Challenges & Measures in Supporting the Energy Transition to Renewable Energy

The Greek Power System towards the Green Transition and RES development prospects

cigre
Next Generation Network

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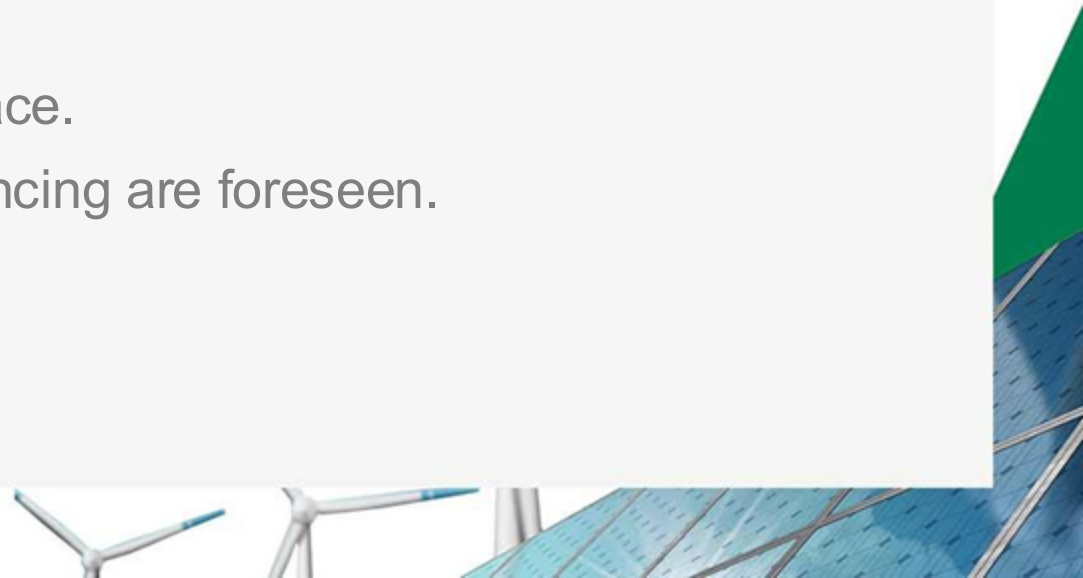
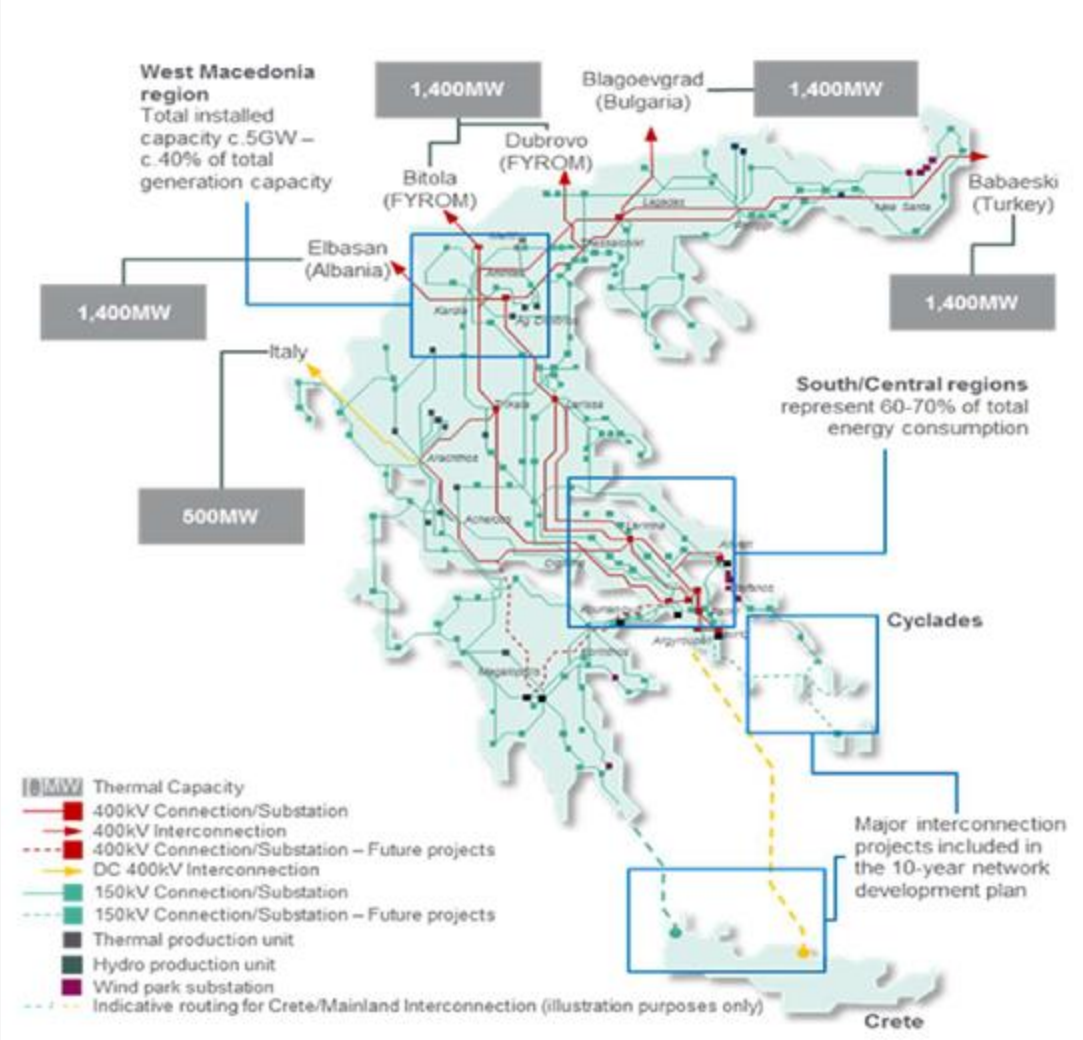
The Green Transition: evolving role of TSOs

- **Guarantee security** and while…
- Facilitating RES integration
  - System balancing?
  - Generation flexibility (fast ramping)?
  - Voltage control?
  - Reduced inertia?
- Facilitating the market integration
  - TSO operated balancing markets already in place.
  - Considerable cross-border exchanges for balancing are foreseen.
- Need for significant network development



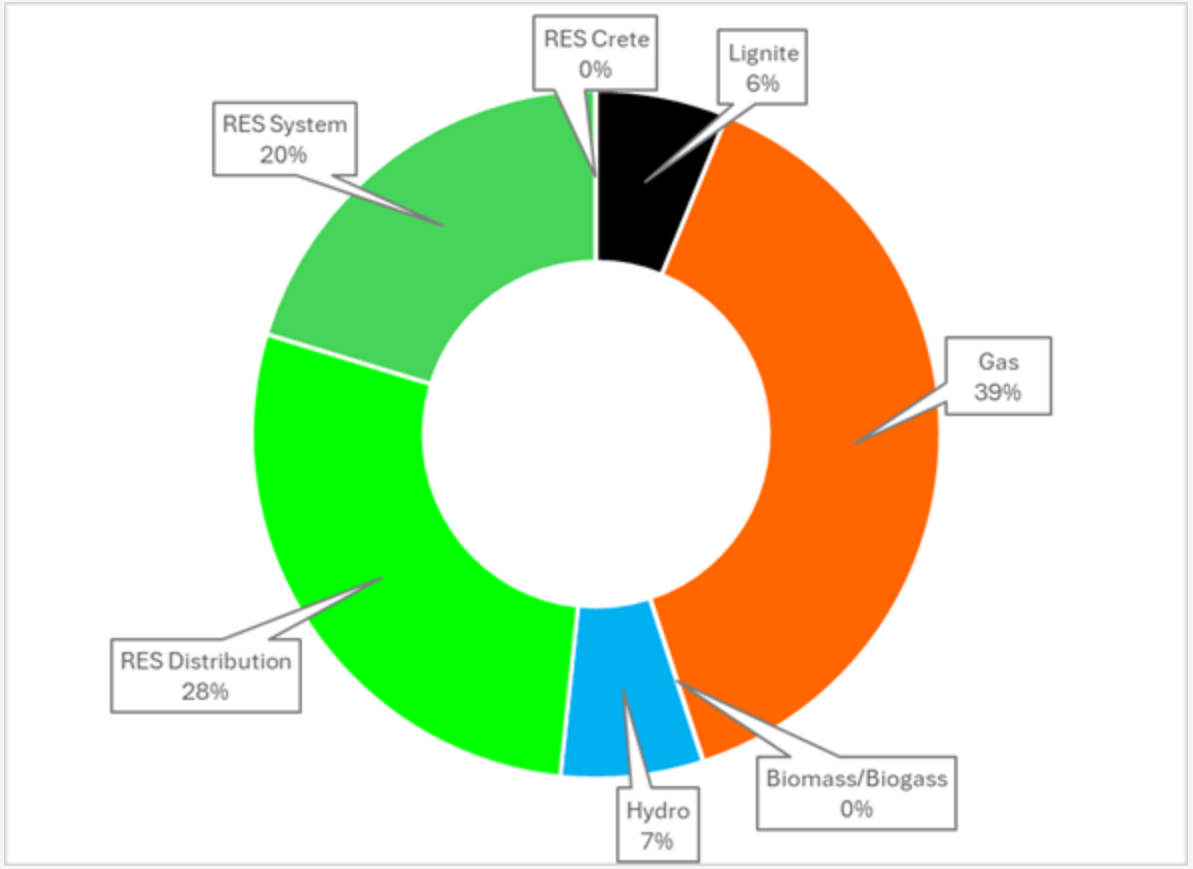
Hellenic Electricity Transmission

- Interconnected Greek mainland & islands system in High Voltage (150kV) and extra- HV (400kV)
- Backbone of 3, double-circuit, 400kV lines
- Submarine cables to Crete, Ionian islands and Cyclades islands
- Cross-border Interconnections

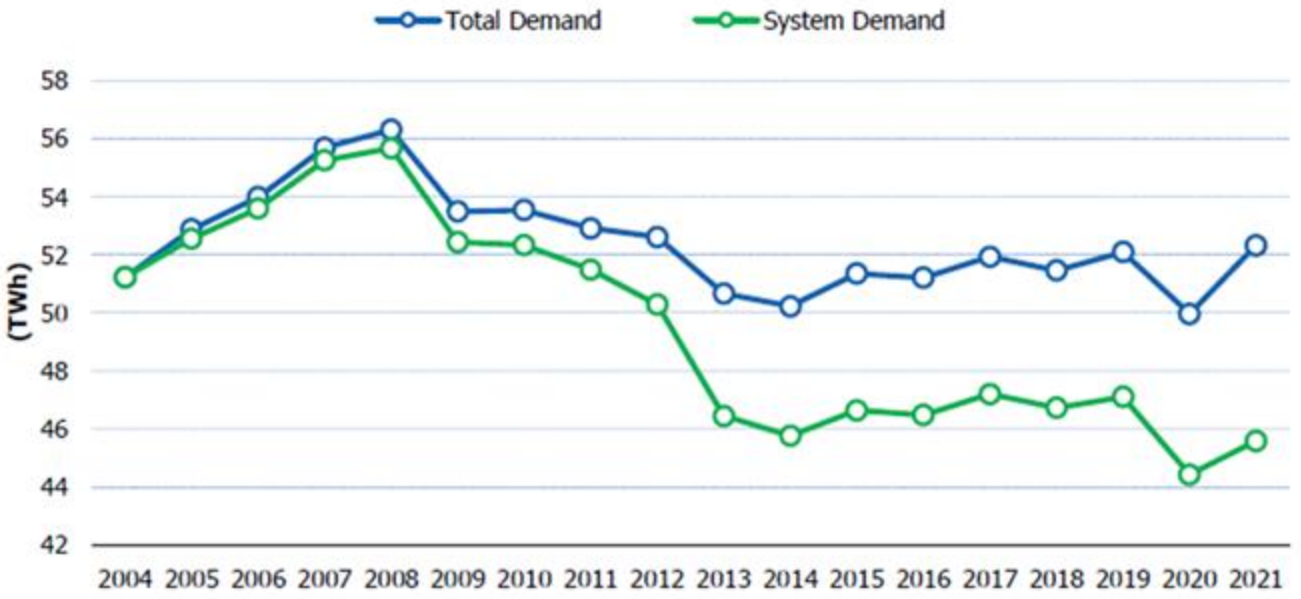


Synthesis of Generation capacity (2024)

Fuel	GWh	(%)	Energy Mix	
Lignite	3.236,309	6%	45%	CO2
Gas	20.189,906	38,74%		
Biomass/Biogass	16,398	0,03%		
Hydro	3.482,476	6,68%	55%	Green Energy
RES Distribution	14.610,390	28,03%		
RES System	10.568,467	20,28%		
RES Crete	13,988	0,03%		
Total	52.117,934	100%	100%	



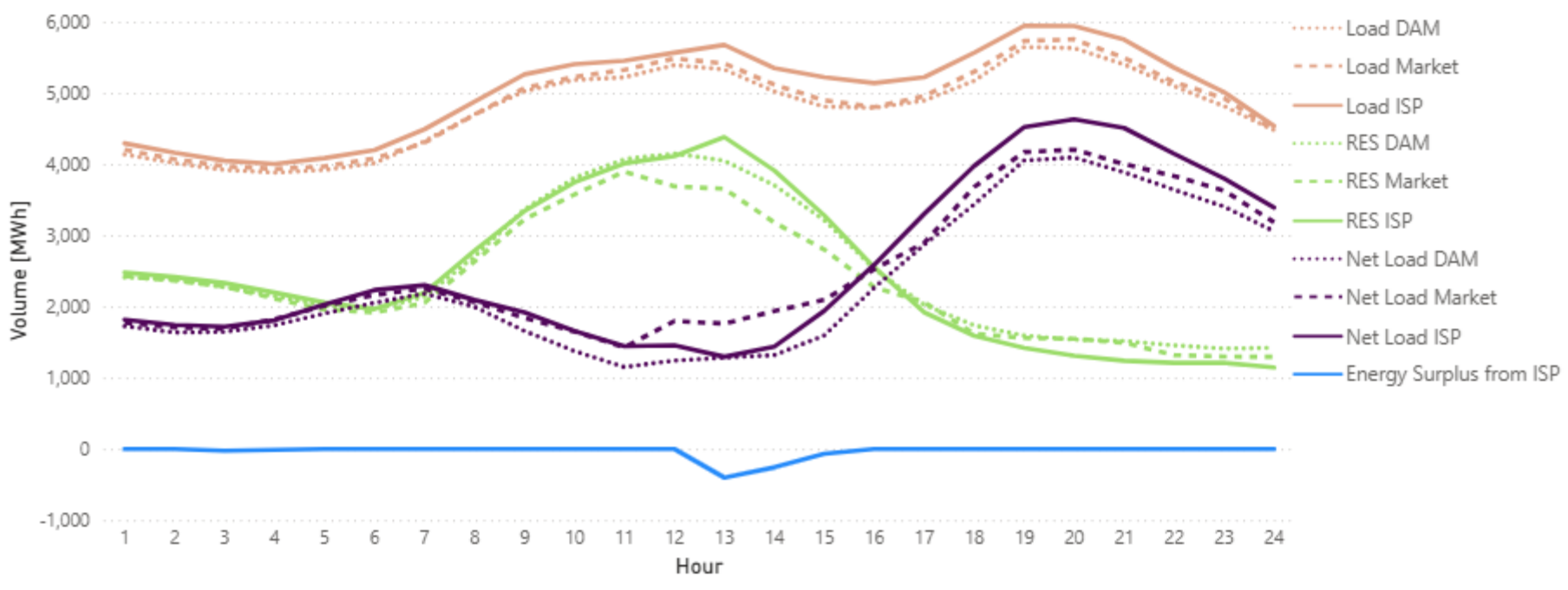
Impact of Dispersed Generation on Demand



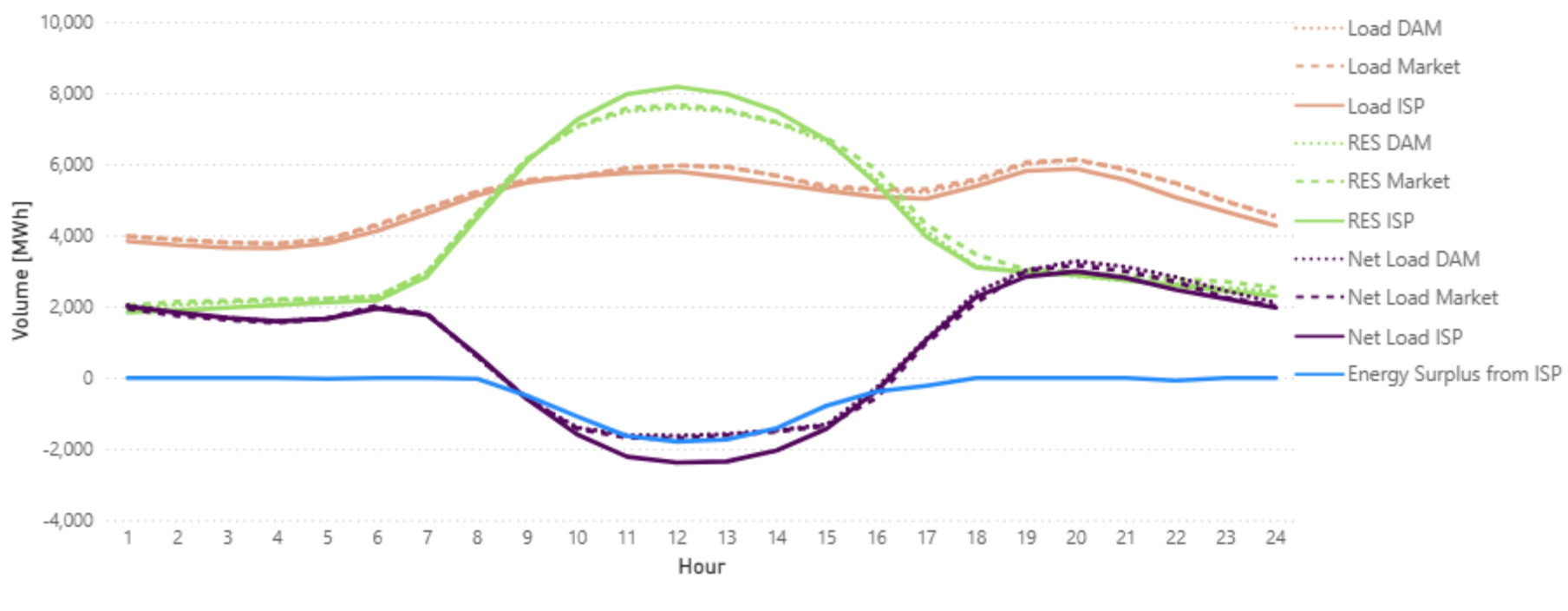
Dispersed RES generation

- 2010: 1.2 TWh
- 2020: 5.5 TWh
- 2021: 6.7 TWh

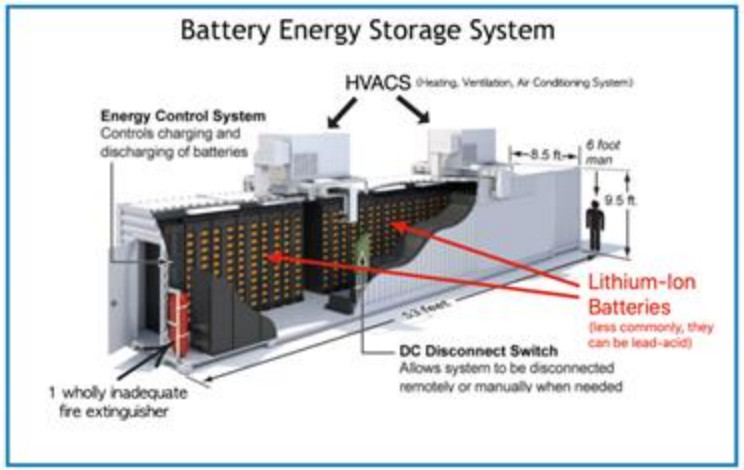
Daily operational profiles - weekday



Daily operational profiles – weekend day



Battery Energy Storage Systems



A crucial decade

National Energy & Climate Plan targets

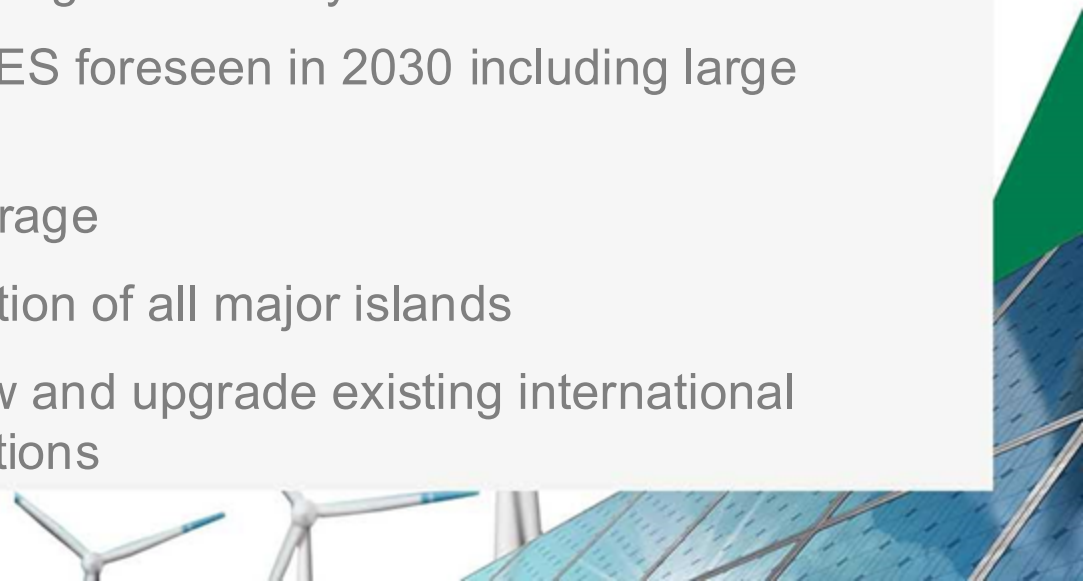
- Energy Consumption reduction
  - ✓ consumption in 2030 should be lower than in 2017 16.1Mtoe in 2030
- GHG emissions reduction
  - ✓ over 42% compared to 1990, or over 56% compared to 2005
- RES share increase in electricity consumption
  - ✓ 61% - 64% in 2030

Revision of NECP (Fit for 55, REPowerEU)

- Targets become even more ambitious to accelerate the transition
- RES amounting to 25GW expected in 2030

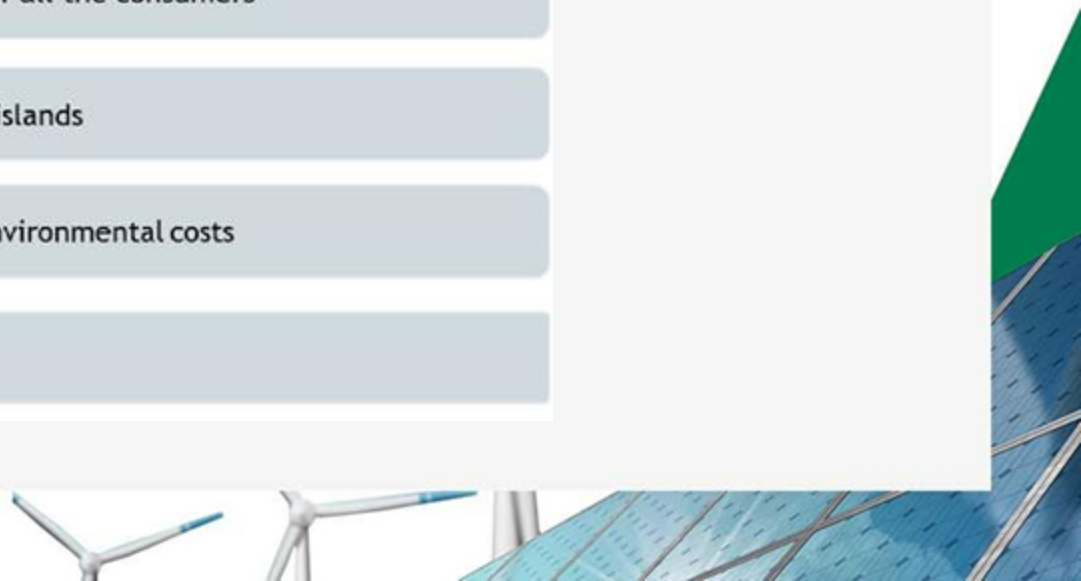
NECP provisions

- Phase out of lignite units by 2028
- 28 GW of RES foreseen in 2030 including large hydro
- 6 GW of storage
- Interconnection of all major islands
- Building new and upgrade existing international interconnections



INTERCONNECTION OF THE ISLANDS / Main Objectives

1. Security of Supply - Adequacy
2. Reliable and Stable operation of islands power system, leading to important benefits on tourism sector and the general economic activity
3. Reduced environmental impact on islands due to phasing out of the thermal power plan
4. Reduced cost of electricity production, more efficient power supply
5. Reduced charges of services of general interest for all the consumers
6. Exploitation of wind, solar and other RES potential of islands
7. Reduction of greenhouse gas emissions and associated environmental costs
8. Reduce of the country's dependence on oil



EU islands interconnections

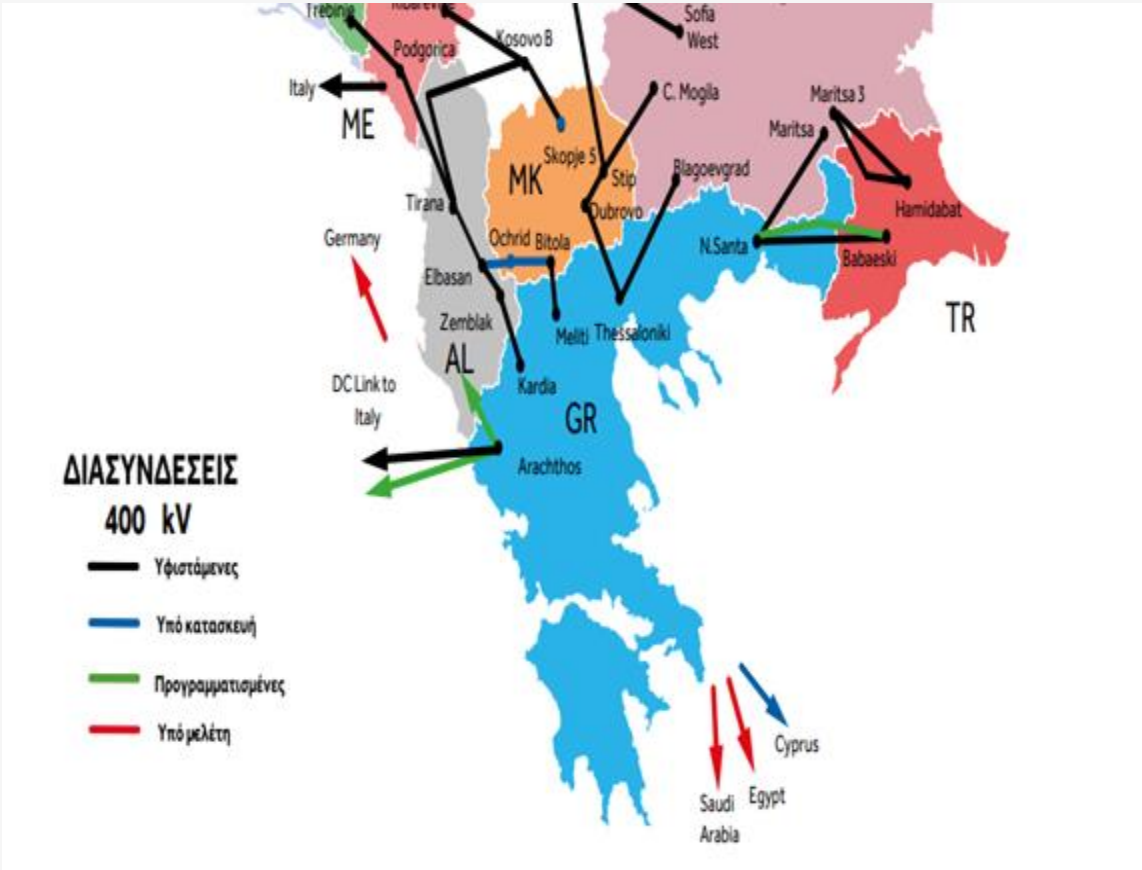
Interconnection Greece – Cyprus – Israel (project Stage 1 expected 2026)

- 1GW electricity interconnector between GR (Crete island), CY & IL
- 1,200km submarine HVDC cable, 3 converter stations
- Breaking Cyprus electrical isolation
- Project of Common Interest
- Budget 2.4B€
- Potential participation of IPTO in the share capital of the interconnection

International interconnections

New interconnections will increase NTC on all borders

- Greece – Turkey (planned)
- Greece – Italy (studies in progress, implementation plan to be finalized soon)
- Greece – Egypt (under investigation)
- Greece – Albania (planned)
- Greece - Cyprus – Israel (EuroAsia Interconnector Stage 1: 1GW Crete–Cyprus)
- Greece – North Macedonia (reinforcement under consideration)



Note: Acc. to **Independent Power Transmission Operator (IPTO) – Greece**: *Public Consultation on the Preliminary Ten-Year Network Development Plan 2025-2034*

NTC values in import direction on the Greek borders

Σύνορο A→B	2023-2025 NTC (MW) A→B	2023-2025 NTC (MW) B→A	2030 NTC (MW) A→B	2030 NTC (MW) B→A	2035 NTC (MW) A→B	2035 NTC (MW) B→A
GR-AL	400-450	400-450	600	600	600	600
GR-BG	950-1000	1100-1150	1400	1700	1400	1700
GR-CY	0	0	1000	1000	1000	1000
GR-IT	500	500	500	500	1500	1500
GR-MK	600-650	600-650	1100	850	1100	850
GR-TR	218	166	660	580	1260[35]	1180[35]
GR-EG			3000	3000	3000	3000
GR-DE					3000	3000
GR-SAU					tbc	tbc

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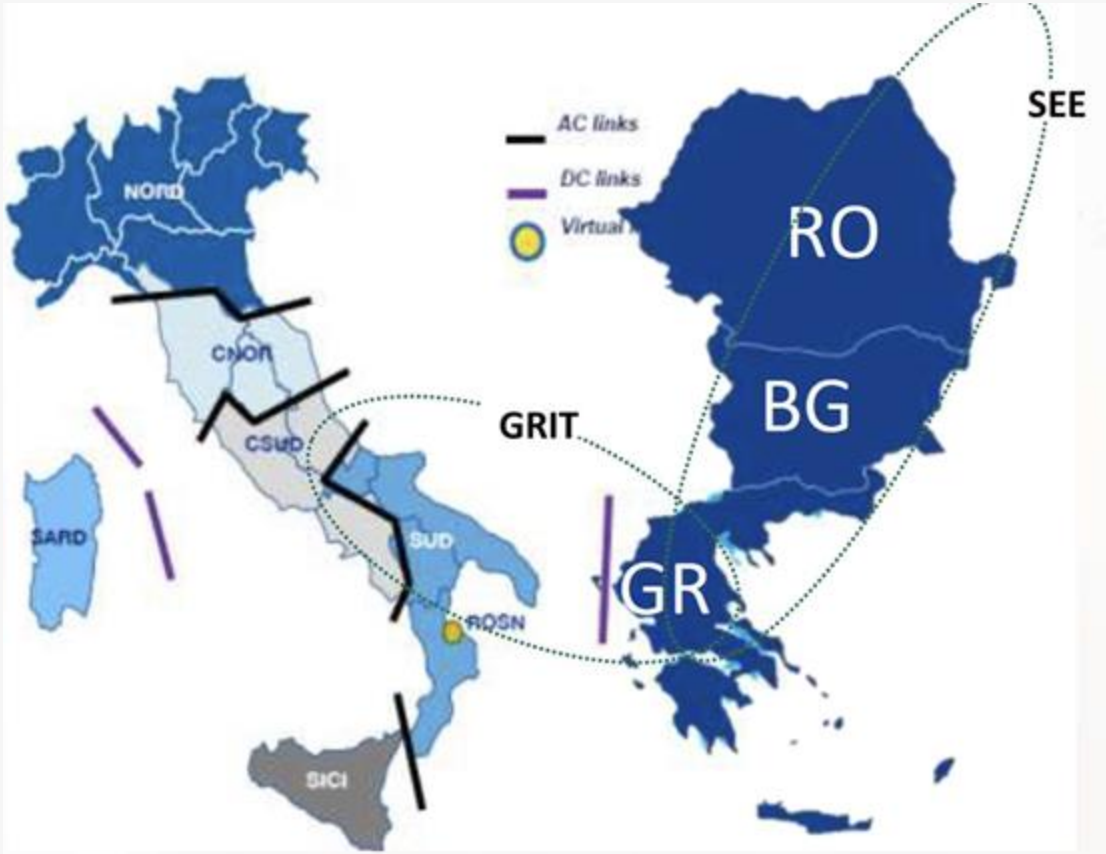
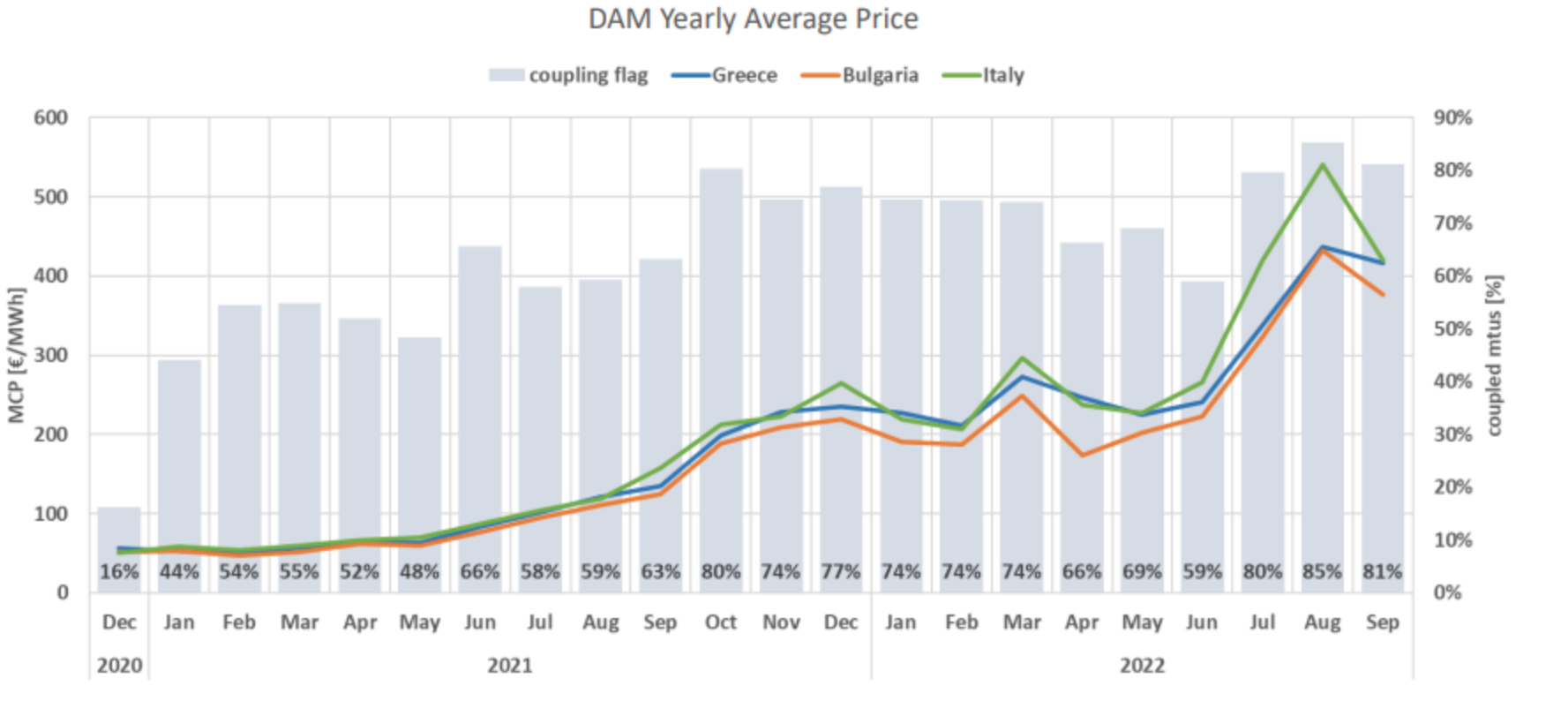
Selene Coordination Centre



- Common Grid Model (CGM)
- Coordinated Security Analysis (CSA)
- Coordinated Capacity Calculation (CCC)
- Short Term Adequacy (STA)
- Outage Planning Coordination (OPC)
- Critical Grid Situation (CGS)

The coupled Day-Ahead Market and Intraday Market



European Platforms for the exchange of balancing energy

Imbalance netting : IGCC

aFRR: PICASSO

mFRR: MARI

RR: TERRE

Thank you

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