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Directorate **No. 29184/06.07.2022**

NOTE
on the Shareholders' General Assembly's approval of
"RET Development Plan 2022 – 2031"

I. General information

"RET development plan 2022-2031" (hereinafter referred to as RETDP) was developed by NPG Co. Transelectrica S.A. in accordance with art. 35 para. (1) and para. (2) of the Law on electricity and natural gas no. 123/2012, with later amendments and additions, according to which:

"(1) At least every two years, the transmission system operator has the obligation to draw up and submit to ANRE a 10-year transmission grid investment and development plan, in accordance with the current state and future evolution of energy consumption and sources, including energy imports and exports, after prior consultation with all stakeholders. The grid development plan shall contain effective measures to ensure the adequacy of the system and the security of power supply. The transmission system operator publishes the 10-year grid development plan on its website.

(2) In particular, the development plan provided in para. (1), must:

a) contain the means of financing and achieving transmission grid investments, also taking into account the plans of exploitation and systematization of the territory crossed by them, while observing environmental standards;

b) indicate to market participants the main transmission facilities that must be built or upgraded in the next 10 years;

c) contain all the investments already established and will identify new investments that must be achieved in the next ten years;

d) provide a timeframe for the achievement of investment projects.

(2^1) When drawing up the 10-year grid development plan, the transmission system operator shall take full account of the potential for the use of dispatchable consumption, energy storage facilities or other resources as an alternative to the system's expansion, as well as expected consumption, trade with other countries and the investment plans regarding the networks within the European Union and regional networks, as well as the targets set by Romania in order to achieve the European Union's global objective.

(3) The plans provided in para. (1) shall be approved by ANRE."

II. Justification

According to the powers and functions established by the Law on electricity and natural gas no. 123/2012, with later amendments and additions, according to the RET Technical Code and the Conditions associated with License no. 161 for the electricity transmission service provision, the system service provision and balancing market administration, with later amendments and additions, NPG Co. Transelectrica S.A. performs the planning activity regarding the development of the Power Transmission Grid (RET).

In this regard, every 2 years, NPG Co. Transelectrica S.A. elaborates a RET Development Plan for the next 10 successive years, a document subject to ANRE approval. In accordance with art. 37, para. (1), let. b) of the Law on electricity and natural gas no. 123/2012, with later amendments and additions, the owner of the transmission grid "finances and/or agrees on the method of financing investments for the power transmission grid, established by the transmission system operator and approved in advance by ANRE, the latter having the obligation to consult both with the TSO and the other stakeholders".

RETDP is a comprehensive presentation of the issues related to the power transmission grid operation, integrated in the context of the National Power System and the electricity market, for electricity market participants, regulators and decision-making bodies in the electricity sector. The paper includes information on the electricity production and consumption sectors, the power transmission grid characteristics and performance, as well as other useful information for assessing existing or potential market opportunities.

RETDP includes refurbishment projects, upgrade of transmission substations, development projects consisting of the construction of new power transmission lines, new transformation units, new substations, IT platforms, data acquisition systems, monitoring, command and control EMS SCADA, etc.

RETDP is based on the analyses performed according to the Procedure on the substantiation and the criteria for approving the investment plans of the transmission system operator and of the electricity distribution operators approved by ANRE Order no. 204/2019, with later amendments and additions.

Also, the elaboration of the RET Development Plan every two years is in accordance with the obligation of NPG Co. Transelectrica S.A. to participate, as a member of the European TSO association ENTSO-E, in the elaboration of the European Development Plan (*Ten Year Network Development Plan*–TYNDP).

The RET Development Plan 2022-2031 was approved internally in CTES Transelectrica on May 5, 2022 and must be sent to ANRE for approval by July 1, 2022.

The RET Development Plan 2022-2031 was submitted for public consultation between May 24 and June 15, 2022, being posted on the website www.transelectrica.ro in the News section.

In the Annex to DECISION no. 2287 of December 9, 2020 on the approval of the Power transmission grid development plan 2020-2029 the following was requested: "The next revision of the RET Development Plan is submitted for approval to the National Energy Regulatory Authority until July 1, 2022".

III. Proposals

In addition to those presented, pursuant to point 4 from the Annex to ANRE Decision no. 2287/09.12.2020, as well as of art. 14, para. 2, letter n) of the Company's Articles of Association, the following is subject to the approval of the Company's Shareholders' Extraordinary General Assembly:

- “RET development plan 2022-2031 - main coordinates” which contains the presentation of the necessary RET development projects and the schedule of their completion in time.

Directorate

Chairman	*Member*	*Member*	*Member*	*Member*
Gabriel ANDRONACHE	**Ștefăniță MUNTEANU**	**Cătălin – Constantin NADOLU**	**Florin – Cristian TĂTARU**	**Bogdan TONCESCU**

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"RET Development Plan 2022 – 2031 – main coordinates"

1. Introduction

In accordance with the competences and attributions established in the Electricity and Natural Gas Law 123/2012, with later amendments and additions, and with the Terms associated to Licence 161 for provision of electricity transmission services, system services and balancing market administration, with later amendments and additions, NPG Co. Transelectrica S.A. performs planning activities regarding the development of the Electricity Transmission Grid (RET).

Every two years, NPG Co. Transelectrica S.A. elaborates a RET development Plan for the following ten successive years, a document submitted to ANRE's approval.

Such biennial elaboration of the RET Development Plan is in agreement with the obligation of NPG Co. Transelectrica S.A. to participate as member in the association of European TSO-s ENTSO-E, and in the elaboration by it, every two years of the European Development Plan *Ten Years Network Development Plan* (TYNDP).

In accordance with article 10 of the Procedure on the foundation and approval criteria of the investment plans of the transmission system operator and of the electricity distribution operators approved by Order 204/2019 of ANRE president:

(1) TSO carries out the following prospective analyses of RET in the short run – for the following 5 years, namely the long term – for the next 10 years, which constitute the basis of the development plan:

- *The current stage and future development of electricity consumption, the structure and capacity of generation sources, including electricity imports and exports, taking into consideration the development forecasts for cross-border exchange capacities – Chapter 5, Annex 2;*
- *RET analysis depending on the age and technical condition of its elements, with details by geographical areas, voltage levels and networks elements - Annex 6, Annex E3;*
- *RET assessment under steady-state stability and transient stability conditions in order to detect the critical network areas and the necessary work to increase operational safety, optimise and render it efficient – Annex 3;*
- *Analysing the power losses in the characteristic segments of the load curve, detecting the critical areas and elements and establishing the measures necessary to reduce them – Annex 3, Chapter 6.3.2;*
- *Assessing the growth potential of energy efficiency within RET, finding measures to improve its energy efficiency, establishing the implementation calendar of such measures - Annex 4;*

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- *Examining the performance level of services according to the indicators provided in specific applicable regulations, detecting the factors of significant influence over it, establishing the necessary measures to improve service performance and to acquire control over the main influencing factors – Annex 6, Annex 7, Chapter 6 ;*
- *Analysing the adequacy of the peak load system in the short-, mid- and long terms by means of methods taking into account the structure of generating capacities and the uncertainty degree induced by the share of available power of generating capacities from renewable sources within the total available power in the entire SEN – Annex 2;*
- *Assessment of RET flexibility – Annex 3 ;*
- *Finding out the RET areas and elements which require investments consisting in modernisation or refurbishment – Annex 6, Annex 7, Chapter 6;*
- *Finding out the network areas where development and extension are necessary – Annex 3, Chapter 6;*
- *Providing the prioritisation of investments by detailing the priority criteria and the kind of analyses used in the execution of chronological development of forecasted investments – Annex 3, Annex 6, Chapter 6;*
- *Evaluating the total value of investments and the level of annual investment expenses, and detecting the financing sources (one's own funds, borrowed sources, financial contributions, revenues from the allocation of cross-border interconnection capacities) – Chapters 7, 8, 9;*
- *Finding out, founding and value estimation of benefits targeted by making the planned investments (e.g. improving the operational safety indicators of RET, the performance indicators, reducing operational and maintenance expenses, reducing OTC, connecting new users, complying with legal obligations, etc.) – Chapter 2, Annex F4, feasibility studies;*
- *Updating the stage of interconnection projects in correlation with the European list of projects of common interest and with the targets assumed at national level with respect to the interconnection degree, European Union-wide - Chapters 2, 6, Annex F3;*
- *Assessing the impact of planned investment expenses over regulated tariffs - Chapter 9.3;*
- *Correlating the 10 years' development plan of the electricity transmission network with similar plans of electricity transmission networks of neighbouring countries as resulting from the cooperation with neighbour TSOs, while pointing out the obligations devolving on TSOs and the positions from the 10 years' development plan of the electricity transmission networks involved in such correlations/cooperations – Chapters 2, 6;*

- *Comparative situations showing the changes from the previous edition of the ANRE-approved plan, with documented justification of each changed objective – Chapter 7, Annex F3;*
- *Monitoring report for the achievement of investments included in the 10 years' development plan of the electricity transmission network approved by ANRE, providing also a value estimation of the delay impact or non-achievement of investments included in the previous edition of the development plan (if applicable, the technical implications that may significantly affect the operating parameters of the RET and/or influence the achievement of ongoing or planned investment projects will also be detailed) – Annex F3, Annex 3,*
- *Plan of maintenance work necessary to provide operational safety of RET or compliance with legal obligations (laws, licence terms, technical norms), also detailing the mode of operation (using one's own teams or third parties); estimating the maintenance costs and the maintenance programme for the network, elaborated in accordance with the provisions of the maintenance regulation – Annex 7;*
- *Analysis of the measures and plans meant to provide cyber security of IT systems – Chapter 6.3.3.*

(2) The 10 years' development plan of the electricity transmission network includes:

- *a brief presentation of the national and European context in the field of electricity transmission, ongoing strategies and policies, the objectives and targets to which the investment projects in the development plan contribute, as well as the principles and methodologies used to develop the development plan, hypotheses and scenarios developed, lines of action - Chapters 4, 5, 2;*
- *the investment works that are necessary in RET during the 10-year perspective period, following the analyses provided in para. (1), the timing of investment projects, the total value and the estimated annual investment expenses for each investment project, highlighting the financing sources (one's own funds, borrowed sources, financial contributions, revenues from the allocation of cross-border interconnection capacities) - Chapters 6, 7, 8, 9;*
- *presentation of the changes in the list of investment projects compared to the previous edition of the 10-year development plan approved by ANRE, with the documented rationale of each modified/eliminated objective - Chapter 7.1;*
- *presentation of the achievement stage of investments included in the previous edition of the 10-year RET development plan approved by ANRE, which includes a value estimation of the delay impact or non-achievement of investments included in the previous edition of the development plan - Chapter 7.1, Annex F3, Annex 3;*
- *investment needs identified during the consultation process carried out by TSO;*

- *presentation and argumentation of the manner of correlation and compliance of the Plan with Romania's Energy Strategy - medium and long term, with the optional 10-year-plan within the Union for the development of the network mentioned in art. 30, para. (1) let. (b) of Regulation (EU) 2019/943 and the National Energy and Climate Plan submitted in accordance with Regulation (EU) 2018/1999, current editions - Chapter 5.*

For each analysis requested according to the Procedure on the substantiation and criteria for approving the investment plans of the transmission system operator and of the electricity distribution operators approved by ANRE President Order no. 204/2019, with later amendments and additions, the chapter or annex within the Development Plan in which the results of the respective analysis were presented was mentioned above.

Following all these analyses the projects were obtained, which were introduced in the Development Plan of RET. A great part of such projects was included in the previous approved editions of the Development Plan; the current edition provides the stage of projects and reconfirms their need. A few of the projects included in previous editions have been excluded and they will be resumed in the future.

2. Comparative analysis of investment projects included in this edition of the 2022 Development Plan compared to the previous edition of 2020

During the time interval elapsed since the approval of the previous Development Plan the following projects were completed:

❖ ***Refurbishment/modernisation of RET:***

- Refurbishing 400/110/20 kV Domnesti substation
- Refurbishing 220 kV Oțelărie Hunedoara substation
- Refurbishing 220/110/ kV Raureni substation
- Replacing autotransformers (AT) and transformers (T) in substations-stage 2-step 2:
  - Replacing AT - 200 MVA in 220/110/20 kV Vetis substation
  - Replacing AT2 - 200 MVA in 220/110/20 kV Cluj Floresti substation
  - Replacing AT - 200 MVA in 220/110/20 kV Ghizdaru substation
  - Replacing AT1, - 200 MVA in 400/220/110/20 kV Urechesti substation
  - Replacing AT2 - 200 MVA in 220/110/20 kV Turnu Magurele substation
  - Upgrading 110 kV Bacau Sud and Roman Nord substations belonging to the 400 kV Moldavia Axis
  - 110 kV, 220 kV and 400 kV mobile bays;
  - Replacing 3 BC 100MVAr400 kV units in Arad, Smârdan, București Sud substations.

❖ ***Safe supply of consumption:***

- Installing Trafo T3-250 MVA (400/110 kV) in 400/110 kV Sibiu Sud substations
- Replacing AT3-ATUS FS 400/400/160 MVA 400/231/22 kV in 400/220 kV Portile de Fier substation
- Installing second AT 400/220 kV, 400 MVA, in Iernut substation;

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- ***Integration of production from new plants-Dobrogea and Moldavia***
  - Connecting 400 kV OHL Isaccea - Varna and 400 kV OHL Isaccea - Dobrudja in 400 kV Medgidia Sud substation. Stage I – Extending the 400 kV Medgidia Sud substation
- ***Increasing the interconnection capacity and integrating RES production:***
  - *400kV OHL Oradea-Nădab*

The following new investment projects have been introduced in the current edition of the Development Plan:

- ***Refurbishment/modernisation of RET:***
  - Refurbishing 400/110 kV Darste substation
  - Modernisation of the protectioncommand-control system in the 220/110/20 kV Gheorgheni substation
  - Optimising voltage control and the electricity quality parameter by installing FACTS-type equipment in Gutinaș, Suceava and Roșiori substations (CARMEN project)
  - "Pilot project - Refurbishment of the 220/110/20 kV Mostistea substation as a digital substation with low environmental impact" - DigiTEL Green
- ***Safe supply of consumption:***
  - 220/110kV injection substation from 220kV OHL Baia Mare Iernut in RED (power distribution network)
  - 400/110kV Bistrita 400kV OHL injection substation Suceava - Gadalin in RED
  - Transformer 400/110kV Calea Aradului
- ***Integration of production from new plants-Dobrogea and Moldavia***
  - Increasing the transmission capacity of 220kV OHL Gutinas-Dumbrava
  - Increasing the transmission capacity of 220kV OHL Dumbrava-Stejaru
  - Increasing the transmission capacity of 220kV OHL Fantanele-Ungheni
  - Increasing the transmission capacity of 400 kV OHL Bucuresti Sud-Gura Ialomitei
  - Installing transformer 3 new 400/110 kV Medgidia Sud
  - Installing transformer 3 new 400/110 kV Smardan
  - Equipping circuit 2 for the new 400 kV OHL Smardan-Gutinas
  - Installing new transformer 400/110kV Medgidia Sud
  - Installing new transformer 400/110kV Smârdan
  - Power flow control devices
  - Modern means of voltage control (SVC)

The exact location and sizing of SVC equipment and power flow control devices will be established through dedicated studies.

- ***Integration of production from plants – other areas:***
  - Reconductoring 220 kV OHL Turnu-Magurele-Ghizdaru
  - Reconductoring 220 kV OHL Turnu-Magurele-Craiova Nord
  - Reconductoring 220 kV OHL d.c. București Sud-Ghizdaru
  - Installing additional AT 220/110 kV in Stupărei substation

- ***Increasing the interconnection capacity and integrating RES production***
  - Reconductoring 220 Kv OHL Portile de Fier- Resita
  - Installing optical fiber on 400 kV OHL Isaccea – Vulcanesti
  - Installing a fiber-optic-embedded protective conductor on 400 kV OHL Roșiori - Mukacevo

Compared to the approved edition of the Plan, the following investment projects have been excluded in the current edition:

- Replacement of AT 1 Arefu 220/110 kV, AT Stupărei 220/110 kV – it will be introduced in future editions of the Plan

The Romania-Georgia submarine cable project was introduced in the category of projects that are not included in the Development Plan, but may be included depending on the confirmation of the necessary decision stages at the level of stakeholders.

Annex F-3 presents a comparative analysis of the projects in the RET Development Plan-edition 2022-2031 compared to the previous edition of the approved Plan, which presents specific information to each project regarding the following aspects: implementation phase, stage of each project, the reasons for any delays in commissioning compared to the scheduled period.

3. Description of RET development projects included in the RET Development Plan for 2022 - 2031

In order to maintain the network adequacy so that it can be properly sized for electricity transmission of the output forecasted to be generated, imported, exported and transited two categories of investments have been included in the RET ten years' Development Plan and they will be carried out as follows:

- Refurbishing the existent substations;
- Extending RET by building new electric substations and lines, increasing the transmission capacity of existing lines, extending the existent substations and increasing the transformer capacity of substations.

❖ **Refurbishment and modernisation of existent substations**

Electric lines and substations providing the national transmission system were in the main built in the 1960-s ÷ 1980-s, with the technological knowledge of such time period.

The actual technical condition of installations has been maintained to date to a proper level both by means of the maintenance plan applied and by a sustained refurbishment and upgrade programme for installations and equipment.

The analysis of the technical condition of the Electric Transmission Networks is presented in Annex 6.

In the following ten years ongoing refurbishment project will be completed and new projects will be initiated, observing the priority based on technical condition and substation importance.

- Replacing AT and T in substations-stage 2-step 2:
  - AT 220/110 kV 200 MVA: AT1 Alba Iulia, AT1 Baia Mare 3, AT3 Târgoviște.
  - Trafo 110/20 16 MVA: T4 Suceava, T4 Oradea Sud, T1 andT2 FAI.
- Replacing AT and T in substations-stage 3:
  - AT 220/110 kV 200 MVA: Tg.Jiu Nord, Sărdănești, Suceava, Dumbrava, Grădiște (AT2); FAI (AT 2).
  - AT 220/110 kV 100 MVA Tihău;
  - Trafo2 110/20 kV 40 MVA in Tg.Jiu Nord substation and Trafo2 110/10 kV 40 MVA in Cluj Est substation;
  - Trafo 110/20 kV 25 MVA: T1 and T2 in Cluj Florești substation, T2 in Sălaj substation, T2 in Câmpia Turzii substation, T1 in Turnu Severin Est substation;
  - Trafo 110/20 kV 20 MVA in Turnu Severin Est substation;
- Refurbishing 220/110/20 kV Ungheni substation;
- Upgrading 220/110/20 kV Arefu substation;
- Upgrading 220/110 kV Râureni substation;
- Upgrading 220/110 kV Dumbrava substation;
- Refurbishing 400/110 kV/m.t. Smârdan substation;
- Refurbishing 220/110 kV Craiova Nord substation;
- Refurbishing 220/110 kV/MT Baru Mare substation;
- Refurbishing 220/110 kV Iaz substation;
- Refurbishing 220/110 kV Hăşdat substation;
- Refurbishing 220/110 kV Fileşti substation;
- Upgrading 400 (220)/110/20 kV Munteni substation;
- Pilot project - Refurbishment of the 220/110/20 kV Alba Iulia substation as a digital substation (DigiTEL Alba Iulia pilot project);
- Refurbishing 110/20 kV Medgidia Sud substation;
- Refurbishing 400 kV Isaccea (Etapa II) substation;
- Refurbishing 400/110 kV Pelicanu substation;
- Upgrading 110 and 400 (220) kV facilities in Focșani Vest substation;

- Refurbishing 400/110 kV Darste substation;
- Upgrade of command-control-protection-metering system 220 kV, 110 kV in the 220/110/20 kV substation and the refurbishment of medium voltage and internal services d.c. and a.c. in the 220/110/20 kV Ghizdaru substation; Upgrade of command-control-protection-integration in CTSI of Drăgănești Olt substation;
- Upgrade of command-control-protection-integration system in CTSI of Grădiște substation;
- Upgrading 220/110/20 kV Vetiş substation - primary equipment
- Upgrading 220/110/20kV Fântânele substation;
- Upgrading 220/110 kV Calafat substation;
- Upgrading SCADA in 400/110/20 kV Oradea Sud substation;
- Upgrading/replacing command-control-protection system in the following substations: 400/220 kV Roșiori, 220/110/20 kV Sălaj, 220/110 kV Baia Mare 3, 220/110 kV Cluj Floresti, 400 kV Țânțăreni, 220/110 kV Paroșeni , 220/110 kV Pestiș, 400 kV Calea Aradului, 400/220/110 kV Mintia, 220/110/20 kV Târgoviște, 400 kV Cernavodă, 400/110/20kV Sibiu Sud, 220/110/20 kV Gheorgheni, 400kV Gădălin.
- Upgrading power supply at UNO DEN headquarters
- Installing two modern means of netting reactive power in the 400/220/110/20 kV Sibiu Sud and 400/220/110/20 kV Bradu substations;
- Acquisition and installation of 21 monitoring systems for the transformer units in Transelectrica substations (DigiTEL Trafo Expert Project)
- Upgrading 400/220/110 kV Urechești substation
- Replacement of Transformer no. 4 - 250 MVA, 400/110 kV in 400/110 KV Draganesti Olt substation
- Replacement of Trafo 1 and Trafo 7 Cluj Est substation
- Replacement of Trafo 2 400/110 kV Smardan substation
- Replacement of T1 and T2 transformer 400/110 kV Constanta Nord substation
- Acquisition and installation of a 100MVAr shunt reactor in 400kV Portile de Fier substation
- Optimising voltage control and the electricity quality parameter by installing FACTS-type equipment in Gutinaș, Suceava and Roșiori substations
- Optimising the operation of the existing 400 kV OHLs in SEN used in interconnection, for power discharge from Cernavoda NPP and renewable energy plants in Dobrogea, by installing on-line monitoring systems (DigiTEL Smart Lines Project)
- Increasing operational and maintenance security in Domneşti substation by using digital technologies (DigiTEL Smart Vision pilot project)
- “Pilot project - Refurbishment of the 220/110/20 kV Mostistea substation as a digital substation with low environmental impact” - DigiTEL Green

❖ **<u>Increasing cross-border interconnection capacity</u>**

➢ *Increasing the exchange capacity on the <u>western interface of Romania</u>* the following network developments are planned:

Taking into account the contribution to the implementation of the European Union's strategic priorities for the trans-European energy infrastructure the European Commission approved the following group of projects in the fifth list of Projects of Common Interest (PCI):

- PCI "Romania–Serbia Group, between Resita and Pancevo", known as "Mid Continental East corridor", which includes the following projects of common interest:
  - The 400 kV double circuit OHL Resita (RO) - Pancevo (Serbia);
  - The 400 kV OHL Portile de Fier-Resita and extending the 220/110 kV substation Resita by building the new 400 kV substation;
  - Converting the 220 kV double circuit OHL Resita-Timisoara-Sacalaz-Arad to 400 kV, including construction of the 400 kV substations Timisoara, Arad & Sacalaz.

The following projects are also included:

- Equipping circuit 2 of the 400 kV OHL Nadab-Bekescsaba (the section between the new 400 kV Graniceri substation connecting Arad and Nădab photovoltaic power plants);
- The 400 kV OHL Portile de Fier - Djerdap OHL circuit 2, resulting from the long-term analyses of ENTSO-E;
- RO-HU interconnection (new 400 kV OHL Oradea-Jozsa, new 400/220 kV AT Rosiori, new 400/220 kV AT Resita, remaking the conductors of the 220 kV axis Urechesti-Tg. Jiu Nord-Paroseni-Baru Mare-Hasdat) – resulting from the long-term analyses of ENTSO-E.

➢ *Increasing the exchange capacity on the southern interface of Romania (border with Bulgaria) for power transmission from intermittent renewable sources installed on the Black Sea coast towards consumption and storage centres; here the following network developments are planned:*

- "Black Sea corridor" cluster, including the following projects:
  - The 400 kV double circuit OHL (1 c.e) Smardan-Gutinas;
  - The 400 kV double circuits OHL Cernavoda–Stalpu, with input/output circuit in Gura Ialomitei.

➢ *Increasing the exchange capacity on the interface with the Republic of Moldova:*

- 400 kV simple circuit OHL Suceava (RO)-Bălţi (RM)
- 400 kV s.c. OHL Gădălin - Suceava (new OHL)
- Installing optical fiber on 400 kV OHL Isaccea – Vulcanesti

➢ *For the interconnection with Ukraine:*

- Installing a fiber-optic-embedded protective conductor on 400 kV OHL Roșiori - Mukacevo

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The next edition of the Development Plan will introduce the conversion to 400kV of the OHL Isaccea – Ucraina Sud (via Primorska), a project promoted on the list of the energy community as a project of mutual interest.

❖ **Increasing the transmission capacity between the eastern area (especially Dobrogea) and the remaining interconnected power system and system integration of the power generated from RES and other sources in Dobrogea**

In order to enhance the transmission capacity in Dobrogea to the rest of the system several projects were planned to consolidate the transmission network.

- Input/output connection of the 400 kV OHL Stupina-Varna and the 400 kV OHL Rahman-Dobrudja in the 400 kV substation Medgidia Sud (stage I Extension of the 400 kV Medgidia Sud substation and stage II implementing connections);
- 400 kV s.c. OHL Gădălin-Suceava;
- 400 kV d.c. OHL (1 c.e) Stâlpu-Braşov;
- Converting to 400 kV Brazi Vest - Teleajen - Stalpu OHL, including: Acquisition of AT4 400 MVA, 400/220/20 kV Brazi Vest, and extension works of the corresponding 400 kV and 220 kV substations, in the 400/220/110 kV Brazi Vest substation, construction of 400 kV Teleajen substation and refurbishment of the 110 kV substation 400 kV d.c. OHL (1 c.e) Medgidia Sud-Constanţa Nord;
- Increasing the transmission capacity on the 8 km section with a smaller section on the 400 kV OHL Bucuresti Sud - Pelicanu;
- Increasing the transmission capacity on the 53 km section with a smaller section on the 400 kV OHL Cernavoda - Pelicanu.
- Transition of the 400 kV OHL Isaccea-Tulcea Vest from single circuit to double circuit.
- Increasing the transmission capacity of 220kV OHL Gutinas-Dumbrava
- Increasing the transmission capacity of 220kV OHL Dumbrava-Stejaru
- Increasing the transmission capacity of 220kV OHL Fantanele-Ungheni
- Increasing the transmission capacity of 400 kV OHL Bucuresti Sud-Gura Ialomitei
- Installing transformer 3 new 400/110 kV Medgidia Sud
- Installing transformer 3 new 400/110 kV Smardan
- Equipping circuit 2 for the new 400 kV OHL Smardan-Gutinas
- Installing new transformer 400/110kV Medgidia Sud
- Installing new transformer 400/110kV Smârdan
- Power flow control devices
- Modern means of voltage control (SVC)

❖ **Integrating into SEN the output generated by other power plants**

The following work is scheduled:

- For safe discharge of power from HPP Portile de Fier II an agreement was made with Co. Hidroelectrica SA to discharge at 220 kV by building the 220 kV substation Ostrovul Mare and the 220 kV double circuit OHL, connection Ostrovul Mare into the 220 kV OHL Portile de Fier - Cetate.

The following projects have been introduced for power discharge from PPP in the south of the country:

- Reconductoring 220 kV OHL Turnu-Magurele-Ghizdaru
- Reconductoring 220 kV OHL Turnu-Magurele-Craiova Nord
- Reconductoring 220kV d.c. OHL București Sud-Ghizdaru
- Installing additional AT 220/110kV in Stupărei substation

❖ **Safe supply of consumption**

- Increasing the operational safety of the network area Arges-Valcea by building a new 400 kV substation Arefu, 400/220 kV 400 MVA 1 AT and connection into the 400 kV OHL Tantareni-Sibiu Sud by means of a 400 kV double circuit OHL of about 0.05 km.
- Installing a new 220/110 kV 400 MVA autotransformer in the 220/110 kV substation Fundeni, increasing the safe supply of consumers in the north-eastern area of Bucharest City connected in the 220/110/10 kV substation Fundeni;
- Installing a new 400/110 kV 250MVA transformer in the 400/220/110 kV substation Bucharest Sud, increasing the safe supply of consumers in the southern area of Bucharest City connected in the 400/220/110/10 kV substation Bucharest Sud.
- The 400/110 kV substation at Grozavesti connected by the 400 kV UPL with the 400 kV substations Bucharest Sud and Domnesti and two 100 MVAr shunt reactors installed at 400 kV in the 400 kV substation Grozavest,
- The 400/110 kV substation at Fundeni connected also by the new 400 kV OHL FundeniBrazi Vest and input-output in the 400 kV OHL Bucharest Sud-Gura Ialomitei by the 400 kV double circuit OHL and installing a 100 MVAr shunt reactor in the new 400 kV substation.
- 220/110kV injection substation from 220kV OHL Baia Mare Iernut in RED (power distribution network)
- 400/110kV Bistrita 400kV OHL injection substation Suceava - Gadalin in RED
- Transformer 400/110kV Calea Aradului

Projects in the RET Development Plan for 2022-2031 and planning their achievement in time is provided in table 1:

Table 1

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ANNEX F-2

RET 2022-2031 Refurbishment and development projects

[RON mn]

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
A	REFURBISHMENT OF EXISTING RET													
2	AT and Transformer replacements in substations (stage 2), of which: phase 2 (8 AT 200 MVA; 4 Transformer 16 MVA)													
2.1	8 pcs. AT 220/110 kV in the substations: Targoviste, Baia Mare 3, Alba Iulia, Cluj Floresti, Ghizdaru, Turnu Magurele, Urechesti, Vetis													
2.2	4 pcs. 110/20 kV transformer in the substations: Suceava, FAI (2 pcs.),													
3	AT and Transformer Replacements in substations (Stage 3) 7 AT & 8 T													
3.1	7 AT 220/110 kV in the substations: Gradiste, Suceava, FAI, Dumbrava, Tg. Jiu Nord, Sardanesti, Tihau.													
3.2	8 110/20 kV transformers in substations: Tn. Severin Est (2 pcs.), Cluj Floresti (2 pcs.), Salaj, Campia Turzii, Cluj Est, Tg. Jiu North.													
4	Refurbishment of the 220/110/20 kV Ungheni substation													
5	Modernization of the 220/110/20 kV Arefu substation													
6	Modernization of the 220/110 kV Raureni substation													
7	Modernization of the 220/110 kV Dumbrava substation													
8	Refurbishment of the 400/110/20 kV Smârdan substation													
9	Refurbishment of 220/110 kV Craiova Nord substation													
10	Refurbishment of the 220/110 / MT kV Baru Mare substation													
11	Refurbishment of 220 / 110 kV Iaz substation													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
12	**Refurbishment of 220 / 110 kV Hăşdat substation**													
13	**Refurbishment of 220 kV Oțelarie Hunedoara substation**													
14	**Refurbishment of 220 / 110 kV Fileşti substation**													
15	**Modernisation of 400 (220) / 110 / 20 kV Munteni substation**													
16	**Pilot Project - Refurbishment of the 220/110/20 kV Alba Iulia substation as a digital substation**													
17	**Refurbishment of the 110 kV Medgidia Sud substation**													
18	**Modernization of the 110 kV Bacau Sud and Roman Nord substations related to the 400 kV Moldavia axis**													
19	**Isaccea 400 kV substation refurbishment (stage II - 400 kV substation refurbishment)**													
20	**Refurbishment of the 400/110 kV Pelicanu transformer substation**													
21	**Modernization of the 110 and 400 (220) kV facilities from Focșani Vest substation**													
22	**Re-engineering of the 400/110 kV Dârste substation**													
23	**Modernization of the command-control-protection-metering system 220 kV, 110 kV in the 220/110/20 kV substation and the refurbishment of medium voltage and internal services d.c. and a.c. in the 220/110/20 kV Ghizdaru substation**													
24	**Modernization of the command-control-protection system and integration in CTSI of the Draganesti-Olt substation**													
25	**Modernization of the command-control-protection system and integration in CTSI of the Gradiste substation**													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
26	Modernization of the 220/110/20 kV Vetiş substation - primary equipment													
27	Modernization of the 220/110/20 kV Fântânele substation													
28	Modernization of 220/110 kV Calafat substation													
29	SCADA modernization in the 400/110/20 kV Oradea Sud substation													
30	Modernization of the command-control-protection system in the 400/220 kV Rosiori substation													
31	Modernization of the command-control-protection system in the 220/110/20 kV Salaj substation													
32	Modernization of the command-control-protection system in the 220/110 kV Baia Mare 3 substation													
33	Modernization of the command-control-protection system in the 220/110 kV Cluj Floresti substation													
34	Modernization of the command-control-protection system in the 400 kV Tantareni substation													
35	Modernization of the command-control-protection system in the 220/110 kV Paroseni substation													
36	Modernization of the command-control-protection system in the 220/110 kV Pestis substation													
37	Modernization of the command-control-protection system in the 400 kV Calea Aradului substation													
38	Modernization of the command-control-protection system in the 400/220/110 kV Mintia													
39	Modernization of the protection control command system in the 220/110 / 20kV													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
40	Modernization of command-control-protection in Cernavoda 400 kV substation													
41	Modernization of the command-control-protection system in the 400/110/20 kV Sibiu Sud substation													
42	Modernization of the command-control-protection system in the 220/110/20 kV Gheorgheni substation													
43	Power supply modernization at UNO DEN headquarters													
44	Installation of two modern means of netting reactive power in the 400/220/110/20 kV Sibiu Sud and 400/220/110/20 kV Bradu substations													
47	Acquisition and installation of 21 monitoring systems for the transformation units from CNTEE Transelectrica stations													
48	Modernization of the 400/220/110 kV Urechești substation													
49	Transformer replacement no. 4 - 250 MVA, 400/110 kV and 400/110 KV substation Draganesti Olt													
50	Replacement of Trafo 1 and Trafo 7 Cluj Est station													
51	Modernization of the command-control-protection system in the 400 kV Gadalin substation													
52	Replacement of Transformer 2 400 / 110kV Smardan substation													
53	Replacement of T1 and T2 400 / 110kV Constanta Nord													
54	Acquisition and installation of a 100MVAr shunt reactor in the 400kV Portile de Fier substation													
55	Optimization of voltage control and electricity quality parameter by installing FACTS equipment in Gutinaș, Suceava and Roșiori substations													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
56	Optimization of the operation of the existing 400 kV OHL in SEN used in interconnection, for power discharge from Cernavoda NPP and renewable power plants from Dobrogea, by installing on-line monitoring systems													
57	DigiTEL Green pilot project - Refurbishment of the 220/110/20 kV substation Mostistea in concept of digital substation and with low impact on the environment													
B	OTHER INVESTMENTS AT BRANCH AND EXECUTIVE LEVEL (planned annually)													
C	POWER CONSUMPTION SUPPLY SAFETY													
1	T3 transformer installation - 250 MVA (400/110 kV) in the 400/110 kV Sibiu Sud substation													
2	AT2 Iernut - 400 MVA, 400/220 k + B83: B92V Installation of AT2 400 MVA, 400/231/22 kV as well as the related bays in the Iernut substation and modernization of the command-control system of the 400/220/110/6 kV substation Iernut													
3	Replacement AT3-ATUS-FS 400/400/160 MVA 400/231/22 kV from the 400/220 kV substation Portile de Fier													
4	Increasing the operational safety of the Argeș-Vâlcea network area, the construction of the 400 kV Arefu substation and the installation of an AT 400 MVA, 400/220 kV.													
5	Increasing the degree of safety in the supply of consumers in the northeastern part of Bucharest connected to the 220/110/10 kV Fundeni substation													
6	Construction of a new 400 / 110kV Grozavesti substation and two 100MVAr shunt reactors + UPC 400 kV s.c. Domnesti - Grozavesti + UPC 400 kV s.c. Bucuresti Sud-Grozavesti													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
7	**Construction of a new 400 / 110kV Fundeni substation and a 100MVAr shunt reactor + 400kV OHL Fundeni-Brazi Vest + 400kV OHL connection Bucuresti Sud-Gura Ialomitei input-output in the 400kV Fundeni substation**													
8	**Increasing the degree of safety in the supply of consumers in the southern area of Bucharest connected to the 400/220/110/10 kV Bucuresti Sud substation**													
9	**220 / 110kV OHL injection substation 220kV Baia Mare Iernut in PDG (Dej or Cuzdrioara)**													
10	**400 / 110kV substation 400kV OHL Bistrita injection Suceava - Gadalin in PDG**													
11	**400 / 110kV transformer Calea Aradului**													
D	**INTEGRATION OF PRODUCTION FROM SRE AND NEW POWER PLANTS - DOBROGEA AND MOLDAVIA**													
1.1	**Connection of 400 kV OHL Stupina - Varna and 400 kV OHL Rahman - Dobrudja in Medgidia Sud 400 kV substation. Stage I - Extension of the 400 kV substation Medgidia Sud**													
1.2	**Connection of 400 kV OHL Stupina-Varna and 400 kV OHL Rahman - Dobrudja in Medgidia Sud 400 kV substation. Stage II - OHL 400 kV d.c. Connections to Medgidia Sud substation**													
2	**Switching to 400 kV OHL Brazi Vest - Teleajen - Pillar, including: Acquisition of AT 400 MVA, 400/220/20 kV and extension works for the corresponding 400 kV and 220 kV substations, in the 400/220/110 kV Brazi Vest substation**													
2.1	**400 kV OHL Brazi Vest - Teleajen - Stalpu**													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
2.2	Extension of Brazi Vest substation (including AT4)													
2.3	400 kV substation Teleajen and 110 kV substation refurbishment													
3	400 kV d.c. OHL (1c.e) Constanta Nord - Medgidia Sud													
4	Transition of the 400 kV OHL Isaccea - Tulcea Vest from single circuit to double circuit													
5	Increasing the transmission capacity of the 220 kV OHL Stejaru -Gheorgheni - Fantanele													
6	400 kV OHL Stalpu - Brasov, including interconnection to SEN (new line)													
7	Increasing the transmission capacity of the 400 kV OHL section Bucuresti Sud - Pelicanu (8 km)													
8	Increasing the transmission capacity of the 400 kV OHL Cernavoda - Pelicanu (53 km)													
9	Increasing the transmission capacity of 220 kV OHL Gutinas-Dumbrava													
10	Increasing the transmission capacity of the 220 kV OHL Dumbrava-Stejaru													
11	Increasing the transmission capacity of the 220 kV OHL Fantanele-Ungheni													
12	Increasing the transmission capacity of the 400 kV OHL Bucharest Sud-Gura Ialomitei													
13	Installation of 3 new 400 / 110kV Medgidia Sud transformers													
14	Installation of 3 new 400 / 110kV Smardan transformers													
15	Equipping circuit 2 for the new 400kV Smardan-Gutinas OHL													
16	Power flow control devices (smartwires)													
17	Modern means of voltage control (SVC)													
E	INTEGRATION OF POWER PLANT PRODUCTION - OTHER AREAS													
1	Ostrovu Mare 220 kV substation (new substation)													
2	220 kV OHL Ostrovu Mare - RET (new line)													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
3	220kV OHL reconductoring Turnu Magurele-Ghizdaru													
4	220kV OHL reconductoring Turnu Magurele-Craiova Nord													
5	220kV OHL reconductoring Bucuresti Sud-Ghizdaru													
6	Installation of new AT 220 / 110kV Stuparei													
F	INCREASING INTERCONNECTION CAPACITY													
1	Switching to the 400 kV voltage of the Portile de Fier - Resita - Timisoara - Sacalaz - Arad axis. Stage I: Extension of the 400 kV Portile de Fier substation; OHL 400 kV Portile de Fier - Resita; 400 kV substation Resita													
1.1	OHL 400 kV Portile de Fier - Resita													
1.2	400 kV Resita substation													
2	Switching to the 400 kV voltage of the Portile de Fier - Resita - Timisoara - Sacalaz - Arad axis. Stage II: 400 kV d.c. OHL Resita - Timisoara - Sacalaz + 400 kV substation Timisoara + 110 kV substation Timisoara													
2.1	Refurbishment of the 110 kV Timișoara substation and the transition to the 400 kV voltage of the Porțile de Fier - Anina - Reșița - Timișoara - Săcălaz - Arad axis, stage II: Timișoara 400 kV substation													
2.2	LEA 400 kV d.c. Resita - Timisoara - Sacalaz													
3	Switching to the 400 kV voltage of the Portile de Fier - Resita - Timisoara - Sacalaz - Arad axis. Stage III: LEA 400 kV d.c. Timisoara - Sacalaz - Arad + 400/110 kV substation Sacalaz + 400 Arad													
3.1	400 kV d.c. OHL Timisoara - Arad													
3.2	Sacalaz 400 kV substation and Sacalaz 110 kV substation refurbishment													
3.3	Extension of the 400 kV Arad substation and refurbishment of the 110 kV Arad substation													
4	400 kV d.c. OHL (1c.e) Gutinas - Smardan													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
5	Extension of the 400 kV Cernavoda substation, et. II: connection of new lines													
6	400 kV d.c. OHL Cernavoda - Stalpu and connection in Gura Ialomitei substation (new line)													
7	Extension of the 400 kV Gura Ialomiţei substation with two cells: Cernavoda 3 400 kV OHL and 400 kV Stâlpu OHL													
8	400 kV Stalpu substation (new substation) + 110 kV and medium voltage bay modernization													
9	400 kV s.c. OHL Gădălin - Suceava (new OHL)													
10	400 kV s.c. OHL Suceava - Balti (new OHL - for the section on the territory of Romania) *)													
11	400 kV s.c. OHL Oradea Sud - Nadab - Bekescsaba, final stage: the section between towers 1-42 (48) of the 400 kV OHL Oradea Sud - Nădab													
12	OHL 400kV Iron Gates - Djerdap circuit 2													
13	Achievement of OHL 400kV Nadab-Graniceri circ.2 and related works in the 400kV Nadab substation													
14	RO-HU interconnection (400kV OHL Oradea-Jozsa, new AT Rosiori, new AT Resita, 220 kV axis reconductoring Urechesti-Tg. Jiu Nord-Paroseni-Baru Mare-Hasdat)													
14.1	400 kV OHL Oradea-Jozsa													
14.2	Installation of new 400/220 kV AT in Rosiori substation													
14.3	Reconductoring the 220 kV axis Urechesti-Tg. Jiu Nord-Paroseni- Baru Mare-Hasdat													
15	Installation of a protective fiber optic embedded conductor on the 400 kV OHL Roșiori - Mukacevo													
16	220kV OHL Reconductoring of Portile de Fier - Resita													
17	Fiber optic installation on 400 kV OHL Isaccea - Vulcanesti													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
G	Hardware replacement, updating and development of specific applications of the Balancing Market Platform - II DAMAS													
H	Metering and data management system for electricity metering on the wholesale market													
I	Power Quality Monitoring System (PQMS)													
J	INFORMATION AND TELECOMMUNICATION SYSTEMS MANAGEMENT													
	Consolidation of servers and data storage network (Private cloud) + Private cloud extension													
	Computing													
	Modernization of the electronic messaging system within NPG Cp. Transelectrica S.A.													
	SDH equipment NE ring													
	Upgrade and update existing antimalware solution and support services													
	Customer Premises Equipment (CPE) Routing Equipment													
	Wi-Fi system, own network access and internet													
	Web Portal													
	Other expenses													
	Back up store system													
	Development of IT&C capabilities of NPG Co. Transelectrica S.A. - Infrastructure, Processes, Competences													
K	CRITICAL INFRASTRUCTURE													

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
L	OTHER INVESTMENT EXPENSES													
1	Operational headquarters DET Craiova													
	Total UEFA													
M	Independent facilities													
	Vehicles (48 pcs)													
5	Technological equipment													
	VRF / VRV type air conditioning installations for office spaces within UNO DEN located in Hristo Botev Blvd. no. 16-18													
	UNO DEN heating system (1pc)													
	Air conditioning in UNO DEN server rooms													
	TOTAL SECTION I													

*) the annual estimation of works and expenses will be made only after the official approval of the financing by the Republic of Moldova

SECTION II - Investments not included in the Plan; they will be included depending on the confirmation of the necessary decision stages at stakeholder level

No.	Project name	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2020-2029
II a	TOTAL - Investments for connecting pumped storage hydroelectric power plant Tarnita												
1	400 kV d.c. OHL Tarnita - Mintia												
2	400 kV d.c. OHL Tarnita - Gadalin												
3	400 kV Tarnita substation												
II b	Romania-Georgia submarine cable												
II c	New headquarters of NPG Co. TranselectricaS.A.												

No.	Project	Estimated value	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total 2022-2031	Past expenses
TOTAL Section II														
TOTAL Section I + Section II														

E = investment in essential fixed assets
N = investment in necessary fixed assets

Land acquisition, studies, authorizations
Execution

Preşedinte
Gabriel ANDRONACHE

Membru
Florin – Cristian TĂTARU

Membru
Cătălin Constantin NADOLU

Membru
Ștefăniță MUNTEANU

Membru
Bogdan TONCESCU

Director UMA
Cosmin Mihai MONAC

Director DEMDRET
Daniel BALACI

Manager DDRET
Daniela BOLBORICI