

# FLEXIBILITY

FEBEG position (full slide pack)



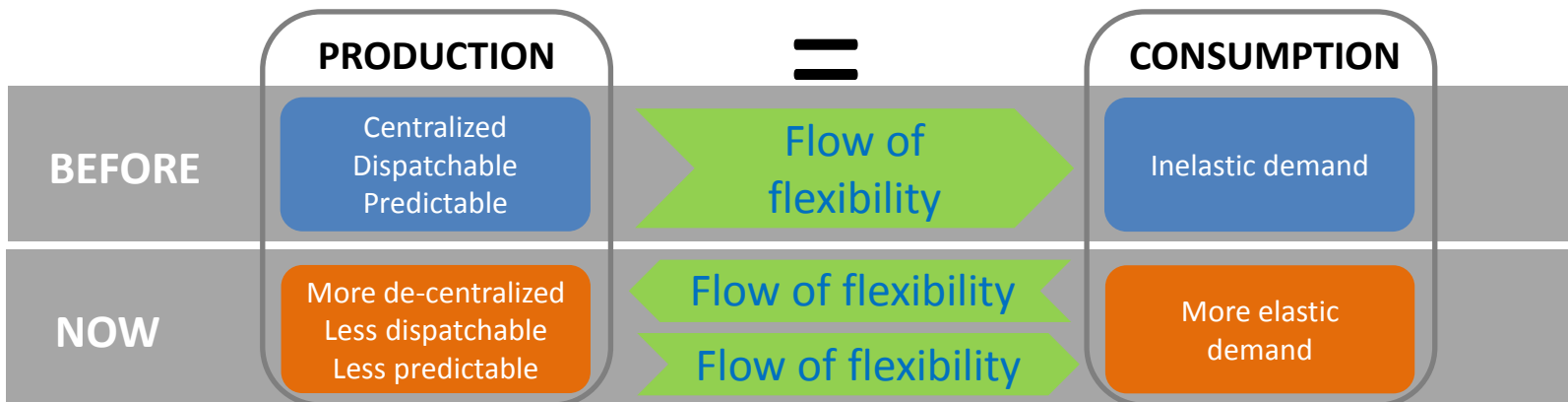
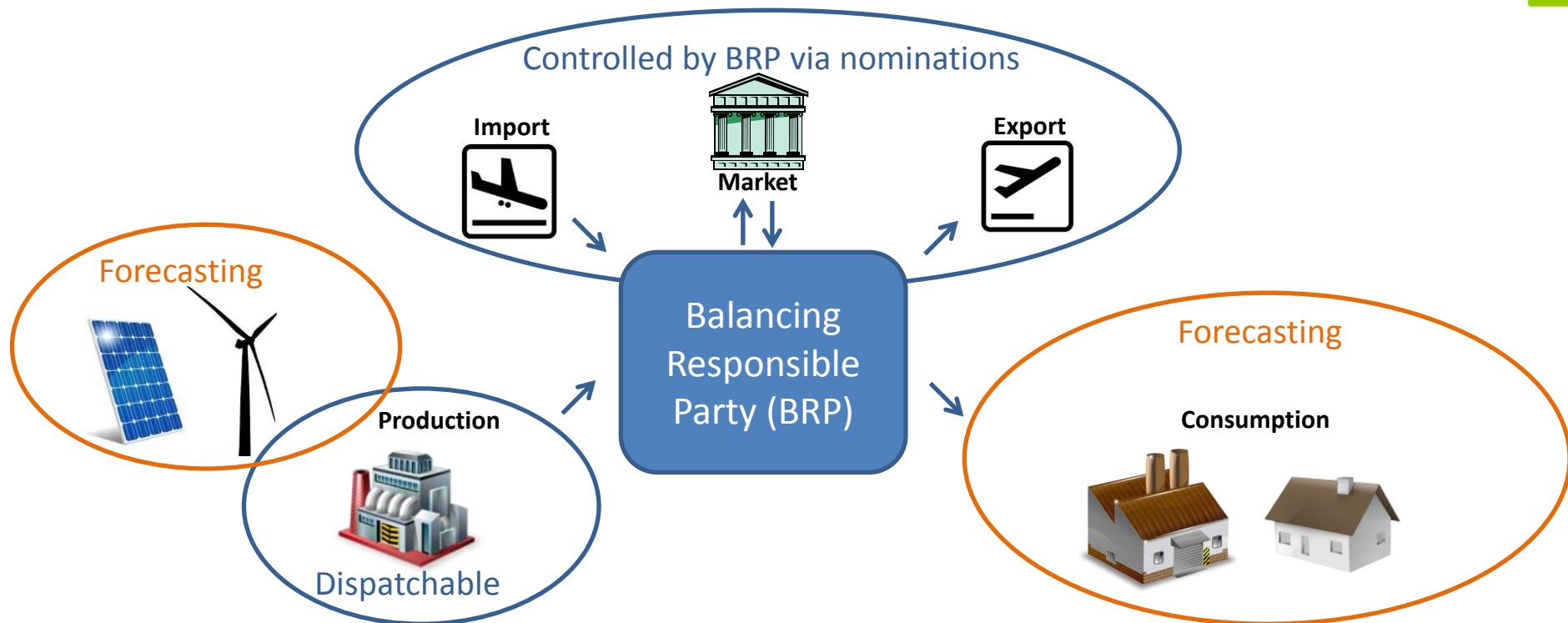


# MEMBERS





# GROWING NEED FOR FLEXIBILITY





# NEED TO INTEGRATE AGGREGATOR

- European Commission, Regulators and System Operators strongly support the development of demand response aggregation
  - E.g. Directive 2012/27/EU: Member States shall promote demand response participation in spot and balancing markets
- Aggregators are already entering the market, but without a clear market model
  - Different market designs in different countries in Europe
- Issues arise when independent aggregators (= third parties) affect the existing business position of other market participants without proper compensation or settlement

How can the independent aggregator be integrated in the market while limiting impact on existing market parties?



# CONTENT

## Concepts

- Definition of flexibility
- Flexibility usage
- Principles of market design
- General recommendations

## Different market parameters

- Load types
- Remuneration types
- Activation forms
- Different markets

## Market roles

- Description of roles
- Responsibility of grid user
- Flexibility register
- Metering
- Centrale role BRP
- SO as market facilitator

## Supply flexibility and diverted energy

- Distinction supply flexibility and diverted energy
- Impact on supply contract
- Transfer price
- Determination activated energy

## Congestion management

- Introduction
- Impact on generator and BRP
- Congestion management model
- Option of free band
- Prequalification

## Process flows

- Overview processes
- Single BRP
- Inter BRP – copper plate
- Congestion management



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# DEFINITION OF FLEXIBILITY

On an individual level flexibility is the modification of generation injection and/or consumption patterns in reaction to an external signal (price signal or activation) in order to provide a service within the energy system. The parameters used to characterize flexibility include the amount of power modulation, the duration, the rate of change, the response time, the location, etc.

Eurelectric, 'Flexibility and aggregation – Requirements for their interaction in the market', January 2014



# FLEXIBILITY HAS MULTIPLE USAGES

- Client supply optimization (dynamic pricing, ...)
- BRP portfolio optimization
- Balancing
  - BRP portfolio balancing
    - Forward market
    - Day-ahead market
    - Intraday market
    - Realtime portfolio balancing
  - Residual balancing
    - Pre-contracted reserves (R1, R2, R3, ICH, R3 DP, ...)
    - Residual flexibility (free bids on Elia bidladder)
- Congestion management (TSO via CIPU, TSO and DGO flexible access, ...)
- System adequacy (participation in capacity market, strategic demand reserves, ...)





# OVERVIEW FLEXIBILITY USAGE

Flexibility usage	Level	Product	Example	Comment
BRP usage (Balancing, optimization, ...)	DSO	Consumption	Existing contracts	Exists
BRP usage (Balancing, optimization, ...)	TSO	Consumption	Existing contracts	Exists
BRP usage (Balancing, optimization, ...)	DSO	Generation	Existing contracts	Exists
BRP usage (Balancing, optimization, ...)	TSO	Generation	Existing contracts	Exists
Residual TSO balancing	DSO	Consumption	R3 DP	Pilot project
Residual TSO balancing	TSO	Consumption	R1, R2, free bids, ICH, R3	Exists
Residual TSO balancing	DSO	Generation	R3 DP	Pilot project
Residual TSO balancing	TSO	Generation	R1, R2, free bids, R3	Exists
TSO Congestion management	TSO	Consumption	-	Announced
TSO Congestion management	TSO	Generation	CIPU, flexible access	Flexible access is being implemented
TSO Congestion management	DSO	Consumption	-	Announced
TSO Congestion management	DSO	Generation	-	Announced
DSO Congestion management	DSO	Consumption	Load shifting (TCC)	Pilot project
DSO Congestion management	DSO	Generation	Flexible access	Flexible access is being implemented
TSO Adequacy	DSO	Consumption	Strategic reserves	Announced
TSO Adequacy	TSO	Consumption	Strategic reserves	Is being implemented
TSO Adequacy	DSO	Generation	Strategic reserves	Announced
TSO Adequacy	TSO	Generation	Strategic reserves	Is being implemented



# BALANCE BETWEEN PRINCIPLES

Confidentiality

Right of property

Freedom of enterprise and contracting

Liberalized market (market based solutions, ...)

Cost efficiency (no over-regulation, limited administrative burden, ...)

Level playing field between market parties

Consumer protection

Fair split of value and risks

Avoiding market abuse (risk of BRP blocking flexibility)

Market integrity

Sustainability (future proof and upscalable solutions)

Presumption of innocence

Transparency



# A GOOD MARKET DESIGN ...

... shall work in congestion, spot and balancing markets

- Coherent market design for different markets
- Keep flexibility available for both market parties as well as system operators

... shall put no additional costs on third parties without proper neutralization

- Additional information flows and operational tasks require room for proper pricing by existing market parties
- No seepage of additional costs from demand flexibility aggregator presence to existing markets, e.g. activation by third parties of flexibility services shall not increase balancing settlement prices

... shall value flexibility correctly

- Aggregator flexibility is not only sourced from the customer, but also from its BRP (balance perimeter)
- The impact on the BRP is not limited to the activation window, e.g. rebound, load shifting, ramp up, ...

... should be scalable

- Current market models are created ad-hoc and based on a limited number of customers/aggregators
- Large-scale-roll-out requires operational processes and contracts that can be automated or standardized

FEBEG envisages a robust market design in which costs and benefits are allocated correctly!



# 10 RECOMMENDATIONS\* (1)

1. Aggregation should be legal, encouraged and enabled in any electricity market where generation participates
2. The aggregated pool of load must be treated as a single unit and the aggregator to be allowed to stand in the place of the consumer
3. Regulators and TSO's should oversee the creation of **streamlined, simple contractual relationships** suppliers/BRP's and aggregators
4. Regulators and the TSO should create clear participation and payment requirements which protect the **legitimate interests of all participants**:
  - allow aggregators to work with any consumer
  - **keep the BRP in balance**
  - **ensure fair compensation for the electricity purchased by the BRP**



# 10 RECOMMENDATIONS (2)

5. Create appropriate products that allow a range of resources to participate, including demand side response
6. Provide a complete product description that includes the technical specifications of both demand and supply
7. Establish appropriate and **fair measurement and communication protocols**
8. Ensure demand side response is compensated at the full market value of the service provided
9. Create market structures which reward and maximize flexibility and capacity in a manner that provides **investment stability**
10. Penalties should be fair and tailored to the business model of the providers



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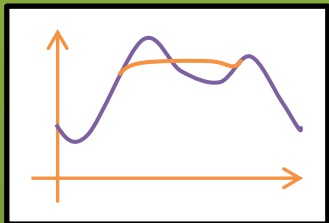
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# DIFFERENT LOAD TYPES

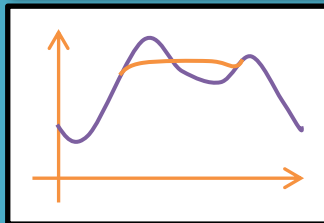
## Demand side flexibility

**Storable load**  
(process and supply decoupled)



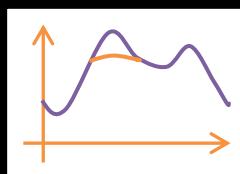
**Non-storable load**

**Shiftable**

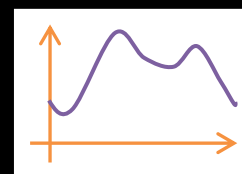


**Non - shiftable**

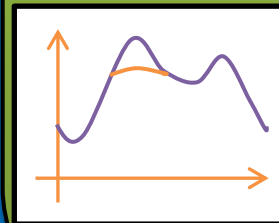
**Curtable load**



**Non curtable load**



**Self generating clients**

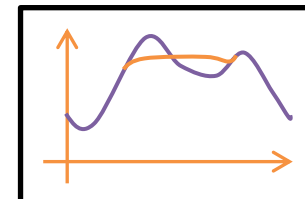




# LOAD TYPE MAKES A DIFFERENCE

- Storable and shiftable load (rebound):

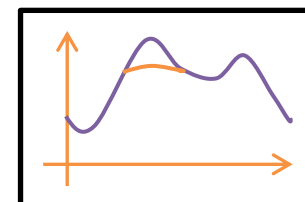
- Activation of demand flexibility has impact
- Consumed energy remains more or less the same
- Complex and unpredictable – in volume and time - impact after activation window (ramp up + rebound)



Difficult to predict the full impact

- Curtailable load and self-generating clients (no rebound):

- Activation of demand flexibility has impact
- Less energy consumed
- Less complex impact after activation (ramp up)
- Total impact is more correlated with the market requesting the activation



Impact is centralized around the activation window





# DIFFERENT REMUNERATION TYPES

## Demand side flexibility

### Capacity based

Fixed remuneration  
€/MW/h

→ Buy service (option)



→ Call option

### Hybrid model

Fixed remuneration to  
cover fixed costs  
+  
Variable remuneration  
to cover activation

### Activation based

Variable remuneration  
€/MWh

→ Buy commodity



→ Back-to-back transaction



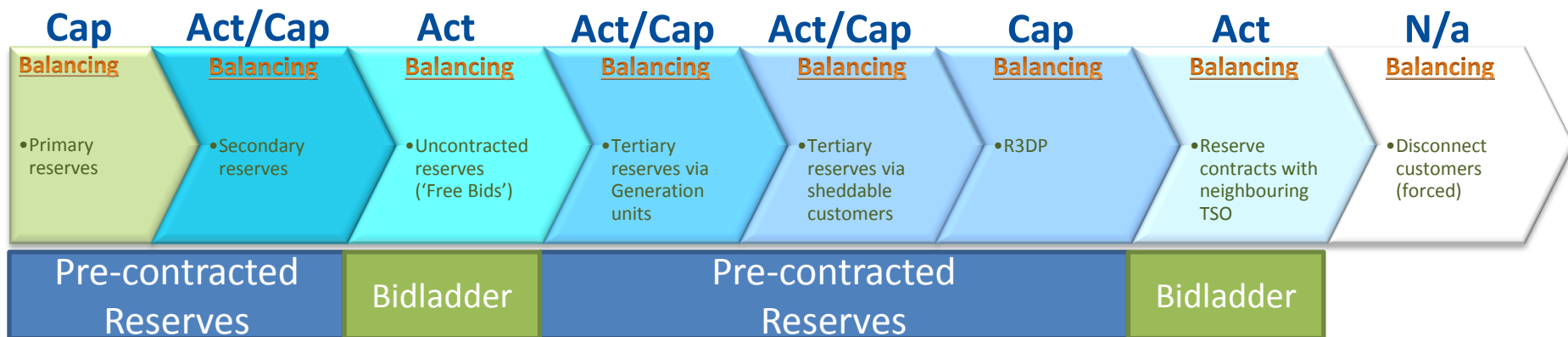
# REMUNERATION TYPE DOES MATTER

- Capacity based
  - Assumptions about commodity and operational costs are fixed upfront
  - Fixed remuneration takes into account assumptions on the numbers of activations and the time of activation
  - Ideal for the grid user to recuperate investment costs to participate in demand flexibility
  - Fixed cost is controllable for contractual parties
  - Unclear activation price (pre-paid option)
- Activation based
  - Price available for each individual activation
  - Price could therefore differ in time
  - Allows a merit order approach optimizing the offers
  - Fixed cost must be recuperated via activation (uncertainty for grid user)

Combination of both models (hybrid model) is possible



# TOWARDS ENDURING MARKET MODEL ...



## Example R3 'Dynamic Profile':

- No economic criterion that will lead to the activation of the cheapest pool/BSP
- Activation without increasing marginal cost and thus saturating imbalance price

- A 'merit order mechanism' allows cost efficient activation but, therefore, an activation price is needed
- Integrating product groups to clusters, e.g. R3-products, by harmonising activation rules
- Volume and price of activated energy must be known for an activation based system



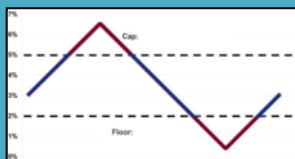


# DIFFERENT ACTIVATION FORMS

## Demand side flexibility

### Volume based

Caps & floors

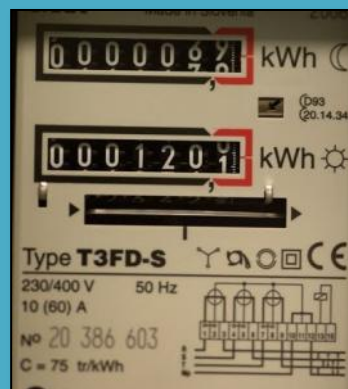


Direct load control



### Price based

Static



Dynamic

Coupled

- DAM  
(before clearing)

- CIM

- Balancing market



Uncoupled

- DAM  
(After clearing)

- Own developed price signal





# ACTIVATION FORMS ARE IMPORTANT

- Volume based
  - Limited freedom for the end user because of steering by FSP
  - Requested volume is known, also time of activation and de-activation
  - Price formula is agreed upfront between concerned market parties
  - Guarantee of volume could be useful for certain markets
- Price based
  - Full freedom to the end user to modify consumption because FSP is only giving a price incentive
  - Requested volume is not known, neither the time of activation and de-activation, but are probably predictable at an aggregated level (learning curve)
  - Difficult to distinguish normal supply (normal client behavior) and demand flexibility (response to price signal)

Price based activation is difficult for FSP and is mainly applied by integrated aggregators/suppliers/BRP to influence load



# DIFFERENT MARKETS

## Demand side flexibility

Portfolio optimization



versus



BRP

Balancing

DA, ID



BRP

Real time



BRP/BSP

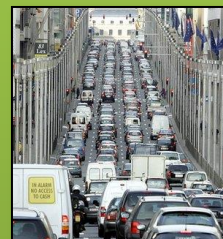
Reserve



-ICH  
-R3 DP  
-...

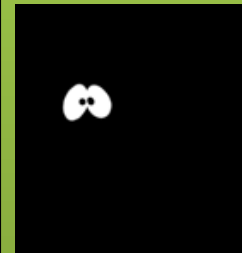
TSO

Congestion



TSO /DSO

Adequacy



TSO



# MARKET DETERMINES ACTIVATION FORM

- **Portfolio optimization**
  - Both price (integrated FSP/supplier/BRP) as volume (integrated or third party) based activation are possible
- **Balancing DA/ID/real time**
  - Both price based (integrated) as volume based activation (integrated or third party FSP) are possible
- **Balancing reserves**
  - Asks for volume based activation to have a guarantee on the available volume
  - Activation should pass via FSP/BSP
- **Congestion**
  - Volume based activation gives guarantee on volume impact (commodity)
  - Activation (possibly through FSP) has impact on other parties in the value chain that should be neutralized to avoid impact on balancing market
- **Adequacy**
  - Asks for volume based activation to have a guarantee on the available volume
  - Activation should pass via FSP/BSP and has impact on other parties in the value chain that should be neutralized to avoid impact on balancing market



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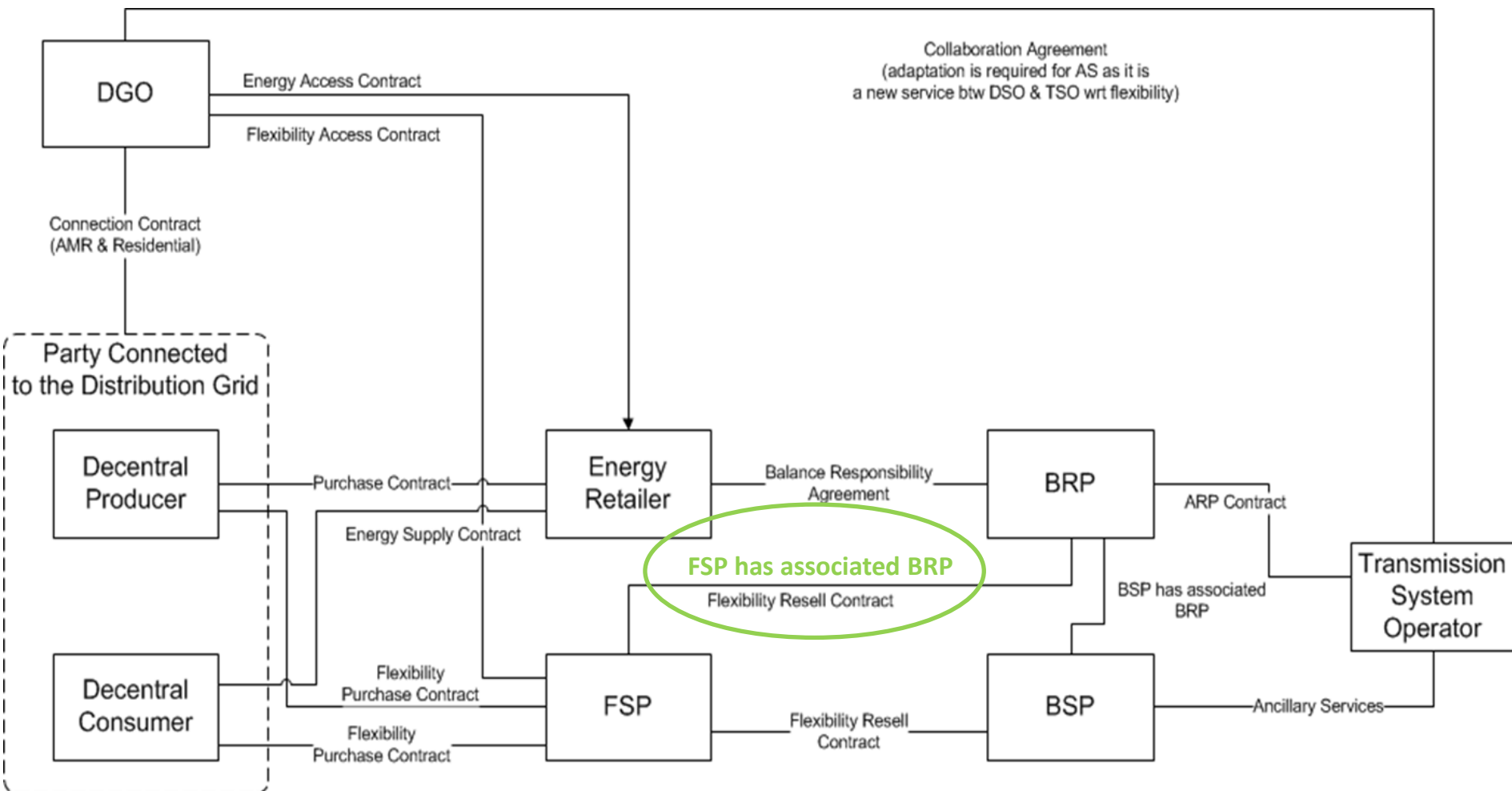


Market roles

# DESCRIPTION OF ROLES



# OVERVIEW ROLES



\* FEBEG prefers term 'Flexibility Services' instead of 'Flexibility'



# DEFINITION OF ROLES

Role	Description
<b>Producer</b>	Market participant connected to the grid and producing electricity also owner of flexibility
<b>Consumer</b>	Market participant connected to the grid and consuming electricity also owner of flexibility
<b>Retailer</b>	Market participant selling electricity to consumers
<b>Balancing Responsible Party (BRP)</b>	Market participant – or its chosen representative – responsible for its imbalances
<b>Distribution Grid Operator (DGO)</b>	Grid operator that operates distribution grids < 70 kV
<b>Transmission System Operator (TSO)</b>	Grid operator that operations transmission grids > 70 kV
<b>Flexibility Services Provider (FSP)</b>	Market participant that gives a signal (price signal or activation) to a producer or consumer and provides flexibility to a third role; <b>an aggregator is a FSP with a pool of flexibility</b>
<b>Balancing Services Provider (BSP)</b>	Market participant providing balancing services to its connecting or contracted TSO



Market roles

# RESPONSIBILITY OF GRID USER



# GRID USER APPOINTS SUPPLIER AND FSP

Grid user is owner of flexibility

Grid user appoints a supplier and – if desired – a FSP

- Via the supplier the grid user has a BRP appointed that will balance its position (open supply contract, based on profile for households and SME, ...)
- Grid user can outsource certain tasks to FSP, e.g. review connection agreement, but costs – if any - should be born by client

Grid user ensures **no gap or no overlap between contracts**

- Having multiple FSP's on one access point is only acceptable if some prerequisites are met (no gaps and no overlap; split balancing responsibility; additional metering, controlling and data exchange allowing to separate rights and obligations in the contracts; fair split of value; ...)
- Recommendation to start with one FSP by access point for simplicity (conform current DSO model for supply)



# OBLIGATION TO INFORM

- Grid user is responsible for setting up additional metering, controlling and data exchange allowing **to separate rights and obligations in the contracts**
- Grid user is **contractually obliged to inform SO and supplier** about changes to its consumption profile:
  - Different types of impact on the consumption profile are possible:
    - Increasing or decreasing manufacturing capacity
    - Different manufacturing scheme (e.g. 2 to 3 shifts system, ...)
    - Conclusion of contract with a FSP
    - Installation of wind turbine or PV
    - ...
  - Privacy is not a key issue for professional clients because handled by legislation and contract between grid user and FSP; commercial sensitive information should be safeguarded though



Market roles

# **FLEXIBILITY REGISTER**



# FSP UPDATES FLEXIBILITY REGISTER

To make certain information flows possible, the relation between FSP and BRP should be registered by EAN in the access register

- Creation of FSP in access register has some consequences:
  - A minimum set of rights and obligations of a FSP (access to register, solvability, obligation to notify, ...) should be defined (= supply permit 'light')
  - Procedures need to be modified (switching of FSP, ...)
- Responsibilities:
  - Grid user mandates FSP to keep information about FSP-BRP up-to-date in the access register (like the grid user mandates the supplier to keep information about relation supplier-BRP up-to-date in the access register)
  - FSP notifies the existence of a flexibility contract to DGO's to allow check on the combination FSP-BRP
- Master data:
  - Grid user is responsible for informing supplier upfront about any change in its consumption profile (e.g. due to the existence of a flexibility contract)
  - BRP would like to perform an 'ex post check via update master data (existence FSP) whenever there's a change of master data





# SCOPE OF FLEXIBILITY REGISTER

How to limit the administrative burden of the flexibility register without introducing a risk of discrimination?

## Price based contracts

- Registering a FSP for all customers with price based signal (quarter-ahead, month-ahead, day-ahead, intraday, balancing, ...)  
would lead to substantial administrative burden
- Price based activation is mainly applied by suppliers; correlation with market is known by SO
- Added value?

## Volume based contracts

- Allows impact of FSP activity on BRP to be compensated
- Allows SO to assess impact on the grid
- Registering has added value



# CONFIDENTIALITY ISSUE

Some FSP's oppose the flexibility register due to confidentiality issues, i.e. BRP receiving information about flexibility

- Contradictory to principles of **transparency and fair split of value**:
  - How could supply flexibility be integrated in individual supply contracts without identification of concerned consumers
  - Supply agreement obliges the customer to inform the supplier about changes in his profile: non-issue
  - Choice of reference profiles is related to the clients profile
  - Metering data for settlement are needed by EAN
- Collateral damage of tackling confidentiality issue (e.g. neutral party as intermediate) is **over-regulation**:
  - Downstream the head-meter, there's a free market for submetering
  - Reference profiles are crucial and should be tailor made
  - Regulated transfer prices could limit FSP profitability
  - Bureaucratic system will lead to high operational costs and reduce flexibility and innovation of FSP's, and will therefore hamper market functioning



Market roles

# METERING



# SUBMETERING

... has no impact on the head meter

- Official head meter is basis for current market processes (off-take, settlement, reconciliation, ...)

... is a commercial activity

- Modalities of the submetering are defined by the concerned commercial parties (GU-FSP, FSP-BRP, ...)

... doesn't resolve issue of reference load curve

- Submetering filters the targetted consumption out of global consumption by EAN
- More accurate reference curves are possible
- Netto results are not guaranteed by EAN as counter-consumption can occur

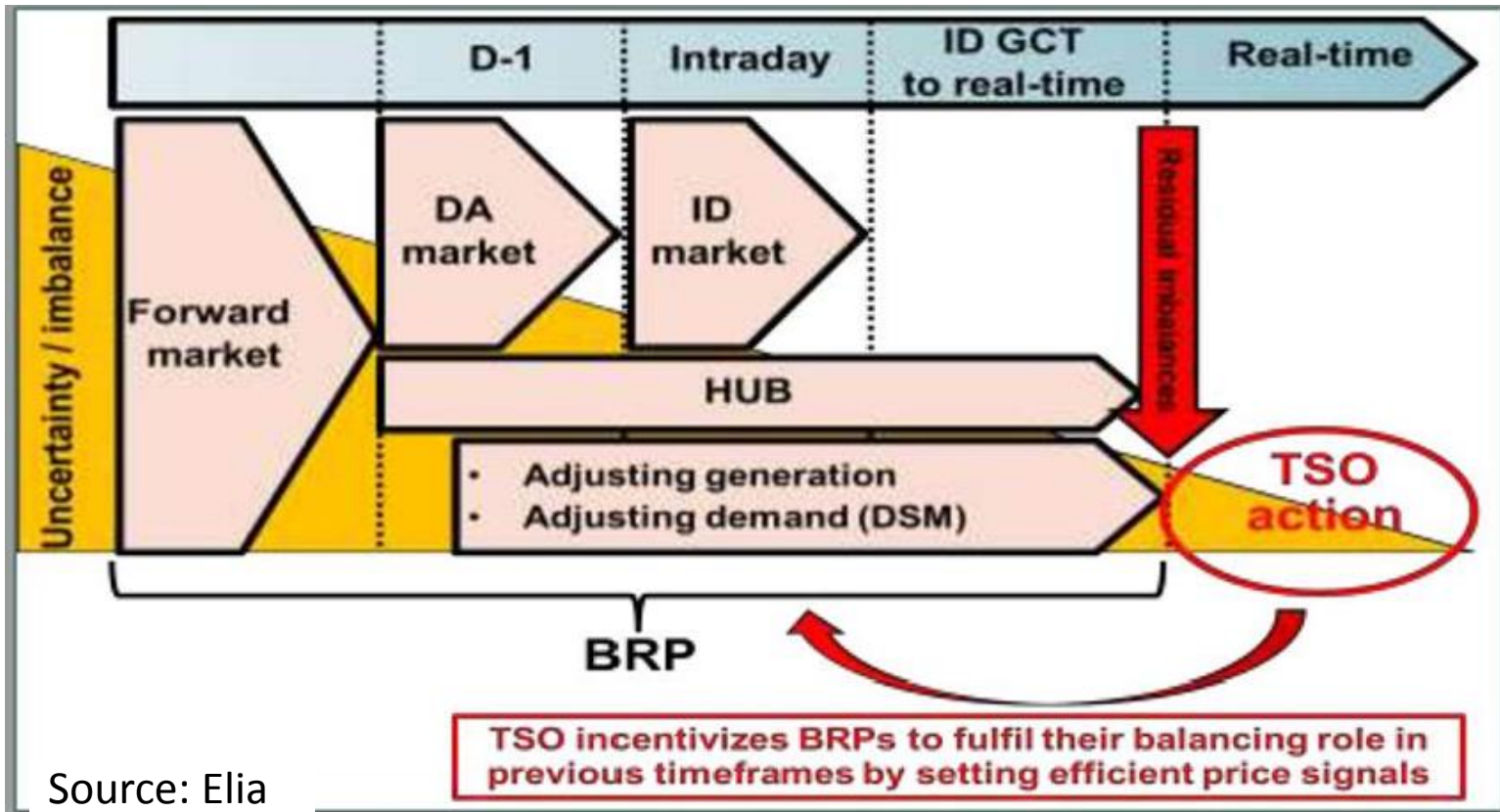


Market roles

# CENTRALE ROLE OF BRP



# CENTRAL ROLE BRP



BRP uses and valorises flexibility in his sourcing – in all timeframes – in order to balance his portfolio.

Due to the increasing share of intermittent RES the BRP tasks becomes more and more challenging!



# INTERVENTIONS IN BRP PERIMETER

Product	Client	Generator	Supplier	FSP	BSP	BRP	SO
ICH	Market based compensation	-	Limited impact	-	-	<b>Volume neutralization</b>	Compensates client and neutralizes BRP
R3 DP	Market based compensation	Market based compensated	Impacted	Market based compensation	Only reservation fee	<b>No neutralization, but positive imbalance</b>	Compensates BSP
Free bids by FSP (expected)	Market based compensation	Impacted	Impacted	Market based compensation	Market based compensation	<b>Impacted</b>	Compensates BSP
Free band	-	Impacted	-	-	-	<b>Impacted</b>	Doesn't compensate service
Load shifting by DSO	-	Impacted	Impacted	-	-	<b>Impacted</b>	Additional revenues from grid tariffs



# NEUTRALIZATION BRP

Every unilateral action of a third party (aggregator, SO, ...) in the perimeter of the BRP **creates an imbalance for the BRP**, e.g. flexible access, load shifting by SO, R3 'Dynamic Profile, ...

- **BRP should not have any negative financial impact** due to an imbalance caused by an intervention of a third party
- Third parties are responsible for their own actions: **a BRP cannot be held responsible for actions of third parties** which he did not want and which he cannot control
- BRP should be **properly and timely informed** to be able to fulfill its tasks





# INFORMATION NEEDS BRP

## Balancing

- A BRP needs to be balanced on a quarter-hourly basis: therefore he will monitor off-take
- As soon as the BRP notices that off-take is dropping - and when he doesn't know this is the result of a flexibility activation - he will react and lower injection to be balanced again
- He will in fact undo the flexibility activation, i.e. **counter-balancing**

## Forecasting

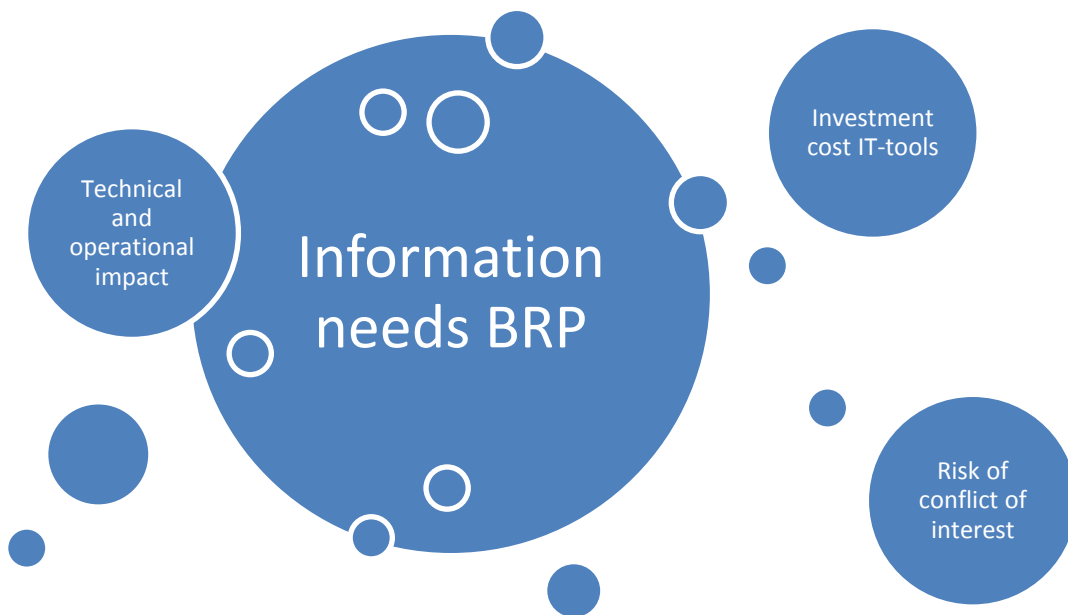
- A BRP sources energy to match the demand in his perimeter: to be able to optimise sourcing, the BRP will forecast demand for all timeframes
- This forecast is based on historical profiles of his clients: these **profiles are impacted** by regular activations of demand side flexibility
- A BRP will intraday update this forecast as he has to be balanced on a quarter-hourly basis
- Without information, it is **difficult for the BRP to interpret a consumption drop**. Will there be a ramp-up? A rebound? Is this a recurrent phenomenon?

## Monitoring

- A BRP wants to dispose of certain information **to be able to monitor processes, both for balancing purposes as for settlement reasons**
- It is a fundamental right of any market party to have access to underlying data to be able to check invoices
- Example in current market set-up: a BRP has a commercial contract with a FSP to manage flexibility in its portfolio: the BRP will want information to monitor – in real-time – the activities of the FSP, but he also wants data to check invoicing in the settlement of this commercial contract



# OVERVIEW REQUIRED INFORMATION



Proposal of Elia and DSO's to provide 'quasi-real time information about exact activated volume R3 DP in perimeter of the BRP' tackles issue of counter-balancing



	Real-time	Ex post
Objective	Balancing, monitoring and forecasting	Monitoring and forecasting
Information need	AMR-metering, activation and rebound/no rebound	Validated metering data and real ramp-up/rebound
Scope	EAN's for wich a flexibility contract is registered in the access register	EAN's for wich a flexibility contract is registered in the access register
Granularity	By EAN or aggregated by 'type of customer' on a lower voltage level	By EAN
Timing	Within 15 minutes	As validated metering data are available

BRP wants to be informed about '**substantial impacts**' on their processes: ideally information by EAN, but a certain degree of aggregation for the real-time information needs on a lower voltage level could be accepted



Market roles

# SO AS MARKET FACILITATOR



# MARKET AS DRIVER

Flexibility is a  
commercial  
product

- Flexibility is a commercial product with an **important economic value** which is increasing due to the growing share of intermittent energy sources
- **Market functioning is the most effective and efficient driver for innovation and transition**, e.g. aggregators, ESCO's, Energy Management Systems, outsourcing portfolio management, ...

System  
operator as  
market  
facilitator

- Proactive SO's should **enforce the innovation and transition power of the market** by designing a grid that allows as much as possible new options and technologies
- SO should not develop commercial activities (**unbundling**: only regulated tasks): SO's should not own or operate flexibility means, but have to **set up and facilitate a flexibility market**
- SO's should procure flexibility services via **adequate market based mechanisms** fostering market liquidity
- SO's should provide **non-discriminatory access** to the grid and to information (access register, metering, grid losses, roll-out plan smart meters, ...)



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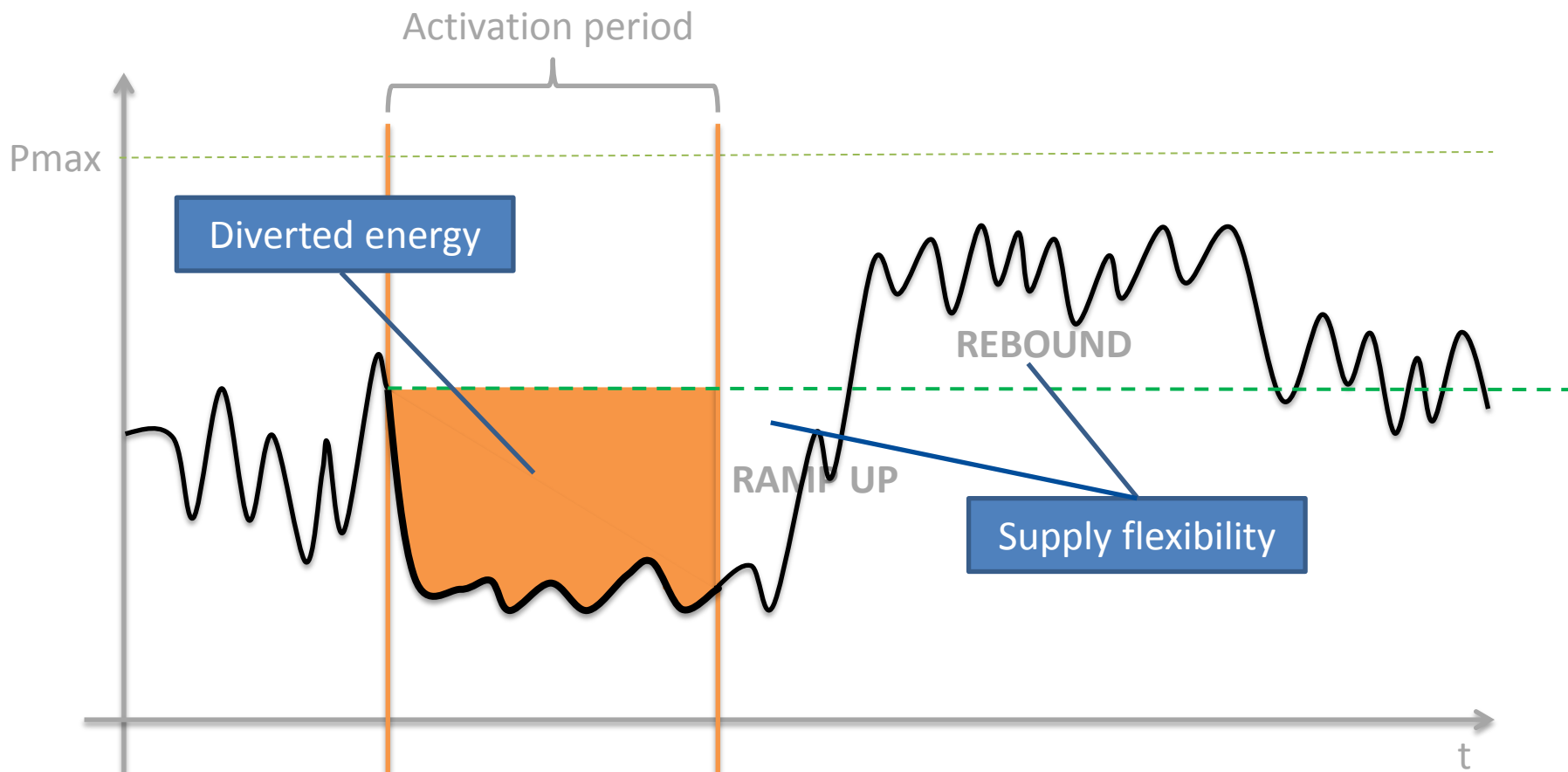


Supply flexibility and diverted energy

# **DESCRIPTION SUPPLY FLEXIBILITY AND DIVERTED ENERGY**



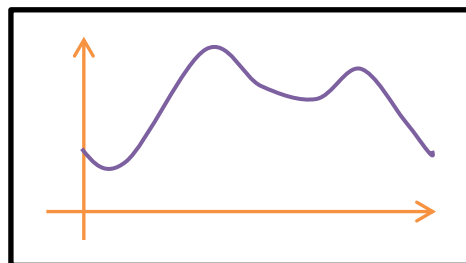
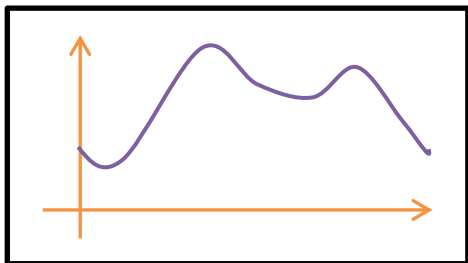
# IMPACT ACTIVATION FLEXIBILITY





# SUPPLY FLEXIBILITY & DIVERTED ENERGY

No Activation



Supply Profile



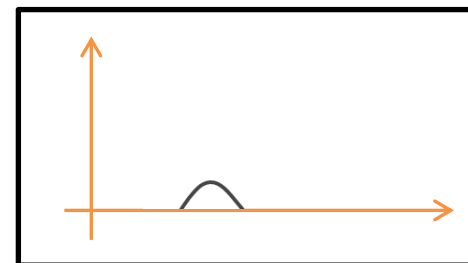
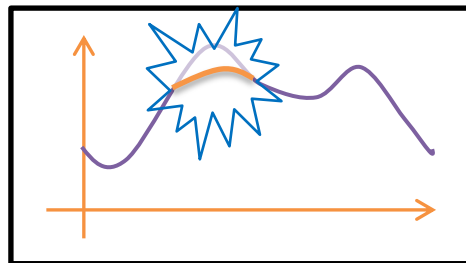
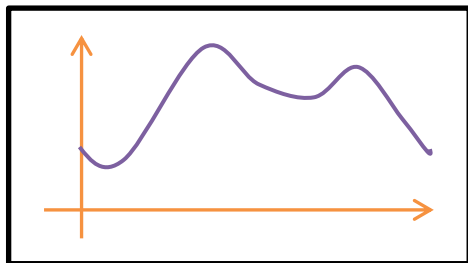
Clients + FSP profile



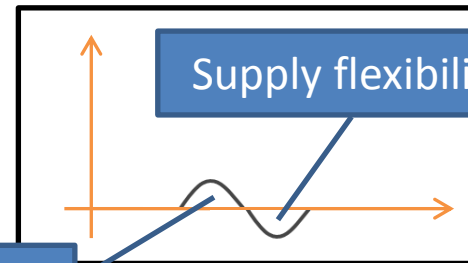
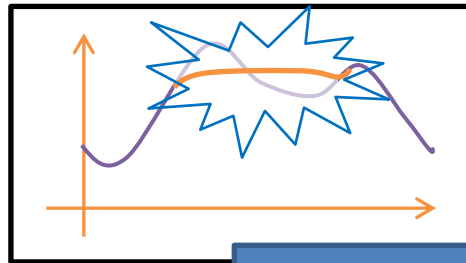
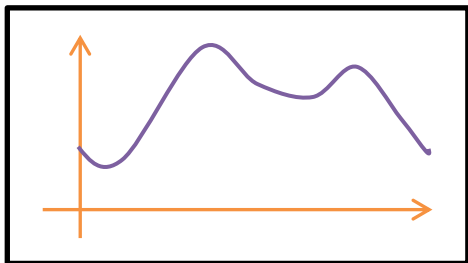
BRP position

Activation

No Rebound



Rebound



Diverted energy

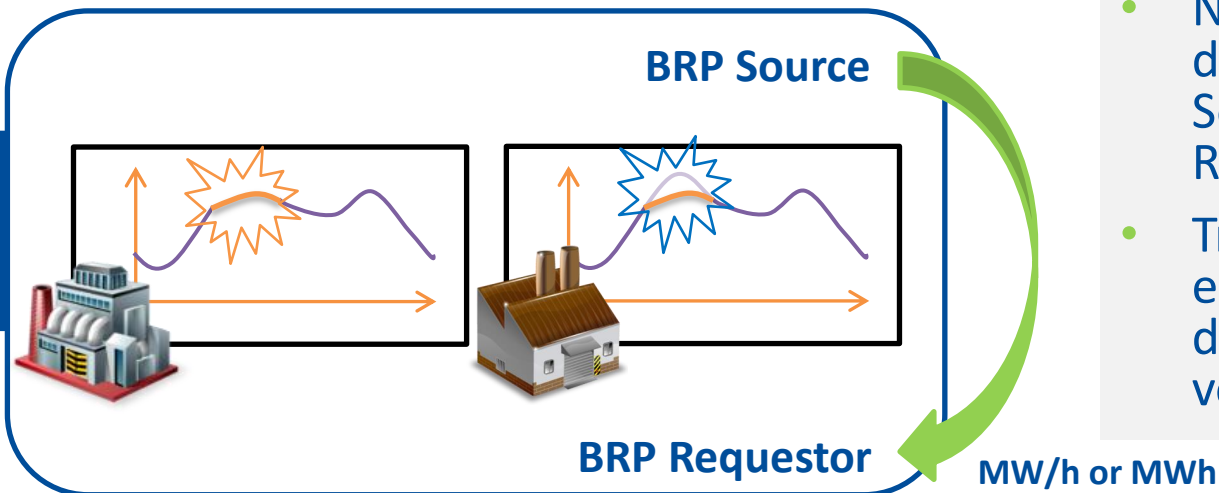




# SINGLE BRP VERSUS MULTIPLE BRP/TSO

SINGLE BRP

BRP 1

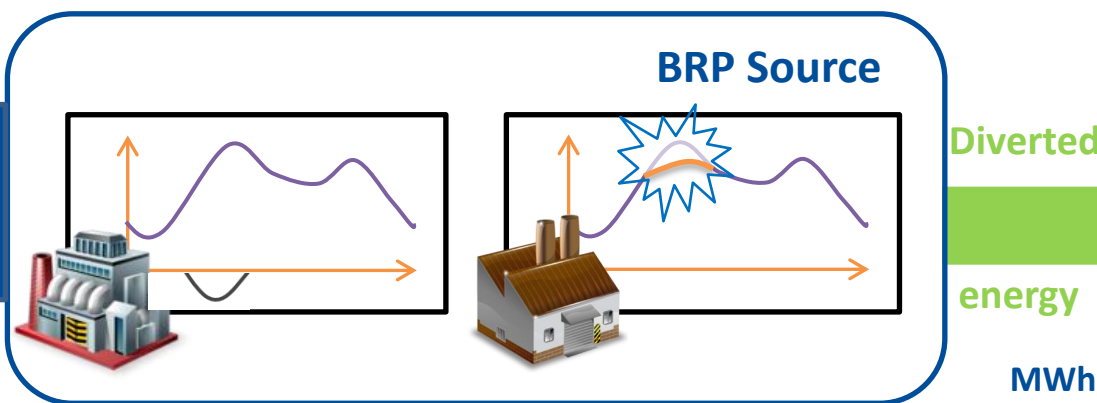


- Necessary to transfer diverted energy from Source-BRP to Requestor-BRP
- Transfer of diverted energy implies determination of volume and price

Source-BRP with available flexibility = requestor BRP

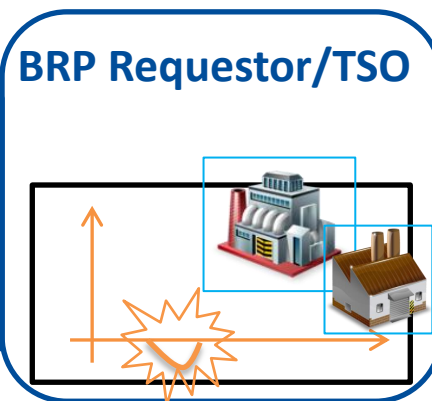
MULTI BRP

BRP 1



Source-BRP with available flexibility

BRP 2/TSO



Unbalanced requestor

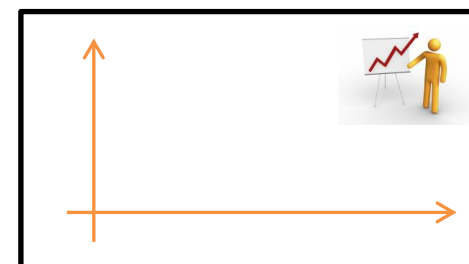
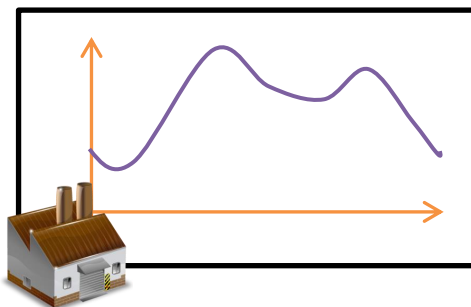
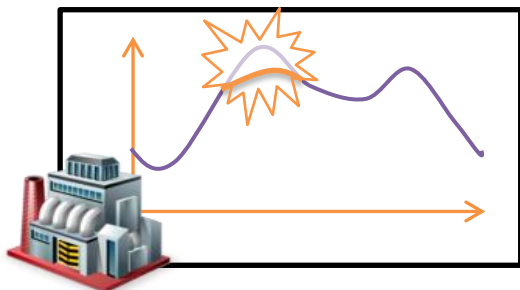


# DIVERTED ENERGY – SINGLE BRP

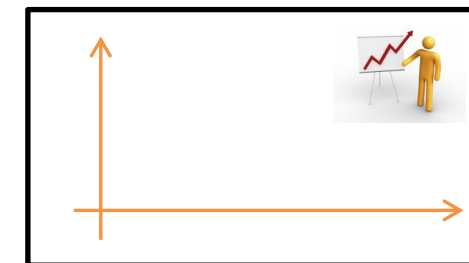
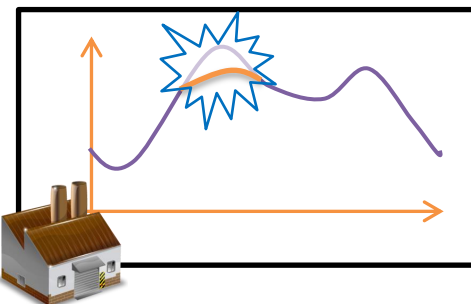
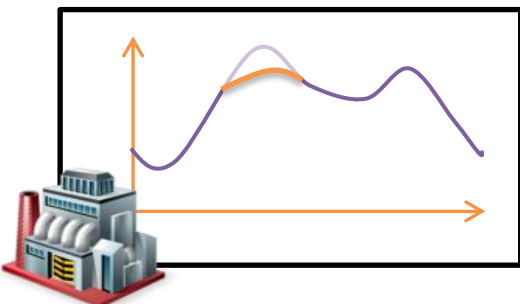
Source BRP = Requestor BRP

FSP

NEED



A CTIVATION



BRP buys from a FSP the service to activate flexibility in his portfolio

FSP acts as a service provider, but has not a netto position

Energy does not need to be transferred as source BRP is at the same time the requestor BRP



# ACTIVATION SINGLE BRP

BRP activates own generation and own demand flexibility



BRP is accountable for controlling own assets



Internal settlement

FSP (third party) activates generation and demand flexibility



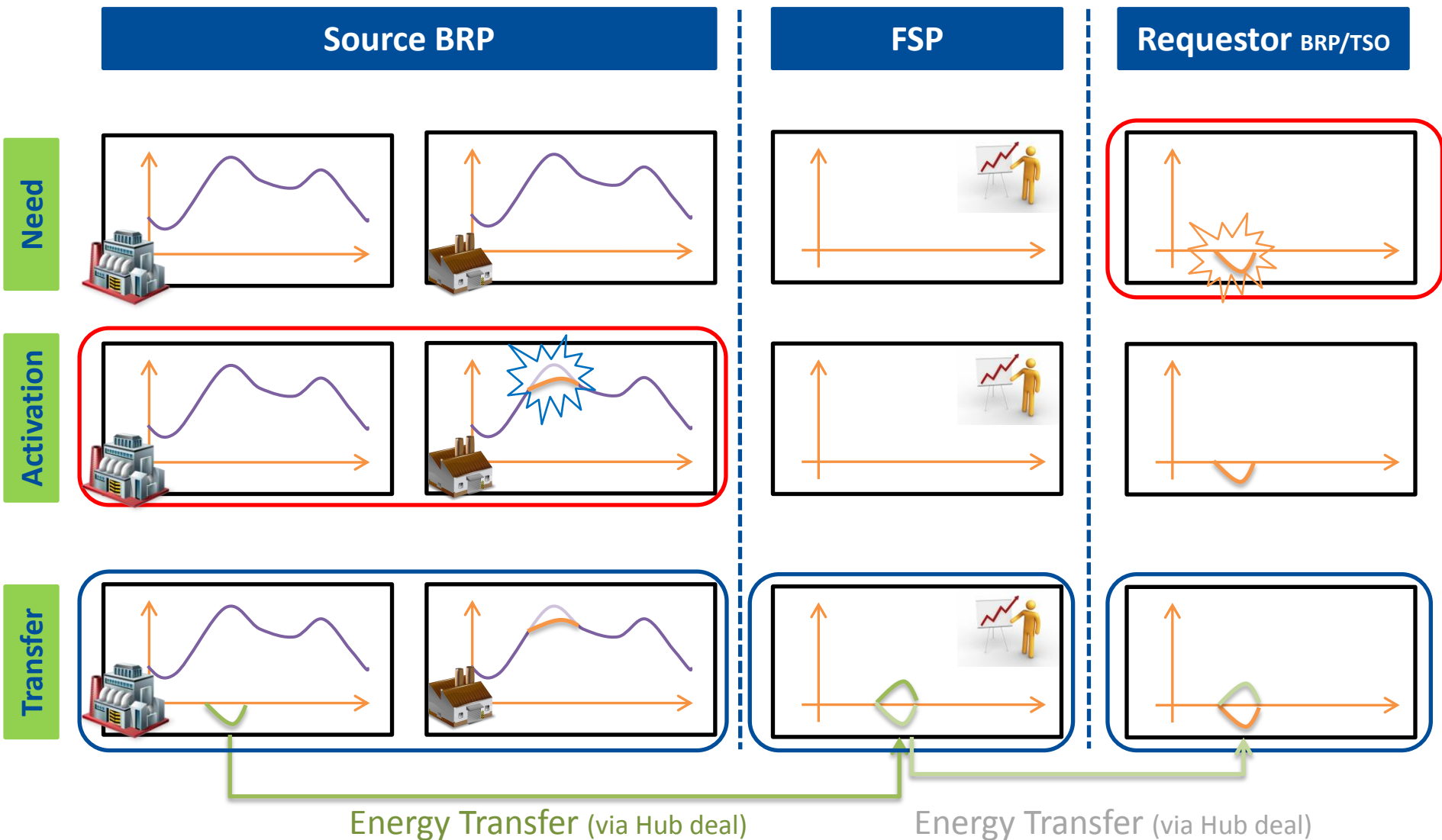
FSP is accountable for activation



External settlement to validate activations



# DIVERTED ENERGY – MULTIPLE BRP/TSO

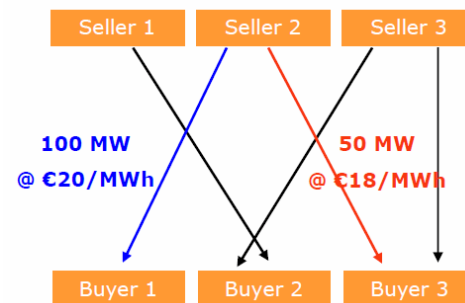




# ENERGY TRANSFER VIA HUB

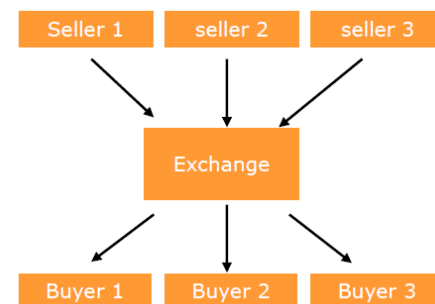
- **Over-the-counter (OTC)**

OTC trading is done directly between two parties, without any supervision of an exchange. The trade could be obtained via bilateral contacts or via brokers or via electronic platforms but always ends in a bilateral contract between 2 parties. In an OTC trade, the price is not registered public. Custom products are possible.



- **Exchange Platform**

Bids and offers are visible on an electronic platform but do not reveal the identity of the bidder and seller. A clearing house acts as an intermediate between the buyer and the seller to guarantee the anonymous trade. Both Buyer and seller ends with a contract with the clearing house. Standardized products only and more expensive due to higher process costs and financial guarantees.



**With regard to demand side flexibility, FEBEG prefers a OTC-based transfer of energy: 'Source BRP – FSP' and 'FSP – Requestor BRP'**



Supply flexibility and diverted energy

# IMPACT ON SUPPLY CONTRACT



# IMPACT ON SUPPLY CONTRACT

- How is the price in a supply contract determined?
  - An agreed profile is used as reference in the supply contract, based on:
    - Historical profile (e.g. last 3 years, ...)
    - A best estimate of future consumption
    - ...
  - Price is bilaterally set based on commodity and reference profile
- There's an issue between BRP/Supplier and FSP/BSP if:
  - Assumptions about flexibility costs in the supply contract are fixed beforehand
  - Realized flexibility usage cost is higher than initially foreseen
  - While the increased costs are caused by a third party FSP
- Unilateral differentiation from this reference profile impacts pricing and should therefore be included in the supply contract



# COMPENSATION FOR SUPPLY FLEXIBILITY

- Therefore the BRP/Supplier needs to be compensated for the different flexibility cost
  - Irrespective of market in which aggregator is active
  - At an agreed price between the customer and the BRP/Supplier
  - Feasible on a large scale, without disproportionate costs for market parties
- How to include customer's flexibility in new profile in the contract?
  - Ex ante: standard inclusion of 'aggregator risk' in all contracts
  - Conditional: renegotiation clause in case of customer contracting with aggregator in all contracts, or
  - Reactive: re-evaluation every year whether aggregator mark-up is necessary

FEBEG prefers ex ante inclusion of aggregator activity in supply contract (like any other change in the consumption profile)



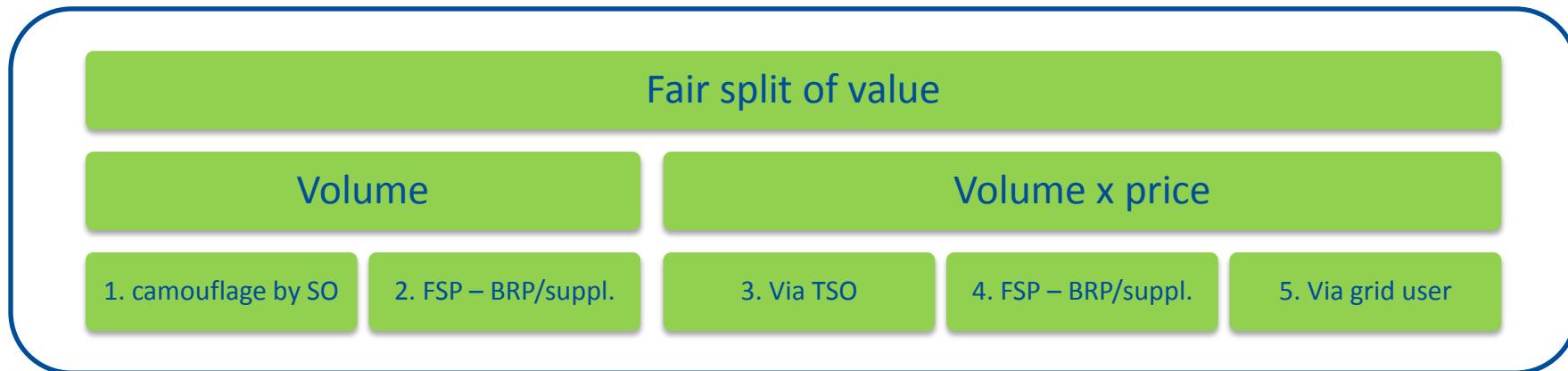


Supply flexibility and diverted energy

# TRANSFER PRICE



# DIVERTED ENERGY: FAIR SPLIT OF VALUE



## Volume

- **Option 1 - Camouflage by SO**
  - A) Real-time camouflage of aggregators activation of customers to BRP/Supplier via SO: not feasible
    - No settlement between market actors as impact fully neutralized via SO
    - Need to adjust in real time the metering data: not feasible
  - B) Ex-post camouflage of aggregators activation of customers to BRP/Supplier via SO
    - Customer pays the energy to the BRP/Supplier → complex (small scale TSO)
- **Option 2 - Volume exchanged ex post between FSP – BRP Supplier**
  - Volumes determined and exchanged ex post between FSP – BRP/supplier to compensate the diverted energy
  - Not feasible option as time/price value is not included



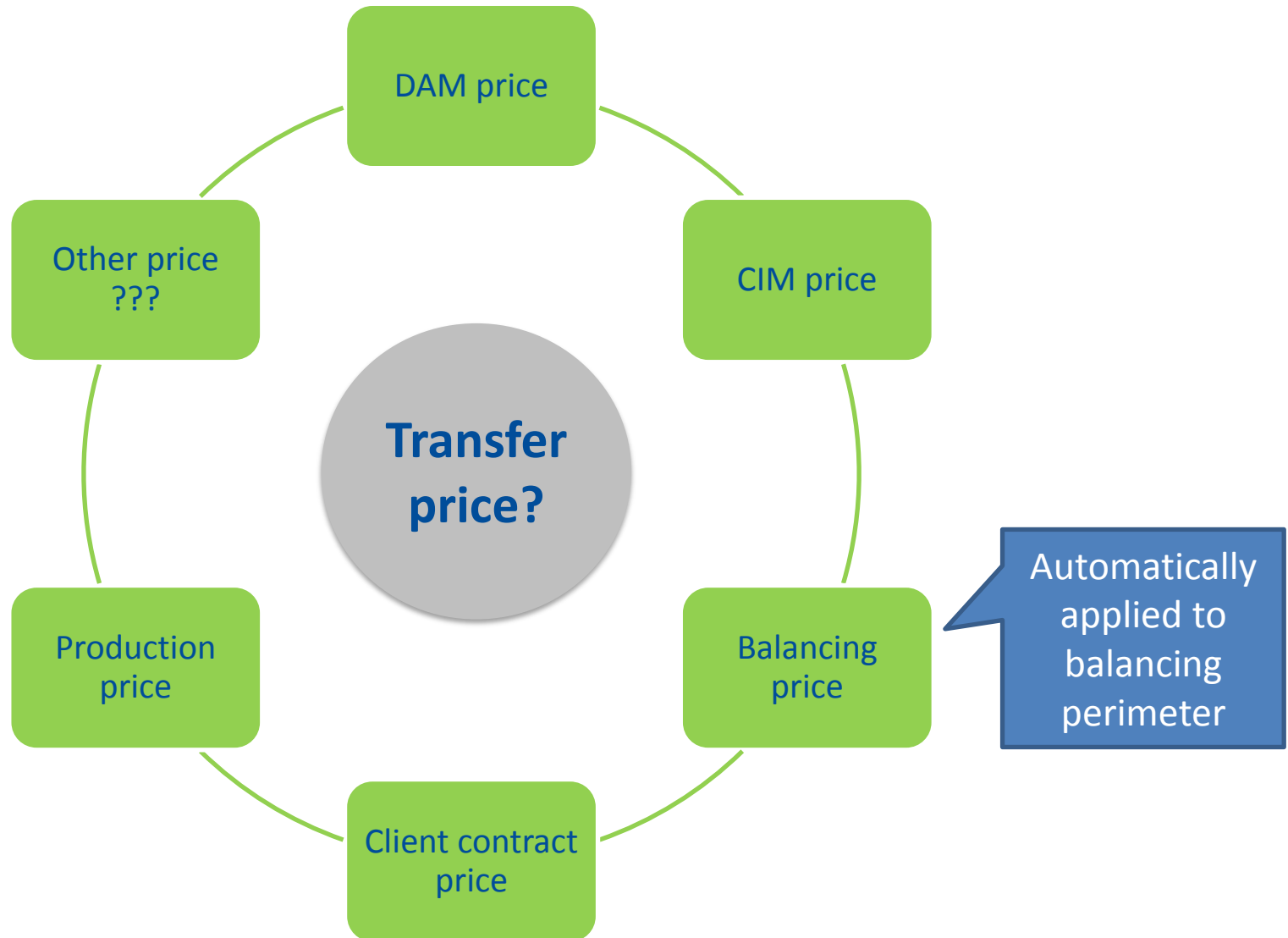
# OPTIONS FOR TRANSFER PRICE

## Volume x Price

- **Option 3 -Through the TSO at imbalance price (e.g. BE)**
  - No specific relation needed between FSP – BRP/supplier
  - Activated energy remains in BRP perimeter.
  - Non compliant for Activation based, full activation remuneration towards BRP
  - Simple but limited applicable for small scale capacity based reserve products
- **Option 4.a - Bilateral free commercial contract between FSP and BRP/Supplier (e.g. GE)**
  - Flexible commercial solution possible between BRP/Supplier and FSP (mixture of different prices is possible)
  - Associated BRP solution: only fair solution for large scale but perceived entrance risk for new FSP role
- **Option 4.b - Bilateral exchange at regulated price between FSP and BRP/Supplier (e.g. FR)**
  - Regulated price is not possible/wanted in Belgium as most clients negotiated different price formula or have direct market access.
  - Simple, not fair and allows arbitration by aggregator (no correlation with prod. cost)
- **Option 5 - Through the customer by adjusting metering data at client contract price**
  - Difficult settlement due to federal taxes, contributions & VAT, CO2, reconciliation, ...
  - Complex, only small scale

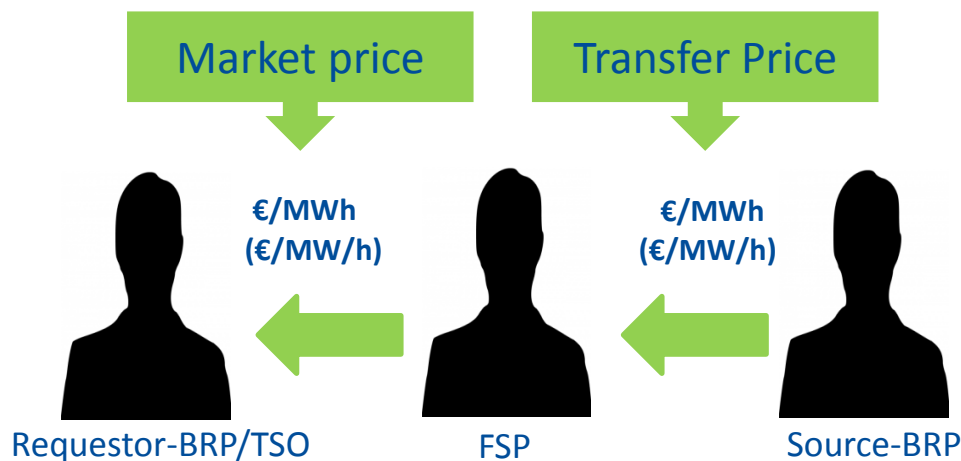


# WHICH TRANSFER PRICE?





# TRANSFER PRICE INTER-BRP



- Transfer price is a wholesale market topic
- A FSP has the option to reduce its consumption while the BRP produced energy which has a value
- Forced sell of property is unacceptable and in conflict with 'right to property'
- A liberalized market implies that market participants need to agree on a market based sales price

**Transfer price inter-BRP cannot be regulated!**



# PRICING IN COMMERCIAL AGREEMENT

- Flexibility services are commercial services in a non-regulated market (freedom of enterprise)
- Market is driver for innovation, flexible and tailor made solutions, ... which is necessary to develop a mature market
- Regulated price (FR) could lead to gaming
- Tailor made price is reflecting market value for each BRP
- Tailor made price is future proof because it allows flexibility to be offered on the bidladder (merit order)
- Cost-efficient solution (no need of neutral party)



# RISK OF MARKET ABUSE IS LIMITED

- Is concern of market abuse, i.e. blocking of flexibility by BRP who refuses to agree on transfer price, justified?
  - Are there issues in Belgian the market?
  - Proportionality of the biased measure?
  - Level playing field between market parties (positive discrimination)?
- Measures that offer some comfort:
  - Client can switch of supplier if BRP blocks his flexibility
  - Contractual arrangements can foresee arbitrage/mediation
  - Economical inspection and competition authorities monitor market abuse
  - Regulator monitors market functioning



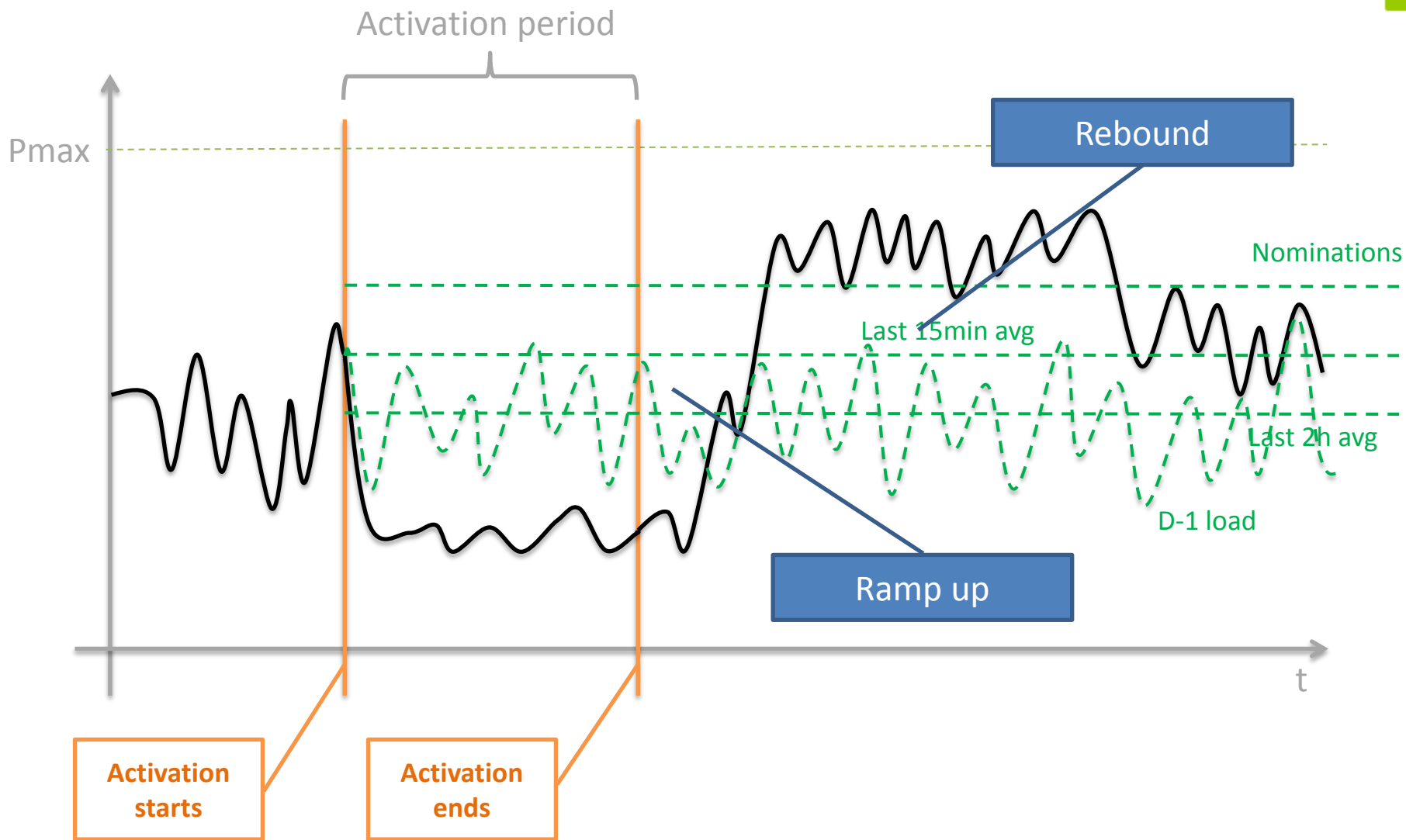
Supply flexibility and diverted energy

# **DETERMINATION ACTIVATED ENERGY**





# REFERENCE PROFILE – REAL PROFILE





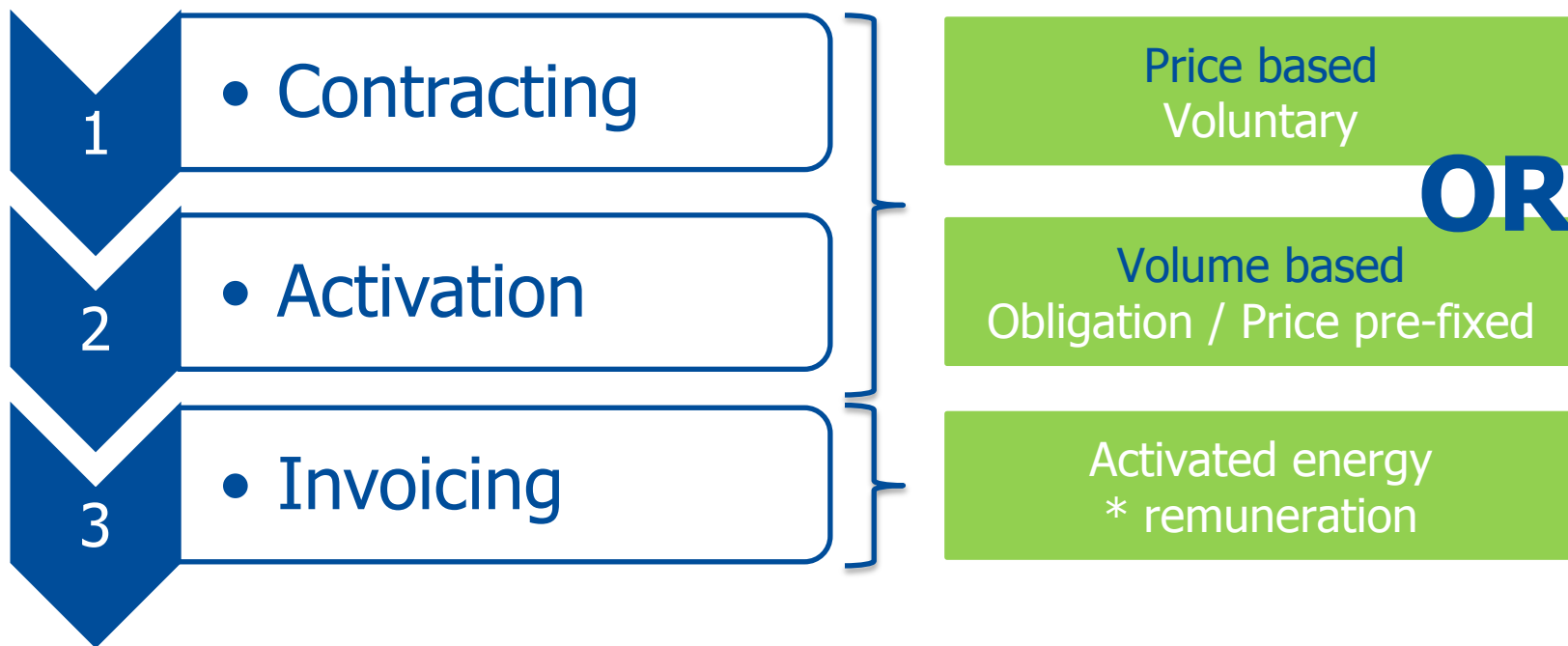
# DEFINING THE REFERENCE PROFILE

- Reference profile is very difficult to estimate
  - Depends on type of load/production and circumstance
  - Tailor made approach:
    - CHP ≠ Wind ≠ PV ≠ Predictable IC ≠ Unpredictable IC ≠ Load & production combined ≠ Profiled
    - Quid load activation during start up? Quid demand flexibility activated while increasing consumption?
- Who needs to determine the reference profile for load or production?
  - DSO/TSO activity? Or commercial activity? Or regulator?
- Quid 'Ramp up' and 'Rebound effect'?

Exact impact is very difficult to define, but approximation is possible!



# ACTIVATED ENERGY ALWAYS NEEDED



How to calculate the 'activated energy'?



# CALCULATION ACTIVATED ENERGY

- Price based (Volume unknown)
  - All in: Consumption/period \* Price signal/period
  - Excl. Flex: (Reference profile – Real profile)/period \* Price signal/period
- Volume based (Target volume predefined; activated energy unknown)
  - All in: n/a
  - Excl. Flex: (Reference profile – Real profile)\* Price/period

In both cases 'the activated energy' needs to be calculated

In both case the Real profile data are needed (settlement)

In both cases, the Reference profile is **COMMERCIALY DEFINED** and the Real profile is **NECESSARY**.



# CONTENT

## Concepts

- Definition of flexibility
- Flexibility usage
- Principles of market design
- General recommendations

## Different market parameters

- Load types
- Remuneration types
- Activation forms
- Different markets

## Market roles

- Description of roles
- Responsibility grid user
- Flexibility register
- Metering
- Centrale role BRP
- SO as market facilitator

## Supply flexibility and diverted energy

- Distinction supply flexibility and diverted energy
- Impact on supply contract
- Transfer price
- Determination activated energy

## Congestion management

- Introduction
- Impact on generator and BRP
- Congestion management model
- Option of free band
- Prequalification

## Process flows

- Overview processes
- Single BRP
- Inter BRP – copper plate
- Congestion management



Congestion management

# INTRODUCTION



# GENERAL PRINCIPLES

## Congestion is infrastructure issue

- Congestion is no commodity issue
- Congestion is problem of 'firmness' of grid capacity
- Risk that trigger or lever to solve grid capacity issue consists of variable grid tariffs, not related to FSP activities

## Flexibility is commercial product

- Unbundling doesn't allow SO to become market actor
- SO is a flexibility client, not a flexibility provider

## Congestion has impact on balancing

- Impact on perimeter BRP (balancing market) should be neutralized
- Need for coördination between DSO's and TSO



# NEED FOR BALANCED SOLUTION







# TYPES OF FLEXIBILITY

## Curtailment of generation or load

- High risk of congestion in the grid or grid is congested
- SO intervenes by curtailing generation or load

## Controlling of flexibility activations

- Grid is not congested
- FSP wants to activate flexibility to offer to third party (BRP, SO, ...)
- SO limits flexibility activations to prevent congestion



Congestion Management

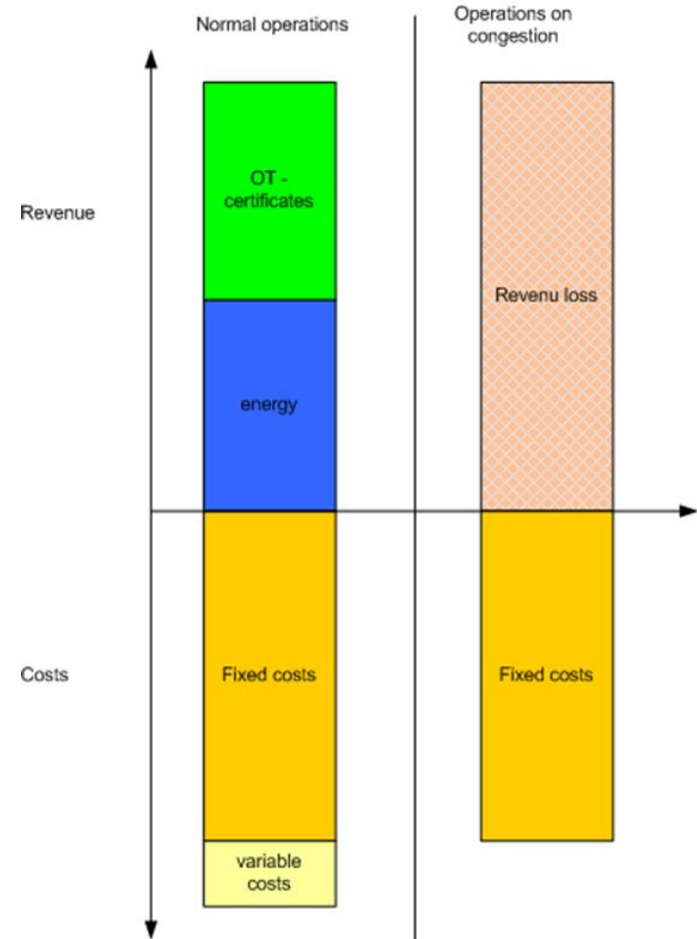
# IMPACT ON GENERATOR AND BRP



# IMPACT ON GENERATOR (1)

Project owner

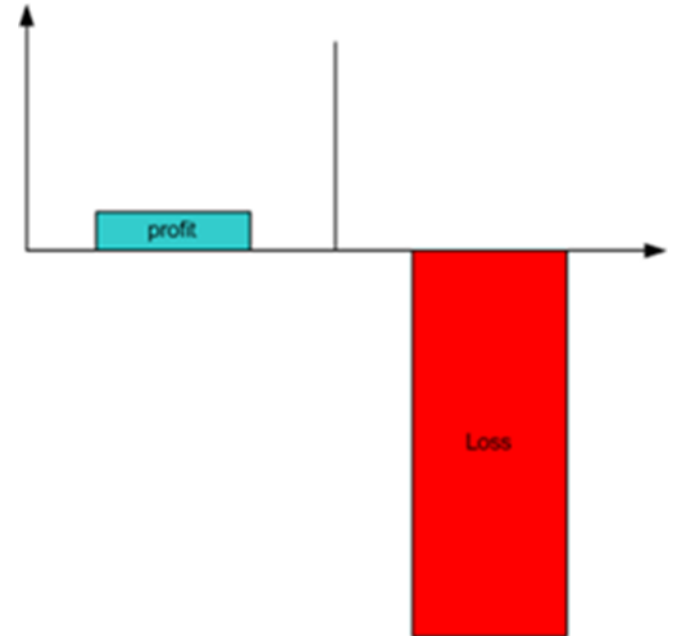
- Over lifetime of a project (e.g. wind)
  - Investment decision is based on a positive business case and sufficient Return on Investment
  - Fixed costs of wind turbines are rather high and stable over time
  - Revenues (sale of energy and support) are based on output and dependent of generated energy (operating hours)
  - A wind project needs to have a minimum amount of operating hours to be profitable
  - Curtailment of generation for congestion leads to:
    - Loss of revenues
    - Additional uncertainty





# IMPACT ON GENERATOR (2)

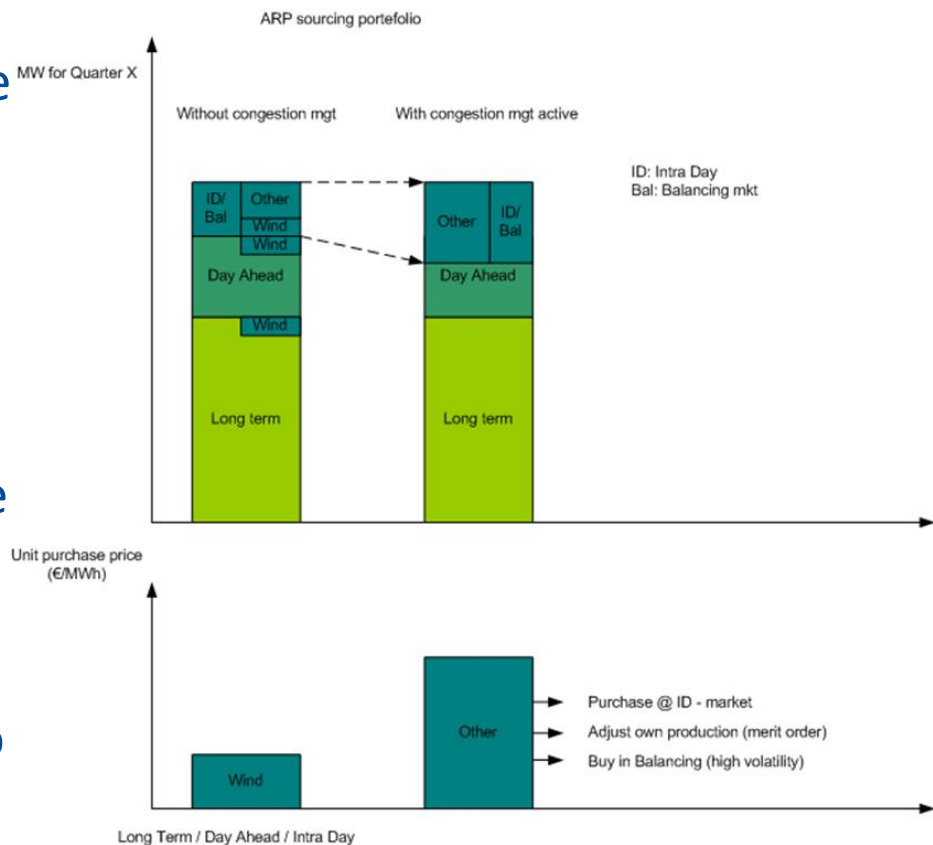
- On quarterhourly basis:
  - Curtailment of generation – at a moment output was expected – leads to a loss instead of revenues





# IMPACT ON BRP (1)

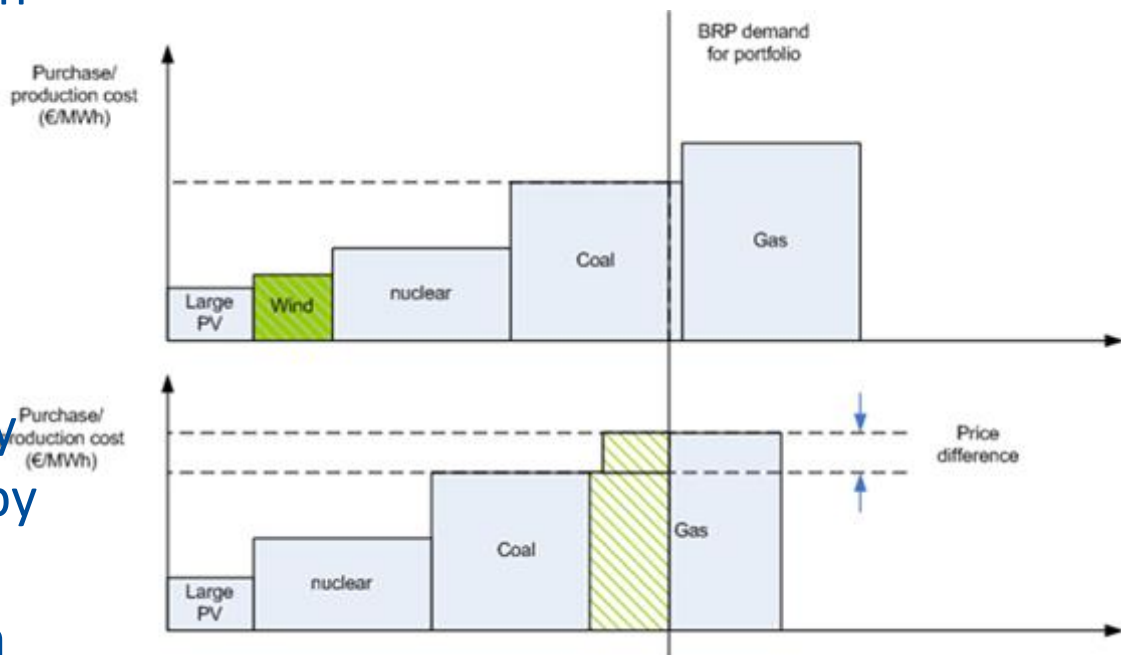
- On quarterhourly basis (e.g. wind):
  - Wind generation is part of the sourcing portfolio of a BRP in order to cover demand of his customers
  - Generation that is forecasted for the different timeframes (forward, day-ahead and intraday) and that is not there due to curtailment, needs to be replaced by other generation
  - Replacement energy needs to be sourced on the day-ahead, intraday or balancing market





# IMPACT ON BRP (2)

- Merit order:
  - Scheduled optimisation (merit order) is disturbed
  - Costs for sourcing or generating energy will increase as the non-generated wind energy needs to be replaced by other – usually more expensive - generation





# CONSEQUENCES

Any uncertainty created via the connection agreement will result in a higher risk **increasing financing costs** of a project (higher loans)

Loss of quality of generated energy will result in a **reduced contract price paid by BRP/retailer** to GU further impacting the profitability of project



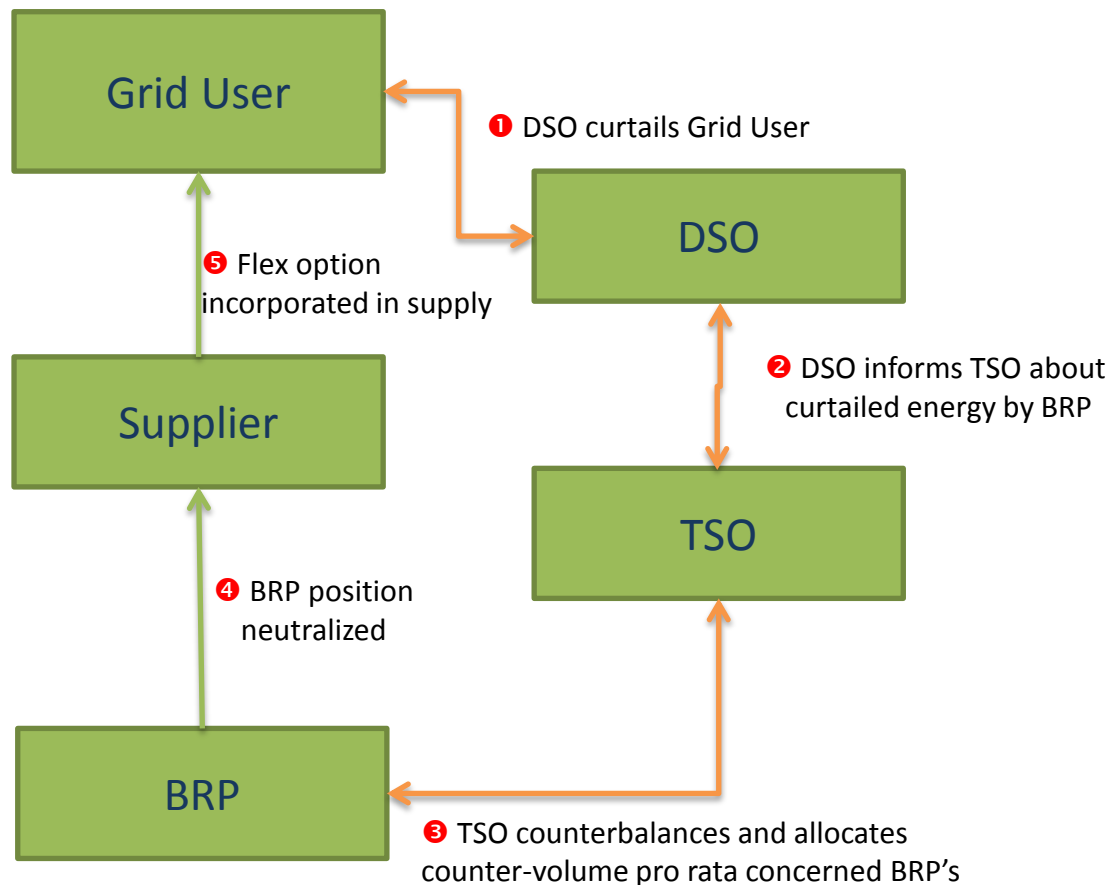
Congestion management

# CONGESTION MANAGEMENT MODEL





# CENTRAL DISPATCHED CURTAILMENT



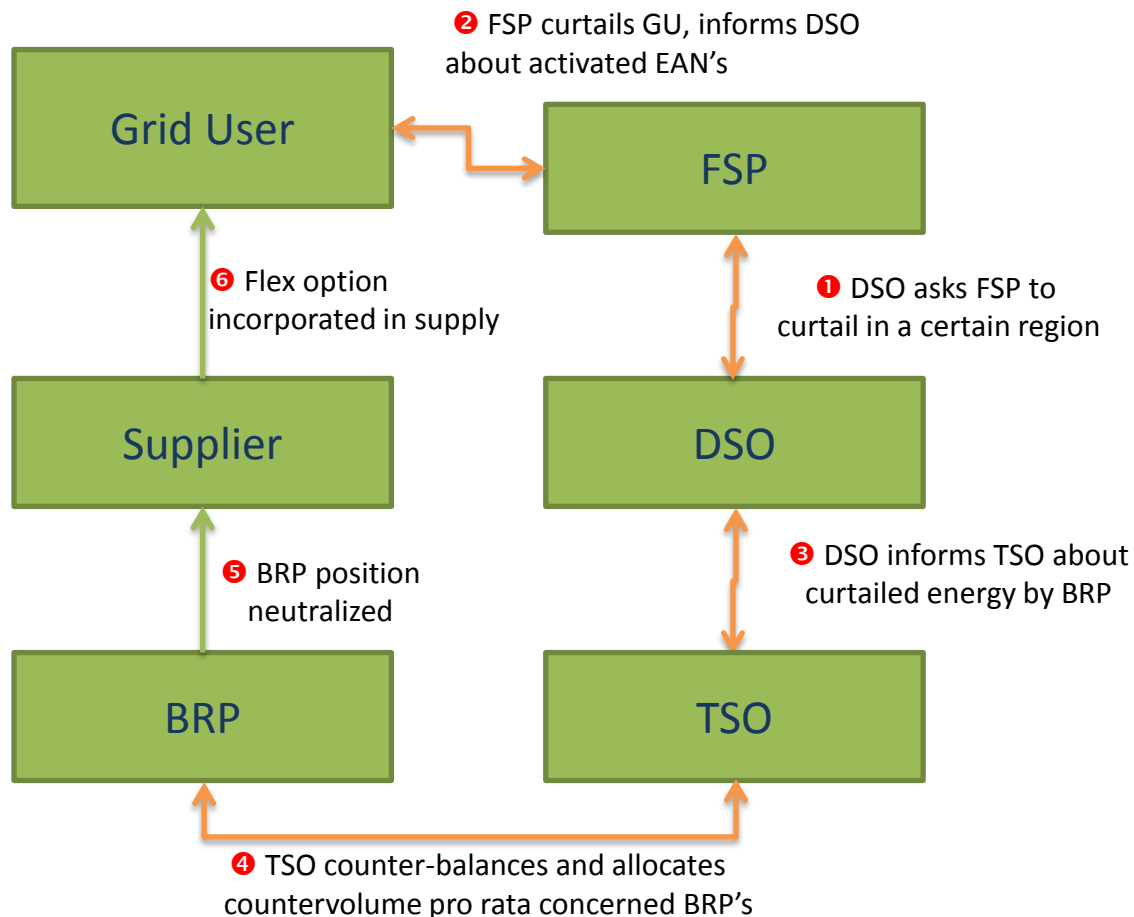
+ Impact on balancing market is neutralized  
+ Activation flexibility is controllable

## Examples:

- Flexible access for generation (volume based activation)
- Load shifting by DSO (volume based and price based activation)



# COMMERCIAL FLEXIBILITY

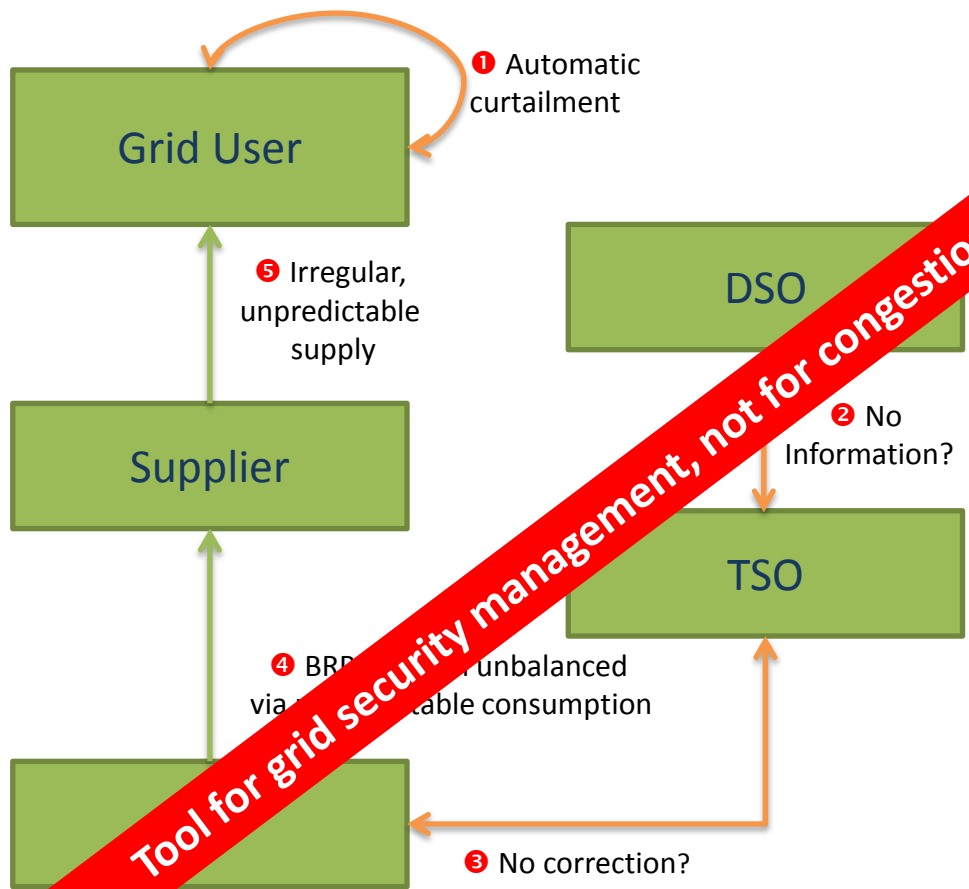


- + Impact on balancing market is neutralized
- + Activation flexibility is controllable
- + Development flexibility market

Example:  
- Commercial flexibility services offered by FSP to DSO



# DECENTRAL DISPATCH CURTAILMENT



**Tool for grid security management, not for congestion management**

- Congestion risks
- Access to market parties
- High macro-economic costs
- Uncontrollable for grid user and SO
- Impact on balancing market
- High risk of chain reaction in system

Example:  
- Curtailment PV (automatic, frequency level)



# VARIABLE GRID TARIFFS

Some DSO's consider variable grid tariffs to reduce and/or shift load in order to limit the risk of congestion

- Commodity price signal could be opposite to the grid tariff counter-acting the desired effect
- Uncoordinated price signals are contrary to the SPOC-role of the supplier
- BRP will be impacted and should be neutralized
- Impact of the tariff is not guaranteed because the grid user is free to respond or not
- A real congestion issue requires a volume based activation with guaranteed result
- DSO would in fact become a FSP (= commercial activity) instead of user/buyer of flexibility
- Dynamic tariffs undermine the incentive to invest in grid reinforcements to resolve congestion as the DSO benefits of (unintended) revenues, i.e. high tariffs during peak load times with high risk of congestion

Are variable grid tariffs an appropriate and proportionate measure?



# BALANCE OF SYSTEM IS KEY

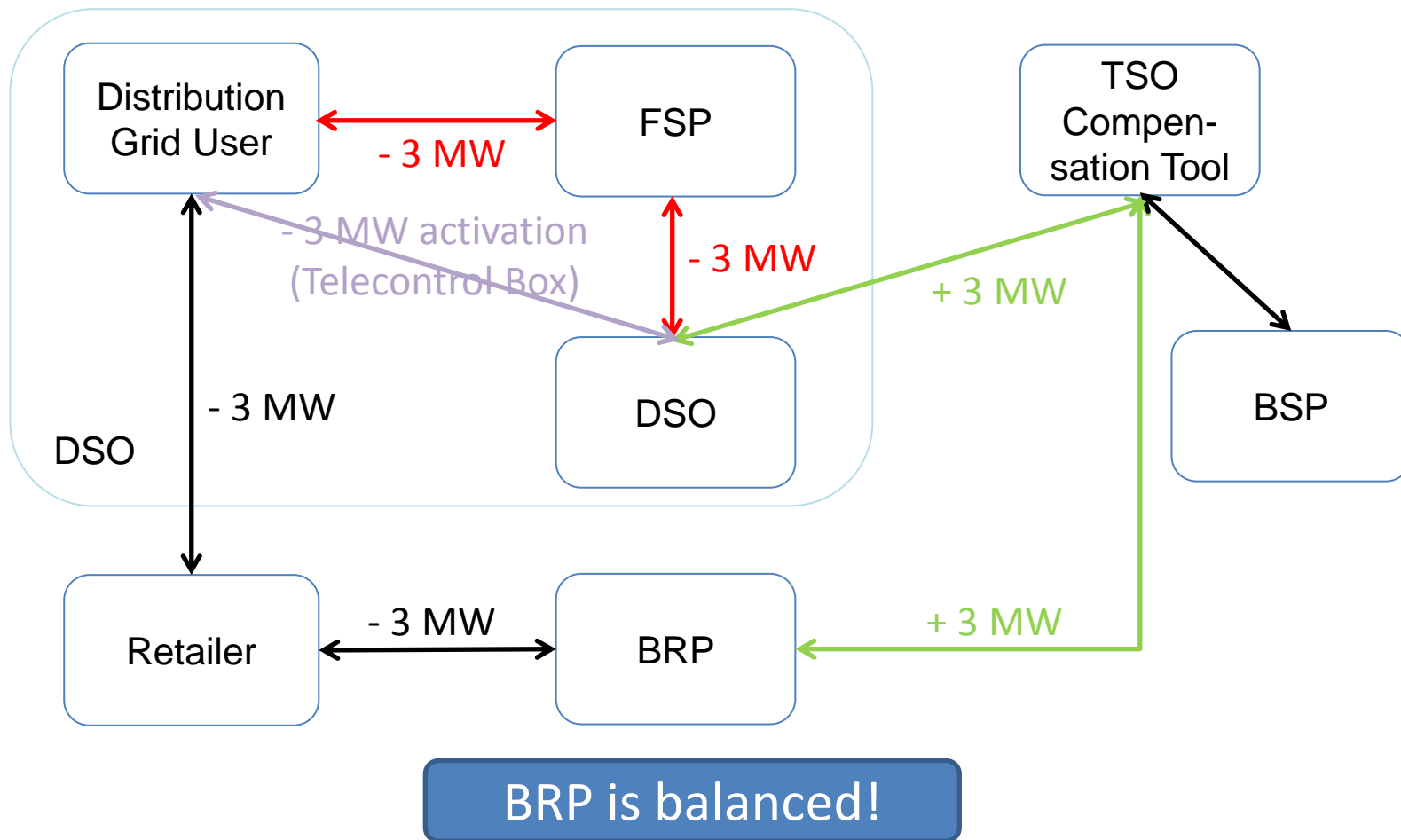
- FEBEG congestion management model is based on neutralizing impact on balancing market ('redispatch')
- Model integrates options 'Central Dispatched curtailment' and 'Commercial flexibility'
- Inspired by Elia congestion rules in 'CIPU':
  - Outcome of learning curve
  - EU supported system
  - Respects the BRP-balancing obligation

Main goal: system balance is guaranteed (on BRP portfolio level) at all times



# GENERAL PROCESS

Congestion bids = compensation bids





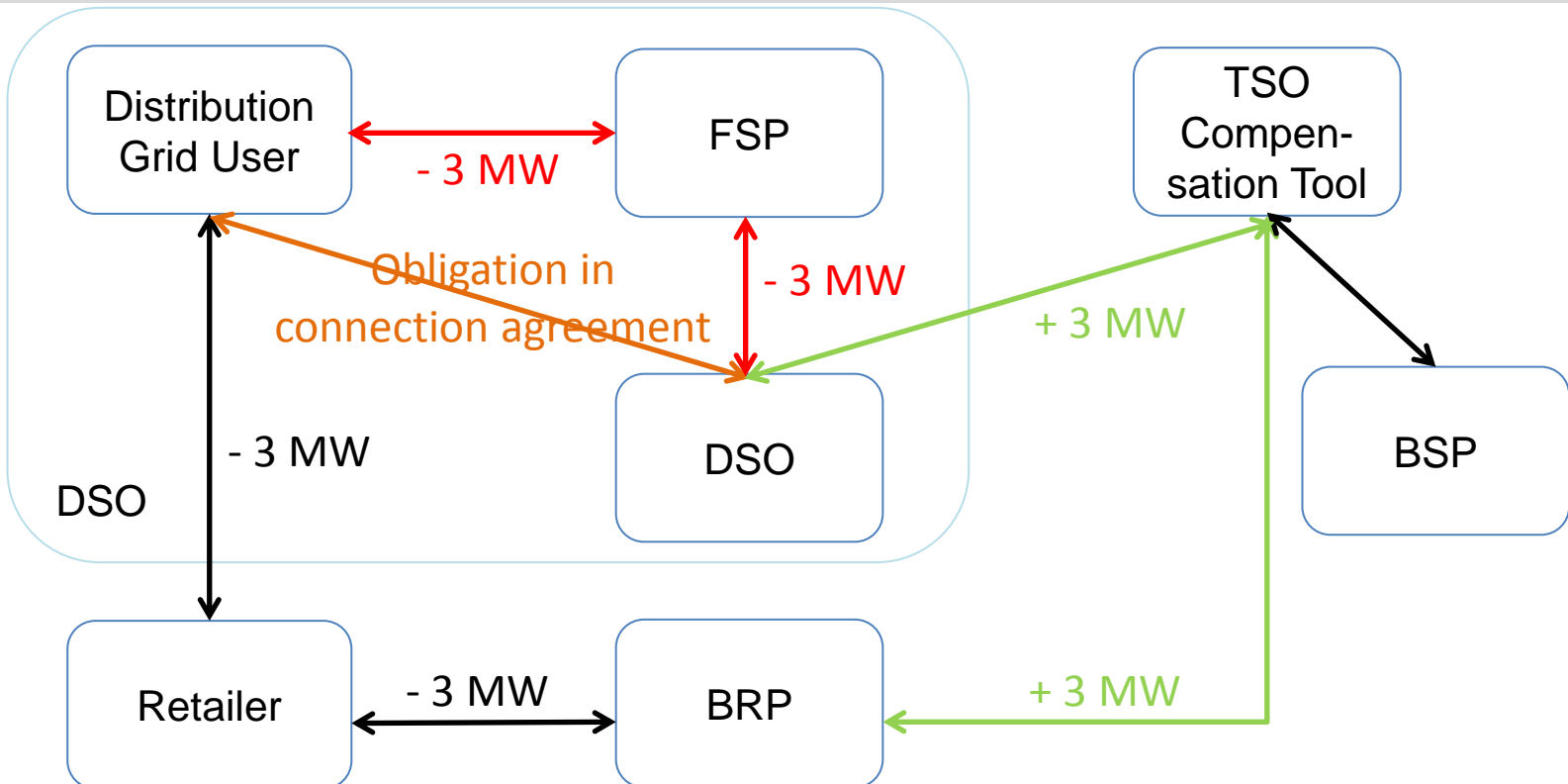
# CONGESTION BIDS = COMPENSATIONS BIDS

- Congestion bids: DSO adapts generation (= curtailment) to deal with system constraints
  - Connection agreement: technical flexibility **imposed in the connection agreement** between GU and DSO
  - Commercial agreement: flexibility services offered **on a voluntary basis** to a DSO, e.g. generation down by GU with firm capacity or consumption up
- Compensation bids: DSO activates a compensation bid on the TSO Compensation Tool in order to compensate for the impact of the curtailment

Transfer of energy via automatic correction of BRP perimeter via TSO on request of DSO.

# OBLIGATORY CONGESTION BID

- Technical flexibility is imposed in the connection agreement between GU and DSO
- GU becomes FSP or signs a flexibility services agreement with a FSP
- FSP is obliged to make a congestion bid to the DSO according to the specific requirements in the connection agreement with regard to the technical flexibility, i.e. curtailment of generation
- DSO decision to activate or not

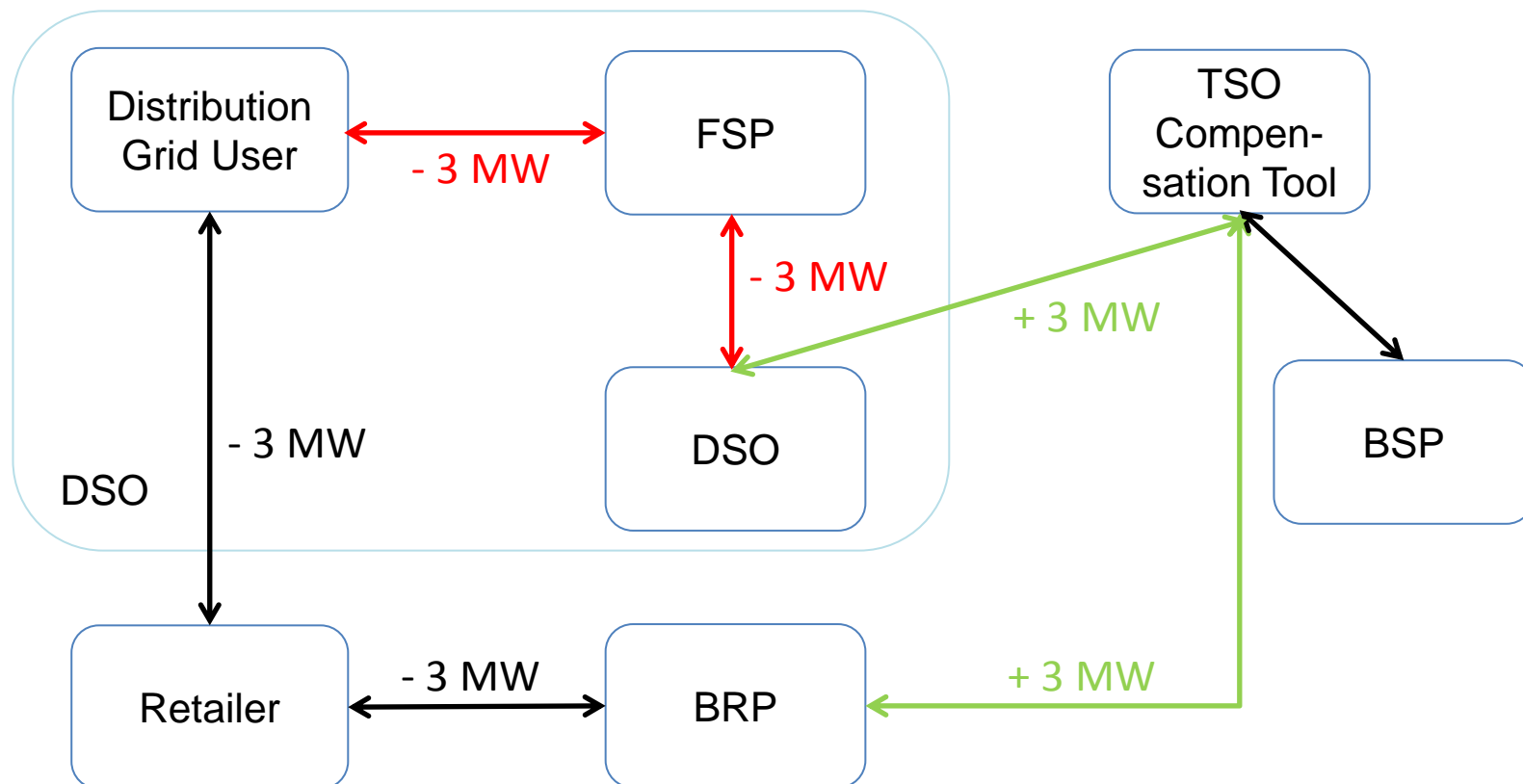






# VOLUNTARY CONGESTION BID

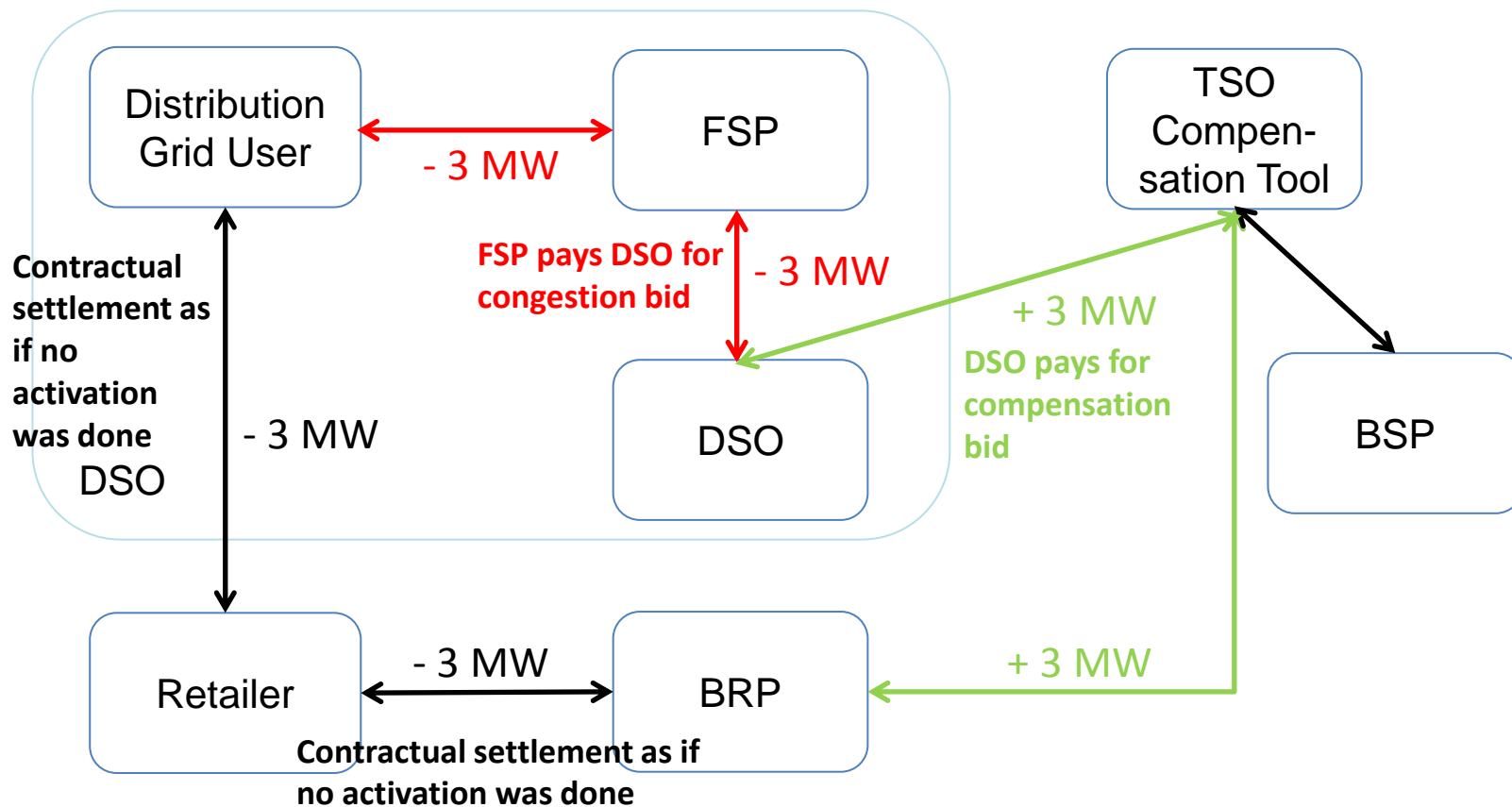
- GU becomes a FSP or signs a flexibility services agreement with a FSP
- FSP makes a voluntary congestion bid to the DSO, i.e. curtailment of generation or increase of consumption
- DSO decision to activate or not





# FINANCIAL FLOWS

- Curtailed volume is generated by other generator or compensated by load shedding
- Grid user will be paid by retailer/BRP for production as if no activation was done
- FSP pays variable running costs to DSO (fuel cost, CO<sub>2</sub> costs, maintenance, ... - green certificate\*)
- DSO pays TSO for compensation bid





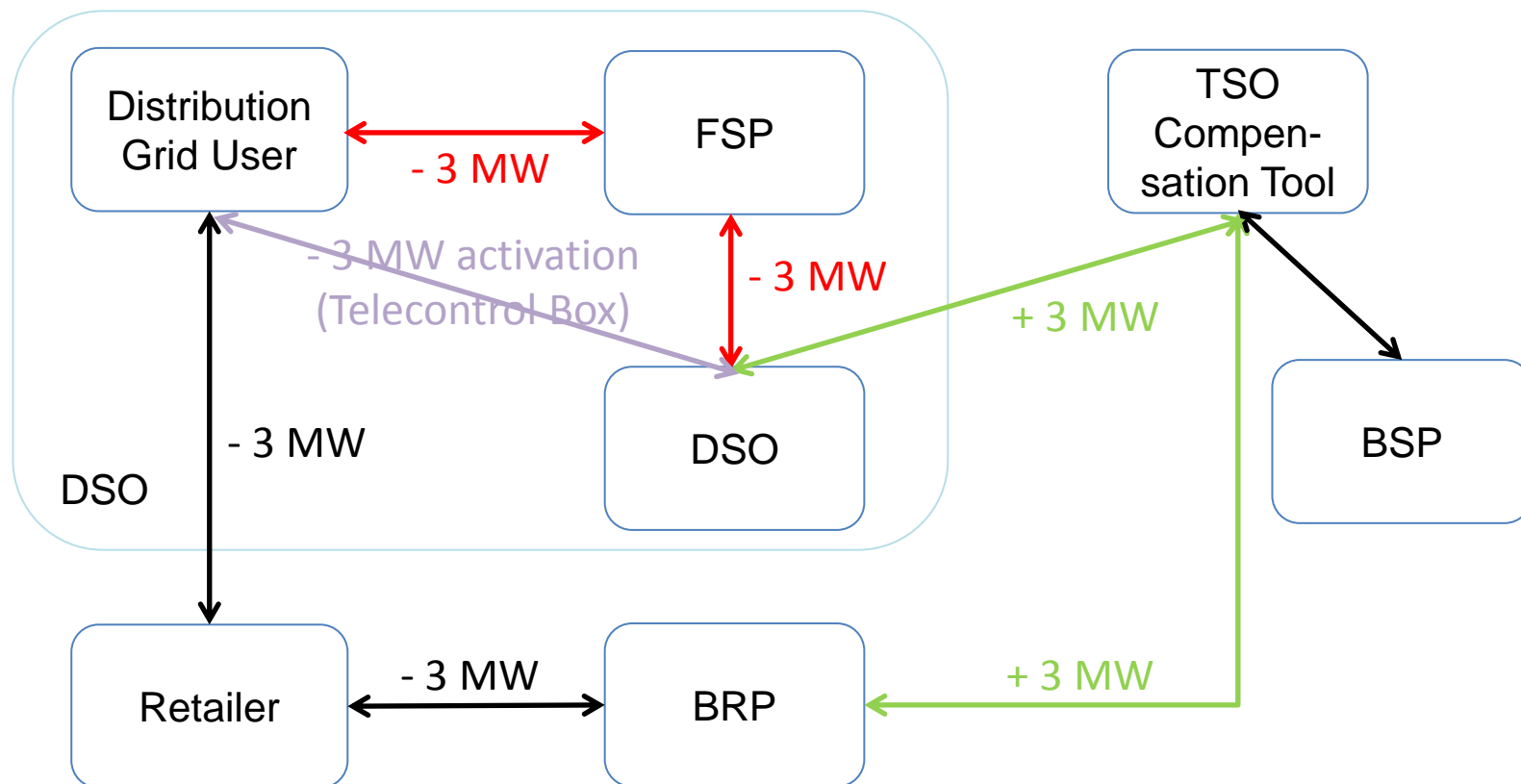
# COMPENSATION BIDS

- Only TSO can counter-balance BRP
- Need of cooperation between DSO and TSO
- TSO Redispatch Tool:
  - To maximise liquidity, at least following means should be available via TSO Redispatch Tool:
    - Bidladder: compensation bids should have a locational signal
      - Skip bids to avoid congestion
      - Select specific bids to compensate locally
    - CIPU: compensation bids by units connected to the transmission grid
  - Remuneration of compensation bid will generally be cheaper than imbalance price (imbalance price is cap)



# VOLUMES FOR COUNTER-BALANCING

- In case of curtailment DSO sends a setpoint to the FSP/GU (e.g. maximum generation of 7 MW)
- DSO estimates the curtailed volume based on a 'reference profile' (e.g. reference profile of 10 MW – setpoint of 7 MW = 3 MW)
- Estimated curtailed volume will be used for counter-balancing, e.g. 3 MW





# REFERENCE PROFILE

## Basic principle

- DSO needs a reference profile to determine the activated volume (= non-generated energy) for counter-balancing and settlement
- **Free choice of generator** between 'nominations' and 'reference profile based on historical data'

## Nominations

- Nominations are the most accurate estimations by a BRP
- **Nominations ensure coherence between markets** and enhance the flexibility market (respect of the flexibility value chain)
- Nominations allow trade-off for use of flexibility in different markets, e.g. nominations are already used to valorise flexibility in the balancing market (R3 'Dynamic Profile')

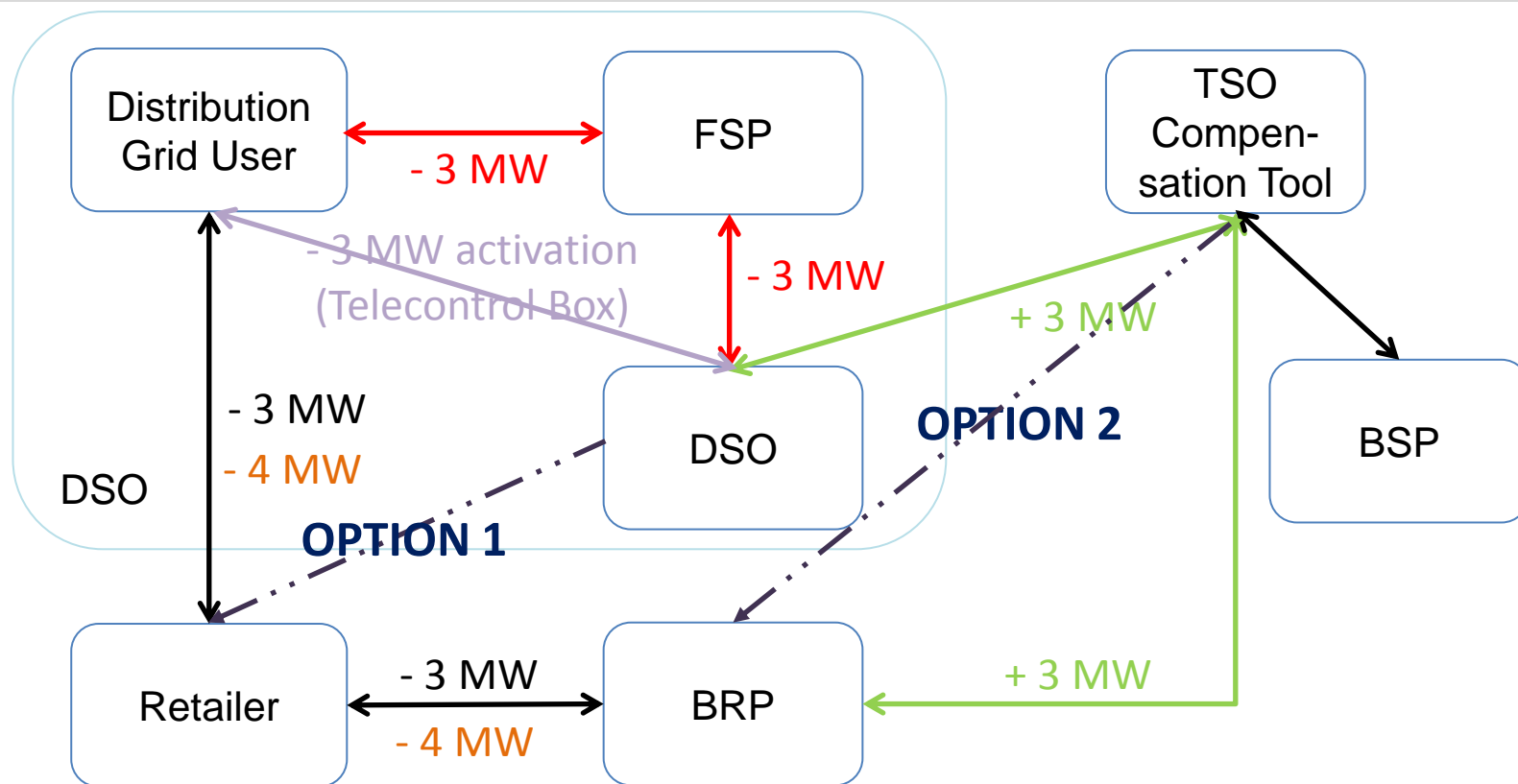
## Historical data

- **Distinction between controllable** (e.g. biomass, cogeneration, gas motor, ...) **and limited controllable** (e.g. wind turbines) units
- Controllable units: reference profile based on historical data of specific unit
- Limited controllable units: reference profile based on historical data in a geographical area, e.g. country, region, province, ... (= proposal Elia)



# SETTLEMENT OF DISCREPANCIES

- Discrepancies = difference between estimated curtailed volume and realized curtailed volume, e.g. realized -4 MW instead of requested -3 MW
- Option 1: DSO informs retailer about discrepancies to be settled between retailer and GU
- Option 2: TSO informs BRP about discrepancies via the imbalance billing
- Option 3: ...



**BRP is not balanced!**



# ADVANTAGES

- No impact on commodity/balancing market (perimeter BRP)
- Proposal integrates existing tools or tools under development, e.g. know-how of bidladder
- Proposal could strengthen - if future integration of redispatch tool in bidladder - the balancing market creating liquidity
- Proposal looks for most cost-efficient solution
  - Most favorable congestion bid (merit order)
  - Cheapest compensation bid in whole system (merit order)
  - DGO cost is limited to difference between both (net cost is incentive to invest)
- Extendable to other cases, e.g. generation up, load down and up
- Neutral for BRP, retailer and grid user
- Level playing field between grid users



Congestion management

# OPTION OF FREE BAND





# CONCEPT OF FREE BAND

CURRENT SITUATION

SO PROPOSAL

FEBEG COUNTER-PROPOSAL

Existing connection

New connection

Existing connection

New connection

FIRM CAPACITY

FREE BAND

OBLIGATORY CONGESTION BID (IMPOSED BY CONNECTION AGREEMENT)

VOLUNTARY CONGESTION BID

FIRM CAPACITY

OBLIGATORY CONGESTION BID (IMPOSED BY CONNECTION AGREEMENT)

Free band is obligatory flexibility without compensation!

Only acceptable, if FEBEG congestion management model is fully applied!



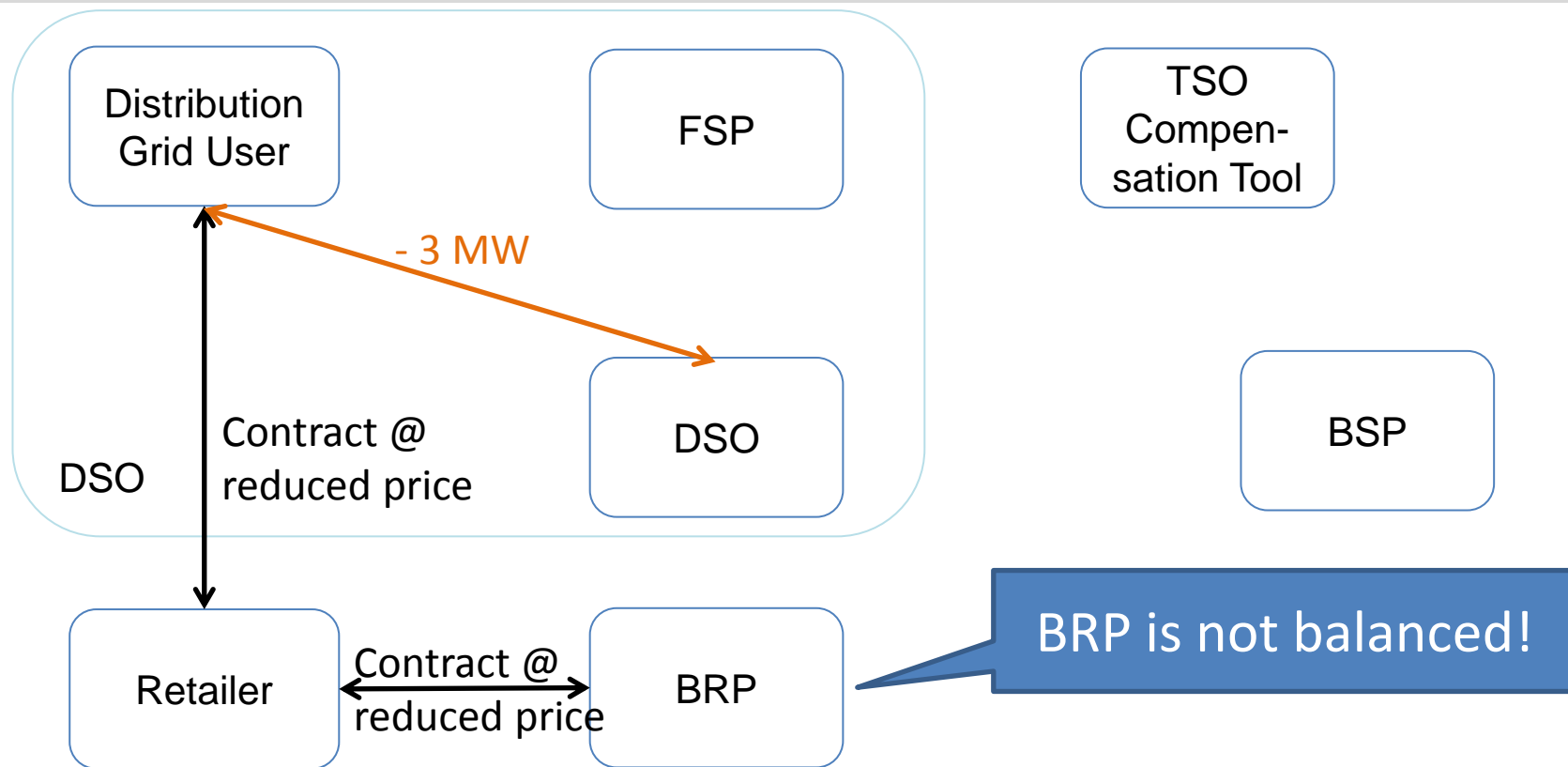
# OVERVIEW TYPE OF CONTRACTS

Categories	Contracts	Bids	Counter-balancing
Firm capacity	Existing contracts with firm capacity	No congestion bids	n.a.
Voluntary flexible capacity	Existing contracts with firm capacity	Voluntary congestion bid	Yes
Obligatory flexible capacity	New contracts with flexible access (including obligation to make congestion bid)	Obligatory congestion bids	Yes
Free band	New contracts with flexible access	No congestion bid	No (resulting in a contract price between BRP/retailer and GU @ reduced price)



# PROCESS FREE BAND

- No congestion bids and no payments towards DSO: free band is compensation issue!
- No counter-balancing by TSO initiated by DSO
- Loss of quality of generated energy resulting in a reduced contract price paid by BRP/retailer to GU
- Free band could be integrated in FEBEG congestion management model (settlement discrepancies, ...): no additional operational processes needed





# MACRO-ECONOMIC ASSESSMENT

- Option of free band is a **political decision**
- **Need for macro-economic assessment showing 'social welfare'** of introducing a free band, taking into account:
  - Maximum integration and promotion of renewables while free band has an impact on the profitability of renewables projects
  - Objective to incentivize to build renewables in non-congested zones, but what about incentive for DSO to invest in the grid
  - Fair split of costs between involved parties
- **Other prerequisites** for introducing a free band:
  - More transparency on congested zones
  - Transparency on methodology for the determination of the free band
  - Free band should be **known upfront**, i.e. before investment decision, and is thus only applicable on new connections

If free band would be considered, then only within restrictive, transparent and non-discriminatory legal framework



# LEGAL FRAMEWORK

Legal framework is necessary to guarantee the incentive for DSO's to invest in the grid!

- Only in congested zones (and thus not everywhere)
- Only temporary pending grid investments (and thus not permanently)
- General rule (in grid code) or negotiable on individual basis (in connection agreement)?
- Interruptibility = fixed %? Peak, volume, time, ...?
- ...



Congestion management

# PRE-QUALIFICATION



# SIMULTANEITY FACTOR

- Grids are designed taking into account a 'simultaneity factor'
- Flexibility increases simultaneity:
  - Direct: activation by FSP
  - Indirect: rebound effect

**Larger simultaneity increases risk for congestion**

SO have set up a pre-qualification process, because they want to

- know – by EAN – the contracted volume of flexibility
- be able to refuse flexibility in certain zones
- be allowed to put certain limits/conditions to the use of flexibility



# NEED FOR PRE-QUALIFICATION?

- **Core business** and legal competence of SO is to manage the grid, including assessing the risk of voltage instability and overloading of the grid
- As all stakeholders have to go through a **learning process** (objective of the pilot), FEBEG understands the DSO concerns and the reasons for the current pre-qualification process

Is the pre-qualification process an enduring solution?





# HURDLE FOR MARKET DEVELOPMENT

- Costs for pre-qualification are increasing risk margin and are to be seen as an entry barrier because costs are made without guarantee that flexibility service will be contracted
- Costs should be assessed and approved by regulator
- Are costs in line with Energy Efficiency Directive (article 15.4)?

‘Member states shall ensure the **removal of those incentives** in transmission and distribution tariffs that are detrimental to the overall efficiency (including energy efficiency) of the generation, transmission, distribution and supply of electricity or those **that might hamper participation of demand response, in balancing markets and ancillary services procurement**. Members states shall ensure that network operators are incentivized to improve efficiency in infrastructure design and operation, and, within the framework of Directive 2009/72/EC, that tariffs allow suppliers to improve consumer participation in system efficiency, including demand response, depending on national circumstances.’

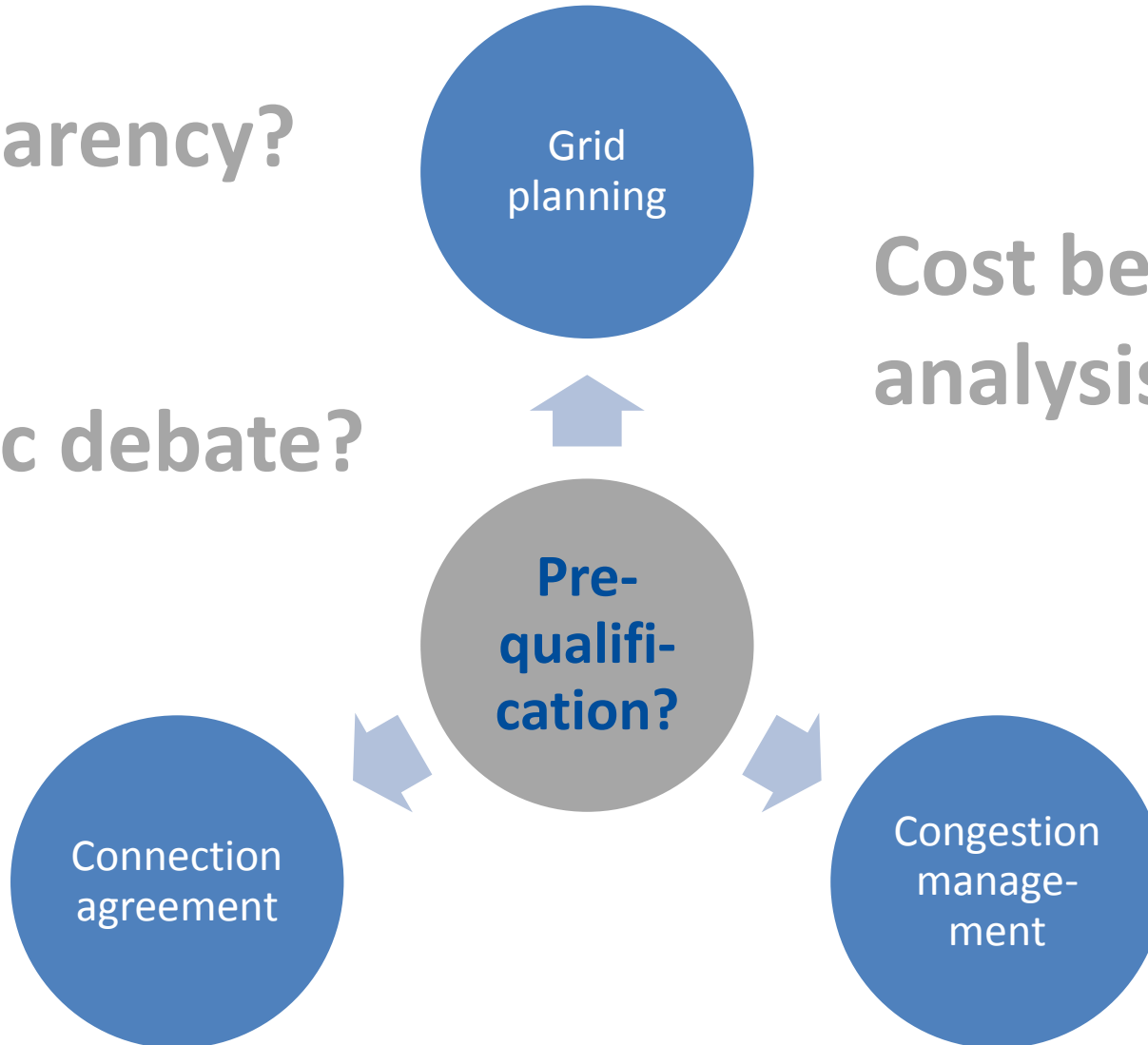


# PRE-QUALIFICATION AS ENDURING SOLUTION?

Transparency?

Cost benefit analysis?

Public debate?





# CONNECTION AGREEMENT

- Connection agreement allows off-take within certain limits:
  - Pre-qualification was mainly used to check compliance with connection agreement rather than to assess simultaneity
  - How (Legal basis? Compensation?) can pre-qualification lead to a reduction of limits in connection agreement?
- DSO should establish a procedure to review connection agreements:
  - Compliance with technical requirements
  - Anticipate (part of) simultaneity effect
- If a grid user wants to start using its flexibility, this should not be a problem of FSP, but of grid user

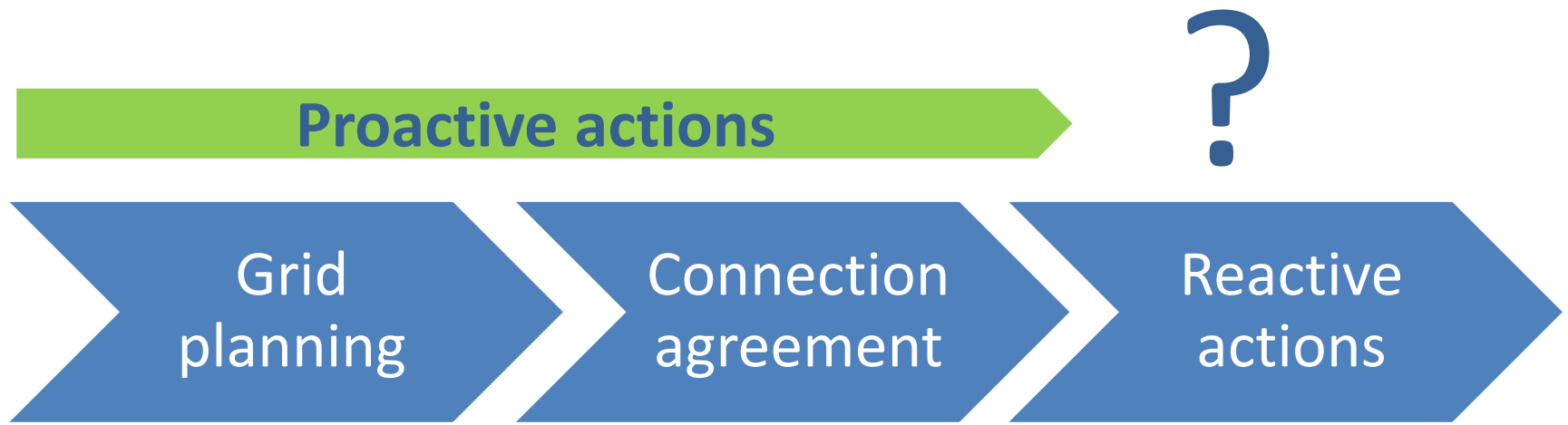


# CONNECTION AGREEMENT REVIEW

- Clear, transparent and coherent legal and contractual framework:
  - Clear definitions
  - Alignment between DSO's and with TSO
  - No discrimination (acceptance criteria load/injection, ...)
  - Transparency (acceptance criteria, alternatives, ...)
  - Acceptable liability regime
- Sufficient time:
  - During prequalification process
  - To full formalities after prequalification process (alignment with other processes)
- More dynamic approach:
  - What if a unit is not available part of the year (e.g. maintenance)?
  - Integration seasonality of certain processes (e.g. greenhouses)



# EVOLUTION TOWARDS TO CLOSE TO REAL-TIME CONGESTION MANAGEMENT



Need for balance between proactive and reactive actions

- Activation standard or negotiated flexible connections
- Buying back of capacity
- Activation of voluntary flexibility bids
- ...



# TO INVESTIGATE ...

- Need for **interactive, more transparent and closer to real-time process**:
  - Consecutive process (forecast, day-ahead prevision, close to real time information, ...)
  - SO's provide information about (risk of) congestions
  - BSP's/FSP's provide information about available flexibility and planned flexibility actions

**SO manages the congestion by cancelling planned flexibility actions or activating available flexibility**

- Process should eventually – after cost benefit analysis - evolve towards **real-time congestion management**



# NO SUCH THING AS 'RED ZONES'

- 'Red zones' – like on the Elia grid - are not acceptable
- Disadvantages:
  - SO can decide unilaterally without compensation
  - Normal rules (CIPU) should be applied -decremental and incremental bid - without exceptions
  - Incentive for grid investment is missing
  - Discrimination between units (CIPU and non-CIPU units)
  - Undermines even further the profitability of power plants (additional external risk)



# CONTENT

## Concepts

- Definition of flexibility
- Flexibility usage
- Principles of market design
- General recommendations

## Different market parameters

- Load types
- Remuneration types
- Activation forms
- Different markets

## Market roles

- Description of roles
- Responsibility grid user
- Flexibility register
- Metering
- Centrale role BRP
- SO as market facilitator

## Supply flexibility and diverted energy

- Distinction supply flexibility and diverted energy
- Impact on supply contract
- Transfer price
- Determination activated energy

## Congestion management

- Introduction
- Impact on generator and BRP
- Congestion management model
- Option of free band
- Prequalification

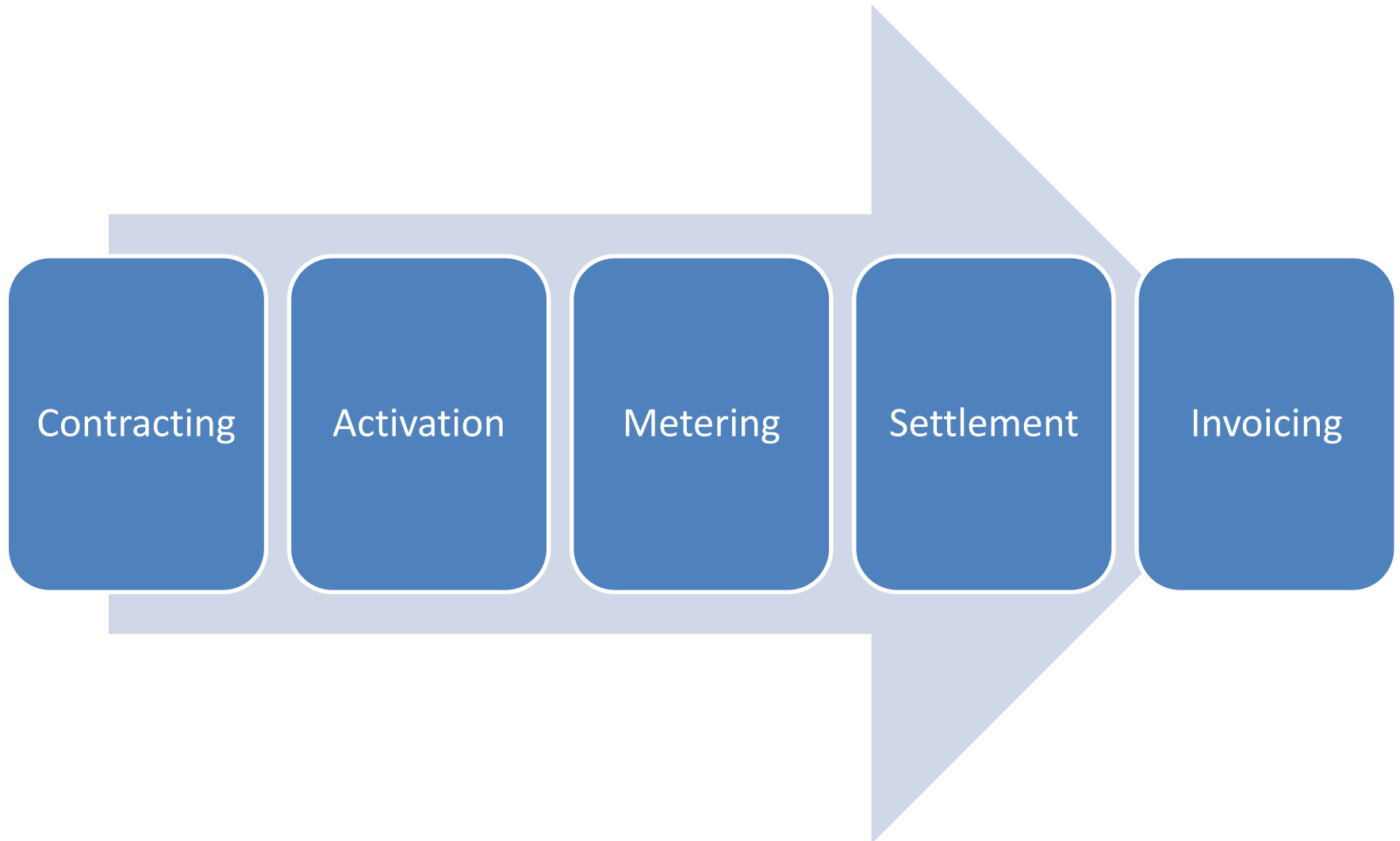
## Process flows

- Overview processes
- Single BRP
- Inter BRP – copper plate
- Congestion management





# OVERVIEW PROCESSES





# SINGLE BRP

## Contracting

- FSP and BRP sign a Flexibility Services Contract for aggregated portfolio
- FSP signs a Flexibility Services contract with GU in portfolio of BRP
- FSP needs an access contract with DGO
- Access register for flexibility:
  - FSP has rights and obligations
  - Procedure for modifications/switches
  - Relation FSP-BRP by EAN
- GU is responsible for informing market parties which he has a contract with

## Activation

- BRP sends activation request to FSP
- FSP activates GU
- FSP informs BRP

## Metering

- Validated AMR-meter data will be used for the settlement process (market settlement)
- DGO sends meter data to BRP in near real time

## Settlement

- Contractual settlement (GU-FSP-BRP) is based on a commercial agreement and is defined by contractual parties, e.g. validated meter data/own meter data, references curves/method, calculated flexibility volume, ...
- Validated ARM meter data will be used for the settlement process (volume settlement)

## Invoicing

- Invoicing according to commercial contracts



# MULTI-BRP (COPPER PLATE)

## Contracting

- FSP signs a Flexibility Sourcing Contract with the Source BRP (market based transfer price and reference curve)
- FSP signs a Flexibility Services Contract with the Requestor BRP (flexibility services and transfer of energy)
- FSP signs a Flexibility Services contract with GU
- FSP signs a contract with a 'broker BRP' allowing him to transfer energy on OTC market
- FSP needs an access contract with DGO
- Access register for flexibility
  - FSP has rights and obligations
  - Procedure for modifications/switches
  - Relation FSP-BRP by EAN
- GU is responsible for informing market parties which he has a contract with
- Supply Contract will integrate flexibility: source BRP will include the ramp-up and rebound)

## Activation

- BRP sends activation request to FSP
- FSP activates GU

## Metering

- Validated AMR-meter data will be used for the settlement process (market settlement)
- DGO sends meter data to BRP in near real time

## Settlement

- Exchange of energy via OTC market
- Source BRP-BRP and FSP need to prove the activated flexibility via the available metering data on EAN basis (commercial settlement):
  - Settlement of contract between parties is executed (freedom regarding reference curves, submetering, settlement prices, ...)
  - Discrepancies are settled at imbalance price
- Contractual settlement (GU-FSP-Requestor BRP) is based on a commercial agreement and is defined by contractual parties, e.g. validated meter data/own meter data, references curves/method, calculated flexibility volume, ...
- Validated ARM meter data will be used for the settlement process (volume settlement)

## Invoicing

- Invoicing according to commercial contracts



# CONGESTION MANAGEMENT

## Contracting

- Connection Agreement
  - GU signs new connection agreement with DSO defining flexibility modalities
  - GU will have to respect limits of its existing connection
- GU that wants to sell a voluntary congestion bid has to sign a Flexibility Services Agreement with a FSP
- DSO has the option to sign a Flexibility Services Agreement with FSP allowing FSP to submit voluntary congestion bids
- FSP via BSP can sign a Flexibility Services Agreement with TSO allowing him to provide compensation bids
- FSP needs a Flexibility Access Contract with the DSO
- Supply Contract between GU and supplier should include that – in case of compensation – the contract will be settled as if no activation was done; that ramp up, rebound and free band will have impact on the energy volume and price; the settlement of discrepancies

## Activation

- DSO's monitor congestion and calculate – on a quarterhourly basis – the energy to be curtailed in a certain zone
- DSO selects a GU or FSP according to merit order
- DSO sends a signal to the selected GU or FSP (setpoint) by quarter hour
- DSO sends the information to the activation register
  - DSO's set up a flexibility activation register and keep it up-to-date at all times
  - Register receives the to be activated capacity from DSO, calculates the flexibility volume based on a reference curve and communicates in real time to the relevant market parties
- Activation register communicates the activated volumes to the BRP, FSP and TSO
- TSO compensates the activated volumes via compensation bids according to merit order

## Metering

- Only EAN's equipped with telemeasurement (AMR) on 15 minutes basis can participate

## Settlement

- Flexibility activation settlement
  - TSO will take activation into account in the imbalance settlement of the BRP
  - BRP/supplier settles Supply Contract as if no activation was done
  - DSO informs the BRP/supplier about the aggregated requested and realized capacity activation (supplier is by EAN)
- Discrepancies settlement
  - DSO calculates discrepancies
  - TSO or DSO informs BRP/supplier of discrepancies
  - BRP/supplier settles discrepancies with GU

## Invoicing

- Invoicing according to contracts



# QUESTIONS





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