Integrating RES in the Electricity Networks and Balancing Mechanism

The case of North Macedonia

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Renewable energy is energy **generated from natural resources, with technologies ranging from solar, wind, hydro, biomass and biofuels.**

Why Renewable Energy?

- because of the desire and necessity to avert irreversible climate damage,
- not hazardous to the environment,
- is obtained from sources that are essentially inexhaustible

The production of electricity from renewable energy sources is unstable on annual level!

In the Republic of North Macedonia, the percentage of the renewable energy sources participating in the gross-final consumption of energy by the end of 2020, should be 23 %.

Innovation

Efficient energy management

Competition

Solid regulation

Portfolio of electricity produces from RES in the Republic of North Macedonia:

- Large Hydro Power Plants (HPP),
- Small sized Hydro Power Plants (SHPP) with installed capacity lower than 10 MW,
- Wind Power Plants (WPP),
- Photovoltaic Power Plants (PVPP),
- Biogas Thermal Power Plants (BGPP), and Biomass Thermal Power Plants

Type of Power Plant	Number of PP	Installed capacity (MW)	Production (GWh)
Total	295	779,96	1.498
HPP	10	586,65	1.003
WPP	1	36,80	117
Small HPP	107	119,2	284
PVPP	173	29,72	37
Biogas	3	6,99	57
Biomass	1	0,60	0

Table 1. Installed capacity and production of electricity in 2020 according to technology

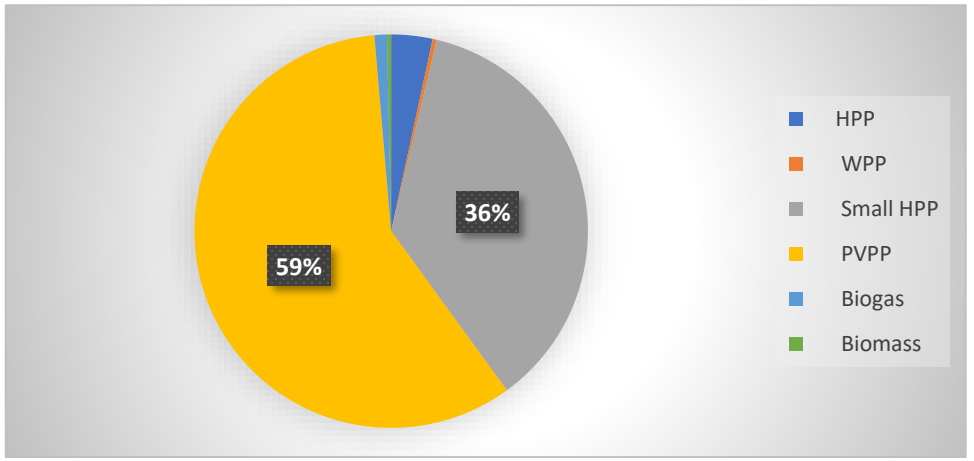


Chart 1. Type of PP based on technology used

Measures to support RES

The main aim:

- to encourage investments in the optimal usage of available potential of RES in the RNM,
- support to the accomplishment of the National mandatory goals on renewable energy sources participation in the total energy consumption, and
- support to conditions for environment protection and mitigation of climate changes.

Feed-in Tariff	Premium Tariff
- Introduced in 2007 - The first PP to sell the produced electricity under FIT started operation in 2010	Introduced in accordance with the Law on Energy*, since 2018

The Feed-in Tariff

1. Is regulated purchase price of electricity produced by a preferential electricity producer by the electricity market operator.
2. The Electricity Market Operator (MEMO):
    1. is obliged to purchase the total of electricity produced by the preferential producers in a period of 15 to 20 years (depending on the type of the PP), following by conducting a power-purchase agreement (PPA),
    2. takes the balance responsibility for these producers,
    3. is balancing responsible party.
3. The PPA is signed for the period of use of FITs determined with the decision issued by the ERC (20 years for SHPP and WPP, and 15 year for PV, biogas and biomass plants).
4. FITs are set in ¢ per kWh of electricity delivered into the electricity system and shall not include the VAT.

The average price of electricity produced by feed-in producers in the RNM is 105 EUR / MWh.

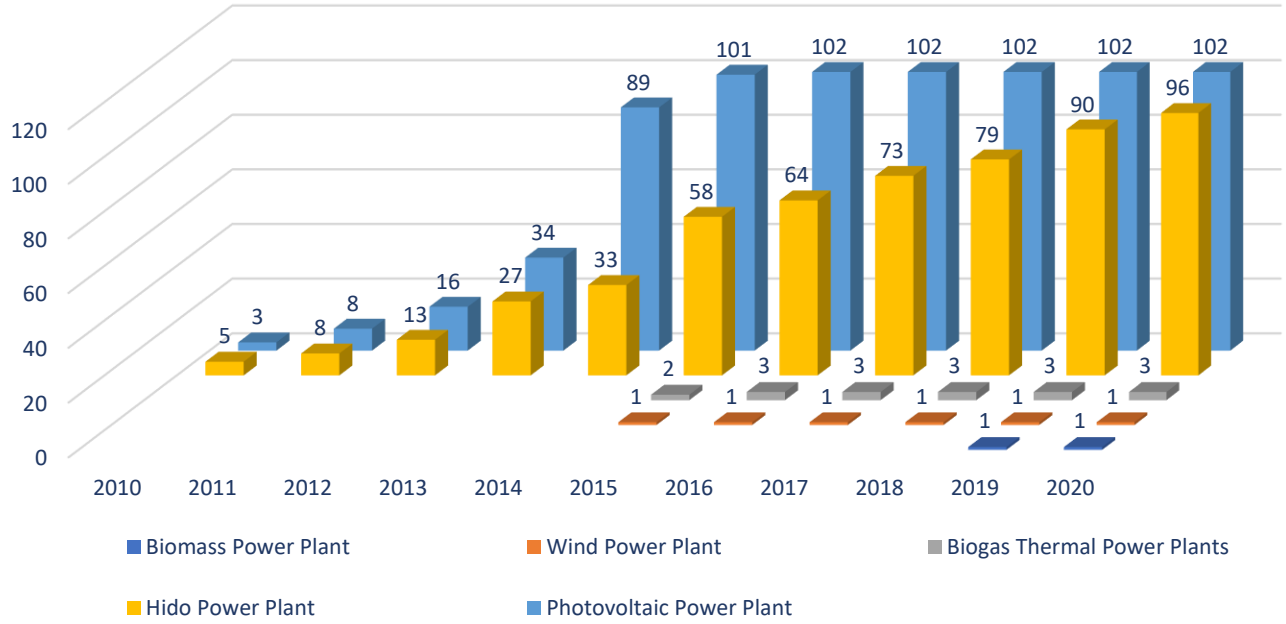


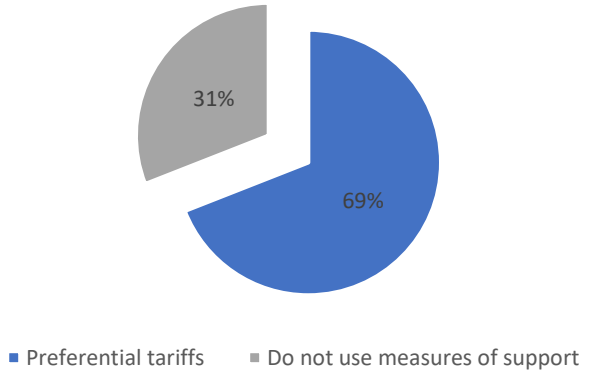
Chart 2. Number of preferential producers using FIT according to technologies, in the period from 2010 to 2020

The number of PVPP dominates, followed by HPP, Biogas thermal power plants, there is one WPP (PVE Bogdanci) and one biomass PP.

Number of preferential producers is 203.

The total installed capacity of the 203 preferential producers operating under FIT, as by the end of December 31st, 2020 is 148,47 MW - growth for 5,5 % compared to 2019.

- In 2010 until 2014 there were only PVPP and HPP.
- In 2015 WPP and two Biogas Thermal PP.
- In 2019, the first Biomass Thermal Power Plant has started operations in our country.



The average price for the electricity produced by the preferential producers using FIT in 2020 amounts with 6,49 MKD / kWh, indicating decrease compared to the price of 6,58 MKD / kWh in 2019.

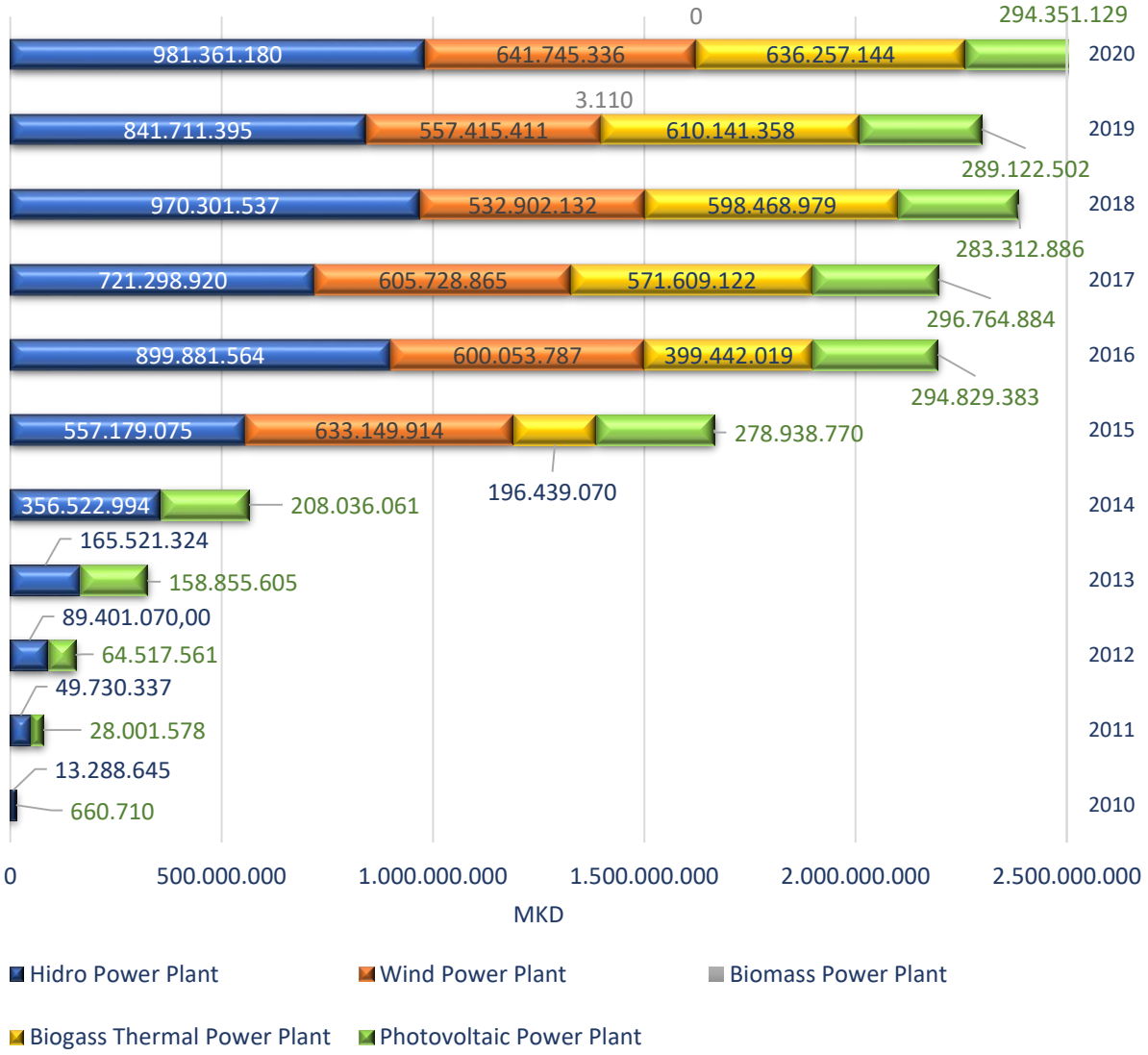
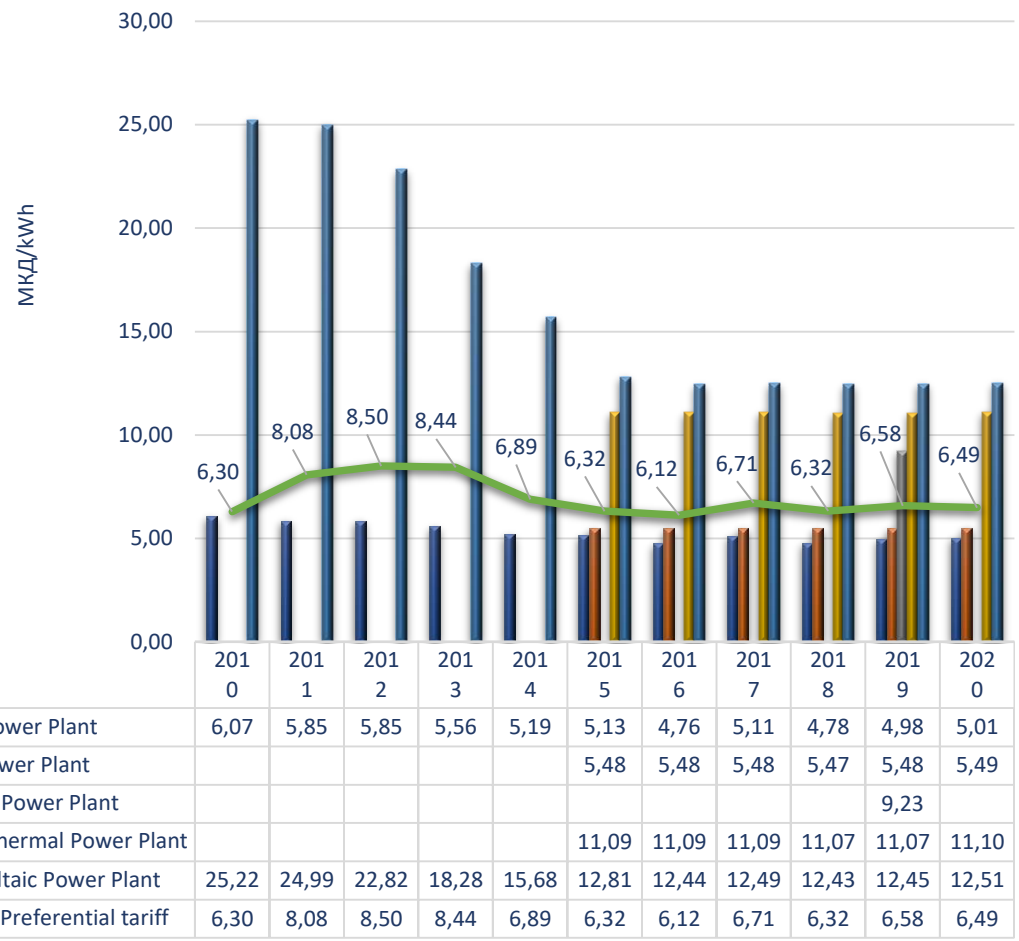


Chart 3. Repayments to preferential producers operating under FIT in the period from 2010 to 2020 (in MKD)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Hydro Power Plant	6,07	5,85	5,85	5,56	5,19	5,13	4,76	5,11	4,78	4,98	5,01
Wind Power Plant						5,48	5,48	5,48	5,47	5,48	5,49
Biomass Power Plant										9,23	
Biogas Thermal Power Plant						11,09	11,09	11,09	11,07	11,07	11,10
Photovoltaic Power Plant	25,22	24,99	22,82	18,28	15,68	12,81	12,44	12,49	12,43	12,45	12,51
Average Preferential tariff	6,30	8,08	8,50	8,44	6,89	6,32	6,12	6,71	6,32	6,58	6,49

Chart 4.Average price of electricity produced by preferential producers in the period from 2010 to 2019 (MKD / kWh)

Premium Tariff

1. Introduced by the Law on Energy*
2. A new measure to support the producers of electricity utilizing renewable energy sources.
3. Additional amount above the price achieved of the preferential producer in selling of the produced electricity on the Electricity Market.
4. The preferential producer using Premium is selected with a Tender Procedure and Auction conducted by the Ministry of Economy.
5. In February 2019, the Government of the RNM has adopted a Decision on the total installed capacity of the preferential producers of electricity, according to which for the total of installed capacity of **200 MW** by the PVPP, shall be granted with Premium tariffs.

Renewable Support Schemes

FEED-IN TARIFF (FIT)	FEED IN PREMIUMS (FIPs)
the manner of obtaining FIT is specified by rulebook of the ERC	will be granted based on a tender procedure involving auctions. The manner of conducting the tender procedure and auction for awarding premiums, concluding contracts and payment of premiums will be further specified by the Decree of the Government, the Ministry will only implement the procedure.
the market operator distributes the costs paid to the preferential producers to every licensed supplier, according to their market share. Consumers are paying for 100% of the RE support	the funds for the premiums: from the state budget
the electricity market operator is obliged to purchase the electicity generated from a preferential producer, following by conducting a power-purchase agreement (PPA)	the preferential producer who has acquired the right to use the premium can not use a feed-in tariff and is not guaranteed by the guaranteed purchase of the produced energy from the electricity market operator
the PPA is signed for the period of use of FITs determined with the decision issued by the ERC FITs are set in ¢ per kWh of electricity delivered into the electricity system and shall not include the VAT.	the manner of conducting the tender procedure and auction for awarding premiums, concluding contracts and payment of premiums will be further specified by the Decree of the Government, the Ministry will only implement the procedure.
the electricity market operator is balancing responsible party	balance responsible

- ✓ Paralel with RES integration in the RNM in 2019, the Wholesale Electricity and Retail Electricity Market became a fully liberalized market.
- ✓ The Electricity Market Operator was positioned as the National Electricity Market Operator – MEMO DOOEL Skopje, acquiring the status of an individual legal entity established by the Electricity TSO.
- ✓ The Electricity Market Operator sells the purchased electricity produced by preferential producers to suppliers and traders with electricity, which is further sold to end consumers.
- ✓ The suppliers and traders purchase the quantity of electricity produced by the preferential producers from the Electricity Market Operator on daily basis, in respective manner with participation as notified in the electricity needs by their consumers within the total forecasted electricity needs by consumers of electricity in the RNM.

For the first time since the beginning of the liberalization of the electricity market in the country, in 2020 more than half of the total consumption, ie 52.24% of the needs, were provided by the open electricity market.

✓ According to the Energy Law* the Transmission System Operator (TSO):

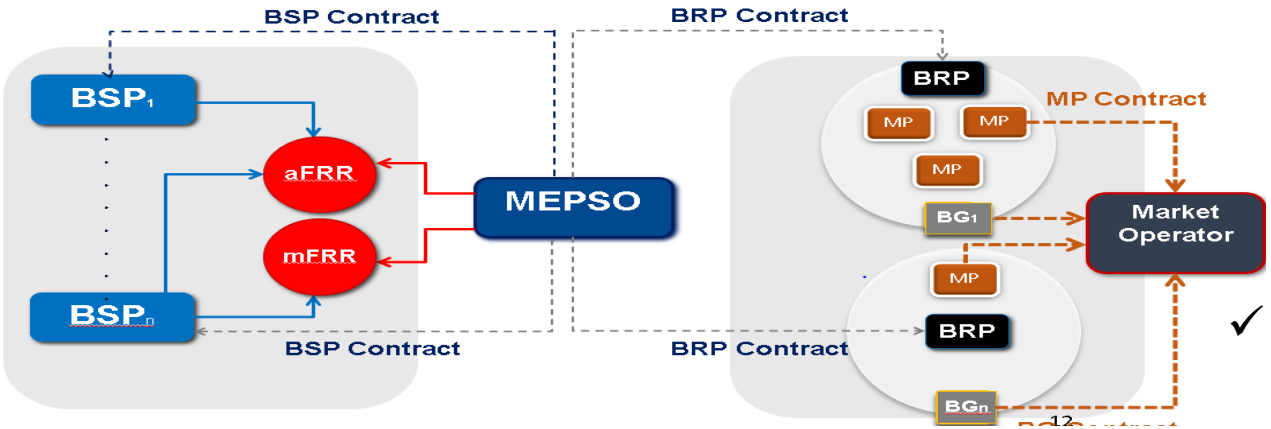
- is responsible for procuring balancing services from balancing service providers in order to ensure operational security,
- is responsible for organizing and managing the balancing energy market,
- is obliged, to ensure priority access to the systems and priority in dispatching electricity produced from RES (Article 163),

✓ Rules for Balancing the Power System

- applied from January 1, 2020, with prior approval by ERC,

- define the role of balancing service providers and the role of balance responsible parties

- a transparent methodology is applied for determining the price for deviation from the nominees.



✓ RES-E variability affects operation of the system in the following level

- Grid Balance and Flexibility
- Frequency Control
- Transient Stability
- Short-circuit Current

✓ RES needs to be:

-properly integrated with non-intermittent traditional baseload power plants,

-the storage needs of excess renewable power generated in favorable conditions should be stored for later.

✓ Regulators play an important role when it comes to the definition of the framework for balancing.

✓ ERC's role is to create a regulatory framework that will be transparent and ensure TSO procure services and recoup costs, also that will provide an optimal system in terms of costs.

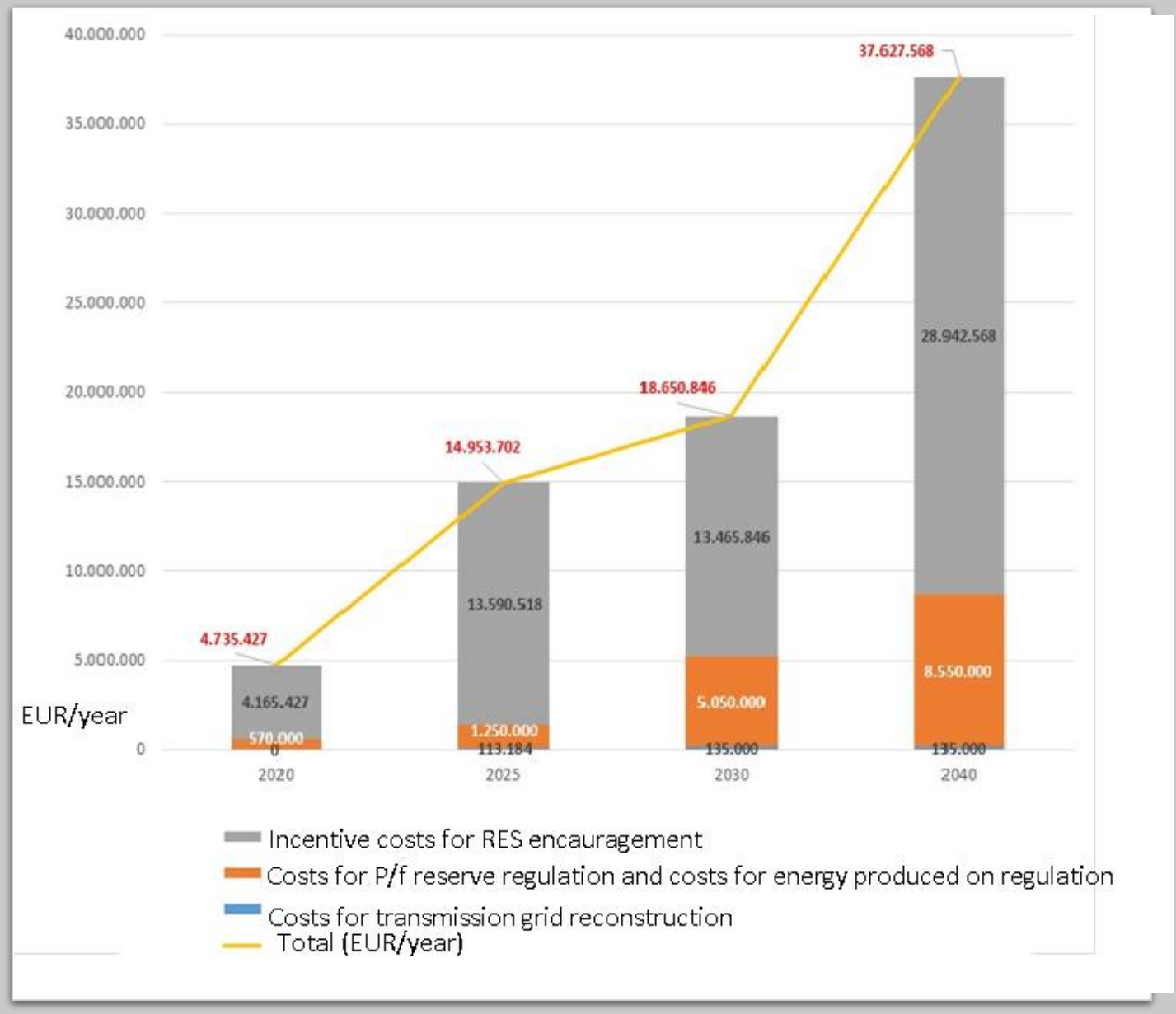
✓ Mechanisms to cover the imbalances costs caused by RES.

Estimation of total costs for integration of RES

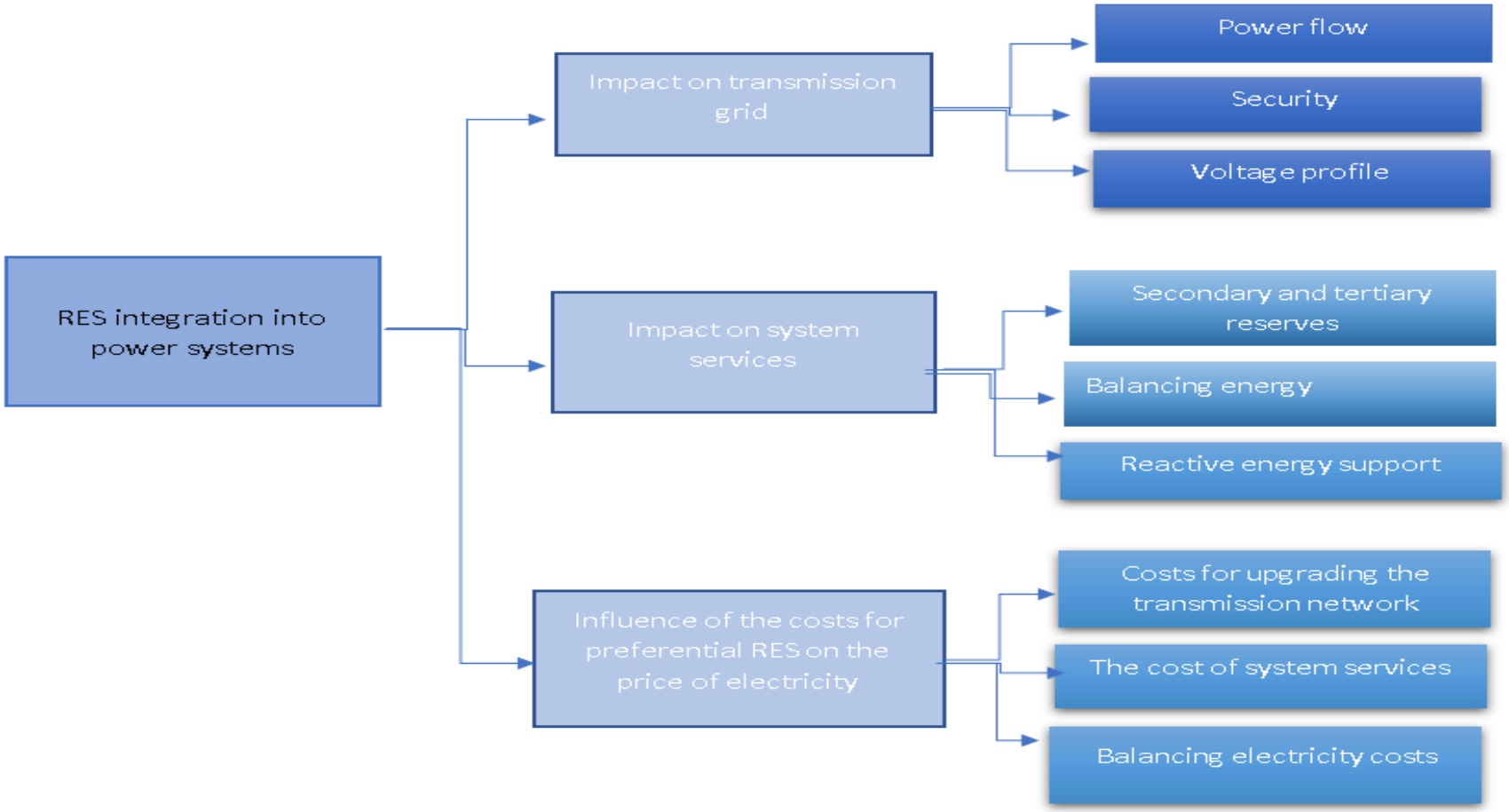
- ✓ Deployment of RES implies larger transmission network and better transmission planning.
- ✓ We need RES installed capacity limits!
- ✓ The basic limitations are in
  - the provision of system reserves and
  - the problems with balancing the changes of production and consumption in the transmission system.
- ✓ The TSO shall provide

  - fast system backups (secondary and fast tertiary backup) and

  - slow system reserves and energy for balancing.
- ✓ The TSO has prepared Study for assessment of total costs for integration of RES in the EES of the RNM.



Methodology for assessing the impact of RES integration in the power system of the RNM



The grids are essential part of the development of the RES and the necessary investments and the financing must be part of the future tariff setting.

THANK YOU
FOR YOUR ATTENTION!

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