

Analyser til debat

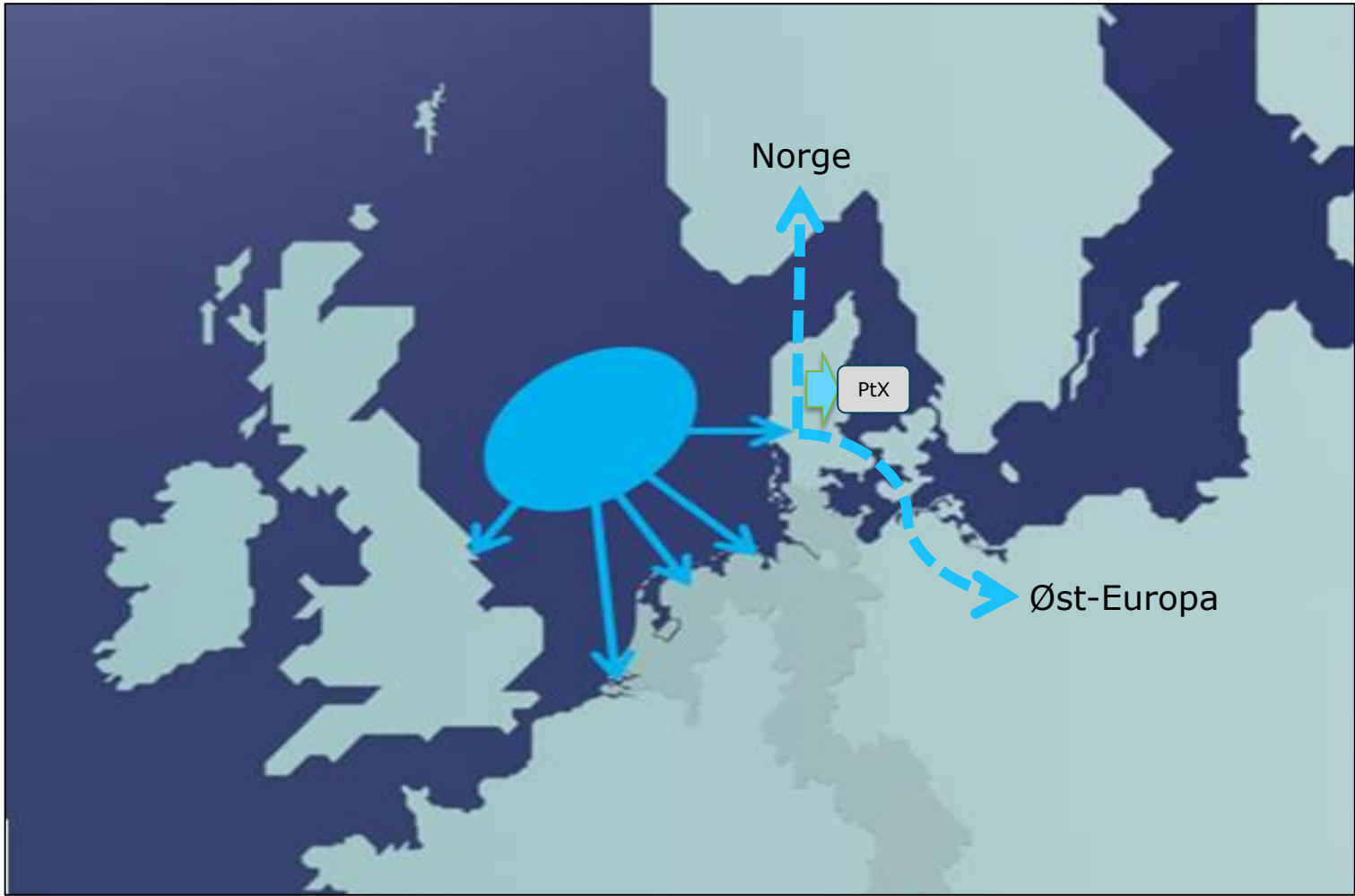
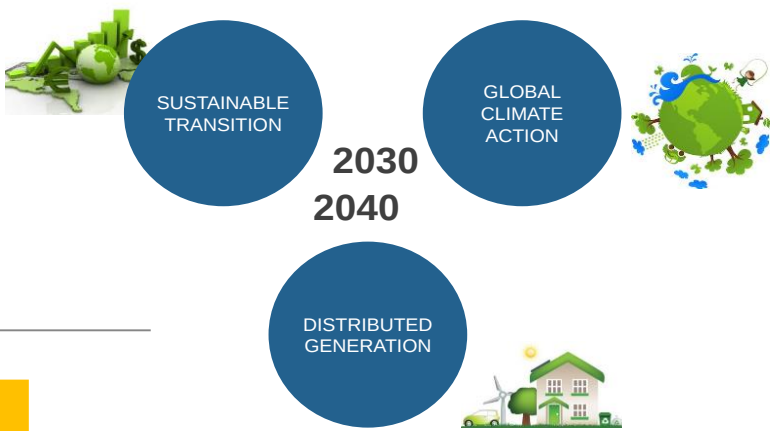
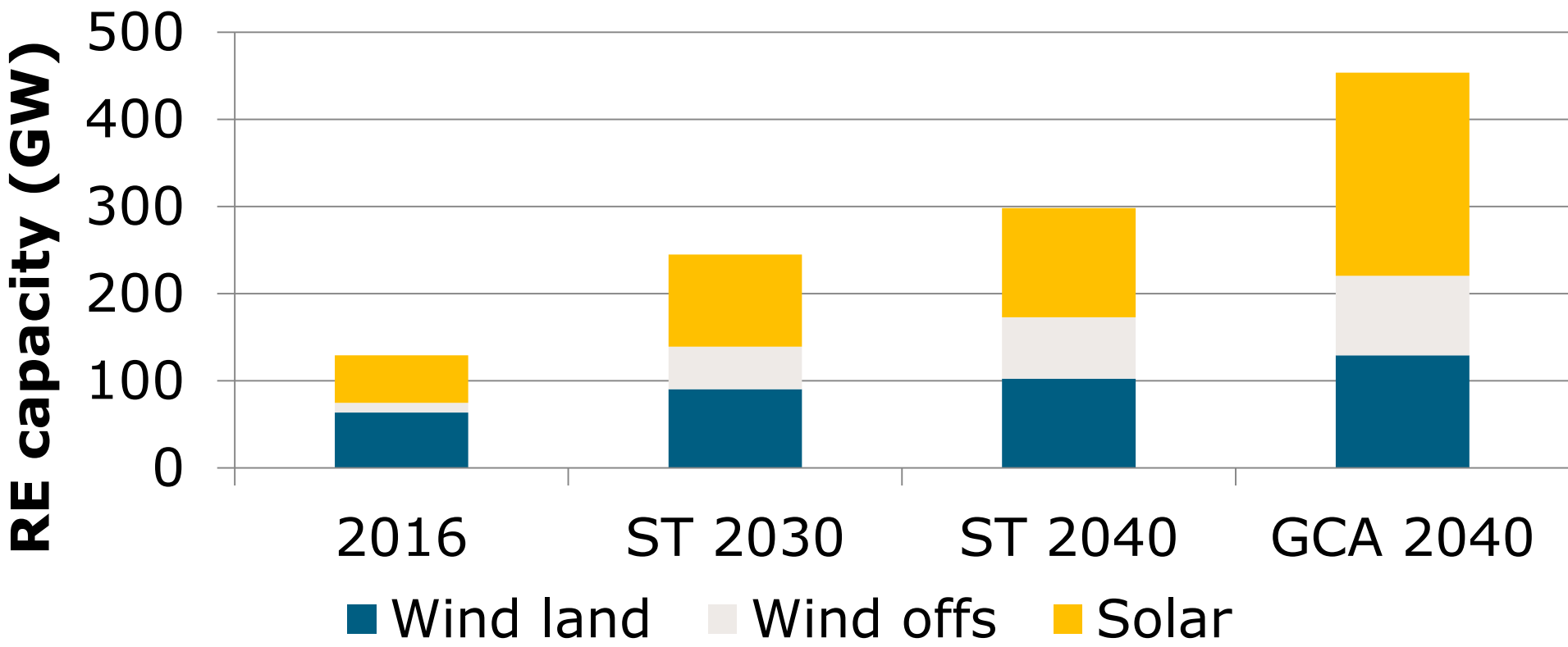
Fra Europa til Lærkevej - ny
systemanalyse på el og gas
2035

Perspektiv for Energisystemet 2035

- Fra Europa til "Lærkevej"

Regionen omkring Nordsøen bliver storproducent af vindkraft
Hvilke løsninger skal der til for at anvende vindkraften effektivt ?

Vind/sol kapacitet i Nordsø-region (DE,NL,GB,DK)



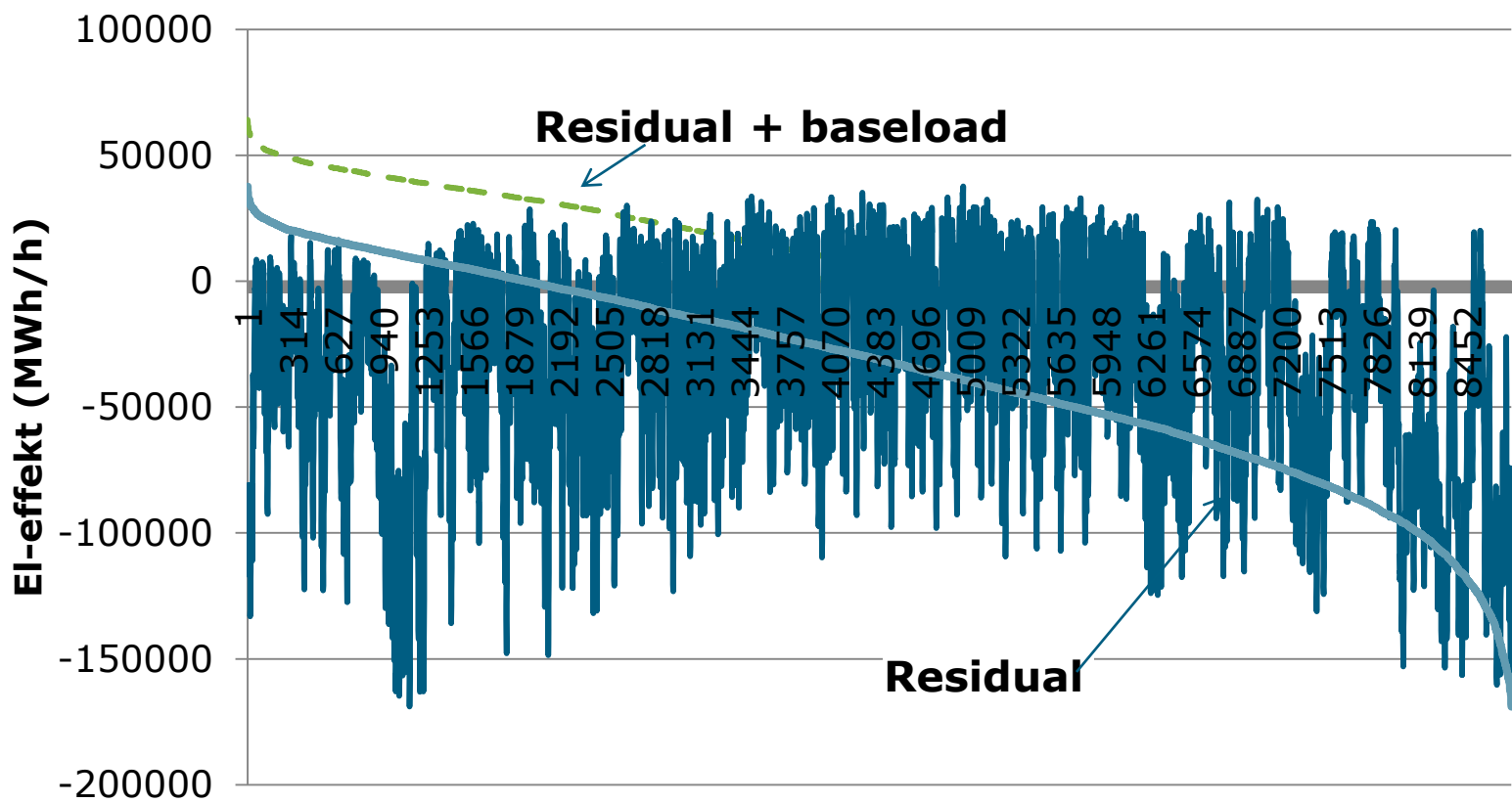
Behov for integration af meget store Nordsø ressourcer

- Elnet integration med vandkraft i Norden
- Elnet integration med øst/syd Europa
- Lagring i batterier mv.
- Integration med gas/biofuels/varme/ammoniak osv.

Der er behov for alle fire typer af indsatser!

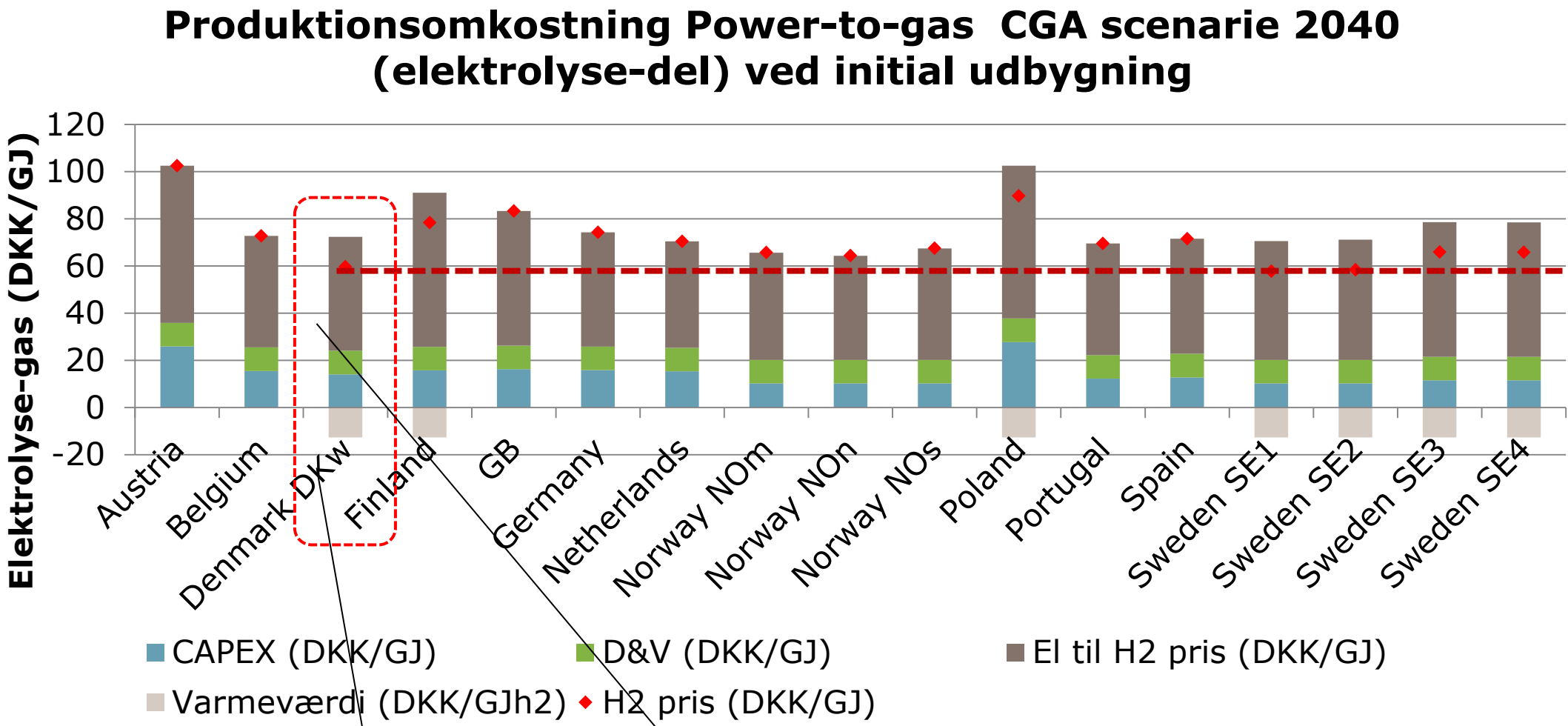
Danmarks rolle og muligheder ?

Wind/solar power production minus consumption (DE,NL,GB,DK) in GCA 2040 scenario

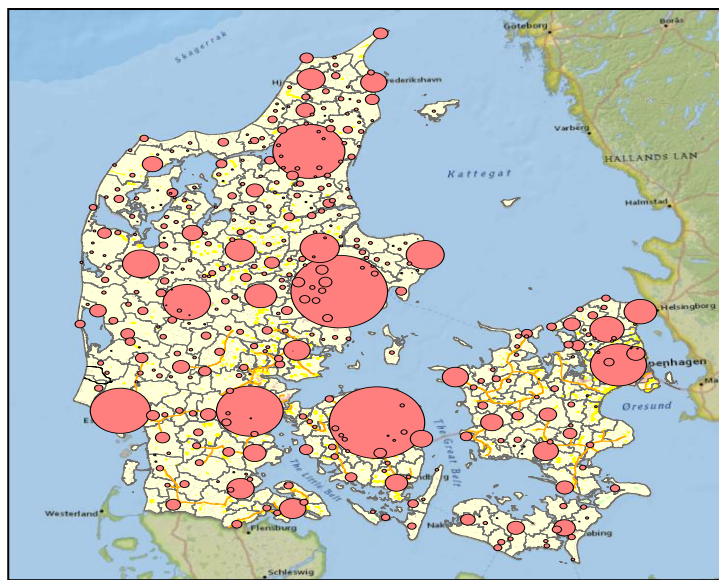


DK's styrkepositioner ved "konvertering" af Nordsø el til energiprodukter (PtX)

Danmark ligger i et område med konkurrencedygtige priser på el



DK har et stort FV-grundlag

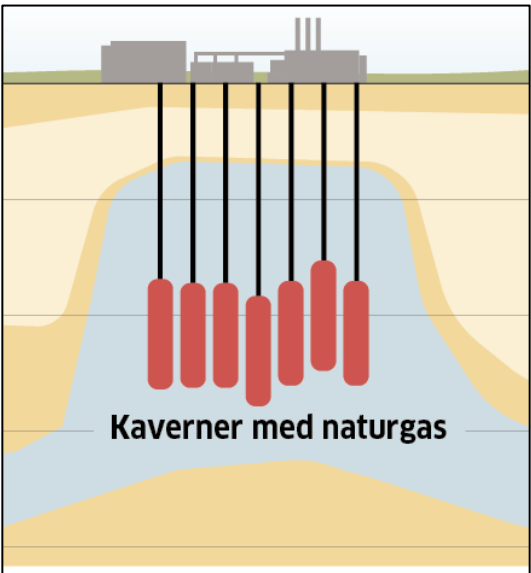
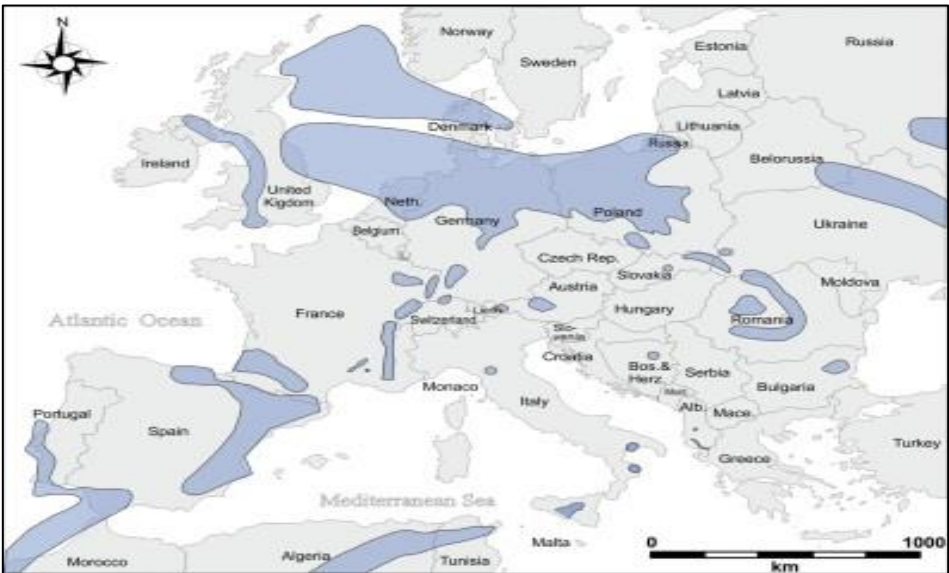


Indtægt ved varmesalg (FV)

Elpriser

VE-andel (ved grønne energiprodukter)

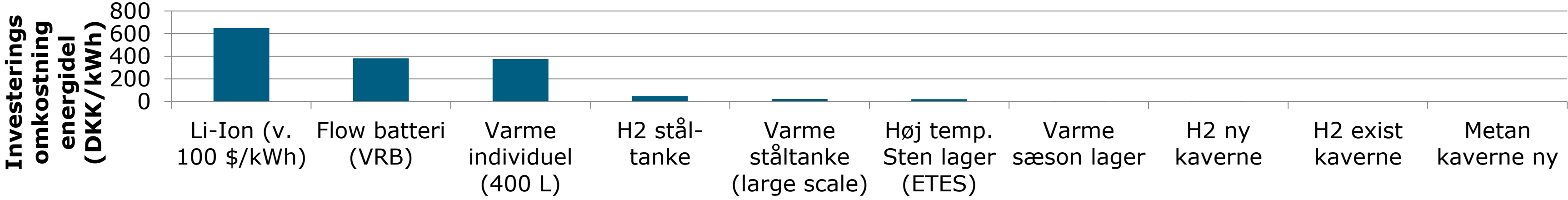
Kaverne lager faciliteter
VE-gas (H2, Syngas, Methan)



Zone1	Middel pris (Euro/MWh)	VE-andel m. hydro
AU	53	0,67
BE	47	0,57
CH	53	0,74
CZ	56	0,18
DE	46	0,60
DK1	45	0,87
DK2	48	0,80
ES	40	0,66
EST	59	0,66
FI	58	0,40
FR	44	0,45
GB	40	0,52
Itcn	53	0,46
ITCs	51	0,49
ltn	58	0,31
Its	48	0,48
Itsar	50	0,52
Itsic	51	0,46
KF_DE	45	
KF_DK	46	
LI	54	0,34
LV	54	0,43
NL	46	0,60
Nom	49	1,00
Non	49	0,95
NOS	49	0,98
PL	61	0,20
PT	42	0,82
SE1	48	0,96
SE2	48	0,96
SE3	50	0,37
SE4	50	0,60

Least cost analyse anlæg/lager (Danmark 2035 i de tre Europa-scenarier)

Investerings omkostning lager (energi-delen)



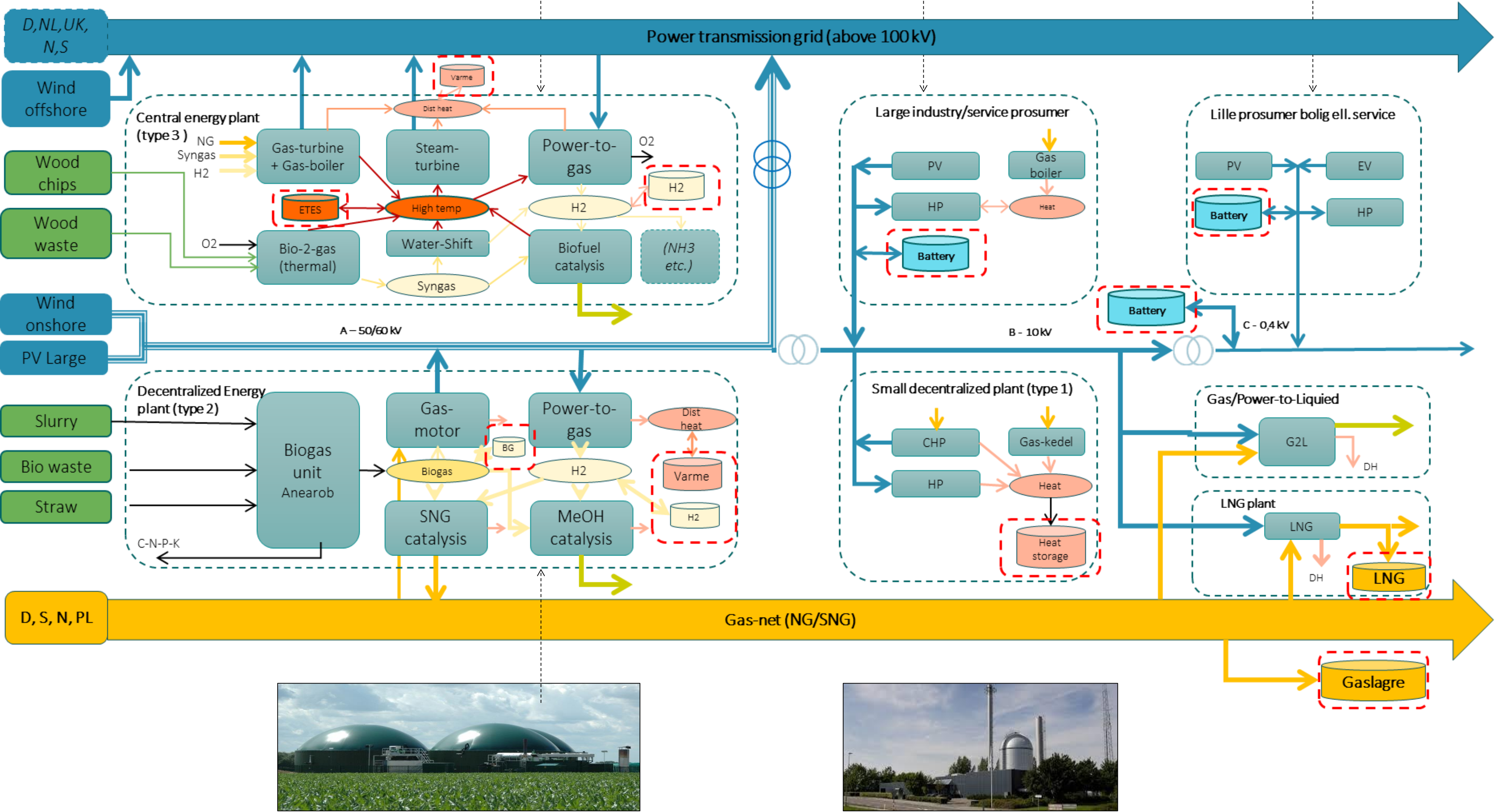
Centralt "energiværk"



Industri/service



Privat prosumer



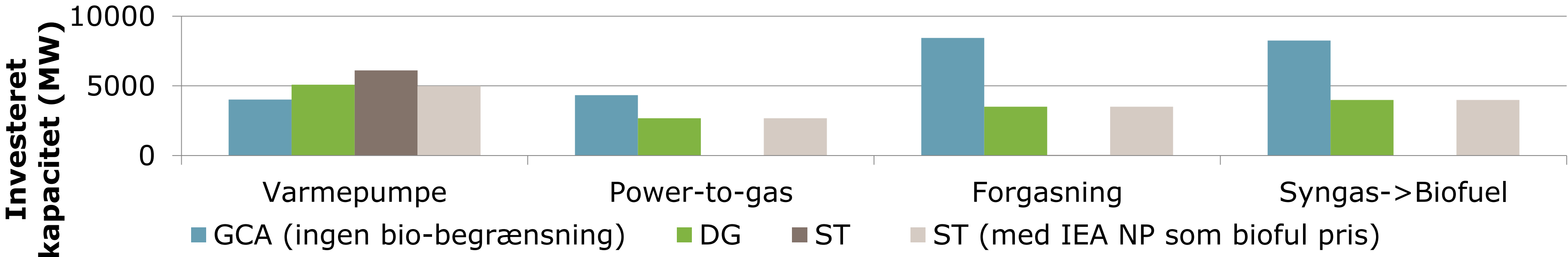
Decentralt "energiværk"



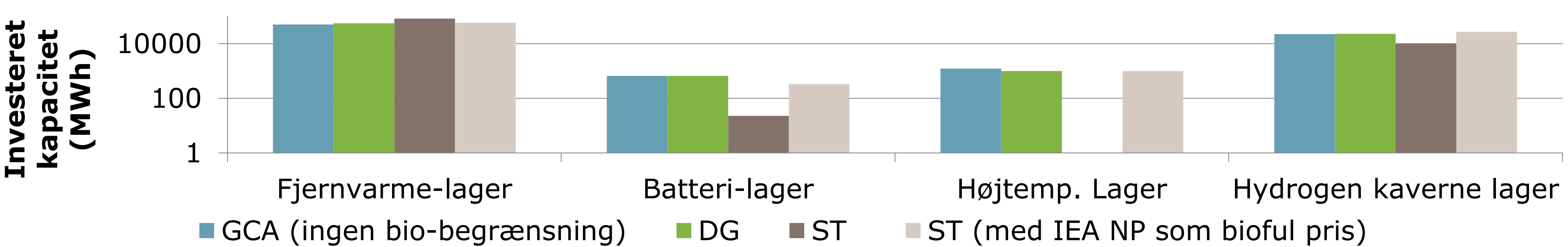
Lille KV-værk



Kapacitet anlæg til energi-konvertering

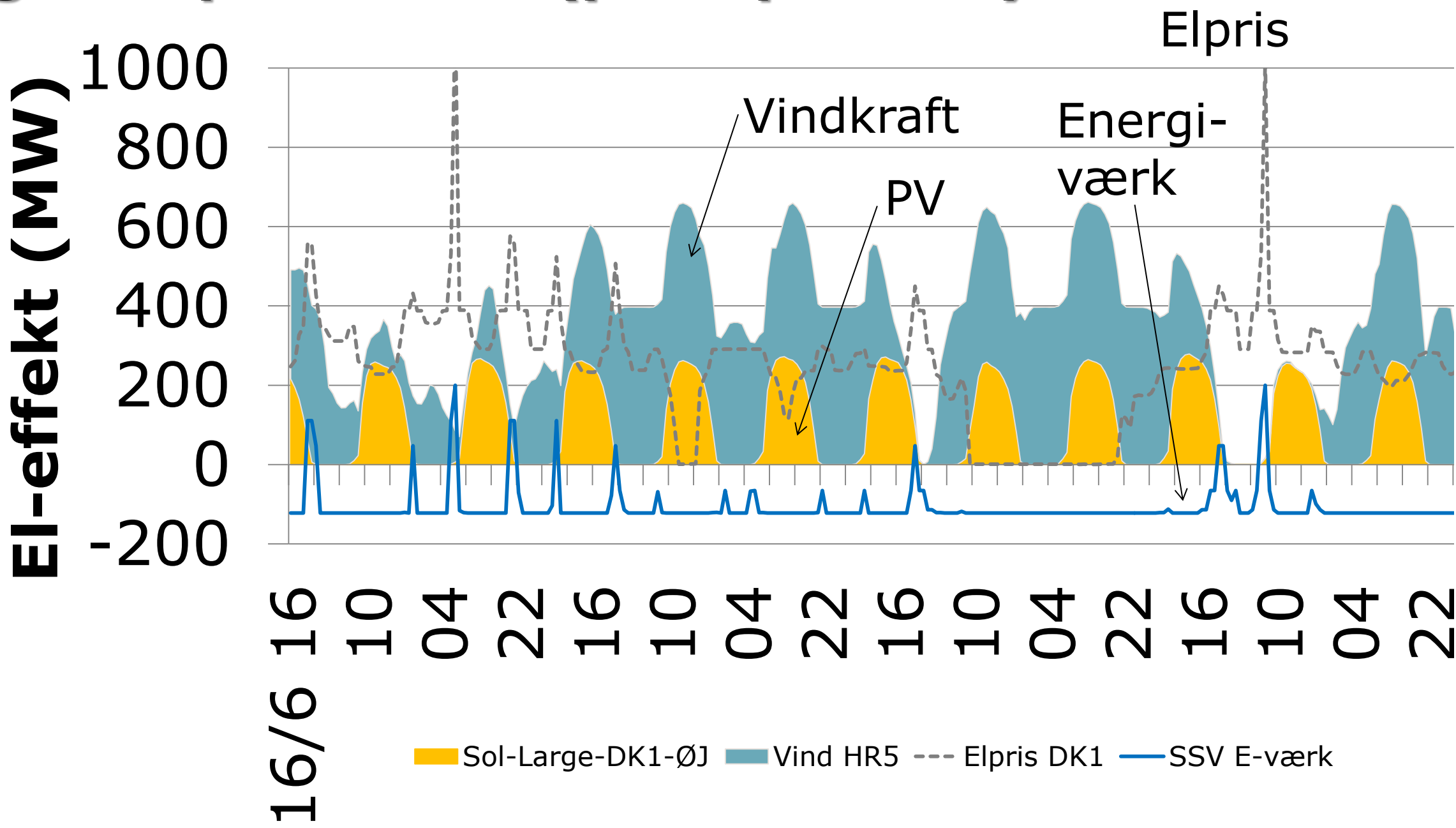
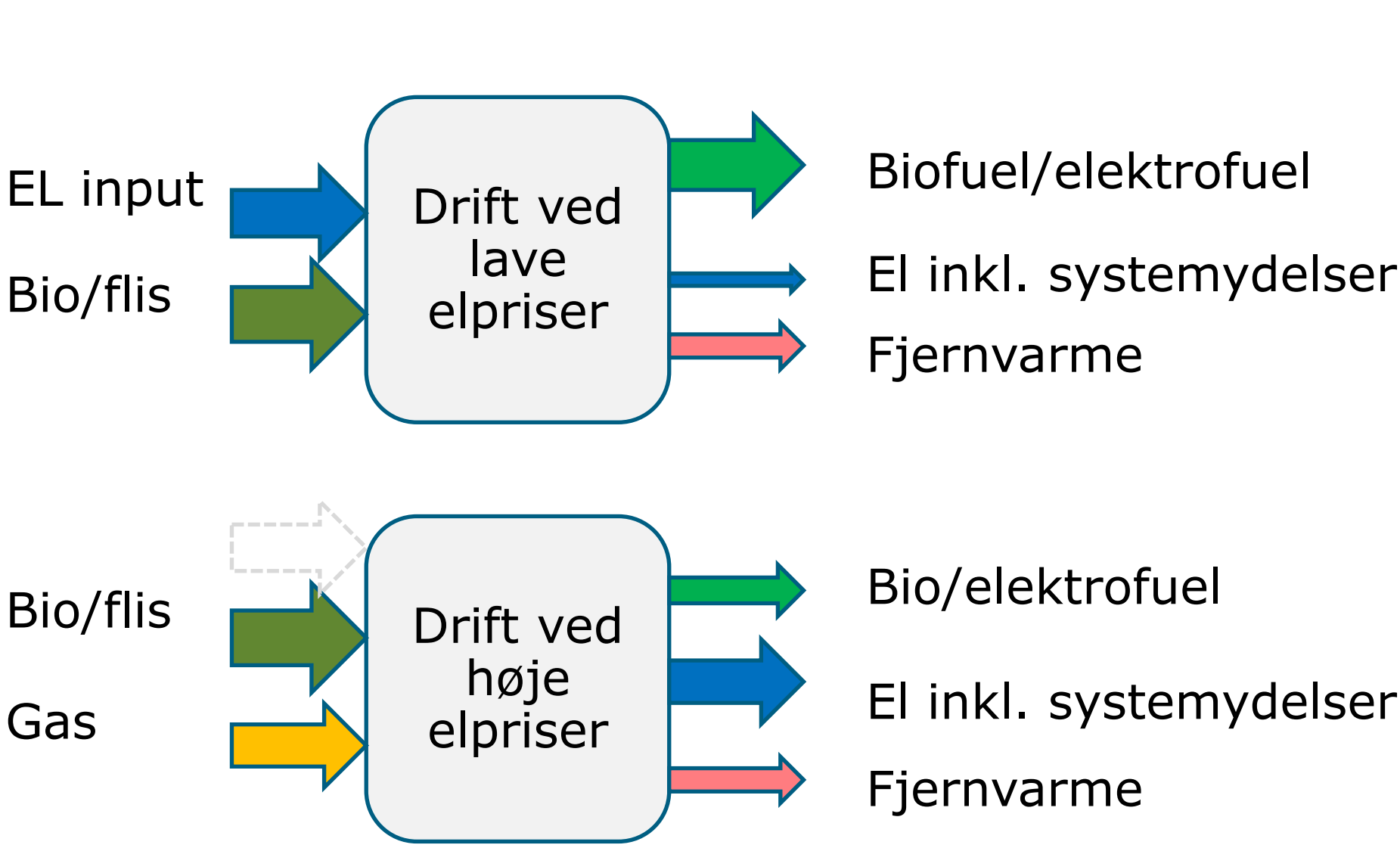


Kapacitet energilagre (Obs. Log skala)



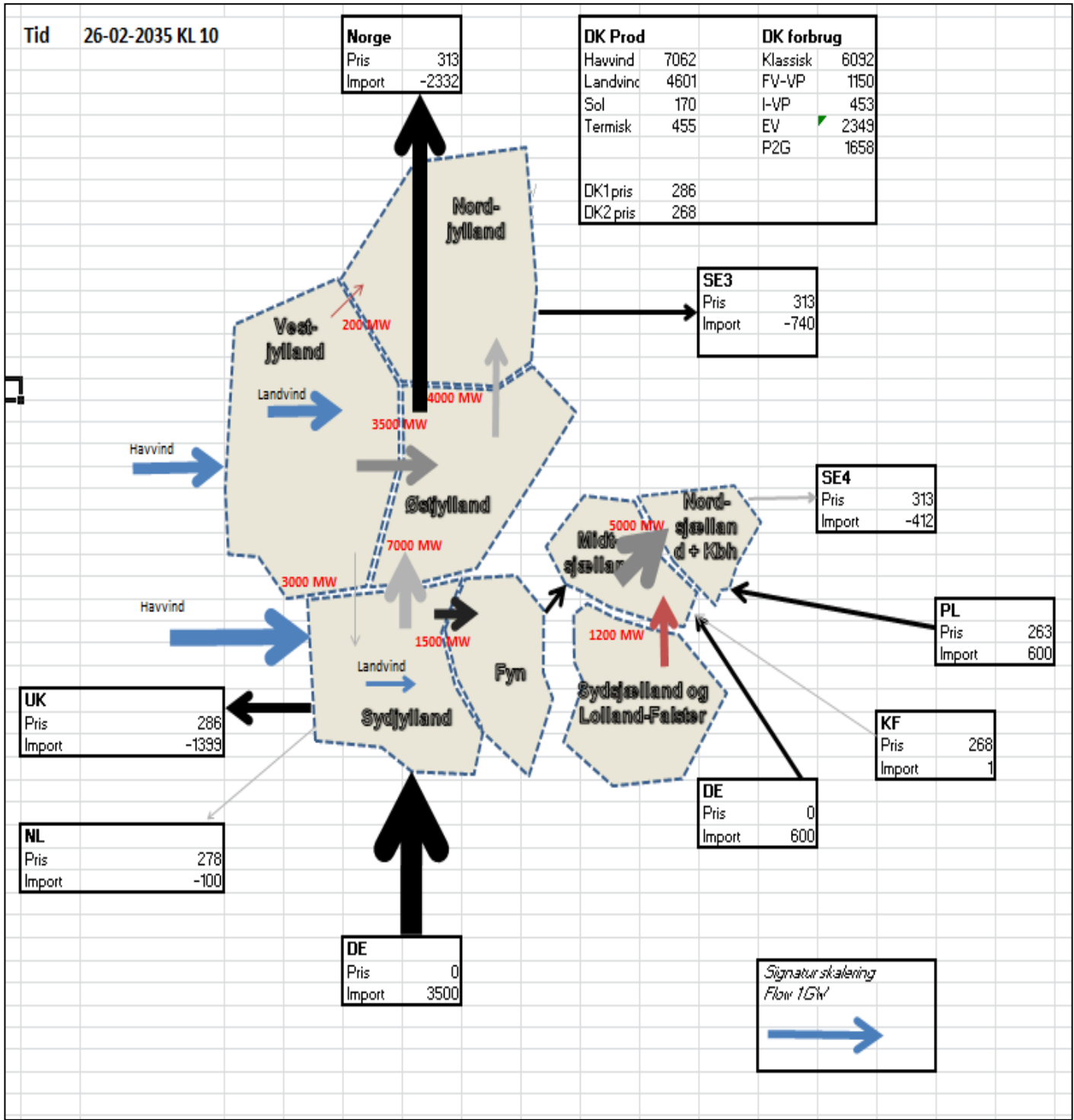
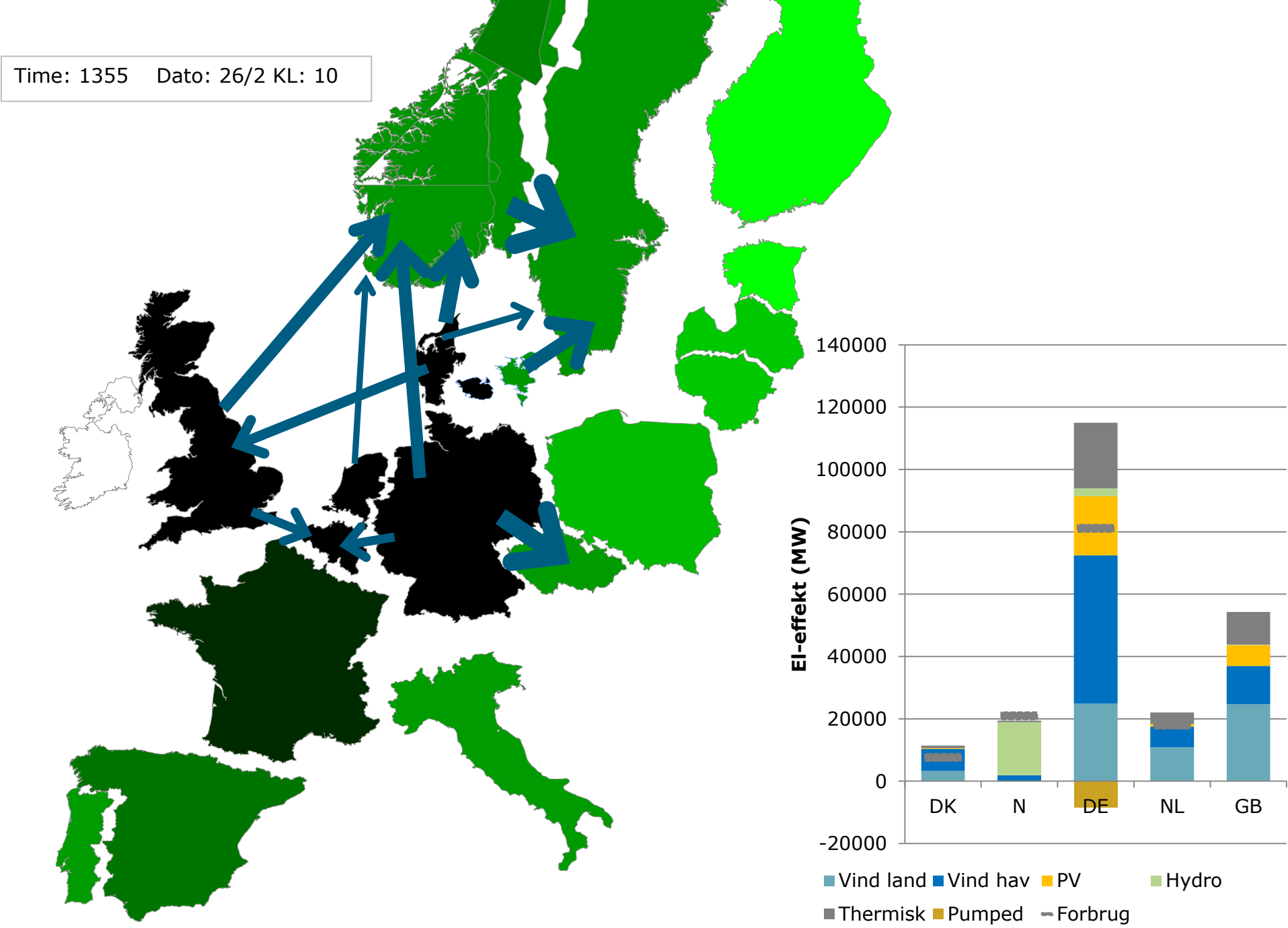
Drift af elsystem med "ny" type værker

Drift af fleksible energiværker med integreret produktion (princip-skitse)

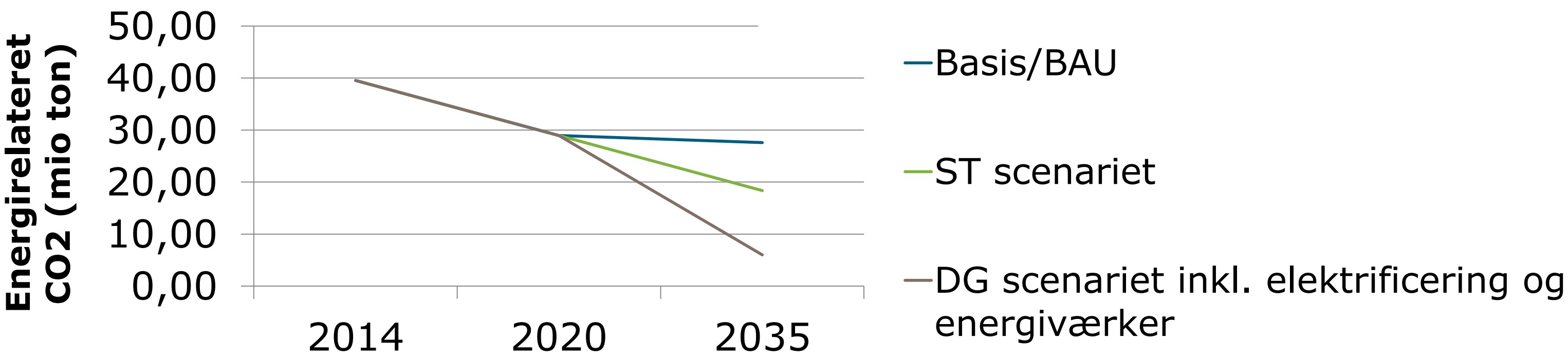


Flexible energianlæg fungerer som net-reserve til international transit gennem DK

Forårsdage med vind og sol - elprisen presses ned i "VestEuropa"



Kombination af elektrificering OG energianlæg kan give kraftig CO2-reduktion

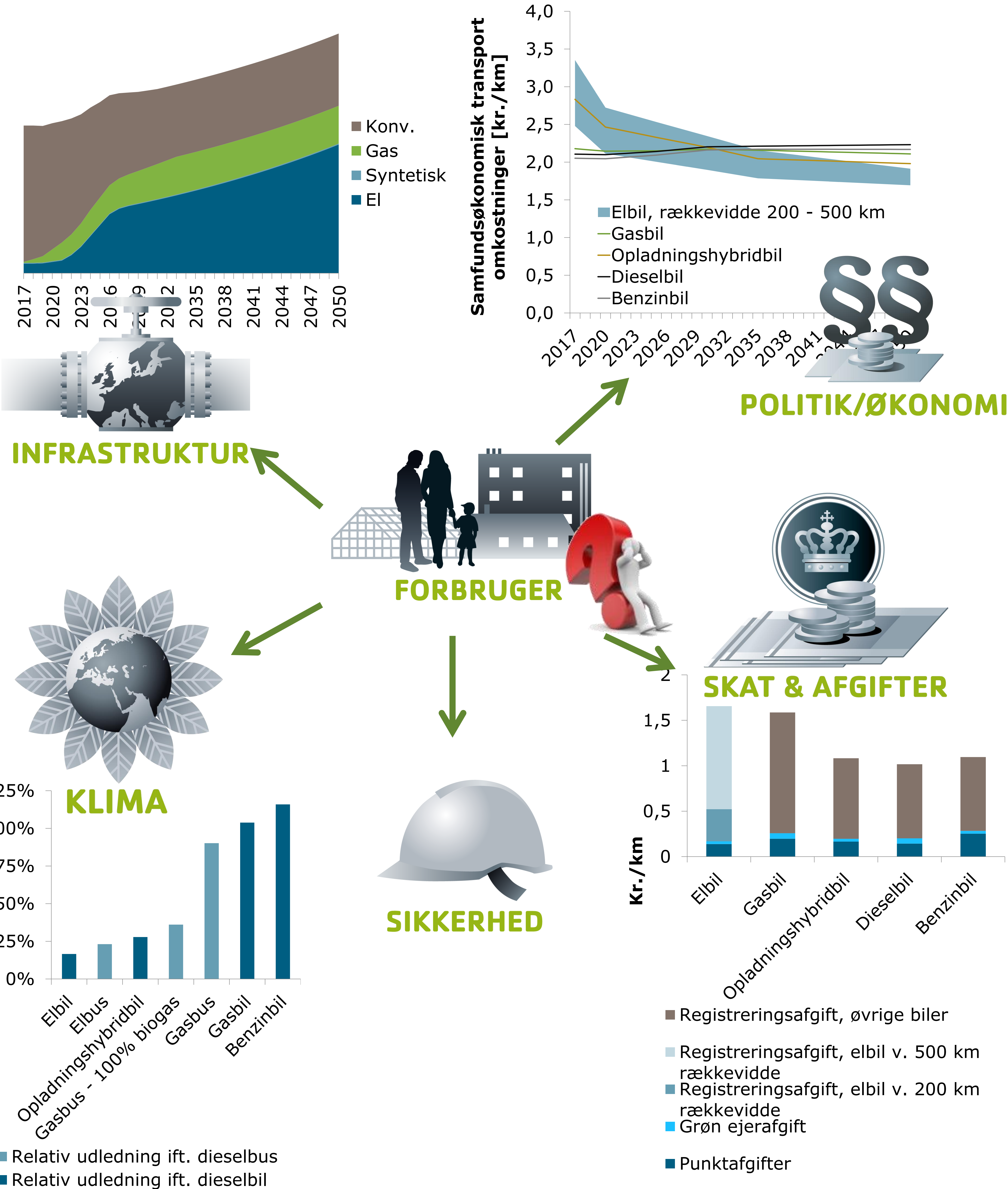


Analysér til debat

El og gas til transport

El og gas til transport

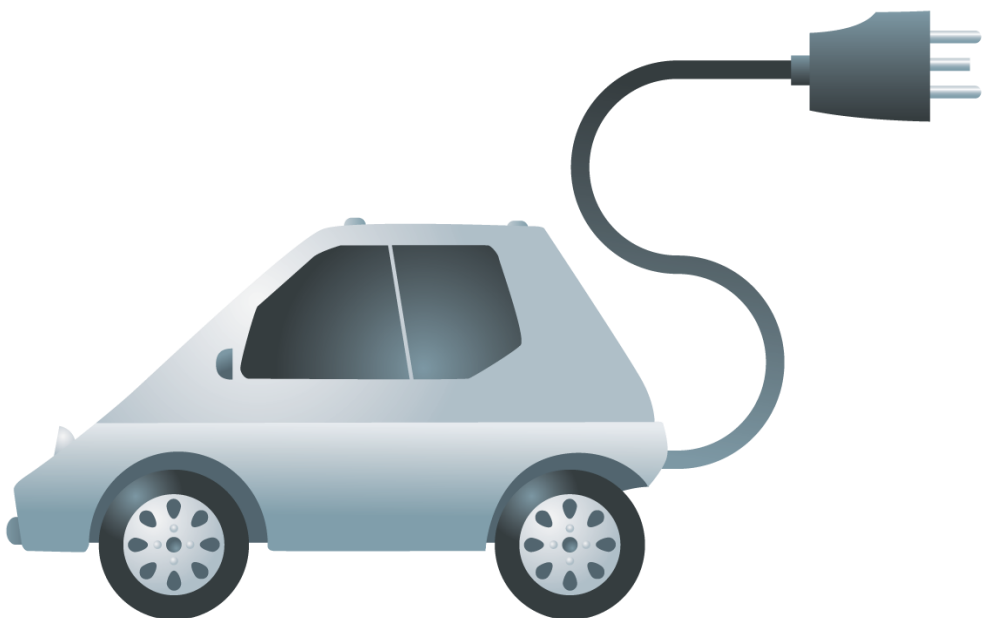
- Hvad skal vi køre på i fremtiden?



El og gas til transport

Forskellige behov dækkes af forskellige aktører

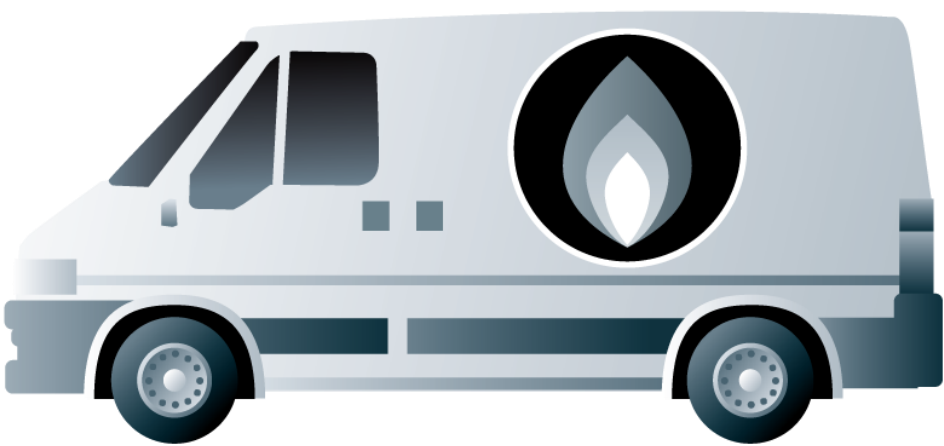
Let transport



ELBILER

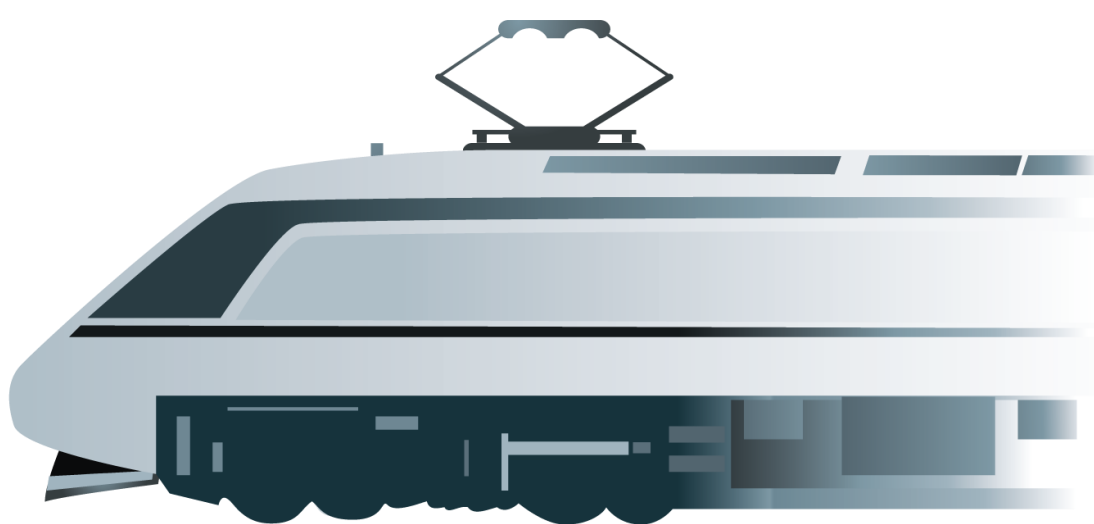


PERSONBIL

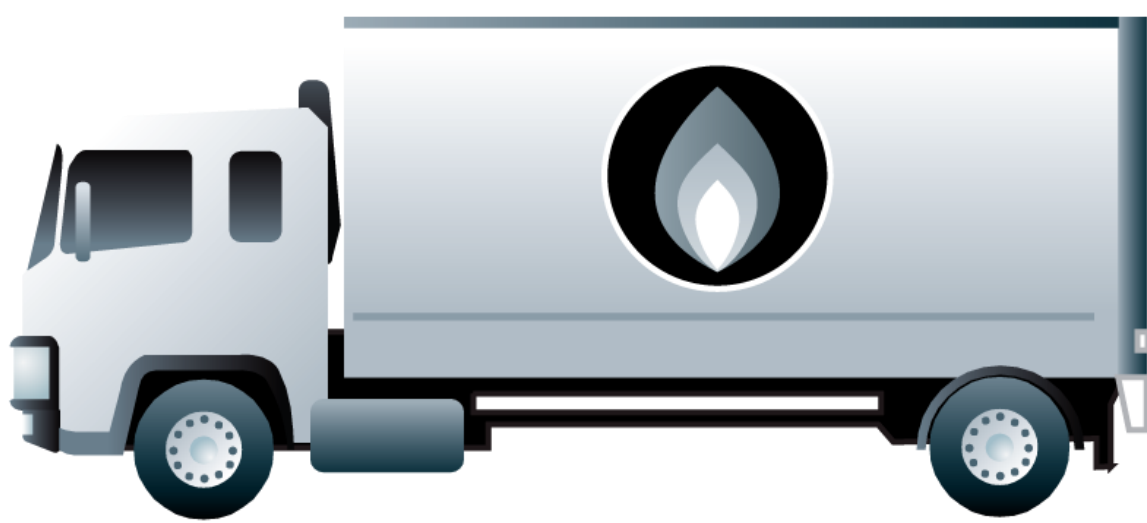


VAREBIL

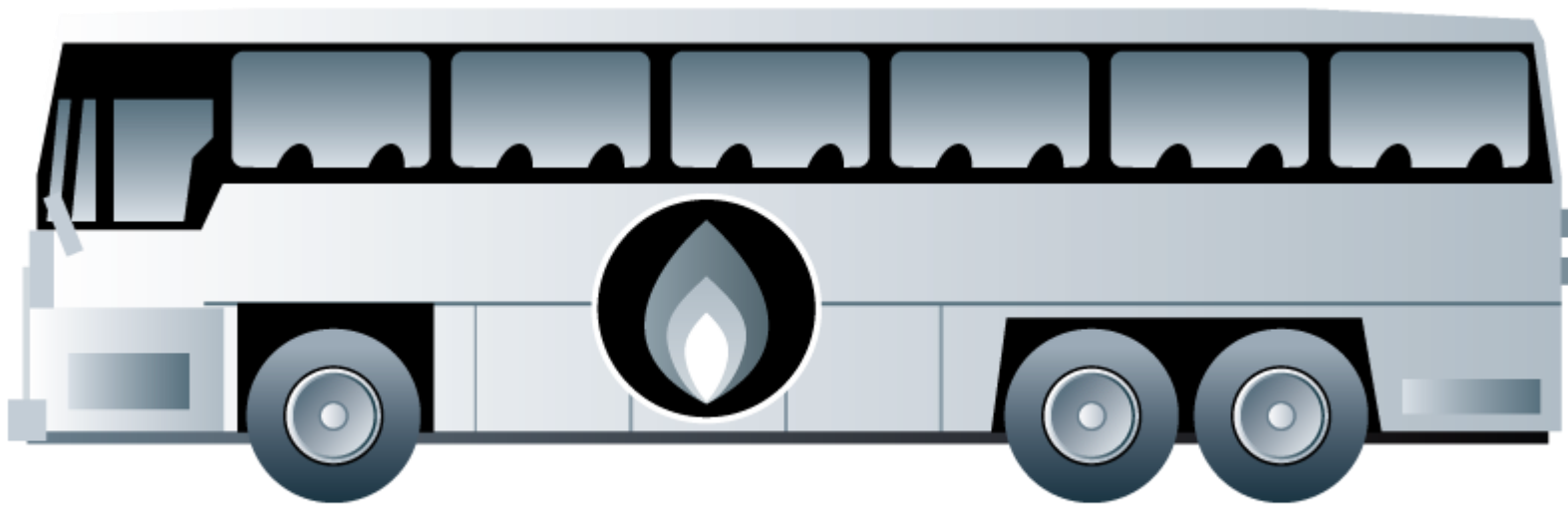
Tung transport



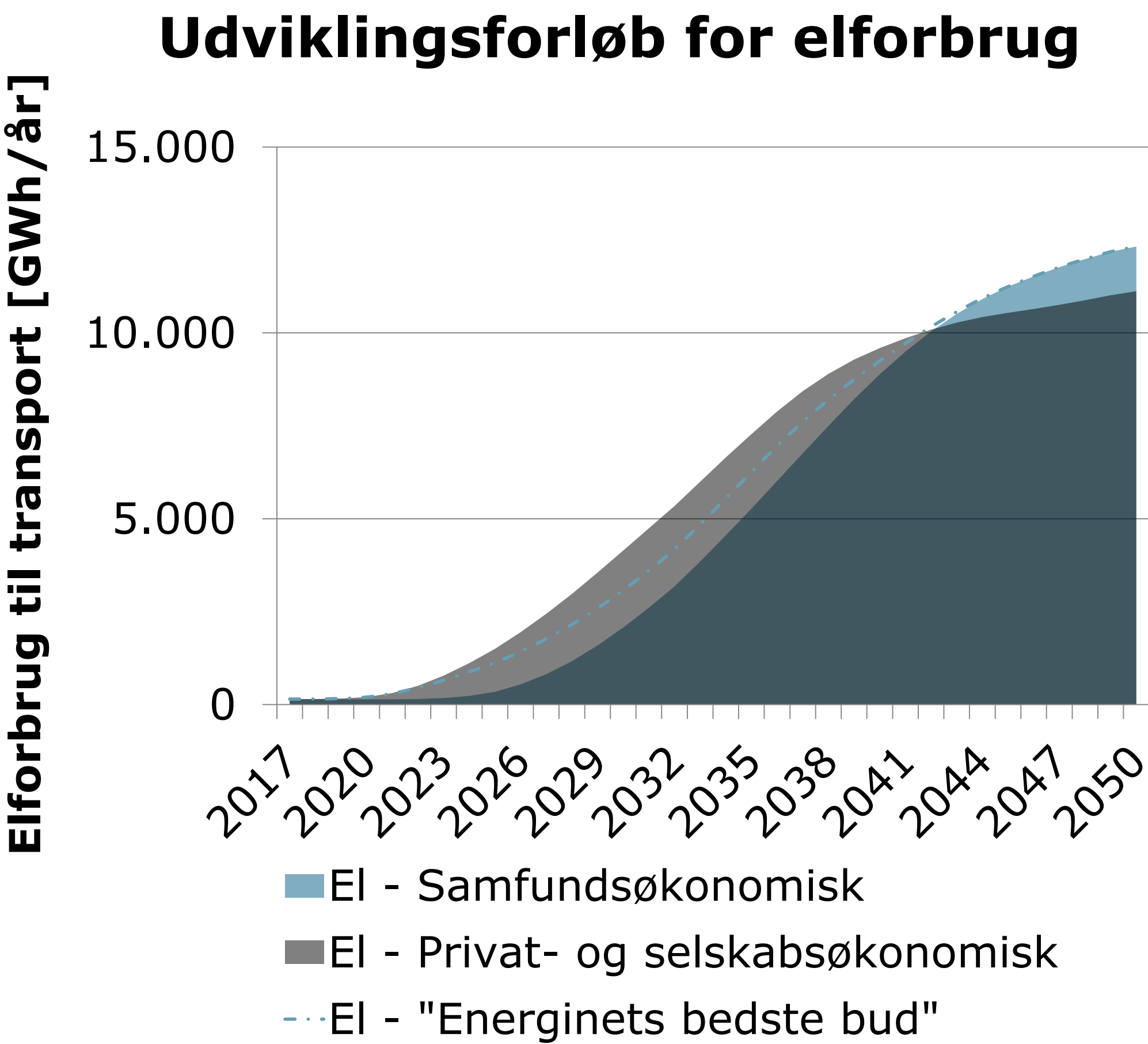
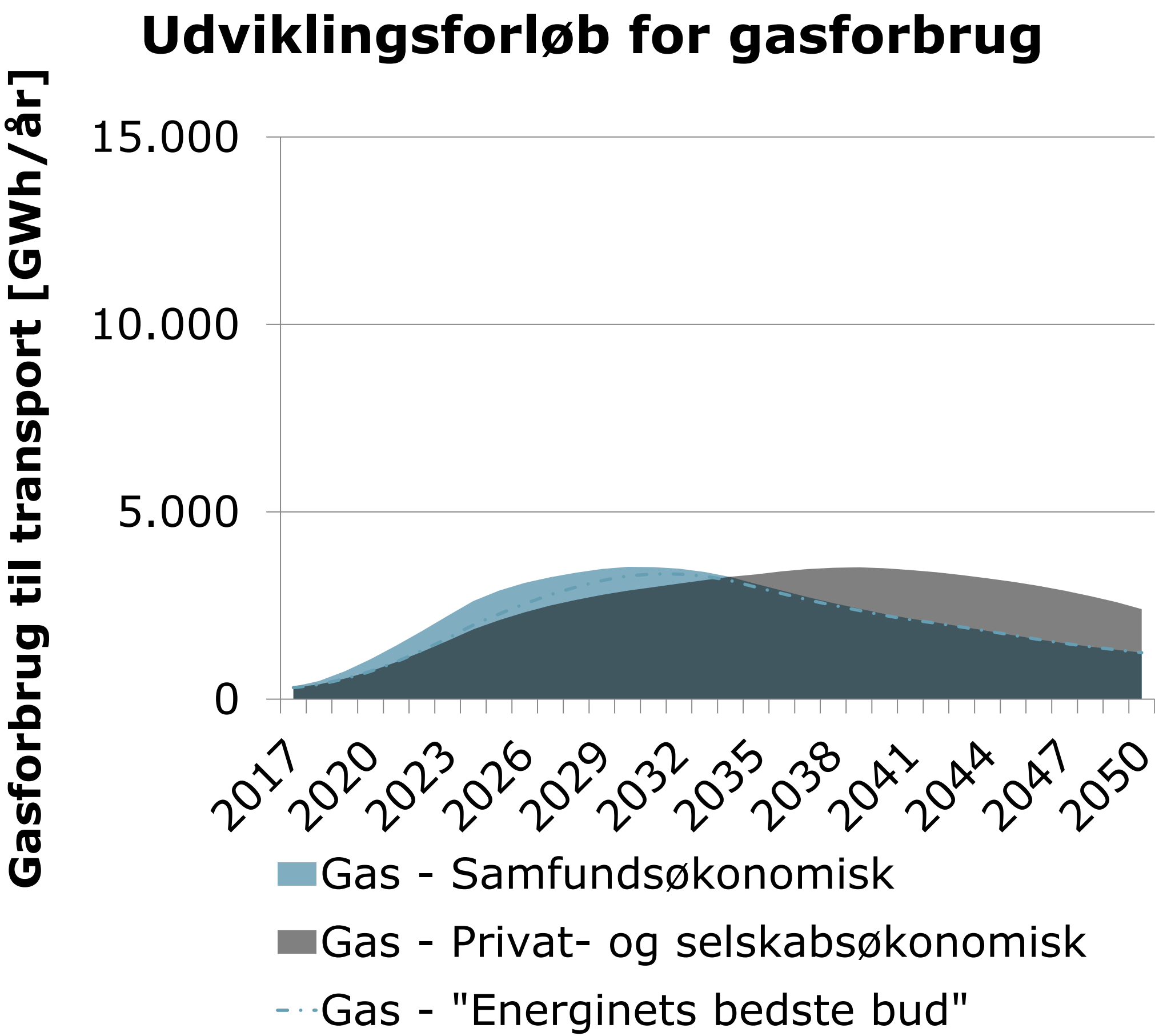
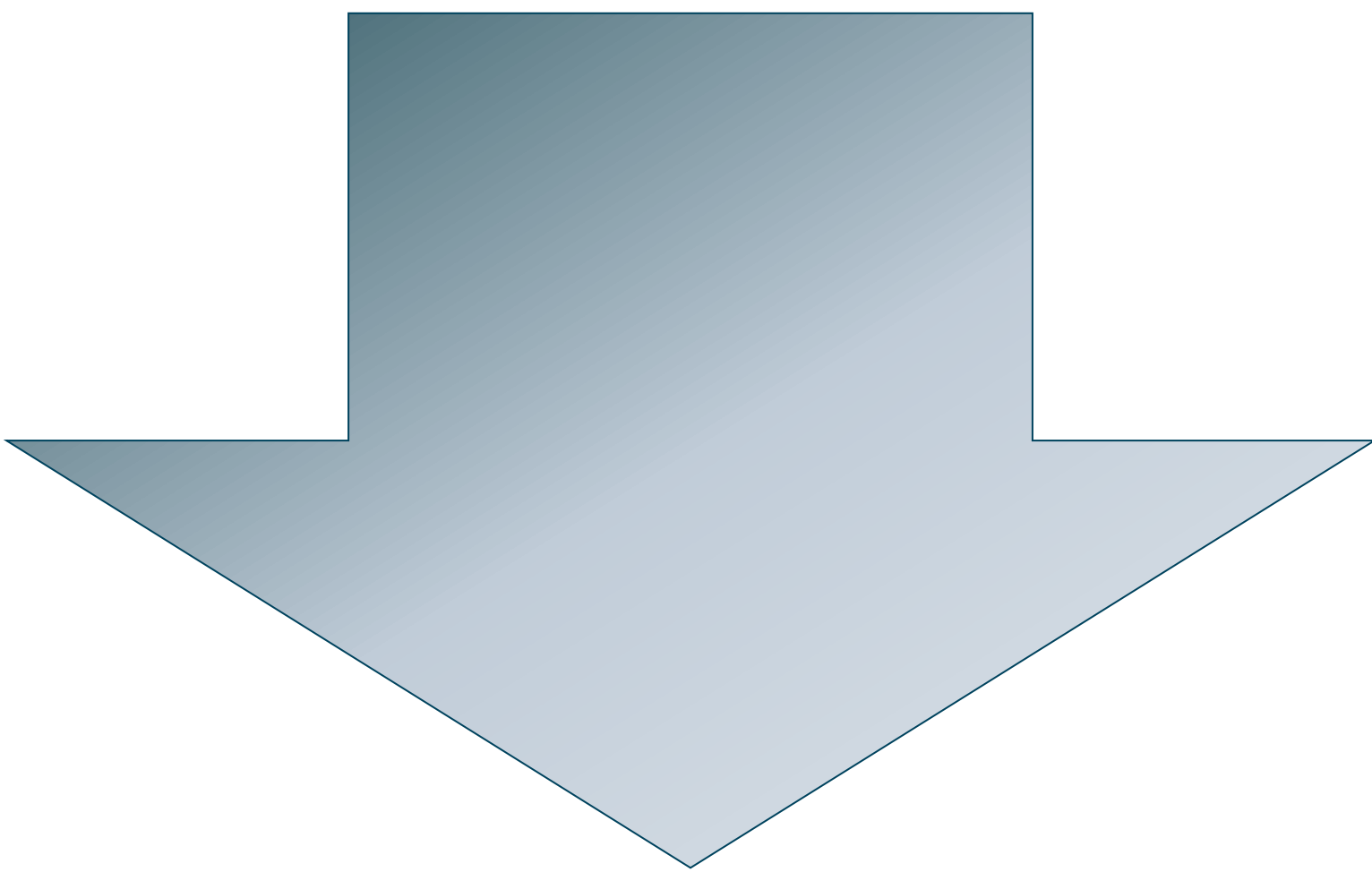
ELTOG



LASTBIL



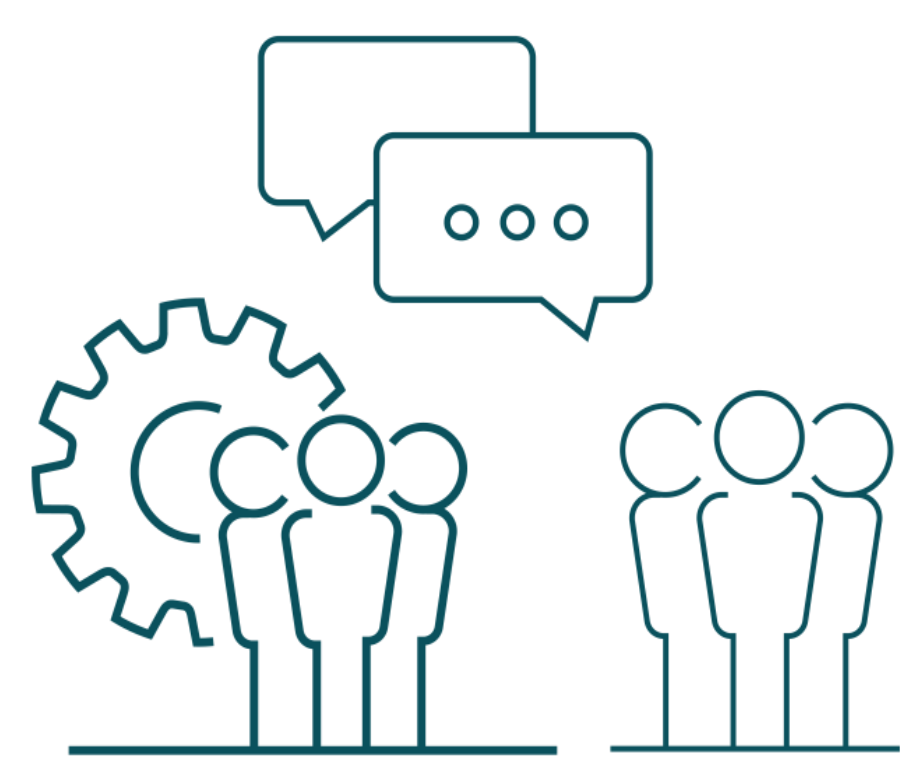
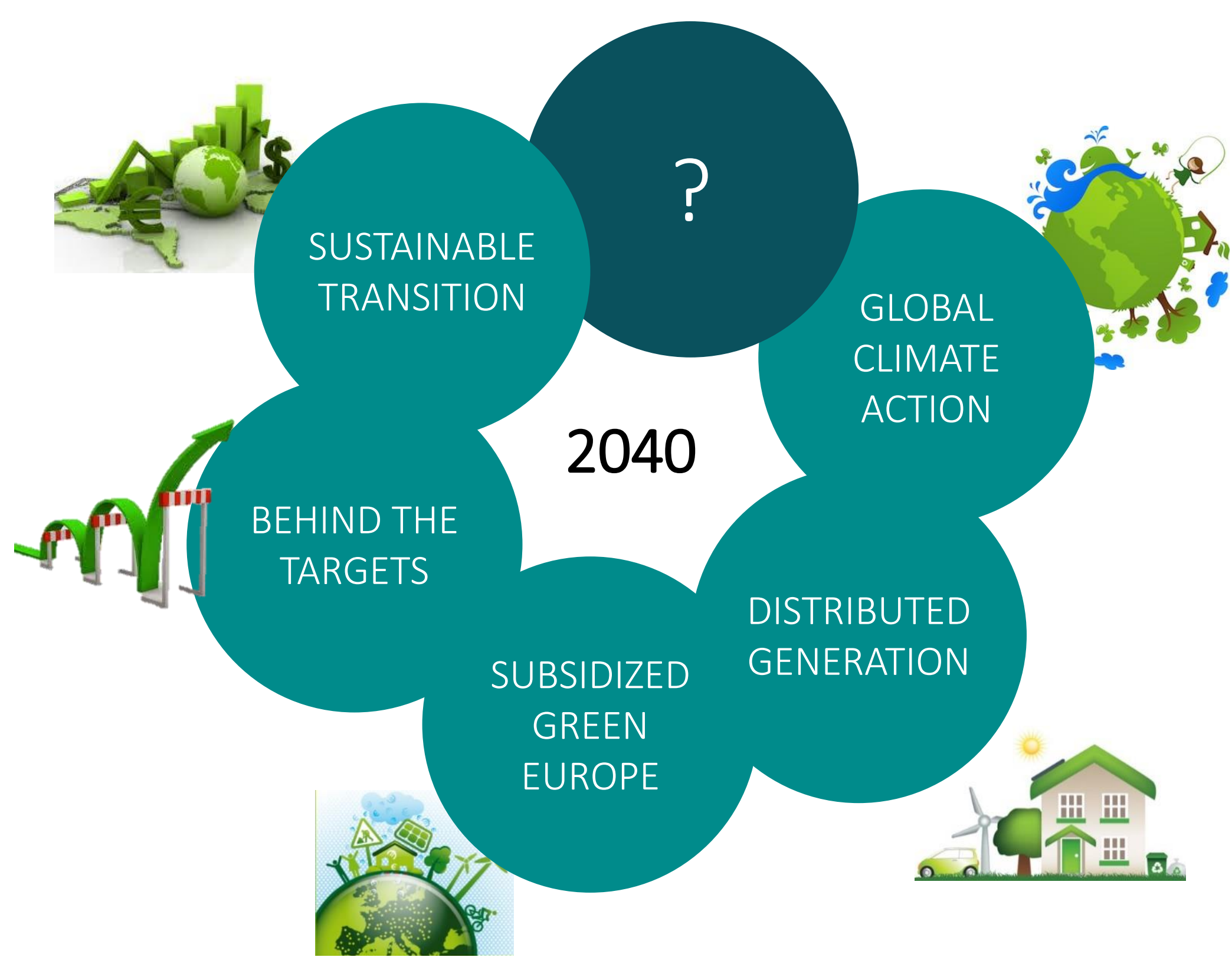
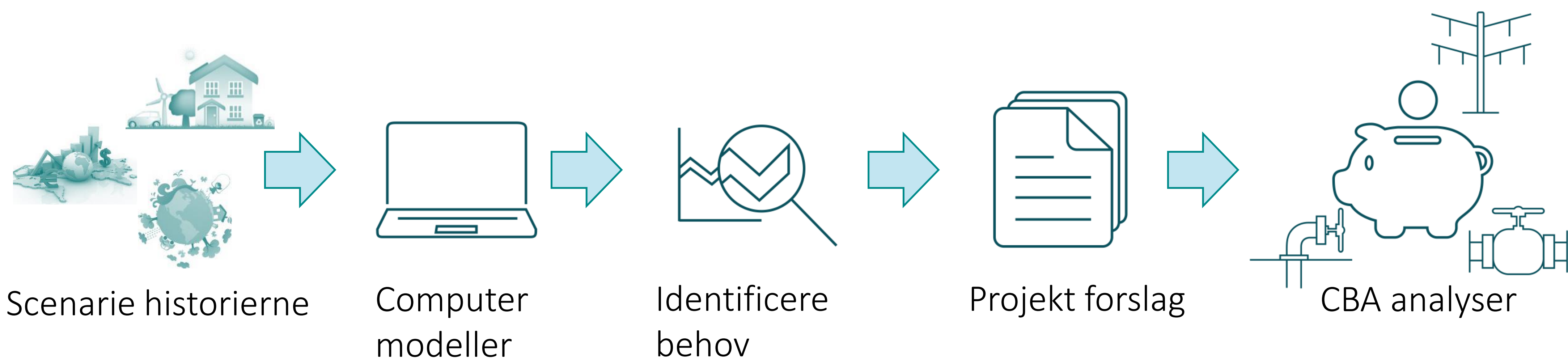
BUS



Analysér til debat

Nye europæiske scenarier

TYNDP 18 Scenarier



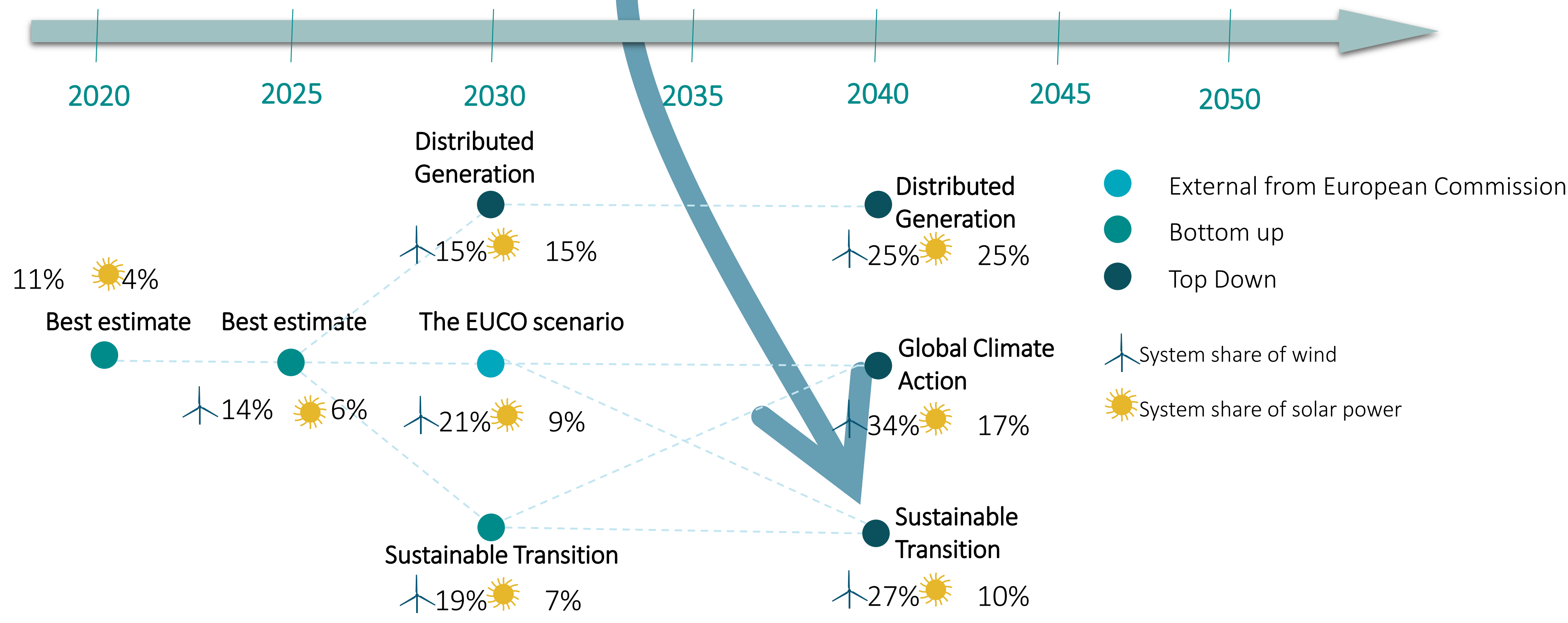
What did the stakeholders say
2 June 2016 workshop

- 1. Global Climate Action - 19
- 2. Sustainable transition - 14
- 3. Distributed Generation - 14
- 4. Subsidised green Europe - 6
- 5. Behind targets - 4

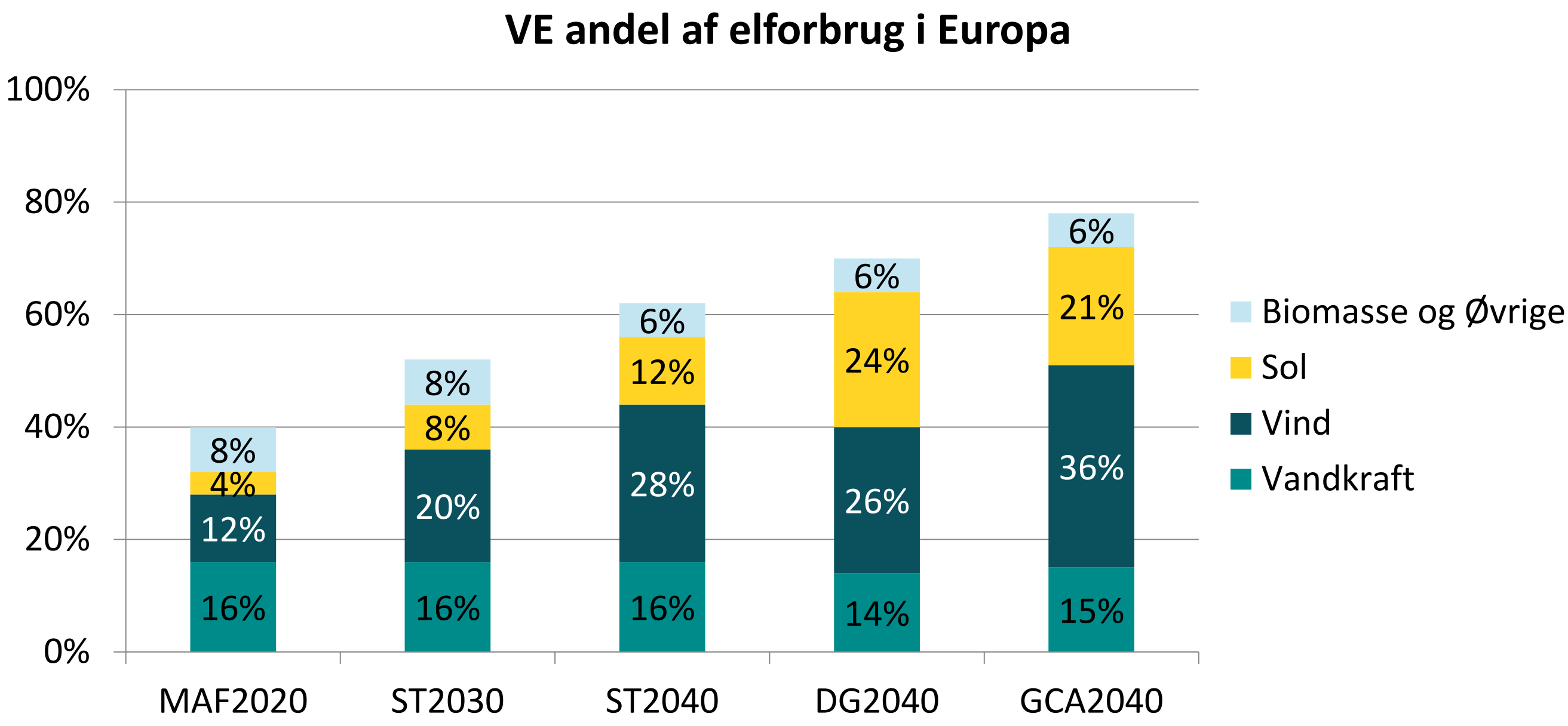
What did the MSs&NRAs say
5 July 2016 workshop

- 1. Sustainable transition - 17
- 2. Distributed generation - 17
- 3. Behind targets - 12
- 4. Subsidised green Europe - 5
- 5. Global Climate Action - 5

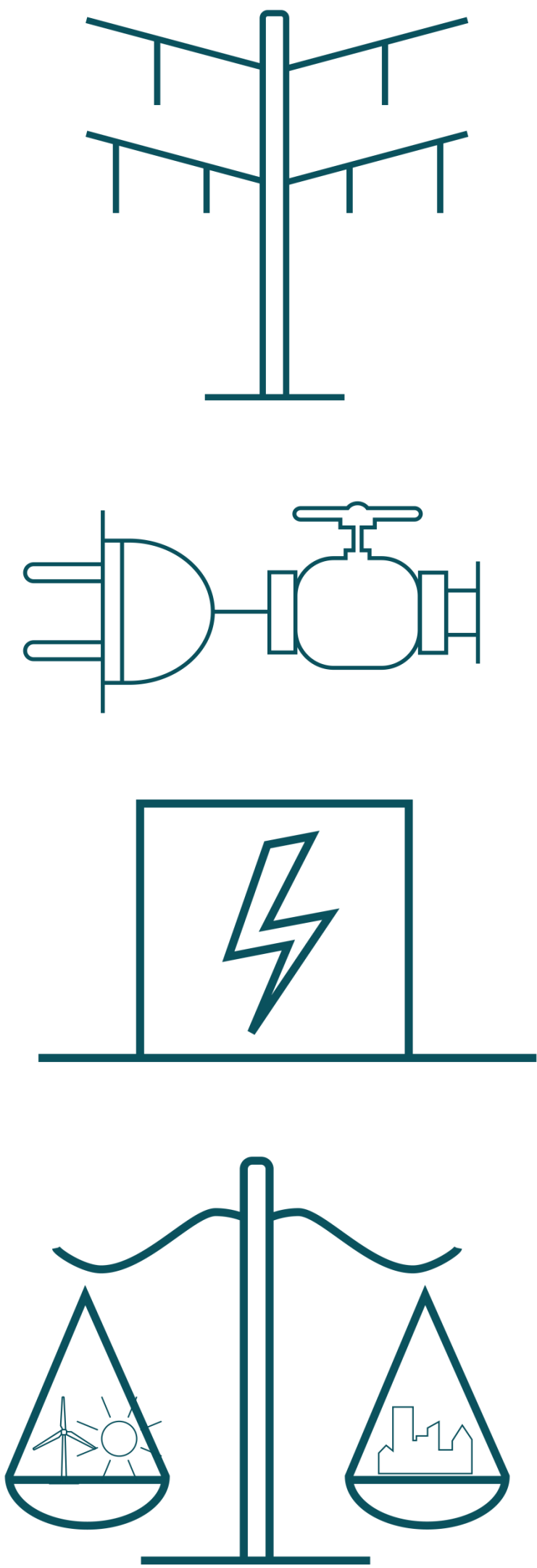
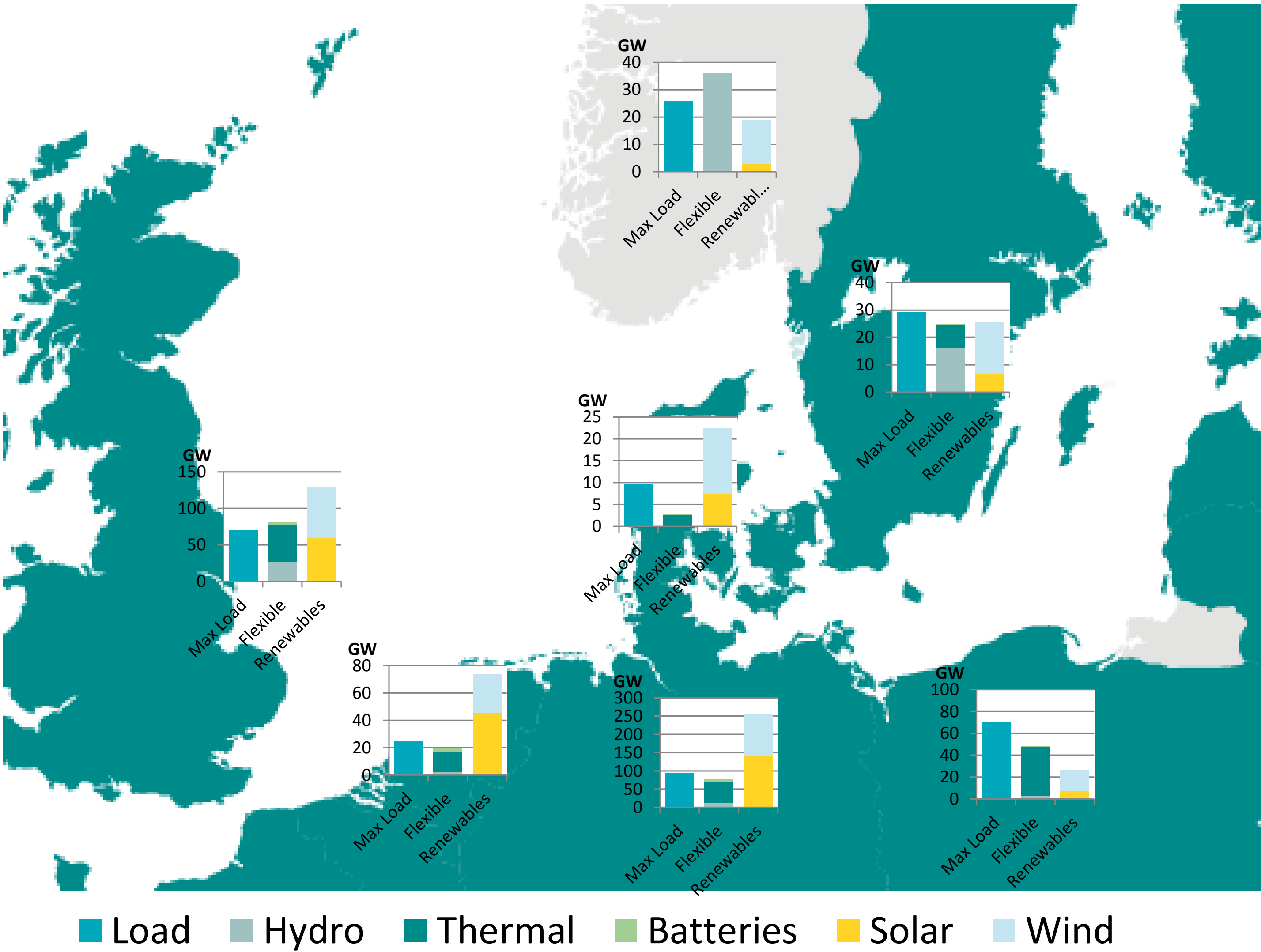
Coal ~~Green~~ CCS ~~Gas /no gas~~



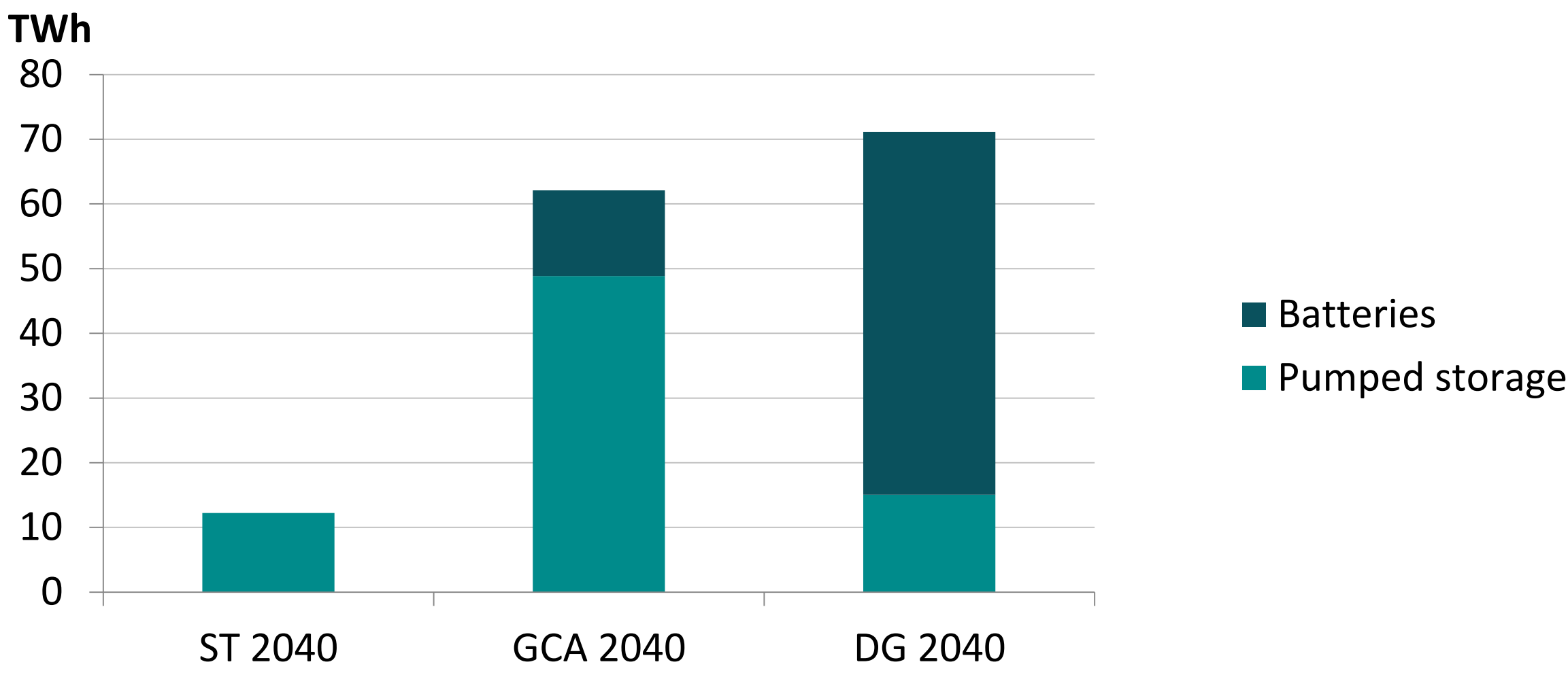
VE i elsystemet 2040



Global Climate Action 2040

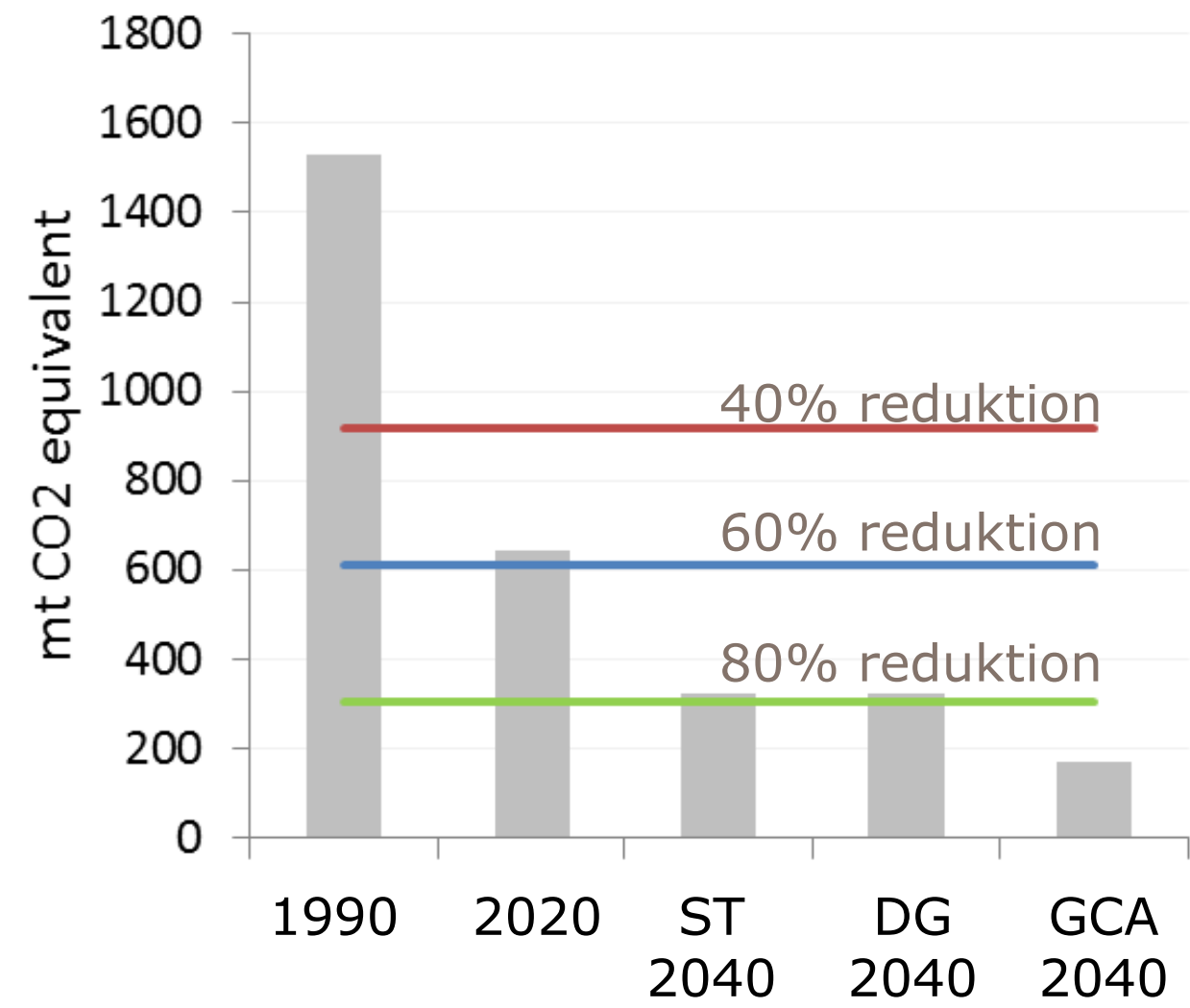


Brug af lager

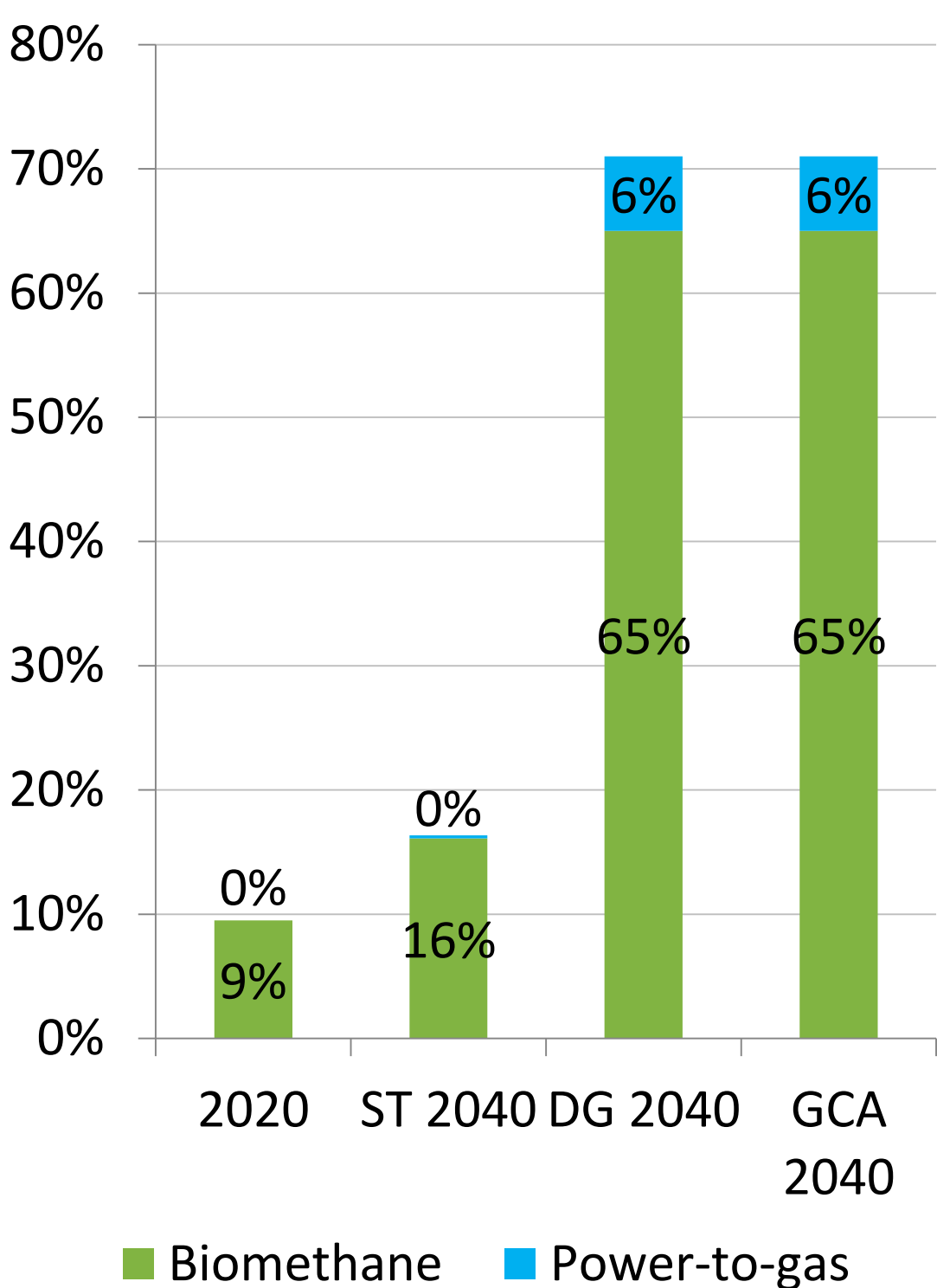
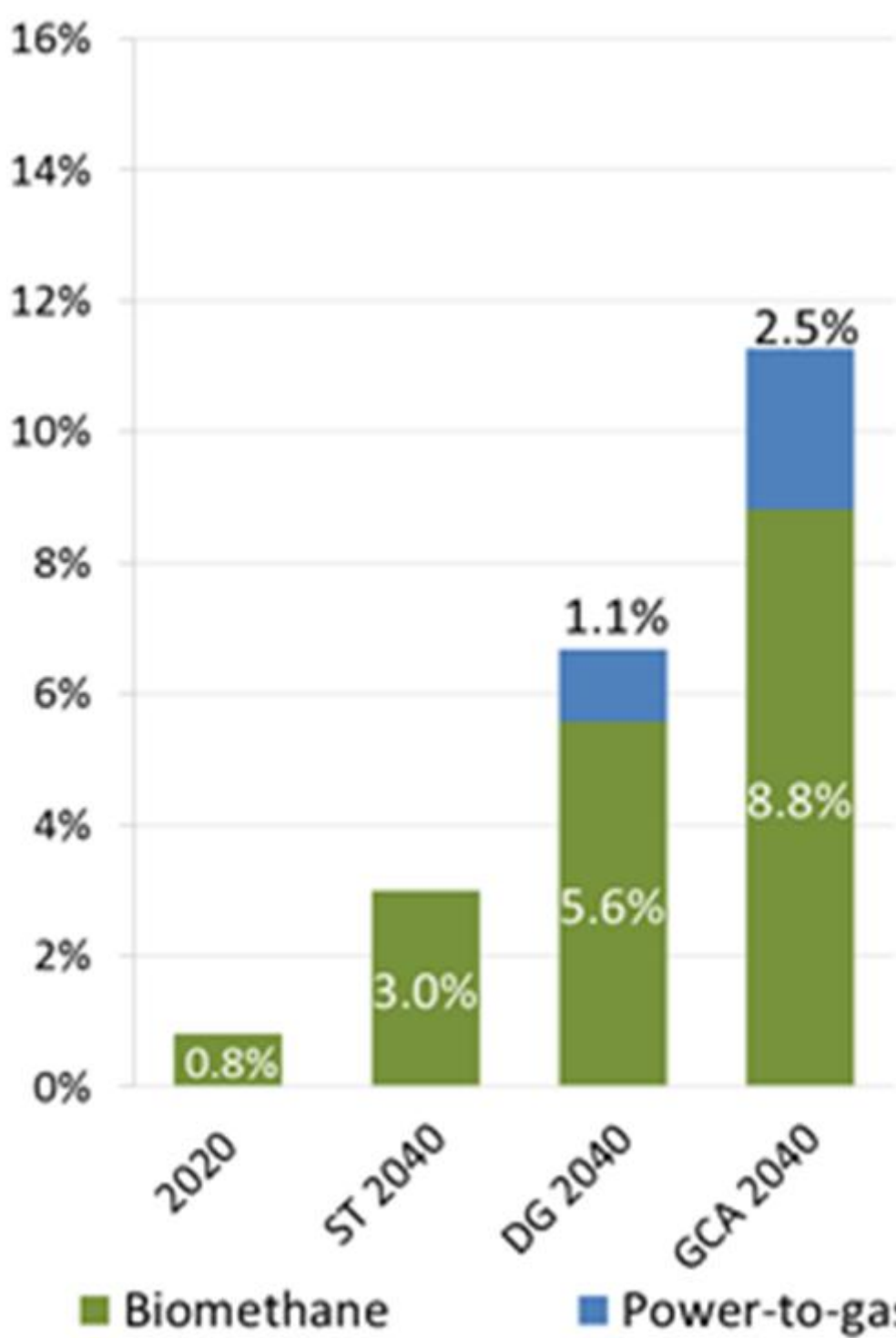
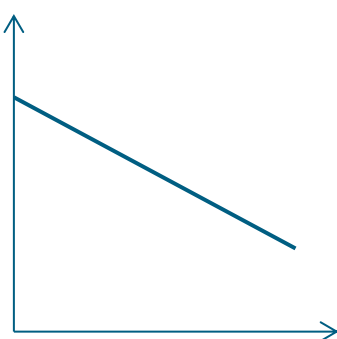
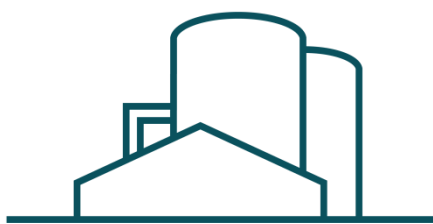
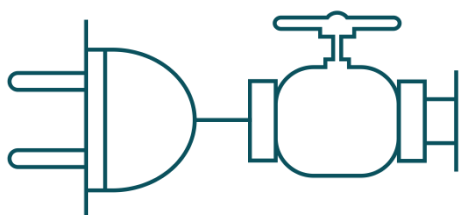
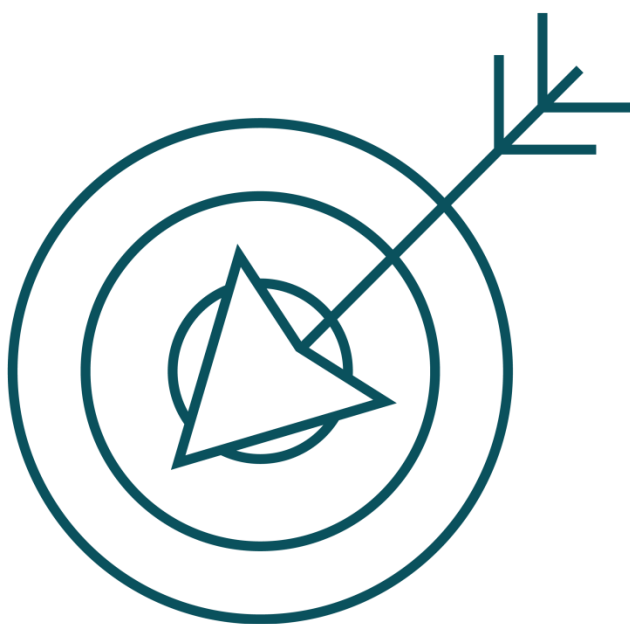
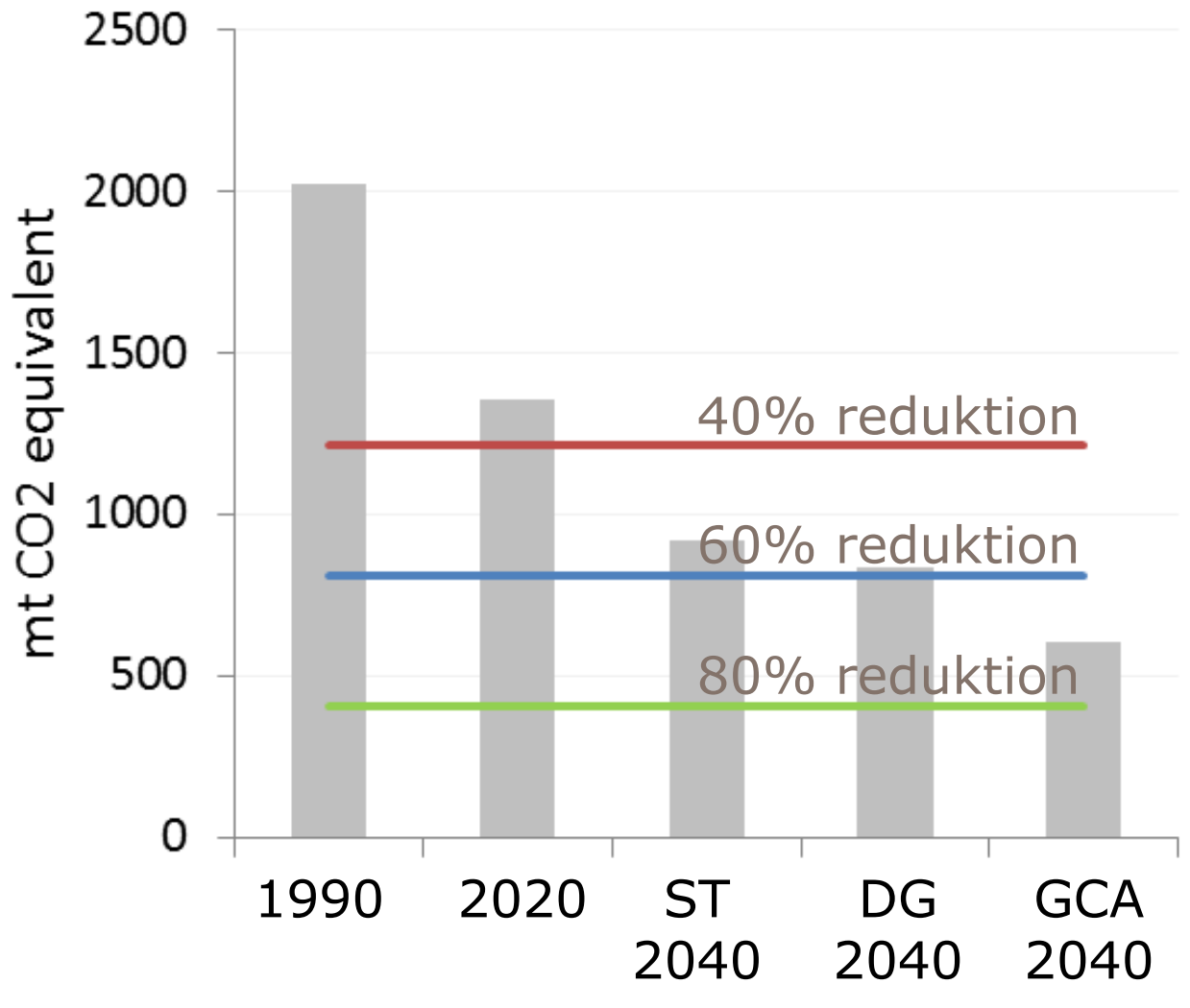


VE i gas samt CO₂ mål

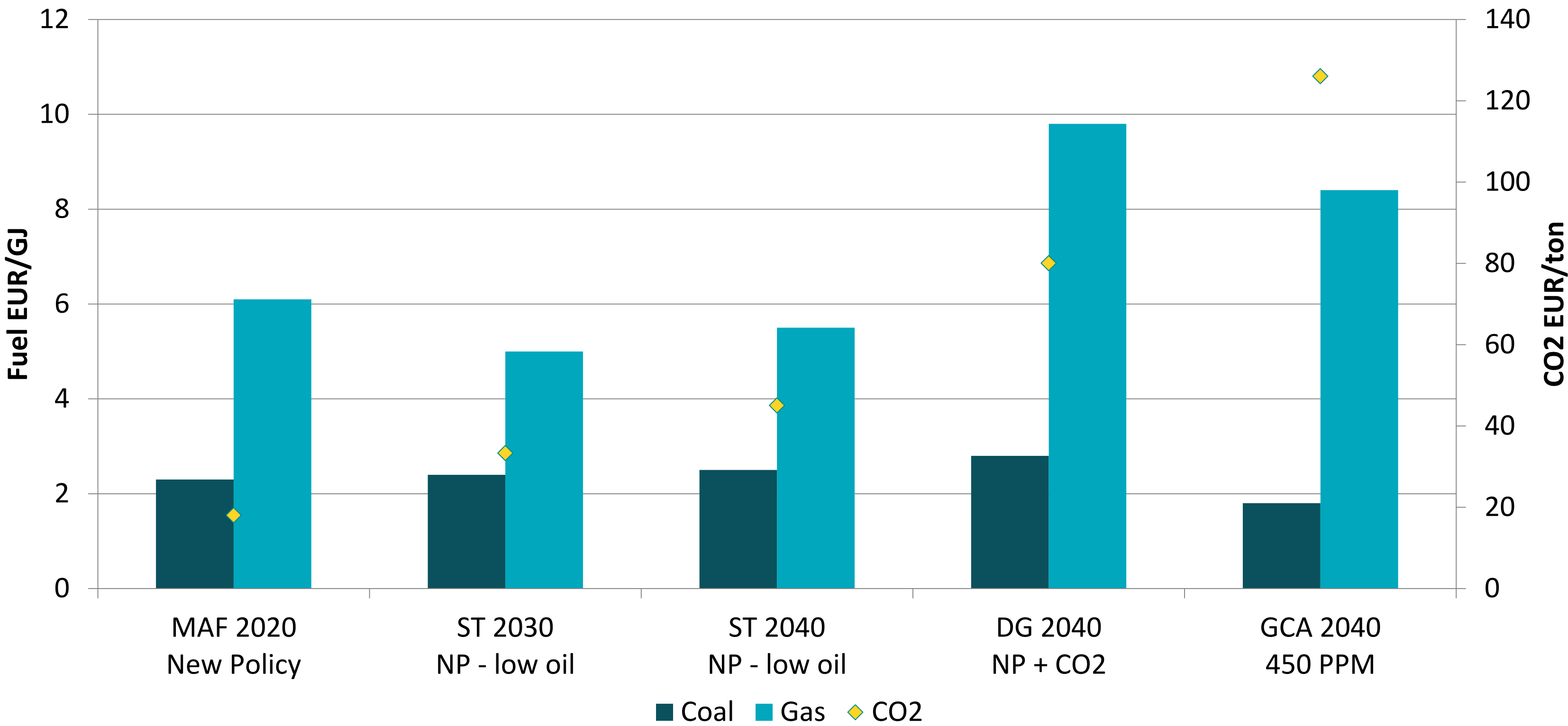
CO₂ fra el



CO₂ fra el og gas



Brændselspriser



Analyser til debat

Energiøen på Dogger Banke
– North Sea Wind Power
Hub

Udviklingsprojekt: NORTH SEA WIND POWER HUB

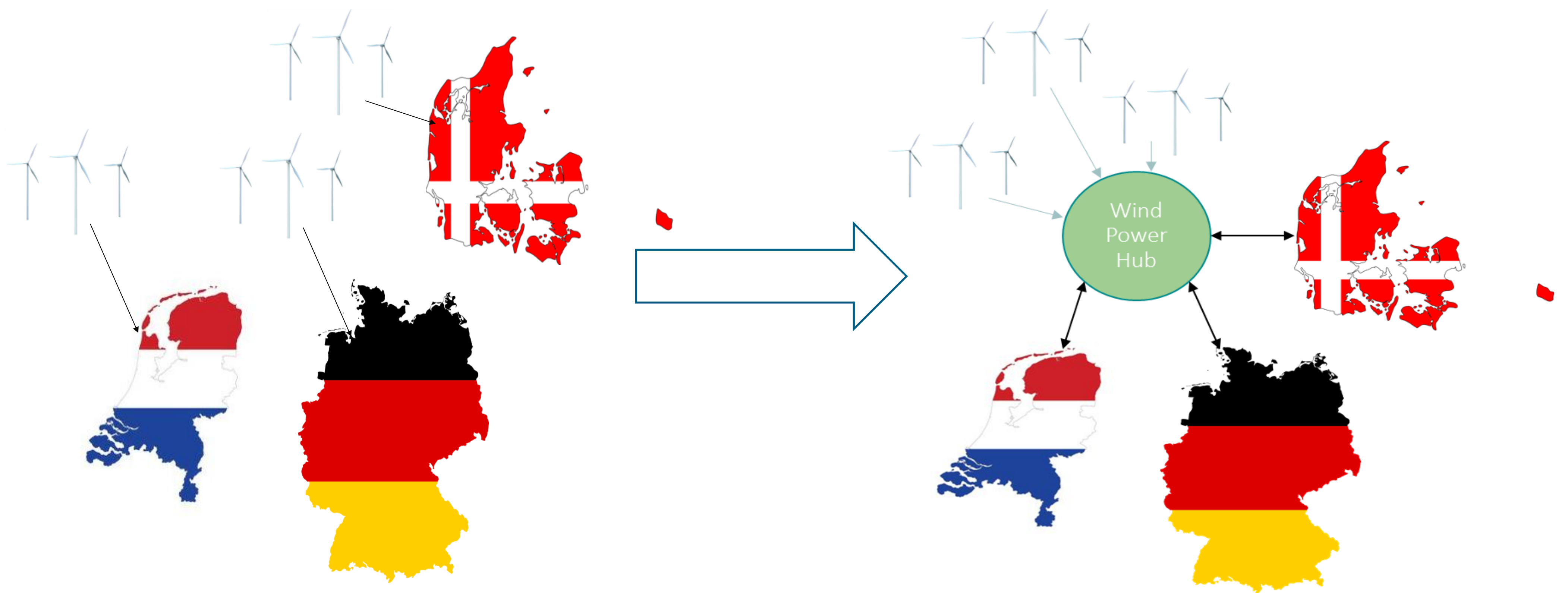
- Pre-feasibility studie

ENERGINET

NSWPH: En mulig vej
til en samfundsøkonomisk grøn omstilling?



Den grundlæggende idé



- ? Paris Klimaaftale (COP21)
- ? Danmark som energihub
- ? Lav havdybde, gode vindforhold, udnyttelse af elforbindelser
- ? Reduktion af omkostninger

Udviklingsprojekt: NORTH SEA WIND POWER HUB

- Pre-feasibility studie

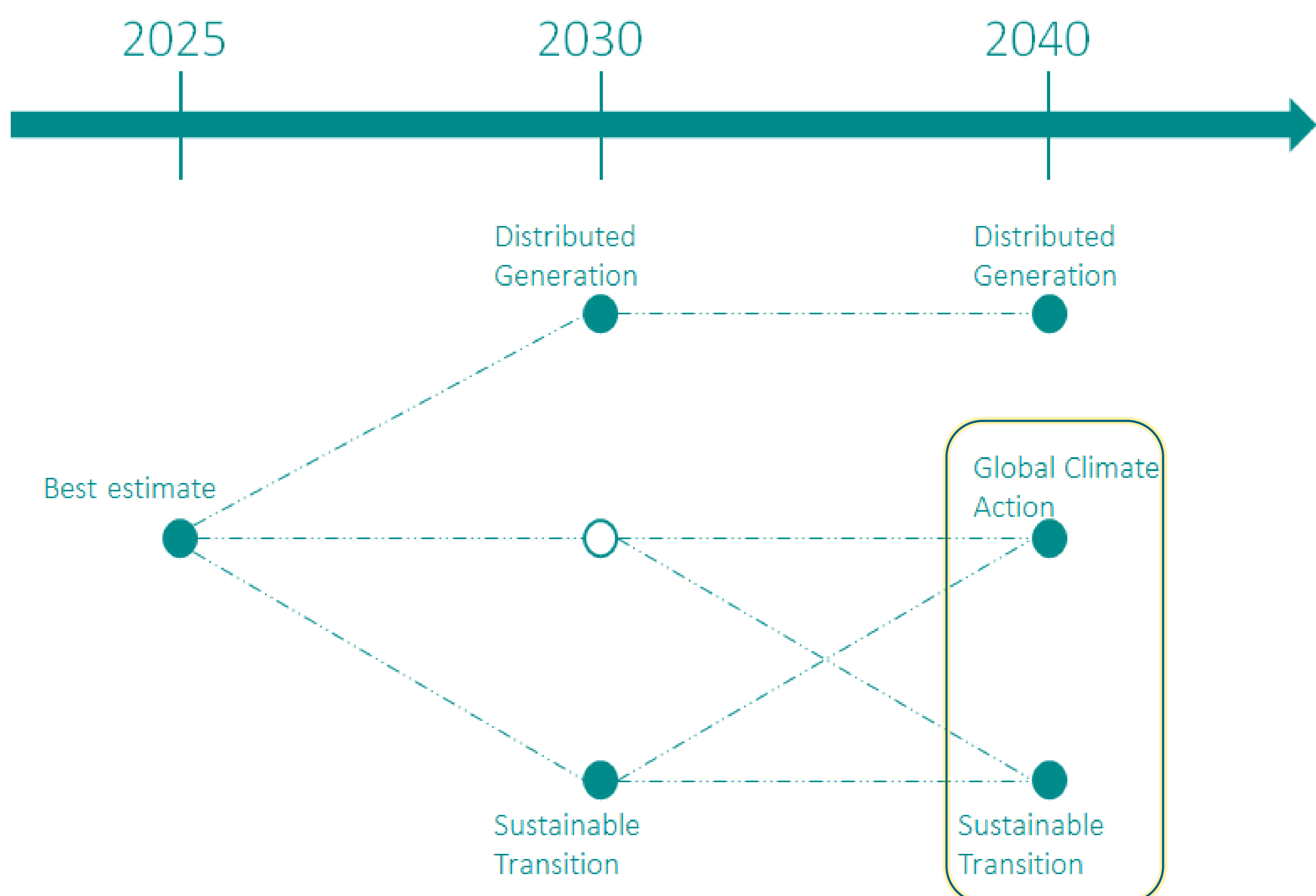
ENERGINET

Formål: Indledende undersøgelse af værdien af NSWPH konceptet

Overordnet analysedesign:

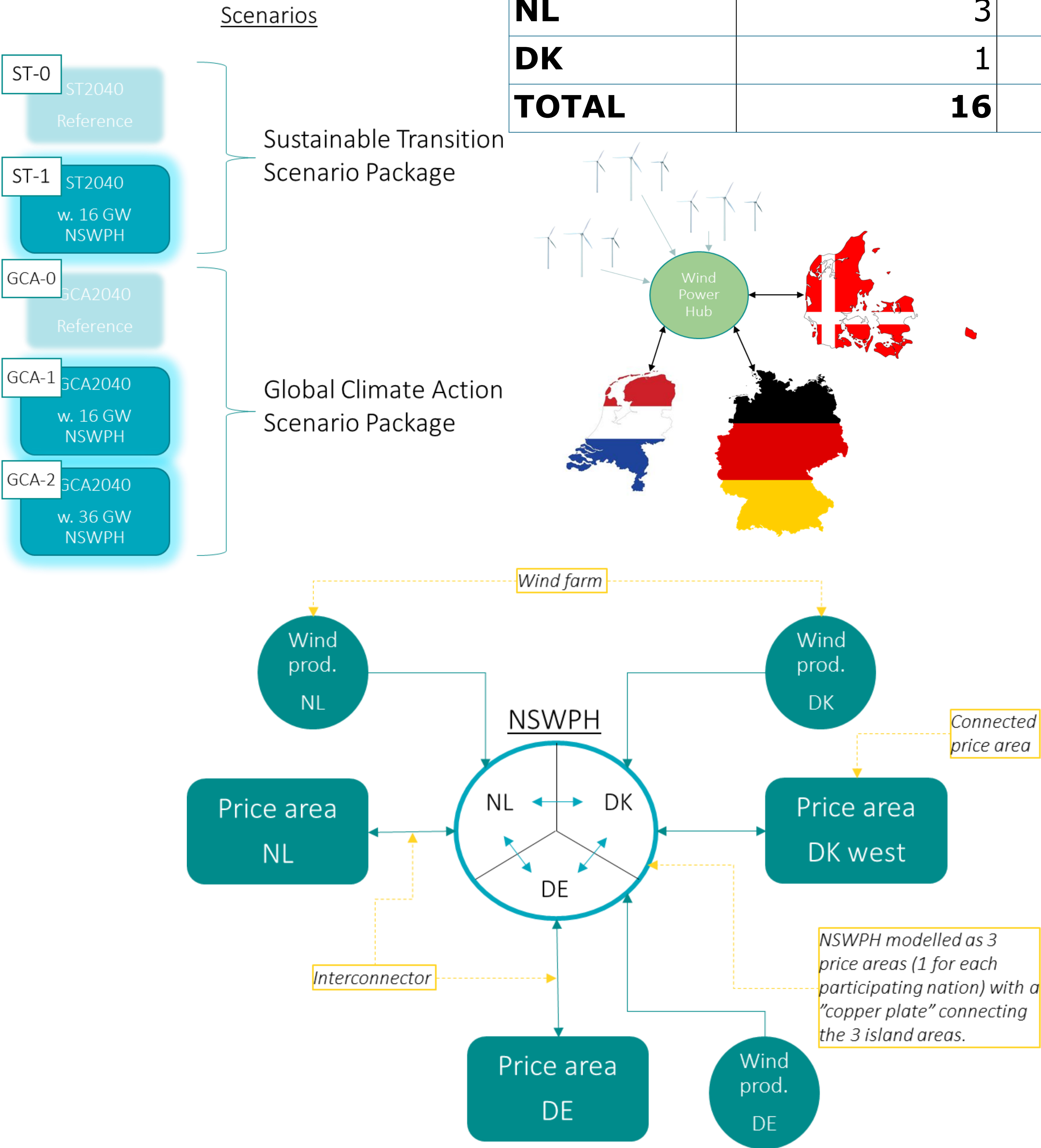
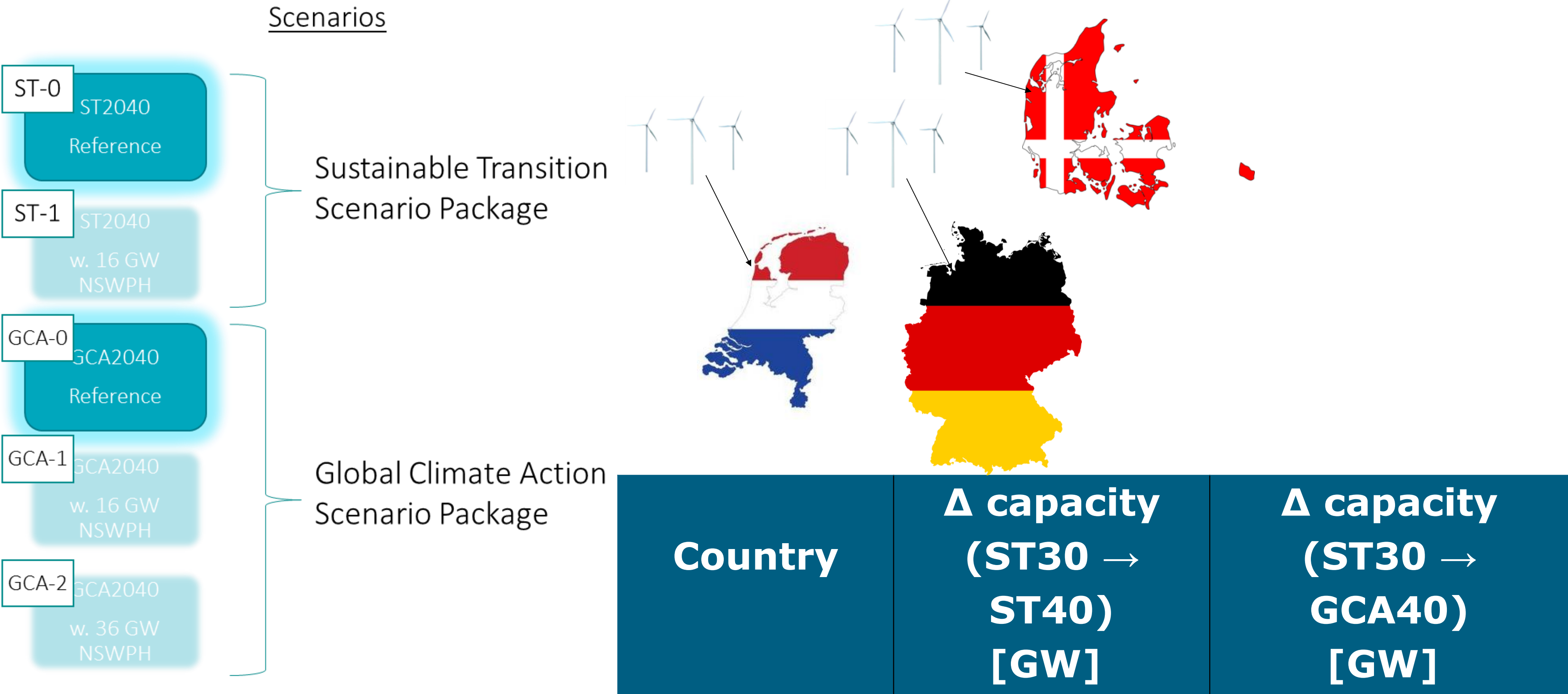
- a) CAPEX/OPEX for offshore vindmøller (fx fundamenter, installation, vedligehold)
- b) CAPEX/OPEX ved netkomponenter (fx IC, onshore/offshore platforms) + Ø
- c) **Samfundsøkonomiske gevinster**

Anvendte scenarier: TYNDP18



Udviklingsprojekt: NORTH SEA WIND POWER HUB

- Pre-feasibility studie



Analyser til debat

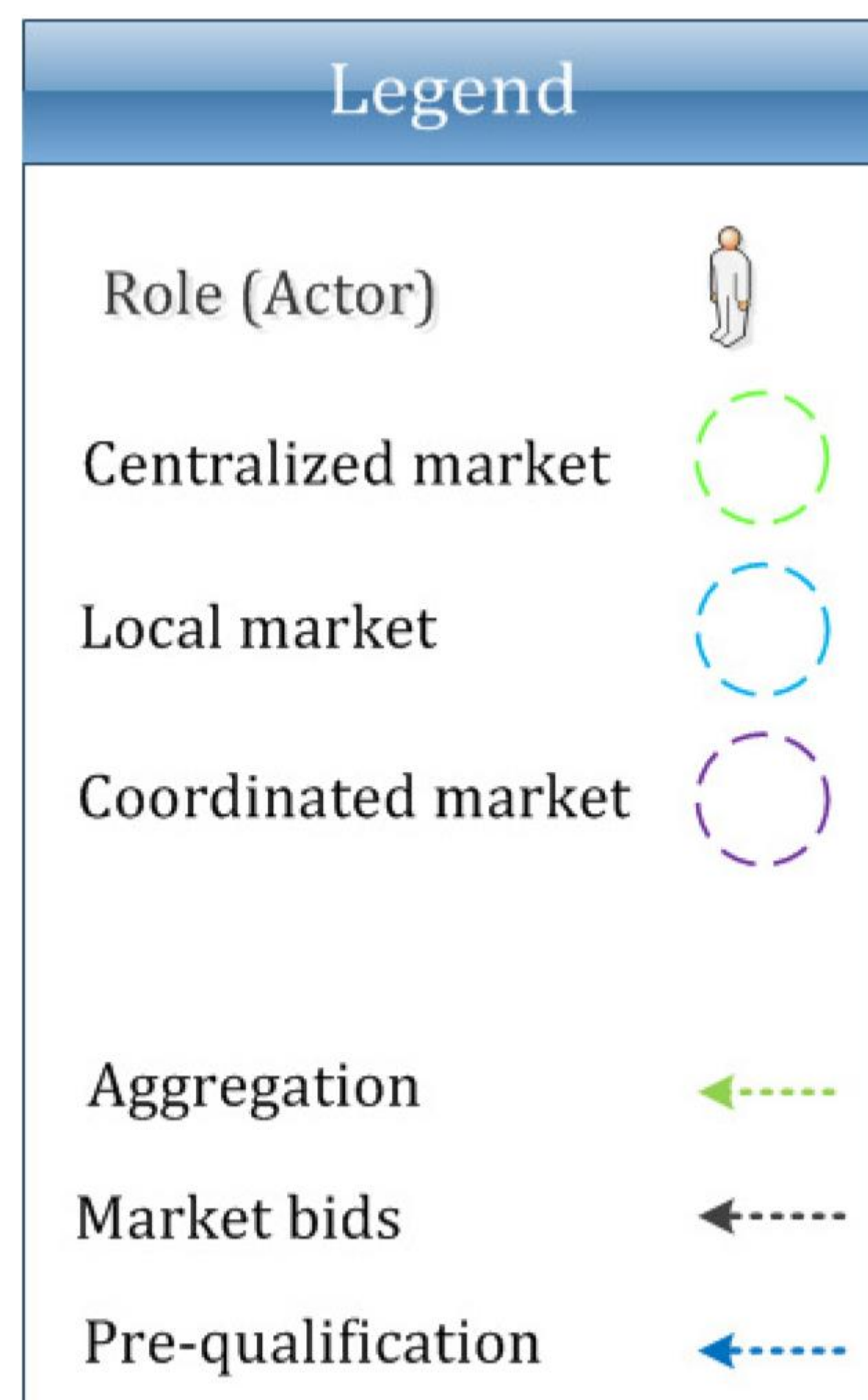
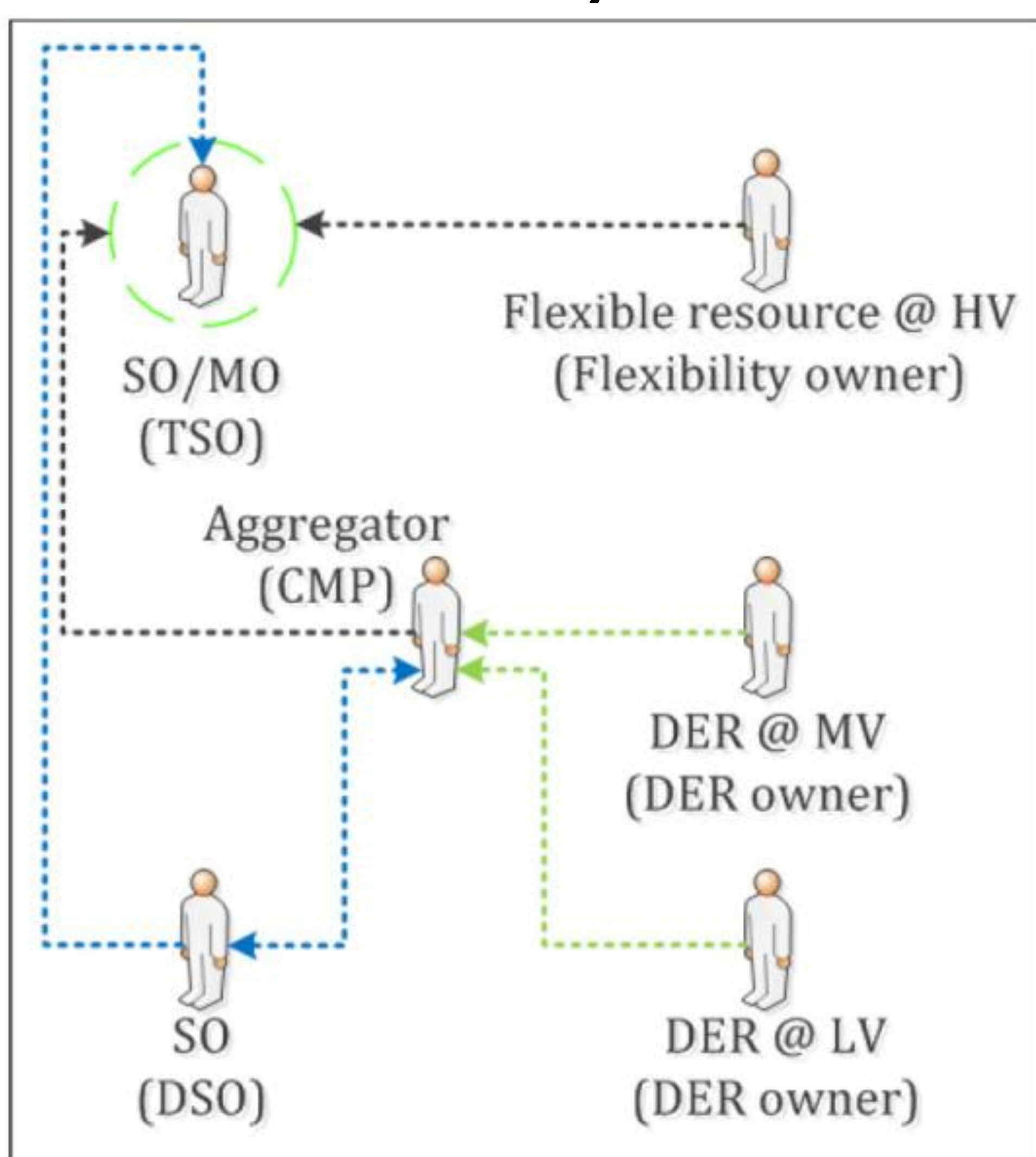
Balancering på tværs af
spændingsniveauer –
Smartnet

**Formål:**

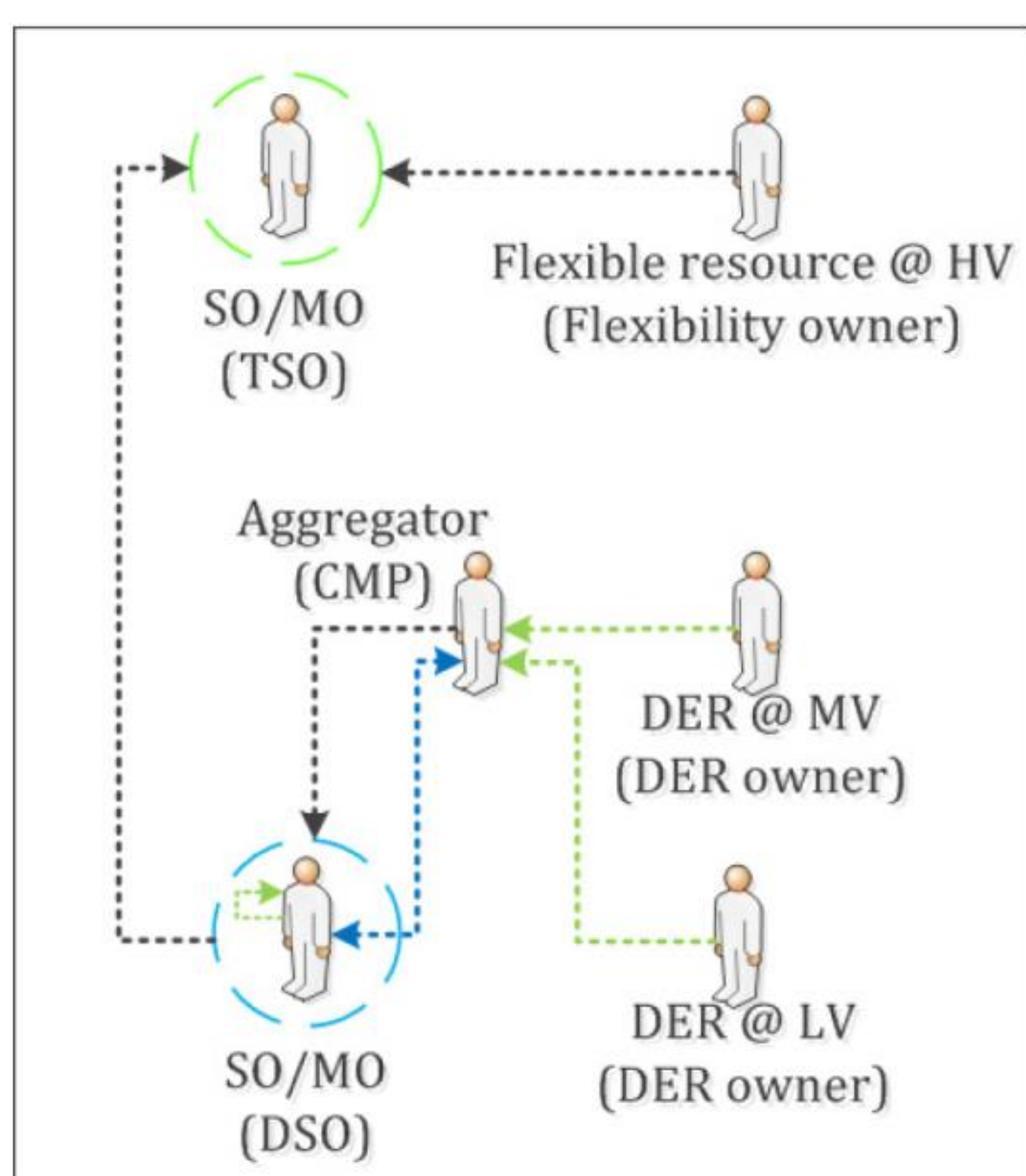
Bedre TSO/DSO-koordinering, markedsarkitektur og ICT-løsninger med det formål at integrere systemydelser fra fleksibelt forbrug og distribueret produktion.

TSO/DSO koordinering

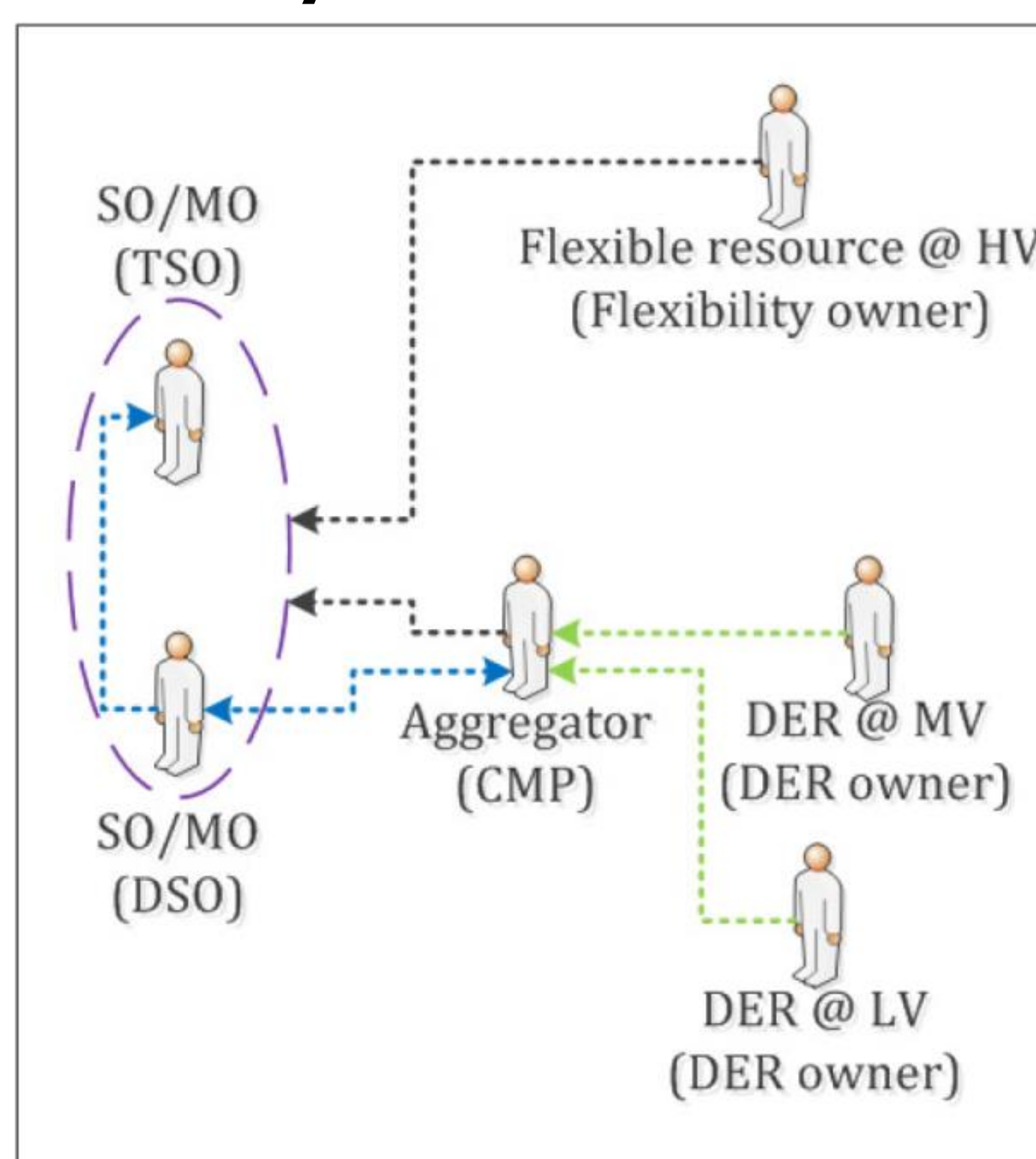
Centraliseret TSO/DSO-marked



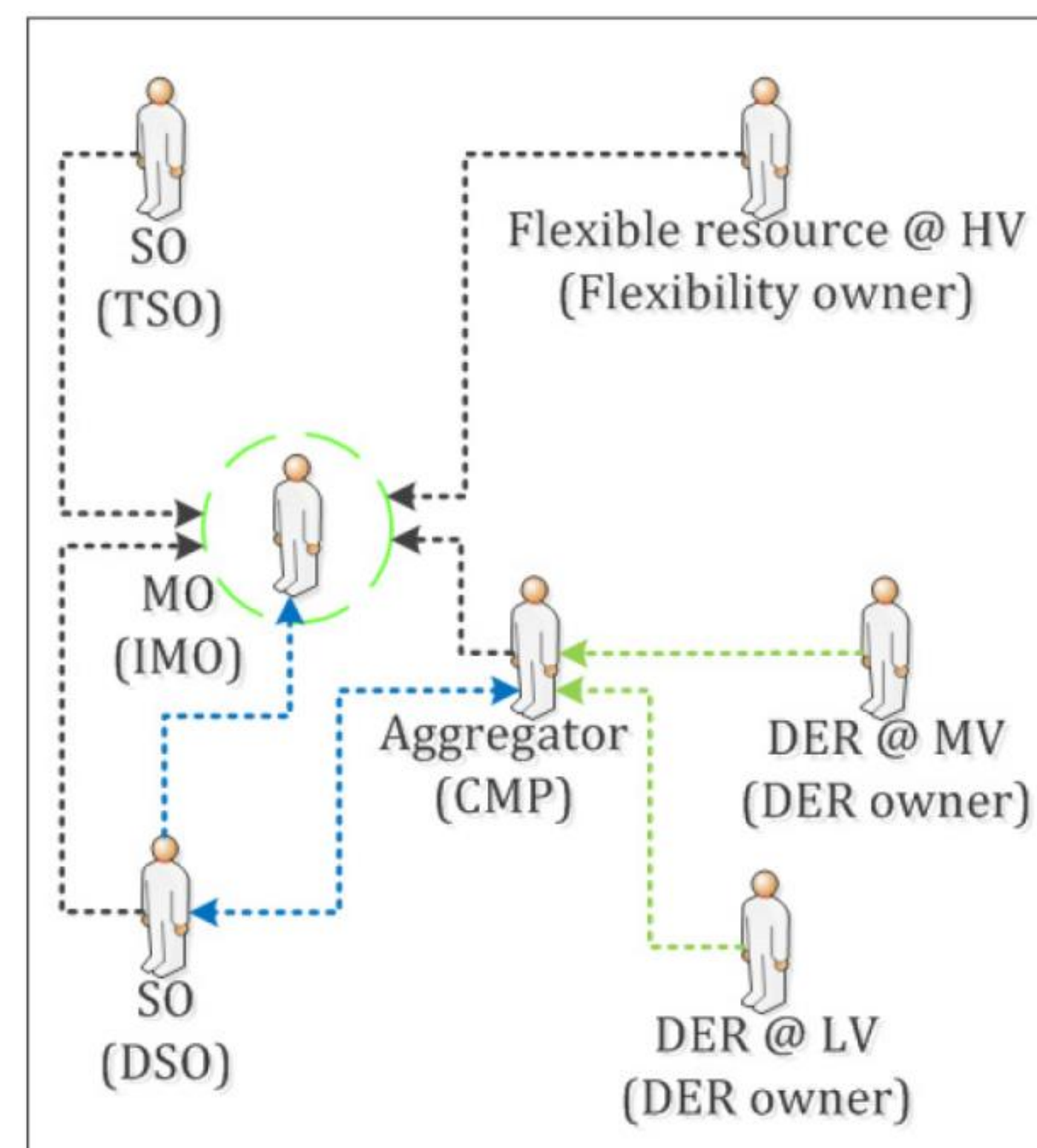
Lokale markeder



Fælles TSO/DSO-marked



Integreret fleksibilitetsmarked



Nyt Markedsdesign

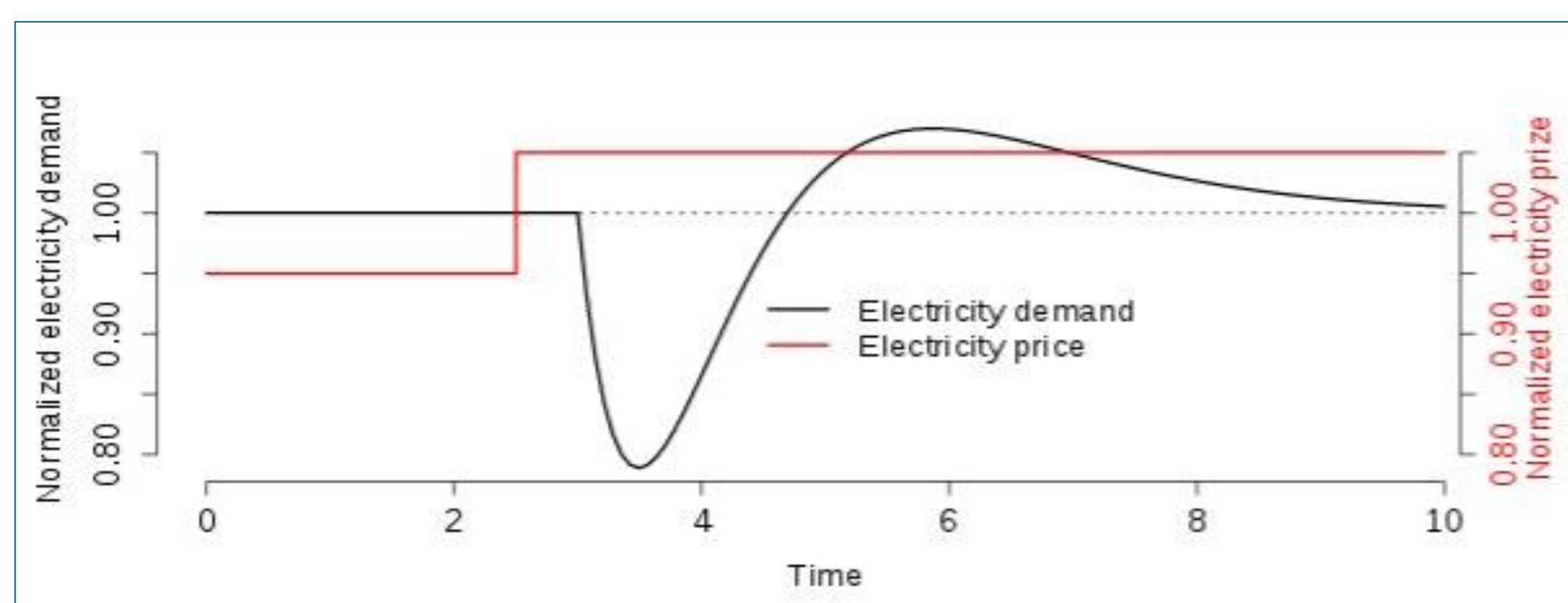
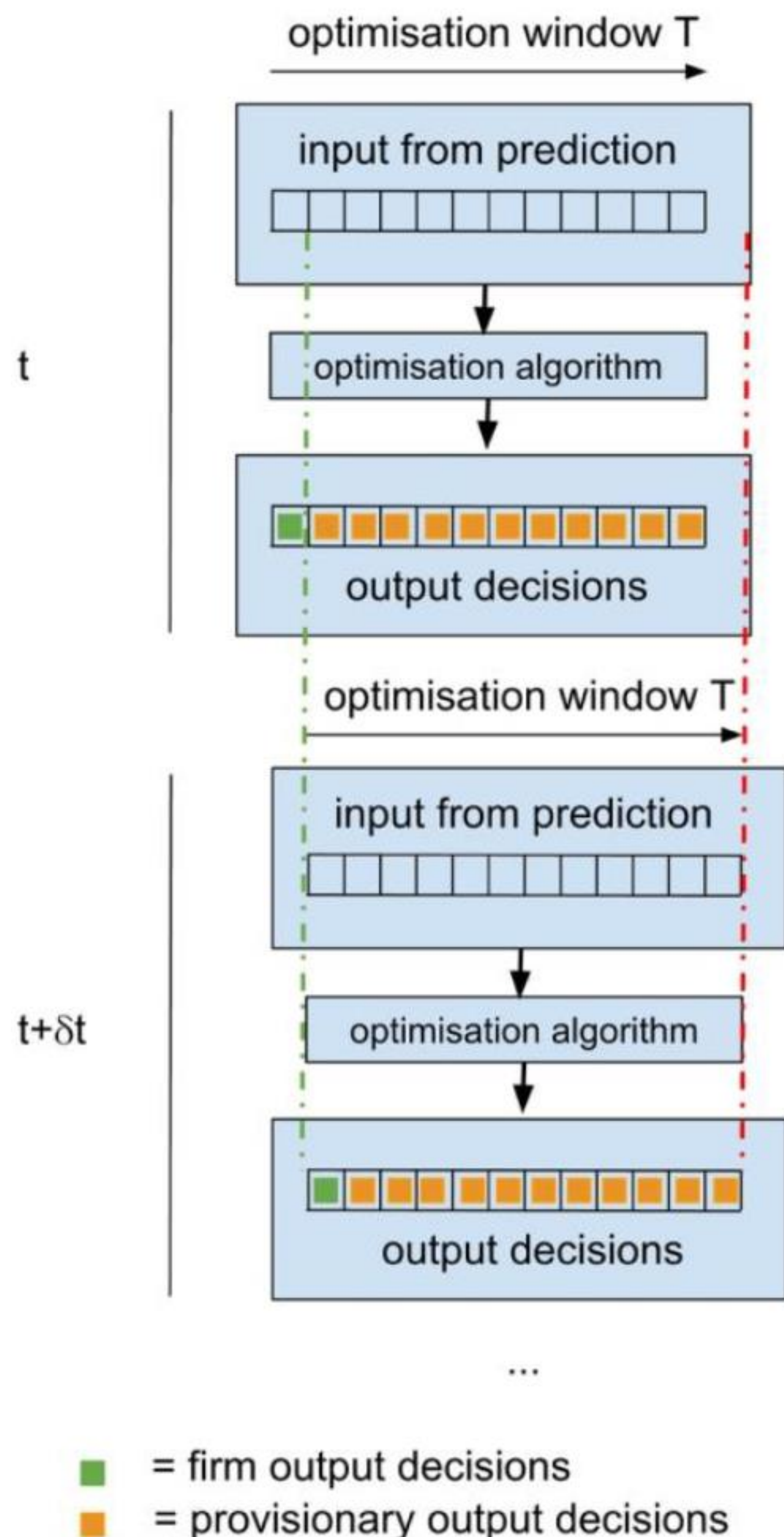
Forslag til nyt markedsdesign som i højere grad tillader distribuerede enheder (DERs) på distributionsnettet effektivt at deltage i markeder for systemydelser (balancering, håndtering af flaskehalse og spændingskontrol)

Hvad er nyt ift.

Regulerkraftmarkedet?

1. Højere tidsopløsning (5 min)
2. Højere geografisk opløsning.
Flere prisområder inkl på DSO-niveau (DLMP)
3. Rullende horisont-optimering
4. Avancerede budtyper
 - Min. aktiveringsperiode
 - Maks. aktiveringsperiode
 - Min. deaktiveringsperiode
 - EXOR = enten/eller
 - Alt eller intet / blokbud
 - Maks. antal aktiveringer per dag
 - Ramp begrænsninger
 - Reaktionsid start/stop

5. Realistisk repræsentation af nettet (ACOPF)



Pilotprojekt

I Vestjylland testes **elopvarmede swimming pools** i sommerhuse som eksempler på distribuerede fleksible enheder.

- 30 sommerhuse
- Prisbaseret styring
- Fælles TSO/DSO-marked til balancering og flaskehalshåndtering

