

Report on 50th IEEJ/20th APERC Anniversary Special Pre-Symposium

IEEJ: The Institute of Energy Economics, Japan

APERC: Asia Pacific Energy Research Centre

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| 1. Date | 14:00-17:30 Thursday, June 11, 2015 (Check-in from 13:30) | |
| 2. Venue | Sirius room, Garden Court Banquet Floor, Hotel New Otani (Chiyoda, Tokyo) | |
| 3. Themes | Session I | Energy mix of major countries based on the "3Es" perspective |
| | Session II | The outlook for oil prices and economic impacts for oil producing and consuming countries |

4. Program

14:00-14:10 Opening Remark: **Masakazu Toyoda**, Chairman & CEO, IEEJ

14:10-15:30 **Session I** Energy mix of major countries based on the "3Es" perspective

(Presenter 1) **Professor Kenneth B. Medlock III**, James A. Baker III and Susan G. Baker Fellow in Energy and Resource Economics, and Senior Director, Center for Energy Studies, James A. Baker III Institute for Public Policy, Rice University, USA^{*1}

(Presenter 2) **Professor Li Zhi Dong**, Nagaoka University of Technology, China^{*2}

(Presenter 3) **Dr. Twarath Sutabutr**, Deputy Permanent Secretary of Energy, Ministry of Energy, Thailand

(Presenter 4) **Ms. Yukari Yamashita**, Board Member, Director in charge of EDMC, IEEJ

(Panel Discussion 1)

Moderator: **Cecilia Tam**, Deputy Vice President, APERC

15:50-17:20 **Session II** The outlook for oil prices and economic impacts for oil producing and consuming countries

(Presenter 5) **Professor Paul Stevens**, Distinguished Fellow, Energy, Environment and Resources, Chatham House, UK^{*1}

(Presenter 6) **Ms. Loreta Guevarra Ayson**, Undersecretary, Philippines Department of Energy, Philippines

(Presenter 7) **Dr. Tatiana Mitrova**, Head of Oil and Gas sector development Department, Energy Research Institute of the Russian Academy of Sciences (ERI RAS), Russia^{*1}

(Presenter 8) **Dr. Marwan Hussein Masri**, President Emeritus, Canadian Energy Research Institute (CERI), Canada

(Presenter 9) **Tetsuo Morikawa**, Senior Economist, Manager, Gas Group, Fossil Fuels & Electric Power Industry Unit, IEEJ

(Panel Discussion 2)

(Moderator) **Kazutomo Irie**, General Manager, APERC

17:20-17:30 (Closing Remark) **Takato Ojimi**, President, APERC

^{*1} a distinguished fellow at IEEJ in 2015 ^{*2} A visiting fellow at IEEJ

14:10-15:30 Session I Energy mix of major countries based on the "3Es" perspective

Presenter 1) Professor Kenneth B. Medlock III, James A. Baker III and Susan G. Baker Fellow in Energy and Resource Economics, and Senior Director, Center for Energy Studies, James A. Baker III Institute for Public Policy, Rice University, USA

(Video speech)

Definition of the "3Es:" First, energy security involves both energy resource importing and exporting countries. Key words for energy security are "reasonable" and "stable." In a general energy security situation, energy is supplied at a reasonable and stable price. For an export dependent country, stable prices can make it easier to develop appropriate investment plans. Stable demand is also an important factor.

Next, in the area of environmental adaptability, environmental load and other external diseconomies must be internalized for future fuel selection. But it is important to balance a sustainable environment with a sustainable economy. If a carbon tax is applied, it should be introduced at a level that does not hurt economic stability. Lastly, for the area of efficiency, future technology development will be the key. Highly efficient technologies can reduce costs and energy consumption. They will also contribute to economic and environmental sustainability.

The 3Es are essentially linked to each other. Particularly, energy security greatly influences national economic structure. Resources in countries such as Canada, Mexico and Venezuela can change the gravity of the world energy market and contribute to more stable energy supply.

(Presenter 2) Professor Li Zhi Dong, Nagaoka University of Technology, China

The main challenges facing China are preventing air pollution, reducing carbon dioxide emissions and ensuring energy security. China depends heavily on coal for energy supply. Coal accounts for nearly 70% of primary energy consumption. China is a net importer of energy and hence concerned about stable energy supply. China depends on imports for about 60% of its oil supply and about 30% of its natural gas supply. It has become a net coal importer as well since 2009. Air pollution is a serious challenge. The Xi Jinping administration is ready to promote an energy revolution to solve these problems. For example, the administration has presented a target for carbon dioxide emissions to peak around 2030 mainly through the expansion of renewable energy.

The China Electricity Council's long-term electricity mix includes a scenario in where non-fossil energy sources will account for 50% of electricity production in 2050 (March 2015). In April, multiple research organizations including the Energy Research Institute announced scenarios for maximum renewable energy penetration. In the electricity mix projected by the institute for 2050, non-fossil energy would account for 90% (including 4.3% for nuclear) of electricity generation. These scenarios, while giving slightly different nuclear share projections, indicate a common direction in which China would break away from coal power generation and expand renewables.

(Presenter 3) Dr. Twarath Sutabutr, Deputy Permanent Secretary of Energy, Ministry of Energy, Thailand

Thailand's energy policies have five pillars: electricity development, energy efficiency development, alternative energy development, gas infrastructure development and oil-substituting fuel development in the transportation sector. It gives priority to five aspects including governance (appropriate plans and implementation) and social security (support for the poor) in addition to the 3Es. In the future, Thailand will exploit domestic resources to expand biofuel and solar photovoltaics.

Thailand will also take advantage of its geographical position to serve as an energy trader for the Association of Southeast Asian Nations (ASEAN). In particular, Thailand is paying attention to cooperating with neighboring countries with significant

untapped energy resources. Under another initiative, in order to reduce energy intensity by 30%, Thailand plans to eliminate subsidies that lead to wasteful energy consumption.

The latest Thai power development plan (PDP 2015) envisages cutting electricity consumption by 90 TWh per year through energy conservation measures. This would allow Thailand to reduce investments in new generation capacity by about 10 gigawatts. In the electricity mix, the plan calls for lowering gas' share from 64% at present to 30-40% in 2036, through the expansion of coal (mainly clean coal technologies) and renewable energy. Thailand is considering nuclear energy development over the next 20 years. The electricity tariff is projected to rise from 3.71 baht/kWh currently to 5.55 baht/kWh.

(Presenter 4) Ms. Yukari Yamashita, Board Member, Director in charge of EDMC, IEEJ, Japan

On June 1, 2015, a panel for the Ministry of Economy, Trade and Industry (the Long-term Energy Supply and Demand Outlook Subcommittee of the Advisory Committee for Natural Resources and Energy) approved a draft energy supply and demand outlook for Japan to FY2030. In line with the basic energy plan released in 2014, the outlook provides a well-balanced energy supply and demand structure for the 3Es + S (energy security, economic efficiency, environment and safety). On the basic premise of safety, the outlook envisages raising the energy self-sufficiency ratio to 25% above the level before the March 2011 Great East Japan Earthquake, cutting electricity costs from the present level and reducing carbon dioxide emissions in line with Europe and the United States (by 25% from FY 2013).

The long-term outlook is based on the premise of greater energy conservation. It forecasts a 17% drop in electricity consumption under an annual economic growth projection of 1.7%. Final energy consumption is predicted to decline by 13%, with the energy intensity falling by 35%. The energy intensity reduction amounts to that achieved over the 1970-1990 period which included two oil crises. To achieve this target, energy conservation will have to be implemented more widely than during the 1990-2010 period.

The energy situation in Japan and other countries is constantly changing. Japan should implement concrete energy policy initiatives and measures mentioned in the long-term outlook with adequate response to changing situations. It will be important for the Japanese government to consider revising the long-term outlook when updating the basic energy plan which occurs every three years.

(Panel Discussion 1) Energy mix of major countries based on the "3Es" perspective

(Moderator) **Cecilia Tam**, Deputy Vice President, APERC

(Presenter 2) **Professor Li Zhi Dong**, Nagaoka University of Technology, China

Presenter 3) **Dr. Twarath Sutabutr**, Deputy Permanent Secretary of Energy, Ministry of Energy, Thailand

(Presenter 4) **Ms. Yukari Yamashita**, Board Member, Director in charge of EDMC, IEEJ, Japan

(※Presenter 1: Professor Kenneth B. Medlock III from the United States provided a speech video and did not participate in this discussion.)

Deputy Vice President Tam (moderator):

What is most important for each country's energy mix among energy security, economic efficiency and environmental sustainability?

Director Yamashita: I think energy security is the most important. Japan's energy self-sufficiency rate is so low that economic operations cannot stand without stable energy supply.

Dr. Sutabutr: Energy security is also the most important for Thailand. From the perspective of sustainability, however, we see S (social security) and G (governance) as similarly important.

Under the previous government, for example, inappropriate governance allowed an excessive subsidy system to be created, which contributed to expanding government debt.

Prof. Li: In China, the situation is somewhat different. Since the inauguration of the Xi Jinping government, China's development strategy has changed. Pursuing a New Normal, the present strategy gives top priority to environmental sustainability while calling for maintaining economic growth and security. The Energy Research Institute's scenario estimates that power generation costs will rise by 3 yen/kWh from the baseline for 2050 in line with the maximum penetration of renewable energy. There is growing support that the scenario could be acceptable if contributions to the environment and renewable energy development are comprehensively taken into account.

Deputy Vice President Tam (moderator):

Over the past several years, solar PV and wind power generation costs have declined substantially. Will renewable energy penetrate further in the world over the next five-year span? Or, will conventional electricity sources remain dominant?

Director Yamashita: Based on Japan's experiences, we cannot be optimistic for the short to medium term. When renewable energy is introduced and diffused, we see some problems that the conventional system cannot address. Japan is also plagued with levy and FIT (feed-in tariff) system problems as well. Meanwhile, we expect to see technological development beyond 2030. I think that innovative technologies would be indispensable for satisfying long-term environmental sustainability.

Dr. Sutabutr: I think technological innovation will change the world. Particularly, I hope to see international coordination in energy storage and electricity transmission networks. Thailand has invested in three energy storage technologies. The first is in pumped-storage. While facilities are under construction for about 500 MW in capacity, the government plans to develop 1,000 MW in new capacity in northeastern Thailand where renewable energy is penetrating. The second is the vanadium flow battery. A Thai company is developing a megawatt-class battery. The third is the lithium-ion battery. As Thailand could utilize the resources of neighboring countries more optimally, we are greatly interested in international coordination.

Prof. Li: Over the short term, China gives priority to mitigating air pollution. China is lowering coal's share of electricity generation, deploying electric vehicles and improving oil quality. But the speed of these improvements is limited. The power generation sector is going ahead with renewable energy development. Hydro power generation accounts for the largest share of renewable energy development, followed by wind and solar. Meanwhile, nuclear power plant construction has been delayed. An initial plan had called for building new nuclear power generation facilities for capacity totaling 40 GW in five years, but the target capacity has been reduced to 16 GW. However, construction has started for only six to eight nuclear power plants. A target of 50 GW in nuclear power generation capacity for 2020 could be achievable, while a target of 30 GW in new capacity construction in 2020 could be difficult to attain.

Director Yamashita:

Which clean coal technologies is Thailand considering?

Dr. Sutabutr: We are considering ultra-super critical coal generation and integrated gasification combined cycle technologies and closely watching technological development trends.

15:50-17:20 Session II The outlook for oil prices and economic impacts for oil producing and consuming countries

(Presenter 5) Professor Paul Stevens, Distinguished Fellow, Energy, Environment and Resources, Chatham House, UK

The oil price collapse after June 2014 reflects oversupply and rising inventories. There remains a huge stock overhang, while more supply is likely to come from Iran, Libya and Iraq. Oil price “recovery” since January 2015 is attributable to geopolitical factors (involving Saudi Arabia, Yemen, Syria and Iraq). When analyzing oil prices, we cannot ignore geopolitics. The number of US oil drilling rigs is a very poor lead indicator for oil prices. Rigs include fracklog, or the backlog of US shale wells that have been drilled but not yet brought into production. The floor price in a competitive market is the short run marginal cost of the highest cost producer at \$40/barrel.

In the UK, we have seen a growing “dash for gas” since the 1980s. Along with this, coal consumption has declined. Renewable energy remains small in the overall energy mix. North Sea oil output has declined since 2000, leading the UK to become a net oil importer in 2005. Low oil prices will seriously inhibit investment in North Sea production. Operators have already been squeezing costs. The shale technology revolution will also reduce costs. But there are large numbers of layoffs in the oil industry which could lead to losing scarce talent. Existing North Sea oil infrastructure is rapidly reaching its “sell-by date.” Within five to 10 years, the existing infrastructure will have to be renovated or replaced at a large scale.

(Presenter 6) Ms. Loreta Guevarra Ayson, Undersecretary, Philippines Department of Energy, Philippines

The Philippines is a net oil importer vulnerable to oil price fluctuations. In 2014, oil accounted for 32% of primary energy supply, gas for 7%, coal for 23% and renewable energy for 38%. The Middle East covered 76% of the Philippines’ oil imports, Russia 17% and ASEAN 7%. Saudi Arabia is the largest oil exporter to the Philippines.

In 2014, the Philippines’ crude oil import and refining volume increased reflecting lower oil prices. As oil prices declined by 1%, oil import volume rose by 1.5%. As oil prices fell by 1%, oil consumption in the transportation and commercial sectors increased by 4.0%, individuals’ savings by 0.29% and overall oil consumption by 0.22%.

Biofuel output increased by 3.0% as oil prices fell by 1%. Oil accounts for 6% of the Philippines’ electricity generation. Low oil prices can work to promote oil power generation as a substitute for hydro power generation plagued with water shortages. But coal power generation still costs less than oil generation. Low oil prices have had little impact on coal. While biofuel output has increased, current low oil prices, could lead to a delay in the development of substitute fuels and domestic resources. Low oil prices can invigorate the economy by increasing private consumption and promoting investment and trade.

(Presenter 7) Dr. Tatiana Mitrova, Head of Oil and Gas sector development Department, Energy Research Institute of the Russian Academy of Sciences (ERI RAS), Russia

The Russian economy has slowed down since 2012 even before the oil price plunge, geopolitical crises and economic sanctions began. Domestic challenges for the Russian

energy sector include (1) the Russian economy's stagnation slowing down energy demand and (2) lower investment availability. Among global challenges are (1) a potential decline in energy export revenue, (2) stagnant oil and gas demand in Europe as the largest market for Russia, (3) main demand growth moving to Asia where the Russian presence is expected to be very limited for the next five to seven years, (4) emerging oil suppliers (US shale, Iran, Iraq, Brazil, Australia, Eastern Africa, etc.) and (5) oil and gas prices expected to remain weak until 2022 to 2025.

In 2013, Russia faced weak oil prices and economic sanctions. The cumulative effect of the weak oil prices and sanctions is around \$200 billion including \$40-50 billion lost on the sanctions. The Russian economy heavily depends on the oil and gas sector, which accounts for 30% of GDP, 50% of tax revenue and 69% of export value. Russia's domestic oil output might have reached a peak at present. The Russian government is attempting to maintain domestic oil production volumes. To this end, however, new oilfield development is required. Even under the low oil prices, pipeline gas shows good economics.

(Presenter 8) Dr. Marwan Hussein Masri, President Emeritus, Canadian Energy Research Institute (CERI), Canada

The current oil price drop is not the first or the steepest. In the past 30 years (1984-2013), five steep oil price declines coincided with major changes in the global economy and oil market. Understanding the factors underlying the oil price decline is important. Whether the oil price decline is caused by factors on the supply side or demand side, or both sides, is important for deciding responses to the oil price decline. Macroeconomic impacts of the oil price decline differ depending on whether the decline is attributable to factors on the demand side or the supply side and whether countries are net oil importers or exporters.

The IMF analysis concluded that the current drop started with demand and ended with supply as triggers. The conclusion resulted from the analysis tracking daily movements in oil prices relative to stock prices in 38 countries and regions. According to the analysis, the demand side accounted for 96.3% of the oil price drop between July and October 2014 and the supply side for 3.7%. During the period between October 2014 and January 2015, however, the supply side accounted for 58% of the oil price fall and the demand side for 42%. The low oil price impacts on Canada had initially been small. But they worked to expand demand's gap with production volume, exerting downward pressure on projected inflation. Canada's real GDP growth is projected to rebound in the second quarter of this year and to subsequently strengthen to average about 2.5% on a quarterly basis until the middle of 2016.

Because Canada has a diversified economy, low oil prices have no devastating impact on the country. But the negative net impact on Alberta and other major oil producing provinces will be larger than the impact on other provinces. Residents' feelings on benefits and adverse impacts of the low oil prices sharply differ between major oil producing provinces and others. The net effect of the low oil prices will depend on the interaction of impacts on energy and non-energy sectors. High oil prices encourage efficiency and innovation that increase supply and reduce demand, lowering prices.

(Presenter 9) Tetsuo Morikawa, Senior Economist, Manager, Gas Group, Fossil Fuels & Electric Power Industry Unit, IEEJ

The recent crude oil import price for Japan stood at around \$49/barrel and the LNG import price at \$9/MMBtu. LNG import prices have followed a downward trend. The LNG price decline will lead the economics of new LNG development projects in Asia to be questioned. Japan will have to consider what it can do as an LNG importer.

As crude oil prices go up again, LNG prices linked to crude oil prices will rise. The linkage emerged about 40 years ago when LNG was positioned as a substitute for oil. The reasonability of this linkage might have to be questioned. Although it is difficult to find a decisive solution, a mechanism in which gas (LNG) prices are determined in line with market supply and demand is desirable.

Two scenarios are conceivable for developing an Asian benchmark price for LNG. The

domestic scenario includes gas market liberalization, domestic wholesale price (hub) development and the application of European and US experiences to Asian countries. But this scenario may take more than 20 years. The international scenario envisages the mitigation of contract terms and conditions, including the relaxation of destination clauses and spot LNG market development.

(Panel Discussion 2) “The outlook for oil prices and economic impacts for oil producing and consuming countries”

(Moderator) **Kazutomo Irie**, General Manager, APERC

(Presenter 5) **Professor Paul Stevens**, Distinguished Fellow, Energy, Environment and Resources, Chatham House, UK

(Presenter 6) **Ms. Loreta Guevarra Ayson**, Undersecretary, Philippines Department of Energy, Philippines

(Presenter 7) **Dr. Tatiana Mitrova**, Head of Oil and Gas sector development Department, Energy Research Institute of the Russian Academy of Sciences (ERI RAS), Russia

(Presenter 8) **Dr. Marwan Hussein Masri**, President Emeritus, Canadian Energy Research Institute (CERI), Canada

(Presenter 9) **Tetsuo Morikawa**, Senior Economist, Manager, Gas Group, Fossil Fuels & Electric Power Industry Unit, IEEJ

General Manager Irie (moderator):

Why did international crude oil prices decline in June 2014? Was the price decline predictable?

Prof. Stevens: The international crude oil price decline was predictable. But it was very difficult to forecast the timing of the decline. When demand weakened, US shale oil supply increased.

Dr. Masri: It is difficult to predict the timing for any international crude oil price fall. Policy authorities had looked at the conditions at the time alone.

Dr. Mitrova: Given supply and demand fundamentals, I had expected that international crude oil prices, even if they decline, would bottom out at \$80-85/barrel. In addition, political problems can affect oil prices. Saudi Arabia might have been disappointed at the United States’ response to Iran. The market may eventually go in the direction of undersupply. US shale oil alone may fail to satisfy demand.

General Manager Irie (moderator):

Over a short term, the international crude oil price decline will have negative impacts on oil producing countries and positive impacts on oil consuming countries. How long will the international crude oil price continue to decline before beginning to exert negative impacts on oil consuming countries as well?

Undersecretary Ayson: That is a difficult question to answer. But I think low oil prices inhibit investment in oil development projects, eventually exerting negative impacts on oil consuming countries as well.

Senior Economist Morikawa:

In the gas area, LNG developers have already expressed concerns over low prices. It is desirable to improve price-signaling functions in response to LNG market oversupply that is expected to continue until around 2020. It is desirable for gas producing and consuming countries to cooperate in new

gas pipeline projects in countries where market functions are underdeveloped.

General Manager Irie (moderator):

How long will international crude oil prices remain weak? When will they turn upward? Dr. Mitrova predicted that market conditions will remain almost unchanged until 2022 to 2025. What is the reason for such a prediction?

Dr. Mitrova: First, we must make it clear that the oil situation is far different from the gas situation. Oil prices are likely to rise back to \$80-85/barrel in 2018 to 2019. Demand will then recover. U.S. shale oil alone may fail to cover supply shortages. In the gas market, oversupply will continue until 2022 to 2025, leading LNG prices to remain in a \$6-7/MMBtu range in the Asian market.

Prof. Stevens: We must take note of the fact that investment has stopped in existing development projects. Demand could rebound in five to 10 years, leading to undersupply.

Dr. Masri: Oil prices may take several years to recover. Given the reverse oil crisis (oil price decline) in 1985, the recovery will take some time.

Martin Brown-Santirso (Researcher, APERC):

How should we view low oil prices' relationship with the 3Es (energy, economy and environment)?

How should we restrict greenhouse gas emissions amid growing demand for oil?

Prof. Stevens: Stable oil supply at high prices is the basic approach of oil producing Middle East countries. If consideration is given to the environment, energy consumption will have to be reduced. To this end, energy efficiency will have to be improved. Of the EIA's five scenarios through 2040, two envisage the United States becoming a net energy exporter by 2030 thanks to energy efficiency improvements.