

# Energy Policies: The Road Ahead

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EBT 554E – Energy Market Management

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# The road ahead - Summary

- Markets work within the framework of available technologies
- If technologies change, markets have to change
  - Insurance markets with autopilot mode cars
- Price is a compressed information of today and expectations
- Markets are social constructs, they can be reconstructed if needed
- Price should be signal for investment or deterring investment
- Markets do not adapt to policies easily
- So a transition is a very gradual process

# What is statistics?

number + unit + metadata

100 million barrels/day oil (is biodiesel included?) of demand

# BP methodology

## Oil production

Oil production data includes crude oil, shale oil, oil sands, condensates (lease condensate or gas condensates that require further refining) and NGLs (natural gas liquids – ethane, LPG and naphtha separated from the production of natural gas). Excludes liquid fuels from other sources such as biofuels and synthetic derivatives of coal and natural gas. This also excludes liquid fuel adjustment factors such as refinery processing gain. Excludes oil shales/kerogen extracted in solid form.

World oil production tables are available in both thousand barrels daily and million tonnes.

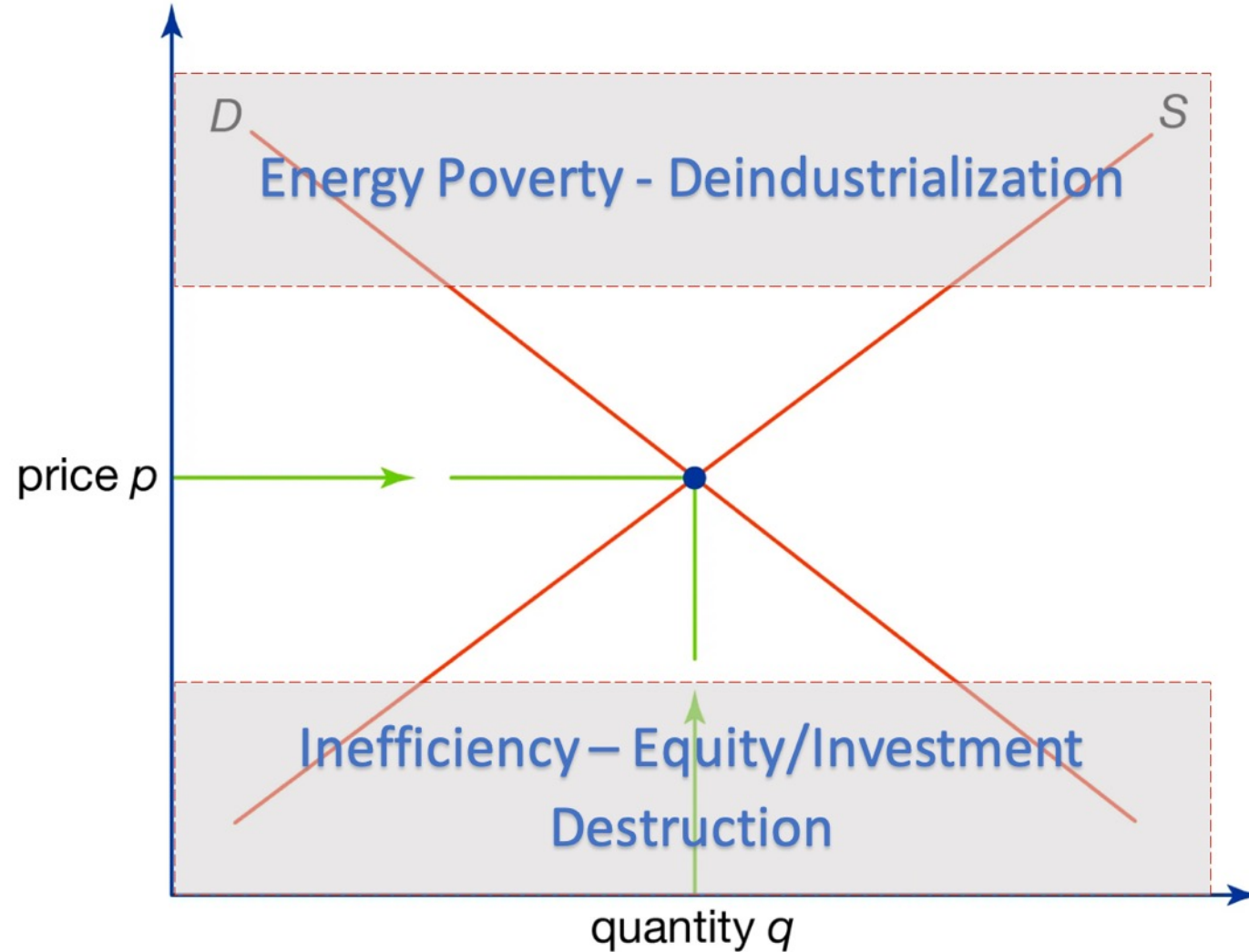
## Liquids, oil and oil product consumption

Oil consumption as defined in previous *Statistical Reviews* (i.e. including biofuels) has been renamed 'liquids' consumption and a table is still included on this original basis. In addition, more granularity has been included on the product split of both oil products and biofuels (breaking out ethane & LPG and naphtha in oil products and the ethanol/biodiesel split of biofuels).

Total liquids consumption comprises inland demand plus international aviation and marine bunkers and refinery fuel and loss. Consumption of biogasoline (such as ethanol), biodiesel and derivatives of coal and natural gas are also included.

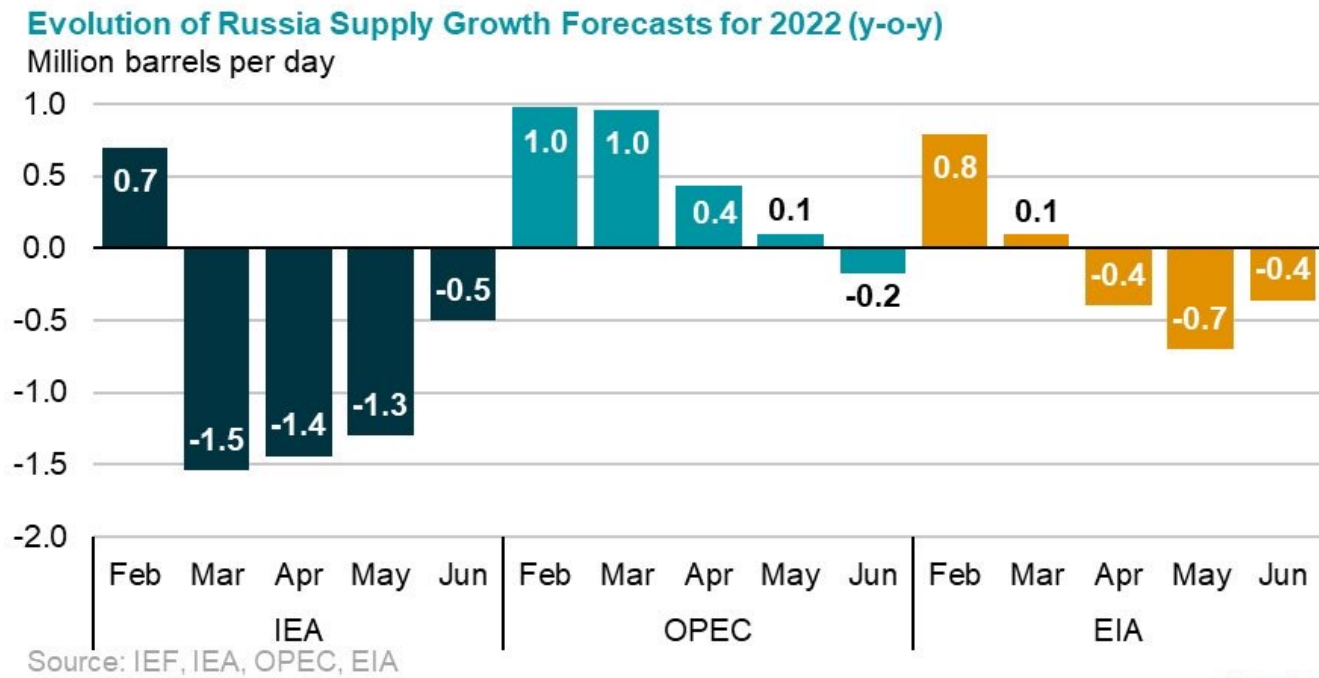
Oil consumption figures include inland demand plus international aviation and marine bunkers and refinery fuel and loss. Consumption of biogasoline (such as ethanol), biodiesel and derivatives of coal and natural

# Is it just Supply-Demand story?

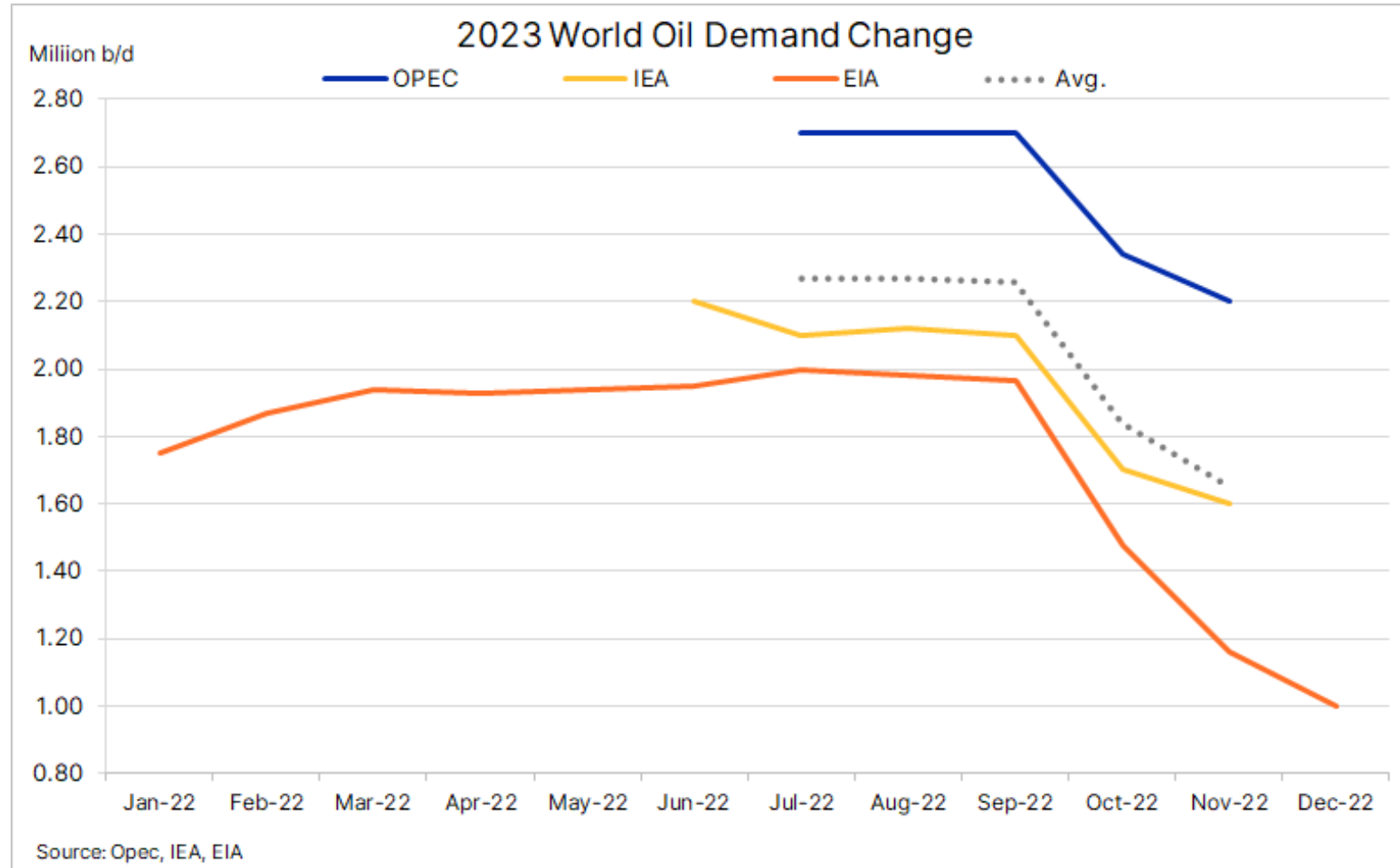


# How forecasts work?

- A forecast is a frequently updated projection
- Monthly Oil Reports



# 2023 Oil Demand Expectations







# Energy Balances – (Baris Sanli format)

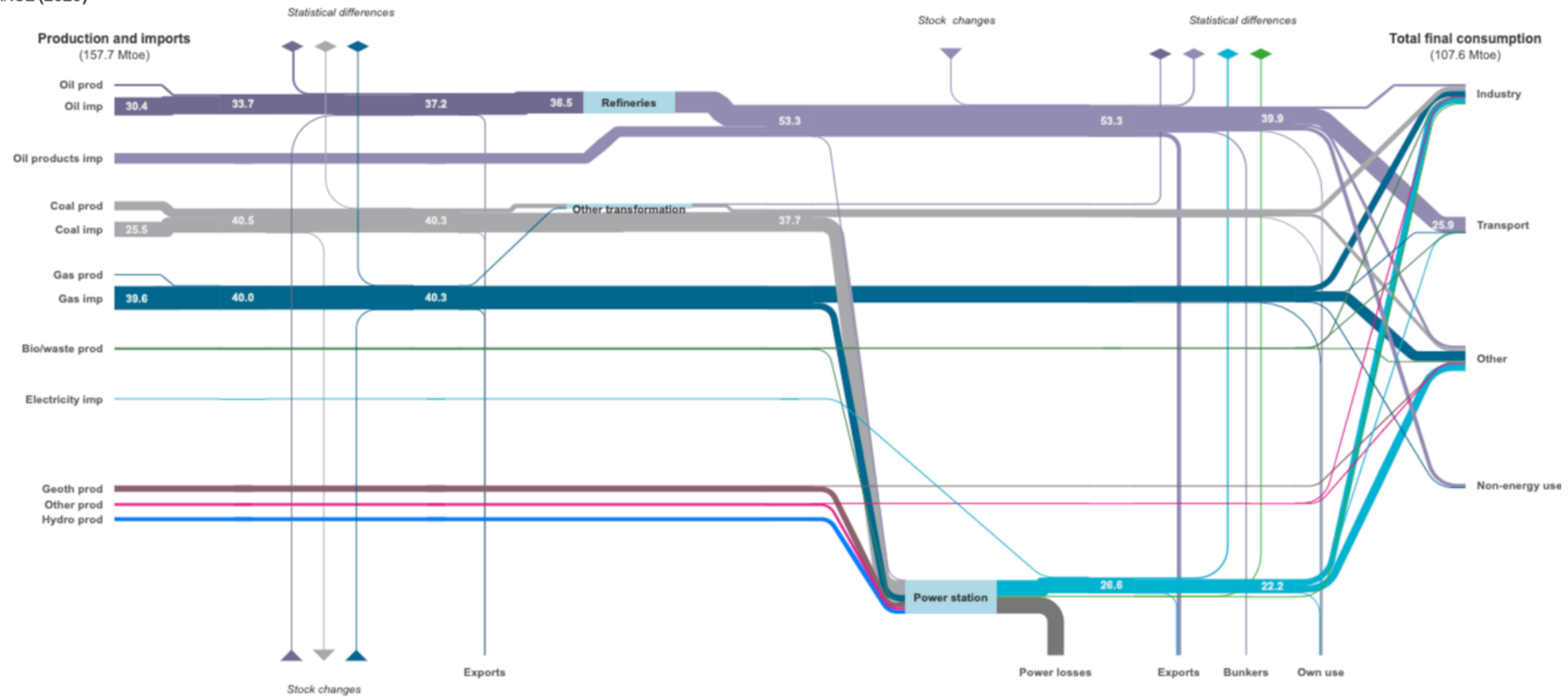
2021 - MTEP - Milyon Ton Eşdeğer Petrol							
	Kömür	Petrol	Gaz	Yenilenebilir	Elektrik	Diğer	Toplam
Yerli Üretim	17,9	3,6	0,3	24,9	0,0	0,0	46,7
İthalat	23,7	52,0	48,4	0,0	0,2	0,0	124,3
İhracat	0,3	8,0	0,3	0,0	0,4	0,0	9,0
<b>Toplam Birincil Enerji Arzı</b>	<b>41,5</b>	<b>44,0</b>	<b>49,2</b>	<b>24,9</b>	<b>-0,2</b>	<b>0,0</b>	<b>159,4</b>
Çevrim	-26,1	0,2	-19,1	-19,3	24,6	4,0	-35,6
Elektrik üretimi	-23,8	-0,3	-18,1	-19,3	28,8	2,1	-30,6
<b>Toplam Nihai Enerji Tüketimi</b>	<b>15,4</b>	<b>44,2</b>	<b>30,2</b>	<b>5,6</b>	<b>24,4</b>	<b>4,0</b>	<b>123,9</b>
Sanayi	10,8	2,6	11,3	1,4	11,5	3,9	41,5
Ulaştırma	0,0	29,9	0,3	0,2	0,1	0,0	30,6
Konut	3,7	0,4	13,8	2,9	5,3	0,0	26,1
Ticaret ve Hizmetler	0,8	0,5	3,9	0,5	6,4	0,1	12,1
Tarım ve Hayvancılık	0,0	3,2	0,1	0,6	1,1	0,0	5,1
Hammadde	0,0	6,9	0,8	0,0	0,0	0,0	7,7

2021 - EJ - Exajoule							
	Kömür	Petrol	Gaz	Yenilenebilir	Elektrik	Diğer	Toplam
Yerli Üretim	0,75	0,15	0,01	1,04	0,00	0,00	1,96
İthalat	0,99	2,18	2,03	0,00	0,01	0,00	5,20
İhracat	0,01	0,34	0,01	0,00	0,02	0,00	0,38
<b>Toplam Birincil Enerji Arzı</b>	<b>1,74</b>	<b>1,84</b>	<b>2,06</b>	<b>1,04</b>	<b>-0,01</b>	<b>0,00</b>	<b>6,68</b>
Çevrim	-1,09	0,01	-0,80	-0,81	1,03	0,17	-1,49
Elektrik üretimi	-1,00	-0,01	-0,76	-0,81	1,21	0,09	-1,28
<b>Toplam Nihai Enerji Tüketimi</b>	<b>0,64</b>	<b>1,85</b>	<b>1,26</b>	<b>0,24</b>	<b>1,02</b>	<b>0,17</b>	<b>5,19</b>
Sanayi	0,45	0,11	0,47	0,06	0,48	0,16	1,74
Ulaştırma	0,00	1,25	0,01	0,01	0,01	0,00	1,28
Konut	0,16	0,02	0,58	0,12	0,22	0,00	1,09
Ticaret ve Hizmetler	0,03	0,02	0,16	0,02	0,27	0,00	0,51
Tarım ve Hayvancılık	0,00	0,13	0,01	0,03	0,05	0,00	0,21
Hammadde	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Hammadde	0,00	0,29	0,03	0,00	0,00	0,00	0,32

# Energy Balances - Sankey

Turkey  
BALANCE (2020)

Millions of tonnes of oil equivalent



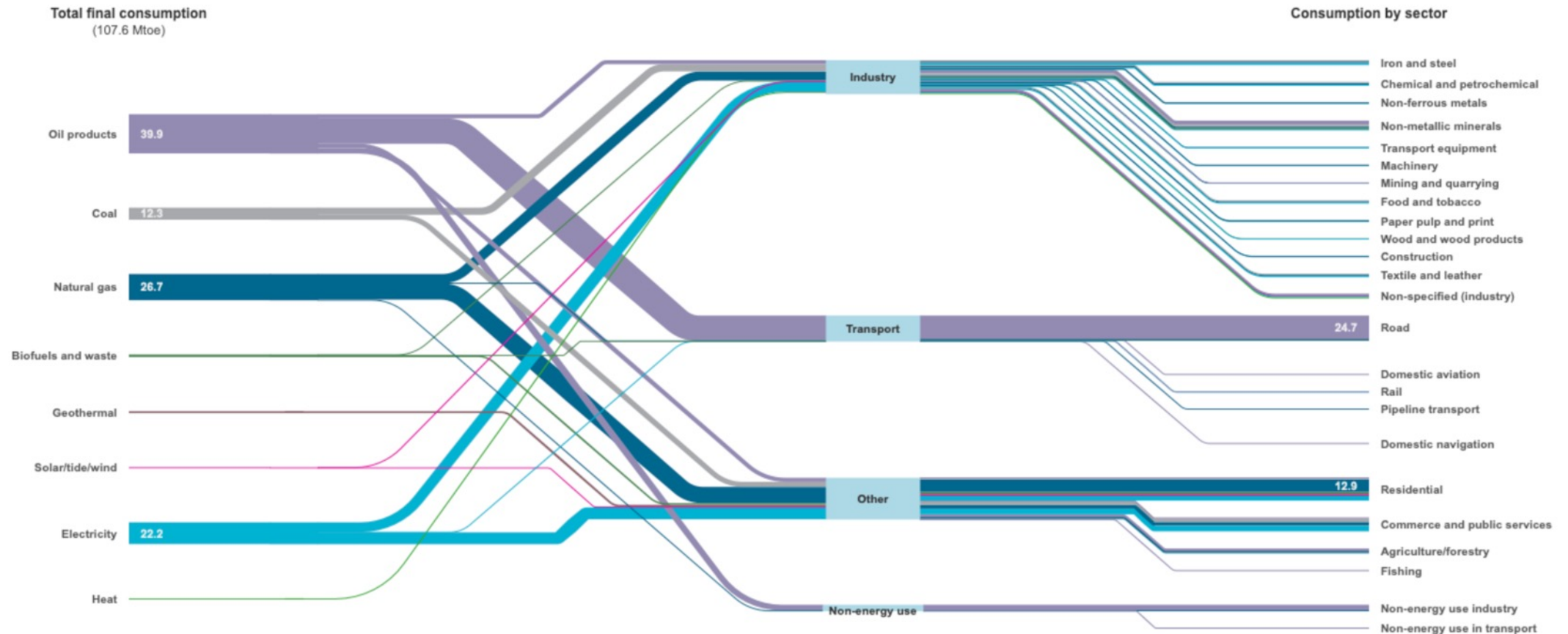
<https://www.iea.org/sankey/#?c=Turkey&s=Balance>

# Energy Balances – Final Consumption- Sankey

Turkey

FINAL CONSUMPTION (2020)

Millions of tonnes of oil equivalent



<https://www.iea.org/sankey/#?c=Turkey&s=Balance>

# What is oil/gas/electricity price?

Question 1) How prices are formed?

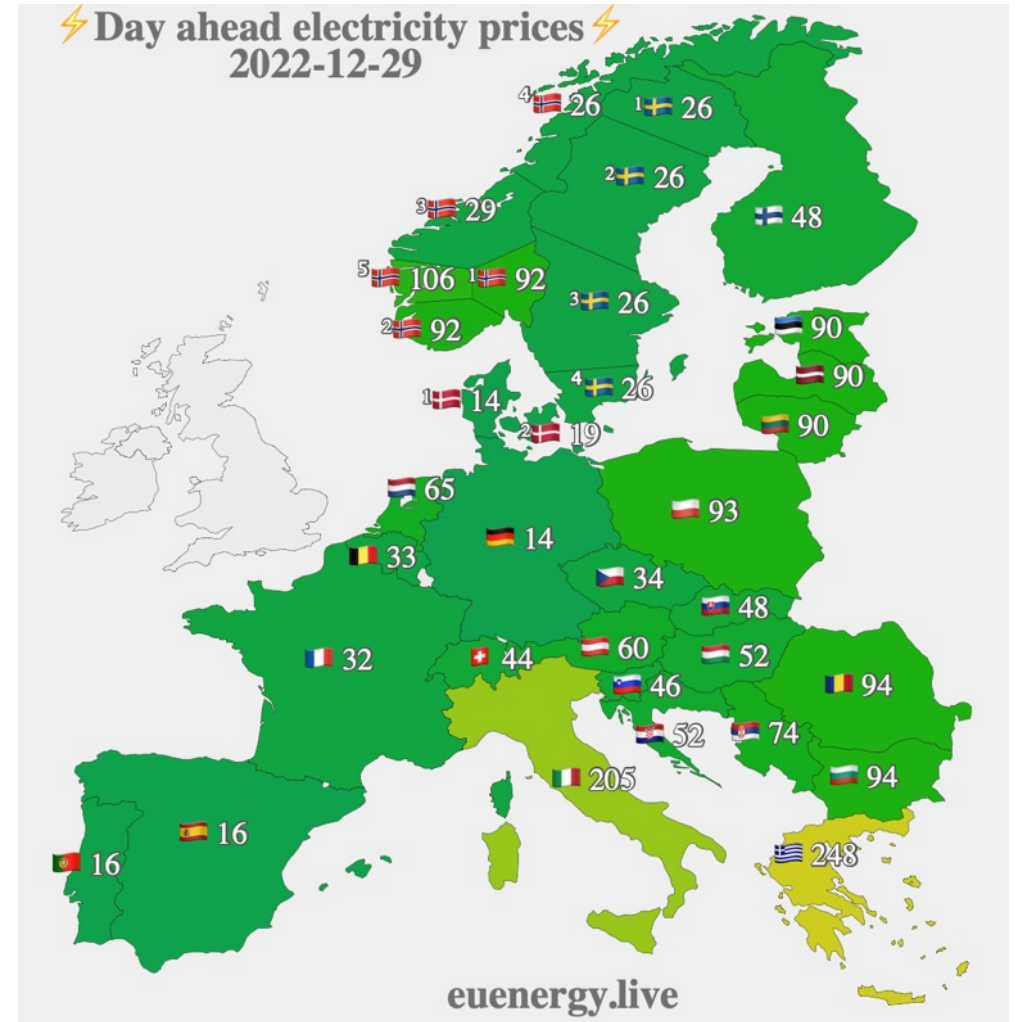
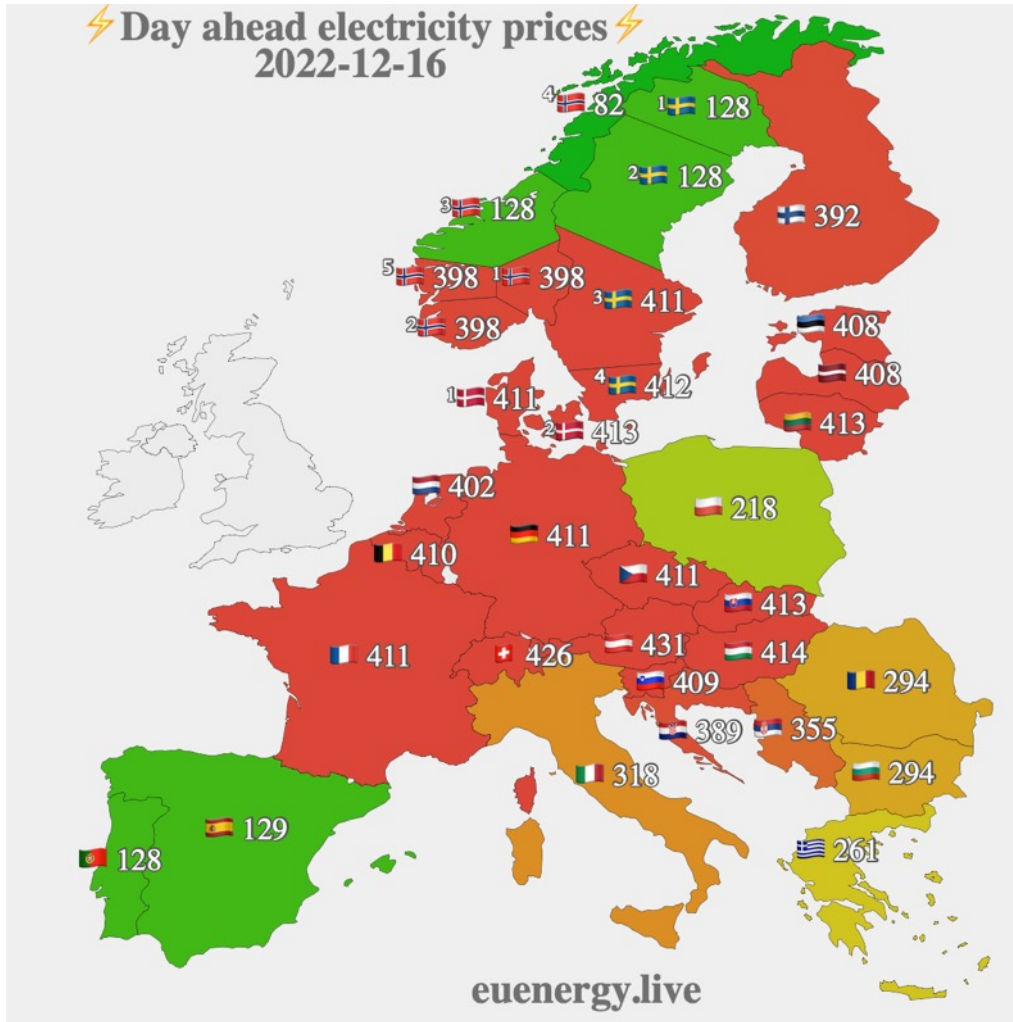
- a) Bilateral
- b) Central exchange
  - b.1) Marginal?
  - b.2) Pay-as-bid?

Question 2) Who declares the price?

- a) PRA (Price reporting agency)
- b) Central exchange

How many rules are there to form a market price?

$P_{\text{electricity}} = f(\text{weather, weather forecast}) ?$

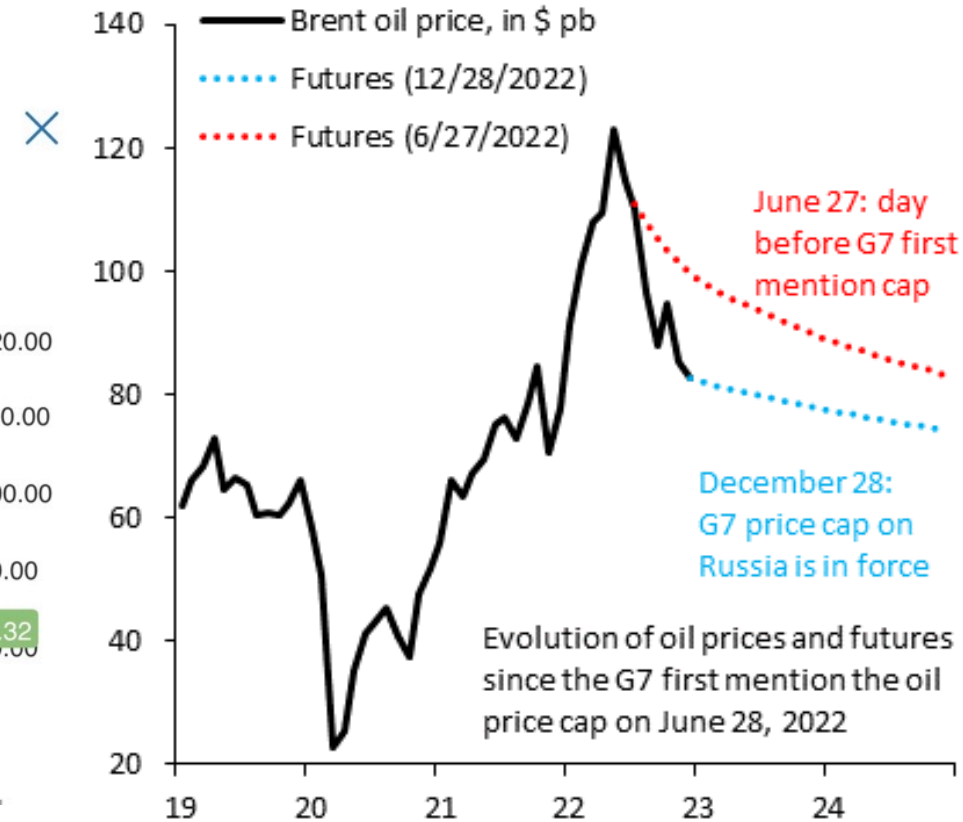
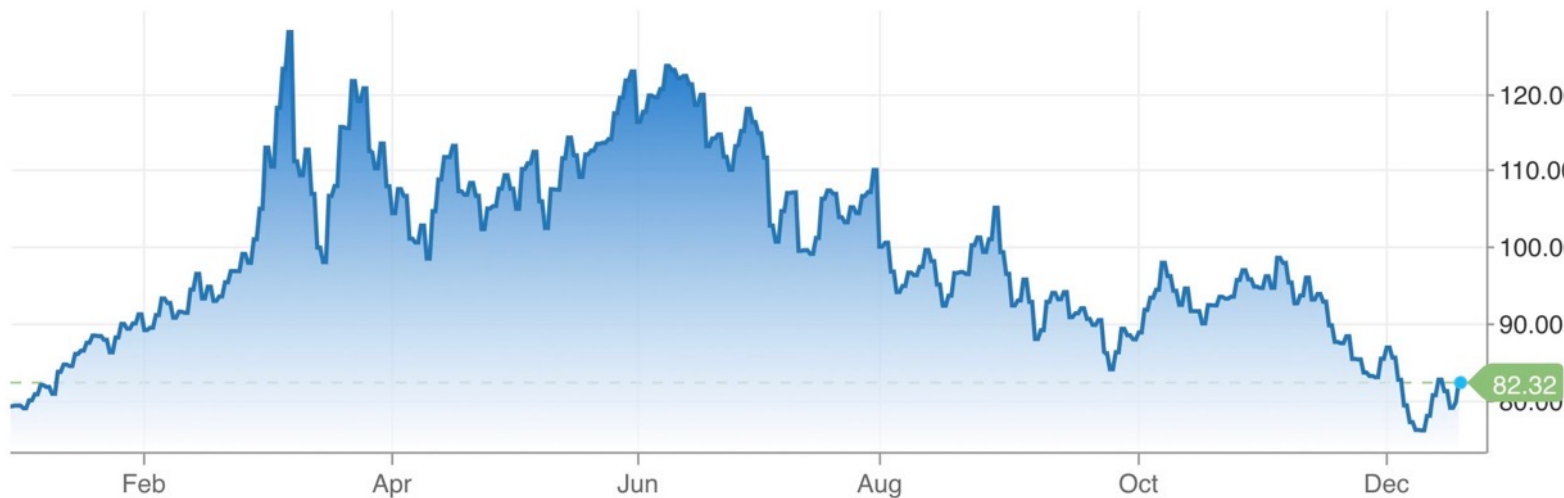


$$P_{\text{CrudeOil}} = f(\text{Producers, Demand, Stocks, Policies}) ?$$

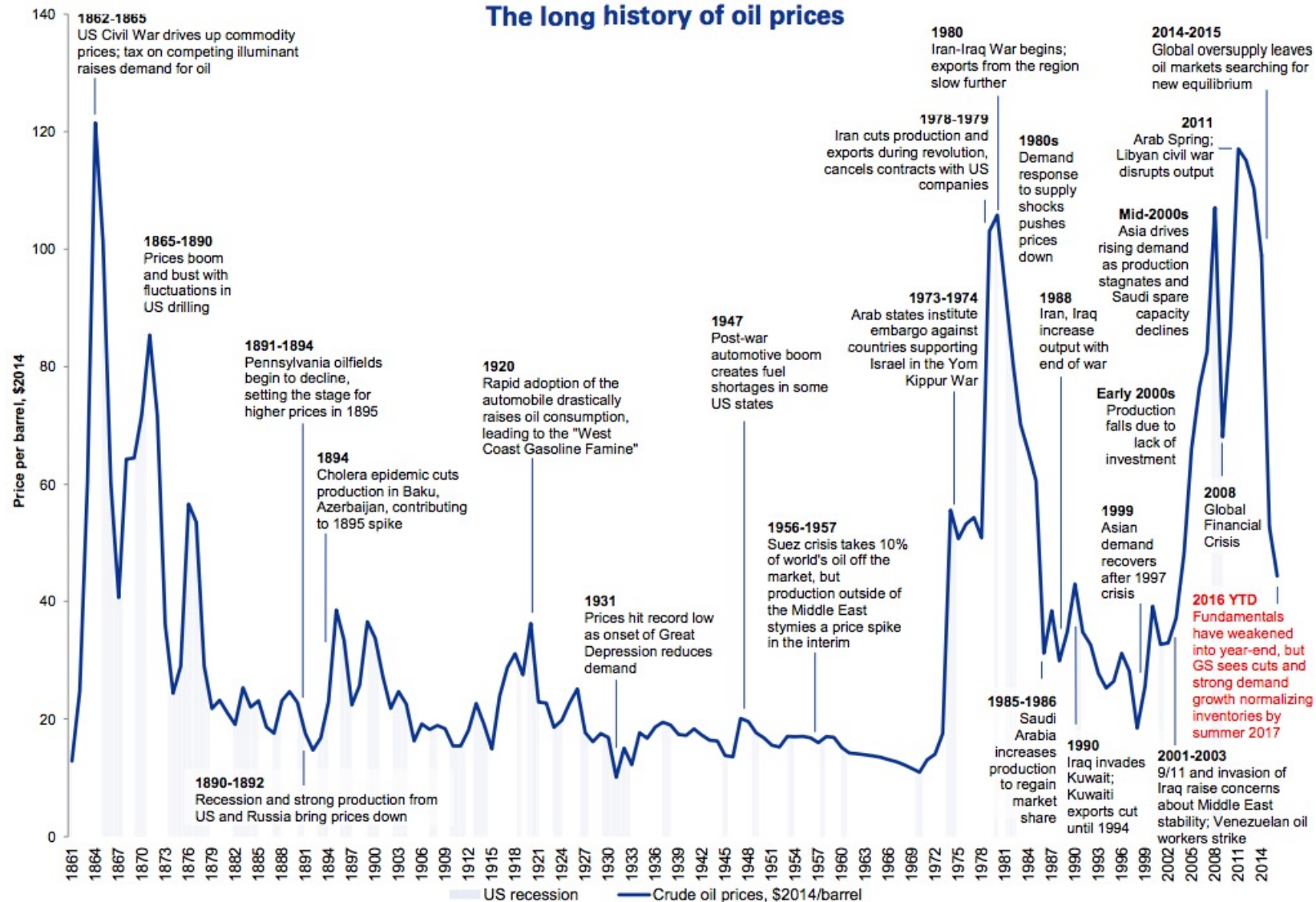
ICE Brent Crude (Feb'23) @LCO.1

82.32 ▲ +2.33 (+2.91%)

10:34 PM BST Data Is Delayed | Source: | USD



## The long history of oil prices



An earlier version of this chart appeared on pg. 16 of *Top of Mind Issue #52: OPEC and Oil Opportunities*.

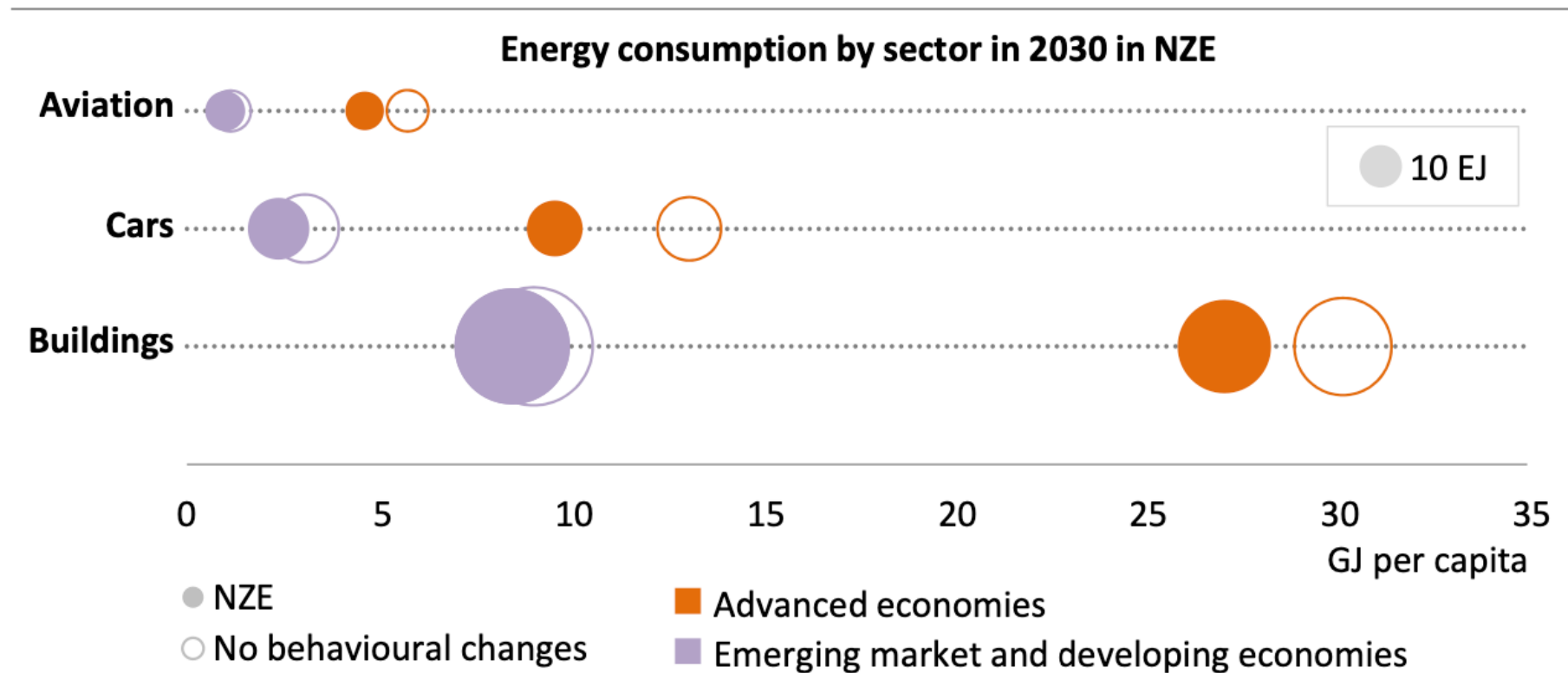
Note: 2016 price shown is YTD average as of Dec. 19, 2016.

Source for data: BP, NBER/Federal Reserve Bank of St. Louis, Haver Analytics.

Source for annotations: ©James Hamilton, "Historical Oil Shocks," University of California, San Diego, February 2011; various news sources; Goldman Sachs Global Investment Research.

<https://www.weforum.org/agenda/2016/12/155-years-of-oil-prices-in-one-chart/>

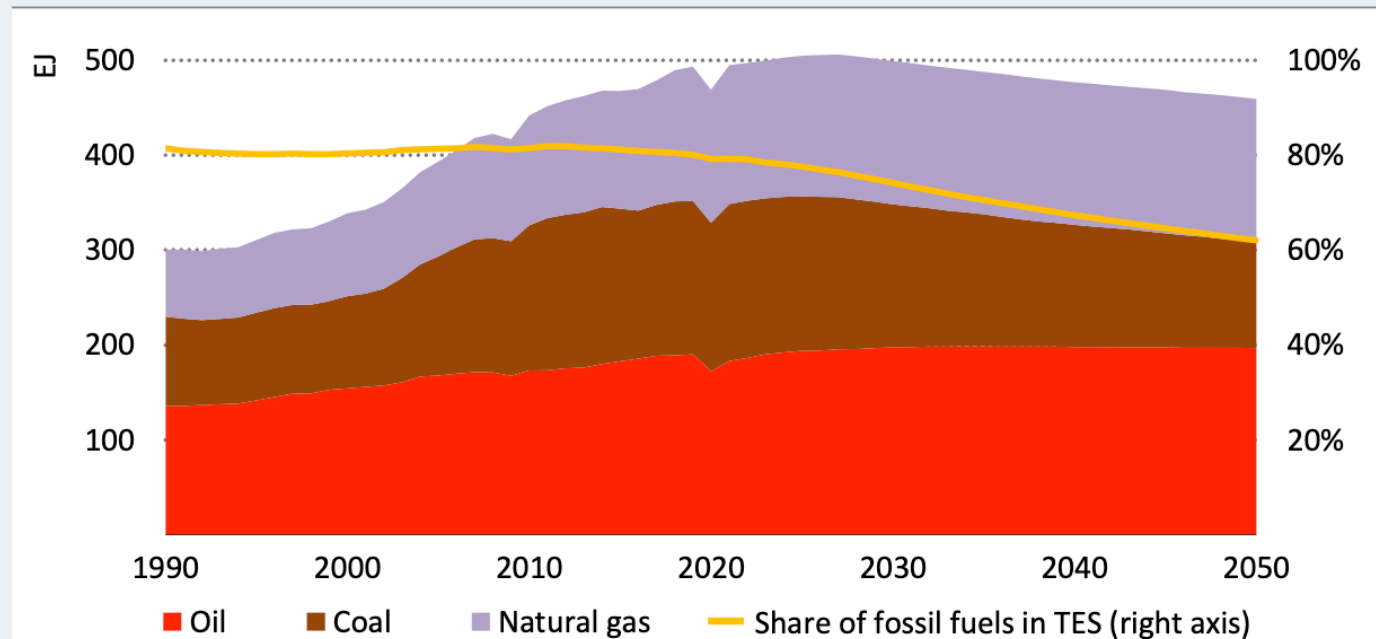
# End of energy use?





# Is it the end of fossil fuels?

**Figure 1.9** ▷ Fossil fuel demand in the STEPS, 1990-2050



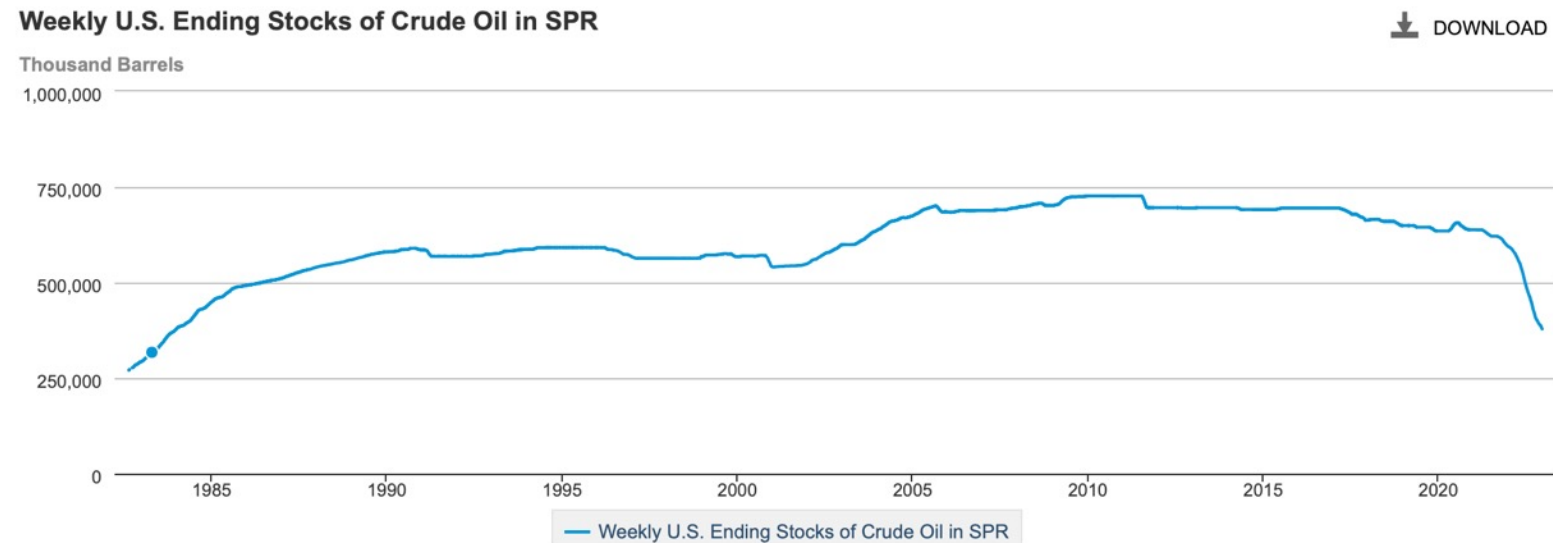
IEA. CC BY 4.0.

Total fossil fuel use sees a definitive **peak** for the first time in this year's STEPS. The share of fossil fuels in the energy mix falls to around 60% in 2050, a clear break from past trends

Note: EJ = exajoule; TES = total energy supply.

# Global Energy Crisis?

- Diverging priorities – US (crude oil)

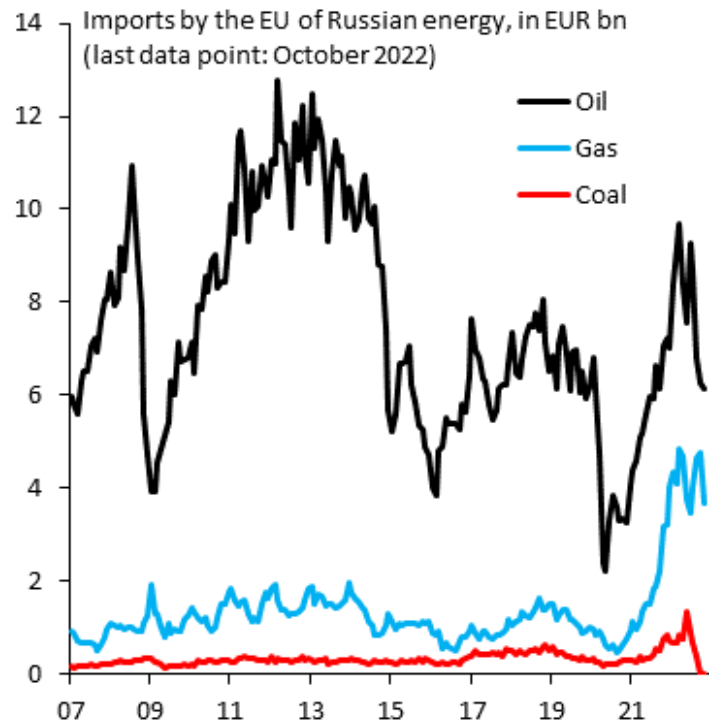


 Data source: U.S. Energy Information Administration

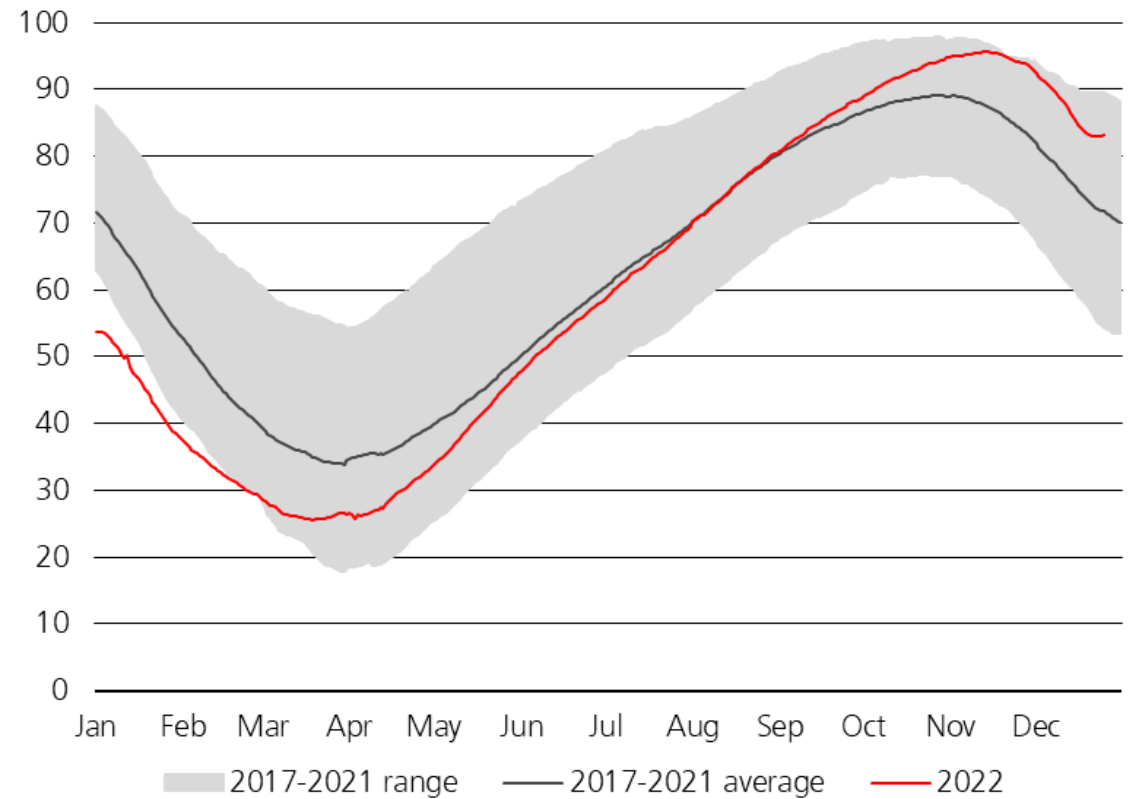
<https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WCSSTUS1&f=W>

# Global Energy Crisis?

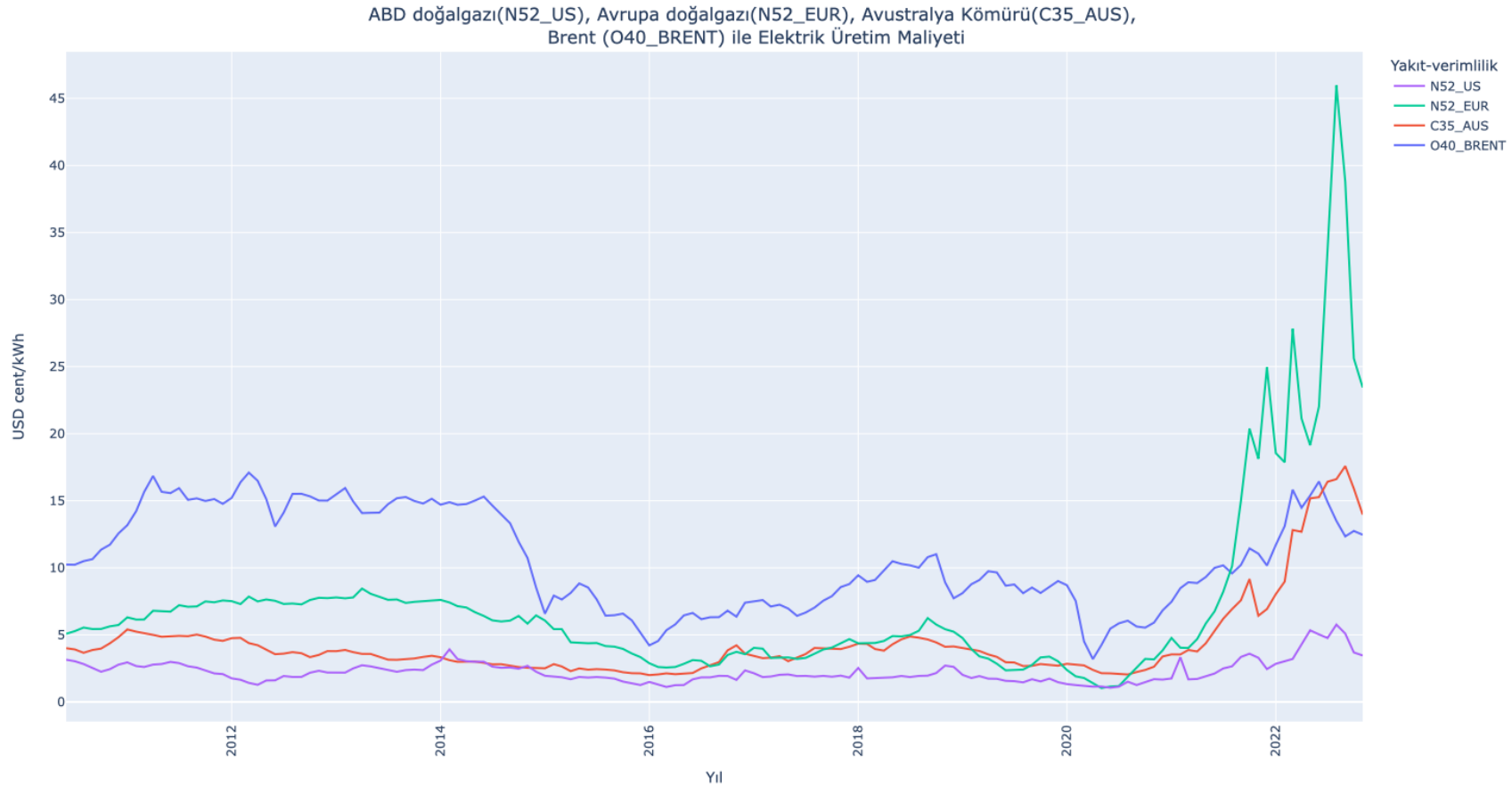
- Diverging priorities (EU – Gas)



<http://agsi.gie.eu>



# Electricity generation costs



# Prices and Markets

- Prices are compressed information (a vector?) of now and expectations
- Markets are social constructs
- If there is consensus
  - New definition
  - New price formations are possible

Example: EU Gas Cap

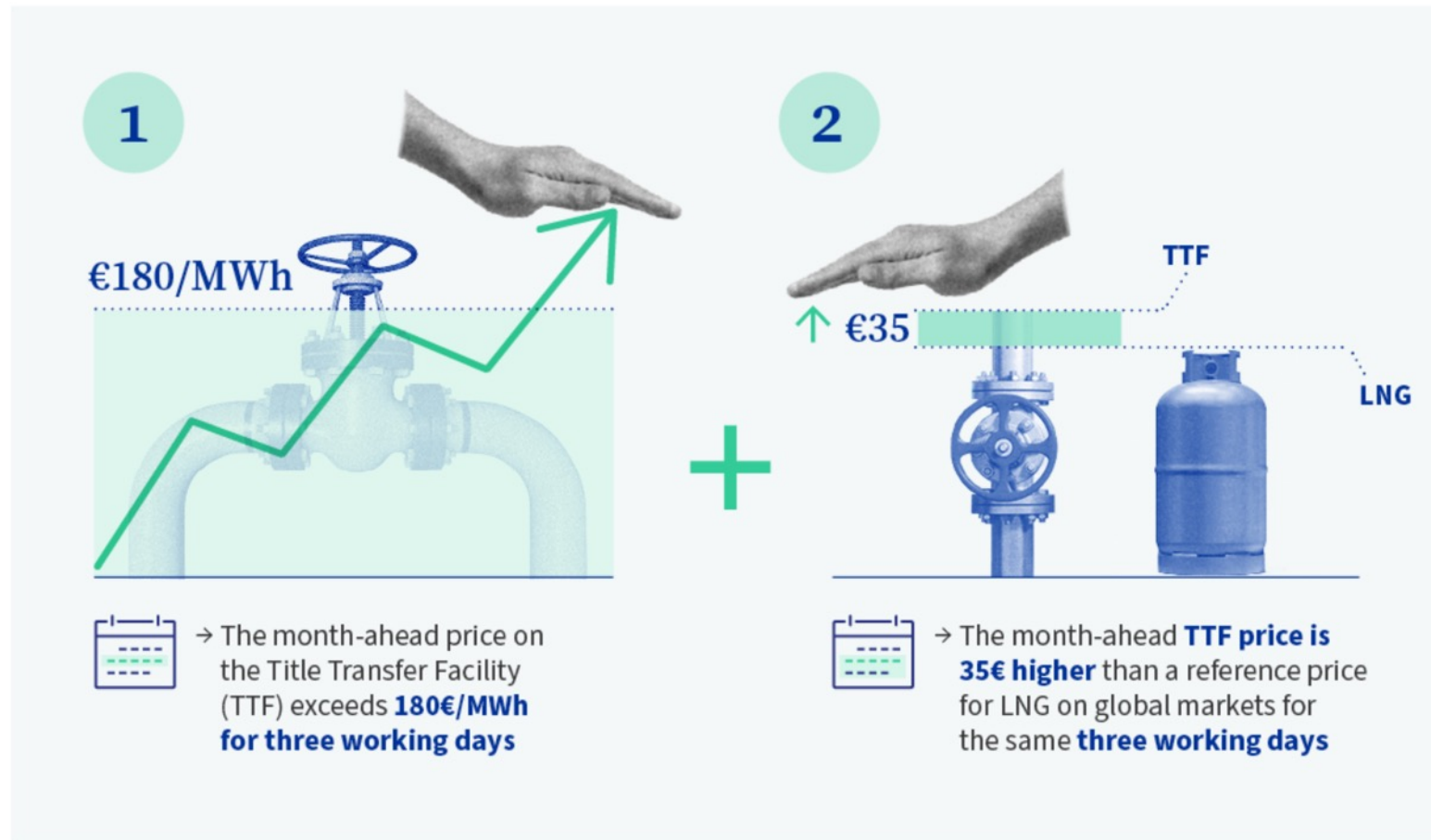
# Market Correction Mechanism

The market mechanism will:



Source: ICE index

# Market Correction Mechanism



The Title Transfer Facility (TTF) is a virtual trading platform used as a reference to set the price of natural gas in the EU.

# Which price

FRONT MONTH Delivery Range  
**SparkNWE-B-F** Jan, 23

🔴 \$ (6.605) / MMBtu 📅 8  
▲ 2.110

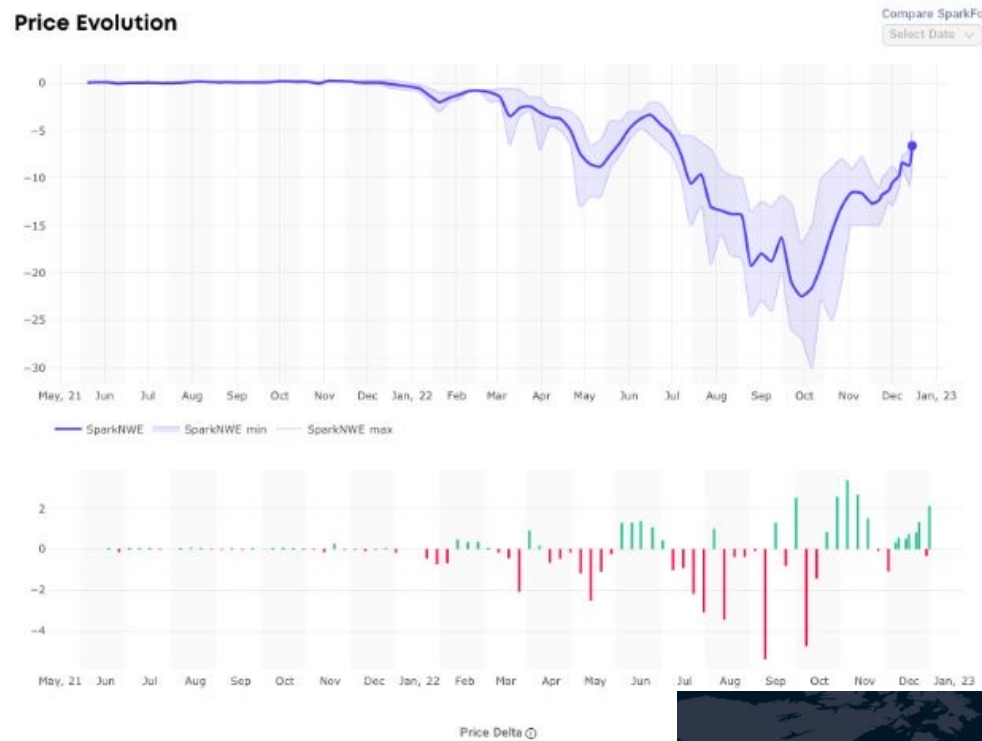
1H 🔴 \$ (6.865) ▲ 1.820  
2H 🔴 \$ (6.350) ▲ 2.400

FRONT MONTH Delivery Range  
**SparkNWE DES LNG** Jan, 23

🟢 \$ 35.461 / MMBtu  
▲ 1.296

1H 🟢 \$ 35.200 ▲ 1.006  
2H 🟢 \$ 35.715 ▲ 1.586

## Price Evolution

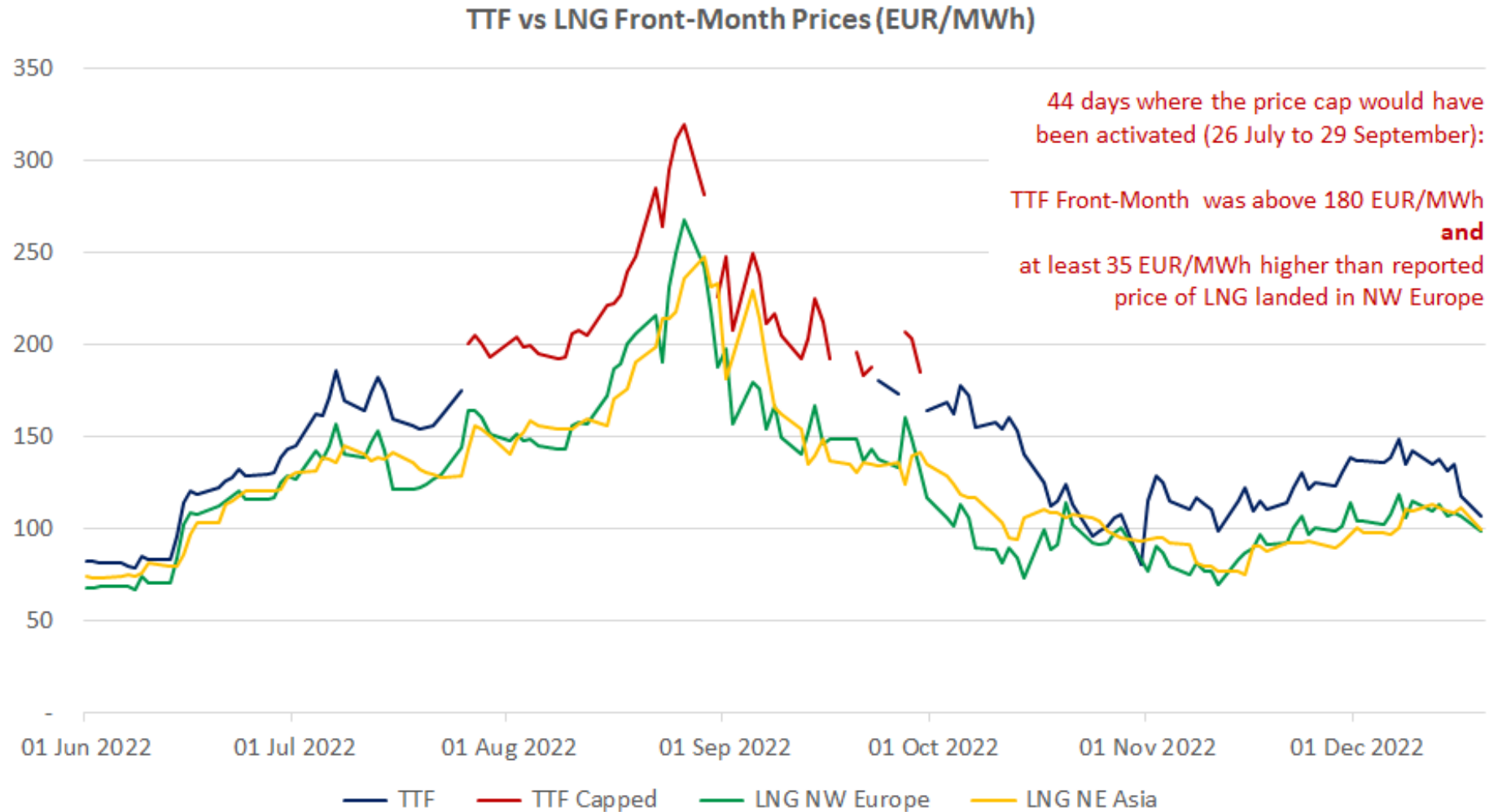


Copyright 2022 Spark Commodities





# Red prices - Trigger



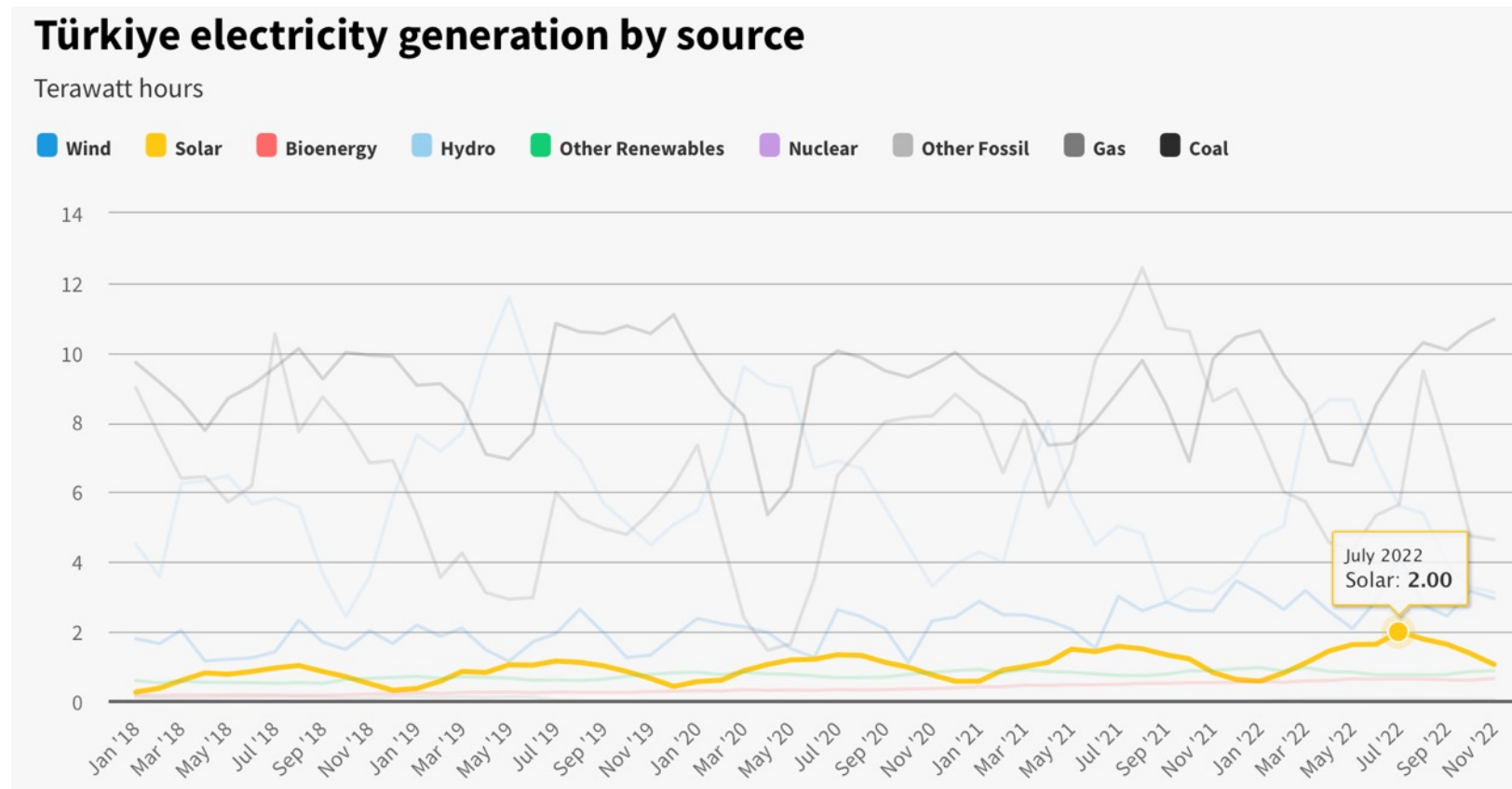
# Electricity Market Reform? – Tools:

Wholesale market - location	National pricing		Zonal pricing		Nodal pricing		
Wholesale market - tech	Unified market			Split by characteristic			
Wholesale market – balancing	National			Local then national			
Wholesale market – price formation	Pay-as-clear			Pay-as-bid			
Wholesale market – dispatch	Self-dispatch			Central dispatch			
Mass low carbon power	Existing CfD	CfD with more price exposure	Deemed generation CfD	Supplier obligation	Revenue cap and floor	Dutch subsidy	Equiv. firm power auction
Flexibility	Optimised CM	CM with flex enhancements	Supplier obligation (inc. CPS)		Targeted tender	Strat. reserve	
Capacity adequacy		Capacity payment	Centralised reliability option	Decentralised reliability option			
Operability	BAU	BAU+	Local markets	Changes to CfD/CM design	Co-optimisation	Dedicated support scheme	

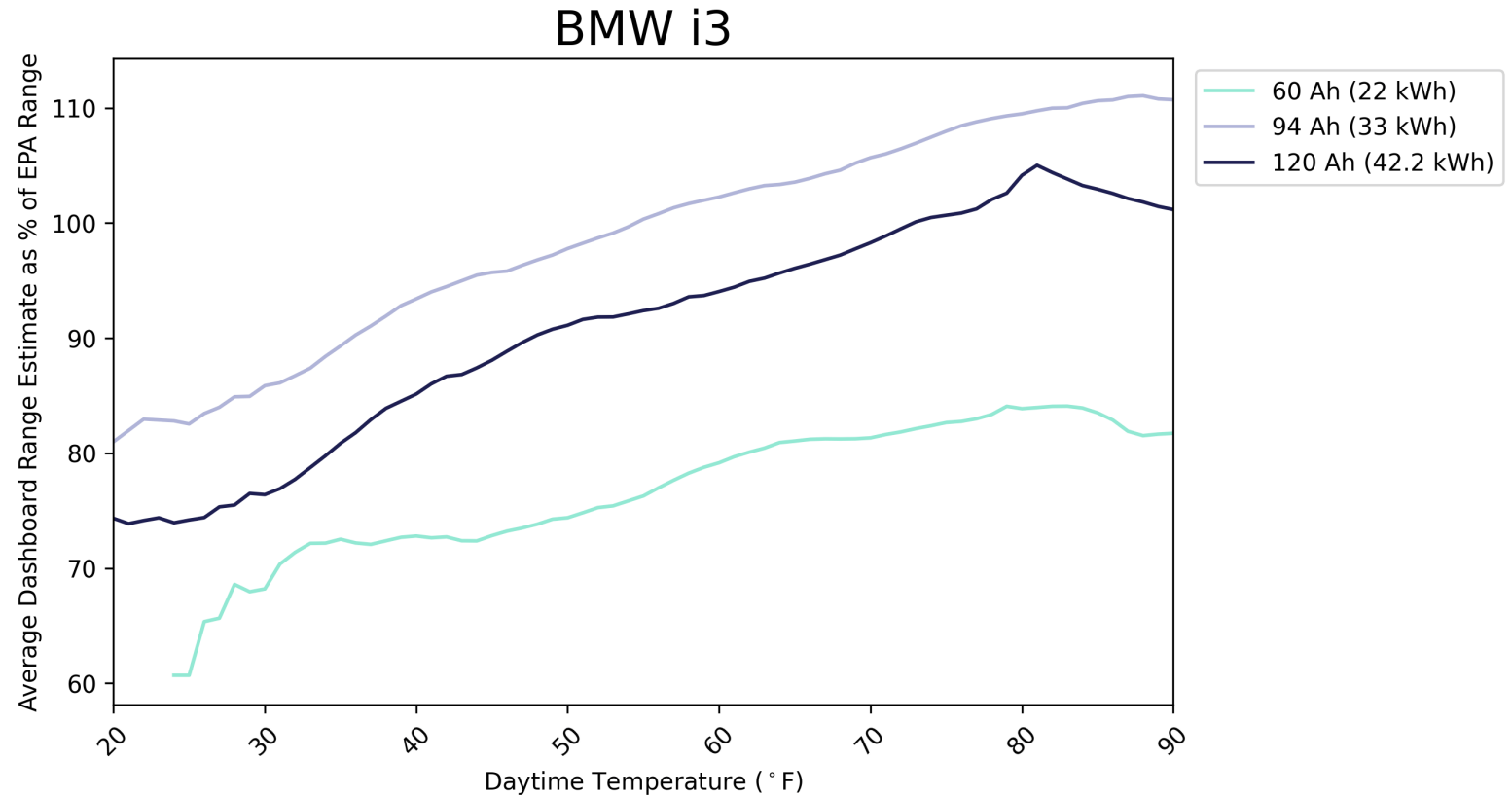
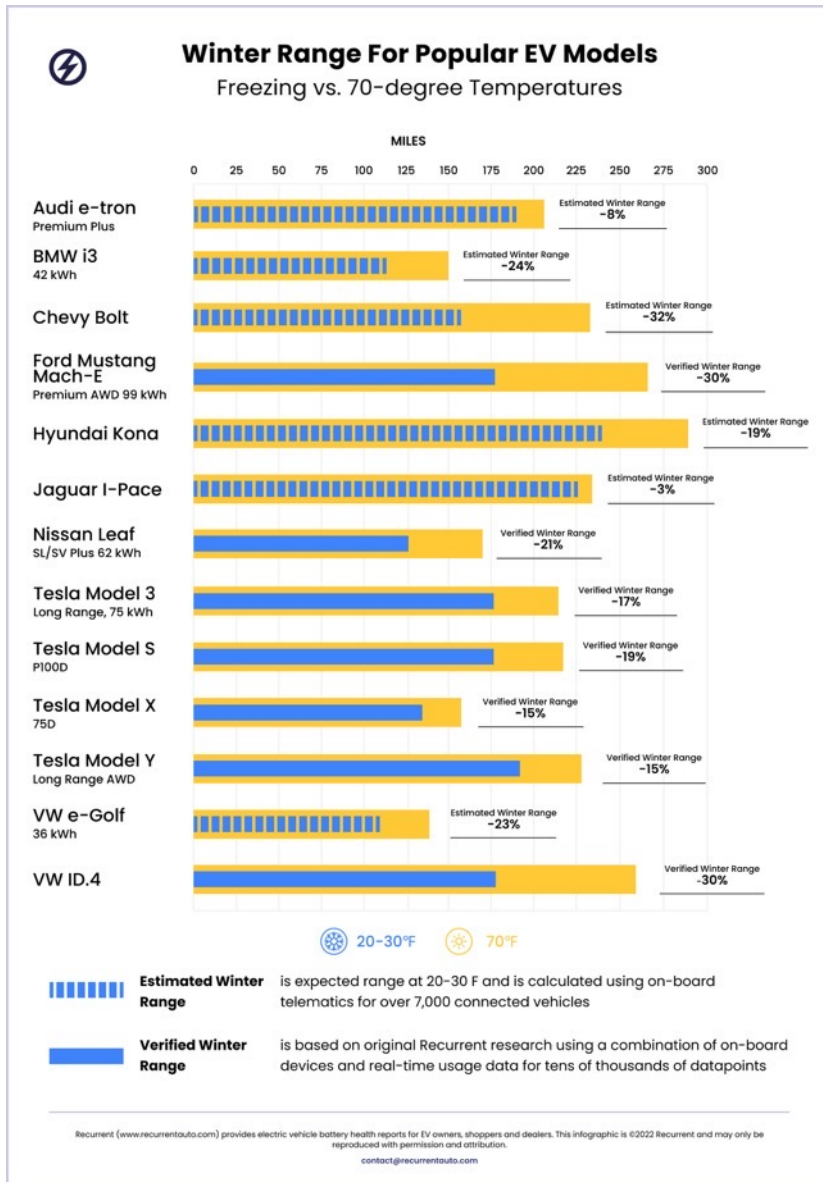


# Net Zero – Curse of Zero?

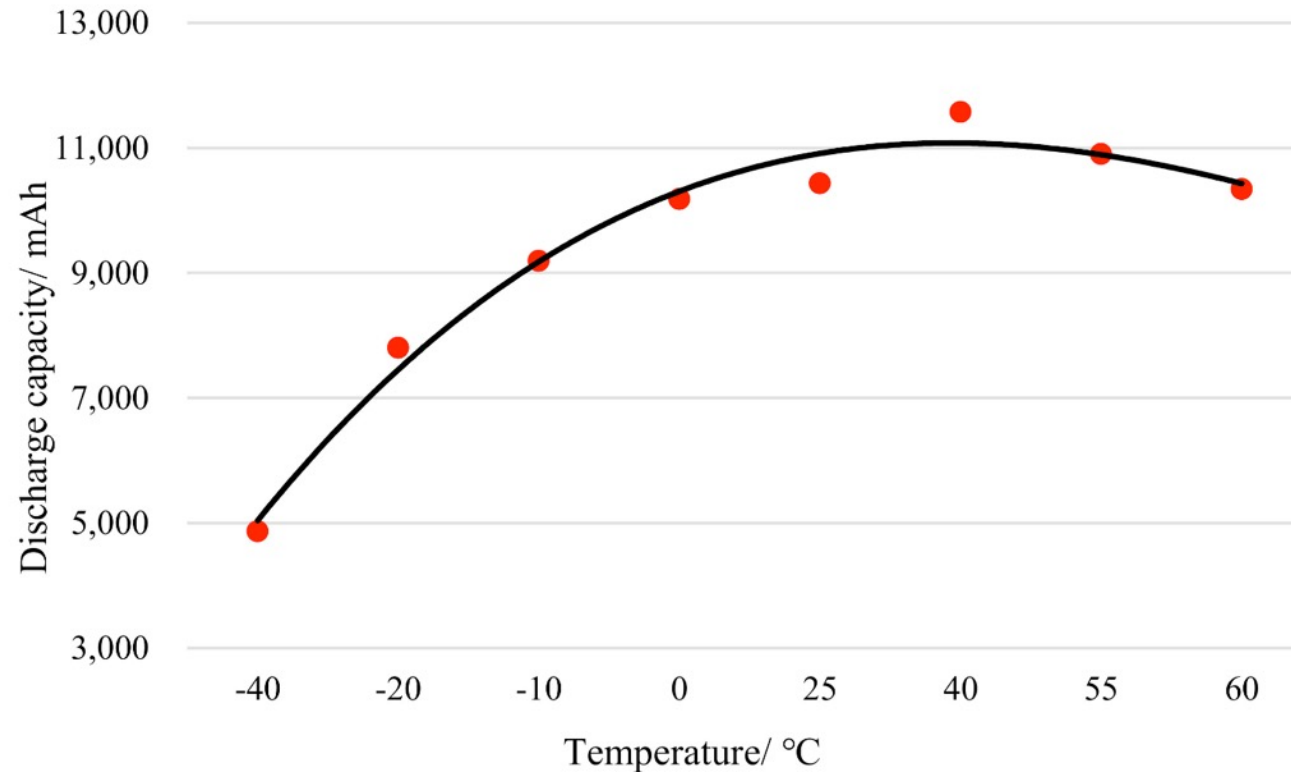
- Why?



# How EV revolution is going?



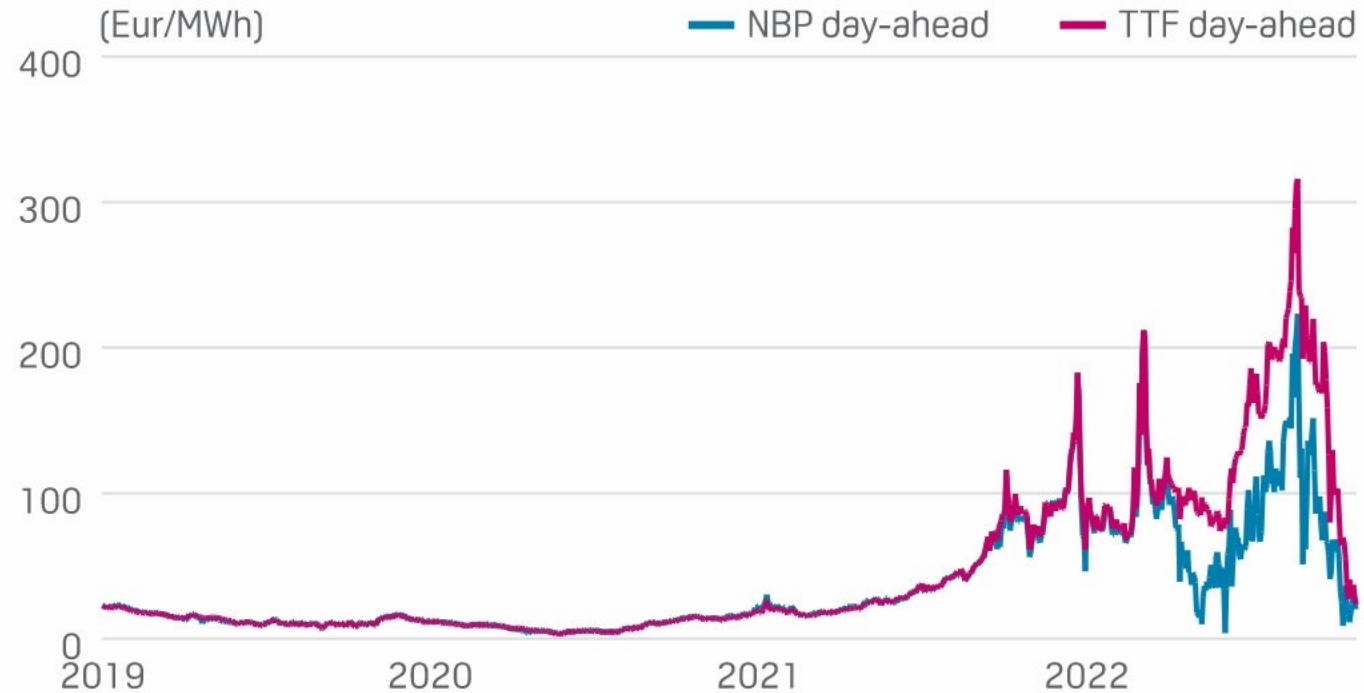
# Lithium charge capacity vs temperature



**Figure 3.** Fitting curve of discharge capacity of a lithium iron phosphate battery at different temperatures.

# Algo Trading

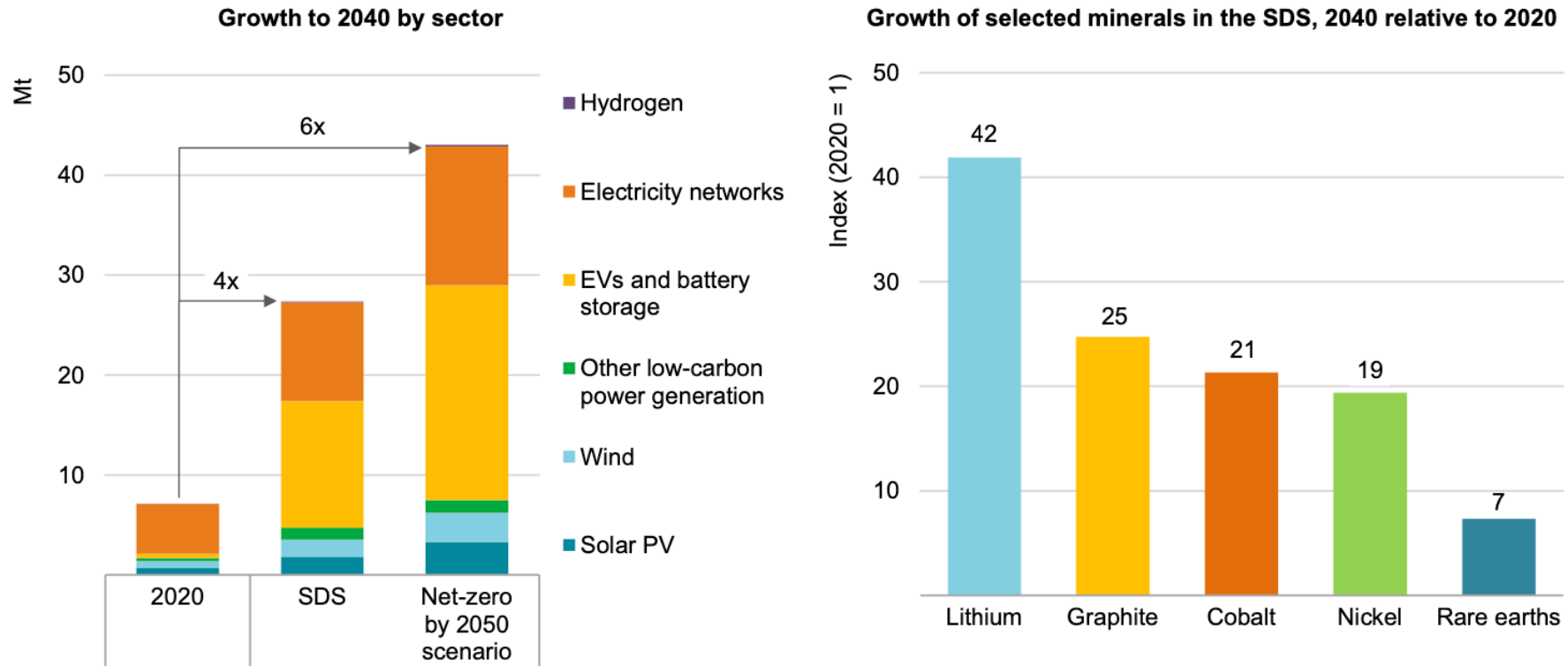
## VOLATILITY ON THE TTF, NBP GAS HUBS RISES



Source: S&P Global Commodity Insights

# Critical Minerals

Mineral demand for clean energy technologies by scenario



IEA. All rights reserved.

Notes: Mt = million tonnes. Includes all minerals in the scope of this report, but does not include steel and aluminium. See Annex for a full list of minerals.

# The road ahead

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- If technologies change, markets have to change
  - Insurance markets with autopilot mode cars
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