WELCOME

Workshop 2
A new countertrade model

Agenda

- Welcome
- Legal framework & market development
- The intraday model & timeline
- External presentations
- Break
- Setup of an intraday model
- Sum up and further process

*Q&A after each agenda topic

# QUESTIONS AND COMMENTS GUIDELINE

- After each agenda point we will open up for a "questions and comments session"

- If you have any questions or comments during the presentations please wait until we open up for "questions and comments session"

- However, during the presentations you can type in your question or comment in the chat box and we will address it in the "questions and comments session"

TECHNICAL GUIDELINES

- Please mute your microphone whenever you are not speaking

- Please turn off your camera whenever you are not speaking and please turn it on whenever you are speaking

- If you have a question or a comment, please use the "raise your hand" function in teams. We will make sure everyone gets speaking time.

- Otherwise, you can ask a question or write a comment in the chat box
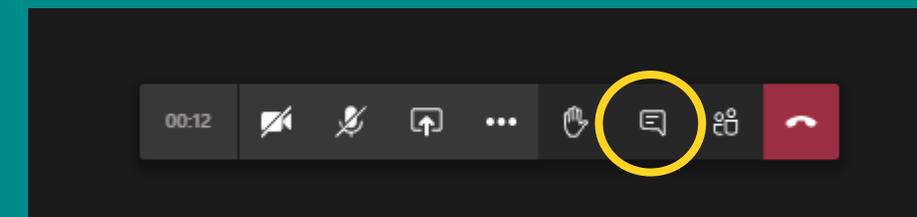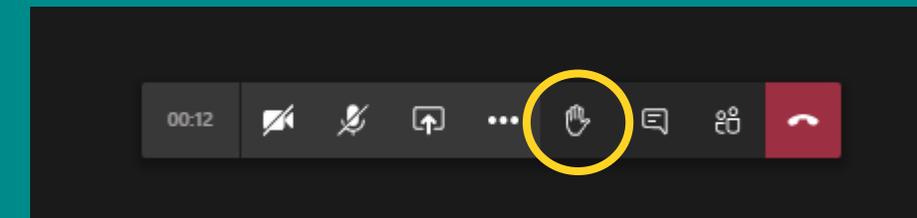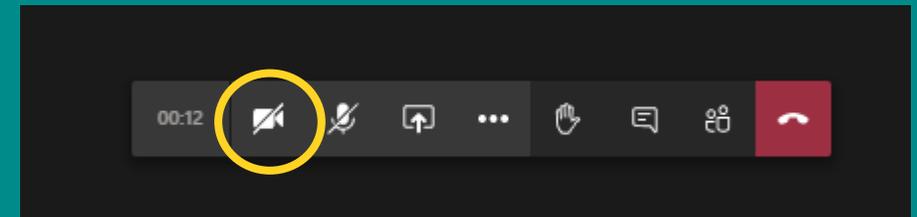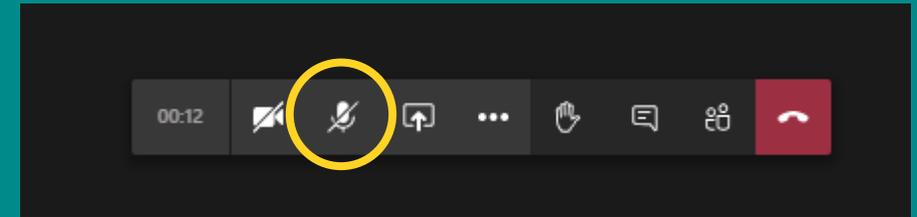
PRESENTATION OF WORKGROUP MEMBERS

Asger Grønlund…

Line Kamp Bräuner

Henning Parbo

Gitte Agersbæk

Astrid Buhr Broge

Majura Thaya Po…

AND

Johannes Bruun

DEFINITION OF COUNTERTRADE

Countertrade is defined as:

"a measure with the objective of relieving physical congestions between two bidding zones, where the precise generation or load patterns is not predefined".

Therefore the precise location within a bidding zone is not necessary for a countertrade new model.

The countertrade model is mainly to be used for structural countertrade needs e.g. arriving from TenneT Commitments and the 70% rule

— ELECTRICITY TRANSMISSION GRID
— GAS TRANSMISSION GRID
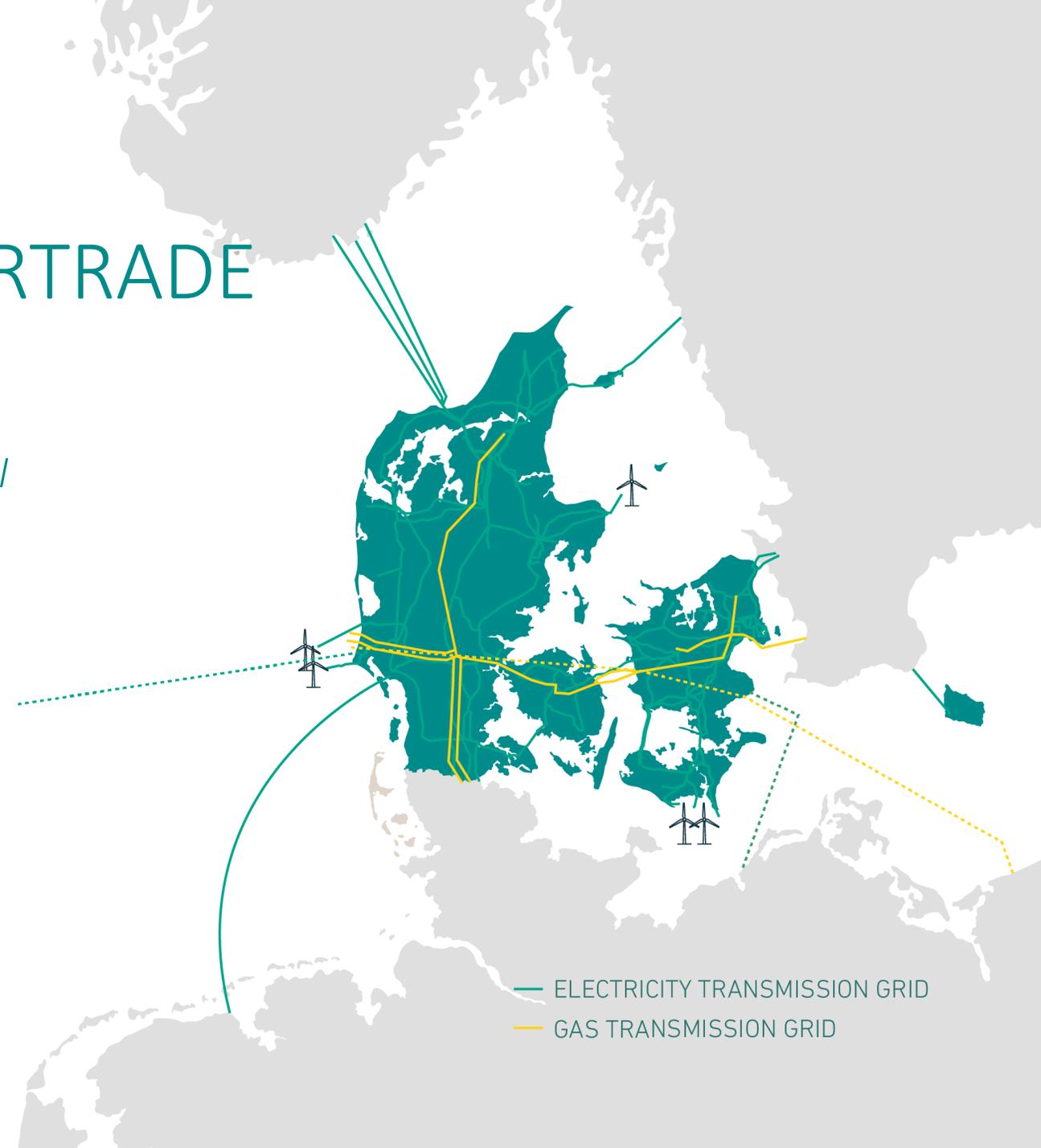
WELL FUNCTIONING MARKETS

Energinets purpose:

"Energinet must maintain a high level of security of supply, integrate renewable energy and <u>promote optimal conditions for Denmark's electricity and gas markets</u>"

THE 70 % RULE AND COUNTERTRADE

The Electricity Market Regulation Articles 16(4) and 16((8)(a)) states that countertrade is among the tools that shall be applied to ensure minimum 70% transmission capacity.

Due to the 70% rule Energinet finds that it is necessary to enable countertrade on all our borders.

Energinet is committed to promote optimal market conditions to solve this obligation.

INCREASED SPECIAL REGULATION VOLUMES AND PRICE IN 2020

In the assessment from 2018 special regulation was chosen as the countertrade model.

Since 2018 countertrade volume has increased 3-fold and also the price has increased 2,5 times.

Danish producers/consumers has received 72 million EUR for downward regulation in 2020.

Danish BRP downward regulation	2020	2019	2018
Volume (GWh)	3.048	1.312	1.114
Average price (EUR/MWh)	-24	-12	-9,2

A negative price for downward regulation means that producers are paid not to produce, and consumers are paid to consume

Balance- og special regulation in Western Denmark 2017-2020, downward regulation
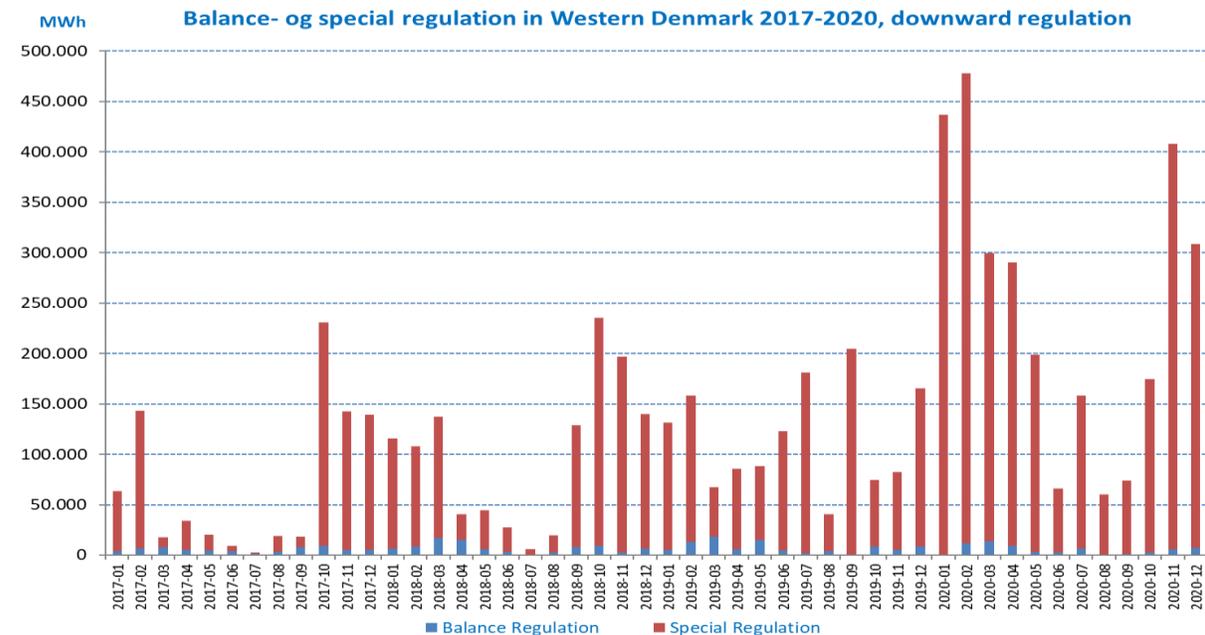
CHANGED SCOPE OF WORKSHOP 2

- The current countertrade model does not optimize socio-economic welfare
- The current countertrade model cannot continue after Q4 2022
- Energinet finds that intraday continuous trading is a better socio-economic alternative, and the only model which can be implemented before Q4 2022.
- No other countertrade model has been suggested at the first workshop

Due to this, Energinet finds that stakeholder input concerning an intraday countertrade model is most valuable.

QUESTIONS & COMMENTS

Presentation

Legal framework & market development

NO LEGAL OBSTACLES IN INTRADAY

Energinet is not familiar with any legal obstacles to the implementation an intraday countertrade model.

The intraday market is a fully established market, and other TSOs are already today using the intraday market for countertrade

A new intraday countertrade model should be designed to ensure compliance with transparency regulation and REMIT.

An intraday countertrade model will be subject to regulatory approval

LEGAL AND TECHNICAL CHALLENGES WITH SPECIAL REGULATION

Technical challenge

In the new Nordic energy activation market the activation algorithm activates all bids at the marginal price. This practice begins with the parallel operation of the Nordic AOF (Q4 2022). Investing time and resources in exploring possible IT solutions to continue the use of special regulation for countertrade in the new Nordic energy activation market, is not desired, as an intraday model is a better alternative model.

Legal challenge

By Nordic participation in MARI (Q3 2023) ACERs pricing proposal and The methodology for pricing balancing energy and cross-zonal capacity (…) applies, and special regulation for countertrading purposes is no longer within the legal framework.

QUESTIONS & COMMENTS

The model

The intraday
model & timeline

SOCIOECONOMIC EFFECTS OF VIRTUAL DAY-AHEAD CAPACITY

Joint Declaration / TenneT commitments / CEP 70 % rule => day-ahead capacity beyond safe operational limits / virtual capacity

With the DK1-DE border as an example, virtual day-ahead capacity has two effects

- Increased export demand in DK1 in day-ahead timeframe => higher DA price (the day-ahead effect)

- Increased supply in DK1 in the relevant market after the day-ahead timeframe => lower price in the relevant market (the countertrade effect)

Socioeconomic effect if virtual capacity change physics. How is physics impacted by the

- special regulation model?

- intraday model?

THE COSTS ASSOCIATED WITH THE COUNTERTRADE EFFECT

Possible routes: Reduced generation, increased demand, reduced import

- Countertrade on the DK1-DE border: <u>Energinet sells energy</u> to market participants

- Market participants: Willing to pay according to according to their alternative costs

  - Thermal generators: Fuel costs if they continue to generate

  - Wind turbines/PV: Little/very low generation costs if they continue to generate

  - Hydropower: Used water cannot be used in the future if they generate

  - Electric boilers: Save costs for heat generation if they start to consume (+ tariffs/taxes)

- The choice of countertrade model: Who changes the physics? / <u>what costs are realized?</u>

- The most efficient model: The one that reduces costs the most.

UNDERSTANDING THE COUNTERTRADE EFFECT

The countertrade effect is impacted by two aspects of the chosen countertrade model; bidding zone scope and market participant scope

The **bidding zone scope:** The bidding zones that are part of the countertrade model

- The special regulation model: DK1 and DK2 only

- The intraday model: All bidding zones (given availability of cross-zonal capacity)

The **market participant scope:** The types bids allowed in the countertrade model

- The special regulation model: Physical-asset-only

    - Activation must result in physical change

    - "No" possibility for speculation

- The intraday model: No restrictions

THE BIDDING ZONE SCOPE EFFECT

The difference between the intraday and the special regulation spread reflects socioeconomic inefficiency. The size depends on the shape of the intraday and special regulation merit-order

Special regulation model merit-order

Intraday model merit-order

Price €/MWh

CT volume

DK1 day-ahead price

Intraday spread

Special regulation spread

Intraday "CT-price"

Downward regulation

Upward regulation

Special regulation "CT-price"

"CT-price" is the socioeconomic cost of the marginal bid necessary for countertrade
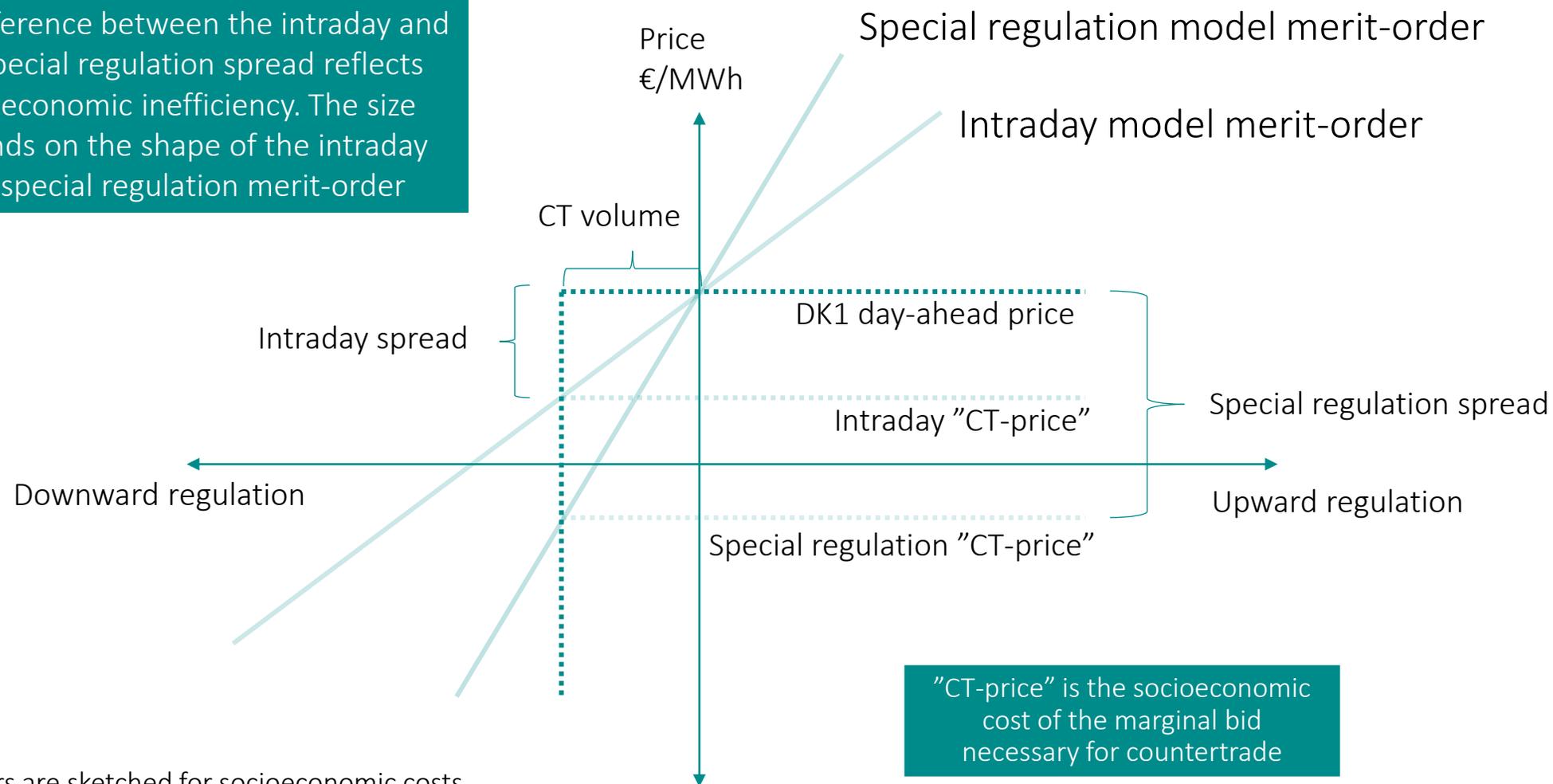
*Merit-orders are sketched for socioeconomic costs

SUMMARY ON THE BIDDING ZONE SCOPE EFFECT

The intraday model allows market participants in more bidding zones to compete for buying the countertrade energy which increases socioeconomic efficiency

- Day-ahead and "CT" price spread is an indicator for socioeconomic efficiency.

  - Lower spread in intraday model => Larger cost reduction in intraday model

- More bidding zones in the intraday model => more competitive supply

  - Bids setting the day-ahead price (highest cost bids) included in the intraday model

  - Intraday model: Largest reduction in global generation costs

THE MARKET PARTICIPANT SCOPE EFFECT

Non-physical/speculative market participants changes the dynamics of the CT-model

Systematic price differences between market timeframes: Basis for speculation

Intraday spread = Systematic price difference

Speculator strategy to "harvest" the intraday spread:

- Sell day-ahead

- Buy intraday

"Not" possible in special regulation model.

Significant change to dynamics of day-ahead and intraday market in intraday model.

THE MARKET PARTICIPANT SCOPE EFFECT

In practice uncertainty implies that risk is associated with speculation. Only "risk-adjusted" price convergence can be expected.

Price €/MWh

Physical intraday model merit-order

Speculative intraday model merit-order

CT volume

Physical DK1 day-ahead price

Intraday spread disappers fully

Speculative DK1 day-ahead price

Physical intraday model "CT-price" =

Downward regulation

Upward regulation

Specu-lation

THE MARKET PARTICIPANT SCOPE EFFECT

In practice uncertainty implies that risk is associated with speculation. Only "risk-adjusted" price convergence can be expected.

Price €/MWh

Physical intraday model merit-order

Speculative intraday model merit-order

CT volume

Physical DK1 day-ahead price

Intraday spread disappers fully

Physical intraday model "CT-price" = Speculative DK1 day-ahead price

Downward regulation

Upward regulation

Specu-lation

Countertrade effect cancels day-ahead effect
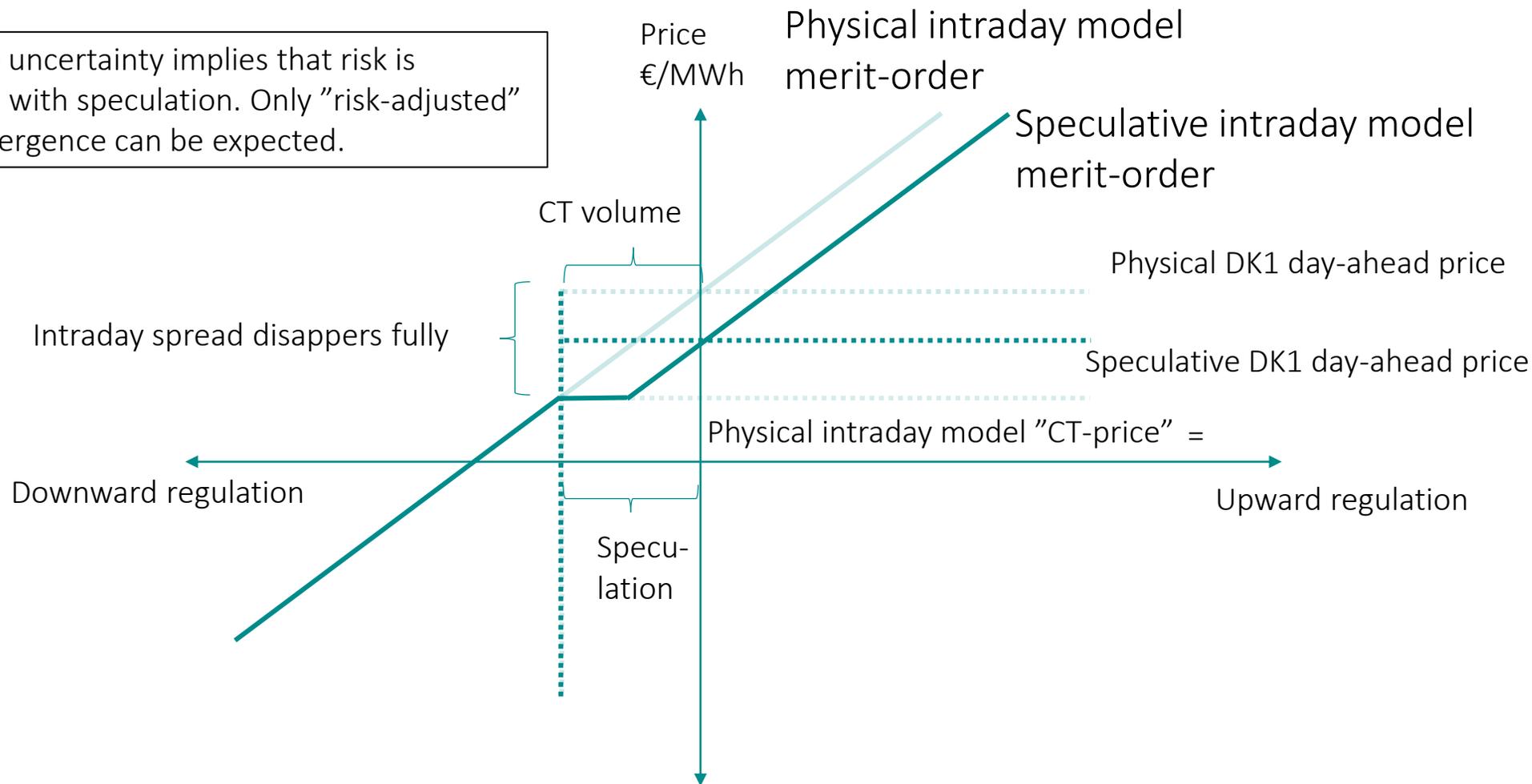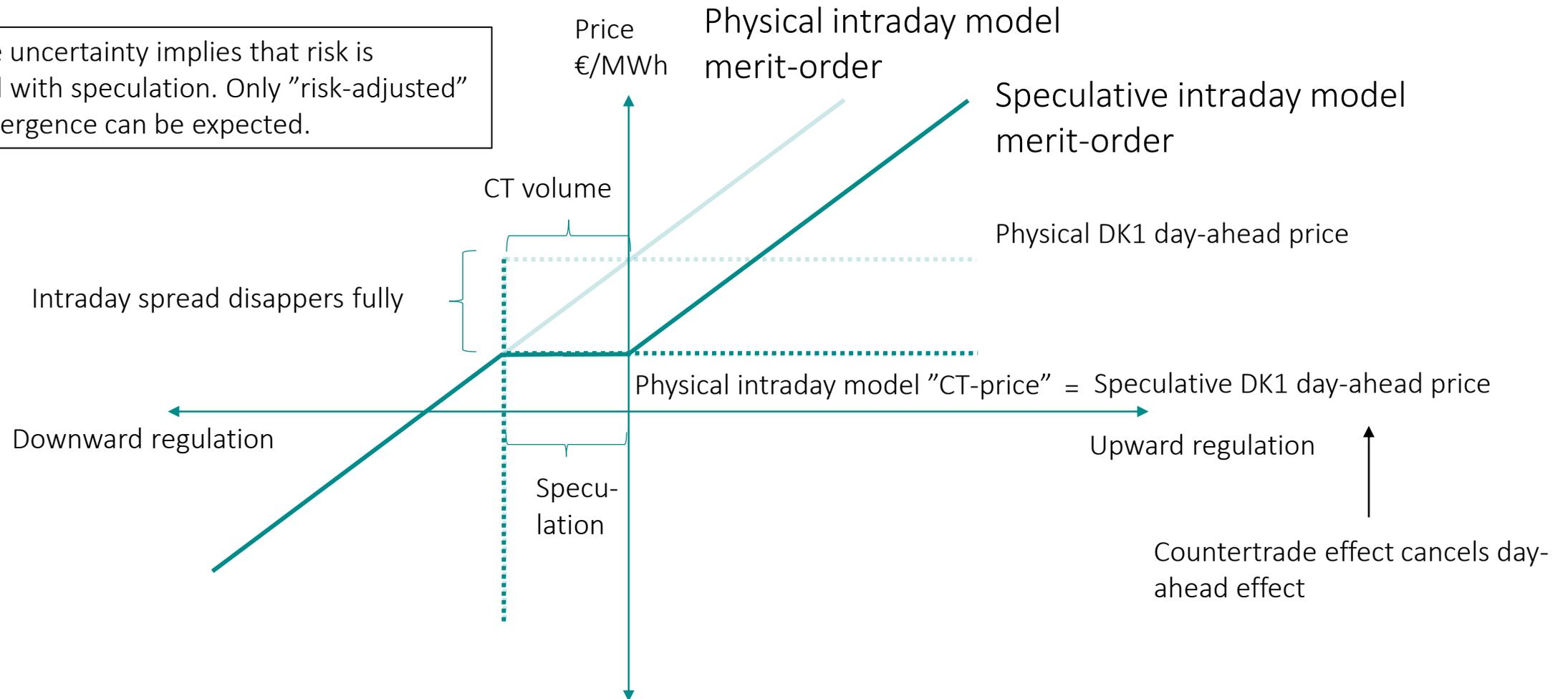
SUMMARY ON THE MARKET PARTICIPANT SCOPE EFFECT

Speculation may increase socioeconomic efficiency but will increase competition leading to lower costs for TenneT and lower profits from countertrade

- Speculators reduce spread between day-ahead and intraday

- Speculation aligns day-ahead result with actual dispatch

  - Reduced commitment costs (e.g. start-up costs) => Potential for increased socioeconomic efficiency

- Speculation changes the distribution of gains from countertrade

  - Reduced day-ahead effect => benefits consumers/harms generators

  - Speculators "steal" some profits from physical buyers of CT energy

- Speculation is

  - inevitable in the intraday model

  - not a key driver for preference for intraday model

PURPOSE OF VIRTUAL DAY-AHEAD CAPACITY

Potentially no socioeconomic effects of virtual day-ahead capacity but high transparency about costs from internal congestion

If no/little impact on the Danish (Nordic) markets => Why virtual day-ahead capacity?

Without virtual capacity:

- Consumers in Germany face **higher** electricity prices

- The German costs from internal congestion are **hidden** in higher electricity prices

With virtual capacity:

- Consumers in Germany face **lower** electricity prices

- The costs from internal congestion are **transparently shown** through countertrade/redispatch costs (but is of course still paid by consumers)
    - Special regulation model "artificially" increases these costs beyond the necessary costs

SYSTEM SECURITY IN THE INTRADAY MODEL

Imbalanced positions after CT trade due to excessive speculation
- Can be balanced in the intraday market until gate-closure
- Can become an imbalance to be balanced by Energinet

Price €/MWh

Physical intraday model merit-order

Speculative intraday model merit-order

CT volume

Physical DK1 day-ahead price

Physical intraday model "CT-price"

Speculator loss (per MWh)

"Excessive speculative" DK1 day-ahead price

Downward regulation

Upward regulation
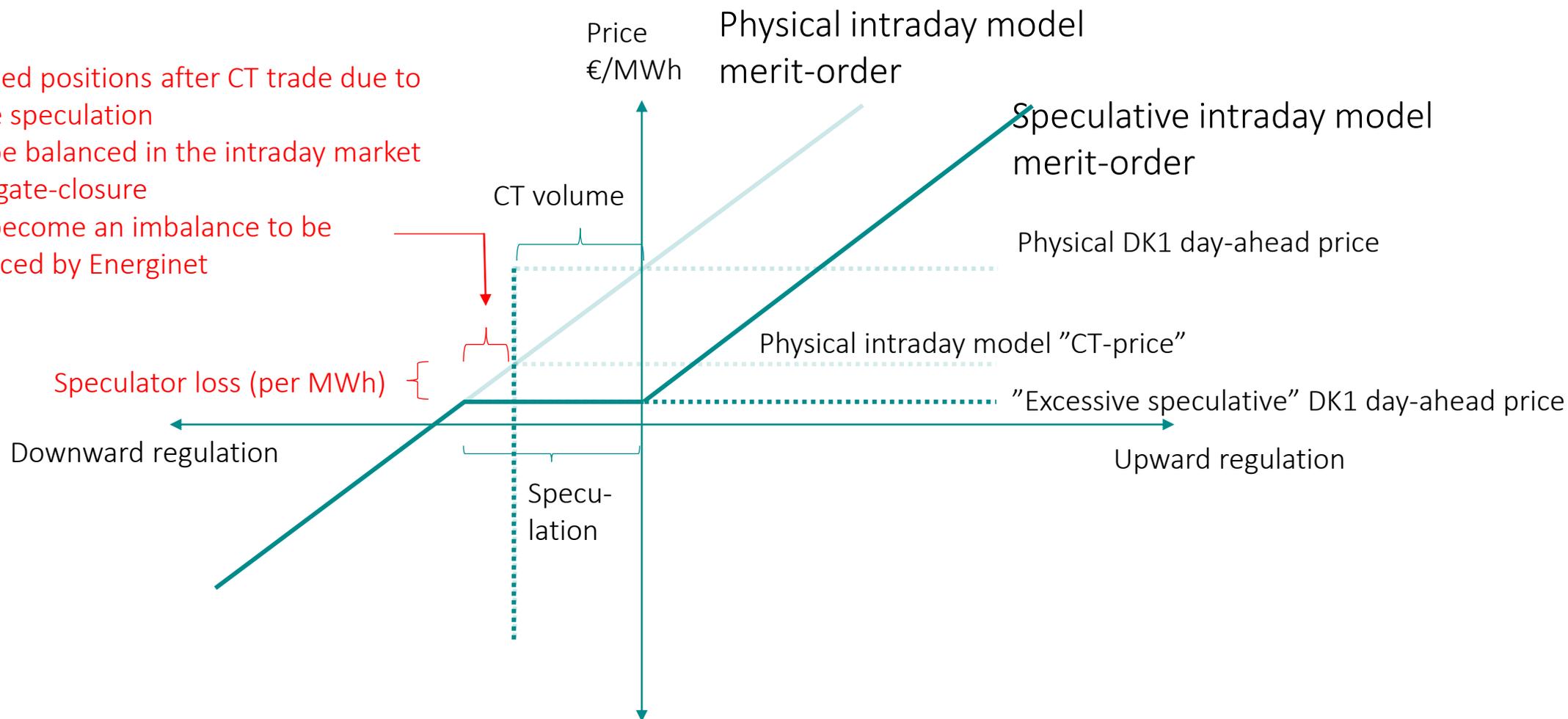
Specu-lation

SYSTEM SECURITY IN THE INTRADAY MODEL

Up- and downsides to speculation are stacked for system security.

- Speculative bids vs. physical bids

    - Potential speculator upside is capped by the physical intraday spread => limits speculation

- Speculative bids vs. speculate bids

    - Competition reduces speculator upside => further limits speculation

- Speculative upside vs. imbalance settlement downside

    - Speculative imbalance => System imbalance => Costly imbalance settlement for the speculator

    - Large speculative imbalance => Large system imbalance => Very costly imbalance settlement for the speculator

    - => Downside is constant and (non-linearly) increasing with speculative imbalances

The incentives in the market are stacked such that the upsides are diminishing and downsides are fixed/increasing with speculation. Speculators are not incentivised to put the system at risk.

THEORETICAL PRECONDITIONS FOR SYSTEM SECURITY

The larger the certainty for speculators, the lower the risk for system security

Competition => "aligned" speculative positions => "low" speculative imbalances – if the right preconditions are in place:

- Transparency about countertrade volumes

  - Absence of "arbitrary" changes to CT volumes reduces uncertainty.

- Transparency about sell price for countertrade energy and timing of bid submission

  - Transparency will allow market participants to focus only on the competition from other buyers

- Experience with speculation in the intraday model among market participants

  - A transitional period with gradually increasing volumes being shifted to the intraday market will allow such experience to be gathered.

To be discussed later in the workshop. Transparency in relation to the risk of market manipulation should also be considered in that context.

COUNTERTRADE MODEL AND IMBALANCE SETTLEMENT – DOWNWARD REGULATION

Special regulation model impacts regulating power bid prices and inflates balancing energy price (through day-ahead effect)

- Pay-as-bid pricing in special regulation model => significant impact on DK regulating power bid prices => indirect effect on balancing energy price

DKK/MWh	Day-ahead price	Marginal intraday cost	Balancing energy price	Marginal special regulation cost
Physical reference (no virtual capacity)	250		200	
Special regulation model	300		250	0
Intraday model (no speculation)	300	250	200	
Intraday model (perfect speculation)	250	250	200	

Intraday model mirrors physical reference better

COUNTERTRADE MODEL AND IMBALANCE SETTLEMENT – UPWARD REGULATION

Very significant effect on upregulation volumes due to netting in special regulation model

	2020	2019	2018	2017
Countertrade, GWh	3.901	1.914	1.598	1.210
- Netting, GWh	853	602	484	429

- Reduced demand for upward regulation => less costly to cause underfrequency => higher system risk

- Lower revenue for flexibility providers => reduced investments => reduced robustness

- Intraday model: Intraday trade close to day-ahead market => CT energy "cannot" be used for balancing => little impact on RK-price for upward regulation

  - However, no saved upregulation costs in intraday model => negative socioeconomic impact

SUMMARY ON BALANCING ENERGY PRICE

Special regulation model impacts the balancing energy price more than the intraday model for both upward and downward regulation

Downward regulation under special regulation model

- Skewed RPM bid prices in DK1 and DK2

- Artificially high balancing energy price (through the day-ahead effect)

Upward regulation under special regulation model

- Netting reduces need upward regulation

Intraday model has very limited inpact on balancing energy market but negative socioeconomic effect of no netting.

THE MARKET PARTICIPANT SCOPE EFFECT, ROUGH QUANTITATIVE ESTIMATION

Merit order assumptions (socioeconomic)
- Special regulation
  - Assumed marginal costs from thermal, wind, and electric boilers based partially on confidential data on acceptance of bids from different technologies
- Intraday
  - Historical RK-prices used to roughly "guessestimate" costs

Special regulation model merit order

Physical intraday model merit-order

Price €/MWh

CT volume

Physical DK1 day-ahead price

Downward regulation

Upward regulation

Higher socioeconomic efficiency from intraday model compared to special regulation model
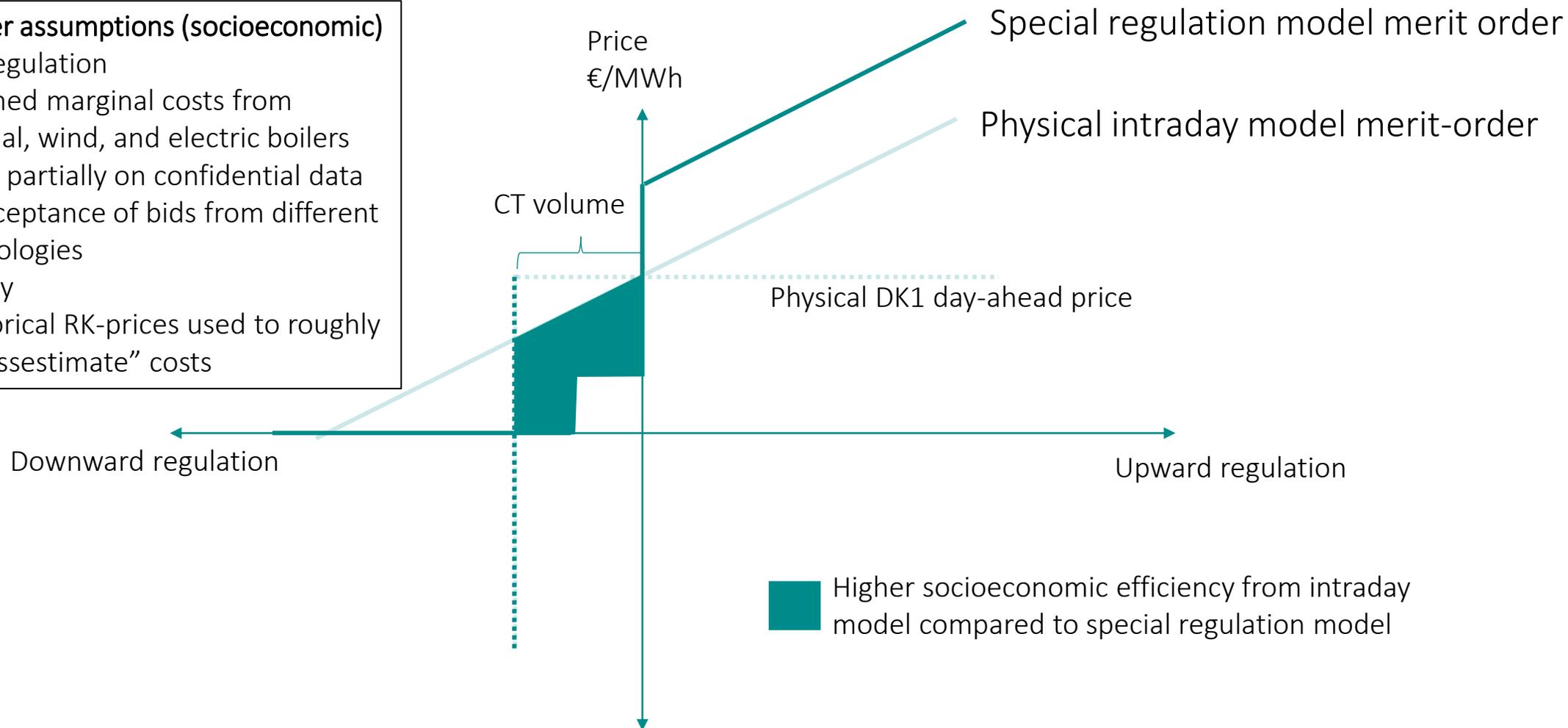
ROUGH ESTIMATION OF SOCIOECONOMIC IMPACT, 2019-Q2 2020

Average RK-price down
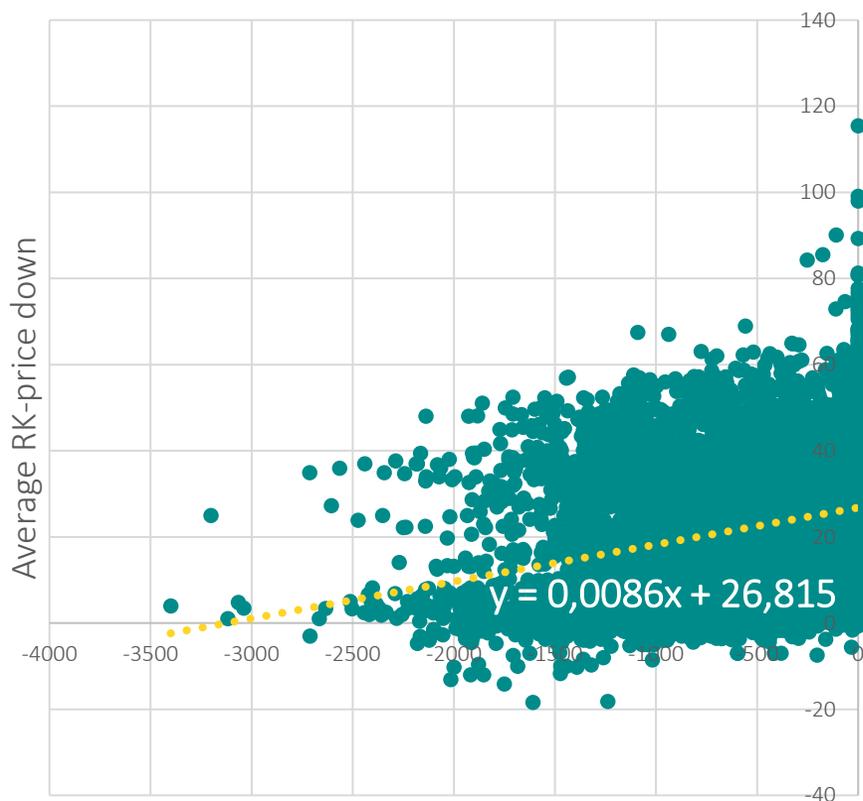
Total Nordic downward regulation, MWh

$y = 0{,}0086x + 26{,}815$

Share of DK zero-cost downward regulation	Expected intraday model costs savings, mEUR	Expected special regulation model cost savings, mEUR	Extra intraday cost savings, mEUR
0 %	63.2	60.9	2.4
10 %	63.2	54.8	8.4
20 %	63.2	48.7	14.5
30 %	63.2	42.6	20.6
40 %	63.2	36.5	26.7
50 %	63.2	30.4	32.8
60 %	63.2	24.3	38.9
70 %	63.2	18.3	45.0
80 %	63.2	12.2	51.0
90 %	63.2	6.1	57.1
100 %	63.2	0.0	63.2

2/3 from 2020, 1/3 from 2019

ROUGH ESTIMATION OF CT COST EFFECTS

Downward regulation of low-cost generation (wind in particular) drives socioeconomic effects. Large increase in volumes of regulated wind indicates increasing socioeconomic loss – particularly in 2020. Similarly but less dramatically so for electric boilers.

GWh/year	2020	2019	2018	2017
Countertrade energy	3.901	1.914	1.598	1.210
- Netting	853	602	484	429
- DK downward regulation	3.048	1.312	1.114	781
- Thermal*	1.065	608	593	503
- Electric boilers*	517	291	235	173
- **Wind turbines***	**1.461**	**423**	**291**	**110**

* Contains minor rounding errors

INTRADAY COUNTERTRADE MODEL IMPLEMENTATION TIMELINE

ENERGINET

regulatory approval

regulatory approval in case of amendments

Nordic AOF go-live → Hard ultimate deadline

Public consultation

2021

Q2 2021

2022

Q2 2022

Q4 2022

Now

Go-live?

Go-live
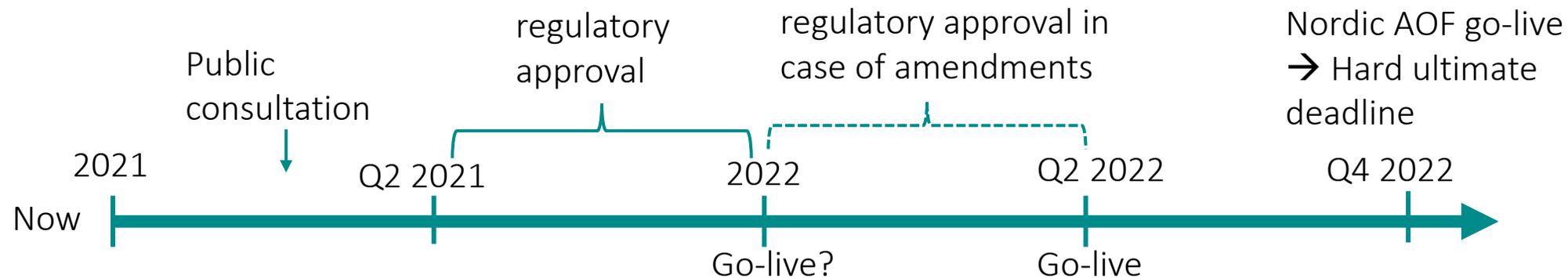
QUESTIONS & COMMENTS

BREAK

Statnett
Ørsted
Energi Danmark

An update on Statnett's work
with a counter trading solution

12th January 2021

Statnett

Statnett

Ongoing work on NSL and NordLink

- Statnett is currently designing a counter trading solution to be implemented on NSL and NordLlink

- The work is conducted together with TenneT and National Grid

- The solution may also be applicable on other borders

- We will also need to have a process with our NRA

- It is not yet decided when the counter trade solution will be in operation

  - Depending on the time needed for design, process with the NRAs and implementation

  - Early 2022 might be possible

The future is **electric**

Statnett

High level design of the counter trade solution

- The counter trade will take place in the intraday timeframe

- Current thinking is that each TSO will trade the agreed volume at its own end of the link

- Statnett is planning to use XBID for trading

- Due to operational security, it is important that the counter trading is done prior the Nordic security analysis at 16:00 (done by the RSC in Copenhagen)

- Our initial thinking is therefore to start trading at 15.00 and have it done at around 15.40 (exact timing not decided)

- It is not yet decided if Statnett will do the trading ourselves or if we will contract with an external party to do it

Statnett

A few comments to Energinet's proposal

- Statnett supports that counter trading should take place in the intraday timeframe

- Apart from being more efficient than using special regulation, early counter trading is also highly preferable from a system security viewpoint

- Known imbalances should be traded early in the intraday timeframe and not close to the hour of operation

- Due to operational security, counter trading should take place prior to the Nordic security analysis done by the RSC at 16.00

- Intraday Auctions are the better solution – when they are available

External Presentations

Statnett
Ørsted
Energi Danmark

DK1-DE Countertrade model

Energinet Workshop 2: Alternative Countertrade Models

Ørsted

Martin Schrøder
January 12, 2021

Current countertrade model is a massive success

Current model delivers:

✓ Down regulation supply in DK has increased significantly to meet demand from Tennet

✓ A strong price signal incentivizes flexibility in DK1 from both generation and consumption - down regulation only available if there is a demand

✓ Model supports integration of RES and electrification of other sectors, ie heating through electric boilers

✓ Down regulation supply has allowed Energinet and Tennet to allocate the required capacity on DK1-DE while safeguarding system security

✓ Minimizes impact on price formation in other markets

✓ Regulators and market participants have expressed satisfaction with the current model

Special regulation supply in Denmark and demand from Tennet, MW/h

Legend:
- DK1 avg. volumes of regulating bids down
- DK2 avg. volumes of regulating bids down
- Demand from Tennet MW/h (avg in hours with specialreg)

Ørsted
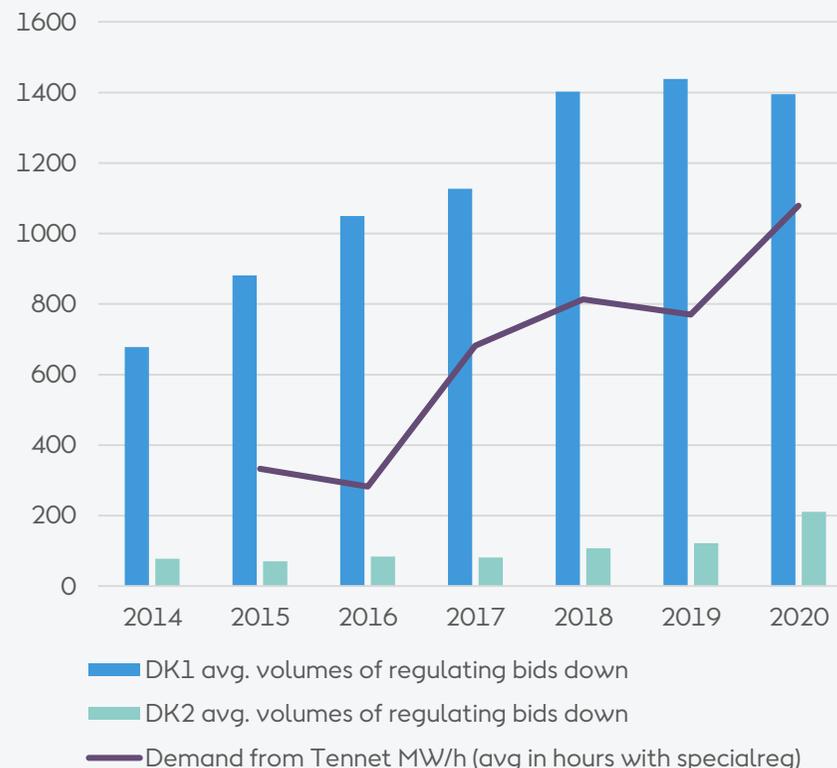
Minimum 70% of transmission capacity must be made available for cross zonal trade

Electricity regulation (2019/943) Article 16(8)

"[t]ransmission system operators shall not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestion inside their own bidding zone or as a means of managing flows resulting from transactions internal to bidding zones."

Minimum 70% of transmission capacity to be made available for cross zonal trade

Total capacity

Loop flows
Internal flows
Reliability Margin

Max 30%

Capacity allocated to the market

Min 70%

ACER Recommendation 01/2019

A minimum capacity margin available for cross-zonal trade (MACZT), the 'minimum 70% target', to be met by all TSOs on all critical network elements. **Margin Available for Cross Zonal Trade (MACZT) >= 70% of Fmax**

*"[The] calculation and monitoring of MACZT should only be conducted for timeframes which fall under Article 14 of the CACM Regulation, **namely the day-ahead and intra-day timeframes"***

Örsted

MACZT compliance is a prerequisite for any countertrade model

NRA compliance monitoring

Day-ahead capacity:

>=70% of Fmax

✓

Intraday capacity (previously allocated capacity +/- intraday capacity)

>=70% of Fmax

✓

- NRA must ensure that methodology does not impact 70% requirement compliance

- Intraday solutions rely on removing CZC on the border

- **Any new countertrade methodology impacting CZC must be approved by relevant NRAs**

MACZT compliance of intraday solutions?

Day ahead

30%

70%

✓ ● ●

Intraday

30%

70%
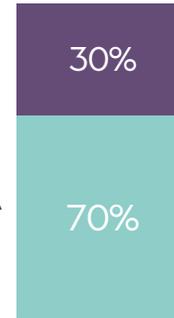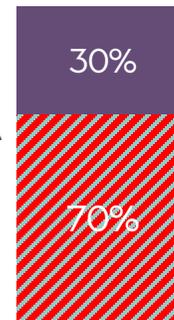
Removed from ID market through CT

● ● ÷

Ørsted

External Presentations

Statnett
Ørsted
Energi Danmark

**Thomas Elgaard Jensen, Director, Origination**
Energi Danmark A/S

Market-based solution for countertrade

Workshop 2: Alternative Countertrade Models
Energinet – 12.01.2021

The electricity market

$$F(t) = E_t\{S(T)\}$$

Financial | Day ahead | Intraday | Balance | Physical

+1 day | 1 day | 60 min. | 45 min. → 0 | 0

Specialregulering

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Problem
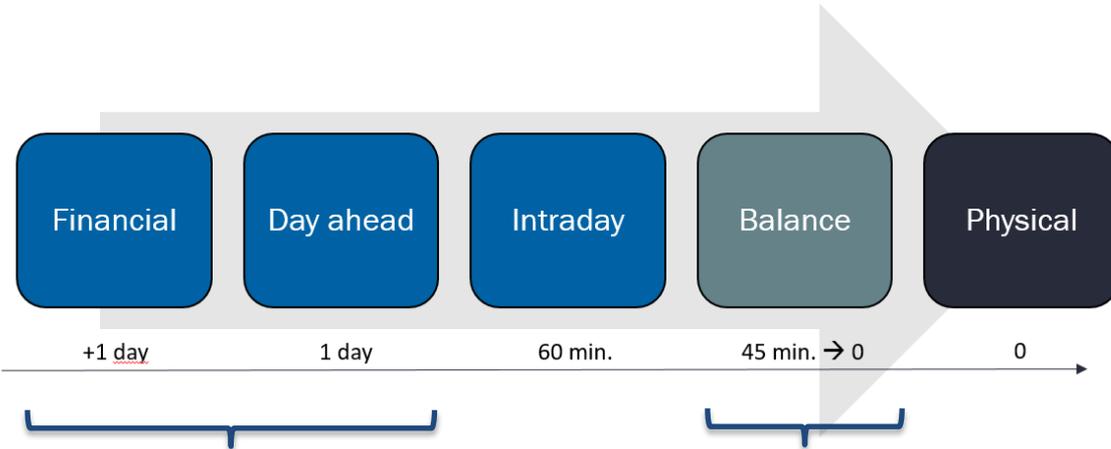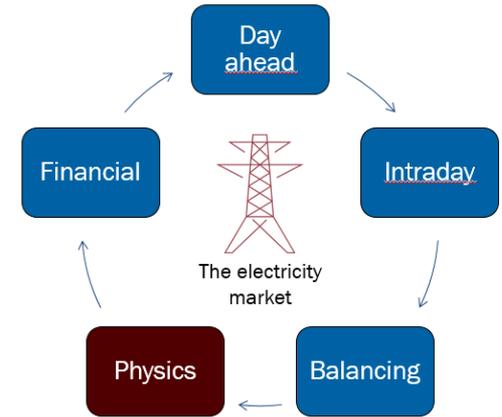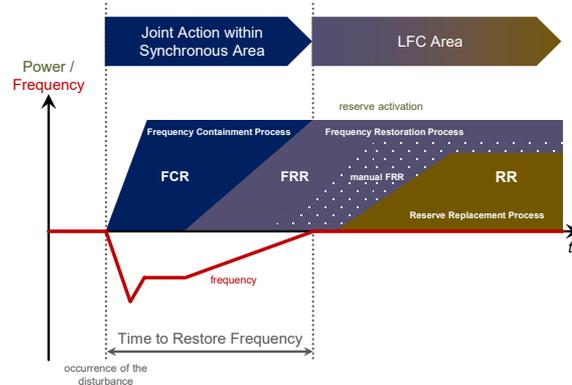
- Volumes at times as big as DK1 consumption
  - How can that not affect all the transparent markets?
- Markets are based on feedback loops (the market circle)
  - Wrong signals in short terms market will in time lead to wrong signals to long term markets.
- Taking a "financial" problem to the physical world is tricky
  - Making a 1700 MW flow 0 MW but still pretending it is 1700 MW
  - Key is it must be priced in the market because of the spill-over-signals (the market circle).

Specialregulering

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Why it should be market-based

- First: the current setup is NOT a market (no price transparency, no market surveillance etc.), but it affects the real markets

- Taking such big volumes of asset resources out of the market price formation, you are left with misguided prices in all markets

- We believe the current model is close to a violation of REMIT
    - Regulator declined price transparency even though the current model affect all markets
    - Encourage strategic behavior in the spot bidding from pay-as-bid volumes
    - Affect price bids in the regulating power market (RPM)
    - Affect intraday markets because of illogical sell side driven by specialregulation (sell prices are coupled with the likelihood of specialregulation)

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The possible market-based solutions

- **<u>Three possibilities</u>**
  1. RPM (mFRR)/stand alone
  2. ID
  3. Long term contracts

  - We are indifferent as long it is market based (e.g. spill over between the markets)
  - But we suggest the ID model, because it is easiest to implement, has more participants/competition and Germany already use it

- RPM:
  - need agreement amongst the Nordic TSOs and will possibly challenge the NOIS system and procedures
  - perhaps difficult with the new European platforms

- ID:
  - this already works in Germany where the TSOs trade the RES volumes ID.
  - It is transparent and will mean more participants in the price formation (e.g. more competition and therefore a more correct market price)
  - difficult to foresee the exact price effects

- Long term contracts;
  - Long term contract for shutting down power. Thus, making correct DA price signal, correct RPM signal and correct ID signal and keeping a financials problem as financial as possible.
  - Need a new setup with long term contracts

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The result of a market-based solution

- We will get all actions performed with physical assets are done transparent in markets (mFRR, ID or long term)

- Correct spill-over between markets - ruling out possible strategic behavior

- Correct market prices

- The electricity market circle works

Energi Danmark®
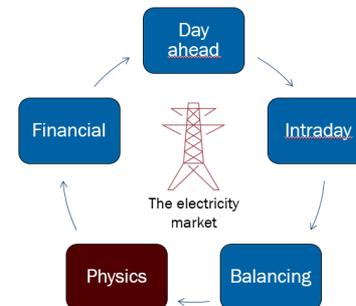
Finally

SUM UP AND FURTHER PROCESS
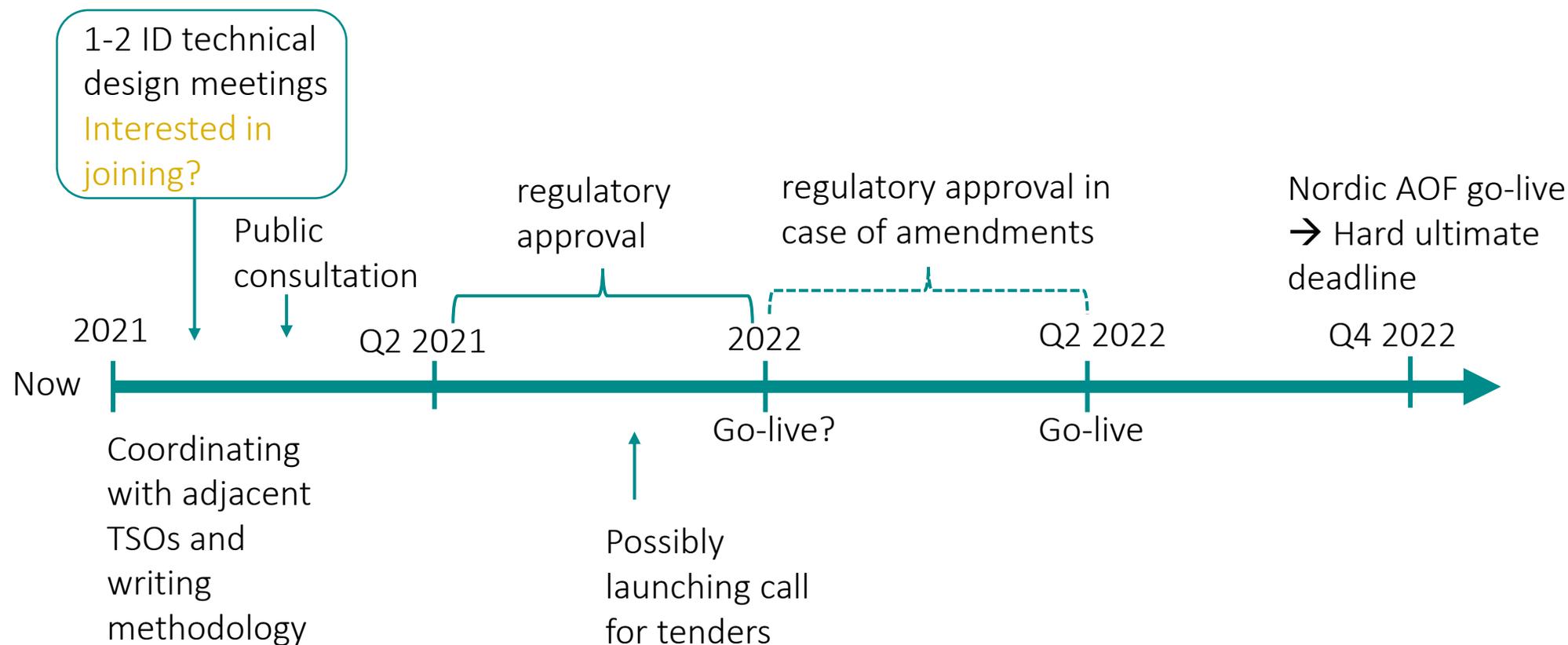
THANK YOU !

Please address questions, comments and further input to

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Ps. If you are interested in joining the technical ID design meetings, please send me an e-mail.