

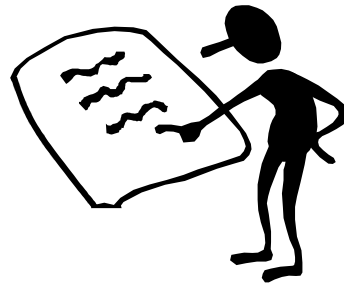


# Introduction

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- ⇒ **In the appendix, you'll find a list of the terms and acronyms used in this presentation.**
- ⇒ **Concerning other documents referred to in this presentation:**
  - ✓ ***At [houmollerconsulting.dk](http://houmollerconsulting.dk), you can download the documents from the sub-page *Facts and findings*.***
- ⇒ **This PowerPoint presentation is animated**
  - ✓ **It's strongly recommended to run the animation when viewing the presentation.**
- ⇒ **On most computers, you can start the animation by pressing F5.**
  - ✓ **Now the presentation moves one step forward, when you press Page Down. It moves one step backward, when you press Page Up.**

# Agenda for this presentation on market coupling



⇒ **Four topics:**

- ✓ **Transparency.**
- ✓ **Zonal pricing versus nodal pricing.**
- ✓ **Quality of market coupling.**
- ✓ **Unbundling.**

# Transparency for market coupling

Eventually, no end user, producer, trader or TSO can opt out of the market coupling



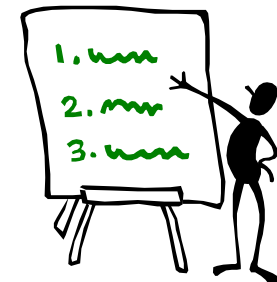
*"You can check out any time you like – but you can never leave"*  
The Eagles: *Hotel California*.

Unfortunately, the legal limbo for market coupling creates a transparency limbo also.



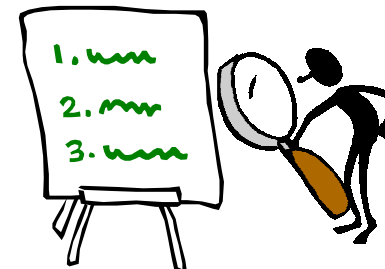
For market coupling: it seems as if we have to fight for every thing, we want to have information on.

**Solution: create a Confidentiality List of things, which cannot be public**



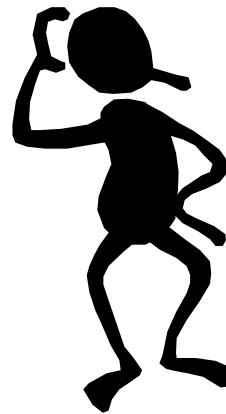
**Example: individual players' exchange bids are confidential.**

Per definition, everything not on the Confidentiality List is public.



**Subject the list to public consultation.**

# Nodal pricing versus zonal pricing



# Nodal or zonal pricing? – 1

**Zonal pricing and nodal pricing is explained in the appendix.**

**As can be seen in the appendix: with nodal pricing, you split the coupled region into many, very small price zones (so-called "nodes").**

**Once every day, you run the calculation. The calculation decides the geographical areas having the same day-ahead prices**



**Thereby, the decision on which areas will have the same day-ahead prices is left to the market.**

**In contrast: with the zonal system's relatively large, preset zones, you may argue the zonal system is a version of planned economy.**

# Nodal or zonal pricing? – 2

**Because the zonal system has relatively large price zones, the TSOs often have to pay for redispatching inside a zone**

**As the zone's common spot price often creates a huge, planned production surplus in part A of the zone and a huge, planned production deficit in part B of the zone**

**And the zone's grid cannot transport the surplus energy from A to B.**

**However, when this happens, the zone's spot price is unreliable**

**The redispatching prices are the true day-ahead prices for A and B, respectively.**

**The zonal system's relatively large zones simplifies price hedging**

**And price hedging is important for retailers, who have customers preferring fixed price contracts.**

**However, via the grid fees everybody pay for the redispatching**

**Therefore, you may argue the zonal system makes end users, who prefer spot price contracts, cross-subsidizing end users, who prefer fixed price contracts**

**As the fixed-price end users do not themselves pay the full cost of the hedging.**



# Redispatching inside a zone with sub-areas A and B

## Example for one hour of tomorrow

For simplicity, exchange of energy with other zones is ignored

**A** At price 50 €/MWh, the producers in A have a planned production 2000 MWh bigger than A's consumption

Redispatching in A: TSO must sell 500 MWh to producers in A – thereby reducing their planned production with 500 MWh.  
The TSO's sale price is 48 €/MWh.

Planned market coupling flow: 2000 MW  Grid capacity: 1500 MW

Redispatching in B: TSO must buy 500 MWh from producers in B – thereby increasing their planned production with 500 MWh.  
The TSO's purchase price is 53 €/MWh.

**B** At price 50 €/MWh, the producers in B have a planned production 2000 MWh smaller than B's consumption

**Zone's spot price: 50 €/MWh**

The TSO's redispatching costs (buying at 53, selling at 48):  
 $(53 - 48) \text{ €/MWh} * 500 \text{ MWh} = 2500 \text{ €}$

The true day-ahead prices in A and B are 48 and 53 €/MWh 7

# **Nodal pricing: the commercial players' settlement of imbalances with the TSO**

**At the outset, we'd have to establish an imbalance settlement per node**

**However, this would place a big burden on the retailers.**

**As they would have to produce a consumption forecast for their customers at each node**

**Thereby, it would also create a huge entrance barrier for new retailers.**



**Hence, we'll have to make a settlement for a larger area**

**Using an average of the area's nodal prices as the starting point for the settlement.**

**This could give wrong incentives, if players can foresee, this will give imbalance prices better than the nodal prices for given nodes**



**However you can deal with this by installing systems ensuring imbalances are never economic advantageous.**



# Nodal pricing: price hedging

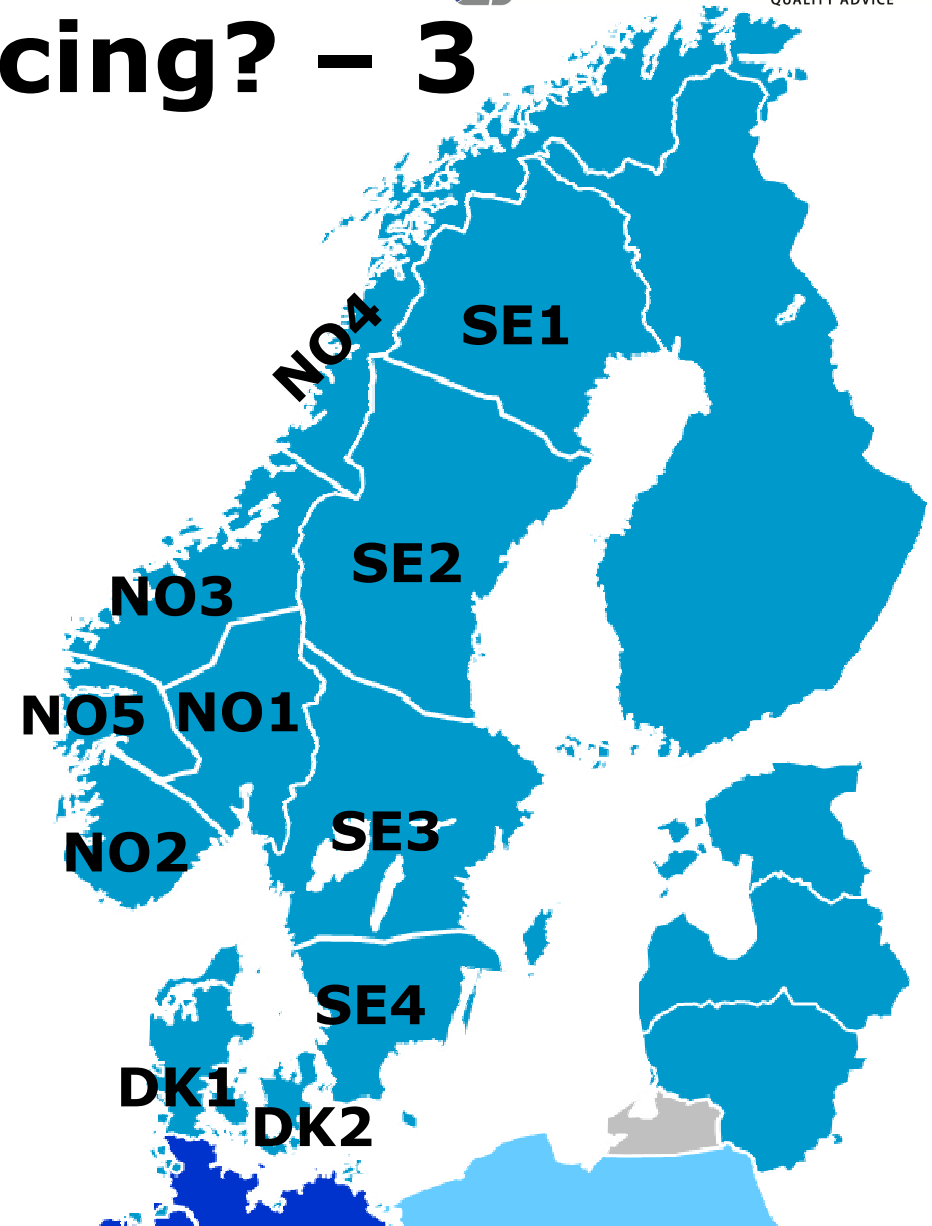
## Derivatives – hedging with financial contracts

- ⇒ You'll never get liquidity in financial contracts using the day-ahead price at a single node as the underlying reference.
- ⇒ Hence, as the underlying reference for financial contracts:
  - ✓ You must use the average of the nodal prices for larger areas, which have strong interconnectors.
- ⇒ Thereby, those who prefer fixed-price contracts, will themselves:
  - ✓ Either bear the remaining risk that their nodal price deviates from the average price.
  - ✓ Or pay for having this risk removed also.
    - With the zonal system, all grid users pay for this risk (via payment for redispatching)
      - Even end users who have spot contracts.



# Nodal or zonal pricing? – 3

- ⇒ **In Scandinavia, Denmark has 2 price zones, Sweden has 4 price zones and Norway has currently 5 price zones.**
- ⇒ **With this many zones, the Scandinavian zonal pricing is not very different from nodal pricing \*)**
  - ✓ **This is especially true for Norway, where the TSO can change the zones with relatively short notice.**



\*) In this description, we ignore the nodal system's shadow price principle.

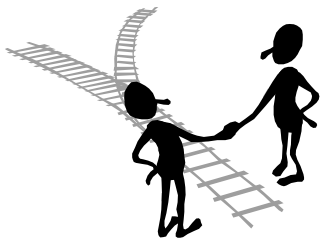
# Combination of nodal and zonal pricing

⇒ **Assume we adapt a version of nodal pricing, where the price for each node is set by double auction**

✓ **i.e. same calculation principle as for the standard zonal pricing**

- **In this case, the difference between the two systems virtually disappears**

- **The remaining difference is the size of the zones**

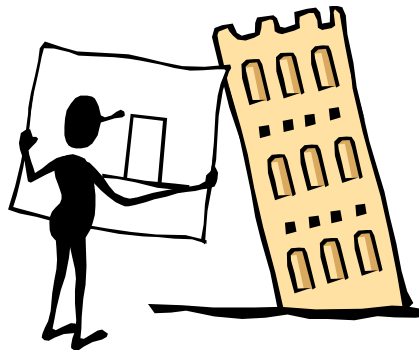


- **Where the "adapted nodal pricing" has very small zones and the standard zonal pricing has relatively large zones.**

⇒ **With this "adapted nodal pricing", the two systems can co-exist in the same market coupling**

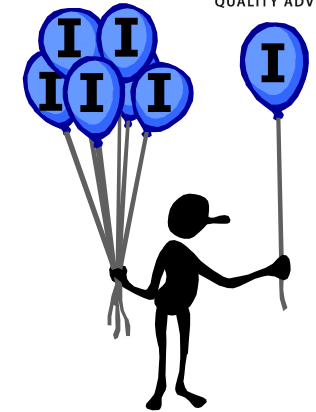
✓ **As some countries in the coupled area may prefer the "adapted nodal pricing" (i.e. very small zones), whereas other countries may prefer the standard zonal pricing (i.e. relatively large zones).**

# Quality of market coupling



# Inclusive or predatory?

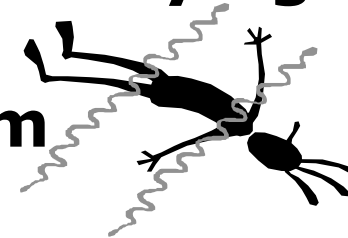
The issue of market coupling governance  
In order to have prosperity for all, we  
need to have “inclusive economies”



I: Influence

Distributing power widely, establishing  
the rule of law and free-market systems.

Even in the rich democracies, ruthless lobbying  
from vested interests may strangle  
economic growth by preventing us from  
having truly inclusive economies.\*)



To establish the Single Electricity Market we need to  
install an inclusive governance for the market coupling

Securing fair and formalised influence for nations,  
end users, producers, TSOs and market players.

\*) For example, refer to the newspaper *The Economist's*  
comments 14 April 2012 to the book

*Why Nations Fail: The Origins of Power, Prosperity, and Poverty.*

# Ignorance is expensive!

**Also in market coupling**  
**In the market coupling calculations, we need to apply the so-called "welfare criterion"**

*\*) You may refer to the PowerPoint presentation **Welfare criterion***

**Thereby, the calculations will produce economic optimal prices and energy flows. \*)**

**However, at the spot exchanges, we have seen employees fighting desperately against the welfare criterion**

**Hence verifying they understand neither linear optimization nor economics**

**Perhaps not people, we should entrust our linear optimization...**

**This lack of understanding is daily inflicting an economic loss on market players and societies – via the current wrong handling of block bids and interconnector capacity. \*\*)**



**The wrong handling of block bids and capacity was not requested by consumers**



**However, the purpose of The Single Electricity Market is to make Europe's trade & industry competitive!**

**Thereby helping to get Europe out of the current crisis.**

**As always, by having good governance, the stakeholders can themselves make decisions concerning their own money.**

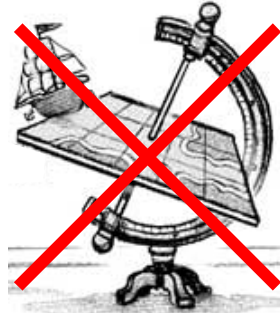


# Use economic efficient market coupling

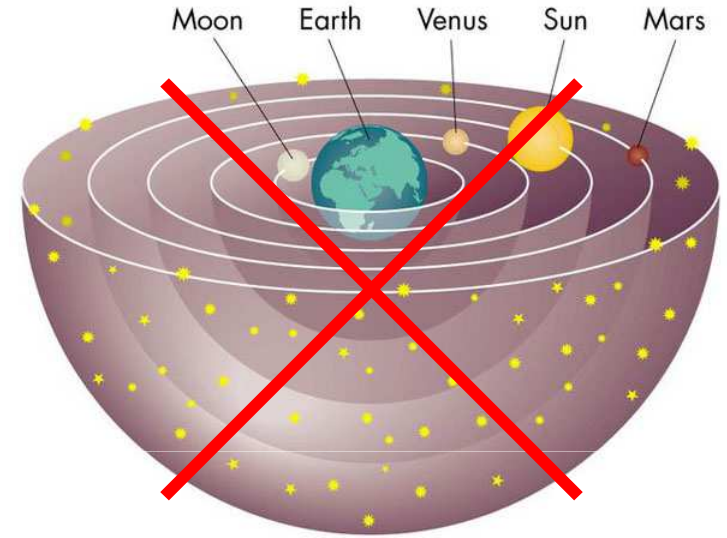
## Not intuitive "solutions"

On technical issues, our intuition is normally wrong.

The earth is not flat.



The sun does not rotate around the earth.



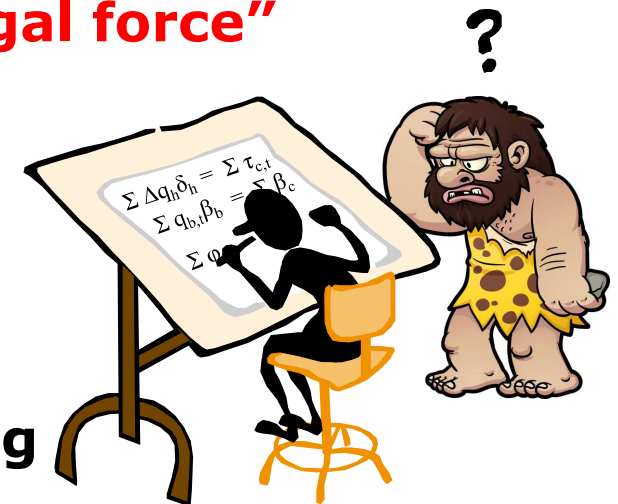
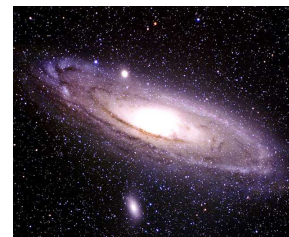
What force is acting on the turning biker?



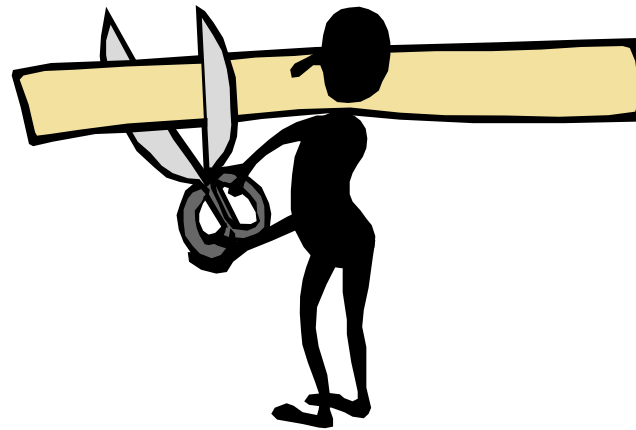
Try quantum mechanics and relativity theory – profoundly defying intuition!

For our ancestors, intuition was not designed to cope with such issues.

In a modern world, applying stone age reasoning to technical problems is very expensive!



# Unbundling





# Unbundling – 1

- ⇒ **Unfortunately, the spot exchanges become monopolies when market coupling or market splitting is introduced as the day-ahead congestion management system**
  - ✓ **Please refer to the PowerPoint presentation *Market coupling makes real competition betw. spot exchanges unfeasible.***
  
- ⇒ **Hence, in order to avoid cross-subsiding, the spot exchanges must unbundle**
  - ✓ **Unbundling means an organisation having a monopoly task cannot have any other business**
    - **Hence, cross-subsidising is automatically prevented**
      - **The regulators can focus on controlling the organisation's economical efficiency**
        - **Please refer to the PDF document *Unbundling of spot exchanges and associated clearing houses.***

# Unbundling – 2

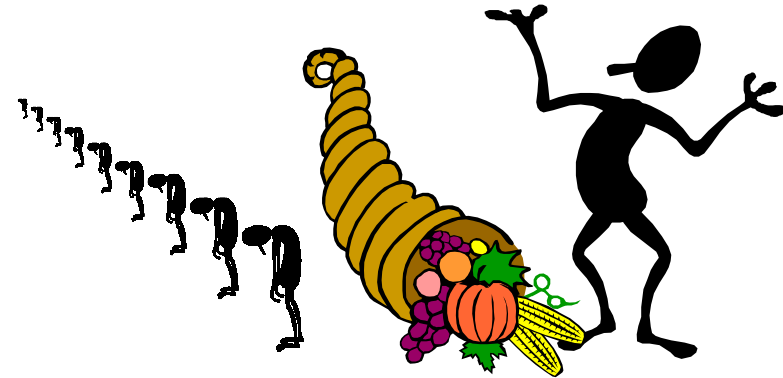
## Terminating cross-subsidizing

- ⇒ **Note: this also means the spot exchanges cannot be involved in intra-day trading**
- ✓ **As experience shows: this gives heavy cross-subsidizing – with the many spot players subsidizing the fewer intra-day players.**
- ⇒ **As cases – turn-over for the year 2013 (numbers in TWh):**
- ✓ **EPEX Spot (Austria, France, Germany, Switzerland)**
    - **Spot turnover** **323**
    - **Intra-day turnover** **23**
  - ✓ **Nord Pool Spot**
    - **Spot turnover (Baltic-Nordic area)** **349**
    - **Intra-day turnover (Baltic-Nordic, Germany)** **4**
  - ✓ **APX (Belgium, the Netherlands)**
    - **Spot turnover** **64**
    - **Intra-day turnover** **1**
  - ✓ **As can be seen: the turnover at the intra-day markets is paltry. It cannot finance the intra-day trading platforms**
    - **Hence the intra-day trading platforms only survive due to heavy cross-subsidizing from the spot trading.**

# Unbundling – 3

**Terminating the spot market players  
subsidizing the intra-day trading platforms**

**Adding insult to injury: as a  
consequence of the  
cross-subsidizing, small  
market players are  
subsidizing big players**



**First and foremost, the intra-day  
market is important for big players**

**Who face the risk of big, unplanned outages.**

# **Appendix**

# **Terminology and acronyms**

# Terminology and acronyms – 1

## As used in this presentation

- ⇒ **AC** Alternating Current.
- ⇒ **Border** means a border between two price zones.
  - ✓ Hence, it need not be a border between two countries. It may be a border between two price zones inside a country.
- ⇒ **Coupled region** A geographical area, in which you have a common IT system calculating the area's flows and day-ahead prices by using: the market players' day-ahead exchange bids and information on the day-ahead cross-border trading capacities.
- ⇒ **Double auction** A calculation method whereby an exchange's price is set by using the exchange's supply curve and the exchange's demand curve. See the PowerPoint presentation "Maximizing the economic value of market coupling and spot trading".
- ⇒ **Energy flow** Actually, in this presentation, "energy flow" means "day-ahead plans for cross-border energy flow".

**Note that implicit auction does not create energy flows. It merely creates day-ahead plans for the cross-border energy flows. Later, these plans may be modified by market players' intra-day, cross-border trading and/or the TSOs' cross-border trading of regulating energy.**

# Terminology and acronyms – 2

## As used in this presentation

- ⇒ ***Flow*** Short-term for *energy flow*.
- ⇒ ***Flow-based zonal market coupling*** A version of zonal market coupling, where the market coupling calculation includes a simplified load flow calculation. Thereby, the calculation tries to take into account the complicated flows of a meshed AC grid.
- ⇒ ***Implicit auction*** The common term for market coupling and market splitting.
- ⇒ ***Market coupling*** A day-ahead congestion management system, you can have on a border, where two electricity exchanges meet. The day-ahead plans for the cross-border energy flows are calculated using the two exchanges' bids and information on the day-ahead cross-border trading capacity.
- ⇒ ***Market splitting*** A day-ahead congestion management system, you can have on a border, where you have the same electricity exchange on both sides of the border. The day-ahead plans for the cross-border energy flows are calculated using the exchange's bids and information on the day-ahead cross-border trading capacity.

# Terminology and acronyms – 3

## As used in this presentation

***Nodal pricing*** With this system, the coupled region is divided into very small sub-areas called “nodes”.

For example, a node may be the sub-area supplied by a given distribution grid.

A node’s whole-sale price is set by calculating the cost of supplying a small extra volume of electrical energy to the node.

Example for a given hour – if a node’s demand is 1000 MWh: the node’s price is set by calculating the cost of supplying one extra kWh (thereby increasing the node’s supply to 1000.001 MWh). Hence, the nodal price is a shadow price.

In the nodal calculation, the complexities of energy flows in a meshed AC grid is taken into account. Thereby, nodal pricing is an alternative to flow-based zonal market coupling.

Apart from the nodal system’s shadow price principle, you may say nodal pricing deviates from zonal pricing in this way:

By splitting the coupled region into very small sub-areas, the nodal pricing abandons the large, (politically?) preset price zones.

# Terminology and acronyms – 4

## As used in this presentation

- ⇒ ***Price zone*** A geographical area, within which the players can trade electrical energy day-ahead without considering grid bottlenecks.
- ⇒ ***Spot bid*** A purchase bid or a sales offer submitted to a spot exchange.
- ⇒ ***Spot contract*** A consumer having this contract with a retailer, pays the retailer the exchange day-ahead price plus the retailer's mark-up. Hence, the consumer's price is tracking the wholesale market's daily price.
- ⇒ ***Spot exchange*** In this document, a spot exchange is an electricity exchange where
  - ✓ **Electrical energy is traded day-ahead.**
  - ✓ **The day-ahead prices are calculated by means of double auction.**



# Terminology and acronyms – 5

## As used in this presentation

- ⇒ ***Spot price*** A price calculated by a spot exchange. Either by a calculation performed by the spot exchange itself, or by a calculation performed by a company, to which the calculation has been outsourced.
- ⇒ ***TSO*** Transmission System Operator.
- ⇒ ***Welfare criterion*** A criterion used in the calculation of the day-ahead exchange prices and the planned energy flows
  - ✓ The criterion states the preferred solution must be the solution maximizing the economic value of the day-ahead exchange trading. Please refer to the PowerPoint presentation *Welfare criterion*.
- ⇒ ***Zonal market coupling*** A market coupling, where the coupled region is divided into relatively large price zones
  - ✓ Further, for each zone, the zone's day-ahead exchange prices are calculated by means of double auction (i.e. it's spot prices).
- ⇒ ***Zone*** Short-term for *price zone*.

# **Thank you for your attention!**

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