*Empowering Mediterranean regulators for a common energy future.*

# Working Group on Gas (GAS WG)

# GAS INFRASTRUCTURE MAP OF THE MEDITERRANEAN REGION

MED17-24GA -5.4.2
FINAL REPORT

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# Table of content

# Acknowledgements

This report is the result of a work carried out by the MEDREG Gas Working Group (GAS WG) in the period November 2015-May 2017.

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# 1. Introduction

The natural gas sector in the Mediterranean region has been fundamentally transformed by some field discovery (i.e. Zohr) and technological development in the drilling process that have enabled the economic extraction of natural gas from shale formations. This breakthrough has in turn unlocked new geographically diverse natural gas resources that are unprecedented in size.

The availability of abundant, low-cost natural gas has increased demand for natural gas from multiple end-use sectors. The electric power sector is currently the largest consumer of natural gas in the Mediterranean south shore and at the same time Algeria is one of the main gas exporters. After the recent developments, gas has regained some of its market share because of gradually rising natural gas prices, the combination of favourable economics and the lower conventional air pollution and greenhouse gas emissions associated with natural gas relative to other fossil fuels is likely to contribute to expansion of use of natural gas in the electric power sector in the future.

However, increased use of natural gas in the electric power sector also presents some potential challenges. Unlike other fossil fuels, natural gas cannot typically be stored on-site and must be delivered as it is consumed since natural gas can only be stored in specific geological formations in gaseous form. Because adequate natural gas infrastructure is a key component of electric system reliability (generation diversification) in many regions, it is important to understand the implications of greater natural gas demand for the infrastructure required to deliver natural gas to end users, including electric generators.

Natural gas consumption studies show a large diversity among the Mediterranean countries. While almost half of the gas consumption is allocated to the residential/commercial sectors, the other half is nearly equally shared by power generation and industry. A high level of residential consumption in the winter is not expected, considering the warm climate of the region. On the production side perspective, it is important to notice that some countries do not even have access to gas, other countries do not have any gas production and others are gas exporters.

The purpose of this report is to understand the actual infrastructure present in the Mediterranean region and potential infrastructure developments in the natural gas transmission systems under several future natural gas demand scenarios. This assessment will include three main deliverables:

- The **first deliverable**, the work’s methodology description, which is presented in this report.
- The **second deliverable**, to be finished during the second semester of 2017, correspond to a questionnaire[1] by which it will be possible to obtain a brief description about the natural gas infrastructure in each MEDREG member.

[1] Based on MEDREG Investment report questionnaire for gas

- A **third deliverable**, to be finalized by December 2017, corresponds to the Final Assessment Report with the compilation of the different MEDREG member's inputs concerning their infrastructure map.

## 2. Work's methodology description

The present report intends to provide a clear picture of the gas infrastructure including interconnection points, transmission pipelines crossing the country, transmission and storage capacities, usage of the above-mentioned capacities and future investment plans across MEDREG members.

Given the diversity of situations in the different countries, this assessment work intends to evaluate the data that members have provided through a questionnaire. At the same time members will be asked if they can share their gas infrastructure map to be included in the final report. The assessment work also includes the collection and the analysis of data related to their new investment plan and can serve as an update to MEDREG Investment report for the Gas chapter.

At present, there are several realities among the MEDREG members concerning the gas infrastructure:

- For some countries, their transmission pipelines are overloaded and require a compressor station upgrade or construction of a new pipeline.
- Other situations exist among MEDREG members where the pipeline capacity is not being used to its full extent.

The information from the different MEDREG members was obtained by a questionnaire. The questions were based on the most recent situation of each country (31stDecember 2015).

When data is available in the Ten-Year-Network-Development of ENTSOG, MEDREG members can provide their own data or indicate whether the ENTSOG data can be used in for the MEDREG gas infrastructure map.

Table 1: Contributions received from the MEDREG countries

| COUNTRIES | | Answer received | Observation |
|---|---|---|---|
| 1. | Albania | √ | No gas market established |
| 2. | Algeria | | |
| 3. | Bosnia – Herzegovina | | |
| 4. | Croatia | √ | |
| 5. | Cyprus | √ | |
| 6. | Egypt | √ | |
| 7. | France | √ | |
| 8. | Greece | √ | |
| 9. | Israel | √ | |
| 10. | Italy | √ | |
| 11. | Jordan | √ | |
| 12. | Libya | | n/a |
| 13. | Malta | √ | No gas consumption |
| 14. | Montenegro | √ | No gas consumption |
| 15. | Morocco | | No gas Regulatory Authority |
| 16. | Palestine | | No gas Regulatory Authority |
| 17. | Portugal | √ | |
| 18. | Slovenia | | |
| 19. | Spain | √ | |
| 20. | Tunisia | | No gas Regulatory Authority |
| 21. | Turkey | √ | |
| **Total** | | **14** | |

# 3. Analysis of the Results

Although the data for the years 2015 and 2016 are also collected from the countries that can provide them, the 2014 values are taken as a basis for the comparisons made in this study in order to provide better consistency since the verified data for the years 2015 and 2016 acquired from different MEDREG members vary considerably both in means of collection and reporting methodology, and in some cases is absent at all. This report will present both numeric and non-parametric data about selected points, while other consolidated data can be found in the appendices.

## 3.1 TPA regimes in a nutshell

The data acquired from the questionnaires shed light to several characteristics of the natural gas infrastructure of the contributing countries. Besides the physical characteristics of these infrastructures such as capacities, pipeline lengths, directions of flow and connected points, an important point of note that shall be examined from the perspective of a regulator is the third party access (TPA) regimes of these facilities.

When analysing the TPA regimes of the existing and the planned infrastructure projects (Appendices I, II and IV), it can be seen that most countries regulate third party access to LNG terminals and storage facilities as well as the entry and the exit points, with the exception of Egypt, Jordan and Italy. While Egypt and Jordan prefer to not to regulate the access to any of these facilities, Italy grants exemptions or apply negotiated TPA regimes to some LNG terminals, and adopts negotiated TPA to Algeria and Libya entry points. By looking at the examples, it can be concluded that decision to adopt nTPA or rTPA regimes is a matter of policy rather than how mature, big or well-established the gas market is.

## 3.2 A growing trend: LNG and FSRUs

Another point worth mentioning about the existing and planned infrastructure projects is the interest in LNG projects, particularly floating storage and regasification units. Besides the Floating Storage Regasification Units (FSRUs) that are recently facilitated in Egypt, Jordan and Malta, the projected investments in Egypt, Greece and Malta indicate the growing interest in this relatively new technology that has considerable advantages over traditional LNG facilities. The advantages of FSRUs over conventional LNG terminals, such as needing shorter time to start operation and less start-up cost, makes the investments for these facilities realisable more easily and quickly. Other advantages like the ability to be relocated according to demand and lesser environmental impact are just the icing on the cake for FSRUs.

Although they are nothing new on the natural gas scene and building them requires longer-term projects compared to FSRUs, the interest in traditional LNG terminals has not faded, thanks to the price dynamics in the international markets. While some of the subject countries, such as Greece, prefer to upgrade the existing LNG terminals for increasing the entry capacity in a cost-efficient manner, it is also worth noting that Italy and Spain have several projects for new LNG infrastructure. On the other hand, countries such as Turkey opt to invest in both utilising new FSRUs and increasing the capacities of the existing infrastructure, in order to increase the LNG input of the market.

## 3.3 Benefits and impacts of the investments

The part of the questionnaire about the benefits and impacts of the projects (Appendix 5) depicts a clear picture of the driving forces behind infrastructure investments. Benefits identified by MEDREG regulators lay in three areas; Security of Supply, Market development and Regional Market Integration. Regulators perceive that the route and source diversification is the most significant benefit derived from interconnection and LNG facility investments. These data may also been taken as a clue for why, how, where and when a new infrastructure investment may be made in order to gain most benefit from an infrastructure investment.

Although the biggest perceived benefit of the storage facilities is security of supply as expected, the flexibility these facilities provide to the market players should not be neglected. In this regard, the types of storage facilities also play an important role. Salt caverns, which allow the working gas to be withdrawn and replenished very quickly, are very good means for market flexibility. Although these facilities are relatively expensive to build, their ability to send out gas in a very short time, make them also valuable tools for emergency situations and peak shaving.

## 3.4 Implementation barriers

As noted while discussing the benefits and the impacts of infrastructure projects, besides the security of supply and market integration, an equally important role an infrastructure investment shall pay is increasing competition and flexibility of the market. Evaluating an investment according to the market dynamics can only be made through a cost-benefit analysis, in other words, by determining the return of the investment. Such a feasibility study brings forward the factors such as attractive tariffs, exemptions, open season practices and incentives.

In this respect, another important focus of the project is the barriers affecting the investment plans (Appendix 7), which aims to determine the shortcomings of the markets that shall be dealt with for betterment of the investment environment. The most important barrier voted as the highest priority by six countries, namely by Spain, Portugal, France, Jordan, Croatia and Turkey, and voted as the second priority by Greece, Malta and Israel is the insufficiency of the market demand.

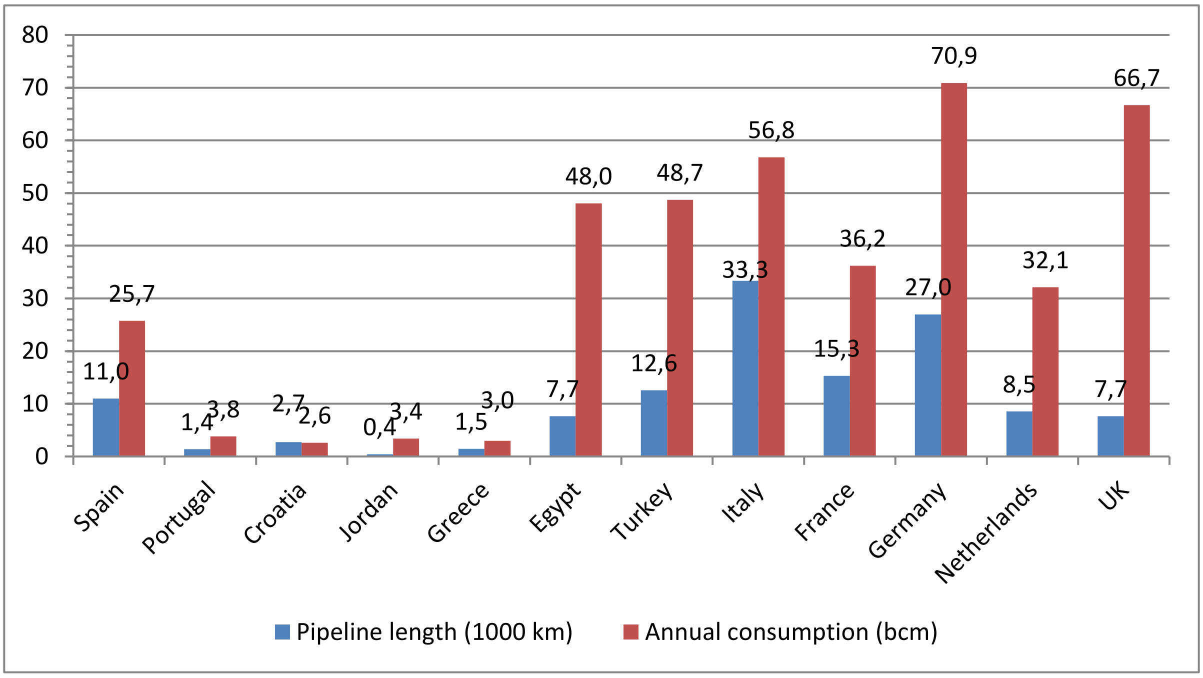
The second priority according to the rankings is again an indicator regarding the market dynamics, the financial feasibility of the projects and the expected revenues, which is ranked as number one by Italy, Greece and Cyprus; and number two as for France, Croatia and Turkey. Regulatory and legal obstacles are determined as higher priorities by countries that are newly starting or have recently started to regulate the gas markets, such as Jordan (*ex-aequo* with insufficiency of market demand), Israel and Egypt, which ranked the obstacle as the first priority; and Cyprus, which ranked it as the second. The lack of interest in interconnection projects is ranked as the second priority by only Portugal, while the lack of internal reforms is determined to be second most important barrier by Egypt following regulatory and legal barriers. Lack of coordination, technical barriers and political instability are regarded as the least important barriers affecting the investments, ranked among the top two priorities by none of the countries.

## 3.5 Key performance indicators

In order to compare the effectiveness and sufficiency of natural gas infrastructures, measurable and objective indicators are needed. In this study, these indicators are referred to as key performance indicators (KPI), a term highly popular in management, for lack of a better term. While evaluating the KPIs of the contributing countries (Appendix I), datasets for the year 2014 values are taken into account in order to provide better consistency. Three major European markets outside MEDREG, namely Germany, the Netherlands and the UK are included in the comparisons, as benchmarks for the examined indicators.

## 3.6 Infrastructure investments and natural gas demand

Since efficiency can be defined as the ratio of the outputs and inputs of a system, the efficiency of a natural gas infrastructure may most basically be measured as the gas supplied by the system, divided by an indicator of the size of the system, namely length of the transmission system.



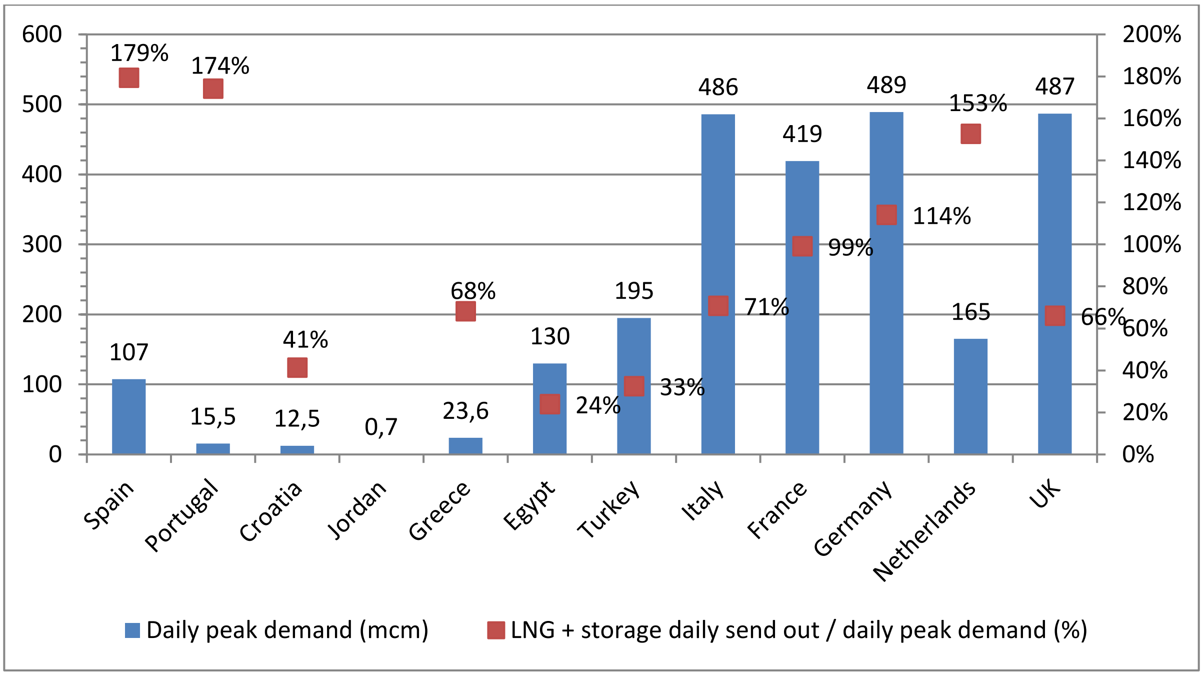

When we compare the pipeline lengths of the selected members with benchmark EU countries, we can see that annual consumptions per length of transmission pipeline differs greatly, which may be due to geographical and socio-economic reasons, as well as market maturity and the sectors mainly using natural gas. The leader among MEDREG countries with respect to unit consumption per network length is Jordan with 8 mcm/km, second only to UK among the selected EU countries. Egypt, having a significant amount of annual demand, follows Jordan with a ratio of 6,26 mcm/km.

It may be beneficial to note here that since a high ratio may be the sign of an efficient transmission system, a lower ratio may mean that the transmission system is widely spread in the country and/or natural gas penetration in households is lower. Another point of note is that smaller countries with higher population densities like Netherlands tend to have higher ratios in contrast to countries that are wider in an axis, such as Italy and Turkey, for which the locations and distances between the nodes of supply, demand and storage is an important factor.

| | Spain | Portugal | Croatia | Jordan | Greece | Egypt | Turkey | Italy | France | Germany | Netherlands | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pipeline length (km)** | 11.000 | 1.375 | 2.694 | 423 | 1.459 | 7.667 | 12.561 | 33.339 | 15.322 | 26.985 | 8.531 | 7.660 |
| **Annual Consumption (mcm)** | 25.730 | 3.800 | 2.627 | 3.400 | 2.990 | 48.019 | 48.717 | 56.800 | 36.200 | 70.900 | 32.100 | 66.700 |
| **Annual Consumption /Length of pipeline** | 2,34 | 2,76 | 0,98 | 8,04 | 2,05 | 6,26 | 3,88 | 1,70 | 2,34 | 2,63 | 3,76 | 8,71 |

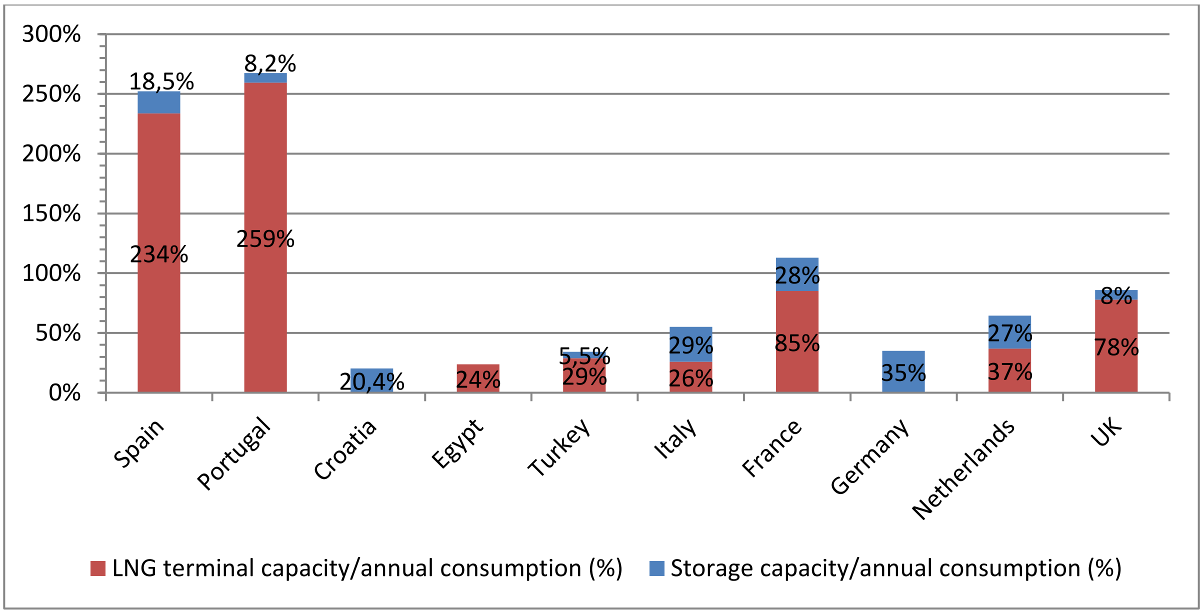
## 3.7 LNG and storage capacities versus demand

Another way of determining how sufficient a country's infrastructure with regards to security of supply is comparing its means of storing natural gas with the demand in the country. Storage and LNG facilities, both being effective instruments for dealing with seasonal demand swings, supply disruptions and peak demand, can be evaluated particularly in two ways: by comparing the daily send-out capacities with daily peak demand and by comparing the annual capacities with annual consumption.




When looking at the graph of daily peak demands of the MEDREG countries, we can note that two countries with historically high daily peak demands, Italy with 486 mcm/day and France with 419 mcm/day, have the highest send-out/peak demand ratios after the leader, Spain, with 71% and 99% respectively. Spain, also the leader among EU countries thanks to its enormous LNG send-out capacities has a 179% send-out/peak demand ratio, comfortably securing its peak demand of 107 mcm/day. Other relatively large Mediterranean markets, Turkey with 195 mcm/day and Egypt with 130 mcm/day, have the lowest send-out/peak demand ratios with 33% and 24% respectively, while Portugal has a 174% ratio, ranking among the most secure EU countries in this regard.

Another way to look at storage capacity is comparing the annual send-outs with annual consumptions of the subject countries. For this comparison, which is a theoretical study of security of supply, some assumptions are made. Assuming that the underground storage facilities are filled before the maximum capacity before the winter season and the gas in the reserves are withdrawn and dispatched once in the peak season, as it is the case for most countries when the demand is high and the gas is scarce, maximum storage capacities are taken as a basis. For LNG facilities, it is assumed that maximum capacities are used throughout the year, which is a situation likely to happen in a long disruption from a certain source, such as an N-1 situation. An alternative approach could be taking the tank capacities of the LNG terminals into consideration, which would be less than fair to these facilities, since their storage capacities are negligible when compared to underground storage and assuming that they will be utilised once throughout the year is by no means realistic.




When comparing the annual send-out and withdrawal capacities of the countries with annual demands, it can be seen that countries with LNG infrastructure, Portugal and Spain, can meet more than twice their annual demands assuming maximum LNG send-out throughout the year. We see that France not only can meet its annual demand with underground and LNG send out capacities, but also has a 28% underground storage/annual demand ratio, second among the MEDREG countries to only Italy, which has a 29% storage/annual demand.

Although having no LNG facilities, Croatia has an adequate underground storage capacity, meeting 20% of its annual demand. Spain, besides its LNG facilities that can double its annual demand, can meet 18,5% of the annual demand with underground storage withdrawal. Portugal, which has the highest LNG send-out/consumption ratio and Turkey, which is carrying out projects that will increase its storage and LNG capacities considerably in the upcoming years, have less than 10% storage/consumption ratios. This comparison could be made by comparing the underground storage capacities and LNG send-out capacities during the winter with the winter demand for another point of view, but further data is needed to be collected for such a study, since seasonal consumption statistics are not present.

# 4. Final Remarks

The study on Gas Infrastructure Map of the Mediterranean Region is an important and hopefully beneficial one, which has the potential to provide an insight to regulators and other decision makers. This report not only provides valuable data that can be used to examine the characteristics of the natural gas infrastructures of the contributing countries, but also makes it possible to better understand what the expectations, aims and motives of the Mediterranean countries are when making an infrastructure investment. These aims and motives reported by the countries, such as increasing security of supply, providing market security and diversifying natural gas sources or routes, may pave the way for better communication and cooperation between the neighbouring countries.

This research, which evaluates the data collected from the contributing countries for the period 2014-2016 and utilises it according to availability, can be regarded as a preliminary work, and may be repeated when more accurate and up-to-date data is present, since the recent years witnessed considerable developments with regards to infrastructure investments, particularly LNG terminals and FRSUs, as well as the fluctuations in the demand structures. A point to note for the further studies is that the data required and the way inputs shall be sent may be defined more clearly in order to have the answers and the data sent more standardised among the contributing countries.

# 5. APPENDIX

## 1- Existing interconnection infrastructure

| Country | Name of the facility | Operating Year | Connected country | Sort of capacity (Entry/exit/bilateral) | Capacity (bcm/year) | Access Conditions: rTPA or nTPA | Transmission pipeline (km) |
|---|---|---|---|---|---|---|---|
| **Albania** | *National Grid (TSO+DSO)* | 1967;1980;1985 | Interial | Bilateral | 1 | | 400 km |
| **Croatia** | Plinacro Ltd | | | | | | 2693 km |
| **Egypt** | Al Arish-Taba-Aqaba (Arab Gas Pipeline)<br>Arab Gas Pipeline<br>Arab Gas Pipeline<br>Arab Gas Pipeline<br>EMG Pipeline | July 2003<br>January 2006<br>2007<br>2008<br>2008 | From EL Arish in EGYPT to Aqaba Jordan<br>From Aqaba in Jordan to EL-Rehab<br>From EL-Rehab in Jordan to the Jordan-Syria border<br>From Jordan-Siria border to AL Rayan in Syria<br>Arish in Egypt to Ashkelon in Israel | | 10 bcm<br>10 bcm<br>10 bcm<br>10 bcm<br>7 bcm | nTPA<br>nTPA<br>nTPA<br>nTPA<br>nTPA | 264 km<br>393 km<br>30 km<br>317 km<br>100 km |
| **Greece** | Transbalkan (Kulata-Sidirokastro Interconnection Point) | 1996 | Bulgaria | Entry / Bilateral | 3.5 bcm /<br>Reverse 0.36 bcm | rTPA | 0 |
| | Kipi Interconnection Point | 2007 | Turkey | Entry | 1.4 bcm | 1.4 bcm | 0 |
| **France** | Oltingue | 2018 | Switzerland | Entry (Exit capacity was already existing) | 3,7 | rTPA | 0 |
| **Italy** | Transgreen | 1978 | Italy, Algeria | Entry Algeria-Exit Italy | 30 bcm | nTPA | 2200 km |
| | Green Stream | 2004 | Italy, -<br>Libya | Entry Libya-Exit Italy | 8 bcm | nTPA | 520 km |
| | TAG | | | | 107 $m^3$/d | rTPA | |
| | TRANSITGAS | | | | 59 $m^3$/d | rTPA | |
| | TTPC | | | | 95.9 $m^3$/d | nTPA | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Panigaglia LNG | | | | | nTPA | |
| | Adriatica LNG | 2010 | | | | Exemption 2nd Pacage | |
| | Livorno LNG | 2015 | | | | rTPA | |
| | Storage Stogit, Edison scc. | 2010 | | | | rTPA | |
| | Sorage Cornegliano | 2014 | | | | rTPA | |
| **Jordan** | Arab Gas pipeline Project / second phase | 2006 | Egypt-Jordan | Bilateral | 10 | nTPA | 423 |
| | Arab Gas pipeline Project / second phase | 2008 | Egypt-Syria | Bilateral | 10 | nTPA | 423 |
| | Alshaikh Subah LNG Terminal at Aqaba LNG | 2015 | | | | nTPA | 423 |
| **Portugal** | Campo Maior | 1997 | Spain | Entry | 0,47 | rTPA | 220 |
| | Campo Maior | 1997 | Spain | Exit | 0,1225 | rTPA | 220 |
| | Valença do Minho | 1998 | Spain | Entry | 0,105 | rTPA | 74 |
| | Valença do Minho | 1998 | Spain | Exit | 0,0875 | rTPA | 74 |
| **Spain** | Larrau | 1993 | Spain-France | Bilateral | 165 GWh/day | rTPA | |
| | Larrau | 1993 | France-Spain | Bilateral | 165 GWh/day | rTPA | |
| | Irún | 2006 | Spain-France | Bilateral | 5 (winter) /9 (summer) GWh/day | rTPA | |
| | Irún | 2006 | France-Spain | Bilateral | 0 (winter) / 10 (summer) GWh/day | rTPA | |
| | Tarifa | 1996 | Morocco-Spain | Entry | 444 GWh/day | rTPA | |
| | Almería | 2011 | Algeria-Spain | Entry | 266 GWh/day | rTPA | |
| | Badajoz | 1996 | Spain-Portugal | Bilateral | 134 GWh/day | rTPA | |
| | Badajoz | 1996 | Portugal-Spain | Bilateral | 35 (winter) /70 (summer) GWh/day | rTPA | |
| | Tuy | 1998 | Spain-Portugal | Bilateral | 30 (winter) /40 (summer) GWh/day | rTPA | |
| | Tuy | 1998 | Portugal-Spain | Bilateral | 25 GWh/day | rTPA | |
| **Turkey** | Malkoclar (Western Line)<br><br>Gurbulak<br><br>Durusu (Blue Stream) | 1986<br><br>2001<br><br>2003<br><br>2006 | Russia<br><br>Iran<br><br>Russia<br><br>Azerbaijan | Entry<br><br>Entry<br><br>Entry<br><br>Entry | 14 bcm/year<br><br>9,6 bcm/year<br><br>16 bcm/year<br><br>6,6 bcm/year | rTPA<br><br>rTPA<br><br>rTPA<br><br>rTPA | 842 km<br><br>1491 km<br><br>1261 km<br><br>113 km |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Turkgozu<br><br>Kipi | 2007 | Greece | Exit | 0.7 bcm/year | rTPA | 296 km |

## 2- Existing natural gas storage/lng terminal projects

| Country | Name of the facility | Operating Year | Capacity | | | Access Conditions: rTPA or nTPA | Transmission pipeline (km) |
|---|---|---|---|---|---|---|---|
| | | | Send-out / Withdrawal (mm3/day) | Injection (mm3/day) | Tank (bcm) | | |
| **Albania** | N/A | | | | | | |
| **Croatia** | **Okoli / Podzemno skladište plina d.o.o.** | | | | | | |
| **Egypt** | **Hoegh Gallant FSRU ''FSRU-1''**<br><br>**BW Singapore FSRU ''FSRU-2''** | April 2015<br><br>November 2015 | Capacity 5 bcm/year Send-out/Withdrawal rate: 14.16 $mm^3$/day (NG)<br><br>Capacity 6 bcm/year<br>Send-out/Withdrawal rate: 17 $mm^3$/day (NG) | | 170,000 $m^3$ LNG = 0.12 bcm (NG)<br><br>170.000 $m^3$ LNG = 0.12 bcm (NG) | nTPA<br><br>nTPA | 6 km with 32 inc<br><br>300 meters of pipeline 24 inc. connecting with the above transmission pipeline |
| **Greece** | LNG terminal in Revithoussa | 2000 | 12.47 | rTPA | | LNG terminal in Revithoussa | |
| **Jordan** | Alshaikh Subah LNG Terminal at Aqaba FSRU | 2015 | 490 MMSCF/D- Storage 160000 $m^3$ | nTPA | 423 | Alshaikh Subah LNG Terminal at Aqaba FSRU | 2015 |
| **Italy** | Panigaglia LNG<br>Adriatica LNG<br>Livorno LNG<br>Storage Strogit, Edison, scc<br>Storage Cornegliano | 2000<br>2010<br>2015<br>2010<br>2014 | 13<br>26.4<br>15<br><br>16.6 | | 16 bcm | rTPA<br>Exemption as 2 Energy Pacage<br>rTPA<br>rTPA<br>rTPA | 200 |
| **Malta** | FSU and regasification plant<br>PCI code:LNG-N-211 | 2016 | Discharge flow rate nominal 75840 $Nm^3$/hr (gas) | | 125.000 $m^3$ | rTPA | n/a |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Connection of Malta to the European Gas Network-LNG Regasification infrastructure | 2031 | 5.5 mcm/day | | 180.000 $m^3$ | rTPA | 12 km from offshore FSRU to Malta; 155 km from Malta to Sicily |
| **Portugal** | Sines (LNG terminal) | 2003 | 27,0 (NG) | 0,24 (LNG) | 0,39 (LNG) | rTPA | NA |
| | Carriço (Storage) | 2005 | 7,2 | 2,0 | 322,6 | rTPA | NA |
| **Spain** | Barcelona (LNG) | 1969 | 46800 (send-out)/0.00076 (tank) | rTPA | | Barcelona(LNG) | 1969 |
| | Huelva (LNG) | 1988 | 32400(send-out)/0.0006195(tank) | rTPA | | Huelva (LNG) | 1988 |
| | Bilbao (LNG) | 2003 | 19200 (send-out)/0.00045 (tank) | rTPA | | Bilbao (LNG) | 2003 |
| | Cartagena (LNG) | 1989 | 32400(send-out)/0.000587 (tank) | rTPA | | Cartagena(LNG) | 1989 |
| | Mugardos (LNG) | 2007 | 9907.2 (send-out)/0.0003 (tank) | rTPA | | Mugardos LNG) | 2007 |
| | Segunto (LNG) | 2006 | 24000 (send-out)/0.0006 (tank) | rTPA | | Segunto (LNG) | 2006 |
| | Gaviota | 1996 | 5700/4500/0.980 | rTPA | | Gaviota | 1996 |
| | Serrablo | 1988 | 6800/3800/0.680 | rTPA | | Serrablo | 1988 |
| | Yela | 2012 | 15000/10000/1.05 | rTPA | | Yela | 2012 |
| | Marismas | 2012 | 400/400/0.062 | rTPA | | Marismas | 2012 |
| **Turkey** | BOTAS Silivri Underground Storage<br>BOTAS Marmara LNG Terminal<br>EGEGAZ Aliaga LNG Terminal | 2007<br>1994<br>1998 | 25 $mm^3$/day<br>22,5 $mm^3$/day<br>8.2 bcm/year<br>16,44 $mm^3$/day<br>6 bcm/year | 16 $mm^3$/day<br>151 $mm^3$/day<br>81 $mm^3$/day | 2.8 bcm<br>0.153 bcm<br>0.168 bcm | rTPA<br>rTPA<br>rTPA | |

## 3 - INVESTMENT PLANS

| Country | Time span of the investment plans | Period of investment plans |
|---|---|---|
| **Albania** | 2016 | 8 |
| **Croatia** | | 10 |
| **Italy** | 2020 | 10 |
| **Malta** | 2026 | |
| **Portugal** | | 10 |
| **Spain** | 2016 | 8 |

## 4 - Projected investments interconnection and storage

| **Country** | **Name of Project** ***Project Type (Interconnection/LNG)*** | **Project type: New or Upgrade** | **The phase of the project: Planning; Preliminary; Construction** | **Estimated operation year** | **Connected country** | **Sort of capacity: Entry; Exit; Bilateral** | **Target Capacity Capacity Increase (bcm/year)** | **Access Conditions: rTPA or nTPA** | **Required Transmission pipeline (km)** |
|---|---|---|---|---|---|---|---|---|---|
| **Albania** | TAP *Interconnection* | New | 2015 | 2020 | | Entry / Exit | 10-20 | | 870 |
| | IAP *Interconnection* | New | Nd | nd | | | | | 516 |
| | Fier *LNG Regasification* | Upgrade | Nd | Nd | | Entry / Exit | 8-12 | | |
| **Croatia** | Lučko-Zabok-Rogatec (HR/SLO) + compressor stations *Interconnection* | New | Preliminary | 2018 | Croatia - Slovenia | Entry / Exit | 5,547 | rTPA | 77 |
| | LNG evacuation pipeline Omišalj-Zlobin-Bosiljevo-Sisak-Kozarac - PHASE I (HR/HU) | New | Preliminary | 2020 | Croatia - Hungary | Entry / Exit | 16,716 | rTPA | 198 |
| | LNG evacuation pipeline Kozarac-Slobodnica - PHASE II (HR/HU) | New | Planning | 2023 | Croatia - Hungary | | 7,788 | rTPA | 128 |
| | Peak storage facility Grubišno Polje | New | Preliminary | 2021 | 5,520 (1st phase-floating terminal) | - | | rTPA | |
| | LNG Terminal on island Krk | New | Preliminary | 2018 (1st phase-floating terminal) 2023 (2nd phase-onshore terminal) | 9,600 (2nd phase- onshore terminal) | - | 150.000 $m^3$ LNG (2nd phase) | rTPA | |
| **Cyprus** | East-Med pipeline (The project is included in the PCI list-code 7.3.1.) | New | | 2020 (3Q) | Greece | The pipeline will have an estimated capacity of 450 GWh/day | The main flow of the pipeline westbound will have | Nd | 1900km (1400 km offshore, 500 km onshore |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | with delivery capacity of 30 GWh/day to Cyprus and 420 GWh/day to Greece. Power of the compressor 320 MW. | an annual foreseen capacity in the range of approximately 7-15 bcm/year | | |
| | Cyprusgas 2EU | Renaming of Mediterranean Gas Storage | Preliminary studies (Prefeasibility/Feasibility Studies) | 2022 | | | | Not decided yet | Yes (Landing in Vasilikos area, south of Cyprus) |
| **Egypt** | Cyprus Pipeline | New PL | Planning | 2020 | Aphrodite in Cyprus to Idku in Egypt | | 7 bcm | nTPA | 340 km |
| | FRSU-3 | New | Q2-2017 | 2017 | | | Total storage capacity:170.000 $m^3$ LNG=0.12 bcm (NG) Send-out/Withdrawal rate:21 $mm^3$/day (NG) | nTPA | 5.5 km with 32 in |
| **France** | STEP | New | Under study, not decided | Not decided | Spain | Interruptible bilateral | F→S: 3,0<br>S→F: 4,5 | rTPA | 224km (120 km in France) |
| | MidCat | New | Under study, not decided | Not decided | Spain | Firm bilateral | F→S: 3,0<br>S→F: 4,5 | rTPA | >320km (in France) |
| **Greece** | Trans Adriatic Pipeline (TAP) | New | Design and permitting, FID | 2020 | Greece, Albania, Italy | Entry-Exit plus Reverse-Flow | 10 bcm/y up to 20 bcm/y | Exemption as for Directive 2009/73/CE | 878 km |
| | Interconnection Greece – Bulgaria (IGB) | New | Permitting | 2020 | Greece, Bulgaria | Entry-Exit plus Reverse-Flow | up to 3bcm/y, up to 5bcm/y (2nd phase) | applied for exemption, not yet granted | 182 km |

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|---|---|---|---|---|---|---|---|---|---|
| | ITGI - POSEIDON | New | Permitting | 2020 | Italy- Greece | Entry-Exit plus Reverse-Flow | 8 bcm/y | Exemption as for 2° Energy Package | 216 km |
| | EastMed Pipeline | New | Planned | 2022 | Greece, Cyprus | | Up to 16 bcm/y | | 1900 km |
| | Revithoussa LNG Terminal (2nd upgrade) | Upgrade | Under engineering-procurement-construction | 2018 | | | | Revithoussa LNG Terminal (2nd upgrade) | Upgrade |
| | FSRU in Northern Greece (Alexandroupolis) | New | Permitting completed | 2020 | | | | FSRU in Northern Greece (Alexandroupolis) | New |
| **Jordan** | Alshaikh Subah LNG Terminal at Aqaba *LNG* | New | Nd | Nd | | | | rTPA | 423 |
| **Israel** | Sodom- Jordan (North Jordan) | New | planning | | Israel-Jordan | exit | 3 bcm | | 22.7 |
| | Palestinian Authority | New | preliminary | | Israel-PA | exit | 0.5 bcm | | |
| | Sodom- Jordan (North Jordan) | New | planning | | Israel-Jordan | exit | 3 bcm | | 22.7 |
| **Italy** | GALSI *Interconnection* | New | Planning | 2020 | Italy-Algeria | Entry Algeria-Exit Italy | 8 | Regulated | 861 |
| | TAP *Interconnection* | New | Planning | 2020 | Albania, Greece, Italy | Entry-Exit plus Reverse Flow | 10-20 | Exemption as for Directive 2009/73/CE | 870 |
| | ITGI-POSEIDON Interconnection | New | Planning | 2020 | Italy-Greece | Entry-Exit plus Reverse Flow | 8 | Exemption as for 2nd Energy Package | 207 |
| | *LNG* Falconara | New | Planning | 2020 | | | 19.8 $mm^3$/day | | |
| | LNG Porto Empedocle | New | Planning | 2020 | | | 26.4 $mm^3$/day | | |
| | *LNG* Gioia Tauuro | New | Planning | 2020 | | | 39.6 $mm^3$/day | | |
| | *LNG* Zaule | New | Planning | 2025 | | | 26.4 $mm^3$/day | | |
| | *LNG* Monfalcone | New | Planning | 2025 | | | 800mcm/y | | |
| | *LNG* Trieste | New | Planning | 2025 | | | 8 bcm/y | | |

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|---|---|---|---|---|---|---|---|---|---|
| **Malta** | PCI Code TRA-N-031 Connection of Malta to the European Gas Network-Pipelines | New | 2026 | 2018 | Malta-Italy | The pipeline will be designed for bilateral capacity but initially it will be operated in the Italy-to-Malta flow direction | Entry (Italy-to-Malta direction): 2bcm/year (in 2026) Exit (Malta-to-Italy direction): 2bcm/year (in 2031) | rTPA | 155 km |
| | FSU and regasification plant | New | Construction | 2016 | | | 12 bcm/y | rTPA | |
| | PCI Code:LNG-N-211 Connection of Malta to the European Gas Network-LNG regasification | New | Planning | 2031 | | | Nd | rTPA | 12 km from offshore FSRU to Malta; 155km from Malta to Sicily |
| **Portugal** | 3rd Interconnection Point | New | Planning | 2024 | Spain | Entry | 2,6 | rTPA | 247 |
| | 3rd Interconnection Point | New | Planning | 2024 | Spain | Exit | 2,1 | rTPA | 247 |
| **Spain** | MIDCAT *Interconnection* | New | PCI (preliminary) | | Spain-France | Bilateral | 7,2 bcm (S-F)/ 2,5 (F-S) | rTPA | 25 Km in Spain |
| | Portugal *Interconnection* | New | PCI (preliminary) | | Spain-Portugal | Bilateral | 4,5 bcm (both) | rTPA | 85 Km in Spain |
| | El Musel *(LNG)* | New | Finished | Mothballed | | | 0.0003 | rTPA | |
| | Bilbao *(LNG)* | Upgrade | Planning | 2014 (delayed) | | | | rTPA | |
| | Tenerife *(LNG)* | New | Planning | 2015 (delayed) | | | 0.000150 | rTPA | |
| | Gran Canaria (*LNG)* | New | Planning | 2016 (delayed) | | | 0.000150 | rTPA | |
| **Turkey** | BOTAS Silivri Underground Storage<br><br>BOTAS Tuz Golu | Upgrade | Construction | 2020 | Send-out/Withdrawal, 40 $mm^3$/day<br><br>Injection, 40 $mm^3$/day<br><br>Tank/reservoir, 4.3 bcm | rTPA | | BOTAS Silivri Underground Storage<br><br>BOTAS Tuz | Upgrade |

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|---|---|---|---|---|---|---|---|---|---|
| | Underground Storage | New | Construction | 2017<br>2020 | Send-out/Withdrawal ,40 mm³/day<br>Injection, 40 mm³/day<br>Tank/reservoir, 0,5bcm, 1 bcm | rTPA | | Golu Underground Storage | New |
| | EGEGAZ Aliaga LNG Terminal | Upgrade | Construction | 2016<br>2017 | Send-out/Withdrawal, 24 mm³/day, 30 mm³/day,40 mm³/day<br>Injection, 81 mm³/day<br>Tank/Reservoir, 0,168 bcm | rTPA | | EGEGAZ Aliaga LNG Terminal | Upgrade |
| | Etki Liman FSRU Terminal | New | Construction | 2016 | Send-out/Withdrawal, 14 mm³/day<br>Injection, 86 mm³/day<br>Tank/reservoir, 0,084 bcm | rTPA | | Etki Liman FSRU Terminal | New |

## 5- The expected benefits and impact of each project listed, on security of supply (e.g. route and/or source diversification, emergency role, N-1 condition), market development (e.g. reduction of congestions, entry of new suppliers) and regional market integration.

| Country | Name of the facility | Security of Supply | Market development | Regional Market Integration |
|---|---|---|---|---|
| **Albania** | **N/A** | | | |
| **Croatia** | Interconnection pipeline<br>Lucko-Zabok-Rogatec<br>(HR/SLO)+compressor station | Project will enable route diversification and will increase N-1 criteria for security of supply in Croatia and Slovenia | Project will reduce bottlenecks at Croatia/Slovenia border and in Croatia gas system which will enable full entry/exit capacity of Dravaszerdahely interconnection point at Croatia/hangar border | Project will enable supply of LNG from Adriaic coast to expected LNG markets:Slovenia, Austria and Slovakia. It will also provide enhanced access to Baumgarten and Italian gas market |
| | LNG evacuation pipeline Omisalj-Zlobin-Bosiljevo-Sisak-Kozarac-PHASE I (HR/HU)<br>LNG evacuation pipeline Kozarac-Slobodnica-PHASE II(HR/HU) | Project will enable route diversification and will increase N-1 criteria for security of supply in Croatia and Hungary | Project will create new transit route for LNG supply in Croatia and for neighbouring countries. It will also reduce possible future bottlenecks. | Project will enable route diversification and will improve remaining flexibility for Croatia, Slovenia and hungary. |
| | Peak storage facility Grubsino Polje | Project will increase N-1 criteria for security of supply in Croatia | Additional mid and and short term services will be offered to users which will consequently attract new shippers and support further development of Croatian and regional gas market. | Project will significantly increase remaining flexibility in Croatia with influence on Slovenia and Hungary. |
| | LNG Terminal on Island Krk | Project will enable source diversification and will increase security of supply in Croatia and Hungary. | Project will create new LNG supply source for south-eastern and central European countries. It will also reduce possible future bottlenecks. | Project will enable supply of LNG from Adriatic coast to expected LNG markets: Croatia, Slovenia, hungary, Austria, Serbia, Bosnia and Herzegovina, Slovakia and Czech republic. Additional potential markets are: Italy,Ukraine, Romania and Bulgaria. It will also improve remaining flexibility for Croatia, Slovenia and hungary. |

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|---|---|---|---|---|
| **Cyprus** | Ast-Med pipeline<br><br>CyprusGas2EU | Security of Gas Supply to Cyprus<br><br>Security of Gas Supply to Cyprus | End Cyprus and Crete nergy isolation<br><br>End Cyprus and Crete energy isolation | Connect Eastern Mediterranean countries with Europe<br><br>Connect Eastern Mediterranean countries with Europe |
| **Egypt** | FSRU-1<br><br>FSRU-2<br><br>Arab Gas PL<br><br>EMG PL<br><br>FSRU-3<br><br>Cyprus pipeline | Emergency role to cover the gap between the supply & demand<br>Emergency role to cover the gap between the supply & demand<br><br>Could be used in the reverse direction to secure some of the domestic consumption<br><br>Emergency role to cover the new demand of the New Capital's power generation plant<br><br>Could be used to cover part of the domestic consumption | Cover the hight consumption of the power generation plant<br><br>Cover the hight consumption of the power generation plant<br><br>Cover the consumption of the New Capital's power generation plant | To export gas to Jordan<br><br>To export gas to Israel<br><br>The gas will be processed and liquefied in one the Egyptian LNG facilities |
| **France** | Oltingue | source diversification | | Implementation of bilateral capacities |
| **Greece** | LNG terminal in Revithoussa | According to the Preventive Action Plan, Revithoussa is the largest infrastructure in terms of capacity. During the 2009 crisis, LNG from Revithoussa was driven, through reverse flow, to Bulgaria to cover vulnerable customers demand there. | As the capacity of the two pipeline entries to Greece was fully booked upstream, LNG cargoes to Revithoussa were, until recently, the only way of entry of new suppliers (in 2011-2012 when LNG prices were favourable, the incumbent had lost 12% of its market share via LNG spot cargoes). Today some competition is developing at the Bulgarian entry point, however, the importance of the LNG terminal remains crucial. | |

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| | TAP | | | TAP will be crucial for the integration of the regional market, linking Turkish and Greek to the Italian gas market and thus the rest of Europe. |
| | IGB | IGB will mainly be important for the SoS of Bulgaria, as its nominal flow Greece to Bulgaria | It is expected to help the development of the greek market, opening the route to the North<br>(Bulgaria, Romania, Ukraine) | |
| | EastMed Pipeline | It will add one more source of supply. However, its impact has not been studied yet in the Risk Assessment study. | | It will integrate the middle-eastern to the greek and then European market. |
| **Italy** | Panigaglia LNG | 200 | 13 | rTPA |
| | Adratica LNG | 2010 | 26,4 | Exemption as 2° Energy Package |
| | Livorno LNG | 2015 | 15 | rTPA |
| | Storage Stogit, Edison, scc. | 2010 | 16 bcm | rTPA |
| | Storage Cornegliano | 2014 | 16,6 | rTPA |
| **Malta** | FSU and regasification plant<br><br>*PCI Code TRA-N-031*<br>Connection of Malta to the European Gas Network-Pipelines | Energy in Malta is currently supplier by fossil fuels with a minor contribution from renewable energy. The new gas infrastructure is expected to strongly contribute to security of supply by providing a new vehicle for energy supply. The project is expected to result in a more reliable, secure and energy efficient from of energy<br><br>The infrastructure is expected to strongly contribute to security of supply by providing a new vehicle for energy supply. The project is expected to result in a more reliable, secure and energy efficient form of transport of fuel.<br>The pipeline is expected to provide for diversification of energy sources, will facilitate the formulation and | The Malta LNG to Power Project shall introduce natural gas as a fuel source to Malta's electricity generation industry and shall be the sole supply of natural gas to the power station<br><br>The project will end Malta's isolation from the Trans-European gas network and thus contribute to gas market integration and improved security of energy supply and diversification of fuels for the island. The project is expected to support objectives of sustainability as it will contribute towards the reduction of GHG | The pipeline can be expected to provide for more flexible market |

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| | | implementation of preventive and emergency action plans, is a more reliable, secure and energy efficient form of transport of fuel, and is in itself a short term storage facility as compressed gas contained in the pipeline may be used in case that the gas flow is interrupted at the terminal point in the supplying infrastructure | emissions whilst also acting as a back-up for renewable energy. It will contribute towards diversification of imported sources. In Malta, it will provide access to a potentially lower cost fuel for both power generation and the inland market thereby improving competitiveness and affordability. | arrangements by, at the very least, introducing a competing form of transport. Furthermore price convergence to the Italian Market price is expected once the gas pipeline is in service. The gas pipeline interconnection will eliminate Malta's isolation from the European Gas Network and will thus contribute to the integration of the Internal Energy Market. The physical interconnection would replace the shipping of LNG, time of transport and externality costs. The project will also contribute to the overall flexibility and interoperability of the system as it will offer future possibility of capacity for reverse flows |
| | *PCI Code LNG-N-211* Connection of Malta to the European Gas Network-LNG regasification Infrastructure | The 'LNG infrastructure' component besides meeting Malta's natural gas requirements including future demand for maritime LNG bunkering; shall also achieve the gas N-1 infrastructure requirement as there would be two sources of natural gas supply to Malta and shall provide for the possibility to export gas to Italy/Europe. This will enhance competition in Italy. The main project driver for this component of the PCI is the Gas Security of Supply EU Regulation No. 994/2010. This second phase of the PCI will contribute to the overall system flexibility and interoperability. The infrastructure will be capable to offer capacity for bi-directional flow through the gas pipeline interconnector. | Energy demand will be increasing over time and as LNG bunkering comes into with the establishment of criteria for the use by liquefied natural gas carriers of technological methods as an alternative to using low sulphur marine fuels in line with the sulphur reduction requirements of the EU Sulphur Directive 2012/33/EU. It is forecasted that bunkering will by 2054 account for about 80% of the total primary energy demand of the Maltese Islands. This therefore has a potentially stronger element of fuel demand associated with maritime bunkering activity centred in and around Malta, which already serves as a key bunkering hub within the Mediterranean, and will play a key role in the implementation of EU goals towards the supply of NG fuel for the purposes of shipping activities in the future. This serves as a basis for the quantification of the demand for the project itself, it informs the optimal choice between alternative options for its | This project is expected to support the objective of sustainability as it will contribute towards the reduction of GHG emissions. The LNG component will also complement the provisions of Directive 2014/94/EU and the Energy Union diversification strategy in fuel by the added entry point of natural gas to the EU i.e. effectively contributing towards the diversification of sources, routes and suppliers of gas to the EU. |

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| | | | implementation, furthermore serving to quantify economic benefits under each of the five dimensions to be served by the PCI listed above. | |
| **Portugal** | Campo Maior | Yes | Yes | Yes |
| | Valença do Minho | Yes | No | No |
| | Sines (LNG terminal) | Yes | Yes | Yes |
| | Carriço (Storage) | Yes | Yes | Yes |
| **Spain** | MIDCAT<br><br>Portugal<br><br>Musel<br><br>Tenerife<br><br>Gran Canaria | Route and source of diversification for Europe (alternative to Russian gas for central Europe)<br>Diversification (for Portugal)<br><br>Diversification, N-1 condition<br><br>Supply of gas in isolated system (Canary Islands)<br>Supply of gas in isolated system (Canary islands) | Liquidity for the Iberian market | Creation of the European internal market<br><br>Creation of the European internal market |
| **Turkey** | Malkoclar (Western Line)<br><br>Gurbulak<br><br>Durusu<br>(Blue Stream)<br><br>Turkgozu<br><br>Kipi<br><br>BOTAS Silivri Underground Storage | Only interconnection point<br>That private companies have contracts<br><br>Source and route<br>Diversification, N-1 condition<br><br>Route diversification, N-1 Condition<br><br>Source and route<br>Diversification, N-1 condition<br><br>Source and route diversification<br>And N-1 condition with the<br>Possible investments for bilateral flow<br><br>Emergency role, seasonal storage<br><br>Source and route diversification, N-1 condition | Entry of new suppliers<br><br>Entry of new suppliers with the possible investments for bilateral flow | Only current exit to European markets |

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| | BOTAS Marmara LNG Terminal<br><br>EGEGAZ Aliaga LNG Terminal<br><br>BOTAS Silivri Underground Storage<br><br>BOTAS Tuz Golu Underground Storage<br><br>EGEGAZ Aliaga LNG Terminal<br><br>Etki Liman FSRU Terminal | Source and route diversification, N-1 condition<br><br>Emergency role, seasonal storage<br><br>Emergency role, seasonal storage<br><br>Source and route diversification, N-1 condition<br>Source and route diversification, N-1 condition | Entry of new suppliers<br><br>Entry of new suppliers<br><br>Provide flexibility to market players<br><br>Provide flexibility to market players<br><br>Entry of new suppliers<br><br>Entry of new suppliers | |

## 6- The role of national regulatory agency in the overall investment plan

| Country | Approval of investment plan by NRA | Government sets investment plan and consults NRA |
|---|---|---|
| Albania | | x |
| Croatia | x | |
| Cyprus | x | |
| France | x | |
| Greece | x | |
| Israel | x | |
| Italy | | x |
| Jordan | | x |
| Portugal | | x |
| Spain | | x |

## 7 - Implementation barriers

| Implementation Barriers | Albania | Cyprus | Croatia | Egypt | France | Greece | Jordan | Israel | Italy | Malta | Portugal | Spain | Turkey |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| a. Regulatory and/or legal obstacles (ex. administration, permitting, licencing, etc.…) | 8 | 2 | 5 | 1 | 8 | | 1 | 1 | | 4 | 8 | | 5 |
| b. Lack of interest in interconnection projects (ex. Inter-Governmental agreements) | 8 | 6 | 3 | 7 | 8 | | 8 | | | 5 | 2 | | 8 |
| c. Technical barriers | 8 | 3 | 4 | 6 | 3 | | 8 | | | 3 | 7 | | 6 |
| d. Financial feasibility of the project (e.g. adequate revenues) | 3 | 1 | 2 | 5 | 2 | 1 | 4 | | x | 1 | 8 | | 2 |
| e. Insufficient market demand | 3 | 8 | 1 | 8 | 1 | 2 | 1 | 2 | | 2 | 1 | 1* | 1 |
| f. Lack of internal reforms | 3 | 7 | 7 | 2 | 8 | 3 | 4 | | | 6 | 8 | | 4 |
| g. Political instability and/or lack of clear institutional framework (including geopolitical barriers) | 8 | 5 | 8 | 3 | 8 | | 5 | | | 8 | 3 | 8 | 3 |
| h. Lack of coordination and/or cooperation (ex. between TSOs, between TSOs and Regulators) | | 8 | 7 | 8 | | 4 | 8 | 7 | 6 | | 7 | 4 | |

## 8 - Infrastructure key performance indicators

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| Croatia | Number of TSOs | 1 | 1 | 1 |
| | Pipeline length (km) | 2.694 | 2.694 | - |
| | Pipeline pressure **(bar)** | 50 bar; 75 bar | 50 bar; 75 bar | 50 bar; 75 bar |
| | Annual consumption (bcm) | 2,627 | 2,745 | - |
| | Seasonal demand swing (%) | - | - | - |
| | Daily peak demand (mcm) | 12,545 | 11,779 | - |
| | Length of pipeline/consumption (km/bcm) | 1.025,45 | 981,46 | - |
| | Storage capacity/consumption (%) | 20,40 | 19,34 | - |
| | LNG terminal capacity/consumption (%) | - | - | - |
| | LNG + storage daily send out / peak demand (%) | 41,3 | 40,5 | - |
| | Number of entry zones | 1 | 1 | 1 |
| | Number of exit zones | 1 | 1 | 1 |
| | Number of compressor stations | 0 | 0 | 0 |
| | Pipeline length / # compressor stations | - | - | - |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| Cyprus | Number of TSOs | - | - | - |
| | Pipeline length (km) | - | - | - |
| | Pipeline pressure (bar) | - | - | - |
| | Annual consumption (bcm) | - | - | - |
| | Seasonal demand swing (%) | - | - | - |
| | Daily peak demand (mcm) | - | - | - |
| | Length of pipeline/consumption (km/bcm) | - | - | - |
| | Storage capacity/consumption (%) | - | - | - |
| | LNG terminal capacity/consumption (%) | - | - | - |
| | LNG + storage daily send out / peak demand (%) | - | - | - |
| | Number of entry zones | - | - | - |
| | Number of exit zones | - | - | - |
| | Number of compressor stations | - | - | - |
| | Pipeline length / # compressor stations | - | - | - |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| Egypt | Number of TSOs | 1 | 1 | 1 |
| | Pipeline length (km) | 7667 | 7872 | 8000 |
| | Pipeline pressure (bar) | 7-70 bar | 7-70 bar | 7-70 bar |
| | Annual consumption (bcm) | 48.019 | 47.812 | 51.627 |
| | Seasonal demand swing (%) | 20 | 20 | 20 |
| | Daily peak demand (mcm) | 130 | 136 | 151 |
| | Length of pipeline/consumption (km/bcm) | 59 | 58 | 53 |
| | Storage capacity/consumption (%) | | | |
| | LNG terminal capacity/consumption (%) | | | |
| | LNG + storage daily send out / peak demand (%) | | 1000 | 1300 |
| | Number of entry zones | 20 | 21 | 22 |
| | Number of exit zones | 607 | 607 | 607 |
| | Number of compressor stations | 1 | 1 | 1 |
| | Pipeline length / # compressor stations | 7667 | 7872 | 8000 |
| | | | | |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| Jordan | Number of TSOs | 1 | 1 | 1 |
| | Pipeline length (km) | 423 | 423 | 423 |
| | Pipeline pressure **(bar)** | Up to 80 Bars | Up to 80 Bars | Up to 80 Bars |
| | Annual consumption (bcm) | 3.4 | | |
| | Seasonal demand swing (%) | - | - | - |
| | Daily peak demand (mcm) | 25 MMSCF/D | 200 MMSCF/D | 444 MMSCF/D |
| | Length of pipeline/consumption (km/bcm) | - | - | - |
| | Storage capacity/consumption (%) | - | - | - |
| | LNG terminal capacity/consumption (%) | - | - | - |
| | LNG + storage daily send out / peak demand (%) | - | 490 MMSCF/D | 490 MMSCF/D |
| | Number of entry zones | - | - | - |
| | Number of exit zones | - | - | - |
| | Number of compressor stations | - | - | - |
| | Pipeline length / # compressor stations | 423/1 compressor st. | 423/1 compressor st. | 423/1 compressor st. |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| **Greece** | Number of TSOS | 1 | 1 | 1 |
| | Pipeline length (km) | 1459.33 | 1466.17 | 1492.47 |
| | Pipeline pressure | 70 bar | 70 bar | 70 bar |
| | Annual consumption (bcm) | 2.99 | 3.26 | 3.4 |
| | Seasonal demand swing (%) | 65% | 65% | |
| | Daily peak demand (mcm) | | | |
| | Length of pipeline/consumption (km/bcm) | 488.07 | 449.75 | 438.96 |
| | Storage capacity/consumption (%) | | | |
| | LNG terminal capacity/consumption (%) | 167% | 153% | 154% |
| | LNG + storage daily send out / peak demand (%) | 68.25% | 63% | |
| | Number of entry zones | 3 | 3 | 3 |
| | Number of exit zones | 3 (39 exit point) | 3 (41 exit point) | 3 |
| | Number of compressor stations | 1 | 1 | 1 |
| | Pipeline length / # compressor stations | 1459.33 | 1466.17 | 1492.47 |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| **France** | Number of TSOS | 2 | 2 | 2 |
| | Pipeline length (km) | around 37 000 km | around 37 000 km | around 37 000 km |
| | Pipeline pressure | 16 to 95 bar | 16 to 95 bar | 16 to 95 bar |
| | Annual consumption (bcm) | 36,2 | 38,9 | 42,6 |
| | Seasonal demand swing (%) | | | |
| | Daily peak demand (mcm) | | | |
| | Length of pipeline/consumption (km/bcm) | | | |
| | Storage capacity/consumption (%) | ~28% | ~28% | ~28% |
| | LNG terminal capacity/consumption (%) | ~85% | ~85% | ~85% |
| | LNG + storage daily send out / peak demand (%) | | | |
| | Number of entry zones | 2 | 2 | 2 |
| | Number of exit zones | 2 | 2 | 2 |
| | Number of compressor stations | | | |
| | Pipeline length / # compressor stations | | | |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| **Israel** | Number of TSOs | 1 | 1 | 1 |
| | Pipeline length (km) | | 530 | |
| | Pipeline pressure (bar) | | | |
| | Annual consumption (bcm) | 7.5 | 8.4 | 9.4 |
| | Seasonal demand swing (%) | | | |
| | Daily peak demand (mcm) | 27.335 | **37,101** | |
| | Length of pipeline/consumption (km/bcm) | | | |
| | Storage capacity/consumption (%) | | | |
| | LNG terminal capacity/consumption (%) | | | |
| | LNG + storage daily send out / peak demand (%) | | | |
| | Number of entry zones | | | |
| | Number of exit zones | | | |
| | Number of compressor stations | | | |
| | Pipeline length / # compressor stations | | | |
| | | | | |
| | | | | |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| **Italy** | Number of TSOs | 10 | 10 | 10 |
| | Pipeline length (km) | 32339 | 34857 | |
| | Pipeline pressure | 24-75 bar | | |
| | Annual consumption (bcm) | 61.9 | 67.5 | |
| | Seasonal demand swing (%) | | | |
| | Daily peak demand (mcm) | | | |
| | Length of pipeline/consumption (km/bcm) | | | |
| | Storage capacity/consumption (%) | | | |
| | LNG terminal capacity/consumption (%) | | | |
| | LNG + storage daily send out / peak demand (%) | | | |
| | Number of entry zones* | | | |
| | Number of exit zones* | | | |

| | | | | |
|---|---|---|---|---|
| | Number of compressor stations | | | |
| | Pipeline length / # compressor stations | | | |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| **Malta** | Number of TSOs | 0 | 0 | 0 |
| | Pipeline length (km) | 0 | 0 | 0 |
| | Pipeline pressure **(bar)** | N/A | N/A | N/A |
| | Annual consumption (bcm) | N/A | N/A | 4.4838 |
| | Seasonal demand swing (%) | N/A | N/A | N/A |
| | Daily peak demand (mcm) | N/A | N/A | N/A |
| | Length of pipeline/consumption (km/bcm) | N/A | N/A | N/A |
| | Storage capacity/consumption (%) | N/A | N/A | N/A |
| | LNG terminal capacity/consumption (%) | N/A | N/A | 0.03% |
| | LNG + storage daily send out / peak demand (%) | N/A | N/A | N/A |
| | Number of entry zones | N/A | N/A | |
| | Number of exit zones | N/A | N/A | |
| | Number of compressor stations | N/A | N/A | N/A |
| | Pipeline length / # compressor stations | N/A | N/A | N/A |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| **Portugal** | Number of TSOs | 1 | 1 | 1 |
| | Pipeline length (km) | 1375 | 1375 | 1375 |
| | Pipeline pressure **(bar)** | 70 | 70 | 70 |
| | Annual consumption (bcm) | 3,8 | 4,4 | NA (Non Available) |
| | Seasonal demand swing (%) | 0,43 | 0,47 | NA |
| | Daily peak demand (mcm) | 15,5 | 17,4 | NA |
| | Length of pipeline/consumption (km/bcm) | 361,8 | 312,5 | NA |
| | Storage capacity/consumption (%) | 8,2 | 7,6 | NA |
| | LNG terminal capacity/consumption (%) | 5,9 | 5,1 | NA |
| | LNG + storage daily send out / peak demand (%) | 174,2 | 155,2 | NA |
| | Number of entry zones | 1 | 1 | 1 |

| | | | | |
|---|---|---|---|---|
| | Number of exit zones | 1 | 1 | 1 |
| | Number of compressor stations | 0 | 0 | 0 |
| | Pipeline length / # compressor stations | NaN (Not a Number) | NaN | NaN |

| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| **Spain** | Number of TSOs | 4 | 4 | |
| | Pipeline length (km) | Around 11000 | Around 11311 | |
| | Pipeline pressure | | | |
| | Annual consumption (bcm) | 25.73 | 26.92 | |
| | Seasonal demand swing (%) | | | |
| | Daily peak demand (mcm) | 107350 | 115555 | |
| | Length of pipeline/consumption (km/bcm) | 427.52 | 408.61 | |
| | Storage capacity/consumption (%) | 18.5% | 19% | |
| | LNG terminal capacity/consumption (%) | | | |
| | LNG + storage daily send out / peak demand (%) | | | |
| | Number of entry zones* | 1 | 1 | |
| | Number of exit zones* | 1 | 1 | |
| | Number of compressor stations | 18 | 18 | |
| | Pipeline length / # compressor stations | 628 | 628 | |

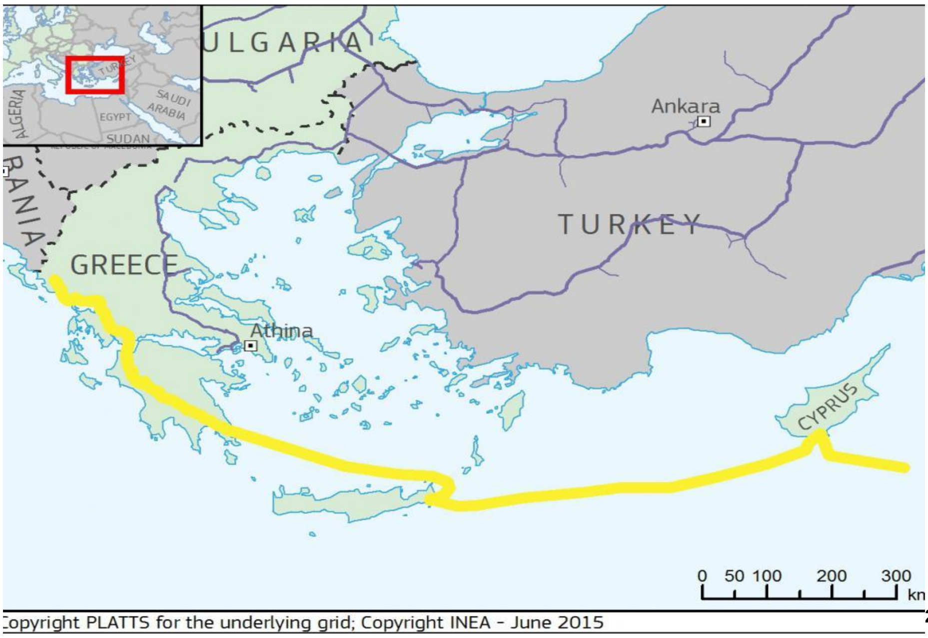
| | | 2014 | 2015 | 2016 (planned/forecast) |
|---|---|---|---|---|
| **Turkey** | Number of TSOS | 1 | 1 | 1 |
| | Pipeline length (km) | 12.561 | 12.963 | 13.000 |
| | Pipeline pressure | 50-75 bar(g) | 50-75 bar (g) | 50-75 bar (g) |
| | Annual consumption (bcm) | 48.717 | 47.999 | 46.500 |
| | Seasonal demand swing (%) | 0.14 | 0.20 | 0.20 |
| | Daily peak demand (mcm) | 195 | 224 | 220 |
| | Length of pipeline/consumption (km/bcm) | 258 | 270 | 280 |
| | Storage capacity/consumption (%) | 5.5% | 5.9% | 6.1% |
| | LNG terminal capacity/consumption (%) | 29.1% | 29.6% | 41.3% |
| | LNG + storage daily send out / peak demand (%) | 28.9% | 27.4% | 40.5% |
| | Number of entry zones | 9 | 9 | 9 |
| | Number of exit zones | 1 | 1 | 1 |

| | | | | |
|---|---|---|---|---|
| | Number of compressor stations | 9 | 9 | 9 |
| | Pipeline length / # compressor stations | 1396 | 1440 | 1444 |

# 9 - Infrastructure maps of the contributing countries

## Croatia

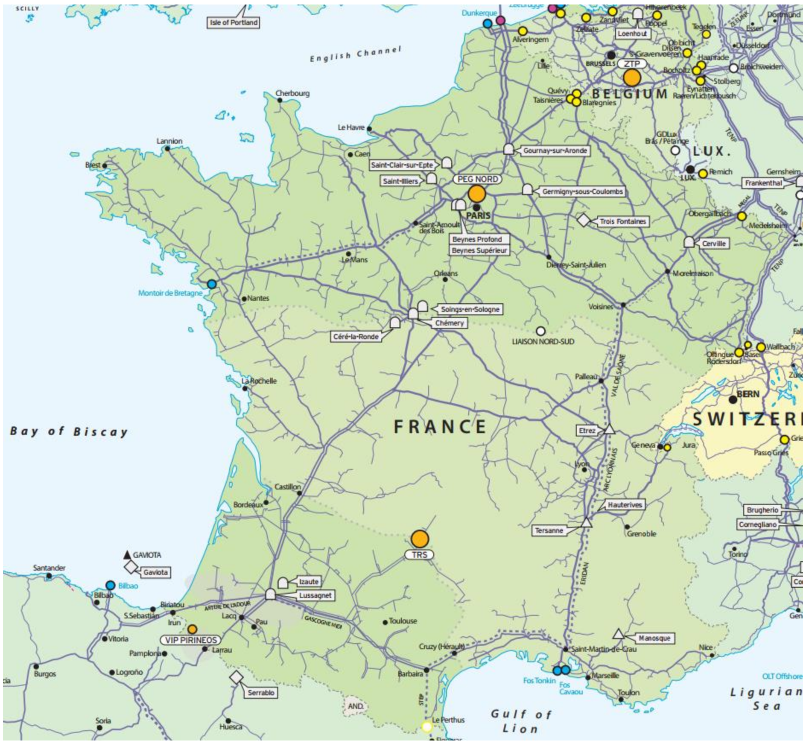

## Cyprus



[2]

## France

[2] Geographical location of PCI 7.3.1"Pipeline from offshore Cyprus to Greece mainland via Crete" namely 'EastMed' (https://ec.europa.eu/inea/en/connecting-europe-facility/cef-energy/projects-by-country/multi-country/7.3.1-0025-elcy-s-m-15)


English Channel
Bay of Biscay
FRANCE
BELGIUM
LUX.
PARIS
PEG NORD
TRS
ZTP
VIP PIRINEOS
Gulf of Lion
Ligurian Sea

## Jordan


TURKEY
SYRIA
LEBANON
MEDITERRANEAN SEA
JORDAN
EGYPT
RED SEA
HEMS
BANIAS
TRIPOLI
DAMASCUS
REHAB
AMMAN
EAST AMMAN
QATRANAH
AL ARISH
TABA
AL AQABA

## Malta

### Geographical Location of PCI 5.19: TRA-N-031 and LNG-N-211

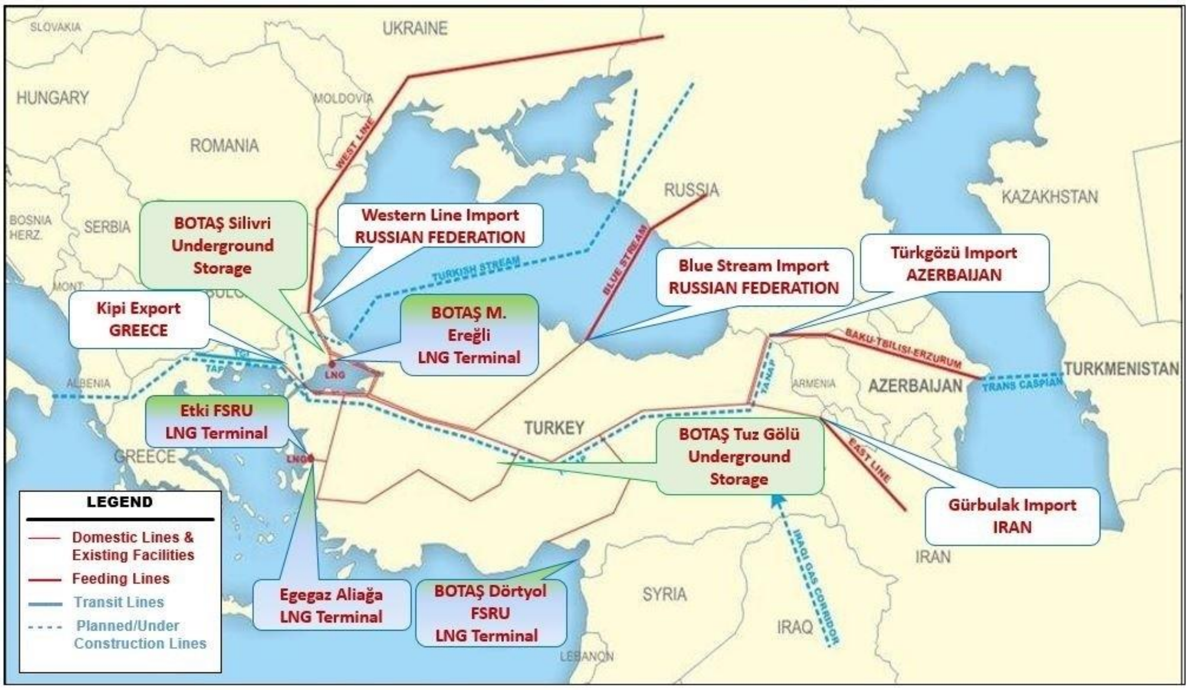
***Note: Map has been updated from TYNDP 2015***


Malta FSRU Offshore terminal

2

## Spain

## Turkey


UKRAINE
HUNGARY
ROMANIA
MOLDOVIA
RUSSIA
KAZAKHSTAN
SERBIA
TURKEY
GREECE
ARMENIA
AZERBAIJAN
TURKMENISTAN
SYRIA
IRAQ
IRAN
LEBANON
WEST LINE
TURKISH STREAM
BLUE STREAM
BAKU-TBILISI-ERZURUM
TRANS CASPIAN
TANAP
EAST LINE
IRAQI GAS CORRIDOR
TAP
LNG
BOTAŞ Silivri Underground Storage
Western Line Import RUSSIAN FEDERATION
Kipi Export GREECE
BOTAŞ M. Ereğli LNG Terminal
Blue Stream Import RUSSIAN FEDERATION
Türkgözü Import AZERBAIJAN
Etki FSRU LNG Terminal
BOTAŞ Tuz Gölü Underground Storage
Gürbulak Import IRAN
Egegaz Aliağa LNG Terminal
BOTAŞ Dörtyol FSRU LNG Terminal
LEGEND
Domestic Lines & Existing Facilities
Feeding Lines
Transit Lines
Planned/Under Construction Lines