# Introduction

➢ **In appendix 2, you'll find a list of the terms and acronyms used in this presentation.**

➢ **Concerning the documents referred to in this presentation:**

  ✓ **Unless otherwise stated, you can download the documents from www.houmollerconsulting.dk/facts-findings/.**

➢ **This PowerPoint presentation is animated**

  ✓ **It's 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*.**

15 July 2023

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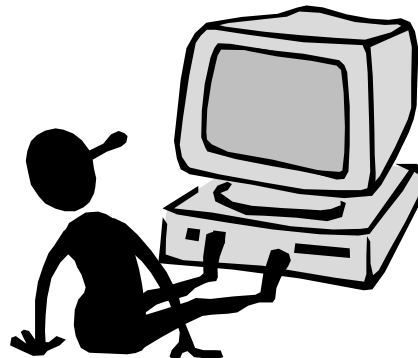
Market coupling in Europe
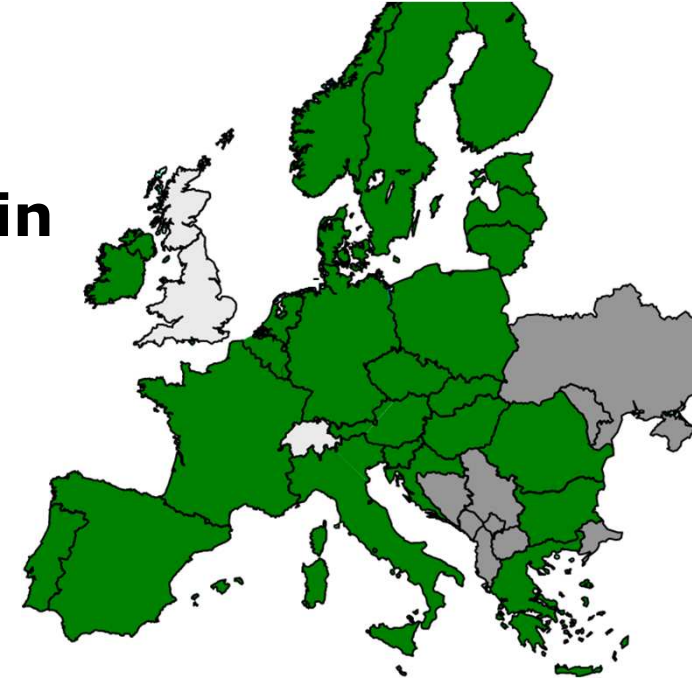
➢ **The current market coupling encompasses the map's green area.**

➢ **Hopefully, the dark grey areas will join within the foreseeable future.**

➢ **However, we need to improve the market coupling's governance & operation.**

➢ **This is needed anyway**

  ✓ **However, it's urgent as more countries, more TSOs and more power exchanges join the market coupling.**

  ✓ **And as we implement the green transition.**

➢ **We need:**

  ✓ <mark>**Fair competition among the power exchanges.**</mark>

  ✓ <mark>**A neutral and service-minded Market Coupling Operator (MCO).**</mark>

  ✓ <mark>**Transparency of the system, which yearly distributes dozens of billions of euro between countries and market players.**</mark>

  ✓ <mark>**Democratic control and fair influence for the stakeholders.**</mark>

  ✓ <mark>**Efficient market surveillance.**</mark>

The current market coupling

➢ **The current market coupling has serious flaws.**

➢ **It requires unnecessarily high amount of human and financial resources**

   ✓ **For example: <u>many</u> power exchanges making the <u>same</u> daily calculation of spot prices and market coupling flows – using same input and same software.**
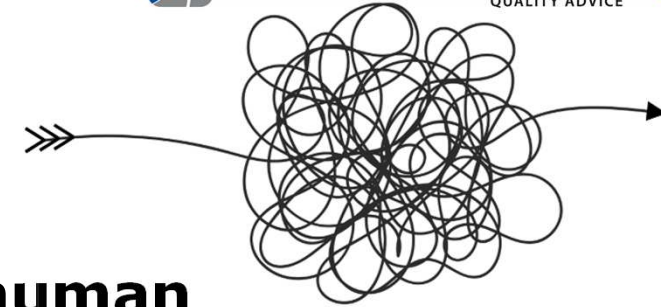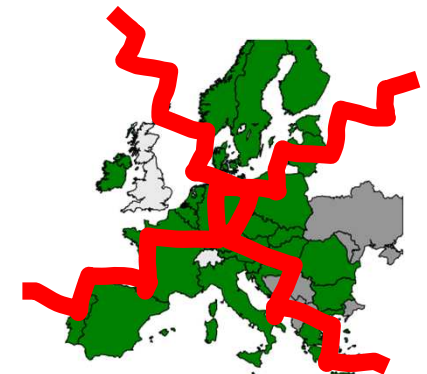
➢ **The daily market coupling operation is too complex and risky**

   ✓ **Far too many cooks to spoil the broth.**

   ✓ **This has repeatedly led to crashes of Europe's market coupling**

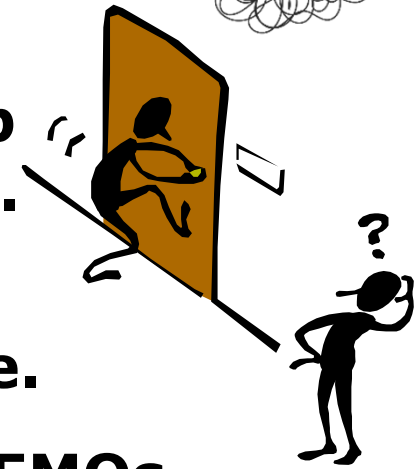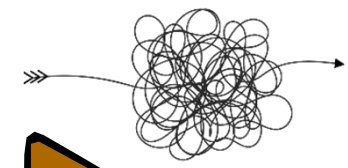   • **Very expensive for both consumers and players at the whole-sale market.**

   ✓ **An error at just one of the many cooks causes uncoupling of Europe.**
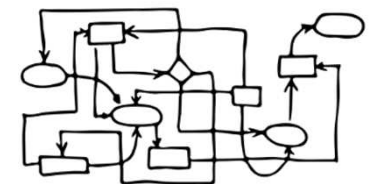
Current market coupling: flaws – 1

➢ **Grid users have been forced to pay for the market coupling software EUPHEMIA**

   ✓ **Nevertheless, some of the NEMOs claim ownership to EUPHEMIA – and the source code is kept secret.**

   ✓ **Considering the financing of EUPHEMIA and the monopoly status of EUPHEMIA, this seems strange.**

   ✓ **Further, it's distorting the competition between NEMOs**

      • **Market coupling algorithms' ownership hinders level playing field, transparency and innovation.**
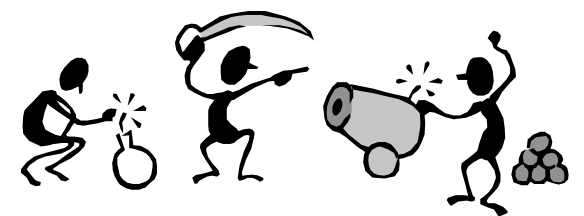
➢ **Competitive NEMOs' conflicts of interest obstruct cooperation for market coupling.**

➢ **The market coupling's convoluted organization & operation makes it difficult to establish efficient regulatory oversight and cost regulation**

   ✓ **Not necessarily inconvenient for the NEMOs claiming ownership of the market coupling software.**

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Current market coupling: flaws – 2

- ➢ **Slow, complex and delayed implementation of changes. This has affected improvements necessitated by the green transition**
  - ✓ **For example: endless delays in the implementing of a shift to 15-minutes trading across Europe.**
- ➢ **In some cases, active NEMO resistance against changes, which will further the green transition**
  - ✓ **For example, NEMO resistance against nodal pricing.*)**
- ➢ **NEMO-invented specifications for the EUPHEMIA software, which were <u>not</u> requested by consumers (who are paying for the whole circus). For example:**
  - ✓ **A preference for small block bids at the expense of bigger block bids.**
  - ✓ **A requirement that neighbouring bidding zones <u>must</u> have the same spot prices, if the interconnector connecting the two zones is not fully utilized.**
- ➢ **Such unrequested, extra requirements may have reduced the value created by the European spot trading with 40%.**
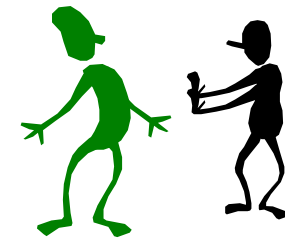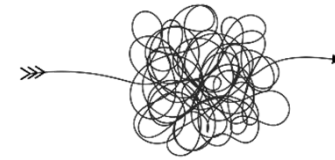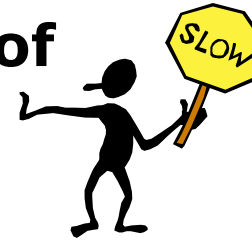
*) See the PowerPoint presentation *Nodal and zonal pricing*

A single, neutral, service-minded Market Coupling Operator (MCO)

➢ **The MCO must be neutral in all respects.**
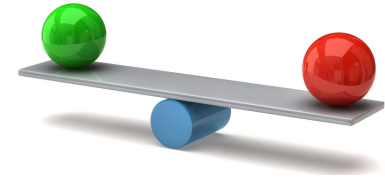
  ✓ **For example: it's <u>not</u> the task of the MCO to have opinions on how the spot market should be organized.**

  ✓ **A <u>service-minded</u> MCO has the task of implementing what electricity consumers, electricity producers and other qualified stakeholders specify – without delay.**

➢ **We need a <mark>well-regulated, cost-efficient single MCO for the Single Electricity Market</mark>.**

➢ **For more information, please see the PowerPoint presentation *Unbundling and EU's Single Electricity Market*.**

➢ **And see ACER's paper *Initial impact assessment on the market coupling organisation* (search ACER's home page).**

By way of comparison: the balancing platforms

➢ **To maintain the security of supply, the European TSOs buy the so-called *ancillary services*.**

   ✓ **The TSOs buy different types of ancillary services.**

   ✓ **The services are bought at the *balancing markets*.**

➢ **For each type of ancillary service, we'll have a single platform with a single operator**

   ✓ **We'll <u>not</u> have anything similar to the market coupling system, which has the flaws outlined previously.**

➢ **For the operation of the market coupling, we just need to establish the same system**

   ✓ **Note: the balancing markets is serious business**

      • **As it concerns the issue of keeping the lights on.**

      • **If we can use this system for the balancing markets, we can surely use it for the market coupling also.**

copy-paste

➢ **No one has in earnest suggested copying the current market coupling system to the balancing markets…**

Why Market coupling?

➢ **With market coupling, the day-ahead plans for the cross-border energy flows are calculated using:**
  ✓ **The market players' spot bids**
    • **i.e., the prices at which the players are willing to buy and sell at a spot exchange.**
  ✓ **Information on the day-ahead cross-border grid capacity.**

➢ **Actually, market coupling is a step backwards towards planned economy.**

➢ **The truly market-based method:**
  ✓ **Allow the market players to do the day-ahead cross-border trading themselves.**
  ✓ **However, experience shows this gives many hours with energy flows, which are sub-optimal for society.**
  ✓ **Because it's difficult for individual market players to make optimal use of the monopoly transportation system (i.e., the grid).**

➢ **The <u>monopoly transportation system</u> distinguishes electrical energy from most other commodities.**
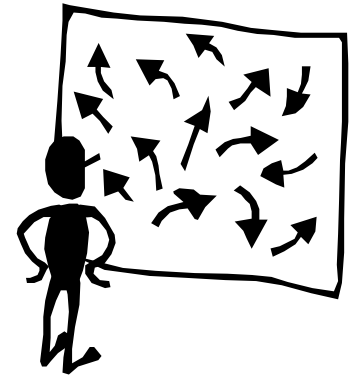
The task for market coupling

➢ **A perfect bilateral cross-border trading system:**

✓ **A system where all players have perfect market oversight**

• **i.e., all players know the market price.**

✓ **No abuse of market power or any other foul play.**
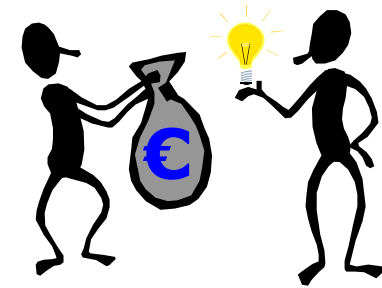
➢ **Such a perfect bilateral bilateral cross-border trading system would automatically settle into the Pareto optimal state.**

➢ **The task for the market coupling algorithm:**

➢ **As far as possible, reproduce the Pareto optimal state, which a perfect bilateral trading system would automatically establish.**

The algorithm calculating spot prices and market coupling flows

The requirement at the previous slide means the algorithm must sit at the intersection between market economy and computer science
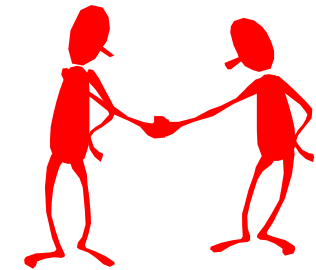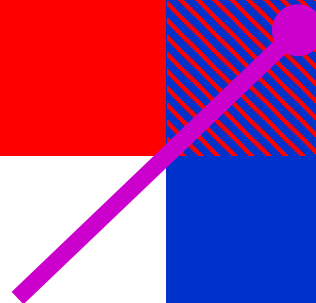

Computer science: Mixed-integer linear optimization

Market economy

Find the Pareto optimal solution

Targeting the optimal solution
Avoiding value-destroying specifications

➢ **Market coupling software – with the perfect, bilateral trading system as the target, <u>avoiding</u> some specifications are obvious:**

➢ **Do <u>not</u> have**

  ✓ **Preferences for small block bids at the expense of bigger block bids.**

  ✓ **Asymmetrical prices, where the sellers' price differs from the buyers' price.**

  ✓ **A requirement that two neighbouring bidding zones <u>must</u> have the same spot price, if their interconnector is uncongested.**

  ✓ **Blocking of counter-intuitive flows, where the flow on some interconnectors goes towards the low price.**

➢ **The optimal solution does <u>not</u> have these features.**

➢ **Hence, installing such extra requirements will severely reduce the value created by spot trading.**

Transparency
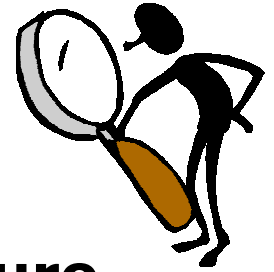
- The market coupling software is a monopoly system
  - ✓ Wich grid users have been forced to finance.
- The software daily distributes hundreds of millions of euro between countries and between market players.
- Therefore, <mark>it must be Open Source Software</mark>
  - ✓ Anyone can access the source code.
  - ✓ This will enable universities, think tanks and anyone else to check for errors and make in-house tests of amendments
    - This means crowdsourcing the tasks of finding errors and testing improvements.
  - ✓ This is why Open Source Software is safer than software where the code is kept secret.
  - ✓ By way of comparison: in the Nordic countries, the introduction of flow-based market coupling has been delayed due to errors in the NEMOs' market simulation tool
    - For obvious reasons, running tests must <u>not</u> be based on a secret NEMO monopoly.

Market surveillance – 1
Enforcing the REMIT rules

➢ **Naturally, the NEMOs must <u>not</u> have the right to deny ACER or any other regulator access to the spot bids**

- ✓ **Non-anonymised spot bids must be included in ACER's database of electricity trades.**

- ✓ **However, apart from this, the creation of a single Market Coupling Operator is not associated with the issue of market surveillance.**
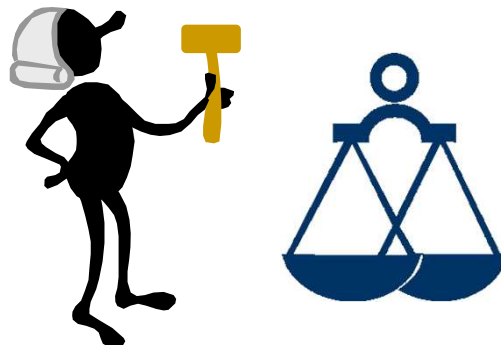
Market surveillance – 2
Enforcing the REMIT rules

- ➢ **EU's REMIT rules provide an excellent legal framework for EU's whole-sale electricity and gas markets**
  - ✓ **However, we need to enforce the rules.**

- ➢ **Every day, for the whole-sale electricity and gas markets, ACER collects more than <mark>7.2 million records of transactions</mark>**
  - ✓ **According to ACER's recent *REMIT Quarterly*.**

- ➢ **Obviously, manual surveillance is futile.**

- ➢ **We need intelligent software trawling this sea of data**
  - ✓ **Searching for suspicious patterns.**

Market surveillance – 3

Enforcing REMIT rules using artificial intelligence

➢ **The software must surveil across <u>all</u> countries and across <u>all</u> markets**

   ✓ **Example: an evildoer could manipulate the spot market**

     • **Afterwards harvesting an ill-gotten gain at the financial market.**

➢ **Per definition, neither national regulators nor exchanges can carry out this multinational, multi-market task**

   ✓ **Further, we should have only <u>one</u> European organization installing & maintaining such advanced, expensive software.**

➢ **This leaves us with ACER as the organization carrying out this task**

   ✓ **Conclusion: <mark>to provide enforcement of the REMIT rules, ACER's budget & staff must be significantly increased</mark>.**

Appendix 1
Getting close to the optimal solution

The optimal solution – 1

Three proposals for improved emulating of the perfect bilateral trading system

➢ **<u>Block bids</u>** It is necessary to allow market players to send block bids to the spot exchanges

  ✓ As thermal producers need this bid form.

➢ However, the introduction of ever more complicated block bids pushes the market coupling software away from the optimal solution.

➢ We need a neutral organization, which can estimate if existing – and proposed new – bid forms move the solution closer to the optimum

  ✓ Or push the solution away from the optimum.

➢ Note: having Open Source Software means this task is also crowdsourced.
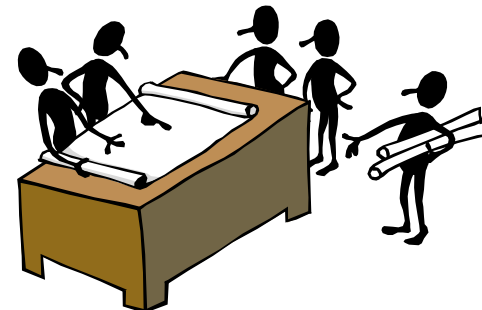
The optimal solution – 2

Three proposals for improved emulating of the perfect bilateral trading system

➢ **Second auction** A bilateral trading system will adjust immediately, if the trading produces strange results

   ✓ **Hence, second auctions for the whole coupled area will provide a better emulation of the optimal trading system.**

Second chance

➢ **Changing the spot price limits** We must have an organized, regulator-approved way of <u>lowering</u> the spot market's price ceiling

   ✓ **Same for changing the price floor.**

Appendix 2
Terminology and acronyms

Terminology and acronyms – 1
As used in this presentation

➢ *ACER* See https://www.acer.europa.eu/en/The_agency/Pages/default.aspx

➢ *Ancillary services* Services the TSOs are buying to maintain the security of supply. See Wikipedia or see https://www.entsoe.eu/network_codes/eb/

➢ *Balancing markets* See https://www.entsoe.eu/network_codes/eb/

➢ *Bidding zone* A geographical area, within which the players can trade electricity day-ahead without considering grid bottlenecks.

➢ *Block bids* See appendix 1 of the PowerPoint presentation *Market coupling – European price coupling*.

➢ *Border* Means a border between two bidding zones.
  ✓ Hence, it need not be a border between two countries. It may be a border between two bidding zones inside a country.

➢ *Day of Operation* The day where the electrical energy is produced and consumed.

➢ *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* and the PDF document *The Liberalized Electricity Market*.

➢ *Electricity* Short for electrical energy.

➢ *Energy* Short for electrical energy.

➢ *Energy flow* In this document, this is short for "day-ahead plan for cross-border energy flow".

➢ *EUPHEMIA* The market coupling software. See https://www.entsoe.eu/network_codes/cacm/implementation/sdac/

➢ *Flow* Short for *energy flow*.

Terminology and acronyms – 2
As used in this presentation

➢ *Market coupling* A day-ahead congestion management system, you can have on a border, where you have spot exchanges at both sides of the border. The day-ahead plans for the cross-border energy flows are calculated using the market players' spot bids and information on the day-ahead cross-border trading capacity. See the PowerPoint presentation *Maximizing the economic value of market coupling and spot trading* and the PDF document *The Liberalized Electricity Market*.

➢ *MCO* Market Coupling Operator. An organization operating the market coupling.

➢ *NEMO* Nominated Electricity Market Operator. See https://www.acer.europa.eu/electricity/market-rules/capacity-allocation-and-congestion-management/market-coupling-development

➢ *Nodal pricing* A market coupling system, where <u>the market</u> decides, which geographical areas that will have the same spot prices.

Nodal pricing contrasts with zonal pricing. With zonal pricing, there are pre-set geographical areas (so-called *bidding zones*). For each hour and each bidding zone, it has up front been decided, that the whole bidding zone <u>must</u> have the same spot price – irrespective of the state of the market.

For more information, see the PowerPoint presentation *Nodal and zonal pricing*.

➢ *Open Source Software (OSS)* This is code that is designed to be publicly accessible. Anyone can see, modify, and distribute the code as they see fit.

➢ ***Pareto optimum*** **For this presentation, this means a combination of the spot prices, traded spot volumes and market coupling flows with the following quality:**

 If you change any of the prices, volumes or flows, then the gain this will give some players will be <u>smaller</u> than the loss the change will inflict on other players.

 Naturally, this is an obvious definition of an economic optimum.

 For more information you may see Wikipedia, for example.

➢ ***REMIT*** **See https://www.acer.europa.eu/remit/about-remit**

➢ ***Second auction*** **Normally, 12 o'clock the day before the Day of Operation is the deadline for submitting purchase bids and sales offers to the spot exchanges. However, if the calculation of the spot prices yields very high or very low prices, the order books can be re-opened. This gives market players an opportunity to send new spot bids.**

➢ ***Spot bid*** **A purchase bid or a sales offer submitted to a spot exchange.**

➢ ***Spot calculation*** **The simultaneous calculation of spot prices and energy flows. See the PowerPoint presentation *Maximizing the economic value of market coupling and spot trading* and the PDF document *The Liberalized Electricity Market*.**

➢ ***Spot exchange*** **In this document, a spot exchange is an electricity exchange where**

  ✓ **Electrical energy is traded day-ahead.**

  ✓ **The exchange's day-ahead prices are calculated by means of double auction.**

  See the PowerPoint presentation *Maximizing the economic value of market coupling and spot trading* and the PDF document *The Liberalized Electricity Market*.

As used in this presentation

➢ *Spot price* **A day-ahead price used by a spot exchange (or the spot exchange's associated clearing house) to settle the participants' trading at the exchange.**

The spot price is calculated using double auction.

See the PowerPoint presentation *Maximizing the economic value of market coupling and spot trading* and the PDF document *The Liberalized Electricity Market*.

➢ *TSO* **Transmission System Operator.**

In EU, each TSO has two tasks:

✓ **Operate the high-voltage grid (the transmission grid) in the TSO's so-called control area.**

✓ **Be responsible for the security of supply in the TSO's control area.**

Most EU Member States have only one TSO. Hence, the TSO's control area is the whole country.

However, some Member States have more than one TSO (e.g. Germany).

➢ *Zone* **Short for *bidding zone*.**

Thank you for your attention!

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