

Demand Response as per the EU Clean Energy Package

The independent aggregator framework and models

Principles and transposition

Helsinki, 3rd Feb. 2020

DR in all electricity markets as an alternative to generation

- Demand reduction is a technical alternative to supply
- DR is a solution to reduce sourcing costs for all
 - Avoid high costs / volatility in the market
 - Improve reliability and stability
 - Use renewables more effectively
 - Benefits for all suppliers, hence all consumers
 - Additional benefits for participating suppliers & consumers
- CEP defines principles to ensure fair and efficient framework
 - Improve consumers' market power and benefits
 - Level-playing field with producers, no discrimination
 - Ensure: no cost for suppliers, incentives to all to participate
 - Prohibit: over-compensation of suppliers, barrier to demand response

The pivotal issues to solve: balance responsibility, imbalances, compensation



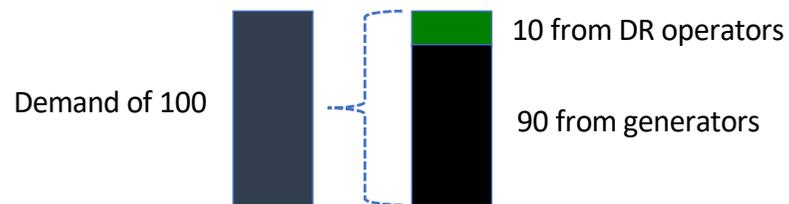
= 'long'

Aka 'positive imbalances'

- Claim from suppliers
 - *They say DR from independent aggregators will throw them out of balance*
 - *They would face additional (balancing) costs*
 - *Consumers would ultimately bear these costs if not compensated*
- 3 questions to address
 - Do suppliers bear costs and if any, which / why so?
 - What about benefits?
 - Imbalances?

DR in the market: 'alternative' MWh-s sold instead of (expensive) generation

Wholesale markets
(in advance)



Via wholesale markets (i.e. in advance)
consumption forecast is balanced by purchases

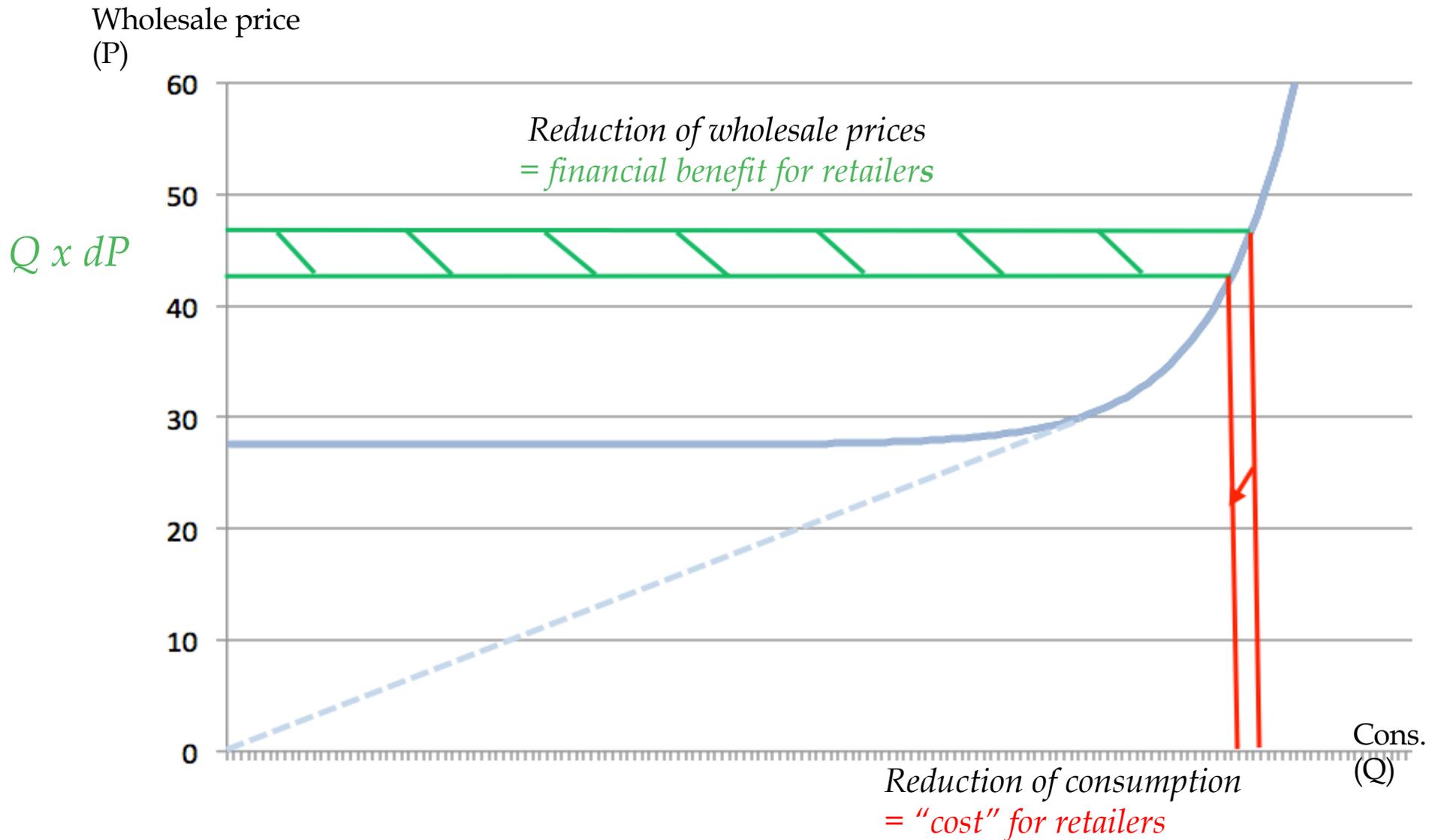
The more DR is sold, the less generation

⇒ **Most expensive generation is avoided**

⇒ **Lower market price**

⇒ **Lower sourcing costs for all suppliers**

DR in the market to reduce high prices



Example

Request from retailers 60 000 MWh
Market price without DR 70 €/MWh

DR offered in the market 100 MWh
Other bids = generation 59 900 MWh
Leading to a market price reduced to 68 €/MWh

Windfall profit for retailers $(70 - 68) * 60.000 = 120 \text{ k€}$

Cost for retailers:

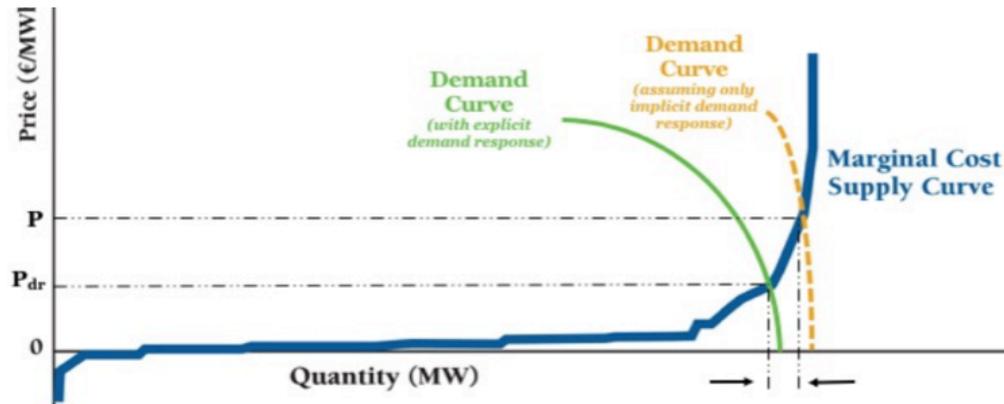
Volume of DR bought without selling to consumers 100 MWh
Price paid for DR = market price 68 €/MWh
Cost for retailers 6.8 k€

Benefit / cost ratio $120 / 6.8 = \times 18$

**Demand Reduction benefits all retailers
by avoiding high market prices**

DR in European markets: benefits >> 10 x costs

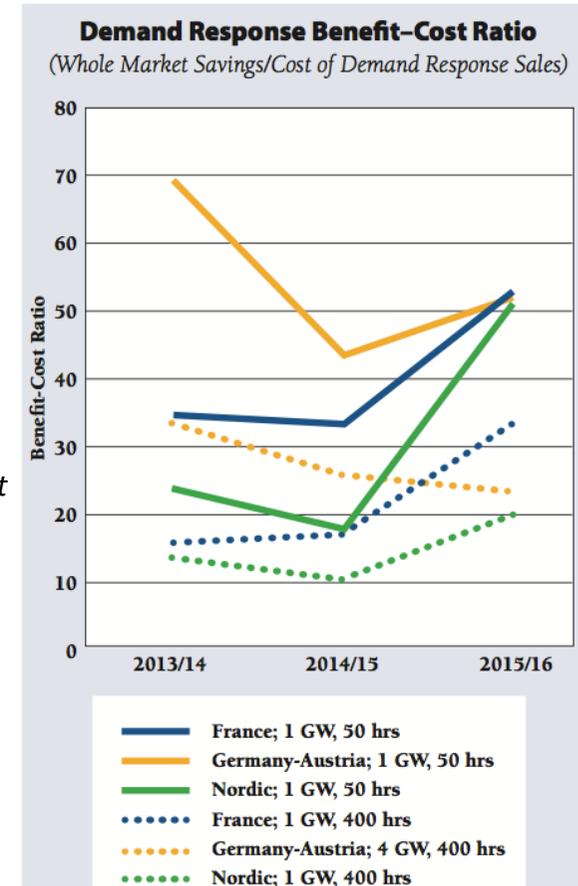
Explicit Demand Response Reduces Wholesale Electricity Prices



Source: The Regulatory Assistance Project

Market	Year	Average decrease in spot price on application of DR (€/MWh)	Whole market retailer benefit [M€]	Compensation payment to retailers (based on French compensation model) [M€]	DR sales [M€]	Retailer market benefit/ (Cost = DR sales)	
400h/LGW	FRA	2013/14	13.01	379.27	28.06	24.68	15.37
		2014/15	11.81	344.57	27.93	20.77	16.59
		2015/16	18.99	515.54	21.42	15.72	32.80
GER-AUT		2013/14	20	635.83	24.44	19.13	33.24
		2014/15	13.83	458.89	22.66	17.9	25.64
		2015/16	11.29	355.13	18.4	15.58	22.79
NORDIC		2013/14	7.71	186.32	19.69	14.26	13.07
		2014/15	5.49	135.12	18.08	13.47	10.03
		2015/16	10.21	272.75	14.75	13.98	19.51

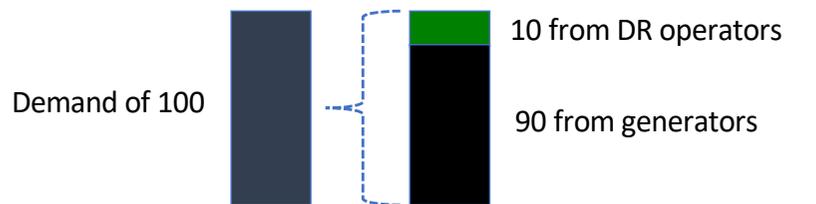
Benefits from market-based DR: reduce sourcing costs for retailers



450 GWh/mkt = 1.6 G€/y
benefits for retailers

DR in the market: 'alternative' MWh-s delivered to ensure physical balance

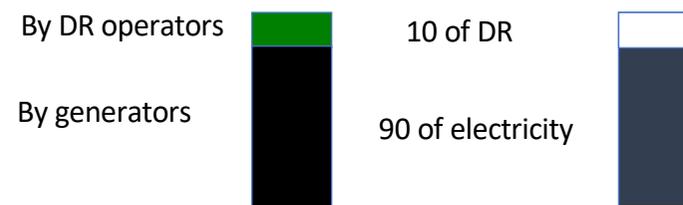
Wholesale markets
(in advance)



Via wholesale markets (i.e. in advance)
consumption forecast is balanced by purchases

The more DR is sold, the less generation

Physical delivery
(in real time)



Actual consumption (90) (*as reduced by DR*)
is balanced
by actual electricity generation (90)

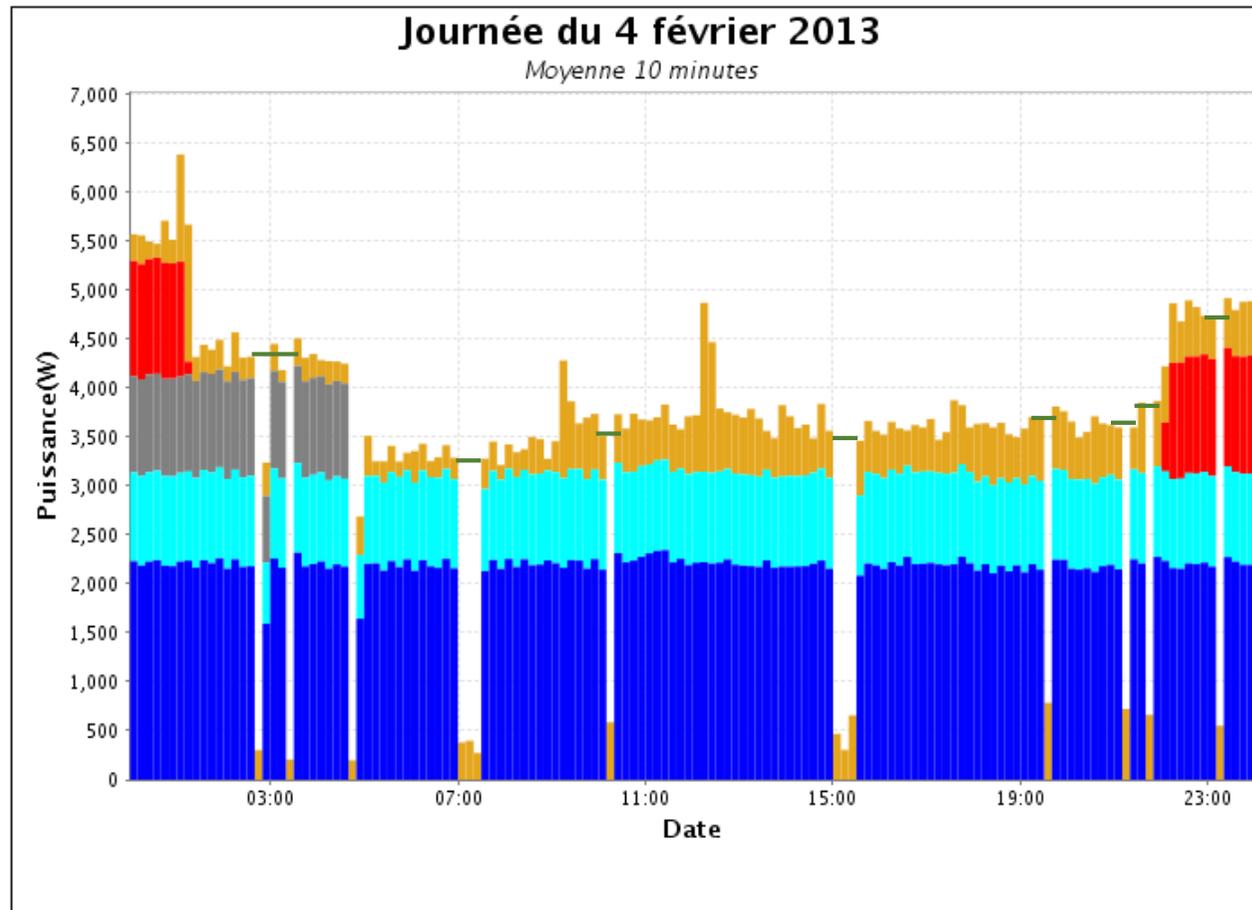
**The more DR is delivered, the less
consumption occurs**

Balance responsibility of DR = same as generators

- Reliability of DR: aggregator commits to deliver
- Aggregator is financially responsible if doesn't deliver
 - Same as generators
 - Similar consequences in case of failure
 - Both must be or have a BRP
 - Responsible to balance commitments (sales) and delivery
 - Delivery for DR is reducing demand
 - Delivery for generator is injecting electricity

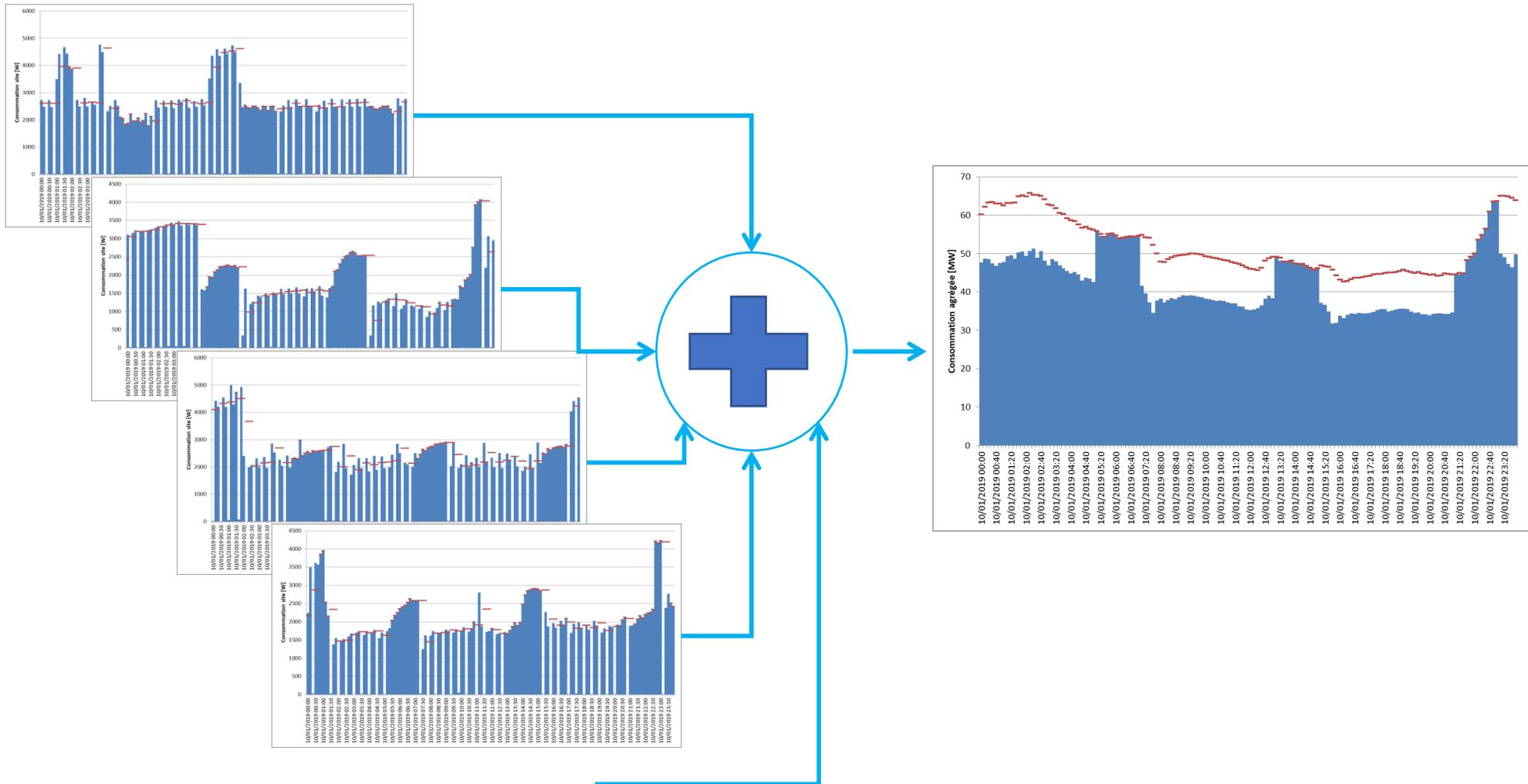
Aggregator is responsible for reducing demand
as he commits to, by selling DR

Delivery check: baseline vs load



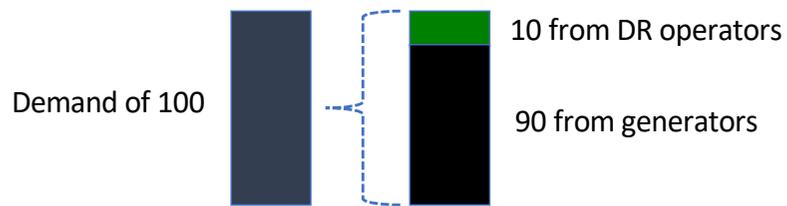
- Real time individually determined baseline from data per consumer

Baseline is sum of real-time individual baselines



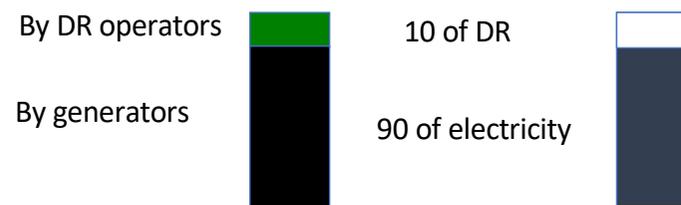
DR in the market: 'alternative' MWh-s to reduce sourcing costs for suppliers

Wholesale markets
(in advance)



Via wholesale markets (i.e. in advance)
consumption forecast is balanced by purchases

Physical delivery
(in real time)



Actual consumption (90) (as reduced by DR)
is balanced
by actual electricity generation (90)

- DR ensures energy is neither generated nor consumed, in two steps
 - DR avoids generation via the market
 - DR reduces consumption physically
- DR ensures balance *instead of* generation
 - DR avoids expensive generation

Save energy and CO₂
Save money for all

Consumers' voice paved the way to a balanced solution benefitting suppliers



ELECTRICITY AGGREGATORS:

STARTING OFF ON THE RIGHT FOOT WITH CONSUMERS

- Consumers should not bear the cost of payments/compensation between suppliers and independent aggregators. If the need for such payments is verified, these should be financed by all market participants benefiting due to the trade of flexibility in the wholesale market.
- Compromise found during trilogue on Directive (EMD)
- Members States may implement a compensation paid to retailers of curtailed consumers
 - Clear distinction between compensation *to* suppliers versus *who pays it*
 - Compensation should not be a barrier to DR => share among various parties
 - How to share taking account of benefits
 - compensation paid by those who benefit, i.e. all retailers
 - ... also by DR subject to the **net benefit principle**

Only when and to the extent that benefits to retailers would not exceed costs for retailers

⇒ *Net benefit for all retailers, to be ultimately transferred to all consumers*

'Costs' for retailer(s)

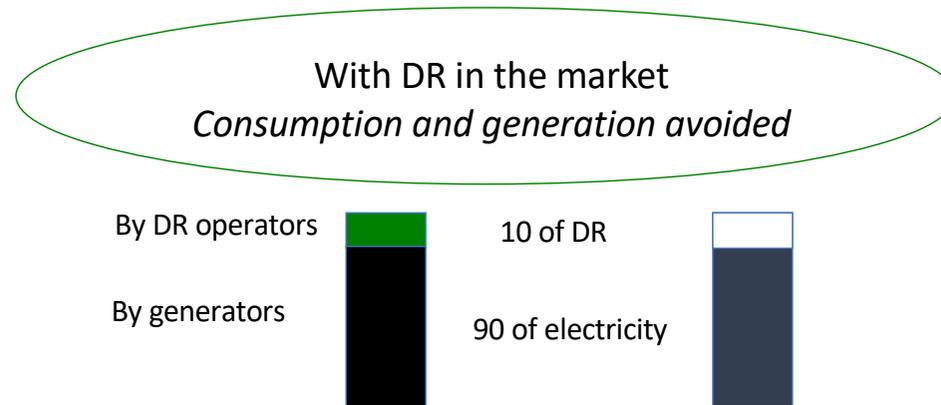
Forecast = 30 MWh
= Wholesale purchases



Position of a supplier/BRP
with participating consumers

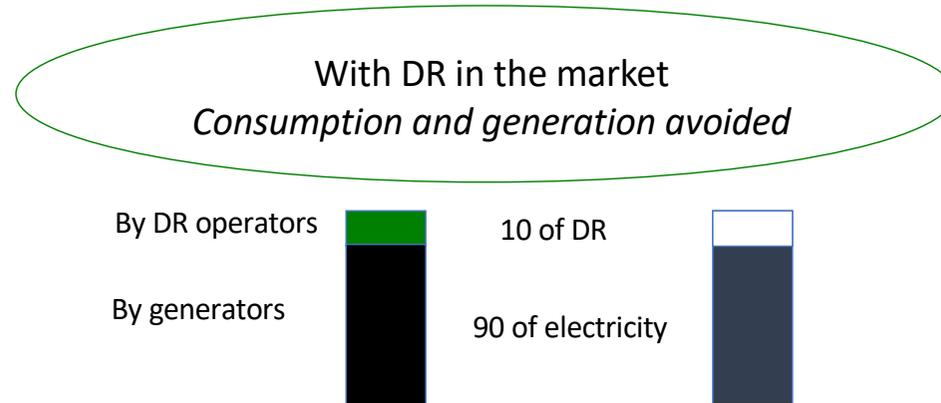
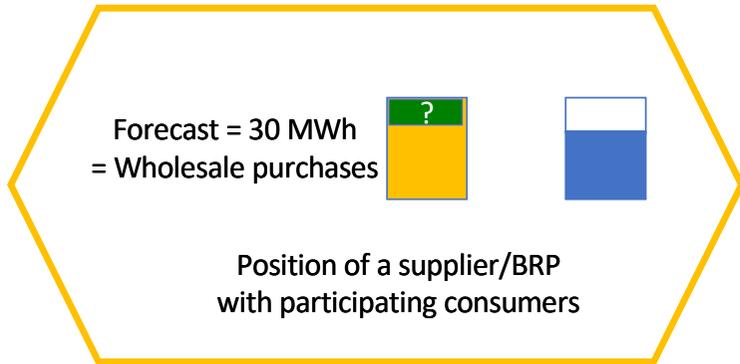
➤ *Retailers claim a 'cost' (buying DR, not billing to consumers), wish a 'compensation'*

'Costs' for retailer(s)



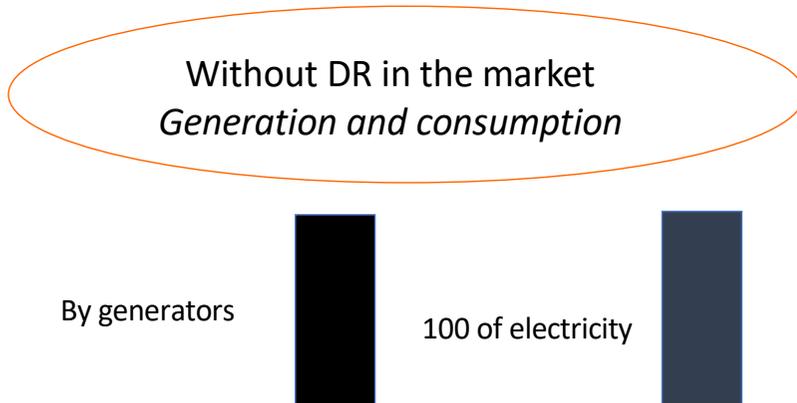
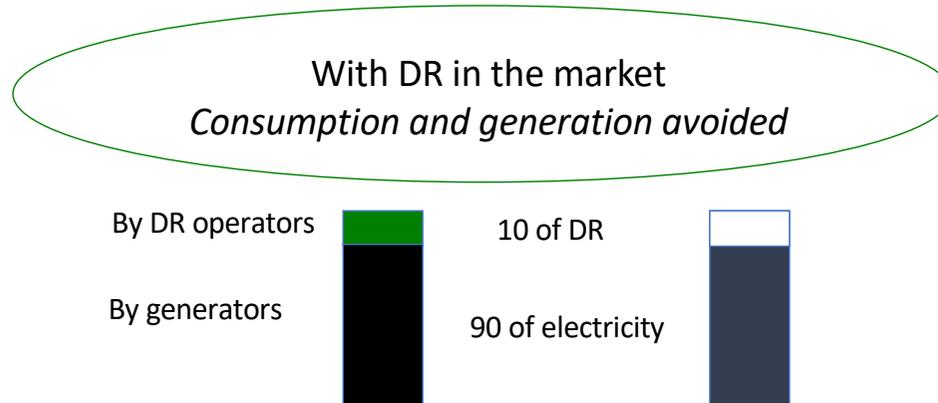
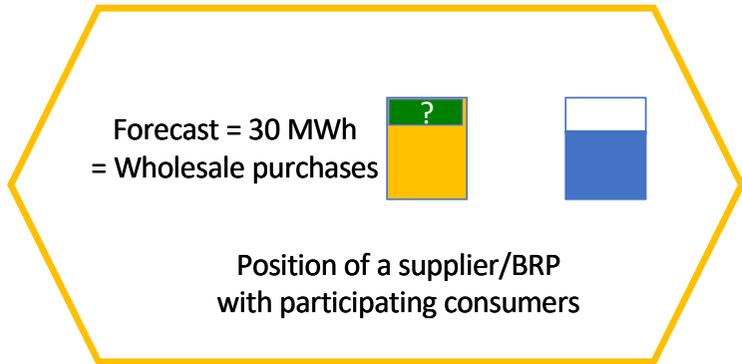
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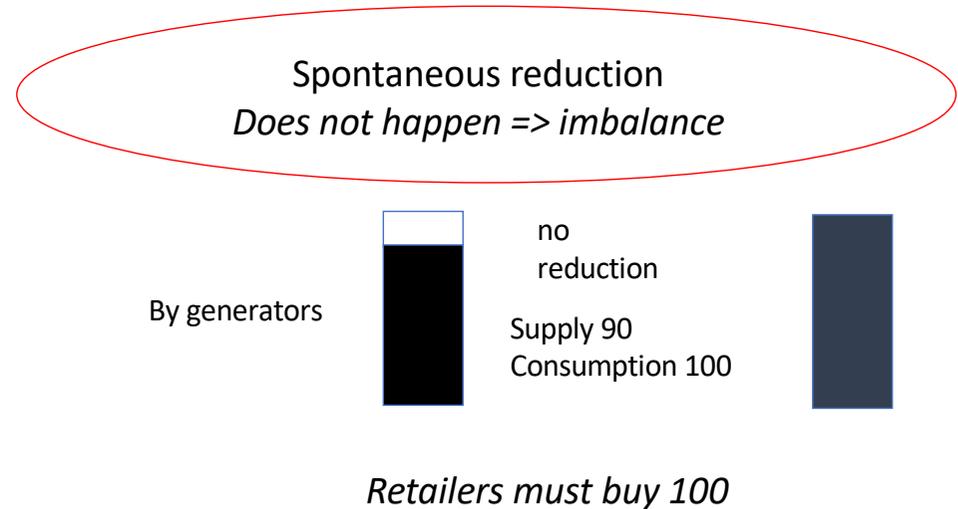
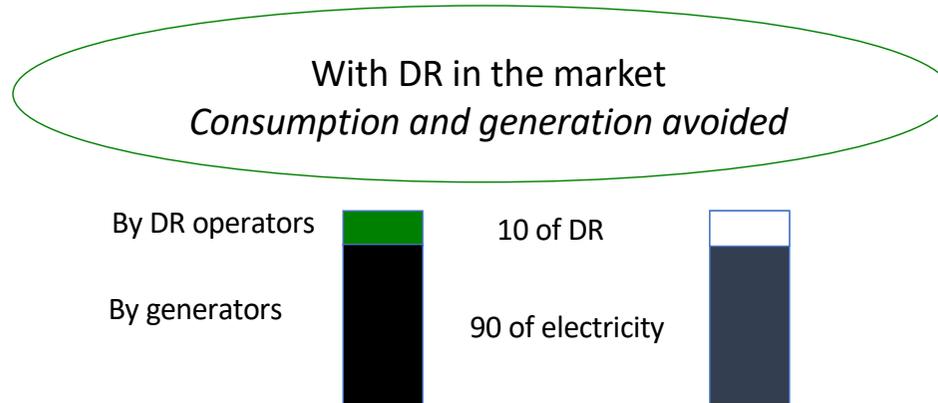
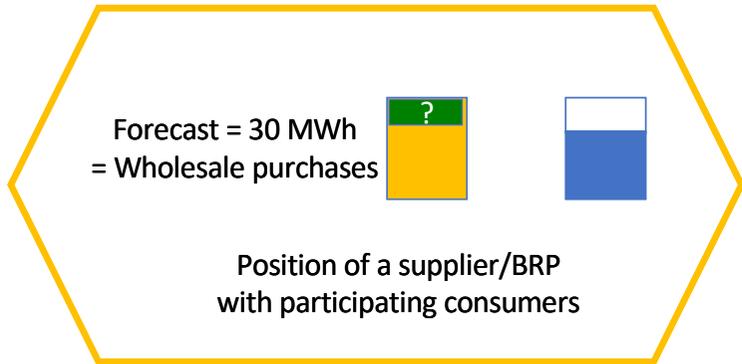
'Costs' for retailer(s)



More revenues for retailers

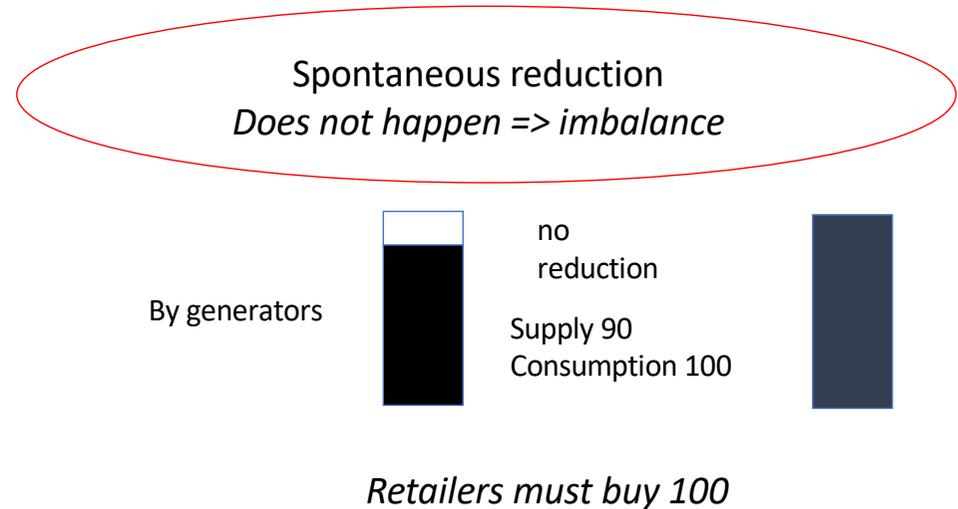
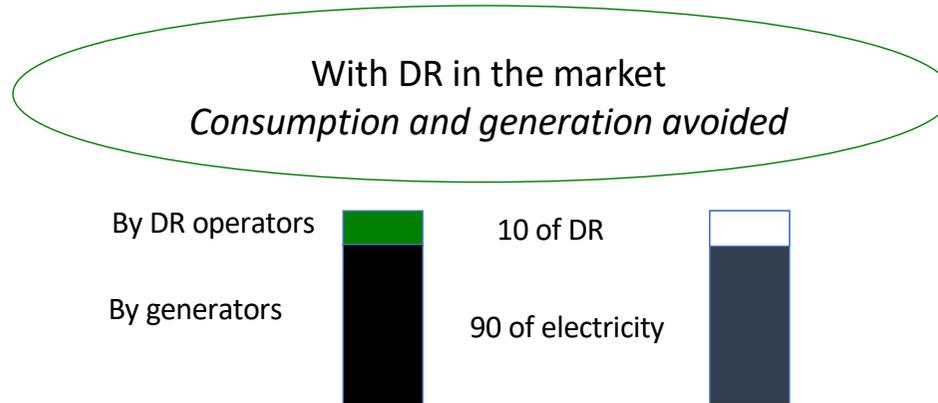
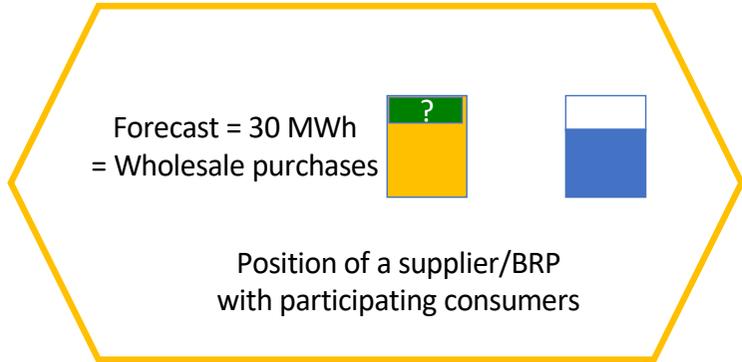
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'Costs' for retailer(s)



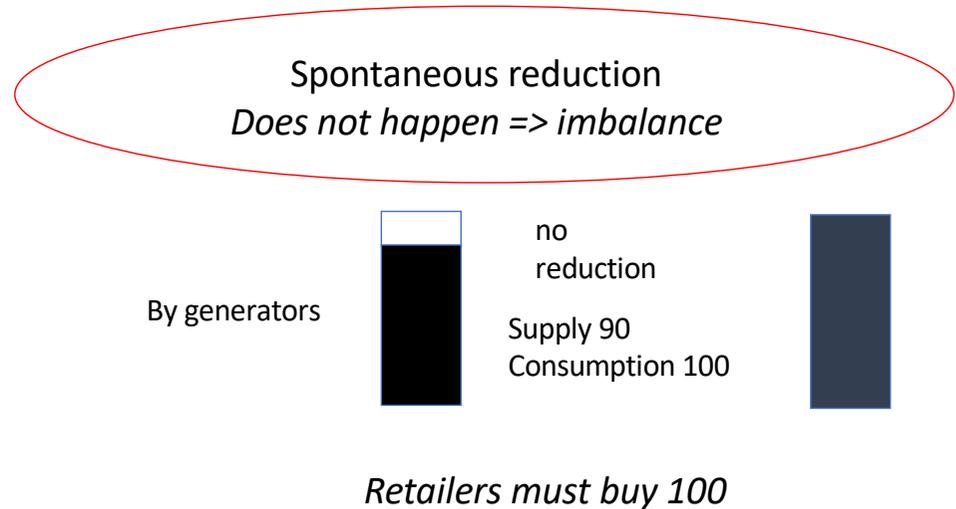
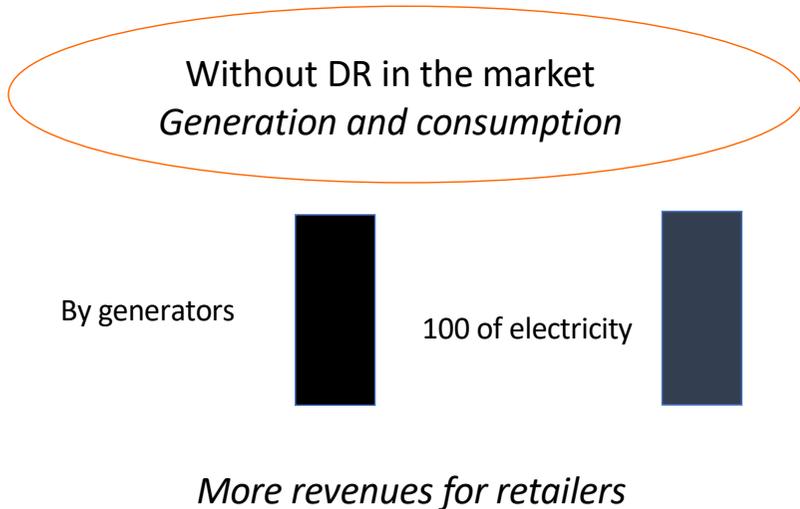
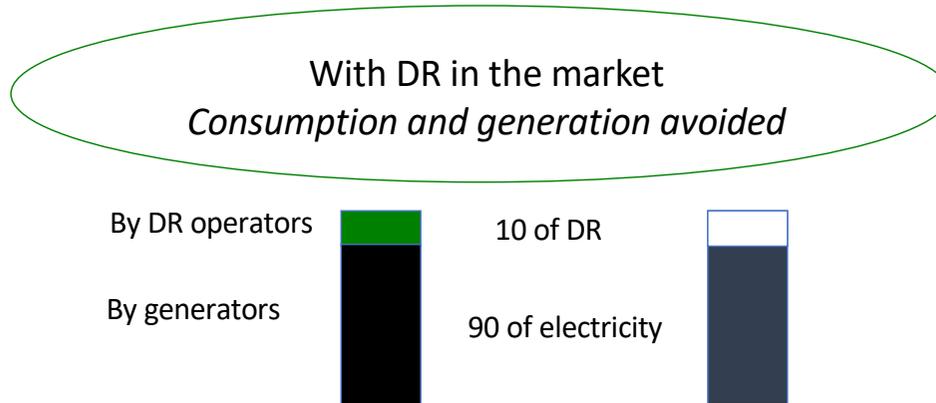
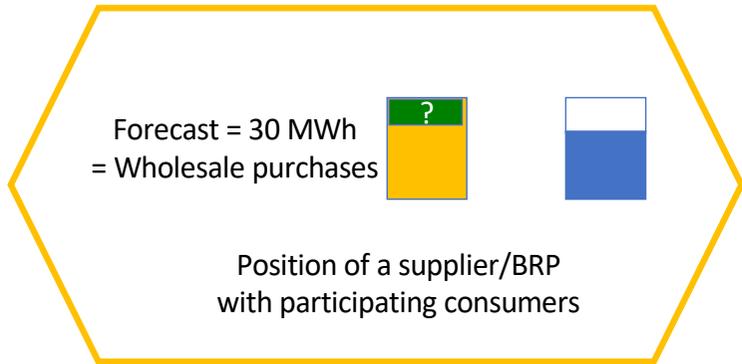
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'Costs' for retailer(s)



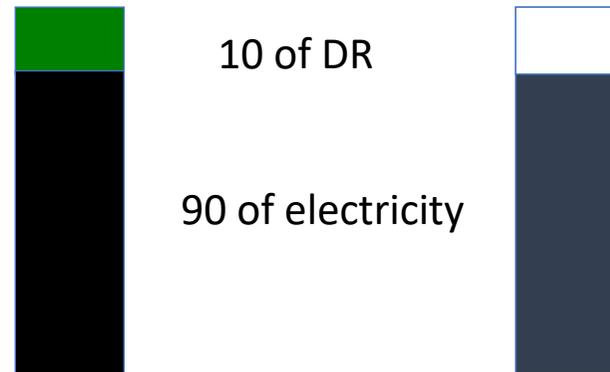
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'Costs' for retailer(s)



➤ Retailers claim a 'cost' (buying DR, not billing to consumers), wish a 'compensation'

How to tackle imbalances? Which?



- Two different meanings to be distinguished
 - Real/physical grid imbalances ... when DR is not delivered

≠

- Apparent / accounting imbalances when DR is properly delivered, hence grid is actually balanced thanks to DR

Balance responsibility of DR aggregator

Defined by CEP,

see recital 15 of the Regulation

BRP/supplier: responsible for consumption 'correction of perimeter' or not

Member State to choose model,

see recital 39 of the Directive

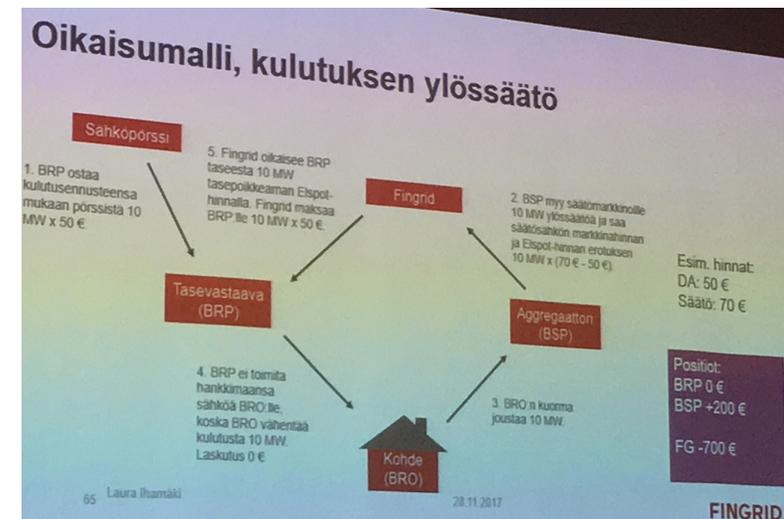
Why the 'old version' does not comply with the EMD

Physical contradiction

- The more DR
 - The more compensation paid by DR
 - The less energy generated and consumed
 - Compensation is not for energy
- In fact DR avoids energy, it is an alternative: competing

Legal / market contradiction

- DR sold at market price would reimburse market price
 - No access to market
 - Barrier is prohibited by EM Directive



Both are good for suppliers doing DR

A choice of 'models' for BRP rules With or without 'perimeter correction'?

Without perimeter correction... BRP is compensated via TSO

- With DR, physical balance: $90=90$
- Yet accounting imbalance:
 - Volumes bought (generation + DR) = 100
 - Volumes sold (actual consumption) = 90
 - Total: positive imbalance $100 - 90 = +10$
- Under existing BRP rules (before any DR), positive imbalances are paid by TSO: income for BRP
- Supplier/BRP is happy with such payment, same as usually paid
- TSO pays BRP: who will compensate the TSO?
Currently: TSO charges all BRPs. Keep as is?

With perimeter correction, and compensation to supplier/BRP... via TSO

- Same physical balance: $90=90$
- Change of accounting rule: BRP's position is corrected, i.e. calculated "as if" no DR
 - Counterfactual consumption: $90+10=100$
 - No positive imbalance
- Often considered fair for suppliers: TSO when correcting perimeter should compensate BRP/supplier
- Neutral for BRP, and fine for supplier, both happy
- TSO pays compensation to BRP/Supplier: who will compensate the TSO? How to share?

Whatever the model, very similar: no costs for any individual supplier/BRP, TSO to pay, then share among all parties.
Directive leaves choice of model to Member State, but sets limits if specific compensation is established:

No overcompensation of suppliers – No barrier to Demand Response

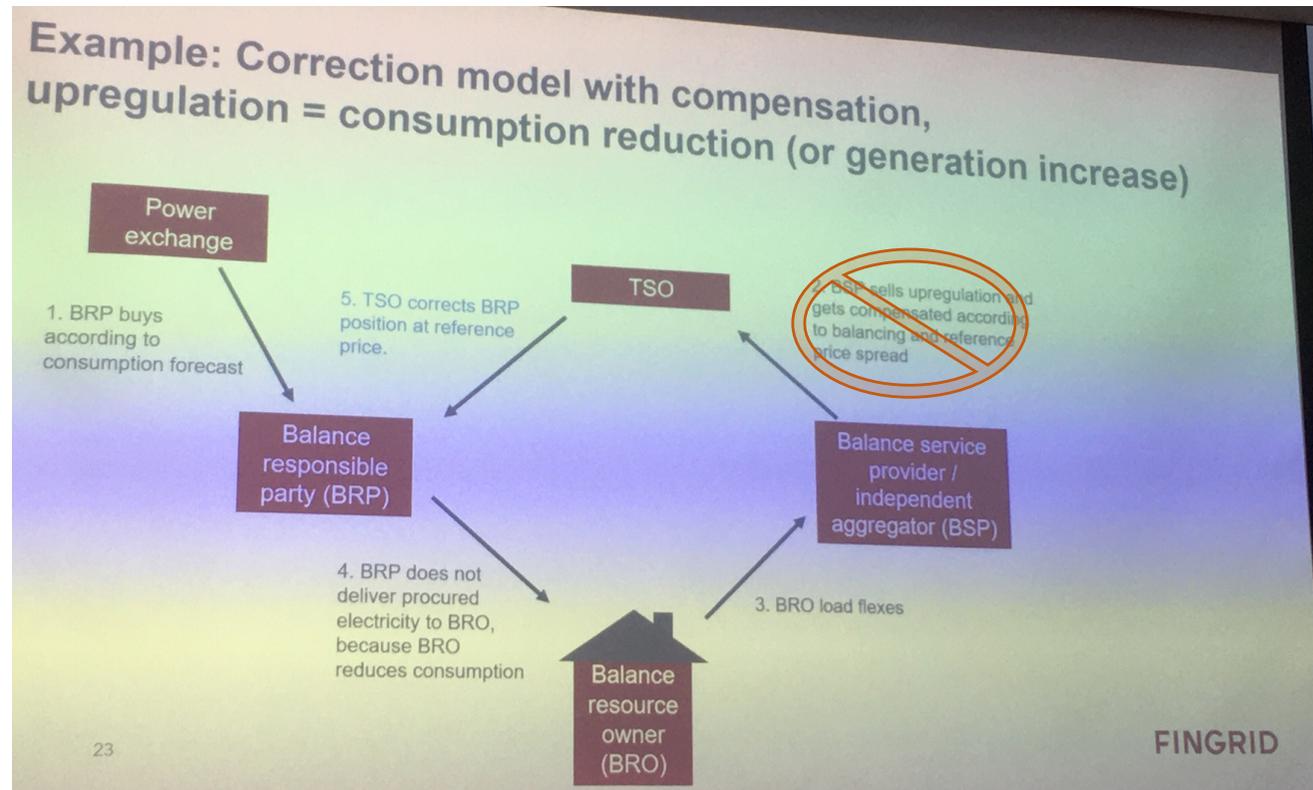
Economics for electricity suppliers

Every supplier will benefit from DR

+ Every supplier may wish to become a DR aggregator

- Neutral for supplier of participating consumers, as he receives compensation from TSO
 - With 'uncorrected model': supplier's BRP is paid by TSO for positive imbalance
 - With 'corrected model', compensation for correction is paid by TSO, hence neutral for BRP & supplier
 - Benefits for all suppliers including supplier of participating consumer
 - Benefits from reduced sourcing costs
 - Direct costs (/foregone revenues) offset by compensation
 - Overall cost = cost of paying TSO
 - If benefits > costs, net benefit for all suppliers, fairly shared
 - If ever costs of DR > benefits, then DR would pay the difference
 - Every supplier benefits from DR in all cases
 - Hence all consumers get their share of the net benefits of DR
- ✓ Electricity suppliers should be strong supporters of DR with this market design
- ✓ Innovative suppliers wish to become (or partner with) DR aggregators

Corrected model may also be used for balancing markets (services to TSO)



- When 'correcting' a BRP's position, TSO should compensate this BRP (or related supplier)
- BSPs should all be paid on the same basis, not on 'spread' only for DR \neq generation
 - If DR pays on balancing markets and not others, little incentive to participate to balancing services

Directive – art.17 on DR aggregation

Directive (art.17) - Demand response through aggregation	Consequences when implementing the directive
1. Member States shall allow and foster participation of demand response through aggregation. Member States shall allow final customers, including those offering demand response through aggregation, to participate alongside electricity generators in a non-discriminatory manner in all electricity markets.	All markets open to DR
2. Member States shall ensure that transmission system operators and distribution system operators when procuring ancillary services, treat market participants engage in the aggregatio of demand response, in a non-discriminatory manner alongside producers on the basis of their technical capabilities.	Including ancillary services (balancing, reserves,...)
4. Member States may require electricity undertakings or participating final customers to pay financial compensation ...	Any electricity company or consumer (not specifically those involved in DR) may be required to pay.
to other market participants or to the market participants' balance responsible parties, if those market participants or balance responsible parties are directly affected by demand response activation.	May receive money only those parties directly affected by DR.
Such financial compensation shall not create a barrier to market entry for market participants engaged in aggregation or a barrier for flexibility.	Payment <u>by</u> DR should not be a barrier, <i>hence only a small part.</i>
In such cases the financial compensation shall be strictly limited to covering the resulting costs incurred by the suppliers of participating customers or the suppliers' balance responsible parties during the activation of demand response.	Payment only <u>to</u> suppliers/BRPs, limited to their costs <i>Note: Demand reduction means no cost for BRPs, be it in a 'corrected' model ('correction' ensures neutrality for BRP), as well as an 'uncorrected' model (his positive imbalance is paid by TSO).</i>
The method for calculating compensation may take account of the benefits brought about by the independent aggregators to other market participants and, where it does so, the aggregators or participating consumers may be required to contribute to such compensation but only where and to the extent that the benefits to all suppliers, customers and their balance responsible parties do not exceed the direct costs incurred. [...]	To share the cost of the compensation, taking into account benefits ensures DR does not over-compensate suppliers as a whole. Hence the part of the compensation paid by DR only if ever and to the extent that DR would result in net cost for them – not if net benefit. Rest of the compensation shared among suppliers, to ensure they all share fairly benefits... and costs – hence the net benefit brought to them by DR.