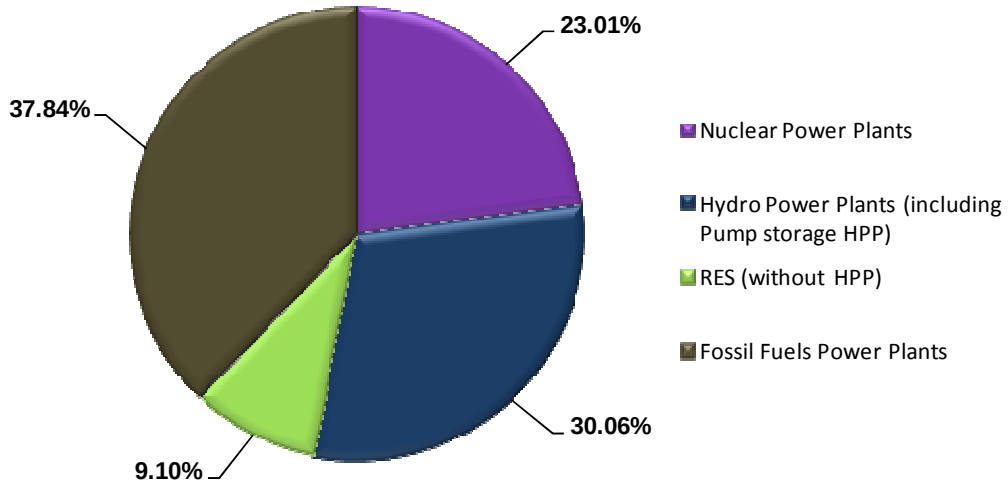


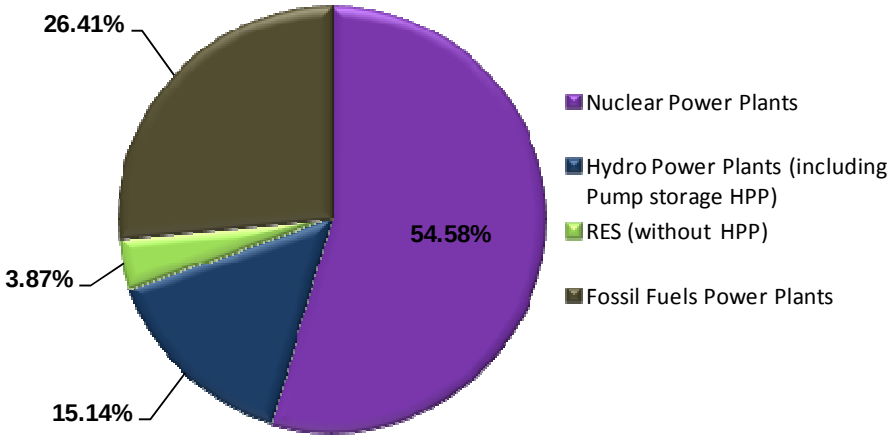
Fig. 7 Share of the Installed Capacity of ES SR According to the Used Primary Energy Source (State as at 31.12.2012)

The category of "fossil fuels power plants" covers power plants including heating plants combusting black coal, lignite, natural gas, crude oil residues as well as generation units combusting non-identified fuel or fuel mix.

The above-mentioned electricity generation units located in the Slovak Republic produced the total energy volume of 28.4TWh in 2012. Particular values of production of individual technologies and percentage share of individual technologies in total electricity production in the Slovak Republic in 2012 is demonstrated in Tab. No. 7 and in Graph No. 8.

Technology	Production (TWh)
Nuclear Power Plants	15.5
Hydro Power Plants	4.3
RES (without HPP)	1.1
Fossil Fuels Power Plants	7.5
Total	28.4

Tab. 7 Overview of Production of Individual Electricity Production Technologies According to the Technology Type in 2012



Graph No. 8 Share of Electricity Production from Individual Types of Electricity Production Technologies in Electricity Consumption in 2012

Electricity production for the period from 2005 recorded relatively frequent decreases and increases (Graph No. 9 below). The decreases were determined especially by shutting-down of two units of the nuclear power plant in Jaslovské Bohunice gradually in 2006 and in 2008, what was reflected in decrease of electricity production in the Slovak Republic in 2007 and 2009. These outages in production electricity in the Slovak Republic were partially compensated by other electricity generation technologies in the Slovak Republic. The electricity production in the Slovak Republic for the past three years is increased; however, the level of years 2005 and 2006 was not achieved.

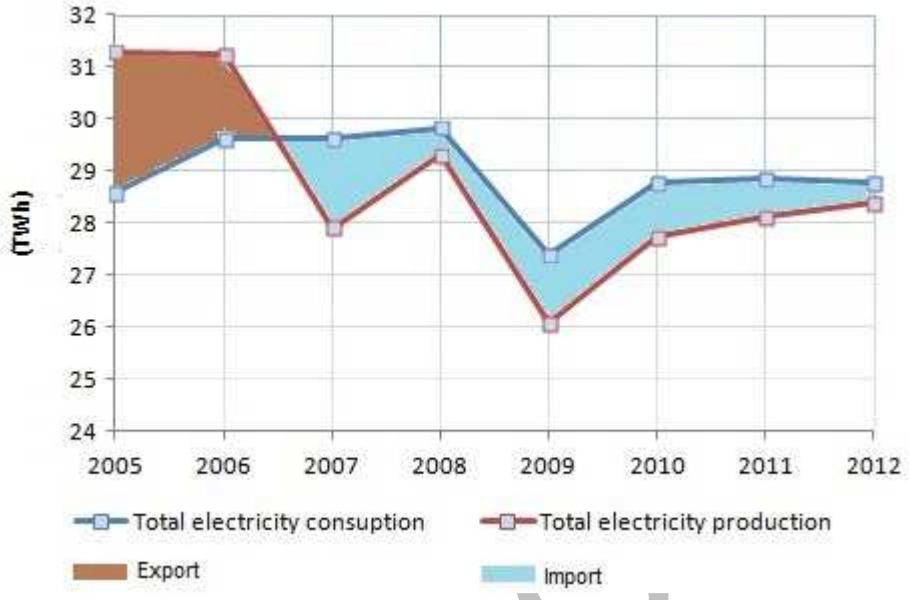
2.3 Current Status of Electricity Consumption and Load in the Electricity System of the Slovak Republic

Total electricity consumption in the Slovak Republic was on the level of 28.8 TWh in 2012, what is more compared to electricity production in the Slovak Republic. It means the remaining part of electricity consumption in the Slovak Republic was covered by imported electricity from abroad within the cross-border electricity exchanges. The import balance of ES SR in 2012 was 393GWh, i.e. approx. 1.4% share from electricity consumption.

This condition, however, does not mean there are not enough generation units installed in the Slovak Republic which could not cover the expected electricity consumption in the Slovak Republic by their capacity but the electricity import from abroad is probably influenced by the price of this commodity on electricity markets. Traders in electricity profit more from purchasing electricity outside the Slovak Republic than from power plants located in the Slovak Republic.

Graph No. 9 demonstrates the development of total electricity production and consumption in the Slovak Republic from 2005 to 2012. In 2012, compared to 2011, the consumption dropped by 76GWh. Drop in consumption of electricity in the Slovak Republic amounted to 0.26 %. In 2010, the electricity

consumption was 28,761GWh. The trend of electricity consumption development from 2010 to 2012 can be referred to as stagnation. The period from 2008 to 2010, especially year 2009, was designated by significant drop in electricity consumption. The mentioned decrease was caused especially by the peaking financial crisis and the recorded stagnation of electricity consumption may be attributed to ongoing consequences of this crisis.



Graph No. 9 Development of Total Electricity Production and Consumption in the Slovak Republic in the Period from 2005 to 2012

2.4 Current Status of Electricity Transmission on Cross-Border Lines of the Transmission System of the SR

SEPS has several cross-border interconnections with the neighbouring transmission systems. Fig. 2 shows cumulative annual commercial flows among the Slovak Republic and the neighbouring countries and actual cumulative physical cross-border electricity flows in 2012. The dominating direction of power flows is usually in the north-south (south-east) direction where 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 Baltic countries south of the Slovak Republic. The total balance of foreign electrcity exchanges in 2012 for the Slovak Republic was represented by import of 393 GWh, what was 1.4% from the domestic consumption.

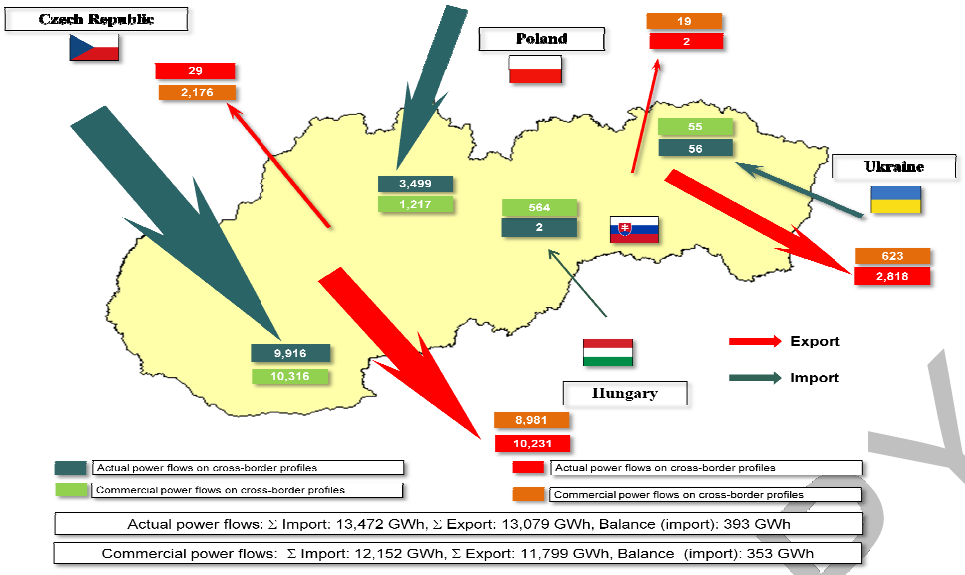


Fig. 2 Commercial and Physical Cross-Border Electricity Exchanges of ES SR in 2012

Commercial electricity flows usually more or less significantly differ from physical transmission flows. Commercial flows are in fact commercially agreed electricity transmission flows among individual business zones within the interconnected ENTSO-E system. These flows shall be reflected in the form of physical electricity flows in individual 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) is not met.

On the profile between Slovakia and CZ the cross-border capacities for Day-2 nominations are allocated as free. If the requirement for the nominated transmissions exceeds the profile's physical limit, the nominations are reduced to zero and the total available capacity shall be allocated to the short-term market organizers for the day ahead nominations in the form of implicit auctions within the trilateral "Market Coupling" the Czech Republic – Slovakia - Hungary. On the mutual profile Slovakia – PL the capacities are allocated via CAO in the form of annual, monthly and daily explicit coordinated auctions. On the Slovakia - UA profile the free tradable transmission capacities are allocated within the unilateral monthly and daily explicit auction.

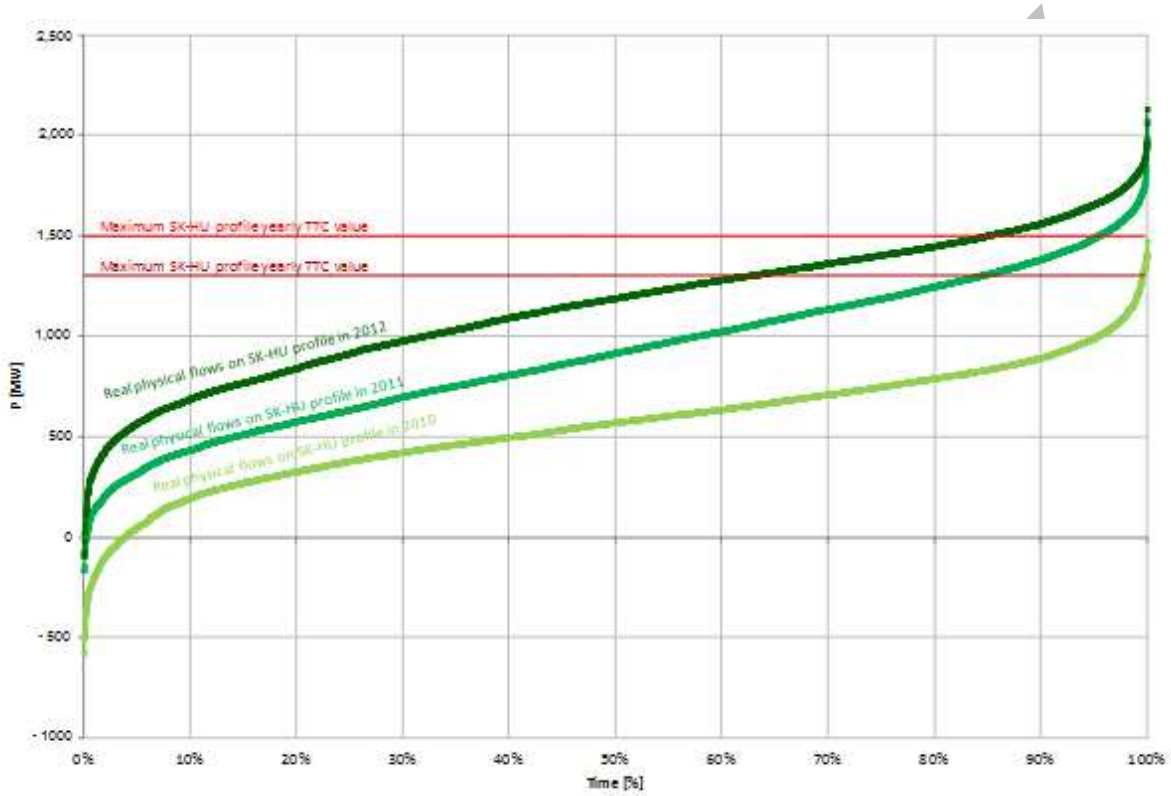
On the profile between Slovakia and HU, the free tradable transmission capacities are allocated on the yearly and monthly basis within coordinated auctions via CAO. The cross-border capacities are allocated in the form of implicit auctions within the trilateral "Market Coupling" the Czech Republic – Slovakia – Hungary on the daily basis. On the intraday basis the cross-border capacities are allocated applying the "first comes - first served" method.

Similarly as CZ-SK-HU, Germany and Austria have the joint bidding zone. Introduction of free trade between these two countries without allocation of cross-border capacity required using auctions but commercial exchanges in electricity are limited only by "maximum capacity" of cross-border profile between Germany and Austria while adhering to safe and reliable operation of transmission systems of Germany and Austria has, apart from advantages such as obvious simplification of trade in electricity also its obstacles. These are determined especially by the fact that due to obviously insufficient transmission capacity of the internal transmission system in Germany which is due to capacity reasons unable to cover big consumption in the south of Germany, a part of electricity exchanges is implemented via cross-border profiles of other neighbouring countries within ENTSO-E (especially CZ and PL), while these power flows from Germany shall be so called "returned" via the Austrian-German transmission profile with big tradeable transmission capacity to the consumption point in the south of Germany.

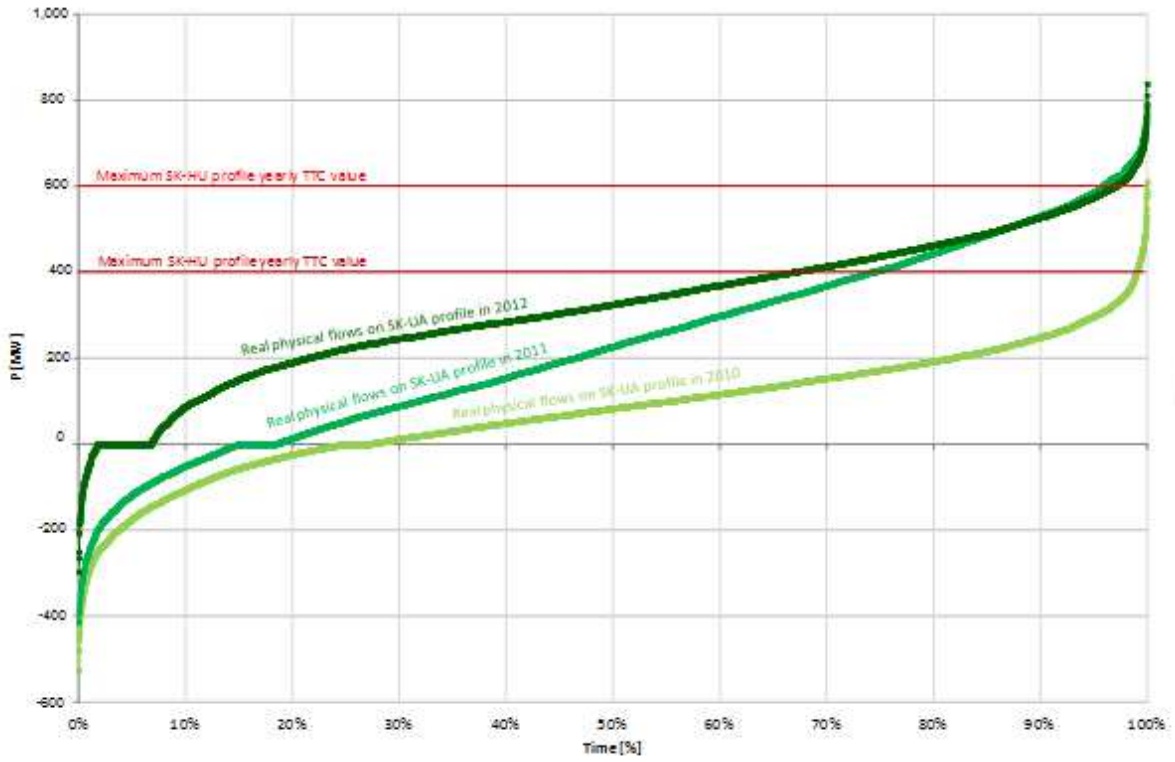
Cross-border flows of electricity via TS SR, especially transmission flows of electricity are caused by high fluctuation of electricity production in the north of Europe, in particular in northern parts of Germany with low electricity consumption. Thus big production of cheap electricity, in particular from wind power plants which is subject to as well as big, currently still available power from nuclear power plants in Germany, together with gradual strengthening of the transmission infrastructure especially on

cross-border profiles result in power flows in the volume and in directions (north - south) in which these are currently recorded and which cause complicated up to dangerous conditions in TS SR. SEPS as TS SR operator shall deal with these conditions via operating measures resulting in reduction of transmission flows via ES SR, but concurrently they cause increase of losses in ES SR and some other operating limitations.

Most frequently such conditions exist on the cross-border profile between Slovakia and Hungary and Slovakia and Ukraine. Graphs No. 10 and No. 11 demonstrate it clearly. An hourly division shows usege of cross-border profiles with Hungary and Ukraine in the period from 2010 to 2012, as well as excess of maximum value of total (TTC) and net (NTC) transmission capacity of the profile in a year.



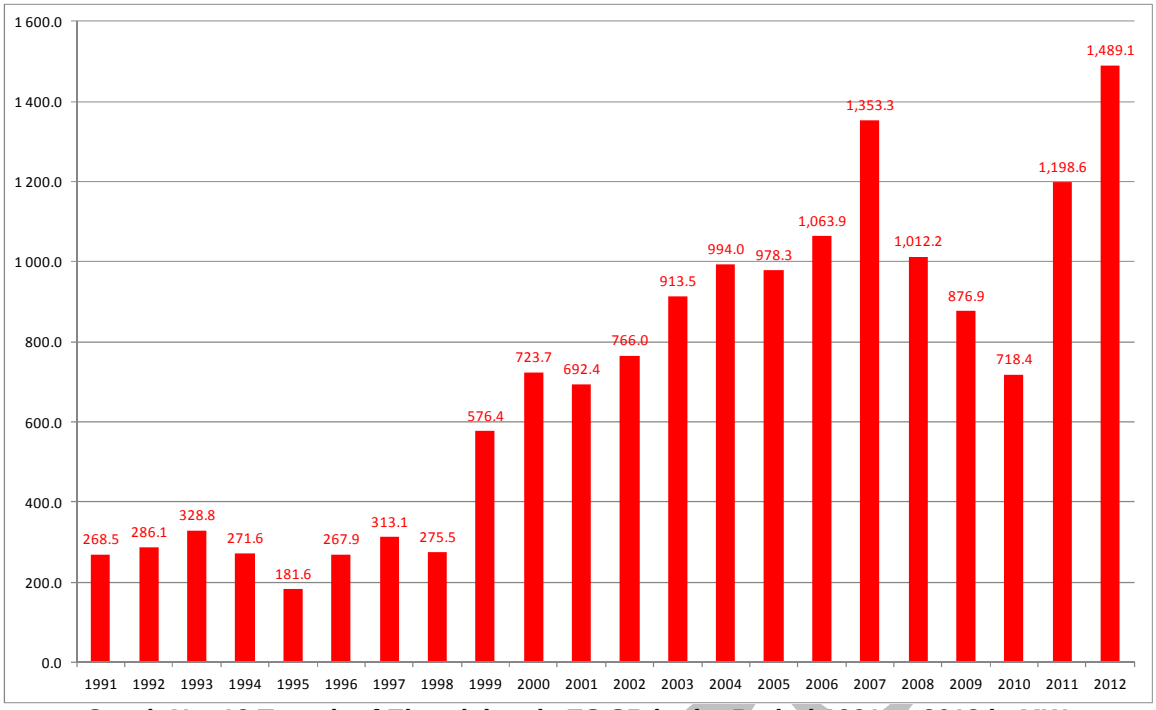
Graph No. 10 Arranged Hourly Real Electricity Flows on Slovakia – Hungary Profile Compared to TTC_{max} and NTC_{max} in the Period 2010 to 2012



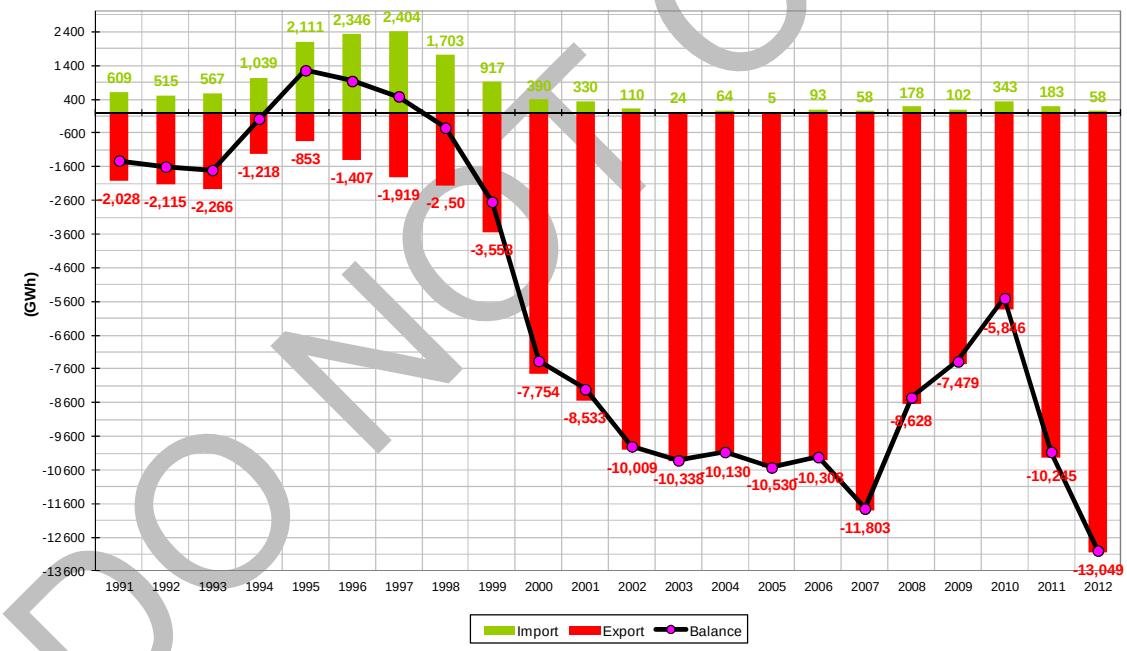
Graph No. 11 Arranged Hourly Real Electricity Flows on Slovakia – Ukraine Profile Compared to TTC_{max} and NTC_{max} in the Period 2010 to 2012

The graphs enable simple provision of information when the safety criterion N-1 is not met in the system, i.e. if the transmission flows on the profile exceeds the TTC value. As it is obvious in case of both profiles in the course of years 2010 to 2012, the number of hours grows when the N-1 criterion is not met while such failure is more significant on the Slovakia – Hungary profile.

TS SR has been in recent 10 years exposed to the growing transits of electricity (Graph No. 12) which are most significantly proved right on problematic profiles Slovakia – Hungary and Slovakia – Ukraine (Graph No. 13). In terms of capacity, these flows shall be maintained not only by the internal topology of TS SR but especially by the transmission capacity of its cross-border lines in the direction towards the neighbouring transmission systems.



Graph No. 12 Transit of Electricity via ES SR in the Period 1991 to 2012 in MW



Graph č. 13 Electricity Flows on the Joint Slovakia, Hungary and Ukraine cross-border Profile in the Period 1991 to 2012

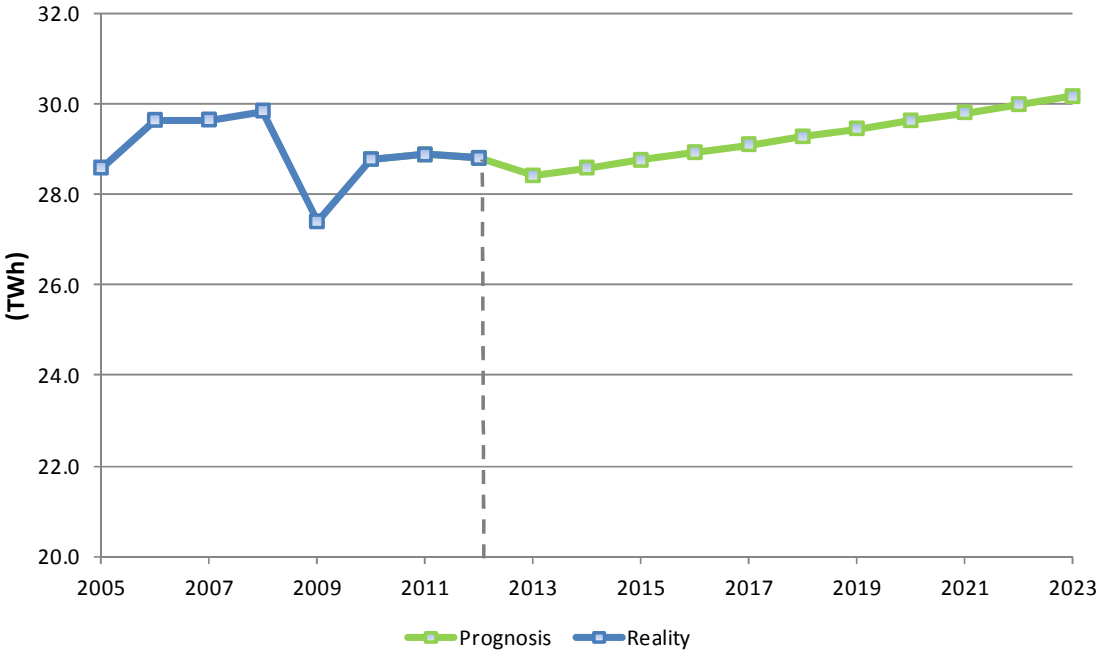
3. Assumed Future Status of Offer and Demand for TS Capacity

3.1 Assumptions of Electricity Consumption in ES SR

The average annual growth of electricity consumption in the SR in the period by 2023 is expected to reach the level of 0.6%. Compared to 2012 it means increase by 1.4TWh by 2023 what is almost 5% growth against the electricity consumption in 2012. In 2015, the total electricity consumption will reach 28.7TWh and in 2020 the level of 29.6TWh is expected.

The considered scenario of the consumption development expects the growth of economy with reducing energy intensity what is in compliance with the priorities of the currently valid energy policy of

the SR and the EU and these assumptions shall apparently apply also after completion of the pending update of the Slovak energy policy. The economy development scenarios include also assumptions created to naturally save the energy resulting from the change of the industry structure and influences of the competitive market environment. Graph No. 14 includes prognosis of the total electricity consumption by 2023.



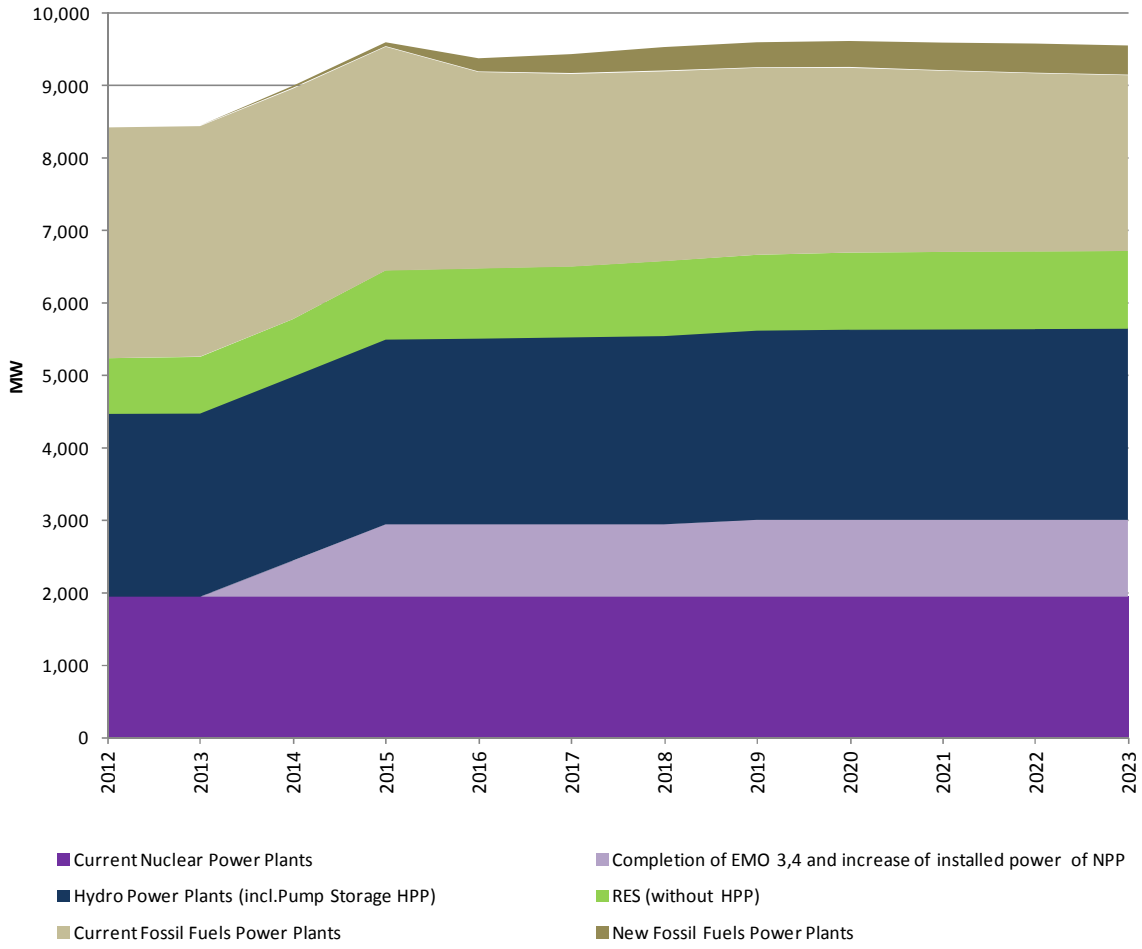
Graph No. 14 Prognosis of the Total Electricity Consumption Development in Slovakia

All the above described considerations concerning electricity consumption development stem from the SEPS analyses and assumptions since at the time of publishing this TYNDP 2023 no relevant strategic document of the SR for such time period was available. These considerations are, however, compliant with the Report on Monitoring Results of Electricity Supply Safety from 2014 to 2018 (http://www.economy.gov.sk/sprava-o-vysledkoch-monitorovania-bezpecnosti-dodavok-elektriny--jul-2013-/141126s).

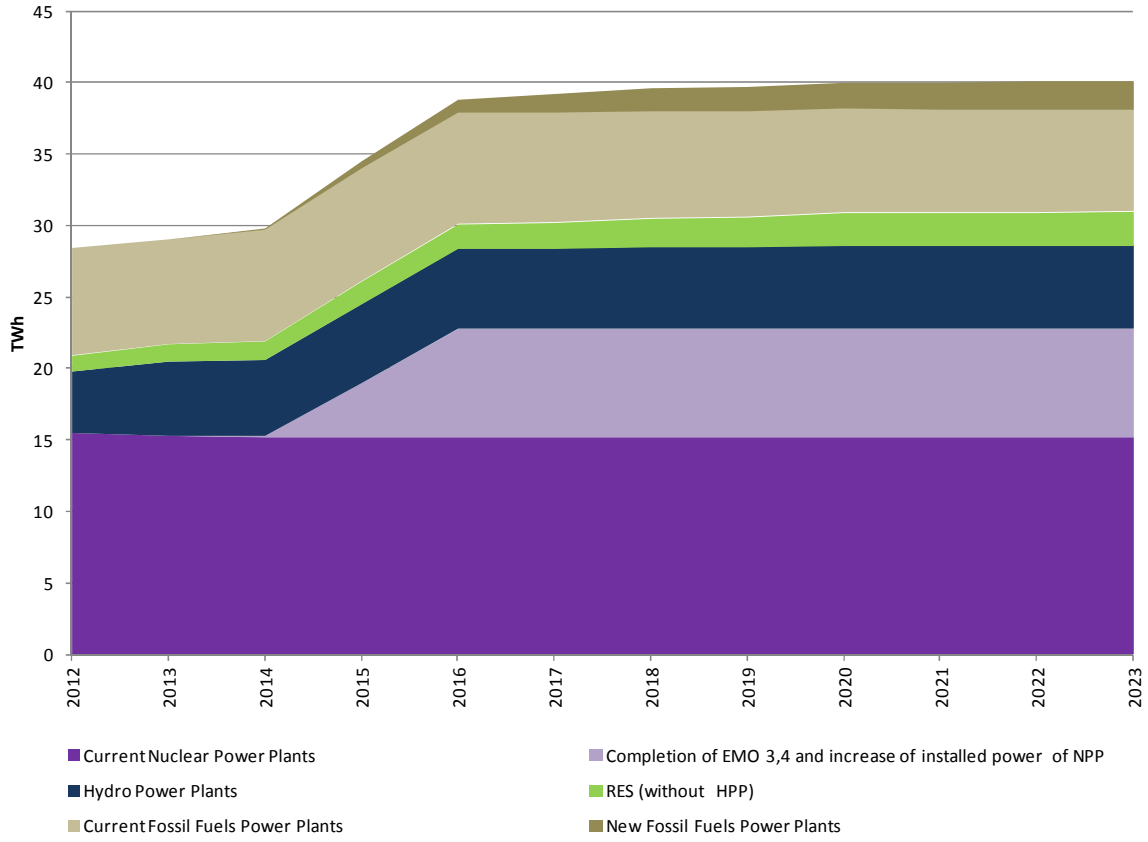
Note: Above mentioned report is available only in Slovak language.

3.2 Assumptions for Electricity Production in ES SR

The volumes of current and notified installed capacities of electricity generating units divided into nuclear, hydro power plants, renewable, and fossil fuels power plants which were taken into consideration at creation of the assumed development of installed capacities from 2012 to 2023 and prognoses for development of available electricity production in the SR by 2023 are provided in Graphs No. 15 and No. 16.



Graph No. 15 Assumed Development of the Installed Capacity of Electricity Generating units by 2023



Graph No. 16 Assumed Electricity Production in the SR by 2023

All the above described considerations concerning electricity production development on the generating units located in the SR stem from the SEPS analyses and assumptions since at the time of publishing this TYNDP 2023 no updated relevant strategic document of the SR was available. The described development in electricity production on the sources located in the SR shall be significantly influenced in the future by development of electricity prices on markets and by interventions of the regulatory authority which significantly influence operation economy of individual technologies for electricity production.

3.3 Assumptions for Electricity Exchanges with Other Countries

Assumed electricity cross-border exchanges in long-term horizon cannot be prognosticated 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 at treating such prognoses. In case of the following considerations one possible scenario of future development of electricity 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 the TYNDP 2012 document processing served as a basis. It is so called “EU 2020” scenario of transmission system operators for 2020, however, the conclusions for this time horizon may be applied also to y. 2023 considering short time period between the both years in terms of long-term development in the electro-energy sector. This scenario stems from national action plans for energy from renewable sources of individual EU member states or from similar documents in case of the ENTSO-E members which are not EU members.

Fig. 3 shows prognosis of commercial cross-border electricicty exchanges among the SR and the neighbouring countries for the perspective horizon of 2020 for the above mentioned “EU 2020” scenario. From the point of view of the SR compared to 2012, the volume of commercial flows on some cross-border profiles has changed. Commercially agreed electricity export to HU grew up while the import on this profile dropped. As for the Czech Republic, the export from the SR dropped

significantly with almost the same quantity of commercially agreed electricity import from CZ than in 2012. The commercial electricity import from PL remains, in fact, on its present level at increased commercial export to PL. Export to Ukraine is doubled similarly as doubled import from this country.

Regarding current investment decisions to strengthen cross-border transmission profiles, the planned construction of new cross-border interconnections between Slovakia and Hungary proves to be reasonable (in the mentioned "EU 2020" ENTSO-E scenario these were considered already). It can be expected that based on the above-mentioned considerations also the volume and direction of physical flows on the cross-border lines of TS SR on this profile can be comparable while apparently the change of the proportion between transit and export to HU occurs.

Furthermore, transit of electricity flows via TS SR can be expected mostly in the north-south direction in approximately identical volume as in 2012. Already from 2016, more than export character of ES SR with comparable volumes of transits as in 2012 can be expected. It is confirmed also by assumptions in Chapters 3.1 and 3.2.

It can be stated that the mentioned assumptions for size and direction of electricity flows from the SR or via the SR confirm the proposed solutions for strengthening the transmission infrastructure of TS SR towards. Moreover, it is obvious that size and direction of power flows depend on the situation in neighbouring countries development of the transmission infrastructure, electricity generation mix as well as on political decisions not only in the SR but also in the countries within synchronously interconnected ENTSO-E system.

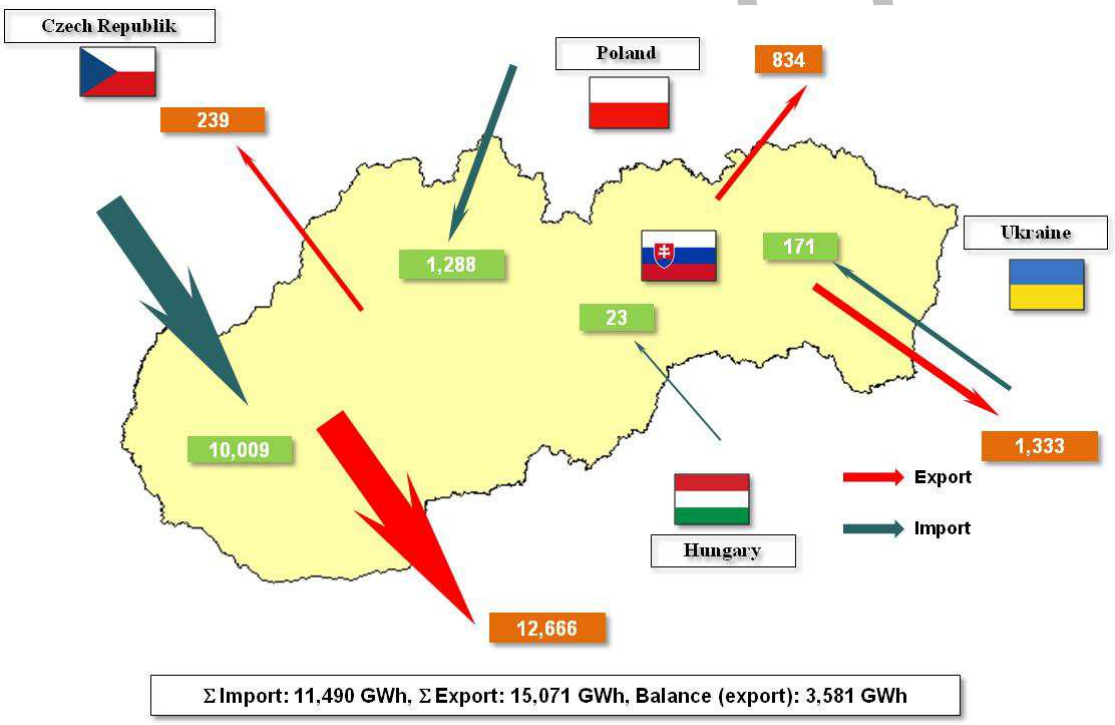


Fig. 3 Assumed (modelled) Annual Commercial Cross-Border Electricity Transmission flows in ES SR for the Perspective Horizon 2020 (Without Consideration of Transit and Circle Flows)

The current and expected development of cross-border electricity flows is the main driver of decisions on construction of a new cross-border line. As it was already mentioned above, in the described considerations for Slovakia the strengthening of the profile between Slovakia and Hungary has been taken into account. This cross-border profile strengthening has been an issue between SEPS and MAVIR (the Hungarian transmission system operator) for several years and it should be put into operation within the years 2016 and 2018.

Regarding the estimated future electricity flows and current cross-border capacity between Slovakia and CZ and PL strengthening these transmission profiles does not seem to be necessary.

Strengthening of the profile between Slovakia and UA seems as necessary with current knowledge, however, negotiations concerning this issue with Ukrainian TSO still continue and eventual conditions

of exceeding maximum permitted cross-border capacity of this profile is currently being resolved by the operational measures. A possible variant solution on this profile between Slovakia and UA may be represented by a new connection of Slovakia and Hungary from ST Veľké Kapušany. No strengthening of the transmission profile between Slovakia and Ukraine or variant interconnection from Veľké Kapušany to Hungary is considered till 2023.

The line construction on the Slovakia – Austria profile is neither at present, nor in the future the topic for discussions between SEPS and Austrian TSO especially due to environmental problems at construction of new lines on the Austrian side.

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

The transmission system of the SR is a part of the synchronously connected and working European transmission system ENTSO-E. Within ENTSO-E, a ten-year network development plan describing possibilities and possible direction of development of the entire tran-European transmission system ENTSO-E for the coming ten years. The mentioned development plan has been processed from 2010 when the pilot document titled “Ten-Year Network Development Plan of ENTSO-E” (hereinafter referred to as “TYNDP ENTSO-E”) was published as the first one. The ENTSO-E association continues in this activity of the TYNDP elaboration in regular two-year cycles within which TYNDP ENTSO-E is or will be updated each time by a new transmission infrastructure which should be built in the respective next ten years.

The update and in certain extent also by extension of TYNDP ENTSO-E 2010, the latest, officially published and valid document is TYNDP ENTSO-E 2012 published in July 2012.

TYNDP ENTSO-E 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 TYNDP ENTSO-E 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 coming recently in force, TYNDP ENTSO-E performs a double role. In addition to the aforementioned, pursuant to Regulation No. 714/2009 it is a fact that for the future it shall become exclusively unique document of which the list of the transmission infrastructure investment projects within ENTSO-E having a character of European significance shall form the basis for selection of the priority projects addressed as “Projects of Common Interest” (hereinafter referred to as “PCI”).

A list of SEPS investment projects in the TYNDP ENTSO-E 2012 documents with the entitlement for denomination and PCI statute with the assumed commissioning date by 2023 is as follows:

- 2x400kV OHL Gabčíkovo - Gönyű (HU) including construction of a new switching station in Gabčíkovo
- 2x400kV OHL Gabčíkovo – Veľký Ďur including extension of the 400kV Veľký Ďur substation
- 2x400kV OHL Rimavská Sobota – Sajóivánka (HU) (in the first phase it shall be operated only as a simple 400kV line),
- 1x400kV OHL Veľký Ďur – Levice including extension of 400kV Veľký Ďur and Levice substations,
- 400kV OHL Lemešany – Veľké Kapušany including extension of 400kV Lemešany and Veľké Kapušany substations,
- 400kV ST Voľa – looping of a simple line V409 in to the new 400kV substation Voľa including transformation 400/110kV.

In the current list of the PCI projects issued by the European Commission in 2013 and which were selected from the recent valid TYNDP ENTSO-E 2012, SEPS as a regular member of ENTSO-E, is represented via the following projects[1]:

[1] More information on these PCI projects is in Chapter 4.3.1

- **2x400kV OHL Gabčíkovo – Gönyű (Hungary),**
- **2x400kV OHL Rimavská Sobota – Sajóivánka (Hungary) ,**
- **2x400kV OHL Gabčíkovo – Veľký Ďur .**

The above-mentioned PCI projects of SEPS are a part of a complex list of 250 key projects of common interest in the field of energy infrastructure of which 140 cover the area of electricity transmission and storage. The mentioned list was approved on the EC level on 14th October 2013 and it was officially published as a list of projects of common interest.

The PCI status is to help the concerned projects and their submitters especially in acquiring the required permissions and approvals for projects implementation and to ensure that the national regulator takes these projects adequately into account when forming a regulation framework considering the all-European nature of the PCI projects. The PCI status can be used also to obtain financial support from the CEF – Connecting Europe Facility framework reserved for the area of energy infrastructure for trans-European energy projects for the period 2014 – 2020. It is, however, necessary, to meet the strict criteria for this purpose, while the financial support amount need not be motivating for TSO's.

All legislative regulations falling into competence of the third liberalisation package are aimed especially at provision of strengthening the European interconnected transmission system ENTSO-E, in particular with regard to achieving the EU target, i.e. "20-20-20" goal. The mentioned "20-20-20" goal covers the RES integration in energy mixes of the EU countries (not only for electricity production) which due to this fact currently experience substantial boom within the ENTSO-E countries. One of the "20-20-20" targets is to achieve the 20% RES share in the energy consumption on the EU level in 2020.

The TYNDP ENTSO-E Report 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 TS SR operator in regard to geographical layout belongs to the Continental Central East region (hereinafter referred to as "CCE") within ENTSO-E System Development Committee. The CCE region consists of nine countries within which there are represented ten transmission system operators (Fig. 4).

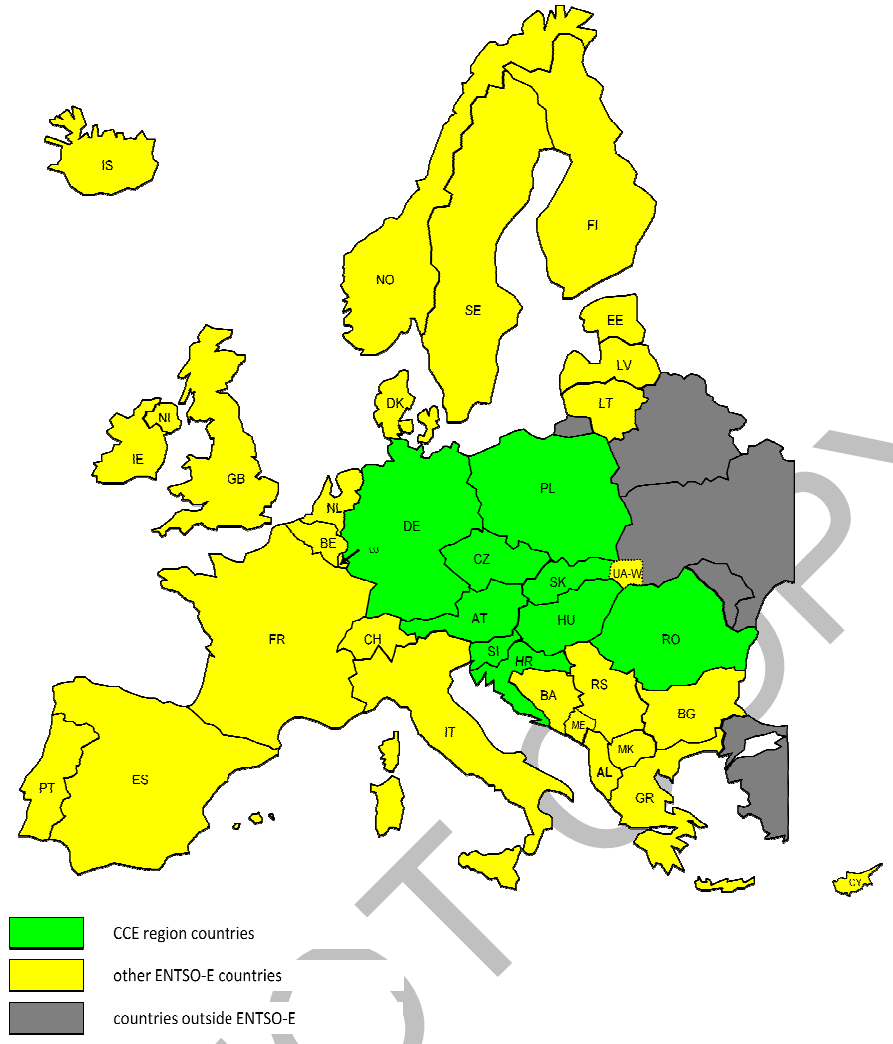


Fig. 4 Map of the CCE Region and of Other ENTSO-E Countries

Within the CCE region, together with the TYNDP ENTSO-E Report the Regional Investment Plan[2] (hereinafter referred to as "RgIP CCE") is being elaborated. The RgIP CCE document identifies Projects of Regional Significance and National Projects of Interest). The RgIP CCE are thus projects which are not or will not be a part of the TYNDP ENTSO-E document since they fail to meet the status of Projects of European Significance and finally they fail to correspond either to the meaning of the PCI.

SEPS has the following investment projects within RgIP CCE:

- A set of investments S400kV Medzibrod[3]
- A set of investments Križovany – Horná Ždaňa

At the time of publishing this TYNDP 2023, ENTSO-E prepares a new version of TYNDP ENTSO-E, i.e. TYNDP ENTSO-E 2014 which should be published at the end of 2014.

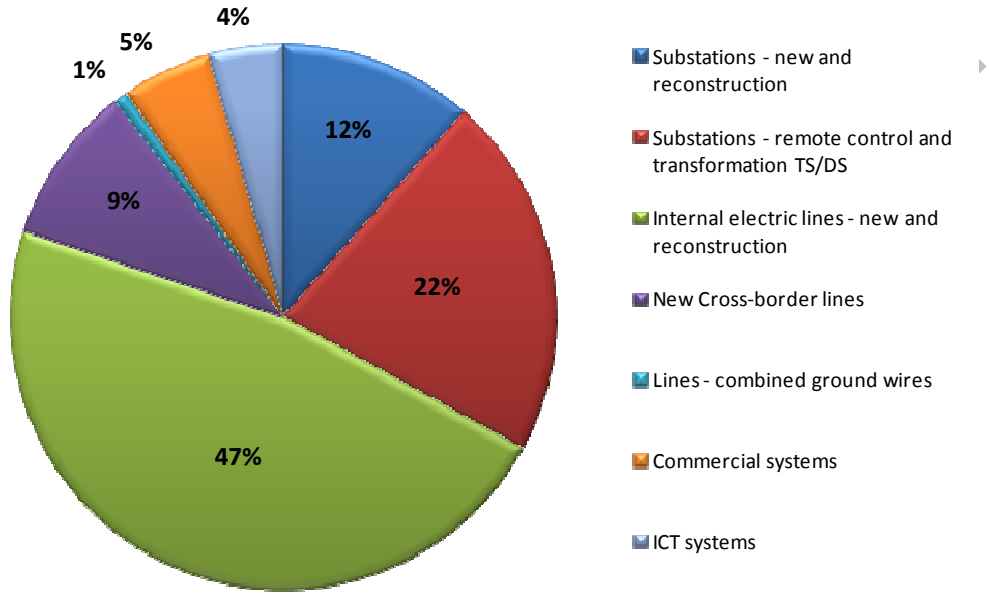
4. Ten-Year Investment Plan of the Transmission System Development for the Period 2014–2023

The Ten-Year Investment Plan for the time horizon by 2023 contains effective investment measures to ensure appropriateness of the Slovak transmission system to ensure its safe and reliable operation

[2] http://www.sepsas.sk/seps/RegInvPlan.asp?kod=550
[3] A set of constructions was completed and commissioned at the end of 2013

and to ensure safety of electricity supplies and it contains the main parts of the transmission system which shall be built and upgraded. These investment projects are verified by network calculations for the considered scenarios and variants for the electricity system development as at the time horizon of y. 2023 using mathematical models of ES SR or ENTSO-E in relation to various variants of the notified new electricity generating units.

By means of investment projects mentioned in the Ten-Year Investment Plan, SEPS intends to invest approx. EUR 618 mil. what is approx. EUR 61.8 mil. annual average investment intensity to ensure inevitable increase of the existing capacities and inevitable upgrade of the main parts of the transmission system. The mentioned investment costs shall be set using a qualified estimate when considering the 2013 price level free of inflation impact. Distribution of SEPS investments in individual categories pursuant to the Ten-Year Investment Plan is demonstrated in Graph No. 17.



Graph No. 17 Distribution of SEPS Investment Needs by 2023

4.1 The Transmission System Development and Requirements of TS SR Users

The TS SR development and the related need of planning individual investment measures is inter alia induced by the requirements of both existing and potential new TS SR users for many times.

The requirements of new users of the DS. operator type, direct customer or producer leading to the need of TS SR 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. on Power Engineering (hereinafter referred to as “Requests for TSO Opinion”). These requirements shall be incorporated in the next elaborated SEPS Development Programme.

The need to extend TS SR, however, may stem also from the conclusions of the SEPS. Development Programme since pursuant to Act No. 251/2012 Coll. and the Technical Conditions for Access and Connection, for the Transmission System Operation Rules (Document A, Chapter A3) all TS SR users shall be obliged to submit input data to process the SEPS, a. s. Development Programme.

As for the requirements of the existing DS. operators, these have an option to ask SEPS, as TSO, to strengthen the transmission system directly, in compliance with the Operation Rules of the Transmission System Operator Slovenská elektrizačná prenosová sústava, a. s., Chapter 2. Electricity consumers and producers connected to TS SR intending to change the technical parameters of their facilities due to which the adjustment on the TS SR part is required act according to this Chapter.

4.2 Internal Investment Projects

Concentration of industry in a part of the East-Slovakian region and continual decommissioning of the 220kV transmission network cause big investment needs the subject of which is extension of the 400kV system and the resulting strengthening the transmission capacity in the east part of TS. One of such invesments is a set of investment needs “Transformation of 400/110kV Voľa” and subsequently the related set of investment needs “2x400kV OHL Veľké Kapušany - Voľa – Lemešany”. The SEPS was requested to pass to the 400kV voltage level in the Voľa substation by Východoslovenská distribučná, a. s. (VSD- company, the DS operator in this region) due to restriction of electricity production evacuated into the 220kV system and perspective increase of load of the distribution system and due to notified construction of new industrial demands in the East Slovakia region.

A set of investment needs “Transformation of 400/110kV Voľa” consists of the following investments:

- 400/110kV transformer station in Voľa
- 2x400kV OHL between the crossing of the V409, V071/072 lines and ST Voľa

A set of investment needs 2x400kV OHL Veľké Kapušany – Voľa – Lemešany consists of the following investment items:

- 2x400kV OHL Veľké Kapušany – crossing of V409 and V071/072[4] lines,
- 400kV substation Veľké Kapušany – extension,
- 2x400kV OHL Voľa – Lemešany[5],
- substation 400kV Voľa adjustments,
- 400kV substation Lemešany – extension.

Regarding the physical age and the current technical state of the 220kV transmission system facilities in the central part of TS SR (especially in the area of the Bystričany substation and also in the node of Bystričany), a set of investment items “Transformation of 400/110kV Bystričany” is being prepared. 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 NNP premature shutdown. The set of investment needs includes the following investment items:

- 400kV substation Bystričany
- 2x400kV OHL Horná Ždaňa –Oslany area
- 400kV substation Horná Ždaňa - extension
- 2x400kV OHL Bystričany - Križovany
- 400kV substation Križovany – extension
- Transformators of 400/110kV Bystričany

Implementation of the investment project “Transformation of 400/110kV Bystričany” is specific due to the fact that one circuit of the 2 x 400kV line Bystričany – Križovany shall be temporarily operated as the 220kV line Bystričany – Križovany while for this circuit the corridor of the original 220kV line V274 Križovany – Bystričany will be used. Its second circuit as 400kV line Bystričany – Križovany shall be interrupted in the Oslany area and it shall be connected in substation 400KV Horná Ždaňa. It is a temporary condition before the final termination of the transformation 220/110kV operation in Bystričany substation with regard to time-limited usage of financial contribution from the BIDSF fund.

To ensure increased safety and reliability of capacity from the new generating unit of SE, a. s., company i.e. two units No. 3 and No. 4 of the Mochovce NPP as well as increase of the total safety and reliability of the transmission system operation in its western part, the implementation of TS extension via the set of investments “2x400kV OHL Gabčíkovo - Veľký Ďur” is being assumed. Concurrently, the assumptions for further intensions of development in this part of TS in the future are being created. The set of constructions assumes the following structures:

- 2x400kV OHL, switching station Gabčíkovo - Veľký Ďur,
- 400kV Veľký Ďur switching station – extension,
- 400kV Gabčíkovo switching station.

[4] Implementation of doubling this part of the line is considered after 2023
[5] Implementation of doubling this part of the line is considered after 2023

To increase safety and reliability the substation 400 kV Horná Ždaňa connection to TS, the change of endings of the overhead lines V492 and V493 for the years 2013 and 2014 is planned. One of the reasons for implementation of this investment measure is also a fact that via this ST, the biggest electricity customer from TS, Slovalco, a. s. company with technology sensitive to electricity supply outages is connected.

Within the Ten-Year Plan of the Transmission System Development, there is an installation of new or replacement of the existing combined earth wires including optical ground wires planned on the selected lines of the transmission system.

In order to ensure continuous trouble-free TS operation it is necessary to implement the replacement of original wire ropes including the insulation of lines renewal on the selected 400kV lines. These measures result also in increase of the transmission capacities of the respective lines.

By 2023, supplementation or replacement of physically obsolete transformers in substations with which it is assumed their technical condition after their life expiry shall not allow their further safe and reliable operation is being expected:

- Replacement of T401 in ST Moldava
- Replacement of T401 and supplementation of T402 in ST Stupava
- Replacement of T404 and T402 in ST Podunajské Biskupice
- Replacement of T401 and T402 in ST Liptovská Mara
- Replacement of T401 and T402 in ST Spišská Nová Ves
- Replacement of T401 and T403 in ST Levice
- Replacement of T402 in ST Rimavská Sobota
- Replacement of T401 in ST Varín
- Replacement of T401 and T403 in ST Horná Ždaňa

Further important part of internal investment projects is a remote control of ST. By 2023 the implementation of the remote control with the following ST shall be performed:

- Veľký Ďur
- Levice
- Rimavská Sobota
- Varín
- Stupava
- Podunajské Biskupice
- Spišská Nová Ves
- Sučany
- Liptovská Mara

After 2023, all ST owned by SEPS should be operated in the remote control mode apart from ST Považská Bystrica. The future of this ST shall be decided upon together with the operator of the respective regional distribution system in further updates of the Ten-Year Plan of the Transmission System Development.

Apart from the mentioned investment projects, the Ten-Year Investment Plan includes also innovations and renewal of inevitable supporting systems such as commercial systems and information-communication systems. The requirements for innovation and renewal of these facilities result from continuously growing requirements to increase 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 consequence.

4.3 Cross-Border Investment Projects

4.3.1 Slovak – Hungarian transmission Profile

The TSO of the SR and Hungary signed the “Memorandum of Understanding” serving as a basis for further processing of the contract on constructing new international interconnections. The following lines are subject to construction:

- 2x400kV OHL Gabčíkovo – Gönyű (Hungary).
- 2x400kV OHL Rimavská Sobota – Sajóivánka (Hungary) – in the first phase it shall be operated only as simple 400kV line.

Due to national and trans-European needs, the most topical is the preparation of the international line 2x400kV Gabčíkovo – Gönyű. In this regard, SEPS prepares construction of new switching station near the Gabčíkovo HPP since the existing substation 400kV Gabčíkovo fails to provide possibilities of further necessary development.

Building of the international interconnection Rimavská Sobota – Sajóivánka shall mean contribution for both Slovak and Hungarian operator where with the Hungarian operator the construction of this line shall result in increase of supply reliability of S400kV Sajóivánka. In case of the Slovak TSO after commissioning new notified electricity sources (EMO 3,4 NNP), this interconnection shall contribute to increase the TS operational safety and reliability in the concerned location (Slovak – Hungarian profile).

Preparation of these PCI projects (including the Gabčíkovo – Veľký Ďur line) proceeds in compliance with the agreements between SEPS and MAVIR. The contract on cooperation shall be signed between both companies approx. in half of 2014 while specifying the crossing point of these planned cross-border lines of the state border and subsequently the contract on cooperation concerning their construction shall be prepared and signed. More detailed information on PCI projects shall be published in compliance with the Regulation of the European Parliament and Council No. 347/2013, Art. 9.

4.3.2 Slovak – Polish transmission Profile

At present, the project covering interconnection via the 2x400kV line between the Varín and Byczyna locations is subject to investigation while the Polish operator processes the need analysis of such interconnection since in the future there is a probable notified reduction of electricity generating capacities on the territory of Poland what shall impact total balance of the Poland regulation area and transmission capacities of cross-border interconnections. Only results of the analysis shall decide on necessity of this interconnection or on time horizon of its construction and thus by 2023 no construction of new international lines between the SR and Poland is considered.

4.3.3 Slovak – Austrian transmission Profile

Historically, the SR followed two projects concerning interconnection of the SR transmission system with the Austrian transmission system. It was interconnection of 2x400kV Stupava – Vienna or Bisamberg and 2x400kV OHL Podunajské Biskupice - Vienna. Both projects were addressed by the Austrian transmission system operator as unfeasible due to nagative influence on environment of the protected territory of Austria under law via which these interconnections should be led. In regard to these interconnections there were initial project documentations elaborated by the SEPS and the required approving opinions of state administration authorities were granted. Due to the above-mentioned reasons and due to failure to meet the obligations by the Austrian transmission system operator, the elaborated projects were cancelled and affirmative opinions expired even after maximum possible extension from the legislative point of view. The implementation of any international interconnection is impossible without the contractual consent and direct cooperation of the concerned foreign partner and since several repeated efforts of SEPS for negotiations on construction of the mentioned lines failed, SEPS does not consider any construction of new international lines between the SR and Austria by the end of 2023.

4.3.4 Slovak – Czech transmission Profile

Considering sufficient existing transmission capacity of the Slovak–Czech profile and considering expected needs of electricity transmission via this profile no construction of any new international lines between the SR and CZ is considered by the end of 2023.

4.3.5 Slovak – Ukrainian transmission Profile

At present, the Slovak republic and Ukraine is interconnected by one simple 400kV line Veľké Kapušany – Mukachevo, the operation of which is considered for approx. further 10 to 15 years when prospectively its reconstruction or doubling is planned. This line belongs among the first lines of the Slovak transmission system the transmission capacity of which is compared to other lines lower since at the time of the transmission system building such volumes of electrcity cross-border as they exist today were not considered. It is a significant cross-border line since it is one of just a few lines interconnecting the EU electricity system with the selected part of Ukrainian electricity system (so

called Burstyn ostrov) which synchronously cooperates with the European interconnected system. The future inevitable solution is replacement of the existing line by a new double 2x400kV line but since the binding opinion of Ukrainian representatives on the common strategic approach towards development of this area was not acquired, no construction of any new international lines between the SR and Ukraine is considered by the end of 2023.

Building of new cross-border lines is conditioned by helpfulness and close cooperation especially of TSO's of the neighbouring transmission systems which in many cases depends on their national energy policies, political decisions, and on the existing condition and planned development of internal parts of electricity systems of the neighbouring countries.

Investment projects to create new capacities or to modernize the TS SR are documented in Table No. 8. The substantial internal and cross-border investment projects are demonstrated in Fig No. 5.

4.4 Investments in the TS SR for the Period 2014 to 2023

Table No. 8 Overview of Investments implementation in the TS SR for the Period 2014 to 2023

Order No.	Investment projects	Start and End Date of Investment Items		Assumed costs [EUR mil.]	Incurred costs by 31.01.2013 [EUR mil.]
Substations - new and reconstruction					
1	Transformation of 400/110kV Medzibrod – reconstruction of S220kV to S400kV – 1st part	2005	2014	30.486	30.075
2	Transformation of 400/110kV Medzibrod - reconstruction of S220kV to S400kV – 2nd part	2008	2014	0.840	0.567
3	Transformation of 400/110kV Voľa – reconstruction of S220kV to S400kV	2007	2014	26.793	9.391
4	Switching station 400kV Gabčíkovo – construction of a new station [**code PCI: E147**]	2008	2017	24.253	1.836
5	Substation of 400kV Bystričany – construction of new S400kV	2014	2019	14.145	
6	Substation of 400kV Horná Ždaňa – extension	2014	2018	3.320	
7	Substation of 400kV Križovany – extension	2014	2018	3.220	
8	Substation of 400kV Lemešany – extension	2023	2023	1.992	
9	Substation of 400kV Rimavská Sobota - extension [**code PCI: E148**]	2017	2018	2.656	
10	Substation of 400kV Veľké Kapušany - extension	2023	2023	3.983	
11	Transport of 1st group of shunt reactors from T401 of ST Lemešany to ST Voľa for T402 and new compensation chokes connected to T401 Voľa	2014	2015	1.554	
12	Additional technological innovation of ST Levice	2015	2015	0.390	
13	Upgrade of ICS of own consumption in ST Križovany	2014	2014	0.010	
14	Splitting automation in ST Veľký Ďur	2015	2015	0.200	
15	Technological unit of TS Východ	2008	2015	1.597	0.126
16	Innovation of ICS facilities for control of S220kV Lemešany	2015	2016	0.500 [1)]	
17	Innovation of border output terminals TG 803	2014	2015	0.382	
18	Innovation of ICS facilities on RKS level for control of S110kV in ST Horná Ždaňa	2014	2015	0.500	
Substations - remote control and transformation TS/DS					
19	Remote control of ST Veľký Ďur	2004	2015	38.858	31.598
20	Remote control and replacement of T404 in ST Podunajské Biskupice	2004	2017	14.367	0.021
21	Remote control and replacement of T402 in ST Rimavská Sobota	2006	2015	18.017	1.384
22	Remote control and supplementation of T402 in ST Stupava	2007	2015	23.725	17.237
23	Remote control and replacement of T401 and T403 in ST Levice	2006	2014	29.715	20.075
24	Remote control and replacement of T401 and T402 in ST Spišská Nová Ves	2006	2019	18.929	0.295
25	Remote control of ST Sučany	2018	2021	9.158	
26	Remote control and replacement of T401 and T402 in ST Liptovská Mara	2014	2022	14.340	
27	Remote control and replacement of T401 and new compensation chokes in ST Varín	2013	2018	17.435	
28	Replacement of T401 and new transformer of VS in ST Moldava	2014	2017	7.100	
29	Replacement of T402 in ST Podunajské Biskupice	2019	2020	5.311	
30	Replacement of T401 and T403 and transformer of VS in ST Horná Ždaňa	2022	2023	10.622	
31	New T401 in ST Bystričany	2022	2023	5.000	
32	Replacement of T401 in ST Stupava	2022	2022	5.311	
Internal electric lines - construction and reconstruction					
33	2x400kV OHL between crossing V409 and V071/072 and ST Voľa	2009	2014	26.023	26.119
34	2x400kV OHLGabčíkovo - Veľký Ďur	2007	2016	72.958	5.198
35	2x400kV OHL Bystričany - Križovany	2014	2019	74.140	0.899

investments to be constructed in the following three years

investments already decided upon by the transmission system operator

other investments to the transmission system modernization

[code PCI: Exxx] PCI projects

Order No.	Investment projects	IPR beginning and end		Assumed costs [EUR mil.]	Incurred costs by 31.12.2013 [EUR mil.]
36	2x400kV OHL Horná Ždaňa - Oslany	2012	2019	34.060	0.746
37	2x400kV OHL Veľké Kapušany – crossing V409 and V071/072	2019	2023	20.627	
38	2x400kV OHL Voľa - Lemešany	2019	2023	33.887	
39	Interconnection of V071 and V285	2013	2014	0.033	
40	Adjustment of ending V492 and V493 to ST Horná Ždaňa	2013	2015	1.283	
41	2x400kV OHL Rimavská Sobota – Medzibrod	2023	2027	169.621 [2)]	
42	Renew insulation and wire replacement V439	2014	2015	4.950	
43	Renew insulation and wire replacement V425	2015	2017	8.000	
44	Renew insulation and wire replacement V424	2016	2018	9.000	
45	Renew insulation and wire replacement V498	2018	2018	1.000	
46	Renew insulation and wire replacement V429	2018	2018	1.000	
47	Renew insulation and wire replacement V448	2019	2019	0.400	
48	Renew insulation and wire replacement V044	2019	2019	0.700	
49	Renew insulation and wire replacement V043	2019	2020	1.500	
50	Renew insulation and wire replacement V496	2019	2020	2.200	
51	Wire replacement V407	2020	2022	8.500	
52	Wire replacement V408	2021	2023	6.000	
Cross-border electric lines – construction					
53	2x400kV OHL Gabčíkovo – border with Hungary [**code PCI: E147**]	2015	2019	20.082	
54	1x400kV OHLRimavská Sobota – border with Hungary [**code PCI: E148**]	2015	2019	21.908	
Electric lines – combined earth wires					
55	CEW/OUC V428 Moldava - Veľké Kapušany	2016	2016	2.490	
56	Replacement of CEW V478	2013	2014	1.750	0.025
57	CEW/OUC V449 Levice - border with Hungary	2013	2014	0.735	0.043
Commercial systems					
58	Completion of the ADCS measurement system	2015	2016	3.985	
59	Innovation of the ADCS system	2014	2020	12.000	
60	Innovation of quality measurement system	2015	2021	6.000	
61	Innovation of measurement technology for cross-border lines	2013	2014	1.492	0.613
62	Upgrade and extension of the PQM central office	2013	2015	2.350	
63	Upgrade of the DaE system	2013	2017	2.945	0.248
64	Innovation of measurement systems	2018	2020	2.000	
65	Supplementation of the ADCS measurement system	2023	2024	4.000 [2)]	
66	Innovation of the commercial measurement information system	2017	2018	1.000	

investments to be made in the following three years

investments already decided upon by the transmission system operator

other investments in the transmission system upgrade

[code PCI: Exxx] PCI projects

Order No.	Investment projects	IPR beginning and end		Assumed costs [EUR mil.]	Incurred costs by 31.12.2013 [EUR mil.]
ICT systems					
67	Innovation of ICS SED	2012	2016	20.018	0.123
68	Renewal of load-bearing telecommunication network of SDH	2016	2017	1.700	
69	Renewal of IP telephony	2014	2014	0.700	
70	Extension of the PM GEO system by new functionalities	2015	2015	0.330	
71	Renewal of facilities F-MUX	2017	2017	1.800	
72	Implementation of security system	2014	2017	1.600	
73	Upgrade of security systems	2014	2017	0.800	
74	Integration of supportive SED systems	2012	2014	1.448	0.912
75	Software for use of data exchange on system deviation of SEPS, a. s. and ČEPS, a. s.	2019	2021	0.524	
TOTAL investment projects				922.246	147.531

investments to be made in the following three years

investments already decided upon by the transmission system operator

other investments in the transmission system upgrade

[code PCI: Exxx] PCI projects

[1)] these costs shall be decided upon only after clarification of future connection of units No. 5 and No. 6 EVO I power plant to TS after shutdown of S220kV Voľa. At present there are negotiations between SEPS, a. s., and SE, a. s.

[2)] the mentioned costs represent total assumed costs, i.e. they include costs incurred after y. 2023, since the beginning of the investment project interferes in the monitored ten-year horizon, however, its completion is considered after y. 2023.

Note:

1. The mentioned investment costs are set up by a qualified estimate while considering the 2013 price level free of inflation impact at the time of incorporation in the investment plan and eventual change of technical solution at the time of investments´ realisation. In case of further TYNDP 2023 processing the investment costs shall be updated.
2. A list of investments in the transmission system for the period 2014 to 2023 fails to consider all SEPS investment needs in the next ten-year horizon but only those investment projects related to ensuring inevitable increase of the existing capacities and necessary upgrade of the main parts of the transmission system.

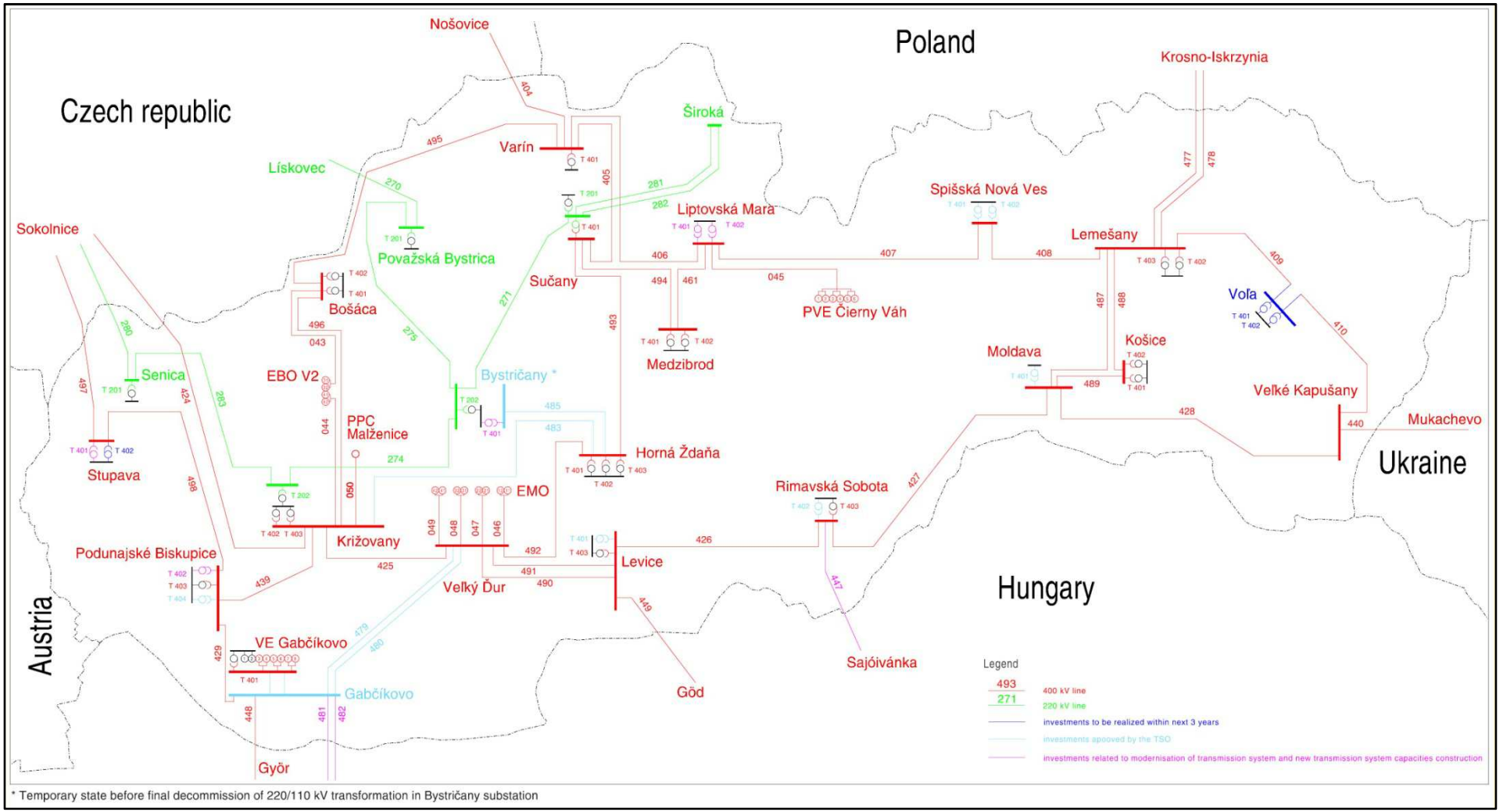


Fig No. 5 Assumed Status of the Transmission System in 2023

5 Conclusion

SEPS created and published this TYNDP 2023 according to the valid legislation of the SR under Art. 28, par. 3, subpar. b), Act No. 251/2012 Coll. on Power Engineering and on amendment and supplementation of some acts. At this preparation it stemmed from the current and expected future condition of offer and demand for the system capacity, from the assumptions of future electricity production, consumption and exchanges with other countries while taking the system development plan for the whole European Union and regional investment plans processed by ENTSO-E association into consideration (in particular the TYNDP ENTSO-E document including the regional plan for the CCE region). Moreover, this TYNDP 2023 stems also from the SEPS Development Programme and from the SEPS respective approved investment plans. All these assumptions and starting points are described and considered in this TYNDP 2023 appropriately to the current knowledge and information available to SEPS as TS SR operator.

This TYNDP 2023 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 as well as 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 development and use of TS SR on the 400kV and 220kV voltage level, the SEPS key decision is building new TS SR facilities only on the 400kV level since TS on the 220kV voltage level due to decommissioning of the nuclear power plant in Jaslovské Bohunice, block V1 (880MW) as well as continual natural termination of other electricity generating units operation on this voltage level (further 440MW in the location of Nováky and Vojany) is not reasonable any more. Due to the mentioned reason, ensuring safe and reliable operation of the 220kV system is ensured only via inevitable maintenance and repair activities up to the moment of its definite decommissioning and liquidation which is planned in the period from 2020 to 2025. It means that gradually with decommissioning and liquidation of parts of 220kV TS these shall not be replaced by similar facilities of the same voltage level but only with 400kV facilities even if based on thorough consideration it is inevitable in terms of TS SR safety and reliability and regarding electricity supply. This state is reflected also in Chapter 4 and in the Ten-Year System Development Plan for the Period 2014 – 2023, when all newly-built TS SR facilities are determined for the 400kV voltage level.

The main SEPS investment projects provided in this TYNDP 2023 are in compliance with the TYNDP ENTSO-E 2012 document which is the last valid and updated system development plan for the entire European Union as well as regional plan for the CCE region. A list of investment projects was based on network calculations according to the ENTSO-E Vision 1 scenario which was publicly consulted with the concerned stakeholders on the ENTSO-E level in the course of its preparation. Apart from network calculations according to the ENTSO-E Vision 1 scenario, in order to confirm the main SEPS investment projects, further network calculations were carried out within processing the SEPS Development Programme for the Period 205 – 2024 with use of the documents from the concerned stakeholders within the SR sent by 30.11.2012 according to the document Technical conditions for access and connection, rules for the transmission system operation.

List of Used Abbreviations

ADCS	-	Automated Data Collection System
BIDSF	-	Bohunice International Decommissioning Support Fund
CCE	-	Continental Central East
CEW	-	Combined earth wire
CZ	-	The Czech Republic
DaE	-	Damas Energy
DS	-	Distribution system
EBO A1	-	Jaslovské Bohunice Nuclear Power Plant, Unit A1
EBO V1	-	Jaslovské Bohunice Nuclear Power Plant, Unit V1
EBO V2	-	Jaslovské Bohunice Nuclear Power Plant, Unit V2
EMO	-	Mochovce Nuclear Power Plant
ENTSO-E	-	European Network of Transmission System Operators for Electricity
ES SR	-	Electricity System of the Slovak Republic
EU	-	European Union
EVO 1	-	Vojany 1 Power Plant
EVO 2	-	Vojany 2 Power Plant
HPP	-	Hydro power plant
HU	-	Hungary
ICS	-	Information Control System
MAVIR	-	Hungarian transmission system operator
MoE SR	-	Ministry of Economy of the SR
NPP	-	Nuclear power plant
NTC	-	Net Transfer Capacity
OUC	-	Optic underground cable
PCI	-	Projects of common interest
PL	-	Poland
PQM	-	Power Quality Meter
PS HPP	-	Pumping storage hydro power plant
RES	-	Renewable energy sources
RgIP	-	Regional Investment Plan
RKS	-	Management and control on the station level
RONI	-	Regulatory Office for Network Industries
S	-	Switching Yard
SDH	-	Synchronous digital hierarchy
SED	-	Slovenský elektroenergetický dispečing
SEPS	-	Slovenská elektrizačná prenosová sústava, a. s.
SR	-	The Slovak Republic
ST	-	Substation
T	-	Transformer
TL	-	Shunt Reactor
TS SR	-	Transmission system of the Slovak Republic
TSO	-	Transmission system operator

TTC	-	Total Transfer Capacity – consisting of NTC and safety margin (TTC = NTC + safety margin)
TYNDP 2023	-	Ten-Year Network Development Plan for the Period 2014 to 2023
TYNDP ENTSO-E	-	Ten - Year Network Development Plan ENTSO-E
UA	-	Ukraine
V	-	Line