Business from technology

Stakeholders and their roles in microgeneration and new end-use technologies

IEA DSM Workshop, Arnhem, 25th April 2012

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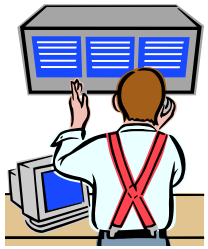
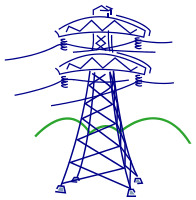
Scope of our study

- Microgeneration includes any type of power generation, which is installed at consumer premises and power output is less than 50 kW_e
  - inspired by the EU Directive 2004/8/EC which defines this limit for micro-CHP
  - We have reviewed μ-CHP and PV technologies
- New end-use technologies include heat pumps, EV, and small energy storages
  - Also review report of heat pumps and EV

Stakeholders considered





TSO

regulator

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wholesale marketplace

DSO

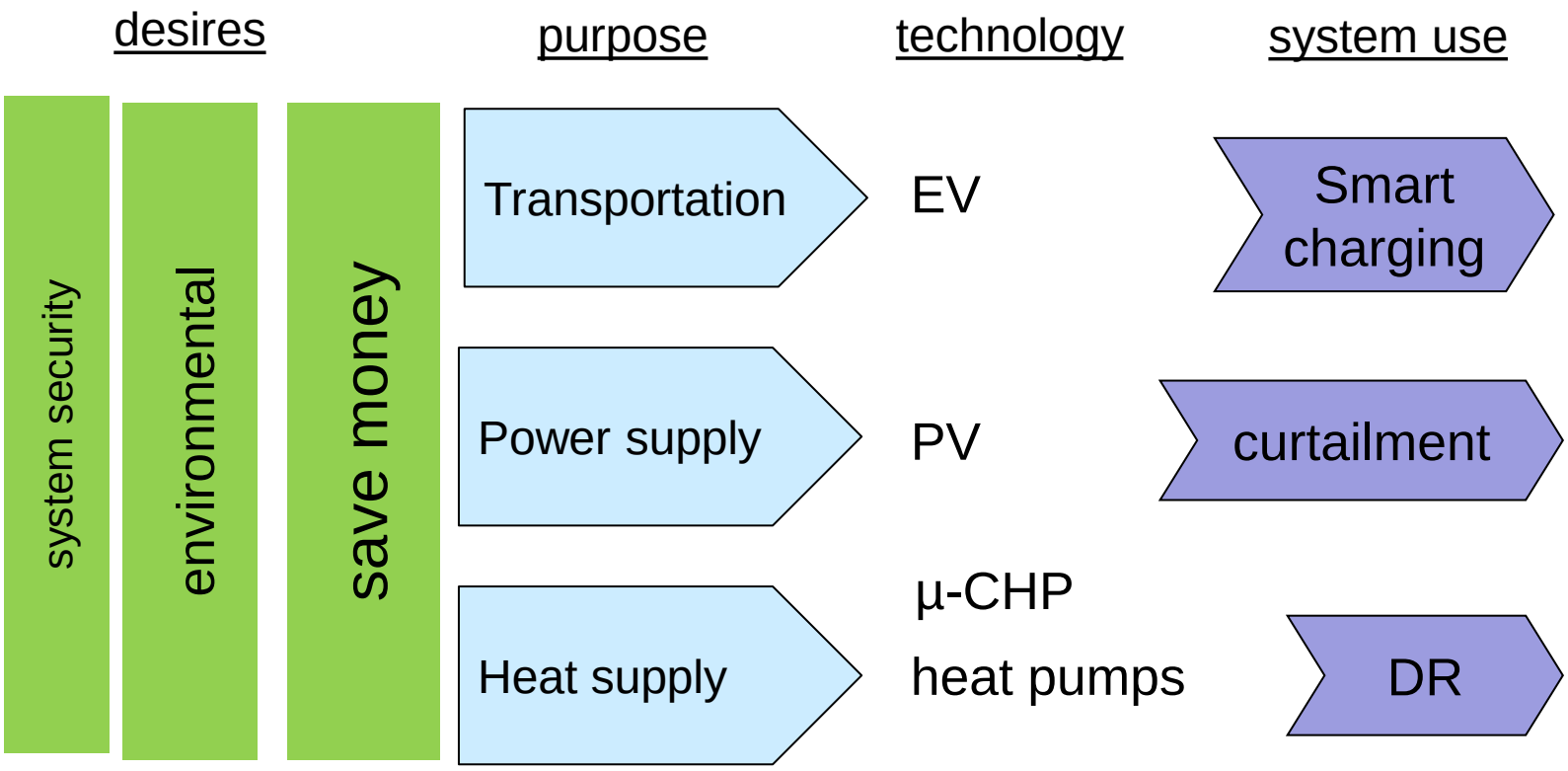
aggregator

supplier

consumer

manufacturer

Consumer position

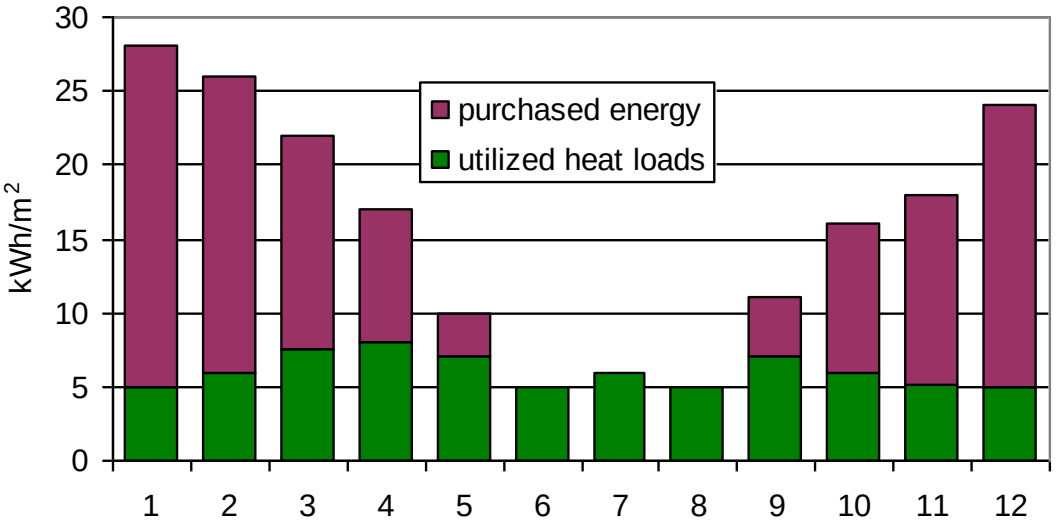


Consumer desires for energy supply

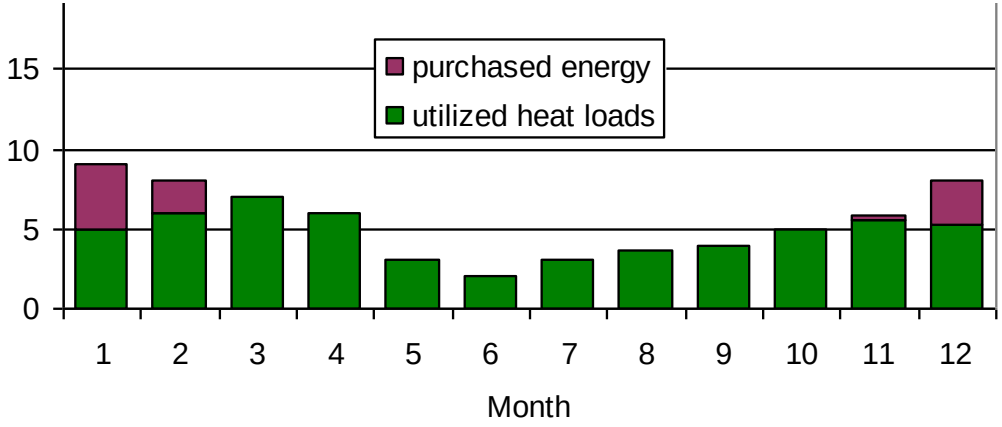
- Affordable
  - Also the costs and benefits should be easy to calculate
- Reliable
  - Also cybersecurity point of view
- Simple to install, maintain and manage
- Environmentally friendly
- Low local emissions and space requirement

Problem: introduction of low-energy buildings

Reference building



Low-energy building



DSO

Power quality

- Active voltage control
- Control of individual DER

Network planning

Value of microgeneration as network replacement

Tariffs

Cost-reflective

Protection

- Mal-trip
- Fail to trip

Public image

Occupational safety

Grid connection of units

ENTSO-E RfG

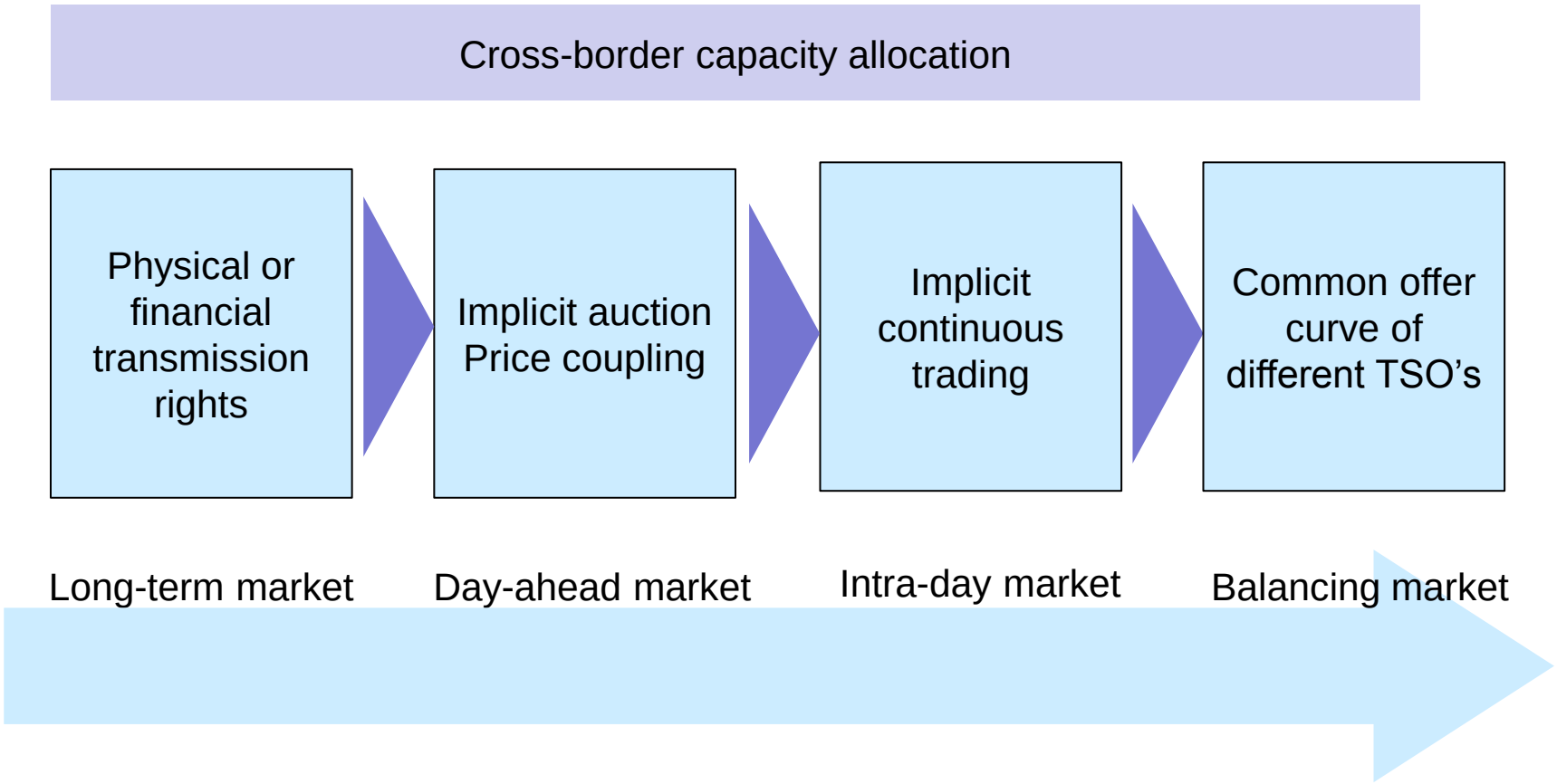
Organized power markets

- Power exhanges are indirectly involved in the proliferation of microgeneration and new end-use technologies through retailers and aggregators
- Power exhanges fulfil the following tasks:
  - Provide a credible and neutral reference price for power to all power system participants
  - Increase competition
  - Provide a market place for trading power even with short notice, as well as trading DR
  - Increase the efficiency of power generation and utilization of network

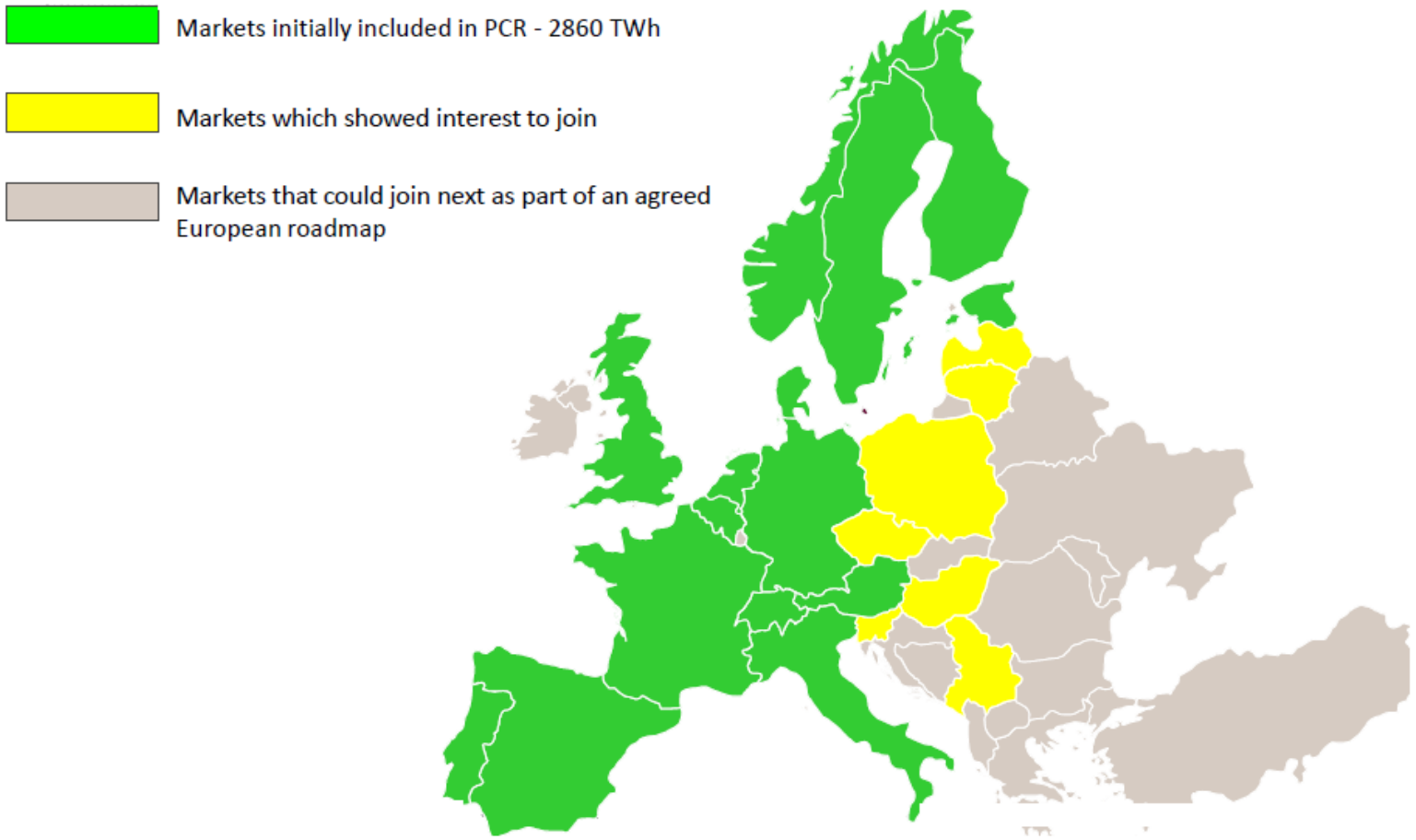
Harmonization of power markets in Europe

- European Council 4th Feb 2011 conclusion: EU needs a fully integrated and interconnected energy market
  - National regulators and TSO's should start working on market coupling
  - Should be completed in 2014
- Background for the integration is the e.g. increasing penetration of renewables
- ERGEG has prepared a target model for the European wholesale power markets
  - Background work by ETSO and the association of european power exchanges (Europex)
  - The model has been prepared by a project group set by the Florence Electricity Regulatory Forum

The European target market model



Price coupling of regions, day-ahead market



Product development within power exchanges

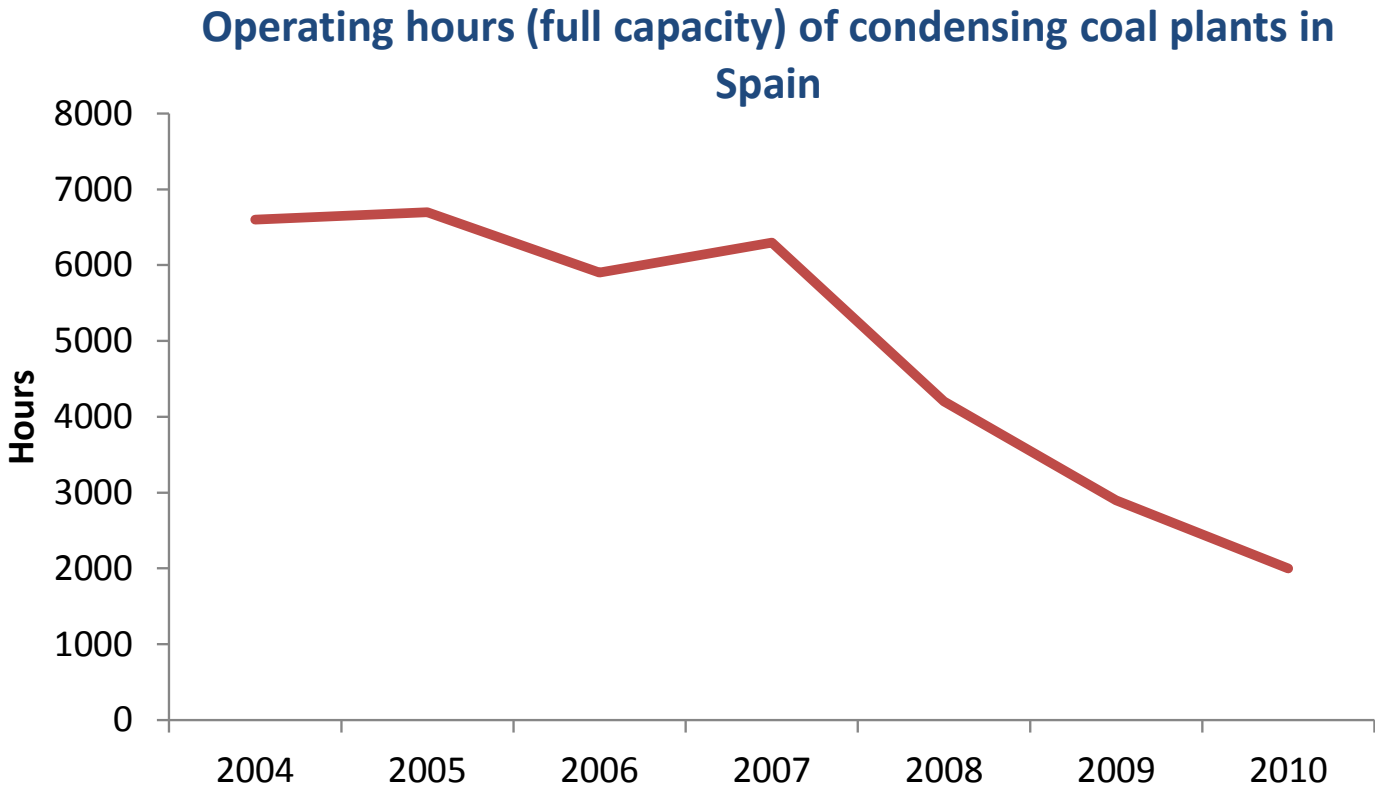
- Products will not be harmonized
- Power exchanges could introduce new products, which are suitable for demand response and smart charging
- One example is the flexible hour bid in Nordpool, which is realized during the highest priced hour of the day
  - This could be developed further with more parametrization
- Another product could be a block bid with both sales and purchase part, to cover the payback peak in demand response

TSO

- ENTSO-E Network code for requirements for grid connection of generators
  - applies also to microgeneration: ”class A” generators start from P_e = 400 W
- It was seen that only TSO can assess which requirements should be met by generators to maintain system security
- Especially microgenerators should provide downwards active power frequency response
  - The frequency limit and droop setting shall be set by the relevant TSO
- ENTSO-E is also preparing a network code on allocating transmission capacity in day-ahead and intra-day timescales

TSO

- Adequacy of capacity during consumption peaks and low RES output



Data source:Fingrid oyj

Manufacturers

- Wish for a clear, detailed and pan-European (universal if possible…) set of requirements for generating units
- However, the *ENTSO-E requirements for generators* in many cases asks the local TSO or DSO to set the requirements

Thank you!