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A long-spanning bridge

Less carbon, more gas. This shift promises to further the global energy industry's goal of ensuring a more sustainable future for the planet. The analysts featured in *Oil* issue 33 praise the “bridging” role that blue gold will play ahead of a more radical energy transition. Amine Mazouzi, President of Algeria's Sonatrach, for example, holds that the coming years will see “gas and renewables” share an increasingly significant space within the global energy mix, echoing a view endorsed by Klaus-Dieter Borchardt, Internal Energy Market Director of the E.U. Commission, when pointing out how, in the name of greater continental energy security, all E.U. Member States will benefit from the same level of access to LNG. The United States, in this scenario, might take on a position of leadership, if, as it seems, the new administration releases the hydrocarbons sector from the more or less restrictive constraints imposed in the past and supports the export of LNG, which is also of much interest to Europe. A leap forward by Washington of this kind could “threaten” Russia's supremacy beyond the Urals, although Moscow's energy presence in the Old Continent, as Konstantin



Simonov points out, has never been stronger. However, the route to U.S. supremacy now seems laid out. According to Mehmet Ögütçü, President of the Global Resources Partnership, the new oil axis seems to make its way overseas, from Canada to North Dakota and southern Texas, and as far as the offshore gas fields near Brazil—a scenario that could, in the short term, reset certain global energy balances that were thought to be “set in stone” but instead look set to change. The use of gas, as pointed out by Ambassador Morningstar, Director of the Atlantic Council Global Energy Center, shall not be limited to the period of time that separates the world from the definitive rise of renewables, even in the face of the pressure that many countries are exerting. Rightly belonging to this group are also Iran and Saudi Arabia, key players, often on opposing sides, in an energy transformation, as Bassam Fattouh explains, and recording a growth in gas extraction levels. On the other hand, Europe, as Paul Betts points out, has, over the past few decades, planned the development of its infrastructure to import and store gas—possibly too much so. The E.U.'s so-called “Ten-Year Network Development Plan” envisages an 8 percent increase in gas demand between 2010 and 2013, while the latest data reveal a 14 percent decline in demand. Even Beijing seems to be sitting on the fence waiting for decisions to be taken at the White House, especially on climate change. The Dragon cannot allow itself to abandon its path towards a low-carbon energy strategy, and seems rock-firm on commitments made after signing the Paris Agreements. We have a global situation that could therefore be defined as “magmatic,” but one that will soon deliver those answers that the global community is awaiting and that, we believe, will naturally restore its balance.

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We know the story: Mother Nature is sending increasingly loud and frequent signals that something new and dangerous is afoot. Regularly, climate scientists release incontrovertible data showing that climate is changing and offer robust explanations of why this is happening. We also know the other part of this story: Not enough is being done by peoples and governments to alter a trajectory that is guaranteed to force drastic changes in the human condition. The American Meteorological Society warns that unless concerted action is taken by all nations, there is an almost certain probability that global temperatures will rise by 4 to 7 degrees Celsius in the next one hundred years. A world with that average surface temperature is very different from the one humans have inhabited since they first appeared in the planet. We also know that, recently, this story included a twist that is as unprecedented as it is welcome: on December 2015 in Paris, 177 nations agreed to transform the planet into a low-carbon economy. The COP21 signatories committed to combat climate change, while promoting adaptation to its already irreversible effects. From then to October 2016, 96 countries have already ratified this agreement, which includes the goal to limit to no more than two degrees Celsius the increase of the average global temperature. This goal cannot be accomplished unless fossil fuel consumption is significantly replaced by less contaminating sources of energy and, eventually, by green, clean renewable sources. Countries that have ratified COP21 are now committed to monitor their efforts to reduce emissions, to take action to ensure that their targets are being met, to help bring underperformers in line and to help developing countries both to reduce emissions and to adapt to the impact of the already irreversible changes in climate. Going from a high to a low carbon economy is a process that will require time, although the growth of renewable energy has been much faster

than expected. Renewable sources of energy have already overtaken coal as the world's largest source of electric power. The EIA reports that two new wind turbines are built every hour in countries like China. Solar, wind and other renewable sources are already generating about 25 percent of the world's electricity. In the U.S., wind and solar capacity has tripled in the last 6 years and a new report from the U.S. Energy Information Agency finds that electricity generated by solar and wind sources grew faster in 2014 than electricity generated by fossil fuels. This expansion has been greatly helped by the plummeting costs of renewable energy technologies. Since 2008 the costs of solar and wind energy have fallen by 80 percent and 50 percent

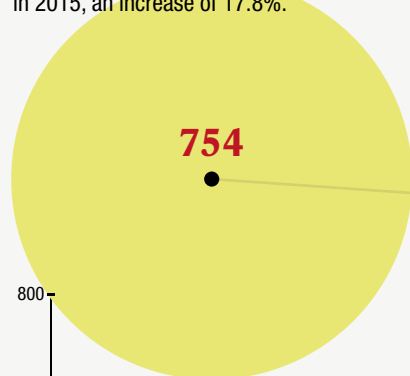
The author

Moisés Naim is a Distinguished Fellow at the Carnegie Endowment for International Peace in Washington, D.C. and an editorial board member of *Oil*. His most recent book is *The End of Power*.

respectively. Worldwide, renewable energy already represents close to 10 percent of total world energy generation and this rate of growth is expected to increase. In fact, the U.S. Energy Information Administration forecasts renewable energy will be the fastest-growing power source through 2040. So, yes, it looks that some kind of energy transition has already begun. This impressive growth in the use of renewable energy is largely taking place in the electricity sector. Unfortunately, other sectors are lagging. Transportation, for example, continues to run by and large on fossil fuels. Even the most optimistic reports on the growth of renewables cannot eliminate concerns that the transition from a high to a low carbon economy is not going fast enough. The International Energy Agency scenarios suggest that there are low probabilities of staying below a warming of two degrees Celsius unless more substantial policy actions are taken to reduce carbon dioxide emissions.

United States

The United States has become the world's top gas producer as a result of the shale revolution. U.S. gas exports rose from 42.87 billion cubic meters (bcm) in 2014 to 50.48 bcm in 2015, an increase of 17.8%.



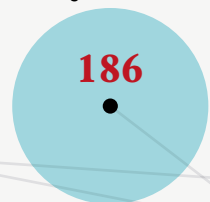
Russia

As of January 1, 2016, Russia held the largest gas reserves in the world: approximately one quarter of proven global reserves. Most of this gas is in Western Siberia. In 2015, more than 75% of Russian gas exports went to Europe.



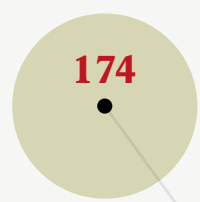
Iran

Iran has 17% of the world's proven gas reserves and more than one third of OPEC reserves. Despite continuous delays in the development of its gas fields and the effects of sanctions, Iran's gas production is expected to increase in the coming years due to development of new phases of the South Pars gas field.



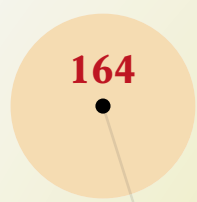
Qatar

In addition to being the world's fourth largest gas producer, Qatar is the main exporter of liquefied natural gas (LNG), with a 31 percent market share. Qatar is also at the forefront in the conversion of natural gas to liquid fuels (GTL), with the largest GTL plant in the world.

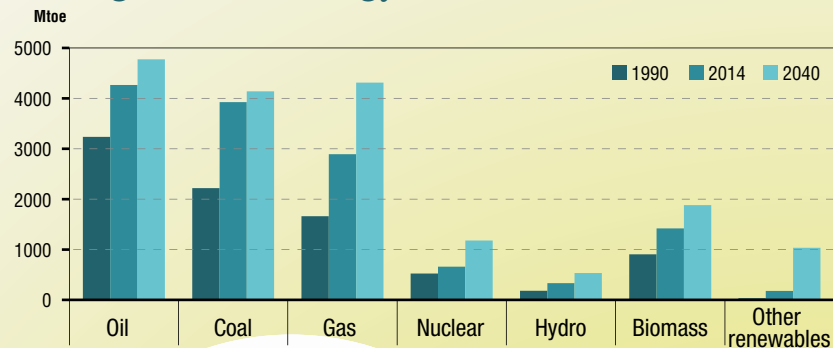


Canada

Canada is the world's fourth largest exporter of natural gas. Although the country is focusing on LNG, all of its gas is currently sold on U.S. markets, where it arrives through a gas pipeline. It is estimated that Canada has unproven shale gas resources amounting to 16,220 bcm.

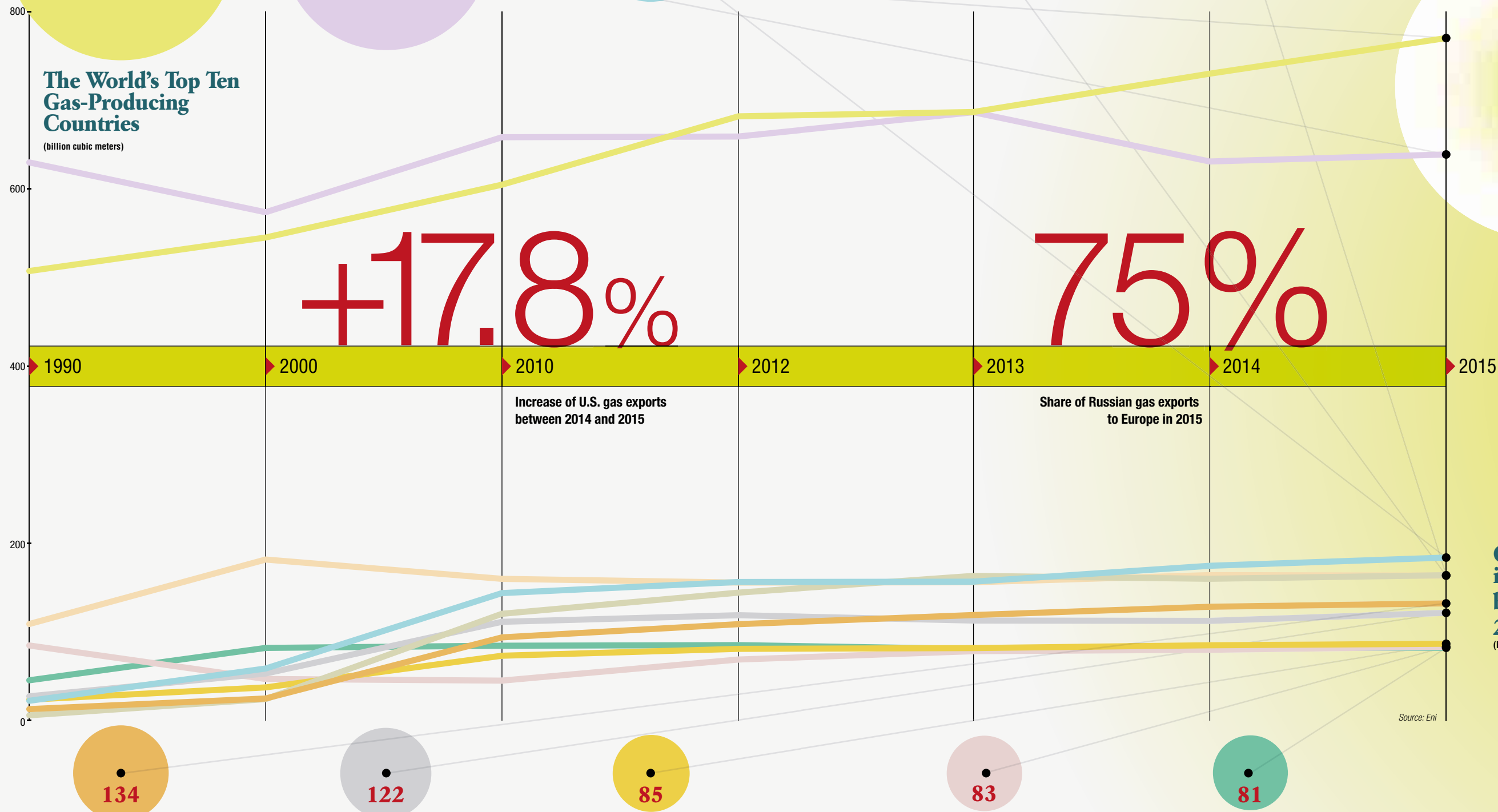


Change in total energy demand



The World's Top Ten Gas-Producing Countries

(billion cubic meters)



China

China was a net gas exporter until 2007. Since then, gas imports have increased dramatically in tandem with rapidly developing pipeline and natural gas processing infrastructure. Natural gas imports meet around 30% of China's demand.



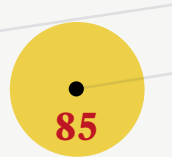
Norway

Norway is the world's third largest gas exporter and supplies most of the gas used in Europe. Although the main gas fields in the North Sea are becoming mature, Norwegian production has grown almost every year since 1993, partly due to the development of new gas fields.



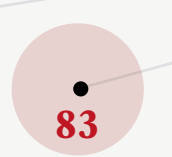
Saudi Arabia

Although Saudi Arabia possesses one-fifth of the world's natural gas reserves, the country's natural gas production is still limited because of high costs. All of its gas supplies are for domestic use, partly to minimize the use of crude oil to generate energy.



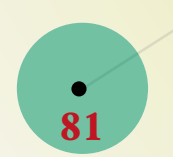
Algeria

Algeria ranks eleventh in the world for proven natural gas reserves and third for technically recoverable shale gas reserves. In May 2014, Algeria's Council of Ministers gave formal approval to the development of shale gas concentrated mainly in the Ghadames Basin.



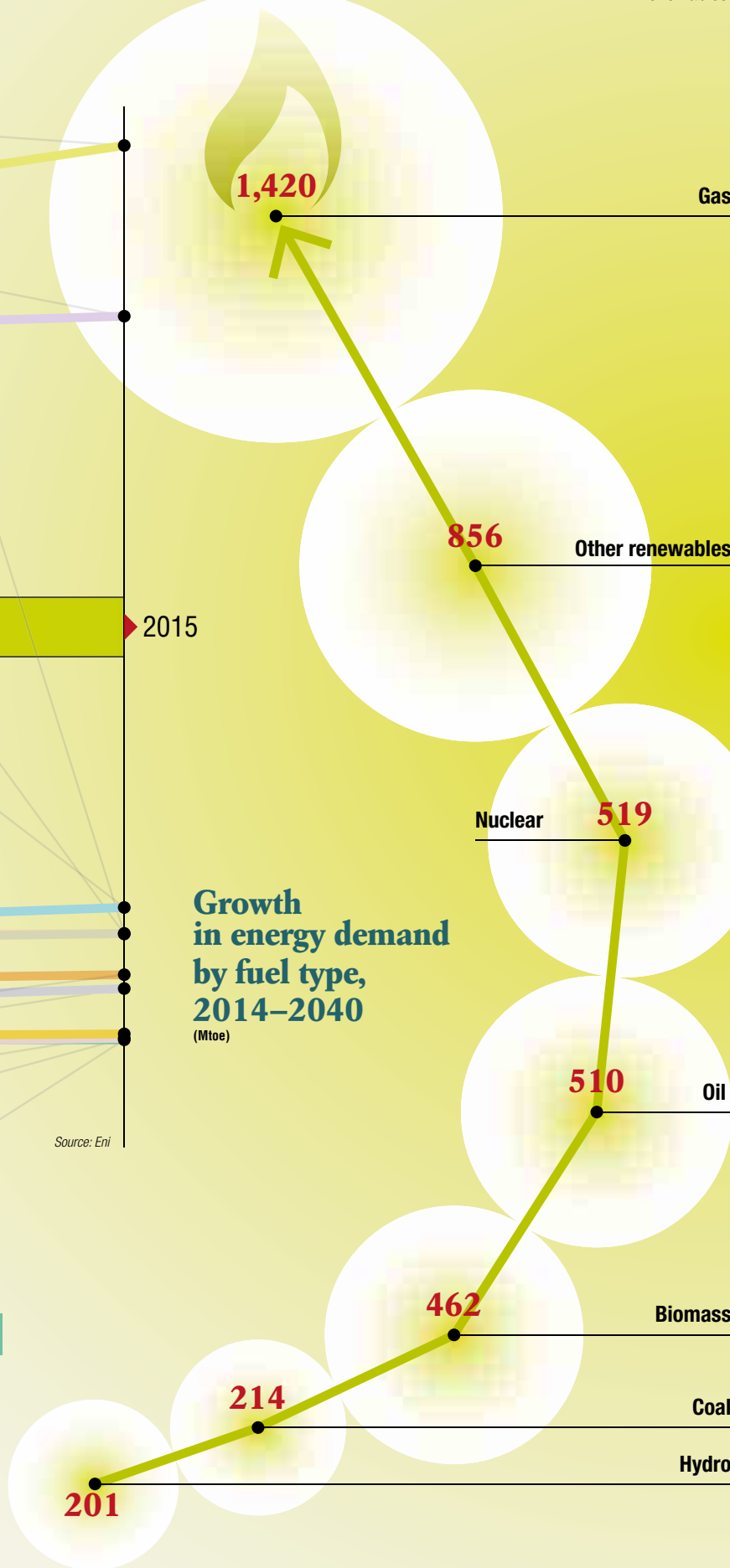
Turkmenistan

Turkmenistan possesses several of the largest natural gas fields in the world, mainly concentrated in the Amu Darya Basin, in the Murgab Basin and in the South Caspian basin. In 2015, it exported 36.81 bcm by gas pipeline, with over 70 percent going to China.



Growth in energy demand by fuel type, 2014-2040

(Mtoe)



Source: Eni calculations



Amine Mazouzi

He is Chairman and CEO of Sonatrach. In the same company he had already held several positions including Director of Strategy and Planning, Director of Research and Projects, Head of the Hassi Messaoud division, New Technologies Manager and Senior Engineer at the Petroleum-Engineering-Development (PED) Division. Mazouzi has authored many international publications.

Exclusive/Amine Mazouzi, Chairman and CEO of Sonatrach

Still a key player

Gas will continue to be a very important fuel worldwide and especially for Algeria. One of the world's main producers, the country will invest \$70 billion in the next five years, most of which will be for the development of blue gold



CLARA
SANNA

She works in Eni as Publications Manager for External Communication Department, Media Production.

The decline in gas production investments will re-establish a balance between demand and supply and will bring prices to a "fairer" level. This is the forecast of the Chairman and CEO of Sonatrach, Amine Mazouzi, who, in an exclusive interview with *Oil*, outlines the future prospects for gas on a global level and describes the projects of one of the world's main producers: Algeria. For a long time, blue gold will continue to play a major role in the energy arena, explains Mazouzi, announcing a \$70 billion plan that is mostly intended for the development of conventional gas.

The Paris agreements project a zero-emissions future. What role do you think gas will play in this context? Are renewables a threat to gas or can the two sources complement each other, at least during the transition phase?

The development of renewables is not inconsistent with the development of gas; on the contrary, they must work together during the transition phase: to have electricity at an accessible price, we need an additional backup source that, in the absence of sun, wind or waves, still enables us to produce the electricity needed according to demand cycles. Therefore, gas will have an important role.



Gas in Algeria

2014
Production: 83.74 bcm
Consumption: 38.48 bcm
Export: 45.26 bcm

2015
Production: 83.49 bcm
Production: 39.00 bcm
Export: 44.49 bcm

Source: Eni world oil & gas review 2016



We believe that the CO₂ market must also develop, which could give real value to the ecological aspect of gas.

The price of gas reached very low levels in the last two years. Why is this? Do you think this trend will continue in the medium term, or is it destined to reverse?

If we look at market fundamentals, the fall in prices seen since 2009 is due to the decline in demand, or rather to the fall in consumption and, therefore, in demand. This is primarily a result of the economic and financial crisis. In addition, we have witnessed the development of new sources of gas—the United States is now the top global producer of shale gas—and this has created an imbalance between demand and supply that leads to the decline in prices. However, this is only in a sense of abundance, because although the price is medium or low, there are peaks in demand: for instance, the European market is currently experiencing a sudden peak in demand due to difficulties in French nuclear power plants. The spot market is still not ready to handle these sudden peaks. Another factor is the development of LNG plants and FSRU, namely floating regasification installations, which are cheaper to develop.

A global market is therefore taking shape. On the other hand, however, there are fewer upstream investments in production. This, combined with the development of the LNG market for electricity production, will lead to a decline in supply that, in the medium term, will restore a balance that we believe will lead to a fairer gas price.

Sonatrach is the sixth largest energy company in the world in terms of natural gas reserves and production, as well as the world's fourth largest LNG exporter and fifth largest natural gas exporter. What are your future plans? What moves will you make in a very rapidly changing world?

In Algeria, we have three types of gas reserves. Firstly, the conventional brownfield gas fields, which are in production and have not yet had the last word. We are optimizing them to maximize gas recovery. Also in this area there is gas associated with oil, which we have so far used for reinjection needs, but we are now seeking alternatives to increase recovery and, therefore, to enable its enhancement.

This involves very significant volumes. A second type of reserve is tight gas, which to date we have not exploited: we are currently in an assessment stage and studies reveal that there is huge potential. In terms of shale gas, our reserves are the third largest in the world. We developed two pilot projects that produced results that exceeded our expectations. Our benchmark was the United States, and results have been higher than average, even in terms of rock features. All indicators show that development of the gas fields would be favorable and economic.

In addition, we recall that so far in Algeria, 34 percent of the areas with mining potential have been explored. Our strategy plans for assessments in the north of the country: the mother rock from which the oil discovered in the 1940s was extracted is, in fact, the same rock from which shale is extracted. The advantage is that we already have the infrastructures; all research and assessment work is carried out in areas in which the necessary installations are already present. Therefore, if we decide to develop these fields, the existing infrastructures will be key factor to the economy.

This is our gas development strategy that leads us to say that gas in Algeria has a bright future.

At market level, we have export infrastructure such as the gas pipeline travelling east towards Italy and west towards Spain and Portugal, and we may have interconnections even further north. Our basic framework is therefore linked to these positions. We then have a scalable LNG capacity. Not all our gas goes into the gas pipelines—we are at approximately 50-50—and LNG enables us to reach the most distant markets, and, on the other hand, to develop our local markets, which are east of the Mediterranean and potentially northern Europe. We are currently looking at markets with clear growth, especially in the eastern Mediterranean—Egypt, Turkey

and the Middle East—and we are developing our capacity by increasing our flexibility to go beyond our existing position.

Algeria is one of Europe's main gas suppliers. How are the energy and trade relations between your country and the E.U., and how will they be in the future?

Sonatrach has been a major supplier to the European market for many years. We have been among the three largest supplier, and we are always here, with an impeccable, proven reliability for many years. We were able to respond when the European market had discontinuity issues from other suppliers, and we plan to maintain this position, developing it for the better and making our supplies increasingly reliable. In addition to gas, our energy relations with Europe also concern crude oil, condensate, LPG and refined products, and therefore we are a major player in the market and expect to maintain this role in the future.

Algeria is also the E.U.'s second largest LNG exporter. U.S. LNG has just arrived in Europe and currently accounts for a small part of E.U. imports. Do you think this proportion will become significant in the future?

The LNG market is globalizing, and the molecule goes where it has more value; thus the market that pays the most will be the target market. American LNG has two natural destinations: Latin America and Northern Europe. Perhaps with the expansion of the Panama Canal, if costs permit, it may also go to Asia. It depends on how the capacity holders decide to handle costs. Each has its line of reasoning. The proximity of Gazprom, Statoil and Sonatrach, with their existing infrastructure, is definitely more competitive.

To optimize gas production and exports, continuous investments in infrastructure and technology are needed. What are your plans?

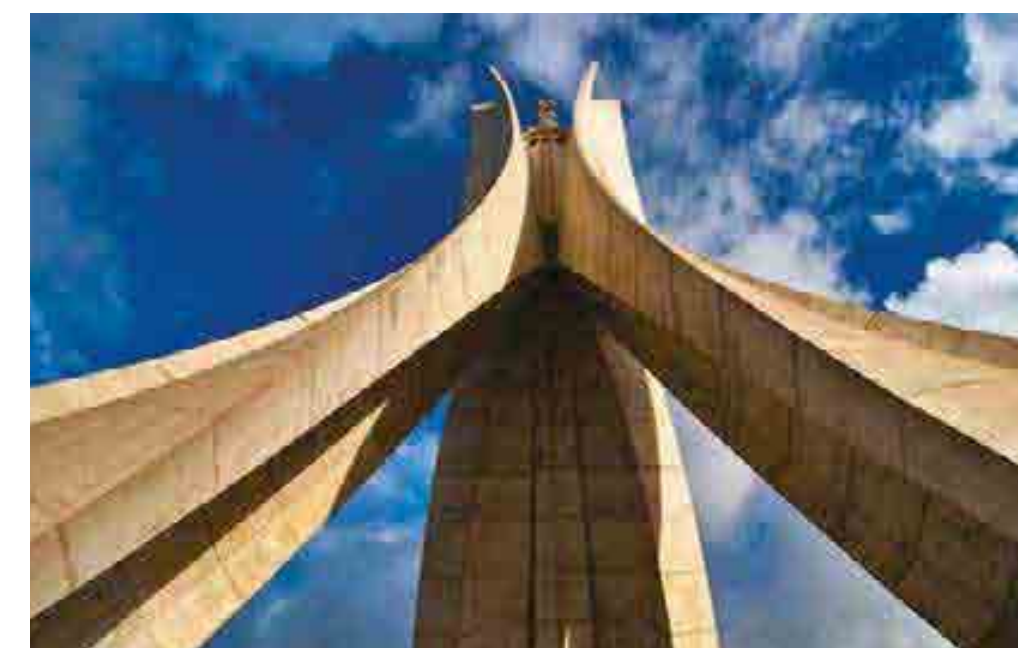
We have very significant gas reserves, developed alone or in association with partners, such as the majors BP or Statoil. Approximately two thirds of Algerian production are produced by Sonatrach and one third jointly with partners that also collaborate in the upgrading of existing installations. Sonatrach has over 55 years' experience. We are investing in upgrading the installations, to produce more and enhance liquids. In terms of gas, we have a number of investments that will enable us to maintain and increase production level. Finally, in the long term, there is shale, for which feasibility and economy has been demonstrated, potential has been confirmed and now a state policy is required to open the way for shale. For the next five years, we have a \$70 billion investment plan, of which 70 percent is intended for the upstream activity.

Algeria is also focusing on renewables with the National Renewable Energy Development Program. Is Sonatrach also working on green energy?

Algeria set itself the goal of 22,000 MW from renewables in 2030, and in this context, Sonatrach has also been asked to contribute. We started with a hybrid solar-gas power plant, and we recently signed an agreement with Eni for a 10-MW power plant on the Bir Rebaa North field. Sonatrach wants to spread this approach so that our deposits, especially in the south of the country, are self-sufficient. In this way, we can allocate all gas to export or to domestic consumption. It is a recent initiative with Eni, with which we have had relations for a long time, and which we would like to extend to other fields. All this is part of the national renewables development strategy.



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BETWEEN THE DESERT AND THE SEA

Algeria has strong historical symbiotic links with the Mediterranean countries. Algiers, with a population of 3 million inhabitants, best puts together the country's historical traditions. It was founded by the Berbers, but in the lower part of the city there are signs of the period of French domination, mainly in architecture. The city is however dominated by ancient buildings and the Kasbah's mosques. Symbol of Algeria's independence, Algiers is a modern city that has developed along the coast.





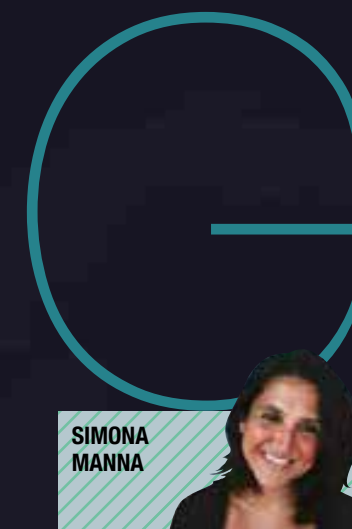
Richard L. Morningstar

He is the founding Director and Chairman of the Global Energy Center at the Atlantic Council. He served as the U.S. Ambassador to the Republic of Azerbaijan from July 2012 to August 2014. Prior to his appointment, since April 2009, he was the Secretary of State's special envoy for Eurasian energy. From June 1999 to September 2001, he served as United States Ambassador to the European Union. Prior to this, Morningstar served as special adviser to the President and Secretary of State for Caspian Basin energy diplomacy.

Interview/Ambassador Richard Morningstar,
Director of the Atlantic Council Global Energy Center

Long live gas

Blue gold will play a major role in supplying the world's energy for at least the next 40 years, and the U.S. will be important in ensuring the presence of liquidity on the market. What about climate change? If the U.S. really were to exit the Paris Agreement, the consequences would be serious



SIMONA
MANNA

A journalist, she works for the *Oil Magazine*. She previously worked for the AGI news agency and, before that, in the print media (*Corriere della Sera*, *Il manifesto*, *El País*) and radio (AGF, RCS MediaGroup).

as is "cleaner than many traditional fuels and will be a reserve for new renewables-based systems." Richard Morningstar, Director of the Global Energy Center at the Atlantic Council and former Ambassador of the United States for the Republic of Azerbaijan and, previously, at the European Union, has no doubts about the role of blue gold in the future of energy. In this wide-ranging interview with *Oil*, Morningstar analyzes the key issues related to gas, including infrastructure, U.S.-Europe relations, pipelines, American shale, climate change, and potential new directions under U.S. President Donald Trump's incoming administration.

Does natural gas offer the best transition to a renewables-based energy system?

I believe that natural gas is an important energy source for transitioning towards a low-carbon emissions future. Gas is cleaner than other forms of energy and will constitute a reserve for new renewables-based systems. It will take time before the energy sector and energy production are entirely based on clean energy sources. In the meantime, we have to rely heavily on gas, while continuing to work on other resources that enable us to reduce carbon emissions and have a clean energy industry, in addition to a clean economy as a whole.

Some experts, however, are concerned that the creation of infrastructure for transporting gas could mean gas will not be a transition source but rather become an entrenched, long-term source. Is this a reasonable worry?

I understand the reasons why there is concern that new gas infrastructure could remain in place even after gas is no longer needed. However, I do not agree. Gas will be needed for a long time, certainly for the next 30 or 40 years, and I believe that some new infrastructure could make a real difference. We are

not dealing with a zero-sum game. Gas must continue to play a significant role alongside other resources such as solar and wind power that are available only on an intermittent basis. We must also remember that in Europe, there is a lot of infrastructure for importing gas, but better interconnections are necessary to transport gas from one place to another within Europe. And Europe must make sure it has the infrastructure to be resilient. For these reasons, Europe must continue to develop its gas sector.

How are current relations between the European Union and the United States? And what does the future portend for the production and transport of gas following the election of Donald Trump?

I believe that President-Elect Trump has made it clear that he wishes to support the export of natural gas from the United States, and I think this is positive. Therefore, cooperation between the U.S. and E.U. will be lasting. We must also ad- →



WAITING FOR ZERO EMISSIONS ENERGY
It will take some time before the energy industry and the energy production are completely based on clean energy sources. In the meantime, we have to rely largely on gas, while continuing to work on other resources that allow us to reduce carbon emissions and have a clean energy sector, as well as an economy in clean complex.

mit that the simple fact of having natural gas available from the United States will force other competing countries, such as Russia, to maintain a low-pricing structure for energy.

The U.S. promises to become one of the main LNG exporters. Will this in any way change relations with the European Union and Russia? Do you think that the U.S. will one day replace Russia as Europe's gas supplier?

I do not believe that the United States will ever fully replace Russia, which will continue to be a major gas supplier for Europe. However, as I said, the availability of gas from the United States will help to ensure the presence of liquidity on the market, to maintain an energy structure with favorable prices and to ensure adequate competition in the industry.

What do you think about the project involving the doubling of Nord Stream? What are the prospects for the Southern Corridor?

Nord Stream 2 is a rather complicated issue. There are commercial, legal and political implications, and I believe that these are very important. I also think that building a new gas pipeline is not a good signal after what has happened in the Crimea and Eastern Ukraine. The issue is dividing Europe and will increase dependence on Russian gas. I do not believe Nord Stream 2 is necessary. However, I need to clarify that even if Nord Stream 2 is constructed, the current European policy, which provides for the integration of the gas market, the creation of other potential sources of gas and the guarantee of competition from the United States and other countries could

mitigate the problems resulting from Nord Stream 2. Again, it is essential to have a network of interconnections within Europe. Regarding the Southern Corridor, I believe it will be constructed, given that the project has now reached an advanced stage. I do not believe that the Turkish Stream gas pipeline will interfere with the Southern Corridor. Given relations between Turkey and Azerbaijan, I believe that Turkey will ensure that it will take place. I am optimistic about the prospects that Caspian gas will come to both Turkey and Europe.

Shale gas: is it still revolutionary? U.S. producers seem to have overcome the price crisis and production has increased this year, yet the sector is still said to be facing difficult times.

There is no question that the development of shale gas in the United States has been a revolution. At the same time, however, we must recognize that there are ups and downs in the marketplace. The technology in the United States has improved dramatically. The situation in the gas market is still delicate, but I think that the United States will continue to be a major gas producer over the coming years.

What will the implication be of the entry into force of the Paris Agreement? Do you think these processes towards a low-carbon future, especially following Trump's selection, will act more as an accelerator or rather as a break?

You have raised a very important question. What will the effects be of Trump's election? Before the elections, I would have

said that the Paris Agreement definitely would be an accelerator; many countries have made commitments—which will be monitored—and they will work together to meet them. Now, I am concerned that if Trump's administration withdraws the United States from the Agreement, this would have very serious effects. The United States is a major emitter of carbon. It has played a key role in the Paris negotiations and needs to continue to be one of the key players as the Agreement is implemented, from the standpoint of ensuring that countries meet their commitments and in helping lesser developed countries meet their commitments as well. If the United States leaves the Agreement, this will make it all the more difficult, but hopefully would not lead to defections from other countries. I also think that if the United States were to leave the Agreement, it would have a very negative effect on our overall conduct of foreign policy and that it will have repercussions on other areas. It will, therefore, be difficult for us to reach agreements on other issues with many of our partners and allies. I think there would be a real danger of the United States becoming isolated from a foreign policy standpoint. Hopefully, this won't happen. I also think that companies need to encourage the new administration to stay with the Paris Agreement. The development of the green economy could provide a lot of jobs. If the United States withdraws from the Agreement, companies could have problems in dealing with other countries. I hope that the new administration will take a real hard, pragmatic look and stay with the Agreement.



Natural gas is an important energy source for transitioning towards a low-carbon emissions future. **Gas is cleaner** than other forms of energy and will constitute a reserve for new renewables-based systems



In Europe there is a lot of infrastructure for importing gas, but **better interconnections** are necessary to transport gas from one place to another within Europe. And Europe must make sure it has the infrastructure to be resilient



I do not believe that the United States will ever fully replace Russia, which will continue to be a major gas supplier for Europe. However, the availability of gas from the United States will ensure **adequate competition** in the industry



If the United States **leaves the Agreement**, it would have a very negative effect on our overall conduct of foreign policy and it will, therefore, be difficult for us to reach agreements on other issues with many of our partners and allies



Klaus-Dieter Borchardt

He is Director of the Internal Energy Market Division at the European Commission, a role in which he manages the development of important laws, including the revision of the Regulation on the security of gas supplies. Mr. Borchardt's career at the European Commission began in 1987, when he joined the Directorate General for Employment.



Dialogue/Klaus-Dieter Borchardt, Director of the Internal Energy Market Division at the European Commission

A natural ally of renewables

The increased proportion of renewables in the energy mix will require clean and reliable backup sources, and gas is the only possible candidate for such a role. The E.U. is preparing to achieve the climate goals set for 2030 by redesigning the electricity market



A journalist, she has worked for *Oil* since its first edition. She has also worked for the AGI news agency and, previously, for the Dire news agency and for Radio24i/sole24ore.

We are not facing a “revolution” in the world of energy, but a process of “evolution” towards a decarbonized economy. This process will have gas as its key player. This is the opinion of the Director of the Internal Energy Market Division at the European Commission, Klaus-Dieter Borchardt, according to whom blue gold is “the natural ally” of renewables. The E.U., to ensure an adequate gas supply (for which demand is expected in the next decade, against a decline in domestic production), aims to introduce a stronger regional cooperation between the member states and to diversify suppliers and routes. The Southern Gas Corridor (SGC) is strategic for this purpose, but so is access to liquefied natural gas (LNG) for all European countries.

What role will gas play in the immediate future and in the medium term? Do you believe it can be a transitional energy source as we move toward a future of lower carbon emissions?

Natural gas will be around for quite some time yet; indeed, we need to increase the share of renewable energy in the energy mix, but to achieve this we will also need a very reliable, non-polluting backup fuel. Today, natural gas is the only candidate for the job. I would say that natural gas is the natural friend of renewables, and therefore I believe it will play a key role in the transition toward a more decarbonized economy.

Are we entering an energy revolution?

I wouldn't say that we will see an energy revolution; that seems excessive. I believe that the world of energy is evolving. We have the climate agreement, which will have an effect not only in Europe, but also globally, provided all of the parties fulfil their commitments. However, what I see is an evolution, not a revolution. Obviously, globally, the energy mix will be broader than in the European Union, and one of the objectives of the European Commission is precisely that of driving Europe to first place in renewable energy. In Europe, renewables will therefore play a dominant role. But as I said, natural gas is still highly significant.

What will the consequences for Europe be of the entry into force of the Paris Agreement?

We are currently committed to achieving the targets we set for 2030, i.e., a decline of 40 percent in CO₂ emissions, having renewable energy account for at least 27 percent of energy used and reducing the E.U.'s energy consumption. This means that by 2030, 50 percent of electricity should be generated by renewable energy. To achieve this goal, we need to create the proper environment in which this development can take place, establish the right incentives, but we also need to deal with the impact that achieving this share of renewables will have on our electricity systems. Generating 50 percent of our electricity from renewables is a great challenge for the security of our grids and also for the market, because renewables are intermittent and highly variable. Therefore, we need to see how we can best integrate them into the market. This is precisely why we are redesigning the structure of the electricity market. The Commission is currently finalizing its proposed reform, which could conceivably be adopted soon. Therefore, we have a very clear vision as to how to get to 2030 and fulfil the commitments arising from the Paris Agreement, and we have laid out effective instruments in our regulatory proposals to do just that.

What were the reactions of the individual Member States to the 2030 framework for climate and energy?

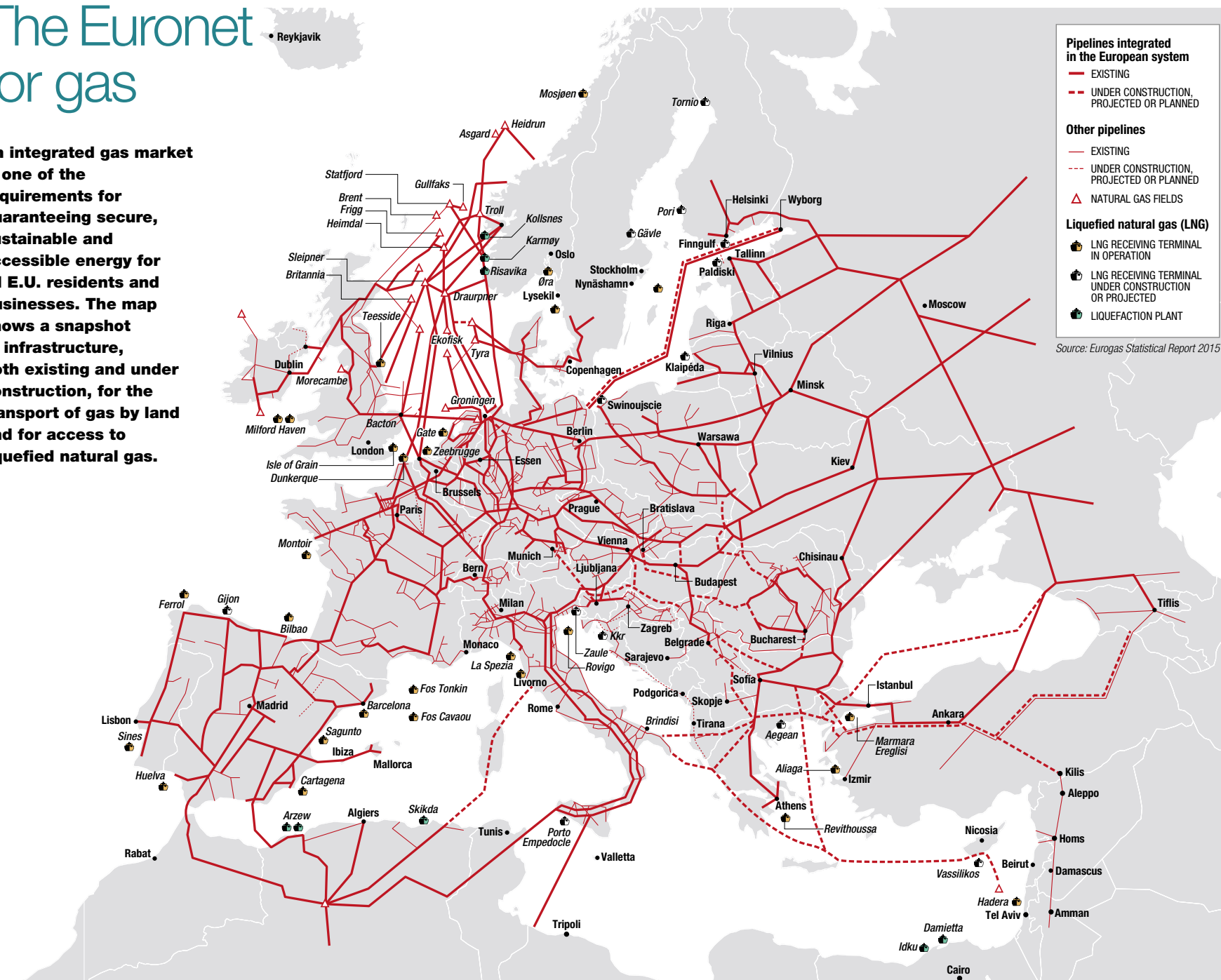
The goal of reducing CO₂ emissions by 30 percent by 2030 was accepted by all Heads of State and government, who all committed to achieving it. Therefore, this is a challenge and a task shared by all 28 E.U. Member States. It is also clear that, since the energy mix remains under the remit of the national governments, and each Member State has the right to decide on its own mix, each one will contribute to the reduction target in a different way. To have a global overview of the efforts made by each individual Member State, we have developed a concept of governance based on which the Commission will check that the Member States are actually making all possible efforts to contribute to reaching the targets of reducing CO₂ and ensuring that renewables account for at least 27 percent of the mix. These targets are binding at E.U. level, not at Member State level, but, through governance, we will ensure that all Member States contribute to them in a way that we believe they can accomplish.

What are you doing for the security of European energy supplies?

We need to distinguish between gas and electricity. For gas, it is quite clear: already in February of this year, we proposed a review of the regulations on gas supply security, in which we made clear proposals on how to improve the resilience of our gas system. For example, we introduced much closer collaboration at the regional level. For the first time ever, we established a principle of solidarity based on the idea that if one Member State is in crisis, the others are required to take action to help it. We improved the preparedness of Member States with preventive intervention plans as well as emergency plans, which will be implemented not only at national level, but at regional level as well. The coordination between Member States will be much more robust. In terms of infrastructure, we clearly stated that our shared objective must be that of ensuring that all Member States of the European Union have at least three →

The Euronet for gas

An integrated gas market is one of the requirements for guaranteeing secure, sustainable and accessible energy for all E.U. residents and businesses. The map shows a snapshot of infrastructure, both existing and under construction, for the transport of gas by land and for access to liquefied natural gas.



different ways of procuring gas, which may take place through the diversification of routes, suppliers or sources. As regards sources, for example, all Member States should have access to liquefied natural gas (LNG) in addition to gas from pipelines. They should also have access to stored gas, possibly by means of multiple routes, not only one or two. The ways in which gas is imported to the European Union need to be diversified. And, naturally, there should be more than one supplier. Countries and Member States should not rely on just one supplier. These are the principles, and we are currently working on the infrastructure and the interconnections that will make all of this possible. Therefore, in terms of gas, we are in good time and we hope that our supply security reform will be adopted by the end of the year. On the electricity front, our package of reforms, which will be announced very soon, includes regulations on risk preparedness. Also in that case we would like to have greater regional collaboration and solidarity.

As regards suppliers of gas to Europe, the Commission is about to enter into an antitrust agreement with Gazprom. What role will the Russian gas giant play in the future of the E.U.?

The agreement is still an open matter. Gazprom still needs to present its final commitment document, then there will be a market test relating to that commitment and only then will the Commission make its final decision. The role that the Russian gas monopolist will play in our market depends on

Gazprom itself. If Gazprom changes its attitude and behaves like a normal player in our market, i.e., if it follows the rules of the third energy package just like any other player, then it is absolutely welcome in our market. But what we do not intend to tolerate is a situation in which Gazprom seeks to dictate the rules since it is such an important player with a dominant position in many Member States. This is absolutely unacceptable. But, since I have already seen several positive signals from Gazprom, I hope that it will be willing to adjust to the needs and rules of our market.

Do you believe that LNG from the United States can play a leading role in Europe in the future?

In general, yes, LNG can definitely play an important role in our market. This is also why in our gas strategy we said that all Member States should have access to LNG. The increase in the global supply of LNG (Australia and Canada, as well as African countries, have injected much more LNG into the global market) makes the European market tempting, especially for the United States, which has now lifted its restrictions on exports. Therefore, we expect LNG to flow to the European market, and we are preparing the required infrastructure. But the extent of sales will depend highly on its competitiveness with respect to pipeline gas. However, we will not interfere in this matter. This is an issue of market competition: if LNG prices are competitive, it will have a bright future in the European market.

Speaking of gas pipelines, there are currently many projects in play to bring gas from the east to Europe, such as the completion of the Southern Gas Corridor or the Nord Stream II. Do you think they are all necessary? And, in your opinion, which are the most strategic for Europe?

We definitely need the SGC because, as I already mentioned, we would like to diversify supply routes as well as sources. We receive gas from Azerbaijan through the SGC, but later on, as soon as we have completed negotiations, we could also receive it from Turkmenistan or, if the political or security situations change in Iraq or Iran, we could also import part from those countries or from Israel or Turkey.

The SGC opens up many possibilities for the future, also in terms of diversification, which is very important for us. As regards imports from Russia, it is quite clear that we are not very pleased that Gazprom wants to transport its gas primarily through the Northern Corridor by laying two additional lines through the Baltic Sea, Nord Stream 2. This corridor would account for 80 percent of the gas that Russia exports to the European Union, and we do not believe it is the best way to proceed because it would be harmful for the current route, through Ukraine, which is already operating and can continue to transport Russian gas.

Therefore, we do not see why it is necessary to construct or expand upon the capacity of the Northern Corridor. As regards the question of whether we will need all of this gas, for the next decade we expect consumption to remain rather stable in Europe, up to roughly 430 or 440 billion cubic meters per year.

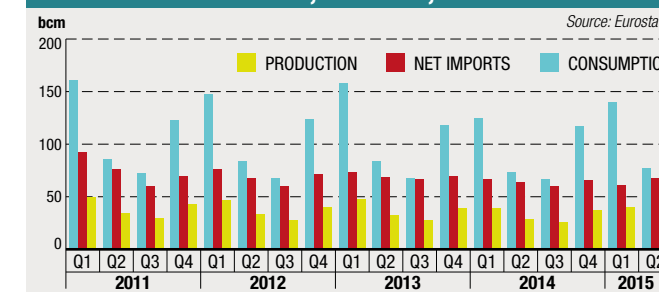
However, domestic production will decline due to problems in the Netherlands and the drop in production in the North Sea. This means that we could need more imports. However, this higher requirement will be covered in part by increased LNG imports and in part by other gas sources, not only through the Southern Gas Corridor, but also from North Africa and so on. If it comes from Russia, it will be welcome, but in that case, as I noted, not all through a single corridor.

Do you believe that the election of Donald Trump will impact the energy relationship between the United States and the European Union?

I believe it is still too early to respond, first of all because we do not know who Trump will appoint as energy secretary. We do not have much information at hand to understand what he thinks of the energy system. I mean that what we know is more relevant domestically. Trump has affirmed that he wants to eliminate all obstacles to the sale of shale gas and coal. This could have a significant impact on climate change. I have not heard him say whether he is against exporting LNG to the E.U., so it remains to be seen whether export restrictions will continue to be relaxed or whether they will be reintroduced.

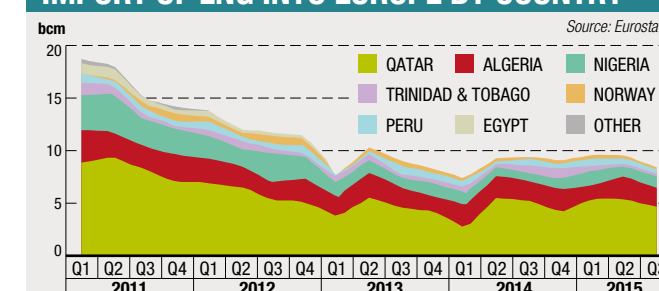
However, in general, as far as the relationship with the United States is concerned, I do not expect changes in the area of energy to be as important as those that we can expect in global commerce or the climate. Indeed, Trump has denied that climate change is real, and this will naturally have a significant impact. He also announced that he will abandon the Trans-Pacific Partnership (TPP) free trade agreement. If he actually does this, the consequences will be huge for the global economy and for the rules of global commerce. However, as regards the energy sector, I have not yet detected this type of great political changes that could affect the relationship between the United States and the European Union. We need to watch closely and wait until we have a clearer idea of who will be put in charge of the energy sector and understand not only how the energy sector will be organized internally, but also how its external dimension will be considered. This all has yet to be seen. However, in all honesty, I do not believe that the energy system and the energy relationship between the United States and Europe will constitute significant problems.

E.U.: CONSUMPTION, IMPORT, PRODUCTION



Europe is highly dependent on gas imports. In the first half of 2015, E.U. demand reached around 218 billion cubic meters (+9 percent compared to the same period of 2014).

IMPORT OF LNG INTO EUROPE BY COUNTRY



Qatar, Algeria and Nigeria have traditionally been the E.U.'s main liquefied natural gas suppliers. In 2016, the first shipments of U.S. LNG arrived in Europe.



Scenarios/How the global energy mix will change

Towards a low-emissions world

Natural gas may lead us towards a future dominated by renewables. However, it will remain indispensable - not only as a transition fuel but also as a permanent feature of our energy future and investments



He is Chairman of Global Resources Partnership, an energy advisory group in the U.K. He is a former Turkish diplomat, advisor to the Prime Minister, as well as senior IEA, OECD, BG Group and Invensys executive. He sits on the Boards of Directors of several international companies. He is also Executive Chair of The Bosphorus Energy Club and Special Envoy for Energy Charter.

No doubt, the world needs to be energized in an affordable, secure, growth-inducing and climate-friendly manner, deploying all available resources, new technologies, policies, institutions and investment dollars. This is critical not only for the needs of today but also for our longer term future. Planet Earth will be home to nearly 9bn people by 2040—up roughly 2bn from today—all requiring access to energy supplies and aspiring to live in a prosperous fashion. Currently, about 1.2bn people live without electricity, including many in Africa, where the generation capacity available to the entire continent roughly equals that of California in the U.S. Globally, 2.8bn people are still cooking on traditional stoves, with firewood, or cattle dung, or some other form of traditional biomass for fuel. Even when energy is available in the developing world, it is expensive and often unreliable. Unless things change dramatically, there is no way we are going to meet the 2030 goal of universal energy access.

The new global energy map

The world's energy map has significantly changed over the past decade or so. Specifically, with the advent of significant discoveries and oversupply in North America and elsewhere, a new global energy map is emerging—it will change the traditional demand-supply equation, rules and players of the “game.” The new oil axis runs from Alberta, Canada, down through the shale fields of North Dakota and South Texas to huge offshore oil deposits found near Brazil. All of these developments point to a major geopolitical shift, leaving the U.S. advantageously positioned in relation to any of its international rivals. The U.S. could arguably become the new “superpower” in oil and gas in the not too distant future, dethroning Saudi Arabia and Russia respectively. Australia will likely replace Qatar as the world's largest LNG exporter. With a man who says global warming is an “expensive hoax” about to become leader of the free world, it is

no surprise that fossil fuel companies have been seen as some of the biggest beneficiaries of the U.S. election result—while renewable energy investors have taken fright. Donald Trump's presidency is likely to herald a seismic shift in domestic policy, unraveling many of Barack Obama's key energy and environmental policies. It also threatens the fragile global progress to tackling climate change that the U.S. helped spearhead—risking undermining the growth of green energy worldwide. The era of hydrocarbons is not over. History tells us that it takes a long time for new energies to gain market share. Whether we like it or not, they will still account for 70 percent of our energy mix by 2050, despite significant breakthroughs in renewables and efficiency. The composition of fuels that provides energy will not significantly change either between now and 2040. Perhaps we will use less coal and oil, and more natural gas and renewables in the global energy mix. It is possible that another major

technology breakthrough could transform global energy use the way mobile phones and cellular networks have transformed communications. However, we should bear in mind that while technology will bring costs down, today's energy infrastructure is so massive and well-established that radical changes would be difficult to effect. The oil and gas industry is therefore not (yet) on its knees; rather, it is at a crossroads that will determine if the industry can flourish for just the next few decades or well into the end of this century. Through collaboration, cost savings and technological advances, it will be possible to improve hydrocarbon recovery and to increase the yield levels to help extend the future beyond a few decades to most of the next century. This does not mean that we will not face a neck-to-neck inter-fuel competition in the world's energy. We certainly will. There are plenty of energy resources available today—no longer is anyone talking about the

scarcity of resources, an approach that has traditionally given rise to geopolitical rivalries, volatility and risks in the global markets. It is the abundance of resources that now concerns the key movers and shakers in the global energy markets, particularly in producing countries. Security of demand and investment takes precedence over security of supply.

Demand is increasing, but for which energy?

Global energy demand, driven by rapid industrialization, growing population and wealth in emerging markets, especially China and India, increased mobility, and long-term energy security concerns, is expected to expand by 34 percent between 2014 and 2035 from 12,928 million tons oil equivalent (toe) to 17,307 million toe. In this picture, coal's share of global primary energy production is expected to drop from 30 percent in 2014 to 25 percent in 2035, its lowest share since the industrial revolution. The shale gas revolution that began about a decade ago sparked the first wave of coal retirements. With Henry Hub prices below \$2 per million Btu (MMBtu), owners of coal-fired power plants are having trouble justifying keeping their plants open. Then, the sun could arguably be the world's largest source of electricity by 2050, ahead of fossil fuels, wind, hydro and nuclear, according to the International Energy Agency (IEA). Globally, it provides 0.5 percent of electricity generation and, in the U.S., only 0.2 percent. Some optimistic IEA roadmaps show how solar photovoltaic systems could generate up to 16 percent of the world's electricity by 2050 while solar thermal electricity from concentrating solar power plants could provide an additional 11 percent.

Combined, these solar technologies could possibly prevent the emission of more than 6bn tons of carbon dioxide per year by 2050—that is more than all current energy-related CO₂ emissions from the US or almost all of the direct emissions from the transport sector worldwide today. It looks as though we are in a better position with wind power, which could possibly generate up to 18 percent of the world's electricity by 2050, compared with 2.6 percent today. The nearly 300 gigawatts of current wind power worldwide will increase eight-to-ten-fold, with the more than \$78bn in investment today progressively reaching \$150bn per year. China is likely to overtake OECD Europe as the leading producer of wind power by 2020 or 2025, with the US ranked third. If it so happens, wind power deployment would save up to 4.8 gigatons of CO₂ emissions per

year by 2050, with China providing by far the largest reductions. The reduction is equivalent to more than the current European Union's annual emissions.

Nuclear power generation is already an established part of the world's electricity mix, providing some 11 percent of world electricity of 22,752 TWh. The global use of nuclear energy is forecast to grow by 1.9 percent per year from 574.0 million toe in 2014 to 859.2 million toe in 2035 this is not actually 50 percent. Nuclear output in the European Union and North America is expected to decline 29 percent and 13 percent, respectively, as aging reactors are gradually retired and the economic and political challenges of nuclear energy stunt new investments.

However, output in China is forecast to increase 11.2 percent annually. Japan's nuclear output will reach 60 percent of its 2010 level by 2020, as reactors restart over the next five years. Other key energy hungry emerging economies are also busy building new nuclear plants to deal with future shortages and to move away from heavy dependence on fossil fuels.

The shift away from fossil fuels takes hold

True, the world is increasingly turning towards renewable energy and, in proportion to total consumption, is moving away from oil, gas and coal. Within the markets for fossil fuels, natural gas has become increasingly favored over coal and oil. The question for government policymakers and business investors is how far and fast these changes can go.

While renewable energy has been growing rapidly, it is coming from a very low base. The share of electricity that the world's 20 major economies are generating from the sun and the wind has jumped in the space of five years. Whether this breakthrough is sustainable and what it means for the battle against climate change is not clear yet. What's clear, though, is that the growth of renewables and other low-carbon energy sources will not follow a straight line. Investment in “clean” energy has been faltering this year after hitting a record high in 2015 (China, alone, had invested over \$110 billion). For the first half of 2016, it was down 23 percent from the equivalent period last year.

There are a few dark clouds on the horizon that could upset the banner year for clean energy. The Trump factor is still not well known in terms of which direction it may go, despite the worrisome rhetoric. China's economic troubles could put a dent in investment. The U.S. Federal Reserve raising interest rates, and supporting

a strengthening of the U.S. dollar, would increase the cost of capital for new solar and wind projects.

And while cheap fossil fuels did not head off the clean energy boom in 2015, persistently low oil and gas prices could prevent much stronger growth. Still, the clean energy sector is now a third-of-a-trillion-dollar industry, with much more room on the upside. The transition to clean energy is already underway, and there is probably no going back.

Investing companies to focus increasingly on gas

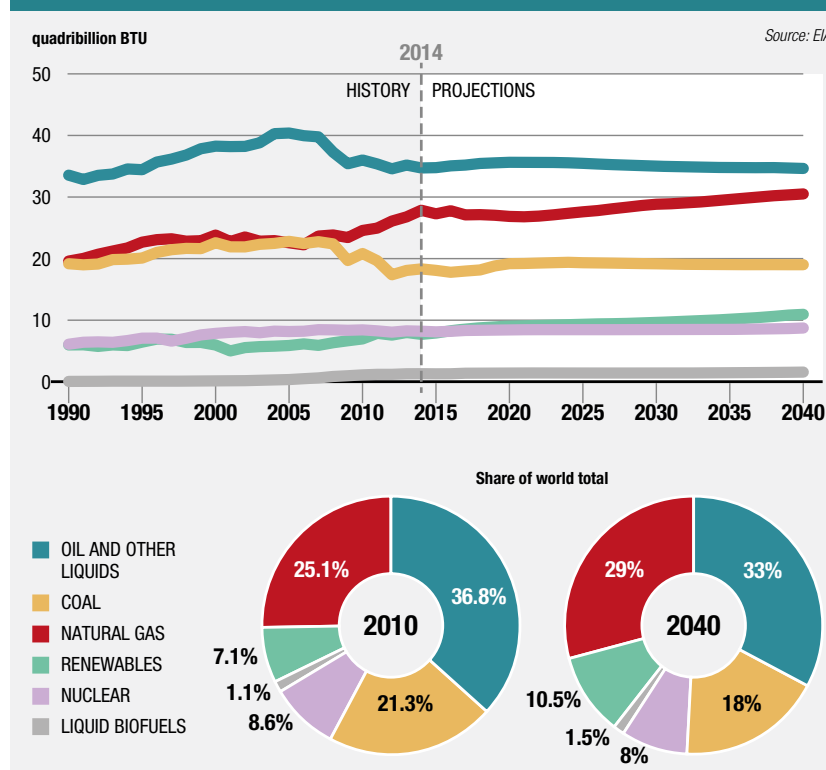
Major international oil companies have gradually shifted focus towards gas, to the extent that they are now sometimes referred to as “Big Gas” rather than “Big Oil.” For companies like Shell or BP, gas now comprises more than 50 percent of their total production. Gas reserves are more accessible and have a wider global distribution. Cleaner gas takes away market share from coal produced for electricity production and oil in the transport industry, due to environmental concerns.

Compressed natural gas (CNG) is already being used in some parts of the world to fuel cars and trucks. It is a “chicken and egg” situation. Consumers do not buy CNG vehicles if they do not live near a filling station. But no CNG filling stations are built if there are no CNG vehicles in circulation. Natural gas could win a considerable share of the truck and ship markets in the coming decades. In addition to CNG, the use of liquefied natural gas (LNG) also has significant potential. By 2030, CNG and LNG together could replace 1.5 million barrels of oil per day in the transport industry.

It is important to remember that, due to its low energy density, gas is much more expensive to transport than other fossil fuels. Transport of gas requires pipelines (for shorter distances) or liquefaction (for longer distances). LNG incurs especially high costs. Recent history reveals price projections have been repeatedly and significantly wrong for natural gas. The actual price of natural gas has fluctuated by more than 400 percent over the past two decades. Future price projections today vary but fall in a similar range.

Since gas exports depend more on rigidly interconnected infrastructure and long-term production arrangements that generate lower revenue streams than those derived from oil, gas sector arrangements carry an intrinsically long-term and strategic character. The capital intensity of the gas value chain and the lower energy density of gas vis-à-vis oil implies a greater profitability in the oil sector. Geopolitical considerations also

ENERGY DEMAND BY FUEL



tend to heavily influence gas infrastructure interconnections and long-term production arrangements.

Renewables, too

Global investment in energy fell by 8 percent last year to \$1.8tn, reflecting low oil and gas prices and cost declines in the sector. Nearly half of the decline was accounted for by the U.S., where plunging oil prices and a recent boom in shale gas, along with cost deflation in the energy sector, have played an increasing role. China remained the world's biggest investor in energy worldwide, with \$315bn spent in 2015, despite a slowing in the pace of its headlong economic growth.

Investment in renewable energy in 2015 remained robust compared to other fuels, according to the IEA. The move towards clean energy was driven by government policies and international demand, with countries pursuing low-carbon growth. About \$313bn was invested in renewable and other low-carbon forms of energy last year, representing about a fifth of total energy spending. Much of it was in electricity generation.

Overall, more than twice as much money was spent on renewables than on coal and gas-fired power generation (\$130bn in 2015). For the first time, emerging economies outspent richer nations in the green energy race, with China accounting for a third of the global total.

The oil and gas companies are now starting to use clean-energy investments to hedge their bets that markets for oil and gas will exist decades from now. They have invested in wind farms, electric battery storage systems

and carbon capture and storage. In the future, the companies will likely call themselves “energy” companies rather than oil, gas, wind, solar or nuclear specialists, though each has a distinct business model and involves different challenges and opportunities.

As a “bridge” for a low carbon economy

The energy industry is coming under increasing pressure (and obligations) on carbon. Simply switching from fossil fuels to renewables alone will not solve the climate change problem. We need to start removing carbon from the atmosphere. And we need to tackle the demand side. We cannot simply assume that relentless economic growth is compatible with a green future.

The commitments made at Paris still fall far short of what is required to halt global warming at the 2°C mark, never mind reversing the growth of greenhouse gases in the atmosphere. The simple truth is that the Paris agreement is blind to the fundamental, structural problems that prevent us from decarbonizing our economies to the radical extent needed. There are some hard facts that cannot be ignored.

First, the renewable schemes to date have largely been at the expense of unpopular nuclear installations, while the global share of fossil fuel-generated energy consumption remains at about 80-85 percent: just where it's been since the early 1970s.

Second, the massive amounts of land required for installing gigawatts of solar and wind power will destroy natural habitats and take away valuable farmland. This is already evident in

the way existing biomass production schemes—forests in the U.S. for instance, sugar cane in Brazil, palm oil in Malaysia or windfarms in Turkey—have had serious environmental and social side-effects to the extent that they have been labelled as “green-wash.”

Third, together with demand from electric vehicle manufacturers, a worldwide renewables boom would rely on a 5 percent to 18 percent annual increase in global production of minerals for the next 40 years.

Inexpensive natural gas provides a low-cost transition path from higher-carbon-content fuels such as coal and petroleum. For economic and pollution reduction reasons, more natural gas is needed for electricity production and transportation around the world.

Natural gas as a power plant fuel has already played an important role in a transition to a low-carbon economy. For example, electricity sector carbon dioxide emissions in many U.S. states are at some of the lowest levels in the past two decades thanks to increased efficiency, deployment of renewables, and structural changes in the electricity sector such as a transition from coal to natural gas-fueled power generation.

Despite environmentalist groups insisting that natural gas cannot be a permanent solution to ending our addiction to coal and oil, I believe that as a “bridge fuel,” it will buy us some good time to develop new technologies that can ultimately replace fossil transportation and power generation fuels. It will also remain a permanent feature of our energy future given its abundance and increasingly effective deployment through the “gasification” strategies in almost every sector of the economy.

Therefore, as our transition towards achieving lower carbon energy and feeding the energy hungry world continues, a careful, commercially meaningful balance needs to be found between the investments allocated to natural gas and those reserved for renewables, nuclear and advanced technologies.



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Everything changes?

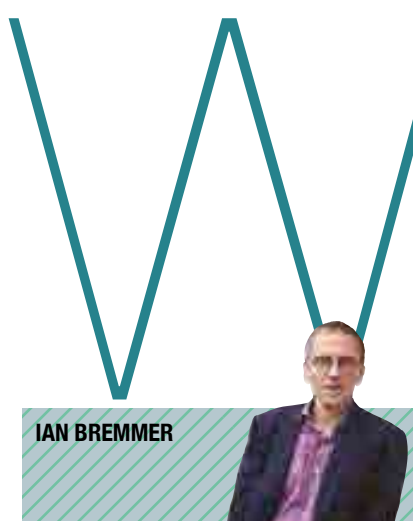
Donald Trump's ascension to the White House has raised profound questions about America's energy choices in the near future. A series of expert voices helps us outline the horizon of the country that seems destined to become the global energy superpower of the twenty-first century



Overview/The new U.S. President and the energy sector

The market will decide

Donald Trump will learn soon enough that market and domestic political pressures, not government regulation, will continue to define what's possible



He is the President and founder of Eurasia Group, a global political risk research and consulting firm. Bremmer created Wall Street's first global political risk index, and has authored several books, including the bestseller, *The End of the Free Market: Who Wins the War Between States and Corporations?*

When Donald Trump strides into the White House on January 20, the first person elected U.S. President without government or military experience, he'll inherit a set of energy policy options that George W. Bush couldn't have imagined. Innovation has brought fundamental change to energy markets, but managing that change will require some tough choices, particularly for someone with no background in energy policy. He'll learn soon enough that market and domestic political pressures, not government regulation, will continue to define what's possible. Full Republican control of Congress will make a big difference, but it can't override the importance of these factors.

The new line on the face of climate change

The first Trump point of departure from the Obama administration centers on tradeoffs between aggressive energy and environmental protection policies. 2016 saw considerable movement on multinational coordination of climate change policies, and Obama was a primary driver of momentum toward signing and ratification of the Paris Agreement. President-

elect Trump will likely trigger the four-year process for withdrawal from the deal and will shrug off the U.S. domestic emissions targets agreed to in it. The effect on further climate talks will be immediate. Though other governments, particularly in Europe, are unlikely to withdraw entirely from Paris commitments, there will be little reason to believe that emissions cuts that don't include the U.S. can help contain the increases in global temperature that made concessions politically possible for most industrialized countries. High expectations from climate advocates for future talks will lose credibility. In addition, Republican control of both houses of Congress will make it easier for industry advocates to reduce the Environmental Protection Agency's (EPA) authority to regulate greenhouse gas (GHG) emissions. The Trump administration will quickly target President Obama's

Clean Power Plan (CPP), which sets state targets for reduction of GHG emissions and a national goal of cutting power sector emissions by 30 percent by 2030. The plan was not due to take effect until 2022, but it would have forced a near-term transition away from coal use toward natural gas and renewables. The plan already faces a legal challenge, and the Trump administration will not defend it. In general, GOP control of Congress will help the new administration reign in EPA authority on GHG reductions. In other areas, the break in administrations will be less obvious. The picture for renewables is mixed. Dismantling the CPP will certainly reduce long-term investment in this sector, but the Trump administration and GOP lawmakers are unlikely to target multi-year tax credit extensions for wind and solar established in 2015, and a number of states will continue to push for a faster shift in the

fuel mix toward renewable energy. Markets will also continue to favor development of renewables as technological progress continues to lower production costs.

Increasing exports of oil and LNG

In addition, the benefits of Trump's victory for the U.S. oil and gas industry will likely be more limited than some assume. The new president will quickly relax federal regulations on hydraulic fracturing, and although Trump has made clear his opposition to existing trade deals, he and fellow Republicans are committed to boosting U.S. oil and gas production. U.S. crude and liquefied natural gas (LNG) exports will continue their growth while Trump is in the White House. But in other areas, we'll see the new president wrestle with tough political problems. His administration and the Republican congressional leadership

could benefit the oil industry through reform of the Renewable Fuel Standard by cutting back on ethanol mandates. But given the importance of Midwestern states for Trump's victory and the importance of these mandates for Corn Belt states, that might not be the smartest political move. That's why the new administration is likely to leave that issue alone. President Trump will open a lot more federal acreage, on and offshore, to oil and gas exploration and production. But his plan to shelve many environmental regulations on the power sector could undermine demand for natural gas. In addition, we shouldn't expect a sudden new surge in fracking, which has been central to the U.S. energy revolution, because low global oil prices rather than onerous federal regulations are primarily responsible for slowing drilling and production. That outlook is unlikely to move much in coming months, because of-

officials in the Organization of Petroleum Exporting Countries (OPEC) and non-OPEC exporting countries know well that U.S. production can respond relatively quickly to any meaningful price increase, costing them precious market share.

Long live pipelines and coal-fired plants

On pipeline politics, grassroots environmental groups will pump up the volume on protests, though the loss of a crucial ally in the White House will slow momentum behind the U.S. "off-oil" movement, and pipeline construction will remain subject to state-level challenges. In the near term, it may be Canada's oil industry, particularly the upstream oil sands sector, that feels the first positive effects of Trump's arrival. The president-elect has pledged to approve the embattled Keystone XL pipeline should TransCanada resubmit its ap-

plication, opening the preferred market access option for oil sands producers. On coal, the industry won't benefit from the assault on Obama's Clean Power Plan as you might expect. Trump will almost certainly keep promises to help existing coal-fired facilities that might have been forced out of business by a Clinton victory, and elimination of environmental regulations that promote fuel switching in the power sector will certainly help the coal sector. Yet, here too the market, not government plans, is driving the outlook. It's the reduced cost of natural gas, rather than the CPP, that will encourage utilities to hedge their investment bets on coal's revival. In short, Trump's victory will bring real change in energy and climate policies, but markets and political realities will limit just how much the new president can do.





Everything changes?



Analysis/The U.S. administration prepares for a dramatic shift on energy policy

Challenging the world

From banning any restrictions on fracking and oil extraction to rejecting environmental constraints, Donald Trump is preparing to overturn every energy paradigm of Obama's administration

GARY HART

He is a former United States Senator and is currently Chairman of the American Security Project and a member of the U.S. Energy Security Council.

The drastic change in American energy policy in the new Trump administration can be summarized as follows: laissez faire, fossil fuels, and global warming. Though it still leaves a number of policy details unclear, perhaps the most direct statement of the President-elect's energy policy was contained in a speech he gave in mid-May of this year in North Dakota. In it, Mr. Trump declared his intention to rescind virtually all federal regulations governing fossil fuels and nuclear power. The regulations to be removed are described as "unwarranted" and "job-destroying," qualifiers whose meaning rests in the mind of the speaker and his listeners. Left unsaid is the fact that virtually all of these regulations fall into categories of worker safety, environmental protection, and public safety. Mr. Trump

promises to invite a resubmission from Trans Canada, the company whose application to construct the controversial Keystone pipeline was rejected after lengthy study by the Obama administration. The clear implication is that his Administration will approve the application.

Ban on all energy regulations

He vows to eliminate regulations on "new drilling technologies," presumably applied to fracking for natural gas, that will, in his opinion, create "millions of jobs." The only standard for any regulation on energy production is whether it will create jobs. Since regulations exist to protect workers, the environment and public safety, that standard will eliminate virtually all energy regulations. In short, a policy of laissez faire will define energy production in the new Trump administration. He promises to "unleash" America's \$50 trillion in untapped shale, oil and natural gas reserves, plus hundreds of years in coal reserves. Since the advent of fracking a few years ago, the United States has moved from dependence on imported, largely Persian Gulf, oil to virtual energy independence. The announced Trump policy promises to achieve an independence from foreign sources it has already achieved.

Mr. Trump promises to "save" the coal industry through abrogation of Obama and Clinton regulations guaranteeing miners' safety and carbon reduction measures. He does not acknowledge that new domestic natural gas development, as well as carbon emission goals, are largely responsible for making coal less competitive. Overall, the Trump policy heavily favors a return to dependence on oil, gas, coal and nuclear power instead of a concerted effort to transition to sustainable sources such as sun and wind to reduce carbon emissions. Nothing is said about conservation or reduction of wasteful uses. There is no acknowledgment that no new nuclear power construction applications have been submitted for a number of years because of the extremely high costs of construction and the failure of nuclear power to achieve competitive advantage without heavy public subsidies. Less expensive, more dependable sources are available.

Increasingly removed from Paris

Perhaps most shocking of the Trump commitments is his rejection of cooperation in global climate change initiatives. He has promised that one of his first acts once in office in

January, will be to withdraw U.S. support from the 2015 Paris Climate Agreement as well as the Obama Administration's Climate Action Plan. To the delight of his climate change-denier supporters, he has called human contribution to global warming a "hoax." Though the Paris Accord has a detailed four-year abrogation process for all national signatories, Mr. Trump apparently will pay no heed to this process and withdraw U.S. support unilaterally. Were this to happen, it is to be expected that any chance of concerted international climate protection will collapse, at least for the next four crucial years, and major carbon emitting nations will be free to pursue their own course of energy production and consumption regardless of impact on the long-range climate. Citing claims from an energy industry policy center, the Institute for Energy Research, the President-elect promises that his "America First energy plan" will achieve the following:

- A \$700 billion increase in annual economic output over the next 30 years;
- More than a \$30 billion increase in annual wages over the next 7 years;
- More than \$20 trillion in additional economic activity and \$6 trillion in new tax revenue.

The Republican Party will control both the House of Representatives and the Senate, and there is little reason to believe the Congress will challenge or overturn his energy policy initiatives that will represent a radical departure from decades of efforts to reduce carbon emissions and protect the environment. Unless Mr. Trump chooses to surround himself with a markedly different set of energy advisors from those he has relied on up to now, Americans and others observing our policies around the world should expect an energy program dramatically at odds with what we have been following up to now. In other major policy areas, including economic, foreign policy, and national security, there will be major departures from past consensus mainstream U.S. directions. In none of these areas will the departure be more dramatic than in the area of national energy policy.



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The next steps

- annulment of all federal regulations governing the production of fossil fuels and nuclear energy
- resumption of negotiations with TransCanada for the construction of the Keystone XL oil pipeline
- abolition of statutes of limitation on "new drilling technologies," presumably applied to fracking for the extraction of natural gas
- unblocking of \$50,000 billion of unused shale, oil and natural gas reserves, in addition to the substantial coal reserves
- withdrawal of the United States' support of the 2015 Paris Climate Agreement and scrapping of the Climate Action Plan of Obama's administration.

A risky plan



The **Clean Power Plan** (in the picture, EPA Administrator Gina McCarthy makes Clean Air Act announcement on June 2, 2014), issued by the Environmental Protection Agency (EPA) in its final version of August 3, 2015, contains guidelines, aimed at each state of the federation, so that carbon emissions produced by the energy sector can be subject, by 2030, to a 32 percent reduction compared with 2005 levels. The CPP indicates specific mandates for reducing emissions for each individual state, based on their ability to implement one or more measures identified by the EPA to limit harmful emissions: the construction of more efficient fossil fuel power plants, the use of low-carbon, or, where and if possible, zero-emission energy sources.



Everything changes?

Strategy/A new government prepares to take over in Washington

Where the eagles fly

A new and perhaps unexpected chapter of American history opens—one that could challenge the world's general equilibrium in addition to the energy status quo

P

resident-elect Donald J. Trump has indicated he will turn current U.S. energy and environmental policies upside down when he takes office in early 2017. Out with the Obama administration's pro-environmental focus, in with a return to greater emphasis on fossil fuels and their extraction. He has vowed to strip regulatory shackles from oil, gas, shale and coal production, open more public lands to drilling, reduce the Environmental Protection Agency to an advisory body and yank the U.S. out of the Paris climate agreement. As a result, some industry officials have barely been able to contain their glee, while environmental groups have all but declared the destruction of the planet under a Trump administration. Trump, whose campaign was long on rhetoric and emotion and short on policy details, has provided

MOLLY MOORE



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few specifics on how he would accomplish most of his energy goals. But with a Republican-controlled House and Senate, he could have powerful support in Congress in addition to his own executive authority. And he has another source of potentially powerful support on many of his policies: Republicans now hold an

all-time high of 68 out of 99 state legislative chambers where much U.S. energy and environmental law is made. In 33 states, Republicans control both chambers of the state legislature. It is clear that Trump, if he can win over mainstream Republicans in Congress and in state capitols—could set in motion major changes

that will impact the U.S. fossil fuel industry and the environment for years to come.

Farmers and oil workers side with the new President

Trump won huge support in the coal and oil country of rural America where he tapped into the deep anxieties

and anger of voters who blamed the environmental policies of the Obama administration for shutting down their mines and thwarting the expansion of oil fields, thus robbing them of their jobs and livelihoods. While he discussed few details of his energy policies on the campaign trail, Trump posted some specifics on

his transition website within hours of his election. "Rather than continuing the current path to undermine and block America's fossil fuel producers, the Trump Administration will encourage the production of these resources by opening onshore and offshore leasing on federal lands and waters." The website goes on to say →



Staff in progress

President Trump began the lengthy process of appointment of the members of his government. Those that we report are currently the names of some of the men and women who will rule the U.S. in the coming four years.



Jeff Sessions
Attorney General,
Department of
Justice



Mike Pompeo
Central Intelligence
Agency Director



Stephen Bannon
Chief Strategist



Reince Priebus
Chief of Staff



Michael Flynn
National Security
Advisor



Nikki Haley
Ambassador
to the United
Nations



Betsy DeVos
Secretary
of Education



U.S. Energy

Source: BP Statistical Review of World Energy 2016



IN 2015, THE COUNTRY RECORDED THE LARGEST INCREASE IN OIL PRODUCTION IN THE WORLD (+1 MBG)

Production (thousand of barrels/d): 12,704 (2015)
Consumption (thousand of barrels/d): 19,396 (2015)
Crude Oil imports: 366.0
Crude Oil export: 24.5 (million tonnes)



IN 2015, GAS PRODUCTION (+5.4%) AND CONSUMPTION (+3%), RECORDED THE LARGEST OVERALL GROWTH

Production (billion cubic metres): 767.3 (2015)
Consumption (billion cubic metres): 778.0 (2015)
Imports (billion cubic metres)
by pipeline: 74.4
by LNG: 2.6
Exports (billion cubic metres)
by pipeline: 49.7
by LNG: 0.8



IN 2015, THE DECLINE IN COAL CONSUMPTION RECORDED IN THE COUNTRY (-12.7%) WAS THE LARGEST VOLUMETRIC DECLINE IN THE WORLD

Production: 455.2 million tonnes oil equivalent (2015)
Consumption: 396.3 million tonnes oil equivalent (2015)

Oil pipelines at the starting blocks

Keystone XL and Dakota Access are two oil pipelines that could be revived by Trump's administration and which could support the development of the U.S. oil industry.

KEYSTONE XL

The project involving the construction of the Keystone XL oil pipeline (1,897 km long and over 91 cm in diameter) was born in 2008 out of the need to connect Hardisty, in the region of Alberta, to Steele City, Nebraska. This infrastructure project is considered crucial for U.S. energy security and for strengthening the country's economy. Following a seven-year review process, on November 6, 2015 President Obama refused the presidential authorization needed for the construction of Keystone XL. On January 6, 2016, TransCanada challenged that refusal, announcing the start of a legal action under the North American Free Trade Agreement (NAFTA) and the initiation of litigation against the government of the United States.

DAKOTA ACCESS

Dakota Access (approximately 1,886 km long and 76 cm in diameter) will connect the production areas of Bakken and Three Forks, in North Dakota, to Patoka, in Illinois, crossing 50 counties in 4 states. The oil pipeline will reduce the use of vehicles via rail and road to transport Bakken crude oil to the main U.S. markets. It will transport approximately 470,000 barrels per day, with a capacity that could reach up to 570,000 barrels per day, or more, a figure that could approximately account for half of the current daily production of Bakken crude oil.

Proposed Keystone XL: Hardisty to Steele City

Keystone Pipeline: Hardisty to Steele City, Wood River & Patoka (In-Service Since 2010)

Cushing Extension: Steele City to Cushing (In-Service Since 2011)

Gulf Coast Project: Cushing to Nederland (In-Service Since 2014)

Houston Lateral and Terminal: Liberty to Houston (In-Service Since 2016)

Dakota Access pipeline project (DAPL)

Keystone Hardisty Terminal
Storage Tanks

Source: TransCanada / Energy Transfer

the Trump administration will:

- Streamline the permitting process for all energy projects, including the billions of dollars in projects held up by President Obama.
- Rescind the coal mining lease moratorium, the Interior Department stream rule, and conduct a top-down review of all anti-coal regulations issued by the Obama Administration.
- Eliminate the "Waters of the US" rule.
- Scrap the \$5 trillion dollar Obama-Clinton Climate Action Plan and the Clean Power Plan.
- Open shale energy deposits on federal land.

Within hours of Trump's victory, TransCanada announced its plans to reapply for its permits to build the Keystone XL Pipeline across the heartland of the United States. During the campaign, Trump said he supported construction of the pipeline, which Obama halted. Another battle over the North Dakota Access Pipeline—which has been strongly opposed by Native American tribes—could also get the go-ahead under Trump. Key members of the U.S. Congress, including House Speaker Paul Ryan, have said they will support many of Trump's proposed regulatory reforms in the energy sector. Trump also has said he plans to make "American energy dominance a strategic economic and foreign policy goal of the United States." Translation: Bad news for OPEC. Trump has said he would support greater U.S. oil and gas production in order to end the country's reliance on OPEC. But Trump also wants to go the extra step of competing with OPEC. Since the U.S. ended its ban on oil exports last year, U.S. oil exports now equal those of Qatar.

The energy sector: the new flywheel for employment

The core of Trump's campaign message focused on bringing back lost jobs to the coal mines and oil and gas fields. He argues that reducing and eliminating "all barriers to responsible energy production" will create at least half a million jobs a year. But the

U.S. energy picture is far more complicated. Most of the recent job losses in the oil and gas industry have been the result of historically low prices. The boom-bust of hydraulic fracking operations has followed age-old roller coaster trends in the oil and gas industry based on supply and demand. Trump will have little control over those vagaries of the market. If oil and gas prices start increasing and the industry resumes aggressive exploration, drilling and fracking, Trump policies would have dramatic impact, especially in opening new areas to drilling and reducing or eliminating pollution controls. The jobs outlook is even muddier in the coal mining industry. Coal mining is on the decline in the U.S. and tens thousands of miners have lost jobs in recent years. Stricter environmental standards have made mining more expensive, and some older mines have been closed because they are too costly to bring up to modern standards. At the same time, natural gas and oil prices have plummeted, making it far more economical for power companies and others to switch to cheaper fuels. Even if a Trump administration loosens standards on coal mines, the demand for coal is expected to continue to decline. Restoring many of those lost jobs will be difficult, if not impossible. In addition, demands for corporate responsibility have gone mainstream, with stockholders, boards and consumers demanding ever-increasing attention to impacts of pollution and climate change. Even if the government loosens restrictions, stakeholders are setting higher standards, a trend likely to continue.

Away from COP21, less power for the EPA and annulment of the Clean Power Plan

As the fossil fuel industry is celebrating a Trump administration, the environmental community is apoplectic. Trump's win came during the opening week of the United Nations' climate talks in Marrakesh, casting a dark cloud over this year's annual summit. During his campaign, Trump

called climate change a "hoax" created by the Chinese to dampen foreign commercial competition and said one of his first acts will be to pull out of the Paris Agreement embraced by the Obama administration. Ségolène Royale, the French environment minister who helped negotiate the Paris accord, said after Trump's election that the U.S. could not withdraw immediately from the treaty. "The Paris agreement prohibits any exit for a period of three years, plus a year-long notice period, so there will be four stable years," she said. Even if Trump could not technically extract the U.S. from the agreement, he could simply ignore its provisions and undercut U.S. compliance by tossing out emissions-cutting regulations imposed by the Obama administration. For instance, Trump has suggested he'd like to take the teeth out of the Environmental Protection Agency's regulatory authority by making it an advisory agency. His view of the EPA: "What they do is a disgrace." With the support of Congress, he could gut a broad swath of EPA regulations across all industries. Trump has said he plans to repeal the Clean Power Plan, which was a centerpiece of Obama's efforts to reduce carbon dioxide emissions in the electricity sector. He also is likely to consider aborting regulations now under consideration for restricting harmful methane emissions at natural gas facilities. An even greater concern for environmentalists is that if the U.S. is seen as pulling back from its commitments to the agreement, other nations could follow. "We will have a lot more hurdles," said Ian Fry, who heads the climate talks delegation for the small Pacific island state of Tuvalu which is experiencing dramatic impact from rising seas. He said action by Trump could have a "domino effect on other nations."

Some environmentalists have noted that even as Trump calls climate change a hoax, he has asked Ireland for permission to build a multi-million dollar seawall to protect one of his luxury golf courses from rising seas on the country's rugged western coast.

Rhetoric or reality? The answer will come in the next four years

The United States has pledged to reduce greenhouse gas emissions 26 to 28 percent below 2005 levels by 2025. To reach that goal, the U.S. would not only have to maintain existing regulations invoked by Obama, but would have to impose additional new requirements. The latter would be highly unlikely in a Trump administration. Trump, however, has advocated an increased use of re-



A boom in need of infrastructure

newable energy sources. But his overall mission statement for energy and environmental policy, implies the potential for inherent policy conflict: "Make America energy independent, create millions of new jobs, and protect clean air and clean water. We will conserve our natural habitats, reserves and resources. We will unleash an energy revolution that will bring vast new wealth to our country." The questions now being debated in the United States are how much of Trump's campaign rhetoric on energy and the environment will translate into law once he is in the White House. "Trump used himself as a negotiator and these are the opening salvos," said Danielle Pletka, a Republican policy expert at the American Enterprise Institute, a conservative Washington think tank. "I don't think we should assume there's a direct connection between what he said during the campaign and what will become policy verbatim." Pletka noted, however, that mainstream Republicans have long voiced Trump's position on what they considered Obama's "overreach on regulatory authority." And Republican administrations generally are more sympathetic to the fossil fuel industry than Democratic administrations. That history, combined with President-elect Trump's campaign pledges, presage seismic policy shifts for the United States over the next four years.



SEBASTIANO FUSCO
[AGENZIA NOVA]

A journalist for over 40 years, he mainly worked on foreign policy and related issues in energy, defense and geopolitics, collaborating with newspapers, print magazines and radio and television broadcasters. Currently, he is Director Responsible for Agenzia Nova.

Delays in the completion of permits and a tortuous bureaucracy prevent the United States for increasing its domestic transport capacity, which it desperately needs to reach its energy development potential

According to estimates published by Anadarko, one of the largest energy companies in the U.S., natural gas reserves in the "Marcellus formation," a layer of underground shale extending from West Virginia to New York State, contain more than one quadrillion cubic feet of natural gas, extractable by hydraulic fracturing technology. This alone is enough to meet the needs of the United States for a century. This abundance—indeed, overabundance—of energy resources paradoxically poses a problem: the lack (noted by many experts) of the infrastructure needed to manage them, particularly transport infrastructure.

"There is increasing awareness that we are living through a unique moment in our history," said Jack N. Gerard, President of the American Petroleum Institute on February 3, 2016, during a hearing before a U.S. congressional subcommittee. "It is a moment that marks the transfer from energy dependence to leadership, both globally and in the energy sector, political objectives pursued by every president and every Congress since 1970," Gerard continued, "but to be clear, taking advantage of this unique moment will depend to a large extent on our capacity to build the infrastructure required to realize our country's full energy potential."

According to Jason M. Thomas, Director of Research at the Carlyle Group, an international asset management company, Congress should concentrate on improving transport and storage infrastructure to promote the energy revolution in the U.S. during this time of low oil prices, while working to simplify the procedures that need to be followed to obtain permits. A recent Government Accountability Office investigation found that authorizations required to lay new interstate pipelines for natural gas transport take 558 days on average from application submission to certification. "The process is so long due to the number of federal, state and local agencies involved, different procedures in different states and the absence of a single agency responsible for coordinating the process,"

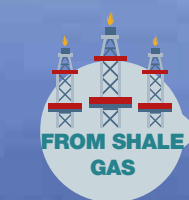
Thomas said. "For a company that invests significant capital in the medium term, these delays may cause projects that would otherwise be appealing to become less cost effective." Although the United States needs an increasing number of gas and oil pipelines, it needs government cooperation to expand its hydrocarbon transport capacity, Andrew J. Black, President of the Association of Oil Pipelines, told the congressional subcommittee. "At a time in which oil pipelines are facing serious competition from other oil pipelines and other means of transport, gas pipeline operators often have difficulty attracting customers willing to make the long-term financial commitments required to move forward with projects." The operators, Black underscored, need rapid decisions

from the government agencies responsible for issuing environmental authorizations, and approving routes and border crossings between states. "While the long-term delays imposed on the Keystone XL project [intended to transport hydrocarbons from Alberta, Canada to refineries in Illinois and Texas, ed.] are well-known, certain states are slowing down their assessments regarding oil pipeline routes," Black noted. "This is important because, unlike natural gas pipelines, pipelines for oil and oil products do not have federal status, which would enable them to take advantage of eminent domain rules. Only individual states control the routes." As a result, difficulties in creating oil pipelines are boosting the importance of hydrocarbon transport by rail, which rose from 9,500 car-

loads in 2008 to 400,000 in 2014, to more than 500,000 in 2015, according to Association of American Railroads data. The railway network offers the necessary flexibility to transport the product quickly to different places, in response to market needs, and with services that can almost always be implemented or strengthened much more rapidly than oil pipelines. According to many specialists, the system is nearing its saturation point. The increase in volumes of oil products travelling through inhabited areas has also given rise to safety issues, and accentuated the environmental concerns of the general public, following a series of serious, widely publicized accidents. A range of local communities have objected to the passage through their inhabited ar-

reas of veritable "oil tankers on rail": convoys of hundreds of cars, each filled with 76 thousand liters of flammable and/or explosive substances. Experts have highlighted that the U.S. continues to depend on DOT-111 tank cars (more than 300,000 are currently in use), which are considered obsolete and not completely safe, despite improvements made in 2015 after a series of derailments between 2012 and 2014 that caused fires, loss of human life and serious environmental consequences. "The federal government," expert Greg Saxton, senior vice president and chief engineer at Greenbrier Cos noted, "was slow in developing more adequate safety standards and deploying new technologies."

Underground wealth

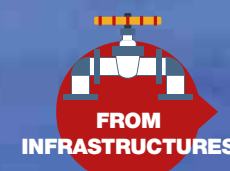


\$190
BILLION
contributed to the United States' GDP in 2015

\$156
BILLION
the increase in disposable income

1.4
MILLION JOBS
the share of employment created

\$1,337
the total savings for each American family



\$1.15
BILLION
in private capital investment

\$120
BILLION
increase in GDP which could reach by 2035

1.1
MILLION JOBS
the employment growth every year

\$1,080
BILLION
total revenue for the government from 2016 to 2035

Source: Wood Mackenzie



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Perspective/The future of U.S. LNG exports

Shale revolution: A story yet to be written

Gas production in the U.S. hit a rough patch this year due to low prices. Yet its future looks bright, considering the potential of Asian markets, which are significant importers of blue gold, and the E.U. market, where it competes with Russian gas



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The U.S. shale revolution began less than a decade ago, and 2016 has proven to be the industry's most challenging year. In 2016, oil prices have fallen below \$30 per barrel in the early months, projected capital expenditures in the U.S. have declined by roughly 40 percent year-on-year (y-o-y) and U.S. gas rig counts have dropped by nearly 60 percent y-o-y. In fact, a confluence of factors is challenging U.S. gas production today. The significant decline in oil prices since 2014 has not only slowed drilling activities by reducing the profit margins for oil and gas producers and thus the levels of capital spending, but also weakened the value of associated liquid from gas drilling that had been an important source of revenue for producers. Additionally, low domestic gas prices in the range of \$1.50 to \$3.00 per million British thermal unit (mmBtu) stressed the economics of gas production in the United States. Ac-

cording to the most recent data by the U.S. Energy Information Administration, the average U.S. marketed gas production for 2016 (per the Short Term Energy Outlook, released on November 8) was 77.3 billion cubic feet per day (bcf/d), a 1.4 percent decline year-on-year. Furthermore, the United States has seen no Final Investment Decision in liquefied natural gas (LNG) projects this year. Yet, the year was far from a disaster.

A very good year for America

In February, the United States made the first export of LNG from the lower 48 states. The LNG shipment from Cheniere Energy's Sabine Pass LNG terminal in Louisiana ushered in a new era for the U.S. gas industry. This first shipment was well worth the substantial scrutiny and regulatory hurdles that the first mover project had to undergo as it

turned the existing import infrastructure around for LNG exporting. From a national perspective, the shipment marked the beginning of the U.S.A.'s emergence as a net exporter of domestically sourced natural gas as early as next year, and more significantly, as the third largest holder of LNG export capacity by 2020. As of October 2016, over 30 LNG cargos had already departed the Sabine Pass LNG export facility, and five projects—or about 63 million tons per annum (mta) of export capacity—are under construction. Another key development this year was the opening of an expanded Panama Canal in June. After a commitment of more than U.S.\$5 billion and nearly a decade of construction, the canal gained an additional lane as well as greater width and depth to the existing lanes. The expansion has enabled the canal to accommodate 90 percent of the global LNG tanker fleet, from about 6 percent pre-ex-

pansion. What's more, transiting through the Panama Canal post-expansion shortens the voyage time for U.S. LNG from the Gulf Coast to markets in Northeast Asia and South America. According to the U.S. Energy Information Administration (USEIA), the LNG shipment from America's Gulf Coast through the Panama Canal to Japan will take 20 days, compared to 34 days for a journey around the southern tip of Africa or 31 days for a journey through the Suez Canal. Also, the Panama Canal can reduce voyage time to Columbia and Ecuador from 25 days to 5 days, and to Chile from 20 days to 8-9 days.

In the time of reduced price differentials between oil-linked LNG prices and U.S. domestic gas prices, lower transportation costs resulting from savings on fuel oil, boil off and labor are nothing to take for granted. The price environment was in fact quite different earlier in the decade,

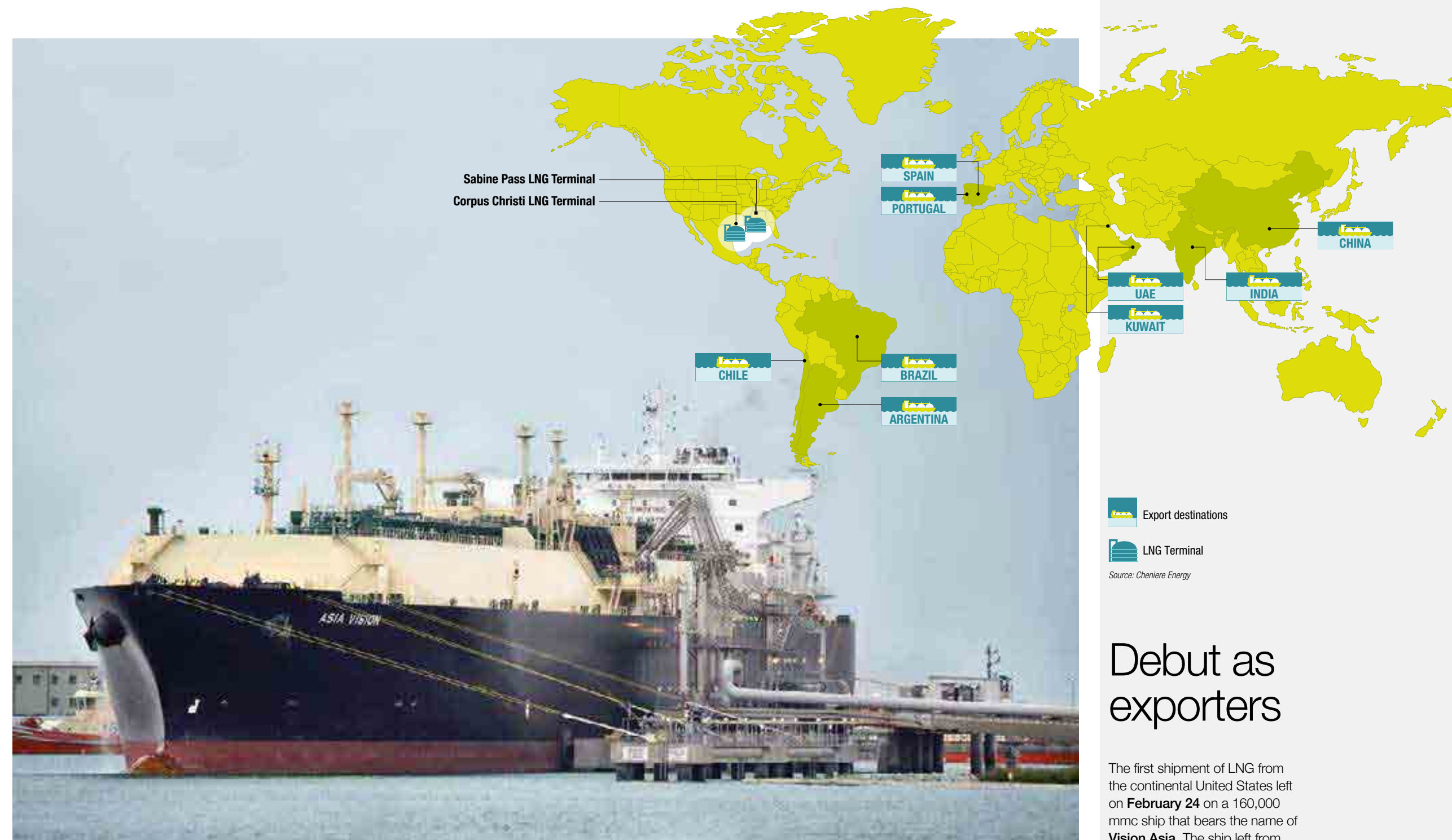
when many Asian companies, including KOGAS of Korea, GAIL of India and several companies from Japan, made investment decisions, and the U.S. LNG export projects were sanctioned. For example, major Japanese electric utilities, gas companies and general trading houses together committed themselves to U.S. LNG volume equivalent to 20 percent of Japan's annual gas import levels. Even after costs incurred for liquefaction and shipping raised the price of U.S. LNG delivered to Asian markets, the Asian importers who were paying about U.S.\$16 per mmBtu believed there would be sufficient price differentials to warrant such commitments.

It is the flexibility of U.S. LNG that appeals

However, it was not just low domestic gas prices that attracted the Asian buyers to U.S. LNG. In contrast to the traditional model of LNG export

project development or contracts, U.S. LNG offer substantial flexibility. Gas markets in the United States are highly liquid and transparent, and U.S. LNG export projects do not require oil-linked price or natural gas production by LNG plant owners to be able to recover on capital investments for developing upstream or export infrastructure. Instead, most of the U.S. export projects offer LNG contracts with Henry Hub spot gas-based pricing and no obligation to the customers to take ownership of the gas when prices are too high and thus unattractive abroad—as long as they pay a fee (or 'toll') for the contracted liquefaction capacity they did not use. Moreover, this so-called tolling model provides off-takers with destination flexibility although it also shifts the risk of gas price volatility to the off-takers.

These flexible features, backed by the current state of LNG surplus, have already emboldened customers in



Debut as exporters

The first shipment of LNG from the continental United States left on **February 24** on a 160,000 mmc ship that bears the name of **Vision Asia**. The ship left from the LNG plant docks of **Sabine Pass** (Louisiana) of the Cheniere Energy company, destined for Brazil (the map shows the Sabine Pass and Corpus Christi Terminals, both belonging to the company Cheniere Energy, and the LNG export destinations worldwide). The Sabine Pass natural gas liquefaction terminal is the first built in the United States after the shale gas revolution that made the country not just a manufacturer and importer of natural gas, but, **for the first time, an exporter**. By October 2016, more than 30 cargoes of LNG had been exported through the Sabine Pass, and five projects, or about **63 million tons** per annum (mta) of export capacity are under construction. About half of the total cargo transported so far from the Sabine Pass terminal has arrived in **South America**, while several others have landed in **Europe** and the **Middle East**.

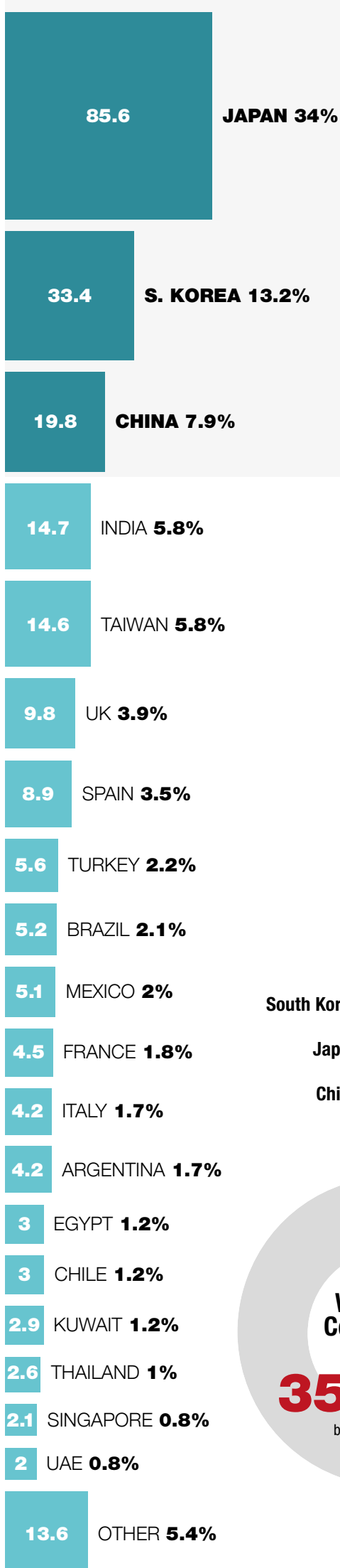


Asia and elsewhere. For example, JERA of Japan—a joint venture between Chubu Electric Power Co. and Tokyo Electric Power Co., whose purchasing power accounts for about 40 percent of Japan's LNG imports—plans to stop signing LNG contracts with destination clauses and to significantly reduce the share of long-term LNG contracts in its portfolio in the coming decades. Korea has expressed its intent to secure more flexible terms and exclude destination clauses in re-negotiating the expiring LNG contracts. Moreover, there are efforts to create a hub or two for LNG trading in Asia as a means to enhance LNG trading liquidity and transparency, as exemplified by the launch of “SLInG” price by Singapore in 2015 and the Japanese publication of a roadmap for LNG hub creation as part of their LNG Strategy announced at the G7 Energy Minister's Meeting in Japan in May of 2016. Additionally, Japan's Fair Trade Commission, keenly aware of the European Commission investigation into Gazprom's anti-competitive business practices in European gas markets, is examining if the destination clauses in Asian LNG contracts impede competition laws.

Asian buyers were not to be the exclusive beneficiaries of these flexibilities. The destination flexibility in U.S. LNG led many shipments from the Sabine Pass project to travel to a variety of markets that were not so obvious in the years leading up to the oil price collapse in 2014, as spot LNG prices in Asia and Europe declined to US\$4-5 per mmbtu this year. In fact, roughly half of the total cargo shipped to date from the Sabine Pass terminal has gone to South America, with several shipments each to Europe and the Middle East. For example, the first LNG shipment of the Lower 48 gas in February went to Brazil, by the 160,000 bcm carrier called—incidentally—Asia Vision. Free of destination restrictions common in traditional LNG contracts, U.S. LNG can be shipped to wherever market conditions are right. An important implication arises for U.S.-E.U. energy relations as much from the future of Asian demand as from future gas prices. Asian gas demand affects the pace and volume of U.S. LNG reaching European markets and consequently affects policymaking and priority-setting by public and private sector leaders relative to Europe's sense of energy security. However, the policy circumstances and domestic market conditions that shape the role of natural gas are in flux in some key Asian markets. In the established LNG markets in Asia, not only the inter-fuel competition but

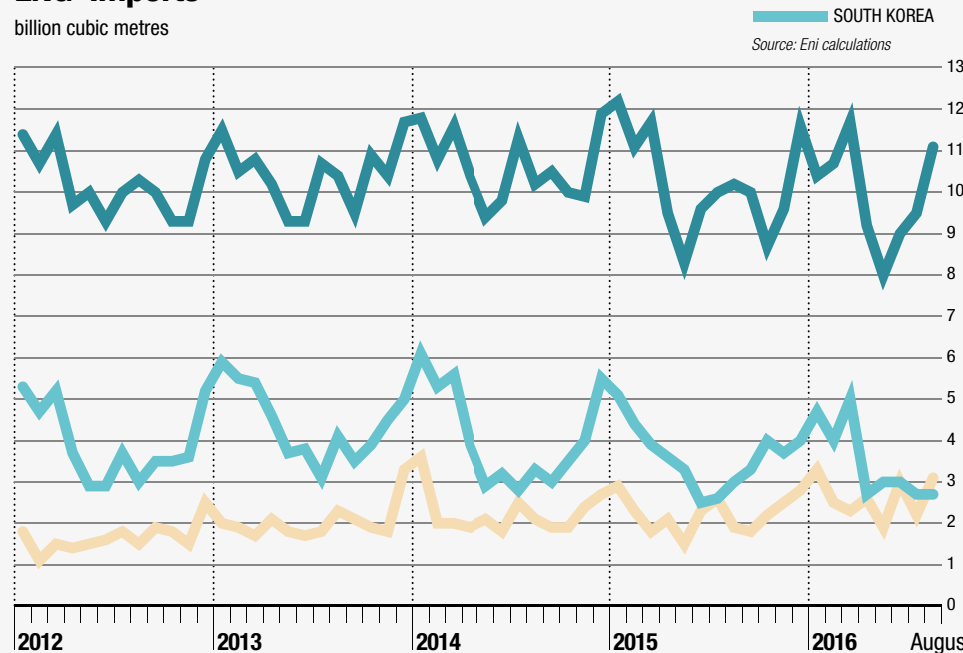
LOOKING TO THE ASIAN MARKETS
The world's main LNG importers are Japan, Korea and China, which account for 55% of global demand. Despite this, imports have declined, although consumption over the last decade has significantly increased, especially in China.

LNG Imports and Market Share by Country (in MTPA)

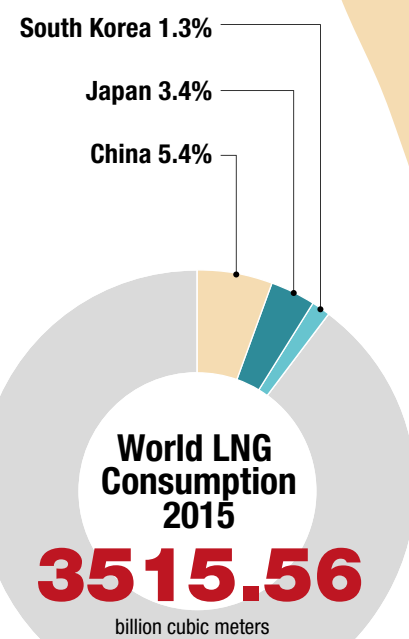
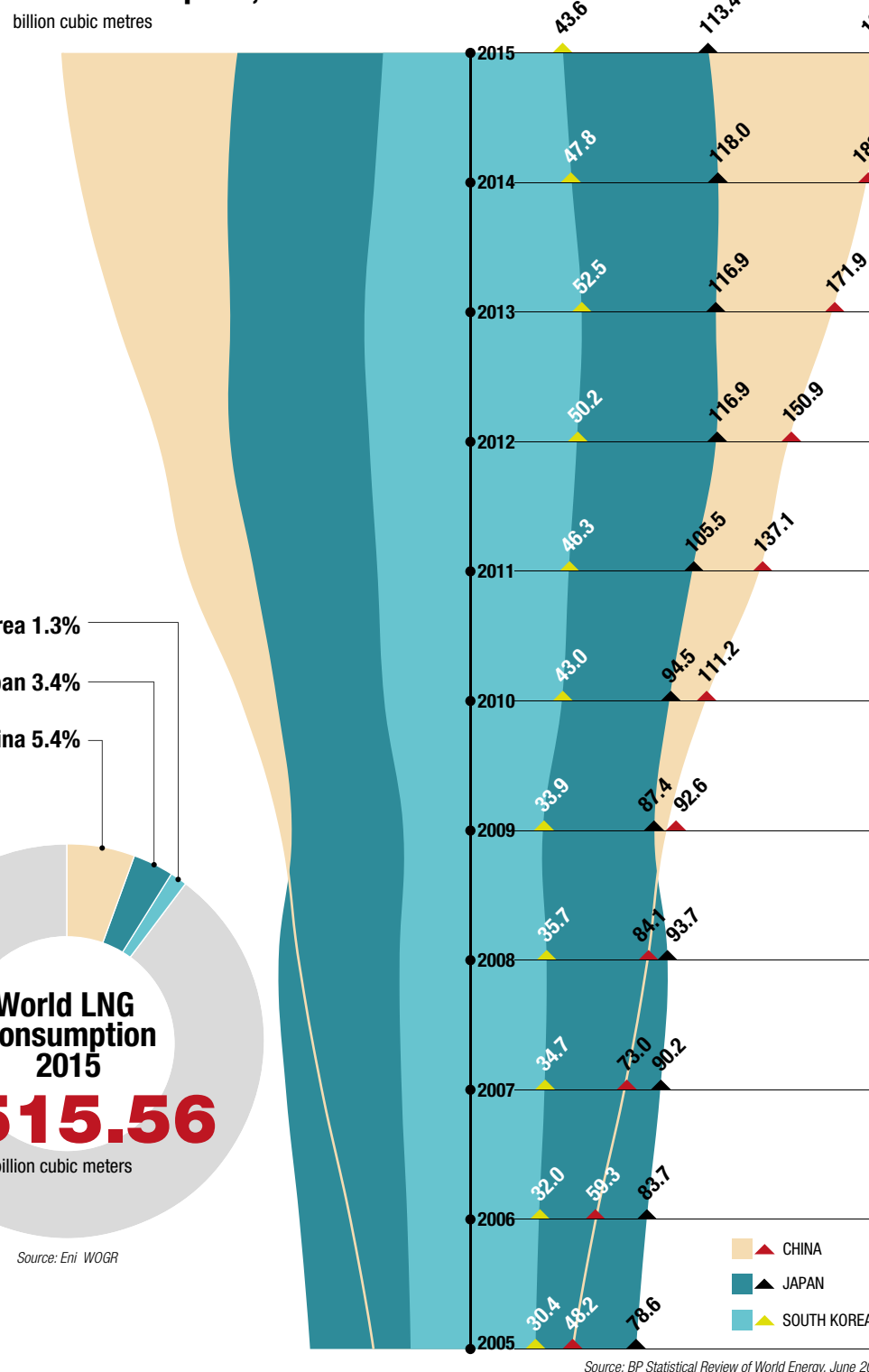


Source: IGU World Gas LNG Report, 2016 edition

China, Japan, South Korea, LNG Imports



LNG Consumption, 2005-15



vision under the 2014 Strategic Energy Plan, the share of nuclear energy would return to 20-22 percent in the nation's power supply outlook by 2030 (which is a little below the pre-Fukushima 10-year average) while the share of LNG would decline from the post-Fukushima high of 43-44 percent to the pre-Fukushima 10-year average of 27 percent, or to 18 percent in the primary energy supply (about 62 mta of imports) by 2030. These targets are quite challenging in light of continued public concern over nuclear safety, however. As of early November, Japan's 54-reactor fleet pre-Fukushima has shrunk significantly after 15 units were slated for permanent shutdown and about 20 units remain under regulatory safety review necessary for restart; a majority of the remainder have passed the safety review but await final technical steps before resuming operation. Absent steady construction of new units or proactive extensions of operational license beyond 40 years, the nation's nuclear fleet could shrink to about 15 percent of the electricity supply mix by 2030 and be nearly extinct by 2040. Additionally, the revival of coal use renders the future level of Japanese reliance on LNG uncertain. Between 2010 and 2014, Japan's coal consumption increased by 19 percent, primarily to fill the gap left by nuclear outage. As deregulation efforts in the power and gas sectors heighten competition among electric power companies, gas companies and new entrants, coal appears to be gaining interest by those entities that seek a low-cost electricity source. Insofar as LNG imports go, U.S. LNG free of destination restrictions may be particularly attractive to Japanese buyers who face such a degree of demand uncertainty.

The Korean and Chinese markets

The inter-fuel competition in the power sector is also rendering LNG import needs uncertain for Korea, which is the second largest importer of the global LNG supply today. Korea's net LNG import level has been on a steady decline in recent years, from 40.86 mta in 2013 to 37.98 mta in 2014, and to 33.36 mta in 2015, according to the International Gas Union. Meanwhile, Korea is planning on building 20 new coal plants by 2020, and increasing nuclear generation capacity by 70 percent by 2029. Insofar as the government favors coal-fired generation and nuclear power generation in the coming years, Korea may feel much more inclined to stay away from long-term contracts. The outlook for demand growth is stronger for emerging economies

in Asia. Despite demand growth slowdown since 2014, natural gas has a strong growth potential in China as the fuel is seen as one of the viable energy sources to help reduce the country's heavy dependence on coal and to alleviate the attendant environmental and climate ills. For example, China strives to raise the share of natural gas in primary energy consumption to 10 percent by 2020 (The 13th Five-Year Plan). Today, LNG accounts for only half of the country's import needs, which in turn meets one-third of domestic gas needs. However, since China began importing LNG in 2006, its net imports have grown rapidly, from 9.47 mta in 2010, to 18.6 mta in 2013, to 19.83 in 2015, according to the International Gas Union. In the near term, the existing long-term contracts will be the source of strong LNG import growth. However, the longer term outlook for LNG needs and the role of U.S. LNG in China depend on a number of factors, including the potential commercialization of domestic unconventional gas resources, the degree of reliance on pipeline gas imports (including the scope of future imports from Russia), as well as more macro-level questions, such as the degree of economic slowdown, structural changes from more energy intensive pathways for economic growth to less intensive pathways, and the extent of carbon emissions reduction. To the extent that U.S. LNG is free of destination restrictions and travel to where market conditions are right, we might see a steady flow of U.S. LNG to China in the future. For example, in late August, U.S. LNG from the lower 48 arrived in China after becoming the first LNG shipment to transit through the expanded Panama Canal.

American LNG destined to Europe

A limited volume of U.S. LNG shipped to Europe since the beginning of this year. However, weak global economic growth in developing countries and low LNG prices have already made LNG a competitive alternative to pipeline gas in continental Europe. For example, in December 2014, Italy paid an average of U.S.\$9.61 per mmbtu for pipeline gas and U.S.\$9.01 per mmbtu for equivalent LNG supplies, while Spain paid an average of U.S.\$10.02 per mmbtu for pipeline gas and U.S.\$8.97 per mmbtu for equivalent LNG supplies, according to the European Parliament. In fact, the global LNG industry is entering a period of oversupply as export capacity ramps up in Australia, Southeast Asia as well as the United States, adding about 160 bcm of capacity through 2020. U.S. LNG later in the

decade has a great potential to enter European markets in a substantial manner, particularly if the moderate appetite in Asia leaves only a little room for U.S. LNG. In the oversupplied market, LNG supplier countries, such as Australia, Malaysia and Indonesia, will likely benefit from the proximity advantage over U.S. LNG in Asian markets, prompting more U.S. LNG to flow to European markets. One consequence of this may be for U.S. LNG to come into competition with Russian gas, which plans to retain about 30 percent of the European gas market for the next two decades. Yet, the outcome of such competition is difficult to predict as it is greatly subject to global oil prices and U.S. domestic gas prices. Not to mention Russia's game plan—particularly regarding Gazprom; the company could choose to reduce the price of its gas to Europe to as low as US\$3.50 per mmbtu in an effort to block the substantial arrival of U.S. LNG, and/or expand pipeline connections to Europe to capture more buyers in the longer term. Notwithstanding questions like how long oil prices may remain relatively low and how long U.S. LNG projects can operate on the basis of variable costs, the future of U.S.-EU energy relations portends opportunities. The reduction in U.S. LNG imports and the advent of robust U.S. LNG supplies are already helping to elevate the role of natural gas in energy security dialogues in Europe. Provided that adequate infrastructure is available to facilitate LNG imports and intra-regional gas distribution, U.S. LNG can be an undeniable asset for Europe's effort to diversify gas supply sources and to enhance regional energy security, either directly through volume or indirectly through added global liquidity and contractual flexibility. The history is still being written for the U.S. shale revolution, and 2016 seems to be only one of the earlier milestones in what may prove to be a long chapter.



Focus/A mix yet to be designed

A low-cost formula

Gas impacts on our future energy choices will depend on the persistence of demand and the sustainability of prices that could fall further if the U.S. continues to support shale and LNG

The past decade has been a period of remarkable change for the energy sector in the United States. The emergence of large-scale natural gas and more recently oil production from shale resources has dramatically altered estimates of U.S. domestic fossil fuel resources. In the case of natural gas in particular, these dynamics have also significantly altered long-term price expectations. The scale of these dynamics have also had a profound impact on the international natural gas and oil markets, and have resulted in a significant shift in the balance of energy geopolitics, as U.S. reliance on foreign oil wanes and the country looks to grow LNG exports.

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A new inexpensive resource unlocked

The sheer scale of the impact that the development of shale resources has had on U.S. natural gas output over the past ten years is difficult to comprehend. Between its modern nadir in 2005 and the end of 2015, U.S. domestic natural gas production expanded by more 50 percent from 18 trillion cubic feet (Tcf) to just under 27 Tcf. One single play alone, the Marcellus Shale, located in the northeast near some of the country's major gas consuming market centers, has seen its output grow more than ten-fold since 2010. It is now producing over 6 Tcf annually, or as much as Iran, the world third largest

producing nation. Adding to the remarkable shale gas production growth narrative is the fact that this growth has been sustained even though U.S. natural gas prices have been very low. Since 2010, the average Henry Hub spot price has been just \$3.50/MMBtu, and in fact over the more recent past that average has been even lower. Since 2014, the average has been just \$3.25/MMBtu, and this low price regime looks certain to continue for several years. The medium term forward to 2021 remains at or below \$3.00/MMBtu. Analysis from entities including the U.S.

Energy Information Agency (EIA) and the International Energy Agency (IEA) reinforces the view that U.S. natural gas will remain low cost for the foreseeable future. Recent modeling from both agencies projects that U.S. shale gas output growth will continue to be buoyant without prices rising significantly beyond \$4.00/MMBtu until the mid-2020s at the earliest. Whether these projections prove to be overly optimistic remains to be seen. Strong natural gas demand growth and low oil prices leading to a moderation in the output of very cheap co-produced gas from

U.S. oil plays could push pricing into a higher range. On the other hand, the exploitation of the U.S. shale resource remains in its nascency, and in particular, very significant opportunities remain to develop better insight into how production from shale formations can be optimized.

Global gas demand increasing

Large-scale financial bets on how the world's energy landscape will unfold over the longer-term can be a rather risky business. Just ask those who invested in LNG import terminals in

the U.S. a decade or more ago. However, the future does look like it will be increasingly gas-centric. A recent IEA assessment estimates global natural gas demand will increase by 1.5 percent annually till 2040—robust growth relative to that of other fossil fuels. Importantly though, this demand growth will vary considerably across the world's major gas consuming markets. In the U.S., demand is expected to experience only modest growth of 0.4 percent annually out to 2040. Of course, the U.S. is already a huge gas user, and so this level of growth would still amount to over 3 Tcf in absolute terms. The election of Donald Trump adds uncertainly to the U.S. gas demand growth story given his statements regarding COP21 and the Clean Power Plan. However, even if the new administration steps away from these commitments, natural gas, at least at today's price levels, will remain reasonably competitive on cost alone with coal in the U.S. power sector. In fact, over the coming years, a bigger threat to natural gas demand growth may well come from the falling cost of renewables. An area where U.S. gas demand growth seems more assured is as a feedstock for chemicals. The structurally lower cost of U.S. gas relative to other markets is driving a strong expansion in U.S. basic chemicals manufacturing, and this growth seems unlikely to moderate over the medium term.

Outside of the U.S., gas demand is expected to grow over the next several decades in each of the world's major markets with the exception of Japan and the European Union. Unsurprisingly, the most profound growth is expected from China and India, whose gas demand is projected to triple and quadruple to 21.3 Tcf and 6.7 Tcf respectively by 2040. Middle Eastern gas demand is also expected to grow strongly during this period, with 28.3 Tcf of demand in 2040 representing a doubling of today's usage. The future for European gas brings together a very interesting combination of issues. To begin, the region is likely to see very little demand growth over the coming twenty to thirty years. What growth does occur will come from the region's power sector, which must deliver greenhouse-gas emissions reductions of 40 percent relative to 1990 levels by 2030. Coal to gas switching is an obvious pathway to achieving much of this goal, however, the realities of Europe's energy evolution don't seem to be as straightforward. To start, natural gas prices in Europe have tended to be appreciably higher than in the U.S. and so there has not been the same simple economic imperative for coal to gas switching in the region as has existed of late in U.S. Addi-

tionally, the pricing of carbon from the European emissions trading scheme has not been sufficiently high to close this competitive gap. Nevertheless, in spite of the rather anemic outlook for natural gas demand growth from Europe, the next quarter century is likely to see some important structural shifts for gas in the region. To begin, local gas supply is going to fall during this period, including supply from Norway, and so the region will become more dependent on imports. Russia has long supplied a plurality of Europe's natural gas imports via pipeline, and this situation is likely to continue. However, what is much more interesting is how a larger and more flexible global LNG market is likely to influence pricing in Europe during these coming years, and in many respects dilute European dependency on Russian gas supply.

The fluctuations in the price and future development

Interregional trade in natural gas, either via pipeline or LNG, has traditionally been a conservative business. Given its nature, participation in this trade involves enormous upfront capital investment, and this can only be accomplished with some degree of buyer/seller bilateral risk sharing. Typically, such risk sharing has been accomplished via the use of long-term supply contracts, which have often directly linked gas prices to liquid-based benchmarks such as Japanese Crude Cocktail. Today, 37 Tcf of natural gas is traded internationally each year. This represents about 28 percent of all natural gas consumed globally. Two thirds of this gas flows via pipeline, with the balance going via LNG. That pipes dominate is not surprising owing to their relative economic advantage over LNG up to distances of approximately 2000 miles. However, going forward, the proportion of gas traded over longer distances will grow and it is now projected that the majority of interregional trade will be via LNG by 2035. The rise of U.S. shale gas over the past five years and the U.S. entry into the LNG export business has yielded a major disruption for the global gas trade, both in terms of destination flexibility and pricing. U.S. LNG export project developers are selling LNG using a "tolling" business model, which provider buyers much greater flexibility. This is a major step away from the traditional long-term bilateral contract paradigm that has dominated in the LNG space, and when coupled to a market that is now very long on LNG liquefaction capacity (as new Australian projects also come online) it represents an overall shift towards a much more flexible supply. Just as an illustration of this

trend, between 2010 and 2015 the proportion of LNG traded via short-term contracts or spot market purchases jumped from 17 percent to 30 percent. In concert with greater cargo destination flexibility, LNG pricing is also transitioning away from its liquids-linked past. Perhaps even more significant than the growing destination flexibility of today's LNG market is the emergence of more gas-on-gas LNG pricing. In 2005, more than 90 percent of European LNG was priced via a liquids linkage, today that is the case for less than 40 percent of cargos. This dynamic has been accelerated by the U.S. LNG tolling model, which offers a direct coupling between U.S.-sourced LNG cargo prices and the U.S. Henry Hub benchmark price. As a result, Asian markets can now also access gas-on-gas priced LNG, albeit via the non-local Henry Hub benchmark. Given where the world finds itself today in terms of natural gas resources and evolving gas market structures, the important questions for gas are less about whether its role will continue to grow—it most likely will till at least mid-century—and more about what gas pricing will look like going forward. The nature of the resource means it will always be relatively expensive to move over large distances, and so regions where demand and supply are co-located (assuming relatively competitive market structures are in place), the U.S. for example, will always be at a cost advantage relative to gas-dependent markets far removed from resources like Japan. However, the recent significant changes in the structure and operation of global LNG markets are likely to result in pricing across the globe that is much more reflective of the global gas supply curve adjusted for transport. This will mean the Henry Hub will become an increasingly important global benchmark, with European and Asian pricing floating above that level by an amount reflective of the contemporary LNG value chain cost. Whether any wildcards dramatically alter this view of the future remains to be seen. On the supply side, progress in the development of international shale gas might be impactful, but chances of that seem very remote. On the demand from, more aggressive carbon policies would certainly soften demand, but beyond the already agreed COP21 commitments, the prospect for agreement on further significant reduction seem remote. In fact, if I was concerned about the future for gas, the dynamic I'd be most concerned about is that further appreciable cost progress for renewables could significantly undermine demand growth in China, India and the Middle East.





LNG/With Trump comes great opportunity for development

A new era of U.S. energy leadership

Gas and crude oil exports are gaining pace and the new administration could give the industry a decisive boost. The U.S. is on track to meet its commitments under COP21



He serves as Executive Director of LNG Allies and Our Energy Moment, two nonprofit organizations working toward U.S. liquefied natural gas exports, and president of Franklin-Hamilton. An advocate, communicator, and entrepreneur, he has been a government and public relations generalist for more than four decades and is a trusted advisor to private and public sector leaders around the world.

A little after the stroke of noon on January 20, 2017, Donald J. Trump will place his hand on a historic Bible, face U.S. Supreme Court Chief Justice John G. Roberts, Jr., and take the oath of office as the 45th President of the United States of America. As this is written (about two weeks after the election), the full implications of a Trump presidency remain impossible to ascertain, but one can make some educated guesses about what the new president and the next congress are likely to do with respect to energy and climate policy matters.

Election results and implications

The federal government of the United States has three “separate but equal” branches, all of which have been dramatically affected by the 2016 elections:

- **EXECUTIVE BRANCH.** Not only has President-elect Trump won the right to live in the White House and run the largest global “enterprise” from the Oval Office; he has also won the

authority to hire and fire some 4,000 men and women to implement his domestic and foreign priorities. Although it will take many months to recruit, vet, and—for the 1,270 most important appointees—secure Senate confirmation, “Team Trump” can begin to shape U.S. energy policy even before the Inauguration Day parade has ended. Topping the agenda for the new administration is “rolling-back” the many energy and climate regulations that the Obama administration put in place over the last eight years. (More on that below.)

- **LEGISLATIVE BRANCH.** In addition to winning the White House, the Republican party maintained its majorities in both chambers of Congress, although the Republican margin in the U.S. Senate was cut by two seats (from 54/46 to 52/48) and the majority in the U.S. House of Representatives was reduced by six seats (with the Republican/Democrat ratio changing from 246/186 to 241/194). While to the uninitiated, it might appear that the Republicans now have

a blank check (since they control the House, Senate, and presidency), the practical reality is quite different. Because the Senate operates under long-standing “filibuster” rules, a 60-vote margin is still needed to end debate/approve legislation and to confirm Supreme Court nominations. (The House does not have similar rules.)

- **JUDICIAL BRANCH.** The president has sole authority to choose the judges for the federal judiciary (district, appeals, and supreme courts primarily), but these nominations must be submitted to the Senate for that body’s “advice and consent” (aka, “confirmation”). During the 113th Congress (2013–2014), the Democrat majority—led by Sen. Harry Reid (Nevada)—changed Senate rules to permit a simple majority (51 senators) to confirm nominees below the Supreme Court level. The Republican majority in the 114th Congress (2015–2016)—led by Sen. Mitch McConnell (Kentucky)—kept this rule in place. This means that President

Trump’s federal district and appeals court nominees will only need 51 votes for confirmation. (Since the Senate has 100 members, in situations where there is a 50-50 tie, the Vice President casts the deciding vote). However, Supreme Court justices will remain subject to the 60-vote threshold, unless Senate Republicans change that rule in early 2017. With one Supreme Court vacancy at present, the stakes are already very high. Since the death of conservative Justice Antonin Scalia in February 2016, the court is now comprised of four “liberal” justices, three “conservative” justices and one—Justice Anthony M. Kennedy—who is considered the “swing” vote. President-elect Trump is expected to name a conservative replacement for Scalia, thus returning the Supreme Court to the balance that existed for many years, namely a court closely divided, leaning right, and with the crucial vote resting in the hands of Justice Kennedy. However, during the four/eight-year

tenure of the Trump administration, the president could replace three more aging justices (Justice Ruth Bader Ginsberg is 80 and Justices Stephen G. Breyer and Kennedy are both 78), thereby ensuring a “conservative” court for twenty years or more. The energy and climate implications of this possibility are—to say the least—profound since the Supreme Court is the final arbiter of whether executive and/or legislative branch decisions are “Constitutional” (i.e. in accordance with the U.S. Constitution).

Regulatory rollback

One reason why the Supreme Court situation is so important is that President-elect Trump has expressed interest in “rolling back” regulations imposed by the Obama administration on the U.S. energy industry. Many of those regulations were promulgated by the U.S. Environmental Protection Agency (EPA) under what is best described as a “liberal” interpretation of America’s basic environment stat-

utes, such as the Clean Air Act and the Clean Water Act.

Premising what I am about to say with the disclaimer that I am not an attorney, most legal practitioners acknowledge that federal regulations that were “finalized” years ago could be more difficult to change than rules more recently developed. An example of the former is the rule promulgated by EPA in 2011 to limit mercury emissions (and other air “toxins”) from coal and oil-fired electric power plants. An example of the latter is the Clean Power Plan (CPP), which was finalized by EPA in 2015 but is now under judicial review by the D.C. Circuit Court of Appeals. (The Supreme Court has prohibited the EPA from implementing the CPP until the appeals court has issued its decision.) Other regulations that are likely to be revisited by the Trump administration include those pertaining to oil and gas development on federal lands (about one third of the nation’s land is controlled by the U.S. government) and those offshore zones that are also under federal jurisdiction.

As one might expect, the Obama administration’s political leaders are furiously finalizing rules aimed at preserving President Obama’s climate and “clean energy” legacy. However, there is a little-used U.S. law—the Congressional Review Act—that could permit Congress and President-elect Trump to invalidate any Obama administration regulations (including non-energy related rules) submitted after May 2016. According to the Congressional Research Service this mechanism requires only a majority vote in both the House of Representatives and the Senate and could, therefore, provide a way in early 2017 for the Republicans to eliminate many of the Obama administration’s “midnight” initiatives.

COP21/Climate change

Beyond his interest in scaling-back Obama-era regulations, President-elect Trump also said during the campaign that he wants to “pull the United States out” of the climate agreement reached during the COP21 meeting in Paris in 2015. The COP21 agreement came into force on Nov. 4, 2016, which was 30 days after the required number of signatory nations (55) representing the requisite threshold percentage of greenhouse gas emissions (55%) ratified the agreement. There are formal means for the United States to withdraw from the COP21 agreement within one year after President-elect Trump takes office (by pulling the United States out of the underlying treaty) or at the end of his first term (by using the “four-year exit” mechanism within COP21 itself). However,

if the President-elect wants to avoid the political firestorm (both at home and abroad) that would likely follow a formal U.S. withdrawal from COP21, he could just not implement/defend the Clean Power Plan (CPP), which is the principal mechanism whereby the United States plans to meet its COP21 obligations. Ironically, all of this may be more symbolic than substantive. Under current market conditions—with natural gas and some renewables now cheaper than coal—the United States has already met the CPP’s 2024 goal for reducing carbon dioxide emissions and the CPP’s 2030 target for cutting coal use. The United States is, therefore, “on track” to meet its’ COP21 commitments whether the country remains a signatory party to the Paris agreement or not.

Potential areas of “opportunity”

However, there are various actions (not only legislative) that Trump’s administration and a Republican-led Congress could take to support the burgeoning U.S. energy exports industry:

- **LNG EXPORT AUTHORIZATIONS.** U.S. LNG exporters must obtain approvals from two federal agencies to export natural gas. The existing regulatory process—as revised by the U.S. Department of Energy (DOE) in 2014—in essence requires the two reviews to be completed sequentially with the DOE delaying its final authorization (to export the gas molecules) until after the agency with jurisdiction over the siting of the LNG facility (generally the Federal Energy Regulatory Commission “FERC”) has issued its final “order” to proceed and resolved any “appeals” of that order. Bills pending before Congress would speed up that process (by five to eleven months) by requiring DOE to reach a final “molecule” export decision within a few weeks after FERC releases its final environmental documentation on the project itself. (See sidebar). Because of the bipartisan momentum already achieved, we are optimistic that 114th Congress will enact such a requirement in 2016, but if Congress fails to do so, or should President Obama refuse to sign such a change into law, then the Trump administration could act unilaterally in 2017. (This is possible because the present DOE regulatory framework was created through executive branch rule-making without direct congressional involvement.)

- **ENERGY INFRASTRUCTURE PERMITTING.** A related but broader issue concerns the growing campaign by U.S. environmental groups to slow—by any means possible—major oil and gas infrastructure projects as a way to keep fossil fuels “in the ground.” Of



More fast revisions for LNG

Section 3 of the U.S. Natural Gas Act prohibits the export of natural gas—including liquefied natural gas (LNG)—to a foreign country without prior approval from the U.S. Department of Energy (DOE):

- Applications to export U.S. LNG to **nations with Free Trade Agreements** with the United States that “include the national treatment of natural gas” must be granted “without modification or delay.”

- However, applications to export U.S. LNG to **nations without FTAs** are subject to a “public interest” review and are approved by DOE if judged “not to be inconsistent with the public interest.”

Under revised regulations adopted in August 2014, DOE now waits to complete the non-FTA public interest review until after the lead agency responsible for facility licensing—usually the Federal Energy Regulatory Commission (FERC)—has rendered its final “order” and after any “requests for rehearing” of that order have been substantively addressed.

DOE has been approving non-FTA applications reasonably quickly after the requests for rehearing have been resolved. However, in almost all cases, DOE has sufficient data to complete its non-FTA public interest review at an earlier date, such as when the environmental studies pursuant to the National Environmental Policy Act of 1969 (NEPA) have been finalized.

Legislation which passed the House of Representatives in 2015 (H.R. 8) and the Senate in 2016 (S. 2012) would expedite DOE action on non-FTA permit applications by setting a new statutory time limit. The House bill would set a 60-day deadline and the Senate bill a 45-day deadline. A joint House-Senate conference is currently considering the LNG provisions as part of a broader energy bill.

In Jan. 2015, at a Senate Energy and Natural Resources Committee hearing on an earlier bill (S. 33), Christopher A. Smith, DOE’s Assistant Secretary for Fossil Energy, indicated that DOE could



and would comply with a new statutory deadline if Congress passed one.

Why enact such a deadline? If a 45-day deadline had been in force at the time, all of the recent major non-FTA applications could have been approved five to eleven months faster.

- **Cheniere Energy’s Corpus Christi** LNG project could have received its non-FTA license on/about Nov. 22, 2014, instead of May 12, 2015, 171 days faster.

- **Dominion’s Cove Point** project could have had its non-FTA license on/about June 29, 2014, instead of May 7, 2015, 332 days faster.

- **Cheniere Energy’s Sabine Pass** (Trains 5 and 6) project could have received its non-FTA license on/about Jan. 26, 2015, instead of June 26, 2015, 151 days faster.

- **Energy Transfer’s Lake Charles** LNG project could have had its non-FTA license on/about Sept. 28, 2015, instead of July 12, 2016, 288 days faster.

While 151 to 332 days (five to eleven months) may not seem so long, setting a deadline on DOE non-FTA decisions could make a difference for many U.S. LNG export projects that are completing the regulatory review process while trying to secure customers, finalize engineering, and arrange project financing.

course, LNG export projects are primary targets, but the keep-it-in-the-ground folks are also working hard to slow/stop interstate pipeline and other midstream projects that likewise fall under FERC jurisdiction. This opposition has expanded to the point where FERC meetings are now often closed to the public because of disruptions and FERC commissioners have even had protestors at their homes! Undoubtedly, those who support the timely development of new U.S. energy infrastructure will see the wisdom of joining with the Trump administration and sympathetic members of Congress to protect and enhance the FERC infrastructure review process. Likely focal points will be making sure that the agency has a full complement of commissioners and sufficient staff/budgetary resources to meet its critical energy infrastructure obligations.

- **CREDIT ENHANCEMENTS.** While current and prospective U.S. LNG exporters have labored to secure their FERC and DOE authorizations, another problem has emerged recently. For nearly two years, there have been almost no long-term LNG sales and purchase agreements involving U.S. projects, and this situation has been particularly problematic for those companies that require non-recourse (off-balance sheet) financing to build their projects. However, the current “buyers’ market” will not last indefinitely, and many experts are predicting that the global LNG de-

mand will outstrip supply in the early 2020s. Since new LNG projects can take as long as five years to complete after a final investment decision, U.S. natural gas exporters must line up off-take agreements in the early years of the Trump administration (i.e. 2017–2018) in order to beat other nations’ LNG projects to market. A proactive approach by the U.S. Overseas Private Investment Corporation (OPIC), the Export-Import Bank of the United States (EXIM Bank), and similar organizations could possibly help bring smaller and less creditworthy customers to the table, thereby expanding the pool of “bankable” off-takers for U.S. LNG exports. While the EXIM Bank (for example) has typically avoided providing support for “commodities,” it is hard to argue that LNG—which requires billion dollar liquefaction facilities to manufacture—is demonstrably different from other manufactured products (e.g., steel).

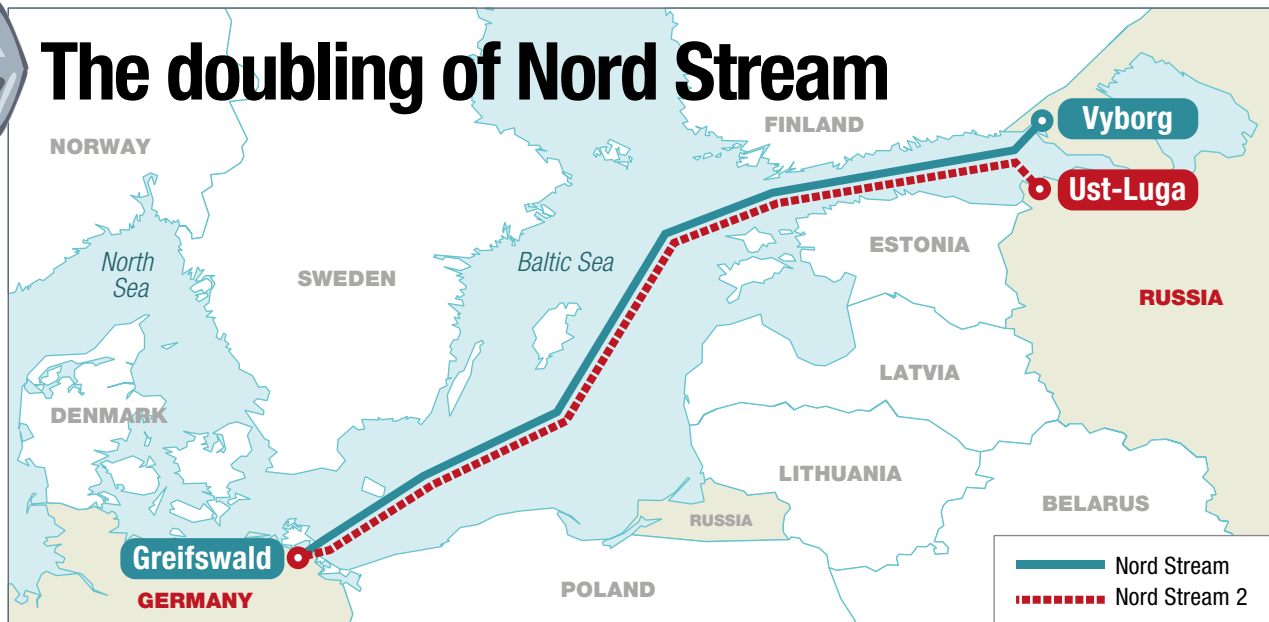
As mentioned at the outset, it is far too early to make definitive predictions about what the next few years will bring. However, there can be no doubt that we are entering a new era. U.S. exports of LNG, crude oil, and natural gas liquids are beginning in earnest and a Republican-controlled government will take office in January. This confluence of events is likely to create conditions that will elevate the United States to a new position of global energy leadership.

Gas Hot Spots

What are the geopolitical and infrastructure-related issues of the main gas routes—present and future—of blue gold transport? Here we consider Russia’s plan to expand Nord Stream; Italy and Algeria’s consideration of GALSI; the exploitation of the rich deposits in the Mediterranean; interests and assumptions that revolve around the Southern Corridor; Turkish Stream and the challenge of a passage to the northeast. The time is right for a focus on global gas networks: their current status, potential developments and the parties driving them

EDITED BY AGENZIA NOVA

The doubling of Nord Stream



Russia's desire to circumvent Ukraine, the Baltic countries and Poland, along with the abandonment of the South Stream project, have prompted the Russian government to support the doubling of Nord Stream, the gas pipeline that since 2011 has transported Russian LNG to Germany via the Baltic Sea. The plan is to increase the transport capacity by adding two new pipelines to the existing two. The knowledge gained from the construction of Nord Stream is expected to facilitate the technical planning, but the proposal of the final

route is still pending environmental impact assessments and the opinion of the parties concerned. The project is subject to national legislation in each of the countries whose waters are crossed by the pipeline: Russia, Finland, Sweden, Denmark and Germany. In a recent report, the European Parliament established that Nord Stream 2 is contrary to the Union's interests. The new gas pipeline is expected to extend for approximately 1,200 km on the seabed of the Baltic Sea to

Greifswald in Germany. As with Nord Stream, both of the two lines will have a capacity of 27.5 billion cubic meters (bcm) per year. Composed of individual pipes measuring 12 meters each and with an internal diameter of 1,153 millimeters, Nord Stream 2 will require approximately 100,000 24-ton steel pipes, coated with cement mortar and laid on the seabed. The laying and welding of the pipelines will be carried out by specialized vessels aided by logistic support from ports on the Baltic coast. The company Nord Stream 2 AG is currently reviewing international proposals for the supply of pipes. The company responsible for designing, constructing and subsequently managing the gas pipeline is headquartered in Zug, Switzerland and is currently 100 percent controlled by a subsidiary of Gazprom (Russia). Nord Stream 2 AG also uses the support of Wintershall (Germany), Royal Dutch Shell (United Kingdom and the Netherlands), OMV Ag (Austria) and Engie SA (France). According to the project's current schedule, the installation work should begin in 2018 and both Nord Stream 2 pipelines should become operational by the end of 2019.

The Levant Basin

The new hydrocarbon discoveries in the Levant Basin (Eastern Mediterranean) could radically change the geography of supplies to Europe. The large Leviathan natural gas field (450-600 bcm) off the coast of Israel, the supergiant reserves of Zohr (850 bcm), along the coasts of Egypt, and the large quantities of gas found in the Cypriot gas field of Aphrodite (200-300 bcm) could potentially meet the energy needs of Europe. However,

there is uncertainty regarding the transport of these resources.

- The first and most realistic option would be to export gas via the existing Egyptian liquefaction plants of Idku and Damietta. On August 31, 2016, Cairo and Nicosia signed an agreement for the construction of underwater pipelines that would transport natural gas from the economic zone of Cyprus to Egypt, to then be piped into the Egyptian

liquefaction plants. Moreover, the two terminals are already prepared to liquefy and export Egyptian gas, in the event of surplus production with respect to domestic needs. Israel, Cyprus and Greece have already agreed on the construction of common infrastructure for transporting gas from the Aphrodite gas field along the coasts of Cyprus. The leaders of Egypt, Cyprus and Greece also signed a joint statement in Athens on December 9, 2015, with the aim of using hydrocarbons as a catalyst for peace "through the adherence of the countries in the region to the consolidated principles of international law."

- The second option involves strengthening interregional cooperation by extending the Arab Gas Pipeline, the pipeline connecting Egypt, Jordan, Syria and Lebanon. The positive aspect of this option is that most of the infrastructure needed to transport gas already exists. However, its feasibility depends on certain highly volatile geopolitical factors, such as the relations between Israel and its Arabic neighbors,

instability in the Sinai Peninsula region and the development of the conflict in Syria.

- A third possibility is one that plans for the construction of an underwater pipeline in the Eastern Mediterranean, one that connects the island of Crete to Italy, passing via the Greek mainland. This solution is strongly supported by the E.U., which has co-funded a technical and commercial feasibility study of the project. The East Med gas pipeline, however, is expected to have very high costs, and the amount of gas derived from Cypriot and Israeli gas fields could be limited.
- The final solution is to pass via Turkey, by constructing a gas pipeline that would transport Israeli natural gas from the Leviathan gas field to Europe, passing via the Turkish Exclusive Economic Zone. In the past, Turkish and Israeli companies signed agreements for the construction of the infrastructure, but various geopolitical considerations make the construction problematic. Cyprus, Egypt, Greece and Israel all harbor a strong distrust of Turkey, albeit for different reasons.

Between Africa and Europe: the GALSI



The GALSI project, which stands for Gasdotto Algeria Sardegna Italia (Algeria, Sardinia, Italy Gas Pipeline), is aimed at the construction of a gas pipeline to export natural gas from Algeria to continental Italy via Sardinia. Founded in 2003, the project was stopped in 2011 for several reasons: the protests of Sardinian environmental movements, the disagreement between partner companies over the cost of supplies, as well as geopolitical

obstacles. The initial plan for the gas pipeline, the construction of which was due to start in 2014, called for connecting Koudiet Draouche (in eastern Algeria) to Piombino, passing via Sardinia (Porto Botte and Olbia). The corporate consortium, established in 2003 with \$10 million in capital, comprised Algeria's Sonatrach (41.6 percent), Edison (20.8 percent), Enel (15.6 percent), SFIRS – Sardinia Region (11.6 percent) and Hera Group (10.4 percent). Since 2007, Snam Rete Gas has also been involved with the project, under an agreement that had entrusted it with the construction and management of the Sardinian segment. Despite being one of the founders, Germany's Wintershall, a subsidiary of the chemical giant BASF, left the consortium in February 2008, selling its shares to the other shareholders.

Sardinian environmentalists argued that the gas pipeline, by diagonally cutting the entire island and requiring a minimum width of 40 meters, would put hundreds of waterways at risk. As for the disagreement between the companies in the consortium, the Italian companies pressed for the cost of gas to be linked to the spot market, with a high fluctuation in prices, in order to exploit forecasts of a downturn in the market. Algeria, on the other hand, wanted a supply at a fixed and predetermined price. For now, the project remains suspended, despite being placed on the list of Projects of Common Interest and, following the exit of SFIRS from the consortium, the feasibility of building two regasification terminals in Sardinia: one in Porto Torres (province of Sassari) and one in Sarroch (province of Cagliari) is being considered.

The Southern Gas Corridor



The Southern Gas Corridor (SGC) was founded because of the European Commission's desire to promote infrastructure projects capable of ensuring the diversification of energy sources and the security of energy supplies, thanks to the transport of gas from Azerbaijan to Europe. With a route almost 4,000 kilometers long, the crossing of seven countries and the involvement of a dozen major companies in the industry, the plan requires overall investments of approximately \$45 billion. This includes the second phase of exploitation of the Shah Deniz gas field (Shah Deniz II), the construction of wells and the production of offshore gas in the Caspian Sea,

as well as the expansion of the Sangachal manufacturing plant on the Caspian coast of Azerbaijan. There are three planned infrastructures: the South Caucasus Azerbaijan-Georgia gas pipeline (SCPX), the Trans-Anatolian pipeline from Azerbaijan to Turkey (TANAP) and the Trans-Adriatic pipeline, between Greece, Albania and Italy (TAP).

- The TAP will pass through Greece and Albania to land in Italy, in the province of Lecce, with a length of 870 km and a capacity of 10 bcm per year, expandable to up to 20 bcm. The current shareholders of the consortium are Italy's Snam, Britain's BP and Azerbaijan's SOCAR, each with 20 percent, plus Belgium's Fluxys (19

percent), Spain's Enagás (16 percent) and Switzerland's Axpo (5 percent).

- The TANAP gas pipeline, on the other hand, is the result of an agreement between Ankara and Baku and is expected to transport Azerbaijani gas from Shah Deniz II via Turkey, to then connect to the TAP. The construction of the gas pipeline commenced in March 2015. The first

gas supplies to Turkey are planned for 2018 and after the completion of the TAP, Azerbaijani natural gas is expected to be delivered to Italy in the first months of 2020. The current shareholders of the TANAP are SOCAR (58 percent), Turkey's BOTAS (30 percent) and BP (12 percent).

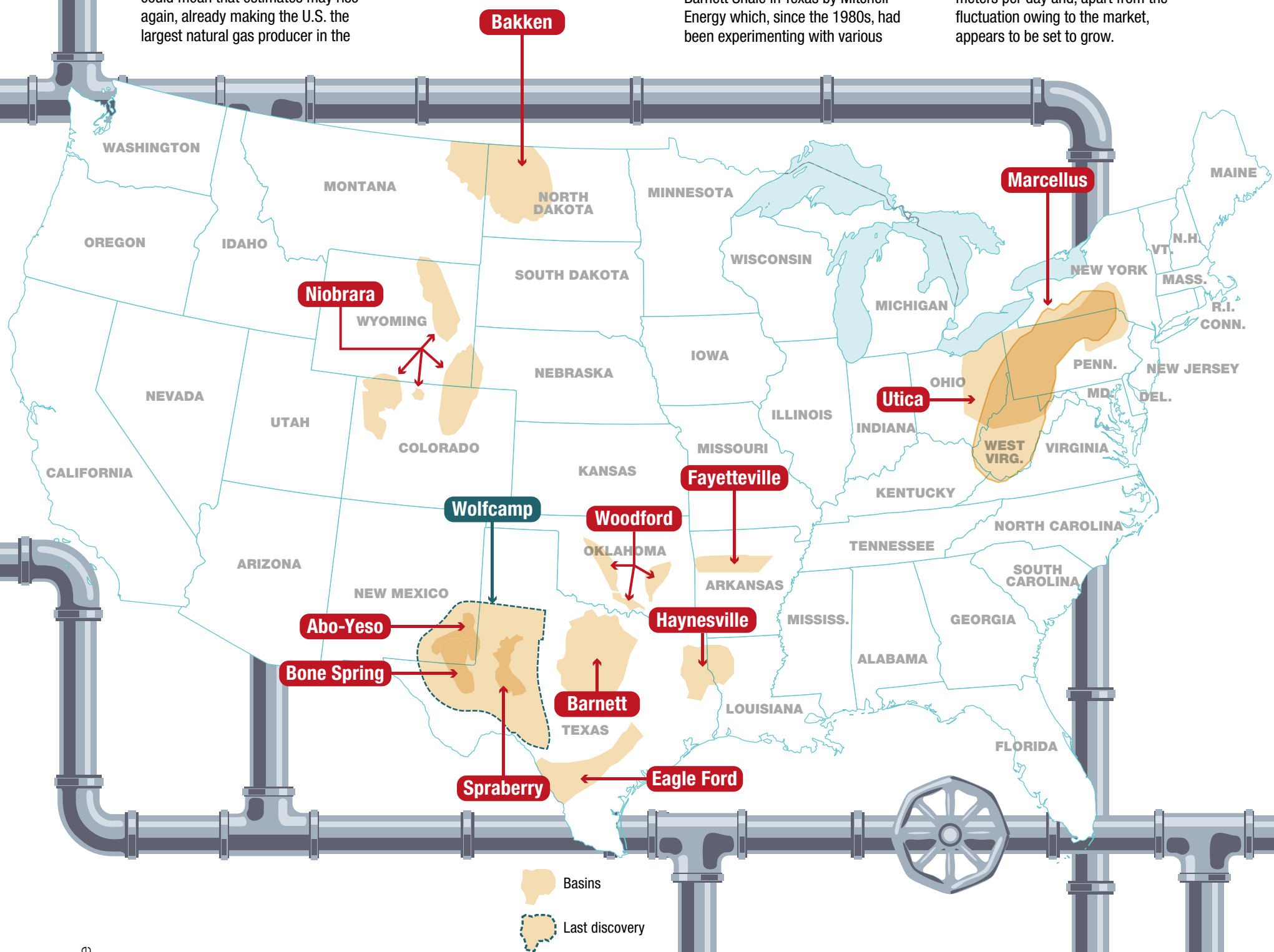
Shale gas in the U.S.

On November 15, 2016, the U.S. Geological Survey reported the discovery in West Texas of the largest deposit of shale hydrocarbons ever found in the United States. The Wolfcamp Shale, it was announced, held 16 thousand billion cubic feet of gas and 20 billion barrels of oil, or approximately three times the country's annual need. While the area had already been previously explored without success; unconventional extraction methods, horizontal drilling and hydraulic fracturing (fracking) now made it possible. The discovery could mean that estimates may rise again, already making the U.S. the largest natural gas producer in the

world by far, and one with the largest reserves. In 2015, according to the latest data provided by the U.S. Energy Information Administration (EIA), the production of natural gas from oil shale reached 37.4 million cubic feet of natural gas per day, that is, 50 percent of the United States' total production. According to forecasts, production will continue to grow steadily over the coming decades, reaching 80 billion cubic feet per day in 2040. The main sites, known as Marcellus and Utica, extend into the

subsoil of Pennsylvania, West Virginia and Ohio. The other two main deposits known, Haynesville and Barnett, are located in Texas and between Texas and Louisiana, respectively. The sites of Marcellus and Utica alone, according to forecasts, will, in 2040, provide 40 billion cubic meters of gas per day, equivalent to half of the total estimated production. In total, however, there are about thirty U.S. states that have shale gas reserves. The large-scale production of unconventional started in around 2000, with the the fracking of the Barnett Shale in Texas by Mitchell Energy which, since the 1980s, had been experimenting with various

extraction techniques at the site. When the commercial viability of the gas field became apparent, other companies became interested in its development, with its productivity in 2005 reaching almost 500 billion cubic feet of gas per year. With the refinement of extraction technologies, exploitation began of other deposits, such as Fayetteville in Arkansas, Woodford in Oklahoma, and the maxi-gas fields of Marcellus and Utica. In 2015, U.S. shale gas production amounted to almost 40 billion cubic meters per day and, apart from the fluctuation owing to the market, appears to be set to grow.



Central Asia-China Gas Pipeline

The Central Asia-China Gas Pipeline is the main infrastructure complex for transporting gas from Turkmenistan to the Chinese region of Xinjiang (via Uzbekistan and Kazakhstan). It is managed by the state-owned China National Petroleum Corporation (CNPC), together with partner companies of the Central Asian countries. It has a capacity of approximately 55 billion cubic meters of gas per year, equal to approximately 20 percent of China's energy need. The complex envisages the parallel passage of three gas pipelines covering a distance of 1,830 kilometers between the Turkmen cities of Gedaim (on the border with Uzbekistan) and Hogor, in the Chinese province of Xinjiang. The total length of the three pipelines is approximately 3,600 kilometers. The first of the two gas pipelines, line A,

was started in July 2008, became operational in December 2009. Line B followed in October of 2010. The two-pipeline system had a capacity of 30 billion cubic meters per year during 2011. Work on a third pipeline, known as line C, started in September of 2012 and was completed at the end of 2013. The pipeline officially entered into operation in 2014, increasing the gas pipeline's capacity by 25 billion cubic

meters per year. In September of 2013, China signed intergovernmental agreements with Uzbekistan, Tajikistan and Kirghizstan for the construction of line D of the gas pipeline, whose construction started on September 13, 2014 and is still in progress. The new gas pipeline will connect the supergiant gas basin of Galkynysh in Turkmenistan to China and will increase the total capacity of the Central Asia-China gas pipeline complex by an additional 30 billion cubic meters per year, reaching a total of 85 billion cubic meters, becoming the largest gas transport system in Central Asia.



Turkish Stream

The Turkish Stream gas pipeline, which is expected to transport Russian gas to Europe via the Black Sea, was first announced in December 2014, during Russian President Vladimir Putin's historic visit to Ankara. The project was founded after the Shah Deniz consortium, which controls the Azerbaijani field off the Caspian coast, had chosen the Southern Gas Corridor to transport natural gas to Europe. According to Moscow, Turkish Stream would have then had to address the failed construction of South Stream,

the large gas pipeline designed to transport gas from southern Russia to Italy via the waters of the Black Sea, Bulgaria, Serbia and Albania. However, the project was frozen in November 2015, after the Turkish air force shot down a Russian fighter jet on the border with Syria. This episode abruptly worsened relations between Moscow and Ankara, enough to fear that conflict might develop between the two countries. After the failed coup in Turkey in July 2016, relations between the two countries significantly

improved and led to a reconciliation, one sanctioned by a meeting in St. Petersburg between Putin and Turkish President Recep Tayyip Erdogan, and they have therefore relaunched the project. Turkish Stream is expected to be based on a BOT (Build, operate, transfer) funding model and should involve two lines: the first should supply the domestic Turkish market with approximately 15.75 billion cubic meters of gas per year, and the second should transport the same amount of Russian gas to Europe.

The Caspian dilemma

The Trans-Caspian gas pipeline project is designed to connect Türkmenbaşy, in Turkmenistan, to Baku in Azerbaijan. Regarded as a natural extension of the Southern Corridor, the pipeline is strongly desired by Turkmenistan, Kazakhstan and the European Union, which, in 2011, attempted to launch negotiations to that end with the two former Soviet republics. The project, however, is strongly opposed by Russia and Iran, countries through which Turkmen and Kazakh gas is currently transported to Europe, and which would be bypassed if natural

gas were to flow via the Caspian Sea instead. Moscow and Tehran are advancing environmental objections to the laying of underwater pipelines, and also claim that the Caspian is not a sea but a lake, and that, therefore, the exploitation of resources must be unanimously approved by all Caspian bordering countries. In this regard, moreover, Iran is recalling the treaties signed in 1921 and 1940 with the Soviet Union, of which all other countries involved in the negotiations were part. These treaties are still in force and in fact require the unanimity of the bordering states.

If the Caspian is declared a sea, albeit closed, it would be subject to the 1982 Treaty of Montego Bay: the bordering states govern within 12 nautical miles, but beyond these 12 miles they can exploit an exclusive economic zone that can extend for up to 200 miles from the base line. However, if the Caspian is acknowledged as a lake, the coastal states could exercise their exclusive jurisdiction only within the 12 miles, and, beyond this, the exploitation of seabed areas—such as the extraction of resources or the laying of pipelines—would become communal and would require an international authority called upon to coordinate the extraction and division of assets. The lifting of the economic sanctions against Iran in January 2016 led Tehran to the center of the regional geopolitical chessboard. The main infrastructure for transporting Iranian gas to the west is the Tabriz-Ankara gas pipeline, with exports of approximately 10 bcm per year, despite having a capacity of 16 bcm. Since 2009, Iran has developed various upstream gas projects and, with the lifting of the sanctions, has reached phase 21 of the development of the South Pars gas field in the Persian Gulf. The country also has huge gas reserves in the deepest part of the Caspian Sea, but does not have the technology required to extract them. Tehran has repeatedly declared its willingness to transport its natural gas to Europe, originally through the—now dismissed—Nabucco gas pipeline project. With the lifting of the

sanctions, Iran is now able to relaunch its export policy, but the fall in crude oil prices is driving the country to look to the more profitable Asian markets. In recent months, Iranian officials have repeatedly stressed the impossibility of constructing a gas pipeline to transport gas extracted from South Pars to Europe via Turkey, due to the long distance (1,800 km) and transport costs. The Tehran government has therefore established the development of infrastructure for gas liquefaction as a priority. At the same time, Tehran and Moscow are pushing for the creation of a North-South Corridor to connect Russia, Azerbaijan and Iran, offering new prospects for common energy policies towards Asia and Europe. Iranian President Hassan Rohani and Azerbaijani President Ilham Aliyev have met seven times over the past two years, and there are approximately 450 Iranian companies operating in Azerbaijan. The intensification of relations between Moscow and Tehran is proceeding on par with the increasingly strong relations between Moscow and Tehran: a framework that could drive Azerbaijan and Iran to join the Eurasian Economic Union, led by Moscow.



TAPI pipeline

Since the 1990's, there has been talk of a gas pipeline travelling from Turkmenistan to Pakistan, passing through Afghanistan. Back then, under the auspices of U.S. President Bill Clinton, the Central Asia Gas Pipeline consortium was formed, led by the U.S.'s Unocal and Saudi Arabia's Delta Oil. The idea was to transport natural

gas from Central Asia to the Indian Ocean, thereby creating an alternative route for exports to Europe presently controlled by Russia. In this way, it was thought, Moscow would lose strategic control of the Central Asian republics. But there was a problem: despite the withdrawal of Soviet troops, Afghanistan continued to suffer from



The gradual melting of polar ice has sparked the interest of the superpowers towards the world's most inhospitable region. From the era of the first specific satellite surveys until the end of the '70s, Arctic ice has lost half its volume, and this trend does not appear to be stopping. In 2007, the European Space Agency (ESA) declared the so-called "Northwest Passage"—that is, the route connecting the Atlantic to the Pacific passing through the Canadian Arctic Archipelago into the Arctic Ocean, which has historically been blocked by ice—totally passable. Slightly more complex, however, is the situation of the "Northeast Passage," the route that reaches the Pacific Ocean, starting from the North Sea and continuing in the Arctic Ocean, along the coast of Siberia, crossing the Bering Strait and the Bering Sea, to reach the eastern coasts of Asia. Until recently, this route was considered dangerous due to the presence of ice and icebergs, and was not included in the ordinary trade routes between China and Europe. The melting of the ice, however, has made navigation possible from July to November, even for normal merchant ships, with great advantages for companies that transport goods from

China to Europe. According to climatologists, if global warming continues at the current rate, between 2030 and 2050 the Northeast Passage would become safely navigable all months of the year. Quite a long time, but not that long for the nations bordering the Arctic, which may claim rights over the seas surrounding it, to start doing something to defend their interests. In twenty years, the Arctic routes could become the world's main shipping routes, avoiding dangerous bottlenecks such as the Strait of Malacca, which is still infested by pirates; politically unstable or disputed areas, such as the China Sea; passages subjected to heavy freight, such as the Suez and Panama Canals, further decreasing navigation times. There is another factor that makes the North Pole one of the most important geopolitical stages on the planet. According to estimates dating back a decade, 30 percent of all conventional gas reserves are in fact enclosed in the Arctic, 13 percent of which are oil, and which also contain large deposits of a variety of minerals, such as uranium, gold and tungsten. Estimates will certainly be revised upwards, as systematic explorations

and, therefore, precise analyses, have never been conducted. The country most interested in knowing the situation is Russia, which already derives approximately 15 percent of its GDP from resources located beyond the Arctic Circle. To give an idea of the

to start from the Turkmen gas field of Galkynish, located 200 km west of the Afghan border; it will travel 773 km across Afghanistan, crossing the provinces of Herat, Kandahar and Helmand; it will then travel another 872 km across Pakistan, passing through the provinces of Multan and Quetta, and will finally reach Fazilka, a city located in the north Indian province of Punjab. The resulting pipeline, the cost of which is estimated at approximately \$10 billion, is expected to have a capacity of approximately 90 mcm of natural gas per day, which would be distributed as follows: 38 mcm to India, 38 mcm to Pakistan and 14 mcm to Afghanistan, which has, however, recently reduced its requirement to 4 mcm. The main problem is security. Afghanistan is still suffering from an endless armed conflict, the Helmand province is controlled by Islamic extremists, and even the western provinces of Pakistan, the so-called tribal areas, are beyond the control of the government in Islamabad.

The Arctic, the new frontier



E.U./Reducing geopolitical risk through diversification of energy mix and source of supply

Europe at risk

The lack of internal infrastructure for transporting gas and the gradual decline in domestic production are making Europe very vulnerable in the event of a prolonged suspension of supplies from Russia or from the countries of the Maghreb



Commission scenarios in which efficiency, renewables and emission targets are met. Studies have also shown that the capacity of the import pipelines from Russia, Norway, Algeria and Libya alone, at 422 billion cubic meters (bcm) would be sufficient to more than satisfy current E.U. gas import requirements (255 bcm). In addition, several member states have already installed a total of 183 bcm of liquefied natural gas (LNG) import infrastructure. As a result of the excessive size of gas infrastructure relative to actual E.U. demand, the utilization rate of import pipelines is only 58 percent and 32 percent for LNG terminals. The issue is therefore clearly not an insufficient level of infrastructure but one of insufficient intra-E.U. networks. Indeed, 95 percent of the E.U.'s LNG import infrastructure is based in Western Europe, and there is not enough internal gas transmission infrastructure to connect LNG terminals to Central and Eastern European countries, many with no access to LNG supply. They are thus all the more dependent on Russia. At the same time, even assuming a stagnant or declining outlook for E.U. gas demand, the EU's vulnerability to gas import disruption is set to continue for multiple reasons. European domestic gas production is rapidly declining. The U.K.'s gas production volume has been steadily falling since 2010, largely as a result of rapid depletion of North Sea resources. Norway, an important and traditionally secure supplier of gas to the E.U., also faces dwindling North Sea resources, while the Netherlands has also seen a sharp drop in gas production. This downturn has accelerated following the decision in 2015 to impose a cap on Europe's largest gas field, Groningen, because of more frequent and powerful earthquakes resulting from the extraction activities. Fierce and continued public and environmental opposition to fracking across Europe is unlikely to release this potentially vast gas resource, unlike in the U.S., where fracking has revolutionized the oil and gas industry. Moreover, popular and political opposition to expanding further nuclear power in the E.U. has left natural gas as the most credible energy source for Europe's transition to a lower carbon future, this despite opposition from environmentalists and Green parties arguing that the European Commission should focus less on gas and more on renewables and energy efficiency to meet its long term climate targets and reduce dependence on foreign supplies. But as Miguel Arias Cañete, the E.U. Commissioner for Climate Action and Energy, pointed out when he unveiled the Commission's latest sustainable energy security package: "We are

PAUL BETTS



He has been with the *Financial Times* for 36 years, of which 28 were spent as the paper's foreign correspondent in Rome, Paris, New York and Milan. He currently works as an international economics columnist and lives in Monaco.

The first shipments of U.S. shale gas have been sailing into Europe—first to Norway, then to Portugal and most recently to the U.K.—in what some foreign policy and energy experts see as the start of a potentially game changing transformation of the European energy market. Europe is the biggest importer of natural gas in the world, and the European Union sees natural gas as the key contributor to its transition to a lower carbon world over the next two decades. The problem is that the E.U. relies for much of its gas on an unreliable source. Russia currently provides about a third of Europe's gas and has used its hold on the European market as a political tool on repeated occasions.

Dependence on Russia

Not surprisingly, E.U. member states have sought not only to diversify their existing energy mix but also to in-

crease their sources of gas to reduce their dependence on Russia. A number of member states, including Latvia, Lithuania, Estonia, Finland and Slovakia, are fully reliant on Russia for gas. Bulgaria, Hungary, Slovenia and Greece are dependent on Russia for more than two-thirds of their gas while Poland relies on Russia for more than half. Russian gas also accounts for 46 percent of national gas consumption in Germany, Moscow's biggest single E.U. gas customer and the largest E.U. consumer of gas, one that accounts for nearly a fifth of the total annual gas demand of the 28 member states. The E.U. has become addicted to Russian gas and has been trying hard to kick the habit—all the more so since the escalation of tensions between Russia and Ukraine, as approximately 40 percent of Russian gas transits to the rest of the E.U. through Ukraine. Russia has used gas as a political

weapon on multiple occasions, halting supplies to Ukraine in the so-called gas wars of 2006 and 2009. On one occasion, a Russian gas shutdown led to a cut off of all Russian gas to Europe for two weeks in the middle of January, leaving many millions of inhabitants in the cold. European governments were forced to declare national states of emergency, shut down factories and scramble for alternative fuels. Following the Russian annexation of Crimea and at the height of the 2014 Ukraine crisis, concerns mounted in Europe over the threat of politically motivated disruptions of Russian gas supplies, especially those passing through Ukraine, disruptions that would cause severe and widespread blackouts throughout the E.U. This prompted the European Commission under its president Jean-Claude Juncker to put energy security at the top of the E.U.'s agenda, triggering the move to

create an Energy Union in Europe to counter the threat of Russian political blackmail. Stress tests were also carried out in 2014 by 38 European countries, including all E.U. members, simulating two energy supply scenarios for a period of one or six months. These scenarios included a complete shut down of Russian gas imports to the E.U. and a disruption of gas imports through the Ukraine transit hub. The tests showed that a prolonged supply disruption would have a substantial impact on the E.U., given that gas accounts for around one quarter of the E.U. energy mix and one third of this is imported from Russia. But the report also confirmed that if all countries cooperated with each other, consumers would remain supplied even in the event of a six-month gas disruption. However, the trouble in the case of gas supplies is that, unlike oil or coal, it is not possible to bring large

quantities of gas to where it is needed if the corresponding infrastructure is not in place.

The decline in E.U. production and the lack of internal networks

The irony is that Europe already has extensive and underused import and storage infrastructure developed during the last decades when the E.U. grossly overestimated its gas demand. Indeed, Europe's track record for forecasting gas demand is poor. The so-called 2009 "Ten year Network Development Plan" foresaw an 8 percent increase in gas demand from 2010 to 2013. Demand, in fact, declined by 14 percent. Considerable uncertainty remains on future demand levels, with projections ranging from a 38 percent increase in consumption by 2035 in the Eurogas "base case" projection to a further 25 percent decline in gas consumption in European

still far too vulnerable to major disruption of gas supplies. And the political tensions on our borders are a sharp reminder that this problem will not just go away.” Indeed, the E.U. remains vulnerable not just to Russia but to other key suppliers that could interrupt their flow of gas for geopolitical or technical reasons. Algeria, for example, which has been a reliable and secure supplier, could cut supplies in the event of unpredictable regional political turbulence. The Maghreb country is also expected to become a net energy importer by 2030 due to rising domestic demand driven by population growth, and that could further squeeze gas supplies to Europe. Elsewhere, Azerbaijan has faced growing domestic discontent, while Turkmenistan has the Taliban along its 750 km long border with Afghanistan. In the Middle East, terrorists and extremists have targeted oil and gas infrastructure provoking inevitable supply disruptions. The E.U. thus needs to adapt to a changing and increasingly troubling landscape of geopolitical risk. In the case of gas supplies, Russia clearly remains the number one issue not just because of the scale of its exports to the E.U. but because of the heightened and continued tensions over Ukraine and Moscow’s intervention in the Syrian conflict. These problems underline the strong geopolitical symbolism of the recent arrival of the first shipments of U.S. LNG to European shores, an arrival prompted by the massive ramp up in American shale oil and gas production that led to Washington’s decision to lift its 40-year ban on U.S. oil and gas exports.

The arrival of U.S. shale and Gazprom’s response

These initial shipments to European refineries by Ineos, a privately owned multinational chemicals company based in Switzerland, are not going to make a significant difference in E.U. gas supply requirements, at least not at this early stage. Nonetheless, as Jim Ratcliffe, the founder and chairman of Ineos, claims, these shipments mark a strategically important development for both his company and Europe. After his first shipment arrived in Norway at the end of March 2016, Mr. Ratcliffe noted that “shale economics revitalized U.S. manufacturing and for the first time ever, Europe can access this essential energy and raw material source too.” His company has chartered a fleet of purpose-built vessels which it claims will create “a virtual pipeline across the Atlantic.” There is still considerable debate over the extent of the impact U.S. gas exports to Europe will have in changing the current balance of E.U.-Russia energy transactions. Some estimates suggest that the U.S.

could match Russian exports to Europe within 10 years. Wood Mackenzie, the energy consulting firm, has projected that 55 percent of U.S. LNG volumes, or about 32 million tons per year, will be sent to Europe by 2020. Others are less bullish. They believe the impact on Europe will be felt very gradually as U.S. LNG will probably go initially to markets in Asia and Latin America where LNG spot prices tend to be higher. However, most experts tend to concur that LNG from the U.S. will probably be one of the most, if not the most, important single developments to transform the future of the LNG market by making it truly global. By providing a major source of competing gas supply on the market, U.S. LNG exports to the E.U. and elsewhere should make gas pricing much more competitive and put pressure on Gazprom, the giant Russian state-owned gas monopoly, to adapt and lower the prices it charges to its European customers if it wants to maintain its market share. Gazprom is hardly going to sit back and accept the loss of its best customers; it has already accepted the U.S. LNG challenge by announcing a few months ago that it intends to ramp up gas exports to Europe to record levels. The Russian group’s strategy is to retain a market share of at least 30 percent in Europe between now and 2035. Gazprom’s deputy chairman Alexander Medvedev also said 12 months ago that imports of North American gas to Europe would be “limited,” as the cost of U.S. LNG is expected to be higher over the next five years than forward prices at the UK’s National Balancing Point (NBP) hub, Europe’s long established spot traded natural gas market. The Russian gas group certainly has considerable market power to undercut competing sources to preserve its market share, especially since its pipeline gas has in the past been relatively cheaper than LNG imports, although prices have been converging. Russia has also sought to expand its pipeline connections to Europe to secure more buyers on longer term contracts and in so doing, its critics argue, to continue to control and manipulate the market more for political rather than purely economic reasons.

The gas pipeline game

It is highly questionable whether most of the big pipeline projects advanced by Moscow in recent years make viable commercial sense given that E.U. gas consumption is most likely going to remain flat or even drop between now and 2030 (as a result of the transition to a low carbon economy). But commercial merits have never weighed that much in the geopolitics of Russian gas. Moscow, for example, is now reviving with

ALGERIA 8%

NORWAY 35%

RUSSIA 41%

LIBYA 2%

LNG 14%

European dependence on foreign gas

Europe is the world’s top natural gas importer. Each year, via gas pipelines or LNG carriers, over 300 Bcm of gas is transported to the E.U. Member States. The E.U.’s main supplier is Russia, which, with 123 Bcm exported per year, covers approximately 30 percent of Europe’s needs; this is followed by Norway (35 percent of E.U. natural gas import), Algeria (8 percent) and Libya (2 percent). Approximately 14 percent of the gas imported to Europe (amounting to 43 Bcm) reaches the shores of Europe via LNG carriers. Qatar and Nigeria are Europe’s main suppliers of LNG.

Ankara the Turk Stream pipeline project that is intended to replace the abandoned South Stream pipeline to Bulgaria and bring Russian gas along part of the now scrapped South Stream route, then crossing the Black Sea to Turkey and on to the E.U. border. Such a pipeline would enable Russia to compete directly in the southeastern European market with the so-called Southern Gas Corridor, one of the E.U.’s flagship pipeline projects that will cost an estimated \$45 billion and is designed to bring Caspian gas to Europe to reduce reliance on Russia. Significantly, Turk Stream would not only help increase Russia’s

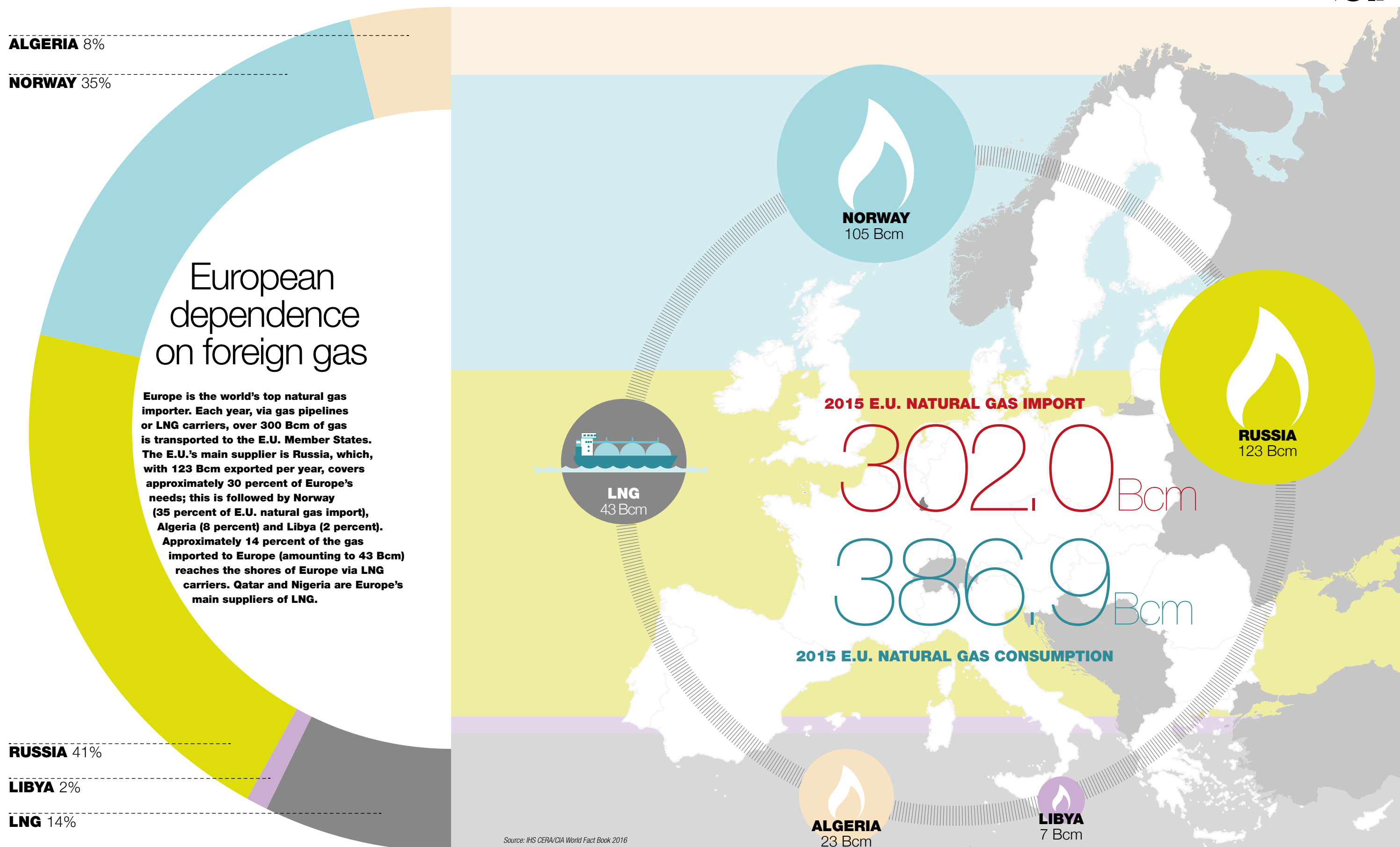
gas export capacity but bypass Ukraine, thus depriving Kiev of one of its principal sources of diplomatic leverage in its ongoing conflict with Moscow. An even better example of Moscow’s transparent attempts to use gas as a divisive political tool to manipulate the European energy market and more broadly destabilize the E.U. is the controversial Nord Stream II pipeline project. A consortium of western companies including Eon, Engie, OMV, Shell and Wintershall has now decided not to participate in this project designed to double the capacity of the existing Nord Stream sub-sea pipeline that

brings Russian gas to Germany and bypasses Ukraine. But Gazprom and Moscow are still planning to press ahead, even though the existing pipeline is operating at 50 percent capacity. The Polish government is vehemently opposed to the project, as are a number of other E.U. central and eastern European member states such as the Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Romania and Slovakia. Writing recently in the *Financial Times*, Konrad Szymanski, Poland’s minister for European affairs, noted that the economic arguments for Nord Stream II were always questionable, especially

considering the overcapacity on existing supply transit routes from Russia to the E.U. “Given Europe’s considerable dependence on Russian gas and the damage the project would cause to the Ukrainian economy (which is subsidized by the E.U.), the political motivations behind it seem obvious,” he said, adding that the project increasingly looked like a Trojan horse designed to destabilize the Ukrainian economy and poison political relations inside the E.U. He also criticized the European Commission’s ambiguous and contradictory position by not clearly opposing the project in spite of the E.U.’s sanctions

against Russia following the annexation of Crimea. “The E.U. cannot continue to offer financial support to Ukraine, maintain sanctions against Russia and call for a resilient energy union while at the same time collaborating on Nord Stream II with Gazprom,” he wrote. Nord Stream II has thus turned into yet another test of European unity and of the credibility of E.U. institutions. It has once again exposed the fundamental weaknesses of an E.U. system that has increasingly become a dysfunctional mess with the differing and competing priorities of member states undermining the wider union. In the

case of energy and the flagship Energy Union, differing priorities and vested interests have made it all the more difficult for the E.U. to ensure the energy security that goes along with the natural gas transition it is seeking towards a lower carbon world. As Mr. Szymanski pointed out: “Promoting the economic interests of certain countries at the expense of the security and stability of others is no way for the E.U. to escape the crisis it finds itself in. Nor is it likely to imbue disillusioned citizens with renewed faith in European institutions.”



Russia/Interview with Konstantin Simonov,
Russian political scientist and energy expert

A necessary relationship

Relations between the E.U. and Moscow depend on a range of geographical and geopolitical factors, some related to Russian gas exports to the E.U., which have reached record highs. Among other important issues are the gas pipelines, the difficult issue of the Caspian Sea, and relations with China

collaboration between the European Union (E.U.) and Russia in the gas industry is not a possibility but rather a necessity imposed by geography as well as geopolitics. This is the claim of Konstantin Simonov, Director General of Russia's National Energy Security Fund, who highlights that Russian gas imports to the E.U. have risen to record levels despite the economic sanctions imposed on Moscow by the West.

Russia and the European Union seem to have reached an agreement to close the proceedings against Gazprom. The Russian gas giant will need to agree not to exploit its dominant position, and in exchange will obtain the possibility of expanding its activities within the E.U. In your opinion, what will the industrial and geopolitical effects of this be?

Effectively, we often talk of compromise. I would say that there's nothing particularly extraordinary about what is taking place, except for the historical moment in which it is occurring. This is because the political situation seems to be exceptionally dramatic and it was not possible to predict that the European Commission would reach a decision apparently in agreement with Russia. The economic and political situation has actually required this logical and rational step to be taken. Besides, current data demonstrate that the accusations against Gazprom are highly questionable. Recently, we have seen decidedly low prices, which had not been observed for years in the European market. But this did not happen because Europe reformed the energy market in accordance with its own principles. To the contrary, prices declined thanks to gas and oil contracts. At the start of the year, oil prices were not so low. Then after nine months, between September and October, they fell sharply. This was the first factor. The second was last October, when European prices were higher than those offered by Gazprom, indicating around \$50. Although they are not officially fully accounted for by the European Commission, these figures represent the reality. Third, Europe has no alternatives to gas. Liquefied natural gas (LNG) terminals are two-thirds empty, all within a context in which Gazprom set its daily all-time record of supplies abroad. Last October alone, 15 billion cubic meters were delivered throughout the European Union. European customers acquired much more than the volumes agreed upon in the contract with Gazprom. These are absolutely unprecedented conditions, and with a situation of this nature it would be absolutely crazy for the European Commission to continue on the path of seeking an alternative to Russian gas. The import figure is absolutely without precedent. I also believe that in Europe, the feeling is emerging that Ukraine may embark upon the winter season with a very limited quantity of gas. And the bad weather has started earlier than in the last two years. Economically speaking, the difficulty is that fighting Gazprom in the winter is a particularly difficult proposition. And it is important not to lose contact with reality. What counts is that this year, quite unexpected decisions have been taken in Europe. Recall that in June, the Court of Arbitration issued a ruling in favor of Gazprom in the dispute with Lithuania. The Vilnius authorities summoned Gazprom to court in 2012 for allegedly taking advantage of its dominant position in the market to overcharge for gas. (According to Lithuania, Russia overcharged by \$1.6 billion from 2004 to 2012, ed.). As also admitted by several Lithuanian representatives, the outcome of the arbitration proceedings was shocking, although there were not great prospects for success, and it is necessary to understand whether the Lithuanians managed to obtain anything from this dispute: perhaps the promise of faster access to the European hub project. However, this success was rather limited. Therefore, from the economic perspective, trends are not positive. From the political perspective, obviously not everything can be changed at once, but it is important that the precedent has been set. Even considering current conditions in Brussels, it was possible to take decisions that are apparently favorable to Gazprom. It is good to see that this type of compromise can be reached.

Konstantin Simonov

He is a Russian "new generation" political scientist and public expert on energy. Currently holding the title of Associate Professor at Moscow State University (MSU), he has been engaged in academic research in the fields of political and economic studies for over 15 years. Simonov is currently Director General of Russian National Energy Security Foundation.



believe that this is a good development for the Russian government?

The history of relations between Russia and Germany in terms of gas supplies started more than 40 years ago. The first gas supplies to Germany were delivered in 1973, and the country represents the primary end market for Russian gas. Gazprom is not only a partner in sales. It also owns the company Wingas (a joint venture between Gazprom and Wintershall), which is co-owner of the Opal gas pipeline infrastructure located in Germany. Opal continues to the Czech Republic through German territory. This special relationship is why German businesses and Gazprom have several points of contact. In addition, in a somewhat rare case, German companies are working actively in the Russian market by extracting gas in Russia. The Nord Stream project itself was carried out as an asset swap and was built jointly. Indeed, the connection is strengthened by the fact that the Germans are present in Russia in the upstream market, and that Gazprom is present in Germany in the downstream market. Therefore, there is

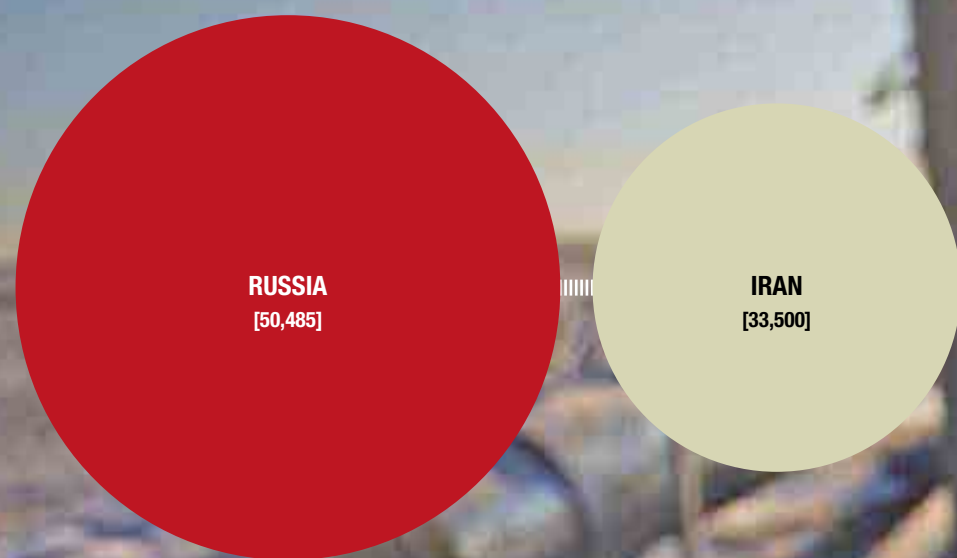
an extremely high level of reciprocal relations, which makes it possible to look at the current political situation with tranquility. This is because everyone on which the United States has a heavy influence, such as German Chancellor Angela Merkel, needs to take into account economic aspects. But this does not stop market rules and the basic concept is that commercially, Gazprom has continued with existing partnerships. I believe it is necessary to underscore the fact that gas was not subject to the sanctions against Russia. There are sanctions, but not for Gazprom, whose activities are fully compatible with European legislation. In addition, in Germany there will be political elections next year, and in Russia we certainly will not be naive. The situation is not good for Merkel and there will likely be changes in the power structure. Perhaps Germany will be more cautious with regard to sanctions. In this environment, it is significant that in Italy, the Nord Stream 2 project gave rise to concerns from many political representatives, although the gas pipeline was conceived of precisely to supply the Italian market. For Brussels, this infrastructure would

AN HISTORIC EXCHANGE
Russia has been supplying gas to Germany for more than 40 years. The first gas supplies to Germany were delivered in 1973, and the country represents the primary end market for Russian gas.



PROVEN NATURAL GAS RESERVES

(billion cubic metres)



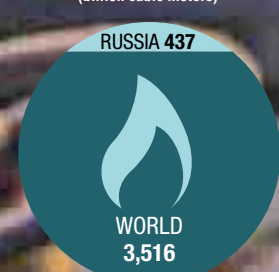
NATURAL GAS PRODUCTION 2015

(billion cubic meters)



NATURAL GAS CONSUMPTION 2015

(billion cubic meters)



Source: Eni

Source: EIA

make it possible to unite Italy with the Baltic region, providing gas to Northern Italy while bypassing Ukraine. In our view, this is a project meant to bypass the “dangerous route” through Ukraine, since European customers do not want to deal with those risks. This is the lesson taught by the “gas crisis” of 2009 (the crisis began on January 7, 2009, when Russia suspended gas supplies to Europe through Ukraine. Moscow accused Kiev of violating transit obligations by illegally withholding supplies meant for European customers. After a series of negotiations and trilateral agreements between the European Union, Russia and Ukraine, an agreement was reached, ed.). I understand why there is some confusion in Italy about the project since, if it is carried out, Italy will receive gas through Germany and Austria. The Chairman of the Austrian company OMV, Rainer Seele, was at the helm of the German Wintershall and is German himself, demonstrating the close integration between the German and Austrian gas companies. This issue has a political aspect, because for Rome the project entails dependence on the companies that will manage transit through Germany and Austria. If Italian politicians fear that Germany and Austria may become more important, then they should have supported the creation of the South Stream. With this infrastructure, Italy would have received gas via a safer route through Greece. But Italy did not support it and indeed abandoned the project. Therefore, Russia had no option other than pursuing the doubling of Nord Stream.

In your opinion, does the Nord Stream represent the death knell for the old South Stream project?

The situation is such that the South Stream, in its first version, and later the Turkish Stream, were designed with four pipelines. By the will of Turkey, given the EU's opposition, the two southern routes were transferred to Nord Stream. Previously, in Italy, it was expected that gas would arrive to the South through Bulgaria and Greece. This is why the issue of the two routes from southern Europe is still standing. One of the two will certainly go towards Turkey, to Istanbul, with-

out a doubt. The second route is still an open question, because Turkey would like to establish a hub at the border with Greece and become the supplier of Russian gas to Europe. However, from the geopolitical perspective, there does not seem to be any agreement at the European level regarding whether this is the best solution. This is why Europe is now proposing to Russia the creation of a hub at the Bulgarian-Greek border. We are also analyzing the possibility of creating a southern route through Bulgaria, but we would like guarantees that Sofia will not block the project again this time, as took place for the South Stream. The fact is that the decision can no longer be put off: we have a precise date—January 1, 2020—when the gas transit contract currently in force with Ukraine will expire. It is necessary to understand how to supply gas without necessarily transiting through Ukrainian territory by that date.

After the failed coup d'état in Turkey, relations between Ankara and Moscow improved considerably: do you think that this will be a lasting consequence, or that things could change again in the near future? And in that case, what may the negative effects be for the Turkish Stream gas pipeline project?

As regards the first of the two Turkish Stream pipelines, I do not believe that anything will change. The work will be completed even if the political situation moves in a negative direction again. The second pipeline will depend on the E.U.'s position, on whether it will accept Turkey as the “controller” of gas being sent to European countries. The agreement signed during Putin's visit to Istanbul concerns only one of the two southern pipelines. For the second, we have not entered into any commitment with the Turks and legally it is still an open issue.

All of the propositions of a Trans-Caspian gas pipeline have come up against the legal status of the sea, enabling Russia to impede the creation of the transport infrastructure.

Do you believe that this situation could change in the future?

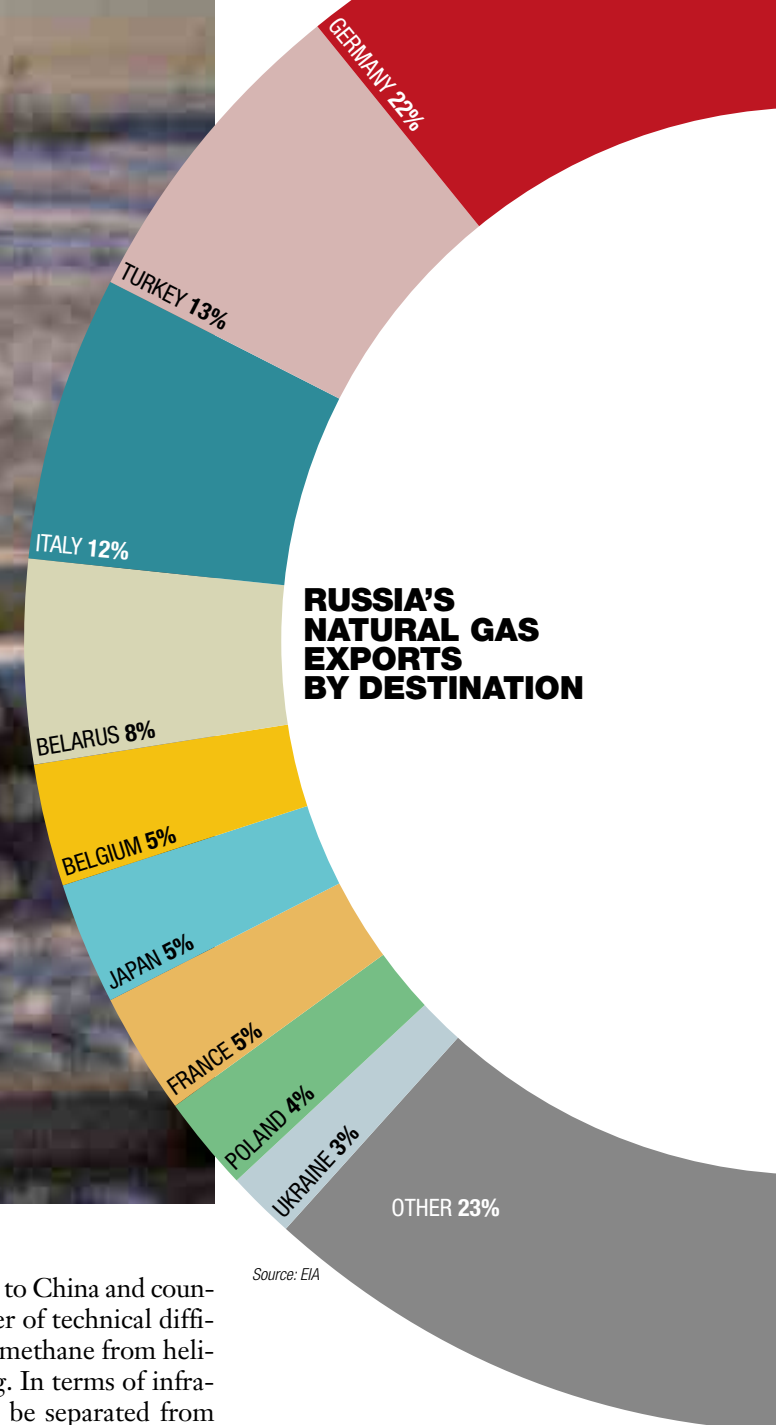
As you know, the Caspian Sea is different from other seas because it is actually a lake, bordered by five countries: Azerbaijan, Iran, Kazakhstan, Russia and Turkmenistan. Russia has always had the same stance: the issue regards exclusively these five countries. The legal issue of the Caspian Sea has remained unresolved for 25 years now. We have yet to come to a compromise. This is not only a Russian issue; for example, Turkmenistan and Azerbaijan also have conflicting views. In addition, recently, the position of Iran, which has its own ideas about how to divide the Caspian Sea, has strengthened considerably. I do not believe that this problem will be resolved soon, as none of the countries in the region of the Caspian Sea is interested in stabilization. Russia does not need an open sea: the Trans-Caspian gas pipeline project is an alternative route for the supply of gas to Europe and, clearly, for Russia, it is useless to build alternative infrastructure to bring gas to Europe. It's the same for Iran, since Tehran hopes to sell its own gas to Europe. On the other hand, Azerbaijan has already signed the contracts for supplies from the Shah Deniz field. Turkmenistan also has no particular interest, especially because Turkmen gas is sent primarily to China. The quantities are enormous. China has no interest in Turkmenistan continuing to sell to Europe, and the country cannot object to Beijing's position, also taking into account its complex economic situation.

What is the current situation of gas supplies from Russia to China? And from Central Asia to China?

Relations between China and Central Asia are excellent. China is a great purchaser of Central Asian gas. It is a situation that plays against Russia's interests in negotiations with Beijing. In May 2014, we signed an agreement with China for the construction of the “Sila Sibiri,” also known as the “Power of Siberia”: the Yakutia-Khabarovsk-Vladivostok gas pipeline, which is in the construction phase in eastern

Siberia, to transport the gas from Yakutia to China and countries in the Far East. There are a number of technical difficulties, for example in the separation of methane from helium, but the project is in fact proceeding. In terms of infrastructure, based on the plan LNG will be separated from methane and a large plant will be built to process gas in the Russian region of Amur. The contract envisages that deliveries will begin between 2016 and 2021. There are four years to complete the project and there is no reason to panic. In Yakutia, the infrastructure has already been operating for one year now. At the same time, we have the construction of a second pipeline, the “Zapad” (West), in the design phase. It will pass through the Altai Mountains, a series of mountains in Asia that spread through China, Mongolia, Russia and Kazakhstan. In this case, problems have arisen, as gas from Central Asia already arrives to Western China, and Beijing will have the upper hand in price negotiations. This is why negotiations continue, but they are decidedly complicated. Gazprom has not pushed particularly, but China has moved forward with its line in view of a favorable price. It has done this even more so because for the transit of these supplies, it would be necessary to approach China's eastern border, and the question arises of who will pay for transport costs. Western China does not need this gas as much as Europe. Therefore, Russia would like to increase the volume of gas deliveries to China through the “Sila Sibiri,” based on the certainty that Beijing will need more. This can be expected not only due to trends in the Chinese economy, but also because of the environmental issue. China has signed the Paris COP21 agreement for a constant reduction in carbon dioxide emissions. This means that it will decrease its use of certain resources, such as coal, in favor of gas. And we are counting on the fact that they will need more. However, it is difficult to negotiate with China—it can already count on gas from Turkmenistan and it uses this as a bargaining chip to pressure Russia.

RUSSIA'S NATURAL GAS EXPORTS BY DESTINATION



Middle East/Natural gas demand grows while domestic supply is insufficient

A region in transition

Attracted by the low cost of LNG, many Middle Eastern countries, previously exporters, have increased their natural gas imports, intended mainly for the energy industry. Meanwhile, Saudi Arabia and Iran are increasing their production and seeking new end markets



**BASSAM FATTOUH
AND RICHARD MALLINSON**

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Natural gas has long been in the shadow of oil in the Middle East, but it still has an important role in the energy mix, particularly for the power, desalination and petrochemical sectors. Many governments across the region are keen to increase the role of gas amid rising energy demand. Improvement in living standards, demographic changes and low renewable adoption all point towards strong electricity demand growth and hence gas strong gas demand growth for the next decade. Power plants are also competing with the petrochemical sector for limited gas supplies. As regional gas demand continues to outpace supply growth, the Middle East is increasingly turning to LNG imports, in a shift from its previous role as an exporter.

The last holdout for liquid-fired power

One of the main drivers behind increasing domestic gas consumption is a growing concern about the amount of liquids being consumed to generate electricity. The Middle East is one of the few places where liquid-fired plants still provide a substantial share of overall power generation. Middle Eastern producers have traditionally provided domestic crude and oil products at cheap prices, including for the power sector, which has encouraged rapid consumption growth and created little incentive to explore alternatives such as renewable generation. Reducing this consumption, so oil exports can be maximized, has been a policy goal in countries such as Kuwait and Saudi Arabia for several years. The regional power sector consumes a mixture of crude and oil products and the demand profile is highly seasonal, with power demand for air-cooling peaking during the summer. The role of liquids in the power sector varies by country, from around over 60 percent in Kuwait and 57 percent in Saudi Arabia, to zero in Qatar and Oman. According to JODI data, Middle East direct crude burn averaged 0.77 mb/d across 2015, with peak demand of 1.20 mb/d in July. Saudi Arabia accounts for almost three-quarters of the total regional crude burn, but the fastest growth over that period came from Iraq, which faces huge power supply issues that result in frequent blackouts. Rapid growth in electricity demand has been one of the drivers of this liquids consumption. Regional power demand has grown by around 6 percent each year on average over the last decade—while political instability has weighed in certain countries, demand in many of the larger markets has grown more rapidly, with Saudi demand growth averaging around 8 percent per year. Notwithstanding the lower electricity demand growth this

BLUE VS. BLACK. Overshadowed in the past by the predominance of oil, gas is gradually regaining, in Middle Eastern countries, a prevalence that will change the energy scenario of the entire area.

year brought on by slower economic growth and reductions in subsidies on electricity prices in some countries, the pace of power demand growth is expected to pick up again once oil prices rise and economic activity rebounds. Growth will be supported by underlying demographic trends and various countries adding new generating capacity. Great adoption of renewables has the potential to dampen growth in thermal power generation, but with the exception of the UAE, where several high profile solar projects are located, Middle Eastern government ambitions remain modest. Renewables may start to make larger inroads towards 2030 and beyond, but for the next decade most of the incremental power demand is to be met by burning fossil fuels.

The advance of gas in Iran and Saudi Arabia

Recently, several countries have broken the trend of steadily rising power sector liquids consumption, but it is a very varied picture across the region. Leading the pack are Saudi Arabia and Iran, with recent increases in gas production in both countries displacing significant amounts of oil-fired power generation. In the Kingdom, the 2.5 bcf/d Wasit gas plant was commissioned in Q1 16 to process gas from the 1.3 bcf/d Hasbah and 1.2 bcf/d Arabiyah fields. A significant share of Wasit output is going into the power sector, with the result that direct crude burn was lower y/y by 0.17 mb/d on average across June and July 2016—although power demand has declined this year, due to the removal of electricity subsidies in late 2015 and the weak state of the economy, which will be exaggerating the effect. However, examining the Saudi power projects due to start-up between now and 2019 suggests this will not be a durable reduction. A number of gas-fired power stations are due online in 2017, but 7.3 GW of crude-fired and fuel-oil fired plants also start-up in 2017 and 2018.

Iranian gas production has also risen rapidly since the start of last year as more phases of the South Pars field are brought online. Over the last Persian calendar year (21 March 2015 – 19 March 2016), power sector consumption of diesel and fuel oil both fell by over 30 percent. But not all Middle Eastern countries are making the same kind of gains in displacing liquid fuel. Iraqi crude burn, for example, has stepped up markedly since 2014, averaging a record 0.17 mb/d in 2015, and on track to remain at similar levels this year. This comes despite the Basra Gas Company nearly doubling the amount of gas it captures from southern oil fields since 2014. Meanwhile, in Egypt, gas production has been gradually de-

clining from a high point of 6 bcf/d in 2009, falling below 3.9 bcf/d in Q2 16. Against this backdrop, rapidly rising power demand has caused Egypt to switch from being an LNG exporter to an importer, and to use more diesel and fuel oil.

A constant rise in demand since 2000

Overall, the Middle East consumed 2.5 times more gas in 2015 than it did in 2000—150 percent demand growth—compared to global demand growth of 44 percent over the same period according to the BP Statistical Review 2016. Iranian demand has tripled to 18.5 bcf/d in 2015, the highest in the region, as gas is heavily used in the power, petrochemical, and transport sectors. Low domestic prices have encouraged this rapid growth, with Iranian per capita gas consumption the highest in the world, with price reform a politically sensitive topic. Elsewhere, Saudi demand passed 10 bcf/d for the first time last year, rising to 10.3 bcf/d, while Qatari consumption has risen fourfold since 2000, to 4.4 bcf/d, despite its small population. Across the region, there is scope for demand to continue rising fast in the coming years. Part of this growth has also been driven by the expansion of the petrochemical sector in the region as various countries are investing heavily in crackers and other facilities as a way to extend their involvement down the value chain. Meeting all of the demand growth from different sectors will prove challenging, even though there have been several recent positive developments in the gas upstream story across the region. In 2015 for instance, demand grew y/y by 5.6 percent according to the BP Statistical Review, while production rose by only 2.4 percent.

As a whole, the region still produced 12.1 bcf/d more gas than it consumed, but this masks an uneven picture—Qatar alone produced 17.6 bcf/d, but this is mostly exported to buyers outside the region, which means the rest of the region actually had a net shortfall of 1.1 bcf/d of natural gas last year. While Saudi and Iranian gas production is growing, perhaps the most striking example of domestic production failing to keep pace with demand growth is in Egypt, where gas production has been in decline since 2009. This trend looked set to continue until the discovery of the giant 25 tcf Zohr gas field in August 2015. The operator, Eni, and the government hope production from the \$16 billion field will begin as soon as end-2017, although the full capacity will not be reached before 2019. While Zohr is central to a reversal of fortunes for Egypt's upstream, the government has also persuaded in-

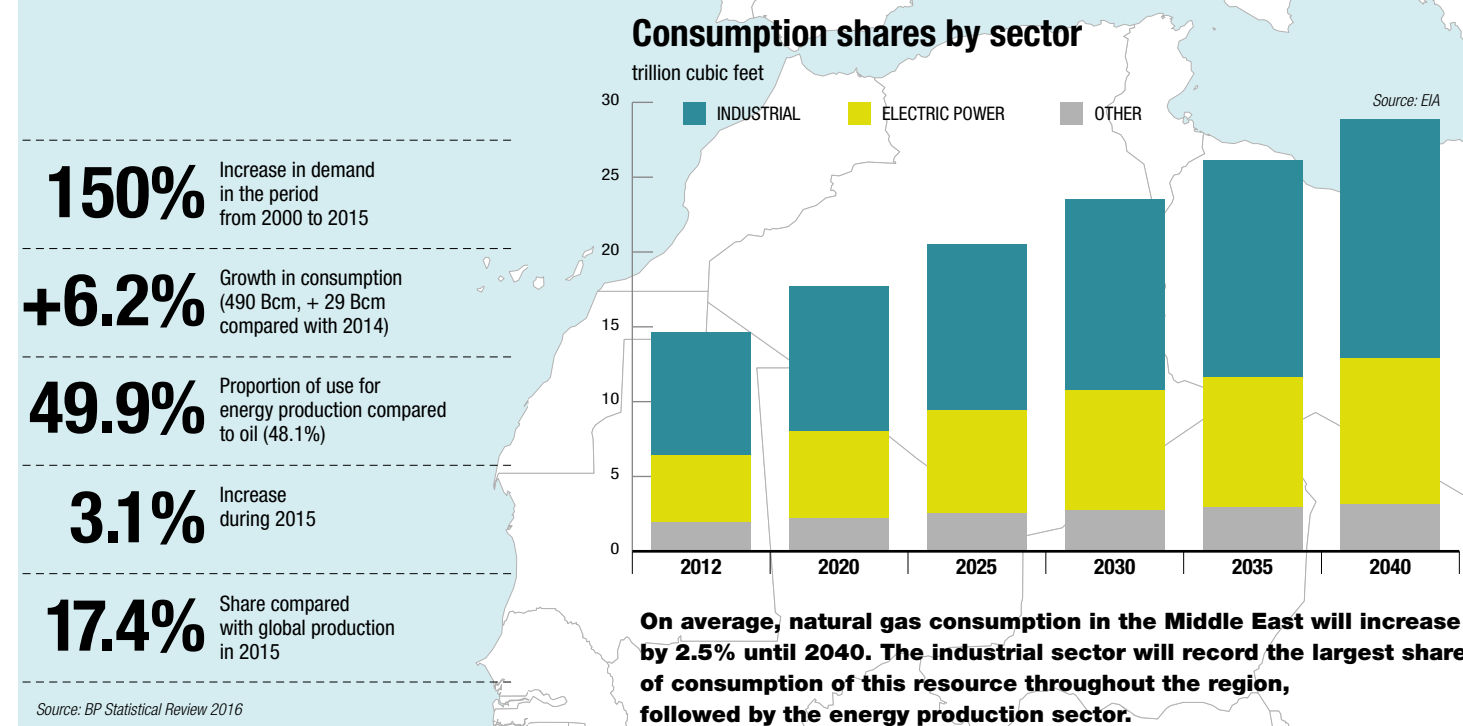
ternational operators to resume work on several stalled projects by reducing payment arrears—although they remain substantial at around \$4.5 billion—and improving the contract prices for gas. BP's West Nile Delta (WND) project is also scheduled to start in late 2017 and reach 1.3 bcf/d capacity in 2019. These two massive projects, along with several other additions, should be enough to offset output declines and return Egyptian gas production to growth by the end of the decade. But all new projects are contractually required to direct output towards the expanding domestic market first, so Egyptian production will still be locked in a race against rising domestic demand and during the period up to 2019 a substantial domestic supply deficit will persist, which has left Egypt importing significant volumes of LNG. Egypt hopes the turnaround in its upstream fortunes will eventually allow it to resume its role as a net exporter, although many remain unconvinced.

New key players enter the LNG market

In southern Iraq, after some further gains in gas capture by year-end, there is little prospect of gas production increasing in the next few years. Kuwait has also struggled to achieve any growth in gas output, despite rising demand, due to unattractive terms and the complex geology of new gas discoveries. The Kuwaiti government is optimistic that the Jurassic gas project will add 1.2 bcf/d of supplies, but this is unlikely to materialise before 2022. Kuwaiti gas demand continues to rise to meet power generation and desalination needs, forcing the country to import LNG via an FSRU and plans to build a permanent import terminal. If domestic supplies disappoint, this will increase the gas deficit that needs to be met by imports. Qatari production grew recently despite the government announcing a moratorium on further development of the North Field in 2005 that remains in force, as production was increased at other fields. However, Qatar's LNG exports have remained in a narrow 76-78 Mtpy range since 2011 and will struggle to maintain this market share in the face of rising U.S. and Australian exports. Production will receive a boost from the start-up of the 2 bcf/d Barzan project in November, with the output ear-marked for domestic power generation and desalination. Work is also underway to develop the Khuff reservoir in Block 4N, with the hope it could provide feedstock for the petrochemicals sector, but initial results have not been promising. So after Barzan ramps up, the Qatari production is expected to stabilise for the rest of the decade. There is a similar

Out of the shadow

The natural gas advance in the Middle East



situation in Oman, where the 1 bcf/d of gas expected from Phase 1 of BP's Khazzan project, which is due to start production in late 2017, will be allocated to the domestic market rather than to boost LNG exports. Oman has large untapped gas reserves but these consist mostly of tight gas, which is costly and technically challenging to produce and requires massive investment. Indeed, Omani LNG exports are declining, and the country is having to import more gas from Qatar via the Dolphin pipeline to prevent domestic demand from taking a larger bite out of exports. The UAE is also finding itself having to import increasing volumes of gas to cope with rising domestic demand and falling production without breaching contractual commitments for LNG exports.

A change in the region's position

The combined effects of rapid demand growth and the patchy domestic supply picture have started to significantly alter the role of the Middle East in the global LNG market in recent years. The region has shifted from almost exclusively exporting LNG to becoming a growing demand centre. In 2011, only Kuwait and the UAE (Dubai) imported a combined 2.4 Mt, while the region exported 102 Mt in 2011. By last year, imports into the region had almost tripled, to 9.8 Mt, while exports had fallen sharply while other sources of supply flour-

ished, most notably from Australia. Both of these trends look set to continue in the coming years.

The more recent growth in LNG imports is down due to both existing importers ramping up volumes and new buyers Jordan and Egypt entering the LNG market. After exports from Egypt were halted by frequent attacks on the Arab Gas pipeline, Jordan began importing LNG via the Golar Eskimo FSRU in May 2015. In 2012, the Egyptian government launched a project to install a floating LNG import terminal. But confusion over the terms and which state agency was responsible led to the cancellation of several tenders. Eventually, Hoegh LNG of Norway was awarded the contract for the first FSRU. LNG shipments began arriving in Ain Sukhna in April 2015. Egypt also installed a second 0.75 bcf/d FSRU in Ain Sukhna in September 2015. The established importers, Kuwait and UAE, have not been standing still either. Kuwaiti gas demand has been growing while Dubai imports are on the rise and Abu Dhabi has installed a new FSRU in August 2016 to meet a domestic deficit while maintaining contracted LNG export volumes. Other Middle Eastern countries could well start importing LNG in the coming years, attracted by low global LNG prices and as they struggle to meet domestic demand. Bahrain's NOGA has contracted for an FSRU to be delivered by July 2018. Saudi Arabia has previously been unwilling

to consider importing gas given its large domestic reserves, but comments made by the energy minister in June suggest that it is at least open to exploring LNG imports as a way to address the domestic supply deficit. Lebanon has issued several tenders for an FSRU over recent years, but the project appears to be stalled by political issues. Oman is said to be looking at importing LNG via the Sohar terminal to meet rising domestic demand without reducing contracted LNG exports to Asia. While not all of these countries will end up becoming LNG importers, the number of importers looks set to continue growing.

Limited prospects for regional trade and export

Given that the Middle East contains several countries with a gas surplus and a growing number with a supply deficit, greater trade within the region by pipeline would appear at first glance to be an attractive alternative to costly LNG facilities. But several existing and proposed pipelines have fallen foul of political and security issues. Egypt used to export gas to Jordan and Israel via the Arab Gas Pipeline, but flows were halted in early 2012 due to a combination of militant attacks, pricing disputes and declining Egyptian supplies. Qatar's Dolphin pipeline is still operational, supplying around 1.65 bcf/d and 0.25 bcf/d to the UAE and Oman respectively. The route to Abu Dhabi has capacity to handle more gas, but the

price Qatar receives for pipeline volumes is well below current LNG prices, creating little incentive for diverting gas onto the pipeline. Iran also has some limited pipeline trade with its neighbors, primarily imports from Turkmenistan and exports to Turkey. Iranian officials have also stated that exports to Iraq will start this year, although there have been a number of delays and of the two proposed routes—into Basra and Baghdad—the latter looks unlikely to proceed due to security issues. Tehran has ambitions to export gas by pipeline to various other countries in the region, including Kuwait, UAE and Oman, but the long-standing political hostility between Iran and the GCC States will block most of these options. The proposed 1-2 bcf/d pipeline to Oman has a better chance, as Oman is keen to source Iranian gas as feedstock for its LNG export plant, but even this project faces challenges. Iran is also looking at more ambitious projects to export gas to Europe by pipeline or in the form LNG, but given the outlook for global gas prices and the fact that Iran will struggle to develop sufficient gas supplies to allow significant exports.

A horizon that continues to evolve

The role of the region in global gas markets is shifting, from almost exclusively exporting LNG to becoming a center for rapid demand growth and LNG imports. The emergence of

the Middle East as a source of substantial LNG demand growth illustrates a key trend: despite the region's massive gas reserves, the slow development of domestic gas assets has left a supply deficit that will not easily be eradicated, even with the recent production growth in Saudi Arabia and Iran, and the improved outlook for Egypt. Regional gas supplies are not managing to keep up with the pace of demand growth from the power and petrochemical sectors. The take-off in LNG demand also underlines the attractiveness of low LNG prices and the flexibility offered by FSRUs in allowing new buyers to gain access to the market relatively quickly, even for a period of just a few years to bridge the gap until domestic supplies come online.



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China/For the Dragon, low-carbon energy remains a priority

Green lanterns

There are too many commercial interests at play between Beijing and Washington for any energy decisions made by the White House to spoil relations between the two countries, despite their distance on environmental matters

LIFAN LI



He is Associate Research Professor at the Shanghai Academy of Social Sciences and Secretary General of the Center for Shanghai Cooperation Organization Studies.

The unexpected President-elect Donald Trump will be sworn in on January 20, 2017. His energy policies are still obscure, and it is unsure the degree to which he will focus on his campaign commitment to achieve U.S. energy independence, whether through increasing the economic impact of fossil fuels, reducing dependence on OPEC or fine-tuning Obama's green energy policy. As a result, conflict may arise between the U.S. and China, depending on whether China pursues a strong confrontation with the United States on the energy issue or avoids confrontation, and achieves a joint Sino-U.S. energy supply and output policy, together confronting the challenges of global warming. In fact, confrontation is one aspect of the development of bilateral relations, whether there is fierce confrontation or eased confrontation, but it is nonetheless an

inevitability with regard to the energy issue for these two countries. The "antagonistic game" related to energy issues will be a process. At the beginning, let us recall Trump's speech on economic policy in Detroit on August 8, 2016, which addressed the five main points of his energy policy reform: first, to save the coal industry; second, to encourage the re-submission of the Keystone XL pipeline application; third, to allow oil and gas development on the outer continental shelf; fourth, to cancel the Paris climate agreement signed by Obama; fifth, to revoke various restrictions on the U.S. energy industry. In the next seven years, the United States will create more than 100 billion U.S. dollars of GDP per-year, through policies that emphasize defense of the coal industry, increase fossil fuel drilling, reduce environmental regulation, abolish the Obama administration's restrictions on the energy industry's right to export U.S. oil, and support hydrofracturing technology to lead the U.S. energy independence.

WHO WINS AND WHO LOSES

The large trade surplus between China and the United States will cause the two countries to start a trade challenge, and who will win and who will lose can not be predicted, but this contradiction between China and the United States will be the main field of confrontation of international trade disputes.

icy, and give priority to the development of traditional fossil fuels, which would mean less money for the development of renewable energy and nuclear energy. Although Donald Trump has talked about building more nuclear power plants, it will be more difficult for nuclear and renewable energy to challenge natural gas in terms of the carbon economy. Trump's New Deal proposes an investment of \$500 billion for infrastructure construction. On the one hand, the United States will increase demand for coal at the same time that it increases demand for steel and electricity in the infrastructure sector; on the other hand, by substantially reducing environmental restrictions on the coal industry, it will thereby encourage the development of coal-fired power plants. Encouraging the use of clean coal will stimulate U.S. coal demand and revive the coal industry. However, Trump's energy policy is expected to be the subject of many complicating factors, which will make it difficult to implement in the short-term. One such factor is the revitalization of the coal industry because since 2008, due to the lower cost of natural gas power generation, coal-fired power generation of U.S. electricity has fallen to less than one-third its earlier level. Prior to the U.S. shale gas boom, the United States depended on coal-fired power generation for more than 50 percent of its production, and natural gas power generation accounted for less than 20 percent. By 2017, EIA predicted that coal-fired power generation and gas accounted for 31 percent and 33 percent. Thus, the decline in U.S. coal consumption is highly correlated with the U.S. shale gas revolution. In the current global economy which is the source of the current situation, Trump's policy can at best prevent the sharp decline in the coal industry, rather than revive it, which is very difficult.

The process of developing renewables cannot stop

Trump has always had a contemptuous attitude toward clean energy. In his view, the return cycle of investing in the PV industry is too long and the benefits are too low, with solar panels requiring a 32-year return on investment, and wind power generation, although more economical, undermining coastline ecology and landscape. Trump has said that he believes that global climate change is a conspiracy theory promoted by developing countries. Because of this, the U.S. renewable energy companies and electric car companies face a serious sell-off in the stock market. However, the election and the ruling government are two different things. For example, the Bush 43 adminis-

Eagle vs. Dragon

409.648

CHINESE EXPORT TO U.S.

484.371

U.S. IMPORT FROM CHINA

A LONG-TERM ECONOMIC CHALLENGE

Between Washington and Beijing the trade competition is open. According to both countries, America's trade deficit with China is large and growing. Where the two sides differ is on how big the deficit is and how fast it has grown. From the U.S. perspective, its bilateral trade deficit with China more than quadrupled in value over the last 14 years, from just over \$83 billion in 2001 to over \$367 billion in 2015. However, from the Chinese view, its bilateral trade surplus with the U.S. increased nine-fold, from about \$28 billion in 2001 to more than \$237 billion in 2015.

(billion U.S. dollars)

EXPORT
IMPORT
CHINA
U.S.

148.736

CHINESE IMPORT FROM U.S.

116.817

U.S. EXPORT TO CHINA

TRADE BALANCE

+260.912

Source: World Trade Statistical Review 2016

ALMOST A QUARTER OF THE GLOBAL MARKET

China and the United States remain the world's two commercial superpowers. In 2015, China was the world's first exporting country, for a total value of \$2.27 trillion and a 14 percent share, followed by the United States (\$1,500 billion, 9 percent). The

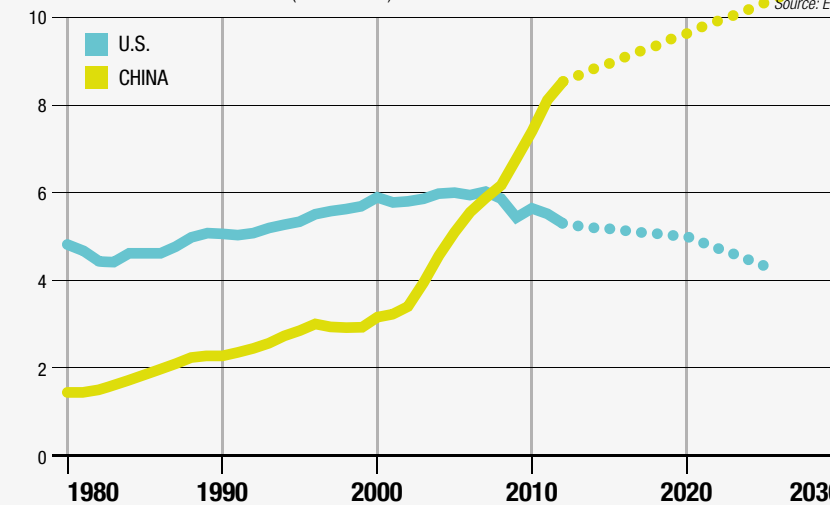
United States, by contrast, has surpassed China in terms of imports, making it the first country in the world, with a total value of 2,310 billion dollars, representing a market share of 14 percent of the world total, followed by China (1,680 billion dollars, 10 percent of the world total).

UNITED AGAINST CO₂ EMISSIONS

Both China and the U.S. have begun to realize the long-term economic benefits and strategic advantages of addressing the environmental crisis. In November 2014, the two countries issued a Joint Statement on Climate Change that would have been unthinkable in the past. China agreed to cap its gas emissions by 2030 or earlier if possible and to increase its use of zero-emission resources to 20%. The U.S. agreed to cut its emissions by 26 to 28% by 2025 compared to its 2005 level.

CO₂ emissions

(billion tonnes)

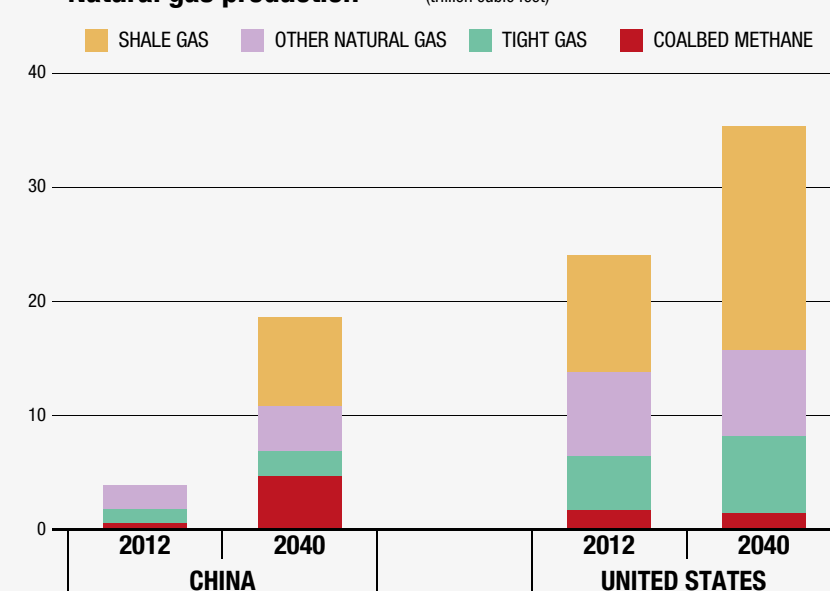


INCREASINGLY SHALE

Both China and the United States have planned for the future development of gas production. By 2040, the two economic superpowers intend to multiply the production levels of this resource by emphasizing the extraction of shale gas, which for the United States represent the largest part comparing the rest of the sources.

Natural gas production

(trillion cubic feet)



tration promoted an oil-friendly policy, but oil production declined during Bush's eight year term; shale gas development should be attributed to George W. Bush, but the shale revolution occurred during Obama's term. So, if Trump's new government decides to reduce subsidies for new energy, it may not be so bad. The short-term will be bad for new energy, but in the long term, lower subsidies will stimulate wind power while photovoltaic and other technological progress will reduce their costs. Whether abolishing NAFTA or committing to the approval of the Keystone XL Pipeline, whether abolishing the Iranian nuclear deal or stopping government spending on renewable energy, all of these would increase oil dependency, which would undoubtedly push up oil prices. In recent years, with the benefit of low oil prices, China has vigorously developed its own industrial economy, and clearly China will follow the commitments of the Paris Agreement, and the main plan on energy will not change as Trump wishes.

China's countermeasures: phenomena and fantasies

But the large trade surplus between China and the United States will cause the two countries to start a trade war, and who will win and who will lose can not be predicted. But this contradiction between China and the United States will be the main battlefield of international trade disputes. The Great Power relations between China and the United States, which the U.S. will ultimately reject, will not cause the two countries to immediately enter a smoke-filled trade war. On December 11, 2016, China's accession to the WTO after the 15-year period of protection will have passed. China will achieve market economy status and be in a position to make concessions, such as opening up the retail market. This is also the chance for U.S. new-energy companies to enter the Chinese market, shifting their emphasis from the U.S. market. As is well known, the Republican bigwigs are heavily invested in China's energy market, which will soon enter the earnings period, so the two sides will try to avoid the "confrontational game." Opening up professional services in China for the U.S. and reducing China's trade surplus will have a positive effect. China's market demand will attract U.S. energy companies to export oil and natural gas, and this highly energy-dependent model will hinder trade fights from both sides. If the United States tries to re-launch a confrontation with Iran and other energy powers, this would strengthen the triad of China, Iran, India and Russia to create a large Eurasian energy consortium that

might be called "CIIR + OPEC," pushing a new confrontation with the United States in the traditional energy industry. If Trump is unwilling to see this, at least he will want to win over Russia against China. China should be well prepared, considering the possibility of an overall confrontation between the United States and China. In the energy industry, China should propose a "natural gas RMB (renminbi)" concept as opposed to "oil dollars." "Natural Gas RMB" promotes the use of natural gas trading in the RMB as the settlement currency, thus promoting the RMB as the natural gas trader with pricing power. As the consumption commodities in future world energy, "natural gas RMB" may lead the RMB internationalization as the important, regular carriers of commodities, for the development of OBOR, the internationalization of the RMB, will slow down oil dollars, and undoubtedly will be a new start for the major gas-importing countries, one which encourages China, Russia, Venezuela, Saudi Arabia and other countries to use the RMB settlement. China should make full use of the Shanghai Futures Exchange Trading Center to promote natural gas futures trading, with a issuance of natural gas bonds, and then using a variety of financial instruments to promote natural gas trading using RMB settlement in the international financial center. If China reaches a large enough proportion of energy consumption worldwide, natural gas RMB will normally challenge the Oil dollar in the financial market which will result in confrontation. That will really be an energy trade war, "China vs the United States." From energy war to financial trade war, and finally to full confrontation of course, Trump is not willing to face up to this development.



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\$2,310 billion
\$2.27 trillion

Climate/Innovation and development in the wake of the Paris agreement and COP22

A matter of opportunity

We need to be convinced that the measures we're taking toward a more sustainable future are not some kind of collective punishment but in fact an economic and cultural incentive providing great entrepreneurial opportunities. This approach might even change the mind of President-elect

ROBERTO DI GIOVANNI PAOLO



A journalist, he has written for, among others, ANSA, *Avvenire* and *Famiglia Cristiana*. He was Secretary General of the Italian Association for the Council of European Municipalities and Regions, and he is a lecturer at the University of International Studies of Rome.

From Marrakesh, we look to the future. COP22, founded and held on the “roller coaster” of international events that, since last summer, have marked the entire world (the contrasts between Russia and the U.S. on Syria, Laurent Fabius’ complaint of a lack of interest in COP21 in Paris, post-Brexit and Trump’s election) has decided to keep a low profile, without backing down one single bit on the obligations ratified by more than 55 percent of the signatory countries, as required by Paris in December 2015. These obligations will require, between 2017 and 2018, control regulations in various countries and the launching of the \$100 billion fund allocated to countries in the Southern Hemisphere and those in difficulty, for the sustainable development of the economies. Donald Trump has also clearly been very present as a “Dom Juan” to the point that the President of COP22, Morocco’s Foreign Minister Salaheddine Mezouar, addressed him directly, inviting him to use one of his virtues on which even his opponents do not despair: pragmatism. That same pragmatism was used by Obama after the summer in which Fabius had expressed his concerns about the ratification of Paris 2015 in *Le Monde*. Therefore, the U.S. and China were the first two countries to sign what was in fact Barack Obama’s final international diplomatic political act: the two great states had decided to be first to sign the ratification and were followed over the coming days and weeks by other major countries, eventually reaching

and then exceeding 55 percent of the countries under consideration, thus bringing into force the Treaty and guaranteeing the start of the actual activities of COP21. The European States, which in the past were normally first in line on these matters, decided to offer a “common view” and sign, following the European Commission’s decision at the end of September to advise all Member States to sign the Paris Treaties. By mid-October, a 55 percent threshold was exceeded, therefore establishing the Marrakesh summit as a joyous ratification of the process that had been launched after the formal meeting of September 21 held at the United Nations.

How does Donald Trump’s election change things?

The election of Donald Trump creates uncertainty for near-term activities. We should consider the electoral campaign statement made by the U.S. President-elect regarding “the need to rewrite agreements and defend the country’s domestic coal industry.” It is unthinkable that a summit of countries prepared over years, one that has decided to take action related to present and future industrial plans for countries, to make substantial funds available for developing (or underdeveloped) countries, and to hold U.N. summits for joint control over activities in order to achieve the specific goals of the Paris summit can now be easily cancelled. Can it be undone by Donald J. Trump, the most divisive U.S.

President of the last 40 years? However, beyond President-elect Trump and the official and future positions of the United States, it is important to understand whether the policies of other countries that have joined are changing. What degree of impact is this having on the private industrial sector and, especially, on all sectors dealing with energy and environmental sustainability? So here are the facts: by reaching at least 55 percent of ratifications of the countries that signed the Paris commitments, the treaty has been in force and operational in all its points since November 4, 2016. The main objective of the treaty is to reduce the uncontrolled rise in the Earth’s temperature, to keep that rise in global warming below 2°, and to reach a maximum increase of 1.5° by 2030. To this end, certain specific points

have been identified through which to measure the new national/international policies of various countries: energy efficiency, sustainable mobility, new food and agricultural methods, stopping the expanded use of land, industrial reconversion, and the development of new manufacturing sectors.

These actions mainly affect each individual country’s industrial policy choices and the resultant choices of individual companies and the use of energy for production, and may constitute a strong disincentive to national policies and national budgets that favor coal and oil: the “good old” fossil fuels. In theory, divestment from these sectors should lead users to renewable energies. This strategy has already spread in the global debate for several years since the Kyoto agreements, but now, after Paris,

this approach has become imperative because of the way the future use of energy is envisaged.

The real challenges to be faced in the near future

Climate and global warming are the root issues for consideration of future strategy. These two major challenges have a cascade effect that needs to be addressed: consideration must be given to the heavy urbanization that is generating car-centered cities on every continent, with the accompanying streets and roads, residential facilities and, above all, infrastructure. These are the issues raised by U.N. Habitat (the United Nations Human Settlements Program) for several years and by associations of local authorities such as the UCLG (United Cities and Local Governments) network that just a few years

ago unified the French and Anglo-Saxon sides of two global associations. The topic is not exclusively climate, but also about services to citizens, new building constructions and new infrastructure. Cash must be found to invest in cities and allow their redesign, and to invest not only in the industrial sectors, which must design new mobility tools, but also the infrastructure to receive them. At the level of global studies, the U.N. Commission, which within U.N. Habitat deals with climate and economy, has calculated that the U.S. with its “urban sprawl,” the expanse of roads, services and infrastructure surrounding U.S., urban boundaries with a specific focus on the car, costs Trump’s country approximately one billion dollars per year. Hundreds of millions of hours are lost in traffic congestion, both a human

problem and an economic problem seen in an estimated 10 percent lost annual income and a substantial loss related to pollution itself. Fortunately for Trump and his compatriots, as almost always in its history, the U.S. is also a producer of antidotes. The President-elect would do well to visit George Washington and Vanderbilt Universities, where he would learn that there are car concepts waiting to be produced that not only reduce the amount of atmospheric carbon dioxide but can even reuse it to recharge car batteries and electronic devices, thus going from “Carbon neutral” to “Carbon negative.” Moreover, even in the rest of the four- and two-wheeled world, one can see activity that features hybrids and new mixed technology as an investment in the future, not just a “trend.”



Rethink power supply methods and decarbonization

The second point is to reconsider the capacities and methods for global power supply, the use of agriculture and the organization and protection of the environment. In 2050, there will be over 9 billion people, with a resultant need to increase food production by almost 60 percent compared with today. However, this increase should occur while we are also dedicated to halving carbon emissions in agriculture, stopping the expansion of deforestation and exploitation of free and/or forest land, and instituting policies that result in less food waste and better use of food chains. The third major point concerns energy systems and decarbonization, a central issue and often the only matter dealt with, due to its symbolic force. Concern is not limited to changing the type of energy used, which we know would be a paradigm shift compared to the previous century, but also and especially the role that energy plays in all manufacturing industries. For now, only the replacement of oil-powered vehicles with electric vehicles can be dealt with, but every legislator, entrepreneur and informed green activist knows that we are talking about how to guarantee energy to the industrial manufacturing sectors, and also especially to manufacturing sectors of advanced innovative service industries and to citizen services. The risk is in the contradiction that exists when we have electric vehicles and reusable electronic devices manufactured from non-renewable fossil fuel-based energy.

After all, we are talking about an economy that, over a century, has experienced an almost 20-fold increase in GDP and which now, with an average growth of 4 percent, would in any case result at the end of the century in an almost 1,000-fold increase between a 21st century salary and one from 1900. With such growth, it seems difficult to convince someone that it is worthwhile to change the system. This is especially the case if, like Trump, they are convinced that the global warming described by scientists is a "hoax." So the real challenge arising from COP21 in Paris, its Agreements and all COPs that will follow is to convince decision makers that future construction is not voluntarily reductive with respect to economic development, but a boost to new forms of development of the future economy. We have lived and live in an economy based on a beginning and an end and a slogan that can be summed up as follows: extract/take, make/produce, remove/discard. If ideology were not prohibited we would say that it's the crucial transi-



Marrakesh's conclusions

Marrakesh was the first major meeting on climate change after the historic agreement in Paris. Held at the same time as the American elections, COP22 closed with the hope that the new American President, Donald Trump, would not waste the paper on which the U.S. made its commitment against climate change a year ago. The summit ended with a declaration of support for the Paris agreement and with the approval of a document that marks the first steps toward drafting the

regulations called for in the Paris agreement—to be concluded in 2018, two years before the agreement was to start functioning. The other delicate "node" was finance. The most developed (and most polluting) countries had pledged in Copenhagen in 2009 to pay \$100 billion by 2020 to help developing countries cope with the new rules. This sum, though, is far from enough. In Marrakesh, the rich countries pledged to increase gradually this amount after 2020.

tion between classic capitalism and consumer capitalism. The choices of Kyoto and Paris introduce a different paradigm that will be implemented in relation to industrial policies and government policy choices, implementation that will not come from dangerous anarchists but from foreign ministers who have signed ratifications with a parliamentary vote. This is the paradigm of a circular economy in which the production and consumption of goods are relevant due to their production with reuse or use. Can anyone still doubt that it is not just a matter of moralism but also and above all of economy when an entire sector of use and reuse, recycling and waste storage, is flourishing? So much so that even the national and international underworld is investing huge financial resources in the sector. Or can there be doubt even when scientific research is in constant activity anticipating in and from the laboratories "killer applications" in terms of chemical materials and equivalents? Moreover, this new approach will take hold when government incentives increase, but above all when the market prepares itself with financial and stock exchange instruments, so as to

ensure substantial investments in innovation, biotechnology, materials, and energy efficient and renewable structures.

The sustainability of new choices on the market

It is important to foresee when, both in terms of image and perception and from an economic point of view, all the 100 years of work involving the exploitation of fossil fuels and oil will be sustainable. We need to take into account current need but also realize that the entire sector that deals with energy efficiency and effectiveness has been the one with the greatest economic development and one that has produced businesses, especially innovative businesses. On these issues, Europe, more so than other countries and/or macro-regions, has been shown to believe and invest the most. This does not only involve growing good practices on a virtual level, but also connecting these practices with the business world. According to studies described at the Paris summit, the global chain of acceleration of the "circular" economy can be estimated at around \$1 trillion (\$1,000 billion) more per year, starting from 2025.

Considering the commitment made by northern-hemisphere countries to guarantee \$100 billion to southern-hemisphere countries for their re-conversion or to repair procurement damages by 2020, this is no small feat. Now, net of what Trump will do, we must be aware that we are on the crest of action: the rise in global temperature is already at 1 percent and 1.5 percent is just a moment away, with the risk of reaching this in just 5 years, rather than by 2030. There is an entire industry of power plants as well as most industrial plants that need to change and reform their targets, while the air and maritime transport industries, with responsibility for 5 percent of the current increasing global emissions, have not yet applied themselves for change equal to that of other sectors.

However, even more complicated is the "battle of hearts." This means convincing and being convinced that the Paris agreements, in operation after Marrakesh, are not some kind of collective punishment, but an economic and cultural boost. It's good to know that in Europe from 1990 to 2014, while emissions decreased by almost 25 percent, the GDP, despite the economic crisis that began in 2008, did not decrease; in fact it increased by 47 percent. This is a sign that economic and social development do not have only one possible approach and that perhaps even Donald Trump, looking at the figures and business possibilities of the future, could be convinced that the economy, as history teaches us, follows the market and finance, not only when it comes to immediate and real economy but also when a possible future can be glimpsed. The rise and fall of stock tickers for IT innovation between the late 1990s and early 2000s are testimony to this. The financial "bubble" itself, if compared to what later meant the "after," namely the current development of IT companies (such as Apple, Google or Facebook or other social networks sold for millions of dollars) means that innovation, climate and market are not necessarily opposed to development. Provided that it is sustainable.



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portfolio

Shapes of Silence

Time suspended and unusual places, illuminated by color "exploding" in colored smoke. This, on a purely descriptive level, is the scenario of the works proposed in these pages.

No randomness, nor documentary intent, but formal composition and accurate technical construction, almost pictorial abstraction. There are multiple levels of reading: Filippo Minelli's art is of a layered density that does not sacrifice the aesthetic message, nor the conveyance of multiple, multifaceted conceptual meanings that intercept one another. The beauty manifests itself suddenly, in the most diverse contexts, evoked by silence and light. The result is surprising: intangible paintings, such as energy from gas, a central topic in this issue of *Oil*.



Filippo Minelli

(Brescia 1983) is a contemporary artist who works between Barcelona and London, researching issues in architecture, politics and geography, combining them to create installations and performances. In 2013, *Elephant Magazine* (UK) dedicated cover no. 13 entitled "Post-Photography" to the series "Silence/Shapes", in which violence is shown from an introspective dimension, decontextualizing the use of tear gas. In 2015, Opéra de Paris chose the series as an image. Minelli's production has been reviewed by leading international media outlets such as *Le Monde*, *The New York Times*, *Harper's*, *The Huffington Post* and *Al Jazeera*.



1 | Italy, 2015.



2 | California - U.S., 2014.
3 | Italy, 2015.
4 | California - U.S., 2015.
5 | California - U.S., 2015.
6 | Florida - U.S., 2015.
7 | Lanzarote - Spain, 2015.
8 | Florida - U.S., 2015.
9 | Lanzarote - Spain, 2015.





FLAVIO CESAR
CULTRERA MUÑOZ

Papua New Guinea and the challenges of LNG

The decline in oil prices in the global market has led Papua New Guinea (PNG) to revise downward the revenues expected from the construction of its LNG facility. The joint venture partners involved with the project will likewise confront reduced revenue, though the low cost of production means that they can still make a profit, even in an era of low oil prices. Furthermore, PNG LNG is regarded by participants and international experts as one of the most competitive greenfield LNG projects in the world.

Substantial funding but the project is competitive

PNG's LNG plant, designed to produce 6.9 million tons of gas per year, is a vertically integrated development comprised of upstream production systems, processing and treatment facilities, pipelines and a liquefaction plant. At the time of project sanction, the total project cost was estimated at approximately \$18 billion. The project debt was raised by loan commitments of \$14 billion with six Export Credit Agencies (ECAs), 17 commercial banks and other co-financiers. The equity sponsors are affiliates of "ExxonMobil (33.2 percent), Australian-based firms Oil Search Ltd. (29 percent) and Santos Ltd. (13.5 percent) Japan Papua New Guinea Petroleum Co. and Nippon Oil Exploration Ltd. (4.7 percent). The three state-controlled Papua New Guinea firms (totaling 19.6 percent) are Mineral Resources Development Co. Ltd., Petromin PNG Holdings Ltd. and The Independent Public Business Corp. of Papua New Guinea." The project's competitive advantage results from the



fact that the plant produces large amounts of gas (9.2 trillion cubic feet [tcf] 2P) with high heating value, minimal impurities and high quality liquid content, which makes it well suited to the Asian market, whose gas demand is expected to double to 400 million tons per annum (mtpa) from 2015 to 2035 (70 percent of the global demand).

The plant's effects on profitability

The idea for the project derives from the belief that Asian demand for LNG is expected to grow at a high rate, that the price of Asian LNG would remain high and, therefore, so would return on investment, and that production is expected to be able to turn towards possible secondary markets such as Europe. However, world oil prices are lower than ever,

which has in parallel brought oil-indexed gas and LNG contract prices. Papua New Guinea supply contracts entered into with four Asian buyers are linked to swings in oil prices, meaning returns on investment are more susceptible to volatility in the markets than those from exporting facilities in the U.S. However, these contracts are take-or-pay, meaning that the buyers must pay for natural gas supply whether they need it or not.

In the case of the project in PNG, the oil and gas value generated is estimated between \$55 billion and \$123 billion. However, one of the project financiers, Oil Search, has seen its total revenue decrease by 39 percent from \$562.1 million to \$342.9 million in just one year as a consequence of the sharp drop in oil and gas prices. According to Fereidun Fesharaki, chairman of Facts Global Energy, once Iran increases production following the removal of international sanctions, oil prices could fall further to \$25 per barrel. But, Oil Search is optimistic and says that based on its current cost structure it would still generate positive operating cash flow even if oil prices fell to \$20 per barrel.

New options for market expansion

The Port Moresby government calculates its budget on an "implied profit rate of 26 percent in 2015 and 28 percent in 2016." These seemed like healthy profit ratios, but they will disappear with the 30 percent fall in gross revenues due to current oil prices. The effect is that there will be no taxable profits for the LNG project for many years, until oil prices increase, but dividends to shareholders will be less affected as they are paid directly from cash flows. 155 LNG cargoes have already left the plant since production commenced in April of 2014, while production capacity has increased from 6.9 mtpa to 7.6 mtpa. Despite this, the future profitability of the plant remains uncertain. Papua New Guinea will need to review its policy to deal with the declining profitability, while the project financiers look to pursue new expansion options by adding a third gas liquefaction train in order to maximize production from the existing trains and generate a 17 percent increase in annual return (Citi forecasts).

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NICOLÒ
SARTORI

Trump: A revolution within a revolution?

Donald Trump's election as the new President of the United States has surprised and concerned many. His views on energy, during the election campaign have raised fears of a sudden withdrawal by Washington from the international fight against climate change and an aggressive return of American coal to the nation's energy mix. As regards the shale gas sector, the impact of "Hurricane Trump" could encourage a further expansion of the American unconventional industry. More uncertain, but with interesting prospects, is the impact on an international level, where the tycoon's foreign policy choices could reshape some trends in key areas for the production of blue gold.

Full steam ahead!

During his race to the White House, Donald Trump repeatedly declared war on the Paris Agreement and the larger fight against climate change. The future president heavily criticized the multilateral efforts on decarbonization, implying that the U.S. might disengage on an international level (not necessarily making a formal exit from the Agreement, which could take a long time), with an accompanying U-turn on the Clean Power Plan on a national level. Although this may not necessarily lead to a dramatic collapse of renewables in the country, the Trump line would certainly favor a revival of coal but especially a potential acceleration of the natural gas sector. Trump could in fact further open up unconventional exploration and production to meet the

industry's hydrocarbon requirements and, above all, to encourage domestic economic growth. However, Trump's approach could go further, with possible implications at the international level. The President, with the support of the Republican Party, could significantly loosen 'strategic' ties to LNG exports, making American production more appealing on markets not subject to free trade agreements.

The path to change is outlined

On the international energy scene, the advent of Trump could have a limited impact. Despite the key role of the United States (in partnership with China) at COP21, a defection from Washington would not necessarily block a series of global processes that currently seem unstoppable. Beijing, a pivotal player in reaching the Paris Agreement, appears likely to continue its decarbonization process regardless of the decisions made on the other side of the Pacific. Domestic factors—first and foremost the urgent need to protect the environment and health of the Chinese from unsustainable levels of pollution—are forcing the government to proceed rapidly towards a more sustainable energy model. It is therefore difficult to imagine the impressive investments in renewables underway in the country slowing down only due to the United States' less cooperative approach. More generally, the low-carbon

sector might not be significantly affected by the (counter-) revolution introduced by Trump. The gradual improvements in technology, the continuous reduction in generation costs through renewables, and innovation in key sectors such as electricity storage and energy efficiency will continue to drive the global push toward decarbonization, dictating trends that the new American President will find hard to limit, even on an internal level. The most significant effect of the new American course will likely be noticed with reference to the financial cooperation, provided for by Paris Agreement, to promote investments in decarbonization in developing countries. America's contribution of \$100 billion per year required by COP21 for the Green Climate Fund could be curtailed, and, with it, efforts to speed up the transition process in the poorest areas of the world.

What is the future for blue gold?

Although threatened by a revival of coal, which still accounts for 30 percent of global energy consumption, gas will continue to be the transition fuel in the decarbonization process launched in Paris, even in the Trump era. In fact, not only could the domestic policies of the new president somehow strengthen the global gas supply, speeding up the procedures for exporting and expanding possible target markets, but the president's lines in foreign policy could also have an impact on the energy dynamics of certain global players. Benefiting from this could firstly be Russia, which, thanks to a greater understanding

between the White House and the Kremlin, could see the gradual lifting of the international sanctions which—albeit not directly affecting the natural gas sector—have effectively crippled the Russian economy and limited the ability to invest in the energy industry. The development of the Yamal peninsula and eastern Siberia as well as a general increase in LNG capacity could materialize in this context. A chapter yet to be written is that on Iran, since the tycoon's position on the matter, and on the Middle East in general, appears more undefined than ever. The region is in fact intersected by the possible agreement with Russia on the fate of Assad's Syria and the announced strengthening of the fight against ISIS Sunni fanaticism, issues on which the convergence between Washington and Tehran could become significant. A relatively soft approach towards the Islamic Republic, and the non-rejection of the nuclear agreement, could in fact finally open the doors to Western investment in the Iranian energy industry, with a potentially great impact (in the medium term) on the global gas supply.



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DAVIDE
TABARELLI

The American lesson on gas and climate

Barack Obama, the Democratic proponent of the "Yes we can" campaign, leaves his post after eight years to a Republican who built his victory on criticism of broken promises and on a very crude approach towards climate change. In fact, President Obama made a significant contribution to the battle against climate change. His administration enabled the explosion in gas production that replaced coal in power generation, with a consequent fall in CO₂ emissions.

The U.S. is the world leader in terms of per capita CO₂ emissions, at approximately 16 tons per year, against Europe's 6, China's 7 and Africa's 1. What happens in the U.S. is important for two reasons: first, for the amount of emissions involved and, secondly, because it is a market that leads in the adoption of new technologies and policy effectiveness. The extremes tone of the presidential campaign won by Donald Trump on November 8th consolidated the stereotype that a President, with his/her government action, can push the U.S.'s energy and emissions in one way or another. The Republican presidents in favor of fossil fuels and indifferent towards emissions, against the Democrats with their more climate-friendly approach. The reality is very different: the underlying trends only partly depend on what Washington decides, while technological innovation and the entrepreneurial drive toward change work together irrespective of politics. This is confirmed by President Obama's experience—he opposed drilling, and yet obtained his best environmental results

thanks to the oil industry, not the traditional oil industry of the major companies, but that of fracking, controversial due to its environmental effects.

The decline in emissions during Obama's presidency

During Obama's two terms, overall U.S. emissions have declined by 14 percent (over 680 million tons of CO₂ less) to 5.1 billion tons, or 16 percent of the global total. The cut, equal to more than one and a half times Italy's emissions, was achieved mainly due to the explosion of gas consumption in power generation instead of coal (in addition, in order of importance, were the growth of renewables and energy efficiency). In 2016, for the first time in the history of the American electricity industry, electricity production from gas exceeded that from coal—with production from gas at 36 percent, followed by coal at 27 percent, nuclear at 20 percent, renewables at 16 percent, and a remaining 1 percent from oil. U.S. gas production has increased by over a third to 756 billion cubic meters (bcm) per year, a level that ranks it in first place as the main gas producer, ahead of Russia, which, significantly, has more than 3 times as many conventional reserves. The steady increase in supply, achieved mainly by the hydraulic fracturing revolution, has kept gas prices low, under €10 per megawatt hour (MWh), on average half those of Europe

or of the international LNG market. Low prices have translated into value for money for power stations to use gas instead of coal. Electricity production from gas in combined cycles has increased by approximately 550 billion kilowatt-hours (kWh) and has displaced a similar production from coal. One kilowatt-hour produced from gas in combined cycles emits 0.35 kilos of CO₂, while a kilowatt-hour from coal emits 0.85 kilos, a difference of half a kilo which, when multiplied by 550 billion kWh results in a total reduction, thanks to gas, of 275 million tons. Renewable sources, in the same period, grew by 225 billion kWh, an additional volume, entirely emission-free, that went on to replace an equal amount of that produced from coal, with a cut in CO₂ emissions totaling 190 million tons per year. Ultimately, gas has helped to produce more electricity from renewables.

Natural gas is very abundant worldwide

This calculation can also be replicated for other countries and for the rest of the world. Essentially, the slowdown we are seeing in the growth of global emissions is primarily due to the increase in the use of gas in place of coal, which also supports the growth of renewable sources. The U.S.'s problem is that hydraulic fracturing is invasive on the environment and involves critical issues and limitations which, at the individual state level, the new president, however favorably inclined, will be unable to change. The movement of trucks, water consumption, the risk of groundwater contamination and, lately, even micro seismicity, are all problems that will increase in importance and will tend

to limit the increased use of the huge gas reserves available. For the rest of the world, hydraulic fracturing is less feasible for various reasons. However, even without fracking, there is plenty of gas in the world. Even today, all gas consumed outside of the U.S. comes from conventional gas fields that, thanks to investments in new research technologies, have recently been discovered more frequently. The difficulty of this gas, unlike that from American fracking, is that it is not accompanied by a dense network of gas pipelines to transport it, as soon as it is produced, to consumption centers. The lesson from the U.S. is that networks need to be extended, liquefaction and regassification terminals need to be increased, and transport technologies by ships and storage in consumption centers need to be improved, especially in Asia. The fracking revolution, destined to continue, and the discoveries of giant gas fields in new areas confirm that there is plenty of gas. This is excellent news for the environment, since, in the production of electricity, for which demand is growing strongly, it will help to limit CO₂ emissions, supporting the growth of renewables.

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GEMINELLO
ALVI



United States' new mercantilist scenario

The shock and anger at Donald Trump's election has made us forget that during

the nineteenth century, the United States was a stubbornly protectionist nation. However, it was also so during the more delicate years of the twentieth century, when President Franklin Roosevelt aggravated the international economy by removing American from the gold standard and launched a policy of reflation that only managed to generate growth and inflation with the advent of the Second World War. Trump's economic ideas conflict with those of the globalizing era initiated by Bush Senior and brought to triumph by Clinton, but there is no period in American history that has seen such globalizing qualities in abundance.

Mercantilism is the name for customs policies, public infrastructure and rising prices and provides for war as well as foreign exchange. Mercantilism must be considered with liberalism as a recurring phase of the international economy: it was so in the seventeenth century, in the eighteenth century, in the twentieth century after the '30s and at least until the '70s. President Trump's economic policy scenarios, if he stays true to the thrust of his electoral campaign, must therefore be framed within a range of choices that are far more complicated than the fiscal or monetary policy of recent years. Moreover, there will be implications that will, I fear, be a very powerful influence on the price of commodities and energy sources.

A massive policy of infrastructure development, of increases in Chinese import fees of up to 45 percent, and the inflationary effect that follows will subvert the entire



framework of the U.S. economy. Suffice it to say that last year, the U.S. foreign accounts were in deficit with over one hundred nations, and that China's pressure on American workers is generated by imbalances in the U.S. economy and is not separately negotiable.

The failure of the U.S.: living beyond its means

For decades, and more so since the Clinton years, the deficit of U.S. foreign accounts has been fed by the lack of saving in the United States. In other words, Americans are living beyond their means. In the fourth quarter of last year, the total saving of the U.S., including the public sector, amounted to a mere 2.6

percent of gross domestic product, a figure half that of the not so high average of the final three decades of the last century. Chinese blackmail isn't credible, as selling American debt would make its value collapse and would first weaken its holder. Rather more complicated is to increase the savings rate and that choice would imply higher interest rates, and that increase is also required to support a huge growth in infrastructure spending such as that promised by Trump. A weaker exchange rate and the replacement of imported with domestic goods would then imply inflation. The U.S. economy grew at an average annual rate of 3 percent in the decades after 1945, but has not had three consecutive quarters of growth at 3 percent in the last ten years. However, the U.S. economy is much less dependent on foreign trade than the European or Chinese economy and, therefore, better suited to Trump's protectionist and inflationary intentions.

However, in this mercantilist scenario, the entire commodity price scenario would change and diversify.

A future yet to be determined

It is difficult to imagine a general boom like that of the seventies or a collapse like that of the thirties. Price trends, including those related to energy, would instead be the result of negotiations between geopolitical areas that would create scenarios of instability and significant fluctuations before finding a new balance, a process that would have its paradoxes. Regarding Trump's energy policy, he could get along better with the Chinese and Russians than with the Europeans (not to mention global warming). However, only in the coming months will we be able to better understand to what extent the scenario of the U.S.'s inflation, investments and domestic growth promised by Trump will be effective in inducing a certain stability or growth in energy prices. However, as a cautionary final thought, in FDR's time, what drove up the prices of all commodities was the Second World War, and even at the time of the American War of independence, Adam Smith was declared the enemy of the people. In any case, wars are the least predictable variant of a mercantilist scenario.

Geminello Alvi has worked at the Bank for International Settlements in Basle. Previously, he was assistant to Paolo Baffi, has collaborated with Gruppo Espresso [Espresso Group] and with Corriere della Sera, and is currently partnered with Agi.

MARKET DEVELOPMENTS

OPEC: a key player once again

Prepared by Market Scenarios and Long-Term
Strategic Options – Oil (SMOS/OIL) – Eni

OIL PRICES

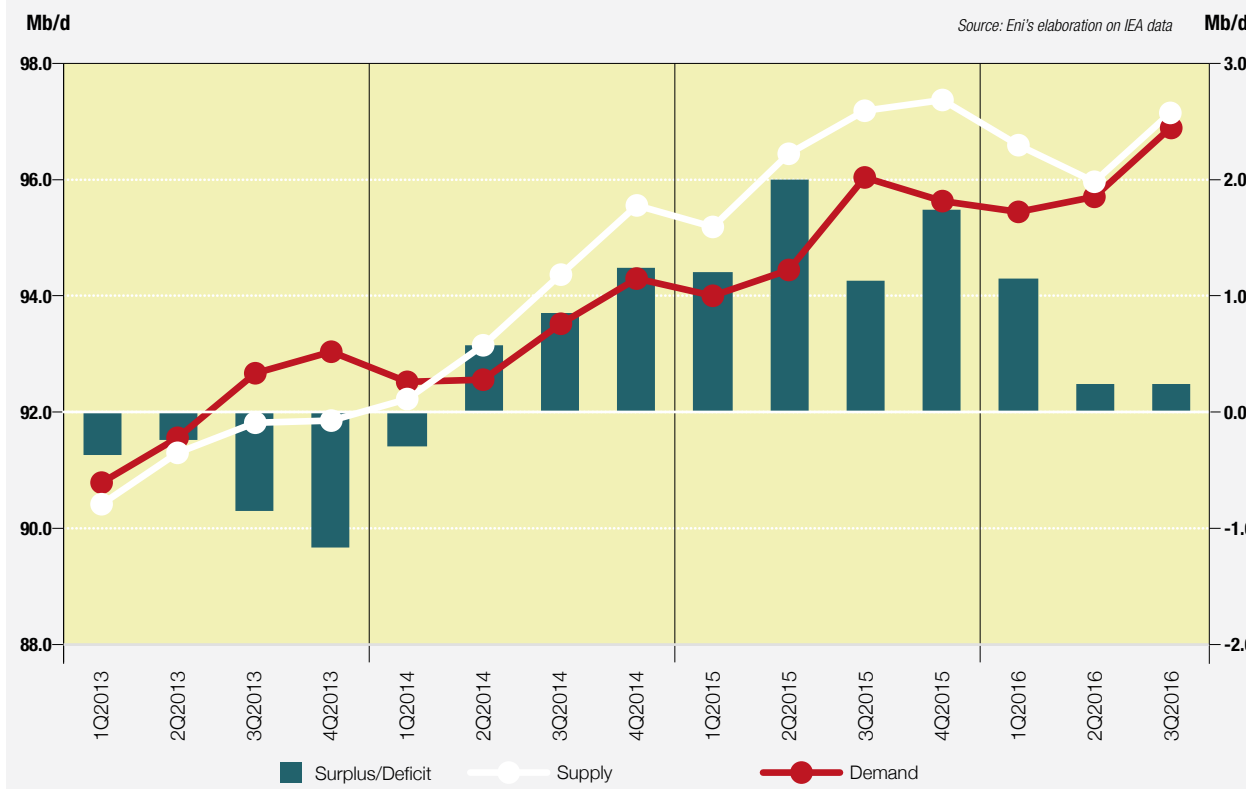
Uncertainty on the outcome of the late-November meeting in Vienna means the markets remain on stand-by

Brent, after its recovery from the lows reached at the beginning of the year, is stabilizing at around levels of approximately \$50/b. The mid-year balance sheet shows a gradual realignment of the supply and demand curves: the surplus of over 1 Mb/d of the first quarter levels out at 0.2 Mb/d after the reabsorption of excess stocks of crude oil taking place in both the U.S. and Europe. However, supporting Brent, above all, is the anticipation of an agreement between OPEC and non-OPEC – primarily Russia – to control production to ensure the rebalancing of fundamentals. This marks an unexpected change of course by OPEC, which for two years has been anchored to a “non-intervention” policy. At the end of September, during the International Energy Forum in Algiers, the announcement of a potential joint OPEC-non-OPEC cut in production, the first since 2008, drove Brent above \$50/b for a few October sessions. The official OPEC meeting on November 30 will establish times and procedures for the cuts. In the meantime, several problems are emerging that are making it difficult to reach an agreement. Among them is the exemption of countries in difficulty, such as post-embargo Iran, Libya and Nigeria, with production still disadvantaged by internal crises, and Iraq, which requires a privileged status due to its economic difficulties, also with regard to the fight against ISIS. At the end of October, the OPEC technical meeting ended with a stalemate and the price declined by approximately \$2/b in a single session. Clearly, decreasing OPEC production from the current 33.8 Mb/d to the target of 32.5-33 Mb/d will be the prevalent task of Saudi Arabia which, over the last year, has increased its production by approximately 0.5 Mb/d, contributing almost entirely to the OPEC increase net of the re-entry of Iran. In the uncertainty of decisions of the late-November meeting, the markets remain on stand-by. The commitment and actual contribution of OPEC and of the major non-OPEC producers will be crucial for the rebalancing of the market which, in the absence of an agreement, is expected to face a third consecutive year of surplus.

BRENT PRICE



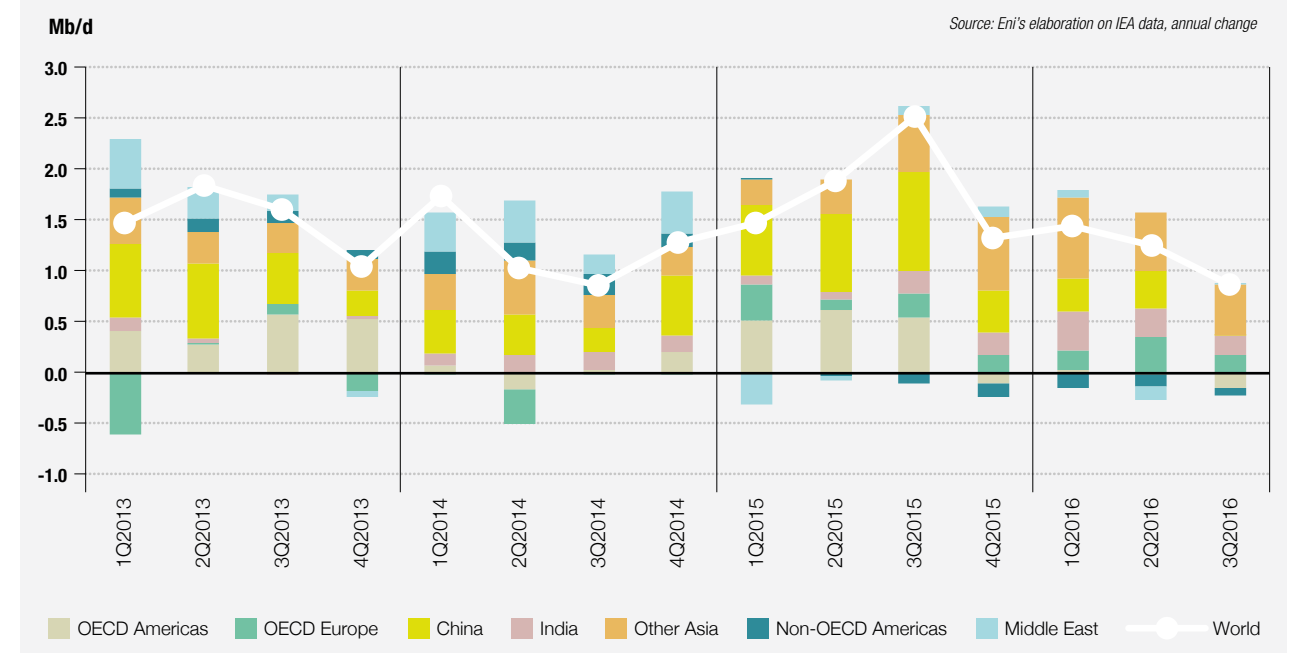
SUPPLY/DEMAND BALANCE



OIL DEMAND

In the third quarter of 2016, global oil demand grew by 0.9 Mb/d, an increase much lower than that of the same period of 2015 (+2.5 Mb/d). The increase in the OECD area is fading and that in non-OECD is slowing down due to the downturn in Chinese and Indian consumption; those countries being the two pillars of demand. Within the OECD, U.S. demand remained stable at 20 Mb/d, driven by gasoline which, thanks to high mileage driven by private individuals, offsets the weakness of diesel, reflecting the current dichotomy in the country's economy, where the industry's weakness is contrasted by private consumption. In Europe, demand grew slightly (+0.2 Mb/d), thanks to diesel and jet kerosene. Diesel benefits from the positive impact of continuously low prices and from the recovery of the Euro, albeit at a moderate pace. Non-OECD consumption halved its increase of last year (+0.8 Mb/d vs +1.7 Mb/d) and signs of weakness emerged in China, Brazil and Saudi Arabia. China's zero growth in 3Q16 was linked, on the one hand, to

ANNUAL DEMAND CHANGE BY SELECTED AREAS



temporary factors such as the forced closure of a few factories prior to G20 in August, and, on the other hand, structural factors related to the country's economic growth model. In terms of products, consumption of gasoline and jet kerosene continues to be robust, while diesel and other products are disadvantaged. Even India, although the growth locomotive is confirmed

(+0.2 Mb/d in India vs +0.0 Mb/d in China), in September, recorded a decline in demand for the first time in 18 months, due to several factors: some structural, such as industry weakness and an increase in final prices; others more circumstantial, such as protests in some provinces and the strong monsoon season. In terms of overall consumption, India remains equal to

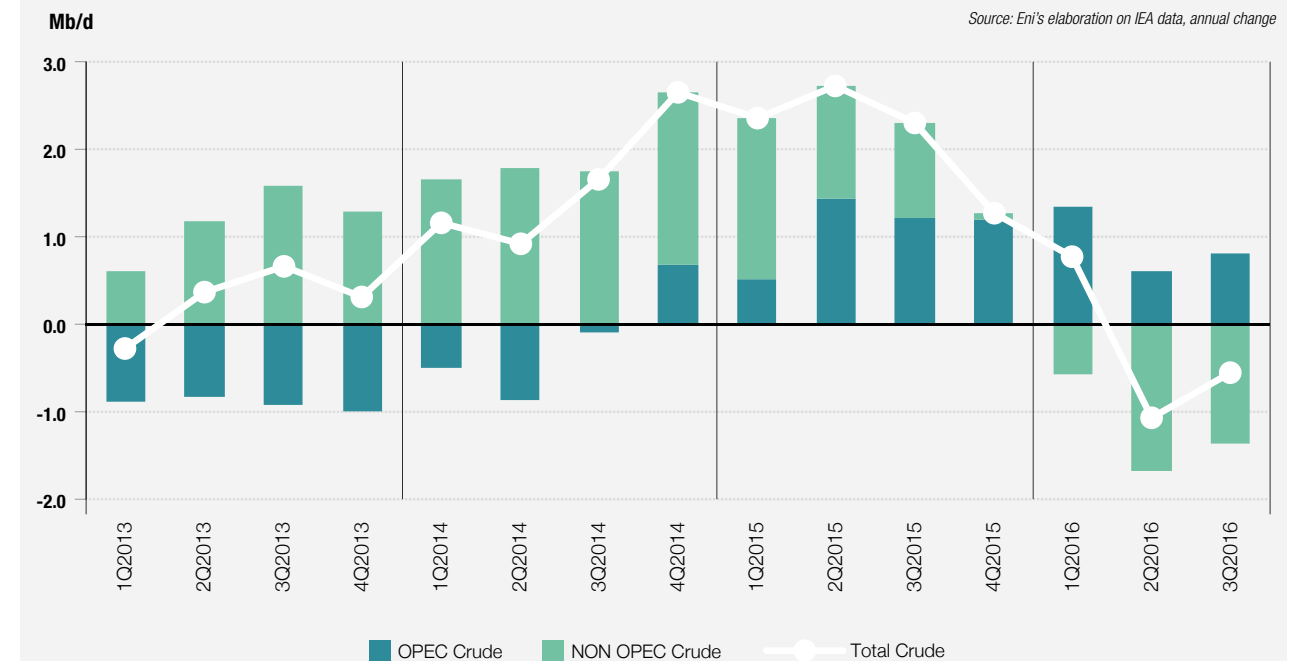
one third of Chinese demand (4 Mb/d vs 12 Mb/d in China). In Brazil, consumption confirms the continued decline in the second half of 2015, due to the economic recession in progress. In Saudi Arabia, demand declined due to the negative impact of the low price of crude oil and due to the significant replacement of oil products with natural gas from the Wasit field.



OIL SUPPLY

In the third quarter of 2016, global oil supply rose to 97.2 Mb/d. OPEC growth continued from the end of 2014, while non-OPEC declined since the beginning of the year. U.S. crude oil production continued to decline (-0.7 Mb/d YoY) along with tight oil which, at the end of October, fell below 4 Mb/d, returning to mid-2014 levels. The other major contributor to the non-OPEC decline was China (-0.4 Mb/d YoY), where capex cuts led to the closure of the most expensive mature oil fields and output fell below 4 Mb/d for the first time since 2010. Countertrending was Russia, which registered record production and, as of September, exceeded 11 Mb/d and Brazil, which started to grow again, especially in the pre-salt basins, where approximately 45% of its output is concentrated. OPEC production continues to increase, supported entirely by the Gulf countries: Saudi Arabia reached a record level of 10.6 Mb/d, but is burdened especially by Iran's recovery, which is returning to pre-embargo levels, and the exceptional

ANNUAL CRUDE SUPPLY CHANGE

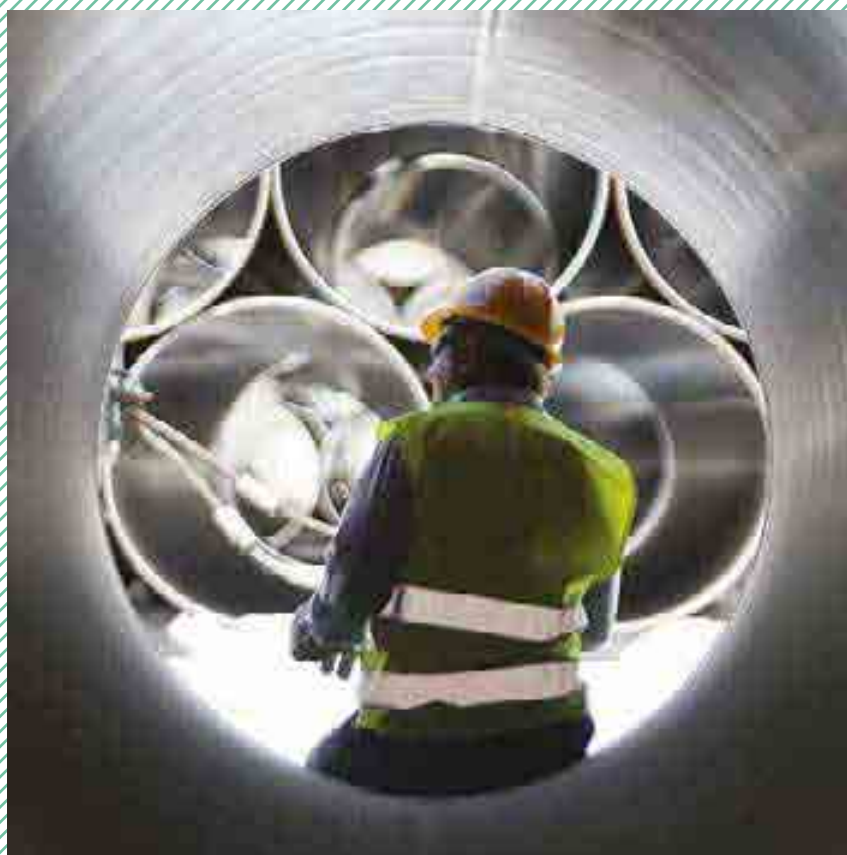


growth of Iraq, which, since the end of 2013, has recorded a long series of increases in both the north and south. However, in other OPEC countries, the situation remains critical: in Nigeria, production remains well below the levels recorded at the beginning of the year, albeit in slight recovery following the truce signed

between the government and rebels; in Venezuela, the severe economic crisis has driven crude oil output to record lows; in Libya, the road still seems long, despite a slow recovery of exports with the recent reopening of some ports. A key element in the coming months will be the implementation of the

OPEC agreement on the limiting of production and the possible participation of the main non-OPEC producers, such as Russia: a decisive step from an oil revenue maximization policy in a context of low prices to a policy of cooperation to reabsorb the surplus and to help rebalance the market.

Oil



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