JOINT PLANNING OF THE GAS AND ELECTRIC SYSTEM AT EUROPEAN LEVEL

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- Motivation -> the Interlinked Model,
- Single or Dual Assessment?
- European Planning & Cost-Benefit Analysis
- Projects of Common Interest

EUROPEAN FRAMEWORK FOR 2050

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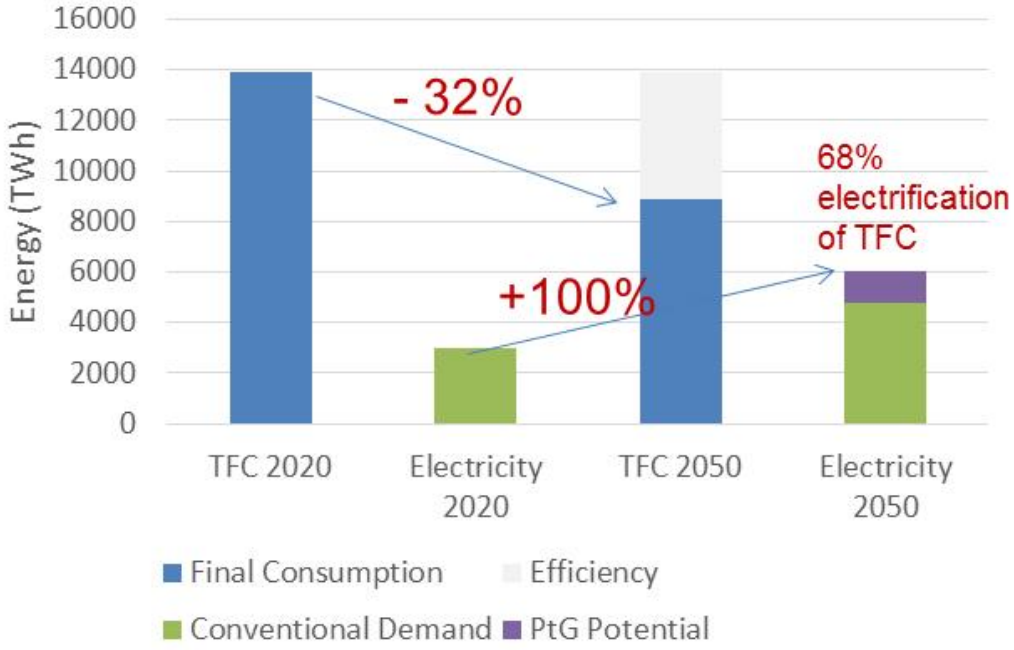
Paris climate agreement: Europe produces 10% of the global CO2 emissions.

- The EU has set its target to reduce GhG emissions by 80-90% by **2050** and in 2018 calculated the 1.5 degree target, meaning to be carbon free in 2050.

European Targets 2030
- 40% GHG emissions (reference 1990)
- 32% RES share of energy consumption (~20% today)
- Efficiency increase of 32.5% (ref. 2007)
- Interconnection target 10% (2020), 15% (2030)



- Member States delivered their NECPs to the EC. The ENTSO's next TYNDPs investigate the impact on infrastructure

PROJECTION OF THE RES ELECTRICITY SHARE IN THE EC'S LONG TERM STRATEGY

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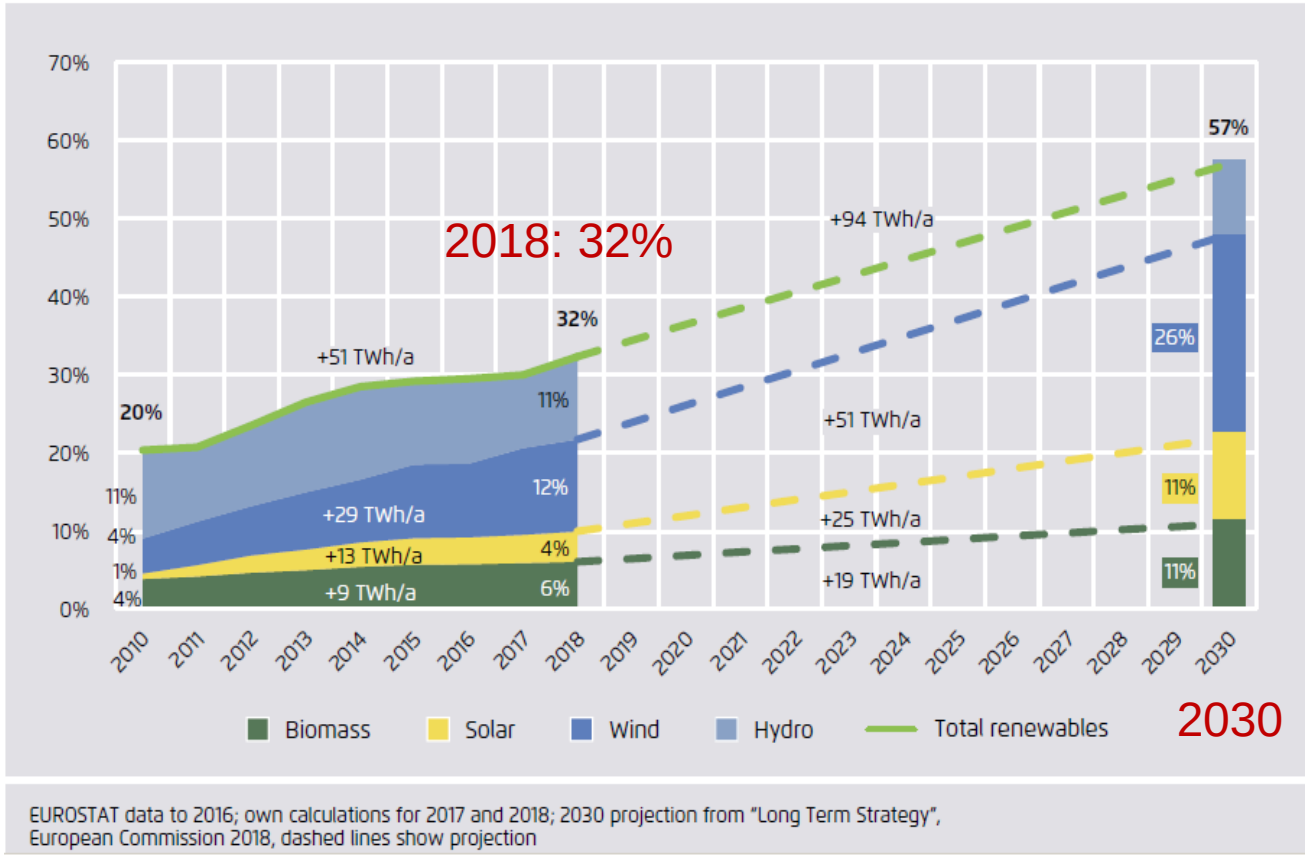
Targets translate into
% RES of el- Consumption,
e.g.:

DE: 31,6% 2016 → 65% 2030
DK: 61% 2019 → 100% 2030

=> **Electrification & Sector Coupling**!

Both ENTSOs look into this.



EUROSTAT data to 2016; own calculations for 2017 and 2018; 2030 projection from "Long Term Strategy", European Commission 2018, dashed lines show projection

57%

Rising to

81-85%
by 2050

Source: "*Agora Energiewende (2019): European Energy Transition 2030: The Big Picture – Ten Priorities for the next European Commission to meet the EU's 2030 targets and accelerate towards 2050.*"

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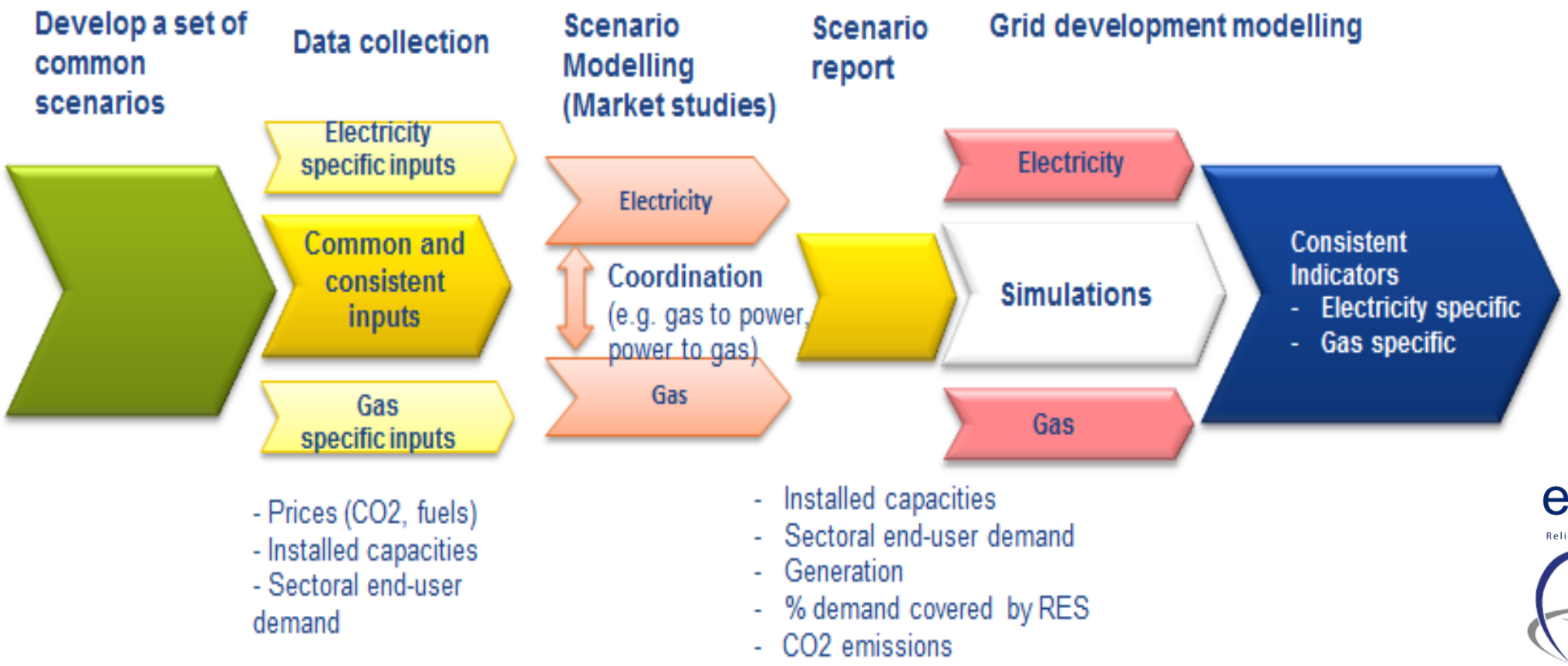
DRIVER FOR THE INTERLINKED MODEL

EC 347/ 2013 Art. 11, paragraph 8:

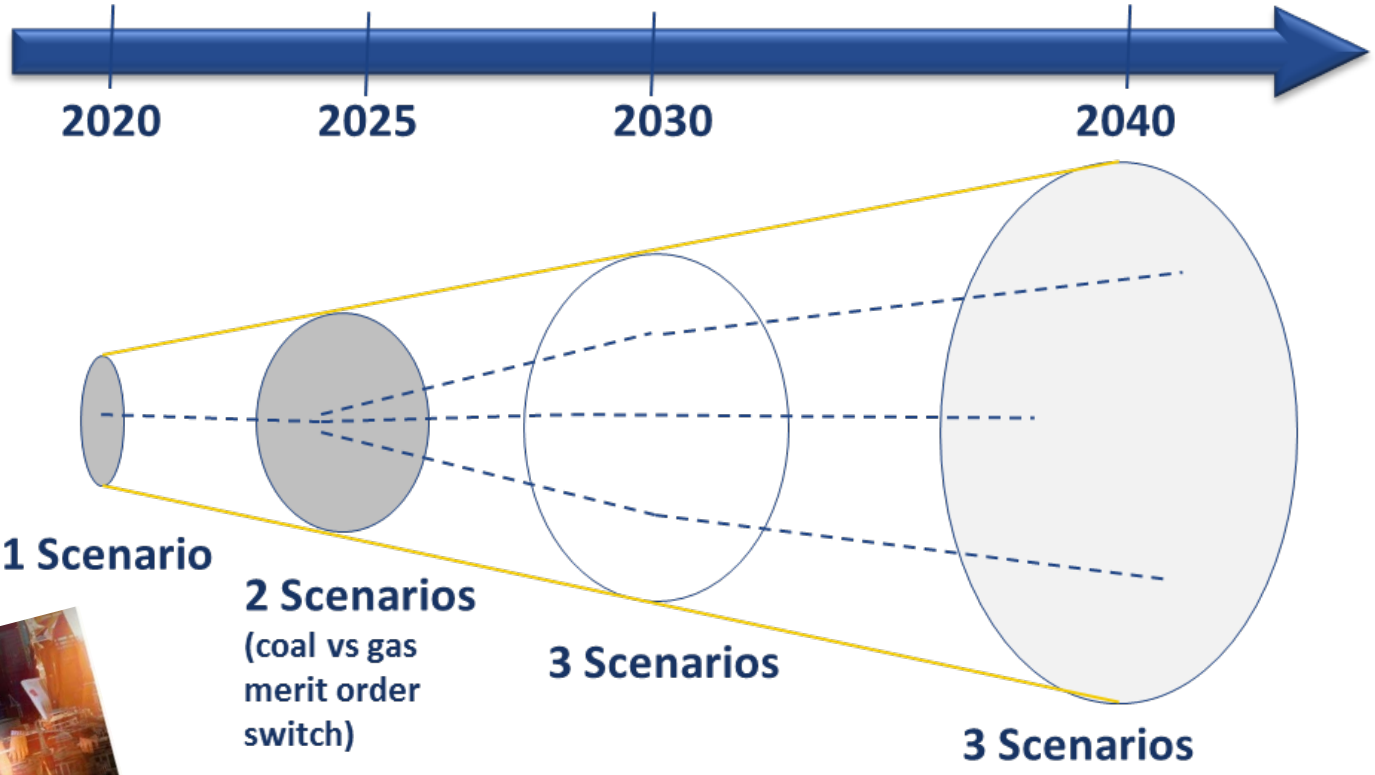
"By 31 December 2016, the ENTSO for Electricity and the ENTSO for Gas shall jointly submit to the Commission and the **Agency a consistent and interlinked electricity and gas market and network model including both electricity and gas transmission infrastructure as well as storage and LNG facilities, covering the energy infrastructure priority corridors and areas** and drawn up in line with the principles laid down in Annex V. After approval of this model by the Commission according to the procedure set out in paragraphs 2 to 4, **it shall be included in the methodologies.** "

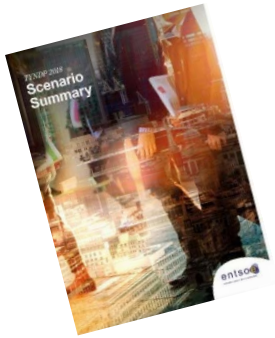
THE ENTSOS' INTERLINKED MODEL



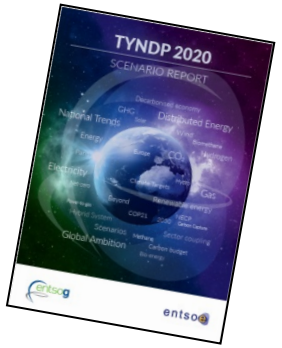
- **2013**: European regulation (EC 347/2013) requiring an "interlinked model":
  - ENTSOs infrastructure plans for el and gas (TYNDPs) 2018 applying joint scenarios
  - Can gas infrastructure replace el-infrastructure expansion? Joint ENTSOs investigations..

EUROPEAN EL AND GAS TYNDPS* BUILD ON THE SAME SCENARIOS





*Ten-Year-Network-Development Plan



Cooperation

entsoe
Reliable Sustainable Connected

entsog
european network
of transmission system operators
for gas

Key factors:

- *Transport*
- *Heating*
- *Power*
- *Renewable Gases*

Find the TYNDPs here:
http://tyndp.entsoe.eu/
https://www.entsog.eu/tyndp#

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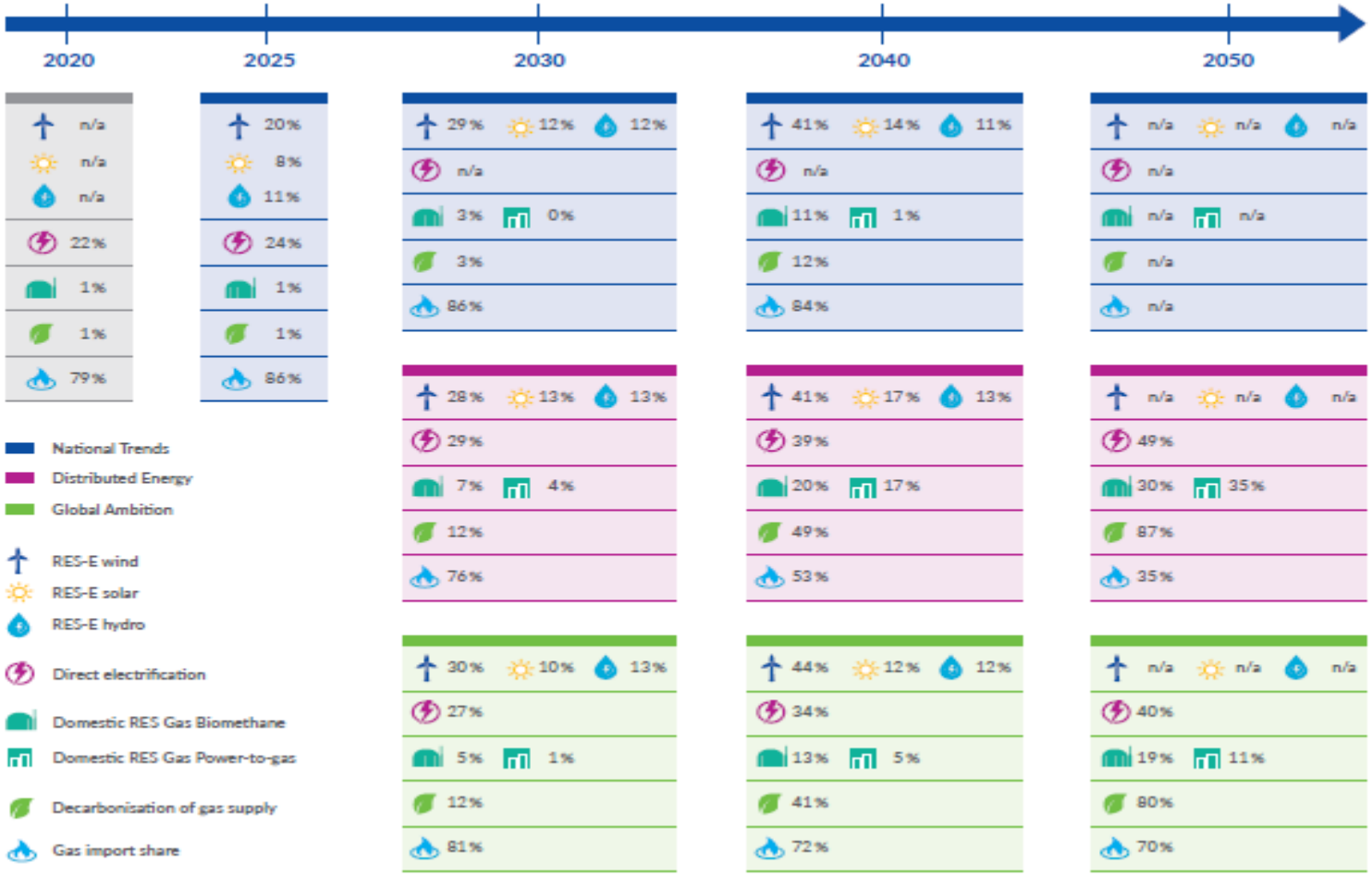

*Ten-Year-Network-Development Plan

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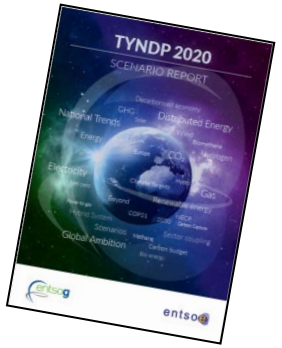

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EUROPEAN TRANSMISSION PLANNING

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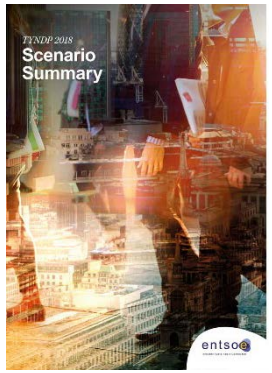
a 2 year's cycle

2 yrs

Scenario building



1 yr

Screening

2040

TSO
3PP
TSO
3PP
TSO
3PP

Projects

0,75 yr

CBA

2030

- Scenarios describe key factors of potential development in technology, economic growth, generation, demand, …..
- across several time horizons
- Combination of bottom-up and top-down scenarios

- Identification of system needs (IoSN): (focus on capacity increases in transmission system)
- Based on: Socioeconomic welfare (SEW), Integration of renewables (RES) & Security of supply (SoS)
- Based on long term scenarios for **2040**

- Cost Benefit Analyses (CBA) of individual projects on mid term time horizon 2025 and 2030
- Also additional studies on e.g. Interconnection Targets and Impact of "No-Grid development" study

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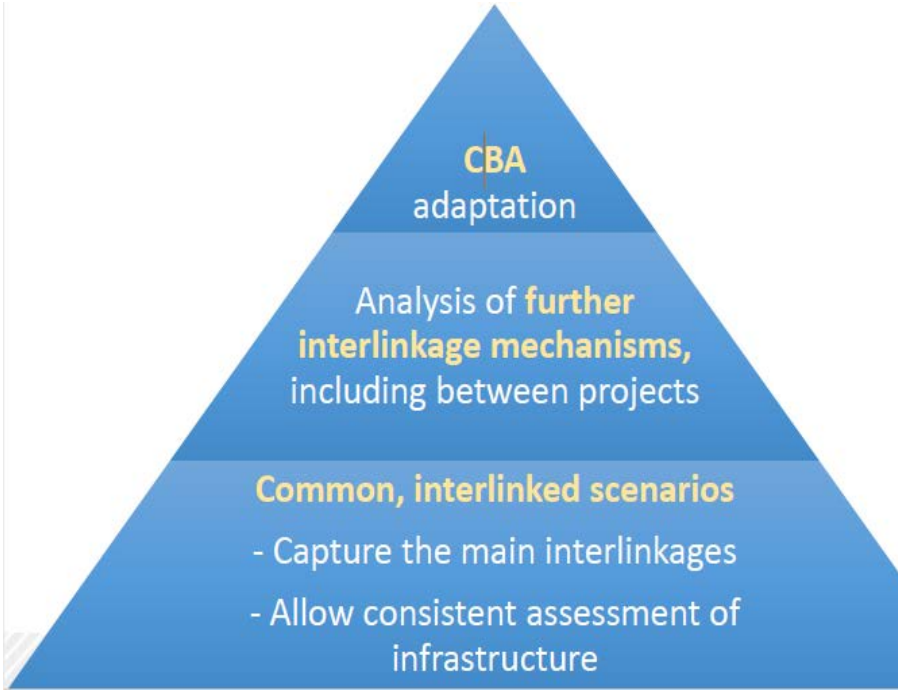
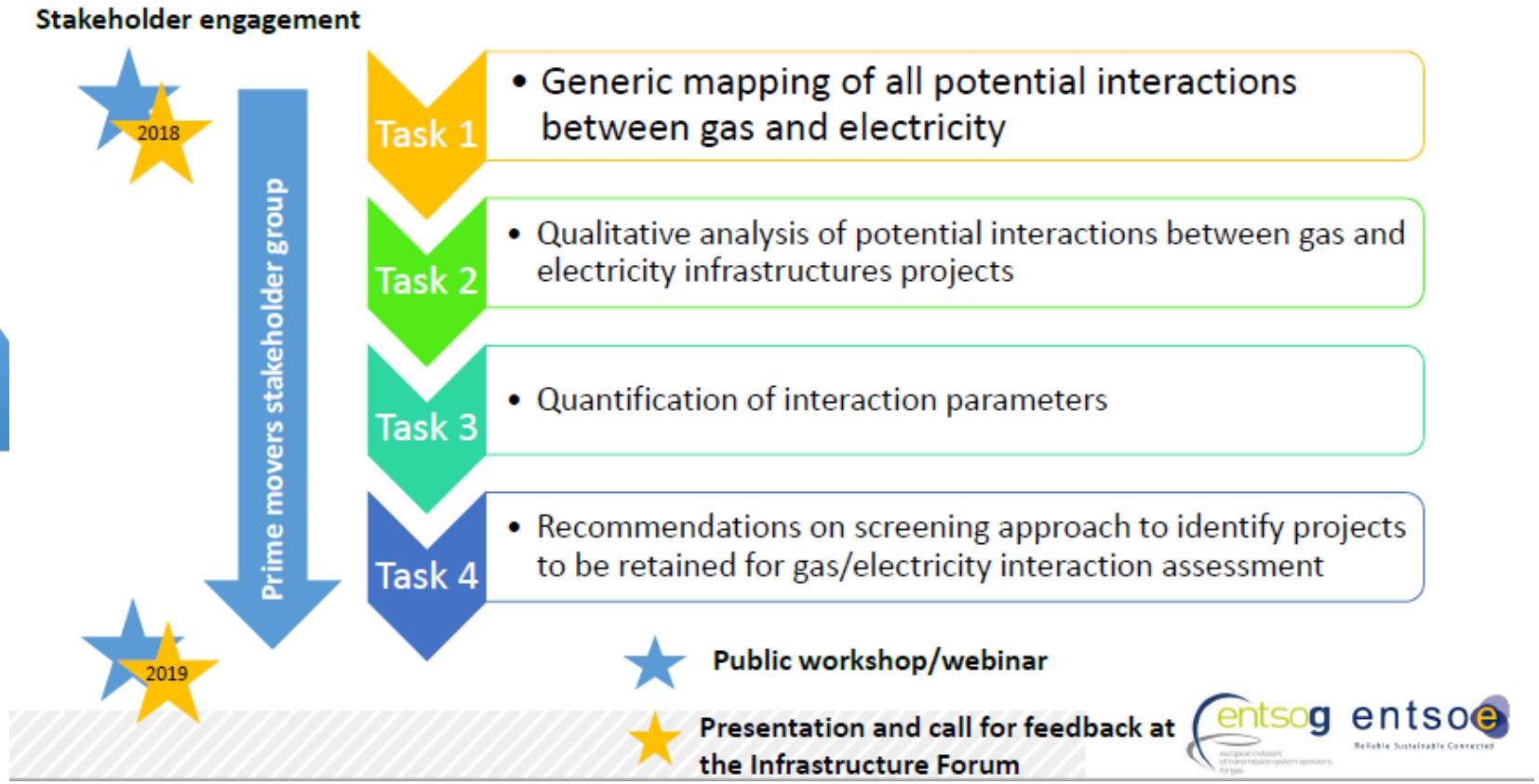
Reliable Sustainable Connected

CO-ORDINATED PLANNING

Both ENTSOs investigating further inter-linkage mechanisms





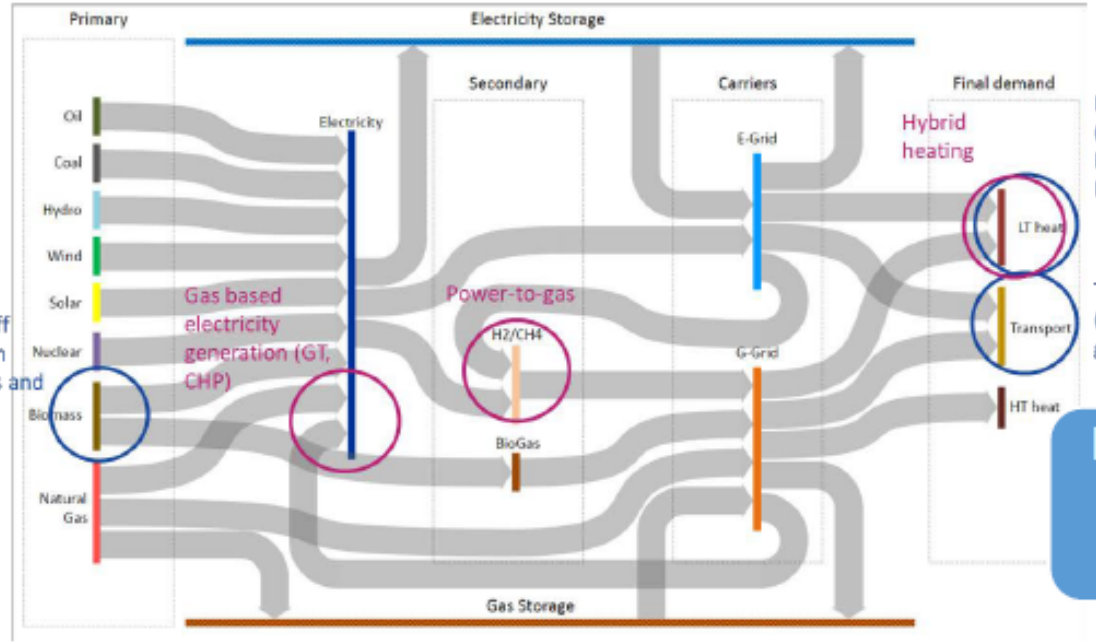
JOINT ENTSO'S STUDY

Task 1 – Mapping

Study performed by Artelys | OPTIMIZATION SOLUTIONS

Systematic mapping of interactions between gas and electricity systems

Direct and indirect interactions



Trade-off between biomass and biogas

Gas based electricity generation (GT, CHP)

Power-to-gas

Hybrid heating

Heating mix (gas boilers, HPs, hybrid HPS, ...)

Transport mix (oil, electricity, gas...)

3 main sources of interlinkages between gas and electricity systems

- **Gas to Power (G2P)**
- **Power to Gas (P2G)**
- **Hybrid systems**

Indirect interactions relate to scenarios assumptions and are translated into demand

Direct interactions relate to scenarios assumptions as well and are translated into generation/conversion capacities, and can be submitted to TYNDPs as projects

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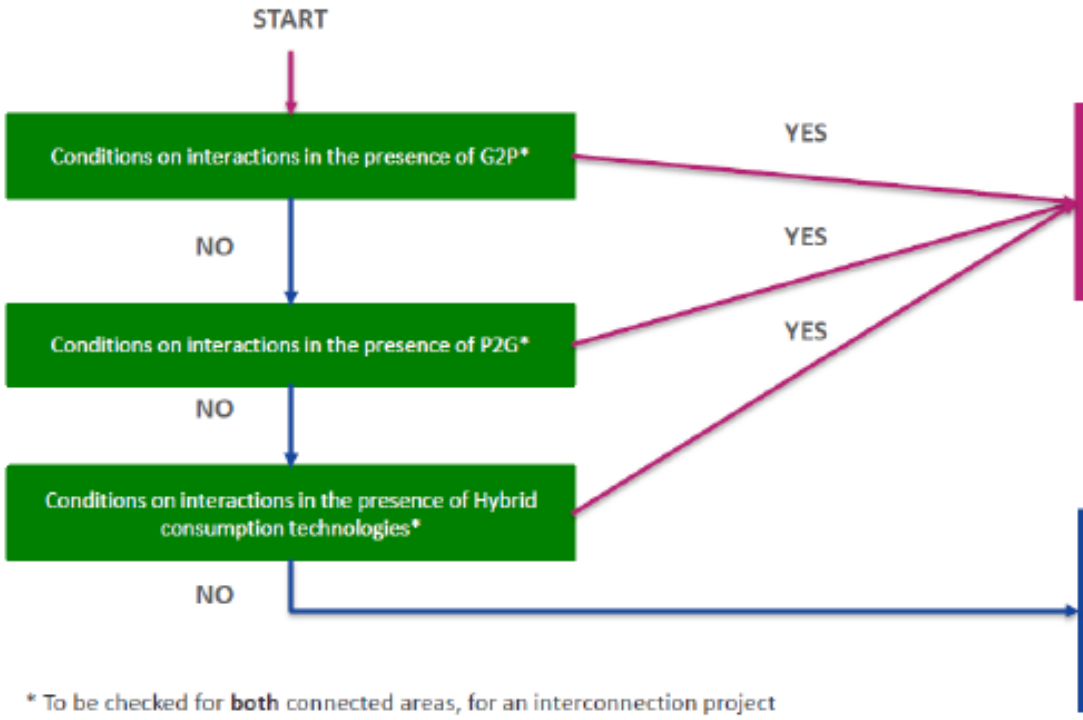
JOINT ENTSO'S STUDY

Task 4 – screening of projects for gas/electricity interaction assessment

- Possible process for project screening



Assessment of the impact of the project on electricity system **AND** gas system

Assessment of the impact of the project on electricity system **OR** gas system

Study performed by Artelys | OPTIMIZATION SOLUTIONS

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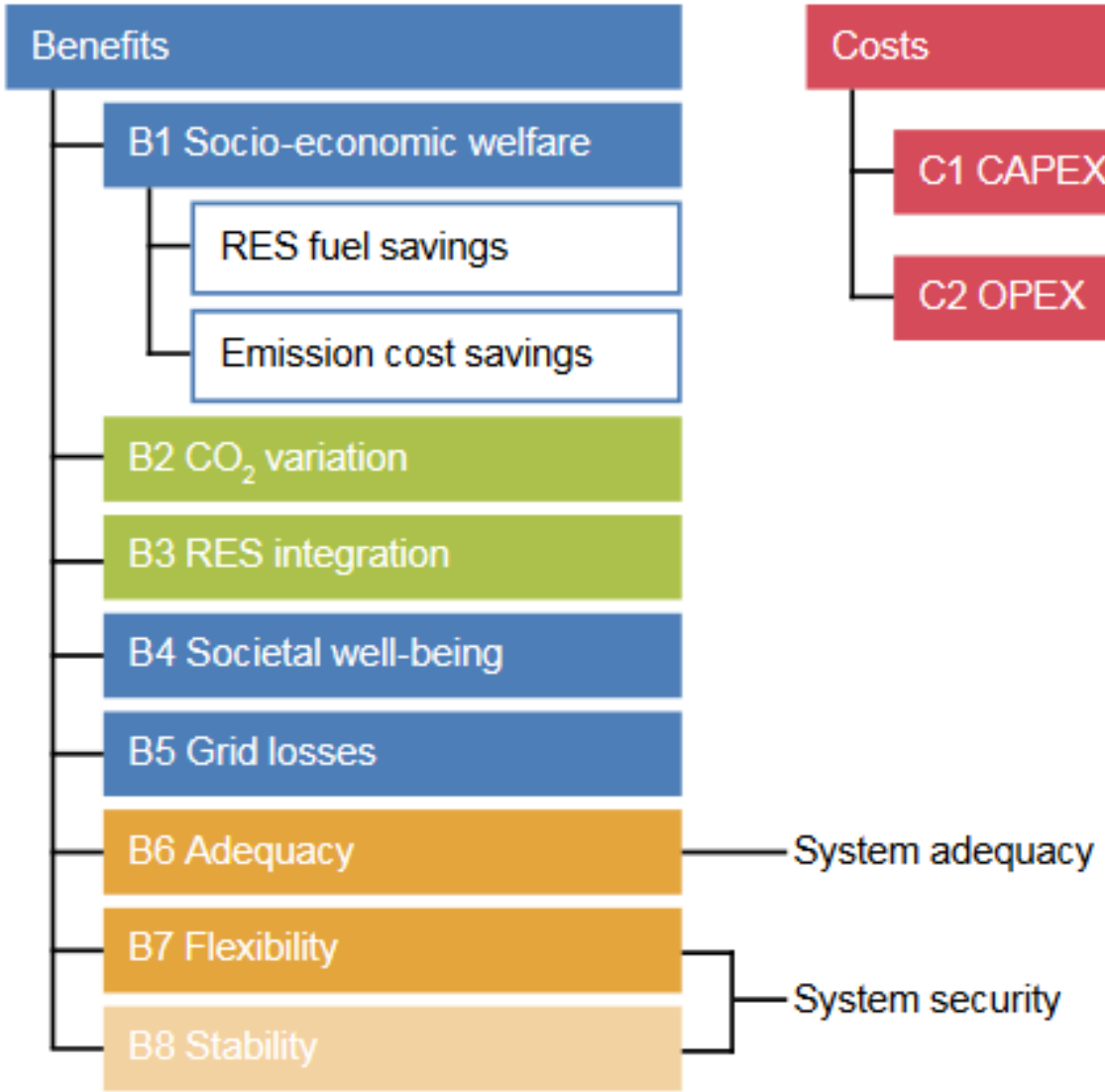
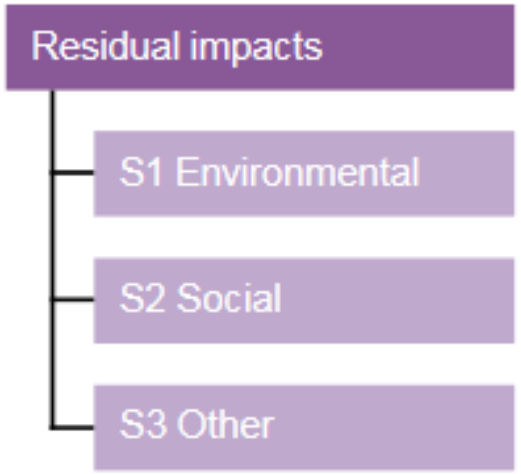
JOINT ENTSO'S STUDY

Direct interactions (G2P, P2G and Hybrid technologies) are mostly captured in scenarios. However, **in some specific configurations, a project can have an impact on** – or be impacted by – **the other energy system**.

- Based on the study output, the ENTSOs will **adapt the Interlinked Model** in view of enhanced project assessment. It will require the ENTSOs:
  1. To elaborate a screening methodology to identify the infrastructure projects requiring a dual system assessment
  2. To elaborate an assessment methodology for those projects having an impact on both gas and electricity systems, and implement it to the respective e-TYNDP and g-TYNDP
- Once approved, the Interlinked Model will form part of the CBA methodologies, ensuring a better common perspective in regards to electricity and gas projects assessment

CBA INDICATORS



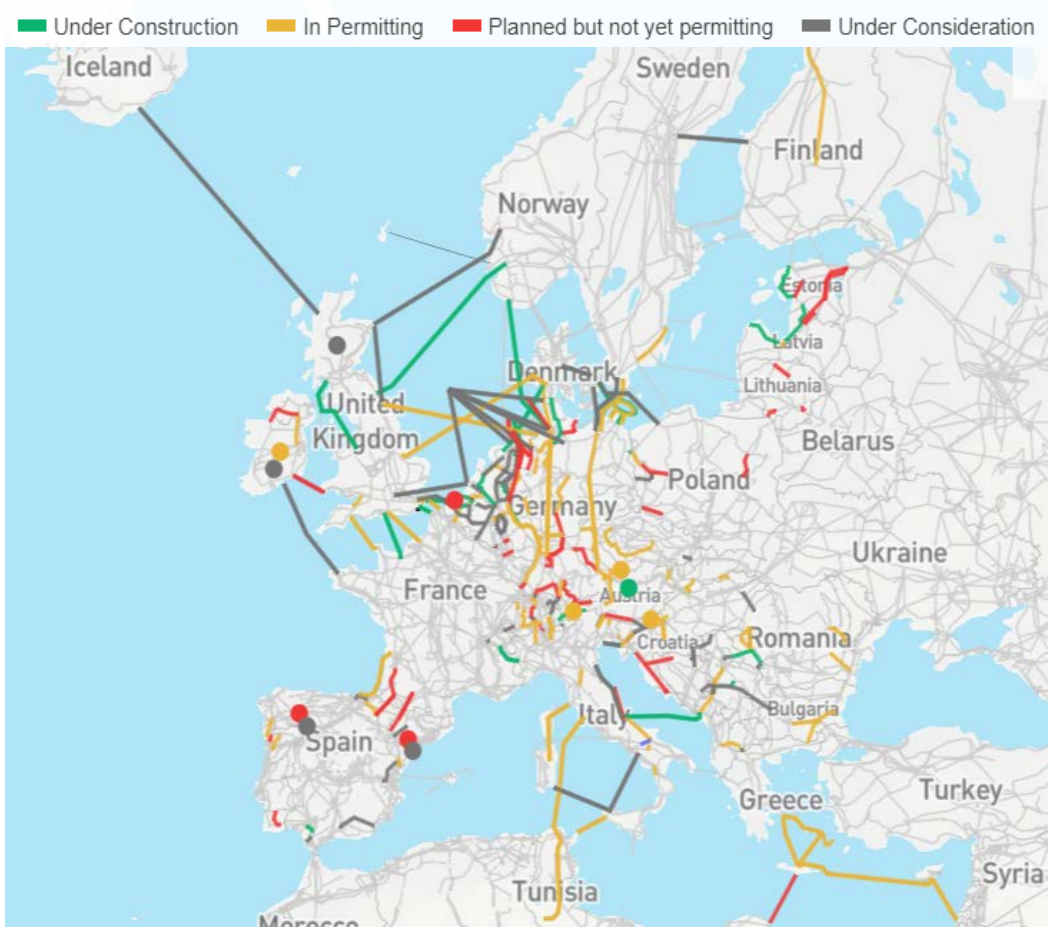


Each project is investigated with:
- At least 3 market modeling tools and
- At least 2 grid modeling tools
- For 3 scenarios, with
  - 3 climate-years per scenario
  - 8760 hours per year

TYNDP18
166 transmission
15 storage

TYNDP2018 - BENEFITS

- **48 - 58% RES share of energy demand in 2030**
  … and 65 - 81 % until 2040
- **65 – 75% CO2 reduction, compared to 1990**
  … and 80 – 90% until 2040
- **2 to 5 bn€ annual savings in cost of el-production due to TYNDP projects in 2030**
  … and 3 til 14 €/MWh reduction in marginal production costs with optimal grid in 2040



Until 2030:

166 transmission projects
13 storage projects

114 bn € investments by 2030 (10.4 bn€/yr)

357 investments, out of which
201 overhead lines
23 cables
67 subsea cables

PROJECTS OF COMMON INTEREST

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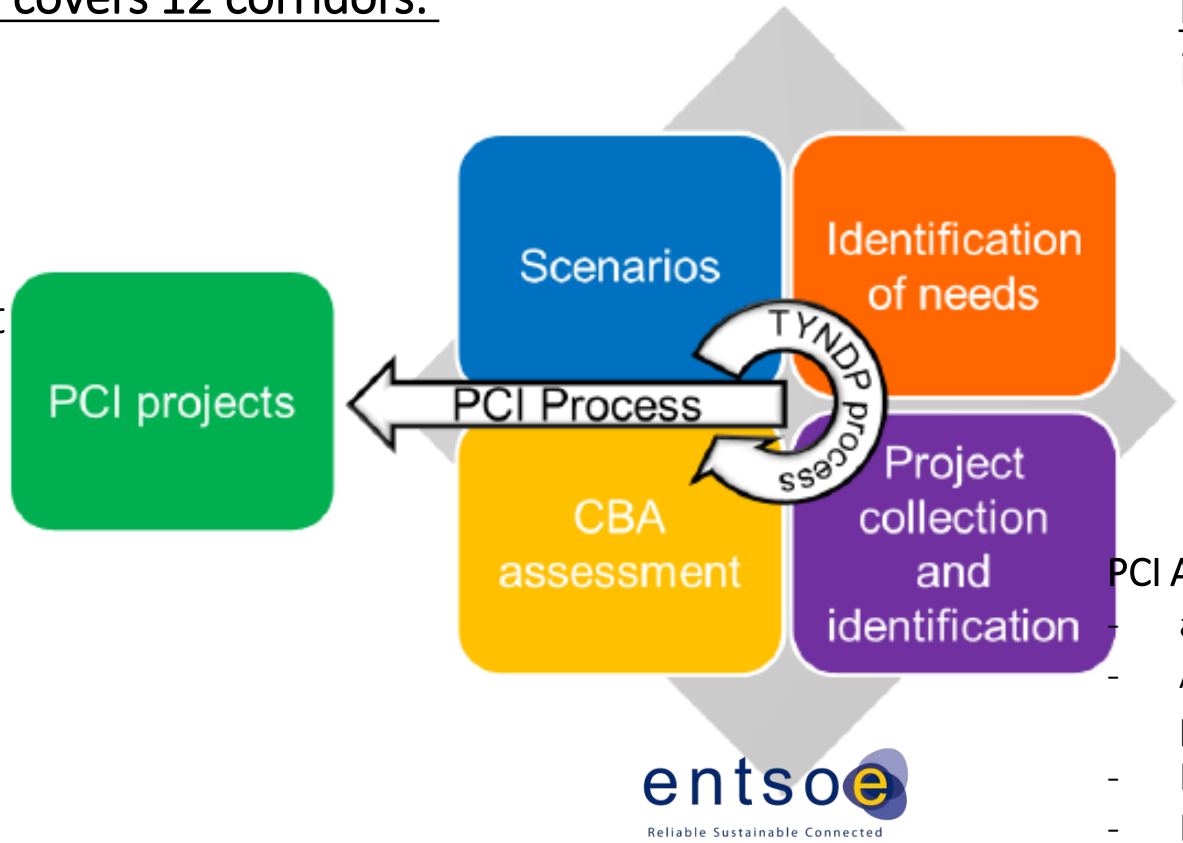
TEN-E Regulation 347/2013 covers 12 corridors:

- 4 electricity
- 4 gas
- Oil

- Smart grids deployment
- CO2 networks
- Electricity Highways

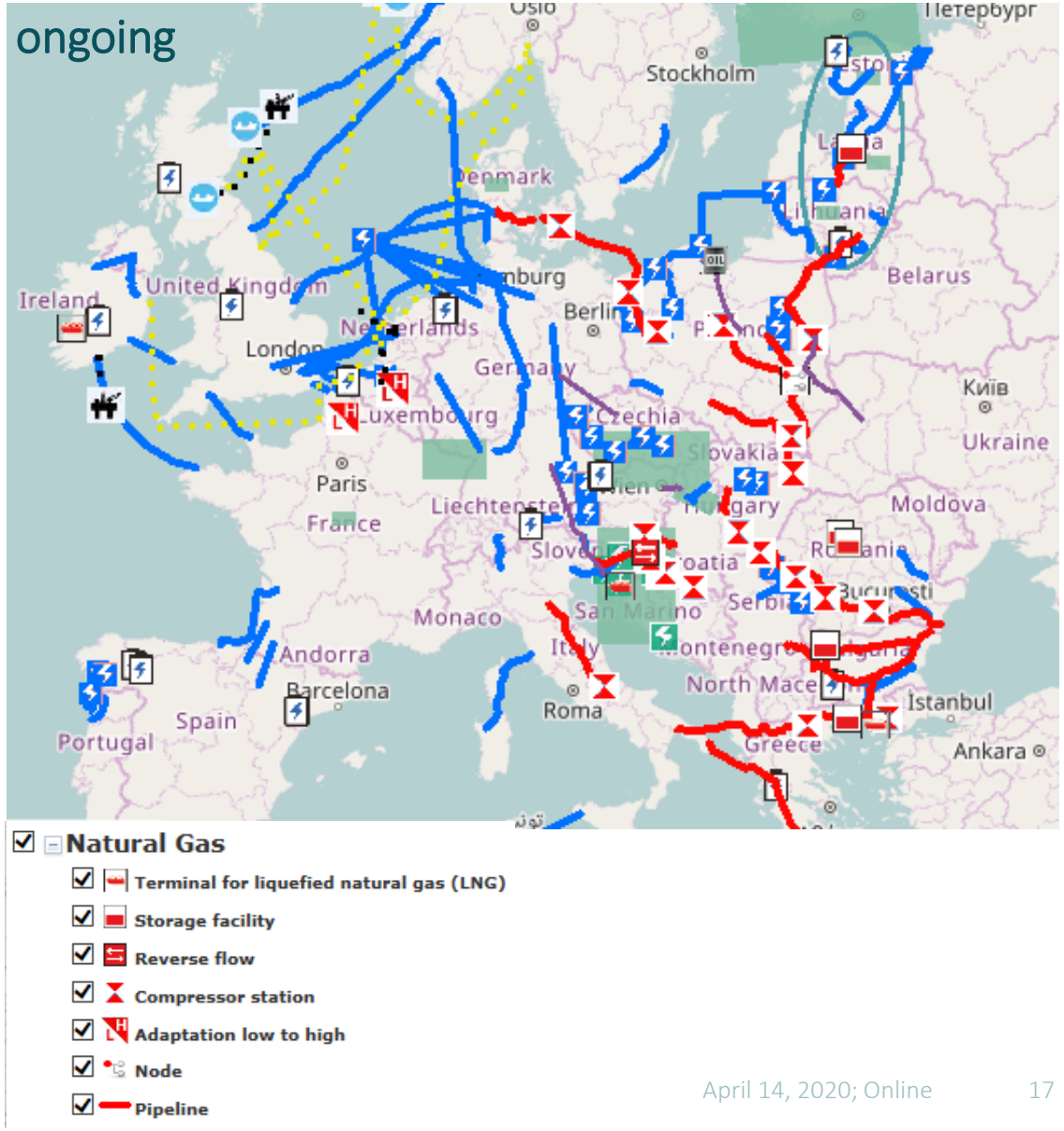


Prerequisites:
inclusion in TYNDP & positive CBA

PCI Advantages

- accelerated planning and permit granting
- A single national authority for obtaining permits
- Improved regulatory conditions
- Lower administrative costs due to streamlined EIA processes
- Increased public participation via consultations
- Increased visibility to investors
- Have the right to apply for European Funding

PCI PROJECTS




THANK YOU!
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