

Methodology Grid Analysis

March 24 - 2011

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Overall methodology

Main focus of study

Assessment of Benefits

Scenario EU2020/B
- 2015 NTCs

Scenario EU2020/B
- 2015 NTCs + inv. portfolio

- Market benefits (EMPS)
- Security of supply (MAPS)
- Investment costs
- Changes in losses

Socio economic
Cost/benefit results
for the inv. portfolio

Contingency/Losses analyses of planning cases (snap shots)

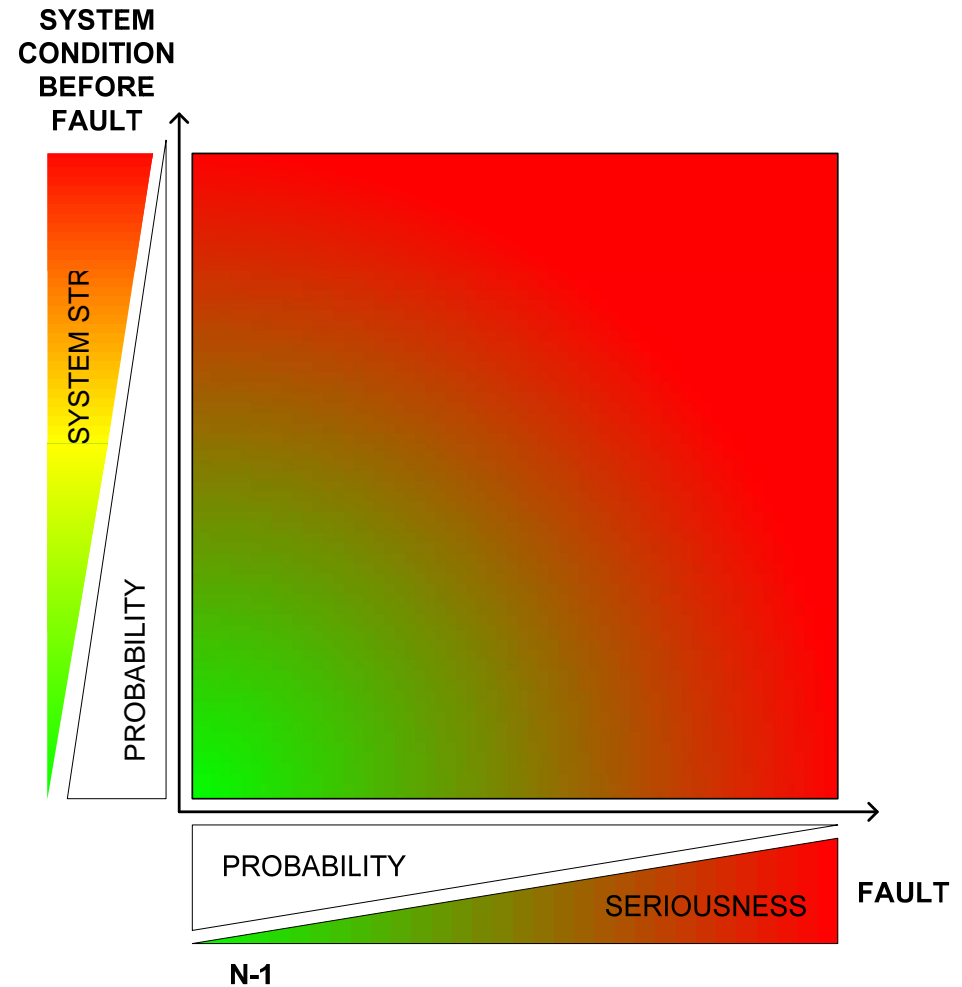
Scenario EU2020/B
- 2015 NTCs + inv. portfolio

Grid Model
- High transmission flows

NTC calculations
Contingency analysis
Calculation of losses

Grid Planning Criteria

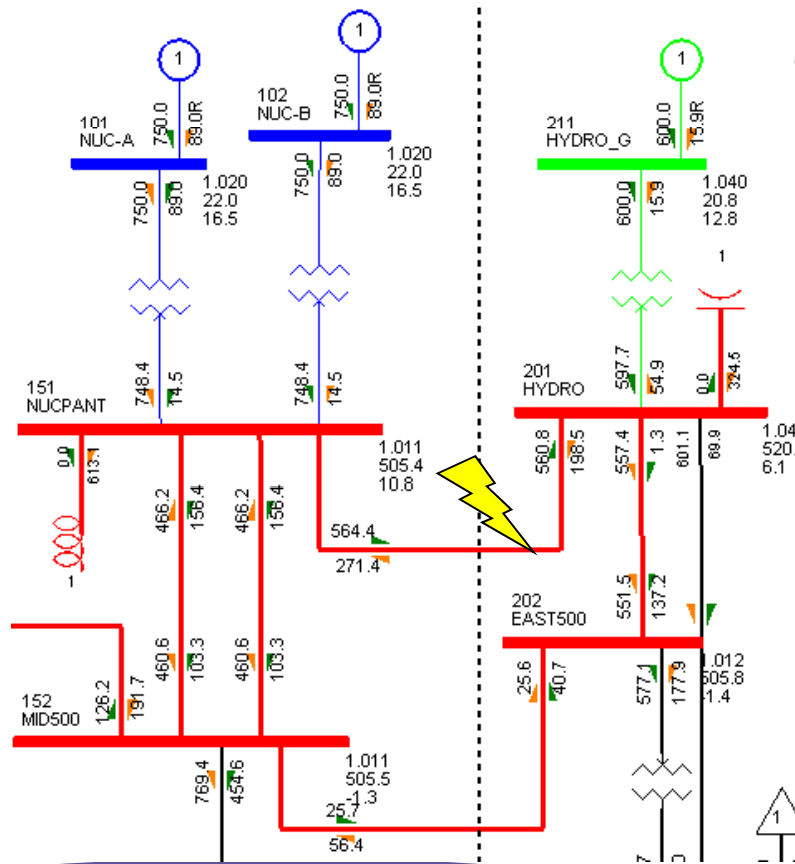
- Faults with high probability should lead to small consequences
- Faults with low probability may lead to more serious consequences
- N-1 faults in the meshed grid shall not lead to any consumer interruptions.



Grid Planning Criteria

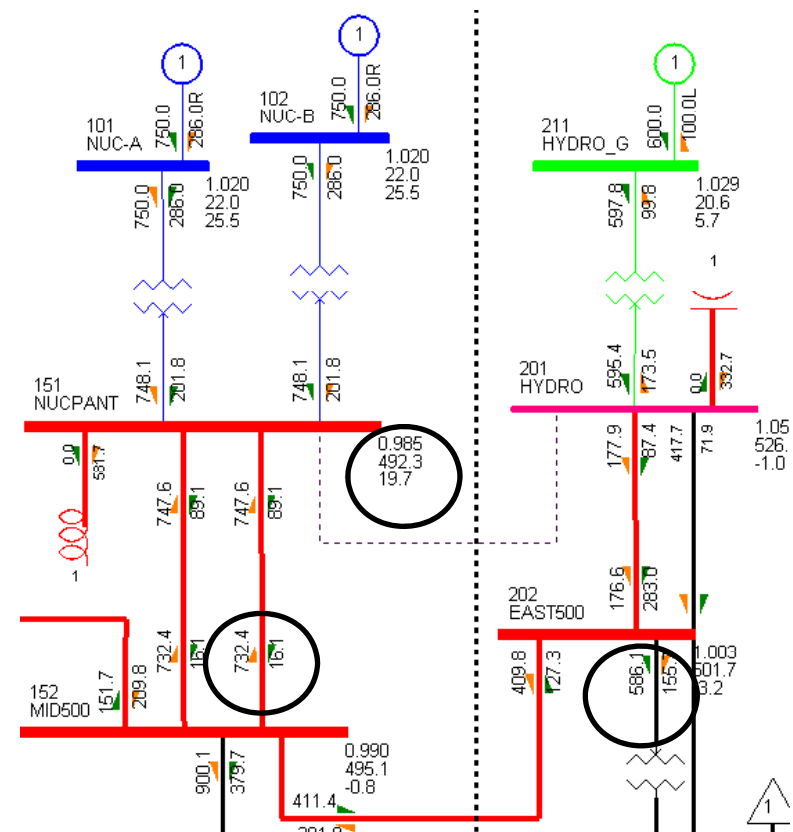
Example: N-1 contingency analysis

Before fault



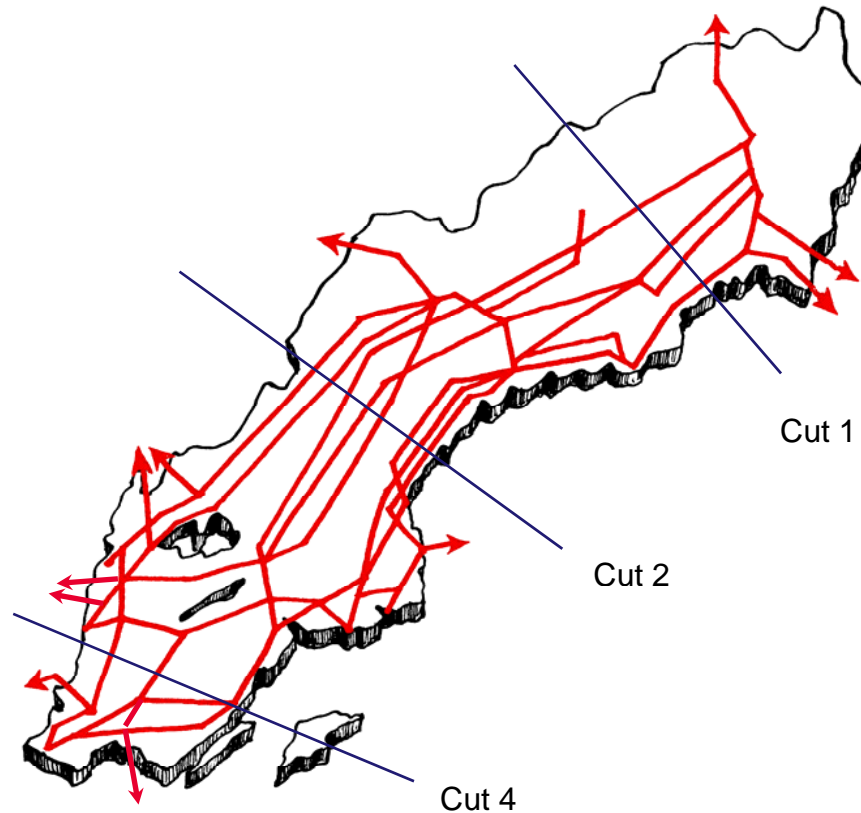
After fault

- Check line/transformer limits
- Check voltage levels



Grid Planning Criteria

Example: Transfer limits



- Defined as highest transfer that after the dimensioning N-1 fault leads to 'stable' conditions
- Normally, the transfer shall within 15 minutes after a fault have been reduced to a limit where the system can withstand another fault

Planning cases (snap shots) - output

Each TSO responsible to perform relevant contingency analysis for the year 2020 as a quality check of the investment portfolio.

According to ENTSO-E Grid Planning Standards:

Load flow analysis (n-1, SoS)

Short circuit analysis

Voltage collapse

Stability analysis

Evaluation of previously assessed GTC increase

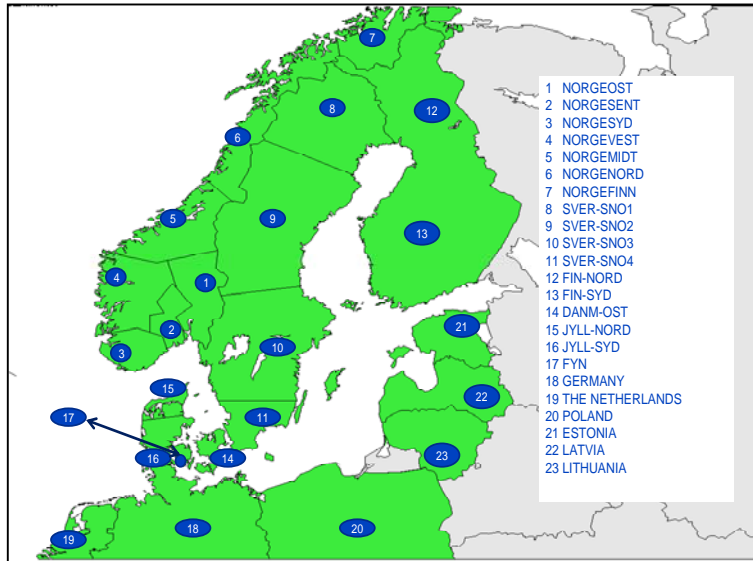
Evaluation of changes in losses

A few snap shots per country representing strained situations

- High wind/low load
- High inflow
- Max import/export

5 snap shots for each scenario covering most hours of a typical year

Snap shots - general methodology



Each planning case (snap shot) is selected in the market model.

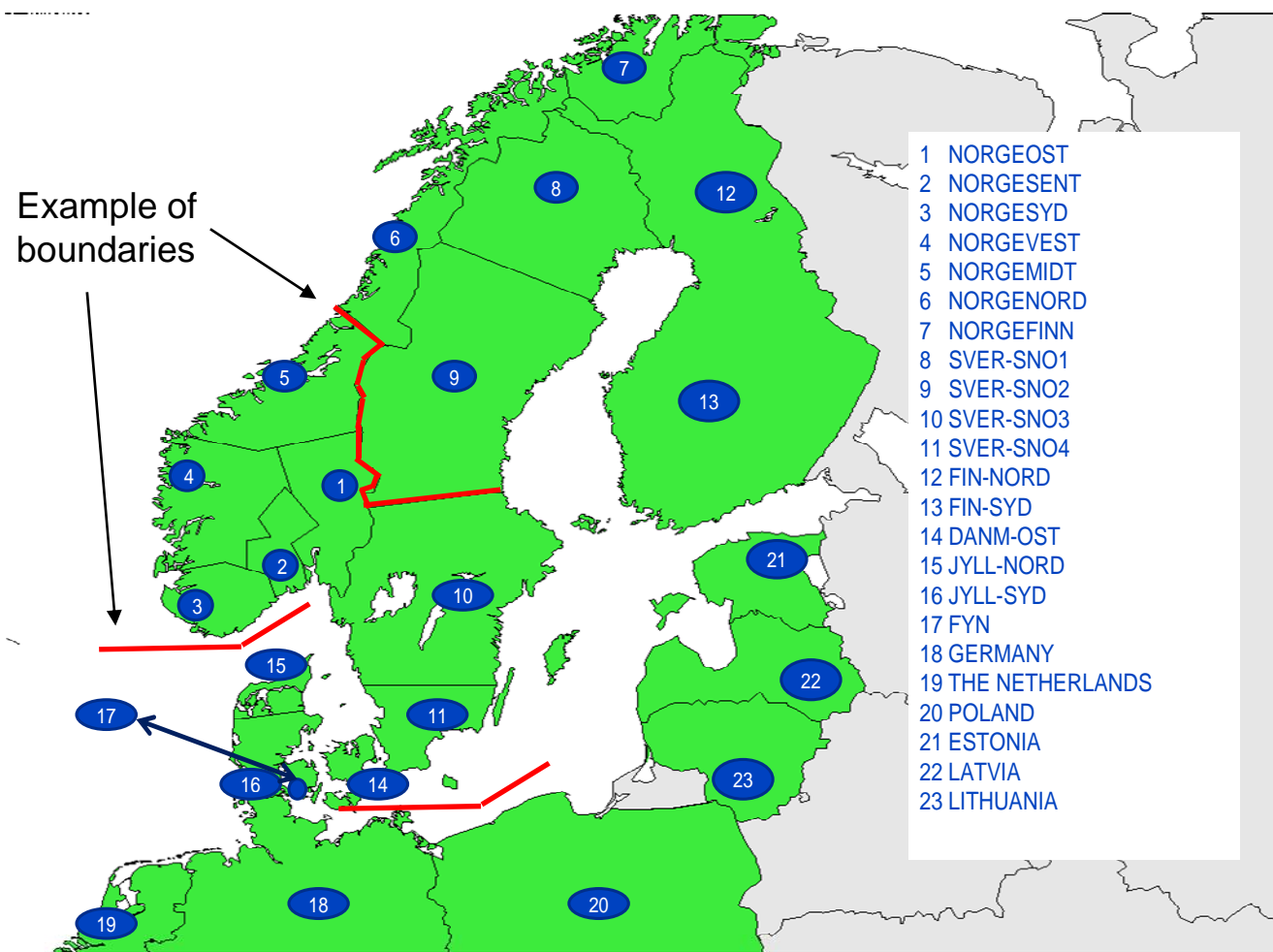
Output from market model in each modeled area:

- Production (generation mix)
- Demand
- Import/Export



Grid Model
e.g. PSS/E

Example: Snap shots for Sweden and Norway

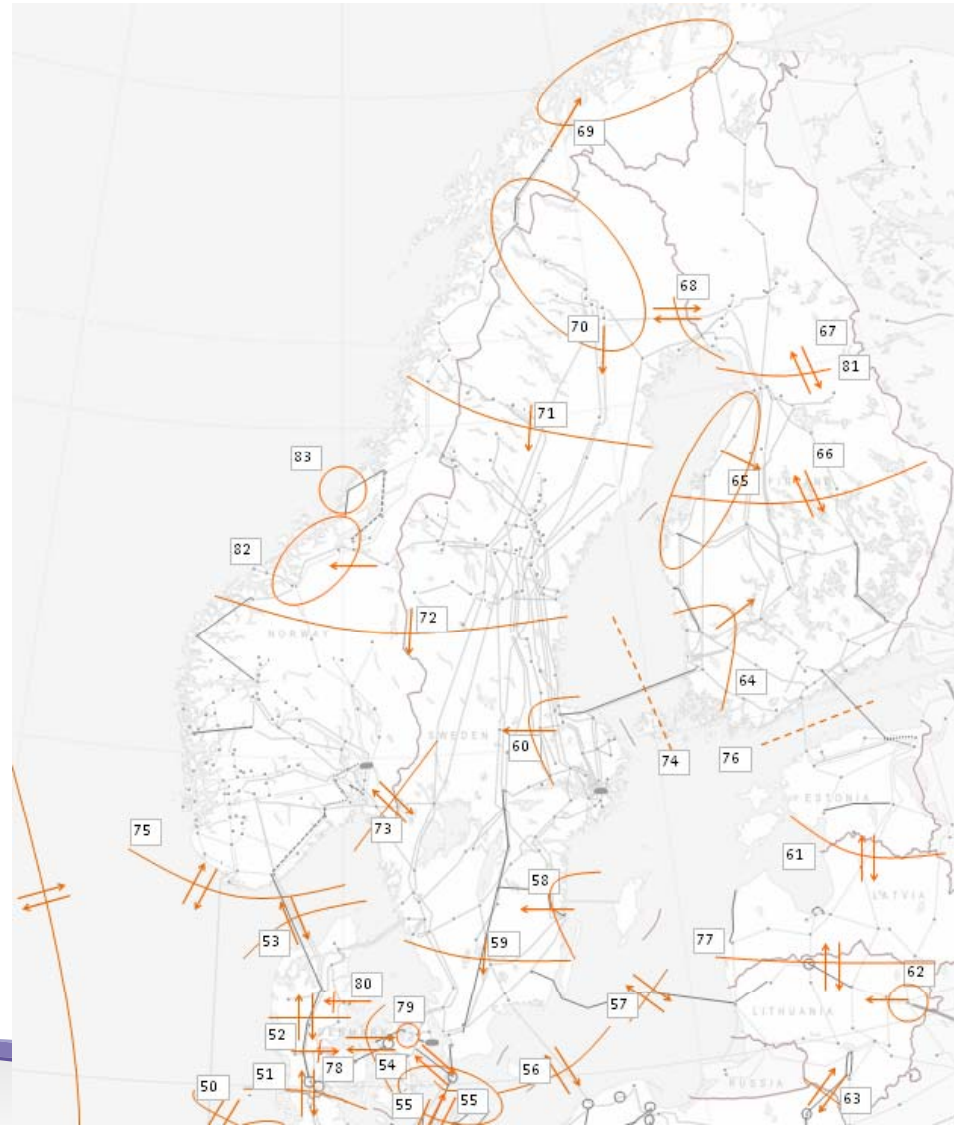


Snap shot
Highest power flow north
to south between marked
areas from market model

**EU2020 scenario with
investment portfolio
included**

Draft boundaries for the Baltic Sea Region

- A boundary is a section of the grid from one area across which it appears relevant for TSOs to assess grid transfer capability values.



Improvements for the future – more iterative process

