

ENTSO-E Ten-Year Network Development Plan & Regional Investment Plans in 2014

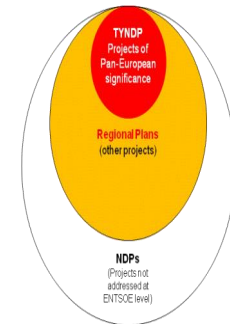
- General Approach and Methodology -

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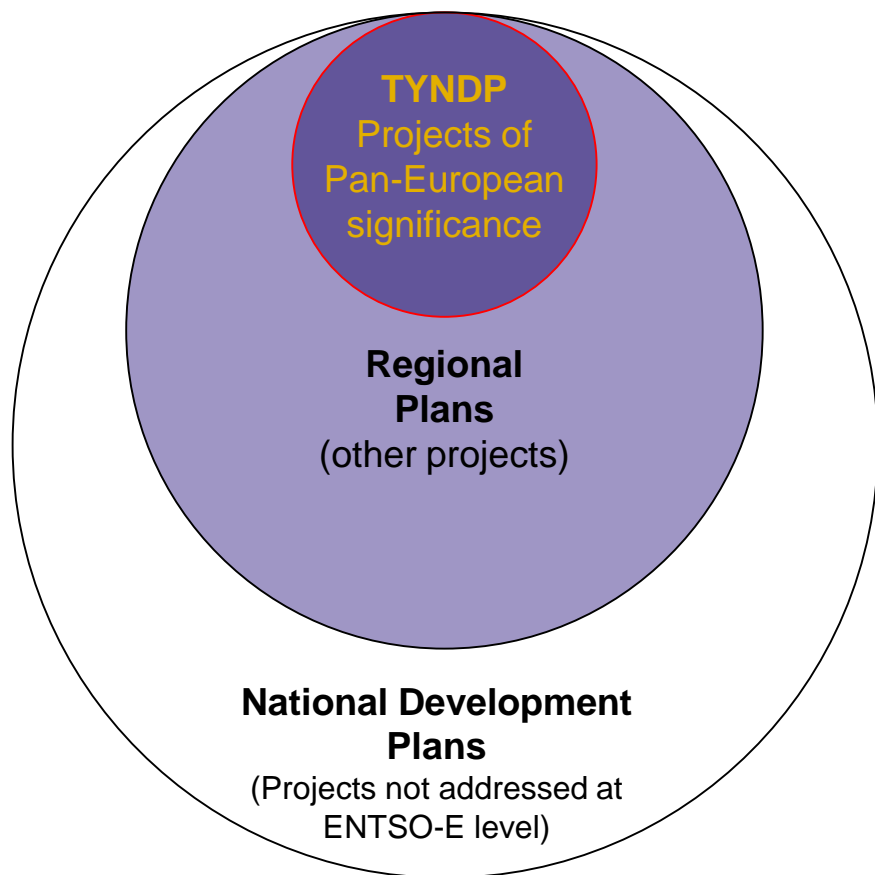
CSE Regional Workshop on TYNDP & RgIP 2014
Zagreb, 27-03-2014

Scope and Objectives

- The TYNDP process produces:
 - A report on the **projects of pan-European significance** for the whole entso-e region (TYNDP)
 - 6 Regional Investment Plans (RglP)
 - Report on Scenario Outlook and generation adequacy (SOAF)
- Objectives:
 - To inform all the stakeholders on the expected future developments of the transmission networks
 - To detect any weak points in the networks and mutually propose solutions
- Taking into account:
 - Views and plans of TSOs
 - 3rd party plans and proposals for new transmission investments
 - The european targets for low carbon electricity sector and market integration



What cover the projects of Pan-European significance?



Definition of Projects of Pan-European Significance

- Meeting the EU energy targets: RES, SoS, IEM
- Voltage & capacity thresholds

From TSOs & 3rd party promoters

- Non-discriminatory procedure

Basis for further selection of Projects of Common interest



- *A Project of European significance is...*
 - ... a **set of EHV assets** (with at least one part in Europe);
 - ... all contributing to a same **grid transfer capability** increase across a grid boundary, valuated in MW;
 - ... matching the following **thresholds**:
 - main equipment > 220 kV for OHL AC and > 150 kV else
 - Grid Transfer Capability Increase either
 - enabling > 500 MW of additional NTC; or
 - enabling or securing output of > 1 GW/1000 km² of generation (new and/or existing); or
 - securing for > 10-year load growth for an area > 3 TWh/yr.

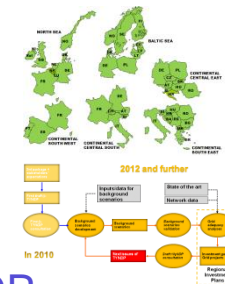
EC Reg.
2010/617 on
notification of
infrastructures

EC 2009/72

Major improvements

- An organisation framework to elaborate Plans

- Identification of Europeans regions relevant for grid development
- A looping elaboration process, constantly improving
- A public procedure to identify 3rd Party projects
- Consistent approaches for Regional Investment Plans and TYNDP



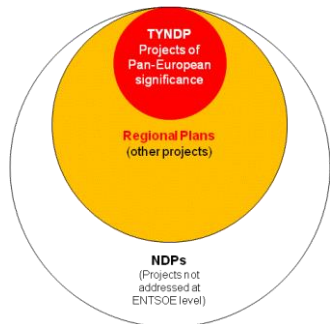
- Bottom-up & top-down scenario development

- Consulted, complying with EC initiatives and Member States positions

- Methodology for project assessment

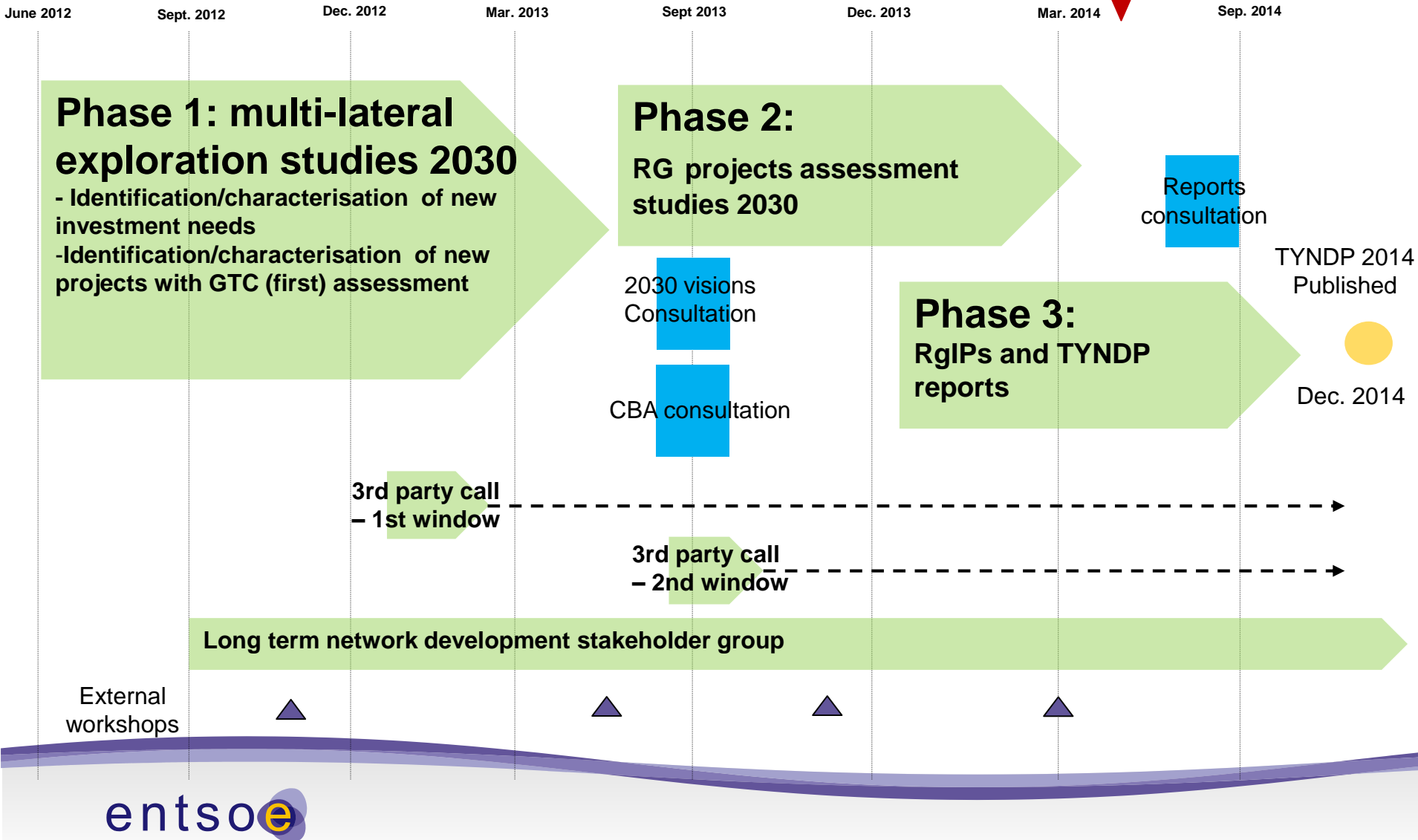
Grid transfer capability increase	Social and economic welfare	RES integration	Improved security of supply	Losses reduction	CO2 emissions reduction	Technical resilience	Flexibility	Social & environmental impact	Costs
+	+	+	+	+	+	+	+	+	+

- Explicit definition of projects of pan-European significance
- Projects identification & standard assessment: **Cost Benefit Analysis**
- Basis for future **Project of Common Interest** selection at Regional level

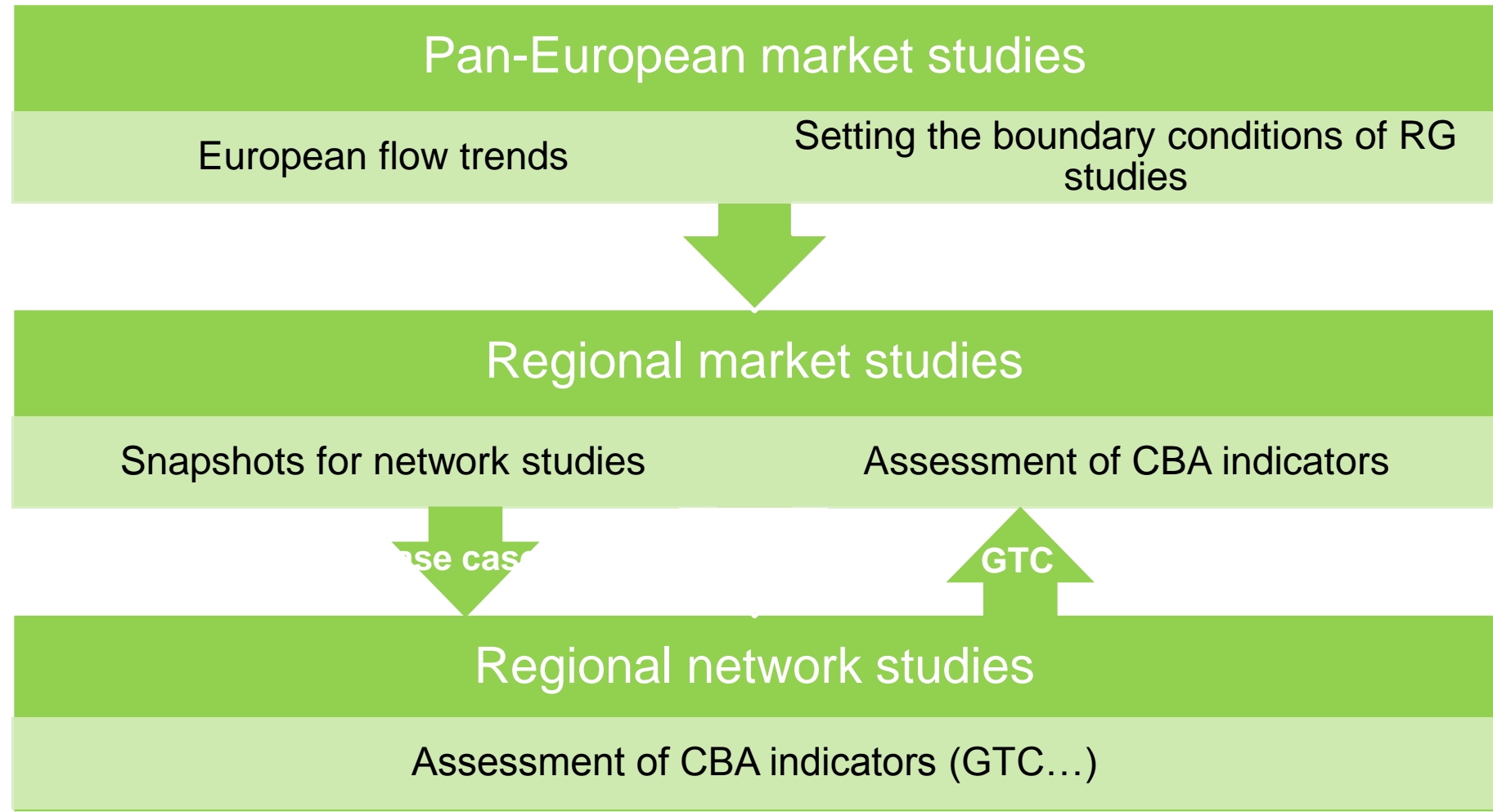


⇒ Many bilateral meetings, external workshops, consultations
 ⇒ ... with limited feedback

TYNDP 2014 - improved process, open to stakeholders



TYNDP 2014 – How is the assessment performed?



Ten- Year Network Development Plan 2014

Process at a glance: scenario elaboration and validation

Scenario
elaboration &
validation

Market
studies

Network
studies

CBA
evaluation

TYNDP 2014

2 Bottom Up & 2 Top Down
Scenarios on 2030

External Workshops With Stakeholder For
Gathering Info & Fine Tune Models:
4 Workshops With Stakeholder

Expert Team Focused On Pan
European Scenario Building:
12 Physical Meetings + 40 Telco

Main Steps

For the target horizon

- **Data collection**
 - **From TSOs and third parties**
- **Build up scenarios – visions for the target horizon**
 - **Bottom-up (based on collected data)**
 - **Top-down (driven by targets)**
- **Clustering of investments - rules applied**
 - **less than 5 years time span**
 - **more than 20% contribution to the total increase of GTC**
- **Setting a “Regional” network model**
- **Carry out “Market” and “Network” studies to calculate specific indicators and apply CBA methodology**

Project assessment: multi-criteria approach



- Every project valuated against 9 criteria

Grid transfer capability increase	Social and economic welfare	RES integration	Improved security of supply	Losses variation	CO2 emissions variation	Technical resilience	Flexibility	Social & environmental impact
+ ... MW								
+ ... MW								
+ ... MW								

- Basis for further selection of
Projects of Common interest

+ technical description
+ monitoring

Assessment of projects: A multi-criteria approach



- The goal of project assessment is to characterize the impact of transmission projects, both in terms of added value for society (increase of capacity for trading of energy and balancing services between price zones, RES integration, increased security of supply, etc.) as well as in terms of costs.
 - Grid Transfer Capability Increase (GTC)
 - Social Economic Welfare (SEW)
 - RES integration
 - Security of Supply (SoS)
 - Losses variation
 - CO2 emissions
 - Technical Resilience
 - Flexibility
 - Social and Environmental impact

Project Assessment- Indicators (I)

- **Grid Transfer Capability (GTC)** is the ability of the grid to transport electricity across a boundary, i.e. from one area (price zone, area within a country or a TSO) to another. It depends on the considered state of consumption, generation and exchange, as well as the topology and availability of the grid. It is expressed in MW, and represents maximum transfer capability between two areas calculated under certain conditions. GTC represents a rough estimation of the ability of the grid to transfer power. It should not be confused with NTC.
- **Social Economic Welfare (SEW)** on electricity markets is characterized by the ability of a power system to reduce congestions and thus providing an adequate grid transfer capability, reflecting to the needs and willingness to pay market players and consumers. The social and economic welfare benefit is calculated from the reduction in total variable generation costs associated with the GTC variation that the project allows
- **RES integration** is defined as the ability of the system to allow the connection of new RES and unlock existing “green” generation, while minimizing curtailments. RES integration is facilitated by increasing the GTC between an area with excess of RES generation and another area where this production can be consumed by reducing other type or generation.

Project Assessment – Indicators (II)



- **Security of Supply (SoS)** is the ability of a power system to provide an adequate and secure supply of electricity in normal conditions. SoS is evaluated by the reduction of proportion of time that the system is at risk due to constraints in transmission system following ENTSO-E standards.
- **Losses variation** has been considered as the ability of a transmission grid to minimise thermal losses in the power system.
- **CO2 emissions** is a result of SEW (unlock of generation with lower carbon content) and losses variation CO2 emissions are calculated using standard emission rates (CO2 emission) for each power plant given in the Pan European Market Data Base.
- **Technical Resilience** is the ability of the system to withstand extreme system conditions (rare contingencies)
- **Flexibility** is the ability of the proposed reinforcement to be adequate in different possible future development paths or scenarios
- **Social and environmental impact** characterizes the project impact as perceived by the local population, investigates crossing of environmentally sensitive areas, and as such, gives a measure of the probability that the project will be build at the planned commissioning date.

Project Assessment methodology



TOOT – Take Out One at a Time:

Project assessment in most plausible future

Conservative approach

Reference network: «all-projects-in» considering needs on each border

Clustering: basic rules

- Project assessment in most plausible future
- Conservative approach

Maybe some needs for adaptations:

- In case of non-mature projects
- Accordance to Scenarios



Equal treatment assured for both TSOs and third Party Projects

Brief description of the Methodology



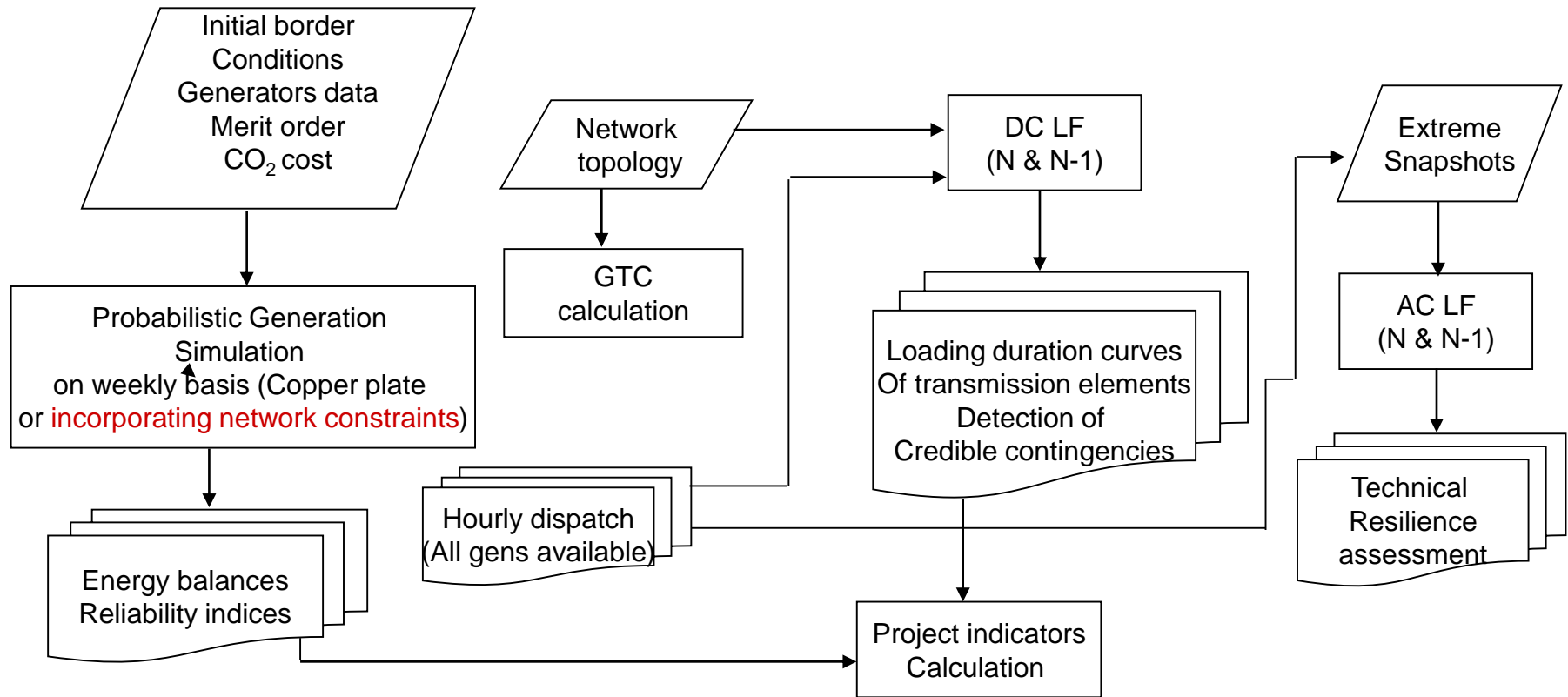
The methodology involves generation simulation (Market studies) and Network analysis

Main steps:

- **Joint simulation of all generation systems in the region in order to determine the 'least cost' dispatch of available generation,**
- **Simulation takes into account a merit order, the flexibility of the units and must-run constraints, ignoring network system constraints (copper plate)**
- **Probabilistic Simulation to calculate energy balances and reliability indices**
- **Based on market simulation, DC power flows are performed to detect possible future congestions (inv. needs)**
- **Duration curves of loading of transmission network elements are calculated**
- **GTCs on boundaries are calculated using AC LF**
- **Hourly power flows are compared to GTCs achieved in order to check TRANSMISSION ADEQUACY**
- **Exhaustive security assessment (N & N-1) for extreme snapshots**
- **Based on the results of the precious steps, the project indicators are calculated**

Overall Methodology description

Market and Network studies consistency

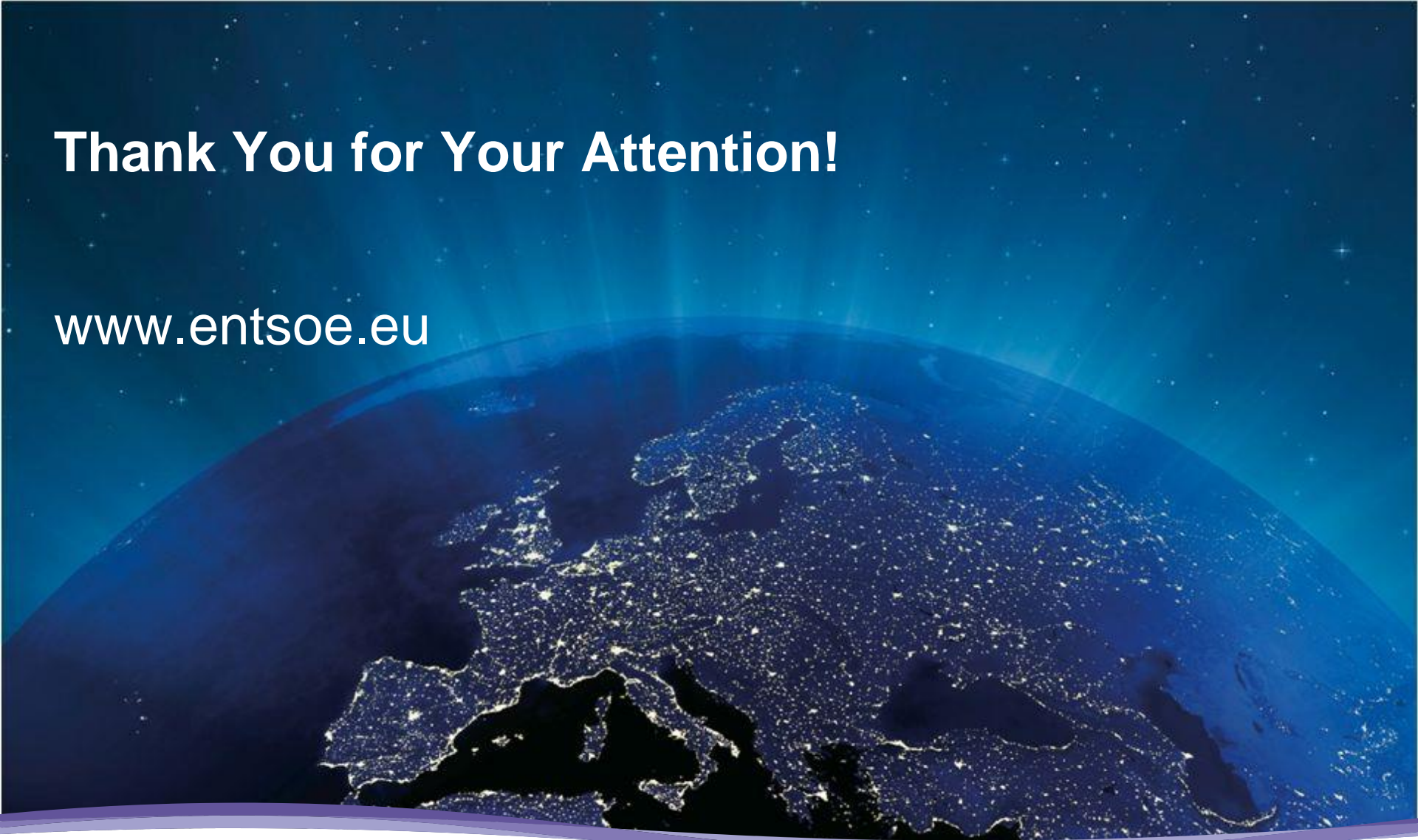


Data and Modeling Hypotheses

- All countries except IT (including AL) modeled in details (full network topology for all voltage levels >150kV, detailed generation models)
- Initial boundary flows were provided by Pan-European Market studies
- Generators modeled in more details than in PEMDB
- Hypothesis of 500 MW export at the Turkish borders
- No exchanges with UA/MD
- Not accurate meteorological data for RES potential in several regions
- Network topology as by WINTER peak 2030 network model provided by WG NM&D
- Compatibility checks (but still to be improved)

Thank You for Your Attention!

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entsoe
Reliable Sustainable Connected

Beyond the clearly needed 2020+ infrastructure: Strategy and architecture for the 2030 and 2050 uncertainties

