HEADING TOWARDS A SUSTAINABLE AND DEMOCRATIC ELECTRICITY SYSTEM

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CONTENT:

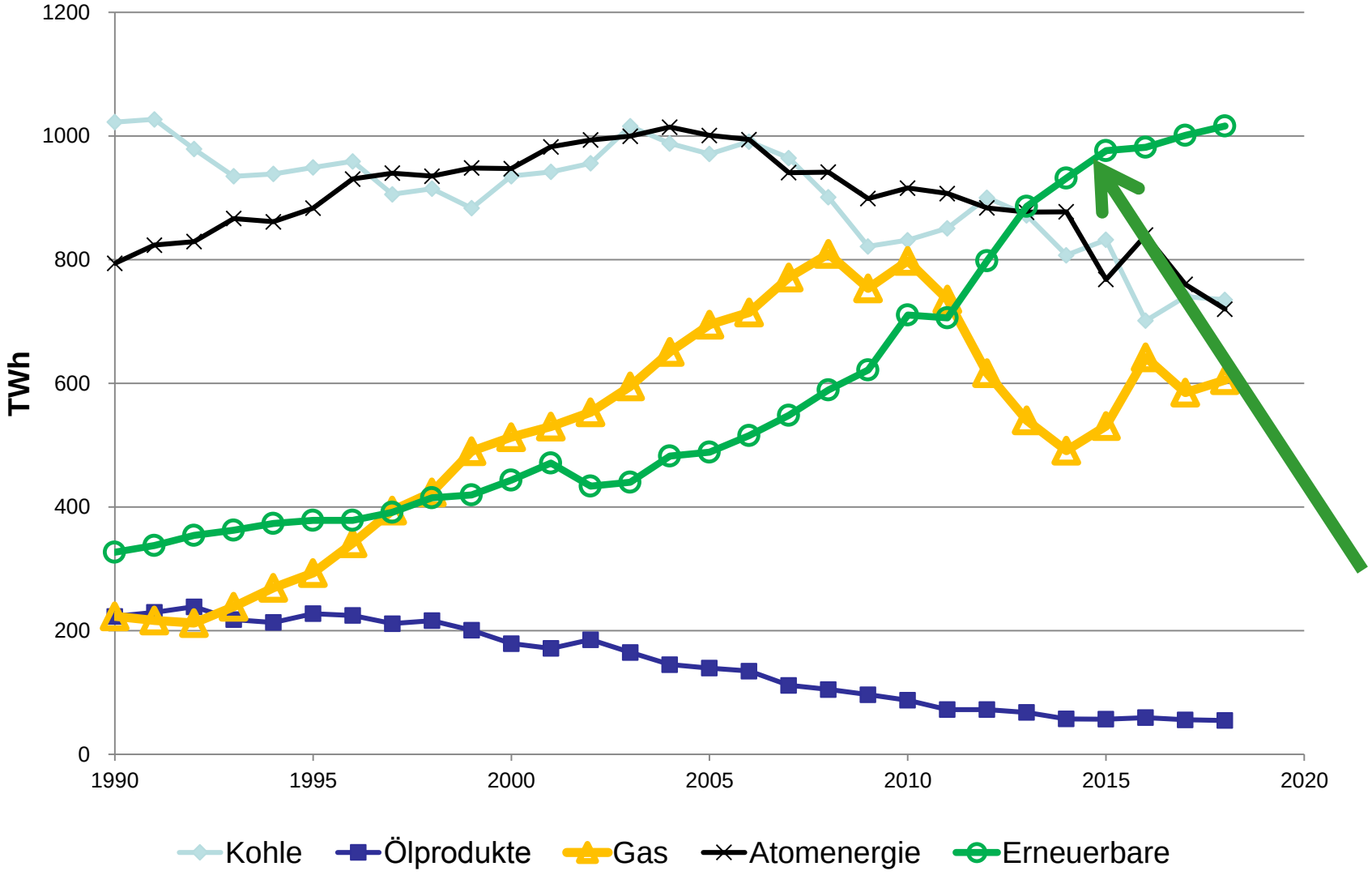
1. Introduction: Motivation
2. Method of approach
3. How variable renewables impact prices in electricity markets
4. The core problem of capacity payments
5. The role of flexibility
6. Subsidizing renewables?
7. Conclusions

1. INTRODUCTION

Motivation:

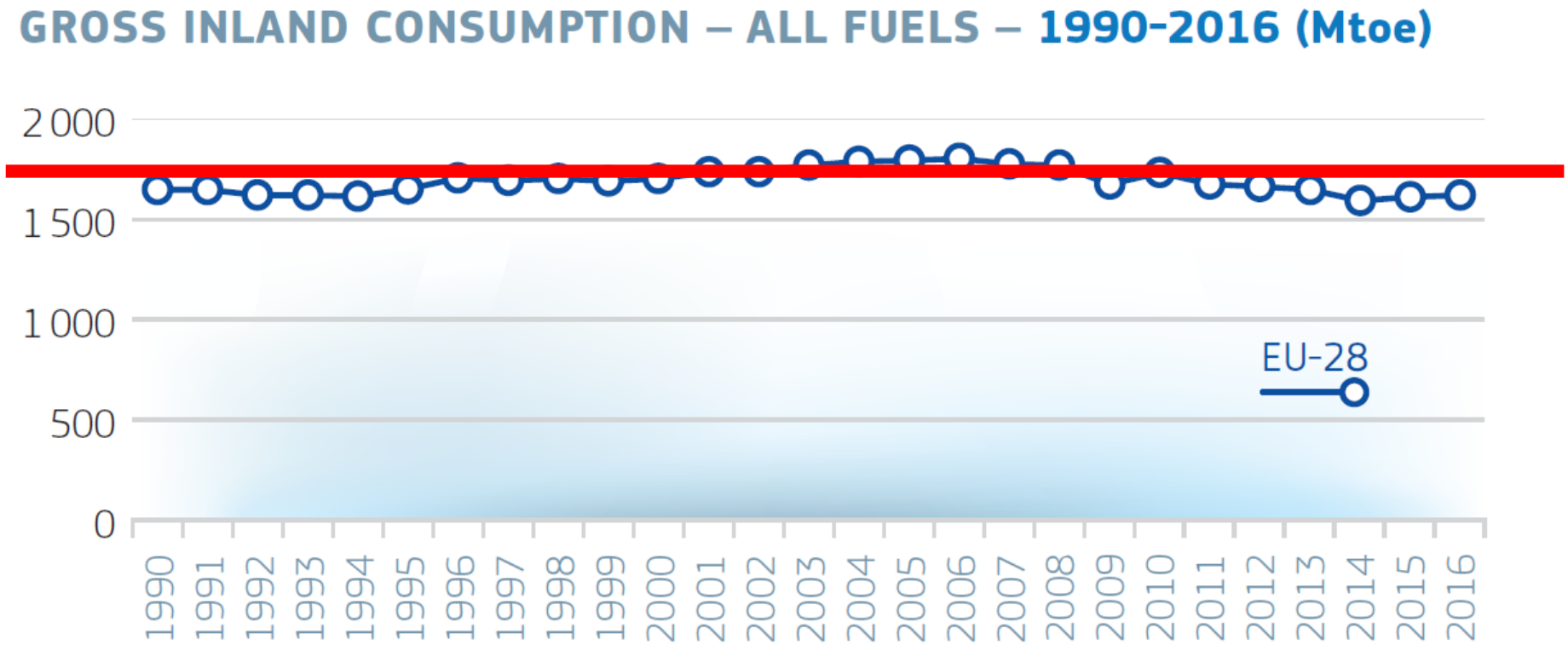
* Climate change → Paris agreements
* Targets for renewables
* Europe: The clean energy package → energy communities
* It is not possible to force variable renewables into the system
* A strong desire of some customers to participate in electricity supply

Electricity generation EU-28

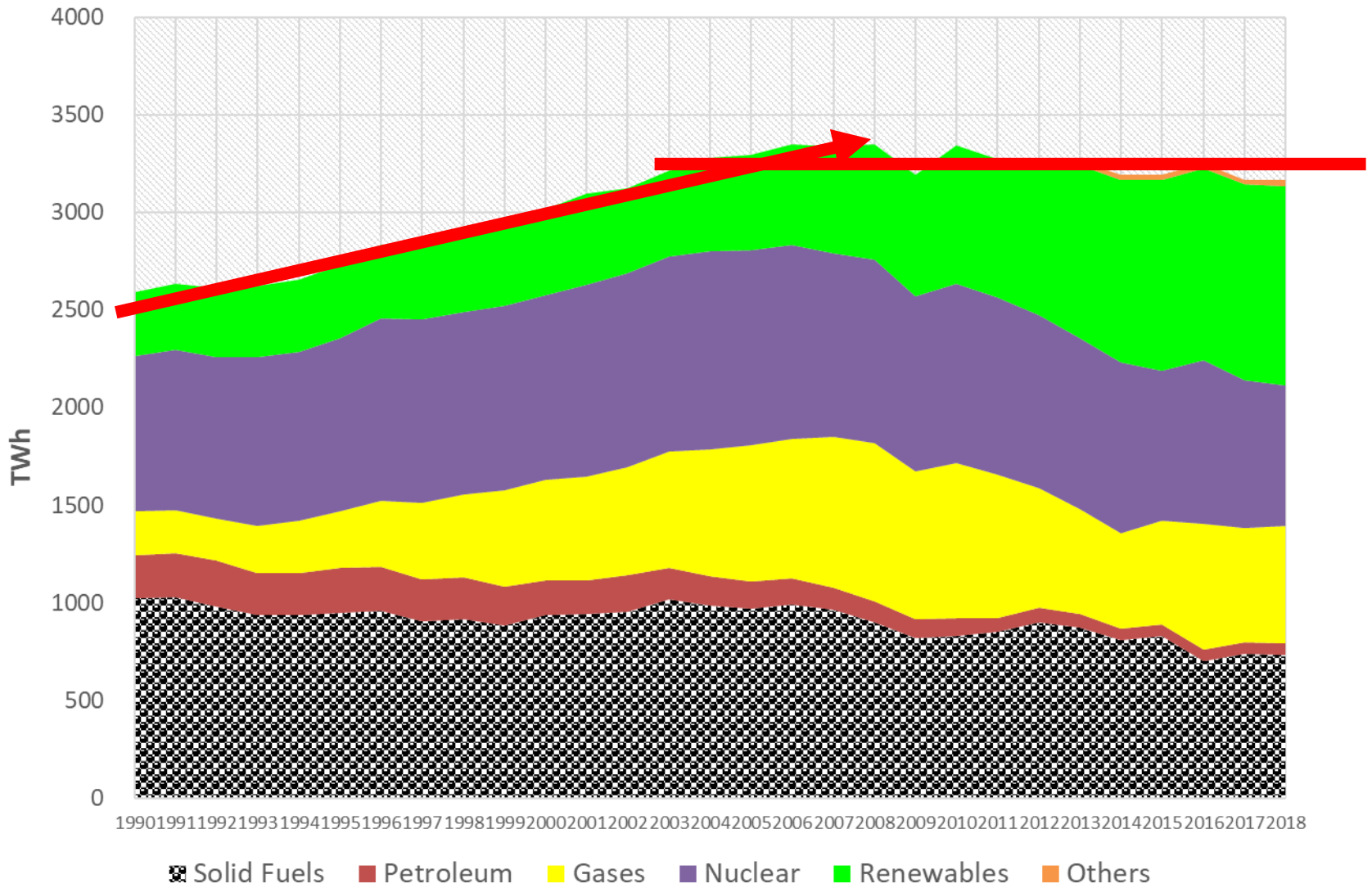


Werte für 2017 und 2018 vorläufig

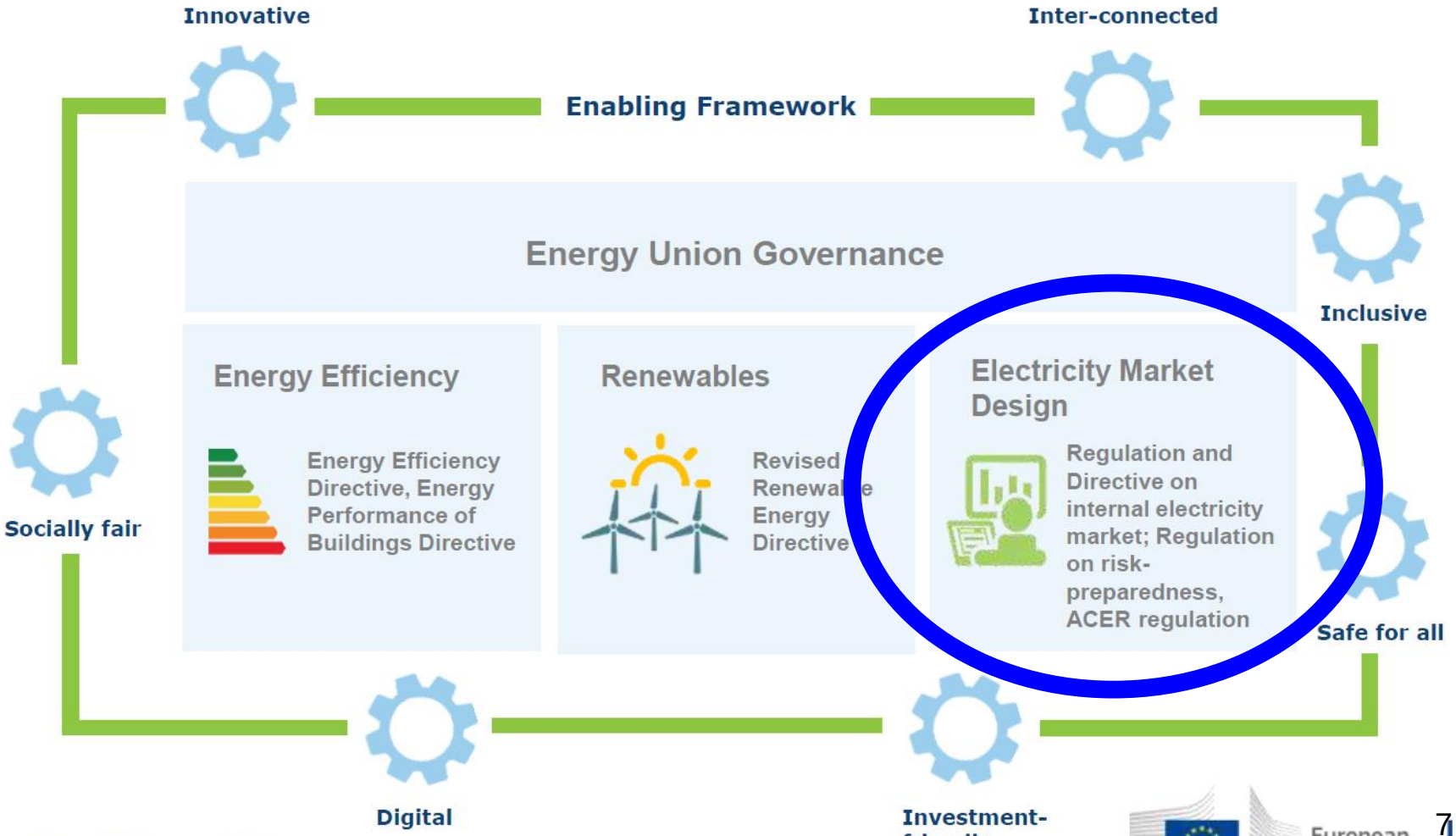
Total Energy Consumption EU-28



Electricity Consumption EU-28



Structure of the Package



European Commission

Core objective

… to identify the major boundary conditions to integrate even larger amounts of variable renewables into the electricity system

Very important:

Our reflections apply in principle to every electricity system world-wide

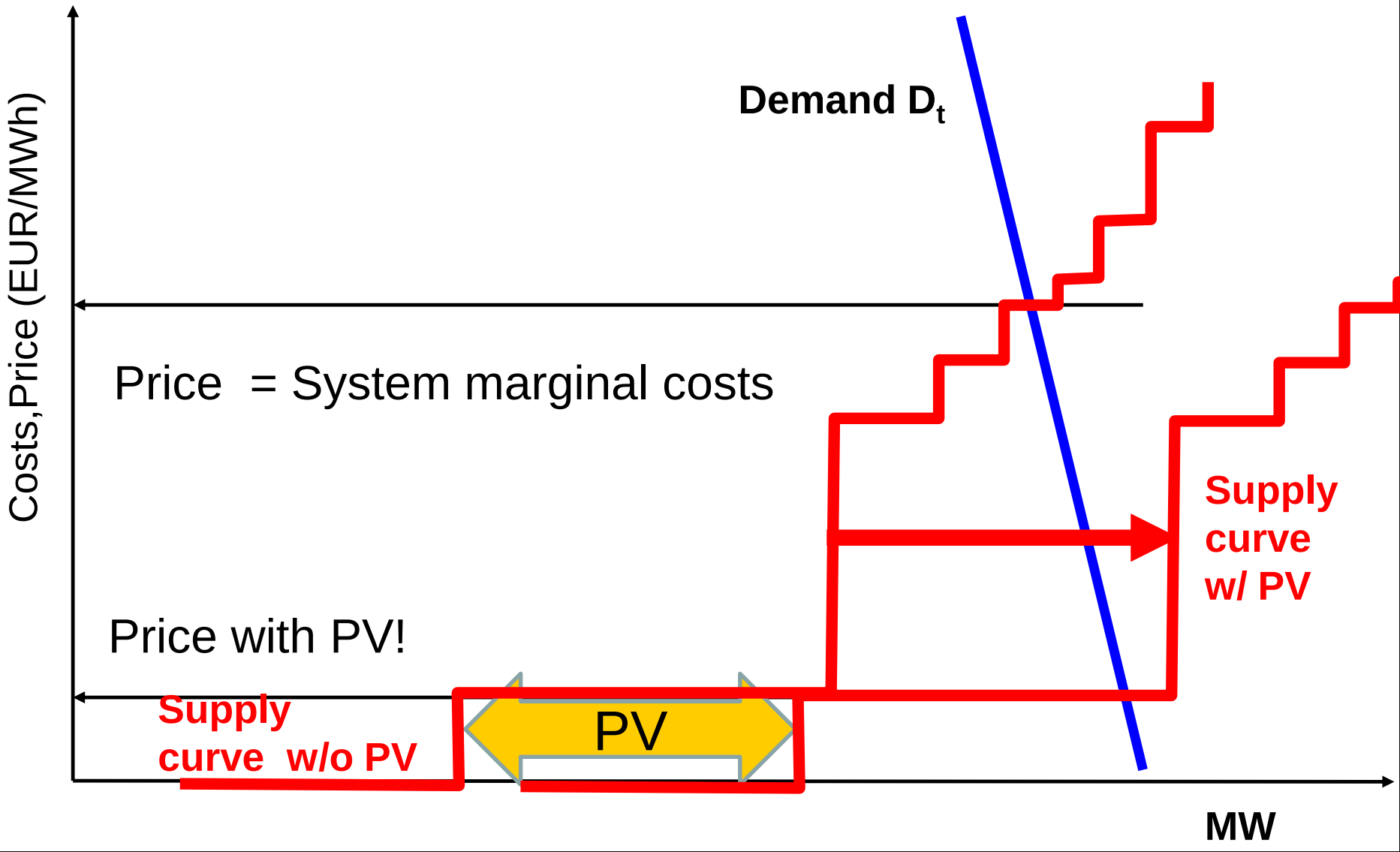
…. are based on electricity economic point-of-view

2. METHOD OF APPROACH

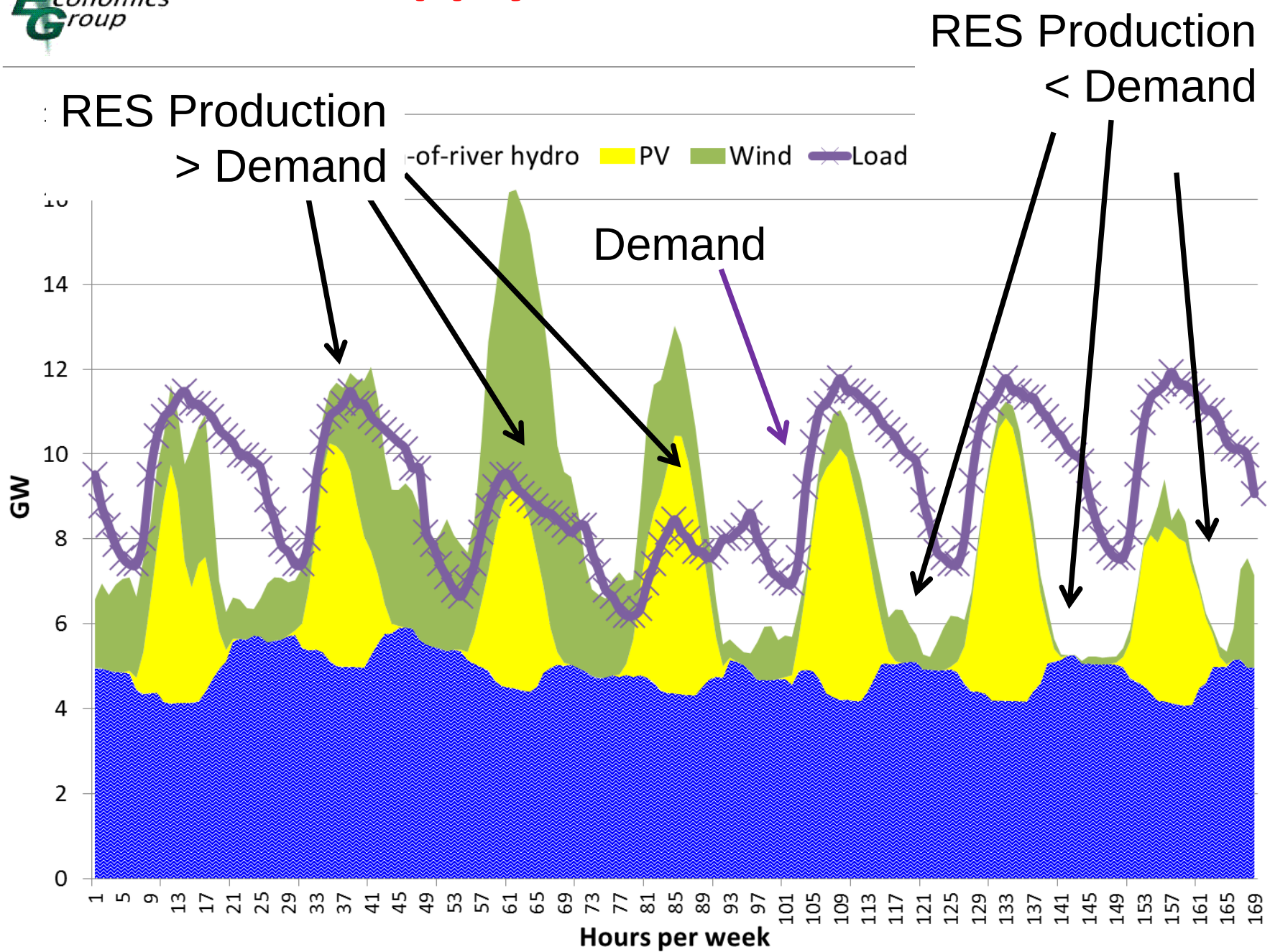
- **hourly resolution of residual load over a year in scenarios with large quantities of variable renewables;**
- **Applying a fundamental model to calculate (static) hourly electricity spot market prices;**
- **Integration of flexibility/elasticity in a dynamic framework for price calculation;**

3 HOW VARIABLE RENEWABLES IMPACT THE ELECTRICITY SYSTEM AND PRICES IN ELECTRICITY MARKETS

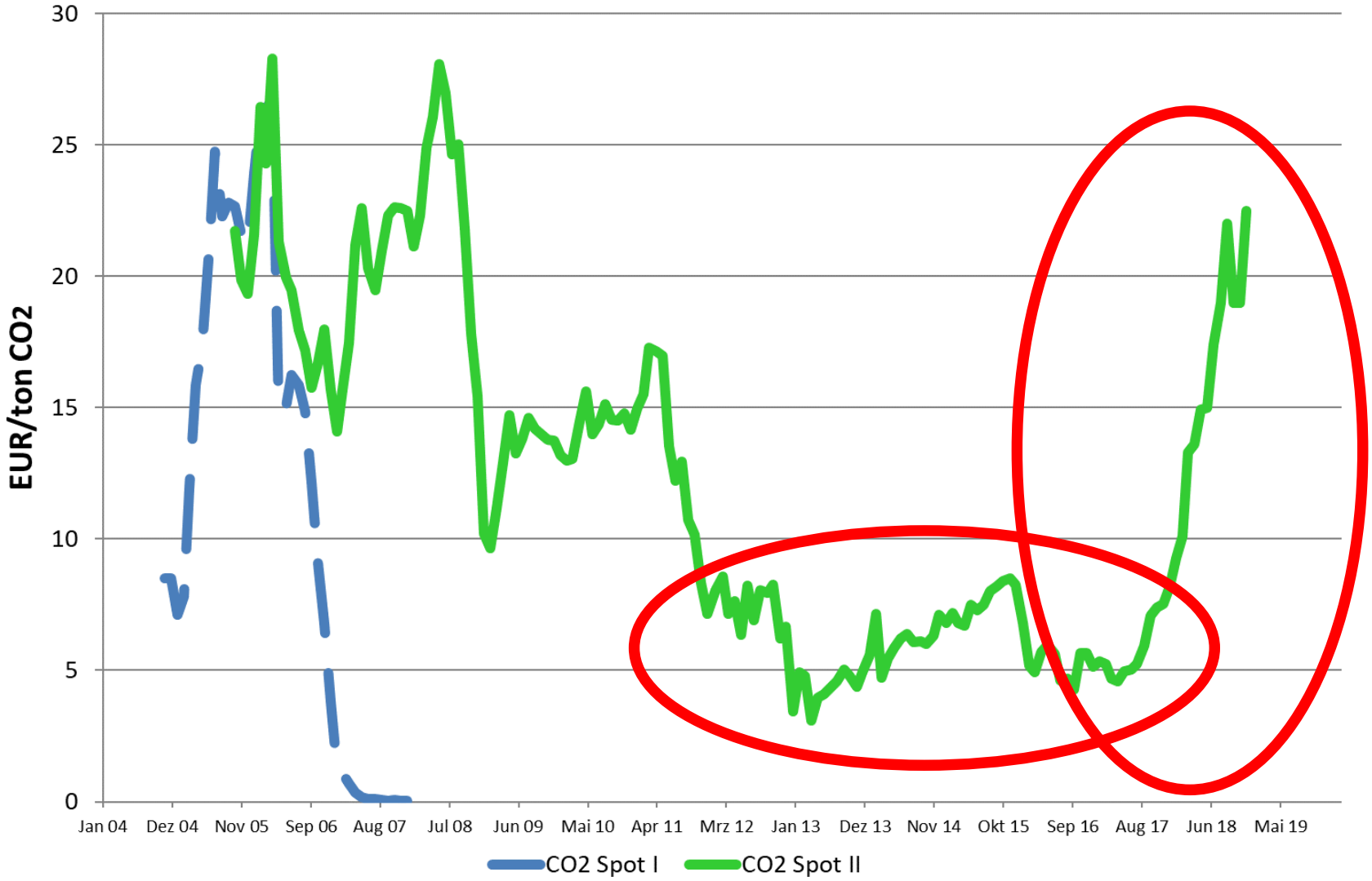
Example: prices without and with PV



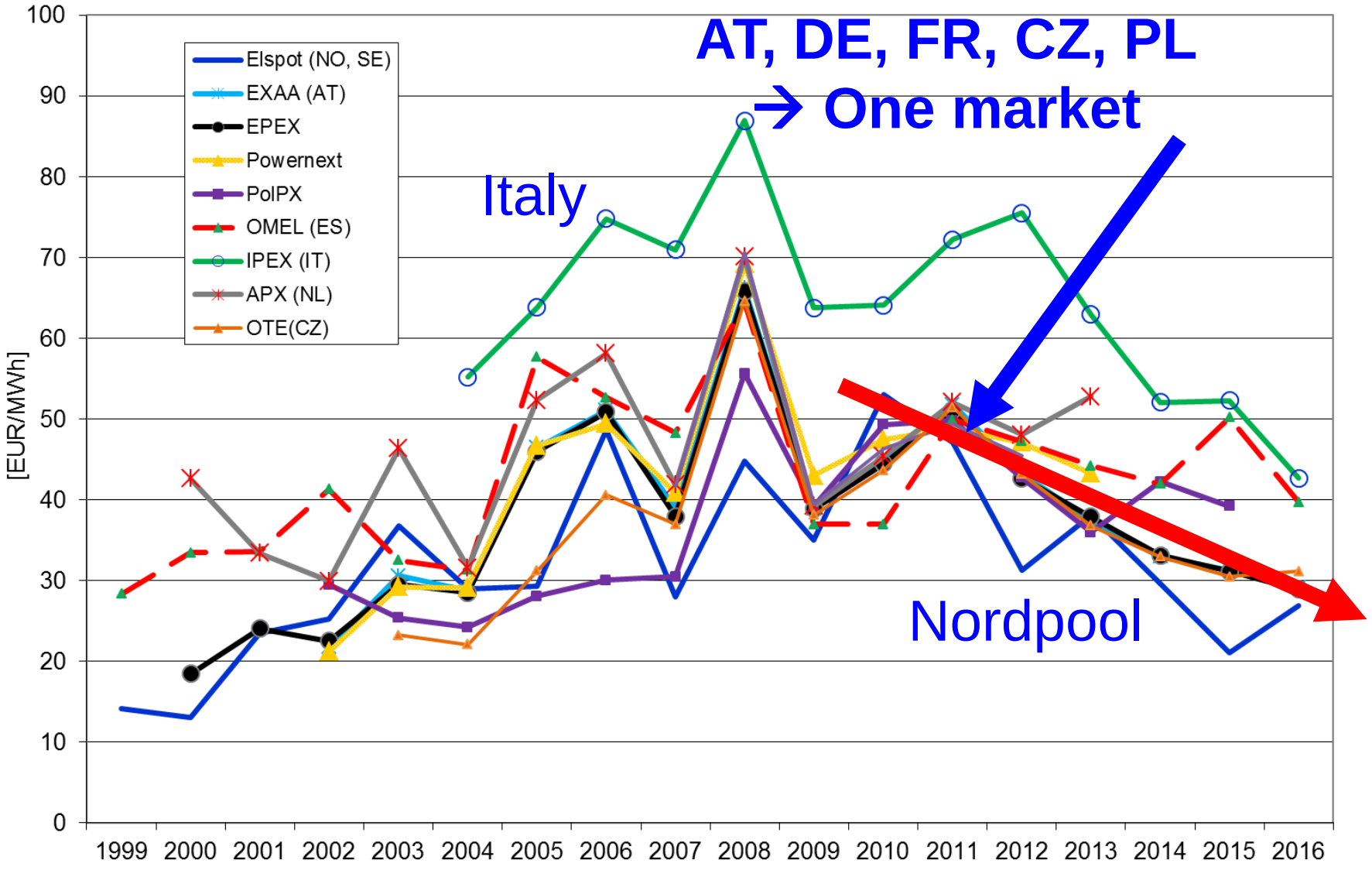
Supply and Demand



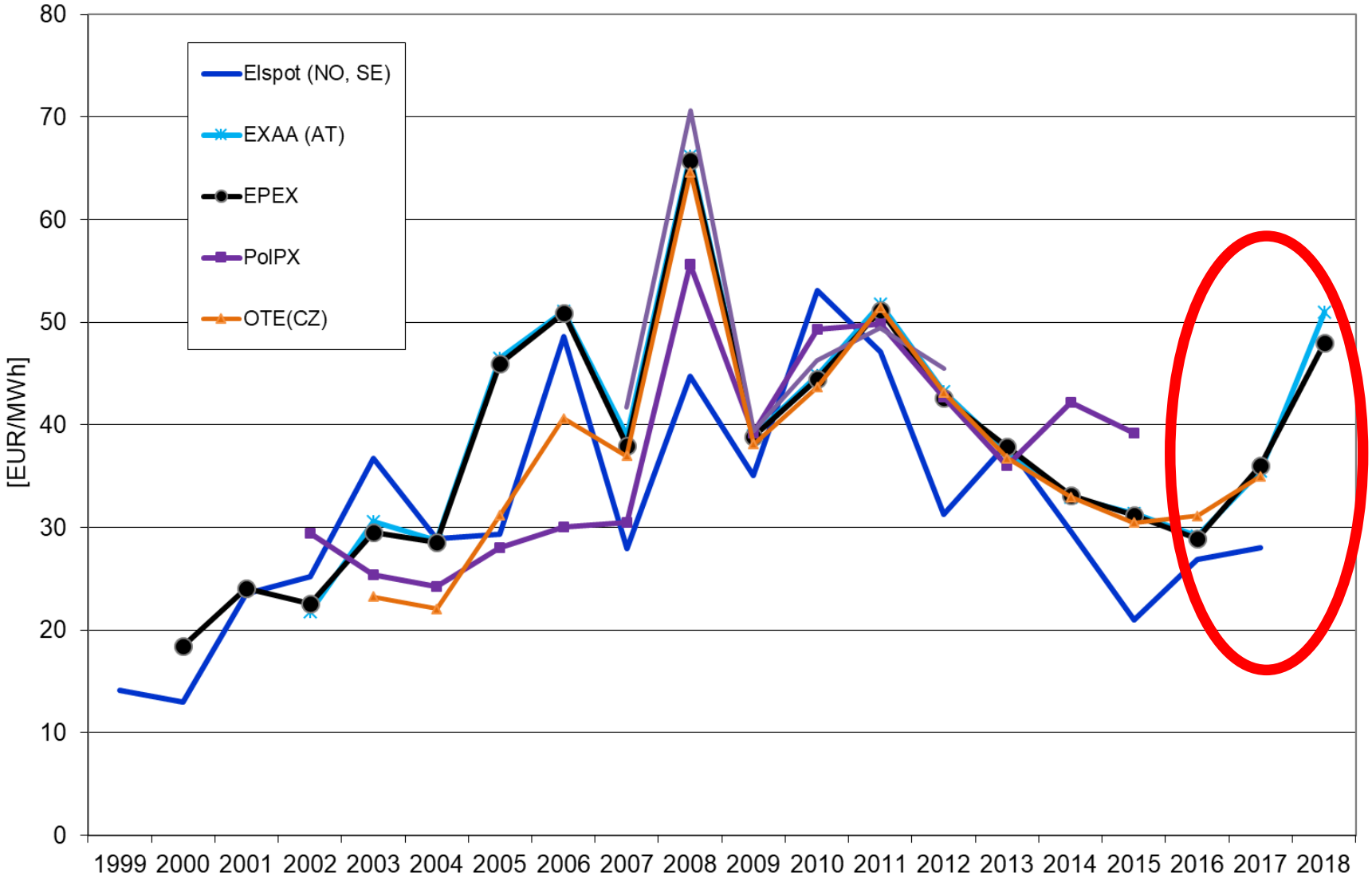
The CO2-Price



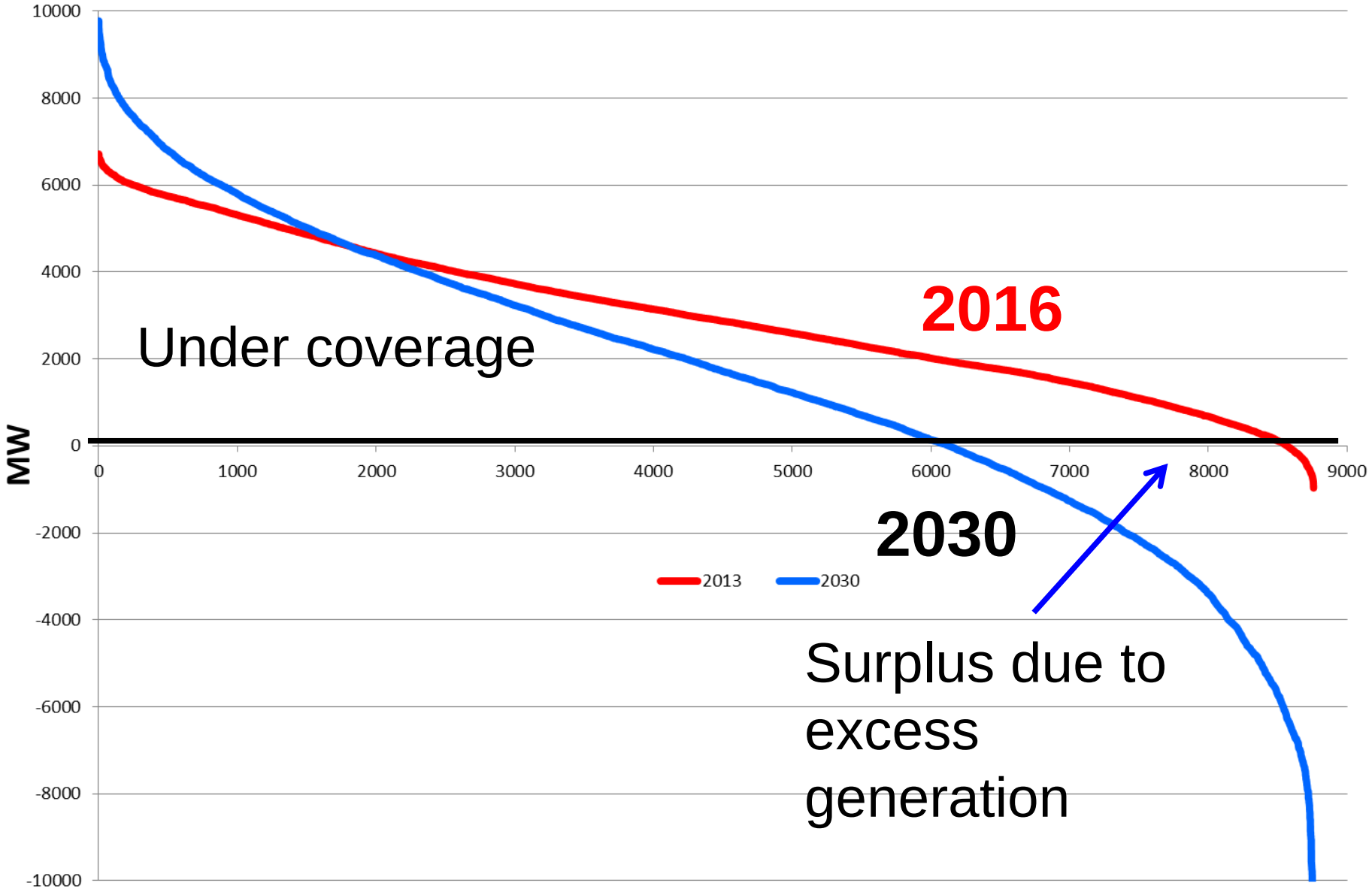
Development of electricity prices in Europe up to 2016 (1)



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



Classified residual load over a year



Classified residual load

There are two extreme positions:

By a regulated capacity payment with STMC pricing?

or

By competition between supply-side and demand-side technologies and behaviour (incl. Storages, grid and other flexibility options) with correct scarcity pricing signals?

4 THE CORE PROBLEMS OF CAPACITY PAYMENTS

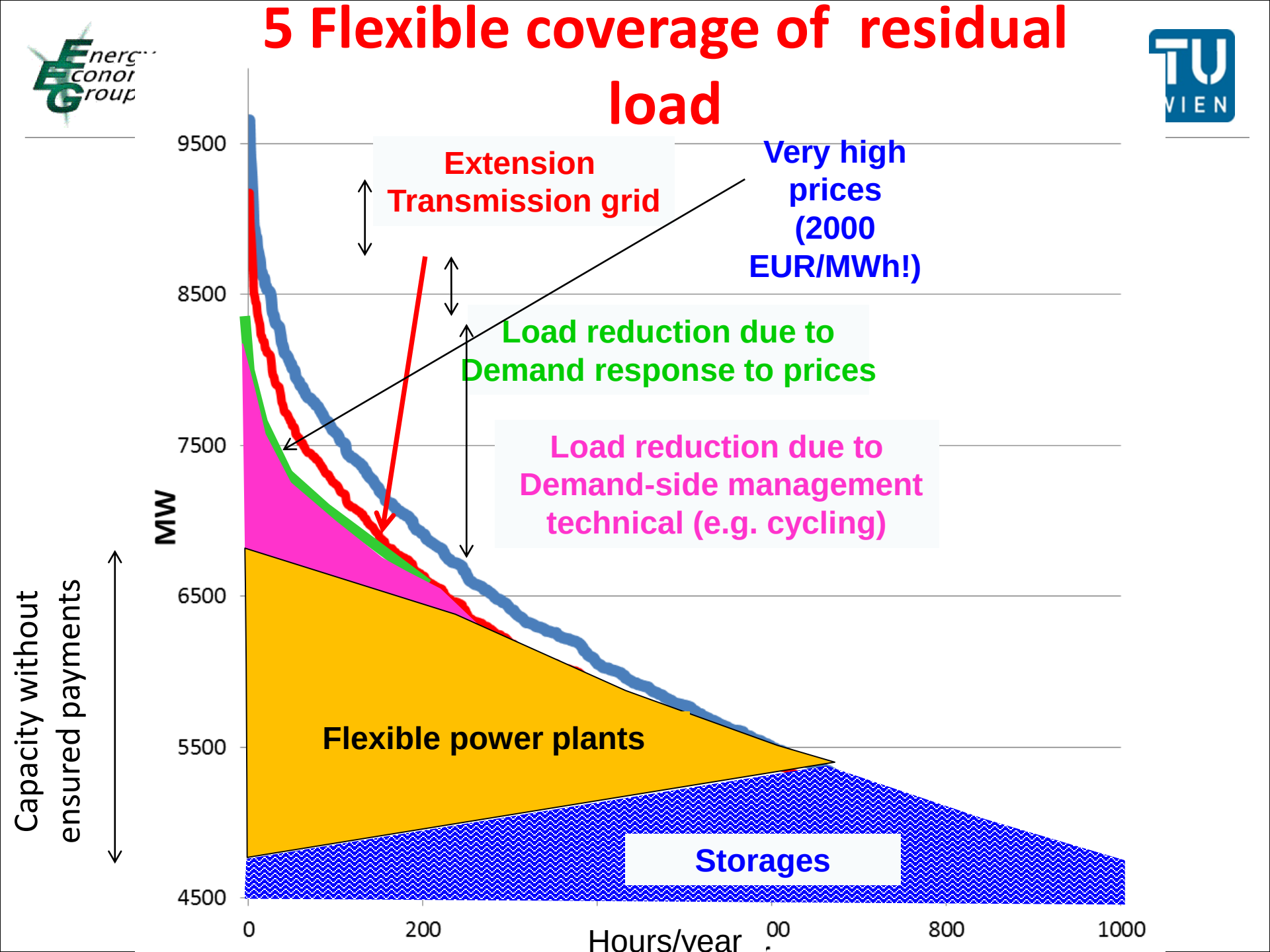
All regulatory capacity payments for power plants destort the EOM and lead to wrong price signals for all other options

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

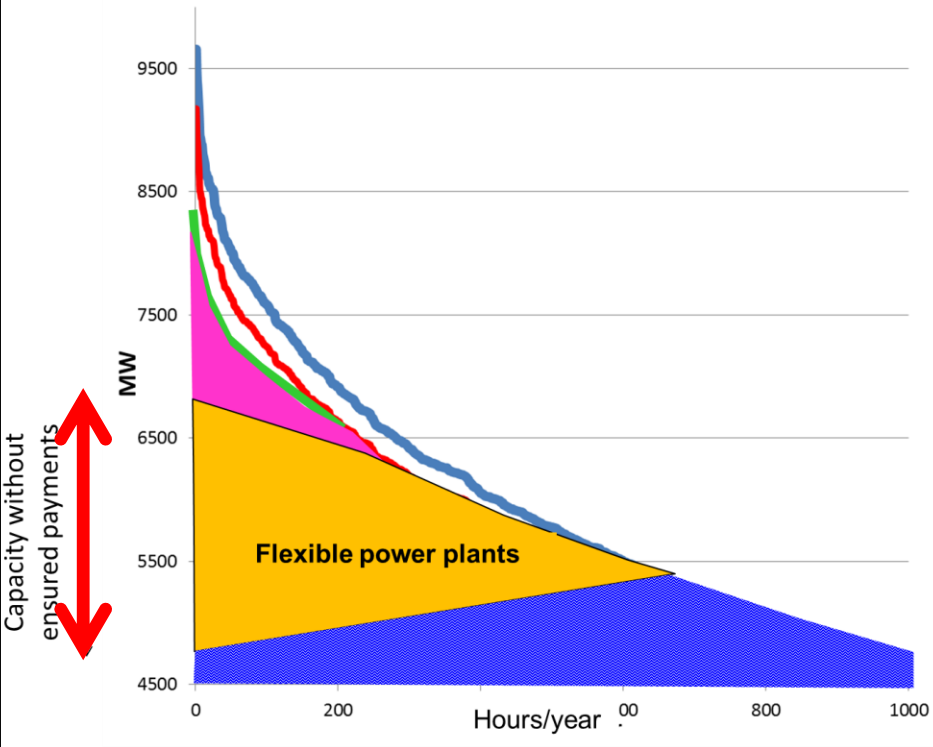
The higher the excess capacities, the lower is the share of RES

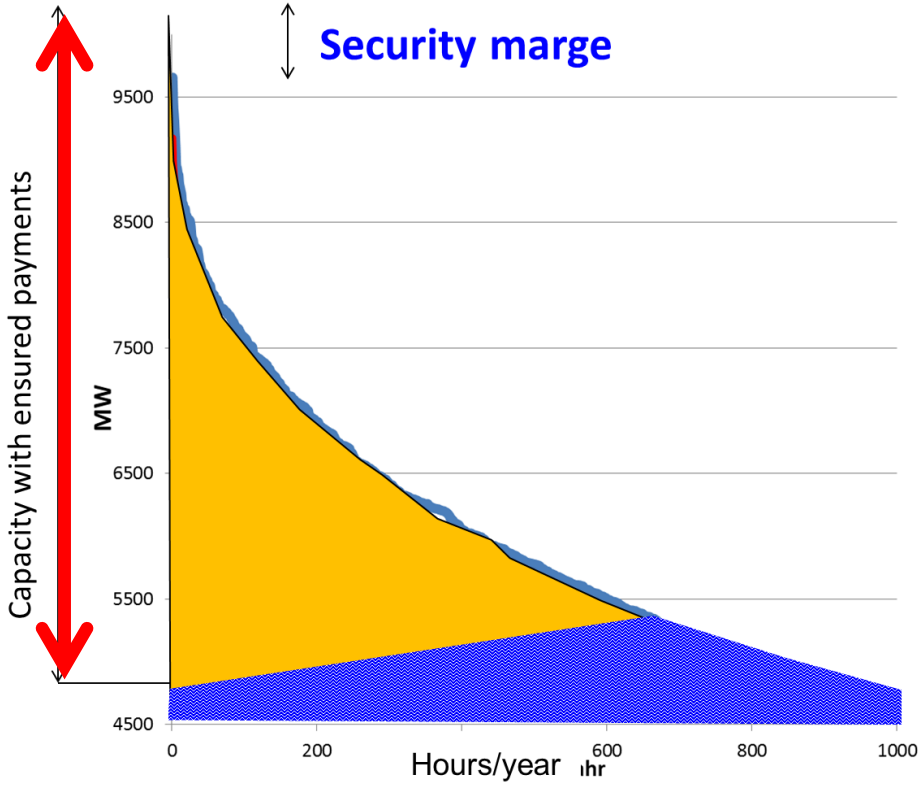
strive to retain system resource adequacy by correct price signals

5 Flexible coverage of residual load



Comparison

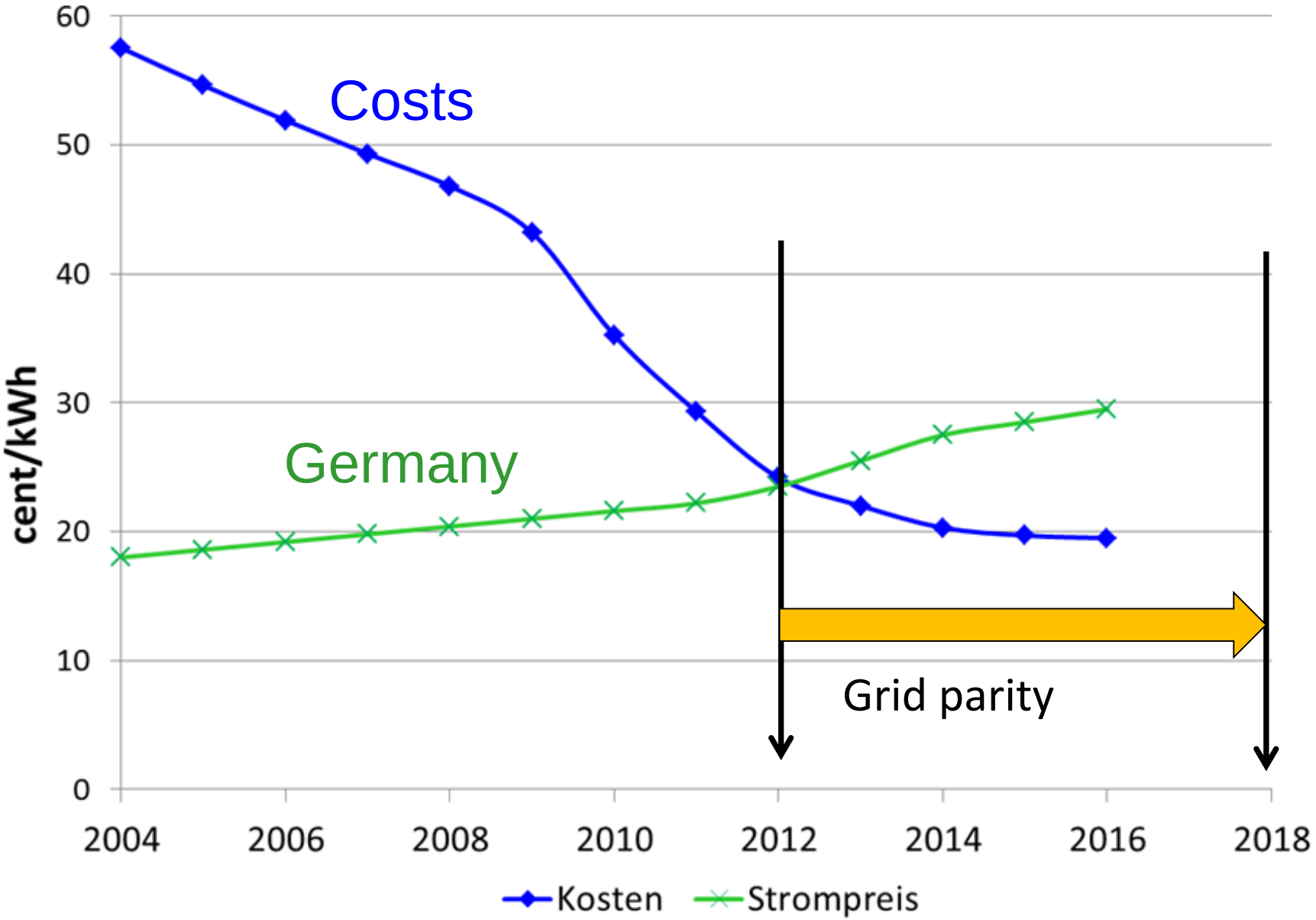

Capacity without ensured payments
MW
9500
8500
7500
6500
5500
4500
Flexible power plants
0
200
Hours/year
800
1000


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

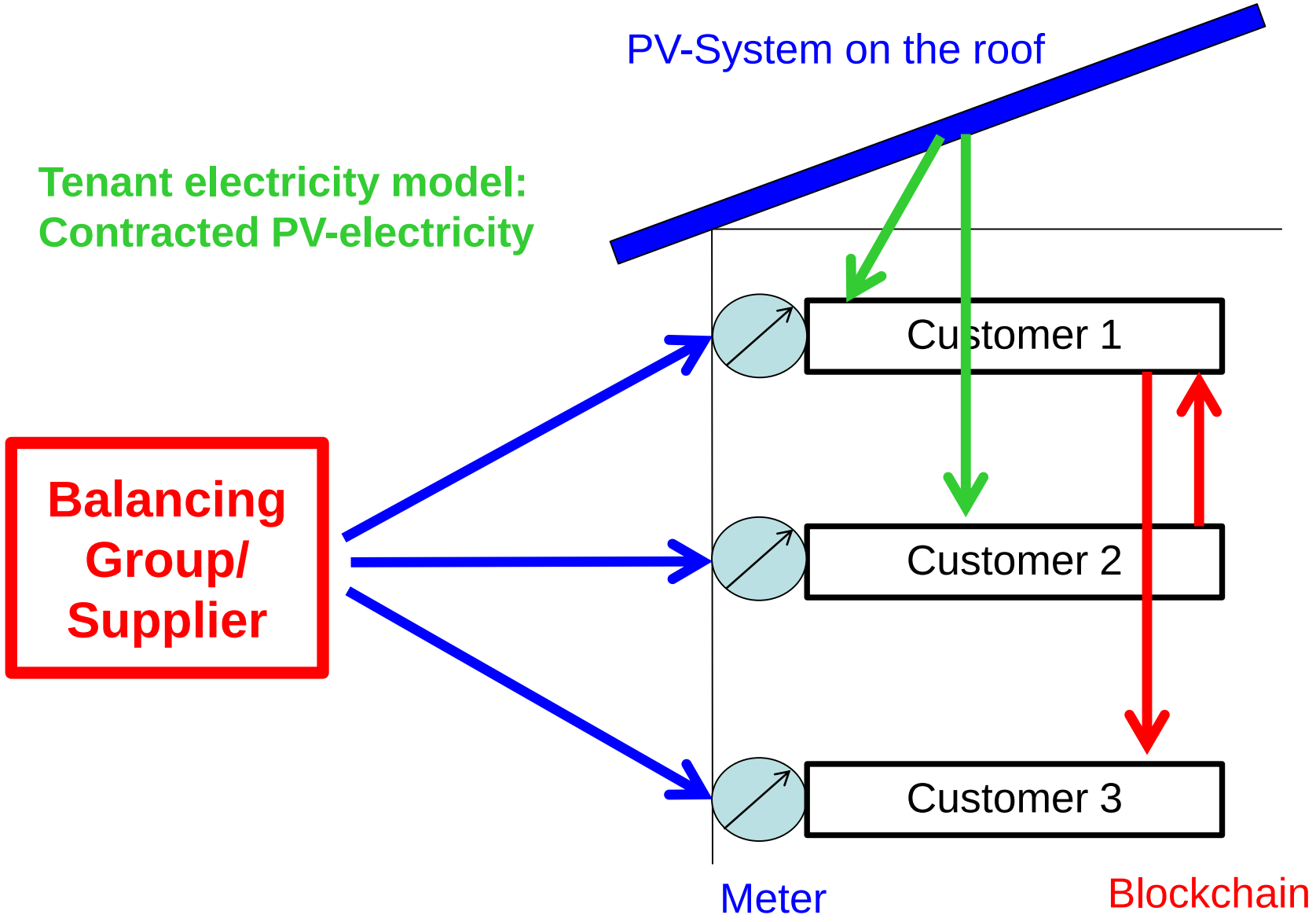
6. IS THE TIME FOR SUBSIDIZING RENEWABLES OVER ?

As long there is no price on CO2 …..

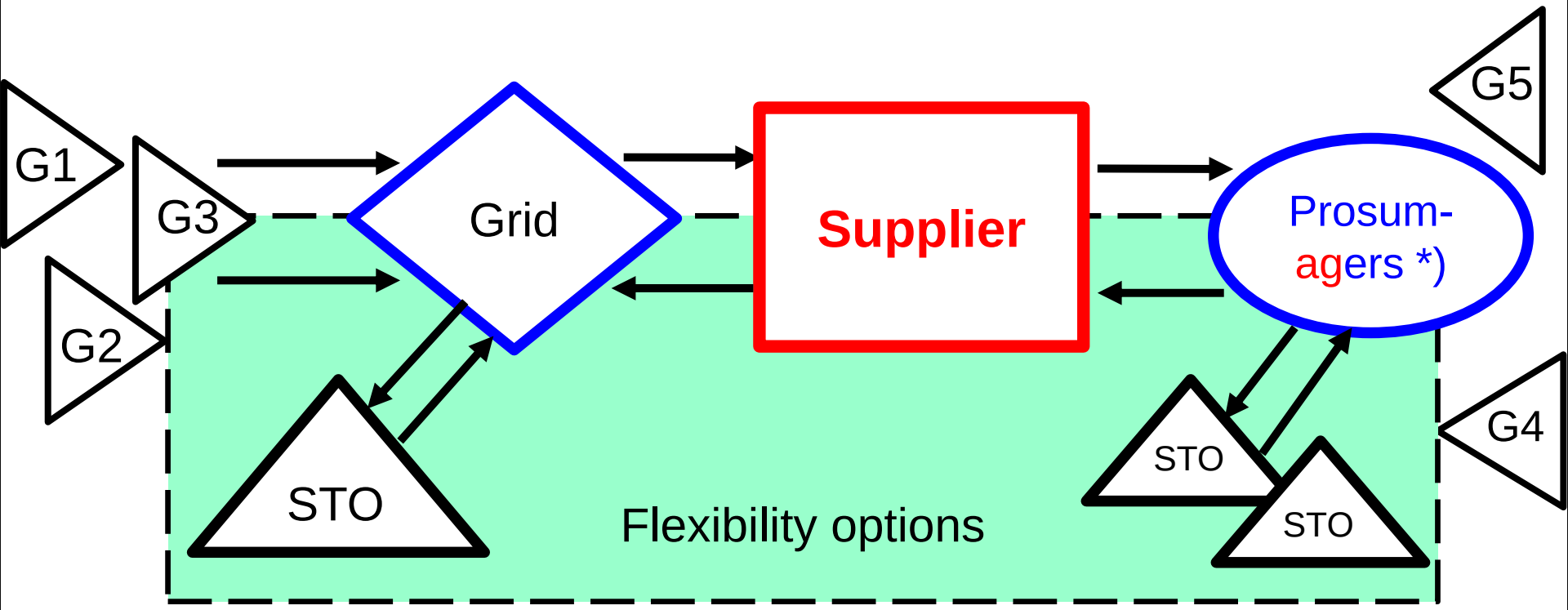
Grid parity: PV-costs and household electricity prices



Tenant electricity model and Blockchain



New Thinking: Making the electricity system more democratic



*) R. Green

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
- Very important: correct price signals (incl. CO2)
- most urgent: exhaust full creativity for flexibility of all market participants incl. decentralised systems (PV …)
- Capacity payments: Any CP will distort the system towards more conv. and less RES capacity
- New key players: Suppliers and prosumagers