entsog
european network
of transmission system operators
for gas

SJWS 5
10 March 2016

TYNDP 2017

Supply potentials

System Development

Image Courtesy of Thyssengas

Introduction

1. **Conventional & Unconventional production (Shale Gas & Biogas)**
   - Use of TSO figures for system assessment

2. ***Import sources:***
   - *Algeria, Azerbaijan, Libya, LNG, Norway and Russia*
   - *Aligned minimum supply assumptions for supply adequacy and assessment (modelling)*
   - *Different assessment approach for 2017 („tomorrow as of today“) and the other modelled years 2020, 2025, 2030, 2035 (supply potentials)*

3. **Potential import sources not directly used in the assessment:**
   - Egypt, Iran, Israel and Turkmenistan

Indigenous production

- **Conventional production**
  - **TSO data** for existing production
  - Potential inclusion of new (Non-FID) production (Black Sea)
  - Other potential new sources (Cyprus)

  ⇒ Quantification during data collection periods

- **Unconventional production**
  - Differentiation between uncertain potential scenarios and the assessment
  - Help transparency by showing analysis
  - Use of **TSO data** for TYNDP assessment

- **Biomethane**
  - Keep detailed analysis of biogas and biomethane potentials for information and transparency purpose
  - Use of **TSO data** for TYNDP assessment (aligned with the green ambition in each scenario)

2017: supply assumptions

Indigenous Production

- Use of TSO figures

Imports

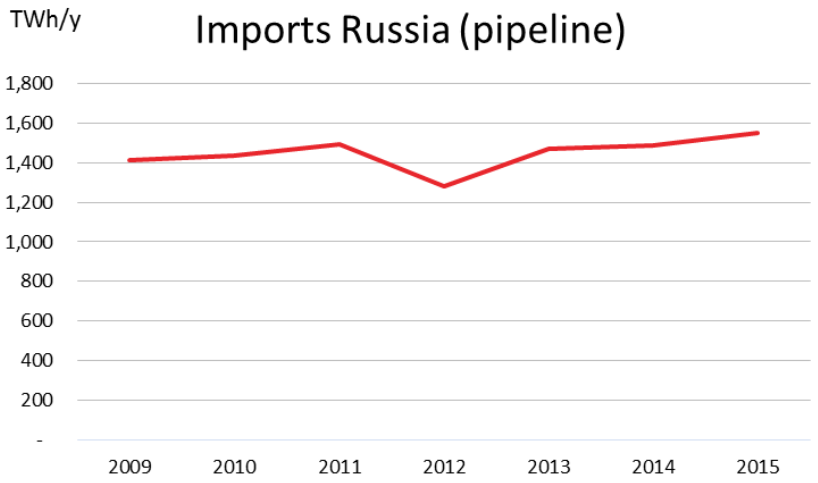
- Reasonable range for Algeria, Libya, LNG, Norway and Russia reflecting current market situation
- **Minimum:** Use of the minimum yearly supply observed in the calendar years 2009-2015 for each source. For Libya 2011 is disregarded.
- **Maximum**: Use of the maximum of Summer Supply Outlook 2016 (with a ratio of 183 of 365) and the maximum of Winter Supply Outlook 2015/16 (with a ratio of 183 of 365) for each source.

The modelling assumptions for 2017 differ from the other modelled years.

Russia: Import routes and history

Three main pipelines:

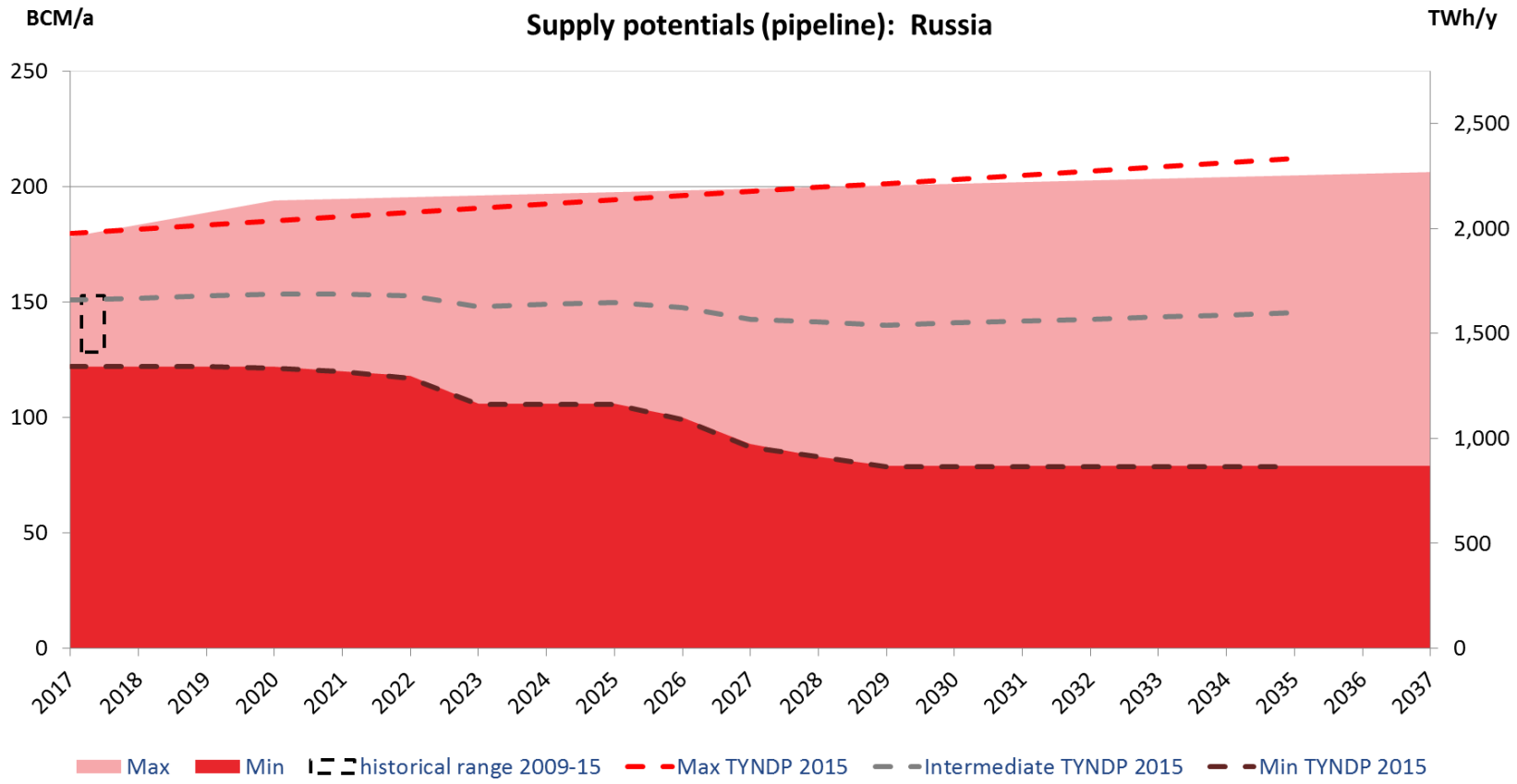
- **Nord Stream:** twin offshore pipeline, 1,220 km between Vyborg (Russia) and Greifswald (Germany), **55 bcma**
- **YAMAL-Europe:** 2,000 km to Poland and Germany via Belarus, **33 bcma**
- **Brotherhood** (Urengoy-Ushgorod pipeline): Transit through Ukraine to Central, Western, and Southern European countries and Turkey, **100 bcma**



According to Gazprom Export website

Main gas supplier of the EU with the second largest proven gas reserves in the world.

Russia: Supply potentials TYNDP 2017

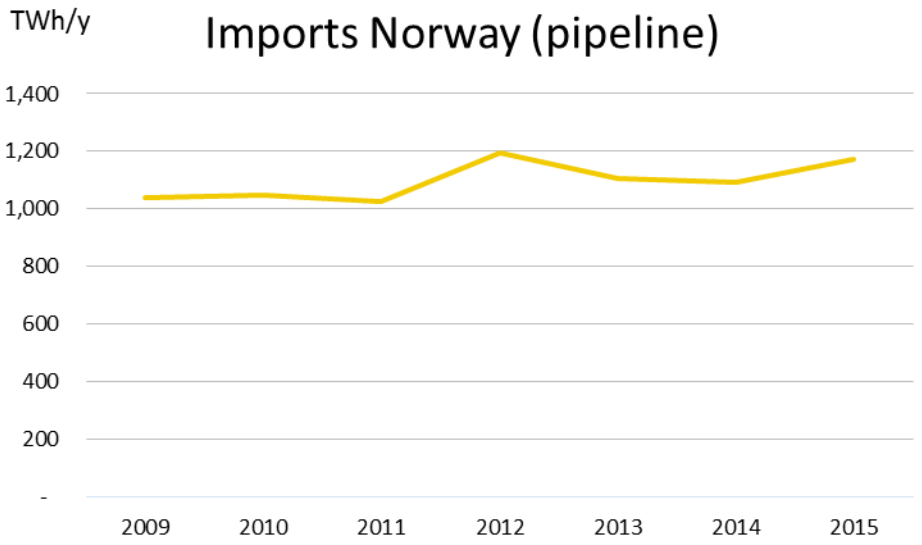


Continuation of approach from TYNDP 2015. Minimum will be used for supply adequacy and assessment of the system.

Norway: Import routes and history

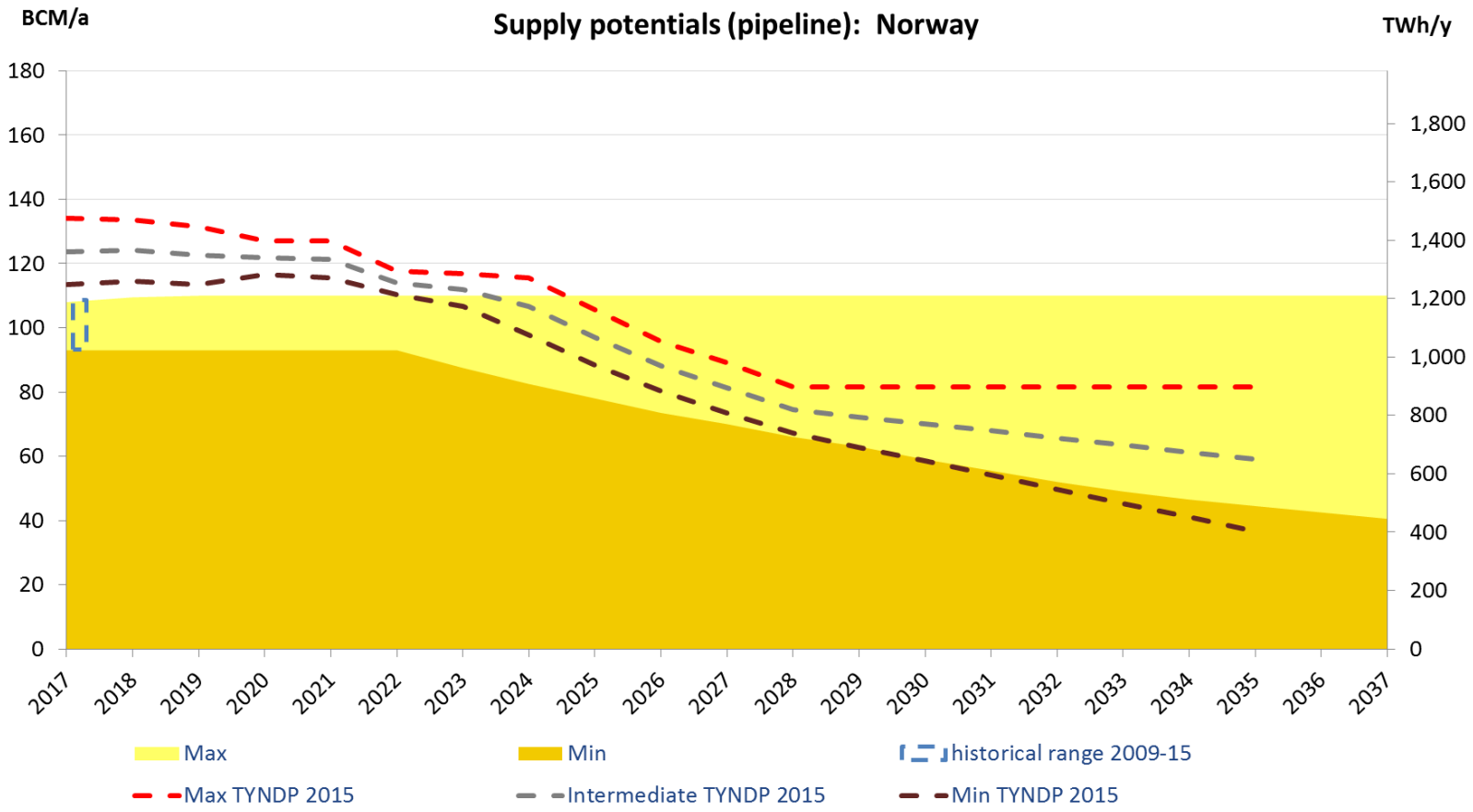
EXPORT CAPACITY OF THE GASSCO OFFSHORE SYSTEM		
Pipeline	**Country**	**Capacity (Million sm³ / d)**
Europipe	Germany	46
Europipe II	Germany	71
Franpipe	France	55
Norpipe	Germany, the Netherlands	32
Tampen Link	UK	10-27
Vesterled	UK	39
Zeepipe	Belgium	42
Langeled	UK	72-75
Gjøa Gas Pipeline	UK	17

According to Gassco website



Second largest gas supplier of the EU, supplying Europe for over 40 years.

Norway: Supply potentials

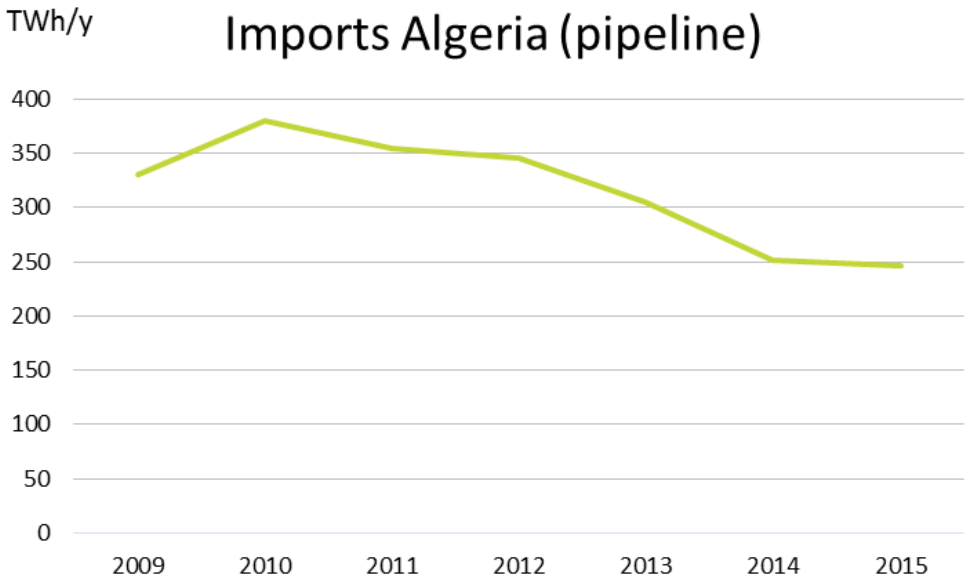


Based on Gassco figures from SJWS #3 and historical minimum.

Algeria: Import routes and history

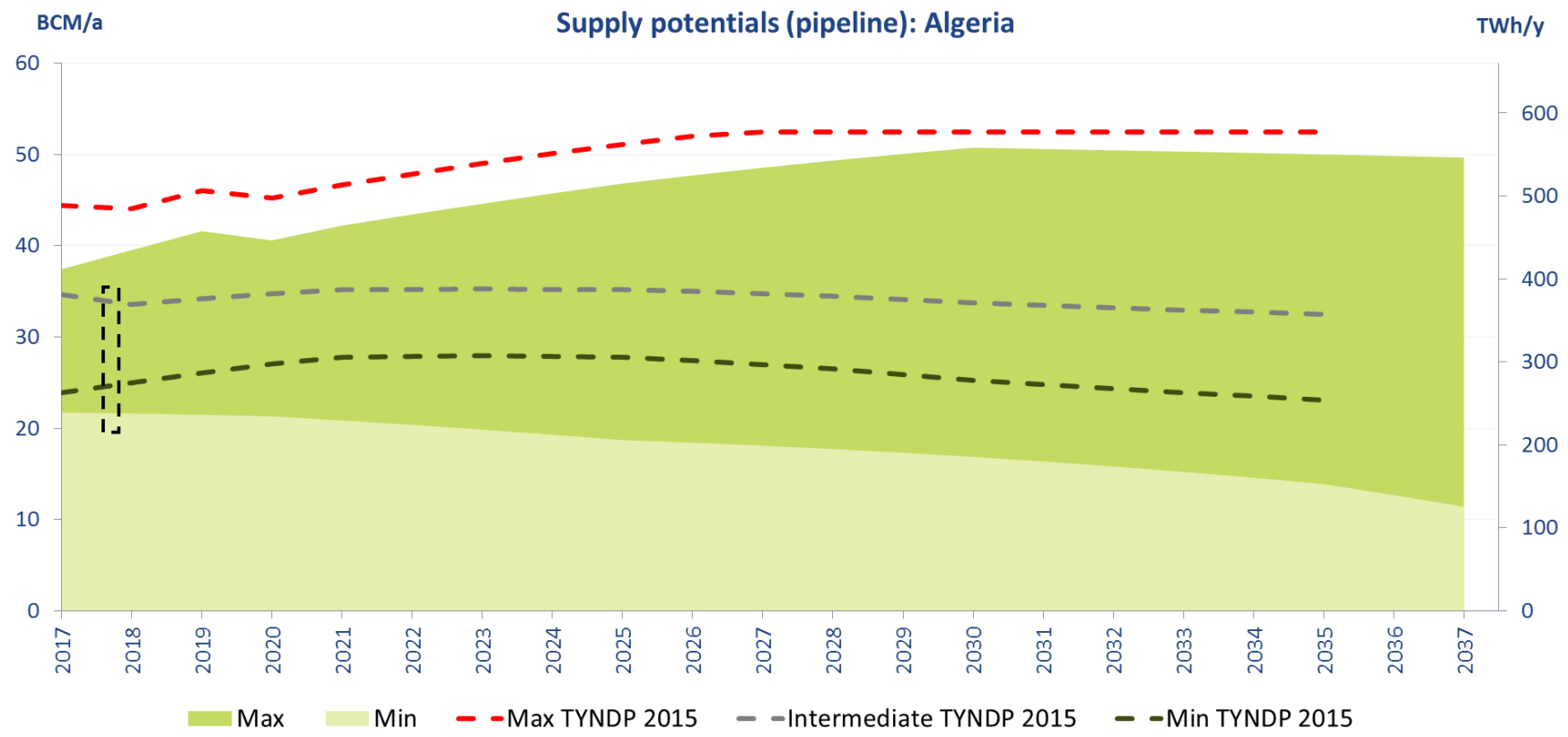
Pipelines:

- **Pipeline Enrico Mattei (GEM):** 1,650 km from Algeria to Italy via Tunisia, **33 Bcma**
- **Maghreb Europe Gasoduc (MEG) pipeline:** 520 km to Spain via Morocco, **12 Bcma**
- **MEDGAZ pipeline:** 200 km from Algeria to Spain, **8 Bcma**



Third largest gas supplier of the EU ranking in the top ten countries with the largest gas reserves in the world.

Algeria: Supply potentials TYNDP 2017



Differentiated approach based on production and demand estimations.

Algeria supply potentials

TYNDP 2017 new assumptions

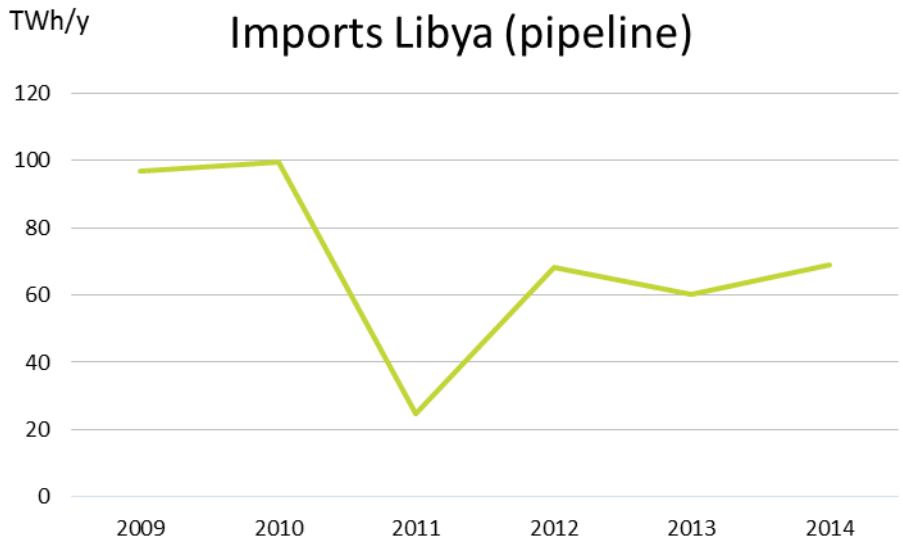
Methodology: *Production – Demand – African Exports – x % LNG Share*

	Production	Domestic Demand	African Exports	LNG Share
Max	**High** MEDPRO 2012 calibrated to 2014 current levels (BP SR)	**Low** MEDPRO 2012	**Low** BP SR 2010-2014 average x African demand development IEA - WEO 2015 (3,3%)	**Low** BP SR 2010-2014 Historical Average Share (35%)
Min	**Low** IEA - WEO 2015	**High** BP SR 2014 x African demand development IEA - WEO 2015 (3,3%)	**High** BP SR 2010-2014 max level x African demand development IEA - WEO 2015 (3,3%)	**High** BP SR 2010-2014 Historical Maximum Share (42%)

Libya: Import route and history

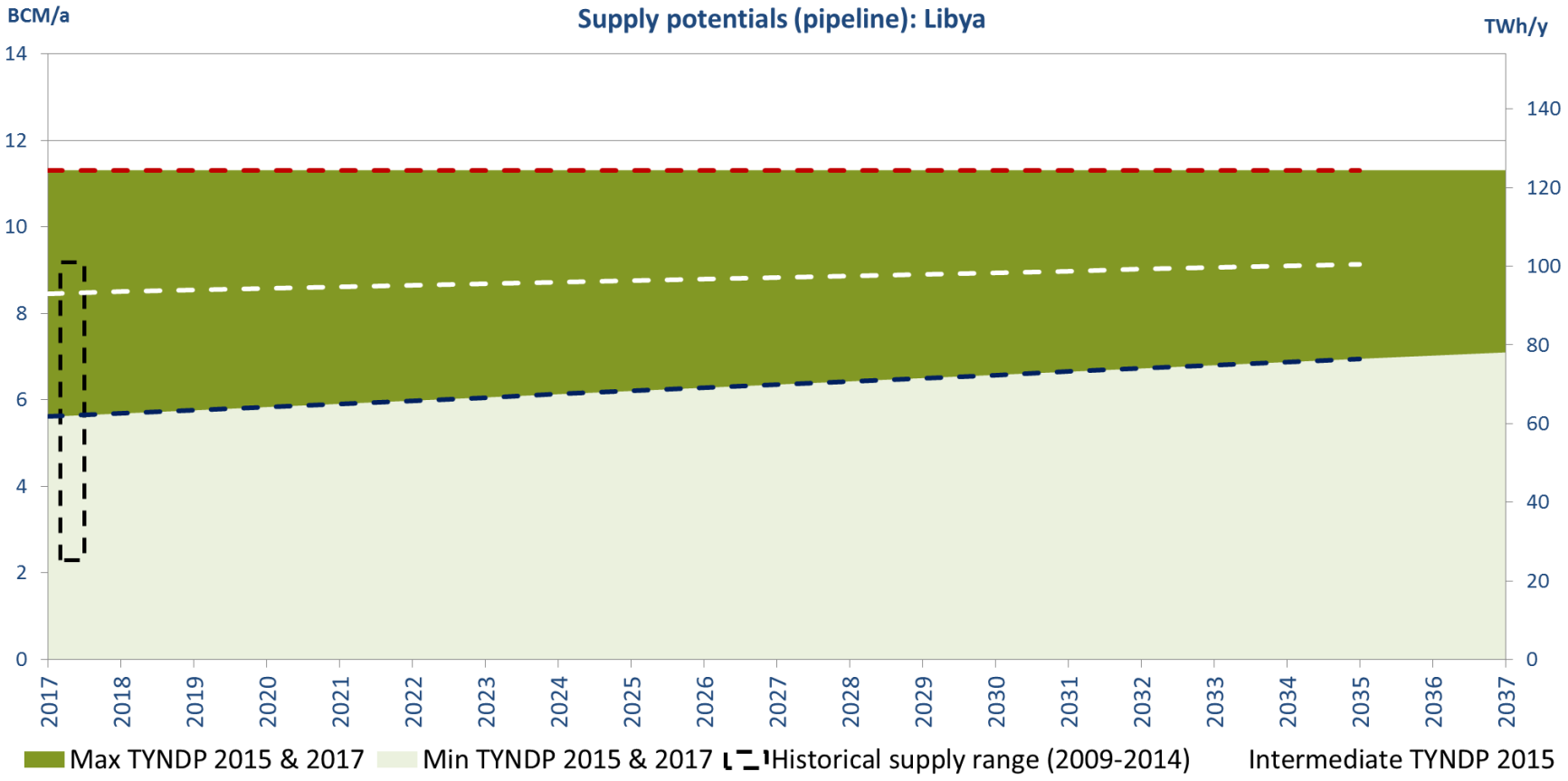
Pipeline:

- **Green Stream**
  Pipeline: 520 km connecting Libya to Italy via Sicily, **17 Bcma**



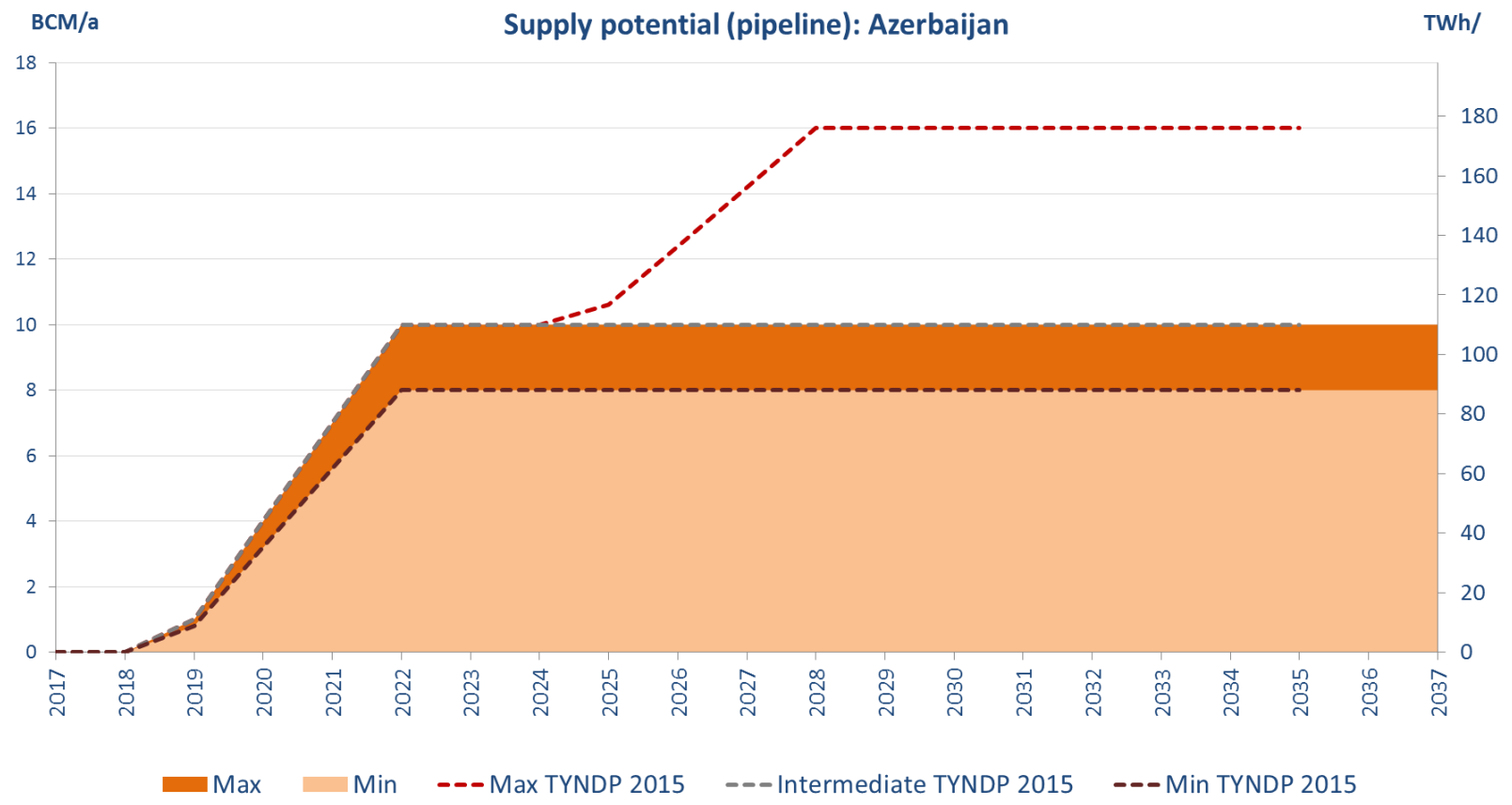
Currently the smallest pipeline supplier of the EU.

Libya: Supply potentials TYNDP 2017



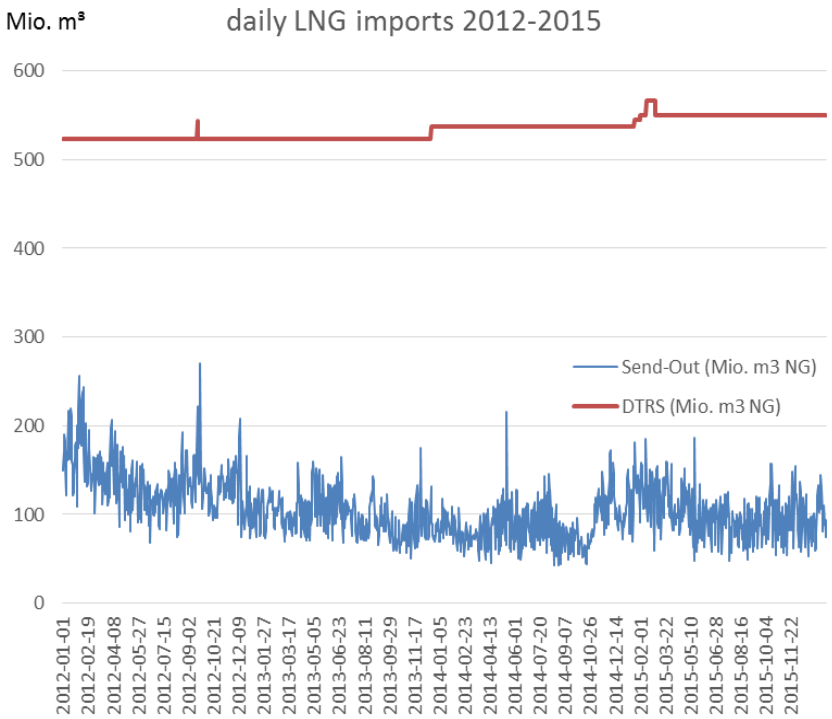
Continuity from approach from TYNDP 2015.

Azerbaijan supply scenarios

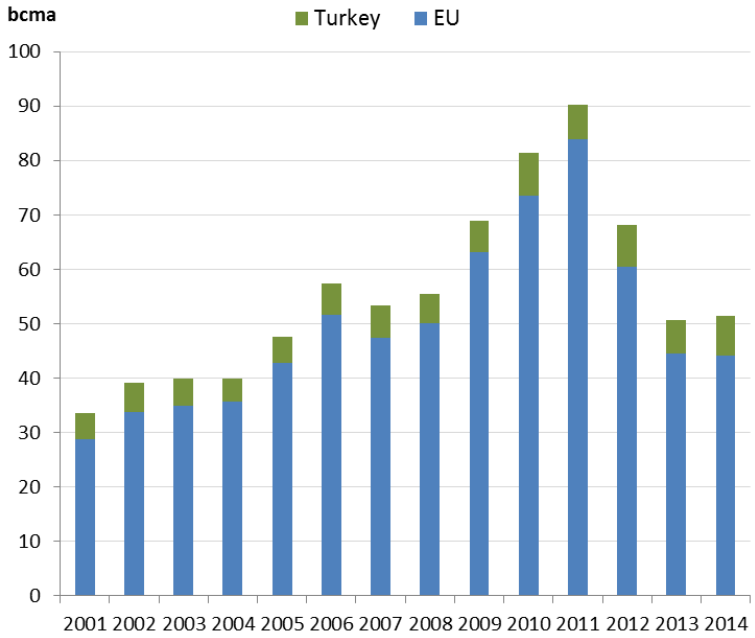


Azerbaijan is an upcoming pipeline supplier of the EU.

LNG import history



Numbers from ALSI platform



Numbers based on BP Statistical Review

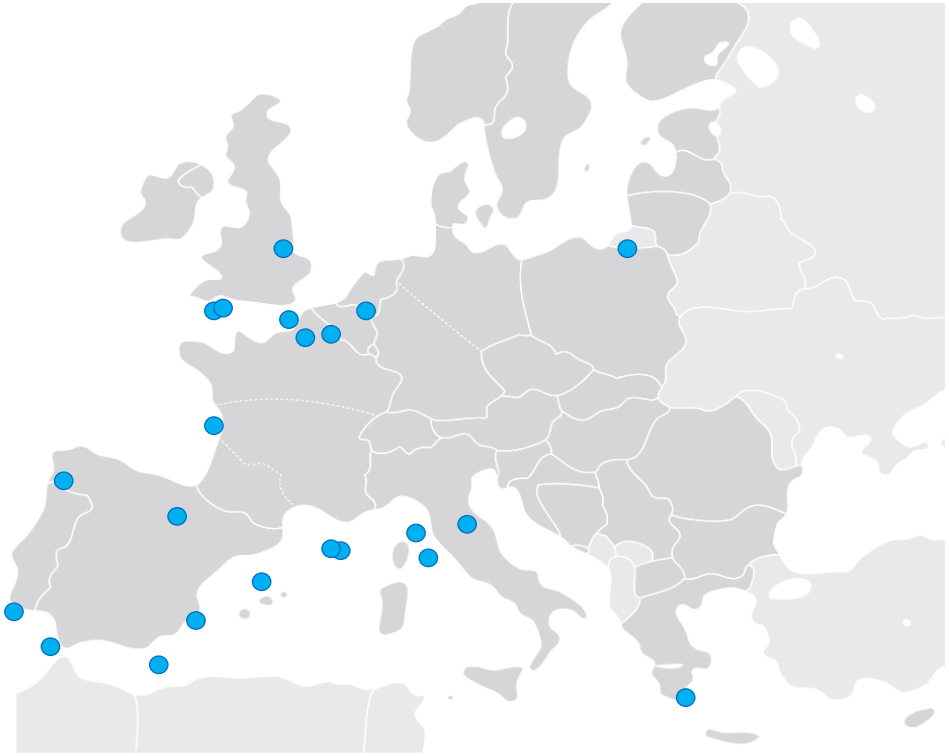
BP SR shows a sustained fall from 2012, stabilized in 2014 to around 44 bcma

LNG terminals

- **22 existing terminals**
  (Barcelona, Bilbao, Cartagena, Cavarzere (Porto Levante / Adriatic LNG), Dunkerque, Fos (Tonkin/Cavaou), Gate Terminal, Huelva, Isle of Grain, Klaipeda (LNG), Milford Haven (South Hook), Milford Haven (Dragon LNG), Montoir de Bretagne, Mugardos, Musel, OLT LNG / Livorno, Panigaglia, Revythoussa, Sagunto, Sines, Teesside, Zeebrugge LNG)
- 7.8 Mio m³ LNG Declared Total Maximum Inventory*
- 550 Mio m³/d natural gas Declared Total Reference Sendout*

*: From GLE's ALSI platform

Operational LNG import points



LNG supply potentials TYNDP 2017

ENTSOG proposes a simplified methodology for the LNG Max scenario after SJWS 3 feedback

- Based on maximum historical peak imports to EU (82 bcm in 2011)
- Using WEO 2015 NPS natural gas net world trading matrix
- Assumption on LNG exporting regions
- Additional LNG net exports share reaching EU of 30% based on slightly inflated historical maximum share

Net exporting regions in 2040	Net exports (bcm)		
	2013	2025	2040
Russia	205	228	251
Caspian	76	124	177
Middle East	127	87	159
Australia	26	98	116
North America	-28	82	95
Sub-Saharan Africa	29	63	83
North Africa	55	41	61
Latin America	9	25	32

***: From IEA WEO 2015 New Policies Scenario (page 216)**

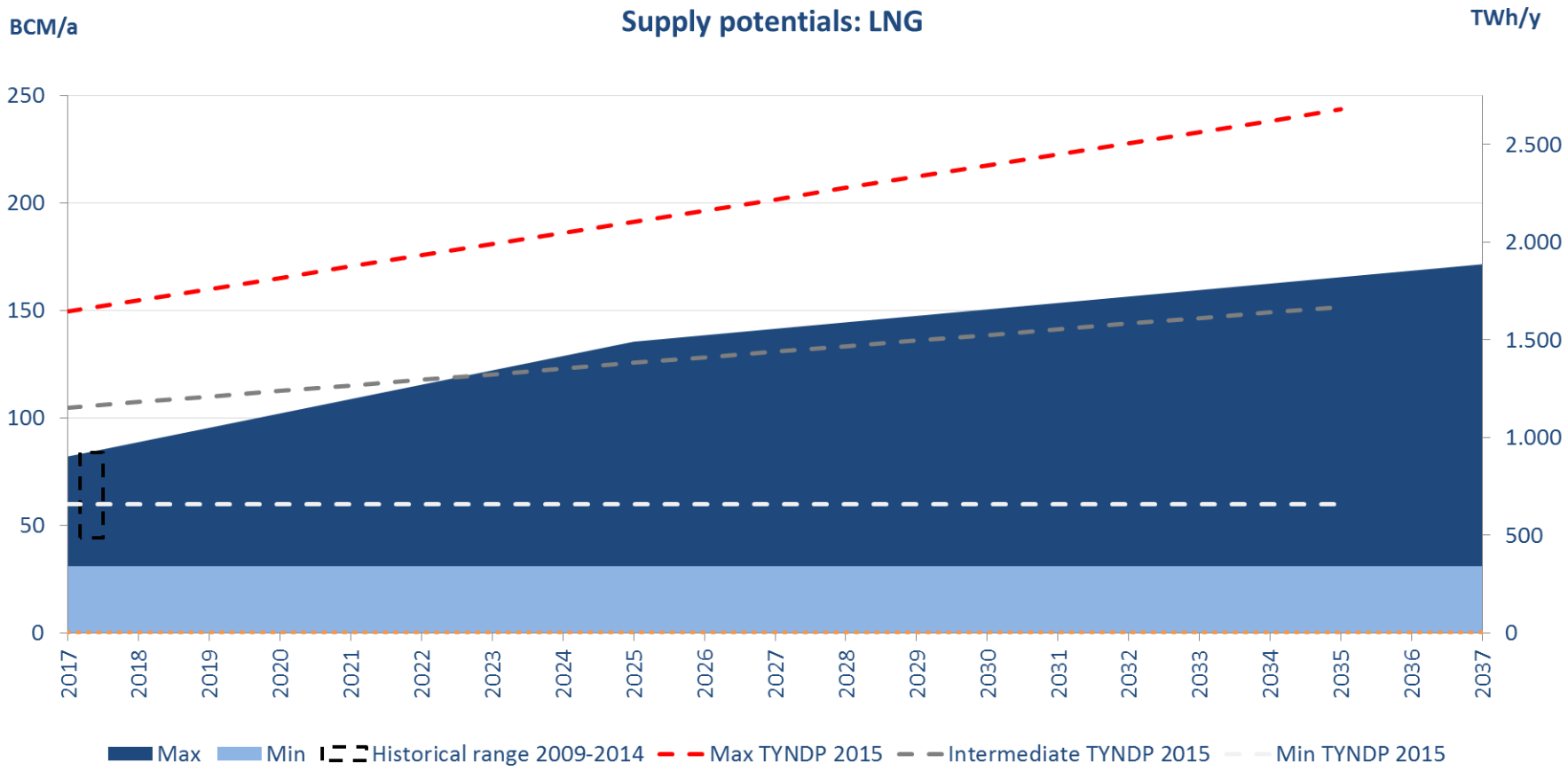
Additional LNG net exports vs 2013

2025	2040
-40	32
72	90
110	123
34	54
-14	6
16	23
178	**328**
53	**98**

Max 82 bcm

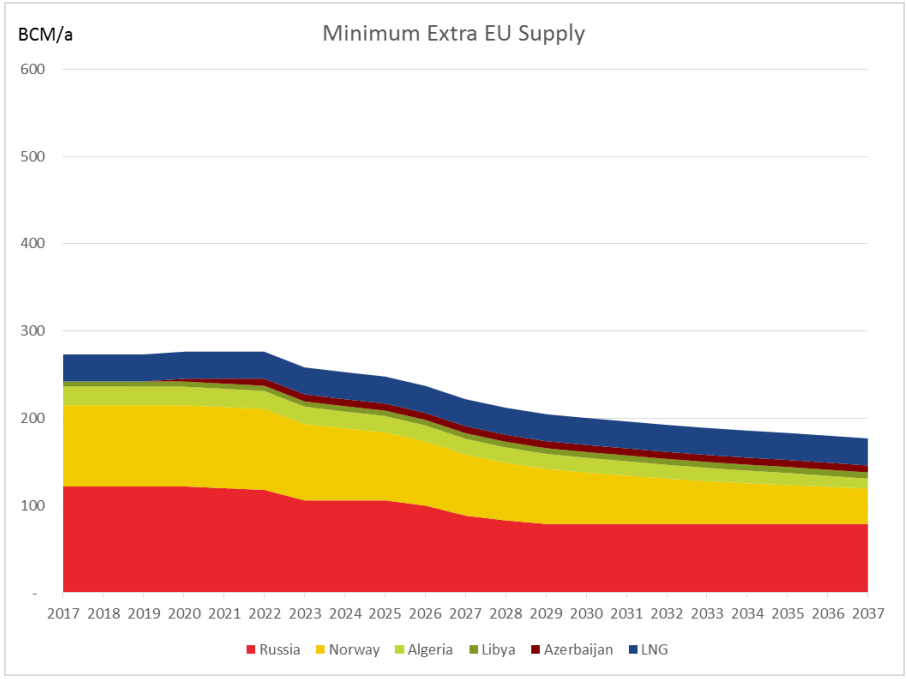
+ 30%

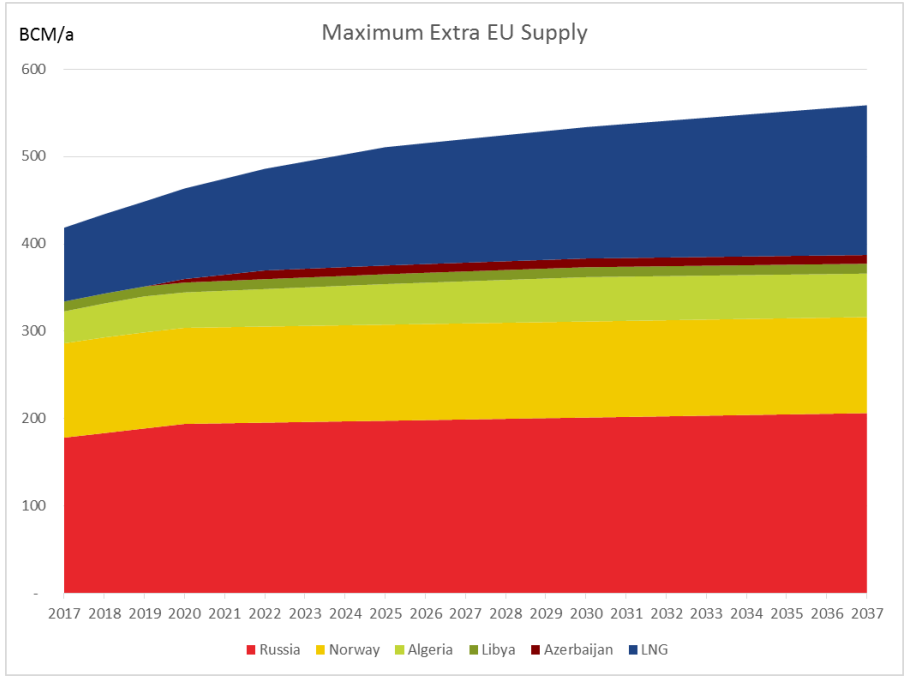
LNG supply potentials TYNDP 2017



Differentiated approach based on new source WEO 2015 and new assumptions

Import Range





Minimum

Maximum

The import range defines the flexibilities for the gas imports. Combining it with the demand and production figures will lead to the supply and demand adequacy.

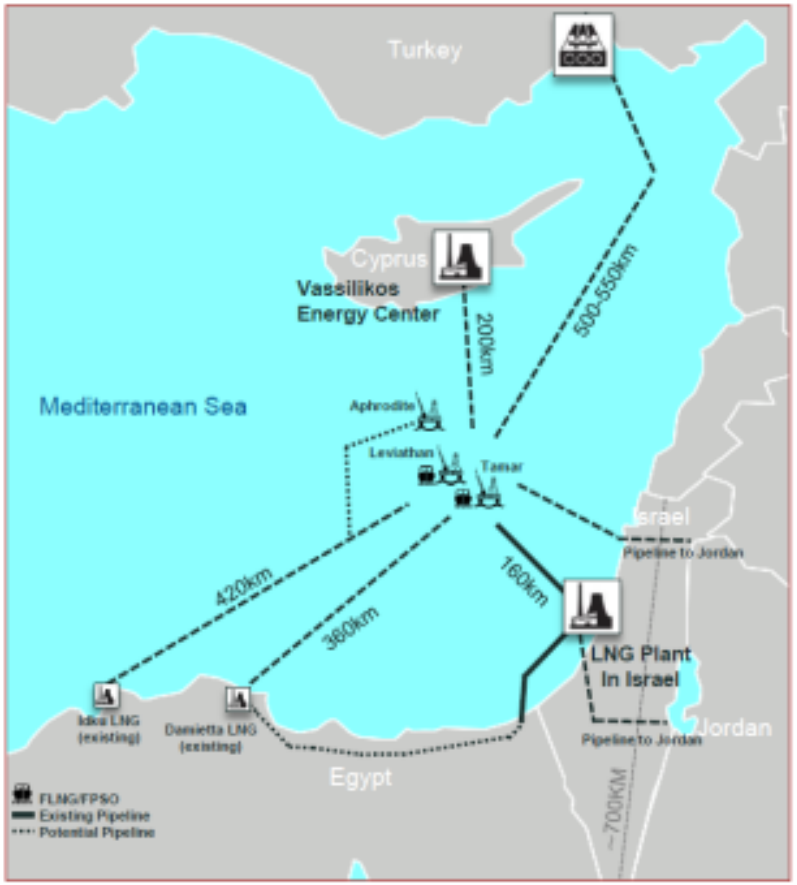
Thank You for Your Attention

ENTSOG -- European Network of Transmission System Operators for Gas
Avenue de Cortenbergh 100, B-1000 Brussels

EML:
WWW: www.entsog.eu

Israeli exports

Export Strategy – Regional Sales & FLNG



For illustration purposes only

Regional Sales through pipeline

Jordan, Egypt, Cyprus and Turkey

FLNG

Leviathan – being evaluated

LNG supply potentials

Balanced view based on WEO 2015, New Policies

	2000	2005	2010	2014	2020	2025	2030	2035	2040
Pipe imports	147	186	187	157	201	196	207	220	237
LNG imports	32	48	80	46	62	120	125	130	123
Share of LNG	18%	21%	30%	23%	24%	38%	38%	37%	34%

Reasonable input for min and max approach can be considered