



Council of the  
European Union

**Brussels, 13 October 2014  
(OR. en)**

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**COVER NOTE**

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From:	Secretary-General of the European Commission, signed by Mr Jordi AYET PUIGARNAU, Director
date of receipt:	13 October 2014
To:	Mr Uwe CORSEPIUS, Secretary-General of the Council of the European Union

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No. Cion doc.:	SWD(2014) 313 final
Subject:	COMMISSION STAFF WORKING DOCUMENT Investment Projects in Energy Infrastructure Accompanying the document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - Progress towards completing the Internal Energy Market

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Delegations will find attached document SWD(2014) 313 final.

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Encl.: SWD(2014) 313 final



EUROPEAN  
COMMISSION

Brussels, 13.10.2014  
SWD(2014) 313 final

**COMMISSION STAFF WORKING DOCUMENT**

**Investment Projects in Energy Infrastructure**

*Accompanying the document*

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN  
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL  
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

**Progress towards completing the Internal Energy Market**

{ COM(2014) 634 final }

{ SWD(2014) 310 final }

{ SWD(2014) 311 final }

{ SWD(2014) 312 final }

{ SWD(2014) 314 final }

{ SWD(2014) 315 final }

## 1. INTRODUCTION

Under Regulation (EU) No 256/2014, replacing Council Regulation (EU/Euratom) 617/2010<sup>1</sup> Member States are required to notify the Commission of their investment projects in energy infrastructure. This Staff Working Document aims to assess the notifications received by the Member States in order to comply with the reporting obligation under Article 10 of the above mentioned Regulations, which state that the Commission shall publish every two-year a cross-sector analysis of the structural evolution and perspectives of the energy system of the Union aimed at (i) identifying potential future gaps between energy demand and supply that are of significance from an energy policy perspective of the Union; (ii) identifying investment obstacles and promoting best practices to address them, hence increasing transparency for market participants and potential market entrants.

### *1.1. Political and legal context*

To meet the ambitious targets of the 2020 Climate and Energy Package<sup>2</sup> and live up to the objectives of the 2030 Framework for Climate and Energy Policies, greater investments in the energy infrastructure will be required in all the sectors that make up Europe's energy market. New investments in energy infrastructure across the Union are also instrumental in ensuring integrated and efficient internal energy market and security of energy supply.

Although investments are needed in all energy sectors, the financial and economic crisis has had a negative effect on the investment climate, particularly in new technologies where investments are usually associated with bigger risks, such as many renewables for which the technology and markets are still new. And although the European Union as a whole is on track of reaching its 2020 RES target<sup>3</sup>, in some Member States more investments are needed to reach the national targets. Furthermore, the Fukushima nuclear disaster has led to nuclear policy being rethought in several EU Member States, which directly influences power generation capacities.

In 2011, it was estimated that Europe's energy system requires investment of EUR 1 trillion<sup>4</sup> by 2020. Of this amount, EUR 540 billion are needed for power generation<sup>5</sup> and EUR 210 billion are for electricity and gas networks of European importance<sup>6</sup>:

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<sup>1</sup> Regulation (EU) No 256/2014 of the European Parliament and of the Council of 26 February 2014 concerning the notification to the Commission of investment projects in energy infrastructure within the European Union, replacing Council Regulation (EU, Euratom) No 617/2010 and repealing Council Regulation (EC) No 736/96.

Note: Regulation 256/2014 was adopted following the decision of the European Court of Justice of 6 September 2012 to annul Council Regulation (EU, Euratom) N° 617/2010 concerning the notification to the Commission of investment projects in energy infrastructure within the European Union on the grounds that it was based on an incorrect legal basis. The Court, however, maintained the effects of Regulation 617/2010 until the adoption of the new Regulation. In order to comply with the Court's judgement and to ensure continuity in the observation of investment projects in energy infrastructure, Member States were required to communicate to the Commission by 31 July 2013 aggregated data and information on their investment projects. Therefore, in this document, we refer to the new Regulation 256/2014, even though notifications received from Member States were based on the annulled Regulation 617/2010. It needs to be added that both Regulations have a similar content. Main changes relate to the legal basis and dates concerning the entry into force of the new Regulation and its review.

<sup>2</sup> The 2020 Climate and Energy Package sets three key objectives: (i) 20% reduction in EU greenhouse gas emissions from 1990 levels; (ii) raising the share of EU energy consumption produced from renewable resources to 20%; (iii) a 20% improvement in the EU's energy efficiency.

<sup>3</sup> <http://iet.jrc.ec.europa.eu/eu-track-2020-renewable-energy-targets>

<sup>4</sup> [http://ec.europa.eu/energy/publications/doc/2011\\_energy2020\\_en.pdf](http://ec.europa.eu/energy/publications/doc/2011_energy2020_en.pdf)

- About EUR 140 billion for high voltage electricity transmission systems, both onshore and offshore, storage, and smart grid applications at transmission and distribution level;
- About EUR 70 billion for high pressure gas transmission pipelines (coming into the EU and between EU Member states), storage, liquefied/compressed natural gas (LNG/CNG) terminals and reverse flow infrastructure;

The volume of investment for the period 2011-2020 would need to increase by 30 % for gas and by around 70 % for electricity compared to current levels.<sup>7</sup>

## *1.2. Approach and methodology*

Member States had to provide aggregated data and information on planned investments, projects for which construction work is scheduled to start within five years as well as energy infrastructure projects to be decommissioned within three years of a certain size in the following sectors:

- Oil (refining, transport and storage).
- Gas (transmission, LNG terminals and storage).
- Electricity (generation and transmission).
- Biofuels (production).
- Carbon Capture and Storage (transport and storage).

In order to ensure that the reporting obligation for the MS does not rise to a disproportionate administrative burden, Article 2.3 of the Regulation allows MS to exempt from the reporting obligations provided that equivalent information is already reported to the Commission in response to other reporting requirements (e.g. **refer to Euratom, ENTSO-E or ENTSOG if they had reported required data to these organisations already in the near past**).

A study by Ramboll, ECN and Ecorys was commissioned by the services of DG Energy to provide cross sector analysis of the energy infrastructure investments that are planned and to identify potential future gaps between investment needs and planned investments in energy infrastructure at the Union level. To reach this objective the consultant compared notifications from the Member State's with selected benchmark data sources (i.e. independent data sources such as ENTSOG and ENTSO-E databases, their respective Ten Year Network Development Plans (TYNDP) and other commercial or public data providers for the specific sectors).

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<sup>5</sup> In the Energy Roadmap 2050 scenarios [http://ec.europa.eu/energy/energy2020/roadmap/index\\_en.htm](http://ec.europa.eu/energy/energy2020/roadmap/index_en.htm), total investment needs in power stations for the period 2011-2020 range between EUR 452 and 487 bn (at 2005 prices). At 2011 prices, this amounts to around 540 bn € for power generation alone.

<sup>6</sup> SEC/2011/1233 final.

<sup>7</sup> SEC(2011) 1233 final. Note: More recent analysis by the International Energy Agency in its World Energy Investment Outlook 2014 suggests that due to the large electricity capacity additions that will be needed in Europe in next two decades and with their relatively high unit investment costs (particularly when it comes to renewables), total investment in the EU power sector is expected to rise to \$2.2 trillion (EUR 1.6 trillion) over 2014-2035. Roughly 30% of this investment is needed to replace and reinforce transmission and distribution grids and to provide new connections. According to the IEA Report, power infrastructure replacement costs make up almost \$655 billion (EUR 480 billion) while about around \$180 billion (EUR 132 billion) is needed to integrate the growing shares of renewables. <http://www.iea.org/publications/freepublications/publication/WEIO2014.pdf>, p.110

Where possible, the data was also compared to the previous notifications received from the last reporting exercise in 2011.

The Commission's assessment is based on the consultant's study, notifications received from the Member States and the conclusions of the 2011 Staff Working Document on Investment Projects in Energy Infrastructure<sup>8</sup>.

## **2. NOTIFICATIONS OF THE EU MEMBER STATES**

**This section provides an overview of the notifications received from Member States concerning investments related to both existing and planned energy infrastructure projects on the basis of the data received and the analysis provided by the consultant's study.**

**In general, it has to be noted that the notifications by MS were often incomplete and the data input provided was limited. Equally, it seems that there have been some basic misunderstandings about the nature of the data to be included in the notifications. For instance, many Member States have included projects that are not listed as Final Investment Decisions (FIDs) in their 'infrastructure to be commissioned' sections.**

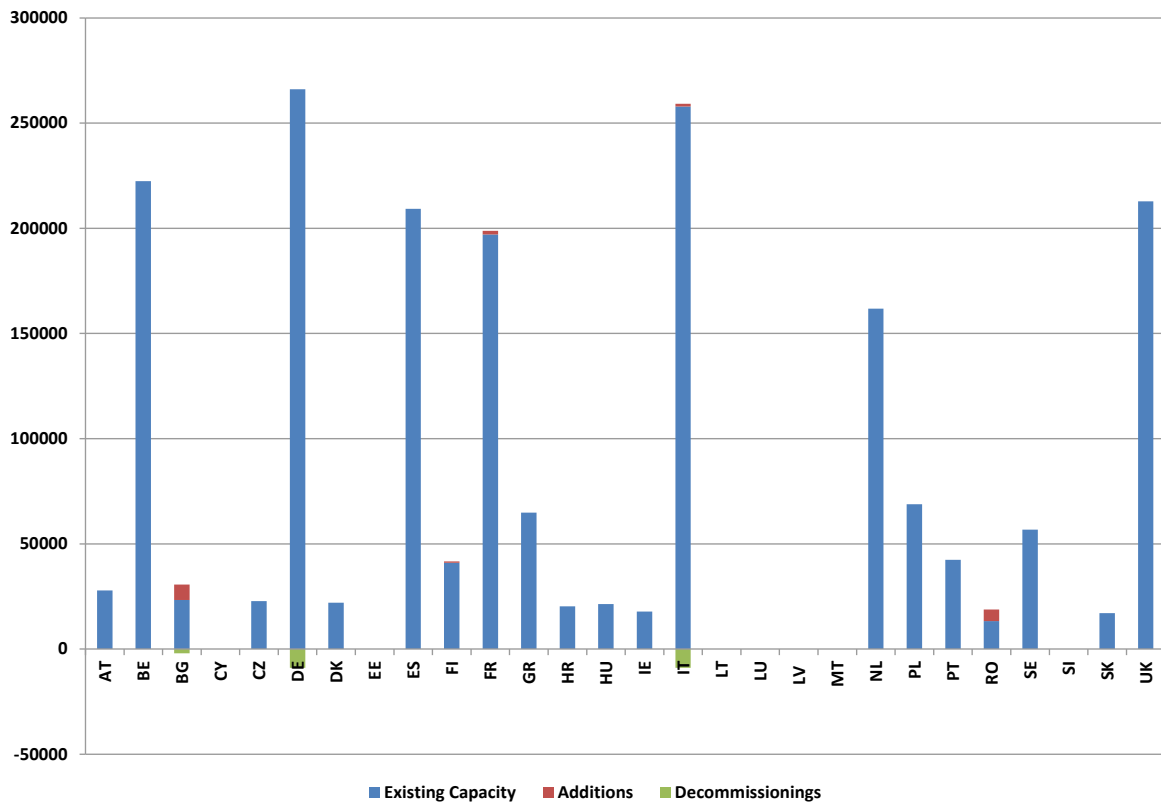
### *2.1. Oil (refining, transport and storage)*

In the oil sector, according to the notifications, no significant investments are foreseen in new refining capacities. This corresponds to the decreased demand for refined products and a general over-capacity which has been prevalent in the market for a number of years. It is notable that the investments in capacity upgrading are also limited.

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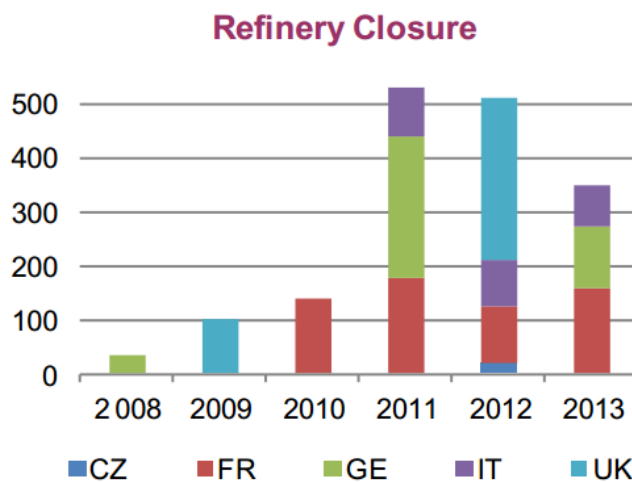
<sup>8</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012SC0367&from=EN>

**Figure 1:** Existing and planned capacity additions in Kton/y for Member States according to notifications



The main development since the last notifications in 2011 has been in the decommissioning of refining infrastructure. A considerable amount of refining capacity has closed since 2011 and this is a trend expected to continue with a number of refineries across Europe presently either idle or up for sale. In addition, there is still a considerable imbalance in refined product production that remains prevalent, namely decreased demand for refined products and a general over-capacity.

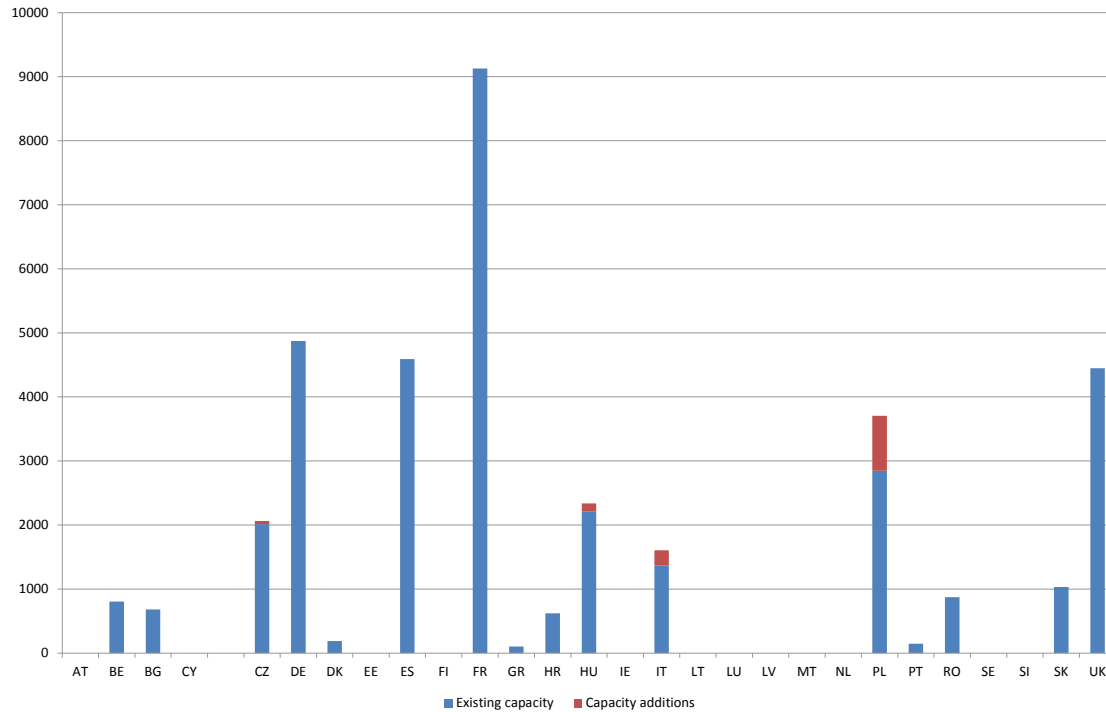
**Figure 2:** Closed refining capacity 2008-2013 (mb/d)



Source: EU refining Fourm, IEA, April 2013

Regarding the oil pipeline network, a number of projects in the East European Member States that were aimed at diversifying supply and decreasing dependence on Russian imports, have failed to make significant progress.

**Figure 3: Existing and planned additions for oil pipelines according to per Member State according to the notifications in kilometres (KM)**

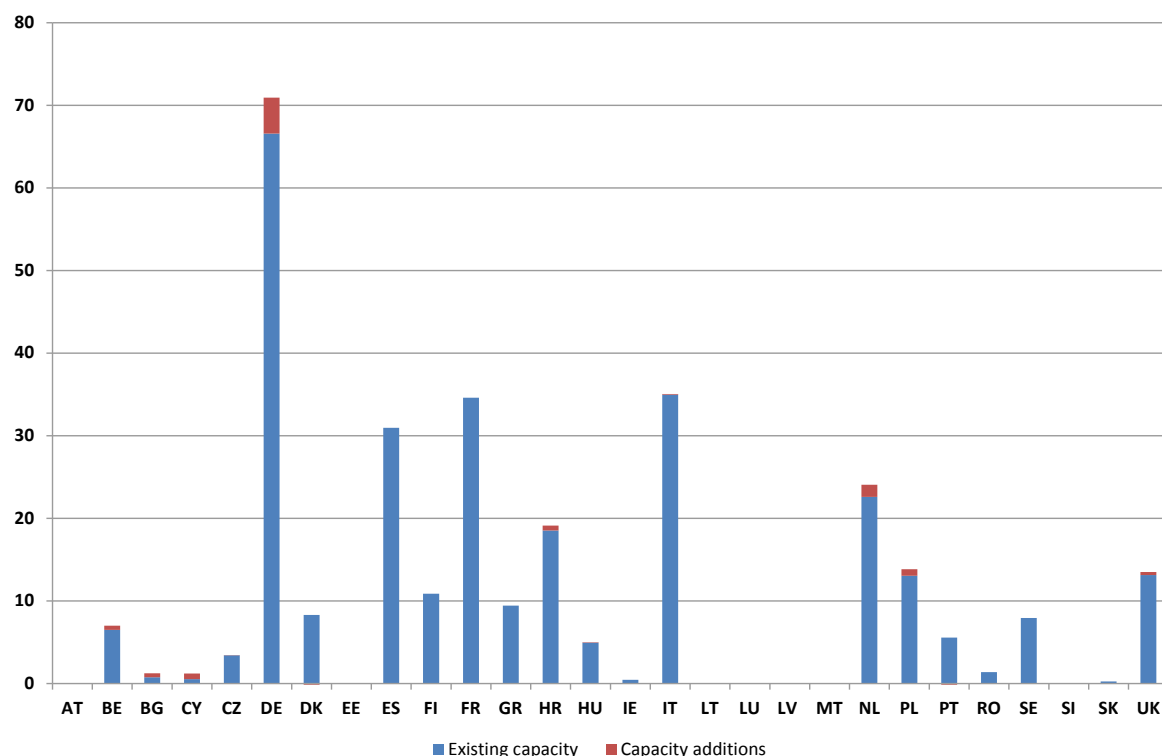


Member States have however continued to invest in oil storage infrastructure and to develop storage capacity. The main issue highlighted by the study in this respect is that such storages should match the continuing changes in crude and/or petroleum product demand.

Council Directive 2009/119/EC of 14 September 2009<sup>9</sup> imposes an obligation on Member States to maintain minimum stocks of crude oil and/or petroleum products. According to the Regulation, Member States must maintain a total level of oil stocks corresponding, at the very least, to 90 days of average daily net imports or 61 days of average daily inland consumption, whichever of the two quantities is greater. Given that overall demand for oil products is falling in most Member States, notifications allow to suggest that no major investments regarding storage capacity are planned.

<sup>9</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:265:0009:0023:EN:PDF>

**Figure 4:** Existing and planned additions for oil storage capacity per Member State according to the notifications O4 (Gton)



Despite the fact that a number of inputs for the oil section of the notifications were not completed accurately or were missing, the consultant concluded that due to the declining prospects of the European refining industry, in oil sector the EU seems positioned to meet demand with the present and proposed capacity for the next decade and only minor additional investments could be forecasted.

## 2.2. Gas (transmission, LNG terminals and storage)

For gas sector in particular, many Member States have chosen to provide the ENTSO-G data instead of filling in the notifications. Furthermore, in some cases the data in the notifications is deficient compared to the ENTSG data, which includes both FID and non-FID projects and also identifies the specific projects rather than listing aggregate numbers.

The European gas market has been characterised by sedate demand in the period 2011-2013. Demand in Europe fell to 514 BCM in 2012, this is the second year of a decline in gas demand and overall demand is down 10% since 2010.<sup>10</sup> The share of natural gas in the European final energy consumption represents 21.9%<sup>11</sup>. Despite the decrease in demand, the imports of natural gas have increased, leading to higher import dependency. The gas import dependency of the EU increased from 43.5 % in 1995 to 62.4 % in 2010 and 67% in 2011<sup>12</sup>.

<sup>10</sup> IEA World Energy Outlook 2013.

<sup>11</sup> [http://ec.europa.eu/energy/publications/doc/2013\\_pocketbook.pdf](http://ec.europa.eu/energy/publications/doc/2013_pocketbook.pdf)

<sup>12</sup> [http://ec.europa.eu/energy/publications/doc/2013\\_pocketbook.pdf](http://ec.europa.eu/energy/publications/doc/2013_pocketbook.pdf)



**As indicated already in the 2011 Assessment of energy infrastructure, a single-source dependency prevails in Northern and Eastern Europe, with varying degrees of import dependency. Certain Member States find themselves on a ‘gas island’ as they have no or insufficient infrastructure connections with the rest of the EU (in particular the three Baltic States, Finland, Romania and Bulgaria). Consequently, gas sources and routes need to be diversified by building new interconnectors. Investments in reverse-flow infrastructure, interconnections, increased storage capacity and additional LNG terminals are also needed to address the security of supply challenges, as highlighted in the recent Communication by the European Commission on European Energy Security Strategy<sup>13</sup>. Such investments are also needed to increase market integration and competition.**

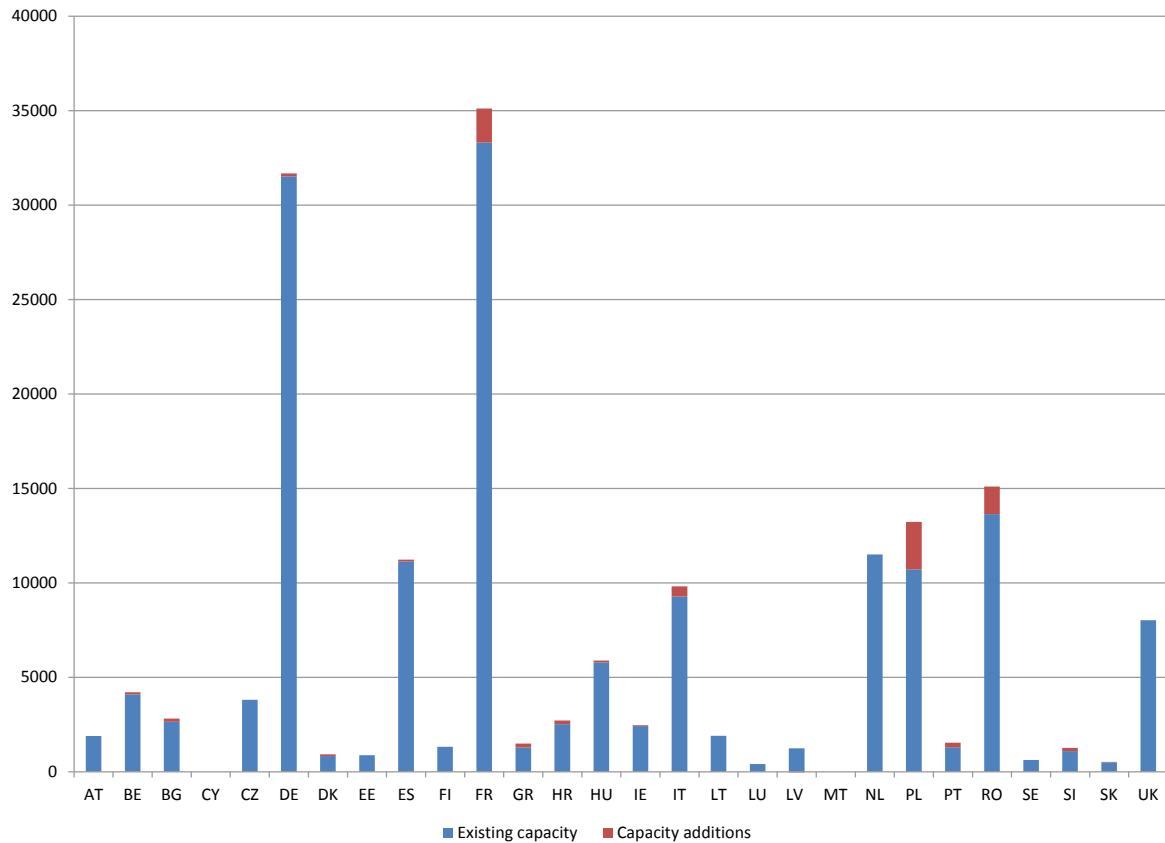
**While many countries chose not to submit additional data concerning gas transmission pipelines, having indicated that the data had been previously provided for ENTSOG, for majority of countries notifications correspondent to the benchmarking data from ENTSOG. Only exceptions are Italy, which reported considerably shorted length of the existing infrastructure as in the ENTSOG data (9.277 km according to the notifications; 32.093 km according to ENTSOG), and France, which reported 33.309 km in its notification, while 37.121 km were indicated in the ENTSOG database.**

**The figure below shows that according to the notifications there are relatively minor additions to be expected in the gas transmission pipelines across the EU. Poland and France have indicated the largest increases, with Romania also indicating that there are due to be capacity increases in the 5 year period.**

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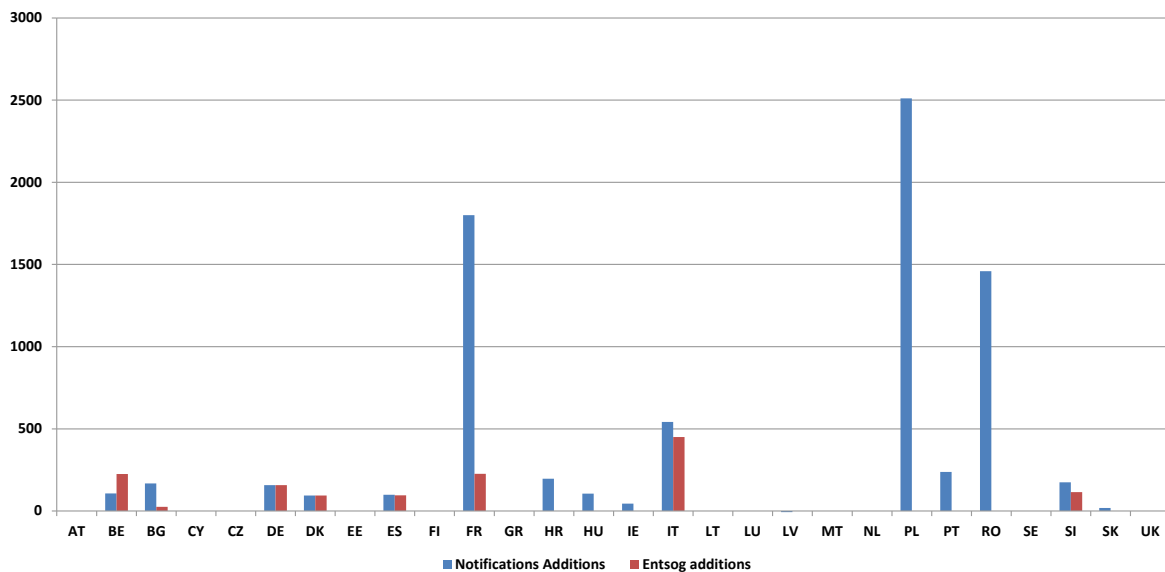
<sup>13</sup> [http://ec.europa.eu/energy/doc/20140528\\_energy\\_security\\_communication.pdf](http://ec.europa.eu/energy/doc/20140528_energy_security_communication.pdf)

**Figure 5: Existing and planned additions for gas transmission pipelines per Member State according to the notifications (KM)**



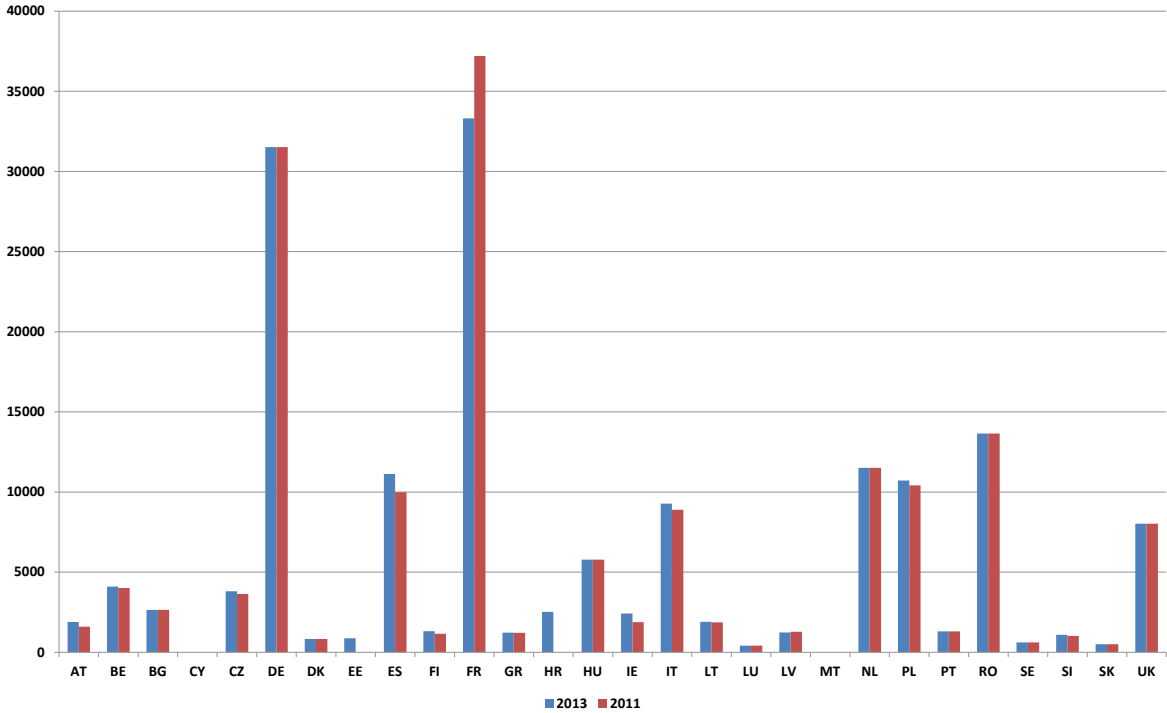
The capacity additions correspond fairly well with the notifications for the majority of the Member States; however there are significant differences between the ENTSOG and notifications data regarding the additions. As the next figure shows, there are considerable differences in terms of FID additions in the cases of France, Poland, Portugal and Romania.

**Figure 6: Comparison of notifications and ENTSOG planned additions for gas transmission pipelines per Member State (KM)**



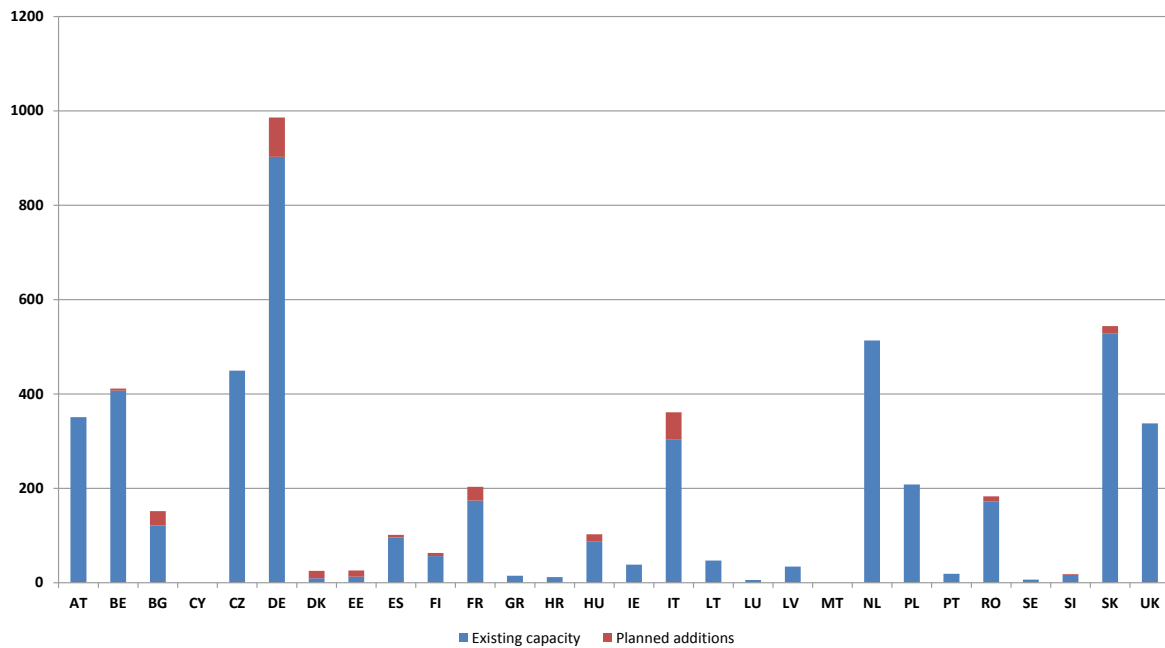
As shown in the table below, with regard to additions to the pipeline infrastructure since the last notifications were undertaken in 2011 there has not been too much additional capacity added to the gas transmission pipelines. France has notified the largest difference and appears to have decreased its national transmission by 3891 km, what could be related to some reporting inaccuracies or use of different definitions.

**Figure 7:** Comparison of 2013 and 2011 notifications for existing pipeline length per Member State (KM)



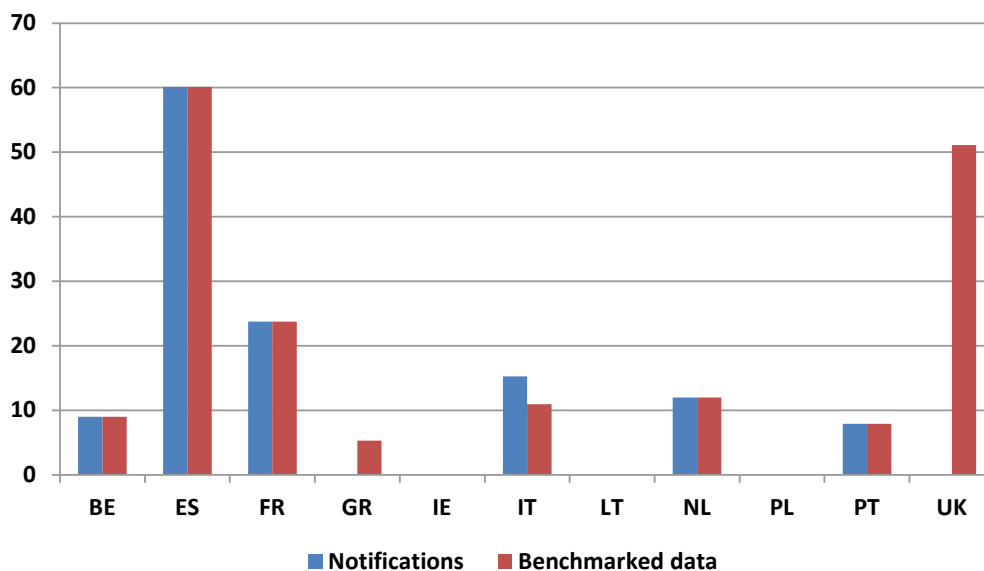
In terms of cross border transmission projects and, in particular, projects that are meant to diversify Europe's gas supply, there are numerous projects listed in the notifications, but few that appear to be at FID stage according to the benchmark data. Due to insufficient data reported in the notifications, the table below is based on the ENTSOG data.

**Figure 8:** Existing and planned additions for cross-border gas transmission capacity into the Member States according to ENTSO-G



Concerning LNG facilities, the notifications show relatively small investments in the period 2011-2013, which corresponds with the existing suppressed demand and over capacity in these markets. However, there is considerable LNG infrastructure under construction at present - capacity additions are proposed or under construction in Belgium, Spain, France, Greece, Italy, Lithuania, the Netherlands and Poland. A number of other countries mentioned LNG projects but these appear not to have reached the FID stage.

**Figure 9:** Existing LNG capacities for Member States according to notifications and benchmark (BCM)



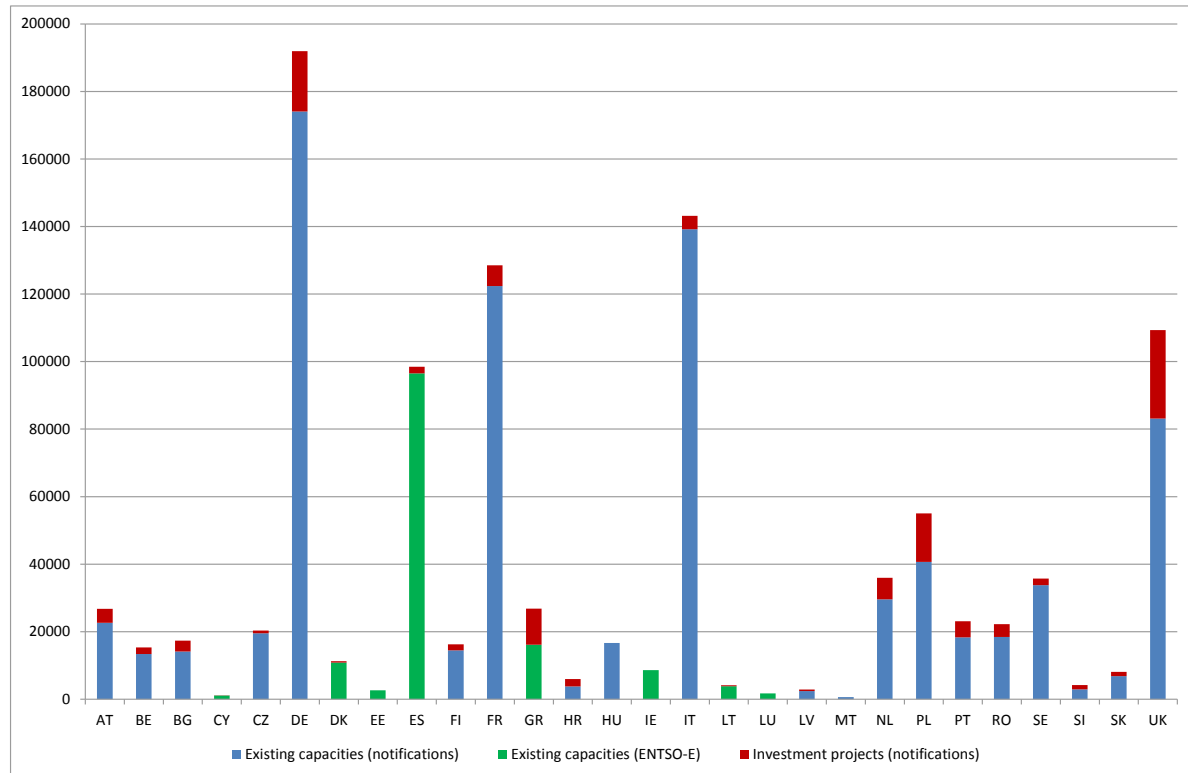
Gas consumption for power production may bounce back and gas could have an increased role as a complementary energy source for renewables, therefore potential investments should be closely monitored.

### 2.3. Electricity (generation and transmission)

Electricity demand across EU has not increased since 2007 largely due to the financial crisis. According to the consultant's analysis, there is currently an overcapacity in electricity generation of at least 10%. This is expected to maintain the electricity wholesale prices at the same level for most of the rest of the decade. Generation projects with renewables, particularly solar and wind energy are substantially underreported in the notifications due to a minimum project size threshold in the Regulation below which a project does not have to be notified.

According to the notifications, most Member States are investing in their electricity generation capacity. Total planned investments in 24 out of the EU-28 countries amount to 116 GW as compared with the 125 GW reported in the notifications of 2011. This apparent decrease may be down to the fact that four countries have not reported their investment plans in 2013.

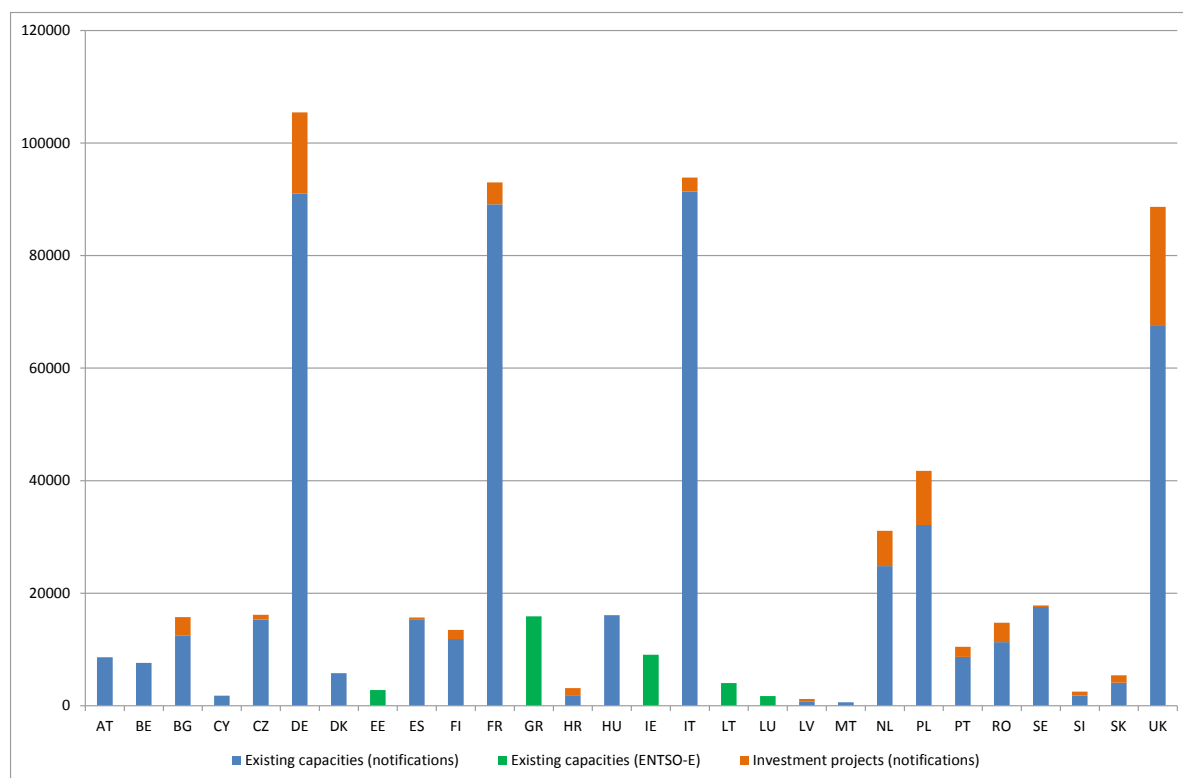
**Figure 10: Existing and planned electricity generation capacity (MW)**



Existing capacity at 1/1/2013. Investment projects at 31/3/2013.  
 Source: Notifications from Member States under Council Regulation 617/2010 and Commission Regulation 833/2010  
 Missing or incomplete notifications from DK, EE, GR, IE, LT and LU were replaced by data from ENTSO-E (2013).

The following charts provide details on the energy source used for electricity generation. Generation based on fossil fuels is shown in chart E1-1. It shows that Bulgaria, Germany, The Netherlands, Poland, Romania and especially the UK are planning to expand their conventional generation capacity substantially in the coming years. This is primarily due to replacing old and obsolete conventional power plants.

**Figure 11: Existing and planned electricity generation capacity from fossil fuels (MW)**



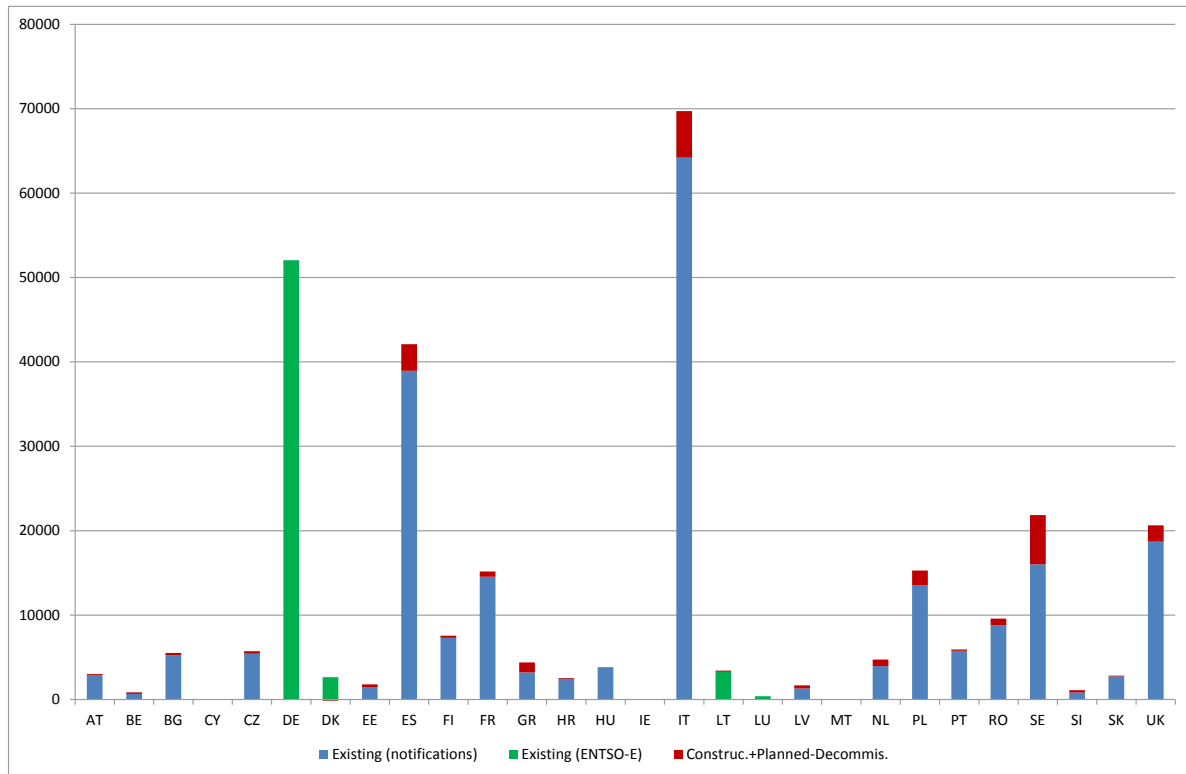
Existing capacity at 1/1/2013. Investment projects at 31/3/2013

Source: Notifications from Member States under Council Regulation 617/2010 and Commission Regulation 833/2010. Missing notifications from EE, GR, IE, LT and LU were replaced by data from ENTSO-E (2013).

Concerning renewables, the notifications show that planned investments in 2013 amounted to 32 GW. This decrease compared to the notifications of 2011 (40 GW) is expected to be mainly due to the missing notifications in 2013. In both cases there is a substantial underestimation of the total expected amounts. This is considered to be an effect of the reporting thresholds in the notifications which are set at 10 MW for PV projects and 20 MW for wind farms.

According to notifications, most Member States will expand their national transmission network, which is in line with the announced grid reinforcements needed to cope with increasing demand and supply, and the take-up of renewables and variable generation. National transmission grid size will be increased by about 12% with a total of around 22,000 km of additional lines. The total length of the transmission line expansion is substantially below the 2011 figure of 28,000 km probably down to a lack of reporting in case of a number of Member States. For those countries which reported in 2013, the growth figure is in line with the 2011 notifications which showed an 11% increase. Large increases in the planned additions compared to the previous notifications will take place in Italy (5500 km) and Sweden (5824 km).

**Figure 1: Existing and planned electricity transmission capacity per Member State (km)**

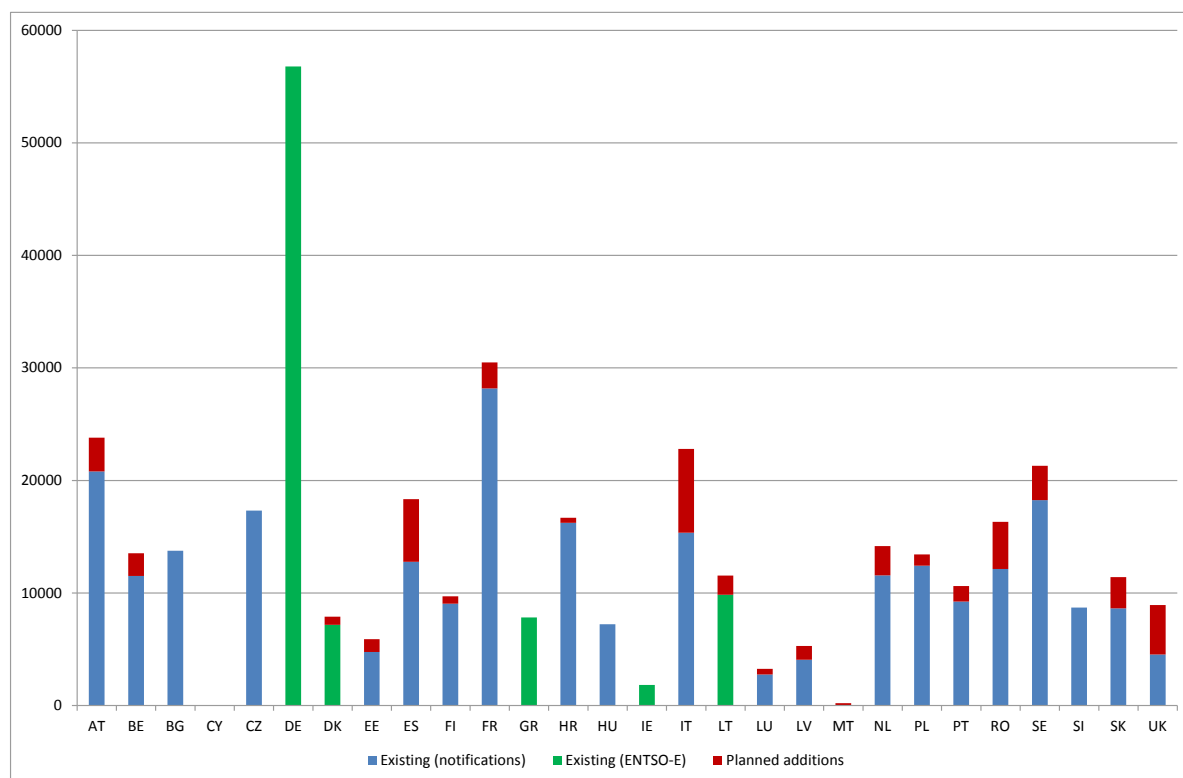


Existing capacity at 1/1/2013. Investment projects at 31/3/2013.

Source: Notifications from Member States under Council Regulation 617/2010 and Commission Regulation 833/2010. Missing notifications from DE, DK, LT and LU were replaced by data from ENTSO-E (2013)

The growth in the total length of the planned transmission network expansions in the notifications amount to 12% over a period of 6 years. This is slightly higher than the growth rate which is expected by ENTSO-E for the European transmission network in the TYNDP of 2012, which is 17% over 10 years. **However, at the level of the individual countries, the differences between the notifications and the TYNDP findings are often large.** Extensive analysis by ENTSO-E shows that the network expansions as planned in the TYNDP are expected to keep congestion in the European transmission network limited to an acceptable level. From the notifications, the grid transfer capacity is expected to increase by 17% in the coming years.

**Figure 13: Existing and planned cross-border electricity transmission**



Existing capacity at 1/1/2013. Investment projects at 31/3/2013.

Source: Notifications from Member States under Council Regulation 617/2010 and Commission Regulation 833/2010, and ENTSO-E, YS&AR, 2012 replacing missing notifications for: DE, DK, GR, IE, and LT

#### 2.4. Biofuels (production)

Notifications by Member States indicate that the vast majority of biofuels are produced and consumed in five countries; France, Germany, Italy, Spain and the UK. Investments are on a more modest scale than previous years and some countries, for example Spain plan to decrease their capacity significantly due to overcapacity in the market.

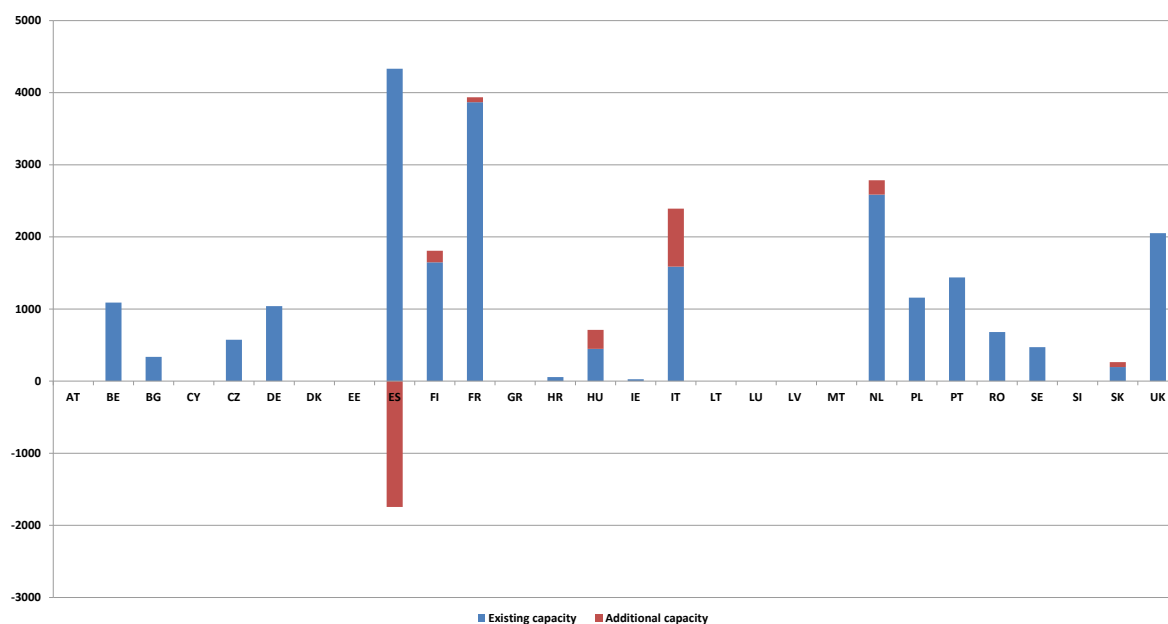
The two main types of biofuels used in the EU are bioethanol and biodiesel, with biodiesel accounting for 79.1% of total energy content consumption and bioethanol accounting for 19.9%<sup>14</sup>. Since the last notifications in 2011 production in the EU has only seen very modest further expansion. Nevertheless, decommissioned capacity is limited to Hungary and number of countries plan to increase their capacity due to the 10% target for the transport sector in the EU Renewable Energy Directive<sup>15</sup>.

<sup>14</sup> Biofuels barometer, 2013 (Full Study)

<sup>15</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0028&from=EN>



**Figure 2: Existing and planned additions for biofuel production capacity per Member State according to the notifications (B1)**



### *2.5. Carbon Capture and Storage (transport and storage).*

Data on Carbon Capture and Storage (CCS) projects in Europe was provided by only 2 countries, France and the Netherlands. These notifications were compared to the database of the Global CCS Institute, which (apart from two active CCS projects in Norway) mentions several planned CCS projects across Europe, namely in the United Kingdom, the Netherlands, France, Italy, Spain and Romania. No projects, however, are stated to have FID decisions to be made in 2014. Furthermore, according to this database, operational CCS pipeline projects are limited to Lacq in France and the OCAP pipeline in the Netherlands, which, however, lists the OCAP pipeline as planned FID in the notifications, but not as an existing infrastructure.

## **3. REPORTING OBLIGATIONS**

### *3.1. Future gaps*

Regulation 256/2014 obliges the EU Member States to report on planned and existing energy infrastructure as it is crucial for **identifying potential future gaps between energy demand and supply at the Union level. Such analysis is key in helping to steer the infrastructure investments where it most needed, ensuring effective functioning of the internal market and increasing security of supply across the EU.**

**On the basis of qualitative reasoning and supported by information in relevant literature and related studies the consultant's report aimed at providing qualitative gap analysis for energy investments in Europe. The gap analysis in the study focused on the identified differences between the demands for the four energy fuels from 2013-2025 with the exclusion of CCS, as these infrastructure projects are not in enough advanced stage to be assessed in this manner. The gap was analysed for oil, gas, electricity and biofuel sectors, and subsequently linked to the planned additions to determine whether or not the gap is likely to be bridged. Due to the insufficient data provided in the notifications and issues in reliability of this data, the gap analysis obtained by the**

consultant was more basic than the ones provided by ENTSOG's or ENTSOE's TYNDPs. Consequently the notifications alone under the Regulation 256/2014 seem to be insufficient to fully identify potential future gaps between energy demand and supply.

### *3.1.1. Oil*

In Europe significant reduction in overall consumption for both crude oil and oil products is forecasted over the medium term and into the longer term. At present, oil consumption in 2012 accounted for 33% of overall gross inland energy consumption in Europe.<sup>16</sup> Overall crude demand is forecast to decrease by 14% over the period 2015-2025, according to the latest PRIMES estimates.<sup>17</sup> This is due to a number of factors such as more efficient vehicle consumption, increased substitution of oil with other forms of transport fuel and reduced consumption of oil for power generation.

Most of the oil transported into the EU is brought by means of tankers which account for 80% of imports and road distribution rather than by pipelines.<sup>18</sup> Tankers and investments in port infrastructures and terminals, however, are not included in the notifications. Pipeline transport in the EU is mostly used for crude oil, whereas rail and trucks are used for the transport of refined products.

With regard to the refining sector the IEA report predicts a long reduction in refining capacity over the 2013-2018 period by 112 thousand barrels a day.<sup>19</sup> Refining margins are under pressure and a number of refineries in Europe lack the complexity that is needed to produce the product yields demanded by the market. In addition, the traditional export markets are reducing their demand. There are also a number of countries that have forecast considerable closures of refining capacity which is in line with the continued low utilisation rates and over-capacity.

Overall there do not appear to be major gaps in the investment needs in oil infrastructure. There are however a number of areas of concern inclusive of refinery disinvestments and continuing lack of diversification in oil supply in the East of Europe. Additionally, a new reality of increased supply of refined products in Europe will require adjustments in investments product storage in the EU.

### *3.1.2. Gas*

With regards to the gas sector, the information in the notifications is not clear enough and not provided in the correct form, to make any strong conclusions about future gaps in gas infrastructure. If only the available data from notifications is analysed, it might seem that no additional investments are required in the gas sector to meet demand over the next 10 years. Biennial ENTSOG and TYNDP data is more fitted for such gap analysis for the next decade, as information provided there is more accurate and complete.

Over the last decade European gas demand has not followed a clear trend. Gas demand reached a peak in 2005 and has remained more or less stable. The ENTSOG TYNDP foresees gas demand to grow on average 1% over the 10 year horizon with the majority

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<sup>16</sup> Eurostat, 2012

<sup>17</sup> [http://ec.europa.eu/energy/observatory/trends\\_2030/doc/trends\\_to\\_2050\\_update\\_2013.pdf](http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2050_update_2013.pdf)

<sup>18</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008SC2869&from=EN>

<sup>19</sup> Medium Term Oil Market Report, IEA, 2013

of this growth emanating from power generation. It expects that growth in gas consumption in the electricity sector will increase by 33% during the next 10 years. The only countries that at present remain self-sufficient in meeting the demand for natural gas are Denmark and the Netherlands. Imports rise for all other countries, and net European imports are expected to rise from 276,001 Ktoe in 2010 to 284,343 Ktoe in 2025.

The most recent PRIMES report<sup>20</sup> has indicated that gas will play a pivotal role in meeting emission reduction targets and in the context of increased penetration of variable RES. Their estimates have gas fired generation decreasing until 2020 and then increasing and maintaining the same share until 2050. They estimate a total investment in gas power plants from 2011-2050 of 335 GW with, gas having a key role in the European energy transition to more RES.

In terms of the assessment of overall gas infrastructure capacity and necessary investment PRIMES report predicts that there will be a negative gap for gas demand over the next decade. However, currently decreasing demand might give misleading impression as infrastructure investments are needed to increase the functioning of the EU internal gas market.

The crisis in Ukraine has showed how important for Europe's energy security is to increase the number of interconnections between EU Member States to facilitate cross-border trade and to provide grated energy stability. Connecting the so called 'gas islands' to the rest of Europe remains priority which requires adequate infrastructure investments, so are various interconnection projects in the south of Europe aimed at increasing pipeline capacity. Equally, a number of EU Member States need to diversify their gas supply. According to ENTSOG's Main Report on the TYNDP 2013-2022, Member States in several regions are heavily reliant on Russian gas with 10 regions in Eastern Europe having a supply dependency of 60% or more in 2013<sup>21</sup>.

### *3.1.3. Electricity*

A phase-out of nuclear energy has been decided in a number of European countries, notably Germany, leading to the planned closure of nuclear power plants over a period of more than a decade. In some countries, the decrease in nuclear energy is compensated by a more or less similar growth in renewable electricity generation. Over the last years the share of RES in electricity has been increasing, reaching 23.5% in 2012. According to Eurelectric data, the average growth rate of installed wind capacity was +11% and for solar +24%. However, the aftermath of the economic crisis is causing a reduction in investment growth which is likely to accelerate again in the coming years. Moreover uncertainty on the regulatory framework and frequent changes to support mechanisms have negatively influenced the investment climate in some MS. Even if the EU is so far on track further efforts at improving the investment framework are therefore needed to meet the 20% RES target for 2020.

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<sup>20</sup> [http://ec.europa.eu/energy/observatory/trends\\_2030/doc/trends\\_to\\_2050\\_update\\_2013.pdf](http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2050_update_2013.pdf)

<sup>21</sup> <http://www2.nationalgrid.com/assets/0/745/746/1632/5363/c5ee88ff-cd49-490f-b0ae-bcfafb0519c3.pdf>

While again notifications from the Member States do not necessarily provide complete data, ENTSO-E's Ten Year Network Development Plan (TYNDP) serves as a rigorous exercise to assess the network expansion need for the coming decade.

The notifications show an expected growth of 11.8% in the length of transmission lines over a six-year period, based on the reported projects under construction and planned projects. When taking into account decommissioning, the growth is reduced slightly to 10.7%, or on average, 1.75% per year. According to the ENTSO-E's Ten Year Network Development Plan of 2012, 52,300 km of network additions or refurbishments are foreseen for the coming 10 years, which is more than indicated in the Member State notifications. With a total transmission network length in 2012 of 305,000 km, this amounts to a growth rate of 1.71% per year. Therefore these two sources are found to be very much in line with each other. Most likely this is due to a common source for the underlying data from most of the countries.

Transmission capacities foreseen for 2020 in the TYNDP of 2012 are deemed to be sufficient to meet the 20-20-20 targets of the EU. Since the notifications were found to be in line with the growth figure in the TYNDP, no substantial gap is foreseen in case of transmission. Developments in cross-border capacities are an integral part of the transmission grid expansion planning. Since the source of the data is of similar origin as for cross-border transmission, and no investment gap was foreseen for transmission, a similar conclusion can be drawn for cross-border transmission.

#### *3.1.4. Biofuels*

For the biofuels sector, according to the study, the gap remains positive for the time frame of 2010-2025, as there is an increase in the use of biofuels from 2010-2025. As part of Renewable Energy Directive 2009/28/EC an EU target was introduced requiring that 10% of energy in transport come from renewable sources by 2020.

### *3.2. Investment obstacles & best practices*

On the basis of Member State notifications, Regulation 256/2014 requires the Commission to identify investment obstacles and promote best practices to address them. The impact assessment in 2011<sup>22</sup> accompanying the Regulation on 'Guidelines for trans-European energy infrastructure'<sup>23</sup>, highlighted that issues related to permit-granting procedures, financing, regulatory framework and public opposition are the main barriers for energy infrastructure investments across the EU. Analysis of the notifications received in 2013 indicates that these obstacles are still present today.

Infrastructure projects are primarily financed by the private sector, which has not fully recovered from the economic crisis and the austerity measures imposed. Consequently access to finance remains a continuing problem for infrastructure development in the EU. Furthermore, lengthy permit granting periods often unnecessarily impede projects or occasionally permanently block them.

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<sup>22</sup> SEC/2011/1233 final

<sup>23</sup> COM/2011/0658 final

To address this challenge, several measures have been undertaken by the Commission to improve the investment climate for energy infrastructure projects. Under the Energy Infrastructure Regulation<sup>24</sup> a new approach has been established, identifying Projects of Common Interest (PCIs) in 12 energy infrastructure priority corridors and areas. A list of 248 key energy infrastructure projects was adopted by the Commission on 14 October 2013 and will be updated every 2 years. Carrying the label "projects of common interest" these projects will benefit from faster and more efficient permit granting procedures and improved regulatory treatment. The agreed PCIs should result in helping most Member States to meet the 10% level of interconnectors agreed in 2002 as a share of installed production capacity.

Some PCI projects with positive externalities that transcend the mere project and can therefore not be financed completely by the market, will also have access to financial support from the Connecting Europe Facility (CEF), under which a €5.85 billion budget has been allocated to trans-European energy infrastructure for the period 2014-20. The CEF, which is providing financial aid to complete priority energy, transport and digital infrastructure, is aimed at leveraging more funding from other private and public investors. The European Regional Development Fund (ERDF) can also support investments in infrastructure for smart energy distribution, storage and transmission systems, mainly in less developed regions. This can cover investments related to both electricity and gas, provided that they contribute to the development of smart systems and are complementary to investments for supporting the shift towards a low-carbon economy. Again, the aim is to leverage more funding from other private and public investors.

Investments in energy infrastructure are capital intensive projects that require stable and predictable regulatory conditions and while investors are still risk averse, lack of stable regulatory framework can risk investors' confidence. Regarding policy and regulatory framework the tone has been set at the European level, by presenting the Policy framework for Climate and Energy for the Period from 2020 to 2030<sup>25</sup>. The 2030 Framework, set in line with the objectives of the 2050 Roadmap<sup>26</sup>, emphasised the need of EU Member States to develop further their policy frameworks to facilitate the transformation of energy infrastructure with more cross-border interconnections, storage potential and smart grids to manage demand to ensure a secure energy supply in a system with higher shares of variable renewable energy.

#### 4. CONCLUSIONS

Although data provided in the Member State notifications was often incomplete, it seems that investments in energy infrastructure are being made mostly in electricity sector. Although at present generation capacities seem to be adequate, focus on cross-border infrastructure that would enhance the internal energy market and increase security of supply as the transition of the energy sector takes shape, should remain at the focus of Member States.

There are no major investments forecasted in oil sector, what reflects a significant decrease in overall demand. Nevertheless, there remain a number of regions that require focus on investments aimed at increasing security of supply and diversification. While there are no obvious gaps in gas infrastructure investments due to decreasing demand, future investments

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<sup>24</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:115:0039:0075:en:PDF>

<sup>25</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0015&from=EN>

<sup>26</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0885&from=EN>

may be necessary, not only to replace ageing networks, but also to connect isolated areas and to prepare gas infrastructure for the application of gas in new areas, such as its use as a **flexible source of power generation to complement variable renewables or its use as a transport fuel**. This implies that investments aimed at enhancing the functioning of the internal gas *and* electricity market as well as security of supply (e.g. cross-border pipelines, reverse flows, increased storage capacities) are still highly necessary. According to the notifications and the TYNDP, significant investments have been made in the electricity sector. Nevertheless, the focus on electricity infrastructure investments should remain on cross-border connections.

The reporting exercise has demonstrated, that Regulation (EU) No 256/2014 has some limitations that should be taken into account when it will be reviewed (by 31 December 2016) in order to avoid that the administrative burden of these notifications is larger than the added value they bring. For instance, the high capacity threshold for renewable electricity generation facilities to be reported in the notifications leads to a situation where significant volumes of renewable electricity generation infrastructure created in last years are not recognised by and reported in the notifications. Equally, the majority of oil transported into the EU is in the form of shipped oil, which again is not covered by the notifications.

Furthermore, it is not always clear what kind of data should be reported in the notifications. While they are meant to include only projects listed at FID stage, it often is the case that Member States mix projects that are both FID and non-FID. Nevertheless, inclusion of non-FID projects is in some cases relevant, for instance to assess CCS infrastructure developments as in this area no projects are listed as FID. The same applies for oil pipeline projects and LNG projects, as there both FID and non-FID projects remain important for determining what the possible outcome of energy investments may be and where further of projects may be needed.

In sum, given the quality of notifications received by the Member States, Commission is only able to report on the information provided in the notifications, but not to provide definite conclusions and proper assessment of future gaps between energy infrastructure and its potential to meet demand at all times.

# ANNEXES

Table 1: Existing capacity infrastructure according to notifications 2013

Unit	Existing capacity	Oil refining Thousand tonnes/year	Oil pipelines Kms	Cross- border oil pipelines (TO) Thousand metric tonnes/day	Cross border oil pipelines (FROM)	Oil Storage Ktoe	Gas Pipelines Kms	Cross border gas pipelines (TO) Mcm/day	Cross border gas pipelines (FROM) Mcm/day	LNG Terminals Bcm/year	Gas storage Bcm	Elec Generation MW	Electransmis sion Kms	Cross border elec transm MVA+MW	Biofuel production Kton
AT															
BE		224.039,00	805,00			5.902,00	4.100,00	186,44	164,33		7,08	21.989,40	2.857,30	20.800,00	
BG		23.037,00	680,00			682,00	2.645,00	229,32	177,84	9,00	0,70	10.042,40	678,00	11.521,00	1.090,00
CY						600,00									
CZ		20.309,14	621,60	70,00	99,00	16.858,00	5.784,00	11,55	-		0,53	4.071,00	2.458,00	16.231,00	110,00
DE		22.776,00	2.014,30			3.110,00	3.810,00	185,02	264,45		2,70	17.555,00	5.417,00	17.324,00	702,00
DK		266.072,00	4.872,00	391,70		60.578,00	34.349,00	515,44	387,18		16,59	175.165,00	-		1.826,00
EE		22.087,00	187,00			7.549,00	832,00		9,46		1,03	8.183,00	-	8.670,00	
ES								12,70					1.470,00	4.758,00	
FI		41.045,00				9.889,00	1.318,00	22,47					7.315,00	9.050,00	1.648,00
FR		197.054,00	9.127,00			31.486,00	33.309,00	139,93	33,91	23,75	12,43	112.006,09	14.540,00	28.184,00	3.867,00
GR		64.906,00	103,00			9.440,60	1.219,00	15,04		5,17		14.475,60	3.210,00	7.820,00	
HR		21.420,00	2.214,00	61,70	28,40	4.502,00	5.784,00	64,82	23,86		6,33	16.646,19	3.806,84	7.230,00	448,00
HU		17.578,00				416,00	2.417,00	30,40	8,07		0,20		-		35,00
IE		257.889,00	1.369,00		124,00	31.816,00	9.277,00	289,50	19,55	15,25	11,36	121.607,00	64.213,20	15.349,00	1.588,00
IT							1.904,00	32,16	14,77				-		
LT							412,00	5,97					-	2.760,00	
LU							1.239,00	22,97	11,26		2,32	2.382,00	1.320,00	4.076,00	
LV						640,00							-		
Malta													-		
Netherlands		161.848,00		4,00		20.557,00	11.500,00	199,77	313,49	12,00	4,16	27.443,00	3.956,80	11.570,00	2.575,00
NL		68.893,00	2.846,00	74,00	137,00	11.871,00	10.717,00	124,08	84,03		1,82	38.457,40	13.564,00	12.429,00	1.350,00
PL		42.540,00	147,00			5.063,00	1.298,00	13,78	5,04	7,90	0,18	16.947,00	5.773,00	9.232,00	1.437,00
PT		13.275,00	873,00			1.264,00	13.642,00	104,56	67,23		3,10	16.517,70	8.808,00	12.138,00	680,00
RO		208.657,00	4.590,00			28.165,00	11.126,00	67,00	29,04	6,00	1,75	28.911,00	38.940,00	12.775,00	6.291,00
SE		56.715,00					620,00	6,54			0,01	31.094,00	16.020,70	18.249,00	471,00
SI							1.094,00	11,70	4,74				836,00	8.696,00	
SK		17.124,00	1.032,00	43,00	33,00	225,68	500,00	302,50			2,94	6.302,75	2.737,00	8.643,00	195,00
UK		212.841,00	4.447,00			11.956,00	8.025,00	253,26	84,57	51,10	3,70	80.114,65	18.716,90	4.536,00	2.052,00
Total		1.895.199,14	35.824,90	644,40	421,40	253.129,68	167.799,00	2.908,15	1.796,64	125,00	79,47	782.345,13	221.905,74	265.799,71	26.701,00





Table 2: Preliminary Planned additions in energy Infrastructure

Planned additions in energy infrastructure at 1/1/2013	Oil refining Thousand tonnes/year	Oil pipelines kms	Cross- border oil pipelines (TO) Thousand metric tonnes/day	Cross border oil pipelines (FROM)	Oil storage ktoe	Gas Pipelines kms	Cross border gas pipelines (TO) Mcm/day	Cross border gas pipelines (FROM)	LNG Terminals Bcm/year	Gas storage Bcm	Elec Generation MW	Electransmis sion kms	Cross border elec transm MV/AMW	Biofuel production kton
Unit	Thousand tonnes/year	kms	Thousand metric tonnes/day		ktoe	kms	Mcm/day	Mcm/day	Bcm/year	Bcm	MW	kms	MVA+MW	kton
Austria					458,00	55,00	24,06	4,46	0,20	0,69	4.125,00	157,00	3.000,00	
Belgium					199,29	83,00	21,59	31,80			1.906,70	181,00	2.000,00	
Bulgaria	5.350,00				491,40					0,45	3.250,00	256,00	-	
Cyprus					91,00	172,00					35,00	-		
Croatia						2,70					2.164,50	100,00	460,00	
Czech Rep.					3.485,00			21,05			840,00	302,00	-	
Germany										0,01	17.841,00	-		
Denmark							21,05				400,00	-428,10	715,00	90,10
Estonia											332,00		1.143,00	
Finland	600,00										1.805,00	240,00	650,00	210,00
France	1.744,00					276,00	9,36	29,41		1,46	6.170,00	625,00	2.300,00	70,00
Greece						203,50	3,20	3,20			10.677,00	1.177,05	-	
Hungary		124,00			54,60	92,00	35,68	15,90			-	29,90	-	185,00
Ireland						61,00								
Italy	1.300,00					237,00	2,23	38,34	24,00	5,91	3.981,00	5.500,00	7.460,00	404,50
Lithuania									4,00		290,00	142,00	1.700,00	
Luxembourg													500,00	
Latvia						102,00					451,00	354,00	1.212,00	
Malta													200,00	
Netherlands					1.344,98						6.389,00	789,60	2.600,00	200,00
Poland		62,50			727,09	879,00			5,00	1,18	14.368,21	1.720,00	1.000,00	
Portugal						76,00				0,12	4.739,00	147,00	1.386,00	
Romania	5.560,00					187,00	20,08	3,79		0,31	3.773,10	781,00	4.190,00	
Spain						32,00	5,36	4,91			1.947,00	3.154,00	5.570,00	
Sweden	35,00					38,00		2,23			1.259,00	273,00	-	
Slovenia						19,00	15,93	15,93		0,25	1.309,00	82,80	2.772,00	
Slovakia											26.151,67	1.930,40	4.400,00	238,00
UK														
Total	14.589,00	186,50			6.851,36	2.515,20	155,34	171,02	33,20	10,37	115.819,18	23.669,65	46.318,00	1.397,60

Table 3: Preliminary Planned additions in energy infrastructure (in % of existing capacity)

Planned additions in energy infrastructure at 1/1/2013 (in % of existing capacity)	Oil refining	Oil pipelines	Cross-border oil pipelines (TO)	Cross-border oil pipelines (FROM)	Oil Storage	Gas Pipelines	Cross border gas pipelines (TO)	Cross border gas pipelines (FROM)	LNG Terminals	Gas storage	Elec Generation	Electransmission	Cross border elec transm	Biofuel production
Unit	%	%	%	%	%	%	%	%	%	%	%	%	%	
Austria										9	18,8	5,5	14,4	
Belgium						7	2	10	2,5		19,0	26,7	17,4	
Bulgaria	14,4				70	6	32,1	59		81	24,8	4,9	0,0	
Cyprus					154						2,0			
Croatia					31	8					53,2	4,1	2,8	
Czech Rep.			4								4,8	5,6	0,0	
Germany	-3				8			5,4			10,2			
Denmark						11				6	4,9		8,2	
Estonia												22,6	24,0	
Finland	1										12,7	3,3	7,2	12
France	3					5	6,7	86		13	5,5	4,3	8,2	2
Greece						16					73,8	36,7	0,0	
Hungary		18			1	2	55	67			0,0	0,8	0,0	98
Ireland						2								
Italy	-2					6	1	2,60	157	55	3,3	8,6	48,6	25
Lithuania						5								
Luxembourg														
Latvia											18,9	26,8	29,7	
Malta											0,0			
Netherlands					7						23,3	20,0	22,5	7
Poland		30			6	23				202	37,4	12,7	8,0	
Portugal					-4	18				180	28,0	2,5	15,0	
Romania	42						19,2	5,6	17	228	22,8	8,9	34,5	
Spain							8	24,5			6,7	8,1	43,6	
Sweden											6,3	36,4	16,8	
Slovenia											46,8	32,7	0,0	
Slovakia		9	13			4				9	20,8	3,0	32,1	35
UK	-1				3		5,2				32,6	10,3	97,0	12
Total	1%	1%	2%		3%	1%	5%	10%	27%	13%	15%	11%	17%	5%