

TYNDP 2017 - identification of problems

Contribution to the 3rd PCI process

Preliminary results

BEMIP Regional Group - 26 October 2016

ENTSOG System Development Team



Infrastructure gap under TYNDP 2017

BEMIP Region



1. TYNDP 2017 - overview
2. The TYNDP Scenario framework
3. The TYNDP assessment frame
4. Identification of problems



Infrastructure gap under TYNDP 2017

BEMIP Region



1. TYNDP 2017 - overview

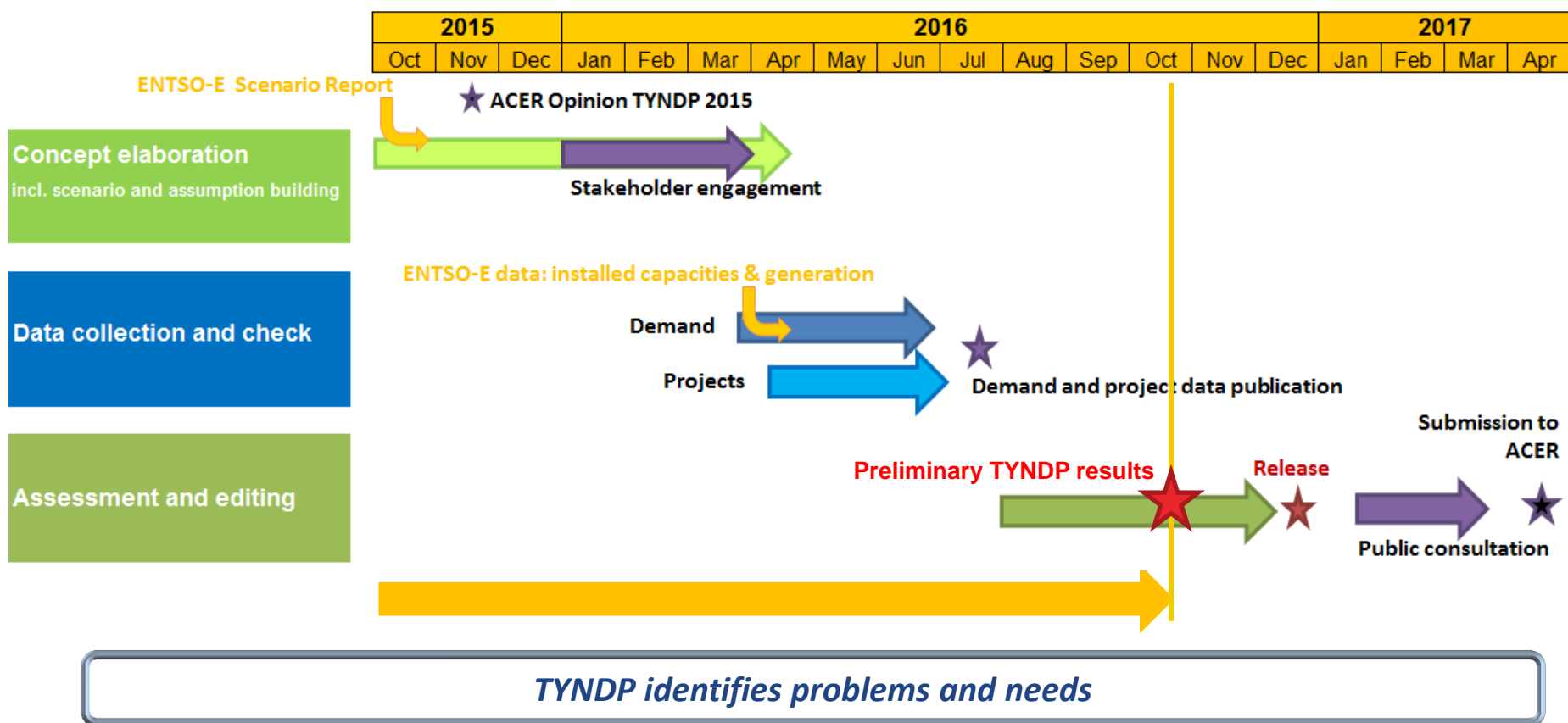
2. The TYNDP Scenario framework

3. The TYNDP assessment frame

4. Identification of problems

Where are we in the TYNDP process?

- Strong cooperation with ACER and European Commission all along the process
- An intense interaction with Stakeholders
- Dialogue with ENTSO-E on TYNDP Scenarios





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4 Demand Scenarios

Scenario		Slow Progression	Blue Transition	Green Evolution	EU Green Revolution
Category	Parameter				
Macroeconomic trends	EU on track to 2050 target?	Behind	On track	On track – National ambitions	On track / beyond – EU level ambitions
	Economic conditions	Limited growth	Moderate growth	Strong growth	Strong growth
	Green ambitions	Lowest	Moderate	High	Highest
	CO2 price	Lowest	Moderate	Highest	Highest
	Fuel prices	Highest	Moderate	Lowest	Lowest
Heating sector	Energy Efficiency improvement	Slowest	Moderate	Fastest	Fastest
	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)	Gas displaced by electricity (district heating, heat pumps)
	Electrification	Lowest	Moderate	High	Highest
Power sector	Renewables develop.	Lowest	Moderate	High	Highest
	Gas vs Coal	Coal before Gas	Gas before Coal	Gas before Coal	Gas before Coal
Transport sector	Gas in transport	Lowest	Highest	Moderate	Moderate
	Elec. in transport	Lowest	Moderate	Highest	Highest

Related ENTSO-E
2030 Visions

Vision 1

Vision 3

Vision 4

Vision 4

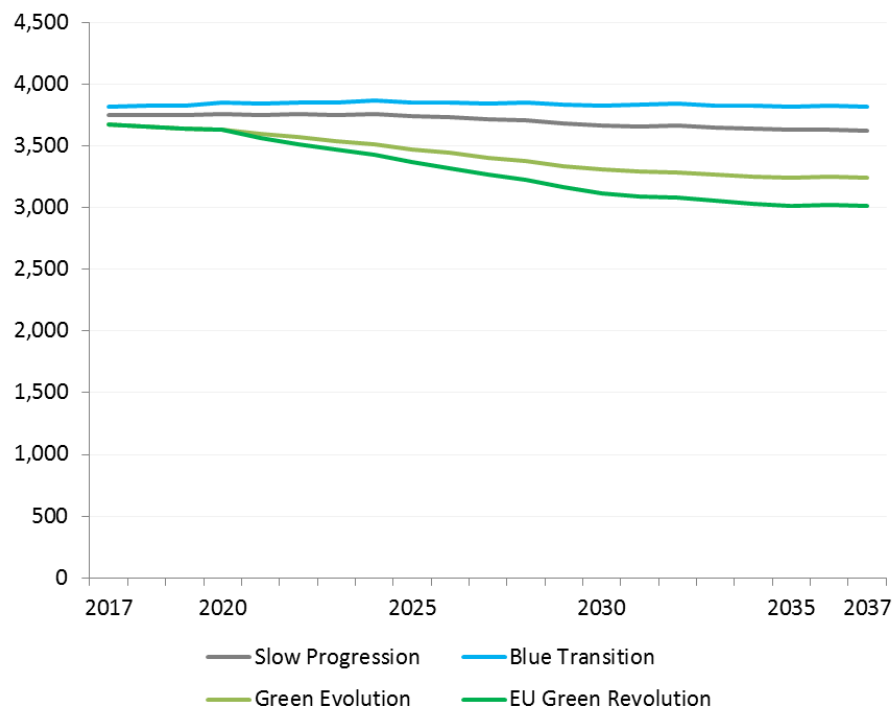


Sectoral gas demand

End-user demand

Stable to decreasing demand depending on **energy efficiency gains** and **electrification** of the heating sector

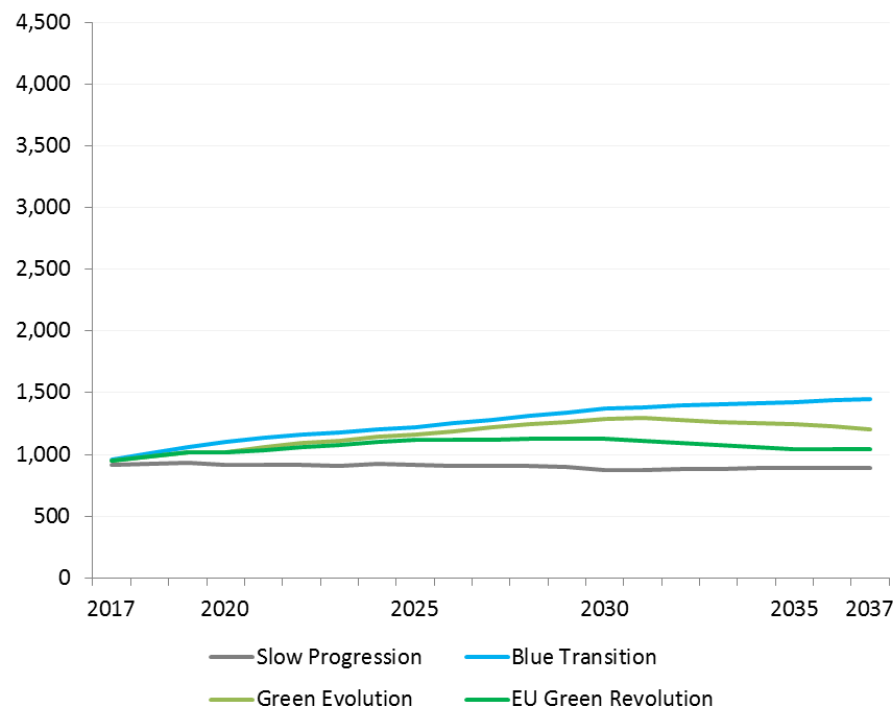
TWh/y



Gas for power demand

Stable to increasing demand depending on role of gas in **RES back-up** and **substituting coal-fired generation**

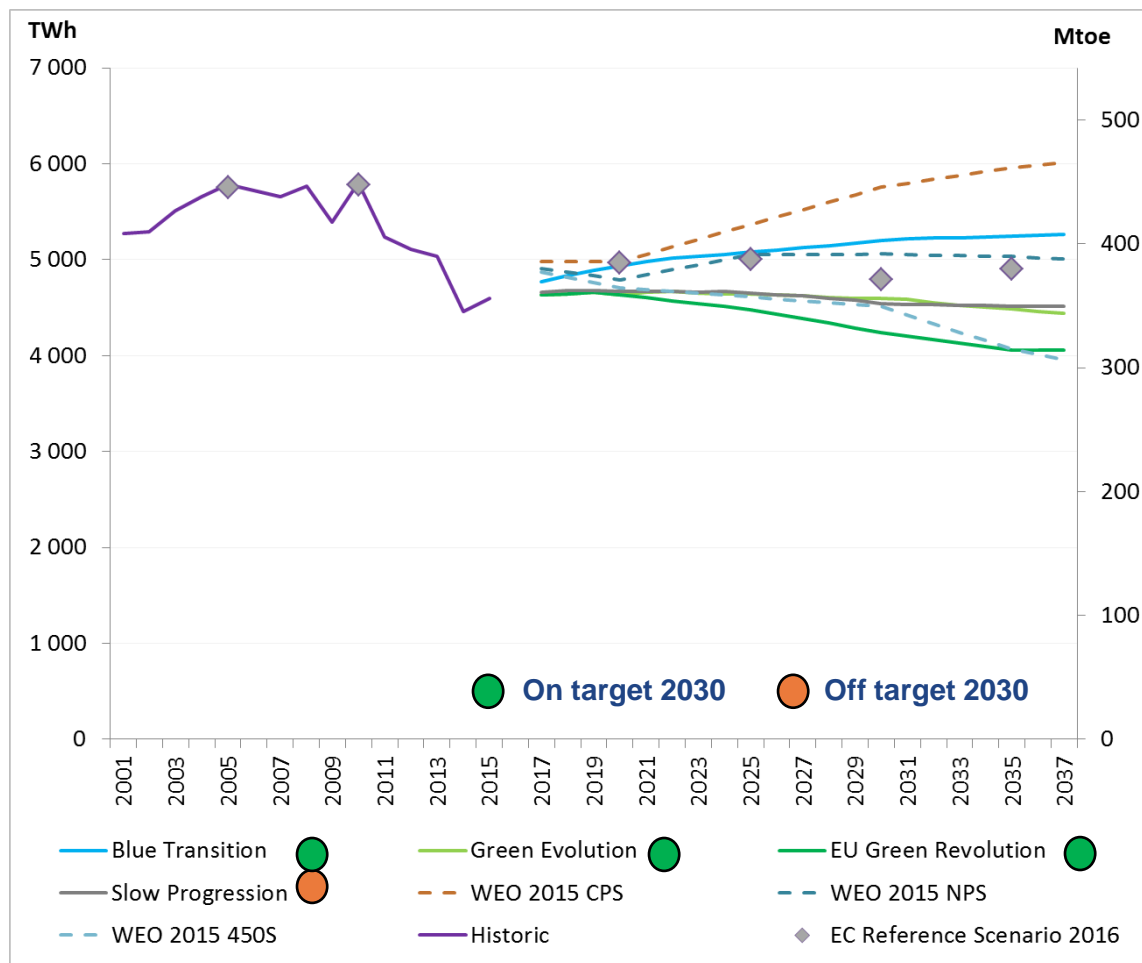
TWh/y



End-user demand consist of the following demand: residential & commercial, industrial and transport



Overall gas demand

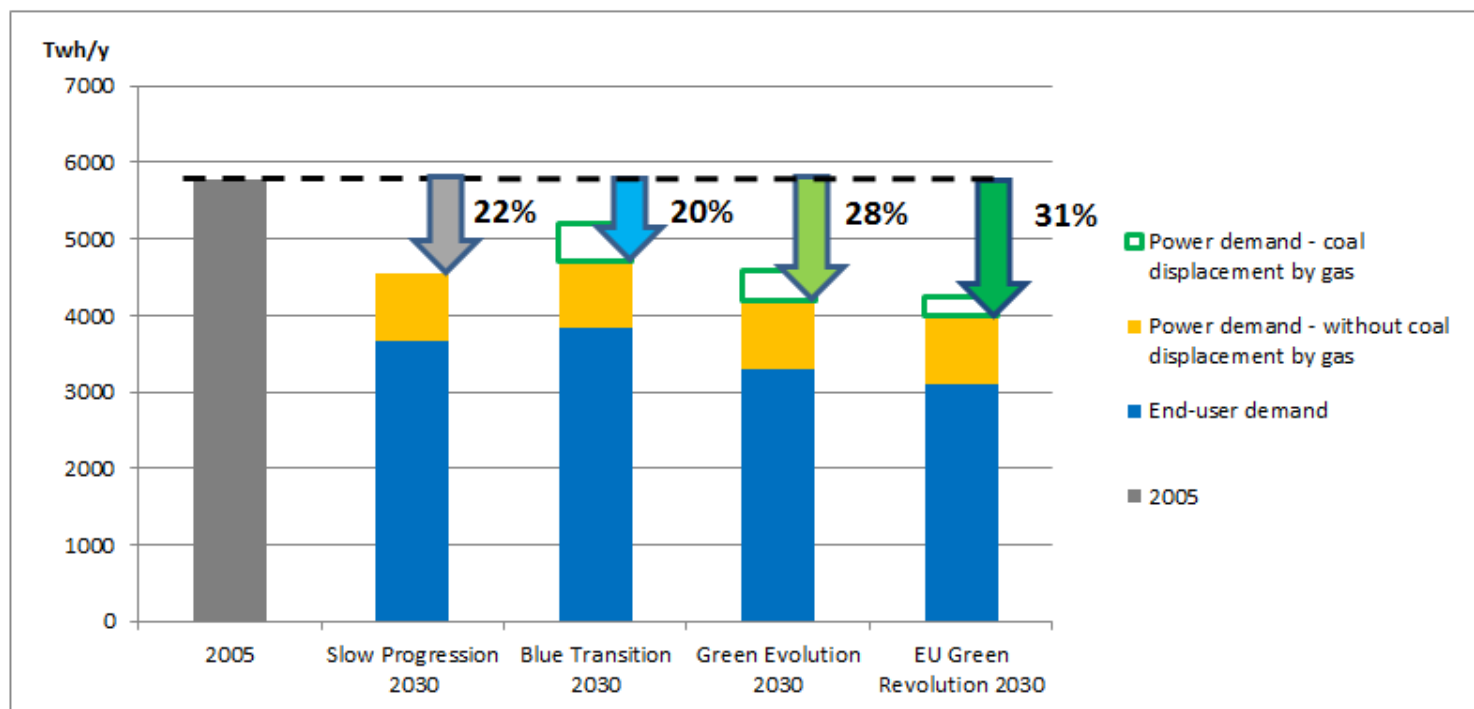


TYNDP assessment performed for the 3 on target scenarios

Several paths to achieving the EU targets

Energy Efficiency

- > 27% (resp. 30%) targets set against the 2007 PRIMES baseline for 2030 (total primary energy). In reference to the **2005 level**, it corresponds to **20% gains** (resp. **23%**)
- > Standard usages of gas already allow to achieve the EE target
- > Gas displacing other fuels, such as for power generation, further increases the gains

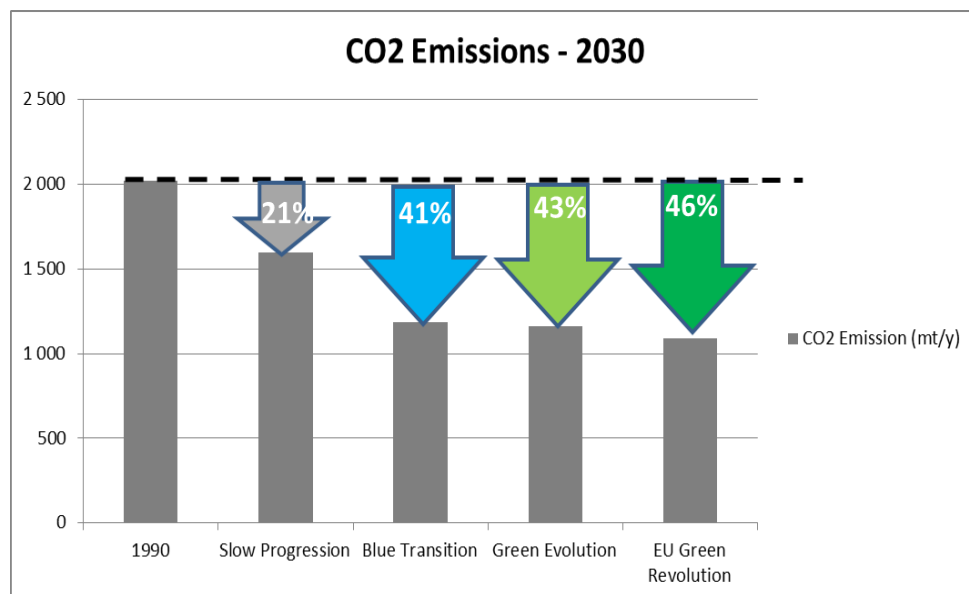


When looking at targets' achievement in the gas and power sectors it should be kept in mind that targets are set globally across all sectors

Several paths to achieving the EU targets

CO2 emissions

- > The on-target scenarios achieve the target of 40% CO2 reduction compared to 1990



CO2 emissions in 2030 – overall power demand and gas end-user demand

Renewables

- > TYNDP 2017 scenarios for power generation are based on ENTSO-E TYNDP 2016 Visions which comply with the **EU RES-E target**
- > TYNDP 2017 scenarios incorporate **biomethane**, a renewable gas source

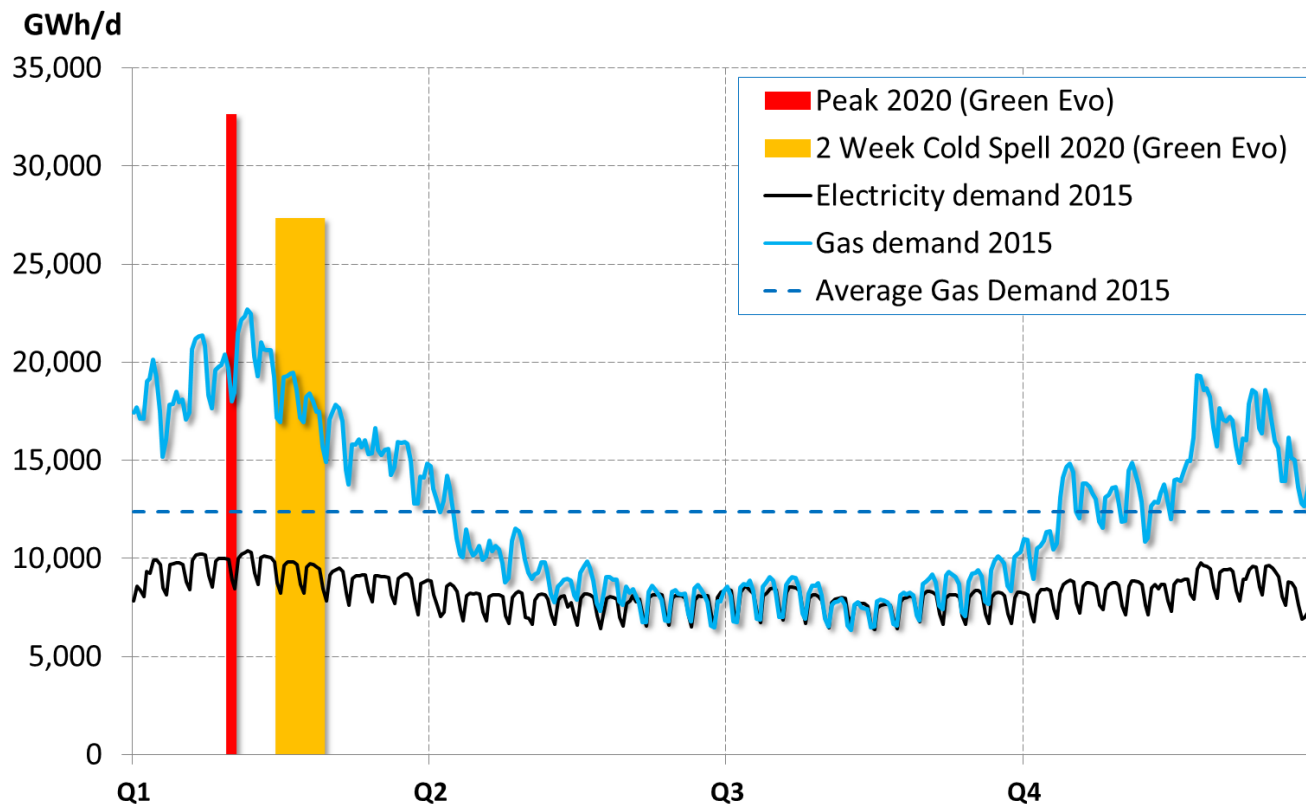
The gas grid is to be assessed for the different paths

When looking at targets' achievement in the gas and power sectors it should be kept in mind that targets are set globally accross all sectors



Gas network designed for peak situation

Gas grid assessed both from an annual volume and high demand situation perspective



European gas and electricity demand – over the year and peak perspectives



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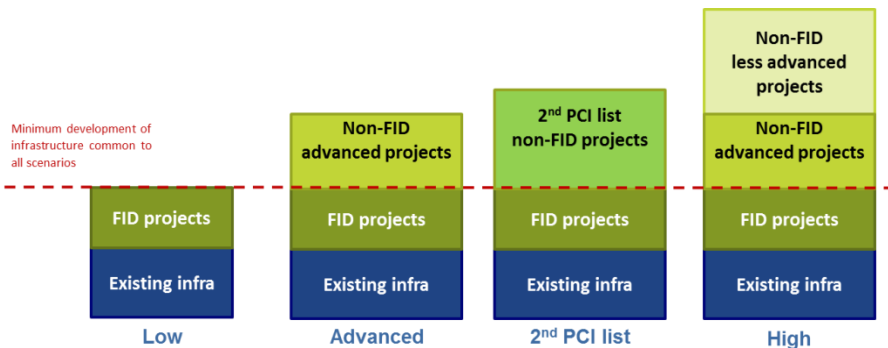
4. Identification of problems



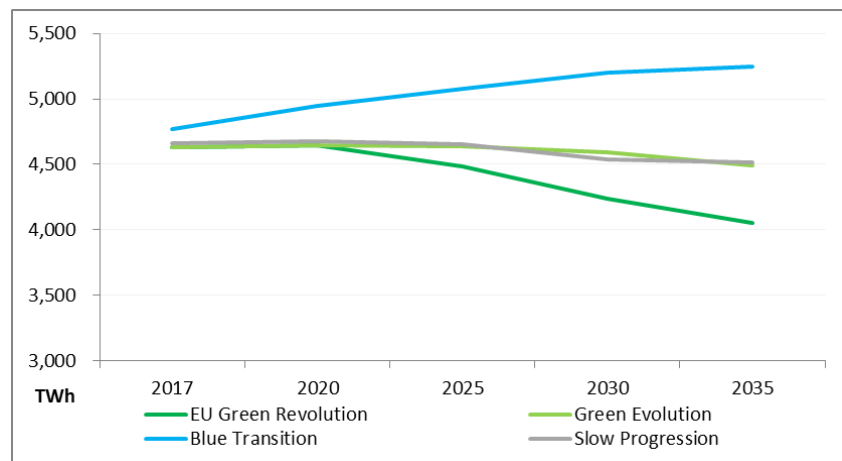
The TYNDP 2017 assessment frame

4 infrastructure levels

Dynamic over time based on projects commissioning date



3 scenarios assessed

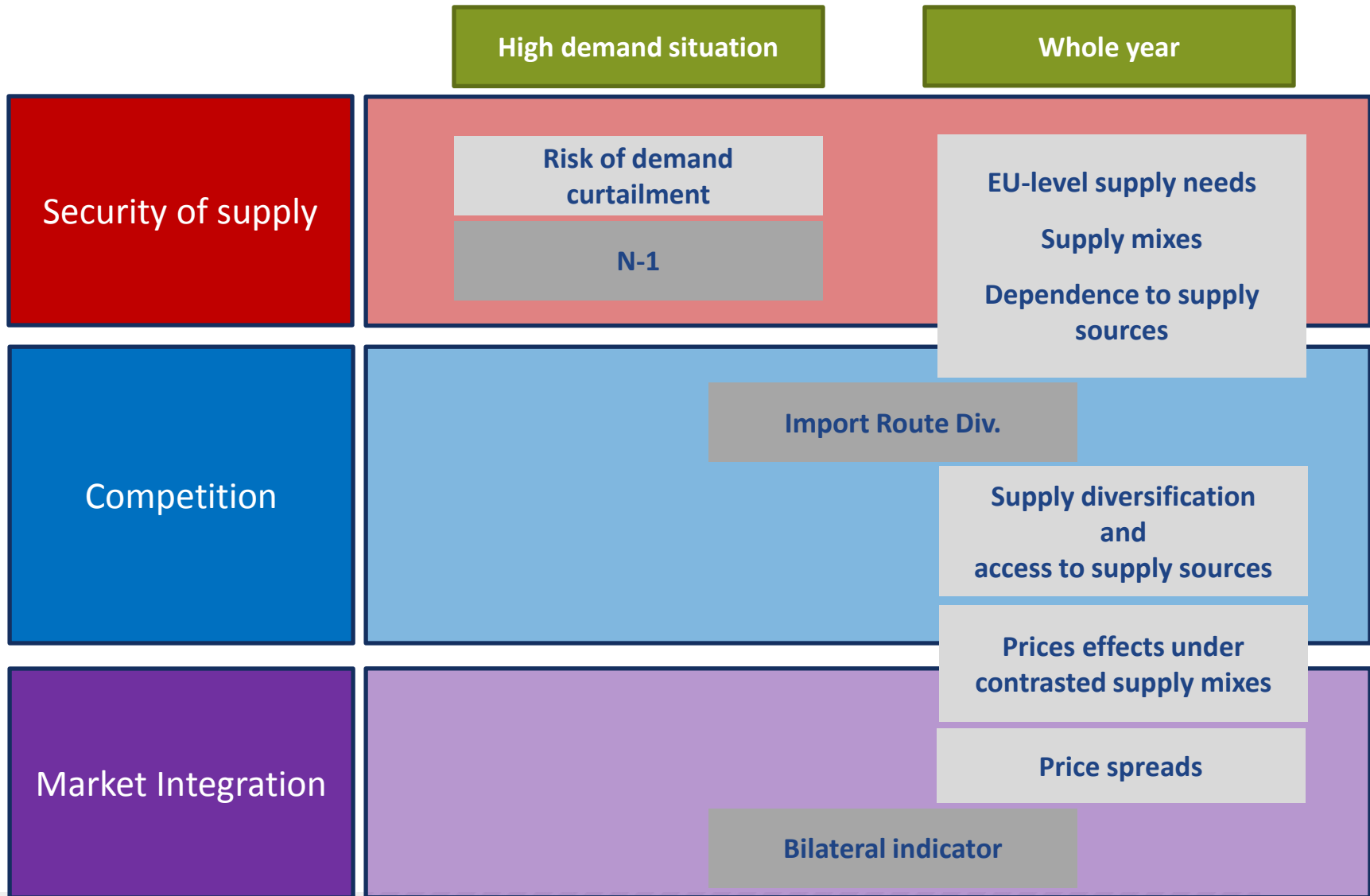


	Low	Advanced	2 nd PCI list	High
Blue Transition				
Green Evolution				
EU Green Rev				

Multi-criteria analysis

**Low infra level analysis:
Focus of today presentation**

A multi-criteria analysis



Not covered in the preliminary results



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Identification of problems

TYNDP identifies the infrastructure gap

- > TYNDP assessment is performed under an assumption of perfect market functioning
 - To avoid identifying needs where better market functioning would solve the issue
 - To focus on the **infrastructure needs**

The results allow to identify

- > The most impacted countries
- > The infrastructure limitations

Identified issues may be mitigated by different types of gas infrastructure



Security of supply

Exposure to demand disruption

High demand
situation

Disrupted rate and Remaining Flexibility

- > The **disrupted rate** indicates the share of a country's demand that cannot be covered. It is calculated under **cooperative behaviour** between countries
 - Countries will align their disruption rate if infrastructures allows for it
 - Non-alignment between countries indicate an **infrastructure bottleneck**
- > When a country does not face disruption, the **remaining flexibility** indicates the additional share of demand that the infrastructure would allow to cover. It is calculated non-simultaneously for each country.

Cases investigated

- > Normal situation
- > Specific route disruption cases: in this case we are interested in the **additional impact compared to the normal situation case**
- > Cases leading to demand disruption are presented



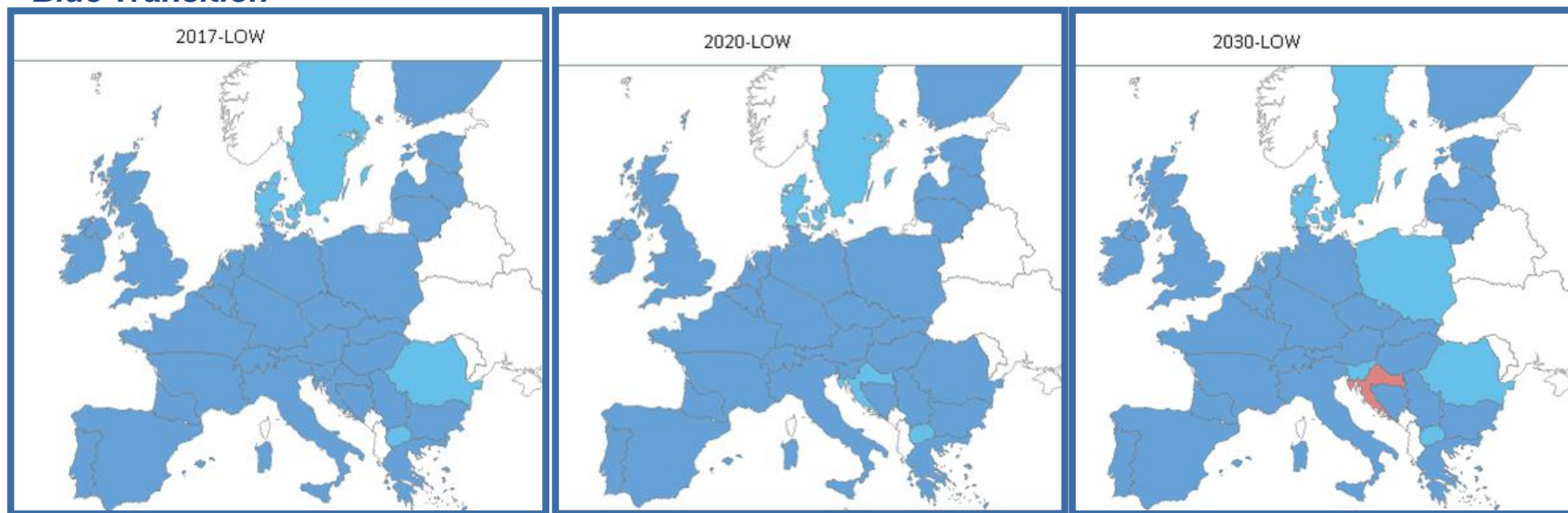
Security of supply

Exposure to demand disruption (normal situation)

High demand situation
(peak day)

The BEMIP Region is able to cover its demand even under peak situation

Blue Transition



Remaining Flexibility

20% - 50%
0% - 20%



Share of curtailed demand

50% - 100%
20% - 50%
0% - 20%



	BEMIP
Exposure to demand disruption under normal situation	Low Rem Flex: SE, DK, PL Green Rev: only SE



Security of supply

Exposure to demand disruption – under Belarus route disruption

High demand
situation
(peak day)

Blue Transition



Remaining Flexibility

20% - 50%
0% - 20%

Share of curtailed demand

50% - 100%
20% - 50%
0% - 20%

HR unchanged from normal situation

BEMIP

Exposure to demand disruption
under Belarus route disruption

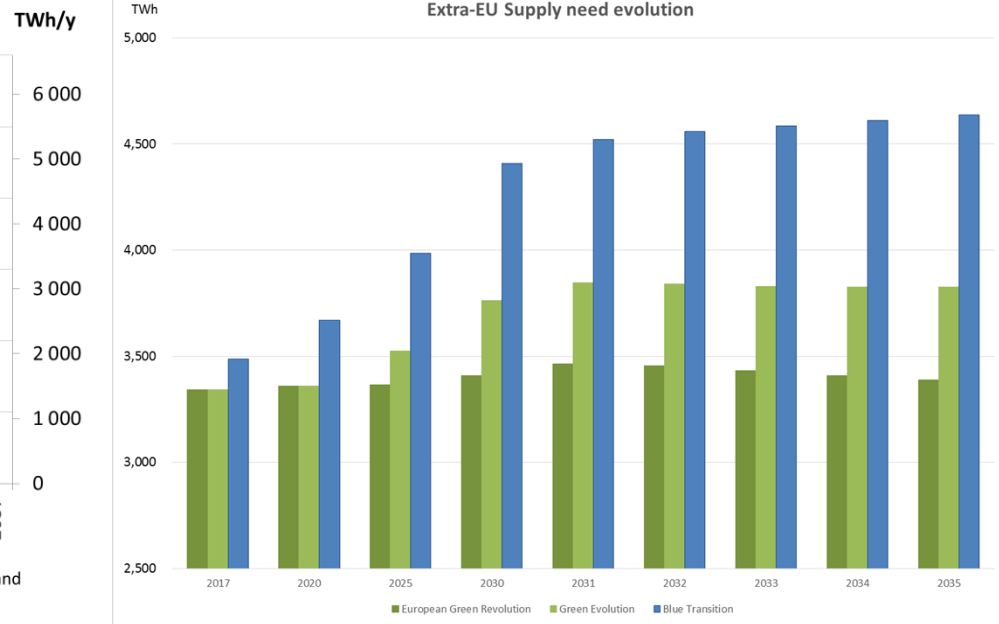
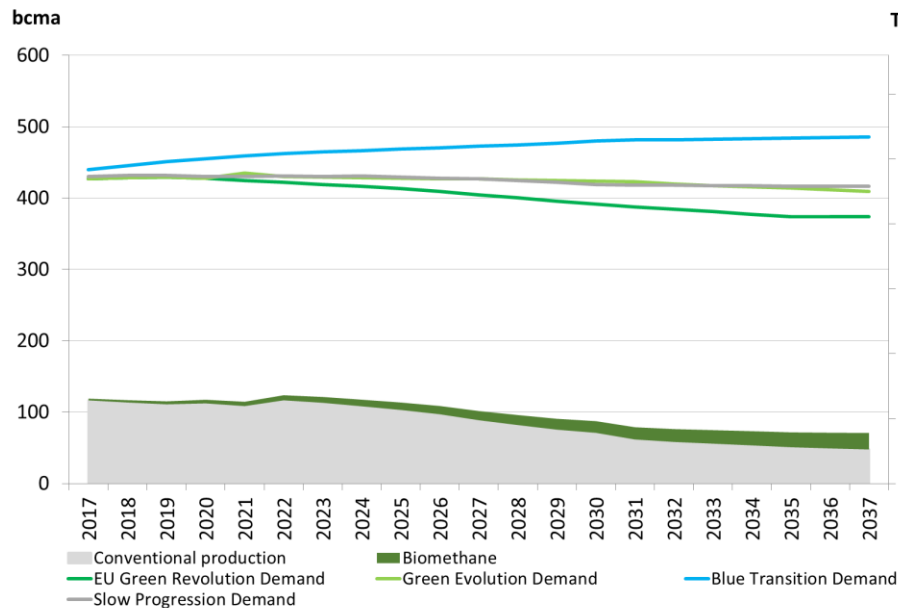
Disruption: PL
GRev: PL low Rem Flex



Security of supply / Competition

EU supply needs

Whole
year



Decline of indigenous production leads to increased supply needs over time for 2 out of the 3 scenarios

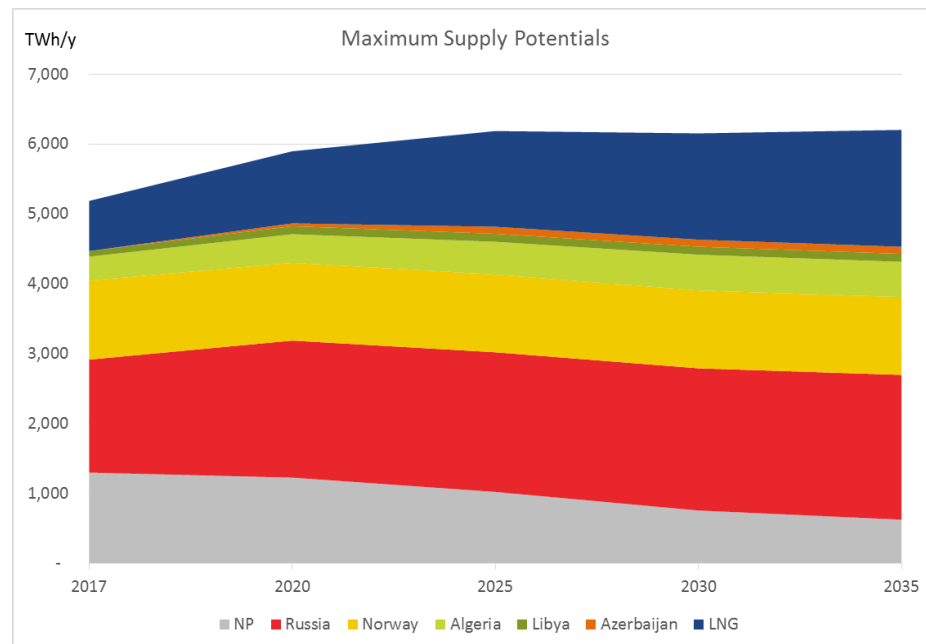
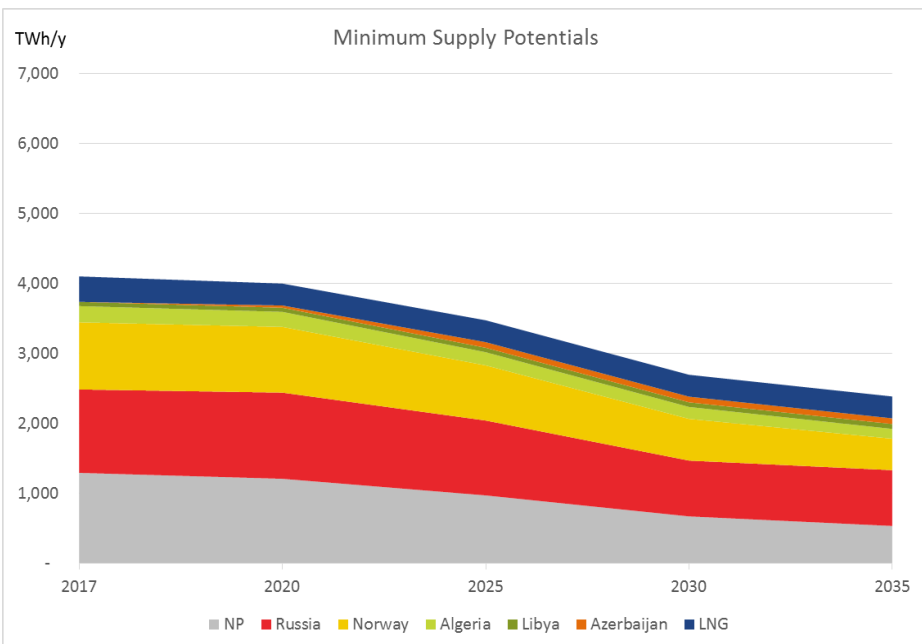


Security of supply / Competition

EU supply mixes – Retained supply potentials



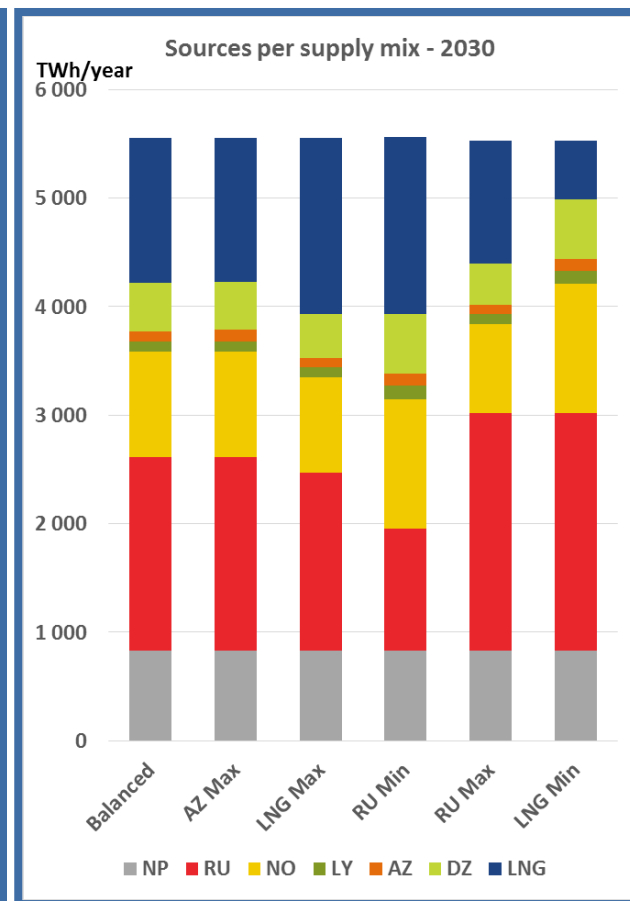
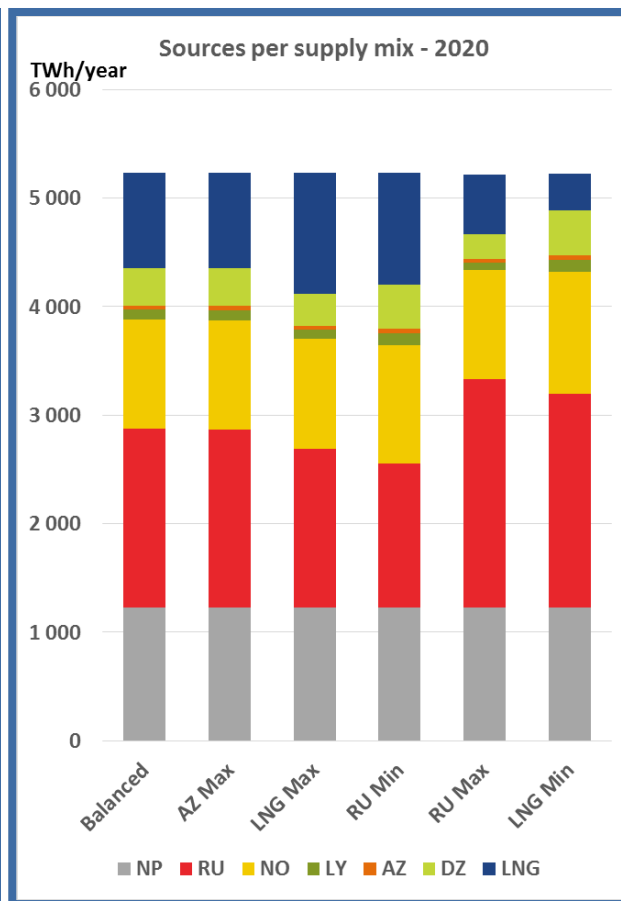
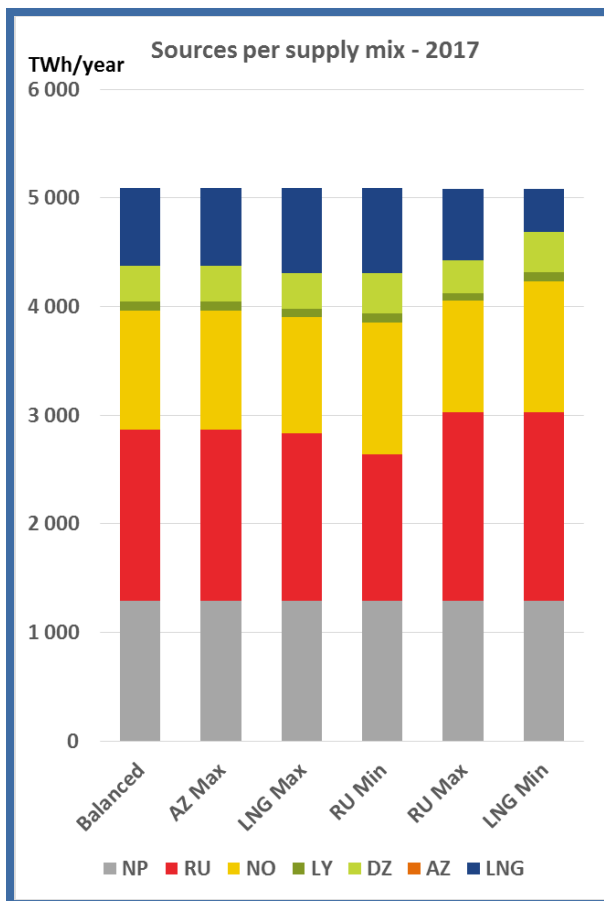
Whole
year



Security of supply / Competition

EU supply mixes

Blue Transition



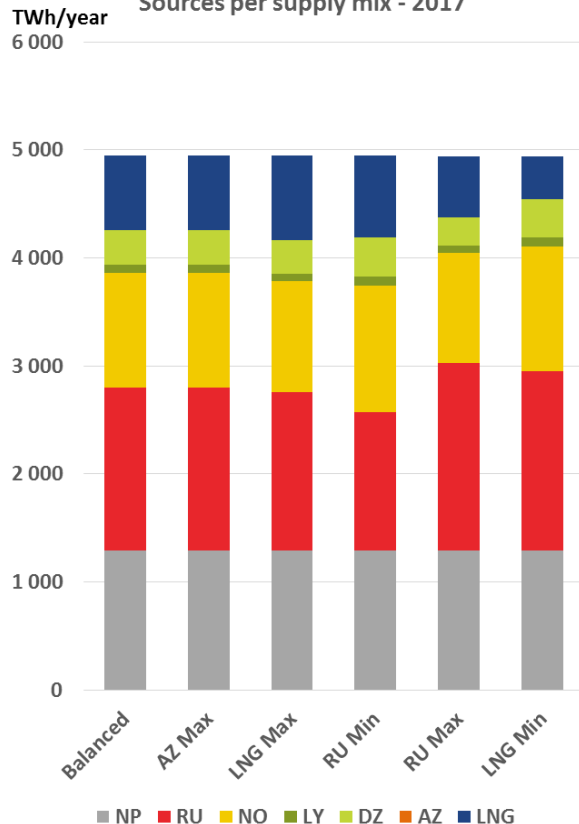
The low infrastructure level enables a wide range of supply mixes.

Security of supply / Competition

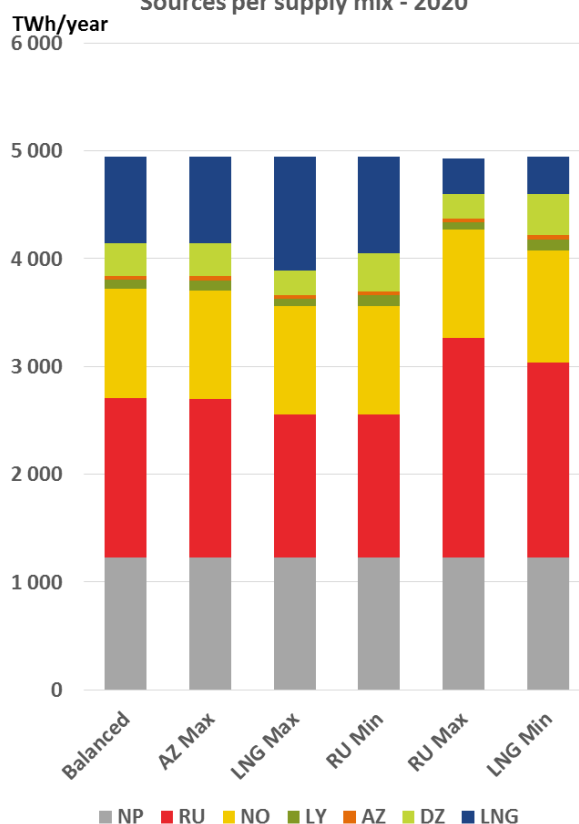
EU supply mixes

Green Revolution

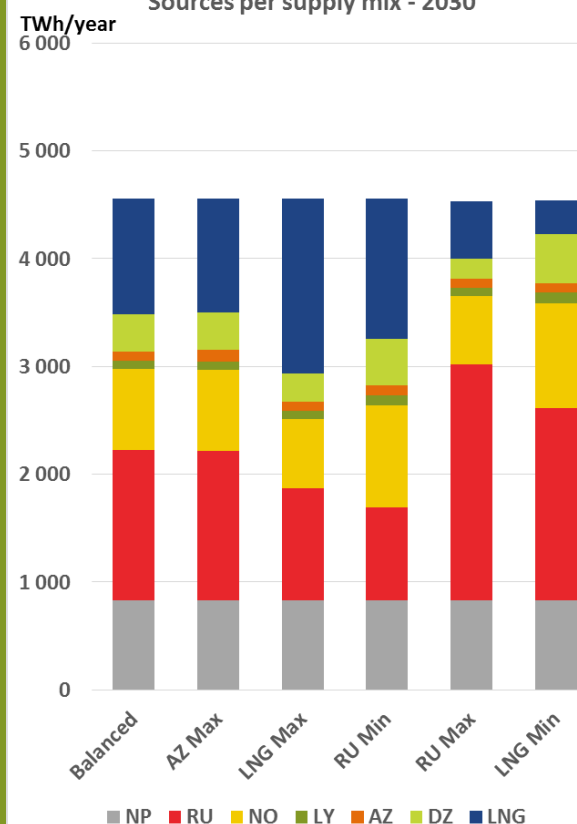
Sources per supply mix - 2017



Sources per supply mix - 2020



Sources per supply mix - 2030



The low infrastructure level enables a wide range of supply mixes.

Security of supply / Competition

Dependence to supply sources

- > Dependence **to a given supply source** (CSSD) should be understood as the **minimum share of this source** necessary for a country to cover its demand on a yearly basis
- > Dependence is presented under **cooperative behaviour** between countries
 - Countries will align their minimum source share (CSSD) if infrastructures allows for it
 - Non-alignment between countries indicate an **infrastructure bottleneck**
- > High CSSD level can inform both on **security of supply** and **competition**
 - In the case of LNG, being a multi-source supply, security of supply is not at stake

Results show no noticeable dependence in the BEMIP Region to Norwegian* gas or LNG



Security of supply / Competition

Dependence to Russian supply

- > **At EU level**, no infrastructure limitation preventing full access to the other supply sources*
- > **At country-level**, some highly dependent countries indicating infrastructure bottleneck

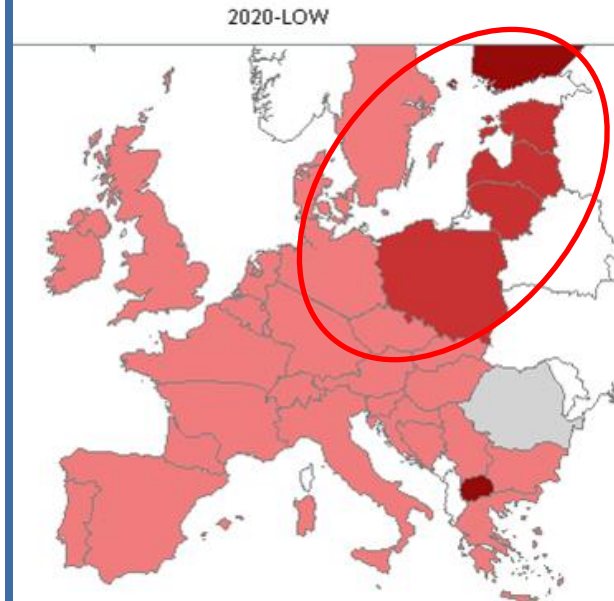
Whole
year

Blue Transition

2017-LOW

2020-LOW

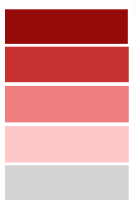
2030-LOW



	BEMIP
Dependence to Russian supply above 25%	EE, FI, LV, LT, PL <i>G.Rev: PL below 25%</i>

CSSD

50% - 100%
25% - 50%
15% - 25%
5% - 15%
0%-5%



*the EU-level dependency derive from the maximum supply potential from the other sources

Results for the other scenarios are provided in Annex

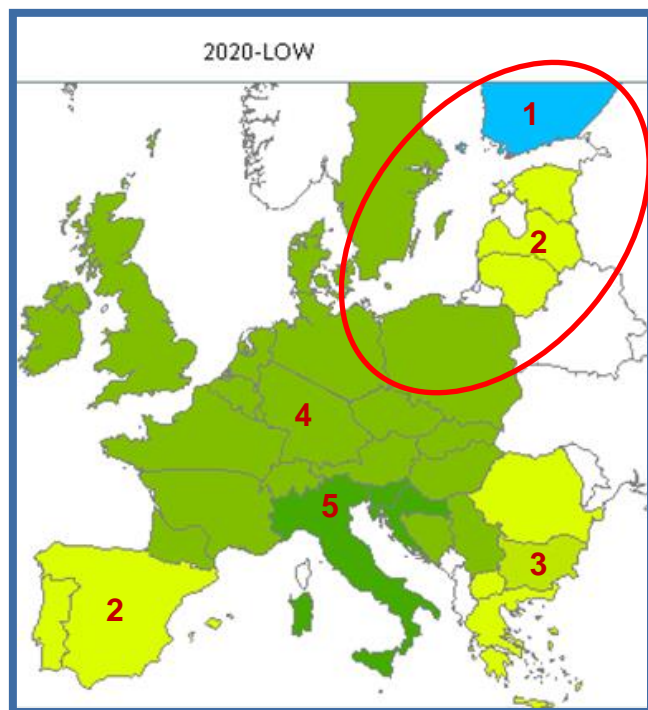


Competition - Access to Supply Sources

Access to Supply Sources is based on the **SSPDi** indicator

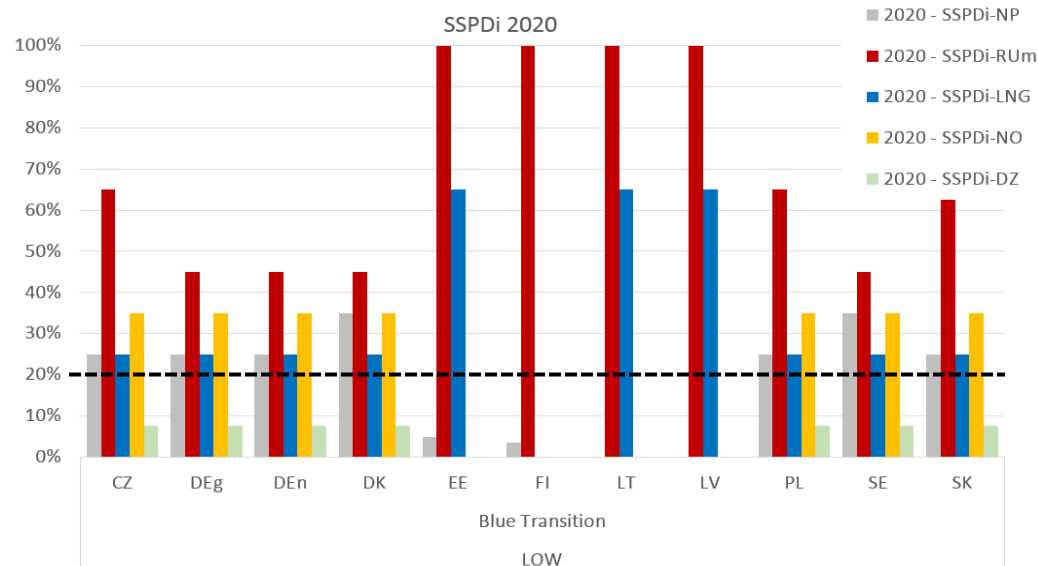
- > **SSPDi**: capacity of a country to reflect a given source low price in its supply bill (SSPDi: supply bill share impacted)
- > **Access to Supply Sources** indicates the **number of sources** for which SSPDi exceeds a 20% threshold

Blue Transition – Access to sources



LNG is a multi-source supply: results should be interpreted accordingly

BEMIP focus



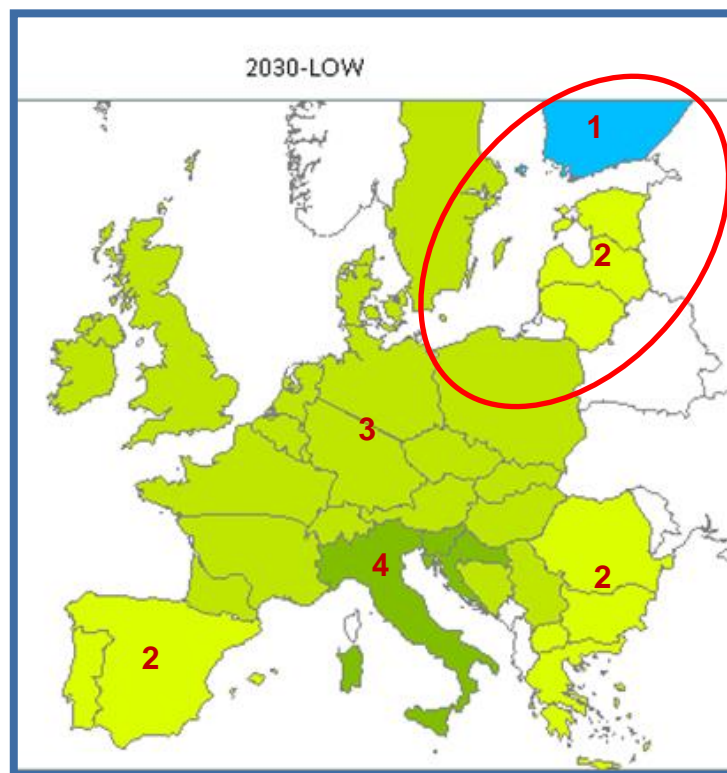
*At EU-level, Libyan and Azeri volumes are too low to have any significant impact on prices



Competition - Access to Supply Sources

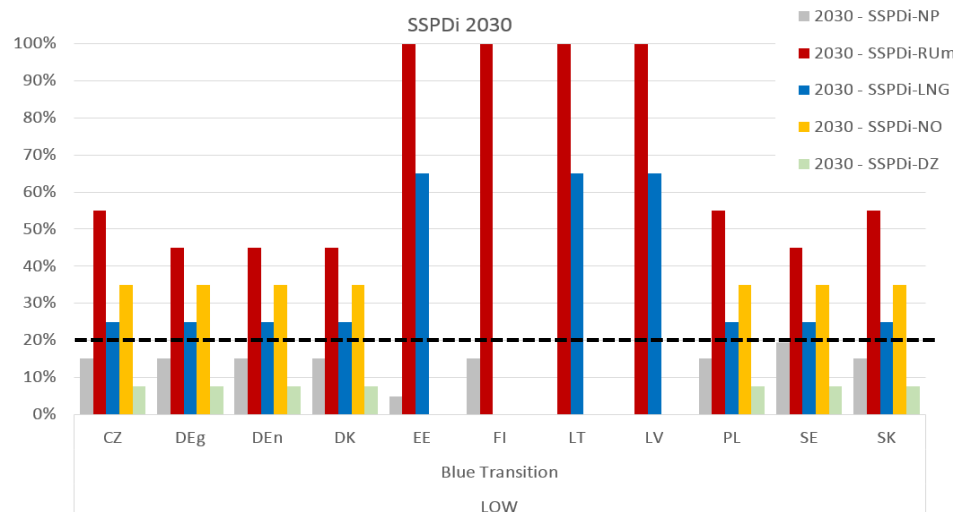
Indigenous production fades out as a diversification option

Blue Transition – Access to sources



LNG is a multi-source supply: results should be interpreted accordingly

BEMIP focus



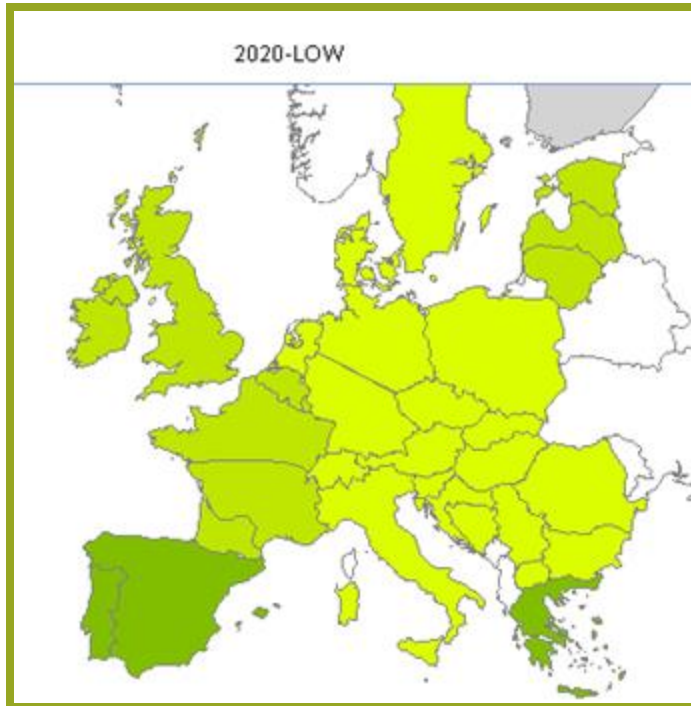
	BEMIP
Access to less than 3 supply sources (* including LNG)	EE*, FI, LV*, LT*

- > Most of the countries accessing a limited number of supply sources also show high dependence to Russian gas

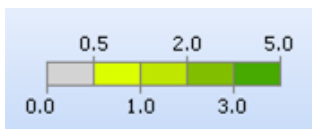
Price effects - LNG

LNG supply maximisation* (low LNG price) -
Green Evolution

Whole
year



Legend: price decrease
compared to the balanced
supply configuration
(EUR/MWh)



Price effect: barriers to low price
propagation

BEMIP

LNG Maximisation
(low LNG price)

FI vs Baltic states
PL vs Baltic states

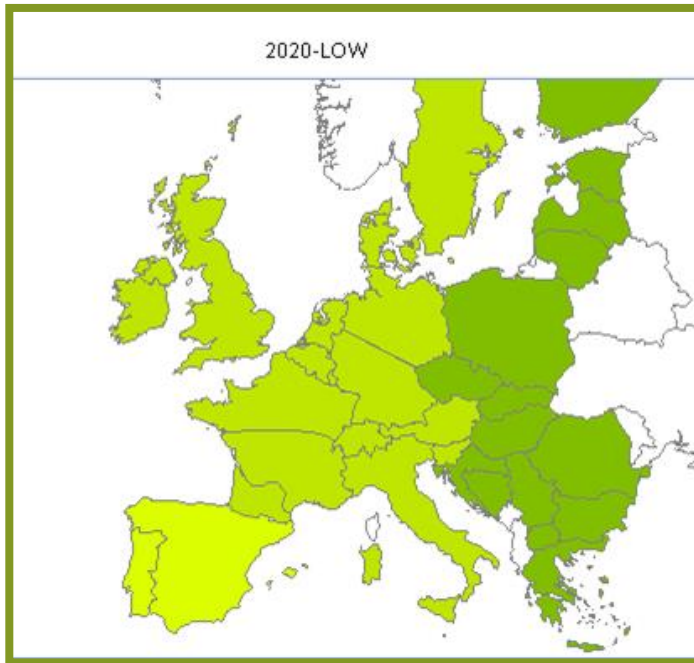
LNG is a multi-source supply: results should be
interpreted accordingly



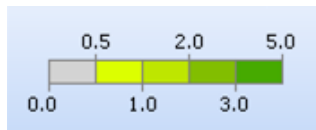
Price effects – Russian gas

Whole
year

Russian supply maximisation* (low RU price) -
Green Evolution

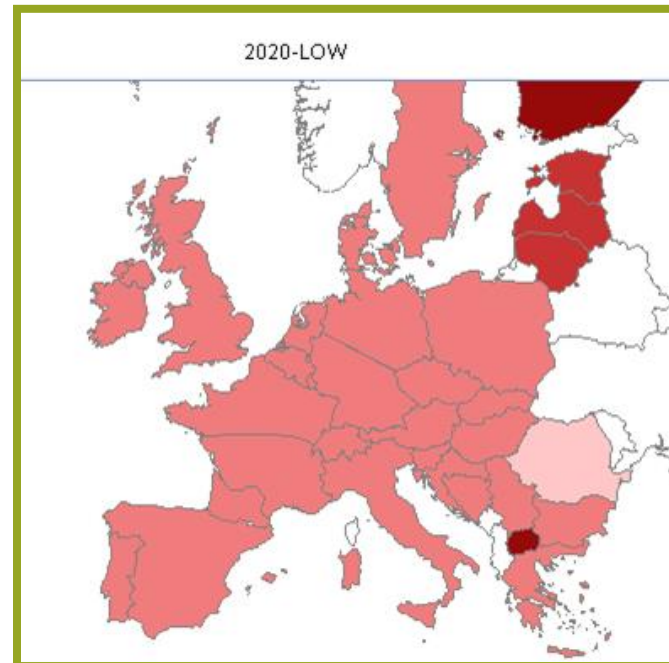


Legend: price **decrease**
compared to the balanced
supply configuration
(EUR/MWh)

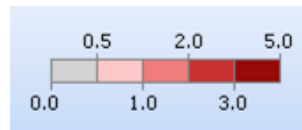


Barriers to low price propagation	BEMIP
Russian gas Max. (low RU price)	West vs East

Russian supply minimisation** (high RU price) -
Green Evolution



Legend: price **increase**
compared to the balanced
supply configuration
(EUR/MWh)



Barriers to high price mitigation	BEMIP
Russian gas Min. (high RU price)	Same as CSSD to RU supply

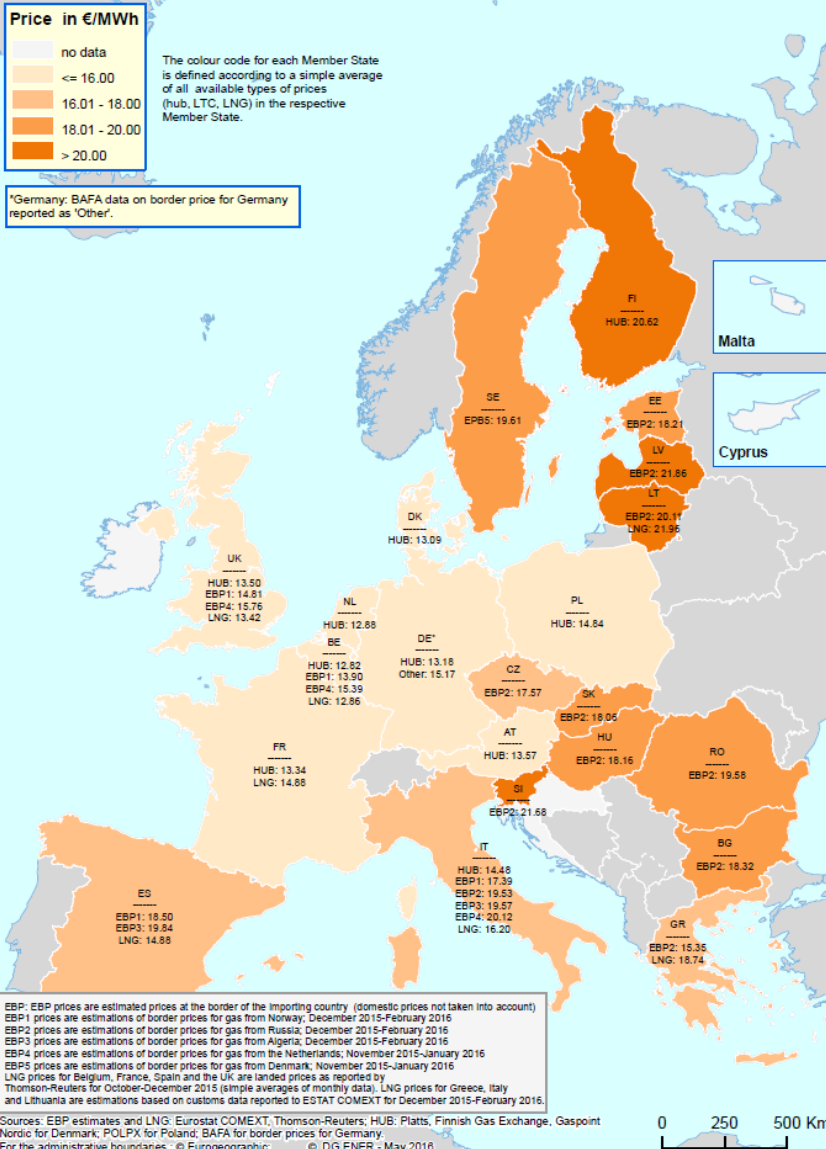
*Price effects under supply maximisation configuration based on SSPDi – Consider SSPDi when interpreting

**Price effects under supply minimisation configuration based on CSSD

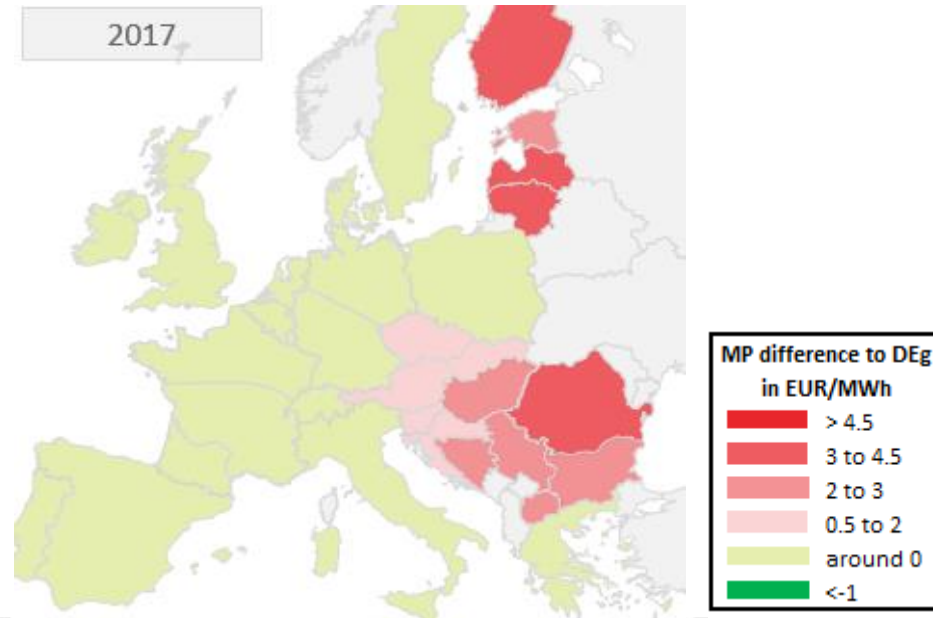


Market integration - Price spreads

Comparison of EU average wholesale gas prices during the first quarter of 2016



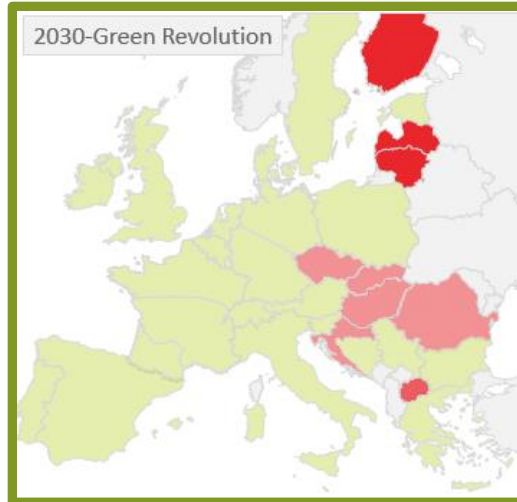
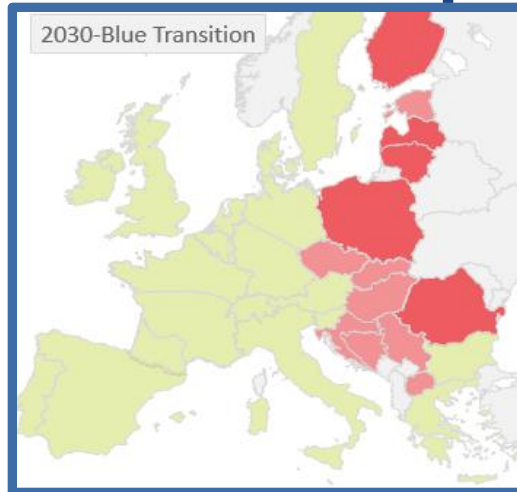
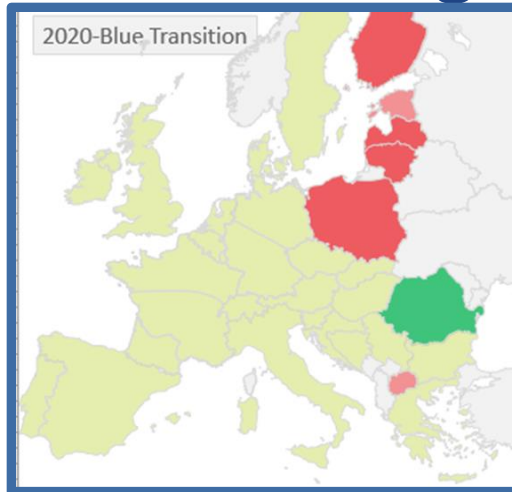
- > Handled through a simulation focusing on Russian supply price information
 - Input: EC quarterly report Q1-16 EBP2 information* (European Border Price: Russia)
 - Price spreads measured to German border price
- > Marginal prices simulated for 2017



*EBP2 not available for PL (use of LT) and FI (use of LT, LV, EE)

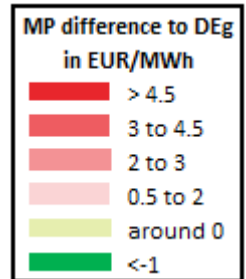


Market integration - Price spreads



Market integration

Whole
year



	BEMIP
Price spreads	EE, FI, LV, LT, PL



Conclusions

	BEMIP
Isolation	FI
Exposure to demand disruption	PL
Increased supply needs due to decreasing indigenous production	All countries
Dependence or access to limited number of supply sources (* including LNG)	EE*, FI, LV*, LT*, PL
Price effects - Barriers to low price propagation - Barriers to high price mitigation	<i>FI vs Baltic states</i> <i>PL vs Baltic states</i> <i>Same as CSSD</i>
Price spreads	EE, FI, LV, LT, PL

- > The results allow to identify the **most impacted countries** and **infrastructure limitations**
- > Identified issues may be mitigated by different types of gas infrastructure



Thank You for Your Attention

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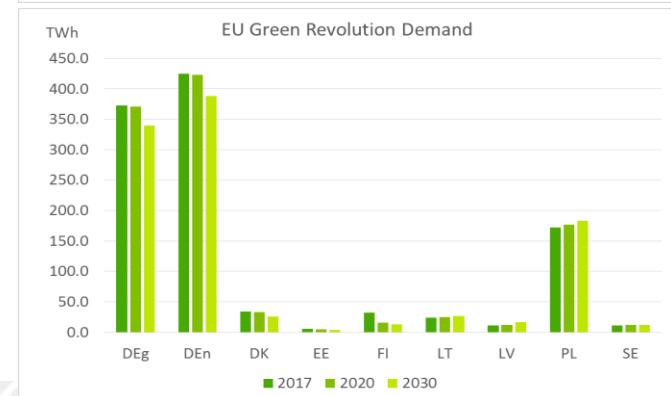
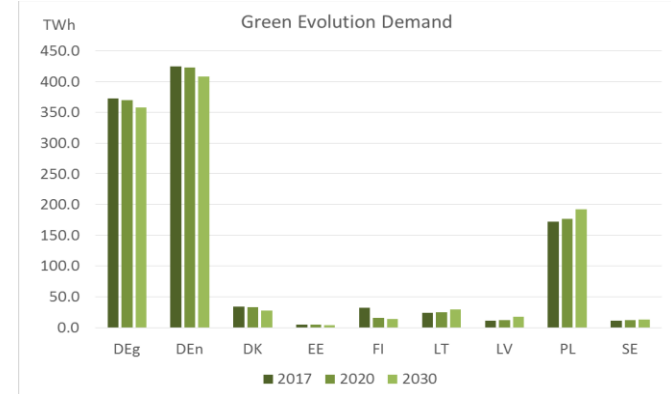
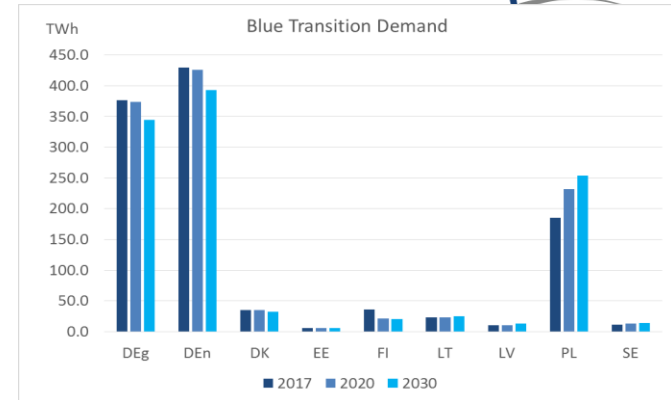
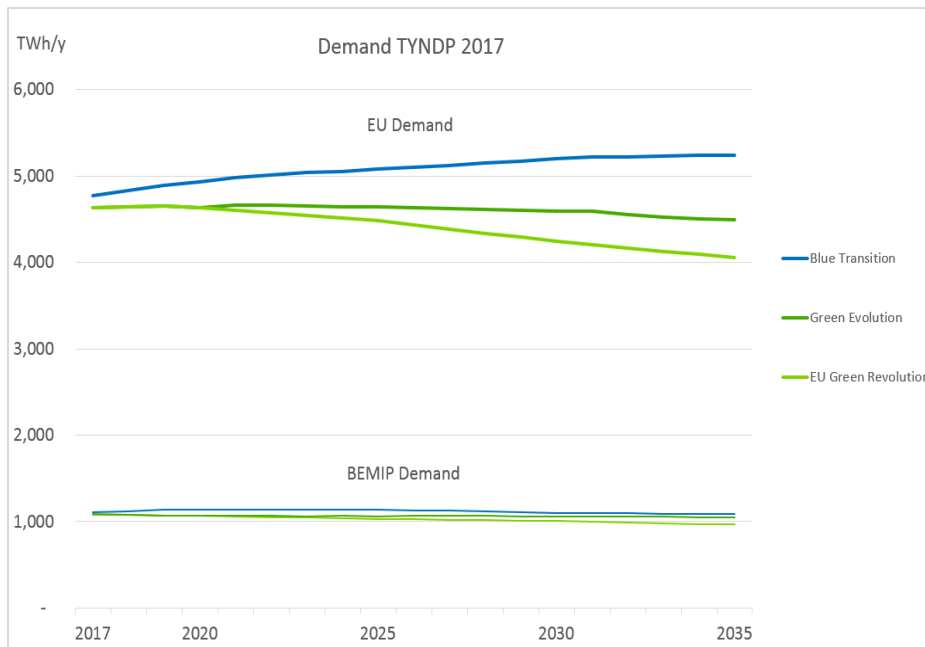
Infrastructure gap under TYNDP 2017 BEMIP Region



Annex



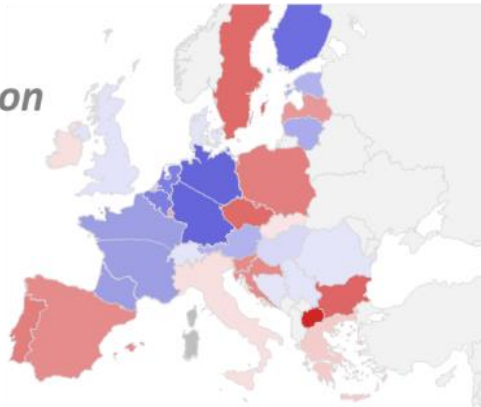
Demand – BEMIP focus



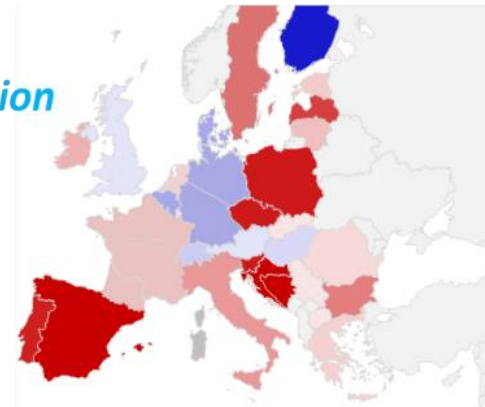


Country-level demand evolution

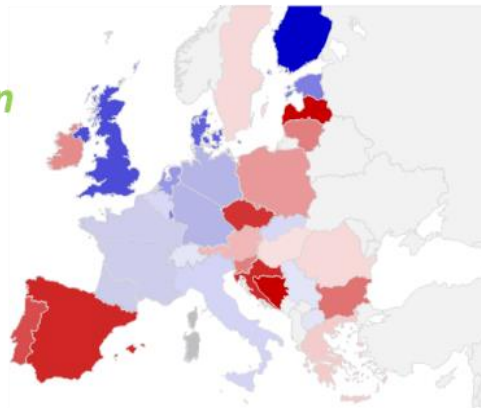
*Slow
Progression*



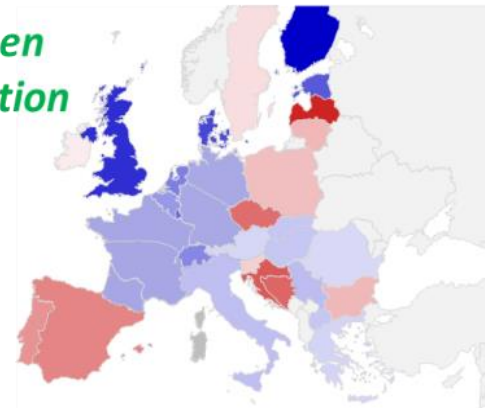
*Blue
Transition*



*Green
Evolution*



*EU Green
Revolution*



> -50 %

0%

> 50 %

Total annual gas demand evolution – 2017 to 2035



Dependence to Russian gas

