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The Korea Energy Economics Institute (KEEI) and the Energy Research Institute (ERI) of China jointly organized a workshop named “Energy Security and Overseas Investment and Green Energy Development,” which was conducted on November 25-26, 2009, at the Coex Intercontinental Hotel, Seoul, Korea.

The KEEI-ERI Joint Workshop was conducted under a performance agreement concluded between Korea and China in 2002; it has been conducted alternately in Korea and China since 2007, and the third meeting of this series was conducted in 2009.

The workshop aimed to exchange information and opinions regarding energy policy changes and the promotion of joint projects between Korea and China and to build the foundation of a close partnership by organizing regular workshops.

At the inaugural session, Dr. Ki-Yual Bang, the president of the KEEI, made the opening remarks, and Prof. Han Wenke, Director General of the ERI, offered his congratulations to all the participants.

The program comprised three sessions. The first session addressed “Energy Security and Overseas investment” and was organized by the chair of this session, Dr. Jin-Woo Kim of the KEEI.

Dr. Gao Shixian of the ERI made a presentation on “China’s Energy Security Policy for Overseas Oil & Gas Development” under the theme “Overseas Oil & Gas Development,” and Dr. Yongduk Pak of the KEEI made a presentation on the “Strategies and Policies in the Overseas Oil and Gas E&P of Korea.” Dr. Jiang Xinmin of the ERI made a presentation on “The Recent Expansion of Oil Refinery Facilities in China” under the theme “Petroleum Products Market,” and Dr. Kim Hyung-Gun of the KEEI made a presentation on “The Oil Industry of Korea.”

The second session organized by the chair, Dr. Yu Cong of the ERI, dealt with “Green Energy Development.” Dr. Zhang Yousheng of the ERI made a presentation on “China’s Coalbed Methane Development and Utilization,” while Dr. Ahn, Dal-Hong of KEPCO KEPRI (Korea Electric Power Corporation, Korea Electric Power Research Institute) made a presentation titled “Introduction to Korea IGCC Development Program” under the theme “Clean Coal Technology.” Dr. Feng Shengbo of the ERI presented a paper on “China’s CDM Policy and Progress,” and Dr. Hwang In-Chul, of KEMCO (Korea Energy Management Corporation) presented a paper on “CDM Implementation in Korea.”

The last session involved a round-table discussion organized by Dr. Nam-Yll Kim of the KEEI and Dr. Gao Sixian of the ERI. All the participants interacted enthusiastically on the subject of effective regional energy cooperation and opportunities and visions for effective energy cooperation between Korea and China.
The KEEI hosted the Second Expert Workshop for the WG-EPP Joint Study and the Third Meeting of the Ad-hoc Task Force for Development of the Five Year Strategy on November 26-27 at the Lotte Hotel in Seoul, Korea.

The Second Expert Workshop for the WG-EPP Joint Study

The Second Expert Workshop for the WG-EPP Joint Study was conducted on November 26 under the theme “Energy Production Potential and Development Plans in Northeast Asia, Phase II.” Approximately 20 participants, including officials from the Russian Government and the ESI (Energy Systems Institute), the ERI of China, the Mongolian Government and the EA (Energy Authority), the UN/ESCAP, and the KEEI members participated in the workshop.

The KEEI was designated a Nodal Institution for the 2009-2010 Working Group on Energy Planning and Policy (WG-EPP) on Feb 2009 in Jeju Island, Korea. This conference was organized to inspect the progress of the 2009-2010 joint research project on “Northeast Asia Energy Production Potential and Development Planning” and interim findings of each country and to conduct a debate on related matters. Furthermore, Dr. Sokolov of the ESI, Dr. Chimeddorj of the EA, Dr. Gao and Dr. Jiang of the ERI, and Nam-Yll Kim and Dr. Ji Chul Ryu of the KEEI discussed on the oil fields of China, Korea, Mongol, and Russia, and they concluded that each of these countries would express their positions on the Development of the Five Year Strategy of Northeast Asian Energy Intergovernmental Alliance.

Third Meeting of the Ad-hoc Task Force for the Development of the Five Year Strategy

The Third Meeting of the Ad-hoc Task Force for the Development of the Five Year Strategy was held on November 27 in Seoul, Korea. The KEEI was designated a Nodal Institution of Ad-hoc Task Force on June 2009 in Bangkok, Thailand (at the seventh meeting of the Working Group on Energy Planning and Policy). This meeting was conducted to evaluate activities over the past three years and reset the future direction of operations.

This meeting was attended by Dr. Aliev of the Ministry of Energy and Dr. Sokolov of the ESI from Russia, Dr. Chimeddorj of the EA from Mongol, Mr. Gao of the ERI from China, Dr. Maritess Cabrera from UNESCAP, and six members of the KEEI, including Jin-Woo Kim, Nam-Yll Kim and Ji-Chul Ryu.

Presentation Detailing the Results of the 2009 Northeast Asia Energy Cooperation Research Projects

A presentation on the results of the 2009 Northeast Asia Energy Cooperation Research Projects was made on December 22, 2009, at the Coex Intercontinental Hotel in Seoul, Korea. The presentation detailed the final results of 16 research projects undertaken
in 2009. Over 30 people attended this presentation and provided valuable comments. The 16 research projects were as follows:

- Study on the changes in the oil distribution market in Japan
- Study on energy conservation policies of major northeast Asian countries
- Study on energy welfare policies of the major northeast Asian countries
- Study on the economic cooperation strategy of South Korea and North Korea through the energy system link of northeast Asia
- Analysis of the long-term energy plan of northeast Asia
- Study on the economic and social development strategies of Turkmenistan and the energy resource development cooperation between Korea and Turkmenistan
- Study on the green energy markets of northeast Asia and international cooperation situation and prospect
- Analysis of energy markets in northeast Asia; energy taxes and prices
- Study on securing the stability of the supply of natural gas in Russia
- Study on the energy-related R&D situation of China and the cooperative measures undertaken by Korea and China
- Study on the cooperative measures applied to uranium resource development in northeast Asia
- Analysis of the energy export structure and transportation system of Russia
- Study on the revitalization of Korea-Mongol energy cooperation: energy development infrastructure
- Study on making inroads into the Uzbek electricity market
- Study on the Local Distributed Power Demand Survey and Resources Cooperative Plan Research in Kazakhstan
- Study on the effect of changes in the investment conditions of Russian energy companies on Korea-Russia energy cooperation

In addition, the international expert of the KEEI, Dmitry Sokolov, presented a paper titled “Potentialities and Problems of Increasing Russian Coal Supplies to markets of APR Countries.”

KEEI-IOG Joint Workshop

The KEEI-IOG (Institute of Oil and Gas) Joint Workshop was conducted on December 4 in Vladivostok, Russia. Dr. Eyu-Seok Yang and Dr. Sung-Kyu Lee of KEEI participated in the conference as speakers. The session began with opening remarks presented by Dr. Alexander Gulkov, the Director of the IOG, followed by a congratulatory address to all the participants by Dr. Jin-Woo Kim, Managing Director of the KEEI. The conference comprised two sessions—presentations and a round-table discussion. In the first session, Dr. Eyu-Seok Yang made a presentation on “The Oil Industry of Korea,” which was followed by a presentation by Dr. Sung-Kyu Lee on “Promotion Status of Energy Cooperation Projects after the 2008-Moscow Summit Meeting between Korea and Russia.” Later, Dr. Alexander Gulkov presented a paper on “The Development of the Oil and Gas Industry of the Far East of Russia.” Thereafter, at the round table discussion session, all participants had a heated debate on issues related to the presentation.

The KEEI and IOG concluded an agreement for the implementation of the 2009 joint research project. The subject of their joint study was “Contents and Promotion Status of Ongoing and Planned Energy Projects in the Far East Region of Russia.”
Briefs on Northeast Asia

New energy to become focus of China’s strategic emerging industries

Departments including the Ministry of Industry and Information Technology (MIIT), the National Development and Reform Commission (NDRC) and the Ministry of Finance jointly formed a coordination group before the Spring Festival. In a group meeting, it was clearly pointed out that China would constitute strategic emerging industries to develop the “12th Five-Year Plan.” The meeting also decided that it would establish a research and coordination department for accelerating the development of strategic emerging industries to coordinate development research ideas and to deal with important issues of constitution work as a whole. The department will consist of the heads of 20 organizations, and Zhang Ping, the director of the NDRC, will be the department leader. The coordination group will make important arrangements such as the main targets and tasks, the key development areas, the main development direction and the industrial geographical distribution of China’s strategic emerging industries.

Reporters learned that of the 7 emerging high-tech realms brought forward by relevant governmental departments in November 2009 including the information industry and biotechnology, the new energy realm will most likely become the main development direction and obtain more policy support.

Up until now, China has established 3 important standards to select strategic emerging industries. First, it must have steady and promising market demand. Second, it must have excellent economic and technological effects and third, it must be able to promote a group of other industries. Compared to other technological realms, the new energy realm is most suited to the standards.

An official from the MIIT said that developing new energy is quite identical to China’s idea of developing a low-carbon economy. “After the Copenhagen Conference, the MIIT has put the low-carbon economy’s development in a more important position.” (People’s Daily Online, 2.23)

Russia threatens BP Kovyskta assets

Russia’s Natural Environment Inspectorate, RosPrirodNadzor, has recommended that BP’s joint venture in Russia, TNK-BP, be stripped of the giant Kovyskta natural gas project in eastern Siberia. Located in eastern Siberia’s Irkutsk oblast, the Kovyskta field holds an estimated 2 trillion cubic meters of gas. RUSIA Petroleum is the license-holding company (technically the “mineral resource user”) in the Kovyskta project. TNK-BP owns a 63% stake in it. TNK-BP is a parity joint venture of British company BP with the Russian TNK (formerly Tyumen Neftegaz company), which is currently controlled by four Russian billionaire tycoons. The Kremlin seems to be moving rapidly to tighten the noose around TNK-BP’s asset, using the state’s regulatory apparatus to threaten with revocation of the license. In recent weeks, RosPrirodNadzor has stepped up its inspection of the project. It claims to have found “continuing violations” of license terms, with field development “persistently lagging”.

Officially, the decision regarding the license is mainly up to Russia’s Mineral Resources Oversight Service (RosNedra). In practice, there is little doubt that the decision will be a...
political one, ultimately to be made at the top of the government and in the Kremlin. State oil company Rosneft has apparently developed ambitions to enter the natural gas business through a major project. Rosneft’s subsidiary, Rosneftegaz, is expected to bid for a controlling stake in Kovykta.

On February 4, Aleksei Miller, chief executive of gas monopoly Gazprom, announced that the company does not need to include Kovykta’s gas resources in Gazprom’s export programs for China or other countries in the East Asia-Pacific region. On the following day, the natural resources ministry (to which RosPrirodNadzor is a subordinate agency) announced an “extraordinary” round of inspection of the Kovykta project. On February 12, Natural Resources Minister Yuri Trutnov warned that a decision to revoke the license might ensue within several weeks. In that case, the Kovykta field would be transferred into the legal category of “unallocated mineral reserves” (unlicensed fields).

The dispute dates to 2006-2007, although it lay dormant since. RUSIA Petroleum was planned to have supplied 9 billion cubic meters (bcm) per year from 2006 onward for the needs of Irkutsk oblast. However, that amount far exceeds the level of demand in Irkutsk oblast, and a local distribution infrastructure would first have to be created. Project shareholders had considered exporting the gas to China. However, the idea was thwarted by the lack, or denial of access to Gazprom’s export pipelines.

RosNedra threatened to revoke the license in 2007 on the pretext that field development was lagging behind schedule and gas production was below the levels stipulated in the license and the contract. Under pressure, TNK-BP agreed to sell its Kovykta stake to Gazprom for a sum in the range of US$700 million to $900 million, with an option to retain or regain a minority stake, subject to further negotiations. At that stage, Gazprom was trying to pressure BP into ceding a stake in BP’s liquefied natural gas (LNG) project on Trinidad and Tobago. That project supplies the US market, which Gazprom was trying to enter.

The resolution was deferred in 2007-2008 by the Russian stakeholders’ conflict with BP. Thanks to the Russian authorities’ strong-arm measures, the TNK side evicted the joint venture’s chief executive, Charles Dudley (an American citizen) from Russia in 2008, and forced changes on the joint venture’s board in favor of the Russian side. Gazprom employee Gerhard Schroeder (formerly the German chancellor) was foisted on TNK-BP’s board as an “independent” member. No sooner was the board coup accomplished than the financial crisis hit, further postponing a resolution of the Kovykta dispute.

At this stage, license revocation threatens not only BP, but also the Russian tycoon owners of TNK: an offer that TNK-BP cannot refuse. Apparently, Russian authorities are about to give all concerned an option to avoid license revocation and investment forfeiture, if they agree to sell the project to Rosneftegaz, or possibly another Russian company. Gazprom may well also be waiting in the wings, its disclaimer notwithstanding.

This time, however, Kovykta stakeholders might try to avail themselves of the Energy Charter Treaty’s provisions on the protection of foreign investment. In a potentially landmark case in December 2009, the Permanent Arbitration Court in The Hague ruled that Russia is bound by the Energy Charter Treaty’s provisions from the moment of Russia’s signature in 1994.

Under the terms of that signature, the treaty took legal effect in Russia through provisional application, ahead of its ratification and irrespective of it. In August 2009, Russia served notice that it would not ratify the Treaty
and that it was not bound by it. The court in the Hague, however, ruled the opposite, in a case brought to the court by the shareholders of the expropriated Yukos company. This means that foreign investments made in Russia after 1994 are covered by the treaty’s protection, apparently for the 20-year period stipulated at that time. This in turn opens the way for investors to seek international arbitration of their disputes with the Russian authorities in energy projects.

(Asia Times, 2.24)

**Russian watchdog may revoke TNK-BP’s Kovykta gas field license**

Russia’s environmental regulator said on Wednesday that the Russian-British joint oil venture TNK-BP may lose its license to develop a huge gas field in Siberia over a failure to comply with the terms of the agreement.

Rosprirodnadzor has completed an unscheduled audit of TNK-BP’s operations at the Kovykta gas condensate field, with estimated reserves of over 2 trillion cubic meters of natural gas, and will recommend that the Natural Resources Ministry revoke the license, the watchdog said.

It was earlier reported that a decision on the revoking of the license for the gas field, which also contains 2.3 billion cubic meters of helium and 115 million metric tons of gas condensate, could be made before March 1, 2010. The gas field is located in East Siberia’s Irkutsk Region.

Under the terms of the license agreement, TNK-BP, a highly lucrative 50-50 joint venture between the British major BP and four Russian billionaires, is required to produce 9 billion cubic meters of gas annually in contrast to its actual output of several dozen million cubic meters.

Russia’s Natural Resources Ministry carried out a check of the joint venture’s compliance with the license agreement in 2007 and gave RUSIA Petroleum, the Kovykta operator owned by TNK-BP, twelve months to bring up output to the level stipulated in the agreement.

Natural Resources Minister Yury Trutnev earlier announced, however, that “the license agreements were not fulfilled in the past and are not being fulfilled at present.”

Last week, Viktor Vekselberg, one of the four Russian partners in the joint venture with BP, said there were difficulties with the implementation of the Kovykta project, adding that an unscheduled check by the regulator was damaging the investment environment in the country and would not contribute to efforts to resolve the problem.

The regulator’s plans to revoke the license may be linked to an unsettled deal between energy giant Gazprom and TNK-BP on the gas field.

Under an agreement signed in 2007, Gazprom intended to buy a 62.8% stake in RUSIA Petroleum to take over the Kovykta gas field. The deal, however, has not been closed as Gazprom was reported in December 2008 to have asked TNK-BP to reduce the price for the purchase of the Kovykta field, originally estimated at $700-900 million.

(RIANOVOSti, 2.17)
China-Central Asian Gas Pipeline: Success and Pitfalls

Under a 2007 accord, Turkmenistan agreed to export 30 billion cubic meters (BCM) of natural gas to China annually for the next 30 years. The deal, the first PSA onshore granted to any foreign country in Turkmenistan, allows CNPC develop natural gas fields in the Bagtyiarlyk area on the Amu Darya Right Bank in Turkmenistan. The output of natural gas from Bagtyiarlyk would amount to 5 BCM by next year. A natural gas pipeline linking Turkmenistan and China’s Xinjiang Uygur autonomous region started operations earlier this month as part of the agreement. The project is expected to boost China’s efforts to increase the use of natural gas to 5 percent of its total energy consumption in 2010, according to analysts.

To secure further gas resources, CNPC and companies from South Korea and the United Arab Emirates (UAE) have won contracts worth $9.7 billion to develop a large natural gas field in Turkmenistan. The consortium, comprising of CNPC, South Korea’s LG International Corp and Hyundai Engineering Co, and the UAE’s Gulf Oil & Gas FZE and Petrofac International Corp, will jointly develop the South Yolotan gas field, considered to be one of the biggest five natural gas deposits in the world. According to some estimates, it may hold approximately 6 trillion cubic meters (TCM) of gas. The integrated gas exploration and production in Turkmenistan and cross border transportation through Uzbekistan and Kazakhstan into China is not merely a commercial partnership, it also creates a political alliance between the four countries based on such a single energy cooperation arrangement. It fosters systematic and broader cooperation. Unfortunately, there are no inter-governmental contractual framework designed to govern the cross border transportation system as BOODC International advised. Taking account of the complicated relations between these Central Asian states, CNPC was advised to ink bilateral governmental agreements with each of these Central Asian nations and form joint ventures with individual country separately. However, the legal regime may be vulnerable to deal with possible disruption of supply, disputes or other conflicts that may occur in the future. We are invited to work out a proposal to assess these issues from the lens of various stakeholders. (Financial Times, 2.13)

Mongolian Prime Minister: Dual Listings to Take Time

Initial public offerings of Mongolia’s state-owned mineral assets could take more time, as the government works on upgrading the stock exchange to facilitate dual listings, Mongolian Prime Minister Sukhbaatar Batbold said Tuesday. “We’d prefer to list [companies] in Mongolia first, but it may take more time than we expected to list on the local exchange because things are not running properly in terms of infrastructure and management and real time functions. It’s getting there but needs more improvements,” Mr. Batbold said in an interview.

Mr. Batbold would like to see dual listings of Mongolian assets with companies simultaneously offering shares on global exchanges such as Hong Kong, London or New York as well as on the Mongolian Stock Exchange. State-owned companies lined up for listing include Erdenes MGL LLC, which owns licenses for the Tavan Tolgoi coal mine as well as other mineral deposits, Erdenet Mining Corporation and national carrier...
Mongolian Airlines, also known as MIAT. In addition to preparing the assets for dual listings, the government is working on hiring a team of new managers with international experience for the exchange later this year, he said. Among the issues that need to be addressed is establishing regulatory and accounting standards that are in line with international standards.

The prime minister said he would also like to see foreign companies that hold Mongolian assets and are listed abroad to list a 10% stake on the local exchange.

Companies with Mongolian assets that are listed on overseas stock exchanges include coal producer SouthGobi Energy Resources Ltd., which listed on the Hong Kong Stock Exchange just last week, as well as Mongolia Energy Corp. Ltd. also listed in Hong Kong.

Development of Mongolia’s nascent stock exchange is one of the challenges facing the poor nation as it tries to capitalize on its natural resources to bring wealth into its population of 2.7 million.

Mongolia’s stock exchange was established in 1991 when the Securities Committee was set up with the goal of privatizing more than 400 major state companies. But since then, the stock exchange and securities market have failed to drive Mongolia’s economy.

“There’s a big discrepancy between the Mongolian stock exchange, which lists about 200 companies with a total market capitalization of about US$450 million and companies that list abroad,” said Alisher Ali Sjumanov, chief executive officer of Eurasia Capital.

“Even if just a few companies [of those listed abroad] list, this will be a big boost to local capital,” he said.

(The Wall Street Journal, 2.09)

Alaska sees China as energy partner

China has a role to play in the Alaskan plans to develop its oil and natural gas ambitions, said Alaskan Lt. Gov. Craig Campbell.

Alaska’s Republican Gov. Sean Parnell said he would invite Chinese investors to the state following a trip to the region by Campbell in December.

Parnell in his January state of the state address said “gushers” in the Prudhoe Bay and Point Thomson regions of the North Slope require an ambitious effort to exploit.

The plans come as international exploration companies said they could slow efforts in Alaska and look for economic benefits elsewhere.

“As North Slope oil production continues to decline, we must work diligently to find additional economic development opportunities,” said Campbell in a statement from his office. “Now is the time to significantly increase our marketing efforts in Asia.”

Alaska needs investors to back its plans to build a gas pipeline in the state to market the gas potential in the North Slope.

TransCanada and Denali, a joint venture between BP and ConocoPhillips, are competing to develop a natural gas pipeline from the Alaskan North Slope to the Lower 48 states.

“Alaska could become a significant partner with China in the development of value-added products from our natural gas resources, produced here in Alaska,” said Campbell.

Exxon Mobil said developing Point Thomson gas fields in Alaska’s North Slope would push developments of the pipeline.

(UPI, 2.15)
At present, we are witnessing the formation of a new era of civilization. It is a result of the latest scientific advances that people living on planet Earth today are in a position to create a comfortable environment for themselves. There are, however, major systemic problems that remain: limited territory and resources, population growth, different levels of technological and political development of nations, etc. The solutions to these problems are yet to be found, although work in that direction is underway: the creation of the European Community (EC), the Eurasian Economic Community (EEC), the Shanghai Cooperation Organization (SCO), and several other institutions is expected to expedite the search for solutions. The decisions that will invariably need to be taken while we look for the aforementioned solutions should be reached on the principles of mutual trust and benefit so as to engender a more open society. Models for sustainable development that are needed by our civilization today do not really exist. It is well known that the center of global civilization in the 21st century is increasingly moving toward the Asia-Pacific region. The growing demand for oil in the industrialized and developing countries is likely to be a decisive factor in the geopolitical struggle that will dominate the period between 2010 and 2030. According to the forecasts of many experts, worldwide oil production will increase until 2015, when production will be at its peak; the subsequent years will experience a slowdown with all of the ensuing consequences. In this regard, as we are compelled to come up with the basis for a model that will allow us to determine the conditions necessary for the development of a prosperous region, it is imperative that we begin by selecting a region. In the subsequent years, lessons learned can be extended to other regions.

In our opinion, one of the most appropriate regions to conduct a pilot project in is North-East Asia (NEA). The prerequisites for a project of this nature are all met by the NEA region—the presence, no matter how incipient, of different symbols of industrial and economic development, of energy and human resources, of political systems, of the nuclear potential, of history, of religion, etc. There are few regions in the world that are as acutely contradictory in their constitution, where symptoms of deep and dangerous deterioration lie hidden only barely beneath the surface. Many people are of the view that it would take 15-20 years and if nothing was done, the situation could spiral out of control and lead to consequences that are difficult to predict. The basic contradiction lies in the uneven distribution of resources, especially energy, which are indispensable for the future.
development of the region. The basis for the formation of a long-term development model for NEA can double up as the core around which co-operative development of the oil and gas sector of the NEA countries can be planned and implemented during 2010-2030. As we know, the oil and gas sphere continues to define the development of the NEA region. In the coming years, the influence of this sector will only intensify. Rapid economic development in NEA in recent years has led to an increased demand for energy. According to forecasts for the next 10 years, more than half of the energy demand of the planet will be driven by the NEA region. Already, out of all the countries of the world, in terms of their consumption of petroleum products, China is the 2nd; Japan, the 3rd; and South Korea, the 7th. Further, their dependence on oil imports is 50%, 99%, and 97%, respectively. No significant change in import policy is foreseen for any of these countries in the coming years despite the introduction of energy-saving technologies and the launch of alternative energy forms.

Today, a large proportion of their energy imports are procured by these countries from the Middle East, Australia, and Russia. Russia is the second largest oil producing country in the world and one of the largest gas producing countries (generating approximately 13% of the global oil production and about 21% of the global gas); exports to the countries in NEA account for approximately 3% of Russia’s exports. What has for so long deterred Russian energy exports from making their way to the countries of NEA Several reasons could be ascribed to explain the matter: first, the lack of transportation hubs—only railroads connect the Far East with the oil-producing regions of Siberia; second, there is a crucial lack of oil terminals on the Pacific coast of Russia; third, the orientation of the oil and gas producers in Europe who are still steeped in the traditional patterns of supply and have not undertaken any significant investments in transportation or in the development of new fields; fourth, the lack of exploratory ventures to look for new reserves of oil and gas and the lack of capital investment in this area; fifth, the instability of markets—China, with the lack of orientation in its north-eastern areas whose reserves of coal are significant, and the binding of the cost of imported energy to the cost of local coal; Japan, with the Northern Territories issue and the issue of long-term contracts with other countries for the supply of energy; and Korea, with its stable pool of long-term energy suppliers and the influence of external and internal factors in the decision-making within its energy sector.

The energy supply to the Democratic People’s Republic of Korea should be considered separately because of the nature of the existing political system that governs it, which serves the country with certain distinct disadvantages as well as advantages. One of the positives is that the specific consumption of natural resources per inhabitant in that country, with its relatively minimal acceptable living standard, allows for an unusual pattern of planning and distribution throughout the nation. One of the primary disadvantages is the largely imaginary threat that is perceived as coming from that country to the world community in the form of aggression and nuclear weapons. While the threat does exist, it is largely a political affair, since the Democratic People’s Republic of Korea is undoubtedly an aberration when the majority of the nations of the world are committed to the capitalist path of development.

We shall now consider the foundations of the concept of cooperation among countries in NEA, particularly with respect to their oil and gas sector, in the near future.
Goals, objectives, and priorities of the concept

The main purpose of the concept advocated in this study is to create a unified approach to the oil and gas sector of NEA, a region capable of producing not only hydrocarbon oil and food petrochemistry but also creating conditions for the sustainable development of its resources and people.

To achieve the goal, key provisions of the development strategies of Russia, China, South Korea, and Japan would need to be implemented by 2030. The following are the main tasks that need to be accomplished:

- Drafting projections of the levels of oil and gas production in the countries of NEA on a medium- and long-term basis, assuming oil and gas exploration
- Evaluating the prospects of the domestic consumption of oil and gas in NEA based on calculations of the optimal energy balance in the region while considering the economic and resource structures of the various nations
- Studies delving into the following areas may have to be conducted:
  - On the countries in NEA, focusing on their common production, their transport infrastructure, on the exploration, extraction, and processing of hydrocarbons in order to ensure the region’s raw materials and oil products are utilized in the best possible way
  - On the creation of a unified system of gas supply in the region
  - On the creation of transport corridors for the transfer of oil and gas pipelines for hydrocarbon processing and use
  - On the organization of common centers for training and retraining and for studying problems related to the complex use of hydrocarbons
  - On the creation of conditions necessary to attract foreign investment, in order to implement a unified approach to the oil and gas sector throughout the NEA
- And on the creation of an international consortium for planning, organizing, and implementing major projects in the oil and gas sector of the NEA

The key favorable factors toward the establishment of a unified approach to oil and gas sector of the NEA are outlined as follows:

- There is a substantial resource base of oil and gas in the region.
- A high and growing demand for petroleum products and gas.
- A need for improving and optimizing the regional energy mix of the countries in the region.
- The unique geographical position of the region creates ample opportunities for exporting both oil and gas and their by-products.

The main factors hindering the establishment of a unified approach to the oil and gas sector of the NEA are listed as follows:

- The lack of a comprehensive agreement on cooperation in the oil and gas sector of the NEA nations stands out prominently. The previous agreement did not contain a systematic approach to support cooperation in the oil and gas sector; it was more of an agreement on the intent of the countries involved and focused on the implementation of local projects only. All this makes the formation of a unified approach to the oil and gas sector of the NEA very uncertain, particularly in view of the complexities involved.

- The lack of a coherent policy in NEA, as each nation attempts to pursue an independent policy in its oil and gas sector without taking into account the interests of other states, is a major deterrent to a unification drive today. Effective development in the energy sector is impossible without a coherent policy, as
countries may be unequally placed in terms of the availability of resources, manpower and technological capabilities, levels of economic development, etc. Only the joint participation of countries in neftegazorazvedke, field construction, extraction of hydrocarbons and their transportation, processing, and finally, in the sale of products, will meet the challenge of creating a single oil and gas complex that can function stably and facilitate solutions to the geopolitical problems in NEA without upsetting the balance of forces in the region.

The lack of an integrated policy with respect to subsoil use is already acknowledged. A lack of consensus plagues other fields too, most notably in relation to the running of oil and gas fields and the management of rights to geological exploration and development of large deposits. There have been difficulties in implementing tasks owing to the lack of clear positions on issues such as participation in mining and infrastructure development in China, Japan, and Korea, particularly among the oil and gas companies in these countries. There is a need for clear and consistent policy in order to draw potential foreign partners and global consumers of oil and gas.

Other inimical factors include the high capital intensity of exploration, mining, oil and gas transportation, and the establishment of processing facilities; the lack of own investment resources for the development of the complex; and the high levels of environmental restriction that demand compliance.

The first step toward the realization of profitable cooperation can be the beginning of the construction of major oil and gas pipelines in the Far East of Russia. A major pipeline from East Siberia to the Pacific Ocean would greatly deliver on the economic and geopolitical interests of Russia and those of NEA as well.

The following points are relevant to Russia as a whole:
- An increase in the capacity of the Eastern and Far Eastern regions would trigger the implementation of important prerequisites for sustainable development.
- Strengthening the geopolitical potential of Russia in the East would lead to the growth of Russia’s geopolitical influence in the Asia-Pacific region.
- The diversification of Russia’s economic systems is vital.
- The formation of new places of employment and income growth is important.
- A positive impact on the demographic potential of the region is long overdue.
- The nation would have to meet its regional needs with regard to oil, gas, and energy resources, through its own sources.

For the countries of NEA (Japan, China, Republic of Korea) the following are distinct possibilities:
- Meeting the growing demand for oil and gas.
- Meeting the growing demand for electricity.
- Diversifying their oil and gas markets and energy resources.
- Creating a more reliable and stable presence in the global market; the construction of the Sakhalin-Khabarovsk-Vladivostok line and the Yakutia-Khabarovsk channel are essential both for the development of the region and the long-term natural gas supply among the countries of NEA.

For the successful implementation of a regime of cooperation between the countries in NEA with respect to their oil and gas sector during the period 2010-2030, all the countries in NEA should consider the following conditions:
- Stop pursuing questions related to possible adjustments or revisions of existing state borders.
The cost of oil and gas should be determined by prevailing world prices.

Equal opportunity should be extended to involve all the countries of NEA in the exploration and development of oil and gas resources along the Far East of Russia, including the shelves of the northern and Far Eastern seas.

The main export routes of oil and gas will end on Russia's Pacific coast, particularly around south of the Primorsky Region.

The main mode of transportation of hydrocarbons is expected to be sea vessels; each nation should respond flexibly to emerging markets and eliminate the creeping in of any privileges to any of the participants in the cooperative undertaking.

Raw materials and the state of oil exploration

In the Far East and the Republic of Sakha (Yakutia) lie concentrated 55 oil fields (13 oil, 13 gas, 16 gas-oil, 13 oil and gas) with recoverable reserves of 196.9 million tons in the categories A, B, and C1 and 157.2 million tons in category C2. Information on resources, reserves, and potential volumes of oil and gas in these regions is presented in <Table 1>.

According to preliminary estimates of Russia's territories and waters on the Far East carried out by academic institutions, there are proven oil reserves of approximately 410 million tons; this includes the shelf off the Okhotsk Sea where there are about 165 million tons of oil reserves. The oil found in these regions is of a high quality, superior in terms of the basic parameters of Russia’s export standards, which basically means that it is of a light and low-sulfur variety. Most of the proven oil reserves of the Far East (68.2%) have a density less than 0.87 g/cm³, while about 78% have a sulfur content of less than 0.5%.

Proven natural gas reserves in the Far East have been measured at about 2000 billion m³, including the shelf off the Okhotsk Sea that holds about 730 billion m³; previously estimated reserves were thought to be more than 1300 billion m³, including the reserves under the shelf off the Okhotsk Sea that were estimated to hold more than 250 billion m³ of natural gas.

The peculiarity of the gas fields of the Republic of Yakutia lies in the fact that their content is made up of significant concentrations of ethane, propane, butane, and condensate. Moreover, the natural gas deposits of the Lena-Tunguska province contain high concentrations of helium (0.20%-0.60%). Estimated geological resources of helium stand at about 60 billion m³. This means that there is a need for a system of transportation for these products in addition to processing facilities that can handle the release of helium gas, ethane, and the propane-butane fraction; further, the formation of new enterprises within the oil and gas chemical industry would be welcome.

Initiatives in the region to conduct geological and geophysical explorations on land and water can be expected to trigger new discoveries, with significant volumes of oil and natural gas likely lying untapped.
Proven reserves of oil and gas within the Yakutia and the Far East can allow for the creation of a new center of hydrocarbon raw materials, fully satisfying the needs of the Far Eastern federal district in the oil and gas sector, as well as ensuring the possibility of East Siberian oil and gas exports to the Asia-Pacific (notably, Korea, China, Japan, and the USA). Increased export of hydrocarbons to relevant markets will largely depend on the detailed exploration of oil and gas in the region.

In analyzing the possible export of oil and gas to the NEA, the reserves in Western Siberia and the shelf off the northern seas should be examined. Even today, in connection with global warming, we should consider the possibility of oil and gas transport along the Northern Sea Route, subject to the exploration and development of deposits in the shelf off the northern seas and the construction of gas liquefaction plants.

The successful participation of Russia in the proposed cooperation in the oil and gas sector across NEA would depend on the understanding that Russia views itself as an equal strategic partner on the Pacific coast, as a nation that is able to influence the development of all events taking place in the region. Moreover, with greater resources, including oil and gas, Russia would be ready to become a guarantor of energy security in the region, subject to its interests.

The main interests of Russia in the Far East would be related to the following:
- The economic development of territories and improvements in living standards
- The rational use of natural resources
- Strengthening national security in the region
- Building promising development and exploration initiatives along the region, taking into account the geopolitical changes in the 21st century associated with the depletion of natural resources.

The progression of the concept of cooperation in the oil and gas sector can be divided into the following stages:

- The conclusion of agreements on cooperation in energy security in the region.
- The development of transnational projects for the exploration and development of the oil and gas resources of NEA.
- Attracting investments for the implementation of transnational projects, taking into account the interests of all countries in NEA.
- Creating the oil and gas markets in NEA.
- The gradual replacement of oil and gas as sources of power with the advent of hydrogen, nuclear, and alternative energy sources.

In conclusion, this paper examined certain objective prerequisites for the formation and development of energy cooperation, particularly within the oil and gas sector of NEA. A special structure-forming role is proposed to be assigned to Russia. The performance of this role would be possible only if the efforts of all countries in NEA were concentrated. The adoption of a strategic line that takes into account all the economic, political, and energy conditions in the region and their associated global fall-out is necessary in addition to the political will to implement the same because only then would it be possible to realize the proposals made in this paper.
The Far Eastern Federal District (FEFD) comprises a total of 6,216 thousand sq. km (36.4% of the Russian Federation’s territory). FEFD includes nine subjects of the Russian Federation: the Republic of Sakha (Yakutia), the Primorski Territory, the Khabarovsk Territory, the Amur Region, the Kamchatka Edge, the Magadan Region, the Sakhalin Region, the Jewish Autonomous Region, and the Chukchi Autonomous Region. As of January 1, 2009, 6,460 thousand people were living in the FEFD (4.6% of the total population of Russia); out of these, 74% comprised the urban population. At the present time, 4.6% of the gross volume of Russia’s total internal product; 3.2% of the country’s industrial product volume; and 3.6% of its agricultural production volume is produced by the FEFD. The Far East basin ports provide 17.7 percent of the total cargo turnover of Russian seaports.

Over the last few years, the FEFD’s gross regional product has shown a growth level of 5.1% (Russia showed an average growth of 7.2% as regards its real gross international product for 1998-2005). It is expected that for the period extending till 2025, the development of the Far East will be defined appreciably by the development of its considerable natural resources (fish, wood, oil and gas, coal, ore, and nonmetallic resources) as also by the essential involvement of the district with the countries of the Asian-Pacific Rim (APR) in connection with goods turnover. The natural climatic conditions of the Far East can be characterized as rather severe, even extreme. Only in the south of the Primorski Territory does the mid-annual temperature exceed zero degrees centigrade. In the light of these facts, it is clear that the power industry plays a key role in the social and economic development of the FEFD. Secure and stable energy and heat supply is a basic necessity for the citizens and enterprises of the Far East during the winter period and should be provided at any cost. In other words, the supply of these resources is mandatory and cannot be subject to the existing market conditions.

Structure and Condition of the FEFD’s Energy Industry

The power industry in Russia can be divided...
into two sectors: the big power industry sector and the small power industry sector. The traditionally large-scale power stations, which were earlier included in the open society system known as the “RAO UES of Russia,” are classified under the “big power industry sector” (the big power). In the Far East, “the big power” presently consists of a number of large thermal power stations (TPS) that have entered into an open society holding called “RAO Energy System of the East.” This company is engaged in supplying energy to the population, the enterprises, and the organizations of the Far East through electrical transmission networks established by the state. Moreover, the company supplies the settlements that are located near its TPS with thermal energy. The hydroelectric power stations (HPS) located in the Amur and Magadan areas, the stations that use renewed energy sources through entering into an open society system known as “RusHydro,” and the Bilibinsky atomic power station located in the Chukchi autonomous region and belonging to the open society “Concern Energoatom” also fall under the “big power” category. In fact, the mains of the East Integrated Power System’s (EIPS) electrical transmissions network, the open societies maintained under the “Federal Grid Company of the unified electric power system,” the open society “System Operator of Unified Electric Power System,” which oversees the administration of the power supply systems of the EIPS, and the open society “Inter RAO UES of Russia,” which is the export operator of electric power in Asian countries—all of these belong to the big power category.

The total installation capacity of the Far Eastern power station is 14 thousand MW. In this capacity structure, the greatest share (62.0%) is occupied by the TPS (Thermal Power Stations) while the share of the HPS (Hydroelectric Power Stations) is 37.1%. Of the other renewed energy sources (RES)-geothermal power stations (GeoPS) in the Kamchatka edge and the Sakhalin region as also the wind power stations (WPS)-0.6% are necessary energy resources. Moreover, 0.3% comprise the total capacity of the Bilibinsky nuclear power station (NPS). <Table 1> below presents the details of the installed capacity of the power stations of the Far East and the planned volume of energy production in 2009.

<table>
<thead>
<tr>
<th></th>
<th>Capacity, MW</th>
<th>Electric power generation in 2009 (planned, GWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPS</td>
<td>8,082</td>
<td>27.6</td>
</tr>
<tr>
<td>HPS</td>
<td>5,189</td>
<td>14.0</td>
</tr>
<tr>
<td>RES (GeoPS, WPS)</td>
<td>81</td>
<td>0.4</td>
</tr>
<tr>
<td>APS</td>
<td>48</td>
<td>0.2</td>
</tr>
<tr>
<td>total</td>
<td>14,000</td>
<td>42.2</td>
</tr>
</tbody>
</table>

The total extent of the Far Eastern Federal District’s electrical transmission network exceeds 105 thousand km and includes. This high voltage belonging to the main electricity transmission lines with 220 kW and EIPS’s main with 500 kW which make 12.5 thousand km, whose area totals 12.5 thousand km. The total installed heat generation capacity of the sources of heat in the structure of the centralized heat supply system of the Far East totals more than 16.9 thousand Gkal/h. The general extent of the heat supply network of the centralized heat supply system exceeds 2 thousand km. The productive supply of thermal energy by the subsidiaries of the RAO Energy System of East totaled 22.5 million Gkal in 2008.

In Russia, we traditionally refer to the segment of the power industry that is based on the installation of small generating units and
complexes and that functions on traditional kinds of fuel and renewed energy sources (RES) as the “small power industry sector” (the small power). Some parts constituting the small power cannot be connected to the centralized electrical transmission network. A small generating unit alludes to a generating object with the installed capacity of up to 25 MWe while a small generating complex refers to a generating object having the combined installed capacity to produce electric and thermal energy of up to 25 MWe, including the heat generating capacity.

The small power has traditionally solved power-related problems by increasing the stability and reliability of all the state power systems. It has been doing this by creating additional generating capacity, increasing the efficiency of the power systems at the regional and municipal levels, bringing down technological losses by bringing generating capacities nearer to the consumers, and finally, by reducing the cost of transmitting power. The small power also facilitates the improvement of power safety and aids the state in balancing fuel and outputted energy by increasing the use of local fuels. Nevertheless, its key mission remains the provision of power supply to decentralized consumers and increasing the reliability and profitability of the existing power supply in housing and communal services.

The small power of the FEFD comprises municipal and private boiler houses and electric power stations, along with enterprises belonging to the local electrical transmission networks and district central heating systems. Most of the “small power industry sector” is controlled and financed by regional and municipal authorities, in whom is also vested the responsibility for this sector. Owing to the specific features of the power industry, private energy enterprises as a rule cooperate with the regional and municipal authorities.

Although a substantial part of the FEFD population lives in small towns and villages, the electricity and heat energy generation centers are concentrated in big cities such as Khabarovsky, Vladivostok, Komsomolsk-on-Amur, Yuzhno-Sakhalinsk, and Petropavlovsk-Kamchatsky. The high concentration of energy facilities in these cities helps them to produce an adequate amount of heat. At the same time, most of the small towns and villages of the Far East are supplied with heat by private industrial enterprises and small municipal boiler houses located in housing and communal services. At present, there are a total of 4,710 small municipal boiler houses in the FEFD’s regions. Most of them use coal and masout (black mineral oil) as fuel. During Russia’s economic development in the soviet period, the construction of apartment houses supplied with centralized heating was preferred. Today, these apartment houses have no alternative heating system, and therefore, the only sources of heat available to them are the municipal boiler houses located in every small town or village.

There are no electricity generation sources in many small towns and villages of the FEFD, and therefore, electric power needs to be transmitted to these places from where the power stations are located, which is often times a long distance. As a result, small towns and villages in remote areas-especially near state borders and in the areas adjoining the power systems of other subjects of the Russian Federation-experience shortage of electric power supply during the peak of the winter season.

In a number of inhabited localities of the Far East, electric power is supplied by decentralized sources—diesel power stations (DPS) that were constructed over the 60th to the 80th year of the last century. In particular, in the Republic of Sakha (Yakutia), the local power industry is equipped with almost 200
DPS, for the functioning of which it annually delivers more than 120 thousand tons of diesel fuel. More than 80 diesel power stations provide consumers with electric energy in the decentralized power supply zone of the Khabarovsk territory while 64 DPS work in the Primorski territory toward supplying power. In the Sakhalin region, there are 22 power knots carrying out a decentralized power supply function. Among these power knots, 11 are located on the Kuril Islands.

The present technical condition of the components of the power industry and municipal services in majority of the regions of the Far East points to a real threat of increase in breakdowns and compromised power safety. In the FEFD, about 70% of the power generating equipment has been in operation for terms ranging from 20 to 40 years-and their deterioration exceeds the 60% margin-while 30% of the equipment has been in use for over 40 years. The general share of the effective equipment totals only 22.8%. The deterioration of the fixed capital of the housing and communal service enterprises ranges from 60% to 100%.

The percentage of the financial resources that the FEFD allocates from its regional and local budgets toward power supply is a constantly growing number. In a situation of economic crisis, this fact leads to an increased deficiency in the budgets of the majority of the Far Eastern subjects of the Russian Federation and municipal unions. Moreover, these limited resources suffice only for the maintenance of the existing heat production capacity and DPS. The abovementioned chronic deficiency of financial assets makes the acquiring of new power equipment difficult and has thus led to an increasing tendency of continuing to use extremely old power equipment. As a result, the efficiency of the equipment of municipal boiler houses is extremely low. It follows that due to the large scale poor quality of thermal protection accorded to the district heating supply system’s pipelines, the loss of thermal energy is excessively great.

The basic fuel resources of Far Eastern subjects of the Russian Federation are coal and mineral oil products. The cost of fuel and the transport cost of its delivery to consumers have both been showing a constant rise. In the 2005-2006 winter, the FEFD’s municipal boiler houses consumed over 6.2 million tons of firm fuel totaling the sum of almost 50 billion roubles and 1.8 million tons of liquid fuel, totaling that of over 16 billion roubles (taken altogether, about 66 billion roubles). The result of the deficiency of fuel that arises during the separate periods of autumn and winter is that the maximum power load, as a rule, occurs during periods of sharp cold. Thus, the heat supply organizations are frequently unable to maintain an appropriate temperature mode as regards the heat-carrier equipment in the heating systems’ pipelines. As a result, the water temperature of the heating system decreases and owing to the low temperature outdoors, the population has no choice but to supplement the provided warmth by using electroheating devices to heat their houses. The direct outcome of this is a considerable growth of electrical energy consumption in housing and communal services, which in turn leads to the electrical supply system getting overloaded and compromises its reliability. The average household power consumption in the FEFD territory is high. It thus follows that in 2008, the share of the electric power consumed by the FEFD population exceeded the Russian middling level on more than two occasions (by 19.6% and 7.4%).

The equipment being used by the DPS today is so worn out that it is inappropriate for use from even the moral point of view. Due to the fact that the cost of the electric power developed by these DPS is the highest,
implementing an overestimated blanket tariff for the electric energy provided to all other consumers becomes necessary—a factor that constrains the development of the real sector of the economy and displeases the population. This problem is especially acute in the Republic of Sakha (Yakutia), where the cost of subsidizing diesel power has already reached 4 billion roubles. In the Primorski Territory, the average deterioration of the DPS equipment is estimated to be 72.9%. Thus, the power branch of the FEFD—especially the “small power” branch—requires urgent modernization, which should be carried out in the near future at any cost.

Prospects of Gasification in the Far East Federal District

Almost 25% of the total gas and 15% of the total oil resources of Russia are located in the bowels of Eastern Siberia and the Far East. The initial total hydrocarbon resources present here are estimated to have been equivalent to 100-140 billion tons of oil. Within this region, including its sea shelf, 140 oil and gas fields have been developed, while the development of about 50 major oil fields and over 170 gas fields is predicted to take place in the near future.

In Eastern Siberia and the Far East, 15 gas and 7 oil deposits containing 1.8 bln. m³ gas stocks and 396.2 million tons of oil have been prepared for industrial development. The reconnoitered and preliminary estimated oil and gas stocks of the six major oil and gas fields of the Sakhalin shelf are estimated to be 292 million oil tons and 0.9 bln. m³ of free gas. At present, the development of oil gas fields is being actively carried out in the Far East. The construction of the main oil pipeline “the Eastern Siberia - Pacific ocean” (ESPO) has resulted in the development of some oil deposits of Yakutia that contain considerable stocks of passing gas.

The realization of the East gas program will allow for the installation of gas almost throughout the small power of the Far East. Within the framework of this program, new centers of gas production will be created in the Yakutia, Kamchatka, and Sakhalin regions of the FEFD. In the beginning of 2012, the open society “Gazprom” will construct a main “Sakhalin-Khabarovsky-Vladivostok” gas pipeline, the resource base for which will be the “Sakhalin-1” gas in the short term and the “Sakhalin-3” gas in the long term. In 2012, Gazprom plans to start the construction of a “Yakutia-Khabarovsky-Vladivostok” gas pipeline (implementation term: the beginning of 2017). The capacity of this gas pipeline will extend to 32-35 billion cubic meters per year and its length will be about 4.5 thousand km. It will share a uniform corridor with the oil pipeline system ESPO and deliver gas from a large Chajandinsky deposit and other Yakutian deposits to the Russian consumers of the Far East, besides exporting it to the countries of the Asian-Pacific Rim. A uniform transport system will be generated on the basis of these two gas pipelines. Gas supply to the Kamchatka Edge is planned to be provided at the expense of infrastructural development of the Kshuksky and Under-Kvakchiksky deposits located at the western coast of the Kamchatka Peninsula and the construction of the main gas pipeline “Sobolevo-Petropavlovsk-Kamchatskij,” the operation of which is planned in 2010. The project will also provide the necessary resources for the construction of distributive networks in the Petropavlovsk-Kamchatskij area. However, in spite of the abovementioned efforts, the gasification of the Far East within the framework of Gazprom open society’s East program will not result in its planned result, that of a sharp reduction of expenses with regard to housing and communal
services power supply, if not accompanied by an in-depth modernization of the power branch at the levels of both the Russian Federation subjects and the power generating companies.

An inspection of the boiler network communications carried out by the Autonomous Non-commercial Organization “The Center of Strategic Researches Development of Resources Power Complex of the Far East” (ANO “CSRD RPC FE”) in localities of the Far East experiencing shortages of electrical objects and security energy carriers confirms the urgent need for installing new power object equipment. The required economy of fuel and decrease in the cost price of electric and thermal energy can only be achieved through the modernization of “the small power” on the basis of the newest technologies facilitating the combined generation of electric and thermal energy (cogeneration).

Cogeneration in “The Small Power” as means of Solving the Power Problems of the Far East

As it is known, cogeneration is the highly effective use of a primary energy source for the generation of two forms of useful energy: thermal and electric. The main advantage of this technology, as compared to the usual technological processes applied in thermal power stations, is the maximum utilization of the generated thermal and mechanical energies, which are usually simply lost in the traditional technological processes. The requirement for purchasing developed thermal and electric energy thus decreases, thereby promoting a reduction of production costs. All this features increase efficiency from usual 30-50% of power station to 80-90% efficiency which has system of cogeneration. A comparison between cogeneration and the separate generation of electricity and heat is shown in <Table 2>. It is based on the typical values of efficiency.

<table>
<thead>
<tr>
<th>Separate manufacture of electric power and heat</th>
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<tbody>
<tr>
<td>Fuel 100%</td>
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<td>Fuel 100%</td>
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<table>
<thead>
<tr>
<th>Cogeneration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel 100%</td>
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</table>

The installation of cogenerators helps the power industry to effectively supplement the existing power supply without reconstructing old, overloaded networks. This results in a considerable improvement in the quality of the electrical and heating supply. The independent work of the cogenerators allows the power industry to provide consumers with electric power characterized by stable parameters of frequency and pressure, as also thermal energy characterized by stable parameters of temperature and qualitative hot water.

Cogeneration can be most profitably applied to the small power of the FEFD. Industrial enterprises, oil and gas fields, main pipeline systems, hospitals, objects of housing and communal services of municipal unions, large buildings, hotels, etc., are all potential subjects for the positive application of cogeneration. As a result of the implementation of cogeneration technologies, it becomes possible to provide consumers with power and heat even without the construction of additional electrical transmission lines and heating mains.
Bringing the power sources nearer to the consumers allows for the considerable reduction of networks, and therefore, leads to the saving of the finance resources that are usually needed for the construction and service of such networks. Moreover, it facilitates an improvement in the quality of energy produced and lowers the losses incurred during its transmission.

The conditions that are put forward by the electric power and heating suppliers for connection to the electricity and heating supply networks often result in considerable irrevocable expenses and sometimes, even to the revision of the above connections. The specific cost of connection to power networks has already been reached and as regards a number of power objects, has even exceeded the specific cost of cogeneration installations with identical power parameters.

The essential difference between the capital expenses for power supply from networks and power supply from one’s own source is that the capital expenses connected with cogeneration acquisition are compensated while the capital expenses incurred during taking a connection to the existing networks are irrevocably lost in the transfer of newly constructed substations. Therefore, according to the economically weak Russian customers who want to connect to the existing electricity networks, the power supply companies should construct all the technological substations (transforming station connectors, etc.) that are needed for this connection and transfer these substations free of cost to the electrical network companies.

The synchronized development of “big” and “small” (or local thermal) power is a phenomenon that is seen worldwide. There has been a global increase in the installation share of the small power due to the cogeneration cycle, which allows for the optimal development of heat and electric power for the housing-and-municipal sector and the establishment of a social and industrial infrastructure, besides facilitating effective power saving. Moreover, cogeneration lightens the load of the main heat and power generating networks of the big power. For example, in the USA and Great Britain, the small power cogeneration share reaches 80% while it reaches 70% and 50% in the Netherlands and Germany, respectively.

Outside of Russia, this process is actively supported by the state through legislative regulation and budgetary financing. The experience of industrially developed countries shows that the construction of thermal power stations having a low generating capacity instead of large power units results in a tenfold reduction in the total expenses incurred during the modernization process of the power industry.

**Gas Turbine Technologies as a Basis of Cogeneration in the Small Power of the Far East**

Aiming to create the necessary prerequisites for the re-equipment of the FEFD’s “small energy,” the ANO “CSRD RPC FE” designed a project concerning the construction of a city plant in Khabarovsk that would comprise a gas turbine and gas turbine cogeneration unit (GTCU) of small and medium generating capacity.

A GTCU generates electrical power through the burning of natural gas, the primary energy carrier inside the turbine, while the thermal energy and exhaust generated at the same time are used for heating. A GTCU has a particular advantage, especially in the cases where simultaneous electrical power supply and large scale heating supply are needed. Better efficiency of fuel use, substantial decrease in the primary demands for fuel, and decrease in power and heating supply costs
are the main advantages of using a GTCU. A GTCU is remarkable for its compact design, operation simplicity, extremely low vibration rate, comparable ease of noise suppression, and low installation cost.

In the Far East, GTCUs are able to efficiently solve municipal heating supply problems as well as local power supply problems. In the towns and villages that are supplied with electrical power through a transmission network of “large energy,” the electricity generated by a GTCU may be used to supplement the existing heat supply or to compete with the open society RAO Energy System of East, through which it may aid a decrease in energy tariffs.

This project is undoubtedly economically viable. As a result of the modernization of 4,710 Far Eastern boiler houses through the replacement of old equipments by GTCUs - of which 80% are to be produced at the Khabarovsk turbine plant - 4.6 million tons of reference fuel will be saved per year. The total amount of money saved only through the decrease in fuel purchasing, even without calculating the money saved in repair and operation costs, will come to 36-38 billion rubles - perhaps even more.

In our opinion, the introduction of advanced technologies used in overseas companies that are world class leaders of turbine manufacturing is the most reasonable way of implementing the Khabarovsk gas turbine plant project. We have already initiated contact with our future partners in Japan toward this objective. We also plan to use the technologies developed in Russia during the implementation of this project.

The Limited Liability Company “Khabarovsk’s gas turbine plant (KGTP)” was founded as a project operator toward the implementation of this project on March 31st, 2009.

In April, the Khabarovsk Region’s government provided the KGTP with a 31.6 hectare plot in the northern industrial area of Khabarovsk. Together with the concerned Khabarovsk agencies and organizations, we formulated an elaborate plan of action aimed at the successful implementation of the project. This plan also included such project support measures as the granting of tax relief and financing of endorsements to the KGTP by the government of the Khabarovsk region.

This project was backed in full by the representative of the Russian president in the FEF, Victor Ishaev, and by the Russian Federation’s minister of energy, Sergey Shmatko. With their support, we could obtain the preliminary consent of the Russian “Vneshekonombank” and “Vneshtorgbank” managements toward extending the credit guarantee of the Japan Bank for International Cooperation to the KGTP. Moreover, the Khabarovsk gas turbine plant construction is to be included in the priority project list of the presidential commission for the modernization and technological development of the Russian economy. The Russian government’s decree concerning the state’s support to the project is presently under consideration in the related ministries and agencies.

At the present time, increasing the energy efficiency of its economy and the saving of its resources are Russia’s national priorities.

On June 4, 2008, the president of the Russian Federation-Dmitry Medvedev-signed the presidential decree No. 889 “on certain measures aimed at increasing the energy-related and ecological efficiency of the Russian economy.”

At the extended session of the state council held in June 2009, the measures needed for increasing the energy efficiency of the Russian economy at large was the main subject of discussion. President Medvedev, who chaired the session, set a target of reducing the power intensity of the state economy by 40%.

The state council took the decision to outline
some drastic measures concerning the modernization of the thermoelectric power stations, including switching them over to the combined heat and power generation mode (cogeneration mode). Medvedev also repeatedly brought up the question of energy efficiency at the sessions held by the presidential commission for the modernization and technological development of the Russian economy. In the session of the commission held in September 2009, the President said: “We have a lamentable situation on our hands because the energy intensity of our country’s gross internal products outnumbers manifold the same of developed countries. Our heat supplying system loses more than 50% of its generated heat.”

The federal law of the Russian Federation No. 261-fl dated November 23 (f 2009), which states that “energy-saving and increasing of power efficiency is also about the introduction of changes into certain legislative acts of the Russian Federation” has already taken effect. This law introduces the concept of energy-saving as well as technologies related to energy-saving and increasing energy efficiency. It also establishes legal relations in this field. The law gives priority to investment projects aimed at reducing the consumption of natural gas, electricity, and useful heat consumption. Companies, organizations, and businessmen implementing such projects might be granted payment subsidies from the federal budget established by the Russian Federation’s government.

The law outlines the measures related to the planning of power saving and increase of energy efficiency at the federal, regional, and municipal levels. These plans will go on to become the base for setting goal-oriented indicators of power saving and increasing energy efficiency together with the fixing of the amount of subsidies granted from the federal budget to the regional and municipal budgets toward furthering the aims of energy saving and increased energy efficiency. Probably, in the immediate future, the personal contribution of the presidential representatives in federal districts and of the state ministers, governors, and other managers toward increasing energy efficiency and recourses saving will become the main criteria for estimating the results of their activities.

The construction of the Khabarovsk gas turbine plant completely corresponds to the government’s established priorities, leading us to believe that the project will undoubtedly receive governmental support and that the plant’s production in the Russian market will move forward smoothly.

As increasing Russia’s energy efficiency, especially in the country’s housing and public utilities, is not only an imperative need from the point of view of the country’s economy but is also one of the most important political challenges facing the Russian leaders of today, the active participation of Korean business circles toward solving this problem will serve to strengthen the friendship and goodwill between Korea and Russia. The successful implementation of the Khabarovsk gas turbine plant project will not only serve as a perfect example of such participation but also has every chance of fostering large-scale cooperation from Russia, which will prove favorable to Korean firms for exerting power in Far East Russia. This cooperation, undoubtedly, will positively impact other spheres of mutual relations between Korea and Russia.
The Turkmenistan-China Pipeline: What Are Its Implications?

On December 14, 2009, China and Turkmenistan formally opened the gas pipeline from Turkmenistan through Central Asia to China. This pipeline, built with Chinese capital, is the first gas pipeline connecting China to Turkmenistan and to Central Asia, but is unlikely to be the last such pipeline. Therefore, this pipeline has significant consequences for both Central Asia and China, as well as Russia. But the likely repercussions of this pipeline do not stop in Central Asia. Instead, they also affect the future of energy flows in East Asia as both Central and East Asia (as this pipeline shows) are becoming increasingly more integrated in energy and other forms of social infrastructure, e.g., transportation.

This pipeline is in fact two pipelines. The first pipeline, opened on December 14, travels 1,833 km from Turkmenistan through Uzbekistan and southern Kazakhstan to Xinjiang in China. From there it will connect to China’s domestic pipeline network, ultimately traversing 700 km (4349 miles). While initially Turkmenistan will be the only supplier of gas; by 2011 Uzbekistan and Kazakhstan will open up the second line, also 1,833 km long, enabling China to get gas from all three Central Asian producers, not just Turkmenistan.1 Second, the pipeline will be sending China 40 bcm by 2012 if not earlier. Thus, it stands in stark contrast to the Prikaspiiskii (Caspian coastline) pipeline agreement negotiated by Russia with Kazakhstan and Turkmenistan in 2007. Whereas the entire Turkmenistan-China pipeline was negotiated, signed, and built in three years, there has been little progress on the Prikaspiiskii pipeline, a stark demonstration of Russian graft, inefficiency and bad faith, compared to China’s progress with its Central Asian neighbors.ii Consequently, even the most cursory analysis of the new pipeline suggests a victory for Turkmenistan and the other Central Asian producers, as well as China, but also a clear defeat for Russia. The benefits to Turkmenistan from this pipeline have already been large since the agreement in 2006 and will continue to flow for some time to come. Most importantly, it was this deal that for the first time gave it negotiating leverage vis-à-vis Russia, which had consistently forced it to export its gas through the only available

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2 Ibid
pipelines that were Russian ones and to do so at prices well below the market price for natural gas. Since 2006 Turkmenistan’s and other Central Asian states’ leverage regarding prices has increased as a result of the availability to them of other options besides Russia and Russia’s continuing and growing dependence upon obtaining cheap Central Asian gas to subsidize its own inefficient and already overly subsidized domestic energy economy while meeting surging European and Asian demand.

Although Turkmenistan has not yet sufficiently prevailed upon Moscow to pay it what it receives from European consumers of the gas it ships westward, its receipts have clearly grown in size as Russian demand for its gas grew. Thus when the current economic crisis hit in 2008-09 Moscow had committed itself to paying $300/tcm to Central Asian producers in the belief that it could charge Europe $380-400/tcm. The crisis ended all that, forcing Moscow to buy Central Asian gas at a loss, a growing and increasingly unaffordable burden for Gazprom. Moscow sought to cut the price it paid but Turkmenistan refused to cut its prices. Then in April 2009 a mysterious explosion in the pipeline to Russia which Turkmenistan blamed on Russia led to a cessation of all shipments for the rest of the year. As Pavel Baev of Norway’s Peace Research Institute (PRIO) writes,

As the international economic crisis gained steam and global demand for energy resources dropped dramatically, Gazprom could no longer afford to buy gas at these high prices. But it was unthinkable to raise this issue with Kazakhstan, and political relations with Uzbekistan were too delicate to back out of the deal (which meant gas through the Prikaspiiskii pipeline-author). Therefore it was Turkmenistan by default that had to take the blow alone. The explosion on the pipeline near the Turkmen-Uzbek border in April inflicted little material damage, but it was used as a pretext to put a complete stop to all Turkmen gas imports. The flow was restored in November after Turkmen President Gurbanguly Berdimukhammedov’s visit to Moscow, but Russia bluntly refused to honor the “take-or-pay” provision in the contract. Moscow also reduced the amount of Turkmen gas that it would take in 2010. Gazprom had been ready to buy over 50bcm from Turkmenistan, in 2010-2012 at a price of $375/tcm but it scaled back its purchases for 2010-12 to 10.5bcm and wanted to pay Turkmenistan about $220-240/tcm, the same price it is trying to obtain from Uzbekistan and Kazakhstan, believing that these forms of pressure would force Turkmenistan, which depends on gas exports, to relent on the high prices for which it had contracted with Moscow in 2008. However, in a portent of future trends, Turkmenistan employed its new leverage with China to obtain a $3 Billion loan from Beijing for the development of Turkmenistan’s South Iolotan gas field with an estimated 4-14 trillion cubic meters. Turkmenistan raised the amount of gas it will export to China through the pipeline from 30bcm to 40 bcm and graced it the rights to South Iolotan to pay off the loan. China’s readiness to assist Turkmenistan escape
Russian threats has clearly paid off, not just in the rapid construction of this pipeline but also in gaining subsequent contracts and even more gas supplies. Thus in December, 2009 a consortium comprising China National Petroleum Corporation (CNPC), South Korean, and UAE companies won contracts to develop the field in South Iolotan. Turkmenistan’s victory is apparent. And to follow up that victory it is consolidating its diversification policy by building a new pipeline to Iran to provide it with gas. This pipeline will carry 20bcm of gas even though Turkmenistan is only shipping 8bcm annually so Turkmenistan will likely increase its ability to supply Iran, adding more diversity to its customer base. Meanwhile, shortly after the pipeline to China opened Gazprom and Turkmenistan negotiated an agreement to end the acrimony that had poisoned relations between them in 2009. But there is no doubt that Russia lost this round to both Turkmenistan and China and that by implication other Central Asian producers like Kazakhstan and Uzbekistan have won. Russian officials have been trying to put a good face on this deal signalling their unconcern, totting the resumption of gas supplies from Turkmenistan, and reiterating that the new pipeline, by annually shipping 40bcm of gas to China, will make it impossible for Turkmenistan to supply the EU’s rival Nabucco pipeline that is supposed to compete with Turkmenistan with the Prikaspiiskii pipeline. Even with this agreement it is clear that by 2012 when the two pipelines connecting China with Central Asia open, China, not Russia, will be the main buyer of Central Asian gas. Even if alternatives like Nabucco have been shut off by Russia’s retreat and new agreements (which is doubtful) China’s primacy in the Central Asian gas market is undoubtedly a blow to Russia with long-lasting consequences. As one newspaper report suggested, strengthening China’s economic positions will inevitably boost its political influence and eventually transform China into the leader of the whole region and the true master in the regional structures like the Shanghai Cooperation Organization. With Russia’s silence signifying consent, Central Asian hydrocarbons flow eastward at an ever increasing rate. The impression is that Russia accepted it. Fierce battles for the Turkmen gas with the paper Nabucco rather than with the actual gas pipeline to China plainly show the true scope of Moscow’s ambitions. The Kremlin lacks either strength

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* Beijing, China Daily Online, in English, December 31, 2009. FBIS SOV, December 31, 2009
* "Russia, China, and Iran to Forge a New Energy Axis This Year," www.asianews.it, January 8, 2010
* FBIS SOV, December 22, 2009
or willingness to put up a fight for Central Asia. It finds protection of its positions in the European gas market a more rewarding occupation.iii

Even if this might be an exaggerated assessment of China’s future position in Central Asia, what it also means for China is that it now no longer has to approach Russia with regard to gas as a supplicant, but rather it has a superior bargaining position because it does not depend on Russia for gas no matter how much it wants that gas. Despite the Russo-Chinese agreements of 2009 to build pipelines to ship China 68bcm of gas, Russia neither has the money to build the pipelines, nor possibly the gas – as it closed many fields due to the current crisis – unless China lends it the money to reactivate pipelines, wells, and fields that were shut down in 2009 due to the economic crisis. Indeed China already produces 76bcm of gas a year and consumes only about 80bcm with Australian LNG making up the difference. So it really does not need Russian gas anytime soon, especially as it will now be getting 40bcm from Turkmenistan.iv And, in any case, neither side has yet agreed on prices or their agreements are merely declarations in principle, not hard contracts, and to judge from previous negotiations, no agreement is imminent, despite Russian claims to the contrary. If anything we can expect hard bargaining on price because China will demand below market prices and Russia will demand market prices in a classic confrontation between supplier and buyer. Indeed Russia needs this pipeline and its revenues more than China does, and therefore the Turkmen-China pipeline could ultimately contribute to expanding China’s increasingly visible ascendency over Russia, not just in Central Asia, but in East Asia as well.

Russo-Chinese Rivalry in Central Asia

Neither is this deal the end of China’s offensive in Central Asia, indeed it has only recently begun. This pipeline ties into China’s larger strategy of global acquisitions and expansion of influence that became clear in 2009. China’s strategy is clear. In conditions where Far Eastern infrastructure is only beginning to appear; where the Middle East remains as volatile as ever; and China’s Straits of Malacca dilemma remains unabated, it must define energy security as having diverse suppliers, at least some of whom cannot be interdicted in the Indian Ocean by the US, Indian or other navies or other hostile forces. Yet as the Middle East remains its largest source of energy, China’s strategy is clearly both one of hedging against the future and of extending its energy and other security links abroad through economic power.

Second, China also seeks to tie Central Asian producers to it to deter them from supporting their cousins and coreligionists, Muslim rebels in Xinjiang, its own largest energy producing province. Third, to the extent that China can gain leverage over both Russia and Central Asian countries, it forestalls a Russian monopoly over Central Asia that could also be used to deprive it of energy or threaten its interests in Xinjiang as happened during the Sino-Soviet split of the period 1956-90 when Moscow sought to exploit Han-Muslim tensions there.v Therefore for geostrategic reasons it also seeks to avoid excessive

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dependence upon Middle Eastern and African producers even as it buys ever more energy from them, seeking producers as far away as Iran who can then ship gas and oil to it overland through new pipelines that China is helping to build in Kazakhstan, Turkmenistan, and Uzbekistan and which could ultimately connect to Iran. Beyond that China ties loans to energy because it not only gets back the loans plus interest it can now tie up energy assets in long-term contracts at reduced prices for exclusive access.

Central Asia is one of the links in this chain for China clearly invests its economic resources in countries with which it has a political affinity and which enjoy a dubious reputation abroad because of their authoritarianism. We find China replicating this approach in Africa, Latin America, and in Southeast Asia where it is Myanmar’s staunchest foreign supporter. China also invests in these countries for two other reasons. Many other fields in producer states that were opened earlier are not available for sale and when China has sought to buy in major countries, e.g. its efforts to buy into UNOCAL in 2005, that action has raised a storm of disapproval from host states. But even bearing these things in mind, China’s strategy began before 2005 and works remarkably well with its geopolitical strategy. This is unlikely to be a coincidence or fortuitous event. This political dimension is another reason why China’s energy strategy is also connected to its overall foreign policy and defense strategy and may be thought of as mutually reinforcing aspects of its overall grand strategy.²⁶

For example China’s Export-Import Bank lent the state-owned Development Bank of Kazakhstan $5 Billion, and CNPC is lending Kazmunaigaz, Kazakhstan’s state-run gas company, another $5 Billion. Moreover, CNPC bought a 49% minority holding in Kazakhstan’s company AO MangistauMunaigaz from KazMunaiGaz National Co.²⁷ This deal enables Kazakhstan to continue its robust pace of exploration for oil, which finances its overall development plan whose long-range aim is its comprehensive economic diversification and modernization. Having received an estimated $21.1 Billion in 2008 in investment for exploration and production, it needs to keep that up during this crisis to prevent an even more severe economic contraction. Kazakhstan’s state news agency Kazinform said the $5 Billion loan would help pay for the MangistauMunaiGaz deal and the construction of the Beineu-Bozoi-Akbulak gas pipeline, which will serve southern Kazakhstan.²⁸ Thus Kazakhstan’s need for capital and reliable export markets plays into China’s strategy and China’s victory was clearly facilitated by its deep pockets and cash reserves.²⁹ But China’s actions do not break with past Sino-Kazakh relations. Indeed, according to Kazakhstan’s President Nursultan Nazarbayev, at least since 2006, “economic cooperation has become the major motivation for pushing the overall development of the Kazakhstan-China relationship.”³⁰ Nevertheless this deal exemplifies the way in which China can now exploit the stricken condition of countries like Kazakhstan whose

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³⁰ "Interview With President Nursultan Nazarbayev of Kazakhstan," Beijing, Xinhua Domestic Service in Chinese, June 8, 2006, FBIS SOV, June 8, 2006
banking system was all but insolvent and where foreign investment has fallen by half since 2008 by early 2009. Indeed this deal gives China control over about 15 percent of Kazakhstan’s total oil output and other Chinese firms have already been there for some time. Furthermore Kazakhstan’s national nuclear power company Kazatomprom has begun mining uranium fields in southern Kazakhstan in a joint venture with Chinese nuclear power companies. Terms of the deal also call for Kazakhstan to provide China with more than 24,000 tons of uranium by 2020. More recently, the China Guangdong Nuclear Power Group (CGNPG) and Kazakhstan’s state nuclear agency, Kazatomprom, have agreed to form a joint enterprise that would build atomic energy stations in China. Thus Chinese Prime Minsiter Wen Jiabao recently outlined a four point proposal for enhancing bilateral partnership that emphasized first of all maintaining the growth of bilateral trade, and second, fulfilling previous agreements and giving priority to cooperation in the energy and resource sectors. Then comes cooperation in investment and finances to ensure smooth implementation of construction projects. Finally both sides should promote cooperation in infrastructure.

This strategy of gaining critical access to Central Asian energy neither occurs exclusively in Kazakhstan, or even Central Asia nor only in regard to hydrocarbons. Apart from lending Kazakhstan money China is also building power plants in Tajikistan and Kyrgyzstan and pipelines in Turkmenistan that will then go on to Uzbekistan so that it can buy gas from these countries at lower than normal prices. It also is mining iron ore in Kyrgyzstan from what is apparently Asia’s largest source of iron. Not surprisingly the Kyrgyz government is encouraging further Chinese investment in its coal mining, non-ferrous metals, precious metals, and infrastructure sectors. Kyrgyz officials also want China to import electricity from the Kambarata power station that Russia is building to prevent surplus capacity and under production. Buying hydropower makes sense for China which has increasingly been pledging infrastructure assistance and cash to Central Asian states through the SCO, e.g. helping Tajikistan build dams and roads. Moreover, China can become a handler or middleman, e.g. wiring Central Asia into Pakistan and Afghanistan and picking up huge transit and construction fees. Likewise, in the past few years China has invested heavily in Afghanistan’s energy and mineral resources, which have been found to be abundant, with a view to building pipelines either directly to China or possibly through the port of Gwadar and Pakistan to China. As many analyses suggest, China ultimately...
hopes to ship Persian Gulf oil from Gwadar overland through Pakistan to Xinjiang in China.

Inasmuch as the Turkmenistan-China pipeline is now functioning and Turkmenistan has expanded its pipeline capacity to Iran, it does not require much imagination to expect that China is going to seek to finance a means of connecting those two pipeline systems into one so that gas as well as oil can be pumped overland from Iran to China through Central Asia. Since 2004 China has signed several major oil and gas deals with Iran which is already supplying over 15% of China’s energy needs. The most recent deal for $3.2 Billion was signed on March 15 2009 where China will help develop the South Pars field, part of what is believed to be the world’s largest natural gas reservoir. But beyond energy considerations these deals meet China and Iran’s overall foreign policy objectives. These deals are not only instrumental in ensuring China’s continuing receipt of large quantities of oil and gas, they also meet Iran’s desire to replace Japan with China as its main Asian energy importer. Thus Iran has warned Japan in the past that if it backed out of energy deals due to Western pressure it would turn to China. Iran’s foreign policy since 2001 has also been driven mainly by Tehran’s “Ostpolitik”, a policy placing primary emphasis on securing Russian, Chinese, and Asian support for its programs. Indeed, Iran seeks broader cooperation with Russia not only on nuclear issues but on a gas cartel and on all security issues in the CIS, or at least so it claims. And it clearly seeks to be a major supplier to China to earn its political support and help break Western sanctions. Indeed, Iran points to such deals as signs that US claims that foreign energy firms are shunning Iran are baseless and that US opposition to energy deals with Iran can be overcome.

Therefore these deals also compromise the unity of the P-5 (permanent members of the Security Council) and the negotiations between the EU and Iran that include China and Russia in forging a strong united front to arrest or reverse Iran’s ever more open quest for nuclear weapons. Thanks to these deals Iran not only gains strong supporters in the East, it gains capital to develop its energy systems and evade or mitigate at least some of the impact of UN and US sanctions. Indeed, according to a report from the CIA, “Chinese entities - which include private companies, individuals, and state-owned military export firms - continue to engage in WMD-related proliferation activities “ to Iran. And even though Beijing has tightened regulations on sensitive equipment exports, “enforcement continues to fall short.” China not only hamstrings the US and deflects its attention away from China’s growing power, putting it in the status of a demandeur vis-a-vis China as regards Iran. China also gets an enormous source of reliable energy supplies and by forging these deals it has already begun to create a basis for enhancing the viability of any projected pipeline linking it through Pakistan and Central Asia (either Kazakhstan or Uzbekistan, Afghanistan

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and/or Pakistan) directly to Iran. Here again China would thus be in a position to realize its ultimate dream of diverse supply lines that cannot be cut off by the US Navy or in this case by Russia or India, all potential rivals.

Thus China’s energy deals with Iran for oil and gas parallel its energy deals in 2009 with Russia and Kazakhstan in that they consolidate a community of interests binding China to its suppliers. But these deals also enable China to attack U.S. objectives, attain lasting partnerships with important energy suppliers and generally strategically important states, gain secure and reliable energy supplies, deflect Washington’s attention and energy away form it and its growth, and to do so at relatively little political cost. At the same time the current economic crisis offers China hitherto undreamt of opportunities to pursue its energy strategy at knock-down prices, for example in the Russian case, where it can obtain its goal of getting energy wherever possible at below market prices.

Beyond that oil pipeline from Iran China is also considering a major infrastructural investment there to make it into an overall energy corridor where it sets up an oil refinery and Gwadar Port Energy zone that also accommodates other energy industries, and creates the basis for oil and gas exploration projects in Pakistan from which the latter will benefit as well.xxxii Indeed, a comprehensive examination of Pakistan-China relations underscores the trend to deepen what had been essentially a security and geopolitically driven relationship with a strong energy and economic component comprising energy, trade, and investment by China in Pakistan.xxxiii Despite enormous Indian concern about China’s naval strategy of using Gwadar or Myanmar’s ports for military purposes, that task appears to be beyond the Chinese Navy’s current and foreseeable capabilities as the PLAN admits, and the main purpose of Gwadar and other similar port projects appears to be for energy transmission and infrastructure.xxxiv

Thus much of its investment in energy and infrastructure abroad in Central Asia seems to be connected or could easily be connected with its efforts to open up the port of Gwadar. Were this port to be established as a hub it could spare China the necessity of going through the Straits of Malacca and become the hub of a network of pipelines from Iran and the Middle East, if not also South and Central Asia, to China.xxxv Indeed, China’s so called string of pearls strategy in the Indian Ocean that combines large infrastructural developments in and around Myanmar and Pakistan with military construction of what appears to be potential naval bases, not only is viewed as an effort to project naval power into that Ocean through available ports or bases, but also as a way of bypassing the Straits of Malacca and creating strongholds of economic and political influence tying these areas to China through energy and infrastructural investments.xxxvi When and if the infrastructure tying these ports to China
is completed these projects could create long-lasting economic and political relationships dominated by China and that ensure that Middle Eastern and African energy supplies need not be at risk in the Straits of Malacca. In another example in early 2007 China loaned Tajikistan several million dollars without interest. In return the Tajik government then signed a political or cooperation agreement with China foregoing recognition of Taiwan, tightening security linkages, and postulating an identity of interests with China on a bilateral basis outside of existing linkages between them through the SCO. Similarly once the loan to Kazakhstan was announced, Chinese Vice Premier Wang Qishan indicated that it should lead to further bilateral cooperation in business and politics while President Nazarbayev of Kazakhstan indicated his support for Chinese investment in Kazakhstan and entrepreneurial activity that carried out mutually beneficial cooperation. The different nuances in these remarks indicate what is at stake here, i.e. Central Asia’s economic independence. Although these are only a few of many such examples in Central Asia and elsewhere, they underscore the tactics by which China is advancing its overall strategy for Central Asia in energy and other domains.

**CNPC’s Future Plans**

CNPC, in its own words, has been making acquisitions in Eurasia non-stop. Indeed, it recently announced a detailed plan to “strive to build five cooperation zones covering Central Asia, Africa, South America, the Middle East, and the Asia Pacific region within eight to ten years.” Ultimately its overseas oil and gas business would amount to 200 million tons of oil and gas annually. As this plan does not include the loans for oil plans that have already started so it represents a new campaign. Indeed, Central Asia is the most important zone for foreign energy cooperation, another sign of the intertwined nature of energy, strategic, and political considerations in China’s energy policies. Apart from expanding holdings in Africa and Latin America, the efforts in the Middle East should be strengthened to make it the company’s future key development zone. Meanwhile efforts should also be made in the Asia-Pacific for producing both natural gas and Liquefied Natural Gas (LNG). That last point has particular relevance for China’s energy ties to Myanmar, a major gas and oil supplier. CNPC has also indicated that this is an auspicious time for such bold plans since energy demand will grow while China already imports most of its oil. Moreover, CNPC aims to become an integrated international energy company with six oil and gas business centers in Asia, America, and Europe. Meanwhile the value of investment becomes more apparent as global economic growth slows down and both energy and
assets decline in price.\textsuperscript{ix} CNPC estimates that Central Asia has 8% of world oil and 5% of world gas and that negotiations are not that tricky since states like Turkmenistan are approaching China.\textsuperscript{x} Thus in Central Asia CNPC emphasizes the need for going beyond the already estimated 40bcm of gas to be transported through pipelines from there to 50-60bcm annually and transmitting 20 million tons of oil annually through the pipeline from Kazakhstan. Apart from the oil pipeline from Russia discussed below, CNPC wants to finish a pipeline that annually transmits 30bcm of natural gas from Russia. This means a priority on finishing pipeline deals, wrapping up their financing, and their construction from Central Asia and Russia. Therefore we can expect an even greater Chinese energy drive and footprint in these areas, for example, CNPC also wants to establish a heavy oil and LNG shipping company to control those products from the wellhead to China itself.\textsuperscript{xi} CNPC also believes that with the breakthrough in Sino-Russian talks there are no longer strategic obstacles to getting oil and gas from all four of these major strategic routes (Central Asia and Russia, South America, Africa, Asia-Pacific) and also expects breakthroughs on the Sino-Burmese pipeline this year.\textsuperscript{xii} CNPC also announced its tactics, i.e. merger and acquisition efforts with closely monitored and selected targeted oil and gas companies and assets, i.e. small to medium sized independent oil companies suffering from financial difficulties but with future potential, as well as sophisticated oil and gas assets. Second, it will also target larger oil and gas firms for mergers and acquisitions to expand its overseas oil and gas business.\textsuperscript{xiii} Although most of China’s energy imports still come from the Middle East; Beijing is clearly and rapidly seeking to diversify its suppliers on a global basis: Venezuela, other Latin American countries, Africa, Russia, and Central Asia. Neither will China slacken the pace of acquisitions anytime soon. As noted above, CNPC’s program will not stop. It recently announced its intention to invest up to $44 Billion in oil and gas projects in 2009, especially in core projects like the ongoing Kazakhstan-China oil pipeline that will send China 15 billion tons of oil a year from 2011-2034. We can expect that other projects in Central Asia, e.g. the gas pipeline from Turkmenistan, will also be moved further to completion and that Chinese firms and the government will continue searching for distressed energy firms that they can acquire at cut-rate prices to gain global and regional leverage among suppliers and governments.

Conclusions

Remarkably enough the implications of the new Turkmenistan-China pipeline simultaneously go beyond the scope of the questions addressed here and deeper into those issues. For example, if China can outbid Russia in Central Asia or provide an alternative to states feeling excessive pressure from Russia what does this say about Russia’s future prospects there or in East Asia where it is clearly unable to compete economically with China? Certainly this pipeline also strengthens native producers in Central Asia and may yet affect a new series of relationships between Iran and China. So the significance of this particular pipeline goes

\textsuperscript{x} Ibid.
\textsuperscript{ix} Ibid.
\textsuperscript{xii} Ibid.
\textsuperscript{xii} Ibid.
\textsuperscript{x} Ibid.
\textsuperscript{xi} Ibid.
beyond economics to involve profound geopolitical relationships as well. But that is hardly surprising given the salience of energy issues in both Russia’s and China’s policies. Finally, it also is clear that this pipeline does not represent the end of China’s policies but is only a very early stage in the expansion of China’s international energy and economic profile. CNPC’s plans and the other deals China has made in 2009 and is now making all point to the expansion of its presence in Central, South, and even Southeast Asia. China’s recent deals also suggest that it gaining sufficient leverage as to be able to induce those states to reorient their preferences towards China and even accommodate its views. Some have discerned even a similar trend in Australia though others deny it. Others argue this is happening in East Asia, particularly Southeast Asia, but also possibly in South Korea. The evidence submitted here suggests that we can begin to discern such patterns of accommodation, particularly in the face of the current crisis, backed up by the unstated but always present specter of China’s power, especially in neighboring areas like Central Asia. Indeed, several writers not only point to the growth of that power in Central or Southeast Asia, they openly herald the advent of a new order that is gradually becoming based on an increasing accommodation to China’s preferences, often manifested through such soft economic power as we have seen here.

Thus Thomas Rawski and William Keller openly warn that “the balance of influence between China and the United States in Asia is shifting decidedly in China’s favor.” Observers and experts will undoubtedly debate those conclusions. But they cannot debate or negate the vigor and assertiveness of China’s overall recent policies in international affairs and economics which are indeed linked together quite closely. Clearly strategic transformations in energy and in Asia’s and China’s overall policies are now upon us and are accelerating in their pace and deepening in their implications of which we can only see the first or early stages. But no matter how uncertain we are of the final outcome of these transformative processes, we can be sure that they will not stop anytime soon.

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The development of the eastern regions of the country will become one of the key priorities of the Russian energy policy in the twenty-first century. This will take place in the context of increasing diplomatic and trade and economic cooperation with the neighboring countries in Northeast Asia. Undoubtedly, the development of the energy sector will be prioritized in the implementation of the state policy in the East.

The Current Structure of the Energy Sector

Traditionally, the Russian energy sector was oriented toward meeting the needs of the domestic market and exports, primarily to the CIS countries and Europe. This structure of supplies was determined in light of historic, economic, and technological reasons. Prior to the beginning of the twenty-first century, energy trade with Asian countries was limited. As of 2008, the share of the eastern direction in Russia’s exports of oil and oil products was only 8%. Within coal exports, this share was 22%. There were no gas deliveries to Asia (1, 2).

At the same time, there has been significant progress in increasing the energy export volumes to the Asia Pacific in recent years. In 2003, when the Energy Strategy of Russia for 2020 was being set, the share of the Asia Pacific region in Russian oil exports was merely 3%, which means that it has been growing by an average of 1% a year for the last five years. Coal exports to this region more than doubled in the period from 2003 to 2008 (3). The processes taking place in the Russian energy sector are determined by the changes in the global market and the new Russian energy policy.

The New Stage in the Development of the Energy Sector

The global energy market has gone through the stages of national and regional development and has entered a new transnational level. This happened largely due to trade in oil and oil products, as inter-regional trade became one of the foundations for the development of the entire global economy in the twentieth century. After economically profitable ways of transporting coal and natural gas by sea were developed, these types of fuel also took a significant place in international trade. Russia is the largest energy exporter in the world. Taking into account the new economic reality, it aims to diversify both methods of transportation and directions of energy exports. In the long term, Europe and the CIS will remain the main buyers of Russian natural resources. However, the eastern
direction is taking on increasing importance in the Russian energy sector. This is linked both to the development of the Russian regions extending from the Urals to the Pacific Ocean and to rapid economic growth in Asia. The analysis of the currently developing oil and gas pipeline distribution system and methods of oil, gas, and coal transportation (by sea and rail), coupled with the growing electricity trade lead us to consider the formation of a new unified Eurasian energy system. The possibility to correct and optimize the direction of supplies depending on the current market demand is one of its specific features. The energy systems of separate countries could serve as reserve supply sources for their neighbors. Even today, it is possible to deliver energy resources from the CIS countries both to the West and to the East, and the well-developed transport infrastructure enables to redirect trade volumes during periods of peak demand. Russia plays a key role in this system, as a chain link between Asia and Europe. The development of new production areas and transport infrastructure in East Russia is crucially important for the entire Eurasian energy sector.

**Development of the Energy Sector in East Russia**

The accelerated socioeconomic development of East Siberia and the Far East is one of the main long-term strategic priorities for Russia. The energy sector plays a crucial role in achieving this aim. First and foremost, this relates to the development of a new energy infrastructure system, which should connect Russian regions and form new production centers based on the development of energy supply and processing facilities. By 2030, the share of eastern regions of Russia in the total coal production should increase to 46-47% as compared to 33% in 2008; that in the total oil production, to 18-19% as compared to 3% in 2008; and that in natural gas production, to 15% as compared to 2% in 2008 (1). Therefore, the development of the region’s energy sector will make a significant leap in the next 20 years. In the next few decades, new centers of production, processing and export of fuel and energy resources will be introduced in the Russian Far East. The inclusion of hydrocarbon reserves in commercial exploration will give an impulse to the development of petrochemical and gas chemical facilities and will promote accelerated socioeconomic development of East Siberia and the East. It will also ensure the growth of gross regional product of at least 0.5-1.5% above average growth across the country. The aim to increase hydrocarbon production will require significant investment in geological exploration. An increase in oil reserves needs to reach optimum production levels in East Siberia, and the Far East is estimated at 1.8 billion tons by 2020 and at over 3 billion tons by 2030 (1). To ensure the development of the resource base of the fuel and energy sector in remote and difficult-to-access regions, the state should create appropriate legislative, taxation, institutional, and other conditions. The component structure of the oil and gas fields in East Russia is conducive to large-scale development of the petrochemical industry. Gas fields in East Siberia have high helium content (from 0.15% to 1%), necessitating the development of the helium industry, including the construction of several large gas processing plants and underground helium concentrate storage facilities. There are plans to build a refinery in Primorsk with an annual capacity of 20 million tons. The following areas will become the largest
centers of gas production: Sakhalin (Sakhalin-1, Sakhalin-2, Sakhalin-3, Sakhalin-4, Sakhalin-5, and Sakhalin-6 projects and the fields in the eastern Kamchatka sector of the Pacific Ocean), Yakutsk area (Chayandinskoye field, Srednebotuobinskoye, Taas-Yuryakhskoye, Verkhnevilyuchanskoye, and other fields), Irkutsk (Kovyktino field), Krasnoyarsk (Sobinsko-Paiinskoye, Yurubchen-Tokhomskoye, Omorinskoye, Kuyumbinskoye, Agaleevskoye, and other fields). They will produce up to 132-152 billion cm of gas a year.

In addition to the Kansko-Achinsk basin, coal production in East Russia will also develop at the following new deposits: Urgalskoye, Elegestskoye, Elginskoye, Apsatskoye, and possibly, the Bering coal basin (Chukotsk Autonomous Region).

In addition to the growing production of energy resources and power generation, we will see an increase in the demand for electricity in East Siberia and the Far East, in response to the socioeconomic development in the region. This growth in demand will be much higher than that on average across Russia. It will be met by increasing the capacity of hydro power plants, construction of thermal power plants operating on coal and gas, new nuclear power plants, and small-scale facilities operating on renewable energy sources.

There are also plans for the large-scale development of power transmission grids, which will help meet the strategic aim to unify the energy systems of Siberia and the Far East. In 2030, the Far Eastern federal district will be a region producing a large surplus of energy, which will meet its own needs in primary energy sources, including those in the remote regions, by utilizing local resources and renewable energy sources. It will have a large potential for providing exports to the Asia Pacific region.

**Russia’s East Export Strategy**

The diversification of energy export routes is one of the main aims of the Russian energy policy. This will be achieved mainly by increasing exports to the Asia Pacific region. Russia aims to develop trade in the region by ensuring the balance between the interests of countries that import, export, and transit energy resources. Russia is willing to supply energy resources needed by foreign consumers. However, their prices should enable the implementation of large energy projects (including production in remote regions) and transportation over large distances.

The policy of the Russian government is aimed at creating favorable conditions for the development of exports to the East. For example, the Russian government made a decision to exempt some of the oil fields that serve as the resource base for the ESPO pipeline, from export duties, in order to speed up the development of these fields. This should promote a growth in production volumes in East Siberia. Zero rate of Mineral Extraction tax was also introduced for the fields in the region. This is another mechanism of economic support for the producers. The fact that the government is taking these steps despite the global economic prices and a reduction in budget revenues testifies that the development of the energy sector in the eastern regions of the country is a high priority.

By 2030, the share of Asia Pacific countries in the structure of Russian energy exports is expected to increase to 26-27% as compared to 4.5% in 2005. (1, 4)

Cooperation with Northeast Asian countries is now developing in all the main spheres of the energy sector.
Cooperation in the Gas Sphere

In 2009, Russia entered the global LNG market, offering its own LNG for the first time. This happened owing to the Sakhalin-2 project implemented by Sakhalin Energy. The Sakhalin liquefaction plant is due to start operation at full capacity in 2010, producing 9.6 million tons of LNG a year. Since the launch of the LNG plant in February 2010, Sakhalin Energy has already shipped over 5.5 million tons of liquefied natural gas. Over 50% of it was delivered to Japan in 2009. The rest was delivered to South Korea, India, Kuwait, China, Taiwan, and other countries (5). Sakhalin Energy Consortium includes Gazprom (holds 50% plus 1 share), Shell (27.5%), Mitsui (12.5%), and Mitsubishi (10%). Therefore, the new LNG plant was a result of the successful cooperation between Russian, Japanese, and European companies. Tankers for the project were built in Japan, ensuring a full load of capacity for local shipping companies. Therefore, the Sakhalin-2 project clearly demonstrates that joint energy projects in Russia promote the economic and industrial development of the entire region of Northeast Asia.

It is no coincidence that the first LNG plant in Russia, which has the largest natural gas reserves in the world, is oriented toward exports to the Asia Pacific region. An analysis of the forecasted world gas demand by various research organizations shows that by 2030, the increase in gas demand in Asia will be significantly above that in the Atlantic basin. According to the International Energy Agency, by 2030, the volume of demand for LNG in the OECD countries in Asia will grow at an average of 1.1% a year, while that in non-OECD countries will grow by 3.8% (6). For comparison, in Europe, demand is expected to grow at 0.8% a year, while there could be negative dynamics in the United States. Currently, the possible expansion of LNG production capacities in Sakhalin is being considered. The construction of other plants in the Russian Far East is also under review. An analysis of the resource base and sales markets indicates that these projects are highly attractive for investment.

In the long term, the expansion of LNG production capacities will be supplemented with export pipelines. China has signed agreements that propose two possible options of gas supply routes: (1) the Western option that provides for supplies from West Siberian fields and (2) the eastern option that provides for supplies from the fields in East Siberia, the Far East, and the Sakhalin shelf. The parties are also considering the potential implementation of joint projects in the gas processing and gas chemicals sphere in East Russia. There are regular negotiations between Gazprom and Kogas in relation to the supply of Russian natural gas to the Republic of Korea. The companies confirm that it is economically feasible to build a gas pipeline between Russia and South Korea. However, the issue of transit through the territory of North Korea has not been resolved.

Cooperation in the Oil Sphere

The oil industry is also actively developing in East Russia. In recent years, the capacity of oil production facilities in the Far East has increased, including the projects in the Sakhalin Island. Infrastructure is also being developed for the delivery of oil from Siberia to the Far East. The ESPO pipeline project has become the largest oil transportation project in recent years. This pipeline is over 4,770 km long. The specialized oil-loading sea port Kozmino in the Primorsk territory is its endpoint.

In December 2009, the first phase of ESPO-1
was commissioned. It is a 2,694km pipeline from Taishet (Irkutsk region) to Skovorodino (Amursk region). The capacity of the first phase of ESPO is 30 million tons a year. Prior to the completion of the second phase of ESPO, oil will be sent by oil trains weighing from 4.5 to 4.8 thousand tons to the Pacific Ocean. The total amount of delivery will reach 15 million tons per year. Another 15 million tons will be delivered to China by a branch of ESPO pipeline being built in the Skovorodino area. The first oil cargo from the ESPO-1 phase has already been sent to Hong Kong.

The system will be technologically linked to Transneft’s existing trunk pipelines and will enable to create a unified network, which will ensure the effective distribution of oil in the Russian territory in the eastern and western directions. Therefore, ESPO will become another element in the developing unified Eurasian energy system.

Cooperation in the Power Sector

There is a large potential for cooperation with Northeast Asian countries in the power sector. This is due to both the balance of the demand and production capacities of separate regions and the difference in the peak levels of consumption. For example, in Russia, the maximum load in the energy system of the East is in the winter period due to the cold climate, while in South Korea, the peak demand is during the summer due to the use of air-conditioning. Therefore, there is a potential to send power supplies to South Korea in the summer and to Russia in the winter. This would enable to optimize the capacity load and solve the issue of peak demand in both the countries. The possible integration of electricity transmission grids in Russia, Mongolia, China, Korea, and Japan is being considered within the framework of the North East Asian Region Electrical System Ties (NEAREST) international energy program. The “NEAREST program proposes the consistent integration of countries in the Northeast Asian region into a unified energy space with the aim to ensure the reliability of electricity supply to consumers by using cross-border exchange of electricity and capacity.” Naturally, there are still many problems on the way to create a unified power system in the Northeast Asian region. The issues are as follows: participation of North Korea, attracting investment, construction of necessary electricity transmission lines, and negotiation of tariffs. However, the parties’ intent to make progress, backed by the signing of formal documents, indicates that this system could begin full operation as soon as in the coming decade. The results of several research studies confirm that it is economically viable to integrate the power systems. The active electricity trade projects between the countries in the Northeast Asian region will become the elements of the new unified power system. In 2009, Russia supplied 854 million kWh of electricity to China (7). According to intergovernmental agreements approved in the autumn of 2009 during a meeting between the prime minister of Russia, V. Putin, and head of the State Council of China, Wen Jiabao, by 2020, the transit of electricity to China should grow more than 60-fold to 60 billion kWh. To meet this target, new electricity transmission lines, converter substations, and necessary infrastructure facilities are being built on both sides of the border. The expansion of generation capacities is planned in the Russian territory. Russia also trades electricity with Mongolia, another country in the Northeast Asian region. In 2008, Russia exported 195 million kWh to Mongolia and imported 15 million kWh. At present, the viability of increasing power flow from Russia to Mongolia is being considered.
There is no electricity trade with other countries in the region, but potential projects have been under consideration for many years. Russia is in negotiations with South Korea and Democratic People’s Republic of Korea on a project to build 500 kW power transmission lines from the Primorsk territory to Seoul. This is not only an energy project but also has great political significance. Its successful implementation should enhance cooperation and trust in the Korean peninsula. The project to create a Russia-Japan energy bridge has been in discussion for several decades. It envisions the construction of generating capacities in the Sakhalin Island and Yakutia and electricity transmission lines to export electricity to Japan. Since the project is fairly complex to implement and requires considerable investment, it has not yet managed to enter the investment stage. However, in the long term, the participation of Japan in the unified power system of the Northeast Asian region is possible. The last few decades have shown that Japan has to be connected with neighboring countries via electricity transmission lines. In the wake of a number of natural disasters, including earthquakes, nuclear power plant units in Japan were shut down on a number of occasions, leading to a shortage in electricity generating capacities. Russia does not intend to limit its cooperation with the Northeast Asian region to electricity trade. Russian companies already have expertise in the construction of power generation facilities in the region. Potential further participation of Russian companies in similar projects is being discussed. At the end of 2009, an agreement was reached with China on the construction of the second phase of the Tyan’van Nuclear Power Station in China. This project is the continuation of the construction in the first phase, implemented by Russia’s Atomstroyexport, which commissioned two nuclear power units of 1,000 MW each. In addition, Russia and China are discussing building a nuclear power plant equipped with fast neutron reactors. Russia and Mongolia are in discussion on future cooperation in projects to implement Mongolia’s Power Sector Development Program. In particular, this relates to the construction of thermal power plants. The participation of Russian companies in energy projects in the Northeast Asian region and the simultaneous participation of Northeast Asian companies in the Russian energy projects enhance the mutual understanding between the parties and promote the development of political and humanitarian dialog.

Mutual Interest is the Basis for Long-Term Strategic Cooperation

Currently, Northeast Asian countries are highly dependent on energy supplies from the Middle East. High country risk of some of the Middle East countries poses a threat to long-term energy security in Asia. This is the reason that Northeast Asian countries should be interested in steadily developing Russia, who can help diversify import sources and guarantee a stable supply of energy to regional economies. Cooperation with Asia will allow Russia to stimulate the development of its eastern regions and diversify energy exports, which consequently means reducing associated risks. Therefore, we can speak of mutual dependence, which is in the interest of all countries in the region. However, the implementation of complex energy projects in the region requires attracting significant investment and use of modern technologies. Russian, Chinese, Japanese, and South Korean companies have high investment and technological ability as well as expertise in the implementation of projects,
unrivalled in the world. Uniting this potential within the framework of separate initiatives, which are of interest to several countries in the region, will enable the implementation of even the most ambitious projects. The fields being developed and the pipelines and nuclear power plants under construction are all related examples. In the near future, the number of these projects should grow significantly. The joint cooperation of these companies is possible not only in this region but also in the third countries. The advantages of various participants will allow them to set up consortia, which will be able to offer attractive terms for securing contracts and winning tenders in many parts of the world. The nuclear power industry could become one of the potential directions of developing cooperation, of interest not only to Russia but also to other Northeast Asian countries. Within the region, there are countries both with large uranium reserves (Russia, Mongolia, and nearby Kazakhstan) and large nuclear power consumers (Russia, Japan, South Korea, and China). At the same time, these consumers have extensive expertise in the construction of nuclear power units. Therefore, there is a basis for cooperation in the construction of nuclear power plants, delivery of fuel to them, and waste utilization. A regional nuclear fuel bank could also be set up. Its reserves would ensure stable supply to power plants. China, Japan, and South Korea are significant global importers of energy resources. In the long term, the dependence of these countries on supply from abroad will grow. The high share of import will undoubtedly have an adverse effect on the level of energy security, unless there is a 100% guarantee of supply reliability. Considering this, Asian countries are aiming to extend the operation of their companies in producing regions and partially provide the import from their own stakes in production. However, the participation of foreign companies in energy projects is not always attractive to exporting countries. In cooperation with Russia, setting the conditions for the access of Russian companies to the domestic markets of Asia in return for the participation of its companies in production could become a compromise option. This measure would promote the creation of a unified energy space and would guarantee the development of a regional energy market based on free market trade. The entry of Russian companies into the markets of several European countries could be an example of this. This has had a positive impact on both the development of the energy sector of these countries and on the development of bilateral relations. European energy companies in their turn are successfully participating in many projects in Russia. Northeast Asia has significant potential for the development of the renewable energy sector. In particular, this is the case with hydro generation, tidal power, geothermal power, and wind power. Renewable energy projects require that the countries in the region develop economically efficient technologies. Cooperation is possible in the area of scientific development and exchange of expertise during project implementation. With respect to developing cooperation in Northeast Asia and the implementation of new large-scale energy projects, it must be noted that the region we live in is unique. In addition to endangered animal population, there also exists a multitude of valuable fish species, beautiful natural parks, and water reservoirs. Depending on how attentively and prudently we treat nature today, the next generation will or will not be able to see the grey whale (lives in the Pacific Ocean near Russia, Japan, and South Korea), Amur tiger (small numbers remain in Russia, China, and North Korea), and other wildlife under
threat of extinction. It is reassuring that environmental issues are given high priority at the political level. For example, on the decision of the Russian government, the route of the ESPO pipeline was moved 400 km to the north of Lake Baikal, despite a significant increase in project costs. There is increased focus on preserving the environment within the framework of other energy projects, which are being implemented in Russia. All companies starting or developing their operations in the country have to be prepared for this.

In conclusion, we list several key tasks that promote the successful development of energy cooperation with Northeast Asian countries:

- Creation of a regional system and rules of trade in energy resources, which take into account the interests of producers and consumers
- Use of expertise, investment, and technological abilities of companies in the implementation of joint production, transportation, and generation projects
- Enhancing trust and broadening the possibility of operation in the sales markets in the region
- Stimulation of innovative development and exchange of technological expertise
- Preservation of the environment and ecology in the region
- Integration of Northeast Asian countries into a unified Eurasian energy system

In the long term, the energy sector of the Northeast Asia region should become a reliable unified blood supply system for the rapidly developing regional economy. The successful achievement of this aim to a large extent depends on the development of the eastern part of Russia, which will be the central element of the system being created now. Therefore, the current energy policy of the Russian government is of utmost importance not only for Russia but also for the entire region. We would like to believe that cooperation in the energy sector will become a sound basis for the development of mutually profitable cooperation between our countries in the economic, political, and humanitarian areas and with respect to issues concerning the preservation of ecology.

References

5. Sakhalin Energy, press release “100th LNG cargo has been shipped within the Sakhalin-2 project,” January 2010.
Decline or Re-rise of OPEC: Implications for Northeast Asia

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Housing three large, growing and vibrant economies of South Korea, Japan and China, Northeast Asia is the engine of growth for Asia. This continent is the world’s rising economic powerhouse to qualify the 21st century as the Asian one. The Asian growing economies, corrected for the troubled Japanese economy, and populations with improving living standards have demanded a large and increasing amount of energy to make Asia the world’s single largest energy consumer. Within this context, the share of the Northeast Asian economies is the largest thanks to their large economies and also populations, which, in the case of China, is the world’s largest and still growing significantly. Their huge and expanding energy requirements have resulted in especially large imports of fossil energy. With respect to oil, lacking any oil reserve of significance, Japan and South Korea have heavily depended on oil imports while China having, relatively-speaking, substantial oil deposits has been increasing its imports due to a growing gap between its oil production and consumption. China is the region’s largest oil consumer whose demand for oil is increasing on a fast and steady basis.

Briefly, Northeast Asia will remain heavily dependent on imported oil in the foreseeable future. For this matter, the availability of supplies will be a major objective of the region’s energy security policy for which its three major economies cannot be indifferent to the developments in the global oil markets. As the single major grouping of oil suppliers, OPEC (Organization of the Petroleum Exporting Countries) is of obvious importance for them because of its salient impact on those markets in terms of supply availability and pricing, on the one hand. On the other, the fact that these economies are dependent significantly on OPEC countries for a large share of their oil imports makes them unsurprisingly interested in OPEC’s life. Given all indicators suggest that non-fossil energy to include the environmentally clean ones will not grow significantly in the foreseeable future to replace fossil energy, including oil, despite environmental necessities, there is no doubt that this interest will remain in place especially because of the status of many OPEC members as the large, long-term oil suppliers drawing on the bulk of the currently-discovered oil deposits.

Against this background, the future role of OPEC in the global markets is of interest to all

1 North Korea is also part of Northeast Asia. However, it is excluded from this study given its insignificant energy requirements, mainly the result of its small and stagnating economy. References to it are only made regarding the regional energy resources.
the players in this market whether suppliers or consumers, including the Northeast Asian consumers, as any major development in this regard will surely have an impact on them in some form. Within this framework, OPEC’s somewhat loss of worldwide significance over the last two decades worth elaboration as this development has provided a ground for arguing about its future and thus whether it can and will continue as a grouping of the major oil suppliers facing many new independent oil suppliers. Yet, while a degree of limiting of its clout and global role is a fact of life, all indicators suggest its continuity and growth in the future as the single largest grouping of the major oil exporters, a point that the Northeast Asian economies need to take into consideration in their pursuit of energy security.

**Why OPEC Is Important to Northeast Asia**

Despite the necessity of using environmentally-clean energy to address environmental degradation, including global warming, Northeast Asia, like other regions, is still heavily dependent on fossil energy, particularly oil. This is notwithstanding the regional efforts to expand the share of non-fossil energy of the regional energy requirements reflected in the growing solar water boilers, solar panels and wind farms, for instance. Yet, being its primary source of energy, Northeast Asia has limited fossil energy resources. Having small amount of coal (Japan: 355 million tons [mt] and South Korea 133[mt] and North Korea: 600 [mt]) providing self-sufficiency only in North Korea’s case, South Korea and North Korea has no oil and gas deposits of any significance while Japan has very insignificant oil (44 million barrels) and gas (0.738 trillion cubic feet) reserves incapable of meeting even its basic needs for these fuels.\(^2\) Comparatively, China’s fossil energy resources are substantial, i.e., being 15.5 billion barrels (hereafter bb) of oil, 86.7 trillion cubic feet of gas and 114 billion tons of coal.\(^3\) China was self-sufficient in these fuels until the early 1990s when it had to begin importing especially a large and growing amount of oil as its consumption started to increase way beyond its production. Despite differences between the East Asian countries in terms of fossil energy reserves, their resources are inadequate to meet their current and future needs. Of course, this inadequacy varies from one regional country to another given the differences in terms of availability of oil, gas and coal between and among the regional countries. Yet, even in the case of oil in which China is relatively rich, there is a phenomenal gap between their current production and consumption as indicated in <Table 1> based on the most recent available statistics (2008).

<table>
<thead>
<tr>
<th>China</th>
<th>Japan</th>
<th>North Korea</th>
<th>South Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>3,790.18</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Consumption</td>
<td>7,931</td>
<td>4,784.85</td>
<td>16</td>
</tr>
</tbody>
</table>


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\(^3\) BP Statistical Review of World Energy.
China, Japan and South Korea will all experience an increase in energy consumption in the foreseeable future ending the benchmark year of 2030. Given their lack of significant fossil energy resources and their predicted insignificant increase of non-fossil energy production, Japan and South Korea will be unable to significantly change their domestic production of energy. In a general sense, this regional pattern is also true for China although it has relatively-speaking large oil, gas and coal resources. To meet its growing energy needs, China has sought to increase its production of both non-fossil and fossil energy. Despite its impressive achievements, non-fossil energy, including renewables, will not be large enough to sharply decrease its needs for fossil energy (11% of its energy demand in 2030)\(^4\). In short, all the East Asian countries will remain heavily dependent on imported fossil energy despite differences in their production capabilities at home. Their dependency on oil will be especially high as indicated in the case of China (from 114 million tons of oil equivalent [mtoe] in 2007 to 758 mtoe in 2030) and also Japan although its oil consumption will decrease somewhat (from 230 mtoe in 2007 to 152 mtoe in 2030). Thus, despite fluctuations in their oil consumption, the region will remain heavily dependent on oil imports. For this matter, developments in the supplying countries and organizations are and will remain very important for China, Japan and South Korea both for the availability and pricing of supplies. Being the largest and the most important supplier’s organization, OPEC’s future to be discussed below will be particularly crucial for them especially because many of their large suppliers are OPEC members.

**OPEC’s Impact on the Global Oil Markets Since Its Establishment**

OPEC was founded in 1960 to help its members improve their status as oil suppliers vis-a-vis their major clients and particularly the large Western oil corporations dominating the global oil markets. Being in a monopolistic position, these corporations basically dictated their terms to the weak supplying countries, including low prices, with the effect of denying them a fair price and thus income for their valuable export commodity. The dissatisfaction with the status quo of the largest oil exporters having vast oil resources (Iran, Iraq, Saudi Arabia, Kuwait and Venezuela) gave birth to OPEC; many other oil exporters of whom the majority are major ones joined the founders over the period 1961 to 2007.\(^5\) These are Qatar (1961), Indonesia (1962), Libya (1962), United Arab Emirates (1967), Algeria (1969), Nigeria (1971), Ecuador (1973), Gabon (1975) and Angola (2007).\(^6\) Being unhappy about their OPEC-determined export quotas and/or unwilling to pay their large annual membership fee, Ecuador and Gabon suspended their membership in 1992 and 1994, respectively,\(^7\) but Ecuador rejoined OPEC in October 2007.\(^8\) Indonesia’s

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\(^6\) Ibid.

\(^7\) Ibid.

membership in OPEC was suspended upon its own request in September 2008 given its inability to meet its designated OPEC export quota due to its large domestic consumption and its depleting operational oil fields.

To affect the global markets in favour of its members, OPEC’s main objective is to coordinate its members’ oil policies through managing the supply of crude oil (by setting quotas for its members). If fully implemented, this should help it set oil prices at an acceptable level for its members. Hence, although each OPEC member can sell its quota to whomever it chooses, OPEC’s strength lies in its membership’s collective operation in the international markets to set prices through the management of supply, and thus prevent low prices resulting from excess supply.¹⁰

OPEC has served since its establishment as a vehicle for its members to upgrade their status in their dealing with their major customers. Yet, in its first decade, OPEC had a negligible impact on the global markets as it was mainly in the process of consolidation. The coordinated efforts of its members to bring about a degree of control over these markets in their favour began in the early 1970s as its members nationalized their oil resources after the 1960s excluding Iran and Indonesia which did so in the 1950s. In fact, the political developments starting in that decade helped improve the economic lot of its membership by pushing up oil prices substantially. The OPEC countries improving financial capabilities and their large oil resources accounting for the bulk of the world’s discovered reserves helped them act as a force in the global energy market and, in fact, in international relations.

Particularly, certain military event in the 1970s had a major impact on OPEC added to its preceding one. Reacting to the humiliating defeat of the Arab states in the Arab-Israeli six-day war of 1967, OPEC’s Arab members and two other Arab oil-producers with much smaller resources and production (Egypt and Syria), founded the Organization of Arab Petroleum Exporting Countries (OAPEC).¹¹ Pressuring the Western supporters of Israel, particularly the United States, was their main objective. The Arab-Israeli war of 1973 (Yom Kippur War) had a major impact not only on the Arab OPEC members, but also on OPEC, in general, a war bringing another major defeat for three major Arab parties to the Arab-Israeli conflict: Egypt, Syria and Jordan. The development led to the 1973 oil crisis as in October 1973 OAPEC imposed an oil embargo (lasted until March 1974)¹² on the United States for its backing Israel; it was subsequently extended to other Western supporters of Israel. The resulting reduction of oil supplies to the United States and the uncertainty about supply availability for other Western countries depending on Arab oil suddenly increased oil prices from US$3 to US$12 in 1973.¹³ Given the Arab countries accounted for the majority of OPEC members, the embargo was seen as a show of power by

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¹¹ The Organization of the Petroleum Exporting Countries (OPEC)-Brief History.


OPEC even though its major non-Arab members (Iran, Venezuela and Nigeria) did not participate in this action.

The development has remained the only coordinated political action attributed to OPEC. The reason is two folds. On the one hand, OPEC is an oil grouping with a clear economic objective of preserving its membership’s interests regarding oil trade.

On the other, there is not any common ground among its members subscribing to different political orientations and objectives.

OPEC has therefore been mainly focused on securing for its members the highest possible oil prices. To that end, it has set export quotas for them by which excess supplies in the global markets that bring down oil prices can be avoided. OPEC record in this regard has been mixed for certain major reasons: periodic economic declines in the oil-importing countries decreasing their oil demand and the non-OPEC oil exporters. Since such exporters do not follow OPEC’s policy of controlling supplies to prevent sudden oil-price falls, on occasions, they might substantially increase their supplies for immediate gains when prices are high notwithstanding its predictable lowering impact on oil prices when the global oil markets are saturated. An additional reason is “cheating” by some OPEC members and thus their exporting more than their allocated quotas to take advantage of special situations when both oil prices and demand are high, a common practice for those members with a significant unused export capacity (e.g., Saudi Arabia).

OPEC’s Current Global Role

OPEC holds the bulk of the world’s proven oil reserves having a great potential to increase due to new discoveries. Thus, its share of these reserves being 78% (equal to 939 bb) in 2007 jumped to 79.3% (1023 bb) in 2008. OPEC now provides for 60.3% of the global oil demand. The fact that OPEC possesses such large reserves has guaranteed a very influential status for the oil organization, added to its combined membership’s rank as the single largest global oil exporters. In short, these facts indicate its importance for the global energy markets and its long-term salience for all oil-importing economies.

Nonetheless, OPEC’s role has been somewhat weakened over the last three decades for certain reasons, but, first and foremost, the gradual emergence of new exporters outside OPEC. Started in its earnest in the 1970s, the process was preceded by the Soviet Union’s exporting oil to non-Communist states (Western European countries) at a substantial scale in the 1960s. Having kept their status to this date, Norway and Britain emerged as oil producers and, in the case of Norway, a significant oil exporter in 1970 as the North Sea’s large oil reservoirs was discovered. At least three major factors have contributed.

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4. OPEC’s Share of Crude Oil Reserves (2007).
to an increase in the number of non-OPEC oil suppliers since the 1990s. First, the Soviet Union’s breakup increased the number of oil exporters in the ex-Soviet territory from one to five (Russia, Azerbaijan, Kazakhstan, Turkmenistan and Uzbekistan). Russia has remained their single largest oil exporter while among the rest Azerbaijan and Kazakhstan have significant non-regional oil exports. Second, discovery of major new oil reserves in the countries with limited production capabilities mainly for domestic purposes and in others with no known oil resources have also pushed up the number of non-OPEC oil exporters. The examples for the first group include Sudan and Vietnam\(^1\) while those of the second group include two surprise countries: Cambodia having found offshore oil and gas in 2005 (estimated to be between 400 and 700 million barrels of oil)\(^2\) and, most recently, Cuba having found in September 2009 offshore oil reserves with potentially 3-4 bb of recoverable oil.\(^3\) Based on geological evidence suggesting the availability of oil in many other regions (e.g., West Africa), the number of non-OPEC exporters will probably further increase. Third, the current accessibility of many inaccessible oilfields especially very deep offshore ones has consolidated the global status of the non-OPEC suppliers. A recent example is the September 2009 discovering by BP of a large offshore oilfield (Tiber well) in the American territorial waters of the Gulf of Mexico requiring drilling the well to a total depth of about 10,685m.\(^4\) The predictable future technological advancement will surely make many currently-inaccessible onshore and offshore oil fields accessible.

**The Impact of the New Situation on OPEC**

The increasing number of non-OPEC suppliers has negatively affected OPEC. Having a significant export capability combined, they have lessened to some extent OPEC’s ability to keep oil prices as high as possible. As many of them have small exportable oil resources, they would rather keep themselves out of the OPEC export quota and pricing system and thus operate as independent suppliers to take advantage of opportunities. When combined, these new suppliers and the old non-OPEC members (being mainly small- and medium-size exporters such as Canada, Mexico and Egypt) have a significant share of the global market of about 40% in 2009 (exactly 39.7% in 2008).\(^5\) These non-OPEC suppliers do not work in concert in the global markets, but their combined supply capabilities have been a major factor, though not the only one, in weakening OPEC’s power to regulate the availability of supplies, a crucial factor to determine oil prices.

As a result, the non-OPEC suppliers’ large share of the global oil markets has weakened OPEC to a degree. However, this development should be analyzed within its appropriate context and thus should not be exaggerated.

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\(^1\) Vietnam is currently has a limited export capability due to its rising domestic consumption and the rapid depletion of its reserves.


given OPEC’s unchallenged status because of its controlling 79.3% of the global proven oil deposits and its currently having 60.3% of the global market share. Moreover, the overwhelming majority of the world’s largest oil suppliers (e.g., Iran, Kuwait, Saudi Arabia and Venezuela) are among its members. Consequently, the impact of the increasing number of non-OPEC supplier on OPEC has been mainly translated in its relative loss of global influence compared to its status in the 1970s. That’s why its current phenomenal capability to affect oil prices through managing supplies thanks to its members’ large exports has motivated in many cases large non-OPEC suppliers such as Norway and Russia to follow OPEC’s lead in pricing and thus controlling supplies out of self-interest.

New Trend

Evidence suggests that OPEC’s somewhat weakened role will be restored to its previous strength in the medium- and long-term. The reason lies in the fact that the majority of the non-OPEC exporters are short-term or medium-term exporters with relatively small export capabilities. Along with the older non-OPEC suppliers (e.g., Denmark and Norway), they will therefore cease to supply oil once their resources are depleted, a scenario to take place long before the OPEC members’ depletion of their oil reserves. Undoubtedly, OPEC’s ability to have a major impact on the global oil markets will be sure bet given the huge reservoirs of its members, particularly its Persian Gulf ones, namely Saudi Arabia (264.1 bb), Iran (137.6 bb), Iraq (115.0 bb), Kuwait (101.5 bb), UAE (97.8 bb) and Qatar (27.3 bb). Another contributing factor is its members large daily exports accounted for 24.19 million barrels per day (m bpd) of the world’s total oil exports of 40,114.4 m bpd based on the 2008 statistics, the most recent year on which OPEC-provided statistics are available today (January 2010).

Among other indicators, OPEC’s growing share of the global oil markets over the period 1998 to 2008 during which many new oil exporters emerged indicates its gradual restoration of its previous unrivalled status. It therefore increased its market share from 55.3% in 1988 to 60.3% in 2008. Symbolically, Angola’s joining the oil organization and Ecuador’s rejoining it in 2007 reflected, among others, this reality’s appreciation by at least some of the independent exporters.

Conclusion

OPEC was founded for a specific reason, which has remained valid for all its members to this date. The coordinated act of its membership through observing the quota system to secure the highest possible price for their finite strategically important commodity has helped the OPEC members to improve their financial gains of oil exports while ending the unacceptable one-sided pricing mechanism of the Western oil corporations. This factor has remained the single major incentive for the OPEC members to remain in the organization despite their occasional unhappiness about its quota system, which
may deny them short-term gains while securing them long-term profits of well-priced oil exports. Surely, the new oil discoveries in many OPEC and non-OPEC countries added to accessibility of many ex-inaccessible oil wells have increased sharply the global oil supplies to prolong the global oil markets’ life span. However, these resources are finite and thus their predictable rapid depletion because of the growing demand will gradually deprive the oil exporters from their exports’ revenues. This reality will surely provide another strong incentive for the oil exporters to seek the highest possible oil prices. This will be a major motivating factor for the OPEC members to stay in the organization. It will also be a strong factor for at least some of the non-OPEC suppliers to join it to offset other non-OPEC suppliers’ ability to overflow the global markets with oil for immediate gains only to eventually decrease oil prices in these saturated markets. Respectively, joining and rejoining OPEC by Angola and Ecuador indicate the importance of this issue in the oil exporters’ calculations.

Hence, even though the increase in the number of non-OPEC exporters has weakened the status of OPEC to some extent, OPEC’s current large share of the global markets and its drawing on the bulk of the world’s proven reserves (securing its long-term export capability) will surely help it repair its somewhat eroded influence in the global oil markets. Far from becoming irrelevant to these markets, OPEC is on its way to consolidate its status as the world’s largest grouping of oil exporters to reckon with.

Given this reality, OPEC will remain the single major player of long-term importance to the three large economies of Northeast Asia. Despite their efforts for supply diversification, their current heavy dependency on the OPEC suppliers dictated by the sheer fact of their large export capabilities will most probably last. The strategic importance of the latter for their economies as the world’s long-term oil suppliers, as many non-OPEC suppliers will disappear in the foreseeable future due to their depleting resources will be the major factor in this regard.
Abstract

World leaders and news outlets often refer to energy independence, upstream investments, and oil supply strategies from a national lens while seeing these pursuits as vehicles towards energy security. Consequently, individual national populations likely view the pursuit of their native oil & gas company exploration and production international investments as efforts to return oil to their economy; what is more, they likely view energy security as an achievable national priority that will insulate them from potential future oil supply instability. This paper selects a sample of governments including the U.S., China, and South Korean to analyze their views towards oil and establish evidence supporting the argument that much of the world views oil from a Cold War lens that does not reflect the reality of globalization. Second, this paper provides evidence supporting the argument that viewing oil supply from a national lens is incompatible with our single world supply and pricing system coupled with the effects of economic and financial integration on energy security. Third, this paper argues that the world’s misinformed view of oil perpetuates a physically pointless, but existent, energy security dilemma bubble.

Introduction

In 1980 following Soviet military gains near oil producing states, the Iranian Revolution, the Arab Oil Embargo, and the Organization of Petroleum Export Countries (OPEC) price hikes, President Jimmy Carter contended in his State of the Union address, “The region which is now threatened by Soviet troops in Afghanistan is of great strategic importance: It contains more than two-thirds of the world’s exportable oil... therefore, that poses a grave threat to the free movement of Middle East oil... An attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force...”

President Carter went on to argue that by reducing dependence on Middle Eastern oil, this would make America stronger. This argument reflected a zero-sum national security view of oil, one in an era before the

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emergence of economic integration, before the decline of OPEC’s influence on world prices, and before the evolution of today’s supply and demand fundamental market forces serving as the dominant driver behind oil supply and demand equilibrium. On the other side of the world, Northeast Asian nations appeared even worse off compared to the U.S. during the 1970s, an experience compounded by rapidly growing regional oil consumption growth and import dependence. Although the U.S. appears to have adjusted its view of oil after the end of the Cold War to accept that market forces govern oil supply security, the oil supply policies of Northeast Asian nations, emerging global rhetoric on energy security, and a globally misinformed media continue to propel momentum into an alternative view of oil supply security that does not reflect the physical reality of oil in an era of globalization. The belief that diversifying oil import sources coupled with securing physical supply for national consumption would improve energy security reflected the reality of the Cold War: a view no longer applicable in an era of economic and financial interdependence with a single oil supply market measured in one world price. However, in Asia for many nations including China and South Korea, the Cold War may never have ended, or at least, from their view, it may be put on temporary hold ahead of another conflict. With China emerging as a great power and South Korea emerging as a solid middle power on its periphery, the pursuit of long term oil import contracts coupled with popular support for nationally owned oil companies may be an implicit reflection of their societies’ fears that they will face a resource war sometime in the future. The media appears to be perpetuating these unnecessary fears, contributing to a zero-sum view of oil supply. Such a condition where two states fear the other’s intention, but do not necessarily prefer this situation, is defined as a security dilemma.

Although the U.S. may view oil from a market lens evidenced by its reliance on spot markets and support for private companies in the oil market, supply nationalism appears to be creeping back into the hallways of the DC-area bureaucracy as well, at least in rhetoric. With the U.S. practically a member of Asia by dint of its trade, economic, and financial integration, any energy supply-security dilemma in Asia naturally entangles the U.S.; therefore, this paper analyzes not only China, South Korea, and the media, but diverging views towards oil within the U.S. as well.

Views towards Oil Supply

U.S. Policies

President Jimmy Carter set the U.S. on a course towards “energy independence” in his 1980 State of the Union address. Like former President Carter, all of the presidents after him sought to “free the U.S. from foreign oil,” including U.S. President Barack Obama. In

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3 The terms Great and Middle Power are derived from International Relations theory interpretations.
2006 speaking before the Governor’s Ethanol Coalition in Washington, D.C., in a speech tellingly titled “Energy Security is National Security,” the then Senator Obama contended, “During World War II, we had an entire country working around the clock to produce enough planes and tanks to beat the Axis powers. In the middle of the Cold War, we built a national highway system so we had a quick way to transport military equipment across the country. When we wanted to beat the Russians into space, we poured millions into a national education initiative that graduated thousands of new scientists and engineers. If we hope to strengthen our security and control our own foreign policy, we can offer no less of a commitment to energy independence.”

In 2004 when speaking at the Democratic National Convention, the then Senator Barack Obama quoted John Kerry when he said “John Kerry believes in energy independence, so we aren’t held hostage to the profits of oil companies or the sabotage of foreign oil fields.” To suggest that ending oil imports will create energy independence and that oil companies hold the U.S. “hostage,” means that the then Senator Barack Obama would like the listener to accept the assumption that American oil companies can exert downward pressure on prices by distributing their income to mitigate its effects-indisputably untrue-and that if a foreign field is sabotaged, the U.S. will be secure should it not import oil from that export source-again indisputably untrue under a single world supply/price system. Moreover, the five Majors only possess a 12% share of the entire world oil market and are unable to influence prices regardless of individual actions. Of course, an understanding of economics proves that individual companies, especially Majors, cannot set or influence prices by reducing their profits. Most importantly, economic integration makes supply export source-diversification incapable of insulating a nation from oil supply or price shocks.

Despite Obama’s misleading words subtly connecting the Cold War race to the pursuit of a modern energy security and oil insecurity to “greedy” oil companies, there are many informed academics in the U.S. bureaucracy that promote a more accurate view towards oil supply and energy security. Home to two of the world’s five Majors as well as the New York Mercantile Exchange (NYMEX) where world oil prices are set by futures contact traders, some, but not all, American policy makers are well aware of the single supply nature of oil despite expressing rhetoric otherwise. In 2006, the U.S. Council on Foreign Relations produced an independent task force composed of 26 distinguished members. This task force produced a report titled “National Security Consequences of U.S. Oil Dependency.” Task force members argued that the reemergence of China and Russia coupled with other global paradigm

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10 Oil Majors include Exxon Mobile, Total S.A., Royal Dutch Shell, British Petroleum, Chevron, ConocoPhillips.
12 Ibid.
shifts, “diminished U.S. leverage, particularly in the Middle East and Central Asia. For example, Chinese interest in securing oil and gas supplies challenges U.S. influence in central Asia, notably in Kazakhstan.” U.S. interests in global oil and gas appear more related to maintaining political influence rather than securing stable supply.

Despite the liberal market nature of oil supply and pricing, nations that view oil supply quantities from a national security point of view may be capable of encouraging an inaccurate Cold War-like lens of oil supply and pricing. Insofar, the task force further argued,

“Many more of [China’s Africa and oil-tied developmental project] investments also include equity stakes for state-controlled Chinese companies... These arrangements are worrisome because they lead to special political relationships that pose difficulties for the United States. And they allow importers to believe that they obtain security through links to particular suppliers rather than from the proper functioning of a global market.”

These authors essentially point out that although viewing oil through a very strategic lens by connecting infrastructure and development investments to exploration and production (E&P) contracts will not necessarily result in increased energy security and oil imports from those destinations, these policies promote a fatally flawed worldview—that diverges from the physical reality: one country’s supply gain is another country’s supply gain. Oil supply is not zero-sum! On the other hand, an alarming trend appears to be emerging in the U.S. where leaders are framing oil from a national lens as well. Leaders such as President Obama, Senator John McCain, Howard Dean, Newt Gingrich, former Governor Sarah Palin, and Brookings Institute Scholar David Sandalow (selected for appointment to Assistant Secretary of Policy and International Affairs, a Department of Energy post), have all argued in some form or fashion that the U.S. can be free from foreign oil, either through drilling in U.S. territory, building a green economy, or embracing conservation.

The first assumption with this argument is that there is a distinction between domestic and foreign oil in a one world supply system. There is no distinction! On the other hand, despite this rhetoric promoting a false reality with the politically loaded concept of “foreign” oil, the U.S. continues to rely on the market place for crude oil imports. Juxtaposing U.S. reliance on spot market purchases for energy security, Northeast Asian nations appear more focused on physical security of supply despite having this global system to offer them market priced oil.

Chinese Policies

Perhaps far more complicated than the origins of U.S. policy towards oil, Chinese policies reflect a diverse mix of interests within multiple state-run oil companies, energy ministries and ad hoc oversight groups, Chinese Communist Party objectives, and foreign policy interests. Understanding
China’s view towards oil requires one to put into perspective China’s relative position to its closest rival: the U.S. Although American media often comments on the strength of China’s emerging military capability, it is important to keep capability in relative view. With American naval, air, and space-related forces patrolling every single sea lane at any given second in the entire world, China’s view of natural resources may likely include increasing anxiety as they are at the mercy of America supply security guarantees through dangerous areas such as the Strait of Malacca, a location known for terrorist attacks on oil tankers. In fact, Yang Ji, director in 2006 of China’s National Defense University, Institute of Strategic Studies, commented on the matter when pointing out that when an American in Washington D.C. asked him how China would defend strategic sea passages for oil if it became necessary to do so, he replied, “the U.S., the world’s traffic cop, is very good at maintaining order and that we can go along for the ride.”

He later said, “Truthfully speaking, this is not reliable. If we do not have any conflicts of interest with the U.S., we can go along for the ride. As soon as a conflict occurs, however, it will be disastrous.” Such a view places China in a position of anxiety, and perhaps a position conducive to irrational calculation in energy security by narrowly focusing on a specific goal that could prove irrelevant. Anxiety can create both panic and sharpened focus; however, it can also create tunnel vision due the inherent narrow impulses humans sometimes demonstrate when under threat. Supply security in an age of economic interdependence may generate such a narrow impulse in China and its peripheral neighbors such as South Korea. Believing that physical supply guarantees will insulate an economy from oil insecurity serves as one such fatal miscalculation.

Coupled with this narrow survival impulse is an exacerbating collection of interests and power interest. China’s energy bureaucracy includes a web of power entangled oversight leaders, energy-related ministerial leaders, and energy policy ad hoc arrangement leaders composed mostly of former Chinese oil company executives and employees. Within this web of power, Chinese energy policies are set and managed by the National Development and Reform Commission (NRDC), Ministry of Land and Resources, Ministry of Commerce, Ministry of Finance, and the ad hoc Energy Leading Group (ELG) and managed through the State Energy Office (SEO). Each of the leaders and company executives are wrapped in a web of power that includes political-oil company favors, inefficiency, waste, corruption, and general disorder. Furthermore, China’s energy security concerns are also entangled with China’s profit-seeking, government power-connected, nationally owned oil companies (NOCs).
China’s NOC-government power web creates a situation where NOC CEOs push the government for assistance in pursuing profits for their companies overseas, partly because NOC leaders are rewarded with high level government positions should they make significant strides in acquiring upstream investments once their leadership appointment term ends. NOC CEOs are motivated to secure upstream investments for profits coupled with the reward of post-NOC-CEO appointments to senior government positions. These NOC interests mix smoothly with government interests that are driven by anxiety and a narrow vision towards oil supply security. The pursuit of upstream international E&P investments and equity oil reflects a relationship between the government’s supply insecurity driven by a perspective that increases in oil upstream investments will mitigate this fear. The value of equity oil, however, may be exaggerated since it accounts for less than 13% of China’s imports: equity oil equals 372,370 imported barrels per day out of a total of 4.7 million imported total barrels per day. Moreover, between CNPC, CNOOC, Sinochem, and Sinopec, 89%, 8%, 2%, and only 1% of their oil production accounts for equity oil with 11%, 92%, 98%, and 99% of their oil production sold on the world market place, respectively. When Chinese companies invest in exploring, developing, and producing oil, they are investing in the process of supplying the world with oil, not simply Chinese consumers. Moreover, even when they import equity oil, this benefits the world because this frees up more oil supply for purchase from other sources such as a spot market. Although new for some leaders to fathom, oil reflects one world supply making equity oil and long term import contracts unable to provide energy security any more than purchasing it on a spot market.

China’s energy strategy appears to be uncoordinated, competitive between ministries and nationally owned companies, and viewed through a Cold War-like zero-sum lens that focuses on securing physical supply as if one nation’s oil imports is another’s loss. If increasing equity oil does not benefit China’s supply security and benefits world supply,
why invest in it in the first place? Erica Downs, a former U.S. Central Intelligence Agency (CIA) analyst working at the Brookings Institute, pointed out that Chinese NOCs are quick to use the term “energy security” as justification to provide them with below-market rate loans, infrastructure aid and government support to E&P destinations, and tax dollars and political support in favor of assisting them to seek upstream investments that eventually result in more profit than energy security.31 This manipulative use of the term energy security works because some Chinese leaders support these NOCs with the flawed belief that equity oil and NOC E&P investments increase Chinese energy security.32 China’s NOC pursuits of upstream oil investments are not alone. South Korea follows similar policies and oil supply perceptions, albeit South Korea’s energy situation and anxiety may be fostered by an instinct-driven fear that China could one day consume so much oil that South Korea might not be able to afford any without having physically-guaranteed supply: a resource race.

South Korea’s Policies

After the second 1970s era oil shock, South Korea began an oil import diversification strategy with the goal of reducing vulnerability to price spikes and supply shortages by focusing on long term supply.33 By diversifying from the Middle East, South Korea sought to invest in long term contracts and “promote overseas resource development in the upstream” sector through Korea’s primary oil NOC, the Korea National Oil Corporation (KNOC).34 Dr. Ji-Chul Ryu points out in “Energy Security in the North Pacific,” that by the end of 2006, Korean companies invested $10.38 billion in overseas E&P with 20.8% funded by the Korean “government (tax payer) [owned and] funded” company, KNOC.35 Most of the discourse in “Energy Security in the North Pacific” refers to Korea’s upstream investments with the implicit premise that these investments benefit the Korean consumer, although this is not possible given transportation costs and other less costly means available to supply oil: an issue clearly illustrated in [Figure 2 ] below.

With South Korea’s KNOC investments not directly contributing to South Korean energy security through supply due to the costly nature of transportation making it more profitable to sell the oil on the market, it becomes clear that public rhetoric on Korean upstream investments enhancing Korean

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31 Ibid., 39, 41.
32 Ibid., 39, 41.
34 Ibid., 300.
35 Ibid., 298-297.
energy security is not accurate. Another component to Korea’s energy security strategy, long term contracts, although no longer relevant in the world’s liberal oil market, prove to be the prevailing strategy in South Korea [Figure 3].

From 2000 to 2009, long term contracts account for an average of 66% of oil imports compared to an average of 33% of spot-price purchased imports. Similar to Chinese officials, South Korean leaders likely also believe that by securing physical supply they will be protected from a physical supply shock or some future resource race scenario where oil needs to be imported through these long term contracts in a market where the world price system fractures. [Figure 4] offers support for this argument, which establishes that the purpose of long term contracts is not to secure a lower import price, but to diversify imports from spot-price purchases to long term contracts.

If long term contracts do not offer lower prices, and oil can be fairly purchased at world price on a spot market, why pursue long term contracts if they offer no economic benefit? Perhaps Northeast Asian nations are extending their physical security fears and mutual suspicion into their energy strategies, creating an energy security race and security dilemma bubble as they prepare for some sort of resource run falsely believed to be potentially mitigated by long term contract guarantees. If this is their purpose for securing long term contracts, it will not necessarily achieve its objective even if the world pricing system were to collapse since only the U.S. maintains the capacity to secure the world’s sea lanes. Moreover, even with secure sea lanes, exporters of oil will likely capitalize on skyrocketing prices under such a scenario and break the terms of these long term contracts, selling to the highest bidder.

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[Figure 3] South Korea Cumulative Monthly Oil Imports

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<th>Year</th>
<th>Spot Purchased Imports</th>
<th>Long Term Contract Imports</th>
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[Figure 4] Average Prices of South Korea’s Monthly Cumulative Oil Imports

Average Prices of South Korea’s Monthly Cumulative Oil Imports: Long Term Contract Vs. Spot Purchased Compared

- Spot Purchased Avg Import Price
- Long Term Contract Avg Import Price

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Korea’s Oil Import Data from Petronet.co.kr.
Calculations made from Korea’s oil import data provided by Petronet.
Korea’s Oil Import Data from Petronet.co.kr
Media Outlets, Reporters, Journalists, and Authors

Perpetuating this energy security dilemma bubble, media outlets and journalists continue to report on oil upstream investments as zero-sum increases in a single nation’s energy security. It does not require a global survey of media reports on oil to conclude that public media discourse perpetuates national-lens driven fears among the masses. This becomes particularly true when media outlets cover stories on Chinese oil companies investing in Africa or when Chinese NOCs attempt to participate in mergers and acquisitions, including the example of the failed Chinese company attempt to purchase Unocal.

In 2004, Time magazine ran a major essay written by Mathew Forney, titled “China’s Quest for Oil.” The author attempted to frame the efforts of Chinese oil companies to acquire upstream E&P investments as a national objective aimed at “[securing] long-term supplies independent of the world’s fickle prices.” Not understanding the nature of oil companies and oil economics, the author failed to share with the reader that oil cannot be delivered to distances that exhaust its use before it arrives to its destination, thus explaining why an oil discovery in the Caspian often results in a local or regional sale on the market place. As Erica Downs pointed out, not only do Chinese companies compete with one another, sometimes undercutting Chinese foreign policy, they also frequently sell their oil in locations like Africa to the market place rather than return it to China. On January 20, 2010, the Financial Time released an article by Christian Oliver titled “S Korea’s KNOC eyes $6.5 [billion] oil deals.” The journalist wrote that “Seoul officials have stressed they will strive to avoid being muscled out of resource deals by powerful Chinese competitors...The moves to increase energy security go hand in hand with Seoul’s pledge to reduce wasteful consumption.” This author’s statements reflect the way most of the masses in the world view oil: as a commodity that their governments have to race to secure before it runs out. As Mikkal Herberg at the National Bureau of Asian Research in Seattle pointed out, “Frankly it’s a delusion [to believe equity oil and NOC E&P increases energy security]... there’s no more security in an equity barrel than a contract barrel.”

None of the aforementioned views in the media reflect the economic reality of oil global supply and demand equilibrium, particularly since oil long term contracts do not result in lower oil import prices. Moreover, companies, including NOCs, sell oil to the highest bidder and not necessarily via equity oil to their home tax-reporting countries. Coupled with world leaders and NOCs that do not bluntly correct politically beneficial energy security misinformation such as the belief that upstream investments or offshore drilling increases only one nation’s energy security, it appears that both media outlets and world leaders participate in fostering a consciousness in people that contribute to wrongly creating...
some of the following myths about oil:
- Oil prices can be mitigated through increases in domestic supply
- Countries acquire oil rather than companies who discover it for market sale
- Companies that acquire oil sell it to their home country
- Acquiring physical supply benefits countries in a zero sum relationship
- NOC and private company upstream investments will increase domestic supply

Although all of the above myths are empirically and verifiably, ceteris paribus, untrue, leaders who might be aware of this economic fact are not exactly in an “ethical” hurry to spill the beans to their voters who might support them on the issue of energy independence through tax-payer funded E&P investments, deregulating offshore drilling, et al.

Oil Pricing and One Single World Supply

Oil Price Discovery and World Supply

Oil prices derive first from physical supply and demand fundamentals. Oil futures contract—an agreement to purchase oil at a future date—traders analyze these fundamentals by introducing information on a commodity exchange market—primarily on NYMEX—by introducing information and factors they believe will affect future price in the near and long-term future.44 Through the introduction of this information, traders participate in the process of price discovery.45 On NYMEX, spot market prices for West Texas Intermediate oil are discovered, and the rest of the world spot markets (Brent, Singapore, Dubai, et al.) and Over-The-Counter (OTC) market traders—including major investment banks—base their prices accordingly, varying in price by only a few dollars, depending on average crude quality, transportation costs, and other factors.46 Every barrel of oil in the world at any given point in time, depending on its quality, is sold at the same price, and so oil price equilibrium reflects one world global supply and demand. If Sinopec discovers oil in Africa, this new quantity, depending on its production per day, goes into the information pool that NYMEX traders use to discover world oil price. An upstream discovery by one company or a country’s NOC is essentially an increase in oil production for everyone.

A resource race is almost impossible under these market conditions between countries since companies, not countries, discover and produce oil. Those who can afford oil will possess it, and those who cannot afford it at market price, whatever that value might be, will not possess it with or without long term contracts and equity oil. There is no other way around a resource race than to pay for oil at its market price.

Economic and Financial Integration

Of the newest issues in oil supply security, economic and financial integration appear to be the least integrated factor into each of the aforementioned nation’s energy oil supply and energy security calculations. In an era of goods and financial services economic

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45 Ibid.
46 Ibid.
integration, if one globalization-connected country’s economy experiences a supply shortage or price shock, seemingly distant and unrelated, but economically integrated, countries will feel the effects of these shocks in their own trade and financial sectors.47 Insofar, nations dependent on the global economy are mutually vulnerable to the effects of oil price and supply shocks.48 To support this hypothesis, this paper turns to the 2008 Financial Crisis as generalizable evidence. Insofar, if America’s subprime mortgage crisis could ripple through seemingly unrelated economies across around the world from South Korea to Russia to London, one should expect the same linkages to spread the effects of an oil supply or price shock to seemingly energy-independent economies, from Korea to China to Brazil. Thus, long-term contracts, upstream NOC investments, equity oil, and offshore drilling will do little to provide energy security in our emerging era of globalization.

**Oil Security Dilemma Bubble**

Defining a security dilemma as an unwanted, but existent, fear of intentions between select nations, it would appear such a dilemma exists in the minds of leaders in South Korea, China, and some in the U.S. By pursuing long term contracts, NOC E&P investments, offshore drilling, freedom from oil strategies, energy independence initiatives, and other policies, slogans, and tactics designed to create national, not international, energy security, these leaders are investing energy into an objective that will not result in its intended outcome: insulation from the negative economic and security externalities associated with oil. Insofar, none of these efforts will mitigate the mutual risks inherent associated with oil in a globally integrated economy operating with one world supply and demand price mechanism. Therefore one might ask “why do some economies pursue different aspects of these initiatives? Perhaps China and South Korea are continuing policies that reflect their experience with WWII and the Cold War since they observed Japan, the U.S., and Russia vie for physical control of oil sources. Perhaps South Korean leaders are demonstrating a knee-jerk reaction to “balance” China’s aggressive, but economically pointless, equity oil import initiatives. Perhaps China views the U.S. through a Cold War lens and South Korean leaders are reacting to this view by seeking to mitigate the costs of a great power rivalry through their own upstream investments. Perhaps each nation is trapped in an unwanted fear of the other’s oil supply gains, which is interesting considering one’s countries import gains are included in the calculation of oil import prices in another country, thus making the race pointless: a security dilemma bubble that will eventually burst. Although the “why” question is important, this paper turns to a broader matter: the implication of this physical supply view of oil.

Long term contracts, equity oil, NOC upstream investments, oil import diversification or independence, and energy independence will prove ineffective in providing energy security due to the following prevailing facts:

- Most NOC investments results in sales to the market place

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48 Ibid.
- Long term contracts do not insulate an economy from price changes or shocks
- Only the U.S. possess the naval capacity to patrol sea lanes for oil tankers shipments
- Equity Oil increases domestic supply, reducing spot market purchases, and thus increasing world supply, which benefits world energy security, not necessarily national security.
- Economic and financial Integration make an oil independent economy vulnerable to shocks realized in a oil dependent economy
- Oil prices are based on one world supply

In today’s market place with one world supply, nations are unable to insulate themselves from the economic and security risks inherent with oil regardless of their independent initiatives, even if they eliminate oil imports. Those who see long term contracts and NOCs that participate in E&P as a medium to increasing energy security initiatives are creating a psychological energy security bubble in the minds of those who passively accept this view. China and South Korea are not alone in their energy security bubble with some American leaders implicitly suggesting that by eliminating oil imports they can be free from the Middle East, and by reducing profits of oil companies, they can lower prices. Full of misinformation, perhaps media outlets and certain leaders are either remarkably misinformed or shrewd political calculators looking for support from a gullible public still viewing oil supply from a Cold War lens. Either way, many leaders and commentators continue to set the world on a psychological path towards a resource race that physically is not taking place. It’s all in their imaginations. It is a bubble that will burst with no return on tax dollar investment.

### Conclusion

This paper introduced a sample of diverse views towards oil and its relationship to energy security, including China, South Korea, and a split between U.S. rhetoric and actual policy. Although China and South Korea’s long term contracts, equity oil, and NOC E&P investments do not increase energy security, it would appear that a temptation exists for some nations to follow their lead in a knee-jerk reaction. Eventually nations, media outlets, and leaders that view oil through a Cold War lens may discover that oil security cannot exist without every consuming and supply nation enjoying the same security, a truth evidenced by the fundamentals of world supply and demand and our knowledge of the linkages inherent with economic and financial integration. Those who presently view oil equity, NOC E&P, domestic drilling, and other efforts to increase national supply, rather than international supply, are perpetuating a view in the minds of other energy consuming nations and their populations that this pursuit of oil supply is zero-sum, thus potentially creating an energy security dilemma bubble that will burst once the world experiences a shock that reveals our mutual vulnerability to one single world oil supply and price.

### Works Cited


Biofuel could be the fuel of future. However, the potential would be realized at great costs as how biofuel is produced renders a wide range of production costs. The biofuel production process is improving with better breeds of plants. Conflicts in demand between biofuel and food may be eased as mutually exclusive feedstock like Jatropha crop is being developed. However, high social and environmental costs make few biofuel programs economically viable. This study examines the impacts of biofuel production on the global economy by three aspects, namely, economic, environmental, and social. In addition, it identifies factors like global output, the size of agricultural land, the share of renewable energy out of total primary energy supply, CO₂ emissions, and poverty rate as key determinants of biofuel production in the world. Using these factors, it analyzes the relationship between biofuel production and these factors. Biofuel can contribute to global output growth, but bring about a daunting trade-off between energy and food by creating bouts of food shortage. Biofuel may not be as great as it seems until the repercussions of using biofuel are contained.

Introduction

Energy is important to a society. It is required for industrial purposes, operating machineries, and even everyday cooking. Ever since the Industrial Revolution just before the dawn of the twentieth century, most of our energy supply has been coming from fossil fuels, a nonrenewable source of energy, which is found in deposits beneath the earth and takes millions of years to form. It is the most abundant and the cheapest fuel available. Till now, about 90 per cent of the world’s total energy demand has been fulfilled by fossil fuels. The main types of fossil fuels, also known as conventional fuels, are coal, natural gas, and crude oil. The burning of fossil fuels produces heat (or energy) but emits a large amount of greenhouse gases (GHG) into the atmosphere, contributing significantly to global warming, which leads to climate change. Addressing the fear of depletion of fossil fuels one day, researchers over the years have been on the search for environment-friendly alternative sources of energy. Biofuel is the alternative source that gets the nod from most governments; it not only helps alleviate the oil-dependency problem but is also considered to emit a lesser amount of carbon dioxide into the atmosphere, making it a popular alternative source of energy globally. Biofuel, also called bio-ethanol or bio-diesel, is produced from living organisms, namely,
photosynthetic plants and food waste products. The plants used to produce biofuel are normally food crops, which are mainly corn, sugarcane, wheat, and grain. Globally, biofuel is commonly used for heating homes and as a source of transport fuel. However, an apparent problem in the world now is that food security is being threatened by the increasing production of biofuel. Higher prices of food are caused by many factors, one of which is the decreasing supply of food due to farmers growing fuel crops instead of food crops. Instead of allocating more land to grow these food crops, the existing land area is shared among food and fuel crops. This may create bouts of food shortage. This study analyzes the impact of using biofuel on the global economy and also examines the extent of such an impact. This impact is discussed in section 2 based on three aspects, namely, the economic impact, environmental impact, and social impact. Section 3 shows some of the key determinants of producing biofuel at a macro-scale and analyzes the extent of the impact of this production on the global economy. Using the key identified factors, section 4 constructs a relationship between the factors of production and the production of biofuel, and evaluates how these factors affect the production of biofuel. Section 5 concludes this study with a verdict on whether or not biofuel can be the fuel of the future.

Three Aspects of Using Biofuel—Economic, Social, and Environmental

Biofuel production and consumption has been widely studied since a long time. Some are in favor of biofuel production as it can increase world energy supply, but some are strongly against it as it does not increase energy supply. The latter group finds that biofuel also poses more harm to the environment than fossil fuels do.

Economic Impact

Biofuel increases the availability of fuel supply in the world, thus making an impact on the global economy. Since the economy of a country largely depends on its fuel supply, when the production of biofuel increases, the supply of fuel increases and economic growth is boosted, which results in an increased demand and consumption of fuel and energy. The cultivation of biofuel crops provides many farmers with (1) a higher income due to higher feedstock prices (2) and increased job opportunities.

In the following subsections, on one hand, some existing studies show that biofuels are more energy efficient than conventional fuels and are considered as net energy positive. On the other hand, some studies may disagree and believe that biofuels yield negative net energy. Some studies even insist that countries should be indifferent between biofuel and conventional fuels as the total energy supply remains the same regardless of which fuel is being produced.

Net Energy Positive

If biofuel is more energy efficient than conventional fuels, that is, lesser energy is required to produce a unit of biofuel as compared to that required to produce an equivalent unit of conventional fuel, it is said that the total energy supply increases. Thus, biofuels are considered as net energy positive for an economy.

It was found that the coproducts of ethanol have positive economic values and have an advantage over competing products that require energy to produce. Further, corn ethanol production yielded a positive net
energy of about 4 to 9 mega joules per liter of ethanol (MJ/l) (Farrell et al., 2006). Hence, lesser petroleum is needed to produce one mega joule (MJ) of ethanol as compared to producing one MJ of gasoline.

**Net Energy Negative**

Some studies have shown that biofuels yield negative net energy. The energy required to produce a unit of biofuel is more than the resulting energy produced by it, rendering biofuel an energy inefficient fuel. Hence, the increased use of biofuel decreases the total energy supply of an economy.

It is also said that producing biofuel is a drain on our resources and pockets. The studies that suggest biofuel yielding nets positive energy did not take into consideration the energy input required to grow the crops and the conversion process. The corn-ethanol conversion such as fermentation and distillation requires a huge amount of fossil energy. The fossil energy used in corn farming is large and equivalent to 0.4 (Wang et al., 1997) to 0.7 (Pimentel, 2003) metric tonnes of gasoline per hectare (ha) and per crop. Large amounts of fossil fuels are expended to convert corn into pure ethanol. Corn requires 29% more fossil fuel energy than the fuel produced (Pimental and Patzek, 2005).

In addition, due to the relatively low energy content of ethanol, the energy content of 1.6 liters of ethanol is equivalent to 1 liter of gasoline. Thus, producing ethanol to provide the same energy content as gasoline is more expensive. The cost of producing 1.6 liters of ethanol is $1.78 as compared to $0.53, the cost of producing 1 liter of gasoline (USCB, 2004-2005).

All these existing studies have shown that the production of biofuel depends on the stock grown and the production method. Different types of biomass will release different amounts of energy “depending upon the productivity of the crop, its responsiveness to fertilizer and irrigation inputs, the need for chemical pesticides, and the difficulty of harvesting and refining it into a fuel” (Worldwatch Institute, 2007). As the energy balance is related to the amount of fossil fuels used, it is extremely important to choose crops for biofuel so as to maximize energy efficiency.

**Environmental Impact**

Biofuel has been increasingly heralded as an ecologically friendly alternative to conventional fuels that are dwindling in supply. When fossil fuels are processed and used, they release carbon dioxide (CO₂) among other gases. However, CO₂ emissions from biofuel production have been considered negligible as compared to those from fossil fuels due to photosynthesis of plants. Although biofuel diminishes GHG emissions, it is said to have higher aggregate environmental costs.

**Net Carbon-Negative**

Carbon-negative biofuel is the fuel that absorbs carbon from the atmosphere when growing and releases a lesser amount through burning. Since the plant material used to produce biofuel is grown using atmospheric carbon, the net emissions of CO₂ are lower for biofuel than fossil fuels. To achieve net carbon-negative biofuel, a portion of the biomass is returned to the soil. Instead of converting the entire biomass into fuel, a portion of it is reduced to biochar through a process called pyrolysis. Carbon capture and storage is an approach to make biofuel carbon-negative. As the name suggests, CO₂ is captured and stored through a biological, chemical, or physical process, like the burial of biochar. Also known as carbon sequestration, this approach aims to mitigate the accumulation of GHG in the
atmosphere. Biofuel made from biomass grown on wasted agricultural lands incurs little carbon debt without releasing large amounts of GHG.

Fairless (2007) has assured that Jatropha, another biofuel crop, contributes to greening barren land and reducing GHG emissions. Biopact (2006) also supports the idea that biofuel is carbon-negative. Since corn has extremely low energy balances, the amount of CO$_2$ emitted into the atmosphere is very little, whereas for sugarcane, CO$_2$ emissions decreased up to 80 per cent. Tilman et al. (2006) also mentioned that biofuel from low-input high-diversity proved to emit lesser GHG as net ecosystem CO$_2$ sequestration (4.4 megagram hectare$^{-1}$ year$^{-1}$ of carbon dioxide in soil and roots) exceeds fossil carbon dioxide release during biofuel production (0.32 megagram hectare$^{-1}$ year$^{-1}$).

**Net Carbon-Positive**

Carbon-positive biofuel is the exact opposite of carbon-negative biofuel; it releases more carbon into the atmosphere. It is especially so when biofuel crops are harvested using farming practices that result in huge GHG emissions. For example, maize requires a heavy input of fertilizers. Biofuel does emit a lesser amount of CO$_2$ as compared to conventional fuels. This, however, comes at a cost. Other environmental impacts like water quantity and quality, soil erosion, and loss of biodiversity have become a rising concern.

In ethanol production, 99.5% pure ethanol must be achieved. This is done through the fermentation and distillation of sugarcane. During this process, water is being added to and extracted from the crushed sugarcane. As considerable amount of water is being removed, more fossil energy inputs are required to acquire 99.5% pure ethanol. In total, 10 liters of wastewater is extracted for every liters of ethanol produced. According to Moreira (2007), for every kg of CO$_2$ avoided, a minimum of 217 liters of water is used. In 2005, 3.9 billion liters of ethanol was produced. Thus, the amount of energy, economic, and environmental costs incurred to dispose this large amount of wastewater can be estimated.

The diffuse run off from sugarcane plantations significantly deteriorates the quality of river water. Another pressing concern is soil erosion. For every kg of CO$_2$ avoided, soil loss ranges from 4.1 kg to 8.1 kg, which further deteriorates river water.

Sugarcane production emits other types of GHG, namely, methane (CH$_4$) and nitrous oxide (N$_2$O). According to Lima et al. (1999), CH$_4$ and N$_2$O emissions are 26.9 kg and 1.33 kg per ha of sugarcane produced, respectively. These correspond to 672 kg and 399 kg of CO$_2$ equivalent emitted, respectively.

The pollution caused by corn production in the U.S. is rather serious, especially soil erosion and the use of pesticides, resulting in water pollution worse than that caused by any other crop (NAS, 2003).

**Net Carbon-Neutral**

Net carbon-neutral biofuels absorb CO$_2$ as they grow, and when burnt, release the same amount of carbon back into the atmosphere. However, studies asserting biofuel as a carbon-neutral fuel are rare. Rosa and Ribeiro (1998) portrayed biofuel to be carbon-neutral, as CO$_2$ released through the combustion of motor fuel is reabsorbed by growing more sugarcane. They strongly advocate that the use of ethanol can significantly mitigate GHG.

**Social Impact**

Biofuel production may have posed some environmental problems and could be among the moral issues that need more global
attention. Increase in biofuel production to meet the soaring demand poses new food security risks. Higher food prices, subsidies for biofuel, and environmental degradation among others will all be felt disproportionately by the developing world. When grain prices increase, the feed cost for livestock increases. This in turn drives up food prices. As lesser land is available for food crops, the supply of food falls and prices of food naturally increase. This will cause a ripple effect whereby consumers will shift demand to other grains, which increases the demand for grains and also causes the price of rice to increase.

The China Statistics Bureau announced in April 2007 that domestic food prices increased by 6.2% in the first quarter as compared to the same period last year. Most Chinese were hit by soaring food prices, especially the poor and net-food-purchasing households, who spend a large part of their income on food. Mitchell (2008) showed that many studies found that biofuel production is a major driver of food prices. This is mainly due to the fact that biofuels demand more of crops such as maize, sugarcane, soy, and wheat. As this demand increases, assuming that supply remains constant, prices will increase. The International Monetary Fund has also made an estimation that the increase in demand for biofuel has accounted for 70 per cent of the increase in maize price and 40 per cent in the case of soybean price.

Fairless (2007) explored Jatropha, which grows on lands that are not suitable for food crops. According to the India’s Ministry of Rural Development, Jatropha thrives on eroded plantation or wasteland and thus does not compete with food production. In addition, Jatropha survives up to 50 years, “fruiting annually for more than 30 years and weathering droughts with aplomb.” As such, the India Planning Commission has recommended a project to cultivate Jatropha on a wide-scale basis. Jatropha, as compared to soya bean, produces more oil, amounting up to 1300 liters of oil per hectare. However, the potential of Jatropha is still unpredictable as it has not been domestically grown. As the optimum living condition and efficient production methods of Jatropha are yet to be found, this crop is still in the infant stages of R&D.

Analytical Framework

There has been much controversy about biofuel in the recent years. There are various opposing views on biofuel. Some believe that biofuels will replace conventional fuels due to their environmental benefits, while some think that biofuels do not alleviate the problem of rising oil prices, but worsen it and place further strain on the economy. There are many factors that contribute to the use of biofuel. In this section, we identify and analyze the key determinants of biofuel at a macro-level rather than a micro-level, that is, we identify and analyze the main forces behind the production of biofuel over the years.

Before analyzing the key determinants, we first identify two groups of people that have different views on biofuel: environmentalists and businessmen. Although environmentalists may agree that burning biofuel emits lesser carbon as compared to gasoline, but considering the overall biofuel production (from growing to extracting), biofuels cause greater harm to the environment. If this continues in the future, environmental damage may get so serious that we may have to cease the production of biofuel. Businessmen think otherwise; they believe that biofuel has the potential to open up new markets and create new investment opportunities, which will have a positive impact on the economy. In other words, the production of biofuel
depends on which sector people value more. If monetary benefits outweigh environmental costs, biofuel will be produced.

**Economic Impact**

The Gross National Income (GNI), agricultural land, and share of renewable energy out of total primary energy supply are identified as the three key determinants behind the increasing production of biofuel. The GNI moves in the same direction as biofuel; when people get wealthier, they demand more goods, which require more energy. From the raw materials to the manufacturing to the transportation of these goods, energy is required at every stage. Agricultural land is an important factor of biofuel production because fuel crops are the same as food crops. If there is more available land, production will most likely increase. As long as energy demand surpasses the supply of energy from fossil fuels, biofuel has to come into place.

**Gross National Income**

The GNI per capita gives a measure of the annual national income per person. How income and biofuel production are related depends on what people demand when their income increases. As people get more affluent, they wish to sustain a more comfortable life. For example, they tend to consume luxury goods that consume more energy, such as air conditioners and cars, showing income elasticity of demand to be more than one. Thus, as income rises, the current demand for energy most likely increases. As the energy demand exceeds the supply of oil, this shortfall has to be met by burning more fuel. Biofuel may not necessarily be burned to meet up with the demand, but it is plausible. Therefore, the relationship between GNI and production of biofuel is likely to be positively related.

**Agricultural Land**

When biofuel is extensively produced, one of the main issues the public is concerned about is food security. Before biofuel was widely promoted, food security was already a critical problem that was experienced mainly by the poorer countries. In 2007-08, there has been a drastic increase in worldwide food prices. With soaring food prices, this makes food security more unstable than before as more people cannot afford the higher prices. Agricultural land is likely to be related to biofuel production in a way that fuel crops compete with food crops grown on the limited arable land intended for food crops. With a continued demand for ethanol and high prices of corn, the additional acres of land are expected to go toward biofuel production. As the prices of fuel crops increase, farmers allocate more arable land to grow more fuel crops instead due to higher profits, thereby increasing the supply of biofuel. Thus, we use the area of agriculture land as a variable to see how much increase of land will affect biofuel production.

**Share of Renewable Energy out of Total Primary Energy Supply**

Of the primary energy supply, about 23 per cent is supplied by renewable energy. This figure is expected to increase as nonrenewable energy like fossil fuels gradually runs out. Out of the total renewable energy source, biofuel by far has the largest share. It has the largest potential to expand since more and more R&D is being spent on its production. Hence, if more renewable energy is used to supplement the total primary energy supply, more biofuel is likely to be produced.
Environmental Impact

The environmental factors that determine the use of biofuel are the levels of atmospheric carbon concentration and CO₂ emissions. As we know that global warming is the main concern of the world, most governments aim to tackle this problem. We all want to achieve a green economy; hence, burning of fossil fuels should be reduced, and a more environmentally friendly fuel should be produced.

Carbon Dioxide Emissions

The economic development around the world has brought in the use of technology and machineries. All these require energy to work, and producing of energy from fossil fuels will release many GHG, mainly CO₂. Atmospheric CO₂ has increased and so has global temperature. The burning of fossil fuels is way too harmful for the environment, emitting a large amount of CO₂ and thus worsening the impact of GHG on the environment. Biofuel is more environmentally friendly in a way that it emits lesser CO₂ into the atmosphere. If CO₂ emissions from burning fossil fuels exceed the ideal level of emissions, fossil fuels have to be displaced by biofuel to provide the energy supply, thus increasing the production of biofuel.

Social Impact

The use of biofuel not only has an economic and environmental impact but also a social impact on the world. As more and more nations industrialize, demanding more energy, increasing attention should be given to diverting food crops to fuel crops. This leads to food insecurity in the world, as the land left to grow food crops is diminishing. Hence, the supply of food declines, and people have to pay more for a lesser amount of food. The poor are hit the most due to shortage of food, and more importantly, the high prices of food mean that the poor end up spending a large share of their income for food.

Poverty Rate

Whether people are eating well depends on the availability of food, and whether they even have something to eat depends on the food supply. As more land is dedicated to growing fuel crops, lesser arable land is available to grow food crops. Further, in the face of meeting energy and food requirements, the demand for energy is better met as it is rather evident that more farmers are growing corn for biofuel purposes instead of producing corn as food stuff.

The poverty rate has been fluctuating and is on the rise for the past few years. Most of the poor people live in underdeveloped countries such as sub-Saharan African regions. We expect the relationship between the poverty rate and biofuel production to be negative. If the poverty rate falls, implying that more people have access to basic food, we say that food production is sufficient. Thus, more land can be allocated to grow fuel crops, increasing biofuel production.

Sample Range

The sample runs from 1981 to 2006, comprising of yearly data, that is, 26 observations in all. All data used are world figures. From 1981 to the 1990s, biofuel was not a popular source of energy. In the twenty-first century, advancement in technology, specialized expertise, and other factors have led to more R&D on biofuel production. Hence, we chose data over a period of 26 years to see the change in trend in the use of biofuel and key determinants affecting the production of biofuel.

The data has been obtained from various sources: Energy Information Administration
(EIA), World Bank, and Food and Agricultural Organization of United Nations (FAO). Table 1 shows the descriptive statistics of data used for the regression analysis.

### Results

The five key macro-level determinants of production of biofuel are GNI, agricultural land, share of renewable energy (SRE) out of total primary energy supply (TPES), CO\textsubscript{2} emissions, and poverty rate. The dependent variable is the production of biofuel. We construct a linear relationship between biofuel production and the factors:

\[
L_{\text{QBio}} = a_1 AGL + a_2 \text{GNI} + a_3 \text{SRE} + a_4 \text{CO}_2 + a_5 \text{POV} + C, \quad (1)
\]

where QBIO denotes the production of biofuel; AGL, the area of agricultural land; GNI, the world gross national income; SRE, the share of renewable energy out of total primary energy supply; PO\text{V}, and the world poverty rate; further, \( C \) is a constant, and \( a_1, a_2, a_3, a_4, a_5 \) are estimated parameters. L stands for a logarithmic function.

After running the ordinary least squares (OLS) regression, our results are as follows (the numbers in parenthesis show the t-statistics of the variables):

\[
\begin{align*}
L_{\text{QBio}} &= 40.62 \times \text{AGL} - 3.07 \times \text{GNI} - 0.78 \times \text{SRE} + 8.63 \quad (4.64) \quad (-3.06) \quad (-0.71) \\
\text{CO}_2 + 3.35 \times \text{POV} &= 680.84 \quad (8.07) \quad (4.04) \quad (-5.19)
\end{align*}
\]

### Results for Economic Determinants

As expected, agricultural land is positively related to biofuel production. A 1 per cent increase in land area will lead to about 40 per cent increase in production. This implies that land is an important determinant of biofuel production. When there is more land area, producers will allocate part of it to grow fuel crops, hence increasing the supply of biofuel. However, the regression result for GNI is inconsistent with our expectations. A 1 per cent increase in GNI will cause the production of biofuel to fall by approximately 3 per cent. The most probable explanation would be when people get wealthier, they demand more fossil fuels like crude oil rather than biofuel. Resources and attention are given to supply more fossil fuels rather than ethanol, as fossil fuels are more readily available and cheaper. Since the share of renewable energy out of the total primary energy supply is insignificant, it appears not to influence the production decision of biofuel against our expectations. Hence, SRE does not seem to be good enough to explain the production of biofuel.

### Results for Environmental Determinants

The regression result for CO\textsubscript{2} emissions is consistent with our expectations. An increase in CO\textsubscript{2} indeed leads to higher production of biofuel. As an increase in CO\textsubscript{2} emissions adds to the atmospheric carbon concentration level, most governments take action, as this serious problem conflicts with their goal to fight global warming. Therefore, they greatly support the production of biofuel. The negativity of the environmental impact of fossil fuels spurs countries to produce biofuel, even if it costs them millions of dollars. Hence, from the results, a 1 per cent increase in CO\textsubscript{2} emissions would lead to an increase of 8.6 per cent in the production of biofuel.
Results for Social Determinants

The poverty rate appears to be positively related to biofuel production. What may explain this discrepancy is that a large number of people living in poverty are in the underdeveloped countries. Even if the world poverty level were to rise, it may mean that this increase is entirely brought about by the underdeveloped countries. Developing and developed countries still demand more energy supply, hence increasing biofuel production. <Table 2> presents a summary of the literature review, our key determinants, and results. It provides a comparison between existing studies and our expectations.

<table>
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<th>Table 2</th>
<th>Summary of Existing Studies, Key Determinants, and Results</th>
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<td>Positive</td>
<td>Negative</td>
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<tr>
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<td>- Pimental and Patzek (2005): Corn requires 29% more fossil fuel energy than the fuel produced.</td>
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<tr>
<td>Environmental Impact</td>
<td></td>
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<tr>
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</tr>
<tr>
<td>- Tisman et al (2006): Biofuel from low-input high-diversity proved to emit less GHG.</td>
<td>- Lima et al. (1999), CH₄, and N₂O emissions are 2.56 kg and 1.33 kg per ha of sugarcane. (NAS, 2003): Corn production caused soil erosion. The use of pesticides results in water pollution worse than any other crop.</td>
</tr>
<tr>
<td>Social Impact</td>
<td>Mutually Exclusive</td>
</tr>
<tr>
<td>- Farrel (2007): Introduction of Jatropha that grows on lands that is not suitable for food crops. Hence food prices are unaffected.</td>
<td>- China Statistics Bureau (2007): Domestic food prices increased 6.2% when biofuel production increased.</td>
</tr>
<tr>
<td></td>
<td>- Mitchell (2008): Biofuel production is a major driver of food prices.</td>
</tr>
</tbody>
</table>
Conclusion

Biofuel could be the fuel of future. However, this could come at great costs. It depends on how biofuel is to be produced. Biofuel and food may be mutually exclusive in specific feedstock like Jatropha crop. However, under global perspectives, they are more interrelated. There would be a positive economic impact from biofuel production but negative environmental and social impact as well. This study analyzes how the production of biofuel influences the world through three aspects, namely, economically, environmentally, and socially. It is undeniable that the production of biofuel can increase the world’s energy supply. As conventional fuels are in danger of depletion, biofuel becomes the next source of energy. However, all this will come at a great price. Whether biofuel will replace conventional fuels and become the fuel of the future remains ambiguous. Having said that, whether biofuel will continue to be produced in the future depends on which sector of the economy will people value more. As is mentioned, environmentalists and businessmen could be a deciding factor behind the production of biofuel.

Technology could make biofuel more feasible in the future. Better methods of producing ethanol will lessen the amount of carbon emissions. Cellulosic ethanol technology that produces environmentally friendly renewable transportation fuel that is produced from wide varieties of feedstock. Unlike corn ethanol, it does not require fertilizers to grow, thus reducing pollution. As pointed out by the Worldwatch Institute (2007), the biofuel production process is improving with better plants breeds, more parsimonious farming methods, and larger processing facilities, leading to an increase in the amount of output fuel. In addition, with the help of advancement in technology, even “fibrous residues extracted during cellulosic conversion will probably become more important energy supplies” bringing the biofuel’s energy balance to be near infinity.

Biofuel and food may be mutually exclusive in specific feedstock, like the Jatropha crop. When we look at it as a whole, however, they are more interrelated regardless of how advanced technology is. This is mainly due to the limitations of land and labor; biofuel and food are believed to be correlated as the production of one will affect the other, both going in different directions.

We predict that few biofuel programs are economically viable due to high social and environmental costs, upward pressure on food prices, intensified competition for land and water, and possible deforestation. The overall impact on the global economy will be negative, mainly due to unstable and declining food security. Its production will have a positive economic impact, but negative environmental and social impact. Biofuel could provide a huge market for agriculture, but with environmental and social costs attached.

References

1. Biopact, December 2006 “Carbon negative biofuels: from monocultures to polycultures” [Online].


• **Nuclear Share of Total Electricity Generation in 2008**

![Nuclear Share of Total Electricity Generation in 2008](image)


• **Total Energy Requirement by Fuel Type in 2008**

![Total Energy Requirement by Fuel Type in 2008](image)

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