

Reforming the Greek Electricity Market: Recent Developments and Challenges

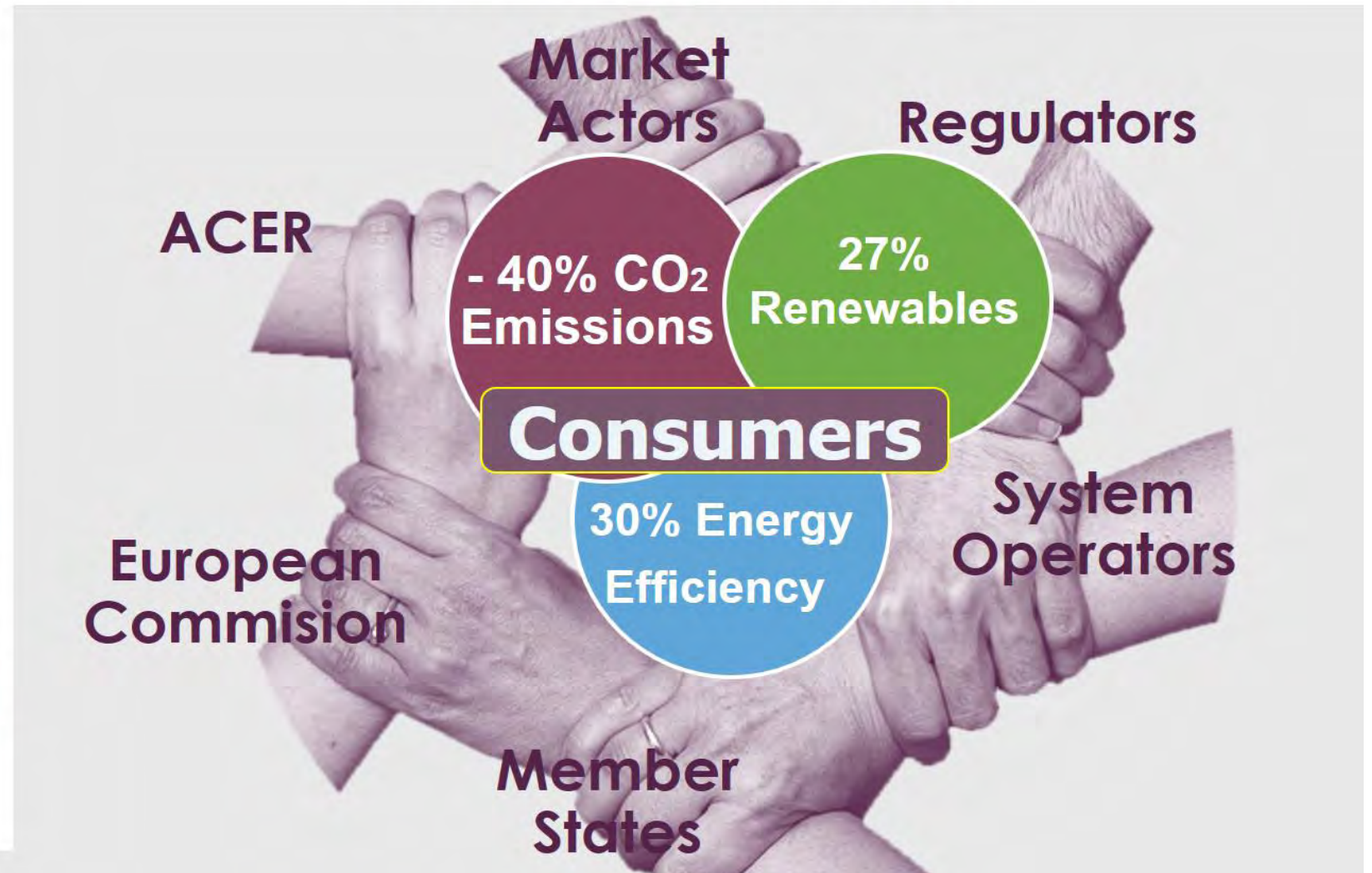
Nektaria Karakatsani,
RAE, Member of the Board

Ενέργεια και Ανάπτυξη 2017, 24 November 2017

Clean Energy Transition

Common Vision

Alignment
+
Coordination
+
Multi-sectoral approach



Electricity Markets: Challenges at EU Level

- **Impact of RES**

RES suppress SMP and displace conventional plants, while requiring **flexible** systems.
More than 20 GW of gas plants have **mothballed** in Europe.

- **Challenges for SoS:** Coal and Nuclear **phase-out** plans.

Storage: barriers and business case. **Cybersecurity:** Major concern.

- More ambitious **environmental targets** for 2030.

Transition to **feed-in-premium** + RES auctions: to alleviate distorting impacts.

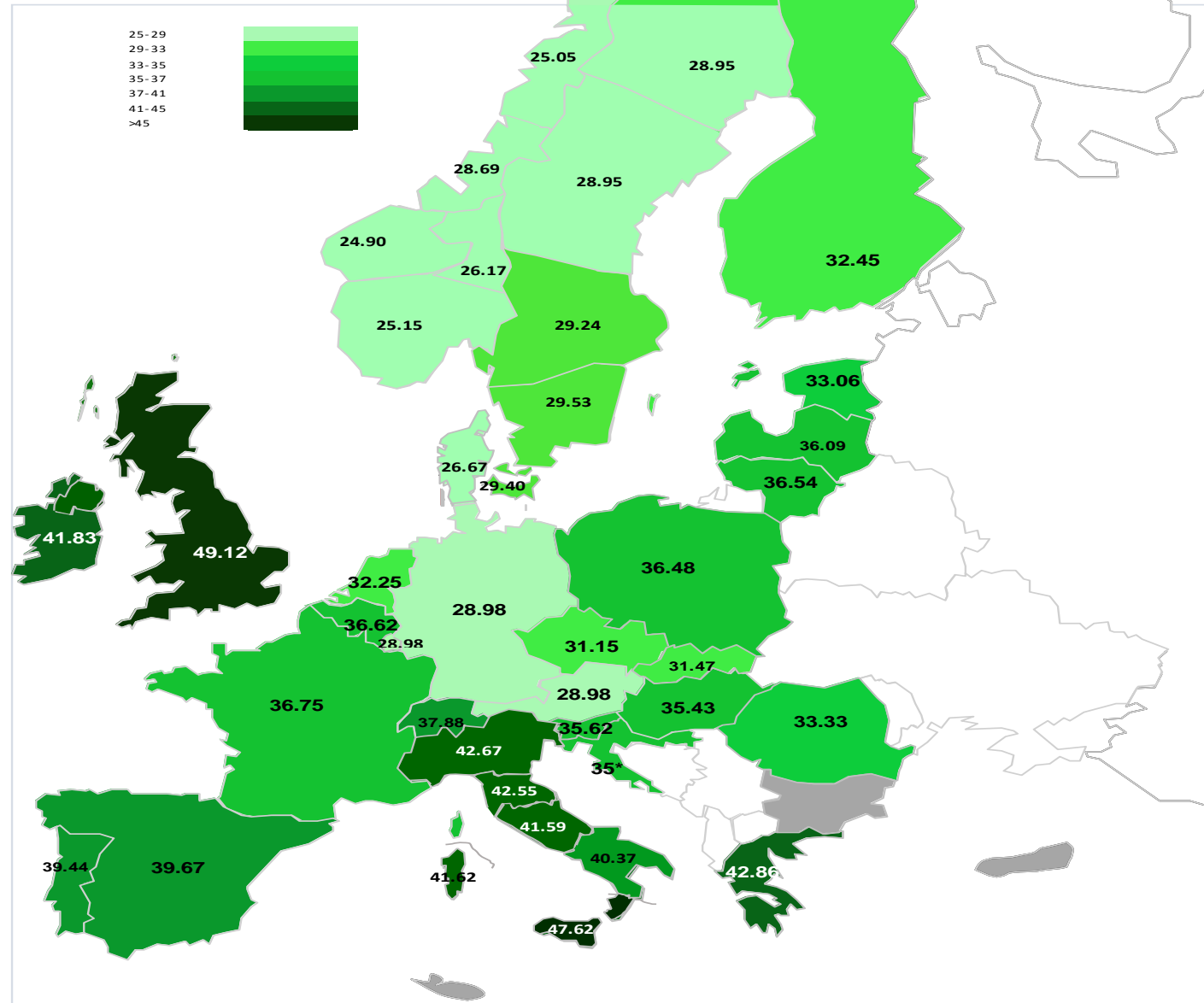
- **More than 1 trillion € investments** are required in infrastructure and capacity.

- **Higher overall costs**, often distributed across **stagnating demand**.

Retail prices: **irresponsive** to wholesale price drops.

Consumers' benefits and involvement need to get enhanced.

Market Integration and Convergence?



Integrating Wholesale Electricity Markets: Facts and Benefits

Day- ahead Markets:

- **1 B€** annual gains in social welfare
- 84% efficient utilisation of capacity
- 1500 TWh (~50% of consumption) traded on PXs

Intra-day Markets:

- 120 TWh traded on main PXs in 2016
- 3.6% annual volume growth over last 5 years

Balancing Markets:

- **3 B€** further benefits expected

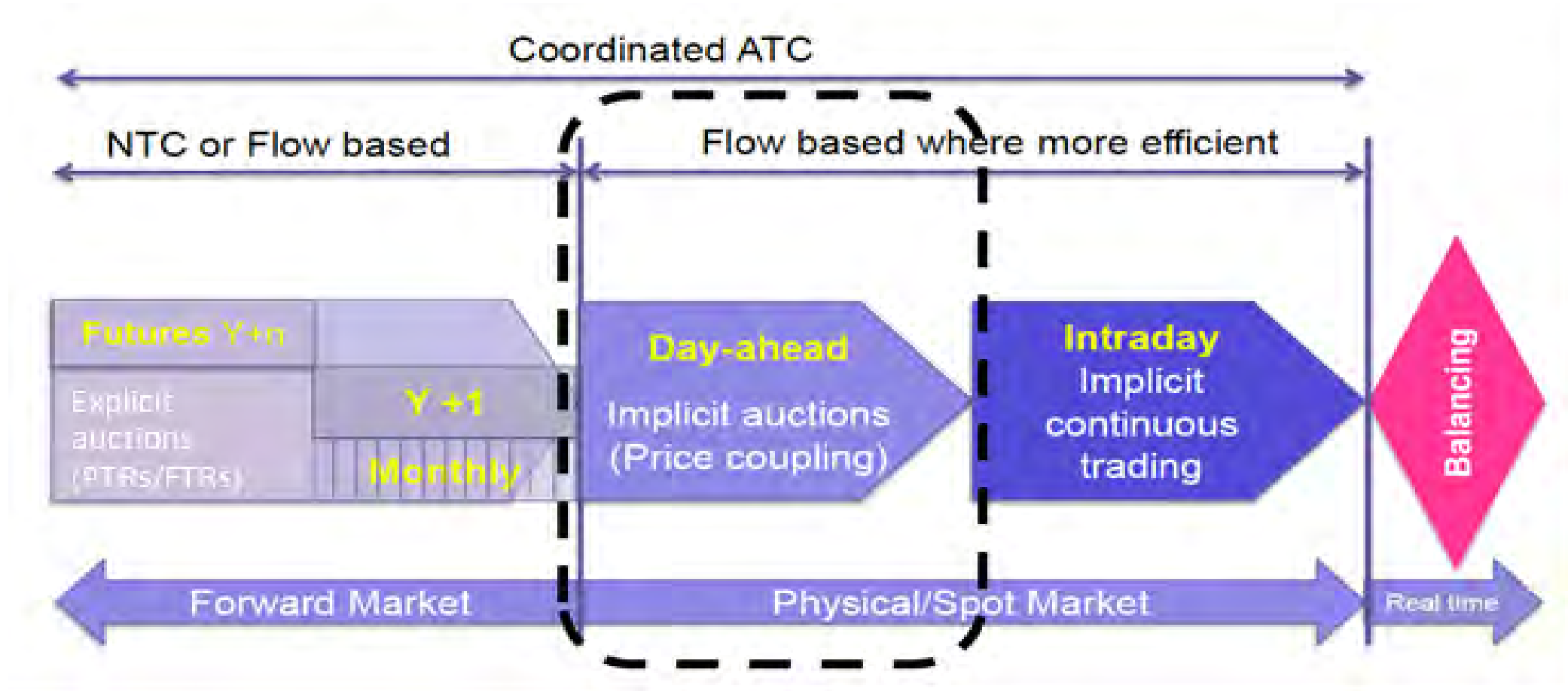
Derivative Markets:

- Market trust, Efficient planning
- Liquid derivatives, Efficient hedging

Transition to Target Model - Timeline

- **Target Model** Implementation: 1st Semester 2018.
 - Day-ahead, intra-day, balancing and forward markets.
 - **Market Coupling** with Italy (initially), then Bulgaria, Energy Community countries.
 - **Current status:**
 - **Legislation in place (Sep 2016), following RAE's Proposal to Ministry.**
 - Guidelines issued by RAE, clarifying key parameters (Jan 2017).
 - **Technical Assistance (JRC)**
Key Deliverables on:
 - Codes, IT specifications
 - Credit and Clearing issues
 - Regulatory measures
 - VOLL Study (survey)
- Market Codes
Public Consultation +
Law on Power Exchange

Η Ακολουθία των Αγορών στο Πλαίσιο του Target Model



Key Issues

- Cap on **hedging ratio**: retain liquidity in short-term markets.
- **Format of bids**: level of flexibility vs. complexity.
- **Min variable cost rule**: Market power mitigation, still against the concept.
- **Technical** aspects: market maker, price limits.
- **RES participation**. Incorporation of **NOME** products.
- **Power Exchange**. Financial products to be introduced. NEMO designation.
- Compliance with **energy and financial legislation** (REMIT, EMIR, MiFID).
- **Regulatory oversight**.

Προθεσμιακή Αγορά Ηλεκτρικής Ενέργειας

- ❑ Συναλλαγές Πωλητών - Αγοραστών για τη φυσική παράδοση ηλεκτρικής ενέργειας στο μέλλον.
- ❑ Σύναψη προθεσμιακών συμβάσεων και καταχώρηση διμερών εξωχρηματιστηριακών συμβάσεων.
- ❑ Η συμμετοχή είναι προαιρετική.
- ❑ Οι συμβάσεις υπόκεινται σε υποχρέωση φυσικής παράδοσης.
- ❑ Τα προθεσμιακά προϊόντα υπόκεινται σε συνεχή συναλλαγή για κάθε ημέρα συναλλαγής.
- ❑ Προθεσμιακές Συμβάσεις Φορτίου Βάσης και Φορτίου Αιχμής.
- ❑ Βάσει περιόδου παράδοσης: Ετήσιες, Τριμηνιαίες και Μηνιαίες Συμβάσεις.
- ❑ Οι ετήσιες και τριμηνιαίες συμβάσεις υπόκεινται σε καταμερισμό.
- ❑ Ημερήσια Όρια Κίνησης Τιμής: $\pm X\%$ της Τιμής Βάσης.
- ❑ Οι δηλώσεις φυσικής παράδοσης κατανέμονται ανά μονάδα παραγωγής από τους παραγωγούς.
- ❑ Οι ποσότητες ενέργειας των επικυρωμένων δηλώσεων φυσικής παράδοσης και φυσικής απόληψης συμψηφίζονται φυσικώς και έχουν προτεραιότητα εκτέλεσης στην Αγορά Επόμενης Ημέρας.

Αγορά Επόμενης Ημέρας

- ❑ Επίλυση με τον πανευρωπαϊκό αλγόριθμο Euphemia.
- ❑ Σύζευξη με την αγορά της Ιταλίας.
- ❑ Συναλλαγές κάθε ημερολογιακή ημέρα H-1 για φυσική παράδοση την Ημέρα H.
- ❑ Διαχειριστής Αγοράς: ο Ορισθείς NEMO (ΛΑΓΗΕ). *
- ❑ Η συμμετοχή είναι **προαιρετική** για όλους τους Συμμετέχοντες **εκτός από τους Παραγωγούς**.
- ❑ Οι παραγωγοί υποχρεούνται να υποβάλλουν εντολές πώλησης **για τη διαθέσιμη ισχύ των μονάδων τους που δεν έχει διατεθεί στην Προθεσμιακή Αγορά**.
- ❑ **Είδη Εντολών**: Step-wise Orders, Linear piecewise Orders, Block Orders.
- ❑ **Διοικητικά Όρια στην τιμές** καθορίζονται από τη ΡΑΕ κατόπιν εισήγησης ΛΑΓΗΕ. *
- ❑ Για κάθε προμηθευτή με μερίδιο αγοράς που υπερβαίνει ένα όριο, **εφαρμόζεται ανώτατο ποσοστιαίο όριο στις συναλλαγές μέσω προθεσμιακών συμβάσεων**.
- ❑ Ο Φορέας Εκκαθάρισης, Διακανονισμού και Κάλυψης Συναλλαγών θέτει οικονομικά όρια.
- ❑ Δημοσίευση αποτελεσμάτων και Διακανονισμός Συναλλαγών. *

* Τα σημεία αυτά αφορούν και την Ενδοημερήσια Αγορά.

Ενδοημερήσια Αγορά

- ❑ Συναλλαγές κατά την ημερολογιακή ημέρα H-1 και H για φυσική παράδοση ηλεκτρικής ενέργειας εντός της Ημέρας Παράδοσης H.
- ❑ Η συμμετοχή είναι **προαιρετική** για όλους τους Συμμετέχοντες.
- ❑ Οι συμβάσεις αποτελούν αντικείμενο διαπραγμάτευσης σε:
Τοπικές Ενδοημερήσιες Δημοπρασίες,
Συμπληρωματικές Περιφερειακές Ενδοημερήσιες Δημοπρασίες ή,
Συνεχείς Ενδοημερήσιες Συναλλαγές.
- ❑ Στάδια υλοποίησης:
1^η φάση: **3 Τοπικές Ενδοημερήσιες Δημοπρασίες**
2^η φάση: 1 Τοπική Δημοπρασία, 2 Συμπληρωματικές Περιφερειακές Δημοπρασίες και Συνεχείς Ενδοημερήσιες Συναλλαγές.
- ❑ Το χρονοδιάγραμμα των Περιφερειακών Δημοπρασιών **θα ευθυγραμμιστεί** με αυτό των Πανευρωπαϊκών, όταν εισαχθούν.

Αγορά Εξισορρόπησης

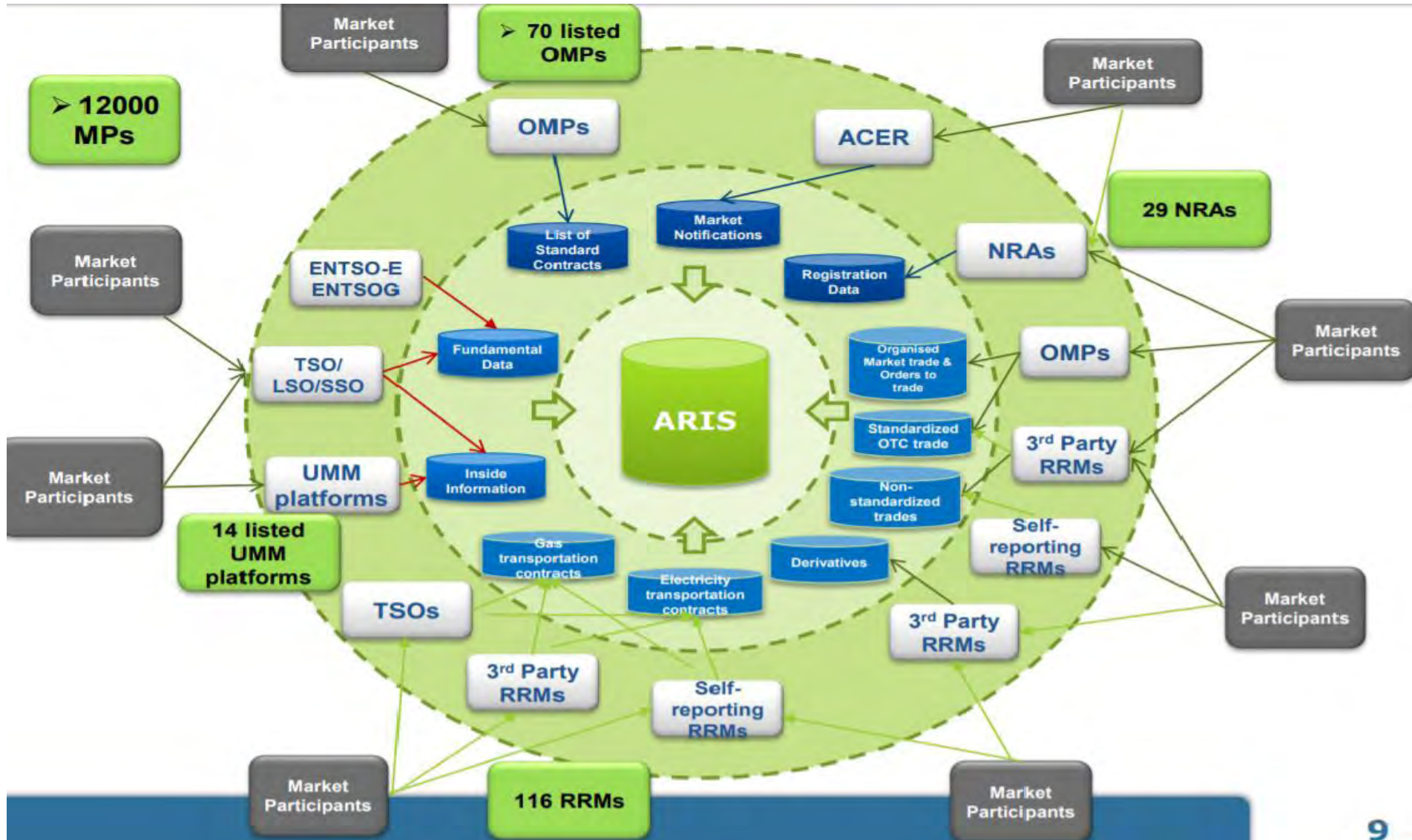
- ❑ Εξασφάλιση **Ισχύος Εξισορρόπησης** για την κάλυψη των απαιτήσεων εφεδρειών.
- ❑ Εξασφάλιση **Ενέργειας Εξισορρόπησης** για την κάλυψη του ισοζυγίου προσφοράς-ζήτησης.
- ❑ **Εκκαθάριση Αποκλίσεων.**
- ❑ Υπεύθυνος για τη λειτουργία της είναι ο **ΑΔΜΗΕ**.
- ❑ **Υποχρεωτική** συμμετοχή των **μονάδων παραγωγής**.
- ❑ Δυνατότητα συμμετοχής: **ζήτησης και ΑΠΕ μέσω Aggregators** καθώς και **διασυνδέσεων μέσω Traders**.
- ❑ **Βασικές αρχές:**
 - ❑ Κεντρική κατανομή. Συν-βελτιστοποίηση Ισχύος και Ενέργειας Εξισορρόπησης.
 - ❑ Χαρακτηρισμός συμμετεχόντων:
 - **Υπόχρεοι Εξισορρόπησης:** Παραγωγοί, προμηθευτές, έμποροι, ΑΠΕ, aggregators, αυτοπρομηθευόμενοι.
 - **Πάροχοι Υπηρεσιών Εξισορρόπησης:** Παραγωγοί, ΑΠΕ, aggregators, αυτοπρομηθευόμενοι.

Regional Cooperation: Essential but Challenging

- ❑ Capacity mechanisms: **More rigid, harmonized framework.**
Auctions, Demand response, **Cross-border participation** -> Uncertain outcomes.
- ❑ Adequacy studies: Regional and national scale may capture additional aspects.
Allowed to **complement** the **pan-European assessment**?
- ❑ Regional Scale of crises.
 - Preventive and Action Plan in Electricity.
 - Regional Risk Assessment in Gas.
- ❑ Regional Operation Centers: Supplementary or core functions?
Will TSOs eventually become redundant?
- ❑ RES support schemes: **Mandatory participation of RES from other Member States**

Still: Exemption from Harmonised Auction Rules for SEE region.
Bulgaria and Romania: not joining JAO.

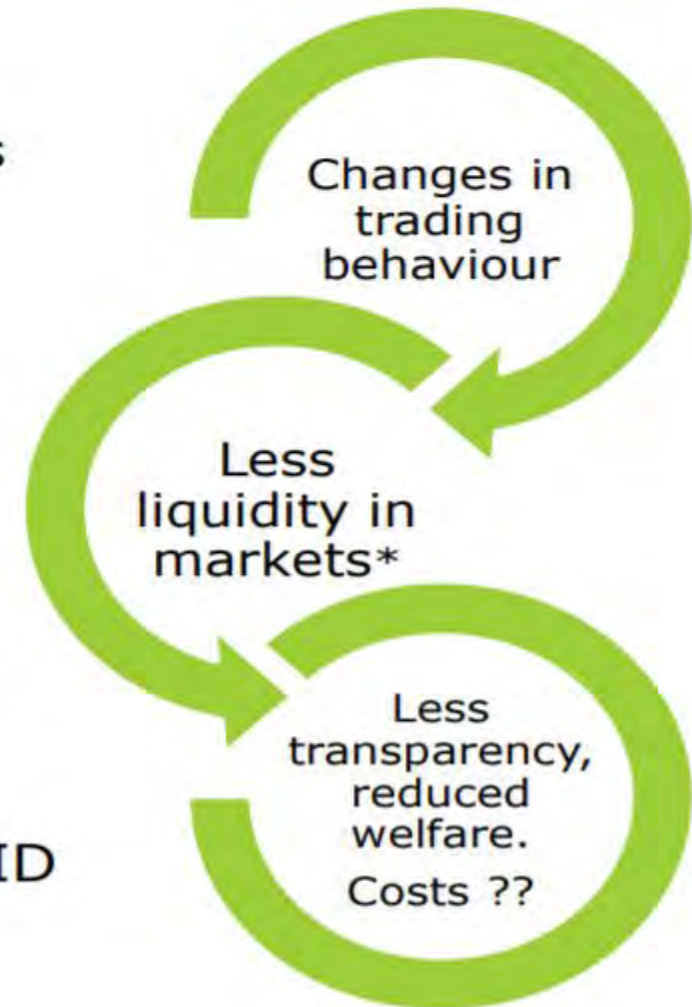
Market Transparency and Integrity: Reporting and Surveillance Tools



Energy and Financial Regulation: Mutually re-enforcing or detrimental to their respective aims?

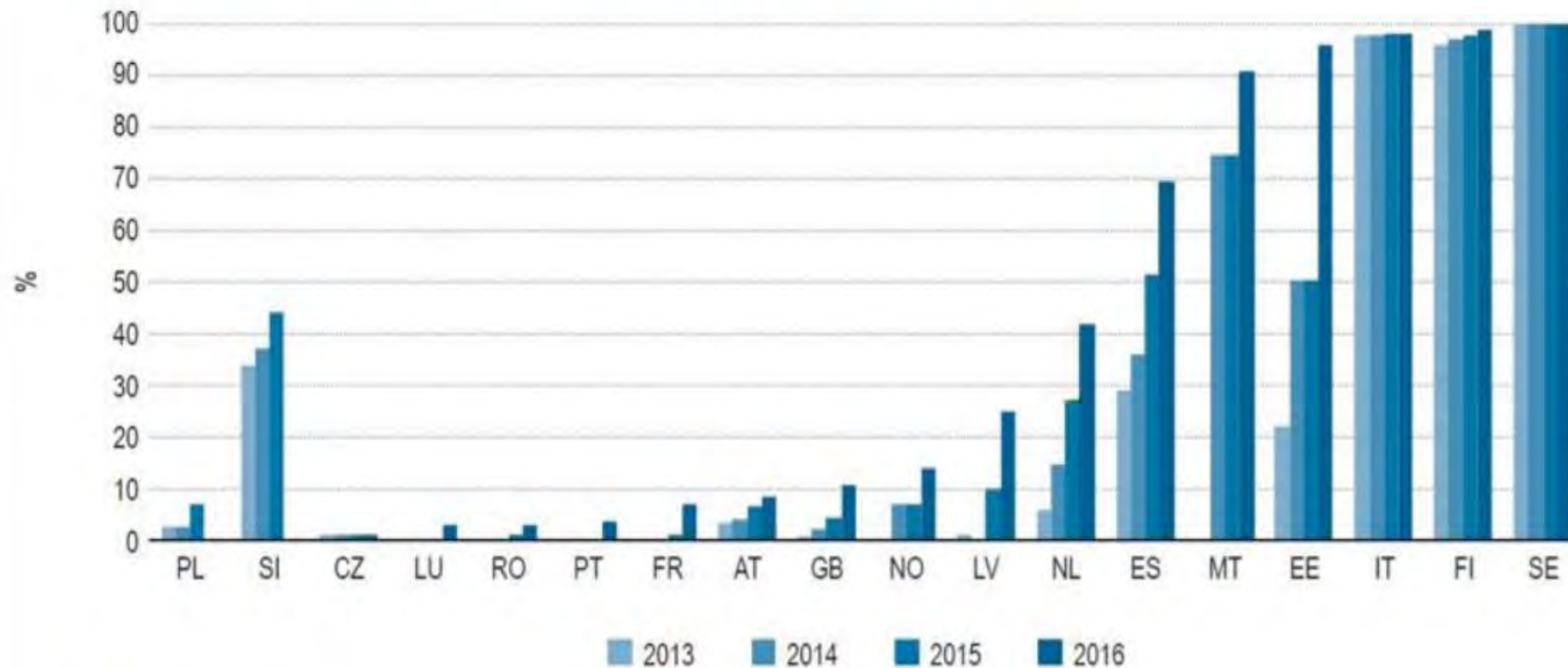
Potential impacts on energy markets

- Shifts in trading patterns
 - » Exchanges to broker platforms (OTFs)
 - » Exchanges and brokers to other platforms (non-OTFs)
 - » Exchanges and brokers to bilateral
 - » Shift trading ex-EU
- Reductions in trading volumes to avoid certain thresholds (both voluntary and mandatory)
- Liquidity splitting (financial and 'physical players')
- Firms restructure into MiFID and non-MiFID entities



Consumer choice: smart meters

Household consumers with electricity smart meters (%) - 2016



- Smart meter roll out close to 25% in European total perspective
- 17 MSs meet minimum technical functionalities as determined by EU law

Challenges and Relevant quotes

“3Ds”: Decarbonisation, Decentralisation, Digitalisation

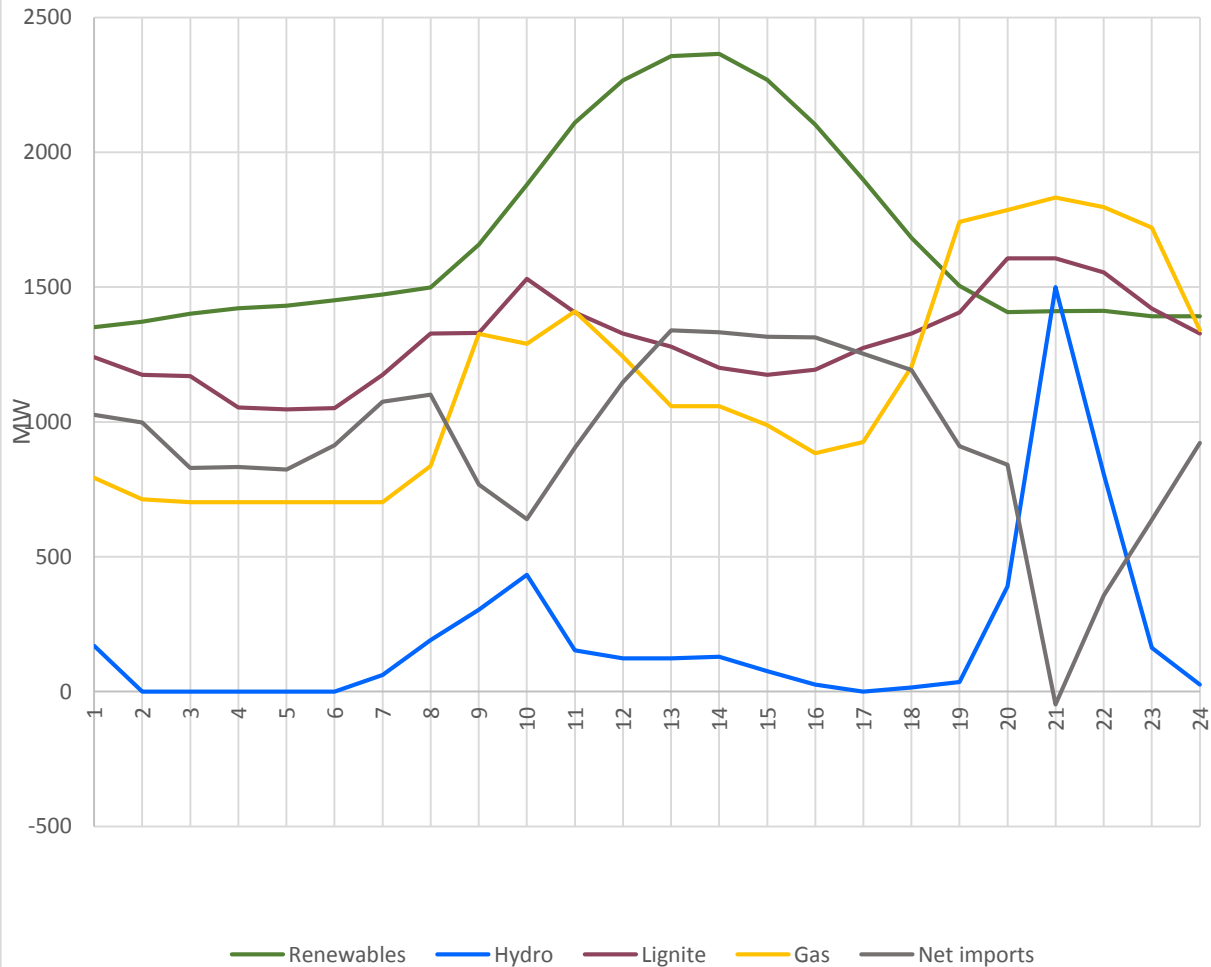
“3Cs”:

“You need to make a choice in order
to take the **chance** to
create **change”**

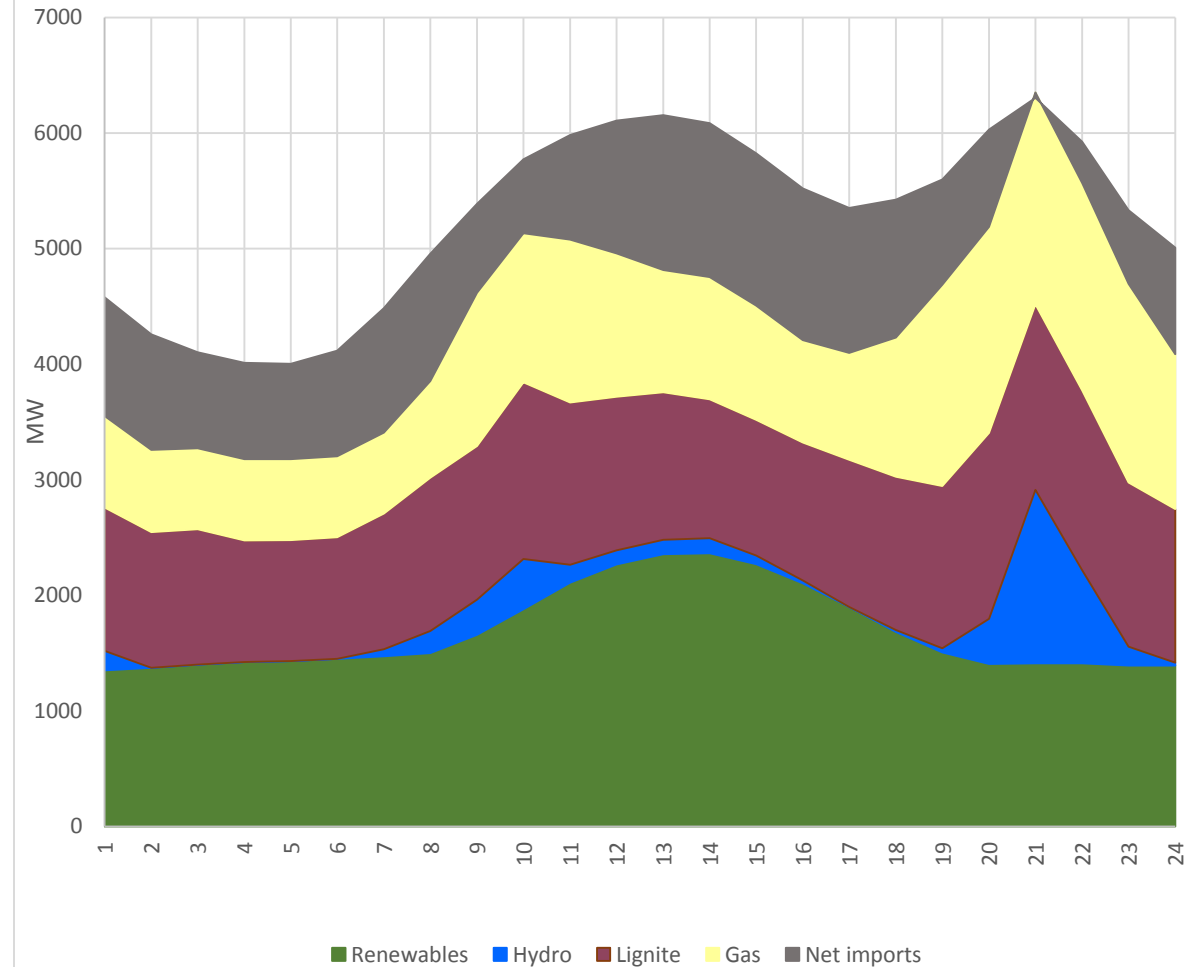
“Remain consistent and committed to the reform process but
do not get emotionally attached to the results”

Intra-day Energy Mix - 29.09.2017

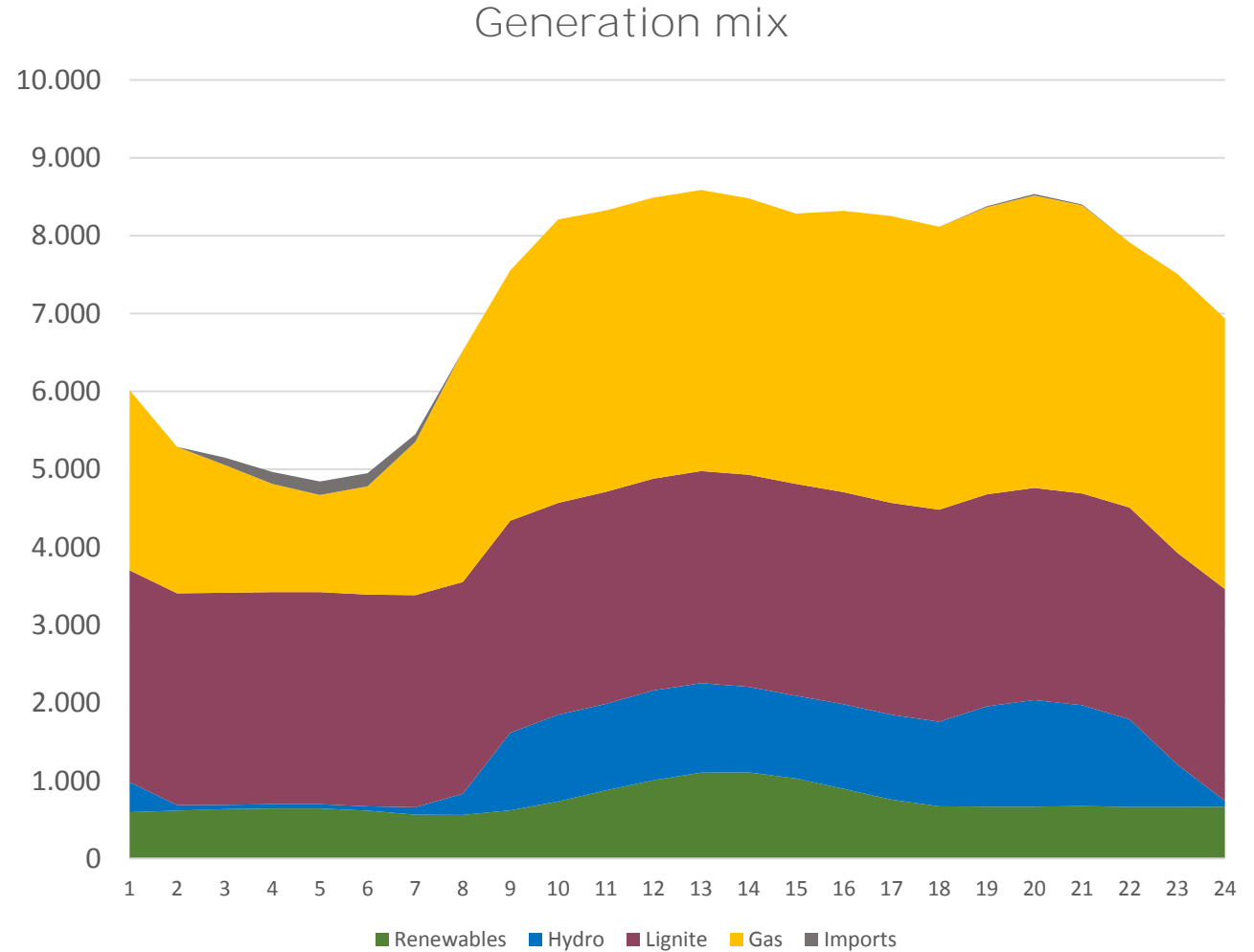
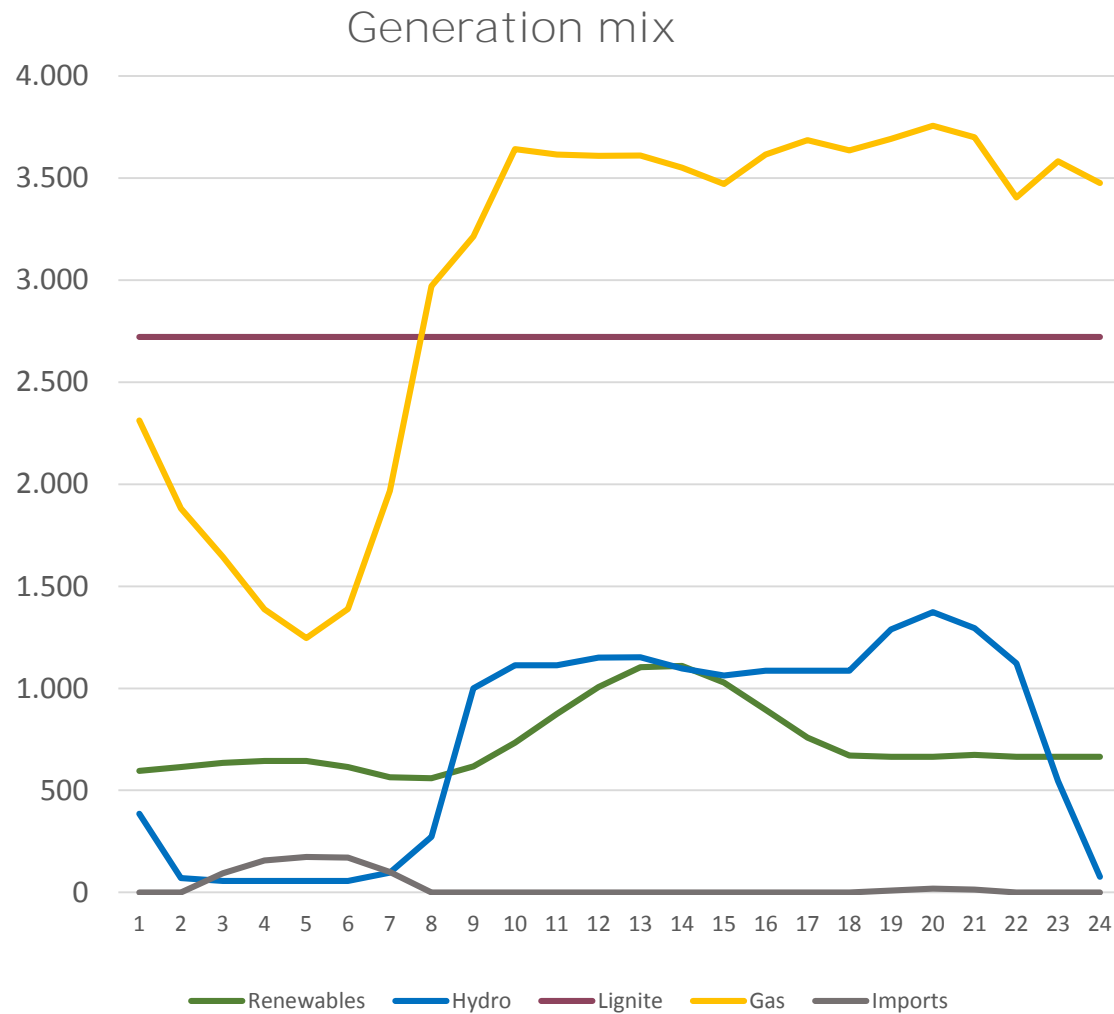
Generation mix 29-09-2017



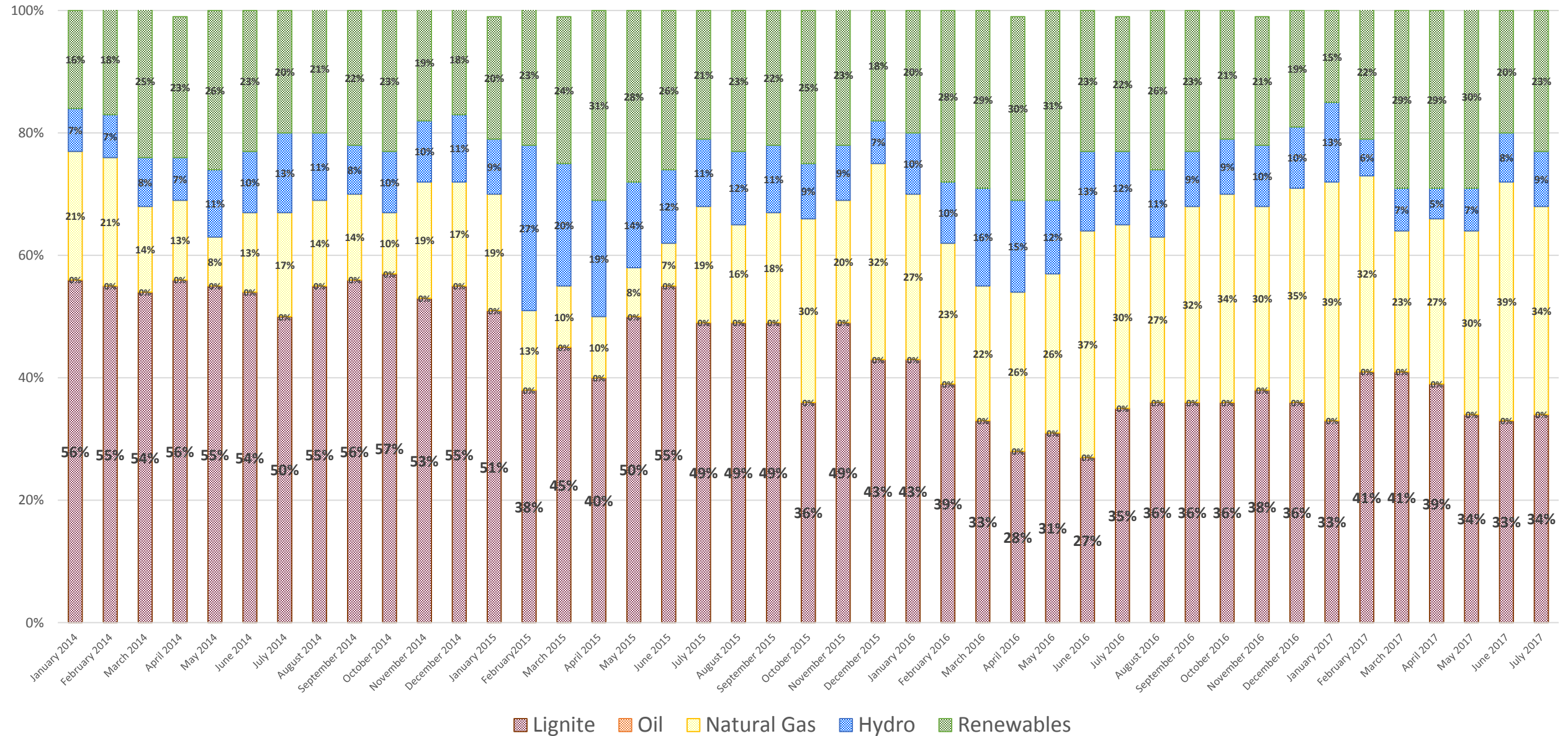
Generation mix 29-09-2017



Gas crisis - Low Renewables - 16.01.2017

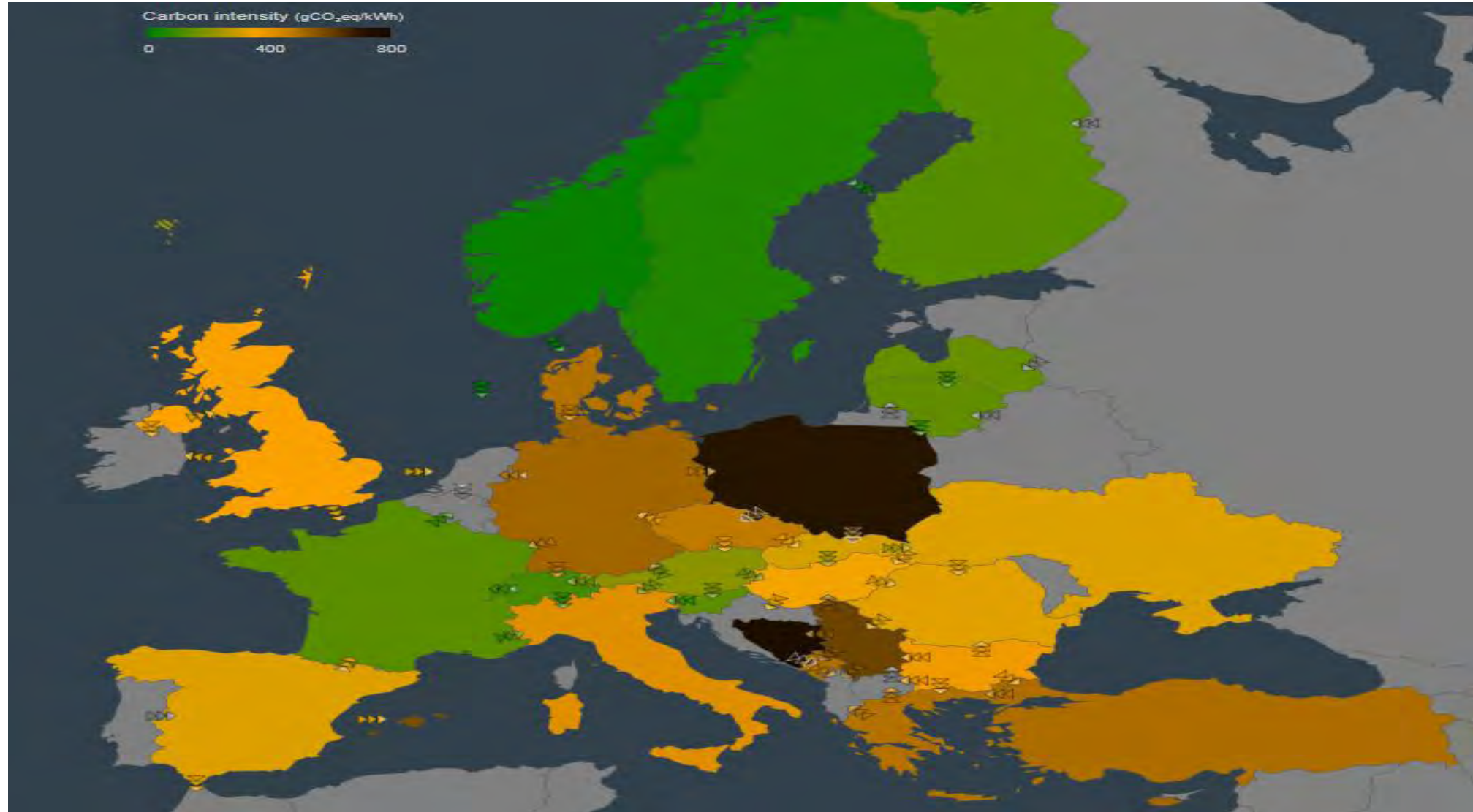


Fuel Market Shares in Electricity Generation, Jan 2014 - Jul 2017



Carbon Intensity for Electricity Production

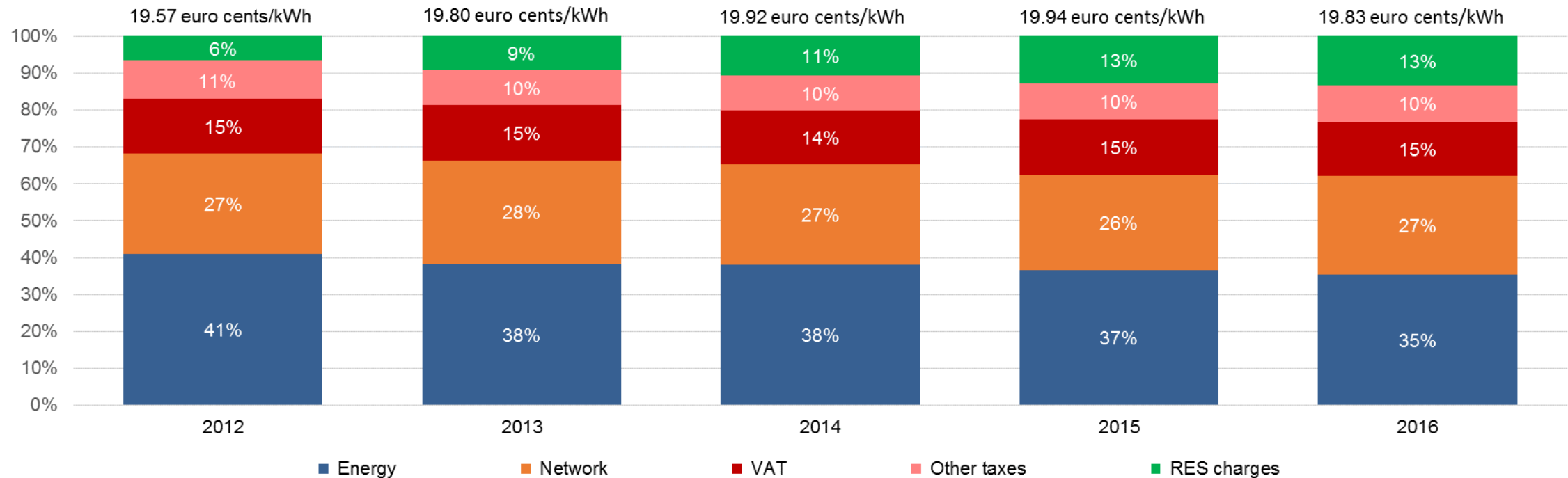
23 November 2017



Share of non-contestable charges in energy bills keeps increasing

- ▶ RES induce lower wholesale prices, feeding into consumer bills.
- ▶ But, subsidies and other levies have risen, squeezing competition effects.
- ▶ Better market functioning is being partially offset by governmental interventions.

Household Energy Bill Composition, ACER/CEER MMR

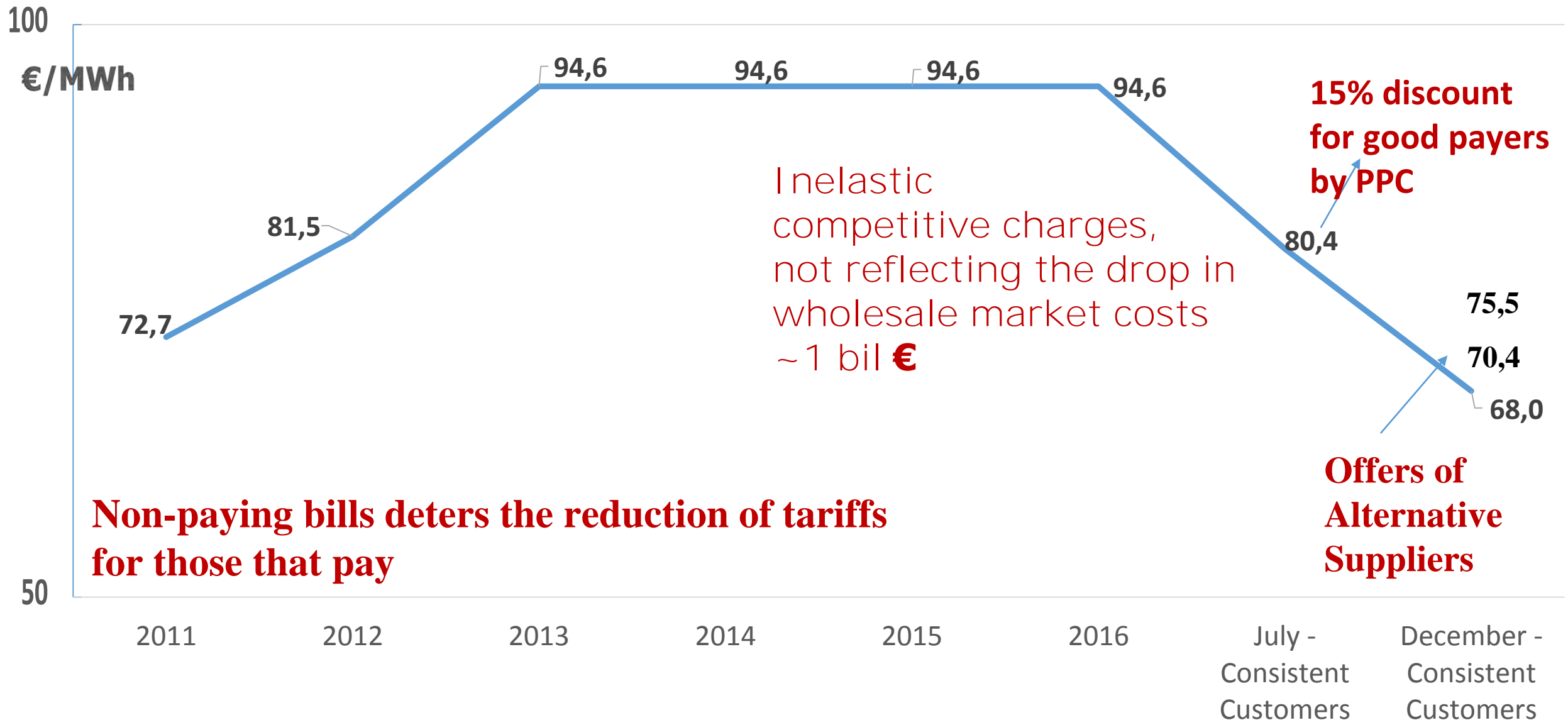


- **The objectives of energy and financial policy/regulation on the surface don't appear to interact, but...**
 - » Are energy firms (traditional utilities) systemically risky? I.e. does their failure pose a risk to the financial system and global economy?
 - » What happens to the European energy market if financial regulation becomes a deciding or important factor in firms' incentives to enter into trades in wholesale energy products?
 - » Do the implications of EU financial policy/regulation help or hinder the goals of EU energy policy/regulation? What does this mean for consumer bills, SoS, industrial competitiveness?
- **Terminology and definitions are being confused**
 - » 'Market speak' **versus** regulator's views/interpretations **versus** legal texts
 - » Lack of clarity can adversely impact policy objectives or implementation

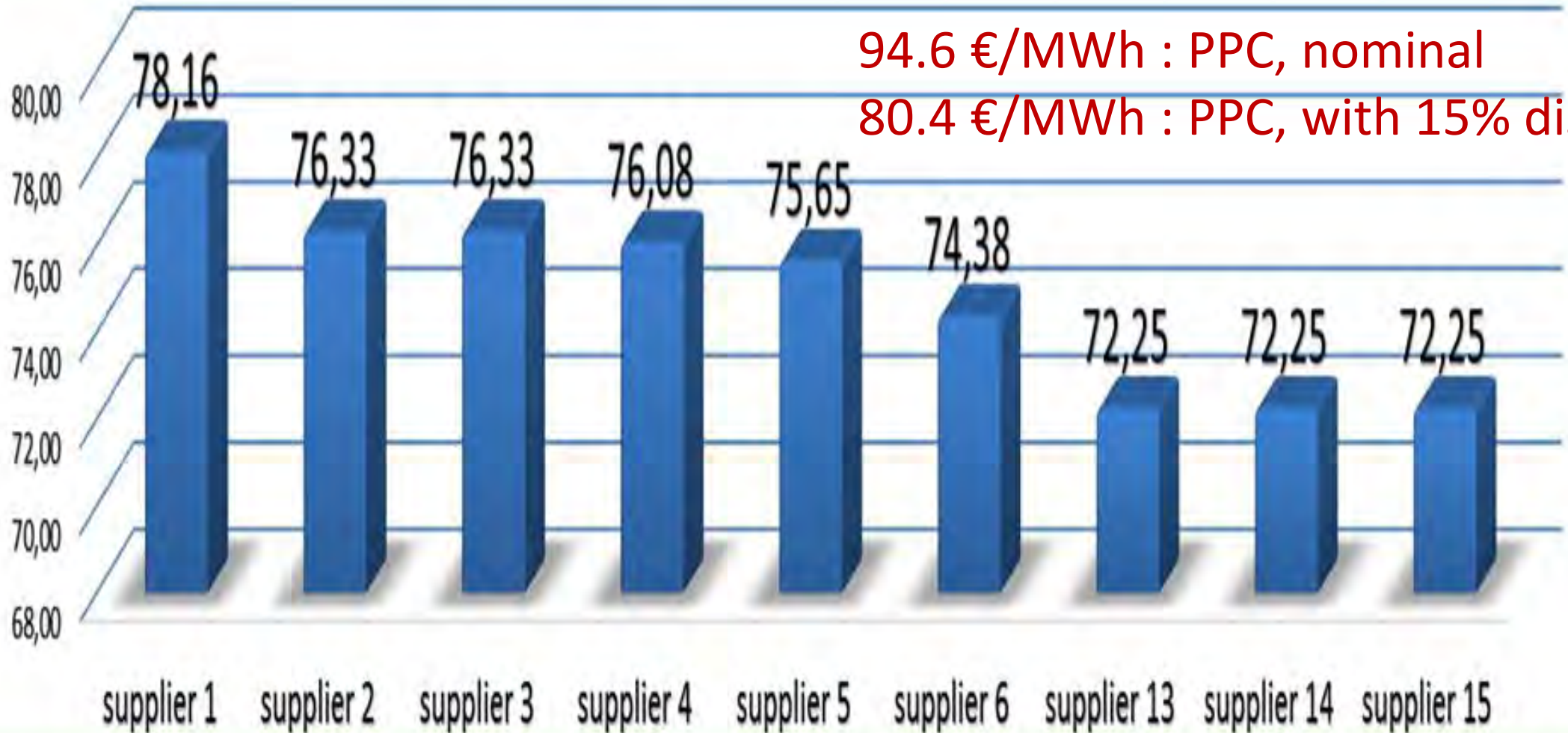
No one has looked holistically at how energy and financial policy/regulation interact – are they mutually reinforcing, neutral or detrimental to their respective aims?

NOME Impact on Retail Tariffs

Competitive Charges for the Average Consumer



Competitive Charges for Good payers – Average Household Consumer, Q3 2017



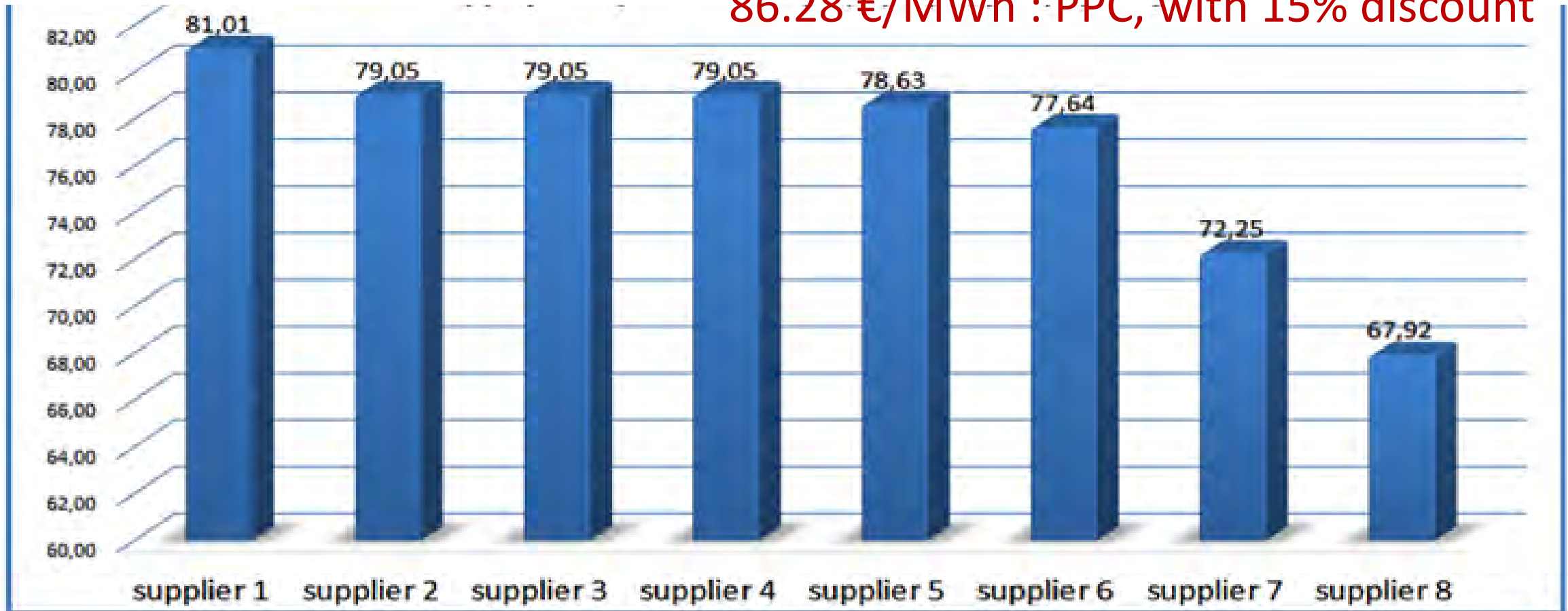
94.6 €/MWh : PPC, nominal

80.4 €/MWh : PPC, with 15% discount

Competitive Charges for Good payers – Commercial Consumer, Q3 2017

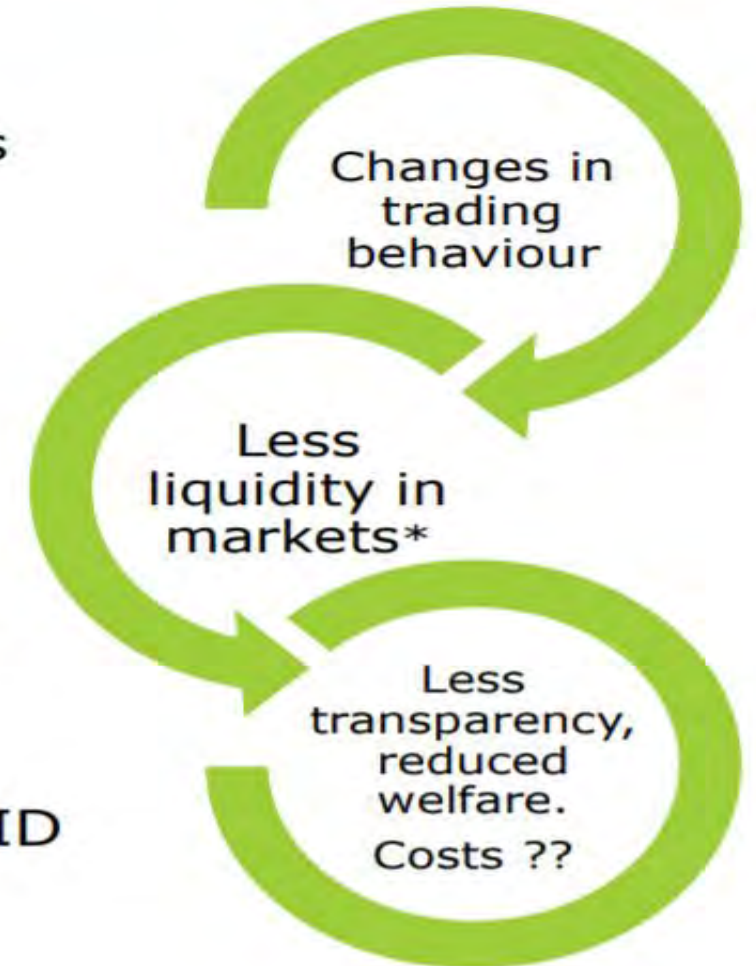
101.5 €/MWh : PPC, nominal

86.28 €/MWh : PPC, with 15% discount

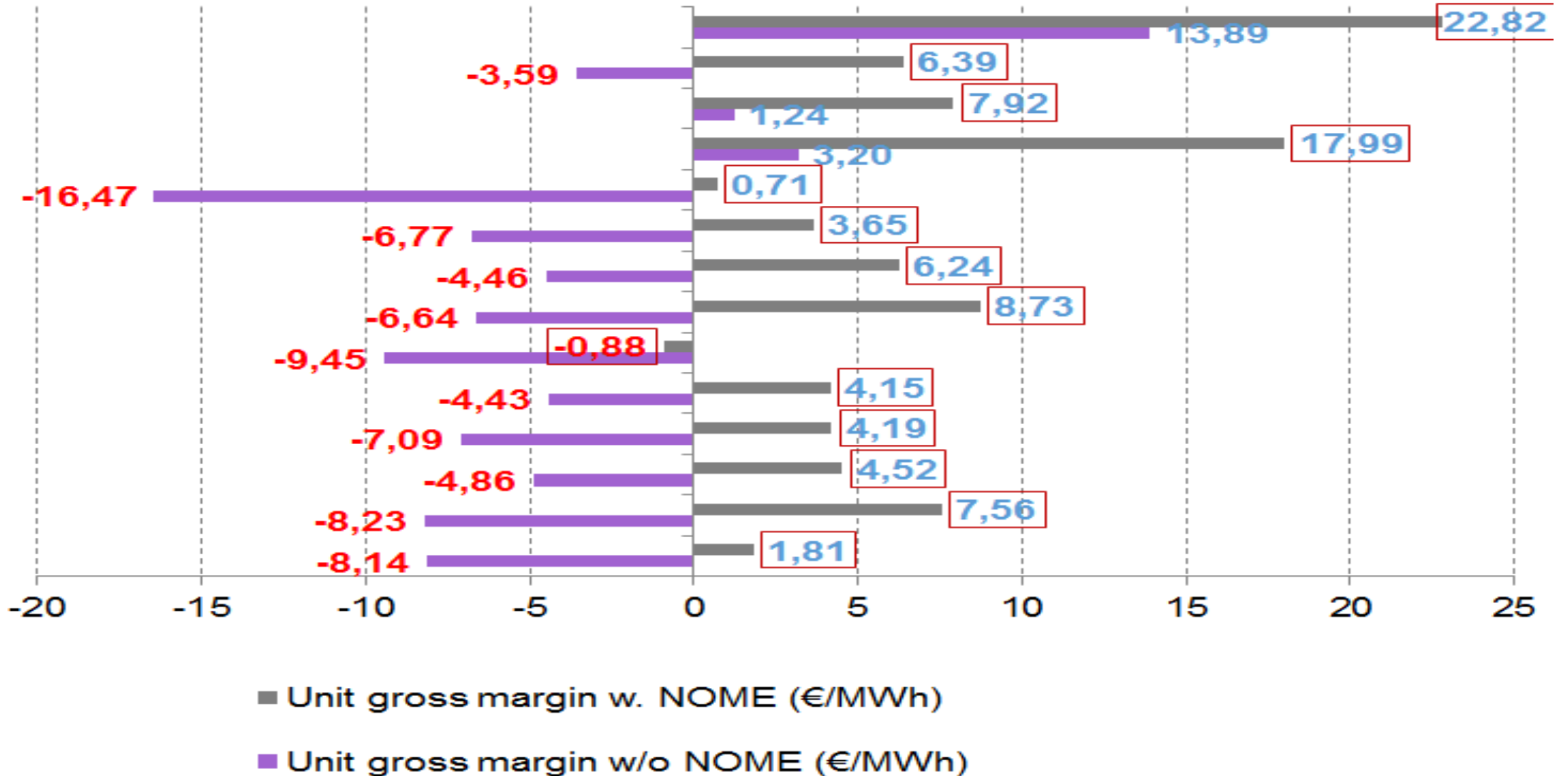


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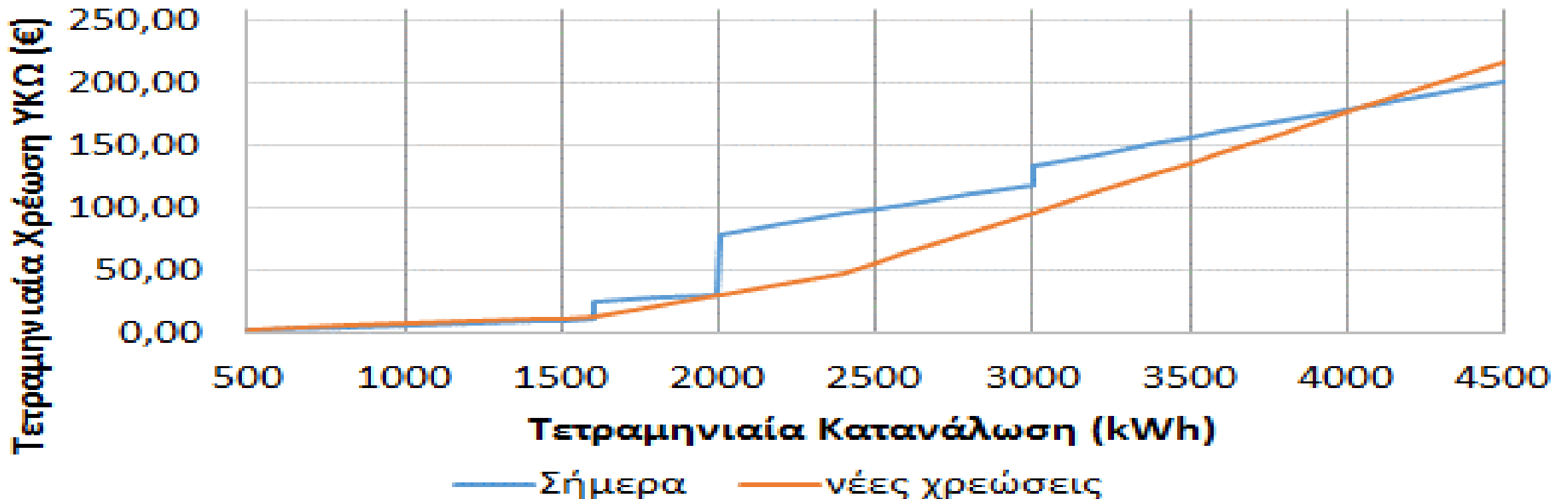
Gross Margin of Alternative Suppliers: Dec 2016 - May 2017



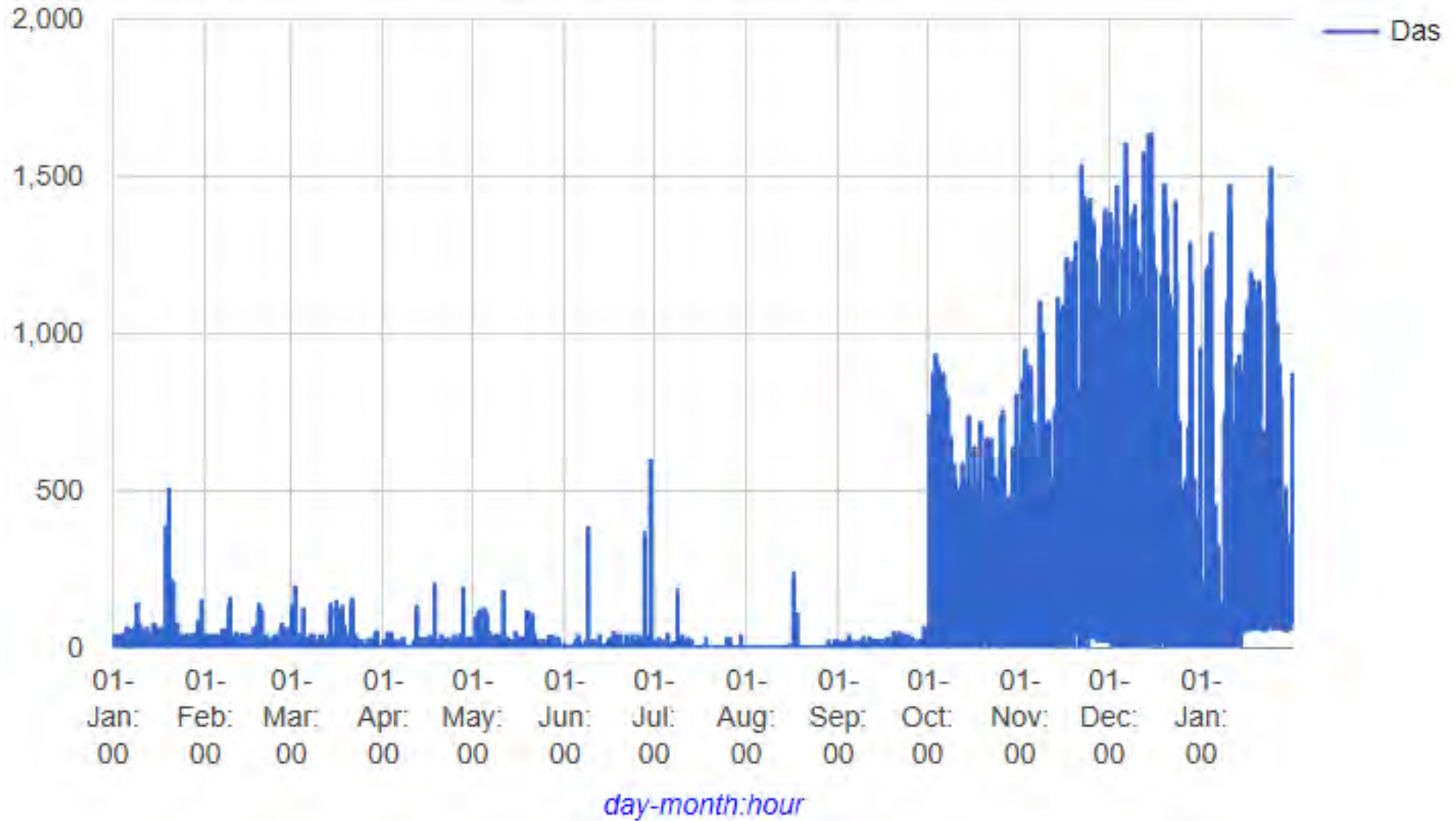
RAE's Proposal for a smoother relationship to consumption

Quarterly charge (€) vs daily consumption (kWh)

Οικιακής χρήσης ΧΤ (Καταναλώσεις Ημέρας)



HYDRO OVER MANDATORY from 2016-01-01 to 2017-02-01

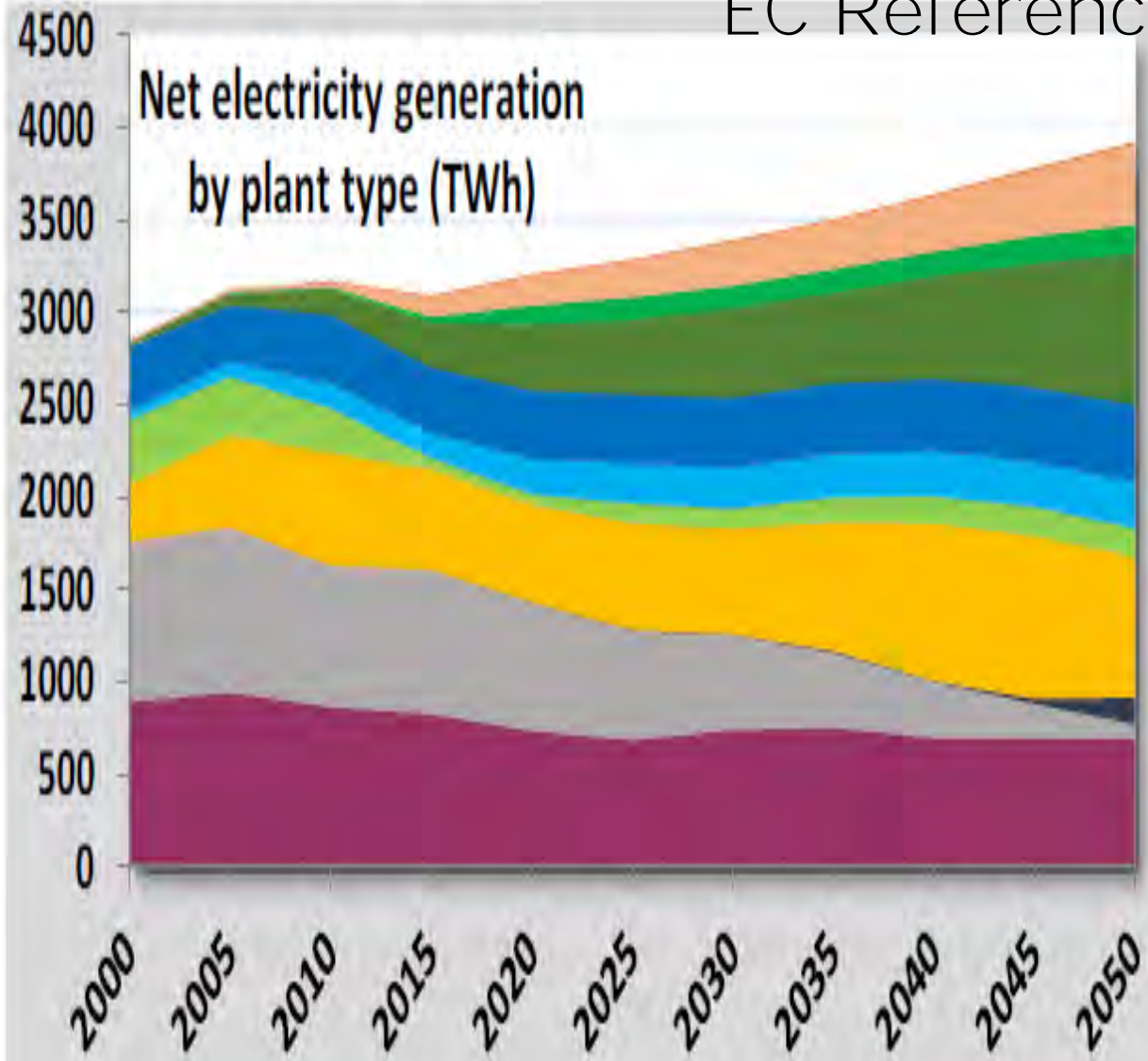


Remarks on Pilot Auction and New RES Framework

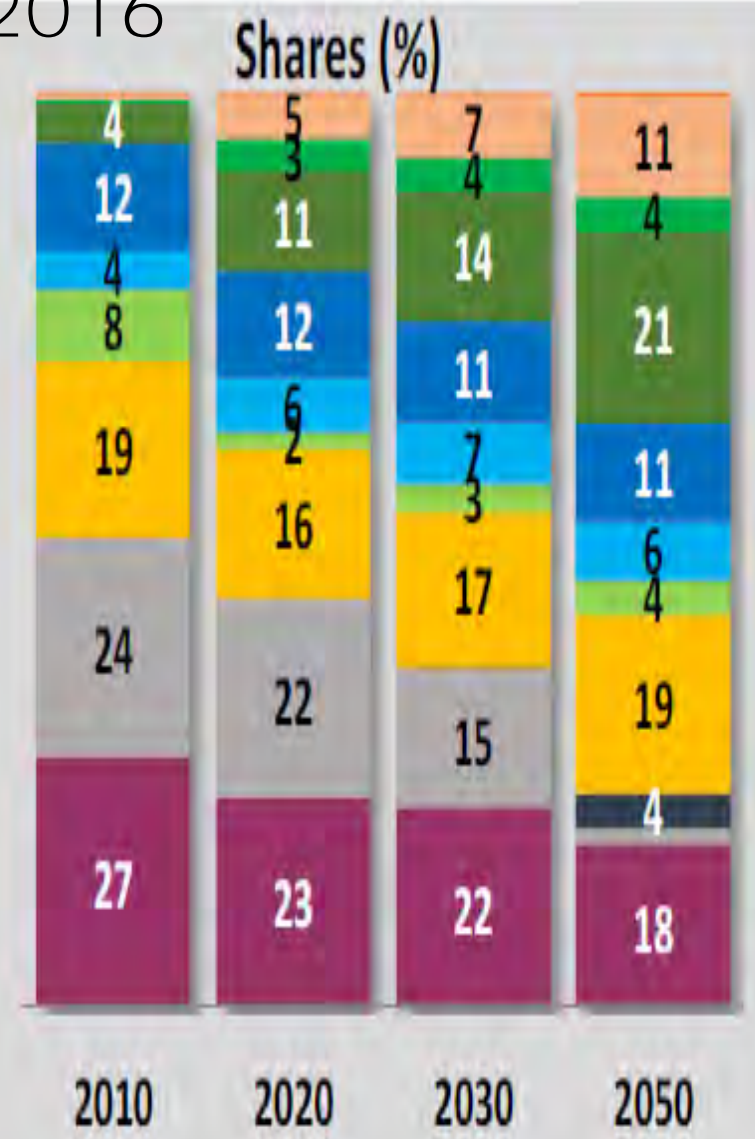
- **Competition** emerged in both categories (small and large projects) - 40 MW total.
- **Significant reduction in prices** compared to reference values:
 - Category I (≤ 1 MW): Price range: 94.97-104 €/MWh → **weighted average price: 98.78 €/ MWh.**
 - Category II (> 1 MW): Price range: 79.97-88 €/MWh → **weighted average price: 83.3 € / MWh.**
 - Still, the price outcomes render the **projects viable.**
- Law 4414/2016 introduced the new RES framework.
- A **new RES support mechanism**, compatible with AEEG, based on the **Sliding Feed In Premium**, was approved by DG Comp (November 2016).
- **Permanent Scheme: Auction procedures to be specified via a Ministerial Decision, following RAE's** opinion (submitted in March 2017) and **DG Comp approval** (currently).
- **RES participation** in the market – Next **challenge** in the context of the target model.
Operating framework for aggregators, Last resort aggregator, transitional mechanism of optimal precision, management information systems and requirements for RES stations.

Gas market share: In 2050 same as 2010

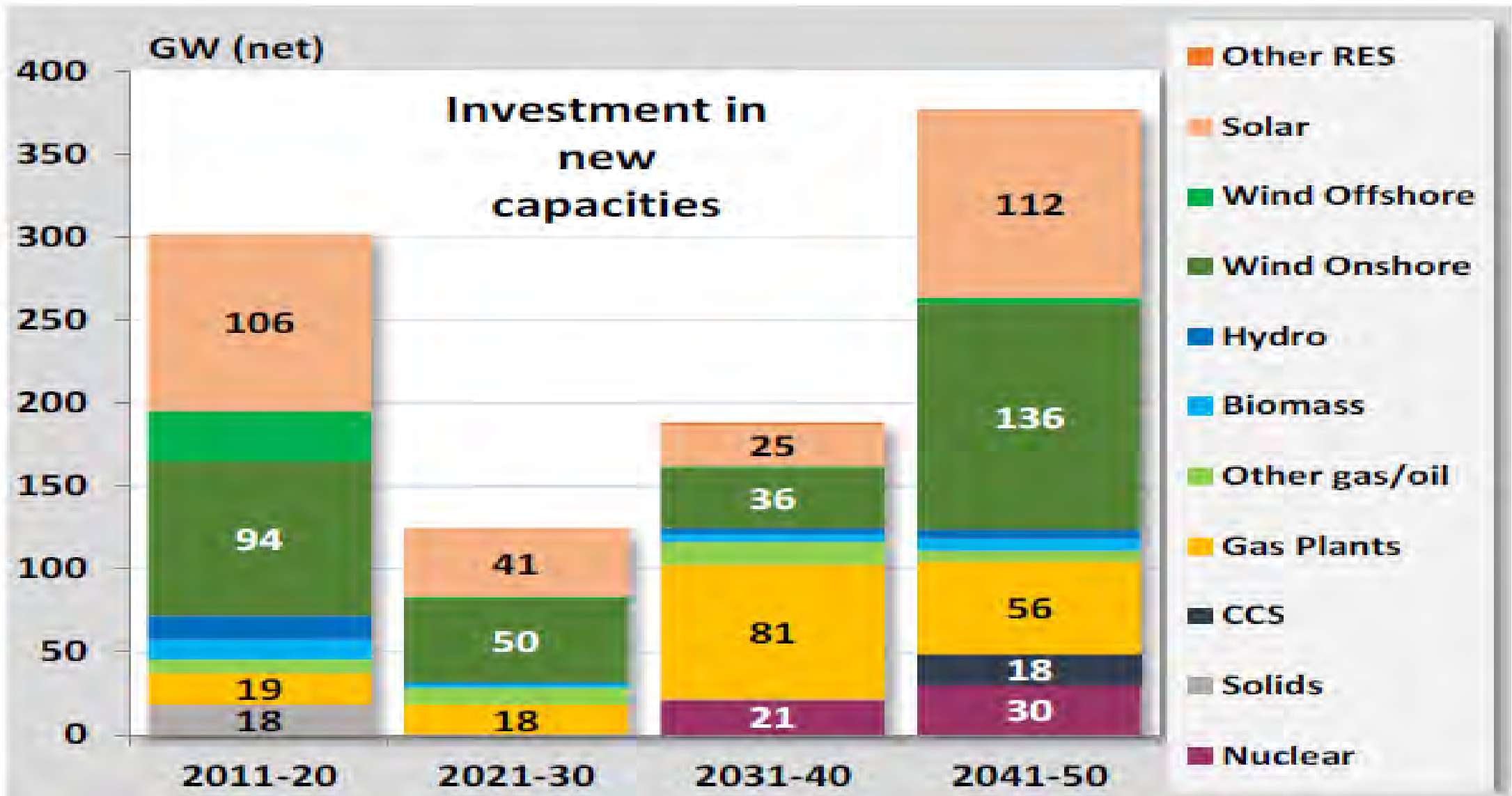
EC Reference Scenario 2016



- Other RES
- Solar
- Wind Offshore
- Wind Onshore
- Hydro
- Biomass
- Other gas/oil
- Gas Plants
- CCS
- Solid Plants
- Nuclear



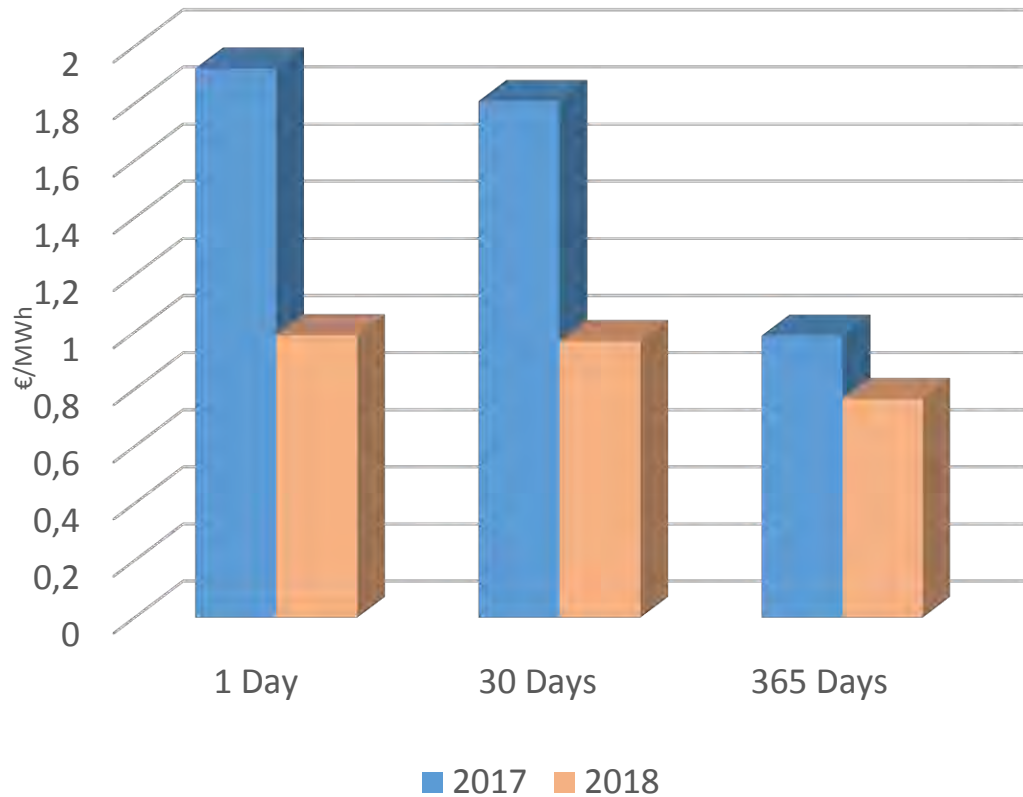
Investment in Gas Capacity: Projected to Escalate



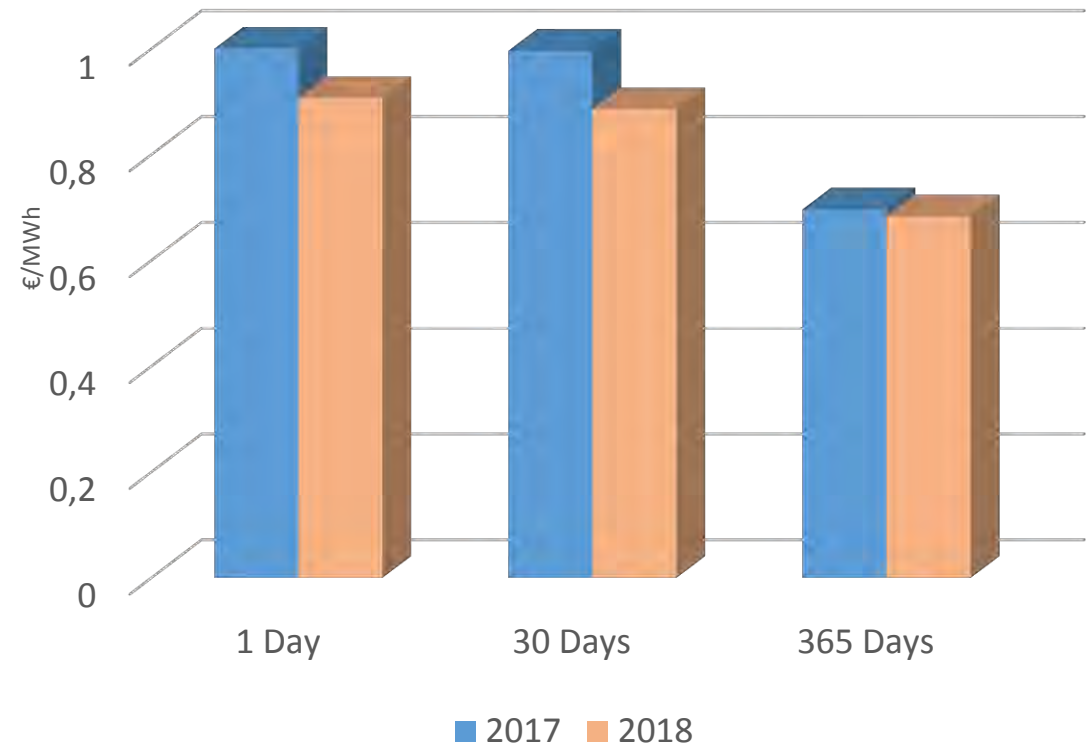
Impact on Tariffs - Overall drop 6%

Examples

Revithousa

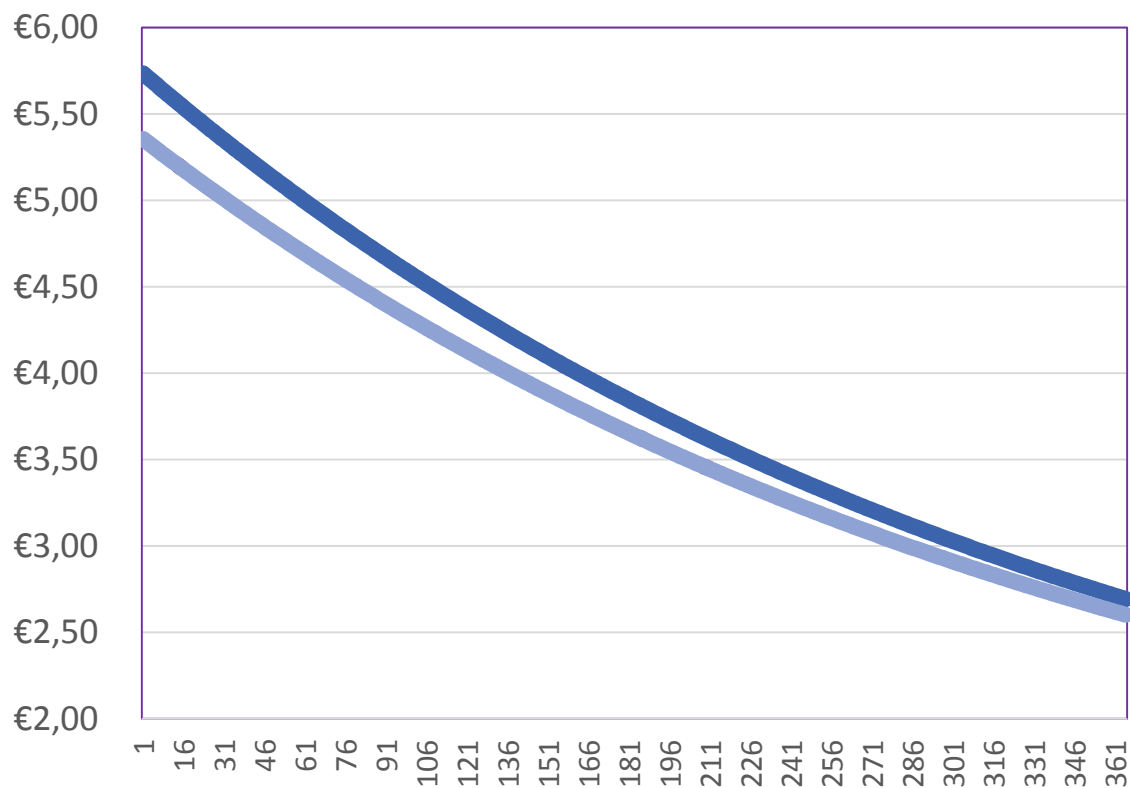


Sidirokastro



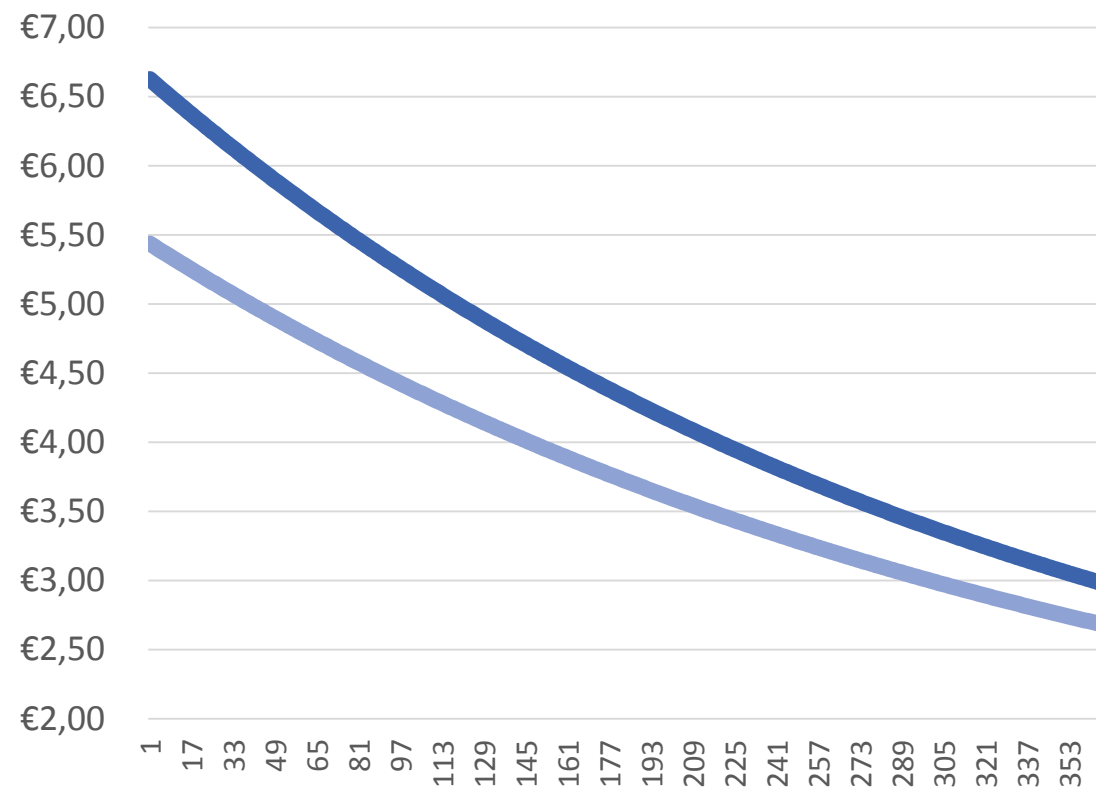
Total Contract Cost for 10.000 MWh, LF = 1, vs. contract duration

Entry: Sidirokastro
Exit: South Zone



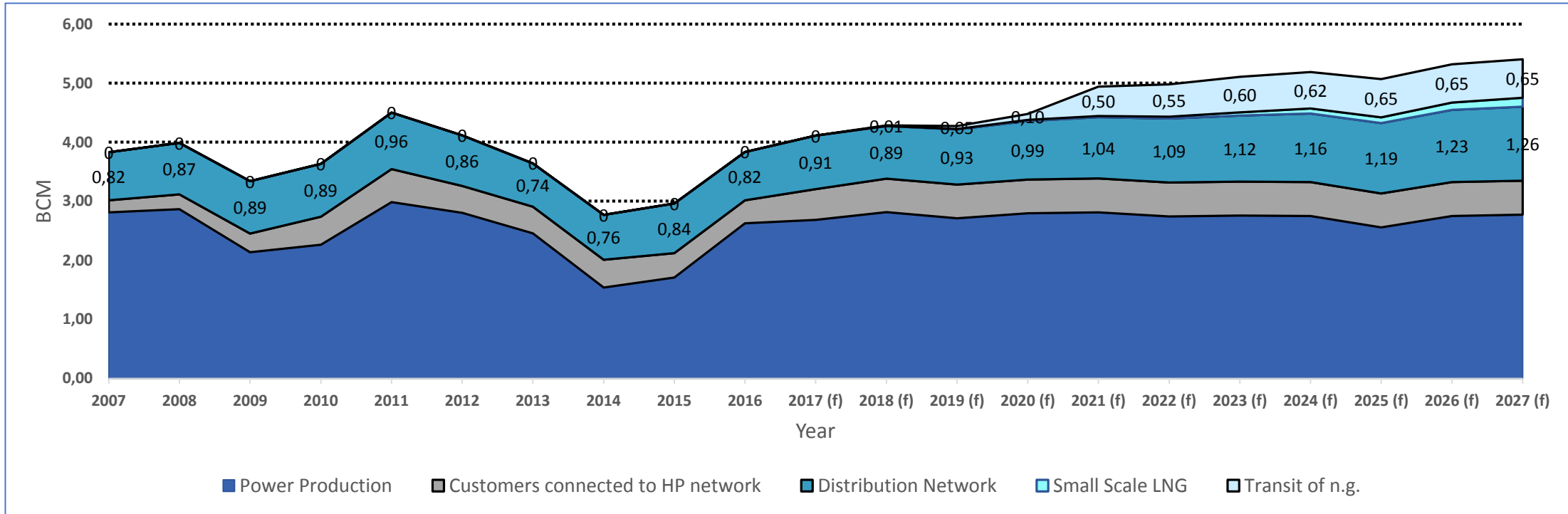
— €/MWh 2017 — €/MWh 2018

Entry: Revithousa
Exit: South Zone



— €/MWh 2017 — €/MWh 2018

Gas Demand in Greece: Actual data and Outlook



Source: DESFA S.A., National Natural Gas Development Study (2018-2027)

- ❑ Gas demand **decreased significantly** after 2011, when it reached a max of **4.5 bcm**.
- ❑ Consumption in 2016 amounted to **4 bcm**.
- ❑ Demand in 2017 has already **exceeded annual forecast**, being revised at **4.3 bcm**.

Major Interest for New Infrastructure

Entry Capacities (bcma)(*)			
		2016	2018
Existing Infrastructure	IP Greece - Turkey (NNGS)	1,4	1,4
	IP Greece Bulgaria	3,5	3,5
	LNG - Revithousa	4,1	6,3
TOTAL		9,1	11,3

(*) LF=90%

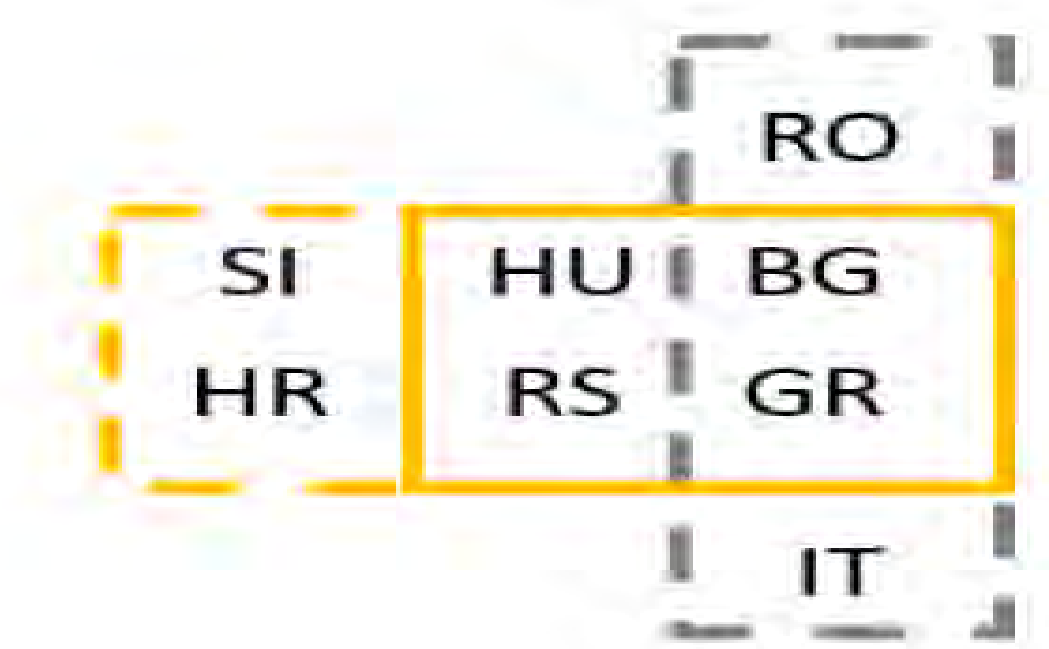
PCI Projects

- TAP (10-20 bcma)
- IGB (3-5 bcma)
- IGI (10 bcma)
- LNG Northern Greece (5-6 bcma)
- EastMed (8 bcma)
- CS Kipi



Source: PCI Interactive map

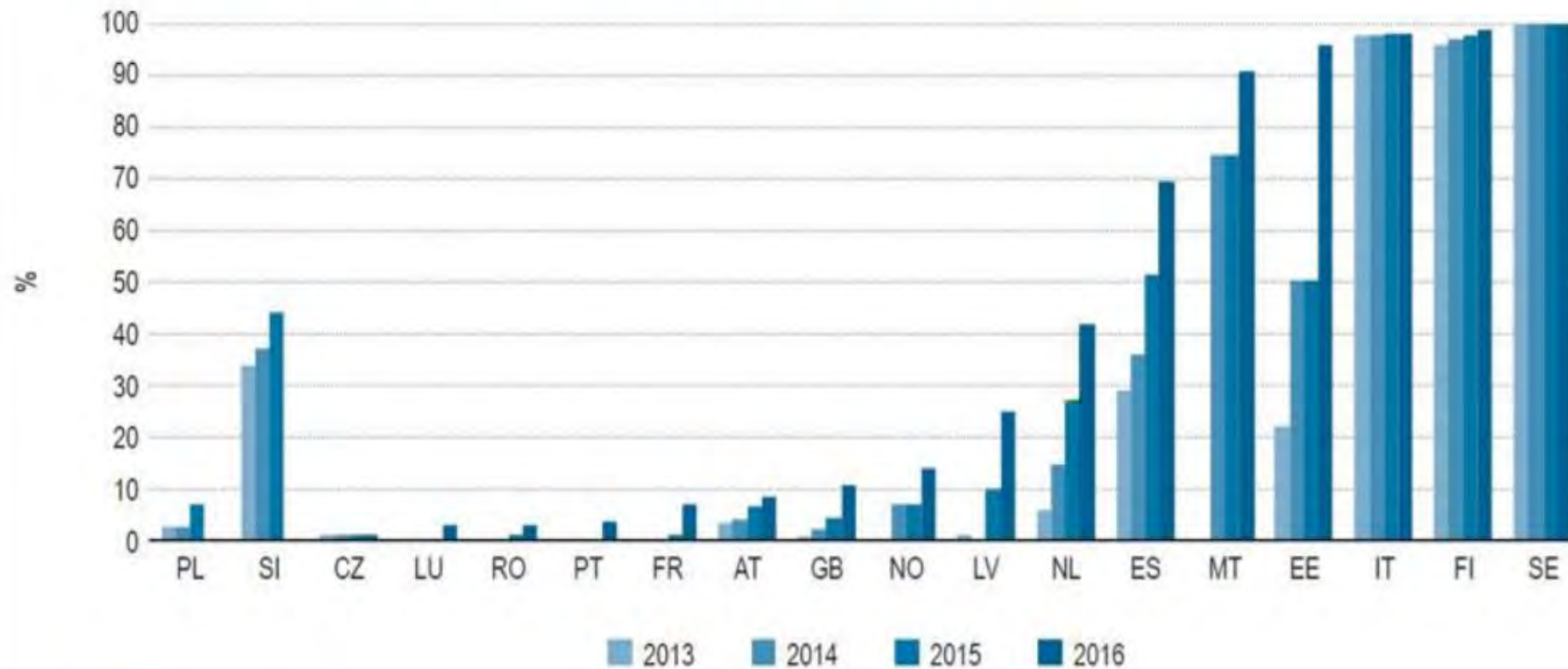
Value in Regional Developments



- ❑ Crucial Corridor: Greece, Bulgaria, Serbia, Hungary.
- ❑ BG-RO bi-directional.
- ❑ Extended to Slovenia and Croatia.
- ❑ Harmonizing TAP flows with Italian storage use.

Consumer choice: smart meters

Household consumers with electricity smart meters (%) - 2016



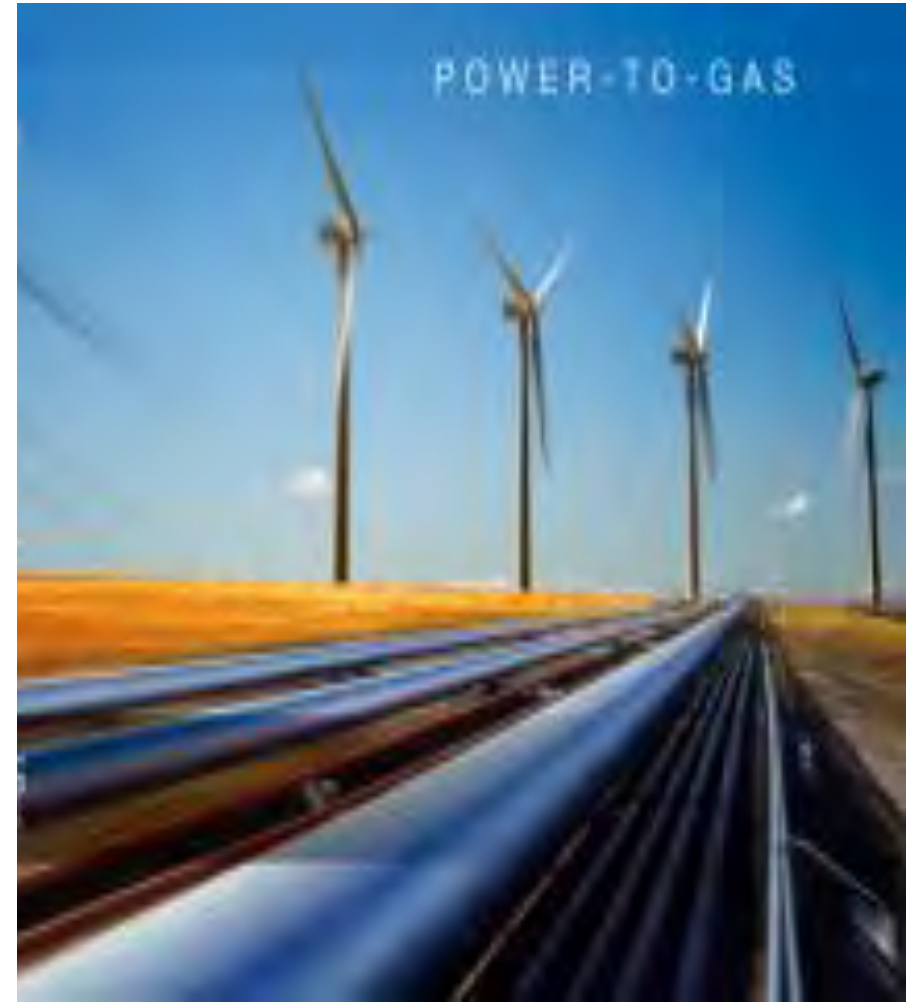
- Smart meter roll out close to 25% in European total perspective
- 17 MSs meet minimum technical functionalities as determined by EU law

Common Objectives and Challenges



Several trajectories,
reflecting local specificities,
need to converge.

Future remains to be invented



Key Energy Reforms: Overview

Electricity Market:

- **Target Model** Implementation (1st Semester of 2018)
- **NOME** Auctions (On going, since October 2016)
- **Capacity / Flexibility Mechanism** (Notification)
- **Market reforms** (In progress)
 - **Hydro**: Pricing methodology (Oct 2016), Restrictions on hydro availability
 - **Ancillary Services**: Remuneration of tertiary reserve, Revision of price cap for secondary reserve

Renewables:

New support scheme (Nov 2016)

RAE: Pilot PV auction (Dec 2016), Opinion for **permanent** framework (Mar 2017), EC Approval: currently

Gas Sector:

- **Structural changes**: Unbundling of distribution and supply (1.1.2017)
- **Distribution: Tariffs Regulation** (Sep 2016), **Network Code** issued (Dec 2016), 1st Revision: currently
- **Transmission**: Revision of **Tariff Regulation** (Oct 2017), 4th Amendment of **Network Code**
- **Licensing Regulation** (Nov 2017), **Supply Code** (Nov 2017)