First of the kind: Kriegers Flak CGS

Offshore hybrid projects in the North Seas and the Baltic Sea
NSEC side event, WindEurope Conference, Bilbao 2019

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PROGRAM

- Objectives and motivation
- General introduction to the KF CGS inkl. video
- A sneak peak on the technical system
- Challenges and experiences
- Key take away
- Future perspectives
Objectives – EU policy level

The Combined Grid Solution...
• contributes to the single electricity market
• fosters the energy transition in Denmark and Germany by strengthening the integration of renewable energy in the electricity grid.
• contributes to the objective of the European Council to provide 15 per cent of generating capacities as interconnector capacities.
Objectives – DK/project partners

The Combined Grid Solution...

- Increases the security of supply and stabilises the electricity system
- Increases the utilization of infrastructure
- Explores new technical solutions
- Increases cooperation with neighbouring countries
Combined Grid Solution  - Brief Overview

- KF CGS will link the German Mecklenburg-Western Pomerania and the Danish region of Sjaelland
- Interconnection between the existing German offshore wind farms Baltic 1 & 2 and the new Danish offshore wind farm(s) (OWF) Kriegers Flak (2021)
- Project partners: Energinet.dk and 50Hertz (+ EU )
- In operation Q3 2019
**Introduction video**

https://youtu.be/wsUQaf-msaE
A SPEAK PEAK ON THE TECHNICAL SYSTEM...
Kriegers Flak CGS – Electrical System Assets

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Kriegers Flak CGS – Electrical System Assets

Denmark

Busbar A
Busbar B

Ishøj 400 kV

Bjæverskov 400 kV

TA1
TA2
TA4

PST

80 km
34 km
80 km

KFA
KFB
KFE
BAZ
BAE

RA1
RA2
RA3

KFB: 400MW

Possible extension towards Sweden

Baltic 2: 288MW

Baltic 1: 48MW

RA1
RA2
RA3

TA1
TA2

RKFA
CB01

KFA: 200MW

KFB: 400MW

220/150kV
450MVA

BwC

HVDC

Germany

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Kriegers Flak CGS – Electrical System Assets

220kV meshed offshore system

150kV cable system

HVDC BtB

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CHALLENGES AND EXPERIENCES
3.1 Challenges (and Opportunities)

- Challenges (and opportunities) related to the specific pilot characteristics of the project
- Challenges (and opportunities) related to having two national TSOs as equal partners in execution and operation
- Typical challenges coming from the execution of complex infrastructure projects
- Challenges on the way

DK regulatory environment

DE regulatory environment

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Challenge dimension 1 = Context...

Two regulatory environments for permitting and approvals:

- National differences adds increased complexity and time management risks
- Coordination of approval timelines needed
Challenge dimension 2: „Just“ typical challenges coming from the execution of complex infrastructure projects

Nothing new - no words needed...

Master plan

The real world
Challenge dimension 3: Issues related to having two national TSOs as equal partners

Cultural clash
- TSOs are different in set up and culture (and so are people...)

Need for new ways due to ownership of assets
- 50% ownership for each TSO
- Contract setup for main contracts as 3-side contracts with both TSOs as employers
- Different insurance approaches of the TSOs had to be aligned.
- System operation and maintenance strategies need to be harmonized.

Mirrored project team – each key function in the project has its counterpart
- High amount of communication traffic
- Energinet in lead for Offshore / 50Hertz in lead for Back-to-Back
Challenge dimension 4: Specific pilot characteristic – part1

Integration into existing and new OWP infeed infrastructure and onshore substations}

Offshore platform Baltic 2 / © 50Hertz

Sea cable pull in at Ba2 platform
Challenge dimension 4: Specific pilot characteristic – part 2

→ Market arrangements and system operation

Driven by heritage and context...
- Existing DE OWFs
- DK OWF close to tender

Pragmatic solution:
- Full access (priority) to OWFs
- Excess capacity to the market (interconnector)

Grid utilization potential (DK side)

- Potential import
- "Excess" capacity on radial grid connection
- Wind generation

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1. Business As Usual.

2. Offshore wind to Land

(High wind scenarios)
1. Interconnector.

2. Offshore wind to Land

(High wind scenarios)
1. Interconnector.

2. Offshore wind to Land

(High wind scenarios)
1. Land to Offshore.
2. Then Offshore to Land
(Low/No wind scenarios)
1. Land to Offshore.

2. Then Offshore to Land

(Low/No wind scenarios)
Lessons Learnt

KF CGS → Successful according to the objectives, but has also showcased issues for consideration in future hybrid projects:

1. Cooperation and mutual cultural understanding is key – and takes time..

2. "First of its kind" requires
   • Regulatory coordination
   • Regulatory innovation
   • Political support and commitment

3. Starting point matters: “add on” versus initial design impact:
   • Technical concept design
   • Market rules
     • From "first and special case" to more mainstream concept within the EU-regulatory framework?
Thank you for the attention!

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Future perspectives

- One way of travel..
- Rules of the game are changing
- Need for new tools inside and outside the electricity system