

Role of Gas

OMV's View

#PartOfTheSolution

COP 21 in Paris marked a milestone in global climate policy, reflected in Austria's climate strategy 2030



2015 – “Paris Agreement”

- ▶ “well below” 2°C
- ▶ peak “as soon as possible”
- ▶ developed countries lead



2018 – #mission2030

- ▶ 100% renewable power 2030
- ▶ fossil-free mobility 2050
- ▶ renewable gas as lighthouse

Why gas is part of the solution ...

Europe aims to reduce CO₂ emissions by 80-95% by 2050 compared to 1990.

- ▶ Time is ticking to achieve this ambitious goal
- ▶ Gas and power have to make use of synergic effects: gas has to be de-carbonized, power needs to be stored.
- ▶ Power-to-Gas technology will require it to be elevated to an industrial level.
- ▶ Gas is flexible, supports integration of renewables & Gas plays significant role in achieving CO₂-neutral Europe.
- ▶ Gas can also be renewable. Gas is not the problem, it is part of the solution.

Brussels, December 2018

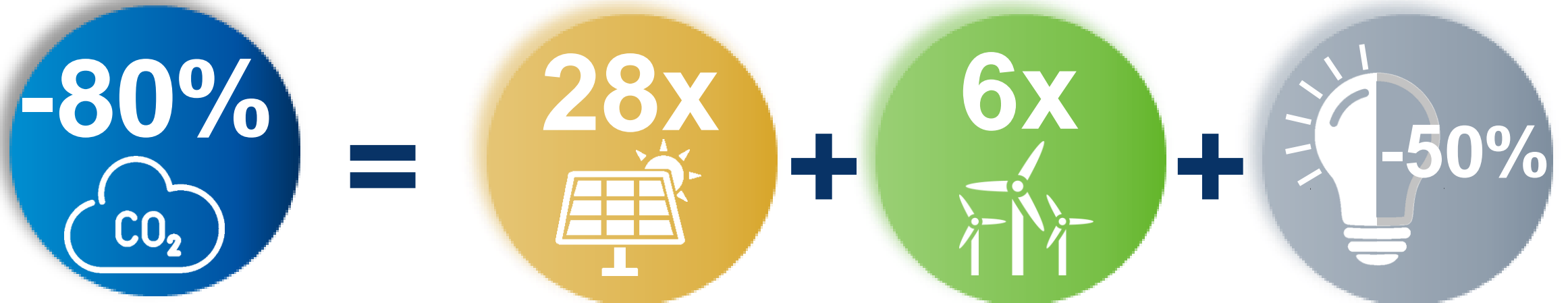


Prof. Dr. Klaus-Dieter Borchardt
Director for Internal Energy Market
European Commission

To reach emission reduction target, PV & wind needs to multiply and consumers would need to halve their consumption

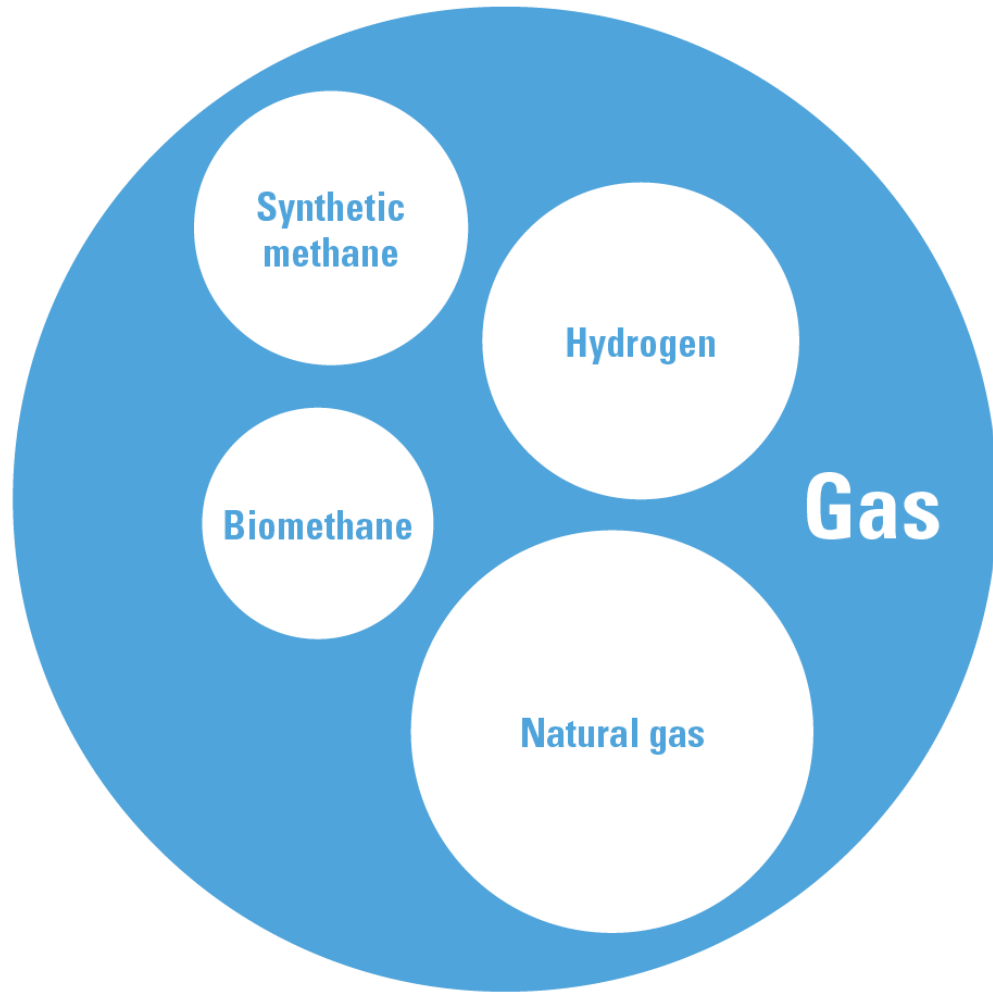
Required CO₂ reduction by 2050
% vs 1990

Required measures by 2050
Needed change vs. 2015



Source: Environment Agency Austria Synthesebericht 2017, E-Control

Gas is more!



Natural gas is well-known, but gas also includes...

- ▶ **Biomethane**
 - ▶ pioneer of the **circular economy** from biomass
 - ▶ used in the same way **as natural gas**
- ▶ **Hydrogen**
 - ▶ potential to lead the pack
 - ▶ **stores energy** from wind & solar power with P2G
 - ▶ makes **sector integration** a reality
- ▶ **Synthetic methane**
 - ▶ produced from **hydrogen and CO₂**
 - ▶ When used, previously extracted CO₂ returns to the atmosphere – like **nature's cycle**

Gas Storyline

External view on Gas

OMV – We are the Energy

Our joint challenge

Gas is more!

Gas now!

Gas tomorrow!

Gas beyond!



Gas leaves coal out in the cold

EU power production: Less CO₂ in %



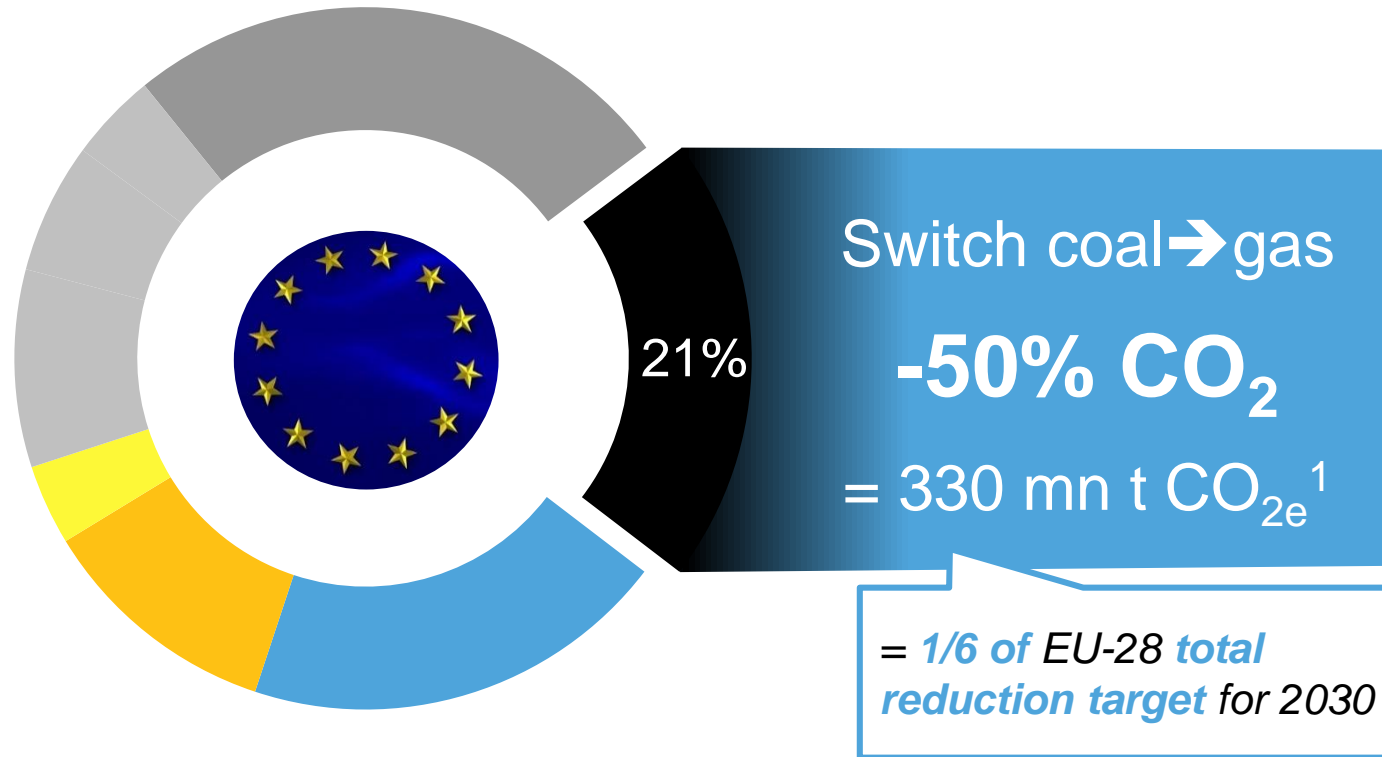
Source: Sandbag, WNA

Coal provides 1/5 of energy for electricity, but emits almost 2/3 of CO₂ – Switch to gas saves -50%!



EU-28 electricity generation 2017

%



■ Nuclear ■ Coal ■ Gas ■ Wind ■ Solar ■ Others

Source: Sandbag, WNA, Climate Action Tracker, European Commission

¹ Carbon dioxide equivalent (CO_{2e}) is a standard unit for measuring the climate impact of different greenhouse gases

Gas leaves coal out in the cold

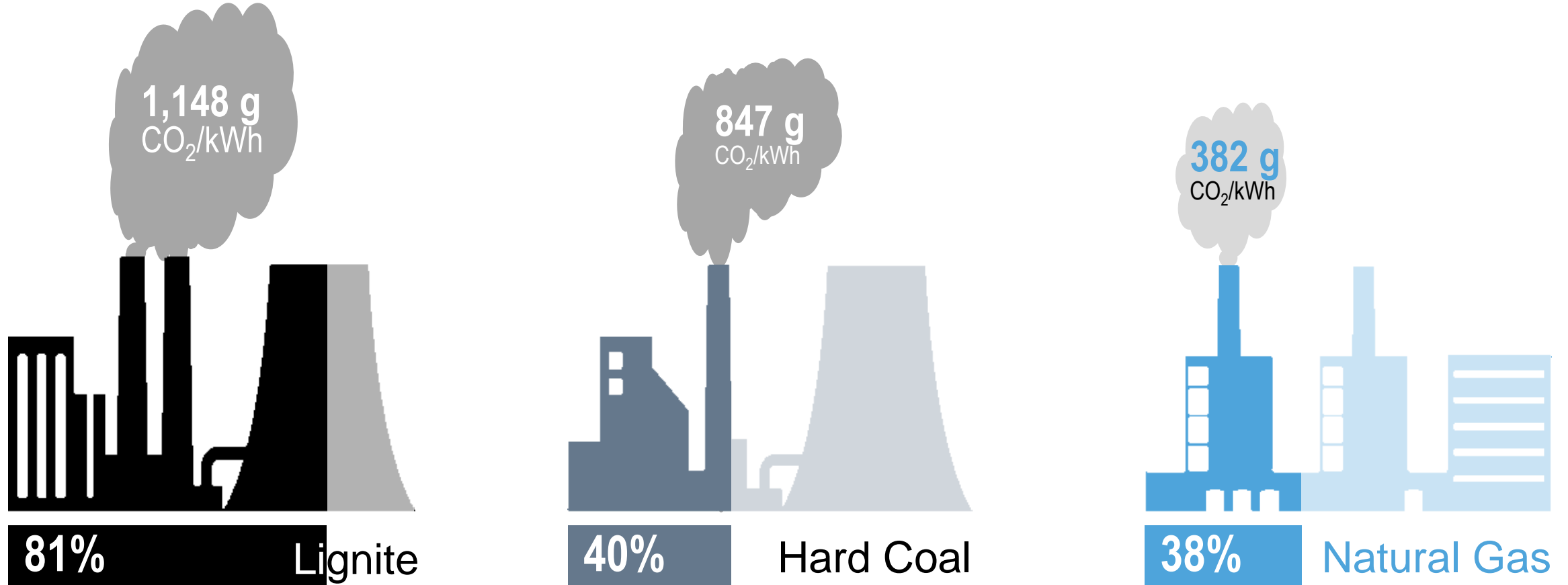
- ▶ Coal is one of the **main causes of climate change**
- ▶ Coal-fired power plants: 1/5 of electricity in EU, but **2/3 of CO₂**
- ▶ Switch from coal to gas: **emissions fall by 330 mn t CO_{2e}¹**
- ▶ Corresponds to **1/6 of emissions target** planned by 2030
- ▶ **Coal has had its day**



Wasted potential: highest emission source most utilized

Power Plant Emissions and Utilization in Germany in 2018

Emissions in CO₂/kWh, Utilization in %



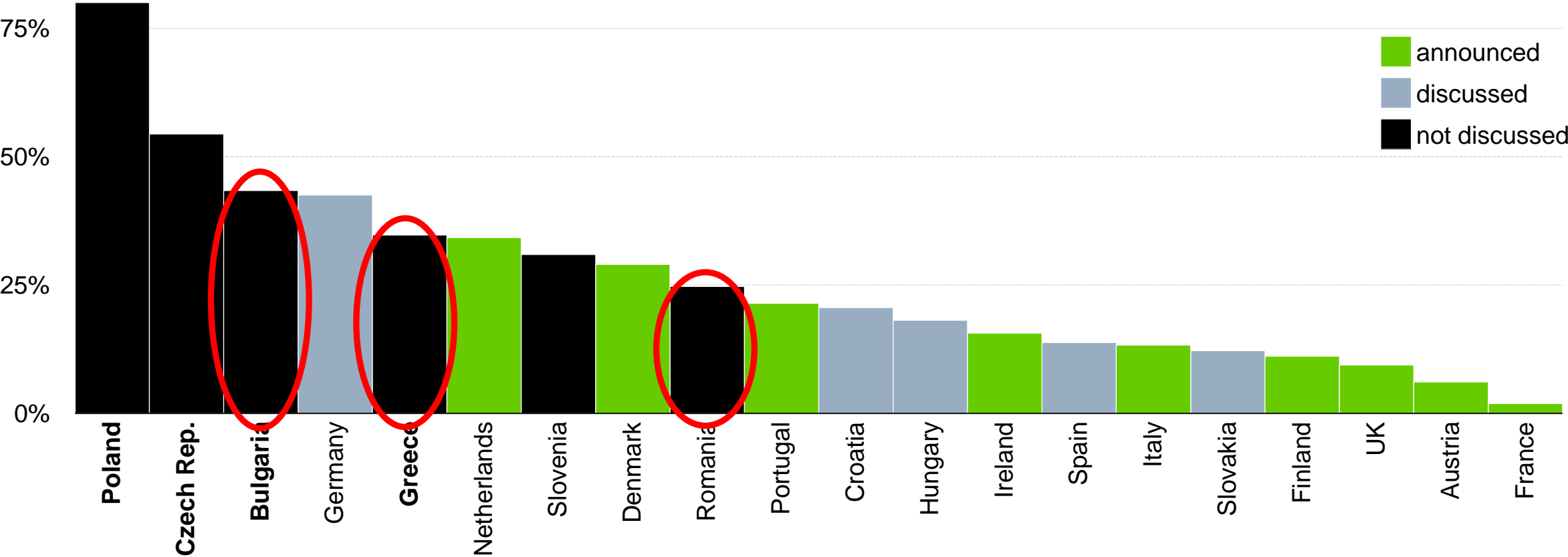
Source: Zukunft ERDGAS

Coal exit not yet on political agenda in 4 out of top 5 countries in terms of coal share in power production



Share of coal in power production and status of coal exit in EU-28

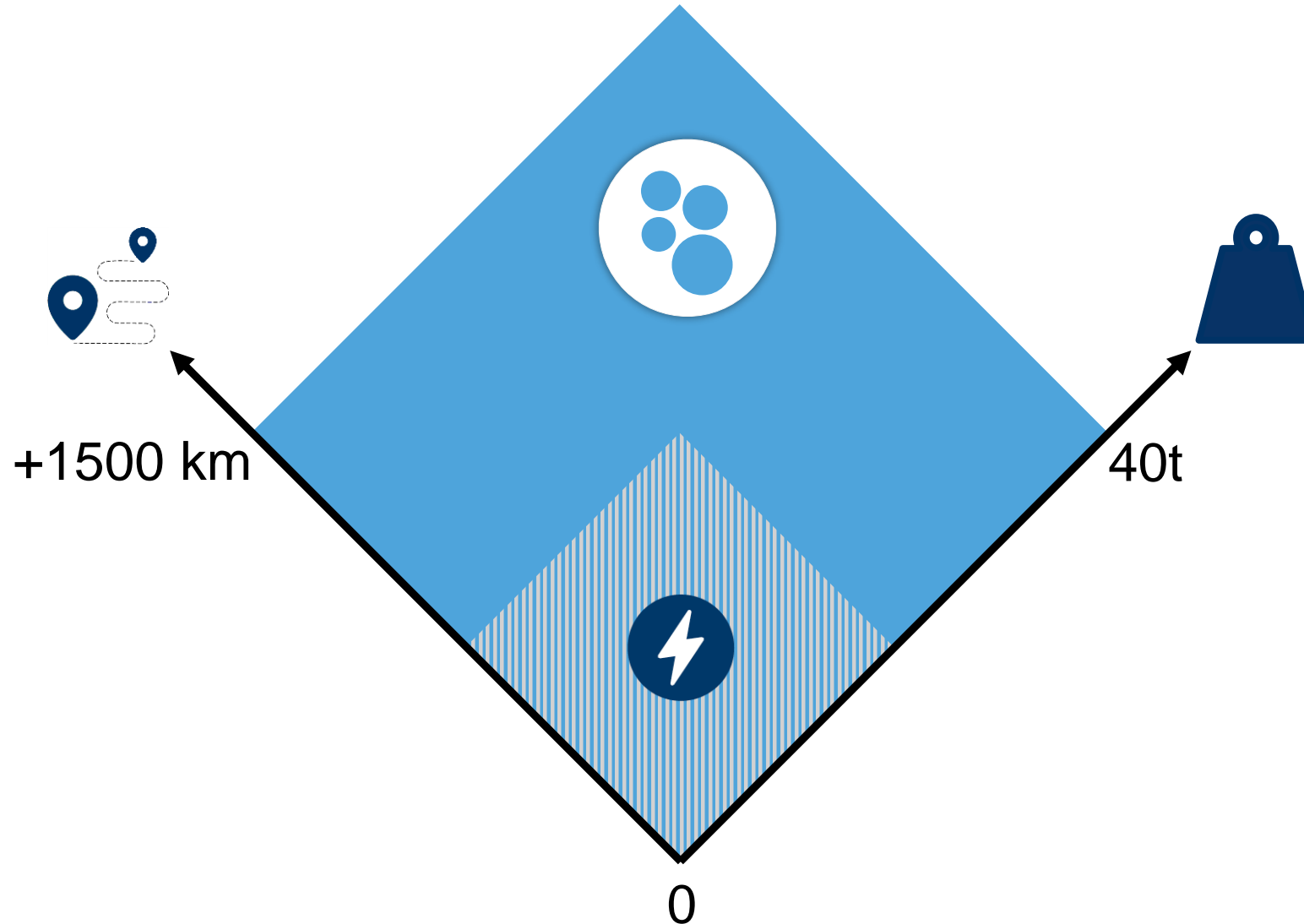
Coal share in %, Status coding to color code



Source: IEA, Europe Beyond Coal



Only a mix of electric and gas covers entire spectrum

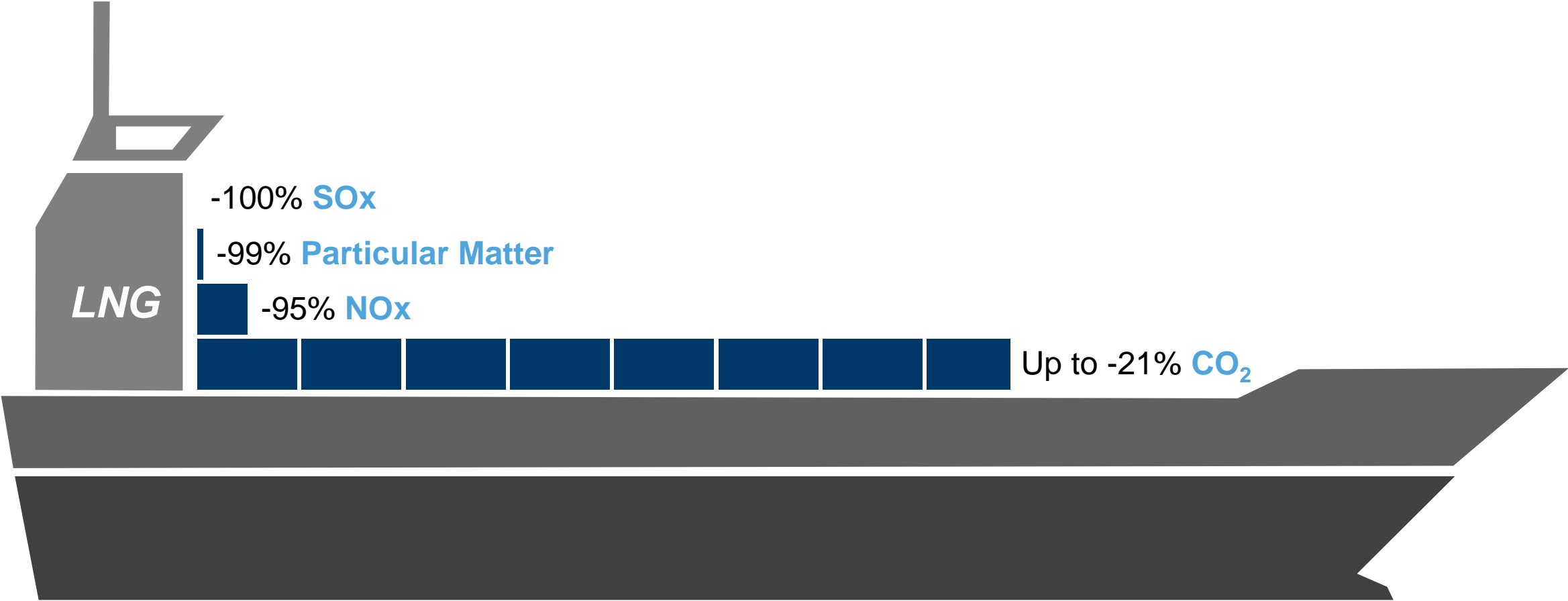




Now: LNG is the only viable option for clearer ships

Emission reduction with LNG in shipping

% vs HFO, Well-to-Wake for CO₂



Source: thinkstep, 2019



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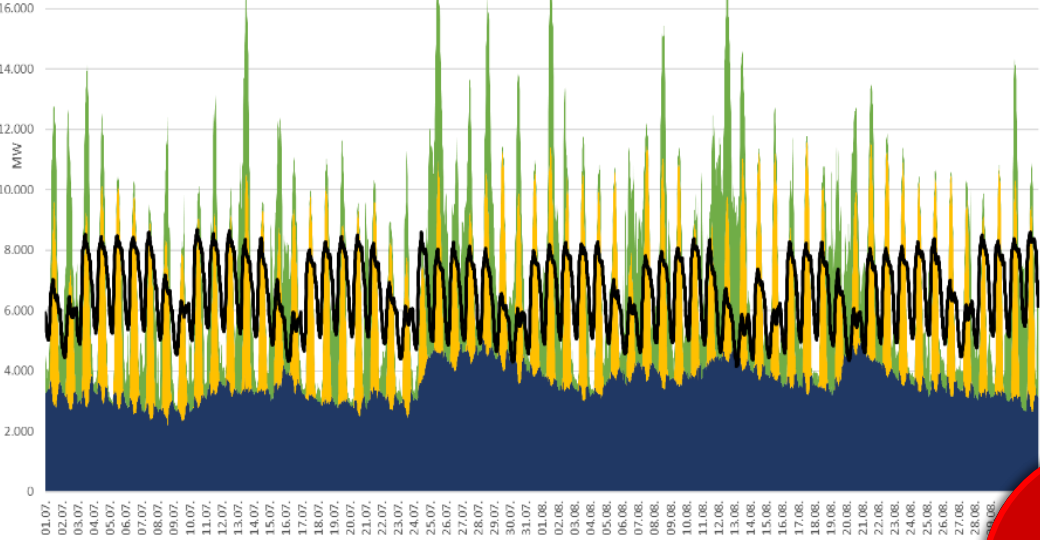
Gas tomorrow!

Gas beyond!

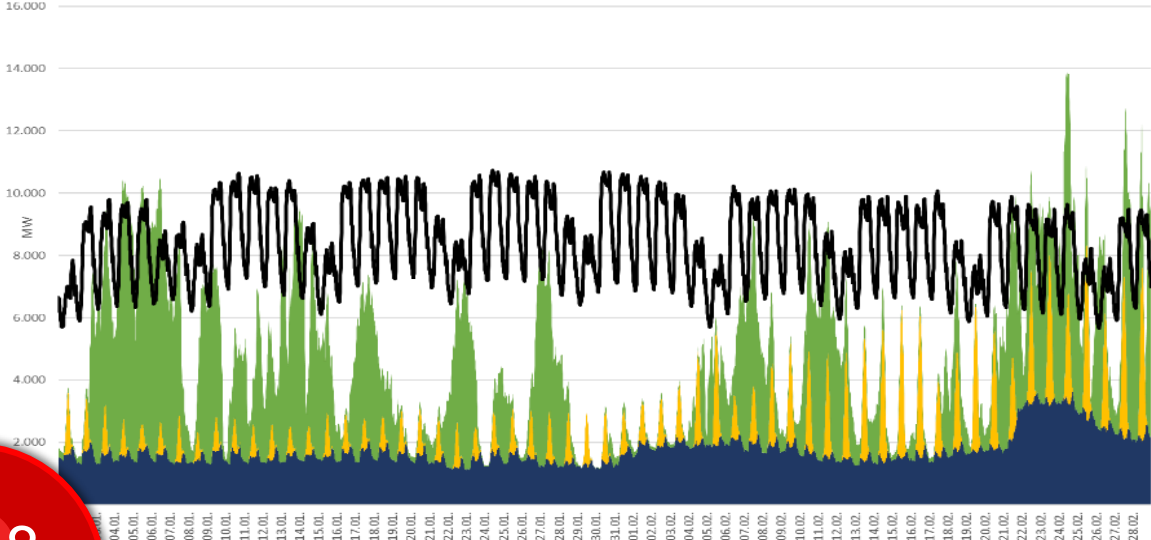
100% renewable power in Austria by 2030, but how to fill the void between summer and winter?



30 days of summer in 2030
in MW



30 days of winter in 2030
in MW



~4.8 TWh

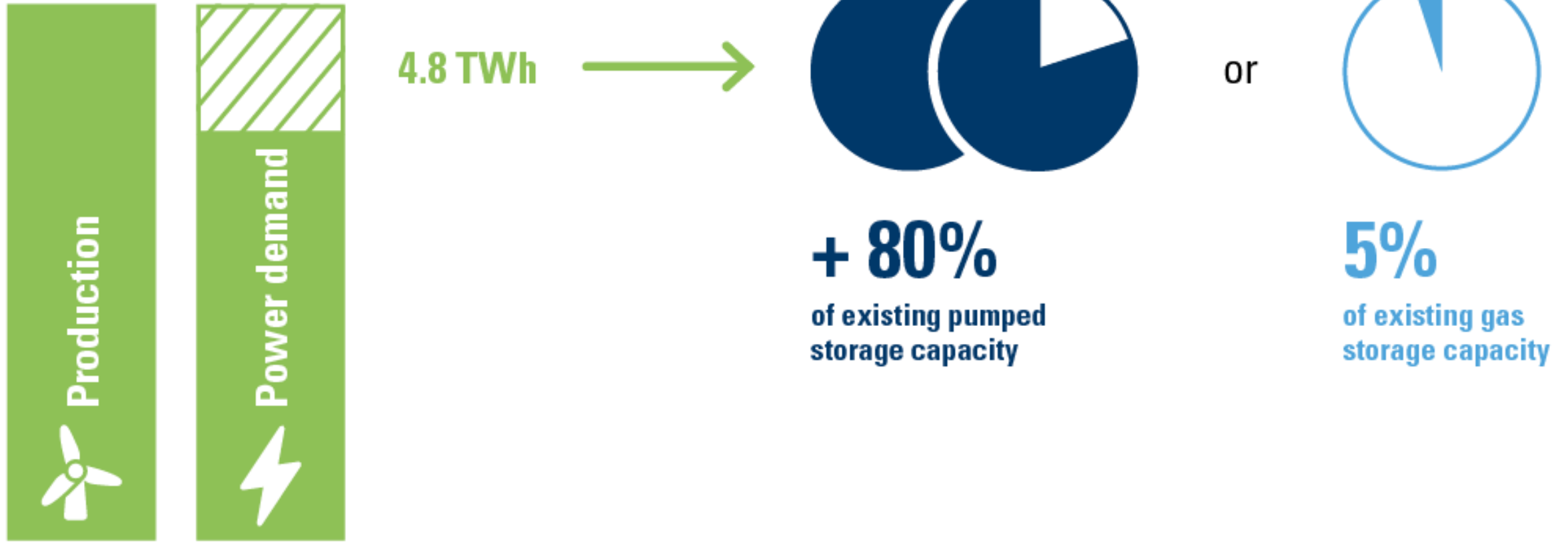





Source: APG

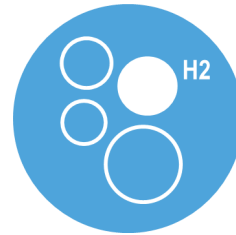


How to store 4.8 TWh?



Source: APG, E-Control

P2G – Profit-to-Gloom?



50

EUR/MWh

75%

Efficiency

67

EUR/MWh

20

EUR/MWh

>100

EUR/MWh

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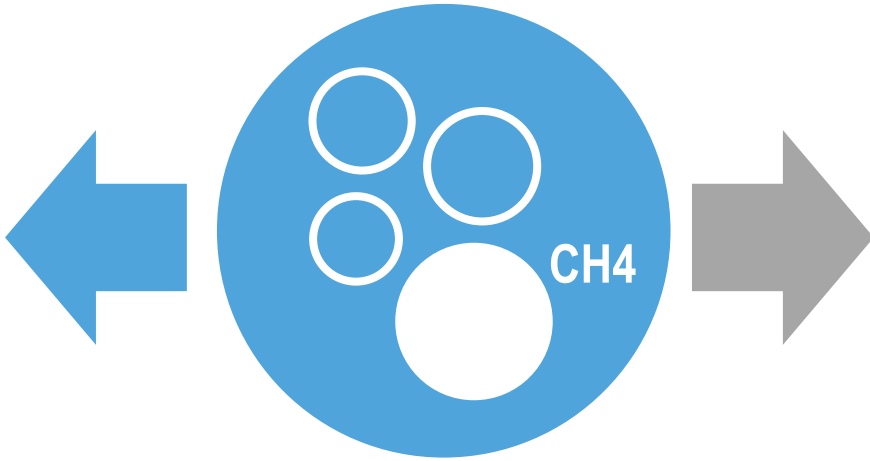
Gas tomorrow!

Gas beyond!

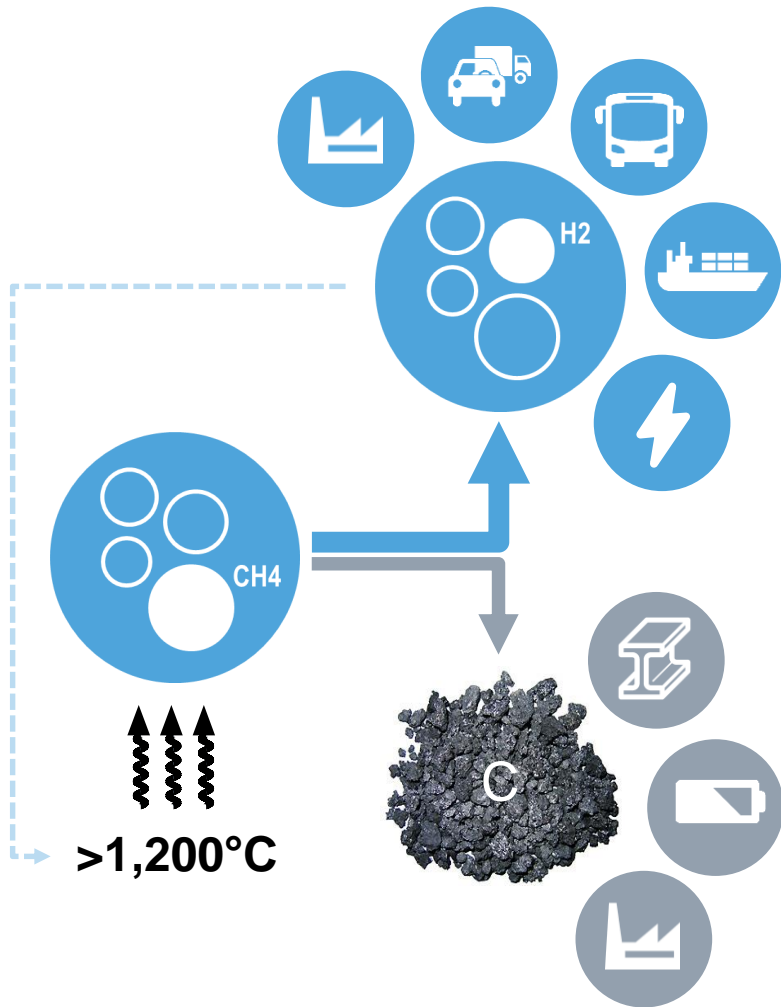
How to decarbonize natural gas? Two options: Methane Pyrolysis or CCS



**Methane
Pyrolysis**



Methane Pyrolysis splits methane into hydrogen and solid carbon – for further utilization



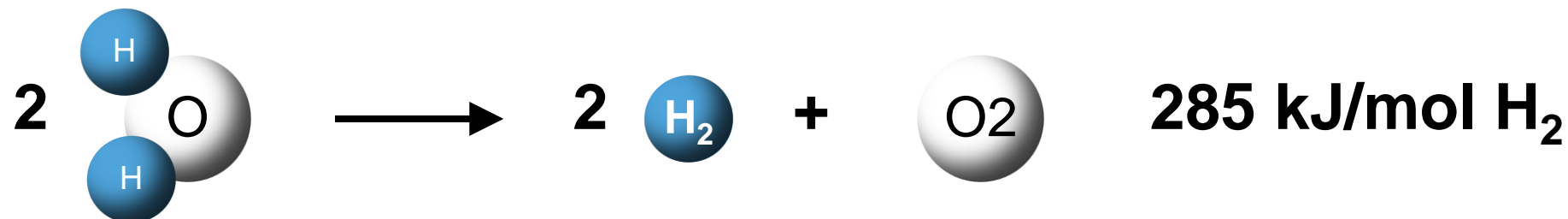
Producing hydrogen from natural gas with zero emissions

- ▶ At **temperatures exceeding $1,200^\circ\text{C}$** , natural gas splits into **hydrogen and carbon**
- ▶ **Benefits of hydrogen** are plain to see. But what happens to the carbon?
- ▶ As **solid graphite** – just like a pencil's lead – carbon becomes a **valuable commodity**
- ▶ Applications in **steel and battery production** – just starting point
- ▶ **Gas** has a clear **part to play in our future!**

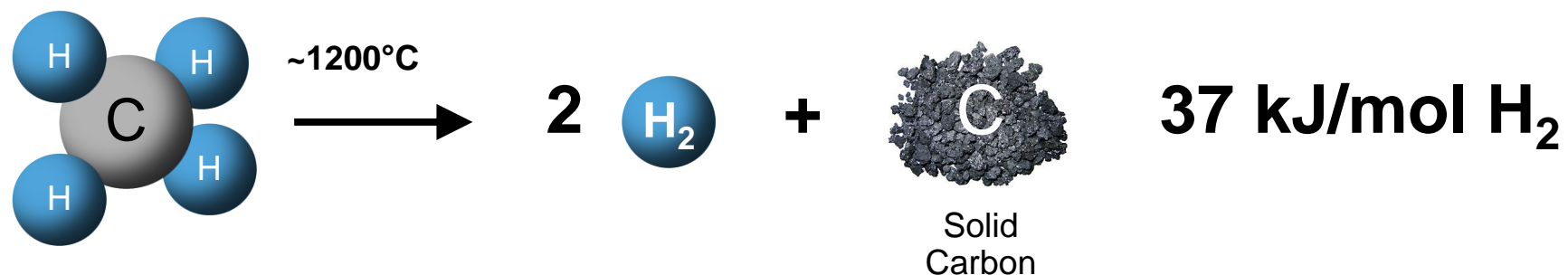
Methane pyrolysis requires a fraction of the energy needed for hydrogen from electrolyzers



Electrolysis



Methane Pyrolysis



- ▶ Gas is more!
- ▶ Gas does not need carbon
- ▶ Gas is **#PartOfTheSolution**
– now, tomorrow & beyond

#PartOfTheSolution