ΡΥΘΜΙΣΤΙΚΗ ΑΡΧΗ ΑΠΟΒΛΗΤΩΝ, ΕΝΕΡΓΕΙΑΣ & ΥΔΑΤΩΝ

REGULATORY AUTHORITY FOR ENERGY, WASTE & WATER

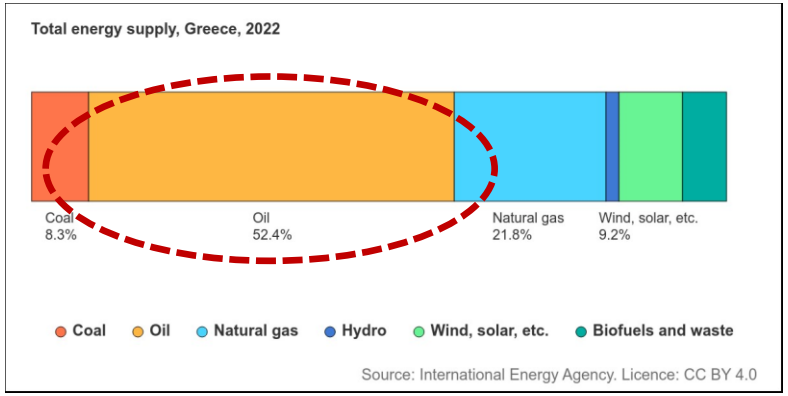
1st Greek – Turkish Energy Forum: Energy developments in Greece

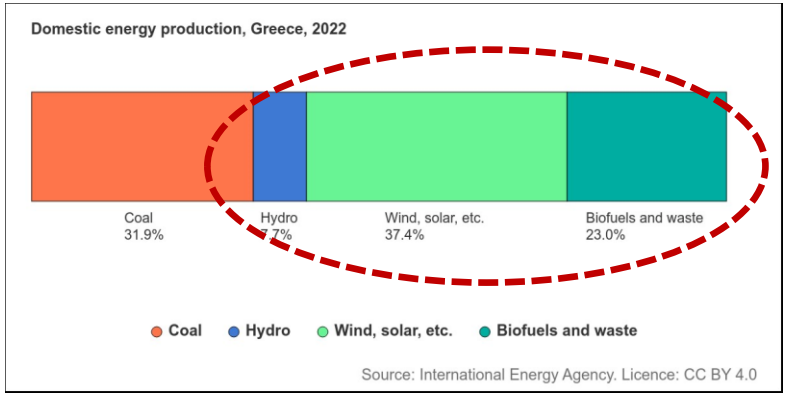
Assoc. Professor, Athanasios Dagoumas
President,Regulatory Authority for Energy, Waste and Water

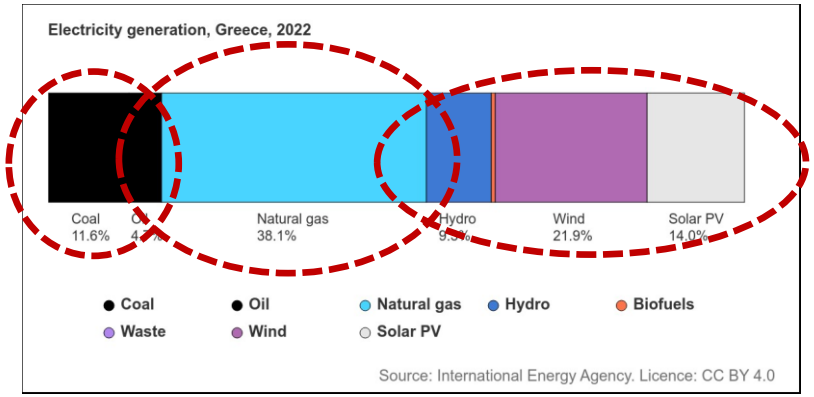
Athens, 25.04.2024

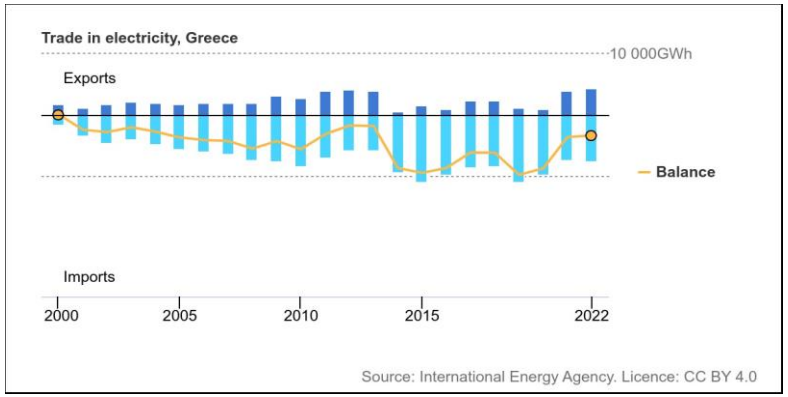
Contents

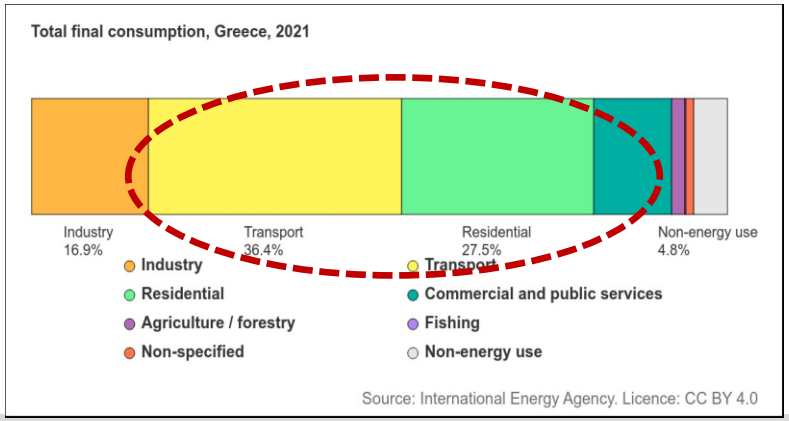
Energy Facts in Greece (2022, source: IEA)

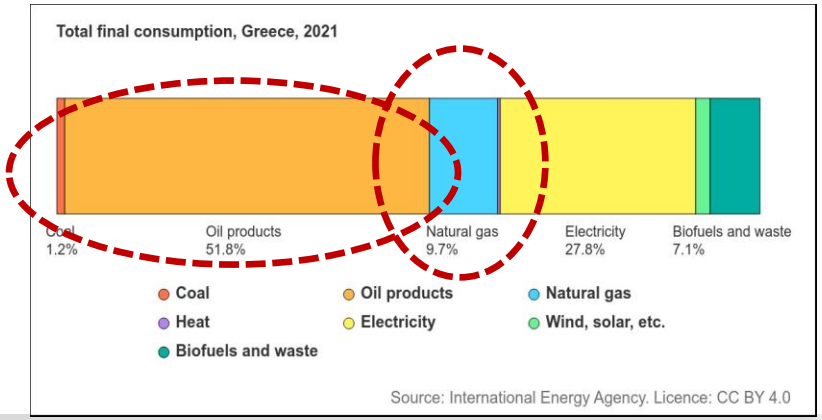












- **High share of oil**
  - Transport&heating/exports from refineries
- **Phase out of lignite**
  - in electroproduction
- **Rapid increase of RES**
  - mainly solar, wind
- **Considerable role of gas (uncertain within European green transition)**

Draft NCEP submitted to EU (2023), under finalization

NECP (Apr 2023)	2021 (estimate)	NECP 2019 for the 2030	2025	2030	2035	2040	2045	2050
GHG,LULUCF (change since 1990)	— 26 %	— 40 %	— 41 %	— 54 %	— 68 %	— 82 %	— 89 %	— 93 %
GHG with LULUCF (change since 1990)			— 44 %	— 57 %	— 72 %	— 87 %	— 95 %	— 99 %
RES indicator as% ofgross final consumption ofenergy	22 %	35 %	31 %	44 %	65 %	83 %	97 %	105 %
Energy efficiency		0 %	— 4 %	— 5 %	— 14 %	— 18 %	— 22 %	— 27 %
Final consumption ofland (million billion)	15.2	16.5	16.6	15.4	13.7	12.7	12.0	11.5
RES-Electroproduction (% gross electricity consumption)	36 %	61 %	58 %	79 %	94 %	96 %	96 %	97 %
RES-heating/cooling	31 %	43 %	36 %	46 %	63 %	80 %	99 %	100 %
RES-transport	4 %	19 %	13 %	29 %	98 %	209 %	381 %	584 %
RFNBO (% fuel transport)	0 %	0 %	0 %	1.00 %	11 %	23 %	31 %	50 %
Advanced biofuels (% transport fuels)	0 %	1.50 %	0 %	2.40 %	10 %	17 %	26 %	32 %
Conventional biofuels (% transport fuels) – upper limit	1.70 %	1.70 %	1.70 %	1.70 %	1.70 %	1.70 %	1.70 %	1.70 %
ESR (% GHG change in non-ETS sectors)	— 32 %	— 40 %	— 36 %	— 46 %	— 61 %	— 76 %	— 84 %	— 87 %

Million tonnes of oil equivalent (E.toe4)

Table 2 Overview of objectives of the revised NECP 2021-2050

Energy Policy in Greece

The latest draft National Climate Energy Plan (NCEP) identifies the following main priorities:

- **Energy efficiency**
  - high domestic value
- **Green electricity**
  - RES and flexible assets (storage - pumping hydro/batteries-, demand response)
- **Electrification of sectors (mainly transport and buildings)**
  - Electric vehicles, ports/cold ironing create electric demand
- **Gas as transition fuel, Renewables gases, H2 and new technologies**
  - Biomethane, Green hydrogen, CCS, Critical infrastructure for energy security….

In alliance to EU Green Deal, enhancing regional energy security and green transition

Energy Policy in Greece

- **Energy efficiency**
  - Supported by numerous funding programs from the State
  - Energy price awareness, real estate market, suppliers becoming ESCOs create gradually a market place for energy efficiency
- **Green electricity**
  - RES and storage are supported by operating (and investment) state aid schemes towards their market uptake (PPAs…)
  - Electricity network development plans
- **Electrification of transport**
  - Chargers (AC&DC) are gradually expanding, State allocated funding for EVs &ports' electrification
- **Renewables gases and new technologies**
  - Biomethane, Green hydrogen, CCS projects implementing, included in IPCEI/Innovation fund

The role of the Regulator in supporting national Energy Policy in Greece

- **Energy efficiency**
  - Innovative IT tools: https://www.electricitycostcalculator.gr/en, https://www.buildingenergysaving.gr/
    - One Stop Shop for Building Energy Efficiency Market (BEEM) under development
- **Green electricity**
  - Facilitate RES and storage licensing (https://licensing.rae.gr/, https://geo.rae.gr/), enhance investments and competition
  - Approval electricity network developments (fines on delays), Digitalization of Network
  - Protect consumers for the green transition through fines, market monitoring/transparency and Consumer tools
    - https://www.rae.gr/en/digital-services-for-energy-markets/
    - https://my.rae.gr/, https://www.rae.gr/energiakos-diamesolavitis/, https://invoices.rae.gr/, https://www.energycost.gr/
- **Electrification of transport**
  - Approve network development plans, Network charges based on Capacity
  - Tools for consumers: https://chargingcost.gr/ to be issued soon
- **Renewables gases, H2 and new technologies**
  - Approve network development plans, Regulatory updates

Contents

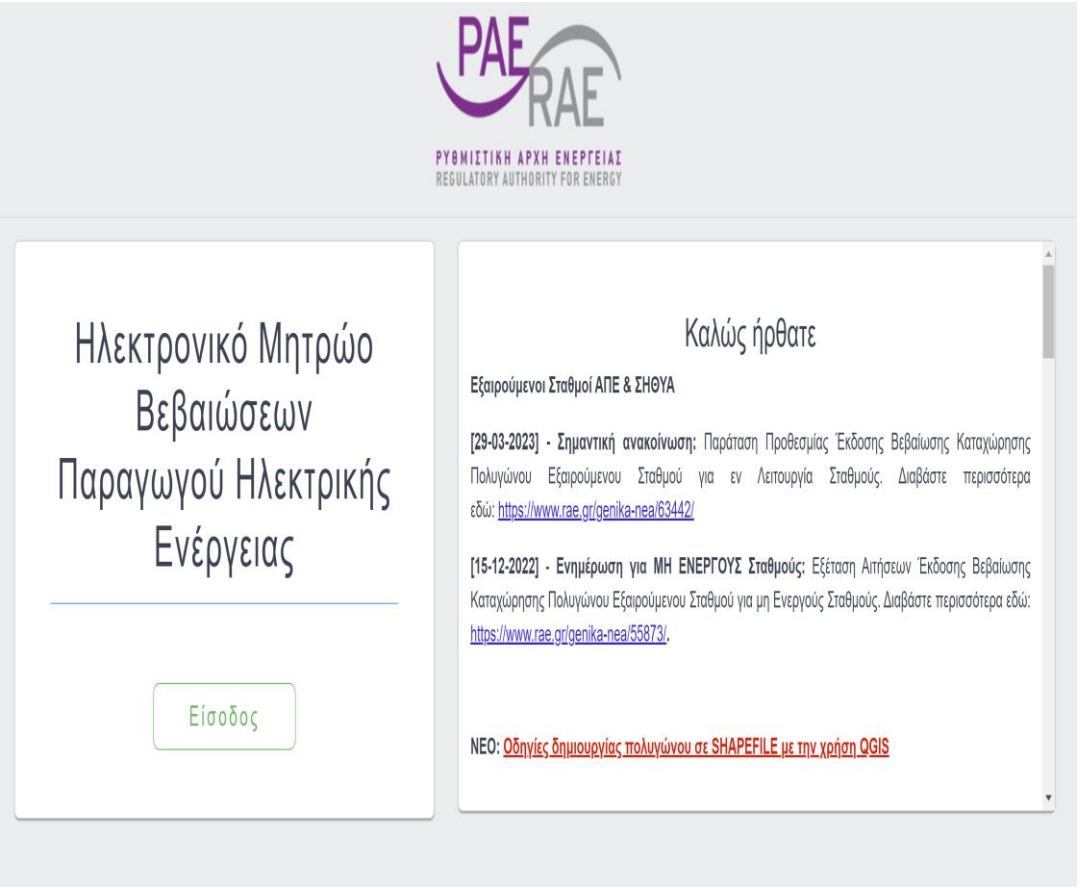
1. **Energy Facts and Energy Policy**
2. **Energy Markets developments**
3. **Developments of Networks/Infrastructure**
4. **Consumer's Place to support consumers during green transition**

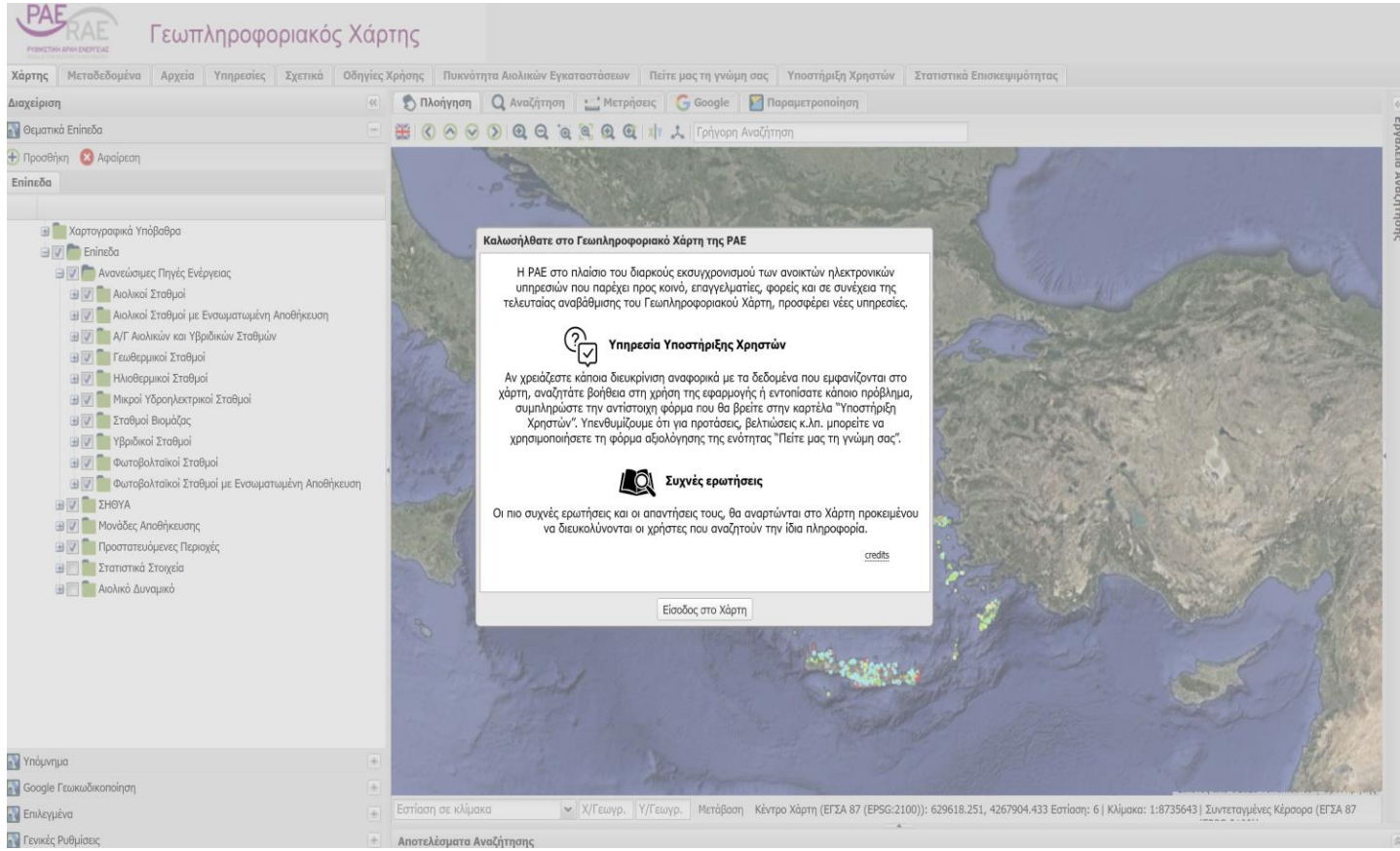
Conclusions

Facilitating RES/storage licensing enhance competition

RES/Storage Licensing – https://licensing.rae.gr/

Geospatial Map – https://geo.rae.gr/



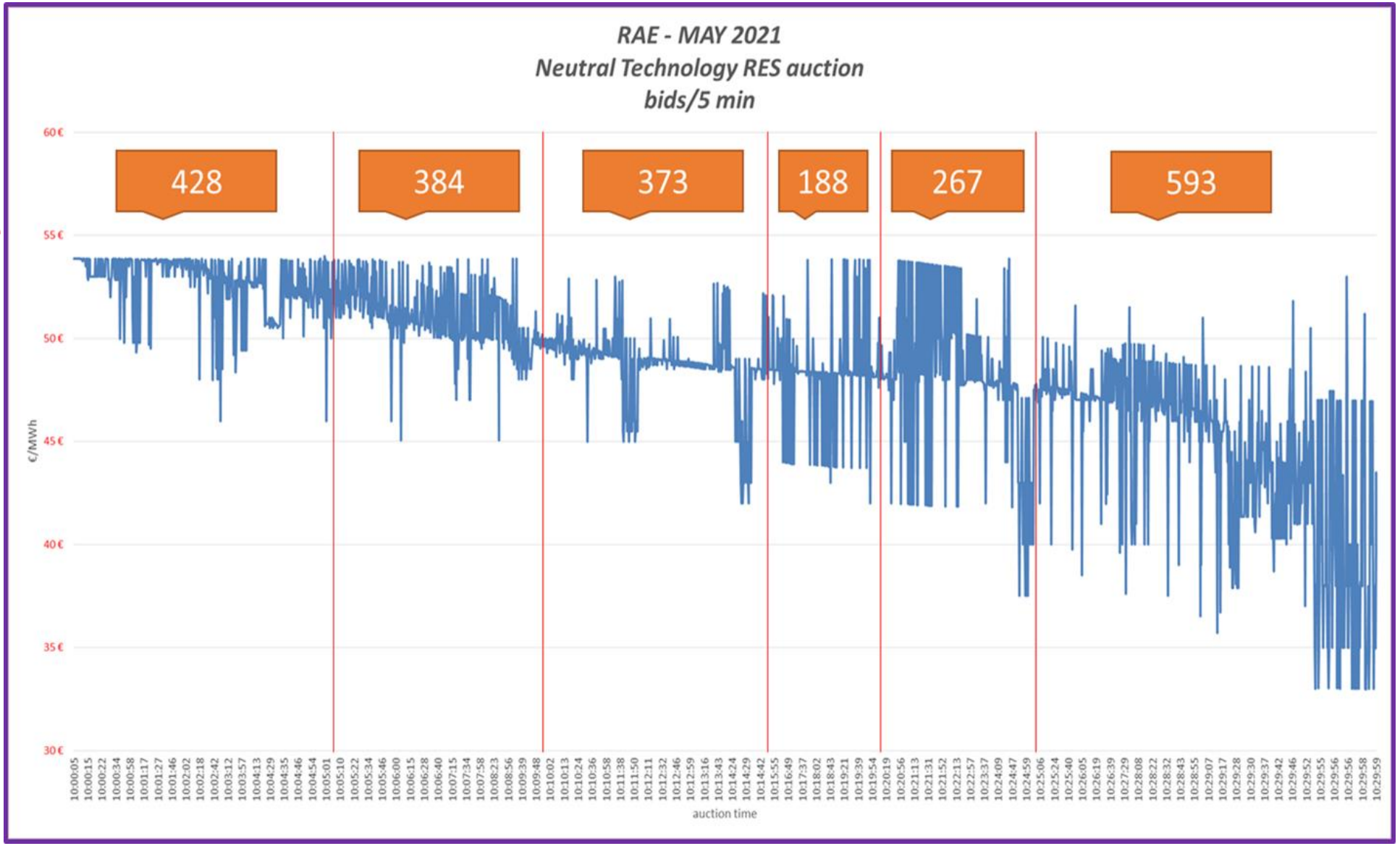


Licensing has been facilitated within RAEEY through innovative IT platforms, enhancing transparency

Licenses issued: About 100 GW of RES, 45 GW of storage, 10 GW of hybrid (RES+storage)

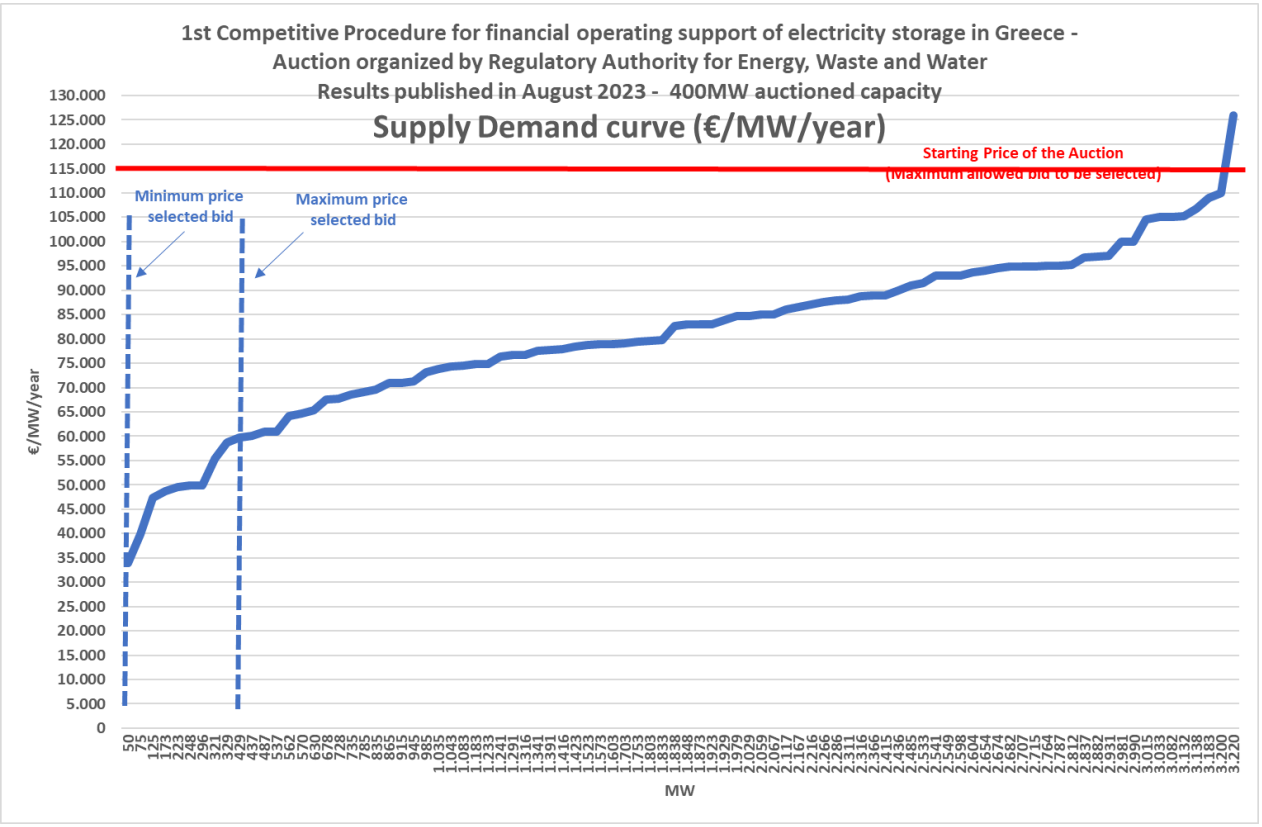
Auctions for financial operating aid for RES electroproduction assets

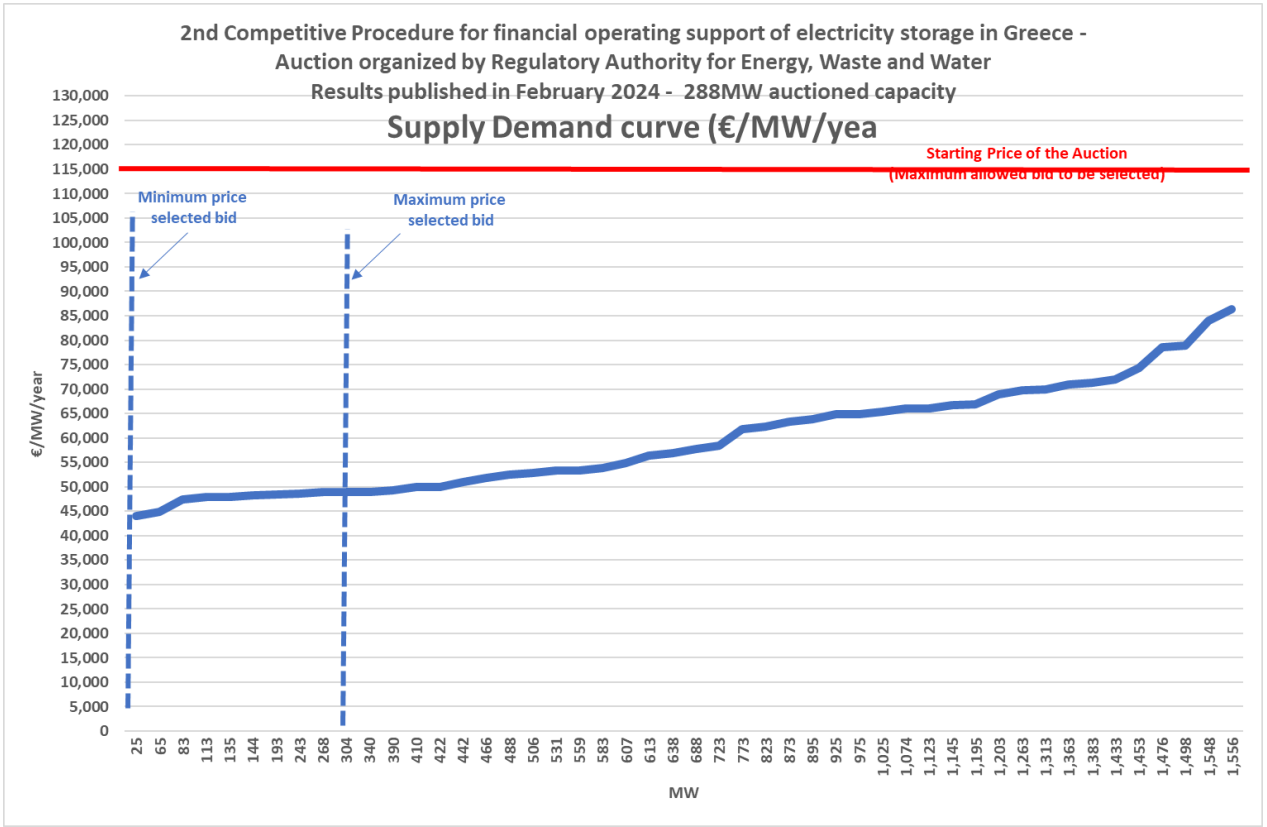
Starting price 54 €/MWh



Weighted average price of selected projects 37.6 €/MWh

Auctions for financial operating aid for electricity storage



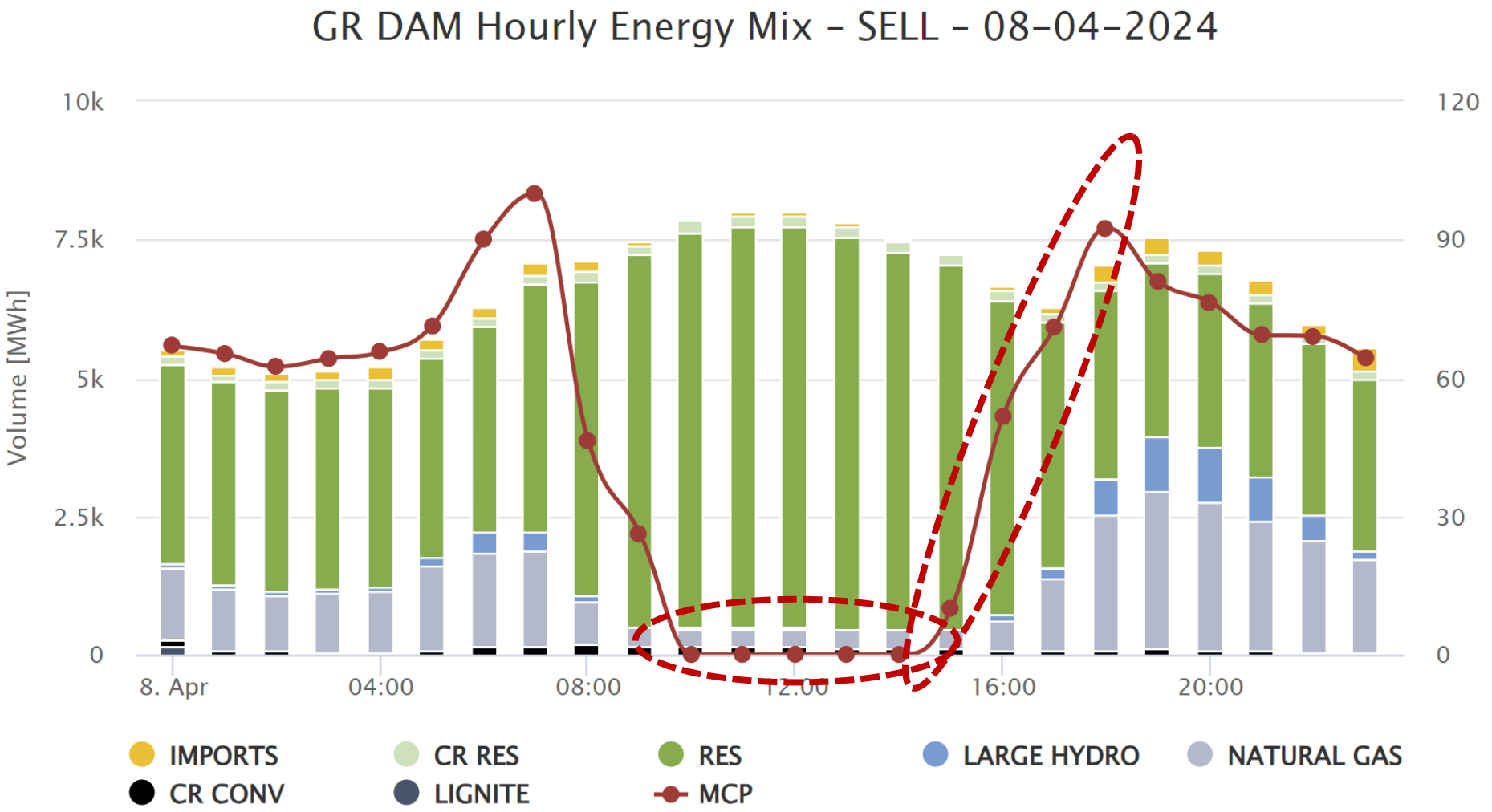


Facilitation of licensing, enhances competition

- in auctions for operating aid for RES and Storage assets

Typical Hourly Energy Mix – in Day-Ahead Market

https://www.rae.gr/energeiako-meigma/

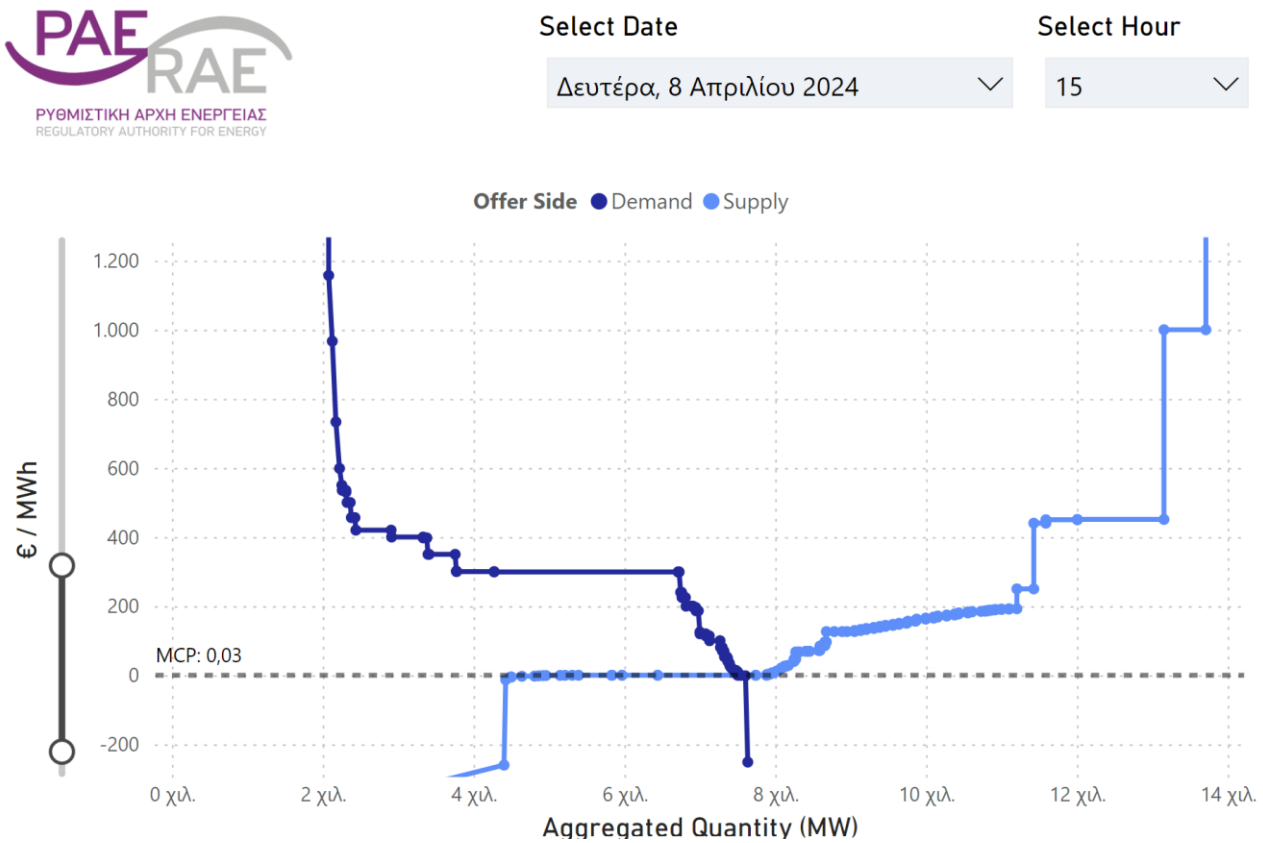


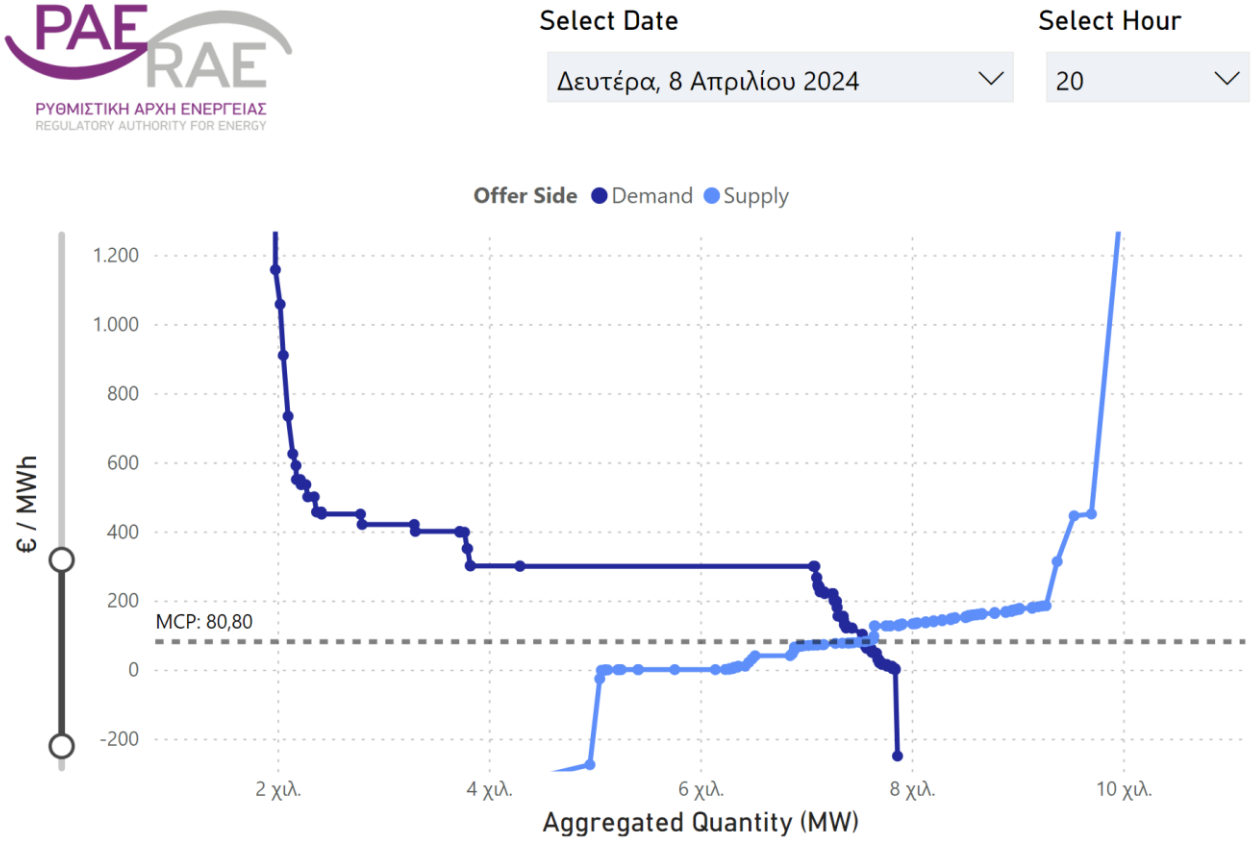
- **zero prices reduce energy cost** for retailers and consumers,
  - however, they create **uncertainty in RES** projects
  - (that could be offset through combing with flexible assets (storage), long-term contracts – CfD and PPAs)
- **price differentials** create **clear signal for storage/demand response** investments

Greek Wholesale Electricity Markets Monitoring

Aggregate Supply-Demand Curves

https://www.rae.gr/soreftikes-kampiles-prosforas-zitisis





Facilitation of licensing, enhances investments and competition

- in wholesale markets

European Wholesale Electricity Markets Monitoring

https://www.rae.gr/en/market-monitoring/european-wholesale-markets/day-ahead-electricity-price-map/

Day-Ahead Market Prices (€/MWh)

Country	DAM Price	(%)	Month-To-Date	Year-To-Date
Italy (IT)	100,23	-4,8% ↓	84,58	90,43
Malta (MT)	100,87	-3,5% ↓	83,68	89,46
Ireland (IE)	100,58	-0,8% ↓	82,48	88,90
Estonia (EE)	106,80	3,6% ↑	58,32	83,70
Poland (PL)	107,30	5,1% ↑	82,44	81,87
Lithuania (LT)	106,80	3,6% ↑	58,14	81,02
Latvia (LV)	106,80	3,6% ↑	58,14	80,95
Ukraine (UA)	112,68	19,3% ↑	70,40	74,42
Greece (GR)	83,18	-15,6% ↓	59,97	74,35
Switzerland (CH)	85,35	-9,8% ↓	60,42	72,84
United Kingdom (GB)	83,67	-2,4% ↓	57,68	71,59
Hungary (HU)	97,98	-2,0% ↓	60,84	70,84
Serbia (RS)	95,31	-1,5% ↓	62,52	70,72
Romania (RO)	97,65	-4,3% ↓	59,16	70,67
Slovakia (SK)	99,01	-1,3% ↓	61,75	70,63
Czech Republic (CZ)	97,53	-2,8% ↓	62,33	70,37
Bulgaria (BG)	83,23	-18,1% ↓	53,94	70,13
Croatia (HR)	95,44	-3,6% ↓	58,67	69,32
Slovenia (SI)	94,96	-3,7% ↓	58,47	68,81
Austria (AT)	94,22	-4,5% ↓	57,44	67,64
Finland (FI)	98,62	42,1% ↑	44,67	66,97

Greece engaged in

- Gradual Market coupling among SEE and CEE
- Gradual Market decoupling from Italian market

The map shows, for the current day, the average daily price (€/MWh) of the wholesale Day-Ahead Market for each European country.

service provided to the Hellenic Regulatory Authority for Energy (RAE)

Powered by DIEM; sources: ENTSOe, GME;

Contents

1. **Energy Facts and Energy Policy**
2. **Energy Markets developments**
3. **Developments of Networks/Infrastructure**
4. **Consumer's Place to support consumers during green transition**

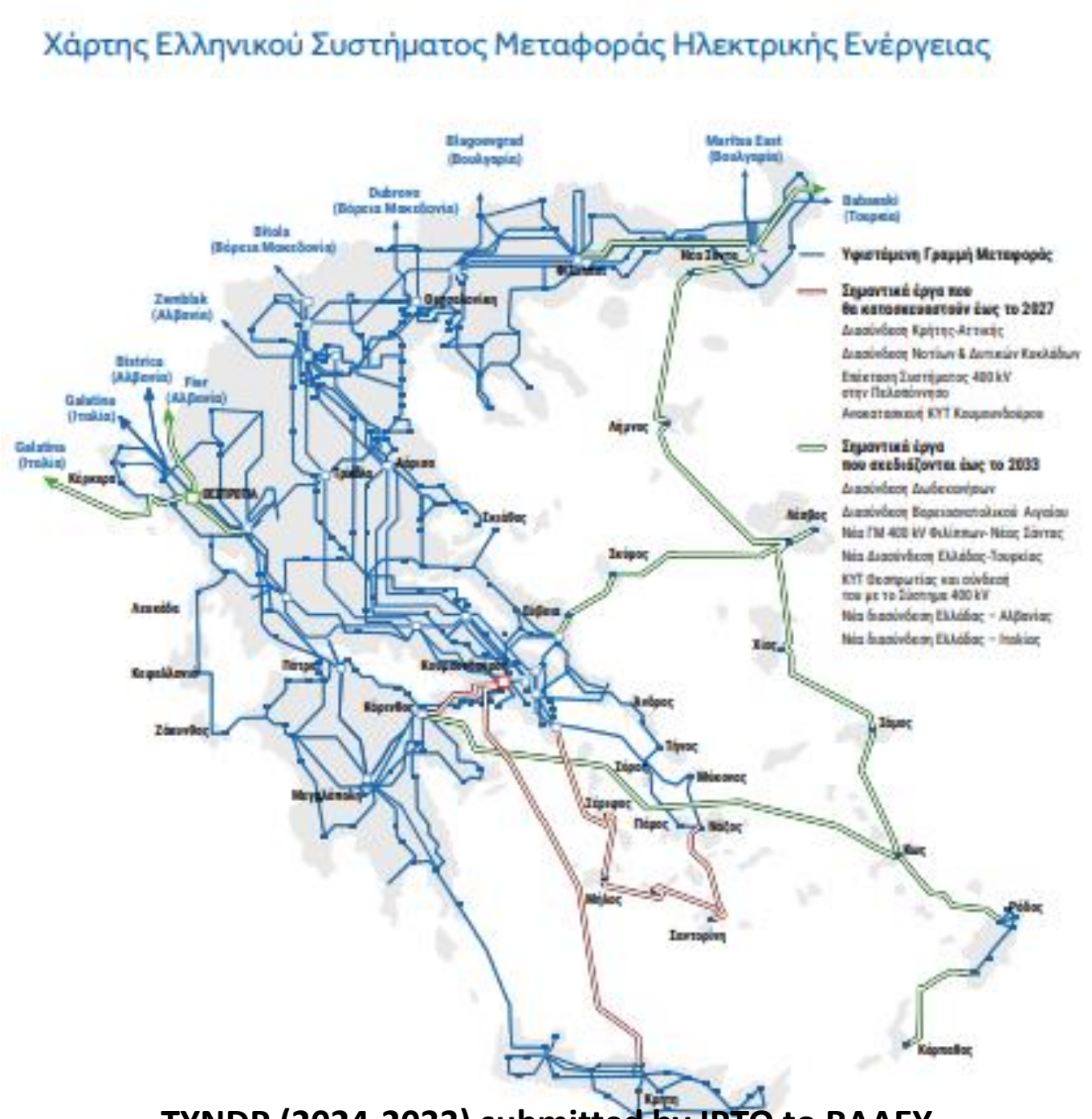
Conclusions

Approval of Ten -Year Network Development Plan in Electricity Transmission System

TYNDP (2022-2031) approved by RAEWW

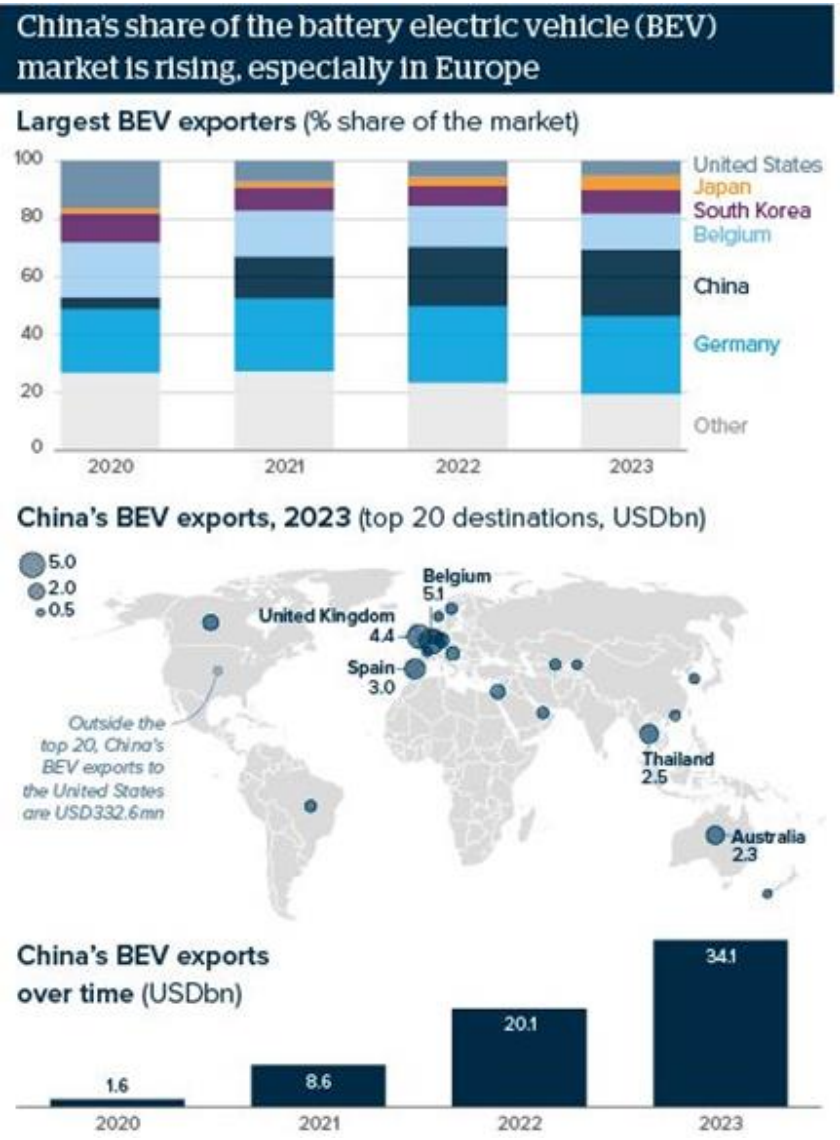
- ***2023 for Crete (DC) - 2025***
- ***2024 for 4th Phase for Cyclades Interconnection (AC) - 2025***
- ***2028 for Dodecanese (DC)***
- ***2029 for North Aegean (AC)***
- ***2023 Extension of 400 kV system in Peloponnese***

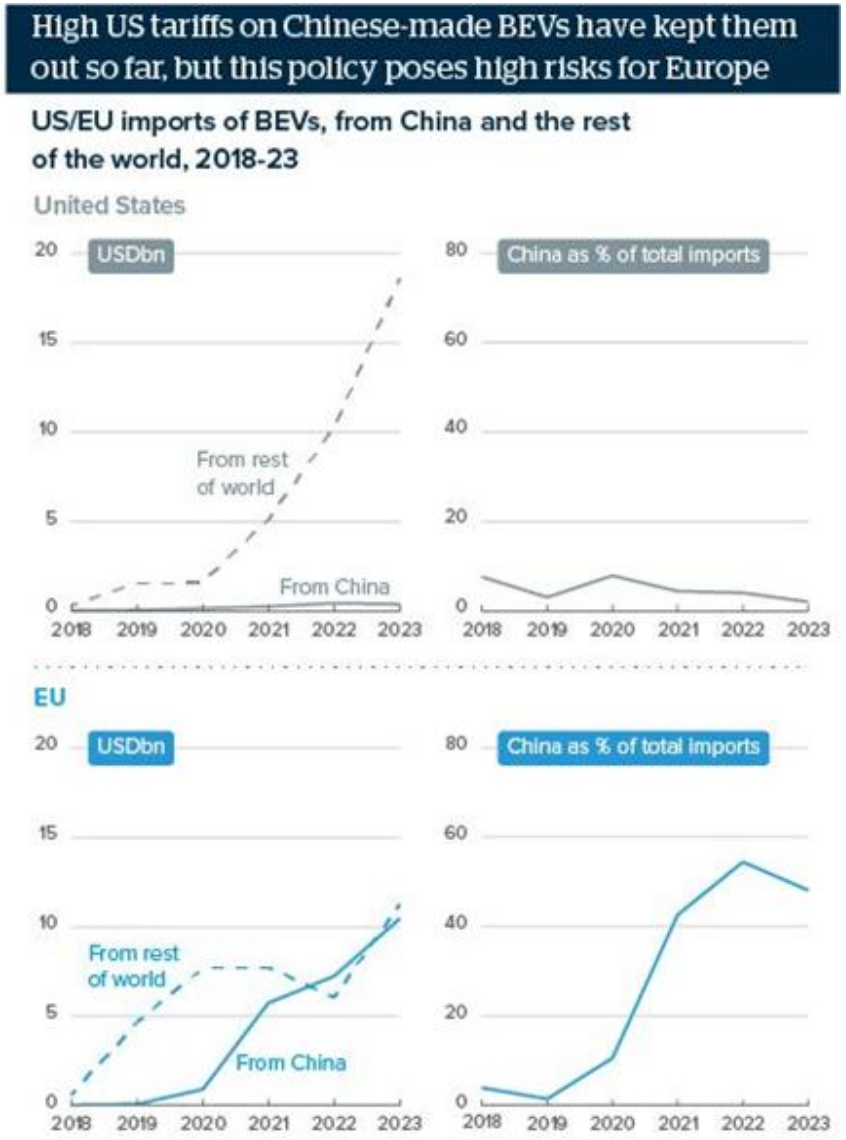
Delay in implementation of interconnections might lead to fine by Regulator (as in case of West route in Peloponnese)



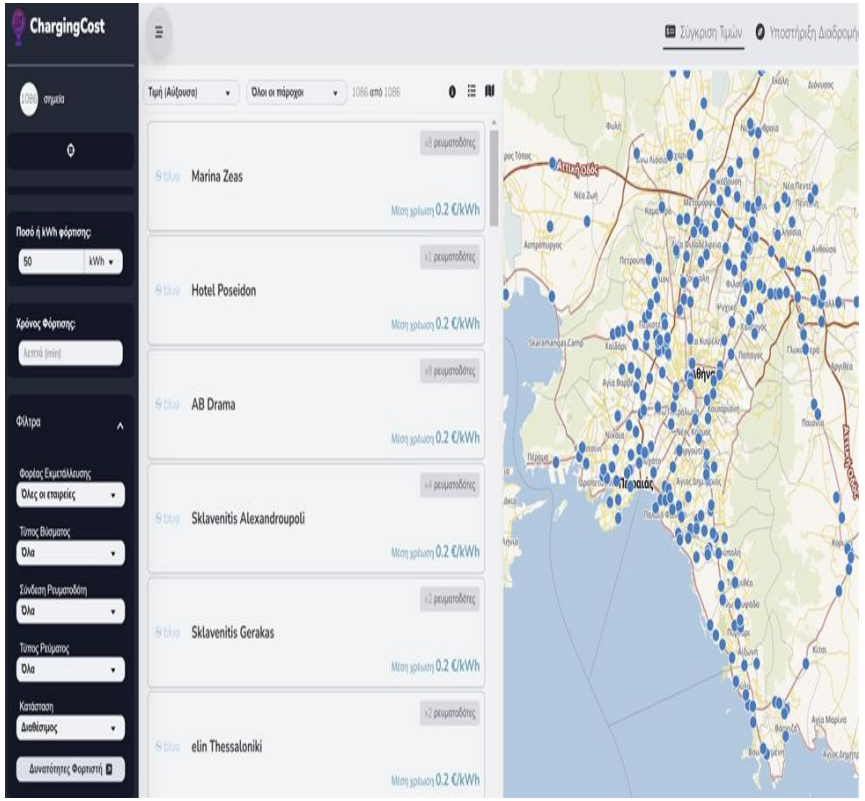
TYNDP (2024-2033) submitted by IPTO to RAAEY

Electrification of transport (new electric demand), enhanced by developments in electric vehicles, storage and fast DC chargers





Electric Vehicles' Prices Comparison Tool (in operation May 2024)



Ten - Year Network Development Plan in Electricity Transmission System

International Interconnections proposed by IPTO:

- ***Second Interconnection Greece-Bulgaria (2023) – in operation***
- ***Second Interconnection Greece-Turkey (2029)***
- ***Interconnection Greece-Cyprus-Israel (2027) – under development***
- ***Second Interconnection Greece-Albania (2030)***
- ***Upgrade of Interconnection Greece-North Macedonia (2030)***
- ***Interconnection Greece-Egypt***
- ***Second Interconnection Greece-Italy***

- ***Green Aegean***

Σχήμα 5.1 Σχηματικό Διάγραμμα των Διασυνδεδεμένων Συστημάτων της ΝΑ Ευρώπης

Network Development Plans in Regional Gas Transmission Systems

Source: IENE

International Interconnections in South-East Europe

TAP – 10bcm annually to Greece, Italy and Bulgaria (through IGB)

IGB – 3bcm annualy to Bulgaria (in operation 1.10.2022) – 5bcm

IGNM: North Macedonia – 1.5 bcm annualy to North Macedonia, (Kosovo, Montenegro, Serbia) (under construction)

Transbalkan – reverse flow of firm capacity bundled products (from Greece to Bulgaria/Romania/Moldova/Ukraine)

EastMed – 12-15bcm annual from Israel/Egypt/Cyprus/Lebanon to Greece/Italy

Vertical Gas Corridor (Hydrogen)

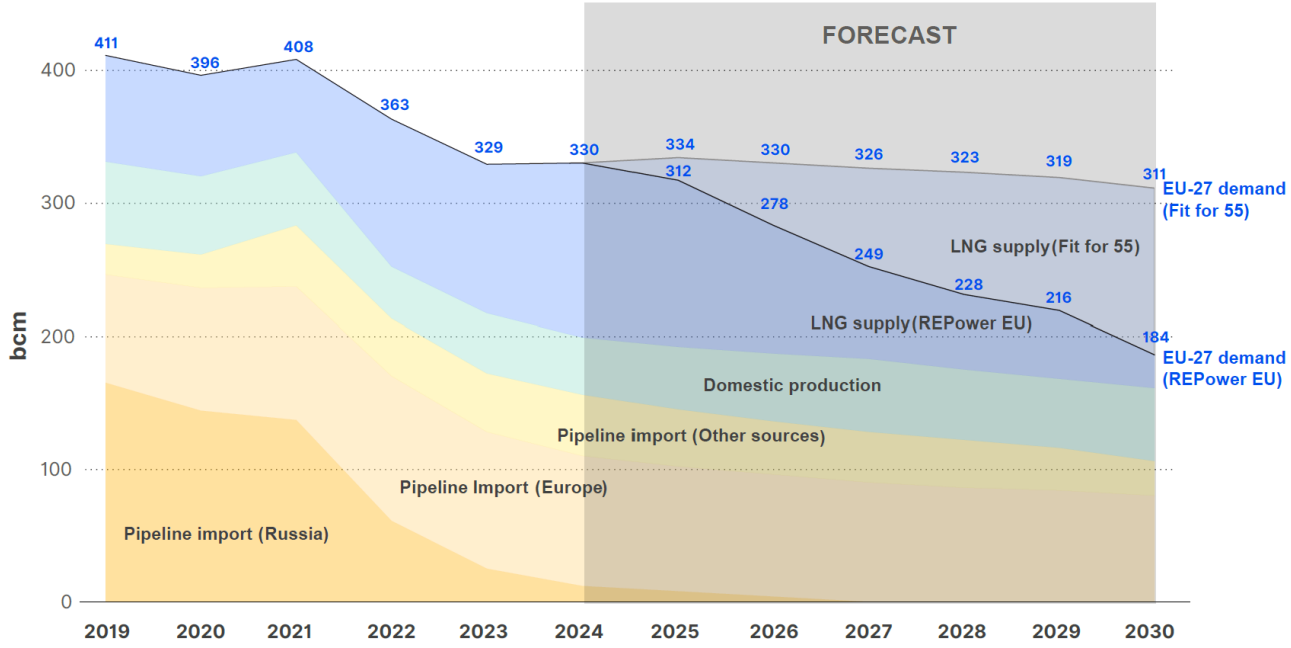
Infrastructure in Greece

High interest for investments in FLNG/FSU/UGS

- **Revythousa FSU** (transitional measure in energy crisis)
- **Alexandroupolis Terminal** (April2024)
- **Korinthos Terminal** (binding Market Test completed)
- **Volos Terminal** (non-binding Market Test completed)
- **Salonika Terminal** (License approved by RAEWW)
- **Thraki Terminal** (License approved by RAEWW)
- **Kavala Underground Storage** (tender by the Hellenic Republic Asset Development Fund S.A.)

Evolution of gas supply in Europe (source: ACER)

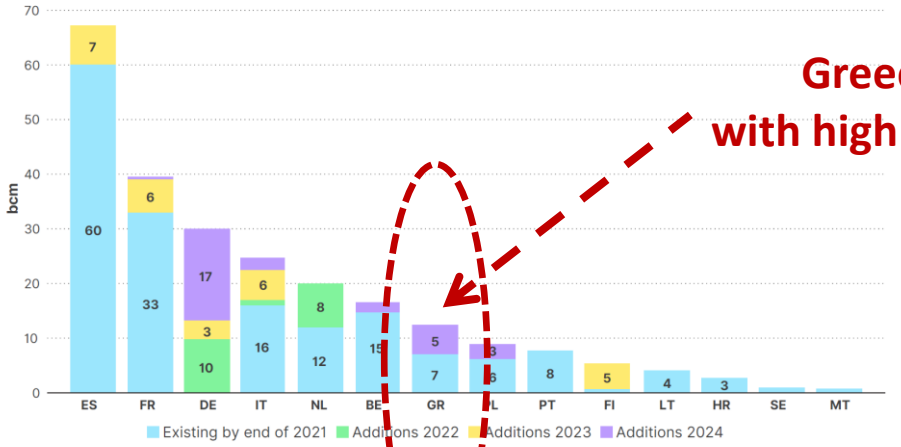
Figure ii: EU gas supply and demand outlook and assessed LNG supply needs relative to Fit For 55 and REPowerEU scenarios by 2030 (bcm)



Source: ACER based on data from ICIS, Platts, and REPowerEU.

Note: The demand evolution from 2024 to 2030 reflects a linear decrease in alignment with the target set for 2030. The potential gas demand reduction described in REPowerEU associated with 20 Mt of green hydrogen introduced by 2030 is not factored in the assessed scenario.

Figure 15: Overview of existing EU LNG capacity per Member State and yearly additions by 2024 (bcm)



Source: ACER based on data from GIIGNL 2023 annual report and ICIS LNG Edge.

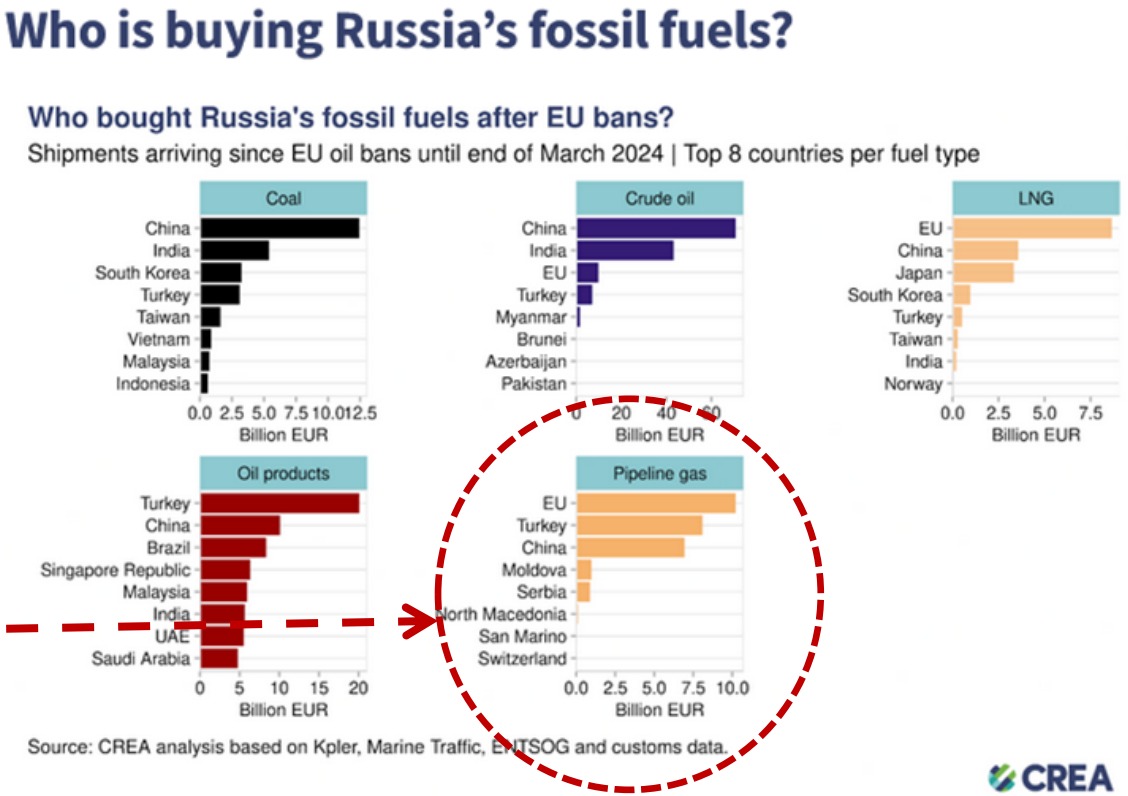
Note: Capacity additions in 2023 for Spain correspond to El Musel LNG terminal. The terminal was already built but was mothballed and had not started commercial operations.

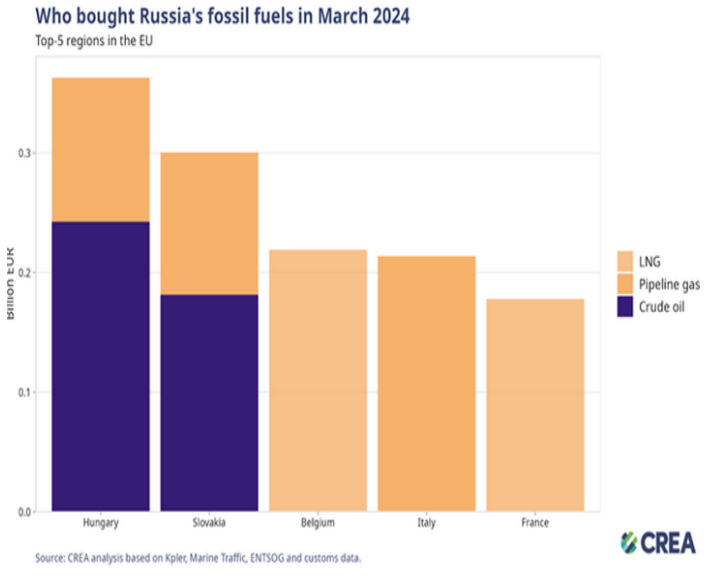
Greece among EU states with high LNG importing capacity

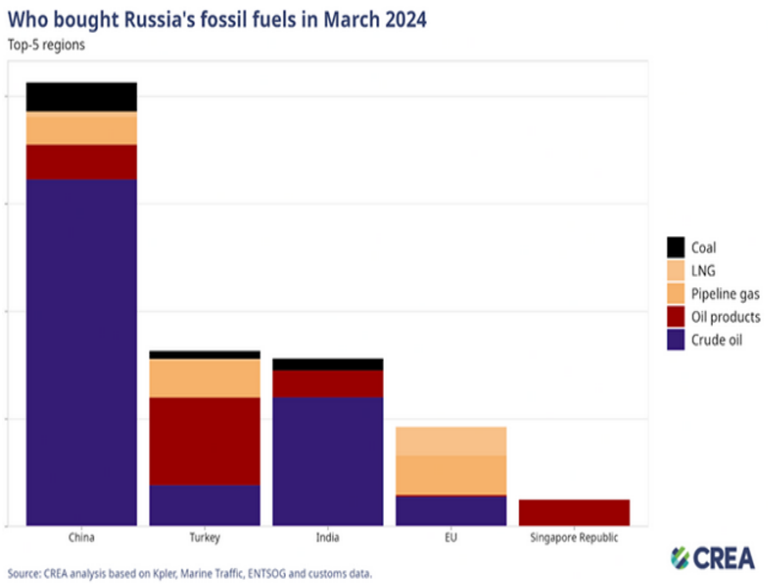
LNG import infrastructure in Europe increased while “REPower EU” contradicts “Fit for 55” LNG demand evolution

Russia’s exports after EU bans

Increased trading role of Turkey for pipeline gas (affecting LNG trade)







Contents

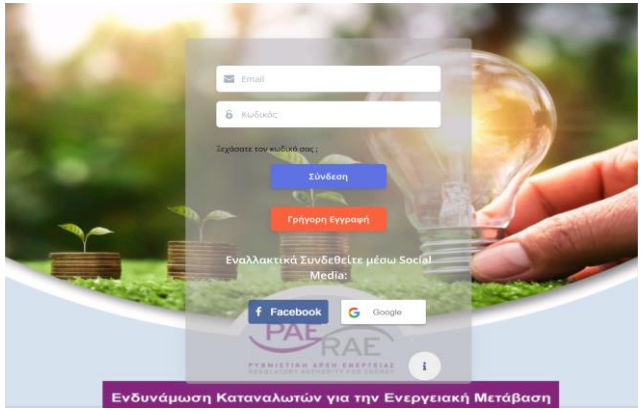
1. **Energy Facts and Energy Policy**
2. **Energy Markets developments**
3. **Developments of Networks/Infrastructure**
4. **Consumer's Place to support consumers during green transition**

Conclusions

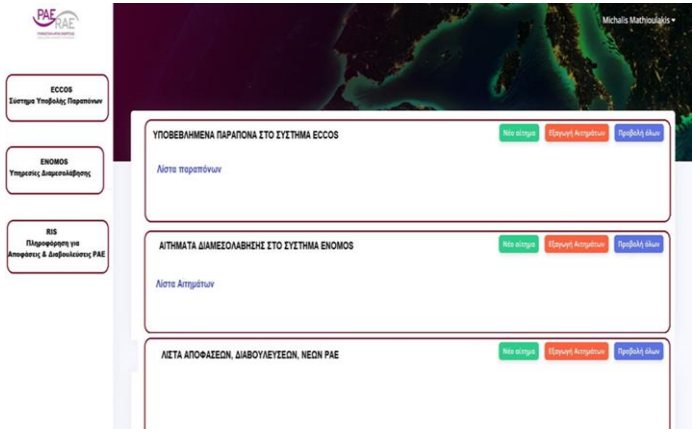
Transforming Regulator nature (R2C), creating Consumer's Place

to Protect Consumers (during Green transition) and Enhance Transparency

Complaints tool – my.rae.gr
(to Energy Providers and Network Operators)
(in operation)



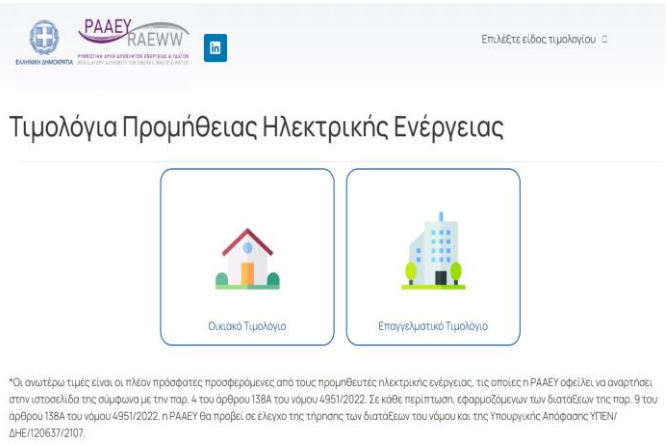
Energy Ombudsman –
Online Arbitration system
(in operation)



Electricity Cost Calculator
https://www.electricitycostcalculator.gr/
(in operation)

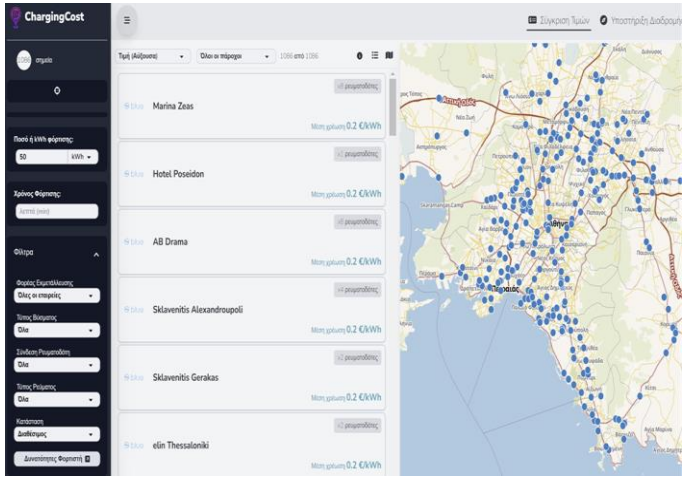
Energy Savings Guide Tool
https://www.buildingenergysaving.gr/
(in operation)

Available Electricity Supply Contracts
– invoices.rae.gr
(in operation)

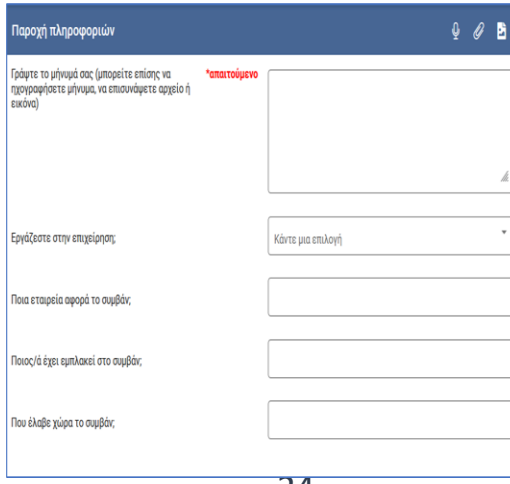


Household Energy Prices Comparison Tool
– energycost.gr
(in operation)

Electric Vehicles' Prices
Comparison Tool
(in operation May 2024)



Anonymous Complaints system
- energy-whistleblowing.gr
(in operation in 2024)

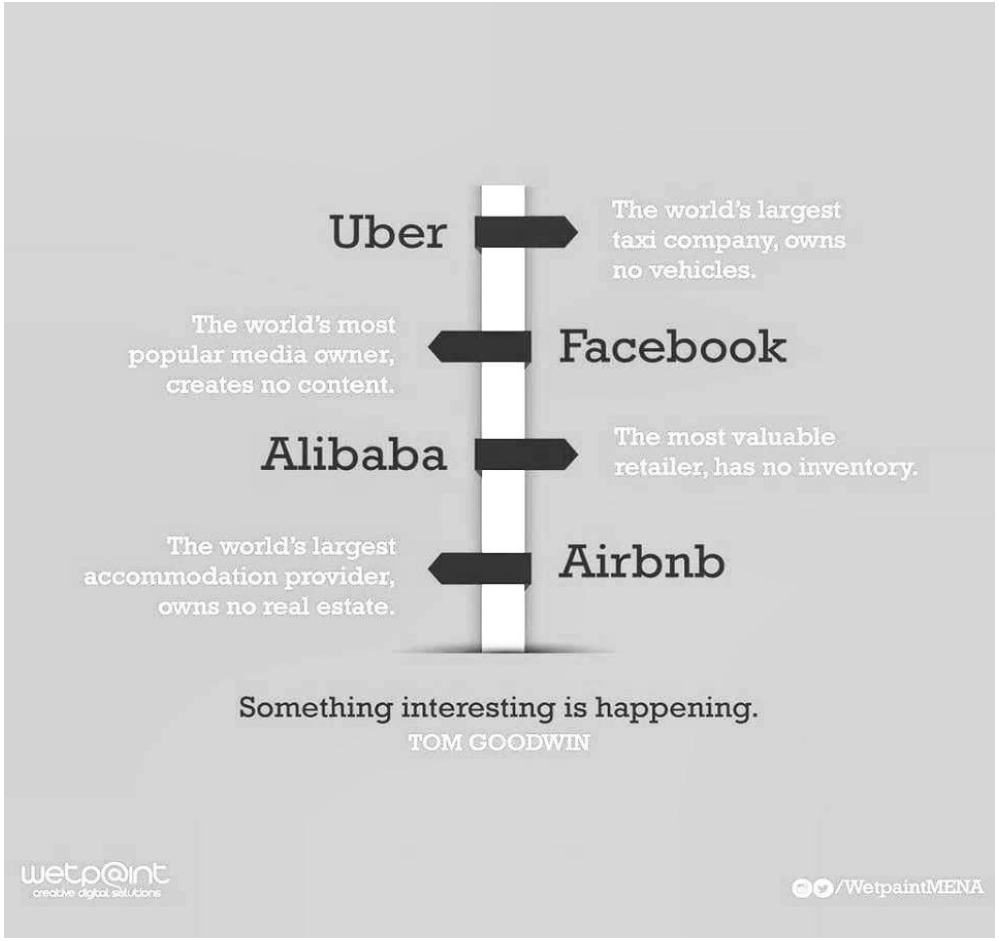


We Create a Consumers' Place

We transform Regulator's nature from B2B (R2B) to R2C

in a similar way that innovative companies

Engage Assets' owners to create Market Place



We Engage Citizens to create Consumers Place

Through a number of innovative tools:

MyRAE
Energy Ombudsman
Energy-Whistleblowing

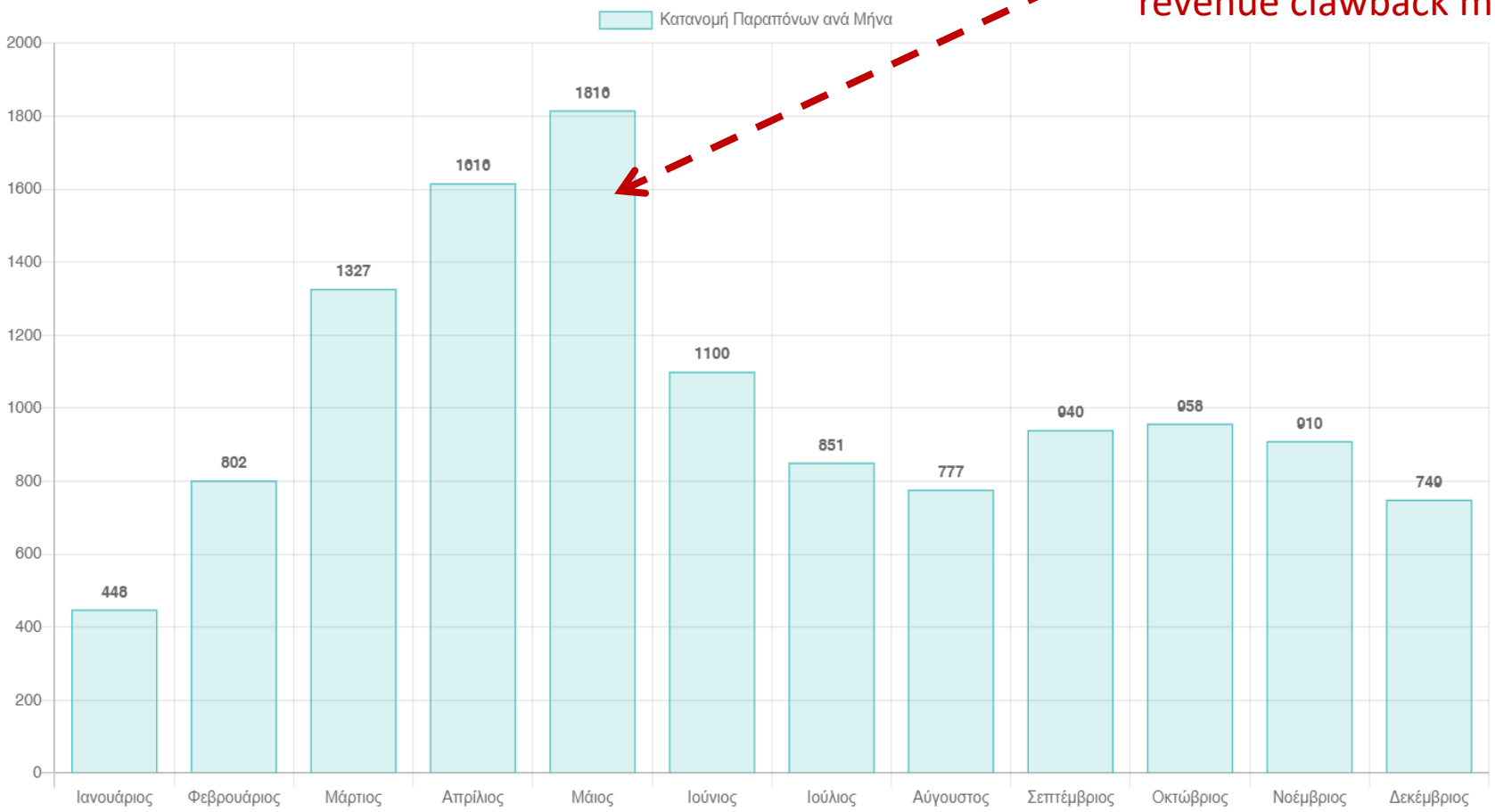
Energy Cost and Charging Cost comparison tools

Tools enhancing Transparency and Understanding
Retail Billing database

Energy Cost calculator and Building Energy Savings tools

Monthly Complaints in MyRAE over 2022

RAE's report on "windfall revenues", initiated ex-post and ex-ante revenue clawback mechanisms



Facilitate decision making for enhancing Social Cohesion and Protecting Consumers

Summary

NCEP key priorities: Energy efficiency, Green Electricity, Electrification of Transport and other sectors, Renewables Gases and new Technologies

- **Energy Market developments**
  - Competition in Wholesale and Retail markets
  - Robust monitoring and transparency
  - Price signals for Storage/Demand Response

Energy markets are competitive and provide price signals

- **Network/Infrastructure developments**
  - Facilitation of network developments/Interconnections/Digitalization
  - Electrification of new sectors create new demand, eliminate curtailments from RES
  - Identify the role of gas/H2/renewable gases in energy transition (energy security)
  - Challenges: Network Costs/ KPIs in TSOs/DSOs performance

Considerable developments of Networks/ Infrastructure

- **Digitalizing procedures for Energy Consumers and Markets**
  - Enhance Competition, Transform nature of Regulator (from R2B to R2C)
  - Create Consumers' Place to Protect Consumers and Enhance Transparency

Protect Consumers for green transition

Participation of RAAEY in Regional and European institutions

ACER
European Union Agency for the Cooperation of Energy Regulators

CEER
Council of European Energy Regulators

ERRA
ENERGY REGULATORS REGIONAL ASSOCIATION

Energy Community

RegulaE.Fr

MEDREG

Thank you for your attention!

ΡΑΑΕΥ

ΡΥΘΜΙΣΤΙΚΗ ΑΡΧΗ ΑΠΟΒΛΗΤΩΝ, ΕΝΕΡΓΕΙΑΣ & ΥΔΑΤΩΝ

RAAEY

REGULATORY AUTHORITY FOR ENERGY, WASTE & WATER