ENERGINET

SHIPPERS FORUM

6 June 2019

HOST

EMERGENCY EXIT

DEFIBRILLATOR (AED)

MEETING POINT

WELCOME

Clement Johan Ulrichsen, Energinet Gas TSO

PROGRAMME

12.00	*Lunch and networking*
13.00	**Welcome** *Clement Johan Ulrichsen, Energinet Gas TSO*
13.15	**Joint Balancing Zone – Since Go-live 1 April 2019** *Poul Johannes Jacobsen, Energinet Gas TSO*
13.25	**Tariffs 2019** *Nina Synnest Sinvani, Energinet Gas TSO*
13.45	**Tyra Redevelopment** • Safe Storage Level – Christian Rutherford, Energinet Gas TSO • PRISMA auction 1 July 2019 – Christian Rutherford, Energinet Gas TSO
14.00	**Gas Storage Denmark** *Mads Vejlby Boesen, Gas Storage Denmark*

14.15 Coffee break and networking

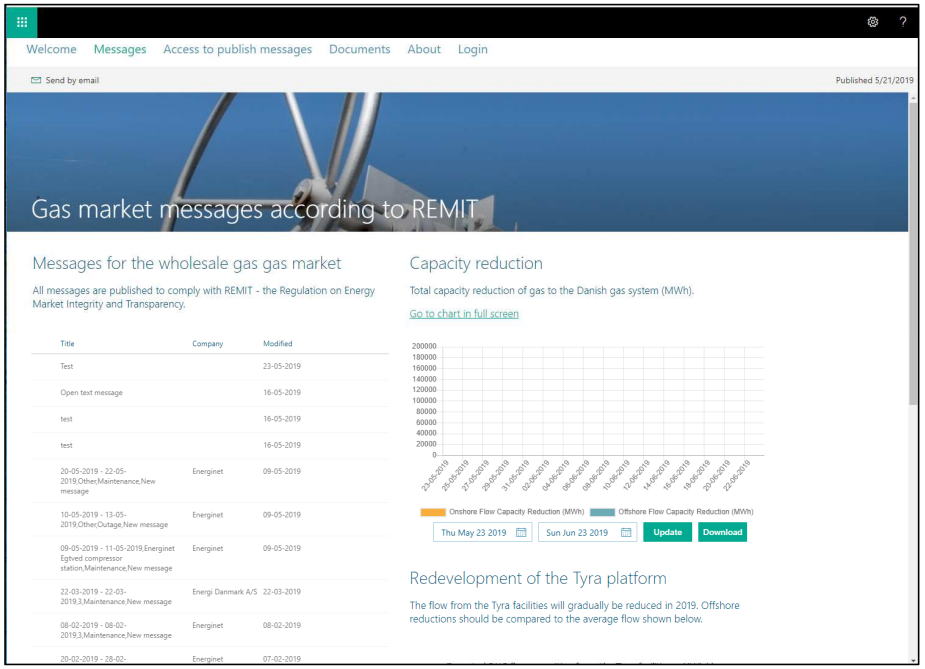
14.45	**Incremental Capacity** *Christian Rutherford, Energinet Gas TSO*
14.55	**Status on Baltic Pipe** *Johnny Thomas Holst, Energinet Gas TSO*
15.15	**Power to X analysis** *Stine Grenaa Jensen, Energinet Gas TSO*
15.25	**Green Hydrogen** *Lykke Mulvad Jeppesen, Ørsted*
15.55	**Final Remarks** *Clement Johan Ulrichsen, Energinet Gas TSO*

NEW REMIT PORTAL GO LIVE IN JUNE 2019

https:\\gasmarketmessage.dk

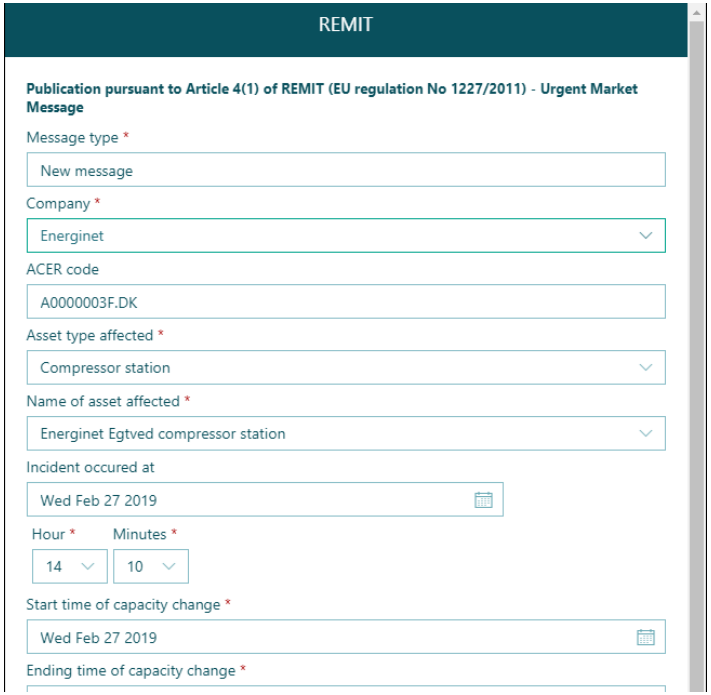
New features:

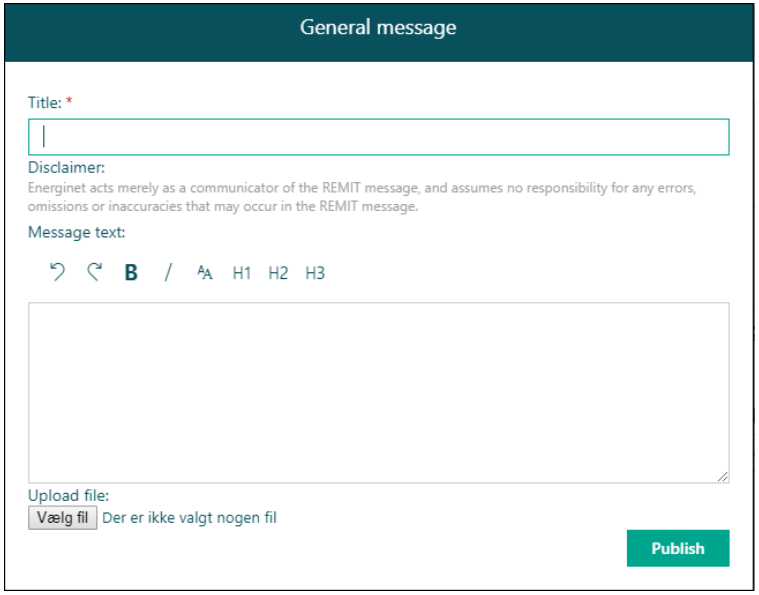
1. Gas market message agreement only for publishing purposes
2. Public subscription feature open for all
3. Information before launch:
   - Through gasmarketmessage.dk and our website
   - How to subscribe and how to access the portal to publish messages.



UPDATED TEMPLATES AND OPTIONS

All messages are categorised REMIT-messages, but with two different templates.
Formatting options in free text fields include graphics and attached documents.





TARIFFS: SEASONAL FACTORS

Not to be introduced in 2019/20

- Energinet Gas TSO has proposed seasonal factors for Ellund capacity charges during the Tyra Redevelopment
- Proposal revised after Shippers' Forum on 7 March and sent to the DUR 15 March 2019
- Not possible for the DUR to process proposal in due time for gas year 2019/20
- The DUR is still processing the proposal regarding gas years 2020/21 and 2021/22

Revised proposal: https://en.energinet.dk/Gas/Gas-news/2019/03/15/Seasonal-tariffs

DEVELOPING THE FUTURE GAS MARKET MODEL

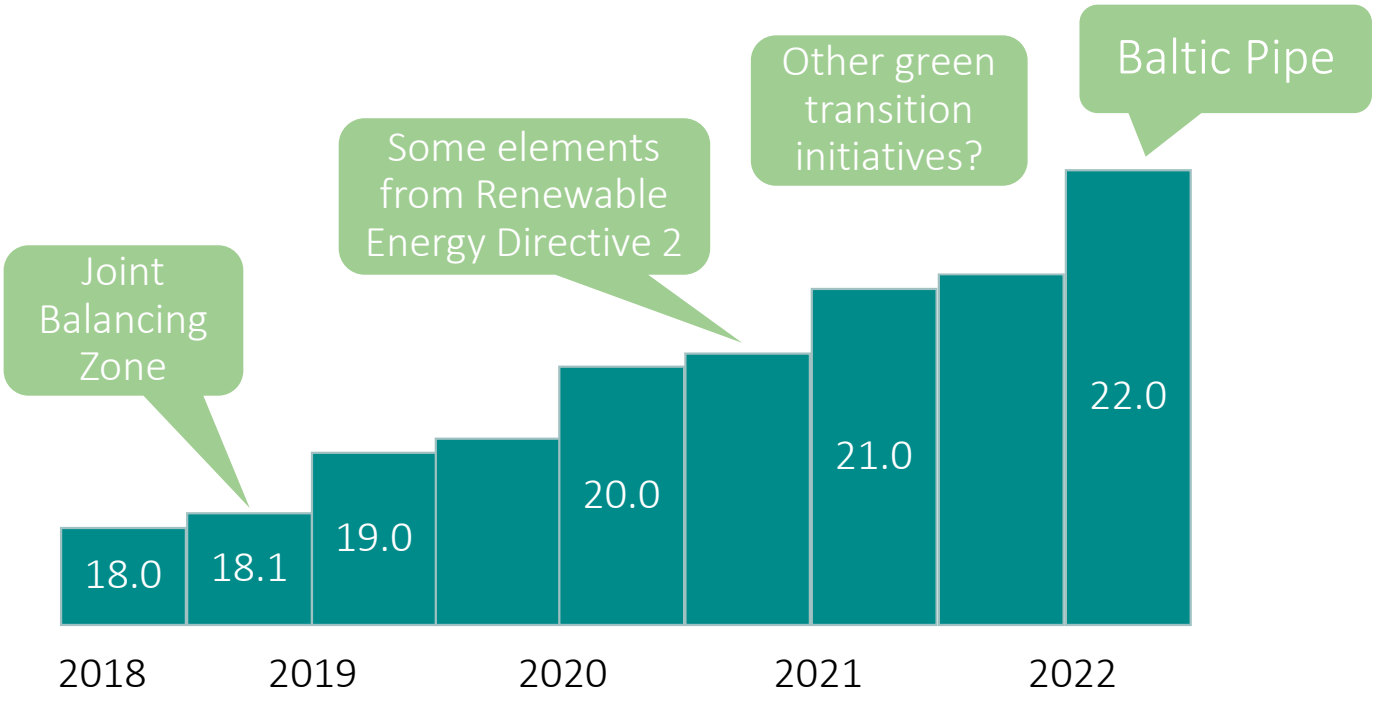
Facilitate the green transition and ensure efficient use of Danish gas transmission

Green transition

Transit

TIMELINE: GAS MARKET MODEL DEVELOPMENT

Expected updates to the Rules for Gas transport



WE NEED YOUR INVOLVEMENT

Process and way forward

Your involvement:

- Overall: engagement at future Shippers' Fora
- Specific topics: during User Groups
- Other: bilateral meetings if you have particular needs / relevant topics

Also, we intend to engage with end consumers to better understand their needs.

Expected User Group autumn 2019:

- Balancing model

PRISMA SHIPPER EVENT

- Lecturers and speeches
- Platform training held by certified trainers
- One-on-one with the PRISMA Team on any topic
- Connecting with the members of our community

More information: https://www.eventbrite.com/e/prisma-shipper-event-2019-tickets-60920740575

QUESTIONS

Contact: cju@energinet.dk

JOINT BALANCING ZONE

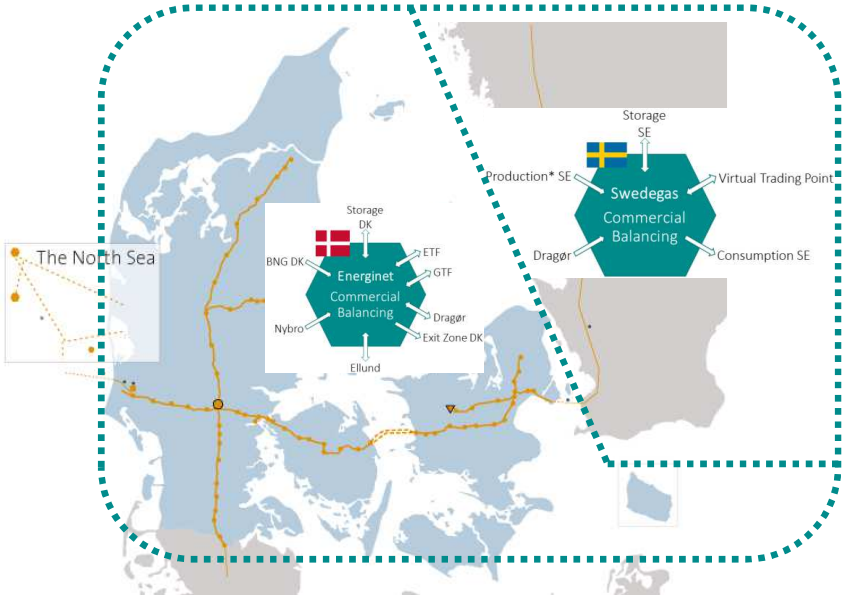
– SINCE GO-LIVE 1 APRIL 2019

Poul Johannes Jacobsen, Energinet Gas TSO

PURPOSE OF THE JOINT BALANCING ZONE

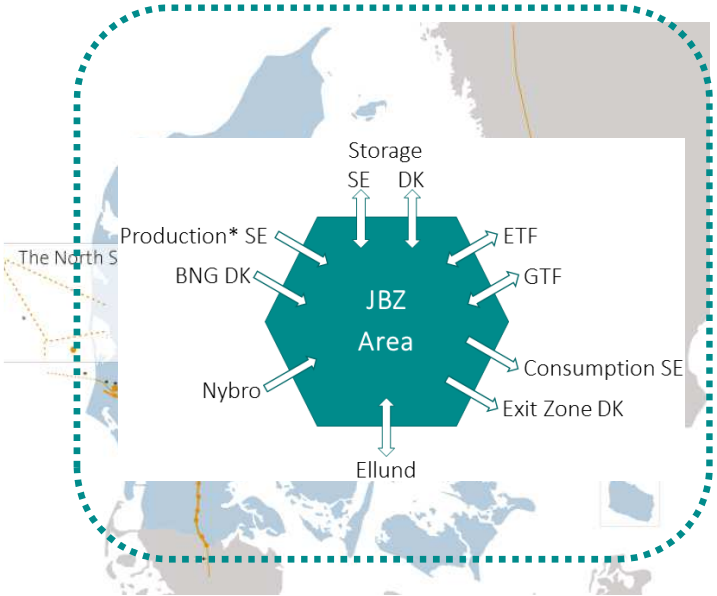
Old model

Two separate balancing zones



From 1 April 2019

Joint Balancing Zone



JBZ - POSITIVE START

A positive start!

Some minor issues:

- Some Balancing Administrators (BA) had smaller issues the first day
- Errors in invalid allocation data from Sweden some days at end of April
  - Corrected with valid allocation data
- BA notified us of almost fully used credit limit
  - IT logic behind overrun charges was corrected before invoicing

SHIPPER QUESTION 1:

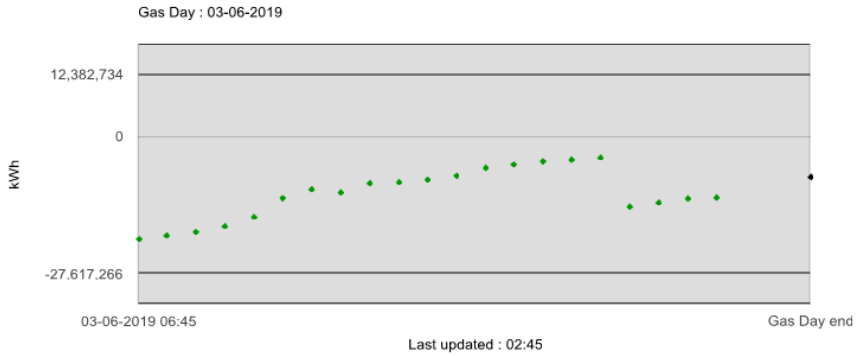
Why do we not receive an invoice from Energinet?

- Changed processing date for invoicing of volume tariff, balancing charges, etc.:
  - Earlier 10th in the month
  - Now 25th in the month
- Reason: we need data from Sweden
- Payment deadline is unchanged:
  - Current month plus 25 days
- Missing: Commodity charge was missing on the invoice and will be sent next week.

SHIPPER QUESTION 2:

What has happened to the green band?

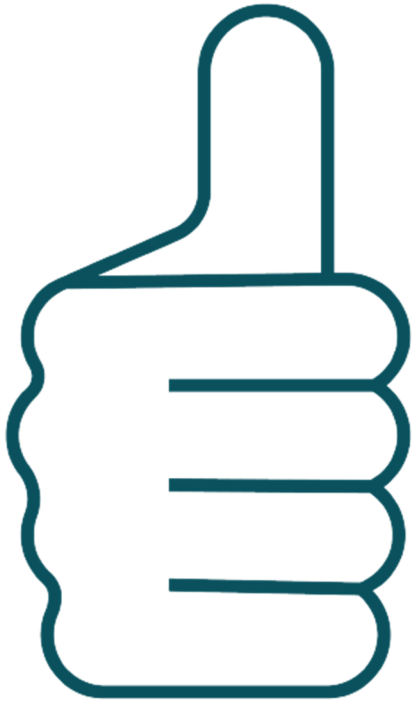
- The green band is based on the total line-pack in the system
- The total line-pack increased when the valve in Dragør was opened
- The green band on any day is dependent on expectations to the gas system, including total gas consumption.



BA FEEDBACK

Swedegas has been in dialog with some of the Swedish BA and they are positive.

- I believe that JBZ was a natural development and we have had a good start.
- I had no problem with the introduction of JBZ, it went quite smooth.
- JBZ went ahead without any large problems
- We have not received the final invoice, so we do not have the full picture.



ENERGINET

JBZ: FROM PROJECT TO OPERATION

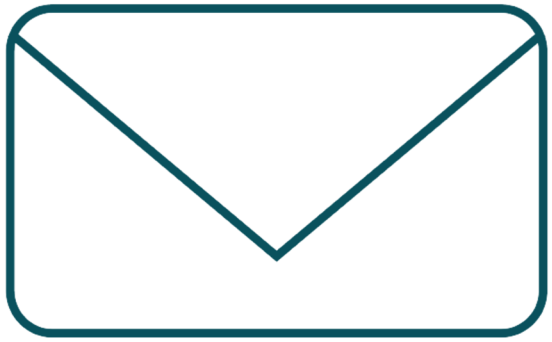
Questions are still welcome, please note the changed contact information

The project has been closed and is now part of the daily operation.

Please use the following email addresses:

Energinet: gasinfo@energinet.dk

Swedegas: systemdrift@swedegas.se



QUESTIONS

Contact: pjj@energinet.dk

TARIFFS 2019/20

Nina Synnest Sinvani, Energinet Gas TSO

IMPLEMENTATION OF TAR NC AND APPROVAL BY DUR

The implementation of TAR NC have been subject of User Groups and Shipper Taskforce for more than 4 years. We have now reached a milestone…

The approval DUR in short:

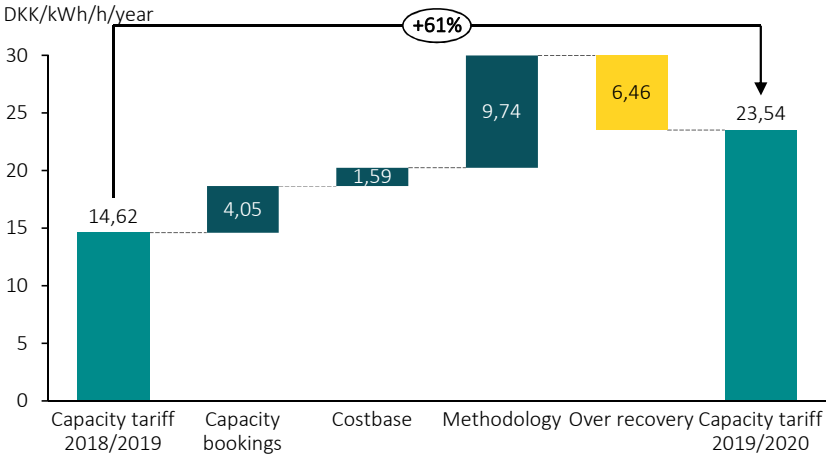
- Uniform tariff principle
- There will be transmission tariffs at zero at the storage point
- The cost base will be split in a 70%/30% ratio between capacity and commodity tariffs
- The long-term multiplier will not be implemented by 1 October 2019
- The seasonal factor will not be implemented by 1 October 2019
- 1/3 of the CAPEX related to the pipeline and compressor station in Ellund-Egtved will be covered by the Emergency Tariffs
- Balancing Charge, approved as a part of JBZ, will be handle as a non-transmission tariff

RESULTING TARIFFS – TRANSPORT

The main tariff driver is the redistribution between capacity and commodity tariff and the over recovery of 88 mDKK

Capacity tariff:

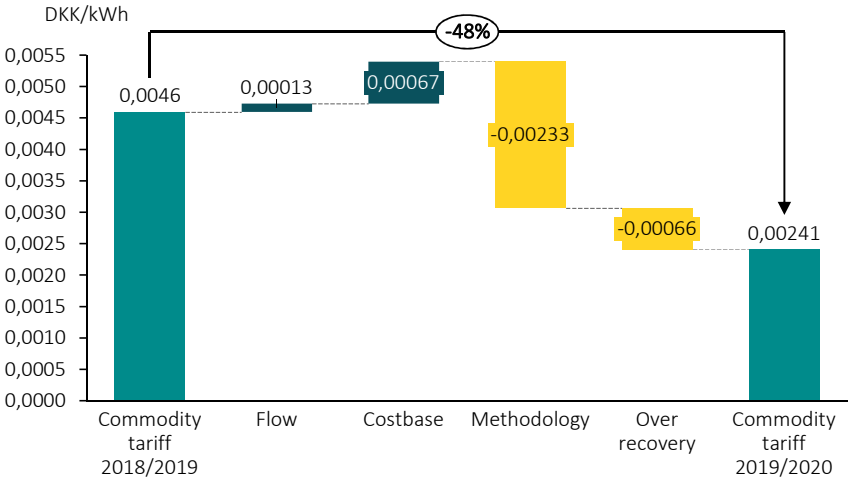
- Decrease in capacity bookings, increase in cost base and change of methodology leads to increase in the capacity tariff
- Over recovery mitigates the increase



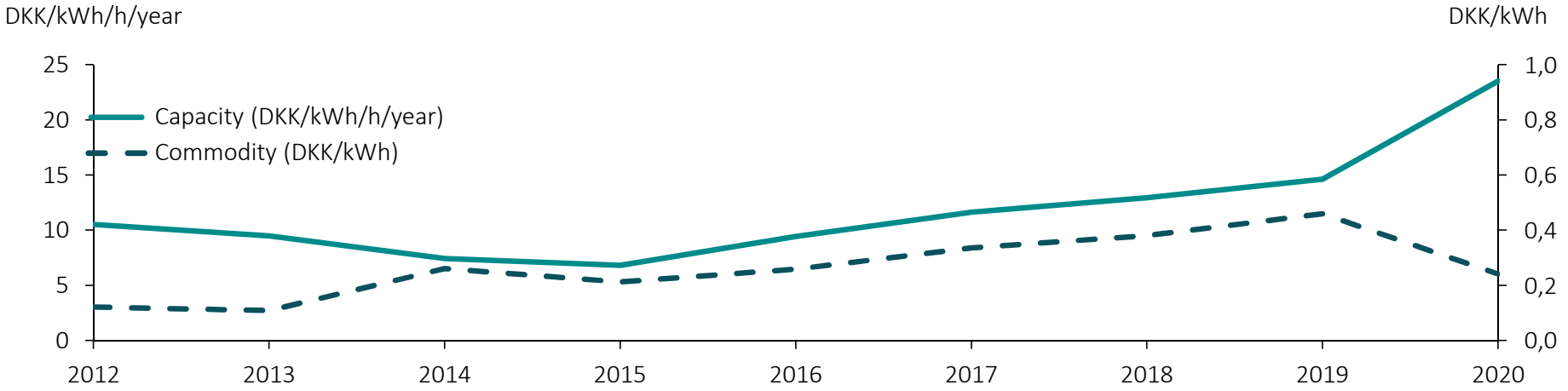
Balancing charge: 0.00016 DKK/kWh

Commodity tariff:

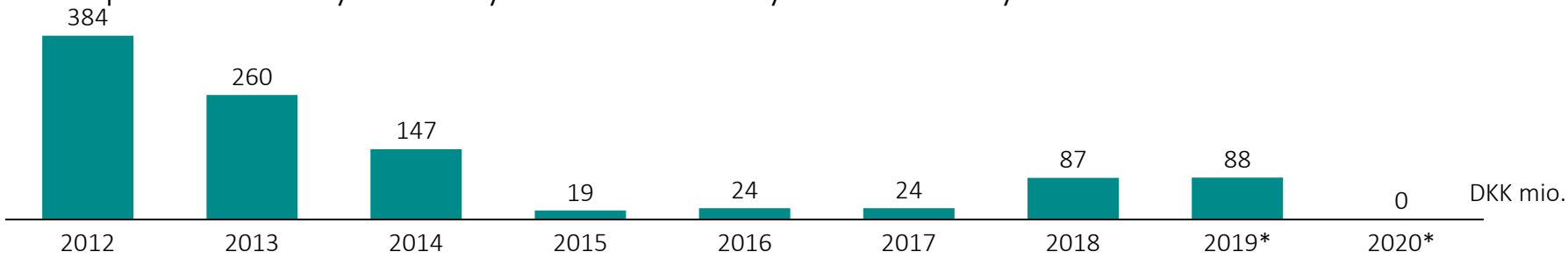
- Decrease in flow, increase in cost base leads to increase in the commodity tariff
- Change of methodology and over recovery mitigates the increase



DEVELOPMENT IN TRANSPORTATION TARIFFS



The development is mostly driven by the over recovery. Over recovery ultimo:

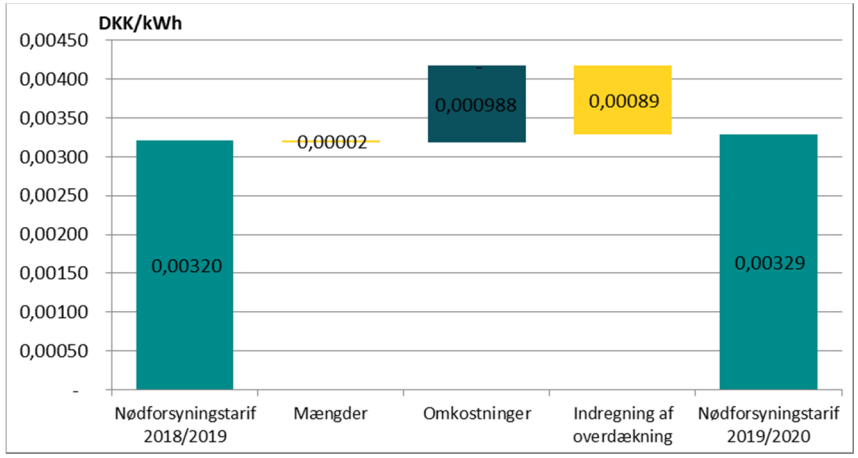


* Expected

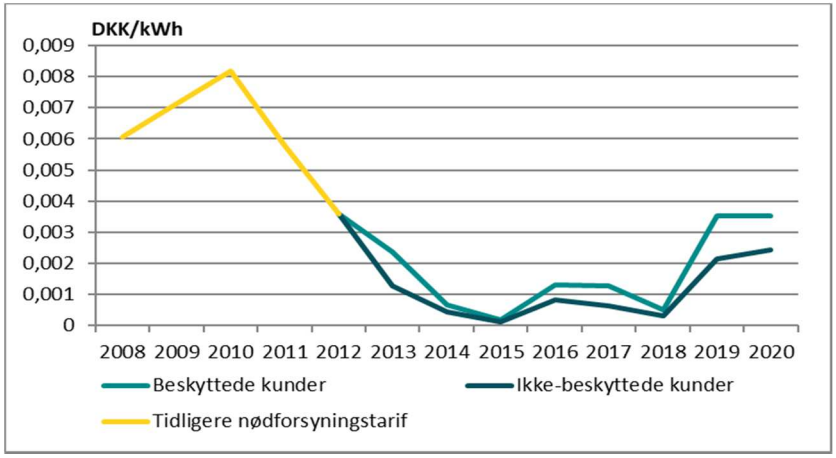
RESULTING TARIFFS - EMERGENCY

Due to over recovery the increase in the emergency tariffs is limited

Average emergency tariff:



Development in the emergency tariff:



COST BASE

Increase in transportation cost base and high impact of the methodology and over recovery

Transportation:

Cost base (mDKK)	2018/2019	2019/2020
Capacity	189	224
Commodity	178	96
Total	**367**	**321**
Over recovery*	0	88

Emergency:

Cost base (mDKK)	2018/2019	2019/2020
Protected (85%)	79	81
Non-protected (15%)	14	14
Total	**93**	**95**
Over recovery*	0	26

*Subtracted in the cost base

CAPACITY AND FLOW ASSUMPTIONS

Decrease in flow and capacity bookings due to the Tyra redevelopment

	2018/2019	2019/2020	Change
Commodity (mio. kWh)			
Denmark	28.900	29.044	0%
Export Sweden	10.890	10.890	0%
Export Germany	1.262	0	-100%
Total	**41.052**	**39.934**	**-3%**
		0	0%
Capacity (kWh/h/year)			
Exit zone	3.645.417	4.733.333	30%
Exit Dragør	1.425.000	0	-100%
Exit Ellund	158.333	0	-100%
Exit capacity	**5.228.750**	**4.733.333**	**-9%**
Entry Nybro	3.210.000	260.000	-92%
Entry Ellund	3.313.738	4.100.000	24%
Entry BNG	425.167	440.000	3%
Entry Capacity	**6.948.905**	**4.800.000**	**-31%**

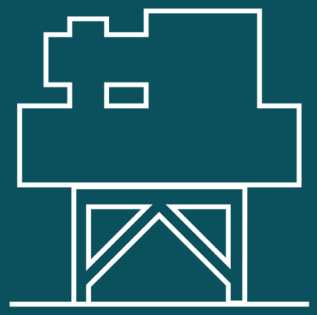
NEXT STEP

We will continue to involve you on the tariff methodology in the coming years…

- User Group or Shipper Taskforce on key points (Long term multiplier, capacity-/commodity-split etc.)
- Updating and improving forecasting tool
- Questions or comments on tariff subjects please feel free to contact us
- We will be pleased to attend bilateral meetings

QUESTIONS

Contact: nsy@energinet.dk



TYRA REDEVELOPMENT

Christian Rutherford, Energinet Gas TSO

ENERGINET

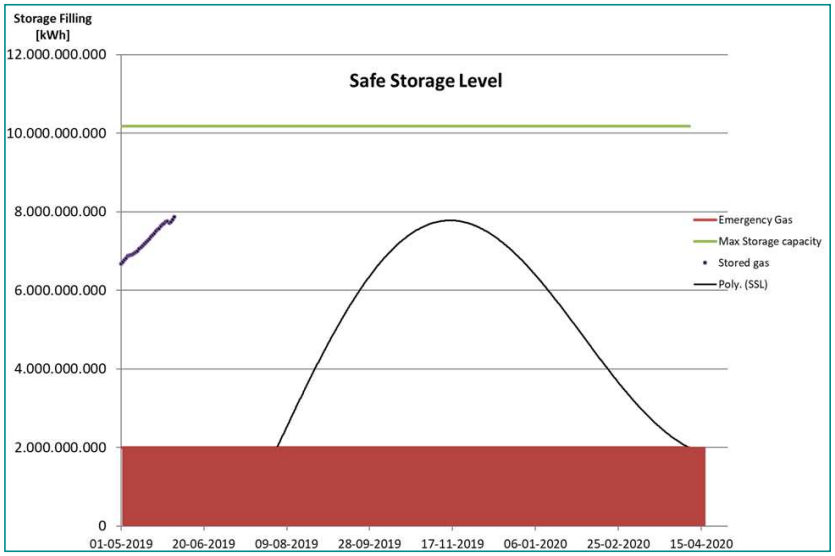
SAFE STORAGE LEVEL

SAFE STORAGE LEVEL

- The Safe Storage Level graph is expected to be ready on 1 July 2019
- Will be available at our webpage at: https://en.energinet.dk/Gas/Tyra/Safe-storage-level

With the prototype, it is ”safe” to say that we have a ”safe storage level” right now, due to the high inventory level for the season…

Prototype of SSL from webpage



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PRISMA AUCTION 1 JULY 2019

KEY MESSAGES

- Capacity offer for 1 July 2019
  - Please note:
    - GUD offers no firm capacity exit Ellund entry Germany both during and after the Tyra redevelopment period.
    - If capacity towards Denmark is not booked, the German TSO's may remove capacity from Ellund, if demand is registered elsewhere

- Interruptible capacity Ellund entry (and exit)
  - Interruptible capacity is offered day-ahead, with a 10 per cent rebate
  - Within-day, interruptible capacity is offered as an over-nomination procedure, with the same price principle as for the overrun charge in the Joint Exit Zone
  - Both are only offered if firm is sold out on the Danish side

INTRODUCTION TO AUCTION PRINCIPLES

Specific rules for annual auctions in CAM NC

Rules of relevance:

- TSO's must;
  - Offer capacity at least 5 years ahead
  - Only offer unbundled capacity 1 year ahead
  - Save at least 10 per cent of capacity for short-term (quarterly or shorter – minimum requirement)
  - Save additional 10 per cent for annual auctions, which must be saved at least for year 5 (minimum requirement)

Energinet goes beyond the minimum requirement and saves 10 per cent for day-ahead and additional 10 per cent for the nearest gas year in years 2-5

German TSO's will only offer entry capacities 2 years ahead (southbound at Ellund). Due to uncertainty of impact from German market merger

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PRISMA AUCTIONS 1 JULY 2019

Capacity offer Ellund Entry (from Germany to Denmark)

Point/GY (in MWh/h)	Gas Year 2019	Gas year 2020	Gas Year 2021	Gas Year 2022	Gas Year 2023
Exit GUD/ Entry Energinet (bundled)	452	775	964	1,264	1,264
Exit OGE/ Entry Energinet (bundled)	644	587	744	844	844
Entry Energinet (unbundled)	2,218	-	-	-	-

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PRISMA AUCTIONS 1 JULY 2019

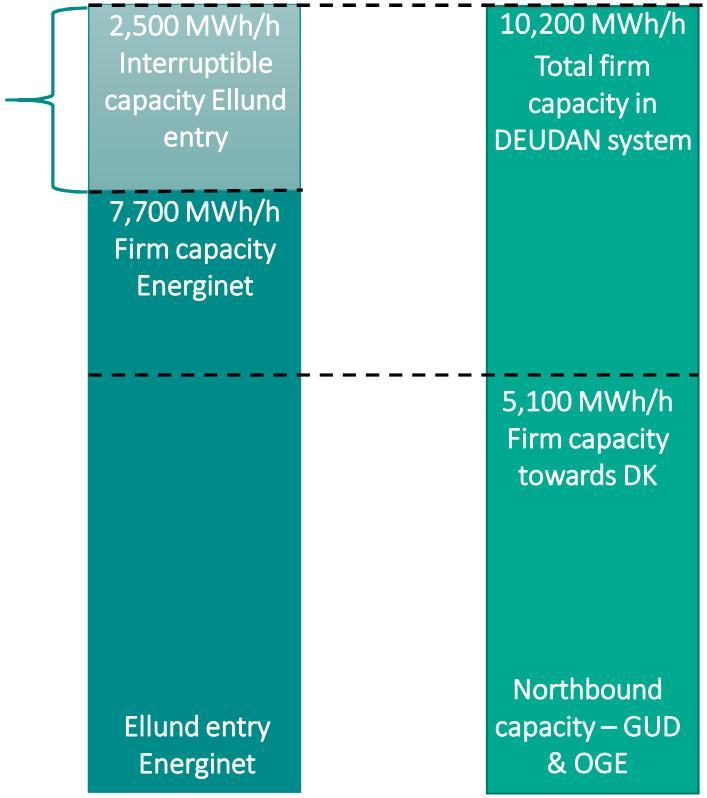
Capacity offer Ellund Exit (from Denmark to Germany)

Point/GY (in MWh/h)	Gas Year 2019	Gas year 2020	Gas Year 2021	Gas Year 2022	Gas Year 2023
Exit Energinet/ entry GUD (bundled)	0	0	-	-	-
Exit Energinet/ entry OGE (bundled)	154	154	-	-	-
Exit Energinet (unbundled)	8,846	-	-	-	-

INTERRUPTIBLE CAPACITY - ELLUND

Interruptible capacity re-introduced at Ellund entry

- Interruptible capacity is reintroduced, to secure use of unused firm capacity.
- Offered interruptible capacity is set at 2,500 MWh/h – only offered day-ahead
  - Difference between firm capacity level at Energinet, and total possible DEUDAN capacity
- Energinet will also introduce an interruptible (unlimited) over-nomination option within-day



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INTERRUPTIBLE CAPACITY - PRICING

”New” formula in Tariff Network Code Article 16

- Same principle to calculate the rebate for interruptible capacity – probability of interruption:

$$\text{Pro} = \frac{\text{N} \times \text{D}_{\text{int}}}{\text{D}} \times \frac{\text{CAP}_{\text{av. int}}}{\text{CAP}}$$

⇒ Number and duration of interruptions are multiplied with the amount of total interrupted capacity

- Issue: No empiric data available!
  - Consequently, rebate level is set at a historic ”normal” level of 10 per cent – can be adjusted

- Pricing for interruptible within-day nomination product will follow same principle as for overrun charge towards the Joint Exit Zone: day-ahead capacity charge based on highest hourly nomination

QUESTIONS

Contact: cru@energinet.dk

GAS STORAGE DENMARK

NEWS FROM GAS STORAGE DENMARK

SHIPPERS FORUM, 6 JUNE 2019

AGENDA

- Result of storage auctions 4 June 2019
- Status on capacity SY 19 – SY 22 (Tyra)
- New price structure SY 20
- Short term products SY 19
- Auction announcement - extra capacity SY 19, ROY
- New office adresse

STORAGE AUCTION 4TH JUNE 2019

GSD GAS STORAGE DENMARK

Options for SY 20 - SY 23

Option with deadline 2nd September 2019 (SHORT)

WGV: 2,000 GWh

Reservation price 0.01 €/MWh
Market clearing price 0.014 €/MWh

All capacity sold

Total demand: 3,050 GWh

Option with deadline 31th January 2020 (LONG)

WGV: 1,000 GWh

Reservation price 0.01 €/MWh
Market clearing price 0.111 €/MWh

All capacity sold

Total demand: 7,926 GWh

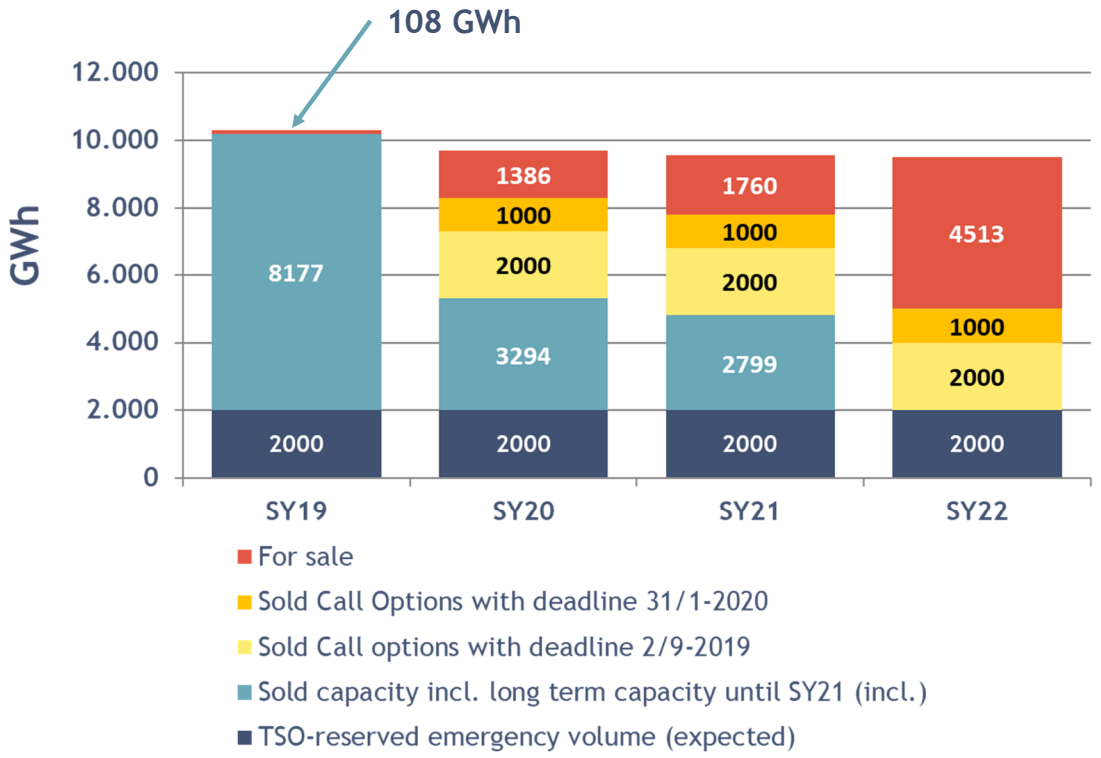
STATUS ON CAPACITY (VOLUME)

Storage year 2019

- Capacity for sale: 108 GWh
- Auction on 14 June

Storage year 2020

- Capacity for sale: 1,386 GWh
- Contact GSD for bilateral deals



UPDATED PRICE STRUCTURE FROM SY 2020

GSD GAS STORAGE DENMARK

- We are still using a cost based approach

- 120/60: **4,0** €/MWh (basic storage cost)
- 170/85: **3,5** €/MWh
- 170/170: **3,0** €/MWh

- Injection: **750** €/MW
- Withdrawal: **2,100** €/MW

https://gasstorage.dk/News/2019/05/14/Pricing-structure-SY20

SHORT TERM PRODUCTS FOR SY 19

Monthly products are available for sale on the customer web portal ONLINE.

ROY flex can be booked as well.

If interested, contact GSD.

Injection: 750 €/MW

Withdrawal: 2,100 €/MW

Month	Injection (€/MW)	Withdrawal (€/MW)
July	125	90
August	250	90
September	250	90
October	250	600
November	250	600
December	125	600
January	125	800
February	125	800
March	90	800
April	90	800

AUCTION - CAPACITY SY 19, ROY

GSD GAS STORAGE DENMARK

Sealed Bid Auction with Market Clearing Price

Auction date: **14 June**

Capacity: **108 GWh**

Produkt: **90/60**

Reservation price: **4 €/MWh**

Contact start: **15 June 2019 06:00**

The Auction Rules will be announced shortly

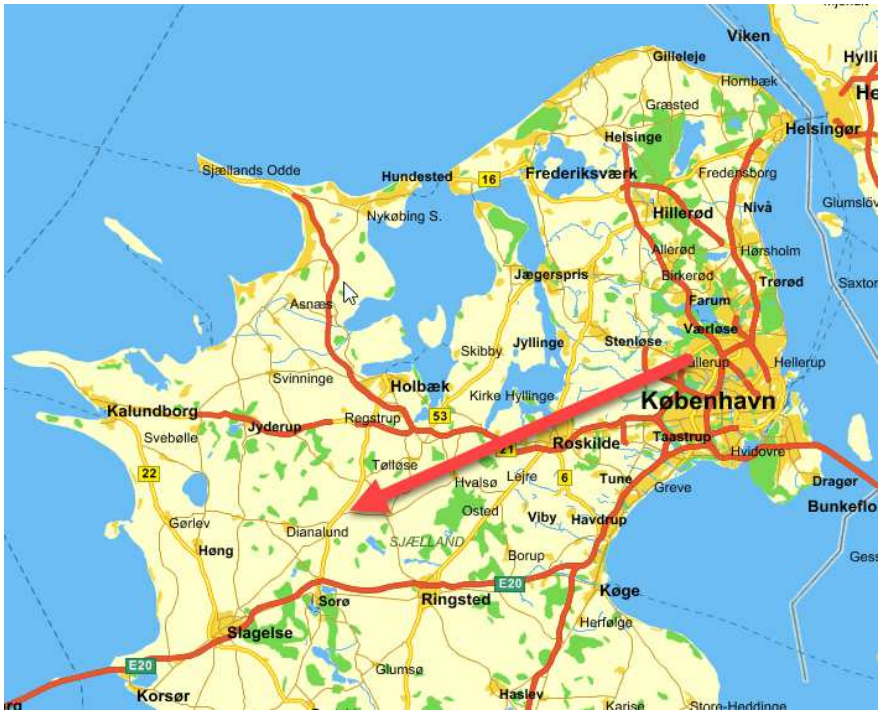
NEW ADDRESS - NEW OFFICE

GSD is affected by the state's relocation of jobs.

New office per 1 August 2019 at the storage site in Stenlille.

No changes in the organizational structure or the ownership.

GSD will be present at shippers forums and will use the meeting facilities in Ballerup



QUESTIONS?

You are always welcome to contact us

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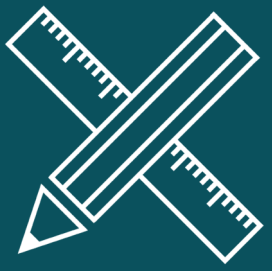
iny@gasstorage.dk
+45 61 24 34 03



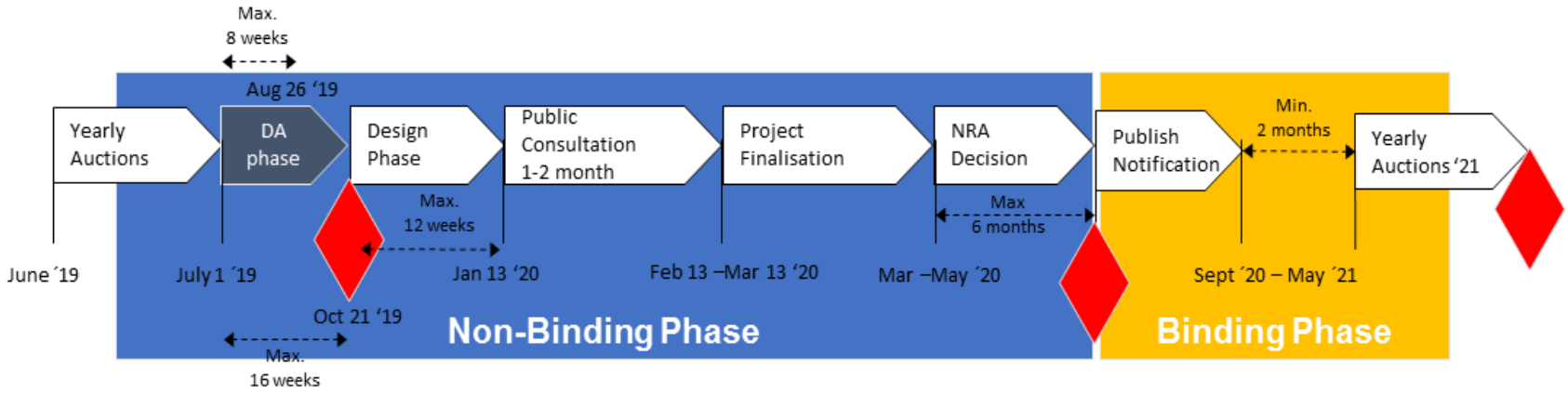
INCREMENTAL CAPACITY

Christian Rutherford

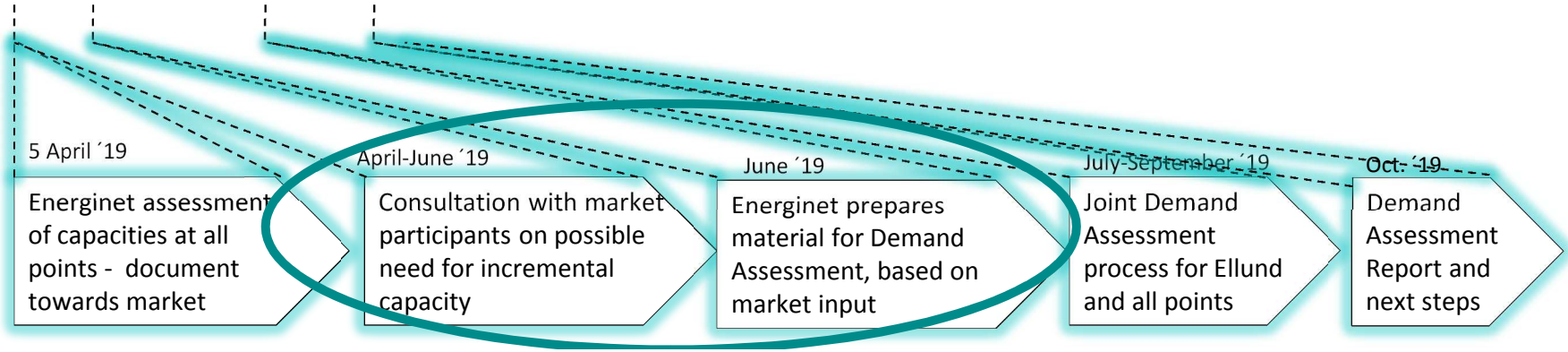
INCREMENTAL CAPACITY PROCESS – TIMELINE

European and Danish approach

European incremental process at interconnection points (Ellund) – Together with GUD and OGE



Danish incremental process (all capacity points)



ENERGINET

INFORMATION PACKAGE AND ENTRY/EXIT POINTS

Information shared on 5 April 2019

Point	Explanation	Expected possible capacity (GWh/h)
Entry Europipe 2	Imports from Norway	13.4
Entry Nybro	Imports from Norway + Danish North Sea	20.3
Entry Faxe	Imports from Poland	3.8
Entry Ellund	Imports from Germany	7.7
Entry RES	Biomethane injection	According to socioeconomic valuation
Entry storage	Withdrawal from Danish storage	8.2
Exit Faxe	Exports to Poland	13.4
Exit Ellund	Exports to Germany	10.0
Exit storage	Injection to Danish storage	4.2

https://en.energinet.dk/Gas/Shippers/Incremental-capacity

INCREMENTAL – NEXT STEPS

- Energinet will share table for non-binding indications by Tuesday 2 July 2019
- Indications must be received by Energinet Monday 26 August 2019

Start (year/month)	End (year/month)	Annual MWh/year	Hourly capacity kWh/h	Daily loadfactor 0,xx (average/max. daily flow)	Yearly profile (daily/monthly) enclosed - Yes/no ?	Request submitted to other adjacent system operator/TSO Yes/No, name	Condtitions for long term contract	Further remarks

ID no.	Point in Danish gas transmission system	Explanation	Total capacity (GWh/h)	Booked capacity (GWh/h	Available capacity (GWh/h)	Start (year/month)	End (year/month)	Annual MWh/year	Hourly capacity kWh/h	Daily loadfactor 0,xx (average/max. daily flow)	Yearly profile (daily/monthly) enclosed Yes/no ?	Request submitted to other adjacent system operator/TSO Yes/No, name	Condtitions for long term contract	Further remarks
1	Entry "Europipe 2"	Imports from Norway	20.3	10.6	2.8									
2	Entry "Danish North Sea", Nybro	Danish North Sea (Tyra-Nybro and South Arne-Nybro)		0	9.7									
3	Entry "Faxe"	Imports from Poland	3.8	0	3.8									
4	Entry Ellund	Imports from Germany	7.7	3	4.7									
5	Entry RES	Renewable Energy Source injection in gastransmission in Denmark	technically "unlimited"	0	technically "unlimited"									
6	Entry Storage DK	Withdrawal from Danish storage facilities	8.2	0	8.2									
7	Entry "*New Denmark*"	Any new Entry point in Denmark apart from RES (i.e. LNG or onshore gasfield)	0	0	0									
8	Exit "Faxe"	Exports to Poland	13.4	10.6	2.8									
9	Exit Ellund	Exports to Germany	10.0	0	10.0									
10	Exit Storage DK	Injection to Danish storage fracilities	4.2	0	4.2									
11	Joint Exit Zone (Sweden)	Part of Joint Exit Zone (Denmark + Sweden)	3.0	0	3.0									
12	Joint Exit Zone "*New Denmark*"	Any new Market demand in Denmark (i.e. large industri or area/municipality) without connection to gastransmission system	0	0	0									

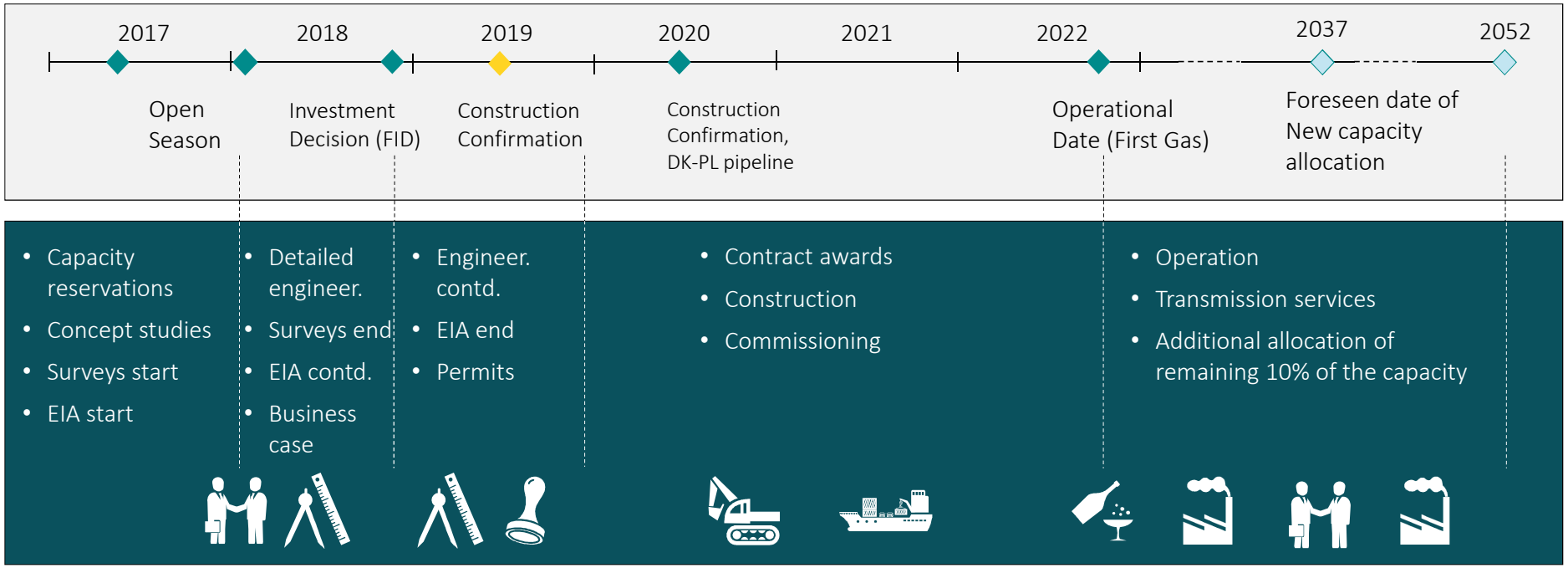
QUESTIONS

Contact: cru@energinet.dk

STATUS ON BALTIC PIPE

Johnny Thomas Holst

BALTIC PIPE PROJECT



2ND PUBLIC HEARING CONCLUDED

150 responses

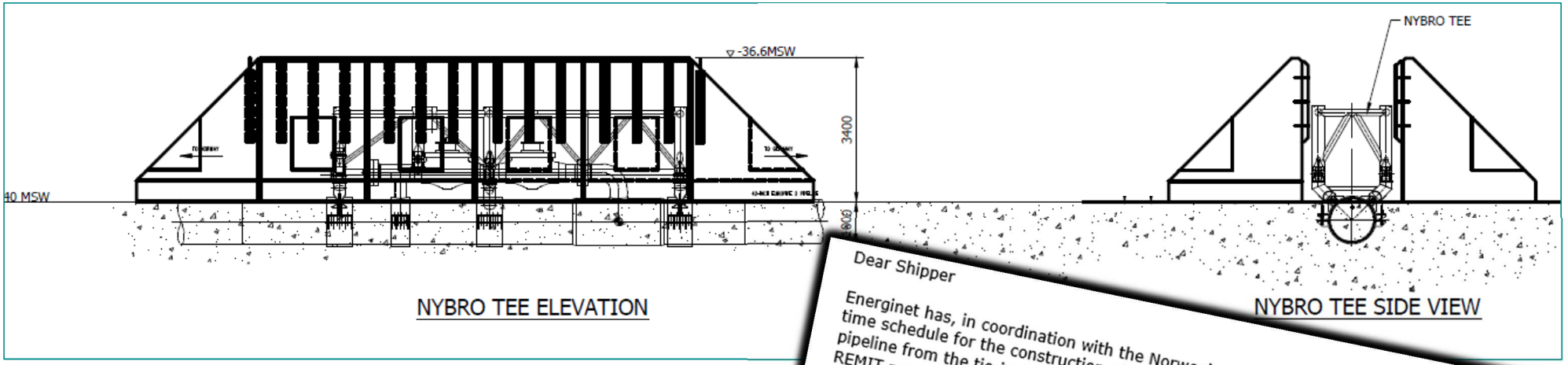
- Noise
- Drainage
- Property value
- Impact on nature
- Alignment with climate policy
- Etc…

GENERAL ELECTIONS

Adjustments of permitting work plan

REMIT ON NORTH SEA TIE-IN

Reverting to original plan



Dear Shipper

Energinet has, in coordination with the Norwegian system operator Gassco, revised the time schedule for the construction of the tie-in of the EPII pipeline and the new offshore pipeline from the tie-in towards Nybro, which was previously communicated via a general REMIT message (ID 93).

According to the revised time schedule, the completion of the tie-in and of the new pipeline is now expected at 1 October 2022, which is equal to the timeline for completion of the Baltic Pipe project.

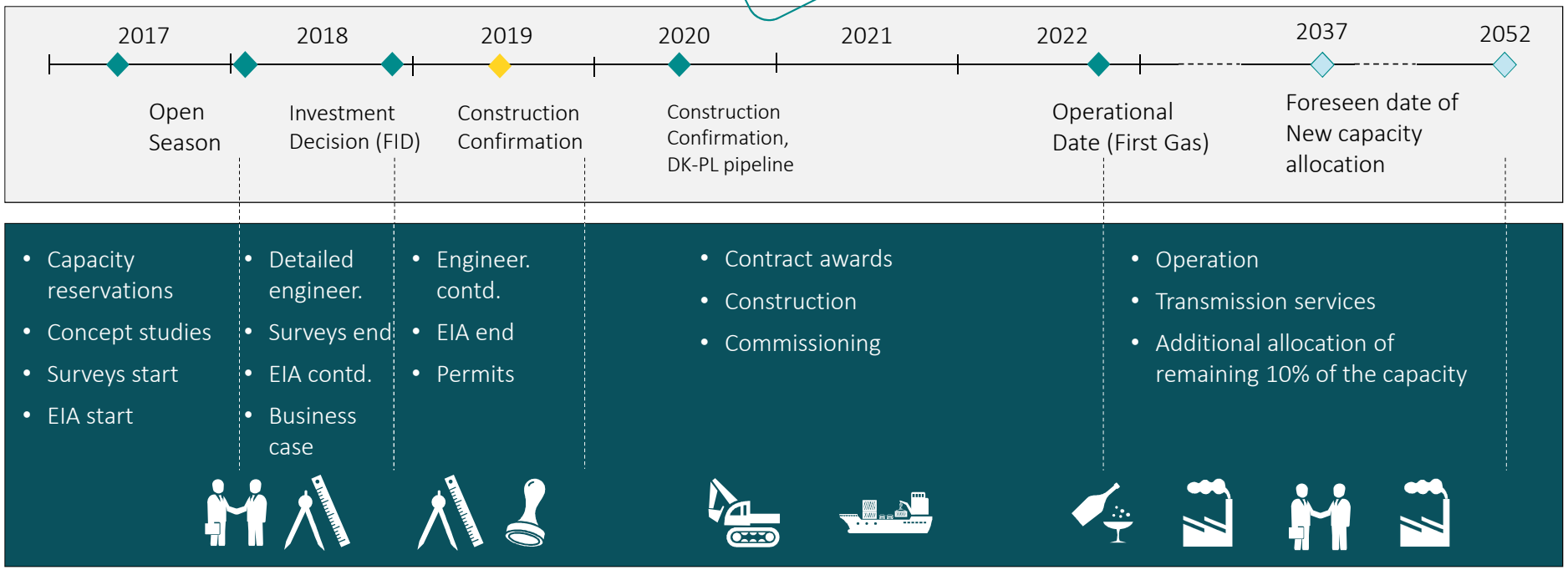
Kind regards

Energinet

ENGINEERING AND TENDERING IN PROGRESS

BALTIC PIPE PROJECT

ON SCHEDULE



QUESTIONS

Contact: jth@energinet.dk

POWER TO X

- INTEGRATING RENEWABLES THROUGH HYDROGEN

Stine Grenaa Jensen, Energinet Gas TSO

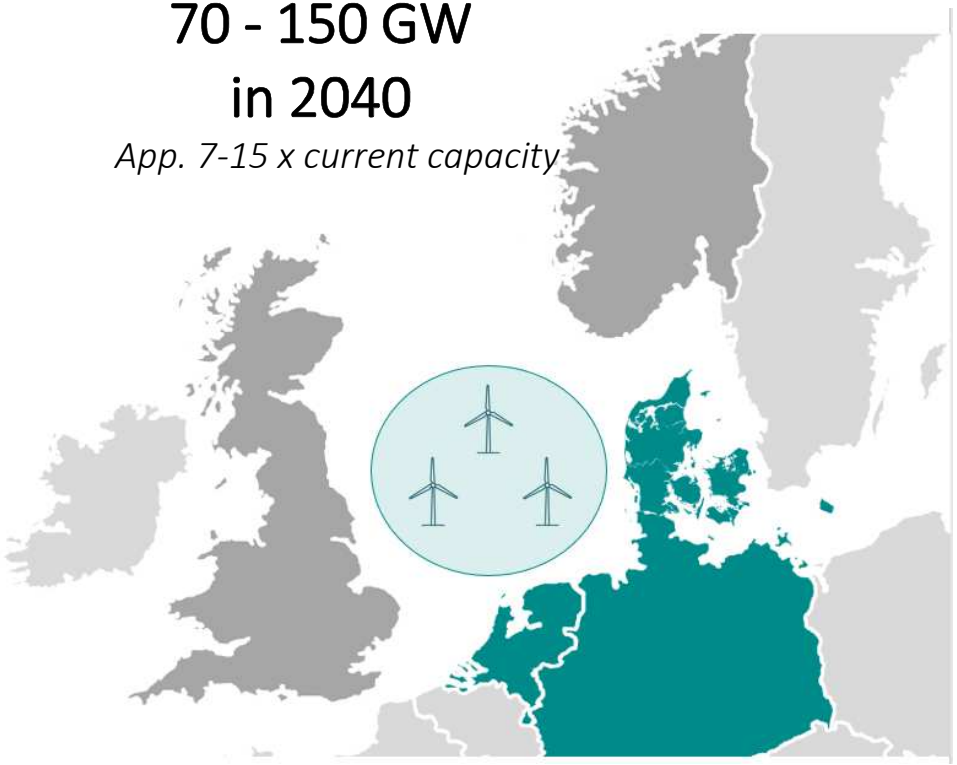
INCREASED FOCUS ON HYDROGEN

Integration of wind and solar power

- The existing energy system cannot deliver without change
- The North Sea is an important resource
- Historic low cost of wind and solar power
- Beginning industrialization of electrolyzers
- Increasing value of green fuels
- New measures needed – storage possibilities

70 - 150 GW
in 2040

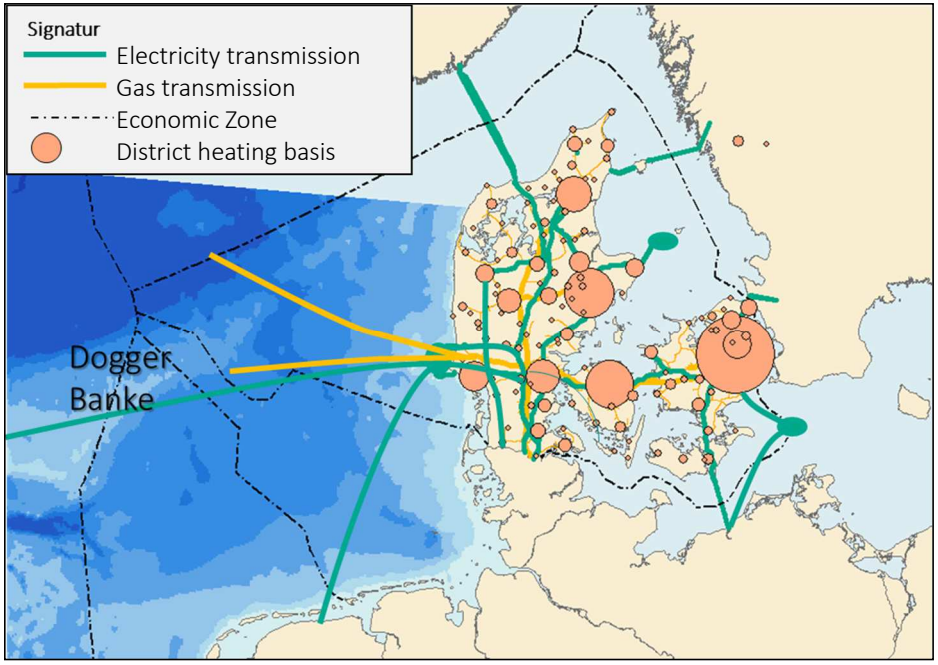
App. 7-15 x current capacity



NEW ANALYSIS:
PTX IN DENMARK BEFORE 2030

ENERGINET

SECTOR COUPLING INCREASES EFFICIENCY



Sector coupling potentials for PtX

Electricity

Competitive prices
Great wind potentials in the North Sea
Already significant share of renewables
(Feedstock to PtX products)

Gas

Gas-grid and salt cavern storage for renewable gasses (H2, Syngas, Methane)

District heating

Additional revenue through waste heat from PtX processes

Bio/Carbon

Massive potential to exploit renewable carbon from biogas and biomass

ELECTRICITY PRICE AS COST DRIVER

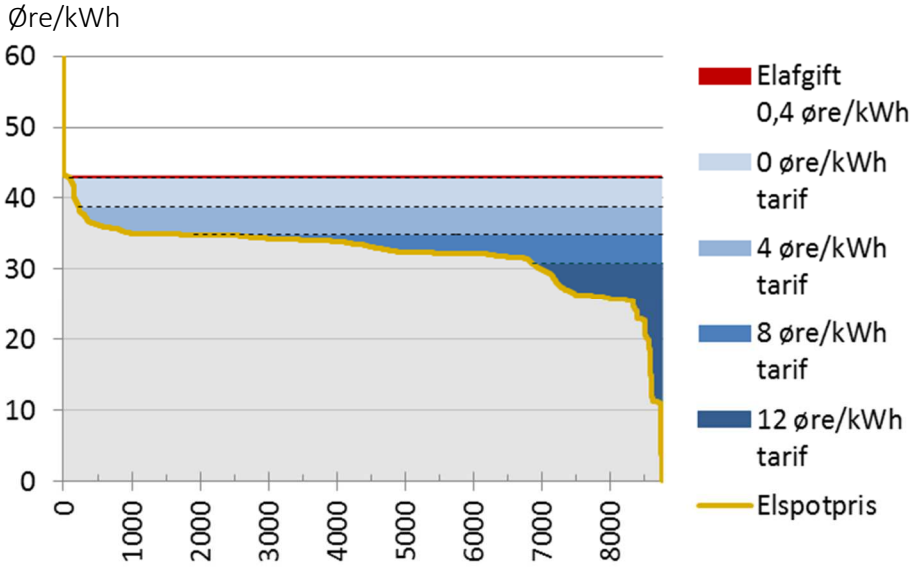
Tariffs and taxes are important

- Reducing CAPEX is crucial for scaling up PtX…
- …however, OPEX – the cost of electricity – including transport – is the biggest cost factor for PtX.

➢ Tariffs could be a determining factor for how fast, and at what scale PtX enters the market.

➢ Energinet is looking into developing new ”grid products” designed for large and fully interruptible electricity consumption.

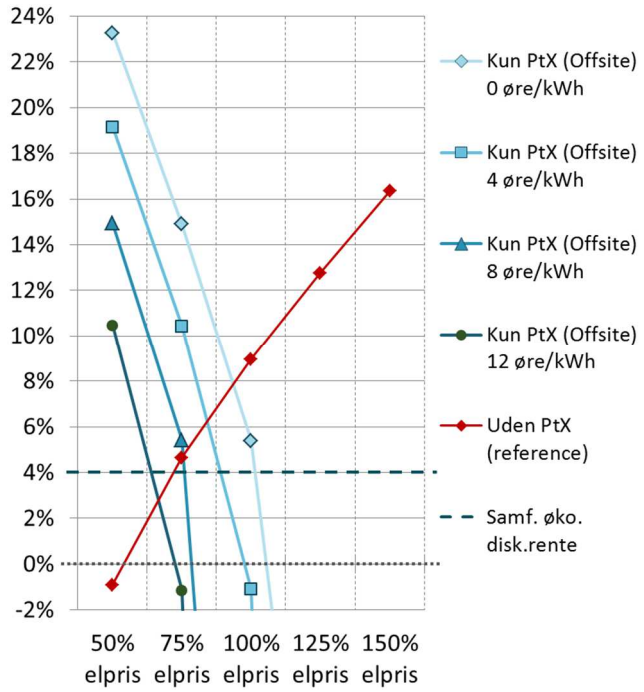
Modeled duration curve DK1 spot price 2025



Assumptions:
- Market price for green methanol: 535 €/ton
- Technology data: Danish Energy Agency’s technology catalogue (2025)

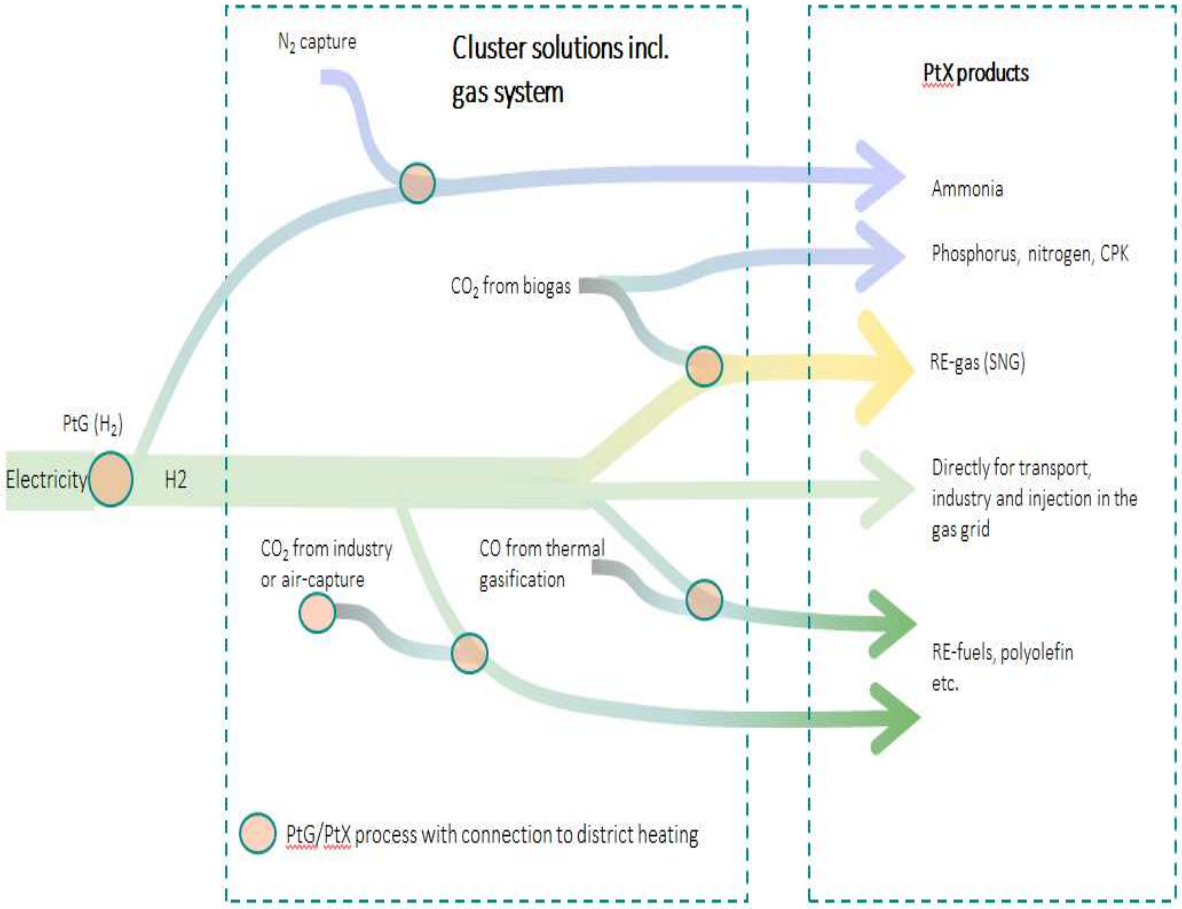
PRICE SENSITIVITY FOR PTX AND WIND & PV

Internal rate of return as a function of market price



50%	75%	100%	125%	150%	Relative electricity price in 2025
16,1	24,2	32,3	40,3	48,4	Average electricity spot price (øre/kWh)
15,6	23,4	31,2	39,1	46,9	Weighted RES electricity price (øre/kWh)

Assumptions:
20 MW_{el} PtX (electrolysis/methanol-plant)
50 MW onshore wind power + 25 MW PV
PtX plant increases investment by 50%



INTEGRATION → COMPLEXITY

PtX is electrofuels and chemicals produced via electrolysis of renewable electricity

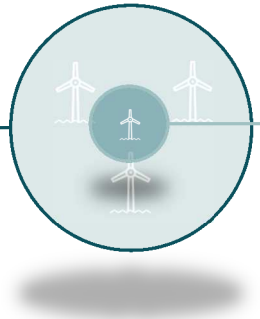
To utilize its potential there is a need for a framework that:

- Allows for mixed products
- Acknowledges sector coupling
- Awards flexibility and storage attributes
- Supports technological innovation

NORTH SEA WIND POWER HUB

TenneT NL, TenneT DE, Gasunie, Port of Rotterdam and Energinet

Step 1: Vision
Coordinated international deployment of in the North Sea

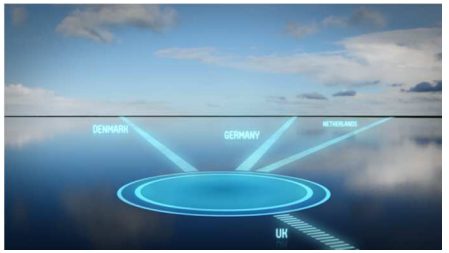


Step 2: Project
First concepts to a common project

Offshore wind power

Platform or island

Trade connections



Modular construction

QUESTIONS

Contact: sgj@energinet.dk

FINAL REMARKS

Clement Johan Ulrichsen, Energinet Gas TSO

QUESTIONS

Contact: cju@energinet.dk