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ELEKTROENERGETIKA

INTERNATIONAL SCIENTIFIC SYMPOSIUM ON ELECTRICAL POWER ENGINEERING

ELEKTROENERGETIKA 2019
September 16-18, 2019
Stará Lesná, Slovakia

CALL FOR PAPERS

Technical University of Košice, Faculty of Electrical Engineering and Informatics
Department of Electric Power Engineering
are proud to announce International scientific event
ELEKTROENERGETIKA 2019

Welcome to ELEKTROENERGETIKA 2019 The 10th International Scientific Symposium on Electrical Power Engineering

Keynote speakers

- **Reinhard Haas**, Institute for energy systems,Technical University of Wien, Austria
  Heading towards sustainable and Democratic Electricity systems
- **Karel Maslo**, Transmission System Analysis Department, ČEPS, a.s., Prague, Czech Republic
  Dynamic Models in the Context of the EU Commission Regulations
- **Michael Negnevitsky**, University of Tasmania Hobart, Australia

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Proceedings indexing

Following proceedings of: EE 2017 (05/2018:WoS CPCI-S; 09/2017:SCOPUS), EE 2015, 2013, 2011, 2009, 2007 have been registered in SCOPUS and Thomson Reuters Conference Proceedings Citation Index-Science CPCI-S.

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HEADING TOWARDS SUSTAINABLE AND DEMOCRATIC ELECTRICITY MARKETS

Reinhard HAAS,

Energy Economics Group,

TU Wien

ELEKTROENERGETIKA, High Tatra

September 2019

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. Storing every peak?
7. Subsidizing renewables?
8. Conclusions

1. INTRODUCTION

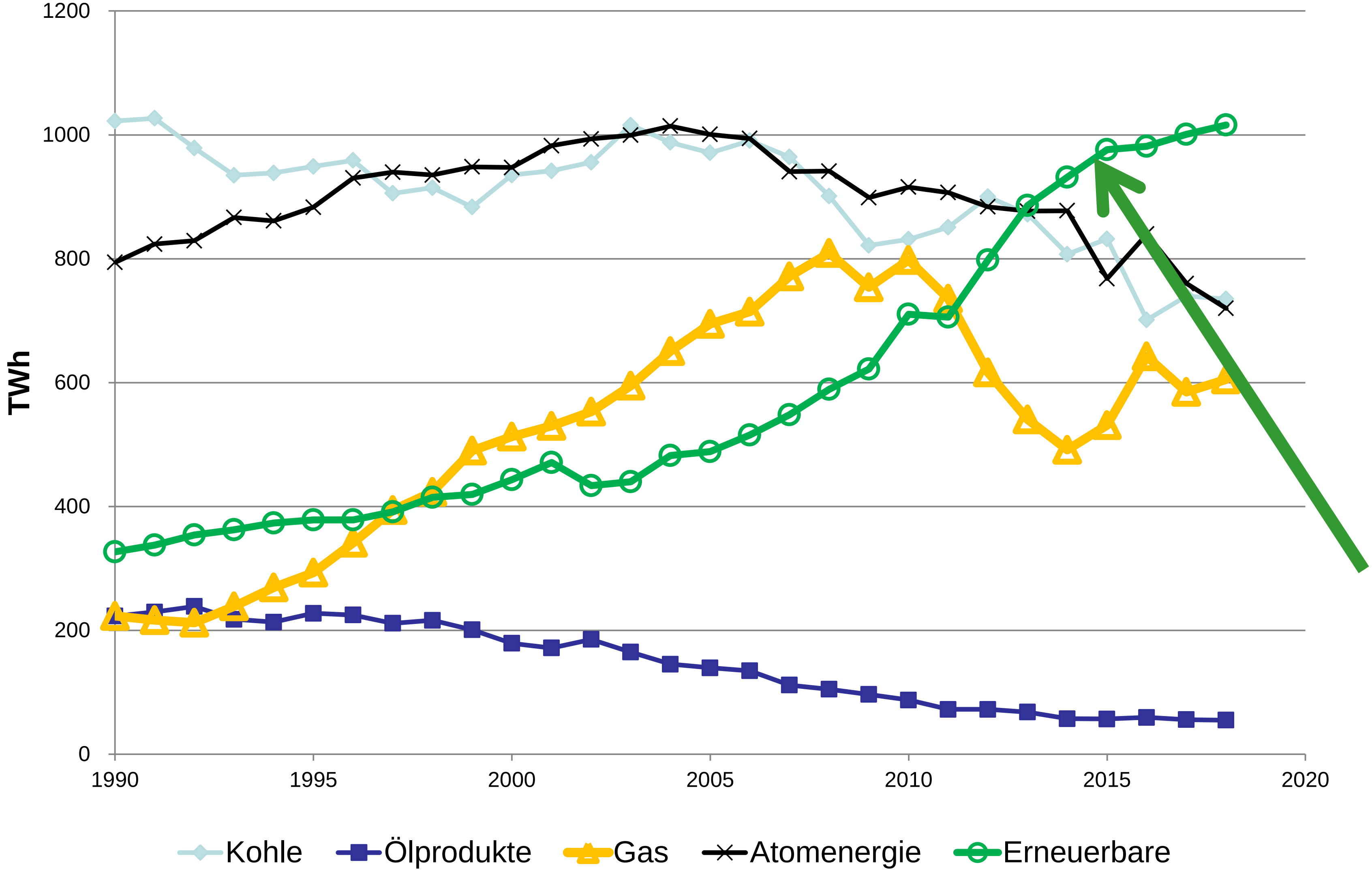
Motivation:

* 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

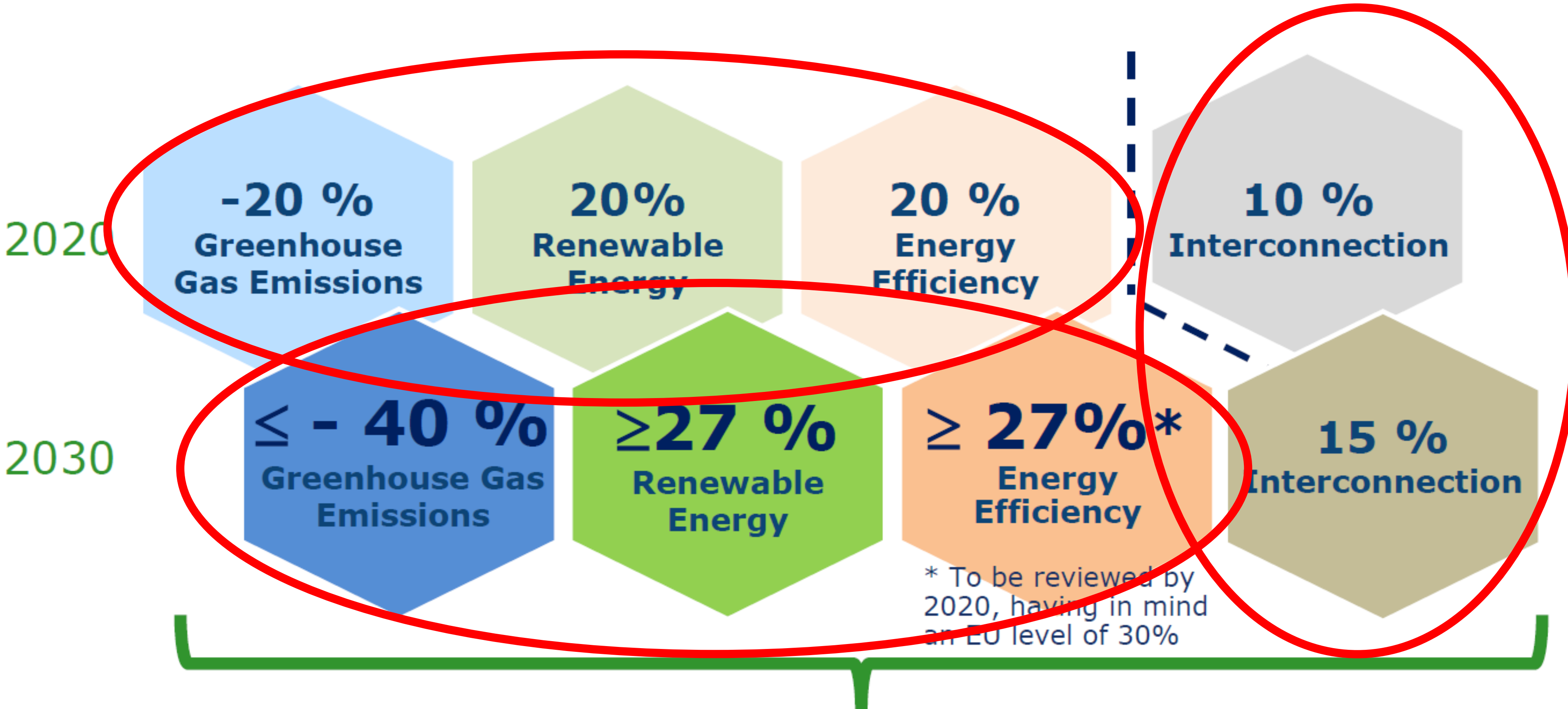
Electricity generation EU-28



2017 und 2018 preliminary

1. INTRODUCTION

Strategic decision by European Council in 2014



New governance system + indicators

Structure of the Package

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

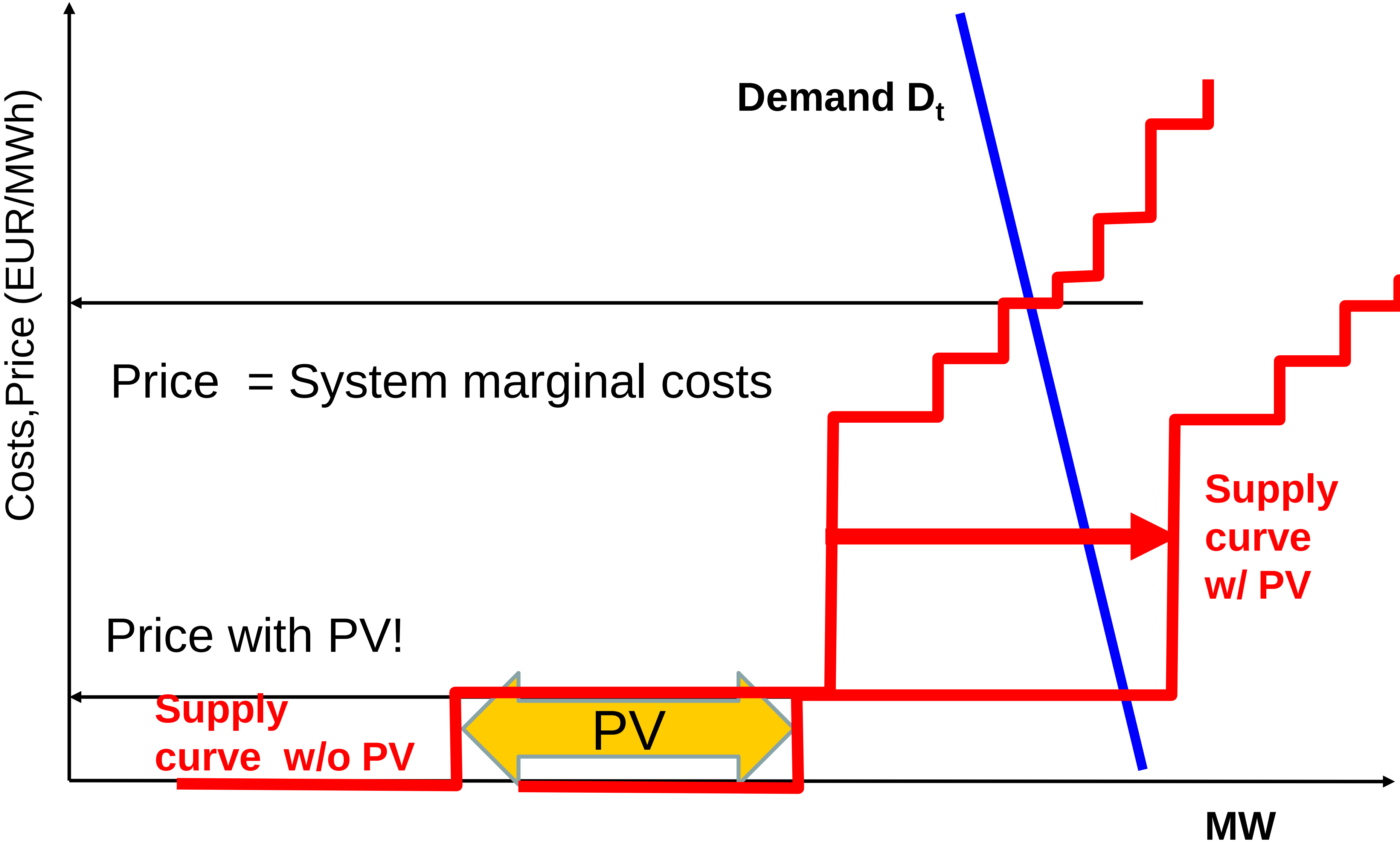
…. are based on electricity economic point-of-view

2. METHOD OF APPROACH

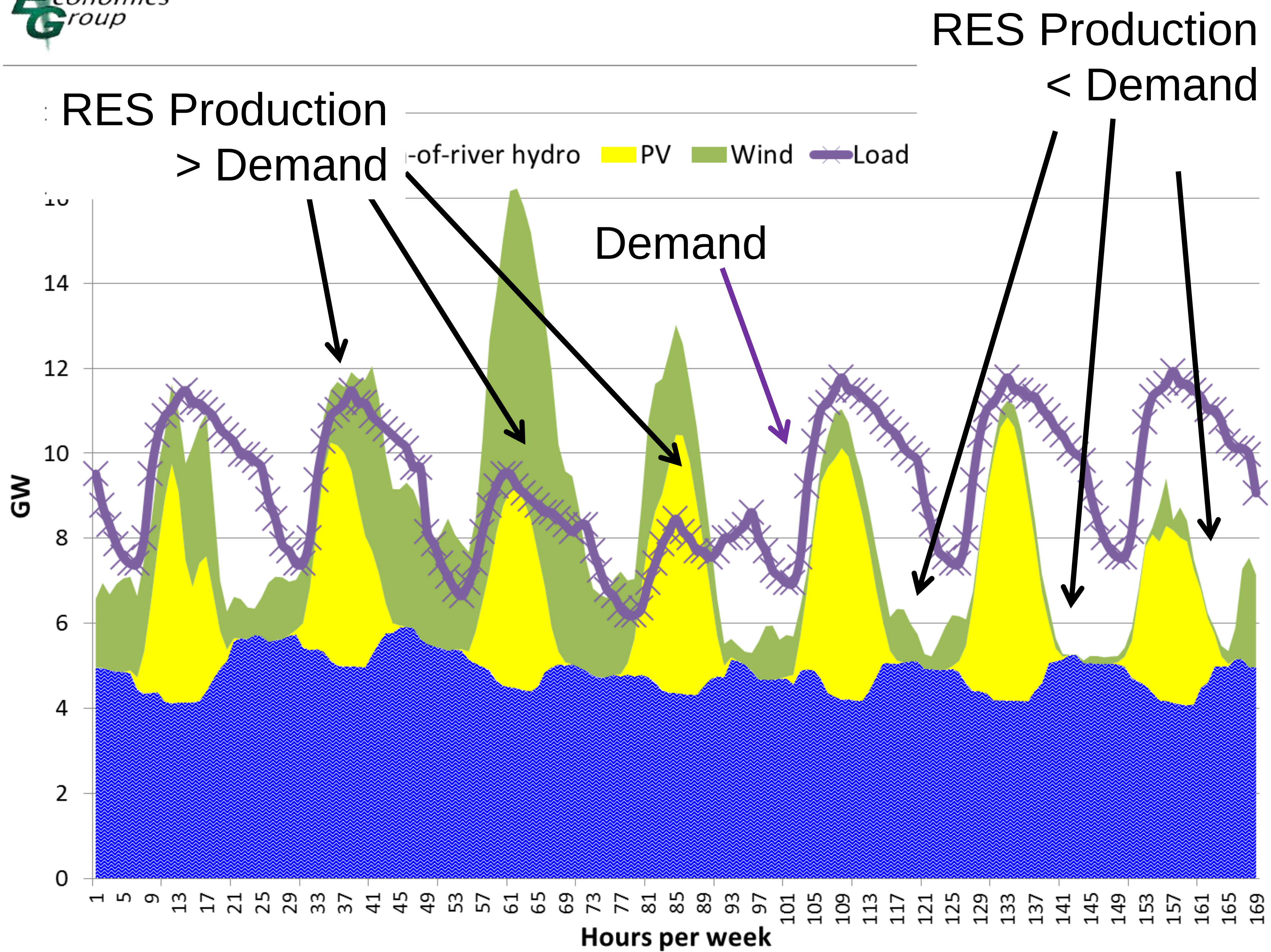
- hourly resolution of residual load over a year in scenarios with large quantities of variable renewables;
- Applying a fundamental model to calculate (static) hourly electricity spot market prices;
- Integration of flexibility/elasticity in a dynamic framework for price calculation;

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

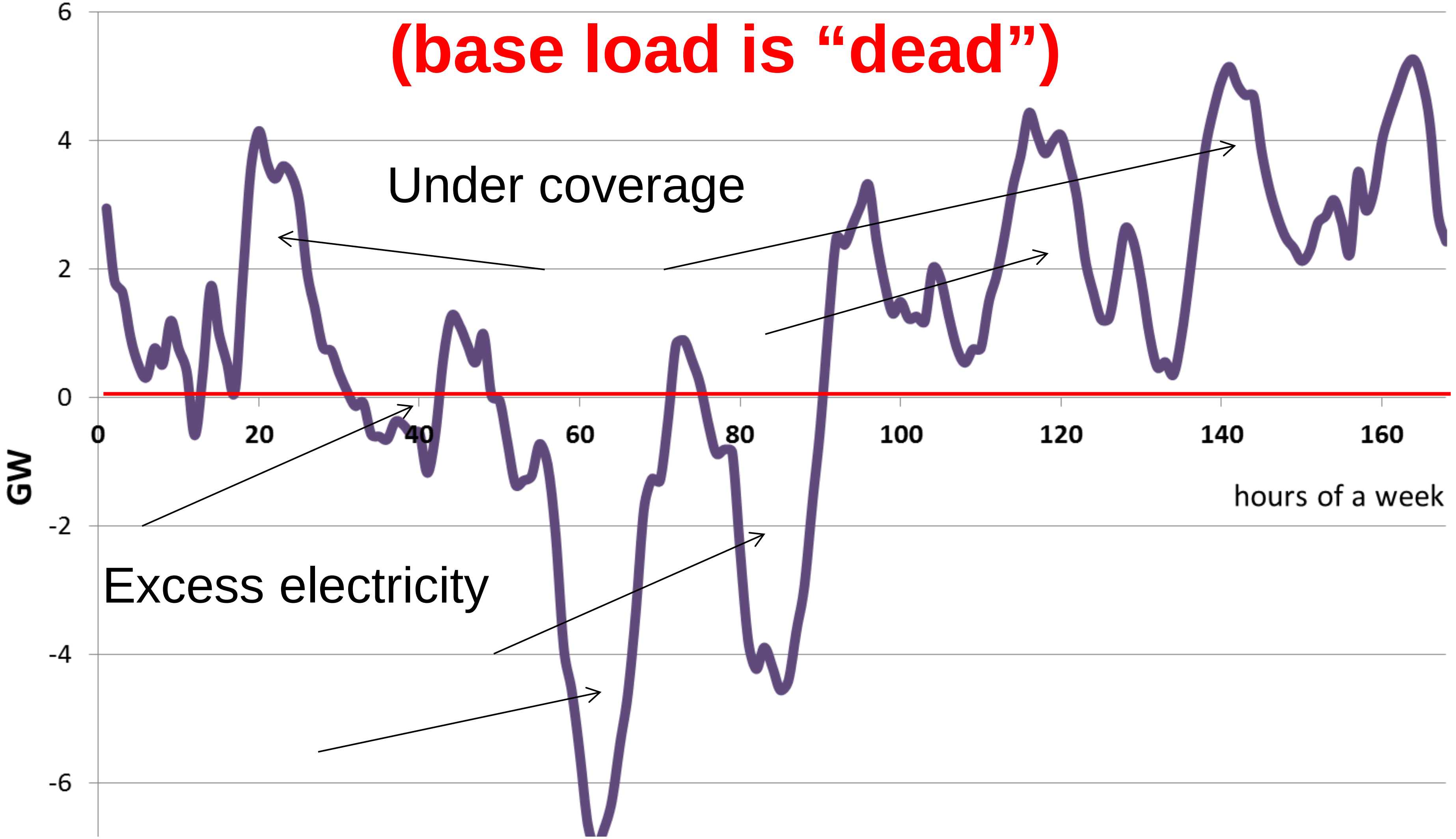
Example: prices without and with PV



Supply and Demand

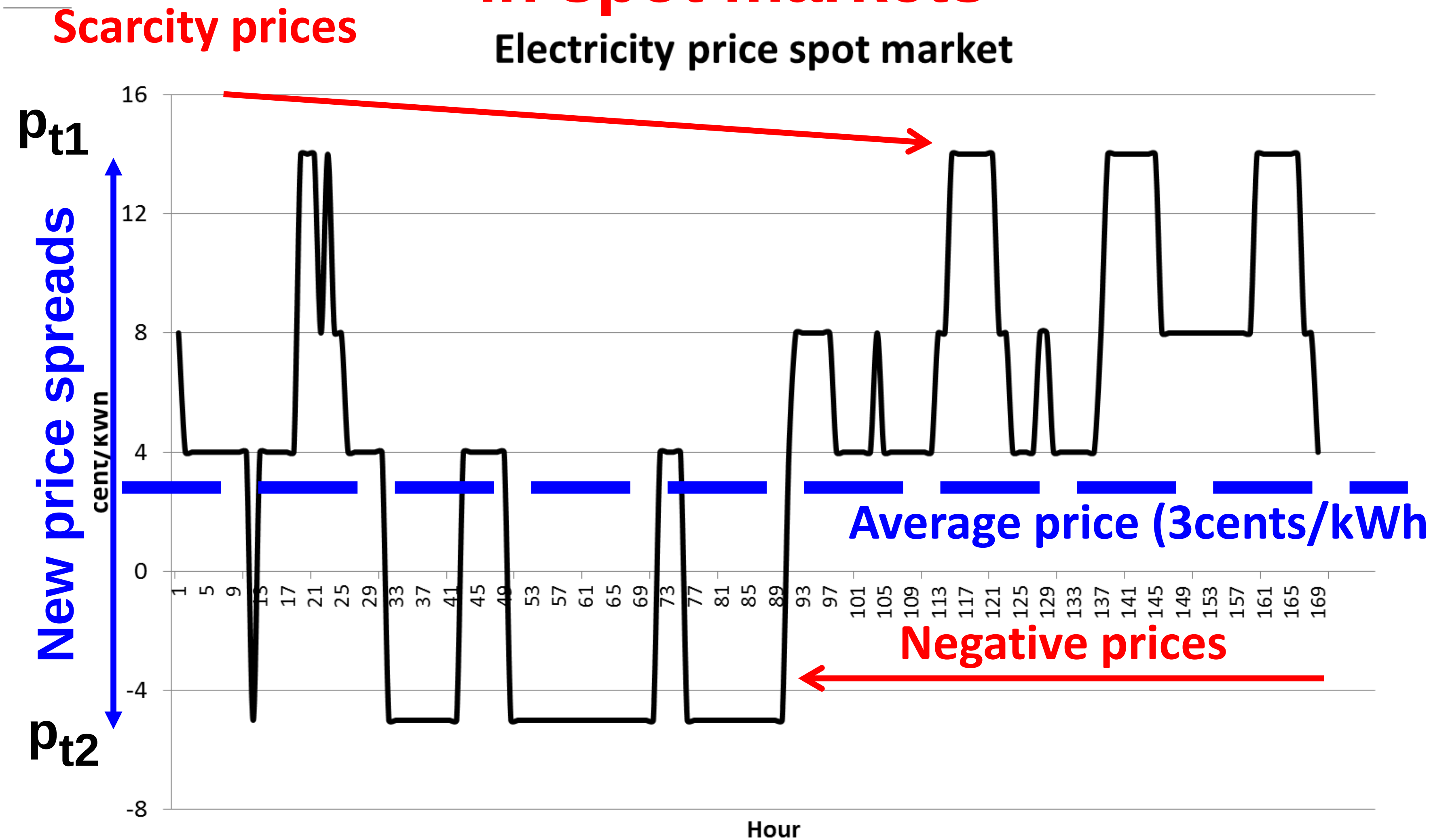


Key term of the future: Residual load (base load is “dead”)



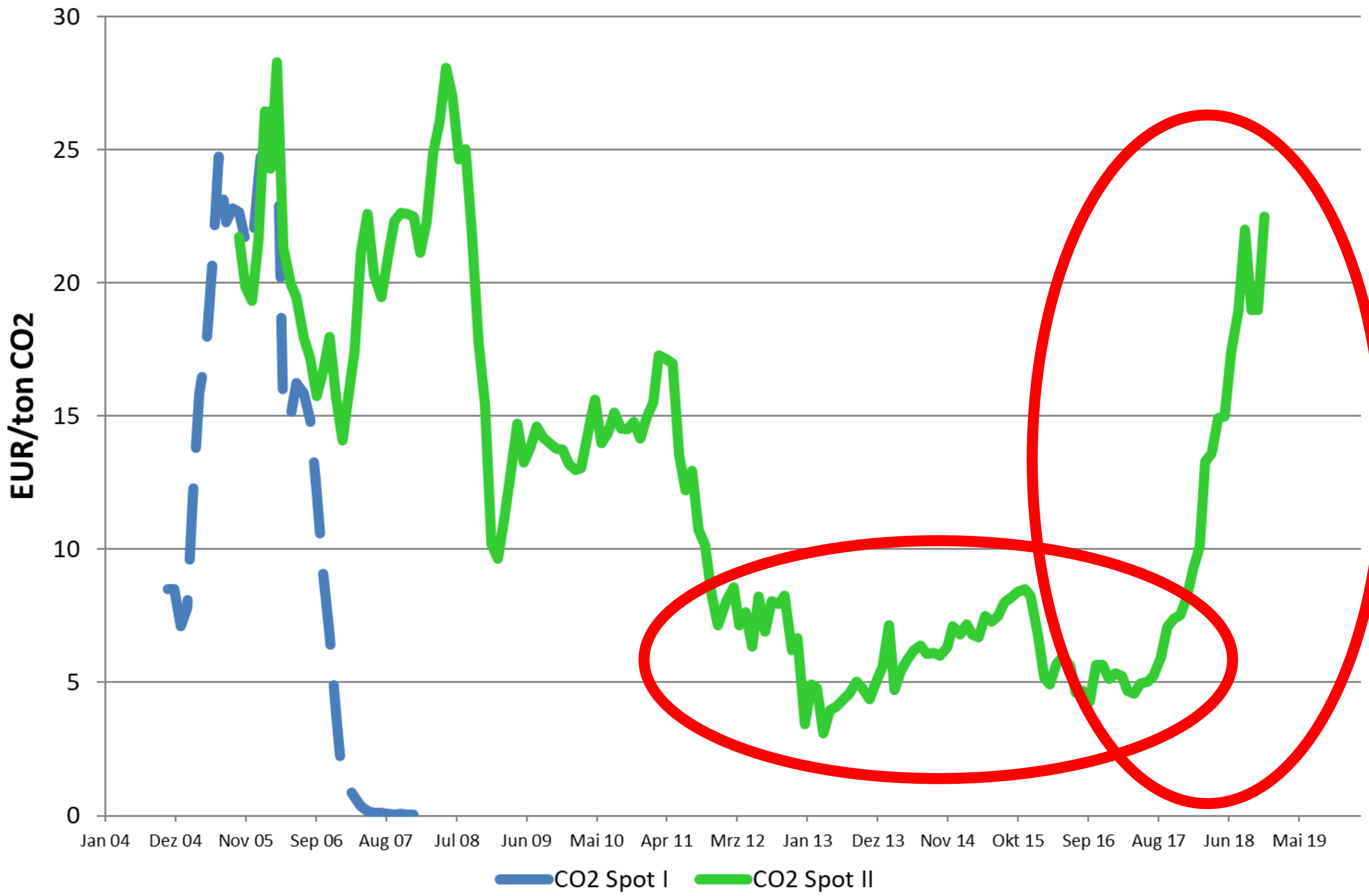
Residual load = Load – non-flexible generation

Deviation from STMC-pricing in spot markets

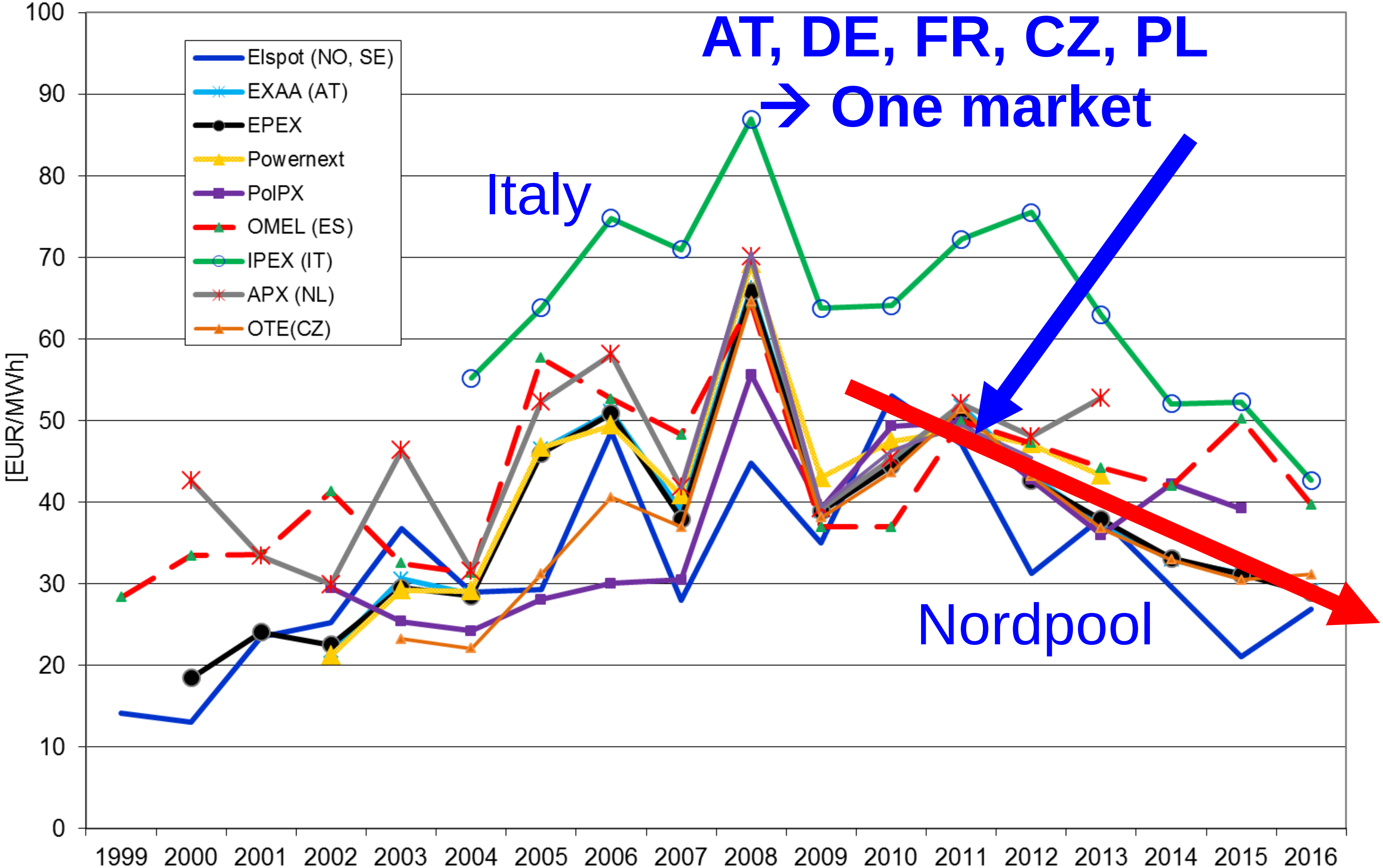


→ These price spreads provide incentives for new flexible solutions!!!!

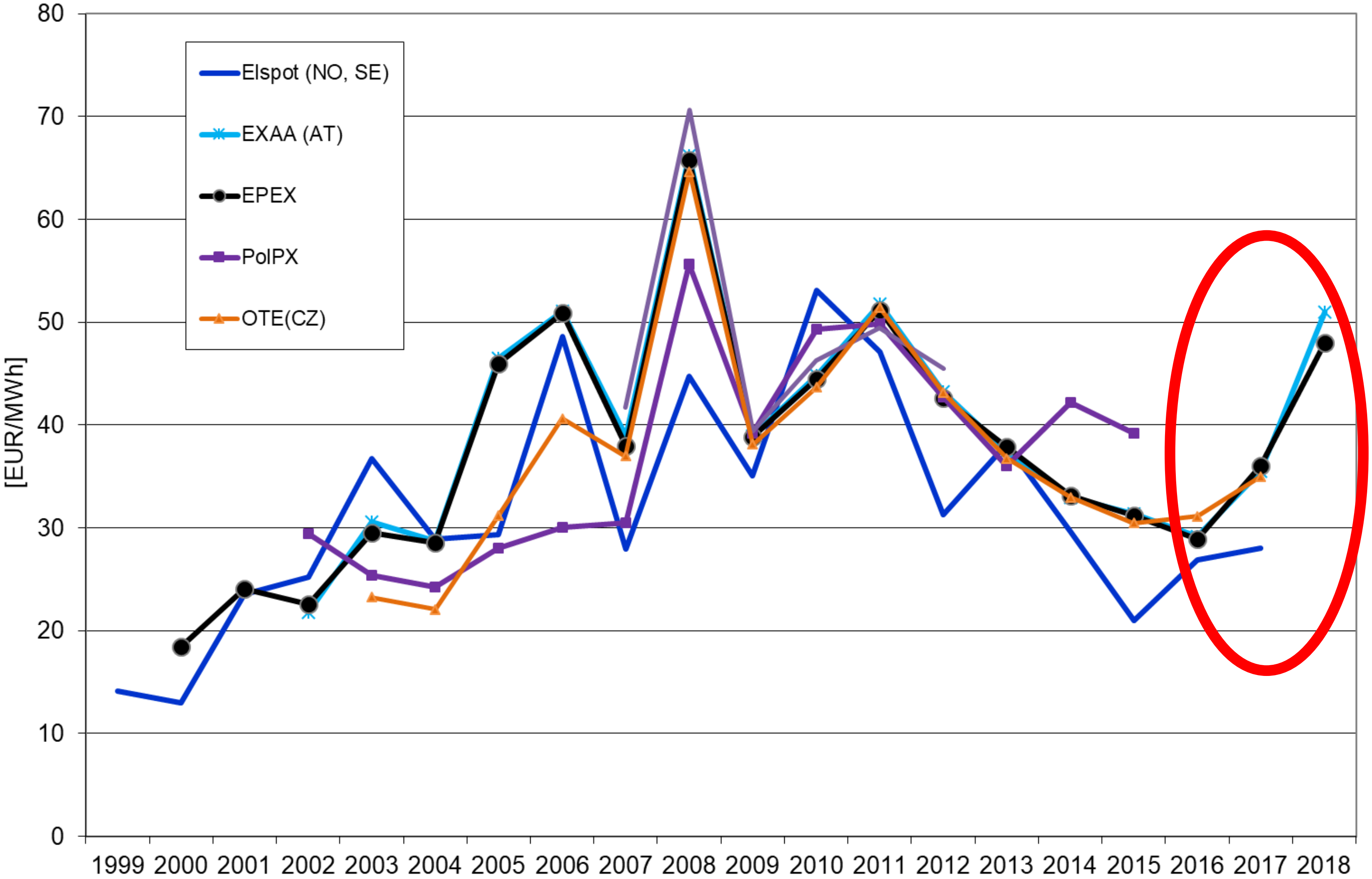
The CO2-Price



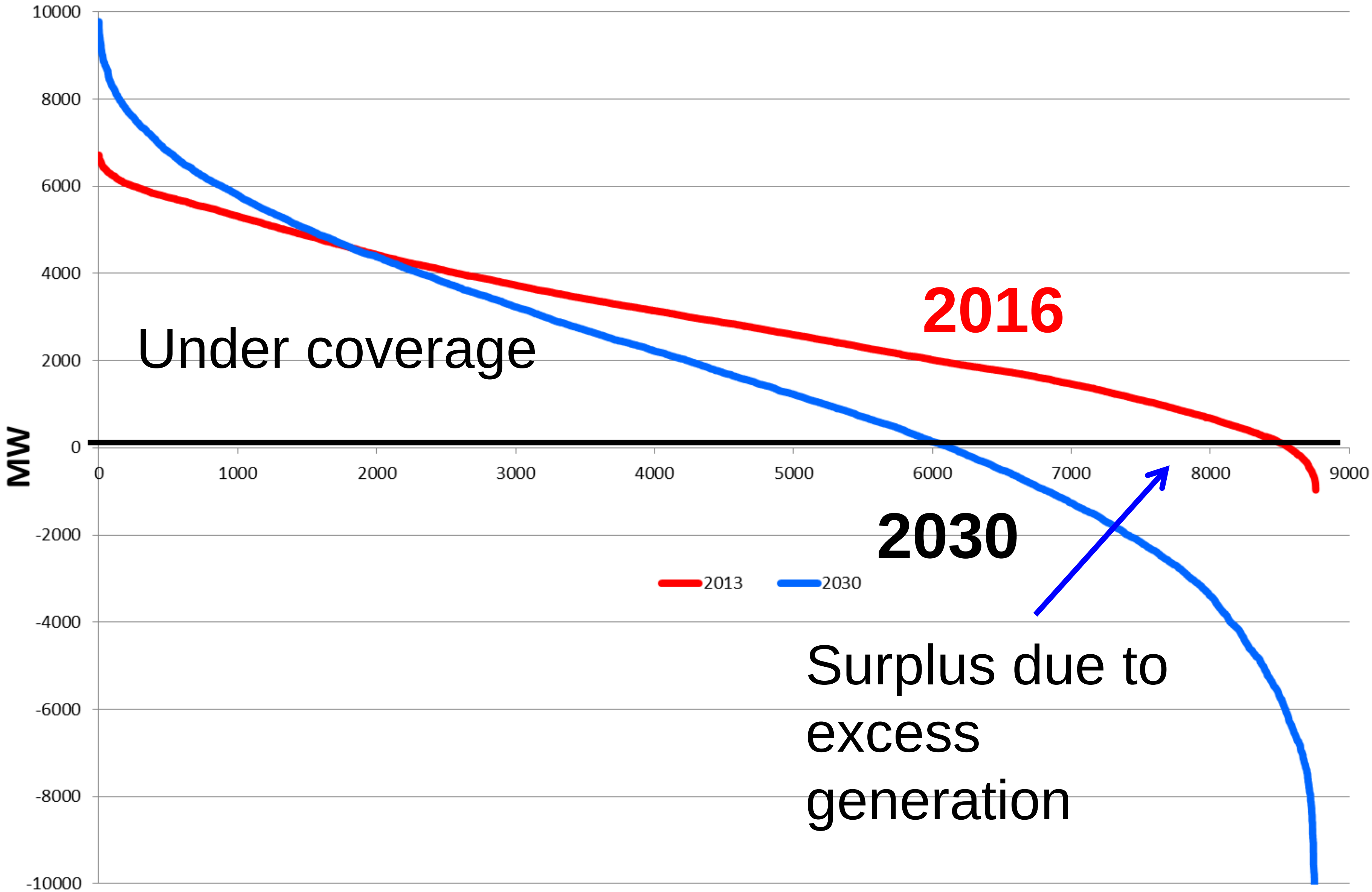
Development of electricity prices in Europe up to 2016 (1)



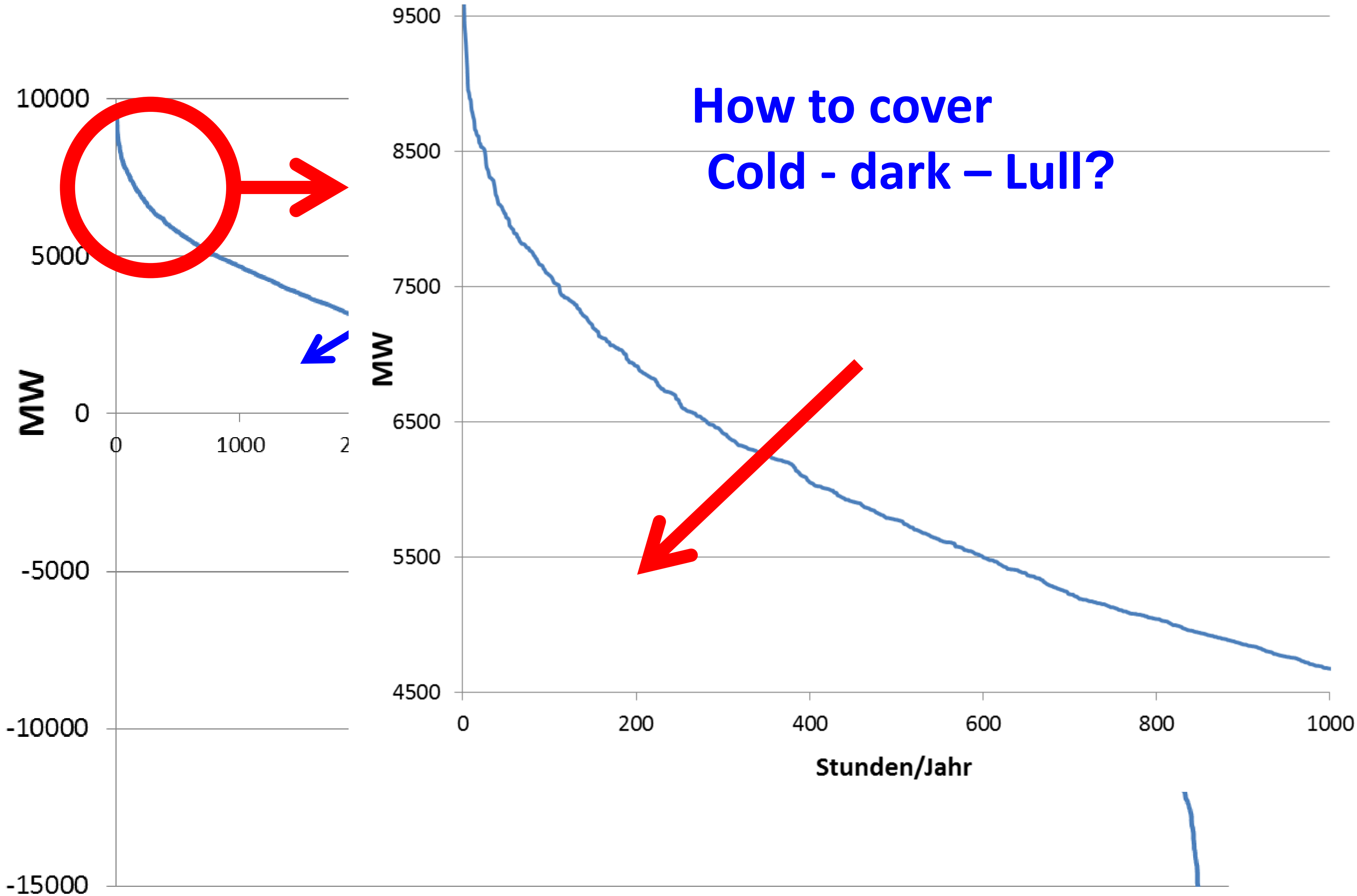
Development of electricity prices in Europe up to 2018 (2)



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

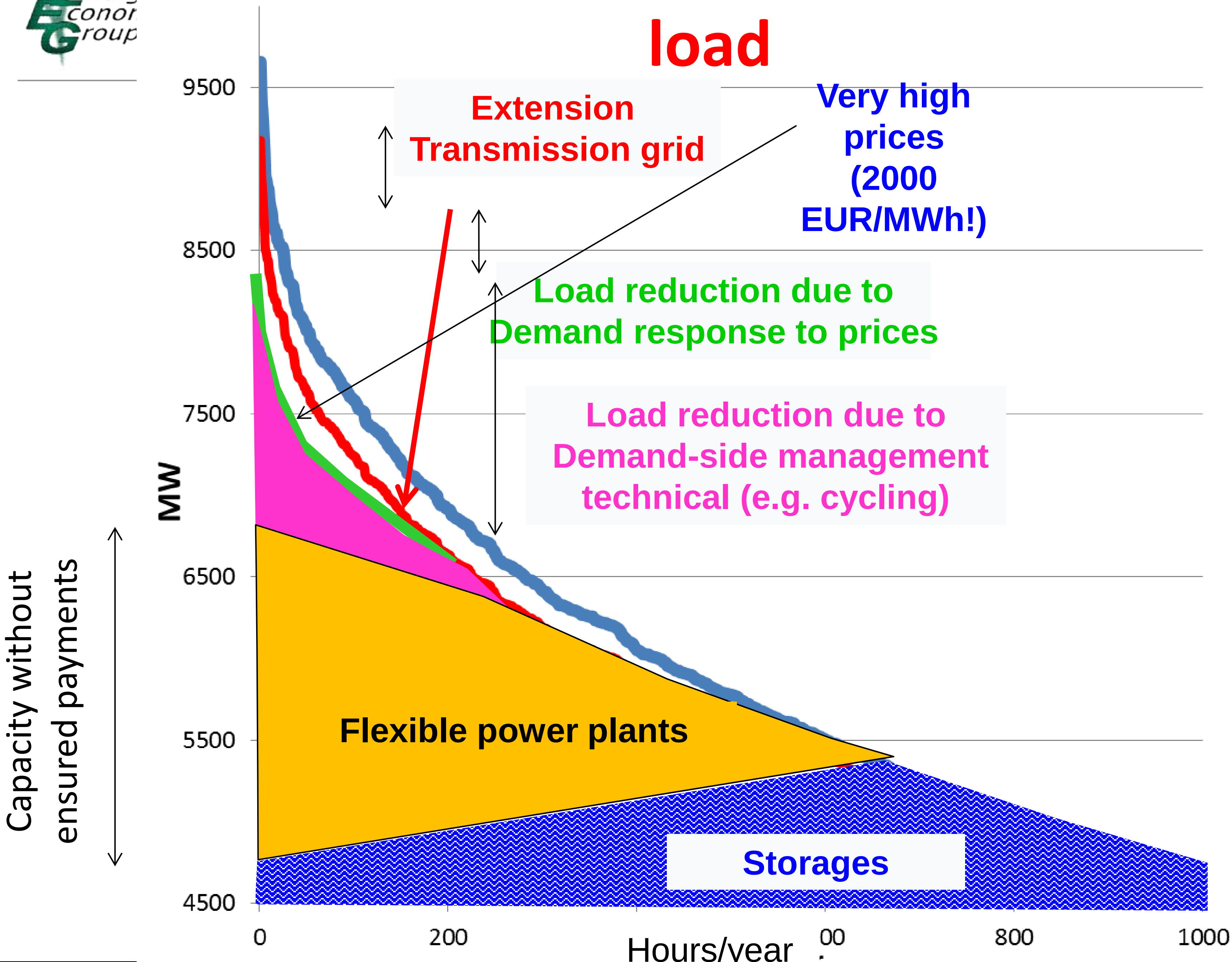
All regulatory capacity payments for power plants destort the EOM and lead to wrong price signals for all other options

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

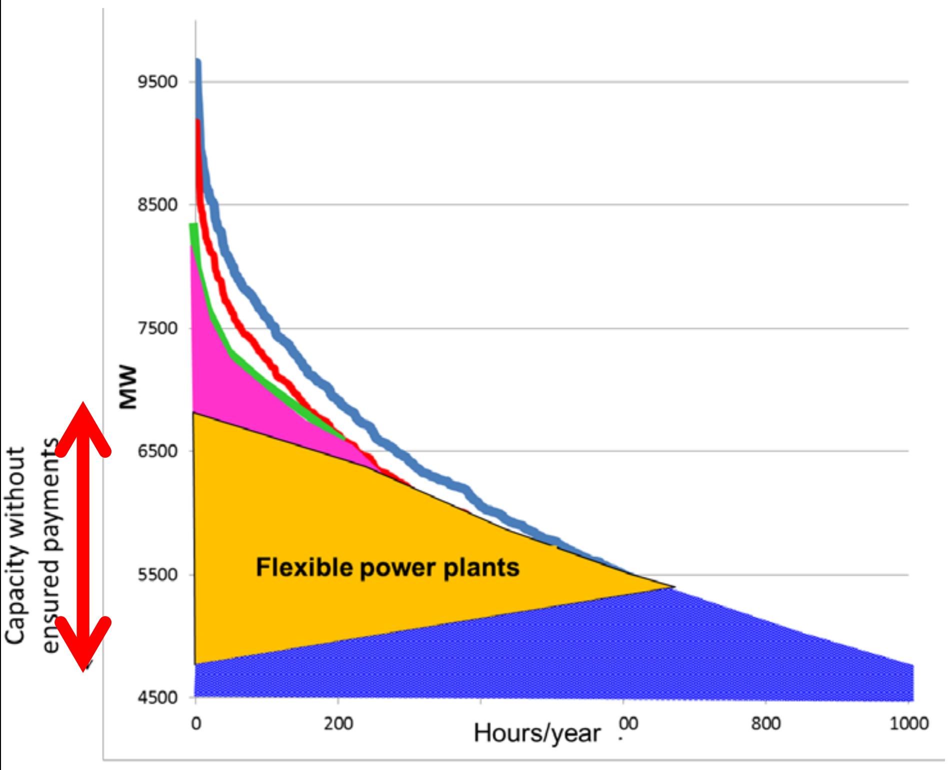
The higher the excess capacities, the lower is the share of RES

strive to retain system resource adequacy by correct price signals

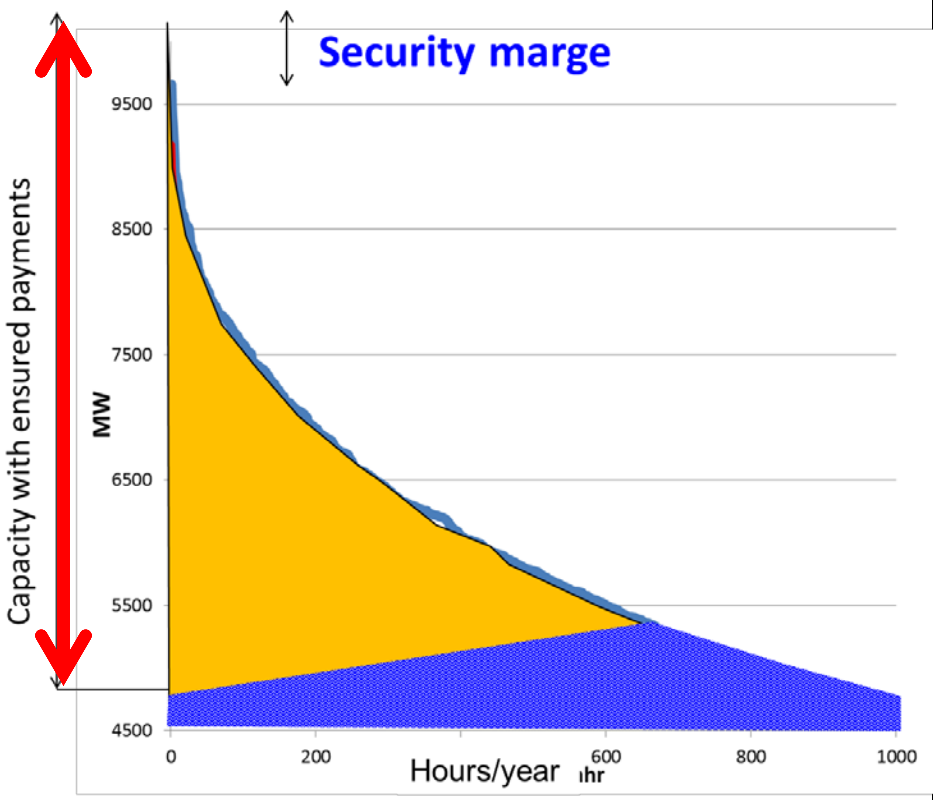
5 Flexible coverage of residual load



Comparison

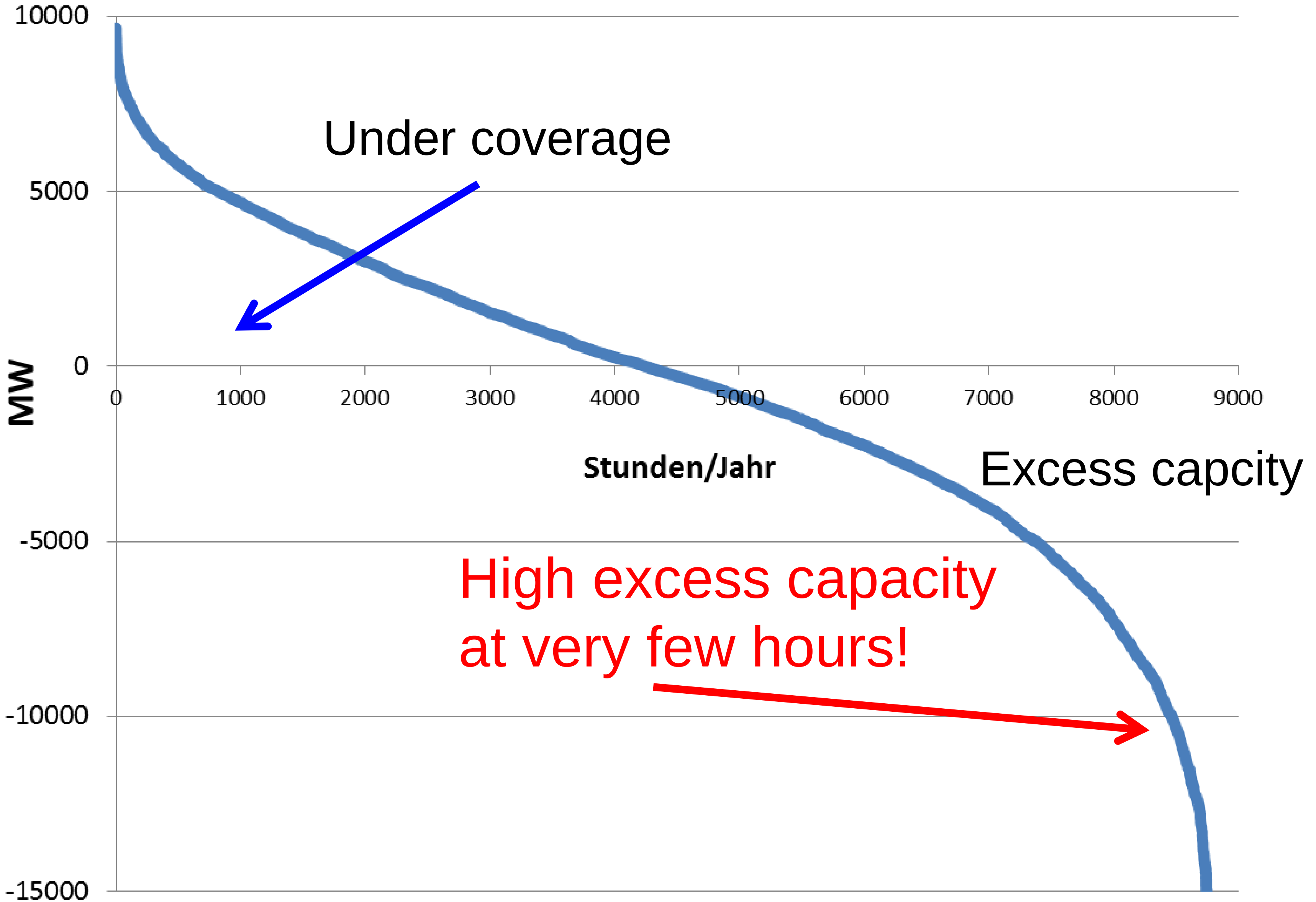


Capacity without ensured payments
MW
9500
8500
7500
6500
5500
4500
Flexible power plants
0
200
00
800
1000
Hours/year

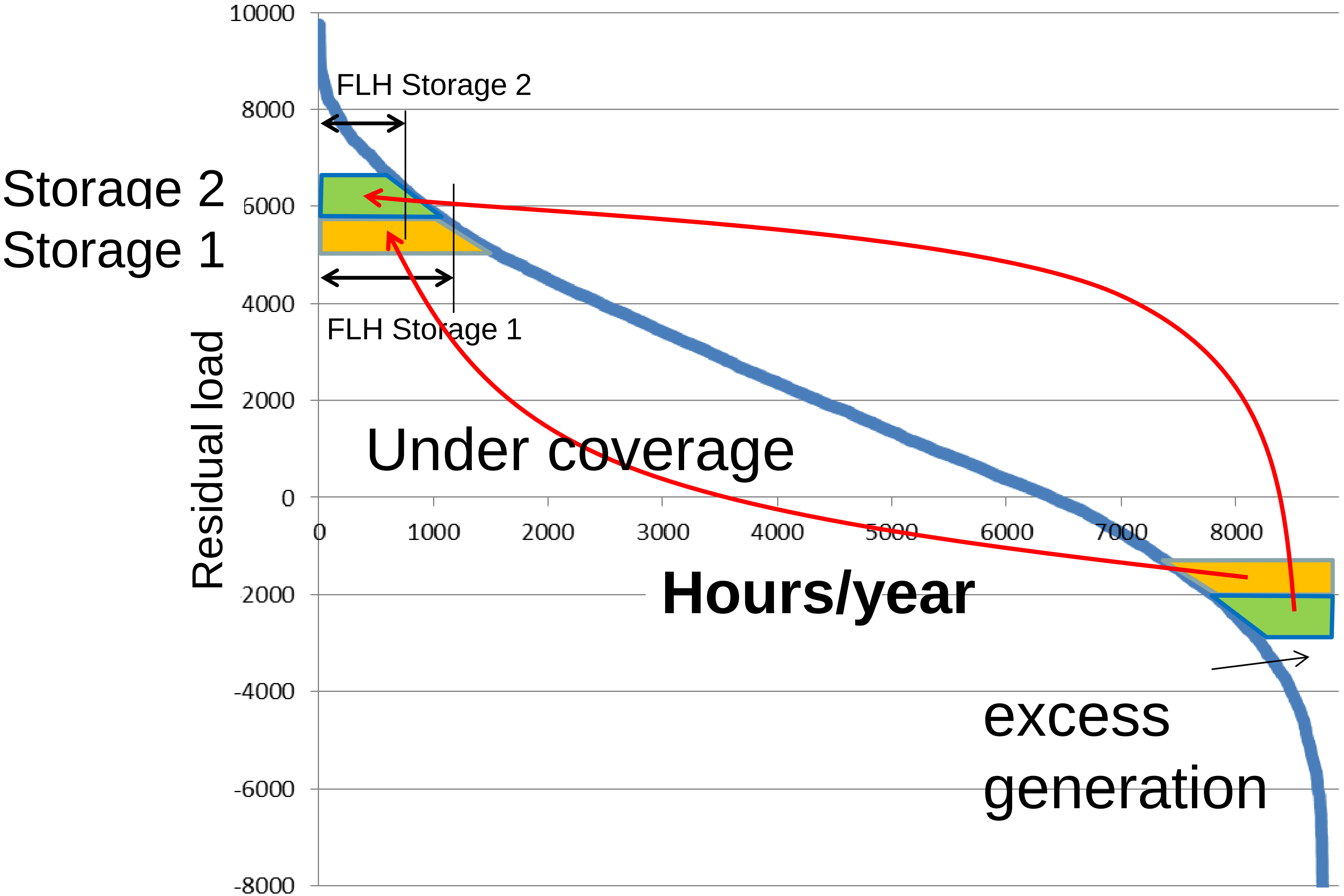


Security marge
Capacity with ensured payments
MW
9500
8500
7500
6500
5500
4500
0
200
600
800
1000
Hours/year

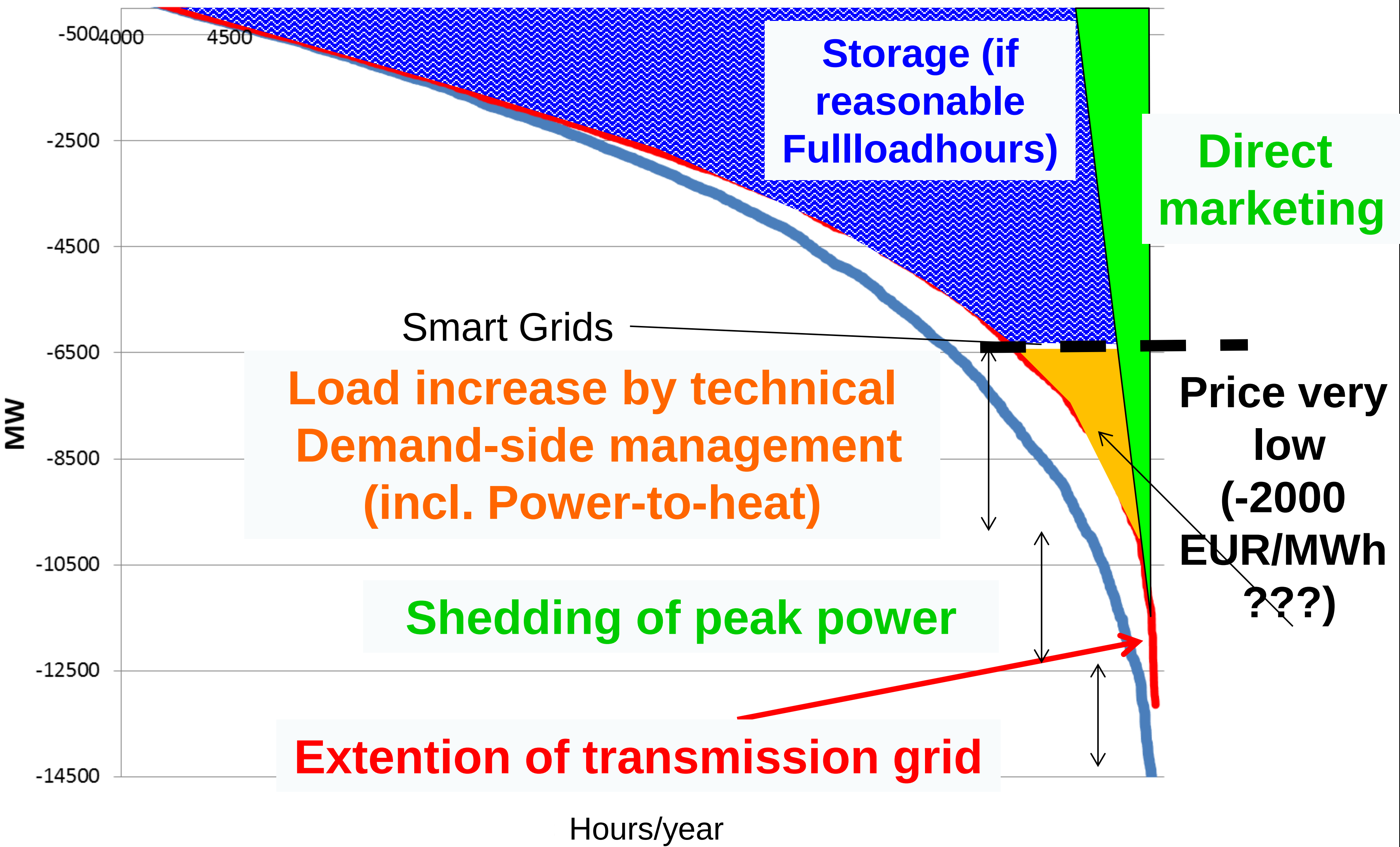
6. STORING EVERY PEAK?



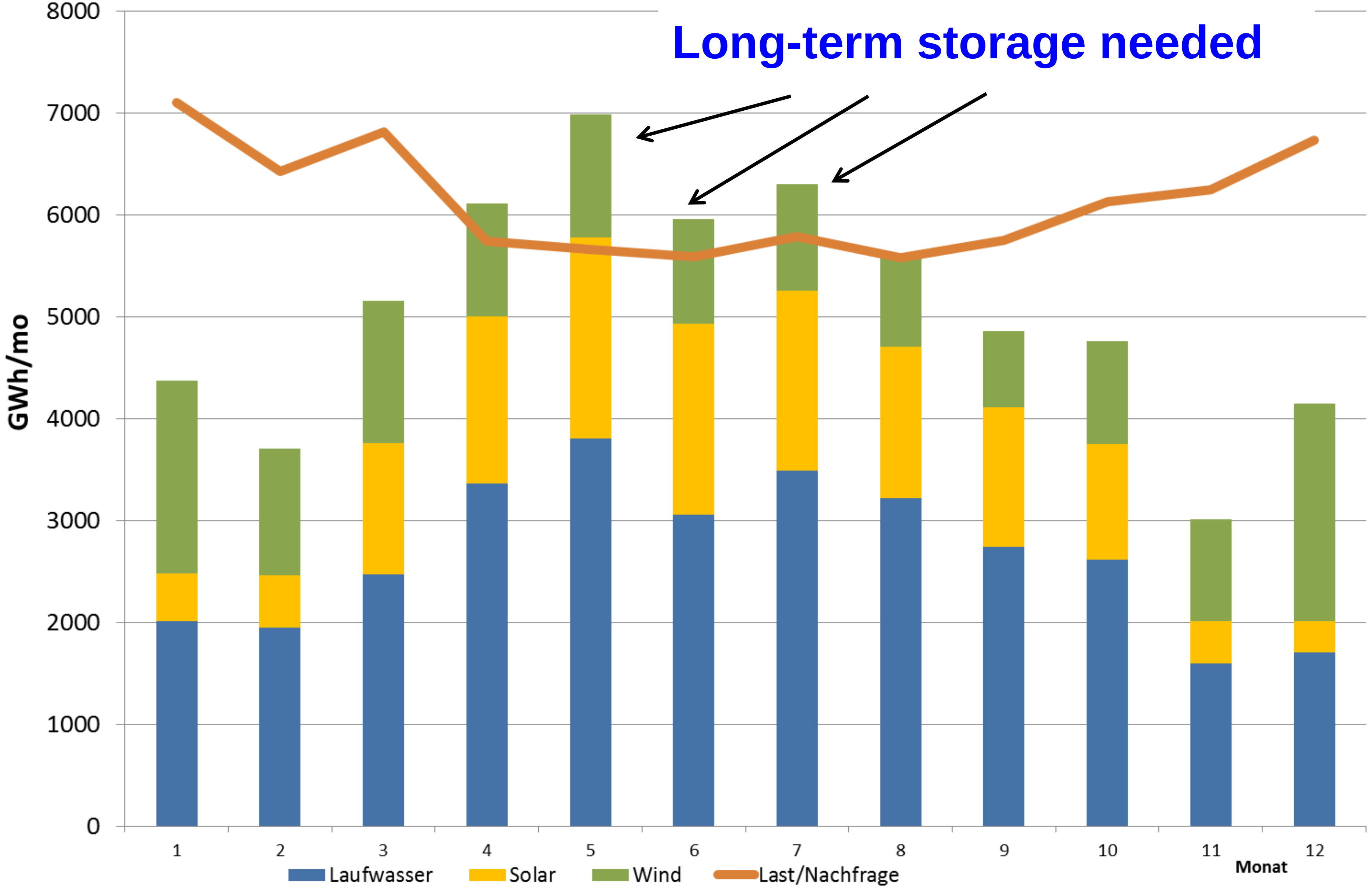
Decreasing full-load hours of storages



Flexible use of excess electricity



Demand for long-term storage



Sector coupling / Sector integration

* In times of surplus generation: How to use excess electricity in meaningful way?

Heating/Cooling

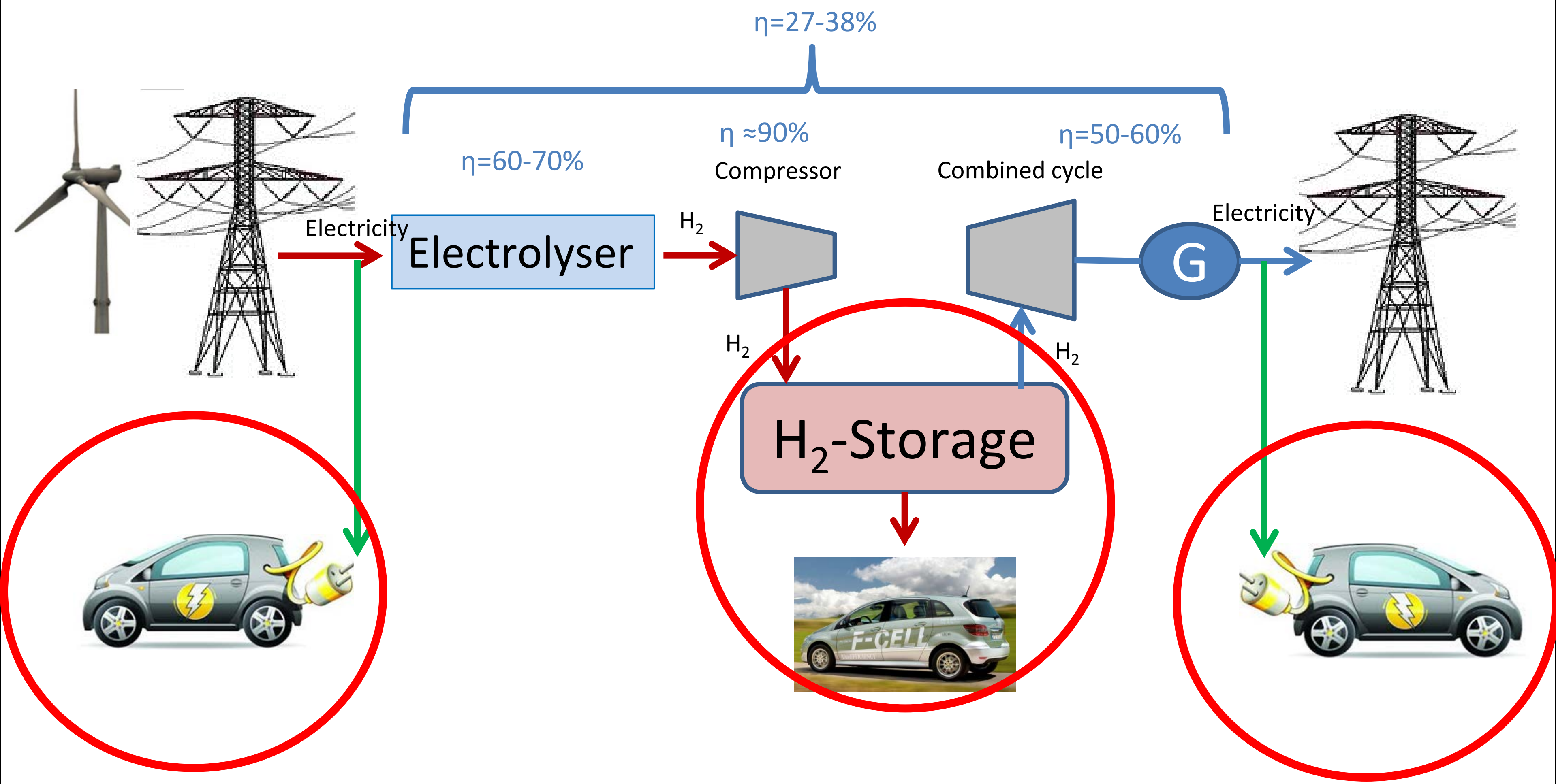
Transport

* Vague simplified suggestions, no convincing long-term solutions

* Central (Ptx approaches, e.g. H2) vs decentral (end user level, E.g. Evs, heat pumps for heating) applications

* How to fit use with time of surplus, e.g of PV for heating ?

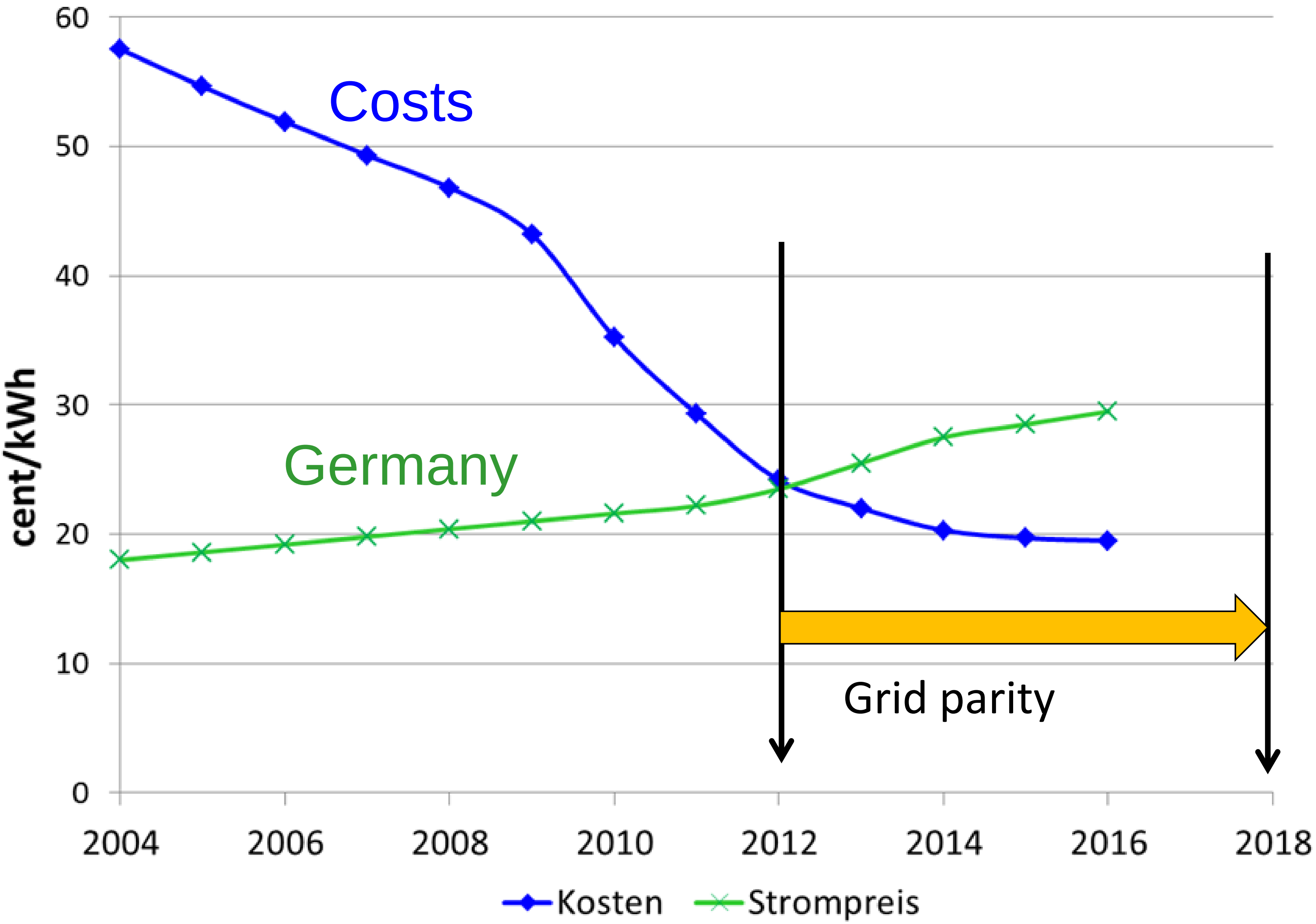
Sector coupling hydrogen: Storage and fuel in transport?



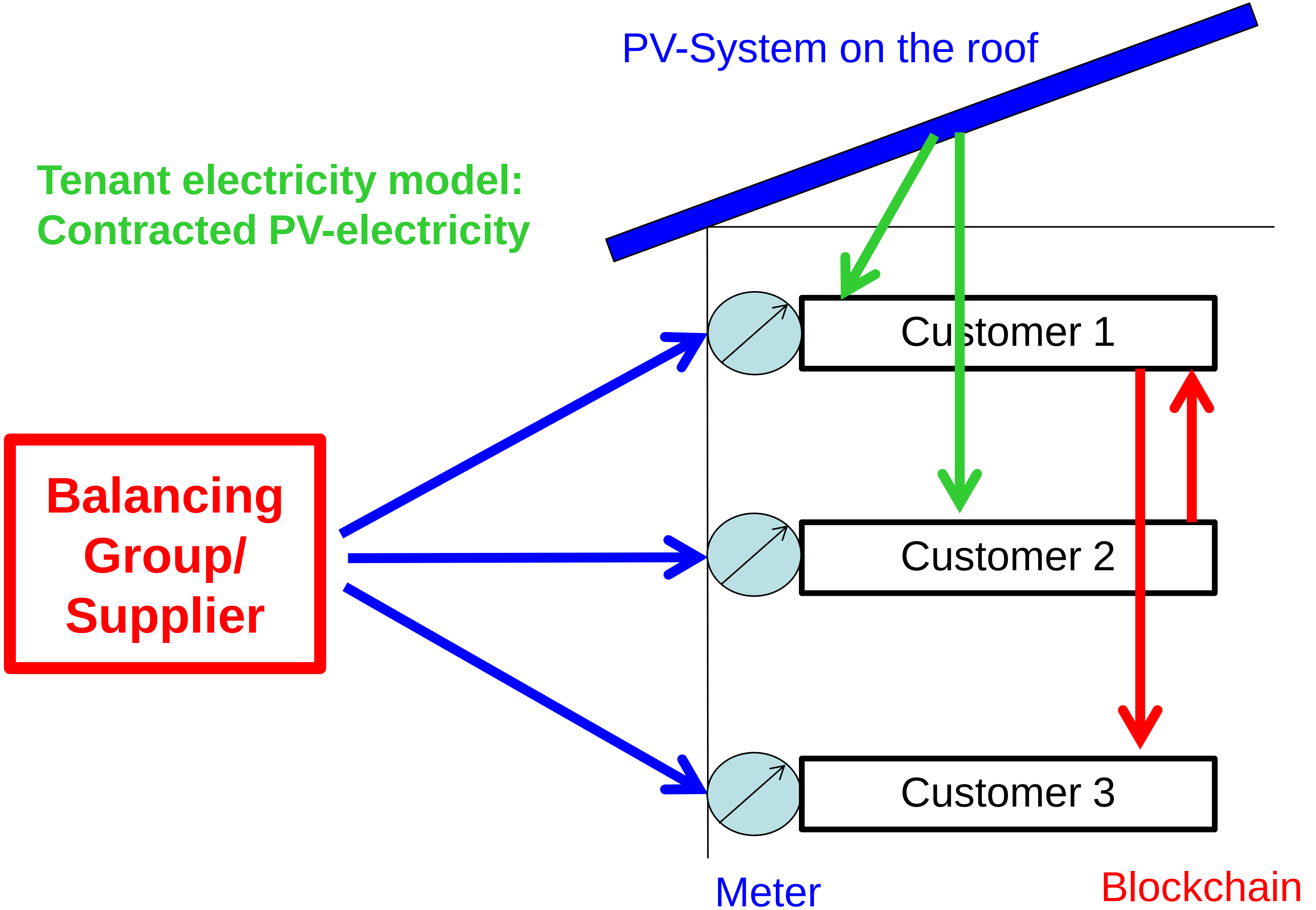
7. IS THE TIME FOR SUBSIDIZING RENEWABLES OVER ?

As long there is no price on CO2 …..

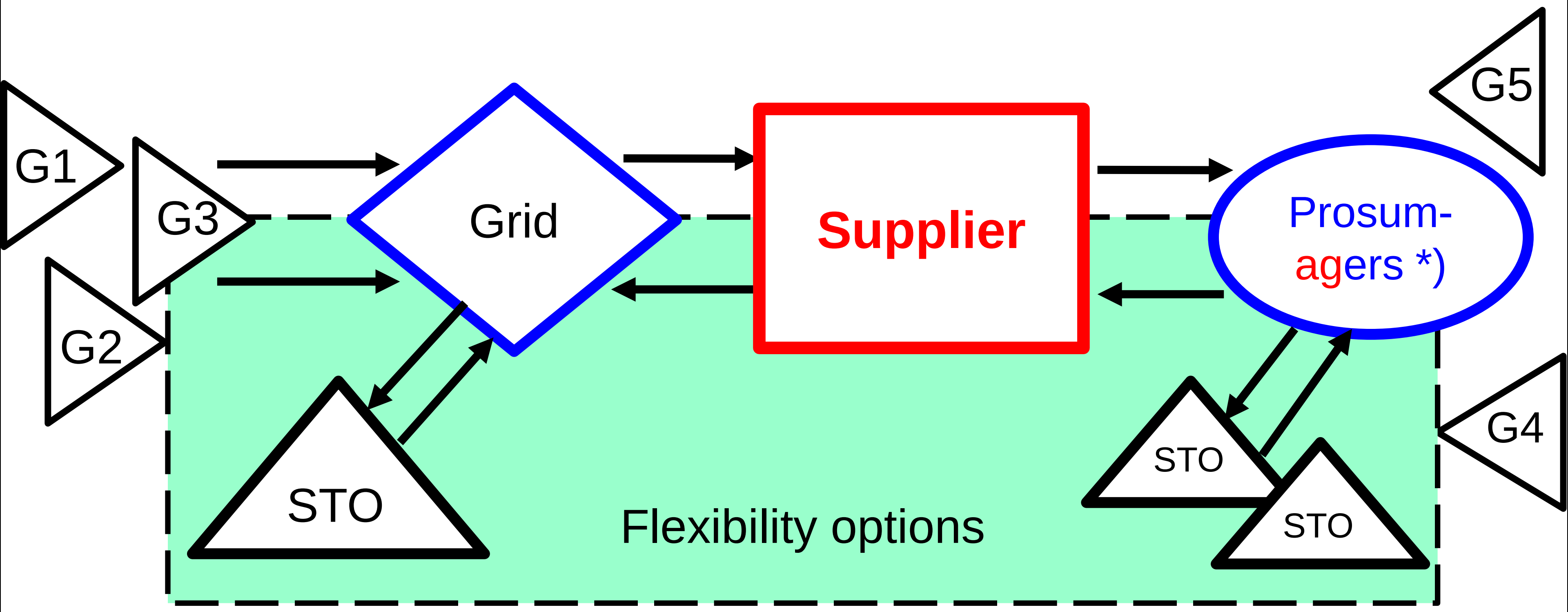
Grid parity: PV-costs and household electricity prices



Tenant electricity model and Blockchain



New Thinking: Making the electricity system more democratic



*) R. Green

8. 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. CO_2)**
- **most urgent: exhaust full creativity for flexibility of all market participants (Erdmann)**
- **Capacity payments: Any CP will distort the system towards more conv. and less RES capacity**
- **Prospects for storage: less bright than argued**
- **New key players: Suppliers / balancing groups**