NEW CHALLENGES IN ELECTRICITY MARKETS

mit tiefgestellten Indizes

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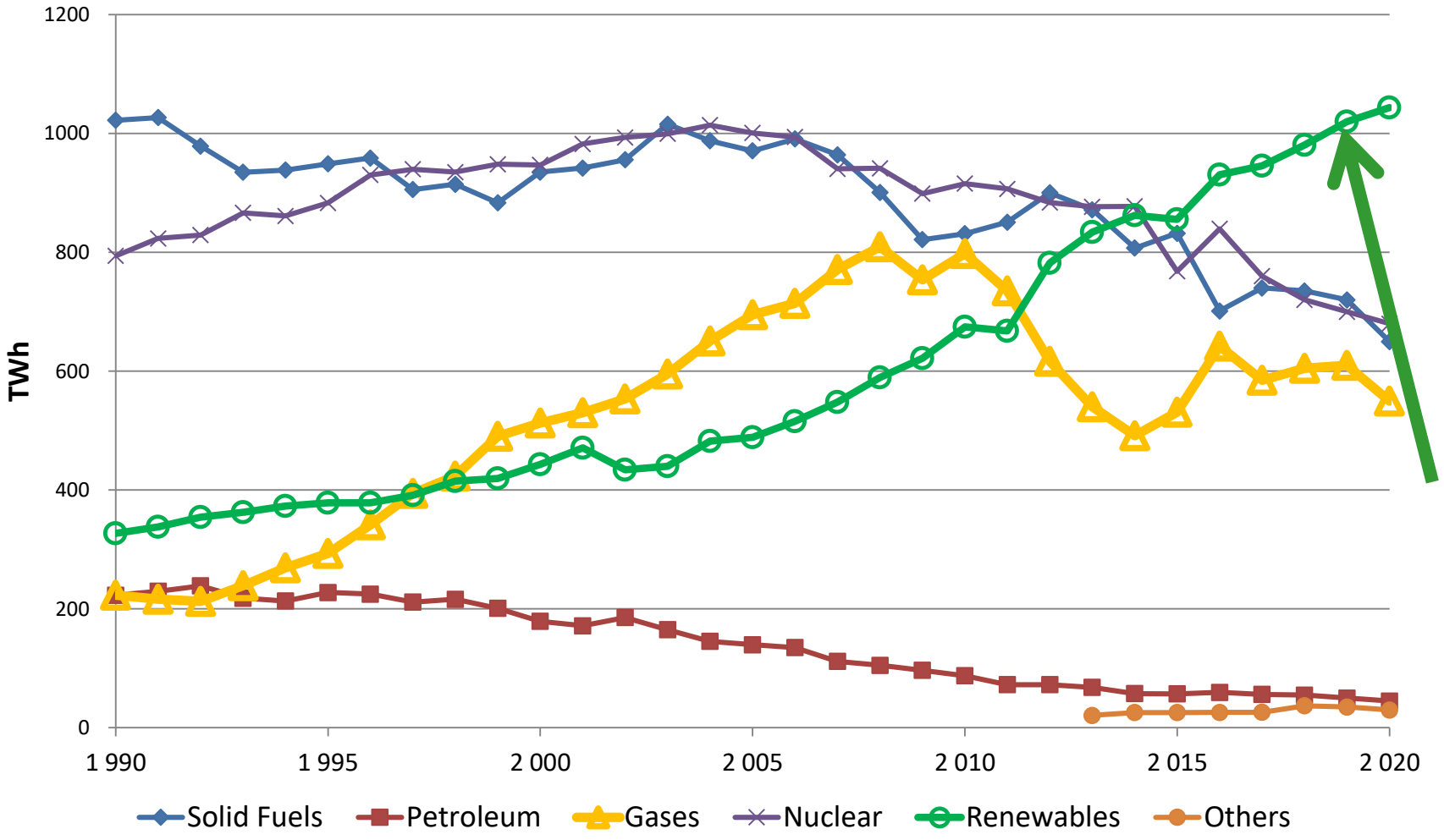
1. INTRODUCTION

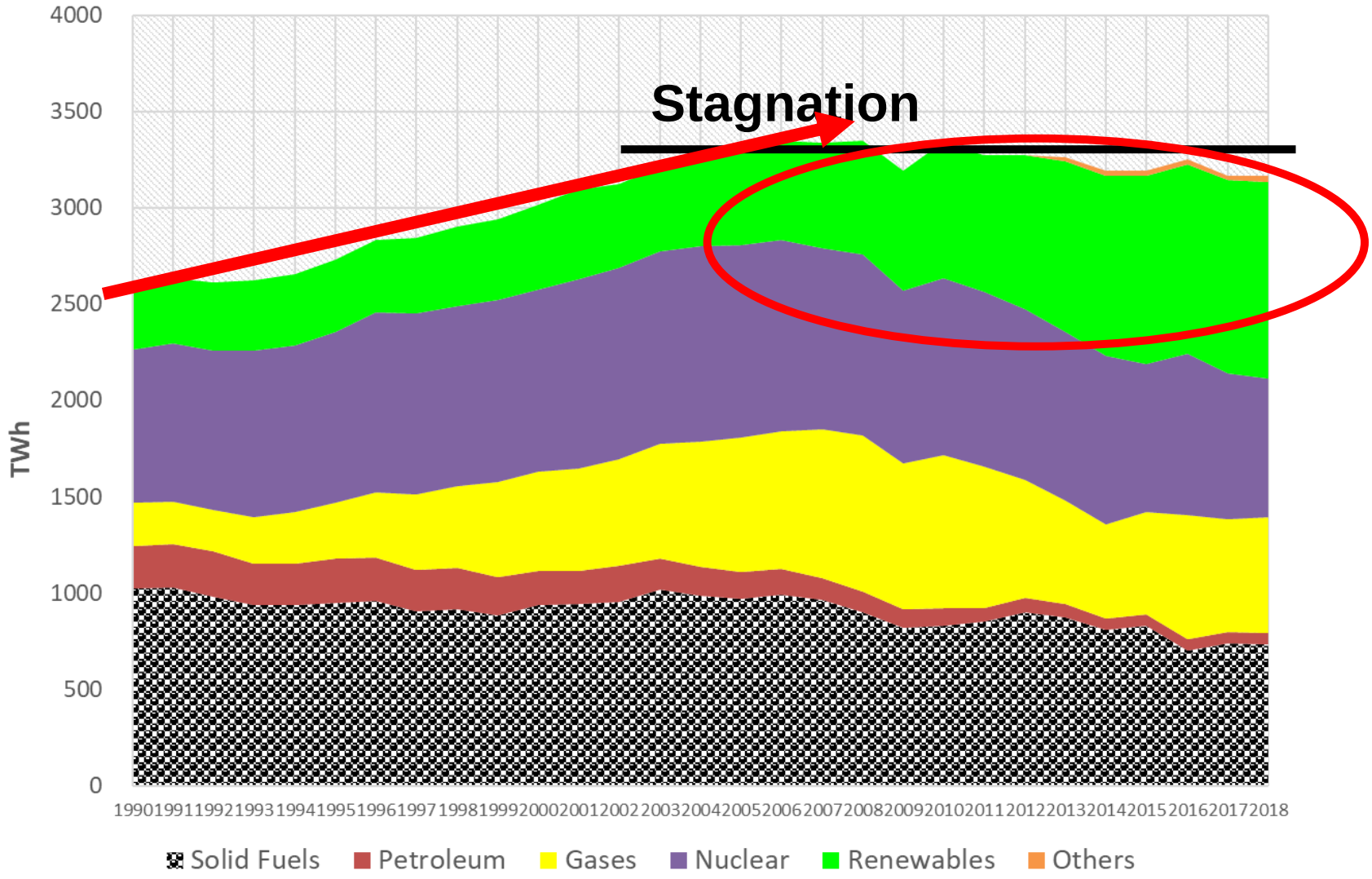
Motivation:

* Climate change → Paris agreements
* Targets for renewables
* Europe: The clean energy package → energy communities
* It is not possible to force variable renewables into the system
* A strong desire of some customers to participate in electricity supply

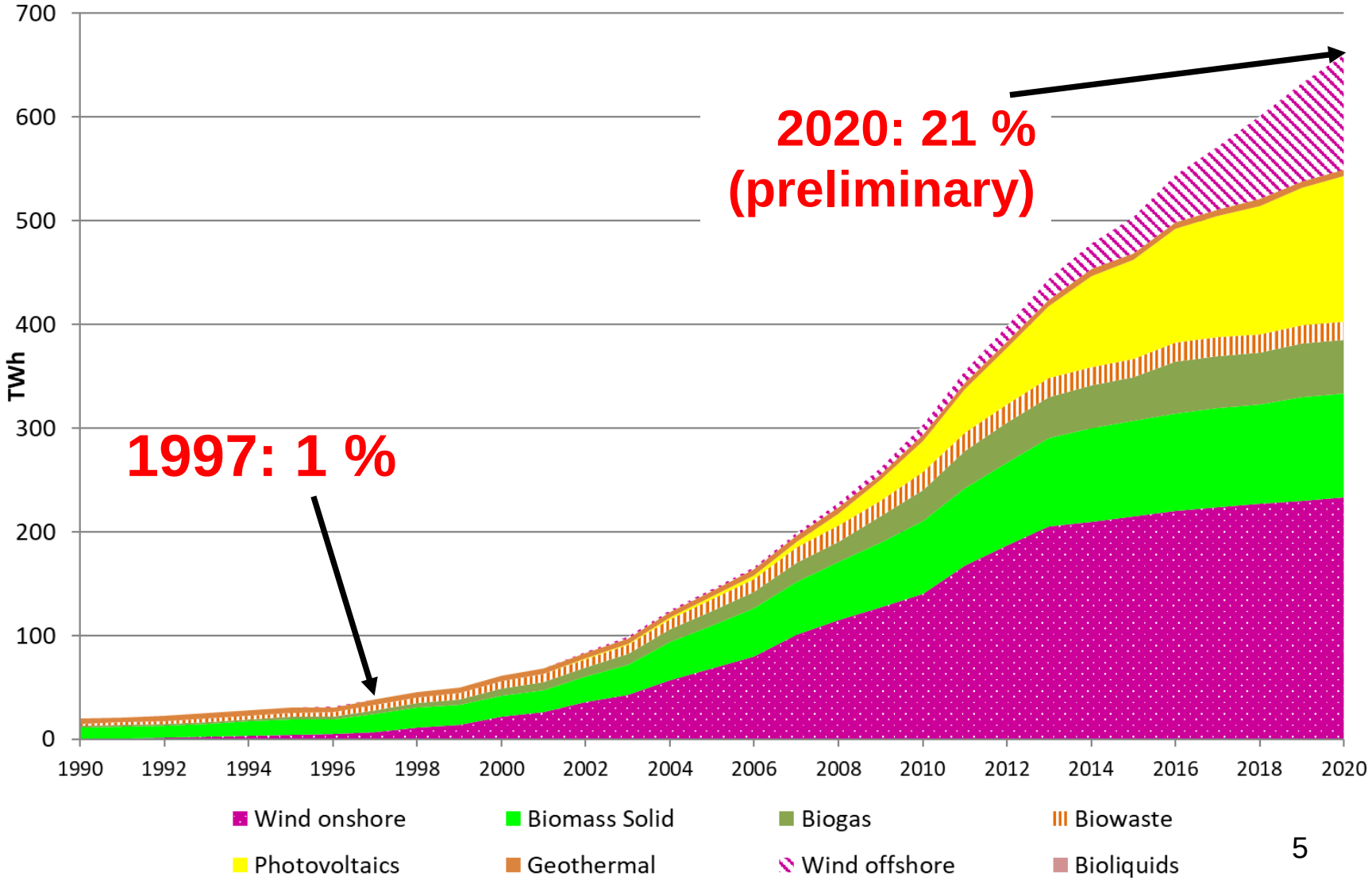
Electricity generation EU-28



Electricity generation EU-28

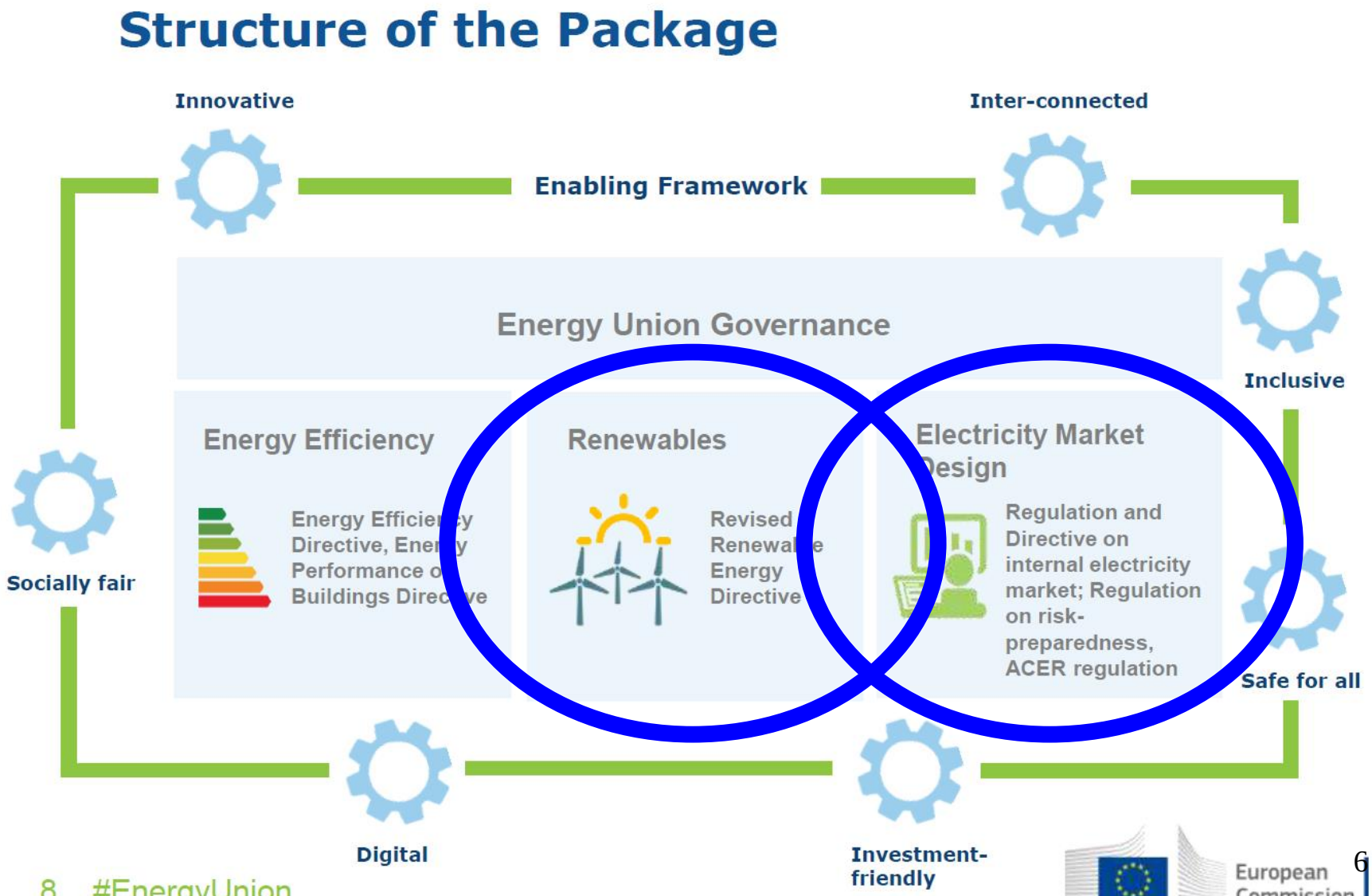


EU-28: Electricity generation from „new“ RES



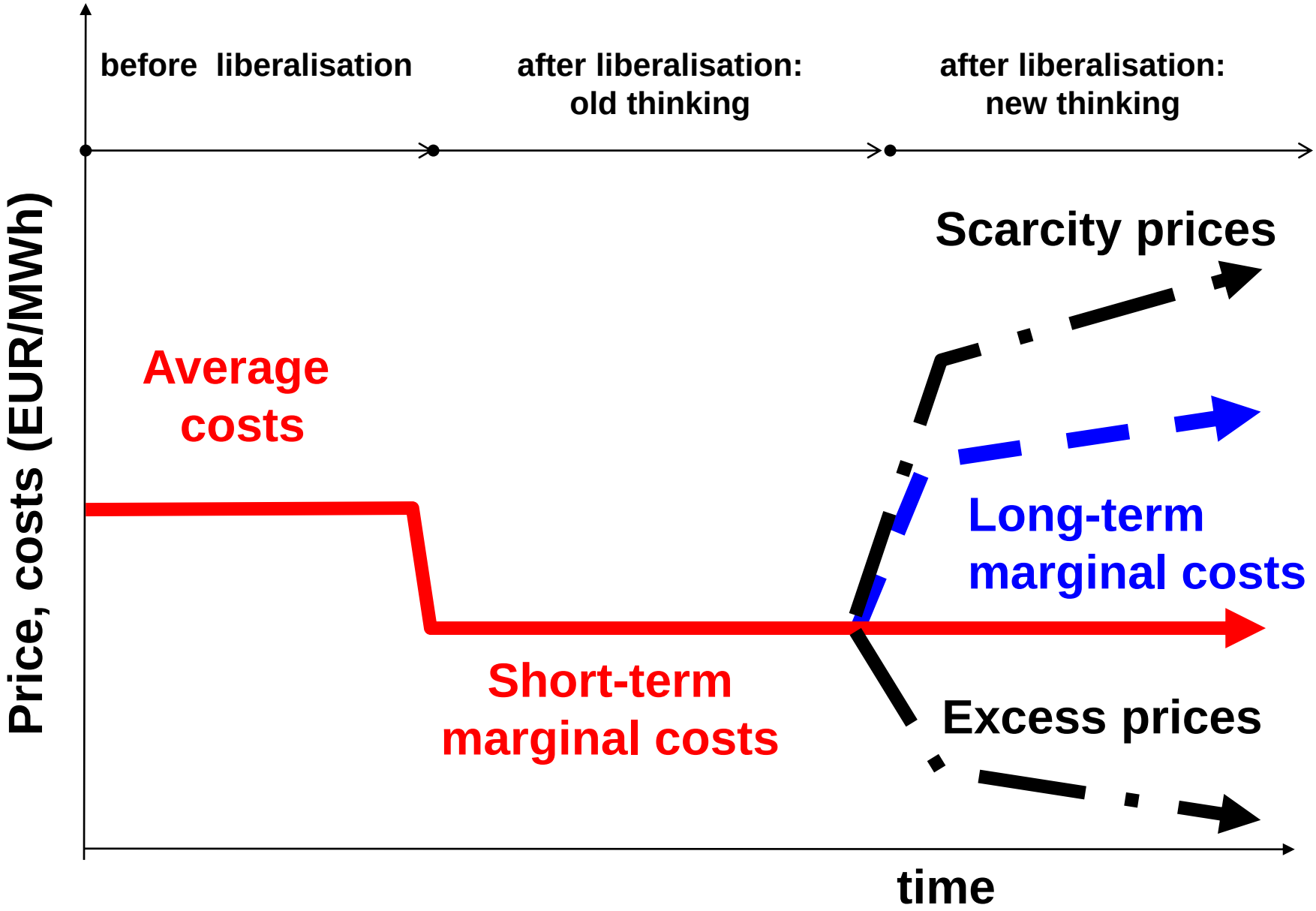
Source: EUROSTAT, own estimations

THE CLEAN ENERGY PACKAGE



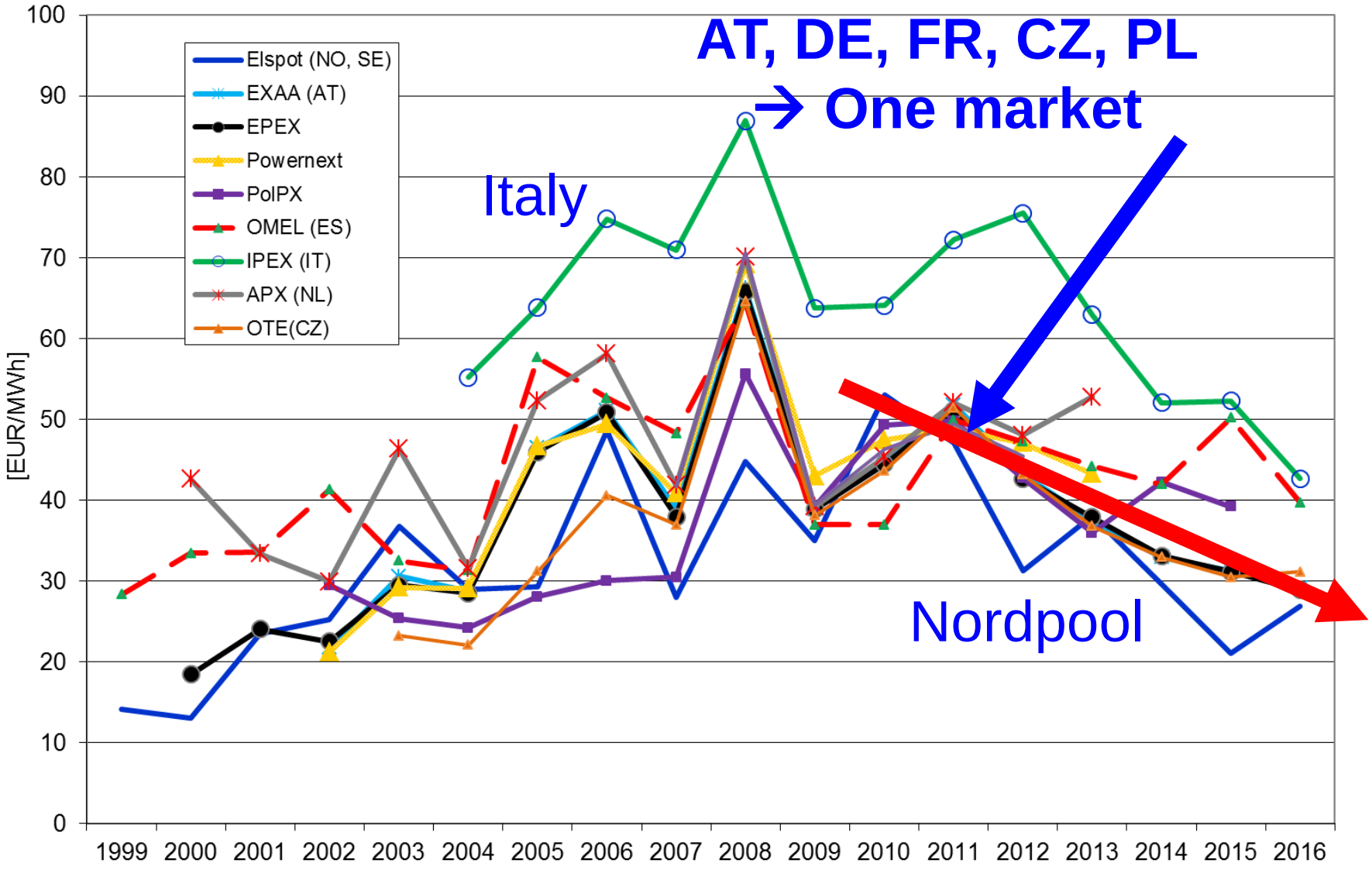
→ Energy communities

2. How prices come about: Three periods of market design



3 HOW VARIABLE RENEWABLES IMPACT PRICES IN ELECTRICITY MARKETS

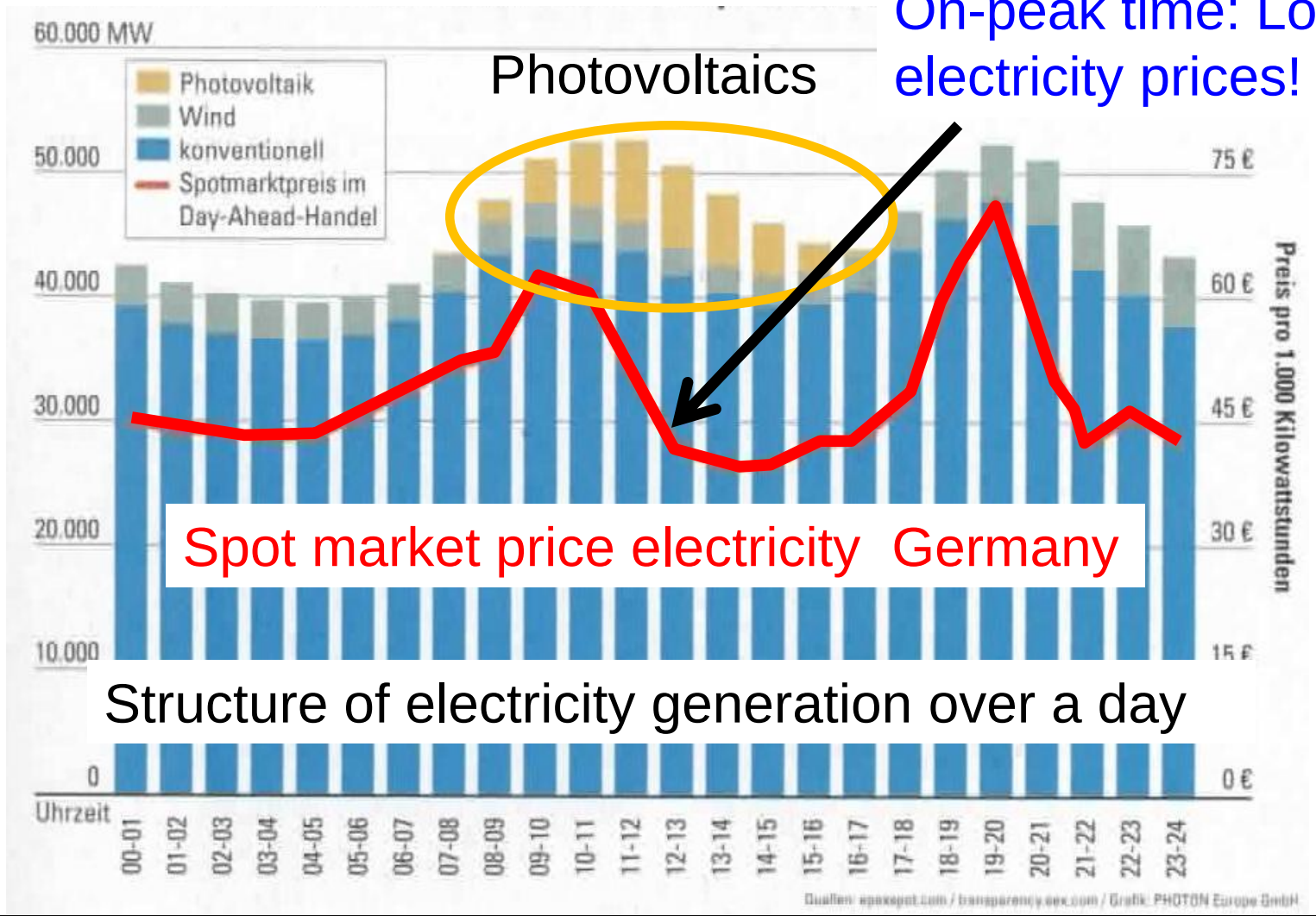
Development of electricity prices in Europe up to 2016 (1)



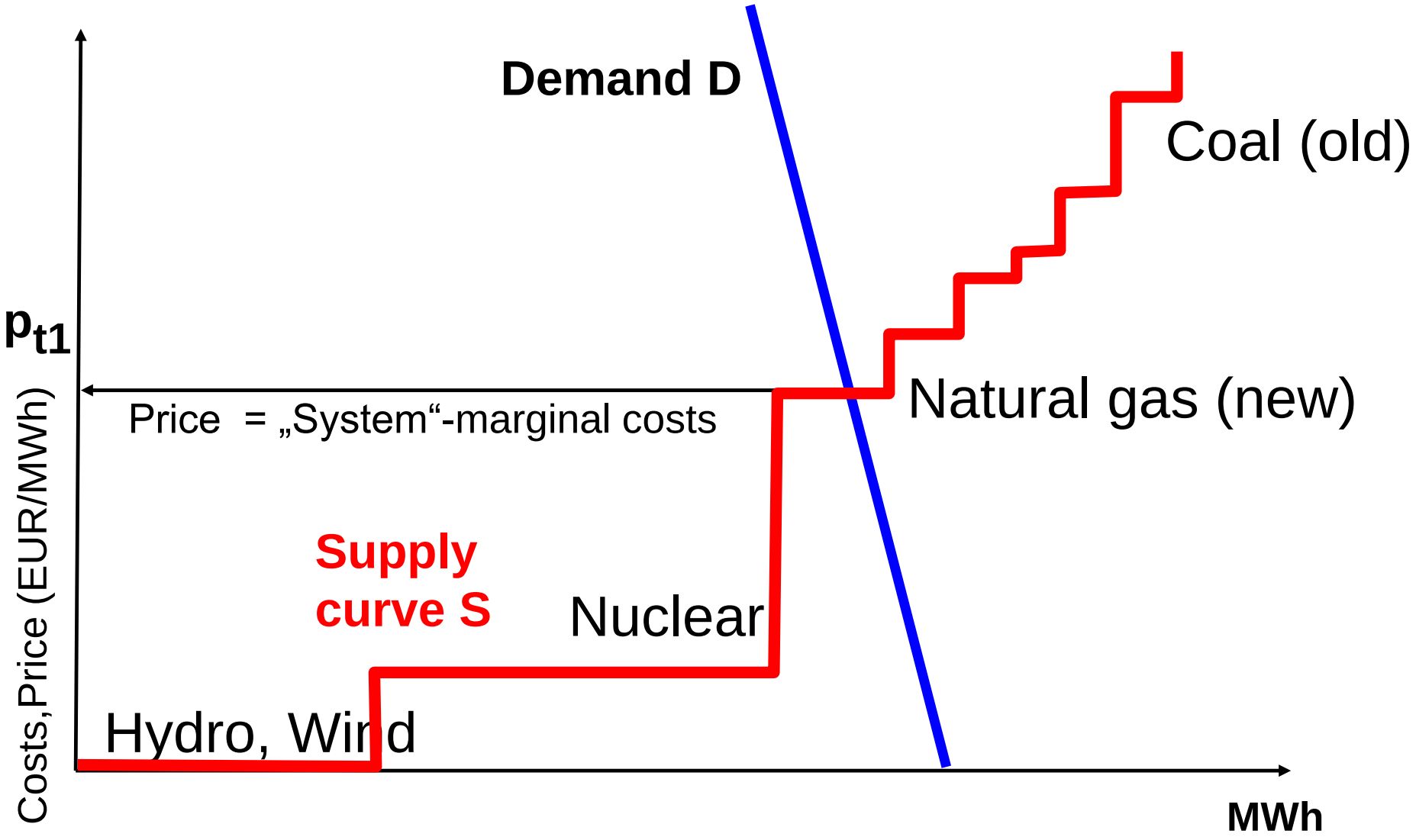
WHY?

STMC = 0!

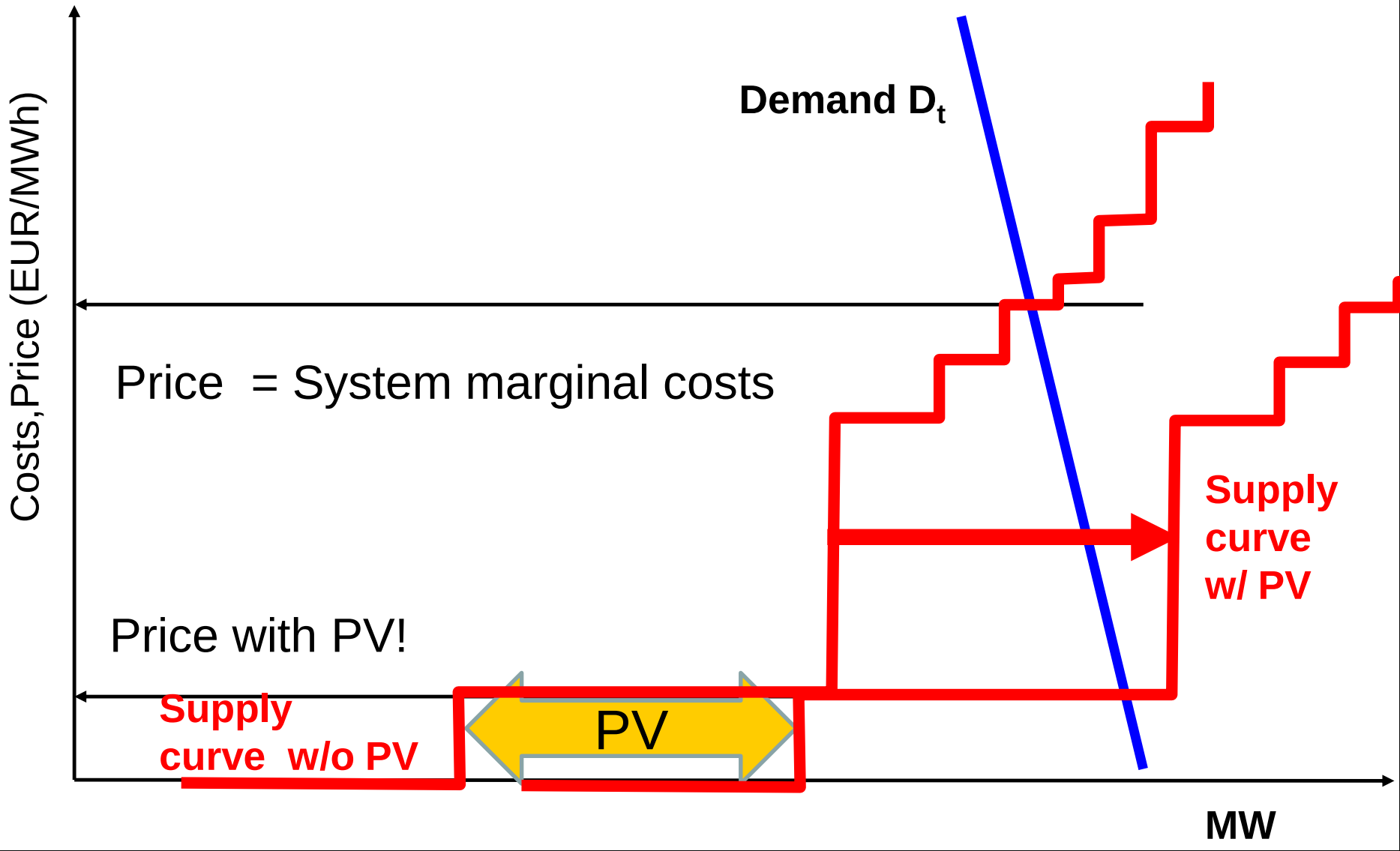
PV AFFECTS THE ELECTRICITY MARKET PRICE IN GERMANY



BASIC PRINCIPLE OF COMPETITION: PRICE = MARGINAL COSTS



PRICES WITHOUT AND WITH PV



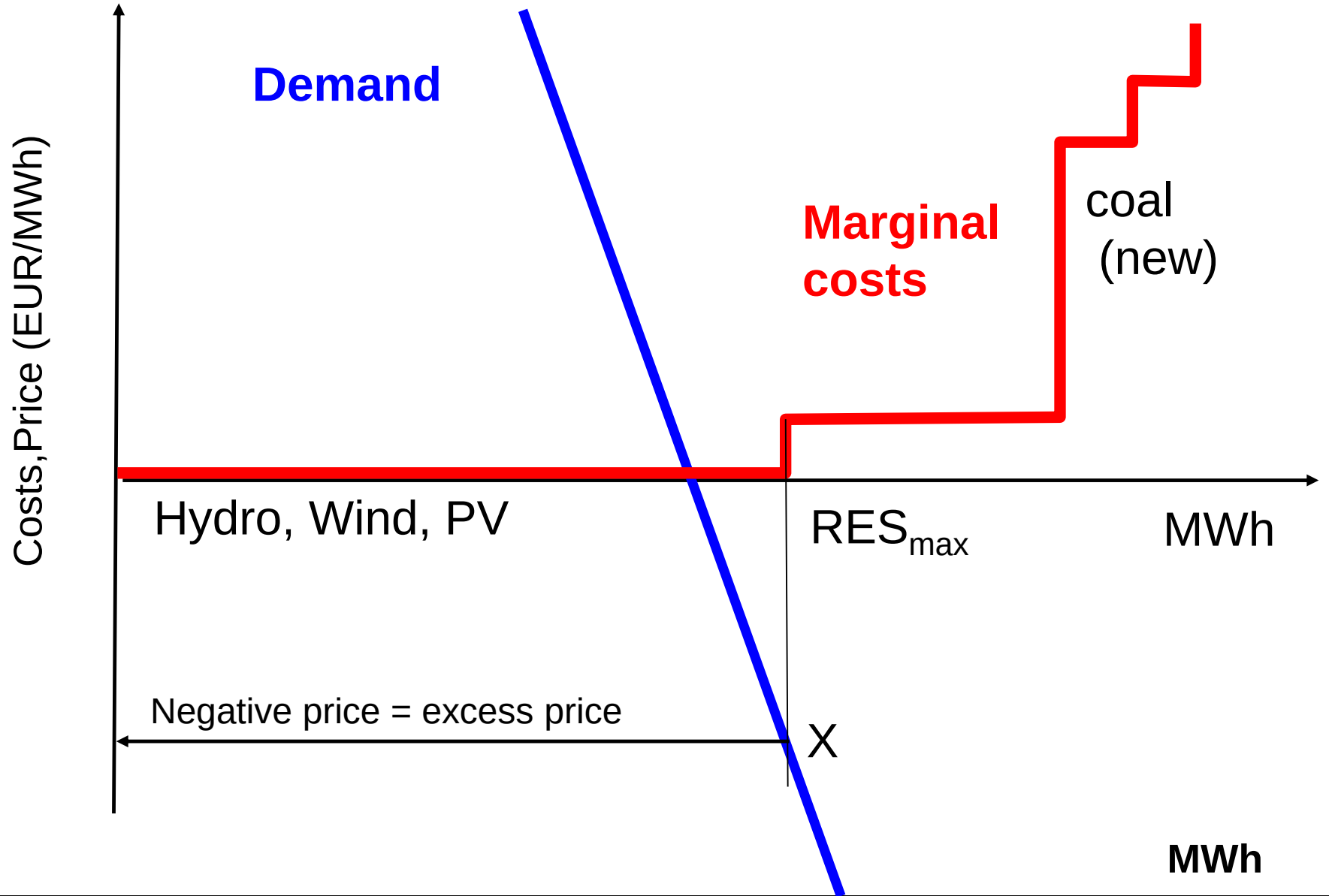
CATEGORIES OF „PROBLEMS“:

1. Prices decrease to Zero (or below) at a number of days;

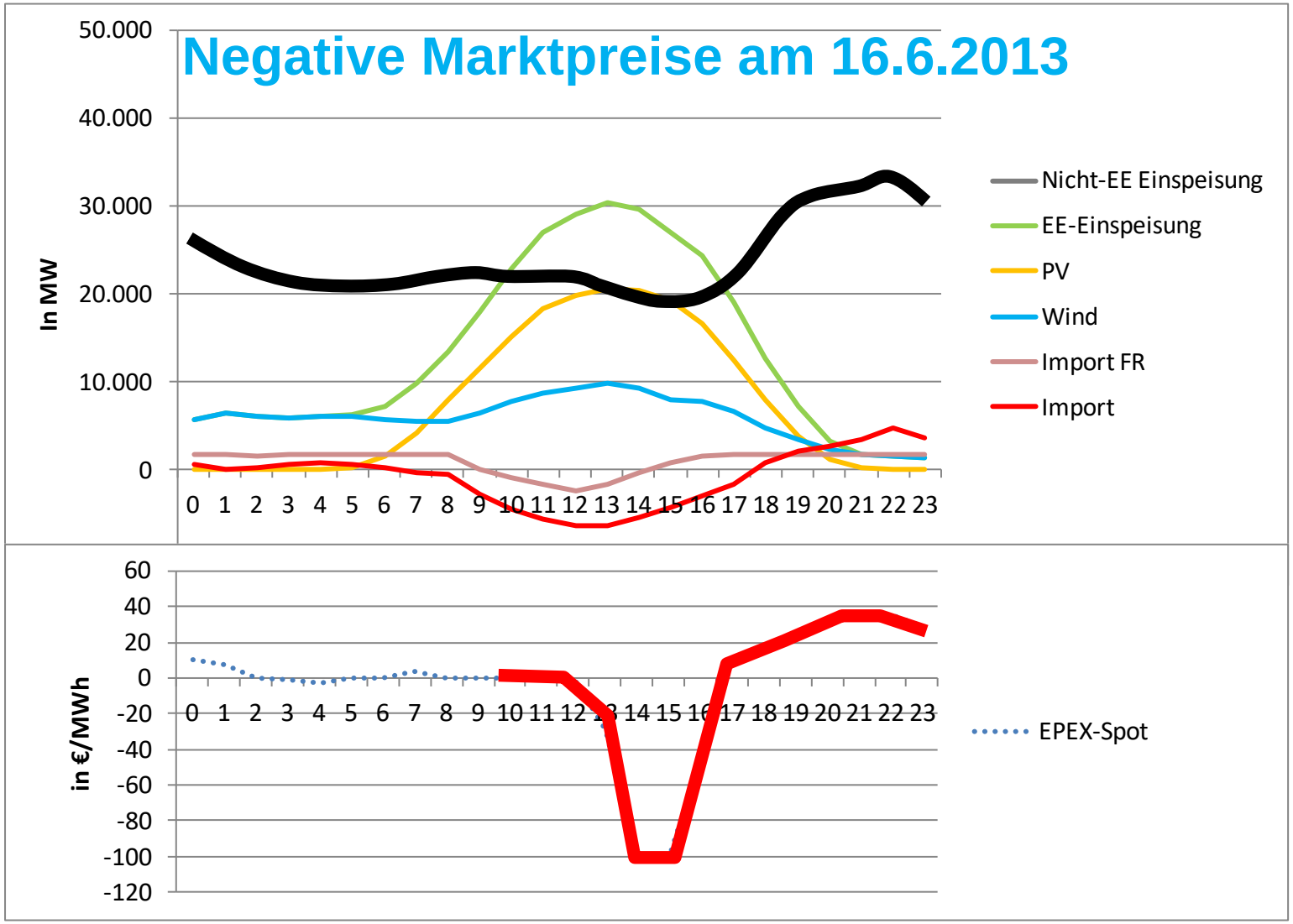
2. Lacking contribution margin to fixed costs

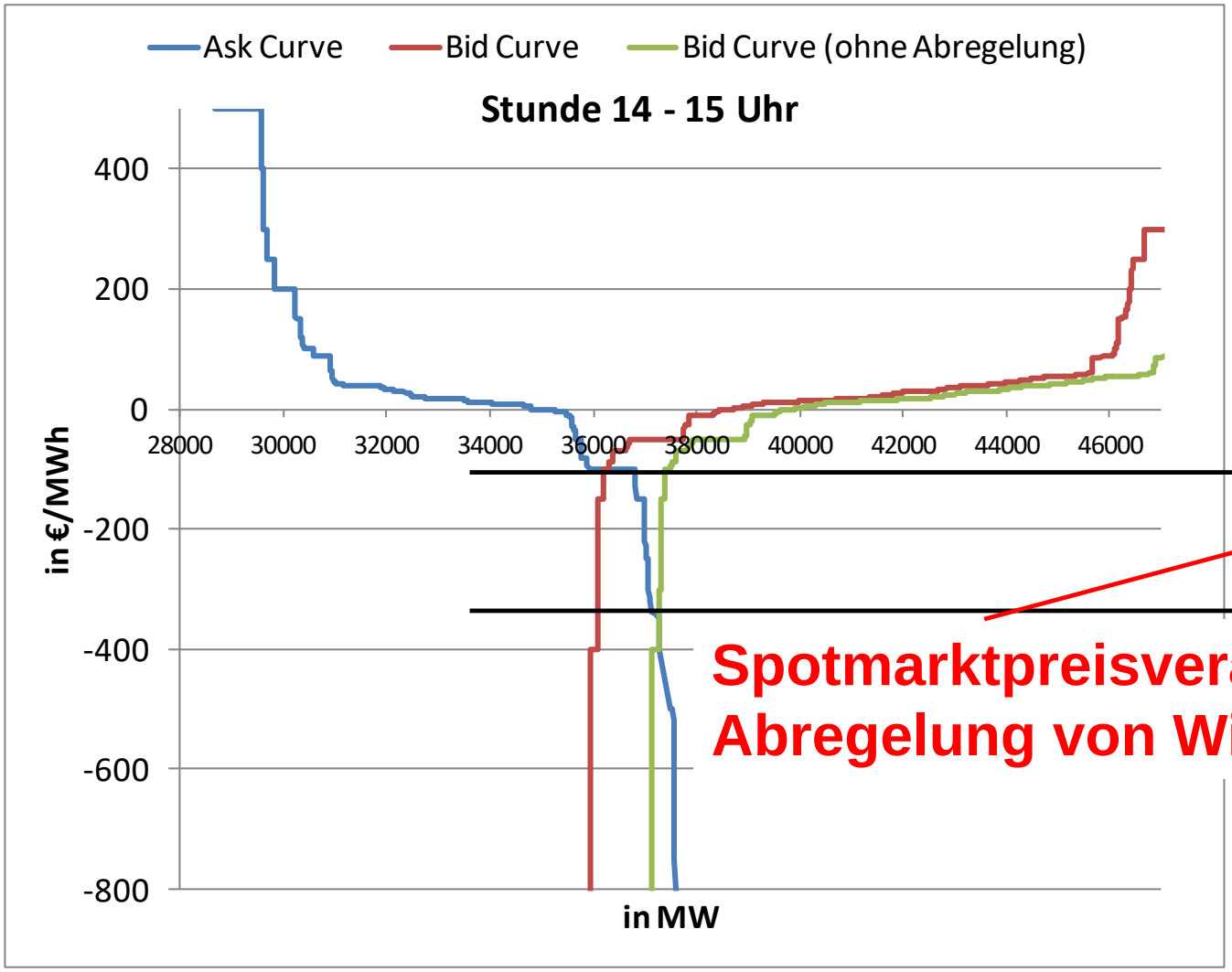
3. On how many days will we face high and on how many dayslow prices?

PRICE SETTING UNDER EXCESS CAPACITY



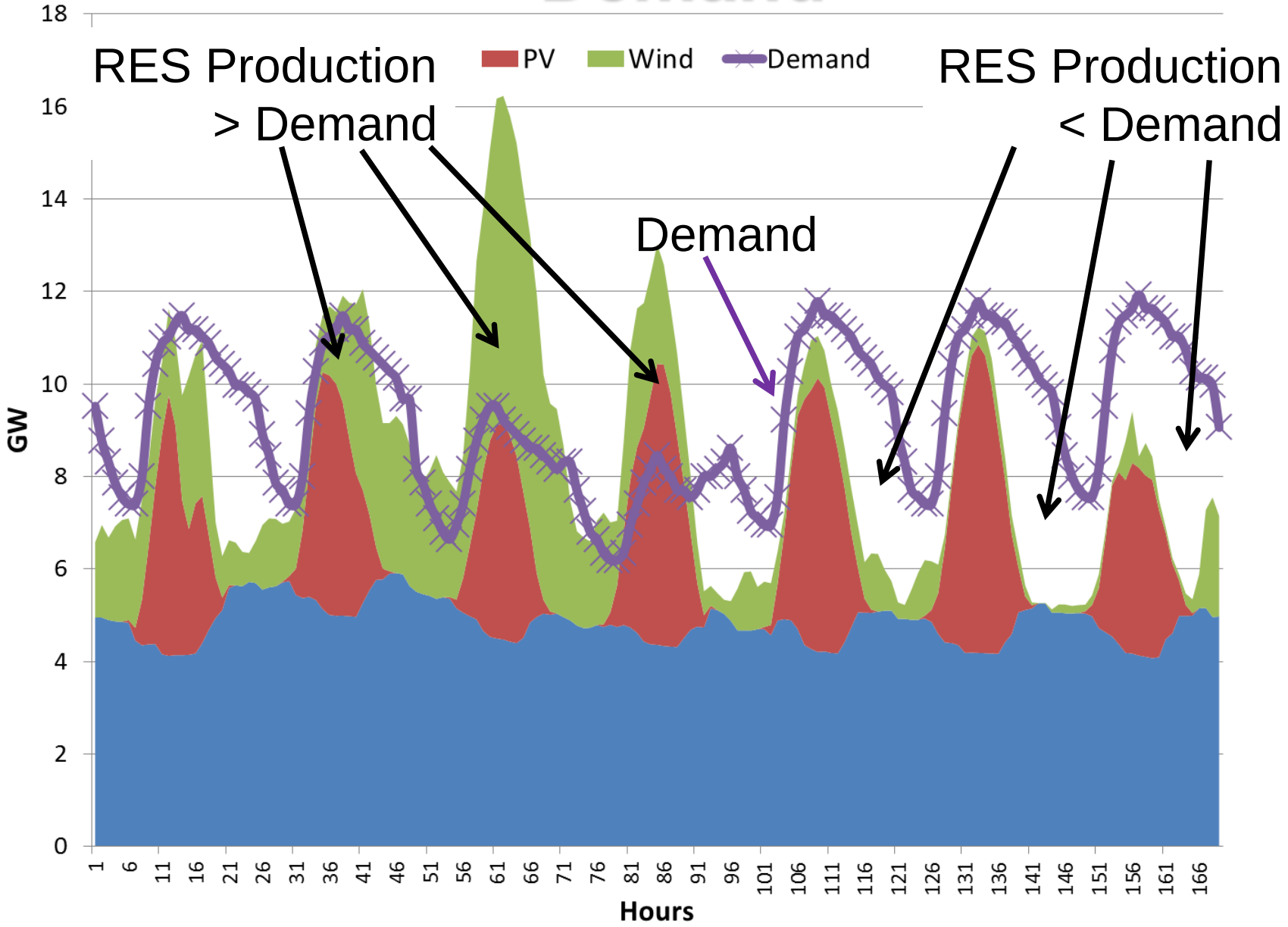
PROBLEM: EINFLUSS TEMPORÄR GROSSER MENGEN EET (?) AUF SPOTMARKTPREISE



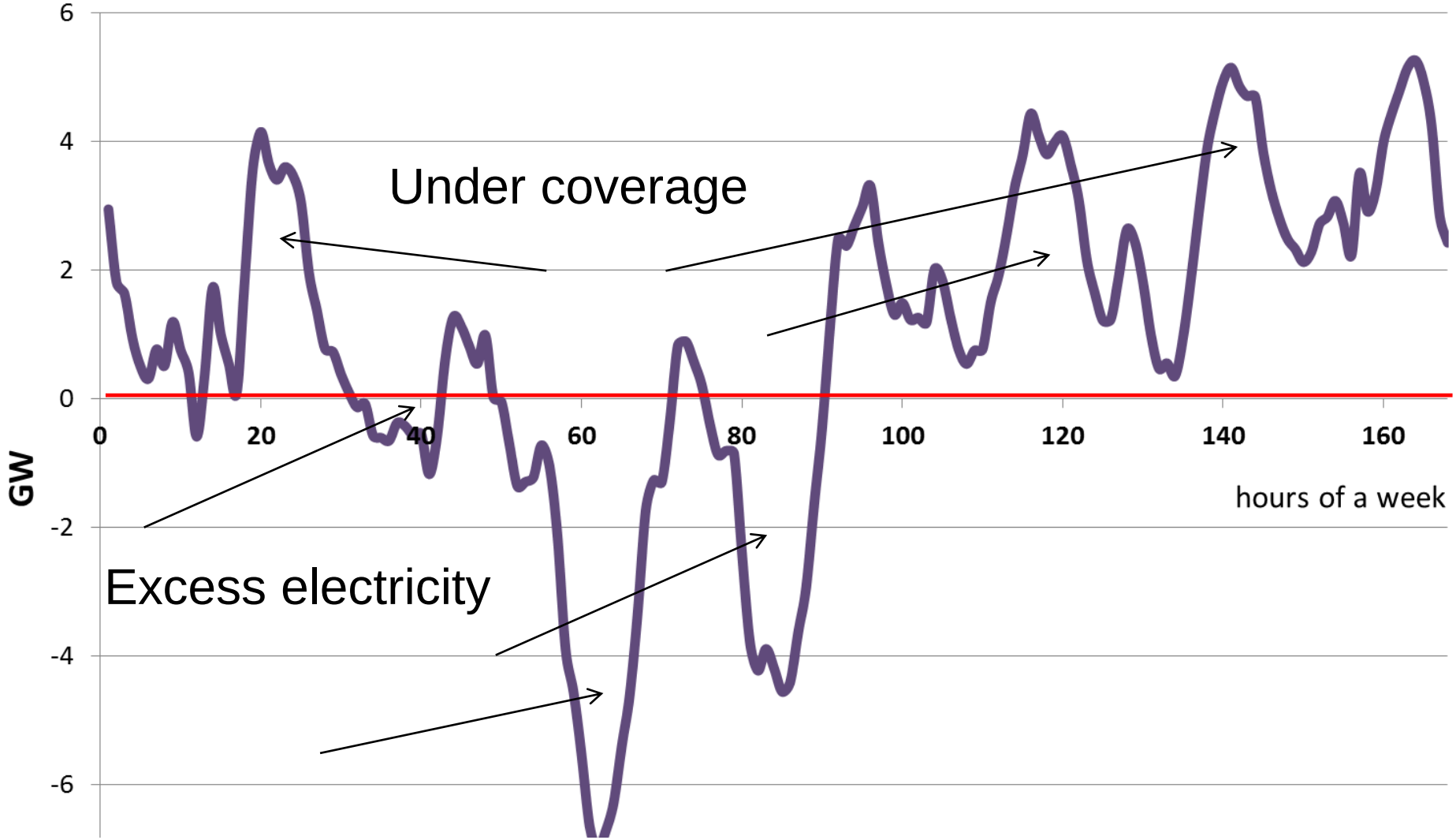


Spotmarktpreisveränderung durch Abregelung von Windkraftanlagen

Example: Supply and Demand

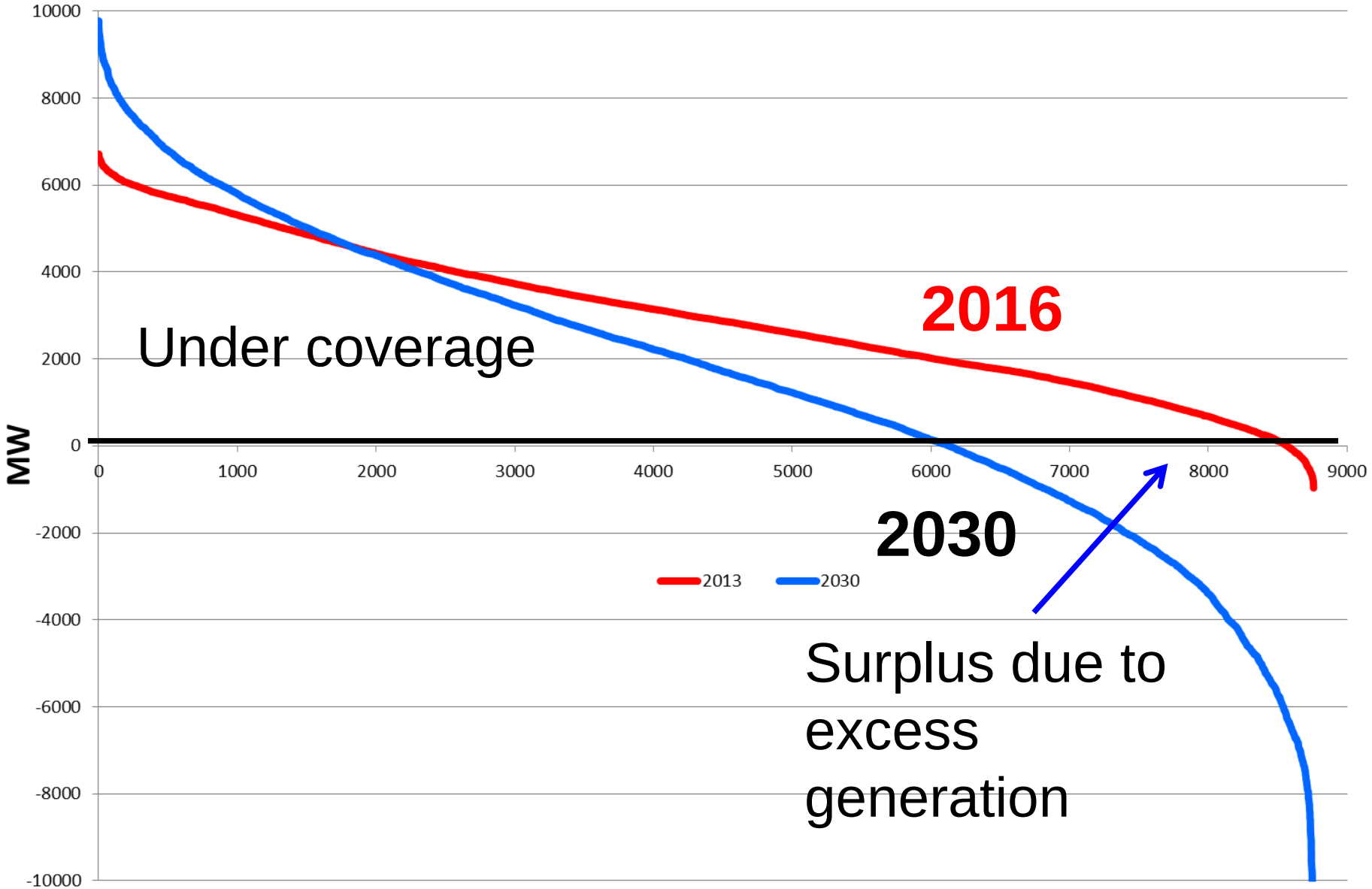


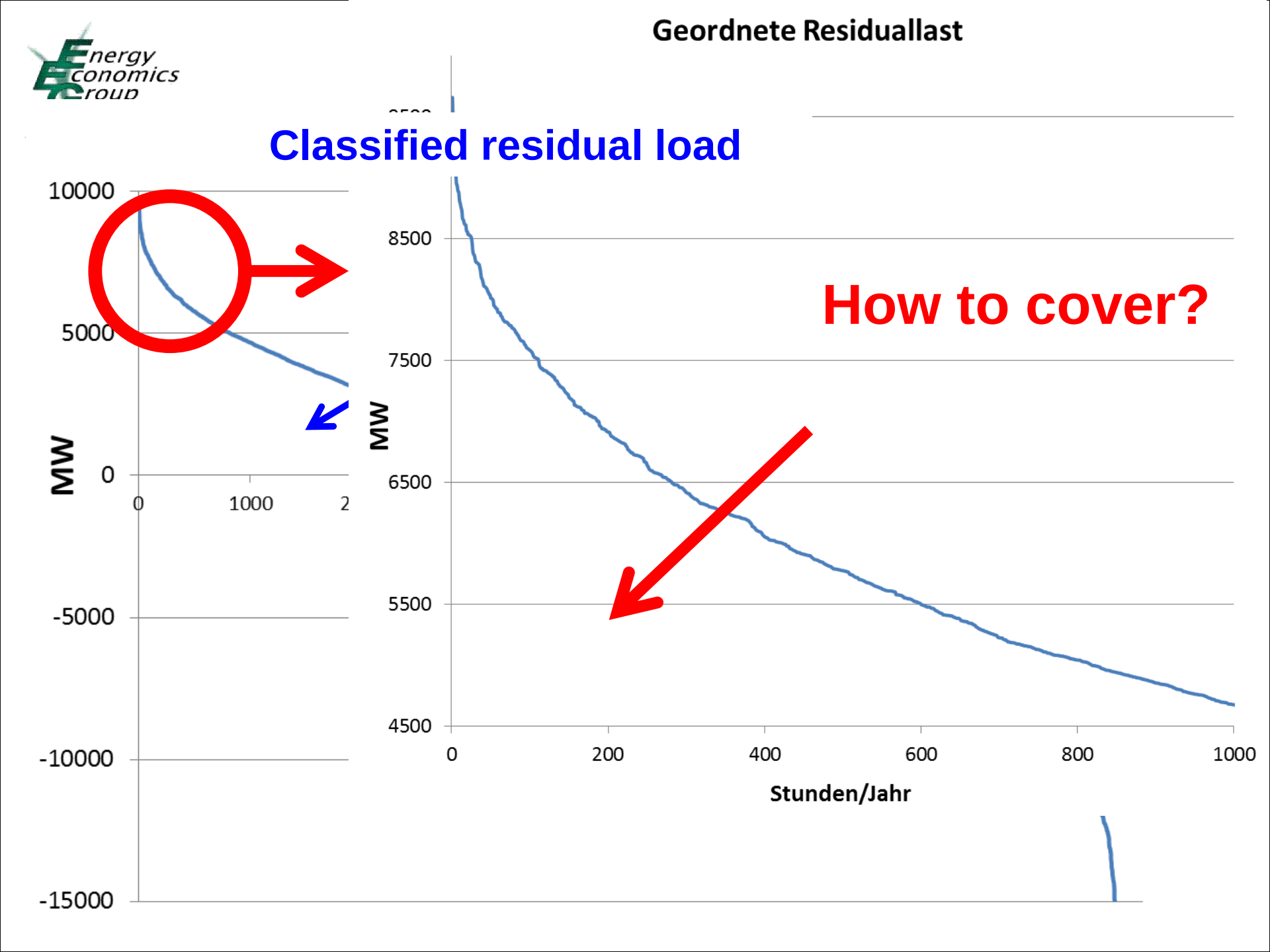
4. Key term of the future: Residual load



Residual load = Load – non-flexible generation

Classified residual load




Geordnete Residuallast
Classified residual load
How to cover?
MW
10000
5000
0
-5000
-10000
-15000
0
1000
8500
7500
6500
5500
4500
200
400
600
800
Stunden/Jahr

By a regulated capacity „market“ ?

or

By competition between supply-side and demand-side technologies (incl. storages and grid)?

THE CORE PROBLEMS OF CAPACITY PAYMENTS

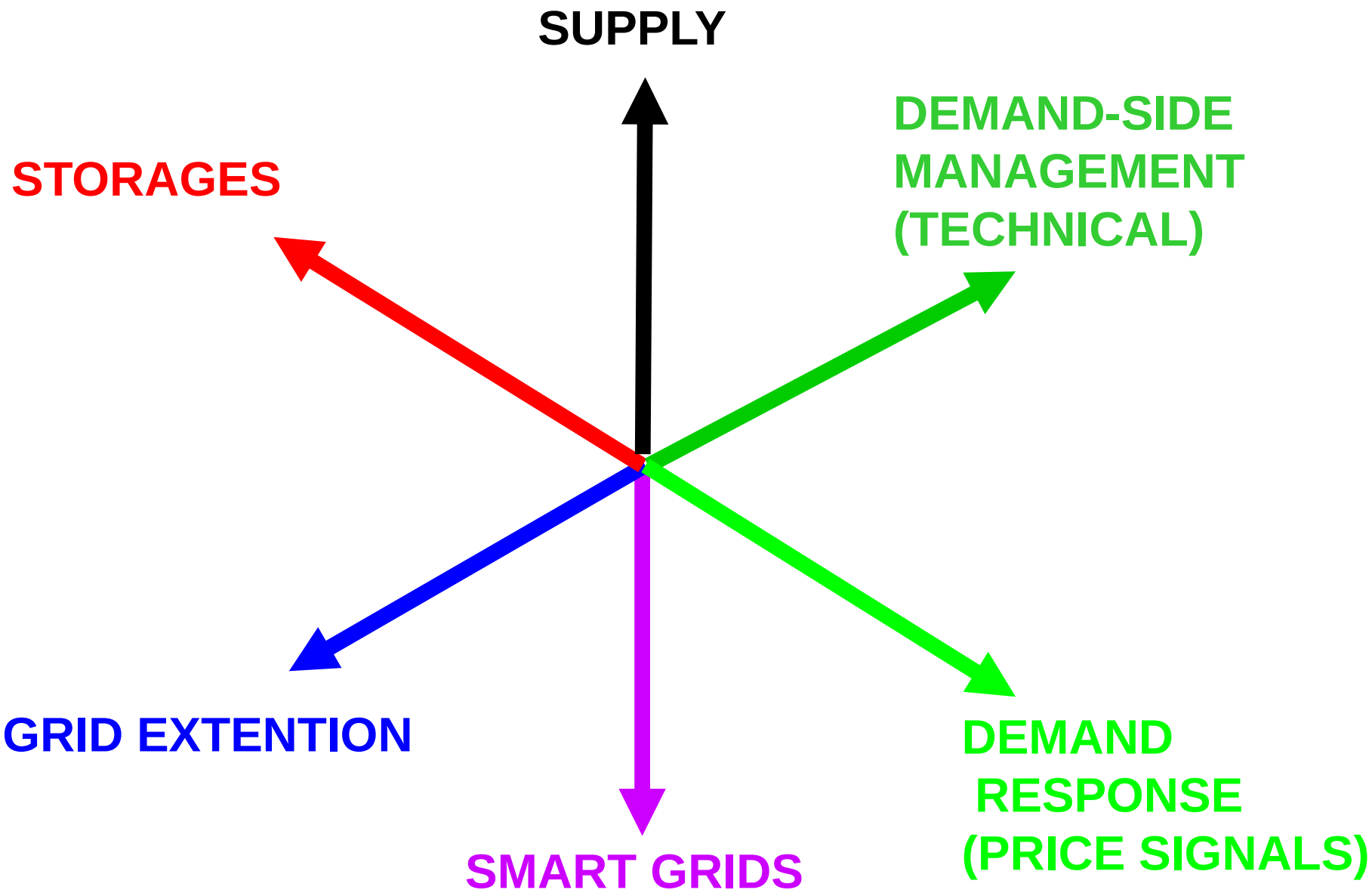
All regulatory capacity payments for power plants destort the EOM and lead to wrong price signals for all other options

Price peaks at times of scarce resource should revive the markets and lead to effective competition

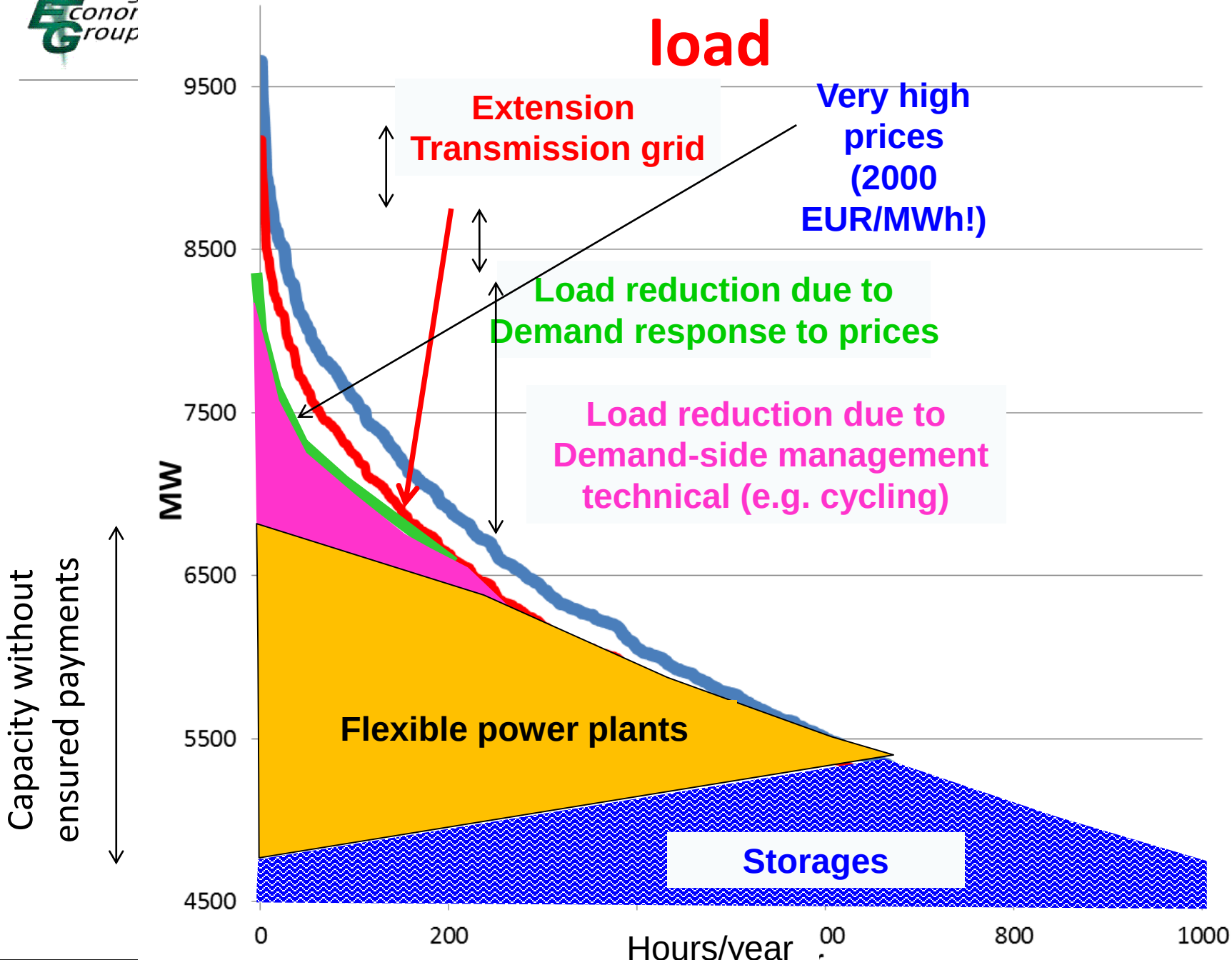
The higher the excess capacities, the lower is the share of RES

strive to retain system resource adequacy by correct price signals

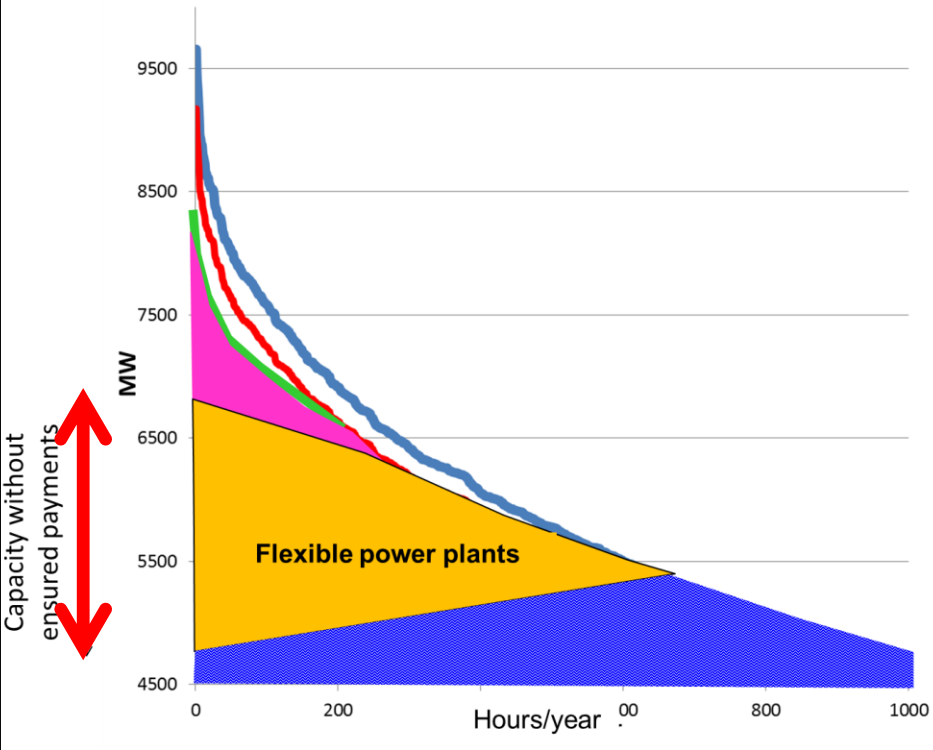
DIMENSIONS OF ELECTRICITY MARKETS

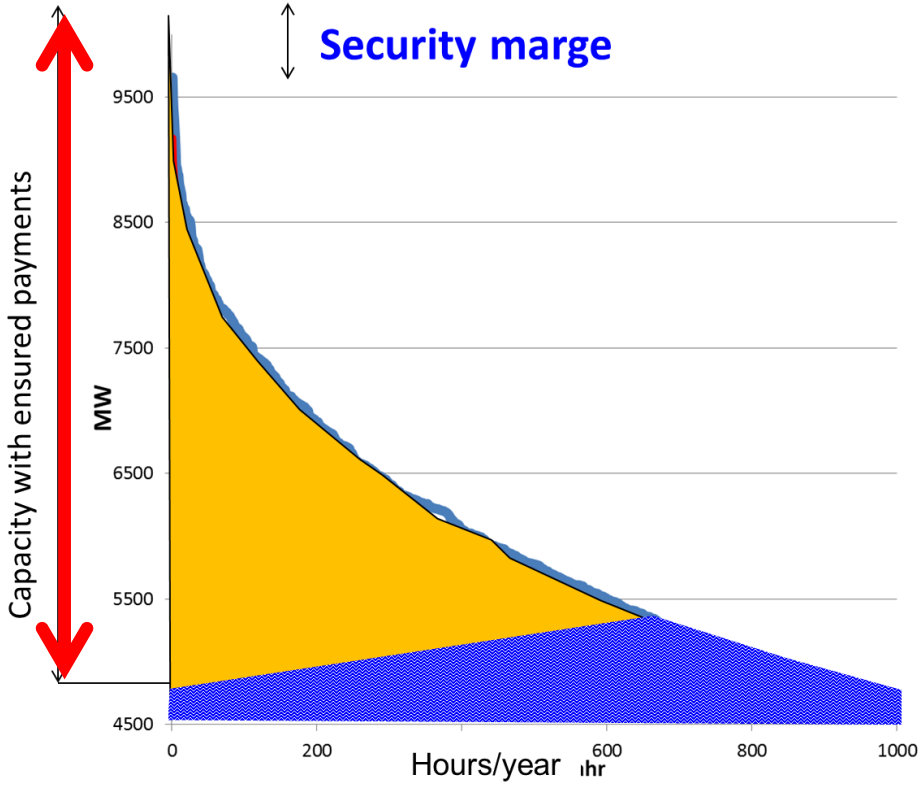


5 Flexible coverage of residual load

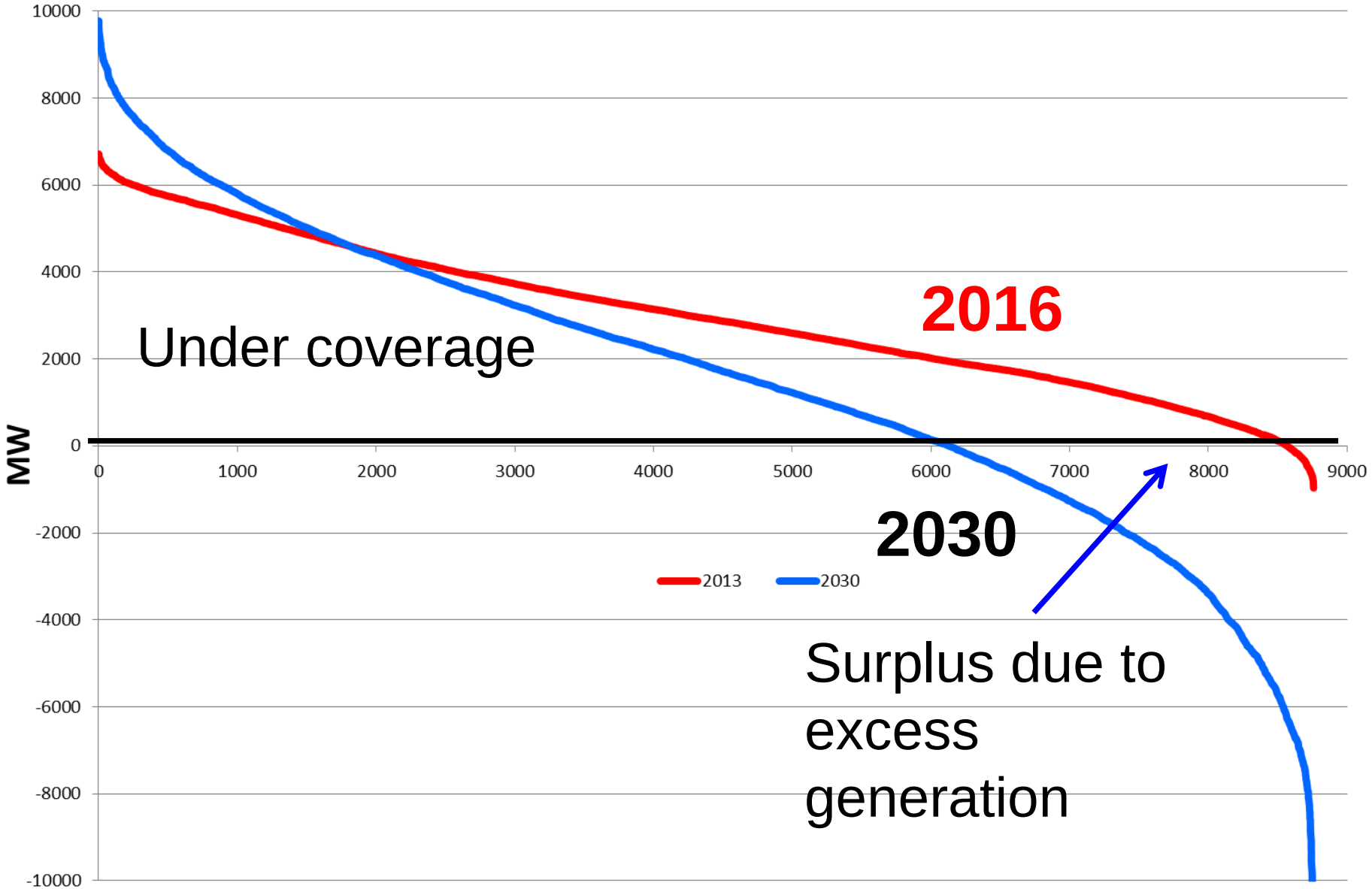


Comparison

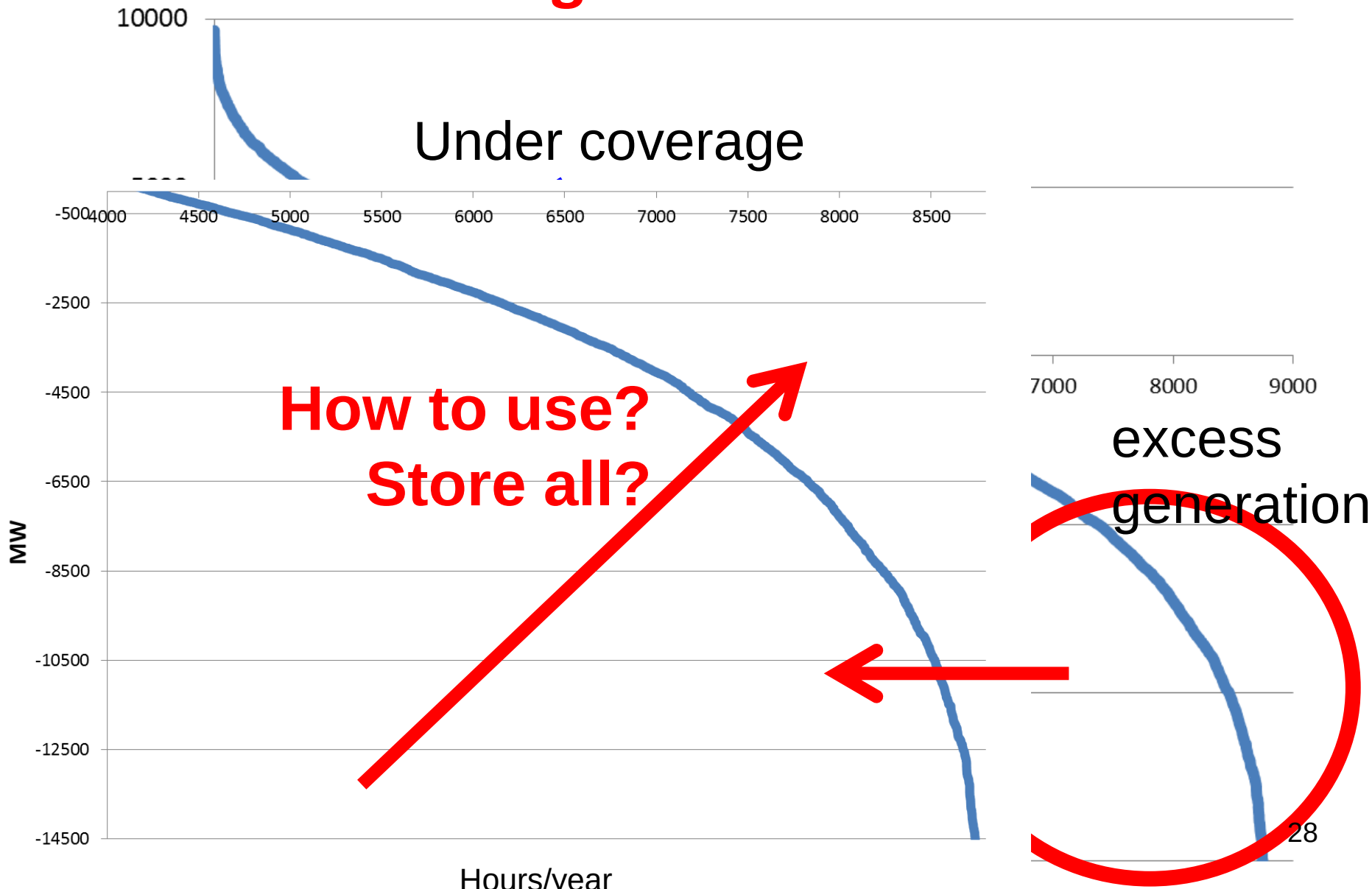

Capacity without ensured payments
MW
9500
8500
7500
6500
5500
4500
Flexible power plants
0
200
Hours/year
800
1000


Security marge
Capacity with ensured payments
MW
9500
8500
7500
6500
5500
4500
0
200
600
800
1000
Hours/year

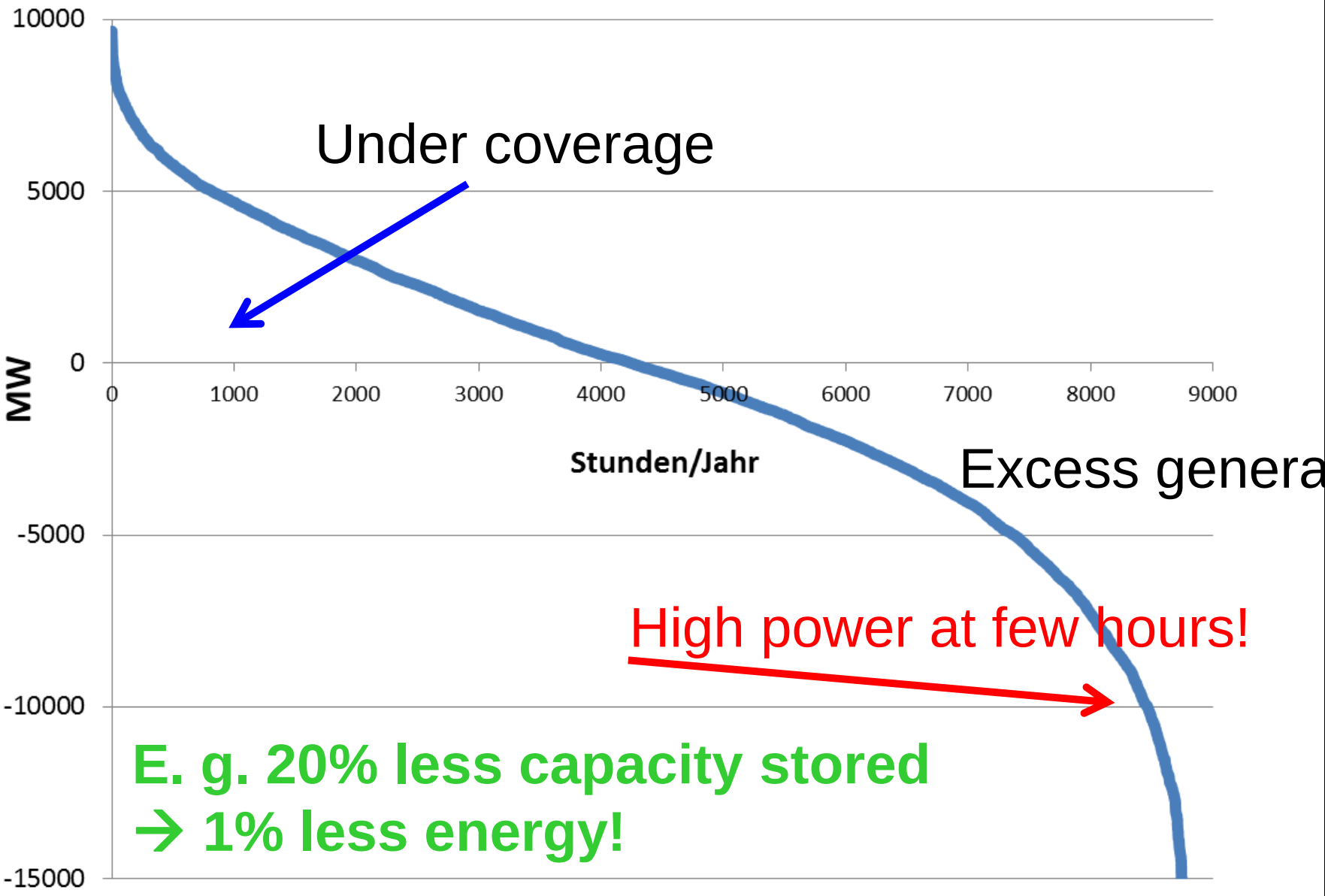
Classified residual load over a year



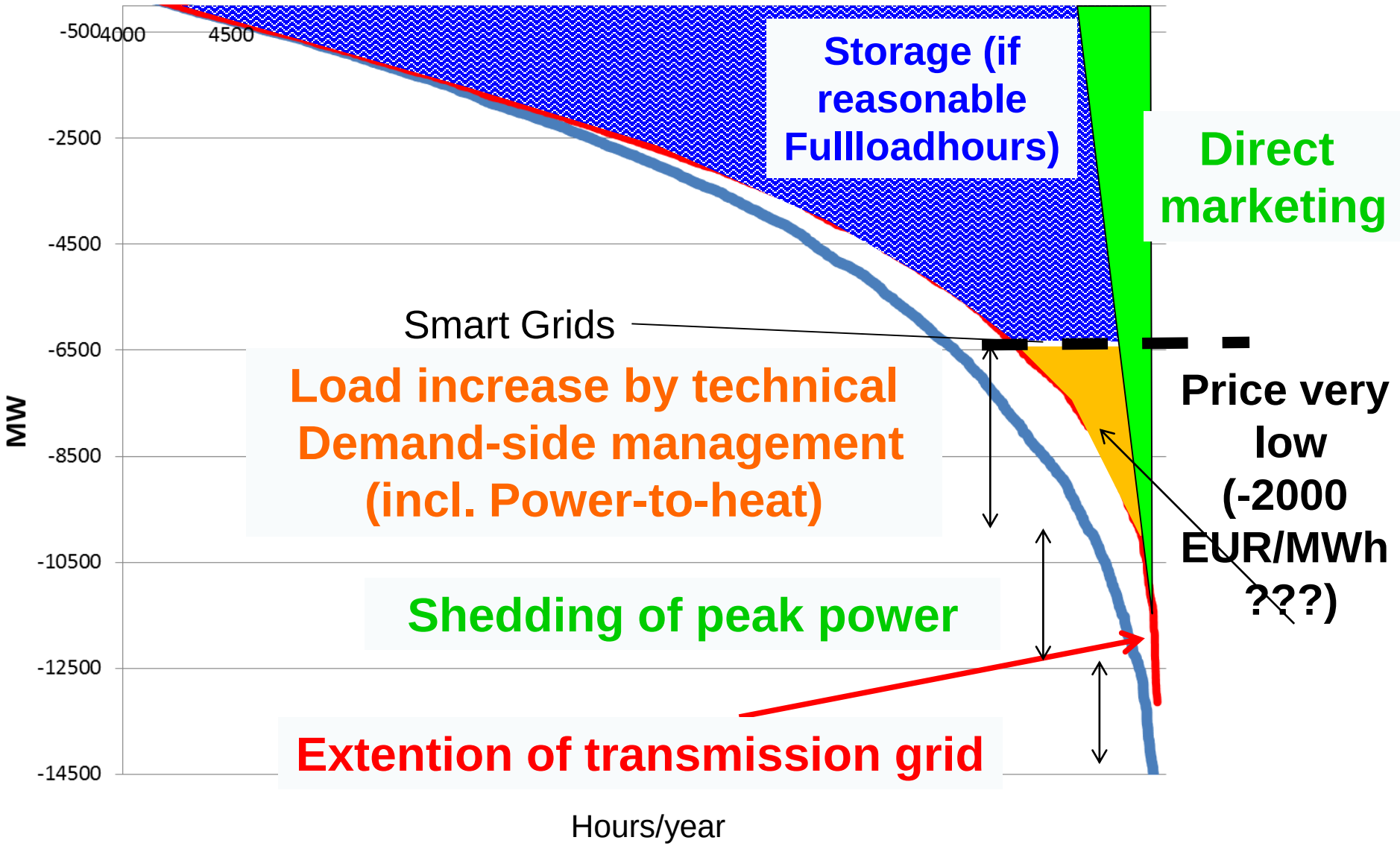
Specific question: How much storage do we need?



Storing every peak?

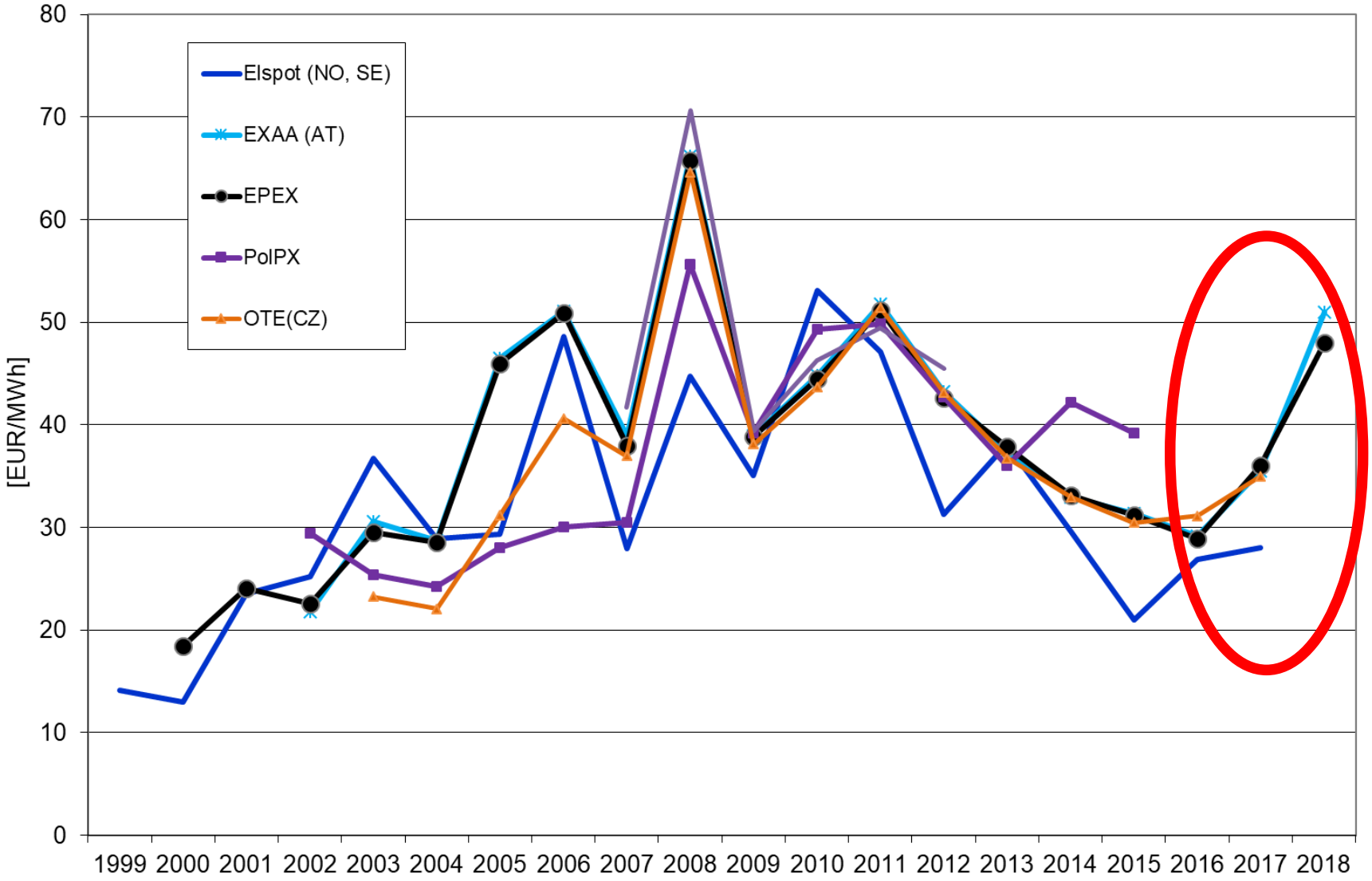


Flexible use of excess electricity and Sector coupling

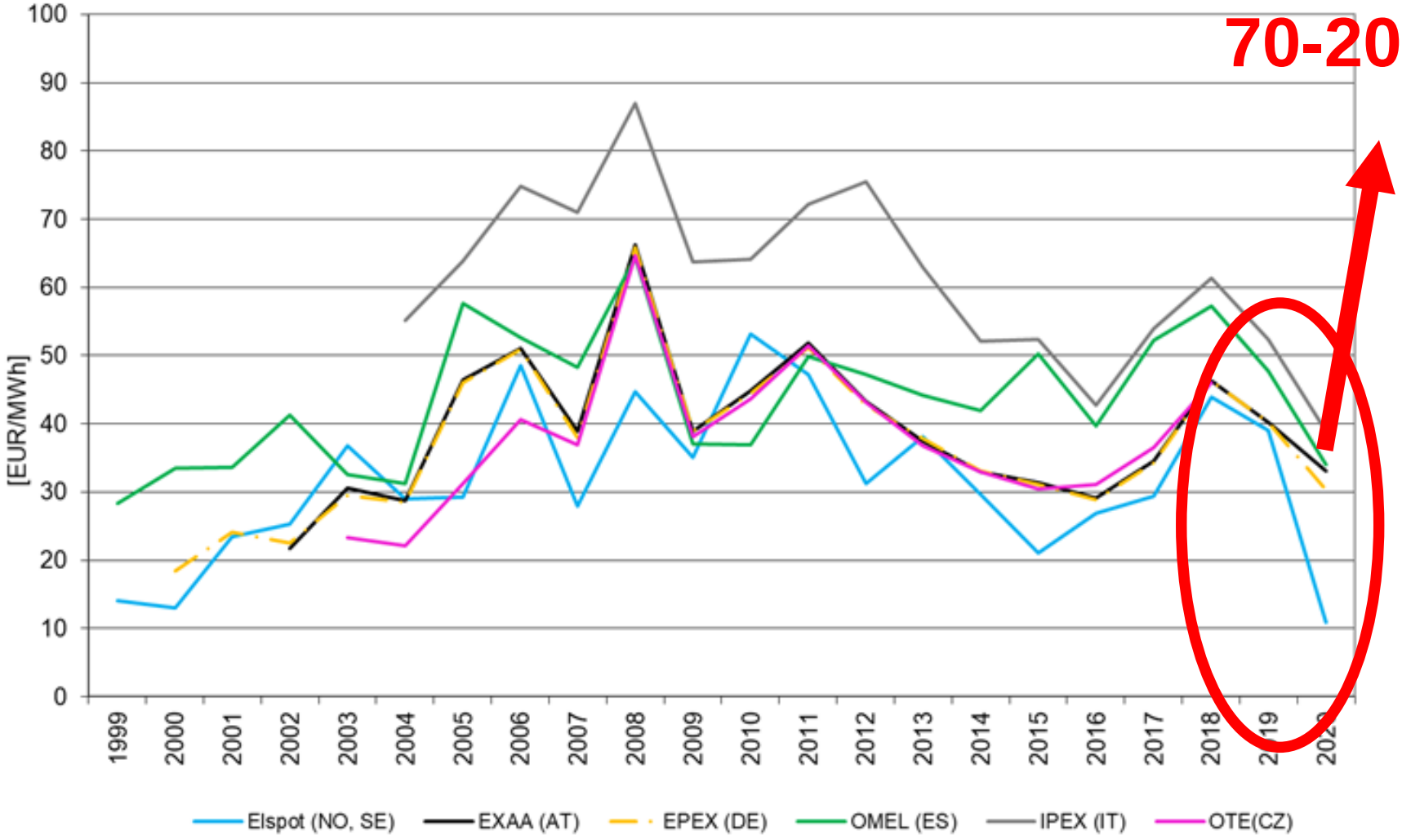


6 IMPACT PARAMETERS ON ELECTRICITY PRICES

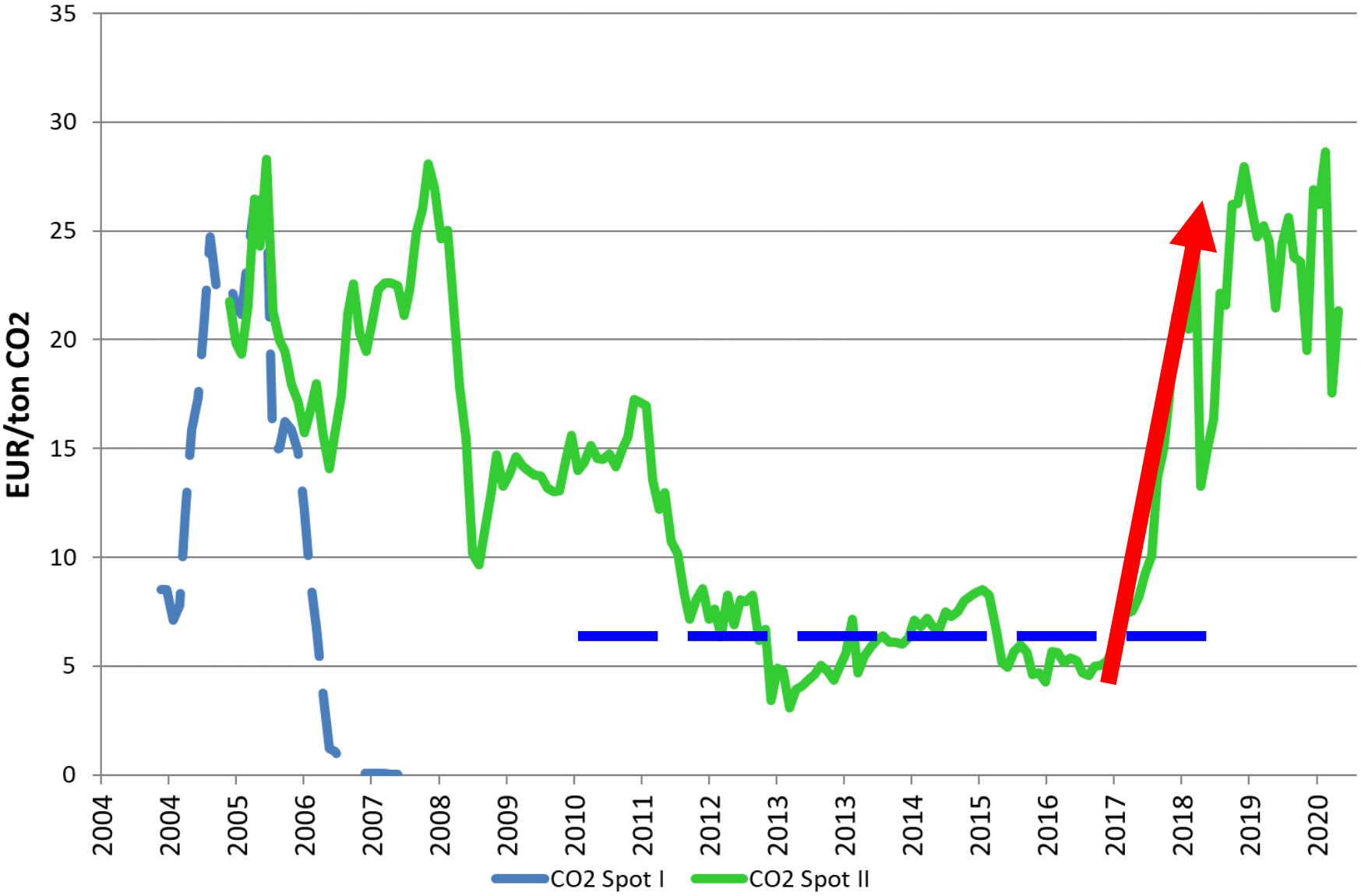
Development of electricity prices in Europe up to 2018 (2)



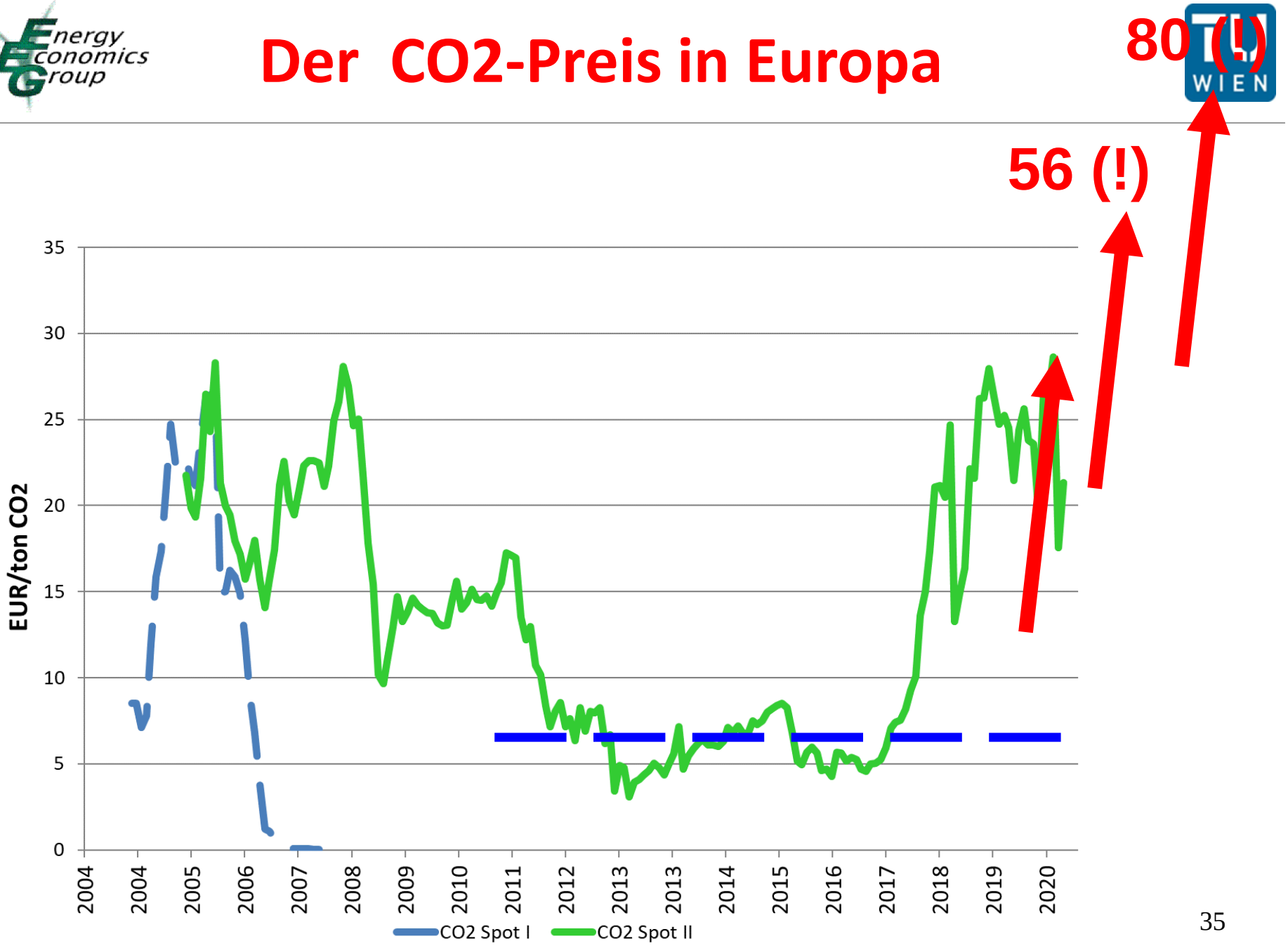
Development of electricity prices in Europe up to 2020 (3)



Development of CO2 prices in Europe



Der CO2-Preis in Europa

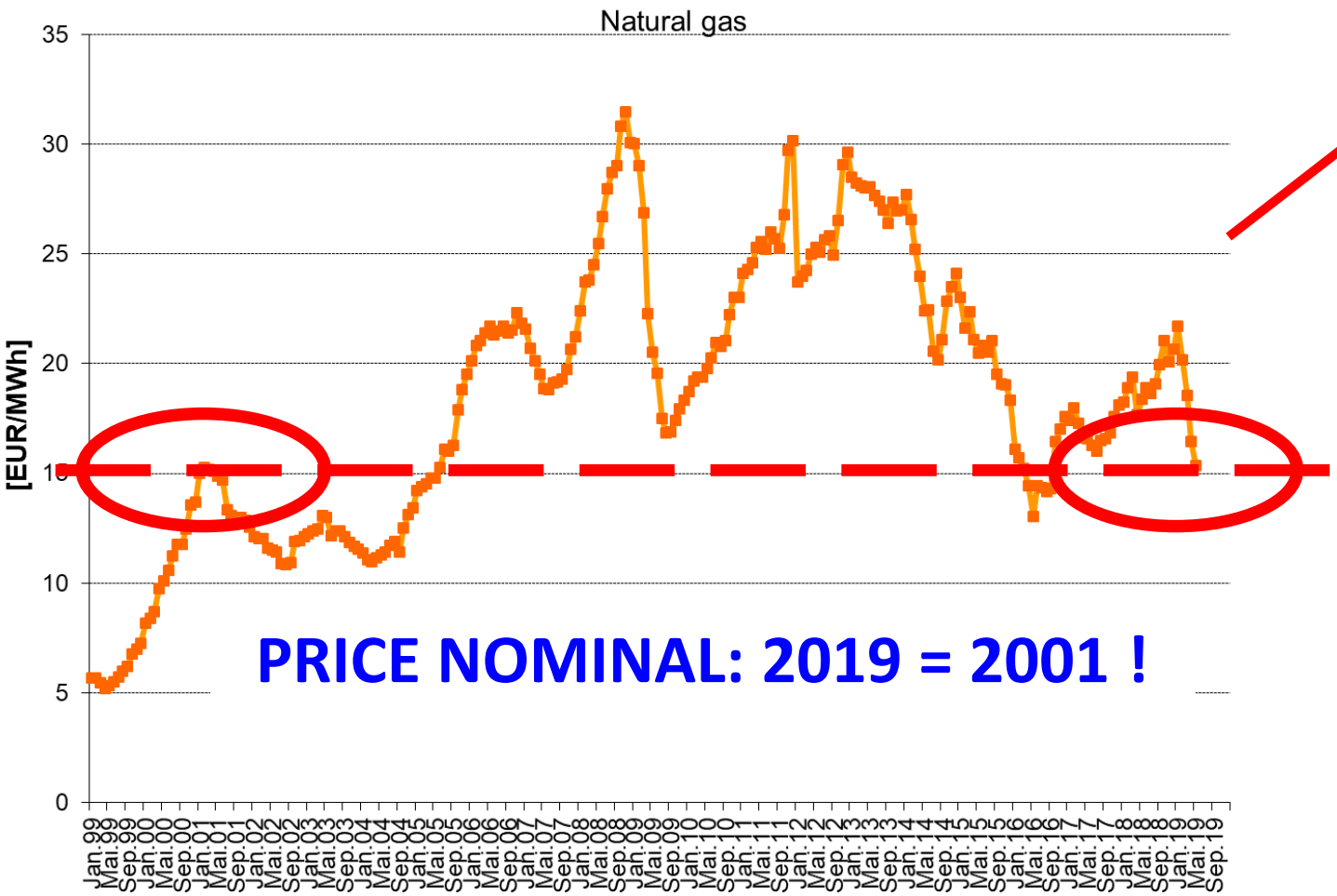


CO_2 emissions price

- ✓ EU Carbon Permits increased 1.72 EUR or 2.13% since the beginning of 2022

Figure 8: EU Carbon Permits price evolution during the last 10 years

THE MARKET PRICE OF NATURAL GAS



100
???

PRICE NOMINAL: 2019 = 2001 !

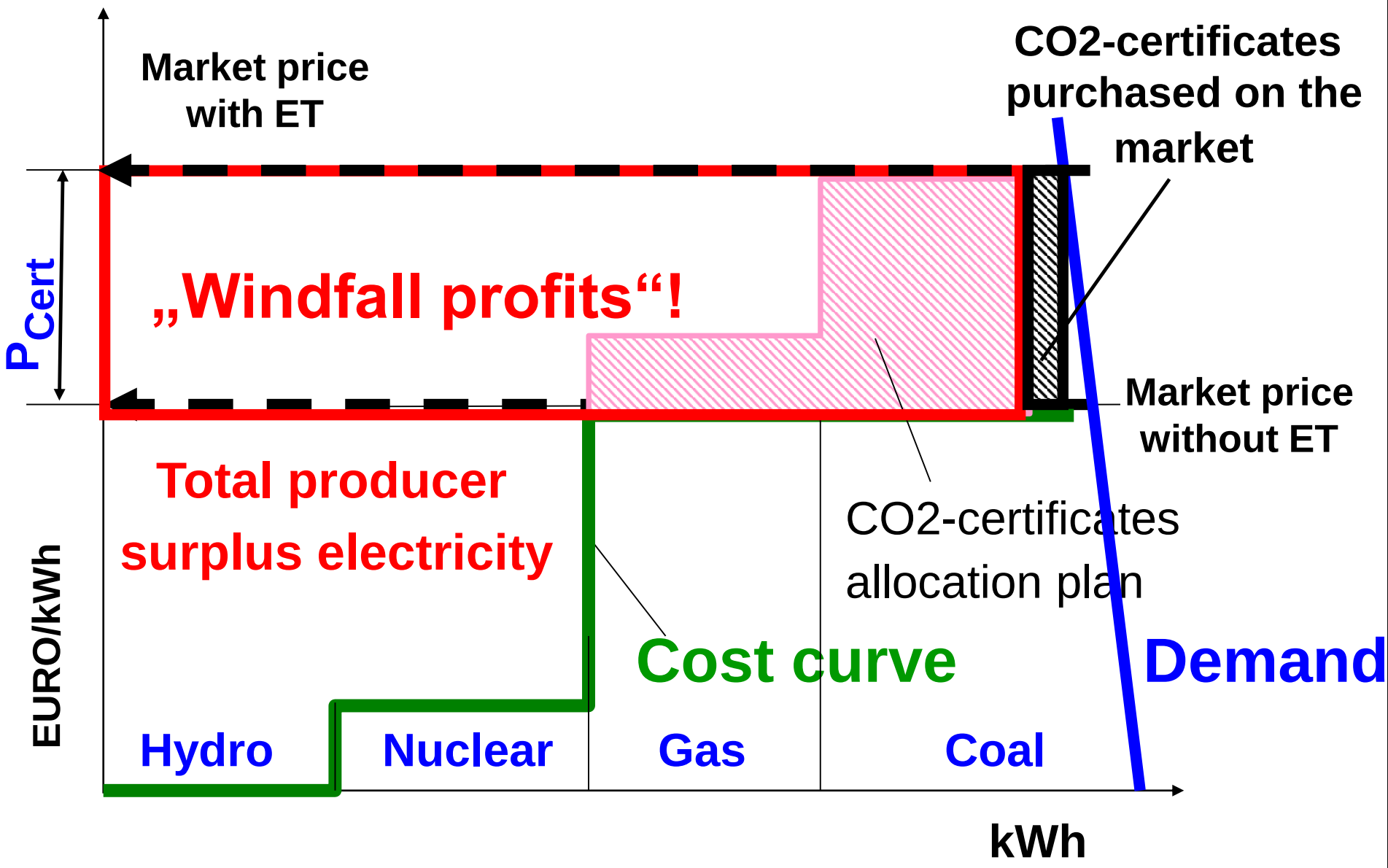
EU Natural Gas price

- ✓ European natural gas futures settled around €117 per megawatt-hour on Friday (June 17).
- ✓ Gazprom tightened further gas supplies to the EU putting in jeopardy EU's objectives to filling 80% of storage capacity before the next winter heating season.
- ✓ The Russian state-owned gas giant has cut more gas supplies to Italy, with ENI set to receive just half of its requested gas while flows to Germany through the key Nord Stream remained limited by 60%.

Figure 6: EU natural gas price evolution during the last 10 years

- ✓ Adding to woes, the shipments of US LNG cargoes are set to decline, following an explosion at Freeport LNG, a facility which accounts for

EMISSION TRADING'S BENEFIT FOR ELECTRIC UTILITIES



Merit-order-Kurve DE 2020 und 2021

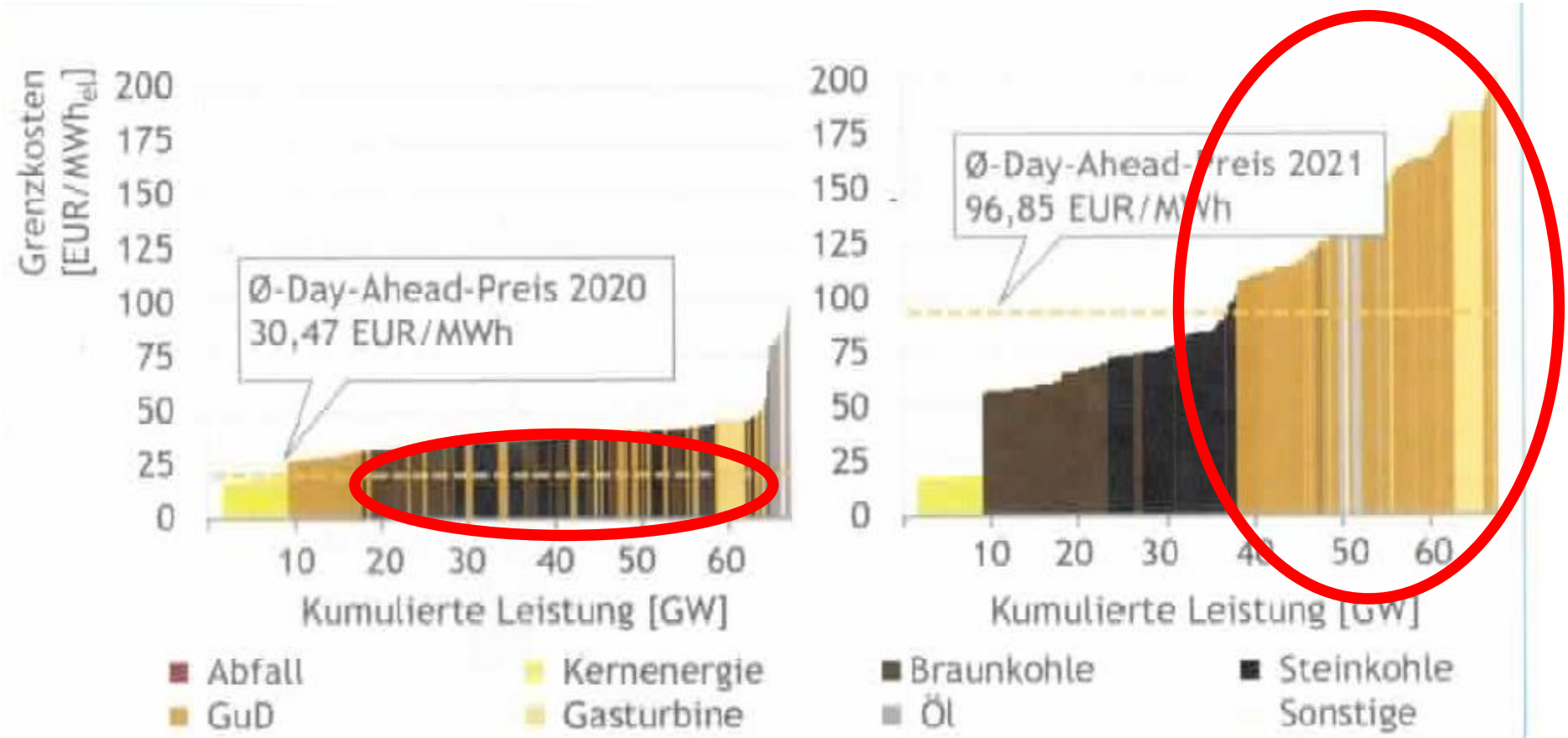


Abb. 3 Durchschnittliche Merit-Order im Jahr 2020 (links) und 2021 (rechts) (auf Basis des EWI Merit-Order Tools)

Monatliche Grenzkosten Kurve DE 2020 und 2021

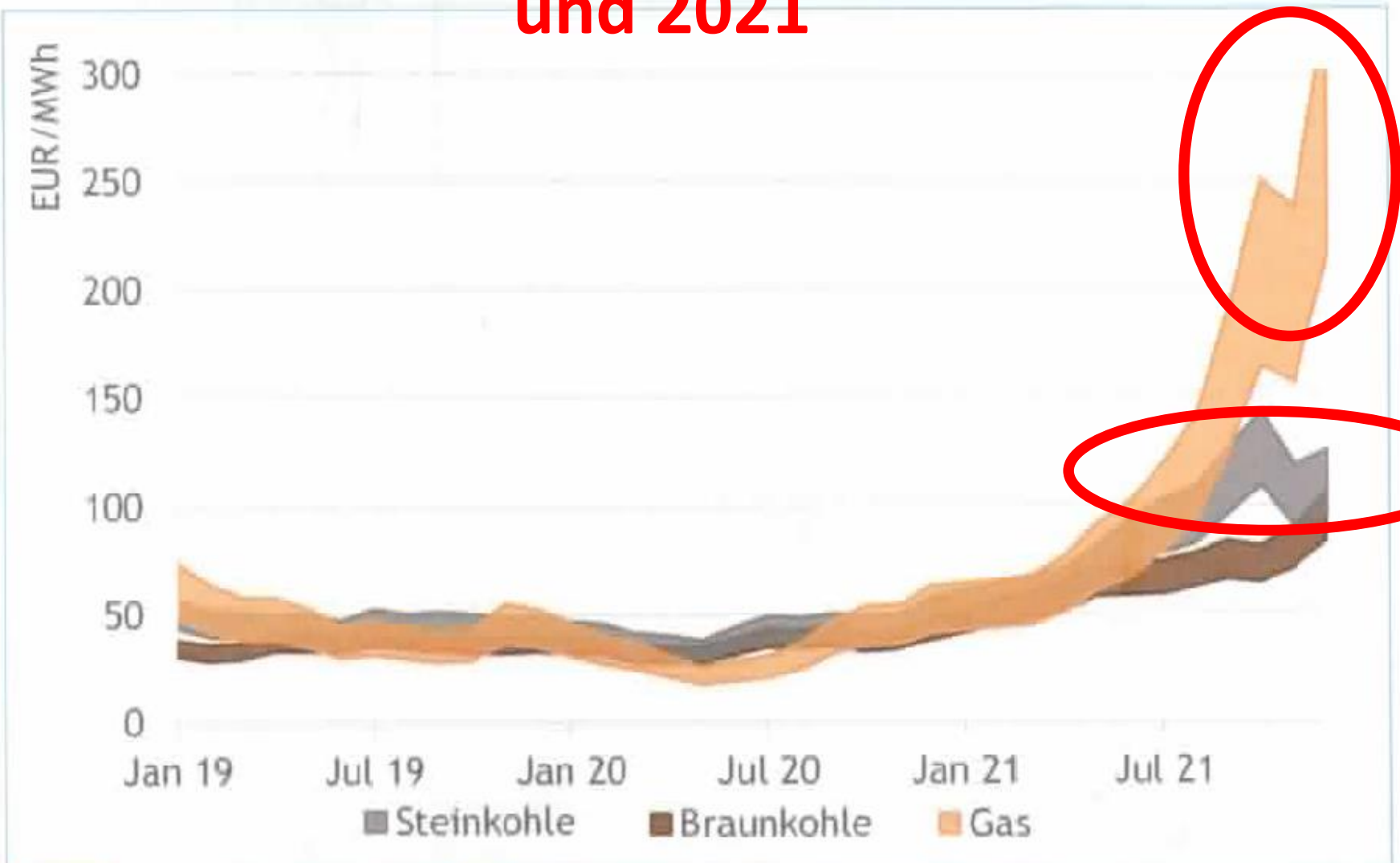
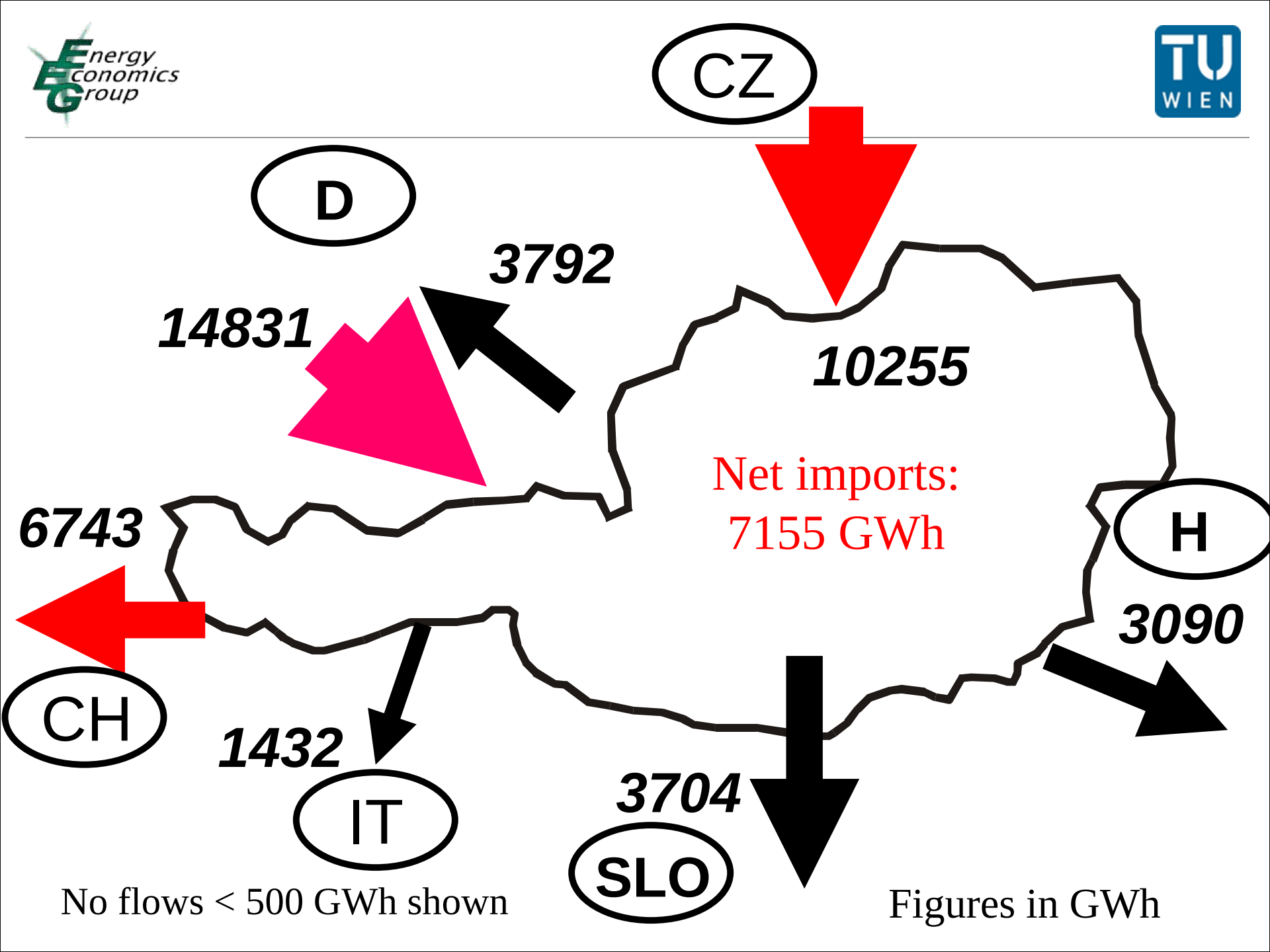
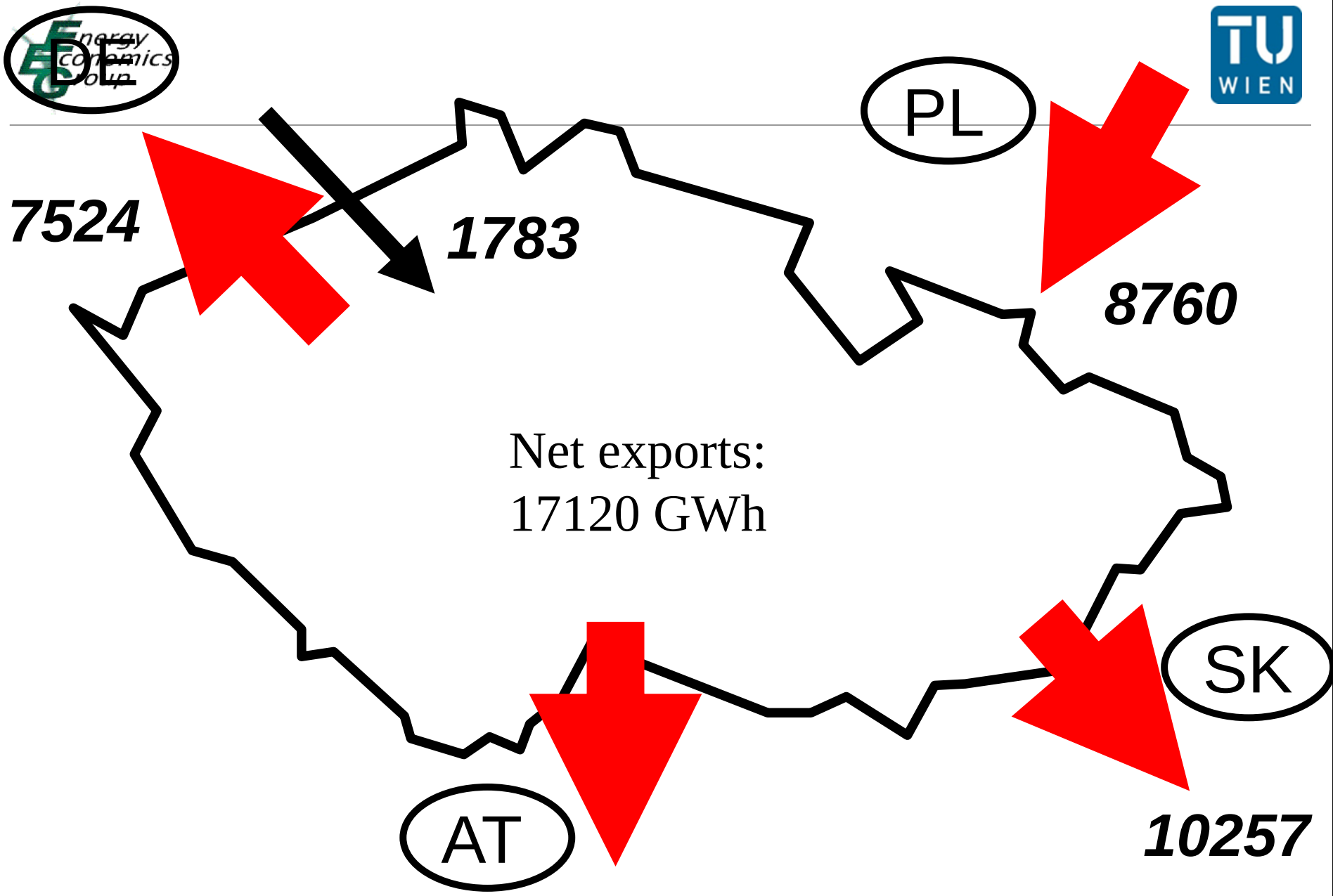


Abb. 4 Monatliche Grenzkosten konventioneller Kraftwerke 2019-2021

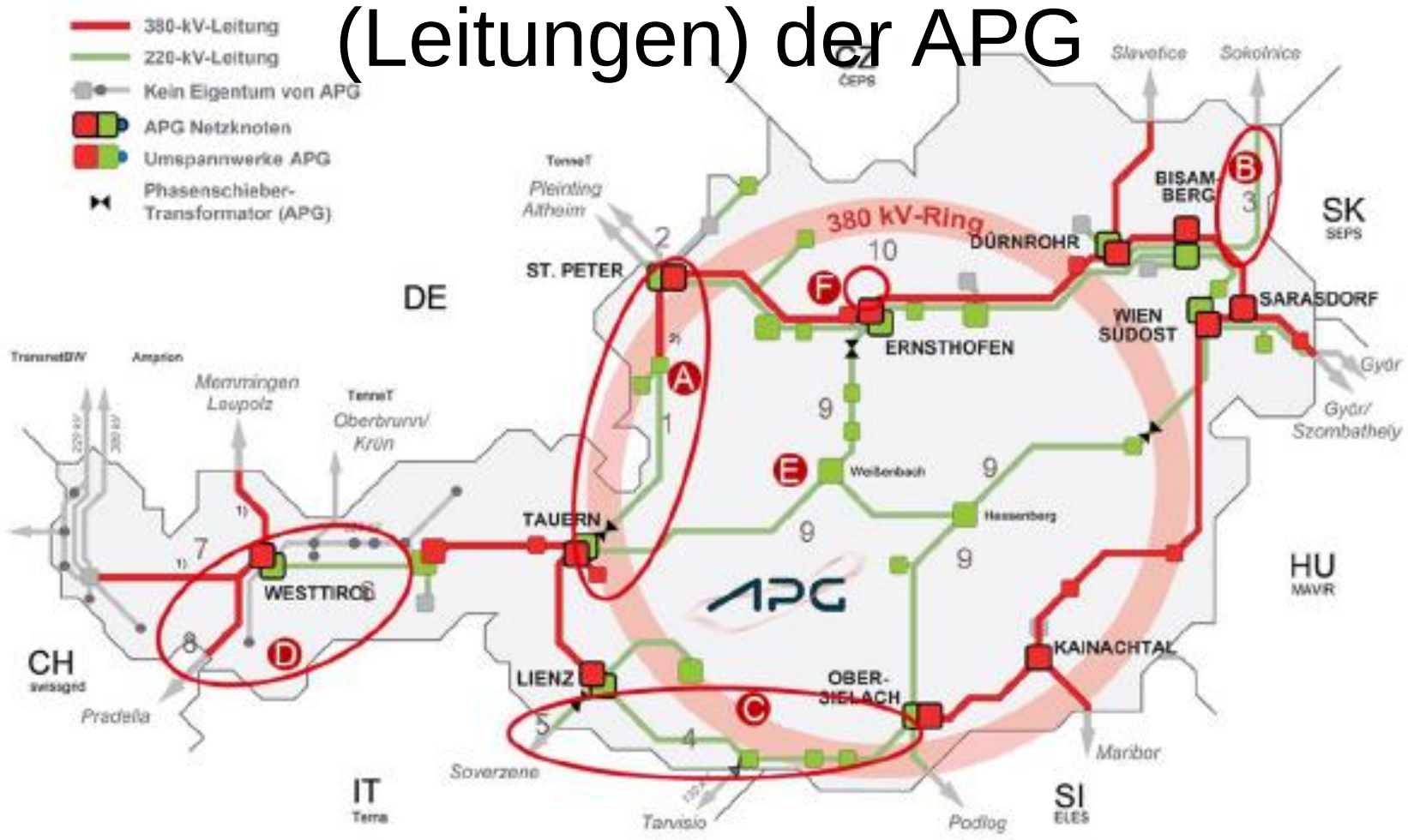

CZ
D
3792
14831
10255
Net imports:
7155 GWh
6743
H
3090
CH
1432
IT
3704
SLO
No flows < 500 GWh shown
Figures in GWh



No flows < 500 GWh shown

Figures in GWh

Die TOP-10-Netzausbauprojekte (Leitungen) der APG



Quelle: APG (2020)

7. CONCLUSIONS

- Sustainable electric. system → integration of a broad technology portfolio & demand-side options!
- No quick fix, no one size fits all solutions
- Larger market areas favourable
- Important: correct price signals (incl. CO2)
- Urgent: exhaust full creativity for flexibility of all market participants (Erdmann)
- Prospects for storage: less bright than argued
- Core relevance: A contract coordinating entity
- New key players: Suppliers / balancing groups