



INTERNATIONAL UNION  
OF RAILWAYS

# Energy Saving Taskforce

## Session 3 – Energy Markets

Workshop UIC Paris  
01/03/2023

# Agenda

09.30 – 17.30,

- 09.00 Networking coffee starting
- 09.30 Welcome, introduction
  - Intro/Recap Task Force outcomes
  - International Energy Agency: the crisis, the energy market and the "electricity market" report  
Keynote speaker Oskaras Alsuskas, IEA
- 09.50 Parallel sessions
  - Session (Christophe Gueudar Delahaye, SNCF and Matthias Tuchschnid, Johannes Estermann, SBB)
    - Operational
    - Rolling stock (Christian Gerster, Alstom)
  - Session
    - Infrastructure (Gerald Olde Monnikhof, ProRail)
    - Buildings and stations (Andreas Toufexes, ProRail)
  - Session (Paul Hodgson, CFL Cargo and Bart Van der Spiegel, Infrabel)
    - Partnerships (eg European Commission, Energy market actors?)
    - Energy contracts (Energy purchasing negotiation, Hedging, ...)
- 11.30 Coffee break
- 11.50 First synthesis (Each group think about a way to feed the rest of the attendance)
- 12.20 Plenary exchange about first outcome
- 13.00 Lunch
- 14.30 Parallel sessions continued
- 15.00 Parallel sessions' focus: Implementation challenges and incentives
- 15.30 Prepare final synthesis
- 16.00 Synthesis
- 17.30 Conclusion, end of workshop
  
- 18.00 Drink reception (Lobby or rooftop if sunny)

# Agenda

- 09.50 – 11.30      Collect information
  - 09.55: Market organisation: Who is responsible? Role of IM? What is possible for RU?
  - 10.25: Volume: How is volume defined? Who takes the risks? Do you have a prediction model?
  - 10.55: Price: How is price defined? Who takes the risks? How are variations handled towards RUs?
- 11.50 – 12.20      First synthesis
- 14.30 – 16.00      Making proposals and prepare final synthesis
  - 14.30: Future evolution?
  - 14.50: Governmental support?
  - 15.10: Making proposals and prepare final synthesis

Your moderators: Paul Hodgson (CFL Cargo) and Bart Van der Spiegel (Infrabel)

Each block: introduction, input from survey, discussion

# **9.55**

## **Market organisation**

# Framework

## 1. Directives

*by European Parliament and European Council*

## 2. Commission regulation

*by European Commission*

## 3. Technical Specifications of Interoperability (TSI)

*by European Union Agency for Railways (ERA)*

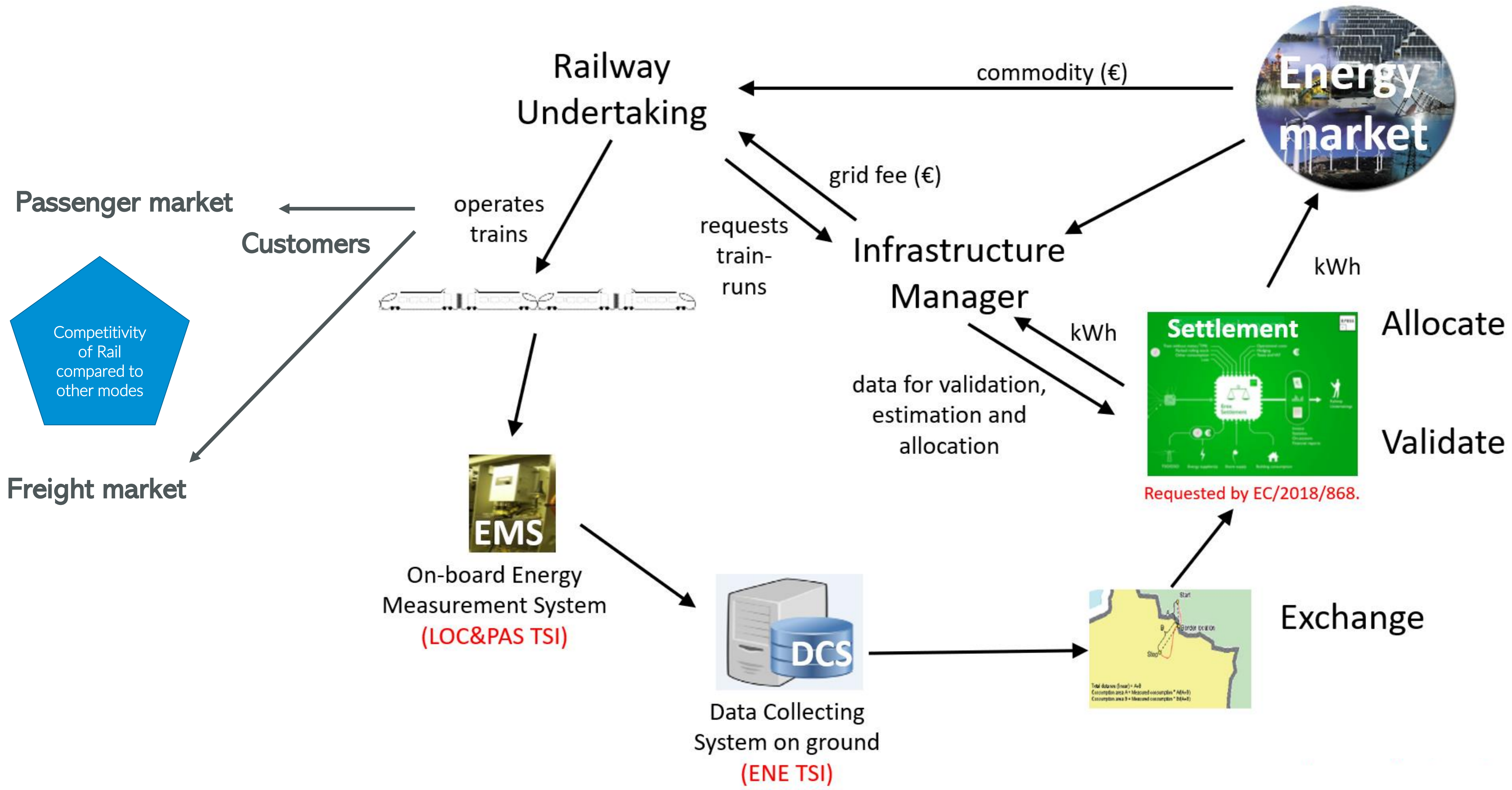
## 4. European Standards

*by CENELEC*

*NOTE When a TSI refers to a standard, this standard is then called harmonised. European Commission publishes every year a list of harmonised standards. Products compliant to harmonised standards are compliant with the EU regulation.*

# Regulatory framework: European directives

- Directive 2009/72: European Electricity Market:
  - Each customer is free to purchase electricity from the **supplier of his choice** (art. 2.12)
  - Different kind of grid operators: Transmission, Distribution and Closed Distribution
- Directive 2019/944 art. 4: RUs should be able to choose the energy supplier
- Directive 2012/34: European Railway Market
  - Services to be supplied to the Railway Undertakings by the Infrastructure Manager:
    - 1. The minimum access package shall comprise:
      - (e) use of **electrical supply equipment** for traction current, where available;
    - 3. Additional services may comprise:
      - (a) **traction current**, charges for which shall be shown on the invoices separately from charges for using the electrical supply equipment, without prejudice to the application of Directive 2009/72;



## Railway Undertakings:

1. RU will install EMS on all traction units where this is technically and economically feasible. This should result in 60% equipped in 2025 and 90% in 2030.
2. All EMS on new traction units shall be fully compliant with LOC&PAS TSI:2018. Non-compliances on retrofitted EMS shall be stated.
3. All new and renewed EMS shall send data to DCS at least every 4 hours and before intentional powering down.
4. RU shall be able to deliver to the IM train compositions by 2023. This shall be done preferably at departure of train-run.

## Infrastructure Managers:

1. IM shall provide DCS in accordance with ENE TSI:2018 latest in January 2022.
2. IM shall process data fast in DCS and exchange-function of Settlement and forward data without further delay in accordance with clause 5.4 of IRS 90930:2020.
3. International data exchanges will be in accordance with IRS 90930:2020.
4. IM enables a pragmatic approach to increase the possibilities of the RUs in the electricity purchasing strategy.
5. All relevant information is publically available.



# Survey (1)

- USA: At Amtrak, we purchase electricity in blocks of 2-3 yr contracts and we stagger the expiration of these contracts. This helps alleviate volume and price risk. We also share the cost with commuter transit agencies that operate on our network.
- Cargo operator running in Austria, Germany, Italy, Croatia, Slovenia, Slovakia, Czech Republic, Romania, Russia, Hungary, Polonia, Bosnia, Turkey, Bulgaria: mostly monopoly, in Germany free market
- The Netherlands: The RU work together in two purchasing collectives (VIVENS for most of network, CIEBR for Betuwe Route) and chose together their own supplier. In the future potentially one purchasing collective. Possibly ProRail will also enable free choice of supplier.
- In Germany DB Energie as IM is only balance responsible party. DB Energie can also be supplier of energy, but not under the role of IM.
- At present, Spanish electricity law does not allow RUs to purchase traction electricity from suppliers. IM chooses supplier via public tender. RUs participate in the design of the tender.
- Poland: Fees for electricity are divided into 2 parts - a distribution fee and a fee for the electricity itself. Distribution fees are subject to approval by the Energy Regulatory Office and are the same for all carriers, both freight and passenger. Currently, the distribution fee is approx. 35% of the total energy price.

## Survey (2)

- BE : through IM or contract between RU and supplier (if EMS on all trains)
- NL : RUs chose together supplier in two purchasing collectives
- FR : through IM or contract between RU and supplier
- DE : free choice of suppliers or through DB Energie (not as IM)
- PL : through PKP Energetyka (maintains traction network and sells traction electricity) or contract between RU and supplier (if EMS on all trains)
- UK : through purchasing collectives to a supplier
- AT : free choice of supplier, including through IM
- LU, SK, CH, IT, ES, NO, SV : through IM

# Market Types

RU Contract  
with supplier

<ul style="list-style-type: none"> <li>• Simple Market with Choice             <ul style="list-style-type: none"> <li>• Choice of suppliers</li> <li>• Energy procurement by RU</li> <li>• Standard energy rates</li> <li>• Little complexity</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Developed Market             <ul style="list-style-type: none"> <li>• Energy procurement by RU</li> <li>• Wide choice of purchasing strategies available</li> <li>• Choice of suppliers</li> <li>• Risk with RUs</li> </ul> </li> </ul>
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IM\* Contract  
with supplier  
« or National Body

<ul style="list-style-type: none"> <li>• Simple Market             <ul style="list-style-type: none"> <li>• Energy procurement by IM</li> <li>• Standard energy rates for users</li> <li>• Little involvement of RUs</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Developed IM Market             <ul style="list-style-type: none"> <li>• Energy procurement by IM</li> <li>• RUs can negotiate their own conditions</li> <li>• Risk on RU side</li> </ul> </li> </ul>
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Simple Contract

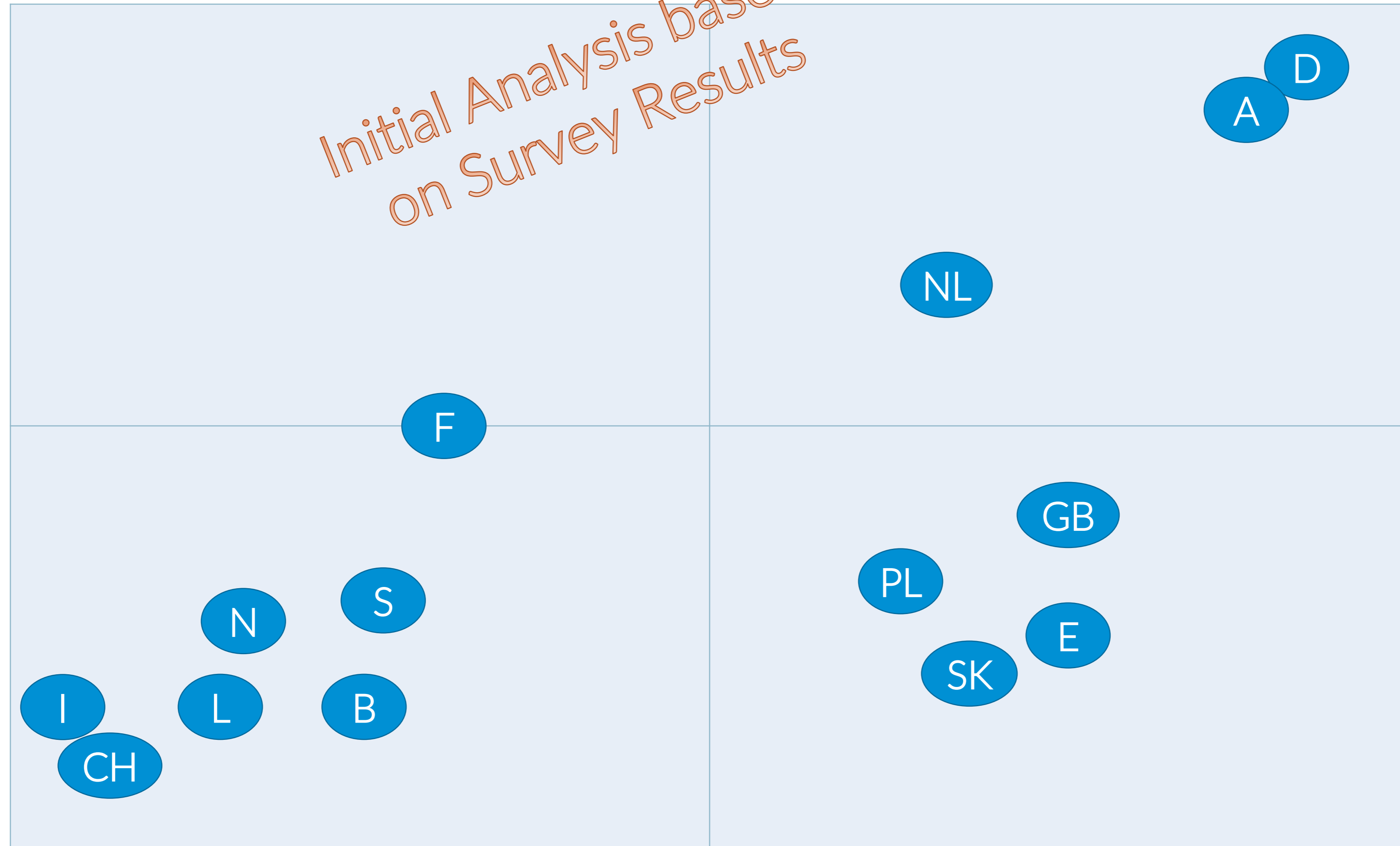
Developed Contract

# Market Types – where do countries sit ?

Initial Analysis based on Survey Results

RU Contract with supplier

IM\* Contract with supplier  
« or National Body



Simple Contract

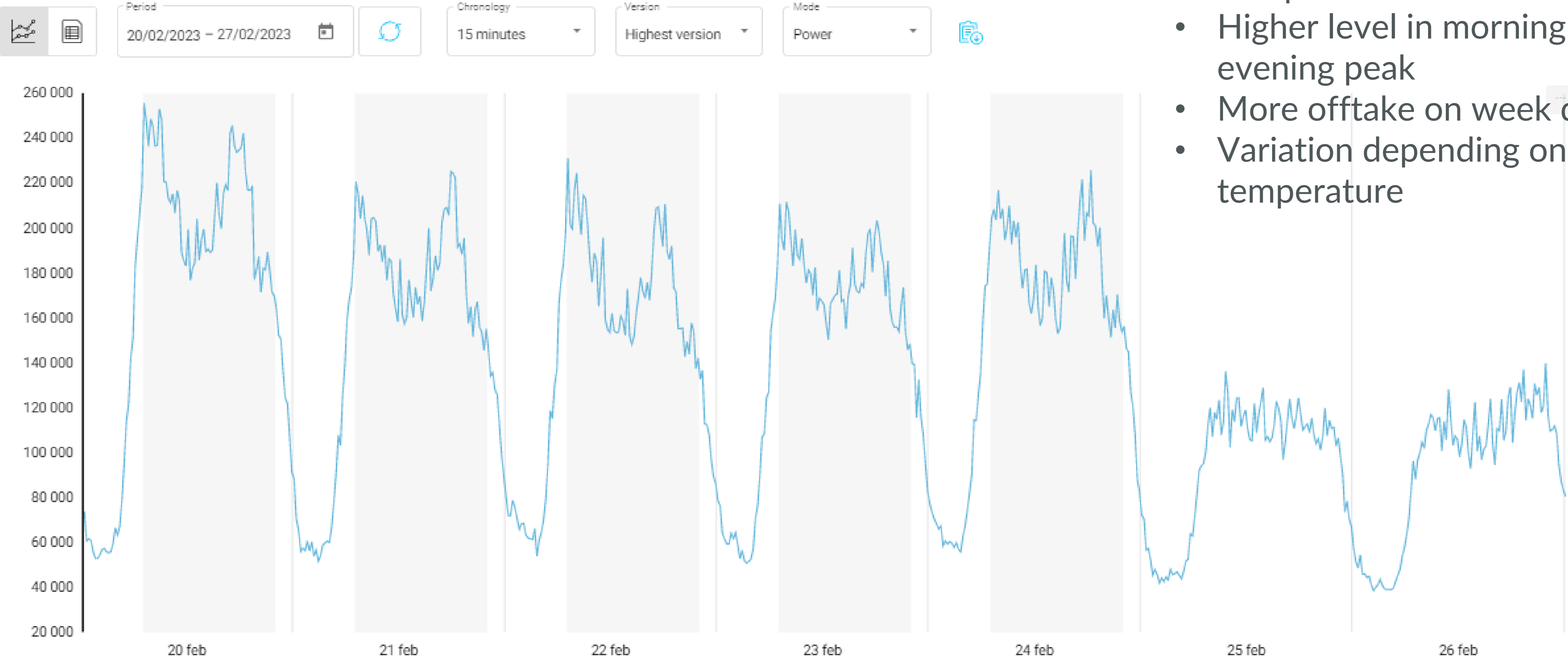
Developed Contract

# Discussion

- Purchasing by RU:
  - You can choose a contract that most fits your needs.
  - But you are responsible for balancing, meaning you will have costs if you have purchased energy and are not using it and also if you haven't contracted sufficient energy.

# 10.25 Volume

# Traction energy Belgium



- Low volume of baseload 60 MW
- Steep increase
- Higher level in morning and evening peak
- More offtake on week days
- Variation depending on temperature

# Survey

- BE : Up to 2024 electricity is purchased in one contract. Volume risks are for the supplier. Infrabel provides the historical data.
- NL : Actual contracts have still yearly bandwidths.
- ES : Volume risk is transferred to supplier (IM pays for the real consumption, electricity imbalance costs are on the supplier)
- SK: Up to 2021, there was one bulk purchase based on RU-IM negotiations, which was split into 4 "time zones" to reflect prices during peak and off-peak hours. The price was defined as an average of the chosen period in the future. For example, the price for 2021 was the market average of September to November 2020, the contract was signed in July 2020 after negotiations. Currently, in 2023, procurement takes place each month directly, with the price being the average of the market prices for the previous month. This method is less predictive.



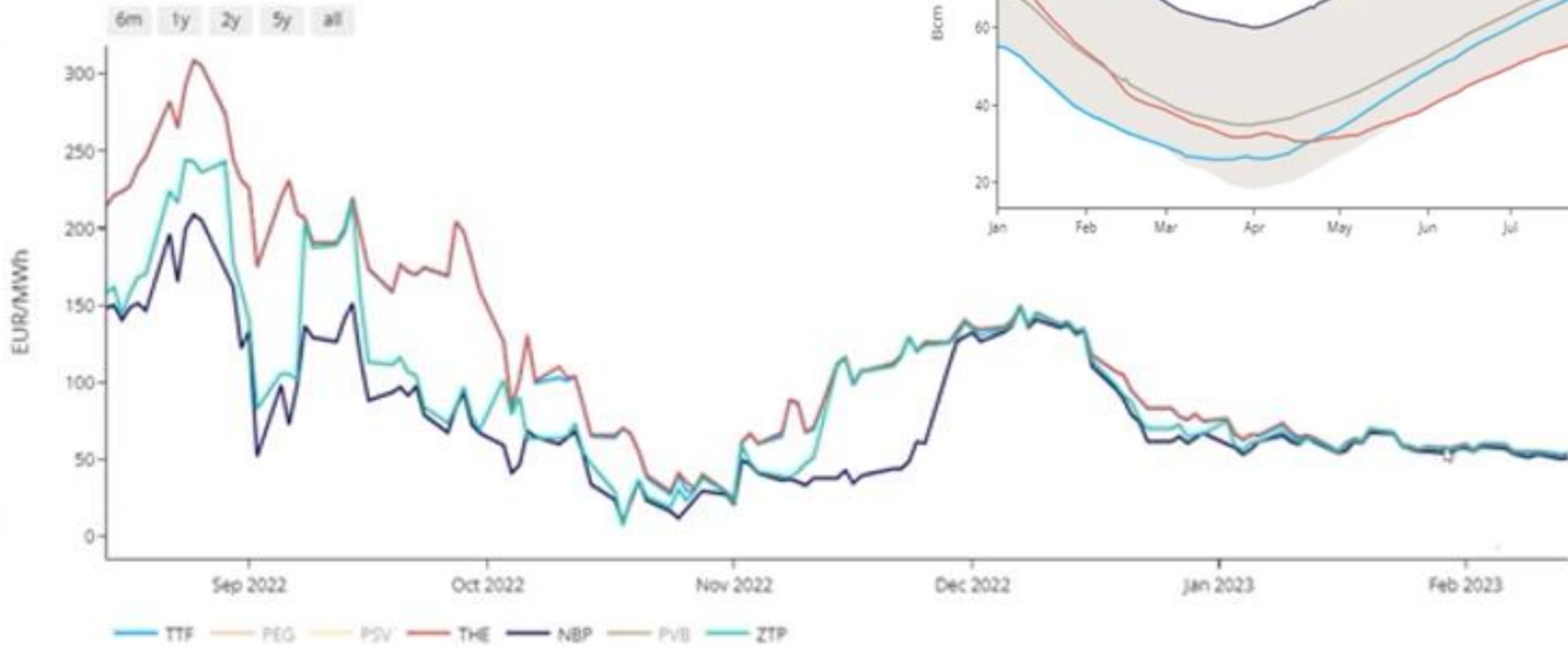
# Survey

- FR : for IM contract, RUs must give a provisional volume to be consumed. In case of under-consumption, the IM can invoice a penalty

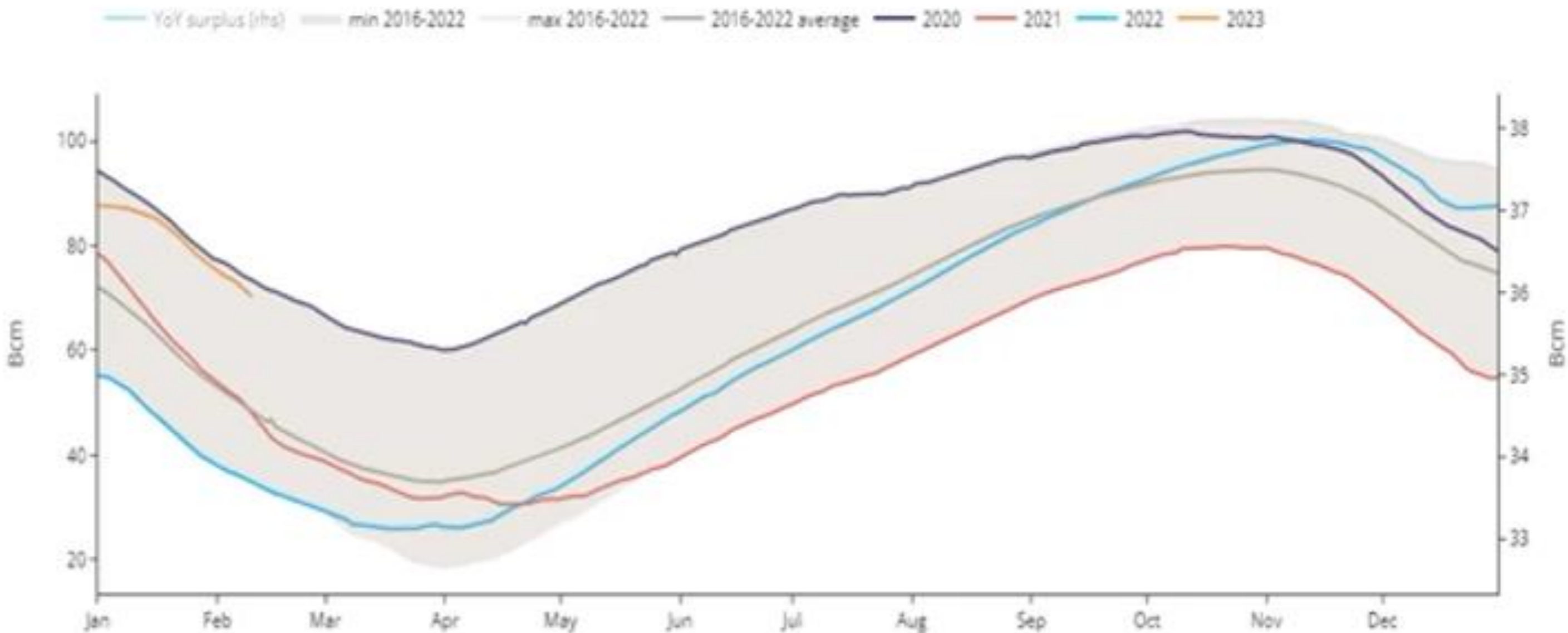
**10.55**  
**Price**

# Gas price defines electricity price

## EUROPEAN GAS DAY AHEAD



## EU STORAGE

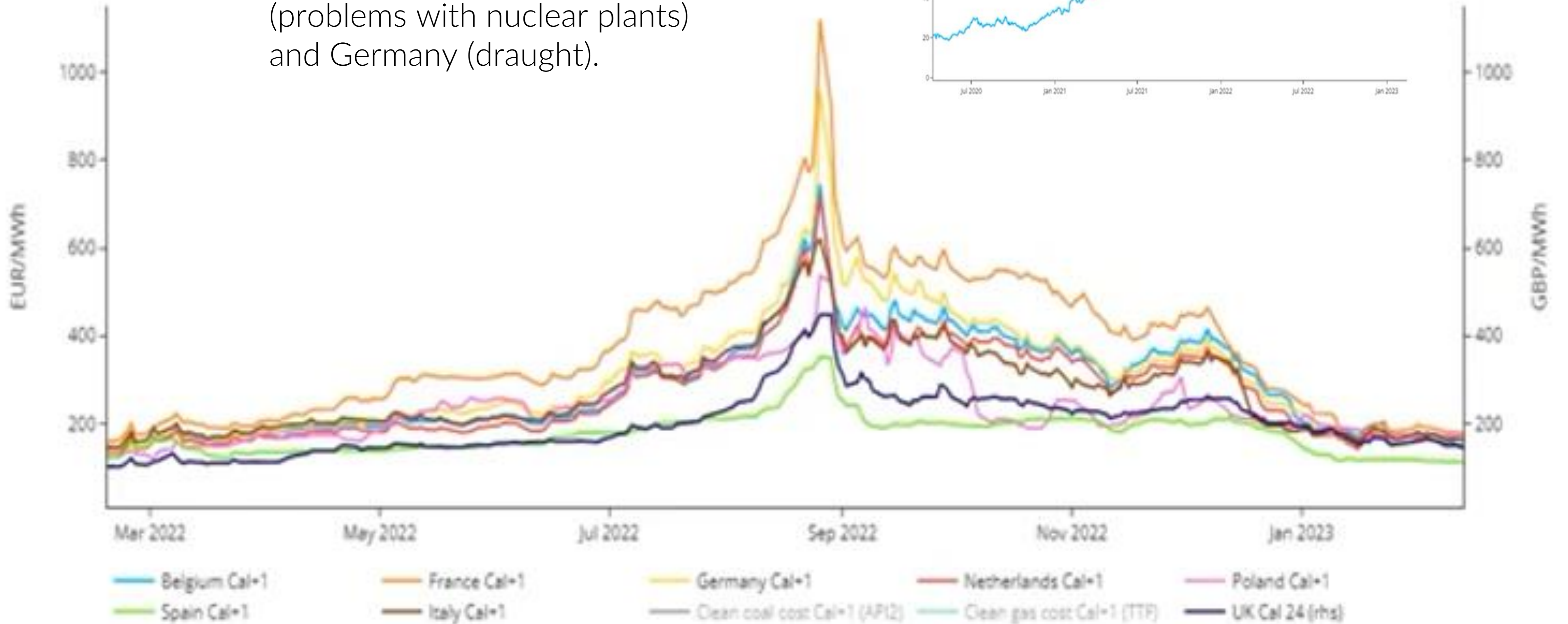


# Electricity price

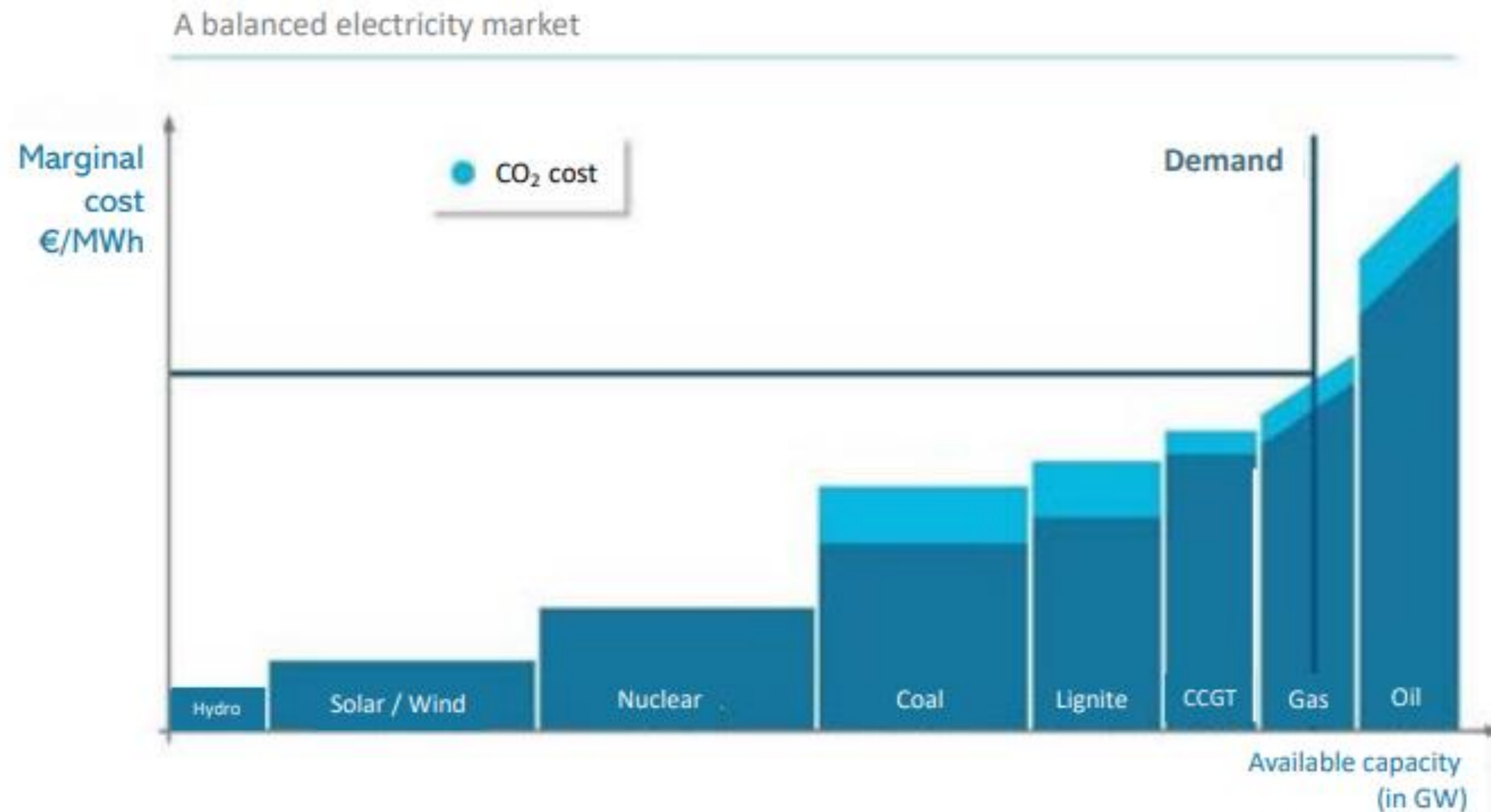
CO2 price increases but remains between 60 and 100 euro/ton

Peak price followed gas peak price. Higher prices in France (problems with nuclear plants) and Germany (draught).

## EU PRICES



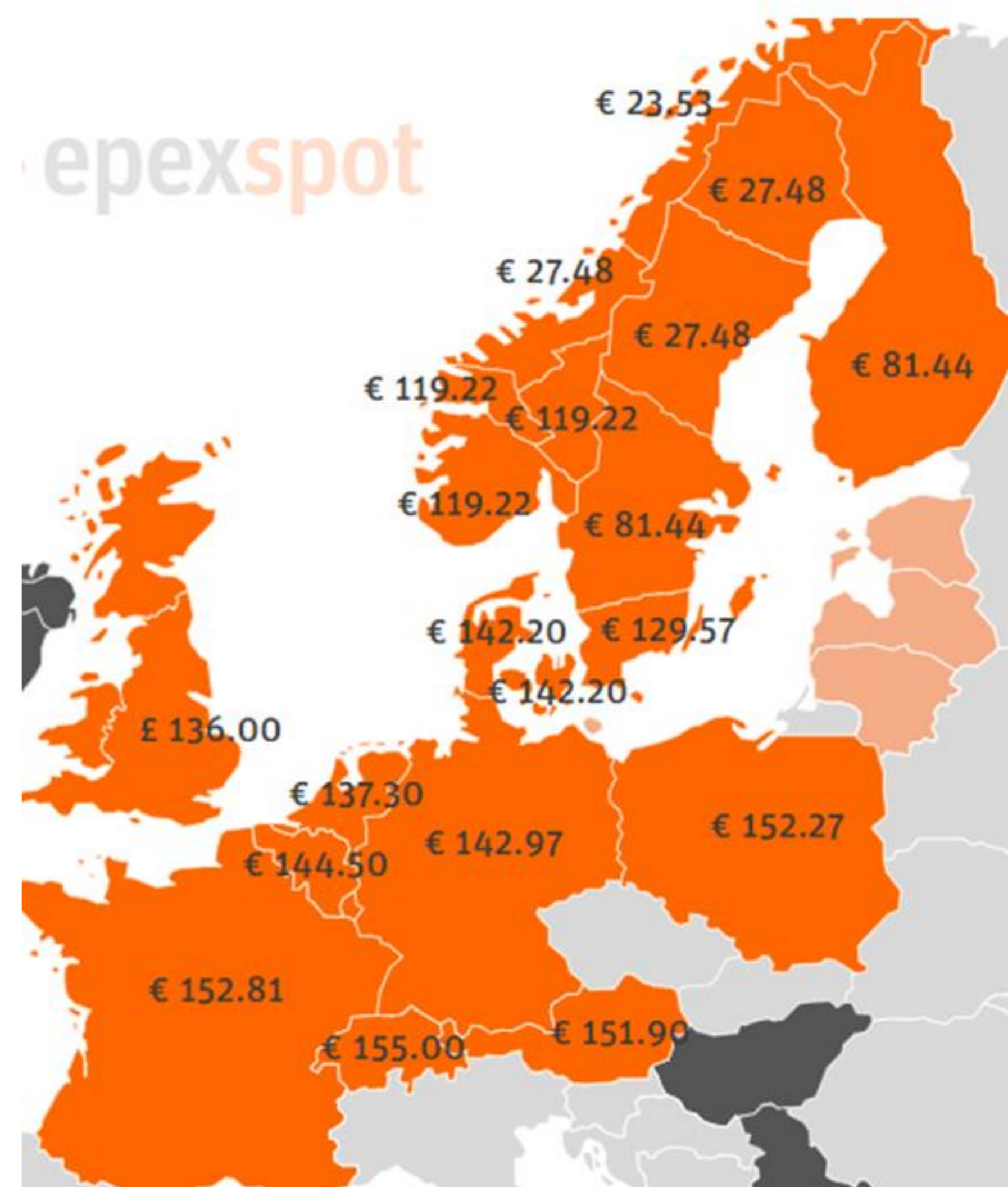
# Electricity spot market price is defined by marginal cost



The efficiency of a gas-fired power station is approximately 50%. So, to produce 1 MWh of electricity you need 2 MWh of natural gas. If the gas price is 50 EUR/MWh, this results in 100 EUR/MWh for electricity. The emissions of a gas-fired power plant are 0.5 tCO<sub>2</sub>/MWh. At a cost of 90 EUR/tCO<sub>2</sub>, this increases the cost of electricity by 45 EUR/MWh. In summary, the electricity price from natural gas is approximately equal to double the gas price plus half the CO<sub>2</sub> price. This results in 145 EUR/MWh for electricity.

# Electricity spot market price is defined by marginal cost

EPEX Belgium Daily Market Results - WED 1/3/2023



# Example of hedging strategy in Belgium

## Purchasing strategy of Infrabel

- The purchasing strategy is based on the following goals:
  - to ensure the energy supply;
  - to avoid sudden price fluctuations;
  - to enable the railway undertakings to estimate the prices in advance;
  - to obtain the lowest possible price.

*Provision of traction current via Infrabel (defining the unit cost in EUR/MWh).*

The price is fixed ...	For energy consumption in ...				
	2020	2021	2022	2023	2024
three years in advance	25%		16,5%		25%
two years in advance	25%	28%	30,5%	40%	25%
one year in advance	25%	47%	28%	30%	25%
In the year of delivery	25%	25%	25%	30%	25%

Based on forward prices on forward market

Based on average day-ahead for each month on spot market

# Survey

- LU : traditionally long-term contracts, given volatility in market, a mix of fixed and spot contract
- FR : market tends to be based on annual contracts; effect of "ARENH" tariffs pushes towards this
- DE : Each RU is free to make their own choices. We can buy future contracts for CAL, Quarter and Month products and also add to our volumes flexible produced energy by PPAs. Since 2022 we carry spot market risks in our contract but our supplier carries the balancing energy and sends our energy prognosis to the IM. Before 2022 our energy supplier carried also the spot market risks when our consumption was in a contractual bandwidth +/-10% on a yearly (until 2020) or quarterly (2021) base.
- ES: Price risk was usually handled by the IM (as the contract responsible) but lately (since September-22) RUs are taking hedging decisions and the IM execute them in a 'pass-pool' contract with hedging possibilities.
- PL: In the contract, we must specify an exact volume that can deviate max. 5% up or down. This volume must be assigned to individual months. Outside band, PKP Energetyka buys or sells on spot market. Risks are at RU side.
- NO: Bane NOR is active in the wholesale market for electricity, we buy physical power directly from the power exchange Nordpool. Financial price hedging is done bilaterally toward pre-qualified counterparties and directly on Nasdaq OMX. Risks are identified and handled in accordance with strategies based on stake-holder's preferences
- UK: Railway undertakings manage those risks through appropriate locking strategies.

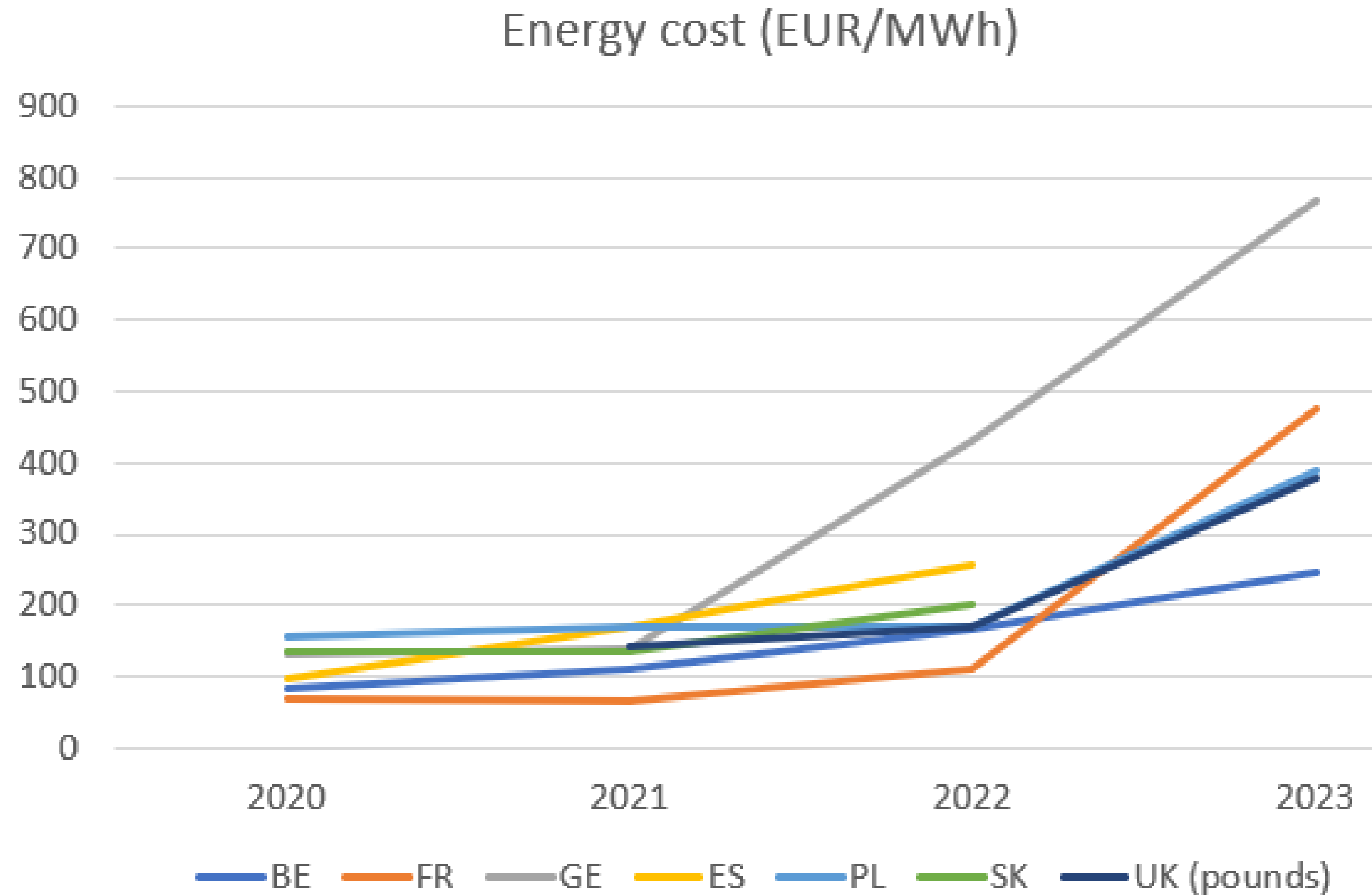


# Survey

- IT : In Italy, besides the energy providers on the liberalised market, there is an energy provider dedicated to public service activities (that sells energy to all public entities). RFI purchases the energy from this provider, who is in fact the one that handles out the procurement on the market.
- DE/AT : mostly Rolling hedge - few RUs also run via SPOT-Market with extremely high risk - energy providers try to shift increasing price risks towards RUs and ask for better prognosis

**14.30**  
**Future evolution**

# Cost evolution traction energy



Disclaimer: It might be that some prices are commodity only and others are commodity + grid fee. Prices also depend on split peak / off-peak. Prices are for energy contracted via Infrastructure Manager. Aim is to show the increase in costs and differences due to risk exposure.

## Survey on energy market evolution

- BE: The suppliers don't want to keep taking the volume risk nor the price risk. So we will likely have to click fixed volume blocks and likely also some blocks with a different volume for each hour of the day. These clicks will be based on a quotation of the end of the day or based on non-verifiable quotation given by one or more suppliers to a request made by us. The remaining volume will likely be invoiced based on the hourly prices on the spot market. We still need to get an agreement with suppliers and biggest railway undertakings to start the tender for 2025 and 2026. I hope to get some interesting feedback during this session on the workshop in Paris.
- FR : end of ARENH system (2025) will lead to changes in strategies for all companies. Current dissatisfaction in France on IM-negotiated rate for 2023.

## EMS in survey

- SK: As the rail DSO, IM is obliged to purchase and install EMS according to Slovak law. Unfortunately, the currently installed EMS is not in line with the latest TSI, and IM does not accept it. RUs are in the process of purchasing EMS themselves, getting it certified, and approved by IM. This is not an easy task considering IM's "100% or nothing" readiness, while not all EMS suppliers meet the latest standards as other IMs accept previous versions. Slovak Ministry of Transport has launched a working group to analyse the current market gaps and propose the required solutions to liberalize the traction market and install EMS to bill RUs based on actual consumption.
- AT : are about to change the strategy soon, Supplier is not able to purchase needed volumes in a three years hedge anymore - already in 2022: change from stock exchange to OTC-Trading in GE

**14.50**  
**Governmental support**

# Survey

- SK : The maximum price is capped at 199 EUR/MWh by the Slovak state.
- BE : We have discounts on renewable energy supporting mechanisms and on taxes. Night trains for passengers will have free electricity (as long as budget for this is sufficient). Government has launched a study.
- DE : for 2023, 90% of volume will be covered by the "Strompreisbremse" at 130€/MWh for rail traffic
- FR : no specific railway help; companies can apply for funding from general schemes available to companies to help cover against increased energy costs
- NL : discussions are ongoing
- ES : Some measures from the gov can be applied to traction electricity and some others, can not. There is an specific tax discount for traction electricity but there should be more support, like for example, the support given to electro-intensive industries.
- PL : support only to SMEs
- NO, LU, SV : No support
- UK : Yes, as they support the rail industry in general in terms of funding.
- IT : government subsidises energy costs prior to the crisis. Political discussion about capping or funding additionally the current high price is still ongoing.
- AT : under discussion but no decision yet

**15.10**  
**Proposals**  
**Conclusions**



# Discussions

- PPA/REC/GO: Eurostar has seen price peaks in GOs. Discussion is ongoing if PPA is not better (supporting new renewable productions).
- Nuclear phase-out will result in an increase of CO2 emissions.
- What with green energy production profile completely different than consumption? Matching hour-by-hour shouldn't be a high priority. Time shift could be with storage but expensive.
- What should we regard as really green energy? It should result in new production of wind or PV and connected (it should be physically possible to get the electricity to your area of consumption). Contract can be for 10 years.
- What with energy cost? Cost will go down when more renewables are in the market and gas will less define the final electricity price.
- Batteries on trains can help. Demand can be reduces on most expensive moments (e.g. battery trains running on electrified line).

# Discussions

- What products can we buy? MWh (future, spot, balancing), GO (Guarantees of Origin).
- Is it possible to shift electricity from one moment to another moment via a certain product? Financial product? Credit? GO can do this.
- But physically this fails. Production have to get switched off. Or electricity is used to pump up water, charge battery, create hydrogen. More interconnections in electricity networks is supporting to reduce amount of moment with too much or too few production.
- Rail can be able to support the electricity market. We can try to reduce the power peaks.
- Rail supports modal shift. High electricity prices makes this difficult. Price cap could be needed to be able to keep prices acceptable towards freight customers and passengers. Rail wants to take up the role to support modal shift to more energy efficient transport.

# Conclusions

- Rail is too fragmented. We have no unified system. Energy in railway market is organised everywhere differently. This will make it more difficult to get a unified approach.
- Rail makes maximal effort in connecting renewable energy to the railway infrastructure. This helps us to limit our exposure to electricity price fluctuation.
- Rail wants to support countries to reach climate goals on transport level. But we need to be able to do so. Prices in 2023 are higher than in previous years. How can we stay competitive? If rail is not competitive transport will shift to more polluting and less energy efficient modes.
- Energy market wants to reduce risks and shift risks to end consumer. This will make it even more difficult to stay competitive.

