European Power Plant Suppliers Association

Developing the Future

# Thermal Power Generation in 2030
# Added Value for EU Energy Policy

Prof. Emmanouil Kakaras
*EPPSA President*

*17th November 2014*
*European Energy Forum*
*Brussels, Belgium*

www.eppsa.eu

I. EPPSA

II. EU 2030 Targets

III. EPPSA Study: Thermal Power In 2030

- Different scenarios, similar conclusions
- New-build database

IV. Conclusions

# I. EPPSA

## The European Power Plant Suppliers Association

The European Power Plant Suppliers Association (EPPSA) is the voice, at European level, of companies supplying power plants, components and services. EPPSA members, located throughout Europe, represent a leading sector of technology with more than 100,000 employees.

EPPSA actively promotes awareness of the importance of flexible and efficient, state-of-the-art thermal power generation and its crucial contribution to ensuring a clean, secure, and affordable energy supply.

EPPSA believes increased investment in Research, Development and Demonstration is a key factor in driving EU competitiveness as well as ensuring an affordable low emission power supply.

**Virtually all thermal power plants in the EU are built by members of EPPSA or equipped with their components, and around 50% of Europe's electricity.**

**EPPSA members provide the most advanced thermal power technologies in the world.**

# I. EPPSA

## Our Members

I. EPPSA

II. EU 2030 Targets

III. EPPSA Study: Thermal Power In 2030

- Different scenarios, similar conclusions
- New-build database
- Conclusions
- Future Added Value Of Thermal Power Plants

IV. Conclusions

# III. 2030 Targets

On the 23rd October 2014 the European Council concluded on its 2030 energy and climate targets:

- **At least 40% emissions reduction from 1990 levels by 2030 (nationally binding)**
- **At least 27% energy efficiency increase by 2030 (binding only at EU level)**
- **At least 27% renewable energy share by 2030 (binding only at EU level)**
- **A revised EU ETS**
- **Energy Security**

So what is the place for Thermal Power as we move towards 2030?

I. EPPSA

II. EU 2030 Targets

III. EPPSA Study: Thermal Power In 2030

- Different scenarios, similar conclusions
  - Generation Mix in 2030
  - Capacity Mix in 2030
  - Thermal Capacity in 2030
  - Capacity Investments Required, 2010-2030
- New-build database
- Conclusions
- Future Added Value Of Thermal Power Plants

IV. Conclusions

# IV. EPPSA Study: Thermal Power In 2030

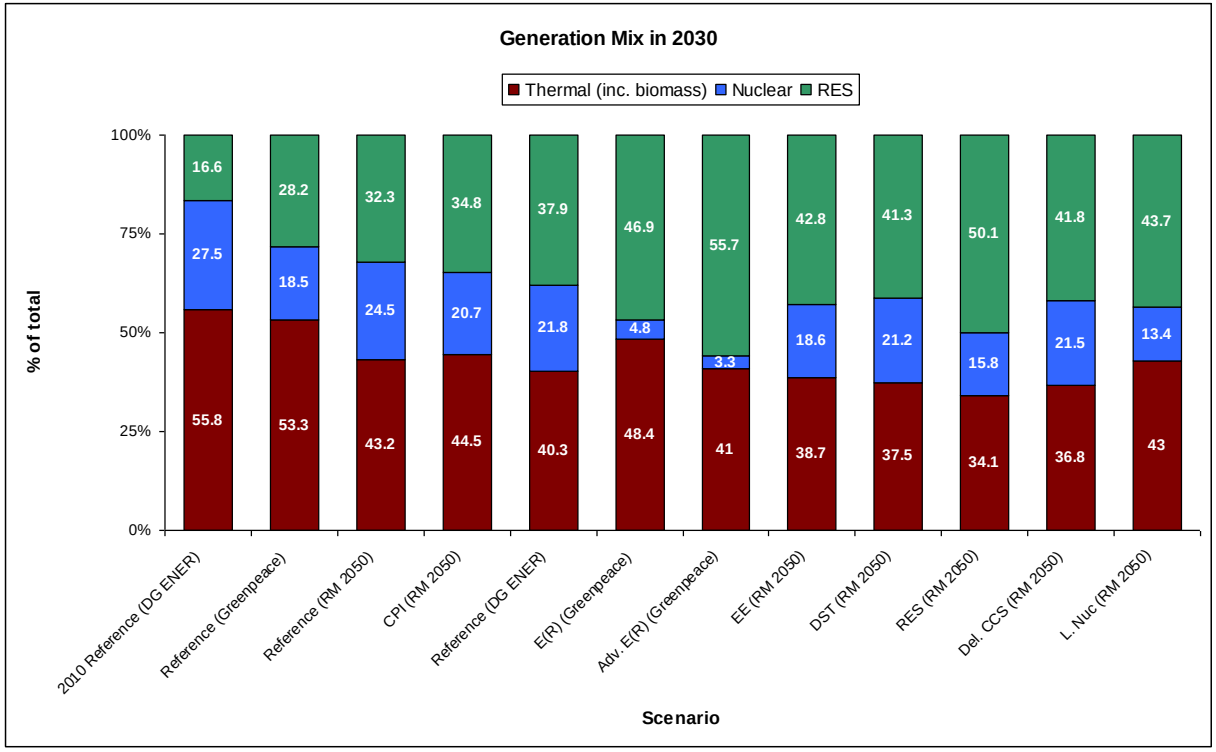
## Different scenarios, similar conclusions

- 24 scenarios from 7 studies were examined with regard to their results for the EU energy system in 2030.
- They were specifically examined and compared with regard to the generation mix, the installed capacity and the additional capacity of thermal power needed by 2030 to account for decommissioning of existing plants.

| | |
|---|---|
| JRC (2009) | Future Fossil Fuel Electricity Generation in Europe: Options and Consequences (*JRC*) |
| Eurelectric (2009) | Power Choices: Pathways to Carbon-Neutral Electricity in Europe by 2050 (*Eurelectric*) |
| Greenpeace (2010) | Energy (R)Evolution: Towards a Fully Renewable Energy Supply in the EU-27 (*Revolution and Adv. Revolution*) |
| European Climate Foundation (2011) | Power Perspectives 2030: On the Road to a Decarbonised Power Sector (*ECF*) |
| DG ENER (2011) | Energy Roadmap 2050 (*RM2050*) |
| DG ENER (2013) | EU Energy Trends to 2050 (*DG ENER*) |
| ENTSO-E (2013) | 2030 Visions (*ENTSO-E*) |

# IV. EPPSA Study: Thermal Power In 2030

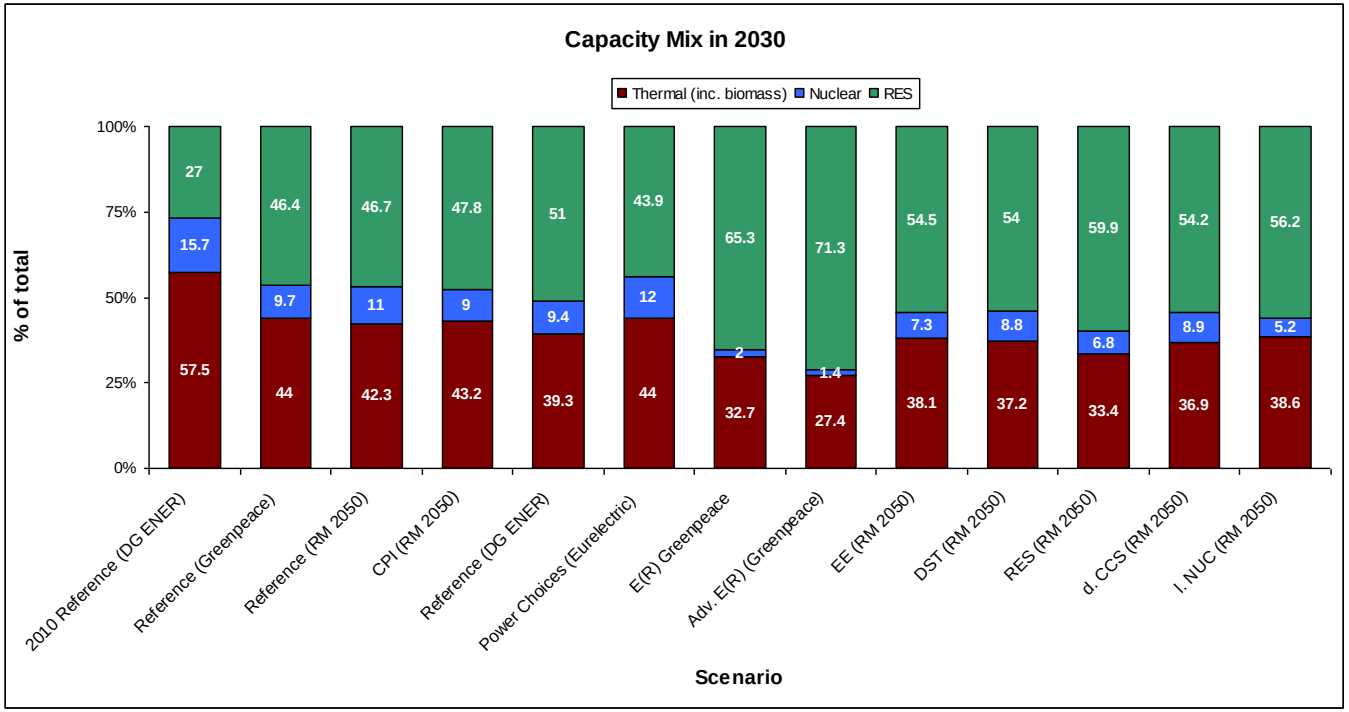
## Generation Mix in 2030




Share of thermal power generation in the 2030 generation mix **never falls below 1/3rd.**

# IV. EPPSA Study: Thermal Power In 2030

## Capacity Mix in 2030

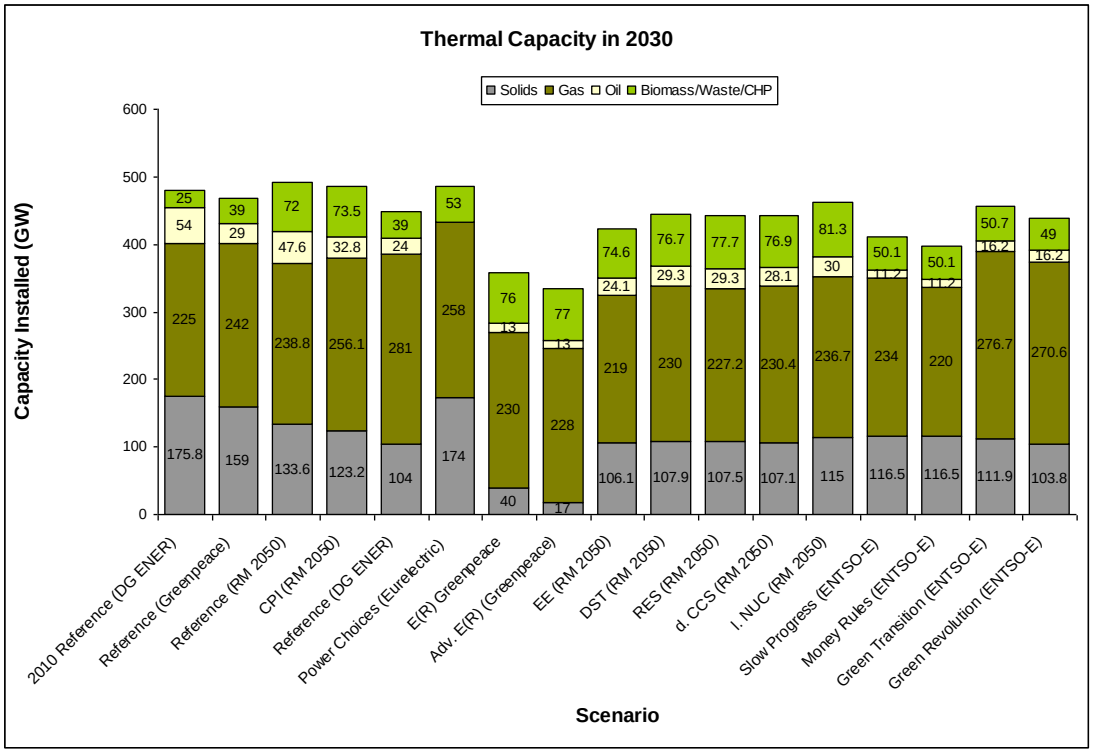



In only 2 scenarios share of thermal power below 1/3rd .

In these scenarios this capacity still **produces 41 – 48.4%** of total electricity;

# IV. EPPSA Study: Thermal Power In 2030

## Thermal Capacity in 2030



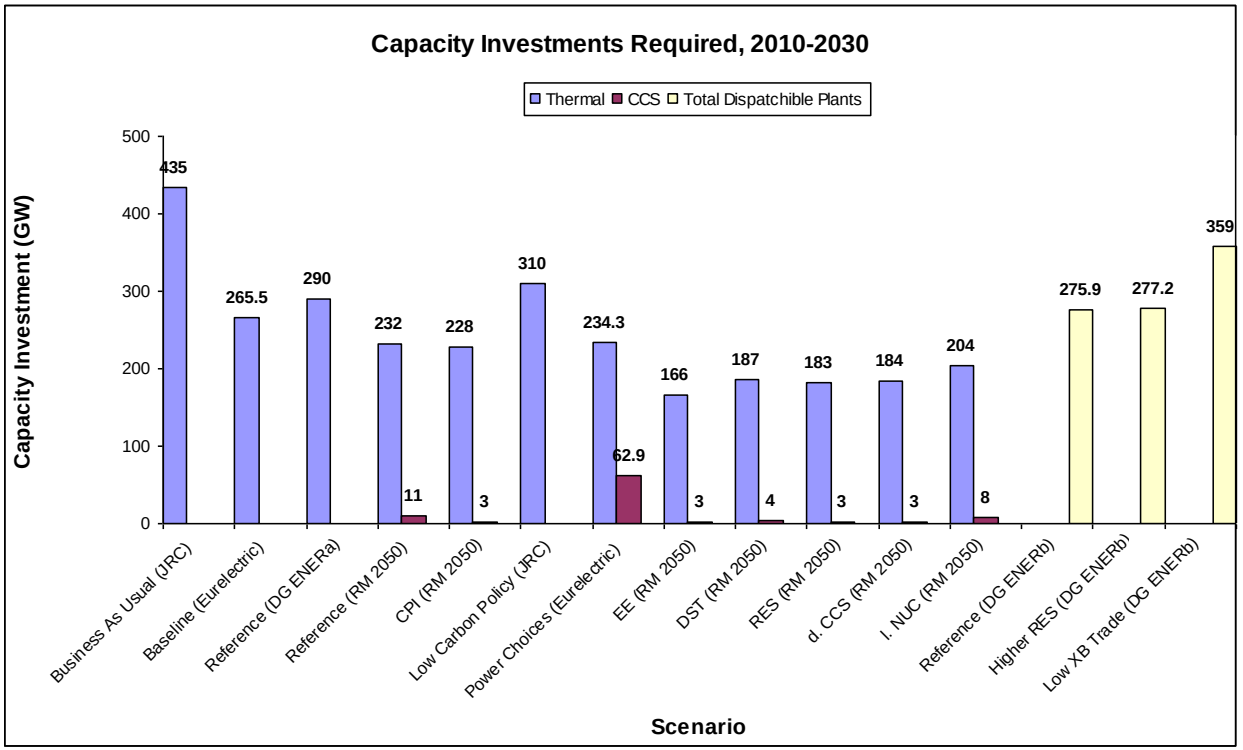

All scenarios show a substantial installed capacity in 2030.

In scenarios with lowest capacity, total installed thermal capacity is 335 GW.

In most non-reference/baseline scenarios, the total installed thermal power capacity is between 423 – 485 GW, not very different from the 2010 Reference case of 479 GW.

# IV. EPPSA Study: Thermal Power In 2030

## Capacity Investments Required, 2010-2030

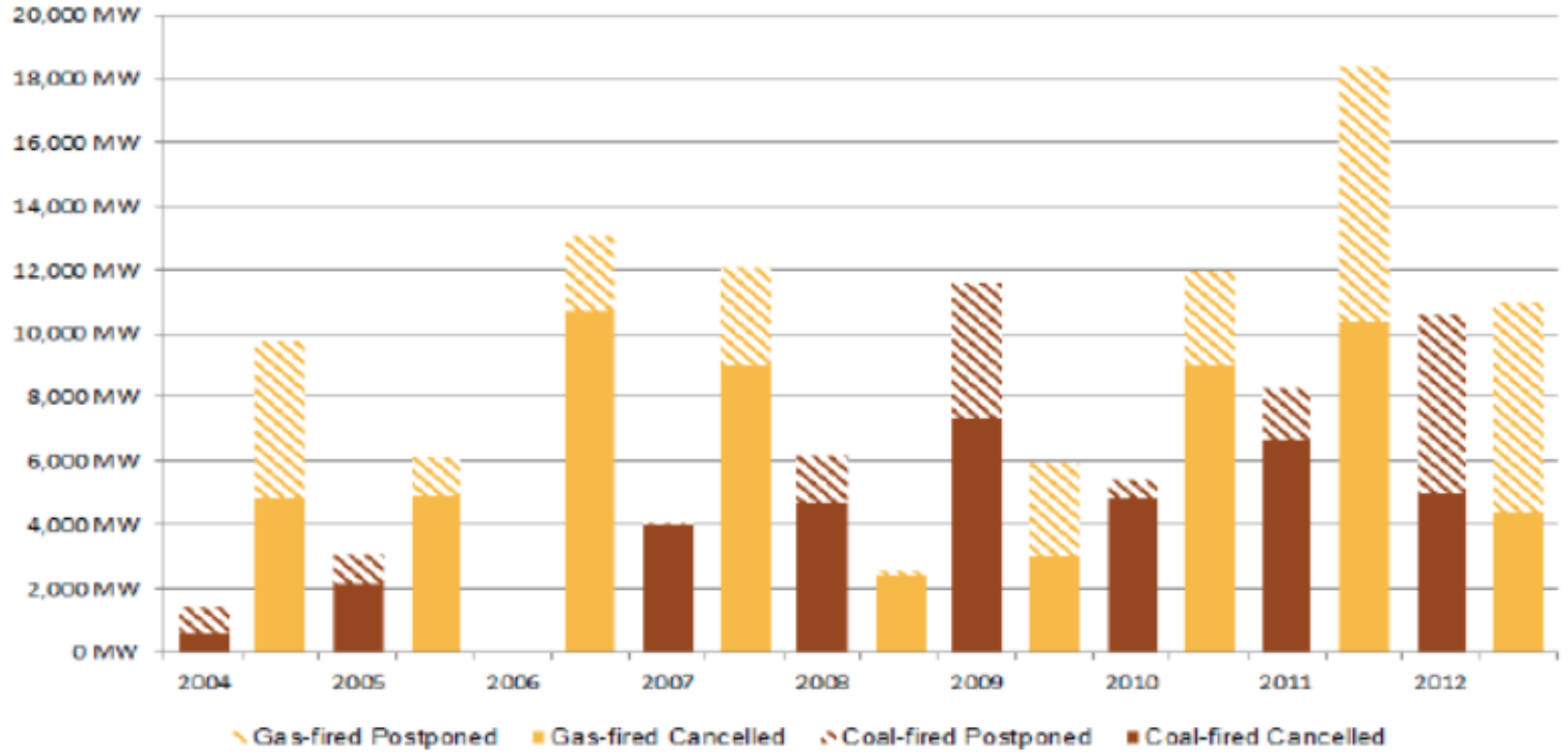



2010-2030 period: investment in dispatchable capacity <u>needed</u> for generation adequacy

Between 166 and 234.3 GW of <u>new</u> thermal power capacity needed.

# IV. EPPSA Study: Thermal Power In 2030

## Capacity Investments Required, 2010-2030




Although grid stability demands a back-up system provided by thermal PPs, and old fleet reaches end of the lifetime <u>many new projects have been cancelled or postponed</u>

# IV. EPPSA Study: Thermal Power In 2030 summary

## Different scenarios, same conclusions

- Thermal Power share in generation mix 2030 decreases in all scenarios, however, **it never falls below a third.**
- Thermal Power **percentage** of the **total installed capacity will decrease by 2030 to between 27.4% and 44%** (versus 55.8% in the 2010 reference case)
- Share of Thermal Capacity decreases (in all but one scenario), but the **absolute thermal capacity will range from 423-485 GW** (similar to 479 GW in the 2010 reference case)
- Significant investment in dispatchable capacity – thermal power in particular – is required to maintain generation adequacy. Between **166 and 234.3 GW additions will be required**, which translates to **39.4 and 48.3% of installed thermal power capacity to be built before 2030.**

I. EPPSA

II. EU 2030 Targets

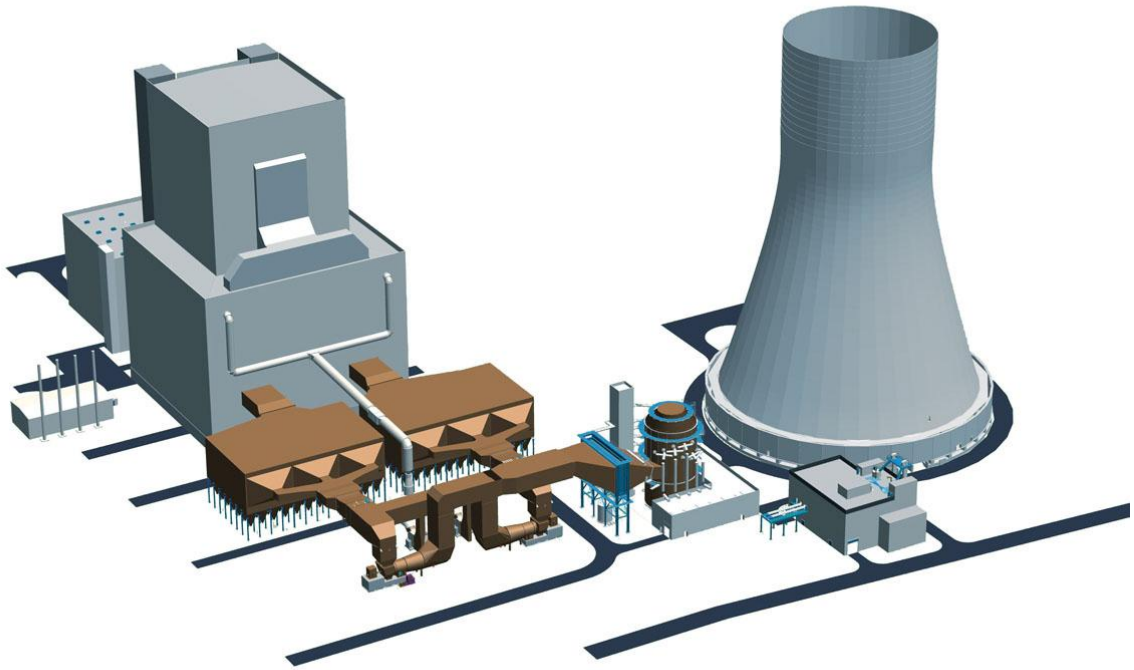
III. EPPSA Study: Thermal Power In 2030

- Different scenarios, similar conclusions
- New-build database

IV. Conclusions

# IV. EPPSA Study: Thermal Power In 2030

## A. New-build Database



EPPSA and its members have been assembling a database, covering the efficiency and emissions of thermal power plants before and after retrofitting/refurbishing

# IV. EPPSA Study: Thermal Power In 2030

## A. New-build Database

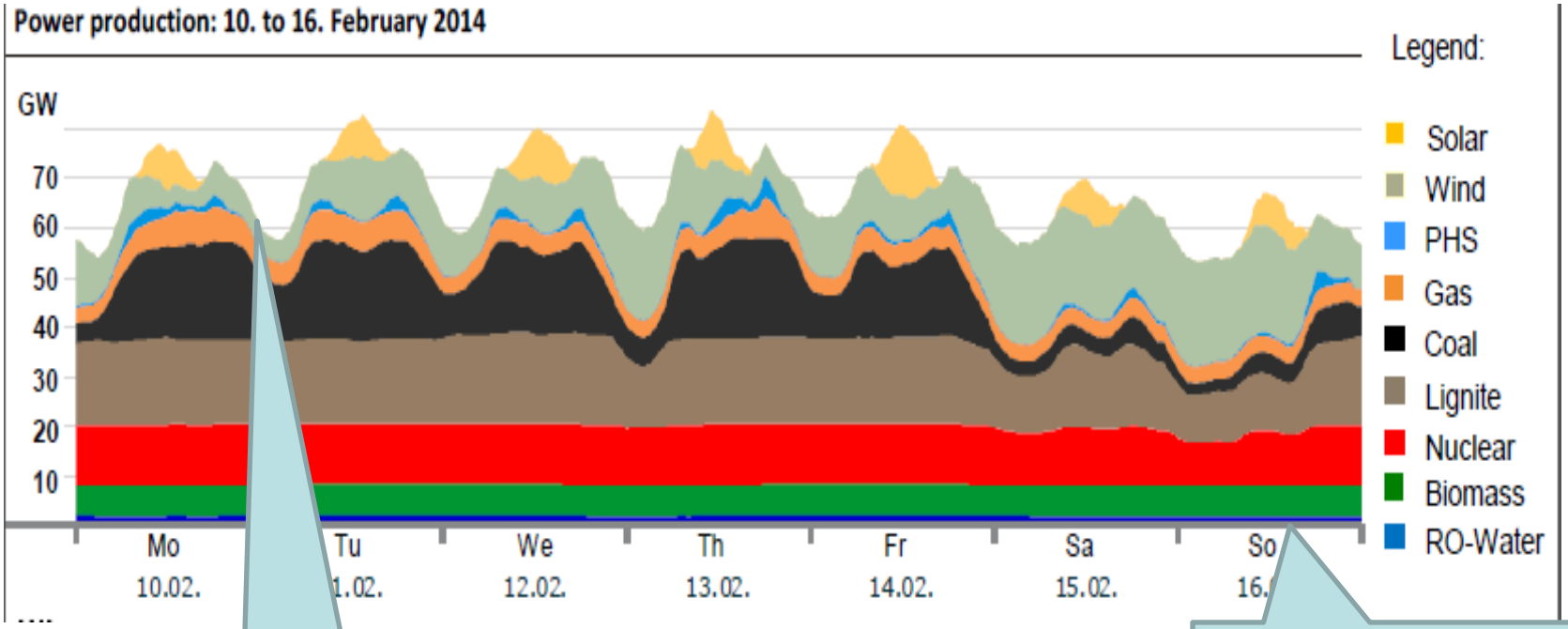
| | |
|---|---|
| Total Net capacity replaced | 22,0 GW |
| Investments from 2000 to 2015 | 27,4 billion € |
| Saved fuel cost until 2030 | 29,1 billion € |
| Saved $CO_2$ emissions per year | 57,37 million t/a |
| Saved $CO_2$ emissions until 2030 | 1,25 billion t |
| Average saved fuel (meaning saved $CO_2$ emissions) | 32 % |
| $CO_2$ avoidance cost over 20 years | 23,92 €/t |
| **Real Cost / saved ton of CO2 (Capex, Opex, saved fuel, saved allowances)** | **-19,58 €/t** |

495 GW installed

# IV. EPPSA Study: Thermal Power In 2030

## B. Flexible Technologies

- Balancing necessities today (Germany, as an example):




Often reality: very low renewable generation, wind and sun; thermal fills the gap

Ideal: high renewable generation, wind and sun; minimum thermal

# IV. EPPSA Study: Thermal Power In 2030

## B. Flexible Technologies

- Increasingly variable supply and demand => even faster ramping in the future:

| Current average fleet performance for ramp rate: (Germany) | State-of-the-art for EPPSA members: |
|---|---|
| Hard coal: 1,5 %MCR/min | Hard coal: 4-5 %MCR/min |
| Lignite: 1 %MCR/min | Lignite: 3-4 %MCR/min |
| CCGT: 2 %MCR/min | CCGT (average): 5-6 %MCR/min |

System needs flexible plants with improved efficiency at part-load. Therefore capacity markets need to support only plants meeting flexible requirements

# IV. EPPSA Study: Thermal Power In 2030

## C. …and what about Carbon Lock-in?

- What is the carbon lock-in effect

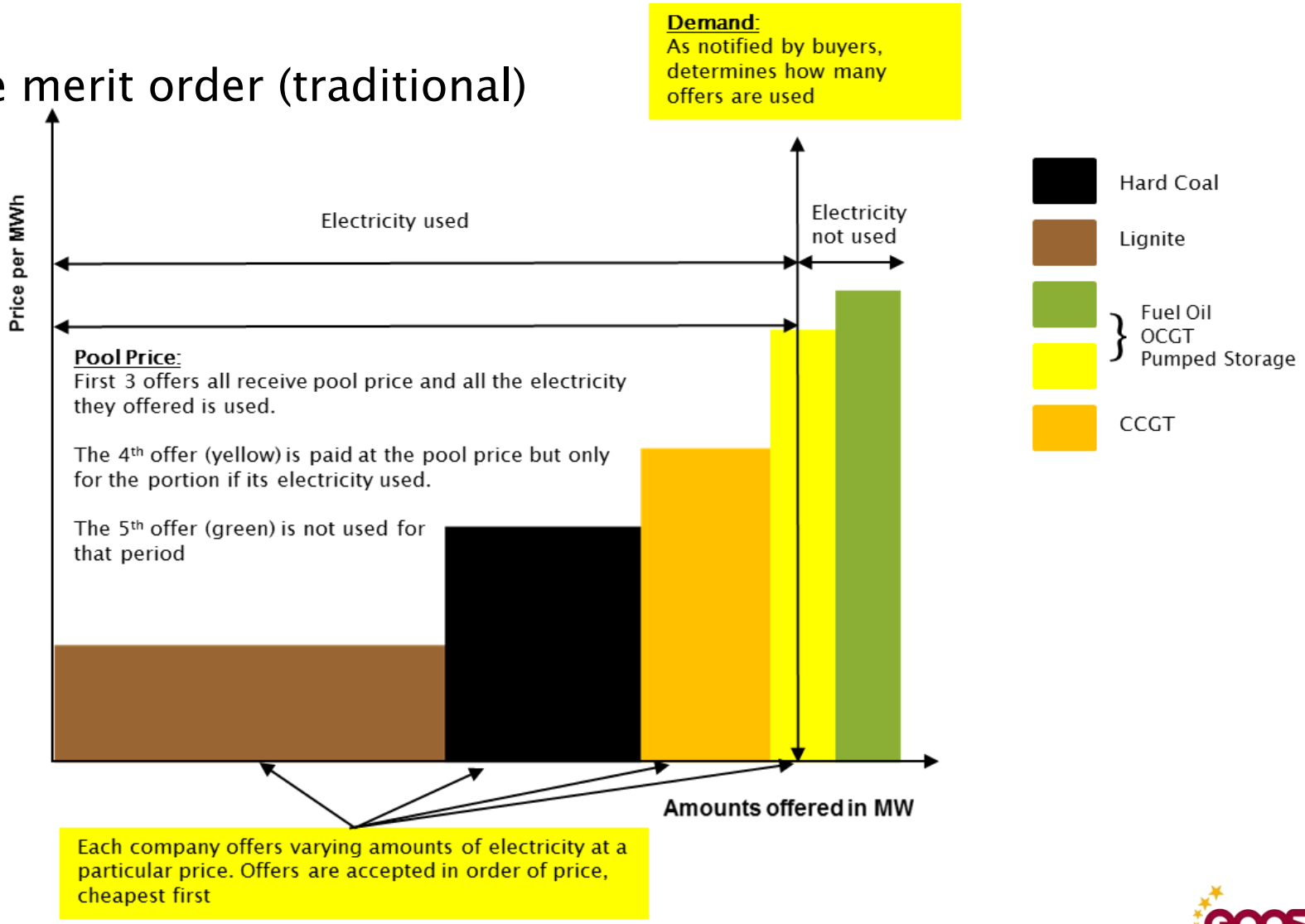
Different definitions exist.

Very often used to indicate that when we build plants today, they will still be in operation in 2050, making a decarbonisation of the Electricity System impossible by 2050.

# IV. EPPSA Study: Thermal Power In 2030

## C. …and what about Carbon Lock-in?

- The merit order (traditional)

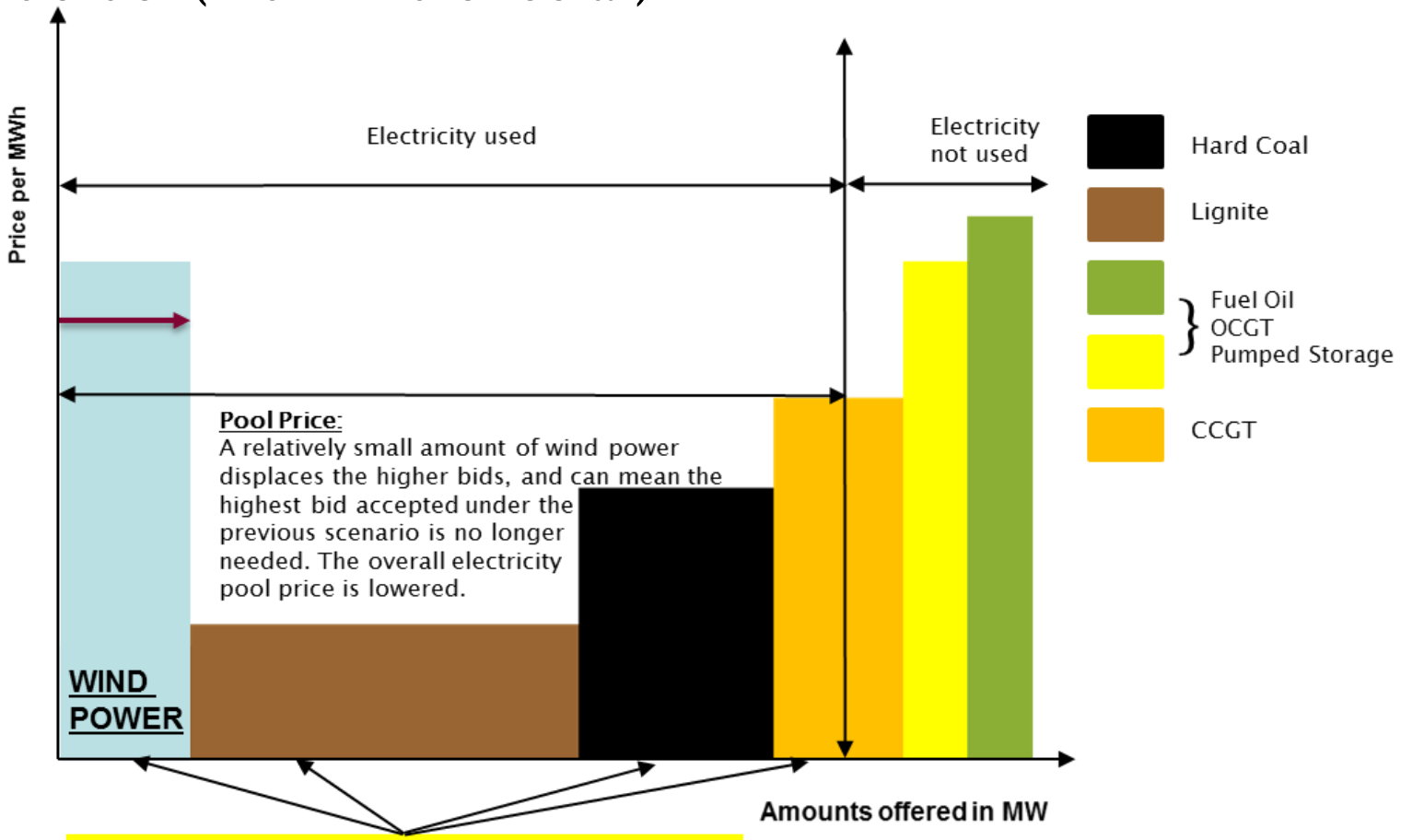


# IV. EPPSA Study: Thermal Power In 2030

## C. …and what about Carbon Lock-in?

**Demand**: unchanged

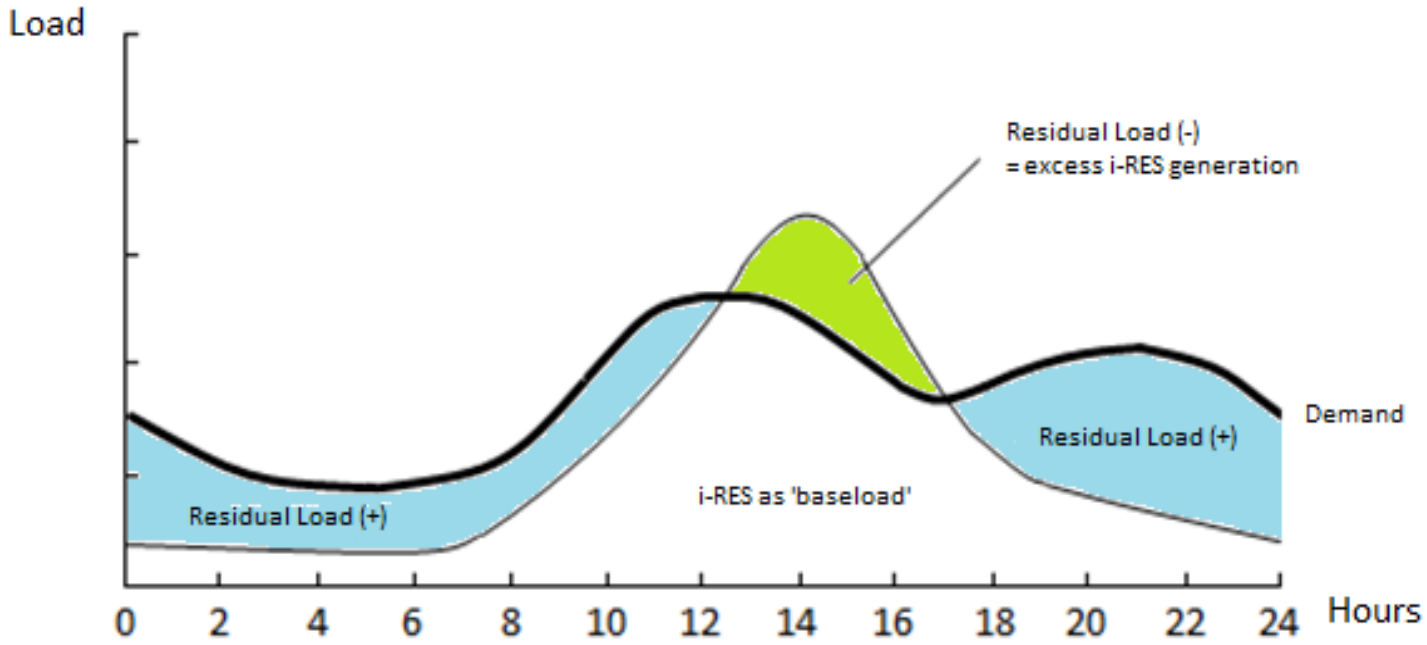
- The merit order (with wind or solar)



# IV. EPPSA Study: Thermal Power In 2030

## C. What about Carbon Lock-in?

- We have seen that the needed thermal power capacity plays a "servicing" role:




**Question: Is there really a lock-in or a necessary contributor?**

# IV. EPPSA Study: Thermal Power In 2030

## C. What about Carbon Lock-in?

It is indeed a clear choice:

- Necessity to balance the system
  - Response from modern thermal power is necessary as they are the only able to render the full fledge services of :
    - Variable energy resources balancing;
    - System security; and
    - Grid services

    even if no dispatchable RES are available

Political choice to achieve this with older, more costly or with modern, cleaner, more flexible and cost effective plants

I. EPPSA

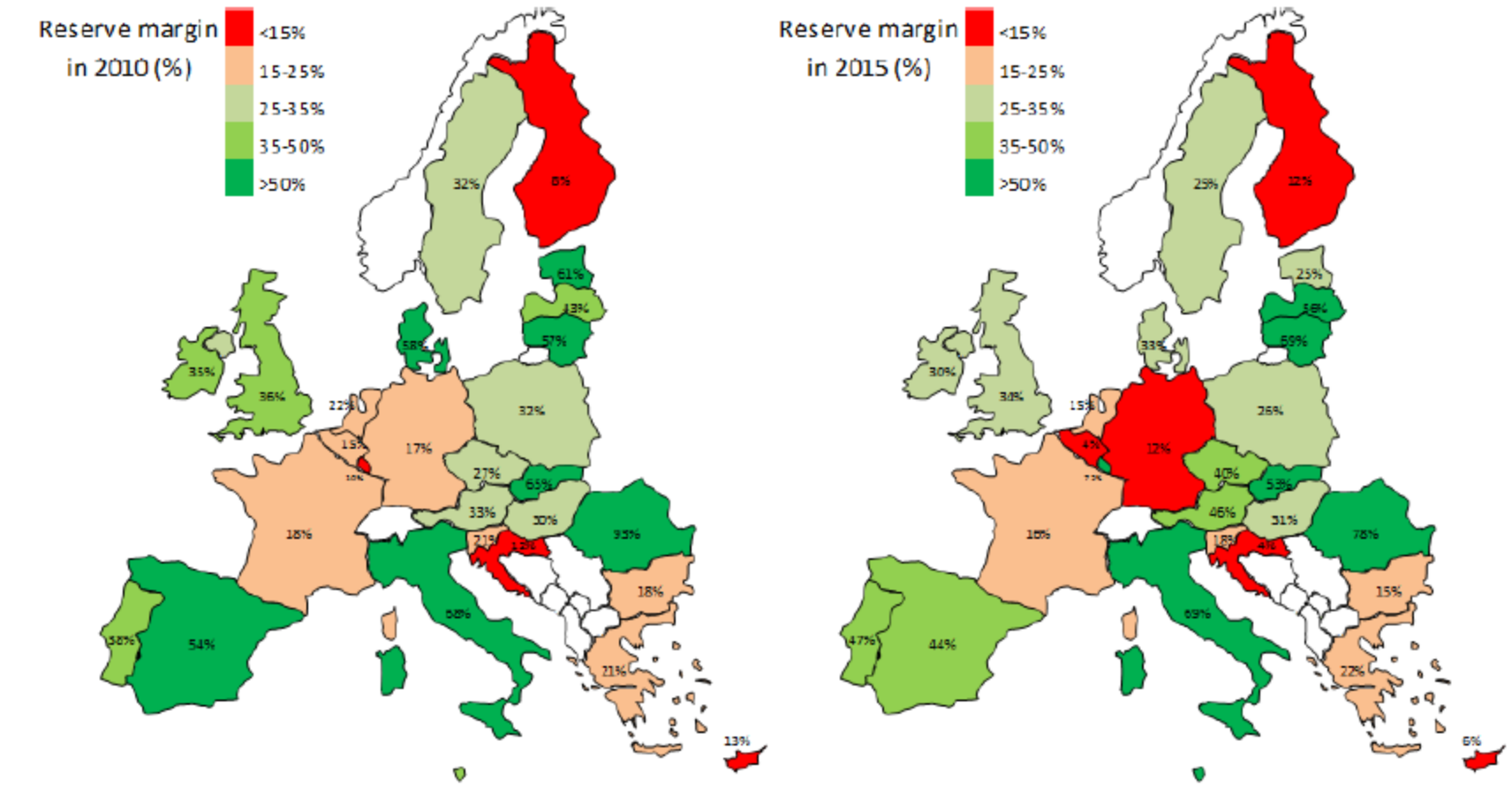
II. EU 2030 Targets

III. EPPSA Study: Thermal Power In 2030

- Different scenarios, similar conclusions
- New-build database

IV. Conclusions

# V. Conclusions –policies to encourage investment




Since 2000 **reserve margin of EU as a whole** sufficient; **2010 – 33%**
However **MSs below the reserve margin threshold of 15% in the short term.**

- In Belgium and Germany the short-fall due to nuclear phase out
- In Finland due to delays in nuclear commissioning

*"Taking **import capacities** into account the EU market is likely to exhibit robust reserve margins in 2015."*

**But will it really do so?**

# V. Conclusions –policies to encourage investment

- **Thermal Power Plants must remain the back bone of the European Electricity System (never fall below 1/3rd of generation mix)**
- **Security of supplies is seriously threatened by insufficient investment in new Thermal Power plants whilst old plants are being closed eg …**

- In June 2014, the de-rated margin in the UK was predicted by OFGEM to fall to 2% in 2015 and this will only improve due to the introduction of a "Capacity Market". Since the summer the risks this winter have worsened due to extended unplanned outages at coal, gas and nuclear power plants

- In Sept 2014, ELIA the Belgian TSO published its strategy for rolling power-cuts in view of "the very real risk of power shortages as winter approaches"
- **It is clear that doing nothing will not be enough and will lead to power shortages.**

# V. Conclusions –policies to encourage investment

**EPPSA recommends that EU and Member State policy makers take more careful account of the essential contribution that will be required by Thermal Power plants (baseload and flexible) through to 2030**

**Assess accordingly the impact of new policies on electricity markets, affordability, investment, business opportunities and R, D & D (research, development and demonstration).**

# V. Conclusions – R+D

- However, due to the ever increasing number of intermittent RES, and the corresponding increase in load variation, more and more steep ramping rates for back-up power will be necessary.

- Current challenges can already be met today by newly built plants:
  - Many newly built power plants can operate down to 30% of their normal load.
  - The ramping rates of new plants can be up to 6% (and even up to 8% with added fuels) of installed capacity per minute
  - Services for grid stability, balancing needs, etc.

Continuous efforts on implementing innovation into new thermal plants will guarantee that future requests regarding the flexible performance and back up role of thermal power can be met!

# V. Conclusions R+D


- Flexible and efficient power plants research and innovation is supported in H2020 under the **LCE 17**:
  - **Highly flexible and efficient fossil fuel power plants**
    - There is a clear need for further R,D&D
    - Which is *oversubscribed* for the WP2014-2015

**We therefore call for flexible and efficient fossil fuel power generation to be replicated in the Energy WP 2016-2017 with adequate funding**

# V. Conclusions

## Added Value of Thermal Power Plants

Suitable policies to encourage investment and R+D will guarantee the added value of Thermal Power Plants in the European Energy System:

Affordability

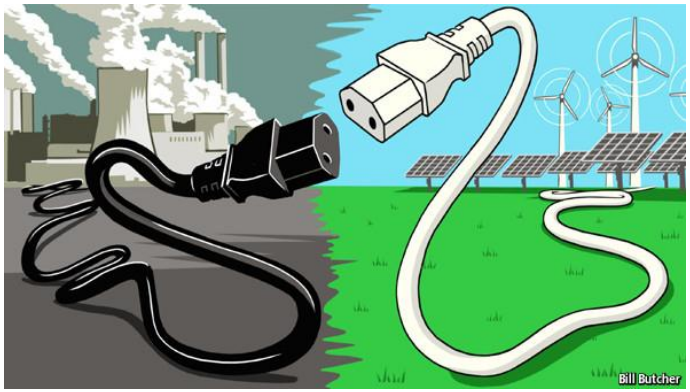
Security of supply

Sustainability

Technological leadership, business and quality jobs

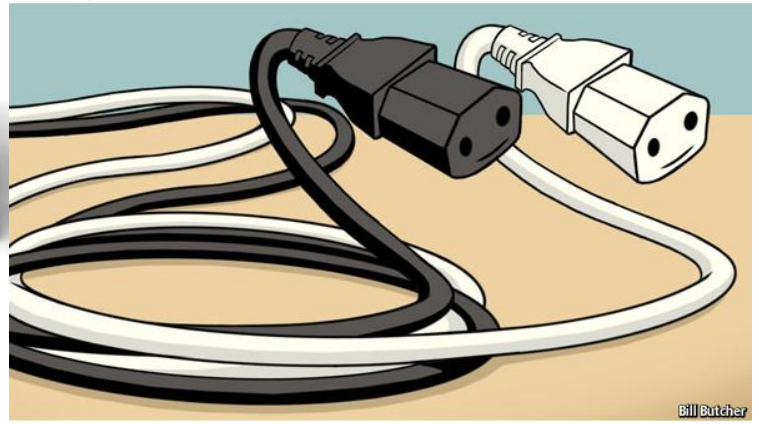
# Thermal Power Generation in 2030

## Added Value for EU Energy Policy





Thank you for your attention!



# Members


# Contact Details

**EPPSA – European Power Plant Suppliers Association**

Avenue Adolphe Lacomblé 59 | B – 1030 Brussels
Tel: +32 2 743 2986 | Fax: +32 2 743 2990
info@eppsa.eu
www.eppsa.eu

**Secretary General:** Patrick Clerens
p.clerens@eppsa.eu

**Policy Officer:** Nicolas Kraus
n.kraus@eppsa.eu



European Power Plant Suppliers Association
Developing the Future