TYNDP 2013-2022

Assessment results

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TYNDP 2013-2022 contents

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B. Country Profiles (.xls, .pdf)

C. Supply & Demand (.xls)

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E. Assessment Results (.xls)

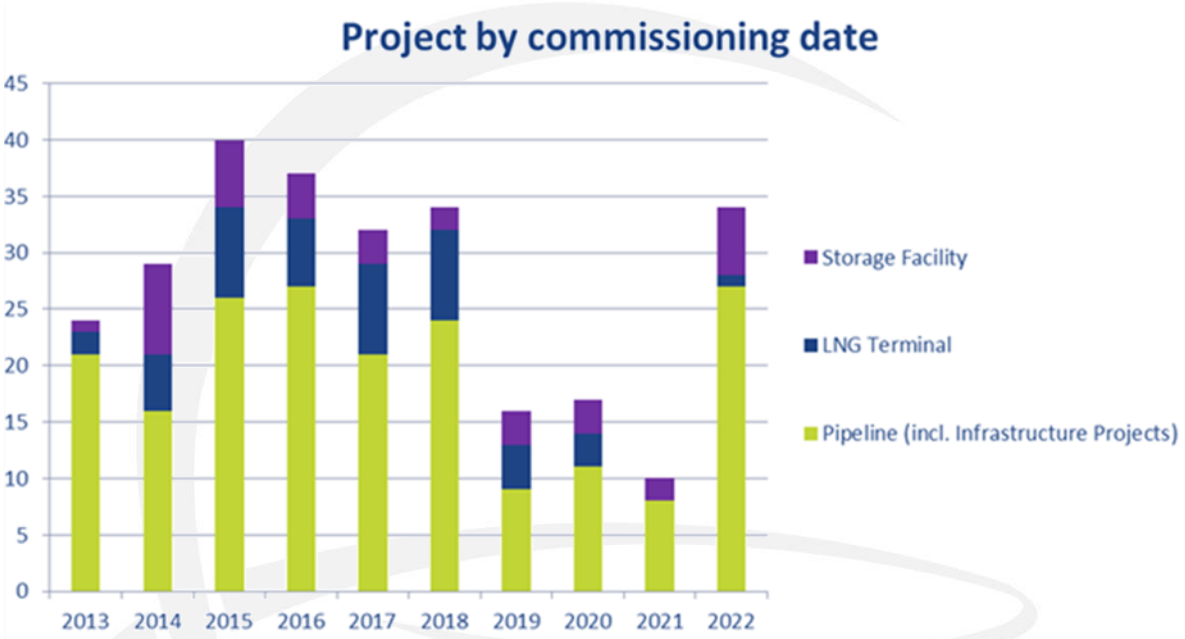
Infrastructure projects

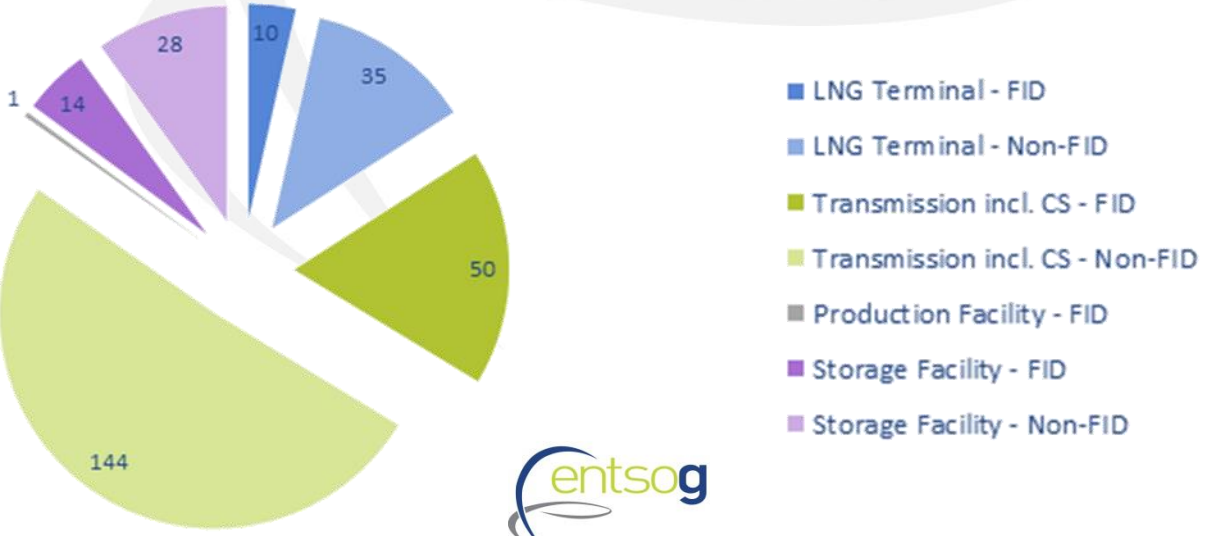
Infrastructure projects (2)

ENTSOG TYNDP remains the most comprehensive project database

- Open to all type of gas infrastructure projects and promoters
- FID status remains the only clustering criterion (status as of 15 Sep 2012)
- Annex A provides detailed information on each project
  - Promoter/operators
  - Capacity increment
  - Time schedule
  - Promoter's assessment of the importance of the project
- Annex provides advanced querying/filtering features
- Due to the new PCI framework, TYNDP includes projects which
  - could be considered as not sufficiently mature for the purpose of the report
  - which do not have a counter project on the other side of the 'system'; these projects are modelled assuming that such counter projects will be realized in the future; all such projects are accompanied by an appropriate remark

Infrastructure projects (1)



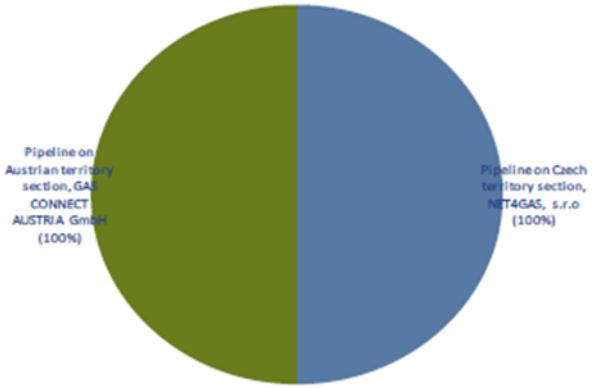


What can be found in Annex A

TRA-N-021	Bidirectional Austrian-Czech Interconnector (BACI, formerly LBL project)	Non-FID

Pipeline (incl. Infrastructure Projects)

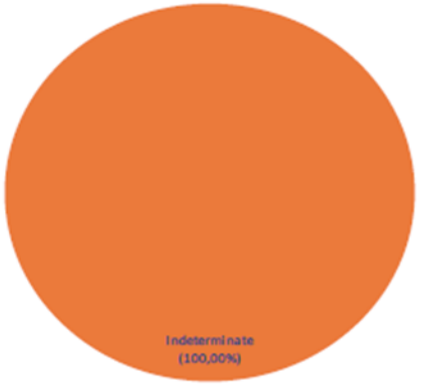
Sponsors



General Information

Promoter	*Gas Connect Austria GmbH*
Operator	*Gas Connect Austria GmbH*
TEN-E Project ?	*Project of Common Interest*
Interested by PCI ?	*Yes*
Web Link	*http://www.gasconnect.at/*

Financing



Third-Party Access Regime

Considered TPA Regime	*Regulated*
Considered Tariff Regime	*Regulated*
Applied for Exemption ?	*No*
Exemption granted ?	*Not relevant*
% Exemption in entry direction	*0%*
% Exemption in exit direction	*0%*

Schedule

End of permitting phase	
FID	
Construction	
Commissioning	*2019*
Last completed Phase :	*Planned*

Technical information

# of Pipelines and compressors	*2*
Total Pipeline Length (km)	*58,00*
Total Compressor Power (MW)	*24,00*
Maximum Capacity (GWh/d)	*255,13*

Capacities

IP	direction	capacity	Status
Reinthal IP	*entry*	*255,13 GWh/d*	*Modelled as an increment*
	exit	*255,13 GWh/d*	*Modelled as an increment*

Methodology

The backbone of ENTSOG TYNDP

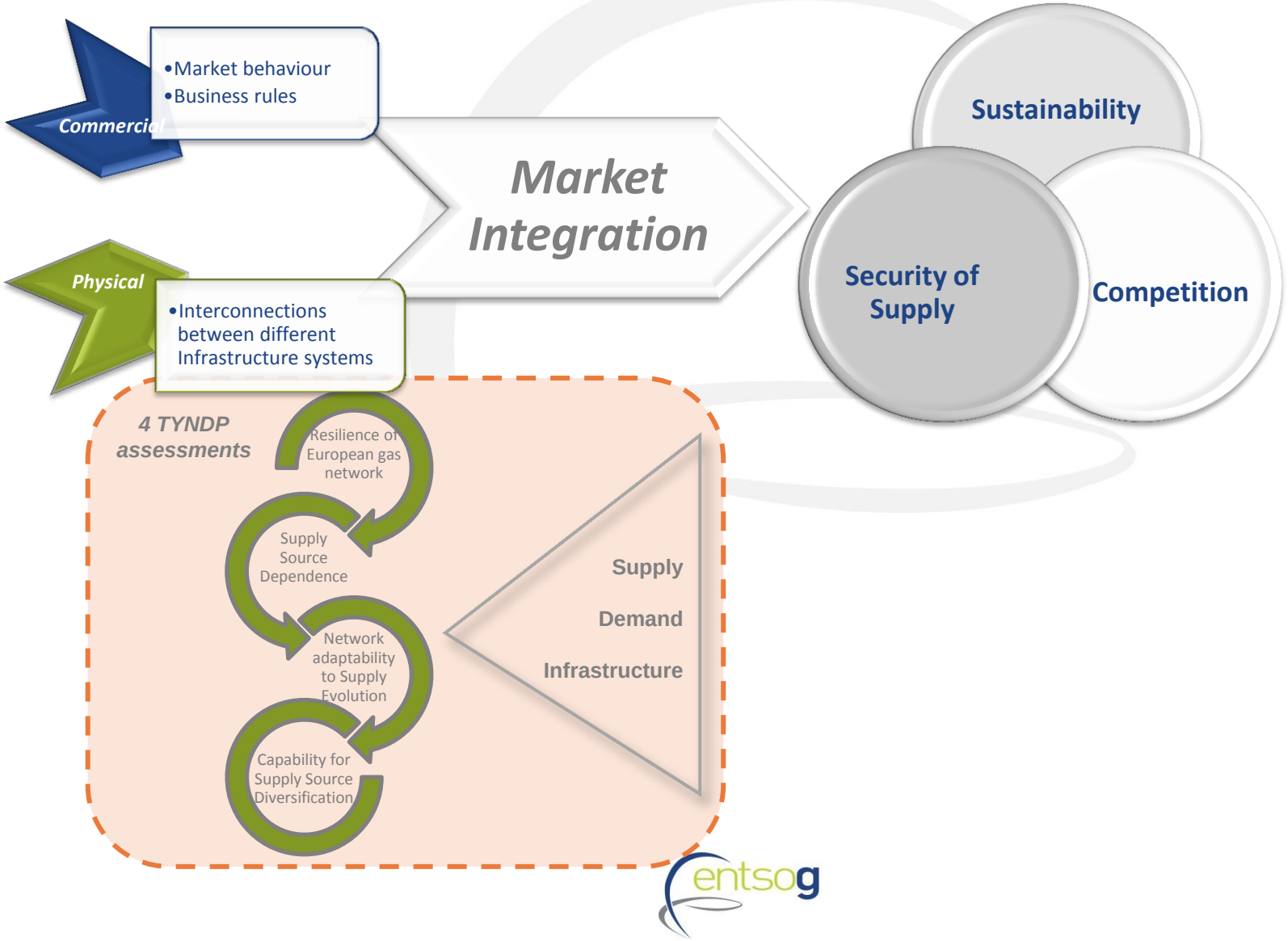
Methodology is the backbone of the TYNDP; it provides full transparency about the TYNDP's concept thus ensuring stakeholders' trust

- In order to face increasing expectations, TYNDP has developed in a complex report making crucial its good understanding
- The developed methodology derived from the concept defined with stakeholders during SJWSs

An updated structure describing the role of infrastructure

- The infrastructure component of Market Integration is defined as the role of the gas infrastructures in sustaining the pillars of the European energy policy, in particular Security of Supply and Competition
- Infrastructure-related Market Integration is defined as a physical situation of the interconnected network which, under optimum operation of the system, provides sufficient flexibility to accommodate variable flow patterns that result from varying market situations

Role of TYNDP in the assessment of the 3 pillars of the European Energy policy



Main elements

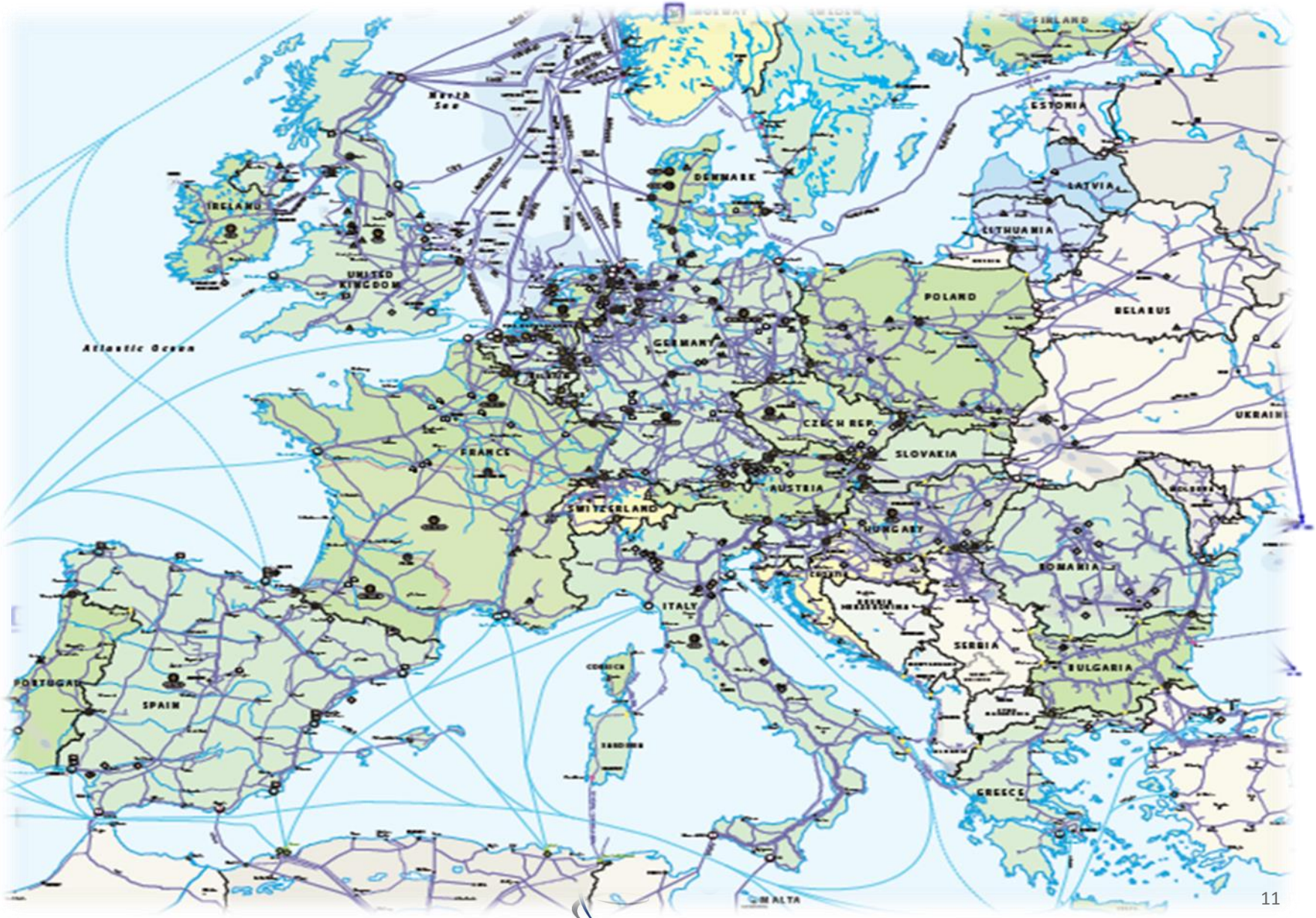
Description of the Network Modelling tool

- Topology of the network: nodes (e.g. E/E Zone) linked through arcs (e.g. cross-border capacity)
- Tool functioning: network flow programming applied on a linear modelling of the market
- Expected output per each case modelled (240+): identification of **a** flow pattern balancing each zone demand and facing all constraint set according the methodology

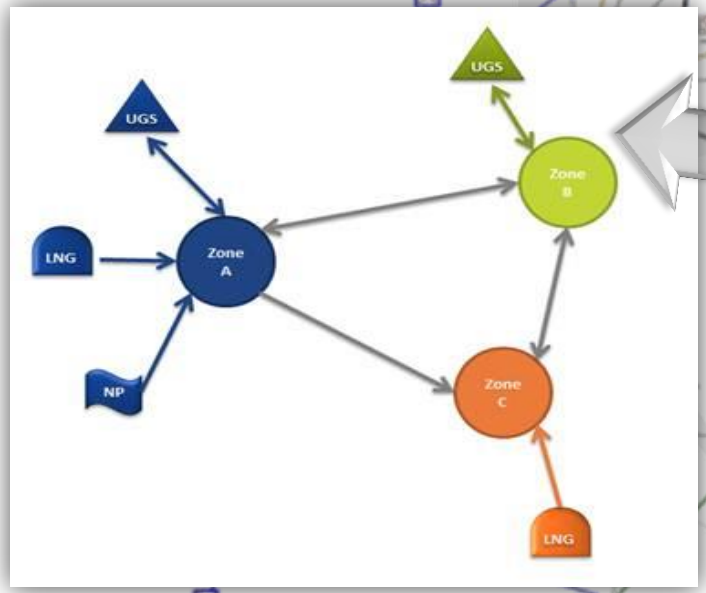
Infrastructure, demand and supply settings

- For each modelled situation, methodology describes:
  - The infrastructure cluster
  - The demand situation
  - The supply situation
  - The modelling approach
  - The investigated facet of infrastructure-related Market Integration
- The process which led to the definition of pilot indexes

The European gas spider web



The European gas spider web

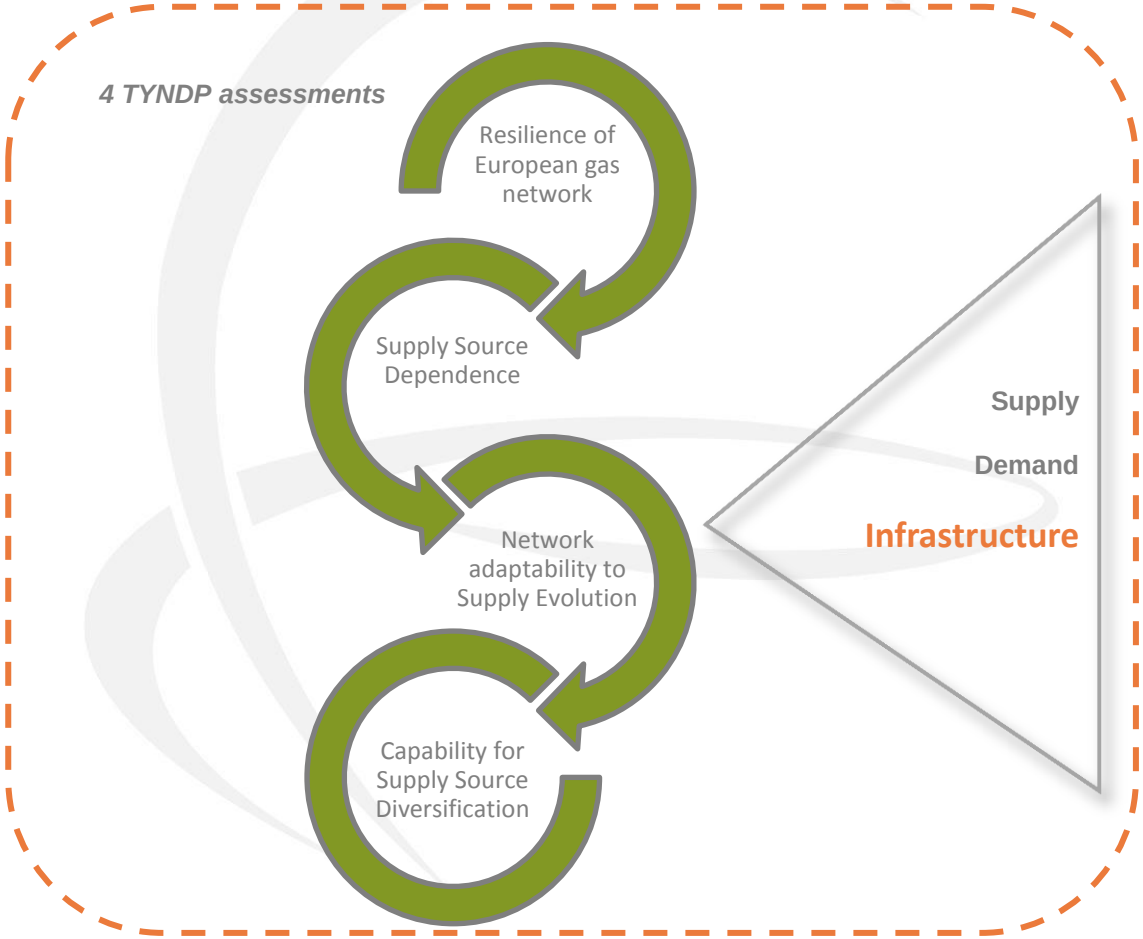


Emden fork

Yamal *transit*

Enhanced topology better considers complex situations such as forks (e.g. Emden) and transit system (e.g. Yamal pipeline)

Parameter settings



Infrastructure clusters

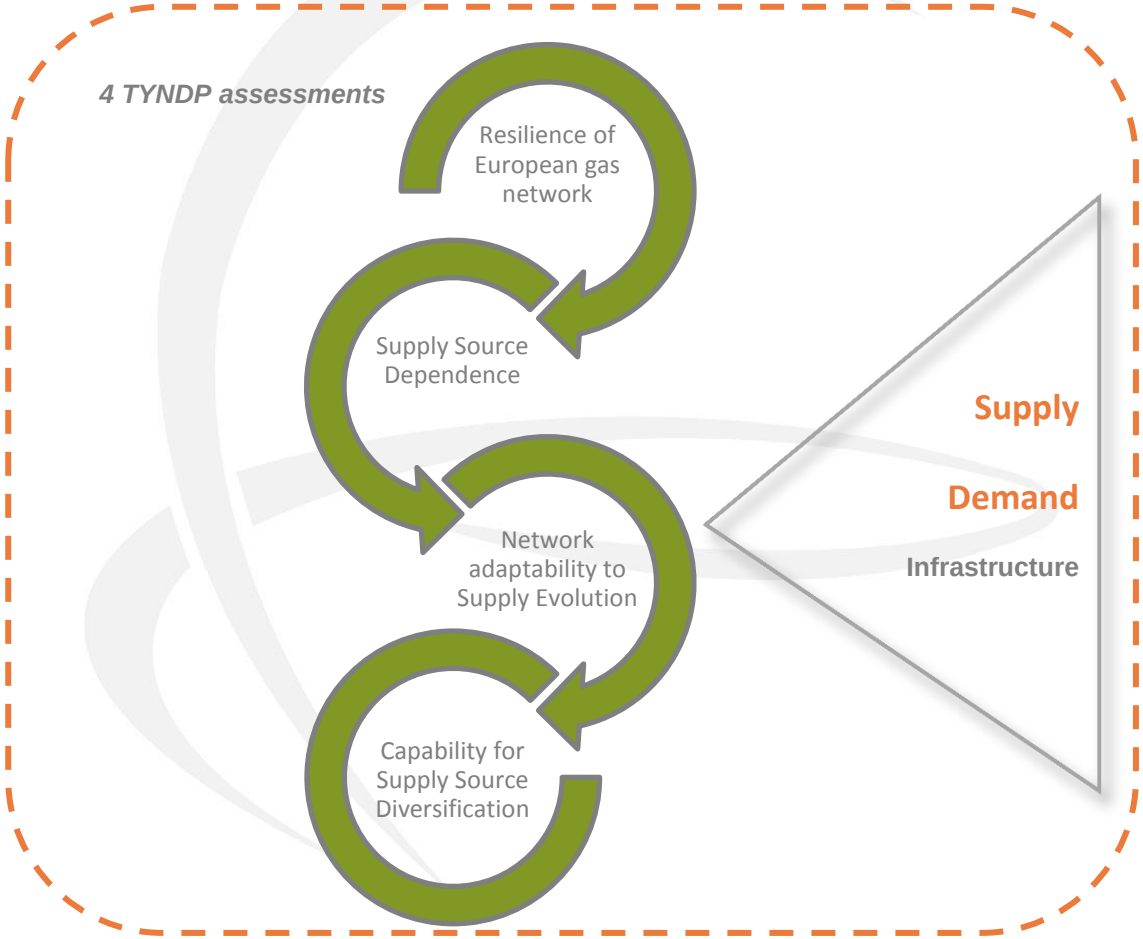
The infrastructure clusters

- The Final Investment Decision (FID) remains the only transparent and non-discriminatory criteria for clustering
- Difficulty faced by project promoters to define the steps of their project and their order clearly supports this choice
- The 2 considered infrastructure clusters:
  - FID: existing infrastructures + FID projects
  - Non-FID: existing infrastructures + FID projects + Non-FID projects

Demand and supply may depend on infrastructure projects

- Some demand and national production figures will only be part of the assessment under Non-FID cluster (e.g. Malta and Cyprus)
- Commissioning of LNG terminals will impact the level of the Minimum and Intermediate LNG Potential scenarios leading to one scenario per infrastructure cluster

Parameter settings



Supply under Average Situation

Source level

- 2013 values: average share (in %) over the 2009-2011 period applied to demand forecast
- 2014-2022 values:
  - share (in%) of the previous year except if resulting import exceed the Intermediate Potential scenario of a source
  - Otherwise missing gas is caught up by other sources based on their shares
- Introduction of a new source is done based on the average load factor (compared to the total export capacity) of the existing source for the previous year

Import route level

- 2013-2022: the weight (in %) of a route among all import routes coming from a given supply source is the same than previous year unless:
  - A route is reaching its technical capacity
    - The missing quantity is reassigned proportionally to routes still having free capacity
  - A capacity increase (or new route) is commissioned
    - The use of the increase part is equal to the average load factor of existing routes, scaled down to fit with the total export from the considered supply source

Supply under High Daily Situation

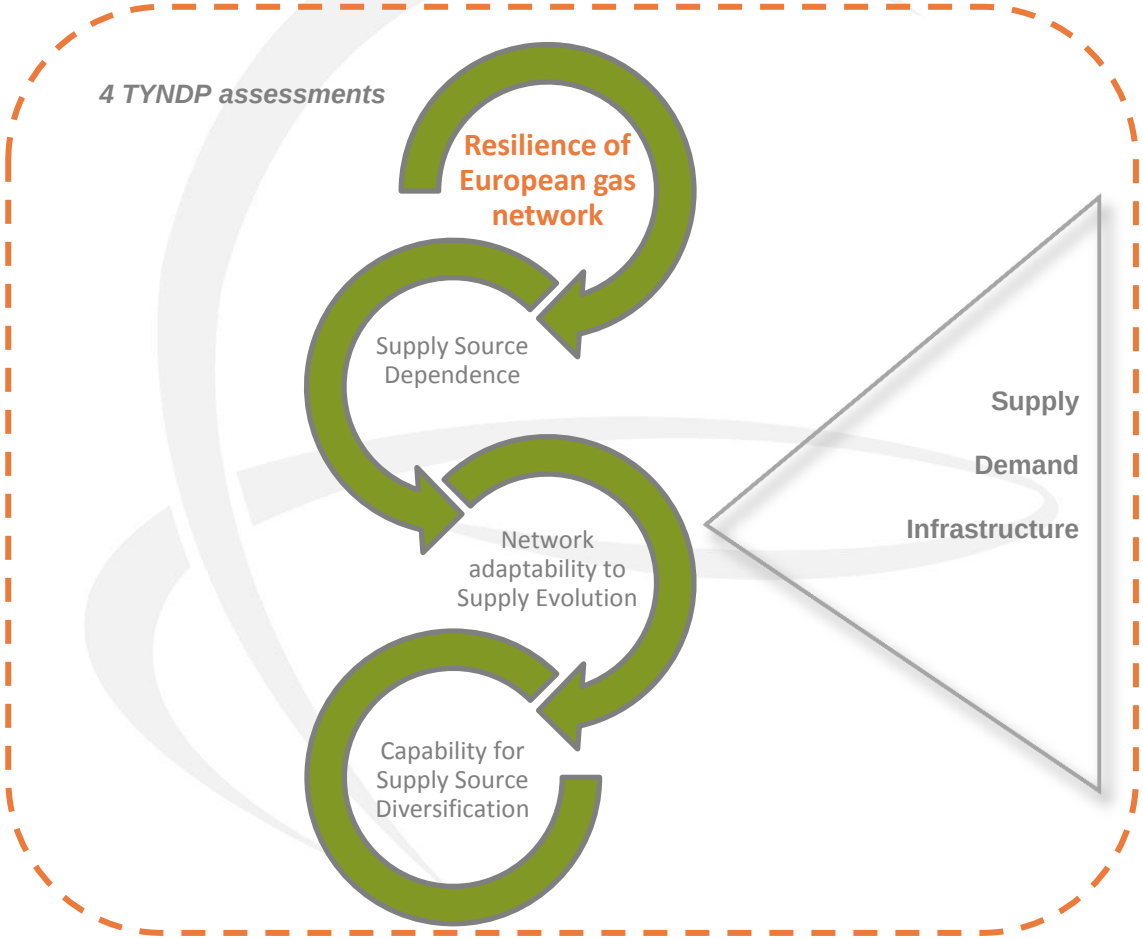
Source level

- 2013 pipe import values: maximum export of the source over the 2009-2011 period
- 2014-2022 pipe import values: same as 2013 (increased prorate the import route total new capacity if any, except for Russia where results are capped by the 2013 peak/average ratio => New import routes bring alternative rather than additional gas)
- 2013-2022 LNG import component value: Average Day value + 10%
- UGS and LNG storage component as last resort supply

Import route level

- 2013 pipe import values: maximum flow on the route over the 2009-2011 period
- 2014-2022 pipe import values: same as 2013 (increased prorate the new capacity if any)
- LNG terminal: Average Day value + 10% as a minimum
- UGS: 50% use as a minimum

Assessment results



Infrastructure resilience - Methodology

AIM

To look at the ability of infrastructures to transport large quantities of gas under High Daily conditions and Supply Stress cases
Assessment used for identification of gaps and potential remedies

DEMAND

1-day Design
14-day Uniform Risk Situations

$$RFlex = 1 - \frac{\sum EnteringFlows}{\sum EntryCapacity}$$

SUPPLY

- Reference
- Complete Disruption of NO to France (Franpipe failure)
- Partial Disruption of NO to UK (Langeled failure)
- Complete Disruption of RU through Belarus (BY)
- Complete Disruption of RU through Ukraine (UA)
- Complete Disruption of Algeria to Italy (Transmed failure)
- Partial Disruption of AL to Spain (MEG failure)
- Complete Disruption of Libya to Italy
- Extreme LNG Minimisation: European resilience to low LNG delivery

RESULTS

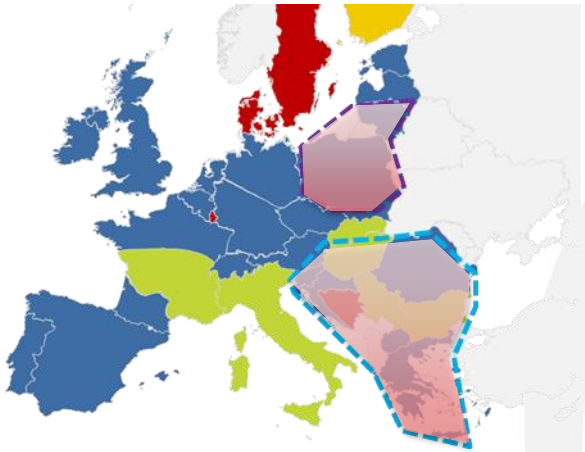
> **Remaining flexibility** (RFlex) indicator at Zone level to identify **investment gaps** when **RFlex < 5% (Ref. Case)** or **< 1% (Supply Stress Cases)**

> **Use of LNG and UGS as last resort supply**

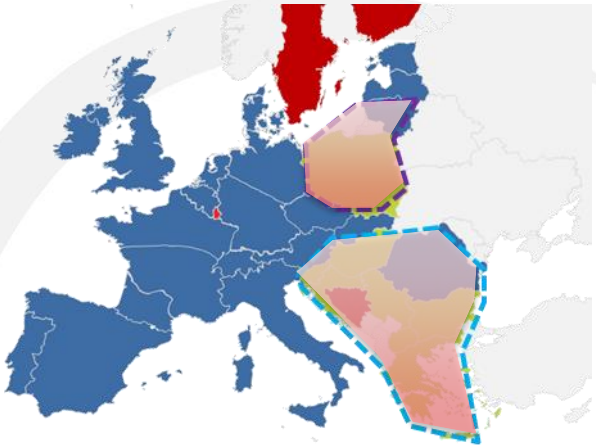
> **European resilience to low LNG deliverability** to identify Zones requiring a LNG minimum **Send-Out >20 %**

Infrastructure resilience - Results

2013



2017 FID



2022 FID

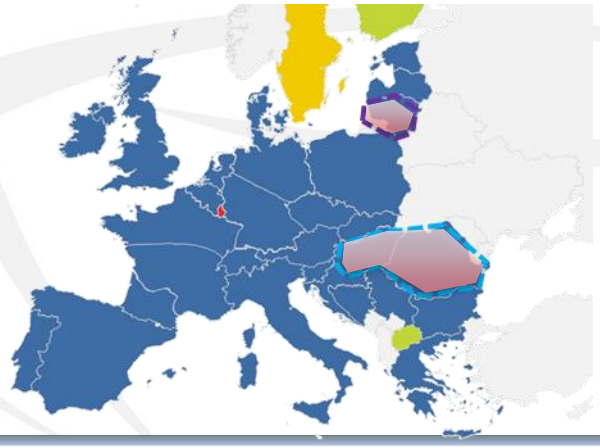
Remaining Flexibility under Reference Case – Design situation

< 1%	1 - 5%	5 - 20%	> 20%

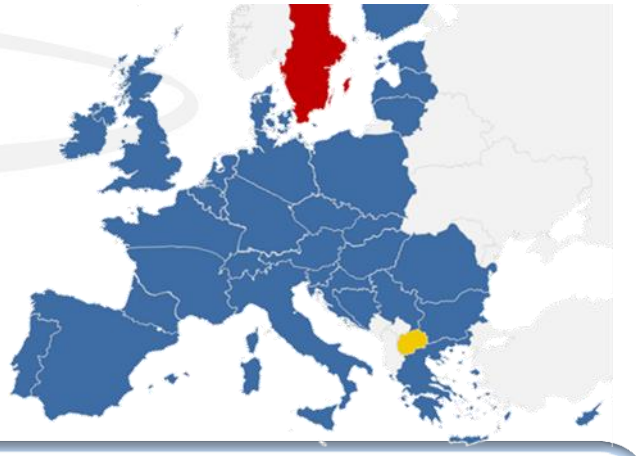
Areas lacking of Remaining Flexibility

- Under disruption of Belarus transit
- Under disruption of Ukraine transit

2017 Non-FID



2022 Non-FID

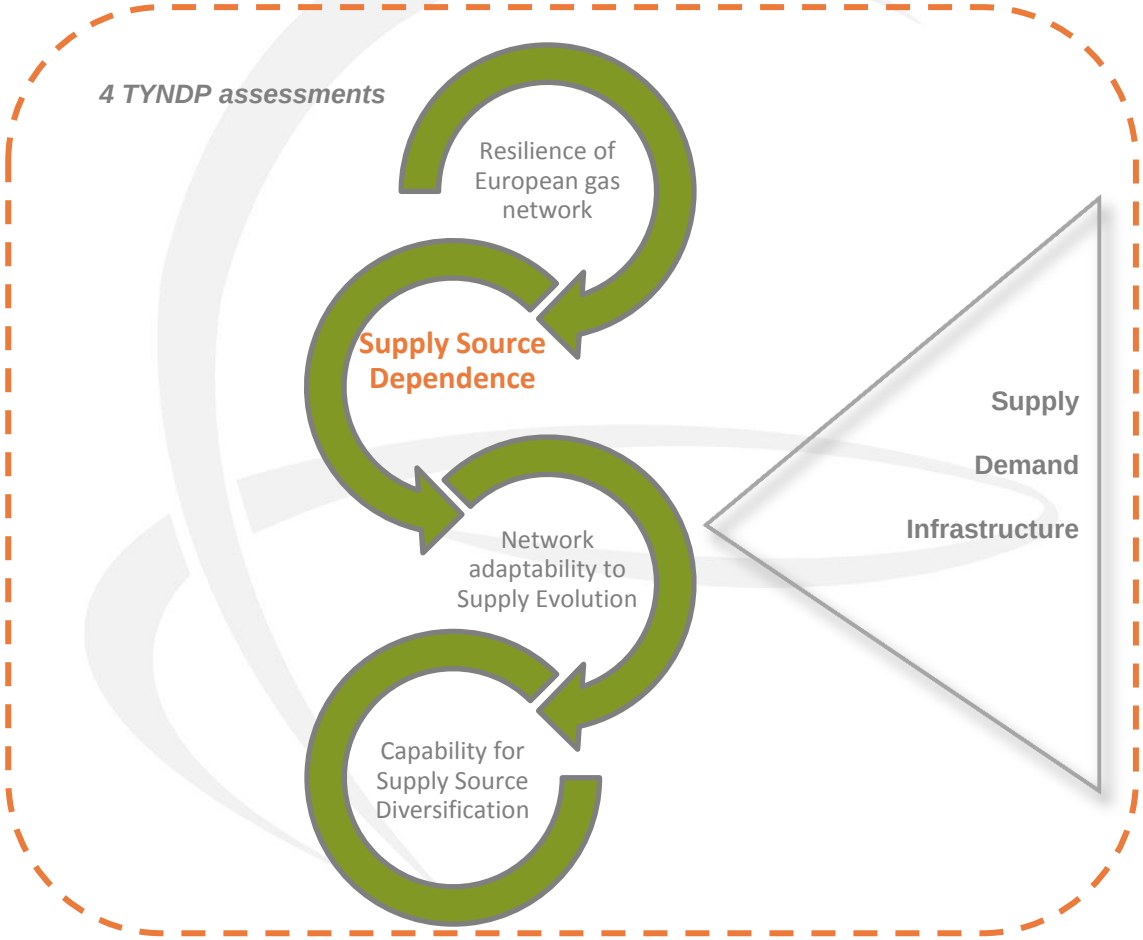


Gaps have been identified under Reference Case (BH, DK, FI, LU, MK & SE), Belarus disruption (+PL& LT) and Ukraine disruption (+BG, GR, HR, HU, RO, RS & SI)

Results are consistent with TYNDP 2011-2020

14-day Uniform Risk situation identified additional gaps in Poland.

Assessment results



Supply source dependence - Methodology

AIM

The identification of Zones whose balance strongly depends on a single supply source

DEMAND
1-day Average Situation

SUPPLY

"Full Minimisation" of supply source *S*

> Source ***S*** is reduced down to the minimum required to balance all Zones

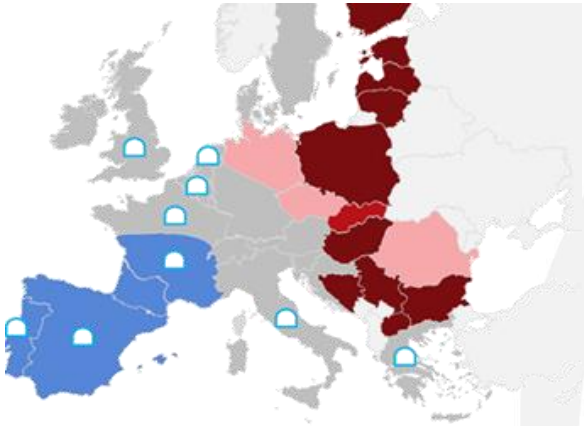
> Rest of the sources are increased up to their technical capacity

RESULTS

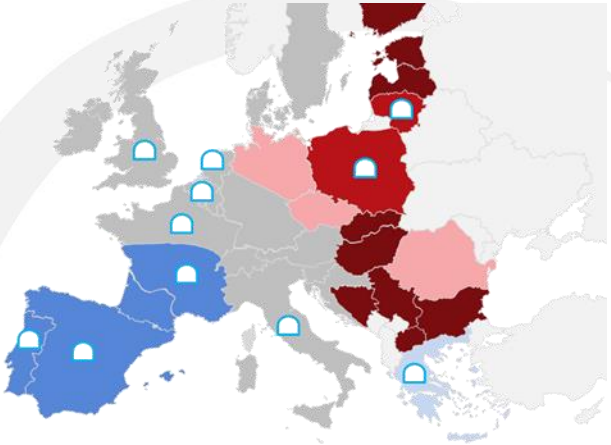
> **Supply Source Dependence** to source S is identified when a Zone requires at least a 20% supply share of the supply source S

Supply Source Dependence - Results

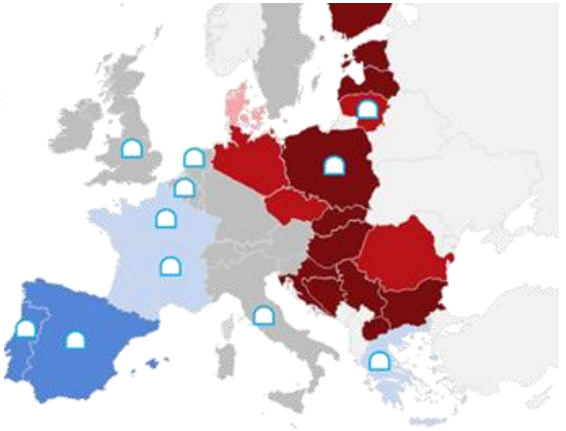
2013



2017 FID



2022 FID

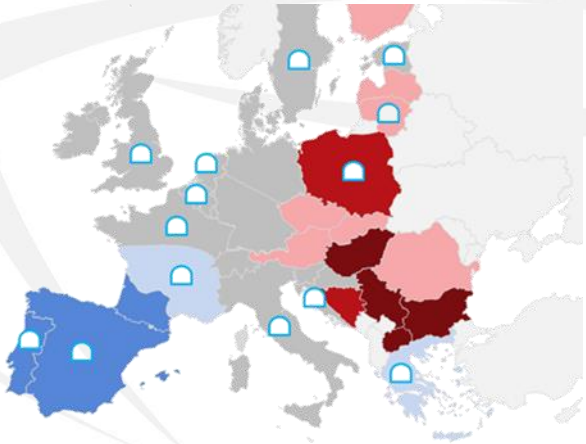


Minimum share in total supply

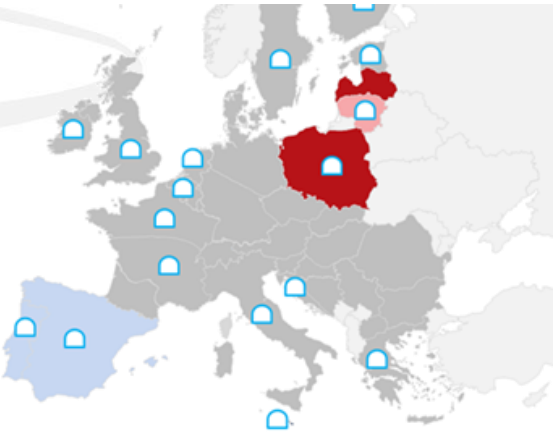
	LNG	RU
< 20%		
20-40%		
40-60%		
>60%		

Zone connected to a LNG terminal

2017 Non-FID



2022 Non-FID



Strong dependence has been identified only to Russian gas and LNG

Whereas the dependence on LNG stays relatively low, the evolution of dependence on Russian gas is strongly linked to the implementation of Non-FID projects

Adaptability to Supply Evolution - Methodology

AIM

To look at the European infrastructure's ability to face very different supply mixes deriving from short-term / long-term supply trends

DEMAND
1-day Average Situation

SUPPLY

Supply source ***S*** move from Reference Supply to Maximum / Minimum Potential Supply scenarios

> **Even Maximisation**: Maximisation of source ***S*** up to its Maximum Potential Scenario, with proportional reduction of the others sources down to their Minimum Potential Scenarios

> **Even Minimisation**: Minimization of source ***S*** down to its Minimum Potential Scenario, with proportional increase of the other sources up to their Maximum Potential Scenarios

In both cases, weights of the different import routes are kept closed to the historic situation

RESULTS

> Achievement of minimum / maximum potential supply from source S, if no flow pattern enables to reach minimum/maximum potential supply from source S

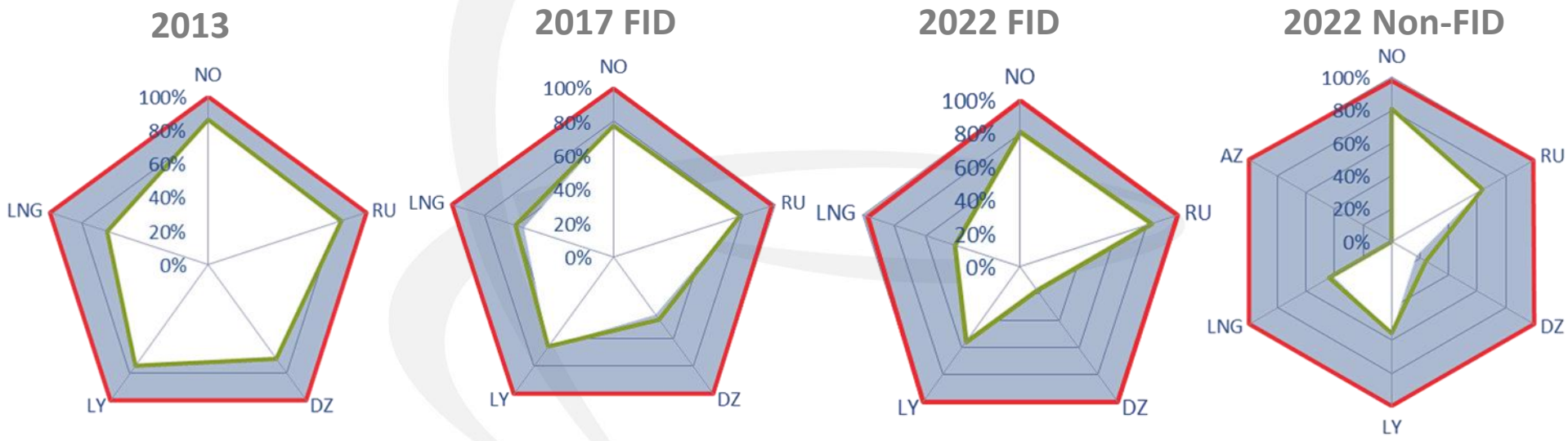
→ lack network adaptability to supply evolution from source S

Adaptability to Supply Evolution - Results

Results

> The **blue area** represents the range between the Minimum and Maximum Potential Supply scenarios

> The **red** and **green** lines represent the highest and lowest levels reached through Even Maximization and Minimization modelling



Potential for change in supply mix will increase with time

European system can easily face such changes in supply mix, still Russian gas cannot drop too low as RO and HU are strongly dependent on it

The same goes for Algerian gas for the Iberian Peninsula and LNG for the Iberian Peninsula and South of France

Supply Source Diversification - Methodology

AIM

To determine the ability of a Zone to access a given supply source having it covering at least a 5% or 20% targeted supply share

DEMAND

1-day Average Situation

SUPPLY

"Targeted Maximisation " of source *S* to zone *Z*

Several simulations in all directions in order to test the supply reach from source ***S***

For each simulation, Source ***S*** is increased up to its Maximum Potential scenario with reduction of the others sources down to their Minimum Potential Scenario, in order to achieve the targeted supply share in the zone ***Z***

Compared to Even Maximisation, weights of the different import routes can vary more compared to the historic situation

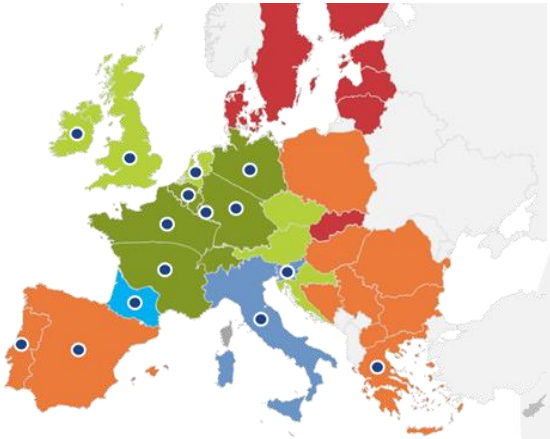
RESULTS

> **Identification of supply sources each Zone may have** access (simultaneity not tested) according the 5% and 20% targeted supply share

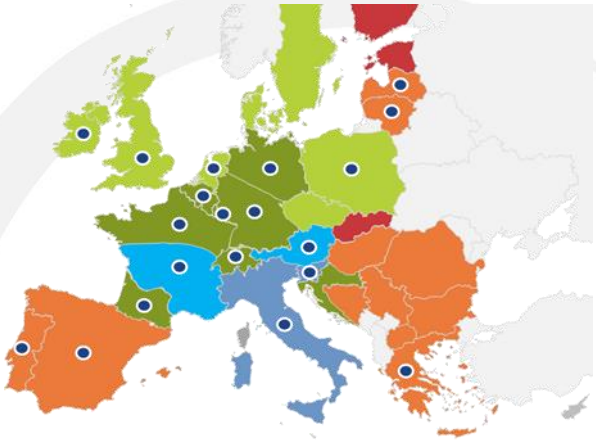
> Identification of the number of supply sources a zone may have access according the 5% targeted supply share

Supply Source Diversification - Results

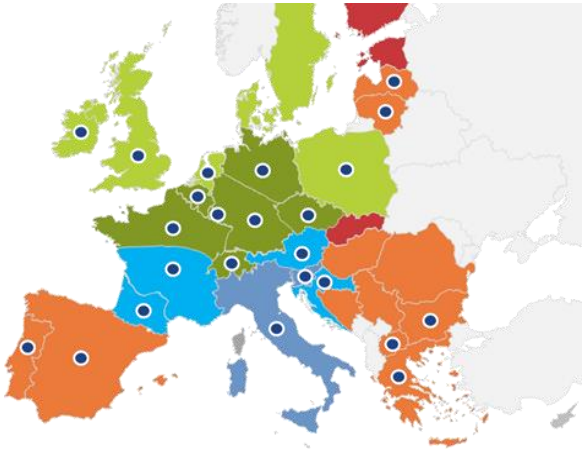
2013



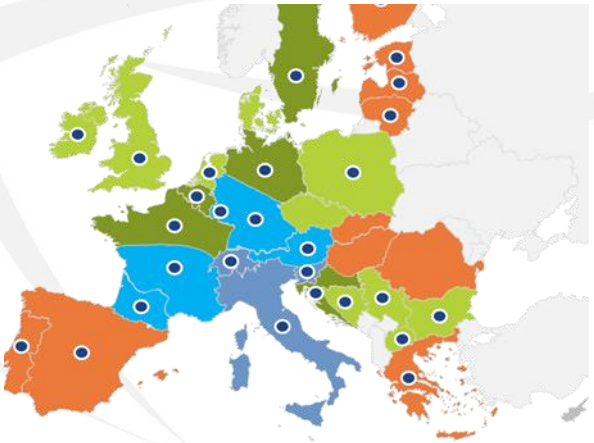
2017 FID



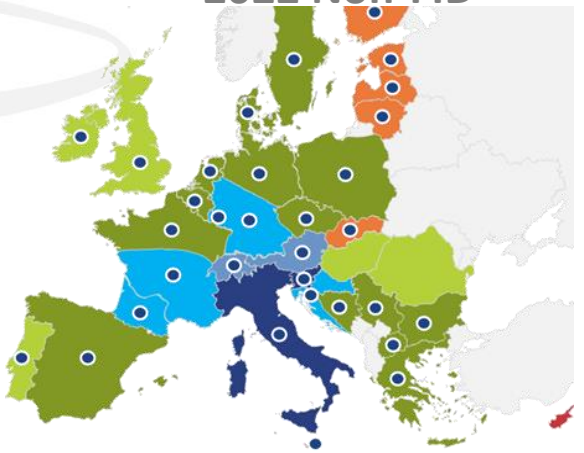
2022 FID



2017 Non-FID



2022 Non-FID



1
2
3
4
5
6
7

Number of accessible sources with at least a 5% share (simultaneity not considered)

Including access to LNG

Diversification will improve but the extent will depend on the commissioning of Non-FID projects especially in South-East Europe

Results would differ if concerning the 20% targeted supply share

Import Route Diversification index - Methodology

AIM

To quantify the diversification of routes bringing gas into a Zone through a capacity-based index not requiring modeling

DEMAND
Not applicable

SUPPLY
Not applicable

Formula

> % based on total entry capacity (UGS and NP excluded)
> IP capacity clustered at cross-border level
> The lower the value, the better the diversification is

$$\sum_{l}^{Xborder}\left(\sum_{k}^{IP}\%\,IP_{k}\,Xborder_{l}\right)^{2}+\sum_{j}^{Source}\sum_{i}^{IP}\left(\%\,IP_{i}\,from\,source_{j}\right)^{2}+\sum_{m}\left(\%\,LNG\,terminal_{m}\right)^{2}$$

RESULTS

> **Definition of 3 ranges** based on 2013 index values (Zones clustered in 3 thirds)

> **For each Zone**, evolution of index by range (main report) or by value (Annex E)

Import Dependency index - Methodology

AIM

To quantify a Zone's dependence on imports (as opposed to UGS and NP) through a capacity-based index not requiring modeling

DEMAND
1-day Average Situation

SUPPLY
Not applicable

Formula

- % based on gas demand
- NP and UGS deliverability as 2 separate aggregates at Zone level
- The lower the value, the better the independency is

$$\frac{1}{1 + (\%\ National\ Production) + (0.5 \times \%\ UGS)}$$

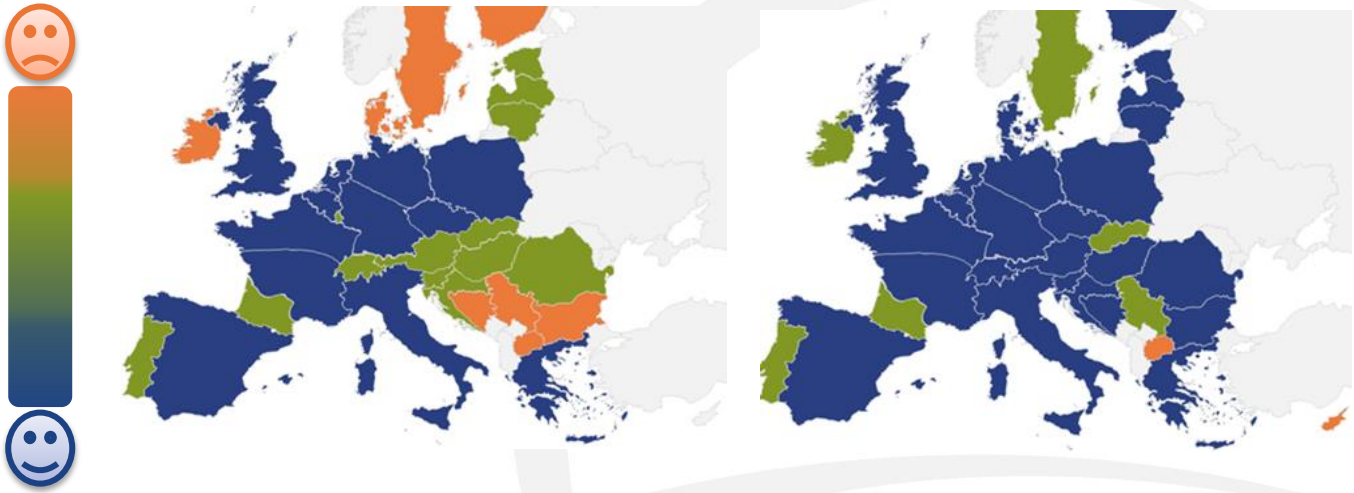
RESULTS

> **Definition of 3 ranges** based on 2013 index values (Zones clustered in 3 thirds)

> **For each Zone**, evolution of index by range (main report) or by value (Annex E)

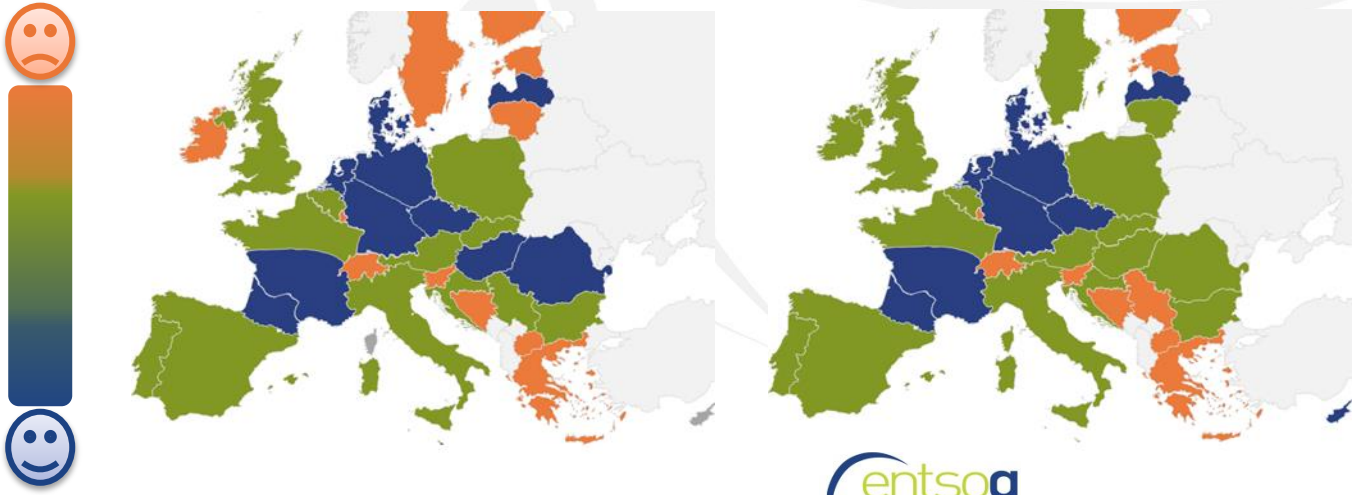
Capacity-based indexes - Results

Import Route Diversification index (2022 FID vs. Non-FID)



Positive evolution of diversification in Baltic and SEE regions will rely on Non-FID projects

Import Dependency index (2013 vs. 2022 Non-FID)



Dependency should remain stable through the 10-year range due to new UGS substituting NP and limited growth of gas demand

Assessment conclusion

Consistence with ENTSOG TYNDP 2011-2020

- The new report confirms the resilience assessment results of previous edition
- This confirm the robustness of the approach together with the updated input data scenarios

Things to keep in mind when reading TYNDP

- Results derive both from methodology and input data
- Results should be considered along a comparative approach (e.g. 2017 vs. 2022, FID vs. Non-FID) rather than an absolute assessment
- In Non-FID cluster, all projects are considered together when some of them are in concurrence
- A perfect market perspective has been considered

Thank You for Your Attention

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