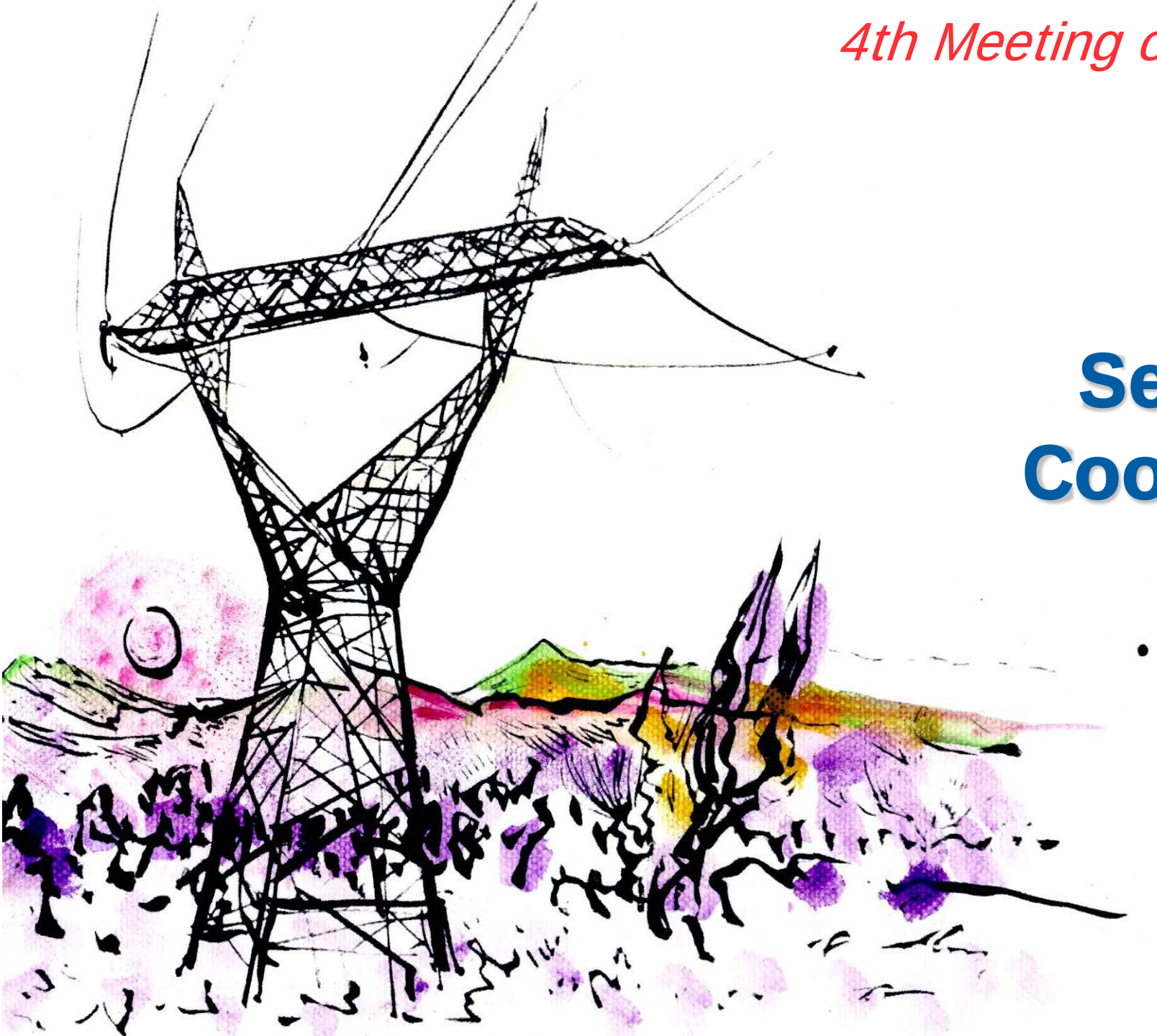


4th Meeting of Sub-Group for Electricity

Energy Community

Security of Supply Coordination Group

Igor Stojanovski, M.Sc.El.eng

МЕПСО

INTRODUCTION

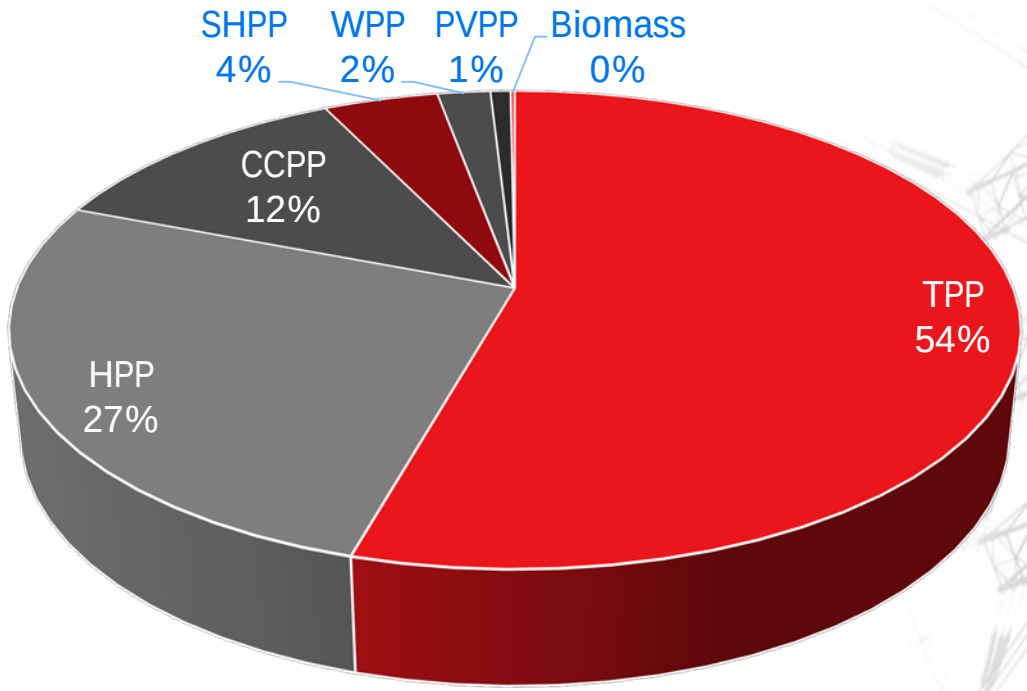
- Overview of power system in Macedonian power system
- Implementation of NC&GL
- Future Grid Development and Planning

OVERVIEW OF THE MACEDONIAN POWER SYSTEM

Installed generation capacity

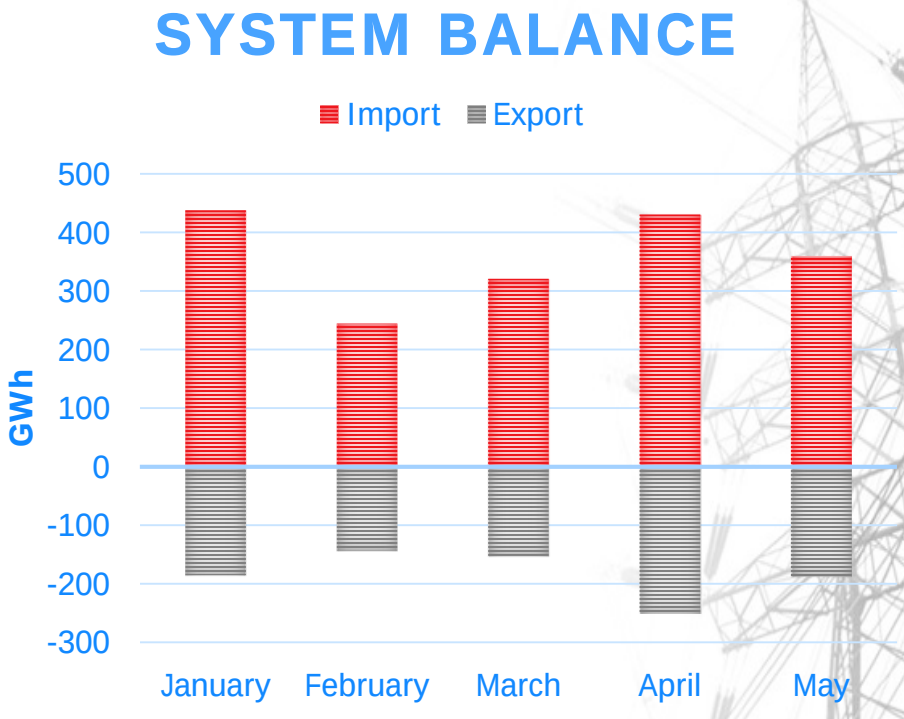
Type	Name	Installed Power by plant (MW)	Total installed power (MW)
Thermal Power Plant	[1] Bitola	3x225	1005
	[1] Oslomej	120	
	[2] Negotino	210	
Hydro Power Plant	Vrutok	150	488
	Spilje	84	
	Globocica	42	
	Tikves	96	
	Kozjak	80	
	Sveta Petka	36	
CHP (Gas)	TE-TO		220
Small HPP's			80
Wind farms			37
Photovoltaics			14
Biomass			3
		TOTAL:	1812

[1] coal fired TPP [2] fuel oil TPP

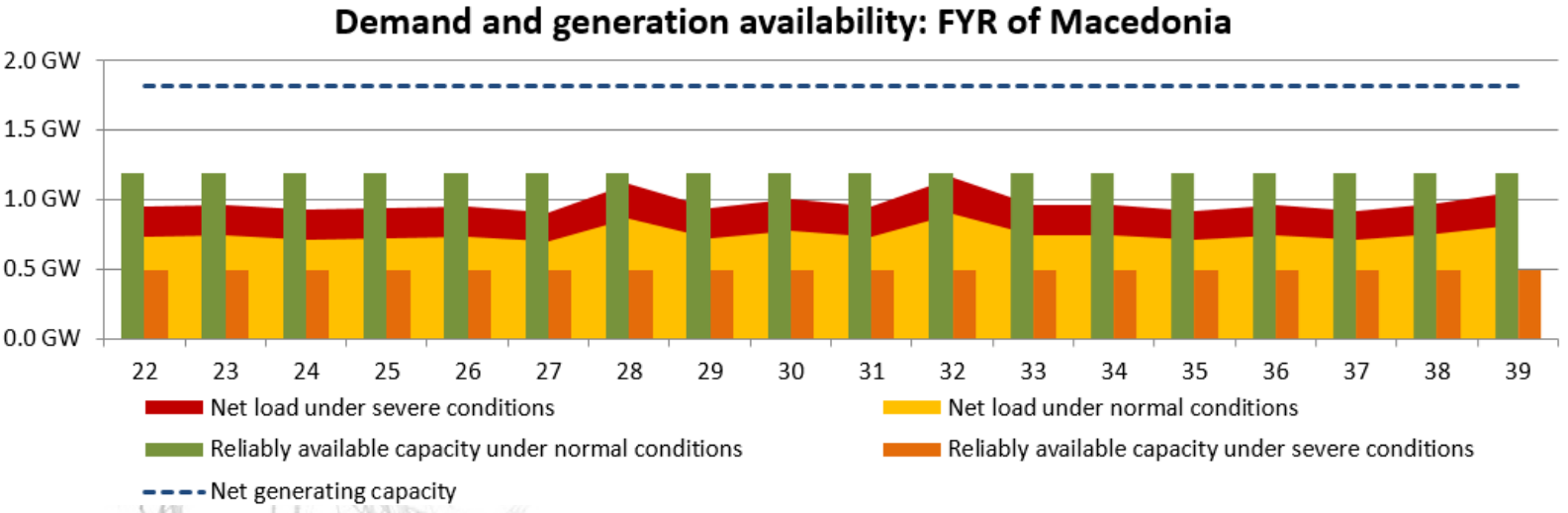


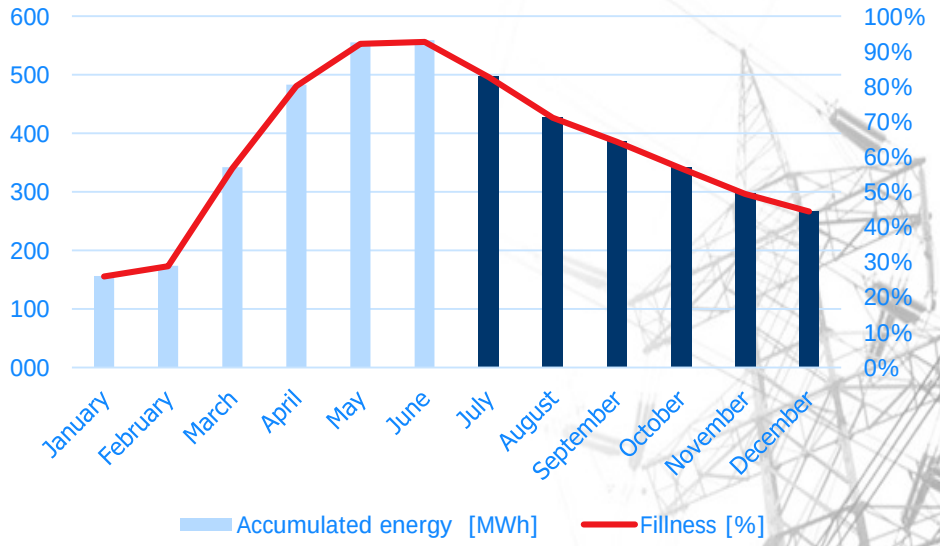
System balance

			January	February	March	April	May
Generation	TPP		365.8	359.4	291.7	124.0	102.4
	HPP		86.8	158.2	168.3	147.6	154.3
	WPP		7.4	8.6	7.3	6.6	5.7
	TOTAL GENERATION:		**459.9**	**526.2**	**467.2**	**278.2**	**262.3**
Exchange per interconn.	EMS	Im (+)	268.5	103.3	166.0	279.7	223.2
		Ex (-)	0.0	5.5	17.6	0.4	0.8
	IPTO	Im (+)	0.6	7.8	16.3	0.0	1.9
		Ex (-)	184.9	137.8	134.6	250.5	186.5
	ESO	Im (+)	168.8	133.4	138.5	151.3	134.8
		Ex (-)	0.0	0.0	0.0	0.0	0.0
	TOTAL EXCHANGE:	**Im (+)**	**438.0**	**244.4**	**320.9**	**430.9**	**359.9**
		Ex (-)	**184.9**	**143.2**	**152.3**	**250.8**	**187.3**
Consumption	Direct Consumption		49.7	45.7	73.6	65.7	70.9
	Distribution		653.2	573.5	560.2	395.2	362.3
	Network Losses		10.8	10.5	10.3	9.0	10.1
	TOTAL CONSUMPTION:		**713.8**	**629.8**	**644.2**	**470.0**	**443.3**



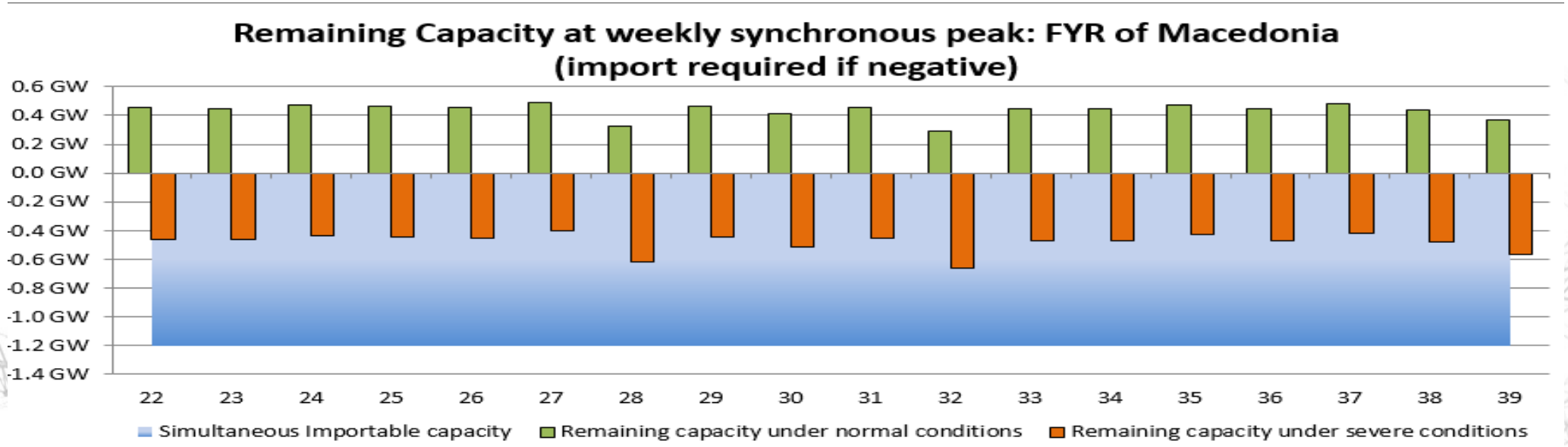
System balance(2)

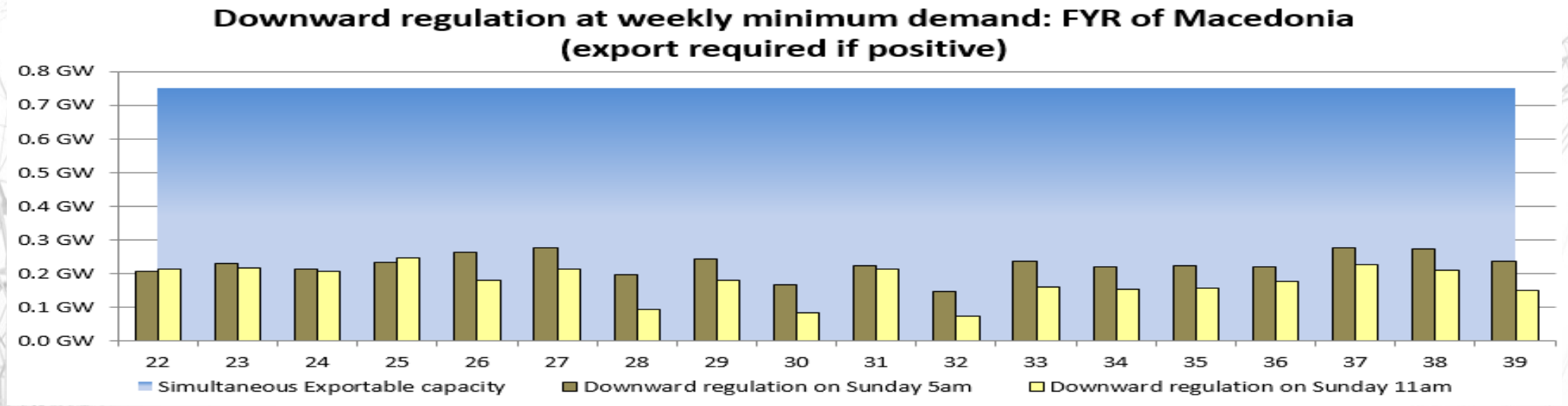




	January	February	March	April	May	June	July	August	September	October	November	December
Total Capacity [MWh]	603	603	603	603	603	603	603	603	603	603	603	603
Accumulated energy [MWh]	155.97	173.55	341.89	483.11	555.41	558.92	498.57	428.75	387.29	342.06	298.09	267.60
Fillness [%]	26%	29%	57%	80%	92%	93%	83%	71%	64%	57%	49%	44%

System balance(2)





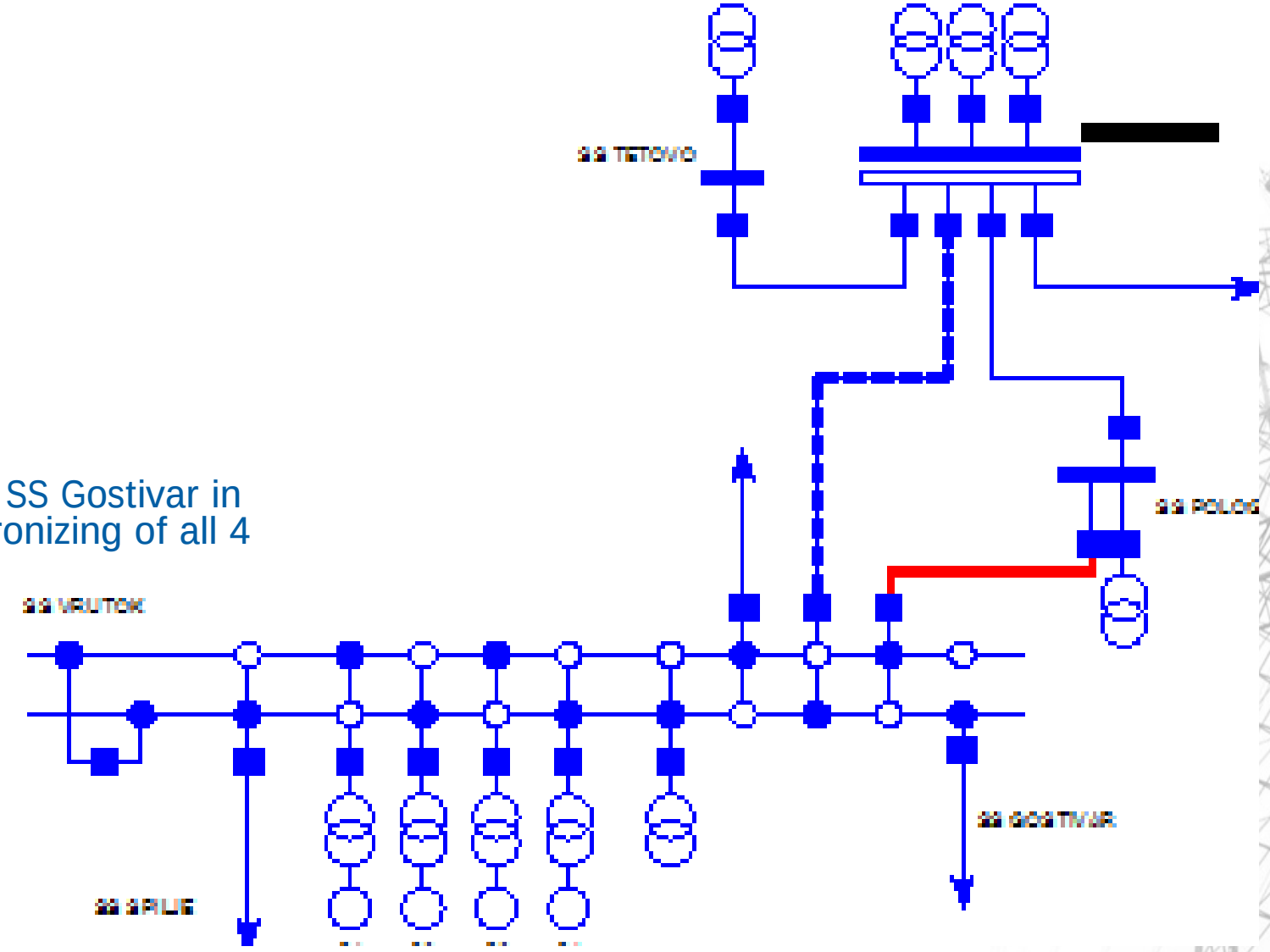
Peak loads in power system from 2013-2018

- 2013, peak load 1527 MW, 22.12 (Sunday), 18h
- 2014, peak load 1503 MW, 31.12 (Wednesday), 18h
- 2015, peak load 1439 MW, 08.01 (Thursday), 24h
- 2016, peak load 1457 MW, 21.01 (Thursday, 19h
- 2017, peak load 1514 MW, 11.01 (Wednesday), 23h

	2013	2014	2015	2016	2017
Winter maximum (system)	1,527	1,503	1,439	1,457	1,515
Loading factor (%)	60.75%	59.83%	62.16%	60.15%	60.27%
Winter maximum (transmission)	1,497	1,473	1,407	1,457	1,458
Trasmission losses	29.9	29.5	28.1	29	30.3
Consuption (distribution + direct)	1,467	1,443	1,378	1,428	1,385
exchange	591	637	624	231	354
Generation	906	836	782	1,226	1161

Security

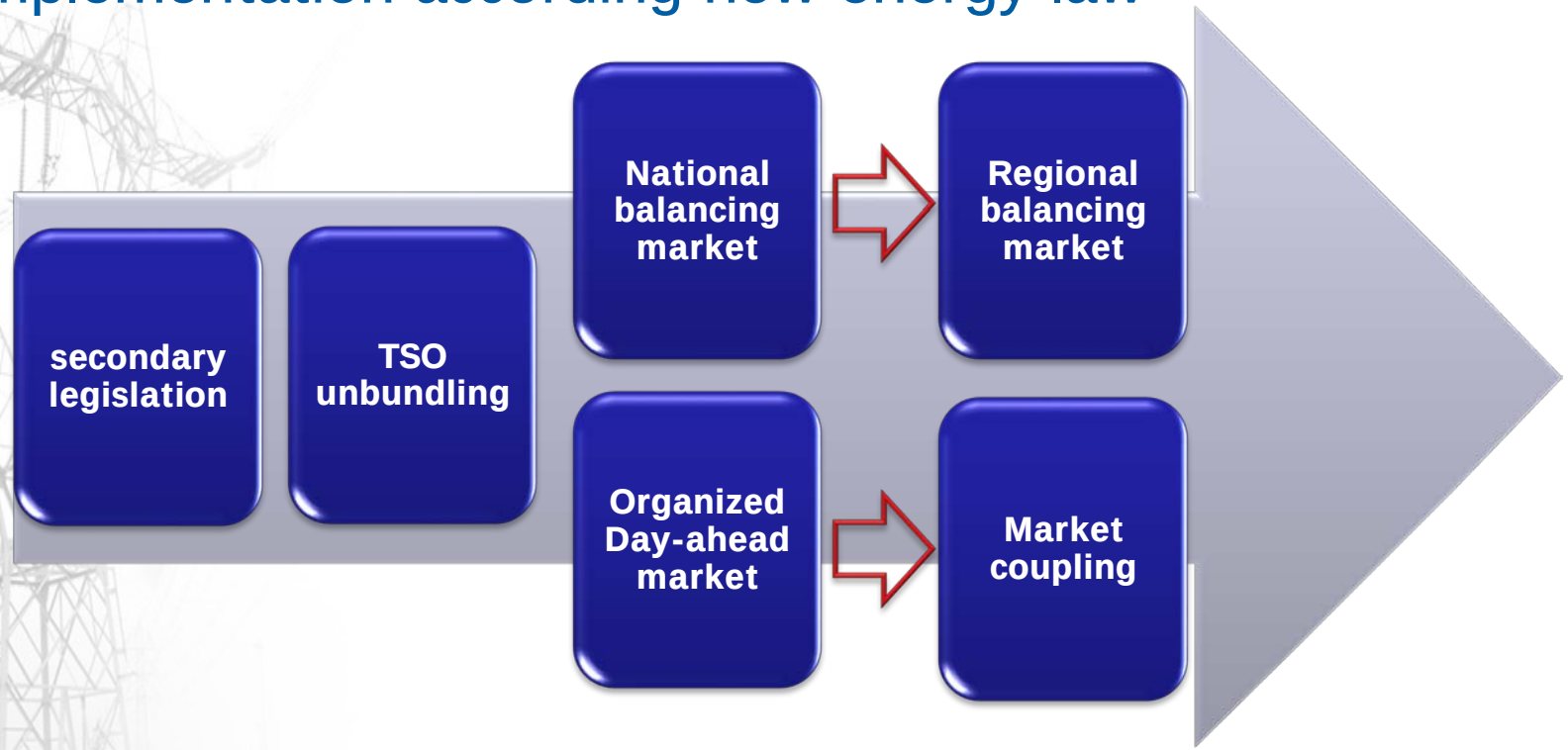
- Planned security analysis
  - DACF – daily
  - D2CF – dry run
- Most frequent contingencies
  - Overload of 110kV line HPP Vrutok – SS Gostivar in winter height load as result of synchronizing of all 4 generators in HPP Vrutok
- Remedial actions - Preventive
  - Bus bar split in HPP Vrutok
  - Bus bar split in SS Bitola 2



IMPLEMENTATION OF NC & GL

Implementation of NC&GL

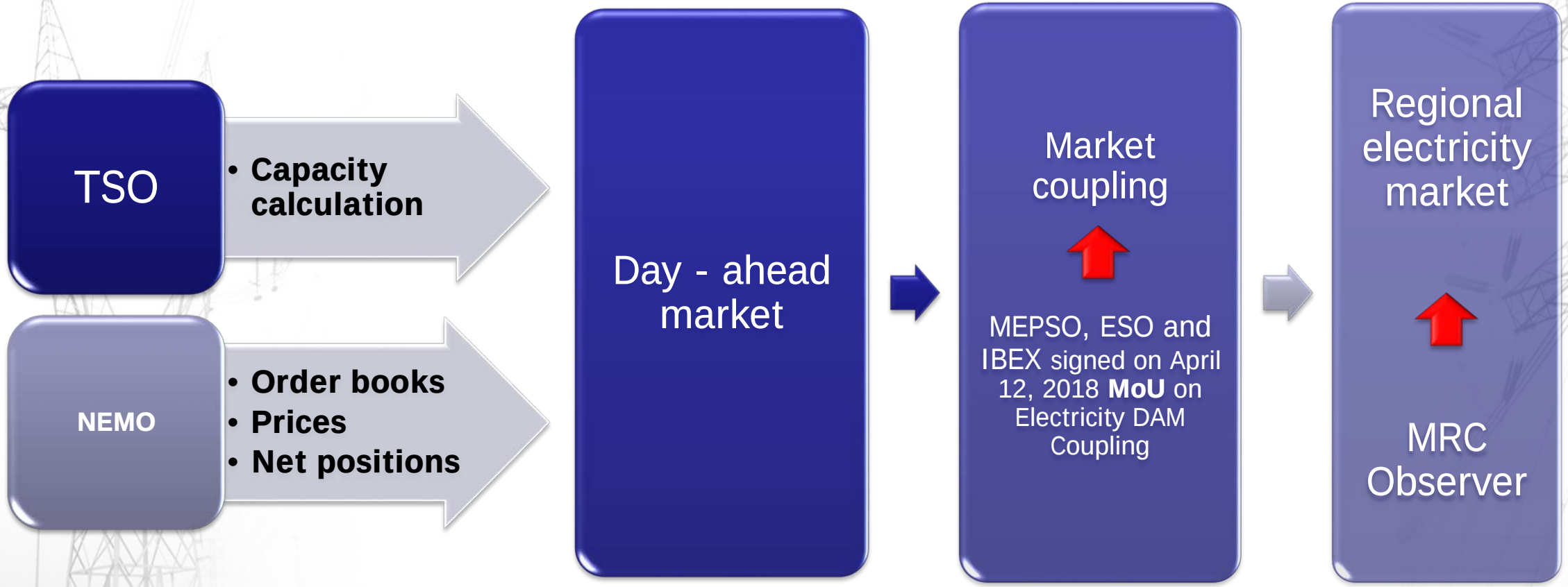
- Adoption of new energy law Future steps and challenges
  - Transposition of the third energy package and NC&GL
  - Implementation according new energy law



According NC&GL and Berlin Process -WB6

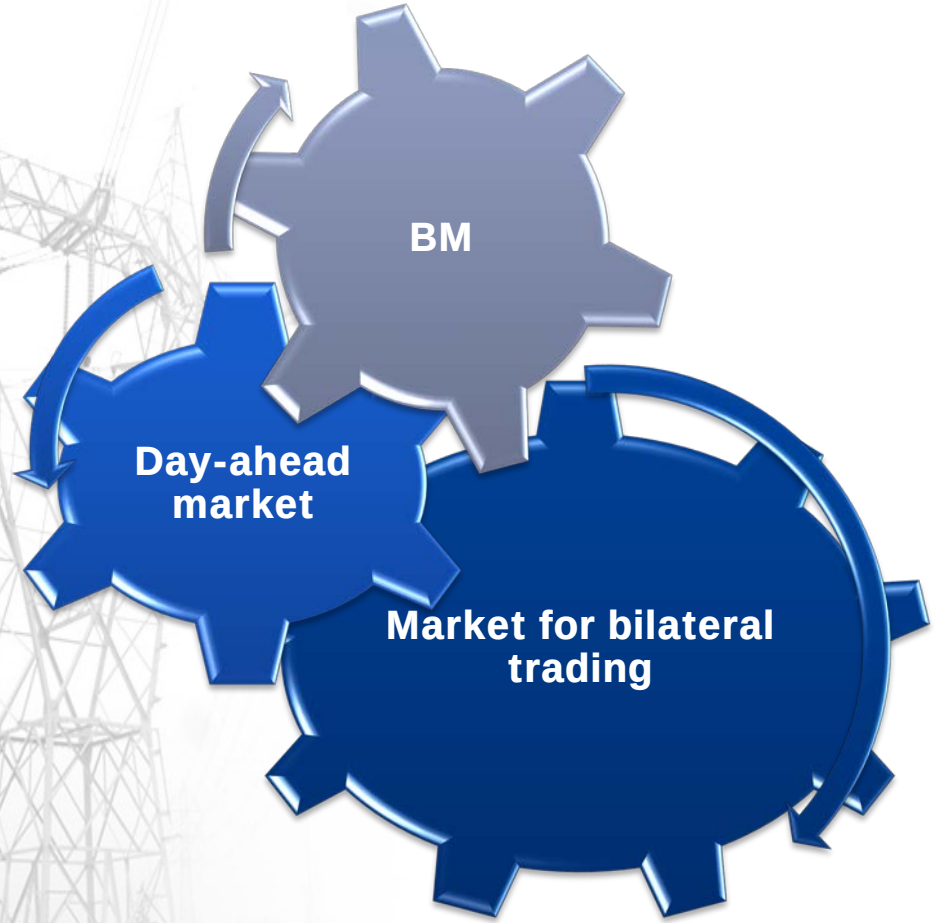
Future steps and challenges – Day ahead market

- MEPSO will establish a legal entity that will perform the activity of Nominated Electricity Market Operator/Power Exchange



Future steps and challenges – Balancing market

- MEPSO will establish and operate with national balancing market and will implementing a cross-border balancing cooperation



National balancing market

Balancing market rules

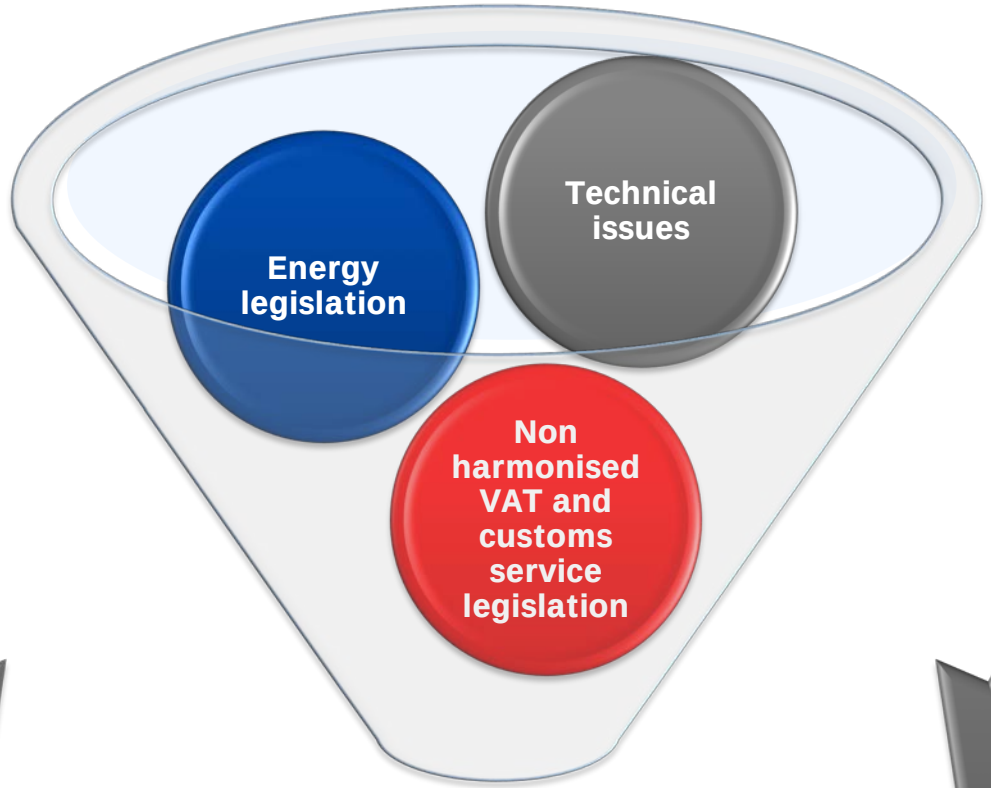
All market participants will be balance responsible

aFRR will be procured from ELEM with market based prices from HUPX

mFRR & RR will be procured from nacional and regional balancing market

Challenges, obstacles and steps for implementation of Regional Balancing Market

National balancing market

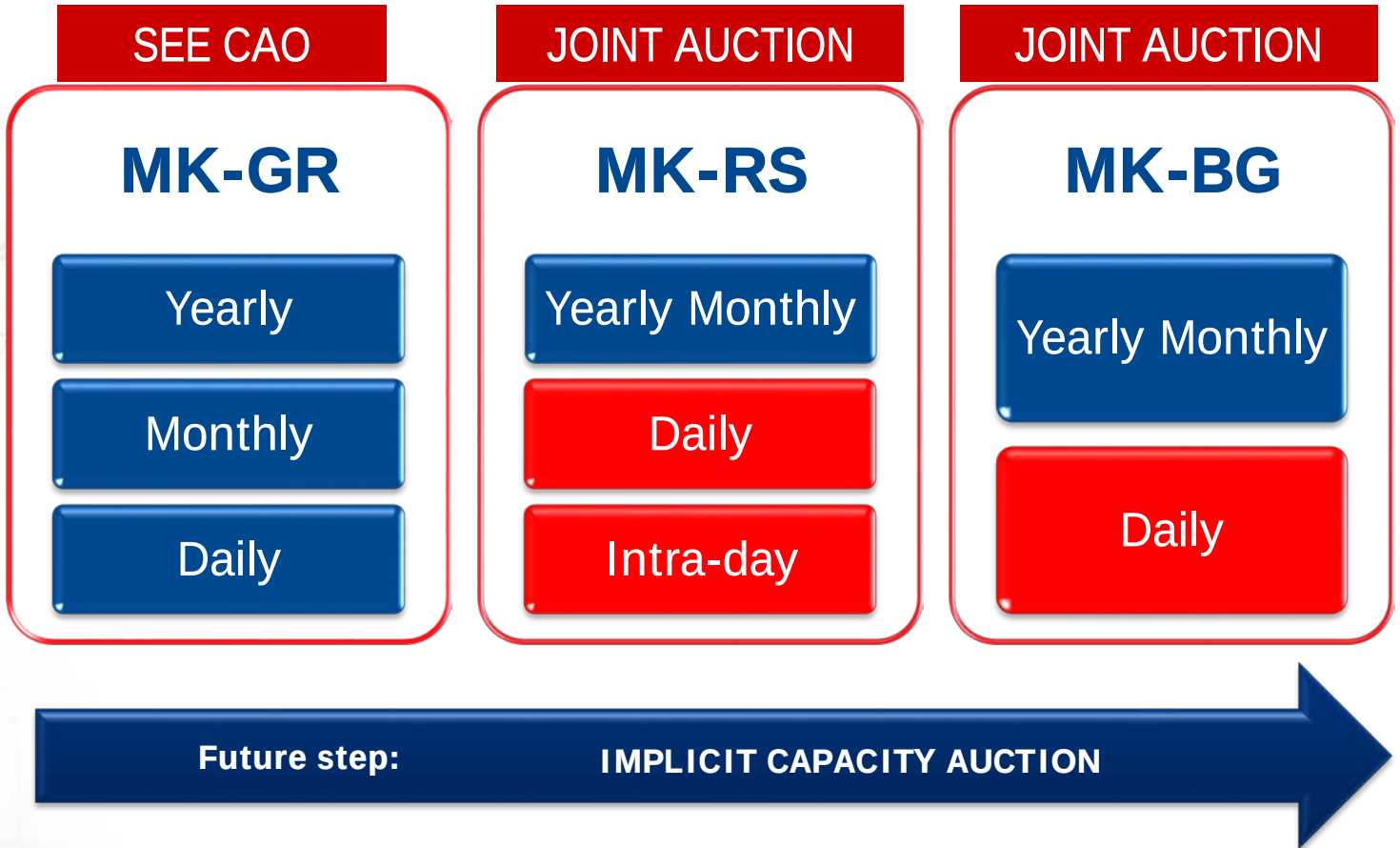


Balance responsibility

Regional Balancing Market

Forward capacity allocation

- Explicit allocation of cross-border transmission capacities



System Operation Guideline

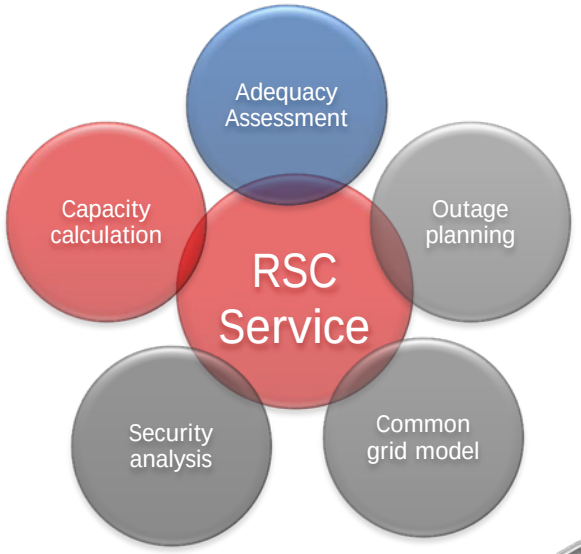
- The current status for implementation of SOGL is presented separately for the following three levels:
- National
- Regional
- Pan-European

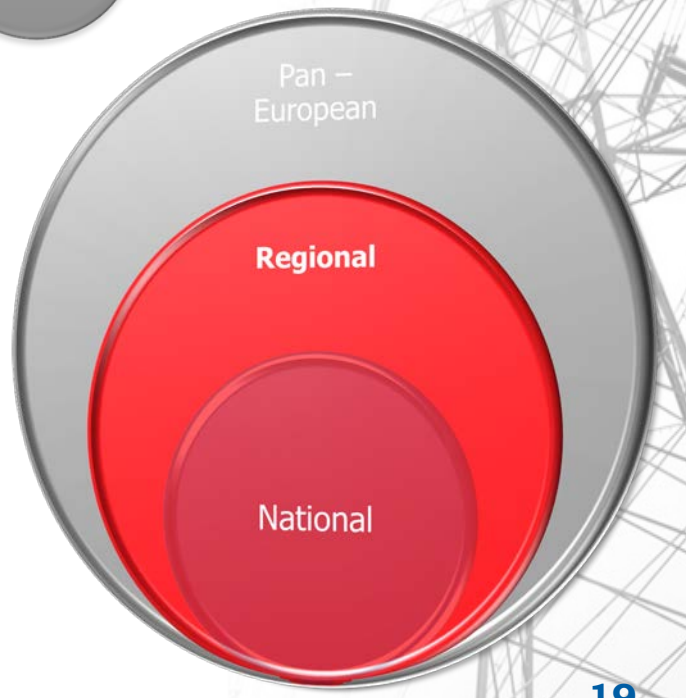
System Operation Guideline – National level

- Adaptation of legislation
  - New energy law in accordance with in RC (EU) 714/2009
  - Preparation of secondary legislation in accordance with the new energy law
- Organization, roles and responsibilities
  - Review and re-adaptation of the working processes in accordance with the requirements from the NC&GL
- Tools and training
  - Preparation of technical documentation for new software tools and expansion of the existing

System Operation Guideline – Regional level

- RSC's initiative
  - MEPSO has signed MLA and RSC contract
  - MEPSO is using services from RSC SCC Belgrade
- Operational Agreements
  - Review and adaptation of the contract requirements in accordance with SOGL





System Operation Guideline – Pan-European level

- CGMM – Common grid model methodology
  - Submitted to NRA
- OPDE – Operational planning data exchange
  - MEPSO has deployed the necessary equipment
- IGCC - International Grid Control Cooperation
  - MEPSO has observatory status
- Transparency
  - Fully implemented data exchange process

Roadmap for implementation of NC&GL

Organized Day-ahead market

National balancing market

Upgrade of Network Codes

National

Regional balancing market

Market coupling

Operational Agreements

Regional

IGCC

PICASSO
MARI
TERRE

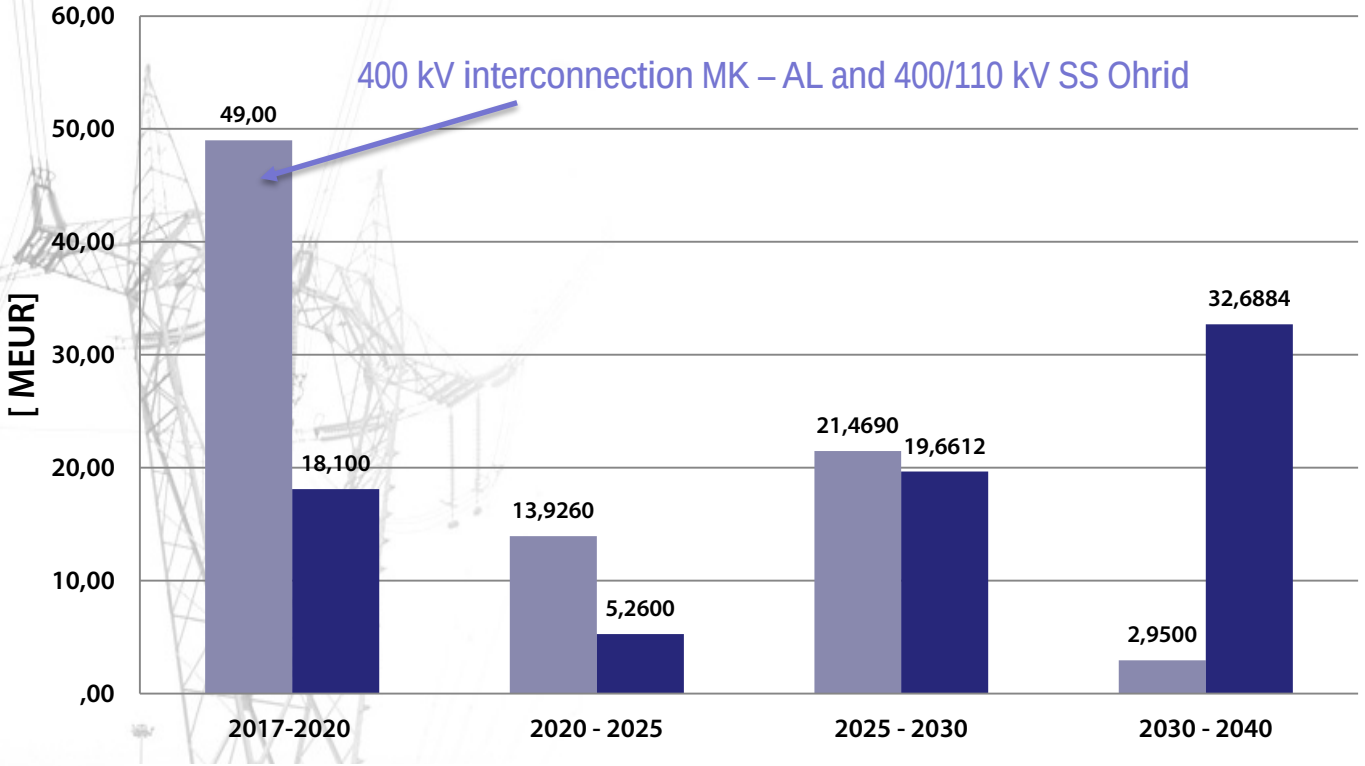
Reporting process
OPDE
Transparency platform

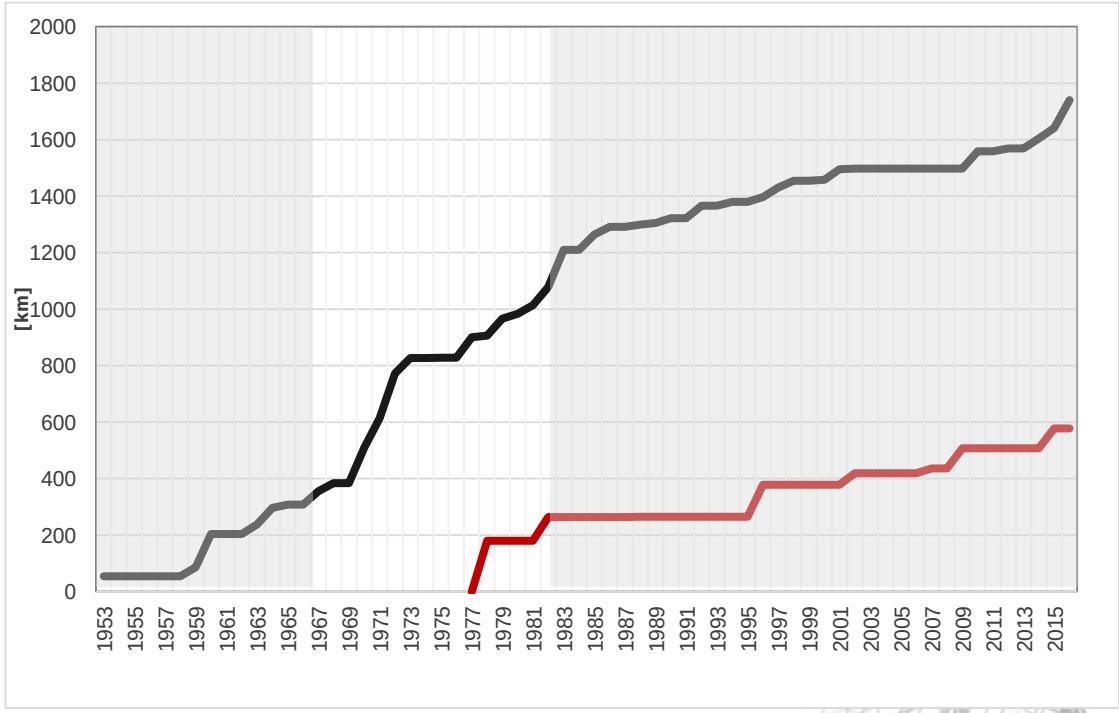
CGM

Pan-European

FUTURE GRID DEVELOPMENT AND PLANNING

FG D&P - mid & long term strategy for MK transmission

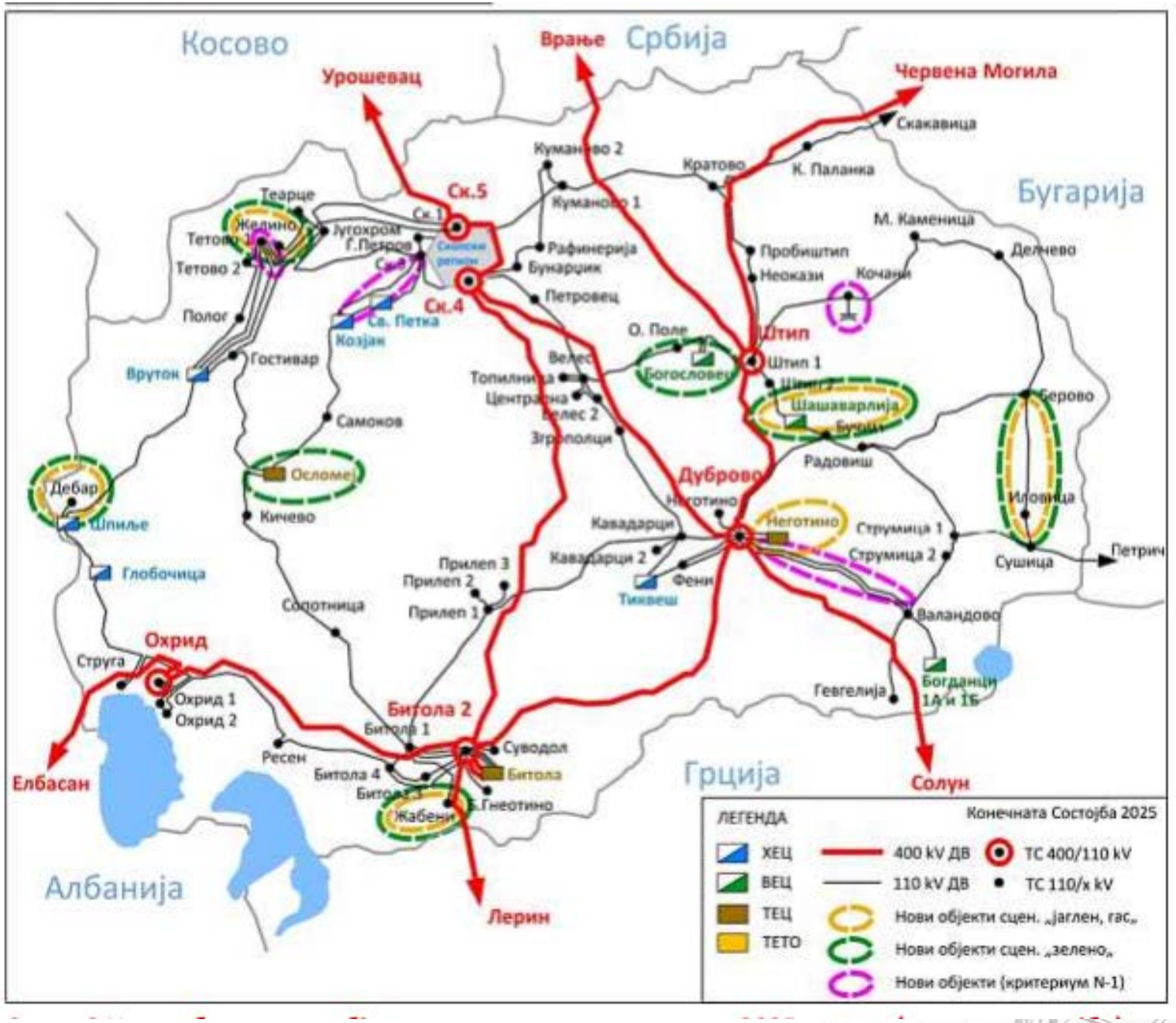




- **New transmission elements (TLs, SSs): 49 + 38 = 87 MEUR**
- **Reconstruction (TLs, 400/110 kV TRs): 76 MEUR**

FG D&P –2018-2022

Projects	Budget (M€)
New Interconnection lines	25.5
New transmission lines and substations	14.35
Reconstruction of the existing 110 kV transmission lines	24.44
Reconstruction of the existing 110 kV/X kV Substations	14.12
Modernization of transmision system	8.1
TOTAL INVESTMENT COST	**86.51**



FG D&P – until 2025

Name of Power plant	Fuel	Scenario Coal,Gas			Scenario Green		
		Intalled capacity (MW)	Planned production (GWh)	Commissioning year	Intalled capacity (MW)	Planned production (GWh)	Commissioning year
TPP Negotino	Coal/Gas	300	2000	2025	Out of operation		2025
CCPP TE-TO Zajcev Rid	Gas	230	1600	2025-2035			
TPP Oslomej	Coal	120	824	2025			
New SHPP (Cumulative)		42		2025-2040	42		
WPP (Sasarlija and Bogoslovec)		54		2025-2030	54		2025
PVPP (Cumulative)		32		2025-2030	40		2025
Biomass (Cumulative)		16		2025-2040	18		2025

Name of Distribution Substation	Installed power [MVA]	Loading [MW]	Commissioning year
TC 110/10(20) kV - Kisela Voda	80	20	2025
TC 110/10(20) kV - Debar	40	12	2025
Name of Industrial Substation	**Installed power [MVA]**	**Consumption [GWh]**	**Commissioning year**
Ilovica	60	424.56	2025
Zabeni	20	100	2025
Zelino	15	67.5	2025

THANK YOU