Brussels – 8 November 2016

# TYNDP 2017 - identification of problems

## Contribution to the 3rd PCI process

*Preliminary results*

## NSI West Regional Group – 8 November 2016

**ENTSOG System Development Team**

Image Courtesy of Thyssengas

# Infrastructure gap under TYNDP 2017

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

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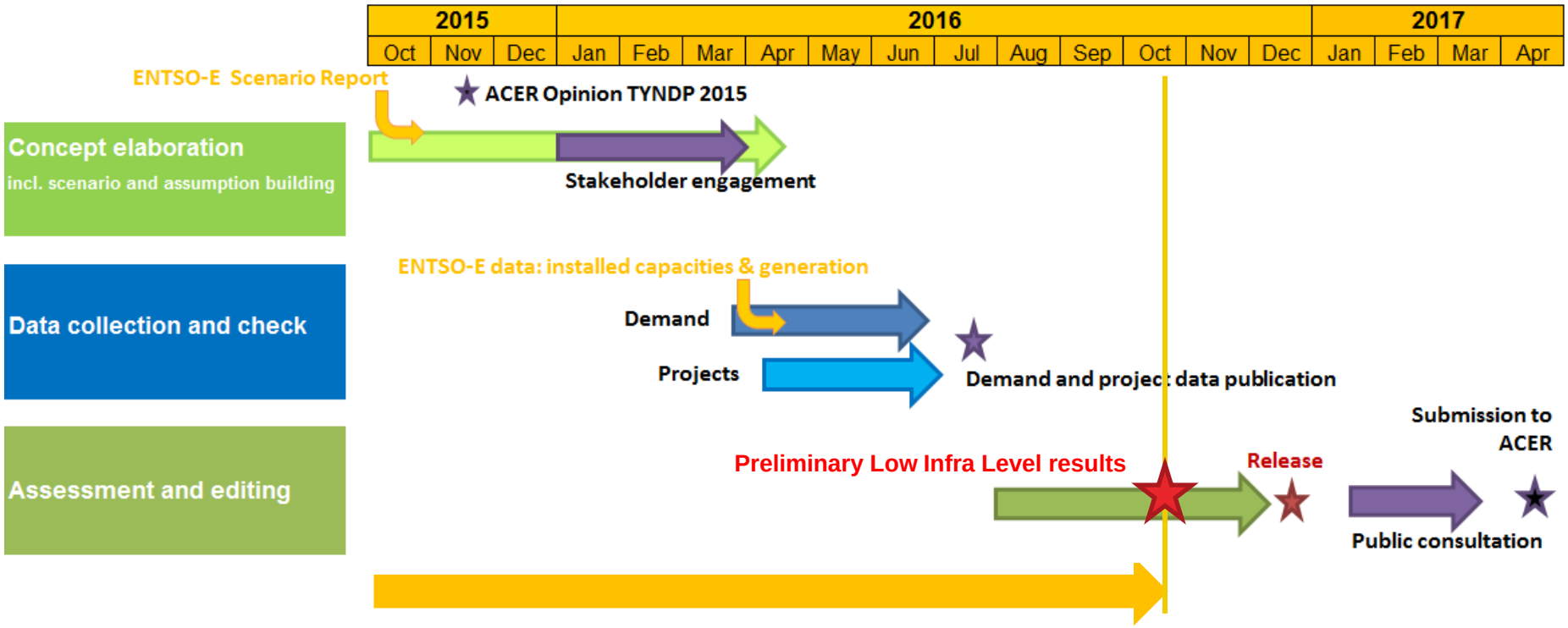
# Where are we in the TYNDP process?

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




*TYNDP identifies problems and needs*

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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

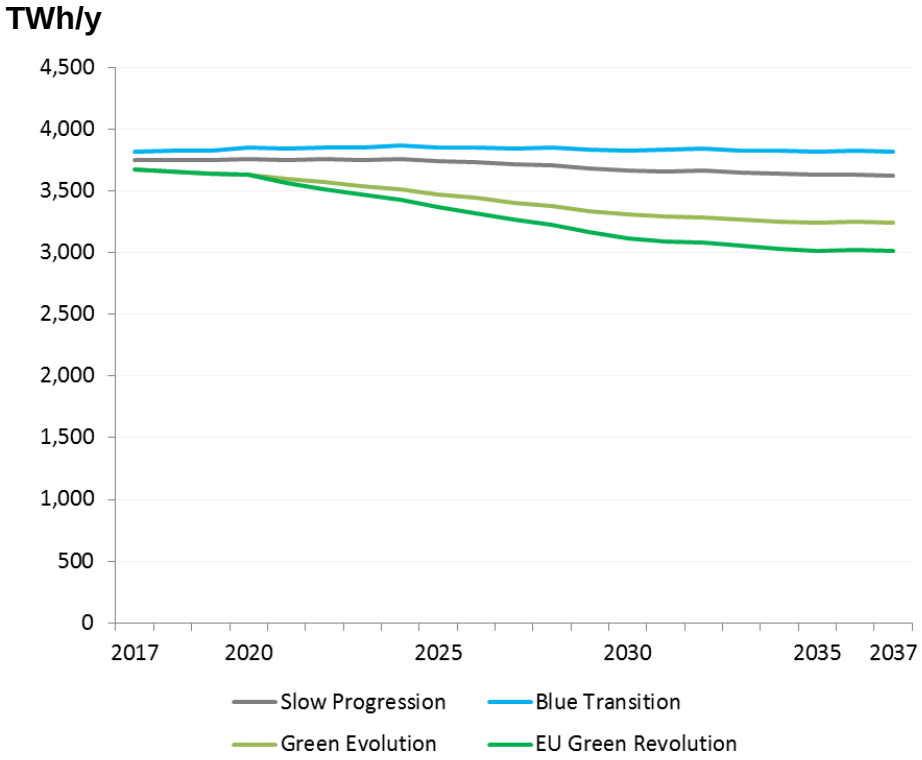
# Sectoral gas demand

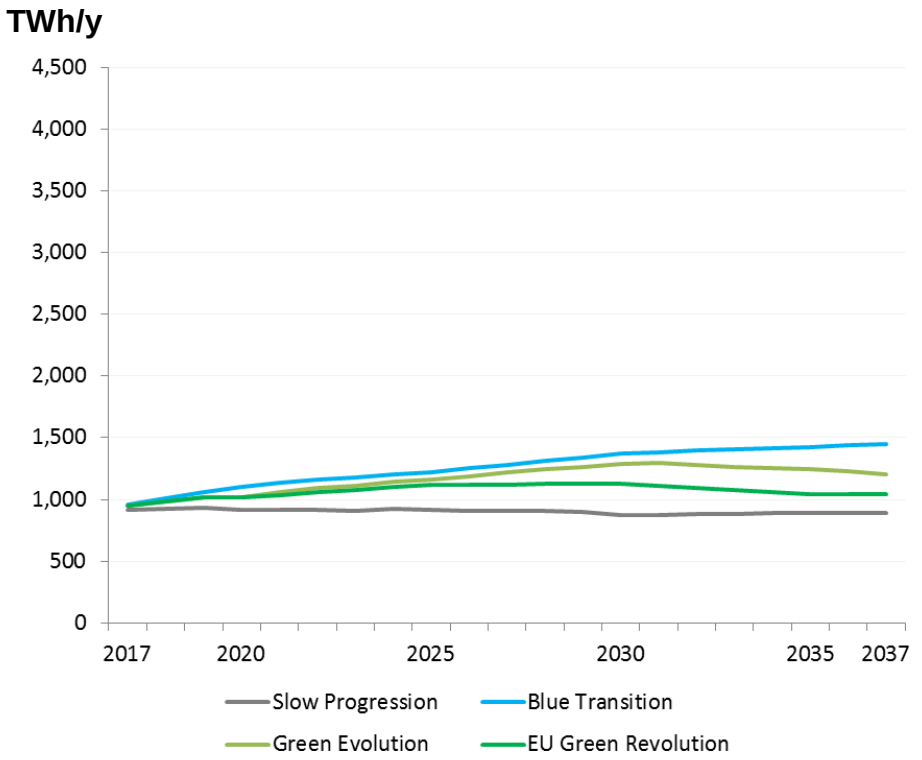
## End-user demand

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

## Gas for power demand

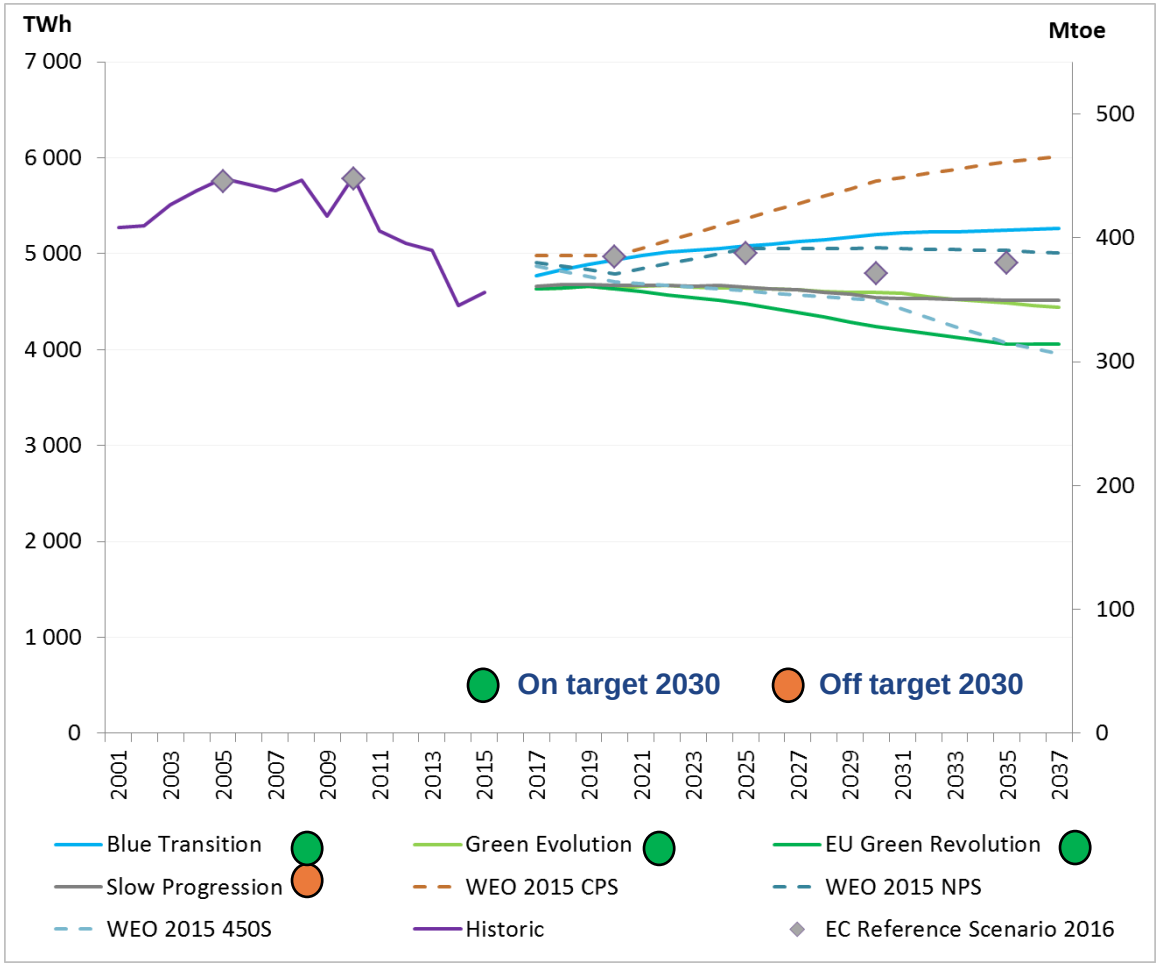
**Stable to increasing demand** depending on role of gas in **RES back-up** and **subsituting coal-fired generation**




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

# Overall gas demand

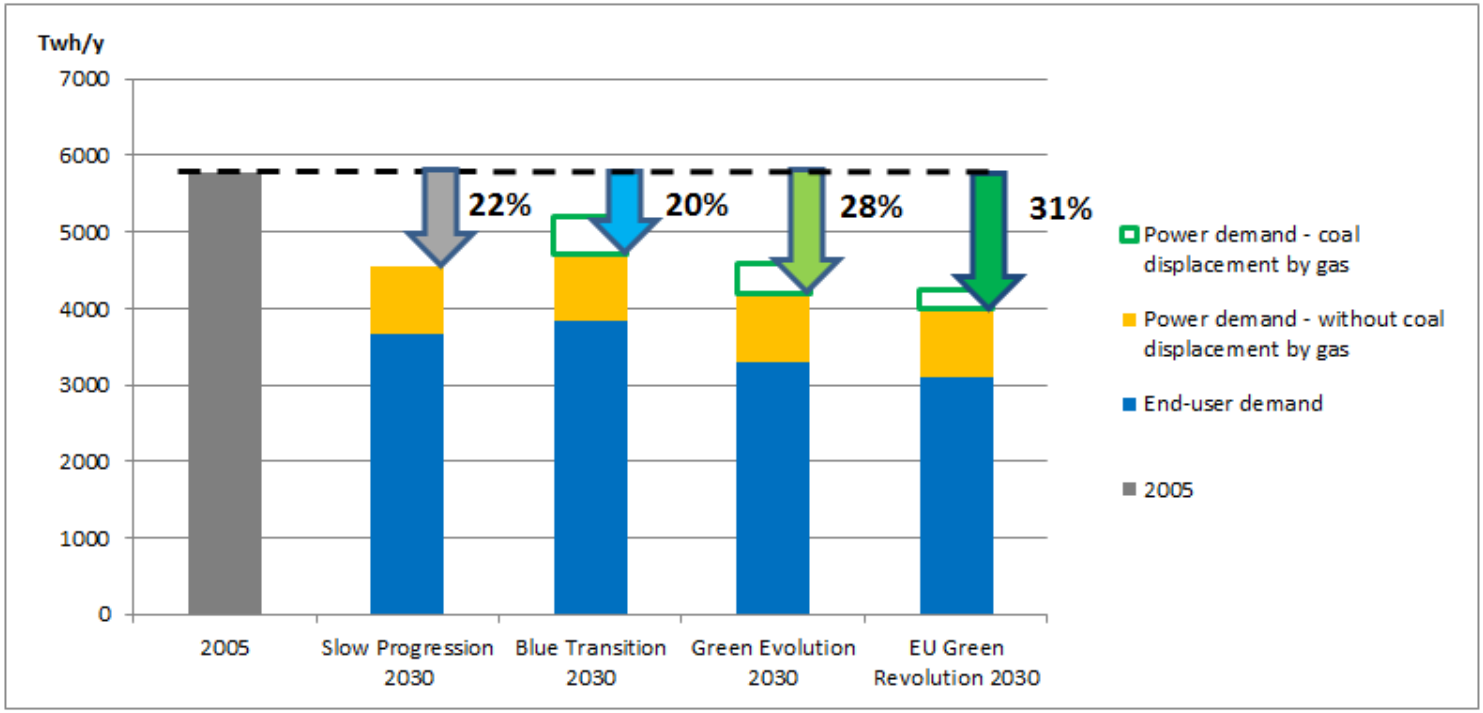



***TYNDP assessment performed for the 3 on target scenarios***

# 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

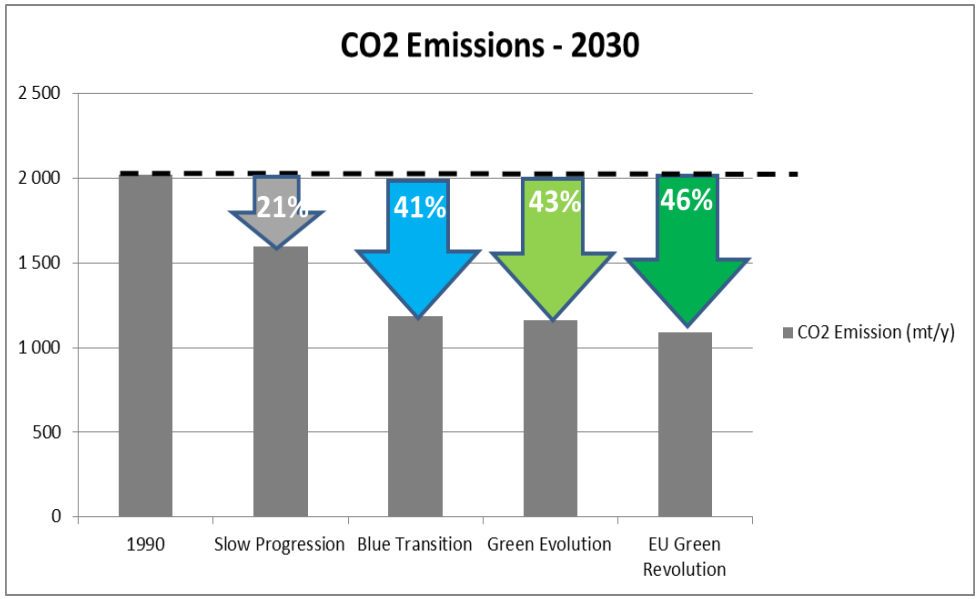



**When looking at targets' achievement in the gas and power sectors it shoud be kept in mind that targets are set globally accross all sectors**

# 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**

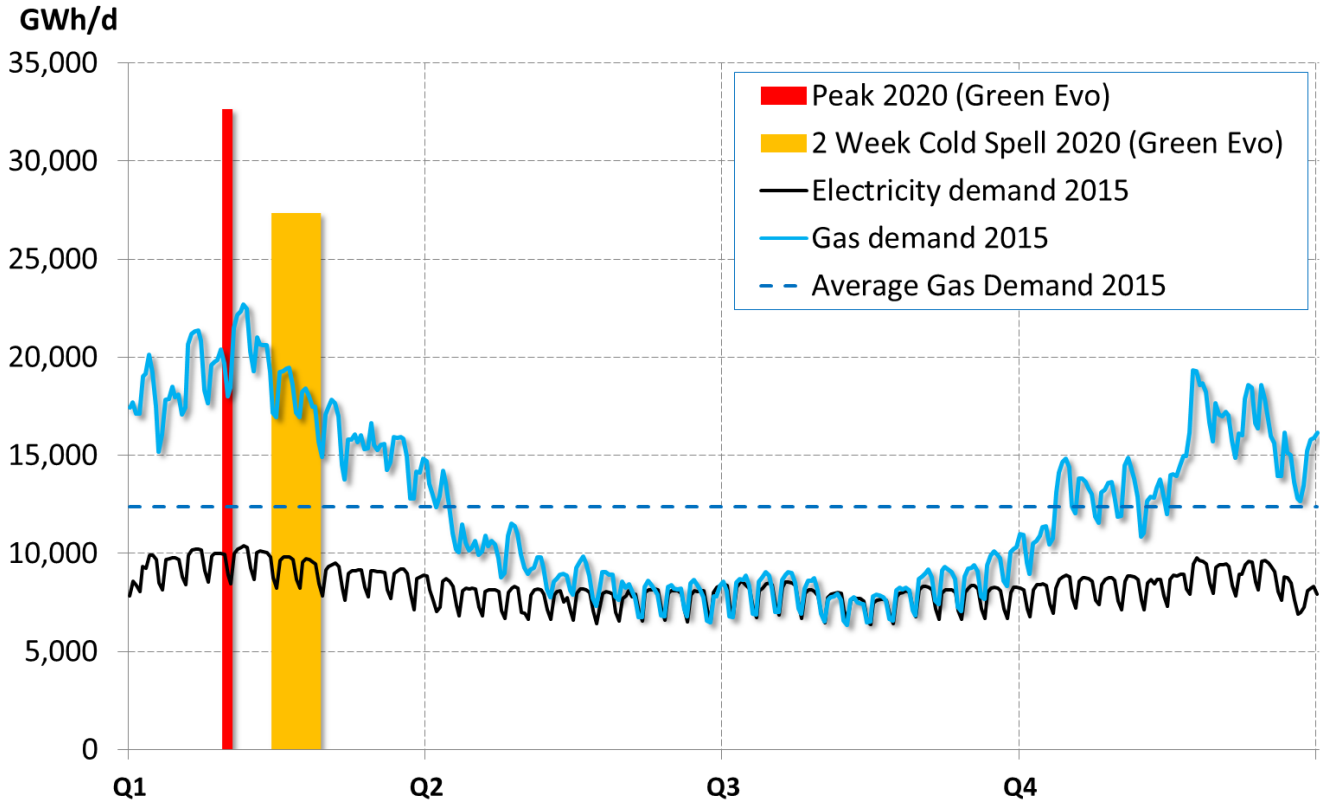
> TYNDP 2017 scenarios incorporate **biomethane,** a renewable gas source

***The gas grid is to be assessed for the different paths***

**When looking at targets' achievement in the gas and power sectors it shoud 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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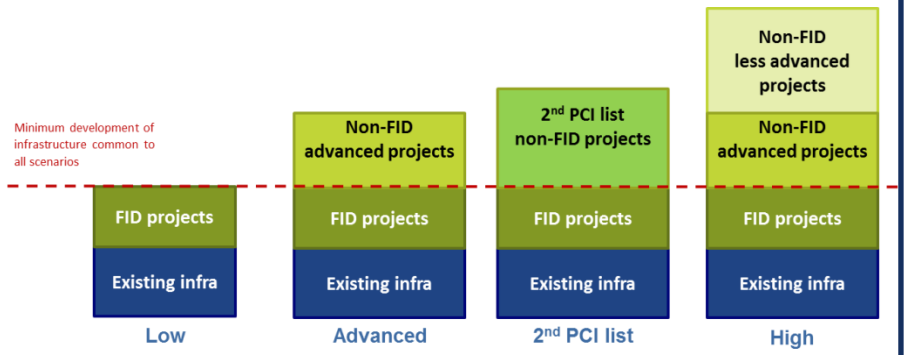
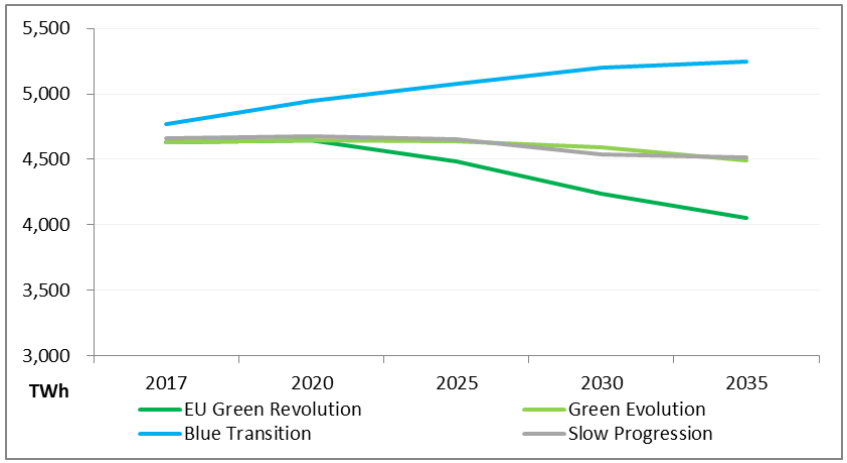
# The TYNDP 2017 assessment frame

## 4 infrastructure levels

***Dynamic over time based on projects commissioning date***



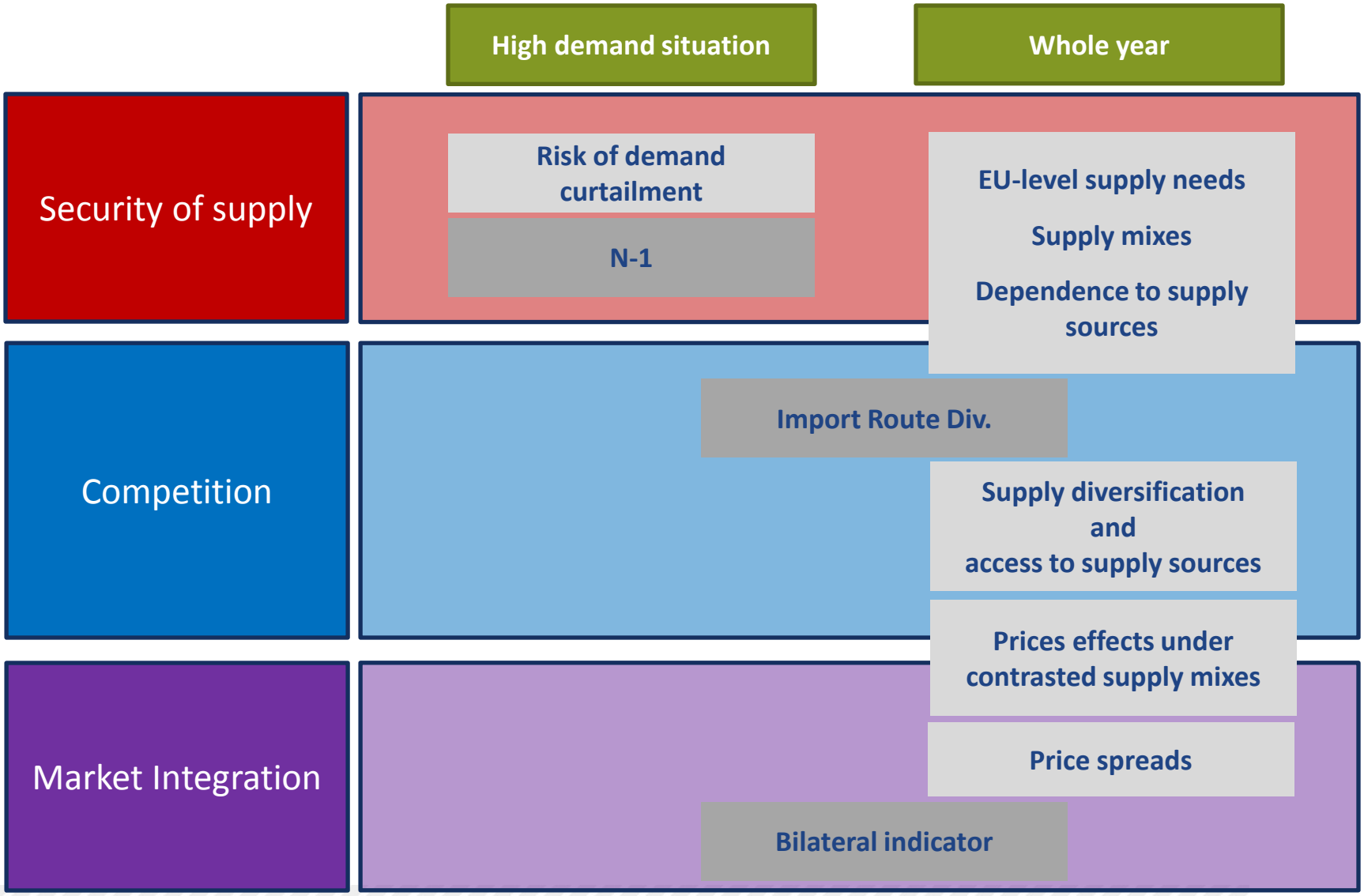

## 3 scenarios assessed




| | Low | Advanced | 2nd PCI list | High |
|---|---|---|---|---|
| Blue Transition | | | | |
| Green Evolution | | Multi-criteria analysis | | |
| EU Green Rev | | | | |

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

# A multi-criteria analysis



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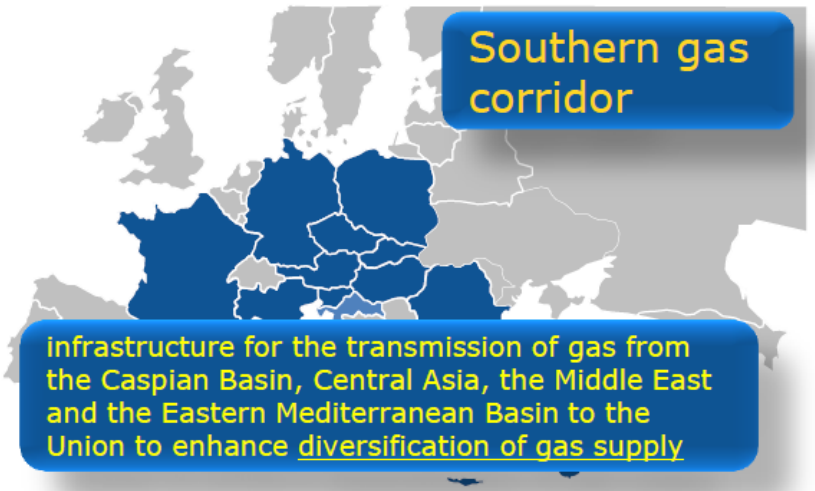
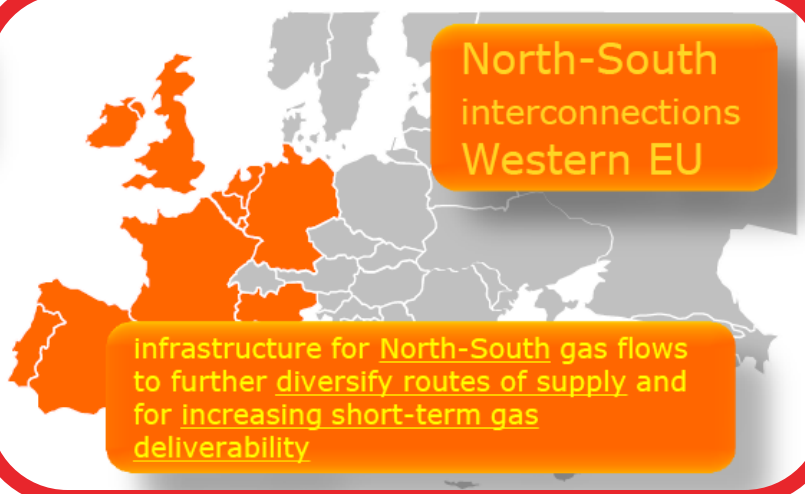
# Priority corridors: gas



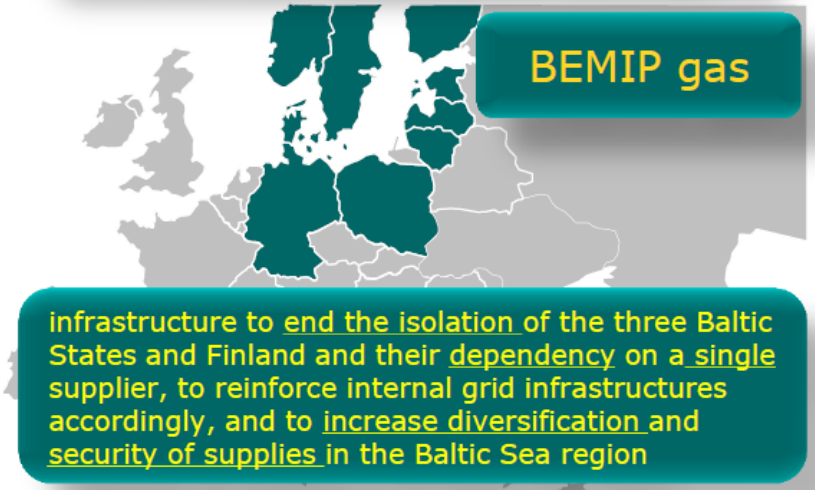
**Southern gas corridor**

infrastructure for the transmission of gas from the Caspian Basin, Central Asia, the Middle East and the Eastern Mediterranean Basin to the Union to enhance diversification of gas supply



**North-South interconnections Western EU**

infrastructure for North-South gas flows to further diversify routes of supply and for increasing short-term gas deliverability



**BEMIP gas**

infrastructure to end the isolation of the three Baltic States and Finland and their dependency on a single supplier, to reinforce internal grid infrastructures accordingly, and to increase diversification and security of supplies in the Baltic Sea region

**North-South interconnections CEE**

infrastructure for regional connections between and in the Baltic Sea region, the Adriatic and Aegean Seas, the Eastern Mediterranean Sea and the Black Sea, and for enhancing diversification and security of gas supply

# Identication of problems

***Objective: share the TYNDP identification of problems***

> TYNDP assessment performed under an assumption of perfect market functioning
  - To avoid identifying needs where better market functioning would solve the issue
  - The assessment focuses 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

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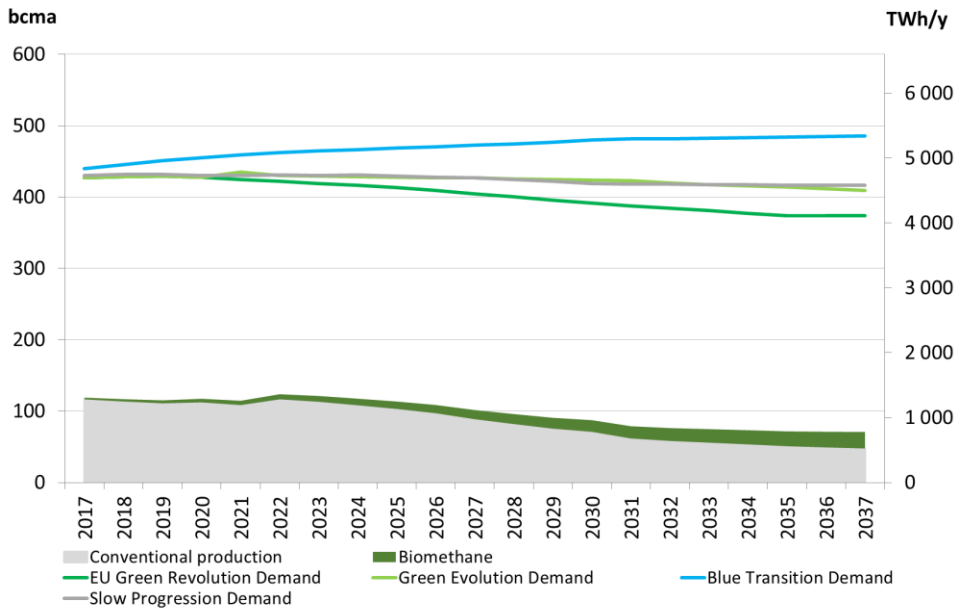
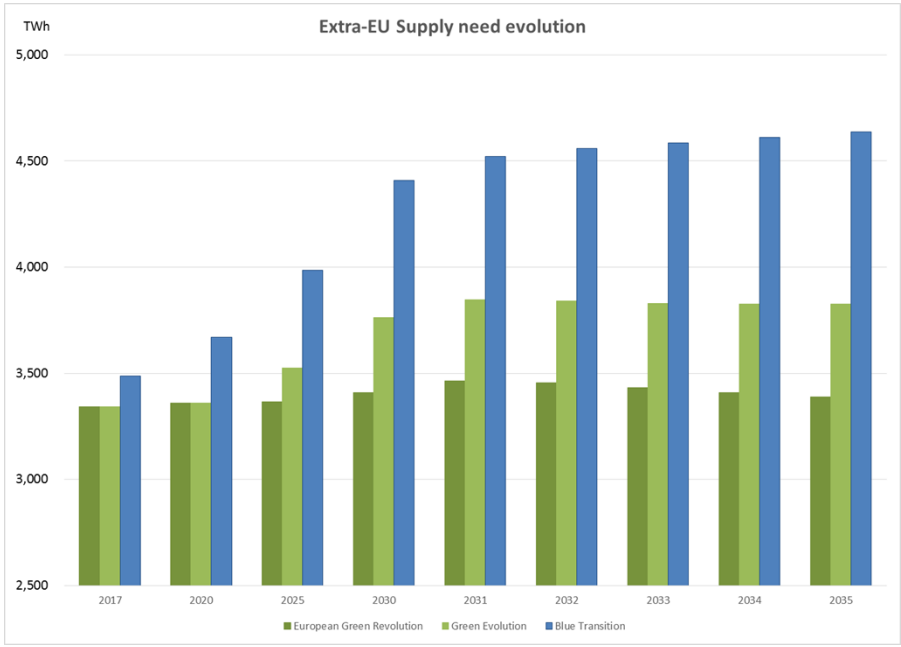
   - 4.1. Supply Adequacy
   - 4.2. Assessment of problems

# EU supply needs

Whole year



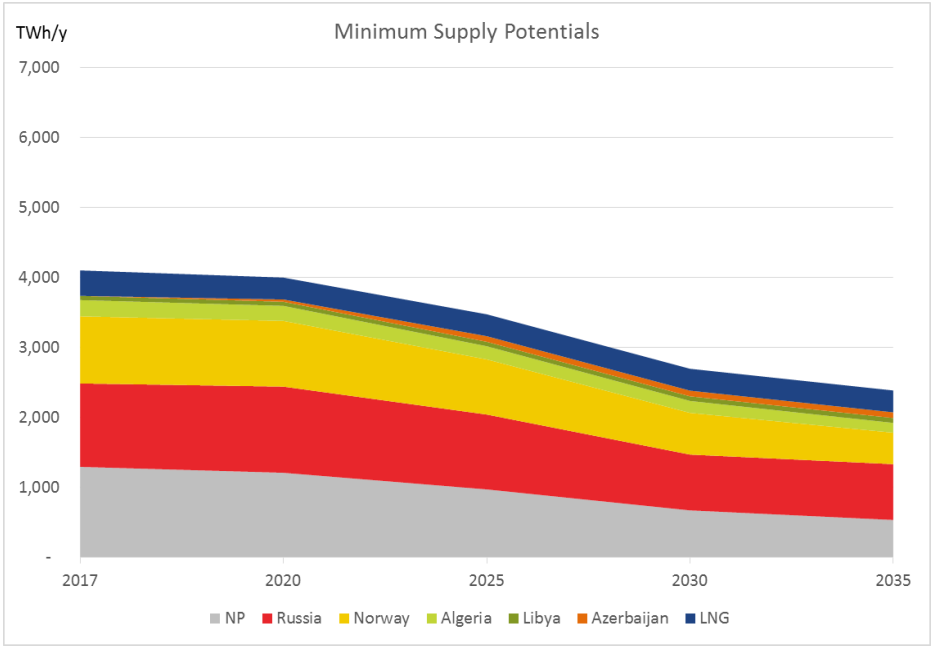



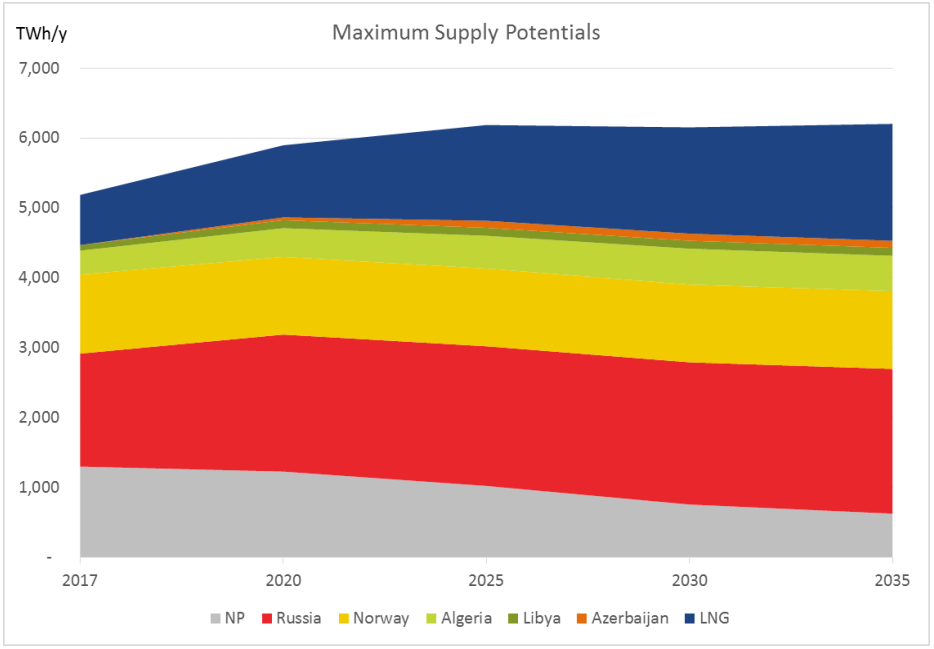

***Decline of indigenous production leads to increased supply needs over time for 2 out of the 3 scenarios***

# EU supply mixes

## Retained supply potentials

Whole year

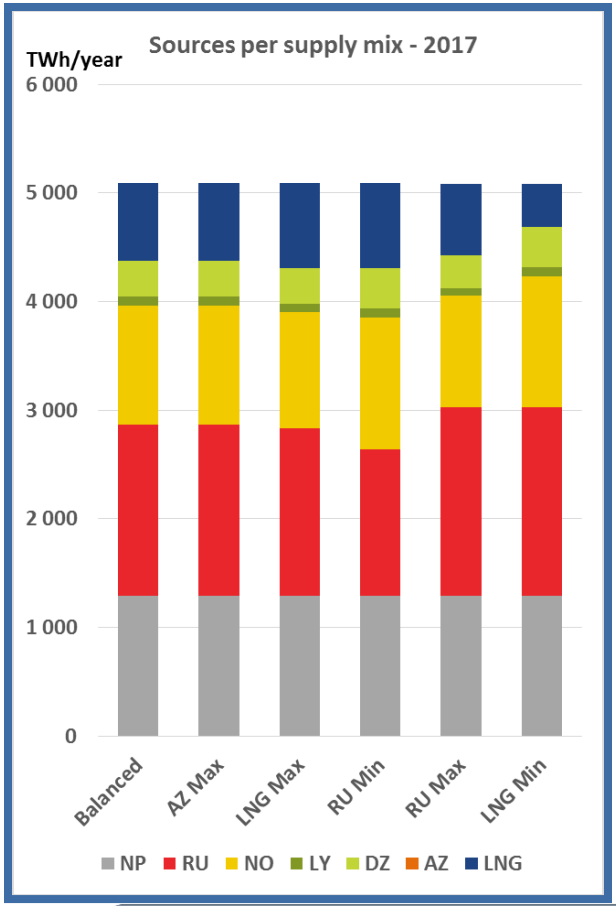


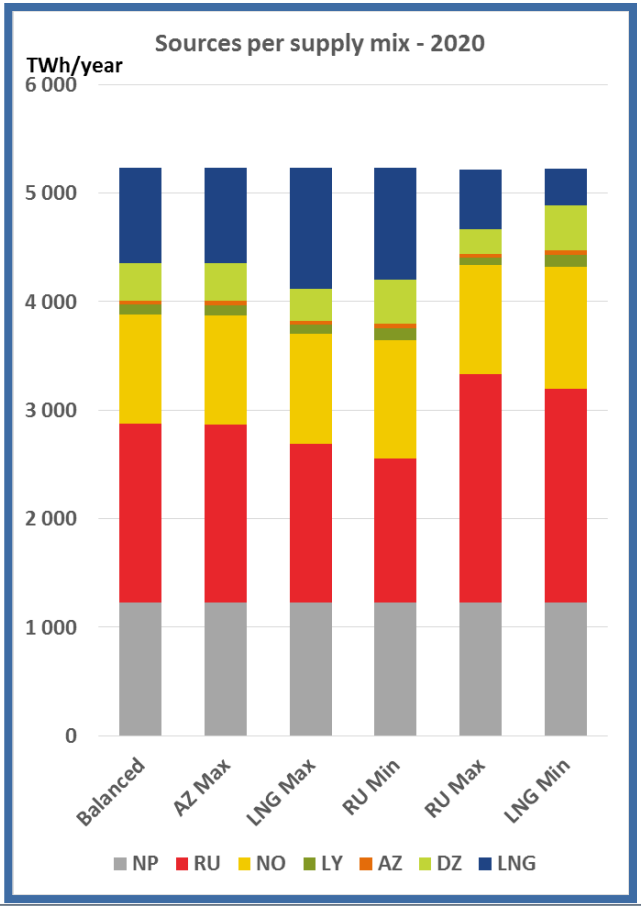



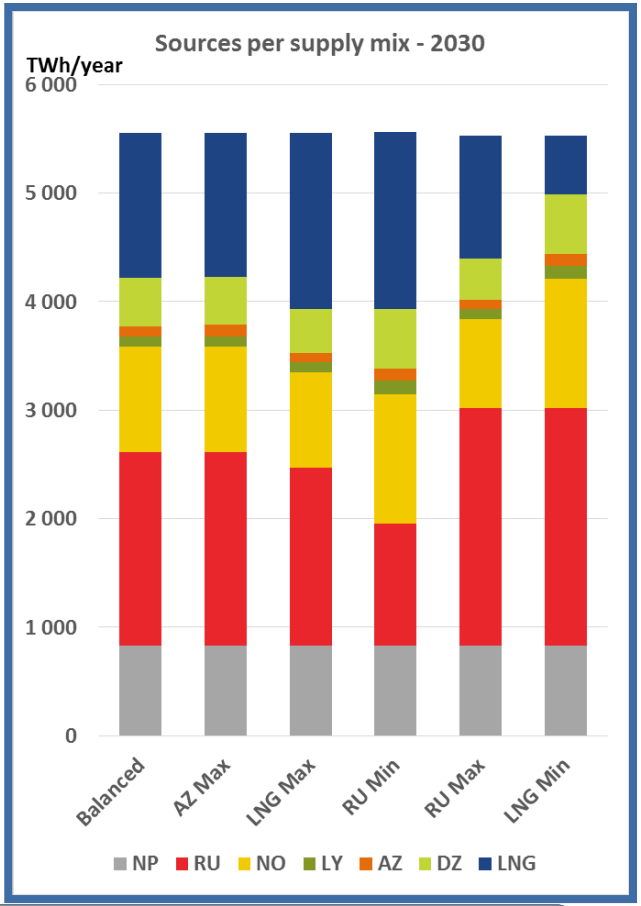
# EU supply mixes

Whole year

## *Blue Transition*



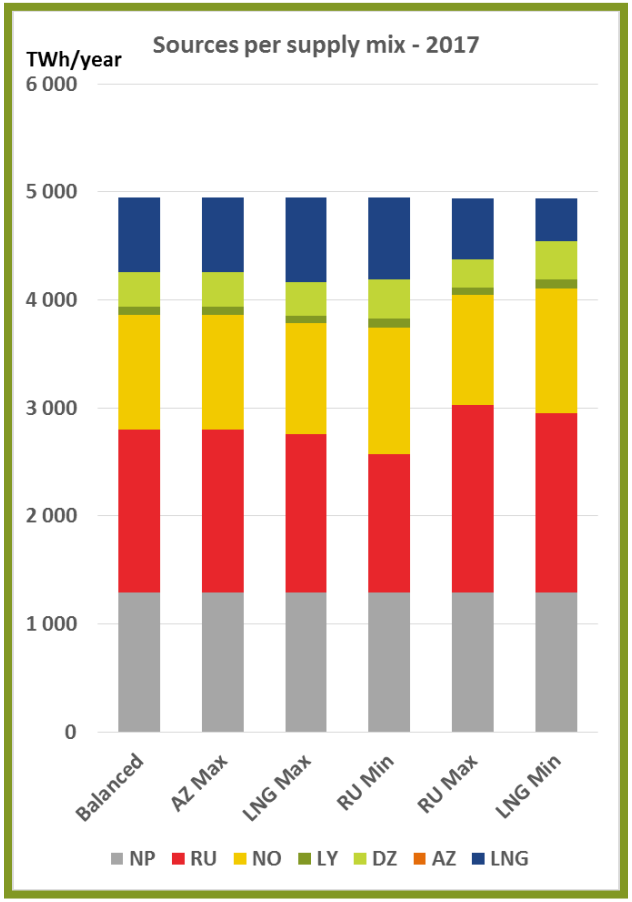



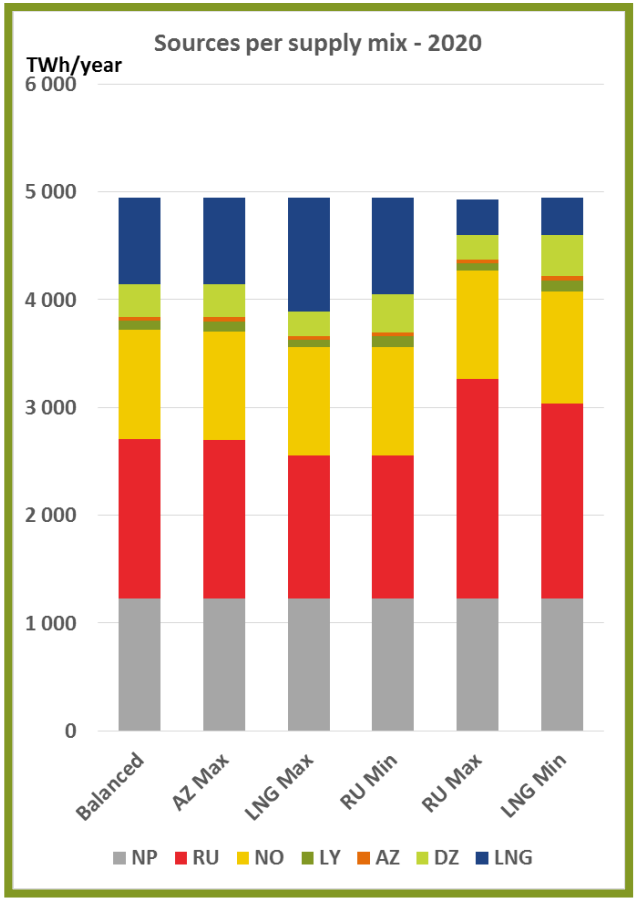

***The low infrastructure level enables a wide range of supply mixes.***

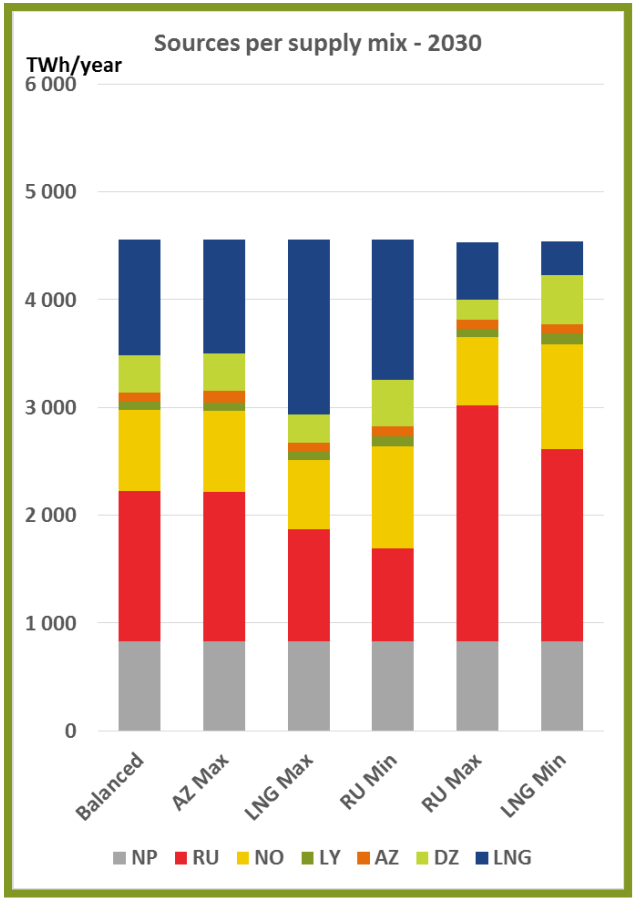
# EU supply mixes

Whole year

## *Green Revolution*




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

# Supply Adequacy in North-West Europe: the challenge of L-gas conversion

***The decline of the European gas production is a general concern and it makes new imports necessary***

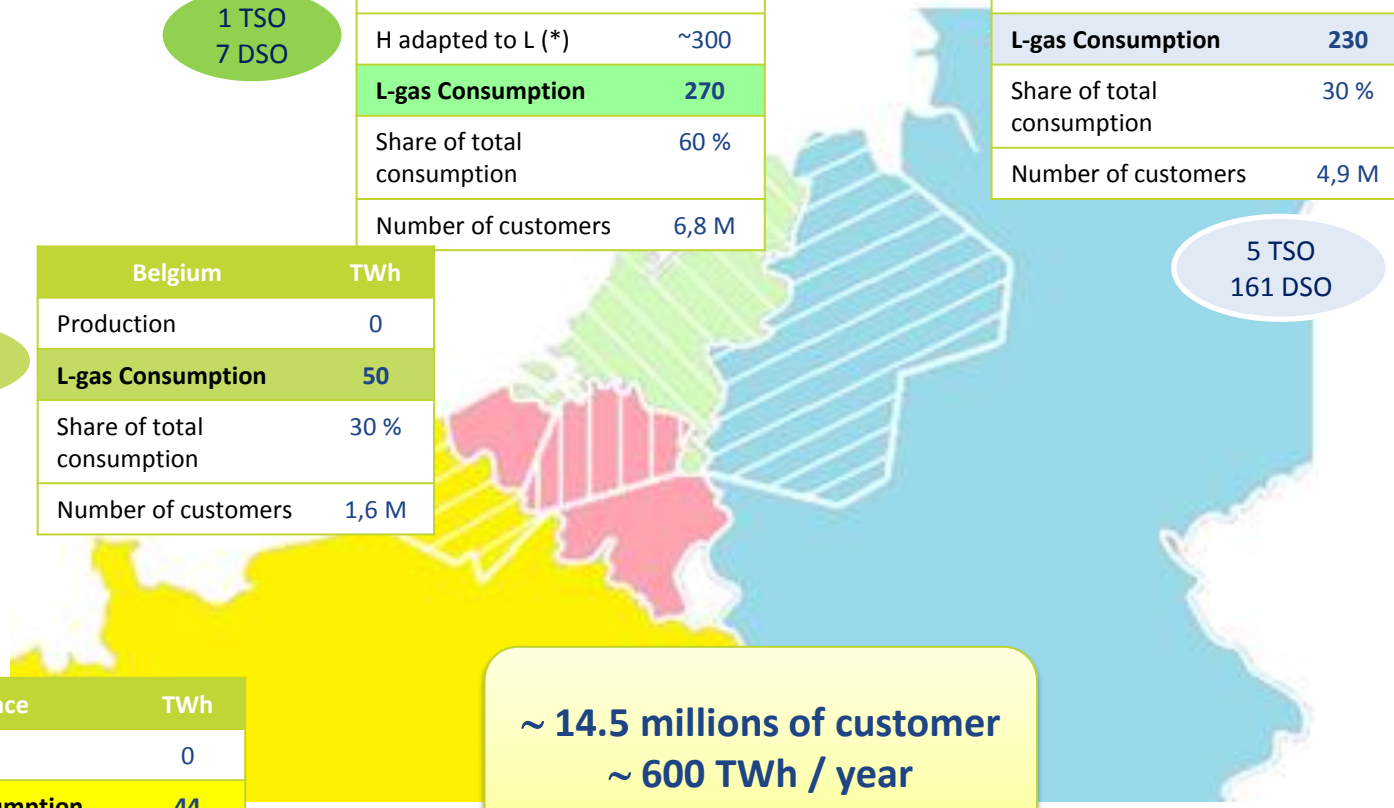
***The case of L-gas is even more significant given***

- the fact that L and H gas are not substitutable
- the limited number of L-gas fields and the predominance of Groningen

***Therefore L-gas market conversion is currently the biggest infrastructure challenge in the North-West Europe gas market***

***The L-gas topic is not part of the TYNDP main assessment.***
***It is handled through a dedicated approach,***
***based on data collected as part of the TYNDP data collection.***

# European L-gas market



| Netherlands | TWh |
|---|---|
| Production | 240 |
| H adapted to L (*) | ~300 |
| **L-gas Consumption** | **270** |
| Share of total consumption | 60 % |
| Number of customers | 6,8 M |

1 TSO
7 DSO

| Germany | TWh |
|---|---|
| Production | 73 |
| **L-gas Consumption** | **230** |
| Share of total consumption | 30 % |
| Number of customers | 4,9 M |

5 TSO
161 DSO

| Belgium | TWh |
|---|---|
| Production | 0 |
| **L-gas Consumption** | **50** |
| Share of total consumption | 30 % |
| Number of customers | 1,6 M |

1 TSO
5 DSO

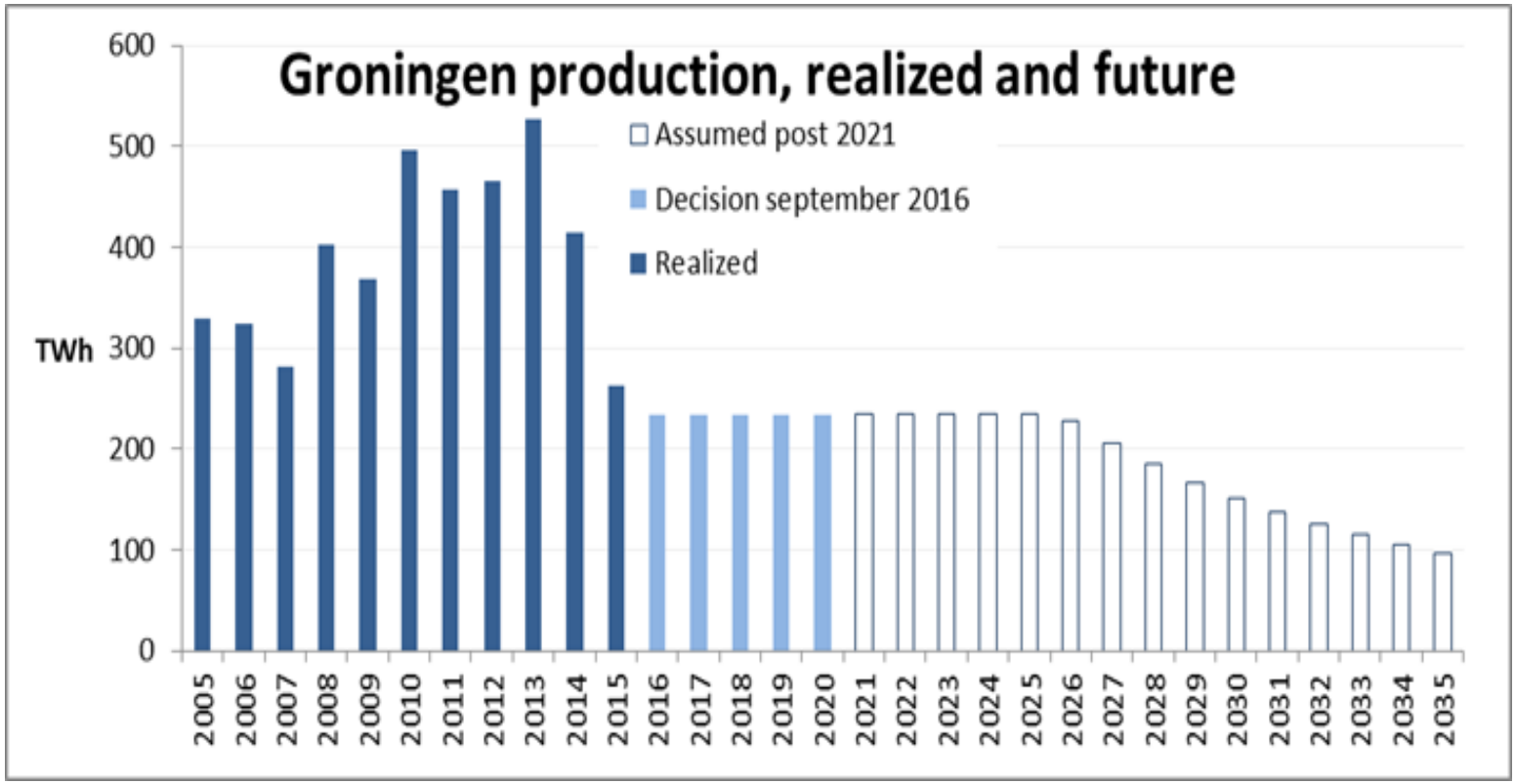
| France | TWh |
|---|---|
| Production | 0 |
| **L-gas Consumption** | **44** |
| Share of total consumption | 10 % |
| Number of customers | 1,3 M |

1 TSO
3 DSO

**~ 14.5 millions of customer**
**~ 600 TWh / year**

*Rounded figures*

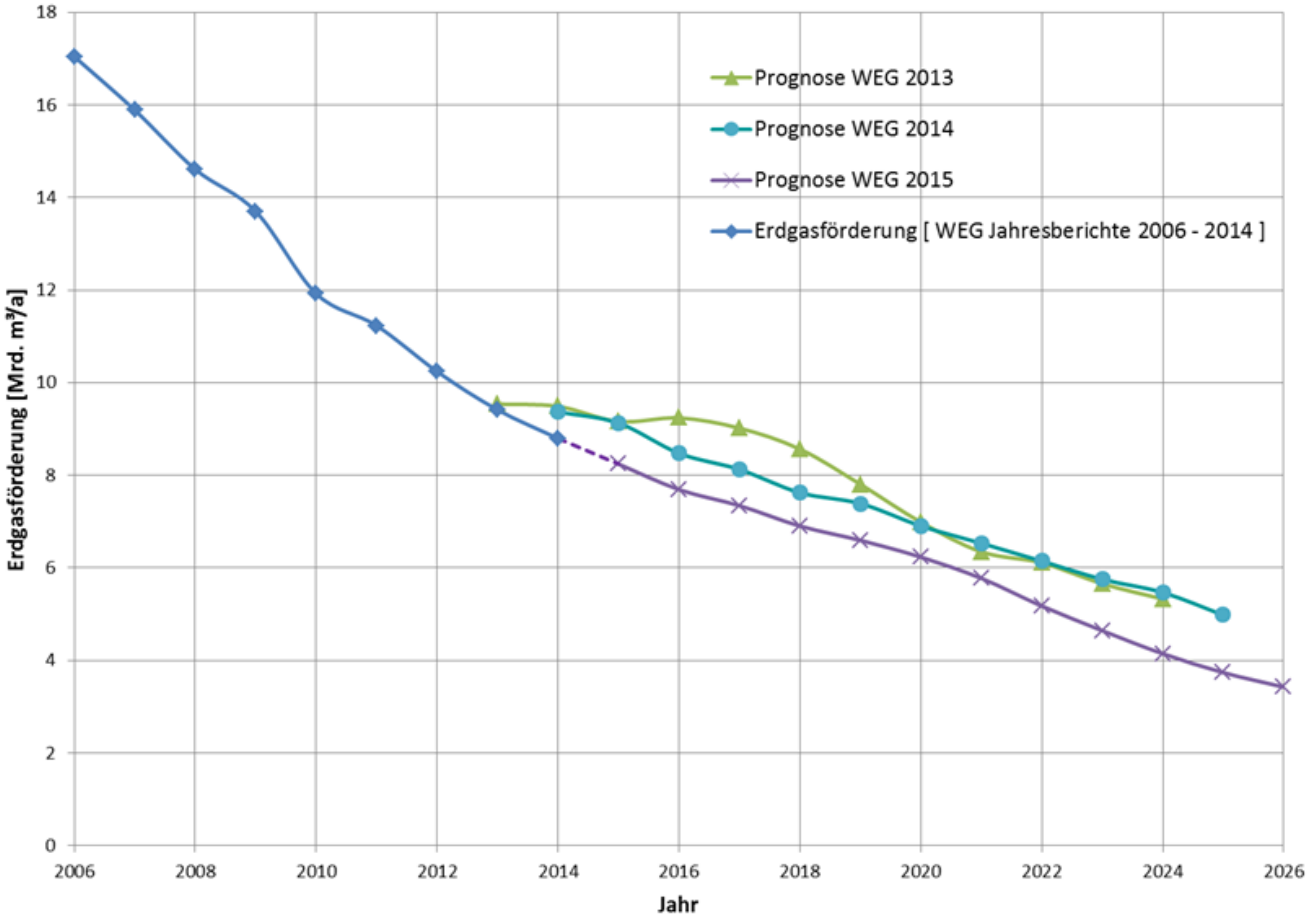
# Decline of L-gas production: Groningen




**Remaining reserves of 650-700 Gm3 (beginning of 2016)**

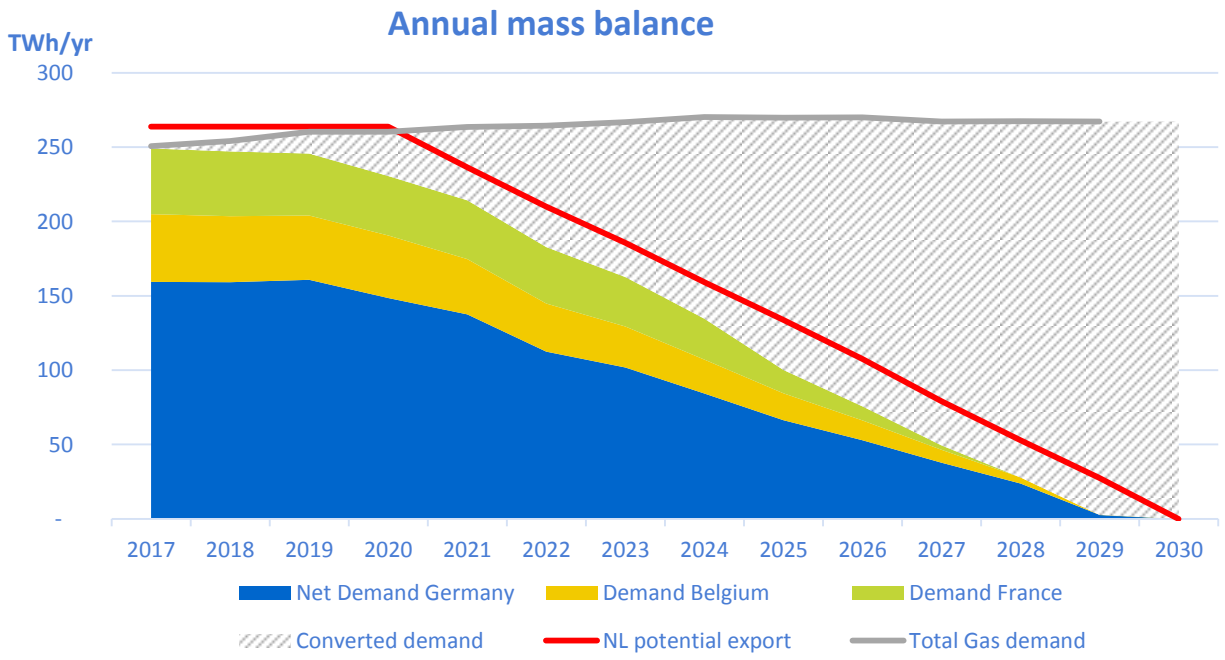
**Export contracts end between 2020 and 2030**

# Decline of L-gas production: Germany




**Producer forecast has become more conservative over the years**

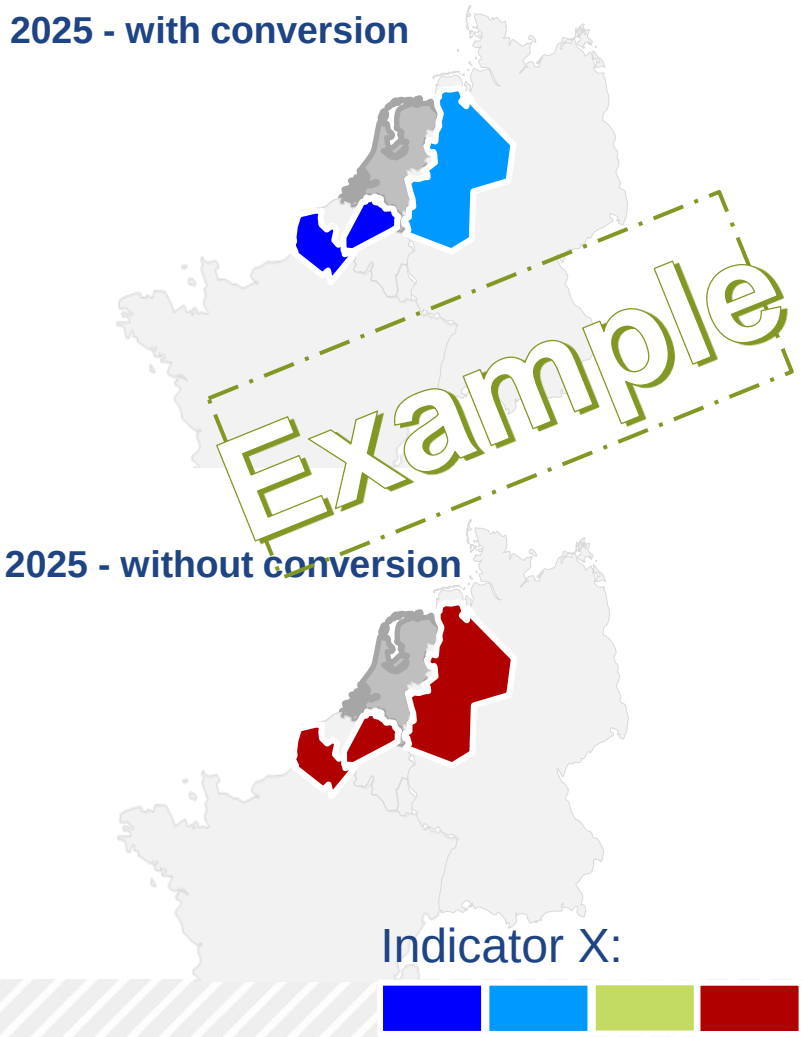
# Supply adequacy for the L-gas market




**Starting from 2020, part of the local gas demand in Belgium, France and Germany may not be covered by L-gas exports from the Netherlands, unless converted to H-gas.**

# The challenge of L-gas conversion

## A specific assessment of needs




- A specific CBA assessment is foreseen to be carried out for the L-gas sub-zones in Belgium, France and Germany as part of GRIP NW
- The following CBA indicators are foreseen to be assessed:
  - Remaining Flexibility
  - Disrupted Demand
  - USSD/CSSD
  - N-1
- The methodology and the data set will be consistent with the data set used for the ESW CBA of the TYNDP 2017

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# 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-alignement 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

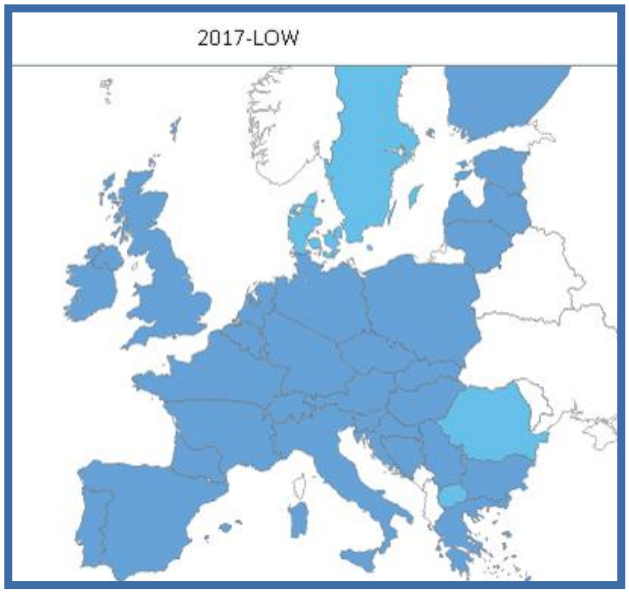
# Security of supply

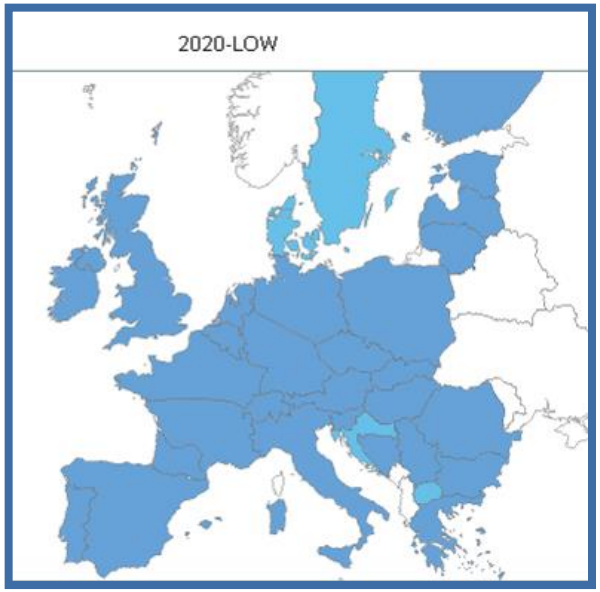
## Exposure to demand disruption (normal situation)

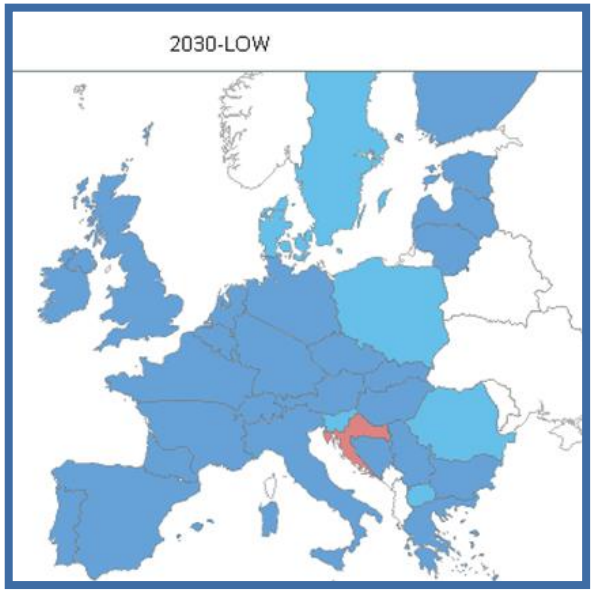
**High demand situation (peak day)**

***The NSI West 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%

| | NSI West |
|---|---|
| **Exposure to demand disruption under normal situation** | Low Rem Flex: DK |

# Security of supply

## Exposure to demand disruption - Route disruption cases

***The following route disruption cases have been assessed***

High demand situation

> Ukraine route disruption
> Belarus route disruption
> Langeled disruption
> Franpipe disruption
> Transmed disruption
> MEG disruption
> TANAP disruption

***None of these cases have any significant impact on the NSI West Region***

> No exposure to demand curtailment
> Only very marginal remaining flexibility decrease

# Security of supply / Competition

## Dependence to supply sources

Whole year

> 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 mimimum source share (CSSD) if infrastructures allow for it
- Non-alignement 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:***
***- neither EU-level nor country-level dependence to Norwegian*, Algerian, Libyan or Azeri supply***
***- EU-level but no country-level dependence in the NSI West Region to Russian supply***

***In 2017: limited EU-level dependence on Norwegian gas due to restricted supply flexibilities for this time horizon, no infrastructure bottleneck**

# Security of supply / Competition

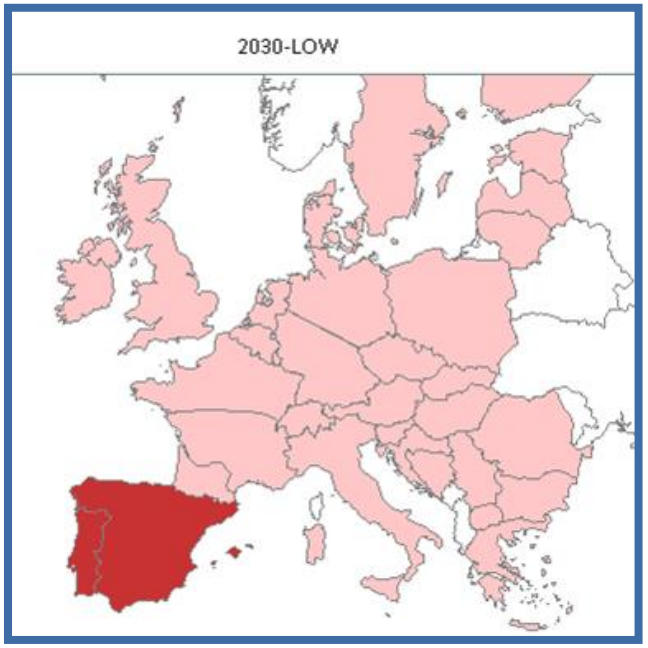
## Dependence to LNG supply*

Whole year

***Blue Transition***

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






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

| | BEMIP | NSI West | NSI East + South. Corridor |
|---|---|---|---|
| Dependence to LNG supply (25% - 50%) | | ES, FR***, PT | |

**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**
*****The FR situation is remedied by 2020 thanks to the commissioning of a project**

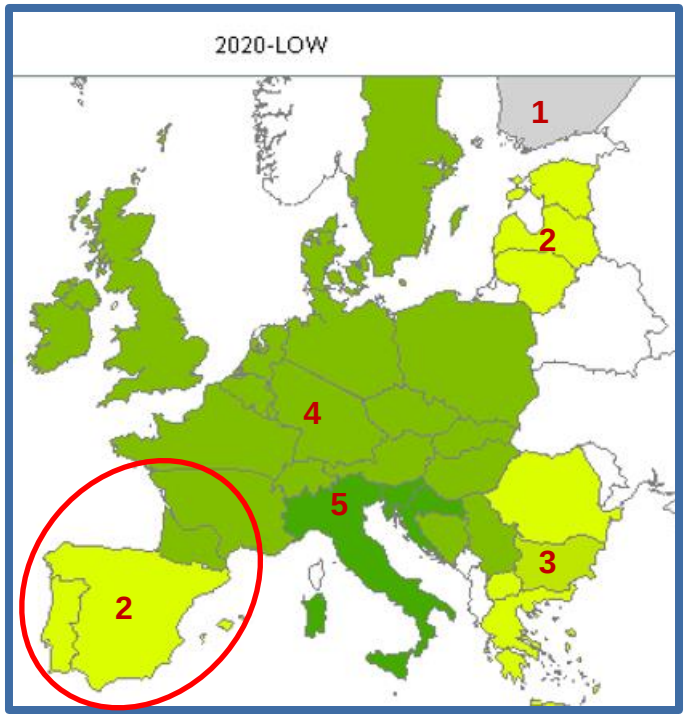
# Competion - Access to Supply Sources

Whole year

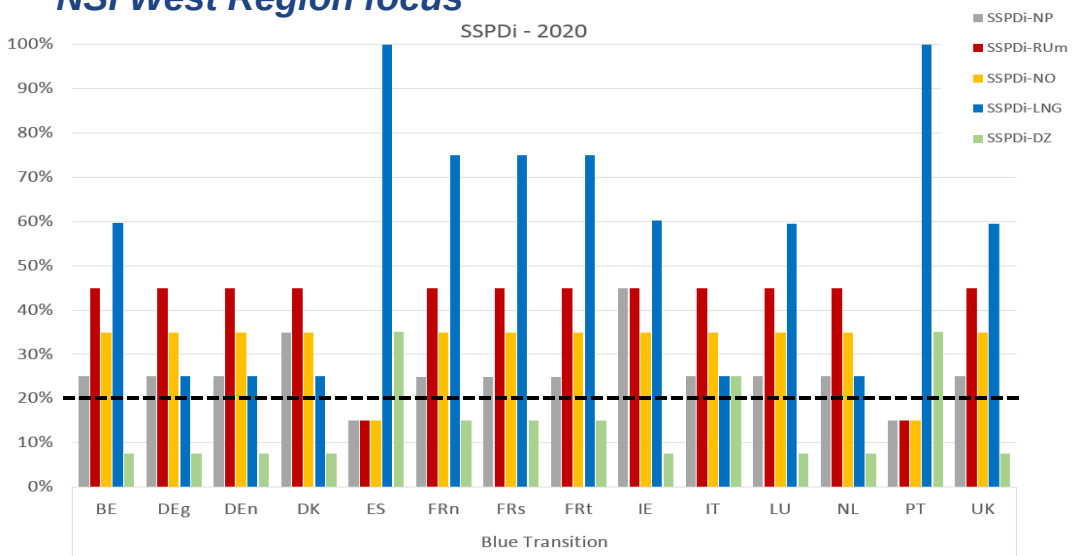
**Access to Supply Sources** is based on the **SSPDi** indicator

- **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***




***NSI West Region focus***




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

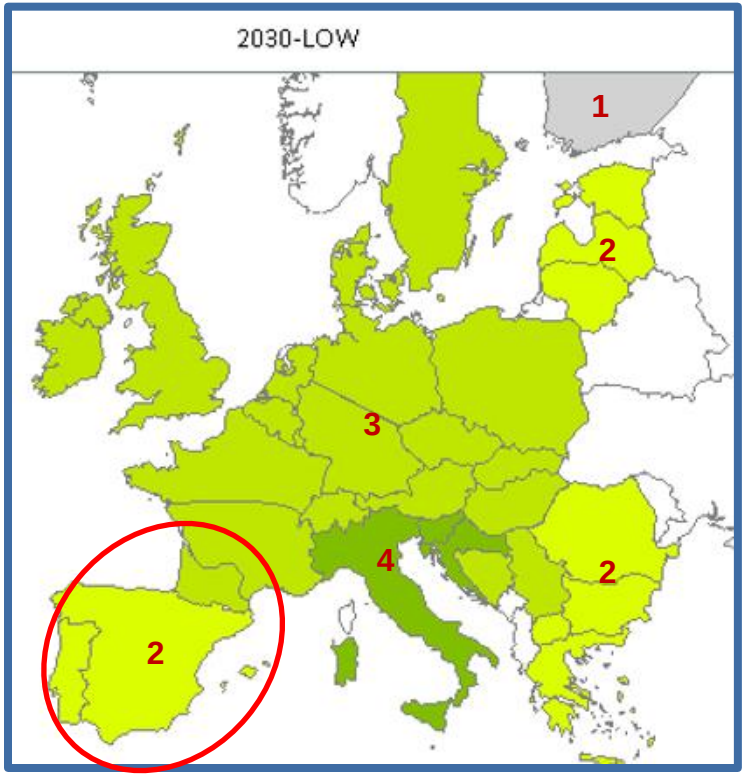
***At EU-level, Libyan and Azeri volumes are too low to have any significant impact on prices**

# Competion - Access to Supply Sources

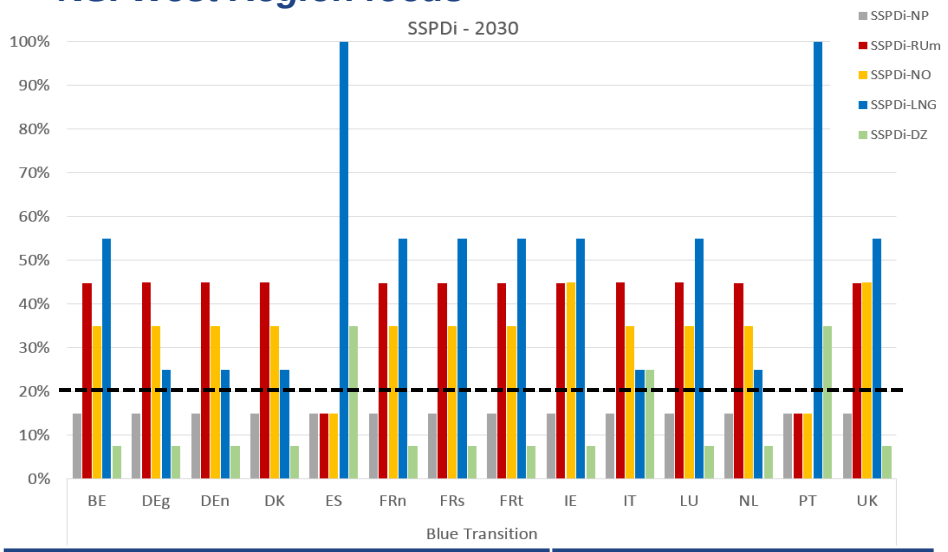
Whole year

## *Indigenous production fades out as a diversification option*

### *Blue Transition – Access to sources*




### *NSI West Region focus*




| | NSI West |
|---|---|
| Access to less than 3 supply sources (* including LNG) | ES*, PT* |

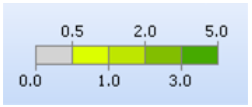
**LNG is a multi-source supply: results should be interpreted accordingly**

> The NSI West countries accessing a limited number of supply sources also show high dependence to LNG supply

# Price effects - LNG

Whole year

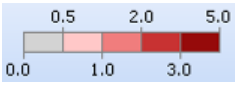
**LNG supply maximisation* (low LNG price) - Green Evolution**


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

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

**LNG supply minimisation* (high LNG price) - Green Evolution**


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

| Price effect: barriers to low price propagation | NSI West |
|---|---|
| **LNG Maximisation (low LNG price)** | FR, BE, UK, IE benefits less than ES and PT; Eastern countries benefit less than Western ones |

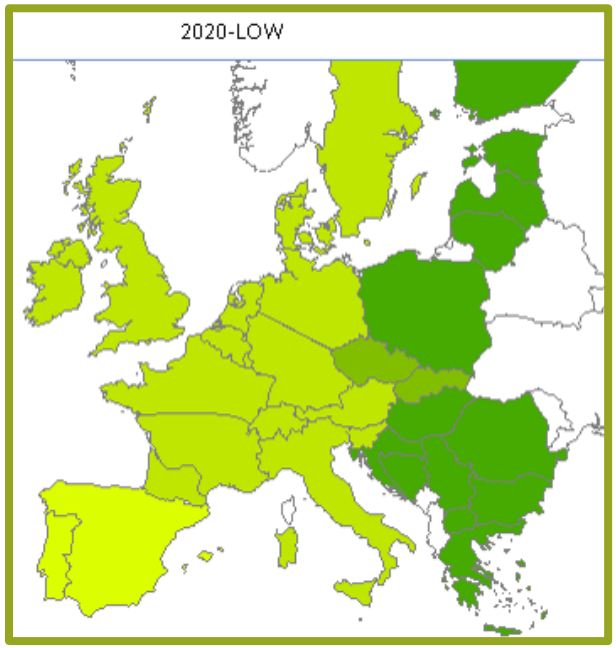
| Barriers to high price mitigation | NSI West |
|---|---|
| **LNG Minimisation (high LNG price)** | PT and ES less able to mitigate than other countries |

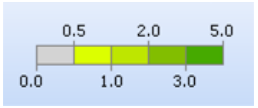
***Price effects under supply maximisation configuration based on SSPDi – Consider SSPDi when interpreting**

# Price effects – Russian gas

Whole year

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

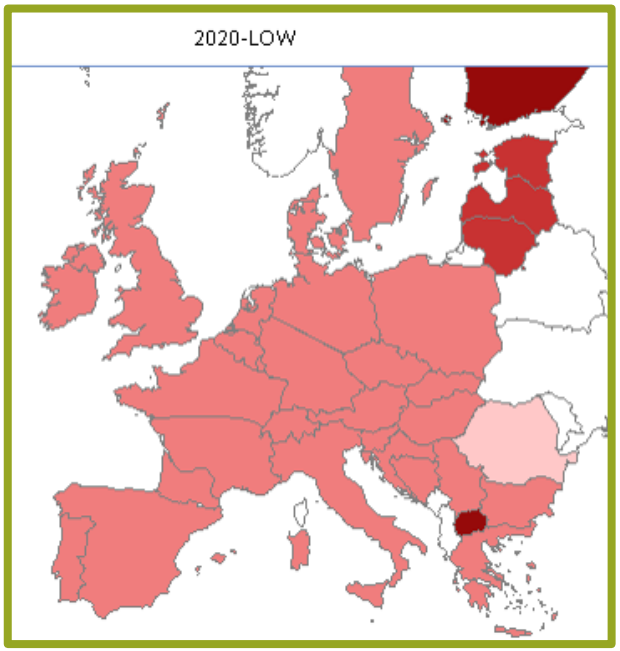


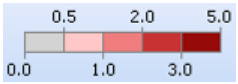




**Legend: price decrease compared to the balanced supply configuration (EUR/MWh)**

| Barriers to low price propagation | NSI West |
|---|---|
| **Russian gas Max. (low RU price)** | ES and PT benefit less than other NSI West countries |

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



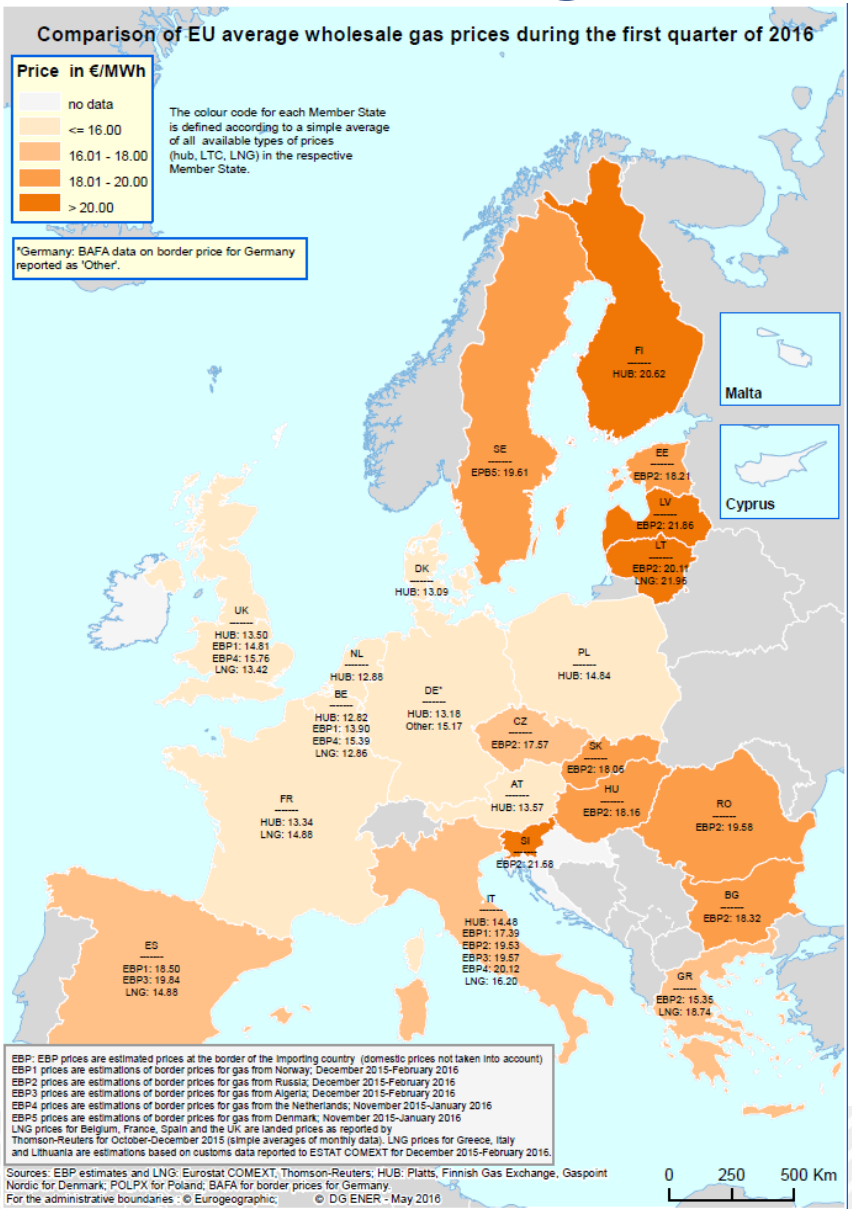




**Legend: price increase compared to the balanced supply configuration (EUR/MWh)**

| Barriers to high price mitigation | NSI West |
|---|---|
| **Russian gas Min. (high RU price)** | No identified barriers: NSI West Countries are equally impacted |

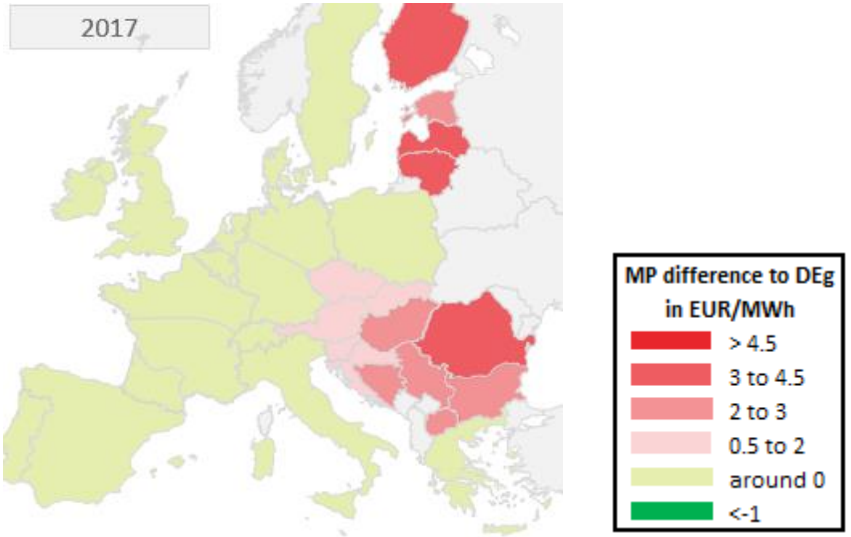
*Price effects under supply maximisation configuration based on SSPDi – Consider SSPDi when interpreting
**Price effects under supply minimisation configuration based on CSSD

# Market integration - Price spreads




- 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

***Assessment shows no spreads in the NSI West Region neither in 2017, nor later***




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

# Conclusions

| Problems | NSI West |
|---|---|
| **Isolation** | **MT** |
| **Decline of indigenous production increasing supply needs.**<br><br>**In particular decline of L-gas production making it necessary to adapt L-gas market to H-gas.** | **Potential impact on all countries**<br><br>**L-gas market countries** |
| **Dependence or access to limited number of supply sources (* including LNG)** | **ES*, PT*,** FR in 2017 |
| **Price effects**<br>- **Barriers to low LNG price propagation**<br><br>- **Barriers to high LNG price mitigation**<br><br>- **Barriers to high RU price mitigation** | **FR, BE, UK, IE** benefits less than ES and PT;<br>**Eastern countries** benefit less than Western ones<br><br>**ES and PT** less able to mitigate than other countries<br><br>**ES and PT** benefit less than other NSI West countries |

> 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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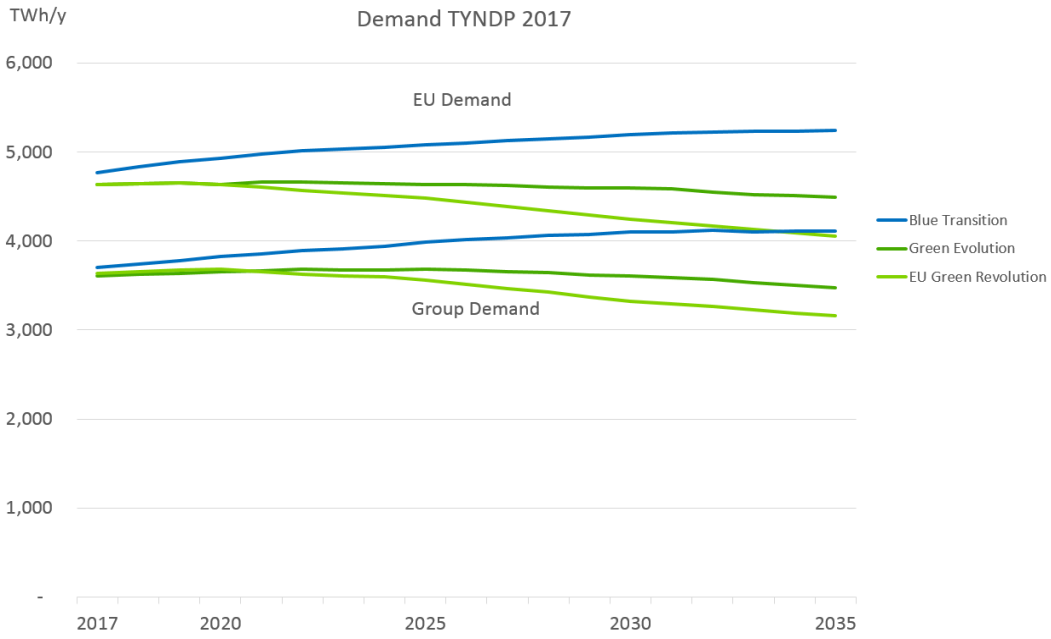
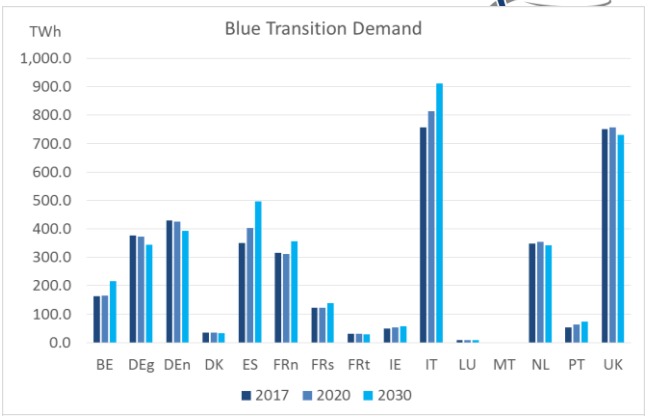
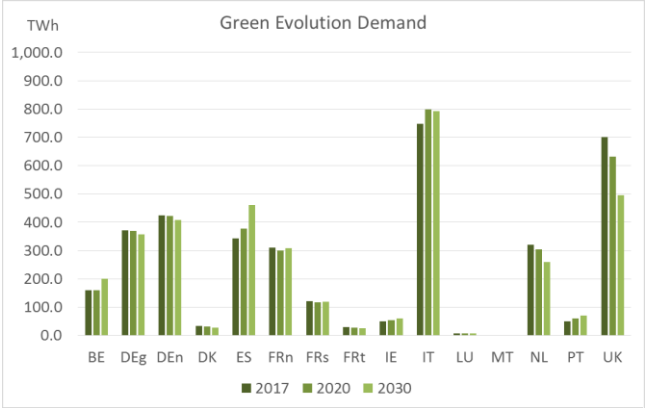
# Infrastructure gap under TYNDP 2017

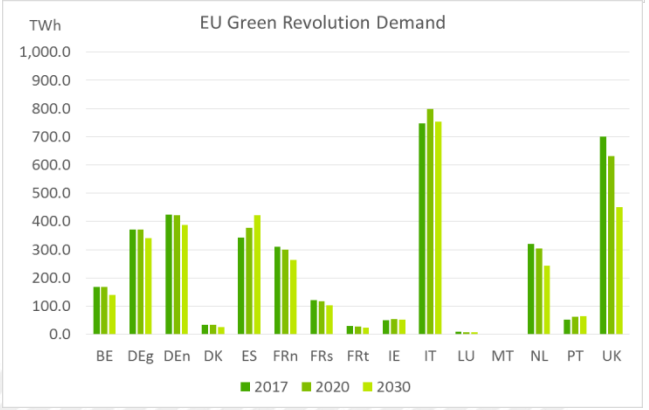
## Annex

# Demand – NSI West focus



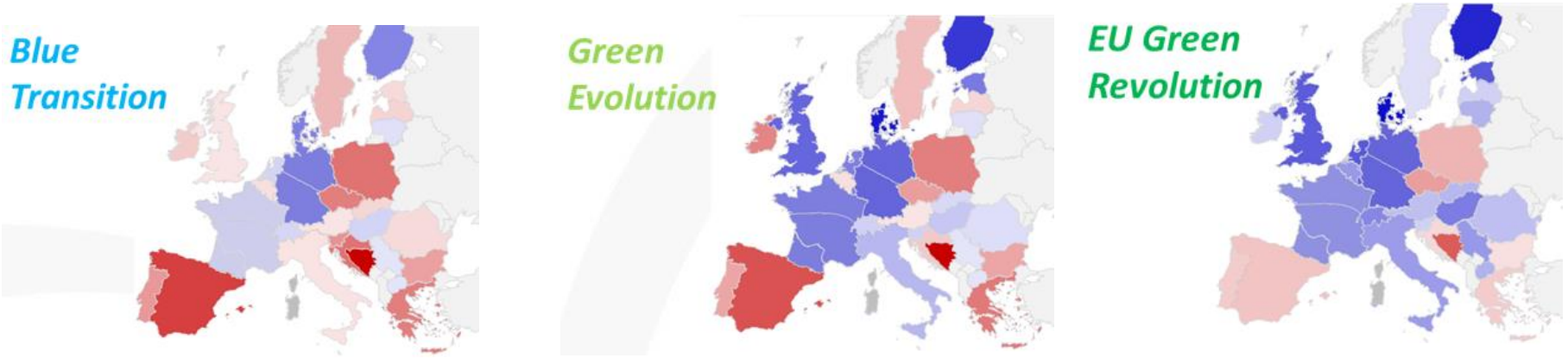



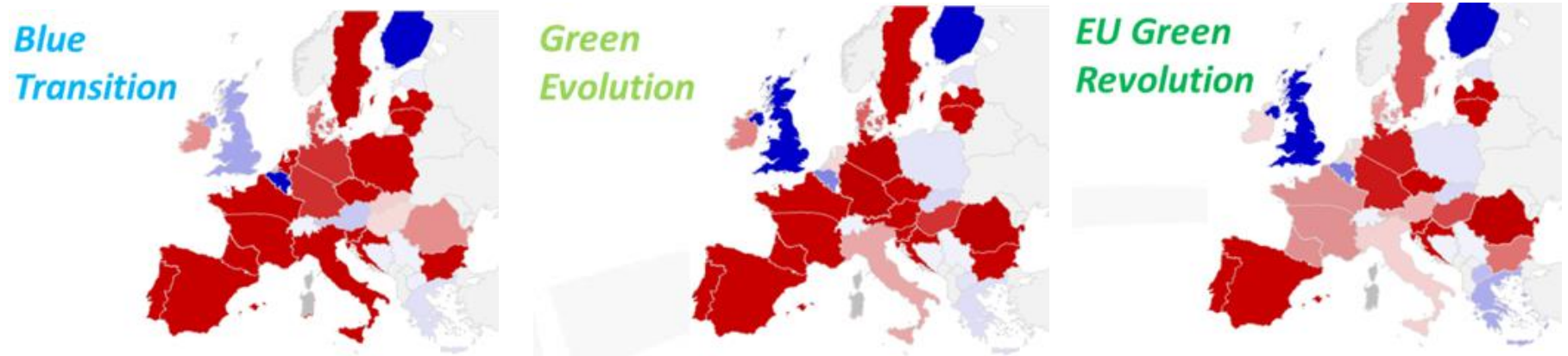

**MT gasification demand cannot be covered under the Low infra level as necessary infrastructures are missing**

# Demand evolution

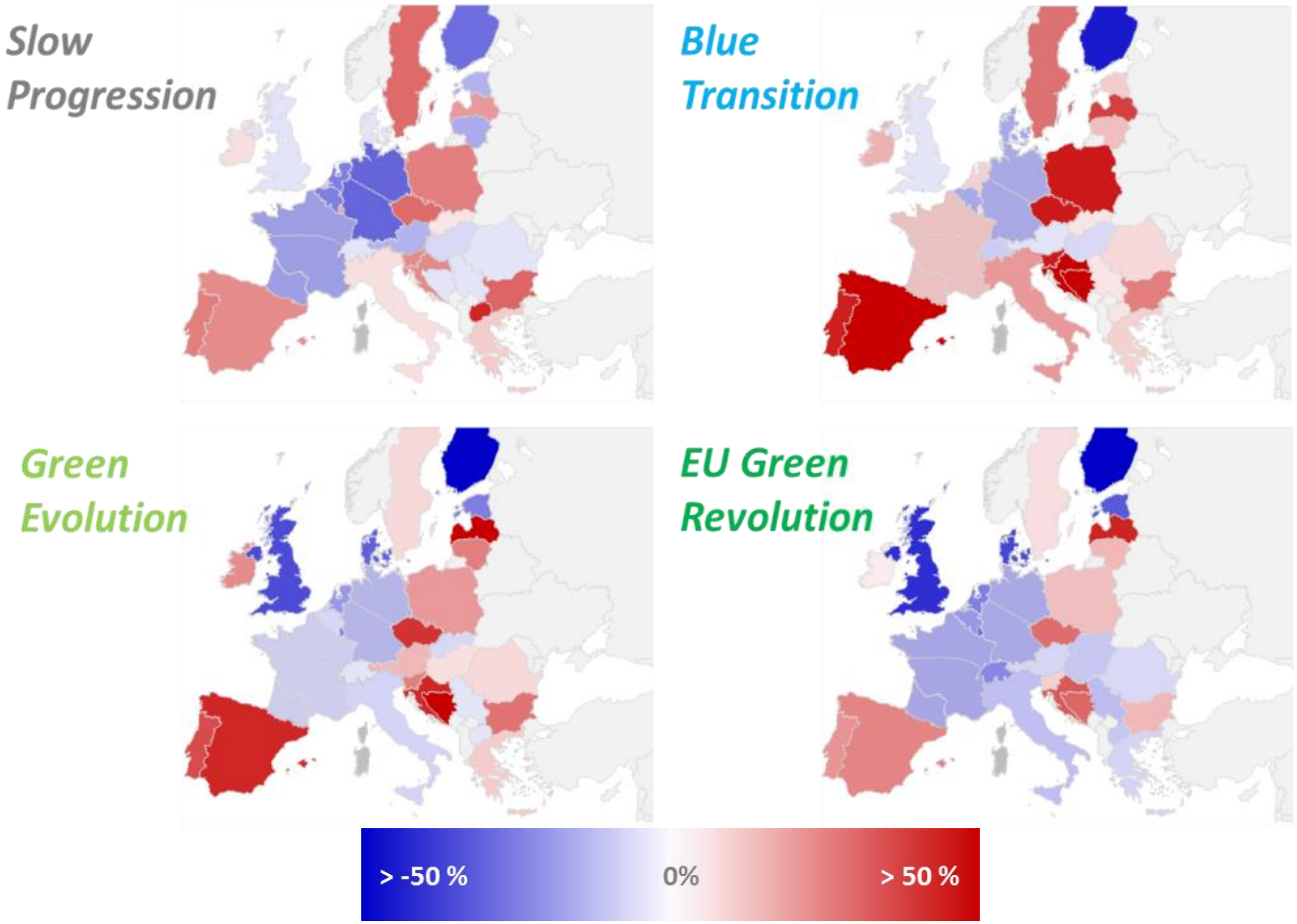
**Evolution of annual final gas demand in the period 2017-2035**




**Evolution of annual gas demand for power generation in the period 2017-2035.**



# Country-level demand evolution




*Total annual gas demand evolution – 2017 to 2035*

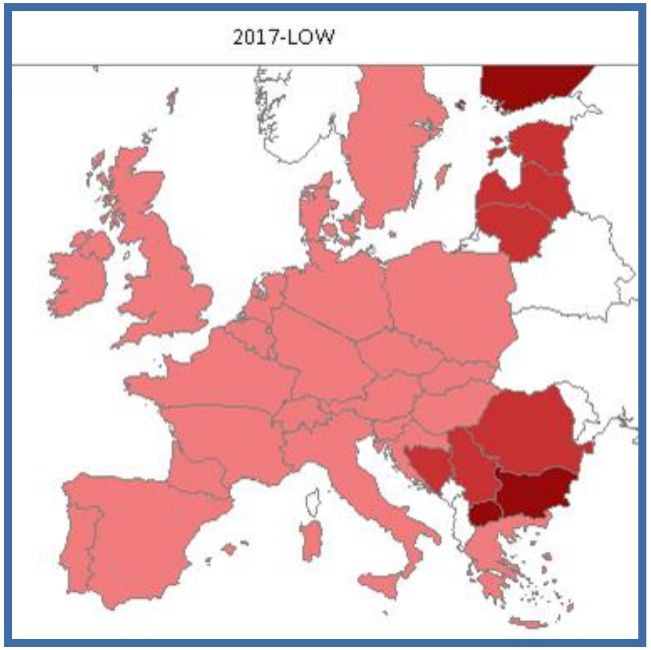
# Security of supply / Competition

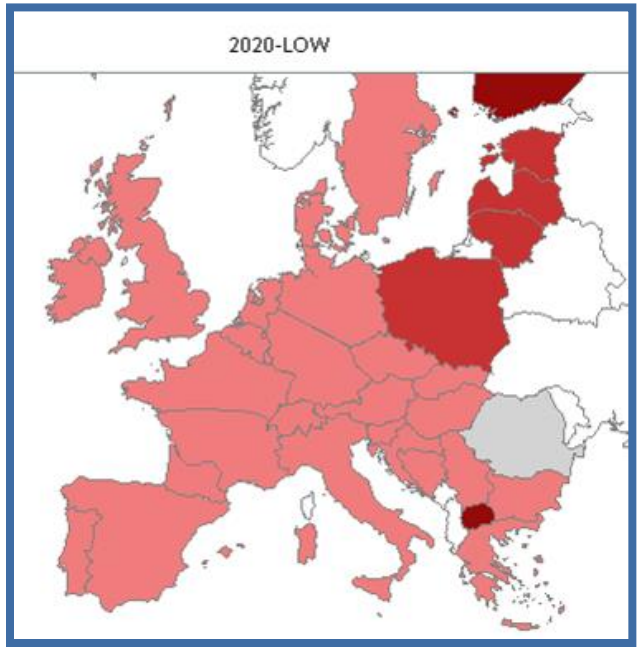
## Dependence to Russian supply

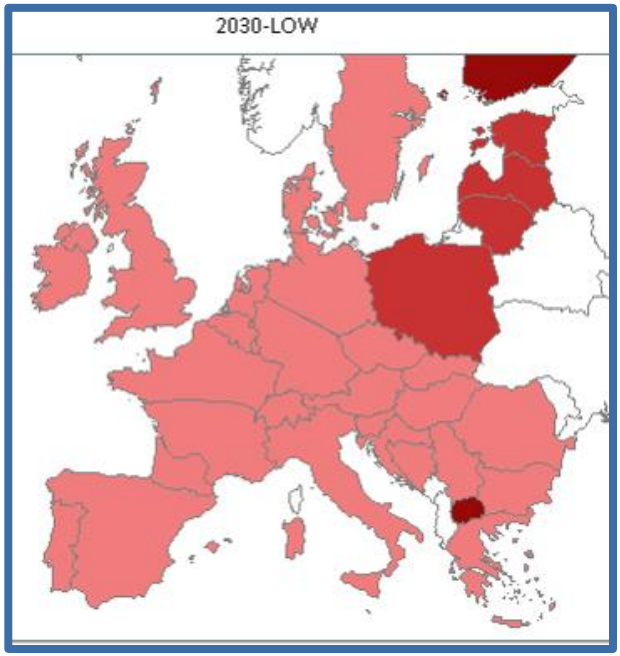
Whole year

*Blue Transition*

- **At EU level**, no infrastructure limitation preventing full access to the other supply sources*
- **At country-level, no infrastructure bottleneck identified within the NSI West Region**




| | NSI West |
|---|---|
| Dependence to Russian supply above 25% | No country |

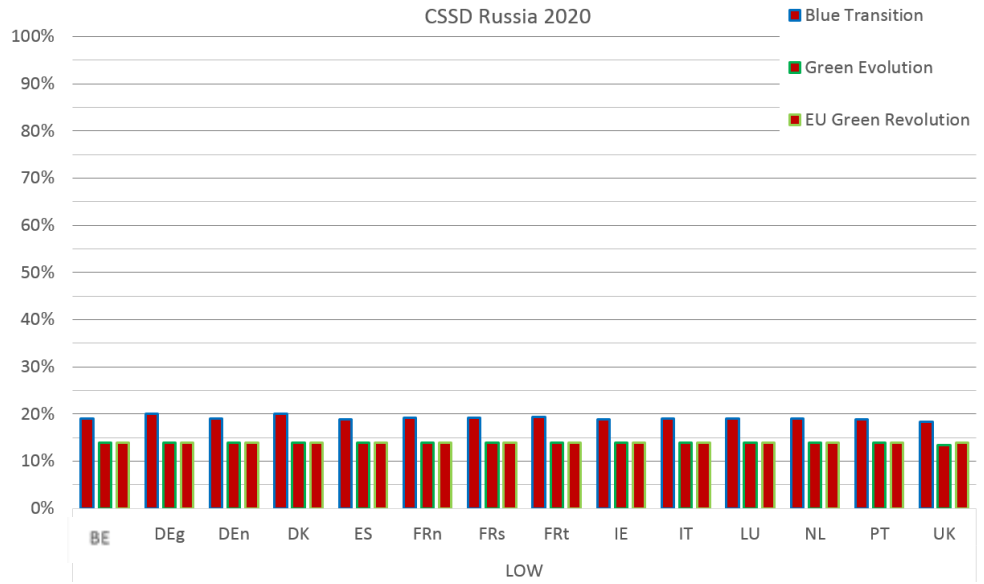
**CSSD**

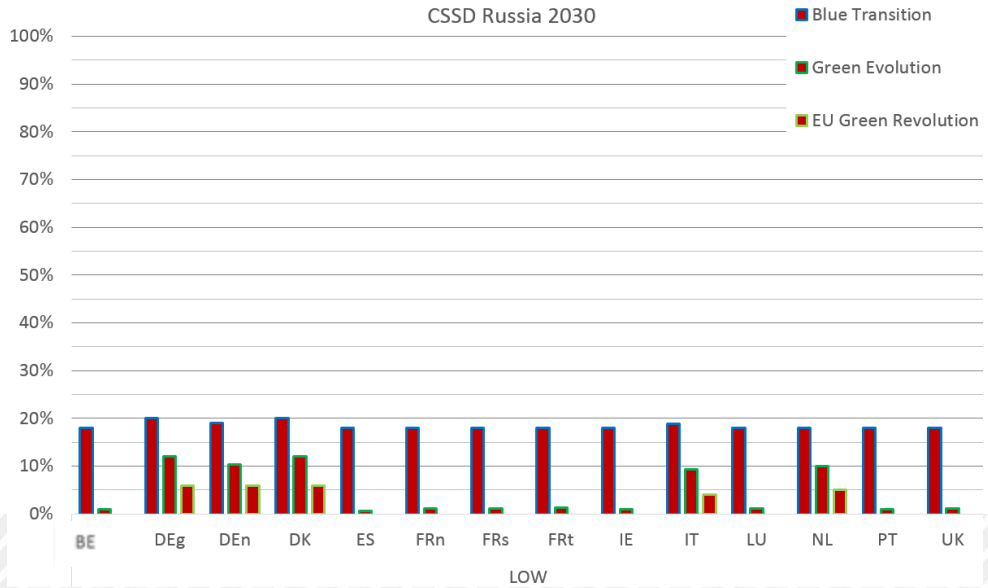
50% - 100%
25% - 50%
15% - 25%
5% - 15%
0%-5%

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

**Results for the other scenarios are provided in Annex**

# Dependence to Russian gas



# Dependence to LNG