world energy

we.

OCTOBER 2021 • N. 50

50 *times* ENERGY STORIES

A LOOK AT THE PRESENT:
VISIONS OF A WORLD IN TRANSITION

Six stories, selected from the photography projects already published in our magazine, form the common thread in a broad reflection on the world we live in and on the changing times.
Technological innovations, which bring epochal transformations in the production and economic processes of society, form the basis of the digital revolution in which we play, at once, the role of architects, protagonists and witnesses.
But although today, in developed countries, digital technologies are now an essential support in our private and working lives, it would be a sensational error to overlook the fact that there are still places in the world where it is impossible to access energy and drinking water.
At the same time, we should take note of how the global and almost indiscriminate impact of Covid-19 has revealed the inadequacy of our society—now almost completely digital based—in managing in a timely manner a pandemic of such proportions.
So, if we want to know where we will be in a few years, we can use our imagination… but maybe not even that far: tickets to Mars are already on sale, online.

C O N T E N T S

WE REACHES 50

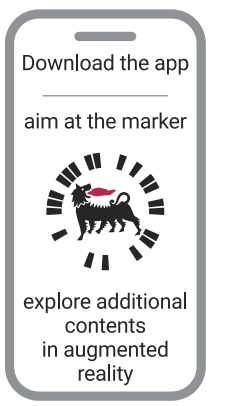
IN A COMPLEX
WORLD, WHERE THERE ARE
NO SIMPLISTIC FORMULAS,
WE PERSIST—OFTEN AGAINST
THE PREVAILING WIND—
TO EXPLAIN PROBLEMS
(WITHOUT BENDING REASON)
AND PROPOSE SOLUTIONS
(WITHOUT IGNITING
DANGEROUS UTOPIAS)

by **Mario Sechi**

FIFTY IS A SPLENDID NUMBER. It is middle age, when you begin to understand, take stock and imagine new beginnings. World Energy has reached fifty and this is a great moment for us because it falls in an important phase; in the midst of the energy transition, a revolution in production and consumption, the life of man on Earth. This magazine has been a pioneer on the issues that today—as I write COP26 opens in Glasgow—are on the top of the global agenda.

Enrico Fermi said that sometimes "it's better to finish second," because if you finish first, you risk misunderstanding. Sometimes, this may have happened to us too, but the key point of this story remains: *Oil* was the explorer in a world in which another scenario could be seen glowing in the distance. *WE* anticipated the themes and underlined the urgency; it is the developer of thought involving science, imagination, pragmatism and courage. These are the pillars of the Eni group, the persisting legacy of its founder, Enrico Mattei, the daily compass of Claudio Descalzi, of the men and women at the heart of the company. A great story.

WE has always interpreted this spirit in full freedom, often going forward, on the strength of facts and with the sincerity of revealing "the crooked timber of humanity" (from the title of a wonderful book by Isaiah Berlin on the history of ideas) because, if something is too straight, it is good and right to be



wary of it, it means that it does not rest on reality: we are full of "healers of humanity" who cure nothing and spread poison. We live in a complex world where there are no simplistic formulas, which is why we persist—often against the prevailing wind—to explain problems (without bending reason) and propose solutions (without igniting dangerous utopias), cultivating the intelligence of all the experts who have found a voice and an audience in these pages.

Fourteen years is a very short time in the longue durée of history; in our case it is an accelerated journey into the Big Bang, the transition from a scenario dominated by hydrocarbons to a landscape where the energy mix is an irreversible reality. "The end of oil" is a prophecy that has burned since its inception; what burned during the first decade of the 2000s was a mythical debate in the absence of myth, which reality took care of erasing with two technological leaps and a cultural gong: the shale oil revolution, the rise of renewables and the ecological turning point led by industry. The strength of man is discovery, the search for new frontiers, the tendency of capitalist enterprise towards efficiency, knowledge in competition to obtain the best energy at the lowest cost.

Any self-respecting historian should look at the price of oil to get a concrete idea of the parable of man: in mid-2008, crude oil reached USD 165, it seemed the rise was unstoppable; the pandemic plunged it to less than USD 17; today we are above USD 80 and the future will be revealed only as we live it. In between, financial crises (the collapse of subprime mortgages in America and the overturn of sovereign debt in Europe); the Arab Spring with the regime change in Libya (the fall of Gaddafi in 2011, after more than 40 years as ruler) and the revolution in Egypt (end of Hosni Mubarak's very long season in power, from October 1981 to February 2011), two key countries in North Africa and geopolitics in the Middle East; the election first of Barack Obama and then of Donald Trump in an America that saves its industry from collapse during the Wall Street shock, phases out coal at a charging pace, increases oil and gas production, speeding up the path towards an energetic independence, which, however—as we are seeing recently—is not the disconnection of the plug from the risk of energy but a change of the rules of the game.

Fourteen years is the time in which the idea has matured that the fact of climate change is not independent from human action. There are many heated discussions on the subject, on the Anthropocene, on the impact of our presence on Earth and on the solutions and paths to take; but my modest opinion is that we have a stable core to work on, each in our own field of action. The demographic boom will continue: we need efficient, clean and stable energy to continue our adventure on Earth; our lifestyle can improve a lot (without necessarily losing the achievements of the twentieth century); our choices must be balanced; the energy mix is good, safe and necessary. Any deviation from this map leads to places unknown.

The decisions of governments today (even the wrong ones, which exist and must be corrected) are influenced by a "green conscience" that is widespread in public opinion, moves consensus, changes patterns of consumption and opens up opportunities. But to be effective (and not to end up in the "bla bla bla" of opposites—green and anti-greenisms) this conscience needs science, reliable data projections, applied research, plural knowledge and liberal thinking, pragmatism, prudence, wisdom, respect for opinions and no dogma. Not everything that happens today is inspired by these elements—concrete example: the road to the circular economy has only just begun and must be taken immediately by governments with actions and not words. We are still in a phase full of "black holes" and, as Antonio Gramsci, the greatest Italian philosopher after Niccolò Machiavelli, wrote:

"The crisis consists precisely in the fact that the old is dying and the new cannot be born; in this interregnum a great variety of morbid symptoms appear."

What is needed in these times is the awareness that "the crisis" (each passage is "a crisis," the word in Greek means to separate, discern, judge, evaluate) is overcome by allowing the new to be born, because being in the middle, in an indefinite "energy tomorrow" that never arrives, is a high risk. We must not pursue unachievable utopias, but projects based on solid scientific foundations. The key is to evolve without dissolving. Decarbonizing is not synonymous with degrowth, it is another path of development that has the constant aim of creating well-being and peace for all.

The covers first of *Oil* and then of *WE* are an excellent "evolutionary guide": from the first issues in which the story focused on the oil industry, from illustrations with barrels, images of pumpjacks, oil pipelines, refineries, oil and gas tankers, we have gradually moved on to the story of the transformation, to a vision that has expanded, multiplied, taken on color. The scene change was that of the real world, we are always guided by the facts. There was the great and pioneering work of Lucia Annunziata who launched the boat—which it was clear immediately was "a racing yacht" (Hemingway, Fiesta)—and of Gianni Di Giovanni who led it out to sea with expert hands. Without the work of Lucia and Gianni, their passion—journalism first of all—I would never have had the opportunity to take the helm of this fantastic creature—an editorial unicum in form, content, independence—and lead it with sails unfurled towards an incredible turning point in history.

Giving the magazine a new name—from *Oil* to *WE—World Energy*—was a logical consequence; the text was in context. The change was conceived in October 2017 with my arrival as editor of the magazine. Five years ago, the industry was rapidly setting the new course: energy consumption had already spiked in Asia; the strategy had for some time no longer been conserva-

Vasily Kandinsky
"Several circles"
January/February 1926,
140.7 x 140.3 cm,
Guggenheim Museum
New York.

tive; the diversification of sources was accelerating; the historical phase of coal in the West was marching toward the finale; gas was destined to become the key element of the transition; the debate on climate change took on shape, substance, intensity; it became a matter of government and no longer just a precious cultural debate.

Looking back helps to understand the extent to which our change of title was far-sighted, thoughtful, respectful of its history and ready for the "carpe diem," for seizing the moment of change. It was a natural decision, the evolution of a species in an environment modified by history, accompanied by industrial strategies, by long-term reflection on sources and climate, on lifestyles and patterns of consumption; a design nourished by scientific research and taste for challenge, the spark of imagi-

© ALAMY/IPA

nation that has always marked Eni's history. For these reasons, changing the name was a quick decision, it went without saying; *WE* arrived after a couple of discussions, exchanges of views, visions without divisions. It was a pleasant passing of the baton and talking about it in retrospect is the proof of a good job that followed a precise map; yesterday was today, the horizon to which we look in the present, tomorrow.

We are about to conclude a difficult, at times dramatic two-year period: in the beginning of 2020 we (re)discovered that man has invisible and powerful enemies. The coronavirus opened another historical phase, a "new order" is being drawn, as we titled one issue of *WE*; in 2021 we saw how people confined to the walls of their own homes, lost in a lockdown of body and soul, are still capable of great deeds. We have resumed our long march: in less than a year, we produced the vaccines and a great global immunization campaign (which must be extended immediately to poor countries); the road to treatment is open; new space race has started which is the prelude to other great discoveries; studies on engines and fuels are fruitful; new propulsion systems are in the workshop; it is a season of inventors who throw their hearts and minds over the hurdles. Magnetic confinement fusion—successfully tested by Eni a few weeks ago, a process similar to what happens in the heart of the stars—is destined to change the energy scenario, the road map foresees an experimental plant (SPARC) in 2025 and a demonstration plant (ARC) connected to the electricity grid in the next decade. Zero emissions, reduced costs, inexhaustible source. It will be a turn of the page in history, and it is on its way.

We have (re)entered a "new normal" of which the energy revolution will be the main driver together with biotechnology, research and education. Mathematics and medicine, computing power and biology, new energy sources and propulsion systems. A new era of exploration of the cosmos will take off. All of this is not "far off," it is materializing now.

We still have one more issue of *WE* for this year that is coming to an end. We will focus on COP26, because in any case Glasgow will be the start of another story, because even in the disagreement among governments, industry is the one driving the transformation, it absorbs it in its veins and makes it a reality, business knows how to be faster than politics in grasping the challenges of modernity.

Fifty issues later, *WE* talks about this present without being a prisoner of "presentism," always looking forward. This has been possible thanks to the work of many people who "cook" the magazine with love and craftsmanship, a scientific committee that is never afraid of proposing new topics often going against the tide, an editorial staff that valorizes the authors' contributions to produce a product of rare quality and a publisher who cultivates freedom of thought as a pillar of business. *WE* has reached fifty; we race on toward a hundred issues with enthusiasm and confidence. We will talk about the future world that we have imagined today, as we prepare to reveal another that has yet to flower.

& SOURCES

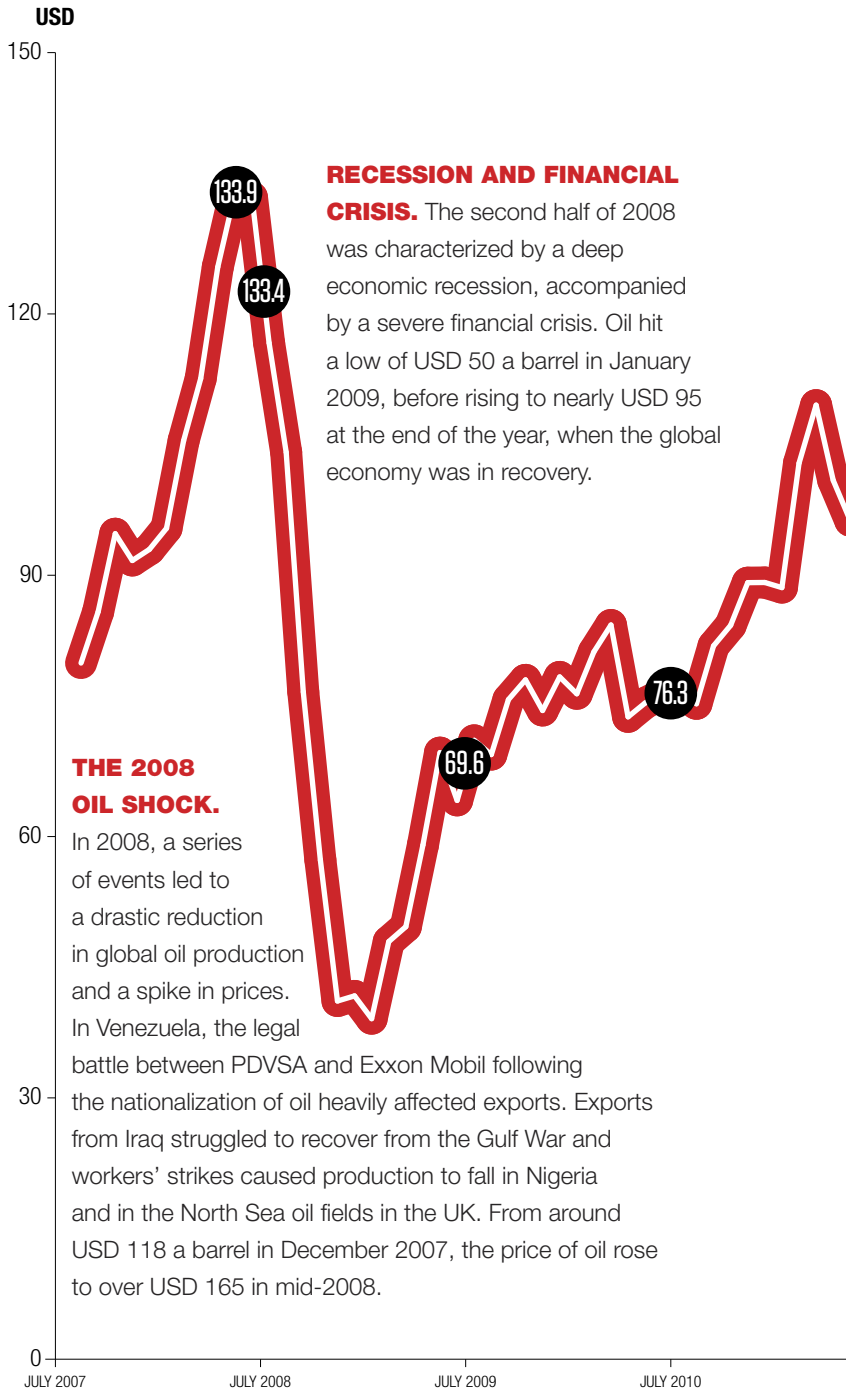
74 YEARS OF HISTORY

RGY

OVER THE LAST 14 YEARS, THE WORLD OF ENERGY HAS UNDERGONE EPOCHAL CHANGES. IN 2008, AT THE START OF OUR EDITORIAL ADVENTURE, WE LOOKED WITH FEAR TOWARDS THE DAY WHEN OIL WOULD RUN OUT. THIS HASN'T HAPPENED, IN PART BECAUSE, IN THE MEANTIME, TECHNOLOGY HAS GIVEN US ACCESS TO RESERVES PREVIOUSLY UNKNOWN OR TOO COSTLY TO DEVELOP, SUCH AS THE SHALE DEPOSITS IN THE US. IN RECENT YEARS, TECHNOLOGICAL ADVANCES HAVE ALSO MADE RENEWABLES MORE AFFORDABLE AND RELIABLE AND THESE SOURCES ARE GAINING GROUND GLOBALLY AND APPEAR A VIABLE PROGRESSIVE REPLACEMENT FOR FOSSIL FUELS.

PRICE STORY

In the past 14 years, the oil market has been extremely volatile. In mid-2008, the price per barrel reached a maximum of USD 165, only to fall just a few years later to USD 27. Between these two extremes, there was the shale oil revolution, which shot the US to the top of the list of crude oil producers and led Saudi Arabia to flood the oil market to defend its share.



RECESSION AND FINANCIAL CRISIS. The second half of 2008 was characterized by a deep economic recession, accompanied by a severe financial crisis. Oil hit a low of USD 50 a barrel in January 2009, before rising to nearly USD 95 at the end of the year, when the global economy was in recovery.

THE 2008 OIL SHOCK. In 2008, a series of events led to a drastic reduction in global oil production and a spike in prices. In Venezuela, the legal battle between PDVSA and Exxon Mobil following the nationalization of oil heavily affected exports. Exports from Iraq struggled to recover from the Gulf War and workers' strikes caused production to fall in Nigeria and in the North Sea oil fields in the UK. From around USD 118 a barrel in December 2007, the price of oil rose to over USD 165 in mid-2008.

THE EXPERTS

OIL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

YOU CAN FIND THE AUTHOR BIOS ON PAGE 84

OIL 1 – APRIL 2008

The price of oil and the pace of freedom always move in opposite directions in oil-rich petrolist states. According to the First Law of Petropolitics, the higher the average global crude oil price rises, the more free speech, free press, free and fair elections, an independent judiciary, the rule of law, and independent political parties are eroded. (…) Conversely, according to the First Law of Petropolitics, the lower the price of oil, the more petrolist countries are forced to move toward a political system and a society that is more transparent.

THOMAS FRIEDMAN

The era of plentiful, low-cost petroleum is approaching an end. The good news is that commercially viable mitigation options are ready for implementation. The bad news is that unless mitigation is orchestrated on a timely basis, the economic damage to the world economy will be dire and long-lasting.

ROBERT HIRSCH

OIL 2 – AUGUST 2008

There is no panacea for such a bleak picture, although a complete change in consumer behavior, especially in the countries that consume most energy, would be as painful as it is necessary.

The incessant rise in the price of oil is making things difficult for young and vigorous economies like China and India.

NOBUO TANAKA

For over 100 years, that is to say, since the beginning of the oil era, we have talked about when it would run out. However, this has never happened and the world's recoverable reserves of conventional oil have doubled since the early 1980s, and continue to grow.

ABDALLA SALEM EL-BADRI

© GETTY IMAGES

THE US SHALE REVOLUTION.

In the period 2014-2015, US oil production doubled as compared to 2008, thanks to the exploitation of shale reserves made possible by substantial improvements in fracking technology. Saudi Arabia flooded the crude oil markets in order to hit US shale producers. At the beginning of 2015, the price of oil dropped below the psychological threshold of USD 50 a barrel and reached a low of USD 27 in March 2016. The end of April saw the start of the recovery, even if the agreement on production cuts within OPEC+ was reached only at the end of September.

THE COVID EMERGENCY OF 2020.

The economic contraction due to the spread of Covid-19 and the termination of the OPEC+ agreement generated one of the greatest crises in the history of the oil markets: in April 2020, crude oil prices hit an all-time low of USD 18.31 a barrel. However, unlike what happened in the 2014-16 cycle, there was a rapid response by producer countries: OPEC+ reached an agreement to make production cuts of historic dimensions.

Source: US EIA

In my opinion, when oil hit USD 145 a barrel earlier this summer, USD 50 of the price was the result of financial factors. But the remaining USD 95 was solely the result of physical fundamentals.

EDWARD MORSE

OIL 4 – DECEMBER 2008

We are approaching the moment of peak oil. It is inevitable: the world is using three barrels for every barrel that is discovered. This is the reality. Even if we discover super deposits, nothing will change. We have not found many in the last 20 years, so we will discover only a few. I fear the peak is near, although I hope the opposite, I hope there are still a few more years to make the transition.

JEREMY RIFKIN

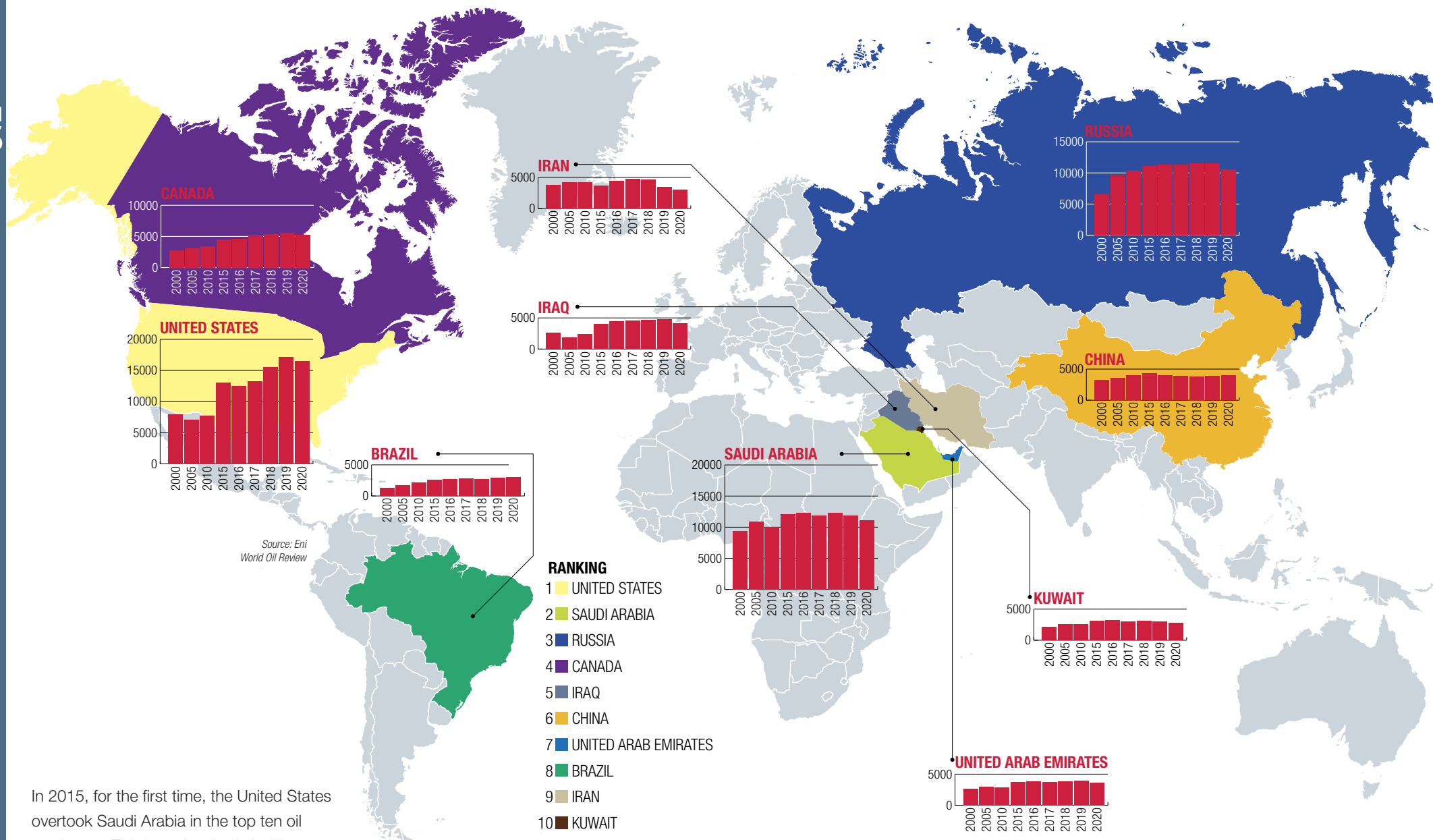
Two aspects worry me. The first is that, with the recession, the price of oil has dropped by fifty percent, lessening the political urgency to do something about savings and alternative energies. Second, in a time of large deficits, it becomes more difficult for the government to build the consensus needed to spend large sums of money on programs to develop alternative energy to oil.

RICHARD NATHAN HAASS

OIL 5 – MARCH 2009

In the past, the government was encouraged to invest in drilling, extraction and export, but now it is too risky: the price of oil could remain low for twenty years. So, the difficulty for producer countries is to maintain their investments and expand, or at least to be ready to do so quickly when the need arises, that is, when the price of oil and demand start to go back up. In the meantime, however, countries like Saudi Arabia and the UAE are looking to the long term and are starting also to invest in renewable energy, because they know their oil will not last forever.

RALPH SIMS



In 2015, for the first time, the United States overtook Saudi Arabia in the top ten oil producers. This jump has had significant global economic and geopolitical repercussions, helping to unleash the "price war." The US started to dream of energy independence.

THE TOP 10 PRODUCERS
(THOUSAND BARRELS/DAY)

OIL 7 – OCTOBER 2009

One feature of this new era is that oil has developed a dual personality: it is a tangible commodity but now also a financial asset. Three other distinguishing features of this new era are the globalization of oil demand, a radical change from even just ten years ago; the rise of climate change as a political factor determining decisions about whether and how much oil to use in the future; and the push for new technologies that can have significant effects on oil and on the rest of the energy portfolio.

DANIEL YERGIN

OIL 9 - MARCH 2010

Thanks to new technologies, shale gas is an impressive discovery from the point of view of natural gas supplies for North America. It is estimated that it is capable of meeting US demand for the next 100 years at current consumption rates.

BRUCE H. VINCENT

What has happened in recent years in the production of unconventional gas in the United States is a real "silent revolution" that will have significant repercussions in both domestic and international markets.

FATIH BIROL

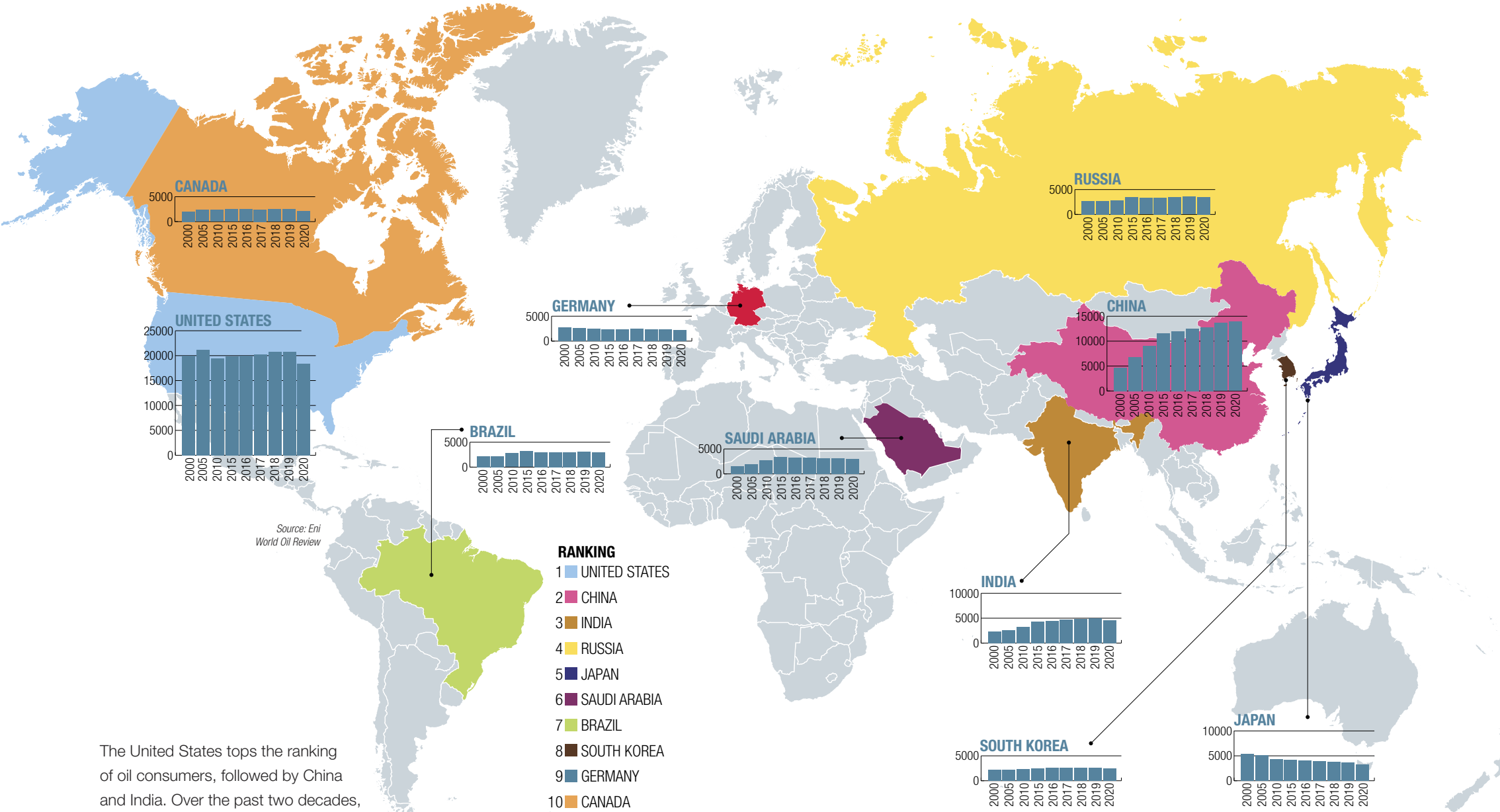
OIL 10 - JUNE 2010

Future markets act as a tool for assessing the balance between today and tomorrow by disseminating price signals that from time to time act as a stimulus to respond to problems of scarcity, including investments in new sources or new extraction techniques.

DAVID J. PENIKET

OIL 20 DECEMBER 2012

I believe that with the increase in oil production in the US, there will also be a decline in crude oil prices, at least in this country. This is certainly a challenge for the oil companies. The fact that the prices of black gold can fall in this country, which could even become independent from an energy per-



The United States tops the ranking of oil consumers, followed by China and India. Over the past two decades, China has more than tripled its demand for crude oil, from 4,651,000 barrels per day in 2000 to 13,953,000 in 2020. India too, between 2000 and 2020, saw its consumption more than double.

THE TOP 10 CONSUMERS

(THOUSAND BARRELS/DAY)

spective, will create pressure on the other producer states, given that we are the main consumer country.

THOMAS F. DARDEN

OIL 24 – DECEMBER 2013

The shale oil revolution suggests decades, if not centuries, of stable supplies; oil resources appear abundant on the planet and technology is making them accessible at prices below the current USD 100 a barrel or higher.

EDWARD MORSE

OIL 31 – AUGUST 2016

We live in an era of seemingly continuous change, in which, however, all of us, oil producers and consumers, must prepare for a world in which crude oil is traded at a lower price, which will have increasingly significant repercussions.

IAN BREMMER

OIL 32 – AUGUST 2016

Mohammed bin Salman said the Saudi Kingdom is indifferent to whether the price of oil is USD 30 or USD 70 per barrel.

BASSAM FATTOUH AND AMRITA SEN

China imports around 7 million tons of crude oil every day; every time the price of oil falls by USD 10, the country saves 400 million yuan.

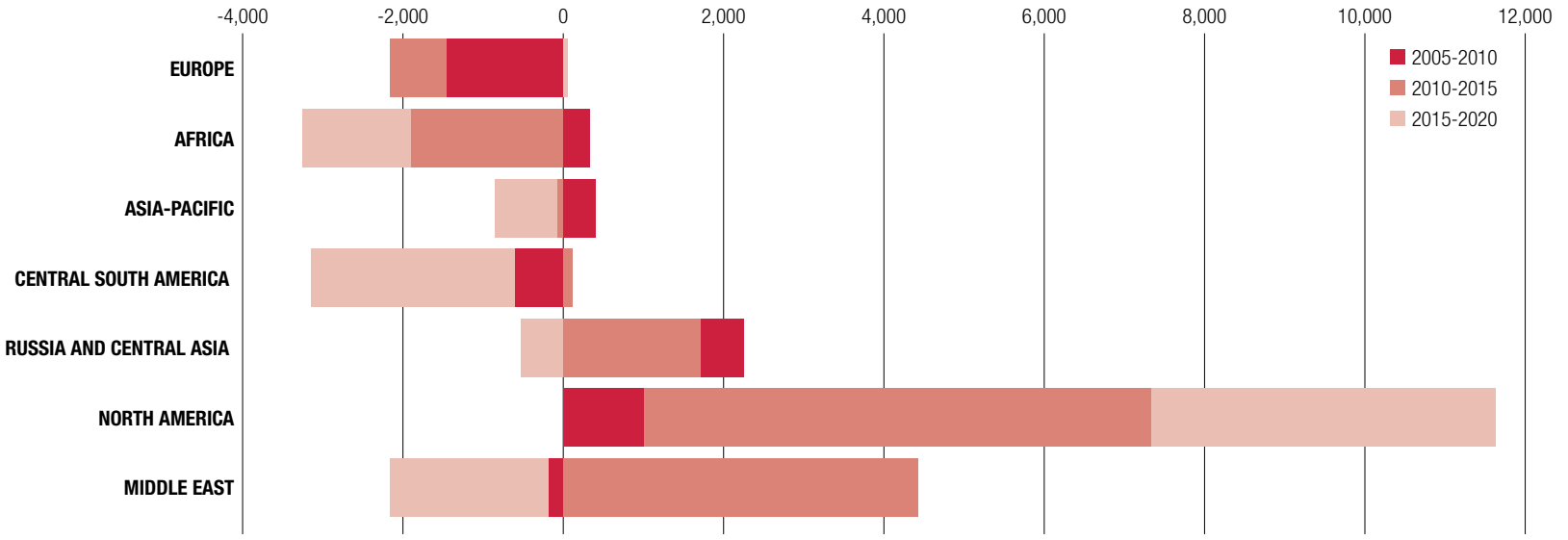
LIFAN LI

As a result of the problematic trends in the Latin American oil industry, a new wave of liberalization began to take hold even before the collapse of oil prices; as expected, this trend has strengthened considerably due to the financial problems facing these countries and their national oil companies following the collapse in prices.

FRANCESCO J. MONALDI

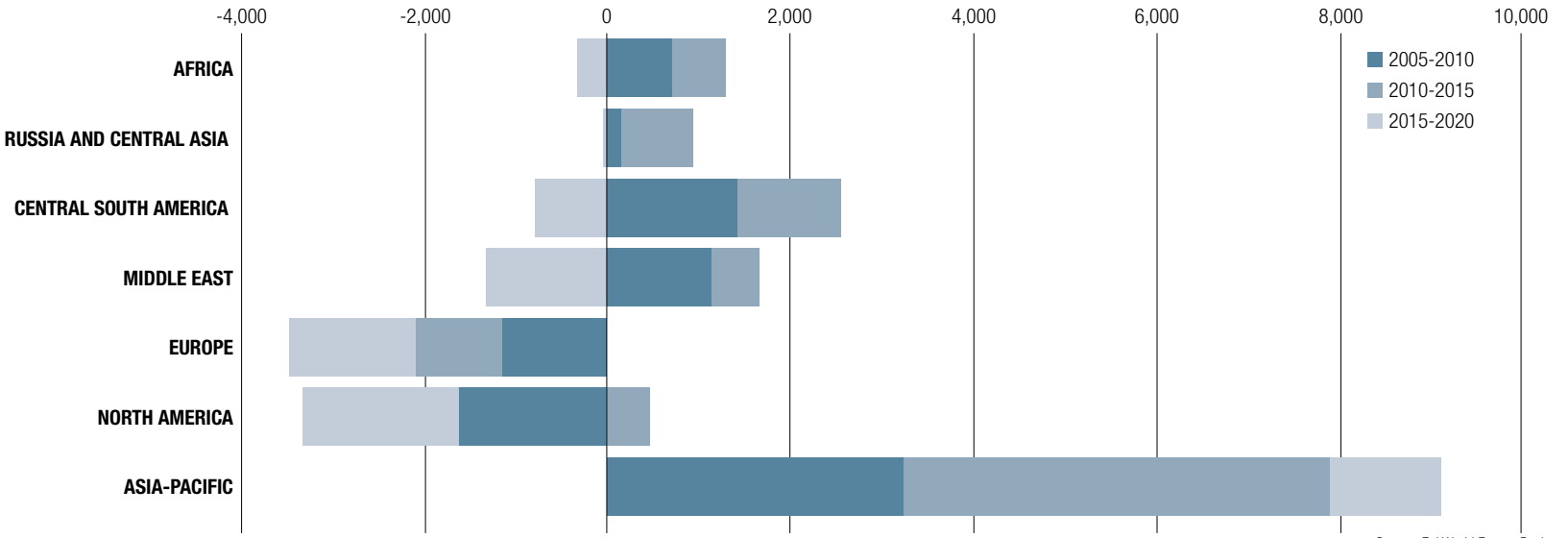
GROWTH OF WORLD PRODUCTION (2005-2020) (THOUSAND BARRELS/DAY)

Between 2005 and 2020, oil production in North America grew by nearly 12 million barrels per day. This increase is mainly due to the exploitation of the shale reserves in the United States and the oil sands in Canada.



Source: Eni World Energy Review

GROWTH OF WORLD CONSUMPTION (2005-2020) (THOUSAND BARRELS/DAY)



Source: Eni World Energy Review

The economies of Asia-Pacific, primarily China and India, have recorded the greatest increase in oil demand over the last twenty years. The consumption in European countries, in the same period, fell by almost four million barrels per day.

26 27 28 29 30 31 32 33 **34** 35 **we** 36 37 38 **39** 40 41 42 43 44 45 46 **47** 48 49 >>

OIL 34 – MARCH 2017

This is a truly historic event because, for the first time, we have the OPEC countries and numerous non-OPEC countries united in signing an agreement to balance the oil market.

MOHAMMAD SANUSI BARKINDO

Growing fears about the turn taken by events have led OPEC to abandon its goal of "protecting" the price of oil to instead adopt a strategy aimed at protecting and, at best, increasing the Cartel's market shares.

MOISÉS NAÍM

WE 39 – JULY 2018

The world oil market has undergone a structural upheaval that had not been seen for at least 50 years (but perhaps it would be more correct to say 80). Today, the market displays structural imbalance and lacks a "swing producer." The extreme inelasticity of oil supply and demand (i.e. price insensitivity) causes periodic large price fluctuations.

ROBERT MCNALLY

WE 47 – NOVEMBER 2020

The fall in demand for oil and gas has a cyclical component and price fluctuations are normal, but the low oil price currently recorded is not only due to the weakness of the world economy that consumes less crude oil. The downward pressure in prices is also due to the widespread expectation that decarbonization will see an acceleration.

MOISÉS NAÍM

The spread of Covid-19 and the termination of the agreement reached by OPEC+ in March have led to one of the greatest crises in the history of oil markets. Although the increase in supply, due to the dissolution of the agreement reached by OPEC+, contributed to the collapse of prices and accelerated the decline in March and April, it is primarily an oil demand crisis caused by the severe contraction of economic activity.

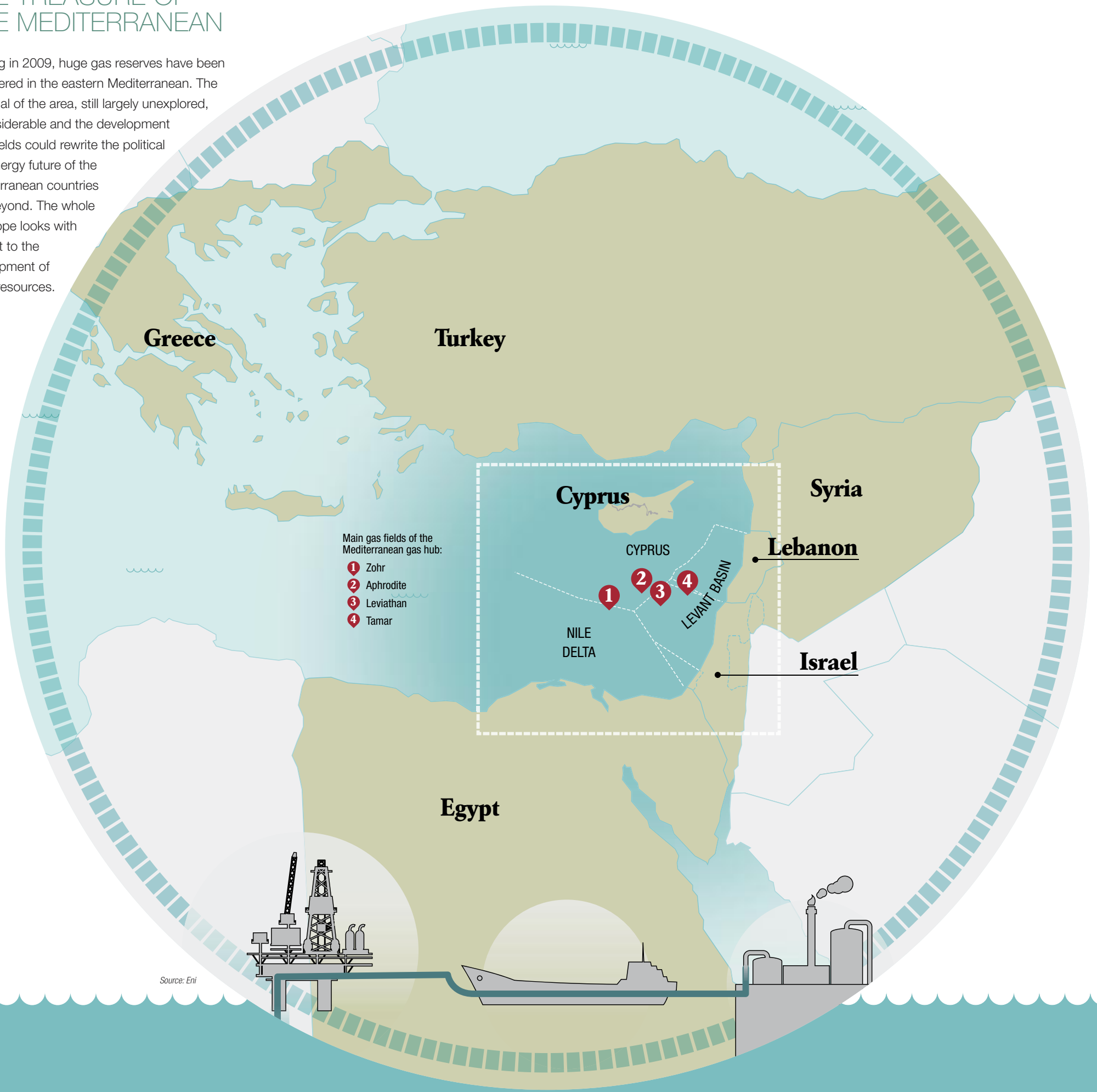
BASSAM FATTOUH

STILL HOLDING ITS OWN

In 2005, gas production in the United States took off, increasing by nearly 70 percent in fifteen years. The US is today a net exporter of gas, through pipelines in Mexico and in the form of Liquified Natural Gas (LNG) around the world. The boom in American shale and the strong developments in LNG are profoundly transforming the gas market, which is moving from a purely regional dimension to an increasingly global dimension. The emergence of new major global players is also a guarantee in terms of security of supply for countries highly dependent on imports, such as Europe. For Europe, a promising source of supply is also the Eastern Mediterranean, where significant discoveries have been made in recent years.

THE TREASURE OF THE MEDITERRANEAN

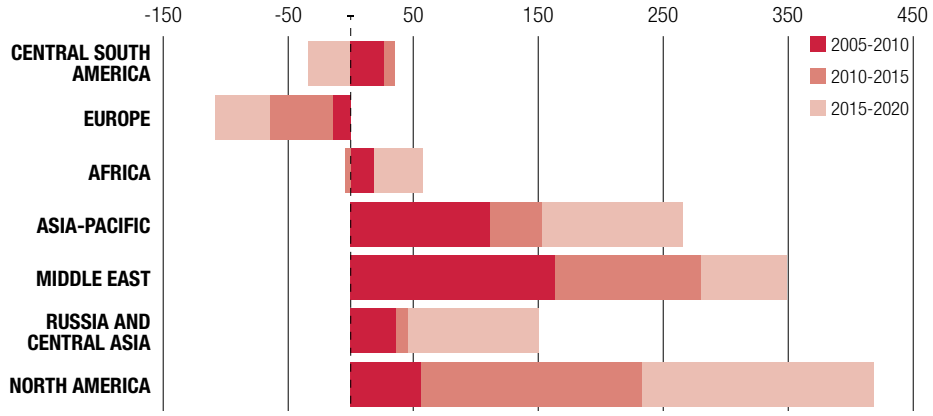
Starting in 2009, huge gas reserves have been discovered in the eastern Mediterranean. The potential of the area, still largely unexplored, is considerable and the development of its fields could rewrite the political and energy future of the Mediterranean countries and beyond. The whole of Europe looks with interest to the development of these resources.



Source: Eni

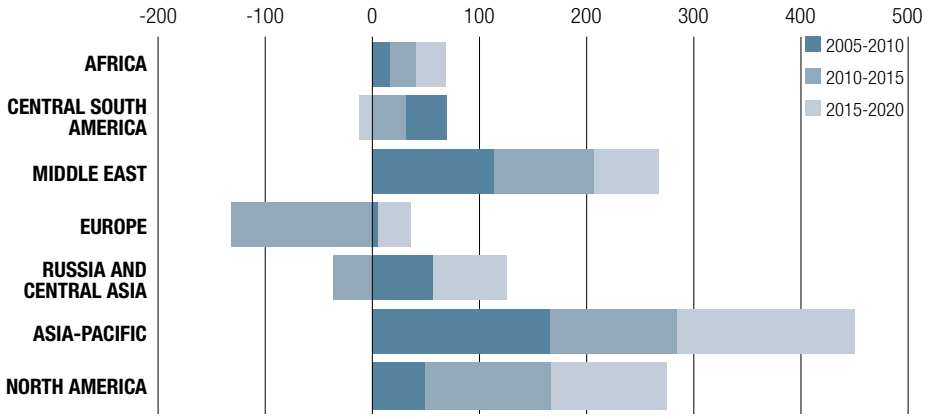
WORLD PRODUCTION GROWTH

(2005-2020 - BILLION CUBIC METRES)

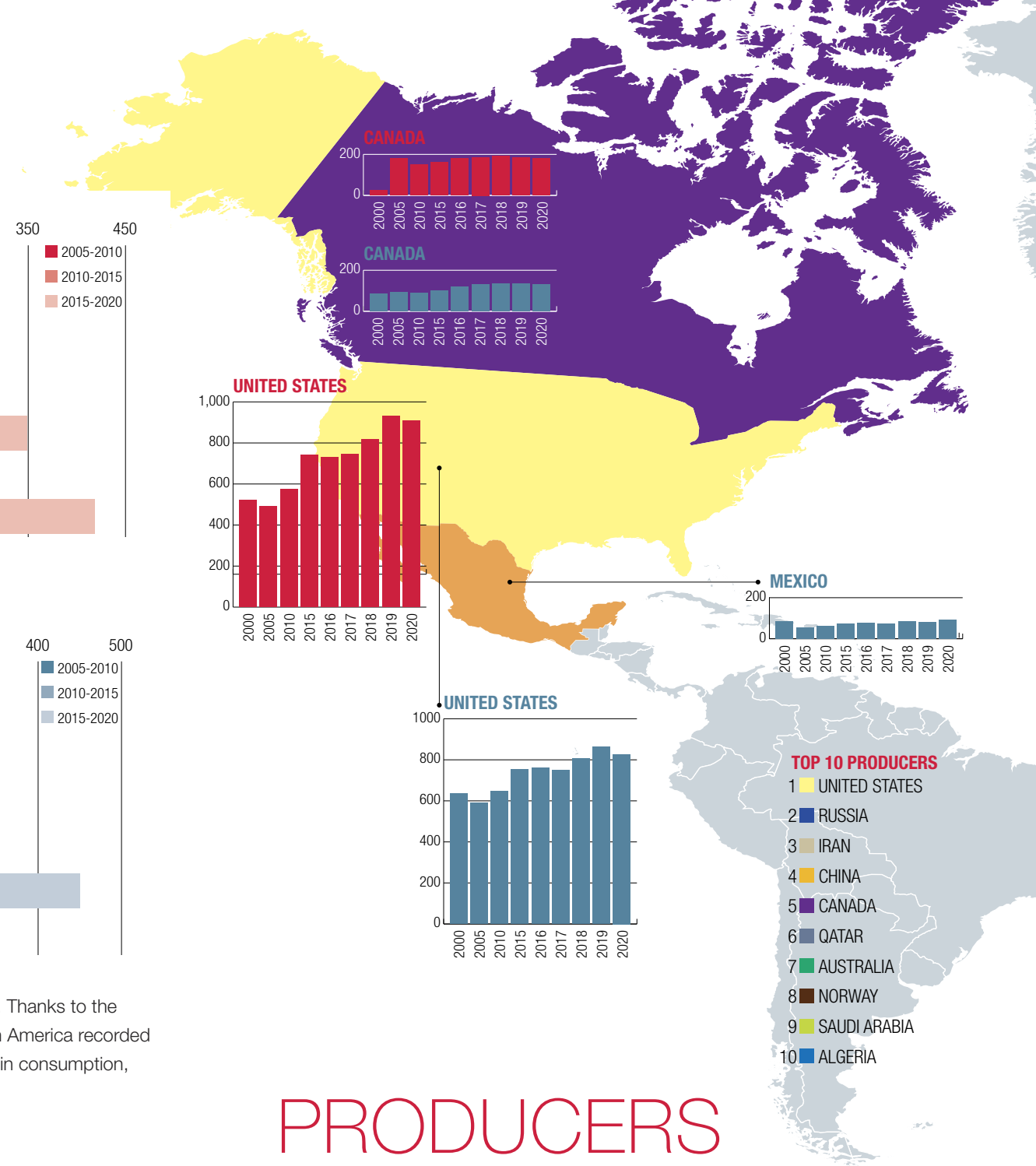


WORLD CONSUMPTION GROWTH

(2005-2020 - BILLION CUBIC METRES)



In 2015, the United States overtook Russia in the top ten gas producers. Thanks to the exploitation of unconventional gas fields, between 2005 and 2020, North America recorded production growth of over 400 billion cubic meters. As concerns growth in consumption, the Asia-Pacific countries take the lion's share.



PRODUCERS

OIL 5 – MARCH 2009

I cannot think of a renewable development where methane is not able to play a role. Gas reserves will last until the second half of this century. Gas increases the effectiveness of Kyoto and any subsequent agreement focusing on sustainable sources.

GERTJAN LANKHORST

OIL 9 - MARCH 2010

Unlike crude oil, there are not that many sources of natural gas supply in the EU. Indeed, dependence on some suppliers has been declared by the European Union as a threat to its energy security. A frantic search has begun for new supplies to replace those from Russia.

KONSTANTIN SIMONOV

Natural gas will be a fundamental source towards establishing a more sustainable energy mix that combines the climate challenge with problems relating to energy security.

FATIH BIROL

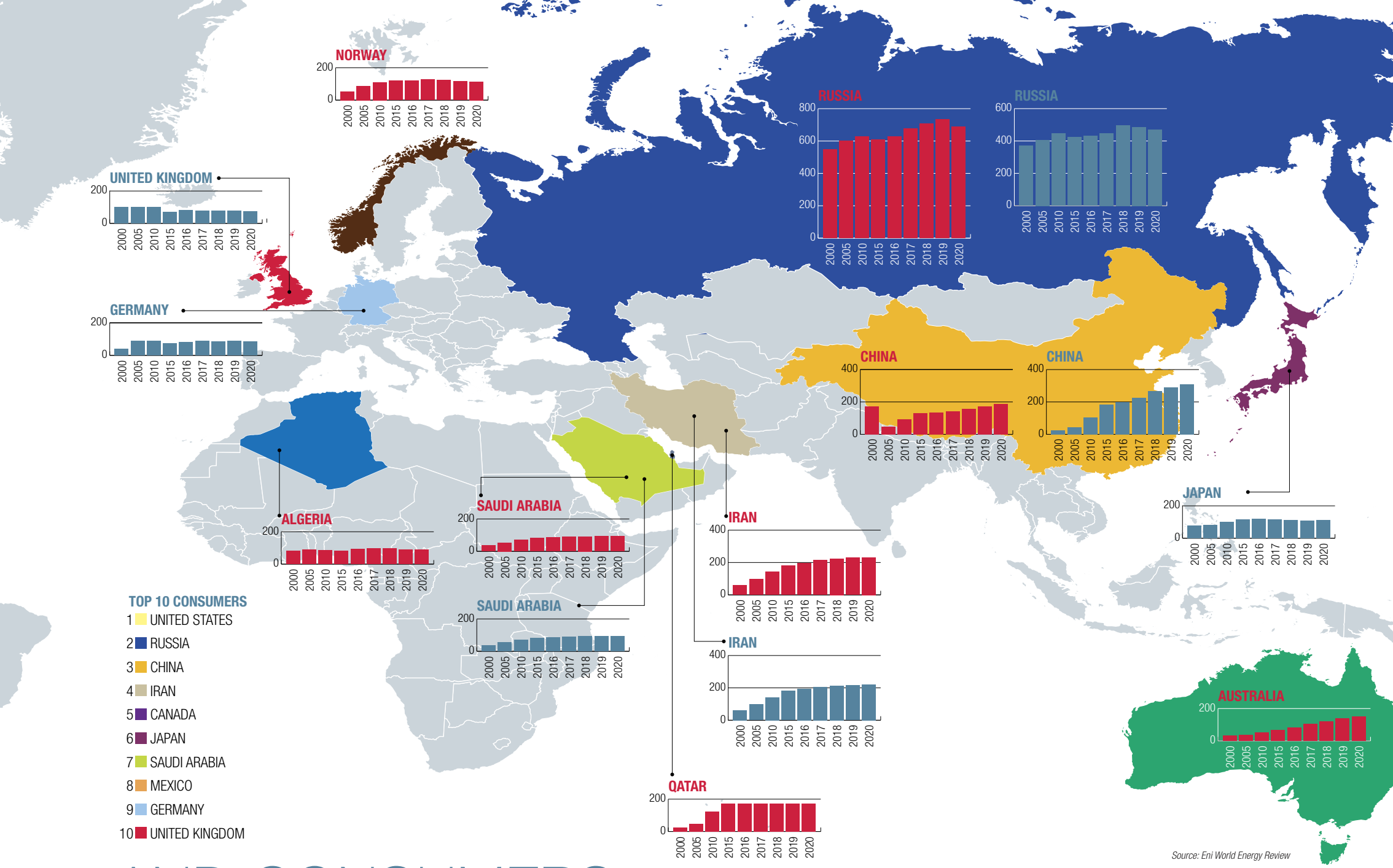
OIL 31 – APRIL 2016

The revolutionary technologies used to explore and produce the gas and oil found in the deep waters of the Mediterranean have led to the discovery of quantities of hydrocarbons that, once commercially available, will rewrite the energy map of the Middle East and Europe. Such an energy landscape will inevitably change the geopolitical landscape, creating new opportunities and new dangers.

MOISÉS NAÍM

Thanks to the significant resources available in Cyprus, Egypt, Israel and Lebanon, the Eastern Mediterranean could become a promising future source of gas supply for the EU as well. At the same time, it could create a win-win situation for all parties involved and contribute to peace and stability.

MAROŠ ŠEFČOVIČ



AND CONSUMERS (BILLION CUBIC METRES)

OIL 32 – AUGUST 2016

2016 is set to be the year in which natural gas will replace coal as the main fuel for energy production. (…)
Thanks to the technological progress achieved in the fracking and horizontal extraction, as well as improved efficiency in production, gas is now a more competitive resource than coal.

DAVID KORANYI
AND MADISON FREEMAN

OIL 33 – DECEMBER 2016

Major international oil companies have gradually shifted their focus to gas, to the point of being known as "Big Gas" rather than "Big Oil." For companies like Shell or BP, gas currently accounts for more than 50 percent of total production.

MEHMET ÖĞÜTÇÜ

In February, the United States saw its first LNG export from the 48 continental states. LNG shipments from the Cheniere Energy Group's LNG terminal in Sabine Pass, Louisiana, have catapulted the US gas sector into a new era.

JANE NAKANO

OIL 34 – MARCH 2017

One of the pillars of Trump's election campaign was the promise to bring back jobs and prosperity to the coal sector. But the decline of the coal industry depends equally, if not more, on falling gas prices and the introduction of new technologies, rather than on environmental regulations.

MOLLY MOORE

WE 47 – NOVEMBER 2020

To date, the direct consequences of the Covid-19 crisis on world gas markets remain unclear, apart from the fact that they are probably less serious than the effects on oil or coal.

TATIANA MITROVA
AND JONATHAN STERN

INCREASINGLY LOW COSTS

Ten years ago, renewables were already seen as the right way to transition and to reduce climate impact. But they were still very expensive and, therefore, not very competitive with traditional energy sources. Now, the situation has reversed: the percentage of renewable energy with lower costs has doubled (International Renewable Energy Agency, IRENA). In 2020, 62 percent of the total production of added renewable energy, equal to 162 gigawatts (GW), recorded lower costs than the cheapest new fossil fuel.

OIL 1 – APRIL 2008

Energy sources not based on hydrocarbons, such as renewable and nuclear energies, produce electricity, not liquid fuels. Therefore, their use in transport is at best foreseeable many decades down the line. Consequently, countermeasures to tackle the decline of conventional oil production must be adopted in the near future.

ROBERT HIRSCH

OIL 2 – AUGUST 2008

The next 10 years will be crucial. Consider, for example, the goal of reducing carbon dioxide emissions by 50 percent by 2050. How can this be achieved? Which technology should we focus on for this purpose? Is a 50 percent cut excessive? It is a very difficult goal to achieve because, in order to change consumer behavior, governments must change the rules. The first recommendation of the IEA to governments is to move in this direction… The next step in reducing CO_2 emissions is the decarbonization of electricity production by using renewables or nuclear or fossil fuels.

NOBUO TANAKA

OIL 3 – OCTOBER 2008

I think that, if there are price cap measures, the signal provided by introducing a price for carbon dioxide in the United States will push both government and private industry to invest greater resources in new low-carbon technology. Europe took steps well before the United States in the field of experimenting

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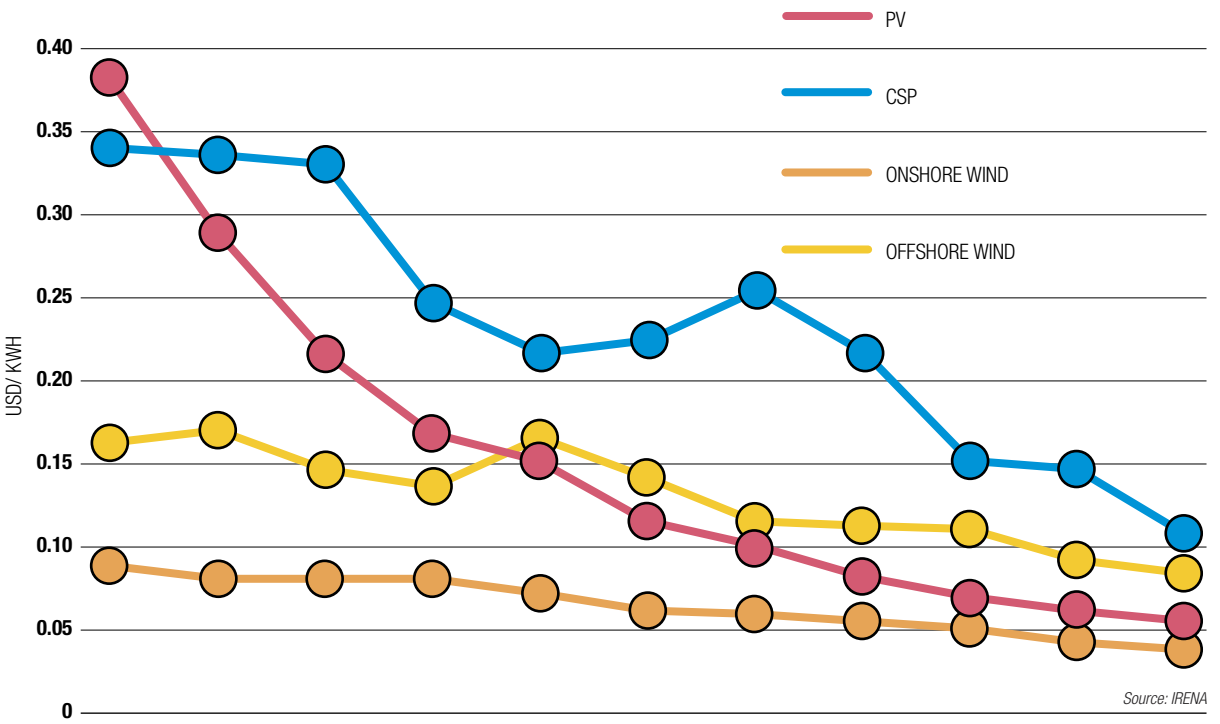
RENEWABLE ENERGY GENERATION: COST IN THE LAST 10 YEARS

The decade 2010-2020 saw a marked improvement in the competitiveness of solar and wind technologies and, in this period, the cost per kWh of the new solar-powered capacity (CSP and photovoltaic) and offshore wind fell to join onshore wind power in the same cost range as the new capacity powered by fossil fuels.



CONCENTRATED SOLAR POWER

In ten years, the cost of electricity produced by concentrated solar power (CSP) fell by 68 percent.

ONSHORE WIND POWER

The cost of electricity produced by onshore wind power fell by 56 percent over the past decade.

OFFSHORE WIND POWER

In ten years, the cost of electricity produced by offshore wind power fell by 48 percent.

PHOTOVOLTAIC SOLAR POWER

The cost of electricity from photovoltaics (PV) fell by 85 percent from 2010 to 2020.

and developing alternative energies… so, I believe the United States has a lot of catching up to do.

ERNEST J. MONIZ

OIL 4 – DECEMBER 2008

Now the question is: how to make the transition? Smart companies will move in two directions: they will continue to use the old energy sources, that is, existing ones, and, at the same time, they will move decisively in the direction of post-carbon energy.

JEREMY RIFKIN

OIL 5 – MARCH 2009

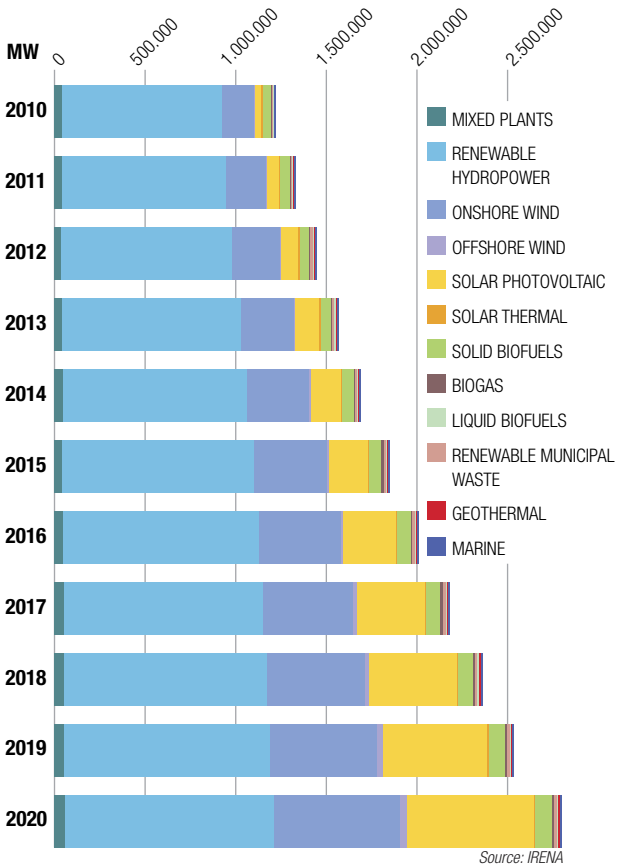
The United States has no choice but to break from dependence on oil supply from the Persian Gulf, about 20 percent of our total imports, unless we want to fight the Third, Fourth and Fifth Gulf Wars in the future. We can reduce this dependency over time, especially with energy savings and the judicious management of our cars and our homes and by building a mass transit system, as well as with the more determined development of new and clean technologies.

GARY HART

There are good signs: last year, all over the world, USD 110 billion were invested in renewable energy and most of the oil companies and many public utility companies are investing in this sector; only small sums, but their interest is growing and progress is being made in this direction.

RALPH SIMS

INSTALLED CAPACITY: GROWTH 2010 -2020



Source: IRENA

The worldwide installed capacity of renewable energy has grown gradually over the past decade. In particular, of the various technologies, capacity derived from offshore wind and photovoltaics has grown most significantly.

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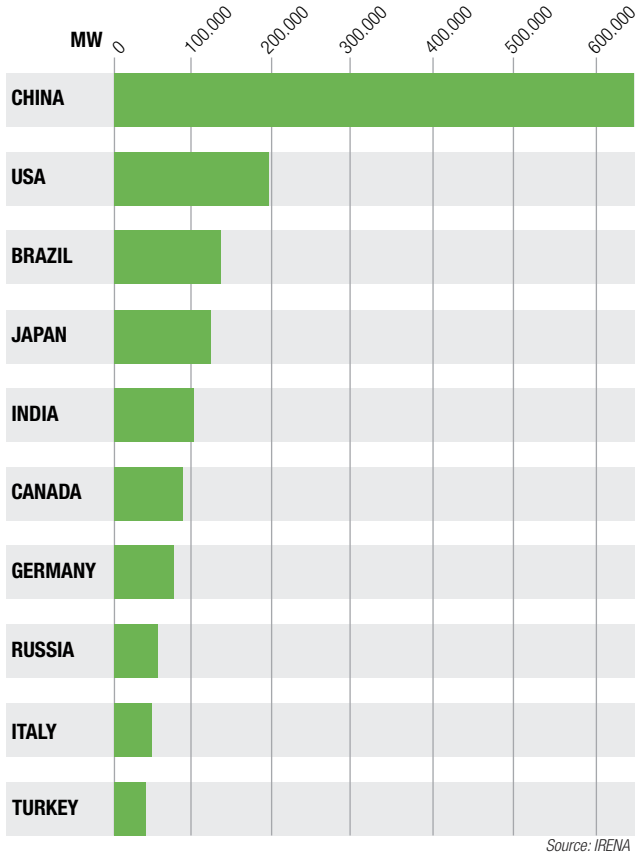
INSTALLED CAPACITY: THE TOP TEN



Source: IRENA

China, one of the countries considered most polluting and energy-intensive, takes first place in the top ten for installed capacity of renewable energy. In fifth place, there is another energy-intensive country: India.

OIL 13 – MARCH 2011

My country (i.e. Algeria) will invest up to $ 60 billion by 2030 to support the development of a national industry for renewable energies. This program will be funded by taxation on oil export revenues.

YOUCEF YOUSFI

OIL 16 – DECEMBER 2011

The energy sector and climate change go hand in hand and we are talking about this because we are thinking about carbon dioxide emissions, and if we really want to do something to reduce them we need to look at the energy situation… It is certainly difficult, but we can use various technologies that we already have available. We can look to renewables, energy efficiency, and to carbon capture and storage when we talk about the use of coal.

MARIA VAN DER HOEVEN

OIL 24 – DECEMBER 2013

Energy dependence on fuel imports can be reduced by increasing the use of alternative energy sources, which is why the EU has set the goal of meeting 20 percent of its energy needs with renewable sources by 2020.

GÜNTHER OETTINGER

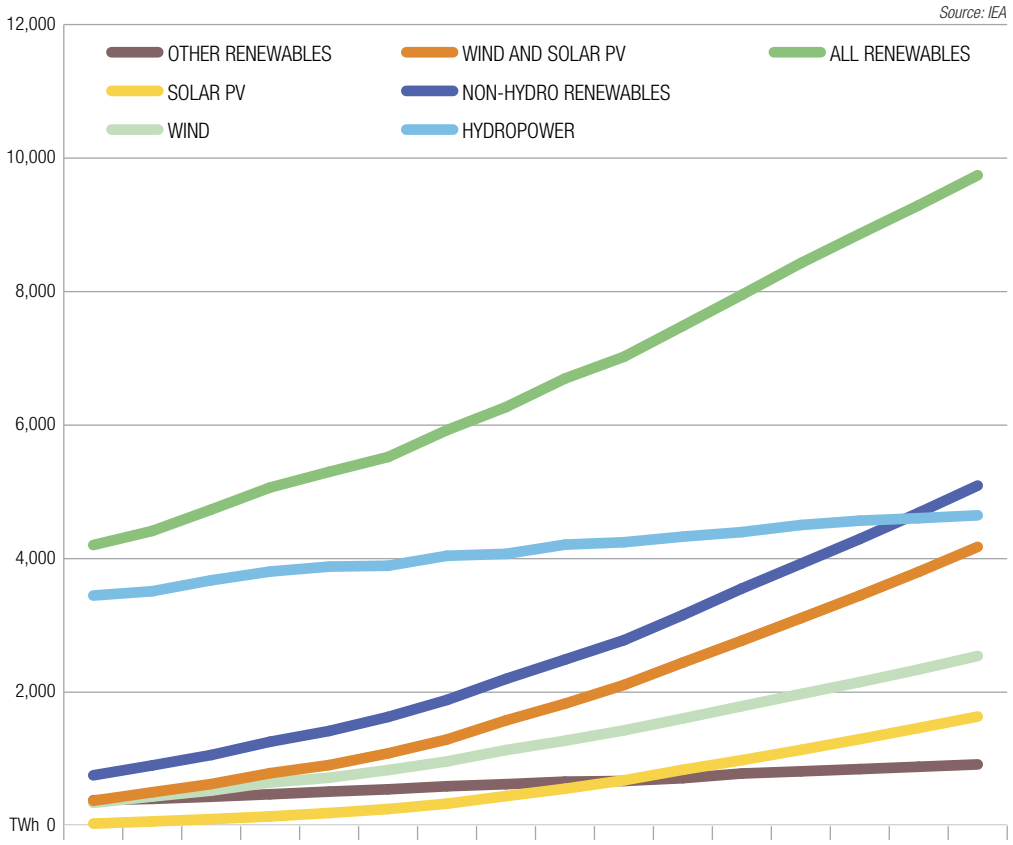
Overall, renewable energy and nuclear power are the fastest growing energy sources, if we consider the situation worldwide. Both are growing by about 2.5 percent a year globally. In the US, renewables are in my view among the fastest growing sources also in terms of individual fuels.

ADAM SIEMINSKI

OIL 28 – MARCH 2015

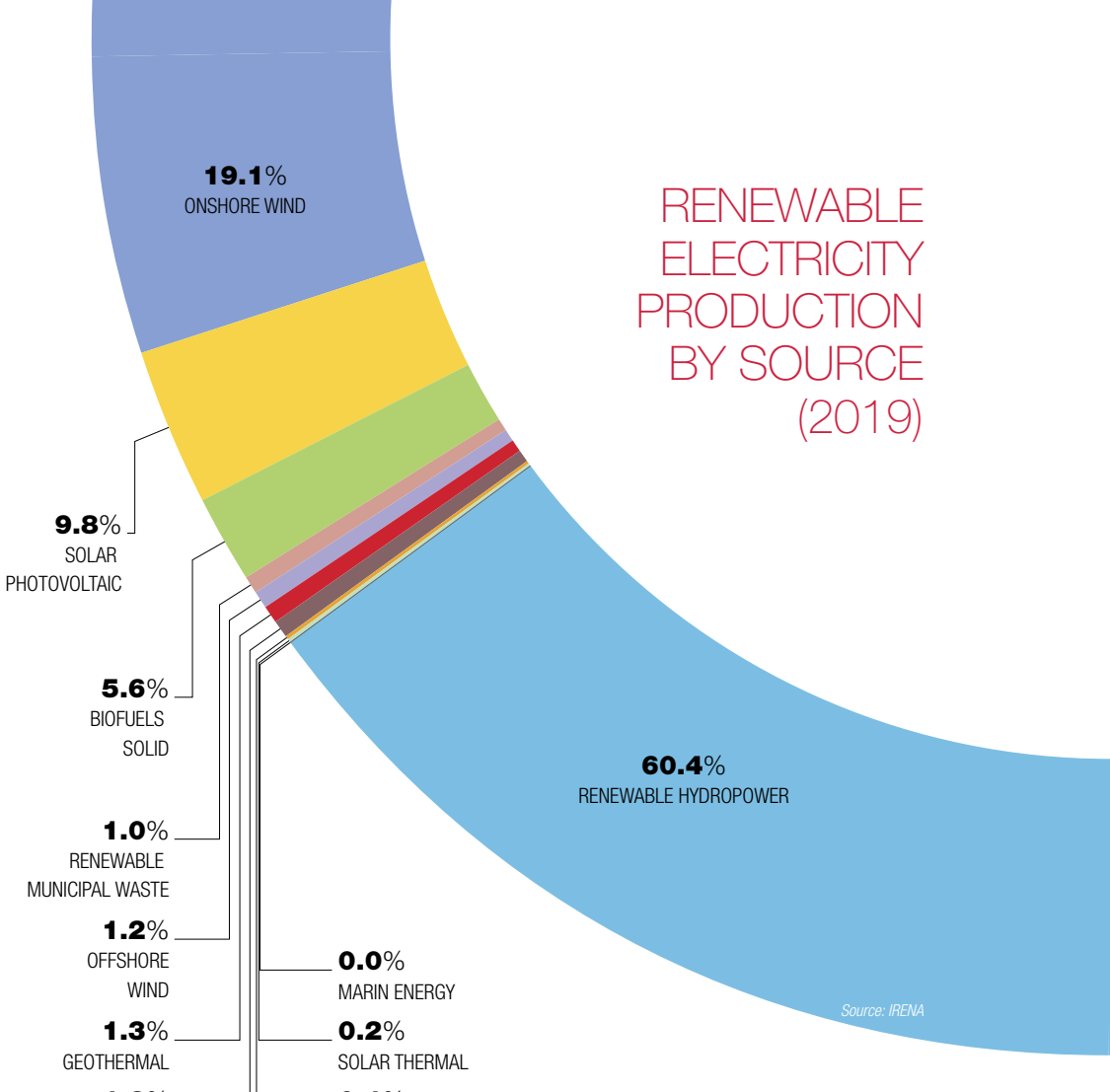
To cope with this increased demand, and strengthen the tools of electricity generation, Morocco has adopted an ambitious energy strategy, based on a diversified mix optimized by reliable and competitive technological choices and which considers the development of renewables as a

RENEWABLE ELECTRICITY PRODUCTION BY TECHNOLOGY (2010-2025)



Electricity production from renewable sources will increase by nearly 50 percent over the next five years to nearly 9 745 TWh, equivalent to the combined demand of China and the European Union. By 2025, the share of renewables in total electricity generation is expected to reach 33 percent, surpassing coal-fired generation.

RENEWABLE ELECTRICITY PRODUCTION BY SOURCE (2019)



Hydropower is by far the main source of renewable electricity generation. In 2019 it accounted for 60.4 percent of the total production worldwide. This is followed, with the most significant shares, by onshore wind power, photovoltaic and solid biofuels.

26 27 28 29 30 31 32 33 34 35 we 36 37 38 39 40 41 42 43 44 45 46 47 48 49 >>

priority and determining aspect.

ABDELKADER AMARA

OIL 30 – DECEMBER 2015

We must not forget that many low-carbon and energy efficient technologies installed throughout the world come from the EU. Every year, we export renewable energy equipment for a value of EUR 35 billion. About 40 percent of the world's wind farms are based in Europe. EU businesses are world leaders in patents for renewable technologies (40 percent from Europe), efficiency of industrial processes and other clean technology used in multiple sectors.

MIGUEL ARIAS CAÑETE

WE 39 – JULY 2018

The trend towards the gradual replacement of fossil fuels with renewables is clear. What is less clear is the speed with which this replacement will take place. Many experts are convinced that the change will be too little and too late.

MOISÉS NAÍM

WE 44 – OCTOBER 2019

Promoted by the EU's leadership, the global spread of renewables has led to huge cost reductions in the past 10 years, especially for solar and onshore and offshore wind power.

ROBERTO VIOLA

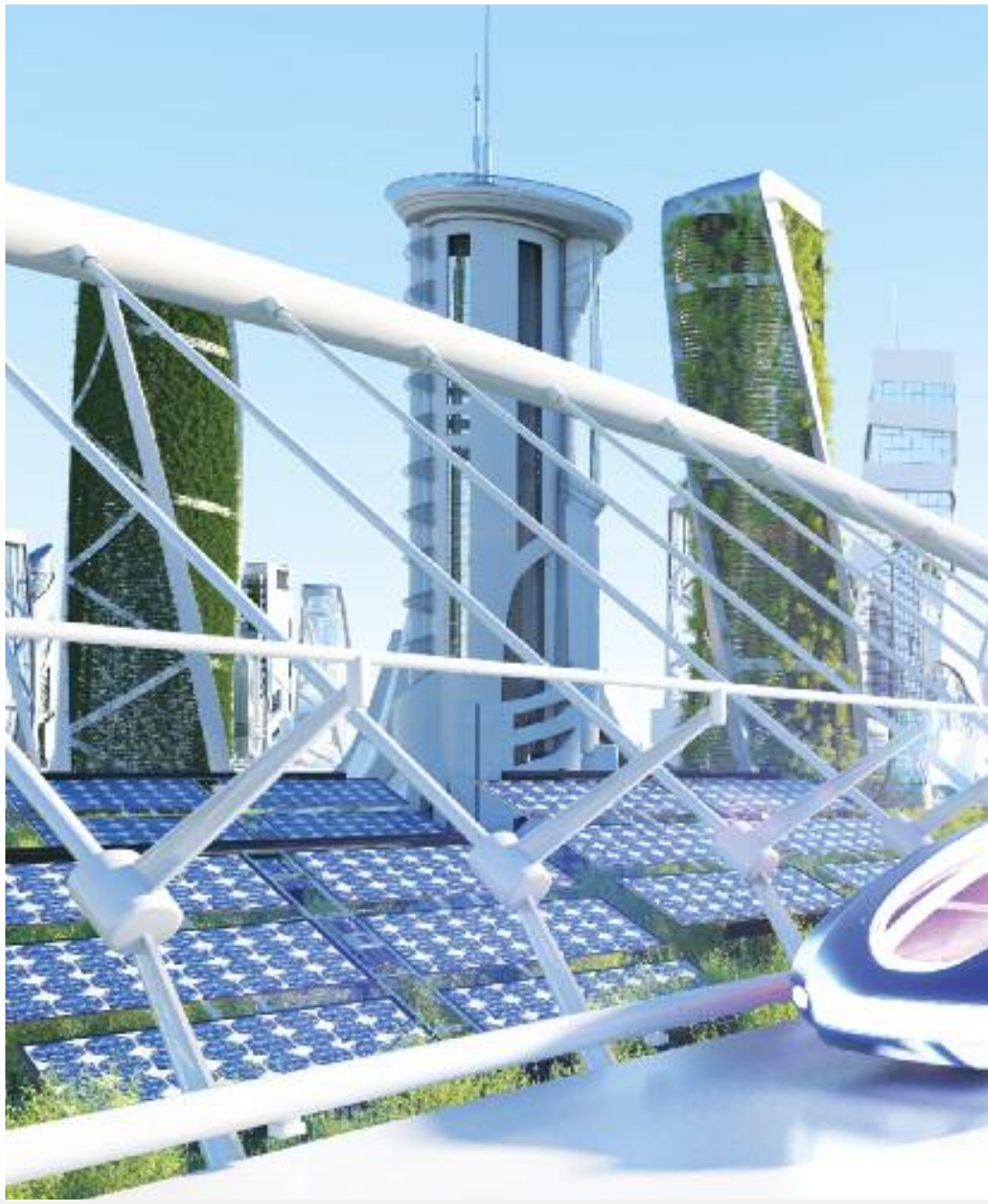
WE 47 – NOVEMBER 2020

The collapse of oil prices, the relative resilience of investment in renewables as well as the increasing divestment from fossil fuels enabled an acceleration of the transition during the pandemic.

RACHEL KYTE

H_2 BOOM

Hydrogen has for years been cited as a resource that can support the decarbonization process, with a view to a carbon neutral future; its multiform and versatile nature means it can play a fundamental role in facing future challenges. Hydrogen is the most abundant element in our universe; but because the process of obtaining it is expensive, it makes up only a small part of the world's energy mix. The IEA, however, predicts that in 2030 the price will decrease by 30 percent, thanks to an increase in production and improvements in renewable technology and technology for generating hydrogen.



OIL 4 – DECEMBER 2008

The solution is not hydrogen. Hydrogen is not the panacea. It is the third industrial revolution. Hydrogen is only one of the four pillars. But it is essential because we will use it to accumulate energy, as is done in digital. We will have a hydrogen economy because we will use renewables and accumulate them thanks to hydrogen.

JEREMY RIFKIN

OIL 18 – JUNE 2012

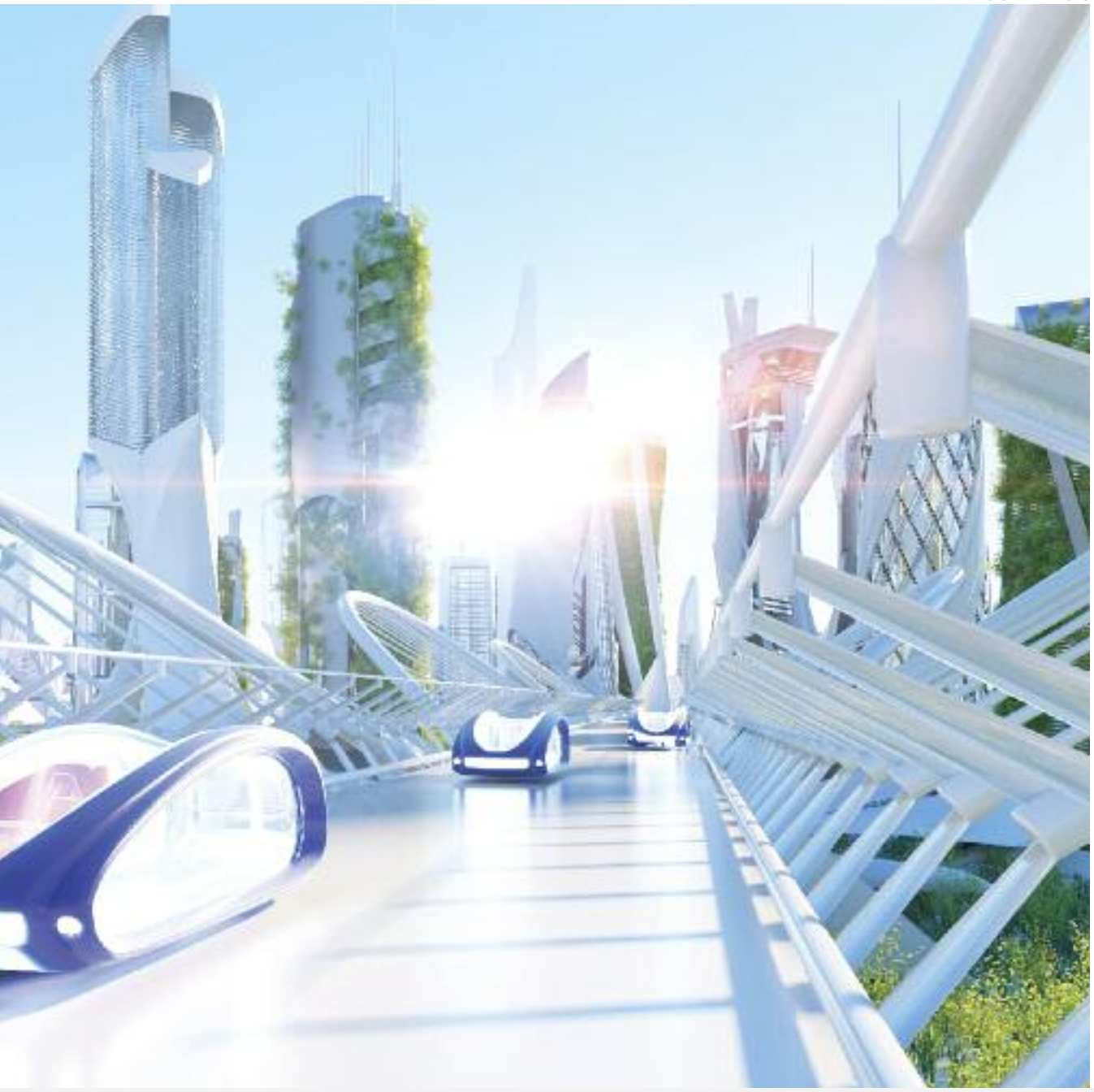
The most ecological method is to identify a process that uses the energy of photons coming from the Sun to break down water (H_2O) into hydrogen and oxygen, and then recombine the hydrogen and oxygen, recovering the stored energy at the time and place of need. In this case, no CO_2 would be produced, and water wastage would be avoided.

HAROLD W. KROTO

OIL 32 – AUGUST 2016

The rise in popularity of natural gas could lead to a hydrogen infrastructure, as hydrogen can be generated by combining natural gas with water (in a process called reforming, or reconstitution). Since natural gas has become more important, the price of the hydrogen equivalent of a gallon of gas is close to USD 1.50 and the generation of hydrogen at the place of use has become feasible with the in-situ reforming process (although it has yet to achieve a cost-effective form), reducing the need for hydrogen distribution infrastructure.

DANIEL NOCERA



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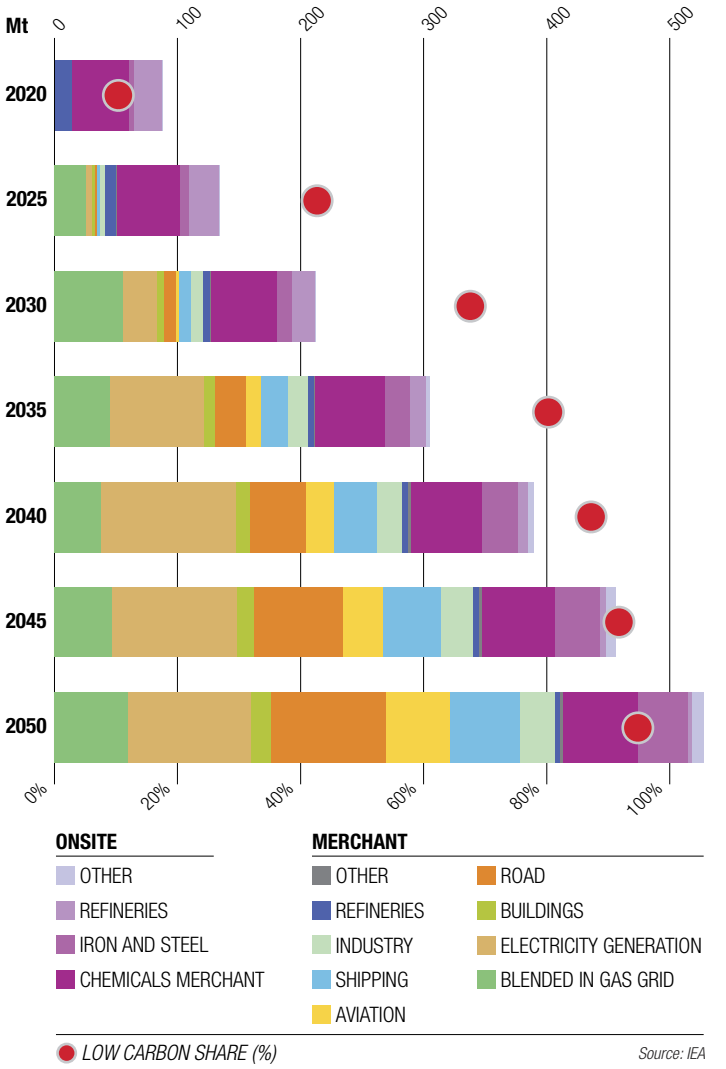
GLOBAL USE OF HYDROGEN



Source: IEA

In the Net-Zero Emissions by 2050 Scenario (NZE) of the IEA, the global use of hydrogen expands from less than 90 Mt in 2020 to more than 200 Mt in 2030.

WE 47 – NOVEMBER 2020

We must restore the relationship between price and value as well as the cost to society: carbon neutrality, which is not a war on carbon dioxide emissions on an ideological basis, makes room for new solutions, including a clean energy vector based on hydrogen, sector coupling, i.e. the combination and integration of different sectors, as well as carbon removal technologies.

ANGELA WILKINSON

Undoubtedly, clean hydrogen is a crucial element for the transformation of the energy system worldwide, particularly in industry, transport and construction. In addition to this, it acts as an accelerator in the use of renewable energy.

ANDRIS PIEBALGS

WE 48 – MAY 2021

For competitive and large-scale hydrogen production, all fuels will have to be used, because renewable electricity and water could really become scarce, and the efficiency losses and logistical needs involve higher costs.

MARC-ANTOINE EYL-MAZZEGA

WE 49 – JULY 2021

Today, all operators in the energy field invariably talk about hydrogen, something unimaginable only two years ago: Japan has effectively triggered the global hydrogen boom. Global hydrogen competition and cooperation add a certain dynamism to the world economy. Ideally and environmentally, hydrogen should be produced from decarbonized energies such as renewables, nuclear and fossil fuels processed using CCUS.

TATSUO MASUDA

INTELLECTUALS, WRITERS, MINISTERS, CENTRAL BANKERS, ENERGY EXPERTS, ECONOMISTS, NOBEL LAUREATES, ARCHITECTS, EVEN FILMMAKERS: THERE ARE MANY AUTHORITATIVE FIGURES WHO IN RECENT YEARS HAVE MADE THEIR VOICES HEARD, FIRST IN THE PAGES OF OIL AND LATER IN WE, ANIMATING THE INTERNATIONAL DEBATE.

ENERGY & PEO

OPLE

It is right that the Arab countries have oil. It is also a form of compensation for the fact that they have so much desert. We have often seen it this way: they don't have lakes, forests and mountains, but they have oil. It is true, however, that the advantage can easily turn into a disadvantage because the easy exploitation of oil can slow down initiative, production and development.

ABRAHAM B. YEHOSHUA

OIL 1 – MARCH 2008

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We must go back to thinking about collective strategic choices, with a long vision. Culture, knowledge, innovative spirit are the drivers that project into the future. The challenge, today and in the coming years, is to create an institutional and regulatory environment, a civil context, which cultivates those values, while at the same time strengthening social cohesion.

MARIO DRAGHI

OIL 13 – MARCH 2011

We cannot think we will win if we continue to focus on energies that are running out. Now the question is: how do we make the transition? Smart companies will move in two directions: they will continue to use the now old energies, that is, the existing ones, and at the same time they will move decisively in the direction of post-carbon energy.

JEREMY RIFKIN

OIL 4 – DECEMBER 2008

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The relations between the two worlds [Europe and Islam, Ed.] are dominated by the power of the economy. Oil is only one element of this power (…). But I humbly believe that what constitutes an element of opposition between peoples and will be increasingly so in the future is spirituality. Some peoples will be able to stop and make room for this spirituality to give meaning to their life and soul. Other peoples, on the other hand, will want to continue to fight and accumulate wealth.

TAHAR BEN JELLOUN

OIL 2 – AUGUST 2008

We need to look for new alternatives [to oil Ed.]. There will always be more demand than supply of oil. Prices will skyrocket. And then there is the climate issue.

WOODY ALLEN

OIL 3 – OCTOBER 2008

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© FRANCES SEYMOUR

To protect the climate and achieve the development goals, it is time for forests to take the leading role they deserve and to attract the level of attention and funding of which they are worthy.

FRANCES SEYMOUR

WE 45 – DECEMBER 2019

© REUTERS

Environmental sustainability can only thrive if women are included as decision-makers and have the opportunity to make a difference. Women are often left out of this context, but they can play a vital role in promoting environmental sustainability if they are given the power to do so.

CHERIE BLAIR

OIL 11 – MARCH 2011

Businesses need to move away from their focus on short-term profits, as it alters both accounting and day-to-day activities. The private sector must look beyond and focus on creating long-term values. An ethical culture must be rooted within business procedures. We cannot ignore the distinction between right and wrong.

BAN KI MOON

OIL 11 – SEPTEMBER 2010

© INFOPHOTO

© REUTERS

Many of our energy infrastructures are over 50 years old and as such present both environmental and safety risks. But they need to be replaced in a smart way to provide not only services and reliability but also resistance to climate change or, for example, cyber attacks.

ERNEST J. MONIZ

OIL 29 – JULY 2015

© STEGANO BOERI

The great challenge of the next few years will be to make the cities of the planet no longer just responsible or victims, but protagonists of a planetary campaign to reduce and slow down the triggers of the climate emergency. Among the most effective tools for achieving this, Urban Forestry deserves a special place.

STEFANO BOERI

WE 45 – DECEMBER 2019

The question today is not whether Obama will win, because he will win in the current situation. The question is whether Obama will be able to lead the country, because it will be very tough. Especially right now, ours is a difficult nation.

KERRY KENNEDY

OIL 3 – OCTOBER 2008

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ENERGY

&

THE FIRST TWENTY YEARS OF THIS CENTURY HAVE SEEN CHANGES IN THE WORLD'S ENERGY AND GEOPOLITICAL BALANCES. THIS HAS INVOLVED THE EMERGENCE, IN PARTICULAR, OF ASIAN ECONOMIES. CHINA, TODAY THE LARGEST CONSUMER OF ENERGY GLOBALLY, IS COMPETING WITH THE UNITED STATES FOR WORLD LEADERSHIP, WHILE THE “OLD” EUROPE, HEAVILY HIT BY SUCCESSIVE FINANCIAL AND DEBT CRISES SINCE 2007, WATCHES FROM THE SIDELINES. RUSSIA, NOW DOWNGRADED TO THE ROLE OF REGIONAL POWER, IS EXPERIENCING AN UNPRECEDENTED ALLIANCE WITH OPEC COUNTRIES TO DEFEND CRUDE OIL PRICES.

COUNTRIES

from IMPORTERS *to* EXPORTERS

Over the past 15 years, thanks to fracking and the shale revolution, the United States has almost doubled its oil and gas production, becoming a net exporter of oil in 2019. This energy turnaround also has important geopolitical consequences, with the US less and less engaged on the Middle Eastern playing field, while competition with China for world leadership intensifies.

YOU CAN FIND THE AUTHOR BIOS ON PAGE 84

OIL 3 – OCTOBER 2008

The legacy that Bush leaves us is the dispersion of certain fundamental American traditions. Obama can therefore immediately take effective action to restore our identity: starting with the abolition of many measures taken in the past legislature that reduce civil liberties in the name of the fight against terrorism.

KERRY KENNEDY

In recent months, the price of gasoline has had an important effect on the behavior of Americans; moreover, in recent years the issue of global warming has attracted more public attention.

ERNEST J. MONIZ

OIL 4 – DECEMBER 2008

[With Obama, Ed.] There will not be the same recourse to fear as a basis for actions motivated by the absolutist conflict between good and evil, in a conception of the world informed by the difference between 'us' and 'them'. And it is less likely that the United States will take unilateral action: America will still lead the world, but in a context of collaboration rather than confrontation.

ZBIGNIEW BRZEZINSKI

OIL 9 – MARCH 2010

Experts and politicians agree on what it takes to make unconventional gas a major fuel source in the future: incentives that promote the continued development of new technologies, greater public acceptance and greater commitment by Congress and the Administration (in the US, Ed.) to

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exploit the potential of these hard-to-access reserves.

MOLLY MOORE

OIL 15 – NOVEMBER 2011

One of the things President Barack Obama is trying to do is to encourage the development of alternative energy sources in the United States. And this is a longer-term strategy in which a lot is being invested, especially in the area of research and development.

ROBERT D. HORMATS

OIL 30 – DECEMBER 2015

We want America's concrete actions to combat emissions to be supported by equally radical actions by other countries in the world, because only in this way will it be possible to reduce the overall impact of climate change. President Obama is showing the world the way forward and other nations are already in the process of following his example.

GINA MCCARTHY

OIL 32 – AUGUST 2016

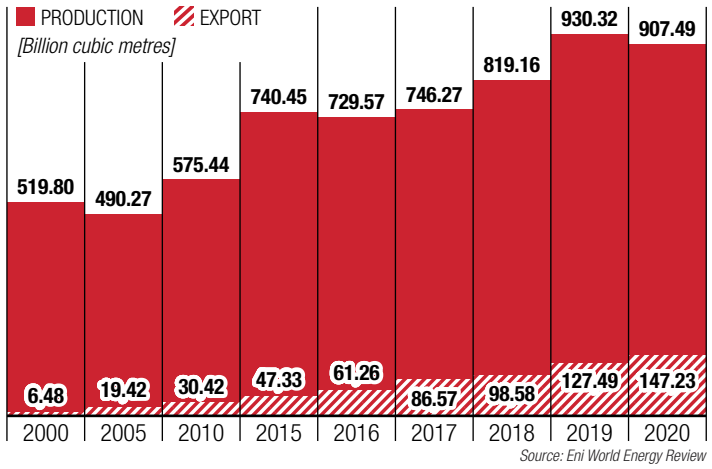
In a possible Clinton government, the United States would be the leaders of a drastic reduction in dependence on oil, a radical increase in investments in renewable energy and a war to the death on climate change. A Trump government, on the other hand, would support the opening of tens of thousands of acres of federal land for oil exploration and drilling, with the abolition of the Environmental Protection Agency (EPA), and the country's turnabout with regard to the Paris Agreement on climate.

MOLLY MOORE

TOWARDS INDEPENDENCE

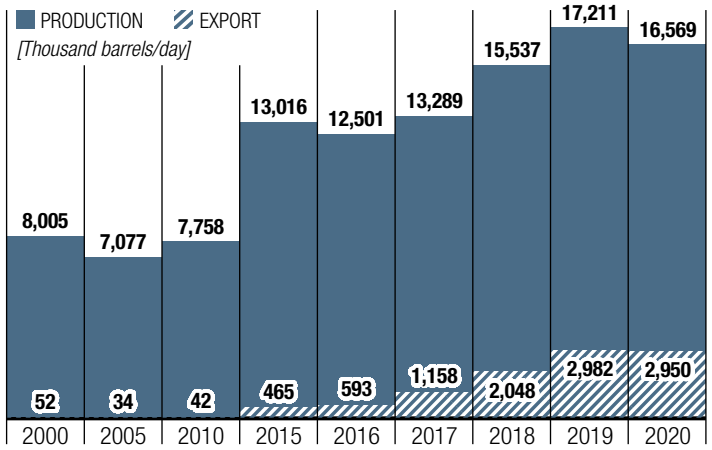
The massive growth in oil and gas production over the past twenty years has propelled the United States towards coveted energy independence and has enabled them to become net exporters of hydrocarbons.

GAS: PRODUCTION AND EXPORT



Source: Eni World Energy Review

OIL: PRODUCTION AND EXPORT



Source: Eni World Energy Review

OIL 33 – DECEMBER 2016

US exports of LNG, crude oil and natural gas liquids are indeed gaining momentum and a Republican-controlled government will take office in January.

This confluence of events is likely to create the ideal conditions to take the United States to a higher position on the global energy leader board.

FRED H. HUTCHISON

OIL 34 – MARCH 2017

Currently, it appears that America, overflowing with shale oil and growing tired of various failed attempts to reshape the Middle East, is taking a more relaxed attitude towards Russian forays into the Gulf.

JIM KRANE

WE 41 – DECEMBER 2018

Trump took office just as Pax Americana (largely coinciding with the postwar period) was coming to an end. It was inevitable that whoever was Barack Obama's successor to the presidency of the United States would set the tone for the geopolitical era to come. Well, so far this tone has been characterized by growing hostility (especially between the United States and China) on numerous fronts: trade, technology and even energy.

IAN BREMMER

It was Trump's controversial criticism of OPEC and its work (as well as the stream of comments by the US President on the price of

© SIME PHOTO

oil, tweeted publicly) that caused chaos among OPEC members and in the oil market itself, which Trump seems to have the ability to pull in diametrically opposed directions.

BILL FARREN-PRICE

WE 43 – JUNE 2019

The return to antagonism between great powers is undoubtedly a geopolitical tragedy, but in retrospect it seems almost inevitable. The main cause obviously lies in the rapid change in the balance of power between the two countries, which has led to a relative decline of the United States and its growing fear of losing world hegemony to China.

MINXIN PEI

The technology race requires the creation of the physical infrastructure on which the new economy of the future will have to be based: this is why the development and security of 5G networks is one of the main reasons for friction between the US and China.

PAOLO MAGRI

WE 48 – MAY 2021

The Biden administration, which has brought America back into the framework of the Paris Agreement, has come up with a USD 2,000 trillion plan for investment in clean energy over the next four years.

MARTA DASSÙ

THE GREAT ENERGY CONSUMER

China tops the world leader board in energy consumption. Over the years, Beijing has built a dense network of economic and commercial ties with oil-rich countries to ensure security of supply, increasing global acquisitions and financing projects in Central Asia, the Middle East, Latin America and Africa. China also tops the world list for CO_2 emissions. Therefore, the global energy transition cannot overlook Beijing's commitment to decarbonization.

OIL 1 – MAY 2008

There is no doubt that China's demand for oil has grown – and dramatically – over the past decade and that the world's largest energy producers have failed to predict the price increases this would cause in oil markets. This surge in demand and the recent frenzied buying of overseas energy by Chinese companies has led many to fear that global energy security may be jeopardized as China's need for oil continues to grow.

VIJAY V. VAITHEESWARAN

If you look at China, you find all types of technology, not just one. They also have their own technology. But they have American, French, Canadian and even nuclear technology. So I imagine they are doing the same thing with oil technologies, which are accumulating at a remarkable rate. And they also become really competitive because they have cheap labor, both in terms of professional knowledge and in terms of manpower.

CHAKIB KHELIL

OIL 2 – AUGUST 2008

Removing the obstacles to clean energy investment in China could help protect the climate more than any international treaty. The incentives and directives of the treaties will remain a dead letter due to the difficulties in operating in what potentially constitutes the largest clean energy market in the world: unless politicians recognize and address the problems that this market presents.

WILLIAM CHANDLER AND HOLLY GWIN

© SIME PHOTO

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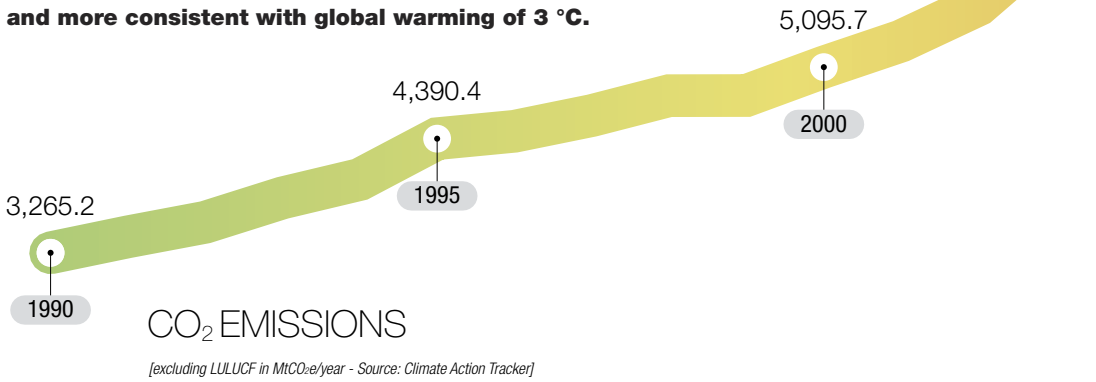
AN UNSUSTAINABLE MODEL

China has seen the biggest growth in demand for hydrocarbons since 2000 and will continue to record the greatest increase in the coming decades. Beijing also holds the worst record for carbon dioxide emissions, which, according to Climate Action Tracker estimates, in 2030 will be between 12.9 and 14.2 $GtCO_2e$. Current Chinese policies are therefore "insufficient" to comply with the +1.5 °C limit established in the Paris Agreement, and more consistent with global warming of 3 °C.



CO_2 EMISSIONS

[excluding LULUCF in $MtCO_2e$/year - Source: Climate Action Tracker]

OIL 7 – OCTOBER 2009

Inevitably, any country in China's position – where demand has grown from 2.5 to 8 million barrels a day in fifteen years – would worry about securing supplies. This increase, however, does not lead to inevitable conflict, but underlines economic growth and better living standards. It would be much more worrying if, despite the growth in demand, Chinese companies failed to invest both inside and outside national borders.

DANIEL YERGIN

OIL 8 – DECEMBER 2009

China is getting richer and richer, yet it continues to be a developing country and still has a long way to go before it can make binding commitments (on climate, Ed.). This aspect is closely linked to its particular situation. It is known that the country has the largest population on the planet (1.3 billion) and that 780 million people live in rural areas where it is still difficult to find food and clothing.

ZOU JI

OIL 16 – DEC 2011/JAN 2012

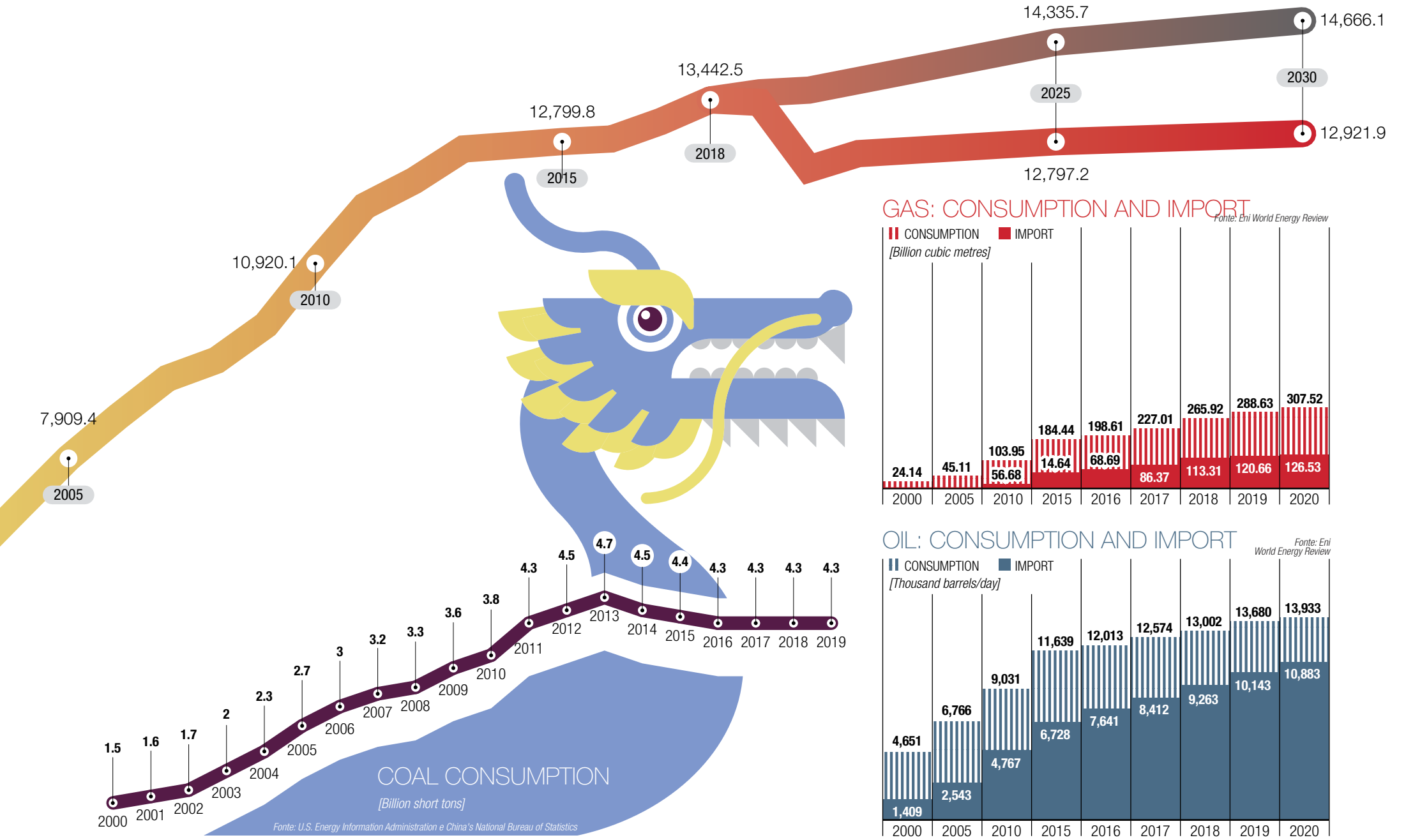
China is very cautious; it does not want to take on the role of leading country, but I believe that if you look specifically at the international financial and monetary phase, China is preparing to become a co-leader country.

GREGORY CHIN

OIL 22 – JUNE 2013

China, whose demand has grown exponentially, will have to import more precisely from the Middle East and will not be able to avoid having a direct interest in protecting the security of the region.

PIALUISA BIANCO



OIL 30 – DECEMBER 2015

Since 1992, the year in which the United Nations Conference on Environment and Development proposed sustainable development, China has been seeking, on a theoretical and practical level, a path with characteristics suitable for the country. However, due to the scarcity and low quality of resources, the fragile ecological environment and rapid industrialization and urbanization, the road to harmonious and sustainable development is very bumpy.

LIFAN LI

OIL 32 – AUGUST 2016

An economic slowdown in China means lower prices for all raw materials, imported voraciously by the Asian giant, including oil. The current low growth rate of the Chinese economy can be seen as only a transitional phase in a normal economic cycle. This means that after decades of double-digit growth, it is normal for there to be a slowdown. However, the concern is that the Chinese economy is not only slowing temporarily but has instead entered a new and prolonged phase of lean growth.

MOISÉS NAÍM

WE 48 – MAY 2021

In the context of the COP, China has traditionally led the G77, the group of emerging countries that puts pressure on industrialized countries to shoulder their responsibilities for historic emissions and make more funds available for climate finance. However, its impetuous economic growth has rendered this position unsustainable and in fact China has gradually taken on greater responsibility for the climate. The pinnacle was reached with the statement in December 2020 in which Xi Jinping pledged to reach a peak in emissions by 2030 and carbon neutrality by 2060.

LUCA FRANZA AND LORENZO COLANTONI

THE NEW BALANCE TIPPER

Russia, world leader in the production and export of oil and gas, plays a fundamental role in the energy markets. In 2016, Russia signed an unprecedented alliance with the UAE: for the first time, non-OPEC countries, led by Russia, joined the OPEC cuts in crude oil production to raise barrel prices. Russia also has a dominant position in the gas market, especially with regard to neighboring Europe.

OIL 2 – AUGUST 2008

Russia continues to be entangled in the status dilemma that has dragged on since the end of the Soviet Union. Yesterday a world superpower, today a great regional power (…), Russia is still searching for an established representation of its national interest.

ANDREA ROMANO

OIL 4 – DECEMBER 2008

Gazprom plans to reach a new level, in terms of quality, of reserve recovery by significantly increasing the volume of geological research in both traditional and new areas of activity - offshore and in the eastern part of Russia. Activities to expand our mining base abroad, to obtain licenses for the geological research of hydrocarbon deposits in various regions of the world, are becoming important for us.

ALEXEI B. MILLER

OIL 6 – JUNE 2009

Russia plays a key role in the Iranian nuclear situation. Firstly, China has so far largely followed Russia's lead in Iranian politics, doubling Russia's importance in this context. Secondly, there is the fact, linked to the first, that Russia's position greatly influences both Iran and Europe's calculations.

KARIM SADJADPOUR

The Russian economy is experiencing a period of contraction after a boom phase. As in the case of China, the assertion of greater political control is expected. However, Russia is not as fully integrated into the world economy as China. Compared to China, there is therefore a greater possibility (which, however, is impossible to quantify) that Russian leaders will turn to the old trick of causing a crisis abroad to divert attention.

RICHARD NATHAN HAASS

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OIL 10 – JUNE 2010

Despite the temporary difficulties of 2009, the Russian gas industry continues to develop, satisfying the increased needs of the economy and the growing market share in export markets.

ANDREY KRUGLOV

OIL 12 – DECEMBER 2010

As concerns South Stream, Russia would like to reduce its transit risks in the short term. In this respect, the best transit partner is a pipe that passes along the seabed and not through someone's territory. So for now there are still risks and uncertainties on transit through Ukrainian territory. In the long term, South Stream is a great project despite the pessimism that exists today over natural gas and even considering the low growth of European gas consumption for the future.

SERGEI KOMLEV

OIL 14 – JUNE 2011

China is one of the most important energy partners and one of Russia's top geopolitical priorities. Chinese-Russian interactions accelerated with the start of Vladimir Putin's presidency: amid worsening relations with the United States and Europe, Russia needed a stable partner for its political and economic deals, and China seemed to be the most suitable for creating long-term relationships.

OLGA MEFODYEVA

OIL 21 – MARCH 2013

In the Arctic region, the amount of undiscovered natural gas is three times the amount of oil reserves and most of this potential lies in Russia's undisputed exclusive economic zone.

KLAUS DODDS

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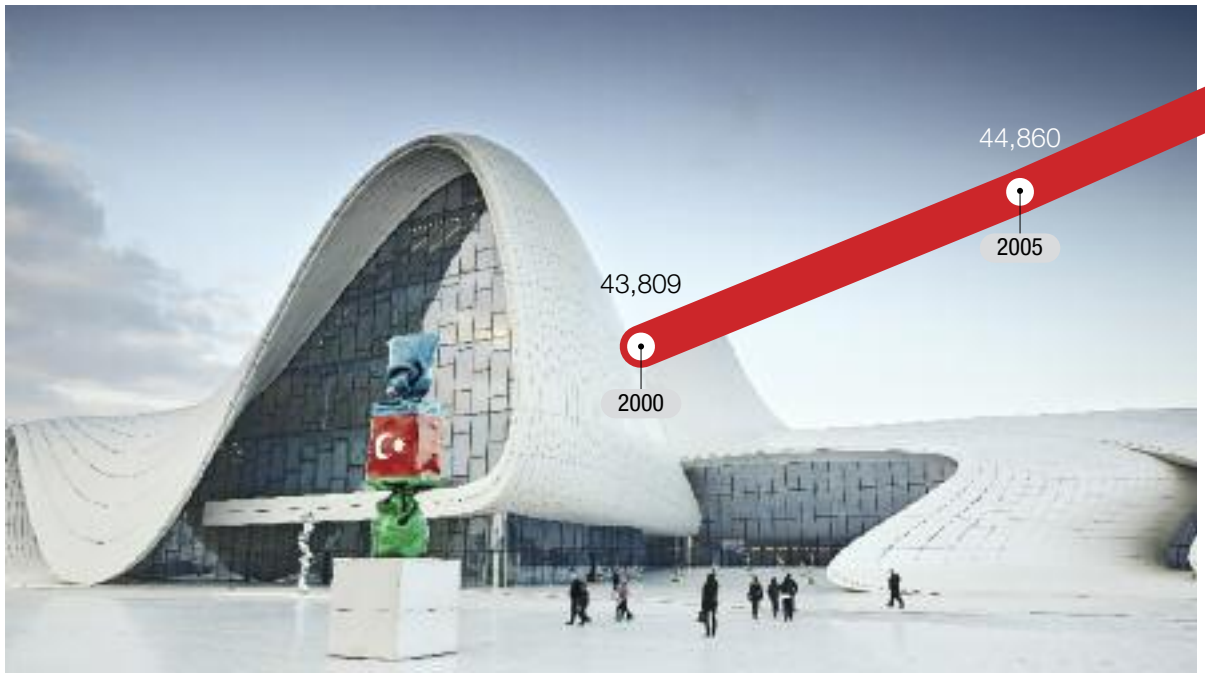

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THE OIL & GAS GIANT

Russia is one of the main global producers of hydrocarbons and holds the world record in gas exports, with 228 billion cubic meters exported in 2020, and reserves, with over 49 trillion cubic meters as at December 31, 2020.

OIL 29 – JULY 2015

Although the prevailing opinion remains that Moscow should not join the OPEC club, between the country and the Organization, since Russia became an observer, relations have been strengthened and there are numerous consultations between the Kremlin and Vienna.

EVGENY UTKIN

OIL 30 – DECEMBER 2015

Up to now, the energy relationship between the European Union and the Russian Federation has featured a kind of mutual constraint. In the medium term, faster growth compared to the EU in gas demand from Asia-Pacific countries would offer Russia the opportunity to move within a new Eurasian energy market, which has long been stigmatized as "the market of the two ovens."

DEMOSTENES FLOROS

OIL 32 – AUGUST 2016

The Kremlin's decision to annex Crimea and thus destabilize Ukraine has resulted in major upheavals in the Russian oil and gas sector and an unexpected opening of US gas exporters to European markets.

MOISÉS NAÍM

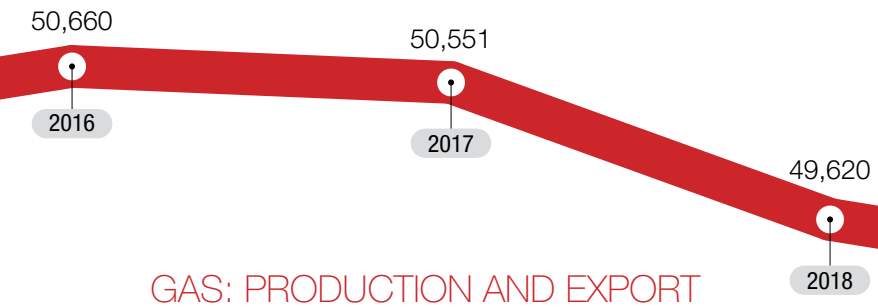
OIL 34 – MARCH 2017

The entrepreneurial approach of the Trump administration's manifesto is a very solid foundation on which the skyscraper of the new Russian-American dialog on energy can be built. Russia has a number of very interesting energy projects to offer and the American contribution could involve both managerial and technological investments and support.

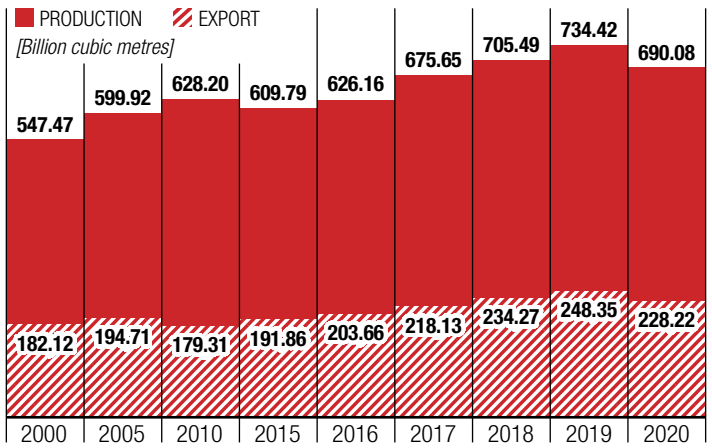
IGOR YUSUFOV

WE 41 – DECEMBER 2018

Saudi Arabia and Russia, as the main countries in the system with reserve capacities, have strengthened their cooperation. Something that would have been unthinkable less than four years

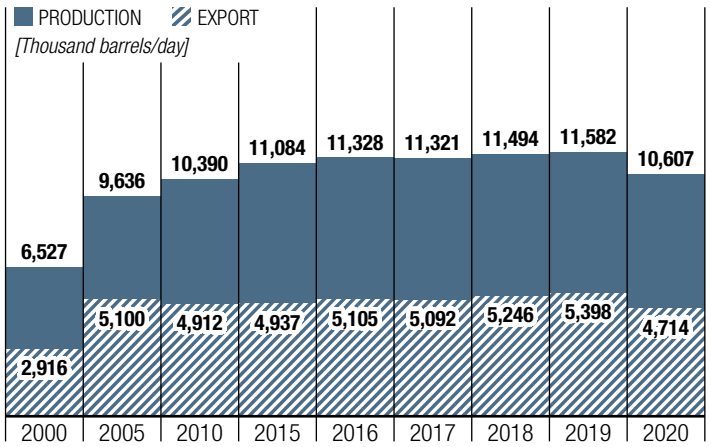


GAS: PRODUCTION AND EXPORT



Source: Eni World Energy Review

OIL: PRODUCTION AND EXPORT



Source: Eni World Energy Review

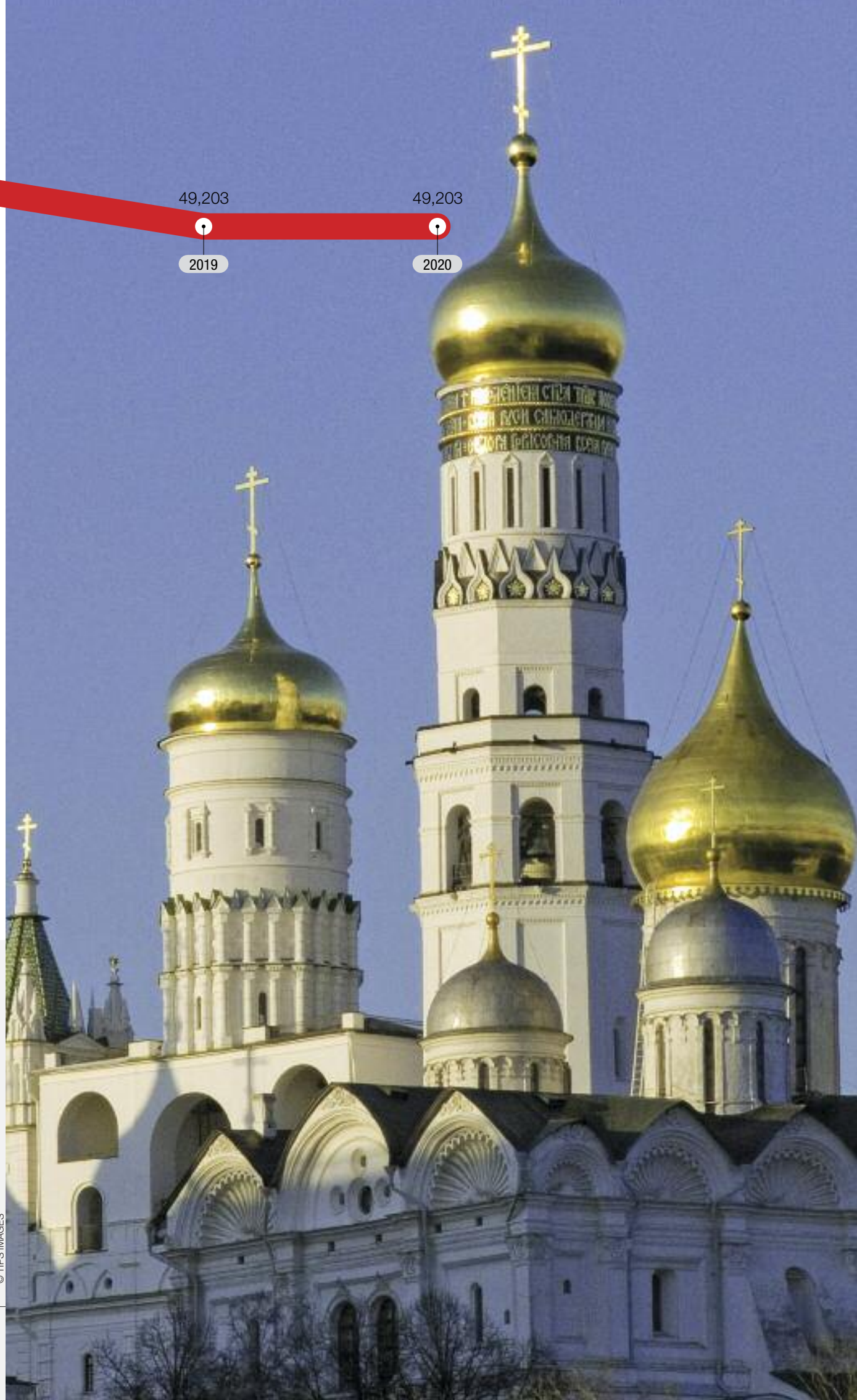
ago: the two states publicly heralded their "full alignment" of interests at OPEC's meeting with non-OPEC allies in June.

NAZRIN MEHDIYEVA

WE 48 – MAY 2021

The rise of renewable energies will also tend to affect the internal structure of "rentier states," the regimes that are supported by energy revenues, with effects on relations between the European Union, on the one hand, and Russia and the Middle East on the other.

MARTA DASSÙ



The European Union is making great efforts to maintain leadership in climate action. In the last year, it has raised its 2030 target of cuts in CO_2 emissions from “at least 40 percent” to “at least 55 percent” to reach net zero by 2050. The transition of the EU’s energy system to low-carbon sources will also allow member countries to free themselves from dependence on Russian gas.

LEADER IN CLIMATE

OIL 4 – DECEMBER 2008

In Brussels it became clear that we cannot create enough solar parks and centralized wind farms to power all of Europe. (…) We have to imagine that every house, every factory, every office, every shopping mall, every industrial park in the world is a potential power plant.

JEREMY RIFKIN

OIL 6 – JUNE 2009

A reconciliation between the United States and Iran could mean the re-emergence of Iran from self-inflicted isolation. Among other things, this could undermine Russia’s monopoly on Europe as the sole supplier of natural gas.

KARIM SADJADPOUR

OIL 8 – DECEMBER 2009

Alternative sources and energy efficiency can help reduce Europe’s dependence on Russian gas. Alternative pipelines can help but the supply problem cannot be solved with pipelines alone.

RICHARD L. MORNINGSTAR

OIL 15 – NOVEMBER 2011

Weakness in political leadership has characterized Europe’s approach to its unsustainable debt crisis, stagnant economic growth and institutional weakness. The Eurozone’s attempt to implement a common monetary policy without a common pot has failed. Therefore, no credible solution has emerged to the situation in the peripheral states of the Eurozone.

JAMES FULTON HOGE

OIL 16 – DEC 2011/JAN 2012

In Europe, to avoid the worst, the path of austerity has been taken almost everywhere. That is to say, the various states have been obliged to put their finances in order, cutting expenses and increasing taxes. And this has ended up (and will end by) stifling an economy that was already not showing signs of great momentum.

GIUSEPPE TURANI

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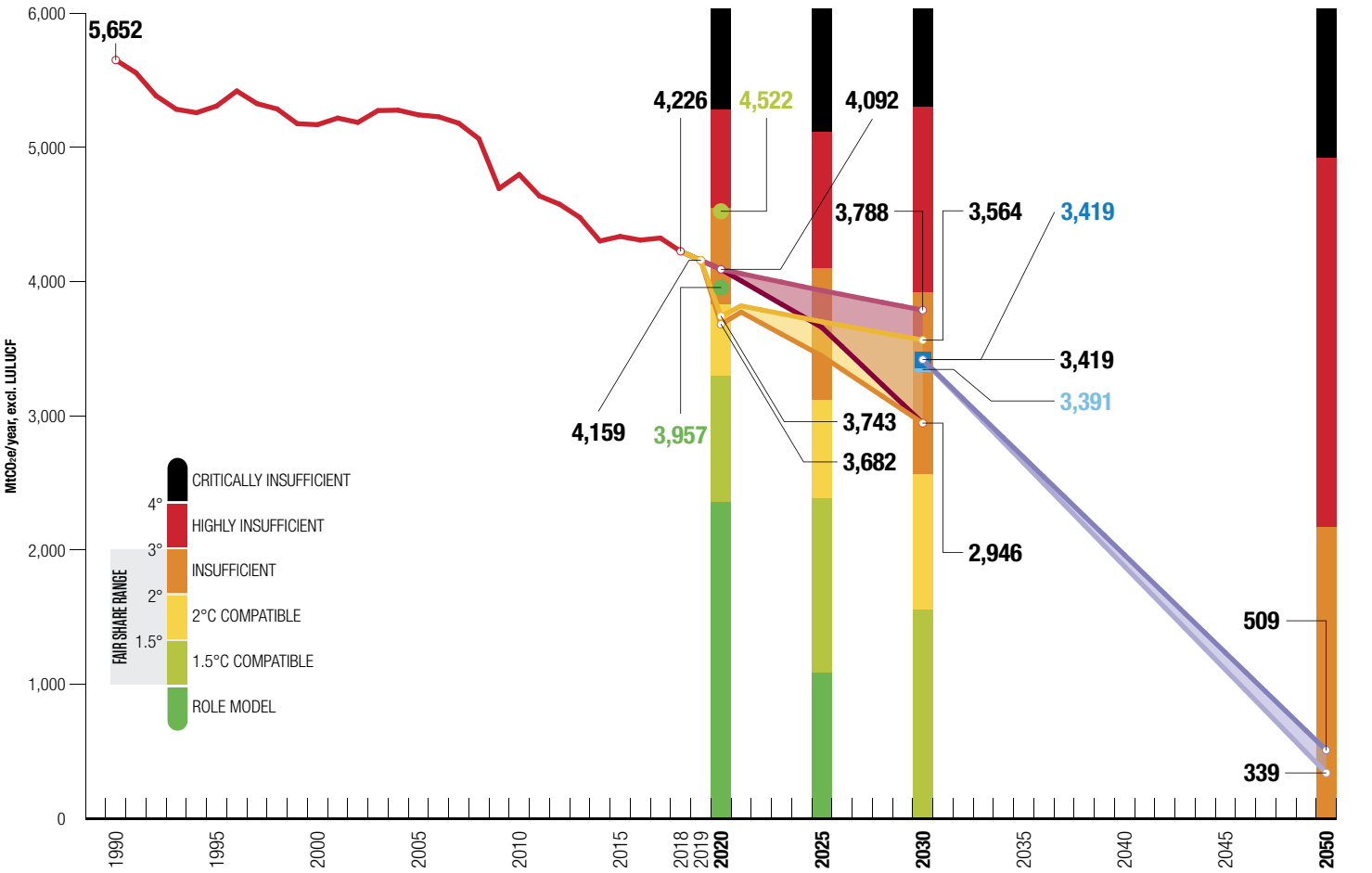
ACTION



EU27, CO_2 EMISSIONS

EU climate policies and pledges need to be further strengthened to remain in line with the +1.5 °C temperature limit of the Paris Agreement. According to the Climate Action Tracker, the EU should increase its 2030 emissions reduction target to "at least 62 percent" below 1990 levels, adopt the necessary policies to achieve this target and significantly increase its support for climate action in developing countries.

HISTORICAL EMISSIONS, EXCL. FORESTRY*
POST-COVID-19 – IMPLEMENTATION OF NATIONAL MEASURES*
POST-COVID-19 – IMPLEMENTATION OF EU LEGISLATION*
2020 PLEDGE *(Unconditional)*
2020 PLEDGE *(Conditional)*
NDC (Min)
NDC (Max)
LONG-TERM PATHWAY (Min)
LONG-TERM PATHWAY (Max)
PRE-COVID-19 – IMPLEMENTATIN OF NATIONAL MEASURES*
PRE-COVID-19 – IMPLEMENTATION OF EU LEGISLATION*

** Total, excl. LULUCF*
Source: 2020 Climate Action Tracker

OIL 22 – JUNE 2013

Today, the refining industry in Western Europe is often referred to as the Cinderella of the oil industry. For some time now, international oil companies (IOCs), that is the historically, financially and technologically best endowed companies in the sector, have been reducing their refining capacity in Europe while increasing their exposure in emerging and non-OECD countries.

PAUL BETTS

Imagining that global energy needs continue to increase in the coming years, the first goal (of Europe, Ed.) is to diversify our sources and supply routes. In this regard, we look with great interest to the different projects that are currently on the table. It seems to us that the project that is most popular at the moment is definitely the TAP, which is racing ahead. The Nabucco, which had started with more enthusiasm and was backed with more interest by the European Union, has now been considerably downgraded.

AMALIA SARTORI

OIL 24 – DECEMBER 2013

Energy dependence on imported fuels can be reduced by increasing the use of alternative energy sources, which is why the EU has set itself the goal of meeting 20 percent of its energy needs with renewables by 2020. Some member states, such as Germany and Sweden, have already made substantial investments in solar and wind power. Unconventional gas production can provide us with new opportunities to increase domestic production.

GÜNTHER OETTINGER

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EU, IMPORTS OF NATURAL GAS BY COUNTRY

In million cubic meters (2019)

Source: Eurostat

total imports 440,593.007

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OIL 25 – MARCH 2014

In my opinion, reindustrialization is the most important issue for Europe today. Without industry, there is no future for the European Union. Therefore, in addition to focusing on energy and climate policies, we need to attach greater importance to industrial policies.

JANUSZ PIECHOCIŃSKI

OIL 26 – JULY 2014

After the outbreak of the Ukrainian crisis, Europe considered importing large quantities of shale gas from the US in order to free itself from dependence on Russian natural gas. However, the construction of intercontinental infrastructure is costly in terms of money and time.

LIFAN LI

OIL 31 – APRIL 2016

The European Union fully recognizes the energy importance of the Mediterranean region and calls for strategic partnerships to be created with Mediterranean producer and transit countries.

MAROŠ ŠEFČOVIČ

OIL 33 – DECEMBER 2016

The referendum (on Brexit, Ed.) and its outcome have introduced a serious source of new turmoil and confusion for both the UK and the European Union economies and, not least, for the energy sector.

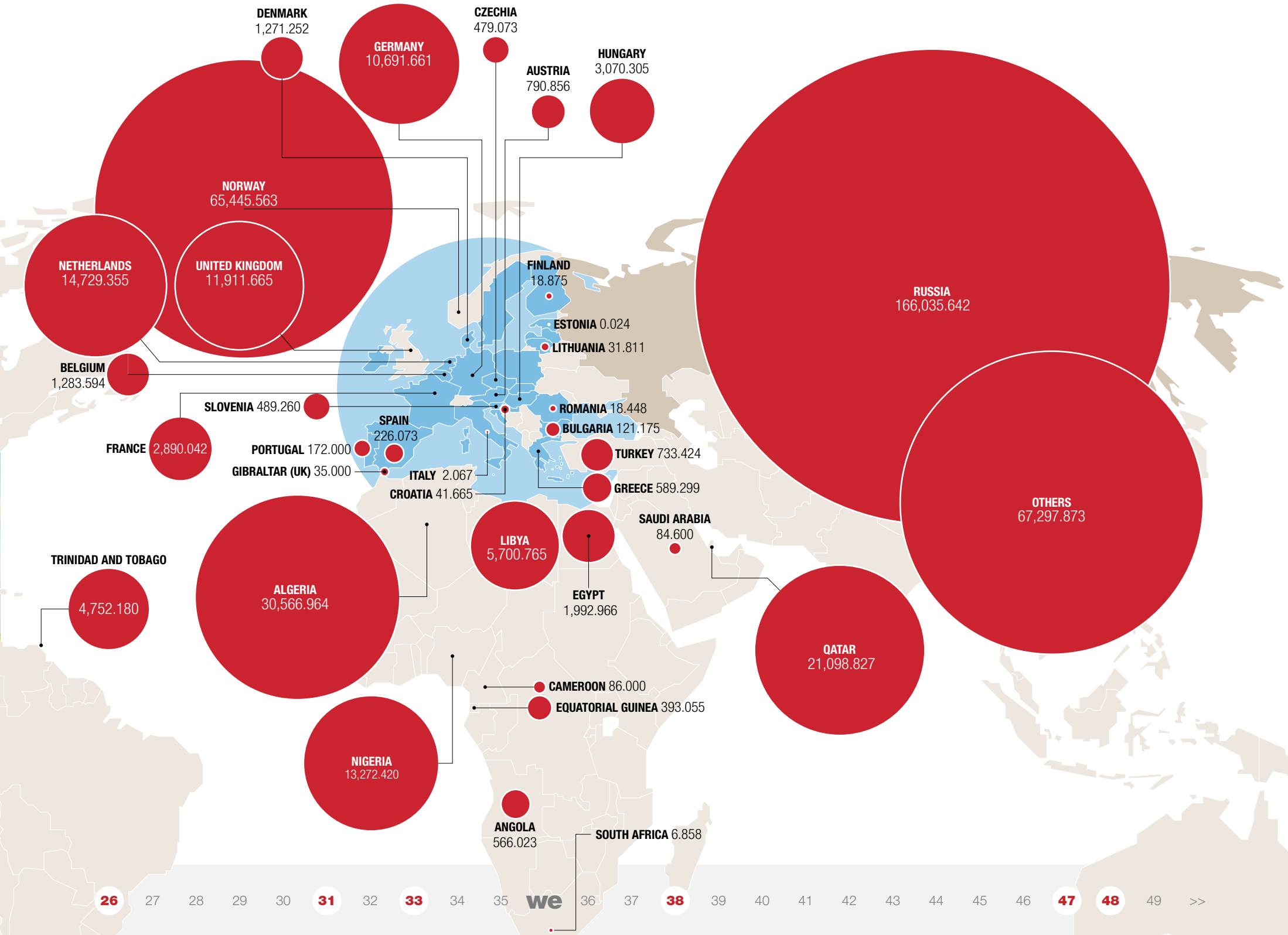
PAUL BETTS

A larger and more flexible global LNG market will be able to influence gas prices in Europe in the years to come, mitigating Europe's dependence on Russian gas supplies in many respects.

FRANCIS O'SULLIVAN

WE 38 – MARCH 2018

The European Parliament has given full support to a true single market for energy, without distortions, with fair prices and consumer protection; as well as to more investments and ambitious targets for renewables and energy efficiency. Thanks to this political action, Europe is a global leader



in energy saving, clean energy, efficient use of resources and emissions cuts.

ANTONIO TAJANI

Energy and climate are our priorities, also in light of the common commitment enshrined in the Paris Agreement and our ambition to be leaders in the global transition to a clean economy. Our goal remains very clear: by 2019, the Energy Union must no longer be a policy. It must be a reality.

MAROŠ ŠEFČOVIČ

WE 47 – NOVEMBER 2020

The pandemic and its impact on economies have overshadowed the urgency of climate action. In times of uncertainty, leadership is key. The European Union could provide this leadership by successfully moving towards its announced goal of achieving a carbon neutral economy by 2050.

ANDRIS PIEBALGS

WE 48 – MARCH 2021

Despite being still heavily dependent on fossil fuels, which represent just over 70 percent of the continental energy mix, Europe is now aiming for a profound transformation of its economic system based on the paradigm of ecological transition: a 55 percent reduction in net carbon emissions by 2030 and climate neutrality by 2050. This is also why financing the energy transition constitutes a substantial part of the funds allocated under Next Generation EU.

MARTA DASSÙ

A NEW VISION

The Persian Gulf is the paradigm in the ongoing energy transformation. The oil countries par excellence, in fact, on the one hand continue to close ranks in defense of their market shares, while on the other adopt “visions” that aim to redirect and diversify their activities. The watchword is to free ourselves from dependence on hydrocarbon rents and develop a new, sustainable economic model.

OIL 1 – MAY 2008

Saudi Arabia used its reserves to establish itself as a dominant member, flooding the market with its buffer when normal global production was disrupted, such as during the Iran - Iraq war and the first Gulf War.

VIJAY V. VAITHEESWARAN

OIL 6 – JUNE 2009

Iraq needs to start from scratch and rebuild everything: from the most basic things, such as schools, hospitals, roads, to wide-ranging services, such as the banking, communications and transport systems. But to do all this, there is the fairly urgent need for USD 10 billion. (…) Some have lost hope, unable to see for themselves the concrete results of the reconstruction plan, which strongly depends on the proceeds of our oil production.

HUSSEIN AL-SHAHRISTANI

The Iranians who oppose dialog express their hostility towards the US in ideological terms but in reality they are driven by greed for power. They know that an improvement in relations with Washington would undermine the political and economic semi-monopolies they enjoy in isolation.

KARIM SADJADPOUR

OIL 24 – DECEMBER 2013

[Transition, Ed.]

Is a term that is used mainly in Europe, not in our part of the world. We prefer to examine the nature of the challenges our country faces, because these vary uniquely from one state to another. They depend on the climate and the location. To overcome the challenges, I believe it is important to engage in dialog and learn from each other's experiences. In this way, each country will have the tools to solve the problems that concern it, in both generation and consumption.

MATAR HAMED AL NEYADI

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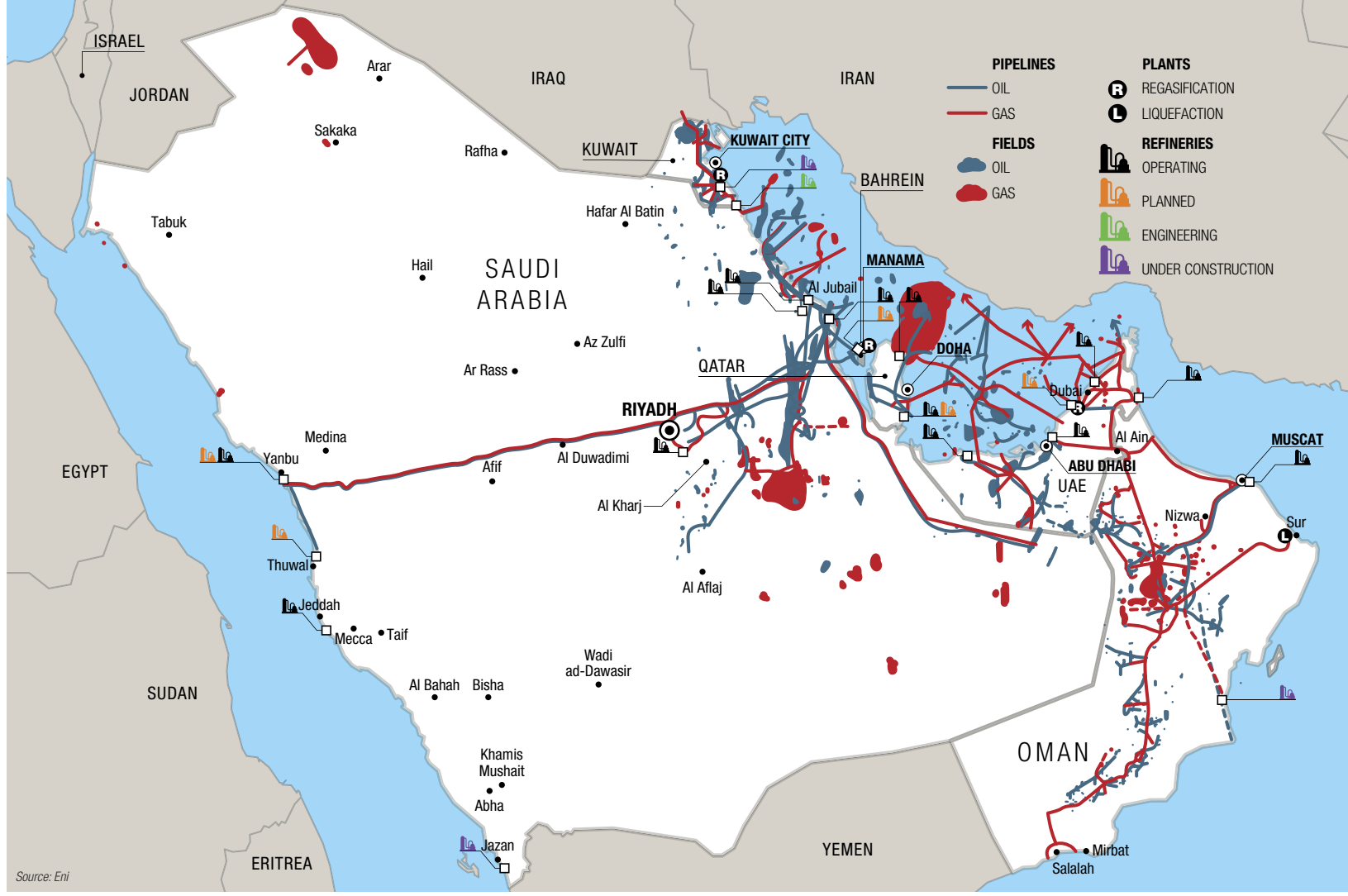

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THE GOLDEN PENINSULA

The countries of the Gulf Cooperation Council (GCC), which brings together Saudi Arabia, Kuwait, Qatar, United Arab Emirates, Bahrain and Oman, occupy an area of just over 965,000 square miles, but own almost a third of the world oil reserves and about a quarter of world gas reserves, as well as 6 percent of global refining capacity. The map shows the main oil and gas fields and the infrastructures for the transport of hydrocarbons and the refining of crude oil.

© ALAMY

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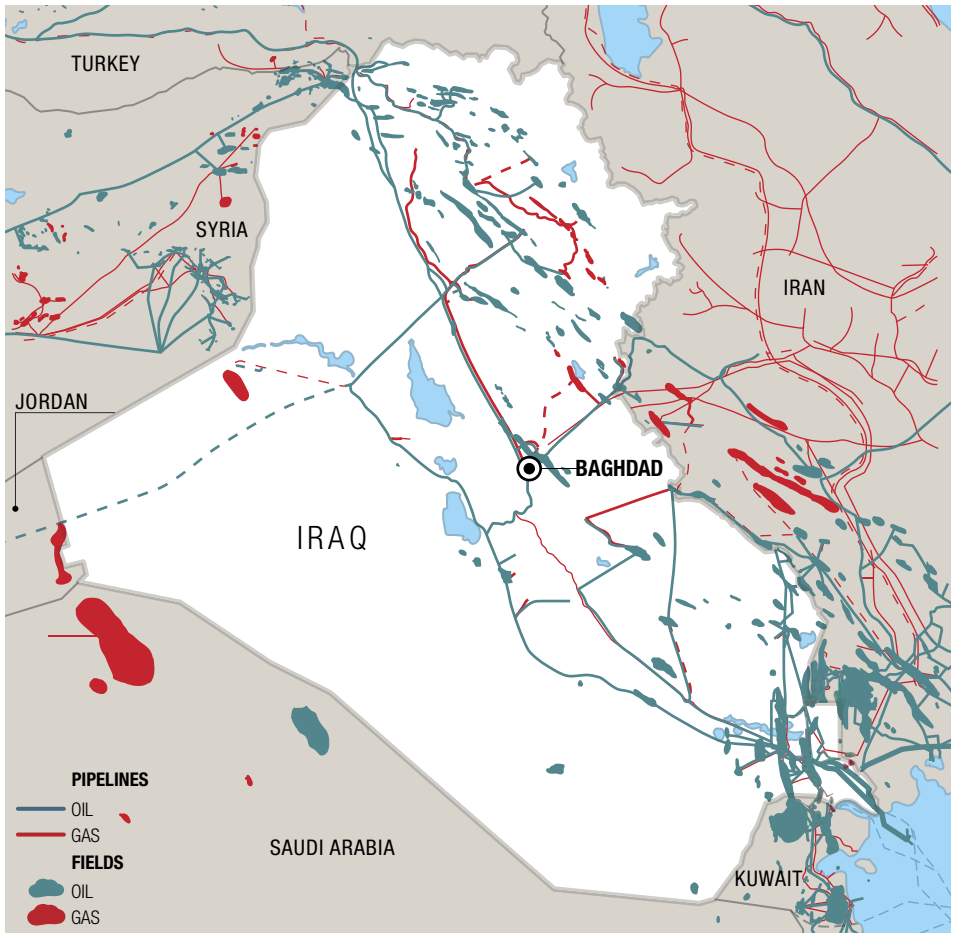
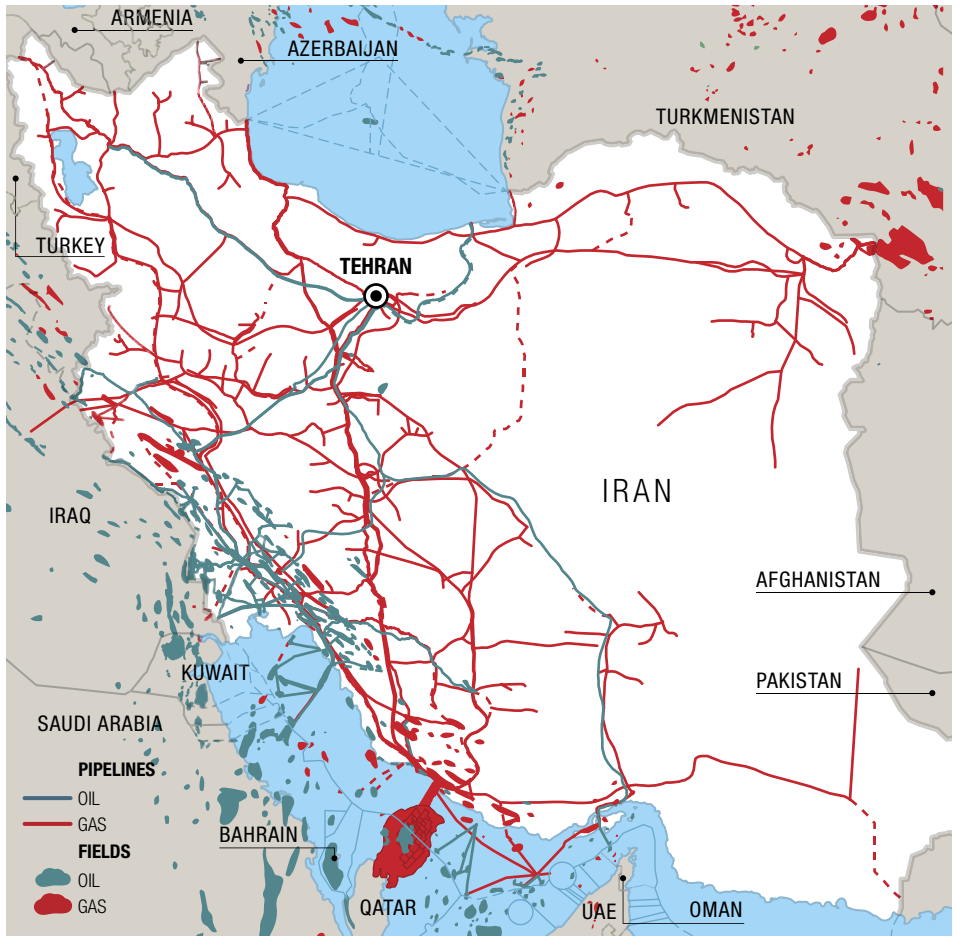
IRAN AND IRAQ

Iran and Iraq are world leaders in terms of reserves and production of hydrocarbons, despite the fact that the potential of both countries is still not fully tapped due to the political events of recent years. The maps show the main oil and gas fields and infrastructures for the transport of hydrocarbons and the refining of crude oil.

Source: Eni





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OIL 32 – AUGUST 2016

One fundamental goal (for Saudi Arabia, Ed.) is to build an economy that is well diversified and less dependent on oil. To achieve this, Vision 2030 focuses on the development of human capital through an improvement in the level of education, focusing in particular on education in early childhood.

BASSAM FATTOUH AND AMRITA SEN

Saudi Arabia is able to extract oil for an average total cost of about USD 10 a barrel, but it needs a barrel price of around USD 100 to balance the state budget.

PAUL SULLIVAN

WE 42 – APRIL 2019

Until recently, the Gulf countries were not even too interested in renewables. In just a few years, not only have they begun to wonder "how many renewables should be integrated with fossil fuels," but they have even gone so far as to wonder "how to go further" both within and beyond the borders of the region.

ADNAN Z. AMIN

Across the Middle East, producers have made significant efforts to shift activities down the supply chain in an attempt to get more value from hydrocarbon resources. (…) This expansion of activities increases revenues per barrel produced but, at the same time, risks increasing dependency on oil revenues.

ALI AL-SAFFAR

© AGF

The Gulf monarchies united under the Gulf Cooperation Council (GCC) – Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates – intent on implementing development plans to diversify their economies, have sought to attract Chinese investments in the context of BRI projects. This consolidation of relations is not an anomaly destined to disappear: on the contrary, the power of the People's Republic of China in the Gulf is on the rise.

JONATHAN FULTON

On March 5, 2018, the Iraqi Council of Representatives voted in favor of the bill establishing the Iraq National Oil Company. In addition to regulating the production and exports of crude oil, this state-owned body has the task of distributing the revenues equally in the different regions of Iraq. This historic decision, in the intentions of the government, should allow the country to develop fields, refineries and production plants through the work of local state-owned companies, thus guaranteeing employment, full sovereignty over its vast resources and independence from foreign companies.

ADIB FATEH ALI

WE 47 – NOVEMBER 2020

In the Gulf countries, decarbonization has not been a significant political driver. Although the development of renewable energy is increasing (albeit at a slow pace in all countries except the UAE), the main results will likely be seen after 2030. The crisis appears to have had a limited impact on Qatar's plans for a huge expansion of LNG export capacity, although these plans could be delayed for logistical reasons.

TATIANA MITROVA AND JONATHAN STERN

THE CHALLENGE OF SUSTAINABLE DEVELOPMENT

In Africa, over 600 million people still do not have access to electricity and nearly one billion do not have clean energy sources for cooking. Funding and technology are needed to capitalize in a sustainable way on the continent's enormous natural wealth. The challenge of access to energy meets the challenge of transition.

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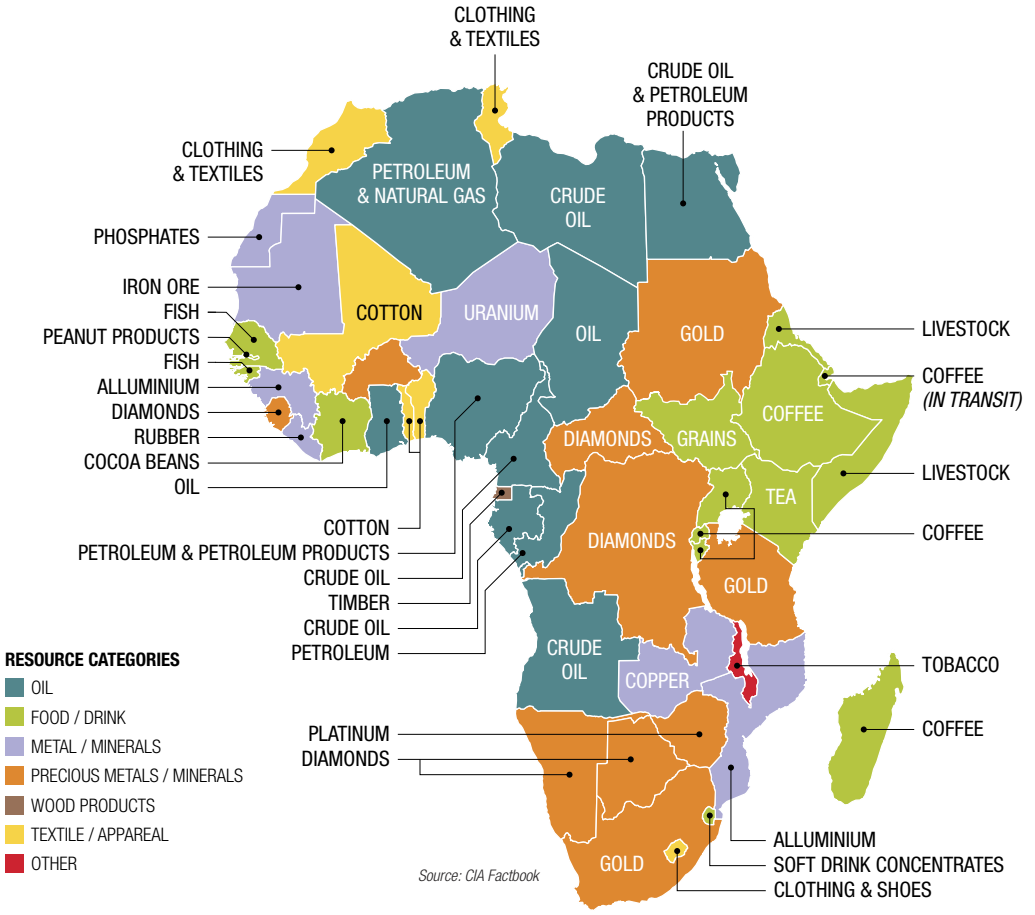


NATURAL RESOURCES

Africa possesses extraordinary natural resources. Gold, diamonds and copper are found in large quantities in many countries in Western and Southern Africa. Oil is found throughout the Sahelian belt, in Nigeria and along the western coasts, in Egypt and Libya in the north, and in southern Sudan. There are also many deposits of iron, bauxite, copper, titanium and uranium.

OIL 11 – SEPTEMBER 2010

In principle, the financial crisis did not hit Africa in the same way it affected Europe and North America because we have a closed economy with few exports and therefore we are more protected. But certainly, the crisis had an effect, insofar as now there are more poor people, more desperate companies that want to invest in Africa and would thus make even more desperate decisions to manage it. In this situation, unfortunately, we can only expect the creation of new opportunities for corruption.

NORMAN TJOMBE

The rise or fall of every country and every society depends on the type of leadership they possess, meaning being capable enough of managing difficult issues and dialogue, and the ability to be honest through these challenges is key. On the contrary, if the ruling class of a country is weak, not much progress can be expected. In African countries, the question of leadership is critical, and this has a negative effect on the whole range of issues related to sustainable development; if your structure of governance is so weak that makes your decisions weak too, we cannot speak of sustainable development.

OLUMIDE ABIMBOLA AJAYI

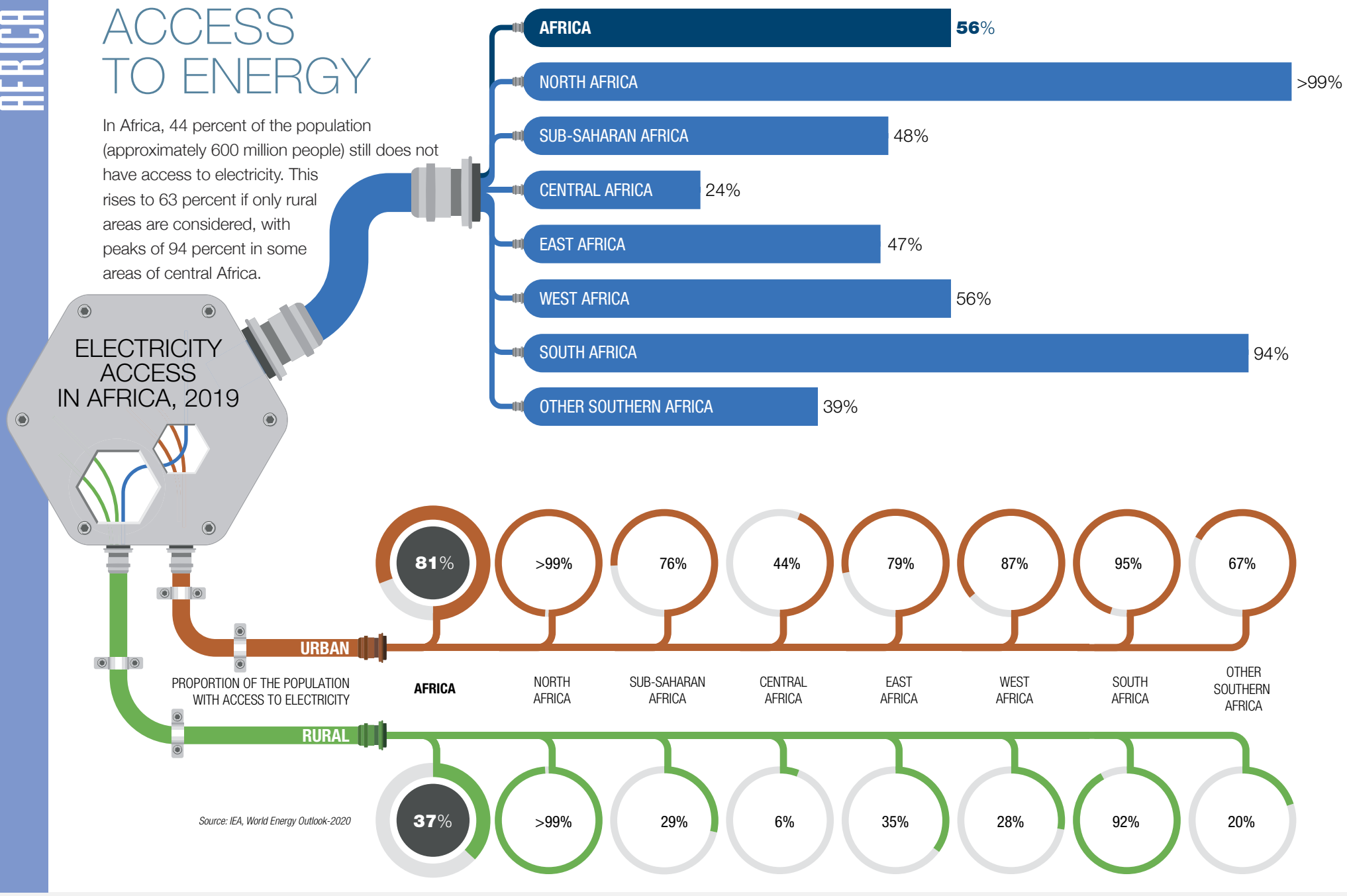
OIL 14 – JUNE 2011

For many African states, Beijing is an ideal partner not only because it has no imperialist ambitions, but even more because it too is seen as an emerging country and therefore a country able to give voice to developing countries and make that voice heard. China's investments in the infrastructure of several African countries are considered as a form of attention towards them, towards their well-being.

CARRIE LIU CURRIER

ACCESS TO ENERGY

In Africa, 44 percent of the population (approximately 600 million people) still does not have access to electricity. This rises to 63 percent if only rural areas are considered, with peaks of 94 percent in some areas of central Africa.



OIL 17 – APRIL 2012

If the predictions prove to be correct, Mozambique will become one of the main exporters of gas and will be able to enjoy a true stroke of good fortune. But Mozambique is not alone. The underground resources per square mile that have been verified in poor countries—especially in Africa—are just a quarter of those in richer and better explored countries. It is therefore not surprising that high prices and new technologies are spurring new discoveries of oil, gas and minerals throughout the developing world.

TODD MOSS AND ALAN GELB

OIL 18 – JUNE 2012

The development of infrastructure for power supply to the population, in all its forms, is a key element in the strategy to reduce poverty reduction and contributes significantly to the industrialization of the country, in the same way as the achievement of the Millennium Development Goals. In Congo, despite the enormous energy potential of which the country abounds—and whose major sources of exploitation are water, oil, wood, natural gas and solar—the overall rate of access to energy remains low.

HENRI OSSEBI

The map of resources in Africa must result in an integrated and continental plan of resources; this will allow us to change the picture of the world overnight (going from the black continent to a continent full of life, hope and a future for generations to come). We know what resources we have at our disposal; what we need now is financial and technological support.

ELIZABETH DIPUO PETERS

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OIL 19 – OCTOBER 2012

The "Arab Spring" did not have an agenda or supranational connections; on the contrary, the protesters were worried exclusively about their own national situation and made no room for claims in support of supranational causes, such as the Palestinian issue, and did not give in to the usual condemnations against Zionism or US imperialism.

OLIVIER ROY

Oil production in Africa should enjoy spectacular development over the next decade. However, oil companies will have to identify local partners who can guarantee a form of "social peace," with a fairer distribution of the proceeds from oil, in order to prevent the proliferation of diplomatic incidents.

PIERRE CHERRUAU

WE 36 – OCTOBER 2017

The discovery of the Zohr oil field proved how the adoption of new exploration models can lead to exceptional results.
Considering the cutting-edge technologies and the operational approaches used for this success in the field of exploration, this discovery is even more important since it was made in Egypt.

TAREK EL-MOLLA

WE 37 – DECEMBER 2017

China is the world's second largest oil consumer and accounts for over 40 percent of the global demand for base metals. Therefore, its portfolio of investments in Africa reflects its own need for resources.

PETER PHAM

SHUFFLE OF THE LEADERBOARD

Twenty years ago in South America, when we talked about oil we were talking about Venezuela, which was among the top five world producers of crude oil. Then there was the collapse: following a mix of lack of investment and corruption, Venezuelan production fell steadily year after year. Brazil, already a promising country in the past, is experiencing a great boom with record Production, which places it in the world's top ten producers. Mexico, on the other hand, big in the 2000s for oil production, has recorded a continuous decline since 2005.

OIL 2 – AUGUST 2008

The decisive role, in terms of political power relations in Latin America, of the availability of a significant wealth of energy resources in America appears evident when considering, on the one hand, its continued support of the fortunes of the Chavista regime, and through this, both "post-Fidel" Cuba (otherwise a step away from capitulating) and the Nicaragua of the revived Daniel Ortega and, on the other hand, the robust growth prospects that would open up in Brazil with the increasingly extensive use of biofuels.

VALERIO CASTRONOVO

OIL 7 – OCTOBER 2009

If the global oil industry's reserve capacity is little to nothing, as in most of the period between 2003 and 2008, major price changes are needed to restore balance to the market when sudden changes occur in demand and supply, such as the interruption of the Venezuelan production in December 2002, the Iraq war in April 2003 and the sharp increase in oil demand in China in 2004.

GUY CARUSO

OIL 11 – SEPTEMBER 2010

Brazil is an example of how new technologies in exploration and production have created a new leader in the energy market. Supply has also been stimulated by new companies that can now access the international financial markets in a significant way to finance their own growth. At the same time, we are also seeing a resurgence of the nationalization of resources and the expansion of state oil companies everywhere.

MOHAMED A. EL-ERIAN

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OIL 16 – JANUARY 2012

Ever greater resources of traditional hydrocarbons are exploited in non-OPEC countries such as Brazil, Russia and Angola. For example, the new oil field of Tupi, off the coast of Brazil, contains proven and demonstrable reserves of over 5 billion barrels of good quality oil, a volume comparable with the current oil reserves in Norway.

MOISÉS NAÌM

OIL 20 – DECEMBER 2012

It is not possible to change the situation in regions rich in resources like the Middle East or Latin America, because the governments and corporations in these countries want to control their own resources. At least some of them are ready to give up a share to the integrated oil and gas companies (IOCs), but they don't want the IOCs to control these reserves. Basically, it means that these reserves will be developed more slowly than they would if the IOCs controlled them.

JONATHAN STERN

OIL 24 – DECEMBER 2013

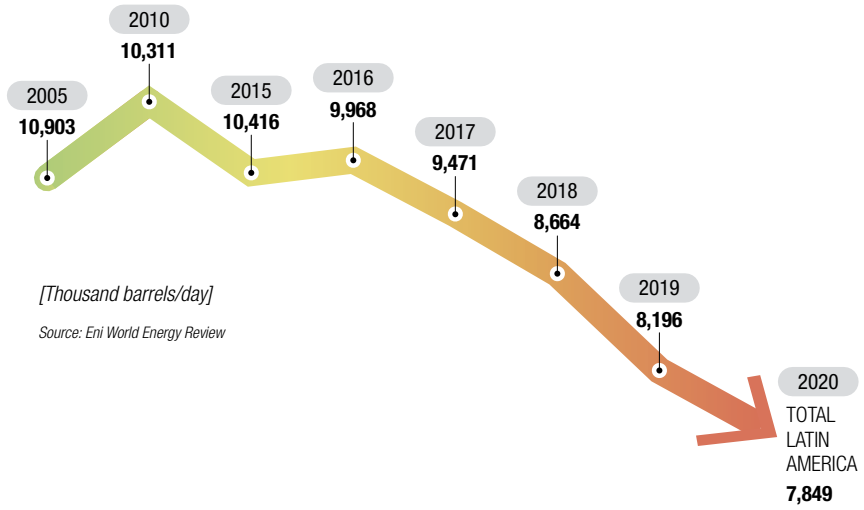
For years, Latin America has been the focus of limited attention, which has led to a weaker US presence in the region. In some countries, this void has been filled by anti-American populist leaders and the unprecedented presence of China. US technology for the development of shale gas and non-renewable energy sources can be instrumental in strengthening the US presence in countries such as Argentina, where there are important shale gas resources, as well as in Central America and the Caribbean, where there are poor hydrocarbon resources.

MOISÉS NAÌM

OIL 27 – NOVEMBER 2014

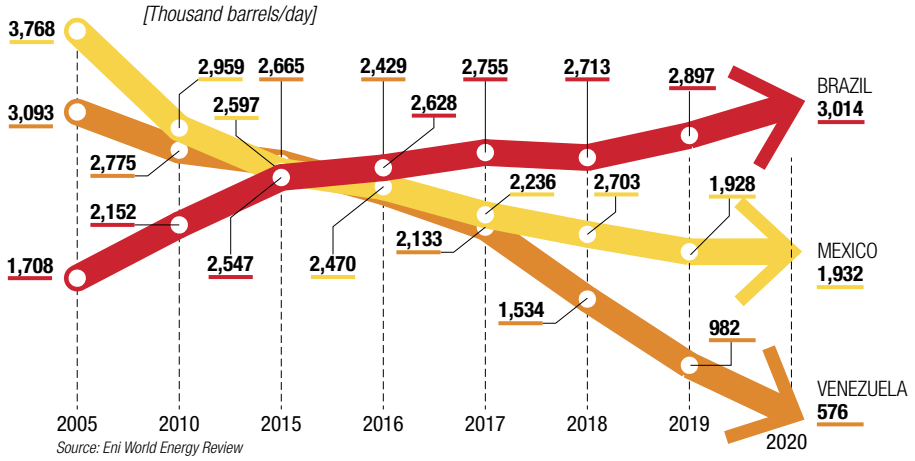
We are following closely the developments of the energy reforms in Mexico (…), a bold move in the energy sector to attract direct foreign investment in Mexico. North America, with Canada and the US, are an immense oil region to which Mexico is connected.

LEE M. TILLMAN



OIL PRODUCTION: SOME GO UP AND SOME GO DOWN

Over the past twenty years, oil production in Latin America has dropped significantly (graph above). In particular, in the biggest producer countries (graph below) the trend was reversed. Venezuela and Mexico, initially the largest producers, have seen a progressive decline, while Brazil is progressively increasing its production share.




© SIME PHOTO

OIL 32 – AUGUST 2016

Latin America's oil industry could have a bright future, as it boasts the greatest resources outside of the Middle East; but besides dysfunctional policies there are other risks to consider. In the long run, the regional oil industry, like the rest of the world, will face the risks derived from climate change and the policies to reduce its impact, as well as the risk that oil will lose its role as the main fuel for transport.

FRANCISCO J. MONALDI

OIL 34 – MARCH 2017

The greatest concern of the gas and oil industry is the fact that more than half of the natural gas exports in the last two years has been purchased by Mexico.

MOLLY MOORE

© ALAMY/IPA

© SIME PHOTO

© CONTRASTO

OIL 35 – JUNE 2017

Mexico's Energy Reform is a "green" reform that defines three mechanisms to stimulate the use of clean energy and accelerate the transition to a low-carbon economy, achieve the goals of generating power from renewables and reduce greenhouse gases to mitigate climate change.

PEDRO JOAQUIN COLDWELL

South America continues to be a land of very hard and intense political adventures and challenges, whose stakes are the control of energy sources and nations that are still immersed in the past of the great oil nationalism cycle.

GIULIO SAPELLI

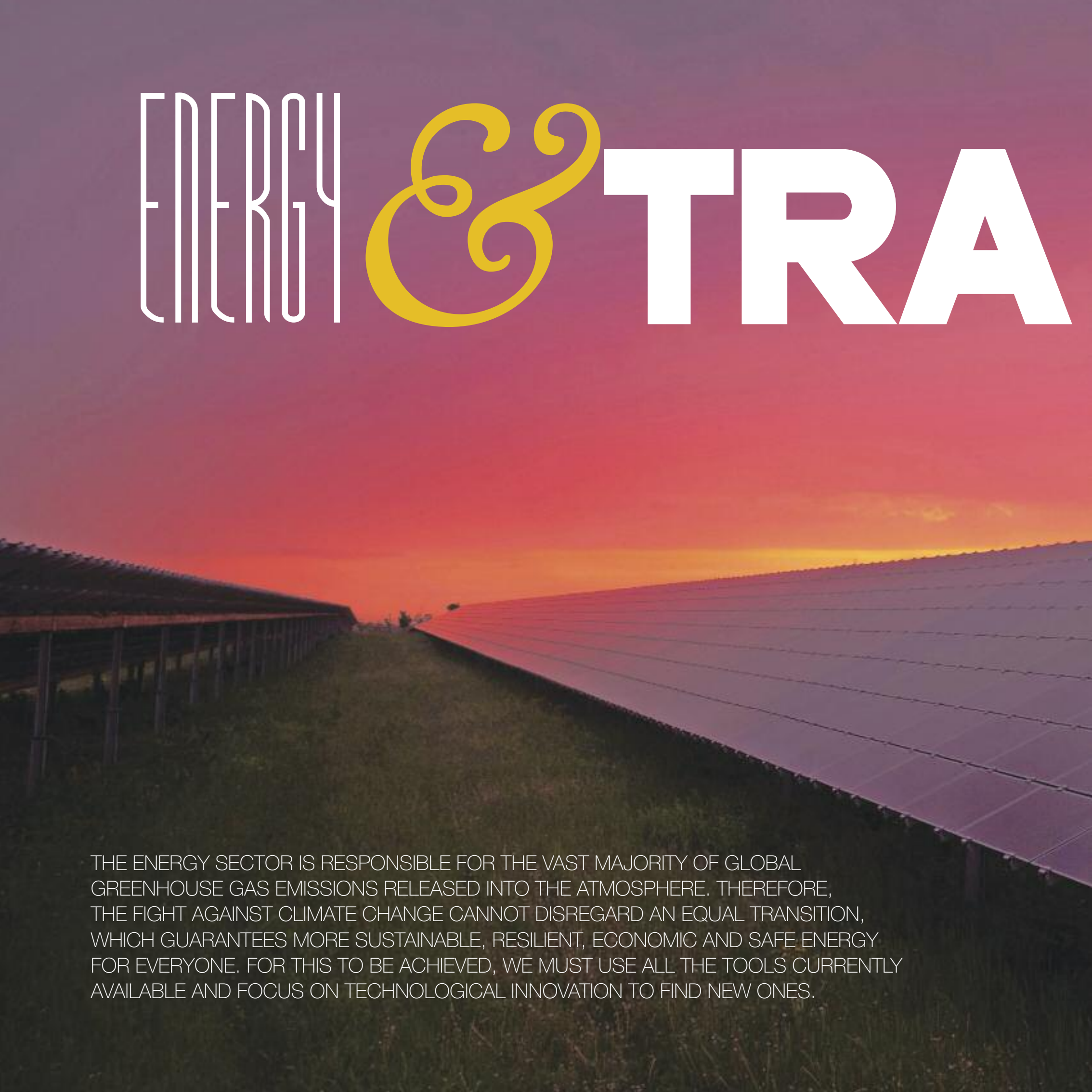
Venezuela is twice the size of California with a population of over 31 million, and is endowed with immense resources and natural beauty.
It was the main supplier of oil to the Allies during World War II and one of the biggest oil exporters on the planet.
It is a nation whose immense potential still holds a lot of promise.

PAUL SULLIVAN

Our goal is to become the energy center of South America. We are working towards this, not just in the sector for which the country is already known, that is, gas export, but also in the development of alternative energies, with the support of other countries.

GUADALUPE PALOMEQUE DE LA CRUZ

ENERGY & TRA



THE ENERGY SECTOR IS RESPONSIBLE FOR THE VAST MAJORITY OF GLOBAL GREENHOUSE GAS EMISSIONS RELEASED INTO THE ATMOSPHERE. THEREFORE, THE FIGHT AGAINST CLIMATE CHANGE CANNOT DISREGARD AN EQUAL TRANSITION, WHICH GUARANTEES MORE SUSTAINABLE, RESILIENT, ECONOMIC AND SAFE ENERGY FOR EVERYONE. FOR THIS TO BE ACHIEVED, WE MUST USE ALL THE TOOLS CURRENTLY AVAILABLE AND FOCUS ON TECHNOLOGICAL INNOVATION TO FIND NEW ONES.

NSITION

© KARSTEN WURTH/UNSPLASH

14 YEARS OF CLIMATE ACTION

2008
DECEMBER

POZNAN
The 14th Conference of the Parties in Poznan, Poland, led to important advances in support to developing countries: the launch of the Adaptation Fund under the Kyoto Protocol and the Poznan Strategic Programme on Technology Transfer.

2009
DECEMBER

COPENAGHEN
World leaders gathered for the 15th Conference of the Parties in Copenhagen, Denmark and signed the Copenhagen Agreement. Developed countries commit to rapid financing for a total of USD 30 billion, to be disbursed in the period 2010-2012.

$30bln

2010
DECEMBER

CANCUN
The XVI Conference of the Parties resulted in the Cancun Accords, a comprehensive package to help developing countries tackle climate change. The Green Climate Fund, the Technology Mechanism and the Cancun Adaptation Framework were established.

2011
DECEMBER

DURBAN
At the 17th Conference of the Parties, governments committed to a new universal agreement on climate change, to be signed by 2015 for the period following 2020, and launched the Ad Hoc Working Group on the Durban Platform for Enhanced Action.

2012
DECEMBER

DOHA
At the 18th Conference of the Parties, governments agreed to work swiftly on a universal agreement on climate change, to be concluded by 2015, and committed to identifying how to intensify efforts further ahead of 2020 with respect to existing pledges to cut emissions.
The Doha Amendment was also adopted, marking the beginning of the second commitment period of the Kyoto Protocol.

2013
NOVEMBER

WARSAW
The 19th Conference of the Parties produces the Warsaw Outcomes, including a rulebook for reducing emissions from deforestation and forest degradation and a mechanism to address the losses and damage caused by the long-term impacts of climate change.

THE EXPERTS

YOU CAN FIND THE AUTHOR BIOS ON PAGE 84

OIL 1 2 **3** 4 5 6 7 8 **9** 10 **11** 12 13 14 15 **16** 17 **18** 19 20 21 22 23 24 **25**

OIL 3 – OCTOBER 2008

I think the issue of climate change and the related issue of energy dependence have increased the collective attention towards both issues.
Although the concern is to reduce energy consumption due to high oil prices, at the same time, efforts are being made to reduce carbon dioxide emissions.

CHARLES A. KUPCHAN

OIL 9 - MARCH 2010

The US refuses to join the Kyoto Protocol, and Barack Obama, although declaring his willingness to address environmental issues, disappointed expectations, as shown by his visit to Copenhagen. The environmental summit largely failed due to the position taken by the United States.

KONSTANTIN SIMONOV

OIL 11 – SEPTEMBER 2010

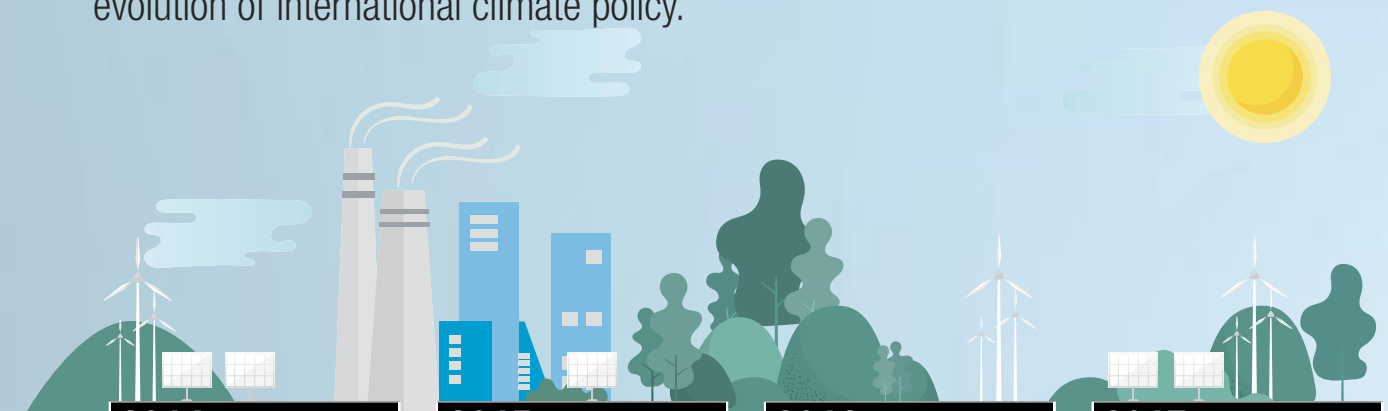
Europe got a head start towards the creation of a low-carbon economy with its 20-20-20 targets in 2007, but since then global competition for growth and employment in the green sector has become much more fierce and our advantage is no longer guaranteed. The major economies, such as China and the United States, have recognized the opportunity and are seeking to make the most of it.

CONNIE HEDEGAARD

OIL 16 – DECEMBER 2011

The Durban Conference was considered the worst by many of the participants: governments, non-governmental organizations and the media. One Nicaraguan delegate effectively expressed the concept when he publicly complained that the UN process does nothing more than "study

In the last 14 years, there has been an increase in collective awareness of the urgent need for shared actions to combat climate change and efforts have intensified to set increasingly ambitious greenhouse gas emission reduction targets. The United Nations World Climate Conferences (COP) represent milestones in the evolution of international climate policy.



COP21

2014
DECEMBER

LIMA
The 20th Conference outlined the guidelines of the agreement to be signed in Paris in 2015 and finalized the rules on national contributions (INDCs) for individual countries, which would form the basis for action for climate action after 2020.

1,5°

2015
DECEMBER

PARIS
On December 12, 2015, 195 countries decided to fight climate change and take action and invest towards a low-carbon future that is resilient and sustainable. With the Paris Agreement, for the first time all countries unite in a common cause that calls on their historical, present and future responsibilities.

2016
NOVEMBER

MARRAKECH
A crucial outcome of the Marrakech climate conference was the advancement of the drafting of the rulebook of the Paris Agreement. The conference effectively demonstrated to the world that the implementation of the Paris Agreement is a reality, and launched the Marrakech Partnership for Climate Action.

2017
NOVEMBER

BONN
The 2017 United Nations Conference on Climate Change was held from November 6 to 17 at the World Conference Center in Bonn, Germany, home to the Climate Change Secretariat. The Republic of Fiji presided over the event: the Bonn COP therefore goes down in history also as the first chaired by a small developing island state.

2018
DECEMBER

KATOWICE
In Poland, governments adopted a solid set of guidelines for implementing the landmark 2015 Paris Agreement on Climate Change. The Katowice Climate Package made the climate change regime of the Paris Agreement operational, promoted international cooperation and pushed to raise ambitions.

2019
DECEMBER

MADRID
The Conference successfully defined several points relating to the full operationalization of the Paris Agreement on Climate Change. The Conference also served to develop ambitions in view of 2020, the year in which, according to the commitment made, the various countries would present their own new and updated national climate action plans.

the studies," year after year. But this is the monster created by the UN.

MOLLY MOORE

OIL 18 – JUNE 2012

The Rio+20 Conference is, in many respects, an invitation to reflect. Twenty years after the Rio de Janeiro Earth Summit, humanity calls itself to account and the accounts don't add up. Yet, we do not have the right to mourn our fate, nor to let ourselves to be paralyzed by pessimism. We need to leave Rio with an action plan.

JEFFREY SACHS

OIL 25 – MARCH 2014

It is true that whatever conclusion may be reached about the "reality" of climate change is subject to possible errors of judgement, but it is equally true that the consequences of climate change appear to be so serious as to force us to consider the saying: "You can never be too careful."

HAROLD W. KROTO

OIL 30 – DECEMBER 2015

The agreement we want to reach in Paris is not a simple declaration of good intentions; it must contain provisions that are legally binding, which will have tangible effects on our development models and lifestyles. Of course, the COP21 in Paris cannot solve all our problems instantly, but it still has an obligation to mark a historical turning point.

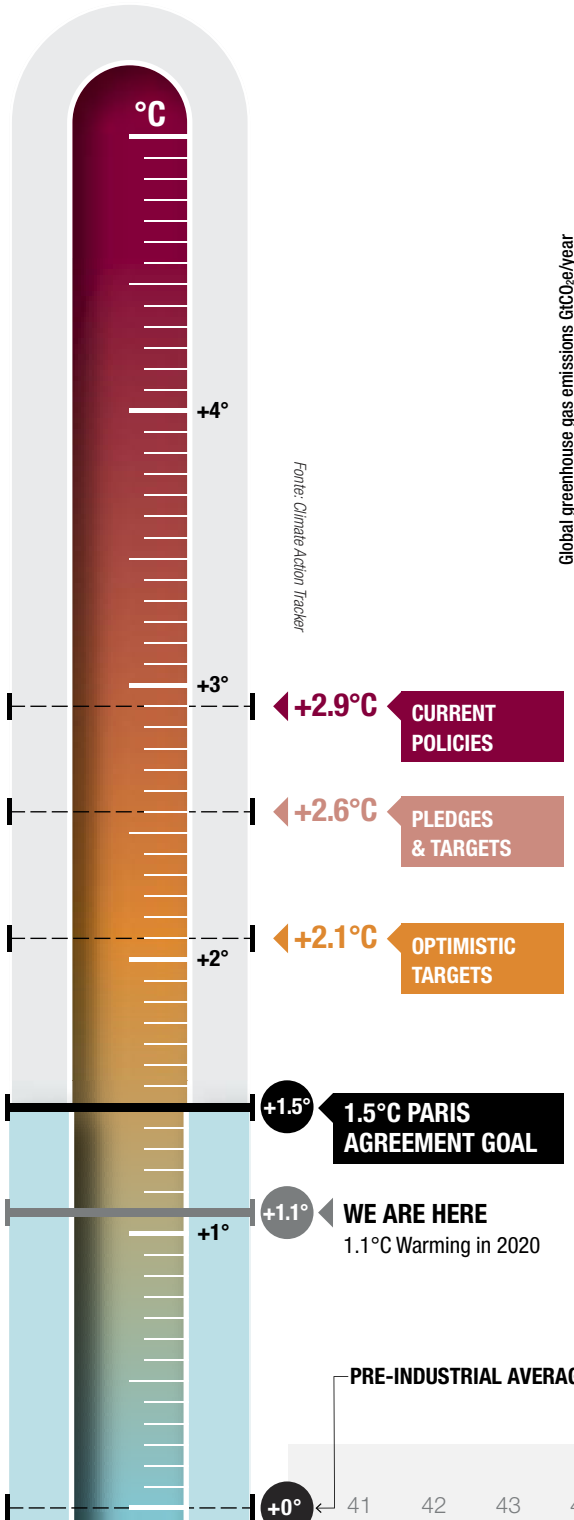
LAURENT FABIUS

Our companies are world leaders in patents for renewable technology (40 percent comes from Europe), efficiency of industrial processes and other clean technology used in multiple sectors. But we need to keep pace with the competition, and to do so we must continue to invest in innovation.

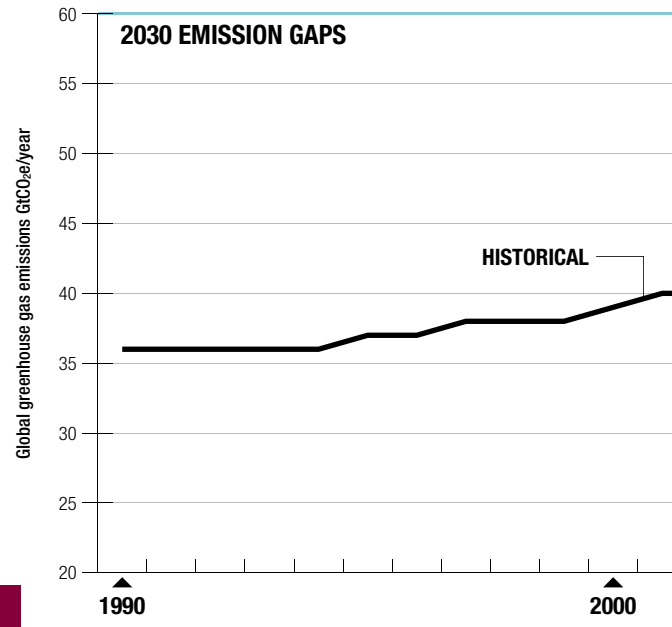
MIGUEL ARIAS CAÑETE

A GAP TO FILL

The Paris Agreement commits the signatory countries to limiting the average global temperature rise to 1.5 °C, or in any case to keep it well below 2 °C, as compared to pre-industrial levels. As a contribution to the targets of the agreement, many countries have presented national climate action plans (nationally determined contributions, NDCs). These, however, are still not enough. According to the estimates of the Climate Action Tracker (CAT), in 2100, keeping current policies unchanged, there would be a median increase in temperatures of 2.9 °C; even considering the targets and pledges made by governments to date, the median increase should remain at around 2.6 °C.



Fonte: Climate Action Tracker



Both curves - emissions under current policies and pledges and targets for 2030 - do not have a trend consistent with the Paris Agreement targets.

OIL 33 – DECEMBER 2016

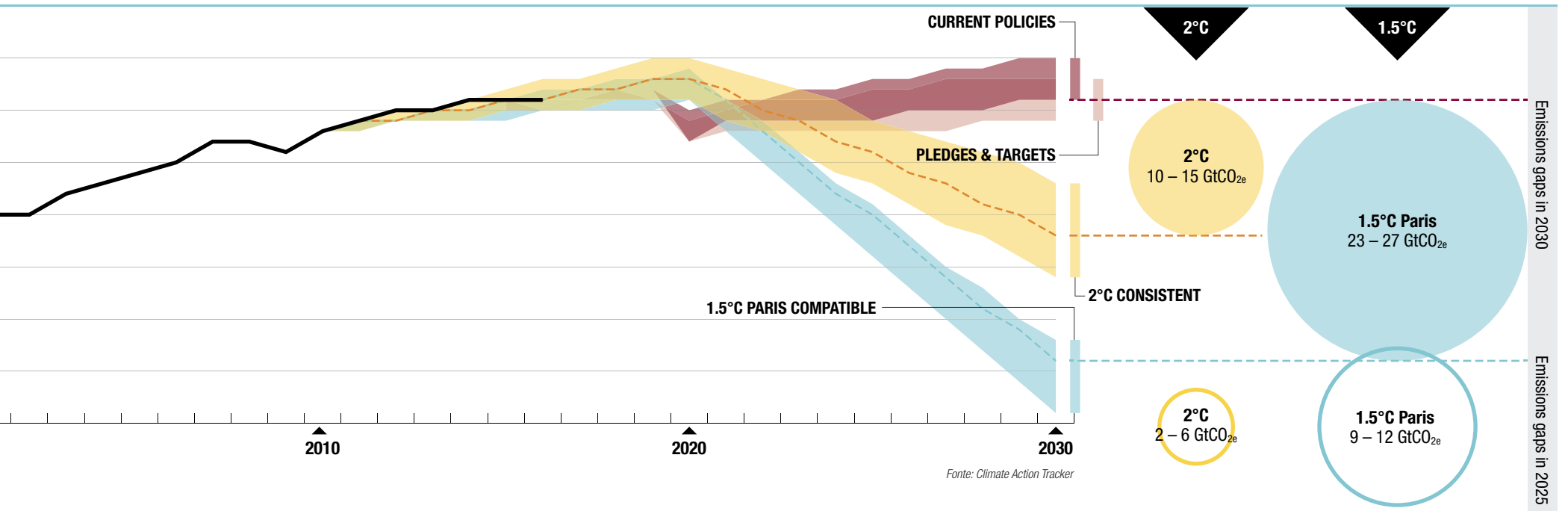
COP22, conceived and experienced amidst the "roller coaster" of international events that have marked the whole world since last summer (the clashes between the US and Russia over Syria, the lack of interest in the COP21 Paris denounced by Laurent Fabius, post-Brexit and the election of Donald Trump) decided to keep a "low profile" without budging even an inch on the commitments now ratified by over 55 percent of the signatory countries, as requested in Paris in December 2015.

ROBERTO DI GIOVAN PAOLO

WE 48 – MAY 2021

With the election of Joe Biden, the United States regained a leadership position in climate change negotiations, which had been lost in the Trump years. This will lead to the US taking on a greater role in the months leading up to COP26. The United States will try to push other countries to scale up their ambitions through climate diplomacy and to promote reforms to global economic and financial governance.

LUCA FRANZA AND LORENZO COLANTONI



Fonte: Climate Action Tracker

THE "GAP" RANGE RESULTS ONLY FROM UNCERTAINTIES IN THE PLEDGE PROJECTIONS

THE MIX OF THE FUTURE

The energy sector is responsible for nearly three quarters of CO_2 emissions. Achieving the target set by the Paris Agreement to keep the global temperature rise well below 2 degrees requires the total transformation of the energy systems that support our economies. In the ICA's Sustainable Development Scenario, renewables will replace a significant share of fossil fuels by 2040.

OIL 4 – DECEMBER 2008

We need to shift from geopolitics to biosphere politics. This is the turning point, the generational change to which we must look. (…) Now the question is: how do we make the transition? Smart companies will move in two directions: they will continue to use the now old energies, that is, the existing ones, and at the same time they will move decisively in the direction of post-carbon energy.

JEREMY RIFKIN

OIL 5 – MARCH 2009

It would be nice if the cars ran on fuels other than gasoline, and in a way we are trying, but the transition will not be that fast. We have to accept the idea that oil will still be vital to the world economy. That is why it is important today to protect oil stocks and to keep the nations that threaten stocks under control.

BILL KRISTOL

OIL 11 – SEPTEMBER 2010

It is fashionable to talk about energy independence from hydrocarbons, but the reality is that this transition is very unlikely to happen in the short term. Certainly, even our children will not see it and it is possible that it will be difficult to achieve even afterwards.

DAN RATHER

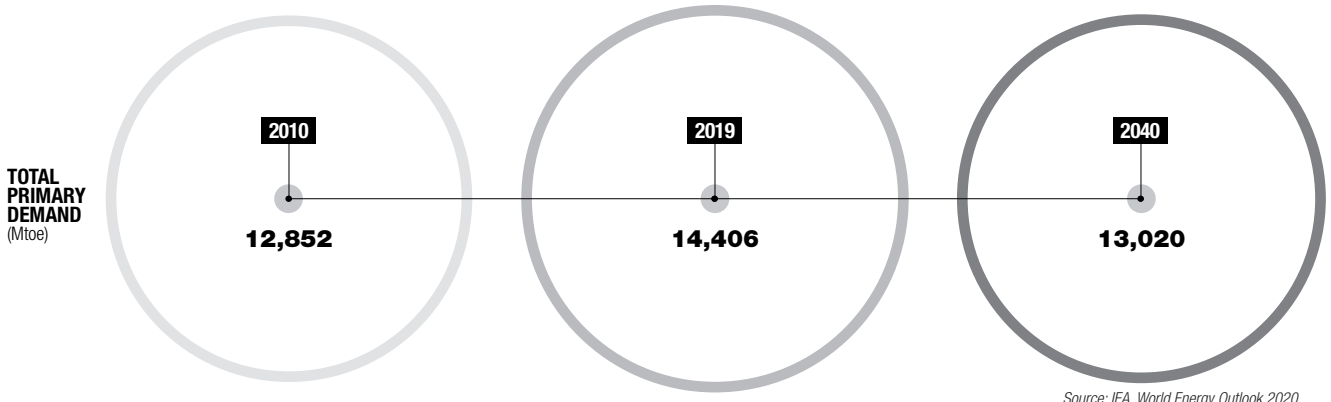
OIL 13 – MARCH 2011

The transition to sustainable growth will come at a cost, so we must work to minimize the human and social cost that will result from economic restructuring. This is the only way that the transition will be accepted by the people. We cannot embark on the path of sustainable development leaving behind the poorest and most vulnerable members of society.

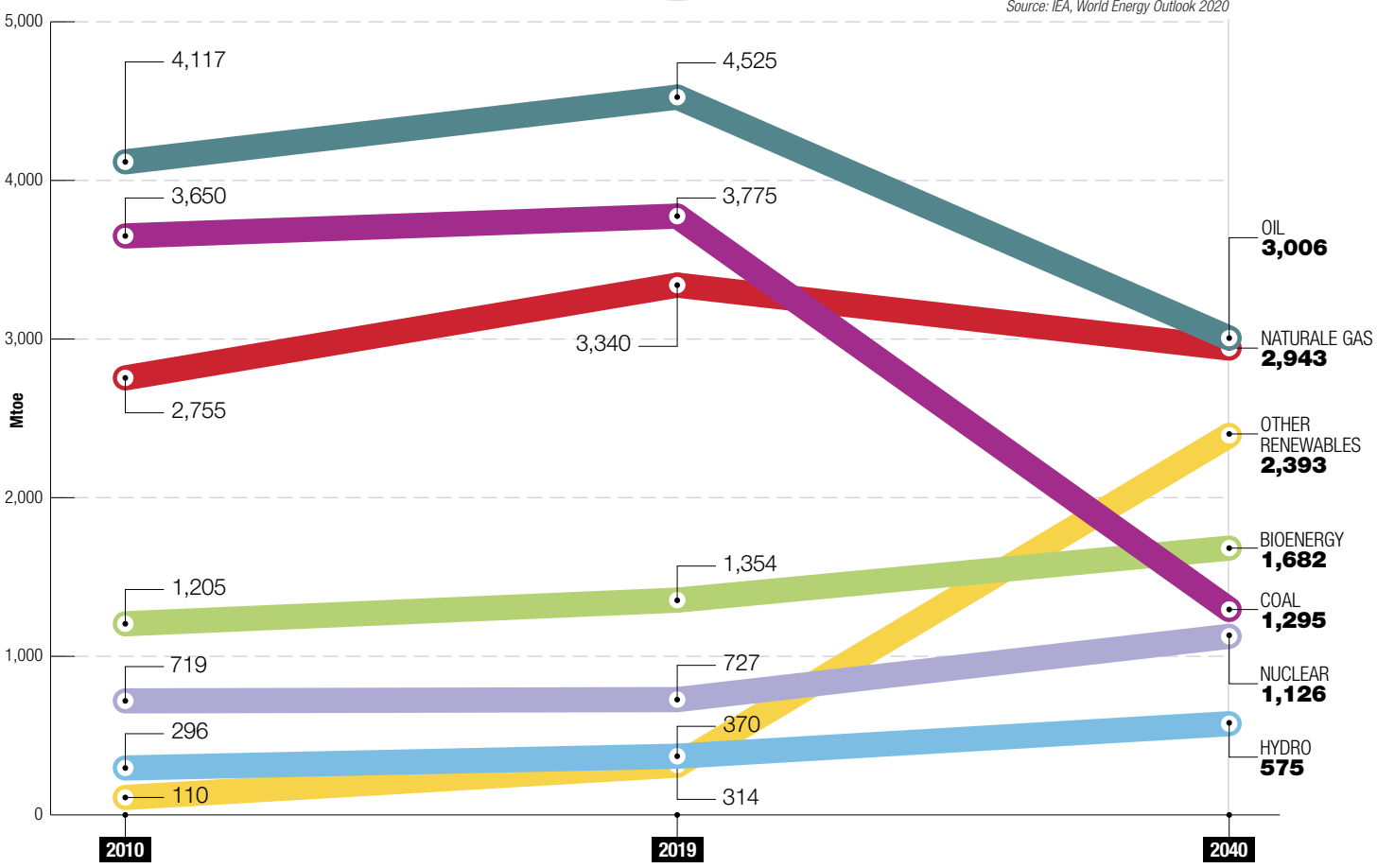
PIERRE GADONNEIX

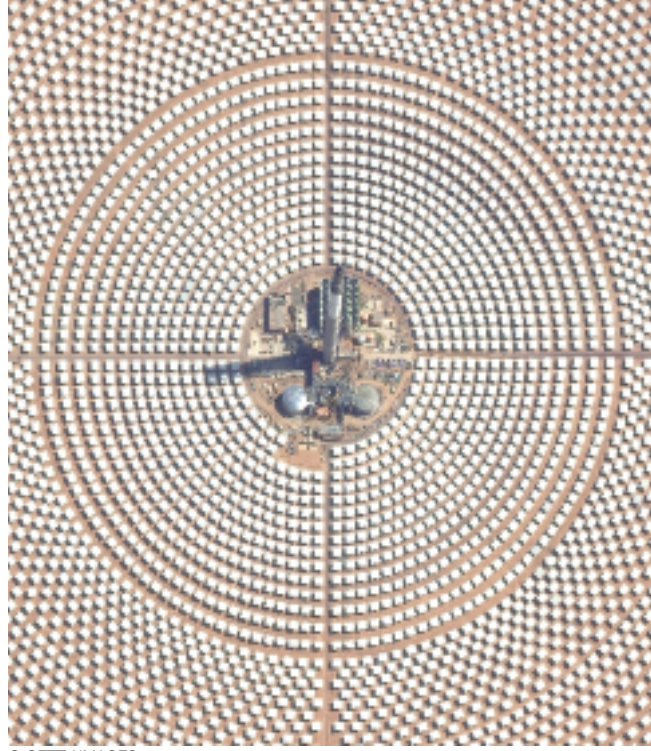
OIL 24 – DECEMBER 2013

We have no other choice: we have to separate economic growth from an increase in fossil fuel consumption. In the long term, the objectives re-



Source: IEA, World Energy Outlook 2020





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A RADICAL TRANSFORMATION

To keep the global temperature rise well below 2 degrees, as required from the Paris Agreements, energy systems that support the world economies must be radically transformed. In the Sustainable Development Scenario of the International Energy Agency, renewables will replace a significant share of fossil fuels in the global energy mix (especially coal and oil) by 2040.

lated to the reduction of emissions and those related to business competitiveness are not mutually exclusive, but of course we need to manage the transition to decarbonization carefully, and this is a cornerstone of our strategies for 2020 and 2030.

GÜNTHER OETTINGER

OIL 30 – DECEMBER 2015

Since the energy sector produces the greatest quantities of greenhouse gases, interventions in this sector can decree the success or failure of initiatives aimed at achieving the climate goal subscribed to by many countries around the world.

FATIH BIROL

WE 39 – JULY 2018

The prices of clean technology are not the only significant factors in the economics of climate change. Failure to move forward with the transition could have a devastating cost far greater than the investment required to make the transition.

KATHERINE HAMILTON

WE 40 – OCTOBER 2018

The circular economy can enable a sustainable transition without a significant change in the quality of life or economic performance. In fact, the system's ability to save resources and eliminate waste can result in real profit.

DAVE KEATING

WE 47 – NOVEMBER 2020

We are at a turning point. The world must come together within initially flawed global coordination and governance structures to ensure that the necessary recovery packages can steer investments towards green and more inclusive growth. But we must also take this opportunity to stop and reorganize our systems, building the cooperation needed to meet the unprecedented challenges of the coming decades.

RACHEL KYTE

ENERGY & SUST

IF WE TALK ABOUT ENERGY TRANSITION, WE CANNOT NOT TALK ABOUT SAFEGUARDING BASIC RESOURCES FOR THE FIGHT AGAINST CLIMATE CHANGE. ONE OF THESE IS WATER, FUNDAMENTAL FOR SUSTAINABLE GROWTH FOR THE PLANET. WE ALSO NEED FORESTS, ESSENTIAL TO THE ECOSYSTEM. TO THIS, WE MUST ADD HUMAN COMMITMENT, THROUGH THE CIRCULAR ECONOMY: AN ECONOMY DESIGNED TO BE ABLE TO SELF-REGENERATE, MINIMIZING WASTE.

AINABILITY

RESOURCES TO BE SAFEGUA

Water is one of the determining factors for the growth, sustainable development and stability of the planet. Today, over two billion people live in countries subject to high levels of water stress and this number is destined to grow further with the increase in world demand for water (+1 percent per year until 2050) and with the intensification of effects of climate change.

Forests and trees play a vital role in the accumulation of greenhouse gases (GHGs) in the atmosphere. Acting as carbon sinks, they capture around 2 billion tons of CO_2 per year. Deforestation, in contrast, causes nearly 20 percent of all global GHG emissions, more than the entire transport sector. Forests, therefore, are an important part of the strategy outlined by the Paris Agreement on Climate.

THE EXPERTS

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WATER

OIL 5 – MARCH 2009

For many people, water shortages are now a painful reality. This may become obvious when a river no longer reaches the sea, or not so obvious when water tables sink at alarming speed; in some areas of Bangladesh, for example, they have reached levels where their use has become dangerous due to the high cyanide content in the deeper layers of the rocks.

PETER BRABECK-LETMATHE

OIL 8 – DECEMBER 2009

If we keep up this pace, considering that the population will likely continue to increase compared to the current six billion, it is estimated that, within four decades, we would need a second planet to maintain our consumption patterns and lifestyles.

VALERIO CASTRONOVO

OIL 23 – SEPTEMBER 2013

There is no doubt the most imminent and fundamental risk is our inability to consider water to all effects a systemic element of any challenge regarding global resources. Water is often considered a local problem, confined to low-income economies. In reality, the risks associated with supply and demand are becoming increasingly clear even in middle- and high-income countries. World prosperity and security depend on water, as well as the future of governments, consumers and businesses.

LORD PETER MANDELSON

The use of water for energy production reaches very high levels. We estimate that it currently stands at 580 billion cubic meters per year, or about 15 percent of the world's total use of water, second only to agriculture.

FATIH BIROL

RDED

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WE 46 – MARCH 2020

To ensure access to water, we must first of all guarantee the availability and protection of the resource itself. We need to find the right compromise between our current and future water needs, finding a balance between the demand for water and restrictions due to water stress. In addition, securing resources means finding additional water resources to meet the demand and keeping the balance over time For this purpose, we can rely on human ingenuity and ability to innovate and continuously find new solutions.

LOÏC FAUCHON

FORESTRY

WE 45 – DECEMBER 2019

In recent years, the gross CO_2 emissions due to loss of tropical tree cover amounted on average to almost 5 billion metric tons per year. Consequentially, if tropical deforestation were a country, it would rank third (after China and the United States) in sources of emissions causing climate change.

FRANCES SEYMOUR

The challenge is still the energy transition towards non-fossil sources and it would be dangerous to consider forests the only alternative to combat climate change. However, the role of forests in mitigation is absolutely essential to limit global warming to 2 °C by the end of the century and even more so for the target of 1.5 °C.

RICCARDO VALENTINI

About 75 percent of Nationally Determined Contributions (NDCs) includes agricultural and forest management and examination of these targets reveals that 20-25 percent of the pledges to cut emissions are attributable to the forestry sector, especially for developing countries, where a broad share of emissions are caused by deforestation.

LUCIA PERUGINI

SAFE AND CIRCULAR

The concept of the circular economy was first expressed in 1966 by the economist Kenneth E. Boulding. It entered the international scenario becoming the theme of the World Economic Forum in Davos in 2014.
Over the years, this efficient, sustainable and competitive model of production and consumption has featured increasingly strongly, to the point of becoming indispensable for the transition process.

OIL 33 – DECEMBER 2016

Clearly, it is not just a question of developing good practices on a virtual level, but also of connecting these practices with the economy; according to the studies already illustrated at the Paris Summit, the global chain of acceleration of the "circular" economy can be valued at around USD 1 trillion more per year, starting in 2025.

ROBERTO DI GIOVAN PAOLO

WE 40 – OCTOBER 2018

So far, the cause of circular economy has been supported predominantly at local level by the private sector and some non-governmental organizations. About 62 percent of the initiatives promoting the circular economy are based in Europe and only 13 percent in North America, while the remaining 25 percent are spread among Asia, Latin America and Africa.

MOISÉS NAÍM

The circular economy model focuses on creating closed-circuit systems that minimize waste and the use of resources, recycling and reusing materials and products once their useful life has come to an end. In some cases, this approach consists of implementing small changes, sometimes obvious, such as reducing waste; in other cases, it requires companies to change radically their mentality and way of doing business and for consumers to modify their behavior substantially.

MIKE SCOTT

In a circular economy, the quantity of resources extracted and materials dispersed and disposed of should be minimized.

JELMER HOOGZAAD & MARC DE WIT

Circular economy is not just about recycling. It is actually a new economic model, sustainable and vital,

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© ALBERTO GIULIANI

in which consumption is based on an increased use of services thanks to sharing, renting and recycling, rather than on owning goods.

MARI PANTSAR

Circular economy must become the focus of the way we think about our cities and countries and at international level. Policy makers as much as companies and individuals are all called upon to do their part to accelerate the transition process.

LIZ GOODWIN

WE 45 – DECEMBER 2019

Europe has for some time been talking about circular economy, intended to reduce the impact of exploiting resources. Forestry has always been a model of circular economy that considers the regeneration and total use of materials, with correlated positive effects such as the maintenance of biodiversity, soil protection, water purification, and the support of local communities in peripheral rural areas that are economically weak.

DAVIDE TABARELLI

WE 46 – MARCH 2020

Continuously purifying and renewing itself through the planet's hydrological cycle, water is the circular resource par excellence. However, in the last century, intensive industrial activities and growing urbanization have upset this natural cycle, often exceeding the purification and circulation capacity of nature.

NICK JEFFRIES

WE 47 – NOVEMBER 2020

Carbon capture, use and storage techniques offer a solution for reducing carbon dioxide emissions and, if used in the energy industry and energy-intensive industry, could bring us closer to a circular carbon economy, in which carbon dioxide is removed, recycled and reused.

ANGELA WILKINSON

& ENERGY TECHNOLOGY

THE PUSH TOWARDS THE DECARBONIZATION OF THE ENERGY SYSTEM, FORESEEN BY THE PARIS AGREEMENT, WILL ONLY BE POSSIBLE WITH TECHNOLOGICAL TRANSFORMATION ON A GLOBAL SCALE. TOOLS SUCH AS BIG DATA, ARTIFICIAL INTELLIGENCE OR IOT (INTERNET OF THINGS), TOGETHER WITH 'GREEN TECH', ARE PROVIDING FUNDAMENTAL IMPETUS TO THE ENERGY TRANSITION TODAY AND WILL BE EVEN STRONGER DRIVERS IN THE NEAR FUTURE.

Source: MacroPolo

2-PERSON AI RACE

In the race for artificial intelligence (AI), as well as in the use of big data, the undisputed leaders are the United States and China, with Europe following some distance behind. Whilst, at the moment, the USA seems ahead, in terms of both consolidated academic structure and the investments made at public and private level, China has announced that it aims to become the largest world power in the sector within 10 years.

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OIL 32 – AUGUST 2016

Alongside the technical problems, we will have to tackle legal and moral problems, write codes that attribute to the owners of robots responsibility for their mistakes, modify urban planning to improve the flow of traffic, solve the social problem of all those that automation will render obsolete.

SERGIO ROMANO

OIL 34 – MARCH 2017

The oil and gas sector is often regarded as the quintessence of the "old economy," and certainly some of its key players have been prominent for over a century. However, it has demonstrated a certain capacity for "disruptive innovation," capable, for example, of taking full advantage of big data and integrating digitization into its processes.

LAZLO VARRO

WE 37 – DECEMBER 2017

Significant progress in the field of Artificial Intelligence will bring extraordinary changes that will affect every aspect of our lives and our economies. As advocates of new rules and standards, the architects of these advances will exercise dominant influence over the global economy of the future.

IAN BREMMER

WE 40 – OCTOBER 2018

The advent of renewable electricity and storage, combined with technologies such as the Internet of Things, machine learning and big data analytics, are helping customers become energy producers as well as consumers. The new energy system will be decentralized, distributed and multidirectional.

MIKE SCOTT

WE 43 – JUNE 2019

China's growth in technology is particularly surprising when it comes to Artificial Intelligence (AI). As early as 2017, the Chinese government had declared supremacy in the sector by 2030 as a strategic goal, with a significant increase in spending on research in this area. On the other hand, AI is

0

THE TOP 20 INSTITUTIONS FOR TOP-TIER AI RESEARCH

1. **GOOGLE** (USA)
2. **STANFORD UNIVERSITY** (USA)
3. **CARNEGIE MELLON UNIVERSITY** (USA)
4. **MIT** (USA)
5. **MICROSOFT RESEARCH** (USA)
6. **UC BERKELEY** (USA)
7. **COLUMBIA UNIVERSITY** (USA)
8. **UNIVERSITY OF OXFORD** (UK)
9. **TSINGHUA UNIVERSITY** (CHINA)
10. **FACEBOOK** (USA)
11. **CORNELL UNIVERSITY** (USA)
12. **UT AUSTIN** (USA)
13. **PRINCETON UNIVERSITY** (USA)
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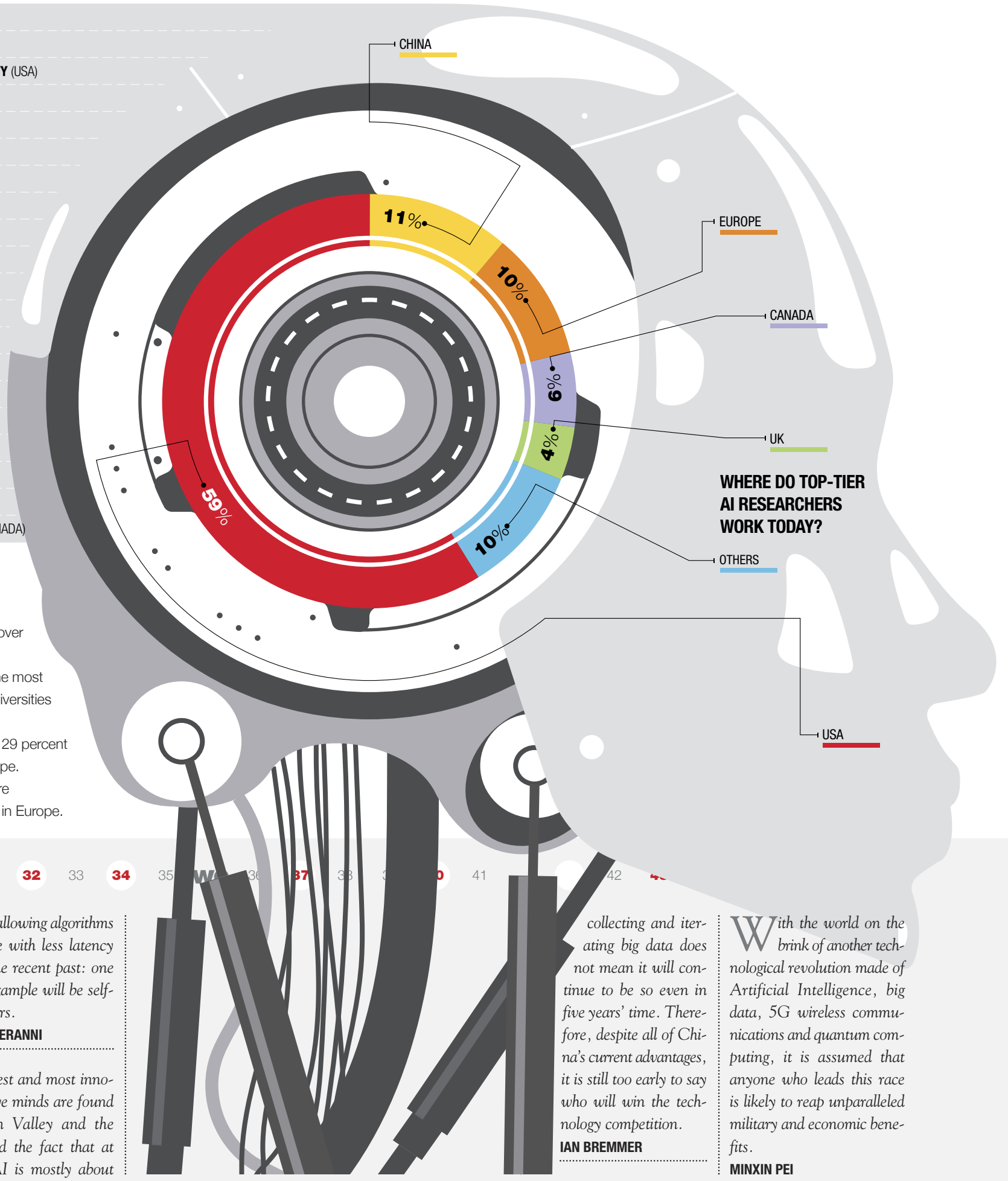
15. **UNIVERSITY OF ILLINOIS** (USA)
16. **INRIA** (FRANCE)
17. **GEORGIA TECH** (USA)
18. **PEKING UNIVERSITY** (CHINA)
19. **IBM** (USA)
20. **UNIVERSITY OF TORONTO** (CANADA)



WHERE DOES AI TALENT WORK?

The United States has a major advantage over all other countries in high-level research on artificial intelligence: nearly 60 percent of the most qualified researchers work for American universities and companies. However, only 20 percent of high-level researchers trained in the US; 29 percent graduated in China and 18 percent in Europe. Of the top 20 AI research institutions, 15 are in the United States, two in China and two in Europe.

26 27 28 29 30 31 **32** 33 **34** 35 W… 37 38 3… 0 41 42 4…

one of the key sectors in which there will be a fundamental battle for technological leadership.

PAOLO MAGRI

Beijing's 5G targets are intrinsically linked to Artificial Intelligence, because the new networks will make calculation speeds possible that were unthinkable until recently, allowing algorithms to operate with less latency than in the recent past: one shining example will be self-driving cars.

SIMONE PIERANNI

The best and most innovative minds are found in Silicon Valley and the West, and the fact that at present AI is mostly about collecting and iterating big data does not mean it will continue to be so even in five years' time. Therefore, despite all of China's current advantages, it is still too early to say who will win the technology competition.

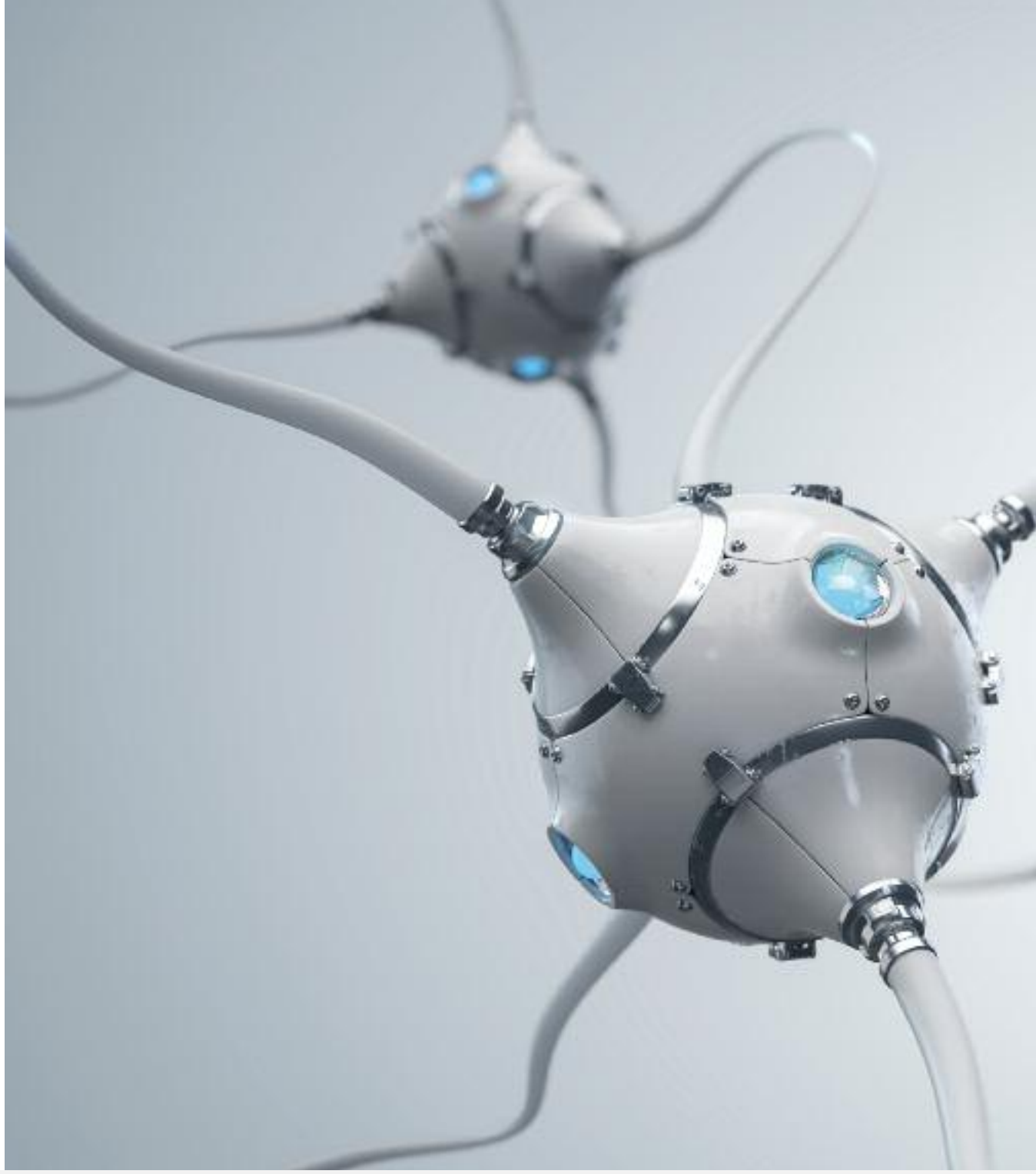
IAN BREMMER

With the world on the brink of another technological revolution made of Artificial Intelligence, big data, 5G wireless communications and quantum computing, it is assumed that anyone who leads this race is likely to reap unparalleled military and economic benefits.

MINXIN PEI

ENERGY FUTURE

Green technologies are a key component of the energy sector transition process. Some applications, such as solar and wind power, are already making a not insignificant contribution in terms of sustainable energy production; other technologies, for the moment still under study, are a promise for the future.



OIL 18 – JUNE 2012

Improving access to cleaner technologies can make a significant difference and does not come at a high cost. Recent research on a program to be applied in India shows that we can spend much less compared to alternatives such as liquefied petroleum gas.

ANIL MARKANDYA

OIL 30 – DECEMBER 2015

The full implementation of climate commitments will require the energy sector to invest USD 13.5 trillion in energy efficiency and low-carbon technologies between 2015 and 2030, a figure that represents nearly 40 percent of total investments in the energy sector.

FATIH BIROL

OIL 32 – AUGUST 2016

The scientific community is focusing on solar-based renewable energy supply for the future of the planet. The past decade of solar power research and technological developments have led to astounding discoveries that form the basis for a new paradigm for the global energy model. The changes follow two directives: production and storage.

DANIEL NOCERA

OIL 34 – MARCH 2017

Achieving the goal of limiting the demand for oil will involve the use of more technologies, such as advanced biofuels, hydrogen and highly efficient processes. These are natural consequences of technology and project management expertise in the oil and gas sector, and which will result in a natural transition for oil companies to a low-carbon society.

LAZLO VARRO

WE 40 – OCTOBER 2018

Technology is redefining the scope of what is possible for transportation. The ongoing wave of innovation opens up a number of exciting new possibilities, such as fully self-driving cars. But the alternative solutions envisaged for the future (such as e-mobility using batteries and hydrogen, green

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methane, sharing and full integration of modes of transport) remain shrouded in uncertainty. Will they be able to achieve the necessary scale and be economically viable?

NANCY VANDYCKE

WE 44 – OCTOBER 2019

Some examples of the incredible transformational potential of these technologies include the development of fleets of autonomous vehicle and advanced grid management systems to promote the integration of distributed generation of renewable energy on a large scale. It is also expected that the use of digital ledgers will allow the creation of cross-border carbon markets such as those envisaged by Article 6 of the Paris Agreement.

ROBERT JOHNSTON

WE 47 – NOVEMBER 2020

Carbon capture, utilization and storage techniques offer a solution for reducing carbon dioxide emissions and, if used in the energy industry and energy-intensive industry, could bring us closer to a circular carbon economy, in which carbon dioxide is removed, recycled and reused.

ANGELA WILKINSON

Currently, many decarbonization technologies, such as CCUS, are very expensive, but this means that there is ample room for improvement in terms of cost efficiency and R&D that these countries (MENA, Ed.) can exploit.

BASSAM FATTOUH AND RAHMAT POUDINEH

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THE ENERGY

OF THOUGHT

OCTOBER
2021

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