BZ Review
MESC meeting

17/09/2019

BZR methodology content

Content of BZRR methodology

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A3: The Bidding Zone Review process (4 steps)

Define the exact scenarios and assumptions considered by each BZRR for elements not defined yet by BZ Review Methodology.

Perform the simulation according to the Methodology and these scenarios and assumptions

Evaluate the criteria describing the performance of the configurations resulting from the simulation chain as proposed in the methodology

Determine and **publish a final recommendation** on maintaining or amending the bidding zones within the BZRR.

A4: Configurations

- The BZ Review shall be carried out on a regional level (by each BZRRs).
- The TSOs of a BZRR shall deliver a set of bidding zone configurations for their BZRR which are to be used in the BZR Process. These sets of configurations contain the current BZ configuration as the benchmark configuration and additional alternative configurations.
- If sufficient justification is provided on the absence of structural congestions that have impact on neighbouring bidding zones under the consideration of applicability of the 70% criterion as intended in Article 16(8) of the IME regulation, TSOs of a BZRRs may submit only the status quo configuration, subject to approval of all national regulatory authorities. In this case, no alternative configurations will be investigated by the TSOs of these BZRRs in the BZ Review.

A5: Scenarios and assumptions

Target year	• **third year from methodology approval** defined as the Base Year. The **data set used for the Base Year shall be based on the year 2025, to align it with the TYNDP scenarios available**, and may incorporate the adjustments or qualitative assessment to show differences between the third year from methodology approval and 2025.
Grid data	• network model shall be based on the TYNDP 2020 process for the 2025 reference grid taking into account at least relevant network elements operating at voltage levels of at least 220 kV and higher that are likely to be built until the end of the Base Year;
Weather years	• allow for simulating different climatic conditions. **The model shall be run for at least one representative weather year**, which may derive from the TYNDP clustering process;
Load / Generation Data	• Zonal load resp. generation data shall be based on the demand resp. generation data from the Pan-European Market Modelling Database (hereinafter "**PEMMDB**") 3.0 'national trends' scenario for relevant target year;
Sensitivity analysis	• additional optional sensitivity analyses on input data or grid infrastructures may be performed by the TSOs of a BZRR

A6: Modelling chain

Capacity Calculation:
- 70% implementation taken into account

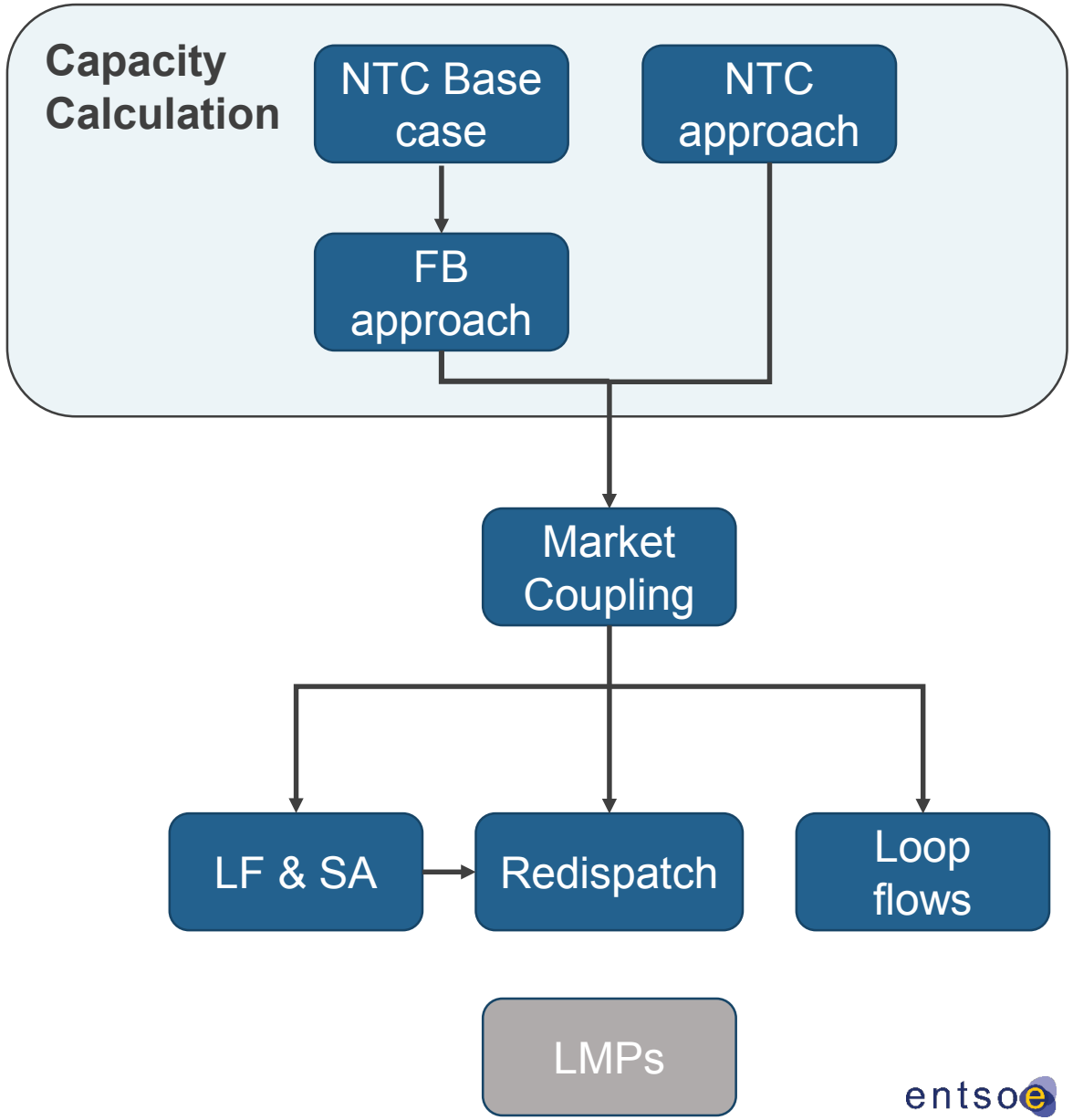
Market Coupling:
- Market dispatch

Load Flow and Security Analysis:
- Simulating real physical flows in grid

Redispatch:
- Determine and implement remedial actions

Loop Flows:
- Impacts of different BZ configurations on loop flows

Optional LMPs (isolated run):
- NOT a benchmark for results



A7: Capacity calculations

General approach

- Choice between NTC and FB by BZ border in accordance with foreseen process in the Base year
- CEP 70% requirement will be applied (in accordance with ACER recommendation or method defined by the relevant NRA)

Implementation

- Methodology offers different possibilities in order to reflect foreseen practices in different regions with the best simplicity/accuracy trade-off
- NTC computation: 4 options
  I. Based on percentage of thermal limits
  II. Based on process-specific computation
  III. Based on PTDF
  IV. Values from TYNDP for existing borders
- FB computation: some flexibility in determination of CNECs and FRMs
- Non-costly remedial actions can be taken into account

A8: Market coupling

Market coupling simulations are based on:

- input data defined for the scenario (load and generation)
- results of the cross-zonal capacity calculation (NTC or flow-based)

The models target cost minimization utilizing linear optimization and assuming perfect competition

- Optionally and if technically feasible, mixed integer optimization can be used instead of linear optimization

Power plant dispatch will be simulated based on input data provided, namely

- short-run marginal costs, based on scenario's fuel and CO2 prices
- weather-dependent parameters, derived from climate time series
- constraints and technical data, such as must-run constraints, hydro restrictions, availability etc

Demand side response will be considered

- In case inflexible demand needs to be shed, value of lost load is applied as cost for the shedding
- Demand side response is simulated similarly to generation

A9: Load-flow and security analysis

Load Flow and Security Analysis (LF&SA) is based on the optimization results delivered by market simulations

LF&SA calculations (DC load flow recommended) are performed in order to assess potential congestions and (n-1) security in the grid model

Optional for LF&SA:

- AC load flow calculations
- Consideration of seasonal line ratings

Main output of LF&SA simulations:

- Flows on all lines and grid elements in N and N-1 states
- A list of contingencies to be considered by redispatch analysis

A10: Remedial action simulation

Non-costly remedial actions: PSTs, HVDC, topological actions

Target: simulate them

Only PST (and HVDC ?) remedial actions are expected to be easily feasible

Topological actions: very difficult

Fall-back options are granted to avoid overestimating redispatching costs in TSOs that make a heavy use them:

- Fully remove 220 kV level from the grid model
- Adapt topology to solve most constraints
- Remove 220 kV level fully or partially from redispatching module
- Perform full optimization of topological actions outside the simulation chain on a limited number of timestamps.

Costly remedial actions: redispatch

Cost-based optimization,

- irrespective of the bidding zone or control area borders, in line with EU redispatch target model (Article 13 of CEP).

Available units for redispatch based on TSO survey.

Available redispatch capacity respects the market coupling dispatch.

Prices allow mark-ups representing e.g. opportunity costs, the mark up is not yet determined.

A11: Flows not induced by cross-zonal trade analysis

- The proposed loop flow approach comes from Core methodology
- It consists in determining the flows in a zero exchange situation (all net positions of BZs included in the CGM shifted to zero):

$$\vec{F}_{0,all} = \vec{F}_{ref} - \mathbf{PTDF}_{all}\,\overrightarrow{NP}_{ref,all}$$

- $\vec{F}_{0,all}$ represent **Flows not induced by cross-zonal trade** on all the cross-border lines.

A12: LMP analysis

General approach

- The LMP analysis is an optional part of the modelling chain and can be used for the model-based assessment of Bidding Zones within the regions (green field approach)
- The decision whether to include an LMP analysis lies with the TSOs of a BZRR
- In case of high LMPs (positive or negative) the reason has to be investigated and, if possible, input data should be corrected, and the simulation repeated

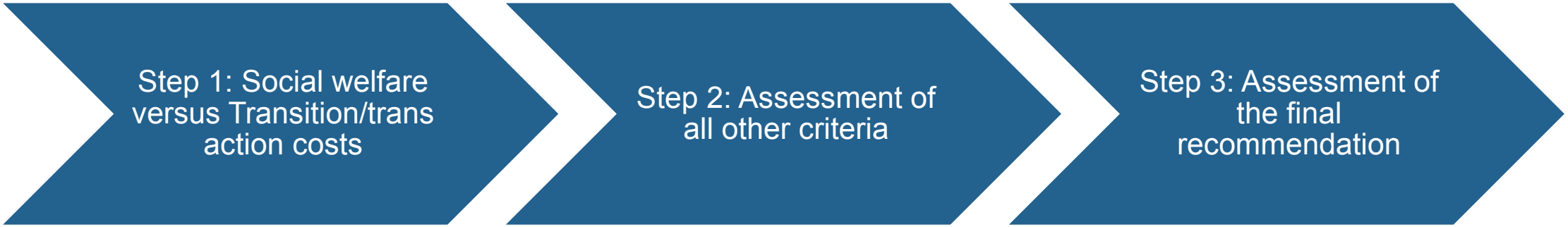
Implementation

- Minimization of total system costs taking into account the capacity of relevant grid elements, the nodal energy balance and the capacity limits of all power plants considered
- Consideration of the (n-1)-criterion, at least with a limited list of critical outages
- Consideration of topological measures, but due to high computational requirements not within the optimization. .

A13: Evaluation

- A **three step approach** will be followed for the final assessment in order to arrive at a recommendation to adapt or maintain the current bidding zone configuration

- The methodology specifies on a high level how to assess each criterion while leaving enough flexibility for different Regions to further agree on the details during the Review as the needs from the Regions may be different



- Additionally to the CACM criteria, there will be one more criterion “RES integration” which will show RES infeed of the simulated years but focus on their long-term development

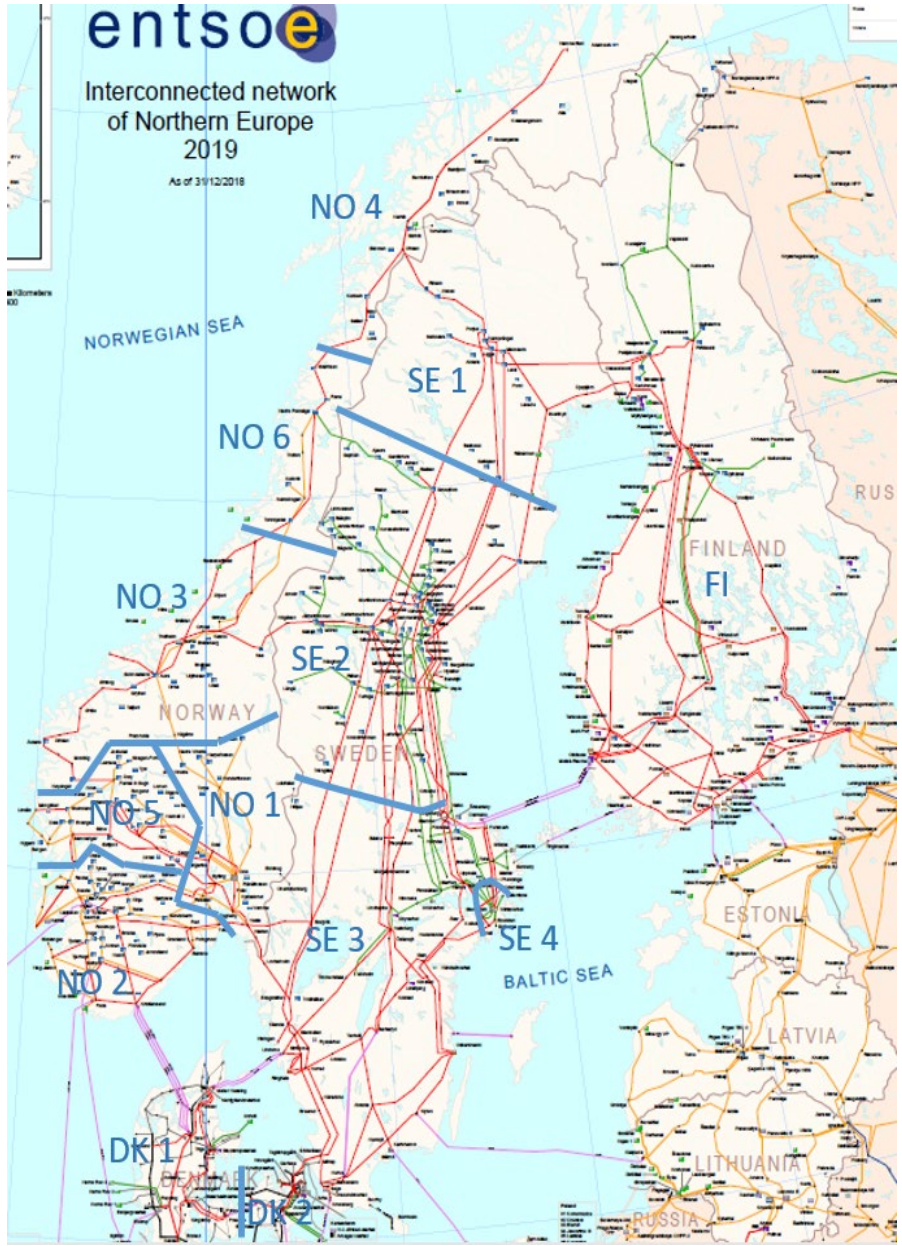
Configurations

Configurations: status quo

Bidding Zone Review Region	Bidding zones included
Iberian Peninsula	ES, PT
UK	GB
Central South Italy	IT2, IT3, IT4, IT5, IT6,
Baltic	EE, LV, LT
Ireland	SEM (IE, NI)

Justifications will be provided on absence of structural congestions

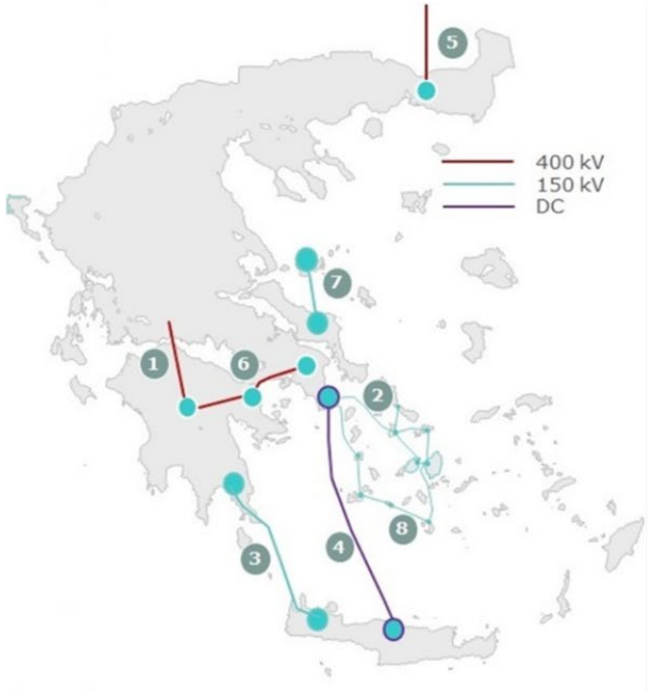
Alternative configurations – Nordic BZRR



Nordic	TSO	BZ1	Action Plan	Config 1	Config 2	Config 3	Config 4
				Current Configuration	Split of NO4 (NO4a and NO4b)	Merge of current SE3 and SE4, and new SE4	Config 2 and config 3 combined
Denmark	Energinet	DK2	No	1 BZ	1 BZ	1 BZ	1 BZ
Sweden	Svenska kraftnät	SE1, SE2, SE3, SE4	No	4 BZ	4 BZ	4 BZ (expert based)	4BZ (expert based)
Finland	Fingrid	FI	No	1 BZ	1 BZ	1 BZ	1 BZ
Norway	Statnett	NO1, NO2, NO3, NO4, NO5	No	5 BZ	6 BZ (expert based)	5 BZ	6BZ (expert based)

Alternative configuration to be analysed for Sweden and Norway. In the proposed configuration regarding Sweden, a modified BZ SE3 is introduced in the Stockholm Metropolitan Area. The current BZ SE4 is expanded to include the remaining area of current BZ SE3. In Norway a split of NO4 is proposed, and a new BZ NO6 is introduced. For Denmark and Finland no alternative configuration will be assessed at this stage.

Alternative configuration – SEE BZRR



ID	Project description	Expected commissioning year
1	First 400 kV branch to Peloponnese (OHL Megalopoli – Patras – Acheloos)	2019
2	Cycladic Islands interconnection (Phases A, B and C)	2020 (2018 for Phase A, 2019 for Phase B and 2020 for Phase C)
3	Crete interconnection (Phase I)	2020
4	Crete interconnection (Phase II)	2023
5	New 400 kV interconnector to Bulgaria N. Santa (GR) – Maritsa (BG)	2023
6	Second 400 kV branch to Peloponnese (OHL Megalopoli – Korinthos – Koumoundouros)	2024
7	Skiathos island interconnection	2020
8	Cycladic Islands interconnection (Phase D)	2024

Configuration 2 "Bidding Zones: GR, CR" (New Configuration)									
Cty-CBk	Bidding Zone Border	TSO1	Station 1	TSO2	Station 2	Voltage level [kV]	Type	Network element Name	New/different compared to status quo?
GR	GR - BG	IPTO	a.Thessaloniki b. Nea Santa	ESO-EAD	a. Blageovgrad b. Maritsa East	400 kV 400 kV	AC AC		No
GR	GR-CR	IPTO	a. Molaoi b. Koumoundourou	IPTO	a. Chania b. Damasta	150 kV 500 kV	AC DC		Yes
GR	GR-IT	IPTO	Arachthos	TERNA	Galatina	500 kV	DC		No

Alternative configurations overview

BZRR	BZ included	Alternative configurations
Central Europe	FR, BE, NL, DE/LU, AT, CZ, PL, SK, HU, SI, HR, RO, DK1, CH, IT1	-
Nordic	FI, SE1, SE2, SE3, SE4, NO1, NO2, NO3, NO4, NO5, DK2	Yes
SEE	BG, GR	Yes
Central Southern Italy	IT2, IT3, IT4, IT5, IT6,	No
Iberian Peninsula	ES, PT	No
Baltic	EE, LV, LT	No
Ireland	SEM (IE, NI)	No
UK	GB	No