Policies and market design for the energy transition

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Summary

1. The energy transition: **a decarbonised power system** in the EU by 2040 **requiring significant investments**…
2. ….Investments that need to be optimised to **keep system costs under control**…
3. …and the **regulatory framework** needs **support stable and affordable prices** and **promote investments**

1 - The energy transition: a decarbonised power system in the EU by 2040 requiring significant investments…

2040 Climate Target Plan: a cost efficient path to the energy transition

- A 2040 climate target for the EU of 90% net GHG emissions reduction compared to 1990 levels.
- The 2040 climate target corresponds to a close to full **decarbonisation of electricity** in the second half of the 2031-2040 decade or shortly thereafter.
- We need **all zero and low carbon solutions** (including renewables, energy efficiency, nuclear, storage, CCS, CCU, industrial carbon removals, and all other current and future net-zero energy technologies).

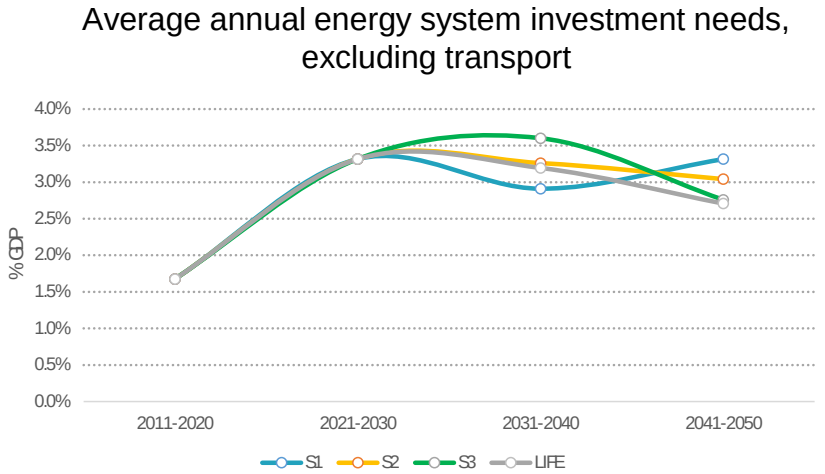
Summary of key energy indicators

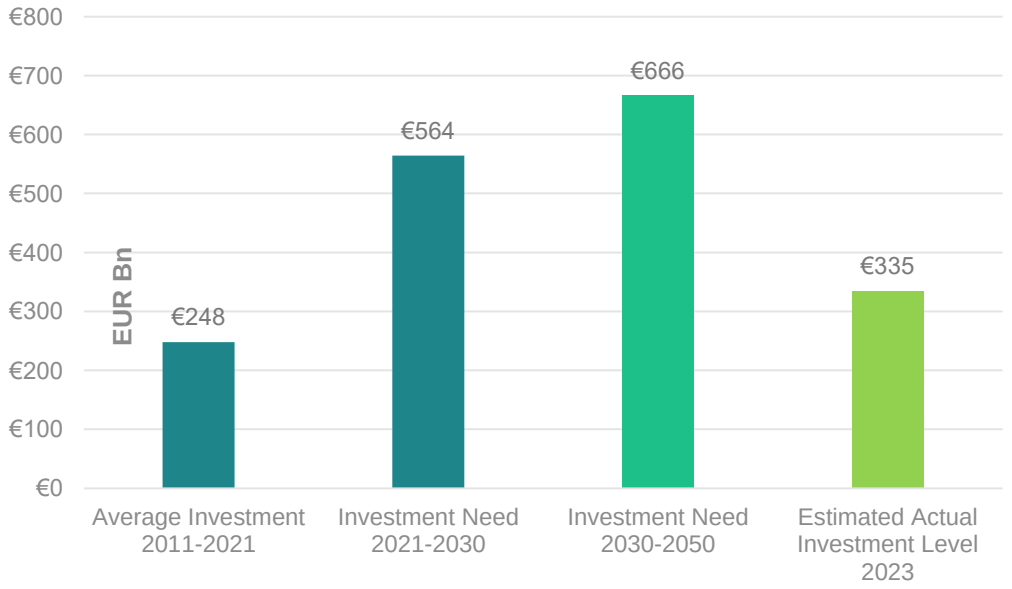
	2030	2040	2050
Policy relevant indicators			
Energy-related CO2 reductions vs 2005	-58%	-94%	-103%
RES share in Gross FEC	42.4%	75.0%	89.0%
FEC reduction vs 2015 ()	-19%	-36%	-40%
Energy indicators - Supply			
Gross Available Energy (Mtoe)	1,160	1,018	1,032
- Fossil fuels	663	275	150
- of which for non-energy use	96	96	80
- of which captured	2	13	24
- Nuclear	139	129	142
- Renewables	328	613	691
Net imports (Mtoe)	572	267	153
Import dependency (%)	50%	26%	15%
Hydrogen production (Mtoe)	9	100	185
e-Fuels production (Mtoe)	2	37	60

Source: PRIMES

Growing investment needs…

- The transition is an investment agenda
- High level of investment needs to be sustained over several decades:
  - ✓ +1.5 pp of GDP vs. 2011-2020
  - ✓ €660 billion / year in 2031-2050
  - ✓ Best available data suggests **current investment levels are far below the required levels** (c. EUR 300 billion).
- No contradiction between affordability/security and energy transition.





Source: A4 analysis of various sources including Bloomberg NEF, Institute for Climate Economics, EC 2040 Communication (scenario 3)

…in a more challenging context

1. Scarce national and EU public funding

- **Tighter national public budgets** with the introduction of the new Stability and Growth Pact rules.
- **Reduced Multiannual Financial Framework (MFF)**: Increased competition for resources within the EU budget (defense, enlargement, etc.) reduces energy allocation.

2. Challenging financial conditions

- **Higher interest rates** impacting project financing.
- **Lack of comparable risk financing to the US**: Capital Markets Union development required for large-scale mobilization.

3. Supply chains under stress

- **Post-pandemic bottlenecks** persisting in critical sectors.
- **Raw Material Availability**: Access to resources for clean energy technologies might be hampered, due to limited supply and geopolitical tensions.

Investment needs between 2030 and 2050

Energy Supply: EUR 311 billion

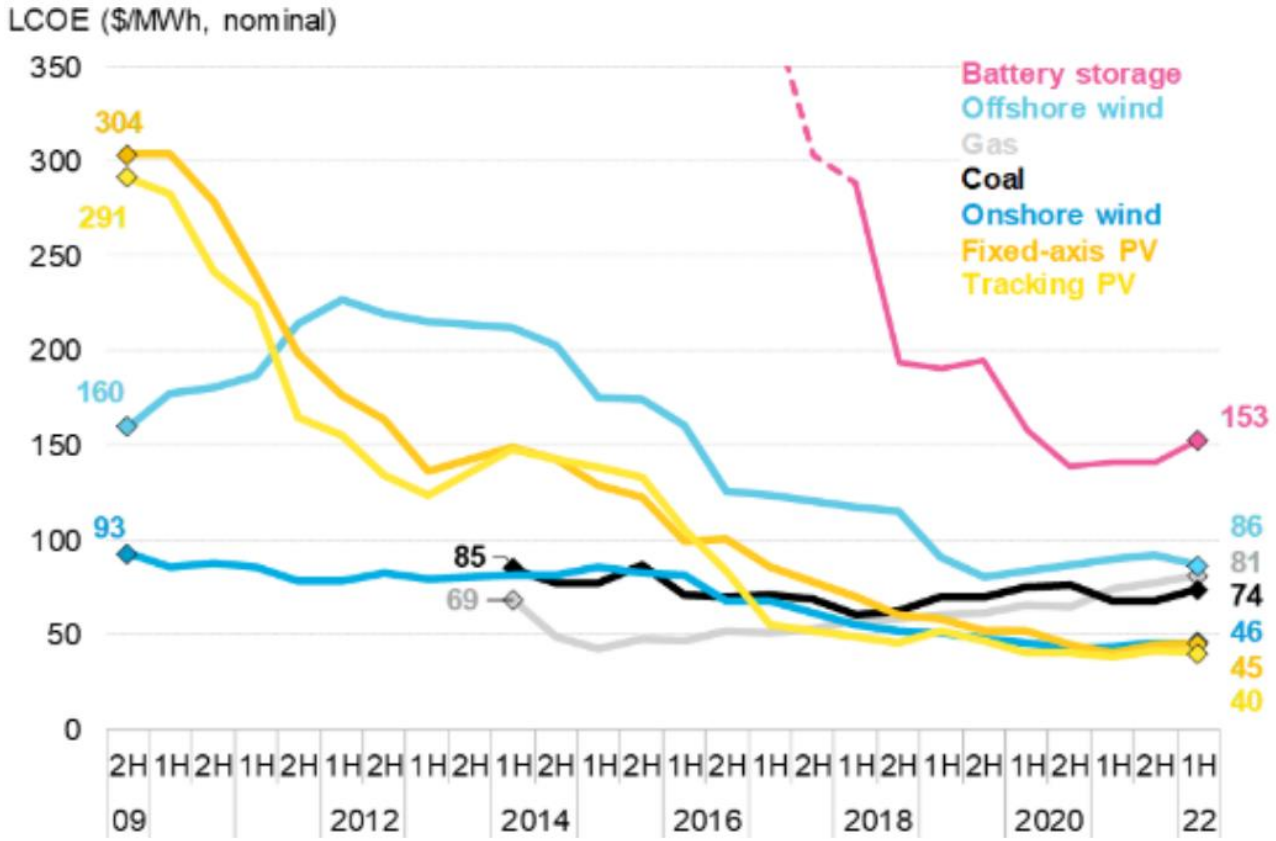
- Power Grids: EUR 85.4 billion.
- Renewables: EUR 114.5 billion.
- Storage: EUR 8.1 billion.
- Hydrogen and Hydrogen Networks: EUR 25.4 billion.

Energy Demand: EUR 355 billion

- Industry: EUR 35 billion
- Residential: EUR 239.5 billion
- Services: EUR 61.9 billion
- Agriculture: EUR 19 billion

2- ….Investments that need to be optimised to keep system costs under control…

Renewables are a cheap source of power…



Source: Bloomberg New Energy Finance H1 2022 LCOE

The usual narrative is the deployment of **renewables will result in lower prices** for companies and households:

- Renewables have lower levelised cost of electricity (LCOE).
- Electricity prices, may eventually also drop as more expensive marginal producers (e.g. gas) are pushed out of the market.

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…but RES intermettency and bottlenecks during electrification will add to price increases

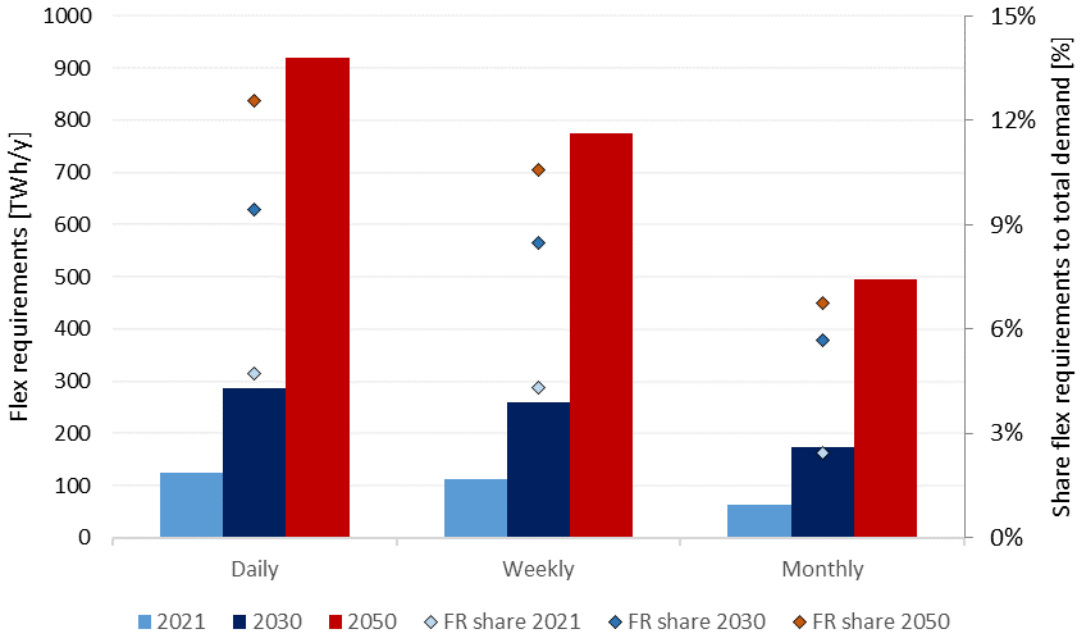


Figure: Daily, weekly and monthly flexibility requirements and their share to total demand (FR share) in the EU for 2021, 2030 and 2050.

***Source**: ENER Chief Economist*

- Move from LCOE to represent system cost (**Equivalent Firm Power Prices**)

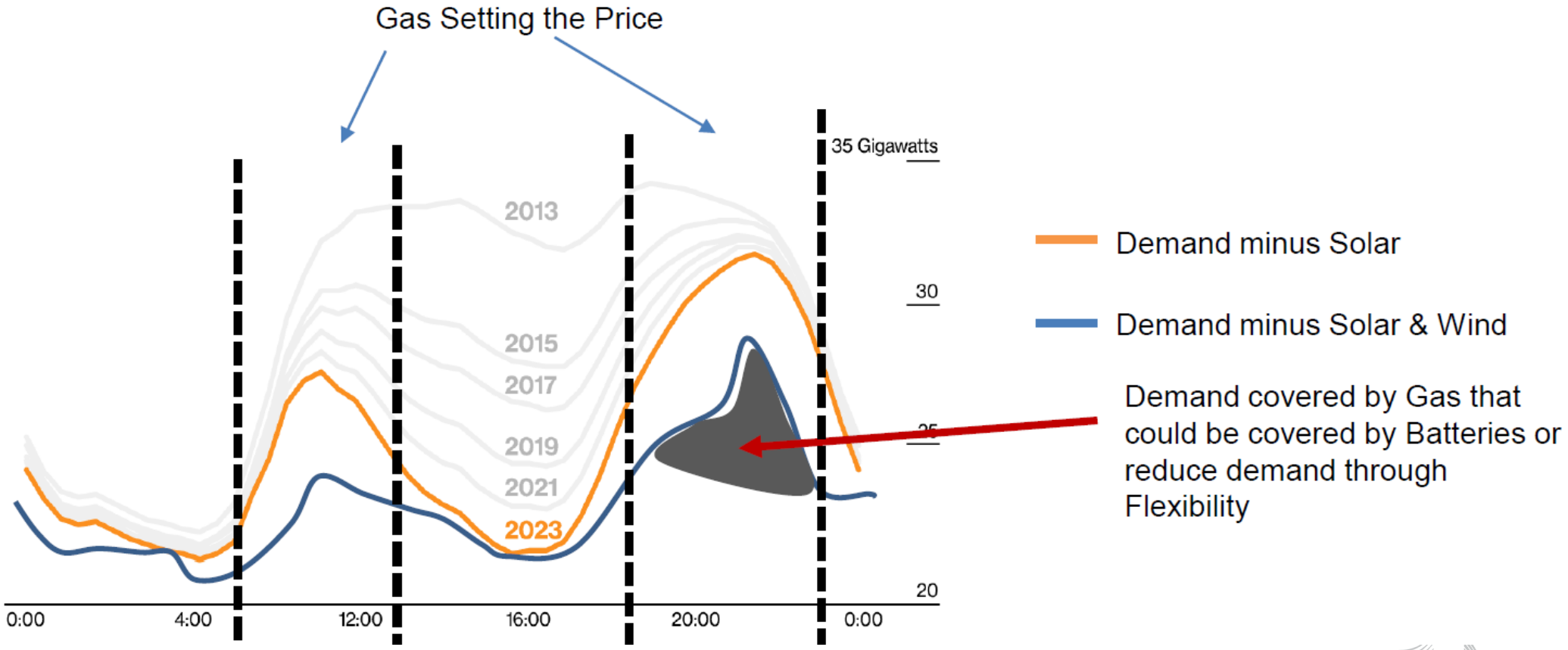
- Significant investments needed in flexibility and storage as well as to upgrade grids and networks.

- Optimise locational signals in renewables and demand to steer appropriate investments.

Total needs equal to 30% of total electrical EU demand in 2050, up from 24% in 2030 and 11% in 2021

Increased flexibility needs

*Combination of **flexibility sources and storage will lower the dependence on gas prices***



***Source**: ENER Chief Economist*

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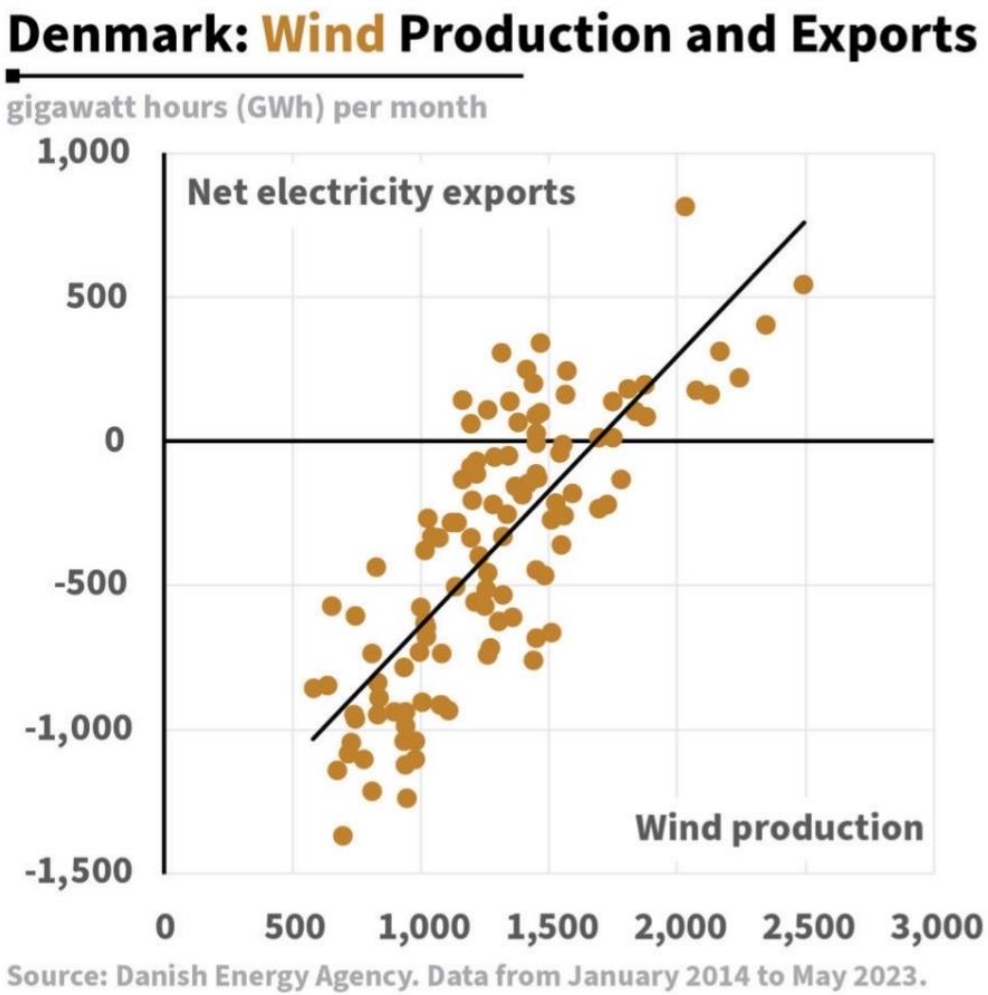
Investments need to address bottlenecks

- Green Transition is progressing on individual installations: RES, HP, EV.
- BUT need for **System Integration**:
- Grids, Storage and Flexibility
- 40% of our grids have more than 40 years.
- The optimal location for renewables generation often being distant from demand centres.
- Bottlenecks to be tackled to deliver the promise of secure and affordable energy.



Increasing cost of power back-up

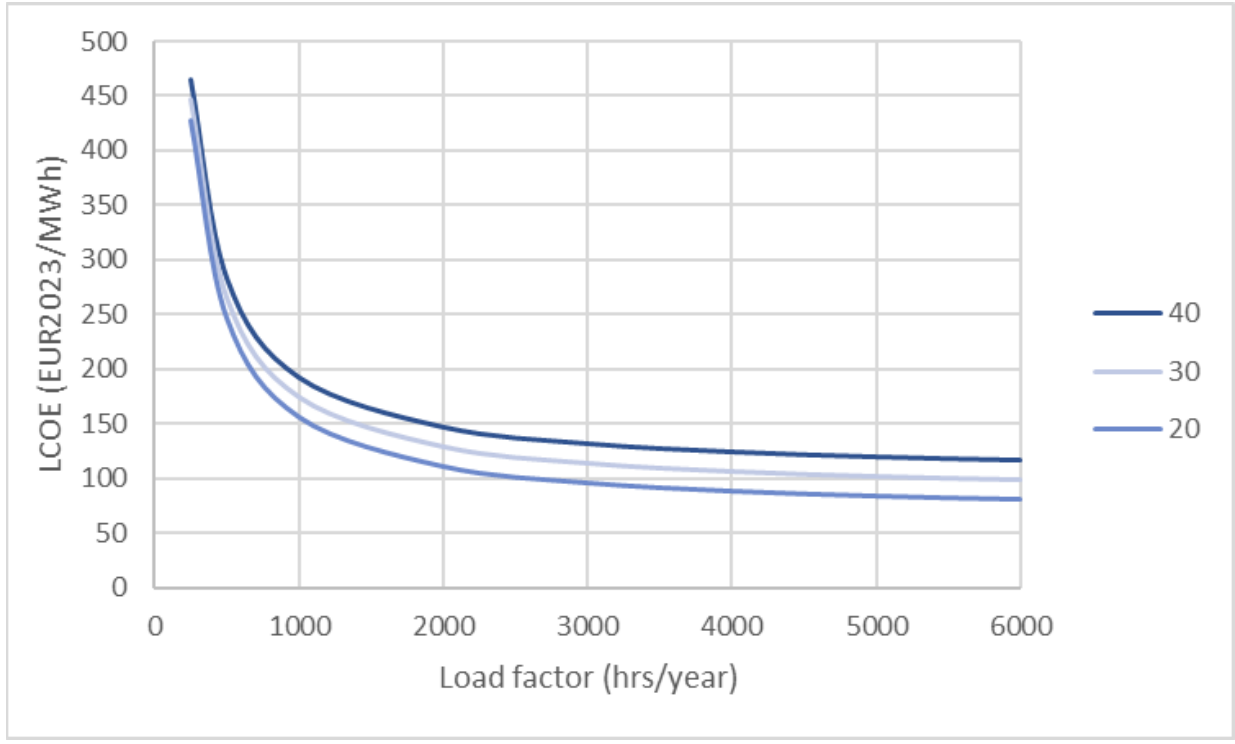
- Need to invest on batteries/storage/demand-side reponse flexibility.
- System integration is key.
- Running back-up (e.g., gas) plants a few hours per year might become extremely expensive.

LCOE (EUR2023/MWh)

CAPEX(EUR2023/kW) = 702

WACC = 0.085

Gas price (EUR/MWh) \ Capacity factor (h/year)	161	250	500	1000	2000	3000	4000	5000	6000
15		419	238	147	101	86	79	74	71
20		428	247	156	111	95	88	83	80
25		437	256	165	120	105	97	92	89
30		446	265	174	129	114	106	102	99
35		455	274	183	138	123	115	111	108
40		465	283	192	147	132	124	120	117



3 -…and the regulatory framework needs support stable and affordable prices and promote investments

EMD and Long-term contracts

3 pillars EMD

Boost renewable energy investments

Better protect and empower EU consumers

Enhance the competitiveness of EU industry

Long-term markets and price contracts, incl. Power Purchase Agreements (PPAs) and Contracts for Difference (CfDs), may help guarantee ***predictable and stable prices for customers, secure predictable revenue streams for investors and ensure the bankability of new generation projects****.*

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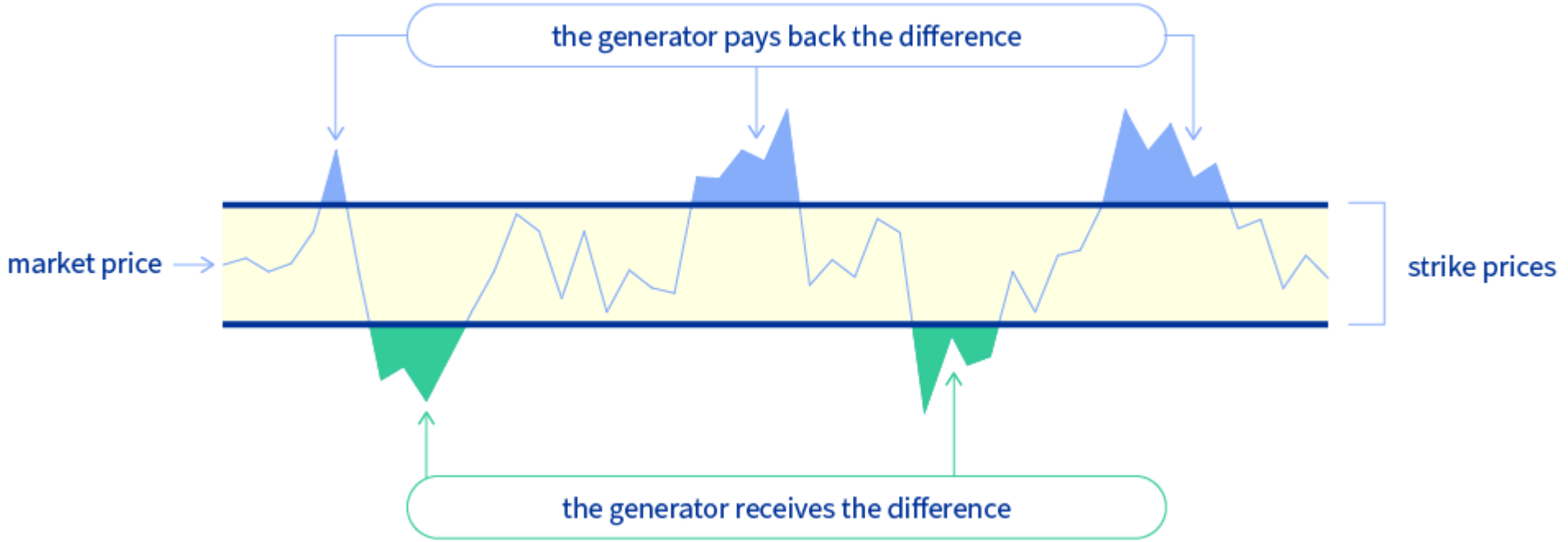
Contracts for Difference

All public support for new investments in infra-marginal and must-run renewable and non-fossil electricity generation will have to be in the form of ***two-way Contracts for Difference (CfDs)****.*



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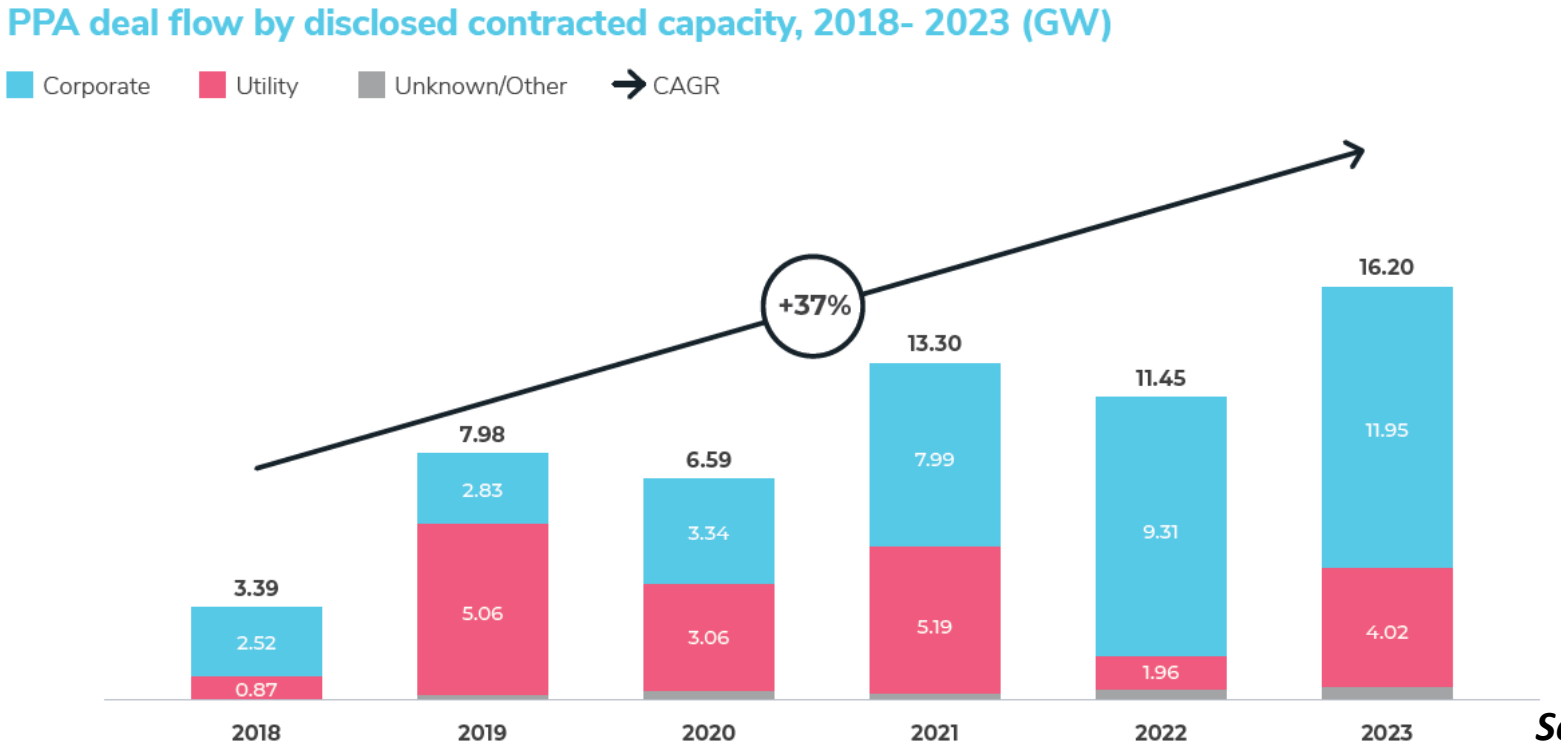
Power purchase agreements (PPAs)

*More stable long-term contracts such as **Power Purchase Agreements (PPAs)** – through which companies **establish their own direct supplies of energy** and thereby can profit from more stable prices of renewable and non-fossil power production.*



***Source**: Pexapark*

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Conclusions

1. Accelerate the deployment of cheaper generation sources (e.g. RES) while guaranteeing returns
2. Limit the impact of fossil fuels on final consumers with a move to longer term contracts (PPAs / 2-way CfDs)
3. Promote PPA uptake with counterparty risk guarantees and standardisation of contracts for a more liquid market

Thank you

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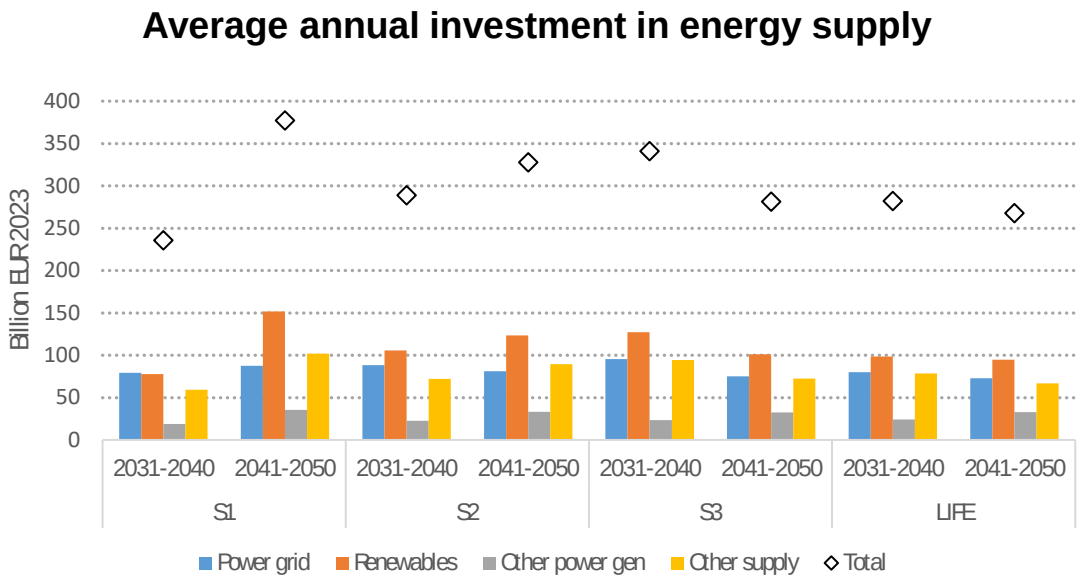
Investment needs: supply side

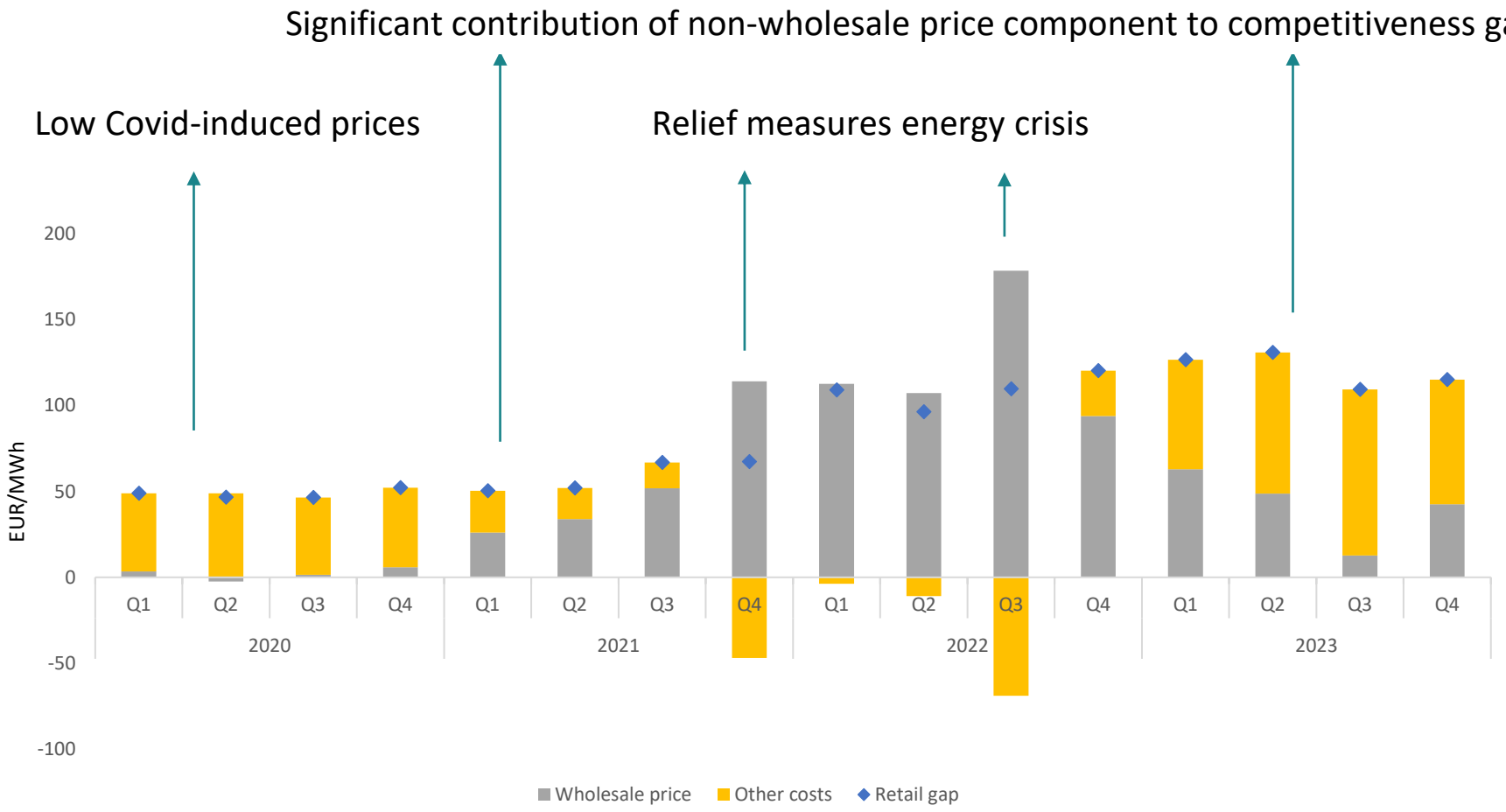


IA Annex 8, figure 106

- Supply side represents almost 50% of investment needs excluding transport
- Majority of investment will be needed in power generation and the grid – integration of renewables
- Hydrogen and CCS network also entail significant investment needs
- Early push on investment under high ambition is most noticeable on supply side:
  - Faster deployment of renewables and grid
  - Earlier deployment of H2 and CCS infrastructure
- Most investment will originate from power utilities and large players with good access to finance underpinned by predictable revenue streams

System costs vs. affordability and competitiveness

Contribution of wholesale price vs. other costs to competitiveness gap with the US



- Beyond differences in wholesale prices, other **system costs** make a significant contribution to the **competitiveness gap with the US**

Source: DG ENER Chief Economist Team based on Eurostat (EU) and EIA (US)

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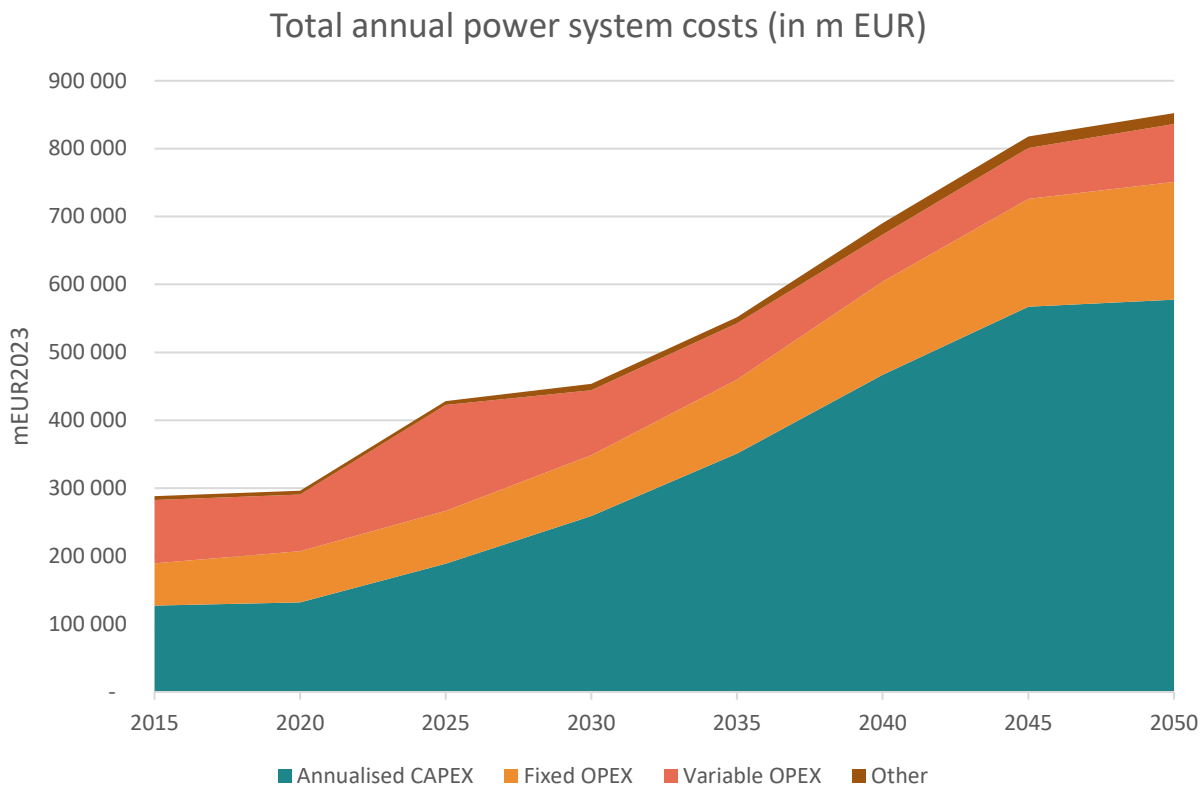
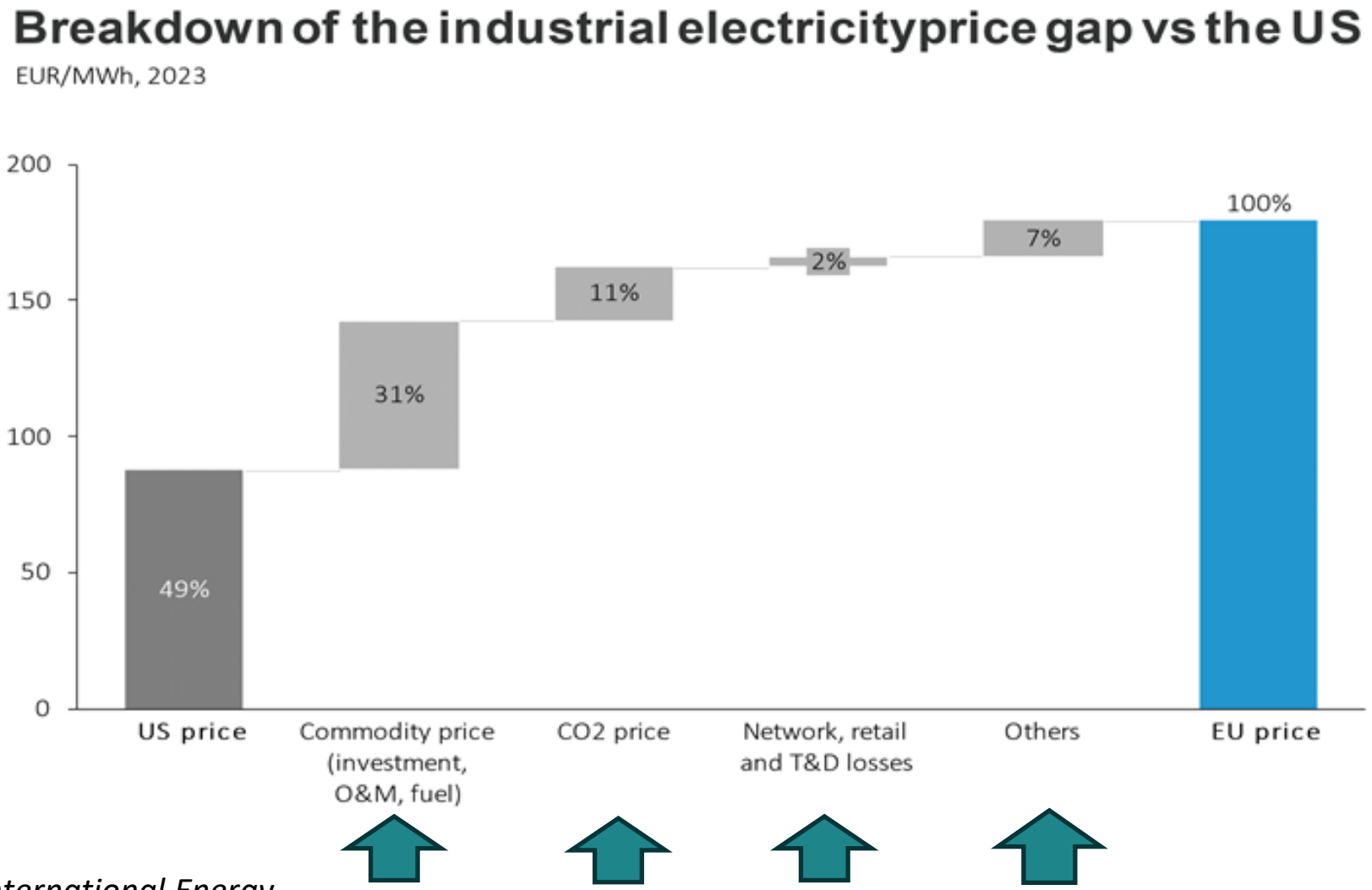
The development of different cost components



Source: DG ENER Chief Economist Team based on CTP2040 PRIMES results (S3)
Note: The graph is for internal use only.

- Energy transition will lead to a change in the cost structure of the power system.
- Variable costs are projected to decrease (due to less fossil fuels in the system)
- Annualised CAPEX and fixed OPEX increase due to the replacement of fossil-based generation and electrification of economy

System costs vs. affordability and competitiveness



- System costs impact the **competitiveness** of **EU energy prices**

- Cost premium:
  - Commodity costs
  - CO2 costs, non-existing in most US retail pricing
  - Network charges are lower in the EU, yet higher retail costs
  - Taxes, no industrial taxes in US

***Source**: International Energy*

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