



North Western Europe Day Ahead Price Coupling Project

NWE 2nd Stakeholder Forum

14 June, London



Agenda

- Requirement of TSOs and modeling by PCR in the algorithm
- Consultant study
- View of Svenska Kraftnät and Fingrid
- Further steps



Capacity provisions and procurement of losses

TSOs determine the available capacity by the same principles as today.

- Inclusion of losses will therefore not cause changes to the available capacity to the market

Losses not included in the algorithm:

- In D-1, TSOs assess and pre-order expected losses to ensure in real time the balance of production and consumption
- Losses are procured by the TSOs outside the implicit allocation
- Leads to imbalances on the ordered losses due to inaccuracies

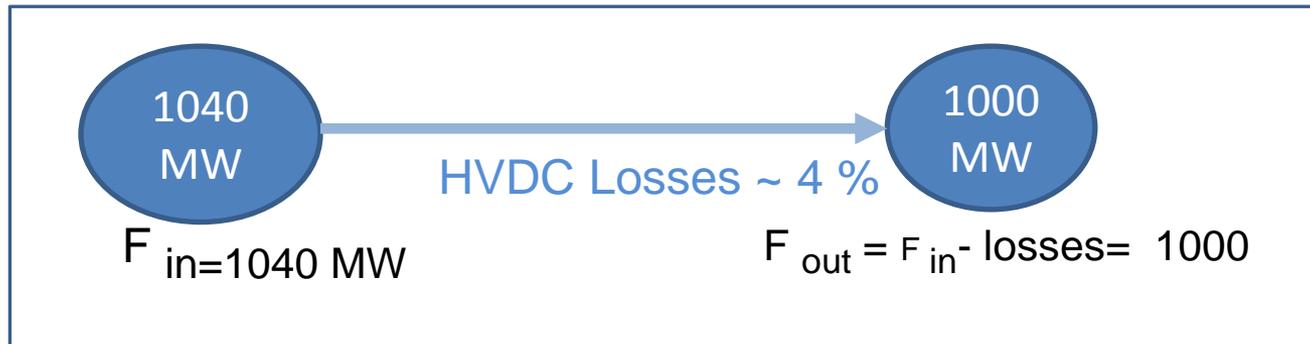
Losses included in the algorithm:

- The handling of losses is integrated with the allocation. The shipper procures/sells different energies on each side of the cable. Costs of losses are borne directly by the Market Participants
- Market prices better reflect marginal cost of supply (i.e. Including losses incurred in the transaction).
- Flow pattern, losses in neighbouring countries and prices will be different.
- Losses will cause minor price differences over a DC interconnector



Loss modelling in PCR Algorithm

- Possibilities by the algorithm
 - Linear losses are allowed, i.e. the losses is a fixed percentage of the flow
- Deciding the loss factor
 - Necessary analysis will define the percentage
 - TSOs specify losses percentage based on actual losses for individual DC line (e.g. IFA ~2%, NorNed~4%)



- Price Properties
 - $MCP_{to} (1 - \text{loss}\%) - MCP_{from} = 0$ when no congestion (no congestion rent),
 - $MCP_{to} (1 - \text{loss}\%) - MCP_{from} > 0$ when line is congested
- The price difference will always be sufficiently high to cover the costs of losses when the cable is uncongested



NWE consultant study

- The NWE project received 10 questions from the NRAs in October 2012 on impact by implementing losses on the DC interconnectors.
- The project agreed to carry out a consultant study to analyse impact on implementing loss functionality in the algorithm.
- Reported to NRAs in a Implementation Group meeting 25. April.
- Report is available at the websites of NWE partners.



Assumptions and limitations of the analysis

- Energy losses are only considered on interconnectors; in particular no losses in the internal AC grids due to cross-border flows are taken into account (unless they are represented by the losses on interconnectors);
- Losses on interconnectors are modeled by a linear loss factor which does not depend on the actual load of the interconnector;
- Quantitative results rely on some assumptions concerning the modeling of the markets when losses are included (e.g. order books remain constant).



Assumption for the analysis

- Simulations cover full year 2011
- Market data are historical data from PXs order books
- Network data are historical ATCs and ramping limits (except when losses apply)
- 5 runs with different loss factor values
- Run#3 with actual loss factors – Run#1 being the reference run

Loss Factor up / down	Run#1	Run#2	Run#3	Run#4	Run#5
NorNed	0%	2%	4%	0%	0%
Storebælt	0%	2%	1.5%	0%	0%
Skagerak	0%	2%	3.8%	0%	0%
Kontek	0%	2%	2.5%	0%	0%
Kontiskan	0%	2%	2.6%	0%	0%
IFA	0%	2%	2.313%	2.313%	2%
Estlink	0%	2%	5.05% / 5.21%	0%	0%
Fennoskan	0%	2%	2.4%	0%	0%
Baltic	0%	2%	2.4%	2.4%	2%
BritNed	0%	2%	3%	3%	2%
SwePol	0%	2%	2.6%	0%	0%



Total welfare and net coupling welfare

- **Net coupling welfare** is the welfare effect that is calculated from the market simulations and which includes the following welfare elements:
 - consumer and producer surplus (from the PX order books) and trade income (congestion rent) from all exchanges of power between all bidding zones minus the costs of the losses on DC interconnectors that were not included in the simulation run
- **Total welfare** includes the following welfare elements that are not accounted for in the net coupling welfare:
 - Welfare changes induced by exchanges on AC interconnectors, e.g. the change in costs of losses over AC interconnectors
 - Welfare changes induced by all exchanges on the AC network inside the bidding zones, i.e. any variable operating costs due to the exchanges like change in costs of AC network losses or redispatch costs



Main welfare results

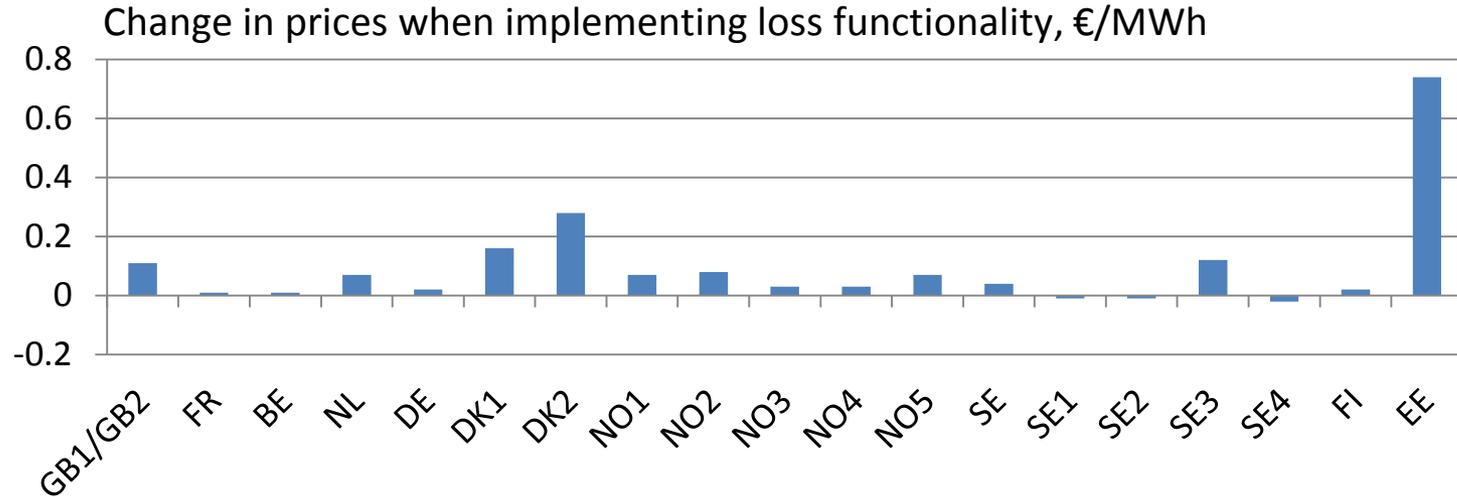
- Increase in Net Coupling Welfare for each Run compared to reference Run#1.

RUN	Net Coupling Welfare Increase (€x1000)	Properties of the runs
1	0	No losses
2	5 768	2% losses all interconnectors
3	7 280	Correct loss factor on all interconnectors
4	1 808	Correct loss factors on IFA, BritNed and Baltic
5	1 593	2% losses on IFA, BritNed and Baltic

- Observations correspond to expectations:
 - Net Coupling Welfare is higher when loss factors included in the algorithm are closer to the actual value;
 - Net Coupling Welfare is higher when loss factors are included on all interconnectors



Average change in prices when including losses



- In average the price changes are small
- For some hours there might be significant differences
 - Small elasticity in demand
 - Interdependencies between hours (block orders and ramping)
 - Change in selection of block orders



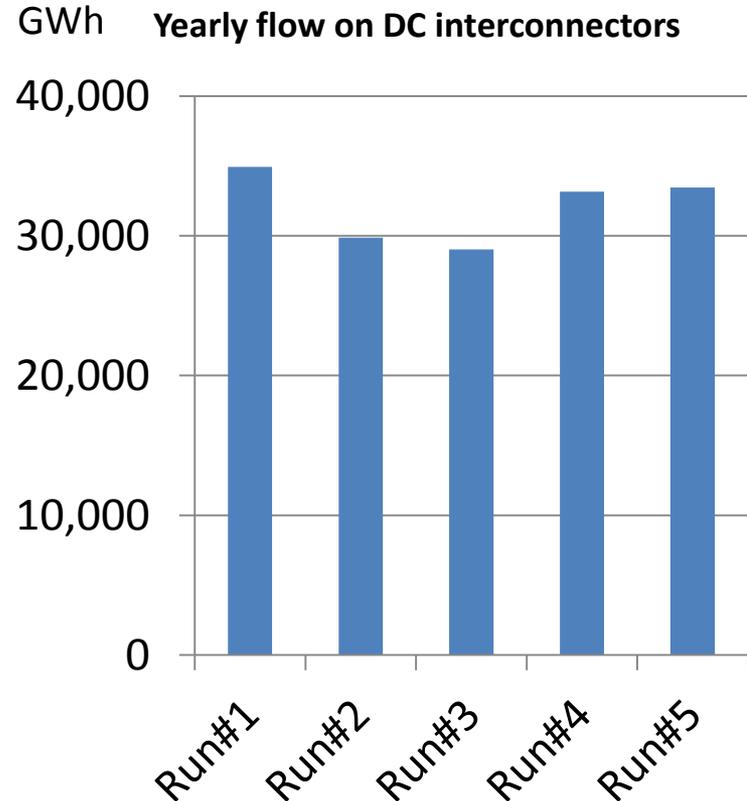
Price effects

- Prices and flows will not change if the lines were already congested and relative price differences were higher than loss factors.
- Price convergence:
 - Price convergence between bidding areas at cable ends is no longer possible except if a parallel AC route remains and is not congested.
 - In regions that have no interconnectors with loss factors included within the region is slightly reduced due to loss factors on interconnectors to or in other regions.



Changes in flow on DC interconnectors

- The flows on interconnectors with a loss factor decrease when losses are included in the coupling mechanism.
- The reason is that the flow will be reduced when the price difference is not sufficient to cover the cost of losses.
- In these cases flow can be reduced to zero, but the most frequent case is that flows decrease but remain positive.





Other findings

- Effect on financial products and long term physical contracts will reflect expected change in price difference and will therefore be small.
- Change in day ahead flow may impact the trade and hence the flow in other timeframes.
 - If a loss functionality is only implemented in DA and not in ID, it is concluded that the net coupling welfare will not be lower than before losses were implemented in DA.
 - However, it has not been done any quantitative analysis across the time frames.
- PTR and FTR can be redefined to take into account losses
 - Models to be further developed



SvK and Fingrid comments to the report

- The study is a good tool for further analysis and discussion
- Strong assumptions leaving several aspects without consideration, e.g.:
 - appropriate market design, impact on cross border trade, fair competition, incentives for building interconnectors, overall impacts on the adjacent networks, and legal issues
- To be able to assess the overall impact of activating a loss factor on interconnectors it is necessary to also include also these aspects.
- In our point of view it is not correct to discuss about welfare maximization when the large part of the system affecting welfare is not taken into account.
- The study should not serve as the only basis for a decision to activate (i.e. include) a loss factor on one or several DC/AC interconnectors.



Further steps

- TSOs have answered the questions from NRAs and have not received and further questions on this issue.
- The TSOs will on a border by border decide if they want to apply to the relevant NRA to implement losses.