Challenges for the Energy Industry

4th Sharing Inspiration Conference

Harald Herzig | 18:24| 18th Nov 2021

mainova

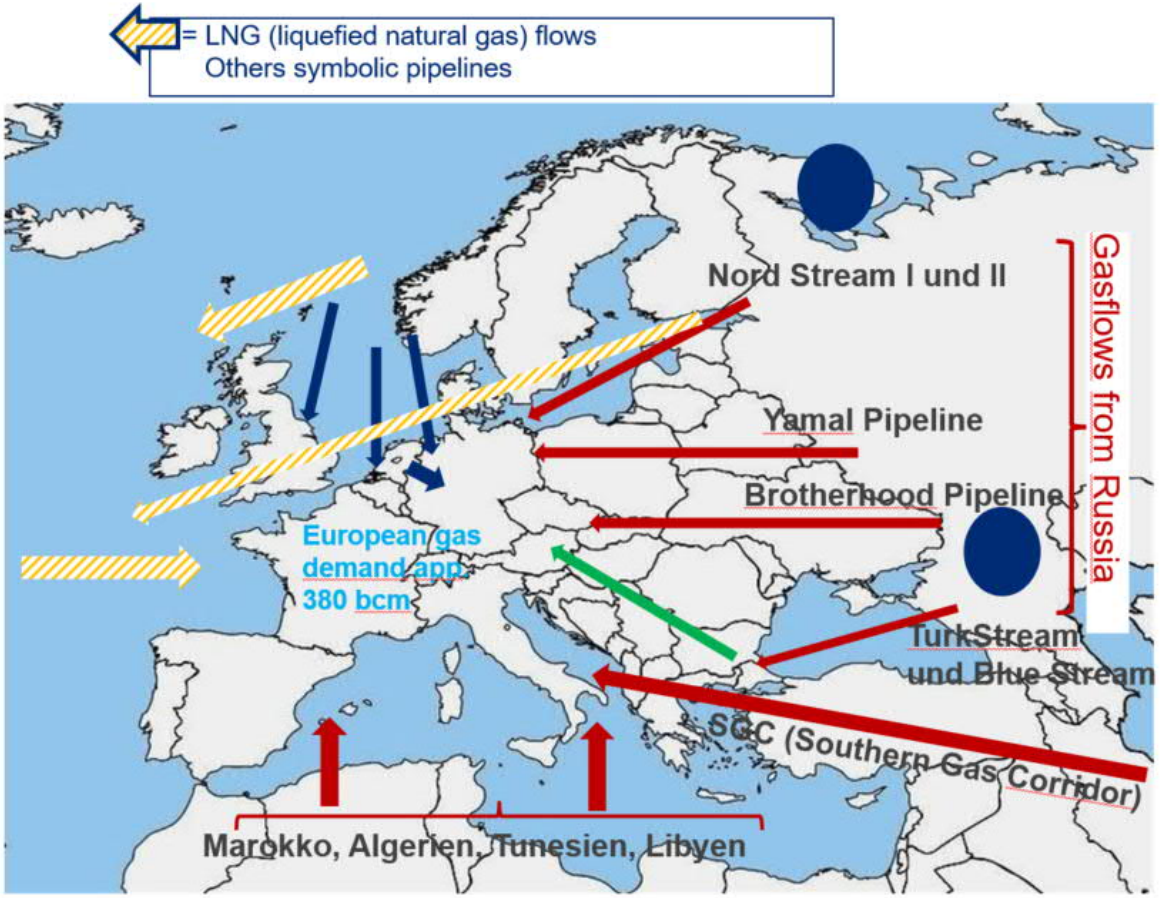
Introduction

- **Who I am…**
- **Focus on Natural Gas, Power and Emissions (CO2)**
- **No deep dive possible! So please ask if something is not clear…**
- **Simplifications:**
  - Gas is used for heating – high demand in winter, low in summer
  - Power = Electricity produced by power plants (renewable or fossil)
  - Power is used for light/cooking and production – very "spiky" demand during the day
  - Power storage is not economical

- **Natural Gas:**
  - LNG (liquefied natural gas) vs. pipeline gas
  - Markets: regional (pipeline) and worldwide (LNG)
  - Storage – to cover high demand in winter (winter demand 80% / summer demand 20%)
- **Power:**
  - Just-in-time production – grid frequency has to be stable (important!)

The information in this presentation is no official Mainova opinion and no recommendation on future developments! Just for private use!

European Natural Gas Sources



- Pipeline Gas and LNG
- European main sources
- Russia different production areas are supplying different pipelines ●
- What happened 2021? Asian influence, US no security of supply and different Russian behaviour

Capacities Russian pipelines:

NordStream I	55 bcm
NordStream II	55 bcm
Yamal	33 bcm
Ukraine	140 bcm
Turk/Blue Stream	31,5 bcm
➔ app.	315 bcm

Natural Gas production 2020:

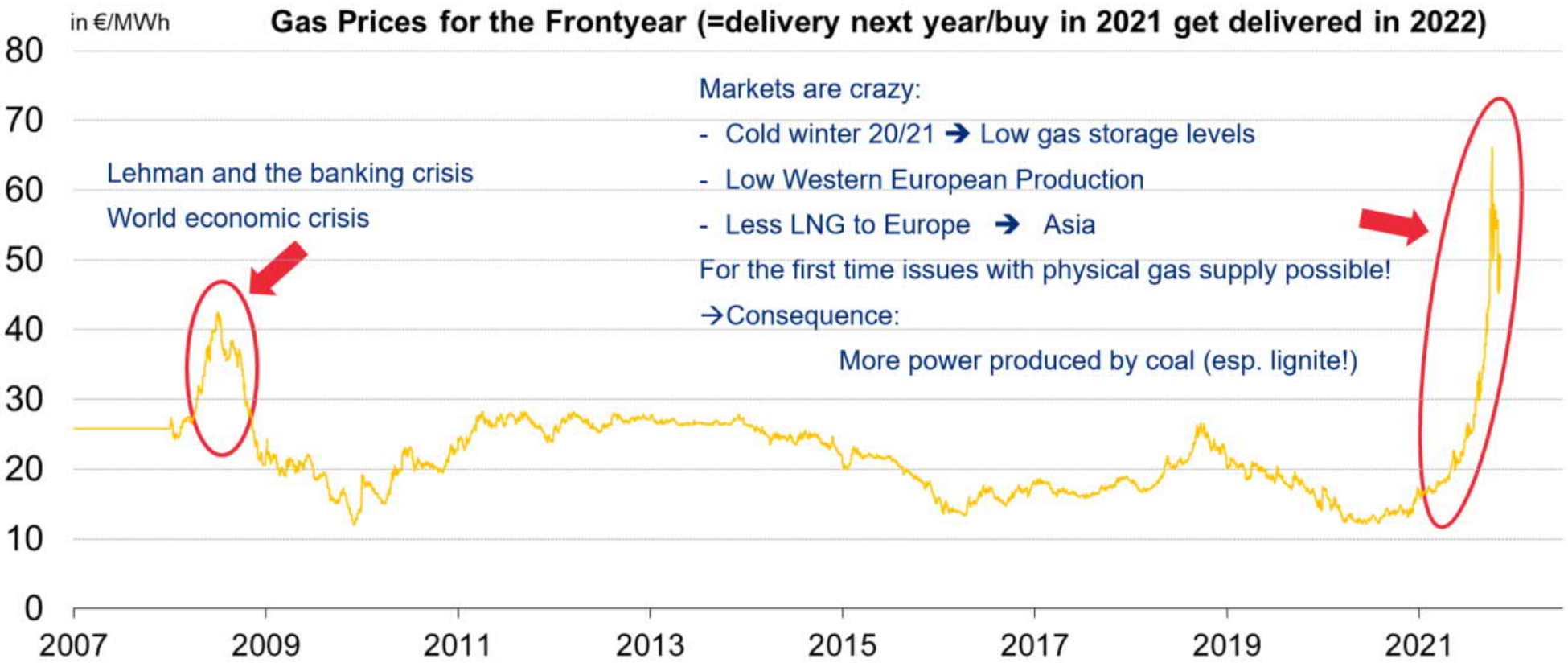
Norway	112 bcm
Netherlands	20 bcm
Russia	600 bcm
Germany	<6 bcm

Source: Graphic template unknown, Mainova AG; Nov 2021

Bcm = billion cubic meters (1 cbm app. 11 kWh)

Natural Gas – where will the price go?

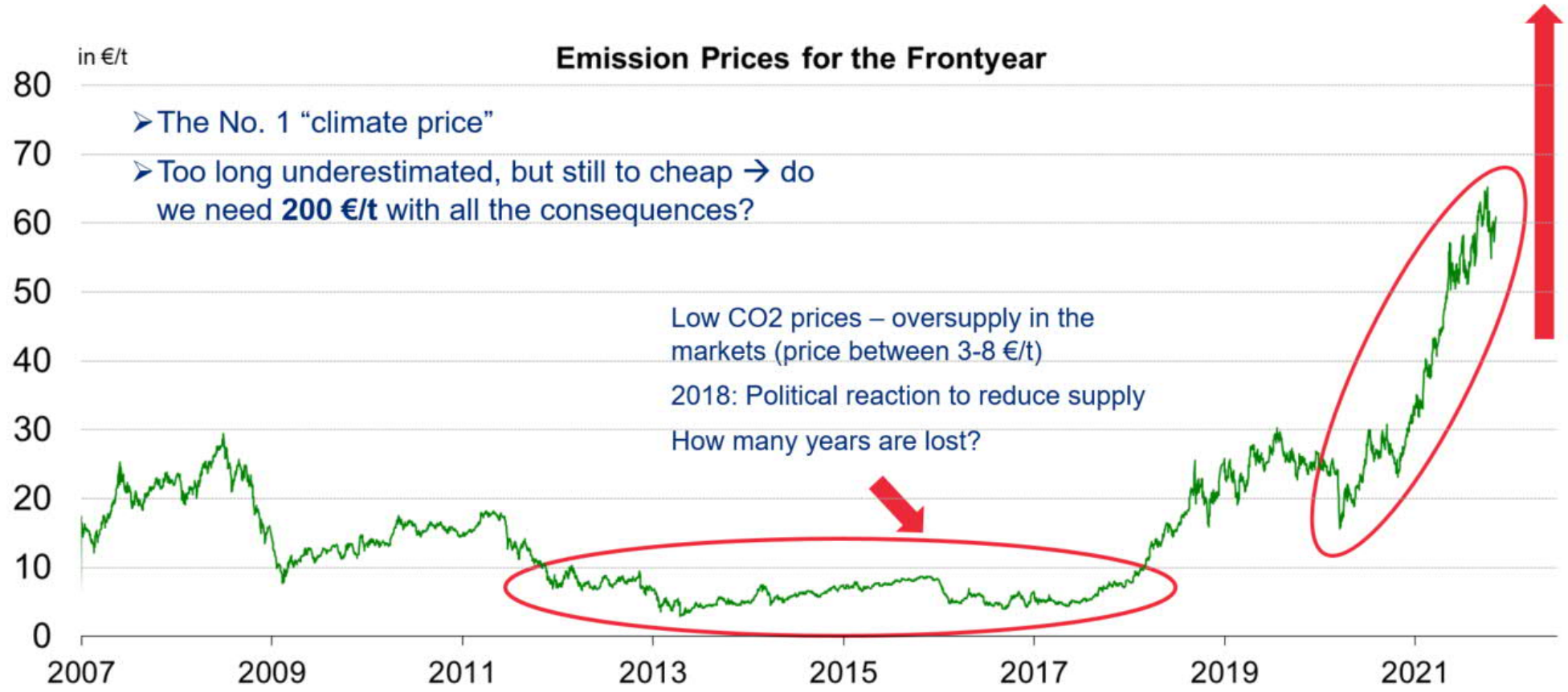
Natural Gas Price NWE – North West Europe



Source: EEX

EUA* – CO2 Prices

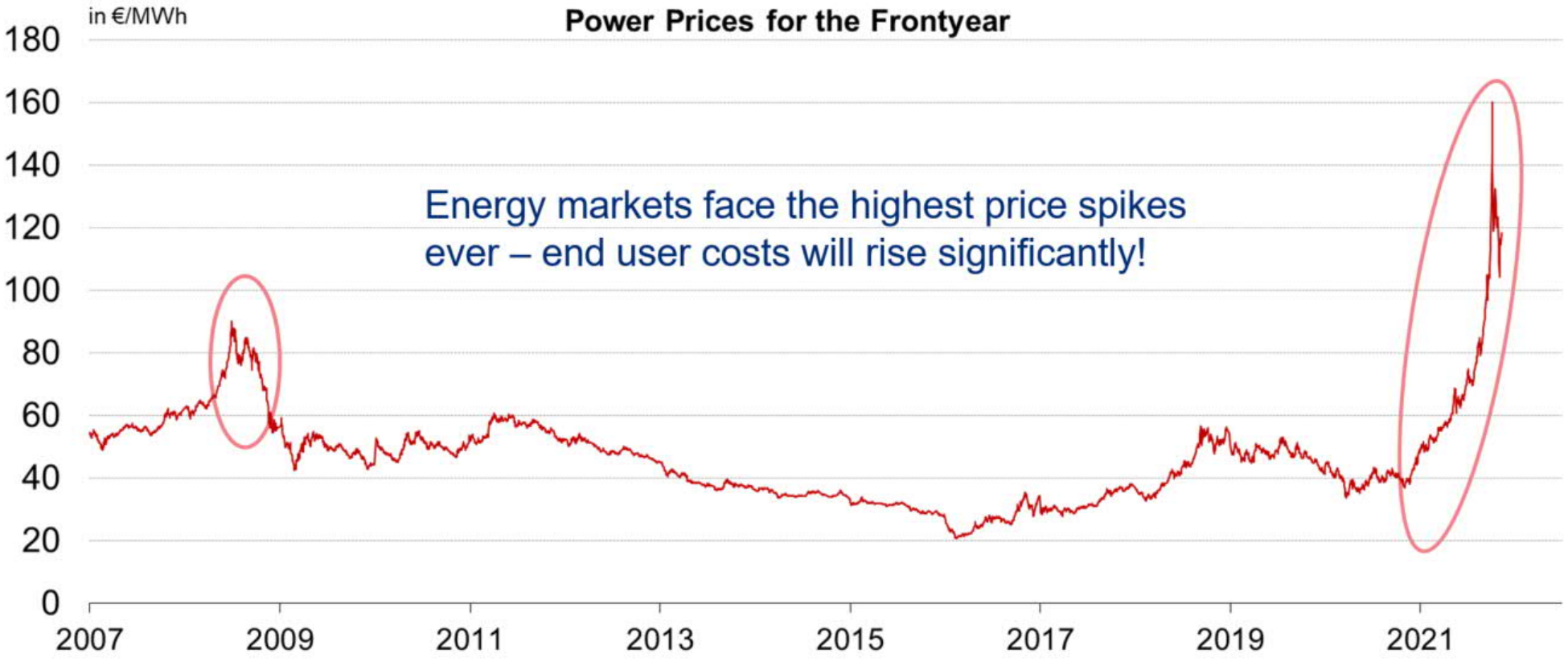
European Emissions Trading Scheme (ETS) – *European Emissions Allowances (setting a price to 1t of CO2 production)



Source: EEX

German Power Prices – Front Year

Subheadline



Source: EEX

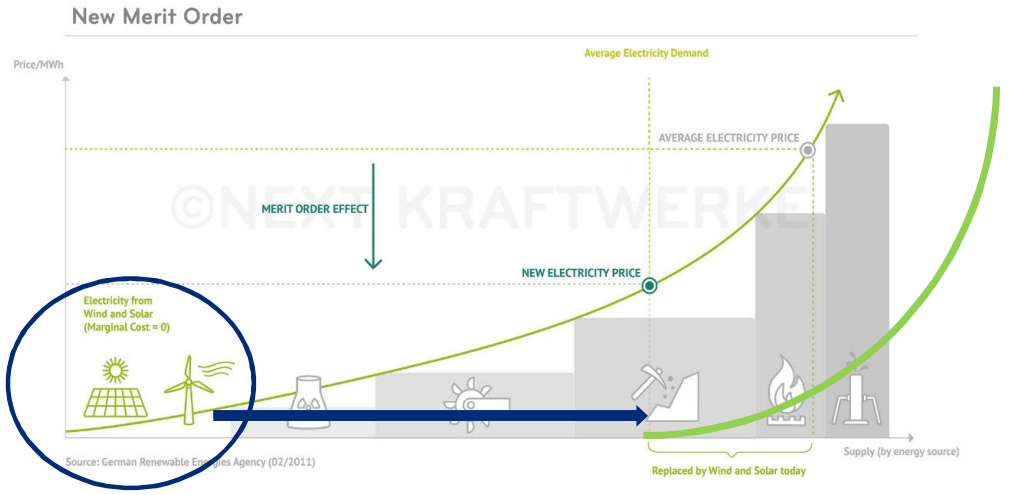
Disruptive Developments in the Energy Markets

Just some examples!

1. **Market Design:** The Market-transformation from traditional to renewable energy sources eliminates price signals from gas and coal markets. Therefore a new market design will be needed: Capacity markets

2. **Power Production:** Renewable power production is relying on wind and sun – load can‘t be increased if no sun is shining or no wind is blowing ➔ power grid stability endangered

3. **Power and gas grids:** Renewable power production has to be built where the wind is blowing, the sun is shining **AND** where we have the space ➔ Huge investments in power grids needed also in retail areas! This will drive the non-marginal costs/fix costs of power supply



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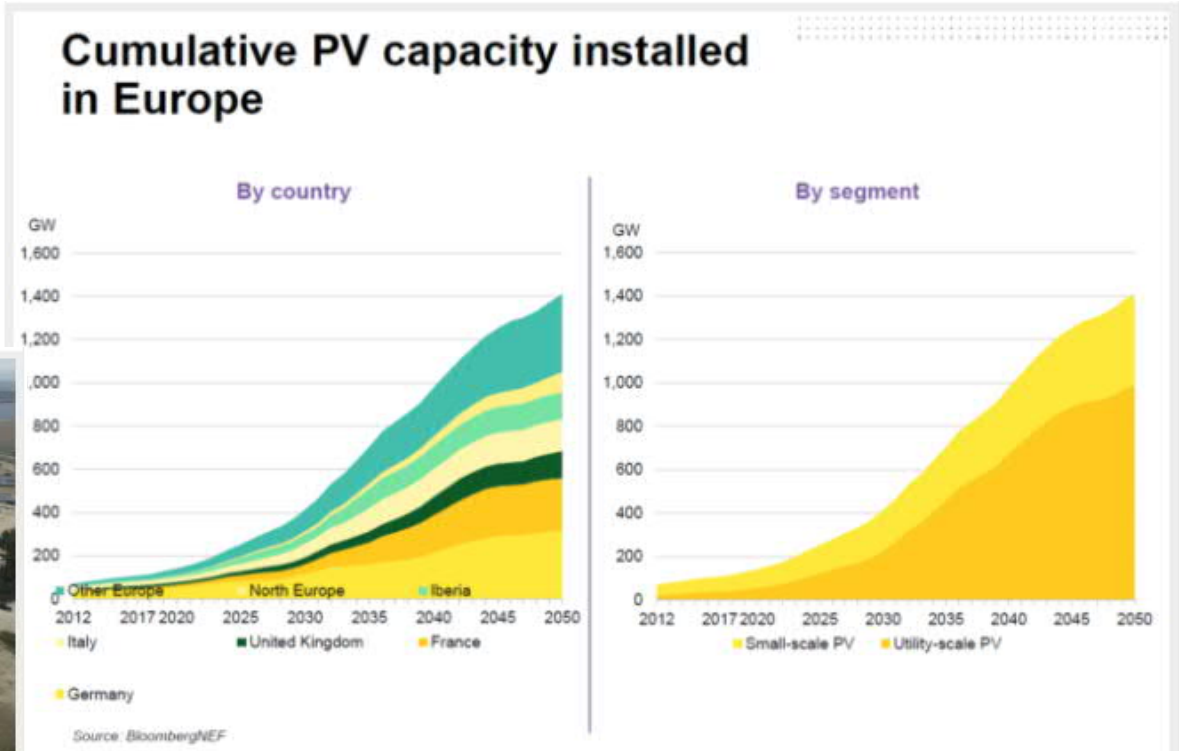
PV Capacity (Solar Panels)

Subheadline

- **Has to triple until 2030 and rise by 10-times till 2045**
- **And we will need space… just in Germany app. 8.400 km² to get climate neutral (app. Corse/Korsika)**

The Don Rodrigo PV solar plant south of Seville in Spain, developed by German company BayWa r.e., is Europe's first subsidy-free utility-scale solar PV plant. (Photo: Baywa r.e.)



Bloomberg New Energy Finance projects very strong growth in European solar PV installations. (Source: European Market Outlook presentation/BNEF, Solar Power Summit).

Source: BMWi Newsletter Energiewende - Mehr Erneuerbare für mehr Klimaschutz (bmwi-energiewende.de)

The “only” way to get to a solution?

1. **Clear cost allocation is needed** – in the light of climate change the cost for “emissions” have to bear all effects.

   But as a consequence:

   - Energy costs will rise significantly
   - Transportation costs will rise significantly (goods and human beings)
   - Subsidies have to be reduced significantly – fuels and power production

2. **Clear cost allocation is needed** – incentivation of companies and human beings

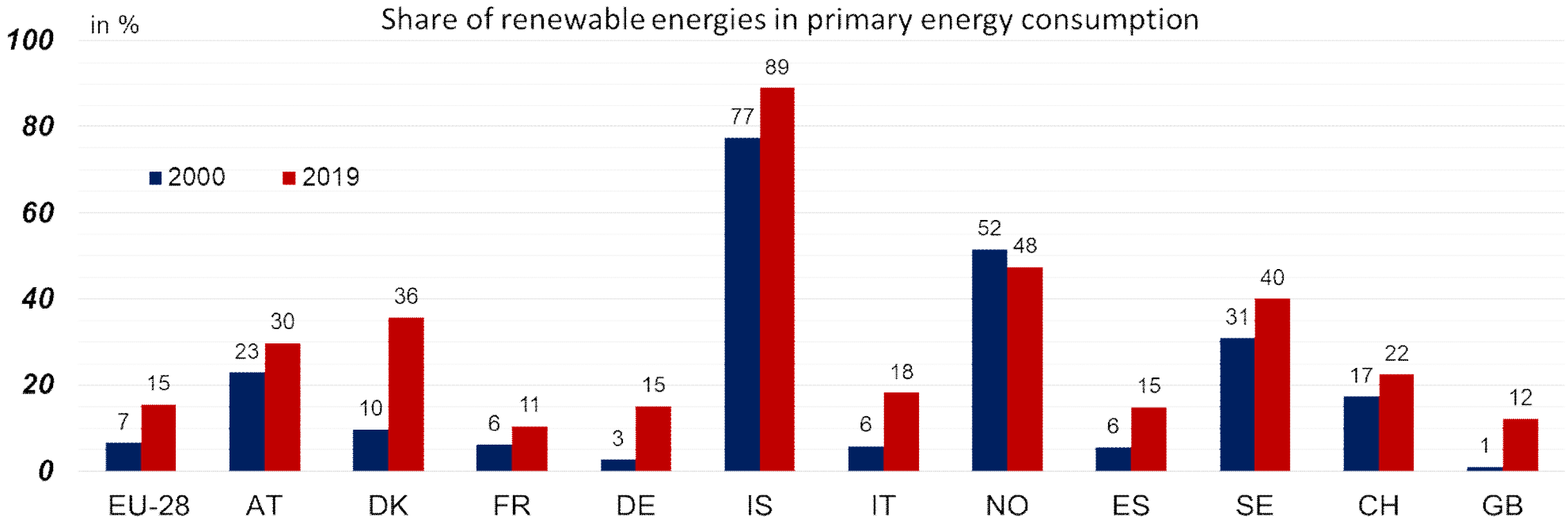
3. **Clear cost allocation is needed** – The cost has to show the consequences
   - E.g. cost for storage of nuclear waste
   - E.g. cost for battery production
   - E.g. cost for floodings

Will the 1,5-Degrees Target Work?

Share of renewables vs. power production or total primary energy consumption?

Share of renewable energy on total primary energy consumption*:

Europe-28: 2000 – 6,6% 2019 – 15,5% 2040 – 35%?

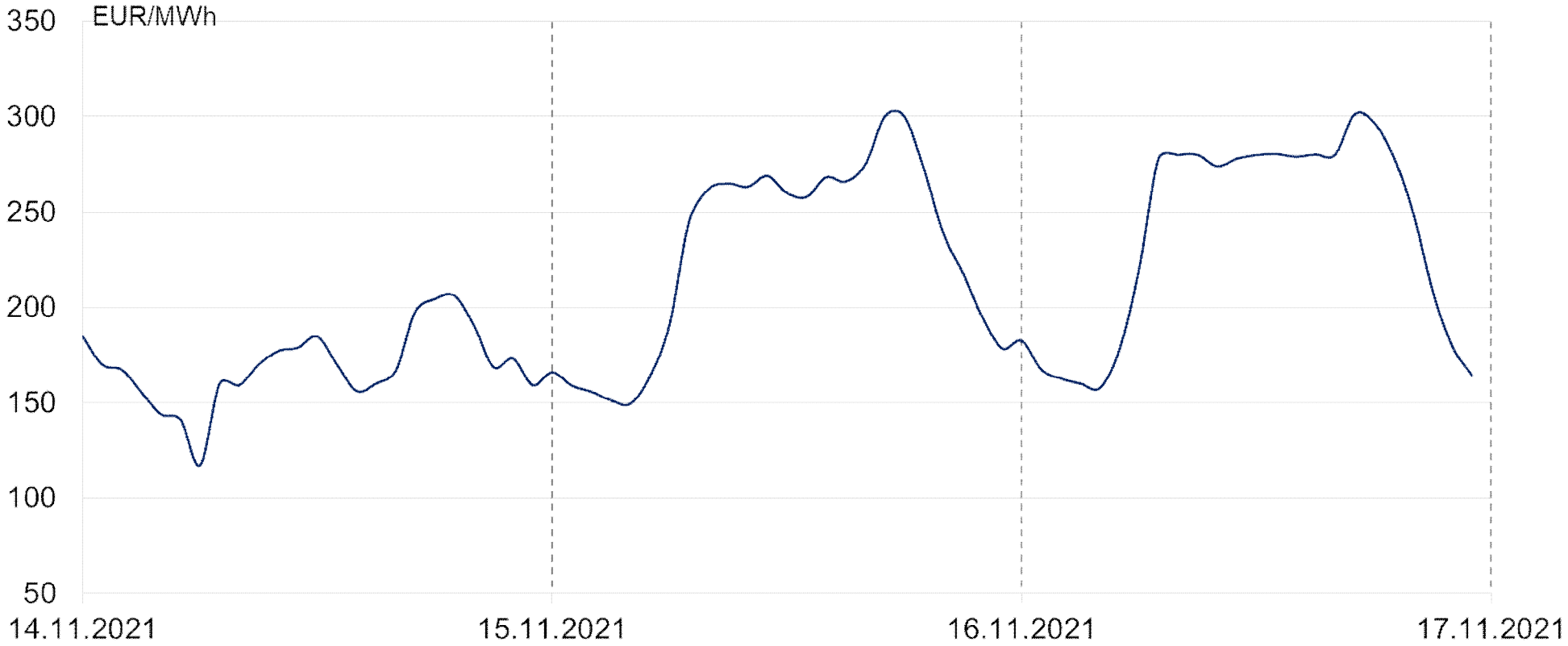


* In Germany power production has a share of > 45% / Traffic 7.3% of total energy consumption

Source: Bundesministerium für Wirtschaft und Energie

Thank you very much!

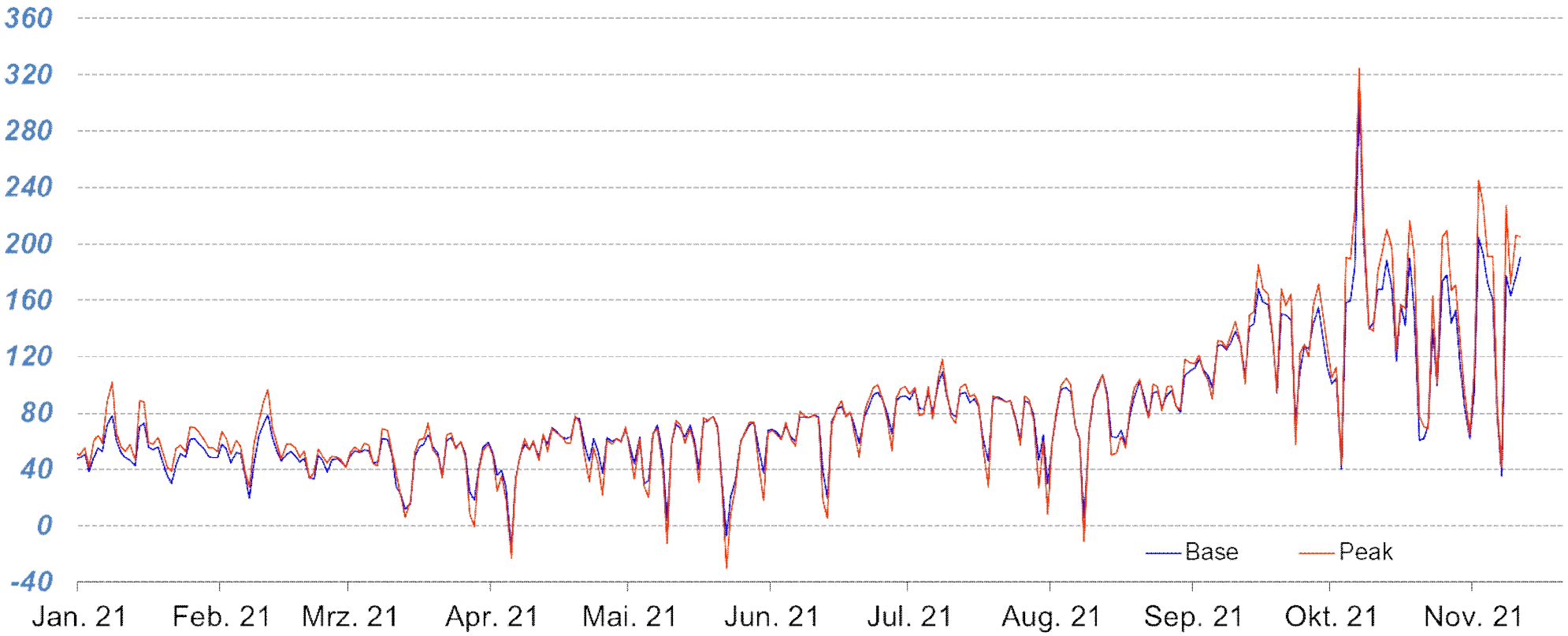
Excursion: Hourely Power Prices (Intraday)



Source: EEX

Excursion: Daily Power Prices (even 15 Min. possible)

Negative prices are sometimes reality – you have to pay to produce power



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