

# A NEW MARKET PLAYER: THE AGGREGATOR AND ITS INTERACTION WITH THE CONSUMER

ADDRESS INTERNATIONAL WORKSHOP  
*ACTIVE DEMAND: THE FUTURE OF ELECTRICITY*

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Paris, June 9th 2010

## interaction

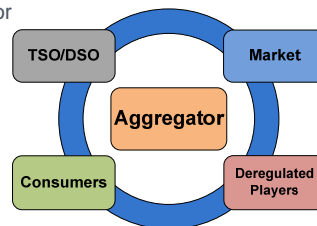
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## The aggregator: definition and relationships

**Aggregator:** Key mediator between the consumers/producers, markets and other power system participants

- Main Functions:
  - Gathers (“aggregates”) the flexibilities of consumers to “build” Active Demand (AD) services
  - Offers the AD services to the power system participants via the markets
  - Manages the risks associated with uncertainties in the markets and responsiveness of the consumer base: Price and volume risk.
  - Maximises the value of consumers’ flexibility
  - Interacts with consumers through price and volume signals and assesses their response and behavior



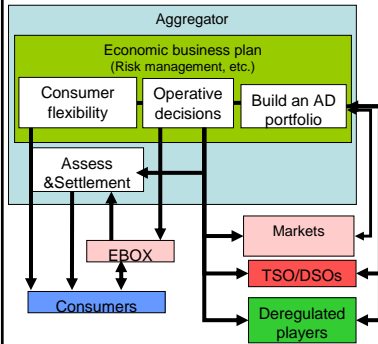
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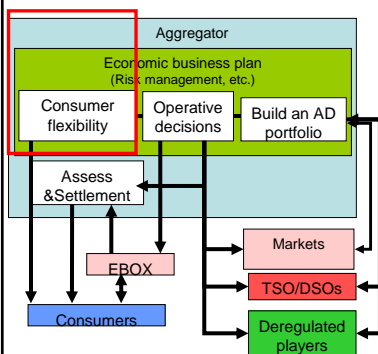
## The aggregator: Core modules

Aggregators need to have the following key modules, to be implemented within the project following ADDRESS strategic approach:



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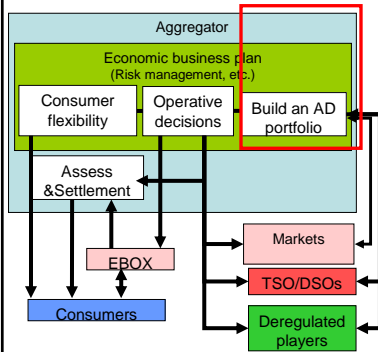
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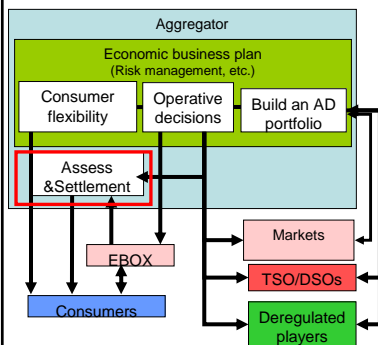


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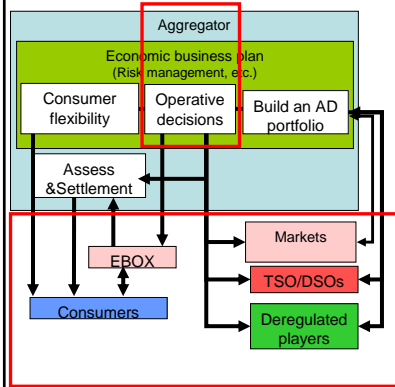
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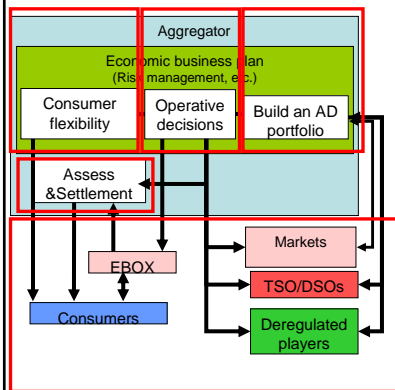
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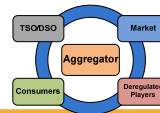
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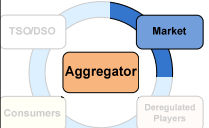
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✓ Algorithms: Under implementation. ✓ Interaction: Defined:





## The aggregator: interaction with markets

- Interaction **still under study**.
  - Existing markets and new markets classification
  - Long term and short term market interaction.
- **Constraints:** Minimum volume, time constraints, location.
- ADDRESS to implement short term activities (operative decisions, price forecast) and study long term activities (consumers portfolio, risk and strategy mgmt)
- **Use cases study done:**
  - Interaction within existing markets: Day ahead market, bilateral contract with deregulated player
  - Interaction within new markets: local market (CRP by DSO) and bilateral contract (deregulated) for a CRP-2w.


Market bid information

➔

AD Service	
ID Service	YYYYYYYY
Power requirement	xxx MW
Macro area code	xxxxxxxx
Load area code	YYYYYYYY
Activation time	Hh24:mi:ss yyyy/mm/dd
Duration	xx min
Energy price --> €/kW (supply offers)	Xxx €/kW

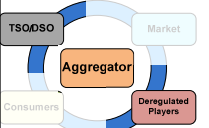
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Under implementation:  
contractual agreements  
definition and related internal  
processes (risk management)



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## The aggregator: interaction with regulated and deregulated players

**Regulated DSO/TSO:** double role in the ADDRESS architecture:

- Can act as active demand buyers in the electricity system
- Additionally aggregators interact for:
  - Validation of products (flexibility) before their activation.
  - Definition of consumer area codes used in validation and product requests.
  - Deliver consumers metering information according to overall system arrangement (15')
- ADDRESS to implement short term algorithms (Operative decisions) for this interaction.

**Aggregator – Deregulated Players**

- Direct interaction used for bilateral contracts. Several alternatives can be considered
- A change in existing market rules might be needed in some cases to allow aggregation of load and generation.
- ADDRESS to implement simulated models for considering this interaction in the short term (bilateral contract activation)



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## The aggregator: interaction with consumers

### Aggregator – Consumers

- **Energy Box (ebox)** as the key gateway to consumer interaction

- Three links are required at ADDRESS:
  - Metering equipment - Ebox
  - Ebox-Aggregator
  - Aggregator- Metering responsible (DSO)
- Ebox will receive **5'** aggregated measurement information either
  - from the meter itself (where possible) or
  - from a new device
- Ebox will send this information to the Aggregator at the end of the AD request as a report on AD delivery (not for billing).
- Registered consumer profile **on 15'** used for consumer assessment and settlement. The information will be sent by the metering responsible (at least monthly)

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## The aggregator: interaction with consumers

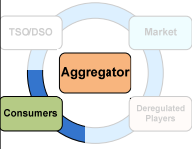
### Aggregator – Consumers

- Aggregator will send activation signals to Energy Box. The main signal will be:
  - A combined Price & Volume signals: an incentive (€/kW) based on actual power consumption

Note: No exchange of forecasted consumption reference to assess consumer's response by either side

	Average power demanded (15 minutes period)	Energy Price <sup>1</sup>
	Less than 0,6 kW	Incentive of X (€/kW)
	0,6 kW ≤ Power < 0,9 kW	Incentive of Y (€/kW)
	0,9 kW ≤ Power < 1,2 kW	Incentive of Z (€/kW)
	More than 1,2 kW	Incentive of W (€/kW)

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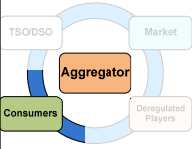
## The aggregator: interaction with consumers

### Aggregator – Consumers. Additional information

- Message exchange to consider additional signals to Consumers regarding:
  - Weather forecast: Temperature, solar radiation
  - Environmental awareness: CO2 emissions
- No forecasting sent from Ebox to Aggregator
- No commitment to fulfill a request sent from Ebox to Aggregator
- Ebox-> Aggregator: Override message included
  - To indicate when the consumer will not follow requests (either already sent or those which might arrive).
  - A way to disable Ebox control over appliances in field tests (if things go wrong).

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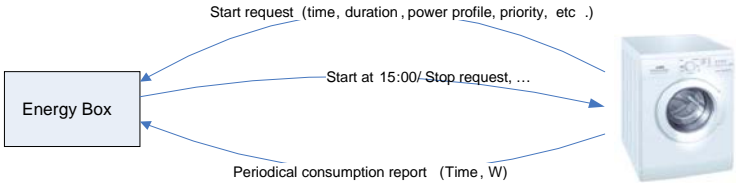
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## The aggregator: interaction with consumers

### EBOX – Devices

- The Ebox will coordinate loads/generation/storage.
- Algorithm: minimize the energy cost considering:
  - User preferences (comfort)
  - Devices profile & constraints
- Algorithms: ADDRESS does not considers to send price information to devices.
- The energy box will need bidirectional communication with the devices:



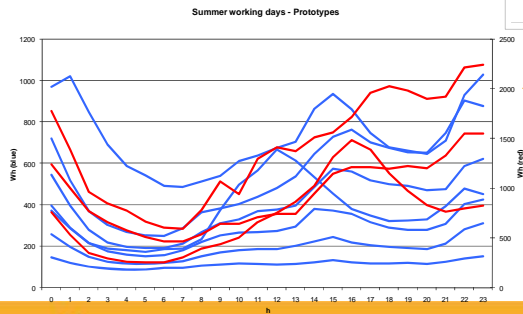
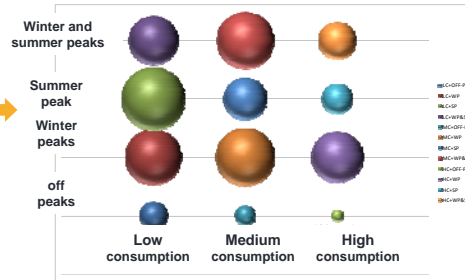
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## Implementing Consumers' flexibility models(I)

**Sample of consumer data:**  
 Geography and climate areas  
 Current contracted power  
 Commercial activity code  
 Hourly consumption  
 3-month consumption  
 Annual consumption

Consumer Clustering

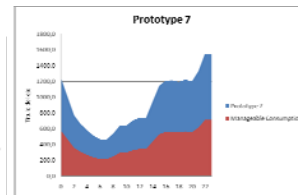
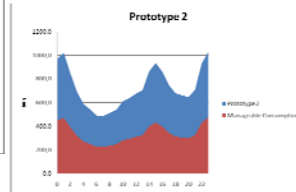
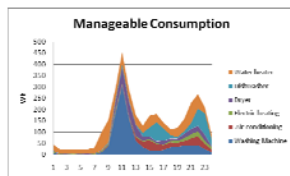


Prototypes for a representative day defined by working day/weekend and season

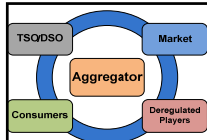
Note: Spain

## Implementing Consumers' flexibility models(II)

- Aggregators are able to estimate the hourly manageable consumption from the consumers
- The study is carried out based on the **probability of use** of some consumers' appliances during the day
- Aggregators finally gather the energy consumption and the manageable consumption from each consumer hourly







## The aggregator: Main conclusions so far

- ADDRESS will focus in the short term implementation.
- Aggregator and Consumer:
  - Requests based on price & volume signals (20' response expected).
  - No forecasting exchanged
  - Report once delivery (consumer model, not billing)
  - Billing and assessment: Metering data on 15' profiles received monthly
  - Override information received by the aggregator.
- Consumer and Metering equipment:
  - Needed: either official meter or additional device
  - Ebox to receive metering avg consumption at least every 5' (for algorithms)
- Aggregator and DSO/Metering responsible:
  - Exchange of local areas
  - Request for service validation before activation
  - Billing and assessment: Metering data on 15' profiles received monthly
- Consumer and HAN:
  - No considering prices to devices. Ebox manages home consumption
  - Bidirectional communication EBOX-Devices
  - Devices deliver profile by standard protocol (new Load/Gen/Storage will do the same)

# THANK YOU