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An Integrated Maritime Policy for the European Union

ENERGY POLICY AND MARITIME POLICY: ENSURING A BETTER FIT

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Introduction

The energy policy for Europe agreed at the European Council in March 2007 aims at achieving major changes in energy supply and use in Europe. The idea of integrating economic development and environmental protection is fundamental and is reflected in the trio of objectives established for Europe's energy policy: to increase security of energy supply, to ensure competitiveness of European economies and availability of affordable energy, and to promote environmental sustainability and combat climate change.

In the extreme Western part of the Euro-Asian land mass, the geographic situation of Europe is a critical factor for the EU Energy Policy. More than 80% of current European oil and gas production is drilled offshore, mainly in the North Sea, but also in the Mediterranean, Adriatic and Black Seas.

The seas around Europe are not only important as a source of oil and gas. They are also an enabler of energy transportation and they allow us to diversify energy transport routes, thereby reducing Europe's dependence on individual external energy suppliers. Furthermore, the maritime areas of Europe are important for carbon free energy generation with the fast development of offshore renewable sources of energy, to building up the interconnections of an energy internal market through submarine pipeline networks, and for the use of the seabed for future potential carbon capture and sequestration.

In this context, the Commission, in its Communication[1] on an Energy Policy for Europe, declared that it will be necessary to develop further the use of oceans and seas to promote the EU's energy goals, given their potential to support the generation of energy and to diversify energy transport and methods.

This Commission Services Working Document, prepared in the context of the package on maritime policy[2], looks at the connections and synergies between Europe's energy policy and maritime policy. The scope for synergy between these two policies is wide and is likely to increase in the very near future. Europe's energy situation and policy imply more reliance on oceans, seas and ports. Firstly, maritime transport of energy in European waters (oil and gas tankers, undersea pipelines and electricity interconnectors,) is projected to grow considerably in the next years, with the development of the internal energy market, the growth in global energy trade and European imports, and the development of offshore energy technology and resources. Secondly, marine energy resources, both fossil and renewables, will be important in the diversification of Europe's energy supply[3].

The fundamentals of both policies are the same: both aim for an integration of economic development and environmental protection. If joined up, they will allow a better exploration of the geopolitical value of Europe's oceans and seas for energy security and sustainability.

A long term and stable Maritime Policy will, for example, facilitate the high-quality investments in marine-based energy infrastructures and resources which need to be made over the next years. It can thus contribute to an effective internal energy market (eg undersea

1 COM(2007) 1.

2 Adopted by the Commission on 10 October 2007.

3 In addition, carbon capture and storage, an emerging technology which may well be crucial in a diverse energy supply during the decades of transition in a carbon-constrained world, is likely to use seabed sites in Europe, notably depleted oil and gas fields and deep saline aquifers.

electricity interconnectors), security of supply (eg pipelines) and climate protection (eg offshore renewables). Geared to the European market as a whole or at least to large regions within it, these investments will normally be large-scale and involve the territories of several Member States, and are likely to encompass innovative technologies. Clear, stable regulations and transparent, predictable permitting, underpinned by good knowledge of impacts and assessment of risks, will be essential. Moreover, in several areas, such as carbon capture and storage, the regulatory framework will have to be developed. Maritime spatial planning, as a tool to reconcile conflicting uses in the same sea area and thus contribute to a more stable regulatory environment for maritime activities, will be valuable in the energy field. With good information and transparent risk assessments, different uses of the sea, including energy using could be treated in comparable ways.

In the framework of Europe's energy policy, regulatory and other cooperation is already being developed to facilitate cross-border and other common interest energy infrastructure investments[4]. As many of these involve undersea connections and offshore resources[5], experience with marine-based energy projects is growing[6]. A clear, coherent approach to maritime affairs will therefore certainly help.

Improved maritime data and information will be needed and will have an impact throughout the energy sector. A European data and observation network to coordinate the collection, storage and dissemination of data on oceans and seas in Europe, created from the many existing observatory and data networks, would be useful. It would strengthen the bases for coherent, integrated approaches to the use of Europe's maritime resources and would support the design and operation of energy infrastructures.

With the growth in maritime transport of energy and the development of marine energy resources, the importance of a strong legislative framework for maritime safety, security and environmental protection is self-evident. A lot of progress has been made in recent years, notably in tanker safety, with more stringent requirements for the carriage of heavy fuels, and a common framework on places of refuge to avoid major pollution incidents. Of particular importance is the establishment of the European Maritime Safety Agency which brings together the 27 member states of the EU and Iceland and Norway. The adoption of the EU Directive for the Preservation and the Protection of the Marine Environment, which is the environmental pillar of the maritime policy will be a major step in the sustainability of our oceans and seas.

Oil pipelines which relieve pressure of tanker traffic in congested and sensitive areas have been supported[7] by the EU: Infrastructure projects routinely involve environmental impact assessments. As regards security, standards binding on all ships entering Community waters are now in place[8]. The Commission's Communication on Protecting Europe’s Critical Energy

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4 Notably, cooperation among energy regulators, among transmission system operators, and the TransEuropean Energy Networks programme (TEN-E); see http://ec.europa.eu/energy/index_en.html.

5 Maps showing identified priority projects in Annex.

6 The Nord Stream gas pipeline project, for example, from Vyborg in Russia to Grunwald in Germany along the Baltic seabed, is currently the subject of Environmental Impact Assessment in a process involving all the countries around the Baltic, in line with the Espoo Convention[6] as well as Council Directive 97/11/EC and national permits and licences.

7 Eg Inogate programme, www.inogate.org.

8 Obligatory security standards, achieved at international level, have been incorporated into EU legislation in order to ensure their respect not only by ships flying the flag of an EU Member State, but by all those entering Community waters. The International Ship and Port Facility Security Code,

and Transport Infrastructure[9] is the first sector-based contribution towards implementing the European Programme for Critical Infrastructure Protection.

A better more operative and integrated framework of maritime surveillance is also an important factor for the safety and the security of energy generation and transport in the maritime areas of Europe[10].The gradual achievement of an integrated network of vessel tracking and e-navigation systems for European coastal waters and the high seas proposed by the new European maritime policy will provide an invaluable tool to achieve the imperative goals of safety and security of generation and transport of energy in Europe's oceans and seas.

The geographic scope, often extends beyond the EU. For example, the Commission has already proposed extending the Motorways of the Sea[11] to neighbouring countries. For energy import infrastructures, cooperation involves not only Europe as a whole, but also neighbouring and partner countries[12]. Energy infrastructure and maritime transport issues are on the agenda in the EU's international energy dealings[13]. Furthermore, much of the maritime transport of energy is serving what is increasingly a global energy market so it is important that any European rules become international rules as quickly as possible.

While likely to benefit greatly from a holistic and integrated approach to maritime affairs, the European energy sector has much to contribute to a European maritime policy. The energy sector responded actively to the Maritime Policy Green Paper consultation invitation and most stakeholders welcomed the initiative for an EU maritime policy. In fact, Europe's energy situation and policy provide distinct demand for a clear approach to maritime affairs in Europe. At the same time, the energy sector is at the forefront of many technological developments, adapting to the changing energy and climate context. It has substantial experience in maritime technologies. Through its cutting-edge maritime investments and the innovation and research underpinning them, it is already contributing expertise, jobs and growth to the maritime sector in Europe, helping to achieve Europe's full knowledge and innovation potential in this field[14].

The relevance of Europe's oceans and seas for the European energy policy is examined in more depth in the following sections.

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adopted by the IMO Diplomatic Conference in 2002, has been transposed into EU law (Regulation (EC) No 725/2004).

9 February 2007, see http://ec.europa.eu/dgs/energy_transport/security/infrastructure/index_en.htm.

10 A comprehensive earth observation system, using space-borne and in-situ techniques (land, air, sea) through well-defined operational services, is key to ensuring the implementation and monitoring of environmental and security policies. Recognising the strategic importance of earth observation and its growing potential, Europe has committed to the development of its own operational potential through the GMES programme - COM(2004) 65.

11 Motorways of the Sea, see http://ec.europa.eu/transport/intermodality/motorways_sea/index_en.htm.

12 For example, the Energy Community provides a particularly strong framework, conducive to energy infrastructure investments in South-East Europe, including for transit of energy to the EU.

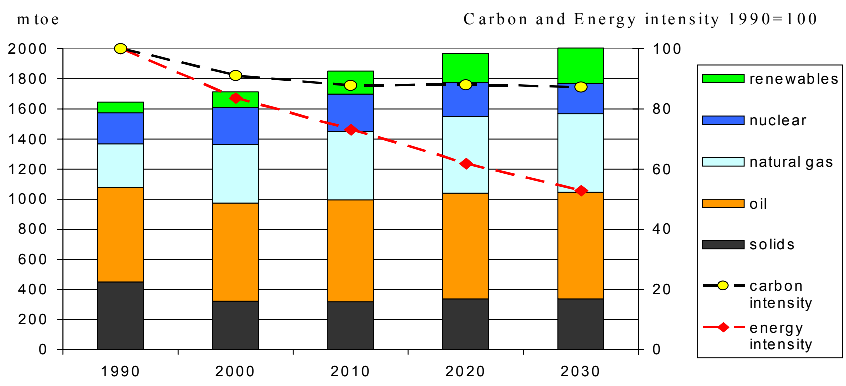
13 Eg in EU-Russia Dialogues on energy and on transport; in the Energy Dialogue, the issue of pipeline safety standards taking into account the protection of the marine environment, for example http://ec.europa.eu/maritimeaffairs/index_en.html.

14 Eg Waterborne Technology Platform, http://www.waterborne-tp.org.

Part I Maritime transport of energy

1 Fossil fuels:

Graph 1: EU-27: Energy consumption by fuel and carbon and energy intensity



Source: PRIMES 2007 baseline projection

In the baseline projection to 2030[15] for EU shown above, oil and coal consumption remain rather flat and natural gas consumption increases by some 17%. However, net imports of oil increase by some 24%, coal by 66% and natural gas almost 70%[16]. Thus, a solid growth in imports is projected, mainly reflecting declining EU production of oil and gas. Even in a scenario with strong European policies on energy efficiency and renewables, fossil fuel imports are not expected to drop substantially from today's volumes[17].

Most of the imports of fossil fuels into the EU are by sea. The vast bulk of oil and coal imports come by tanker and dry bulk carrier respectively. For natural gas, currently over 80% of imports are by pipeline, the rest is in the form of Liquified Natural Gas (LNG), transported in tankers by sea and regasified in importing ports, or offshore, for transmission to Europe's natural gas networks[18]. Transport by pipeline is normally less expensive than LNG shipments for shorter distances. However, decreasing costs for the LNG chain have made longer transport routes economically viable, so LNG may in the future displace gas from some longer pipeline routes.

The share of shipping versus pipeline transportation of oil and gas could be influenced by the application of CO_2 emissions reduction measures. Shipping is a source of CO_2 emissions, although it is more energy-efficient than other transport modes as road transport. Whatever action to reduce the emissions from the transport sector is finally decided, it will presumably influence the modal choice, including maritime v. pipeline transport of energy. Early resolution of the issue of emissions of the shipping sector at the International Maritime

15 The baseline projection reflects developments till 2030 under current trends and policies of the EU and Member States, see http://ec.europa.eu/dgs/energy_transport/figures/index_en.htm.

16 2007 baseline projection, 2005 and 2030 figures.

17 High efficiency, high renewables scenario, net imports are flat till 2030 at least; see http://ec.europa.eu/dgs/energy_transport/figures/index_en.htm.

18 Roughly 250 bcm were imported to the EU in 2005 by pipeline, whereas only 50 bcm were imported as LNG-shipments; see http://ec.europa.eu/comm/competition/sectors/energy/inquiry/index.html.

Organisation (IMO) level and how the shipping sector will contribute to Europe's climate strategy would help in energy infrastructure decisions[19].

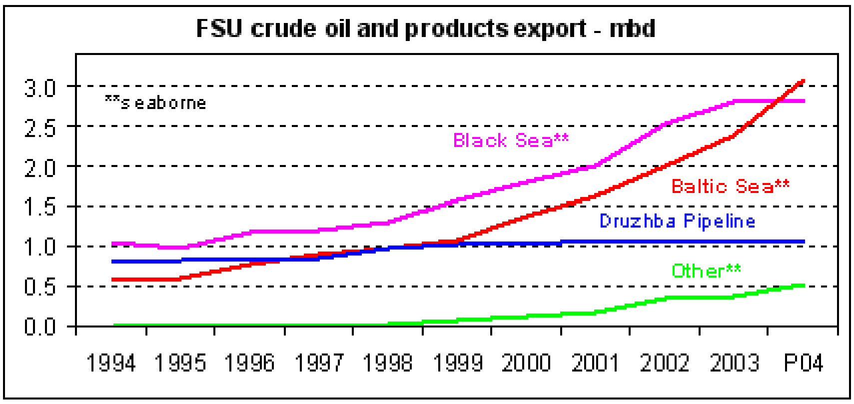
Pipelines (gas and oil) are currently mainly land-based. However, looking at the new pipelines and those under construction or planned, quite a few are undersea[20]. This reflects technological developments, demand for interconnections in the internal gas market and other factors.

Alongside imports to the EU, maritime transport of fossil fuels through European waters to other markets, notably North America, is also likely to increase in volume. The growing regional mismatch worldwide between demand and production will result in a major expansion of international trade in oil and gas over the next decades. Inter-regional trade in oil is expected to increase by two-thirds by 2030[21]. North America, currently largely self-sufficient in natural gas, could see imports surging. This would all mean a massive growth in LNG imports, some of which (eg from Russia) would pass through European waters.

1.1. Oil

Currently, oil imports to the EU are from Russia/CIS (38%, with this share constantly increasing in the past few years), Middle East (22%), Norway (15%), North Africa (14%) and other countries (11%)[22]. Net imports of oil into the EU are projected to increase by some 24% between now and 2030, in the baseline projection[23].

Some 90% of today's imports are transported by tanker, the rest by pipelines. Pipelines are important in oil imports from Russia. However, pipeline v. tanker transport choices are often complex and current developments, notably in relation to the Druzhba pipeline[24], suggest that Russia may use maritime transport, notably through the Baltic and Black Seas, to an increasing degree in the future.



Source: Energy Information Administration www.eia.doe.gov

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19 Also, in the future, decisions about the feasibility of carbon capture and storage.

20 See Annex to this paper.

21 International Energy Agency's World Energy Outlook, www.iea.org

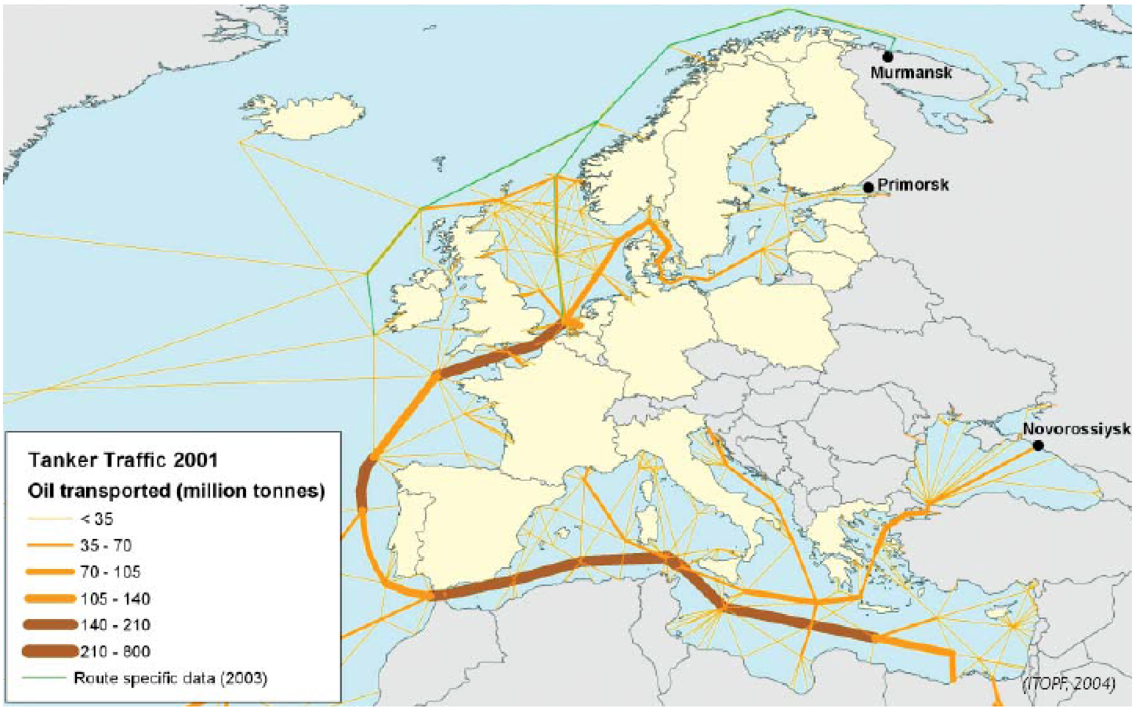
22 Source: DG TREN.

23 http://ec.europa.eu/dgs/energy_transport/figures/index_en.htm.

24 Impact of Russian decision to invest in exports via Primorsk.

More specifically, **indicative** traditional tanker routes, in European waters are shown below.

Indicative Tanker Traffic and Volume of Oil Transported in 2001



There is particularly high tanker traffic in certain zones in Europe, notably the entrance to the Baltic Sea, the North Sea, the Channel, the Atlantic coast, especially off the coast of Spain and Portugal and the Mediterranean Sea. Not represented fully in the European map above is the increasing volume of oil transported along the routes taken by tankers servicing the growing oil exports from the Russian Federation including those from the Black Sea. The turnover of the four largest oil terminals in the Gulf of Finland has grown by over 250% since 2000.

Regarding the Caspian Sea, Kazakhstan has announced plans to increase oil transport by tanker to over 1.2 million barrels a day by 2010. Given the particularity of the Caspian Sea[25], the increase of traffic by oil tankers raises serious issues and the development of a mechanism of cooperation in the field of accidental marine pollution should be considered (similar to the Community mechanism for civil protection).

Some of the high tanker traffic zones are in Particularly Sensitive Sea Areas[26] designated by IMO, that is, areas are vulnerable to damage by international maritime activities and need protection for ecological, socio-economic or scientific reasons.

Despite oil tanker traffic growth, there has been a significant fall in the number of tanker accidents over the last few years. This underlines the importance of a comprehensive and enforceable legislative framework for maritime safety and environmental risks related to tanker traffic and effective implementation of that framework. A lot of progress has been

[25] The Caspian Sea is in fact a landlocked lake with no natural outflow.

[26] Notably (i) Wadden Sea, adjacent to the North Sea, responsibility shared between the Netherlands, Germany and Denmark. (ii) Western European Waters, encompassing an area to the south of Portugal along the Atlantic Coast and as far north as the Shetlands Isles in the United-Kingdom, also the Channel and its approaches.

made in recent years within Europe and the EU is consolidating and extending this through the relevant international and regional organisations. As part of the Baku Initiative, a maritime safety working group has been formed bringing together authorities from the Black and Caspian Seas and including Russia as an observer. Within the Permanent EU-Russia transport dialogue, one of the five Working Groups is dedicated to maritime and inland waterway issues. This working group is a key driver for the increased cooperation with Russia on maritime safety issues. Under the Euromed process, the European Commission is also financing maritime safety programmes and trainings in the MEDA countries.

Through the legislative measures adopted after the Erika[27] and Prestige accidents, and the proposed third maritime safety package[28], the EU has focused on tanker safety. Increased inspections in ports of oil tankers, more stringent requirements for the carriage of heavy fuels and development of a common framework on places of refuge to avoid major pollution incidents are examples of EU initiatives with a strong impact on maritime safety and environmental protection.

Since 2004 the European Maritime Safety Agency[29] has had a legal obligation in the field of response to ship-sourced pollution within the Community[30]. The Agency is required, if requested, to assist coastal states when such large-scale incidents occur. The primary responsibility to react to an incident remains with the Member State concerned. The North Sea has a high level of tanker traffic and spill incidence but extensive response resources are already in place. Four other areas have been identified as requiring additional action: the Baltic Sea, (where, exceptionally, Russia has been granted access to the CleanSeaNet maritme satelitte surveilance system which is managed by EMSA), the Western approaches to the Channel, the Atlantic coast and the Mediterranean Sea, particularly along the tanker trade route from the Black Sea. For every tonne of oil recovered at sea, an estimated 10 tonnes of shoreline clean-up waste material is avoided.

A pipeline may be preferable to maritime transport of oil in congested and environmentally-sensitive areas. The pressure of further tanker traffic in the Bosphorus, for example, could be relieved somewhat by the building of an oil pipeline. In the Inogate programme - Interstate Oil and Gas Transport to Europe[31], a number of priority axes for crude oil pipelines have been identified: (i) Upgrading and enhancing the whole Druzhba pipeline, in particular across northern Europe as an alternative to increasing maritime oil transportation in the Baltic Sea, and the reversal of the Adria pipeline in Croatia and Hungary; (ii) Extending the Odessa-Brody pipeline to Plock to link into either the Druzhba route or the existing line to the Polish Baltic Sea port of Gdansk; (iii) Building a Constanza-Omisalj-Trieste pipeline, linking Romanian port of Constanta across to Omisalj in Croatia on to Trieste, Italy and supplying oil to the countries transited; (this project is being pursued in cooperation among members of the Energy Community[32]); (iv) Building a Burgas-Alexandropoulis pipeline, linking the Bulgarian Black Sea port of Burgas with the Greek Mediterranean port of Alexandropoulis, which however may see increase of oil traffic in the Aegean Sea, requiring risk avoidance

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27 Following a long list of environmental catastrophes linked to the transport by sea of heavy oils, in 2003 the EU banned the use of single hull tankers for this type of oils. A similar prohibition was introduced by the International Maritime Organisation in 2005.

28 http://ec.europa.eu/transport/maritime/safety/2005_package_3_en.htm

29 http://www.emsa.europa.eu/

30 Regulation (EC) No 724/2004.

31 www.inogate.org

32 Commission press release IP/07/464, 3 April 2007.

measures. Construction of this pipeline would reduce the increasing pressure of maritime oil transport through the Bosphorus.

As maritime transport of energy, by pipeline or tankers, creates economic opportunities and raises concerns from the perspective of safety and environmental impacts of accidents, these issues could be addressed in guidelines for a dedicated Trans-European Network for hydrocarbons, covering all infrastructure elements

1.2. Coal

International trade in coal, mainly steam coal for power generation, relies on shipping over huge distances by sea. Over 90% is transported by sea[33]. Over the last twenty years, seaborne trade in steam coal has increased on average by about 8% each year[34].

Net imports of coal to EU-27 are projected to increase by some 66% between now and 2030, in the baseline projection[35]. Coal imports to the EU come from a diverse range of countries. Steam coal is imported currently from South Africa (34%), Russian Federation (28%), Colombia (16%), Indonesia (9%) etc, mainly by sea[36].

Transportation costs account for a large share of the total delivered price of steam coal, particularly when there are difficulties in the freight market.

Coal and lignite (the latter domestically-produced, normally used locally) account for around one-third of the EU’s electricity production, a reflection of reliable access to diverse sources, both domestic and international, and relatively stable prices. Europe’s own coal reserves offer security of supply. The major issue for Europe is whether coal can be demonstrated to be secure, competitive and also sustainable, in the context of the climate challenge. If the feasibility of clean coal technologies and carbon capture and storage can be demonstrated, then the role of coal in Europe's energy mix is likely to grow, with implications for imports. The European Council has emphasized the importance of work by Member States and the Commission on strengthening R&D and developing the necessary technical, economic and regulatory framework to bring environmentally safe carbon capture and storage to deployment with new fossil-fuel power plants, if possible by 2020[37].

1.3. Natural gas

European net imports of natural gas are projected to grow by almost 70% between now and 2030, in the baseline projection[38].

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[33] 579 Mt out of 623 Mt (2002), see World Coal Institute.

[34] World Coal Institute "The Coal Resource: A Comprehensive Overview of Coal".

[35] 2007 baseline projection, 2005 and 2030 figures, steam coal and coking coal, http://ec.europa.eu/dgs/energy_transport/figures/index_en.htm

[36] Eurostat 2005 figures, http://ec.europa.eu/dgs/energy_transport/figures/index_en.htm. Most Russian exports are seaborne. See also study by the Commission's Joint Research Center "The Future of Coal" .

[37] Presidency Conclusions, 8/9 March 2007.

[38] PRIMES 2007 baseline projections 256,828mtoe (05) to 434,768 (2030), ie 69%, see http://ec.europa.eu/dgs/energy_transport/figures/index_en.htm

Liquified Natural Gas:

Currently over 80%of imports into the EU are by pipeline[39]. However, imports in the form of Liquified Natural Gas (LNG), transported in tankers by sea, have been growing strongly in recent years. There have been substantial cost reductions in all phases of the LNG chain, although since 2004, this trend has been reversed.

Due to the increased amount of transport of gas with tankers[40], the LNG market has been transformed from a relatively limited set of bilateral into an increasingly liquid market with a much larger number of players on a global base. This reflects the evolution of the US and UK from surplus natural gas markets with low prices to shortage markets with high prices, a greater emphasis on diversification of gas supplies to promote security, particularly in southern Europe and the UK, and arguably the slow pace of progress in access to pipeline networks in Continental Europe[41].

Seven of Europe's coastal Member States have LNG infrastructures in place, principally Spain, France, Belgium, UK, also Portugal, Italy and Greece[42]. LNG represents a substantial part of their net imports – almost 70% for Spain, around 30% for France and the UK and around 25% for Belgium. Thus, it is far from a marginal contribution and it is growing. Investment plans for LNG terminals in these and other Member States suggest that there could be at least a doubling of regasification capacities in Europe in the next few years[43].

LNG imports to the EU currently come mainly from Algeria, Nigeria, Egypt and Qatar, also Trinidad and Tobago, Oman and Libya[44]. LNG offers the possibility of access to resources from a wide range of countries, more than in pipeline transport of natural gas. This will be important in the coming years, with regional and global fossil fuel markets likely to be tight, reflecting increasing competition among a growing range of consumers for resources which will be increasingly concentrated in a few producer countries. In addition, LNG offers more flexibility in location of delivery within Europe, with benefits for Europe in terms of the functioning of the internal market, efficient grid use, security of supply and solidarity[45]. A number of LNG terminals figure among the priority projects in the TransEuropean Energy Networks programme, see map in Annex 1.

International trade in LNG is still rather regional, with most of the LNG to Europe coming from the northern part of Africa, most to the USA coming from South America and most to Japan coming from the Asia Pacific region. However, it is expected that a global LNG market

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39 Roughly 250 bcm were imported to the EU in 2005 by pipeline, whereas only 50 bcm were imported as LNG-shipments, see http://ec.europa.eu/comm/competition/sectors/energy/inquiry/index.html.

40 LNG trade in the Atalntic Basin (Europe and North America) is expected to quadruple over the next 10 years, going from 47 BCM in 2002 to around 210 BCM in 2010 (IEA Security of gas supply in open market).

41 Argued in Stern, "The New Security Environment for European Gas", October 2006, http://www.oxfordenergy.org/stern.php.

42 ES: 40 bcm/year capacity, FR: 14, BE: 9, IT: 3.5, PT: 5, UK: 4, EL: 4.5, total 80 bcm/y of which 43 bcm used in 2005

43 Some 25 new terminals and capacity expansions have been planned, and by 2011, the total capacity could be 189.5 bcm/y.

44 Algeria 37%, Nigeria 26%, Egypt 16%, Qatar 10% of 51.70 bcm in 2006; see BP Statistical Review 2007.

45 See Priority Interconnexion Plan COM(2006) 846, 10.1.2007; Commission will consider in 2007 whether Community action is necessary to increase energy solidarity through an action plan for LNG.

will gradually emerge. The Snøhvit LNG project in northern Norway, for example, is expected to sell LNG to both EU and US markets. The US Energy Information Administration finds it most likely that the substantial incremental LNG to the US over the next 10 years will come from Middle East (Qatar) and African countries (Egypt, Nigeria and possibly Libya)[46]. This would mean an increase of traffic through European waters.

Highly specialized shipping operations are required for the transport of LNG. After cooling, it is transported by sea at approximately atmospheric pressure and a temperature of -161° C. In ports, or offshore, special installations are required for liquefaction, storage, refrigeration, loading and unloading and regasification of LNG.

Pipeline gas:

Several of the new gas pipelines planned or under construction will involve maritime investments[47]. Some of the new import pipelines have substantial underwater elements, reflecting the location of markets and the new sources (eg Caspian, where non-pipeline options are under consideration, and North African gas to Italy, Nordstream from Russia along the Baltic to Germany and beyond). Some of the new interconnectors are underwater, reflecting the linking of previously separate regional networks in the development of the internal gas market (eg UK-Netherlands, Norway-UK). Technological developments in recent years have made underwater pipeline projects more feasible than in the past.

Offshore storage of gas (in depleted fields) could in principle be brought into service in the future, if greater storage of natural gas within Europe is judged useful.

1.4. Electricity

In the development of the internal market in electricity, several of the interconnections which still need to be established are undersea connections. The map in the Annex to this document shows electricity projects of European interest identified in the Priority Interconnection Plan.

In the development of offshore wind energy in Europe (see next section), a major issue for success is the creation of a European offshore grid, connecting wind parks to the European grid. Offshore wind energy needs to be integrated in the European grid and the grid needs to be capable of accommodating changes in intensity of power production over short periods of time. The concept of a European offshore grid is being studied, in cooperation with grid authorities, European electricity regulators and the wind industry.

The EU's focus on overcoming this challenge is demonstrated by the current priorities in the Trans-European Energy Networks programme[48] and the decision to nominate a European coordinator[49] for the TEN-E projects – to be updated after the Commission decision on 12 September - on the connection of offshore wind power in Northern Europe (Denmark, Germany and Poland) to the high-voltage grid and power transport to the load centres. The

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46 www.eia.doe.gov

47 See map of Gas Projects of European Interest, annexed, from Priority Interconnexion Plan - COM(2006) 846.

48 Decision No 1364/2006/EC laying down guidelines for trans-European energy networks.

49 Under the TEN-E Guidelines, coordinators will promote the European dimension of the project; initiate a cross-border dialogue between promoters, local and regional authorities and the local population; help to coordinate the national procedures (including environmental procedures); report on the progress of the project(s) and on any difficulties or obstacles likely to result in a significant delay.

TEN-E project on electricity reinforcement in Denmark-Germany-Baltic Ring will increase interconnection capacities among the countries around the Baltic Sea, including the possible integration of offshore wind energy.

Part II Marine energy resources

In the global energy markets of today and tomorrow, high prices and uncertainties are likely to persist. In this context, domestic resources in the EU and the European Economic Area, both fossil and renewable, increase in value. The development of renewable energies is important not only for security of supply, but also for helping to meet the climate challenge.

II.1. Oil and gas production

More than 80% of current European oil and gas production is offshore, mainly in the North Sea, but also in the Mediterranean, Adriatic and Black Seas. These fields are mature, with declining production and rising costs. In the baseline scenario, primary production of oil in EU-27 is projected to decrease steadily, arriving at a 2030 production level of 30% of today's level. For natural gas, the decrease is less strong but still, 2030 production is projected to be less than half of today's production[50]. However, these domestic resources still can represent an important contribution to European security of energy supply over the next years, especially given high global fossil fuel prices and uncertainties about security of supply. Also, the projection does not include Norway. The Barents Sea, where Norwegian exploration and production is underway, has prospects and could become a major petroleum province.

Currently, the EU and Norway together is the fourth largest oil and gas producer region in the world, in terms of production[51]. The industry emphasizes the importance of the regulatory and fiscal regime in ensuring that the considerable remaining potential is exploited, noting access to resources subject to appropriate environmental impact assessments, cost-effective requirements for operations and a stable fiscal regime[52]. The industry argues that the integration of provisions for carbon capture and storage in existing international, regional and national legislation will be important element in a stable legal environment for investments.

Production will involve the complex technologies and methods necessary for the exploitation of reservoirs in decline. Research on new extraction technologies including CO_2 injections into producing oil and gas fields to enhance recovery rates should help. Improved technologies to find and produce oil and gas as efficiently as possible, with a minimum of discharges and emissions, are crucial.

Non-conventional hydrocarbon resources such as heavy oil/tar sands, coal base and coal mine methane and methane hydrates, are estimated to be very substantial[53] - figure. Their exploitation, however, can present major risks and technical challenges. For methane hydrates, for example, Europe is leading the research into the risks and consequences of their accidental release, which could seriously contribute to the greenhouse effect [54]. Given their

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50 Baseline projection, see http://ec.europa.eu/dgs/energy_transport/figures/index_en.htm

51 See http://www.ogp.org.uk, International Association of Oil and Gas Producers (OGP)

52 See response of OGP to this consultation

53 See "Ressources to Reserves – oil and gas technologies for the energy markets of the future" IEA 2005

54 See http://www.metrol.org/; http://www.igme.gr/anaximander/; http://www.hydratech.bham.ac.uk/; http://www.geotek.co.uk/hyacinth/; http://www.crimea-info.org/project3/crimea0.htm; http://www.gashydat.org/; http://www.eu-hermes.net/.

potential contribution to security of supply in the long-term, research is warranted. A call for proposals within the 7th Framework Programme will be prepared in 2007, for projects primarily in the area of methane hydrates, looking at technologies which may be needed in individual parts of the value chain, with a view to an assessment of the feasibility of sustainable commercial exploitation.

As exploration and production move into deeper waters, technological innovations will be needed. Europe holds a technological edge due to the advanced developments in the North Sea, but needs to develop continuous innovations, notably for deep and ultra-deep (1500 to 3000 m) offshore fields. Risk assessment methodologies will have to be developed further[55].

There is scope for technology transfer between the offshore hydrocarbon and renewables sectors. Some techniques developed as solutions for offshore wind are now being used in the oil and gas industry, notably the use of monopiles for gas production platforms in shallower water[56]. The Maritime Industries Forum and the Waterborne Technology Platform, for example, show that clusters in the maritime sector can work to good effect.

II.2. Renewable energies

The March 2007 agreement on a binding 2020 target of 20% for the contribution of renewable energies to primary energy consumption in Europe is ambitious. The Commission believes that with the support which this target implies, wind could contribute 12% to EU electricity generation by 2020[57].

Currently, offshore wind electricity generation has barely started, it amounts to less than 2% of total wind capacity in Europe. However, offshore generation has certain advantages, such as higher and more predictable wind speeds. Also, as suitable land for onshore wind development becomes scarce, it could become relatively more attractive. Costs for offshore projects are currently higher than for onshore developments, so research and economies of scale are needed to bring them down to a competitive level.

The Commission is launching a study on off-shore wind development with emphasis on existing barriers and risks. As noted in the previous section, the concept of a European offshore grid is being studied, to connect wind parks to the European grid.

With progress on all of these issues, the contribution from offshore wind generation should increase dramatically over time. The Commission believes that about a third of wind energy generation in 2020 could be from offshore installations[58]. The industry envisages a six-fold increase in wind energy capacity in Europe by 2030 with about half of this offshore. If this works out, today's total offshore wind capacity of less than 1GW would be multiplied by 150. This would be mainly in the North-West Europe but also in some Mediterranean sites[59]. Already, wind parks in the territorial waters of UK, Germany, also Belgium, Sweden, Denmark, the Netherlands and France have been confirmed for construction.

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55 See response of Eurogif, the European Oil and Gas Innovation Forum, to the consultation on the Green Paper.

56 Eurogif response. See also the consultations with the sector in the preparation of the Strategic Energy Technology Plan, http://ec.europa.eu/energy/res/setplan/public_consultation_en.htm.

57 Renewable Energy Roadmap - COM(2006) 848.

58 Renewable Energy Roadmap - COM(2006) 848.

59 European Wind Energy Association, www.ewea.org envisages 300 GW installed wind capacity in 2030, of which 150 GW would be offshore.

Even now, individual wind farm projects are increasing in size to 50 MW and more, the largest development so far being the 166 MW Nysted wind farm off the southern coast of Denmark.

Thus offshore wind will become a major new factor in maritime planning and permitting in Europe and in the sustainable development of Europe's marine resources. Its contribution to security of energy supply in Europe and to the transition to a sustainable energy future will be very important. There is much interest in the wind industry in a European maritime policy, notably establishment and use of marine spatial planning, lessening the regulatory risks. Coordinated data gathering and access, underpinning risk assessments, would be welcomed.

Over the last twenty years, the EU has financed research and development on ocean, wave and tidal energy development projects[60]. – R&D funding is critical to advancing the development of ocean energy systems, with two major challenges: proving the energy conversion potential and overcoming a very high technical risk from a harsh environment. Ocean energy systems cover a wide range of applications that can be deployed on the shoreline and offshore. Research encompasses shoreline and offshore wave energy devices, tidal current turbines and salinity gradient systems. Technology is emerging to allow large scale demonstration projects. To date, a few demonstration prototypes exist[61] and a new generation of promising concepts will be demonstrated in the near future with the support of EU research funds. Some projects go beyond demonstration, generating a non-negligible share of the electricity needs of the region, eg the tidal power plant in La Rance, France.

Marine biomass feedstock for energy production is currently exploited only marginally but it may have important potential. Research is necessary on order to assess the current technologies for marine biomass production and conversion, and to identify the major challenges and opportunities for its exploitation for energy production.

II.3. Carbon Capture and Storage

The geological formations under the seabed and particularly under the North Sea seem to offer the largest suitable underground storage capacities for CO_2 in Europe[62]. Carbon capture and storage (CCS) technology is still emerging, a lot of work is still necessary to demonstrate its safety, public acceptability and economic feasibility. However, Statoil has been successfully reinjecting a million tonnes a year of carbon dioxide since 1996 from its Sleipner gas field off Norway back into the seabed in a pioneering use of the technology, spurred by a substantial carbon dioxide emissions tax.

CCS may well be an essential element in allowing continued power generation and energy-intensive activities in Europe from fossil fuels in a climate-compatible way during the next decades of transition to a sustainable energy future. The global market for CCS technologies could be immense, given the dependence on coal in many countries and the need to limit global CO_2 emissions.

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60 Under the Research Framework Programme, the cumulated EC contribution over the last fifteen years is above 20 million €.

61 Flagship prototypes are Shoreline Wave Energy, for which there exist two demonstrators, one on the island of Pico in the Azores, and one on the island of Islay, Scotland; Offshore Wave Energy with a prototype of 20kWe; tidal current turbine, with a prototype of 300kWe.

62 It should not be confused with deep-sea CO2 storage which is a proposal not supported in Europe.

The concept of sustainable coal being developed by the Commission[63] is future power generation from coal based on an integrated technological solution combining advanced conversion (combustion) processes with CCS. A number of off-shore CO_2 related activities need to be established: (i) transport of CO_2 by ship or by dedicated pipeline systems; (ii) drilling of test wells and CO_2 injection wells in underground geological formations below the seabed, installation of the injection infrastructures (including platforms) and operation of injection of CO_2 into such formations; (iii) long-term storage of CO_2 in geological sub-seabed formations; (iv) monitoring of CO_2 capture, transport and storage activities.

Important initiatives are underway. In Europe, an enabling regulatory framework for CCS (including off-shore) is being developed. The EU's Joint Research Centre is undertaking research and techno-economic analyses on CCS and identification of CO_2 storage potentials. Research, development and demonstration of CCS technologies is being supported through the 7th Framework Programme. Among stakeholders, the European Technology Platform on Zero Emission Fossil Fuel Power Plants has been established, with the objective of creating highly efficient power plants with near zero emissions, including CCS. With a mandate from the 2007 Spring European Council, Commission services are working on how the EU could support the construction of up to twelve large-scale demonstration power plants using CCS by 2015. Given the location of potentially suitable storage sites, notably offshore, several of these demonstration plants are likely to be located in coastal areas. Injection of CO_2 into producing oil and gas fields, most of which are offshore, can increase the total yield of such fields by as much as 15%.

If CCS does come into widespread use, the location of future coal- and gas-fired power plants (or other fossil fuel conversion processes, eg refineries) may be concentrated in coastal areas adjacent to suitable the geological storage sites under seabed. Increased environmental and weather risks in these locations related to climate change will have to be taken into account.

Conclusions

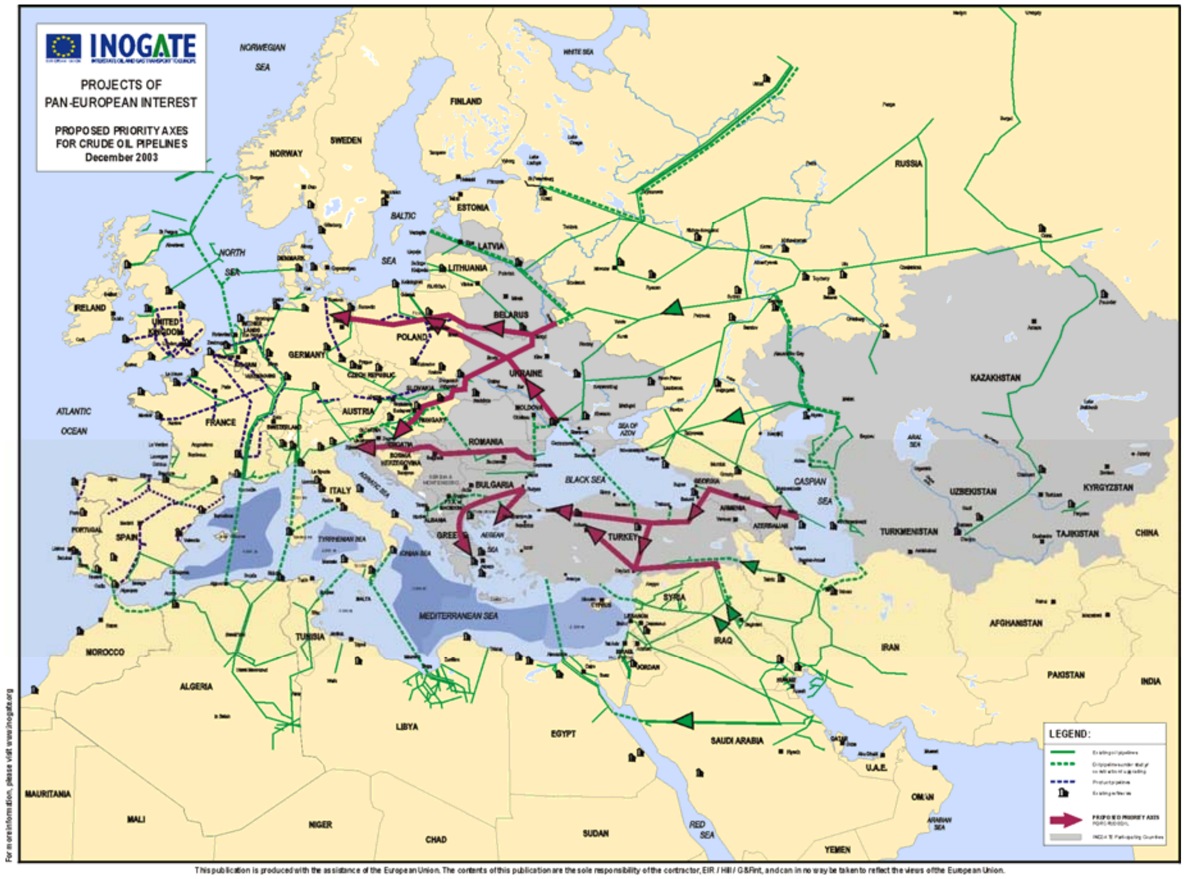
Energy is essential for Europe to function, especially when the challenges of climate change, increasing import dependence and higher energy prices are faced by all EU members. Moreover the interdependence of EU Member States in energy, as in many other areas, is increasing.

Europe needs to act together, to deliver sustainable, secure and competitive energy. Maritime policy plays an important role in achieving this goal. The links therefore between the recent adopted energy policy and the future maritime policy are many and clear:

[63] Communication from the Commission to the Council and the European Parliament - Sustainable power generation from fossil fuels: aiming for near-zero emissions from coal after 2020 - COM(2006) 843.

The maritime areas around Europe are useful for energy production (offshore oil and gas); for carbon free energy generation (offshore renewables); for promoting diversification of transport routes and methods through maritime transport; for contributing through present and future submarine pipeline networks to building up the interconnections needed for the energy internal market; and for the use of the seabed for future carbon sequestration and capture.

An integrated and long term maritime policy will contribute decisively to a stable regime on the uses of Europe's oceans and seas. It will therefore allow for the full exploitation of the energy potential which lies on the vast maritime areas of the EU Member States, for the benefit of energy sustainability and for its security of supply.



Source: Inogate programme, www.inogate.org

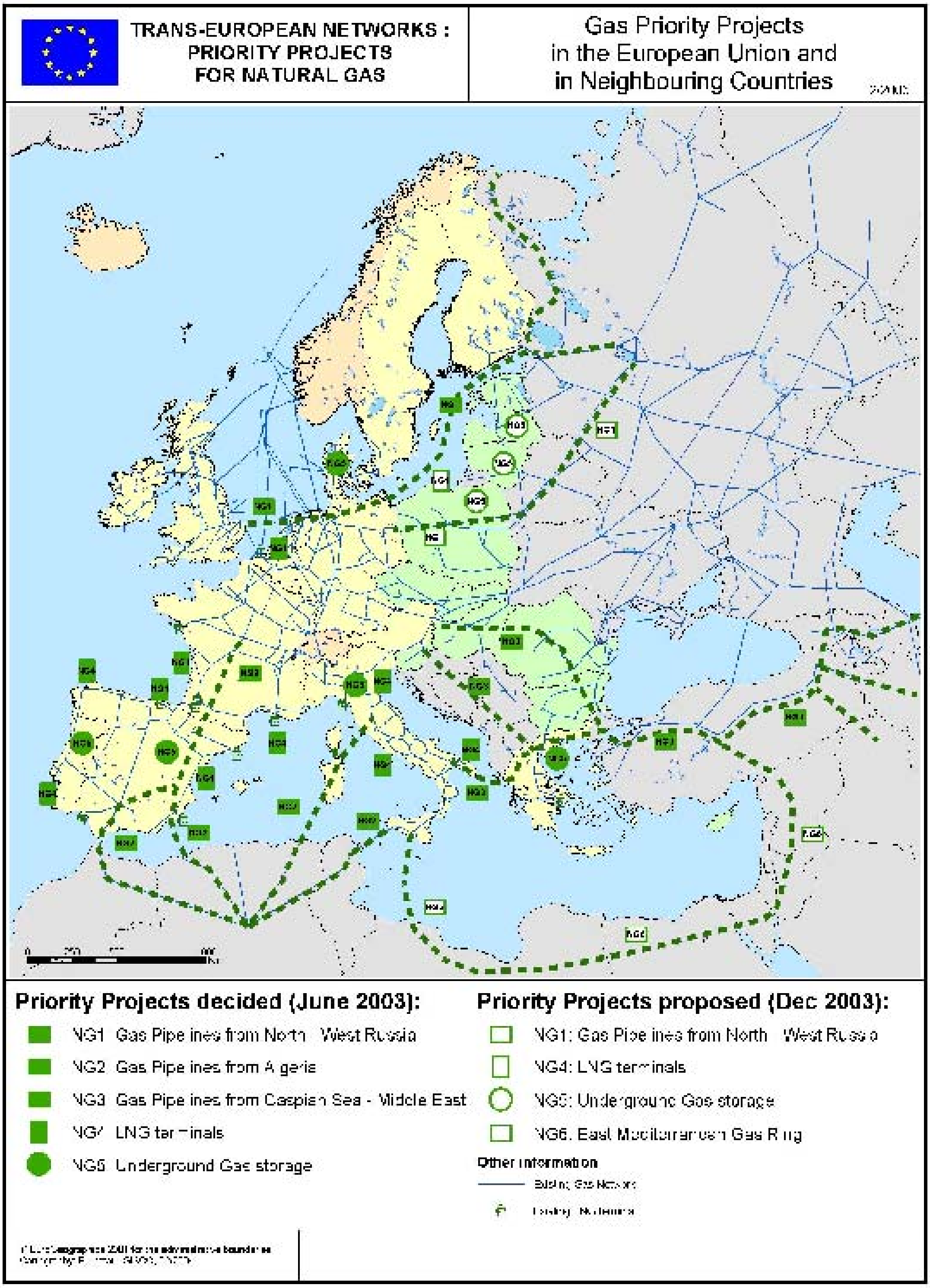
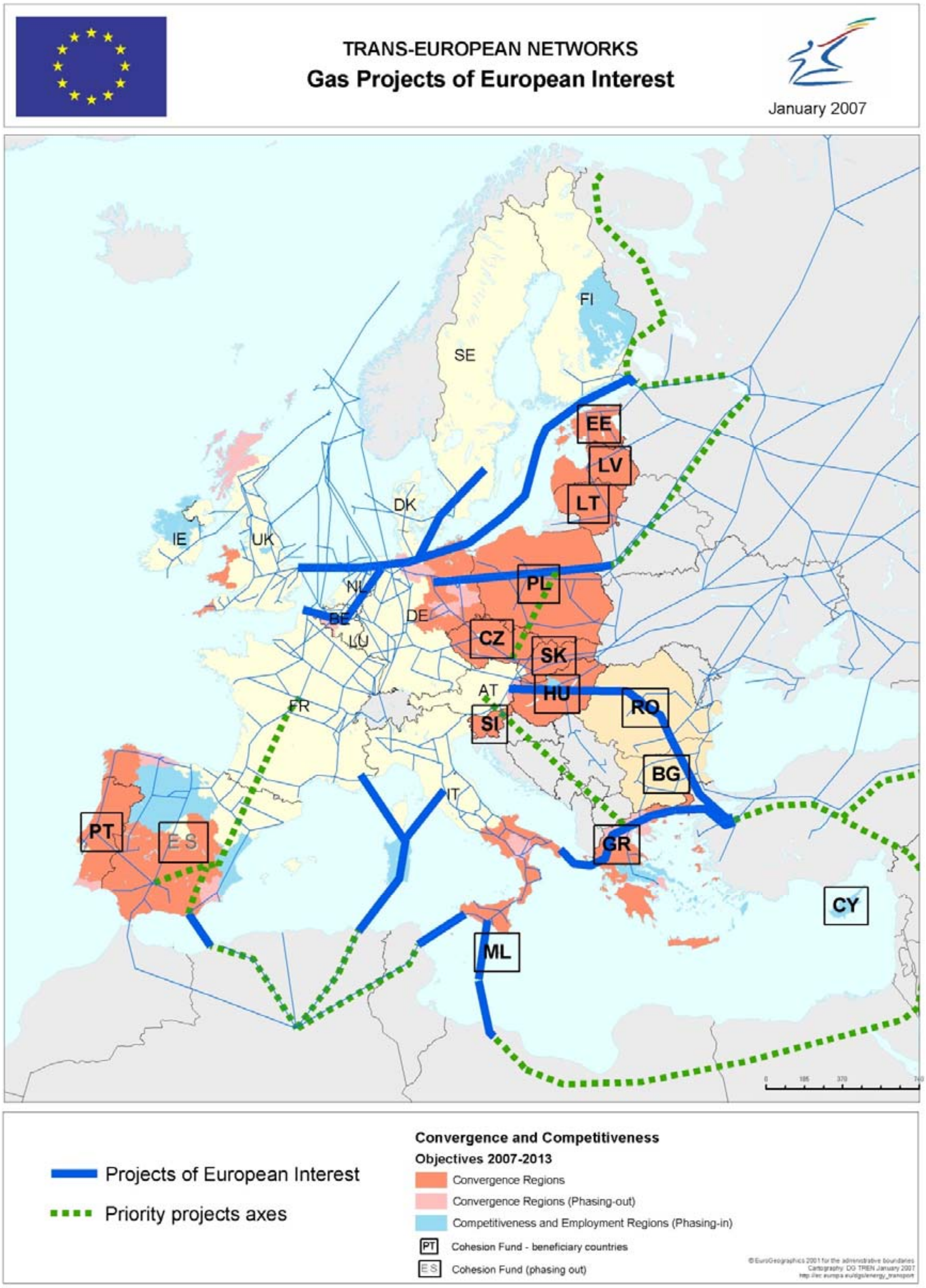


FIGURE 2

Source: TransEuropean Networks programme, http://ec.europa.eu/ten/energy/index_en.htm



Source: TransEuropean Networks programme, http://ec.europa.eu/ten/energy/index_en.htm