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

**Long term infrastructure vision for Europe and beyond**

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**1. Introduction: stock-taking and challenges**

**Adequate, integrated and reliable energy networks are a crucial prerequisite not only for Union energy policy goals, but also for the Union's economic strategy.** Developing our energy infrastructure will allow the Union to deliver a properly functioning internal energy market, enhance security of supply, enable the integration of renewable energy sources, increase energy efficiency and allow consumers to benefit from new technologies and intelligent energy use. Energy infrastructures are also indispensable to make the transition into a competitive low-carbon economy happen.

The European energy system is in transition. Whilst the short term priority is to **complete the internal energy market** by developing the missing interconnectors, ending the isolation of a number of Member States and by removing internal bottlenecks, the energy infrastructure planned today must, at the same time, be compatible with longer term policy choices.

**Different decarbonisation scenarios** imply different energy mixes and thus different infrastructure requirements. The Energy Roadmap 2050 outlines different scenarios how to ensure a more competitive and secure energy system while meeting the challenge of reducing carbon emissions by 80% in a 2050 perspective and provides a strong policy signal. It also identifies investments in **increasingly smart and flexible infrastructures as one of the no-regret options**. The Commission is currently preparing concrete proposals for a post-2020 framework for climate and energy policies.

Tackling the **challenges of increasingly variable low-carbon generation** while maintaining high standards of security of supply is far cheaper if done at European level through integrated markets, for which adequate infrastructures are a prerequisite, compared to the overall cost of fragmented national policies. In the longer term, high-voltage long distance and new electricity storage technologies must be developed to accommodate ever-increasing shares of renewable energy, from the Union and from its neighbourhood.

It is crucial to improve the **diversification of gas supplies** so that no Member State would be dependent on one single supply source. It is also important to significantly increase the gas system's flexibility and resilience in the short and medium term to support gas' role as a **back-up fuel** for variable electricity generation while keeping in mind the Union's long-term decarbonisation objective, but also to be able to benefit from the recent developments in the **LNG markets, biogas and unconventional resources**, in particular in the US. A well-integrated gas network is also the best guarantee to compensate for a possible failure of the largest gas infrastructure in any Member State, an obligatory standard introduced by the gas security of supply regulation<sup>1</sup>.

It is estimated that up to 2020 about 200bn euro investments are needed to upgrade and expand European energy networks to make them the central enabler of all our medium and long-term policy goals. This impressive figure, however, can entail important savings of up to

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<sup>1</sup> N-1 standard, see Regulation (EU) No 994/2010, OJ L 295, 12.11.2010, p. 1–22

40-70bn euro<sup>2</sup> on an annual basis by 2030 in terms of avoided generation costs and more competitive gas wholesale prices, translating into **7-12 euro savings in the monthly bills**. This could greatly contribute to counterbalance the increase of energy prices and improve the Union industries' competitiveness.

The long-term energy infrastructure policy was first outlined in the **Communication on Energy infrastructure priorities for 2020 and beyond** – a blueprint for an integrated European energy network<sup>3</sup> and successively enshrined in the recently adopted Regulation on **Guidelines for trans-European energy infrastructures**<sup>4</sup> (TEN-E Guidelines) which identify nine strategic geographic infrastructure priority corridors in the domains of electricity, gas and oil, and three Union-wide infrastructure priority areas<sup>5</sup> for electricity highways, smart grids and carbon dioxide transportation networks, the implementation of which is the Union's common short and long-term priority.

This Communication outlines a **long-term vision for a pan-European energy infrastructure**. The **first set of Projects of Common Interest (PCIs)** is an important step towards the better integration of Member States' networks and making sure no Member State remains isolated, in facilitating integration of renewable energy sources across the Union, in diversifying sources of gas supply by opening new gas corridors, and in offering alternatives to Member States dependent on a single source of oil or gas supply.

But much more still needs to be done. The **first Union list of PCIs is just the first step towards the implementation of the longer term infrastructure vision**. The PCI list will be reviewed every two years with a view to integrating new projects, so as to fully implement the twelve priority corridors and areas in the direction of the long-term vision of a pan-European market integration and low-carbon transition. In particular, the Union must make sure that the remaining energy islands are integrated as soon as possible, but also that the emerging Northern Seas off-shore grid is expanded and further developed through the electricity highways into a truly pan-European electricity system. At the same time, the Union must make sure that the neighbouring countries are effectively integrated with the Union through adequate infrastructure networks and regulatory frameworks in line with the strategy outlined in the Communication on security of energy supply and international cooperation<sup>6</sup>.

## **2. Union list of projects of common interest**

As a first step to the implementation of the TEN-E Guidelines, the **Commission has adopted, under the delegated act procedure, the Union list of about 250 projects of common interest**<sup>7</sup> in electricity and gas transmission, storage and LNG, as well as in smart grids and in oil. This first list is based on the intensive work of twelve regional groups, which brought together the representatives of the Member States, national regulatory authorities, project promoters as well as the European networks of transmission system operators for electricity and gas (ENTSO-E and ENTSOG), the Agency for Cooperation of Energy Regulators and the Commission.

The majority of the projects of common interest are in the field of **electricity**, prevalently transmission lines, fourteen storage projects and two smart grids projects. They will contribute to the better integration of the internal electricity market, enhance the preparedness

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<sup>2</sup> Study on the Benefits of an integrated European energy market, 2013, Booz&Co; [http://ec.europa.eu/energy/infrastructure/studies/doc/20130902\\_energy\\_integration\\_benefits.pdf](http://ec.europa.eu/energy/infrastructure/studies/doc/20130902_energy_integration_benefits.pdf)

<sup>3</sup> COM (2010) 677 final

<sup>4</sup> Regulation (EU) No 347/2013, OJ L, 25.4.2013, p.39

<sup>5</sup> See Annex I.

<sup>6</sup> COM(2011) 539 final

<sup>7</sup> C(2013) 6766 final

of the grid to take up increasing amounts of energy from variable renewable sources and maintain system stability at the same time. While the Union will come closer to the achievement of the 10% electricity interconnection target advocated by the Barcelona European Council in 2002, still more projects need to be identified for the true integration of the Iberian Peninsula within the European market.

The implementation of the projects of common interest in the field of **gas** will allow the Union to diversify its gas sources, end the single source dependency of several of its Member States and also increase choices and reduce uncertainty in the market. The opening of the Southern Gas Corridor through the Trans-Adriatic Pipeline as of 2018 is an important milestone. It must be complemented by timely implementation of the other projects identified, notably the Trans-Anatolian Pipeline, in order to enhance security of supply throughout the region and by further diversification by tapping on the gas resources in the Eastern Mediterranean region.

**The timely implementation of the projects of common interest is a common priority.** That is why the TEN-E Guidelines introduce strict requirements on the permit granting process for PCIs, including binding time limits for the permit process (in general 3.5 years), the establishment of a national 'one-stop-shop' for permit granting, early and effective public consultations and a requirement for the Member States to streamline environmental assessment procedures. These requirements are aimed at accelerating the permitting process, whilst respecting the strict standards of the Union environmental acquis. The Commission services dealing with energy and environment have jointly prepared a **guidance document**<sup>8</sup> in order to support Member States in defining adequate legislative and non-legislative measures to streamline environmental assessment procedures and to ensure coherent application of these procedures required under Union law with regards to PCIs.

The Union list contains PCIs in different stages of their development. Some are still in the early phases, therefore studies are still needed to demonstrate that the project is feasible. The inclusion of such projects in the Union list of PCIs is without prejudice to the outcome of relevant environmental assessment and permitting procedures. If projects included in the Union list of PCIs turn out not to be in compliance with the EU acquis, they should be removed from the Union list.

A sufficiently attractive framework for long term financing, including **adequate regulatory incentives and long-term regulatory certainty (incl. cross-border cost allocation)** is a pre-condition for infrastructure development. The sector is fundamentally changing and requires accelerated investment pace which poses high cash flow needs. The evaluation methods by investors will need to adapt to successfully reap such investment opportunities and contribute to the future. The **Connecting Europe Facility** will play a key role in leveraging the necessary private and public funding.

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<sup>8</sup> [http://ec.europa.eu/energy/infrastructure/pci/doc/20130724\\_pci\\_guidance.pdf](http://ec.europa.eu/energy/infrastructure/pci/doc/20130724_pci_guidance.pdf)

Next steps for PCIs:

- Launch an investors' dialogue to promote investment in European infrastructures to attract the necessary financing from the global capital markets
- Monitor the appointment of national one-stop-shops (starting December 2013)
- First call under the Connecting Europe Facility in 2014
- Monitor the implementation of the permit granting measures
- Monitor closely the implementation of the PCIs (first reporting in 2015)

### 3. Remaining challenges and longer term infrastructure vision

The projects of common interest identified in this first round mainly focus on completing a borderless internal energy market, with only few projects of common interest affecting neighbouring countries or beyond. Once the internal bottlenecks are being removed, **the Union can effectively engage with and provide a larger market place for energy produced and consumed in the Union and in the neighbouring countries.** Every two years, the process of project identification will be launched to cater for new emerging projects geared to fulfil future needs.

Further work must focus on integration of ever increasing shares of energy from variable renewable sources while maintaining security of supply and minimising the risk of stranded assets. In electricity, about 40% more transmission capacity is needed by 2020 to fully reap the benefits of integration compared to 2010 and this pace is not expected to slow down in the subsequent decade (105% to 146% additional capacity needed compared to 2010 levels, depending on the policy scenarios)<sup>9</sup>. One of the main challenges for the mid- and long-term is to further understand and plan the interaction between the different grids, the electricity and gas systems, as well as transport of carbon dioxide, and to improve cross-sectoral coordination and optimisation. We know that the increasing variability of electricity generation from renewable sources poses a flexibility challenge also for the gas system, which could provide not only important back-up generation, but in the future also large-scale electricity storage. These interactions need to be taken into account in **future pan-European infrastructure planning.**

One of the objectives of the Union is to **further improve interconnections with neighbouring countries.** Already this first list of projects of common interest includes some links to non-Union countries, while there is increasing possibility in the future to identify more and more such projects either as projects of common interest or **projects of mutual interest**, for the latter of which the policy and – if needed – legal framework still needs to be explored and developed.

Similarly to the PCI process within the Union, the Energy Community has also engaged in the identification of so-called **Projects of Energy Community Interest (PECI)s** which are scheduled for adoption by the Ministerial Council in October 2013. The candidate projects for this list have been collected via an open call for proposals and have been assessed by a dedicated Task Force of the Energy Community against a set of criteria very similar to those of the PCIs (security of supply, market integration, enhancement of competition and facilitation of renewable energy use). Due to the geostrategic importance of its Contracting

<sup>9</sup> Study on the Benefits of an integrated European energy market, 2013, Booz&Co.

Parties and its continuous progress towards the integration with the internal energy market, the Energy Community plays an important role in the Union's infrastructure planning. The decision of the Ministerial Council on the list of PECIs will deliver the much needed political endorsement, with a view to facilitate their regulatory treatment and to provide a positive signal for potential investors. The completion of the PECIs is key for market opening, security of supply and sustainability in the wider region.

In May 2012, the "**MED-TSO**" has been established as a platform for the co-operation of transmission system operators around the Mediterranean to work better towards the objective of developing a master plan for an integrated network in the South and for linking the electricity systems of both sides of the Mediterranean along three route paths in the Western, Central and the Eastern Mediterranean area. This Infrastructure Master Plan, which will include the identification of a set of priority infrastructure projects that will be conducive to the goal of more integrated Mediterranean electricity systems, will be presented by the Euro-Mediterranean Ministerial meeting on energy in December 2013.

(a) *Remaining priorities in electricity*

In **electricity**, the areas which will require further projects and technological development are:

- Further increase the interconnection level between the **Iberian peninsula** and the rest of the continent to fully benefit from an optimal allocation of electricity generation from renewable sources. In the longer term, further connections with Northern African countries should be explored.
- Implementation of the **Baltic energy market interconnection plan**, with the future **synchronisation** of the Baltic electricity system with the ENTSO-E system.
- Further expanding a truly **meshed off-shore grid** in the Northern Seas. While the current list of projects of common interest does include about 20 interconnectors and relevant internal reinforcements, there is only one grid-ready off-shore hub involving anticipatory investments as a forerunner for the future integrated off-shore grid. The technology challenges are being pursued by major manufacturers in this area. The design and coordinated development and management of the future meshed grid and storage solutions, as well as appropriate regulatory and financing solutions remain to be developed. The abundant geothermal storage resources in Iceland should also be looked at in the longer term.
- More and more electricity will have to be transported over increasingly longer distances within and from outside Europe. Removing or preventing bottlenecks through the construction of high-capacity **electricity highways** remains a focus for the future. Such electricity highways would include links beyond the Union borders, connecting the Energy Community, Turkey, Russia as well as the North African and Eastern Mediterranean countries with the Union, as well as links to import electricity from the sub-Saharan area in the longer term, while also taking into account the possible evolution of distributed generation and demand-response. While some of the PCIs, such as the German North-South connections, may be considered as forerunners for this priority area, the design and coordinated development of Union-wide electricity highways as well as the technological challenges remain to be solved.
- The first PCI process has identified only two projects in the field of **smart electricity grids** which intelligently enlarge the area of consumption to better align with the provided generation and thus demonstrate that it is possible to ease tension in the electrical system by the cooperation of DSOs and TSOs while bridging across

national borders. It is a new challenge for – so far – locally oriented and distribution-centred smart grid developers to establish vertical (distribution and transmission level) co-operation whilst crossing national borders at the same time. More determination will be needed in the deployment of smart grid technologies as smart grids provide promising results in the managing of distributed and variable generation from renewable sources, offering new customer side services, thus complementing traditional infrastructures.

The **Horizon 2020 Research and Innovation Programme** includes activities to facilitate the development of a pan-European electricity grid that have been developed and will be implemented through strong synergies with the Union's electricity infrastructure policy. They will address among others the technological challenges posed by the medium- and long-term infrastructure needs, in particular, the development, demonstration and market uptake of innovative grid technologies to support the implementation of the Northern Seas off-shore grid priority corridor, the electricity highways and smart grids. The **Connecting Europe Facility** can successively contribute to the industrial-scale roll-out of such technologies.

*(b) Remaining priorities in gas*

In **gas**, the long term objectives remain a sufficiently diversified gas infrastructure to facilitate safe supplies to the Union under attractive framework conditions. While the investments in the current PCIs may broadly cover the long-term infrastructure needs, nevertheless a number of **expansions** will be necessary:

- Europe needs to continue efforts to diversify its supplies and to further **expand the Southern Gas Corridor** in order to increase the diversification of supplies in particular in South-East Europe and to achieve the medium-term political target to import about 10% of European demand from the Caspian region and the Middle-East.
- The gas system must further increase **flexibility** to respond to the needs of variable gas use, including through the development of more LNG terminals and storages.
- Europe needs to promote **indigenous** production and, as a first step, assess a more systematic recourse to on-shore and off-shore indigenous sources of energy with a view to their safe, sustainable and cost-effective exploitation, be it from new fields in the Eastern Mediterranean, from biogas or unconventional sources insofar as they meet the highest standards imposed by Union environmental legislation. All options to transport gas from Eastern Mediterranean to the Union should be kept open, from the already identified PCIs consisting of bringing Cyprus gas as LNG or through a pipeline to Europe. All potential routes should be considered and assessed both from an energy security point of view and from the point of view of their relative economic costs and benefits.

*(c) Longer term carbon-dioxide networks*

Due to favourable market conditions for coal and coal-fired power generation, the share of coal is again rising in the Union energy mix. Latest developments in the field of carbon capture and storage have been less encouraging as several carbon capture and storage projects seem to stall due to unfavourable economic conditions. The Union should pursue its efforts to develop a pan-European vision for a **carbon-dioxide transport network** and identify first cross-border projects, in cooperation also with Norway.

Next steps towards implementing the longer term infrastructure vision:

- Prepare for the identification of projects of common interest in view of the review of the Union list in 2015 and beyond;
- Pursue discussions with the neighbouring countries on further integration of networks and the adequate regulatory frameworks, in particular in the framework of the Energy Community and of the MED-TSO;
- Ensure adequate support to the PECIs and other projects deemed of mutual interest under relevant Union financial frameworks;
- Explore how to best implement the concept of projects of mutual interest.

#### **4. Conclusions**

This initial list of projects of common interest is just the first step within a longer term infrastructure vision. The Union, including countries from the European Economic Area, should work together in completing the single market for energy, removing all barriers to the transmission of energy, including from renewable sources while maintaining its high standards of supply security. However, the Union's energy and hence energy infrastructure vision is far broader than just the internal market. Close co-operation should continue with members of the Energy Community, neighbouring countries and strategic energy partners to develop projects of mutual interest. The tools are there (third package and TEN-E Guidelines), all this can be achieved step-by-step within a stable and attractive long-term framework for infrastructure investments.

## 1. PRIORITY ELECTRICITY CORRIDORS

(1) Northern Seas offshore grid ('NSOG'): integrated offshore electricity grid development and the related interconnectors in the North Sea, the Irish Sea, the English Channel, the Baltic Sea and neighbouring waters to transport electricity from renewable offshore energy sources to centres of consumption and storage and to increase cross-border electricity exchange.

(2) North-South electricity interconnections in Western Europe ('NSI West Electricity'): interconnections between Member States of the region and with the Mediterranean area including the Iberian peninsula, notably to integrate electricity from renewable energy sources and reinforce internal grid infrastructures to foster market integration in the region.

(3) North-South electricity interconnections in Central Eastern and South Eastern Europe ('NSI East Electricity'): interconnections and internal lines in North-South and East-West directions to complete the internal market and integrate generation from renewable energy sources.

(4) Baltic Energy Market Interconnection Plan in electricity ('BEMIP Electricity'): interconnections between Member States in the Baltic region and reinforcing internal grid infrastructures accordingly, to end isolation of the Baltic States and to foster market integration inter alia by working towards the integration of renewable energy in the region.

## 2. PRIORITY GAS CORRIDORS

(5) North-South gas interconnections in Western Europe ('NSI West Gas'): gas infrastructure for North-South gas flows in Western Europe to further diversify routes of supply and for increasing short-term gas deliverability.

(6) North-South gas interconnections in Central Eastern and South Eastern Europe ('NSI East Gas'): gas infrastructure for regional connections between and in the Baltic Sea region, the Adriatic and Aegean Seas, the Eastern Mediterranean Sea and the Black Sea, and for enhancing diversification and security of gas supply.

(7) Southern Gas Corridor ('SGC'): infrastructure for the transmission of gas from the Caspian Basin, Central Asia, the Middle East and the Eastern Mediterranean Basin to the Union to enhance diversification of gas supply.

(8) Baltic Energy Market Interconnection Plan in gas ('BEMIP Gas'): gas infrastructure to end the isolation of the three Baltic States and Finland and their dependency on a single supplier, to reinforce internal grid infrastructures accordingly, and to increase diversification and security of supplies in the Baltic Sea region.

## 3. PRIORITY OIL CORRIDOR

(9) Oil supply connections in Central Eastern Europe ('OSC'): interoperability of the oil pipeline network in Central Eastern Europe to increase security of supply and reduce environmental risks.

## 4. PRIORITY THEMATIC AREAS

(10) Smart grids deployment: adoption of smart grid technologies across the Union to efficiently integrate the behaviour and actions of all users connected to the electricity network, in particular the generation of large amounts of electricity from renewable or distributed energy sources and demand response by consumers.

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<sup>10</sup> Excerpt from Annex I of TEN-E Regulation (EU) No 347/2013

(11) Electricity highways: first electricity highways by 2020, in view of building an electricity highways system across the Union that is capable of:

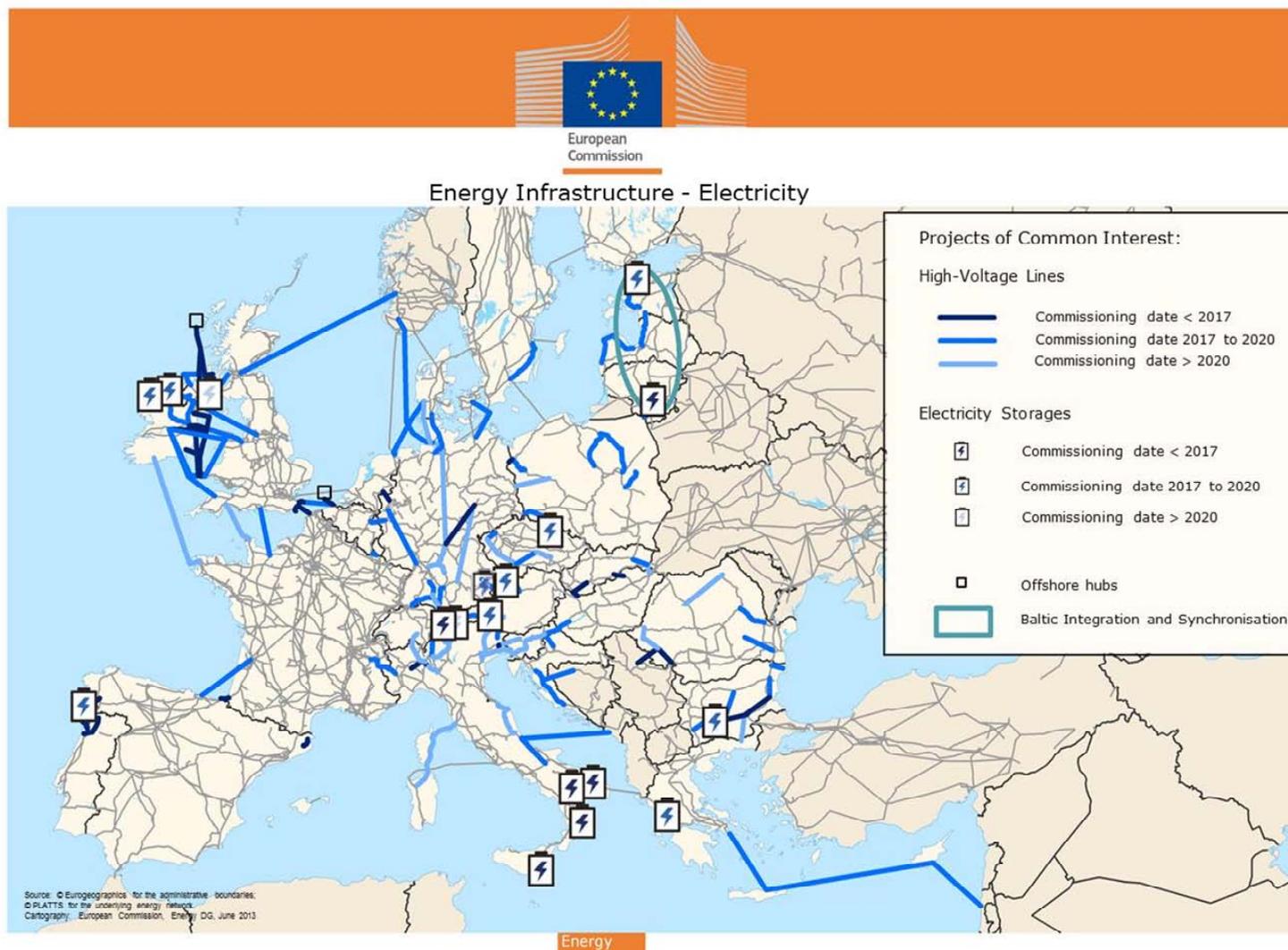
(a) accommodating ever-increasing wind surplus generation in and around the Northern and Baltic Seas and increasing renewable generation in the East and South of Europe and also North Africa;

(b) connecting these new generation hubs with major storage capacities in the Nordic countries, the Alps and other regions with major consumption centres; and

(c) coping with an increasingly variable and decentralised electricity supply and flexible electricity demand.

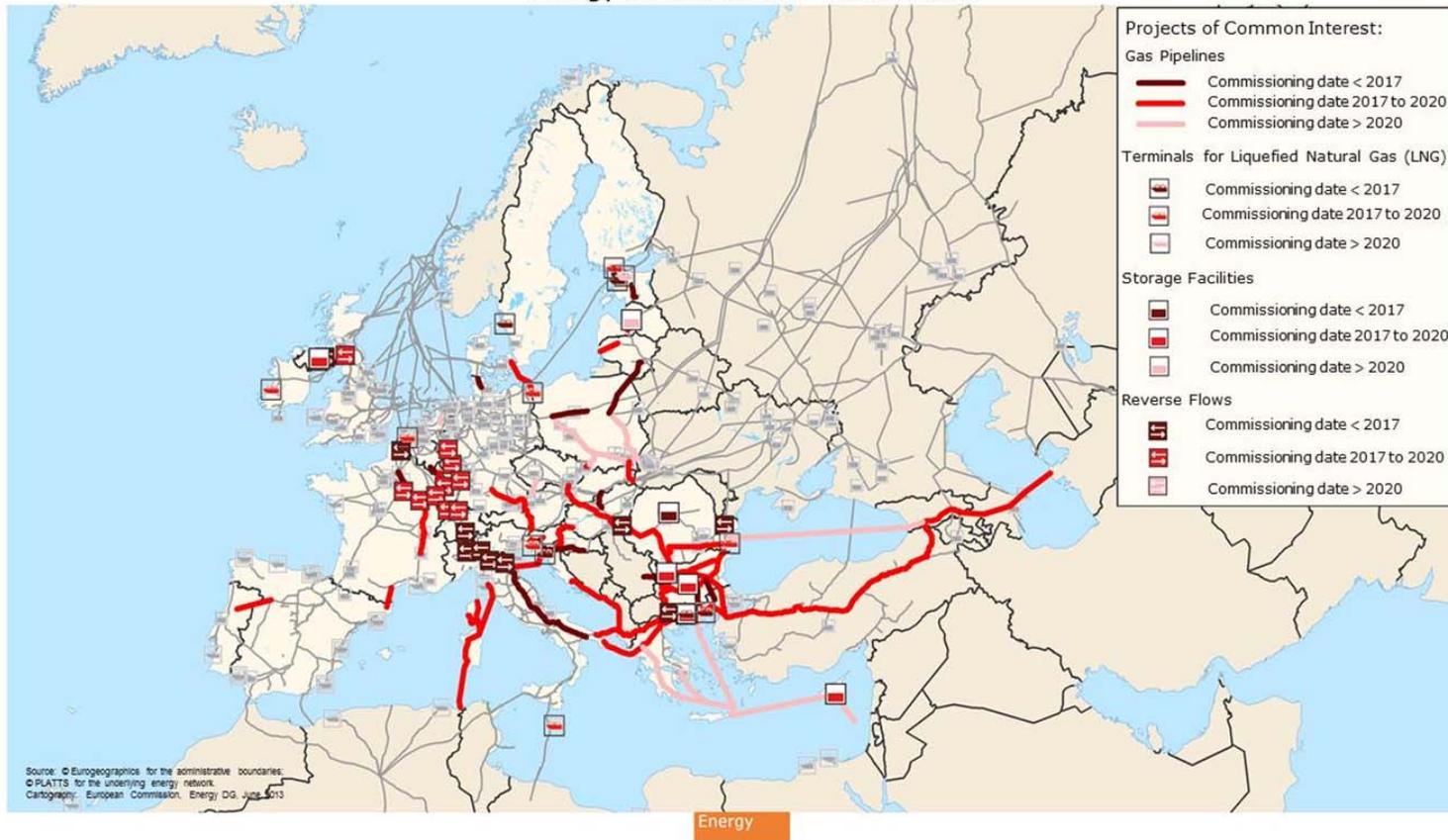
(12) Cross-border carbon dioxide network: development of carbon dioxide transport infrastructure between Member States and with neighbouring third countries in view of the deployment of carbon dioxide capture and storage.

Annex II – Maps of projects of common interest



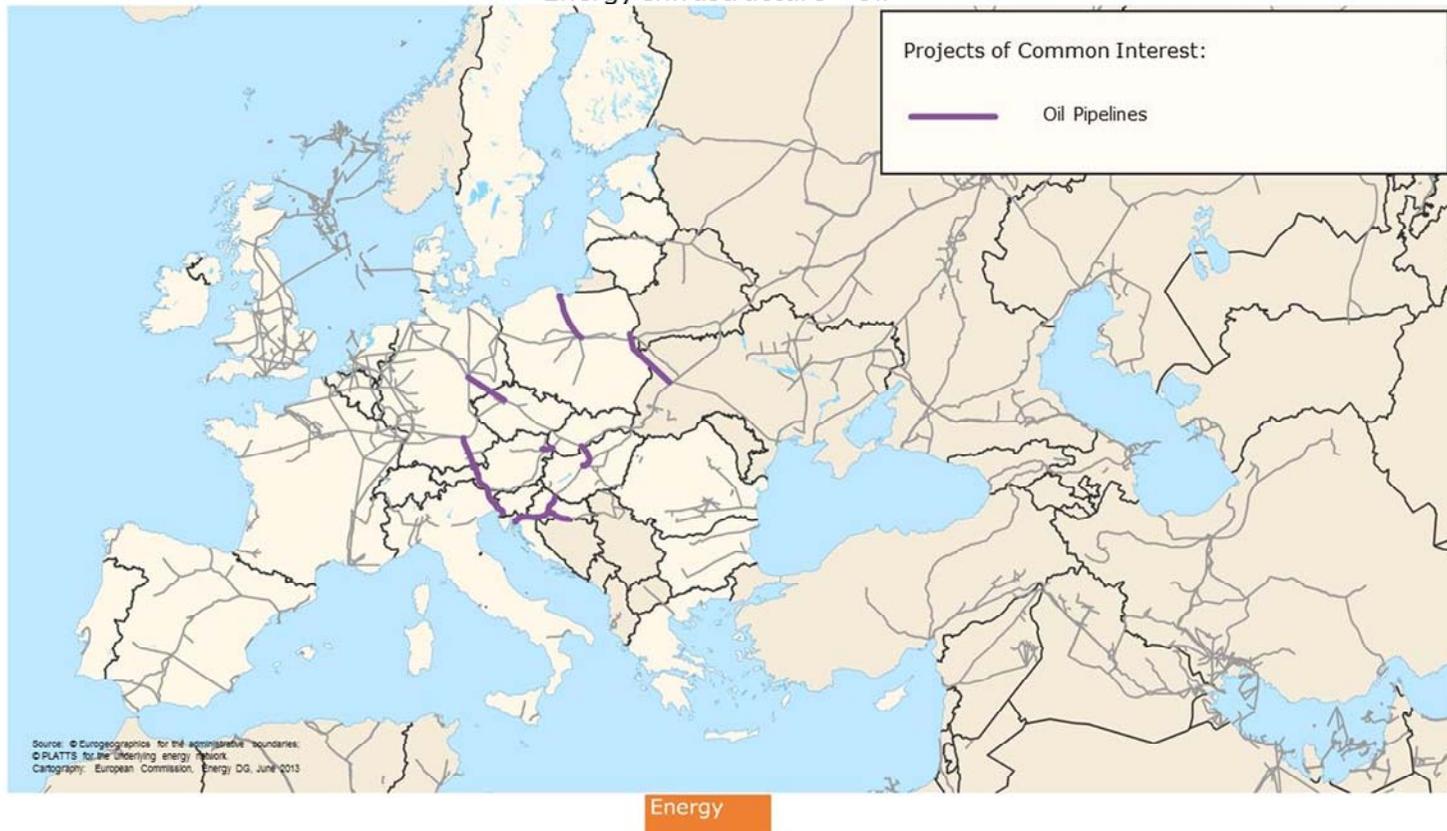
All potential routes should be considered and assessed both from an energy security point of view and from the point of view of their relative economic costs and benefits.

## Energy Infrastructure - Natural Gas



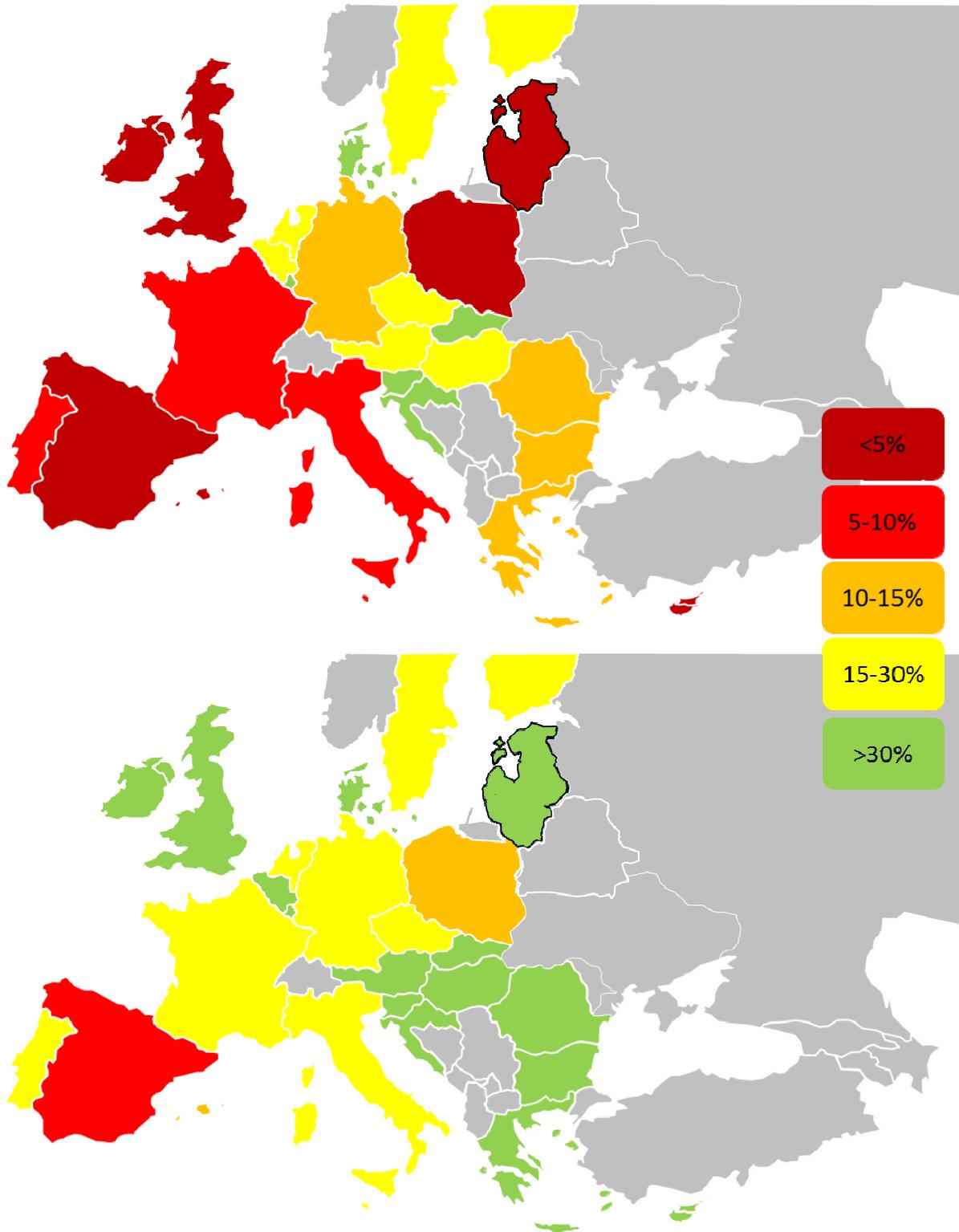
*All potential routes should be considered and assessed both from an energy security point of view and from the point of view of their relative economic costs and benefits.*

## Energy Infrastructure - Oil

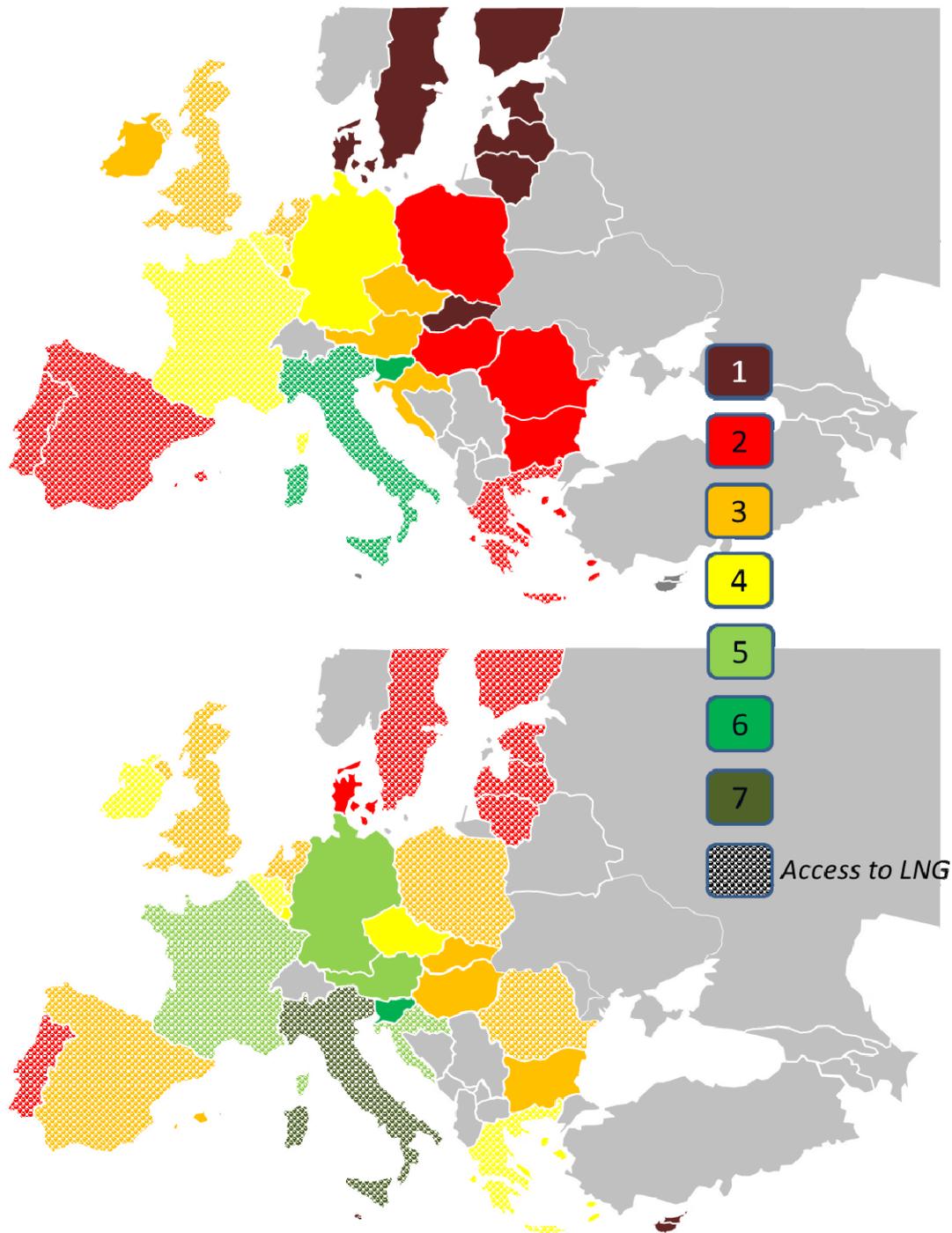


*All potential routes should be considered and assessed both from an energy security point of view and from the point of view of their relative economic costs and benefits.*

*Annex III: 10% interconnection target in electricity before and after the PCIs*



*Annex III: Supply source diversification before and after the implementation of the projects of common interest in the field of gas*

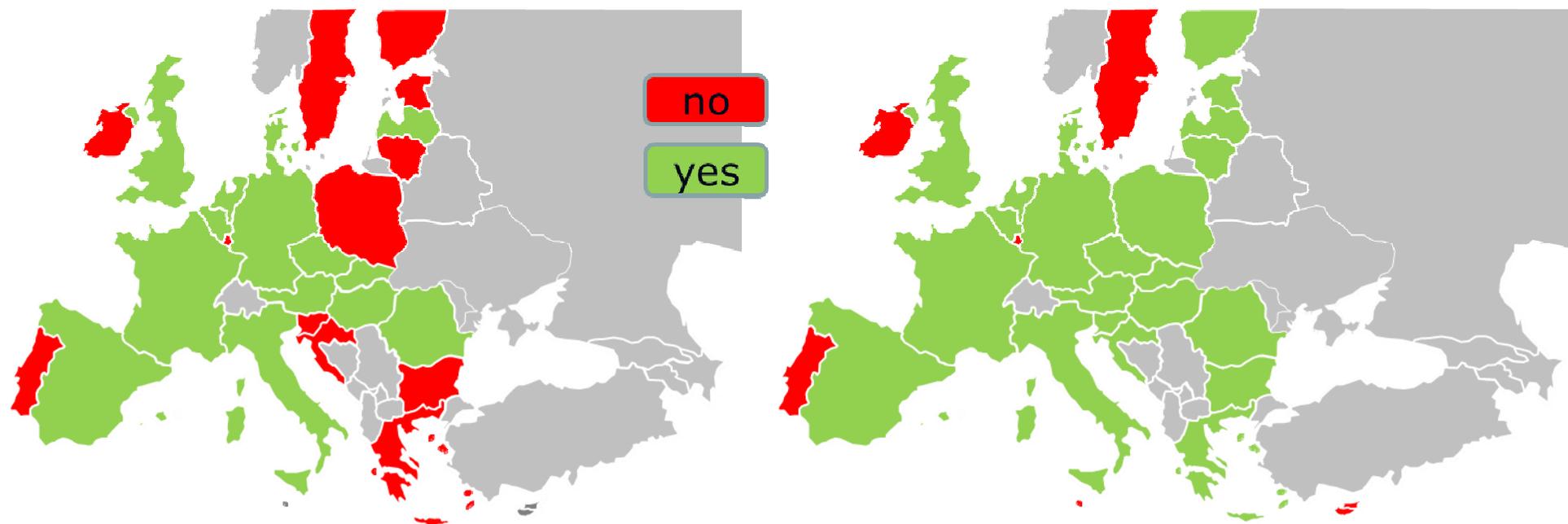


*Number of supply sources a country may potentially access through infrastructure (at least 5% share)*

*Supply Sources: Azerbaidjan, Algeria, Lybia, Norway, Russia, National Production, for simplification, LNG is depicted as one source, but the pattern indicates which countries have access to LNG. This graph does not prejudice any commercial contracts.*

*Source: ENTSO-G TYNDP 2013, Commission*

*Annex IV: Compliance with the N-1 infrastructure standard before and after the implementation of the PCIs*



*Reference: Article 9 of Regulation (EU) No 994/2010*