DanskeRederier

CCUS

CARBON CAPTURE, USAGE AND STORAGE

ALLIANCEN

DANSK INDUSTRI – DANSKE REDERIER – DANSK FJERNVARME – DANSK METAL
DANSK OFFSHORE – AXCEL FUTURE – GREEN POWER DENMARK

VELKOMMEN TIL CCS-ALLIANCE-MØDE!

Hos Danske Rederier, 21. september 2023

DAGSORDEN

Velkomst: Jacob Clasen

An ambitious CCUS strategy – new strategy and the Net Zero Industry Act

Johanna Fiksdahl, DG Energy; Francois-Regis Mouton, International Association of Oil & Gas Producers; Ana Serdoner, Bellona og Kathrine Thomsen, Klima-, Energi- og Forsyningsministeriet

Hvordan opnår vi både konkurrence og samarbejde mellem transportformerne? Perspektiver fra udledere, transportører og lagringsvirksomheder

Kim Søgaard Kristensen, Evida; Carsten Manniche, NavigatorGas; Peter Hindsberger, INEOS, Lars Bruhn Sørensen, Ørsted og Kathrine Thomsen, Klima-, Energi- og Forsyningsministeriet

Status for de danske NECCS- og CCUS-udbud

Finn Lauritzen, Axcelfuture

Eventuelt og lidt til ganen

Industrial Carbon Management Strategy for Europe

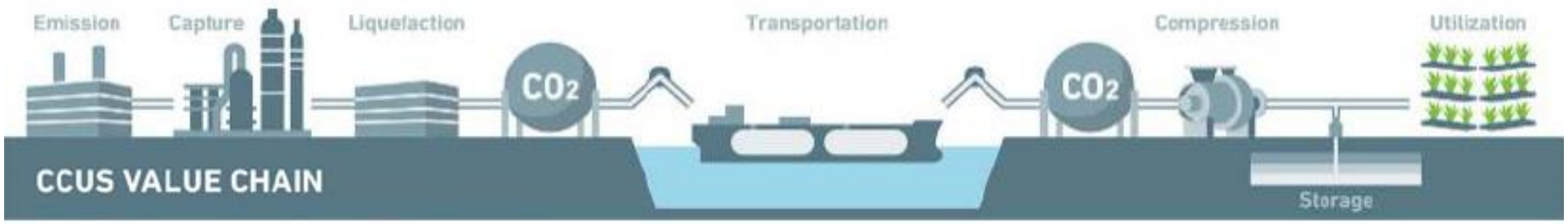
Johanna Fiksdahl

Policy Officer / SNE, Directorate-General for Energy

European Commission

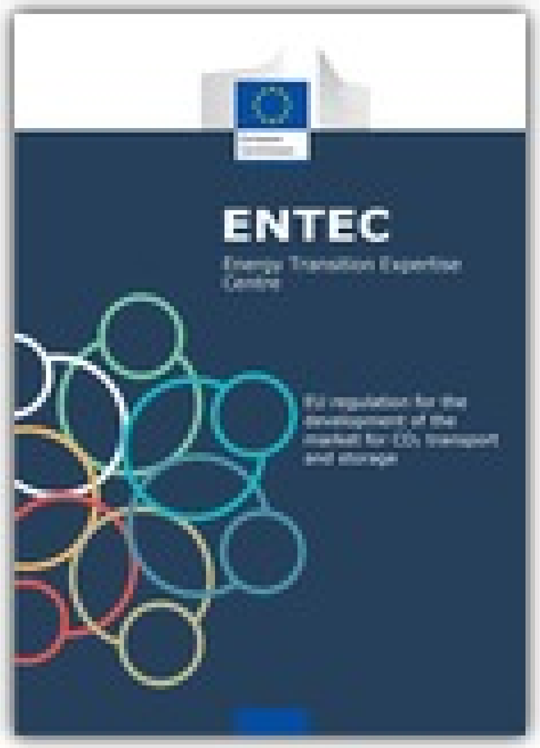
Driving the ICM Strategy

- Existing framework and projects
- CCUS Forum – regular meetings and issue papers
- Net Zero Industry Act (NZIA) – negotiations ongoing
- Two studies on CO_2 transport and storage infrastructure



CO_2 transport regulation

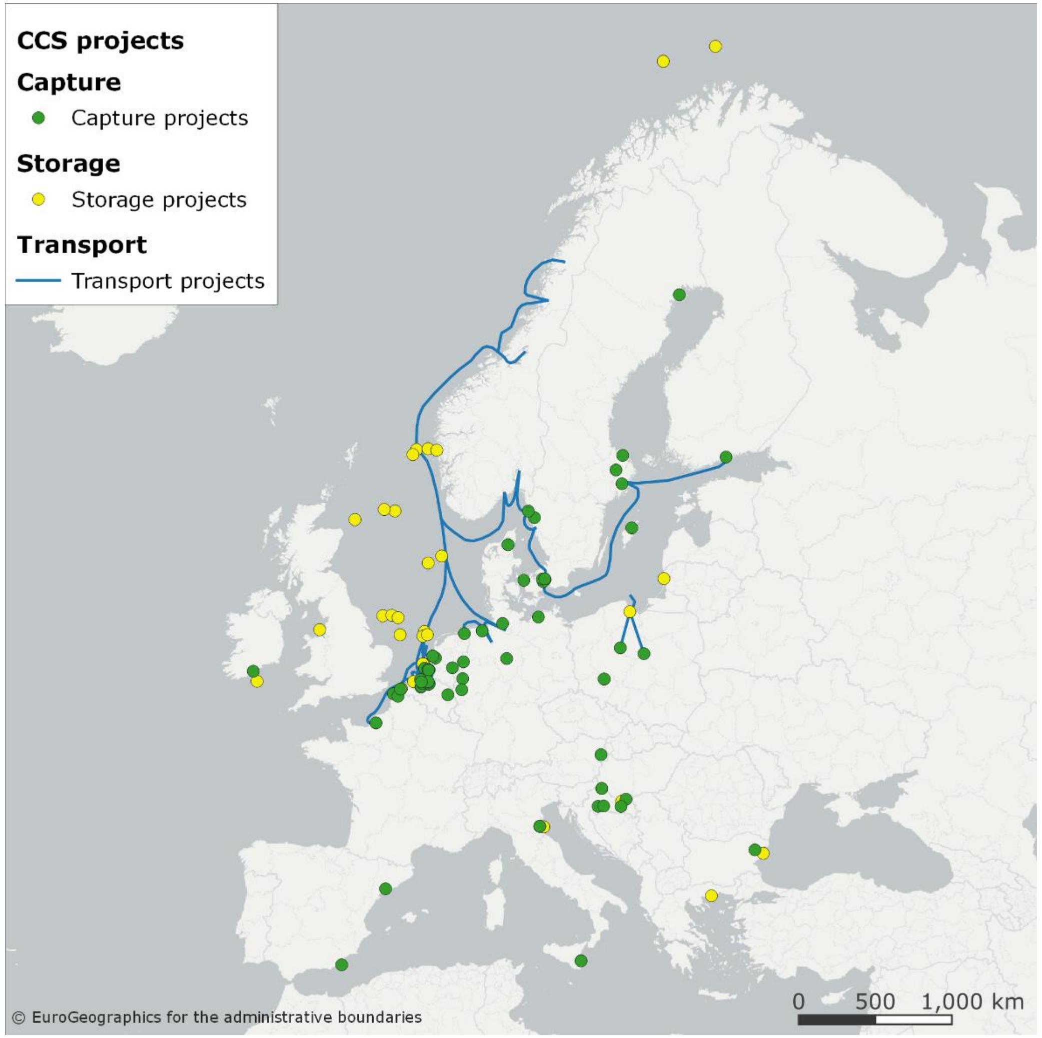
- Open access
- Long-term planning
- Business models
- Regulatory oversight
- Common standards
- Unbundling
- Lessons from n. gas and H_2
- Lessons from other countries



https://energy.ec.europa.eu/publications/eu-regulation-development-market-co2-transport-and-storage_en

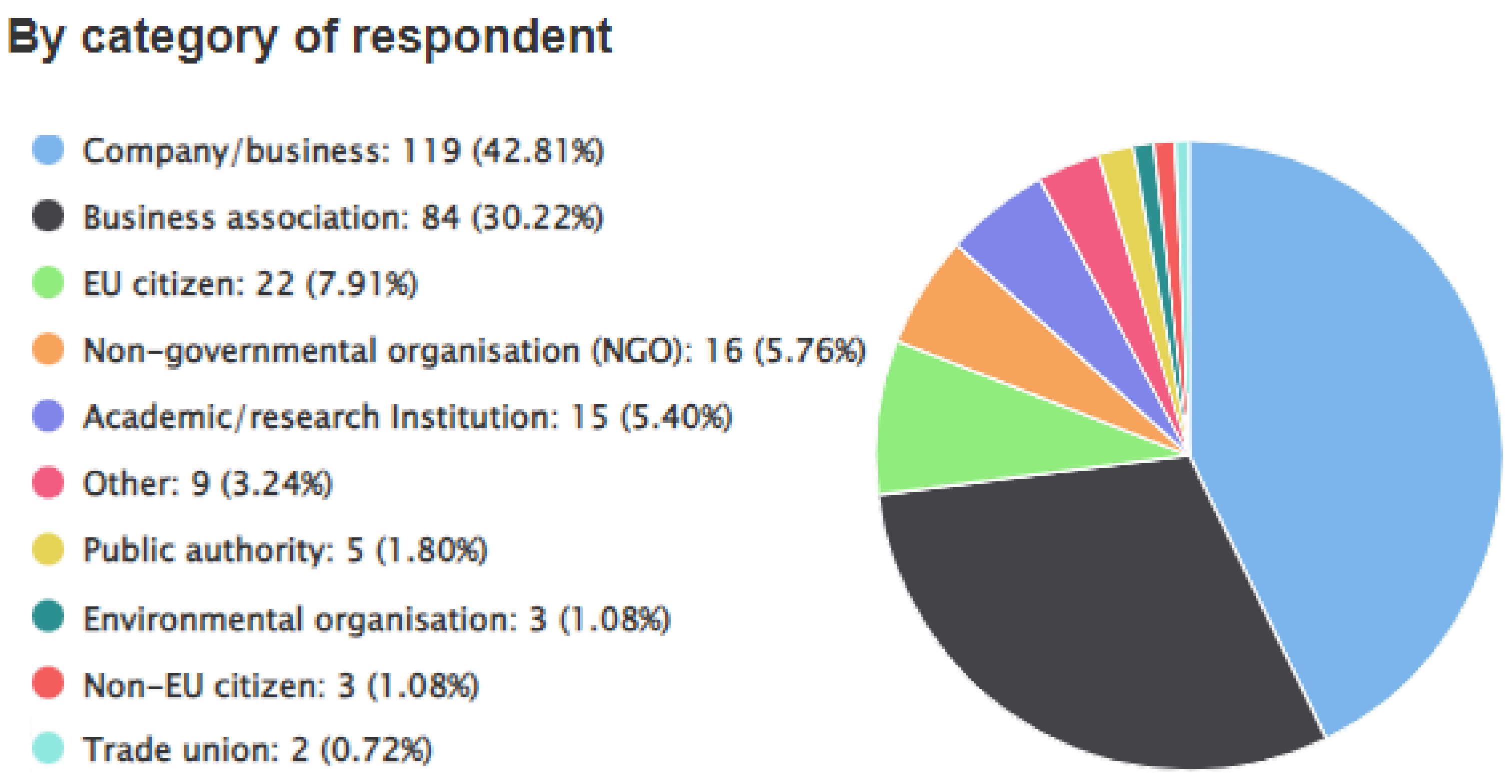
Optimising the grid

- Identification and clustering of CO_2 sources and sinks
- Scenarios on evolution of emission sources and storage capacities
- Routing of pipelines
- Network evolution over time



European Commission

Open Public Consultation, June-Aug 2023



- 278 feedbacks + 205 position papers
- 30 countries

→ Wrap-up workshop 6 Oct

Possible elements of the Strategy

- Network regulation and planning needs
- Common CO_2 stream standards
- Carbon management value chain MRV
- Market set-up
- Storage capacity needs
- What international co-operation on carbon management

CCUS Forum update

1. Infrastructure
2. Industrial Partnerships
3. Public perception
4. Communication / Strategy

Plenary meeting in Aalborg 27-28 Nov

European Commission

European Commission

Thank you!

#CCUSForum #ICMStrategy

Net Zero Industry Act - CCS as a key enabler of the energy transition

François-Régis Mouton
21 September

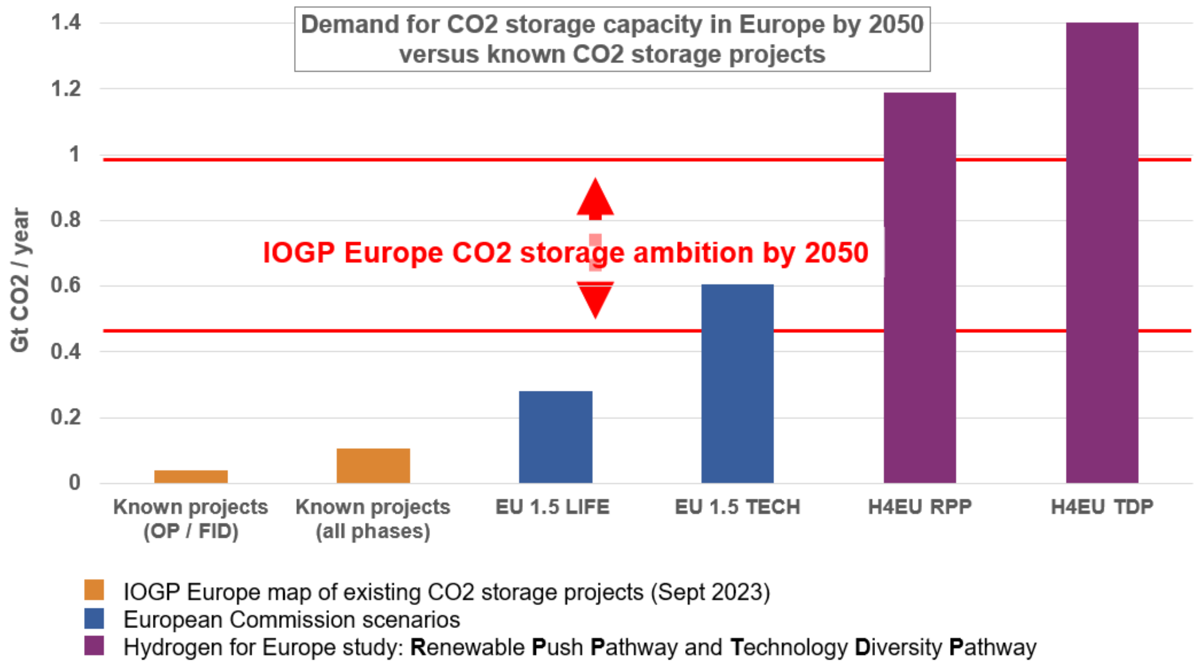
NZIA - our reaction – In a nutshell

IOGP welcomes the recognition of CCS as ‘net-zero technologies’

Reaching the 50 Mt CO_2 injection capacity objective requires an enabling framework

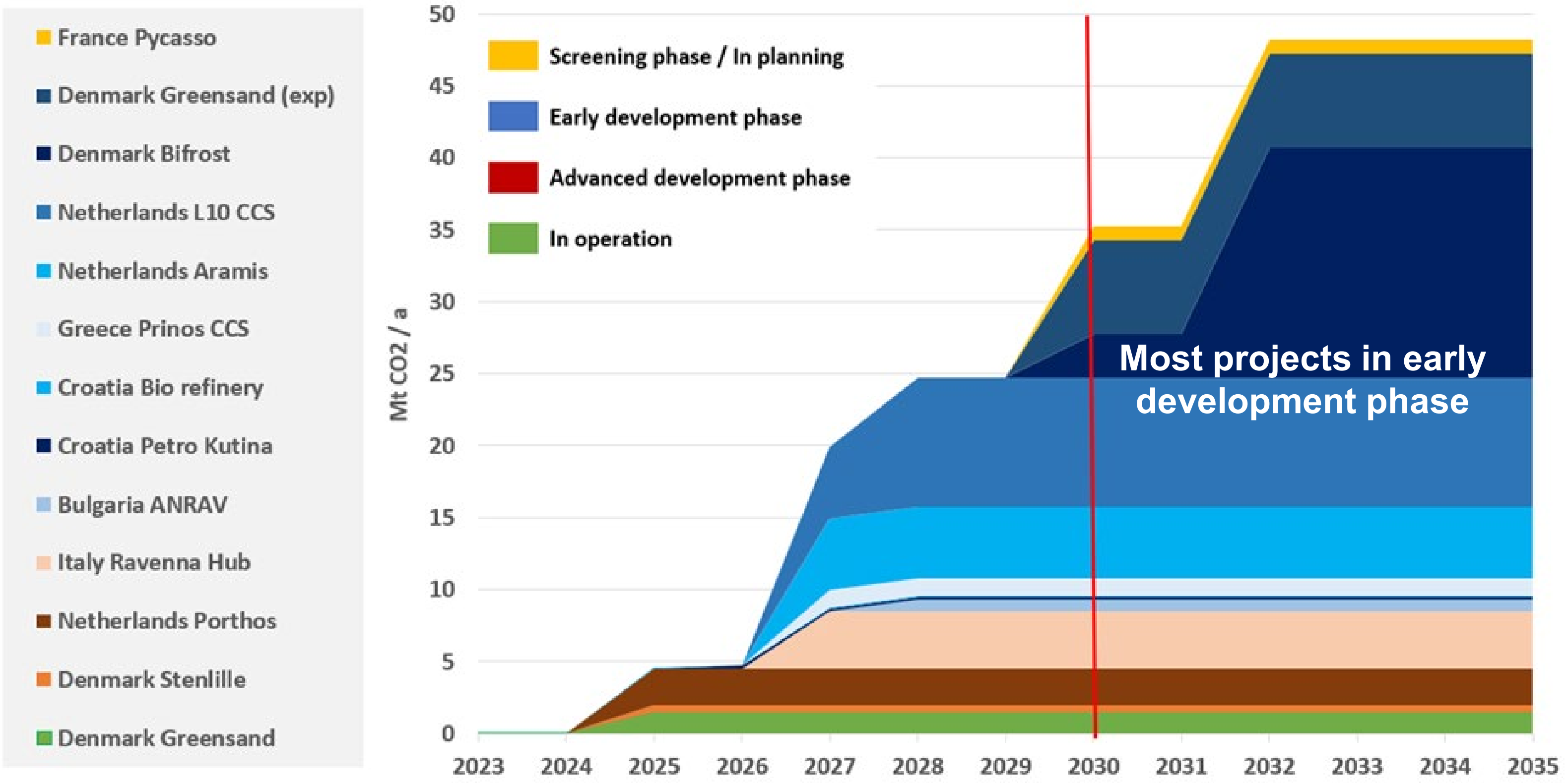
And a business case is needed for all entities operating along the CCS value chain

We aim higher!



- **IOGP Europe member ambition to develop 0.5 to 1.0 Gt CO2/a storage injection capacity by 2050, subject to an enabling framework**

35 Mt CO2 storage injection capacity in EU by 2030 if all known projects realized … and on time



Overview of existing and planned CO_2 storage projects in Europe

BULGARIA

1. ANRAV (IF)

CROATIA

1. Petrokemija Kutina*
2. Bio-Refinery Project*
3. CCGeo (IF)
4. **CO_2 EOR Project Croatia***

DENMARK

1. **Greensand***
2. Bifrost*
3. Stenlille demo CO_2-storage
4. Norne
5. Ruby

FRANCE

1. Pycasso*

GREECE

1. Prinos CCS

ICELAND

1. **Orca**
2. **Silverstone** (IF)
3. Coda Terminal (IF)
4. Mammoth

ITALY

1. Ravenna CCS*

THE NETHERLANDS

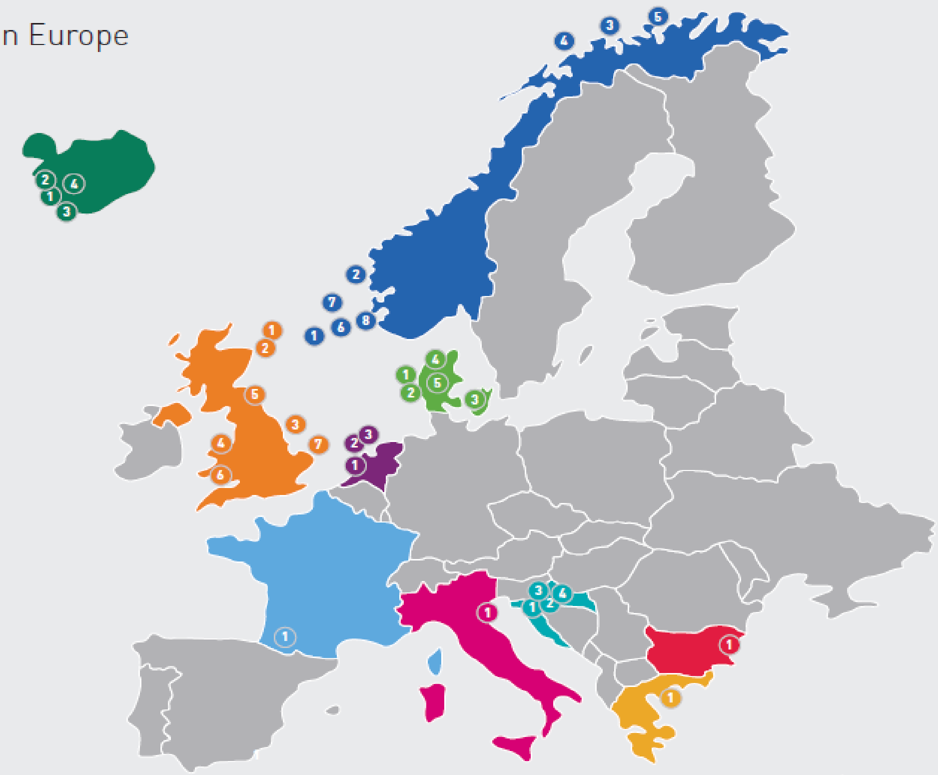
1. Porthos* (PCI)
2. Aramis* (PCI)
3. L10 CCS*

NORWAY

1. **Sleipner***
2. Longship (includes Northern Lights)* (PCI)
3. Barents Blue
4. **Snøhvit***
5. Smeaheia*
6. Trudvang*
7. Luna*
8. Havstjerne*

UK

1. Acorn*
2. Caledonia Clean Energy
3. Zero Carbon Humber*
4. HyNet*
5. Net Zero Teesside*
6. South Wales Industrial Cluster
7. Bacton Thames Net Zero initiative*



* Project where IOGP Members are involved
Projects listed in **bold** are in operation
(PCI) – Project of Common Interest
(IF) – Project supported by the EU Innovation Fund

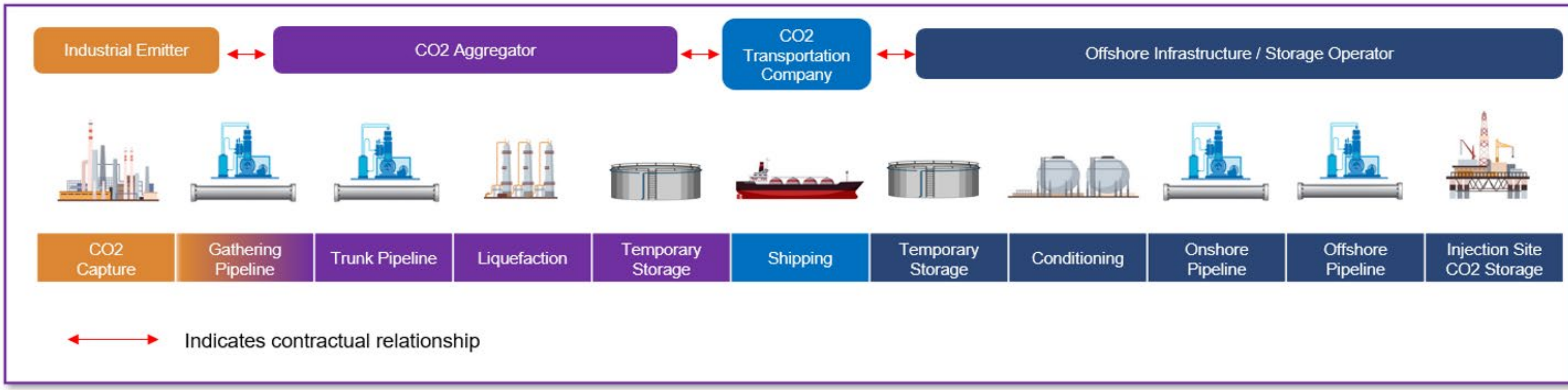
EU	**16 projects** - 35 $MtCO_2/yr$ by 2030
Europe	**35 projects** - 105 $MtCO_2/yr$ by 2030

A M

➢ **Make CO2 storage capacity developments <u>in EEA and UK</u> by obligated EU O&G entities count** towards the 50 MtCO2 CO2 storage objective too (**addition in Article 16**)

International Association of Oil & Gas Producers

Complex and long CCS value chains with multiple entities

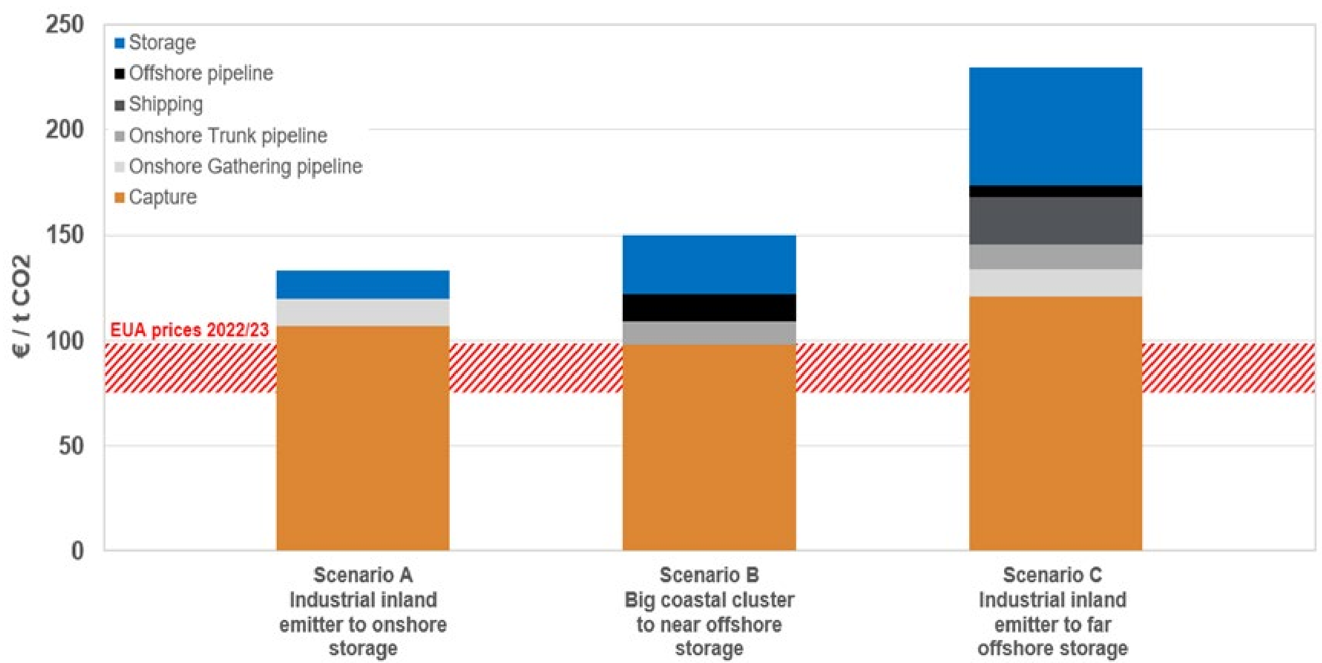


A M
- Expand **the scope of “net-zero strategy projects” beyond CO2 storage projects by including CO2 capture and CO2 infrastructure projects** necessary to the transport captured CO2 to CO2 storage sites (**amend Article 10**)

A M
- **Allow competent authorities approval of start-up delays:** many project milestones are outside control of CO2 storage project developers (**include in Article 18 (6)**)
- **Recognize need for long-term / back-to-back contracts between entities to underpin investment decisions**

Levelized cost of CCS value chains range from 130 to 230 €/t_{CO2}

3 scenarios based on Rystad Energy data



➢ **Current ETS allowances prices are insufficient for emitters to underpin CCS value chains**

Each segment of CCS value chain need targeted support

Key de-risking & funding mechanisms along the CCS value chain

- CCfDs
- Targeted funding
- Long term CO_2 offtake contracts

Emitter with capture

- Government backed guarantees
- CO_2 aggregators with public banking
- Long term back-to-back capacity bookings
- Regulated tariffs

Transportation infrastructure operators

- Targeted funding
- Long term store-or-pay contracts

Storage & offshore infrastructure operators

A M

➢ **Introduce in Art. 18(6): Member States to take necessary measures … including needed funding and de-risking mechanisms** (at least in initial build-up phase)

How can the NZIA proposal be improved to reach the 50Mt CO2 storage capacity objective faster?

- **Apply value chain approach:** expand scope of "net-zero strategy projects" to include **CO2 capture and CO2 infrastructure projects too => Article 16**
- **Expand geographical scope:** allow CO2 storage developments **in EEA and UK** to count towards the 50 MtCO2 storage objective **=> Article 16**
- **Fully use potential of CCS to contribute to net-zero:** do not limit CO2 storage to emissions from certain emitters only
- **Require dialogue between Competent Authorities and obligated O&G entities:** allow delayed start-ups if conditions outside control of project developers are not in place => **expand Article 18 (6)**
- **Expand Article 18(6): Member States / European Commission to facilitate projects by:**
  - **organizing tender rounds for exploration licenses** for geological structures suitable to store CO2 (incl. saline aquifers)
  - **making available funding and de-risking incentives** (e.g. carbon contracts for difference for emitters)
  - **putting in place a fit-for-purpose framework for CCS**: standards, transportation access; CO2 accounting rules, etc.

For more information please contact:

François-Régis Mouton , Regional Director IOGP Europe

frm@iogp.org

IOGP Headquarters

City Tower, 40 Basinghall St, London EC2V 5DE, United Kingdom
T: +44 (0)20 3763 9700
E: reception@iogp.org

IOGP Americas

T: +1 713 261 0411
E: reception-americas@iogp.org

IOGP Asia Pacific

T: +60 3-3099 2286
E: reception-asiapacific@iogp.org

IOGP Europe

T: +32 (0)2 790 7762
E: reception-europe@iogp.org

IOGP Middle East & Africa

T: +20 120 882 7784
E: reception-mea@iogp.org

www.iogp.org

EVIDA
DEN NATIONALE GASDISTRIBUTØR

Infrastruktur
Udviklinger , driver og vedligeholder 18.000 km rør i hele landet som en del af Danmarks kritiske infrastruktur.

Kunder
Vi leverer bio- og naturgas til:

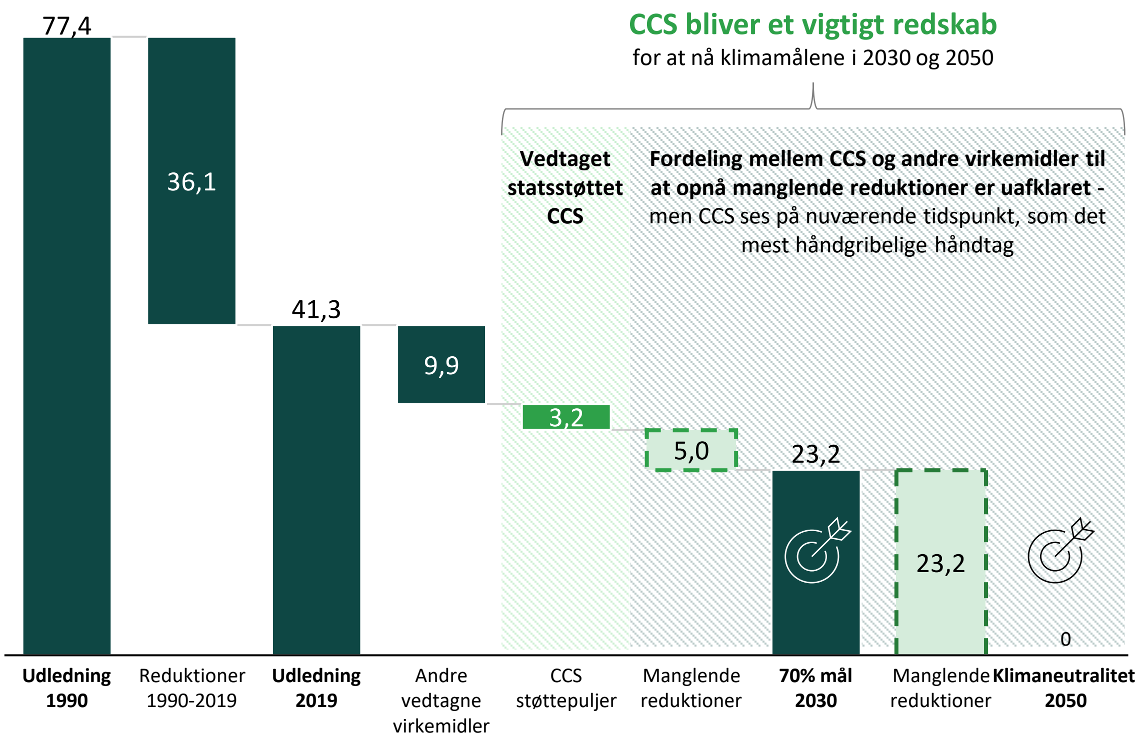
- 310.000 privatkunder
- 36.000 erhvervskunder, heraf 5.000 industrikunder.

Grøn omstilling
Grøn omstilling ved at tilslutte biogasanlæg til gasnettet, og nr. 57 er netop tilsluttet.

Myndighed
Udfører myndighedsopgaver på vegne af Sikkerhedsstyrelsen, Bla. kontrol af gasinstallationer.

CCS BLIVER ET VIGTIGT VÆRKTØJ TIL AT OPNÅ POLITISKE KLIMAMÅL, OG FOKUS PÅ CCS ER STEGET I DE SENESTE UGER

Danmarks vision for at opnå klimamål i 2030 og 2050, mio. ton CO2/år

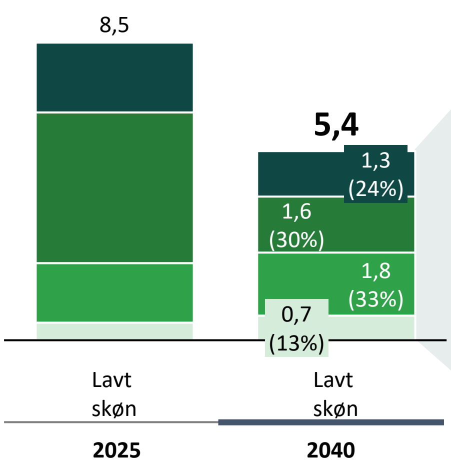


Aktuelt øget fokus på CCS

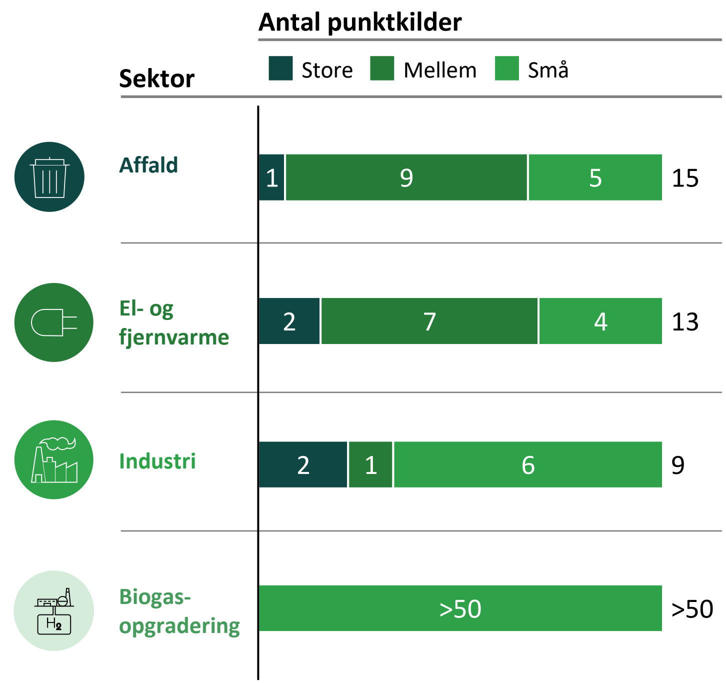
- Sommerens ekstreme vejr i Europa har intensiveret debatten om klimahandling
- Usikkerhed om, hvorvidt Danmark kan nå 2025- og 2030-mål skaber
- **Nyt politisk udspil sammenlægger og målretter støttepuljer til CCS alene –**

CO2-UDLEDNING FRA FANGSTLOKATIONER ESTIMERES TIL 5,4 MIO. TON/ÅR OG FORDELER SIG PÅ ET LILLE ANTAL DANSKE UDLEDERE…

Årligt CO2-fangstpotentiale[1], mio. ton/år



CCS investering vil kun ske med forventning om udledning på lang horisont



5,4 mio. ton CO2

i samlet årligt fangstpotentiale i Danmark.

EVIDA HAR ET STÆRKT UDGANGSPUNKT FOR AT BLIVE EN CENTRAL AKTØR I CCS-VÆRDIKÆDEN

Kernekompetencer inden for gastransport

Evida har kompetencerne til at:

1. Etablere rør
2. Drive rørinfrastruktur for gasarter

Bred erfaring med sikker netværksdrift

Evida har 30 års historik inden for sikker drift inklusiv overvågning, beredskabshåndtering, fejlretninger og sikkerhedshåndtering i anlæg

Forståelse for myndigheder og tilladelser

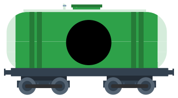
Evida er vant til at arbejde med myndigheder og opnåelse af tilladelser samt stor erfaring med større infrastrukturprojekter

Tæt dialog med branchen og kunder

Evida har opbygget brancheviden gennem en god dialog nationalt og internationalt på tværs af værdikæden

TRE FAKTORER FREMSKYNDER BEHOVET FOR CCS-INFRASTRUKTUR FOR UDLEDERE

Modtagelse af støttepuljer

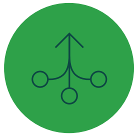


Stigende CO2-afgifter

Salg af frivillige klimakreditter

Aktører kan opnå skalafordele ved at fremskynde processen for at..

Koordinere udledere placeret tæt på hinanden (klynger)



Facilitere import gennem Danmark

EVIDAS ROLLE I CCS-VÆRDIKÆDEN SKAL LEVERE ET PRODUKT DER LØSER ADSKILLIGE BEHOV FOR BÅDE PUNKTKILDER OG LAGRE

Værdikæde

Punktkilde

Fangst

Transport

Transport | Havne-facilitet | Transport | Havne-facilitet | Transport

Transport | Havne-facilitet | Transport

Onshore lagring

Offshore lagring

Identificerede behov for koblingen mellem punktkilder og lagre

Adgang **hele vejen** fra punktkilde til lager, herunder:

Tilstrækkelig **kapacitet**	**Langtidssikret** fremtidsudsigt	Monitorering af mængder og **molekyle-ejerskab**	Løbende **balancering** af flow	Overvågning og **sikkerhed**

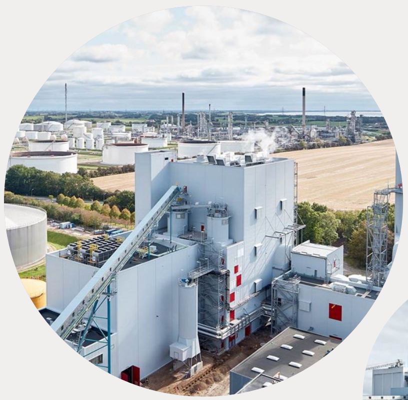
..til *'den rigtige pris'* sammenlignet med alternativet evida

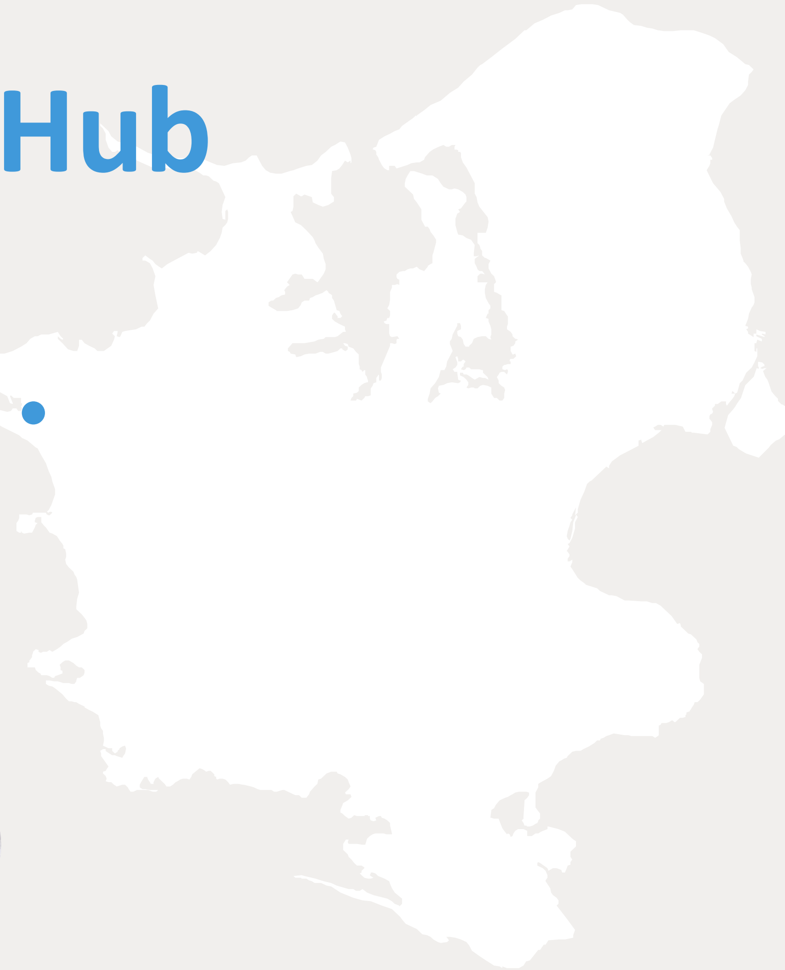
Ørsted

Ørsted Kalundborg Hub

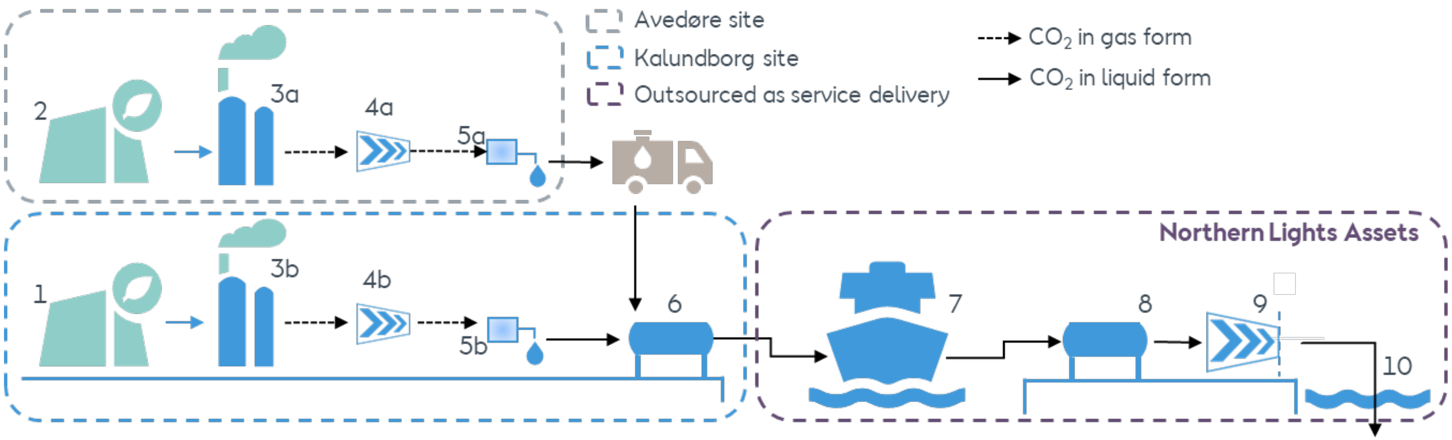
Lars Bruun Sørensen

Head of CCx





Ørsted's key partners in the Ørsted Kalundborg Hub project



Description

The solution is based on a concept with the two point sources:

(1) Asnæsværket unit 6 (ASV6)

(2) Avedøreværket, unit 55 Straw Boiler

CO_2 is captured from five carbon capture modules (3) before it is liquefied by compression and cooling (4). The liquid CO_2 streams are joined in the shared intermediate storage and shipping terminal, awaiting transport (5)

Transportation of captured CO_2 from AVV to ASV via truck (6)

At ASV terminal the CO_2 is loaded to intermediate storage tanks (7)

Transport is performed by ship (8), at a rate consistent to the operation of the two CC units. Liquid CO_2 is delivered to onshore intermediate storage terminal (9) ahead of transfer and injection into offshore permanent geological reservoir (10) 2,600 m

Carbon removal certificates (11) from BECCS at ASV and AVV can be sold through bilateral offtake agreements and commodity trading platforms

Ørsted AKER CARBON CAPTURE Northern Lights Microsoft

Industry challenges highlight the need for scaling efficient value chains

The market is in need of solutions that are cost efficient, flexible and easily scalable, because:

1	**CCS is a low cost game** driven by cost efficiency to scale up investment
2	**The CCS industry is growing**, though the exact capture timelines are difficult to predict
3	**Available storage uncertainties** in regards to capacity and timeline
4	**Scaling of transport solutions** needs to be aligned with above and at low cost

STATUS FOR NECCS- OG CCUS-UDBUD

Finn Lauritzen, Axcelfuture

AXCELFUTURE
ERHVERVSLIVETS TÆNKETANK

CCUS-ALLIANCENS ANBEFALINGER - OG RESULTATET

Anbefaling	NECCS	Kommende CCUS
Lemp tidskravene – gerne 5 år fra tildeling til første lagring	Nej – senest 1/1 2026	Ja, tildels
Reducer bøderne	Ja, lidt	?
Lemp vilkår for tilbagebetaling af tilskud hvis forsinkelse skyldes eksterne forhold	Ja, lidt	?
Reducer "beskatning" af effektiviseringer	Ja	?
Udbetal noget af støtten up-front	Nej	Nej
Flere vindende bud ved siden af hinanden	Ja	Ja
Reducer kompleksiteen i udbuddene	Ja	?
Løs momsproblemet	Ja!	?
Tilpas Varmeforsyningsloven	Nej	?
Tæl kommunegarantier med som egenkapital	Nej	?
Staten skal understøtte infrastrukturen	Nej	?