

TYNDP and PROMOTioN – complementing or competing?

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They are complementing each other!



Thank you for your attention!

Some more details...

Complementarity

Different purpose:

- **TYNDP:** regularly informing EU about impact of different future scenarios on infrastructure. Identifying needs; assessing projects against scenarios.
- 2012 – serving NSCOGI with offshore grid study:
case by case // modular development // all technologies (AC, DC),
various designs (radial – hubs – hybrid - meshed)
- **PROMOTioN** – research. Diving into the "meshed" part, investigating many details and designs, including demonstrations.
Broad spectrum of issues (technology – regulatory issues).

Identification of the System Needs (IoSN) - Process

The general process of the TYNDP

Scenario building process

Identification of System Needs in 2040

CBA

All reference scenarios
used for all analysis
performed

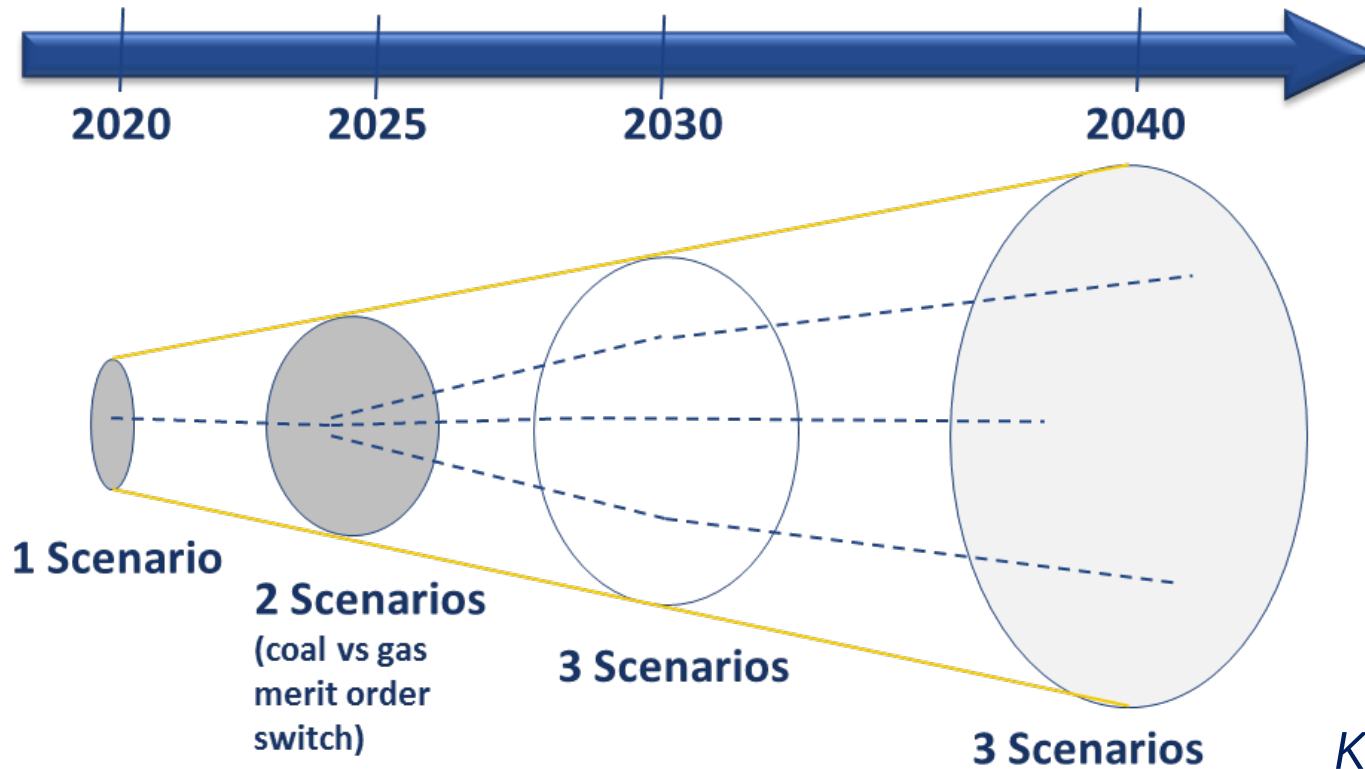
New capacity
increases
would be necessary by
2040.

To evaluate the impact
of planned network
reinforcements



Identification of the System Needs - Scenarios

Scenario used in TYNDP process



Main update respect the TYNDP 2016

Cooperation with ENTSOG
Publication of Clean Energy
Package

European Network of
Transmission System Operators
for Electricity

entsoe

entsog
european network
of transmission system operators
for gas

Key factors:

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

Identification of the System Needs - Scenarios

2040 scenarios – Key Indicators

Key indicators

Global Climate Action Sustainable Transition Distributed Generation

Transport

Electric and hybrid vehicles	High growth	Moderate growth	Very high growth
Gas vehicles	High growth	Very high growth	Low growth

Heating

Electric heat pump	High growth	Low growth	Moderate growth
Hybrid heat pump	High growth	Moderate growth	Very high growth

Power

Storage	Moderate growth	Low growth	Very high growth
Wind	High growth	Moderate growth	High growth
Solar	High growth	Moderate growth	Very high growth

Renewable Gases

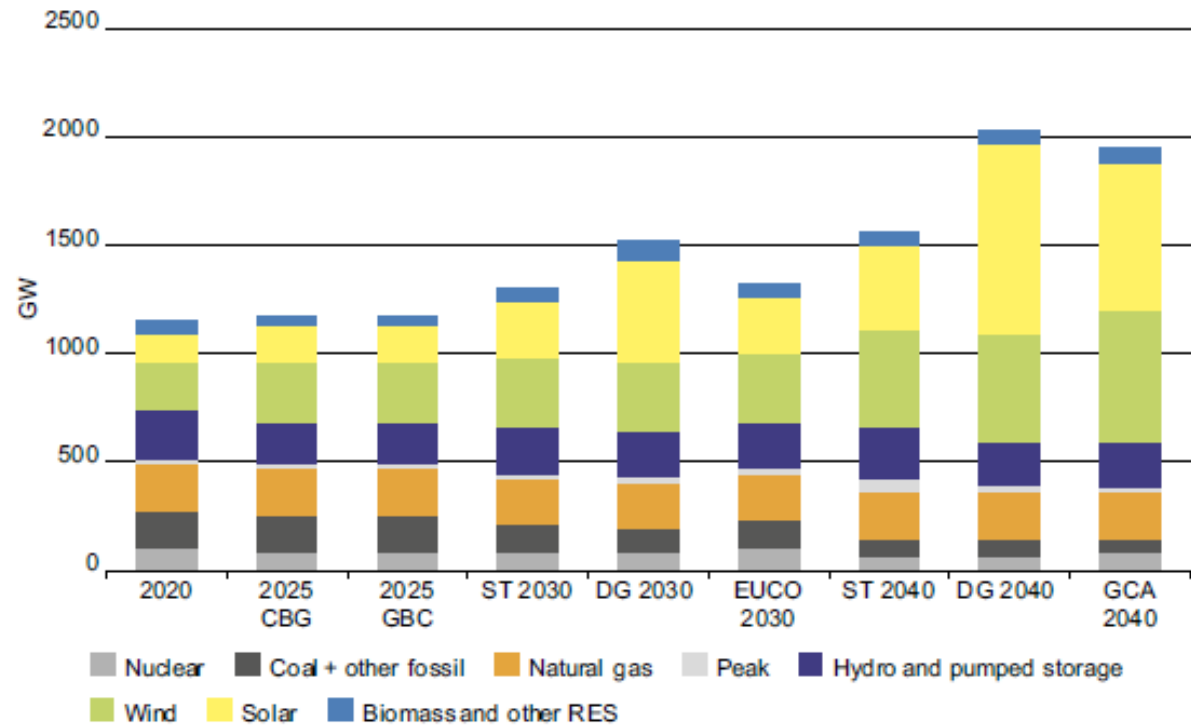
Power-to-gas	High growth	Not significant	High growth
Bio-methane	High growth	High growth	High growth

Scenario		Global Climate Action	Sustainable Transition	Distributed Generation
Category	Indicators	Indicators		
Macroeconomic trends	Global GDP	High growth	High growth	High growth
	EU GDP	High growth	High growth	High growth
	EU GDP per capita	High growth	High growth	High growth
	EU GDP per capita by 2040	High growth	High growth	High growth
Transport	Electric and hybrid vehicles	High growth	Moderate growth	Very high growth
	Gas vehicles	High growth	Very high growth	Low growth
Energy demand	Electricity demand	High growth	Moderate growth	Very high growth
	Gas demand	High growth	Moderate growth	Very high growth
Electricity	Electricity demand	High growth	Moderate growth	Very high growth
	Electricity efficiency	High growth	Moderate growth	Very high growth
Renewables	Renewable demand	High growth	Moderate growth	Very high growth
	Renewable efficiency	High growth	Moderate growth	Very high growth
Storage	Storage demand	High growth	Moderate growth	Very high growth
	Storage efficiency	High growth	Moderate growth	Very high growth
Wind	Wind demand	High growth	Moderate growth	Very high growth
	Wind efficiency	High growth	Moderate growth	Very high growth
Solar	Solar demand	High growth	Moderate growth	Very high growth
	Solar efficiency	High growth	Moderate growth	Very high growth
Renewable Gases	Power-to-gas demand	High growth	Moderate growth	Very high growth
	Bio-methane demand	High growth	Moderate growth	Very high growth

Identification of the System Needs - Scenarios

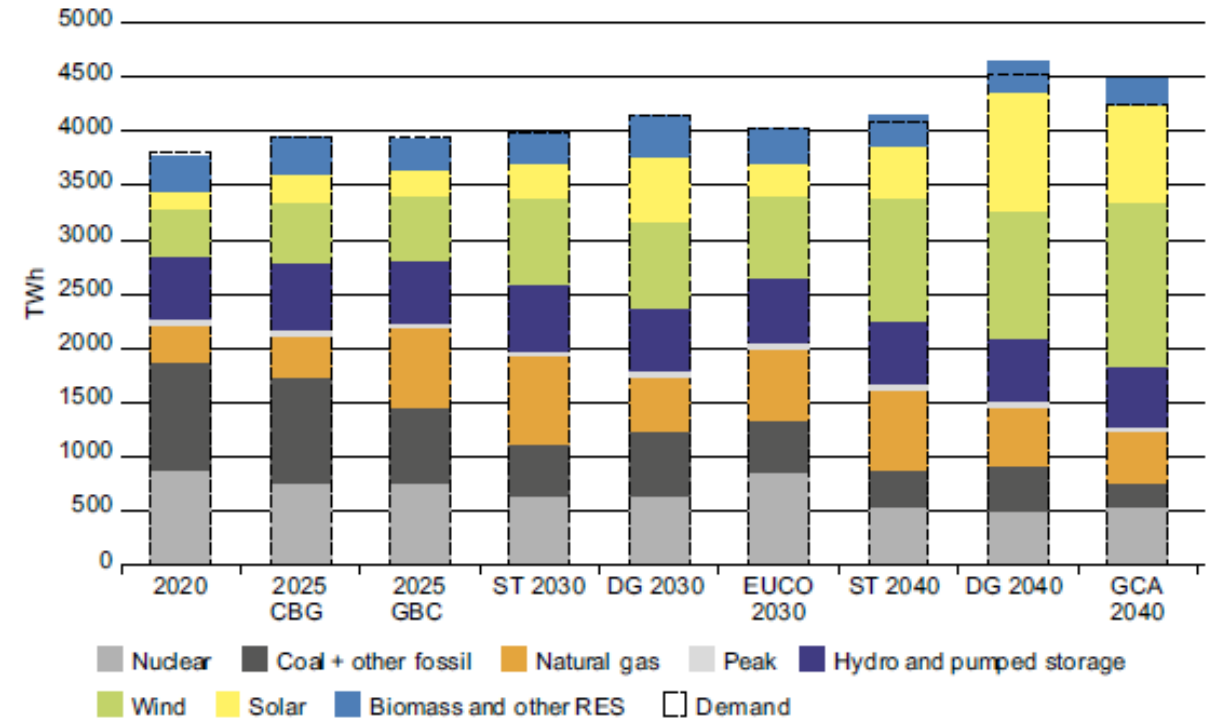
2040 scenarios – Electricity

Installed Capacity



PV and Wind drive RES development

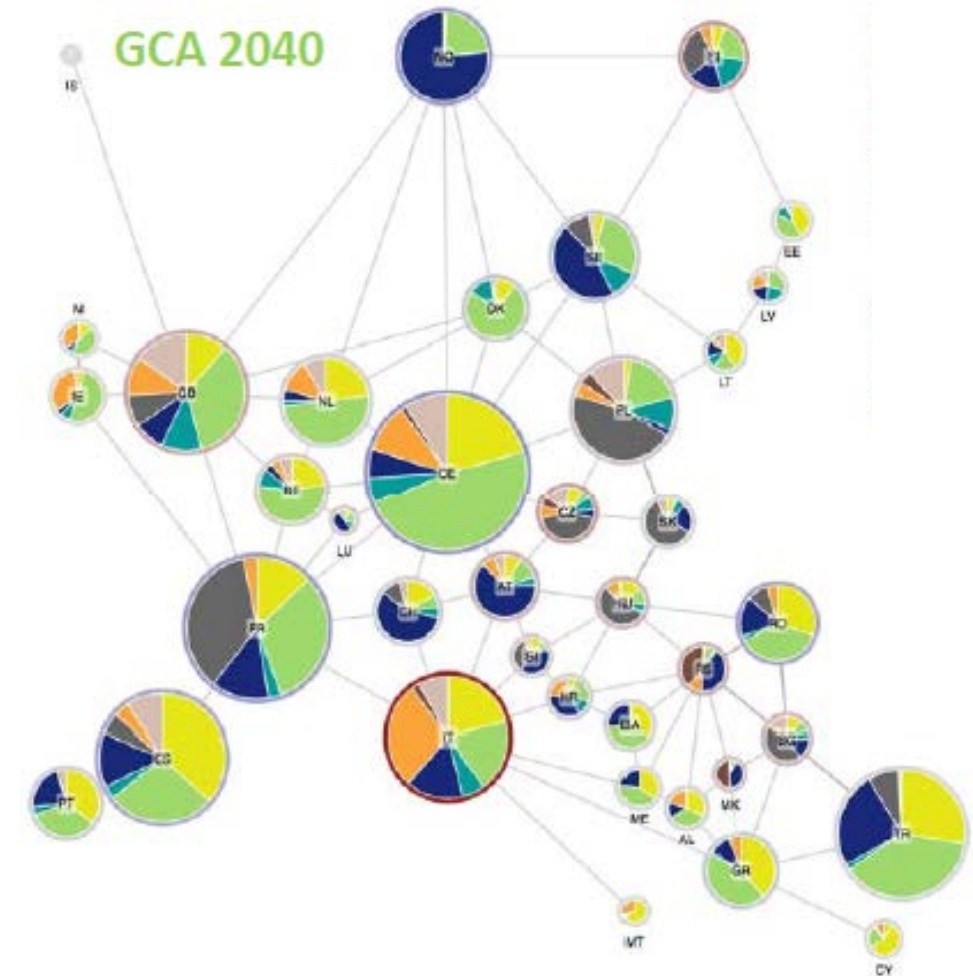
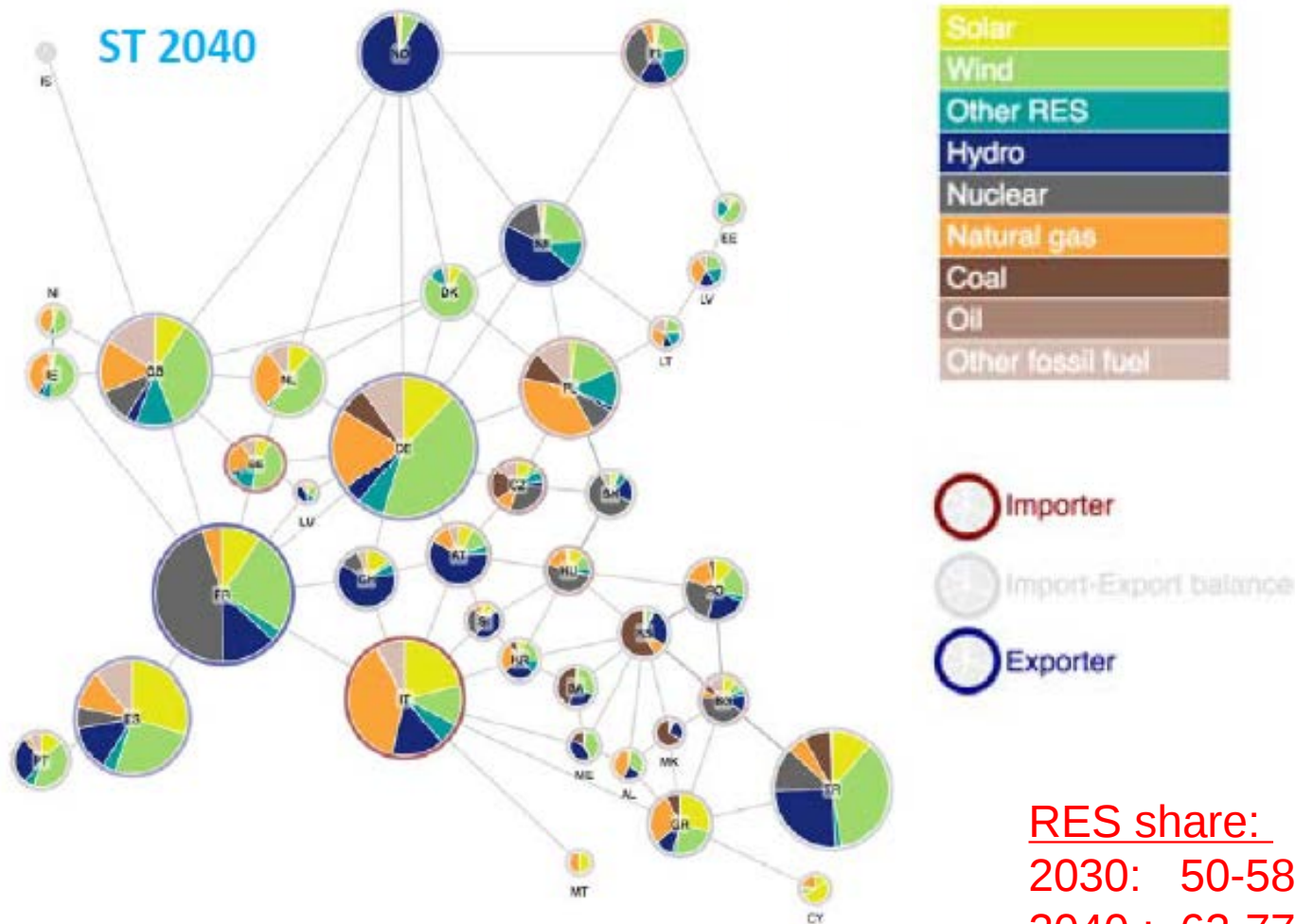
Energy Mix



Generation Mix shifts towards low Carbon sources

Identification of the System Needs - Scenarios

2040 scenarios – Electricity: Energy Mix



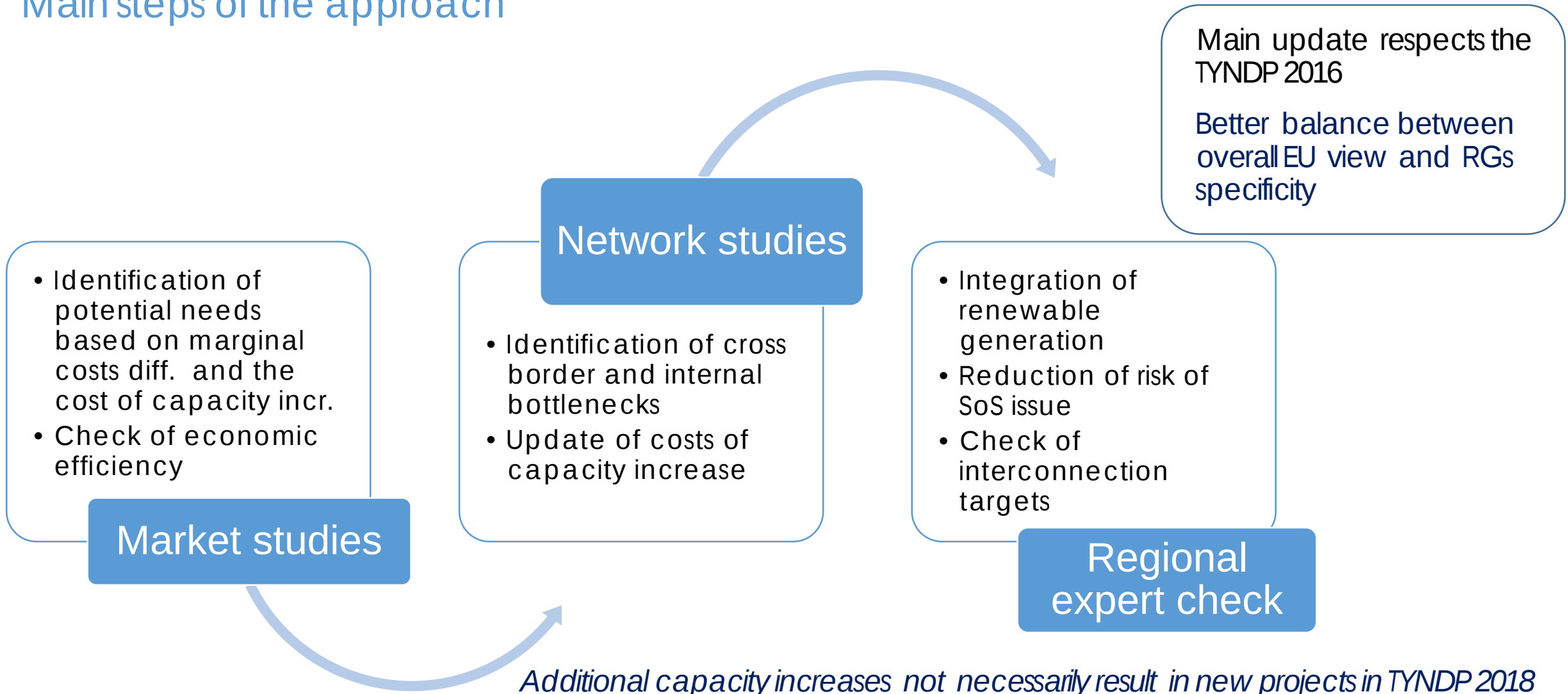
RES share:
2030: 50-58%
2040 : 62-77%

Scenarios create contrasted Country level results

from: Scenario Report for Consultation, Oct 201

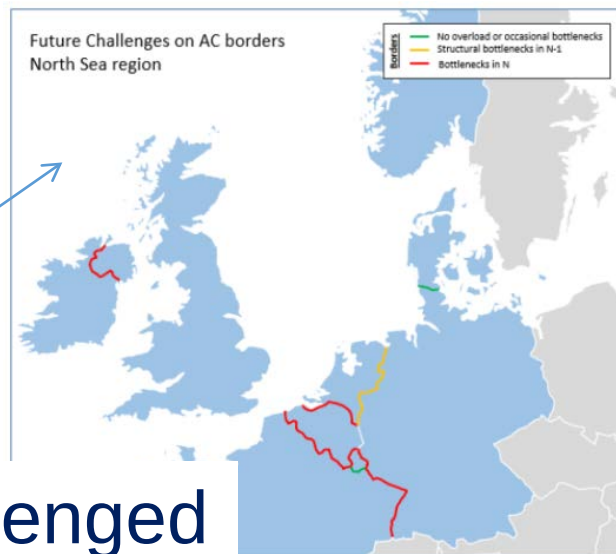
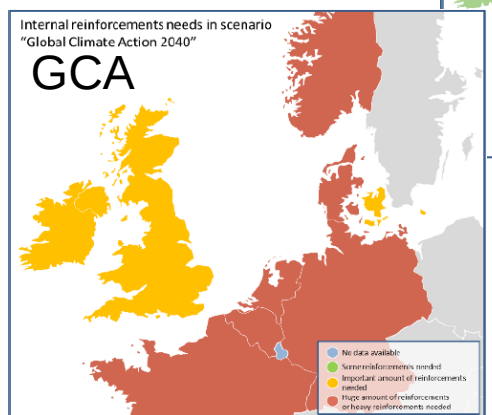
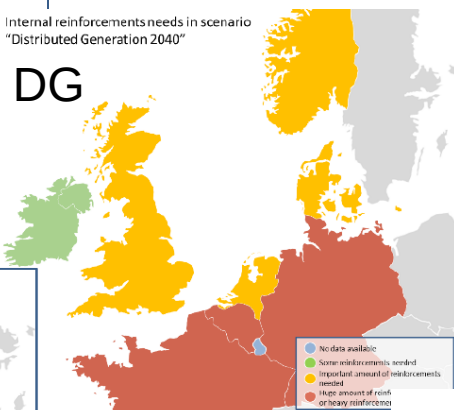
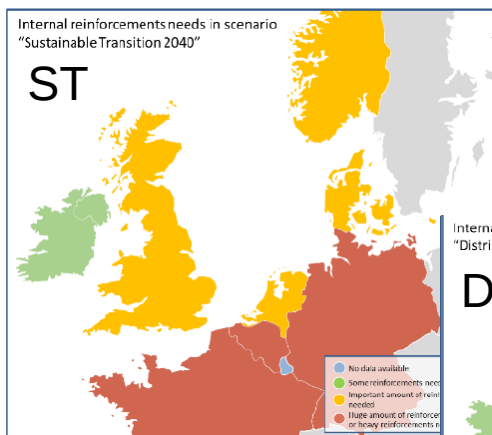
Identification of the System Needs - Methodology

Main steps of the approach

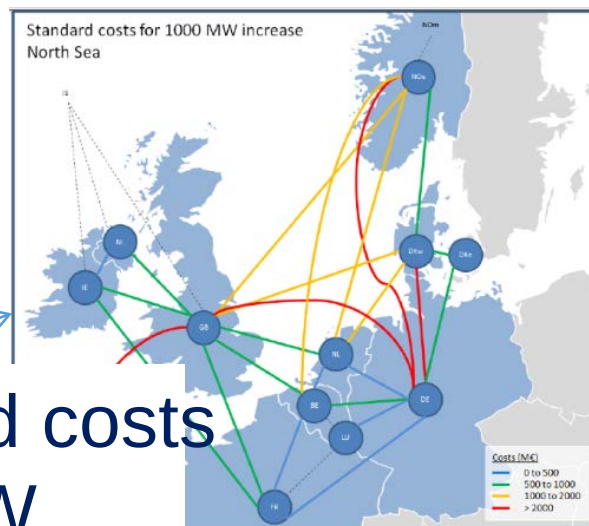
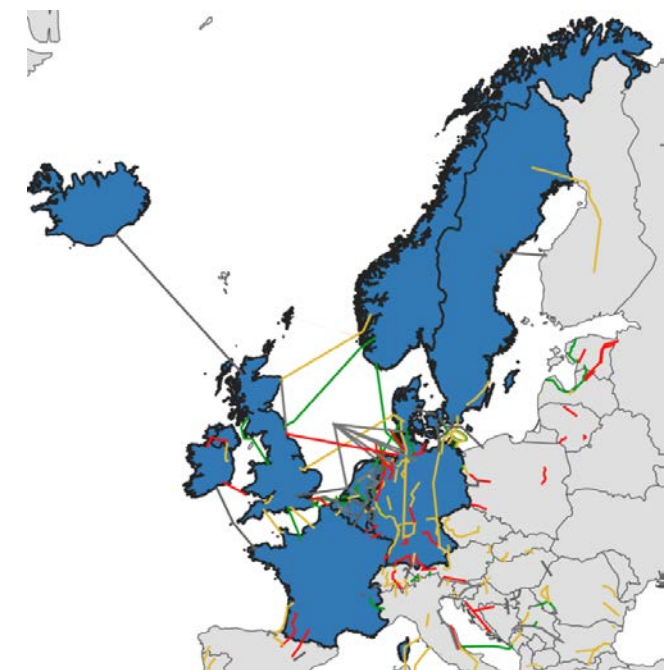


Many investments needed..

Internal
reinforcement
needs



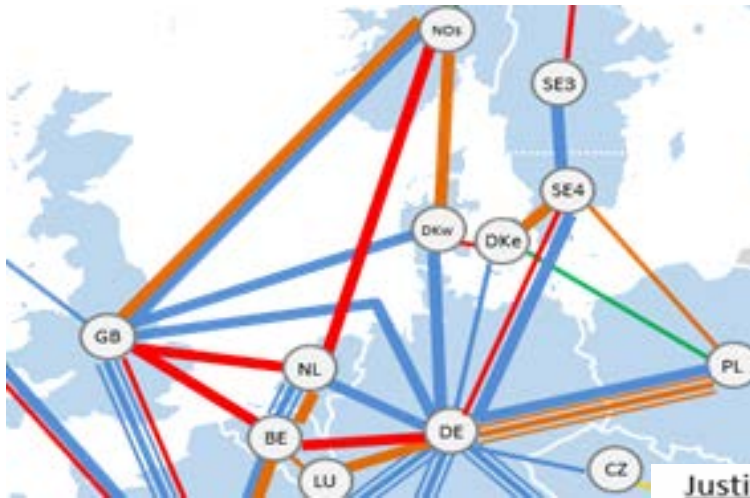
Challenged
AC borders



Standard costs
per 1 GW

IOSN: Results for three 2040-scenarios

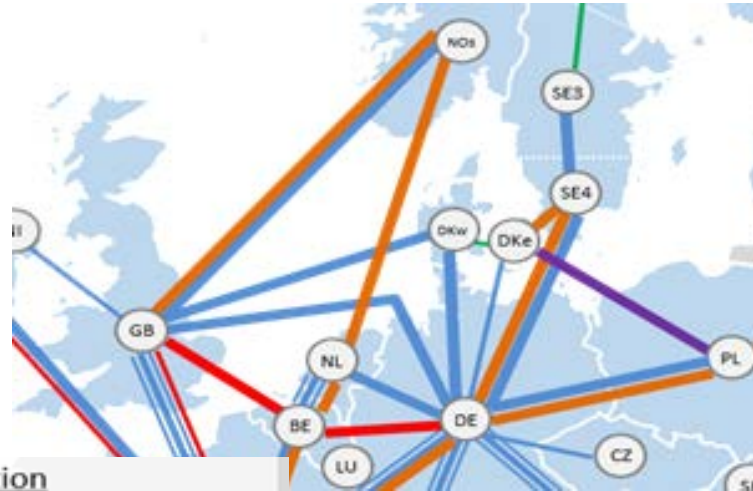
Global Climate Action



Justification

- SEW
- RES
- SoS
- RES and SoS
- SEW and RES
- Increases identified in TYNDP2016

Distributed Generation



Level of increase

- ≤ 500 MW
- 501 to 1500 MW
- > 1500 MW

Sustainable Transition

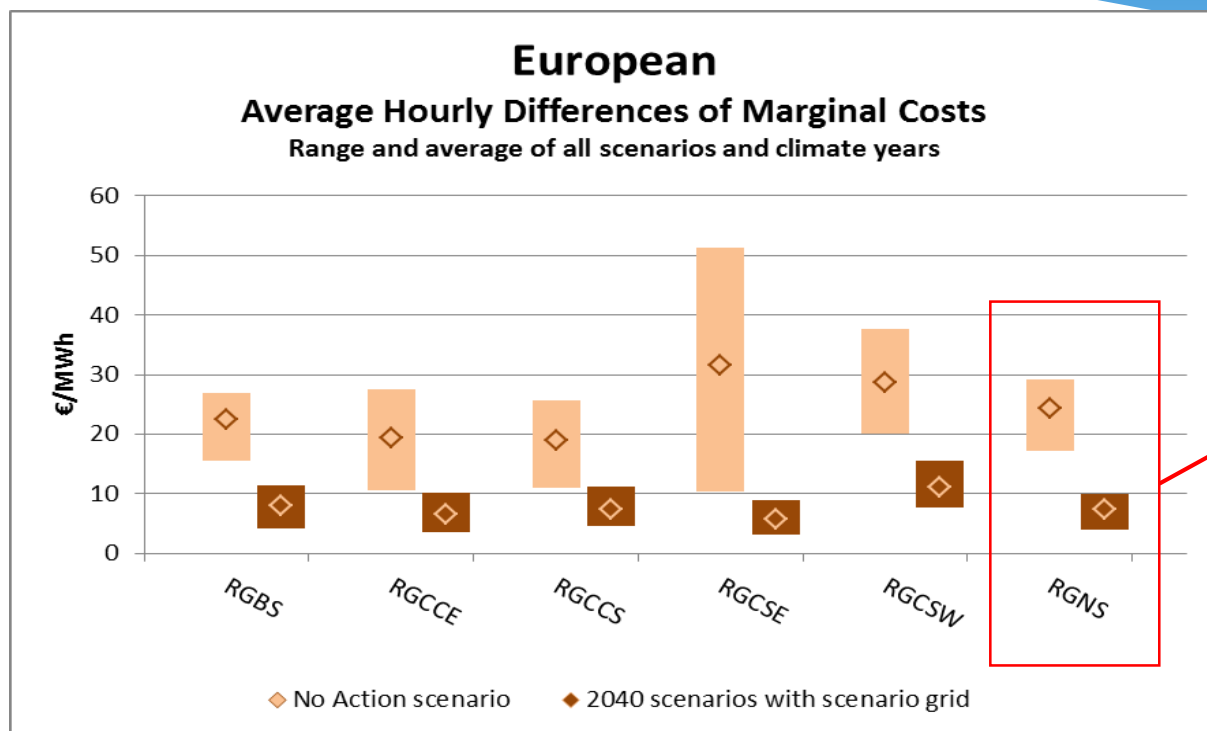


- Global emissions trading scheme
- Large scale development of renewable resources. Low Carbon technologies.
- High economic growth & Energy Efficiency
- Electric and gas vehicles displace oil in the private transport sector
- Gas helps the decarbonisation of the shipping and heavy good transport sectors
- Power-to-gas commercially available. Bio-methane
- Electric and hybrid heat pump technology help to decarbonise heating

- 'Prosumer' lead climate action, helped by strong EU Policies and an efficient ETS.
- Storage drives climate action
- Decentralised growth of RES
- High economic growth
- Smart cities enabled with electricity storage and demand response
- Decarbonisation of transport driven by electric vehicles
- Hybrid heat pumps offer consumer choice and flexibility

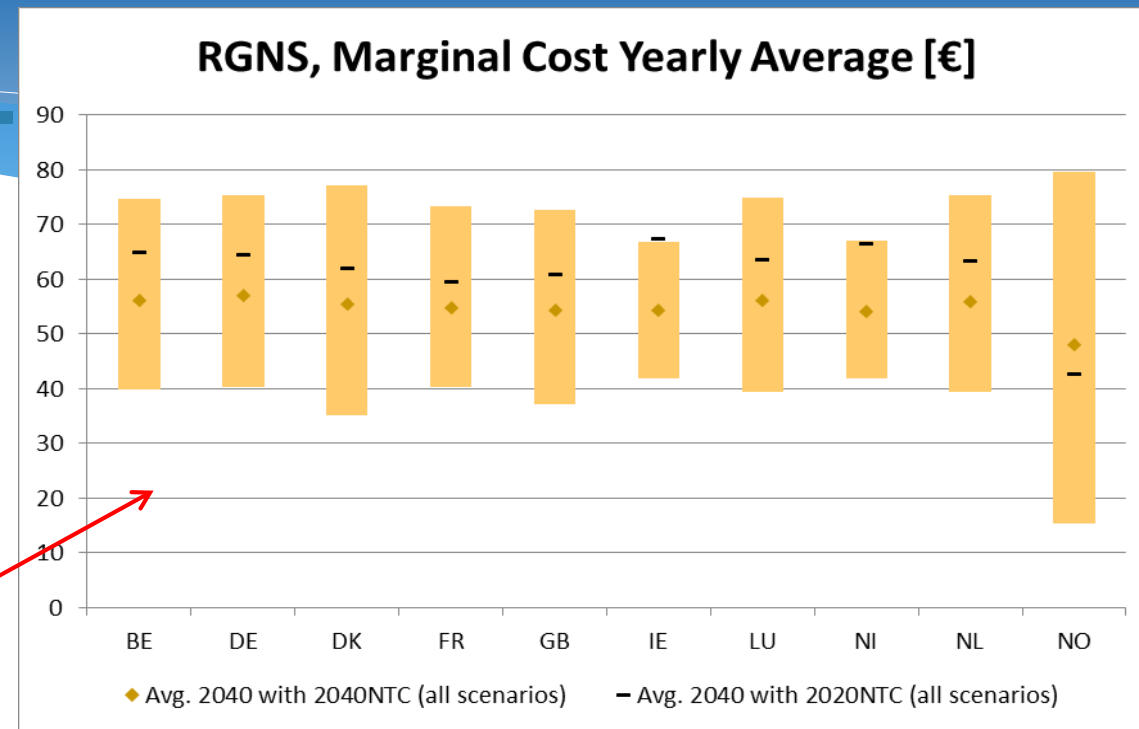
- National focus on climate change, driven by ETS and national subsidies
- Steady growth of renewable resources
- Moderate economic growth
- Gas sees significant growth in the shipping and transport sectors
- Electrification of heating and transport sees stable development
- Strong development in Bio-methane but none in Power-to-gas
- Heat pump technology most common in new buildings

The cost of no action.....



3 to 14 €/MWh reduction in marginal costs (prices)

.. and 40 to 60 Mton reduction in CO₂



Benefits...

...referring to *IoSN*
2040 capacities

compared to the
2020 grid



Up to 16 €/MWh
reduction in marginal costs
of electricity generation



19 to 97 TWh
less curtailed renewable energy

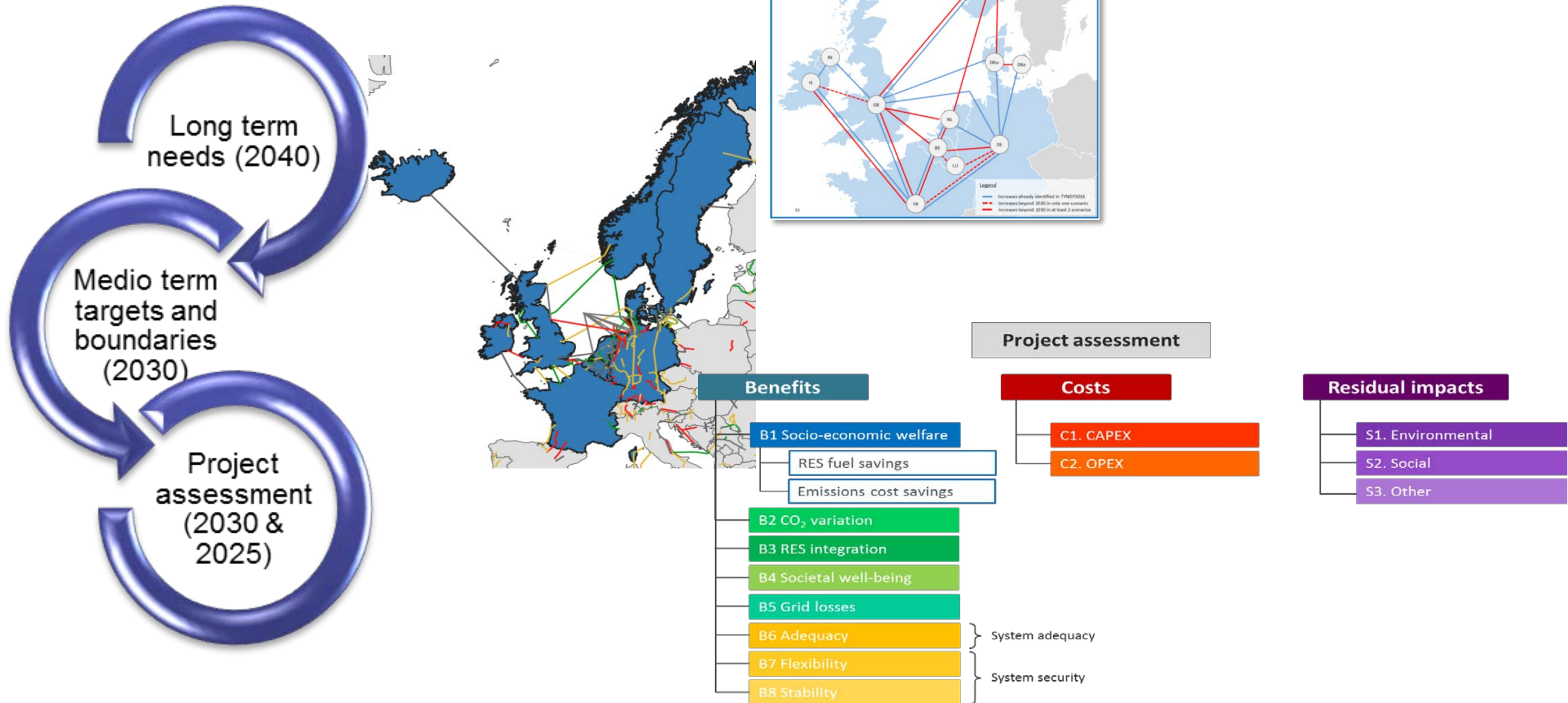


-5 to +23 Mton
reduction in CO₂



Up to 180 GWh
reduction in Energy Not Served

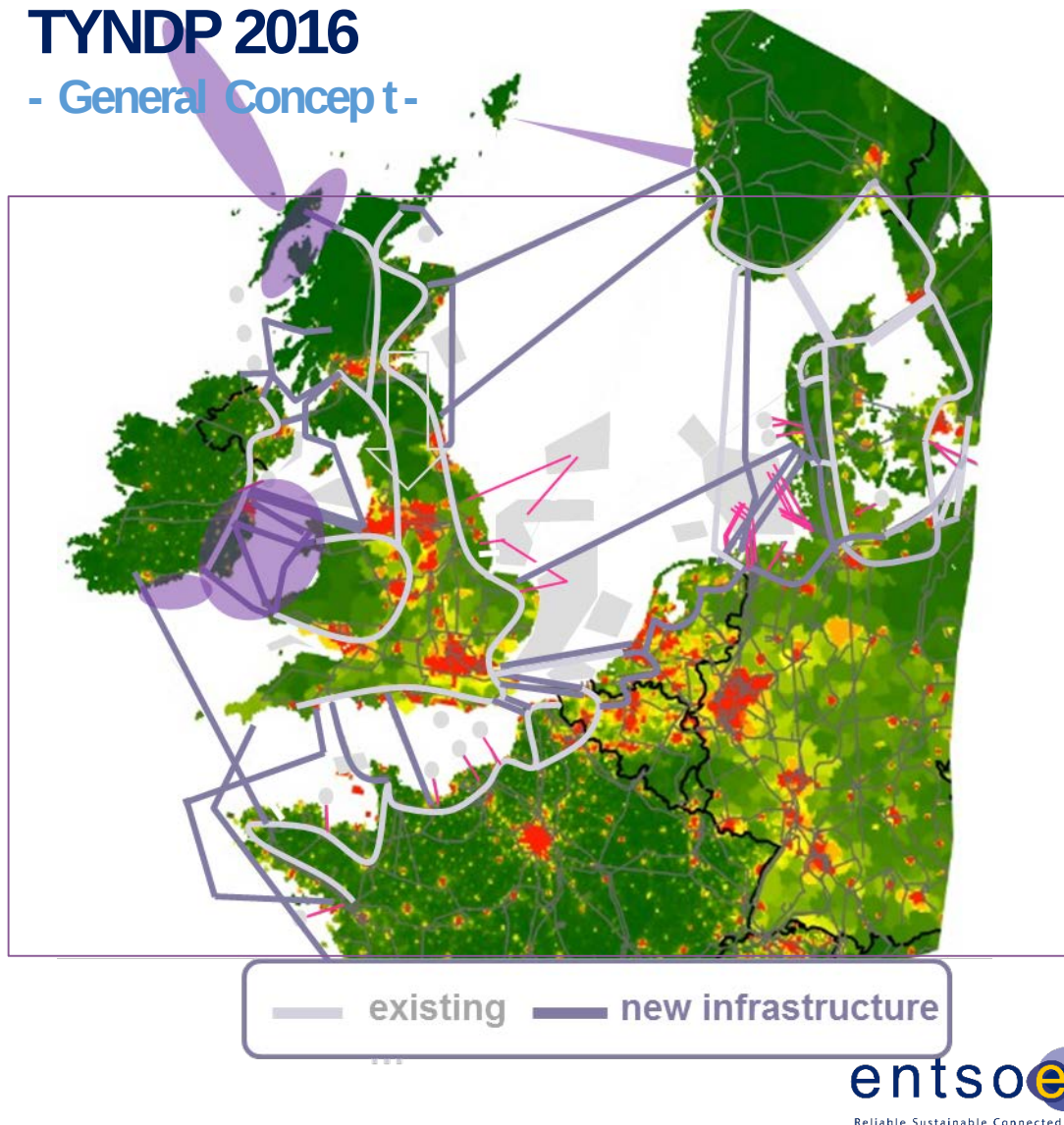
Summer Package = Focus on 2030 time horizon



ENTSO-E's 2016 view on the 2030 offshore grid infrastructure

TYNDP 2016

- General Concept -



Key Facts and Figures

- 25 individual projects develop into a global scheme
- Infrastructure costs of 12 - 25 bn €
- Socio-economic benefits of 2 - 3 bn € / yr
- Additional RES integrated of 15-32 TWh/ yr
- CO2 reduction of +10 200 ... -19 500 kt/ yr

General findings

- **Modular, step-wise** development of the Northern Seas grid infrastructure is **ongoing and re-evaluated** every 2 years
- **Cooperation** among countries and among stakeholders **is key**.

See the whole story here:

<http://tyndp.entsoe.eu/insight-reports/north-seas/>

Northern Seas Offshore Grid Infrastructure - 2018

TYNDP18 edition



On- and Offshore wind development (TYNDP16 vs TYNDP18

TYNDP16

[GW]	2020	Vision 1	Vision 2	Vision 3	Vision 4
Offshore wind	24.1	30.6	30.8	72,2	79,6
Onshore wind	94.0	110.9	124.7	155.1	154.5
			DG 2040	GCA2040	
Offshore wind	24	59	59	40	
Onshore wind		86	86	127	
		142	142	137	
		170	185	197	

Assessment Results for NS-OGI

	BE2025	ST2030	DG 2030	EUCO2030
SEW [M € /y]				
CO2 [kT/y]				
RES [GWh/y]				
20 projects developing into the global scheme				

North Sea Wind Power Hub

TYNDP18 edition

2018Draft

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On- and Offshore wind development (TYNDP16 vs TYNDP18

TYNDP16

[GW]	2020	Vision 1	Vision 2	Vision 3	Vision 4
Offshore wind	24.1	30.6	30.8	72,2	79,6
Onshore wind	94.0	110.9	124.7	155.1	154.5
			DG 2040	GCA2040	
Offshore wind	24	5986	5986	40127	
Onshore wind		142170	142185	137197	

Assessment Results for NSWPH

	BE2025	ST2030	DG 2030	EUCO2030
SEW [M € /y]				
CO2 [kT/y]				
RES [GWh/y]				
Costs				

Welcome the ENTSO-E summer
package 😊

Thank you!
