

„GAS 2 POWER“ „POWER 2 GAS“

GAS-STORAGE is ENERGY-STORAGE
Gas is a sustainable system

By: Markus Mitteregger, CEO of RAG

Date: 7 June 2012

Venue: Kuala Lumpur, Malaysia



Patron



Host



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Markus Mitteregger

- CEO, RAG, Austria-Vienna
www.rag-austria.at
- Vice-President, Gas Storage Europe (GSE)
www.gie.eu.com



- RAG is Austria's oldest E&P company; **since 1935**
- RAG is active in **6 further** countries
 - Germany, Hungary, Poland, Ukraine, Romania, Portugal
- RAG increased operated storage volume **10-fold in 10 years**
- RAG is Europe's **fastest growing** storage operator



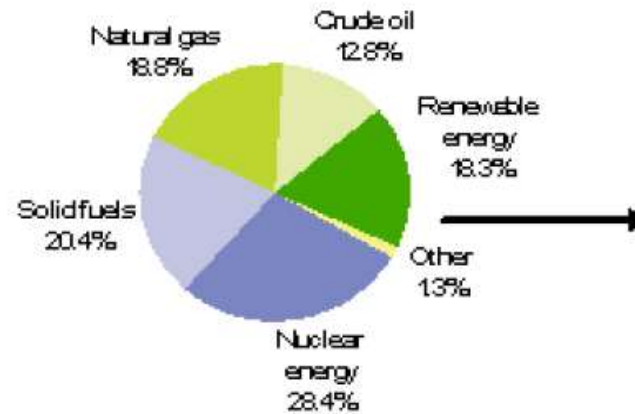
Future of gas in Europe?



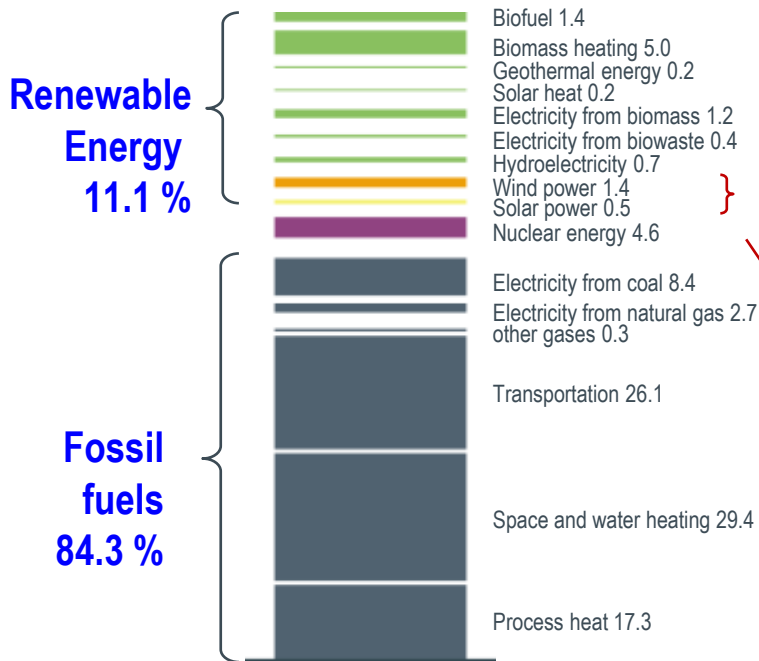
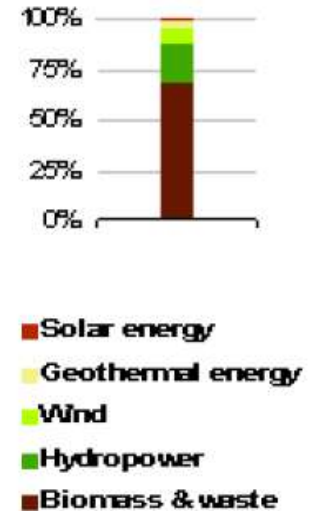
- **EU-Commodity market will be triggered by**
 - Decreasing indigenous production in EU (Shale ?)
 - Higher import dependency
 - Diversification of gas sources (LNG)
 - Global impact on price scenario
 - Increasing share of renewables
 - Reduced gas demand
- >>> **No GOLDEN AGE for gas in Europe! (IEA)**
- >>> **BUT, what about infrastructure?**

What are we talking about ?

- Primary energy sources for electricity production EU-27, 2009
(% of total, based on tons of oil equivalent)



Source: Eurostat



Electricity Supply, 20.3 %

- Final energy consumption Germany, 2010

Volatile Production, 1,8 %

“GREEN ENERGY” is promoted and subsidised by EU-policy makers: Strong increase foreseen!!

(calculation, shares in %, deviations due to rounding)



„GAS 2 POWER“

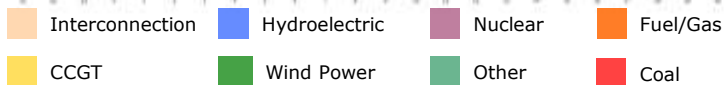
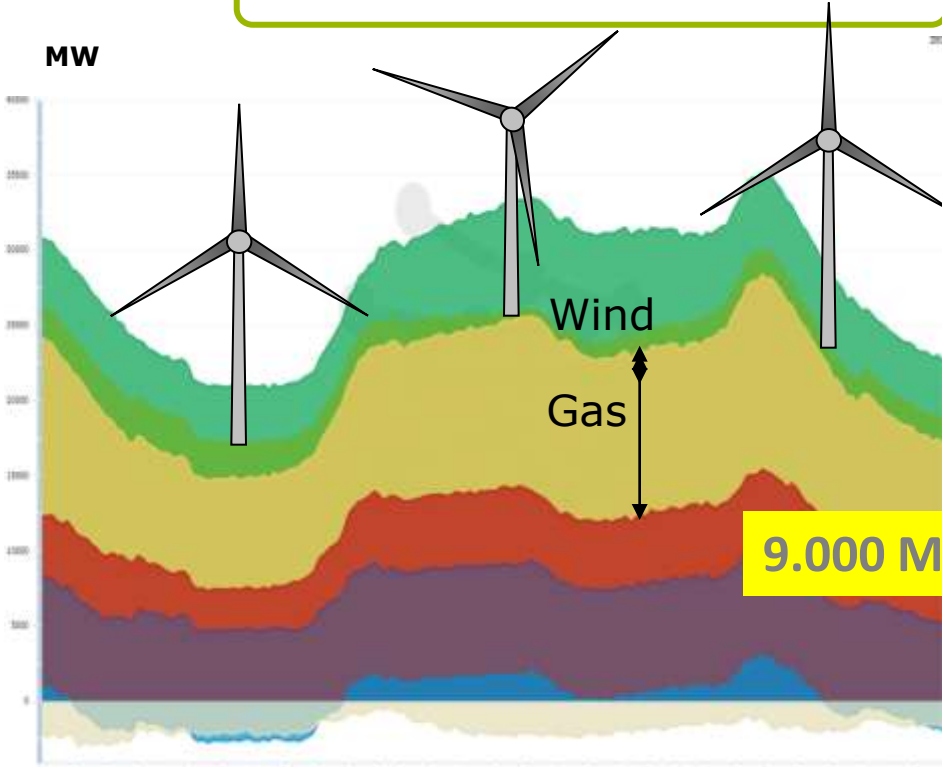


- “GAS 2 POWER“ = partner of wind and sun
 - The increasing share of renewables in the energy-mix will strongly increase capacity needs
 - Stored gas can back up for additional electricity production in the frequent times when there is no/not sufficient wind and/or sun
- >>> Gas storage is **ENERGY STORAGE**

30-September-2010

Wind Power 1%

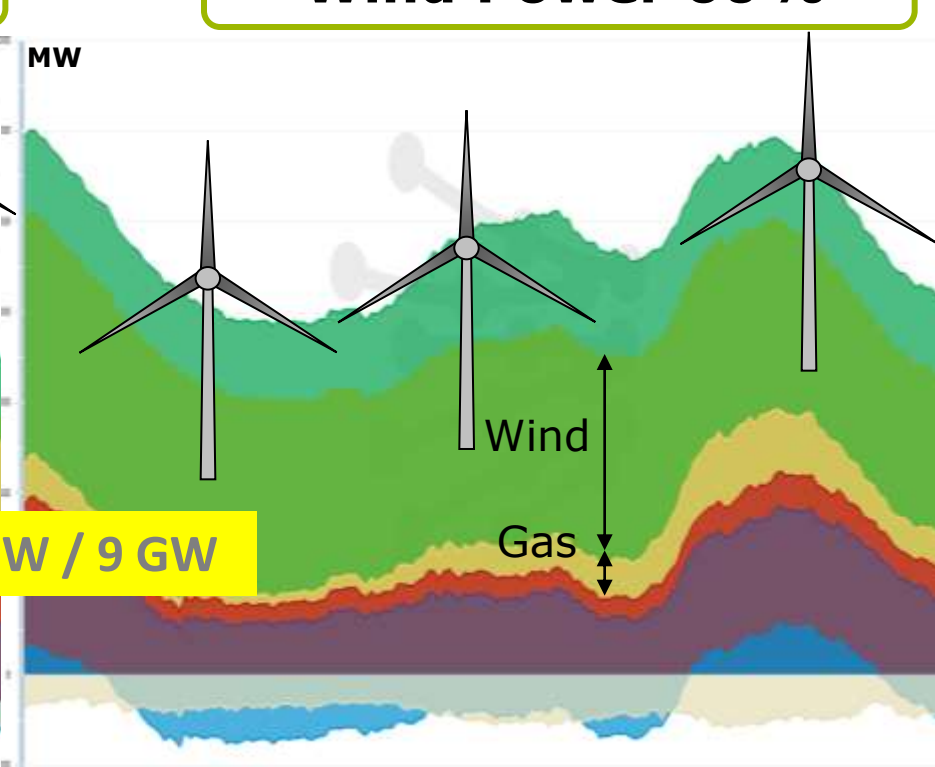
MW



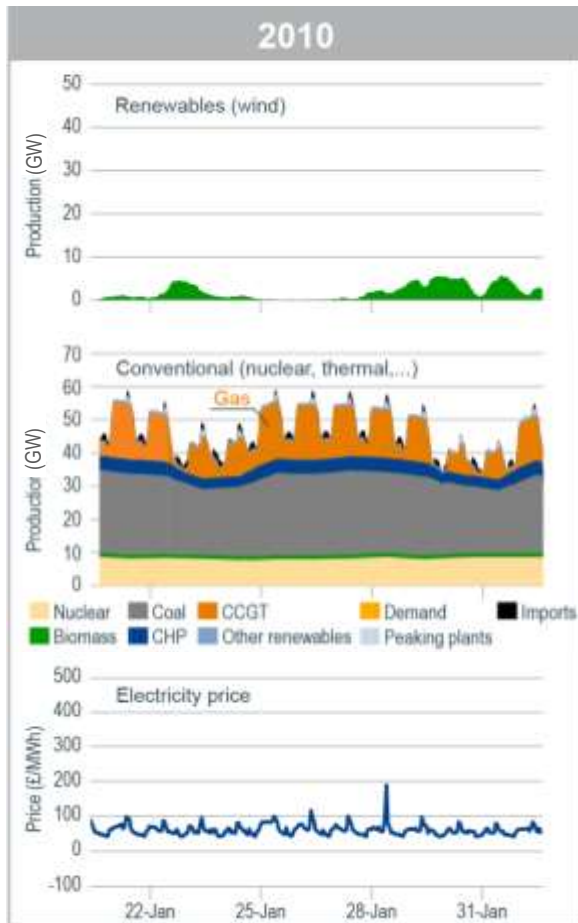
6-November-2011

Wind Power 60%

MW



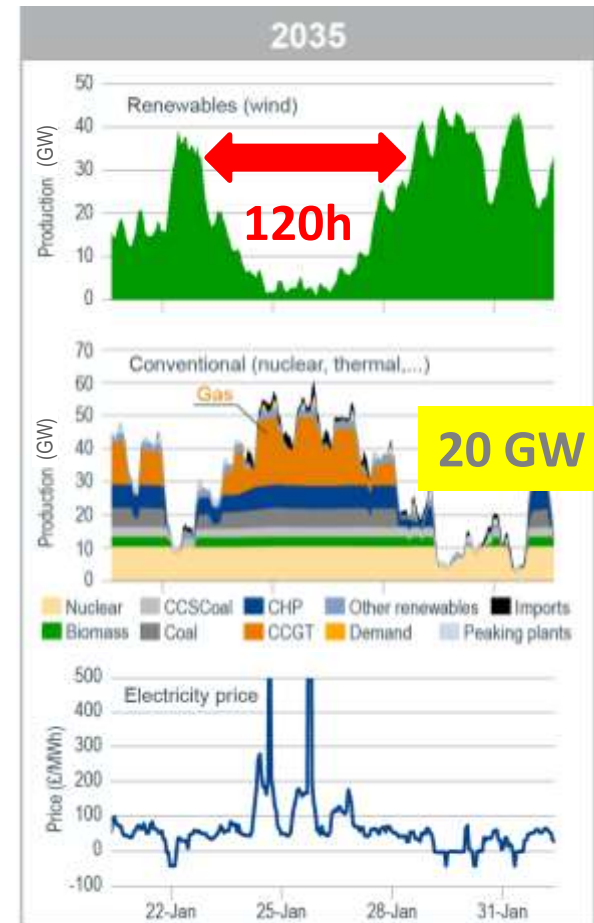
- UK model 2035 - based on January 2010 weather conditions



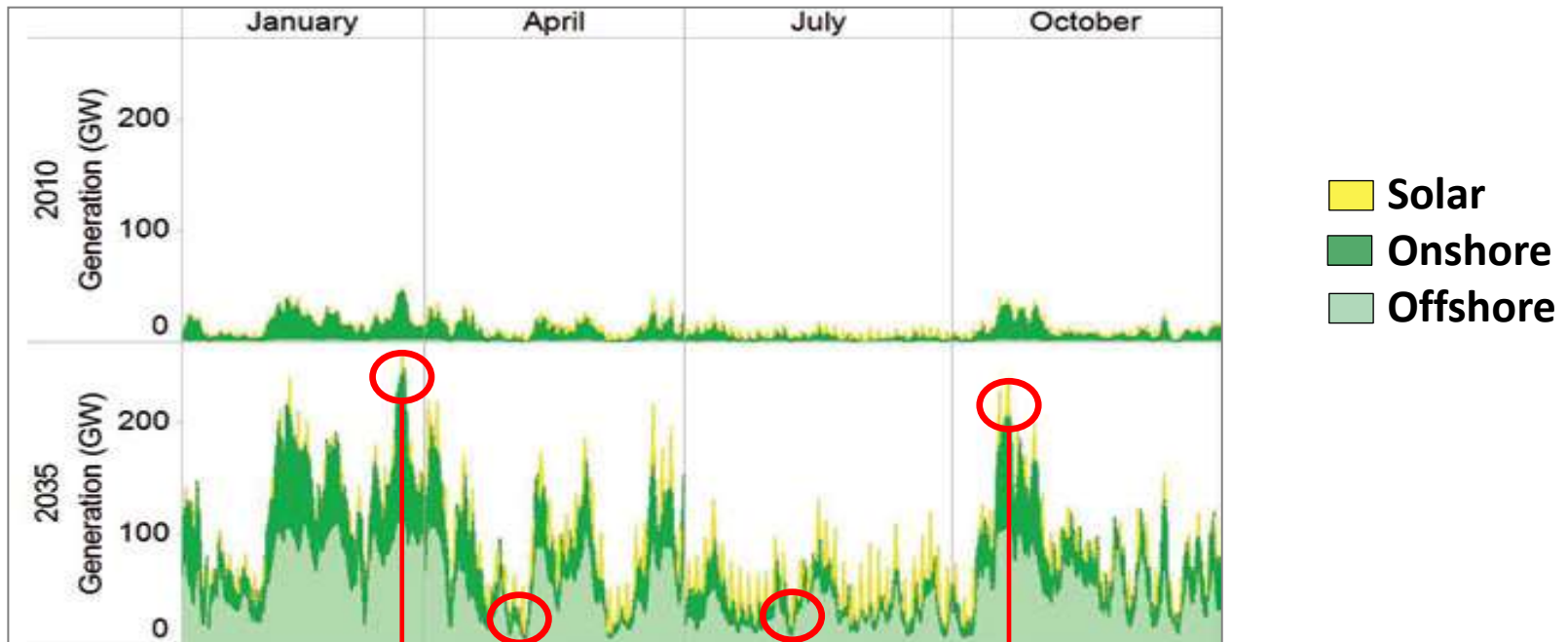
Significant fluctuations in power generation from wind due to weather influences

Volumes will decrease significantly while required capacity / **deliverability will „double“**

Volatile prices, especially during extreme weather conditions



- NW-European power production from wind and sun



Source Pöyry: The Challenges of Intermittency in North West European Power markets, March 2011

- >>> wind and sun will not balance themselves
- >>> triggers massive shortfalls and overproduction



„POWER 2 GAS“

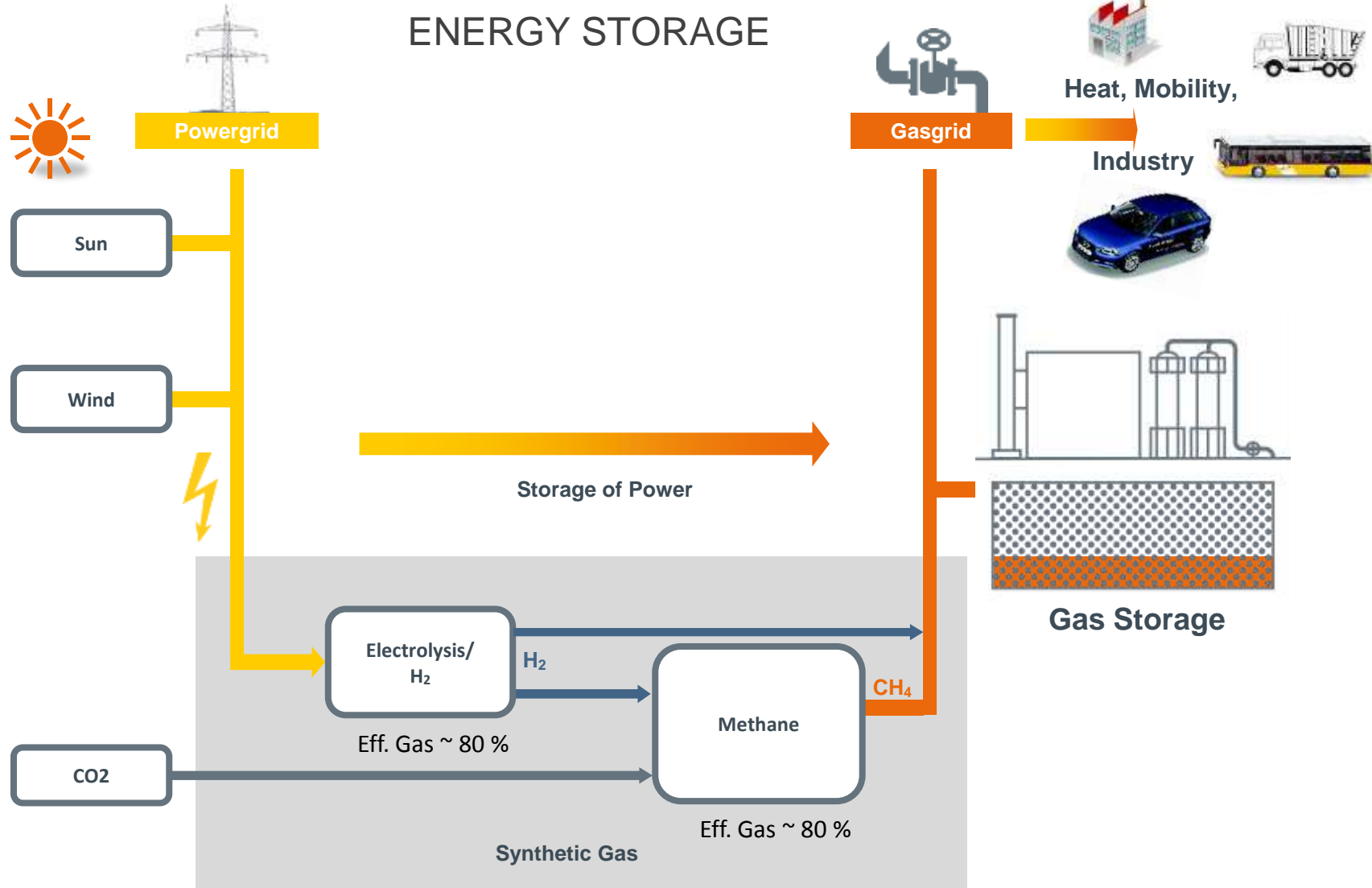


- **“POWER 2 GAS”** = storage of wind and sun
- **POWER 2 GAS** uses overproduction of renewable electricity to convert it into Hydrogen/Methane = NATURAL GAS
- Such gaseous energy carriers can easily be stored to make them available when needed
- Large scale storage of energy is key to enable further developments of variable Renewables

>>> Energy storage by **GAS STORAGE**

„POWER 2 GAS“

ENERGY STORAGE





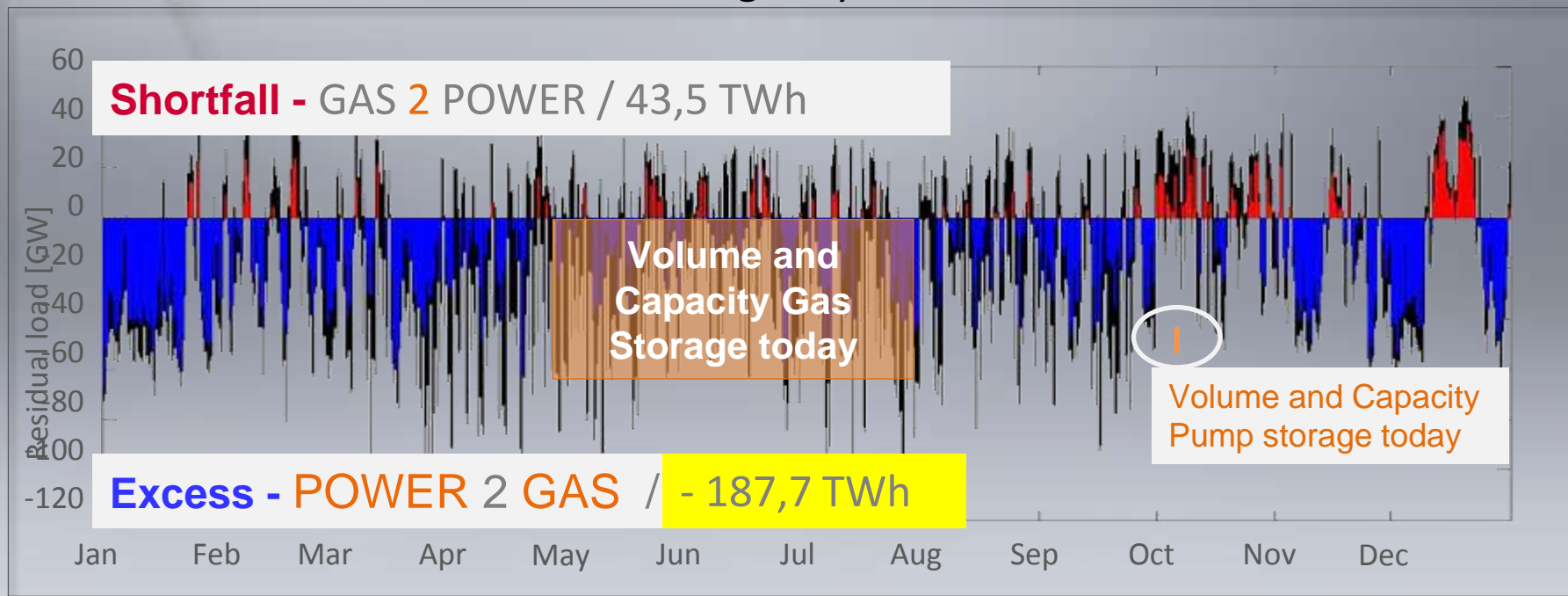
„GAS 2 POWER“ „POWER 2 GAS“



Residual load of the German electricity grid

(after consumption and balancing)

- Assumption of **78 % share of Renewables** and ideal grid development
- Simulation based on the meteorological year 2007



Source: Audi; Simulation Fraunhofer IWES 2010
Translated and adapted by RAG

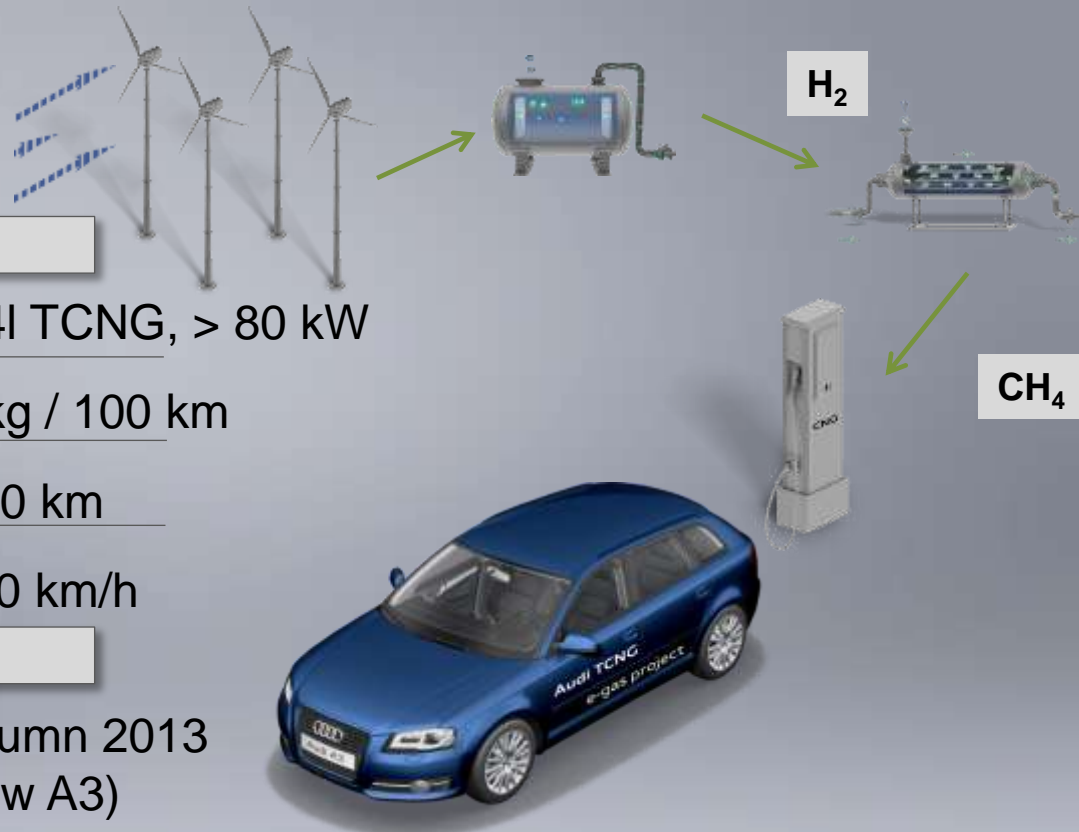
A3 Sportback TCNG

Technical data

- ▶ Engine: 1,4l TCNG, > 80 kW
- ▶ Consumption CNG: < 4 kg / 100 km
- ▶ Range CNG: > 400 km
- ▶ Max Speed: > 190 km/h



General data

- ▶ Start of production: Autumn 2013
(New A3)



» 2013 Audi will start with 1.500 TCNG-models powered by e-gas

Commissioner Öttinger: „EU stores Oil for 90 days, Gas for 30 days, Electricity for 8 seconds!“

	Hydroelectricity, Pumped storage, Goldisthal 	Underground Gas Storage, RAG 	Underground Gas Storage, (ref. GSE, AGSI 85% EU market coverage)
Volume	12 billion m ³	5 billion m ³	~75 billion m ³
Capability	8 h	2.000 h	~ 2.000 h
Electrical Energy (60% eff.)	8,5 GWh / 0,0085 TWh	33.570 GWh / 33,57 TWh	> 600.000 GWh / 600 TWh
Withdrawal rate	1.5 mcm/h	2.29 mcm/h	55.4 mcm/h
Electrical Withdrawal	1.060 MW / 1,06 GW	15.400 MW / 15,4 GW	> 300.000 MW / 300 GW

2 days in Spain **9.000 MW / 9 GW**

Model UK in 2035 **120 h / 20 GW**

Simulated overproduction/shortfall in Germany (78 % RES) **187,7 / 43,5 TWh**



CONCLUSION



- **GAS 2 POWER** is pre-condition for integration of Renewables and Security of Supply
- Natural gas, storage and infrastructure are key for the development of Renewables
- **POWER 2 GAS** plus gas storage is one important element for the sustainability of the gas system
- >>> The development and employment of innovative gas technology such as „**POWER 2 GAS**“ needs a supportive framework



**THANK YOU FOR
YOUR KIND
ATTENTION**



BACK UP

