ENTSOG and the TYNDP process

ENTSOG Roles and processes

ENTSOG System Development Area
ENTSOG role and TYNDP-related activity
1) What is ENTSOG...?

ENTSOG was created on 1 Dec 2009 and is now comprised of:

44 TSO Members and 2 Associated Partners from 26 European countries

4 Observers from EU affiliate countries:
- GA-MA AD (FYROM)
- Gassco AS (Norway)
- Swissgas AS (Switzerland)
- Ukrtransgaz (Ukraine)
Most ENTSOG tasks are defined by the Third Energy Package

- Development of Network Codes
- Development of Common Network Operation Tools
- Provision of information and data (Transparency Platform, Maps)
- Summer and Winter **Supply Outlooks** *(WSO 2015/16 published in November 2015)*
- **Ten-Year Network Development Plan** *(TYNDP 2015 published in April 2015)*
- Define a **CBA Methodology** to provide common basis for the COM PCI selection procedure – *(approved by COM in February 2015)*

- ENTSOG has voluntarily taken on -based on the request of DG ENER- the simulation of Project-specific CBAs for Project clusters, applying for PCI status
The TYNDP has various objectives

- Reg. (EU) 715: deliver a supply adequacy outlook and identify possible investment gaps
- Reg. (EU) 347: gather all possible PCI candidates, deliver the Energy System Wide Cost Benefit Analysis (ESW-CBA) and be the basis for the project specific assessment of PCI candidates

The TYNDP is developed in close cooperation with all relevant stakeholders

- Consideration of ACER Opinion
- Workshops and Working Sessions with stakeholders, Public Consultation of the TYNDP report
- Cooperation with ENTSO-E
**TYNDP is developed under the frame of the CBA methodology**

> For TYNDP 2017: the CBA methodology approved by EC on February 2015
> It delivers the Energy-System Wide Cost Benefit Analysis on a 20-year range
> It is the basis for the project specific assessment (PS-CBA) of PCI candidates by promoters

**TYNDP and PS-CBAs support the PCI selection by Regional Groups**

> TYNDP gathers all possible PCI candidates
> TYNDP identifies the investment gap
> PS-CBA, developed under the CBA methodology, ensures the assessment of all candidates on common grounds
## 2) TYNDP development timeline

<table>
<thead>
<tr>
<th>TYNDP 2017</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>ON</td>
<td>J</td>
<td>F</td>
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<tr>
<td>Public workshop</td>
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<td>Stakeholder Joint Working Session</td>
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<td>Data collection</td>
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<tr>
<td>Report edition</td>
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<td>Report release</td>
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<td>Public consultation</td>
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</tbody>
</table>

(Blue cells on the chart denote activity periods with green cells denoting key deliverables visible to external stakeholders.)

- **First key step: the stakeholder engagement process**
  - 5 Stakeholder Joint Working Sessions until March 2016
  - Stakeholder contribution will be factored in final TYNDP concept (presentation in a Public Workshop in April 2016) and therefore in the TYNDP assessment

- **Demand data collection**: 21 March - 27 April

- **Call for projects**: project submission 11 April – **8 May**; cross-check 9 May - **25 May**

- **TYNDP 2017 publication in December 2016**
  - The assessment will be final at this date, to support the 3rd PCI selection process
  - Following TYNDP release: public consultation and submission to ACER
TYNDP 2017 in details
The presentation is an overview, providing a high level insight into the TYNDP process

> Detailed information can be found on ENTSOG website in
  - CBA Methodology (approved by EC in Feb 2015)
  - TYNDP2015 Methodological Chapter – Annex F
  - SJWS presentations – on all topics touched upon today there is a detailed presentation

Questions are welcome throughout the presentation
2) ENTSOG ambition for TYNDP 2017

**TYNDP 2015 is the first one developed under Reg. (EU) 347**

- It has inaugurated the application of the **CBA methodology** approved by EC...
- ... and a new role of TYNDP: being the **basis for Project-Specific CBA** of PCI candidates
- TYNDP 2015 and the CBA methodology have allowed a **fair and valuable** assessment of PCI candidates, although perceived as **too complex**
- Following the release of TYNDP 2015, and under the mandate of promoters, ENTSOG has handled the PS-CBA of more than 100 Groups of projects: it has allowed a **very deep and thorough testing** of the CBA methodology and TYNDP basis, and provides a **high-value feedback** that will be reflected in TYNDP 2017

*Strengthened by this experience, ENTSOG has a high ambition for TYNDP 2017*

- Improve TYNDP in a **transparent** manner, making the best possible use of the approved CBA methodology
- To deliver a **comprehensive** and yet **intelligible** TYNDP in December 2016 that will be a **reliable** basis for PCI selection
Throughout the presentation, the following steps will be discussed.

TYNDP is based on a simulation tool consisting of several important blocks:

- The input data – Demand – Supply – Projects – Projects and Assumptions
- The topology – Representation of the existing and planned infra for modelling purposes
- The algorithm – Objective function solved by the optimization engine

What does it deliver?

- The tool is run for different simulation cases
- As a result it provides a number of outputs
3) Introduction to TYNDP modelling

How to imagine the topology...? The shortest way problem...

> The model is at **balancing zones** level (usually **countries**) and is built of
  - **Arcs** – connection between countries with capacities
  - **Nodes** – demand centers representing balancing zones

- The model is a non-hydraulic, linear market model
- The objective function ensures* the EU demand/supply balance at the lowest cost
- The solution has to satisfy demand and respect arc capacities and supply limits (hard constraints)
- Details to be found in the ESW-CBA Methodology and TYNDP 2015 Annex F
- Simulation is run for 2017-2020-25-30-35

*Use of the Jensen solver as developed by Paul Jensen for the Texas University in Austin (https://www.me.utexas.edu/~jensen/ORMM/index.html)
3) TYNDP modelling process overview

**Input data set**
*Data categories defined by Reg. 347*

- **Demand scenarios**
  - Gas demand
    - Final
    - For power
  - Fuel prices
    - Gas
    - Coal
  - CO2 price
- **Supplies** (Supplies)
  - Imports
- **States of the world**
- **Infra levels**
  - Network
    - Transmission
    - LNG TM
    - UGS

**Modelling tool**
*described in CBA meth.*

**Outputs**
*defined by CBA meth.*

- Modelled outputs
- Non modelled outputs

**Data collection from different sources**
*Elec. data*
The following countries are included historically in TYNDP modelling

- Modelling is done for EU28+
- From contracting parties:
  - Serbia, BiH and FYROM are modelled – demand submitted and attached to the Balancing Zone
- Exports have been assumed to the following countries:
  - Turkey, Ukraine, Russia Kaliningrad, Russia Kornati (LV-RU)
4) Demand in the TYNDP - scenarios

Scenarios are possible story lines for the EU energy sector in the future

- ENTSOG sees 3 scenarios
- Aim is to develop plausible story lines for a range of demand.
- ENTSOG is not assigning weight (chance of occurrence) to any of them.

Scenario descriptions are developed as guidance for TSOs to submit bottom-up demand data. ENTSOG does not calculate demand based on the scenarios.
### 4) Demand Scenarios: the story lines

<table>
<thead>
<tr>
<th>TYNDP 2017 Scenarios</th>
<th>Slow Progression</th>
<th>Blue Transition</th>
<th>Green Revolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Policies/Regulation</td>
<td>2050 targets not realistically reachable</td>
<td>Mainly on track with 2050 targets [closure of coal-fired power plants (regulation)]</td>
<td>On track with 2050 targets</td>
</tr>
<tr>
<td>Economic conditions</td>
<td>Limited growth</td>
<td>Moderate growth</td>
<td>Strong growth</td>
</tr>
<tr>
<td>Green ambitions</td>
<td>Lowest</td>
<td>Moderate</td>
<td>Highest</td>
</tr>
<tr>
<td>CO2 price</td>
<td>Lowest CO2 price (limited spread of carbon taxes)</td>
<td>Moderate CO2 price (carbon taxes mainly spread)</td>
<td>Highest CO2 price (carbon taxes well spread)</td>
</tr>
<tr>
<td>Internal energy market</td>
<td>Well functioning, low MS cooperation</td>
<td>Well functioning, moderate MS cooperation</td>
<td>Well functioning, strong MS cooperation</td>
</tr>
<tr>
<td>Renewables develop.</td>
<td>Lowest</td>
<td>Moderate</td>
<td>Highest</td>
</tr>
</tbody>
</table>

### Gas in heating sector

| Energy Efficiency             | Slowest improvement                             | Moderate improvement                                 | Fastest improvement                                 |
| Competition with electricity  | Limited gas displacement by elec. (new buildings) | Limited gas displacement by elec. (new buildings)   | Gas displaced by electricity (district heating, heat pumps) |
| Electrific. of heating        | Lowest                                          | Moderate                                             | Highest                                             |

### Gas in power sector

| Gas vs Coal                   | Coal before Gas (on regulatory basis)           | Gas before Coal (on regulatory basis)                | Gas before Coal (on regulatory basis)               |

### Gas in transport

| Gas in transport              | Lowest penetration                              | Highest penetration                                  | Moderate penetration                                 |
| Electricity in transport      | Lowest penetration                              | Moderate penetration                                 | Highest penetration                                 |
| Expectations regarding EU overall gas demand | Expected to remain stable                      | Expected to increase                                  | Expected to decrease                                 |
4) How do ENTSO-E scenarios align with ours

- Green Revolution
- Blue Transition
- Slow Progression
- On track for Energy roadmap 2050
  - Vision 3: National Green Transition
  - Vision 4: European Green Revolution
  - Vision 1: Fast Progress
  - Vision 2: Constrained Progress
  - Delay of Energy roadmap 2050
5) Introduction to Supplies in the assessment

Supplies potentials are defined for each source

> Supply arrives to EU import points – except for National Production, which is always used first

> Reference price is anchored to reknowned source – IEA WEO2015 scenarios

> Price configurations are developed to check the effect of sources being cheap or expensive
  - LNG cheap – expensive; Russian cheap – expensive; Azeri cheap; Neutral

Price configurations are the trigger of flows. Reaction of the gas infrastructure is analyzed for each case.
## What kind of assessment results does the TYNDP assessment generate?

- TYNDP assessment frame is defined by the CBA methodology
- There are 3 types of information that can be extracted from the model results.

### TYNDP Outputs

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Indicators with possible Monetization</th>
<th>Standardized Monetization</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOS Indicators</td>
<td>Disrupted Demand (DDD)</td>
<td>Integrated Market config</td>
</tr>
<tr>
<td>- Remaining Flexibility</td>
<td>- Disruption resulting from a demand effect (2W/DC)</td>
<td>- EU supply bill AS/AW</td>
</tr>
<tr>
<td>- USSD/CSSD</td>
<td>- Disruption resulting from a supply effect (route disruption)</td>
<td>- Marginal Prices</td>
</tr>
<tr>
<td>Strongly model dependent indicators</td>
<td></td>
<td></td>
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<tr>
<td>- SSPDe</td>
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<td>- SSPDi</td>
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<tr>
<td>Non-modelled indicators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- IRD</td>
<td></td>
<td></td>
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<tr>
<td>- Bi-Directional</td>
<td></td>
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<tr>
<td>- N-1</td>
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</tr>
</tbody>
</table>
Learnings from TYNDP 2015
Learnings from TYNDP 2015

Investment gap: situation for 2020, based only on FID projects

Regions lacking of integration still strongly rely on specific supply sources

Minimum share of Russian gas / LNG in countries’ yearly supply mix under a cooperative approach

<table>
<thead>
<tr>
<th>LNG</th>
<th>Russian gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSSD &lt; 5%</td>
<td>CSSD &lt; 5%</td>
</tr>
<tr>
<td>5% &lt; CSSD &lt; 15%</td>
<td>5% &lt; CSSD &lt; 15%</td>
</tr>
<tr>
<td>15% &lt; CSSD &lt; 25%</td>
<td>15% &lt; CSSD &lt; 25%</td>
</tr>
<tr>
<td>25% &lt; CSSD &lt; 50%</td>
<td>25% &lt; CSSD &lt; 50%</td>
</tr>
<tr>
<td>CSSD &gt; 50%</td>
<td>CSSD &gt; 50%</td>
</tr>
</tbody>
</table>

> Results are shown under a cooperative approach between Member States

> Under an uncooperative approach, situation in some Member States would be exacerbated

Low = Low Infrastructure level: only existing infrastructures and FID projects considered in the assessment
CSSD = Cooperative Supply Source Dependence
Learnings from TYNDP 2015
Investment gap: situation for 2020, based only on FID projects

Regions lacking of integration face lower diversification and competition

**Level of import route diversification (IRD)**

- Low route diversification: > 6150
- High route diversification: < 3580

*The IRD is an HHI-type indicator measuring the diversification of paths that gas can flow through to reach a zone, based on the entry capacity split between entry points. The lower the value, the better the diversification is.*

**Level of supply source price diversification (SSPDi)**

*This assessment focuses on import sources (LNG, Russian, Norwegian, Algerian, Lybian and Azeri gas) and is not considering European production. The assumption of well-functioning markets across Europe may give a picture more positive than currently perceived.*

Low = Low Infrastructure level: only existing infrastructures and FID projects considered in the assessment
Learnings from TYNDP 2015

Investment gap on the longer term

Europe faces Norway and indigenous production decline...

By 2035, without new supplies and related infrastructure projects, Europe supply diversification would be at risk

Minimum share of Russian gas / LNG in countries’ yearly supply mix under a cooperative approach

Low = Low Infrastructure level: only existing infrastructures and FID projects considered in the assessment

CSSD = Cooperative Supply Source Dependence
Including a country in TYNDP
Including a country in TYNDP

*There are 2 ways of being included in TYNDP*

> Full inclusion

> Inclusion as importing country

*Current legal basis for TYNDP is community-wide analysis*
Including a country in TYNDP

**Full inclusion**

> Following data are needed

- Demand data

- Infrastructure data: data on existing infrastructure:
  - Interconnection points: capacities
  - Underground storages: working gas volume, injection and withdrawal capacities, deliberability curves
  - LNG terminals: send-out capacities and stocks in tanks

- Infrastructure data: data on planned infrastructure => using ENTSOG Project Portal

> In TYNDP 2015: Serbia, Bosnia-Herzegovina, FYROM

*Full inclusion is demanding in terms of data submission*
Demand Data for full inclusion in the modelling

To fully consider a balancing zone, the following data should be available throughout the time horizon with good reliability:

> Demand – as Historical Data from 2010 and Forecast for TYNDP time horizon for the 3 scenarios
  - 1-in-2 yearly average (GWh/d)
  - 2-Week peak average (GWh/d)
  - Daily peak (GWh/d)
  - Seasonal Demand Factor – ratio btw. summer and winter daily average consumption

> Demand data used for consistency check:
  - Final Demand (Residential & Commercial, Industrial and Transport) (GWh/d)
  - Demand Power Generation
  - Residential and Commercial
  - Industrial and Transport
  - Non-Network

> We are considering to split demand data into existing demand and gasification (new demand generated by new import capacity) to avoid disruptions due to unrealistically high demand input

Demand should not exceed the capacity of importing infrastructure
There is already an existing network topology – e.g. Low Infra Scenario – 2025

Available information:
- Which Point
- What capacities
- Which operators
And a Project is submitted between countries B and C...

> The minimum information to enable the assessment of the Project are seen below:
  - Point Name (if necessary create new point);
  - Capacities;
  - Commissioning Date;
  - FID Status;
  - Maturity

Point X between country B and C

<table>
<thead>
<tr>
<th>Submission 1</th>
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<tbody>
<tr>
<td>Promoter B</td>
</tr>
<tr>
<td>From 2021</td>
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</table>

<table>
<thead>
<tr>
<th>Submission 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promoter C</td>
</tr>
<tr>
<td>From 2023</td>
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</tbody>
</table>

Mismatch: 40 from 2023

Mismatch: 35 from 2023

25 from 2023

35 from 2023
Project Submission: Minimum set of data

The following information is the minimum set of data which is necessary to enable ENTSOG to simulate a project

<table>
<thead>
<tr>
<th>Transmission Projects</th>
<th>LNG Project</th>
<th>UGS Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name</td>
<td></td>
<td></td>
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<tr>
<td>Project Promoter Name</td>
<td></td>
<td></td>
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<tr>
<td>Capacity Modification or actual Investment Project</td>
<td></td>
<td></td>
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<tr>
<td>FID Status</td>
<td></td>
<td></td>
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<tr>
<td>PCI Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commissioning Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental Capacity on the given IP</td>
<td>LNG Send out capacity = Incremental Capacity on the given IP</td>
<td>Injection and Withdrawal capacities = Incremental Capacity on the given IP</td>
</tr>
<tr>
<td></td>
<td>Incremental LNG Tank volume</td>
<td>Incremental working volume</td>
</tr>
<tr>
<td></td>
<td>The given IP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flow Direction</td>
<td></td>
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<tr>
<td></td>
<td>Modelled Project Variant Selected if several variants are submitted</td>
<td></td>
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<tr>
<td></td>
<td>Elements within Project Schedule and inclusion in National Development Plan to be retained for the definition of project maturity</td>
<td></td>
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<tr>
<td></td>
<td>Confirmation of the Disclaimer</td>
<td></td>
</tr>
</tbody>
</table>
Project Submission process: What’s new

> Updated ENTSOG Data Portal

> Updated Documentation on Data Submission and Data Portal funcionality

> Collection of Project Costs to enable the monetization of Infrastructure levels in the TYNDP

> Enhanced collection of Project schedules for newly introduced Maturity Criteria
The Project Submission process

The submission of Up-to-Date, Timely and Correct Project information is a prerequisite for the assessment

<table>
<thead>
<tr>
<th>Event</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication of ENTSOG Documentation Kit</td>
<td>15/03/2016</td>
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<tr>
<td>Information email and Press Release about ENTSOG Data Collection Procedure</td>
<td>11/04/2016 - 08/05/2016</td>
</tr>
<tr>
<td>Account Validation and Creation Starts</td>
<td>09/05/2016 - 25/05/2016</td>
</tr>
<tr>
<td>Data Collection - Project Submission</td>
<td>Project Submissions are accepted during this time only - full submissions by 08/05</td>
</tr>
<tr>
<td>Data Consistency Check</td>
<td>Non-matching capacities can be modified or Projects can be deleted</td>
</tr>
</tbody>
</table>

Coordination of Promoters shall start well before the Data Collection. Fully non-coordinated Projects will not be modelled – Lesser of Rule

14 - March  Ma  Ma  Ar 11 - April  18 - April  25 - April  02 - May  09 - May  16 - May  23 - May  30 - May
The Project Submission process

*Where to submit Projects – within the geographical scope of TYNDP*

- [https://data.entsog.eu/](https://data.entsog.eu/) - ENTSOG Data Portal
- Documentation to become available on 15 March
- Check/ ask for credentials
- Contact ENTSOG for Project topology

- Functionality of the Data Portal
  - Submit/ delete/ modify Projects and their increments
  - Check Project representation in ENTSOG topology
  - Check submitted capacities and their matching on interconnection Points
For TYNDP 2017, ENTSOG proposes to introduce an additional Mature Infrastructure Level based on a maturity criterion for non-FID projects.
Including a country in TYNDP

Conclusions on full inclusion

> Full inclusion is demanding in terms of data

> Gas system is optimised at the level of EU + included countries => goes beyond Reg 347 requirements

> Included countries are fully assessed along all TYNDP indicators

> Countries already in TYNDP 2015 will stay in TYNDP 2017

> Full inclusion of additional countries
  - Could be usefully tested as part of other ENTSOG deliverables (such as Winter Outlook)
  - Would need to be carefully considered for TYNDP 2017

> Another solution may be considered: inclusion as importing country
Including a country in TYNDP

**Inclusion as importing country**

> Necessary data:
>  - expected import flows from the EU over the next 20 years
>  - Capacities of cross-border infrastructure

> ENTSOG is investigating using projected country data (demand projections, ...) to derive import flows

> This could allow to consider projects allowing for country’s gaseification
>  - In Low Infra Level: imports based on gas demand as allowed by existing infrastructure
>  - In Mature / High Infra Level: imports based on gas demand as allowed by planned infrastructure

> Additional import flows linked to gaseification would be part of TYNDP. But it will come with costs (supply costs).

> Benefits of gaseification are up-to-now not handled in the TYNDP modelling => handling aside the modelling is under consideration
Thank You for Your Attention

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