



A Just Transition to New Sources of Energy: Technologies, Costs, Geopolitics

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LOW CARBON INTENSITY, ENERGY SECURITY AND ENERGY INDEPENDENCE THE CHALLENGES FOR EUROPE

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Sommario

Gli obiettivi europei per la decarbonizzazione dell'economia entro il 2050 non possono essere raggiunti se l'Europa continuerà ad essere dipendente dall'importazione e uso dei prodotti petroliferi (il 34% dei consumi energetici di cui il 90% importati) e del carbone (il 16% dei consumi energetici di cui il 42% di importazione).

Sono necessarie misure condivise e coordinate tra gli Stati Membri per promuovere da un lato l'elettrificazione dei trasporti (che consumano l'80% dei prodotti petroliferi) e la riduzione drastica dell'uso del carbone nelle produzioni di energia e in quelle industriali..

Per procedere in questa direzione è necessario adottare misure comuni in materia di fiscalità energetica, come la carbon tax.

Nello stesso tempo è necessario

- 1. Rafforzare il ruolo del gas naturale come combustibile di transizione a basso contenuto di carbonio. A questo fine sono strategiche sia il raddoppio del “North Stream” tra Russia e Germania per decarbonizzare la più grande economia europea, sia il completamento del “ Southern Gas Corridor” (che include TAP) e del collegamento Egitto-Grecia per fornire gas all'Europa da fonti diversificate rispetto alla Russia. In questo contesto il ruolo dell'Italia come “hub strategico” è di grande rilievo.**
- 2. Realizzare più efficienti reti elettriche ad altissima tensione (UHV) sia per il trasferimento senza perdite e a lunga distanza delle energie rinnovabili prodotte in Europa (Nord-Sud per l'energia eolica e Sud-Nord per l'energia solare), sia per l'importazione di energia elettrica rinnovabile dall'Africa e dall'Asia. Lo scenario è quello della Global Energy Interconnection proposta dalla Cina per assicurare che entro il 2050 almeno l'80% dell'energia elettrica consumata sia prodotta da fonti rinnovabili”**

The third State of the Energy Union, released by the European Commission in November 2017, highlights that “Europe is moving from a fossil fuels-based energy system to a low-carbon and fully digital and consumer centric one”.

The Energy Union builds on the "Clean Energy Package for All European", the “2030 Framework for Energy and Climate” and the “European Energy Security Strategy”.

WHAT IS THE ENERGY UNION ABOUT?

Energy security, solidarity and trust: Diversifying Europe's sources of energy and making better, more efficient use of energy produced within the EU.

A fully-integrated internal energy market: Using interconnectors which enable energy to flow freely across the EU - without any technical or regulatory barriers. Only then can energy providers freely compete and provide the best energy prices.

Energy efficiency contributing to moderation of demand: Consuming less energy in order to reduce pollution and preserve domestic energy sources. This will reduce the EU's need for energy imports.

Decarbonising the economy: Pushing for a global deal for climate change and encouraging private investment in new infrastructure and technologies.

Research, innovation and competitiveness: Supporting breakthroughs in low-carbon technologies by coordinating research and helping to finance projects in partnership with the private sector.

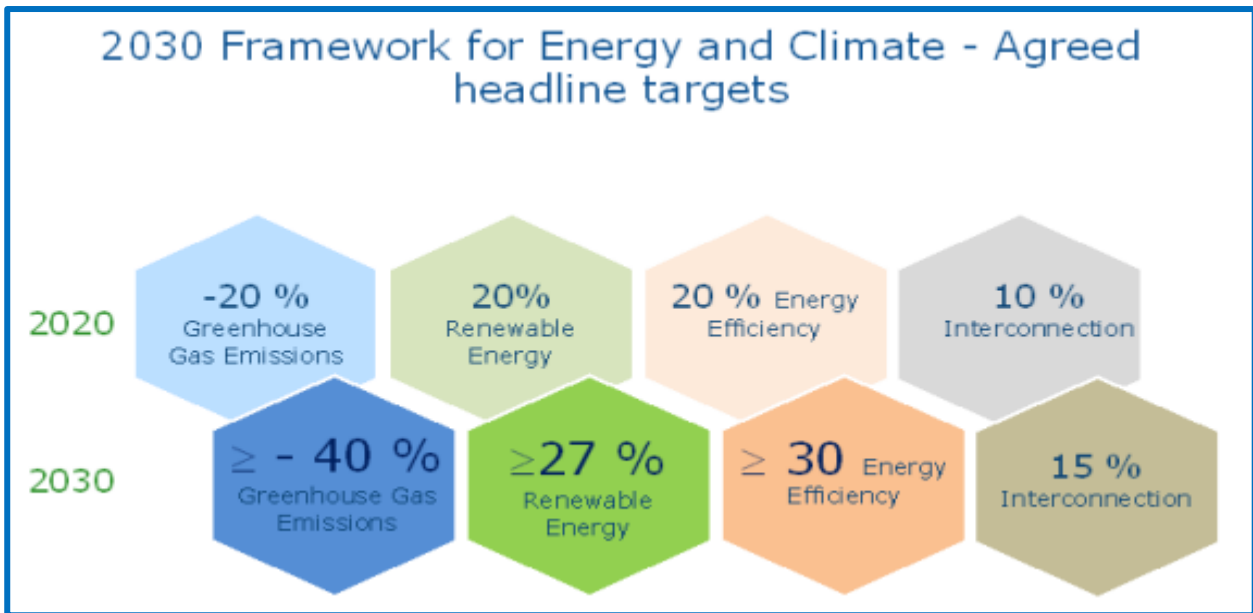
European Commission

THE GOOD NEWS

According to the figures, EU is on track to reach the 2020 and 2030 targets on renewables energy, energy efficiency, interconnection, as well as the emissions reduction.

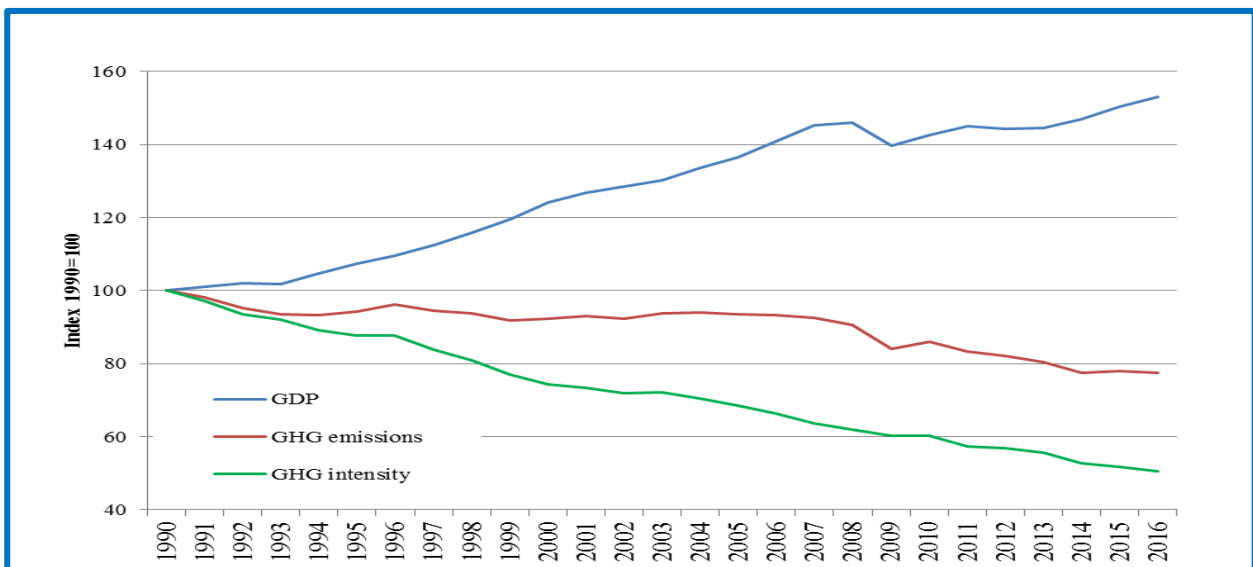
Production of primary energy

More than half (29% nuclear and 27 % renewables) of the EU-28's total production of primary energy was accounted in 2017 by zero/carbon neutral sources, while coal was about 19%, natural gas 14 % and crude oil 10%. Over the last 10 years the production from renewables increased by 71.0 %, by partially replacing the production of fossil fuels based sources of energy. The development and promotion of new technologies and best practices improved significantly the energy efficiency, and today the EU energy consumption is below the 1990 levels.



Decoupling of carbon emissions and economic growth

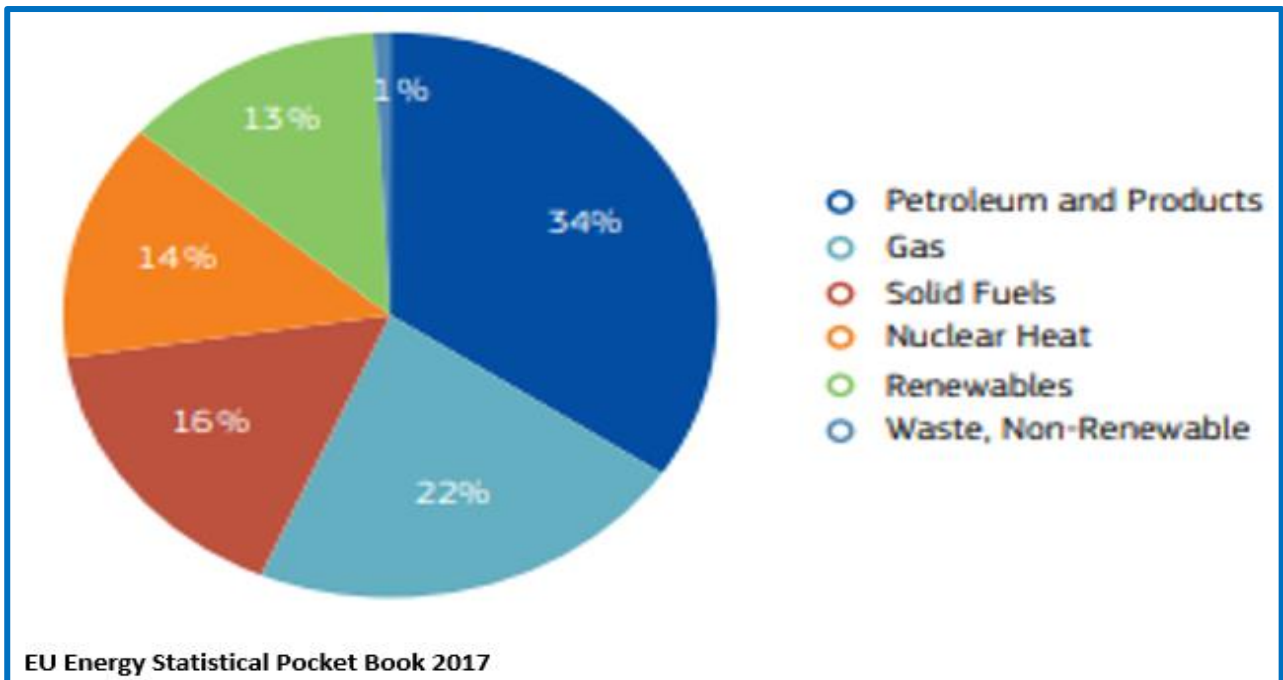
In the last 26 years the EU's combined GDP grew by 53%, while total emissions decreased by 23%. Primary energy demand and GDP continue to decouple, and the carbon (GHG) intensity decreased by about 50%.



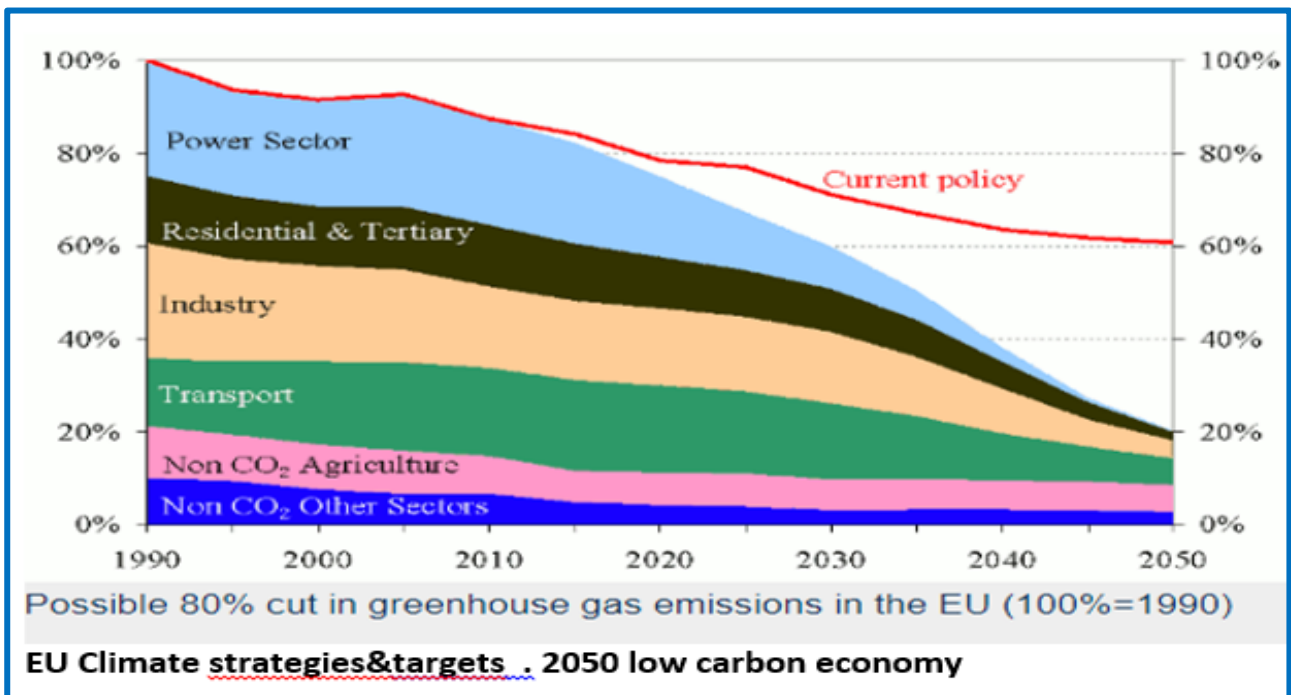
THE BAD NEWS

The European economy is heavily dependent on fossil fuels

Despite the progress in the low carbon intensity, fossil fuels account today for about 72% of EU primary energy consumption. Subsidies provided by Member States (e.g. support to coal/lignite mines, capacity payments for emission intensive power plants, tax incentives for diesel cars) increase the share of fossil fuels in the energy mix.



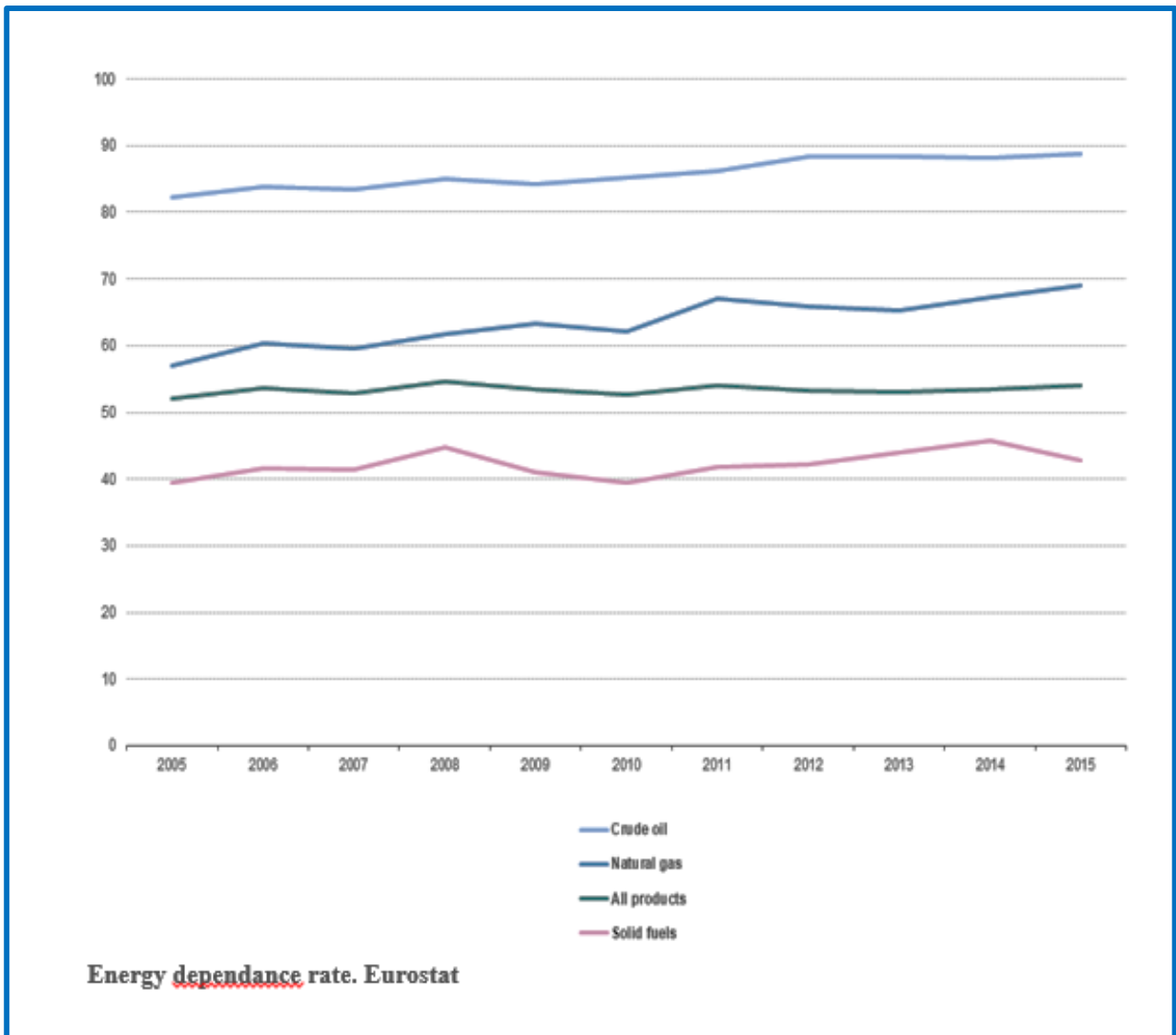
This (*the current policy*) could undermine the EU longer term carbon emissions objectives : 40% emissions cuts by 2030, 60% by 2040 and (at least) 80% below 1990 levels.



The Energy dependance

Most of the fossil fuels used in EU are imported : 90% of crude oil, 69% of natural gas, 42% of coal and other solid fuels.

That is to say that the reduction in the primary production of fossil fuels has been mainly replaced with primary energy imports.



The heavily dependency of the Europe on fossil fuels imports poses serious challenges on the decarbonisation track (mainly crude oil and solid fuels), as well as on the energy security.

Decarbonisation track

Crude oil imports supply mostly the transportation sector (two-thirds of final demand), increasing the carbon intensity of the European economy .

Reduction of oil consumption in the transportation sector is a key driver to decarbonisation.

Coal and solid fuels imports supply power sector (a quarter of all electricity in the EU is produced by coal fired plants, sometime as back-up for renewable energies) and industrial processes such as steel production. Coal and the other solid fuels have the higher “CO2 to energy” content. The reduction in use, and/or the development of advanced low emissions coal technologies, is a top priority.

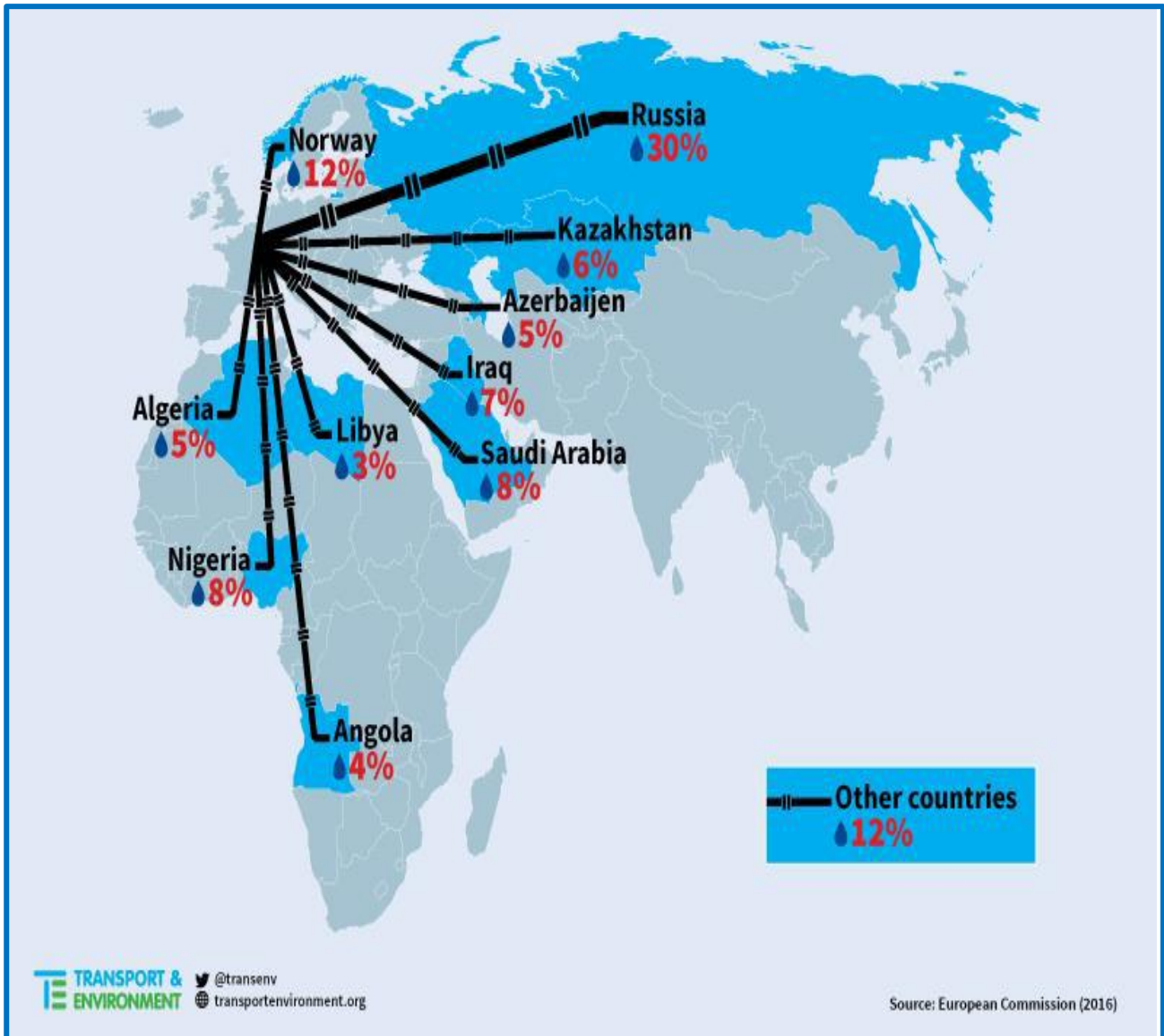
Natural gas imports supply power generation, as well as the industrial and heating/ cooling sectors. LNG imports supply mostly shipping and heavy-duty trucks.

Although natural gas/LNG is a fossil fuel, it has a relatively lower “CO2 to energy content” and can work as a transitional fuel towards the decarbonisation, by gradually replacing solid fuels in power generation as well diesel in transportation.

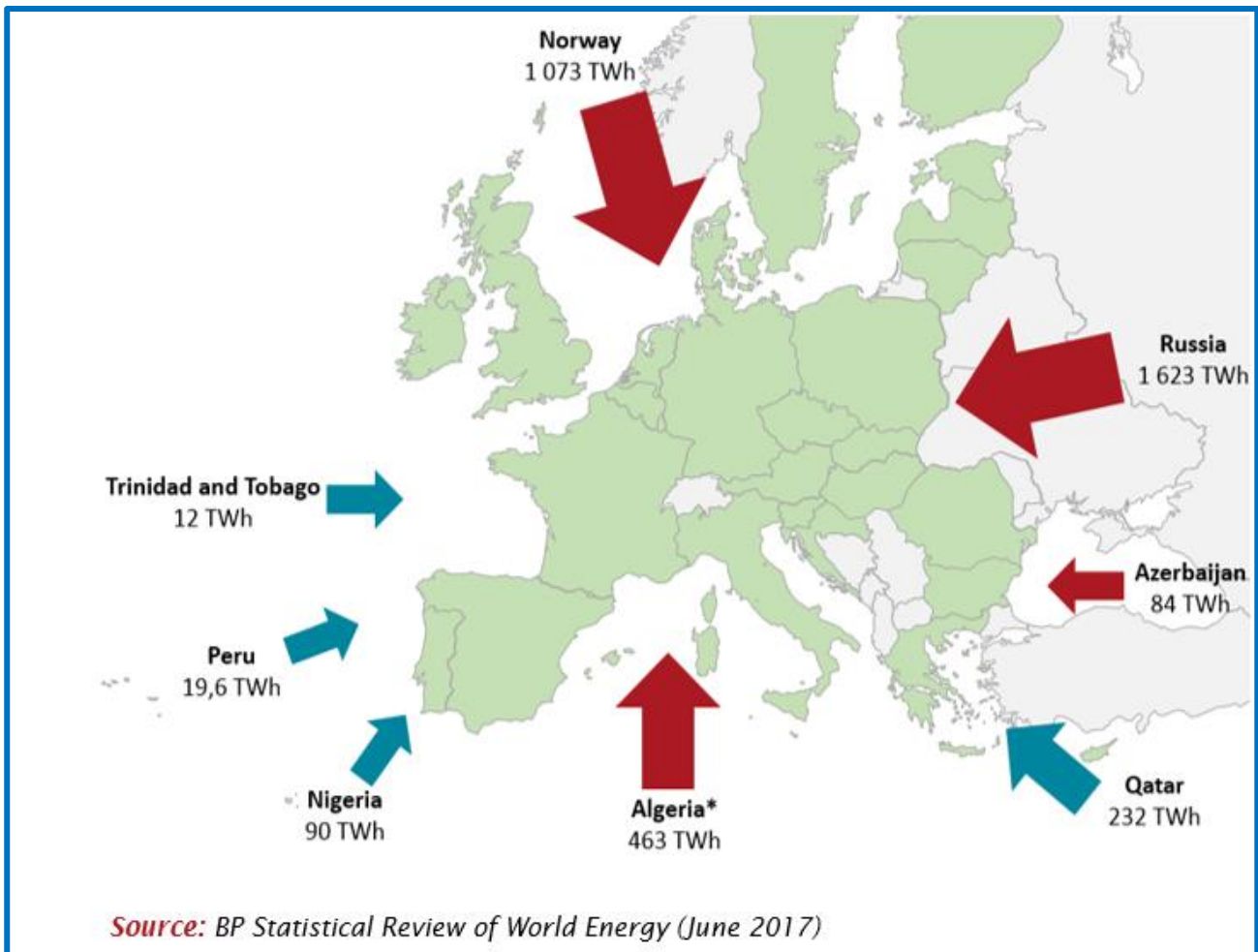
Energy security

Looking at the geopolitical situation, EU is between “*the rock*” of a dominant energy supplier and the “*hard place*” of a strong dependence on regions with high instability. This is threatening the energy resilience of Europe.

Russia is the main supplier of **crude oil** to Europe (30%) followed by Norway (12%). Nigeria and Saudi Arabia account 8%, Iraq 7%, Kazakhstan 6%, Algeria and Azerbaijan 5%, Angola 4% and Libya 3%. Other countries account together 12%.



Today, about 80% of imported **natural gas** comes from two countries, Russia and Norway. The remaining 11% comes from Algeria and, at the moment in a very limited extent, from Azerbaijan. 9% is carried in the form of LNG from other countries. (*blue arrow in the figure*).



Electricity Interconnection

Despite the step towards the fulfilment of 10% electricity interconnection target by 2020, the connection of Europe's electricity systems is facing bottlenecks and difficulties, both in building the cross-border electricity interconnectors as well as in the integration of the energy markets. Interconnection is a priority to meet the energy and climate objectives.

The Report of the European Expert Group on Electricity Interconnection

(November 2017) highlights that *“Much of Europe's electricity grid network has been designed in consideration of the locations of conventional generation plants. However a large share of today's renewables production - notably variable wind and solar – does not correspond to this grid architecture. Interconnectors, in addition to internal infrastructure, are key to creating new electricity routes to connect areas of abundance to areas of scarcity. In this context, the Expert Group recognises that a fundamental role of transmission infrastructure is to enable the integration of areas of high renewable energy potential with main consumption areas. To address the new energy reality the Expert Group proposes a new approach for setting interconnection targets”*.

THE CHALLENGES

Reducing and diversifying energy dependency, as well as improving electricity interconnection, are the necessary and integrated “infrastructure” to meet both the energy security&decarbonising of the European economy.

OIL USE AND IMPORT REDUCTION

The priority is decarbonising transport, improving electrification and e-mobility as well as promoting the shift from diesel to alternative (biofuels) and low carbon fuels (natural gas/LNG) in shipping, aviation and heavy trucks.

This is the way to reduce drastically the demand of oil and petroleum products.

To this end, the *European Strategy for Low-Emission Mobility* should be integrated with effective policies for electrification and diversification of primary energy supply.

DIVERSIFYING OF NATURAL GAS SUPPLY

Natural gas is the best short term available option as back-up capacity of renewable energies, to generate electricity when "the wind doesn't blow" and "the sun doesn't shine."

Natural gas is also a transitional "low carbon" resource to replace the carbon intensive coal and petroleum in power sector, heating and cooling, driving towards the drastic reduction of solid fuels imports, with a significant outcome both in decarbonisation and energy security of Europe.

PRIORITY EUROPEAN GAS CORRIDORS

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.

NORTH-SOUTH GAS INTERCONNECTIONS IN CENTRAL EASTERN AND SOUTH EASTERN EUROPE ('NSI EAST GAS'): Gas infrastructure for regional connections between and within the Baltic Sea region, Adriatic and Aegean Seas, eastern Mediterranean Sea and Black Sea, and for enhancing diversification and security of gas supply.

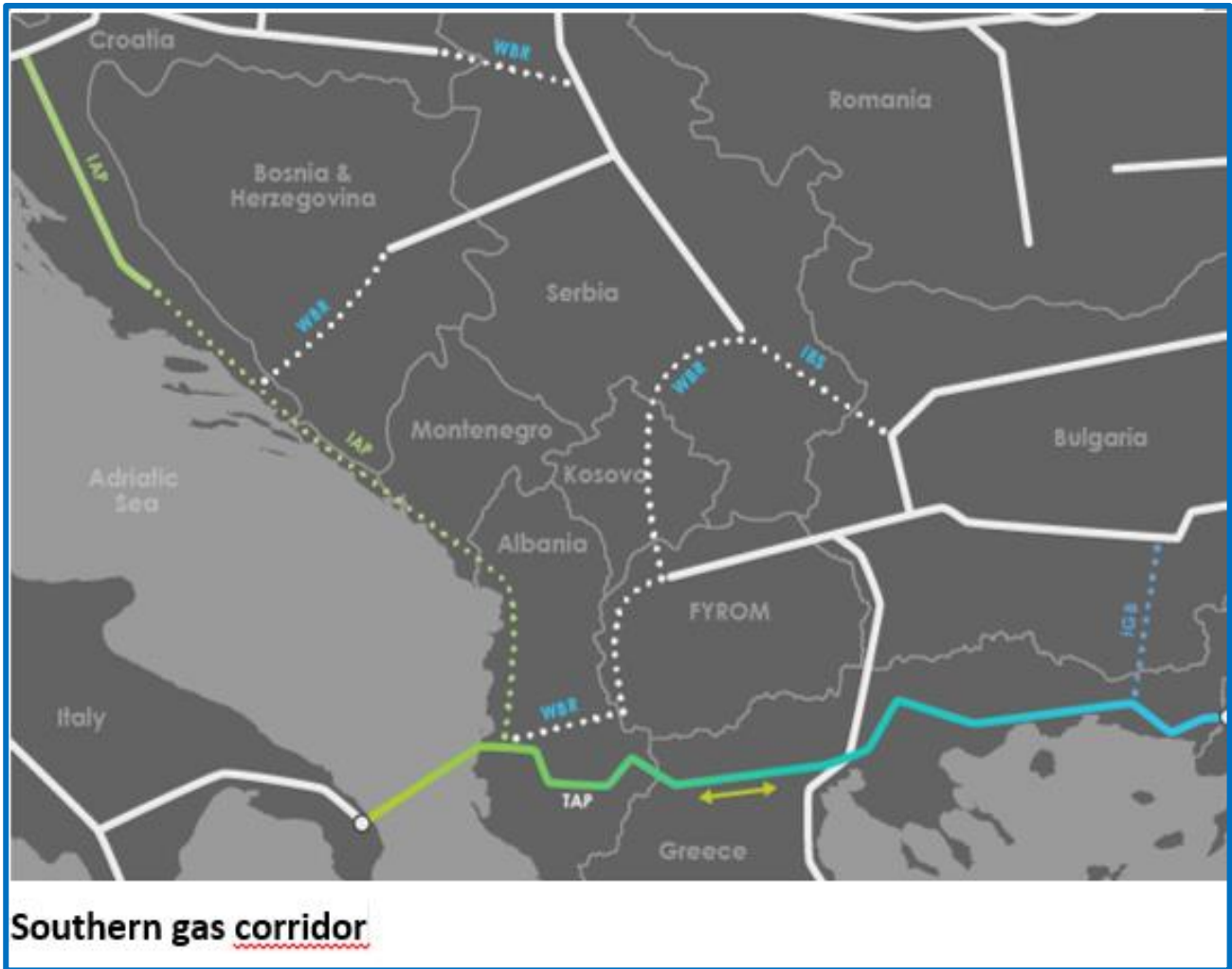
SOUTHERN GAS CORRIDOR ('SGC'): Infrastructure for the transmission of gas from the Caspian Basin, Central Asia, Middle East and eastern Mediterranean Basin to the EU to enhance diversification of gas supply.

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, and to increase diversification and security of supplies in the Baltic Sea region.

That's why natural gas is a strategic "energy bridge" towards the decarbonisation, while at the same time the security and diversification of supply are essential for the future of Europe.

The priority European Gas Corridors are the framework for the energy security.

In this context, according to Miguel Arias Cañete, the European Commissioner for Energy and Climate Action "a key major project for our diversification efforts is the **Southern Gas Corridor**, to bring gas from the Caspian region directly to Europe. It is a measure of the success of all involved that the first gas from Azerbaijan will be delivered to Turkey this summer already, and that it should arrive in Europe as of 2020" (April 2018)



The Southern corridor (TAP) will supply natural gas from Azerbaijan to Greece, Western Balkans and Italy with the initial capacity of 10 billion cubic meters (bcm) per year, reducing the European dependence on Russian gas.

To this regard, Commissioner Cañete said that *“looking at our short term geopolitical and energy situation, it is clear that Russia will remain a key energy supplier for the EU. What is important is to ensure that Russian energy supplies into Europe are subject to competitive pressures from the existence of other suppliers able to compete anywhere across our market”*.

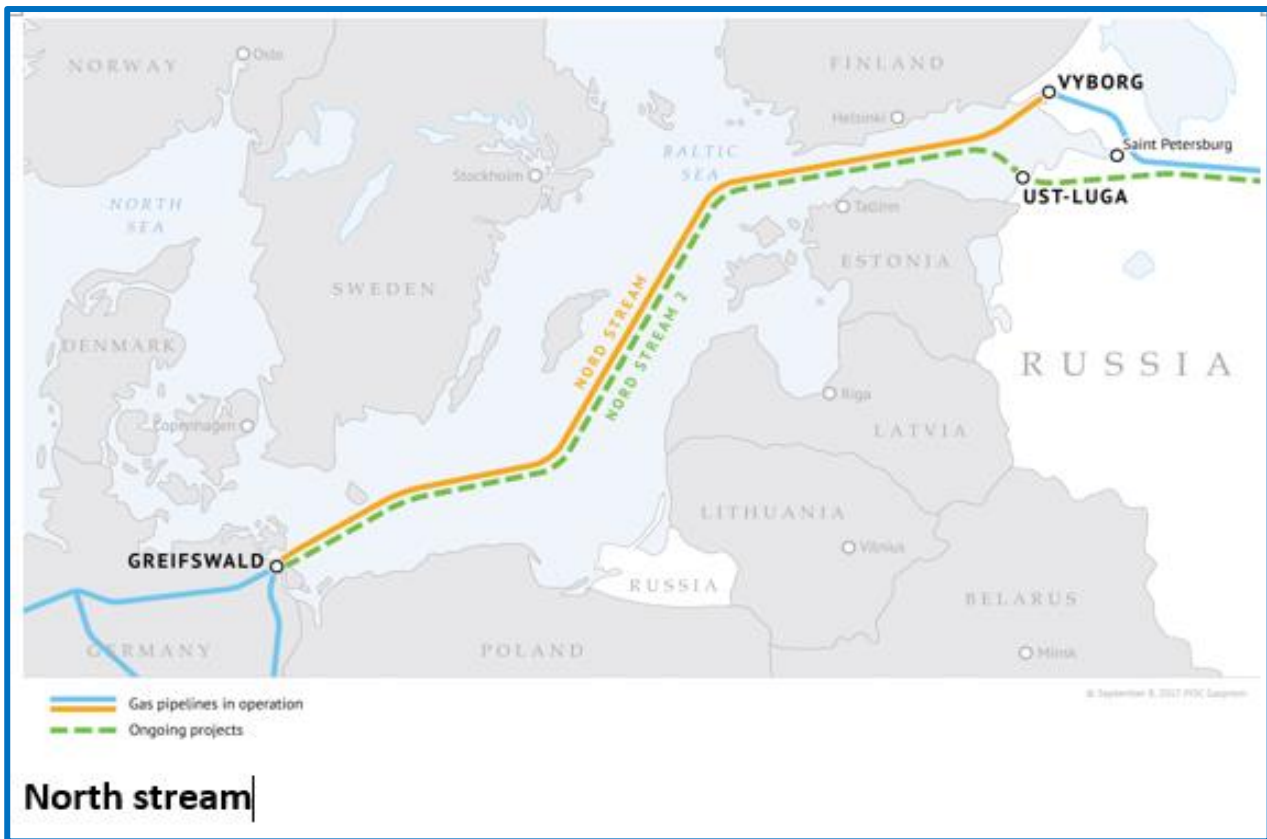
Obviously Russia does not want to lose positions in the market, supported by the highly efficient Gazprom network of facilities and services in Europe.

This is the context of the **North Stream 2 project**, aimed to supply natural gas from Russia directly to Germany with the annual capacity of 55 billion cubic meters.

North Stream 2 will double the North Stream pipeline, supported by the European Union and operating since 2011.

The project is finalized mostly to meet the demand of Germany, committed to phase out in the medium term coal fired power and nuclear plants. Five European energy firms are financing the pipeline: German energy groups Uniper and Wintershall, Anglo-Dutch group Shell, Austria’s OMV and France’s Engie.

From a technical and economic point of view the project does not seem to have real alternatives.



Nevertheless, the project is highly divisive.

The European Parliament says it increases Europe's dependence on a single supplier, while USA underlines the risks of supply disruption as in the case of Ukraine.

But, on the other hand, the legal service of the Council of the European Union has recently rejected a European Commission proposal to extend the bloc's internal energy market rules to regulate North Stream 2.

Decarbonising the German economy should be the priority to link North Stream 2 construction with the energy security concerns, also taking into account that a large LNG terminal will be built in northern of Germany (Brunsbuettel). The LNG terminal, according to the state's Economy Minister Bernd Buchholz "*will help cut Germany's dependence on Russian imports.*" In other words, LNG will balance North Stream 2.

ELECTRICITY INTERCONNECTION

Interconnection and decarbonisation are the two sides of the same coin.

Efficient and well integrated electricity European networks, in combination with the smart grids dissemination, reduce the primary energy demand as well as the fossil fuels import, improve the continuity of dispatching electricity from renewable energies, increase the electrification and the final uses of electricity in transportation and heating/cooling sectors.

European interconnection should be reviewed in the context of the new "*energy reality*", in order to maximize the supply of renewables in the grid.

Today, because of the lack of HV transmission lines from the wind power in northern Europe to the consumption centers in the southern, when the winds blows hard the surplus is not dispatched in the grid in efficient way.

This is the same for the solar energy in Southern Europe.

New advanced and effective technologies -like Ultra High Voltage Direct Current lines (UHVDC) – can allow the long distance and cross border transmission of electricity from renewables along the Priority European Electricity Corridors.

The new corridors can become the backbone of the European Super Grid, like the *North Sea Countries' Offshore Grid Initiative*, which aims to create a regional supergrid.

PRIORITY EUROPEAN ELECTRICITY CORRIDORS

NORTH SEAS OFFSHORE GRID (NSOG): Integrated offshore electricity grid development and related interconnectors in the North Sea, Irish Sea, English Channel, 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.

NORTH-SOUTH ELECTRICITY INTERCONNECTIONS IN WESTERN EUROPE ('NSI WEST ELECTRICITY'): Interconnections between EU countries in this region and with the Mediterranean area including the Iberian peninsula, in particular to integrate electricity from renewable energy sources and reinforce internal grid infrastructures to promote market integration in the region.

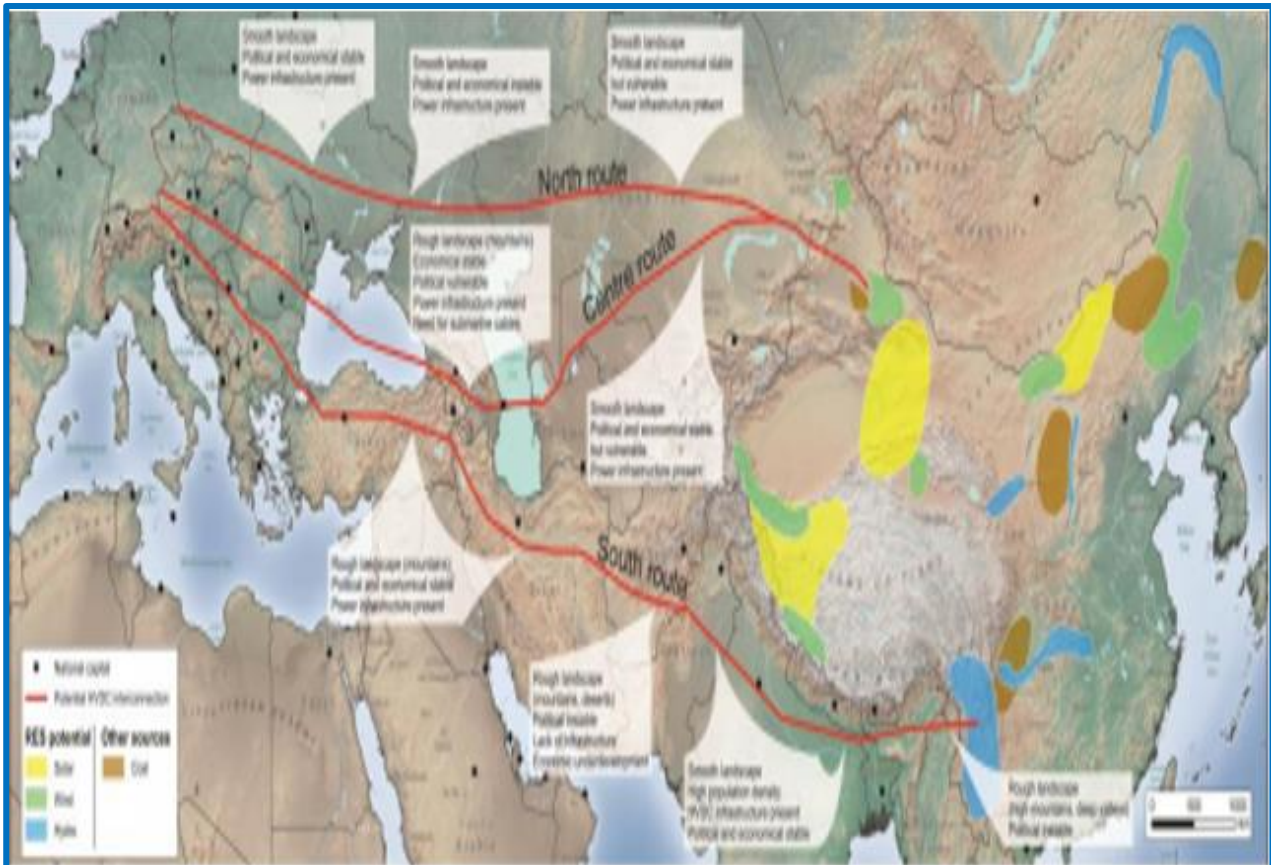
NORTH-SOUTH ELECTRICITY INTERCONNECTIONS IN CENTRAL EASTERN AND SOUTH EASTERN EUROPE ('NSI EAST ELECTRICITY'): Interconnections and internal lines in north-south and east-west directions to complete the EU internal energy market and integrate renewable energy sources.

BALTIC ENERGY MARKET INTERCONNECTION PLAN IN ELECTRICITY ('BEMIP ELECTRICITY'): Interconnections between Member States in the Baltic region and the strengthening of internal grid infrastructure, to end the energy isolation of the Baltic States and to foster market integration; this includes working towards the integration of renewable energy in the region.

The interconnection of the European electricity network can also facilitate the supply of electricity from non European regions.

The Chinese proposal (Global Energy Interconnection) for building an HVDC interconnection to transmit “clean” electricity to Europe has been evaluated by the Joint Research Center of the European Commission (2017).

“Given the challenges of finding a steady source of clean electricity to meet the ever increasing power demand of Europe the moment to study and consider the advent of such an interconnection is just right. The technology advances in the last decade in the field of HVDC transmission brought the state-of-the-art at the level where such an infrastructure is technically possible to be built and operated. The numerous examples around the world show that the technology is mature and well established as common way of transmitting large quantities of electricity over long distances. The capacities and ratings are high enough to withstand long distance associated losses maintain a high efficiency”.



Scenarios for an HVDC power interconnection between China and Europe. Joint Research Centre – European Commission (2017)

The transmission of clean electricity to the European grid can change dramatically the current energy scenarios : the energy dependence from fossil fuels could be set near zero, while the security of electricity supply should be addressed and managed.

It's certainly better.