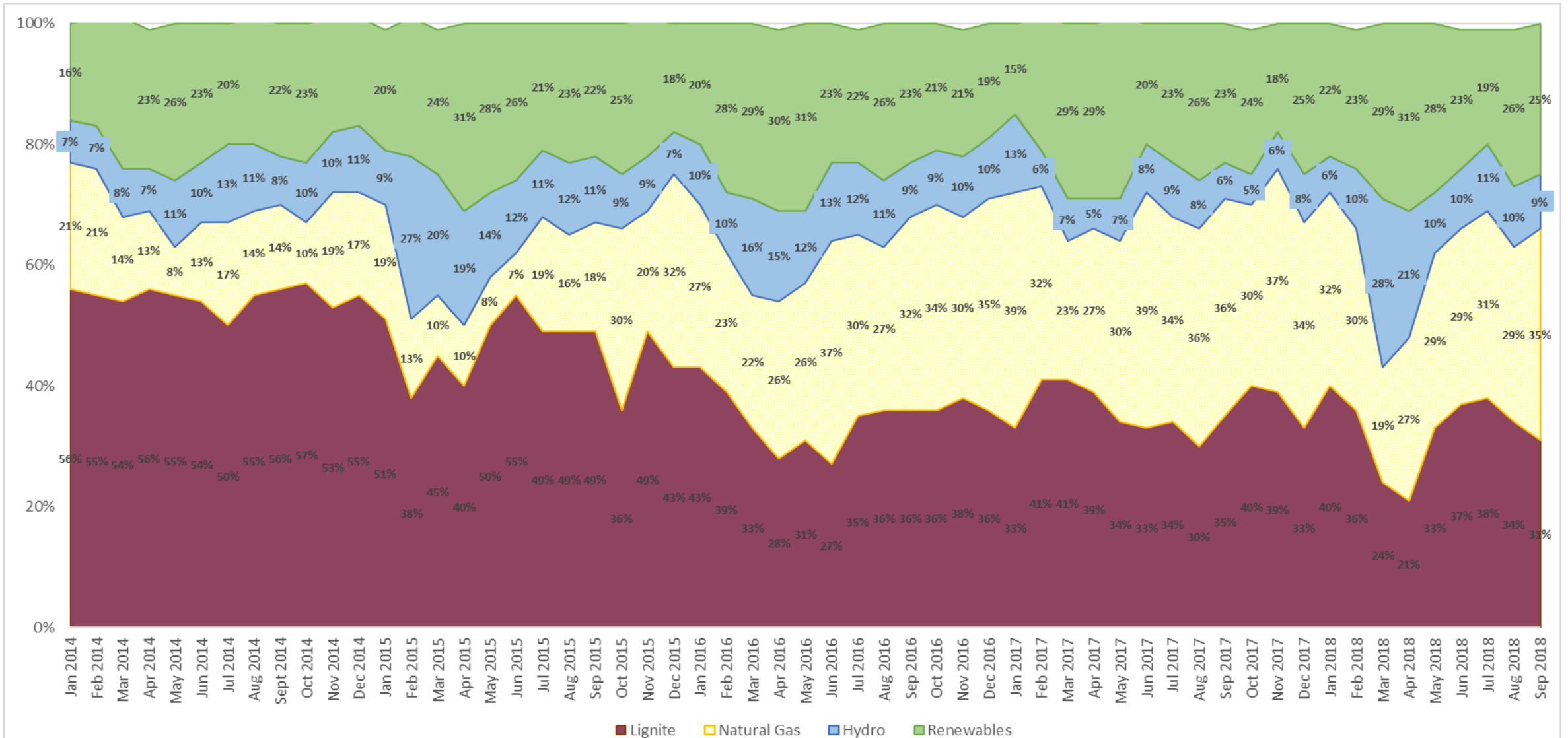


# **The Greek Energy Market: On-going Reforms, Outcomes and Challenges**

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

**IENE Conference  
Athens, 22-23 November 2018**

# Gradual Decarbonisation: Fuel Market Shares in Electricity Generation, 2014 - 2018



# Transformation of the Greek Energy Sector (I)

- ❑ **More competitive markets, shifting away from monopolistic structures.**
- ❑ Antitrust measures on incumbents (PPC and DEPA).
  - ✓ **Electricity auctions:** Forward yearly products for suppliers (NOME).
  - ✓ **Gas release program:** Yearly and quarterly auctions for suppliers & large consumers.
- ❑ New investors in **System Operators**.
  - State Grid China: 24% of ADMIE.
  - Snam, Fluxys, Enagas: 66% of DESFA.
- ❑ **Divestment** of lignite assets. Final Expression of Interest.
- ❑ New shareholders in **gas distribution** and **supply** companies.
- ❑ **New market actors:** e.g. aggregators in electricity / paper traders in gas balancing.  
**Structural asymmetries are being alleviated.**

# Transformation of the Greek Energy Sector (II)

- ❑ **More integrated with the European markets.**
- ❑ Better **connected**, with new cross-border infrastructure.
  - Several PCI projects. **Major investment interest**.
  - Gas pipelines (TAP, IGB, East Med). Electricity cables (Euroasian, Maritsa East).
- ❑ More harmonized in terms of market rules.
  - **Target Model implementation**: New markets in isolated mode, June 2019.
  - Interconnection Point GR-BG: **Full compliance** with EU framework (CAM).
  - Gas balancing platform: 1<sup>st</sup> July 2018.
- ❑ More **diversified and resilient**, regarding Security of Supply.
  - LNG Terminal **extension**, Underground **Storage** (Kavala), **FSRU** Alexandroupolis.
  - **Reverse flow** from Greece to Bulgaria is now feasible.
  - Preventive Action Plan. Several **cost-effective measures** were adopted.

# Transformation of the Greek Energy Sector (III)

## ❑ More focused on the **clean energy transition**.

- Currently, **20% RES market share** in electricity production.
- **2600 MW of RES** to be auctioned until the end of 2020.
- Transition from Feed-in-Tariffs to **Feed-in-Premium**.

2.5 bil €  
RES investments

## ❑ **Gas** network is **expanded** across Greece.

## ❑ CNG / LNG framework for remote areas and customers.

250 mil €

## ❑ **Islands interconnections** and **small-scale LNG** to reduce oil-based production.

1.5  
bil €

## ❑ On-going developments on “**Smart Transition**”:

- **Electrical vehicles**: Framework for charging stations (public consultation).
- **Smart meters**: Roll-out scheme (under discussion).
- **Smart islands**: Tenders for hybrid stations (DSO's proposal).
- **Energy communities**: Attractive incentives were introduced in Jan 2018.

# Which benefits arise for consumers?

- ❑ Choice, diversity and significant discounts in retail electricity products.

- ❑ 20 alternative electricity suppliers: 22% market share vs. 2% in 2015.

Consumers that switched supplier: 186.000 in 2017, 160.000 in 1<sup>st</sup> Semester 2018

- ❑ All islands open to retail competition since 1<sup>st</sup> January 2018.

- ❑ All gas customers became eligible since 1<sup>st</sup> January 2018.

- ❑ Bundled electricity and gas products emerged.

- ❑ Access to gas is extended (1500 km network), including remote areas.

- ❑ Social tariffs and PSO charges: Refined on a more fair and smooth basis.

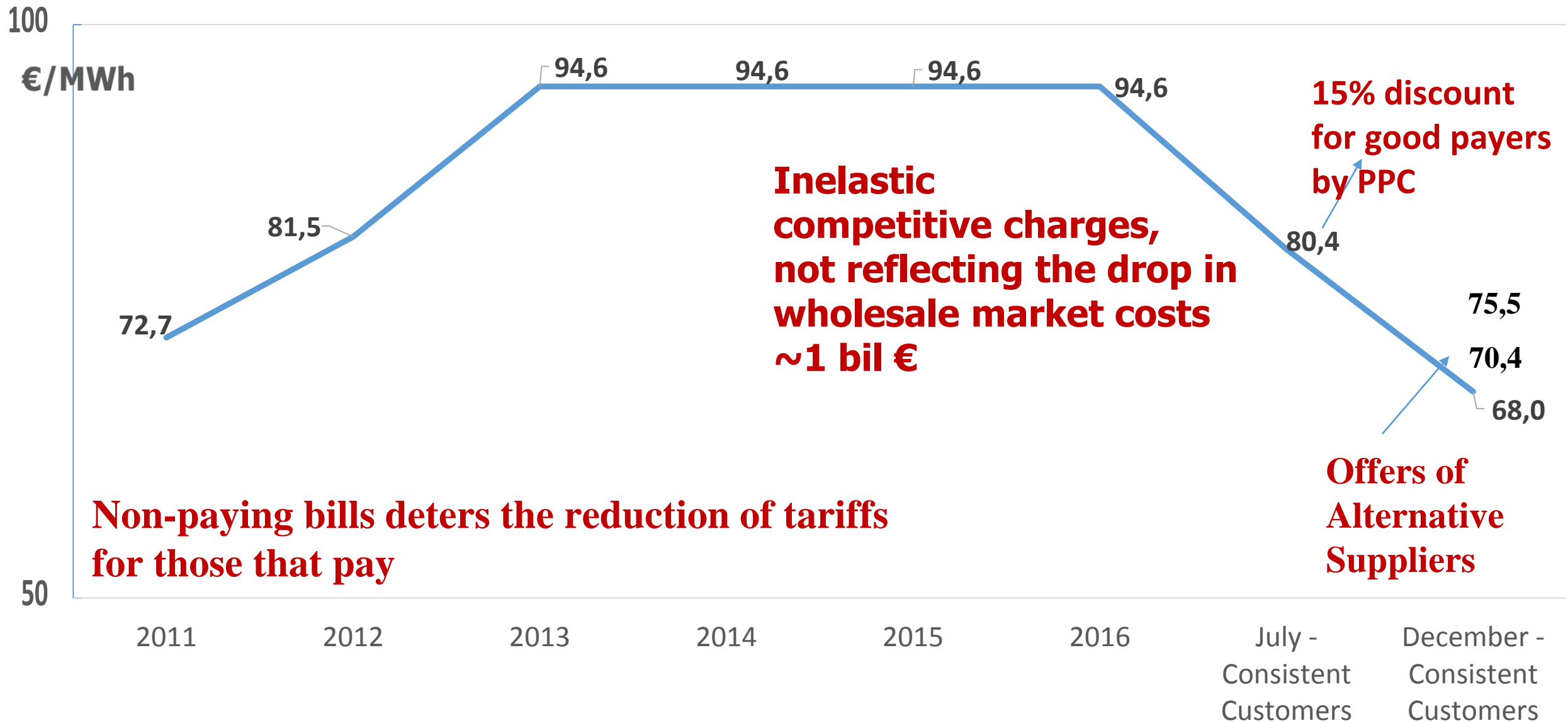
More than 600.000 consumers on social tariffs.

Vulnerable consumers for gas are being defined.

Energy efficiency policies.

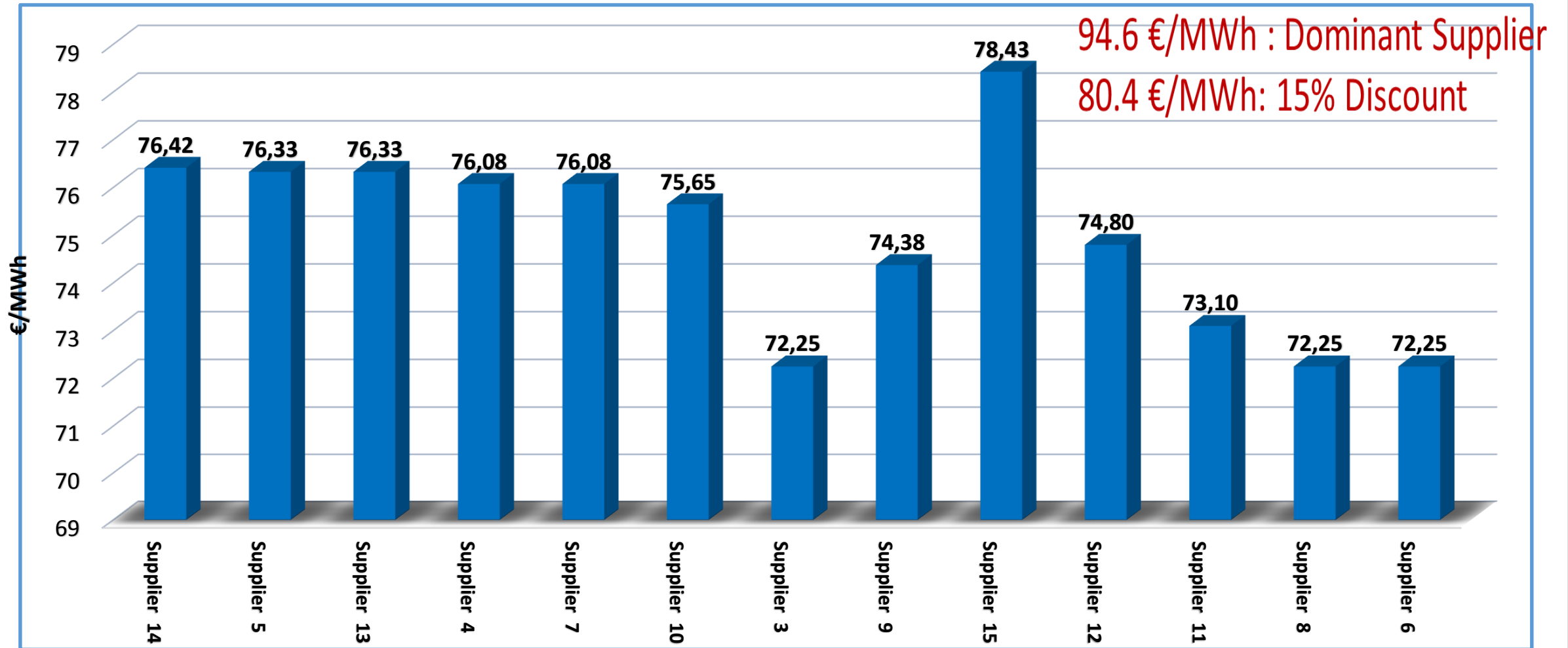
# NOME Impact on Retail Tariffs

## Competitive Charges for the Average Consumer



# Lower Competitive Charges for Household Consumers

## Good-payers, average consumption, Q3 2018





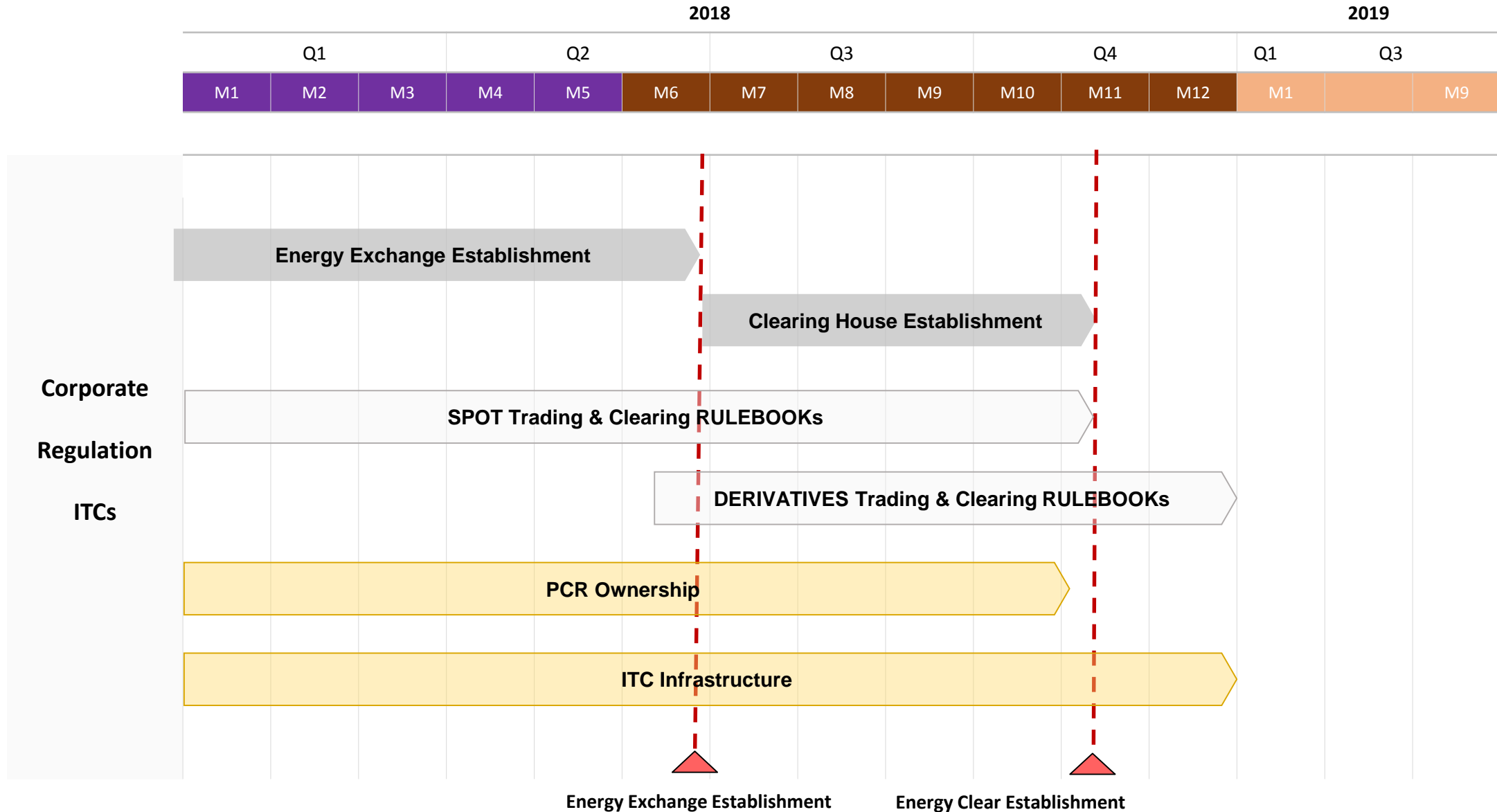
# Electricity Market: Transition to Target Model

- **The Hellenic Energy Exchange** was established in June 2018 and **the Energy Clearing House** in November 2018.

**Rulebooks for Spot Trading and Balancing were approved by RAE in November 2018.**

- Forward, Day-ahead, intra-day and balancing markets.
- **Market Coupling** with Italy, then Bulgaria and later, Energy Community countries.
- The market is expanded both in **geographical** scope and **time horizon**.
- **Market power** potential is reduced. **Efficiency** gains from cross-border flows.
- Generators will be able to contract production -> Facilitates **financing**.  
**Value of plant flexibility:** To be better reflected.
- **Hedging** for suppliers -> More competitive retail products.
- Derivatives are expected to **multiply the market value**.

# Roadmap on Corporate - Regulation - ITC



# Key Principles and Changes

- ❑ **Transparency in Price Formation and Market power mitigation:**  
Unit-based bidding in all markets apart from the forward market, where portfolios are allowed.
- ❑ **Robust and Smooth Transition:** Central dispatch instead of self-dispatch.
- ❑ **Security of Supply:** Mandatory participation of generators in day-ahead and balancing markets.
- ❑ **Bids format:** Flexibility vs. complexity trade-off (hybrid, blocks, linked).
- ❑ **Market Liquidity:** **Cap on hedging ratio.** Compatibility: Min variable cost rule was **abolished**.
- ❑ **Various changes arise, including:**
  - The **operational profile of plants and all costs** (ramping, desynchronization) to be incorporated into **orders**.
  - Expensive plants may perceive bilateral contracts as a way to **"hide" costs and get dispatched**.
  - Credit limits and processes **avert arrears**.
- ❑ **Ex-post market monitoring** is enhanced.

Strong incentives for operational efficiency.

Variable cost data will continue to be submitted and assessed.  
Several indicators will be published (e.g. orders' curve and volume).

# Spot Trading Rulebook: Further Regulatory Parameters and Methodologies to be specified

Έως 31.12.2018:

Ανώτατες - Κατώτατες Τιμές Εντολών.

Τέλη και χρεώσεις της EXE προς τους Συμμετέχοντες.

Περικοπή εντολών αγοράς / πώλησης με αποδοχή τιμής και προτεραιότητα εκτέλεσης.

Ανώτατα και Κατώτατα Όρια Τιμής Εκκαθάρισης για δυνατότητα διενέργειας 2<sup>ης</sup> Δημοπρασίας.

Έως 28.02.2019:

Ρυθμιστικές Παράμετροι Υπολογισμού Χρεώσεων Μη Συμμόρφωσης για Εντολές Πώλησης.

Ρυθμιστικές Παράμετροι Υπολογισμού Χρεώσεων Μη Συμμόρφωσης Ενεργειακών Χρηματοπιστωτικών Μέσων.

Διοικητικά Οριζόμενη Τιμή Προστίμου Δήλωσης Θέσης Ενεργειακών Χρηματοπιστωτικών Μέσων.

Διαδικασίες αναφορικά με Φυσικό Διακανονισμό και Εκκαθάριση στην Αγορά Επόμενης Ημέρας προϊόντων NOME.

# Balancing Rulebook: Further Regulatory Aspects and Methodologies to be specified

Έως 31.12.2018:

Μεθοδολογία Καθορισμού Ζωνικών /Συστημικών Αναγκών Ισχύος Εξισορρόπησης.

Μεθοδολογία Υπολογισμού Φορτίου Αναφοράς Χαρτοφυλακίων Κατανεμόμενων Φορτίων.

Μεθοδολογία Υπολογισμού Μεταβλητού Κόστους Θερμικών / Υδροηλεκτρικών Μονάδων.

Μεθοδολογία Υπολογισμού Εγγυήσεων Συμμετοχής στην Αγορά Εξισορρόπησης.

Μεθοδολογία Συμψηφισμού.

Έως 15.2.2019:

Όροι και Προϋποθέσεις Συμβαλλόμενων Μερών με Ευθύνη Εξισορρόπησης.

Μεθοδολογία Υπολογισμού Μέγιστης Συνεχούς Ικανότητας Παραγωγής.

Κανόνες αναστολής / αποκατάστασης δραστηριοτήτων αγοράς.

Έως 31.3.2019:

Μεθοδολογία Υπολογισμού Ενεργοποιημένης Ενέργειας Εξισορρόπησης.

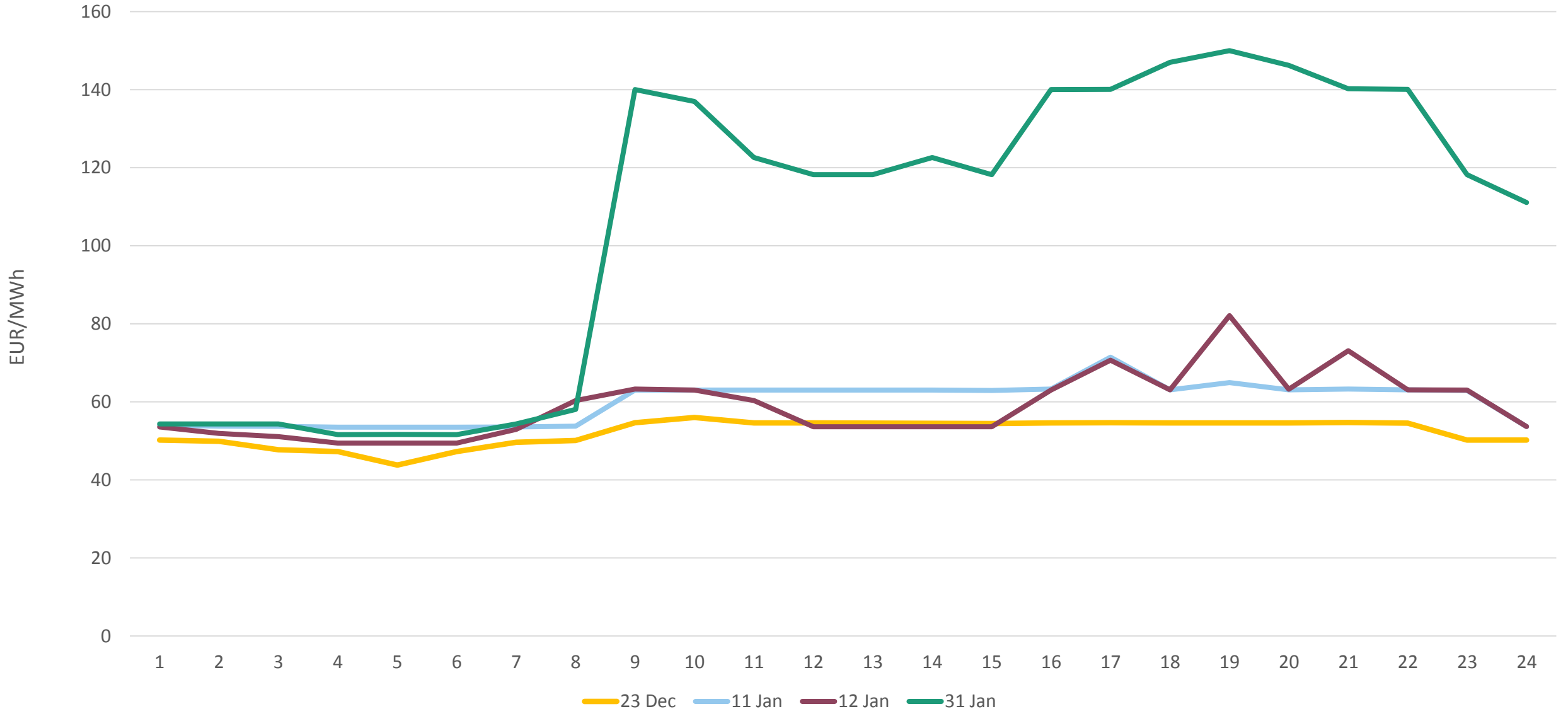
Μεθοδολογία Υπολογισμού Συντελεστών  
Απωλειών.

Όροι και Προϋποθέσεις Παρόχων Υπηρεσιών Εξισορρόπησης.

# RES participation in Day-ahead and Intra-day Markets

- Participation is **compulsory for DAM** and **optional for IDM**.
- New RES, under **FIP**, participate individually or via an Aggregator, on a **portfolio basis**.
- Old RES stations, under **FIT**, and RES with **Fixed Price** are **represented by the RES Operator**, which submits price-taking offers on their behalf.
- RES stations under FIP **perform hourly energy forecasts** on a daily basis and submit **priced offers** both for DAM and IDM.
- Currently, temporary settlement: at 90% of reference value per technology.
- **Last Resort Aggregator**: To be established within 2018.  
RAE proposed DAPEEP. Neutral in terms of imbalances.  
Other **aggregators**: Licensing terms similar to electricity trading.
- **Balancing responsibilities** for RES arise if **sufficient liquidity** in intra-day markets.
- RAE will make this assessment within 2020.
- Until then, a **transitory prediction mechanism** with tolerance levels applies.

# Price Reaction, Greece, Energy Crisis, 19.12.2016 -13.2.2017



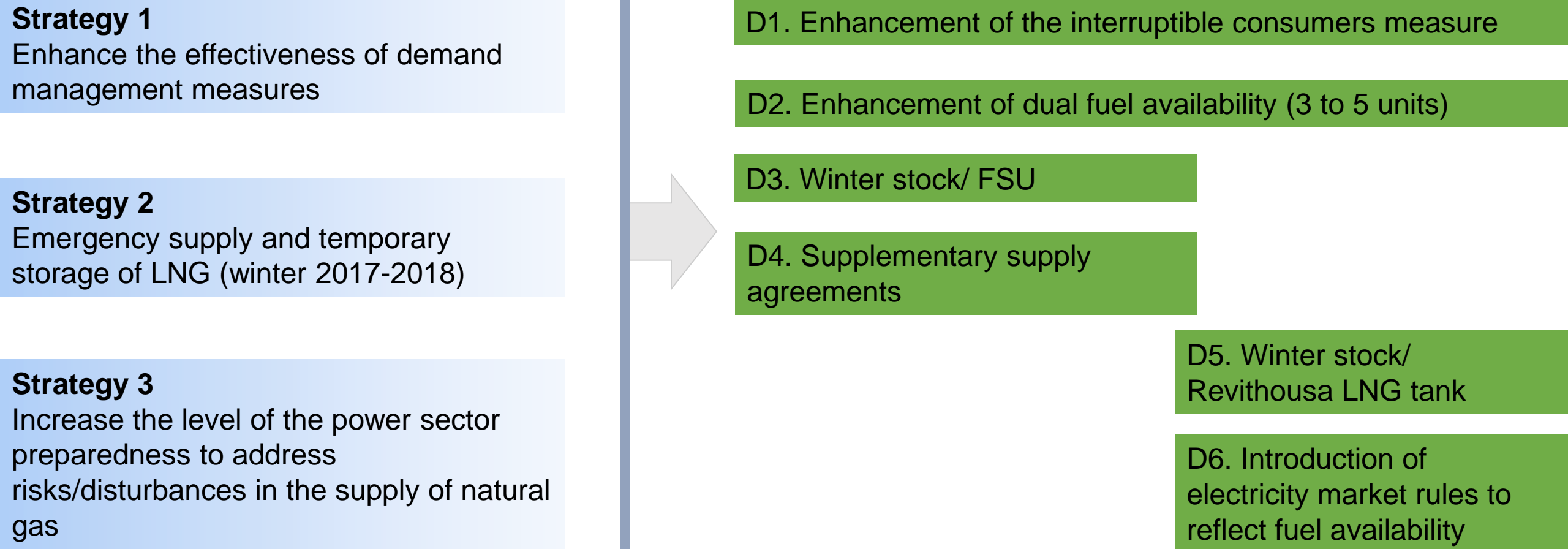
# Energy Crisis Resolution - 2 years ago

- ❑ Mixture of measures, based on Emergency Plan.
  - Gas plants shifted to **diesel**, if feasible (0.4 TWh).
  - **Demand response**. Several industrial consumers reduced output.
- ❑ **9 additional cargos** at LNG Terminal (Revithousa) -> **Exhausted within 1.5-3 days**.
- ❑ **Generators' consensus to adjust their plant output**, according to **ADMIE instructions**, reflecting upon **DESFA's predictions** for gas shortage, so as to avoid escalation of crisis to level 3.
- ❑ **Curtailments of cross-border transmission rights by TSOs in the region** for security reasons.
- ❑ Exports could have been corrected without interventions if prices reflected scarcity.
- ❑ Hydro pricing methodology **allowed prices to better reflect water scarcity in phase 2**.
- ❑ **Cost of crisis resolution unclear. What if price signals had worked instead?**



# Preventive Action Plan 2018

## Strategies and Measures assessed



# RES Auctions, 2 July 2018: Key Outcomes

Significant price reductions emerged.

## ❑ PV $\leq$ 1MW: Ceiling price: 85 €/MWh

- 155 Projects, 1.527 accepted bids.
- Price range: 80-75.87 €/MWh
- Weighted average price: **78.42 € / MWh**

## ❑ PV > 1MW: Ceiling price: 80 €/MWh

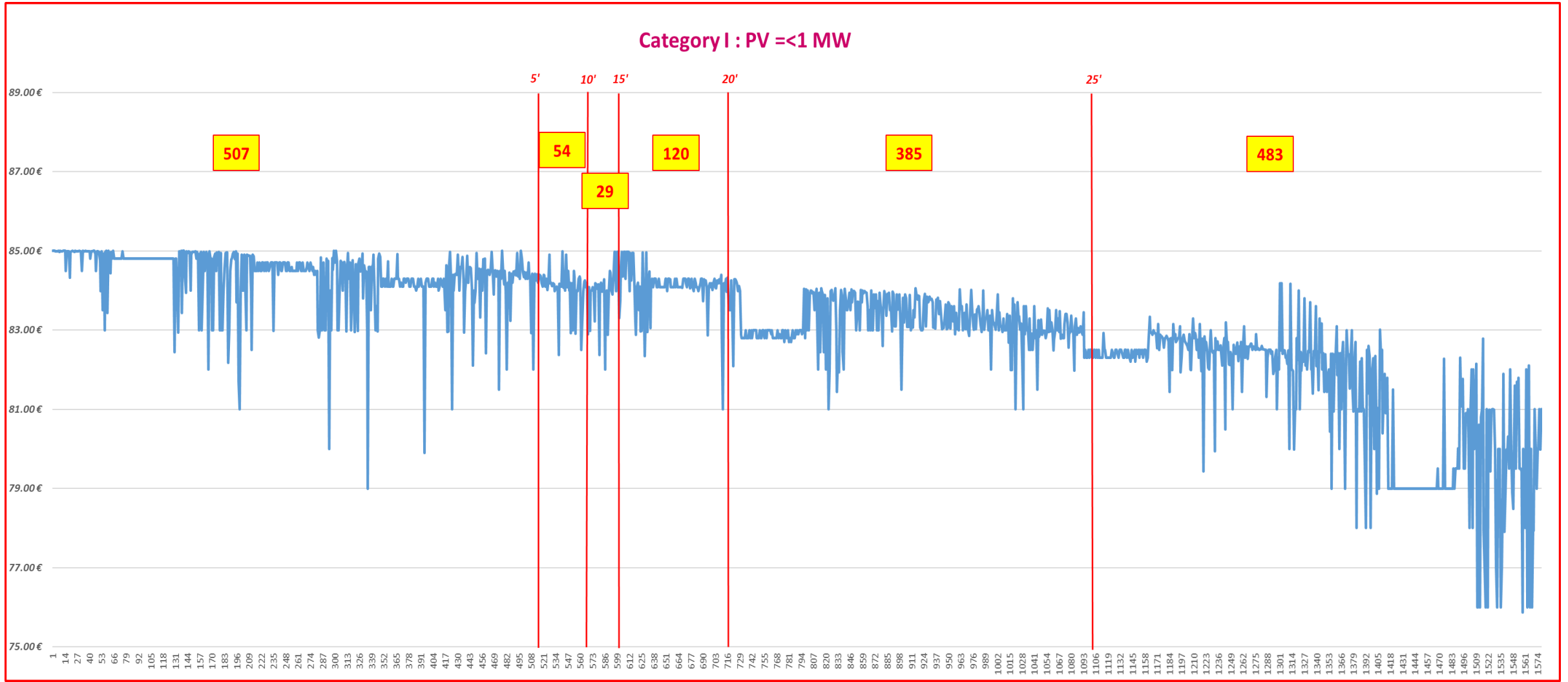
- 13 Projects, 280 accepted bids.
- Price range: 71- 62.97 € / MWh
- **Weighted average price: 63.81 € / MWh**

## ❑ Wind > 3MW: Ceiling price: 90 €/MWh

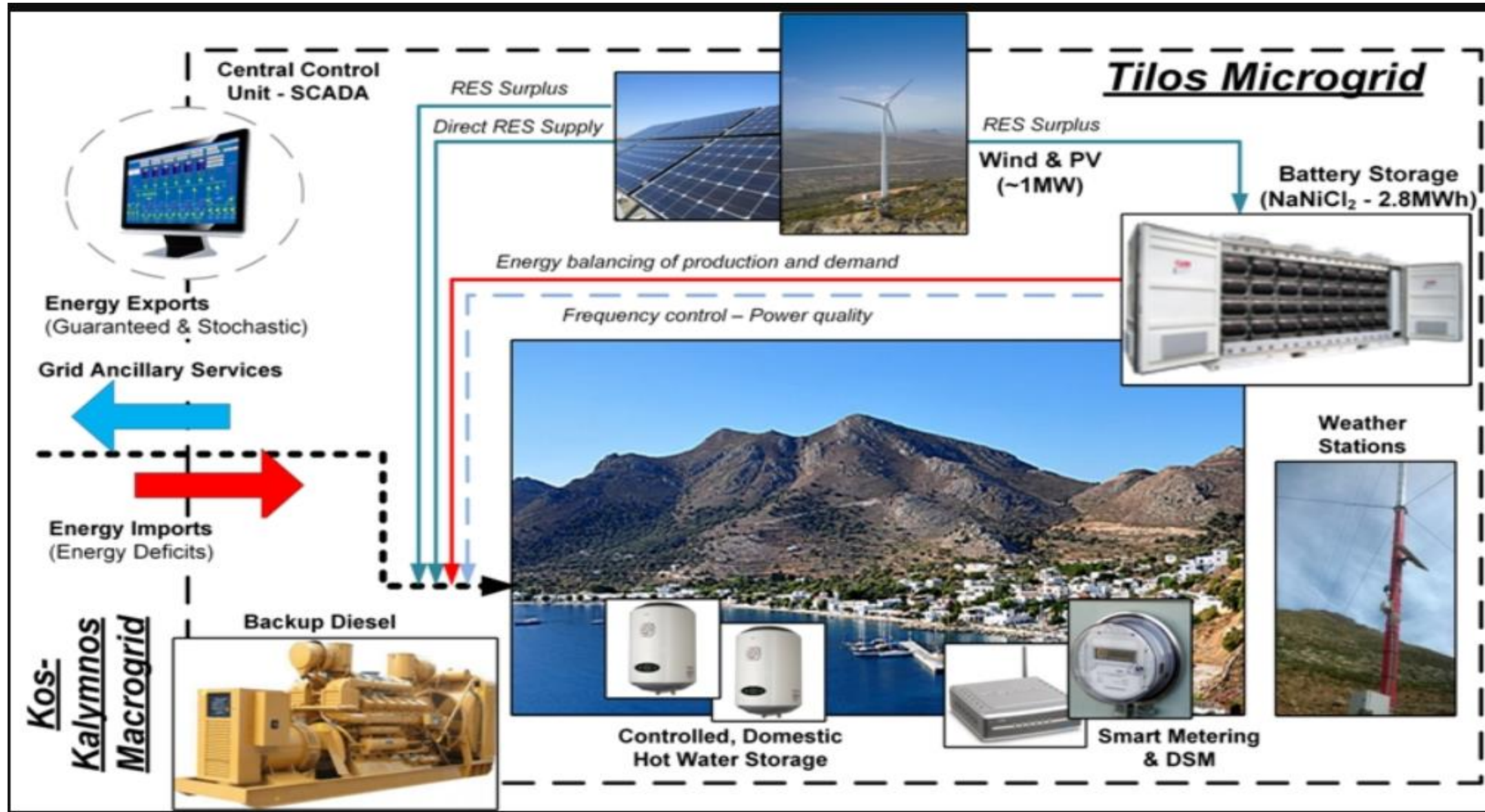
- 14 Projects, 336 accepted bids.
- Price range: 71.93- 68.18 € / MWh
- **Weighted average price: 69.53 € / MWh**

# RES support arising from auctions - Competition drives down prices

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



# Smart Island of Tilos: An Inspiring Case



# The Energy Transition of Coal-dependent Regions

- 41 EU regions, 12 countries, 240.000 direct jobs, 215.000 indirect ones.
- EU reference scenario 2016: 60% decline in coal production, 70% in consumption by 2050.
- High operating costs, lower international coal prices, competitively priced imports into the EU. Coal mines were closed in Spain, Poland and Romania.
- Coal Regions in Transition: Platform launched in Dec 2017. Pilot in Western Macedonia.
- Just Energy Transition Fund (4.8 billion): Proposed by the European Parliament.
- Funds for Clean Energy Transition: Multiannual Financial Framework 2021-27  
EC Proposal: 20->25% EU Spending (from 206 to 320 billion €)  
Cohesion and Regional Funds (41 and 20 billion €).
- ETS Directive revision (2018): Rate of annual reductions in allowances at 2.2% as of 2021.  
Compensation mechanisms: Innovation and Modernization Funds.

Are these measures sufficient? Regulatory tools should be explored to support the transition.

# Overview and Progress in Gas Transportation

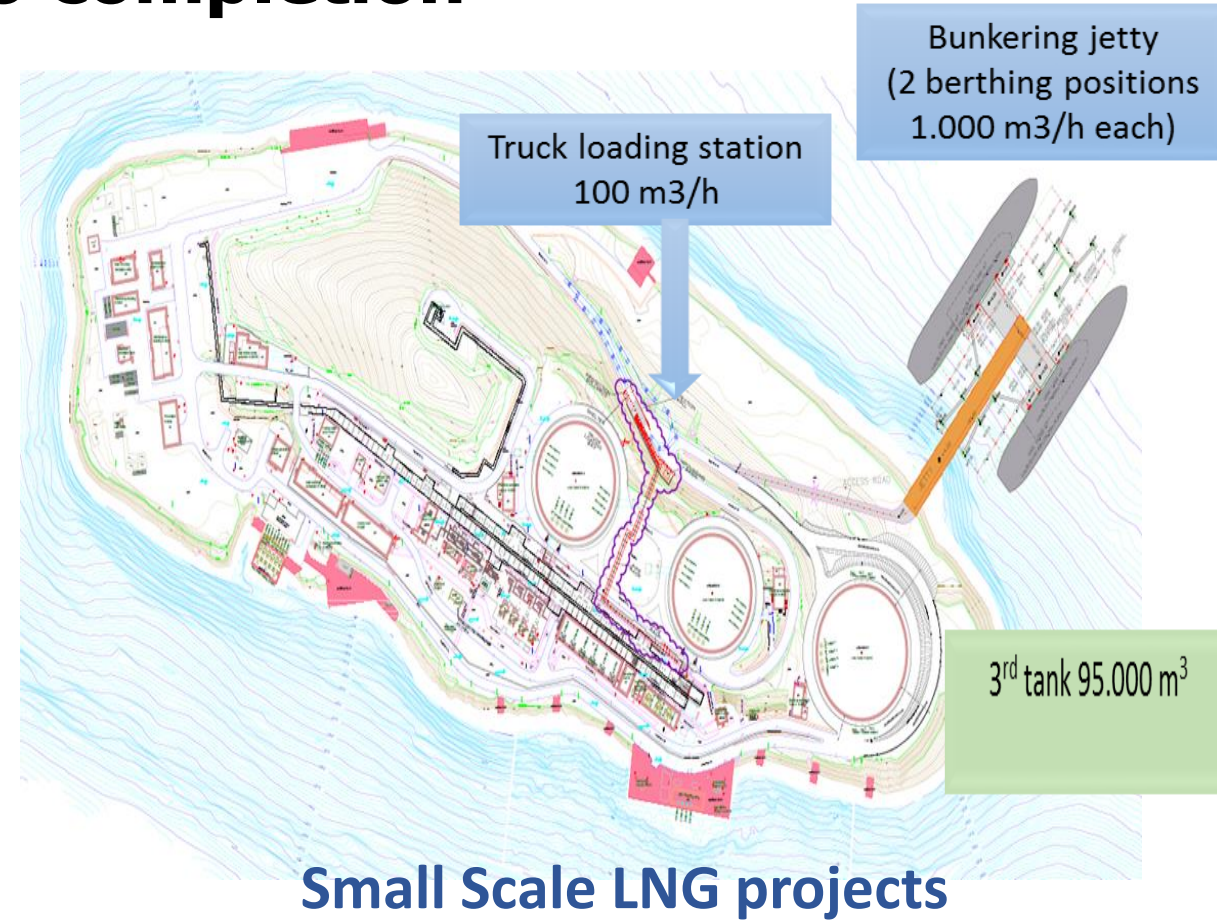
- ❑ **Gas Network Code** was amended to incorporate the **CAM Regulation** (March 2018), along with the standard transportation agreement.
- ❑ **Gas Tariff Regulation** was amended to incorporate **intra-day products** (July 2018).
- ❑ A **2<sup>nd</sup> Revision** of Tariff Regulation is expected in 2019 in order to incorporate **TAR**.
- ❑ DESFA's **10-Year Development Plan** was approved in November 2018.  
For specific projects: **Market test and conditions**, so as to reduce impact on tariffs.  
Services provided compatible with TAR.
- ❑ **Metering regulation** will be amended within 2019.
- ❑ Specification of **WACC** and other parameters for the next regulatory period.

# Overview and Progress in Gas Distribution

- ❑ Gas Supply Code was published in June 2018.
- ❑ Gas License Regulation was published in August 2018.
- ❑ Distribution Network Code was amended in June 2018, e.g. to capture issues of gas theft.
- ❑ Regulatory Framework was issued regarding Remote Distribution Networks and Virtual Pipelines (CNG, LNG) in July 2018.
- ❑ Distribution Licenses will be issued within 2018.  
These will include the approval of 5-year development plans of the DSOs.
- ❑ Metering regulation will be amended within 2018.
- ❑ Specification of WACC and other parameters for the next regulatory period.



# LNG Terminal: Expansion close to completion



Small Scale LNG projects

❑ Impact on: Both commercial services and Security of Supply.

- ✓ Storage: From 130.000 to 225.000 m<sup>3</sup>.
- ✓ Unloading LNG vessels: size up to 260.000 m<sup>3</sup>.
- ✓ Truck Loading: mid 2020. Bunkering Jetty: 2022.

LNG Swaps and New Services



# Regional Cooperation: Essential at Several Levels

- ❑ Risk assessment and crisis mitigation both for electricity and gas.  
Solidarity obligations: Arrangements to be adopted by 1.12.2018.
- ❑ Capacity mechanisms: Cross-border participation is a key element.
- ❑ Regional Operational Centers: reserves requirements and sharing.
- ❑ RES Schemes: Mandatory participation in tenders of RES from other MSs.
- ❑ Still, regional challenges emerge in SEE.
  - Efficient co-operation on infrastructure projects (TAP, IGB, Maritsa 2).
  - GR-BG Gas IP: Capacity auctions, reverse flow feasible, renomination cycles.
  - Coupling of electricity markets: Delayed. Currently, positive momentum.
  - Reliability of Greek-Italian electricity interconnector? Technical or commercial?

# Trans-Balkan Joint Risk Assessment

## RAE: Co-ordinator

1

- Risk Identification

2

- Risk Analysis

3

- Risk Evaluation



# Electricity Markets: Challenges at EU Level

- ❑ RES suppress wholesale prices and displace conventional plants, while requiring flexibility.
- ❑ Coal and Nuclear phase-out plans. More than 20 GW of gas plants have mothballed.
- ❑ Capacity mechanisms: More harmonized, auctions, emissions limit -> Uncertainty.
- ❑ Storage and Demand Response: Despite progress, business case + barriers.
- ❑ More ambitious environmental targets for 2030.  
Transition to feed-in-premium + RES auctions: to alleviate distorting impacts.
- ❑ More than 1 trillion € investments are required in infrastructure and capacity.
- ❑ Higher overall costs, often distributed across stagnating demand.  
In electricity bills, 50% reflects non-contestable charges. Network tariffs to be revisited.

**Do markets provide the right signals for investments?**

# Capacity Mechanisms: Unclear Framework

- ❑ Adequacy studies may raise SoS concerns.

Capacity payments: To stimulate investment or avert mothballing.

- ❑ Are national studies complementary to ENTSO-E MAF study? What if results diverge?
- ❑ The Commission's proposal introduced the emissions limit of 550 gCO<sub>2</sub>/kWh.
- ❑ Stricter approach by the Parliament vs. the Council:
  - The emissions standard to apply by mid 2019 for new plants and 5 years later for existing ones.
  - The Council wishes to postpone implementation to 2025 and 2030 respectively.
- ❑ The Parliament is reducing the time horizon of the schemes (max of 5 years, contracts of 1 year).
- ❑ The Parliament exempted "strategic reserves".
  - Instead, the annual emissions limit was proposed.
  - The German case: Lignite and coal plants may still operate for up to 500-600 hours per year.
- ❑ Approved schemes need to comply with the new provisions.
- ❑ Significant impact for certain countries (e.g. Poland, Greece).

# Concerns arise even in Mature Retail Markets

## ❑ The UK Case

- In 2001: Retail margin cap, above wholesale market cost, was removed.
- Price freezing (Labour party, 2013) vs. price cap (Tories, 2017).
- Ofgem considered the cap reasonable only for vulnerable consumers.
- A requirement was imposed by law.
- In July 2018, Ofgem proposed an annual cap of 1.136 GBP on energy bills for a typical dual fuel consumer.

## ❑ Side effects emerged:

- Switching supplier could save up to 120 GBP more than the imposition of the cap.
- Other tariffs increased before the introduction of the cap.

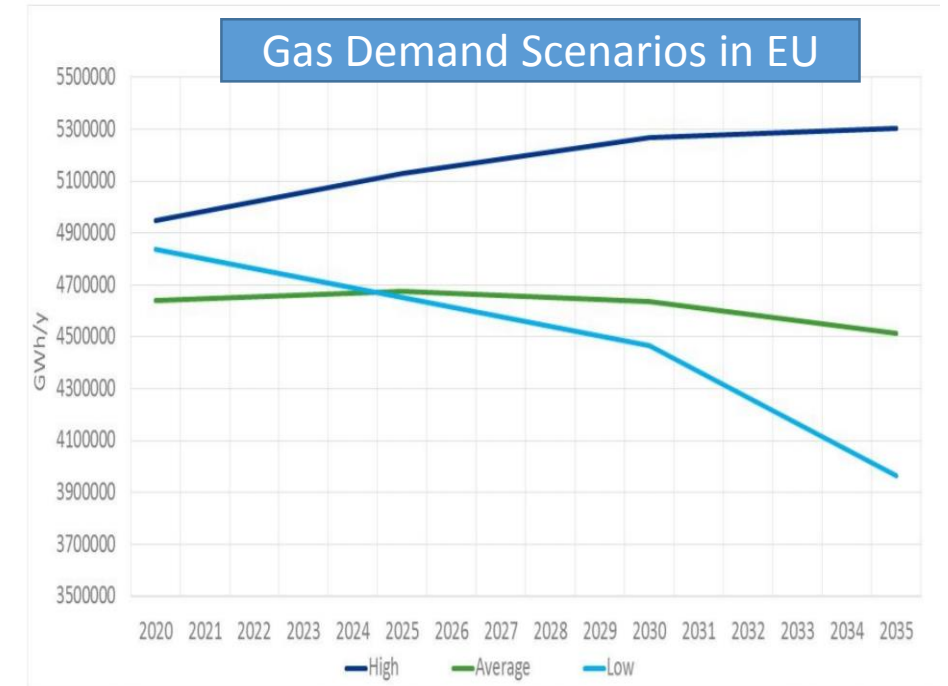
## ❑ Australia: Energy minister called energy suppliers to offer lower prices.

## ❑ Spain: Government considers measures to mitigate volatility in wholesale markets.

Despite the emphasis on price formation, reflecting market conditions, market interventions still occur.

# Gas Needs to be Redefined: Renewable Gases and Sector Coupling

- ❑ Crucial for flexibility, SoS and **emissions reduction**.
- ❑ Role in **heating** depends on energy efficiency.
- ❑ Expansion in **transportation**, including shipping.
- ❑ Development of **green gases**.
- ❑ **Power to gas**. Gas grids to act as storage for RES.
- ❑ From pilots to large scale (Leeds example).
- ❑ **Co-ordination** between electricity and gas in scenarios and planning.
- ❑ **Regulatory issues**: GOs for renewable gas, TSOs neutral role, Networks tariffs reflecting joint value, Innovation incentives, hydrogen standards.



**Transportation**  
**LNG & CNG**



**Small-scale LNG**  
**and CNG**



**Power-to-gas**



# EU Decarbonization Strategy

## Road-map across Sectors

