SCHEDULE

Note that some changes can still be made to the schedule. This page holds the current schedule of the conference. If you have any doubts or questions on the schedule do send an email to: sdewes2017@sdewes.org

find your session:
(enter paper id or surname and hit Enter)

Wednesday, October 4

1000 - 1700 Registration

HEADING TOWARDS SUSTAINABLE AND COMPETITIVE ELECTRICITY SYSTEMS

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Energy Economics Group, TU Wien

Dubrovnik, 6 October 2017

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 and sector coupling
6. Balancing groups: A future market design
7. Subsidizing RES: How long?
8. Conclusions

1. INTRODUCTION

Motivation:

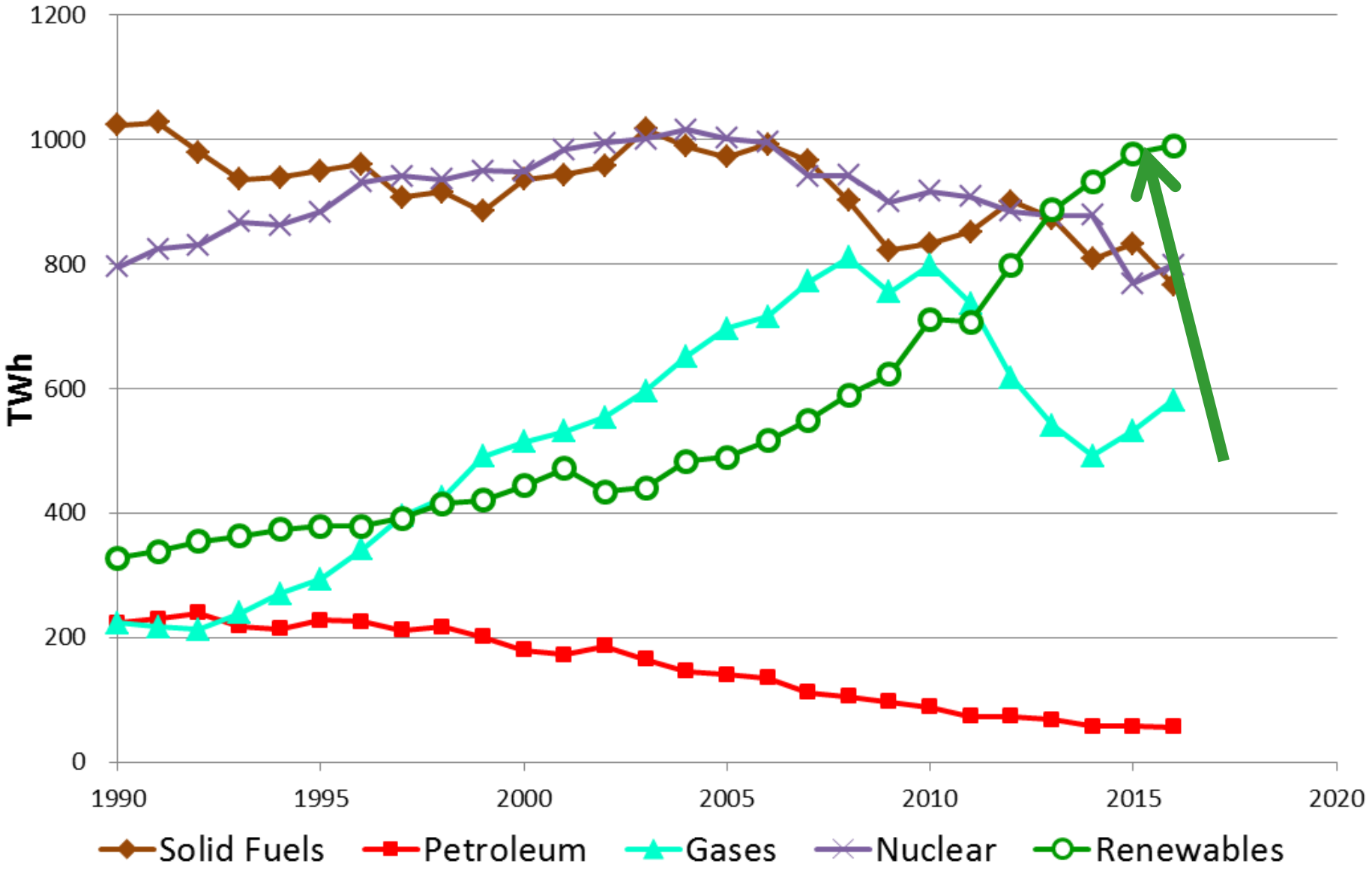
* Climate change → Paris agreements

* Targets for renewables

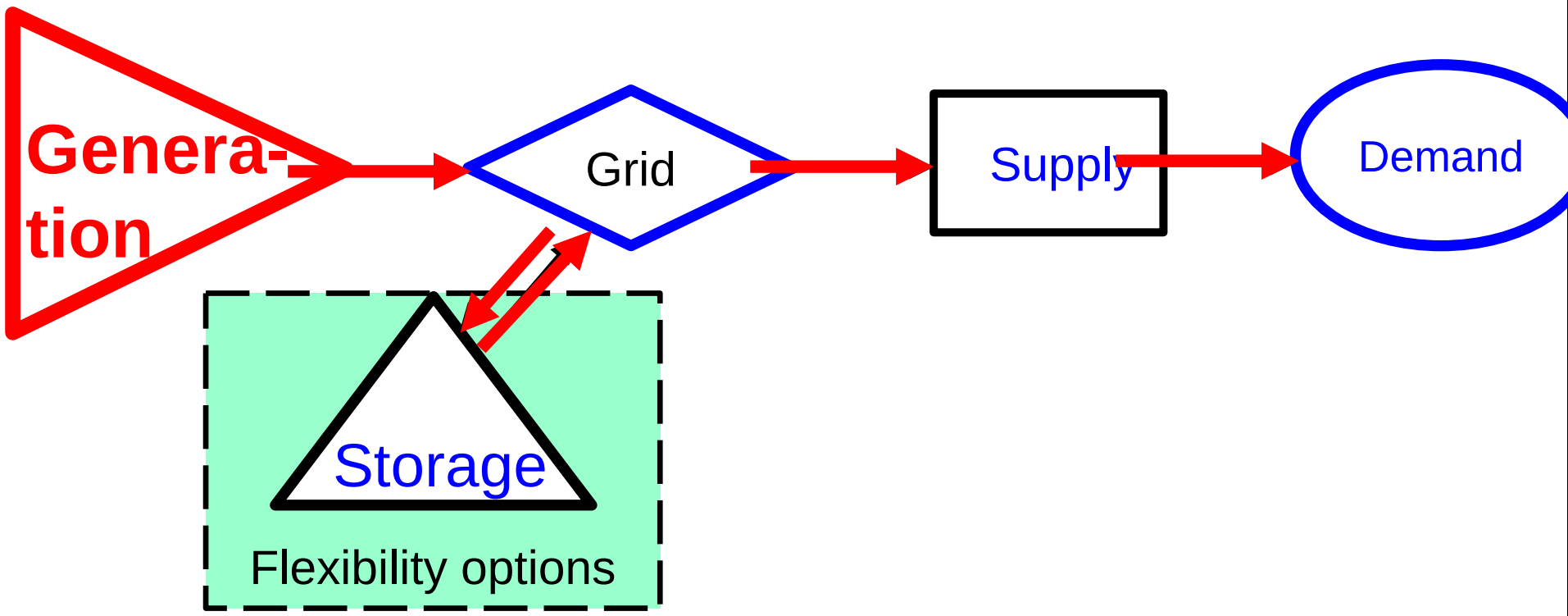
* Competition & democracy

* It is not possible to squeeze variable renewables into the system by violence system integration

Introduction:
Electricity generation EU-28



Old thinking



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

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

Day-ahead electricity markets

Expectation of

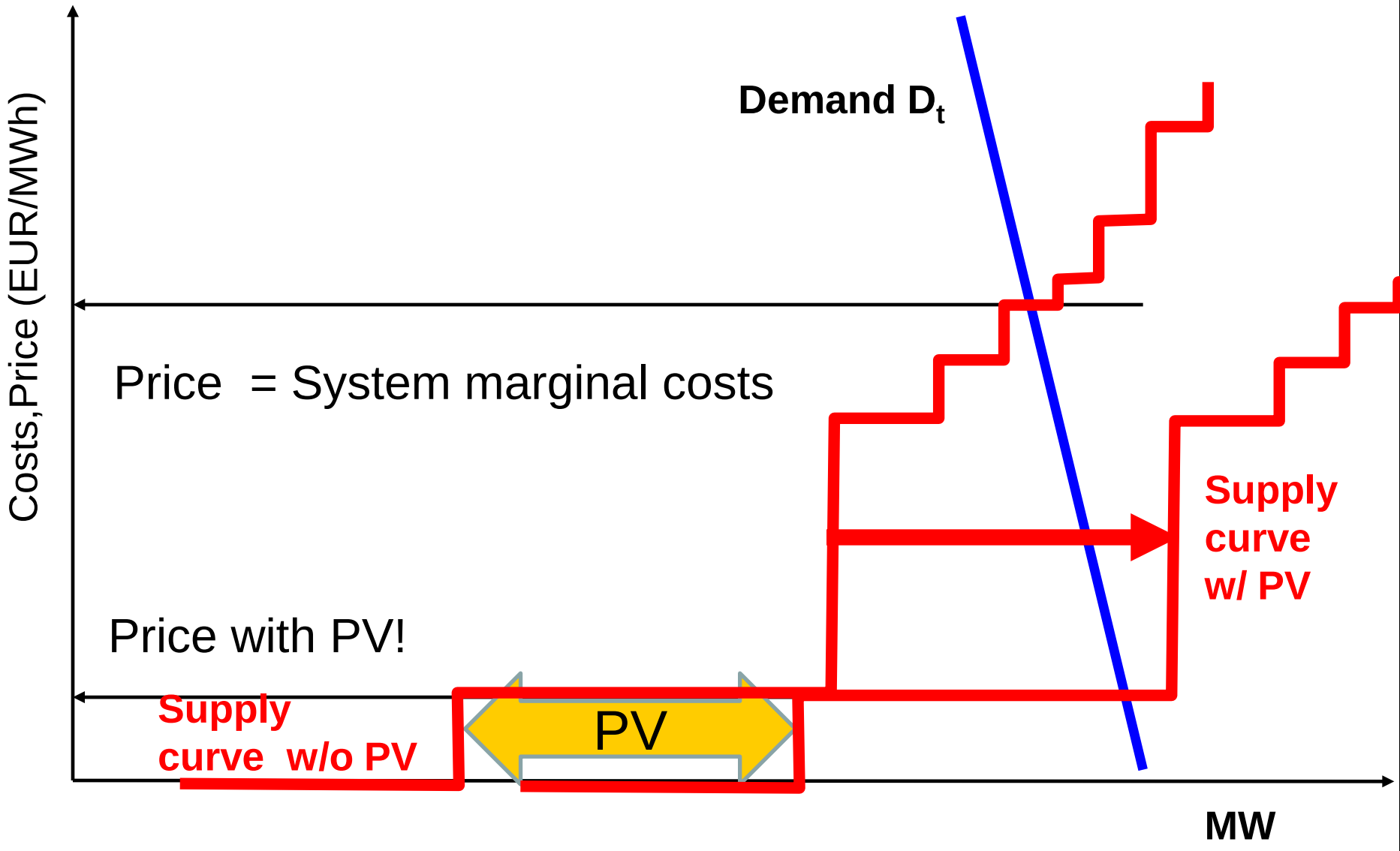
prices = Short-term marginal costs

(Short-term marginal costs = fuel costs)

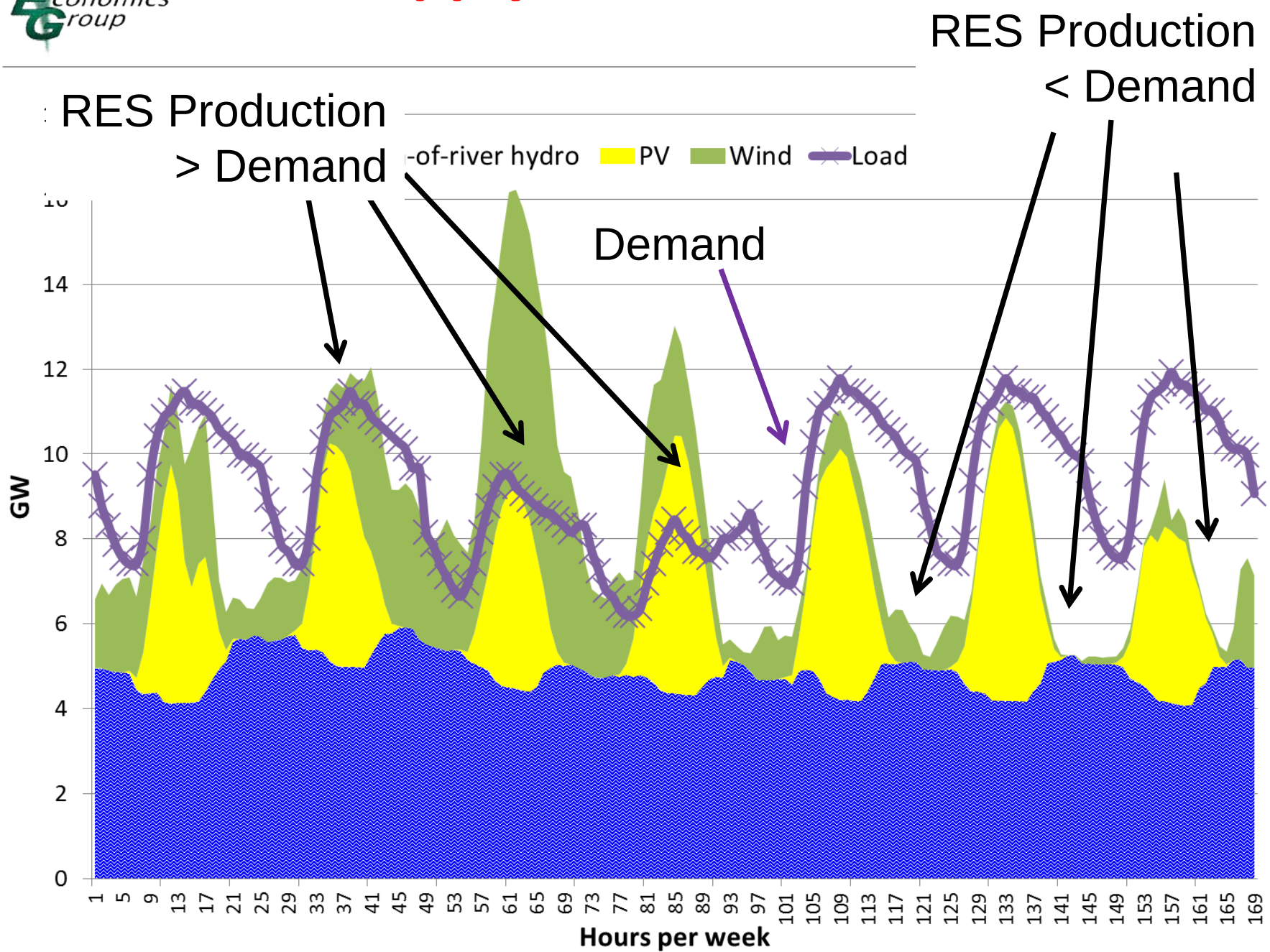
due to huge depreciated excess capacities at the beginning of liberalisation!

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

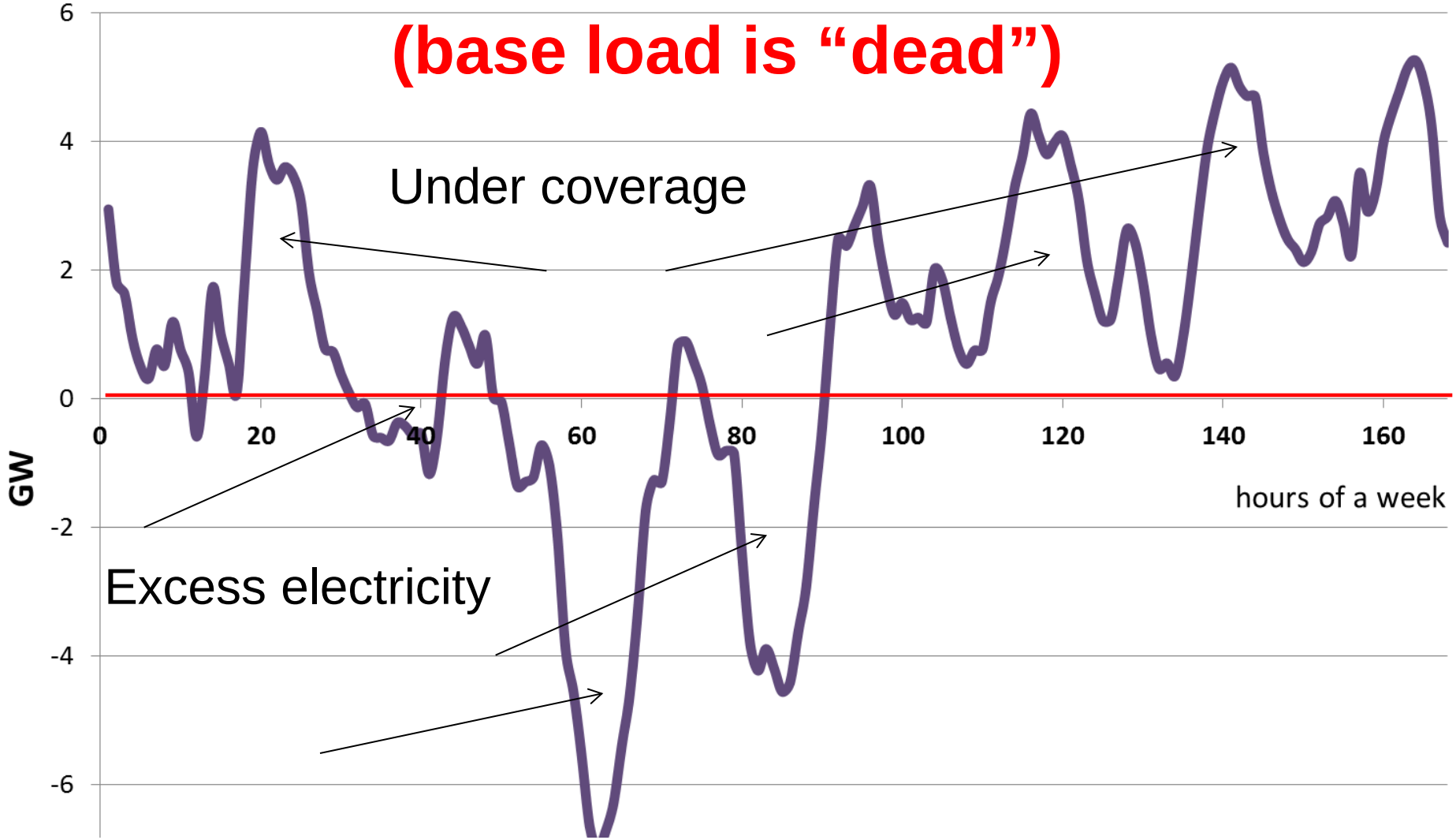
Example: prices without and with PV



Supply and Demand



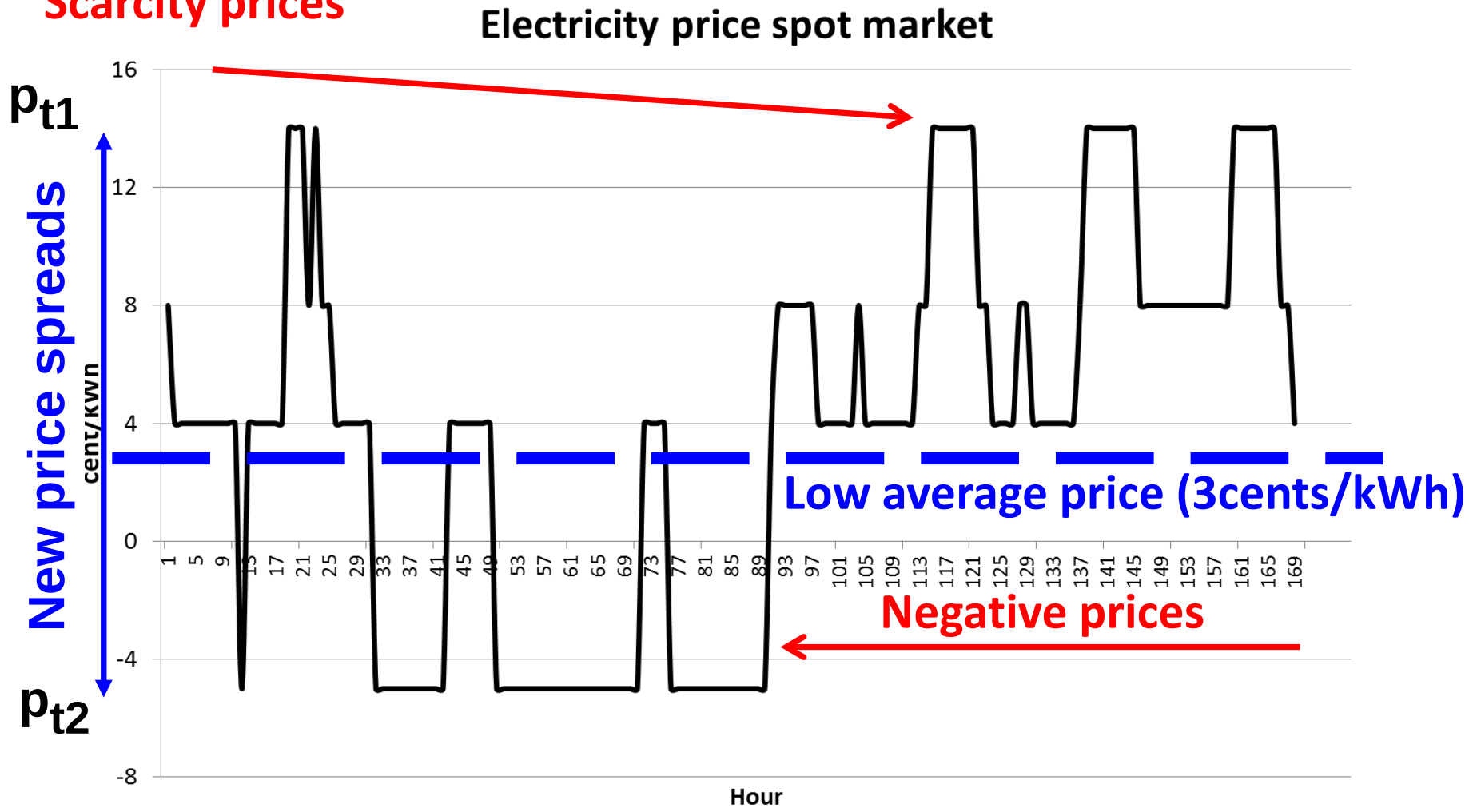
Key term of the future: Residual load (base load is “dead”)



Residual load = Load – non-flexible generation

Deviation from STMC-pricing in spot markets

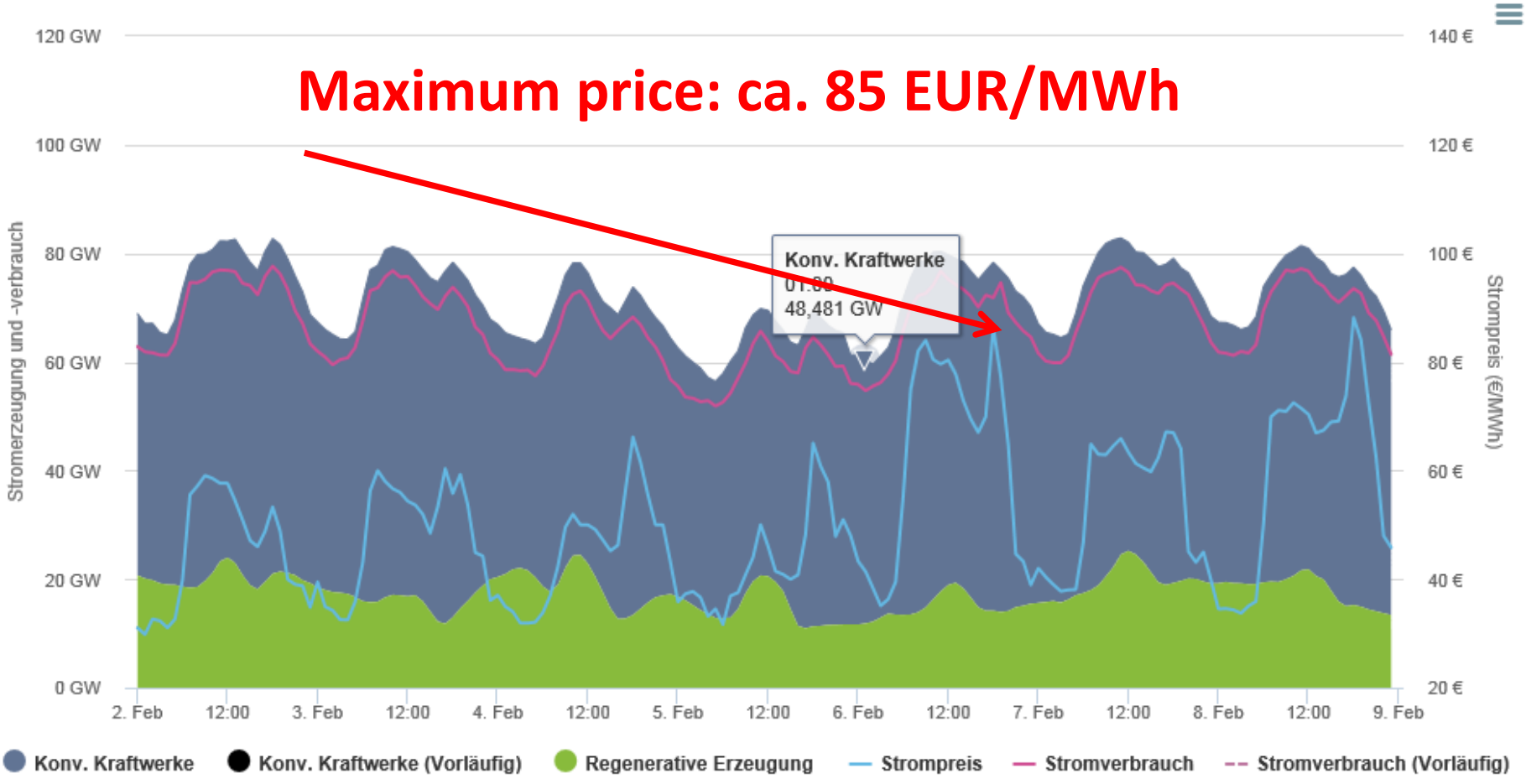
Scarcity prices



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

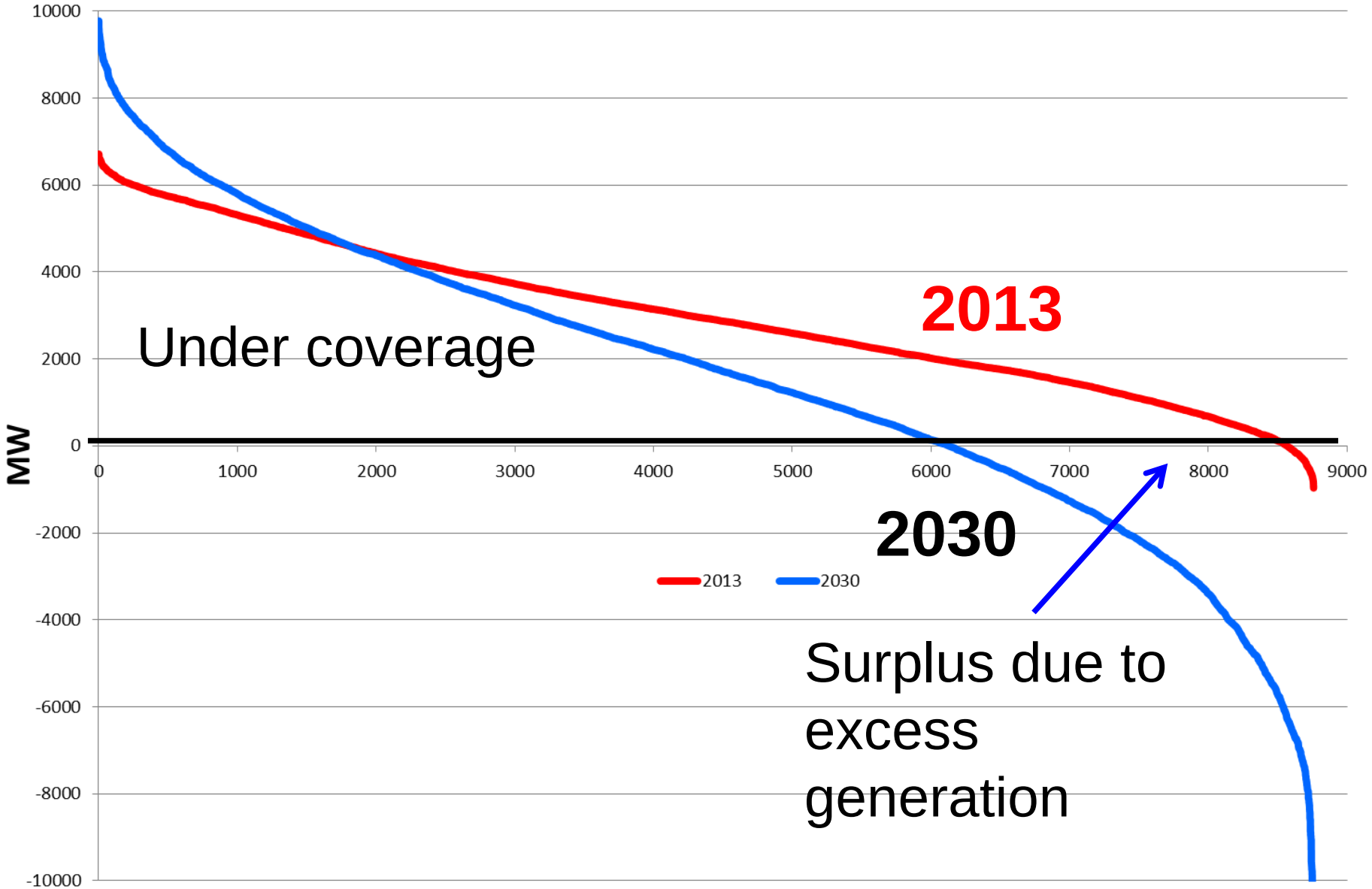
Remark: Cold - dark – Lull („Kalte Dunkelflaute“)

Maximum price: ca. 85 EUR/MWh

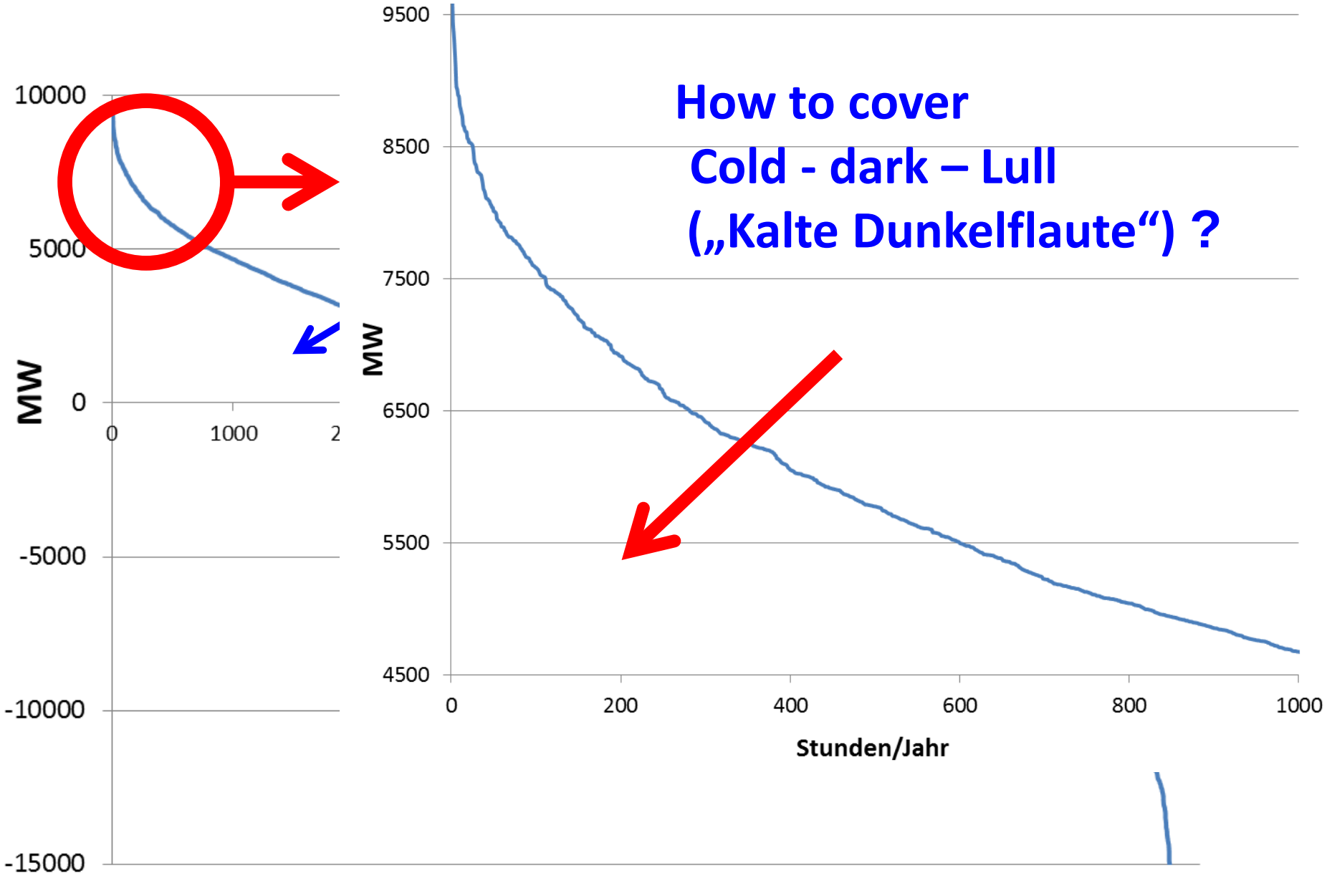


Agora Energiewende; Stand: 16.04.2017, 15:30

Classified residual load over a year



Classified residual load



There are two extreme positions:

By a regulated capacity „market“ 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

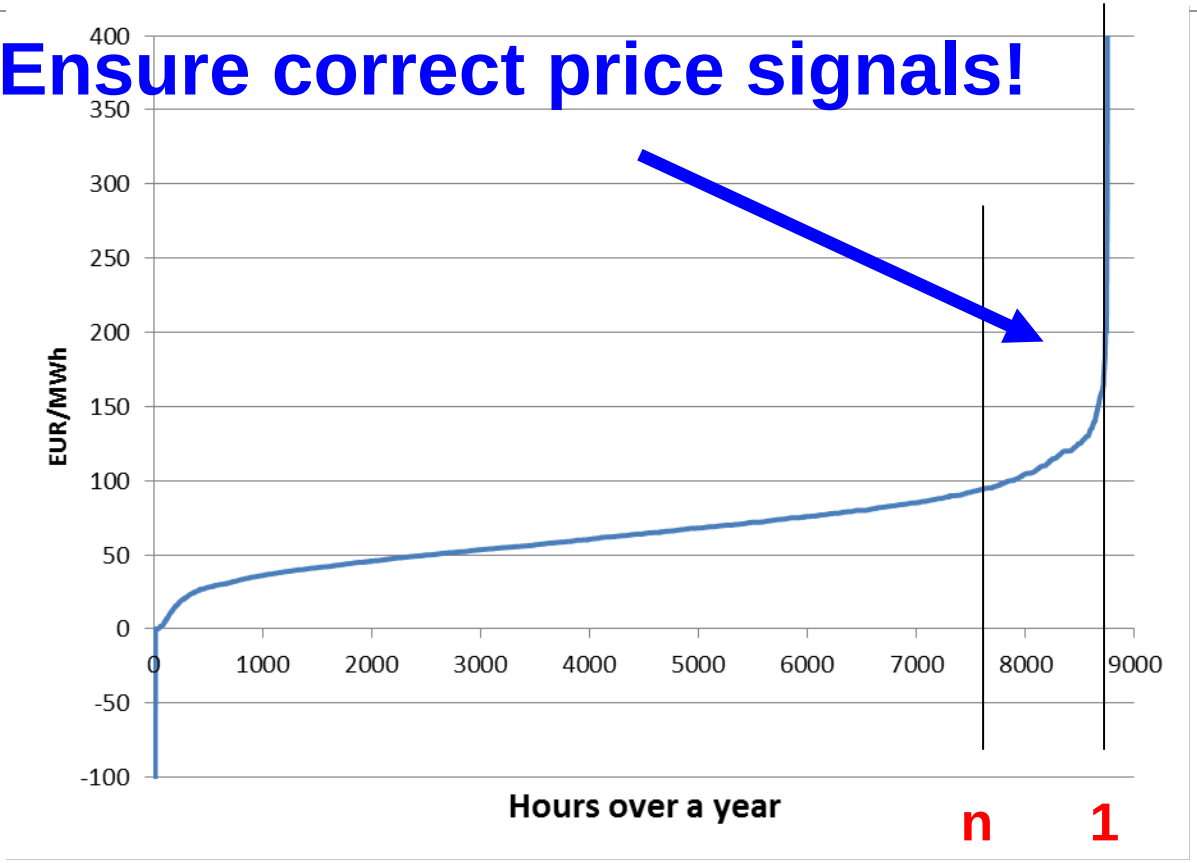
All regulatory capacity payments for power plants destort the EOM and lead to wrong price signals for all other options

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

We should strive to retain system resource adequacy by ensuring correct price signals and without capacity payments

Cost duration curve

Ensure correct price signals!



Generators stay in the market if:

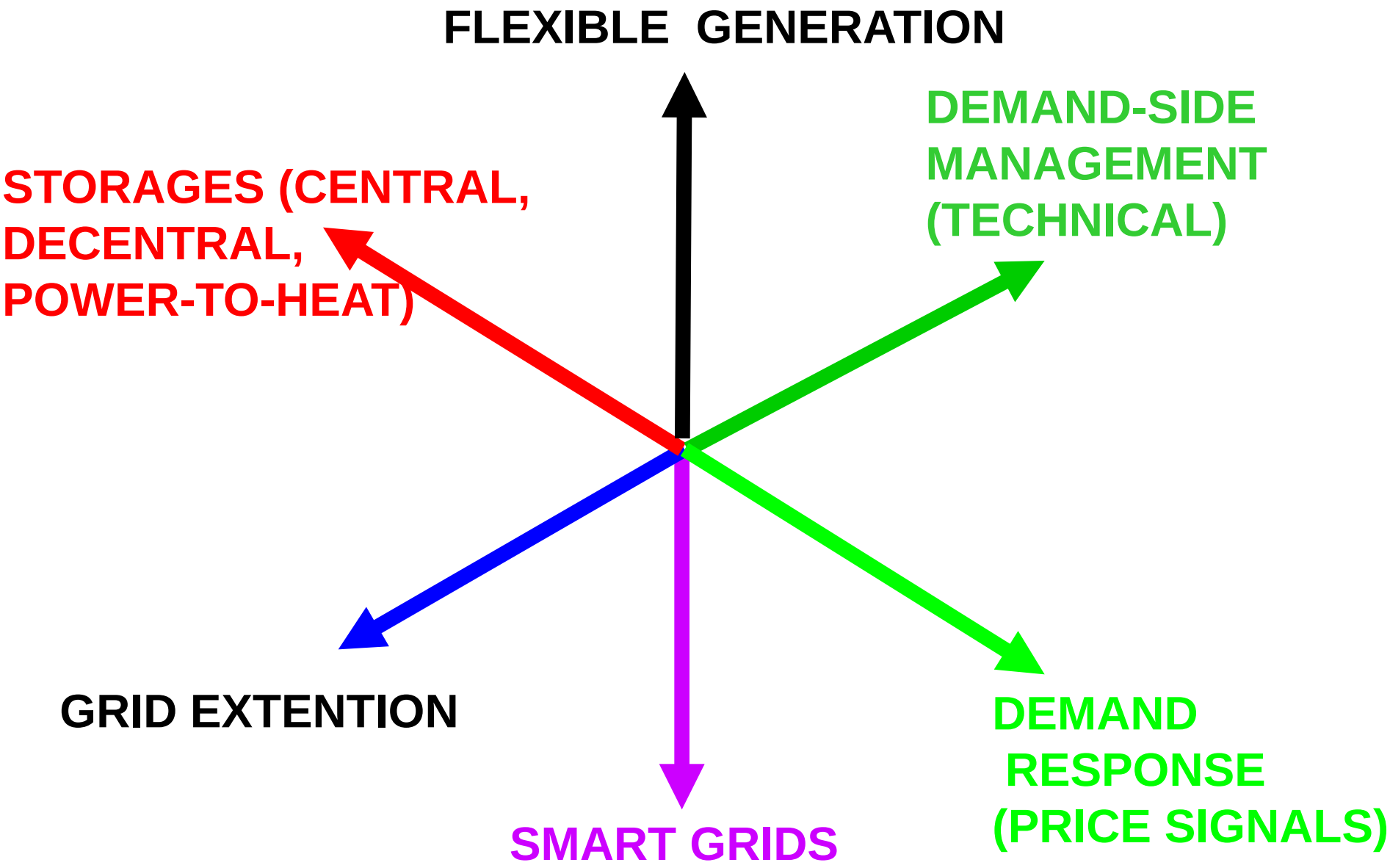
$$\sum_{t=1}^{n} (p_{ele_t} \cdot q_{ele_t} - c_{f_t}) > (c_{c_y} + c_{O\&M_y})$$

Given a price pattern, showing excess and scarcity prices it would be attractive for a sufficient number of flexible power plant operators to stay in the market!

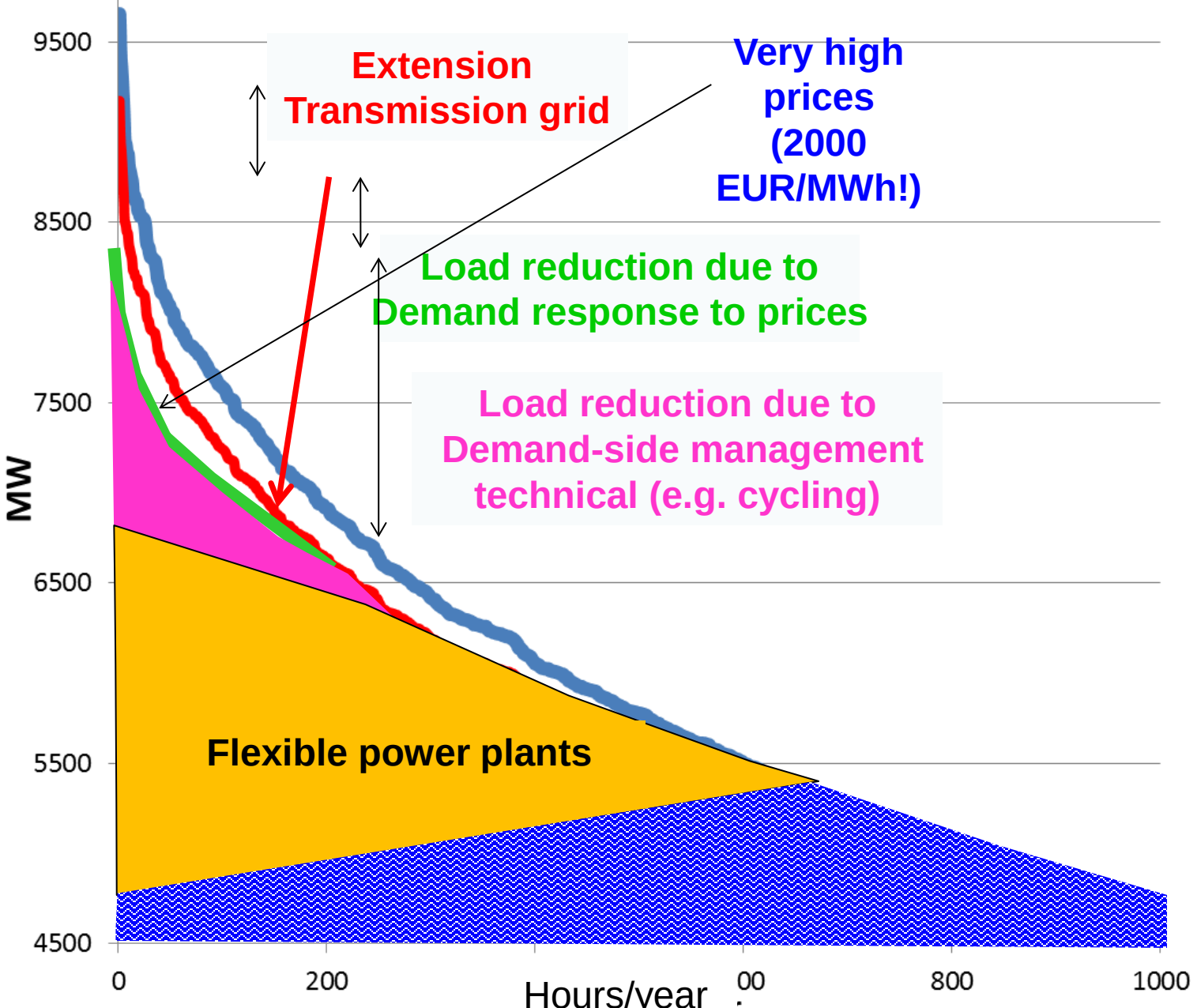
→

REVISED ENERGY-ONLY MARKET

5 THE ROLE OF FLEXIBILITY AND SECTOR COUPLING

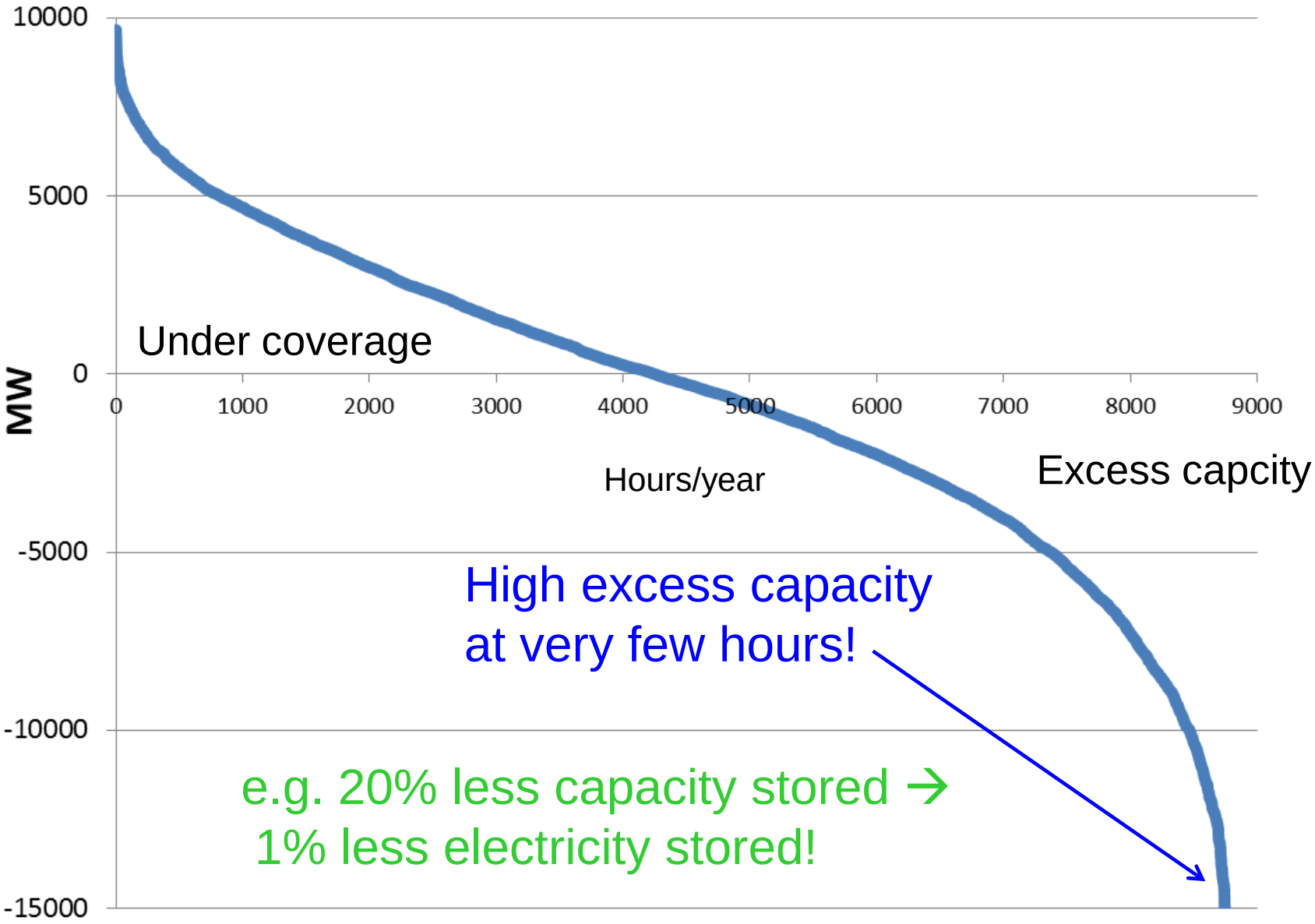


Flexible coverage of residual load



Capacity without ensured payments

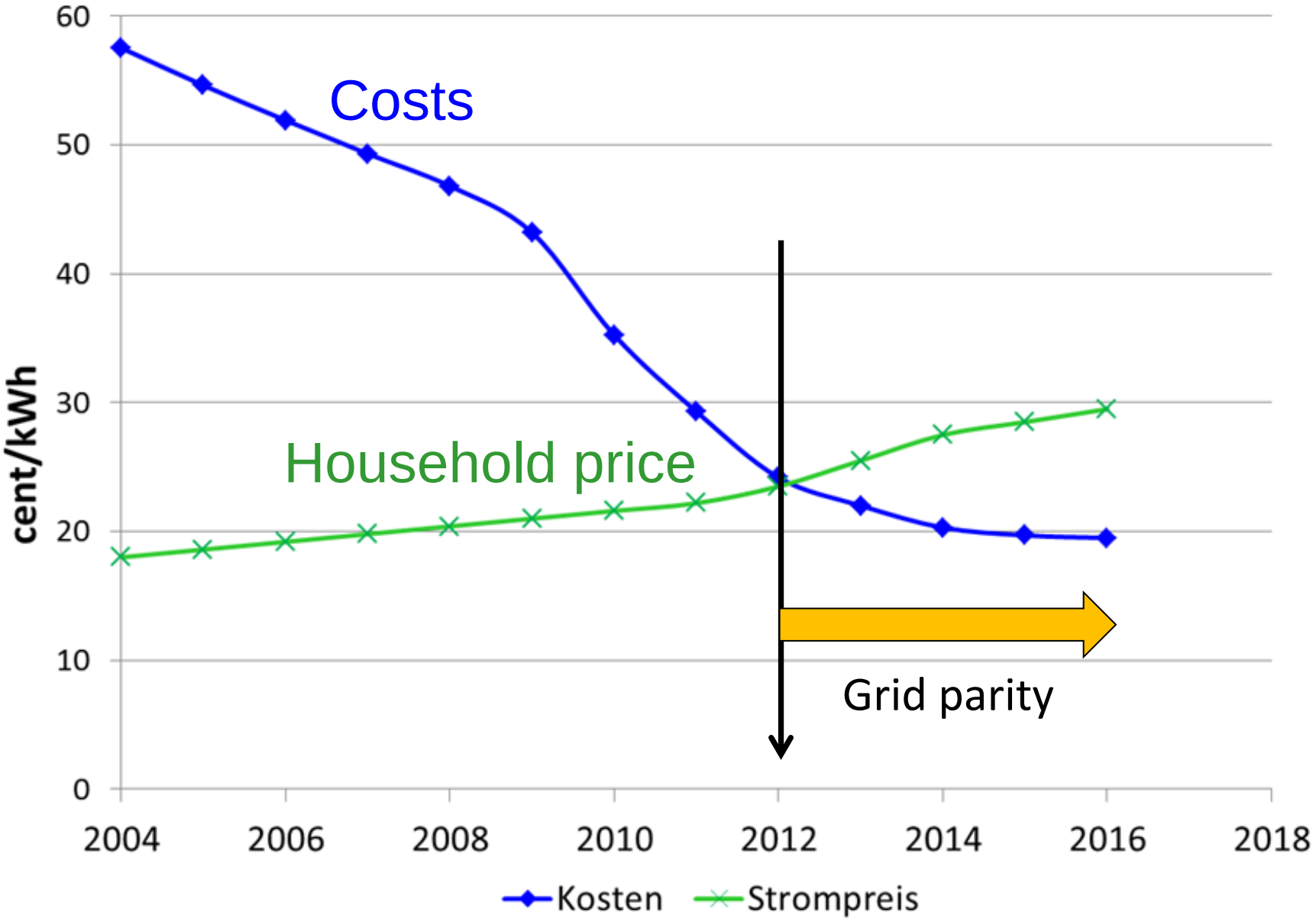
Storing every peak?



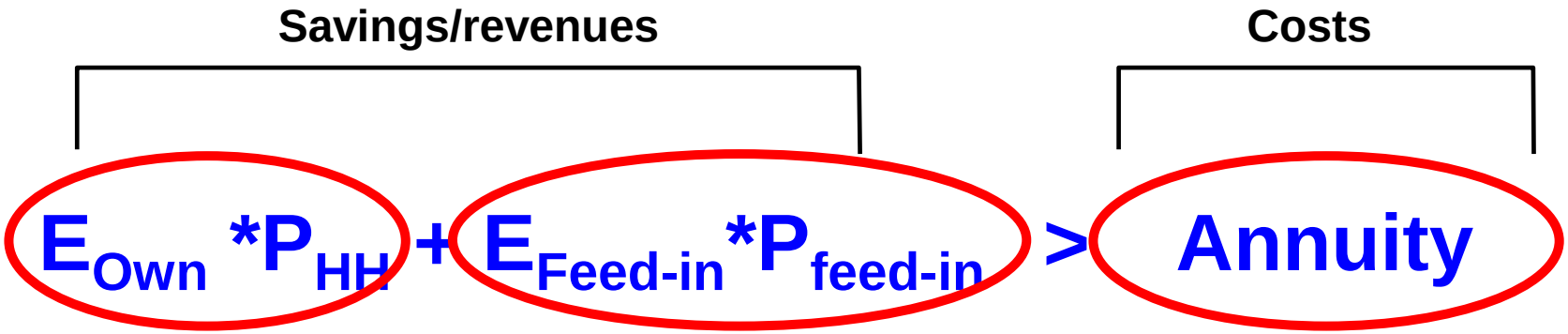
6. IS THE TIME FOR SUBSIDIZING RENEWABLES OVER ?

As long there is no price on CO2 …..

Grid parity: PV-costs and household electricity prices



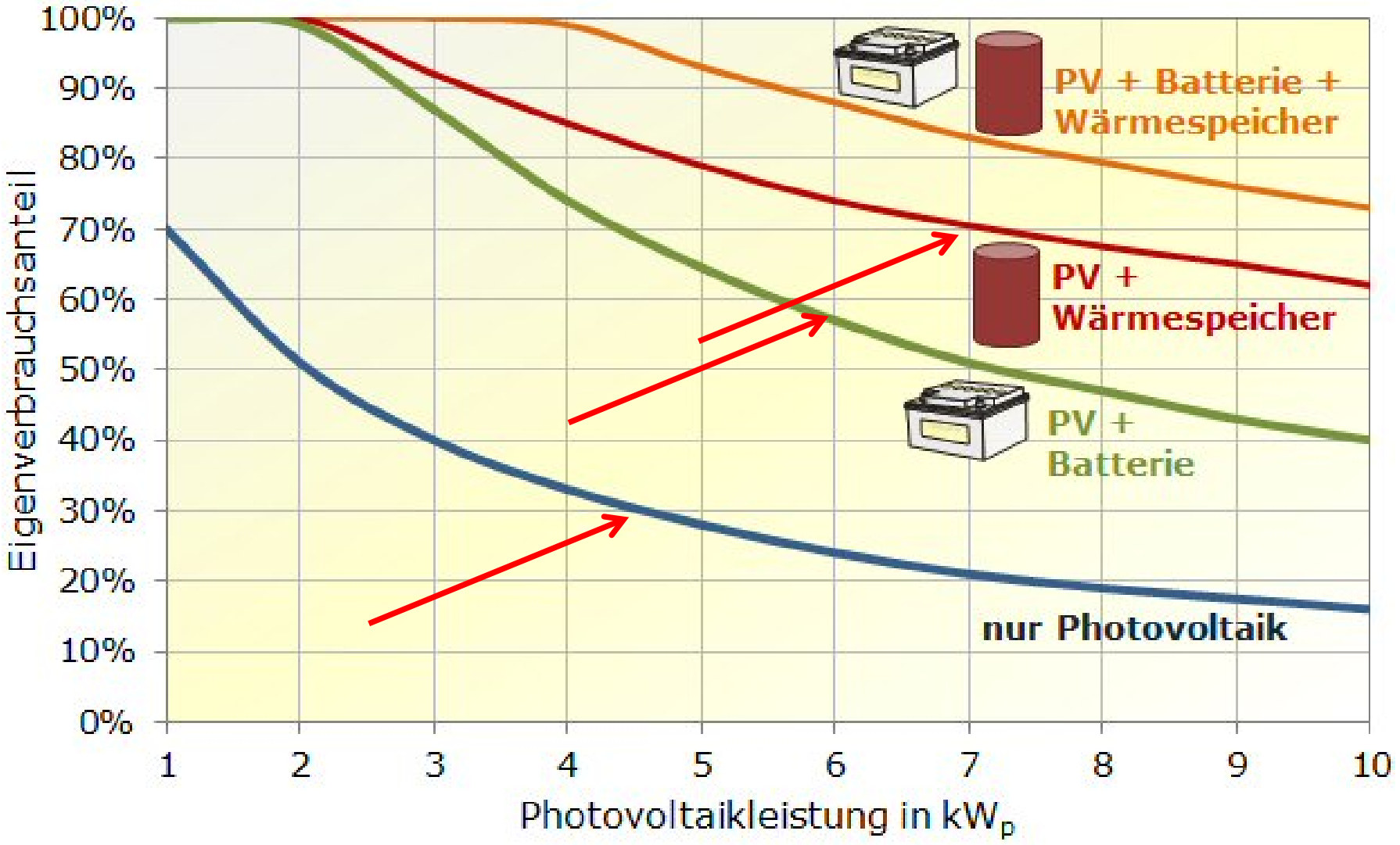
Assessment of Grid Parity



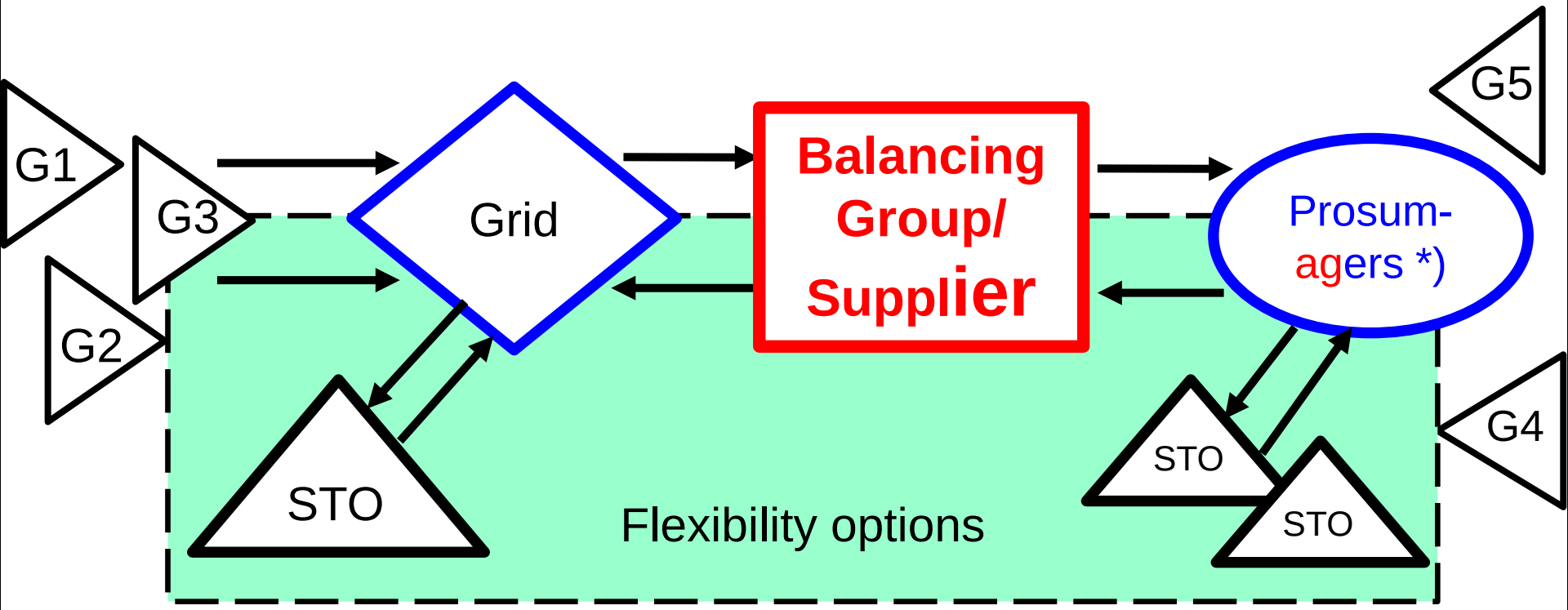
Grid parity term

Subsidy still necessary?

Share of own consumption

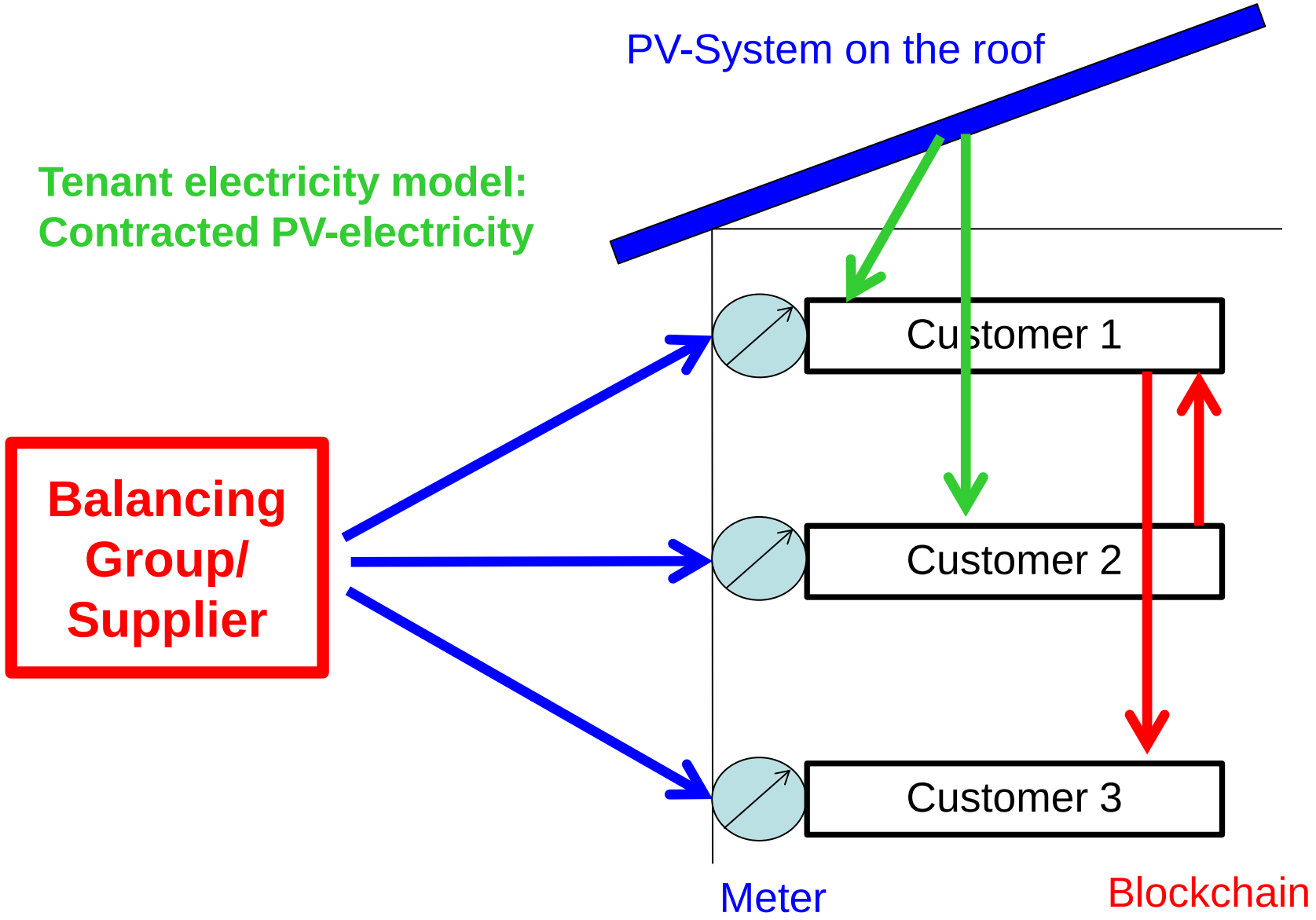


New Thinking: Making the electricity system more democratic

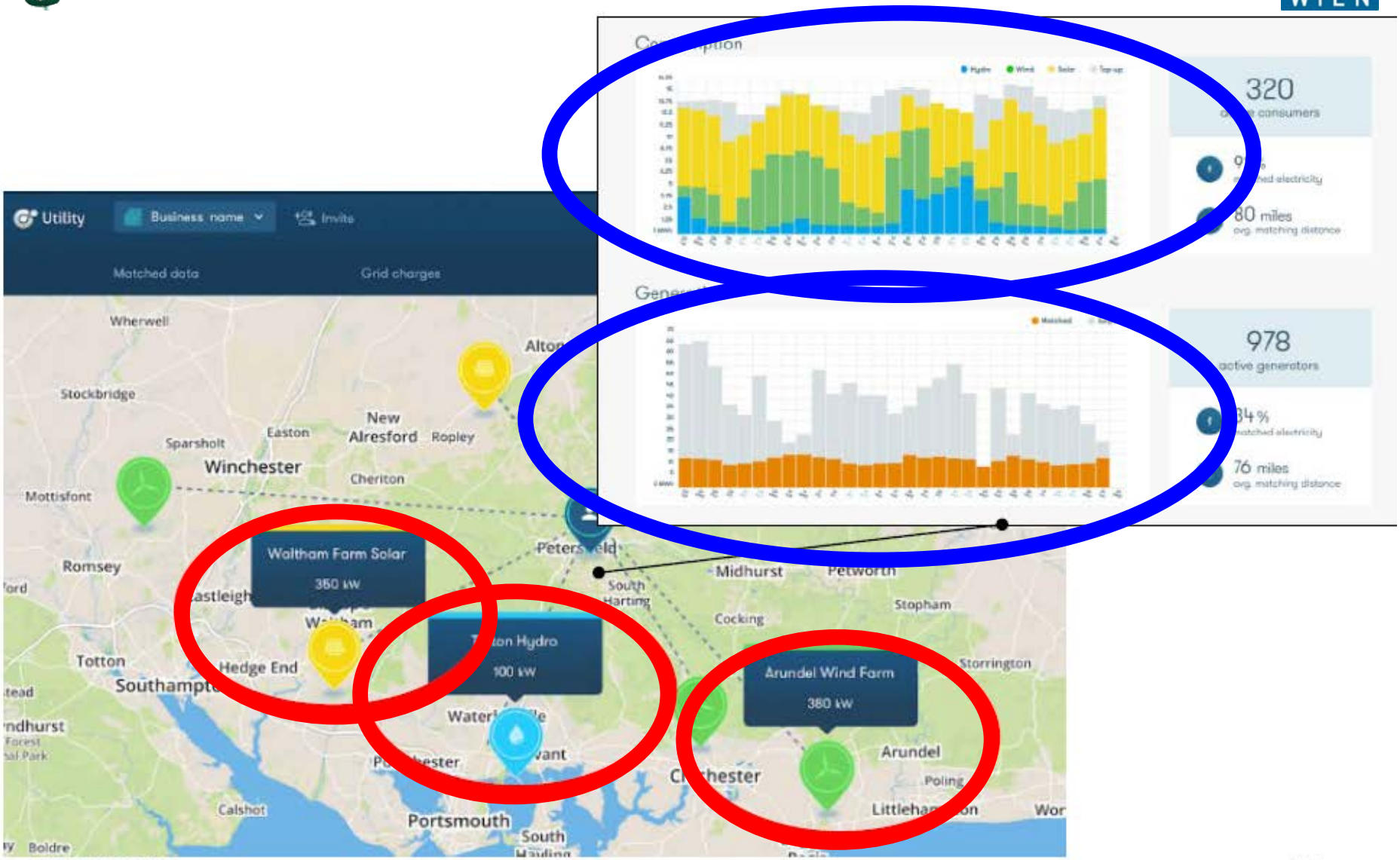


*) R. Green

Tenant electricity model and Blockchain



Peer-to-peer



Source: piclo.co.uk

7. CONCLUSIONS

- Sustainable electric. system → integration of a broad technology portfolio & demand-side options!
- Larger market areas favourable
- Very important: correct price signals (incl. CO2)
- most urgent: exhaust full creativity for flexibility of all market participants incl. decentralised PV systems
- Capacity payments: Any CP will distort the system towards more conv. and less RES capacity
- New key player: Balancing group (Supplier), no more the generator