IAEE
WWW.IAEE.ORG
INTERNATIONAL ASSOCIATION for ENERGY ECONOMICS

IAEE Energy Forum

Second Quarter 2015 International Association for Energy Economics

President's Message

I thank all of you who completed the recent IAEE member survey. We received a total of 419 responses distributed across countries roughly in line with the IAEE membership. The latest survey contained two items of good news on our publications and web site.

With regard to publication quality, it was gratifying to see that the proportions reading *The Energy Journal* (EJ) and *Economics of Energy and Environmental Policy* (EEEP) frequently or every time were all noticeably higher than in 2012. Almost 63% of respondents to the latest survey thought that EJ was well balanced compared to almost 10% who said it was not (the remainder had no opinion and this question was not asked in 2012). In the case of EEEP, a little over 56% rated it as well balanced and almost 4% said it was not. In both 2012 and 2015, about 24% of respondents thought that the quality of EJ was improving and about 2% that it was deteriorating. The corresponding proportions with regard to EEEP in 2015 were about 27% and 1% (the question was not asked in 2012).

Since the IAEE has invested resources in improving its web site over the past few years, it was also gratifying to see that the proportion of respondents reporting that they could find everything they are looking for increased from about 12% in 2012 to 14% in 2015. The proportion who could find most things they are looking for increased from 55.5% to almost 57%. Those reporting required items were often missing declined from almost 5% to just below 2.5%, while those saying the site rarely contains what they are looking for fell from almost 2% to less than 1.4%.

Some results from the 2015 survey were less positive. About 55% of the respondents were affiliated with an academic institution as either students or faculty compared to 48% in 2012. This suggests that we still need to do more to attract and retain non-academic members. We have also been trying to add young professionals to our membership. Defining "young professionals" as people within two years of graduation, the survey found that only 1.4% of respondents fell into that category. This result does seem to reflect our concern that people let their membership lapse after graduating. In 2012 (but not 2015) we asked people who let their membership lapse and then re-joined the Association to nominate important factors in their decision to re-join. We found that desires to attend a conference, receive our journals or meet new people were important attractions for many.

A second Association issue I would like to discuss concerns our recently adopted 2015-17 Strategic Plan. I am happy to report that we have made progress on many of the strategies outlined in the plan. I do not have the space to go over all these developments, but I want to highlight a couple.

The first involves our recent introduction of a "Distinguished Lecture" Series to promote IAEE in new locations or to support existing affiliates with members but without a strong local program. We have chosen Gürkan Kumbaroglu, Ben Schlesinger and Georg Erdmann as distinguished lecturers for 2015 and they have delivered lectures in several strategic locations. We also sent an email to all Affiliate leaders announcing the program and seeking both nominations of potential speakers and topics that local Affiliates would be interested in hearing about. I urge local Affiliates to consider how they might use this program to provide service to their members and increase membership levels.

A second initiative that might be of particular interest to our regional Affiliates is

(continued on page 2)

IAEE INTERNATIONAL ASSOCIATION for ENERGY ECONOMICS
WWW.IAEE.ORG

CONTENTS

Editor: David L. Williams

President's Message (continued from page 1)

that a Petit Committee has established guidelines for summer school programs. We envisage summer schools as operating somewhat like our conferences in that we are calling for local Affiliates to develop a proposal for hosting such a program. Anyone interested in offering such a program can obtain a copy of the procedures from IAEE headquarters.

The strategic plan also called on IAEE to identify regions with existing members where we believe a new IAEE affiliate may be viable. President elect Gürkan Kumbaroğlu has been working to establish a Eurasian Affiliate encompassing members ranging from the Caucasus to the Balkans. This covers the Caspian Region with its vast oil and gas potential and could also boost our existing presence in Russia. Various pipeline projects in this region could also be significant issues for discussion at regional meetings. Two particular proposals are relevant to this initiative. One is to hold a conference in Baku, Azerbaijan in 2016 or 2017 where the proposal to establish an Azeri IAEE affiliate and a regional affiliate would both be discussed. The Azeri state oil company, SOCAR, has expressed interest in supporting such an event. Gürkan and IAEE Executive Director, Dave Williams have also planned a trip to Greece, Macedonia, Kosovo, Serbia, Bosnia Herzegovina, Albania, Montenegro, Croatia and Slovenia to promote IAEE in the region.

Finally, I take this opportunity to remind members of our forthcoming International Conference in Antalya Turkey to be held from May 24-27. This will be followed by the North American conference to be held in Pittsburgh from October 25-28. Finally, the 2016 Asian Conference will be held in Perth from February 14-17 in 2016.

Peter Hartley

Get Your IAEE Logo Merchandise!

Want to show you are a member of IAEE? IAEE has several merchandise items that carry our logo. You'll find polo shirts and button down no-iron shirts for both men and women featuring the IAEE logo. The logo is also available on a baseball style cap, bumper sticker, ties, computer mouse pad, window cling and key chain. Visit http://www.iaee.org/en/inside/merch.aspx and view our new online store!

With your smart device, visit IAEE at:

International Association for Energy Economics

IAEE Mission Statement

The International Association for Energy Economics is an independent, non-profit, global membership organisation for business, government, academic and other professionals concerned with energy and related issues in the international community. We advance the knowledge, understanding and application of economics across all aspects of energy and foster communication amongst energy concerned professionals.

We facilitate:

- Worldwide information flow and exchange of ideas on energy issues
- High quality research
- Development and education of students and energy professionals

We accomplish this through:

- Providing leading edge publications and electronic media
- Organizing international and regional conferences
- Building networks of energy concerned professionals

Editor's Notes

We conclude our focus on the geopolitics of oil and natural gas with this issue of the Forum and hope our readers are as pleased as we are. Next issue we'll turn our attention to the impact of the decline in oil prices.

Lord Oxburgh of Liverpool posits that there is general agreement that the accumulation of greenhouse gases from the burning of fossil fuels is dangerous and that the most danger comes from the concentration of CO_2 in these ghg's. His "bathtub analogy" is most enlightening. One important answer, he says, is Carbon Capture and Storage (CCS). He outlines the current status of CCS costs and urges more technical work on CCS while also suggesting some alternative approaches to making useful products from the CO_2.

Paul Tempest follows up Lord Oxburgh's article emphasizing that fossil fuels are necessary to maintain growth momentum for the future and, therefore, we must accelerate fundamental research to develop new non-pollutant technologies while at the same time investing adequately to ensure an increased supply of fossil fuels.

Ross McCracken notes that despite its current hardships, U.S. shale oil has a supply-side responsiveness that will see it gain market share long term. Its ability to respond to short-term changes in the oil price will affect the longer investment cycle of the conventional oil industry. They, rather than shale oil, will be the victim of OPEC's current output policy.

Bjorn Lomborg presents some interesting energy targets for the world community to consider, including one that would produce $14 in good for every $1 spent and another where the benefit/cost would be even greater.

John Weinberger writes that China's growing oil and gas demands and increasing reliance on imported supplies are forcing the country to seek new sources, including off-shore oil and gas reserves in the South China Sea and East China Sea. Conflicting territorial claims among China, Japan, Vietnam, the Philippines, Taiwan, Malaysia and Indonesia have discouraged oil companies from investing in the region. China's aggressive stance in the area has kept tensions high and inhibited rather than encouraged oil and gas production.

Aviel Verbruggen and Thijs Van de Graaf poisit that the dominant view of oil geopolitics as a struggle over scarce reserves is lopsided. Assuming that strict carbon limits will be imposed as a result of expected climate change, they believe oil markets will face a structural glut. The geopolitics of oil revolves around abundance-induced conflict, with rival oil producers competing to serve the shrinking oil market.

Mamdouh Salameh suggests that the steep decline in oil prices has more to do with geopolitics than glut and economic slowdown. He argues that oil prices will start to rebound soon.

Fred B. Olayele comments that the current slide in oil prices underscores the importance of the complex interplay of economics, geopolitics and technology in the global energy picture. This continues to impact policy choices across the world.

Joseph Naemi notes that the geopolitics of oil and gas is evolving from one with a Persian Gulf centric orientation to one with an East-West orientation and that it threatens to escalate geopolitical tensions. He cites the alignment of Russian and Chinese energy interests; the negative impacts on the U.S. dollar and rising impacts on the Chinese yuan as the global balance of trade shifts. He notes that the history of mankind is fraught with wars and conflicts of all kinds and that today we are in a natural resources war and especially the battle over energy resources. Given the backstory he outlines, he urges a revamping of the United Nations into a forum for the world's nations to debate and formulate public policies for the betterment of all.

Robert Germeshausen, Philipp Massier and Nikolas Wölfing present results of a survey of German energy market experts on the expected impacts from the crises in the Ukraine on the EU's energy supply.

Yuri Yegorov and Franz Wirl explain that due to the high cost of transport there is no unique price of natural gas. Further, the need for pipelines to transit countries can lead to the imposition of monopoly costs and playing of transit games. This creates a geopolitical aspect for natural gas. They analyse the growing role of geopolitics for natural gas markets in Europe.

DLW

Broaden Your Professional Horizons

Join the

International Association for Energy Economics

In today's economy you need to keep up-to-date on energy policy and developments. To be ahead of the others, you need timely, relevant material on current energy thought and comment, on data, trends and key policy issues. You need a network of professional individuals that specialize in the field of energy economics so that you may have access to their valuable ideas, opinions and services. Membership in the IAEE does just this, keeps you abreast of current energy related issues and broadens your professional outlook.

The IAEE currently meets the professional needs of over 3400 energy economists in many areas: private industry, non-profit and trade organizations, consulting, government and academe. Below is a listing of the publications and services the Association offers its membership.

• **Professional Journals:** *The Energy Journal* is the Association's distinguished quarterly publication published by the Energy Economics Education Foundation, the IAEE's educational affiliate. *Economics of Energy & Environmental Policy* is a new journal published twice a year. Both journals contains articles on a wide range of energy economic and environmental issues, as well as book reviews, notes and special notices to members. Topics addressed include the following:

Alternative Transportation Fuels	Energy Management	Natural Gas Topics
Conservation of Energy	Energy Policy Issues	Natural Resource Issues
Electricity and Coal	Energy Security	Nuclear Power Issues
Emission Trading	Environmental Issues & Concerns	Renewable Energy Issues
Energy & Economic Development	Hydrocarbons Issues	Sustainability of Energy Systems
Energy & Environmental Development	Markets for Crude Oil	Taxation & Fiscal Policy

• **Newsletter:** The IAEE *Energy Forum*, published four times a year, contains articles dealing with applied energy economics throughout the world. The Newsletter also contains announcements of coming events, such as conferences and workshops; gives detail of IAEE international affiliate activities; and provides special reports and information of international interest.

• **Directory:** The Online Membership Directory lists members around the world, their affiliation, areas of specialization, address and telephone/fax numbers. A most valuable networking resource.

• **Conferences:** IAEE Conferences attract delegates who represent some of the most influential government, corporate and academic energy decision-making institutions. Conference programs address critical issues of vital concern and importance to governments and industry and provide a forum where policy issues can be presented, considered and discussed at both formal sessions and informal social functions. Major conferences held each year include the North American, European and Asian Conferences and the International Conference. IAEE members attend a reduced rates.

• **Proceedings**: IAEE Conferences generate valuable proceedings which are available to members at reduced rates.

To join the IAEE and avail yourself of our outstanding publications and services please clip and complete the application below and send it with your check, payable to the IAEE, in U.S. dollars, drawn on a U.S. bank to: International Association for Energy Economics, 28790 Chagrin Blvd., Suite 350, Cleveland, OH 44122. Phone: 216-464-5365.

- -

_____**Yes**, I wish to become a member of the International Association for Energy Economics. My check for $100.00 (U.S. members $120 - includes USAEE membership) is enclosed to cover regular individual membership for twelve months from the end of the month in which my payment is received. I understand that I will receive all of the above publications and announcements to all IAEE sponsored meetings.

PLEASE TYPE or PRINT

Name: ______________________________

Position: ______________________________

Organization: ______________________________

Address: ______________________________

Address: ______________________________

City/State/Zip/Country: ______________________________

Email: ______________________________

Mail to: IAEE, 28790 Chagrin Blvd., Ste. 350, Cleveland, OH 44122 USA or
Join online at http://www.iaee.org/en/membership/

2/15Forum

CONFERENCE OVERVIEW

Massive transformations in how and where energy is produced and consumed are drastically changing our energy economy. This dynamic energy landscape is challenging government and industry decision makers to formulate a clear path forward. Policy and investment decisions need to balance the use of natural resources with impacts on the environment and local economies. One answer is to stimulate innovative technologies to enable access to increasing supplies of energy as well as more efficient consumption. But doing this requires appropriate policies, incentives and mandates, something that challenges even the most well informed policy makers.

The conference will bring together business, government, academic and other professionals to explore these themes through a series of plenary, concurrent, and poster sessions. Speakers will address current issues and offer ideas for improved technical, commercial, and policies covering all facets of energy development and use. The conference also will provide networking opportunities for participants through informal receptions, breaks between sessions, public outreach, and student recruitment. There also will be offsite tours to provide a direct and close-up perspective on the region's dynamic energy landscape.

The 2015 conference will be held in Pittsburgh, Pennsylvania, one of the main centers of American energy. The region around Pittsburgh contains a rich history of energy, with the discovery of the Coal Hill seam in 1762, the commercialization of the Drake Oil Well in 1859, and the formation of Westinghouse Electric Company in 1886. Today, the Pittsburgh area is a U.S. leader in energy development. The region is ranked 25th for the number of employees in energy-related industries. Among other things, it is the center of one of the most active natural gas plays in North America, the Marcellus Shale, and is the locus of the first U.S. nuclear power plants being built in over 30 years. Over the past three decades, Pittsburgh has had a remarkable environmental evolution and has been repeatedly named one of America's most livable cities. The Pittsburgh region is fortunate to support a diverse mix of energy activities including nuclear, coal, natural gas, and renewables. The region is home to a host of energy businesses, research facilities, industry groups, and world-class colleges and universities, many of which have active energy centered policy and academic programs. Finally, more than $1 billion per year in government-funded research flows through the region's academic, corporate and government energy research centers, assuring that new ideas and new technologies constantly emerge.

TOPICS TO BE ADDRESSED INCLUDE:

The general topics below are indicative of the types of subject matter to be considered at the conference. A more detailed listing of topics and subtopics can be found at: www.usaee.org/usaee2015/topics.html

- Energy Demand and Economic Growth
- Energy Supply and Economic Growth
- Financial and Energy Markets
- Energy and the Environment
- Non-fossil Fuel Energy: Renewables & Nuclear
- International Energy Markets
- Energy Efficiency and Storage
- Energy Research and Development
- Political Economy
- Public Understanding of and Attitudes towards Energy
- Other topics of interest include new oil and gas projects, transportation fuels and vehicles, generation, transmission and distribution issues in electricity markets, etc.

HOSTED BY

THREE RIVERS CHAPTER, USAEE

33RD USAEE/IAEE NORTH AMERICAN CONFERENCE CALL FOR ABSTRACTS

We are pleased to announce the Call for Abstracts for the 33rd USAEE/IAEE North American Conference, *The Dynamic Energy Landscape*, to be held October 25-28, 2015, at the Wyndham Grand Hotel, Pittsburgh, PA, USA.

The deadline for receipt of abstracts for both the Concurrent Sessions and the Student Poster Session is Thursday, **May 21, 2015**.

CONCURRENT SESSIONS

There are two categories of concurrent sessions: 1) Academic research on energy economics, and 2) practical case studies involving applied energy economics or commentary on current energy-related issues. This latter category aims to encourage participation not only from industry but also from the financial, analyst and media/commentator communities. In either instance, papers should be based on completed or near-completed work that has not been previously presented at or published by USAEE/IAEE or elsewhere. Presentations are intended to facilitate the sharing of both academic and professional experiences and lessons learned. It is unacceptable for a presentation to overtly advertise or promote proprietary products and/or services. Those who wish to distribute promotional literature and/or have exhibit space at the Conference are cordially invited to take advantage of sponsorship opportunities www.usaee.org/usaee2015/sponsors.html. Those interested in organizing a concurrent session should propose a topic and possible speakers to Mina Dioun, Concurrent Session Chair (mdioun@diounenergy.com). Please note that all speakers in organized concurrent sessions must pay speaker registration fees and submit abstracts.

Concurrent Session Abstract Format

Authors wishing to make concurrent session presentations must submit an abstract that briefly describes the research or case study to be presented.

The abstract must be no more than two pages in length and must include the following sections:

a. Overview of the topic including its background and potential significance

b. Methodology: how the matter was addressed, what techniques were used

c. Results: Key and ancillary findings

d. Conclusions: Lessons learned, implications, next steps

e. References (if any)

Please visit www.usaee.org/USAEE2015/PaperAbstractTemplate.doc to download an abstract template. All abstracts must conform to the format structure outlined in the template. Abstracts must be submitted online by visiting www.usaee.org/USAEE2015/submissions.aspx. Abstracts submitted by e-mail or in hard copy will not be processed.

Student Poster Session

The Student Poster Session is designed to enable students to present their current research or case studies directly to interested conference delegates in a specially designed open networking environment. Abstracts for the poster session must be submitted by the regular abstract deadline and must be relevant to the conference theme. The abstract format for the Poster Session is identical to that for papers; please visit www.usaee.org/USAEE2015/PaperAbstractTemplate.doc to download an abstract template. Such an abstract should clearly indicate that it is intended for the Student Poster Session – alternatively that the author has no preference between a poster or regular concurrent session presentation. Abstracts must be submitted online by visiting www.usaee.org/USAEE2015/submissions.aspx. Abstracts submitted by e-mail or in hard copy will not be processed. Poster presenters whose abstracts are accepted should submit a final version of the poster electronically (in pdf format) by August 21, 2015, for publication in the online conference proceedings. Posters for actual presentation at the conference must be brought directly to the conference venue on the day of presentation and must be in either ANSI E size (34in. x 44in.) or ISO A0 size (841mm x 1189mm) in portrait or landscape format.

Presenter Attendance at the Conference

At least one author of an accepted paper or poster must pay the registration fees and attend the conference to present the paper or poster. The corresponding author submitting the abstract must provide complete contact details—mailing address, phone, fax, e-mail, etc. Authors will be notified by July 7, 2015, of the status of their presentation or poster. Authors whose abstracts are accepted will have until August 21, 2015, to submit their final papers or posters for publication in the online conference proceedings. While multiple submissions by individuals or groups of authors are welcome, the abstract selection process will seek to ensure as broad participation as possible: each author may present only one paper or one poster in the conference. No author should submit more than one abstract as its single author. If multiple submissions are accepted, then a different author will be required to pay the registration fee and present each paper or poster. Otherwise, authors will be contacted and asked to drop one or more paper(s) or poster(s) for presentation.

STUDENTS

In addition to the above opportunities, students may submit a paper for consideration in the Dennis J. O'Brien USAEE/IAEE Best Student Paper Award Competition (cash prizes plus waiver of conference registration fees). The paper submission has different requirements and a different deadline. The deadline for submitting a paper for the Student Paper Awards is June 23, 2015. Visit www.usaee.org/usaee2015/bestpapers.html for full details.

Students are especially encouraged to participate in the Student Poster Session. Posters and their presentations will be judged by an academic panel and a single cash prize of $1,000 will be awarded to the student with the best poster and presentation. For more details including the judging criteria visit www.usaee.org/usaee2015/postersession.html

Students may also inquire about scholarships covering conference registration fees. Please visit www.usaee.org/usaee2015/scholarships.html for full details.

HOSTED BY

THREE RIVERS CHAPTER, USAEE

WITH SUPPORT FROM:

USAEE United States Association for Energy Economics

IAEE International Association for Energy Economics www.iaee.org

CAEE

AMEE

38th IAEE International Conference

Energy Security, Technology and Sustainability

Challenges Across the Globe

24-27 May 2015
Antalya- Turkey

http://www.iaee2015.org
#enerjimvarken

ZORLU ENERJİ GRUBU

Managing the Legacy of Fossil Fuels

By Ronald Oxburgh*

There are still many uncertainties in climate science but although understanding may differ in matters of detail there is general agreement that the accumulation of greenhouse gases in the atmosphere from burning fossil fuels is already leading to changes in climate over and above those changes that occur naturally such as the alternation of ice ages and inter-glacial periods.

For this reason most governments now agree – if with different degrees of commitment – that action has to be taken to curb the emissions from fossil fuels and industrial processes. In spite of this agreement the concentration of CO_2, the most important greenhouse gas, in the atmosphere has continued rise over the last fifty years alongside the explosive growth of the world population. Moreover, emissions have grown half as fast again as population. Not only is more fossil fuel being used because there are more people on the planet, but their average per capita energy use is steadily rising as well. To be sure energy sources such as wind, hydro and solar are on the increase, too, but increasing overall energy demand means that their proportion in the energy mix has scarcely changed and they still account for little more than 15% of energy consumed.

When governments or journalists talk about managing emissions they often present the problem as one of not increasing the rate of our emissions and *stabilising* at our present levels. Unfortunately this approach misses the point. If we think of the atmosphere as an enormous filling bathtub and the amount of CO_2 in the atmosphere as the level of the water, *stabilising emissions* means leaving the water taps running at the same rate and continuing to fill the bath. As far as we can tell our bath is at present over half full, and if emissions continue to rise we have only another fifty years or so to avoid catastrophic changes in climate such as breaking down of the Gulf Stream and disruption of the monsoons, not to mention chaotic conditions for world agriculture.

In spite of best efforts to speed the introduction of more renewable energy, not to mention hydro and nuclear, it is clear that at their present rate of growth they will at best simply slightly delay the overflowing of the bath. To have significant impact on the problem the emissions must not be allowed to enter the atmosphere. This means speeding up work on the suite of technologies known as Carbon Capture and Storage (CCS) that trap greenhouse gas emissions at source whether that be a power station, an oil refinery or a cement works. Present practice is to capture the emissions and then transport them – probably by pipeline – to a place where they can be pumped underground and stored in abandoned oil or gas fields or in saline aquifers. To continue the bathtub analogy this is equivalent to easing out the plug from the plughole sufficiently for the water running out to balance the water flowing in. A power station with CCS provides low carbon energy.

All the basic technologies for CCS are well known to the chemical and petroleum engineering industries and combining them as an operating system at an industrial source of CO_2 is perfectly feasible. Unfortunately at the end of 2014, there is, as far as I know, only one power station in the world that has done this and is operating with full CCS. That is the station at Boundary Dam in Saskatchewan, Canada.

The Canadian project was completed with substantial state support. CCS projects in other parts of the world are less advanced but all depend on state support. And therein lies the nub of the problem; at present there is no business case for the private sector to make CCS a high priority and commit to the required heavy investment. The costs of the current technology are substantial not only because of the additional plant needed at the CO_2 source, but also because the gas has to be compressed for transport by pipeline and injection underground, and because a suitable subterranean store has to be developed. The additional energy needed to process the flue gases and to compress them could in the case of a power station amount to increasing the cost of generating electricity by 30%. There is clearly little incentive for any power company to install CCS measures on any of their power plants unless Government deploys one or other of both of the levers at their disposal namely regulation or subsidy. At present there has been too little of either to convince industry to implement CCS with any sense of urgency.

Although the developed world would not welcome CCS costs on the massive scale needed to address the global problem, the costs would probably be manageable, particularly in light of the report of the CCS Cost Reduction Task Force that foresaw significant cost savings as the technology developed. Around 70% of the cost of CCS comes from the present capture process which is both capex

* Lord Oxburgh of Liverpool, KBE FRS, is a graduate of University College, Oxford and Princeton University where he worked on the emerging theory of plate tectonics. At Cambridge UK he was Head of the Department of Earth Sciences and President of Queen's College. From 1988-93 he was Chief Scientific Adviser to the UK Ministry of Defence and Rector of Imperial College, London. During 2004-5 he was non-executive Chairman of Shell. Today, among many other appointments, he is the honorary president of the Carbon Capture and Storage Association.

and opex intensive. A less expensive process is urgently needed to avoid bubbling the flue gases through a solvent that selectively dissolves CO_2 and then heating the solvent to release the gas.

Although the developed world might absorb the additional costs of CCS, the developed world is not where the main challenge lies. At present around half the GHG emissions come from the developed world and half from non-OECD countries and China. Forward projections show the OECD countries emissions dropping slightly while those from other parts of the world increase. By 2030 it is expected that about one third of the emissions will be due to the OECD, one third to China and one third to the others. It is clearly unrealistic to expect countries that have relatively low standards of living and face major immediate problems of health, water supply and food, to give priority to a problem that has its major impact some decades in the future, the more so when the problem was largely generated by more than a century and half of emissions from members of the OECD.

It follows that not only is there an urgent need to implement CCS widely before the bathtub overflows but also to find a way of doing it affordably. One realistic possibility that will be feasible in some places is to use the captured CO_2 for enhanced oil recovery in ageing oil fields. CO_2 is pumped into the field to displace residual oil and enhance its flow. The CO_2 is then retained underground. CCS done this way pays for itself but the opportunities are rather limited.

An alternative approach now receiving attention is to find ways of using the CO_2 to make useful products. At least one business is making money today by taking commercially produced CO_2 and allowing it to react with solids recovered from urban garbage to make carbonate pellets that can be used to make light building blocks. In principle, making solid carbonate building materials is a process that could be widely developed provided there is a plentiful supply of suitable reactants; much natural rock has a suitable composition, but if it has to be crushed to react with the gas the process is not likely to be economic. Other research is focussed on using the CO_2 to make methanol or graphite. Yet other groups are exploring the possibility of using unseparated flue gas directly for some of these reactions. These efforts come under the general name of CO_2 reuse or CO_2 mineralisation.

Whatever efforts are made to reduce our dependence on fossil fuels they (fossil fuels) will be around for decades to come and if the bathtub is not to overflow we must somehow immobilise their emissions. CCS can be applied both to coal and gas although coal should have priority insofar as it produces roughly half as much useful energy as for the same emissions. Immobilisation of emissions will become pervasive rapidly only when CO_2 can be turned into a money-making resource rather than a waste that must be managed. Given that most of the emissions growth is likely to come from developing countries mineralisation of emission gases into building materials would seem particularly appropriate. The volumes of solids produced would be massive.

Without some form of CCS urgently I see no way of preventing the bath from overflowing.

Avoiding Catastrophe: An Acute Danger From Changing Climate

By Paul Tempest*

The most pressing message from Lord Oxburgh in the previous article is its warning about the likely severe impact of climate change within the next 35 to 50 years. The accumulation of greenhouse gas in the earth's atmosphere can be attributed largely and with a high degree of certainty to industrialisation in the nineteenth century mainly to the use of coal in Europe and North America and to an acceleration of much wider pollution of the atmosphere during the twentieth century. There has been no sign of abatement so far in the twenty-first century. Indeed, by 2035, global emissions of carbon dioxide are expected to be almost double the level in 1990. We are no longer discussing a hypothetical outcome in a distant future. The build-up of scientific evidence has already reached a tipping point, a very serious matter that should be of immediate concern world-wide.

For the great majority of children on this planet today, the risk may be all too apparent.Within their lifetime, they will most probably witness major economic disruption caused by climate change. Unless a strong curb on greenhouse gases can be devised and achieved, these, our children and grandchildren, are likely to witness a progressive sequence of events including the breaking down of the Gulf Stream, the melting of the ice-caps and the disruption of monsoons, each having chaotic impacts on global agriculture, accessibility to clean drinking water and curtailment of food supply. Along that track, rising sea-levels pose very serious problems for the energy industries with considerable damage to specialised ports, power stations, particularly nuclear power plants and liquefied natural gas plants sited close to the shoreline, and to exploration and development activity. As a consequence, damaging disruptions to international trade and investment will threaten to slow down the momentum of global economic growth and the relief of poverty and distress.

Fossil Fuels are Necessary To Maintain Growth Momentum

As Lord Oxburgh argues with compelling scientific evidence and relentless logic, we cannot afford to shut off the use of fossil fuels without any credible replacement in sight. Indeed, with continued population growth and enhanced expectations of a steady rise in global per capita income, the demand for coal, gas and oil can be expected to continue to rise roughly in line with population and economic growth. Wind, solar and hydro will continue to grow but will find it very difficult to enhance their small current share of the energy mix, less than 15% at present, out of which hydro accounts for half. Nuclear development (4% of the mix) has been slowed markedly by the decisions of Japan and Germany to run down their nuclear capacity and by the widely held fears that rogue terrorists and irresponsible states will seek and may achieve a proliferation of nuclear capacity as a first step on the road to acquiring a nuclear weapon manufacturing capacity of their own. So globally, we have to accelerate much more strongly fundamental research and the rapid implementation of new non-pollutant and less dangerous energy technologies. Meanwhile, it is essential that we invest adequately and evenly to ensure an increased supply of fossil fuels to tide us over.

Investment in Carbon Capture and Storage

So our first priority is to ensure that carbon capture and storage (CCS) is implemented worldwide as fast as possible to the point where we can substantially reduce its impact on the atmosphere. This is not an impossible task, but it is one that requires a global consensus on the necessity for this change and a much wider understanding of the dangers that we will otherwise face. The problem at present is essentially one of attracting adequate investment in these new technologies. What is seen at present as a dubious prospect of costly and incomplete waste-management has somehow to be transformed into a positive commercial venture with long-term prospects of generating substantial profit. At the same time governments have to be fully convinced of the urgency of these issues and the need to move to much more effective international co-operation and implementation.

Adverse Impacts of a Falling Oil Price

The abrupt fall in the oil price in late-2014 has diminished both the flow of surplus funds from the fossil-exporters and the appetite of the energy investors seeking a fast, secure stream of profit. Consumer governments worldwide have also become increasingly nervous about their own budget shortfalls and about preserving secure access to imported energy. So, many are focussing on the

* Paul Tempest was the first Chairman of the British Institute of Energy Economics appointed by the UK Department of Energy in 1979 and its Vice-President in 2000-2009. Today he is Secretary of the International Steering Panel of the Windsor Energy Group of which he was Executive Director (CEO) from its foundation in 1999 until 2009. He is also a Past President of IAEE. His book on this subject was published in March by Medina Publishing, London, and is available through Amazon and Waterstones.

short-term to the neglect of the long-term fundamentals. Investment so far in carbon capture and storage has been very slow indeed with only one plant (in Canada) operating at present and that single plant is dependent on very heavy state subsidy. The high cost of subsidy and consequent low expectations of an acceptable rate of return for the commercial and industrial investor and high risk in mostly brand-new, unproven technology is a strong deterrent for the private sector. Some radical new thinking and a burst of industrial innovation is needed to dispel this gloom.

Reinvigorating the International Infrastructure

In our view, much of the international infrastructure today is outdated, inefficient and no longer fit for purpose. New institutions, such as a brand-new international energy bank, a new co-ordination agency for stimulating advances towards more efficient energy use and carbon capture and new financing packages will need the backing of a re-focussed United Nations protocol on carbon capture.

Now for the Good News – Ample Fossil Resources

As indicated in my earlier article, oil and natural gas reserves, swollen by new discoveries of shales and deep-water oil and gas, offer some confidence that supply can meet demand until the bridge to new technology can be safely crossed.

How Do We Achieve these Carbon Capture Objectives?

As a starting point, I offer this matrix:

- Long-term Objective – We must ensure that the global population and economy is not put at risk by the failure to implement permanent effective climate change remedies in good time
- Short-term Objective – The acceleration of new technology and stimuli for the necessary financing has to be seen widely to be on the right track as soon as possible.
- Resources – ample fossil fuel resources can help to bridge the gap.
- Intelligence – co-ordination of ever-advancing telecommunications should assist in market transparency and speed of implementation.
- Obstacles – the greatest obstacles are essentially political – power-block rivalries, regional infighting for access to resources, local squabbles over investment failures.
- Surprise – we somehow have to develop a new means of conveying optimism and confidence in the global long-term future.
- Superior Technology and Skills – New centres of technical excellence and skills training will need access to both public and private financing and incentives to attract the best recruits..
- Identifying Weakness – High-lighting weakness is as good a route as any to enhance efficiency. A new generation of energy automation and enhanced co-ordination will be needed to displace the obsolete and atrophied systems still to be found worldwide.
- Communication co-ordination – will be needed to achieve the best results.
- Simple orders – the use of a simple, standard world language understood by all is a pre-requisite. For the time being, this will be English. Within 50-100 years, it may well be Chinese.
- Concentration of Fire – New global, regional and national centres will be needed to mobilise the right resources whenever major obstacles are encountered.
- Reinforcement Options – To what extent can additional resources be called up through the international agencies responsible for such responses?
- Securing the ground – What incentives can be devised to curb new pollution?
- Follow-up – Enhanced sensitivity for consequences hitherto unseen.
- Contingency Planning – A series of sessions at the 3-day WEG International Consultations in Windsor Castle in March 2015 will address these issues.

Atmosphere, Oceans and Space – the New Science

Among the advanced scientific community, the penny has again already dropped. A rational scientific consensus was already being expressed 20 years ago, resulting in the Kyoto Conference of 1997 and consequent Kyoto Protocol endorsed by the United Nations but deeply flawed by the division of governmental opinion, the determination of industry and commerce led by the heavy weight of the energy industries to sweep the proposed targets and strategies under the carpet and a confused, largely indifferent response from public opinion. Within the last five years, a new tipping-point has been reached as the leading scientists have realised the gravity of the threat to the earth's atmosphere. The pace of research swollen by access to the necessary funds has provided re-evaluations of the usefulness of ocean, space, chemical and medical research. It is here where we may well find the solutions to some of our current concerns about an abundant long-term global energy supply.

The Agility of Shale Oil Production

By Ross McCracken*

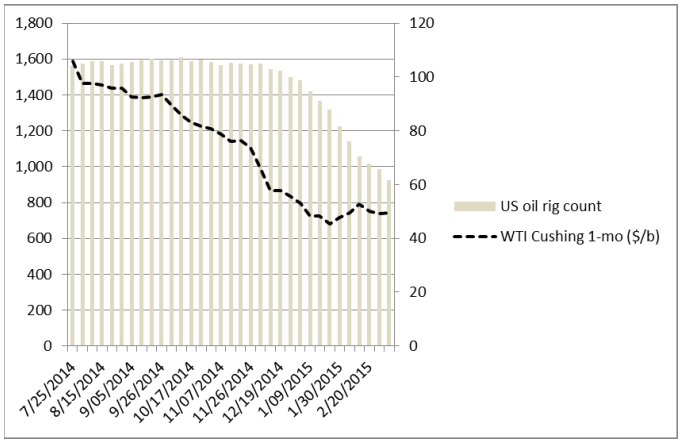
Oil production is diverse, ranging from stripper wells producing as little as a few 10s of barrels a day on the Texan plains to the prolific 30,000 b/d Brazilian offshore wells drilled deep into the subsalt layers of the Campos Basin, to give but two examples. Each mode of production has different sensitivities both to short-term changes in the oil price and to changes in longer-term expectations. For a multi-billion dollar offshore project, it is the latter that dominates decision-making, but for the new beast on the block, shale oil, it is the former.

As such, shale oil has changed the short-run supply-side dynamics of the oil industry. It is also evident that the economics of shale oil come in not at the top of the cost curve, as might be expected for what was so recently an oil frontier, but in the middle. Estimates vary, but U.S. shale oil at least looks pretty secure at $60/b, certainly cheaper than Venezuelan heavy oil, Canadian oil sands or the Arctic, but more expensive than the onshore giant fields of the Middle East.

These two factors–shale's responsiveness to short-term movements in the oil price and its mid-ranking position in the cost curve–will together have a major impact on the oil industry's entire investment cycle.

Shale Oil Indicators

The price of front-month U.S. marker crude West Texas Intermediate, priced at Cushing, Oklahoma, fell from $106.95/b July 23 to below $50/b in January 2015. The response of the U.S. shale oil industry was rapid.

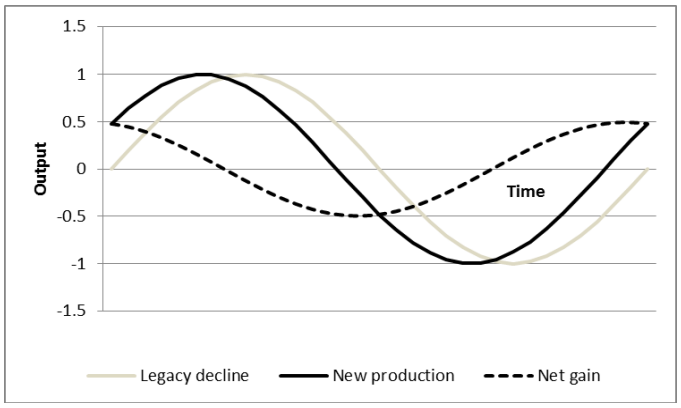


The U.S oil rig count, as reported by Baker-Hughes, started to drop in October, with a sharp contraction in activity evident by January. The count fell from 1,609 for the week ending October 10 to 922 for the week ending March 6.

Any decline in actual shale oil output naturally lags this contraction in drilling activity, a notable feature of which is that the rate of well completions fell quicker than the rate of new well drilling.

Shale oil wells produce the bulk of their output in the first 24 months and decline rapidly thereafter. Each individual well is also relatively cheap to drill and the completion costs make up a significant part of the total drilling cost.

So while Petrobras, with a prolific ready-to-complete, expensive but long-life well in the subsalt, will move from drilling to completion regardless of the oil price drop, the U.S. shale oil driller will weigh the cost of completion against the possibility of an upturn in the oil price in the short-term because this is when the shale well will be most productive.



There is also the likelihood that well completion costs will fall due to the lack of drilling activity. The backlog of drilled but uncompleted shale oil wells represents a new phenomenon in the oil industry, akin to a form of storage.

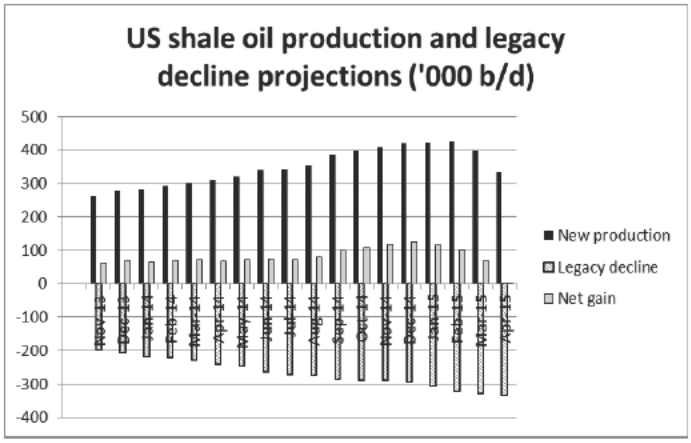
However, in assessing the impact on output of the decline in U.S. drilling activity, the rapid depletion rate of shale oil wells also has to be taken into account. As drilling activity stalls, new production falls, but the legacy declines from the earlier, more active drilling period continue to increase.

The result is that the net gain from shale production declines sharply. The supply curves relating to new production and legacy declines can be represented as two sine waves, one behind the other, producing a third curve – the net gain.

The U.S. Energy Information Administration has, since November 2013, produced a Drilling Activity Report on seven key shale plays. This shows for each play the expected level of new production, the loss attributable to legacy declines and the net gain for the month ahead. In total, the projections demonstrate a very close correlation with the theoretical sine curves.

The EIA's projection for April, made in March, forecast a net gain in U.S. shale output from the Bakken, Eagle Ford, Haynesville, Marcellus, Niobrara, Permian

* Ross McCracken is Managing Editor of Platts Energy Economist, London. He may be reached at ross.mccracken@platts.com



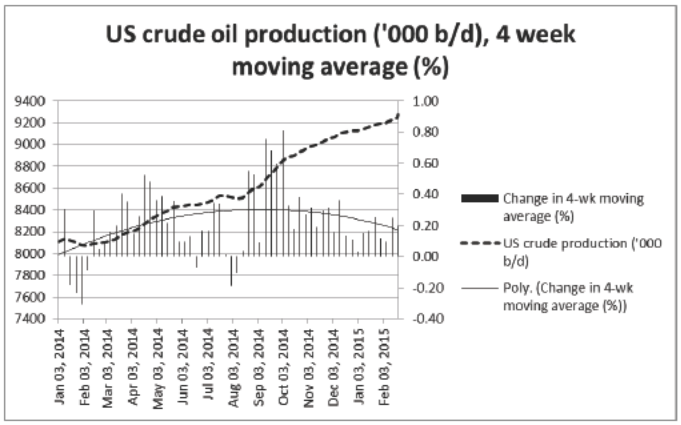
and Utica regions of just 1,000 b/d. Output, for the first time, from the Bakken, Eagle Ford and Niobrara regions was expected to contract.

New production reached its peak at 425,000 b/d in February, but the net gain had already peaked earlier in December at 125,000 b/d. Legacy declines were catching up and continue to grow, reaching a projected record 335,000 b/d in April. Following these trends, and on the assumption that U.S. crude prices remain around $50/b, U.S. shale oil output as a whole should start to contract in May, just nine months after the oil price started its precipitous decline and just six months after the rig count started to fall.

The impact on total U.S. crude production is lagged again because shale oil makes up only a proportion of the total, albeit a growing one. In 2010, tight oil made up under 1 million b/d of total U.S. crude production, but this had risen to over 3 million b/d by the second half of 2013, suggesting it may now make up about 38% of total U.S. crude production of just over 9 million b/d.

The conventional side of the industry takes longer to slow down. U.S. offshore crude production, for example, should increase this year, owing to several large fields coming on-stream based on investment decisions made five years ago and exploration wells drilled up to a decade before.

Nevertheless, based on the EIA's weekly supply estimates, while total U.S. crude production was still rising at end-February, the rate of output growth has been slowing since October 2014, supporting analysts' projections that total U.S. crude supply may start to contract by the end of 2015.



What happens if oil prices increase again? In a period of new activity, the supply response should also be quick because legacy declines will start to fall at the same time that new production starts to rise again. Legacy declines will begin to reflect the weak activity period engendered by low prices. And there is also that backlog of well completions to work down.

This has significant implications for the longer investment cycle of the conventional oil industry. U.S. shale oil may make the harsh short-term adjustments that put the more sluggish conventional industry back in the money, but any price recovery will promote a resurgence in shale oil output long before the conventional industry can deliver production from a reversal of the cuts in capital expenditure expected this year and next.

Shale oil's cost basis and its responsiveness to short-term changes in the oil price suggest that it will not be the long-term victim of OPEC's current output policy. Instead, it will be Venezuelan heavy oil, the Arctic and the like, where capital costs are high, project sizes large and investment cycles long.

Shale oil makes up only a proportion of U.S. crude output and a fraction of total world output, but the conditions are in place for its expansion, whatever hardships it may face today. Should shale formations north of the U.S. border, Argentina's Vaca Muerta or Russia's Bazhenov prove just as prolific as the U.S. shale plays, they should take market share from other frontier production areas. In this new, turn-on, turn-off oil supply world, the investment risk associated with a 20-25 year conventional offshore development, for example, becomes much more uncertain.

An Energy Target for the Next 15 Years

By Bjorn Lomborg*

Nutritious food, clean water and basic healthcare for all may be obvious high-priority targets for the international community, but we shouldn't ignore energy. Reliable and affordable energy is as vital for today's developing and emerging economies as it was before the Industrial Revolution. Driven mostly by its five-fold increase in coal use, China's economy has grown 18-fold over the past thirty years while lifting 680 million people out of poverty.

The energy ladder is a way of visualizing stages of development. This starts with what we call traditional biofuels – firewood, dung and crop waste. Almost three billion people use these for cooking and heating indoors, which is so polluting that the World Health Organization (WHO) estimates they kill one of every 13 people that die on the planet.

The next step on the ladder is 'transition fuels' such as kerosene, charcoal and liquified petroleum gas, while the top of the ladder is electricity, which thankfully makes no pollution inside your home. Because electricity is often powered by fossil fuels, it does contribute to the problem of global warming. Hence an alluring option could be to move to clean energy, like wind, solar and hydro. Some suggest that developing countries should skip the fossil step and move right to clean energy. However, rich countries are already finding the move away from coal and oil to be difficult, and there are no easy answers for developing economies.

Today's crucial question is: what should the world prioritize? Fifteen years ago, the world agreed the Millennium Development Goals (MDGs), ambitious targets to tackle poverty, hunger, health and education. These goals have directed lots of international aid and mostly led to improvement, although much remains to be done.

Now, the UN is considering the next set of targets for 2016-2030. Some argue that we should continue with the few, sharp targets from the MDGs, since we're still not done. Others point out that other issues, like environment and social justice, also need attention. My think tank, the Copenhagen Consensus, is helping to bring better information to this discussion. We have asked some of the world's top economists to make analyses within all major challenge areas, estimating the economic, social and environmental costs and benefits of different targets.

So, should the almost-three billion people cooking with toxic open fires take higher priority than the broader, long term objective of cutting back on fossil fuel use? It turns out there are smart ways to help on both accounts, say economists Isabel Galiana and Amy Sopinka.

Burning firewood and dung on open indoor fires is inefficient and causes horrendous air pollution. More than four million people each year die from respiratory illness because of smoke from indoor open fires. Most of these are women and young children, who are also the ones spending their time fetching firewood, often from quite far away. Providing cleaner cooking facilities – efficient stoves which run on liquefied gas – would improve health, increase productivity, allow women to spend time earning money and children to go to school.

The economic benefits of getting everyone off dung and wood are as high as the human welfare ones: more than $500 billion each year. Costs would be much lower, about $60 billion annually, including grants and subsidies to purchase stoves. Every dollar spent would buy almost $9 of benefits, which is a very good way to help.

However, the economists also provide a more realistic target, which turns out to be even more efficient. Since it is awfully hard to get to 100%, they suggest providing modern cooking fuels to 30%. This will still help 780 million people, but at the much lower cost of $11 billion annually. For every dollar spent, we would do more than $14 worth of good.

While clean cooking is important, electricity can bring different benefits. Lighting means that students can study after dark, clinics can refrigerate vaccines, and water can be pumped from wells so that women do not have to walk miles to fetch it. About 68% of sub-Saharan Africa still misses access to electricity, according to 2012 data by the International Energy Agency.

The value of getting electricity to everyone is about $380 billion annually. The cost is more difficult to work out. To provide electricity to everyone would need the equivalent of 250 more power stations but many rural areas might best be served by solar panels and batteries. This is not an ideal solution but would still be enough to make an enormous improvement to people's lives. The overall cost

* Bjørn Lomborg, an adjunct professor at the Copenhagen Business School, directs the Copenhagen Consensus Center, ranking the smartest solutions to the world's biggest problems by cost-benefit. He is the author of *The Skeptical Environmentalist* and *Cool It*. His new book is *How To Spend $75 Billion to Make the World a Better Place.*

is probably around $75 billion per year, which still does $5 of benefits for each dollar spent.

If we want to tackle global warming, on the other hand, there are some targets we should be weary of. One prominent target suggests doubling the world's share of renewables, particularly solar and wind but this turns out to be a rather ineffective use of resources. The extra costs of coping with the intermittent and unpredictable output of renewables makes them expensive, and the cost likely to be higher than the benefits.

However, the world spends $544 billion in fossil fuel subsidies, almost exclusively in third world countries. This drains public budgets from being able to provide health and education, while encouraging higher CO_2 emissions. Moreover, gasoline subsidies mostly help rich people, because they are the only ones to afford a car. To phase out fossil fuel subsidies would be a phenomenal target, because it would cut CO_2 while saving money for other and better public uses. The economists estimate that every dollar in costs would do more than $15 of climate and public good.

With such high-return targets, the economic evidence shows that – if carefully chosen – energy targets should definitely be part of the promises for the next 15 years.

IAEE/Affiliate Master Calendar of Events

(Note: All conferences are presented in English unless otherwise noted)

Date	Event, Event Title and Language	Location	Supporting Organization(s)	Contact
2015				
April 26-28	8th NAEE/IAEE International Conference *Future Energy Options: Assessment, Formulation and Implementation*	Ibadan, Nigeria	NAEE/IAEE	Adeola Adenikinju *adeolaadenikinju@yahoo.com*
May 24-27	38th IAEE International Conference *Energy Security, Technology and Sustainability Challenges Across the Globe*	Antalya, Turkey	TRAEE/IAEE	Gurkan Kumbaroglu *gurkank@boun.edu.tr*
October 25-28	33rd USAEE/IAEE North American Conference *The Dynamic Energy Landscape*	Pittsburgh, PA, USA	3RAEE/USAEE	David Williams *usaee@usaee.org*
2016				
February 14-17	5th IAEE Asian Conference *Meeting Asia's Energy Challenges*	Perth, Australia	OAEE/IAEE	Peter Hartley *hartley@rice.edu*
February 18-19	9th NAEE/IAEE International Conference *Theme to be Announced*	Abuja, Nigeria	NAEE NAEE/IAEE	Adeola Adenikinju *adeolaadenikinju@yahoo.com*
March 12-15	1st IAEE MENA Conference *Theme to be Announced*	El Gouna, Egypt	GEE/IAEE	Georg Erdmann georg.erdmann@tu-berlin.de
June 19-22	39th IAEE International Conference *Energy: Expectations and Uncertainty Challenges for Analysis, Decisions and Policy*	Bergen, Norway	NAEE	Olvar Bergland *olvar.bergland@umb.no*
September 21-22	11th BIEE Academic Conference *Theme to be Announced*	Oxford, UK	BIEE	BIEE Administration *conference @biee.org*
October 23-26	34th USAEE/IAEE North American Conference *Implications of North American Energy Self-Sufficiency:*	Tulsa, OK, USA	USAEE	David Williams *usaee@usaee.org*
2017				
June 18-21	40th IAEE International Conference *Meeting the Energy Demands of Emerging Economic Powers: Implications for Energy And Environmental Markets*	Singapore	OAEE/IAEE	Tony Owen *esiado@nus.edu.sg*
September 3-6	15th IAEE European Conference *Heading Towards Sustainability Energy Systems: by Evolution or Revolution?*	Vienna, Austria	AAEE/IAEE	Reinhard Haas *haas@eeg.tuwien.ac.at*
2018				
June 10-13	41st IAEE International Conference *Security of Supply, Sustainability and Affordability: Assessing the Trade-offs Of Energy Policy*	Groningen, The Netherlands	BAEE/IAEE	Machiel Mulder *machiel.mulder@rug.nl*

China Seeks to Dominate Off-Shore Energy Resources in the South and East China Seas

By John R. Weinberger*

On May 2, 2014, without announcement, Chinese vessels floated China National Offshore Oil Corp.'s (CNOOC) state-of-the-art deep water drilling rig into Vietnamese waters and began sea floor drilling operations for natural gas. The location of the rig - within Vietnam's 200 nautical mile exclusive economic zone (EEZ) and only 17 nautical miles from Triton Island in the South China Sea, one of the Paracel Islands that is claimed by Vietnam, China, and Taiwan – was unmistakably set up in maritime territory claimed by Vietnam. The Vietnamese Foreign Minister called the move a violation of Vietnamese sovereignty. The U.S. State Department described the move as "provocative." The deployment of China's first and only home-grown deep-water semisubmersible drilling rig in such a brazen manner illustrates the value that China places on Asia-Pacific off-shore oil and gas resources and the lengths that China will go to assert control over seabed hydrocarbons beneath the far western Pacific Ocean.

China's Quest for Asia-Pacific Energy Resources Driven by Overall Growth in Energy Demand

Fossil fuels are the lifeblood of China's economy. Affordable, reliable sources of crude oil enable China's transportation sector to grow and thrive. Natural gas is becoming a cornerstone to China's electric power capacity and an alternative transportation fuel.

China's remarkable economic growth over the past three decades is matched by an insatiable thirst for oil. China's 2013 oil consumption of 459 mmt exceeded domestic production by 239 mmt.[1] China's average annual growth in crude oil consumption has been 7.4% over the past ten years. In the ten year period 2001 to 2011, Chinese oil consumption more than doubled from 4.859 billion barrels to 9.758 billion barrels.[2] 58% of China's 2013 crude oil demand was met by imports.[3] By 2020, the CNPC Economic and Technology Research Institute projects that 65% of Chinese crude oil supplies will be imported.[4] 42% of China's imports come from the Persian Gulf region.[5]

Natural gas is quickly emerging as a primary alternative fuel in China for electric power generation and transportation. 30% of China's 2013 natural gas consumption was imported.[6] Demand growth for natural gas is expected to climb. The Institute of Energy Economics of Japan's projection, through the year 2040, forecasts a steep 42% rise in China's natural gas consumption from 2011.[7]

Oil security for China means the assurance of sufficient oil at affordable prices. The fact that most of China's oil requirements must be met by sources outside of China is a simple realty of geography, geology and demand. Given that domestic supplies are insufficient to meet China's energy needs, China's oil security policy is based on the broad goals of supply availability, affordability, reliability and diversity. China's exploitation of East China Sea and South China Sea resources is consistent with those goals. On-shore domestic oil and gas reserves are significant but insufficient to meet China's needs. Off-shore domestic oil represents only 19% of China's domestic oil production and has been limited to shallow waters.[8] China relies heavily on oil and gas reserves in the Persian Gulf, Angola, Russia, Iraq, Iran and Venezuela. These supplies are subject to political risk, civil unrest, sea lane transportation risk, price volatility and supply disruption. The Asian Pacific sea beds, although claimed by multiple countries, contribute to Chinese energy security by providing sources of oil and gas close to home where China has the military and political strength to minimize risks which might result in supply disruptions.

Conflict in the South China Sea

The South China Sea is an 800,000 sq. km semi-enclosed area of water roughly surrounded by China, Taiwan, Vietnam, the Philippines, Malaysia, Brunei and Indonesia. There is much disagreement about the energy resource potential of the South China Sea because the area is under-explored and hydrocarbon development has been slow. There is no clear authoritative estimate of South China Sea hydrocarbon reserves but U.S. EIA estimates that there is approximately 11 bbl of oil reserves and 190 Tcf of natural gas reserves.[9] These numbers represent both proved and probable reserves, so the estimates may be on the high end.

The lack of hydrocarbon exploration and development in the South China Sea is a function of two factors: (1) international territorial conflict among the countries enclosing the South China Sea and (2) the lack of deep water technology and inexperience in deep water development by the local national oil companies. Overlapping and conflicting maritime claims by China, Taiwan, Malaysia, Viet-

* John Weinberger is a Washington, DC based policy consultant specializing in energy and environmental issues. He may be reached at jweinberger@sbcglobal.net
See footnotes at end of text.

nam and the Philippines have made the South China Sea an unattractive area for NOC investment.

China in particular has taken a highly aggressive stance toward the other South China Sea nations and has essentially claimed hegemony over the waters and uninhabited islands in the region. The Chinese government announced in 2010 that the South China Sea is a "core interest" of China, putting the South China sea on a par with Taiwan and Tibet as a matter of Chinese sovereignty.[10] For the purpose of off-shore oil and gas development, China claims veto power over any new project. Beijing sees unilateral energy development by Vietnam or the Philippines as a territorial challenge, even in areas that are generally recognized as international waters.

China claims that its intent is not to exclude any nation from off-shore projects and that it is open to joint development of South China Sea off-shore resources with other countries. The other South China Sea nations are wary. In order to participate in a joint oil or gas development project with China, they would have to accept Chinese sovereignty over the project location. As one analyst put it, "although China has offered joint development to other claimants, its concepts of joint development seems to involve joint development of the producing oil and gas fields on other claimants' continental shelves – and then only after China's sovereignty has been recognized."[11]

The tension between China and its South China Sea neighbors has played out most dramatically with the Philippines and Vietnam – two nations that both contest Chinese claims of sovereignty over the Spratly and Paracel Islands.[12] China mobilized forces against Philippine projects in the Reed Bank in April 2012 with Chinese vessels gaining control of Scarborough Shoal, an uninhabited islet claimed by China and the Philippines, after a standoff between a Philippine navy ship and Chinese commercial vessels.[13] Chinese ships have been patrolling around Thomas Shoal, a reef in the Spratly Islands, since May of 2013. The Philippines claim Thomas Shoal as part of its continental shelf. Manila invited Chinese companies to engage in joint exploration, but has not conceded Chinese sovereignty. Beijing refuses to take part in international arbitration with the Philippines and refuses to recognize Philippine jurisdiction in the area.

Conflict is also evident between China and Vietnam. A Chinese marine surveillance vessel sabotaged a Petrovietnam seismic exploration vessel in May 2011. CNOOC invited foreign oil companies, in June 2012, to bid for blocks in waters claimed by Vietnam. And, as noted above, CNOOC had placed its deep water drilling platform within Vietnam's EEZ.[14]

If not for conflicting national claims over maritime territory, parts of the South China Sea would be ripe for oil and gas exploration. The waters around the Spratly and Paracel Islands are shallow enough for low-cost exploration and are thought to be resource rich. They are promising areas of exploration but remain neglected. The Philippines National Oil Company has stayed away from the area since Chinese ships started patrolling in 2011 and international oil companies are deterred from getting involved in the area by the conflicting national claims.

Although most of the region's oil and gas resources are thought to be in deep water, off-shore activity has been limited thus far to shallow water. Other than Japanese companies, and very recently CNOOC, East Asian oil companies haven't had the technical capability to produce hydrocarbons from deep sea beds. IOCs have been reluctant to invest in deep water development in the area because of the uncertainty of national territorial claims. There has been some recent deep water activity. Beginning in the mid-2000s drilling to depths beyond 1500 meters began. Vietnam's state oil company signed agreements with Eni SpA, Exxon Mobil, and ONGC Videsh for deep water off-shore development.[15] China's CNOOC began operating its first deep water drilling platform in 2012. In fact all of CNOOC's new activities in the South China Sea are in deep water.[16] It appears that deep water exploration and production will continue to be CNOOC's focus. China Oilfield Services Limited (COSL), a subsidiary of CNOOC, invested heavily in new off-shore platforms in 2013.[17]

Sino-Japanese Tension in the East China Sea

The East China Sea is a 1.2 million square km semi-enclosed body of water bounded on the north by the Yellow Sea and the Korean peninsula, on the south by the South China Sea and Taiwan, on the east by Japan's Ryukyu and Kyushu islands and on the west by China. The East China Sea contains the deep Okinawa Trough, an arc shaped basin 470 km east of the Chinese coast. Like the South China Sea, it is thought to be rich in sea floor oil and gas but international conflict and difficult terrain have left its hydrocarbon resources largely unexplored.

China and Japan, Asia's two largest energy consumers, have conflicting territorial claims over the East China Sea and are in competition with each other for access to sea floor natural resources. Both countries make overlapping territorial claims under the United Nations Convention on the Law of the

Sea (UNCLAS). China claims the right to control the continental shelf extending from its coast line 350 nautical miles east to the Okinawa Trough. About 40,000 square kilometers of that same territory is claimed by Japan as being within its EEZ. Japan proposes a north-south Median Line, roughly bisecting the East China Sea from Taiwan north to South Korea, marking the division between China's and Japan's respective EEZs.

China's national oil companies are developing oil and gas fields just to the west of Japan's claimed Median Line. Specifically, China's NOCs are producing oil and gas in three fields – Pinghu, Chunxiao (called Shirakua by Japan) and Tianwaitian (called Kashi or Kashiide by Japan). The Chunxiao field is at the center of Sino-Japanese undersea resource conflict in the East China Sea. Chinese drilling rigs exploiting Chunxiao gas have been operating 5 kilometers west of the Median Line since 2003 – close enough to the line to make Japan uncomfortable. Furthermore, the Chunxiao gas field extends into Japanese territory. Japan's position is that energy resources on or near the Median Line should be developed jointly and the Chunxiao field should be a shared resource. China's position is that the only area for joint development is east of the Median Line to the Okinawa Trough, including the area around the disputed Diaoyu/Senkaku islets.[18]

After four years of bilateral talks, in June 2008 China and Japan agreed that (1) there should be a joint development zone straddling both sides of the Median Line proposed by Japan, and (2) Japan would participate in the Chunxiao gas field. However no progress toward joint development has been achieved and China continues its unilateral development of the Chunxiao field.

Almost all of the East China Sea oil and gas development to date has been on the west side of the Median Line and has been conducted by Chinese NOCs. Japanese companies and other IOCs have shown little interest in the East China Sea. There was some exploratory drilling in the 1990s on the Japanese side of the Median Line but production was disappointing.[19] China is in a better position than Japan to exploit East China Sea hydrocarbon resources. Most of the East China Sea oil and gas fields are entirely or mostly within undisputed Chinese territory. All of Japanese seabed claims by contrast are west of the Okinawa Trough in contested territory. Proven hydrocarbon reserves are closer to China's coast and more readily accessible by China's undersea pipeline that runs from the Pinghu gas field to Shanghai. Proven gas reserves are farther from Japan's main islands and the Okinawa Trough makes pipeline transportation to Japan expensive and technically challenging.

China's approach to Japan in the East China Sea is less aggressive than its approach to Vietnam and the Philippines in the South China Sea. In the South China Sea, China asserts hegemony over the region, requiring other countries to recognize Chinese sovereignty as a condition of joint development of sea bed resources. By contrast, in the East China Sea, China does seem to respect Japan's assertion of the Median Line and narrows the area under dispute to the waters and sea floor between the Median Line and the Okinawa Trough.

By not working cooperatively with its East and South China Sea neighbors, China is inhibiting energy security for itself and its region. Energy security among Asia Pacific countries is not a zero-sum game. China and its neighbors achieve the greatest energy security when: (a) there is stability and economic integration in the Asian Pacific region and (b) where Asian Pacific countries are open to foreign investment in oil and natural gas production. China's aggression and unwillingness to work towards a settlement of claims in the western Pacific seas are, therefore, counter-productive to China's energy security.

Footnotes

[1] CNPC Economic and Technology Research Institute, November 21, 2014.

[2] BP Statistical Review of World Energy, June 2012.

[3] CNPC Economic and Technology Research Institute, November 21, 2014.

[4] CNPC Economic and Technology Research Institute, November 21, 2014.

[5] BP Statistical Review of World Energy, June 2012.

[6] Institute of Energy Economics Japan, Status and Prospects of China's National Gas Market, November 21, 2014.

[7] Institute of Energy Economics Japan, Status and Prospects of China's National Gas Market, November 21, 2014.

[8] U.S. EIA China Analysis, February 4, 2014.

[9] U.S. EIA South China Sea Analysis Brief, Feb. 7, 2013.

[10] "South China Sea part of core interests: Beijing," The Strait Times, July 12, 2010.

[11] Zhao Suisheng, "China's Global Search for Energy Security: Cooperation and Competition in the Asia-Pacific," The Asia-Pacific Journal, Vol. 49-4-08, December 2008.

[12] Jonas Gratz, "Energy Cooperation in the South China Sea," ISN, ETH Zurich.

[13] "Reed Bank: South China Sea Flashpoint," Asia Times, June 3, 2014.

[14] Erica S. Downs, "Business and Politics in the South China Sea: Explaining HYSY 981's Foray into Disputed Waters" Brookings, China Brief, June 24, 2014.

[15] Will Rogers, "Finding Common Ground: Energy, Security and Cooperation in the South China Sea," East and South China Seas Bulletin 9, Center for a New American Security, February 12, 2013.

[16] U.S. EIA, Country Analysis, China, February 4, 2014.

[17] Platt's Oilgram News, February 1, 2013.

[18] Guo Rongxing, "Territorial Disputes and Seabed Petroleum Exploration: Some Options for the East China Sea," The Brookings Institution, September 2010.

[19] James Manicom, "The Sino-Japanese Energy Dispute in the East China Sea: Strategic Policy, Economic Opportunities and Cooperation," The Economics of Peace and Security Journal, Vol. 4 No. 2, (2009).

USAEE
UNITED STATES ASSOCIATION for ENERGY ECONOMICS

IAEE
INTERNATIONAL ASSOCIATION for ENERGY ECONOMICS
WWW.IAEE.ORG

!! Congratulations !!

2014 USAEE/IAEE Working Paper Best Paper Award

USAEE and IAEE are pleased to announce the winner of the 2014 USAEE/IAEE Working Paper Best Paper Award. Congratulations go to:

Michael Grimm, University of Passau, Erasmus University, and IZA
Anicet Munyehirwe, IB&C
Jorg Peters, RWI and AMERU, University of the Witwatersrand
Maximiliane Sievert, RWI

for their paper entitled:

A First Step up the Energy Ladder? Low Cost Solar Kits and Household's Welfare in Rural Rwanda

Over 45 papers were received into the Working Paper Series in 2014. Papers were judged based on their contribution to the literature, scholarship, and originality. The review committee was composed of Kevin Forbes (chair), Catholic University of America, Ricardo Raineri, World Bank and Thomas Drennen, Hobart and William Smith Colleges.

The committee noted that the overall quality of the papers was excellent and would like to thank all of the authors for their submissions.

The Geopolitics of Oil in a Carbon-Constrained World

By Aviel Verbruggen and Thijs Van de Graaf*

Introduction

Energy issues continue to make headlines in international politics. In May 2014, China placed an oil rig near the disputed Paracel islands, leading to multiple incidents between Vietnamese and Chinese ships. Russia's annexation of Crimea and the conflict in Ukraine has led the EU and the U.S. to adopt several sanctions, including energy sanctions, against Russia in an attempt, as UK Energy Minister Ed Davey put it, to *disarm Russia's energy weapon*.[1] Russia had halted its gas deliveries to Ukraine in June 2014, the third gas cut-off since January 2006.[2] Meanwhile, vast parts of Syria and Iraq are occupied by radical islamist fighters known as Islamic State of Iraq and Syria (ISIS, also known as ISIL or IS), who reportedly generate $1 to $5 million daily from oil theft and sales from seized oil fields and refineries.[3]

Such events illustrate and nourish the continued relevance of a geopolitical view of energy markets and trade. The dominant image of energy geopolitics, reproduced in international news media and by vocal scholars, is revolving around a struggle for access to scarce oil and gas reserves. These energy battles are often forecast to become more prominent in the future as energy demand continues to soar, particularly in the emerging economies, while oil reserves shrink due to rapid depletion of existing fields and fewer discoveries. Faced with increasing scarcity, it is claimed that major consumers will eventually clash, potentially in an armed conflict, as they try to preserve their access to foreign oil and gas supplies in a global *race for what's left* (Klare, 2012). This supposedly inflates the power of energy-rich states, such as Russia, in international relations (Klare, 2009).

Our thesis is that this prevailing view of scarcity-induced conflict over oil and gas resources is lopsided. The argument is developed in two steps. First, we show that oil demand will decline in a 2°C scenario, resulting in excess oil reserves. Second, we argue that this oil abundance opens up a host of new geopolitical risks and threats.

The Oil Market in a 2°C World

Rather than facing an imminent shortage of hydrocarbons, the world still hosts plenty of oil and gas resources (BP, 2014). This means that, in the coming years, oil production can still expand, although the unit cost of marginal production (also known as: short-run marginal cost) will likely rise (IEA, 2013). However, unabated fossil fuel consumption spells trouble for the ongoing efforts to mitigate climate change. Previous studies have shown that fossil fuel resource constraints are, in and of themselves, unlikely to limit future greenhouse gas emissions (Verbruggen and Al Marchohi, 2010; McCollum et al., 2014). Hence, to avoid dangerous climate change, a sizeable chunk of the world's fossil fuel reserves will need to be left in the ground. Rather than joining those voices who argue that we have entered a new age of plenty (Maugeri, 2012), we argue that the global drive towards decarbonization will result in a shrinking oil market.

This brings us to the questions: when will the demand peak occur, and next: at what rate will use of oil decline? The best answer to these questions is provided in chapter 6 (Clarke, Jiang et al., 2014) of working group III of the IPCC Assessment Report 5. The chapter discusses hundreds of future CO_2 and greenhouse gas (GHG) emission pathways as forecast by all accessible and verifiable models in the world. The hundreds of pathways are assembled into four Representative Concentration Pathways (RCP #, where the number # refers to the radiative forcing in W/m2 around the year 2100 due to the concentration pathway). RCP 2.6 assumes that global annual GHG emissions (measured in CO_2-equivalents) peak between 2010-2020, with emissions declining substantially thereafter. Emissions in RCP 4.5 peak around 2040, then decline. In RCP 6, emissions peak around 2080, then decline. In RCP 8.5, emissions continue to rise throughout the 21st century. Only RCP 2.6 covers pathways that are likely to maintain global temperature rise on earth below 2°C. An earlier study, coordinated by some of the IPCC working group III, chapter 6 lead authors, examined the implications for energy use and oil consumption of the four RCPs (Van Vuuren et al., 2011). It found that oil consumption is to drop sharply in RCP 2.6 before 2025, as is illustrated in Figure 1. Put differently, if the world is to abide by the Cancun pledge of limiting anthropogenic climate change to 2°C, global oil use is to decline sharply before 2025.

Falling oil demand in RCP 2.6 around 2020 implies that the oil market will not be characterized by scarcity and shortages, but by relative abundance. The specter of energy abundance does not strip hydrocarbons from their geopolitical

* Aviel Verbruggen is Professor in the Department of Engineering Management, Antwerp University, and Thijs Van de Graaf is an Assistant Professor in the Department of Political Science, Ghent University, Belgium. Professor Vergruggen may be reached at Aviel.Verbruggen@UAntwerpen.be
See footnotes at end of text.

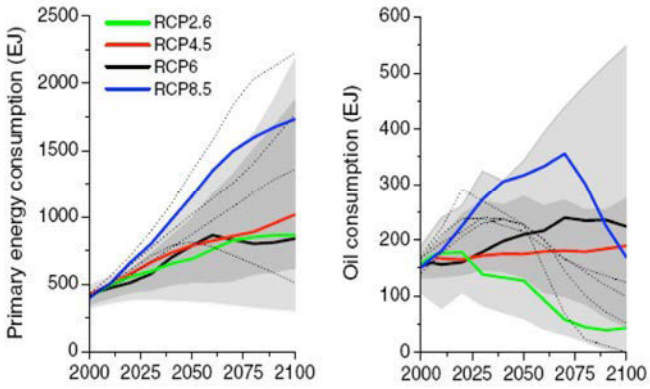


Figure 1. Development of primary energy consumption (direct equivalent) and oil consumption for the four RCPs. The grey area indicates the 98th and 90th percentiles (light/dark grey).
Source: Van Vuuren et al., 2011, p. 18 (Fig. 3).

content, however. Quite the contrary, the existence of too much oil and gas could equally trigger geopolitical strife, conflict, and even war (Verbruggen and Van de Graaf, 2013). The *geopolitics of oil* – which can be defined as the *struggle to define who wins and who loses as oil moves from underground reserves to the point of consumption* (Bridge and Le Billon, 2013: p. 27) – thus revolves around organizing scarcity in the face of prodigious abundance. In the remainder of this article, we focus on how oil-exporting countries, particularly the large reserve holders in the Middle East, could react to the scenario of peak oil demand. Our aim is not to provide a full repertoire of possible countermoves (quota agreements, price wars, economic diversification, etc.) but rather to illustrate the potential for conflict resulting from a structural oil glut.

A Race to Sell Oil

The prospect of a structural oil glut does not mean that oil is decoupled from geopolitics. The geography of oil and gas demand and supply will continue to inform much of the political and strategic relations around the world. In fact, energy abundance in itself could stir international conflicts. In the next paragraphs, the prospect of abundance-induced energy conflicts is illustrated with the case of oil because this still is the leading and most globalized energy commodity. We contend that ongoing and future oil conflicts are likely not revolving around the conquering of oil reserves, as is commonly thought, but around keeping the oil reserves of rival producers in the ground so as to sell as much of one's own reserves as possible to fill the remaining quota in a world of shrinking oil demand.

Oil abundance will, of course, affect major oil producers, be they oil exporters, their national oil companies, or the oil majors. Throughout its history, OPEC and especially the Gulf member states holding the largest, low-cost reserves, have been trying to keep the price of oil up, but not to levels where demand destruction would occur. Their main goal is to maximize the rents from oil extraction over a longer time span. This is different from the perspective of the *price hawks* within OPEC, holding much shorter time horizons and keen to maximize their oil export revenues today. The so-called *price doves,* of which Saudi Arabia is the main exponent, consider oil in the ground like having money in the bank.

The prospect of declining oil demand, imposed by shrinking carbon dioxide emissions quota, instigates oil exporters to sell more of their oil (Sinn, 2012). In a market fenced off from unfettered growth, oil exporters will compete with rival exporters for market shares. This competition stimulates a crude oil price collapse. Normally, this would lead to a recovery of the demand for oil by consumers. However, when climate policy-makers really support emissions reductions, they will fill the gap between a low crude price and high final end-use prices of oil products by higher levies. Waisman et al. (2013) find that, irrespective of the oil pricing strategy they choose (either flooding the market with oil to depress prices or cutting back production to trigger price increases and hence maintain revenues despite the drop of oil consumption), Middle-Eastern producers will face a significant drop in oil revenues in a 450 ppm stabilization scenario.

National Oil Companies (NOCs) differ from International Oil Companies (IOCs). The NOCs of net oil-exporting countries, which own the bulk of the global reserves, have the most to lose when oil demand shrinks. Often they operate not just on commercial terms but also serve other political, financial, social and strategic goals for their governments as well (Victor et al., 2013). IOCs, by contrast, are only accountable to their shareholders and put profitability first. They command much more flexibility in moving assets to other global business opportunities. IOCs ally with countries that guarantee safe property rights and high net profit margins. Their profits are less dependent on the height of the crude price than on the volumes of processed oil. In this way IOCs ally with *friendly* NOCs and countries that allow room for privately owned assets, protect investment, and uphold the rule of law.

Keeping *Hostile* Oil in the Ground

In a context of abundance, oil producers stand to benefit from situations in which their direct competitors cannot produce at full capacity, for some reason or another. The continued unrest in Libya, Syria, and Iraq, for instance, plays into the hands of all other oil exporters since it helps to keep oil prices high while also preventing large additional oil supplies from reaching international markets. In a *benign*

interpretation, such outages are the result of internal political dynamics (Hamilton, 2014). In Libya, for example, oil production was briefly restored after the 2011 toppling of the Gaddafi regime, yet strife among different clans and factions has since curbed the country's oil output.

A more *malign* interpretation, however, allows room for deliberate destabilization of rival oil producers by the Western friendly alliance. For example, the radical fighters known as IS (Islamic State) that have seized large parts of Syria and Iraq have allegedly received financing from Gulf petrostates (Marcel, 2014). Emboldened by their own tight oil revolution and the prospect of exporting oil again in the near term, the United States has taken the lead in setting up oil sanctions against Iran and recently also against Russia, backed up by financial sanctions. While it is questionable that the oil producers in the United States profit directly from these sanctions, they certainly helped to ease tensions in Riyadh about a U.S.-driven oil glut in the wake of the fracking revolution (Weinberg, 2014). The way the U.S. benefits from good relations is by having Riyadh as loyal purchaser of billions dollars U.S. weaponry, with money coughed up by European and Far Eastern industrialized countries.

Our unusual interpretation of recent events illustrates how the geopolitics of energy could evolve in the coming years. The central stake would not be to conquer foreign oil and gas fields, but to unlock or close production fields for global markets in order to obtain the maximum revenues (rents) from the limited oil quota allowed to be combusted by humans in the coming decades. Oil producers would be catalogued, as is now already done quite often in an implicit manner, in *friendly oil sources* and *hostile oil sources*. The first category refers to countries that accept and protect foreign investment. It is centered on the axis U.S. (with NATO allies) – Arab Gulf states (assembled in the Gulf Cooperation Council). Hostile oil is led by Iran with a few committed allies (e.g., Venezuela). Many oil producers are drifting in between, several of them dazed by violent events or aggression.

Conclusion

Our heretical analysis of the crude oil markets and of recent geopolitical events highlights the effects of a structural abundance of fossil fuels. How to organize scarcity in the face of prodigious abundance (Bridge and Wood, 2010), has been a continuous issue in the international oil markets. The history of OPEC revolves around that issue. In light of the strict limits imposed by anthropogenic climate change, we find that abundance rather than scarcity will continue to inform much of the geopolitics of petroleum in the foreseeable years and decades. While the sharp drop in oil prices between June and December 2014 is not primarily related to climate policy, it offers large oil-exporting countries a taste of their fate if governments around the world get serious about climate change mitigation and start implementing credible oil substitution policies.

We outline two possible strategies for oil producers to follow in a world of abundant oil reserves and shrinking demand. One is to sell as much oil as possible, as rapidly as possible, in order to prevent one's own reserves from becoming stranded. Another, more aggressive strategy, is to ensure that rival producers' oil is kept underground. The latter may result from internal strife, conflict or plain warfare, or from organized international boycotts of oil and gas exports. These are possible moves and outcomes on the geopolitical chessboard, inviting further inquiry into the geopolitical consequences of energy abundance, decarbonization and climate change (see, among others, Dupont, 2008; Gleditsch, 2012; Jewell et al., 2014). This analysis also serves as a reminder that the transition to low-carbon energy sources is not just a *walk in the park* but a major socio-technical and political overhaul with winners and losers across the globe.

Footnotes

[1] Naomi O'Leary, "G7 to begin reducing Russian energy dependency - Ed Davey," Reuters, May 6, 2014.

[2] Despite an agreement in late October, brokered by the EU, gas flows had yet to resume as of early December 2014. "Ukraine draws record high volume of gas from stocks," Reuters, December 4, 2014.

[3] Borzou Daragahi and Erika Solomon, "Fueling Isis Inc.," Financial Times, September 21, 2014.

References

BP, 2014. Statistical Review of World Energy, June 2014. Available at: http://www.bp.com/statisticalreview [last accessed: August 7, 2014].

Bridge, G. Wood, A. 2010. Less is More: Spectres of Scarcity and the Politics of Resource Access in the Upstream Sector, Geoforum 41: 565–576.

Bridge, G., Le Billon, P. 2013. Oil. Cambridge, UK: Polity Press.IEA, 2013. World Energy Outlook 2013. Paris: IEA/OECD.

Clarke L., Jiang K., et al. 2014. Assessing Transformation Pathways. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, pp. 413-510 (www.ipcc.ch)

Dupont, A. 2008. The Strategic Implications of Climate Change, Survival, 50(3): 29-54.

Gleditsch, N.P. 2012. Whither the Weather? Climate Change and Conflict, Journal of Peace Research, 49(1): 3-9.

Hamilton, J., 2014. The Changing Face of World Oil Markets. International Association for Energy Economics Energy Forum Fourth Quarter 2014, pp.7-13.

Jewell, J., Cherp, A., Riahi, K. 2014. Energy security under de-carbonization scenarios: An assessment framework and evaluation under different technology and policy choices, Energy Policy 65: 743-760.

Klare, M.T. 2009. Rising Powers, Shrinking Planet: The New Geopolitics of Energy. New York: Henry Holt and Co.

Klare, M.T. 2012. The Race for What's Left: The Global Scramble for the World's Last Resources. New York: Metropolitan Books.

Marcel, V. 2014. 'ISIS and the Dangers of Black Market Oil,' Chatham House, 21 July 2014. Available at: http://www.chathamhouse.org/expert/comment/15203 [last accessed: August 7, 2014].

Maugeri, L. 2012. Oil, the next revolution. The unprecedented upsurge of oil production capacity and what it means for the world. Discussion paper 2012-10, Belfer Center for Science and International Affairs, Harvard Kennedy School, June 2012.

McCollum, D., Bauer, N., Calvin, K., Kitous, A., Riahi, K. 2014. Fossil resource and energy security dynamics in conventional and carbon-constrained worlds, Climatic Change 123(3-4): 413-426.

Sinn, H.W. 2012. The Green Paradox: A Supply-Side Approach to Global Warming. Cambridge, MA: MIT Press.

van Vuuren, D. P., J. Edmonds, M. Kainuma, K. Riahi, A. Thomson, K. Hibbard, G. C. Hurtt, T. Kram, V. Krey, J. F. Lamarque, T. Masui, M. Meinshausen, N. Nakicenovic, S. J. Smith and S. K. Rose (2011). "The representative concentration pathways: an overview." Climatic Change 109(1-2): 5-31.

Verbruggen, A., Al Marchohi, M. 2010. Views on peak oil and its relation to climate change policy, Energy Policy 38(10): 5572–5581.

Verbruggen, A., Van de Graaf, T. 2013. Peak Oil Supply or Oil Not For Sale? Futures 53: 74-85.

Victor, D.G., Hults, D.R., Thurber, M. 2013. Oil and Governance: State-Owned Enterprises and the World Energy Supply. Cambridge: Cambridge University Press.

Waisman, H., Rozenberg, J., Hourcade, J.C. 2013. Monetary compensations in climate policy through the lens of a general equilibrium assessment: The case of oil-exporting countries, Energy Policy 63: 951-961.

Weinberg, D.A. 2014. King Crude: How Iraq's ISIS Crisis Restores Saudi Influence. Forbes, February 7, 2014.

IAEE INTERNATIONAL ASSOCIATION *for* ENERGY ECONOMICS
WWW.IAEE.ORG

What is Behind the Steep Decline in Crude Oil Prices: Glut or Geopolitics?

By Mamdouh G. Salameh*

Introduction

The crude oil price has lost 54% of its value since September 2014 and there are no indications that it will stop there in the absence of a major production cut by OPEC. It is not inconceivable that the price could even slide to $40 a barrel.

The reasons given so far for the steep oil price decline is glut in the global oil market caused by rising U.S. shale oil production and a slowdown in economic growth in China and the European Union (EU) reducing the demand for oil. This was exacerbated by OPEC's very wrong decision not to cut production by at least 2 million barrels a day (mbd) to absorb the glut in the oil market. Had they cut their production, Russia and Mexico would have joined them and cut production by 500,000 barrels a day (b/d) and 300,000 b/d, respectively, a total of 2.8 mbd capable of removing the glut and stabilizing the oil price. It is not too late for OPEC to reverse their earlier decision and cut production.

Still a glut in the global oil market estimated at 1-2 mbd and slightly slower economic growth in China and the EU should not have led to such a steep decline in oil prices. The global economy suffered harsher and more dire banking and economic crises during the period of 2009-2011 and still oil prices never declined as steeply and for such a long time.

Circumstantial evidence suggests some political collusion between Saudi Arabia and the United States behind the steep decline in the oil price.

Saudi Arabia took advantage of the low oil prices to inflict damage on Iran's economy and weaken Iran's influence in the Middle East in its proxy war with Iran over its nuclear programme whilst the United States is taking advantage of the low oil prices to weaken Russia's economy and tighten the sanctions against Russia over the Ukraine.

Saudi-U.S. Collusion

History is repeating itself. Early in the 1980s, Sheikh Ahmad Zaki Yamani, the veteran, former oil minister of Saudi Arabia, suddenly awoke to Saudi Arabia's need for market Share. He flooded the market with oil causing the oil price to collapse to $10/barrel. It later transpired that the Saudi need for a market share was just a cover for a CIA-Saudi conspiracy to hasten the demise of the former Soviet Union.[1]

And now the Saudi oil minister Ali Al-Naimi is waking up to the same need. Al-Naimi has followed in the exact footsteps of Yamani. He suddenly remembered at the 166th Meeting of the Conference of OPEC on the 27th of November 2014 the need for Saudi market share. This is probably a cover for a new collusion between the United States and Saudi Arabia to lower the oil prices in a new conspiracy against Russia and Iran. Whilst the key players have changed, the strategic objectives have remained the same.[2]

Impact of Low Oil Prices on the Global Economy

The global economy can't reconcile itself with low oil prices for a long while because the main ingredients that make up the global economy such as global investments, the oil industry and the economies of the oil-producing countries, will be undermined.

A continuation of low oil prices could damage the global economy in many ways. Whilst oil consumers around the world may enjoy for a short while low crude oil prices, eventually global consumption will overtake global production and that will push oil prices steeply up. Already crude oil's plunge has fuelled a big jump in U.S. petrol demand.[3] Current low oil prices could be planting the seeds for a future damaging oil crisis in the next two to three years.

The challenges facing the global economy in 2015 are manifold. One important challenge is a curtailment of global investments in many sectors of the global economy particularly the oil and energy sector.

Another is a sustained damage to the global oil industry. The seven major oil companies - Royal Dutch Shell, BP, Exxon Mobil, Chevron, Total, ENI and Statoil - need a price of $125-$135/barrel to balance their books.

In January 2015, Schlumberger, Halliburton and Baker Hughes, the three largest international service companies in the world reported that spending by their customers is dropping by 25-30% in North America compared with 10-15% in

* Mamdouh Salameh is an international oil economist, a consultant to the World Bank and a technical expert of the United Nations Industrial Development Organization (UNIDO) in Vienna. He is a member of both the International Institute for Strategic Studies in London and the Royal Institute of International Affairs. He is also a visiting professor of energy economics at the ESCP Europe University in London. He may be reached at mgsalameh@btconnect.com

See footnotes at end of text.

the rest of the world. They also reported a 29% drop in the number of rigs drilling for shale oil in the U.S. from October 2014 to January 2015.

While the world-wide slide in the price of oil has focused attention on the United States' relatively new shale oil fields, it is the mature, high-cost fields such as those in the North Sea that seem likely to suffer most. At prices much below $75 a barrel, some of the North Sea reserves might be too expensive to develop.[4]

In 2003, the seven majors produced 11.5 mbd of oil liquids, or 14.5% of global output of 79.6 mbd. Fast forward 10 years and their smaller output of 9.5 mbd is equivalent to only 10.4% of larger global production of 91.6 mbd. Oil majors have very little leverage over actual oil prices today.

The faster downturn in the North American industry is in part explained by the higher costs of U.S. and Canadian production compared with oil from the Middle East. A break-even price for U.S. shale oil production was estimated at $70-$85 per barrel. While some efficient shale oil drillers could live with an oil price of $50-60 a barrel, many of them are fracking themselves to bankruptcy.

Impact on the Arab Gulf Oil Producers

My calculations show that the Arab Gulf oil producers earned an estimated $452 bn in 2014, down 21% on 2013 earnings. They are projected to earn $340 bn in 2015 based on an average oil price of $60/barrel throughout 2015 (see Table 1).

		(US$ bn)	
Country	**2013**	**2014**	**2015**
Iran	86	74	55
Kuwait	92	34	25
Saudi Arabia	274	208	156
UAE	53	42	31
Oman	27	22	19
Total	574	452*	340*

Source: U.S. Energy Information Administration's (EIA) 2014 Short-term Energy Outlook (STEO) / Author's projections for earnings in 2014 & 2015.
*Based on an average price of oil of $60/barrel in the second half of 2014 & 2015.

Table 1. Net Oil Export Revenues of the Arab Gulf Oil Producers

If oil prices continue at $50/barrel for a year, Saudi Arabia alone will lose an estimated $128 bn.

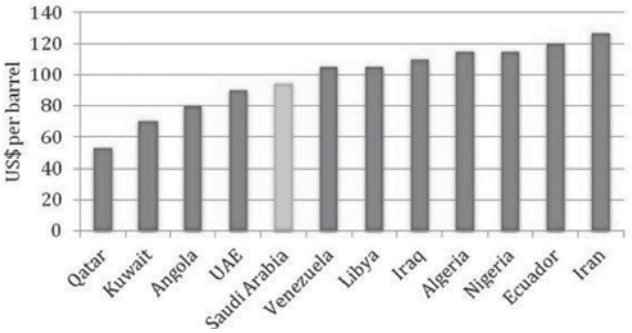
Saudi Arabia is forecast to reduce state expenditure to $229 bn this year, down18% on 2014, a clear sign of the impact the slump in crude prices is having on its finances. It will end up with a $38 bn deficit amounting to 6% of Saudi GDP. As a result, Saudi Arabia's non-oil economy would contract by 5% this year.[5]

Weakened oil prices have resulted in the rating agency Standard & Poor (S&P) downgrading its outlook for Saudi Arabia. "We view Saudi Arabia's economy as undiversified and vulnerable to a sharp and sustained decline in oil price," S&P said. Saudi Arabia's petroleum sector accounts for 44% of its GDP.

And now Saudi Aramco, the largest oil producer in the world, has been advised by the Saudi government to slash its future spending on production and exploration by as much as 25% from $40 bn to $30 bn.[6]

However, Aramco isn't the only big state-owned oil company seeking to cut costs. Suhail bin Mohammed al-Mazroui, the UAE oil minister, said in January that his country, along with other producers, would squeeze oil contractors' costs to adapt to lower oil prices. "We will need the service companies and contractors to understand the cycle of the oil market," he said at an energy event in Dubai.

Some OPEC countries need very high prices to "break even" in their budgets and pay for all the government spending they have racked up in recent years. Iran for instance, needs prices at around $130 a barrel while Saudi Arabia needs an oil price of US$106/barrel in 2015 to fiscally break even, up from $98 a barrel in 2014 according to the International Monetary Fund (IMF) (see Figure 1).



Source: OPEC "Break-even" Prices (Matthew Hulbert/European Energy Review).

Figure 1. OPEC Median Budgetary Breakeven Price

The Arab Gulf oil producers will always be vulnerable to declines in the oil price as long as they continue to be dependent on oil export revenues to the tune of 85%-90%.[7] This is because they have not diversified their economies since the discovery of oil in their territories in the early twentieth century.

In addition to their vulnerability to the volatility of the oil price, the greatest threat to their oil-dependent economies comes from the steeply-rising domestic oil consumption for power generation and water desalination and a lack of diversification. A precursor of this consumption is the wasteful subsidies.

This means that the GCC countries will have to cut their domestic oil consumption drastically or replace oil by nuclear power and solar energy in electricity generation and water

desalination. Failing to do either would result in their relegation to minor crude oil exporters by 2030 or ceasing to remain oil exporters altogether by 2032 (see Table 2).

Impact on Iran's Economy

The international sanctions against Iran and the steep decline in the oil price have adversely affected the value of its currency and reduced its oil exports from 1.81 mbd in 2012 to 1 mbd in 2014 (See Table 3).

However, before the recent fall in the oil price, Iran was selling its crude at an average price of $105-$110/barrel. At $60/barrel, the government will face a shortfall of about $14-$16 bn compared to original plan, or 27%-31%, of total planned government revenue.

Iranian President Hassan Rouhani was quoted by Reuters on January 13, 2015 as saying that countries behind the fall in the global oil prices would regret their decision and warned that Saudi Arabia and Kuwait would suffer alongside Iran from the price drop. He added that "If Iran suffers from the drop in oil prices, other oil-producing countries such as Saudi Arabia and Kuwait will suffer more than Iran. In 2013 oil accounted for roughly 90% of Saudi Arabia's overall budget income and 92% of Kuwait's according to Reuter's calculations based on official data. On the other hand, only a third of Iran's budget is based on oil sales, with an estimated 60% of the country's exports tied to oil".

Year	Production (mbd)	Consumption (mbd)	Net Exports / Imports (mbd)
2010	16.65	4.59	12.06
2011	18.70	4.77	13.93
2012	18.92	5.35	13.57
2013	19.07	5.99	13.08
2015	19.51	6.38	13.13
2020	20.90	9.64	11.26
2025	19.83	13.19	6.64
2030	18.55	17.06	1.49
2031	18.44	17.91	0.53
2032	18.33	18.81	- 0.48
2035	17.79	21.78	- 3.99

Sources: US Energy Information Administration (EIA), Oil Outlook 2013 / OPEC Annual Statistical Bulletin 2014 / BP Statistical Review of World Energy, June 2014 / Author's projections.

Table 2. Combined Current & Projected Production, Consumption & Export of Crude Oil Exports in the Arabian Gulf Countries, 2010-2035

(mbd)	2009	2010	2011	2012	2013	2014	2015	2020	2030
Production	3.56	3.54	3.58	3.74	3.56	3.15	3.17	3.40	3.35
Consumption	2.01	1.87	1.91	1.93	2.00	2.15	2.17	2.57	3.63
Net exports/Imports	1.55	1.67	1.67	1.81	1.56	1.00	1.00	0.83	-0.28

Sources: IEA's World Energy Outlook 2014 / BP Statistical Review of World Energy, June 2014/ OPEC Annual Statistical Bulletin 2014 / Author's Estimates.

Table 3. Iran's Current & Projected Crude Oil Production, Consumption, Exports & Sustainable Capacity, (2009-2030)

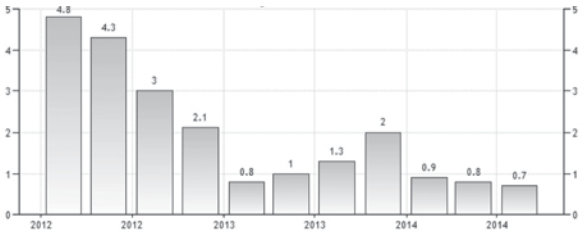
Impact of Sanctions & Declining Oil Prices on Russia

Sanctions were imposed on Russia in the aftermath of its intrusion into the Ukraine in February 2014 and the ensuing annexation of the Crimea.

In 2013 more than 45% of the national budget was funded by gas and oil revenues estimated at $219 bn.[8]

The combination of sanctions and falling oil price has adversely affected the Russian economy by sending it to recession and causing the Russian currency to lose 40% of its value against the dollar.

Russian international reserves also decreased from $510 bn to $386 bn during 2014. Moreover, the combined effect of sanctions and low oil prices has resulted in downside pressure on Russia's GDP. GDP growth slowed down to only 0.7% in the third quarter of 2014 (see Figure 2). Based on an average oil price of $78/barrel in 2015, the World Bank forecasts real GDP contraction by 1.7% for Russia.[9]



Source: www.tradingeconomics.com, Federal State Statistics Service

Figure 2. Russia GDP Annual Growth Rate (percent change in Gross Domestic Prodct)

While the international sanctions against Russia have had so far little effect on the Russian economy, it is the declining oil prices that have had the biggest impact. Still, Russia will be able to withstand the onslaught of sanctions, declining oil prices and currency depreciation by increasing its oil exports and by having a trump card in China's energy needs and financial support.

Impact on the U.S. Shale Oil Production

The surge in U.S. shale oil production over the past five years has been truly phenomenal, but the notion that it was ushering in a new age of global oil abundance is looking more exaggerated by the day.

One need only look at the trend in the number of rigs drilling for oil in the U.S. to see that the shale oil industry is now in severe crisis. The U.S. rig count is now down by 469 units (29%) since October, and is at its lowest level since December 2011.[10]

The implications of shale oil's treadmill dynamics have until now been largely overlooked by the market. The declining oil prices have prompted the sharp drop in the U.S. rig count. However, once the impact of a dramatically lower rig count starts feeding through into shale oil supply from the middle of the year, prices should start to rally on a more sustained basis, with Brent likely to be back at $75 a barrel by year-end. The shale model simply does not work without high prices, and the market is starting to understand that.

In a way, oil companies in the U.S. are perpetuating the crash by continuing to drill and push up U.S. shale oil production to its fastest pace ever. Rather than pulling back in hopes of slowing the amount of supply on the market to try and boost prices, drillers are instead operating at full tilt and pumping oil as fast as they can. So will U.S. shale oil producers frack their way into bankruptcy? That's a real possibility now.

However, the biggest obstacles to an expansion of US shale oil production would be a backlash against its adverse impact on the environment and rising costs of production resulting from the steep first year decline rate of 70%-90% for new wells. Without higher prices exceeding $90/barrel, no one would be chasing shale oil.

Can OPEC Disrupt U.S. Shale Oil Production Surge?

OPEC's ability to push prices lower to disrupt new emerging sources of supply is constrained by members' higher fiscal break-evens, a result of the social turmoil unleashed by the Arab Spring.

OPEC members need prices at least as high if not even higher to the ones that shale drillers need to sustain their businesses. Saudi Arabia needs oil prices above $100/barrel to sustain the extra spending. Other Arab Gulf producers are in a similar situation. On the other hand, U.S. shale developments need prices of $70-$85/barrel to break even, according to industry estimates. The shale boom, thus, is not in danger of an OPEC attack.

Conclusions

A continuation of low oil prices could damage the global economy, inflict sustained damage on the global oil industry and the economies of the oil-producing countries in the world.

Moreover, declining oil prices could be planting the seeds for a future severe oil crisis in two to three years.

The global economy can't reconcile itself with low oil prices for a long while. That is why I am convinced that oil prices will start to rebound soon. My projection is that the oil prices will start to recover by the second half of 2015 probably reaching $75/barrel and recouping most of their earlier losses.

Footnotes

[1] Seyed GholamHosein Hassantash, "Naimi in Yamani's Attire; Are Authorities in Riyadh Witless or Lying? History is Being Repeated", IAEE Energy Forum, 1st Quarter of 2015,p.21.

[2] Ibid.,.

[3] Ed Crooks & Gregory Mayer, "Crude's Plunge Fuels Jump in U.S. Petrol Demand", Financial Times, 16 January, 2015, p, 28.

[4] Selina Williams & Justin Scheck, "North Sea Region Is Hot as Oil's Tumble Persists", Wall Street Journal, January 16-18, 2015, p.1.

[5] Financial Times, 16 January, 2015, p. 5.

[6] Summer Said & Benoit Faucon, "Oil-Drop Pain Spreads to Saudi Arabia's Behemoth", Wall Street, February 19, 2015.

[7] Mamdouh G Salameh, "Impact of U.S. Shale Oil Revolution on the Global Oil Market, the Price of Oil & Peak Oil" (a paper given at a Symposium of Peak Oil, 2-4 April, 2013, Doha, Qatar.

[8]Mamdouh G Salameh, "Turning the Gaze towards Asia: Russia's Grand Strategy to Neutralize Western Sanctions" (A USAEE Working Paper No: 14-168, posted on 19 July, 2014).

[9] Elvin Mirzayev, "Sanctions & il Prices Bring the Russian Economy Near Collapse" 21 January 2015, accessed on 2 February 2015 at www.investopedia.com.

[10] Selina Williams & Justin Scheck, "North Sea Region Is Hot as Oil's Tumble Persists",p.1.

The Geopolitics of Oil and Gas

By Fred B. Olayele*

The importance of energy as a major driver of economic activity, and by implication a basic denominator of growth, is well explained by history – especially with regards to how the world's energy use pattern has evolved over the years. Changes in oil prices and availability continue to affect economic growth prospects, international security and political stability of consuming countries. To a large extent, many contemporary regional energy-driven contentions – among producing, transit and market states – determine the world's energy security architecture. While many industrialized economies are working aggressively to develop alternative non-oil based energy sources, their emerging counterparts continue to rely on relatively cheaper hydrocarbon-based energy sources to increase their productive capacities, at least for the foreseeable future.

According to the International Energy Agency (IEA), global demand for energy is expected to rise by one-third by 2035 as economies in both developed and emerging countries continue to grow and standards of living improve. In the past – and perhaps for years to come – the global energy security architecture has been geared to the needs of the Western market. However, with recent population forecasts showing Asia as a centre that will host nearly half of the world's urban population, with a concomittal increase in oil consumption, the gradual shift of global energy trade to this region will have many geostrategic implications.

Energy Prices

Many factors explain 2014's global slide in oil prices, chief among which are increased American and Canadian production, increased energy efficiency, economic stagnation in Europe, slowing economic growth in China and Saudi Arabia's refusal to help stabilize price by cutting production. Among other things, many in the field of energy economics agree on one thing: that energy prices are determined by a complex interplay of economics, geopolitics and technological changes. Not only that, there is a consensus that global oil and gas prices are an important economic indicator for firms and households, since they affect inflation, purchasing power, and industry's production costs. Since it reached its peak in mid-June this year, the price of oil has declined by 40 percent. This plunged further last week after the Organization of the Petroleum Exporting Countries (OPEC) resolved to continue to produce at the same rate, in an effort to squeeze out some of the marginal producers in the fast-growing U.S. oil industry. Given the weak state of the global economy and increased domestic energy supplies in the U.S., tumbling oil prices continue to drain hundreds of billions of dollars from petroleum producers, exporters and oil companies. On the other hand, lower prices play to the advantage of many European countries, the U.S. and Japan by shifting hundreds of billions of dollars into stimulating their economies as household demand continues to pick up.

Falling oil prices continue to push down already low inflation rates, thereby delaying the need for monetary authorities in many countries to raise interest rates even as growth picks up due to rising household spending on non-energy products. While this presents an opportunity, there definitely are some offsetting negatives. The IEA said recently that about $900 billion per year in investment will be required in the upstream sector to meet energy demand between now and 2030. Interviews and surveys from many oil and gas headquarters around the world show clearly that the current environment is unlikely to encourage that level of capital investment, given the oil wealth transfer to consumers from current low prices. It doesn't stop there. A lower-than-expected level of investment has far-reaching economic implications, including the likelihood of a global economic slowdown further down the road when global oil prices may rebound to yet higher levels than earlier this year in order to incent oil investments. Again, understanding the geopolitics of energy is strategic to escaping the conundrum just presented above.

From Moscow to Baghdad, from the Middle East to Asia, recent happenings show that regional disagreements that ordinarily would have been handled by regional powers have now begun to increasingly attract global interest, with some of the most powerful countries in the world intricately involved. The reasons for this are obviously not far-fetched. For instance, the recent crisis in Ukraine explains the importance of energy in the global geopolitical matrix, as well as why and how energy will continue to be a fundamental indicator of national power.

Pipelines

Understanding the strategic importance of pipelines in the global petroleum geopolitical equation is key. Because they help diversify a region's petroleum

* Fred Olayele is a Senior Energy Economist, in the Ministry of the Economy in the Government of Saskatchewan, Canada. He may be reached at fredb.olayele@gov.sk.ca

supply routes, in addition to connecting trading partners and influencing the regional balance of power, pipelines are more than a mere medium of resource transportation. Europe is served by a pipeline put in place up north by Russia. Economic ties remain one of China's most potent instruments in Central Asia. In fact, it would not be out of place to say that one of the most 'political' Chinese investments in Central Asia are the pipelines; the Turkmenistan-China gas pipeline – which passes through Turkmenistan, Uzbekistan and Kazakhstan – delivers gas into Xinjiang. The Chinese have a pipeline going as far as Shanghai and connecting with their network east. While these pipelines generate great economic benefits to the participating regions, Beijing is able to significantly shape the direction of many Central Asian states' foreign policies by leveraging its economic clout.

The more than a decade-old proposed Turkmenistan-Afghanistan-Pakistan-India (TAPI) pipeline project is another vivid example of how the rapidly changing global energy geopolitical landscape continues to play out. Estimated at $10 billion with the capacity to transport 33 billion cubic meters of Turkmenistan gas over 30 years, important security and financing concerns through Afghanistan have been a clog in the TAPI project's wheel of progress. Recently, the TAPI countries decided to begin constructing the pipeline by 2016, with completion estimated for the end of 2018. With the Asia Development Bank recently designated as transaction advisor, hopes are high again that the 1,800 km pipeline project may see the light of the day. The one question that remains on the lips of many is how Sino-American relations might have impacted the political chess game of the project. While the Americans favour it, the Chinese are skeptical. A successful completion of the project will imply total avoidance, or at least, a reduction in total dependence on Chinese gas purchases. The U.S. position is relatively easier to understand –increased U.S. oil and gas production has had a profound impact on the country's position in global energy markets – more so than at any other time in decades. Nonetheless, the Americans continue to watch and assess events on the global energy geopolitical stage, and from time to time, react to suit their economic and national security interests.

The proposed Keystone XL pipeline by TransCanada has become another reference point in the complex interplay of economics, geopolitics and technology. While advocates believe that increased flow of Canadian oil into the U.S. will lower gasoline prices, strengthen energy security and generate substantial economic benefits, pipeline opponents cite environmental consequences, including climate-warming greenhouse gas emissions. While both views have their merits, the global commodity status of oil makes this argument more a function of global economics, geopolitics, security and technology than any other thing.

Recent Geopolitical Developments

While the impact of economics on many of the geopolitical decisions by governments across the world is well understood, many are concerned that political insecurity and uncertainty could negatively impact global energy and trade dynamics, leading to another global economic meltdown. The important role that Russian energy plays in European geopolitics has again been highlighted by the Crimea crisis and moves against Eastern Ukraine. Almost one-third of Europe's natural gas supplies come from Russia; half of Ukraine's natural gas needs are met by Russia. Given such a delicate demand and supply picture, there is no gainsaying the fact that energy is central to the political and economic turmoil in Ukraine. After more than two years of discordance on price, coupled with worsening Russia-Ukraine relations over Moscow's annexation of Crimea and fighting, Russia finally cut off gas supply to Ukraine. An interim gas deal recently brokered by the European Commission for Moscow and Kiev should help Ukraine receive enough supply to get through the winter. Contentious debt figures between both countries do not help matters either; Ukraine says it will honour its debt obligations with Russia only after the International Court of Arbitration in Stockholm delivers its verdict.

Russia remains one of the world's most resource-endowed jurisdictions – it is the largest natural gas exporter and one of the two largest producers of crude oil. While the country's oil resources constitute an economic lever, Russia uses its abundant natural gas to remain politically relevant in the global sphere. With a new wave of Western sanctions hitting Russia's economy hard, coupled with falling oil prices and its currency at a record low against the dollar, it remains to be seen whether or not President Vladimir Putin will pull a new set of policy levers.

Elsewhere, the Saudis are taking charge in the rapidly changing face of the Middle East. As the world's largest oil exporter and second largest producer, Saudi Arabia's unique position allows it to dramatically influence global economics and politics. While Saudi Arabia, Kuwait and United Arab Emirates have the financial muscle to voluntarily reduce oil production, the other OPEC members – Nigeria, Libya, Algeria, Iran, Iraq and Venezuela – rely on maximum production and high prices to finance their

budgets. For instance, the Saudis are not interested in a nuclear deal for Iran, and neither are they happy with the U.S. for endorsing this policy choice. Because Israel is very sensitive about a nuclear deal with Iran, the Israelis and the Saudis have a common destiny here, notwithstanding the divergent views of the Americans on this issue. This might explain, in part, while Saudi Arabia will always prioritize a greater market share over higher prices.

The U.S. continues to import oil from the Middle East, despite its rising domestic production. The Americans maintain that increased domestic production is not enough to deter America's strategic relationship with the Middle East. Oil imports by the U.S. from Africa have also taken a nosedive, and again, America says that its interests in Africa will not change despite the dramatic fall in oil imports from the region. To minimize the economic and fiscal costs of reduced exports to the U.S., major African oil-exporting countries like Nigeria, Algeria and Angola have diverted their oil to other growing Asian countries and European markets. Although the U.S. says it cherishes a free and uninterrupted flow of energy to its allies and trading partners, these happenings all have significant geopolitical implications that will be manifest in the years ahead.

Conclusion

The rapidly changing global energy picture will continue to determine what policy and strategic choices producing, transit and consuming countries make. It has become clear that U.S. foreign policy –which sways global economics and politics – is significantly influenced by energy security, as demonstrated by the continual shifts in markets. Increased domestic oil production has changed the position of the U.S. in the global energy markets. In turn, this has huge implications on European policies, maybe not so much with respect to its strong and traditional allies – but at least with Russia and its neighbours. Rapidly growing Asian and African populations, which places a huge burden on hydrocarbons, portends grave concerns on climate change concerns. Again, countries will have to rely on the interesting, but complex, interplay of economics, geopolitics and technological changes to successfully navigate these waters.

References

[1] International Energy Agency (2014). "World Energy Outlook 2014". International Energy Agency.

[2] United States Department of State (2014). "Energy Geopolitics: Challenges and Opportunities". International Security Advisory Board.

Fuel for Thought

By Joseph Naemi*

The geopolitics of oil and gas has evolved from its Persian Gulf centric chapter, to an East-West separation of supply and demand dynamics. From the Cold War era prism, the aforesaid evolution has the potential to escalate the present geopolitical tensions, as the success of the Shale Revolution that is making the USA less dependent on its traditional Middle Eastern supply sources; migrates to Europe, and enables the eventual European independence from Russian hydrocarbons.

In anticipation, the integration of the Russian hydrocarbons supply chain into China and Northeast Asia (i.e., Japan, Korea, and Taiwan), will have profound effects on the future of the global distribution of energy resources; affecting the economics and competitiveness of both oil supplies from the Middle East and natural gas (i.e., LNG) supplies originating from East Africa, Persian Gulf, Indonesia, and Australia.

The foregoing trend will have military/security implications, as it binds Russia and China into the same type of relationship that the USA has long had with Saudi Arabia, Kuwait, and other countries surrounding the Persian Gulf. It will also bring into question, whether or not the USA should still be solely responsible for safeguarding the world's seven chokepoints for maritime transit of oil (and LNG).

Furthermore, the global balance of trade will shift, which will negatively impact the prominence of the U.S. dollar; hence expediting the rise of the Chinese Yuan ("RMB"), as an alternative medium for settlement of international trade.

Despite the fact that the Atlantic Alliance will become even stronger in the future than it has ever been in the past, the reality is that there shall be a clear line of "energy security" demarcation between the West and the East; perhaps, akin to the infamous Berlin Wall.

The history of mankind is fraught with wars, regional conflicts, rising and falling empires, persecution, oppression; and yes, democracy. Today, a natural resources war, and especially the battle over energy resources, is undisputable. The primary characteristic of any war is volatility. Volatility means instability, impulsiveness, unpredictability, and several other synonyms of the same attributes; precisely, evidenced in the oil and gas industry nowadays. A basic industrial commodity, whose availability should be smooth, reliable, measured, and stable, continues to be the singularly most volatile commodity; whose price deviates more often than not, from any correlation with fundamental economics.

To exacerbate the dilemma, we have recently (and naively) become accustomed to an international relations protocol, where "sanctions", are the permanent appetizer for the diplomatic main course. The UN Sanctions, the U.S. Sanctions, the EU Sanctions, the Autonomous Sanctions of Australia, Canada, UK, et al; against an array of countries worldwide, is best described as schoolyard bullying, rather than the art of diplomacy.

It is with this backstory that we fail to create harmony in the oil and gas industry. In an un-politicized market environment, the producers and consumers of hydrocarbons, have a very simple but contradictory objective. Producers are expected to maximize their revenue, and consumers are just as equally expected to minimize their expense. Consider that there is nothing in the marketplace (which is price inelastic) to allow free enterprise markets to efficiently and peacefully, keep producers' and consumers' interests in balance. This would only be possible, if governments universally refrain from intervening, by eliminating the supply and consumption of hydrocarbons from their political toolkit and diplomatic agenda. In its stead, governments ought to focus on revamping the United Nations into the organization that it was meant to be: a forum where the 193 nations of the world may talk, listen, debate, and formulate public policies not only for the betterment of their constituencies' living standards, but also for the competent management of a tranquil, prosperous, and sustainable global village.

As Plato has so eloquently said: "Man is nothing but a two legged animal without feathers".

* Joseph Naemi, is an Australian entrepreneur with Ninox Captial Pty Ltd in Sydney with nearly 25 years of experience within the international petroleum industry. He may be reached at jn@ninoxcapital.com

Geopolitics Move Back up the Agenda: Turmoil in Ukraine and its Impact on Risk Perceptions Among Energy Experts

By Robert Germeshausen, Philipp Massier and Nikolas Wölfing*

The escalation of the conflict in Ukraine and the involvement of Russia have moved geopolitical aspects of energy security back up the political agenda in Europe.[1]

Ukraine is of key importance to energy supply for several EU member states as a main transit country for Russian gas deliveries. In 2013 about 39 per cent of all imports of natural gas into the EU were delivered by Russia.[2] Approximately half of these volumes still pass through Ukraine.[3] Although this figure decreased from 80 per cent since the Nord Stream pipeline began to deliver in 2011, fears among European governments, businesses and households that Russia could "turn off the gas tap" became virulent in early2014.[4]

The fact that Russia and Ukraine conflict over gas deliveries is not new. Also the fact that Russia utilizes the restriction of gas deliveries to amplify political pressure has been exemplified in the past. But the vehemence of the approach towards Ukraine up to military interventions and annexation of national territory had been unimaginable for many European leaders until recently. The drastic escalation of the conflict raises questions whether the EU and their member states should reconsider the assessment of their most important gas supplier with reference to reliability.

Against this backdrop, the EU Commission – in its communication for a European Energy Security Strategy[5] – presents a stress test by scenario analyses for the impacts of an interruption of the natural gas supply from Russia and via Ukraine. The commission concludes that there is a "(…) substantial impact in the EU, with the Eastern EU Member States and the Energy Community countries being affected most."

But how likely are these scenarios in the current geopolitical environment? Objective risk measures for these issues are obviously hard to find. Aggregated sentiment of market experts, however, might give an idea on how far the perception of energy security and Russia as a trading partner have changed, and thus inform policy makers and academics. To this end, we asked energy experts from the ZEW Energy Market Barometer[6,7] about the expected impact of the Ukrainian crisis on energy security in Germany and the EU. The survey design seeks to capture a general view from the energy market expert panel on the yet intangible consequences of the recent political events. In our survey, the experts indicated whether their perception of Russia's reliability as energy supplier as well as their assessment of the security of supply for Germany and the EU had changed in light of the Ukrainian crisis. Furthermore, we asked for their opinion on the suitability of various measures to guarantee security of supply in the EU.

The results allow us to draw – based on subjective assessments – a more detailed picture of the impacts of the Ukrainian crisis on the security of the natural gas supply in the EU and Germany. In the following we present and briefly discuss the findings of our survey.

Expectations of Russia's Reliability as an Energy Supplier

"Did the latest conflict between Russia and Ukraine change your view on Russia's reliability as an energy supplier?" 47 per cent of the experts answered this question with "slightly deteriorated", further 12 per cent answered with "significantly deteriorated". Nevertheless, 41 per cent had no reason to change their evaluation of Russia as a trading partner. None of the experts was of the opinion that Russia's reliability as an energy supplier has improved. Hence, according to the opinion of the survey participants, Russia's reliability is negatively influenced by the conflict, but one could hardly diagnose a dramatic alteration. That said, the survey did not ask for how reliable Russia was regarded before the crisis.

But does this also reflect a change in energy security? What is the take of the panellists on the impact of the conflict on the European and more specifically the German supply situation? The majority of experts consider the situation to be unchanged for Germany: 62 per cent do not see a relevant shift in the security of supply in Germany against the background of the Ukraine crisis. For the EU, the panel is almost evenly split in experts that believe there is no impact (53 per cent) and experts that see security of natural gas supply decreasing (47 per cent). For completeness, we also asked for a positive impact on security of supply with natural gas, but none of the experts endorsed this proposition.

Although these figures do not hint towards major impacts of the crisis yet, the mere eventuality that conditions for gas deliveries are used as an instrument of Russian foreign policy causes concerns all over Europe. For Germany, the experts are not worried in this matter. Three quarters of the survey respondents do not expect that natural gas supplies to Germany will be connected with political demands in the future. With regard to the rest of the EU, the result is less clear:

* Robert Germeshausen, Philipp Massier and Nikolas Wölfing are with the Centre for European Economic Research (ZEW) in Mannheim, Germany. Nikolas Wölfing may be reached at woelfing@zew.de

See footnotes at end of text.

48 per cent consider a leverage of Russia's political demands towards other EU member states by means of the energy supplier's bargaining power to be likely. 52 per cent deny this aspect. Apparently, the experts have faith in the bargaining power of Germany, while this is less true for other member states.

Measures to Guarantee Energy Security

Asked for concrete measures and how appropriate they are in order to secure the future supply of natural gas in the EU, the experts provide clear recommendations. The measures were divided into measures focusing directly on the supply of natural gas (see FIgure 1) and those focusing on the reduction of natural gas consumption (see Figure 2). With regard to natural gas specific measures, infrastructure projects were especially in favour. The extensions of the infrastructure for liquefied natural gas (69 per cent of survey respondents) and of pipelines in other EU member states (61 per cent) ranked first and second. Within short distance of these follow efforts to increase the integration of the European Single Market, a rather institutional and economic-oriented measure. The utilization of unconventional natural gas reserves (such as shale gas or tight gas) is seen more critically: 34 per cent vote for "appropriate", 34 per cent vote for "less appropriate" and 26 per cent for "inappropriate". Widely refused is the idea to somehow bundle bargaining power through centralised purchases for the whole European Union, which turned out to be the least popular

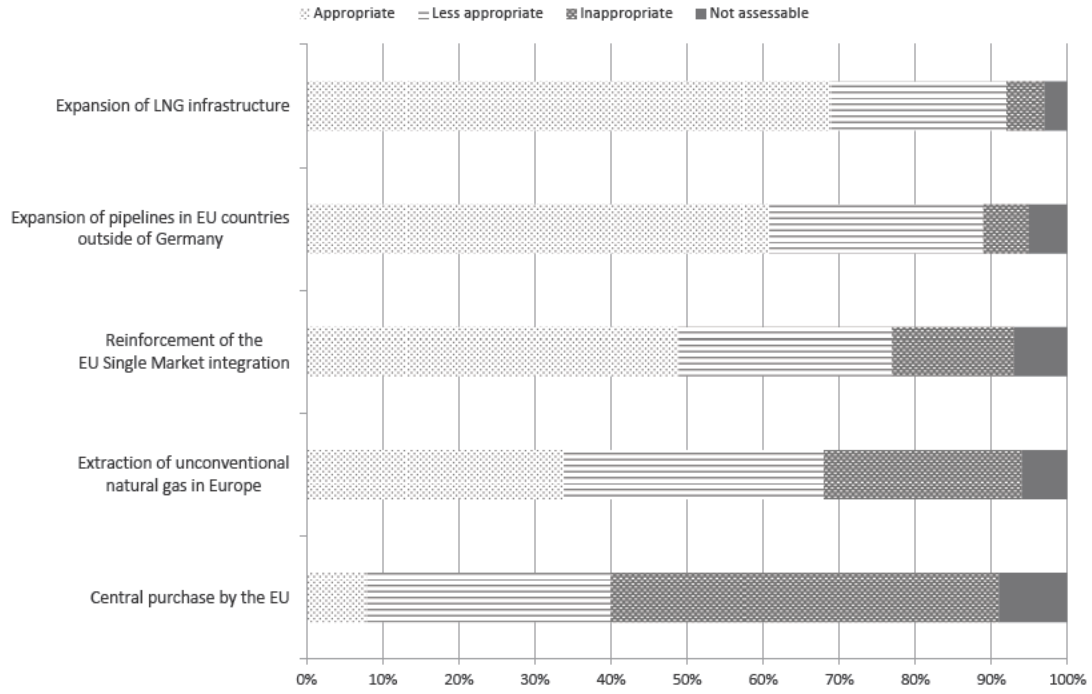


Figure 1. Appropriateness of Gas-specific Measures to Guarantee Security of Supply with Natural Gas

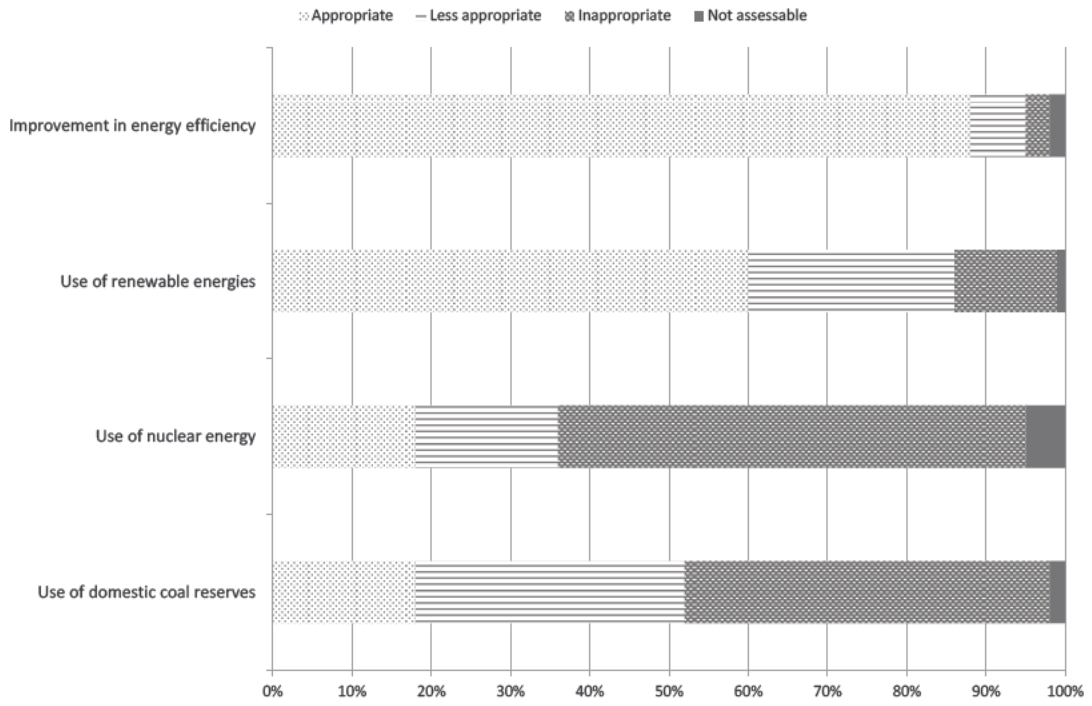


Figure 2. Appropriateness of Measures to Reduce Consumption of Natural Gas

measure within the given possibilities.

There is also a clear vote on the measures addressing a reduction of dependency on natural gas as an energy carrier. It is the increase of energy efficiency which is most widely approved by the experts of the ZEW Energy Market Barometer. 88 per cent of the experts see this as an appropriate measure to reduce dependencies. The extension of the use of renewable energies still receives a large majority but not as much consent. Here, about 60 per cent find this measure to be appropriate. The option to use nuclear energy – similar to the use of domestic coal reserves – as a measure to reduce natural gas consumption only receives 18 per cent of consent in the German panel.

Taking a Broader European Perspective

The German panellists do not seem to expect high impacts from the Ukrainian crisis on the natural gas supply in Germany. Apparently, a large fraction considers energy trading between Russia and Germany to continue as usual. This view differs, however, for other EU member states that indeed are affected in their energy security according to the expert panel. It is thus all the more enlightening that we had the chance to compare our results to those of an offspring panel which conducts similar surveys among energy experts in France. The Grenoble École de Management (GEM) asked equivalent questions to the French experts of its recently established energy market barometer.[8] The French panellists are more pessimistic about the impact of the Ukrainian crisis on security of supply and report a stronger decline of the valuation of Russia's reliability as an energy supplier. Three-quarters of the experts in total indicated that their estimation of Russia's reliability has deteriorated due to the conflict with, and within, Ukraine over the course of the year. 58 per cent recognize a slight deterioration; 18 per cent even recognize a significant deterioration. Interestingly, a significant deterioration in security of supply for France is also stated by the French panellists. With regard to other EU countries, about 80 per cent of the GEM experts report a decrease in energy security. Thus, the French experts are more alarmed by the conflict in Europe's east then their German counterparts, although Germany should be much more affected by the mere proportion of its gas imports. The differences in perception may also result from different interrelations with Russia. On one hand, the German energy industry has higher stakes at risk and might want to exert some optimism. On the other hand, the relative tranquillity of the German experts could reflect their experience in dealing with Russia and a knowledge about bidirectional economic dependencies. Possibly, cultural differences may also play their role leaving a close cooperation of state owned companies for the government interests in foreign policy appear to be more plausible in France than from a German perspective.

What Could be the Intra-European Response?

Within its stress test, the EU Commission identified two weak spots in the EU's security of supply. First, infrastructure projects are not yet fully commissioned as planned after the 2009 supply crisis. Second, security of supply strategies of the EU member states are "either unilateral in nature, insufficiently coordinated and/or insufficiently cooperative".[9] Our experts confirm these needs given their opinion on the expansion of the natural gas infrastructure (also in the EU) and the reinforcement of the EU Single Market integration, enabling the transfer of natural gas from Western Europe to Central and Eastern Europe when needed.[10] But also unilateral strategies among the measures to guarantee security of supply are favoured by the majority of surveyed energy experts. The improvement of energy efficiency receives almost undivided consent as a measure to reduce dependency from energy imports. This holds for the French as well as the German panel.

Similar unanimity, however, is unlikely to be found for other possible measures. For instance, the relative unimportance the German panellists gave to the use of nuclear energy and coal reserves is likely to be seen differently in other countries. Eastern Europe might tend more to rely on domestic coal deposits, shale gas, and the use of nuclear energy, as other measures could be seen as very costly.[11] Differences occur also between the German and the French panel, for example, in the assessment of the utilization of unconventional natural gas reserves. This option receives the largest consent under the natural gas specific measures in the French panel with 77 per cent. The experts of the German ZEW Energy Market Barometer, however, see this option much more critically.

In summary, energy market experts within the EU do not yet agree on an approach regarding energy security. Correspondingly, the energy security policies of EU member states do not always reflect a coherent common strategy. However, there are already measures taken to strengthen cooperation within the EU. These measures also find wide support among the majority of experts surveyed in Germany and France. This is even more important as the renewed prominence of geopolitics in energy policy underscores the need for cooperation among EU member states.

Footnotes

[1] International Energy Agency (IEA), 2014, World Energy Outlook 2014, Paris, France.

[2] EU Commission, 2014 a: European Energy Security Strategy. Communication from the Commission to the European Parliament and the Council. Brussels, Belgium.

[3] Simon Pirani, James Henderson, Anouk Honoré, Howard Rogers and Katja Yafimava, 2014, What the Ukraine crisis means for gas markets. Oxford Energy Comment, March 2014, Oxford, United Kingdom.

[4] The Independent, 2014, Fear over Russian gas switch-off sees EU states stockpile supplies. Retrievable under http://www.independent.co.uk/news/world/europe/fear-over-russian-gas-switchoff-sees-eu-states-stockpile-supplies-9727466.html [12.12.2014].

[5] U Commission, 2014 a, ibid.

[6] The Centre for European Economic Research (ZEW) hosts a panel of energy markets experts, who are surveyed biannually for the ZEW Energy Market Barometer [ZEW Energiemarktbarometer]. The ZEW Energy Market Barometer is an industry-specific indicator of economic sentiment regarding energy supply, energy trade, and energy service industries in Germany. It comprises the expectations of about 200 experts concerning short- and long-term developments in the national and international energy markets. The majority of the panellists work for the energy supply industry or in energy trading. Furthermore, experts stem from academia and energy consultancies. A small part of the participants work for energy related associations, administrations or institutions. Given that the ZEW Energy Market Barometer addresses German energy market experts, results may relate particularly to the German situation. The panel was established in 2003.

[7] The complete series of the ZEW Energy Market Barometer can be retrieved from: http://www.zew.de/de/publikationen/energiemarktbarometer.php. This article is based on the latest ZEW Energy Market Barometer from July/August 2014, which is only available in German.

[8] Grenoble École de Management (GEM) Energy Market Barometer 2014 – Report 2. Retrievable under http://en.grenoble-em.com/energy-market-barometer-report [05.12.2014].

[9] EU Commission, 2014 b, Communication from the Commission to the European Parliament and the Council on the short term resilience of the European gas system. Preparedness for a possible disruption of supplies from the East during the fall and winter of 2014/2015. Brussels, Belgium.

[10] Christian Hübner , 2014, European Energy Supply Security in Light of the Ukraine Crisis. Facts & Findings No. 151, July 2014, Konrad-Adenauer-Stiftung, Berlin, Germany.

[11] Christian Hübner, 2014, ibid.

IAEE 2015 Award Winners Announced

Wumi Iledare, Immediate Past President and Chair of the Awards Committee, is pleased to announce the followiing:

Winner of:

Outstanding Contribution to the Profession Award:

Severin Borenstein, University of California

Since 1981, this award has been given each year to an individual judged to have made an outstanding contribution to the field of energy economics and its literature.

Outstanding Contribution to the IAEE Award:

Mine Yucel, Federal Reserve Bank of Dallas

This award is given at the option of the Awards Committee to an individual or an organization deemed to have made an outstanding contribution to the IAEE over the recent past.

IAEE Journalism Award:

John Kingston, Platts

This award is given to each year to the individual or individuals deemed to have contributed to excellence in journalism on topics relating to the field of international energy economics.

In addition to Iledare, Awards Committee members were Carol Dahl, David Knapp, David Newbery and Lori Schell.

European Gas Supply Security and Geopolitics

By Yuri Yegorov and Franz Wirl*

Introduction

Natural gas plays an important role in the world's energy portfolio, and IEA forecasts an increase of its share in coming years. There are several reasons for this. Among them the most important are:

- Natural gas is an environmentally clean fuel and it gives less carbon emissions than coal,
- The global reserves of natural gas are more abundant than oil, this makes it cheaper and calls for the substitution of gas for oil in heating (mostly accomplished) and transport (just starting).

Europe depends on natural gas less than on oil, but due to depletion of domestic reserves (in Netherlands gas production will decline while in Norway it will stay on a plateau at 110-120 bcm/y in the next decade before eventual decline) its dependence on imports will increase.

In 2011 Europe imported 248 bcm of natural gas (47% of its demand); in 2020 it is projected to import 288 bcm or 56% of demand, while in 2035 the projection is for imports of 390 bcm or 87% of demand.

One of the reasons for less optimism about the EUs future gas consumption is failure of the program for a rapid substitution of gas-fired for coal-fired electricity plants. At present, the market for carbon dioxide has collapsed in Europe, and policy makers did not provide any subsidy for it while providing much larger subsidies for renewable energies, especially photovoltaics.

We see that gas demand in Europe is shrinking comparing to the previous forecasts. While this is mostly a middle term phenomenon of a 10 year horizon, demand can be driven by other than economic factors. The goal of this paper is to study to what extent geopolitical concerns and energy security reasons can be the drivers of such an outcome.

Economic Perspectives for Future Gas Supply

Indeed, there is no global shortage of natural gas in the coming several decades, contrary to oil, where the production peak (at least for conventional oil) either has already occurred or will come soon. Iran and Qatar hold 15% and 14% of world reserves, and their reserve/production ratio stays well above the global average. This means that they can substantially increase natural gas exports in the coming decades. It is expected that between 2011 and 2035 Iran will increase its production by 56 bcm, while the increase in Qatar is 86 bcm (WEO2013). The growth of Russian production can be even more substantial – by 135 bcm. Most of this gas will go for exports. Additionally more gas for export can come from Algeria, Nigeria and Venezuela and other countries. Yegorov and Wirl (2011) argue that based on purely economic reasoning (cost optimization and reserve-to-production-ratio) the future conventional gas market will be dominated by Russia, Iran and Qatar, while countries with lower fractions of global reserves (like Algeria and Nigeria) will be important suppliers only in the middle run, before their reserves are depleted.

Should then Europe care about a gas shortage? While global demand is uncertain (mostly because of fast growth in China), it is clear that it is easy to satisfy European growth in demand for gas imports. If the question has a purely economic origin, the answer would be a clear "no".

The Role of Geopolitics

In economic literature it is common to find purely economic rationality for all decisions. However, in the case of natural gas the role of geopolitics is very high. Several case studies have been presented in the book edited by Victor, Jaffe & Hayes (2006) while the theoretical analysis was developed by Yegorov & Wirl (2010).

Briefly, transport costs and especially fixed costs of investment in infrastructure are very important for natural gas. That is why geographic location plays a very important role. In some cases, especially for land locked countries, a pipeline (the only way of gas delivery) is either never built (like a pipeline crossing Afghanistan) or built with delay (the export route from Turkmenistan to China).

If we look at those countries that have the largest reserves and thus will dominate future gas export, we can easily see that many of them are considered politically non-secure. This presents a complex issue.

If there would be no sanctions over Iran, Europe could have included it as potential supplier to the Nabucco project to keep it alive. Given recent tensions in Iraq, there is a chance of cooperation between the U.S. and Iran on this issue, and lifting of sanctions can happen sooner rather than later. In this case Iran can become a substantial competitor of Russia in the European gas market. This is

* Yuri Yegorov and Franz Wirl are professors at the University of Vienna, Austria. Yuri Yegorov may be reached at yury.egorov@univie.ac.at

See footnote at end of text.

a medium term perspective, since the development of additional capacities for Iran (especially in gas transportation) requires substantial investment and time.

However, if these options become realistic, Europe could revise its future forecast for natural gas consumption. If Russian gas exports to EU would remain constant, an additional 50-100 bcm from Iran could allow Europe to make more gas for coal substitution. The gas from Iran is likely to be even cheaper than shale gas from the USA after liquefaction, and thus will be competitive and not allow gas prices in Europe to rise.

However, geopolitics today seems to play a negative role for Europe, forcing it to lock in economically inferior outcomes. While gas supply from Russia and Iran to EU could be abundant in the future, non-economic reasons (like sanctions) limit those future flows of natural gas from Russia (the country that has set contracts with China in 2014 to supply 68 bcm of gas via 2 pipelines to be constructed) and Iran (which can supply cheap gas from the world's largest South Pars deposit).

European Energy Security: Different Views

It became common to use the term "European energy security" after the gas conflict between Russia and Ukraine in January 2009, resulted in a temporary termination of the physical flow of imports to the EU. Balkan countries were exposed to even larger losses. Energy security in gas supplies necessitates broader diversification of import sources, construction of additional gas pipelines between EU countries and more storage capacities.

From purely economic perspectives (based on an assumption of a rational consumer) the acceptable level of security has to be chosen based on the analysis of different scenarios for losses and the choice of measures to divert them that would have minimal cost.

We know that Nabucco has been one of the projects of that type. However, the capacities of Azerbaijan have been insufficient to make it economically viable, while Iraq is still not secure, and Iran is out of consideration because of U.S. sanctions.

If one minimizes transport cost, energy security cannot be guaranteed. As we can see from Figure.1, transit routes from Russia to EU today have to pass either transit countries, or to use more expensive transit over the bottom of the sea.

Figure 1. Transit routes for natural gas.
Source:http://en.wikipedia.org/wiki/Russia%E2%80%93Ukraine_gas_disputes

The Case of Ukrainian Gas Transit

Historically, most natural gas transit routes from Russia to EU were through Ukraine. This did not matter in the time of the USSR, but became very important in recent years. While Russia has proven to be a reliable gas supplier to Europe, Ukraine was not rich enough to sustain the European price for natural gas. For political reasons, it had been subsidized by Russia for many years. But when Russia wanted to raise prices (either to lift the subsidy for political reasons or to move toward market prices), Ukraine bargained very hard (often beyond what is accepted in an economic world). This has resulted in several so called gas wars (2006, 2009) with temporary cuts in transit and with the EU being the loser.

This has raised the issue of European gas security, and resulted in steps to limit dependence on Russia, which supplies about 1/3 of EU gas imports. However, at present this is impossible without a substantial raise in gas prices. After the Fukushima tragedy, Japan has increased its demand for gas. Besides that, Chinese gas demand is growing, pushing most of the flexible gas supply in the form of LNG away from Europe and towards Asia.

Russia paid attention to European concerns and started two projects – North Stream and South Stream – with the latter (apart from a potential increase in export volume) to bypass Ukraine and thus make gas supply to EU more secure. Both projects can be extended to a capacity of 60 bcm/y. North Stream is already functioning, while South Stream is only planned.

The highest transit over Ukraine was at the level of 137 bcm/y in 2004, just before the Orange revo-

lution. After the construction of North Stream in 2011 it dropped to about 85 bcm/y in 2012 and 2013 (Source: Naftogaz). At present, 16% of the natural gas consumed by Europe flows through Ukraine[1]. The share of Ukrainian transit gas in imports is very high for Southern and Central Europe. In particular, Austria, Bulgaria, Croatia, Hungary, Romania, Slovakia and Slovenia are 100% dependent on this transit for their imports. Gas import dependency for those countries is also high. The share of Russian gas in gas consumption is the highest for Bulgaria, at 83.3%, and the lowest for Romania, at 24.3% (Sharples & Jugde, 2014).

In 2013, 82.3 bcm of EU imported gas (57.6%) came via Ukraine, 37 bcm (25.9%) via Belarus and 23.5 bcm (16.5%) via North Stream. In 2012, all imported gas to Austria, Bulgaria, Croatia, Hungary, Romania, Slovakia and Slovenia came via Ukraine, while Italy, Poland and Czech Republic have between 40% and 50% dependency on this route. (Sharples & Jugde, 2014).

Pirani et al (2014) analyzed the consequences of a potential interruption of gas transit via Ukraine, given the political situation in early March 2014. Although there have been many political changes since then, we are not aware of a more recent economic analysis. Moreover, most of the conclusions still hold. The authors have found that while gas imports by Ukraine has declined from 50.6 bcm in 2007 to 27.9 bcm in 2013, the value of those imports have risen from $6.6 bln. to $12 bln. The presence of outstanding debt for gas by Ukraine has become an issue. The debt was growing, along with payment date, and finally in June Ukraine not only violated debt payments, but also failed to agree on a price. Now the case is being considered by an arbitrator in Stockholm.

In 2014, Ukraine had accumulated about 16 bcm in storage but that is not sufficient for the normal functioning of transit (it requires about 20 bcm in winter). That is why Gazprom warned EU consumers, in the autumn, of the risk of the illegal use of part of the transit gas for domestic Ukraine consumption.

While the final agreement about gas supply from Russia to Ukraine was reached on October 31, 2014, there is still a danger of an interruption to Europe in the winter 2014/15. Much depends on the ability of Ukraine to pay for this gas with further complications likely if it is unable to do so (see gas transit game analysis in Wirl & Yegorov, 2009).

South Stream, Blue Stream and European Gas Security

The South Stream project has enough capacity (63 bcm) to bypass Ukrainian transit, and at the same time additional capacity to bring any gas from the south, including the Caspian area. Besides that, Russia was going to finance this project which obviously brings more energy security to Europe.

While it is clear that South Stream is vital for EU energy security, especially for Bulgaria, a final decision on its construction was blocked in June 2014, possibly following political pressure. Here we observe how political forces can prevent a country from making rational economic decision.

The formal reason for the blockage is the Third Energy package. According to it, there should be free access of third parties to the pipeline. If South Stream would be a joint investment project between Russia and EU and if there would be a clear partner that could fill it, that possibly would make sense for Russia. Given that it is a win-win project for Russia and EU, it is strange, that some formal EU legislation can block it.

While it is becoming clear (and the winter 2014/15 can only prove it again) that only the construction of South Stream can guarantee energy security to South-East and Central Europe, there have been continued attempts to block it and even political pressure on some EU countries (like Hungary) that had chosen to enhance their future energy security by supporting it. In fact, blocking finally became successful and on December 1, 2014, Gazprom took the decision to stop South Stream and to replace it by expansion of the Blue Stream to Turkey; the corresponding agreement between Russia and Turkey was signed the same day. While Russia has practically no losses from this substitution, EU energy security is not likely to increase because Turkey will have too much market power over transit even though the Third Energy package of EU, which should prevent this, is now formally ratified.

Conclusions and Policy Implications

Geopolitics plays a very important role in the natural gas industry and it happens on several levels. The first level comes from the importance of geography for gas supply routes. If the delivery is by pipeline, then a transit country becomes a local monopolist that can influence this supply and play rent-seeking games. In the case of LNG, geopolitics plays a lessor role (since there are many sea routes to connect two particular ports) but it can still play a role if control over some vital straits or channels can take a non-economic form.

In the year 2014 geopolitics became even more important. Before 2014 we saw it as a limit to Iranian

access to global markets for its natural gas (only Turkmenistan and Turkey had gas trade with Iran), while sanctions against Russia (following its policy regarding Ukraine) are bringing a threat to future gas trade between Russia and EU. The reason is far from economic; moreover, it contradicts all principles of free trade. Russia is already looking towards China, and two long term contracts (for 38 and 30 bcm/year) that will make China the largest buyer from Russia after construction of the related pipelines.

What will this imply for Europe? Despite widespread talk about plenty of cheap LNG from the USA soon, those volumes cannot substitute for Russian gas. The possibility of Norwegian gas supply are limited, and new LNG projects in Africa and Australia will supply gas at prices above current European rates, due to high transit costs. Meanwhile Germany pushes for too much expensive renewable energy with a lot of coal in electricity production, making its transition to a lower carbon world more expensive.

Footnote

[1] http://www.eia.gov/todayinenergy/detail.cfm?id=15411

Literature

Natural Gas and Geopolitics: From 1970 to 2040, D.Victor, A.Jaffe, M.Hayes, Eds.; Cambridge University Press, 2006.

Pirani Simon, James Henderson, Anouk Honore, Howard Rogers and Katja Yafimava (2014) What the Ukraine crisis means for gas markets. - WP of Oxford Institute for energy Studies.

Sharples J., Jugde A. (2014) Russian gas supplies to Europe: the likelihood, and potential impact, of the interruption in gas transit to Europe. – The European Geopolitical Forum, 24th March. http://gpf-europe.com/forum/?blog=energy&id=157

WEO2013, IEA.

Wirl F., Yegorov Y. (2009) Ukrainian Gas Transit Game, Zeitschrift fur Energiewirtschaft, iss.2, p.147-155.

Yegorov Y., Wirl F. (2010) Gas Transit, Geopolitics and Emergence of Games with Application to CIS Countries, USAEE - IAEE WP 10-044, 28 February 2010, 29 p. (http://ssrn.com/abstract=1560563).

Yegorov Y., Wirl F. (2011) Gas Transportation, Geopolitics and Future Market Structure, Futures, 2011, v.43(10), p.1056-1068; http://dx.doi.org/10.1016/j.futures.2011.07.005

Yegorov Y., Wirl F. (2014) Smooth Transition to Low Carbon World with Optimal Policies for Natural Gas and Renewable Energies, presentation at the 14th IAEE European Energy Conference, Rome, Italy, 28-31 October 2014.

Careers, Energy Education and Scholarships Online Databases

IAEE is pleased to highlight our online careers database, with special focus on graduate positions. Please visit http://www.iaee.org/en/students/student_careers.asp for a listing of employment opportunities.

Employers are invited to use this database, at no cost, to advertise their graduate, senior graduate or seasoned professional positions to the IAEE membership and visitors to the IAEE website seeking employment assistance.

The IAEE is also pleased to highlight the Energy Economics Education database available at http://www.iaee.org/en/students/eee.aspx Members from academia are kindly invited to list, at no cost, graduate, postgraduate and research programs as well as their university and research centers in this online database. For students and interested individuals looking to enhance their knowledge within the field of energy and economics, this is a valuable database to reference.

Further, IAEE has also launched a Scholarship Database, open at no cost to different grants and scholarship providers in Energy Economics and related fields. This is available at http://www.iaee.org/en/students/ListScholarships.aspx

We look forward to your participation in these new initiatives.

2016 International Meeting in Norway: Planning Well Underway

Scheduled for 19 to 22 June, 2016 in Bergen, Norway, the IAEE's International meeting will be hosted by the Norwegian School of Economics (NHH).

At a luncheon planning meeting on February 4, Past President, Einar Hope, who heads the meeting and Professor Gunnar Eskeland, head of the Programme Committee met with NHH researchers from various fields to start the planning phase of the conference. The meeting gave the NHH scholars the opportunity to provide input on various topics and discuss the best approaches for ensuring the major speeches are given by speakers with international profiles.

"We have already sent out invitations to top people," said Eskeland, who is Professor in the Department of Business and Management Science.

Professor Emeritus Einar Hope is in charge of the work on the IAEE Conference to be held at NHH in 2016. He provided information about the preliminary plans at a lunch for a number of researchers from several departments.

Foto: Helge Skodvin

The IAEE 2016 conference committee at NHH (from the left): Professor Emeritus and leader of the conference Einar Hope; organisational leader Linda Rud; professor and leader of the programme committee Gunnar S. Eskeland; PhD student and student representative for the Norwegian Association for Energy Economics, Lisa M. Assmann; and Olga Pushkash, administrative coordinator for the conference.

Foto: Helge Skodvin

IAEE
WWW.IAEE.ORG
INTERNATIONAL ASSOCIATION *for* ENERGY ECONOMICS

SCENES FROM THE 5TH IAEE LATIN AMERICA CONFERENCE MARCH 15-17, 2015

5th Latin America Energy Economics Meeting
Medellín, Colombia 15-18 Marzo 2015

5th Latin America Energy Economics Meeting
Medellín, Colombia 15-18 Marzo 2015















5th Latin America Energy Economics Meeting
Medellin, Colombia 15-18 Marzo 2015


5th Latin America Energy Economics Meeting
Medellin, Colombia 15-18 Marzo 2015

The future of energy in Latin America was shown in Colombia

Colombia hosted the 5th Latin American Meeting on Energy Economics from March 15 to 18, at the Intercontinental Hotel in Medellin.

Experts, academics, politicians and business leaders shared their analysis of current Latin American and presented their future vision on energy and global trends.

Plenary speakers included David Newbery (University of Cambridge, UK), who spoke about Utility Business Models and Challenges, Luis Alejandro Camargo (XM, Colombia), who gave a talk on Colombian electricity market and subsidies, and Perry Shiosansi (Menlo Energy Economics, USA), who gave a plenary talk on Energy Efficiency and lessons for Latin America.

And representatives from around the world shared their research and work in different energy issues: Natural Gas, Oil, Renewables, and many other topics.

Social Events

Gala dinner

The Conference Gala Dinner was held Monday night at Botanical Garden, a space surrounded by nature where all the participants had a very pleasant dinner enjoying the live entertainment provided by the Banda sinfónica de la Universidad de Antioquia and the Colombian folklore.

Cocktail

The cocktail reception was held at the Caná de Galilea, where wine and snacks, was served to everyone's enjoyment.

Many thanks to all for being part of this event!

Supporting Sponsors

Welcome New Members

The following individuals joined IAEE from 1/1/15 to 3/31/15

Halima Abba
University of Cambridge
UNITED KINGDOM

Tanko Abu
Glasgow Caledonian Univ
UNITED KINGDOM

Bekir Sami Acar
Ewe Holding
TURKEY

Rajesh Acharya
National Inst of Tech Karnataka
INDIA

Briana Adams
ICF International
USA

Berker Adiguzel
Deloitte Consulting
TURKEY

Roar Adland
Norwegian School of Economics
NORWAY

Gulsum Akarsu
Ondokuz Mayis University
TURKEY

Masayuki Akazawa
Hokkaido Univ
JAPAN

Amin Al Yaquob
Doshisha University
JAPAN

Aslihan Albostan
Istanbul Technical University
TURKEY

Abdulaziz Alturki
Saudi Aramco
SAUDI ARABIA

Nourah Alyousef
King Saud University
SAUDI ARABIA

Arafat Amoussa
FRANCE

Olugbenga Anfela
NCRIB
NIGERIA

Manfred Antoni
Inst for Employment Research
GERMANY

Nikolay Arkhipov
Russian State Univ of Oil and Gas
RUSSIA

Bilal Aslan
IGDAS
TURKEY

Nicolas Astier
FRANCE

Zauresh Atakhanova
Na Zarbayev University
KAZAKHSTAN

Helen Axelsson
Jernkontoret
SWEDEN

Simon Bager
IIIEE at Lund Univ
SWEDEN

Branka Bajde Gabrovsek
C&G SKUPINA d.o.o.
SLOVENIA

Pinar Bal
Beykent University
TURKEY

Andy Balkwill
National Grid Company
UNITED KINGDOM

Yalin Baloglu
TURKEY

Frederic Baule
Cedrac Conseil
FRANCE

Saule Baurzhan
Eastern Mediterranean University
TURKEY

Funda Bayulu
T2 yazilim AS
TURKEY

Per Bengtsson
Nordea AB Publ
SWEDEN

Mustafa Ozgur Berke
WWF-Turkey
TURKEY

Audrey Berry
CIRED
FRANCE

Marco Berti Palazzi
European Commision
BELGIUM

Pradyumna Bhagwat
Delft University of Technology
NETHERLANDS

Roberto Bianchetti
SWITZERLAND

David Bielen
Duke University
USA

Stefan Boessner
Notre Europe
FRANCE

Claire Marie Bono
EDF R&D
FRANCE

Daniela Bory
EDF R & D
FRANCE

Moriah Bostian
Lewis and Clark College
USA

Quentin Boulanger
FRANCE

Erik Brandsma
Statens energimyndighet
SWEDEN

Runar Brannlund
Umea University
SWEDEN

Thomas Broberg
CERE Umea universtet
SWEDEN

Jerome Brueziere
AREVA
FRANCE

Paul Burke
Ontario Power Generation
CANADA

Liya Cai
State Nuclear Power Corporation
CHINA

Alrick Campbell
Australian National University
AUSTRALIA

Ping kee Chan
The Hong Kong Electric Co Ltd
HONG KONG

Emmanuel Chaslin
UFIP
FRANCE

Yurong Chen
Ecole Centrale Paris
FRANCE

Alice Chiche
Artelys
FRANCE

Samuel Ciszuk
Statens energimyndighet
SWEDEN

Martyn Coates
UCL
UNITED KINGDOM

Myriam Cohen
FRANCE

Francoise Colas
EDF
FRANCE

Darius Corbier
Paris Dauphine
FRANCE

Javier Cuervo
Inter American Development Bank
USA

John Curtis
Economic and Social Research Inst
IRELAND

Mitchell Curtis
University of Reading
UNITED KINGDOM

Antonio de Andres Gonzalez
Gas Natural Fenosa
SPAIN

Gabriel de La Marnierre
Capgemini Consulting
FRANCE

Benedict De Meulemeester
E&C
BELGIUM

Jan De Mulder
National Bank Belgium
BELGIUM

Aymeric De Villaret
FRANCE

Aurora del Valle Diez
IIT
SPAIN

Antoine Delavenne
Universite Paris 10
FRANCE

Milena Delcnjak
SODO
SLOVENIA

Omer Demirhan
Ewe Holding
TURKEY

Olivier Derceville
FRANCE

Baptiste Desbois
E & C
FRANCE

Abhishek Deshpande
Natixis
UNITED KINGDOM

Paula Diaz
ETH Dept of Env Systems
SWITZERLAND

Andreas Dietrich
Univ of Duisburg Essen
GERMANY

Anne Lise Ducrot
Total EN
FRANCE

Urs Eggenberger
SWITZERLAND

Jeremy Elbeze
Dauphine
FRANCE

Catherine Enck
UFIP
FRANCE

Tashi Erdmann
Shell Global Solutions Int'l
NETHERLANDS

Antonio Francisco Erias Rodriguez
Iberdrola
SPAIN

Federico Ermoli
SNAM Spa
ITALY

Gonca Erozkan
CLK Energy
TURKEY

Andreas Essl
TU Wien
AUSTRIA

Millicent Eze
University of Abuja
NIGERIA

Christopher Fabre
ERDF
FRANCE

Olugbenga Falode
University of Ibadan
NIGERIA

Thomas Faugere
Univ Montpellier 1
FRANCE

James Feehan
Memorial Univ of Newfoundland
CANADA

Juan Fernandez
UNITED KINGDOM

Sandra Bettina Ferrante
Universidad Pablo de Olavide
ARGENTINA

Alfonso Gonzalez Finat
ACER
SPAIN

Shadi Firouzi Alizade
Bogazici University
TURKEY

Denis Florin
Lavoisier Conseil
FRANCE

Nam Foo
Curtin University
AUSTRALIA

Marko Gabrovsek
C&G SKUPINA d.o.o.
SLOVENIA

Serge Galaup
Greenfluence
FRANCE

Artur Galbarczyk
POLAND

Jean Baptiste Galland
ERDF
FRANCE

Jose Luis Gandia Fornes
Fundacion f2e
SPAIN

Abdul Ganiyu
IQRA Travel and Tours Ltd
GHANA

Rafael Garaffa
COPPE/UFRJ
BRAZIL

Jean Jacques Gautrot
JJ Gautrot Consulting
FRANCE

Mahaman Laouan Gaya
FRANCE

Marc Geffrault
Trans Mission
FRANCE

Christos Georgantonis
TITAN SA
GREECE

Jacques Ghisgant
EDF
FRANCE

Yves Giraud
EDF
FRANCE

Alexis Gleron
Univ Montpellier 1
FRANCE

Jesse Goellner
Booz Allen Hamilton
USA

Robert Golob
GEN-I D.O.O.
SLOVENIA

Susana Gomez Munoz
CEPSA
SPAIN

Raquel Nadal Goncalves
COPPE/UFRJ
BRAZIL

Robert Gorosch
PwC Sverige
SWEDEN

Clemence Granveau
Mines Paristech
FRANCE

Peter Gray
Dept of Economics, CWU
USA

Ovunda Green
University of Port Harcourt
NIGERIA

Markus Groissbock
GERMANY

Josef Urs Grueter
Alectron AG
SWITZERLAND

Joel Hamann
CIRED
FRANCE

Ian Hamilton
UCL Energy Institute
UNITED KINGDOM

Adil Hanif
European Bank for Recon and Dev
UNITED KINGDOM

Nizamettin Sami Harputlu
Istanbul Technical University
TURKEY

Omar Hatimi
Supelec
FRANCE

Philipp Hauser
TU Dresden
GERMANY

Gerald Hazen
EY
USA

Werner Hediger
HTW Chur
SWITZERLAND

Steve Heinen
Electricity Research Center
IRELAND

Claude Heller
Air Liquide
FRANCE

Chrysanthus Heruela
Philippine Electricity Market Corp
PHILIPPINES

Antoine Herzog
EDF
FRANCE

Hazem Heswani
UNITED KINGDOM

Christopher Holzen
CBS
DENMARK

Santiago Horacio Hoyos Velasquez
COLOMBIA

George Hsu
National Chung Hsing University

Lars Jacobsson
SWEDEN

Jean Francois Jacques
Dauphine
FRANCE

Mengfei Jiang
University of Edinburgh
UNITED KINGDOM

Katarina Johnsson
SEB
SWEDEN

Mathias Kaeso
Brandenburg University of Tech
GERMANY

Nasia Kalaika
Ministry of Energy, Cyprus
CYPRUS

Ihuoma Kanu
PPPRA
NIGERIA

Kuddusi Katalay
IGDAS
TURKEY

Kuddusi Katalay
IGDAS
TURKEY

Benoit Kervoelen
Ecole des Mines
FRANCE

Ibrahim Halil Kilic
TUV NORD Turkey
TURKEY

Eunsung Kim
Seoul National University
SOUTH KOREA

Hyungkwan Kim
Purdue University
USA

Juhan Kim
Hanyang University
SOUTH KOREA

Paraskevas Kipouros
Univ of Surrey
UNITED KINGDOM

Alexandre Koberle
COPPE/UFRJ
BRAZIL

Arnaud Koehl
DGEC
FRANCE

Susanne Konrad
DENMARK

Fredrik Kopp
SCA Svenska Cellulosa AB
SWEDEN

Karen Krey
BFL Associates Ltd
USA

Douglas Kris
KLR Group
USA

Bengt Kristrom
Umea University
SWEDEN

Bojan Kumer
Elektro energija d.o.o.
SLOVENIA

Abdurrahman Kurucak
Energy Market Regulatory Authority
TURKEY

Evgenii Lebedev
GERMANY

Elvire Leblanc
CEA
FRANCE

Jaewoong Lee
Kaist College of Business
SOUTH KOREA

Jinhoa Lee
SOUTH KOREA

Chun Fun Jeffrey Leung
CLP Power HK Ltd
HONG KONG

Angele Lim
FRANCE

Johan Linnarsson
Sweco Energuide AB
SWEDEN

Manuella Lion
Univ Federal do Rio de Janeiro
BRAZIL

Diogo Lisbona Romeiro
UFRJ
BRAZIL

Yang Liu
CRU
UNITED KINGDOM

Rohan Ma
SolarCity
USA

Ann Maclachlan
Autre
FRANCE

Stella Ifeoma Madueme
University of Nigeria Nsukka
NIGERIA

Rico Maggi
Univ della Svizzera Italiana
SWITZERLAND

Olivier Maigrot
GDF Suez
FRANCE

Agnieszka Majewska
Certinergy
FRANCE

Maria Malmkvist
Energigas Sverige
SWEDEN

Shane Malone
Schlumberger Business Consulting
IRELAND

Christine Mansilla
CEA
FRANCE

Sabbioneda Massimo
Alpiq Energia Italia SpA
ITALY

Richard McBain
Partner Energy Ltd
UNITED KINGDOM

Scott McLachlan
Oxford Institute for Energy Studies
UNITED KINGDOM

David McLellan
Packers Plus Energy Serv Inc
USA

Shaun McRae
University of Michigan
USA

Maria Meneses
Dauphine
FRANCE

Claus Michelsen
GERMANY

Emmanuel Mignot
Areva
FRANCE

Bradford Mills
Virginia Tech
USA

Jianlei Mo
CHINA

Thomas Moebius
Brandenburg University of Tech
GERMANY

Seyed Mehdi Mohaghegh
UCL ISR
UNITED KINGDOM

Fabian Moisl
Vienna University of Technology
AUSTRIA

Christian Mollard
Enerdata
FRANCE

Ana Maria Montoya Gomez
ifo Institute
GERMANY

Christopher Morris
Baker Hughes
USA

Alessandra Motz
Univ della Svizzera Italiana
SWITZERLAND

Jean Marc Moulinier
FRANCE

Axella Moussanza Mboga
Univ de Mons
FRANCE

Theresa Mueller
TU Dresden
GERMANY

Isabelle Muller
UFIP
FRANCE

Giovanni Murano
Esso Italiana
ITALY

Elisabeth Murphy
Federal Energy Regulatory Comm
USA

Daniel Muwooya
Univ of Dundee
UNITED KINGDOM

Paul Nahmmacher
PIK Potsdam / TU Berlin
GERMANY

Ioana Neamtu
Aarhus University
DENMARK

Siu Lun Alan Ng
CLP Power HK Ltd
HONG KONG

Hui Ni
USA

Helena Nielsen
Vattenfall AB
SWEDEN

Casper Hvilsted Noergaard
SEAS NVE
DENMARK

Anna Nordling
AF Industry AB
SWEDEN

New Members (continued)

Ito Noriko
Dauphine
FRANCE

Fethi Nouri
TUNIS
TUNISIA

Ukadike Nwaobi
Univ College London
UNITED KINGDOM

Ifeanyichukwu Franklin Nworie
University of Portsmouth
UNITED KINGDOM

Kari Nyman
The World Bank
USA

Philipp Offenberg
EUCERS King's College London
GERMANY

Rosemary Okubaniyi
PPPRA
NIGERIA

Lanre Oladele
PPPRA
NIGERIA

Iyabo Olanrele
Nigerian Inst of Social and Econ Re
NIGERIA

Kabir Olanrewaju
Kobry Ventures
NIGERIA

Tiago Oliveira
University of Porto
PORTUGAL

Oyedeji Oluwasanmi
Federal Polytechnic
NIGERIA

Sermin Onaygil
Istanbul Technical University
TURKEY

Regina Osuagwu
Nigerian Electricity Regulatory Com
NIGERIA

Umit Ozden
Enerjico Enerji Solutions and Serv
TURKEY

Deniz Ozkan Ozaydin
Atlantic Grid Development LLC
USA

Tiziana Pagano
Technofi
FRANCE

Dejan Paravan
GEN-I, d.o.o.
SLOVENIA

Sungjun Park
Hanyang University
SOUTH KOREA

Saul Pedraza
Commission de Régulation de l'Energ
FRANCE

Sylvie Perrin
De Gaulle Fleuranc et Assoc
FRANCE

Lars Persson
Umea University
SWEDEN

Lea Petrac
Petrol
SLOVENIA

Zac Phillips
Oil & Gas Advisors
UNITED KINGDOM

Mathieu Piccin
EDF
FRANCE

Virgilijus Poderys
UAB "EPSO-G"
LITHUANIA

Jacques Portalier
PSA Peugeot Citroen
FRANCE

Eric Prentis
Univeresity of St. Thomas
USA

Steve Pye
Univ College London
UNITED KINGDOM

Frank Quante
Ewe Holding
TURKEY

Simon Quemin
Dauphine
FRANCE

Neil Raffan
University of NSW Australia
AUSTRALIA

Graziella Raqazzi
EDF
FRANCE

Bruno Ratouis
RTE
FRANCE

Tilmann Rave
ifo Institute
GERMANY

Noemie Rebiere
Univ Paris 8
FRANCE

Francesco Ricci
Univ de Montpellier
FRANCE

Iegor Riepin
Brandenburg Technical University
GERMANY

Niclas Ringblom
Nordea Bank kAB publ
SWEDEN

Cedric Ringenbach
TSP
FRANCE

Erik Rundell
Norwegian Petroleum Directorate
NORWAY

Lisa Ryan
Electricity Research Centre
IRELAND

Thomas Rzepczyk
GERMANY

Noha Saad Hussein
ISE
GERMANY

Ryosei Sai
Tohoku University
JAPAN

Pablo Salas
Univ of Cambridge
UNITED KINGDOM

Othman Salhi
Areva
FRANCE

Oguzhan Salihoglu
Ewe Holding
TURKEY

Maria Sandqvist
Teknikforetagen
SWEDEN

Maria Eugenia Sanin
FRANCE

Amanda Santos
UFRJ
BRAZIL

Hans Schermeyer
KIT
GERMANY

Helder Seabra Consoli
UFRJ
BRAZIL

Rolf Seifired
IzN
GERMANY

Paul Serrat
GDF Suez
FRANCE

Ed Sharp
UCL Energy Institute
UNITED KINGDOM

Mohammad Shirijian
Imam Sadiq University
IRAN

Lise Skovsgaard
DTU Management
DENMARK

Gorazd Skubin
Petrol d.d.
SLOVENIA

Alan Smith
Dept of Enterprise and Trade
UNITED KINGDOM

Kevin Snodgrass
DeGolyer and MacNaughton
USA

Marco Sonnberger
GERMANY

Fernando Soto Martos
AEGE
SPAIN

Nicolas Soulie
Autre
FRANCE

Tania Sousa
Instituto Superior Tecnico
PORTUGAL

Christian Spindler
University of Vienna
AUSTRIA

Daniel Spiro
NORWAY

Suchita Srinivasan
IHEID
SWITZERLAND

Martin Steurer
IER University of Stuttgart
GERMANY

David Stickelberger
Swissolar
SWITZERLAND

Brenda Sullivan
United Biscuits
UNITED KINGDOM

Fabien Supizet
Areva
FRANCE

Merve Suslukaya
Istanbul Technical University
TURKEY

Shinichi Takayama
JAPAN

Ebba Tamm
Svenska Petroleum & Bio Inst
SPBI
SWEDEN

Laniran Joseph Temitope
CPEEL
NIGERIA

Esin Tetik
Isik University
TURKEY

Jonathan Thurlwell
IPA Advisory
UNITED KINGDOM

Allan Loi Tian Sheng
Energy Studies Institute
SINGAPORE

Gerhard Toews
University of Oxford
UNITED KINGDOM

Jean Yves Touboulic
UFIP
FRANCE

Matthieu Tusseau
EDF R & D
FRANCE

Greg Upton
LSU Center for Energy Studies
USA

Anton Urankar
ELES, d.o.o.
SLOVENIA

Mallory Vachon
Syracuse University
USA

Anne Vadasz Nilsson
Energimarknadsinspektionen
SWEDEN

Marit Van Hout
ECN
NETHERLANDS

Daniela Varela
CEARE UBA
ARGENTINA

Eveline Maria Vasquez Arroyo
PPE-COPPE-UFRJ
BRAZIL

Vito Umberto Vavali
SIS Power Grid
ITALY

Mikel Vega Andres
Wind to Market Grupo CIMD
SPAIN

Thomas Veyrenc Personne
RTE
FRANCE

Bertrand Villeneuve
Univ Paris Dauphine
FRANCE

Monika Vitvarova
FME CTU in Prague
CZECH REPUBLIC

Stanislav Vojsk
SODO
SLOVENIA

Sophia Von Gehlen
GERMANY

Bertrand Walle
Borealis
FRANCE

Goetz Walter
Int'l School of Management
GERMANY

Can Wang
Tsinghua University
CHINA

Shun-Hao Wang
North China Electric Power Univ
CHINA

Adam Welch
APPEA
AUSTRALIA

Marijke Welisch
TU Vienna
AUSTRIA

Daniel White
Berkeley Research Group
USA

Mats Wielbass
Nordea Bank AB publ
SWEDEN

Niven Winchester
MIT
USA

John Wolfram
Catalyst Consulting LLC
USA

Oskar Wood Hansen
KU
DENMARK

Jules Wurlod
CIES Graduate Inst
SWITZERLAND

Burak Yitgin
Ozyegin University
TURKEY

young yoon
Hanyang University
SOUTH KOREA

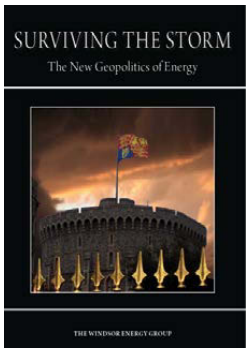
Damjan Zagozen
ACER
SLOVENIA

Christoph Zehetner
TU Wien
AUSTRIA

Meng-Feng Zeng
Inst of Nuclear Energy Research
TAIWAN

Lingdi Zhao
Ocean University of China
CHINA

Samo Zolger
GEN-I d.o.o.
SLOVENIA



SURVIVING THE STORM

The New Geopolitics of Energy

by The Windsor Energy Group

Medina Publishing

Hardback, £10

Failing to restore healthy investment to the energy sector and to preserve free trade are two of the biggest risks humans face today

Surviving the Storm is an analysis, undertaken by the Windsor Energy Group over the past 12 years, focusing on the availability of an ample global energy supply over the next 35 to 50 years. It charts a way through the storm but warns of the many political conflicts and economic obstacles looming.

With the effects of climate change and the growing damage to the Earth's atmosphere, catastrophe seems at first sight inevitable. The impact on international trade, economic growth and food supply could be critical. With a steadily rising global population and the ever-widening expectations of the billions who live in the non-OECD developing world, it is safe to assume that their global consumption of primary energy could come close to doubling within the coming years.

Where is all this energy going to be found? Alternative energy is struggling hard to hang on to its tiny share of the global energy mix. Scientific research shows the dire consequences of doing nothing and the pressing need to accelerate the pace of developing much more efficient and energy-saving technology.

The good news is that we have ample resources of oil, coal and gas to bridge the gap to these new technologies. However, we will have to maintain the current momentum of production of these fossil-based fuels and to invest heavily in expanding their capacity. The bad news is that we can only achieve this if we can simultaneously ensure that we can neutralise and curb their adverse impact on the atmosphere, agriculture, fisheries and urban air quality.

"If emissions continue to rise, we have only another 35 to 50 years or so to avoid catastrophic changes in climate such as the breaking down of the Gulf Stream and disruption of the monsoons, not to mention chaotic conditions for world agriculture."

Lord Oxburgh of Liverpool

"Our world is indeed being endangered and much harm being done to our environment and to future generations through the energy and failed climate policies that have been pursued."

Lord Howell of Guildford

"Diplomacy has a vital part to play in the process of survival"

HE Khaled Al-Duwaisan

"Investment in new energy projects has slowed up just as the need to accelerate has become urgent. The present structure of global coordination and surveillance is derelict. New thinking should include a Global Energy Bank."

Paul Tempest

"The outcome of the struggle against ISIS and the future of US-Iranian relations will have a major impact on medium- to long-term oil supply security."

Dr Herman Franssen

"The world risks conflict between the developing world already consuming 58% of global primary energy (and rising) and the few industrialised countries able to manipulate global supply and price to their own advantage."

Paul Tempest

"What is needed now is the declaration of a powerful climate initiative by Japan."

Professor Tatsuo Masuda

"...we in the British Isles are in energy chaos. None of our objectives will be reached. All are severely threatened."

Lord Howell of Guildford

OTHER POINTS: A strong Russia-Iran alliance, escalation of fighting in the Levant, Russia-China confrontation or economic collapses in Europe could shatter current long-term assumptions and seriously damage global energy markets.

Calendar

12-15 April 2015, ICEED's 42nd Annual International Energy Conference (by invitation) at Boulder, Colorado, USA. Contact: Dr. Dorothea El Mallakh, Director and Conference Co-Chair, ICEED, 850 Willowbrook Road, Boulder, CO, 80302, USA. Phone: 303-442-4014, Email: iceed@colorado.edu, URL: www.iceed.org,

13-15 April 2015, International SAP Conference for Utilities at CityCube Berlin, Messedamm 22, Berlin, 14055, Germany. Contact: Luba, Jersova, T.A. Cook Conferences, 4th Floor, Mclaren Building, 46 The Priory Queensway, Birmingham, B4 7LR, United Kingdom. Phone: +44 (0) 121 200 3810, Email: l.jersova@tacook.com, URL: http://atnd.it/17310-4,

14-16 April 2015, Argus European Biomass Trading 2015 at Hilton Park Lane, 22 Park Lane, London, W1K 1BE, United Kingdom. Contact: Laura, McAulay, Argus Media, Argus House, 175 St John Street , London, EC1V 4LW, United Kingdom. Phone: 02077804352, Email: laura.mcaulay@argusmedia.com, URL: http://atnd.it/17398-0,

14-16 April 2015, International SAP Conference for Oil and Gas at CityCube Berlin, Messedamm 22, Berlin 14055, Germany. Contact: Luba, Jersova, T.A. Cook Conferences, 0. Phone: +44 (0) 121 200 3810, Email: l.jersova@tacook.com, URL: http://atnd.it/17403-4,

14-15 April 2015, Social Media for Utilities - Atlanta at AGL Resources, 10 Peachtree Plaza Northeast, Atlanta, GA, 30309, United States. Contact: Gus Calabrese, Mr., Conferences Connect, USA. Phone: 610-325-4830, Email: gus@utilityevents.com, URL: http://atnd.it/21966-0,

15-17 April 2015, Master Class LNG Industry at Barcelona, Spain. Contact: Thiska Portena, Senior Course Manager, Energy Delta Institute, Netherlands. Phone: +31 (0) 88 1166827, Fax: +31 (0) 88 1166899, Email: portena@energydelta.nl, URL: http://www.energydelta.org/lng-course,

15-15 April 2015, Platts 4th Annual EU Biofuels Seminar at Hotel President Wilson, 47, Quai Wilson, Geneva 1211, Switzerland. Contact: Platts, Kingsman, Platts / Kingsman, United Kingdom. Phone: +44 (0) 20 7176 6300, Email: conf_registrations@platts.com, URL: http://atnd.it/20111-0,

16-17 April 2015, Social Media in the Utilities Sector at Holiday Inn Regents Park, Carburton Street, London, W1W 5EE, United Kingdom. Contact: Sarah, Watson, SMi Group Ltd, Harling House, 47-51 Great Suffolk Street, London, London, SE1 0BS, United Kingdom. Phone: +4402078276134, Email: swatson@smi-online.co.uk, URL: http://atnd.it/18520-1,

17-18 April 2015, International Conference on Global Challenges, Policy Framework & Sustainable Development For Mining Of Mineral And Fossil Ene at India. Contact: Department Of Mining Engineering, NITK, Surathkal, P.O. **Srinivasnagar, Mangalore, Surathkal, Karnataka, 575025, India**. Phone: +91-824-2474052, Fax: +91-824-2474033, Email: mininghod@gmail.com, URL: http://gcpf2015.com,

21-23 April 2015, Sustainability Live incorporating NEMEX and Energy Recovery at NEC Birmingham, Pendigo Way, Marston Green, Birmingham, West Midlands, B40 1NT, UK. Contact: Stacey Bird, Faversham House, 0. Phone: 013 4233 2093, Email: stacey.bird@fav-house.com, URL: http://atnd.it/18787-0,

21-22 April 2015, Solar & Off-Grid Renewables West Africa at Movenpick Ambassador Hotel, Independence Avenue, Accra, Ghana. Contact: James, Wight, Solar Media, 5 Prescot Street, London, E1 8PA, United Kingdom. Phone: +44 (0) 207 871 0122, Email: jwight@solarmedia.co.uk, URL: http://atnd.it/20545-0,

21-23 April 2015, Utility Week Live incorporating IWEX at NEC Birmingham, Pendigo Way, Marston Green, Birmingham, B40 1NT, United Kingdom. Contact: Stacey Bird, Faversham House, Windsor Court Wood Street, East Grinstead, RH19 1UZ, United Kingdom. Phone: 01342332093, Email: stacey.bird@fav-house.com, URL: http://atnd.it/21111-1,

21-21 April 2015, Gas and Mining Law Mozambique - Market Briefing (Maputo) at Radisson Blu, 141 Avenida Marginal, Maputo 1100, Mozambique. Contact: Christina, Lopez, African Influence Exchange, South Africa. Phone: +27817770028, Email: enquiries@africaninfex.com, URL: http://atnd.it/21377-0,

21-22 April 2015, Onshore Gas Africa Conference at Radissson Blu Gautrain Hotel, Corner West Street & Rivonia Rd, Sandton, 2196, South Africa. Contact: Informa Australia, Informa Australia, 18/347 Kent Street, Sydney, 2000, Australia. Email: info@informa.com.au, URL: http://atnd.it/20438-0,

22-23 April 2015, CWC Ghana Oil & Gas Summit & Exhibition at Accra International Conference Centre, Castle Road, Accra, 00233, Ghana. Contact: Roshan, Jan-Mahomed, The CWC Group, Regent House, Oyster Wharf, 16-18 Lombard Road, London, SW11 3RB, United Kingdom. Phone: 44 20 7978 0018, Email: rjanmahomed@thecwcgroup.com, URL: http://atnd.it/22145-1,

22-24 April 2015, CWC China LNG International Summit at TBC, Beijing, 1000, China. Contact: Roshan Jan-Mahomed, Mr., The CWC Group, 0. Phone: 44 20 7978 0018, Email: rjanmahomed@thecwcgroup.com, URL: http://atnd.it/22124-0,

22-24 April 2015, Economics of Petroleum Refining at Golden, Colorado, USA. Contact: Dave Geddes, Professional Refining Consultant, Colorado School of Mines, 1600 Jackson St., Ste. 160, Golden, CO, 80401, USA. Email: davegeddes@comcast.net, URL: http://www.csmspace.com/events/petrolrefecon/,

22-24 April 2015, 11th China International Exhibition of Nuclear Power Industry 2015 at Beijing, China. Contact: Conference Coordinator, Coastal International Exhibition Co Ltd, Rm B 16/F Times Tower, 391-407 Jaffe Road, Hong Kong, Hong Kong. Phone: (852) 2827 6766, Email: general@coastal.com.hk, URL: www.coastal.com.hk,

23-24 April 2015, Argus LPG Moscow 2015 at Swissotel Krasnye Holmy Moscow, Kosmodamianskaya nab., 52 bld. 6, Moscow, 115054, Russia. Contact: Valentin, Kin, Argus Media, Russian Federation. Phone: +7(495)9337571, Email: valentin.kin@argusmedia.com, URL: http://atnd.it/19165-0,

27-28 April 2015, 1st International Forum Somalia Oil, Gas & Mining at TBC, TBC, London, EC4A 3EB, United Kingdom. Contact: Catherine, Dicker, The Energy Exchange, London, London, United Kingdom. Phone: +44 (0) 207 384 8015, Email: c.dicker@theenergyexchange.co.uk, URL: http://atnd.it/20248-0,

27-29 April 2015, SPE Petrophysical Challenges in Reservoir Life Management at SOFITEL Dubai Downtown, Sheikh Zayed Road, Downtown Dubai, Dubai, United Arab Emirates. Contact: Miyadeh Al Ramathany, Society of Petroleum Engineers, 222 Palisades Creek Drive, Richardson, Texas, 75080, USA. Phone: 97144575866, Email: mramathany@spe.org, URL: http://atnd.it/21013-0,

27-28 April 2015, Global Water Summit- The Water Value Revolution at The InterContinental Hotel Athenaeum Athens, Syngrou Avenue 89-93, Athens, 11745, Greece. Contact: Edyta Bednorz, Global Water Intelligence, 0. Phone: 018 6520 4208, Email: eb@globalwaterintel.com, URL: http://atnd.it/17404-0,

27-28 April 2015, 1st International Forum Somalia Oil, Gas and Mining at Grange City Hotel, 8-14 Cooper's Row, London EC3N 2BQ, United Kingdom. Contact: Catherine, Dicker, The Energy Exchange, United Kingdom. Phone: +44 (0) 207 384 8015, Email: c.dicker@theenergyexchange.co.uk, URL: http://atnd.it/20248-0,

27-28 April 2015, 1st International Forum Somalia Oil, Gas and Mining at GRANGE TOWER BRIDGE HOTEL, 45 Prescot Street, London, London E1 8GP, United Kingdom. Contact: Catherine, Dicker, The Energy Exchange, United Kingdom. Phone: +44 (0) 207 384 8015, Email: c.dicker@theenergyexchange.co.uk, URL: http://atnd.it/20248-0,

28-30 April 2015, Small-Mid Scale LNG 2015 at Crown Plaza Amsterdam, George Gershwinlaan 101, Amsterdam, 1082MT, Netherlands. Contact: Jane, Cook, IQPC, 129 Wilton Road, London, SW1V 1JZ, United Kingdom. Phone: +44 (0) 207 368 9300, Email: jane.cook@iqpc.co.uk, URL: http://atnd.it/22064-0,

28-29 April 2015, Platts 6th Annual European Power Summit at The Tower Hotel, St Katharine's Way, London, E1W 1LD, United Kingdom. Contact: Platts, Platts, United Kingdom. Phone: 020 7176 6300, Email: conf_registrations@platts.com, URL: http://atnd.it/20113-0,

28-30 April 2015, Transport and Installation for Offshore Wind at Swissôtel Bremen, Hillmannplatz 20, Bremen 28195, Germany. Contact: IQPC, Germany, IQPC Germany, Germany. Phone: 0049 30 20913 274, Email: eq@iqpc.de, URL: http://atnd.it/19313-0,

28-30 April 2015, Large-Scale Solar UK at Thistle Bristol City Centre, The Grand, Broad Street, Bristol, BS1 2EL, UK. Contact: Jason Andrews, Solar Media Limited, 0. Phone: 020 7871 0123, Email: jandrews@solarmedia.co.uk, URL: http://atnd.it/18434-0,

28-30 April 2015, 5th Colombia Oil and Gas Conference and Exhibition at Centro de Convenciones Cartagena de Indias, Centro Historico, Getsemaní, Cartagena, Colombia. Contact: Catalina Zuliani, The CWC Group, Centro de Convenciones Cartagena de Indias, Centro Historico, Getsemaní, Cartagena, Colombia. Phone: +44 207 978 0000, Email: czuliani@thecwcgroup.com, URL: http://atnd.it/21656-0,

28-30 April 2015, Corrosion Protection for Offshore Wind at Swissôtel Bremen, Hillmannplatz 20, Bremen, 28195, Germany. Contact: IQPC, Germany, IQPC Germany, Friedrichstrasse 94, Berlin, 10117, Germany. Phone: 049 30 20913 274, Email: eq@iqpc.de, URL: http://atnd.it/19308-0,

29-30 April 2015, M2M for Oil and Gas at The Marriott Hotel, Regents Park, 128 King Henry's Road, London, NW3 3ST, UK. Contact: Julia Rotar, SMi Group Ltd, 0. Email: jrotar@smi-online.co.uk, URL: http://atnd.it/17949-1,

29-30 April 2015, Smart Water Systems at Marriott Regents Park Hotel, 128 King Henry's Road, London, NW3 3ST, United Kingdom. Contact: Teri Arri, SMi Group, 0. Email: tarri@smi-online.co.uk, URL: http://atnd.it/19845-0,

April 30 - May 01 2015, Australian Coal Conference at Sydney Harbour Marriott, 30 Pitt Street, Sydney NSW, 2000, Australia. Contact: Informa Australia, Informa Australia, 0. Phone: +61 2 9080 4300, Email: info@informa.com.au, URL: http://atnd.it/20446-0,

April 30 - May 01 2015, Computer Simulation of Gas Turbines at Best Western Village Park Inn, 1804 Crowchild Trail NW, Calgary, AB T2M 3Y7, Canada. Contact: 001(888) 384 4863, Canada. Email: tbenner@gic-edu.com, URL: http://atnd.it/19081-2,

04-06 May 2015, MCE Saudi 2015 at Riyadh International Convention and Exhibition Center, King Abdullah bin Abdul Aziz Road, Al Waha district, Riyadh, Saudi Arabia. Contact: Olga Mamizheva, Reed Sunaidi Exhibitions, 0. Phone: +971 2 491 7615, Email: olga.mamizheva@reedexpo.ae, URL: http://atnd.it/16288-1,

06-07 May 2015, 1st International Conference Anti-icing for Wind Turbines at Grand Elysée Hotel, Germany. Contact: IQPc Germany, Germany, IQPc Germany, Rothenbaumchaussee 10, Hamburg, Hamburg, 20148, Germany. Phone: +49(0)3020913388, Email: eq@iqpc.de, URL: http://atnd.it/21224-0,

10-12 May 2015, 2015 Abu Dhabi International Downstream Conference & Exhibtion at Rosewood Hotel, Al Maryah Island, Abu Dhabi, United Arab Emirates. Contact: Mrs., Lisa Meli, World Refining Association, United Arab Emirates. Phone: +971 4 4 435 6101, Email: lisa.meli@clarionevents.me, URL: http://atnd.it/21778-0,

10-14 May 2015, SASEC 2015: 3RD Southern African Solar Energy Conference at Skukua Camp, Kruger National Park, Skukuza, South Africa. Contact: Mrs., Tersia Tegmann, Prof Josua Meyer, University of Pretoria, South Africa. Phone: +27 11 468 1580, Email: tersiat@ie.co.za, URL: http://atnd.it/21686-0,

11-12 May 2015, Collections and Hardship Programs in Utilities at Rydges Melbourne, 186 Exhibition Street, Melbourne VIC, 3000, Australia. Contact: Informa, Australia, Informa Australia, 18/347 Kent Street, Sydney, NSW, 2000, Australia. Email: info@informa.com.au, URL: http://atnd.it/20442-0,

11-13 May 2015, Argus Rio Oil Conference 2015 at Sofitel Rio de Janeiro Copacabana, Avenida Atlântica, 4240, Copacabana, Rio de Janeiro, CEP 22070-00, Brazil. Contact: Umer Qureshi, Mr., Argus Media, 0. Phone: + 1 713 400 7827, Email: umer.qureshi@argusmedia.com, URL: http://atnd.it/21339-0,

11-15 May 2015, Economic Evaluation & Investment Decision Methods at Golden, Colorado, USA. Contact: John Stermole, President, Investment Evaluations Corporation, 3070 S Newcombe Way, Lakewood, CO, 80227, USA. Email: jstermole@me.com, URL: http://www.csmspace.com/events/econeval/,

12-13 May 2015, Argus Africa Base Oils and Lubricants at Nairobi, TBC, Nairobi, Kenya. Contact: Melissa, Wong, Argus Media, 175 St John Street, London, EC1V 4LW, United Kingdom. Phone: +44 (0) 20 7199 4341, Email: baseoilconf@argusmedia.com, URL: http://atnd.it/20424-0,

12-15 May 2015, CWC World LNG Series: Americas Summit at Four Seasons Hotel Austin, 98 San Jacinto Boulevard, Austin, Texas, 78701, USA. Contact: Roshan Jan-Mahomed, 0. Phone: 44 20 7978 0018, Email: rjanmahomed@thecwcgroup.com, URL: http://atnd.it/22133-2,

14-15 May 2015, Energy for Sustainability 2015 at Coimbra, Portugal. Contact: António Gomes Martins, Professor, University of Coimbra, Coimbra, Portugal. Email: EFS2015@uc.pt, URL: http://efs2015.uc.pt/index.php?module=sec&id=283&f=1,

14-14 May 2015, FT Energy Strategies Summit 2015 at TBD, New York City, 10013, United States. Contact: Nicole Rene Bullock, Mr, FT Live, 0. Phone: 1 917 551 5104, Email: nicole-rene.bullock@ft.com, URL: http://atnd.it/17211-0,

18-22 May 2015, International Gas Value Chain Course at Amsterdam, The Netherlands. Contact: Boryana de Haan, Senior Course Manager, Energy Delta Institute, 0. Phone: +31 (0) 88 1166834, Fax: +31 (0) 88 1166899, Email: dehaan@energydelta.nl, URL: http://www.energydelta.org/gas-value-chain-course,

IAEE INTERNATIONAL ASSOCIATION for ENERGY ECONOMICS
WWW.IAEE.ORG

IAEE ENERGY FORUM
Volume 24, Second Quarter, 2015

The *IAEE Energy Forum* is published quarterly in February, May, August and November, by the Energy Economics Education Foundation for the IAEE membership. Items for publication and editorial inquiries should be addressed to the Editor at 28790 Chagrin Boulevard, Suite 350, Cleveland, OH 44122 USA. Phone: 216-464-5365; Fax: 216-464-2737. Deadline for copy is the 1st of March, June, September and December. The Association assumes no responsibility for the content of articles contained herein. Articles represent the views of authors and not necessarily those of the Association.

Advertisements: The *IAEE Energy Forum*, which is received quarterly by over 4100 energy practitioners, accepts advertisements. For information regarding rates, design and deadlines, contact the IAEE Headquarters at the address below.

Membership and Subscription Matters: Contact the International Association for Energy Economics, 28790 Chagrin Boulevard, Suite 350, Cleveland, OH 44122, USA. Telephone: 216-464-5365; Fax: 216-464-2737; e-mail: IAEE@IAEE.org; Homepage: http://www.iaee@iaee.org

IAEE Energy Forum
Energy Economics Education Foundation, Inc.
28790 Chagrin Boulevard, Suite 350
Cleveland, OH 44122 USA

PRSRT STD
U.S. POSTAGE
PAID
Hanover, PA
Permit No. 4