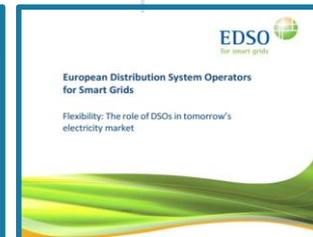


# Towards an expanded view for implementing demand response aggregation in Europe

An engineering perspective for Europe's energy flexibility markets

INTERIM RESULTS



# Europe's Changing Energy Landscape

“By 2030 half of all our electricity will be powered by renewables, and in about 35 years it will be carbon-free. That’s a big step up from today’s 27.5% renewables. We must prepare our electricity system, making it more flexible and market-oriented. Only then can we meet our Paris climate commitments and Energy Union goals.”

***Miguel Arias Cañete,***

*European Commissioner for Climate Action and Energy.*



**New forms of energy flexibility are required**

# A key role to unlock the flexibility market

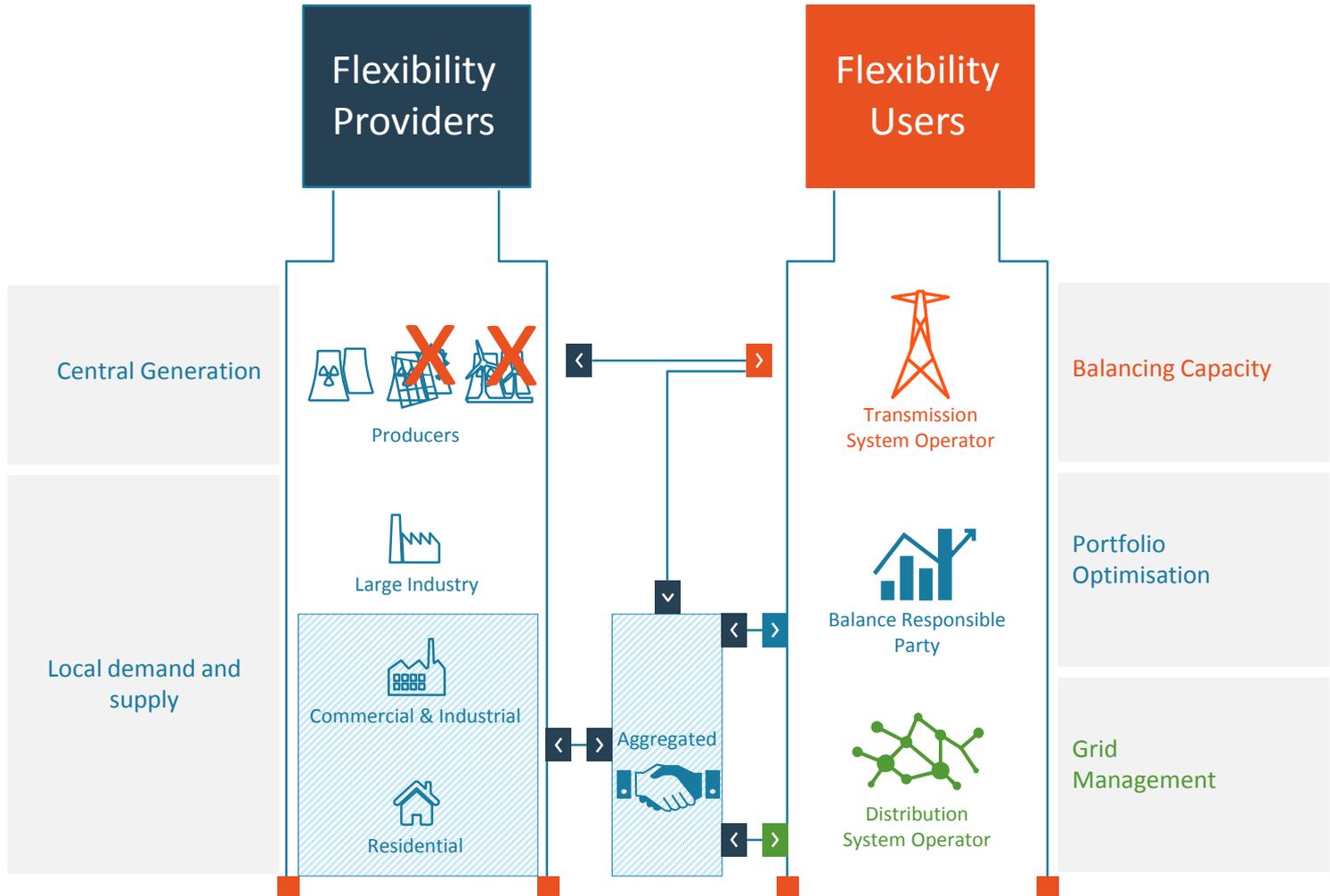
Aggregators exploit flex and maximize the **value** of flex for its customers

Aggregators **bundle small flex assets** into a **flexibility volume**

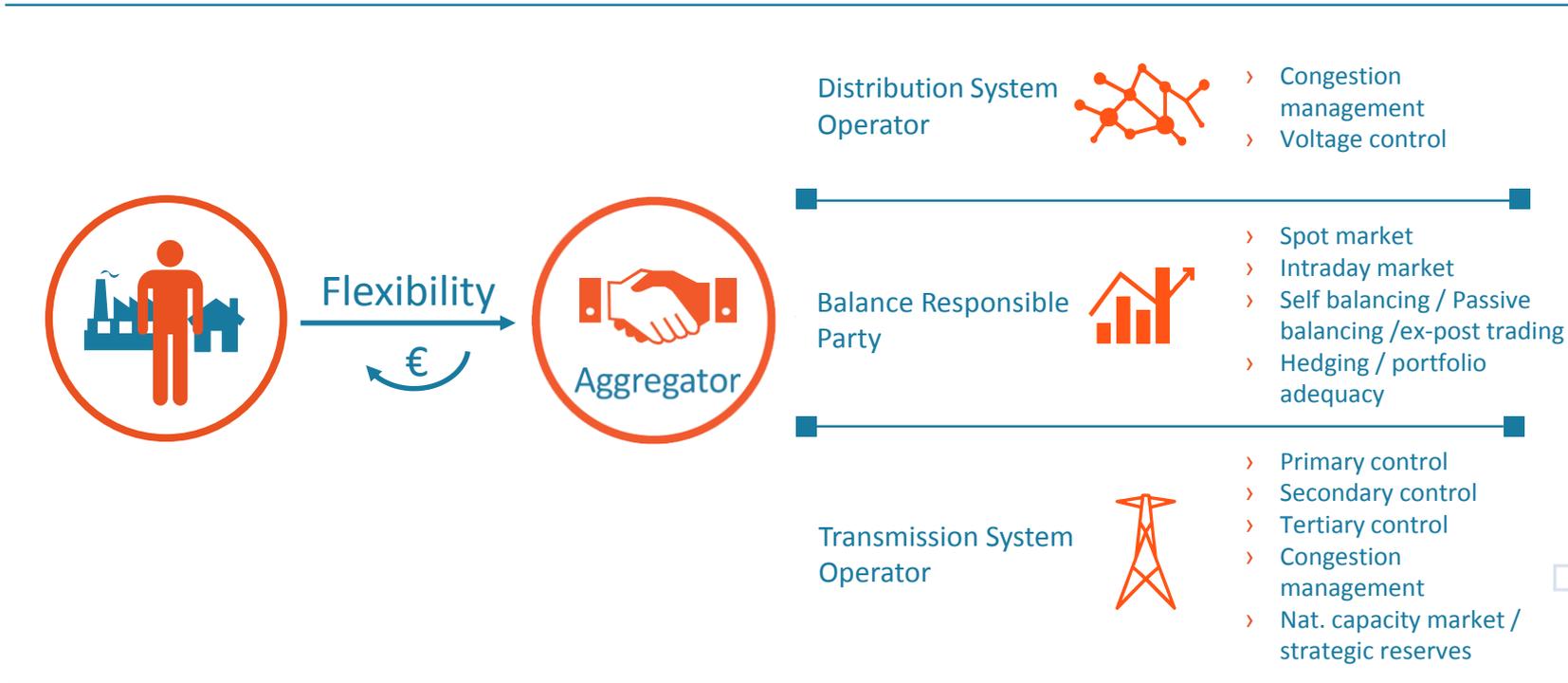
Aggregator enables (the trading of) **energy flexibility**

Aggregator is a **new market role** that can be taken by **existing market parties** (suppliers) and **new entrants**

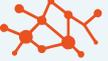
**Aggregators' role requires additional regulation**



# The Aggregator's Position in the Value Chain



# In Short: Added Value of Aggregators

	Consumers enjoy lower overall cost of energy
	Distribution System Operators (DSOs) can avoid or delay grid enforcements
	Balance Responsible Parties (BRPs) can optimize portfolios to mitigate risks and reduce sourcing costs
	Transmission System Operators (TSOs) have more flexibility options to balance the system and ensure generation adequacy



# Industry bodies agree on the need

“ CEER regards customer participation in the electricity market as extremely important, and realizing the potential of demand-side flexibility offers an important route to increasing that participation.



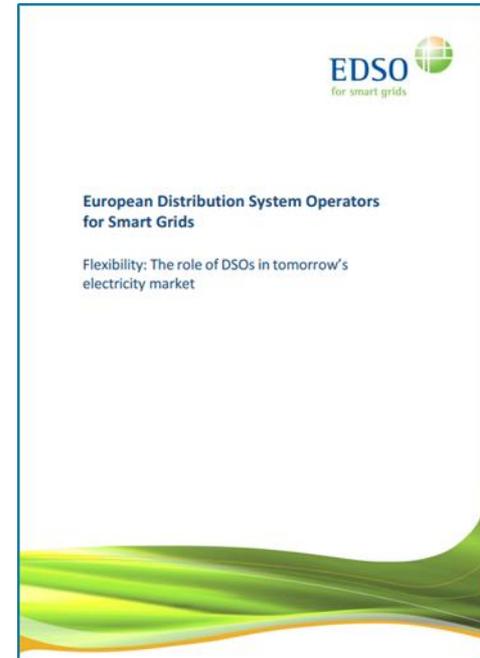
”



*CEER – Fostering energy markets, empowering consumers*

# Industry bodies agree on the need

“ Using system flexibility services for voltage control and congestion management could provide clear benefits for DSOs, grid users and society as a whole. ”



# Industry bodies agree on the need

“ ENTSO-E advocates the further development of DSR and highlighted the numerous associated benefits, from the reduction of energy costs for consumers to making the system more flexible and increasing competition to the markets. ”



*ENSOE-E – Market design for demand side response*

# Industry bodies agree on the need

“ Demand response (DR) will be one of the building blocks of future wholesale and retail markets, offering electricity customers the opportunity to reap the full benefits of their flexibility potential. The development of innovative demand response services will empower customers, giving them more choice and more control over their electricity consumption.

**eurelectric**  
ELECTRICITY FOR EUROPE

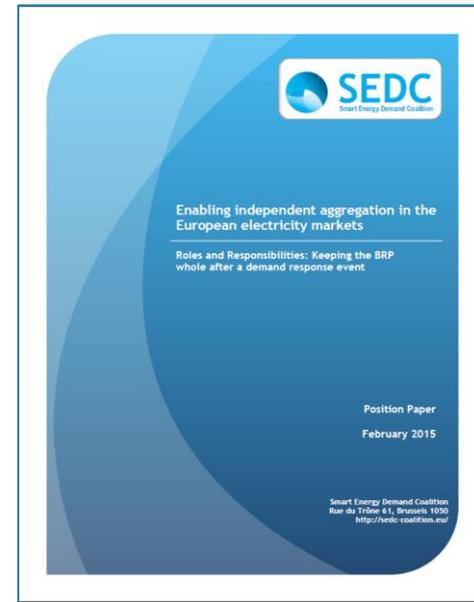
*Eurelectric – Designing fair and equitable market rules for demand response aggregation*



# Industry bodies agree on the need

“ There is growing consensus, among policy makers and market participants alike, that demand-side flexibility, empowered through Demand Response, is a critical resource for achieving a low carbon, efficient electricity system at a reasonable cost.

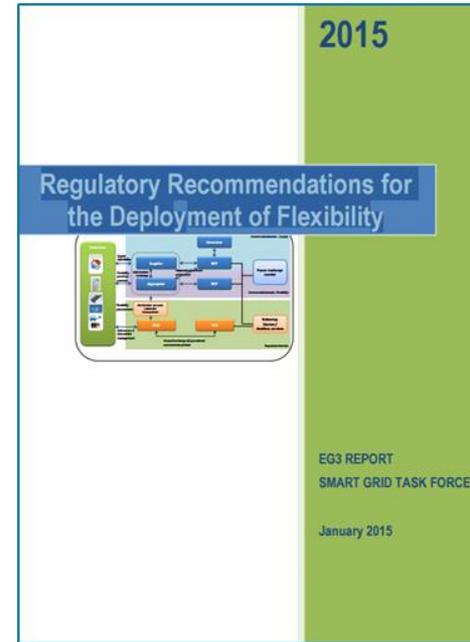
”



*SEDC – Mapping Demand Response in Europe today*

# ... and so does the European Commission

“ Creating flexibility on the demand side will be the key to success of the transition to a new energy paradigm. This will require active participation and empowerment of customers in the Energy System. ”



**European Commission** – *Regulatory Recommendations for the Deployment of Flexibility*

How should the  
Aggregator role be  
shaped?



# Current state of regulatory discussions in Europe

Great strides have been made towards integrating demand response

It is becoming clear that a one-size fits-all solution isn't feasible

**Need to take a deeper look at the full picture of demand response**

# Challenges of integrating demand response

- ✓ **Role of baselining**  
Roles and responsibilities and appropriate baseline methodologies

---

- ✓ **Transfer of energy**  
How to neutralize the position of the Prosumer's supplier and its BRP  
Correction of perimeter

---

- ✓ **Rebound effect**  
Can the BRP be negatively impacted and if so, how can this be compensated

---

- ✓ **Relationship between implicit and explicit DR**  
How to separate both impacts unambiguously

---

- ✓ **Information exchange**  
Finding a balance between transparency and confidentiality

---

- ✓ **Measurement and validation**  
Ensuring correct and trustworthy data



# Example questions

? Which roles and responsibilities need to apply to the sub-metering activity of a flexible resource?

---

? Should the same baseline methodology be applied as basis for the Transfer of Energy , as for the performance quantification of the flexibility service?

---

? Who should bear the consequence if an aggregator delivers more or less flexibility than requested in a balancing service contract?

---

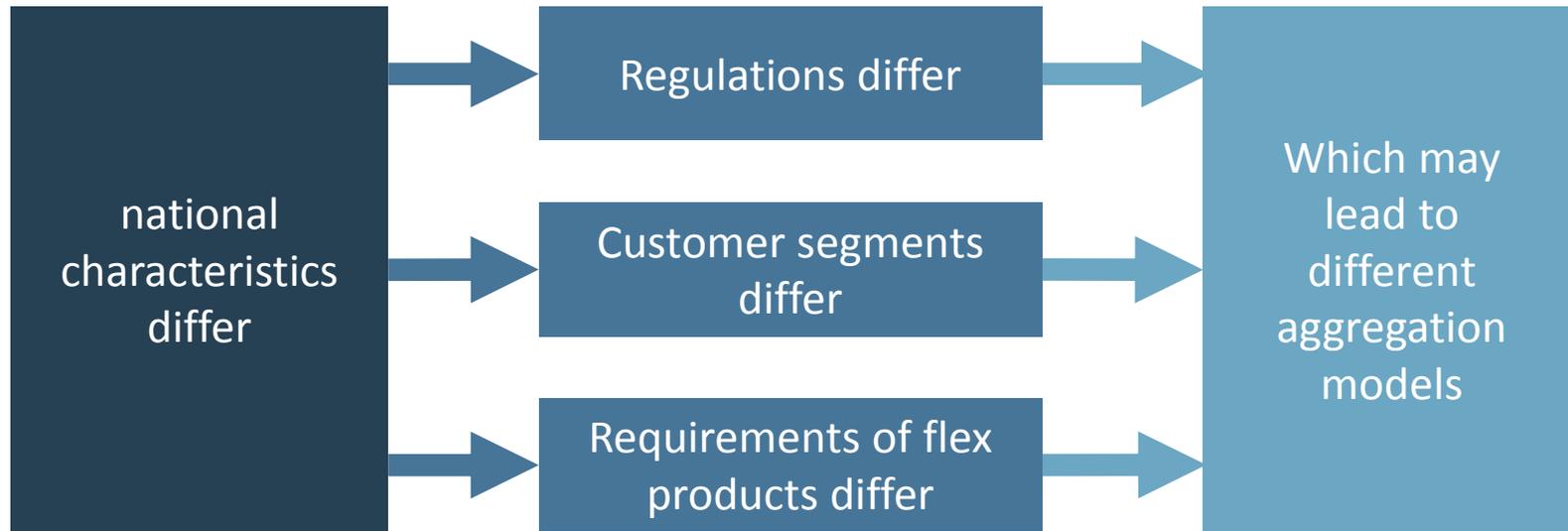
? Can a Prosumer sign a contract with an aggregator if he is exposed to balancing prices through its supply contract?

---

? Should a symmetric price methodology be applied for the Transfer of Energy?



# Towards a comprehensive set of models and solutions



**Joint approach is needed to meet EU harmonization efforts**

# Evaluation criteria for AGR models



Transparency



Simplicity



Verifiability /  
Accountability



Fairness



Protection of  
(commercially)  
sensitive data



Free choice  
for consumers



Avoid gaming



Correct incentives  
(reward desirable  
behaviour)

# Towards an Expanded View

By looking at full complexity, we aim to find appropriate solutions for different markets

Up to 7 implementation models have been identified

Work in progress - Full report will be published in Q4 2016

Our recommendations could help markets / countries in finding the best fit for their needs



# Primary classification is based on three aspects

ASPECT	EXPLANATION
Aggregator needs to assign its own BRP	There is a clear distinction between single-BRP and dual-BRP models. In general, a dual-BRP model complicates the allocation process: synthetic profiles are needed on connection level to separate the two perimeters. However a single-BRP model restricts the aggregator in the type of flex-products and markets he can develop/access.
Aggregator needs a contract with the supplier's BRP	Models that are based on a contractual relationship require less regulation, as most (if not all) aspects can be arranged bilaterally. However, if all allowed models require a contract with the BRP of the supplier this may affect the level playing field for Aggregators.
Energy transfer method	Dual-BRP models are further classified on the energy transfer method, defining if, and how energy volumes are transferred between the BRP of the aggregator and the BRP of the supplier. Possible methods are: Prosumer, Central, Bilateral, Central/socialized and None.

# This classification leads to 7 models

	CONTRACT between aggregator and supplier's BRP	NO CONTRACT between aggregator and supplier's BRP
SINGLE BRP	<ul style="list-style-type: none"><li> Integrated</li><li> Broker</li></ul>	<ul style="list-style-type: none"><li> Uncorrected</li></ul>
DUAL BRP	<ul style="list-style-type: none"><li> Contractual</li></ul>	<ul style="list-style-type: none"><li> Corrected</li><li> Central settlement</li><li> Net benefit</li></ul>



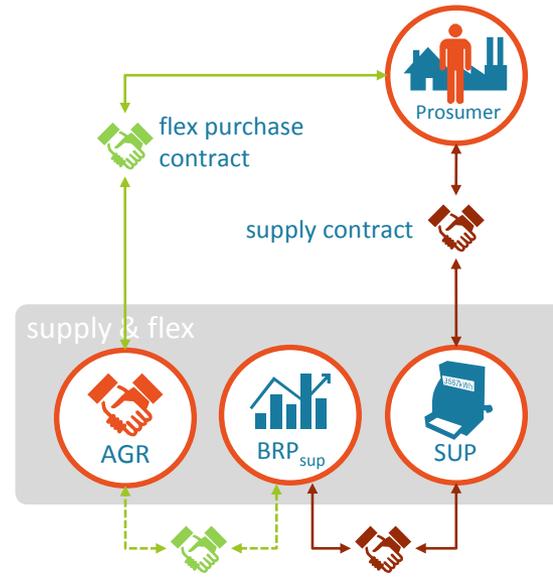
# Integrated Aggregator model

## Synopsis

In the integrated model the roles of supplier and aggregator are combined in one market party. Compensation for imbalances and the open supply position are not necessary.

## Deployment

NL: passive balancing and secondary control  
 BE: passive balancing  
 Nordics



## Legend:

$BRP_{sup}$  = BRP of the Supplier;

$RP_{agr}$  = BRP of the Aggregator

 = existing contract relation

 = new contract relation

## Main characteristic

yes no n.a.

AGR needs to assign own BRP

✓

AGR needs contract with  $BRP_{sup}$

✓

Energy transfer method

n.a.

# Broker model

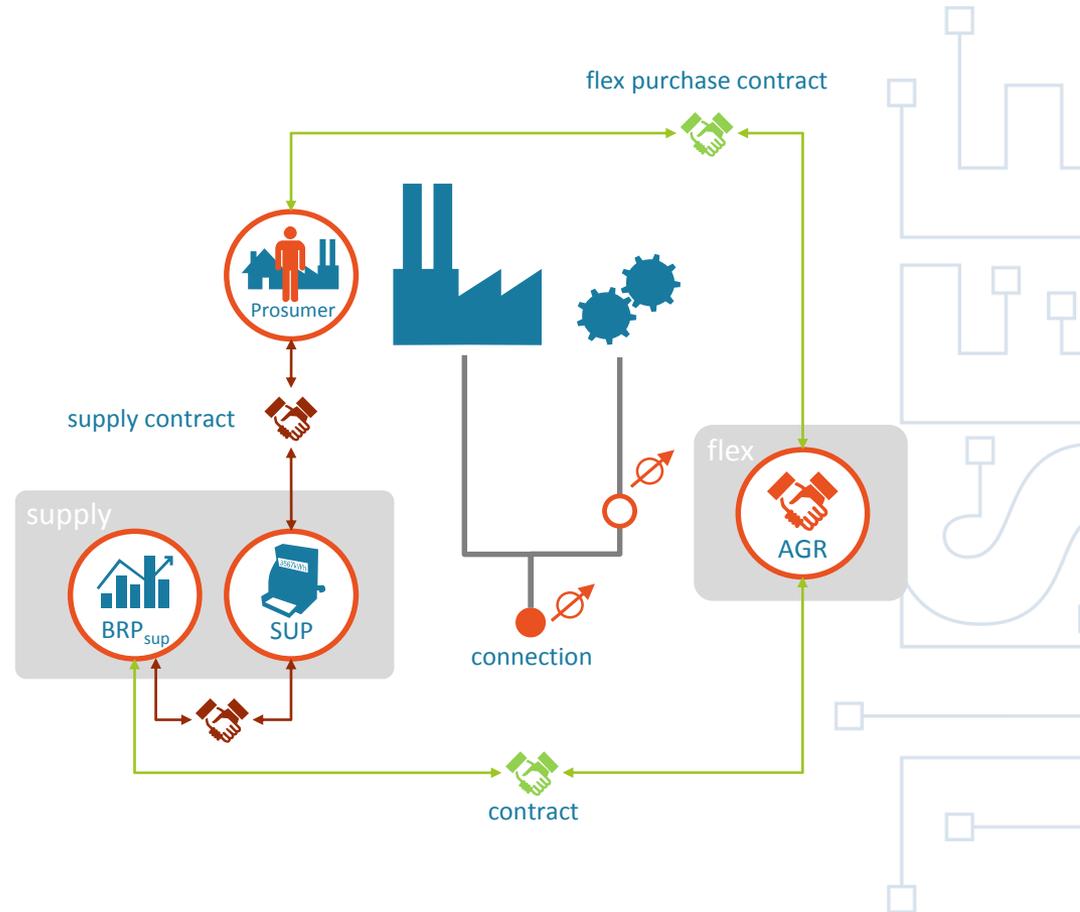
## Synopsis

In the broker model, the aggregator transfers the balance responsibility to the BRP<sub>sup</sub>. Compensation for the open supply position and the caused imbalance is settled bilaterally based on contractual arrangements.

## deployment

none

Main Characteristic	yes	no	n.a.
AGR needs to assign own BRP		✓	
AGR needs contract with BRP <sub>sup</sub>	✓		
Energy transfer method	None		



# Contractual model

## Synopsis

In the contractual model, the aggregator associates with his own BRP. Balancing parameters are corrected through a hub-deal (ex-post) between  $BRP_{agr}$  and  $BRP_{sup}$ , transfer prices are based on contractual arrangements.

## deployment

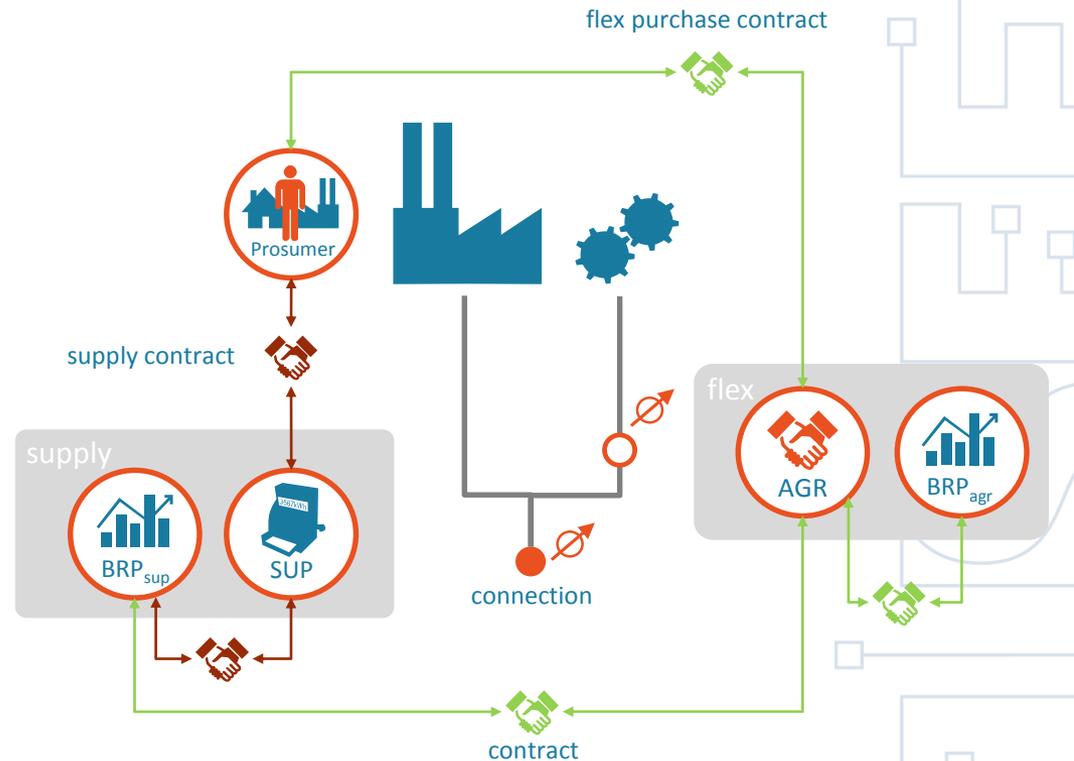
AT: primary, secondary and tertiary control

DE: secondary and tertiary control

FI: primary, secondary and tertiary control

FR: tertiary control (DSO clients), wholesale

main characteristic	yes	no	n.a.
AGR needs to assign own BRP	✓		
AGR needs contract with $BRP_{sup}$	✓		
Energy transfer method	<b>Bilateral</b>		



# Uncorrected model

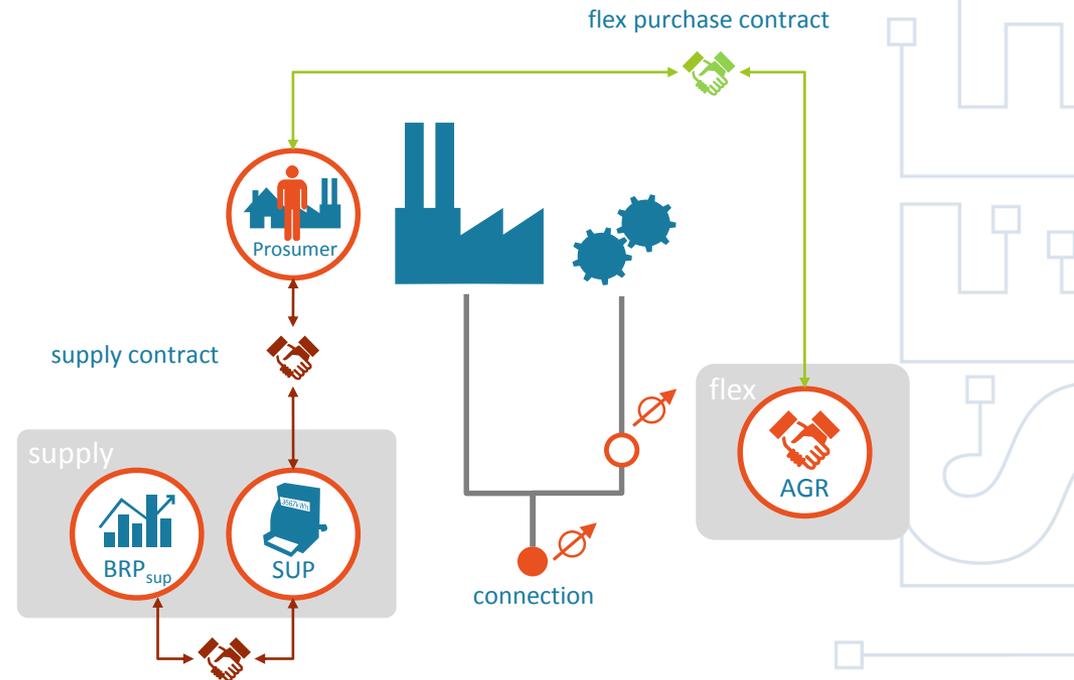
## Synopsis

In the uncorrected model, no perimeter correction is performed and no volume transfers occur between the  $BRP_{agr}$  and  $BRP_{sup}$ . The activated volume is settled through the regular balancing mechanism.

## Deployment

BE: tertiary reserve, strategic reserve  
 UK:RR (STOR)  
 IE: capacity market

Main Characteristic	yes	no	n.a.
AGR needs to assign own BRP		✓	
AGR needs contract with $BRP_{sup}$		✓	
Energy transfer method	None		



# Corrected model

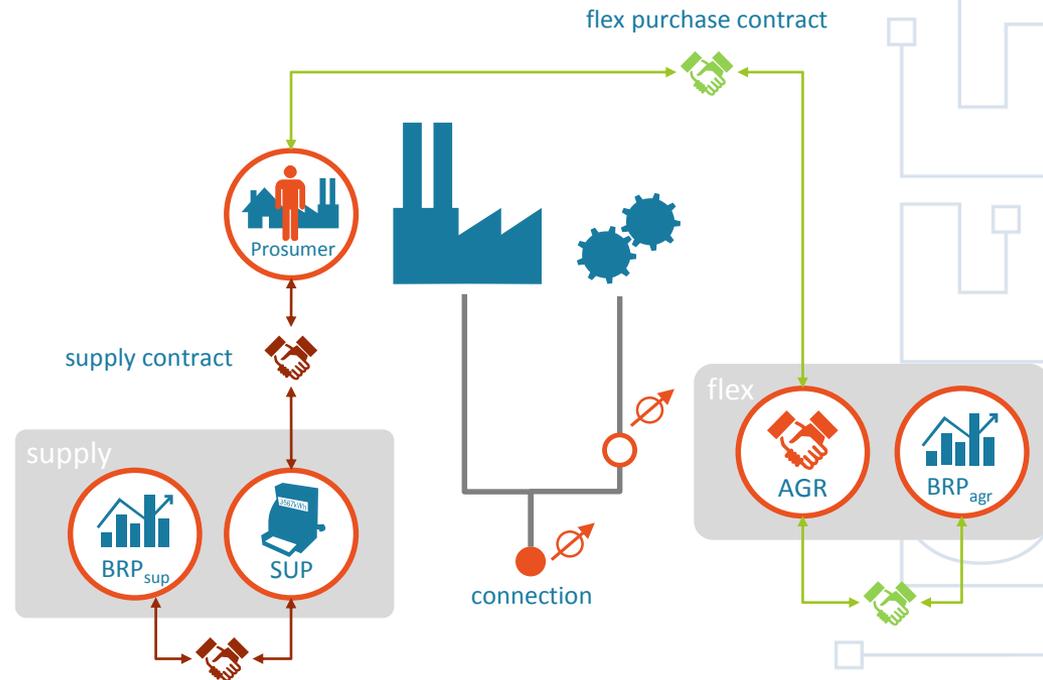
## Synopsis

In the corrected model, the Prosumer's meter readings are modified, based on the amount of flexibility that has been activated by the aggregator. The transfer of energy takes place through the Prosumer, based on retail prices. The aggregator associates with his own BRP.

## Deployment

BE: tertiary control (ICH), strategic reserve (SDR)  
 FR: ancillary services TSO network, wholesale markets  
 DE: adopted in German law (June 2016)

Main Characteristic	yes	no	n.a.
AGR needs to assign own BRP	✓		
AGR needs contract with BRP <sub>sup</sub>		✓	
Energy transfer method	Prosumer		



# Central settlement model

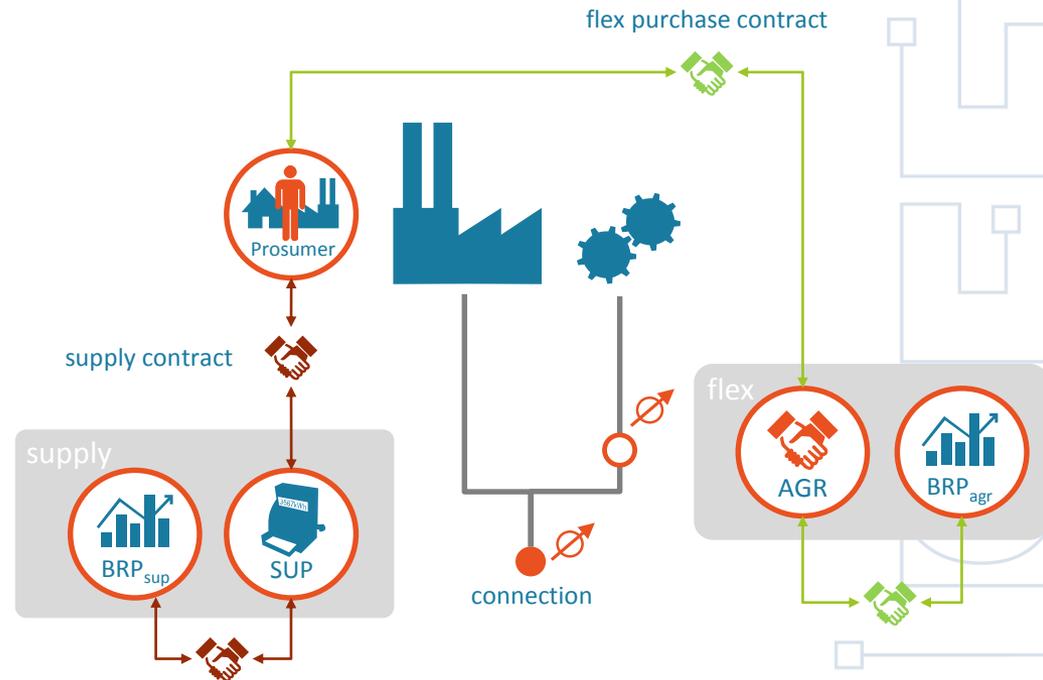
## Synopsis

In the central settlement model, the aggregator associates with his own BRP. A central entity (e.g. TSO) corrects the balancing perimeters following a DR activation. Compensation for the open supply position is also settled by this central entity, based on a pre-defined price formula.

## deployment

FR : wholesale and balancing markets  
CH: balancing markets

Main Characteristic	yes	no	n.a.
AGR needs to assign own BRP	✓		
AGR needs contract with BRP <sub>sup</sub>		✓	
Energy transfer method	Central		



# Net benefit model

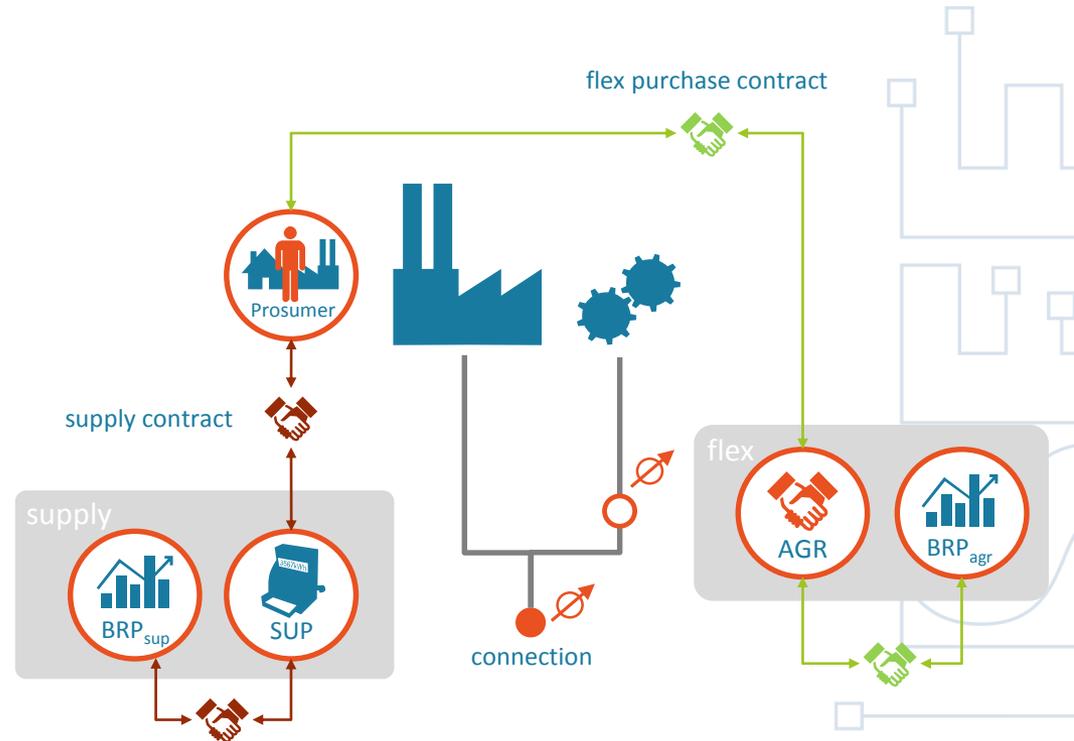
## Synopsis

The net benefit model is similar to the central settlement model, yet the cost of neutralizing the BRP<sub>sup</sub> is not born by the aggregator but socialized. Socialization may be limited to situations where DR brings energy savings.

## Deployment

US: Prevalent model for adequacy in most US states

Main Characteristic	yes	no	n.a.
AGR needs to assign own BRP	√ <sup>2</sup>		
AGR needs contract with BRP <sub>sup</sub>		√	
Energy transfer method	Central/socialized <sup>1</sup>		



<sup>1</sup> No energy transfer occurs from/toward BRP<sub>agr</sub>. However, BRP<sub>sup</sub> is compensated by all other BRPs.

<sup>2</sup> In the US, the aggregator does not take balance responsibility (as in uncorrected model); this variant is not elaborated.

# Identified implementation models

Name	Description
Integrated model	In the integrated model the roles of supplier and aggregator are combined in one market party. Compensation for imbalances and the open supply position are not necessary.
Broker model	In the broker model, the aggregator transfers the balance responsibility to the $BRP_{sup}$ <sup>1</sup> . Compensation for the open supply position and the caused imbalance is settled bilaterally based on contractual arrangements.
Contractual model	In the contractual model, the aggregator associates with his own BRP. Balancing parameters are corrected through a hub-deal (ex-post) between $BRP_{agr}$ and $BRP_{sup}$ , transfer prices are based on contractual arrangements.
Uncorrected model	In the uncorrected model, no perimeter correction is performed and no volume transfers occur between the $BRP_{agr}$ and $BRP_{sup}$ . The activated volume is settled through the regular balancing mechanism.
Corrected model	In the corrected model, the Prosumer's meter readings are modified, based on the amount of flexibility that has been activated by the aggregator. The transfer of energy takes place through the Prosumer, based on retail prices. The aggregator associates with his own BRP.
Central settlement model	In the central settlement model, the aggregator associates with his own BRP. A central entity (e.g. TSO) corrects the balancing perimeters following a DR activation. Compensation for the open supply position is also settled by this central entity, based on a pre-defined price formula.
Net benefit model	The net benefit model is similar to the central settlement model, yet the cost of neutralizing the $BRP_{sup}$ is not born by the aggregator but socialized. Socialization may be limited to situations where DR brings energy savings.

# Summary



- Europe needs energy flexibility and DSR
- Aggregators play a central role in unlocking flexibility
- A one-size fits all aggregation implementation is not feasible
- Looking at the whole picture highlights multiple possible implementation solutions
- Our work stream has built a method for assessing aggregator implementation models and is applying it to find solutions that:
  - Are integral, open, scalable, replicable, and market-based
  - Enable a sustainable market
  - Ensure the lowest costs for the entire energy system
- This method will help markets / countries in finding the best fit for their needs

# Ask Our Team of International Experts

<b>Aggregator</b>	Andreas Flamm (EnerNOC) Peter Schell (REstore)	DE BE
<b>TSO</b>	Ulrik Stougaard Kiil (energinet.dk) Klaas Hommes (TenneT)	DK NL
<b>DSO</b>	Paul de Wit (Alliander) Poul Brath (Dong Energy)	NL DK
<b>BRP</b>	Valentijn Demeyer (Engie)	BE
<b>Supplier</b>	Claus Fest (RWE)	DE
<b>USEF</b>	Hans de Heer (DNV GL) Marten van der Laan (ICT)	

## Work In Progress

- Investigations still ongoing
- Final report due Q4 2016

### Get updates

[aggregator@usef.energy](mailto:aggregator@usef.energy) | [www.usef.energy](http://www.usef.energy)