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the chessboard of refining

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The chessboard of refining

Among the many and complex issues shaking up the oil industry, the crisis in the refining sector has thus far taken something of a back seat – it remains the exclusive preserve of discussions between experts. Although the general public is quite attentive to the industry's more prominent problems (especially the question of resource sustainability) it remains almost oblivious to the difficulties that beset the companies – in the West, at least – that perform this final step in the oil supply chain. And this is despite the fact that the sector has been showing significant cracks for some time and been the subject of several major European inquiries, including one by the Italian parliament.

So what is going on? And why is the problem so serious as to merit greater public awareness? In this issue, Oil attempts to answer these questions, calling upon some of the biggest experts on the subject. Their answer is unanimous: the situation could get out of hand and urgent action is required.

The crisis in the refining sector affects the entire western world but seems particularly acute in Europe, which faces a changing market, falling demand, ageing technologies, and rising costs that have made many refineries economically unviable.

Hydrocarbon production has begun to shift to other areas of the world. Many historic European refineries have closed down and others risk closure in the near future; almost all are currently running at a loss. The consequences are clear. There will, of course, be major repercussions on the economy (including reduced tax revenues) and on labor. Above all, though, Europe faces the alarming strategic prospect of being reduced to



GIANNI
DI GIOVANNI

dependence on foreign imports of crucial fuel products.

European governments must come together to overhaul the sector from top to bottom, restructuring and upgrading production with the support of an improved legal and fiscal background. Above all, the European Union needs to come up with a new core strategy.

The European Commission must “put a greater balance on what they are trying to do for the environment and for climate change [and] recognize that Europe cannot do this by itself,” urges Chris

Beddoes, Secretary-General of Europa, the association representing all European refiners. For the time being, the Commission has responded by ordering a “fitness check” to “look at the effects of existing legislation” on the sector's ability to compete, explains Pierre Dechamps, advisor to Commission President Barroso. And while Europe limps along, “Asia's refining boom has barely begun,” and Middle Eastern countries have laid the foundations to take a leading role in downstream activities as well. As Moisés Naim of the Carnegie Endowment in Washington points out, “The developing countries are set to increase their refining capacity by around 6.9 million barrels per day between 2011 and 2015.”

All this – and much else besides – is covered the pages that follow. To conclude this short introduction, I would echo the words of OPEC Secretary General Abdalla Salem El-Badri: “While there are clearly many risks facing refiners, there will also be opportunities for those able to successfully negotiate the challenges before them in the years ahead.”

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Exclusive/Ashti Hawrami,
Kurdistan's minister for natural resources

Blessed with resources

The region's abundant resources, with reserves estimated at 45 billion barrels of oil and 3-6 trillion cubic meters of gas, will ensure stability and development in Iraq and a secure supply to expanding markets



ASHTI HAWRAMI is the Kurdistan Regional Government's minister for natural resources. He first assumed this position in May 2006 and retained the portfolio after the 2009 and 2012 elections. Before joining the Kurdistan Regional Government, he worked as an engineer in the North Sea for the British National Oil Company and as chairman and CEO of ECL Group Plc.

“T

by **FABIO
SQUILLANTE**
(AGENZIA NOVA)

he resource curse of the past must be turned into a blessing,” says Ashti Hawrami, Kurdistan's minister for natural resources, summing up the regional government's strategy on energy and development. Kurdistan's reserves of oil (45 billion barrels) and gas (3-6 trillion cubic meters) will help to ensure the stability of Iraq as a whole and guarantee security of supply for growing markets such as Turkey.

Hawrami claims that the region will be capable of exporting around 400,000 barrels per day by early next year and 1 million barrels per day by the end of 2015.

The regional government aims to reach exports of 2 million bpd by the end of 2019.

After the fall of Saddam Hussein's regime, the autonomous region of Iraqi Kurdistan underwent remarkable economic and social developments, due largely to energy resources, making it an important player from a political prospective as well. What role do you think Kurdistan can play in the stabilization of Iraq and of the region as a whole?

In the past, Iraq's natural resources have been used and abused to fuel internal repression and to fund damaging and costly wars with Iraq's neighbors. We in the Kurdistan Region →

Erbil-Ankara relations and the interests at stake

The governments of Turkey and the autonomous region of Iraqi Kurdistan are building an increasingly close relationship thanks to the former's rising demand for crude oil and the latter's demand for refined products. Oil industry sources say that Iraqi Kurdistan began exporting crude from the **TAQ TAQ RESERVE** to Turkey last January, in exchange for limited amounts of diesel and kerosene for its power plants. Mehmet Sepil, chairman of the Turkish-British company Genel Energy, said that the first shipment of crude was transported from Taq Taq to the Turkish Mediterranean port of Mersin in January.

Iraqi Kurdistan currently produces approximately **400,000 BARRELS OF OIL PER DAY (BPD)**, around 15,000 barrels of which is refined into condensate. Taq Taq is Kurdistan's largest field, with an output of 130,000 bpd, followed by Tawke (105,000 bpd) and Khurmala (110-115,000 bpd).

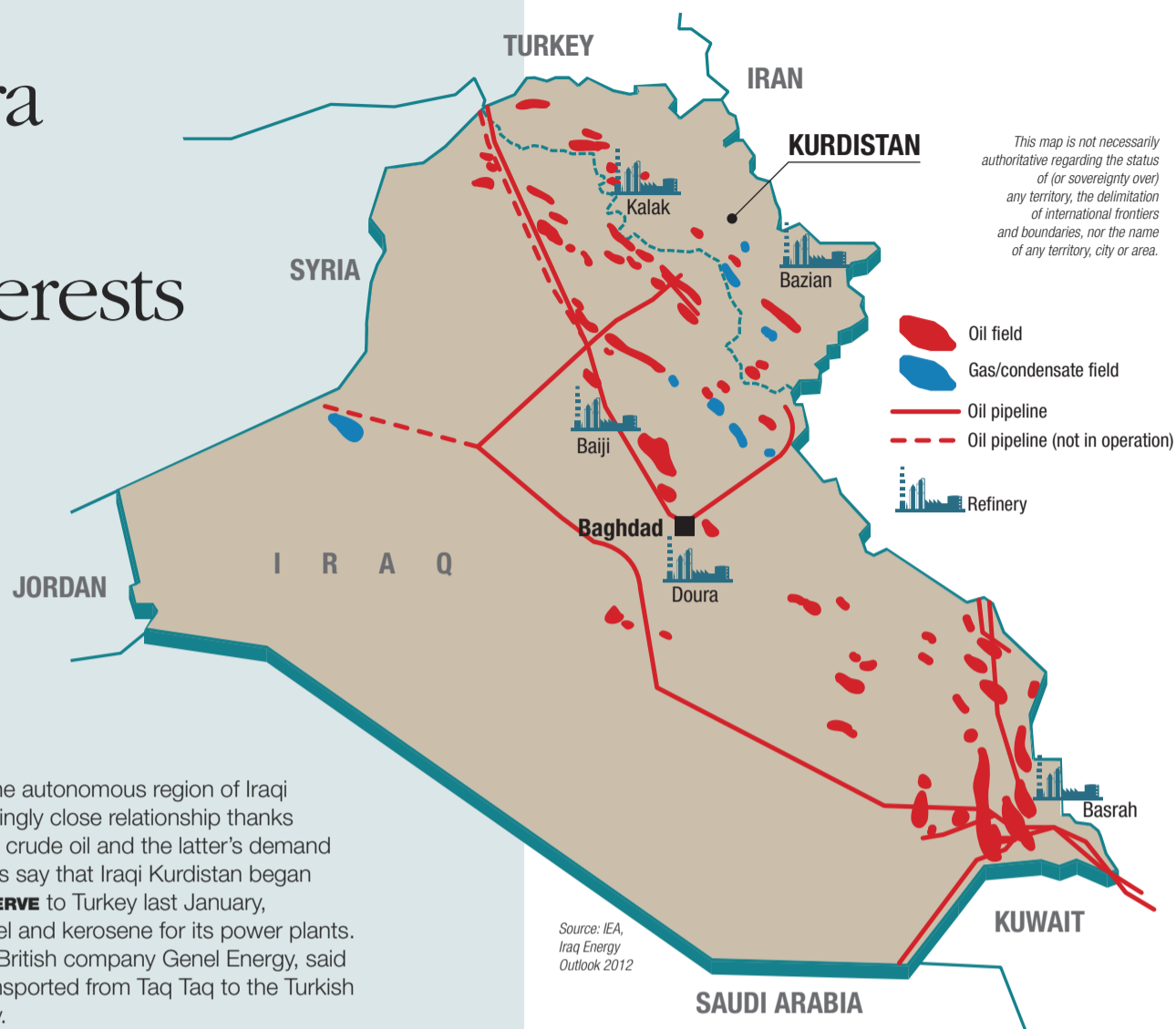
The northern Iraqi region has a potential export volume of between 250,000 and 300,000 bpd, with a domestic **REFINING CAPACITY** of 100-110,000 bpd **THAT COULD REACH 150,000 BPD** by the end of the year. The government in Erbil says that Kurdistan's oil reserves exceed 45 billion barrels, accounting for just less than a third of total Iraqi reserves (143 billion).

"KURDISTAN IS THE OIL EXPLORATION CAPITAL OF THE WORLD," claims Tony Hayward, the recently-departed CEO of BP, who in September 2011 became part-owner and CEO of Genel Energy, the company selling Taq Taq crude directly to Turkey. The oil is currently trucked to Turkey, but a **NEW PIPELINE** will open in the coming months to connect the field with the border city of Fishkabur and the Kirkuk-Ceyhan pipeline. Oil industry sources say that the pipeline will be finished by September. Genel's export capacity will increase significantly, by an average of 20,000 bpd, thanks to the new infrastructure.

The Turkish-British company has also discovered a **NEW OILFIELD** in northern Iraq, in collaboration with Petoil – another Turkish oil company – and the autonomous region of Kurdistan.

Genel Energy is not, however, the only company to have signed commercial agreements with the Kurdistan Regional Government (KRG). During a visit to Washington, alongside Prime Minister Recep Tayyip Erdogan, Turkish energy minister Taner Yildiz pointed out that at least **19 COUNTRIES AND 39 COMPANIES HAVE SIGNED BILATERAL DEALS** with the KRG. Exxon-Mobil was the first foreign oil giant to put pen to paper with Erbil back in 2011, and Chevron and Total have since followed suit. Chevron has purchased 80 percent of the interests in the region's Rovi and Sarta blocks from Reliance, an Indian company, while the remaining 20 percent is owned by Austria's OMV. The contract for Rovi and Sarta marked Chevron's entrance to the Iraqi gas and oil industry, after it had lost the fourth license auction called by Baghdad. Over the past two years, the world's four largest oil companies have all gained a foothold in **KURDISTAN, WHICH IS ACQUIRING INCREASING AUTONOMY THANKS TO THE AGREEMENTS MADE.**

The oil giants will make **PROFIT MARGINS** of between **25 AND 30 PERCENT** under the contracts signed with Erbil. Foreign investment is flooding into Kurdistan thanks to its political, economic and social stability.



are determined to make sure that never happens again. Iraq's federal constitution, passed in 2005, has as its fundamental concepts power sharing and revenue sharing. It decentralizes the management of new oil and gas reserves in the country to the Regions and Governorates, and calls for joint rights for the old fields. By supporting and implementing the requirements of the constitution, the Kurdistan Region Government (KRG) will be aiding Iraq's unity and stability. The KRG's policy is to use our oil and gas wisely and prudently so that the benefits go not just to the people who live in the Kurdistan Region and Iraq today but also to future generations. The KRG believes in managing its resources so that they can play a major role in helping Iraq economically and also providing reliable security of supply of energy resources for growing markets such as Turkey and other international actors.

Can you explain the guidelines of the Regional government concerning the development of energy policies, in particular regarding the construction of new transport infrastructure – and the role that international companies can play in this process?

All oil and gas activities in the Region fall within Kurdistan's oil and gas law of 2007. This law is entirely in line with Iraq's federal constitution. Under this law, the KRG has signed over 50 production sharing contracts with international oil and gas companies from over 20 different countries. We started with the small independent exploration companies and are now in a period of consolidation whereby the majors, such as Exxon Mobil, Chevron, Gazprom and Total, have all signed exploration contracts. There have already been some significant discoveries, and the KRG will be able to export about 400,000 barrels of oil per day by early next year and 1 million bpd by the end of 2015. The plan is to export 2 million bpd by the end of 2019. So you will see a great growth spurt at all levels of the industry, from the exploration phase to field

GIORGIA LAMARO/Agenzia Nova



development and export transit infrastructure. This oil and gas will find its way to market through an extensive internal pipeline network that is currently being constructed to the border with Turkey. The KRG pursues a pro-business policy and believes the private sector, rather than the state, is the most effective and speediest implementer of our plans for export infrastructure.

In the past there have been differences between Erbil and Baghdad over the possibility of exporting oil and gas from Kurdistan, as well as over the division of the proceeds. But it seems that an agreement has recently been reached.

Could you explain the details of this agreement?

The KRG's policy on oil and gas is to implement the provisions of Iraq's constitution, under which oil is owned by all the people of Iraq in all its Regions and Governorates, but management and control of the extracted resources falls to the Regions and the Governorates. Oil and gas are not listed as the exclusive preserve of federal government. Any lasting agreements and laws on hydrocarbons in Iraq must be based on these fundamental concepts. Unfortunately there are some people in the federal government who want to turn back the clock, and try to recentralize government in Iraq. That will only bring more failure. The KRG is committed to cooperation and coordination, not confrontation, and will engage in constructive dialogue with counterparts in Baghdad to resolve all outstanding oil and gas issues within the context of the constitution.

Can you give us an estimate of the proven reserves in the Kurdistan Region?

Estimated reserves are 45 billion barrels of oil and 3-6 tcm of gas. These are reserves that Iraq never knew it had until exploration started in Kurdistan following the removal of the former regime in 2003, and they can add to the resource wealth of the whole country.

It is obvious that energy resources will ensure economic growth for the region; how is the Government planning to use them?

The resource curse of the past must be turned into a blessing. Which is why, for example, our production sharing contracts require companies to commit sums of money to capacity building. Some \$3 billion has already been spent, allocated to social programs including hospitals, universities, water sanitation, and social housing programs for victims of the past dictatorship.

We must also use our oil and gas to help diversify the Region's economy and ensure the well-being of future generations. Areas targeted for growth include agriculture, tourism and mining.

Despite its huge production capacity, Kurdistan is still lacking in refining capacity, as is the whole of Iraq. The Iraqi Strategic Plan 2008-17 aims to increase refining capacity from 600,000 to 1.5 bpd. Are there going to be any facilities in your Region?

The Region's downstream activities are operated by the private sector. There are two main refineries, one at Kalak, west of Erbil, and one at Bazian, near Sulaymaniyah. Their combined output is 70,000 barrels per day, but ongoing work will upgrade refining capacity to 100,000 bpd by the end of this year. There are also currently a number of topping plants, or small basic refining units, that fill the need for the KRG's domestic demand for products until the bigger refineries are able to ramp up their capacity. Under an agreement with Baghdad, the KRG is entitled to 17 percent of Iraq's total refined products. The Kurdistan Regional Government (KRG) policy is to become self-sufficient in refined products by the end of 2015.

Iraq's federal constitution, passed in 2005, has as its fundamental concepts power sharing and revenue sharing. It decentralizes the management of new oil and gas reserves in the country to the Regions and Governorates, and calls for joint rights for the old fields



U.S.A./Talking with Sally Jewell, new Secretary of the Interior

A strong industry and a clean environment



SALLY JEWELL was sworn in as the 51st Secretary of the Interior on April 12, 2013. In nominating Jewell, President Obama said, “She is an expert on the energy and climate issues that are going to shape our future.” Prior to her confirmation, Jewell served in the private sector, most recently as President and Chief Executive Officer of Recreation Equipment, Inc. (REI). Before joining to REI, Jewell spent 19 years as a commercial banker. Trained as a petroleum engineer, Jewell started her career with Mobil Oil Corp. in the oil and gas fields of Oklahoma.

The hydrocarbons sector is crucial for the United States and the White House will support it, while also protecting people and the environment. But the industry should not throw regulators under the bus when things do not move forward – the responsibility is shared

Just a few weeks after her appointment, Sally Jewell, the 51st Secretary of the Interior of the United States, used an early public appearance at the Offshore Technology Conference 2013 in Houston to introduce herself and set out her department’s energy agenda. The visit to the OTC was the first by a Secretary of the Interior since Gale Norton’s, some 10 years ago. The new incumbent met oil and gas industry executives and toured exhibition stands, trying out drilling simulators and listening to presentations. Jewell is the former President and CEO of Recreational Equipment and has a back-

by RITA KIRBY

ground in oil engineering. She has been received favorably by the industry, which is calling for regulation that is in tune with the needs of the sector.

What is your overall philosophy?

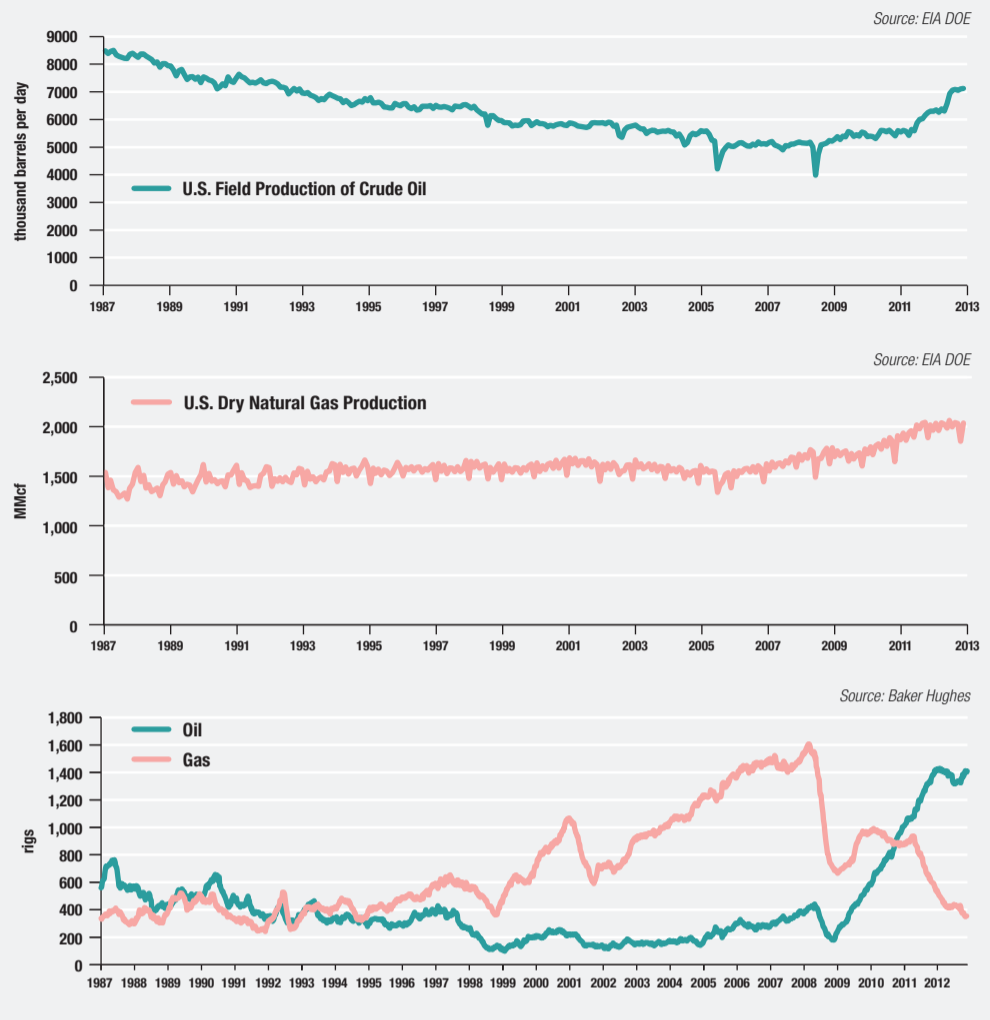
Our philosophy is to really stay right with the industry as it grows and develops, and to develop new ways of keeping the environment clean and people safe while also supporting oil and gas development, which is a very important driver of the energy independence of the country. Part of my duties in this new position is to stay abreast of technology that is moving forward quickly and of how the department can do the best job possible in assisting the energy industry.



You began your career as an engineer for General Electric in Alaska and then for Mobil Oil Co. in Oklahoma and Colorado. As a woman in this sector, you are something of a pioneer...

As a woman working in the energy industry, you had to have a pretty thick skin because there weren't a lot of people that were like you or that you appeared to connect with. When I was in the oil business they didn't even let women offshore! The population of our country is far more diverse than this industry as a whole. I don't see the level of diversity that reflects the U.S. population in this industry. I didn't when I worked in it before and I don't when I walk around the floor here. It's a huge issue in regards to young people, women

THE EVOLUTION OF OIL AND GAS ACTIVITY IN THE U.S.



The three graphs show the evolution of U.S. oil and gas from 1987 to today. Oil production declined until 2009, when it began to turn around; gas production began to rise (albeit with fluctuations) back in 2007.

and people of color. The industry has some work to do. We all need to work together to create an environment that is welcoming of women, of people of color, of people with different backgrounds, because the industry is missing some super-talented folks who could strengthen it. I also see a lot of retirement among a lot of talented people who have really built the industry to where it is, who are my age. Within a reasonable period of time you are going to have a significant brain drain.

The Outer Continental Shelf Governors Coalition has used the OTC as a stage to call for new areas to be opened up for deepwater drilling...

The definition of deepwater is constantly evolving. The key is: do we have the technology available to develop these resources safely and responsibly.

What was your message to the energy executives you met at the OTC?

That we need to work together, not at odds with each other. I did poke them a little bit about not throwing the regulators under the bus or blaming us when there is actually shared responsibility, perhaps, when something doesn't move forward. We do not want to be in the way of development, but we have a job to do protecting the assets of the American people. I did not sense a reluctance to embrace regulation.

What they want – and what we are committed to providing – is regulatory certainty, predictability and consistency, recognizing that different circumstances warrant different ways of behaving.

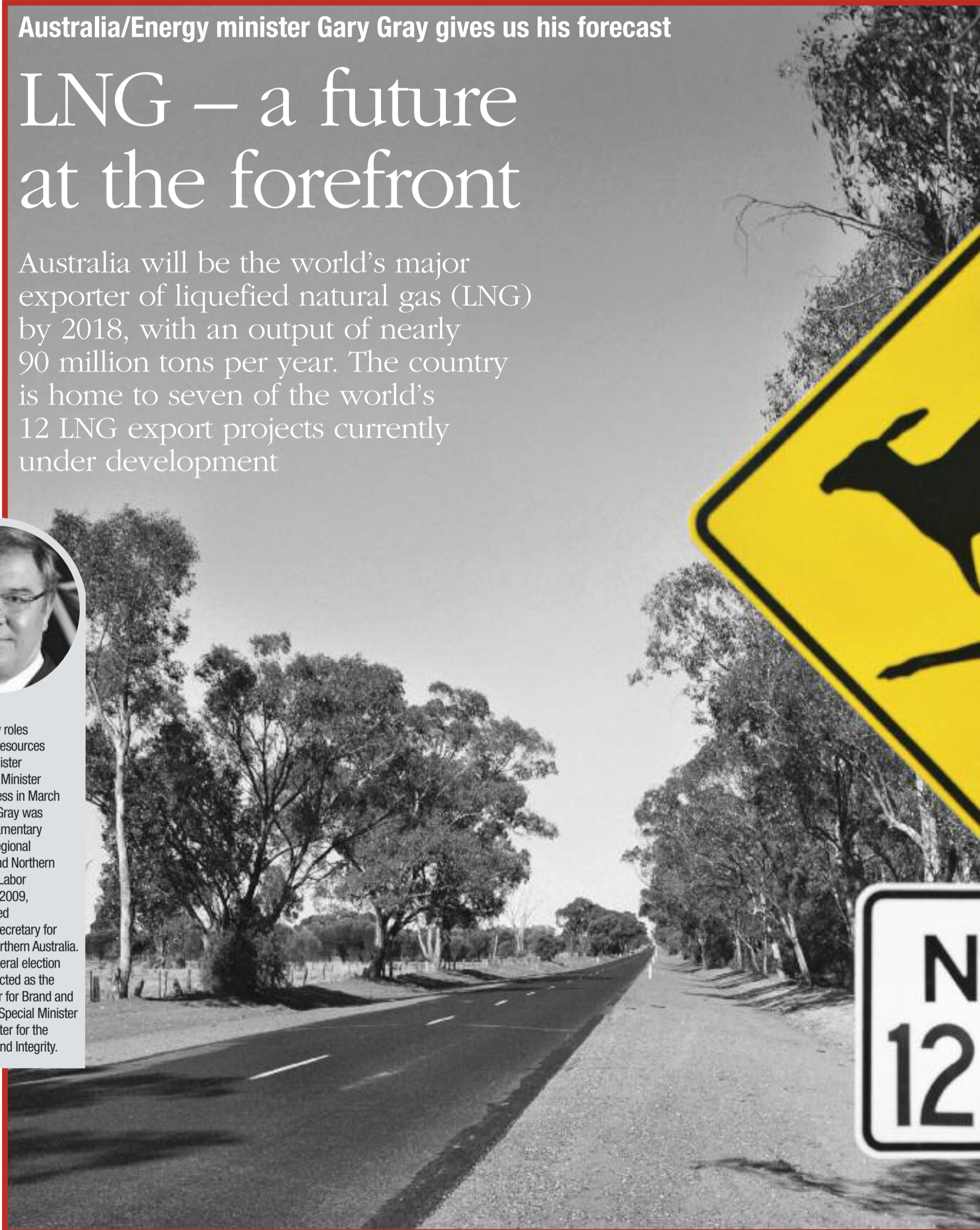
Australia/Energy minister Gary Gray gives us his forecast

LNG – a future at the forefront

Australia will be the world's major exporter of liquefied natural gas (LNG) by 2018, with an output of nearly 90 million tons per year. The country is home to seven of the world's 12 LNG export projects currently under development



GARY GRAY took on the new roles of Minister for Resources and Energy, Minister for Tourism and Minister for Small Business in March 2013. In 2007, Gray was appointed Parliamentary Secretary for Regional Development and Northern Australia in the Labor Government. In 2009, he was appointed Parliamentary Secretary for Western and Northern Australia. At the 2010 Federal election Gray was re-elected as the Federal Member for Brand and later appointed Special Minister of State & Minister for the Public Service and Integrity.





Australia has no concerns over rival natural gas suppliers and expects to become the world's leading exporter of LNG within the next five years.

by RITA KIRBY

This was the message of the country's new energy minister, Gary Gray, who attended the LNG 17 conference in Houston to receive the baton of the sector's biggest event worldwide, scheduled to be held in Perth in 2016. As recently as 2007, at the LNG 15 conference in Barcelona, shale gas was barely mentioned and the focus was on Qatar as the "emerging exporter" of LNG. Now the scenario has totally changed.

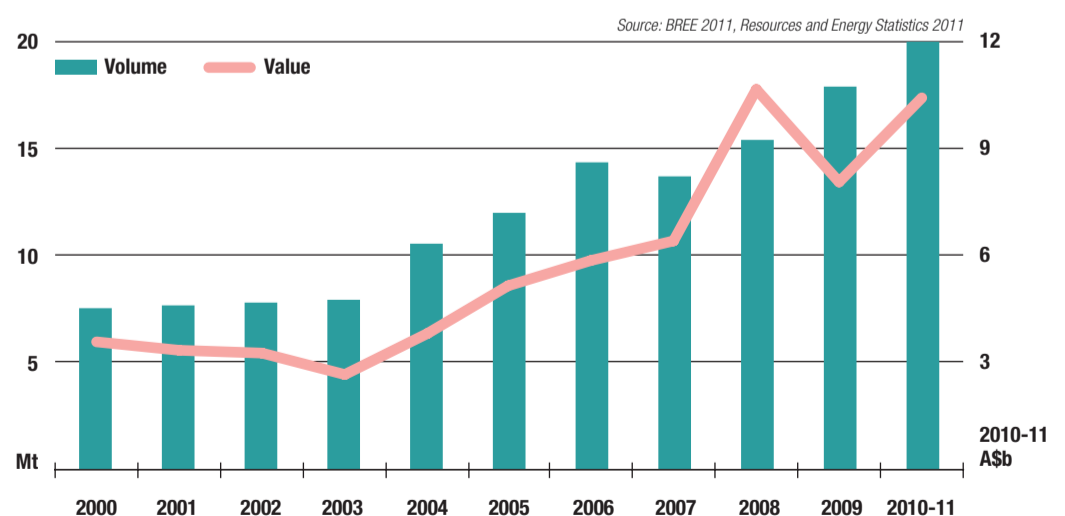
The role of LNG in global energy markets is the hot topic in the industry right now, and Australia is right at the forefront...

Over the next five years we will see the LNG industry expand further, and Australia will be at the epicenter of that. We expect to become the largest or second-largest exporter of LNG by 2018. Seven of the world's 12 LNG export projects currently in development are in Australia. Soon the "Magnificent Seven" will be joined by another facility, the Browse, on the Kimberley coast. In the next five years our output will reach nearly 90 million tons per year. Moreover, the Australian projects are famous for the degree of innovation involved. Gordon incorporates the largest CO₂ capture facility, three projects use coal seam gas as feedback for the LNG and, off the northwestern coast of Australia, Shell is planning to use floating liquefied natural gas (FLNG), another world first.

There is cost pressure on the Australian LNG export projects, especially now that the United States is ready to get into this business area. To what extent is the government in Canberra intending to intervene to ensure the success of Australia's projects?

Our government will not intervene on prices or trade agreements. Market forces will determine which projects are successful. What the Australian government intends to guarantee is a reliable and solid regulatory environment, bearing in mind that the benefits of good regulation must not be limited to providing assistance on poor business or trade results. The regulatory process must also reassure local communities about the environmental impact of these projects, and every step must be absolutely transparent. We in Australia are proud of our systems of regulation and the results in terms of safe- →

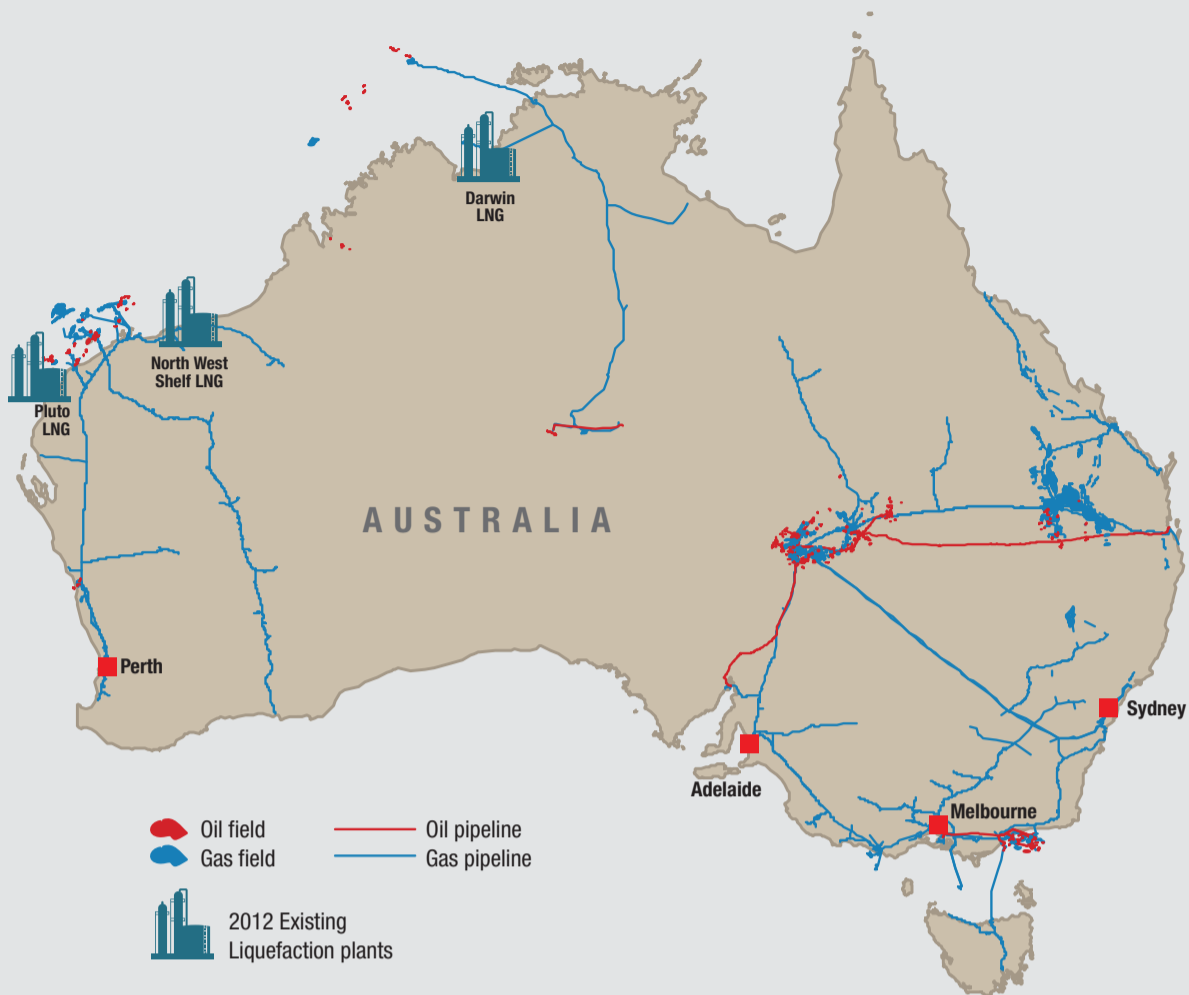
AUSTRALIA'S LNG EXPORTS



Australia's LNG exports in 2010-11 were 20 million tons, an increase of 12 percent on 2009-10. The value of Australian LNG exports in 2010-11 increased 30 percent compared to 2009-10 to \$10.4 billion, reflecting higher oil prices.

Oil&Gas

	1995	2000	2005	2008	2009	2010	2011
OIL							
Production Thousand Barrels per Day	580	802	545	551	553	513	434
Reserves Million of Barrels as of Dec 31st	3799	4944	3718	4239	4061	3831	3873
Reserves / Production Ratio Years	18	17	19	21	20	20	24
Consumption Thousand Barrels per Day	811	872	933	964	951	961	997
Per Capita Consumption Barrels	16.34	16.62	16.69	16.35	15.85	15.75	16.1
Production / Consumption Ratio	0.72	0.92	0.58	0.57	0.58	0.53	0.44
REFINING							
Number of Refineries Numbers	11	11	9				8
Primary Capacity Thousand Barrels per Day	739	837	752				765
FCC Equivalent %	49	51	61				59
Nelson Complexity Index Index	8	8	7.8				7.7
Utilization of Primary Capacity %	81	80	82				72
GAS							
Production Billion Cubic Meters	29.82	34.04	37.4	43.54	46.9	50.73	59.05
Reserves Billion Cubic Meters as of Dec 31st	1264	2203	2428	3569	3594	3759	3849
Reserves / Production Ratio Years	42	65	65	82	77	74	65
Consumption Billion Cubic Meters	19.97	22.99	22.63	30.08	32.04	31.6	37.91
Per Capita Consumption Cubic Meters	1102	1200	1109	1398	1463	1419	1677
Production / Consumption Ratio	1.49	1.48	1.65	1.45	1.46	1.61	1.56



Source: Eni Oil & Gas Review

ty and environmental impact. We are really well equipped to grasp the opportunities that the market presents and to address challenges.

Do you think good regulation alone is enough to quell the fears over environmental impacts, especially from coal seam gas?

A good regulatory framework is essential, but it is not enough by itself. The industry must work directly with local communities to gain their support. Across the world – not only in Australia but also in Europe, Africa and the United States – production of natural gas is creating thousands of jobs, encouraging innovation and favoring development in areas that have been left behind for decades. While the industry excels on the technology front, it does not do so well on non-technological issues. We need greater commitment to involve local populations, non-governmental organizations, and environmentalists, so that there is a deeper awareness of how this sector works. Sometimes, instead of working to improve regulation, activists seek only to create fear and confusion. What we need is clarity: if the industry cannot manage to transmit its message, giving populations the right information, there will be increasingly few politicians who, like me, intend to pursue sensitive regulations based on scientific facts and mindful of environmental sustainability.

The International Energy Agency predicts that global natural gas demand will double by 2035. What will be the future trading routes for LNG?

Emerging economies are expected to account for 80 percent of the increase in global demand for natural gas over the next 20 years. Imports of LNG in the Asia-Pacific area should grow, on average, at a rate of 7 percent, reaching 220 million tons per year by 2018, compared to 185 million in 2012. China alone will represent a fifth of this growth, since it is about to become one of the main LNG importers in the world. LNG also plays an increasing role in India, and it is estimated that imports there could reach 31 million tons per year by 2018, as long as the

right infrastructure is developed. We also expect Singapore, Thailand, Malaysia and the Philippines to become LNG importer countries, while there will be continuing strong demand from Japan, Korea and Taiwan. Singapore will become a regional gas hub. In terms of supplies, the size of the reserves in the eastern Mediterranean, off the African coast, will be more definite, as will production lead times. The impact of the North American shale gas revolution will begin to be felt after 2016, with the development of a number of export projects. Regarding Australia, the goal is not only to meet future demand but also to participate actively in the development of new technologies, like FLNG. Since Australia will be host to the first FLNG project in the world, the Australian government's ambition is for Perth to become the global capital of FLNG.

The baton for the most important worldwide conference on LNG now passes from Houston to Perth, which will host LNG 18 in 2016. Is the ambition to strip Houston of its status as the energy capital of the world?

Perth and Houston are sister cities, in every sense. Perth, like Houston, is an outward-looking city, a technological city and certainly an energy capital. There is an anecdote about Perth that is emblematic of the ties between the two cities. One night in 1962, the people of Perth turned on all their lights as a tribute to astronaut John Glenn, as he passed overhead aboard Friendship 7. Glenn was the first American astronaut to orbit the Earth, and he was also the one who gave Perth the name "City of Light."

E.U./Amalia Sartori of the European Parliament explains the Union's agenda

Security and sustainability

These two words encapsulate Europe's priorities on energy. The challenges of infrastructure, of the single market, and of supply that is affordable for households and competitive for industry



AMALIA SARTORI is Chair of the Committee on Industry, Research and Innovation of the European Parliament. She was first elected as a Member of the European Parliament in 1999, keeping her seat in 2004 and 2009. She is a member of the Group of the European People's Party. Sartori has also served on the Committee on the Internal Market and Consumer Protection, the Committee on the Financial, Economic and Social Crisis, the special committee on the implementation of the Lisbon Strategy, and the Temporary Committee on Climate Change.

Europe's energy policy is based around the two guiding principles of security of supply and care for the environment. As such – explains Amalia Sartori, who since 2011 has served as Chair of the European Parliament's Committee on Industry, Research and Energy – Europe must diversify its energy sources and supply routes, create new infrastructure into and between European states and round out the single market. The E.U. will also be looking to back energy sources with a lower environmental impact.

by CHARLOTTE BOLASK

What are the main energy challenges that Europe is facing today?

Our main challenge is achieving security of supply at prices that are affordable for households and competitive for industry,

in a way – obviously – that is safe and sustainable. This follows the guidelines from the conclusions of the European Council meeting of May 22, 2013, which state: “The E.U.'s energy policy must ensure security of supply for households and companies.”

How will these guidelines be translated into reality?

Firstly I think it is worth noting that – thanks to the Lisbon Treaty, which puts energy at the heart of E.U. activities and gives it a legal basis – energy policy within the Union is partly an E.U. matter, while decisions over the energy mix remain the prerogative of each individual state. Each country can decide which energy sources to use to make up its mix. The European Union has decided to follow the “20-20-20” policy [a 20 percent reduction in CO₂ emissions, a 20 percent improvement in energy efficiency, and raising renewable resources →

E.U. energy policy in five points

The E.U.'s energy policy must ensure **SECURITY** of supply for companies and households.



All member states are working towards the **OBJECTIVES** under the 20-20-20 framework, and some are even exceeding them.



The project that is currently going best is the Trans-Adriatic Pipeline (**TAP**); the Nabucco pipeline, which the European Union had backed more enthusiastically, has fallen behind.



Europe has an **INFRASTRUCTURAL** issue in terms of inter-state energy networks.



The **E.U. REFINING FORUM** aims to monitor the security of oil products and involve the industry in adopting shared policies.



to 20 percent, all by 2020 – ed.]. Everything we have envisaged for 2020 has already been translated into regulations or directives. The last one we adopted related to energy efficiency, and we have had very good feedback. Actually, even though individual states are only required to begin implementing it next year, all governments are already putting the provisions into action. All member states are working towards the objectives that were set, and some are even exceeding them.

Now we are focusing on 2030 and 2050. Since we think global energy demand will continue to increase in the future, the first objective is to diversify our sources and supply routes. We are keeping a close eye on the various projects currently on the table in this regard. We think the project that is currently going best is the Trans-Adriatic Pipeline (TAP), which is racing along. The Nabucco pipeline, which was more heralded at the start and had attracted greater interest from the European Union, has now fallen a great deal behind.

Lastly, we have an issue over European infrastructure in terms of energy networks. As it stands, despite a strong appeal from the European Parliament and the Commission, the E.U.'s member states have not managed to give a proper answer, in financial terms, to the proposals of the Connecting Europe Facility (CEF), which above all provides for the interconnection of the various E.U. states. According to our calculations, it would cost 200 billion euros to connect our countries with energy infrastructure. Europe has put five billion euros on the table. So the big question mark is over who is going to provide the rest of the money. Of course, large private companies could put up the funds, but we have to work out how to make this kind of investment more attractive for them. Otherwise we will not be able to make these investments, even though they are essential – including in view of the completion of the internal energy market, which should theoretically come to fruition in 2014.

What about energy sources?

To answer that question we have to bring in two more major issues: the first is the environment, which we are very careful about and which leads us to favor sources with a lower environmental impact; the second is energy efficiency and developing renewables. To date, the projections in every European Commission study on energy sources have made it explicit that even though 85 percent of our energy from now until 2050 must not come from fossil fuels, we cannot do without them in the intermediate phase.

New technologies will be hugely important during this transition phase ...

Definitely. The question of shale gas, with all its pros and cons, recently hovered into view. The debate is ongoing and is getting a lot of attention, partly because – although it looked at first as if only Poland, the United Kingdom and Romania had shale gas – now it seems as though it is pretty much everywhere in Europe, except perhaps in Italy. Of course, we immediately noted the potential environmental issues, but research is underway to find ways to reduce its impact. So, I think this is an area where we can probably make some headway on increasing the E.U.'s self-sufficiency to an extent.

A bit like what has happened in the United States?

Exactly. What is more, we should point out that in Strasbourg we recently passed the first resolution on the trade agreement between the European Union and the United States. This is an extremely important agreement because, just three or four years ago, the United States probably could not have imagined that things would develop as they have, but now it is taking a keen interest in Europe once again. The collaboration between the United States of America and what I call the United States of Europe is now properly under way, with the potential for creating a free-trade market between us in a whole series of areas. I also see this as being important in political terms. What has happened in recent years has probably made the U.S. reflect on how sensible it was to “abandon” a strong



and significant relationship with a part of the world that still represents a market of 500 million citizens (willingly or otherwise) and has a strong economy. I think energy, too, will have a part to play in this relationship. For example, working together on new technologies could be an avenue worth exploring.

What about nuclear energy?

I think traditional nuclear energy will be hard-pressed to hang on in Europe, because of the accidents that have happened. I do not see a huge future in this area. Of course, there is the big question over fusion, which would be the ideal solution for clean, low-cost energy. Europe is funding the ITER project, along with many other countries. We will continue to fund this grand vision, but we are talking about medium- to long-term timeframes.

Many refineries in Western Europe are closing and, according to a study by A. T. Kearney, one in five are at risk of being squeezed out of the market in the next five years. Is this inevitable or is a change in fortunes possible? If so, how?

Certainly, the refining industry in Europe is going through a particularly delicate time: on the one hand, there is a global crisis causing a decline in consumption; on the other, there are environmental restrictions and the impenetrability of European regulations, which have continued to multiply over the years, forcing the refining industry to address a whole series of problems it had not faced in years gone by. Now what refiners are asking for is legal clarity, freeing the industry from some red tape, and stimulus for new investment. At European level there is an awareness that the energy sector – more than many others – is in constant flux: there are always new discoveries and innovations, but also fresh limitations and restrictions. As such, more than in other industries, all enterprises (but especially refiners) must focus even more on research and development to answer the environmental concerns that are part and parcel of this world. We must bear in mind that operating in Europe is harder than operating in Asia or

the Middle East – not only because of the different tax systems, labor costs, access to credit and the immediate availability of raw materials, but also because of the restrictions that are in place. We cannot persist with subsidies, because subsidies are only useful in a transition phase to help a company to change direction, to understand new market demands and opportunities. If a company stands by and does nothing, subsidies only help put off the inevitable.

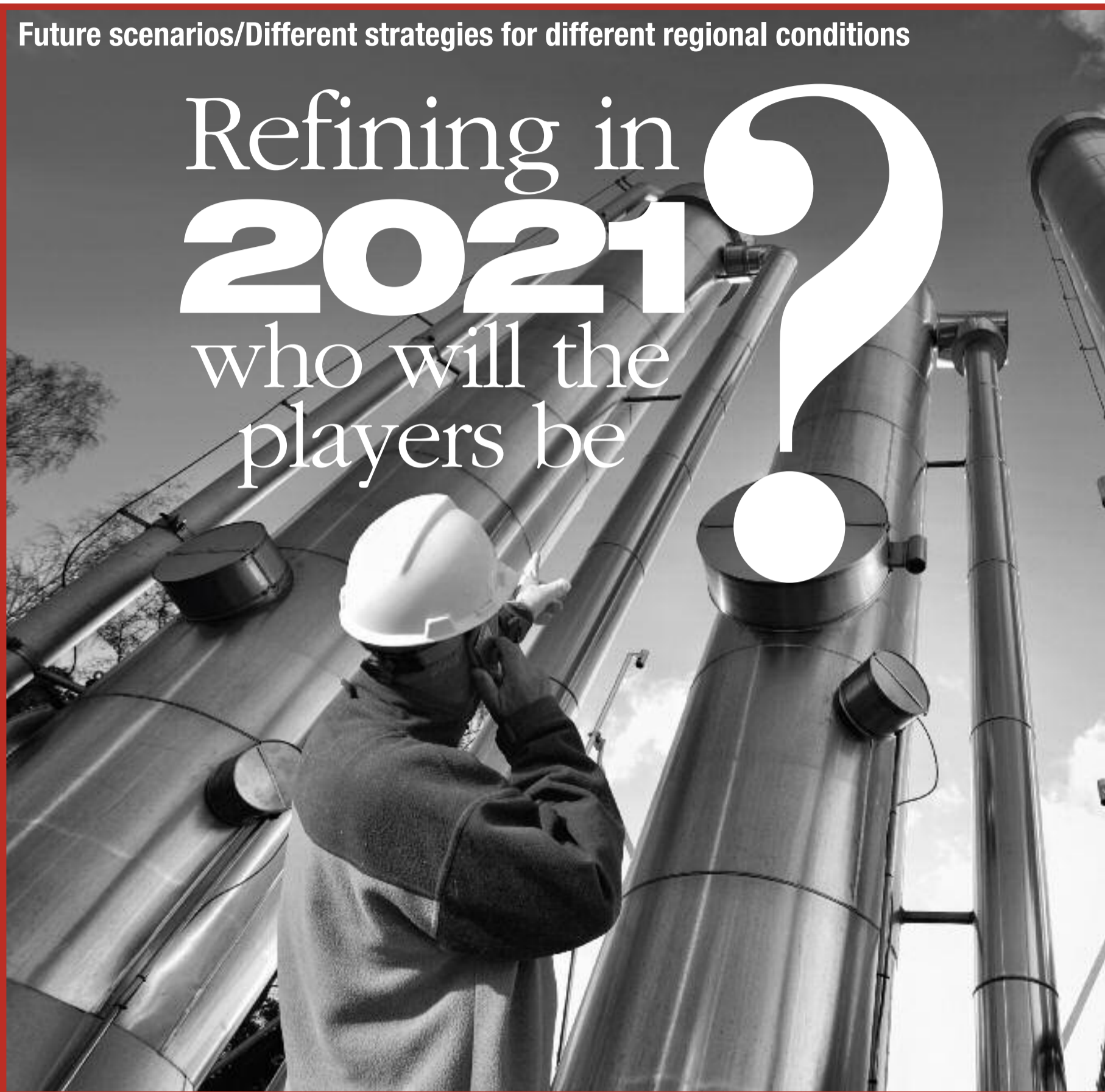
In 2009, there were 98 refineries in Europe. Since then refining capacity has fallen 30 percent, seven facilities have closed and a further 13 have changed ownership. We have got three refineries up for sale at the moment and Petroplus, one of the most important independent operators, has gone bankrupt. The most pessimistic predictions talk about the possibility of another 40 facilities closing down. That is why Commissioner Tajani and Commissioner Oettinger pushed ahead with two initiatives that are underway right now. Last year they launched the E.U. Refining Forum, which held meetings in November 2012 and April 2013, with another scheduled for next autumn. The purpose of this permanent body is to monitor the security of oil products and to involve industry representatives, leading to the adoption of jointly-formulated European policies. The second initiative is what the Forum calls “fitness checks” to provide ongoing monitoring of the health of the refining sector. In the coming weeks we are also set to adopt a large-scale European program for research and innovation called Horizon 2020, which ought to provide about 70 billion euros over the coming years and could give real impetus to addressing innovation in the industry. The other thing we can do is to work on streamlining regulations, avoiding legal overlaps and constantly monitoring the impact of the various regulations on industry competitiveness, in order to ensure that we can compete with non-E.U. countries. It is easy to talk about these objectives, but hard to achieve them – we are quite aware of that. These are the solutions that the Forum has put forward, so the Commission is working on them.

The energy sector – more than many others – is in constant flux. As such, more than in other industries, all enterprises (but especially refiners) must focus even more on research and development to answer the environmental concerns that are part and parcel of this world

Future scenarios/Different strategies for different regional conditions

Refining in 2021

who will the
players be



One in five refineries will close in the next five years, claims a study by A.T. Kearney. Choosing the right operating model and the required level of integration will be crucial to survival and continued profitability

O

ANALYSIS BY
A.T. KEARNEY

keep up with changing global markets and compete with improving

ver the next years, operators at one in every three refineries in North America and Western Europe will need to reconsider their operating models and how they are integrated across the value chain. Otherwise, they will struggle to

global standards in refining. By 2021, refineries will need to restructure, strategically reposition their assets, or leave the market.

These stark prospects are among the findings of a recent study by consulting firm A.T. Kearney of the global refining market. In North America and Western Europe, the current trend of refinery closings is expected to continue, with one in five refining assets being squeezed out of the market over the next five years. Meanwhile, the boom in demand in



Asia and the Middle East will lead to substantial changes in capacity and partnership structures. Choosing the right operating model and the required level of integration across the value chain—for each asset and each region—will be crucial for improving margins and sustaining profitability in a volatile market. For assets that are not financially viable, regardless of their model, a decision about whether to exit will need to be made early on to prevent financial losses later in the decade.

This article examines the changes taking place in refining, the value drivers shaping the future of refining, the models available to refiners for different assets and different regions and the strategies for maximizing value in every region.

GLOBAL AND REGIONAL MARKET CHANGES

Global refining is a mature market where substantial restructuring has already taken place and where more re-

organization will take place in the future. Refinery margins in developed countries have dropped significantly in recent years (see figure 1). Further pressure on refining and a continuing poor margin environment may make future divestments or investments difficult.

On the demand side, oil consumption continues to rise in developing markets and fall (or remain static) in developed countries. As a result, more than half the refineries in Asia, the Middle East, and Eastern Europe have been constructed or significantly upgraded during the past decade. Elsewhere, the industry has seen major shutdowns, especially in Western Europe and on the east coast of North America, while further assets are for sale with closure possible if buyers are not found. These trends have accelerated during the past 10 years.¹

An interesting paradox is that although refineries are shutting down in North America, the total refining capacity in the United States continues to expand, due to fewer bottlenecks and, at the larger sites, an increase in capacity. Smaller players are being squeezed out of the market. Demand patterns for refined products are also changing.

The conventional wisdom of vertical integration as the ideal and sustainable model is being challenged, with more differentiated approaches now under discussion

The recession has depressed gasoline demand in the United States and Western Europe. Looking ahead, a surplus of gasoline is expected in these regions, putting pressure especially on “gasoline-heavy” refineries. The overall trend in demand is clearly toward higher-quality fuels such as ultra-low sulfur.

The supply side is responding differently to these trends in different parts of the world. China and the Middle East—notably Saudi Aramco—are building more refineries and planning to integrate more closely with upstream activities (see figure 2). Brazil, meanwhile, in the wake of recent substantial pre-salt discoveries, is aiming to become an exporter of refined products and is leading capacity expansion in South America.

The United States is forecast to become an exporter of products, reversing its long-held position as a massive importer. Western Europe,

for its part, is seeing changes in asset ownership, with major players rethinking their portfolios and expediting divestments.

These changes reflect a more deep-seated change than a simple transfer of assets. The conventional wisdom of vertical integration as the ideal and sustainable model for refiners is being challenged. More differentiated approaches are being discussed, in which asset specifics are considered, along with the broader issue of network integration.

Middle East export refiners are in talks with downstream integrated players or specialized retailers in Asia to secure market outlets in the context of future changes in supply and demand. We are also seeing attempts to better lock in value from deeper integration with petrochemicals, lubricants, or other specialties, which are directing the discussion to the next level.

VALUE DRIVERS IN REFINING

In the face of such rapid regional and global change, refiners need to re-examine what really creates value in their industry to ensure they capture the most value from their asset portfolios. The value an asset generates

depends on factors related to input, output, and the asset itself (see figure 3).

Value related to input factors include crude fungibility, trading and hedging, energy imports, and blending components. Output value relates to the choice of product and market sectors, for example, lubricants,

petrochemicals, specialties (aviation and marine), or fuel and energy (domestic or industrial).

Asset value relates to scale and technology, the fiscal and regulatory (regime) environment, supply chain management, and slate flexibility.

Value derived from each barrel of oil consumed varies from day to day and over the long term, as does the risk to that value. Risk factors relate to supply and demand fluctuations and arbitrage, price and time exposure, volatility and availability, political and regulatory instability and uncertainty, and interdependencies along the value chain.

In such a complex and changing environment, refiners must be confident that they are participating in the market in the most productive way—ensuring that a refinery asset has both the right flexibility and the ability to capture multiple marketing options. →



IN MIDDLE EAST

While upstream integration continues to dominate, most new investment is going downstream, with the majority of refined products being exported.

OPERATING MODELS

Four principal operating models are currently in play in the industry, with no single model dominating. The picture is evolving constantly, as companies adopt models they feel are best suited to the times.

The operating models can be defined briefly as follows:

- **Upstream integration.** A single source of crude oil accounts for more than 50 percent of the upstream integrated refiner's supply; the crude source can be either equity crude or a long-term contractual arrangement.
- **Merchant refiner.** Lacking both upstream and downstream integration, the merchant refiner has the flexibility to react quickly to both crude and downstream supply opportunities and to adjust operations or integrate into a larger logistics hub.
- **Downstream integration.** Dedicated marketing channels take more than 50 percent of the downstream integrated refiner's production. These trades are secured either through equity or long-term contractual arrangements.
- **Vertical integration.** Fulfilling the requirements for upstream and

downstream integrated refiners at the same time, the vertically integrated refiner is able to capture value by making the most of advantages across the value chain.

Different operating models dominate in different regions of the world (see figure 4).

North America. Shrinking gasoline demand is reducing the gasoline deficit, which in turn reduces the op-

States, where the market is confined by the Pacific Ocean and the Rocky Mountains, emphasis is placed on the right location. Crudes coming from Alaska are light and do not require significant configuration of facilities, although some heavy crudes are supplied locally. Numerous fuel standards in California are driving up-grades.

For Gulf Coast refineries, to opportunistically capture the light-heavy spread, conversion capability is a prerequisite of crude slate flexibility, thus making configuration the predominant value driver. Ample product distribution infrastructure allows for both merchant and downstream-only operating models; most companies now adopt a

In the face of rapid regional and global change, refiners need to re-examine what really creates value in their industry, to ensure they get the most value from their assets

portunities for refiners that are big exporters to the United States and for traders monetizing arbitrage opportunities. Shrinking demand also has significant impact on refiners within the United States.

On the west coast of the United

100 percent "either-or" strategy that reflects their assets in the region.

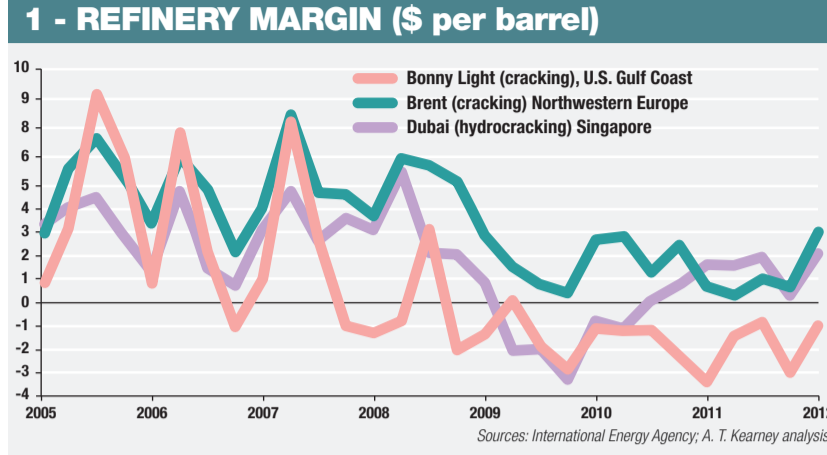
The east coast of North America favors downstream integration where there is proximity to crude and a large retail market, whereas in the Midwest, upstream integration is the favored

operating model for companies that have equity oil sands crude and can capture more value by refining or upgrading it than by selling on the open market.

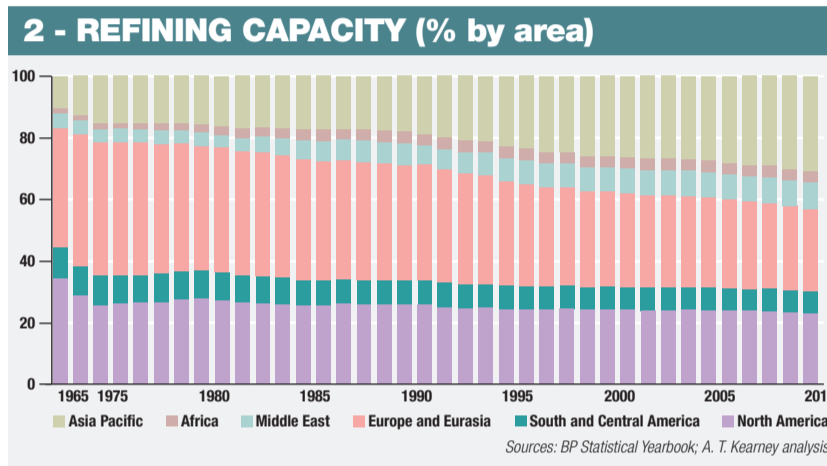
Refineries in the United States and on the Canadian east coast are vulnerable to declining demand for gasoline, to the highly unfavorable WTI-Brent spread, and to competition from overcapacity in Europe. These trends are responsible for instance for the recent closure of two major U.S. refineries, ConocoPhillips' Trainer facility in Pennsylvania and Sunoco's Marcus Hook refinery in New Jersey. Central Canada and mid-America have proven to be advantageous refining locations because of the combination of good pipeline access to Western-Canadian crude and limited product competition as a result of their relatively "locked" location. Prompted by growing exploration in Canada's oil sands, some refineries in Canada and the United States are planning to improve their processing capability toward heavier crudes. BP, for example, has now sold its two refineries in Carson (California) and Texas City, significantly reducing its footprint in the U.S., but has retained highly advanced assets, such as Cherry Point and Whiting, where it made significant investments in crude flexibility. Other companies may follow BP's restructuring and upgrading of refineries to take new crude available from shale developments and the rapid upgrades in the midstream and associated infrastructure that we are currently seeing. Refined product balances will continue to change, with condensate and LPG flows already switching from import to export and substantial increases in diesel exports arising from the recent upgrade projects.

South America. The South American market is dominated by vertically integrated oil companies that are mostly state-owned, such as Petrobras, PDVSA, and Ecopetrol. Only a few joint ventures exist between international oil companies—Repsol, Exxon, Shell—and local players in refinery activities; these are formed mainly for specific investment in heavy crude processing.

Middle East. While upstream integration continues to dominate in the Middle East, most new investment is going downstream, with the majority of refined products being exported. The continuing trend is toward mega-refining and petrochemical integration, while forming joint ventures for local exports and target-market assets are increasingly becoming part of corporate strategies. Another trend is emerging as talks between Middle East refiners (for example, Qatar Petroleum and Saudi Aramco) and Chinese downstream in-



Refinery margins in developed countries have dropped significantly in recent years.



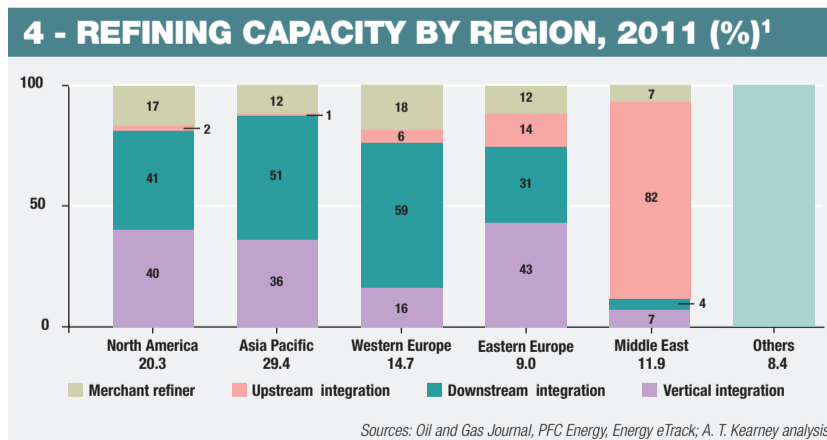
New plants are being built in the Middle East and Asia Pacific (especially China), increasing their refining capacity.

3 - REFINERY VALUE DRIVERS

INPUT	ASSET RELATED	OUTPUT
Crude fungibility <ul style="list-style-type: none"> Local or regional balances Pipeline or imports by ship Multiple asset optimization 	Scale and technology <ul style="list-style-type: none"> World-scale or sub-scale Distillation and conversion Technology 	Fuel and energy <ul style="list-style-type: none"> Merchant only versus retail Export versus local sales
Trading and hedging <ul style="list-style-type: none"> Feedstock Products Currency 	Fiscal and regulatory regime <ul style="list-style-type: none"> Tax Regulation Environment 	Specialties <ul style="list-style-type: none"> Specialist markets (marine, aviation, asphalt) with dedicated assets Brand quality
Energy imports <ul style="list-style-type: none"> Electricity Steam 	Supply chain management <ul style="list-style-type: none"> Location Logistics infrastructure Working capital optimization 	Petrochemical <ul style="list-style-type: none"> Which value chain Joint venture or sole ownership Export versus local sales
Blending components <ul style="list-style-type: none"> Gasoline Biofuel Gas to liquids 	Slate flexibility <ul style="list-style-type: none"> Dedication of technology Ability to change baskets Operational flexibility 	Lubricants <ul style="list-style-type: none"> Base oil plant Blending plant and storage

Source: A. T. Kearney analysis

The table compares the value generated by an asset with factors related to input, output, and the asset itself.



The chart shows the different operating models prevalent in each region of the world.

¹ 72 percent of global refining capacity, 672 refineries globally

tegrated players (for example, Sinopec) are underway to secure supply for Asia Pacific and outlets for the Middle East—these are the archetypal "win-win" situations.

Western Europe. In Western Europe, downstream integration is the dominant model. Scale, complexity, and location are critical for ensuring a competitive edge and supply flexibility. Asset-light strategies—or pure trading under a strong brand—are preferred because the region has both liquidity in petroleum products and good infrastructure, but is saddled by poor refining margins and inadequate raw materials base.

Many smaller and less updated assets have been closed or converted to terminals in Western Europe—for example, Reichstett by Petroplus in France, Dunkirk by Total in France, Cremona by Tamoil in Italy, and Harburg by Shell in Germany. Others have been offered for sale, including Humberside by Conoco in the United Kingdom and Chevron's interest in Nerefco in the Netherlands.

Other smaller gasoline-heavy refineries are at risk. In this region, the pure merchant model is being questioned as a result of increased price volatility for both refinery inputs and outputs, as evidenced by, for example, the insolvency of Petroplus in January 2012.

Eastern Europe and Russia. Eastern Europe and Russia still see vertical integration as the highest priority. The Russian government continues intervening to support fuel oil exports, with refining being subsidized to encourage investment in modernizing assets. Meanwhile, Eastern European refiners focus on serving local market needs, with local governments securing existing market positions. This strategy may mean the industry is at a dead end.

Asia Pacific. Asia Pacific exhibits some common features across the region, and some major distinctions, especially with regard to energy shortages. Prices are generally controlled by the government, distribution chains are owned by national oil companies, and downstream integration is the dominant model. Merchant refiners are exposed to subsidies and need to be able to adapt to local conditions regarding supply versus export opportunities.

Ownership structures in Asia Pacific refining have been changing significantly: Players that were marginal or non-existent 15 years ago have recently created a great deal of additional capacity—for example, 75 million tons per year in India from Reliance and Essar. In this area of rapid economic growth, international oil companies are increasingly trying to invest through partnerships.



RIO DE JANEIRO
Petrobras intends to meet all of the growing domestic demand for fuel and to become an exporter. The company is investing more than \$70 billion to increase its refining capacity by 50 percent and to modernize its facilities in order to comply with Western fuel standards.



DIFFERENT STRATEGIES FOR DIFFERENT REGIONS

In such a diverse landscape, it is clear there can be no one-size-fits-all approach to business. Adapting to local or regional conditions, while making the most of global synergies, is the name of the game. And evidence shows that companies are starting to recognize that the time for change has come.

North America, for instance, has seen a significant challenge to the conventional wisdom of the integrated operating model, with planned divestments by BP, Sunoco, and others, and the divorcing of ConocoPhillips and Marathon into separate upstream and downstream companies. The industry forces driving such an about-face are explored in a recent A.T. Kearney paper, *Challenging the Integrated Oil and Gas Model*. Marathon Oil's spin-off of its refining operations pushed the company's stock price up 20 percent higher than that of integrated oil companies, with the upstream company assessed at three times the market value of the downstream company.

In contrast, the larger regional players in South America are expanding

refinery capacity to capture more value related to local oil production. They are embedded in the classic model of full vertical integration. Petrobras is planning to completely cover growing demand for domestic fuel and—an even more expansive target—to become an exporter. The company is investing more than \$70 billion, increasing refinery capacity by 50 percent, and upgrading existing assets to meet western fuel standards. The Middle East has seen more refineries open since 2005 than any other region. Many joint ventures have been formed to integrate refining, petrochemical, and chemical plants. Local companies are partnering with international players to gain technical expertise, guaranteed off take, and reduce exposure to geopolitical risk. The key features of this region include easier access to capital, dependence on access to technology, and increasing complexity. Saudi Arabia, for example, has moved to consume heavy crude in its new refineries. This leads to far more complex refining and petrochemical integration than before, as seen in the Petro Rabigh project and the co-location of the Satorp and Sadara projects.

Similar to North America, Western Europe is facing a strong challenge to the traditional integration model, with Exxon, Shell, and BP all announcing divestments. Regional leaders such as Austria-based OMV have also announced asset-light strategies and are considering significant divestments in refining. Merchant refiners are milking their assets to get the most out of the barrel. For local refiners, specialized retailers and hypermarkets are becoming increasingly important.

Eastern European and Russian refiners are investing in technologies and scale to overcome the limitations of their dated structures and to pursue asset excellence. However, infrastructure and output issues around the still-underinvested and not-yet-upgraded refining technology landscape are hindering integration with the local market and are favoring fuels export instead. Players such as Rosneft and Lukoil are targeting assets in Western Europe to broaden their portfolios.

Asia Pacific is the region with the highest activity in terms of numbers of refineries opened and closed, even as small, polluting, and less efficient

refineries are being closed and world-scale state-of-the-art facilities are coming on line. In this highly attractive market, international oil majors are becoming much more involved in joint ventures to build petrochemical plants, attracted by relatively high economic growth in many countries.

THE ONLY CERTAINTY: A REQUIREMENT FOR EXCELLENCE

We expect further significant up-scaling in global refining, which will result in divestment and closure of lagging assets in North America and Western Europe. The changing global supply and-demand situation will push Middle East refiners to intensify their partnering with Asia Pacific players.

Meanwhile, more refineries in Asia Pacific—especially China and India—will integrate with petrochemical plants, as a combined build-or-buy reverse integration. Changes in crude availability and discounts will affect refining capacity and profitability of some players in the region. As discussed earlier, companies can respond to these changes by choosing among different operating models and methods of value-chain integration. Each model has its own strengths and weaknesses; for instance, the pure merchant-refining model ranges from vulnerable to high volatility in absolute oil price.

For new investors, integration with a competitively positioned upstream player or a secure downstream business will be important. Deep integration of refining with petrochemicals can add value but comes with its own complexity and economic factors. The only given in this shifting landscape is that refining excellence is imperative in all input, output, and asset-related dimensions. The market gives no one a free ride, and it has become more important than ever to manage risk exposure. ■

A.T. Kearney is a global management consulting firm, focusing on strategic and operational CEO-agenda issues for the world's leading organizations across all major industries and sectors.

THE AUTHORS. Tobias Lewe, Joerg Doerler, Vikas Kaushal, Tomislav Corak, Jose Alberich, George Smith, Neal Walters, Dario Gaspar, Richard Forrest.



OPEC/The global refining outlook: mid - to long-term

Risks and opportunities in a changing world

Continual structural changes, low plant utilization rates, weak margins, capacity surplus and increased competition for market share mean that refiners are facing a plethora of challenges

Over the last few years the global refining industry has undergone some substantial restructuring that is shifting the downstream landscape. And it is clear that the next few years are likely to be a challenging and turbulent time for the industry. There is much for refiners to contemplate as the industry un-

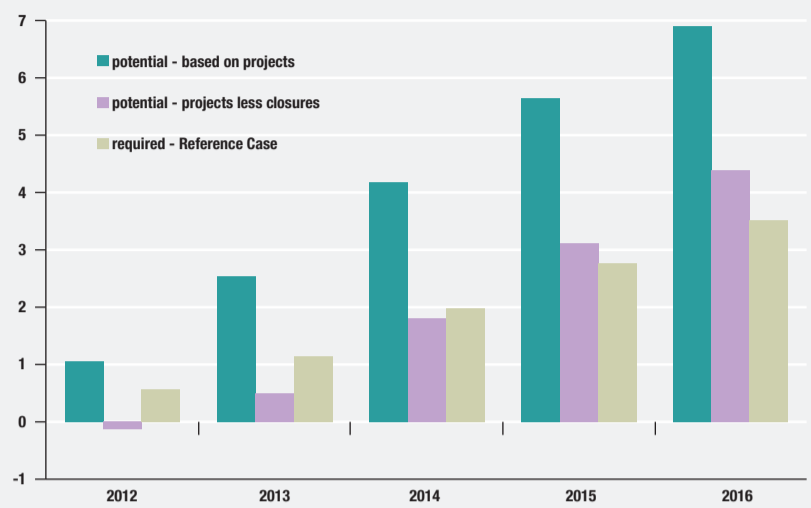
by **ABDALLA
SALEM
EL-BADRI**

dergoes further restructuring. There are obviously many views as to how the industry might actually look in ten or twenty years, but what is certain is that it will be very different from today.

With an expectation for continued structural change to the industry, in both the product mix and the regional balance, low plant utilization rates, weak margins, capacity surplus and increased competition for market share, refiners have a plethora of issues to negotiate and challenges to over-

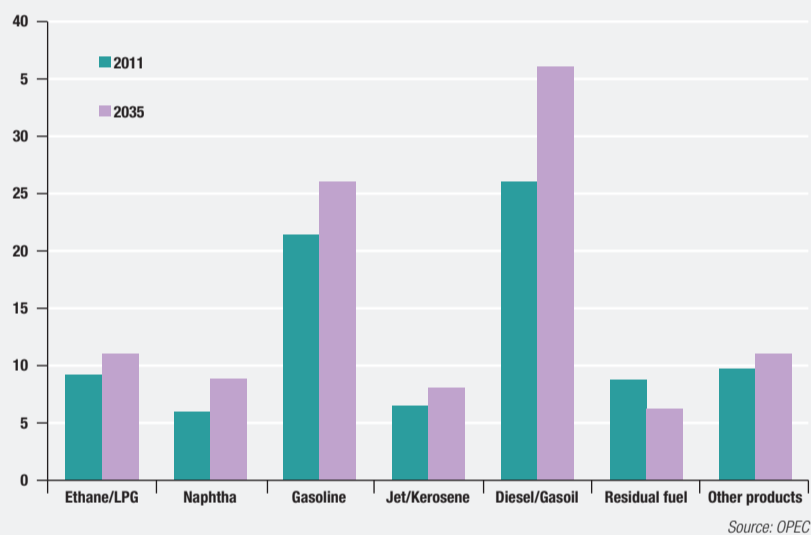


1 - DEMAND AND POTENTIAL CAPACITY (tbpd)



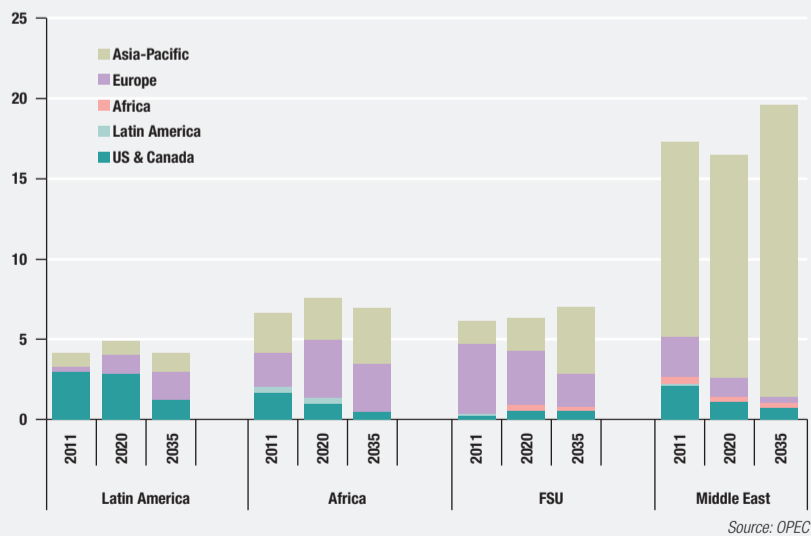
The graph shows the increase in refinery throughputs – resulting from demand increases – compared with the “potential” to increase throughputs based on the additional refining capacity that is expected to come on stream within the 2012-2016 period.

2 - GLOBAL PRODUCT DEMAND 2011-2035 (mbpd)



Of the 20 million barrels of additional demand by 2035, about 60 percent is for diesel oil and 38 percent is for gasoline and naptha.

3 - MAIN MARKETS (mbpd)



The graph shows exports of crude oil by destination in 2011, 2020 and 2035. The Middle East will become a key exporter, at nearly 20 million barrels per day.

come. The outlook for the downstream is covered comprehensively in OPEC’s World Oil Outlook (WOO) 2012, and this article will focus upon some of the key developments and the potential changes the industry might face in the years ahead.

SPARE CAPACITY AND CLOSURES

For the medium term – the next five years – refining developments will primarily be driven by the quantity and type of capacity additions, and the extent to which these additions will be offset by closures. An assessment of existing refining projects shows that around 7.2 million barrels per day (bpd) of new crude distillation capacity will be added to the global refining system in the period up to 2016. Forty percent of the additional capacity is expected to materialize in Asia, mainly in China and India. The Middle East, Latin America and Russia also feature strongly with capacity additions. Part of this new refining capacity will be offset by refinery closures. Recent refinery closures have reached 4 million barrels per day globally and, taking into account some recent announcements, are heading towards 5 million bpd by 2014 — and potentially higher, since at least 15 refineries are known to be for sale. Europe has experienced most closures, at around 1.7 mb/d. Refineries in North America and Japan are also being hit hard. In addition, it is no longer just small and simple plants; today there are a number of more complex refineries closed, or facing closure.

In balancing out the expected new projects with closures, and comparing them to the required runs in the reference case of the WOO 2012, it is clear that there will be more capacity coming on-stream than will be required by the incremental “call

2011 and 2012, refinery closures mainly in OECD regions reduced spare capacity to below 4 million bpd. However, new projects will bring it back above 5 million bpd towards the end of the medium-term horizon unless more refineries are closed. And, without closures, the level of spare capacity would move towards 10 million bpd by 2016. This means that there is scope for more capacity rationalization.

In fact, the closure of around 4 million bpd committed so far has only removed the primarily surplus capacity that was often idle anyway and thus had little impact on margins. Current estimates imply that additional closures of 3–6 million bpd are needed to restore long-term refining viability.

GASOLINE SURPLUS – DISTILLATE DEFICIT

However, it should be stressed that a surplus of distillation capacity that exists in the industry does not necessarily mean there will be a surplus for all products. In fact, the industry is facing the challenge of distillate deficit and gasoline surplus. Therefore, the proportions of distillate versus gasoline and naptha in the output of a refinery will be key factors affecting margins and profit. In this respect, refinery process technologies, some of them nearing the commercial stage, could markedly change refinery yields.

In general, what all this means for the industry is that the next few years are likely to be a period of continued low refinery utilization, weak margins and increased competition, since the refining surpluses evident in the OECD regions are not deterring projects in non-OECD regions. Moreover, a review of existing projects indicates that conversion and hydrotreating capacity additions grow

faster than crude distillation. Therefore, it is potentially misleading to infer refining margins purely as a function of distillation capacity utilization. Overall, higher utilization rates – probably above 85 percent – are needed to improve margins to healthy and sustainable levels.

When looking to the long-term, it is important to highlight the rising share (and volume) of non-crude liquid supply that will satisfy around 60 percent of the increase in product demand to 2035. This is because most of these streams bypass the refining system, thus reducing the scale of future expansions needed. On the demand side, the importance

Additional plants producing between 3 million and 6 million bpd will need to be closed in order to restore the long-term viability of refining

on” refining. This can be seen in figure 1.

This is particularly evident when looking at spare distillation capacity. Post-recession developments took the global refining system’s spare capacity above 6 million bpd in 2009. In 2010, the situation was somewhat reversed, as demand increased. In

What is driving diesel and naphtha demand



ROAD TRANSPORT



MARINE INDUSTRY



AERONAUTICS



PETROCHEMICAL INDUSTRY

of the transportation sector is reflected in the fact that, out of 20 million bpd of additional demand by 2035, around 60 percent is for middle distillates and another 38 percent is for gasoline and naphtha (figure 2). Besides the growth in road transport, demand for diesel also receives support from marine bunkers, jet kerosene from the expanding aviation sector, and the growing petrochemical industry provides momentum for naphtha demand. For the remaining products, a decline in residual fuel oil is broadly offset by an increase in ethane, liquefied petroleum gas, and the group of “other products.”

To meet this future demand for refined products, OPEC’s WOO 2012 projects that cumulative total additions will reach 15 million bpd by 2035. However, almost half of these additions will already be on-stream by 2016. Thus the industry is set for a surge of additions in the next five years, after which a much slower rate will be needed up to 2035.

It is also important not to forget the growing importance of secondary process units, which play a vital role in producing advanced finished products. Nowadays, essentially all major new refinery projects comprise complex facilities with high levels of upgrading, desulphurization and other secondary process units. This trend is set to continue, since the WOO 2012 projections emphasize a sustained need for incremental conversion capacity. In particular, hydrocracking will account for almost 70 percent of the required total conversion capacity. In contrast, much fewer additional coking and FCC units will be needed, since there is already over-capacity in these areas.

Furthermore, the drive towards continued tighter fuel sulphur standards will lead to desulphurization accounting for the largest volume of capacity additions in the period up to 2035. These additions will be one and a half times more than those of distillation – or, in terms of volume, it is expected there will be 22 million bpd of these units.

CHANGES IN TRADE PATTERNS

Of course, it is also vital to understand the changes that are likely to occur in the crude oil trade between major regions (figure 3). In general, it is projected to remain stable in the medium term and grow in the long term. The Middle East will become the key crude-exporting region in the long term, with almost 20 million bpd of crude exports by 2035, compared with 17 million bpd in 2011.

Higher utilization rates of the refineries – probably above 85 percent – are needed to improve refining margins to healthy and sustainable levels

There will, however, be an eastward shift in the long-term crude trade pattern. Due to declining demand, combined with growing supply in the U.S. and Canada, net crude oil imports to this region in the WOO 2012 reference case are set to drop below 2 million bpd by 2035, from more than 7 million bpd in 2011. This leads to a

shift in the global crude trade, which, to a great extent, will be determined by the type of additional barrels that are expected to be produced in North America.

In the first place, increased crude production will come in the form of light crude oil grades, supplemented by a rise in ethanol supply, which will gradually displace part of the current imports from Africa and the North Sea. And growth in heavy crude oil supply in Canada will also reduce U.S. imports from Latin America at some point after 2020. It is projected that these displaced barrels from Africa and Latin America will progressively change the direction of trade to the east, attracted by growing demand in Asia.

And it is clear that refiners will also need to carefully monitor the proportion of crude oil that needs to be refined per barrel of incremental product.

This is presently in decline, and shale gas developments could change this picture even further not only on the supply side by adding more natural gas liquids (NGLs) or allowing for more gas-to-liquids (GTLs) than is anticipated in the WOO 2012 reference case, but also on the

demand side, as more and cheaper natural gas, could mean more substitution of crude oil-based liquids. The net effect could be that conventional refineries are further squeezed by both additions to non-crude supply and reductions in demand. In the coming years and decades, the refining sector will have to face up to

some fundamental and complex challenges. Many are already occurring and evolving, while others may impact the industry in the future. From capacity surplus to competition and closures, economic drivers to technology, as well as supply and demand developments, there are many interlinked issues for refiners to discuss, and act upon. It should be stressed, however, that while there are clearly many risks facing refiners, there will also be opportunities for those able to successfully negotiate the challenges before them in the years ahead. ■



THE AUTHOR. Abdalla Salem El-Badri was appointed OPEC Secretary General on 1 January 2007. He began his oil industry career with

Esso Standard (now ExxonMobil) in 1965. In 1983, he became Chairman of the Libyan National Oil Company, before being made Minister of Petroleum in 1990. His ministerial career continued with his appointment as Minister of Energy, Oil and Electricity and Deputy Prime Minister. During the latter half of 1994, he was both President and Secretary General of OPEC, and again served as its president in 1996 and 1997.

Analysis/Refineries are now greener and more efficient

The factors that have changed the sector

The global oil refining sector is undergoing a period of profound transformation. Seven important changes have come to light in recent years.

1 THE INDUSTRY IS ON THE MOVE. Even though the number of refineries in industrialized countries is falling, new structures are spreading across the developing world. There are two main reasons for this geographical shift. Firstly, there has been a change in demand trends: according to OPEC forecasts, demand for refined oil products in the Asia-Pacific region will grow by around 2 percent per year between 2015 and 2020, compared with stagnant or even slightly declining demand in Europe and the United States over the same period. Partly as a reaction to this trend, the developing countries are set to increase their refining capacity by around 6.9 million barrels per day between 2011 and 2015. In stark contrast, refining capacity in Europe and the U.S. is only expected to increase by 1 million barrels per day. The second reason behind the plant closures is the shrinking profit margins being earned by refineries in developed markets, where the sector is becoming economically unviable. A study conducted by consultants A.T. Kearney estimates that one refinery in five in the U.S. and Europe are destined to shut down in the next five years (see page 14).

2 THE OWNERSHIP STRUCTURE IS CHANGING. International oil companies (IOCs) have gradually abandoned the refining sector, making way for national oil companies (NOCs), which are building new plants in consumer countries as well

New operators, trade agreements, ownership structures, locations and technological innovations are pushing refining into hitherto unexplored places and situations

by MOISÉS NAÍM

as oil-producing areas. In their home countries, large NOCs are often seen as a way to stimulate the creation of new industrial sectors and new jobs, and to add value to oil exports. As such, increasing installed refining capacity is a natural way to build on NOCs' activities. Saudi Arabia is a fitting example of this trend. Khalid al-Falih, CEO of ARAMCO, has said that Saudi Arabia could become the leading oil refiner in the world over the medium term. He is not alone. In her recent farewell speech as president of the African Refiners Association, Anabela Fonseca declared with fresh confidence that "Africa is growing." She is right: from Nigeria to South Africa, there are many plans for new

refineries, some of which are already under construction.

3 NEW ENERGY SOURCES. Refineries often have no choice but to process low-quality oil because the crude that is increasingly available tends to be heavier and "unconventional" – so much so that it requires special production and refining technologies. The crude oil that is currently processed most frequently has a lower average quality than in the past, is more viscous and has a greater metal content, including sulfur. In the past 10 years, massive volumes of

heavy crude oil from Mexico, Venezuela, Canada and Saudi Arabia have displaced lighter, better-quality crude. Because of this, refineries need high-tech equipment to perform cracking – including desulfurization, thermal decomposition (visbreaking) and hydrogenating cracking – to reduce viscosity, separate heavy molecules into their lighter components and extract the sulfur and other metals. In some cases, unconventional heavy oil requires specific and sophisticated deep conversion refineries that make it extremely expensive to produce commercially viable products. This clearly adds to the pressures that are leading many refineries to close down.

4 THE OIL REFINING SECTOR IS INCREASINGLY "GREEN." As governments worldwide bring in increasingly strict environmental regulations, refineries have had no choice but to become "greener." Specifically, rigorous domestic regulations on pollution and emissions controls have triggered a cycle of profound changes. Under the new legal framework, for example, the percentage of fuel oil in the global refining mix fell from 25 percent in 1979 to around 10 percent in 2011. In addition, co-generation plants are far less polluting than traditional power stations. Despite this, it is inevitable that efforts to build eco-friendly oil refineries will clash with the reality that the low-quality oil available for refining is more polluting. This basic fact has given rise to many initiatives to try and reduce the environmental impact of the refining sector. One promising example of this new trend is the emergence of bio-refineries: developed along the same lines as traditional oil-based structures, bio-refineries integrate cutting-edge technologies and biomass conversion

processes to produce fuels, chemicals, animal feed, materials and energy from non-traditional sources. Recently, two New Mexico companies – Tesoro Corporation and Sapphire Energy Inc. – joined forces to build a refinery capable of processing marine algae. Another encouraging sign is the rise of “Ecofining” – a process developed by Eni SpA and Honeywell UOP, which uses hydroprocessing technology to convert natural oils and inedible animal fats into clean diesel. The process has already been put into practice by Emerald Biofuels to build a refinery in Louisiana. However, perhaps the clearest example of the new trend for eco-friendly refineries can be seen in Italy, where Eni is engaged in a project costing \$125 million to transform the oil refinery in Venice into a bio-refinery that will produce diesel from biofuels. Works are expected to conclude in late 2013.

5 THE EFFICIENCY REVOLUTION. The need to cut costs to compensate for falling profit margins, together with more rigorous environmental requirements and the new opportunities presented by the latest technology, has led to a rise in the average efficiency of refineries. A clear sign of this is a more productive use of energy. The co-generation plants mentioned above do not only generate electricity but have also been designed to store heat, which is then recycled within the plant or supplied to communities in surrounding areas. This process could lead to 80 percent efficiency rates, compared with the 40-50 percent rates provided by combined cycles, gas turbines and coal-powered plants. One of the main structures of this type is located in northern England and supplies the nearby Lindsey and Humber refineries, using 20 percent less fuel than traditional plants. Another example is the Jamnagar refining complex in India – the largest in the world – where environmental restrictions and the need to process heavy crude have propelled significant growth, which now balances the main economies of scale, based on these innovative projects that reduce both investment and management costs. The result is that the refining sector has never been as efficient and clean as it is now.

6 NEW CORPORATE STRUCTURES. NOCs, IOCs, independent and specialized refineries, and national governments are coming together under new forms of partnerships and agree-

BIO-REFINING
German Chancellor
Angela Merkel, at center,
and the prime minister
of Saxony-Anhalt,
Reiner Haseloff, right,
visiting a bio-refinery
at the Fraunhofer Center
in Leuna, Germany.
Scientists at the center study
how to use renewable
resources effectively
to replace petroleum
in the chemical industry.



ments. Historically, it was the IOCs that owned refineries in consumer countries.

However, we are now seeing a growing interconnection of interests, giving rise to new corporate structures forged in order to meet the modern commercial and energy security requirements that affect producer and consumer countries alike. A good example of this is the refinery owned by the Motiva Enterprises LLC group in Port Arthur, Texas. The largest refinery in the United States, it is joint-managed by Saudi Arabia’s ARAMCO (a NOC) and Royal Dutch Shell (a huge IOC), and located in a third country – the United States. This structure allows Saudi Arabia to ensure a stable market for its heavy crude.

For its part, the U.S. can count on a solid trade relationship with the world’s main oil producer, thus increasing its own energy security. Royal Dutch Shell, meanwhile, is able to expand its presence on both fronts: establishing a partnership with the producer and setting itself up as a key player in the U.S. refining segment.

Agreements like this – where, for various reasons, partners reach a compromise to develop shared initiatives – are now the order of the day.

7 CHANGING PRODUCT DEMAND REQUIRES DIFFERENT REFINING MODELS.

New refineries are already adapting to changing consumer preferences. Diesel, for example, will account for 60 percent of additional global demand for refined products by 2035 – a trend attributable both to diesel’s rising market share as fuel for cars and heavy vehicles, and to its increasingly frequent use as bunker fuel. Accordingly, new refineries will be set up to produce more diesel and less gasoline.

Throughout much of the 20th century, the orthodox line was that technology, cost models, the nature of demand and other considerations regarding risks and profits had – almost naturally and inevitably – caused the absorption of refineries into the structures of vertically integrated oil companies. Clearly, there were also independent refineries, but these were mostly the exception that proved the rule. In the majority of cases, large oil companies owned and ran refining assets as an additional step in the processing chain, from exploration to retail hydrocarbon sales.

Now the situation seems completely different: although the idea of a vertically integrated refinery is still a key part of the industry, refining activities are expanding into hitherto unexplored places and situations, thanks to new operators, trade agreements, ownership structures, locations and technological innovations.

Moisés Naim is a scholar at the Carnegie Endowment in Washington and the author of *The End of Power: From Boardrooms to Battlefields and Churches to States, Why Being In Charge Isn’t What It Used to Be*, Basic Books, 2013 (see page 55).

Europe/The industry crisis puts energy security at risk

A Cinderella story with no happy ending in sight

International oil companies have been reducing their European refining capacity for some time, while increasing their capacity in emerging countries. So far, no fairy godmother has come along to take their place



The Western European refining industry is often described these days as the Cinderella of the oil industry. The international oil companies (IOCs), its traditional and most financially and technologically capable owners, have been divesting their European refining capacity for some time while increasing their exposure to emerging and non-OECD (Organisation for

by PAUL
BETTS

Economic Co-operation and Development) countries. No fairy godmother has so far come along to replace the IOCs. Independents have acquired capacity from the IOCs, but their high hopes of performing more flexibly and efficiently have not materialized, and the biggest European independent refiner, Petroplus, has been forced to file for bankruptcy. The national oil companies (NOCs) from both oil-producing and oil-deficient emerging countries have made a few targeted investments in the European refining sector, but they have been no prince charming limiting

One of the main problems for the European industry is the mismatch between the type of products produced and demand, with gasoline surpluses and a shortage of middle distillates

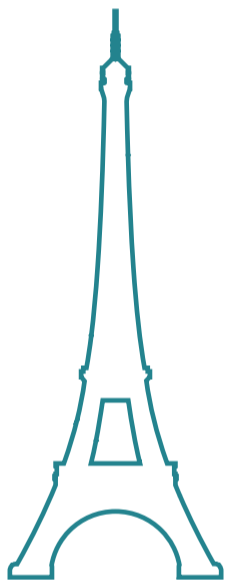
their European forays to establish a presence in the old continent as well as buying themselves a useful platform to monitor industry developments

and accelerate their way up the learning curve. These acquisitions by NOCs in selected European refineries are also widely seen as Trojan Horse investments in what will, essentially, be storage facilities to help distribute on the European markets refined

products produced and then exported from the NOCs new state-of-the-art, highly-competitive large-scale refineries in their home countries.

THE INDUSTRY'S DISCONTENTS

Governments and the European Commission have begun to fret over the risk of not just security of oil and gas supplies but of all-important supplies of refined products, although offering little concrete assistance and instead continuing to put pressure on the sector's margins and operations by levying hefty taxes and imposing increasingly stringent environmental standards as well as encouraging the development of substitutes such as bio-fuels. This at a time when the industry in Europe is facing an ever-growing list of challenges including fierce competition from Middle East producing countries and other emerging nations such as India, China and (more recently) Brazil, which also now intends to become an exporter of refined products.



In France, four refineries have been lost since 2009. Four additional plants are now at risk, including Exxon-Mobil's Fos facility, the Lavera refinery partly owned by the Ineos Group, and two Total refineries at Feyzin and La Mede.

Meanwhile, domestic demand in Europe and U.S. demand for European exports of gasoline products continues to decline. Indeed, the U.S. is also becoming exporters of refined products to Europe. Compounding all this is the problem of the mismatch in Europe between the type of products produced and demand, with surpluses in gasoline and a lack of capacity for middle distillates. Last but not least is the lack of scale of many older European refineries in an industry where fixed costs and investments have always been high and are continuing to rise. All in all, the picture in Europe is not a pretty one.

The industry's statistics and its forecasts reinforce the prevailing gloom. Between 2008 and 2012, around 30 percent of total European capacity has changed hands, was mothballed or was converted (20 percent of it in the last two years), according to a detailed and hard-hitting study of the European refining sector crisis by the Dutch Clingendael International Energy Programme in combination with the Netherlands Institute of International Relations. The study points out that since the so-called "golden years" of profit margins in the refining sector from 2004 to 2008, European refining margins have been razor-thin as a result of declining European demand for oil products, higher prices of crude oil feedstock, and the pre-existing overcapacity in the European refining sector further lowering margins.

CLOSINGS IN FRANCE

The French Petroleum Institute (UFIP) recently warned once again that the European oil refining industry is in deep crisis and that governments should brace themselves for more problems. "European refineries are going to continue to suffer, it is something that government leaders and policy makers should understand," cautioned Jean-Louis Schilansky, the head of the French petroleum industry association. "We continue to forecast that in 2015 there will still be an 8 to 10 percent overcapacity in the European refining system and the shake-up in Europe is not over," he added. In France, four refineries have been lost since 2009. Four additional plants are now at risk, including Exxon-Mobil's Fos facility, the Lavera refinery partly owned by the Ineos Group, and two Total refineries at Feyzin and La Mede. For the French oil major Total, the problem is all the more acute. The company owns around 2 million barrels a day of European refining capacity with 85 percent of this capacity located in Europe, of which 40 percent in France alone. The company, however, has struggled to restructure its French downstream operations because of union opposition and government arm-twisting. Indeed, Total has confirmed that it will honor a pledge it made (when it decided to shut down its Dunkirk plant in 2010) of not closing any other refineries until 2015.

LOOKING FOR REASONS IN THE UNITED KINGDOM

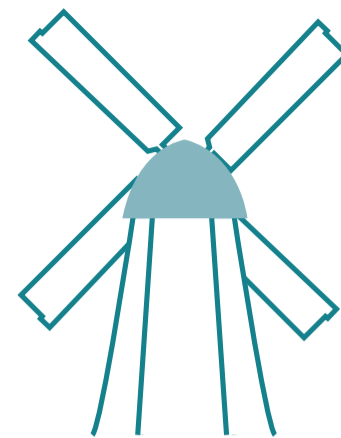
In the U.K., the political establishment has also become alarmed by the crisis. The parliamentary Energy and Climate Change Committee is now seeking written evidence on the

reasons for U.K. refinery closures, the impact of domestic and European Union regulation on the industry, and what mix of products is likely to be required in the future. In the late 1970s, the U.K. had 18 oil refineries. Today there are only seven. The most recent to close, in 2012, was Coryton, one of the largest and most modern facilities in Europe, which supplied 10 percent of the U.K.'s fuel market. Owned by the now-insolvent Swiss Petroplus group, Coryton was the second U.K. refinery to be shut down since the economic crisis erupted in 2008. But at a Platts European Markets Conference, Robert Turner, the Price Waterhouse Coopers (PWC) director who led the PWC team for the Petroplus insolvency in the U.K., told participants that they should not make the mistake of thinking that the circumstances which led to Petroplus' downfall were unique to the Swiss pan-European refiner.

"The European refining sector will have to restructure massively, but new capital may not be willing to come in," he said. "This period of restructuring will be radical and extremely painful for the sector." In the case of the Coryton refinery, the PWC director said the bankruptcy administrators had received a better offer from parties looking to turn Coryton into a storage terminal than from those wanting to run it as a going concern. At the end of the day, nobody was willing to take over the facility, which was ultimately forced to close. There are various estimates on how many refineries may have to be closed in coming years in Europe. A study of the sector by consultants A T Kear-



The United Kingdom had 18 refineries in the late 1970s. Now there are only seven. The most recent to close, in 2012, was Coryton, one of the largest and most modern facilities in Europe, which supplied 10 percent of the U.K.'s fuel market.



The Netherlands is looking to increase the scale of its refineries. The nation also has the added advantage of access to a deepwater harbor.

ney (see page 14) suggests one in five oil refineries are expected to cease operations over the next five years. A Bloomberg survey of European refinery executives shows that of the region's 104 facilities, 10 will shut permanently by 2020, from France to Italy to the Czech republic. "Purely from the falling European demand point of view, one bigger refinery or two smaller plants would have to shut in Europe every year," one executive noted.

A senior BP refining and petrochemical executive, now retired after managing a big U.K. refinery, says that Europe's issue is that there is little ready access to large quantities of oil near refineries. At the same time the related problem is that most of Europe's refineries are old and relatively small in current-day terms, making it difficult to compete with the giant new refineries of China, India, Saudi Arabia and South America. "Moreover, indigenous oil if you are lucky to have it is not the simple solution. There is a structural issue, for oil supplied to refiners in Europe is of varying degrees, with good and bad crude, and this ultimately dictates what you can do and get out of it," says the former BP manager with years of hands-on experience in refining. He adds "You have little control at the refinery end of your supply source these days, as a lot of oil comes from the spot market. Given the way oil is traded on the spot market, it is difficult to determine where the crude is coming from, so it is important to have long-term contracts with suppliers, even if these can at times be uneconomical as a result of the swings in crude and gas prices. At the same time your labor costs keep going up in Europe, every year, while Eastern producers benefit from lower labor costs – at present, at least," he explains.

Independents have indeed been buy- →



ing up refineries from majors who want to reduce their exposure to this business and focus on the much more profitable upstream. But many of these independents have been caught by the dismal economics of European refining and are in turn closing down plants or converting them into storage facilities and not running them as a going concern. In the U.K., for example, gasoline consumption has dropped by 25 percent so far this year as a result of the recessionary climate. The BP managers explains: "Prices are high, people are short of cash and cutting back on the money they are spending on fuel. Then there is the amount of tax governments take on pump prices that has exacerbated the problem. Taxation regimes are pushing down demand and the ability of refiners to make an effective profit. Capital investments are high, and the problem is compounded for older refineries because of the cost of installing new safety equipment to meet current standards. New regulations and safety requirements all come into play. In a nutshell, it is cheaper to build in China where compliance is not as rigor-

Attention should be paid to the competitive position of the European industry versus external refiners with respect to differences in local regulations and local advantages

ous. It has become too expensive to build in the U.K. Also, by building in China, you are close to your market, given the strong local demand there."

THE NETHERLANDS ARE AT THE RIGHT END OF THE SCALE

So where does Europe go from here and where will its refinery industry end up, especially given that no viable successors have emerged to the IOCs with the necessary financial and technical muscle to tackle the challenges of the sector? The IOCs have been unwilling to commit to medium- to long-term investments in European refining, preferring to increase their

refining exposures in emerging and non-OECD countries. On average, IOCs spend only 15-20 percent of their total investments in the downstream part of their business. Indeed, the current crisis in Europe has been staring everybody in the eyes for a good 30 years or so. Even if

they would probably like to divest themselves as much as possible of their European refining activities to focus on the upstream, oil companies can clearly not simply turn their back to this troubled sector. They have been pondering the best solution, and one obvious conclusion is that a small refinery is not economical. You need scale, and in Europe the Dutch are probably at the right end of the scale, with the added advantage of access to a deepwater harbor. The industry has been turning to new technology to help in its restructuring, but while technology is important it cannot fix the problems of high fixed, labor and capital costs.

THE NEED FOR A EUROPEAN STRATEGY

The Dutch Clingendael study of the European refining industry urges European Commission and national policy makers to address the structural problem of short-term market uncertainties and long-term horizons for refining investments. The market alone, it argues, will not solve the dilemma. It makes a number of sensible recommendations. There should be a review of the current impact of levies – including differentials in sales tax on diesel- and gasoline-fuelled cars – on the demand for various fuels. Attention should be paid to the competitive position of the European industry versus external refiners with respect to differences in local regulations and local advantages. There should be a lowering of entry and especially exit barriers for uncompetitive European refiners. A fourth type of solutions for the longer term could be to substitute fuels, particularly light and middle distillates with biofuels, fuel from coal or natural gas to balance the amounts of fuels required and reduce the necessary throughput of crude oil. Europe needs an innovative oil and renewables-based industry to provide its future needs in an efficient, effective and environmentally-friendly manner and one which also provides security of supply.

The European Commission pointed out in a 2010 working paper the long-term need to restructure the sector. But the European market, framed partly by European and national legislators, has so far failed to send out the right signals. It appears nowadays increasingly difficult to renew, exit or enter the market. The economic crisis comes on top, further weakening the sector, and the situation is not only an industrial concern to maintain jobs. From an energy perspective, the ongoing closures, or the clearances of many European refineries to foreign companies from emerging or oil-producing countries raise the issue of European security of supply of oil products. It is all terribly gloomy, and Cinderella is certainly not about to be whisked to her glamorous ball. Her prince will have to be very patient. ■

Paul Betts has worked for the *Financial Times* for the last 36 years, including 28 years as the paper's foreign correspondent in Rome, Paris, New York and Milan. He is currently based in London.

EUROPIA/Director General Chris Beddoes sounds the alarm

A loss we cannot afford



Europe must keep hold of its refining industry or risk a threat to the security of the energy supply. The European Union must consider the impact of climate policies on competitiveness



CHRIS BEDDOES is Director General at EUROPIA since January 2013. He joined EUROPIA in January 2008 and was responsible for the Energy and Climate portfolio, covering the impacts of EU policy on Refining. Chris is a graduate Chemical Engineer and has 30 years' experience with ExxonMobil in Refining, Supply and Distribution.

The decline of the refining sector would be an enormous loss for Europe in terms of economics (it means 20-30 billion euros per year), taxes (270 billion euros) and jobs. It would also put the security of supply at risk, increasing member states' dependence on imports. The man sounding the alarm is Chris

by **SERENA VAN DYNE**

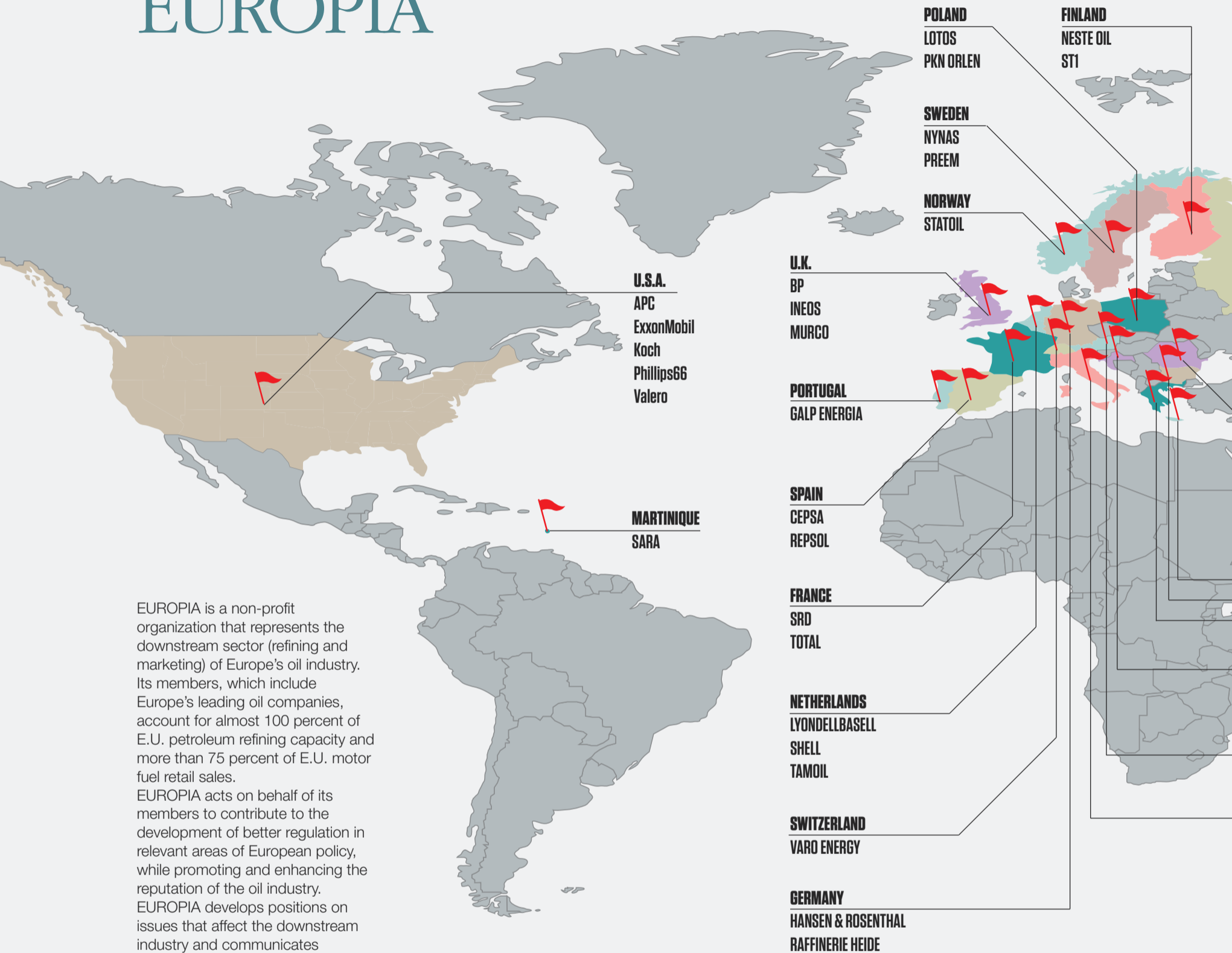
Beddoes, Director General of EUROPIA, representing the European refiners. The international context is worrying, he says, and Europe is in danger of being squashed between Asia and the United States. "When it comes to looking at individual policies, it is important to pay more attention to their impact on competitiveness," warns EUROPIA's chief.

What is the role of refineries in Europe and why

is it important to keep hold of them?

Refining plays a role on several levels. Above all, it guarantees a reliable supply at an affordable price to European consumers. That is why it has grown in line with demand for 30 or 40 years. It has enormous economic and infrastructural value because it is integrated with the petrochemical industry to a huge extent, and there are an awful lot of high value special products that industries build up around refineries. It is a significant →

EUROPIA



EUROPIA is a non-profit organization that represents the downstream sector (refining and marketing) of Europe's oil industry. Its members, which include Europe's leading oil companies, account for almost 100 percent of E.U. petroleum refining capacity and more than 75 percent of E.U. motor fuel retail sales. EUROPIA acts on behalf of its members to contribute to the development of better regulation in relevant areas of European policy, while promoting and enhancing the reputation of the oil industry. EUROPIA develops positions on issues that affect the downstream industry and communicates its views to European institutions and organizations. EUROPIA currently has 43 members and 1 associate member.

employer of high quality jobs and it adds significant value to the economy – between 20 and 30 billion depending on the year. That is money that determines our balance of trade. It has a very big impact on the tax revenue of member states, since we collect 270 billion euro from the taxation of our products. As you know, the product price to the consumer is 60 or 70 percent higher than the effective price, so the price the consumer pays at the pump is about 60 percent tax. The price of the raw ma-

terial is less than half the price of the product.

What impact could the decline of European refining have on the security of energy supplies?

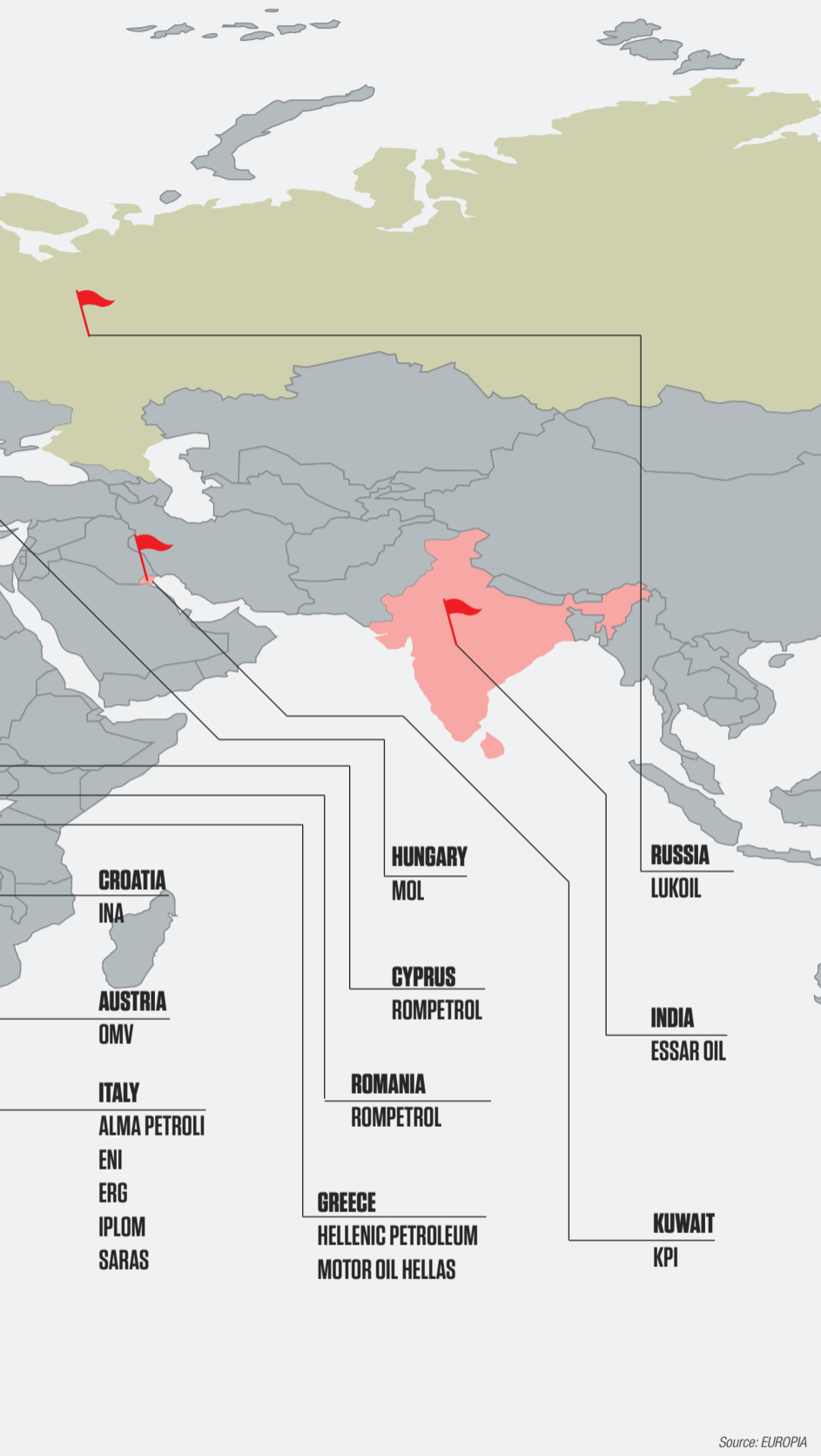
Security of supply is not an absolute. You cannot say that this number of closures will mean that all of a sudden we have insecurity. But I think there will be a growing dependence on imports as we lose our refining capacity. We lose our options. Now, you

can counterbalance some of that to a certain extent by using different suppliers, assuming there are different suppliers. But if our capacity diminishes excessively we risk becoming import-dependent on a limited number of suppliers.

We stretch the supply chain, because as the International Energy Agency has said, we start to see potentially more volatility. We have fewer choices, so it is likely to cost more to consumers. We would lose value-added refining and we would

have a less reliable supply chain. This could, perhaps, be compensated by increasing storage, but then you would have to have a huge storage infrastructure but not the added value of the industrial infrastructure.

So we see increasing concerns in different countries like the U.K. and France, which are incredibly dependent on distillates. Their governments are getting very concerned about this reliance on imports and what it might do to the security of supply.



What factors are affecting European refining? What are the main concerns at the moment?

There are a number of concerns. If you look at the international picture, clearly what is happening is a growing refining capacity in the Middle East and Asia, some of which is turned towards exports. The pressure from these countries has been growing over the years and I guess we have seen that coming. Over the past three or four years, the resurgence of

U.S. refining caused by cheap energy has been a major change. The United States has been a big market for our gasoline, but in recent times we have seen declining imports there. We see refineries in the U.S. restarting based on relatively cheap oil. Europe risks being squeezed in the middle.

What Europe can do without is imposing its own international constraints on these markets. That is our big argument with the institutions of the member states: just recognize the

competitive pressure; you cannot solve all the issues, but look at the things you can solve and do not add to our burdens and push us into an even more premature decline.

So what should the European Commission and the refining industry do to address this situation?

To begin with what we can do ourselves: we will do what our companies tell us to do, because it is not the association that does these things. Our companies will make their own strategic choices. We need to look at our energy efficiency. Europe has one of the most energy-efficient refining systems. We do have some that are less efficient, but Europe also has some of the best. That has been driven by the high cost of energy to

What we are asking the European Commission to do is to intervene in a more balanced way on the environment, recognizing that Europe can not do everything alone

our refineries. So we have good energy efficiency that is improving continually.

Despite the situation, we are still investing in some places in improving the product balance, making more diesel. We have seen huge investments in Spain, Greece, Portugal and parts of central Europe. And there are still investments in northern Europe. So the industry will control its costs. We will look at strategic investment. We will manage energy where we can. But what we cannot do is manage the environmental context. What we are asking the Commission to do is to put a greater balance on what they are trying to do for the environment and for climate change; to recognize that Europe cannot do this by itself; to look at self-imposed burdens and to look carefully at the impact on competitiveness. We want a much greater balance on climate policies. It is not a question of rights and wrongs – we are not arguing that. There is a global issue that needs to be tackled. We are just saying, “Do not take the whole burden on Europe’s shoulders, at the risk of putting our industry out of business.” There are things we can do in Europe to redress the balance. We have talked about “fitness checks” – a kind of a cross-sectoral evaluation of the impact of European policies on refining. So when it comes to looking at the individual policies, they really need to

look more carefully at competitiveness. They need to inspect these policies and make sure they have evaluated them carefully before they introduce them. That does not always happen at the moment.

For example, your stance is that one of the updates to the fuel quality directive of 2009 is a serious threat to the competitiveness of European refineries. Why is this the case?

The proposal puts an economic restriction on certain crude types, such as oil sands from Canada. The proposal is currently still being discussed in the Commission, which is doing an impact assessment. But we are very concerned because the Directorate-General for Climate Action, which is driving this, has been very clear in its motives. They want to stop oil sands production and they certainly want to keep them out of Europe. We have a lot of concerns, which are shared by a huge number of member states. It seems to us that the DG’s action will not contribute to the reduction of global CO₂ emissions, but it is going to put a cost on European industry and deoptimize trade flows.

A number of European refineries have closed down in recent years. What are your predictions for the future?

I think we had 97 refineries in 2008 when we looked at the population of refineries for the introduction of the Emissions Trading System in Europe and Norway. Now we are down to 87. But we are not in the business of predicting where it will go.

If you look at the continued decline of demand and were to assume that it was reflected in an equivalent reduction in capacity in Europe, then we could estimate a decline of some twenty percent by 2030.

If you take an average sized refinery – 90-odd producing 700 million tons makes eight million tons [per refinery] – this is probably equivalent to 25 of those refineries closing down.

If you look at the smaller refineries then the number of closures could be higher. But I’m sure it won’t play out like that. Some of the smaller refineries will stay and some of the bigger refineries might shut down. How governments react will be very interesting.



Rules/Notes from Pierre Dechamps, advisor to Commission President Barroso

The rules of the game

The E.U. is nearing the 20-20-20 aims on energy and the climate, but Roadmap 2050 is only “a vision.” Plans for restoring the gasoline-to-diesel balance, and for a “fitness check” for the refining sector

A

by SERENA VAN DYNE

José Manuel Barroso – took time out at the “7th Refining Summit” held

addressing topics from the controversial fuel quality directive to the energy taxation directive, from the fitness check to shale gas, Pierre Dechamps – advisor on climate change and energy for European Commission President

May 21-23 in Barcelona, to update Oil on the European Union’s legal framework on fuels and the environment. Dechamps – who was keen to stress that he was only giving personal opinions – reviewed the upcoming E.U. initiatives and directives that will have the greatest impact on the refining sector.

What is the European regulatory framework for the refining industry?

Before talking about what I call the

“rules of the game,” we need to look at the long history of the climate and energy package. Towards the end of 2008, we set our three framework objectives for 2020: 20 percent less greenhouse gas compared to 1990, a 20 percent share of renewables in the final energy mix, and a 20 percent improvement in energy efficiency. Of those three objectives, the first two are legally binding. The third one is not. So that was meant to provide a complete framework for accountable economic growth – a low-carbon

growth. Regarding the 20 percent reduction in total E.U. greenhouse gas emissions, levels in 2011 were 17 percent lower than in 1990. So we are well on track. We may even be a bit better than on track, but this is no surprise at all. It is just a reflection of the economic crisis we are in at the moment. As soon as we come out of the economic crisis, we are also likely to see our greenhouse gas emissions coming back up.

What about the second



target, for 20 percent renewables?

We must be around 10 percent at the moment. From a mathematical point of view, we are on a straight line towards the objective. But we will not get to the objective unless we introduce new policies and measures in the meantime. If we do not do so, it will probably plateau below the 20 percent we wanted. It is quite difficult to guess the final extent of energy efficiency savings. The number usually quoted is on the order of 17 percent. Whether or not we get to 20 percent will probably depend less on legislation and more on the economic pressure on industry to become energy efficient.

Now, this package is only one part of the long journey towards our Roadmap 2050, which is not legally binding. It is not a piece of legislation, but more of a "vision" – a policy objective. It would require us to cut our greenhouse gas emissions by at least 80 percent by the middle of the century. We are at a stage when we need something between our legally binding objectives for 2020, which are set in stone, and that vision for

2050. We would like to start discussing objectives for 2030 – an intermediate date. We expect the E.U. Commission to have new proposals towards the end of this year.

The refining sector needs an E.U. strategy that will make refineries more competitive. What is Europe doing and what should it do?

At the moment what we are doing is a "fitness check" of the sector – an analysis of current policy. It will only look at the effects of existing legislation, rather than make an impact assessment of what we might do in future. The fitness check on refineries is one of only four that we have planned, so it has been clearly identified as an at-risk sector – one of the top four at risk. That, clearly, is a good sign. I would expect this exercise to give a clear indication of how existing legislation could be adapted, since some existing laws are not useful anymore. The landscape could be simplified and changed with a view to improving competitiveness with the refining sector outside the E.U.

The industry's needs are pressing, but operators think the E.U. is really very slow.

We are a big machine, so obviously we are rather slow if you see us from the outside. But again, for instance, this next check is a study that is going to take a year, from now until May 2014. It should lead to policy recommendations in September 2014. So seen from the industrial sector it probably is very slow, but seen from a Commission perspective it is reasonably quick.

One of the most sensitive issues at the E.U. level is the fuel quality directive...

The fuel quality directive has been under review for quite some time, to try to deliver a six percent reduction in greenhouse gases from transport fuel by 2020. But the real question is: how is this going to be checked, implemented and controlled? How do we make sure that it actually works and that the goal is really achieved? There was an initial draft proposal from the Commission and then everything was delayed – and has been for quite a while. The Commission was asked to provide an impact assessment, but there are still no definitive dates. Then there is the competitiveness, the position of the sector and the effect competition could have on it. Everything really is still in the making.

What can you tell us about the energy taxation directive then?

This is another one that has been greatly delayed, and the directive is probably in need of a serious review. We do not have a complete proposal for that, but I would say that we do at least have ideas of where we should go. One of the principal considerations is that all energy products should be subject to the same minimum taxation on an energy basis, by which I mean on energy content and not per liter. We wanted to introduce a smaller, specific tax, which would not be based on fuel bought at the pump, but a small additional tax based on the CO₂ content of the fuel. It would not overlap with the Emissions Trading System (ETS), but add to it. The energy taxation directive is a very good instrument – if not the best instrument – to get to some sort of convergence on diesel and gasoline taxation in all of our member states. We are trying to reduce the mismatch between those products, doing what we can with operators so we can have a certain amount of gasoline and a certain amount of diesel. We all know that in the E.U. we produce too much gasoline, which we have to sell



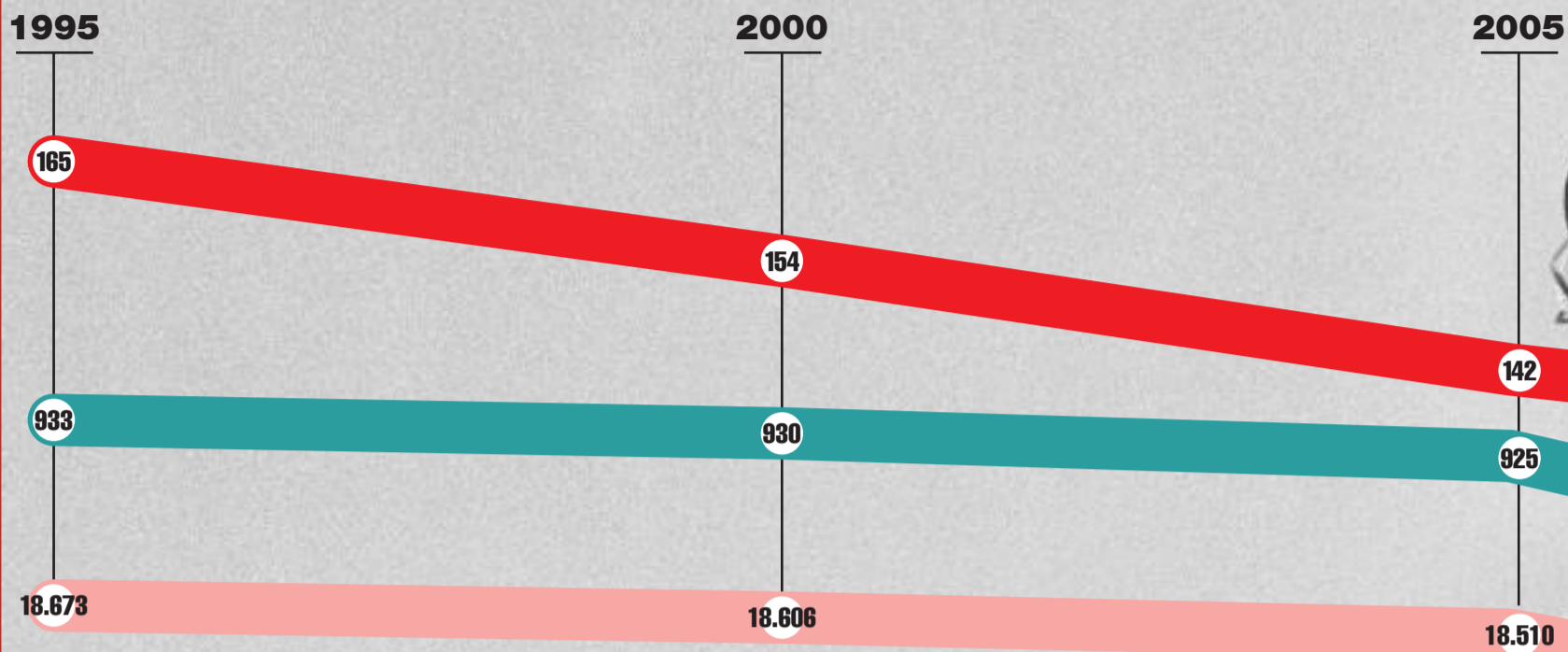
PIERRE DECHAMPS

From 1998 to the end of 2007, Pierre Dechamps worked for 10 years for the European Commission Directorate General for Research as project officer for clean coal technologies and later on for CO₂ capture and sequestration. In January 2008, he joined the Bureau of European Policy Advisers to President Barroso as the adviser for energy, climate change and the environment.

to the U.S., and then we need to import diesel, mostly from Russia. This is not the best situation to be in. I know, too, that favoring diesel over recent decades has been a political decision, but it is no longer just a political decision to want to return to a more balanced share between those two fuels.

What is the European Commission's stance on exploration of unconventional hydrocarbons within its borders?

The trouble is that it is very difficult for the Commission to come up with statements and opinions on the exploration of unconventional hydrocarbons such as shale gas or shale oil, because our 27 member states are in very different situations from this point of view. At one extreme, we have countries like France that have banned exploration for shale gas. At the other extreme, we have countries like Poland, which – if I may say so – are probably daydreaming somewhat if they hope to become energy independent from Russia and provide even more energy to the rest of the E.U. It is therefore quite a delicate issue and it should be an objective to come up with a coordinated European policy. It is very difficult though, because under the Lisbon Treaty these decisions remain the responsibility of the member states.



Crisis/The old world nations must face this challenge together

Time to take action

Europe's refining industry has been hit hard by the economic and financial crisis, competition from Asia, and the "voracity" of big Russian oil companies. Forty plants could be closed in coming years



2011

Fifty-three European refineries closed down in the 16 years between 1995 and 2011, shedding around 45 million tons of primary refining capacity, equivalent to 1.074 million barrels per day.

Source: Eni World Oil and Gas Review

133

REFINERIES

888

PRIMARY CAPACITY (mmtons)

17.763

PRIMARY CAPACITY (tbpd)

Who would ever have guessed that the spirit of the legendary John D. Rockefeller would be echoed in the early years of the 21st century, deep in the heart of Eastern Europe, some 800 km from Moscow? The audacious founder of

by GUIDO GENTILI

Standard Oil in 1870 was born back in 1839 and at age 16 he invested his very first earnings in buying an oil refinery in Cleveland; now the autonomous Republic of Tatarstan – home to 70 percent of Russia's heavy oil – is embracing refining too: it has the very first mega-refinery to be built since the fall of the Soviet Union.

And 50 years ago who would have said that Venezuela would someday build three refineries in China? Who could have forecast that the commemorative photos of the King Peleus, the first oil tanker to moor at Sicily's "Mediterranean Refinery" – one of the largest in Europe then, in 1961 – were destined to be nothing more than a souvenir of an unrepeatable past? Old Europe's

The spike in U.S. diesel fuel exports has plunged like a knife into the heart of European refining, which is geared mostly towards producing gasoline

refineries, which for a century symbolized industrial capitalism, are now at risk of closing their gates forever.

Times have changed – especially in Europe, which accounts for 17 percent of global output. And the main reason is that the market has changed.

A BLEAK OUTLOOK

A very recent study by U.S. news agency Bloomberg explains that the outlook for the crude oil refining sector is bleak indeed. Demand for fuel in Europe is falling to its lowest level in 20 years, and it is estimated that more than 10 percent of refining capacity will be lost this decade. Translated into raw numbers, five of the 98 refineries operating in 2009 had stopped production by mid-2012 (while 13 changed ownership) and at least another dozen could suffer the same fate by 2020. Moreover, crude oil consumption has been on the slide for five years and the Inter-

national Energy Agency (IEA) is predicting a return to 1994 levels. Roughly two out of every three European refineries are running at a loss: the last good period (known by experts as the "golden age of refining") began in 2003 and ended in 2008. Refining margins of \$20 a barrel are just a faded memory.

Moreover, the spike in U.S. diesel fuel exports has plunged like a knife into the heart of European refining, which is geared mostly towards producing gasoline to service European fuel demand (75 percent of which is diesel). Furthermore, even though oil products still account for nearly 95 percent of transport fuel, non-refinery products are set to take a larger role, especially biofuels.

The economic crisis has hit hard, but competition from Asian countries (which account for around 30 percent of global output) has played a crucial role in changing the rules of the game: they have redesigned the geo-strategic map to reduce the distance between supply and the engine of global demand (now located in the emerging economies). Competing starts to look like a decidedly uphill battle when China, for exam-

ple, has systems capable of processing and producing 2 million barrels per day, and in Saudi Arabia alone, construction is under way on three refineries, each of which will be able to process 400 thousand barrels per day, turning low quality crude into sought-after fuels; all of this with better

economies of scale, and far lower environmental standards and labor costs.

Furthermore, the old European refineries – burdened with a "sovereign debt" crisis and resource shortages – has become a target (an easy one) for Russia's oil majors, which have huge financial resources (and a tax system that incentivizes expansion). They are now buying up beleaguered refineries at knock-down prices, seemingly happy to settle for low margins during the recession. As Vladimir Socor of the Jamestown Foundation in Washington explains, they will then "invest to reconvert the facilities so that they can process Russian crude while awaiting of Europe's recovery and fresh profits for the refining sector."

SECURITY OF SUPPLY

Refining not only props up the oil industry, but also has an impact on many other industries that it supplies, such as lubricants for industrial →

RefinItaly



PROJECT EST

Eni's Sannazzaro refinery is one of the most efficient in Europe, with a balanced primary refining capacity of 190,000 barrels per day and a conversion index of 59 percent. The most important upgrade currently under way relates to the construction of a conversion facility (shown in color in the photograph) based on proprietary technology known as "EST" (Eni Slurry Technology), with a capacity of 23,000 barrels per day. It is expected to enter production in 2013, turning high-sulfur heavy crudes into sought-after middle distillates (especially gasoil) without

fuel oil. In addition, the refinery has also launched the Short Contact Time – Catalytic Partial Oxidation project, which will produce hydrogen using another proprietary method. Eni is also developing Slurry Dual-Catalyst conversion technology (an evolution of EST), which combines two nano-catalysts in order to increase EST productivity, improve product quality and reduce expenditure and operating costs. Detailed plans for the first industrial facility to produce hydrogen using proprietary Hydrogen SCT-CPO (Short Contact Time – Catalytic Partial Oxidation) technology are



also nearing completion at the Sannazzaro refinery. This reforming technology turns liquid and gas hydrocarbons (including from biomass) into synthesis gas (carbon monoxide and hydrogen).

machinery and solvents for inks and paints. In Europe it (directly and indirectly) provides 600,000 jobs – 100,000 in Italy alone – and it faces a structural crisis. Yet it receives precious little attention, even though the term “oil products” does not mean only fuel, as was noted by Alessandro Bartelloni, head of the transport and oil products sector of the European Petroleum Industry Association (Europia). This is a crucial raw material for industry and especially for petrochemicals: 41 of Europe's 58 steam cracking plants – the basic facility for petrochemicals – are integrated with refineries. “In conclusion,” says Bartelloni, “we can say that refineries are important from the point of view of Europe's security of supply.”

That being so, Europe must get to grips with the refining crisis. But how? First of all it must look at the reality, starting with the issue of competitiveness – a core question especially in Italy, which has a refining capacity of 100 million tons from 15 refineries, and which is expected to be over capacity by more than 20 million tons in the coming years. Moreover, Europe must assess whether it is true that it has become

cheaper to import refined products than to produce them, and whether European output can perhaps find some international export markets.

THE ITALIAN CASE

Italy's 2012 parliamentary inquiry into the subject of refining concluded with a final report that left little room for doubt. The country's industry faces significantly higher costs of production due to environmental and labor regulations, a very high tax burden, past failures to update technology in obsolete plants, high transport costs, and exorbitant bureaucratic costs (one serious hindrance is the cost of red tape for permits, including those to close down and convert plants). Meanwhile, American refineries buy cheaper oil, Middle-Eastern refineries benefit from lower supply costs and zero transport costs, Asian refineries process low-cost crude and receive subsidies, and all refining countries have “social and environmental policies that are far less restrictive than Europe's.” Closing down refineries – which governments are considering – is a frightening prospect for all of

Europe. However, the continent must start to take action. According to Samuele Furfari, a high-ranking representative of the Directorate General of Energy at the E.U. Commission, “member states must pay attention to the risks and opportunities of the refining sector, but they must at all costs avoid granting subsidies that do nothing but delay the inevitable. Instead, they must allow the market to operate to its full extent, while at the European level it is the Commission that offers the necessary weight to tackle a global problem, since no one state or company is capable of facing this challenge alone.” During debates over the Fuel Quality Directive, the strategic value of the refining sector and the crisis in the sector were acknowledged. Moreover, a discussion forum has been started with a view to the new goal of raising industry's contribution to Europe's GDP from 16 to 20 percent by 2020. And there have also been promises of an improved legal framework, which Furfari has said “will aim to ensure that E.U. legislation is beneficial for people and businesses.”

The problem is that there is no

more time for conversation. As the Italian report concludes: “Without fast, urgent and shared decisions, European refining will be exposed to a grave crisis, with the closure of another 40 plants in the coming years and increasing dependency on foreign supplies, despite ongoing excess of supply.” Unfortunately, this scenario looks all too likely to become reality.

Guido Gentili is a columnist for *Il Sole 24 ore*, and he edited it from 2001 to 2005. From 1996 to 1998 he was an editorial writer at *Corriere della Sera* and editor of the weekly *Il Mondo*.

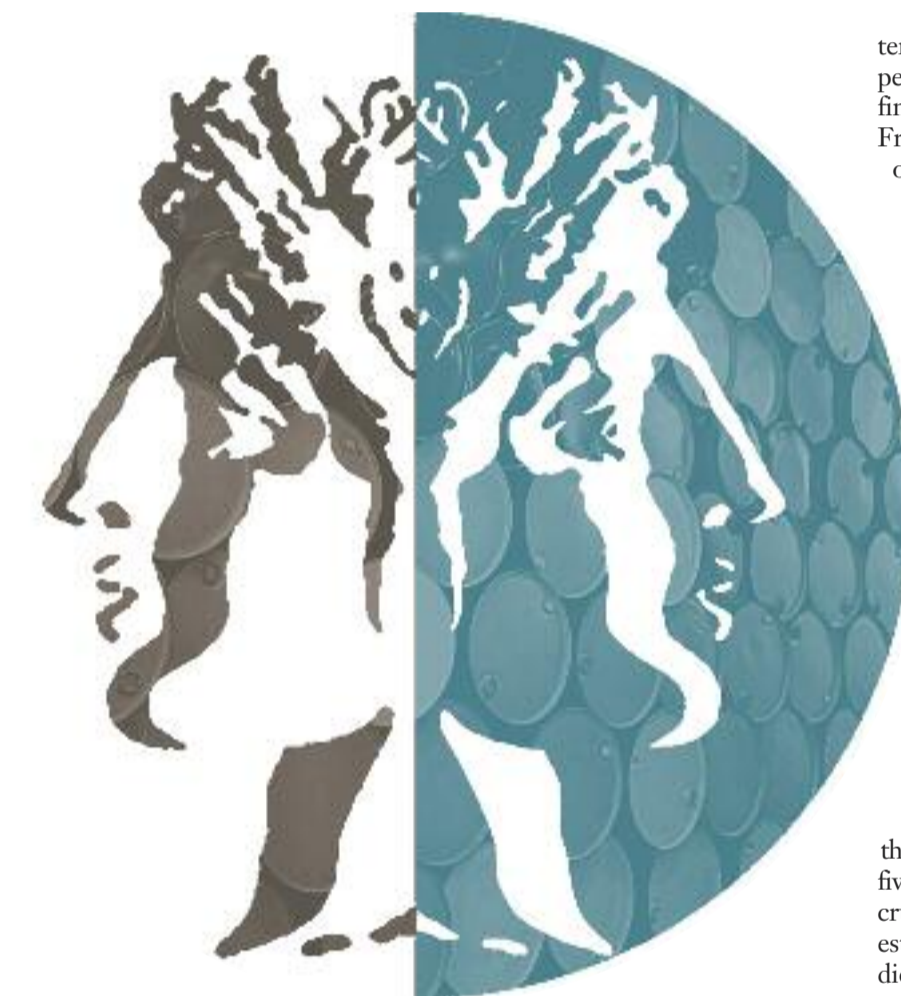
Outlook/How the energy map will change

Janus, the black swan, and the same old story

Oil has two faces: its dual status as a commodity and as a key player in global financial markets is further complicated by the globalization of demand, by climate change and by the shale gas/tight oil revolution

As long as there is an oil industry, we can be sure that the modernity we have inherited has not gone to wrack and ruin. As long as we can buy the energy that drives the world, we will be able

to calculate the price and the risk of daily life. The world burns energy not only when generating wealth, but also when it looks at security, aspires to peace and freedom, and hankers after a clean environment. It has taken us some time to learn this truth. Yet since those distant days of 1861 – when, in the first and most banal instance of globalization of oil, the first load of kerosene was shipped from Pennsylvania to England – the qualitative and quantitative changes to the oil sector have been extraordinary. Now we must learn how to deal with this two-faced Janus – the dual identity of oil. It is no longer just a crucial commodity for the security and vitality of nations, but one of the most closely watched elements of global finance. Even at the height of the crisis that began in 2008, daily trade in crude futures (or “paper barrels”) was thirty times global daily consumption. This duality is further complicated by a series of factors: the globalization of oil demand – a striking trend that has been going on for some 15 years now; the rise of climate change as a political issue that influences decisions on how much oil we can use and how we should use it; and the drive towards new technologies, which affects oil as it does all other energy resources. Lastly there is the “black swan” of this new era: the shale gas and tight oil revolution, which will inevitably re-



draw the demand curve for oil, change the entire energy panorama – industry, trade, prices, financial assets, policies and international competition – and turn geopolitics on its head.

OIL'S DUAL IDENTITY

Refiners are not safe from the paradoxical, schizophrenic, two-story market: created to appease the market by making oil volatile, they are now, ironically, being destabilized by the market. The paradox is this: the refining industry comes from the old industrial world, but oil now strays outside the lines of post-industrial international competition. This giant of industry, the refining

system – striking if you merely look at the enormous number of tubes, towers and reservoirs that dismantle and reconstruct hydrocarbon chains to turn crude oil into gasoline, diesel, jet fuel, gas oil for domestic heating and all other products in modern use – is no longer compensated by its profits. No new refineries have been built in the United States for the last 30 years. In Europe, two thirds of refineries have been losing money over the past five years, while 10 percent have been shuttered. The wretched state to which the business has been reduced is signaled by the fact that Europe has shed 2.2 million barrels per day in refining capacity. Reindustrialization is a prohibitive en-

terprise that is discouraged by competition with new, super-efficient refineries in the Middle East and Asia. From there, gasoline, diesel and all other derivatives can be shipped throughout the world, just as in 1861 Pennsylvania could ship kerosene to England. Many large businesses instead prefer to sell off their refineries and concentrate on exploration and production. However, the issue is not so much whether anyone is willing to buy (albeit at a low price), but rather whether there is a huge geographical shift going on in the sector. The map of the countries that have gradually eaten away at the privileged domain of earlier-industrializing countries is surprising. The most recent report from the International Energy Agency (IEA), published in April, backs up this change. It predicts that in the next five years, the market will move from crude to refined products. An interesting idea and yet another contradiction, because not so long ago the only question was how quickly global crude demand would grow. In 2009 the IEA was confident that oil would continue to account for 30 percent of global resources and that energy demand would more than double by 2030. According to April figures, though, demand has grown by →



THE AUTHOR

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a feeble 795,000 bpd in the past three years. This is because stronger demand from non-Organization for Economic Co-operation and Development (OECD) countries (1.28 million bpd) has been counteracted by a fall in consumption of 480,000 bpd in OECD countries – particularly in Europe, where demand is at its lowest since 1985. Global trade will thus fall to 32.4 million bpd in 2018, but – and this is the big news – demand will mainly be for refined products. It is here that the geographical shift we have mentioned will come into play, because of the increased capacity for exporting refined products of seasoned refining areas such as Saudi Arabia or China, thanks to the ad hoc construction of export-focused refineries. It is no great leap to predict that under such industrial conditions, the shift towards demand for refined products will not be a passing circumstance or a temporary episode. However, it is more important than ever to bear in mind that traditional export routes will be overturned, from short- to long-range, including the more inaccessible routes between the countries of the Gulf, the Indian Ocean, all of Asia and Africa.

THE ONE CONSTANT: A CHANGING MARKET

So many upheavals have left only one thing intact: the only thing that does not change is the changeable nature of the oil market. The continuous adjustment of supply and demand – influenced by the economy, politics, technology, consumer tastes and all kinds of incidental factors – will continue to move prices, followed all the while by attempts to stabilize them. That is the way it always has been: it is the way things were in the late 19th century, when Pennsylvania saw-sawed between growth and collapse; the way they were in the 1930s, when the world ran on Texan oil at \$0.10 a barrel; and it is the way things were in the heady days of July 2008, when the barrel price for West Texas Intermediate touched \$147.27.

The oil crisis of 1973 following the Yom Kippur War, exactly 40 years ago, made the world begin to realize how dependent it was on the stability of the Middle East and the reliability of OPEC. Every little tremor in these producer countries – aptly called the “oil jugular” by Henry Kissinger – could have enormous repercussions on international security. Since then, oil and geopolitics have gone hand-in-hand.

But the energy panorama of today is so complex and so unmanageable that the oil industry is influenced by a myriad of other factors. It would be truly naive, even superstitious, to

HIGHS AND LOWS



1859 • The first oil well is dug in Pennsylvania on August 27.



1931 • Prices fall to \$0.10 per barrel with the Great Depression and the discovery of the East Texas field.



1973 • The oil crisis makes the world realize it is dependent on Middle Eastern stability.



2008 • West Texas Intermediate hits \$147.27 a barrel in July.

think that the delicate balance in the Middle East or elsewhere in oil-rich countries is now the only risk to bear in mind. In 2008, there was a shocking drop in production (8 million bpd) in four countries: Iran, Iraq, Nigeria and Venezuela. Internal conflict, poor investment and, in Iraq, the U.S. invasion and post-war period were certainly among the causes. However, they were not the only factors behind the spike in prices. Without China's massive appetite (in 2010 it overtook the U.S. to become the main energy consumer), the concurrent fall in global refining capacity and, lastly, the intrusion of a swarm of hedge-fund speculators, things might have gone differently. We can also take a relatively cool view of the wave of revolutionary activity

in North Africa and the Middle East, which has had a less dramatic effect on the energy map of the region than expected. Of course, if Saudi Arabia or Iran were to see uprisings, then the consequences would certainly have wide-ranging geopolitical implications. However, in Syria, despite the regional dangers, the damage to the energy industry is only afflicting Syrians. Oil exports account for 25 percent of state revenues, and these have simply been wiped out. The civil war has devastated the local industry. The rebels control the reserves; Assad's army controls the refineries. No analysis is more telling than the images (published by Reuters) of Syrians trying to improvise rudimentary refining systems near the oil fields, in the hope of coming up with a saleable product.

CHANGES IN THE DISTRIBUTION OF POWER

The Middle East will struggle to keep the pre-eminent place in the game it had in the 1970s, even regardless of the revolutionary turmoil. New producers are gaining a footing in the western hemisphere and already threaten the historical supremacy of the Middle East. Moreover, this doesn't even consider the effect of the shale revolution, which will truly change the distribution of power in the energy world, opening up a hitherto unseen battle between the haves and have-nots of shale gas and tight oil. Again, though, we must be wary of simplification and bandwagon jumping. It would be naive to think that Middle Eastern oil is the be-all and end-all right now, just as it would be naive to imagine that it could vanish into thin air. The shale revolution will not free the United States or the rest of the world from this long-standing dependency, but it will begin to influence the industry, trade and prices. Ultimately, it is destined to redraw the geopolitical map, but it will not be a smooth, linear transition. We are already seeing strong fluctuations caused by internal divisions in OPEC over whether the various member countries should react by cutting prices or cutting production. Oil guru Andy Hall – nicknamed “God” because of his infallible predictions – is even convinced that the revolution will be “temporary” and is unsustainable except at very high costs.

However things turn out, the changes underway in the United States are modifying its economy, industrial structure and energy outlook. At relatively derisory costs – a third of the price in Europe and a quarter of the price in Japan, thanks to the abundance and accessibility of natural gas – the United States is embarking on

an intensive process of reindustrialization that no European country could ever dare to follow. According to the IEA, the U.S. will overtake Russia as the leading global gas producer in 2015, bypass Saudi Arabia as leading oil producer in 2020, and be totally self-sufficient in 2035. Is the dream of energy independence – first spelled out by Richard Nixon during the 1973 crisis – about to become a reality? Perhaps, but gradually. The United States will continue to import oil, including from the Middle East, but in ever-lower quantities, partly because of its own increased production and partly because U.S. demand has reached its peak. Most of its imports already come from the western hemisphere, with 30 percent from Canada alone. It is foolish to think that U.S. engagement in the Middle East is due to the oil it imports from the region (just 12 percent of its oil imports). U.S. interest is not related to the number of barrels that arrive on American soil, but to concern over whether the oil supplies that drive the world economy are accessible and stable, warding off any major market distortions or severe price spikes. It is still difficult to imagine how the strategic balance in the region will be redrawn, given that Iran is still the sore spot for the U.S. If there has already been a visible geopolitical effect on the Iranian question, perhaps it is that growing American production, flanked by Saudi Arabian output, has compensated the effects of sanctions on importer countries, thereby making them truly effective.

The significance of any geopolitical rebalancing will extend well beyond the Middle East. It will also affect the delicate relationship between Russia and Europe, as well as the critical confrontation between the superpowers of the 21st century: the U.S. and China. European countries will benefit from the current revolution by being able to be bolder in negotiations with Russia, whose natural gas meets a quarter of European demand. China – whose demand has grown exponentially – will have to import more from the Middle East and will not be able to avoid taking a direct interest in security in the region. Whether they want to or not, China and the United States will have to develop some form of reciprocal understanding and come up with a framework for collaboration that ensures global energy security. This, perhaps, will be the crucial issue of the coming years, in spite of many hasty analysts predicting U.S. disengagement and the end of geopolitics. Will it be enough for the rest of the world – and especially Europe – to sit by and mourn its lost refineries? ■



India/Constant growth in demand has brought a decade of expansion

The Asian boom has barely begun

The subcontinent's private refiners have become more competitive and better-run, with performances helped along by the region's continuing fast growth. But they face tough competition and tight margins

The heart of India's refining belt sits along the side of Highway 25, a neatly-paved divided highway that hugs the south of the Gulf of Kutch in the western state of Gujarat. It is a sight best seen at night. Rising up one side of the road stands Jamnagar, the world's largest single-site oil refin-

by JAMES
CRABTREE

ery, operated by billionaire Mukesh Ambani's Reliance Industries: a vast 7500-acre operation, whose giant towers and sparkling lights resemble skyscrapers on a distant city skyline. A few miles further on lies Vadinar, India's second-largest such complex, owned by Essar — another large industrial group, and one founded by two further billionaires, brothers Ravi and Shashi Ruia. The surrounding area is often dubbed "the refining hub of the world," in India at least; facilities →

operated by state-backed Indian Oil Corporation and others dot the rest of the state. With its long coastline, large ports and easy proximity to the Middle East, Gujarat also attracts much of the oil that is shipped in each year to feed India's growing economy.

These facilities have been part of broader boom in Indian oil refining over the last decade, as operators scrambled to build capacity in response to sharply rising demand. It is a picture mirrored around the region, and especially in China and the Persian Gulf, which have also seen aggressive supply ramp-ups, much of it designed to pick up the slack as recession-hit facilities in Europe and North America struggle, or are closed entirely.

A STRANGELY INSECURE SECTOR

"A huge amount of refining capacity is now being added in the Middle East and Asia, almost all of which was planned in what you might call the 'golden era' of the industry, between 2004 and 2007," says Dayanand Mittal, an oil and gas analyst at Ambit, a brokerage in Mumbai.

Yet Asia's refiners are an oddly insecure bunch, despite all of this growth. Senior industry figures often complain that too much supply has been added, in turn holding down their margins — a problem exacerbated by recent economic slowdowns in both China and India. "Asian demand will continue to grow, but a lot of this extra capacity was added in expectation that the golden age would continue indefinitely, which it hasn't," Ambit's Mr. Mittal says. "So while things are much better here than in Europe, the future is now more uncertain. Operators are having to adapt."

Evidence of this supply glut is not hard to find. The International Energy Agency estimates that Chinese refiners will add 4 million barrels of daily capacity by 2017, far outstripping the country's domestic demand. Persian Gulf oil producers are following suit, especially in Saudi Arabia, where state-owned Aramco is working with Total of France to finish a mega-complex at Jubail with a capacity of 400,000 barrels a day. The refinery will open later this year, while two further giant facilities of similar size will follow over the next four years.

If anything, however, this expansionary trend has been most pronounced in India, given the low base from which the country began. Total capacity in Asia's third-largest economy jumped from just 62 million metric tons per year in 1998 to

JAMNAGAR SKYLINE
Jamnagar, in the Indian State of Gujarat, is the world's largest single-site oil refinery. It is operated by billionaire Mukesh Ambani's Reliance Industries.



around 215 tons last year. "The refinery sector in the country has shown phenomenal growth and India has emerged as a refining hub," Prime Minister Manmohan Singh said last year, during the dedication of the Guru Gobind Singh refinery, a newly-opened \$3.6 billion facility in the northern state of Punjab. A further 50 metric tons per year of capacity is now planned at existing refineries by 2017, while three further new facilities will add 30 million more. "We have sufficient refining

capacity to enable us to export petroleum products," Mr. Singh said, an unusual event in a country where energy shortfalls are depressingly common.

Most of India's refining capacity lies in the hands of state-backed businesses like Indian Oil, which are known as oil marketing companies. Their refining divisions are typically profitable, although the companies then face strict regulations governing the prices at which they can sell their products to consumers. "They are forced to lose money by the government, and generally they are a pretty dissatisfied lot," says one Indian oil expert, who asked not to be named.

PUBLIC AND PRIVATE

In an Asian industry dominated by state-run entities, however, the Indian refining sector is especially notable for its private operators, whose recent history is both happier and more profitable than their public sector competitors. Reliance is easily the larger of the two main companies: the energy-to-petrochemicals conglomerate is also India's biggest listed company by revenues, while Mr. Ambani, its chairman, is his country's richest and arguably most powerful businessman.

The facility was set up by his father, Dhirubhai, who began with a small trading house and went on to create one of India's most celebrated rags-to-riches stories, building operations from textiles and petrochemicals to telecoms and power. The company began constructing Jamnagar in the mid-1990s, after India first allowed

private players to enter the refining market. Although partially delayed by a cyclone, it was finished in 1999, and Reliance has since spent at least \$16 billion opening and expanding it, including the addition of a second adjoining export-only facility.

The neighbouring Vadinar facility is, if anything, more illustrative of the boom in Indian refining, however, given the fact that its owners entered the market, and then built and opened the facility, entirely during the last decade.

Essar itself is a colorful business house, with operations stretching from energy to ports and IT outsourcing, and a reputation for imaginative financing that matches its ultra-competitive business style. The group also has a history of debt-funded expansion and currently carries net debts of 938 billion rupees (\$14 billion), the result of extensive capital expenditure on operations ranging from steel to power and shipping, in addition to its refinery facilities.

Vadinar's construction was oddly similar to its larger neighbor's, given that its half-completed site was largely destroyed by a second cyclone during 2006. It opened two years later, however, and the company has since plowed a further \$1.8 billion into an upgrade that was completed last year.

I met the facility's director, C. Manoharan, during a visit to the site last year. A cheerful industry veteran with a scraggly grey beard, he showed my round the expanded facility and argued that Asia's newer refineries now held a double advantage over their aged competitors in

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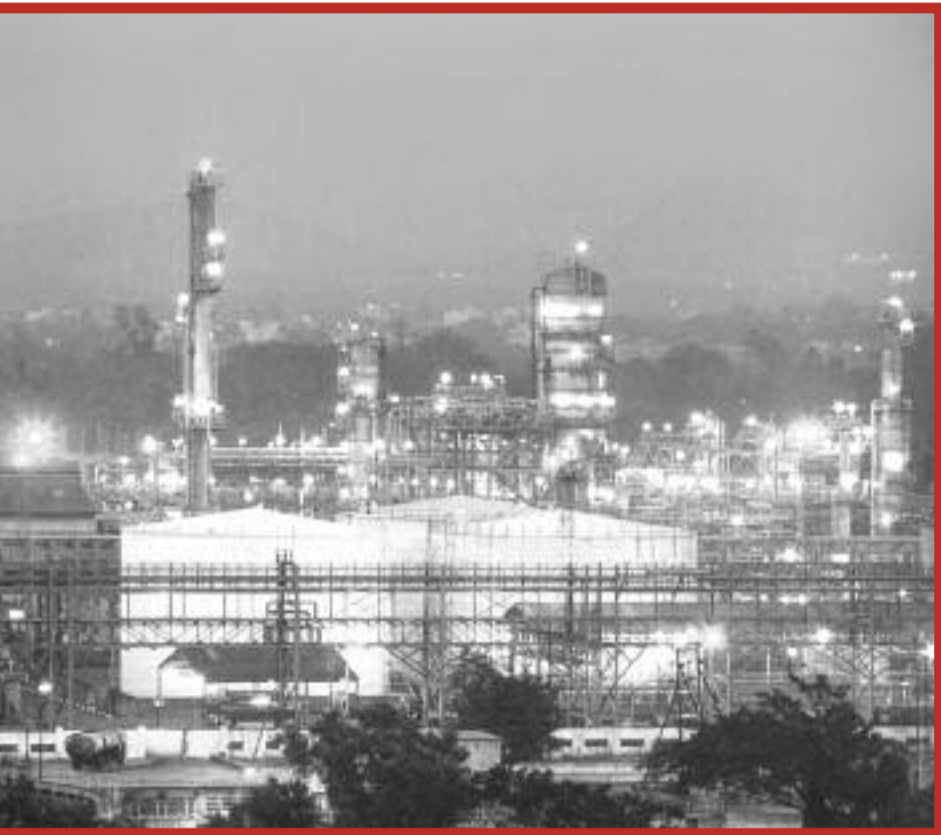
MILLION

barrels per day of spare capacity to be achieved by Chinese refineries in 2017, far outstripping domestic demand

215

MILLION

tons per year — India's total refining capacity in 2012, compared with just 62 million tons per year in 1998



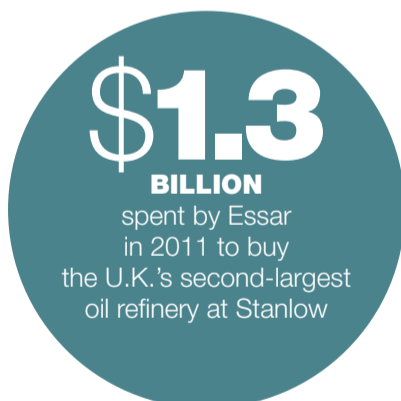
the industrialized world, given both their proximity to consumers in rapidly-expanding Asian markets and their superior technological processing capabilities.

A BRIGHT FUTURE

“Globally we are seeing that inefficient refineries are having to close, but also that while previously most refining was done by the big oil majors, they now focus on exploration and production, and this has opened up the way for independent refiners to grow,” he says. His upgraded facility also allows Essar to process more exotic, lower quality and cheaper types of crude from areas like Latin America, he says, another commercial advantage.

It is a point echoed by Prashant Ruia, the chairman of the overall Essar group and the son of founder Shashi Ruia, who says that India’s new refineries will now maintain their competitive edge precisely because their facilities are technologically advanced but relatively inexpensive to build and run. “If you were to say that I’m going to build a new refinery of 20 million tons today anywhere else in the world, you are talking of minimum \$10 billion,” he says. “In the Middle East... they are spending \$10 billion on a refinery which is smaller than what we have built. So we have an opportunity to scale up these assets, get them to world class, world scale, at very low cost.”

Take all this together, therefore, and India’s refining future looks bright, as it does for their competitors around Asia. India’s private sector



operators, in particular, tend to be competitive and well-run, while their performance is being helped along by the region’s continuing fast growth, a fact that will see Indian demand for refined products again overtake domestic capacity in the coming years. Asian refiners are even making moves into the industrialized world as when Essar bought Britain’s second largest oil refinery at Stanlow for \$1.3 billion in 2011, or PetroChina’s \$1 billion purchase of a stake in Grangemouth during the same year.

Yet just as some are looking further afield, challenges remain home. In the short term, many companies across Asia must come to grips with the region’s excessive supply, which means waiting for demand, and hence economic growth, to pick up again in China and India in particular. But in the longer term the producers must also decide when to begin investing seriously again, given the fact that the regional demand is still forecast to increase sharply over the next two decades. “It is breakneck growth, and they are all chasing that growth,” says Deepak Mahurkar, the head of oil and gas at PwC in India. “And some of the refineries are not able to keep up.”

Increased competition is a more immediate worry, and one that is a consequence of the burst of new facilities. It may mean that Asian refineries will face competition from exports into their domestic markets, in particular from new facilities in the Middle East, including Saudi Arabia’s trio of new mega-refineries. Even if this doesn’t happen, profitability is likely to be tight: “With the refining system being global with reasonable fungibility of products across regions, we expect Asian margins to remain under pressure,” an oil gas report from Barclays noted recently.

Some other global factors might actually help Asia’s refiners, not the least of which would be if the spate of plant shutdowns in Europe and elsewhere accelerates, reducing global competition. But others are likely to prove more problematic, from the need to find new sources of oil, to the potential longer-term threat from a rise in American gas exports, driven by the country’s shale revolution.

DEMAND AND INVESTMENT

“The big issue is where they get crude: Indian companies are trying to look at new geographies, possibly some higher-risk areas,” says Kalpana Jain, an oil and gas expert at Deloitte in India. “If the U.S. starts to export more liquefied natural gas, then the price and availability of



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worked on the op-ed page as Comment Editor. Before joining the FT, Mr Crabtree was Deputy Editor at *Prospect*, Britain’s leading monthly magazine of politics and ideas. Prior to returning to journalism, he worked as a policy advisor in the U.K. Prime Minister’s Strategy Unit, and for various think tanks in Britain and America. He also spent a number of years living in the U.S., initially as a Fulbright Scholar at the Kennedy School of Government at Harvard University.

crude becomes less significant, and the balance of oil and gas will change. Gas will become far more important,” she says.

Yet for all this, perhaps the industry’s biggest challenge is how to prepare for yet more growth, and in particular the management of the delicate task of matching supply to fast-growing future demand. It is a task the region’s refiners have largely flunked in recent years, as they raced to build new facilities, but were then caught out by an unanticipated economic slowdown — the golden age of refining which did not last quite as long as so many had assumed.

As a result, the recent investment splurge is set to slow overall, even if some refiners are still spending — as with Reliance, which plan to invest a further \$4 billion into Jamnagar between now and 2017. Over the longer term, however, growth and expansion are sure to return; this is why the IEA estimates that India, for instance, will see investment of around \$140 billion in new refining infrastructure over the next two decades. Set against such figures, it is clear that Asia’s refining boom has actually barely begun.

China-Russia/The future of refining

A forward-looking alliance

Russia is set to invest \$24.4 million in its refining sector during 2015, but Chinese capital could be the real driving force behind the industry's renewal. There is no shortage of difficulties, though, starting with the regulatory environment

The future of refining in Russia looks very bright. Moscow will attempt to boost the country's capacity over the next five years, after having taken note of the backward state of its refineries. Under the plan, state investment in the sector is expected to increase by \$24.4 million in 2015. Meanwhile, China – the world's second-largest refiner – is keeping a particularly keen eye on Russia's renewed potential. The two countries already have strategic relationships in place, and Beijing could be looking to invest in the Russian market, aiding its revival and offering a counter to the perceived “Chinese threat.”

by LIFAN LI

SYNERGIES AT THE REGIONAL LEVEL

On April 25, 2013, Moscow hosted the 14th international forum entitled “High Technologies of the 21st Century: Regional Innovation of the Shanghai Cooperation Organization (SCO),” sponsored by the Entrepreneurs Committee of the SCO and focusing on “The Future Development of Russian Petrochemical Groups: Experience from Members of the SCO.” Issues discussed in the forum included national measures to support the development of petrochemical groups, the influence of

the World Trade Organization system on the operations of petrochemical groups, and regional cooperation between petrochemical groups. It was not difficult to conclude that the transfer from primary processing to intensive processing is the main goal of the development of Russia's petrochemical industry. Partners from member countries could invest in the Russian market based on their experience and interests and thus accelerate the change in the development mode of the Russian petrochemical industry.

Under directives from Russia's Prime Minister in 2012, the Russian government authorized the establishment of new regional petrochemical groups in Bashkir and Nižnij Novgorod in the Republic of Tatarstan. The groups are specifically located in Stavropol Kray, Irkutsk and Primorski Krai. The Petrochemical and Natural Gas Chemical Industry Development Plan to 2030, which was approved by the authorities, lists olefin and commodity polymer as the focus for development.

It is estimated that olefin production in Russia could reach 14.2 million tons in 2030, 4.8 times higher than the 2.4 million tons registered in 2010, and accounting for 5.6 percent of global production (against 1.6 percent in 2010). According to the plan, 60 percent of its light hydrocarbons will be processed in 2030, compared with 30.8 percent in 2010.



THE DEVELOPMENT OF THE REFINING INDUSTRY; RECENT PROJECTS

Russia's petroleum processing capability is listed as the third-highest in the world, following the U.S. and China. However, due to the greater focus on “mining rather than processing,” its secondary processing ability lags far behind that of western countries. Global demand for oil has been increasing steadily in recent years, especially in the U.S. and European countries, where the refining industry has reached a bottleneck. Meanwhile, increasingly strict environmental regulations are pushing oil companies to enhance their investment in refining. For now, refining capacity is growing rather slowly. In the near future, the increase will be mainly accounted for by petrochem-

ical companies that were established or began operations around 2010. Peak growth in refinery capability was achieved in 2010 and 2011, reaching 2.58 million barrels per day and 2.74 million bpd, respectively. The next round of increases will come from countries in the Middle East, China and India. Secondary processing growth will happen in the U.S. and western European countries. The increase of primary processing capability comes mainly from Russia and Kazakhstan, while the growth from the Organization for Economic Co-operation and Development (OECD) countries will be rather limited.

As the world's largest oil producer and second largest oil exporter, Russia plays an important role in the world oil market. However, its refining ca-



capacity is relatively low. For example, the structure of primary processing is simple, achieving 5.34 million bpd in 2006. The use of catalytic cracking, hydrocracking, reforming and coking in secondary processing – accounting for 6.1 percent, 1.0 percent, 13.8 percent and 1.6 percent in primary processing – lags far behind global averages.

In 2010, Russia's minister for industry and energy proposed the construction of six petrochemical industry units in the Caspian Sea, the north-west, the Volga, West Siberia, East Siberia and the Russian Far East, either by expanding current facilities or building new ones through private petrochemical companies. The choice of sites is based on access to the raw material source or to the market. The units will be highly

competitive and possess leading facilities, with an ethylene capacity of 10 billion tons every year. In the next five years, Russia plans to enhance its primary refining capability to satisfy increasing internal demand. On the other hand, to raise the value of products and achieve the strict standards set by Europe and the U.S., Russia will further its secondary refinery capability. For example, the new refinery factory built in Nakhodka, in the Far East, has a capacity of 0.4 million bpd, raising Russia's overall capacity to 0.6 million bpd.

WHY THE INDUSTRY LAGS BEHIND

Russian refineries are small compared to those of OECD countries. At the end of 2009, Russia had 28 re-

fineries and 40 refinery processing units, with an average capacity of only 0.13 million bpd and a primary processing capacity of 0.28 billion tons every year. In 2009, the volume of crude oil processed was 236 million tons: the amount of gasoline produced could only satisfy the internal needs, while diesel and fuel oil was exported mainly to the Commonwealth of Independent States (CIS).

Russia's refining industry faces many problems. Its facilities and technologies are lagging behind, while investment is limited and the quality is far from satisfactory. Most of Russia's refineries were built from the 1940s to the mid-1960s, with only a few plants being built thereafter. The plants can only reach 70 percent processing capacity (and this level was only achieved by 12 plants in 2009).

Therefore, the quantity and quality of light oil is relatively low. Eighty percent of diesel produced in Russia is made up of sulfur and 50 percent needs to be reprocessed in Europe. Despite the low quality, refineries' gross profits are higher than in Europe. The export tariff system is the main reason for the stagnation of the refining industry. Currently, the export tariff collected by Russia is 40 percent for raw crude and 50 percent for light oil. Therefore, the high profits offer little motivation for refineries to upgrade, renovate and invest.

On the other hand, the size and capacity of Russian refineries is limited. A large number of export-oriented small plants produce fuel oil and low-quality straight-run distillation diesel and gasoline. According to statistics, there are 250 such plants with a processing volume of around 12 million tons a year. The country pays little attention to these plants. Given these problems, Russia has reduced exports of light oil and encouraged refineries to reinvest in recent years. It is expected that in 2015, Russia's investment in the refining industry will increase by 780 million rubles (\$24.4 million). The authorities also hope to improve quality levels and technology, and want to see mergers to form large petrochemical groups. It was precisely because of these measures that Russia hosted the High Tech in the 21st Century forum on this occasion.

A JUICY OPPORTUNITY FOR CHINA

The backwardness of Russian refineries provides opportunities for China's energy companies to enter the Russian market and enhance cooperation between the two countries in the energy industry. As of July 2011, the primary processing capacity of China was 586 million tons, compared to 276 million in 2000 and 324.5 million in 2005. It has become the second largest national refiner, trailing only the U.S. However, the rapid increase has caused an excess of supply. In July 2011, it was estimated that the primary processing capacity of the main plants in China would gradually increase by another 179 thousand tons. Therefore, cooperation between China and Russia in the refining industry will be a win-win situation and Chinese capacity and technology will enter the Russian market. Russian and Chinese leaders exchanged many visits in 2012 and 2013 and established a strategic relationship between the two countries. The most important issue was to ensure that the Far East pipeline passes through China, which will benefit the country. Chinese oil →



Igor Sechin, President of Rosneft, meets Fu Chengyu, President of Sinopec. These big Eastern players in energy are building promising synergies.

The Sakhalin project

Sakhalin-3 is just one of five gas projects in Sakhalin being developed by the **joint venture** (JV) between Sinopec and Rosneft under an agreement signed last March by Sinopec chairman Fu Chengyu and Rosneft counterpart Igor Sechin. Venineft, the Sinopec-Rosneft JV, holds the development license for Sakhalin-3, which comprises four smaller blocks, including the **Veninsky field**. Under the agreement, Sinopec – which has a 25.1 percent stake in the JV – will finance 75 percent of the exploration costs. Rosneft holds the remaining 74.9 percent. It was anticipated that \$120-150 million would be invested in the project from 2006 onwards, but it was calculated in 2007 that investment had dried up at **\$69.8 million**. Observers believe that the project's financing mechanism did not function as intended: the joint fund established last March by the China Investment Corporation and the Russian Direct Investment Fund when Xi Jinping visited Russia (his first foreign trip as Chinese president) had failed to make any investment. Rosneft is refusing to divulge the total investments made in exploring a further three wells, but analysts say the project could cost **\$300-500 million**. The development licenses for the other three fields (Kirinsky, Ayashsky and Vostochno-Odopinsky) are held by Gazprom, which is also the license-holder for the Kirinskoye field gas reserves. According to Gazprom estimates, gas reserves in the Sakhalin-3 development total **1,400 billion cubic meters**, most of which are accounted for by condensate in the Kirinskoye field.

As it stands, only projects 1 and 2 are under development, while projects 4 and 5 have been put on hold. Rosneft and BP decided to pull out of Sakhalin-4 after two fruitless explorations. BP subsequently cancelled the partnership with Rosneft for Sakhalin-5, which the Russian group estimates as holding 56 million tons of oil. Work is expected to begin **there in 2017**.

companies consider Russia a strategic area and are exploring projects for oil and gas development in Russia. The Sakhalin Project proposed by Sinopec and Rosneft is in progress – the first major oil and gas project carried out by the Chinese national oil company in Russia. After years of trying, Chinese companies have finally entered Russia's huge market. On October 31, 2012, Sinopec announced its investment in Russia's largest petrochemical and gas pro-

cessing company, Sibur, and acquired 25 percent of its synthetic rubber plant in Krasnoyarsk. In December, Igor Sechin of Rosneft held a meeting with China's deputy Prime Minister Wang Qishan to discuss the possibility of building a refinery together in Tianjin and thus entering the Chinese market. The Chinese-Russian Tianjin Petrochemical Company, established in November 2007, was based on the Basic Guideline for Further Oil Cooperation between

China and Russia, signed in 2006. According to the guideline, Sinopec would hold 51 percent and Rosneft 49 percent. The company built a refinery plant in Tianjin with an investment of \$5 billion dollars and reached a capacity of 13 million tons. Sinopec expected to enter the refining and exploration sectors in Russia, while Rosneft hoped to enter China's market through the channels offered by Sinopec.

OBSTACLES TO COOPERATION – STARTING WITH THE LEGAL SYSTEM

However, there are some obstacles to energy cooperation between the two countries. Russia's legal system and the form and terms of Russian contracts are complicated and often subject to change, lacking stability and consistency. Russia's national oil companies play an increasingly important role in the energy industry and can influence government decisions on the legal and tax system. There are no fair and transparent regulations for foreign companies, and the country also has the potential for political instability. Too many laws suffer from frequent changes and little guarantee of enforcement. Foreign currency regulation is very strict while the financial insurance system is far from perfect. Inflation is high, as is the tax burden. There is little interest from foreign investors. Corruption is common and the administration is inefficient. As such, it is complicated and difficult to participate in large oil and gas projects in Russia. Energy cooperation between the two countries has had no solid outcome, except the Sakhalin Project. Rosneft and Sinopec have reached a series of strategic cooperation agreements for Magadan,

East Siberia, and the North Pole, while Chinese companies theoretically have the license to mine and develop Russia's energy sources. However, the Russian government did not authorize Chinese investment in the future. Most of the areas covered by the agreement are strategic and can only be developed after the approval of the Mineral Products Law. Russian oil companies, in need of investment, might start work without permission from the government. Furthermore, Russia's companies need to be included in the development process.

Overall, there is huge potential for cooperation between the two countries. China has a traditional structure, in which 70 percent of electricity is produced from coal. In the 13th five-year plan, the energy strategy of China will certainly be revised. Russia's oil exports only represent 6 to 6.5 percent of total Chinese imports. The refining industry cooperation between China and Russia can be extended to the development of biodiesel. Therefore, imports from Russia can improve environmental protection in China.

Through better investment and more widespread renovation activities, China's petrochemical companies can drive the partnership and contribute to renewal in Russia, investing in its market and therefore counteracting the so-called "Resource Plunder Theory" and the "China Threat Theory." During the Asia-Pacific Economic Cooperation (APEC) summit held in Russia in September 2012, Russian energy minister of Alexander Novak pointed out the potential for cooperation is great and cannot be limited to the simple trade of energy and raw materials. Companies from both countries can exchange technology and experiences and contribute to each other's development through investments in companies. ■

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Middle East/Prospects for the largest oil producers

Energy strategies in the Middle East

Refining dynamics in the Gulf countries and their implications for the products market. Diesel and gasoline are expected to grow most quickly

Following the wave of nationalizations in the 1970s, many national oil companies (NOCs) in the Middle East adopted a strategy of vertical integration, constructing export refineries designed to capture the value added by converting crude oil to refined products. Between 1973 and 1990, the Middle East's refining capacity increased at a rapid pace, doubling from 2.7 million barrels per day to 5.2 million bpd, and during this period many regional NOCs also invested in refining and marketing assets in the major consumer countries. However, following the rapid increase of refining capacity in the 1970s, which extended well in the 1980s, growth stagnated in many countries for most of the 1990s. Declining oil production, falling government revenues due to weak oil prices, low refining margins, and the relative profitability of upstream compared to downstream all contributed to this stagnation.

by **BASSAM FATTOUH**

REFINING CAPACITY RISING SINCE 2000

Since the early 2000s, however, rapid growth in global oil demand and the improvement in refining margins have shifted the attention of governments back to refining. Consequently, investment in new refineries and expansion of existing capacity have started to pick up, especially in the six Gulf Cooperation Council (GCC) countries, Iraq, and Iran. Many factors can account for this new drive towards expansion in refining capacity. Some of the drivers are purely technical, related as they are to factors such as maximizing high-value products, producing clean fuels, meeting environmental regulation, and reconfiguring refineries to changing patterns in petroleum product demand. Another relates to the shift in strategy towards integrating refineries with petrochemical plants to diversify the feedstock going into petrochemical plants. A further consideration is the limited availability of gas to the power sector, and in some cases the lack of gas infrastructure, meaning that some countries have no choice but to continue to rely on liquid fu-

els. For instance, in Saudi Arabia, the main new gas discoveries are located in the Gulf, but these new fields can't feed into the power plants in the western and southern regions, where the penetration of gas in the fuel mix is low, because of infrastructure constraints.

DEMAND QUADRUPLED BETWEEN 1980 AND 2011

However, the most important driver has been the need to meet the rapid increase in domestic demand for petroleum products. According to the BP Statistical Review, the Middle East's demand for petroleum products almost quadrupled between 1980 and 2011 – from around 2 million bpd to more than 8 million bpd. The fastest growth has been for light distillates, which registered an average annual growth of 4.85 percent during 1980–2011. Middle distillates and fuel oil also registered strong growth rates, around 3.94 percent and 3.58 percent respectively. In fact, one of the region's very interesting features is the importance of fuel oil in the energy product mix – accounting for almost

25 percent of the total mix in 2011. Despite the increasing penetration of natural gas into the power sector, liquid fuels are still widely used for electricity generation in many countries. For instance, in Saudi Arabia, the Saudi Electricity Company (SEC) consumed around 363 million barrels of oil equivalent in 2011, with crude oil and natural gas accounting for equal shares of around 37 percent, followed by diesel (21 percent), and fuel oil (5 percent). In Iraq, power plants also rely heavily on liquid fuels, with heavy fuel oil, crude oil, and gasoil accounting for 57 percent of power generation in 2010.

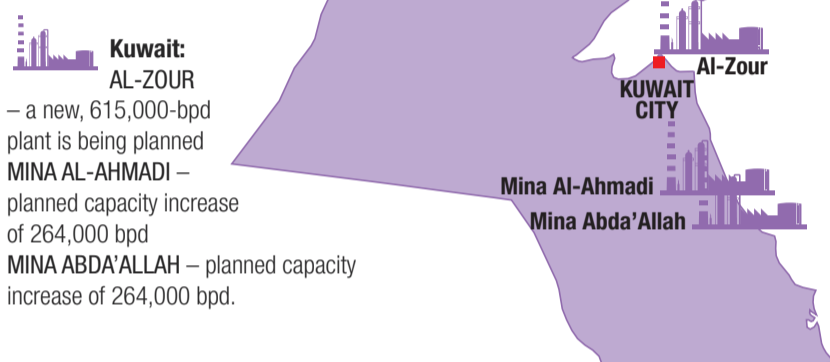
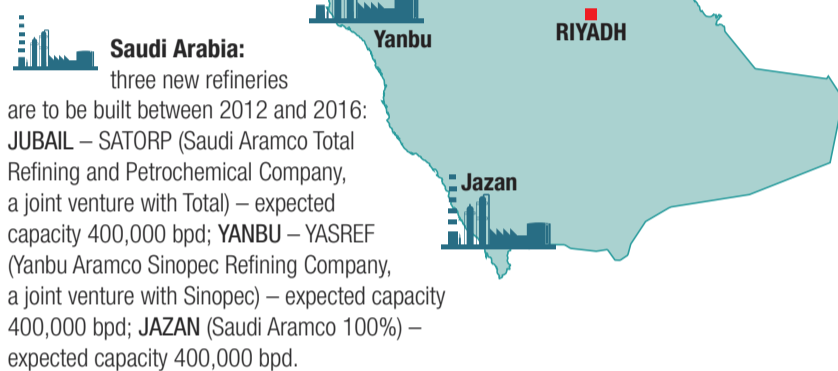
Many factors have been responsible for the rapid growth in demand for petroleum products: rapid population growth, robust economic growth, and improvement in living standards – all of which have contributed to increased car ownership and higher electricity consumption. The low prices charged for petroleum products are another key factor. For instance, in Saudi Arabia, gasoline and diesel prices stand at 12 US¢/liter and 6.7 US¢/liter respectively – low prices even by regional →



Ali Al-Naimi, Saudi Arabian minister of oil and mineral resources.



Mustafa Jassim Al-Shamali, Kuwait's Deputy Prime Minister, Minister of Finance, and Oil Minister *ad interim*.



standards. Crude oil, heavy fuel oil, and diesel are supplied to the power sector at a fraction of the prices prevailing in international markets. Such low prices distort pricing signals, resulting in a misallocation of resources, which in turn prevents the country from optimizing the use of its natural resource endowment. They also encourage wasteful consumption and smuggling of petroleum products into neighboring countries. However, following the political shock waves in the aftermath of the Arab Spring, many governments in the region are reluctant to undertake a comprehensive reform of energy pricing – success in which would put a dent in the growth in oil demand. Looking ahead, low energy prices, the use of more liquids in petrochemicals, increased car ownership, and higher electricity demand will continue to put upward pressure on oil demand. The IEA projects Middle East oil demand will increase by 1.7 million bpd between 2011 and 2017 – an average growth rate of 3.4 percent, one of the highest in the world. Diesel and gasoline are expected to experience the fastest growth rates during this period.

PRICING POLICY AFFECTS INVESTMENT

Domestic pricing policy also affects investment in the refining sector.

Due to low domestic prices, there is no incentive for NOCs to supply petroleum products to the local market or to invest in new refining capacity. But given the importance of providing stable supplies of petroleum products for the local economy, NOCs are often mandated by their governments to meet local demand at regulated prices. Surging domestic demand, which has outpaced growth in refining capacity over the last decade, has eroded the export capability of some key Middle East producers, while others have become increasingly dependent on imports of products, mainly gasoline. For instance, according to OPEC statistics, figures for the UAE's exports of petroleum products almost halved in a relatively short period of time – from around 400,000 bpd in 2007 to 227,000 bpd in 2011 – while those for Saudi Arabia declined from 1.14 million bpd to 900,000 bpd during the same period. In contrast, some countries increased their exports of refined products – for example Qatar, whose figures increased from 74,000 bpd in 2007 to more than 500,000 bpd in 2011. As a whole, the Middle East remains a net exporter of refined products (with fuel oil and naphtha constituting the largest export categories), a status that is unlikely to change in the next decade due to increased investment in refining capacity.

INCREASES EXPECTED IN GULF COUNTRIES

Mainly due to pressure from domestic demand, many Middle East and North African (MENA) countries have announced projects for new refineries over the last few years. If the announced projects are all implemented, the MENA region could increase its refining capacity by 5 million bpd by 2015. However, many of the announced projects have been shelved or postponed, and thus the actual increase in refining capacity over the next few years is likely to be more modest. According to OPEC, between 2012 and 2016, the Middle East is expected to add 1.79 million

chemical Company, a joint venture with Total) in Jubail; YASREF (Yanbu Aramco Sinopec Refining Company, a joint venture with Sinopec) in Yanbu; and Jazan (Saudi Aramco alone); each of which is planned to have a capacity of 400,000 bpd. Abu Dhabi Oil Refining company is currently building a 417,000 bpd capacity expansion alongside its existing Ruwais refinery. Kuwait, Qatar, Oman, Iraq, and Iran have projects in the pipeline which are expected to come online towards the end of this decade, but some could be subject to serious delays. For instance, Iran's refining projects are likely to be hit by the financial sanctions recently imposed on the country.

One of the region's features is the importance of fuel oil in the energy product mix – accounting for almost 25 percent of the total mix in 2011

bpd in new refining capacity, with most of the additions expected to come from Gulf countries – particularly Saudi Arabia and the UAE. Saudi Aramco is pushing ahead with three new refineries: SATORP (Saudi Aramco Total Refining and Petro-

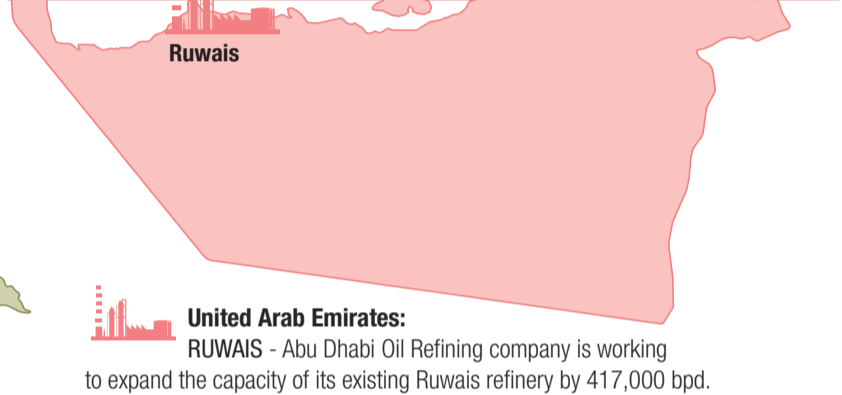
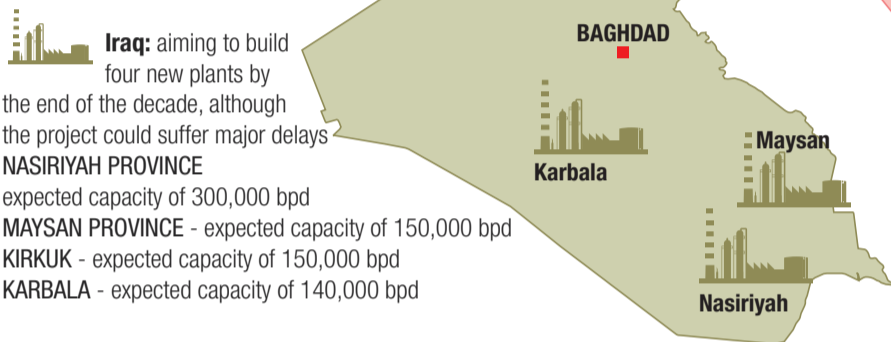
Iraq is also struggling to meet its ambitious plan to build four new refineries (with a total capacity of 740,000 bpd) and upgrade its existing refineries to produce clean fuels for the domestic market. Factors such as unattractive terms, inability to attract investors, low domestic prices, and an uncertain regulatory framework all indicate that Iraq's refining capacity is likely to grow at a very slow pace in the next decade. Kuwait's plans to build a new 615,000 bpd plant at Al-Zour and to implement a clean fuel and expand capacity by



Abdulkareem Luaibi,
Iraqi oil minister.



Suhail Mohamed Al Mazrouei,
UAE's energy minister.



264,000 bpd at the Mina Al-Ahmedi and Mina Abda'Allah refineries could be delayed further due to a series of crises that have paralyzed the political system for years. Most of the additional products from new investment projects are likely to stay in the region, so the region's imports of gasoline will be curbed as the refining projects become operational. For instance, according to a Bloomberg Survey, Saudi Arabia (the region's biggest gasoline importer) will reduce its purchases of gasoline by 50 percent in 2014. The UAE could become self-sufficient in gasoline when the Ruwais plant comes online in 2014. Oman is aiming to become self-sufficient in petroleum products by 2016, as the country expands its Sohar refinery by 70 percent. Furthermore, some countries will achieve a surplus in petroleum products, which will be exported. Once the 0.4 million bpd YASREF refinery comes online in 2014, Saudi Arabia is likely to develop a small surplus in diesel, which can be exported, "depending on economics." SATORP alone is expected to increase Saudi diesel production capacity by around 0.176 million bpd, while YASREF and the Jazan refinery are likely to take total Saudi diesel capacity to over 0.45 million bpd. Thus Saudi Arabia is likely to become a net exporter of diesel over the next few years, until domestic consumption catches up by the end of the decade.

THE CASE OF INDIA

Reduced imports of some petroleum products and increased exports from the Middle East will have serious implications for Indian refiners in particular. India currently exports 0.4-0.55 million bpd of diesel, mostly to Europe and Africa, but with the advantage of lower shipping costs to Europe, the Middle East is likely to give the country stiff competition in the future. Upgrades to existing refineries are already allowing the Middle East to produce low-sulphur diesel. Abu Dhabi National Oil Company (ADNOC) is planning to offer diesel with a sulphur content of 10 parts per million for 2013

India currently exports 0.4-0.55 million bpd of diesel, mostly to Europe and Africa, but the Middle East is likely to give the country stiff competition in the future

contracts, making it the first Gulf producer to export ultra-low sulphur diesel on a term basis. This change in trade flows of oil products could open up new business for the NOCs in the area of oil products trading. For instance, Aramco

Trading will be handling many more products once Saudi Arabia's new refineries are up and running. In addition, the company is the sole entity supplying the Kingdom's large and fast-growing needs. Potentially, such bodies as Aramco Trading could grow in size and expertise and rival some of the established trading houses. Beyond these direct effects on the products market, it is important to note that the new refining capacity coming online in the Middle East is closely matched with the type of crude oil being produced. For instance, the Manifa oil field in Saudi Arabia, which is projected to reach full capacity of 900,000 bpd by the end of 2014, will supply heavy oil to the new refining projects in Jubail and Yanbu. This implies that the bulk of the increment in heavy-sour crudes will be used domestically. Given the large investments made recently by refineries to process heavy-sour crudes, especially in the USA, the reduced supply of heavy crude to international markets could affect the light-heavy differential, and hence the profitability of some of the heavy refineries. Thus, the above discussion suggests

that while the new wave of investment in the Middle East's refining sector is intended mainly to meet the rapid rise in domestic demand, there are wider implications on crude and products markets and on trade flows. In the short- to medium-term, reduced imports into, and increased exports from, the Middle East of some petroleum products will put further pressure on global refining margins. In the long term, however, the expected increase in domestic demand for refined products, together with uncertainty regarding implementation of some of the announced projects, paint a more uncertain picture about the supply-demand balances of the various products. While the recent increases of refining capacity in some oil exporting countries will help them achieve temporary self-sufficiency, in the absence of serious energy pricing reform the race between building new refining capacity and satisfying rising demand will continue.

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1989, Texas, U.S.A.



U.S.A./Boom, bust and the future of the refining industry

Optimize, or face extinc

In the last 30 years, half the refineries in the United States have been shuttered. Experts say that better management and the use of software technology will be critical to the industry's survival

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by MOLLY MOORE

he last new petroleum refinery opened in the United States on the banks of the Mississippi River in Louisiana 37 years ago. In the span of the last three decades, half the refineries in the United States have been shuttered. Of the 300 refineries that were operating in 1982, only 142 remain open. Even so, U.S. refining capacity has grown by about 13 percent as more efficient, upgraded refineries take on a greater share of the load.

LIKE THE OLD LINOTYPE MACHINE

Like the linotype machine that was replaced by computers, and the human factory assembly lines supplanted by automated robots, the

U.S. petroleum refining industry is undergoing unprecedented restructuring. The U.S. market for petroleum fuels is shrinking and the industry is facing major regulatory and economic challenges. Many of the aging plants that turn crude into a myriad of byproducts are melting from the American landscape. Environmentalists hail the disappearance of refineries and their belching stacks as a victory for public health and the environment. Industry officials routinely describe the shuttering of refineries as a disaster that will lead to higher gas and petroleum product prices. The truth lies in the complex gray area between the two extremes and represents both a natural evolution in the industry and the reality of changing American lifestyles and outlooks. Technological advancements such as automation, co-generation and solvent-extraction systems have boosted refining capacity immensely

and helped squeeze more out of every barrel of oil processed at plants that have been modernized. As a result, even though no new refineries have been built, the American Petroleum Institute estimates that improvements to existing facilities have increased refining capacities to the equivalent of 23 new average-size facilities. To be sure, some aging plants have been closed because it is too expensive to upgrade them to meet new pollution control standards. But many others have closed because of the vagaries of the international oil markets and growing competition from around the world. Last year, one of the largest refineries in North America – the massive HOVENSA refinery in St. Croix in the American Virgin Islands – shut down. Even processing 350,000 barrels of crude a day, the plant lost an estimated \$1.3 billion during its last three years of operation—about \$1 million a day.

The refinery was paying high prices for Brent crude and had no access to cheap natural gas, an economically unviable combination.

YOU CAN TELL A COAST BY ITS REFINERIES

The U.S. refining industry is divided between older refineries, most of which are located on the East Coast and generally process only higher quality imported Brent sweet crude, and the Midwestern and southern plants that can refine the heavy, cheaper crude from Western Canada, the Gulf of Mexico and South America. Those refineries, in a belt from Louisiana to Chicago, also have access to West Texas Intermediate crude, sweet oil not dissimilar to Brent. That leaves the East Coast refineries at a disadvantage when Brent trades at a higher price than WTI. The most successful companies are engaged in



cycles. At one point in the U.S., demand for new refineries was so high that President George W. Bush offered to allow new refineries to be built on unused military bases.

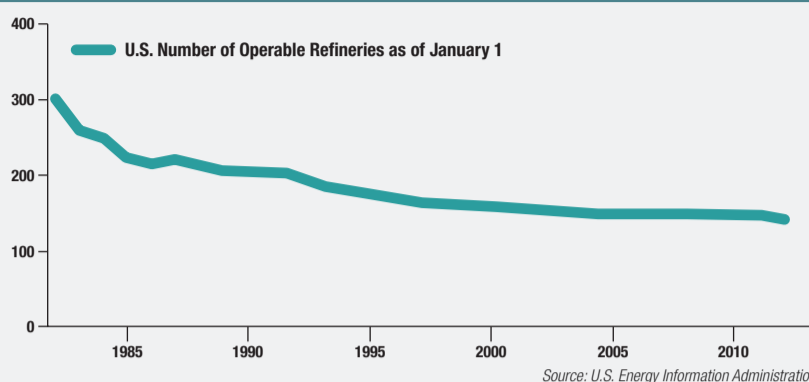
MORE RECESSION MEANS LESS DEMAND FOR GAS

The recession of the past four years has reduced the demand for gas and other refined products. The U.S. Energy Information Administration has lowered its forecasts for oil consumption in the U.S. in the coming years. Biofuels and ethanol are displacing gasoline and diesel and new fuel efficiency standards for automobiles are slowly reducing overall demands for gasoline. The Obama administration has required that cars average 35.5 miles per gallon by 2016, up from the roughly 25-mile-per-gallon rating of 2010. That could reduce oil consumption by about 1.8 billion barrels between 2012 and 2016. In its 2013 energy outlook, the U.S. Energy Information Administration forecast a continuing decline in motor gasoline consumption “reflecting the effects of more stringent corporate average fuel economy standards.” Charles Drevna, president of the American Fuel & Petrochemical Manufacturers trade association, blamed higher fuel efficiency standards for automobiles and biofuel incentives as leading “to the unnatural destruction of demand for gasoline equivalent to 18 refinery closures,” in a recent letter published by *The Wall Street Journal*. But many companies, seeing the handwriting on the wall, are embracing the shift in regulations and automobile standards. America’s largest refiner, Valero Energy, recently shut down a Delaware refinery after watching its stocks plunge during the recession. Now Valero is buying ethanol refineries. Other major companies are getting out of the refining business altogether.

PROFITS FOR SOME

And in the uneven world of refinery markets, some companies are prospering. In the final quarter of 2012, Exxon and Chevron showed strong profits buoyed by income from U.S. refineries. Refineries, many of which blanketed communities in the smell of sulfur, have also been favored targets of the environmental movement. The plants consume vast amounts of water, require large tracts of land and pump large amounts of carbon dioxide into the atmosphere. Rather than battle the years-long regulatory process to build new refineries to meet ever-tougher environmental standards,

THIRTY YEARS OF CLOSURES



Half of all refineries in the United States have closed down over the past 30 years: of the 300 refineries operating in 1982, only 142 are still running.

most companies have turned to upgrading existing refineries, often increasing both capacity and efficiency. Some in the industry have vociferously attacked the Obama administration, blaming it for contributing to refinery closings with “policies that are inundating domestic refiners with costly and often conflicting regulations that threaten their competitiveness, while offering little or no environmental benefits,” in the words of the American Fuel & Petrochemical Manufacturers’ President Drevna. But, in some cases, state regulations have been even stronger than federal regulations. Some companies have decided to

The U.S. administration has been blamed for contributing to refinery closings with policies that are inundating domestic refiners with costly and often conflicting regulations

stop fighting environmentalists and combative neighbors and compromise instead. Flint Hills Resources, a subsidiary of Koch Industries Inc., recently agreed to reduce greenhouse gas emissions and air pollution for a planned \$400 million upgrade of its Pine Bend Refinery in suburban Rosemount, the largest oil refinery in Minnesota, in return for environmentalists agreeing not to contest the company’s permit requests. The company not only agreed to install extra energy-efficiency and monitoring equipment that will cut greenhouse gas emissions by about 52,000 metric tons, but also said it would donate \$1 million to Project Green Fleet, an organization dedicated to reducing emissions from school buses and other diesel-powered vehicles. For

their side of the deal, refinery expansion opponents – the Minnesota Center for Environmental Advocacy and the Environmental Integrity Project – said they would not fight the company’s applications for refinery air permits, which must be approved by the Minnesota Pollution Control Agency. By negotiating a settlement before the regulatory process began, both the company and environmental opponents saved time and money, a company spokesman said. Still, it is the weaker profit margins that are pushing many companies out of the refining business. Newer, more efficient refineries opening elsewhere around the globe will force even more of the older U.S. plants out of business. Cheaper gas imports from abroad will also undercut U.S. refineries. Many experts say refinery optimization will be critical to the industry’s survival in the United States. They point to a need for better planning and management; for analyzing gaps at every step of the process (from planning and scheduling to operations); and for the use of software technology. The refineries that adhere to those guidelines will likely prosper; those that don’t will likely go the way of the dinosaurs. ■

Molly Moore is a senior vice president of Sanderson Strategies Group, a Washington, D.C., media strategies firm, and a former *Washington Post* foreign correspondent.

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large-scale upgrades for handling shale oil and the complex hybrids resulting from bitumen exploration in the U.S. West and in Canada. But those efforts benefit the industry on the western side of the U.S., leaving the eastern refineries too far away from the source material to make it worth the cost of modernizing. In fact, the boom in activity in North Dakota’s Bakken shale formation has prompted the construction of the first new U.S. refinery since 1976. Officials hope the refinery, from MDU Resources Group Inc. and Calumet Specialty Products Partners, will meet the state’s fast growing demand for diesel fuel for the rigs, trucks and trains supporting North Dakota’s oil boom. Because of the refinery’s remote location and the state’s sparse population, the plant has not encountered the environmental opposition that has grounded other efforts to build new refineries. Still, the companies building the refinery are hedging their bets, using a modular design that will allow them to move the refinery to a different location in the future if the market shifts. The refining side of the industry has always operated in boom / bust



by ANTONIO
GALDO

Four steps to jobs, security and sustainability

Europe's refining industry faces a crisis that is equal to the one engulfing its steel industry – if not worse. Moreover, it is a serious threat to employment figures and comes at a time when joblessness is becoming rife across the continent, especially among young people. This is a structural, systemic crisis, brought on by a series of factors that are symptomatic of a limp European industrial policy that pays little heed to issues of global competition. For one thing, refineries in the European Union are paying the price of a generalized drop in consumption (at a rate of 2 percent per year) and hence of over-production and excessive supply. However, above all they are suffering from ruthless competition from Asia, where labor costs are far lower, environmental safety regulations (where they exist and are respected) are much more lax, the tax system is more favorable, and credit is cheaper. These days, confronted with the constant closure of refineries, it is frightening to remember that this not only weakens energy supply security but also, more worryingly, translates into a serious threat to 600,000 jobs – many of which are in skilled labor, including logistics and business-side operations. Moreover, even if the idea of turning facilities into storage sites avoids conversion costs, it is actually no solution at all. Rather, it is an illusory panacea, while the loss of jobs is all too real: each refinery provides jobs for an average of around 5,000 people. So how can we avoid falling

into this abyss? How should we tackle a phenomenon that is less to do with economics than with a structural phenomenon of deindustrialization? And what steps can we take to protect thousands of jobs and even the very social cohesion of the E.U.? So far, Europe has responded to these questions with round tables, forums, Commission reports, and the occasional general sounding of the alarm. That will not suffice. We need urgent measures, with the understanding that the crisis of European refineries cannot be dealt with piecemeal, by each member state; instead it requires a shared, inter-governmentally funded European industrial policy that covers four main areas.

First of all, we must recognize the strategic value of Europe's refining industry, including in terms of the jobs it provides

We must not make the same mistake that was made with the steel industry, where – faced with impending crisis – competition broke out among European countries, bringing in subsidies that merely delayed the inevitable closure of a number of plants. If refining is to be considered a key asset for European industry, then we must establish the Union's long-term demand and overall production capacity, and then spread it among the individual countries. The second step would be to convert plants that are excluded from the multi-annual production plan. The potential here is huge, and these sites could, for example, be transformed into modern industrial



centers for recycling waste and turning it into energy. Of course, we must ensure the utmost safety for workers and minimize the threat to job security and the environment, but such concerns cannot be used as an excuse to avoid the wholesale reconversion of refineries. Hence, we will need lean and efficient regulation, quick processes for granting permits, and the option to make exceptions where it is found that current laws are too restrictive. We must have rules that are stable, certain and equal for all E.U. countries. This redevelopment process would have the huge benefit of providing support for a sector – waste transformation – that is not only certain to grow but also fundamental to the development of a new, sustainable economy. In addition, transforming former refineries into other energy-

related facilities would ensure current employment levels remain unchanged – the very opposite of what will happen if we pursue the current fudge of turning refineries into storage facilities, which have entirely different staffing requirements.

We must bear in mind that the reconversion of a refinery for civil use is hugely costly and therefore calls for tax incentives and adequate financial backing

The third point of the plan must address public and private investment in transforming current production sites. Money is needed in order to develop new skills, new products, and to back innovation and energy efficiency – another nerve center of the new economic model. For example,

biorefineries are being developed across the world, backed by massive investment in countries such as the U.S. and Canada. But the incredible irony is that these activities are based on European patents! As ever, Europe is exporting its innovation and failing to use it at home, thereby contributing to its own marginalization on the global industrial playing field. Like the reconversion option, pursuing the development of biorefineries would also provide at least as many jobs as the current stock of refineries.

The fourth aspect of the plan is the most delicate, because it recruits global trade policies to its cause. The time has come to put a stop to unfair competition, including in the refining sector, and start implementing the basic rule of ensuring equal conditions of competition between E.U. and non-E.U. countries. This can only be achieved by European industrial and trade concertation, leading to the introduction of a green label for products refined inside the Union. Then, regulations must be changed so that the only non-E.U. products that can be used are those obtained through industrial processes that meet equivalent standards on safety and environmental protection. Lastly, we must be able to trace the provenance of refined products, which is the only way to discourage competition from companies that do not work to the same standards set in the E.U. This would be a strong move and one that would doubtless spark debate within international organizations, but it would also serve as proof that Europe will act to defend its refining industry, the workers in that sector, and its targets on environmental sustainability. ■

Antonio Galdo runs the website www.nonsprecare.it and is the author of the books *Non Sprecare* and *Basta Poco*, published by Einaudi. He recently published *L'egoismo è finito* (Einaudi).



by GIUSEPPE
ACCONCIA

Egypt looks to *sukuk* to combat the crisis

The Egyptian Muslim Brotherhood is betting on liberalization policies to overcome the current economic crisis. Public-private joint ventures, in particular, are central for their political program. For this reason, the Egyptian government approved a new law regulating the issuance of *sukuk*, which are Islamic bonds or fixed-value financial instruments. The economic committee of the Shura Council, which has had full legislative powers since the new Constitution was enforced last December, unanimously approved the decree. According to the new law, by July Egypt could see the first *sukuk* issuance; the government hopes that yields will range from \$10 to \$15 billion a year. The Islamic Investment Bank in Egypt alone will support the *sukuk* issuance with loans amounting to \$388 million.

The Egyptian Minister of Finance, El-Sayed Hegazi, rejected concerns that the new law would allow the selling of public assets

Hegazi noted that the new bill prohibits the selling or mortgaging of state properties. In this instance, the law bans the issuing of *sukuk* bonds backed by public assets such as the Nile River, the Suez Canal, the Pyramids, and other historic properties. But the matter has given rise to several controversies. Last December, the government prepared a law on sovereign *sukuk* bonds that



Cairo, headquarters of the Central Bank of Egypt.

was harshly criticized by the Islamic Research Academy of Al-Azhar. According to the country's most influential Islamic institutions, the draft decree on *sukuk* violated *sharia* (Islamic law) and posed a threat to state sovereignty. In April, the Al-Azhar scholars sent new comments about the second draft of the *sukuk* law. They recommended that the duration of the Islamic bonds should not exceed 25 years. Moreover,

they argued that only Al-Azhar, as Article 4 of the Constitution states, can have the last word on whether *sukuk* abides by *sharia*. The worldwide growth rate of Islamic finance reached 20% last year. This amount does not include funds invested in private banking. According to Alberto Brugnoli, director of the Assaif, an Islamic finance consultancy, "in 2012-2013 the Islamic bond market reached a new record after

its good performance in 2008-2009, with an expected volume of \$4-5 trillion by 2020. Qatari businessmen are especially engaged in buying public assets in other countries investing in Islamic bonds," he says. One of the goals of Islamic finance, however, is to reinvest capital in social projects focused on the diffusion of wealth and private equity. In this instance, microfinance programs are especially

relevant. According to Brugnoli, "microfinance products have indeed been successful in Muslim-majority countries; large banks operate in the microfinance sector in Indonesia, Bangladesh, Pakistan, Morocco, Egypt and India – but few of them are *sharia*-compliant." As this expert explains, those instruments can also be interesting for non-Muslim investors: "Conventional products do not fulfill the needs of many Muslim clients, as *sharia* compliance in some societies may be less a religious principle than a cultural one: even people who are less religiously observant prefer *sharia*-compliant products."

For instance, Islamic insurance known as *takaful* is increasing in Europe, especially in Germany and the United Kingdom

In England, Islamic banks apply the conventional laws for savings on alternative instruments for shared deposit without guarantees. Finally, the growth of these new economic instruments has brought many women into Islamic finance projects. The heads of several Islamic banks are women, in Malaysia and Pakistan, for example. Moreover, several Islamic foundations or *awqaf* are managed by women. According to Valentino Cattelan, a researcher at Tor Vergata University in Rome, "the Islamic Development Bank has already started microcredit projects in Mali, Pakistan and Afghanistan to ameliorate life conditions of tribal and traditional families." ■

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watch CENTERS OF GRAVITY



by NICOLÒ
SARTORI

European refining and the threats from the East

The center of gravity of global refining capacity is moving rapidly away from Europe and towards the large emerging economies and the main Middle Eastern producer countries. The bankruptcy in 2012 of Petroplus – one of the largest European refineries – and the hitherto fruitless attempt by the French government to resuscitate it are emblematic of the profound crisis across the sector. If the European refining industry were to be dismantled, the consequences would not be limited to the social and economic sphere, but would also have a major strategic impact on the security of oil-product supply. In an increasingly competitive and hostile international environment, Europe cannot allow itself to become too dependent on imports. Instead, governments and institutions must work with their industrial counterparts to identify ways to bring about a lasting revival of a crucially important sector.

The economic crisis has exacerbated the sector's structural weaknesses

The economic crisis decimating the E.U. since 2008 has worsened the problems faced by a sector already weakened by high overheads and the high costs of maintenance and skilled labor. The result has been a constant fall in per-barrel profit margins. The collapse in consumption has led to a gradual decline in infrastructure investments and thus a reduction in refineries' installed processing and production



The Petroplus refinery in Cresser, Switzerland.

capacity and – above all – a net contraction in their rates of utilization. Consumption patterns in the transportation sector have also changed, with the introduction of new fuel types (especially liquefied petroleum gas – LPG – and electricity) and a substantial drop in global consumption of gas in favor of diesel, which is still produced to only a limited extent in Europe. European Union environmental regulations also play a major part in explaining the sector's travails. Refineries are subject to the Commission's edicts on industrial emissions, which require companies to make massive investments to keep their emissions within assigned quotas or, vice versa, to incur huge costs in buying emissions credits if they

cannot keep within the limits. The E.U. directive on the promotion of the use of energy from renewable sources has had a significant impact, calling for the use of a sizeable amount of fuel from renewable sources (biofuels) in the transport sector.

Global refining capacity is gradually shifting eastwards

Against this background of structural decline, it is clear that global competition and the emergence of new international players have not just inflicted a serious blow on European refining; these also represent a strategic threat to the security of the supply of oil products in Europe. Global refining capacity is gradually shifting eastwards, driven by by perpetually increasing

consumer appetites and by lower operating costs. In Asia, the dynamism of China and India will result in an increase in refining capacity of 8 million barrels per day by 2020. Moreover, the next few years will see the launch of a number of projects that will turn the Middle East into the new global hub for refining. This scenario is a threat to European energy security, especially considering that the main drivers of the current changes are national oil companies (NOCs). Giant NOCs in Asia and the Middle East are embarking on an extraordinary process of vertical integration, overhauling their refining and downstream sectors. The industrial and commercial partnership between Middle Eastern producers and Asian consumers could threaten European geo-strategic interests. In any case, aside from the risk of the oil-products industry shifting rapidly to the East and thus making Europe severely dependent on imports, the change in the strategic background could have a direct impact on the character of the European industry. The danger is that European companies will, in an attempt to streamline their activities, end up selling off their assets to the NOCs. These, however, would surely be far less sensitive to Europe's political and strategic considerations if, at some point, they decided to shut down facilities because of unsatisfactory profits.

Toward a new model of industrial development

A secure, indiscriminate and sustainable supply of oil products is a strategic priority for Europe, and

a basic condition for ensuring political, economic and social stability in the years to come. However, current internal and global trends reveal Europe's increasing vulnerability in this area. To deal with this, the continent must develop and implement a model of industrial development that takes account of unavoidable issues, including stagnant consumer spending and the non-negotiable status of a number of environmental policies. In industrial terms, Europe's focus must be firmly on technological development: first, to generate greater efficiencies, and second, to open the way to new, emerging markets. The revolutionary effects of unconventional North American fuels could even be intercepted by the European industry, with potentially positive repercussions on corporate profit margins and industry competitiveness. Eni is something of a paragon in this area: thanks to the development of Eni Slurry Technology (EST) the company will be able to process very heavy oil residues, significantly increasing its target market. Institutionally speaking, the strategic nature of the refining sector should lead the E.U. to move to protect it. Above all, the Union should support private research and development in technology. Then, following in the footsteps of the 1990s initiative to tackle the crisis in the European defense industry, the Union should drive a process to streamline and consolidate the refining sector. Such a program would, of course, require an acknowledgement of the strategic interests at stake, a thorough understanding of the trends in play, and the cooperation of industrial stakeholders – a joint effort that could benefit all players. ■

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watch THE WAY WE WERE



by VALERIO
CASTRONOVO

From W. Burton to the Green Refinery in 100 years

The first thermal cracking process was used in the United States just 100 years ago, in 1913; with this, the oil refining business lifted off. Before then, refineries had merely distilled crude oil to separate the different hydrocarbon fractions and sell them for their various uses. At the time, there was particularly high (unsatisfied) demand for fractions with 10-15 carbon atoms, for use in kerosene oil lamps; meanwhile, there was an excess of fractions with 6-10 carbon atoms, which can be used for petroleum; these were often simply dissolved and washed away into rivers and sewer systems – partly because they were considered too dangerous due to their flammability.

Chemist William M. Burton, a manager at a Standard Oil refinery, tested the first thermal cracking process in 1913

Things continued this way until the motor car burst onto the scene in the early 20th century; and an old concept was brought up again: the idea of thermally splitting heavier hydrocarbon chains to obtain lighter fractions (or “cuts”). It was William M. Burton, the manager of a Standard Oil refinery, who tested the process in a special facility in 1913. It was so successful that from its first year in use, revenues outstripped production costs ten to one. The Burton method was the standard for a decade or so, before it gave way to a more efficient process invented by Charles P. Dubbs and developed thanks to the backing of a wealthy businessman, who bore



Aerial view of the Venice refinery. Thanks to Eni's Green Refinery project, the traditional units will be converted during 2013 into a “bio-refinery” for the production of biofuels.

the massive costs that it entailed. It would, however, take more than twenty years of research and testing to find a more technically sound method suitable for large-



Chemist William M. Burton tested the first thermal cracking process.

scale use. Eugène Houdry, a French engineer, had begun to research the potential of catalytic cracking in 1925. In 1937 Vacuum – a U.S. company set up in 1930, which Houdry collaborated with – achieved the first industrial-scale success with the new (semi-continuous, fixed-bed) process devised by Houdry, who had by then invested much of his personal wealth in the project. In 1942, a team set up to coordinate the research of four major U.S. oil companies (Indiana Standard, Jersey Standard, Shell and Texaco) managed to get a continuous, fluid-bed cracking process working; it was perfected in the subsequent decade. The work of a brilliant chemist called Walter Reppe turned out to be essential to

this development. IG Farben had asked Reppe to synthesize butadiene from acetylene (extracted from coal) and in 1930 he came up with a method based on four consecutive reactions, including hydrogenation under high pressure. By then, bonds and interdependencies had developed between research and production, and between chemistry and the oil industry, which in the two decades after the war's end gave rise to further significant developments; chief among these was the use of polyethylene from thermal cracking in the mass production of plastics. Meanwhile, the role of refineries had become increasingly important, and they had set up new facilities for preliminary treatment of their various

crude oil distillation activities. This launched the surge in oil production, which reached 30 percent of global energy consumption in 1950 (it had been 10 percent in 1920).

The 1970s saw a great leap forward, to 45-50 percent of consumption, partly thanks to the major improvements in catalytic cracking with the introduction of zeolite catalysts in 1965

Once the endothermic engine made the waste products of the process usable, new refining technologies made it possible to gradually reduce liquid and gas waste, and hence their polluting effects. In recent years, following the total or partial restructuring of many refineries (to achieve economies of process or of scale), and the completion of environmental recovery projects, the environmental effects of refining have been further mitigated. Eni's “Green Refinery” pilot project is part of this picture: the Italian company is set to convert its Venice facility, in 2013, into an environmentally friendly “bio-refinery” – the first of its kind in the world. ■

Valerio Castronovo is former Professor of Contemporary History at the University of Turin and current editor of the science and history magazine *Prometeo*. Since 2000, he has been a lead writer for *Il Sole 24 Ore*. One of his most recent publications is *L'avventura dell'unità europea* [The adventure of European unity].

MARKET TRENDS

\$100/barrel: a ceiling, not a floor?

The economic crisis and abundant supply have pulled crude down in recent months

Oil prices

The price of Brent has held steady over the last two years between \$105 and \$115/barrel, with only a few temporary excursions out of this range. Last year, prices jumped in March to above \$125/barrel, before falling in June to below \$90/barrel and then returning to the previously mentioned trading range. Prices this year have followed a similar trend, peaking at \$119/barrel in February and falling to a low of \$97/barrel in mid-April.

The economic crisis and abundant supply have been behind the bearish sentiment of the past few months. Following on from record levels in 2012, this year is also seeing a constant excess of supply.

The International Energy Agency (IEA), OPEC and the U.S. Department of Energy have all cut their demand forecasts for 2013, given weak macroeconomics that in some cases are even worse than expected. Indeed, recent economic figures point to the fragile state of the global economy: the situation in Europe has become increasingly critical, while expectations of recovery in the U.S. have been dampened and even Chinese growth is falling to less stratospheric heights. On the supply side U.S. tight oil is the other destabilizing factor: production continues to expand aggressively, causing a chain reaction of effects both on the domestic market and in international trade. Not least, it is reducing OPEC market share.

At the moment though, OPEC is not taking action, even if the basket of prices is more than \$10/barrel below last year and the cartel's effective spare capacity is

low. Many countries – including Nigeria, Libya, Algeria, Venezuela and Iran – are in serious difficulty. The biggest countries in terms of production potential are essentially Saudi Arabia and Iraq, although the latter remains hampered by the instability that is still compromising exports and progress in developing projects.

It is therefore down to Saudi Arabia to manage the market and, in this period of weak fundamentals, attention is focused on possible cuts to try to support prices. The country has already reduced its production compared with 2012, but does not seem to be in a hurry to declare cuts. "The market is large enough for everyone," said the Saudi minister on the eve of the OPEC meeting held in late May, which concluded with a de facto rollover of current output. The ideal price has been kept at \$100/barrel, which is sufficient to balance the country's budget and allow space for new production (tight oil), while not overly depressing global consumption. Meanwhile, the Saudi minister said that the new long-term floor has fallen to \$70/barrel, equivalent to the break-even price of U.S. tight oil – the key factor in the global oil scenario.

Could \$100/barrel for Brent – which until now has been seen by some analysts as a floor for crude prices – become a new ceiling? At the moment it is all a bit unclear: there is an ongoing push-and-pull between the clear weakness of the economy and the substantial geopolitical risk, fed by the various hot spots in North Africa and the Middle East that threaten reliability of supply from those areas.

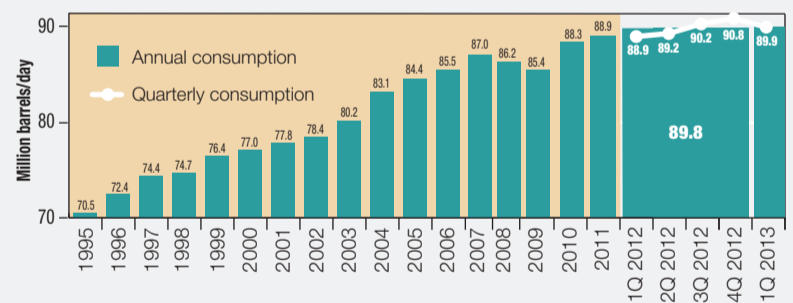
Oil demand

During the first quarter of 2013, global oil demand touched 89.8 mb/d, up 0.9 mb/d. In terms of contribution, only the non-OECD countries saw an increase (+1.4 mb/d), while OECD countries dropped once again (-0.5 mb/d). Among industrialized countries, Europe saw the sharpest reduction (-0.5 mb/d) due to the ongoing recession. Meanwhile, the OECD Americas region reported a 0.3 mb/d rise in consumption in light of positive signs from the U.S. labor market: more than a million new jobs have been created in the past two quarters and unemployment fell to 7.1 percent in April – the lowest since 2008. The non-OECD area is coming ever closer to overtaking the OECD in terms of consumption, with Q1 figures of 44.1 mb/d for the former and 45.7 mb/d for the latter.

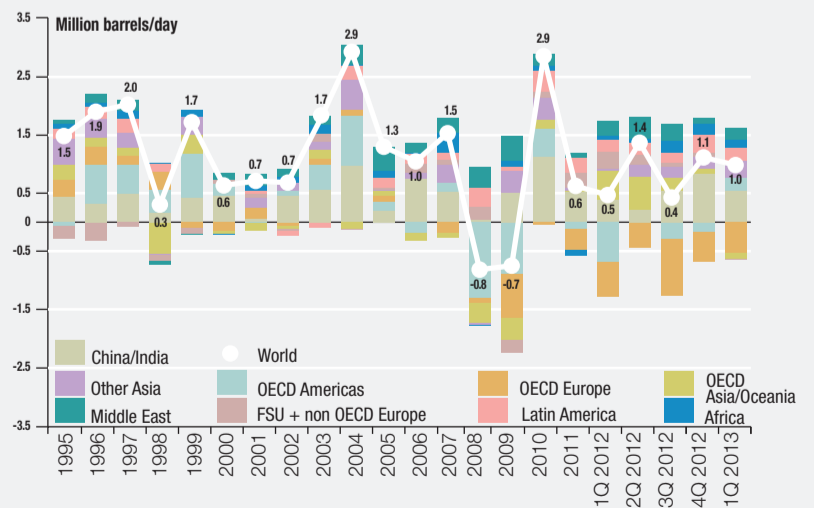
More than 30 percent of non-OECD growth in demand originates from China, which in Q1 recorded an increase of 0.5 mb/d. However, the export-dependent Chinese economy is feeling the effects of the euro area recession and fundamentals that are weaker than in the last decade. Domestic demand and the manufacturing sector are down: in the first quarter, China saw GDP growth of 7.7 percent on 2012 compared to expectations of 8 percent, while in May the Purchasing Managers' Index (PMI – an index of orders in the manufacturing and service sectors and indicator of economic performance) fell for the first time since October 2012. These factors have a direct negative impact on gas oil consumption, which is used in heavy transport and industry. Gasoline, meanwhile, mirrored the growing transport sector. In the first four months of 2013, automobile sales increased by 16 percent compared with 2012, hitting 5.8 million units.

China thus retains its position as the driver of global oil demand and as second-largest consumer after the U.S. (China at 9.6 mb/d vs. U.S. 18.6 mb/d in 2012).

GLOBAL DEMAND



VARIATION IN DEMAND (GLOBAL AND BY AREA)



Source: Eni's elaboration on International Energy Agency data; change vs the same period of the previous year

Refining has changed radically in recent decades

The “other” petroleum industry

Around 11 percent of any given barrel of crude is used for non-fuel/non-lubricant products: from detergents to aspirin, varnishes, and antihistamines. Forty-six percent is turned into gasoline, 26 percent into diesel

by JAMES HANSEN

It was once said of the very efficient hog butchers of Chicago that they made use of every part of the pig excepting only the “oink,” the vocal protest of swine as they suddenly discover the purpose for which they have been raised.

There is a similar efficiency in the case of petroleum refining, even if as consumers our natural inclination is to think of oil primarily as a source of energy for transport and heating.

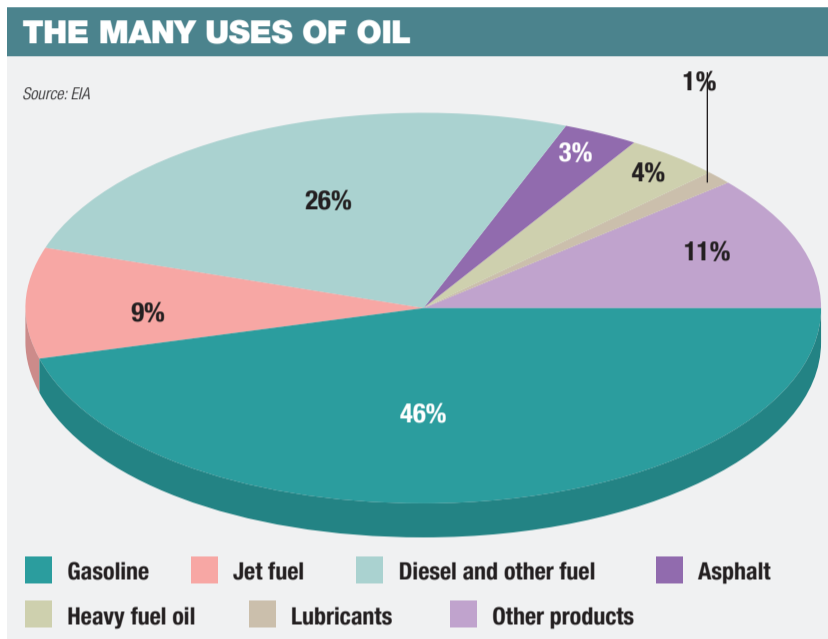
That view is accurate enough as far as it goes: A standard 42 gallon “barrel” of crude oil as it passes through the refining process typically yields around 21 gal (80 L) of gasoline, 3 gal (11 L) of jet fuel, 9 gal (34 L) of distillates and petrochemical feedstock, 4 gal (15 L) of lubricants, and 3 gal (11 L) of heavy residue. All in all, about 75 percent of the 6.79 billion barrels of petroleum used in 2012 were consumed in the form of gasoline, heating oil/diesel or as jet fuel.

What is less obvious is the vital presence of petroleum in a huge range of other consumer products

Petrochemical feedstock is processed into, among many other things: plastics (above all), waxes and sealants, anti-freeze, bases for paints, cleaning agents, soaps and detergents, dyes, explosives, fertilizers, rubbing alcohol, industrial resins, synthetic fibers (nylon, polyester, rayon), synthetic rubber, solvents, thinners and varnishes.

Very common medical specialties like aspirin and antihistamines are based on petrochemicals. Even the heavy residues left behind by the refining process find further life in the form of tar and asphalt. Sulfur, an undesirable contaminant in some crude oils, is an important commercial product, as is petroleum coke, used in specialty carbon products like electrodes.

The list is only partial. As many as six thousand important product categories are thought to be based on



In 2012, 75 percent of the 6.79 billion barrels of crude consumed was in the form of gasoline, diesel or jet fuel.

chemical compounds derived from oil refining. All told, around 11 percent of the contents of any given barrel of crude ends up in this “other,” non-fuel/non-lubricant category, as shown in the graph on this page.

The world petrochemical industry has changed dramatically in the last twenty to thirty years. The United States, Western Europe and Japan once dominated production of primary petrochemicals, not only to supply their own domestic demand but also to export to foreign markets. These areas accounted for over 80 percent of world primary petrochemical production before 1980.

Since then, however, the construction of large-scale petrochemical facilities has been on the rise in other parts of the world. Countries with important hydrocarbon reserves like Saudi Arabia and Canada have built plants to add value to their resources. Since these countries may have limited domestic demand, an important share of their petrochemical production is reaching other world markets.

Asian nations, such as China, Indonesia, Singapore, the Republic of Korea and Taiwan, have also greatly expanded capacity during the past two decades to support growing internal economies and for export.

All of this activity has diminished the

number of export markets available to the West. The petrochemical industries in the United States, Western Europe and Japan have been falling sharply behind. In 2010, these three regions accounted for only 37 percent of world primary petrochemicals production, less than half that of the 1970s.

By far, the most important use of fossil fuels – including coal and natural gas – remains energy production

Recent estimates suggest it amounts to around 17 quadrillion BTUs – five to seven percent – of total fossil fuel consumption in terms of energy value. This means that petrochemical prices are heavily influenced by fluctuations in the world energy market in a way that is largely independent from the dynamics of the consumer markets these products eventually reach. In other words, prices for petrochemicals are driven primarily by the demand for hydrocarbons as energy sources and to a much lesser degree by the value of production as raw materials for other downstream manufacturing.

Among other things, this implies that petrochemical production, which has steadily been shifting to the East from the West of the world

for the last thirty years, may be facing a sharp change in direction. The “fracking” revolution that has suddenly and greatly increased the access to raw hydrocarbons in the United States may be paving the way to a spectacular recovery in national petrochemical production there.

Present American production is worth \$83 billion a year, according to market researcher Ibis, while the trade paper Hydrocarbon Processing notes that: “In response to rising shale gas production, total NGL (natural gas liquids) fractionation capacity in the U.S. will grow to 2.6 million b/d (barrels per day) in 2013, increasing by 575,000 b/d from 2012.”

Much of that increase will be in the production of ethane – the feed stock for ethylene, the single most commercially important petrochemical compound – to the point where the new volumes available are expected to result in a glut, lowering prices for the key material in North America. The continent that has been left out of this epochal change is of course Europe, since it possesses only limited hydrocarbon resources of its own and so far has appeared hesitant, on ecological and political grounds, to embrace the controversial fracking technology that has boosted American natural gas production.

According to the German consulting firm Roland Berger: “Fourteen out of 43 European (petrochemical) plants will no longer be profitable by 2015. This will result in a 26 percent drop in capacity. At the same time, the players in Asia or in the Gulf region are building new, state-of-the-art installations with capacities of a million tons. The European plants can hardly handle half as much output.”

James Hansen provides financial reporting and international relations consulting to major Italian companies. He came to Italy as the U.S. Vice-Consul in charge of economic affairs at the U.S. Consulate General in Naples. He became a correspondent for various leading foreign press organizations, including the *International Herald Tribune*.



by CARLO ROSSELLA

The new face of power

Those who are currently in power, have power, or covet power, would do well to read Moisés Naím's book, *The End of Power*. In doing so, he or she – whether powerful or not – would gain an understanding of why power has changed in our modern world. From boardrooms to battlefields, and churches to states, power is not what it used to be. Instead, what we are now seeing – as Naím recounts with remarkable skill and clarity – is a decay of power, of large institutions, of leadership.

Naím explains why the powerful people of today are more restricted, have smaller margins to work within, and a greater chance of losing their position than ever before. The author has had the chance to witness this phenomenon in the environments that leaders habitually frequent, from the annual Davos summit, to the Bilderberg Club, to the Trilateral Commission, to frequent meetings with heads of state, renowned intellectuals, economists and financiers, and at seminars of the Carnegie Endowment for International Peace, where he is an esteemed member.

Naím himself is among those who have fallen from power, and he tells his own tale in the book. In February 1989 he was appointed minister of industry and trade in his country, democratic Venezuela. But in the wake of mass demonstrations, the program of economic reform that Naím and his colleagues had brought in no longer symbolized hope and prosperity, but was instead considered the cause of street violence and increasing poverty and inequality. Some time later, Naím came to understand “the huge gulf between the perception and the reality” of his own power.

In today's world it is important to understand the social, political and managerial impact of the conquest of power from below, which no longer guarantees the same privileges that it once did; it has paradoxically grown easier to grasp but harder to exercise and more easily lost. Power is now weaker than it used to be, thanks to the media, social networks, non-governmental organizations, online political parties that are able to mobilize millions of people around an issue, blogs, and document leaks (e.g. Wikileaks). Even heads of state and the Pope are on Twitter now, chasing after the power they have lost among the masses – and it would be strange if they were not. In doing so, they have jumped on a bandwagon heading who knows where; certainly not towards increased power.

Essentially, the decay of power has changed, and is changing, the world. Naím demonstrates the validity of this assertion in his Chapter Eight, for example, by reference to changes in the economy and the oil industry. For decades the “Seven Sisters” – the seven largest oil companies in the

world, including Exxon and Shell – dominated the sector, but that is no longer the case.

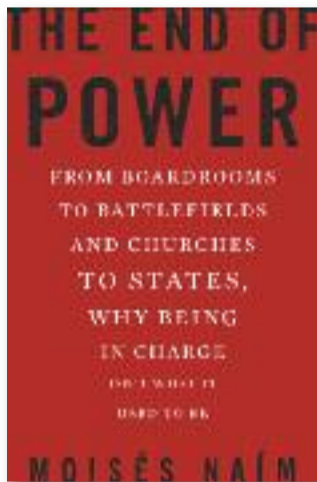
Naím argues that “the Seven Sisters have not just been substituted ‘like for like;’ rather, the oil industry of today is less vertically integrated and more fragmented than it was. The system for buying and selling oil in the new futures and spot markets has changed significantly. The sector is crowded with new “independents,” small companies that rival or, in some cases, even surpass giants such as ExxonMobil, Chevron and BP. Among the new players in the oil industry are the state companies, which have become much more competitive and assertive of their control of national resources.” In addition, enormous investment funds also exert “an unprecedented influence in the oil industry's ownership, accounting structure and finances.” Until now, only the Seven Sisters had access to the huge financial reserves needed to enter the oil market, but “now even small companies can raise enough capital to get involved in projects that were once the exclusive preserve of oil majors.”

There is more to it than fragmentation, though, says Naím. He argues that “all operators in the sector are subject to, among other things, close observation and unprecedented interference from governments, shareholders who use their power to amend business plans, environmental groups, institutional investors, unions and the media.”

On this subject Naím cites an admission from Paolo Scaroni, CEO of Eni, who told him that “when I think about the way the managers of the large oil companies of the 1960s, 1970s and 1980s ran their businesses, I am amazed by the freedom and independence they enjoyed. From my position, it is clear that today, the CEO of every single oil company has far less power than his or her predecessors.”

And the same is true of the banking, industrial, political and military spheres. Basically, power is in decline, even if, as Naím writes, “newspaper headlines every day seem to indicate the exact opposite.”

Is the decline of power unstoppable? Naím's answer is essentially “yes,” but to find out exactly why – and to discover the best antidotes and countermeasures – it is really necessary to read every word of his excellent explanation.



Title: The End of Power
Author: Moisés Naím
Publisher: Basic Books
Info: 2013, 320 pages
Price: \$27.99

Carlo Rossella is a journalist and executive. He has been the head of La Stampa, Panorama, and TG1 and TG5 (the TV news programs). He is currently chairman of Medusa Film, the production company of Mediaset.

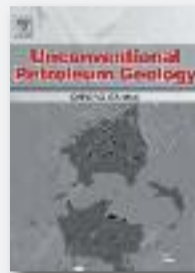
Responsible engineers



Title: Refining Expertise
Author: Gwen Ottinger
Publisher: NYU Press
Info: 2013, 240 pages
Price: \$23

Refining Expertise is a book about corporate social responsibility and environmental activism. Residents of a small Louisiana town were sure that the nearby refinery was a threat to their health. But they came around to the idea that the refinery was not dangerous when the scientists and engineers, rather than claiming to be infallible, earned trust by showing that they were responsible.

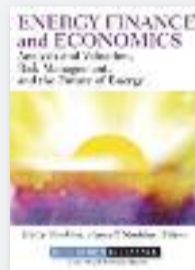
The new hydrocarbons



Title: Unconventional Petroleum Geology
Author: Caineng Zou
Publisher: Elsevier
Info: 2012, 384 pages
Price: \$179.95

Unconventional Petroleum Geology is the first book of its kind to collectively identify, catalog, and assess the exploration and recovery potential of unconventional hydrocarbons. Advances in hydrocarbon technology and petroleum development have recently made the exploration of unconvensionals – such as shale gas, tight sandstone oil and gas, heavy oil, tar sand, and coal-bed methane – the hottest trend in the industry.

Finance and Future



Title: Energy Finance. Analysis and Valuation, Risk Management, and the Future of Energy
Authors: Betty Simkins, Russell Simkins
Publisher: Wiley
Info: 2013, 606 pages
Price: \$125

Energy Finance offers the best recent information and compelling insights into the finance and economics of energy. With contributions from experts in various areas, the book provides an overview of the energy industry and addresses issues concerning energy finance and economics. It focuses on a range of topics including corporate finance relevant to the oil and gas industry, and addresses issues of unconventional, renewable, and alternative energy.

The natural gas myth



Title: Cold, Hungry and in the Dark: Exploding the Natural Gas Supply Myth
Author: Bill Powers
Publisher: New Society Publishers
Info: 2013, 336 pages
Price: \$19.95

Conventional wisdom has North America entering a new era of energy abundance, thanks to shale gas. But how long will it last? *Cold, Hungry and in the Dark* argues that declining productivity combined with increasing demand will trigger a crisis that will cause prices to skyrocket, damage the economy, and have a profound impact on the lives of nearly every North American.



June 2013

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