

Clean Energy Investment Opportunities and Relevant Policies

**Nektaria Karakatsani,
Regulatory Authority for Energy (RAE), Member of the Board**

**Belt and Road, Invest in Greece Online Forum 2020,
4 June 2020**

*** Any views expressed are personal.**

Energy: Catalyst for Stability and a Sustainable Future

❑ Geopolitics may raise complications, but **energy** can create strong **links**.

❑ **3D Transition** + Climate change mitigation:
raise common challenges and require global collaboration.

❑ Europe:

➤ **Green Deal**: 50-55% CO2 reduction by 2030.

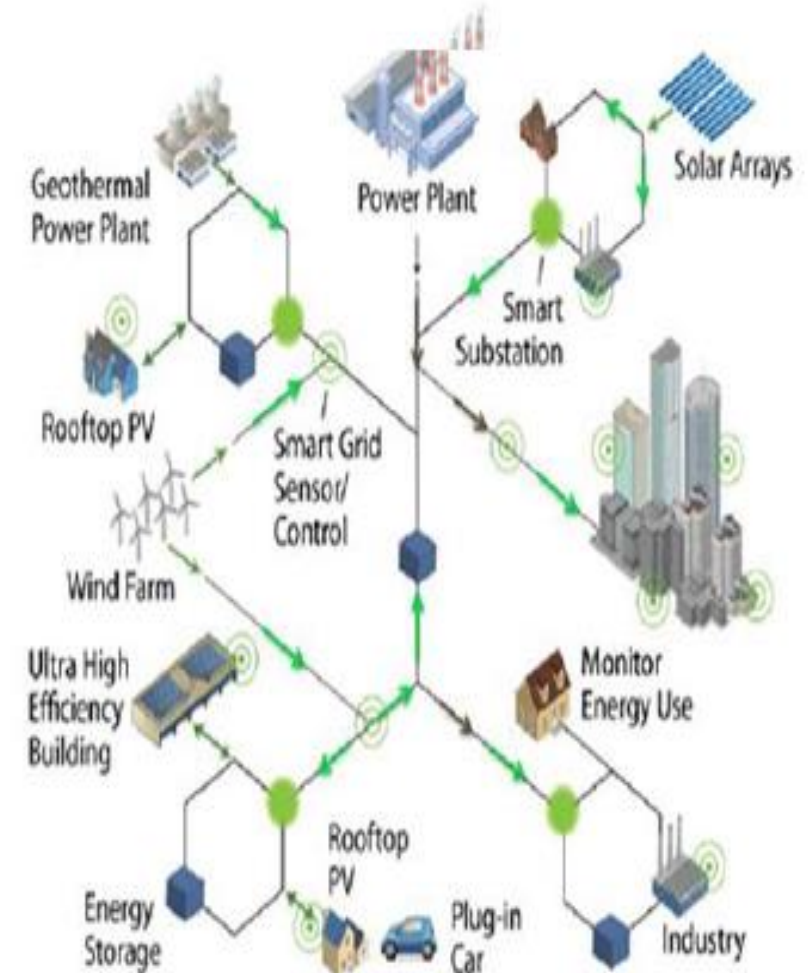
➤ Climate neutrality by 2050.

➤ **Only 11% of global CO2** emissions. 5% in 2030.

❑ **EU-China collaboration**: Essential and more intense.

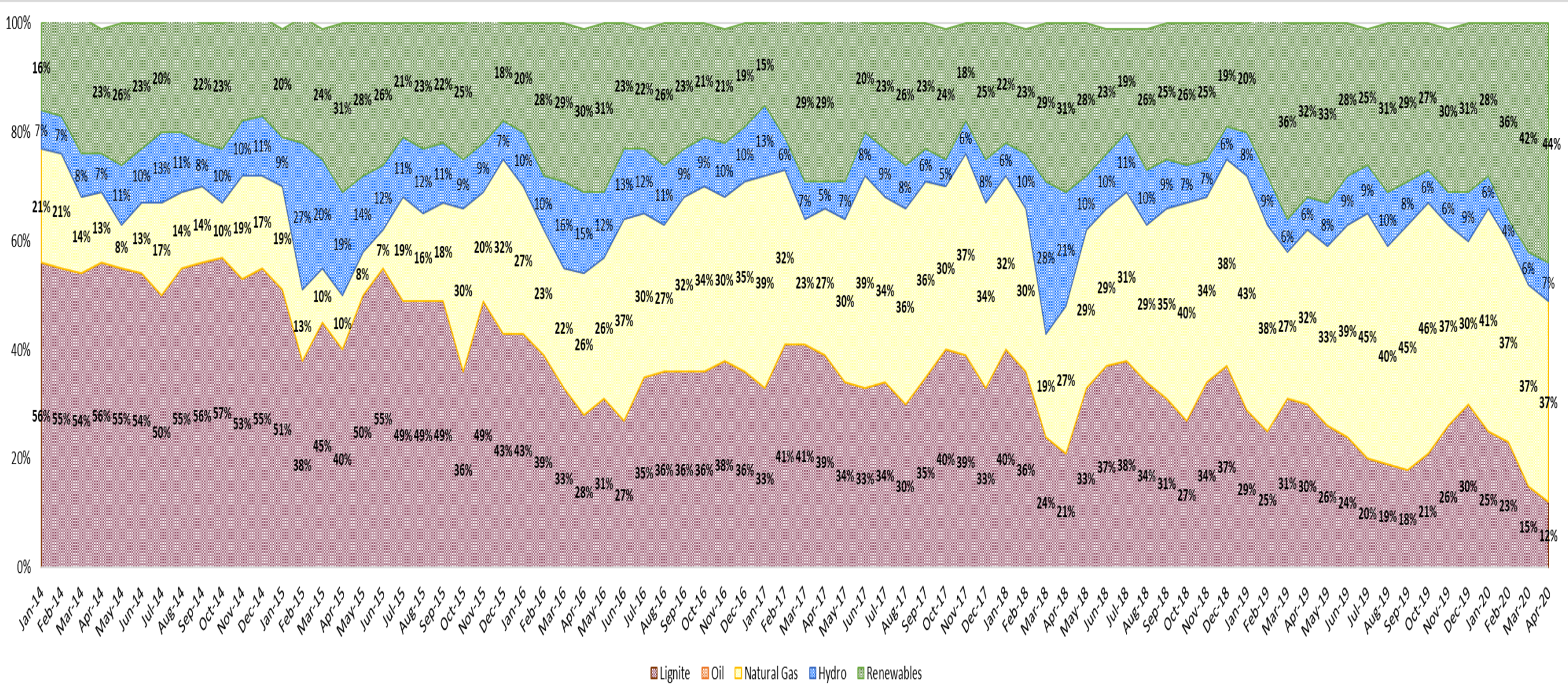
❑ European Commission's study:

Adopting elements of the EU electricity market design
could yield CO2 savings in China=Germany's emissions.



Energy Mix: Significantly Redefined

Fuel Market Shares in Electricity Generation, 2014 - 2020



Clean Energy Transition: Investment Boom

**RES Market Share
in electricity production:**

24% in 2019.

60%: Target for 2030.

44 bil investments up to 2030.

RES: 9 bil €.

7 GW Wind, 7.7 GW PV in 2030

vs.

3.8 GW and 2.9 GW currently.

2030 Targets:

**RES: 35% gross energy
consumption.**

**Energy efficiency: 38%,
600.000 buildings.**

EVs: 1/3 new sales.

CO2 reduction > 56% vs. 2005.

Electricity Grids: 9 bil €

**New gas plants +
storage: 1.3 bil €**

Gas grid + storage: 2 bil €.

Energy efficiency: 11 bil €.

Cyclical economy : 5 bil €.

Renewable Tenders: Successful Outcomes

**2600 MW auctioned over
2018-2020.**

**>1900 MW in construction
phase.**

14 RES Auctions.

2 Technology Neutral.

Conducted by RAE.

**Lowest bid:
49.11 €/MWh**

vs.

**94 €/MWh ceiling price in
1st PV auction in 2016.**

**Next Auctions:
27.7.2020**

**Max Capacity:
482 MW per technology.
Ceiling Prices: 63 €/MWh.**

Role of Regulators

- ✓ Fair market rules to enhance **competition and transparency**.
- ✓ Licensing and monitoring.
- ✓ **Harmonization** with EU framework.
- ✓ Energy security.
- ✓ **Cost-efficiency** in monopolistic networks.
- ✓ Allow for **investment visibility**.
- ✓ Incentives for **innovation**.
- ✓ Cross-border **infrastructure**: Assess costs and benefits **across countries**.

**Clean Transition
at least cost for consumers**

RES Support Schemes

- ❑ Transition from Feed-in-Tariffs to **Feed-in-Premium**: since 1.1.2016.
- ❑ **Market revenues + premium** -> Mitigation of RES account deficits.
- ❑ Reference prices arise from auctions for mature technologies (PV, wind).
- ❑ 20-year contracts with RES Operator.

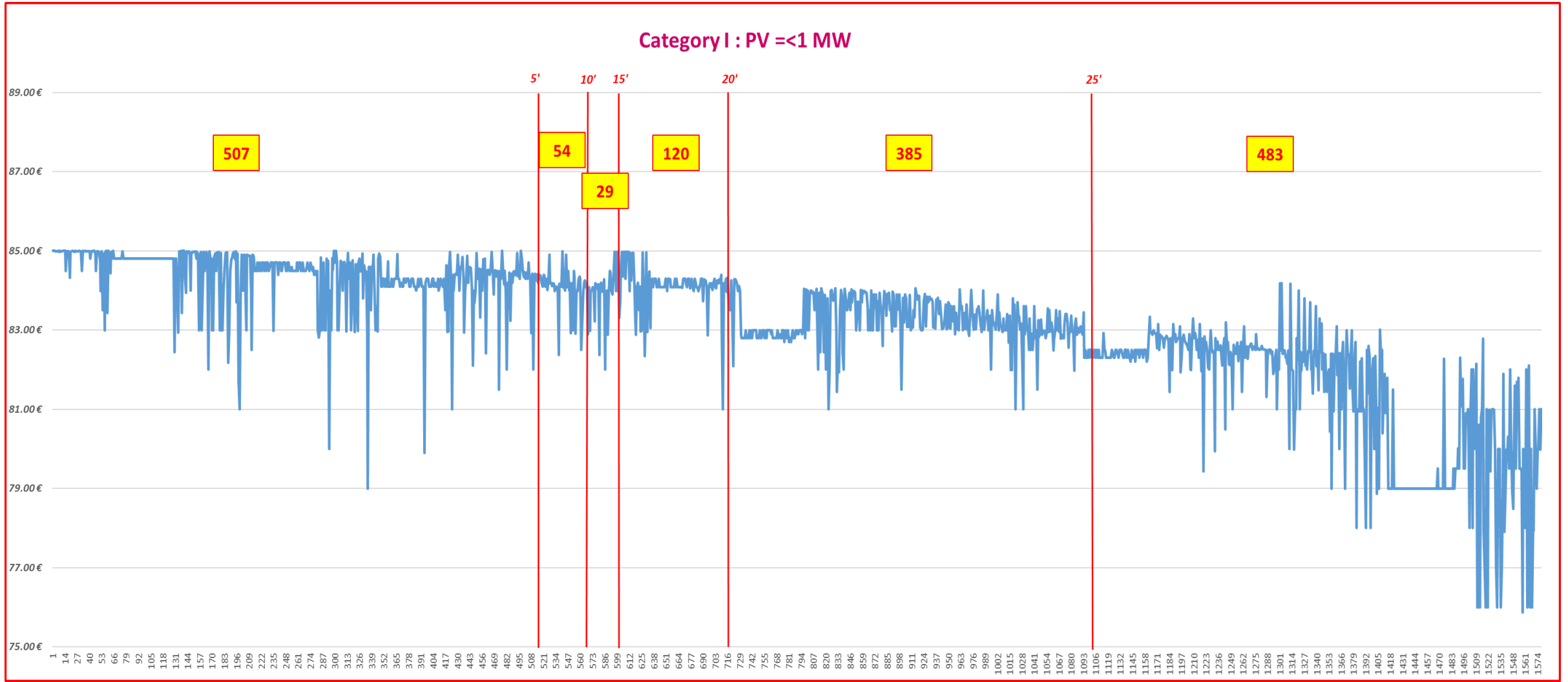
- ❑ RES Tenders: Competition, transparency and least-cost outcomes.
- ✓ **Technology-neutral auctions**: Approved by the European Commission up to 2025.
- ✓ **Technology-specific auctions**: Request for extension beyond 2020 (e.g. 3 years or more).

- ❑ **Limited balancing exposure.**
 - FiT (~5 GW): No balancing requirements.
 - FiP: Participate into the market.
- ✓ Submit forecasts but with error tolerance (until continuous cross-border intra-day trading).
- ✓ Can be represented by aggregators to reduce imbalance charges.

- ❑ Weighted-average prices in Q1 2020 (Interconnected system):
Wind: €84 €/MWh. PV: 264 €/MWh, Biomass/Biogas: 146 €/MWh.

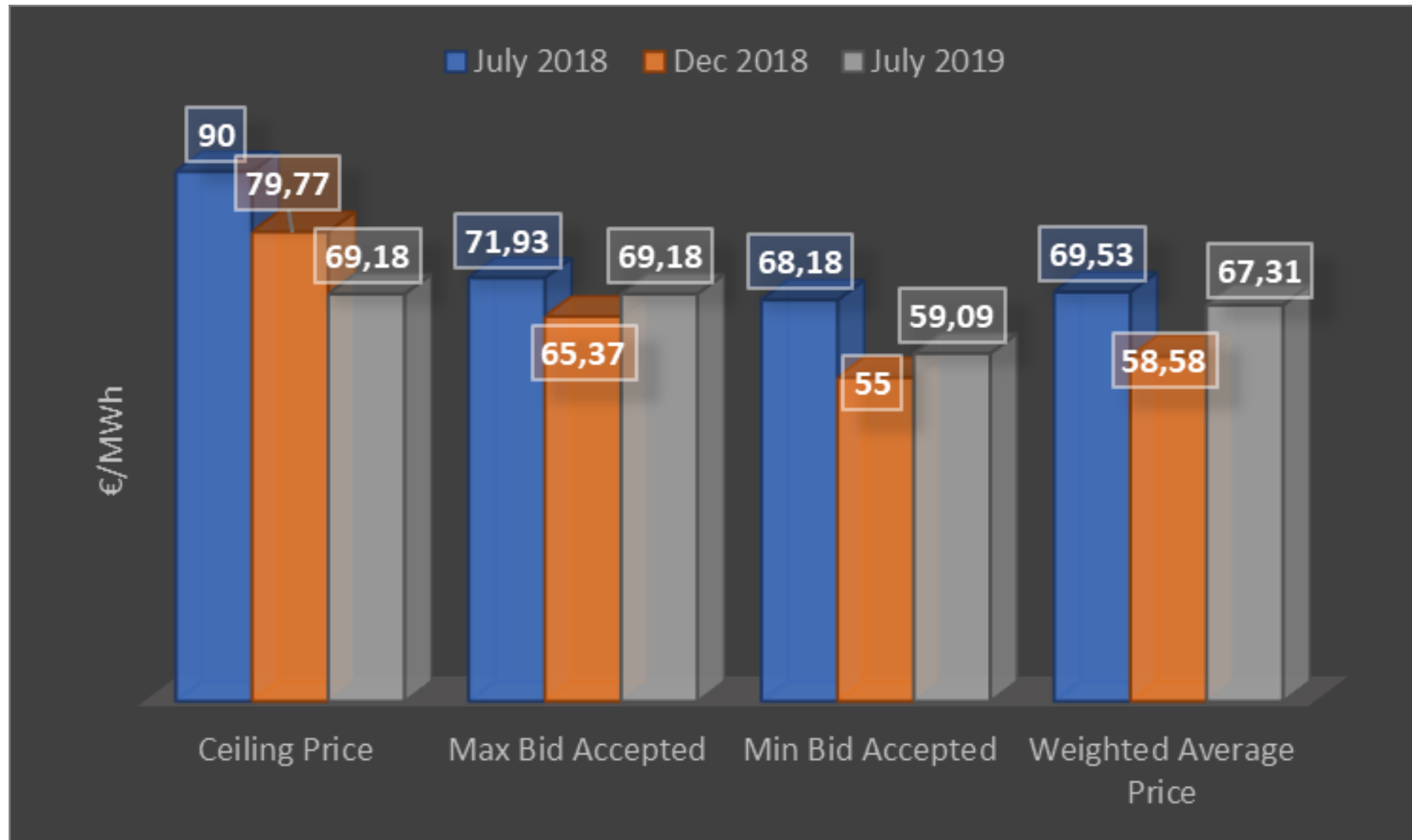
Competition drives down prices

Auction for PV = <1MW (2 July 2018)



Regulatory Focus on Project Viability

Revision of Ceiling Price Methodology for Wind Auctions



RES Momentum in Greece:

Some Indicators

Installed RES: 7.237 MW

**Strong interest by international players.
Both mature projects and development.**

Escalation of license applications to RAE.

Dec 2018: 260, 2.9 GW.

Mar 2019: 273, 2.7 GW.

Sept 2019: 115, 2.2 GW.

Dec 2019: 485, 15.6 GW.

New CCGT plants: > 4 GW licensing requests.

Lignite phase-out: By 2023. Apart from new plant (Ptolemaida V): New fuel mix by 2028.

**RES Integration: Island interconnections,
Network upgrading, Storage, Hybrid stations.**

Investment opportunities and Funding schemes

Examples

PPC's new strategy: Strong focus on RES.

Target: 1 GW by 2024 vs. 153 MW currently installed.

Project 1: 200 MW PV + 2 substations 150kW, Kozani.

Budget: 110 mil € . On-going Tender.

Project 2: 50 MW PV in Megalopoli.

Tender expected shortly. PPA.

Energy Efficiency: 1st Pilot Tender, 5-10 mil €.

ESCOs or Aggregators that deliver max energy savings.

Green loans: Climate indicators via European Taxonomy.

Green Bonds.

Terna: 150 mil €, 684 mil € offered. 2.6%. 7-year.

Mytilineos: 500 mil €, 1.9 bil € offered. 2.5%, 4-year.

RES Licensing made simple

- ❑ **Shortening** of the entire process to **2-3 years**.
- ❑ On-going: **Digital registry**, interacting automatically with financial and environmental registries.
- ❑ Unique ID for each project across all stages.

- ❑ **New Environmental Law (7 May 2020)**
- ❑ Production license: **Substituted by a notification** issued electronically.
- ❑ Grid connection: **Cost-sharing for substations** (50 MW) if multiple projects apply.
- ❑ **Less disruptions**: Early co-ordination and conditions for judicial appeals.

- ❑ RAE is developing the IT system for the current, intermediate stage.

Privatisation Schemes - Regulated Energy Operators

❖ Gas DSOs

- **Tender in progress for DEPA Infrastructure.**
- 5 companies at the 2nd stage. Virtual Data Room.
- WACC: **7.7%** in 2020.
- **Extra WACC: 1.5%** if targets achieved (Km, penetration).
- 5-year Capex: 470 mil €.

❖ Electricity DSO (DEDDIE)

- WACC: **7%** in 2019.
- New Framework: Under consultation.
- **Extra WACC: up to 2%** for significant projects.
- 1.5 bil € investment plan + 1 bil € smart meters.
- 753 mil € allowed revenues in 2019.
- 210 mil € capex.
- Regulated asset base: 3 bil €.
- 6.500 employees, 313.000 km.
- Assets Ownership: PPC.

❖ Electricity TSO (ADMIE)

- **State Grid China: 24%.**
- WACC: **6.5%** in 2020.
- **Extra WACC: 1-2.5%** for Crete-Attica Interconnection.
- 5 bil € investment plan up to 2030.
- 254 mil € allowed revenues in 2019.
- 250 mil € capex.
- Regulated asset base: 1.68 bil €.
- 1.300 employees, 11.800 km.

Transformation to a Gas Hub

- Gas TSO (DESFA):
 - ✓ LNG Terminal: Upgrading and Extension (2018).
 - ✓ Utilization rate escalated > 55%.
 - ✓ Currently: **Truck Loading** + **Small-scale LNG**.
 - ✓ New compressors + Interconnector with North Macedonia.
- Underground Storage Facility (Kavala).
 - ✓ **Tender** being drafted by TAIPED.
 - ✓ RAE: **Regulatory framework**, following the CBA.
- Virtual Trading Point -> **Gas products** in energy exchange.
- **Pipelines**: TAP, IGB, IGI, EastMed.
- **FRSU Alexandroupolis** (market test). FSRU (Dioryga Gas).
- From 3 entry points today -> 7.
- From 1 exit point today -> 3.



Key Reforms have been implemented.

New Key Entities:

Hellenic Energy
Exchange.

Energy Clearing
House.

Market rules
harmonized with
EU framework.

New Market Roles:

Aggregators,
gas traders,

Clearing parties,
EV service providers.

Measures on
incumbents +
New Investors in
networks.

Huge investments:
Cross-border
Infrastructure.

**More competitive,
EU compliant and
well-connected
markets.**

RAE Proposals on Clean Transition

- ❑ RAE has submitted Opinions on key issues including:
 - ✓ Pricing Framework for Hybrid systems (RES + storage).
 - ✓ Support scheme for hydro-pumping storage (680 MW, capex: 500 M €, Amphilochia).
 - ✓ Allowing RES without support schemes, outside tenders, to enter the market. Legislated in May.
 - ✓ RES in the same region with common grid connection point > 250 MW:
possibility of individual notification to European Commission.
 - ✓ EV: Development of charging points and market roles.

- ❑ In progress:
 - ✓ New Licensing Framework.
 - ✓ Storage Framework.
Study presented in May 2020 suggests: 1000 MW pumped-hydro + 500 MW batteries.
 - ✓ Tenders for immature RES projects.
 - ✓ Wind projects with dedicated interconnection.
 - ✓ Framework for Off-shore wind.

Innovation: Key Driver in Greece

- ❑ Coal transition areas: **Green Hydrogen** (PV in West Macedonia).
PPC: 3GW RES in lignite areas.
- ❑ Strong **manufacturing interest** in: Batteries, Smart meters, EV, ext.
- ❑ Subsea Cables.
- ❑ Smart cities (e.g. Trikala)+ Islands (**Tilos**).
- ❑ Cyclical economy solutions.
- ❑ Energy from **agricultural** and **waste** sources.
- ❑ Cross-sectoral synergies.
- ❑ **RES in other sectors**: heating, cooling, transportation.
- ❑ PPAs: Strong trend in Europe. Greece to follow shortly.
- Norsk Hydro (**Aluminium**): 29-year PPA with wind farm in Sweden.
- Signify (**Lighting company**): 10-year VPPA with wind farm in Poland.

“ Nothing endures but change” - Heraclitus, 500 BC



Why invest in the Greek Energy Sector?

- **Reliable market instruments.**
- **Competitive environment.**
- **Huge infrastructure potential.**
- **Regulatory frameworks rewarding performance.**
- **Reforms + Investment visibility.**
- **Strong commitment to energy transition.**
- **Well-designed National Energy and Climate Plan.**

Thank you very much for your attention

□ **Nektaria Karakatsani**

RAE, Member of the Board

PhD (London Business School), MSc (Oxford)

Email: nkarakatsani@rae.gr