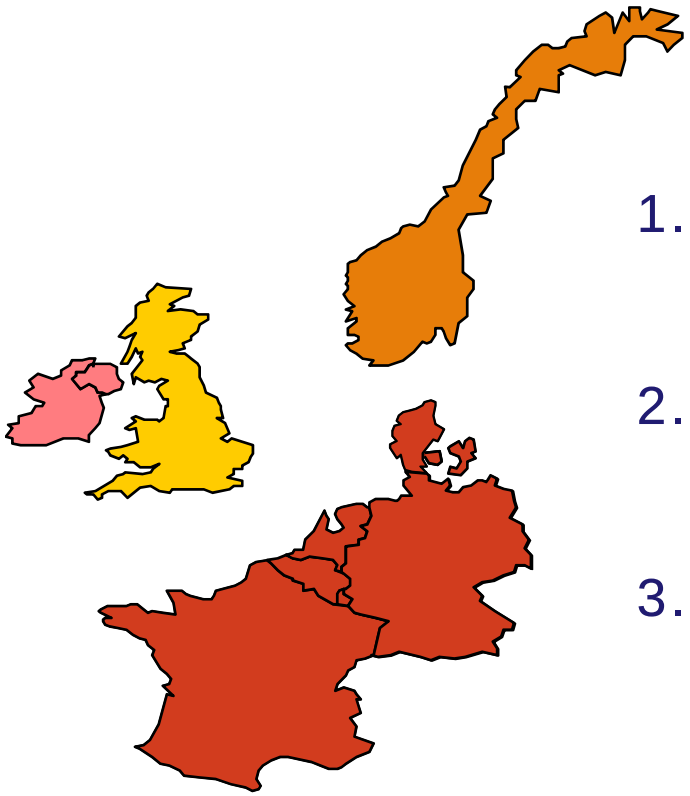
ENTSO-E – Regional Group North Sea

Grid Studies – Objectives, methodology and main messages

Brussels, 15 December 2011

entsoe

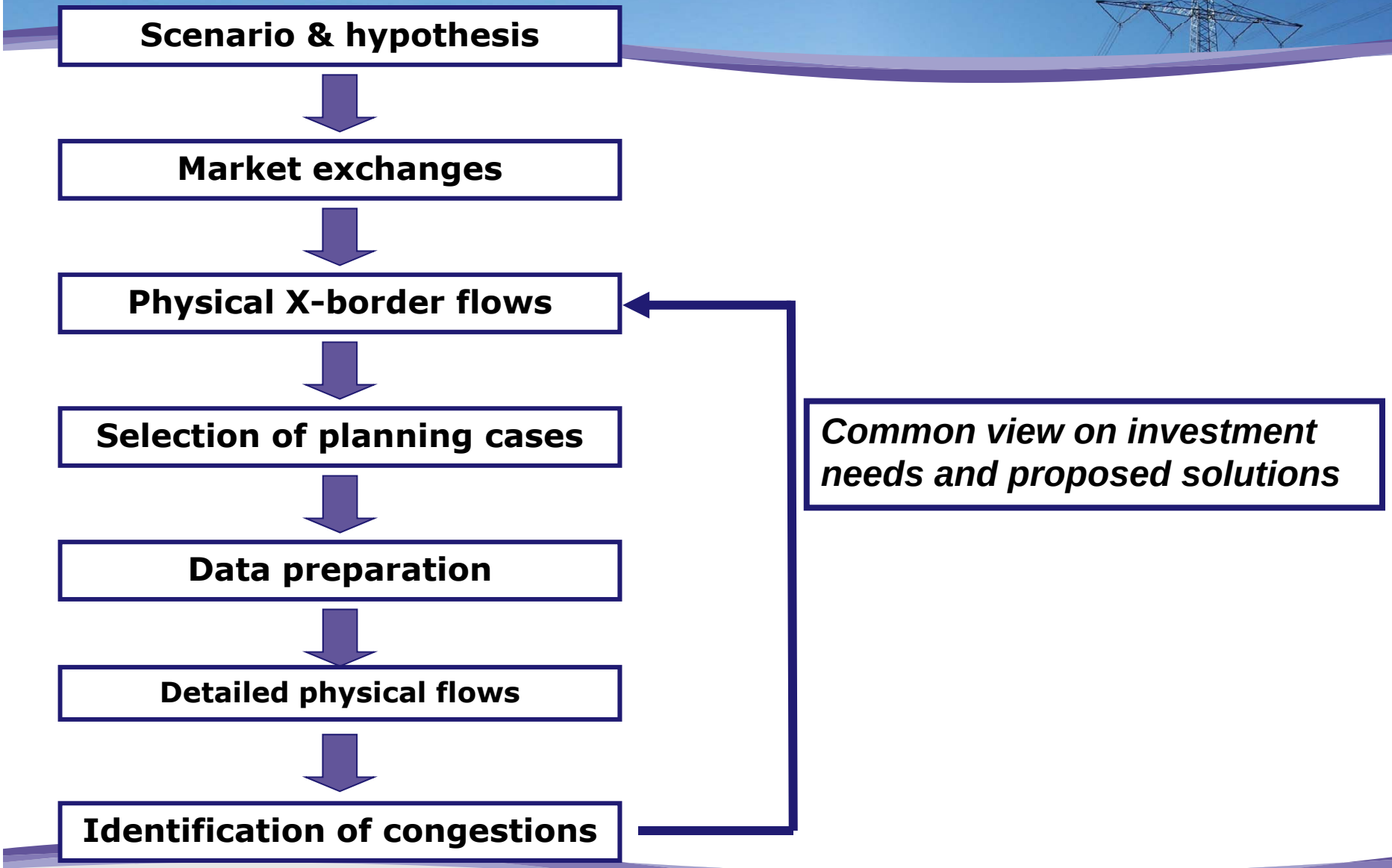
Study 2020 - Objectives



On the basis of common hypothesis (time horizon : 2020) and a common methodology, the TSOs within RGNS performed a grid study, aiming to :

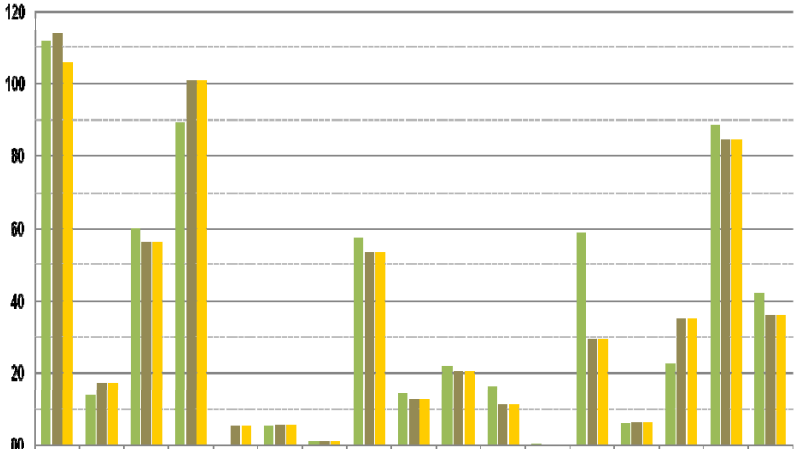
1. Identify new investment needs to meet planning reliability criteria
2. Propose the best investments to answer those needs
3. Prepare our analysis in a longer-run perspective (NSCOGI work for 2030)

Study 2020 : overview of the methodology



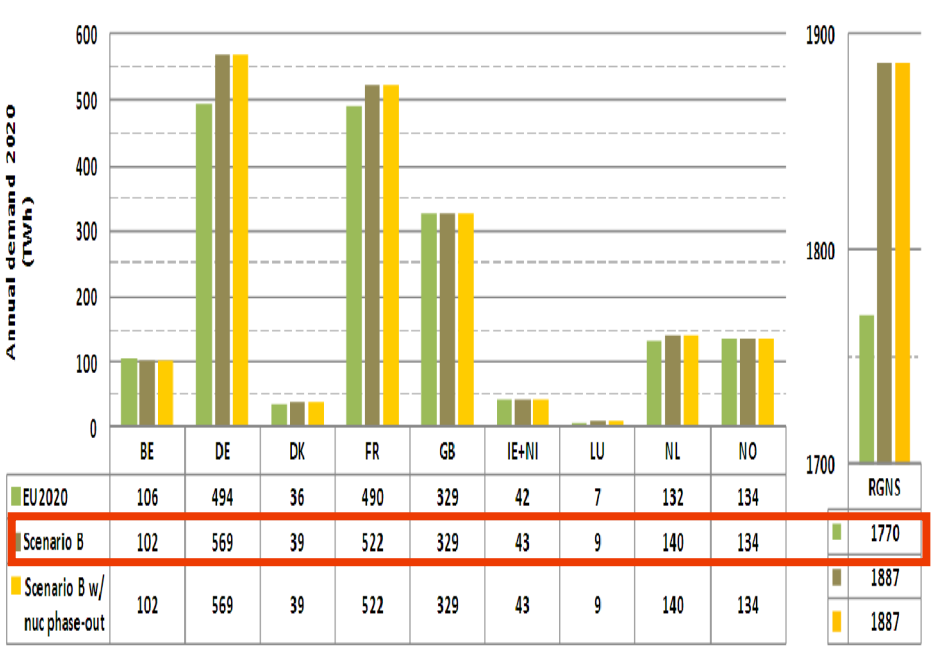
Study 2020 – Scenario & hypothesis

Aggregated installed capacities RGNS (GW)



	Nuclear	Lignite	Hard Coal	Gas	Heavy Oil	Light Oil	Mixed fuel	Reserv oir	Run-of-River	Pumped Storage	Biomass	Waste	Solar	Non-dispatachable CHP	Miscellaneous	Onshore wind	Offshore wind
EU2020	111	14	60	89	00	05	01	58	14	22	16	00	59	06	22	89	42
Scenario B	114	17	56	101	05	05	01	53	13	20	11	00	29	06	35	85	36
Scenario B w/ nuc phase-out	106	17	56	101	05	05	01	53	13	20	11	00	29	06	35	85	36

Annual demand



	BE	DE	DK	FR	GB	IE+NI	LU	NL	NO
EU2020	106	494	36	490	329	42	7	132	134
Scenario B	102	569	39	522	329	43	9	140	134
Scenario B w/ nuc phase-out	102	569	39	522	329	43	9	140	134

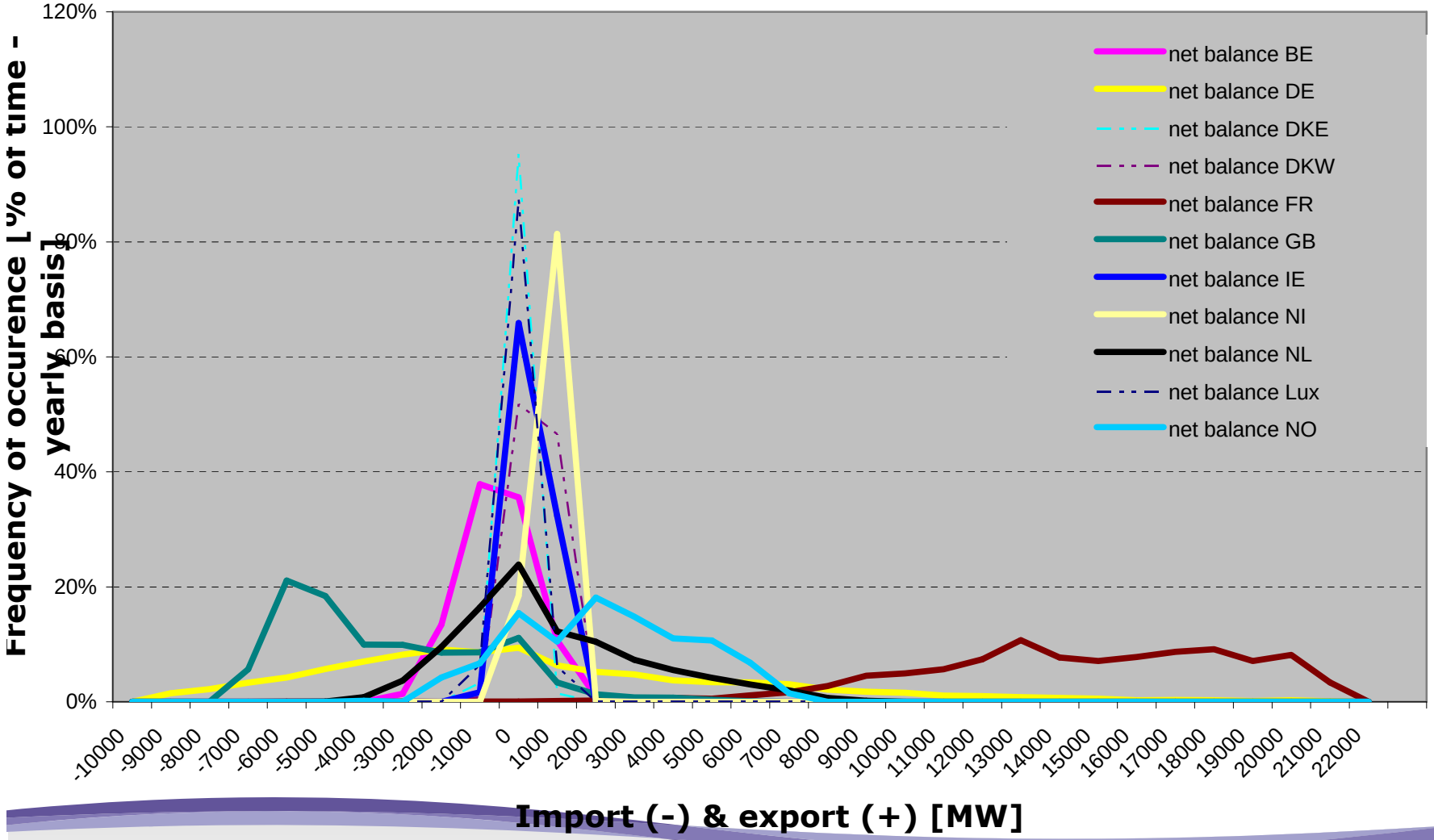
RGNS
1770
1887
1887

First : Scenario 2020

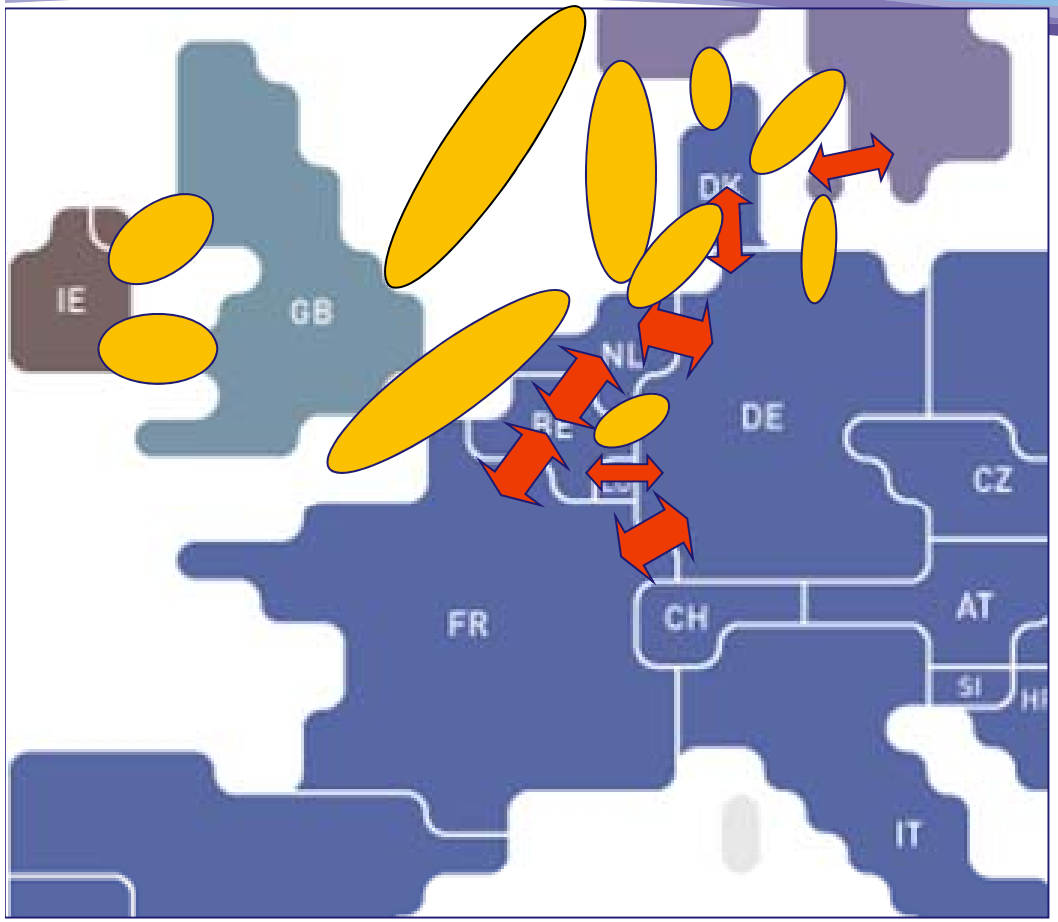
Then sensitivity analysis where were appropriate

Study 2020 – Market exchanges (promod – scenario EU 2020 – BTC 2020)

Market exchanges - power balances (BTC in 2020)



Study 2020 – Physical cross-border flows



DC link

- **controlable**
- **no overloads but possibly full loaded = congested**

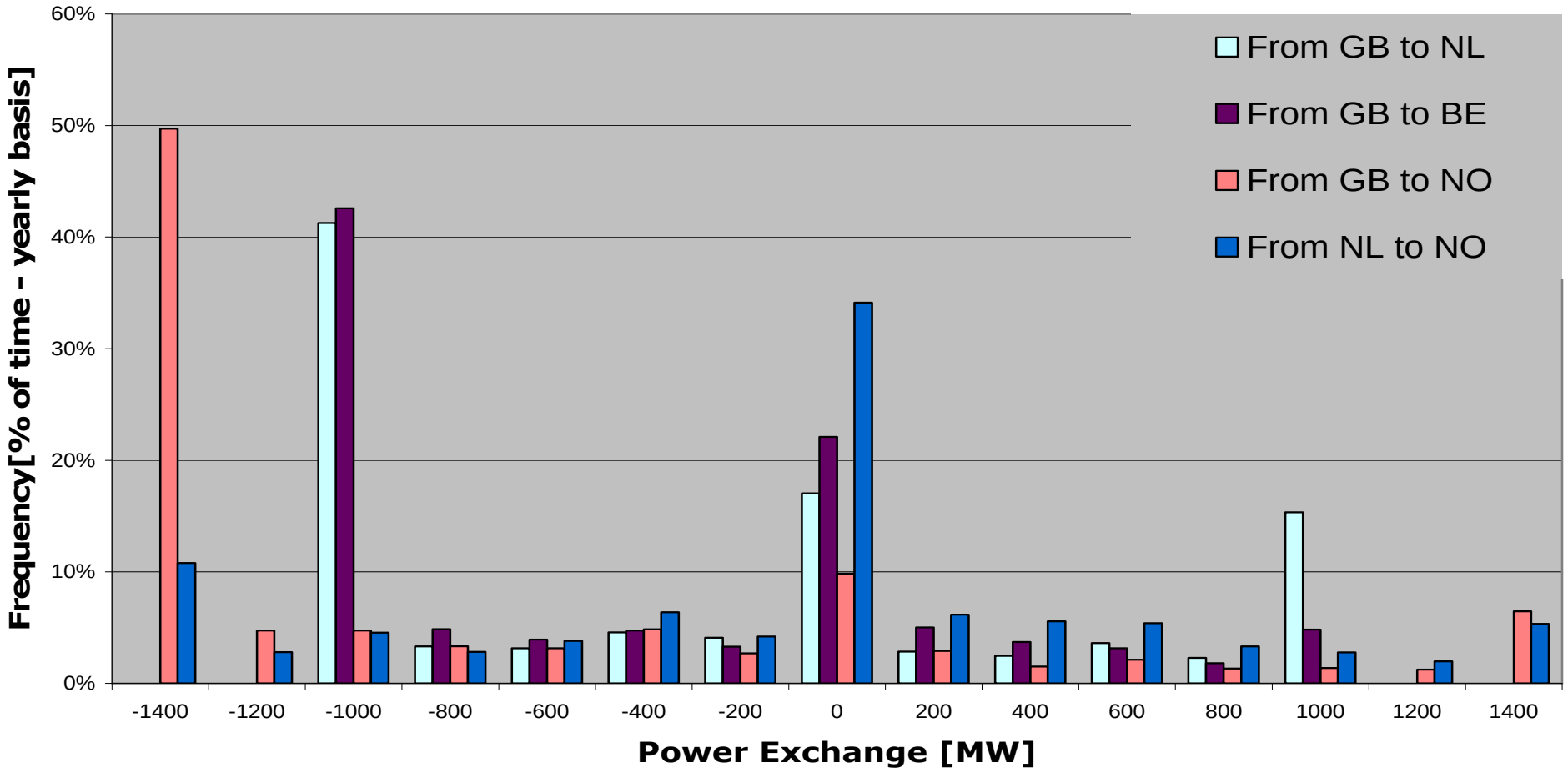
AC interconnections

- **Market exchanges (BTC limited)**
- **Market exchanges ≠ power flows**
- **Some overloadings are possible (loop flows)**

Study 2020 – Physical cross-border flows

(examples on DC interconnections)

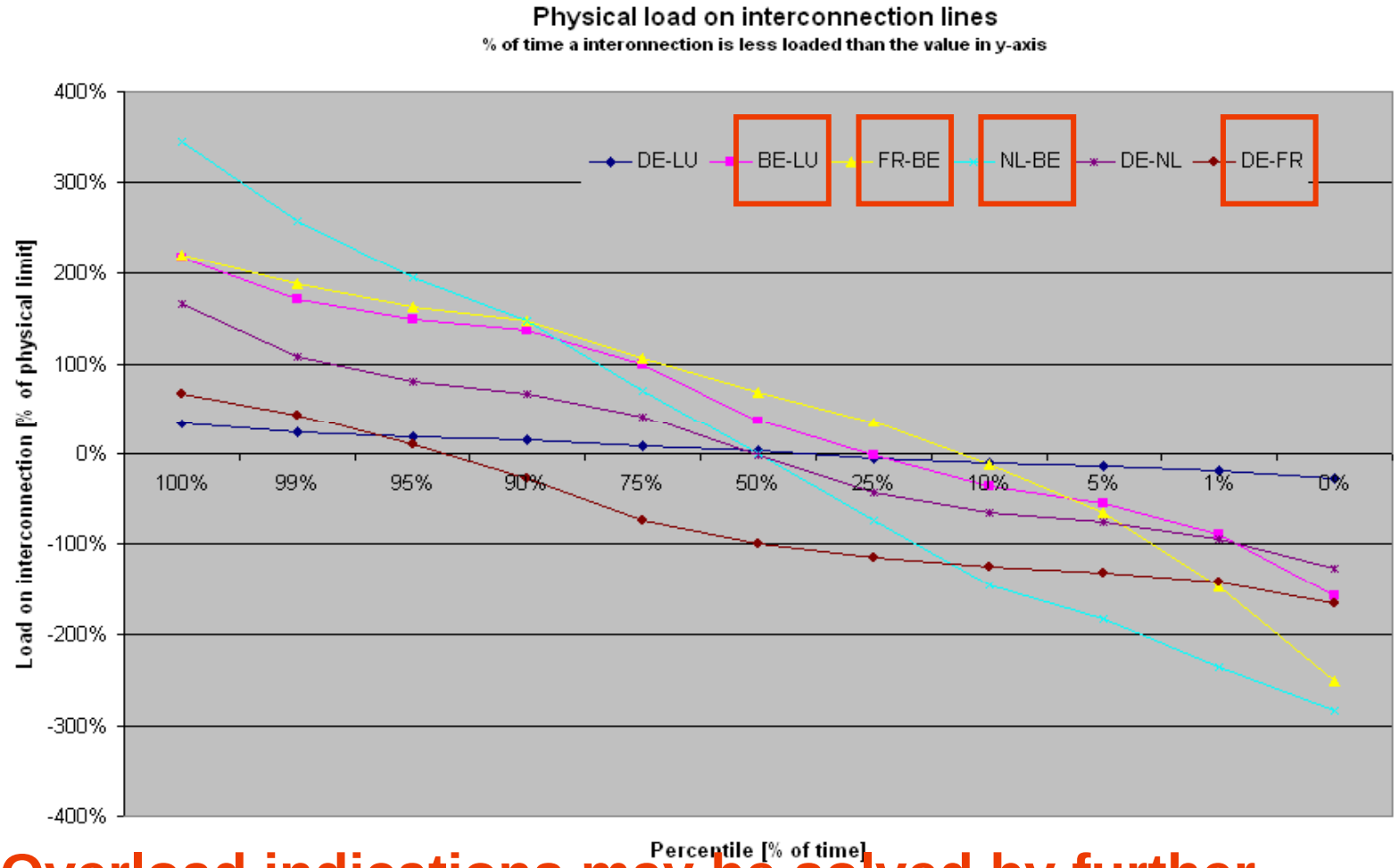
Simulated used of DC interconnections within countries - BTC 2020 - Promod



Interconnection at full load → congested not overloaded

Study 2020 – Physical cross-border flows

(on AC interconnections without use of the PSTS)



Overload indications may be solved by further interconnections or by congestion management

Study 2020 – Selection of planning cases

- Planning case = representative situation (***= 1 hour***) of the grid

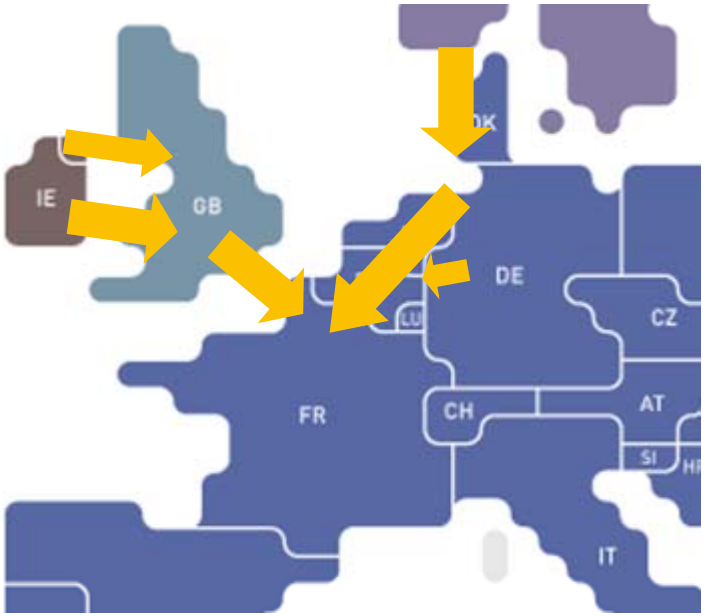
- Selection of a planning cases

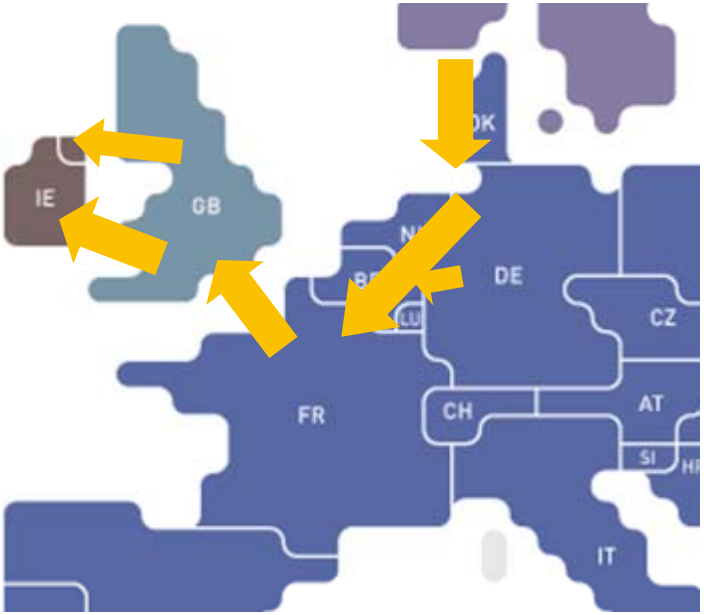
  1. First set (“*common*”) : common planning cases to be analyzed by all the TSOs
  2. Second set (“*optional*”) : some planning cases –specific to each TSO– to represent some TSO-specific situations

- Identify some representative situations
  Based on high cross-border flows for some of the borders
  Ex :BE-to-FR, GB-to-FR
  Ex :DE-to-FR, DE-to-LC, LC-to-BE

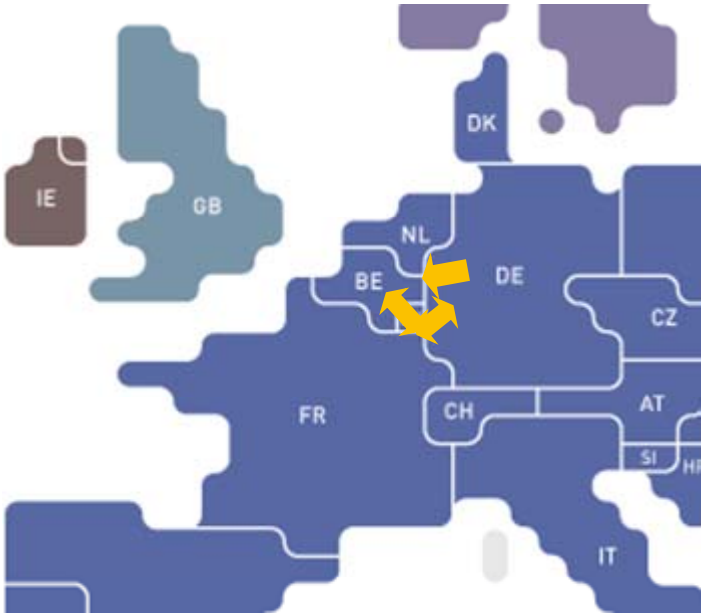
- After consultation with market experts, 29 common planning cases were identified from the market models

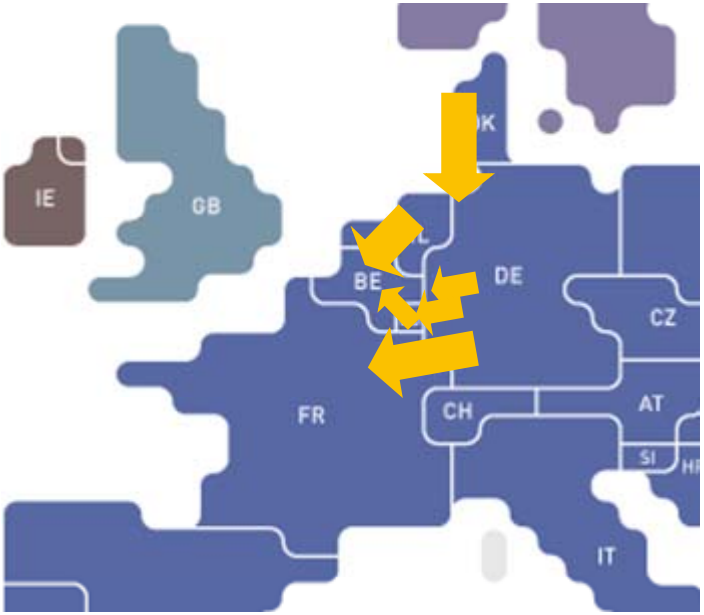
Selected Planning Cases (1/4) – AC planning cases



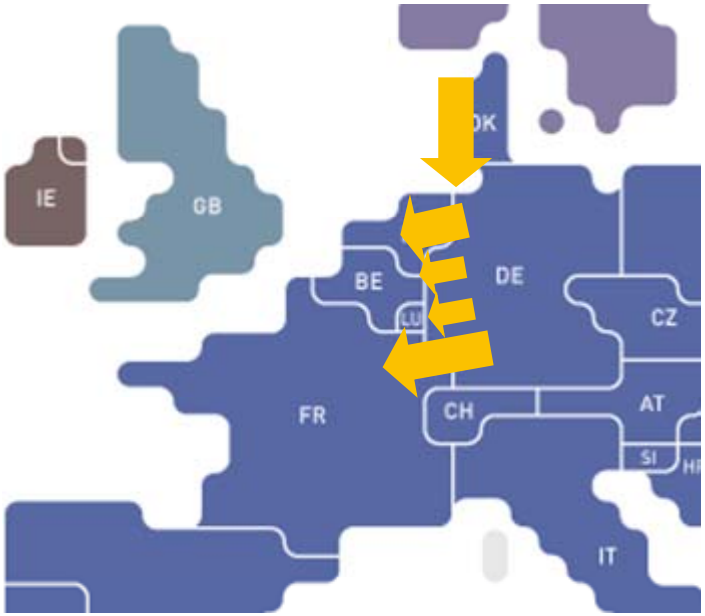


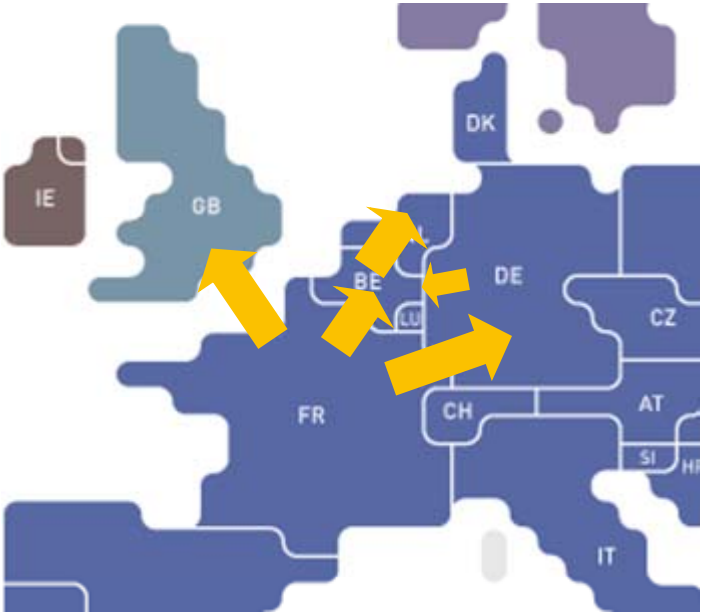
Selected Planning Cases (2/4) - AC planning cases



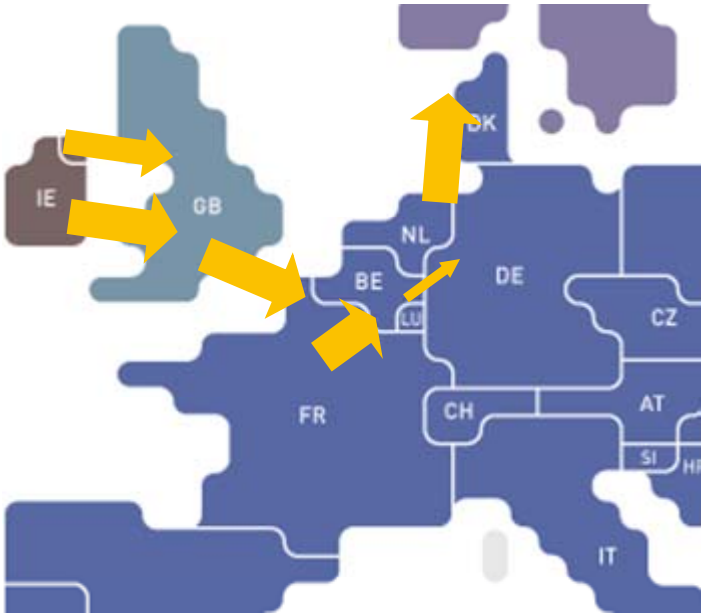


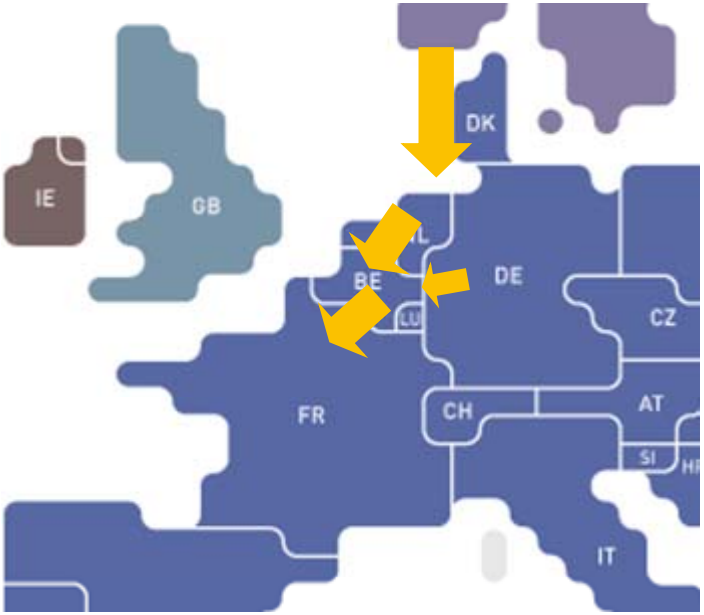
Selected Planning Cases (3/4) - AC planning cases





Selected Planning Cases (4/4) - AC planning cases



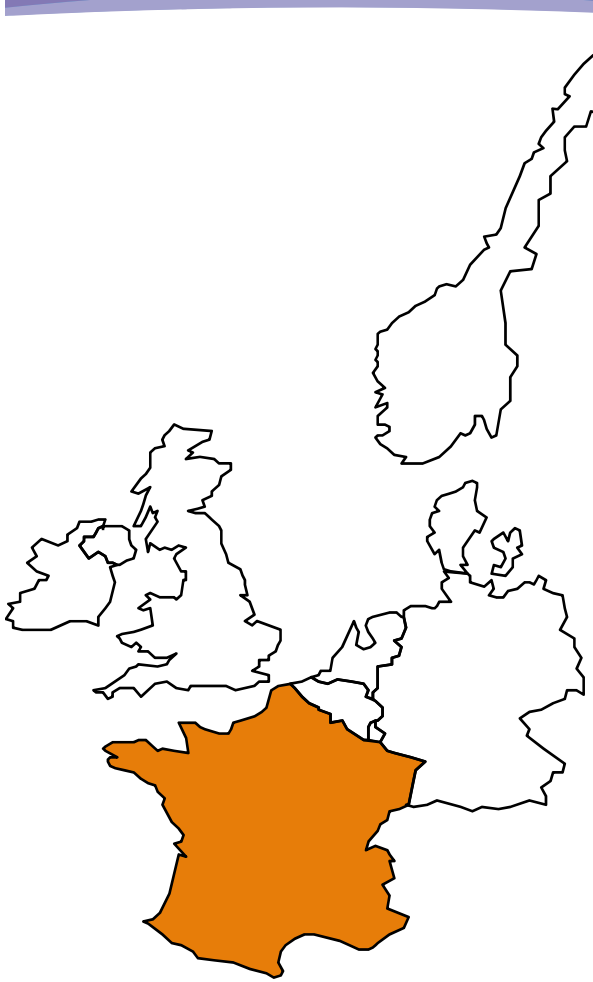


Selected Planning Cases : optional national cases

Assessment of optional cases planned by:

- *Creos (LUX): based on common study performed with neighbouring TSOs*
- *EirGrid (IE) : including cases from additional market simulations (sensitivity) to evaluate necessity of increased exchange capacity*
- *Energinet.dk: extra market analysis conducted to identify important cases*
- *National Grid (GB) = at peak/low demand and high wind*

Study 2020 – load flow results



1. **North border, flows BE ->FR & FR <-> GB**

   Overloads *on Belgium lines to France*

2. **North-East border, flows FR -> DE**

   Overloads *on French grid & French/German border*

Study 2020 – load flow results

1. **North border, flows NL to BE**

   Overloads *on phaseshifters Zandvliet and transformers on axis VanEyck-Lixhe-Gramme*

2. **North border, flows BE to NL**
   Overloads *on phaseshifters Zandvliet and Van Eyck,Lixhe-VanEyck, Baekeland-Mercator-Doel-Zandvliet*

3. **South border, flows FR to BE**
   Overloads *on all lines FR-BE, and some lines inside BE*

4. **South border, flows BE to FR**
   Overloads *on internal line Horta-Avelgem in BE*

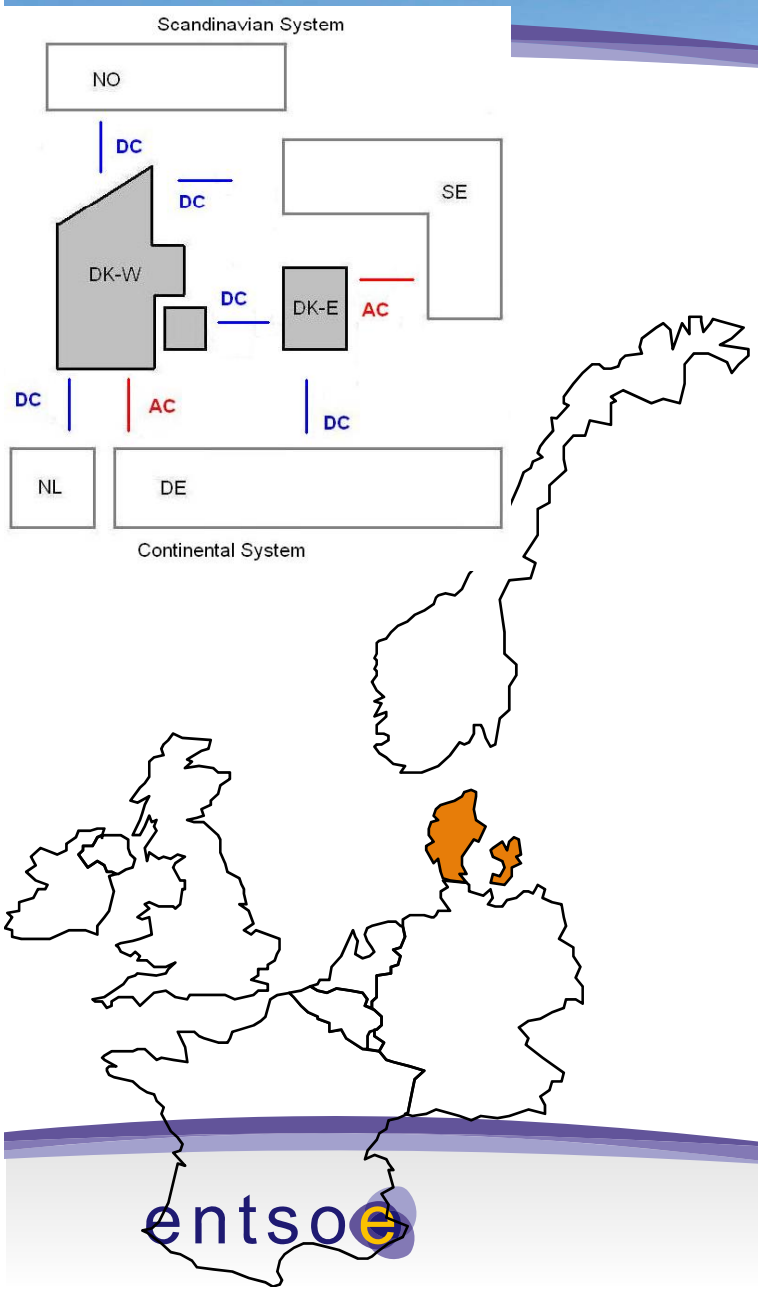
Study 2020 – load flow results

1. **Internal bottlenecks in NL grid:**
   Overloads *on lines Krimpen ad IJssel - Geertruidenberg, Eindhoven – Maasbracht, and Diemen – Breukelen.*

2. **Cross border bottleneck, flows NL to BE and BE to NL:**

   Overloads *on PST Zandvliet – Kreekrak*

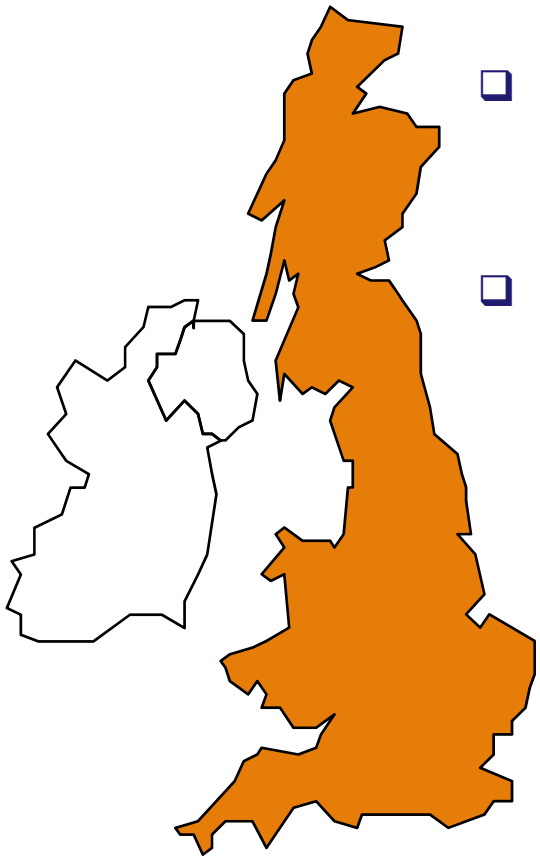
Study 2020 – load flow results



Overloads found during some (N-1) contingency situations at the Danish AC borders.

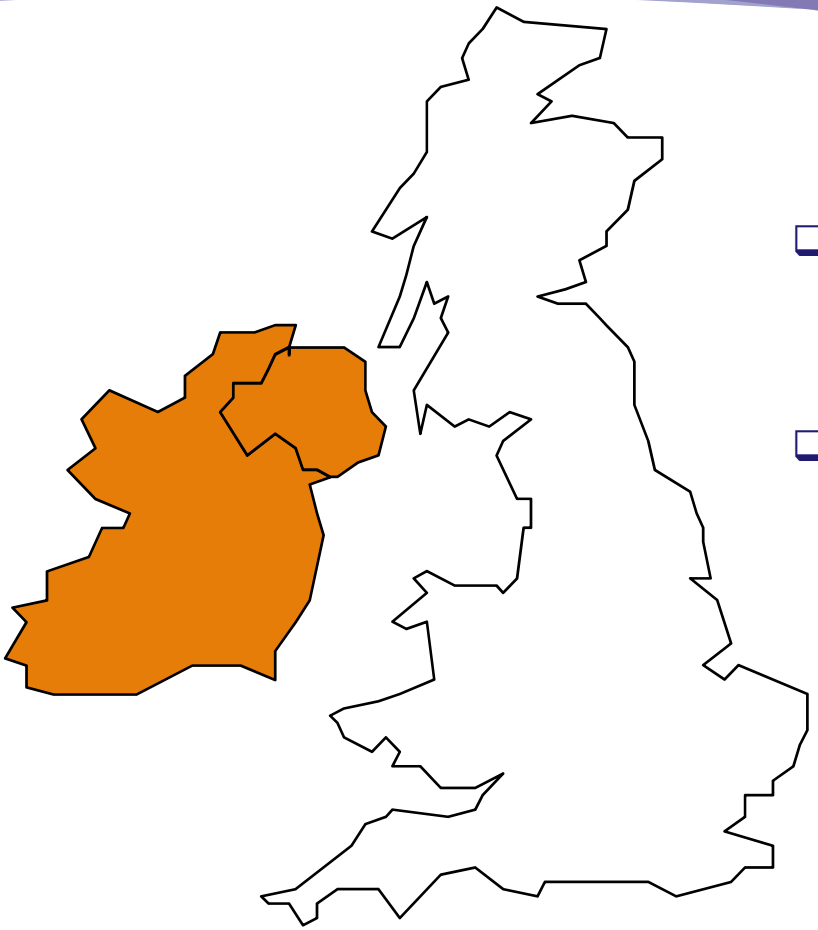
These cases will be further investigated together with the neighbours in order to remove the risk for market constraints.

Study 2020 – load flow results



- High wind farm output conditions stress the thermal capacity of the transmission circuits all the way ***from Scotland down to the south midlands***
- Interconnection through flow (UK import to the North and export from the South) combined with high northern generation production heavily stresses the ***transmission circuits from the North East down to North London***

Study 2020 – load flow results



- Significant ***wind curtailment*** without additional DC interconnection
- ***Interconnectors*** IE-GB & IE-FR under investigation

Study 2020 – conclusions

- Common ***methodology*** discussed and implemented

- Based on BTC-limited market simulations (scenario EU2020) identification of some ***congestions*** in the AC grid

  → **Need for** potential grid reinforcements or congestion management

- The ***Regional Investment Plan*** will identify ***some solutions*** (reinforcements) or report an ongoing ***analysis***

- The present analysis will be fed into the NSCOGI work out to **2030 timescales**