

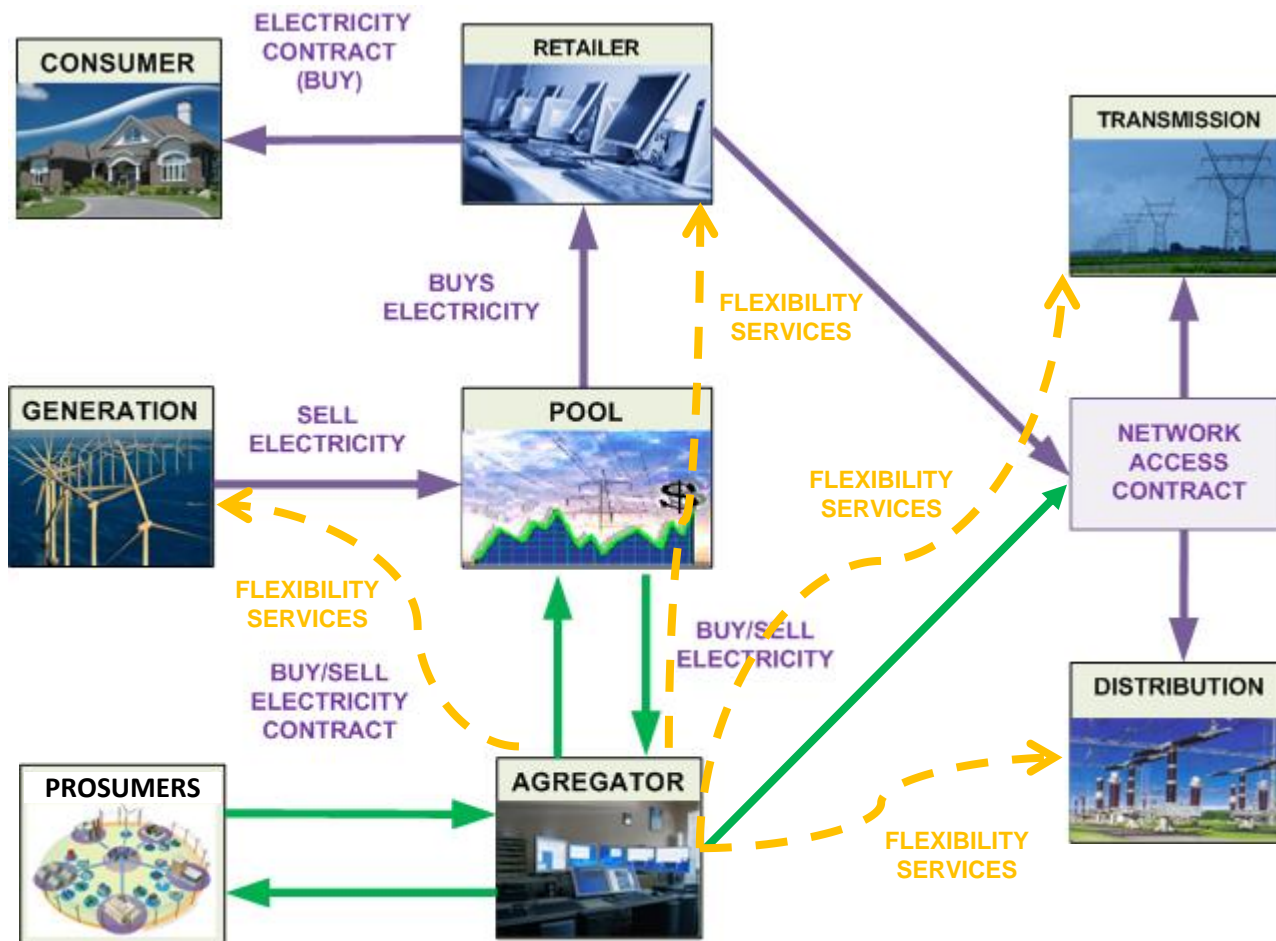


- IDE4L project overview and ANM concept
- Aggregator concept
- Developed functionalities
- Distributed automation system
- Demonstrations
- Conclusions



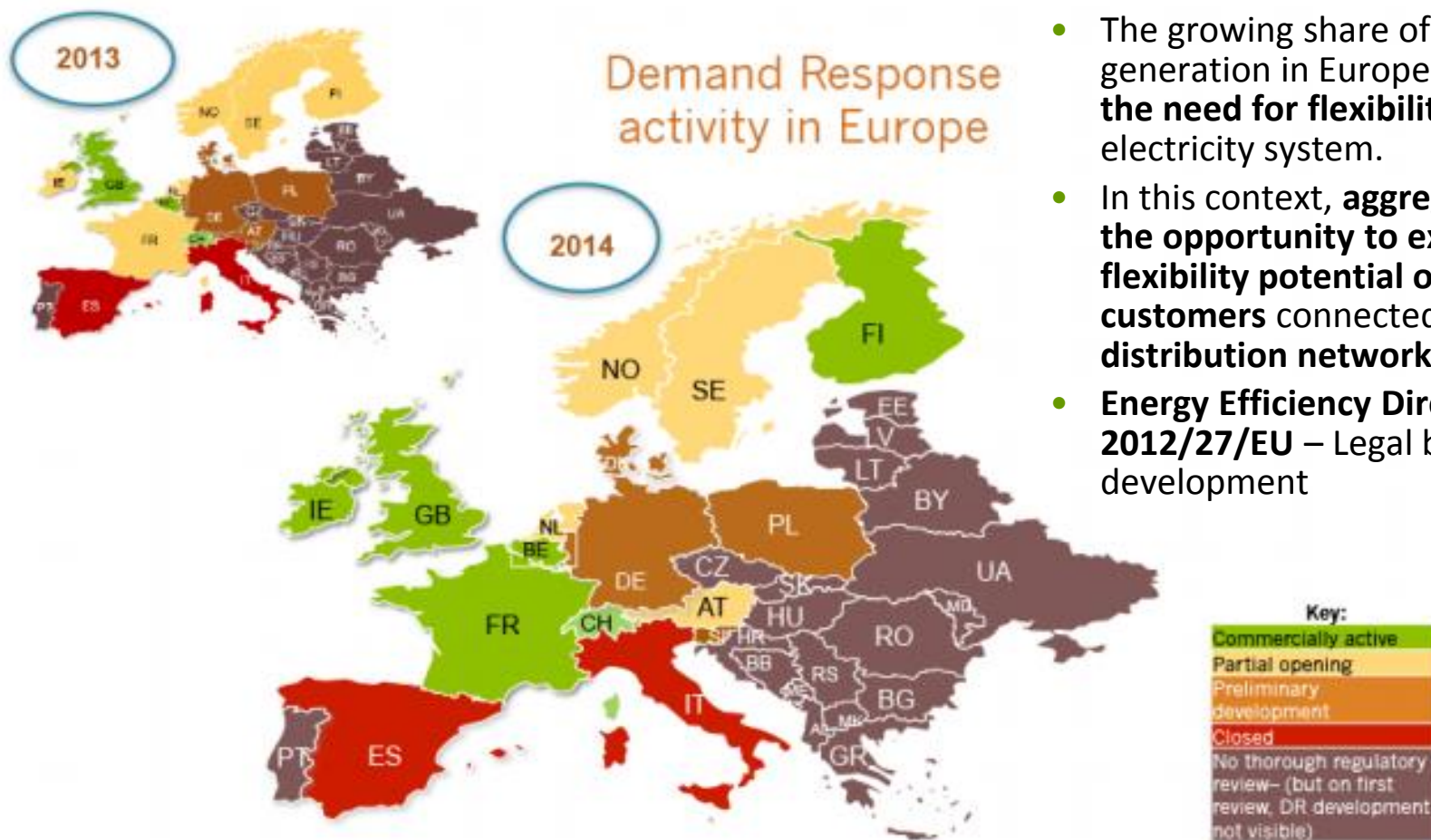


Aggregation concept: key enabler of “FLEXIBILITY”





State of the art - markets



- The growing share of variable generation in Europe is increasing **the need for flexibility** in the electricity system.
- In this context, **aggregation offers the opportunity to exploit the flexibility potential of smaller customers** connected to distribution networks.
- **Energy Efficiency Directive 2012/27/EU** – Legal basis for development

Demand Response Map of Europe 2013-2014





State of the art - markets

Some European demand response programs...

Meine Flexibilität unterstützt die Energie der Zukunft - wie geht das, E.ON?

Ganz intelligent mit E.ON Demand Response.

VERBUND Power Pool: Der smarte Weg, Energie gewinnbringend einzusetzen.



DONG energy

DONG ENERGY DEMAND RESPONSE MANAGEMENT PLUS: MEHR FLEXIBILITÄT UND HÖHERE DECKUNGSBEITRÄGE

„Wie können Stadtwerke und ihre Kunden an den Märkten für Flexibilität teilnehmen und dadurch attraktive Zusatzerlöse erwirtschaften?“



M-Partnerkraft

Das virtuelle Kraftwerk der SWM

Stadtwerke München

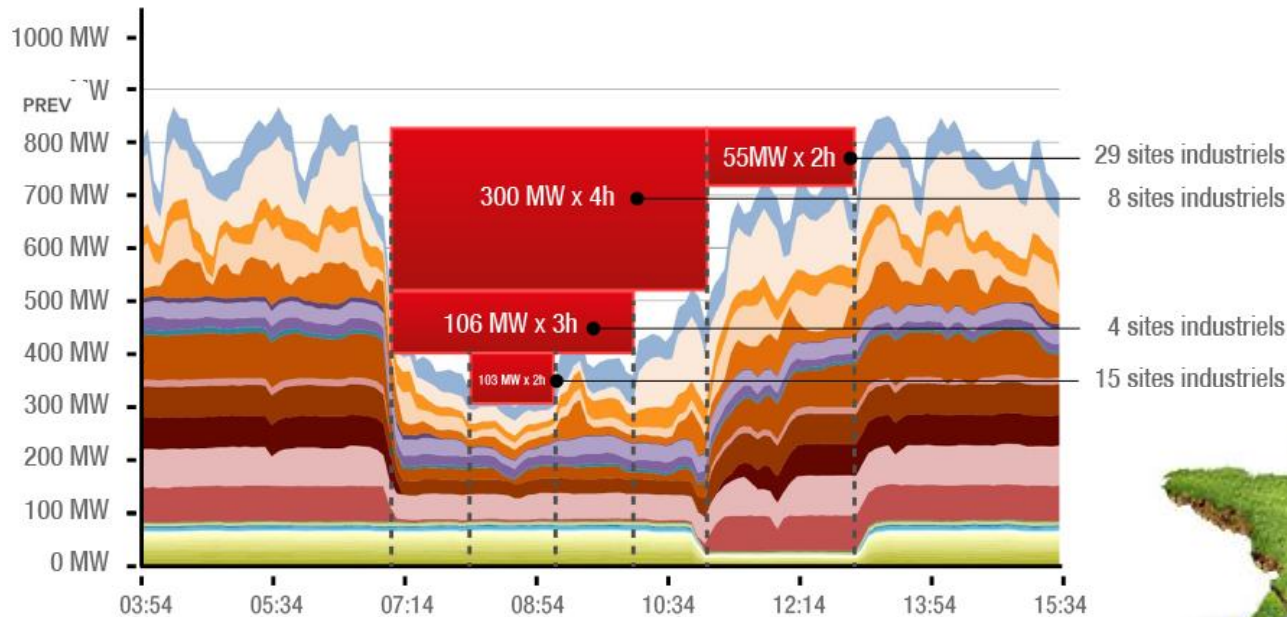




State of the art - markets

Some demand response providers...

- Energy Pool (1,2GW capacity):



- a fixed rate per MW that is made available
- a variable rate for each MWh of consumption that has been shifted

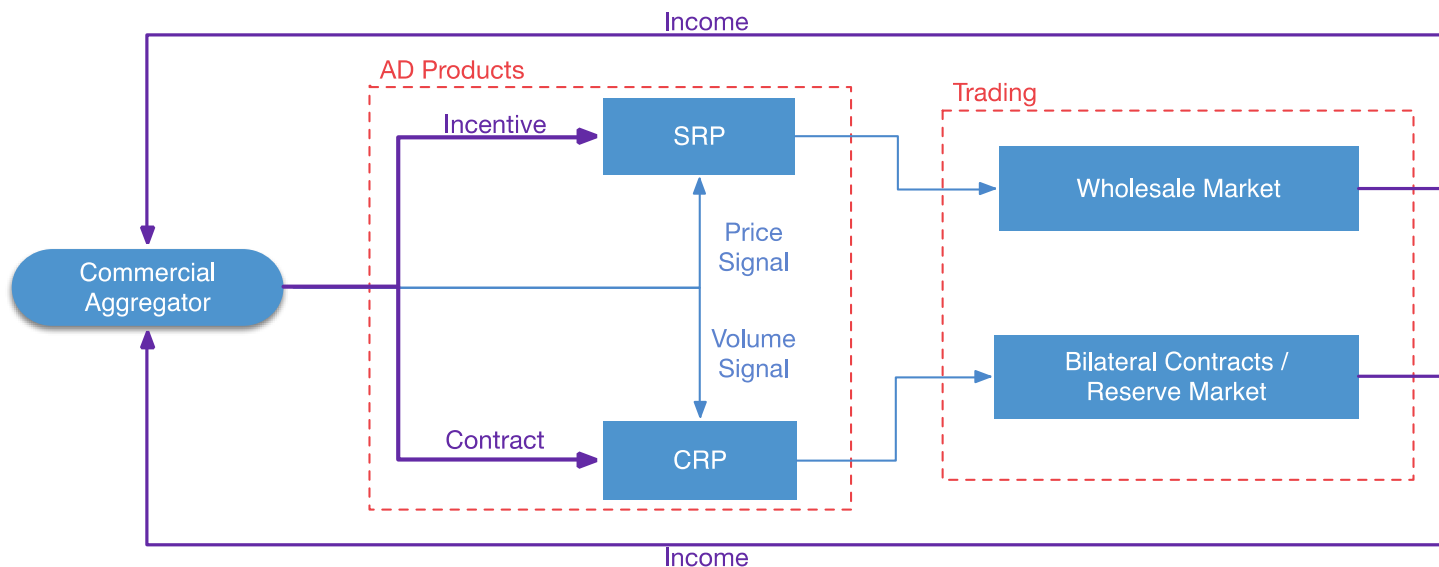




Flexibility products

Two types of standardized Flexibility Products

AD Product	Conditionality	Example
Scheduled re-profiling (SRP)	Unconditional (obligation)	The aggregator has the obligation to provide flexibility services
Conditional re-profiling (CRP)	Conditional (real option)	The aggregator must have the capacity to provide flexibility services





Aggregator: target markets

- Three possible market uses for the aggregator's flexibility:

1. Balancing markets

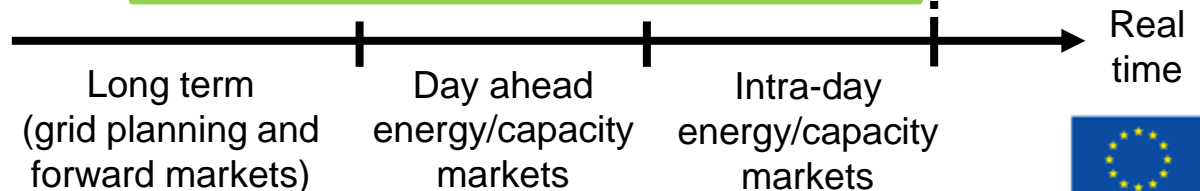
Procurement of balancing services (**capacity**) and activation of balancing **energy** by the **TSO** to balance demand and supply through the **balancing energy market**.

2. Constraints management at transmission and distribution level

Network constraints resolution in all timescales, maintaining **reliability** and **quality of service** at TSO and DSO levels. Typical constraints refer to **thermal ratings, voltage violations**, fault levels and transient stability issues.

3. Portfolio optimization

Used by market players to meet their **energy obligations** in the market at **minimum costs** by **arbitrating between generation and demand** response on all different time horizons.





While ensuring further coordination between TSOs & DSOs

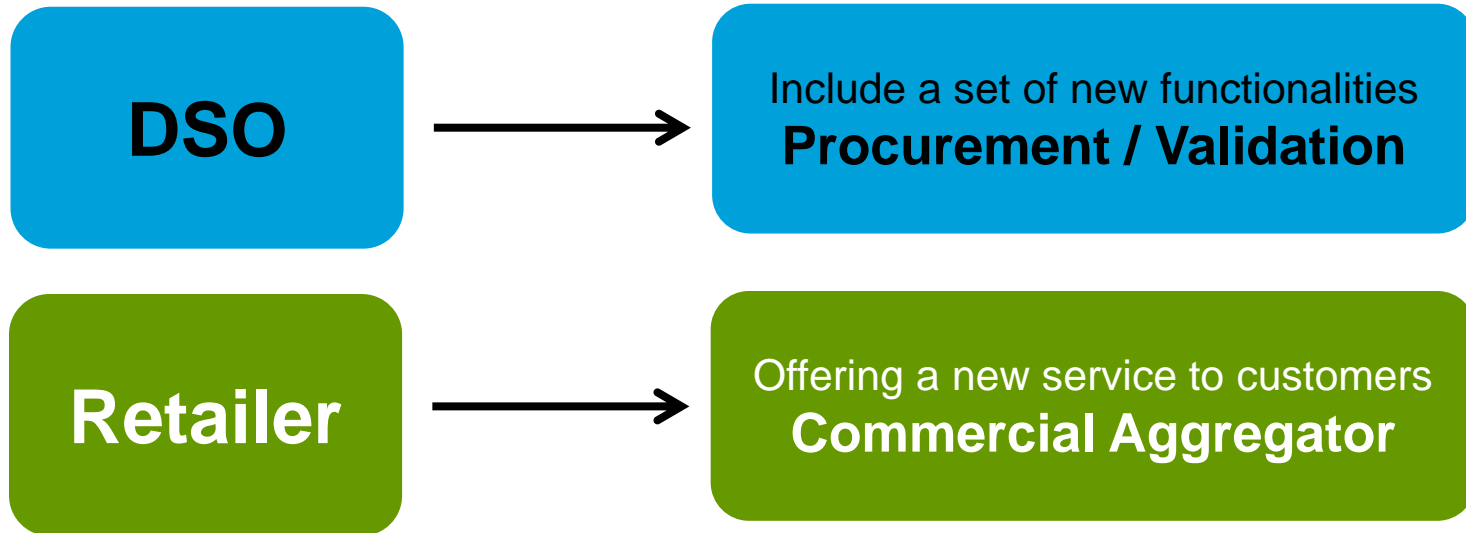
- Activation of **flexibility resources** connected to distribution networks by the TSO for the purpose of system **balancing** or **transmission constraints management** may lead to **constraints in distribution networks**
- Similarly, **DSO constraint management** will also **affect the TSO** grid and balancing of the system and the other way around
- Regarding energy markets, the program should be **validated not only for TSOs but also for DSOs**.
- A robust and **efficient IT framework** is required to ensure the necessary **information exchange** among commercial aggregators, DSOs, and TSOs.





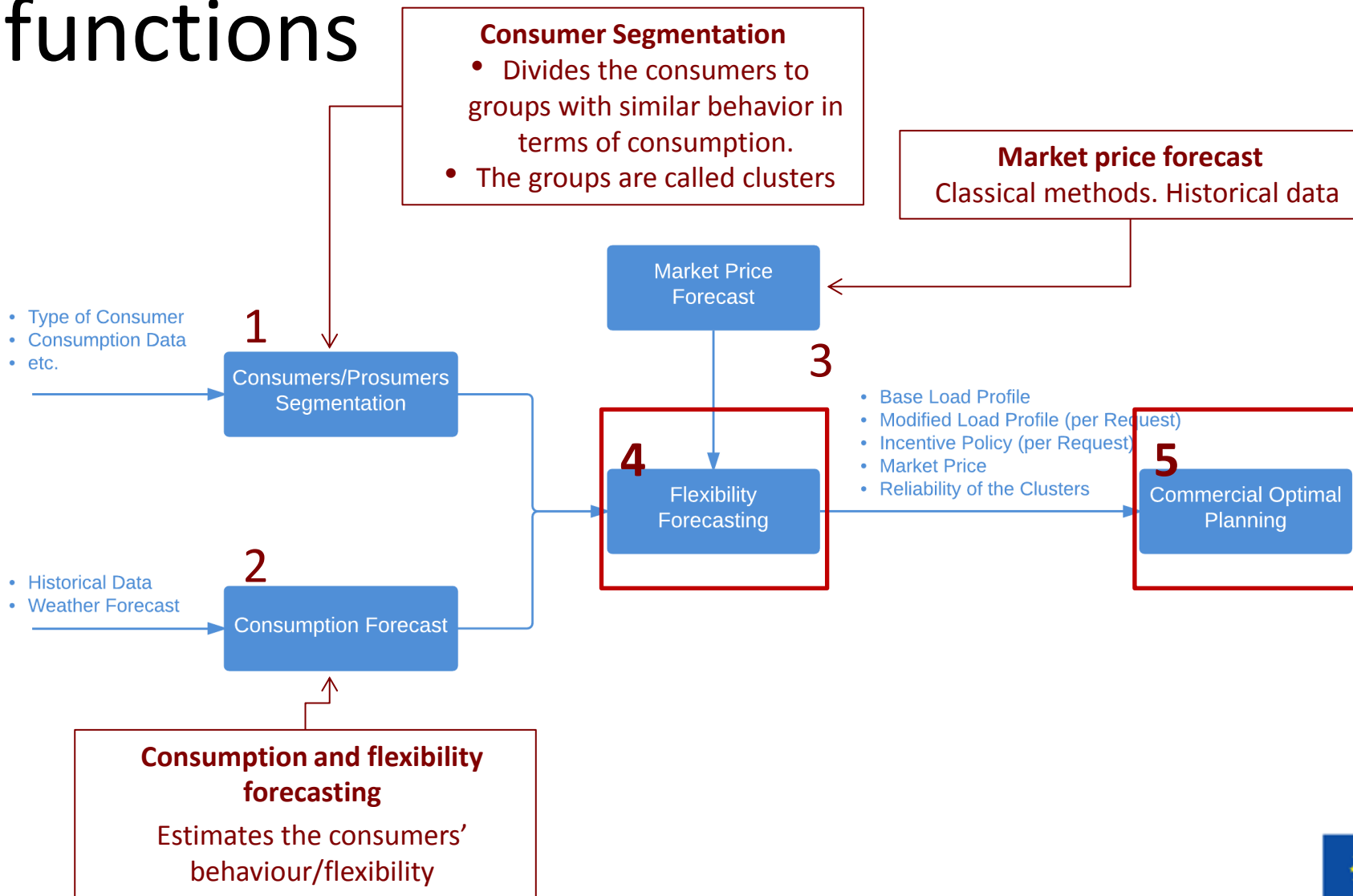
Aggregator concept

- Within IDE4L project an aggregator concept is being developed trying to ensure a **robust, transparent and equitable** market functioning.
- IDE4L aggregator concept consists of two new agents, **evolving from** their **classical roles** to include new functionalities





Commercial Aggregator key functions





Commercial Aggregator key functions

1) Consumer Segmentation

- i. Divides the consumers to groups with similar behavior in terms of consumption.
- ii. The groups are called clusters

2) Consumption and flexibility forecasting

- i. Estimates the consumers' behaviour/flexibility upon different price/volume incentive signals

3) Market forecasting

4) Operational planning/optimization

- i. Maximizes aggregator profit
- ii. Determines the market bids
- iii. Determines the incentive policy and the price signals

5) Send price/volume signals to prosumers

- i. Price signals (€/kWh) for Schedule Re-profiling Products (SRPs)
- ii. Volume signals (kW) Conditional Re-Profiling Products (CRPs)

