

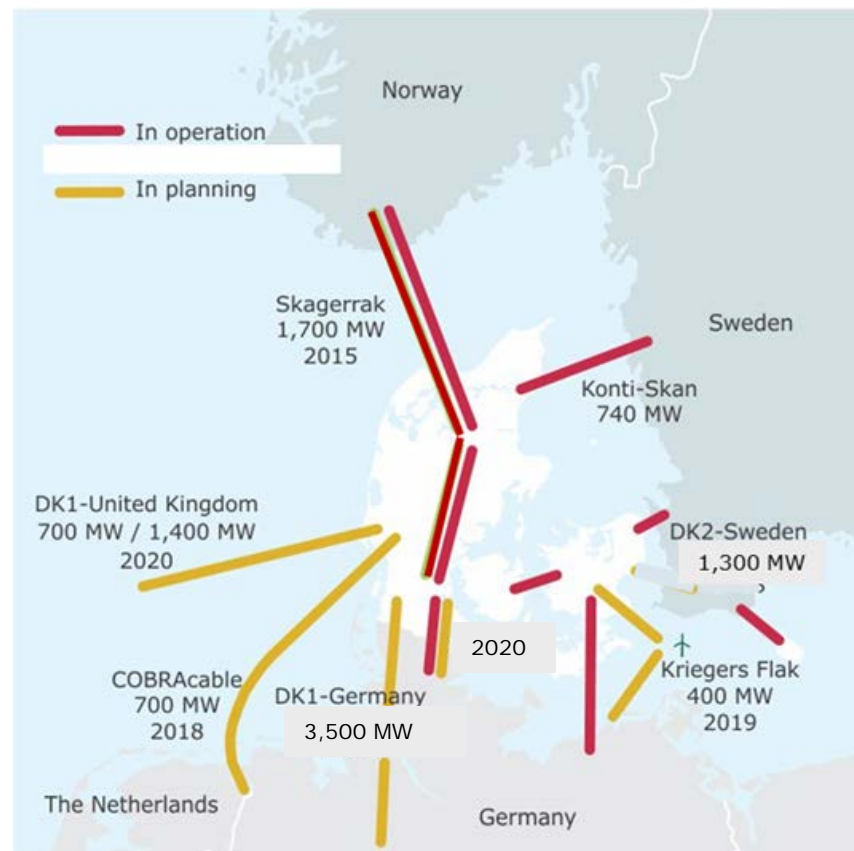
Interconnection as a flexibility option

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Agenda

- Denmark and HVDC interconnectors
 - Brief history – why?
 - Change of purpose
- Need for flexibility
- What is on the other side?
- Is the capacity released to the market?



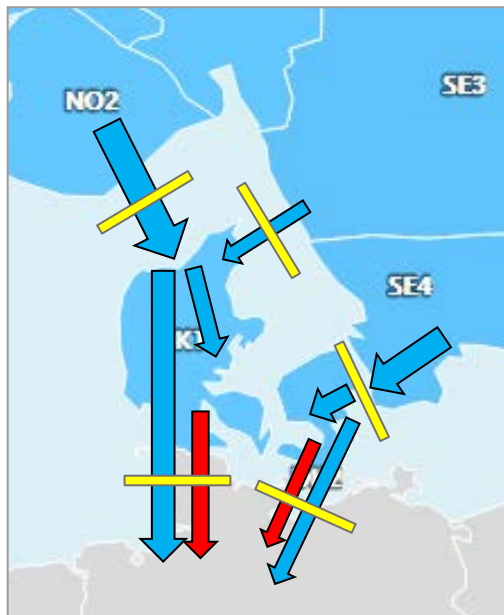
Skagerrak and Kontiskan



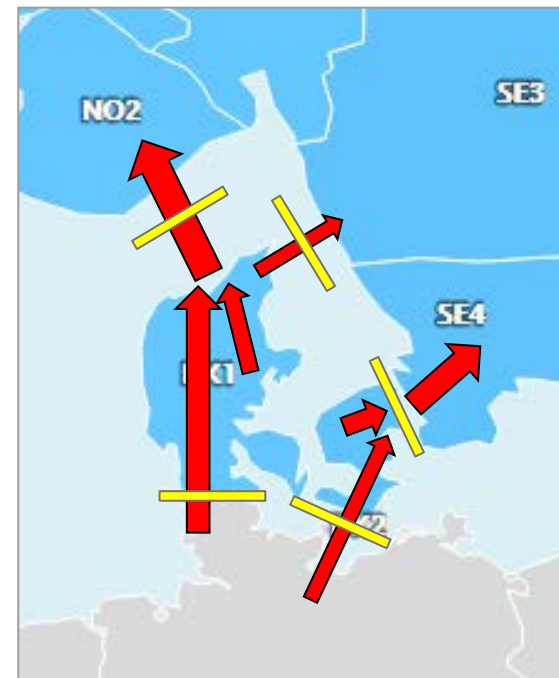
Denmark: The "silk road" of power

Historically

Wet year / daytime



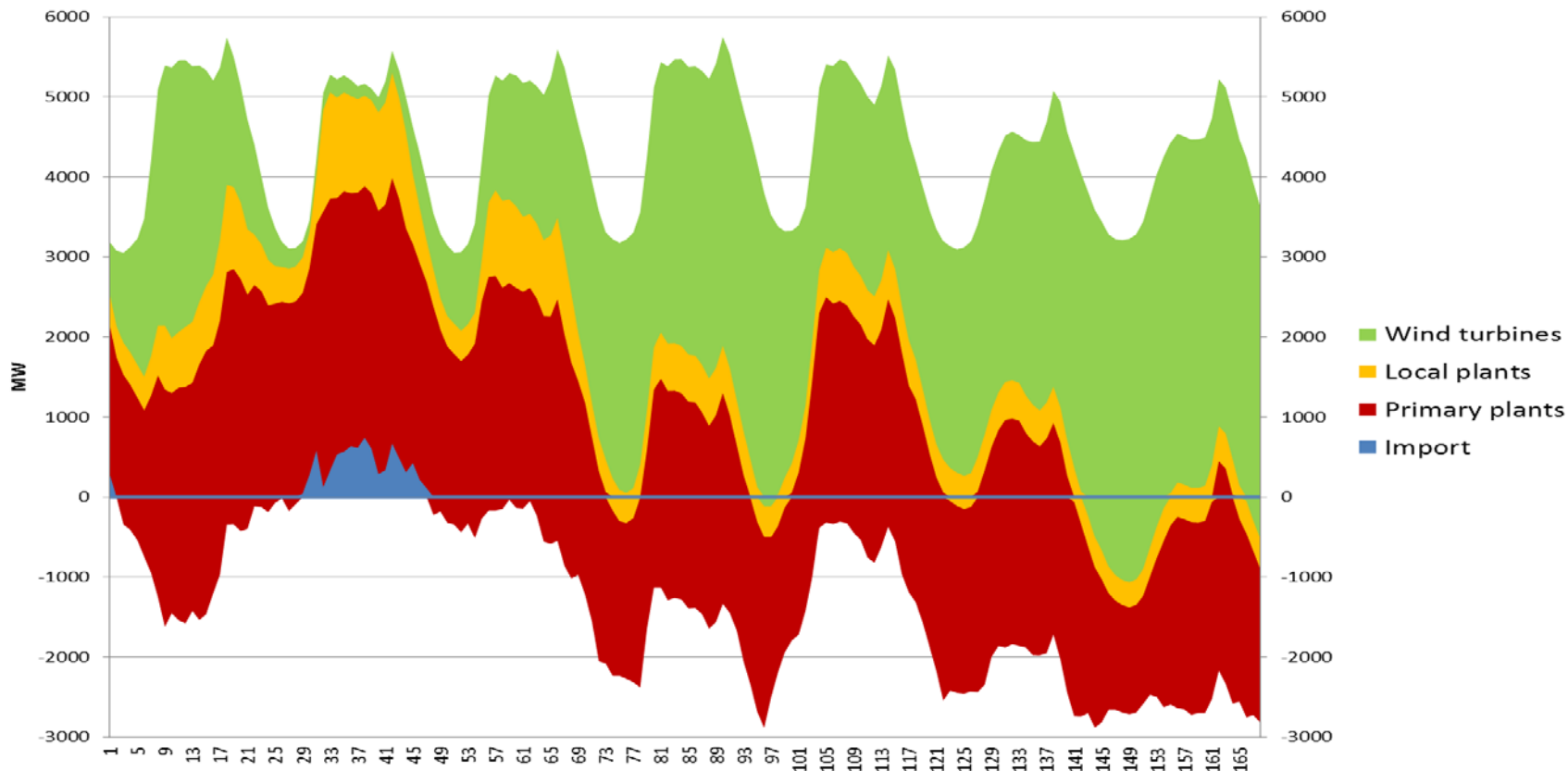
Dry year / nighttime



Challenge:

Flexibility in the electricity system is needed

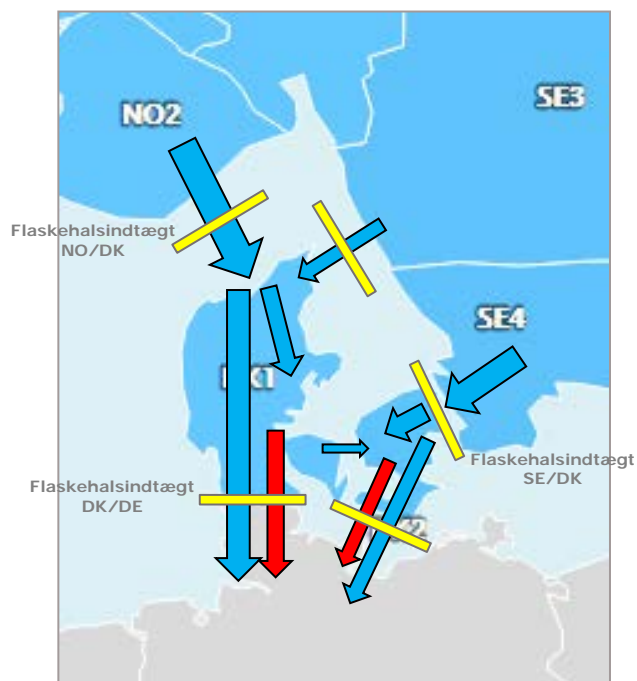
- hourly dispatch 13 – 19 January 2014



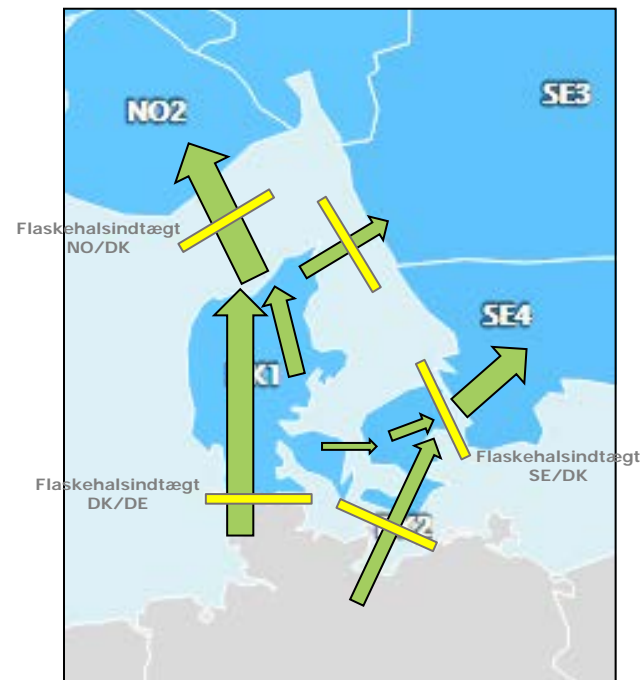
New patterns on the "silk road"

2015

Low wind

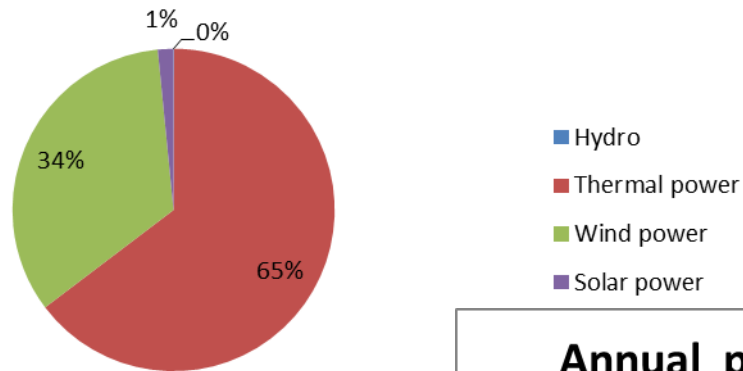


High wind/solar

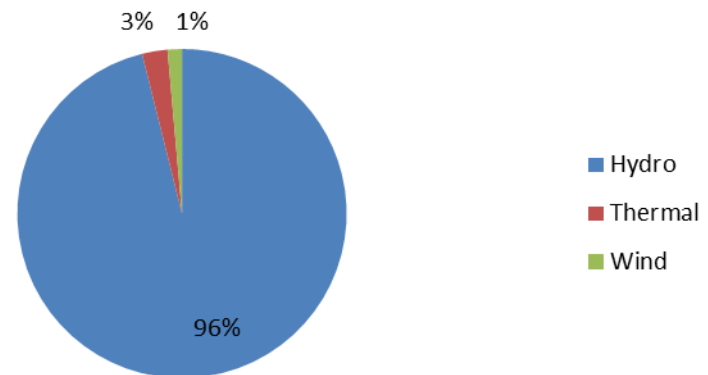


On the other side of the interconnector - Norway

Annual power generation in Denmark
2013

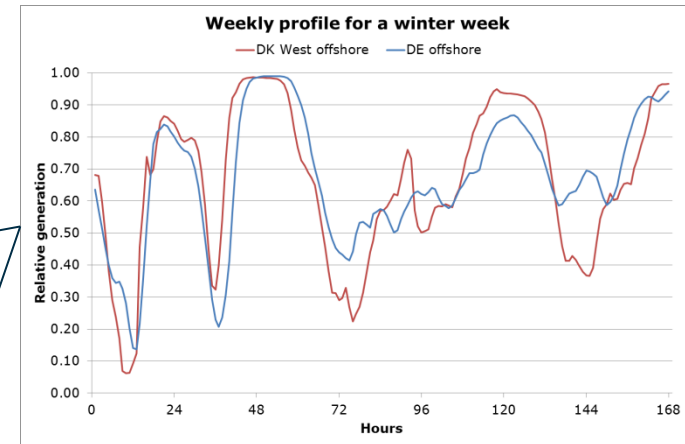
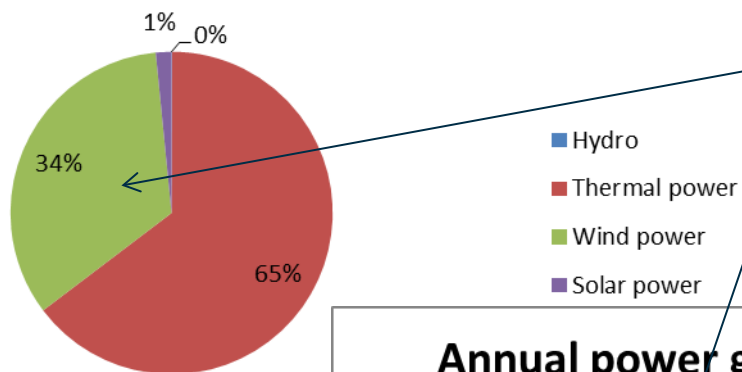


Annual power generation in Norway
2013

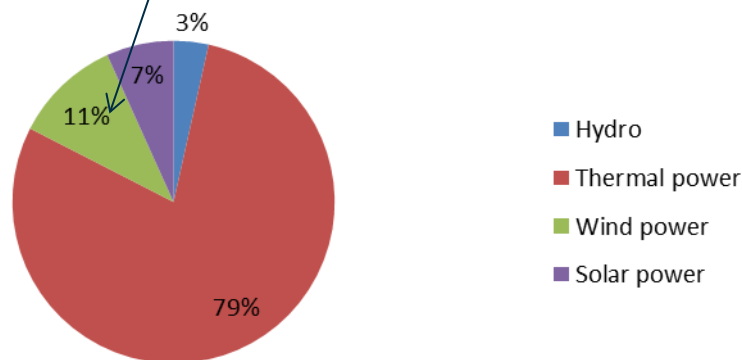


On the other side of the interconnector - Germany

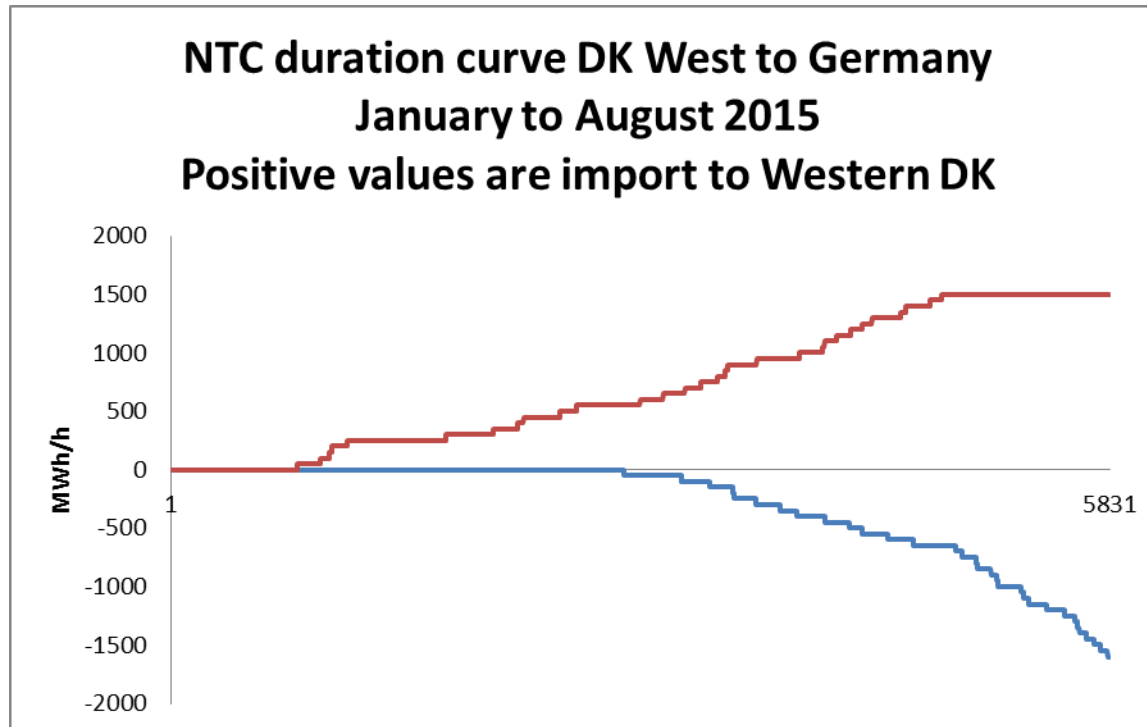
Annual power generation in Denmark 2013



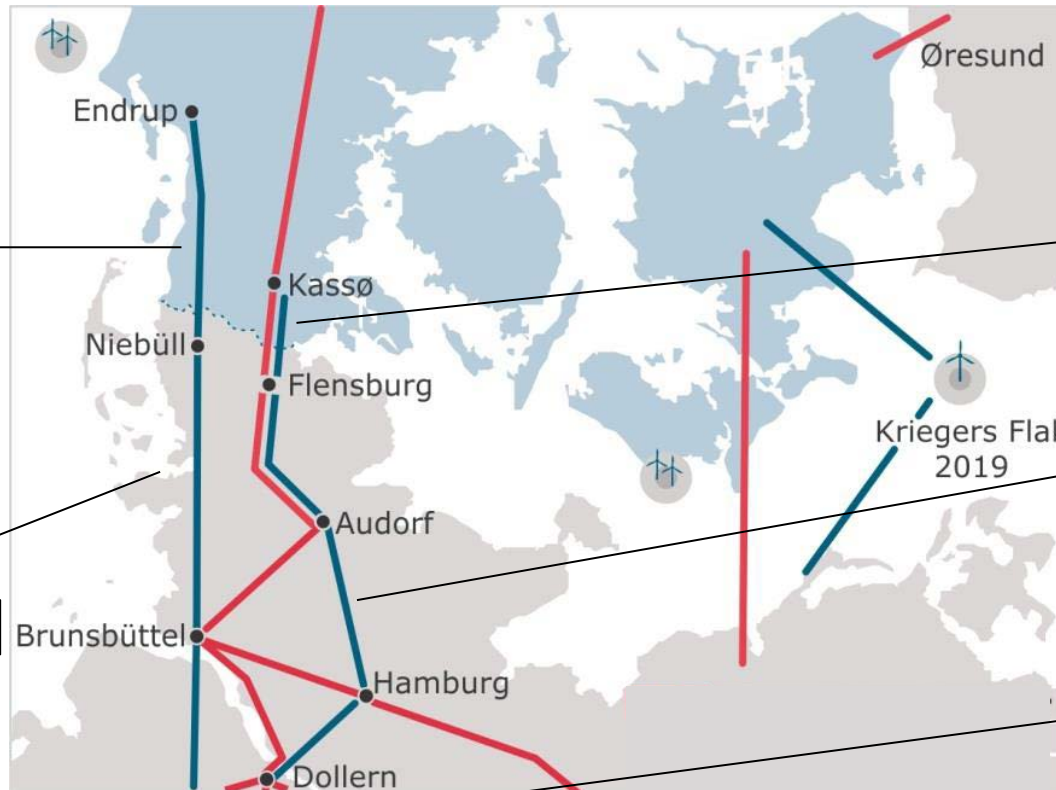
Annual power generation in Germany 2013



Is the capacity released to the market?



The Danish-German interconnection lines and related projects



Under investigation by Energinet and TenneT

Approved by Energinet.dk board awaiting Ministry approval (Planned 2020)

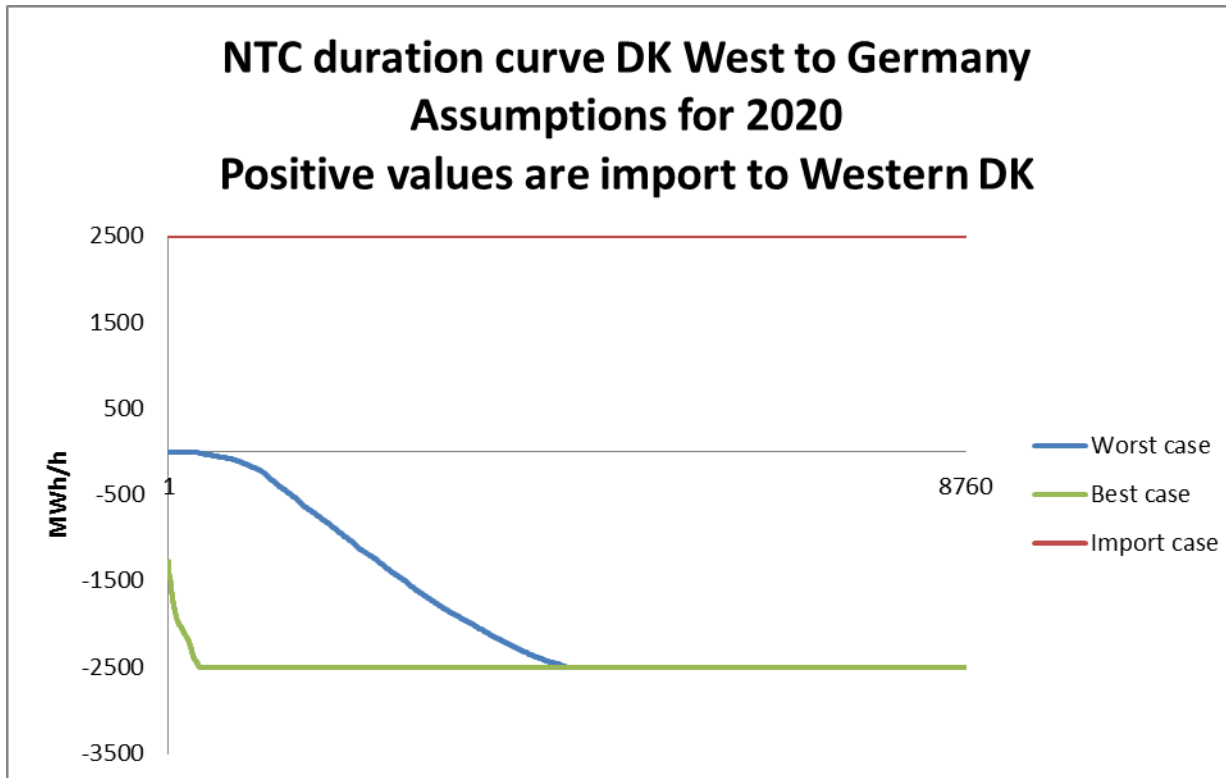
Mittelaxe 2020

Westcoast 2022

Südlink 2023

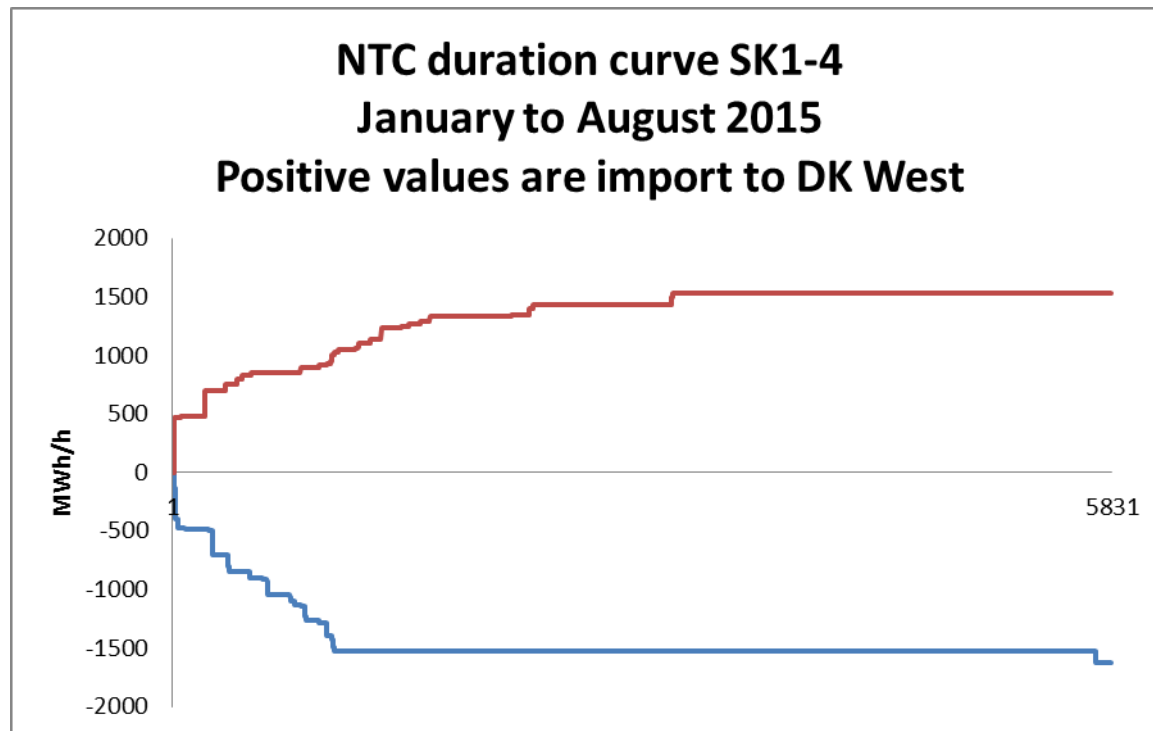


Expected duration curve for the NTC in 2020

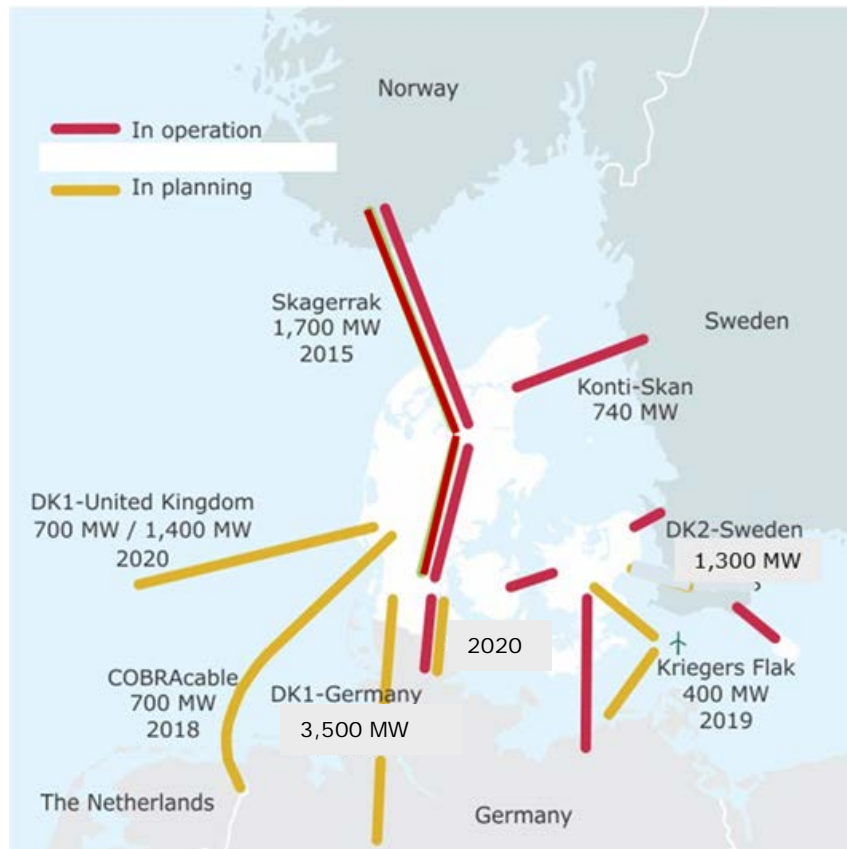


What about Norway?

- Situation is not perfect, but acceptable
- Norway is getting ready for Nord.Link



Wrap up



- Danish HVDC interconnectors were built to help with dry and wet years
- Now they are a flexibility measure
- What's on the other side is important
- Capacity needs to be available
- There are more interconnectors to come

Thank you!