entsog

european network
of transmission system operators
for gas

Cost-Benefit Analysis

From methodology to application

TYNDP/CBA SJWS 6 – 13 May 2014

Overview of the next months

Methodology to be published in Summer 2014 by ENTSOG

- Document to be approved by Commission
- Document content:
  - Energy System Wide CBA Methodology (TYNDP & Project Specific steps)
  - Modelling approach
  - Input data to be used in the ESW CBA on a 20-year time horizon

Infrastructure project collection

- Every project candidating for the 2nd PCI selection has to be submitted to TYNDP
- 2-step data collection in Summer 2014

Energy-System Wide CBA implementation

- Application by ENTSOG of TYNDP-step within report to be published Feb. 2015
- Application by promoters of PS-step for selection by Regional Group to be closed on May 2015

Energy System Wide CBA

Content of the adapted methodology

Framework of methodology development

> **Objectives:** supporting PCI selection, CBCA and Investment request

> **Specificities:** system-wide and comparable assessment of each project

> **Constraints:** use of public data and confidentiality of commercially sensitive data

Integrated Energy-System Wide CBA

> A TYNDP-step to be applied by ENTSOG as part of TYNDP:

- Feedback loop on the cumulative impact of latest PCI selection
- Basic assessment supporting the individual assessment of each project

> A PS-step to be applied by promoters on their own project

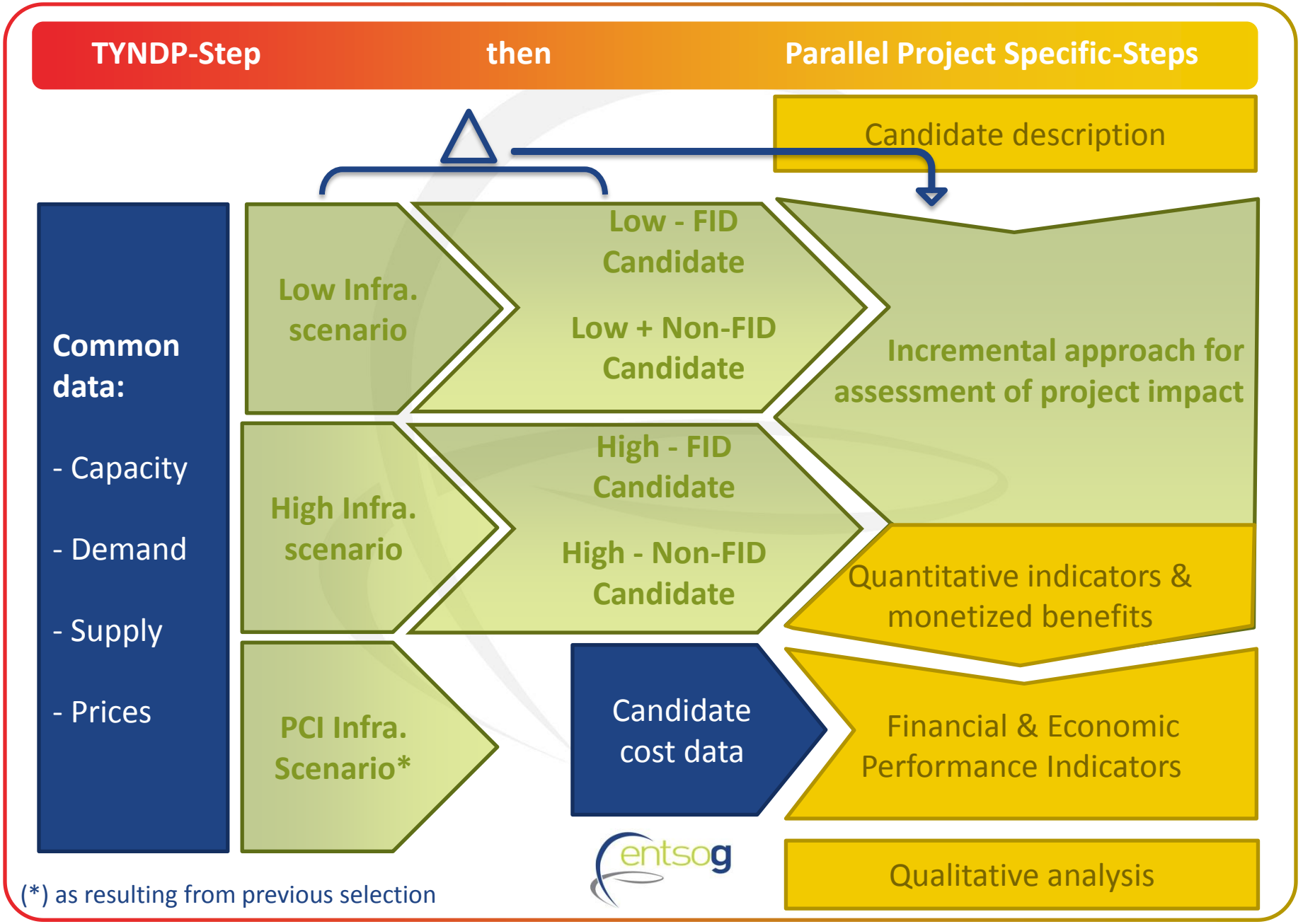
Modelling approach

> Linear programming apply to European balancing zones

> Minimization of the objective function being the gas, coal and CO2 bill for Europe

> Breakdown of monetized benefit per country as an output

Structure of the methodology



Data included in the methodology

Demand data

> Residential, commercial and industrial demand scenario from TSO perspective

> Thermal gap to be covered by gas and coal-fired power generation (2 scenarios considering elements from ENTSO-E visions)

Supply data

> 3 Potential Supply Scenarios per source (including National Production)

> Source maximum deliverability per scenario and climatic case

Capacity data

> Transmission, UGS and LNG firm capacity on 1 January 2015

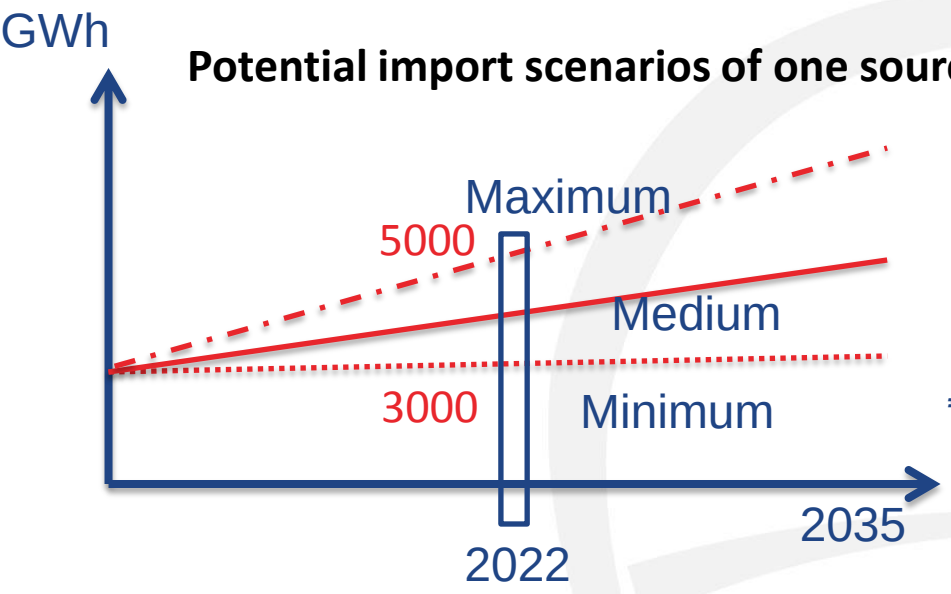
Cost data

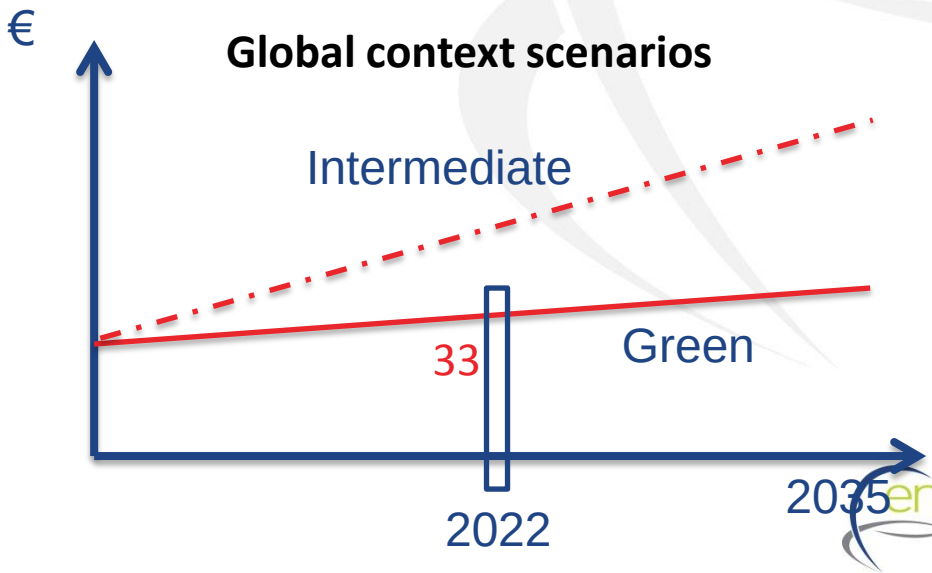
> 2 Global Context scenarios defining consitent average prices for gas, coal and CO2

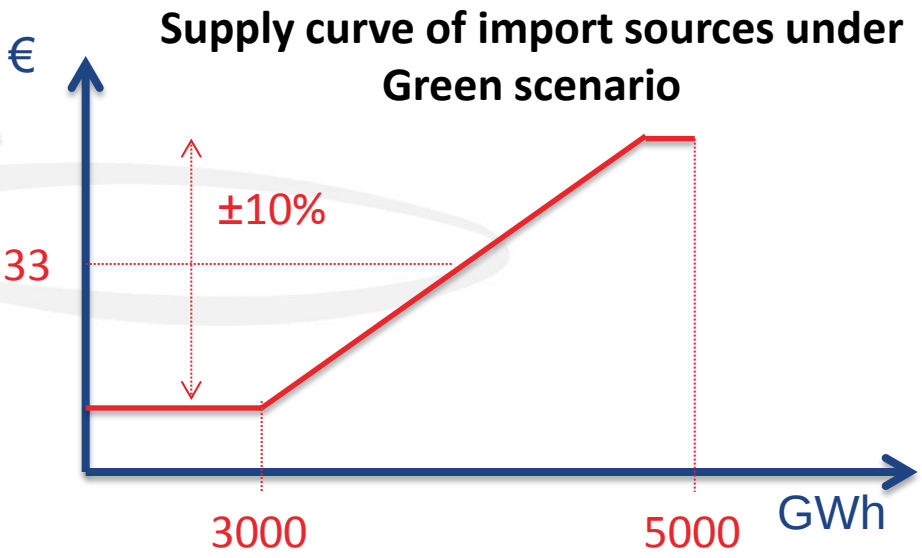
> Supply Curve per source and Global Context scenario

> 1 Social Discount Rate for whole Europe

Focus on the supply curves







Infrastructure project collection

Interactive data collection process

Experience has shown the need of an early check of submissions

- **By end of July 2014:** All projects will have to make a preliminary submission with core data required for modelling:
  - Capacity increment
  - Commissioning date
  - FID status
  - PCI status (according latest PCI selection)

- **By 12 September 2014:** checking of project data (bilateral discussion between promoters and ENTSOG when required) and especially their consistent connection to European gas infrastructures

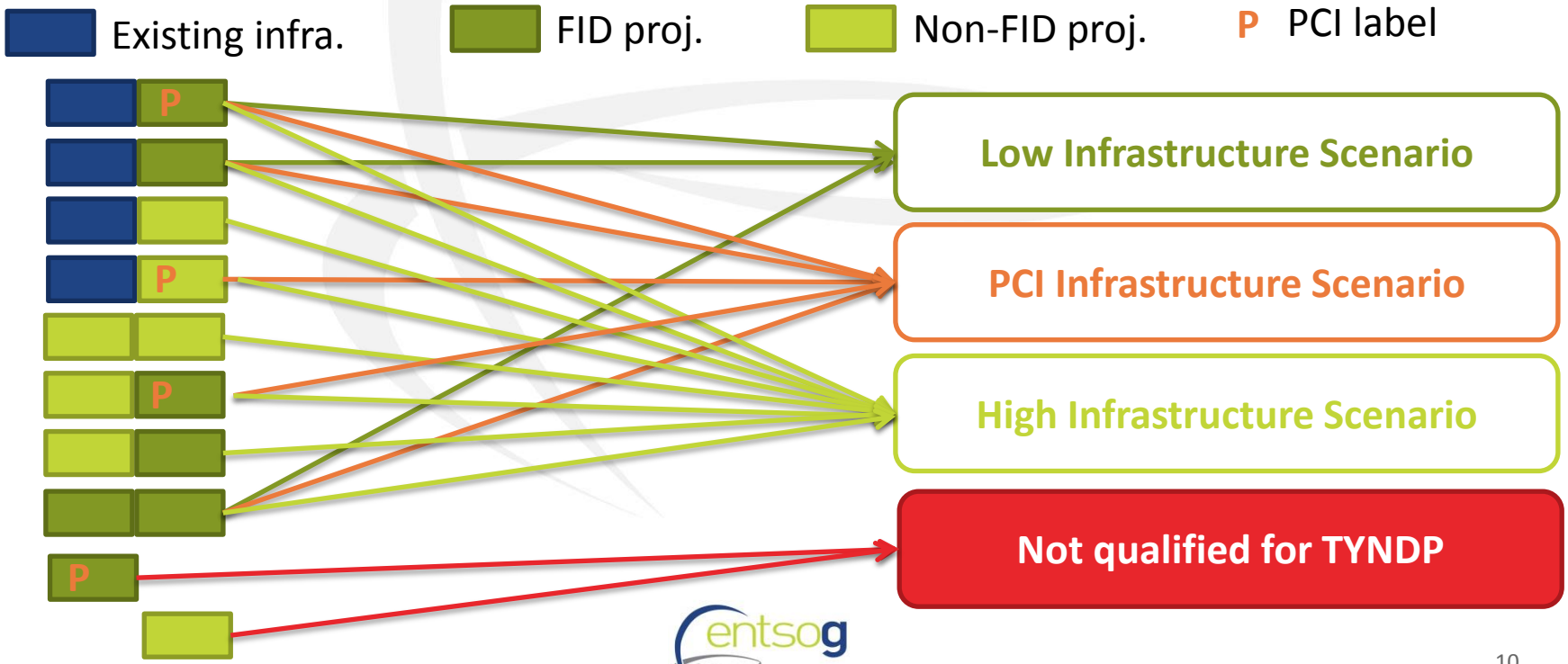
ESW-CBA cannot be applied to stand-alone projects (not connected to another project submitted to TYNDP or to existing infrastructures)

Building Infrastructure Scenarios

Filtering of infrastructure projects

> Identification of:
  - stand-alone project connected to neither existing infrastructures nor other project
  - “mirror projects” as being those requiring their interconnection to produce an effect

> Addition of project increments to the January 2015 capacity level according to their FID/PCI status



Online submission by promoters

Use of an improved Sharepoint portal

- Project collection will be announced end of June 2014 through:
  - A press release
  - The TYNDP/CBA workshop to be organized in Vienna on 26 of June

- Promoters will have to send a request for credential to ENTSOG to access the online collection tool (Project Promoter Portal)

- For projects already submitted for TYNDP 2013-2022 or the 2nd GRIP edition, questionnaire will be already filled with latest information

- Only projects having provided all mandatory data will be included in TYNDP

Active submission by the promoters is requested even if their projects are already in last TYNDP and/or GRIP or granted a PCI status

Implementation of TYNDP-step of ESW-CBA

Indicators & Modelling

Calculation of capacity-based indicators

> Results are given per country:
  - N-1 Regional level
  - Import Route Diversification
  - Seasonal Capacity Balance (to be confirmed)

Modelling of cases

> Definition of a flow pattern based on linear programming for each case

> Approximately 100 cases per year

Calculation of modelling-based indicators

> Results are given per country for:
  - Remaining Flexibility
  - Supply Source Dependence
  - Supply Source Diversification
  - Price convergence

Quantification of disruption & Monetization

In addition to be factored in the formula of modelling-based indicators, flow patterns support…

1/ Quantification of disrupted demand

> For each case, modelling provides the level of demand that cannot be covered by supply in both absolute and relative term per country

2/ Monetization

> For each case, the following monetary information are provided at European and country level:
  - Cost of total gas supply
  - Cost of total coal supply for power-generation
  - Cost of CO2 emission from gas and coal (for power generation)

Implementation of PS-step of ESW-CBA

A recast of the TYNDP-step

Recalculation of cases of TYNDP-step

> For each case of the TYNDP-step, modelling results in a new flow pattern leading to:
  - A lower or equal result of the objective function when adding the project
  - A higher or equal result of the objective function when removing the project

> Based on the new flow patterns, a new value is calculated for:
  - Modelling-based indicators
  - Quantity of disrupted demand
  - Monetization of gas, coal and CO2 cost

> Project increment results in a new value for capacity-based indicators

Project impact through the incremental approach

> Measured as the difference in value of indicators and monetization between calculation with and without the project

Economic Performance Indicators (EPIs)

3 Indicators

> Economic Net Present Value

> Economic Internal Rate of Return

> Economic Cost Benefit Ratio

Economic cash flow

> Benefits coming from the incremental approach applied to monetization

> Costs coming from OPEX and CAPEX of the project

> Discounted using the Social Discount Rate included in the methodology

EPI per case vs. Aggregation and sensitivity-analysis

> Each EPI can be calculated at case level

> The formula of the Economic Net Present Value authorize the combination of the ENPV of different cases

> Sensitivity-analysis on project cost (CAPEX/OPEX) and date of commissioning

Additional results

Environmental impact of the project

> Length/area in sensible area

Impacted area

> Group of countries where the incremental approach shows a change in indicator or monetization

Net benefit per country

> For each year of the analysis:
  - Monetized benefit per country
  - Project cost in countries where infrastructure is built and operated (CAPEX & OPEX)
  - Net benefit per country as the difference of the 2 above items

Qualitative analysis

> Comment on indicators and monetization

> Description and justification of potential benefit of the projects not sufficiently captured by the ESW-CBA

Guidance for result interpretation

Decision-makers should understand

The link between assumptions and project benefits

> Benefits of the projects are likely to vary depending on:
  - Level of infrastructure development
  - Supply prices (Global Context and relative level of each source)
  - Disruption cases

The interaction between projects

> Comparison of results under the Low and High Infrastructure Scenarios will support the identification of projects:
  - In synergy: benefits under High Infra. > Low Infra. Scenario#
  - In competition: benefits under High Infra. < Low Infra. Scenario

The respective role of indicators and monetization

> As providing a different perspective of a given project benefit

This guidance should invite decision-makers not to over interpret CBA results but to take an informed political decision

Thank You for Your Attention

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