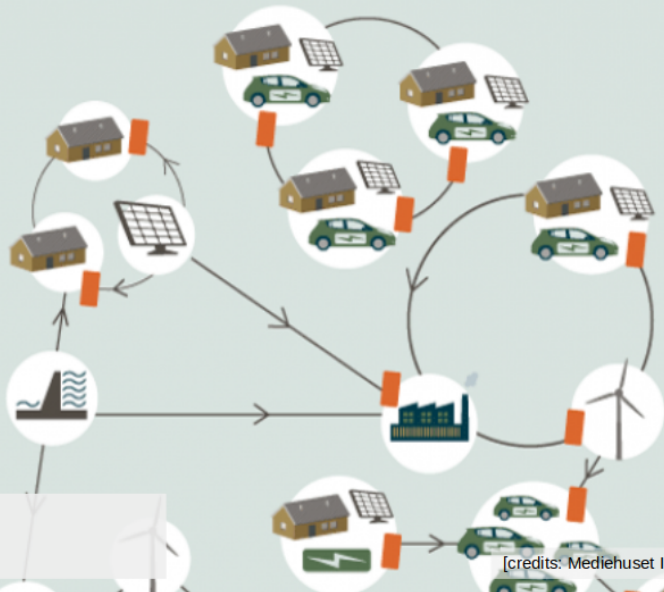
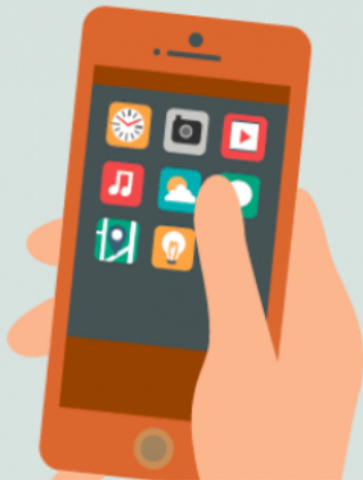


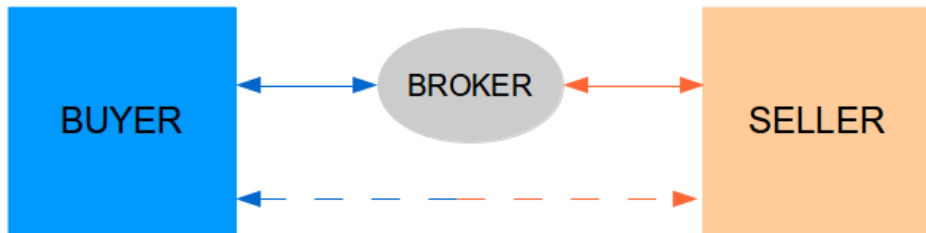
Module 2 – Electricity Spot Markets (e.g. day-ahead)

2.1 From bilateral contracts to the electricity pool



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[credits: Mediehuset Ingeniøren]



- **Bilateral contracts** are for a *direct exchange* of energy between a buyer and a seller, in a decentralized fashion
- They may both be producers and/or consumers
- Most likely a broker is involved...
- Eventually, the *system operator is informed* about the trades that occurred

- **Customized long-term contracts:**
 - very flexible contracts (basically, you can try to negotiate whatever you want)
 - private transactions (conditions are fully unknown to others)
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 - large amounts of energy, over long periods of times

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- **Electronic trading:**

- based on an electronic platform that consistently match supply and offer bids
- virtually no transactions costs
- very fast, therefore allowing trading “until the last second”

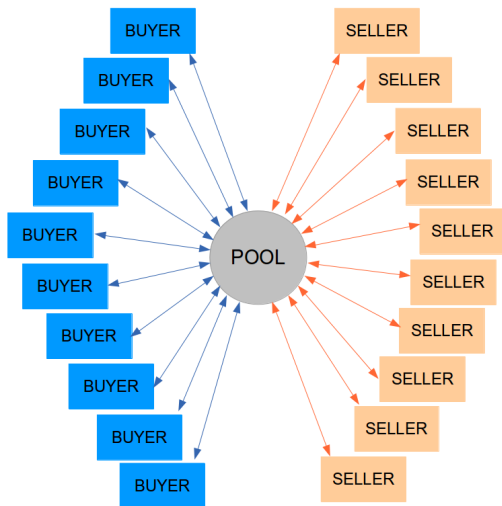
Placing it into perspective...

- Bilateral trading may be interesting...
- but the pool provides a **centralized form of system management**, which seems to be increasingly preferred in Europe for day-ahead markets.

Example:

- Nord Pool Spot is the Europe's largest power market
- 505 TWh of energy traded in 2016
- Nordic and Baltic day-ahead auction Elspot represents 391 TWh of energy traded
- Average system price of 26.91€
- In Elspot: 380 buyers/sellers - >2000 orders a day

- Let us focus on pools and auctions for now...



- All generation bids and consumption offers are placed **at the same time**
- **No-one knows about others' bids and offers**
- A centralized *market-clearing algorithm* decides about bids and offers that are retained
- Eventually, the *system operator* is informed about the trades that occurred

An example auction setup

- *Deadline for offers:* 29th of January, 12:00 - *Delivery period:* 30th of January, 11:00-12:00
- Supply and demand offers include:

Demand: (for a total of 1065 MWh)

Company	Supply/Demand	id	Amount (MWh)	Price (€/MWh)
CleanRetail	Demand	D_1	250	200
El4You	Demand	D_2	300	110
EVcharge	Demand	D_3	120	100
QualiWatt	Demand	D_4	80	90
IntelliWatt	Demand	D_5	40	85
El4You	Demand	D_6	70	75
CleanRetail	Demand	D_7	60	65
IntelliWatt	Demand	D_8	45	40
QualiWatt	Demand	D_9	30	38
IntelliWatt	Demand	D_{10}	35	31
CleanRetail	Demand	D_{11}	25	24
El4You	Demand	D_{12}	10	16

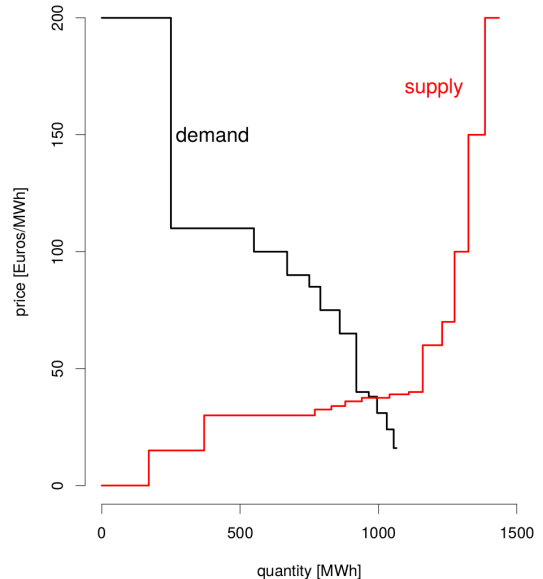
An example auction setup

Supply: (for a total of 1435 MWh)

Company	Supply/Demand	id	Amount (MWh)	Price (€/MWh)
RT [®]	Supply	G ₁	120	0
WeTrustInWind	Supply	G ₂	50	0
BlueHydro	Supply	G ₃	200	15
RT [®]	Supply	G ₄	400	30
KøbenhavnCHP	Supply	G ₅	60	32.5
KøbenhavnCHP	Supply	G ₆	50	34
KøbenhavnCHP	Supply	G ₇	60	36
DirtyPower	Supply	G ₈	100	37.5
DirtyPower	Supply	G ₉	70	39
DirtyPower	Supply	G ₁₀	50	40
RT [®]	Supply	G ₁₁	70	60
RT [®]	Supply	G ₁₂	45	70
SafePeak	Supply	G ₁₃	50	100
SafePeak	Supply	G ₁₄	60	150
SafePeak	Supply	G ₁₅	50	200

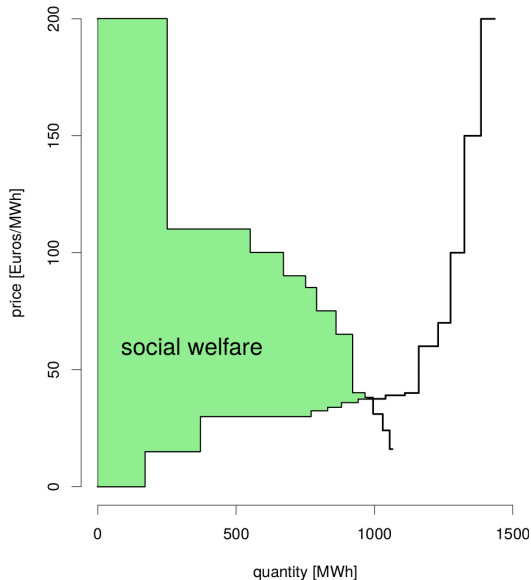
That is a lot of offers to match... but how?

- Consumption offers are ranked in *decreasing price order*
- Supply offers are ranked in *increasing price order*
- This defines the **merit order**
- A “magic” point appears: the equilibrium point between supply and demand...

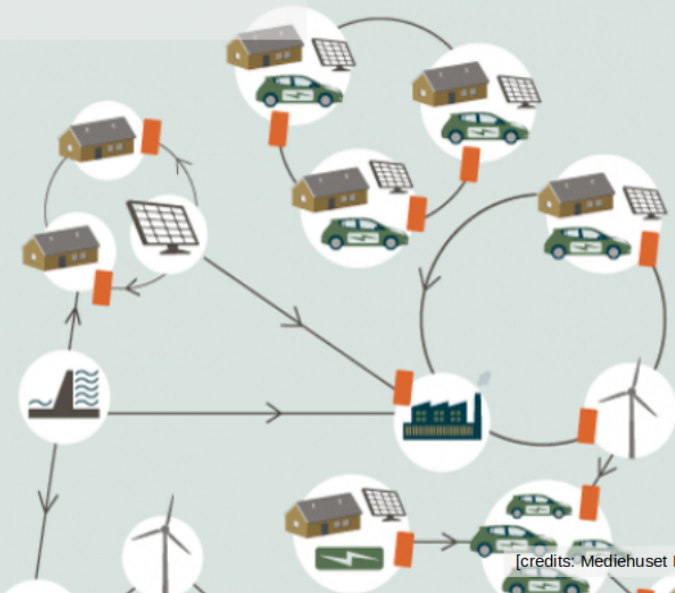
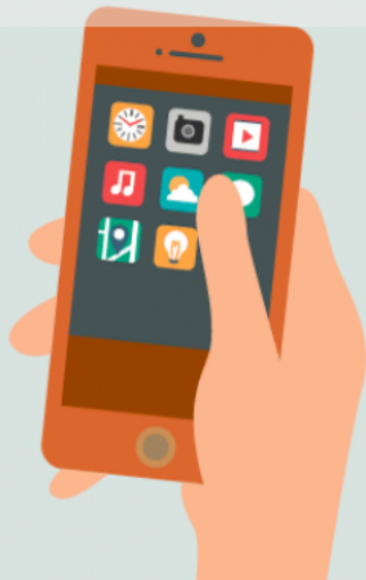


Social welfare and its maximization

- *Social welfare is defined as the area between consumption and generation*
- This equilibrium point is that which allows to maximize social welfare
- *Why?*
 - **Any buyer is to pay at most what he was ready to pay**
 - **Any seller will get at minimum the price he was ready to sell for**



Use the self-assessment quizz to check your understanding!



[credits: Mediehuset Ingeniøren]