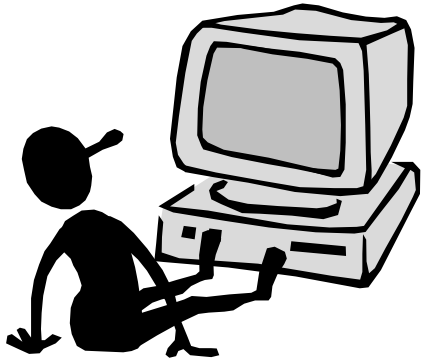
Introduction

- **In the appendixes, you'll find explanations of the concepts, 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*.**



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Imbalance settlement prices

- **This presentation suggests a model, which aligns the imbalance settlement prices with the state of the electricity market.**
- **In 2025, in many European countries, the imbalance settlement systems have become dysfunctional**
  - ✓ **For example, in Austria, Baltic-Nordic countries, Poland and The Czech Republic, we have seen volatile imbalance settlement prices completely detached from the state of the market.**
- **Imbalance prices detached from reality have inflicted huge losses on market players.**

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Consequences of the dysfunctional imbalance settlement system

- Imbalance prices detached from reality have consequences.
- For example, huge losses have been inflicted on wind farms and solar cell farms (RE Producers).
- RE Producers will often have a production deviating from their sale to the market (i.e., they often have imbalances).
- Unless we fix it, the dysfunctional system will require more tax-founded subsidies for new RE installations
  - ✓ This increases the cost of the green transition.
  - ✓ It will impede the green transition, if taxpayers revolt against these expenses.
- Hence, the green transition is threatened by the dysfunctional imbalance settlement system.
- Currently, some countries have introduced individual fixes to tackle the problem
  - ✓ However, we should aim at a sustainable, pan-European solution.

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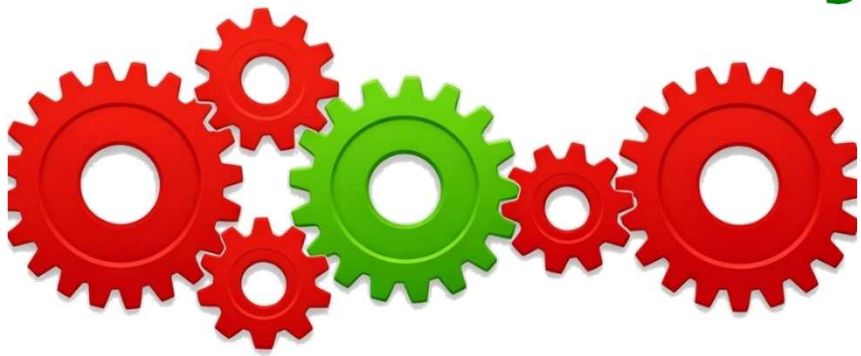
Imbalance settlement

- **EU requirement: the imbalance price must be set by a combination of the prices for energy produced by aFRR and mFRR units**
  - ✓ **Problem: the markets for energy from these units have been reduced to *Mickey Mouse* markets.**
  - ✓ **With prices often without relation to the state of the market.**
  - ✓ **In turn, this has created imbalance prices detached from reality.**
- **In time, improved liquidity and enhanced market surveillance may solve the problem.**
- **However, with huge losses inflicted on market players and societies, we cannot wait for this.**
- **EU exemption: if the local regulator approves, an extra component can be included in the setting of the imbalance prices.**



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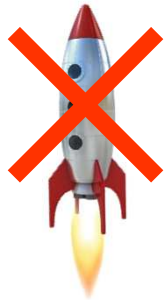
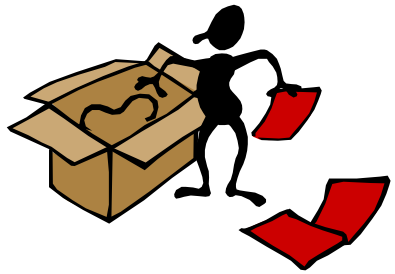
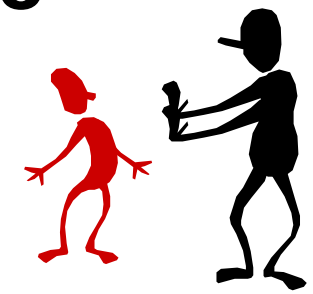
Fair imbalance settlement prices



- **Bringing the imbalance settlement prices in accordance with the market situation is <u>not</u> rocket science.**
- **As we can simply use the prices from the spot market and the intra-day market.**
- **Use these prices to discard the *Mickey Mouse* part of the prices for aFRR energy and mFRR energy**
  - ✓ **When the imbalance prices are set.**



- **aFRR and mFRR prices with low correlation to the spot and intra-day prices should <u>not</u> be used, when imbalance settlement prices are set.**



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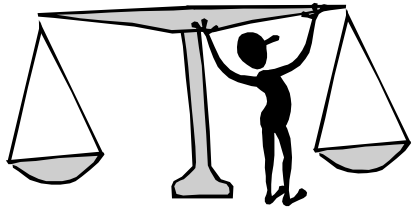
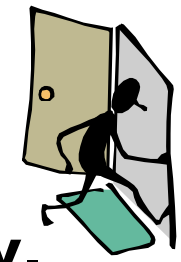
Using spot and intra-day prices to sort aFRR and mFRR prices

- **Question: in this sorting, what weight should we give to the spot prices and the intra-day prices, respectively?**
- **Answer: use the liquidity at the spot market and the intra-day market to determine the weights.**



- **All things being equal: low liquidity at the intra-day market indicates the spot prices are still valid, when we arrive at the Quarter of Operation.**
- **If the intra-day liquidity is high: intra-day prices set close to the Quarter of Operation may be given high priority in the sorting.**
- **Note: if *Mickey Mouse* prices are eliminated from the prices for ancillary services by improved liquidity and enhanced market surveillance in the future**

  - ✓ **Then this sorting will automatically tend to discard fewer aFRR and mFRR prices.**
  - ✓ **At best, eventually, no prices paid for ancillary services will be discarded.**
  - ✓ **At best, this sorting system will fade away automatically.**



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Covering the TSOs' expenses

- At the outset, the TSOs' imbalance settlement system should cover the TSOs' expenses for buying balancing energy.

- This requirement may not be fulfilled, when the *Mickey Mouse* priced part of balancing energy is discarded
  - ✓ Before the imbalance price is set.

- Hence, some of the TSOs' costs for buying balancing energy may have to be covered by grid fees
  - ✓ The grid fees are mainly paid by energy consumers.
- However, eventually, the burden of the dysfunctional imbalance settlement systems falls on the energy consumers
  - ✓ And on taxpayers, when this dysfunction increases the need for subsidies to new renewable energy units.
- Recovering some of the TSOs' expenses via grid fees is a better temporary solution

  - ✓ Until improved liquidity and enhanced market surveillance may solve the problem.
  - ✓ Better than a "solution", where heavy losses are inflicted on market players and society.

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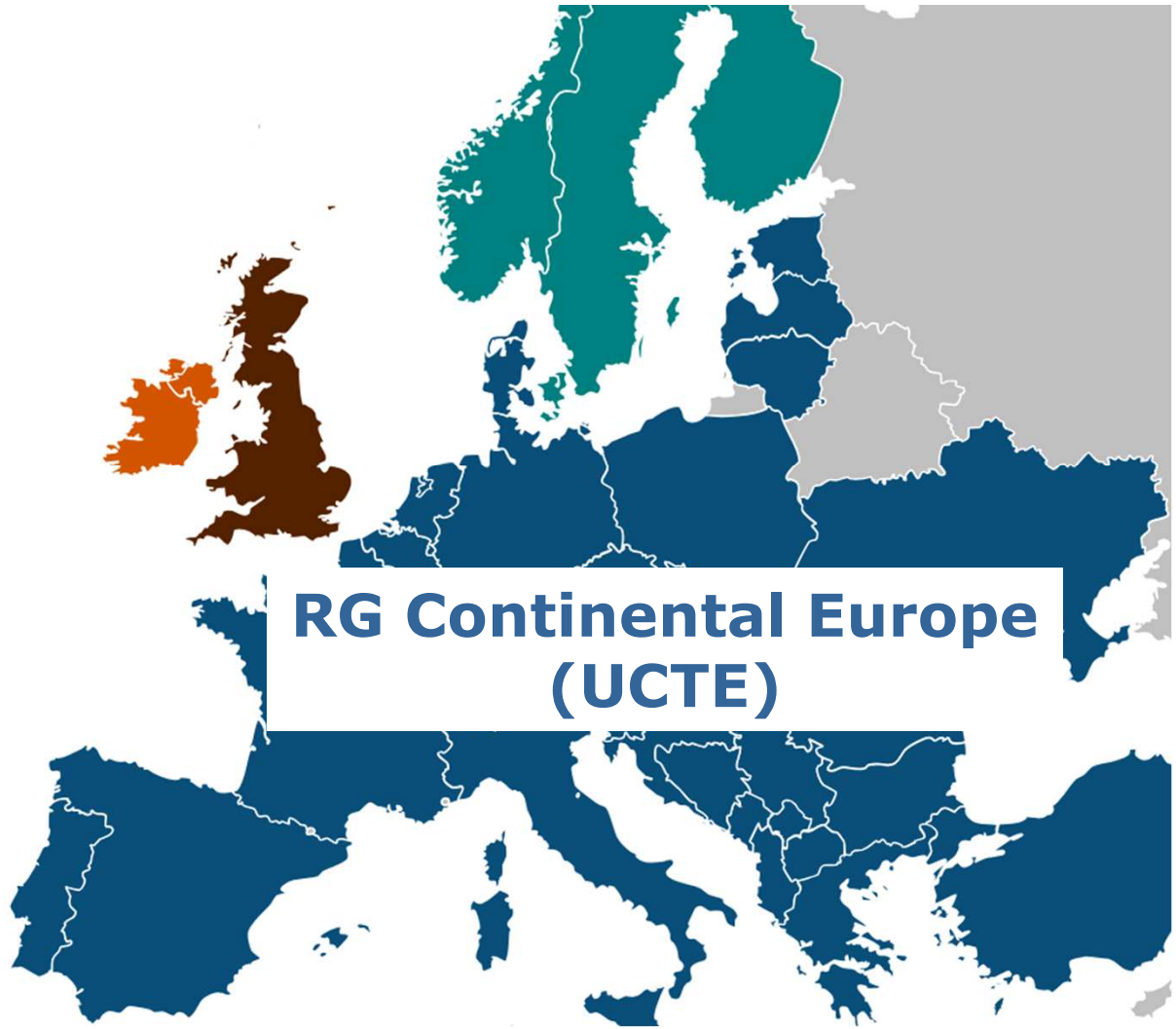
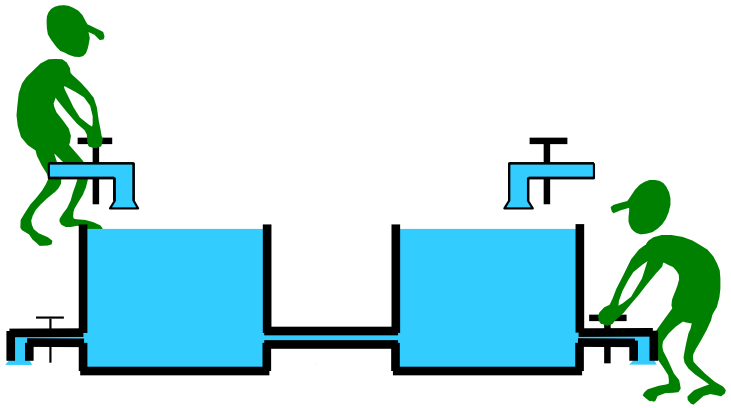
Appendix 1

Capacity purchase in UCTE





In this context, capacity is the ability to change production or consumption of electrical energy fast

Former name: Union for the Co-ordination of Transmission of Electricity (UCTE). Today RG Continental Europe

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Capacity bought by the TSO

Western Denmark as a case

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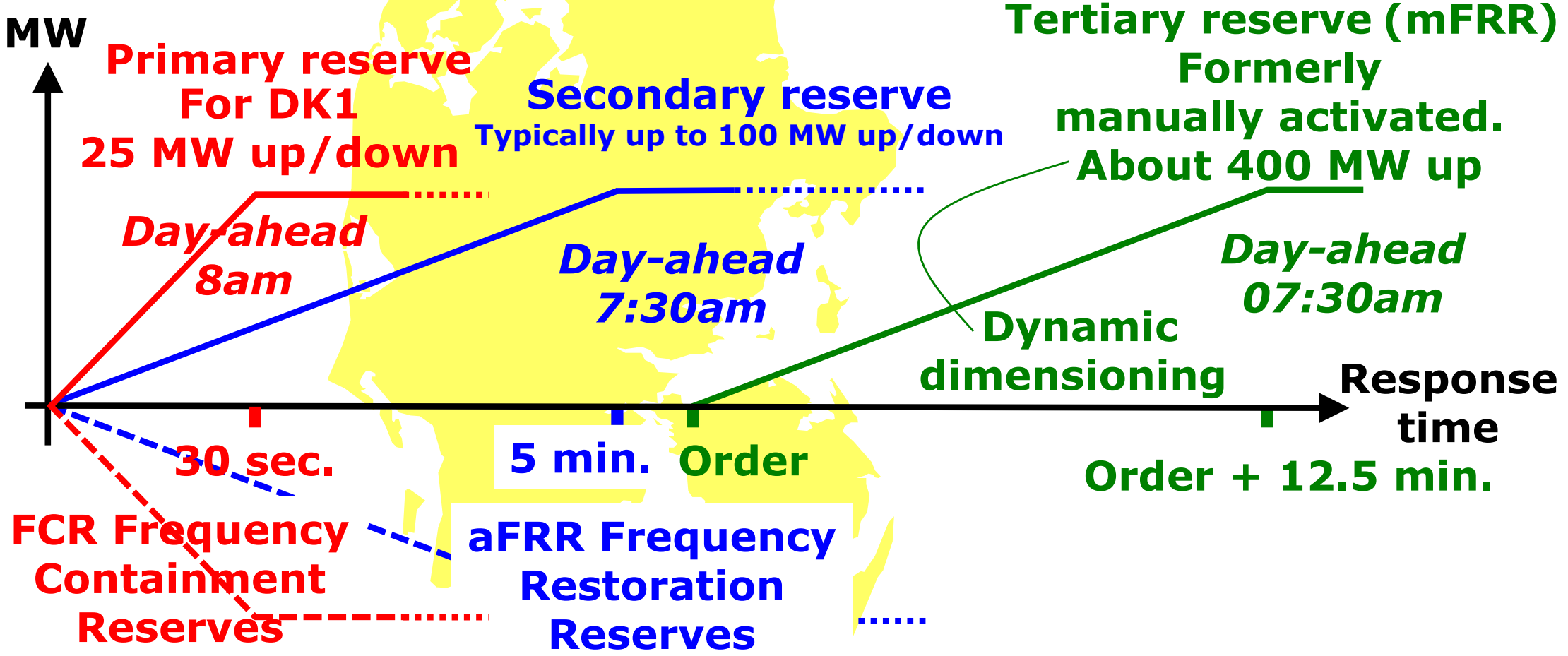
This is the UCTE system

- **Western Denmark (DK1)**
  - ✓ **Consumption about 24 TWh/year.**
  - ✓ **Min. load about 1 400 MW. Max. load about 3 600 MW.**
  - ✓ **Jan. 1st, 2025: wind ca. 5 900 MW and solar ca. 3 100 MW (!).**



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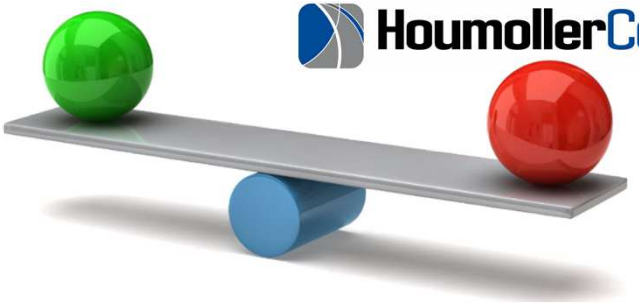
Appendix 2
Imbalances



- A power producer has an imbalance, if there is a difference between the energy the producer sold at the whole-sale market and the energy produced by the producer.
- A supplier has an imbalance, if there is a difference between the energy, the supplier bought at the whole-sale market, and the energy the supplier's customers consumed
  - ✓ For consumers, who buy at the whole-sale market themselves, an imbalance is defined the same way.
- A trader has an imbalance, if there is a difference between the trader's energy purchase and energy sale.
- For each player, imbalances are calculated per quarter (i.e., per 15 minutes).
- In most Member States, The local TSO settles the players' imbalances.

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Appendix 3

Timeline for trading electrical energy in EU

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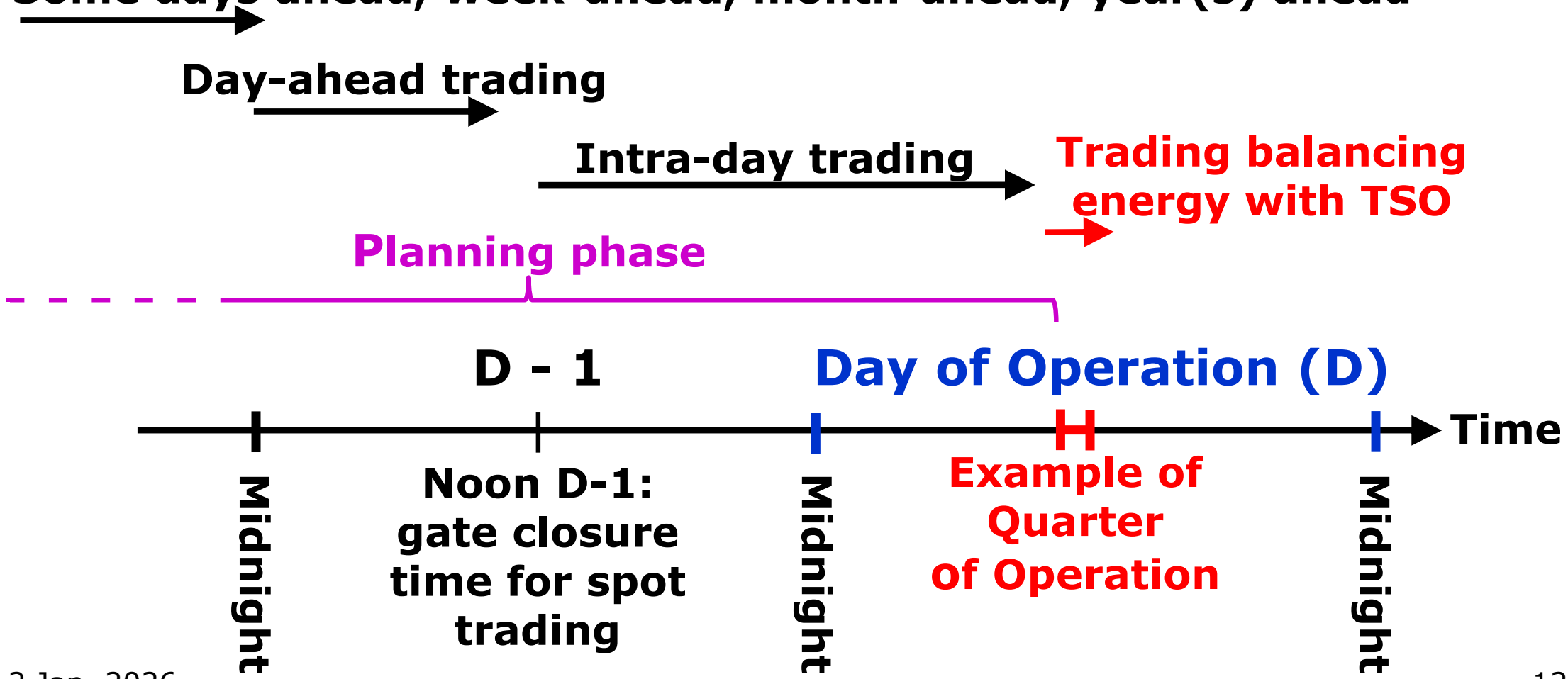
Timeline for trading electrical energy in EU

Day of Operation:
The day where the energy is produced and consumed.
Quarter of Operation:
The quarter where the energy is produced and consumed.

Long-term contracts (physical and financial):
Some days ahead, week-ahead, month-ahead, year(s) ahead



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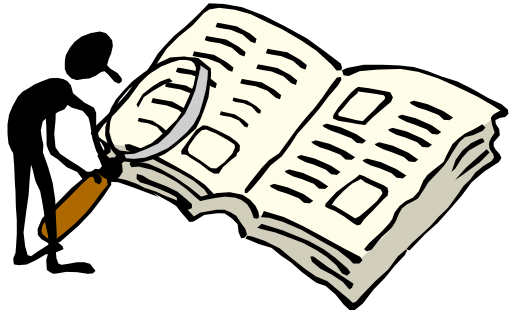

Appendix 4
Terminology and acronyms
as used in this presentation

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Terminology and acronyms – 1

- ***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 energy*** **Energy traded by the TSOs to maintain the balance between production and consumption.**
- ***Consumer*** **In this document this is a consumer of electricity.**
- ***Electricity*** **Short for electrical energy.**
- ***Energy*** **Short for electrical energy.**
- ***Imbalance settlement*** **The rules for the imbalance settlement system are set in The Guideline on Electricity Balancing https://eur-lex.europa.eu/eli/reg/2017/2195/oj/eng and ACER Decision on the imbalance settlement harmonisation methodology**

  https://eepublicdownloads.entsoe.eu/clean-documents/nc-tasks/200715_A52(2)_ACER%20Decision%2018-2020%20on%20balancing%20ISHP%20-%20Annex%20I.pdf
- ***Market*** **Short for electricity market.**
- ***Market player*** **A player who trades electrical energy at the whole-sale market.**
- ***Member State*** **A state which is member of the European Union.**
- ***Producer*** **In this document this is a producer of electricity.**
- ***RE*** **Renewable Energy. In this presentation, the concept is narrowed: in this document, *RE producers* means wind turbines and solar cells.**
- ***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*.**

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Terminology and acronyms – 2

- ***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*.

- ***Spot trading*** **Trading with a spot exchange.**
- ***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*.

- ***Supplier*** **In this document this is a retailer, who sells electricity to consumers.**
- ***Trader*** **In this document this is a player who buys and sells energy at the whole-sale market – but is neither responsible for production nor consumption.**
- ***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).

- **UCTE See Wikipedia "Continental Europe Synchronous Area".**

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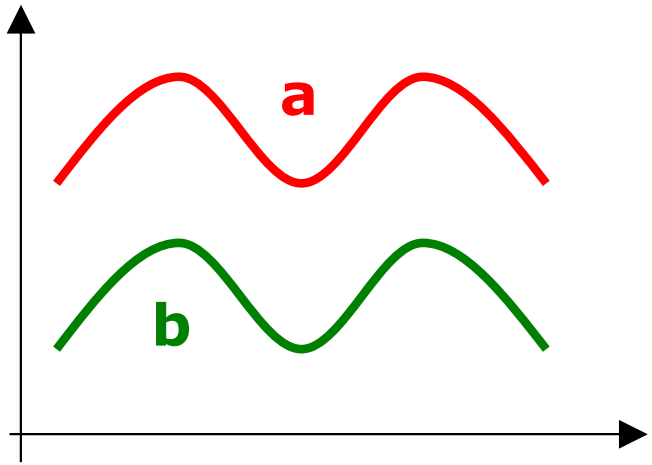
Appendix 5
The correlation function

- The correlation function measures the correlation between two variables.
- If the two variables move in lockstep, the value of the correlation function is 1.
  - ✓ A value of 0 means there is no correlation at all.



In this example
Correlation(a,b) = 1
as a and b move
in lockstep

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Thank you for your attention!

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