

FlexPower

- a market design project

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Ea Energy Analyses

Team

- DTU – Centre for Electric Technology (CET)
- DTU – Risø
- DTU – Informatics
- Actua
- Eurisco
- Enfor
- EC Power
- SEAS/NVE
- Ea Energy Analyses

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Background

- Expanding the share of wind power will increase the need for regulating power
 - and may at the same time reduce the capacity of the central power units – those who traditionally have supplied regulating power.
- However
 - there exists a potential for using demand as a stable and low cost resource for regulating power.

What is regulating power?

- Up and down
 - More or less generation
 - Less or more demand
- Manually activated reserve
 - Decided by TSOs
- Must be fully activated within 15 minutes
- Activated to
 - Avoid overloading of transmission lines
 - Restore automatic reserves (frequency)

Optimised for demand

- In this project
 - A simple and efficient market will be designed
 - Focus on electricity demand and small scale generation as regulating power.
 - Minimum end-user administration
- The proposed market will be verified
 - Simulations
 - Laboratory tests (SysLab and PowerLab)
 - Real life tests

End-user perspective

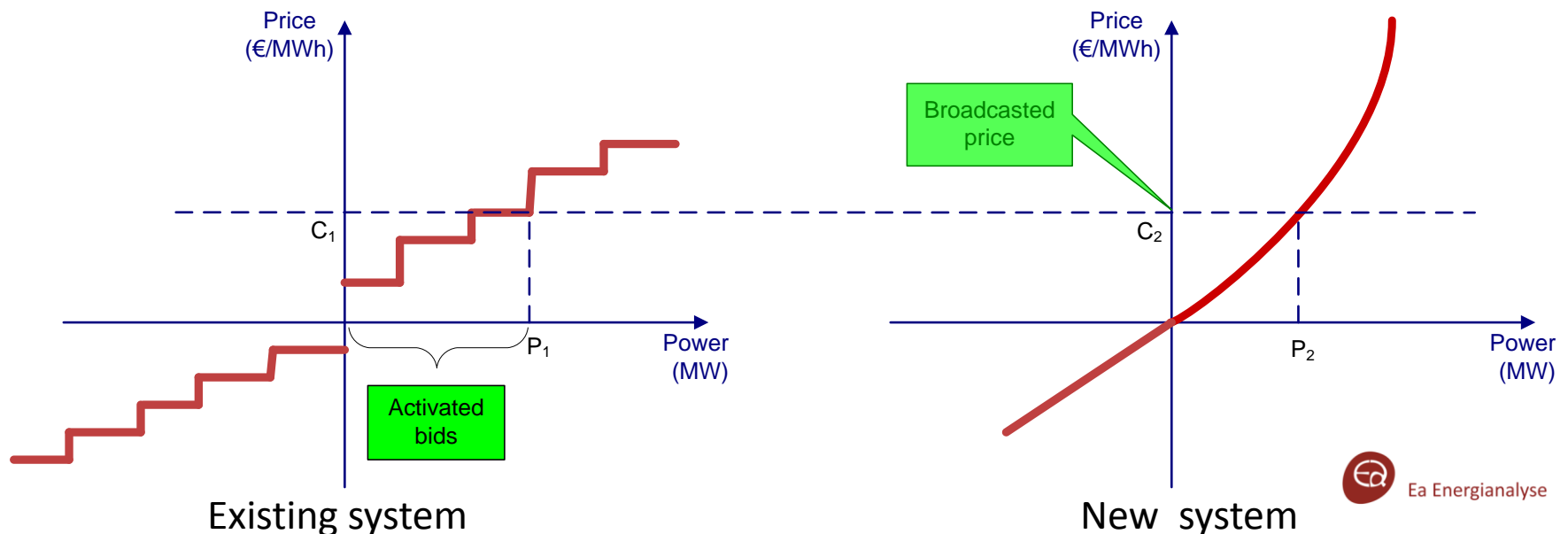
- The end-user receives a price each five minutes
 - Price = Spot price + regulating power price (when needed)
 - This is the final settlement
 - It is voluntarily to react
 - No bids are required
- Typical set-up
 - A computer looks up the price each five minutes and controls demand
 - No manual reaction needed
 - Local preferences respected (input to computer)
- Application
 - Heat pump, electric heating, electric vehicle
 - Pumps, processes, air condition
- For a user with some flexibility a reduced electricity cost can be realised
 - System can also be used for generators, e.g. micro generators

The balance responsible/retailer

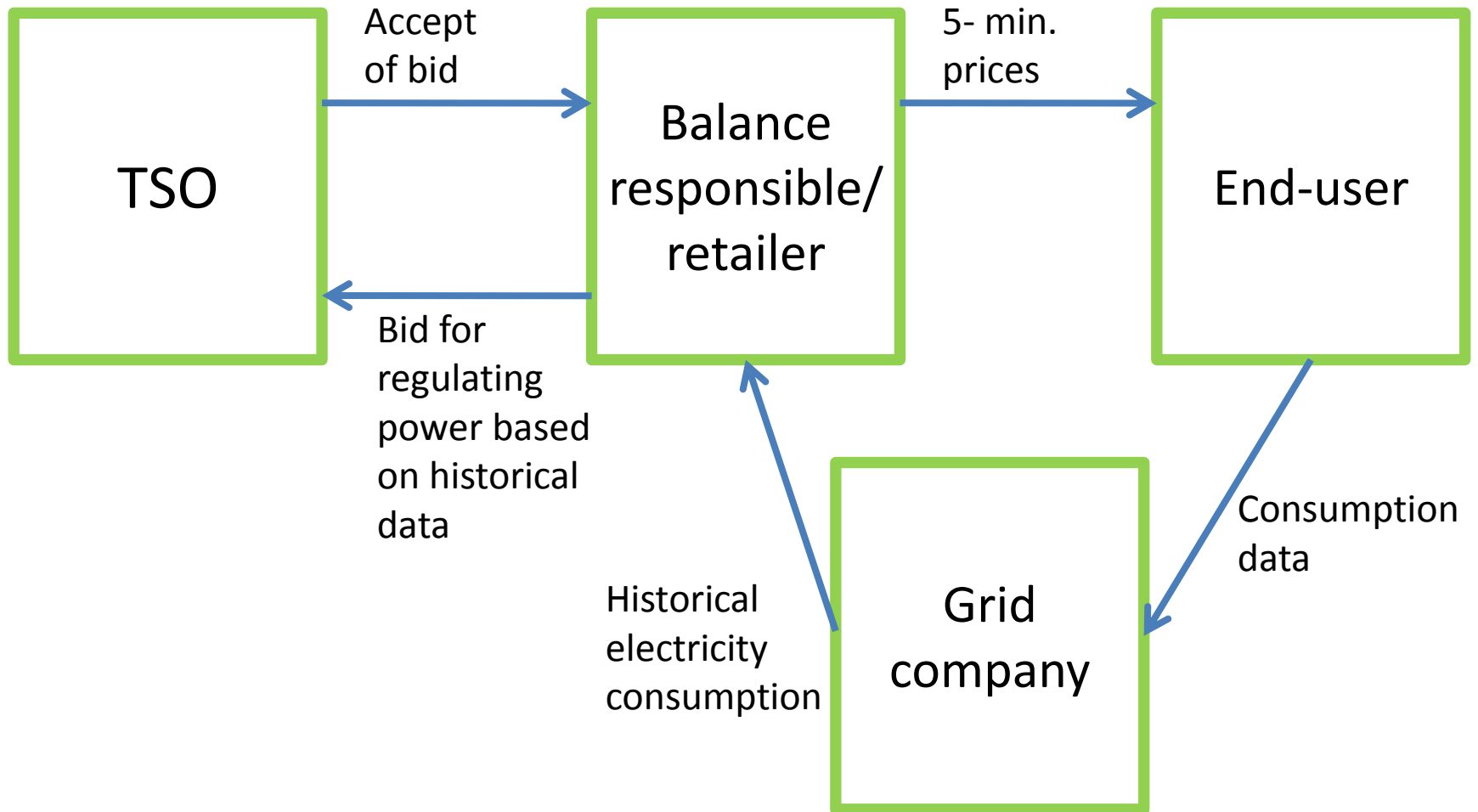
- Sells the new price concept to customers
 - Develop simple price offer
- Predict aggregated impact of possible five minutes prices
 - Based on historical consumption data
- Submits bids to Energinet.dk

TSO

- Maintain existing market for regulating power
- Needed power $P = P_1 + P_2$
- Price is defined as marginal bid (based on both systems)



Example of FlexPower set-up



Advanced option

- The suggested price system can be extended to cover other services than regulating power
 - To avoid bottlenecks in distribution grid
 - As secondary reserve (LFC)
 - Price signal for losses
 - Voltage control?
 - Primary reserve?

Work packages

WP1: Design of a real time market (Ea)	Current practices and future prospects. Design of real time market (spot and regulating power). TSO operations and market facilitation with real time market
WP2: Prediction of aggregated response (Informatics)	Development of practical models for predicting the aggregated response from many end-users exposed to a 5-minuttes price signal. Including uncertainty and develop of test design.
WP3: Advanced options (CET)	Potential DSO perspectives on dynamic prices (losses, local congestion) and Ancillary services (frequency, voltage, inertia, LFC)
WP4: Control strategies for DER (Risø)	Technical capabilities of existing and future DERs. Control strategies and algorithms of DERs
WP5: Prediction as part of local control (Enfor)	Prediction of prices, heat demand, comfort requirements and other input to user optimisation
WP6: Simulation (Actua)	Modelling and analysis of the real time market system including analyses of dynamic stability
WP7: Communication (Eurisco)	Development of needed communication for the PowerLab test and field test
WP8: PowerLab test (Risø)	Practical test in a secure laboratory environment
WP9: Field test (CET)	Practical test with real end-users
WP10: Conclusion (Ea)	Performance evaluation, business cases. Conclusion and recommendation and recommendation. Overall project management.

Two PhD's

- As part of the project two PhD projects will be concluded
 - Focus on
 - WP3: Advanced options
 - WP4: Control strategies for distributed energy resources (DER)
 - WP8: PowerLab test

First results

- Results will continuously be published on homepage
- Several deliverables are due at internal workshop 16. November 2010
- Public workshop is planned for January 2011

Contact

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