



The Effect of the Crude Oil Price Drop on the Global Energy Market

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APERC
Asia Pacific Energy Research Centre



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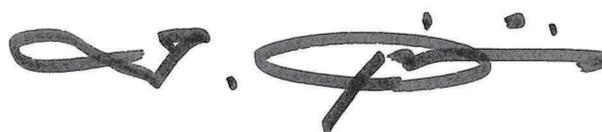
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Foreword

Crude oil prices have always been the focus of attention. If you look back in history, two oil crises in the 1970s and the subsequent price collapse in the 1980s, price fluctuations due to the Gulf War and the Asian currency crisis in the 1990s, and wild fluctuations around the time of the collapse of Lehman Brothers in the 2000s drew substantial attention. Now, the world of high global oil prices lasted that four or more years since 2010 has come to an end and how long low global oil prices will last is of utmost interest. It is quite natural based on the facts that fluctuates in crude oil prices affect the oil market, other energy markets, the world economy, people's lives, and even the balance of power in international politics.

This report focused on the crude oil price drop in and after 2014 and first analyzed the background and contributing factors. Second, based on the results, the impacts that the crude oil price drop will have on future energy markets were examined with respect to oil, natural gas, and other fields. We tried to make the analysis as fair as possible by collecting a variety of different information through the exchange of opinions with experts from different backgrounds.

This report is the work of the Asia Pacific Energy Research Centre. It is an independent study and does not necessarily reflect the view or policies of the APEC Energy Working Group or individual member economies. I hope that this report will be of some help in looking into the future and that it will contribute to the stabilization of the international energy market and sustainable development of APEC member economies.



Takato OJIMI

President

Asia Pacific Energy Research Centre

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Content

Table of Figures.....	1
Executive Summary.....	3
Introduction.....	5
Chapter 1: Background of the Crude Oil Price Drop and the Future Crude Oil Price Forecast.....	6
Chapter 2: Effects on the Global Macro Economy	23
Chapter 3: Effects on the Oil Market	36
Chapter 4: Effects on the Natural Gas Market	54
Chapter 5: Effects on Other Fields	63
Chapter 6: Summary and Implication.....	80
Report of the Field Study in Europe.....	87
【Reference】	89

Table of Figures

Figure 1. Changes in the Crude Oil Price in a Long Term	6
Figure 2. Changes in the Crude Oil Prices in a Short Term	8
Figure 3. Changes in the Oil Supply-Demand Balance in Recent Years.....	9
Figure 4. Changes in the Growth of Oil Demand in Recent Years.....	9
Figure 5. Changes in the Growth of Oil Supply in Recent Years	10
Figure 6. Statements Made by the Market Players in Chronological Order	11
Figure 7. Changes in WTI/Brent Price Forecasts by EIA (Reference Case).....	17
Figure 8. Changes in the Crude Oil Price Forecasts by the World Bank	18
Figure 9. OPEC Basket Price Forecast	19
Figure 10. IEA Imported Crude Oil Price Forecast by Scenario	20
Figure 11. Crude Oil Price Forecast by IMF.....	21
Figure 12. Changes in the Forecasts of the World Economic Growth by IMF	24
Figure 13. Changes in Gasoline Prices in Major Advanced Countries/Economies	24
Figure 14. Changes in the Diesel Oil Prices in Major Advanced Countries/Economies.....	25
Figure 15. Changes in the Monthly Change Rates of the Consumer Price Index in Major Advanced Countries/Economies.....	26
Figure 16. Review of the Economic Growth Outlook in Major Oil-Producing Countries/Economies.....	27
Figure 17. Ratios of Oil/Gas Exports in each of the OPEC Member Countries (2014)	28
Figure 18. Changes in and Outlook for OPEC Oil-Producing Countries' Oil Revenues Excluding Iran.....	29
Figure 19 Oil-Producing Countries' Financial Equilibrium Crude Oil Prices	29
Figure 20. Fiscal Revenue and Expenditure/Balance of Current Account in the Middle Eastern Oil-Producing Countries	30
Figure 21. Each Country's SWF Amount Derived from Oil Revenues	31
Figure 22. Movements of Reducing Fuel Subsidies in Asian Countries/Economies (August, 2014 – March, 2015).....	35
Figure 23. European and American Major international oil Companies' Account Settlements in the April-June Quarter in 2015	36
Figure 24. Overview of Philips 66's Account Settlements in the January-March/April-June Periods in 2015.....	37
Figure 25. Overview of Marathon Petroleum's Account Settlements in the	

January-March/April-June Periods in 2015.....	37
Figure 26. Overview of Apache Corporation’s Account Settlements in the January-March/April-June Periods in 2015.....	38
Figure 27. Current Status of the Major Investment Projects that had been scheduled in 2014-2015.....	40
Figure 28. European Oil Companies’ Cost Reduction Status.....	42
Figure 29. Conditions of the Energy Companies in Russia.....	43
Figure 30. Conceptual Diagram of the Oil Taxation System Revision and Change in Tax Imposition in Russia	45
Figure 31. Comparison of the Changes in the Natural Gas Prices (left axis) and the Crude Oil Price (right axis).....	56
Figure 32. Natural Gas Demand Forecast.....	61
Figure 33. Natural Gas Production Forecast.....	61
Figure 34. LNG Import Forecast by Region (2014/2020).....	62
Figure 35. Changes in Fuel Energy’s CIF Prices per Unit of heat.....	65
Figure 36. Increase in coal & oil “new energy” by year versus oil price.....	66
Figure 37. Coal demand, production and trade by scenario (Mtoe).....	67
Figure 38. Changes in the Primary Energy Supply.....	68
Figure 39. Long-Term Contracts on the Electric Power Supply Fees Using Renewable Energy in Recent Years.....	69
Figure 40. Forecasted Increase in Renewable Energy in Power-Generating Facility Capacity (Standard case).....	71
Figure 41. Forecasted Increase in Renewable Energy in Power-Generating Facility Capacity (Promoting case).....	72
Figure 42. Changes in Biofuel Consumption in the World.....	74
Figure 43. Changes in Electric Power Generation and Composition of Electric Power in the World.....	75
Figure 44. Forecast of the Changes in CO ₂ Emissions in the United States due to Differences in the Oil Price.....	77
Figure 45. Relationship between GDP and CO ₂ Emissions	78
Figure 46. Forecast of the Changes in CO ₂ Emissions in the United States due to a Difference in the Economic Growth	79
Figure 47. Forecast of CO ₂ Emissions with Respect to Each Case.....	79

Executive Summary

With regard to the crude oil price drop that started in the middle of 2014, the price dropped from the \$110/bbl level to the \$40/bbl level in only six months and dropped further to \$30/bbl or below in one year. This phenomenon affected not only the global oil market, but also every energy market and global society. This study was carried out with the aim of contributing to energy supply and demand forecasts as separately prepared by APERC by analyzing the effects of the crude oil price drop on the various types of energy.

First, in the oil market, the decline in the oil price is linked to the decrease in the oil producing countries'/economies' revenues, decrease in the major international oil companies' assets, downturn in both parties' investments in crude oil development, and uncertainty over the maintenance of future crude oil producing capacity. With regard to the oil-consuming countries on the other hand, apart from the viewpoint that the decline of the price will promote consumption, there are also concerns about the effects on the world economy that the reduction and abolition of the energy subsidies, reduced activities of the oil-related industry, and the disposition of the sovereign wealth funds (i.e. withdrawal from the financial and real estate markets) will cause economic stagnation. Initially, the decline in the oil price was said to drastically reduce the production of shale oil but because of the improvement in efficiency in shale oil production, production volume was still large even as the price reached \$30/bbl. Coupled with the return of the Iranian oil into the market, the sign of a favorable turn in the crude oil supply-demand balance (i.e. the oil price increase) has not been seen.

Next, in the natural gas market, Asia and Europe are affected by the decline in the oil price because a price formula that works in conjunction with the crude oil price is used. Therefore, some projects have already been abandoned or postponed, and there are opinions that if the current low price continues, the LNG market will be in short supply by 2020. On the other hand, the cost of natural gas is now competitive with coal in the electricity market, and the use of natural gas will increase in terms of countermeasures in response to global warming. Policies to strengthen energy security and low carbonization are strongly reflected in the plans for investments in renewable energy and nuclear power generation. Therefore, the effect of the crude oil price drop is not significant.

In terms of countermeasures in response to global warming, the increase or decrease in oil consumption has a positive correlation with the increase or decrease in CO₂

emissions. However, changes in economic growth will have a greater influence on the volume of CO₂ emissions than changes in the crude oil price. Therefore, efforts to weaken the correlation between economic growth and energy consumption (i.e. energy saving) will become more important.

Last, we organized the points in preparing the long-term energy supply and demand forecast.

- (1) How do you choose diversifying energy sources in forecasting supply and demand?
- (2) What effect will each country's/economy's energy policy have on the energy supply and demand forecast?
- (3) How do you see the comparative advantages and disadvantages of competing energy in the supply forecast?

Introduction

1. Background to the Survey

The decline in the crude oil price that started in the middle of 2014 has been a factor that significantly changed the global energy market and the supply-demand environment. So, what effects will future trends in crude oil prices have on the medium- to long-term global oil supply and demand? What will happen to oil production in non-OPEC countries/economies, such as shale oil in the United States by that? What effects will that have on OPEC production, mainly in Middle Eastern oil-producing countries? There is an uncertainty to these points.

These changes are not just particular problems in the oil markets but will affect the international natural gas and LNG markets, and because of the changes in the price competitiveness between each energy source, such changes are considered to have an effect on the future vision of coal and non-fossil energy (nuclear power, renewable energy, etc.) with a focus on the power generation sector.

2. Purpose of the Survey

This survey is aimed at enhancing the content and improving the accuracy of the long-term energy supply and demand forecast that APERC will separately prepare by analyzing the medium- and long-term effects of the new market that emerged because of the crude oil price drop on the global energy market and will provide information.

Specifically, we identify the factors for the crude oil price drop and then accumulate the latest information and opinions on how the crude oil prices will change in the future by the responses of parties concerned with each market, what effects the crude oil price drop will have on the global macro economy, and consequently what effects it will have on the oil market, natural gas market, and other energy markets through literature published by the specialized institutions and research institutions at home and abroad and through the exchanges of opinions. The January 2016 field study report in Europe is attached as Appendix.

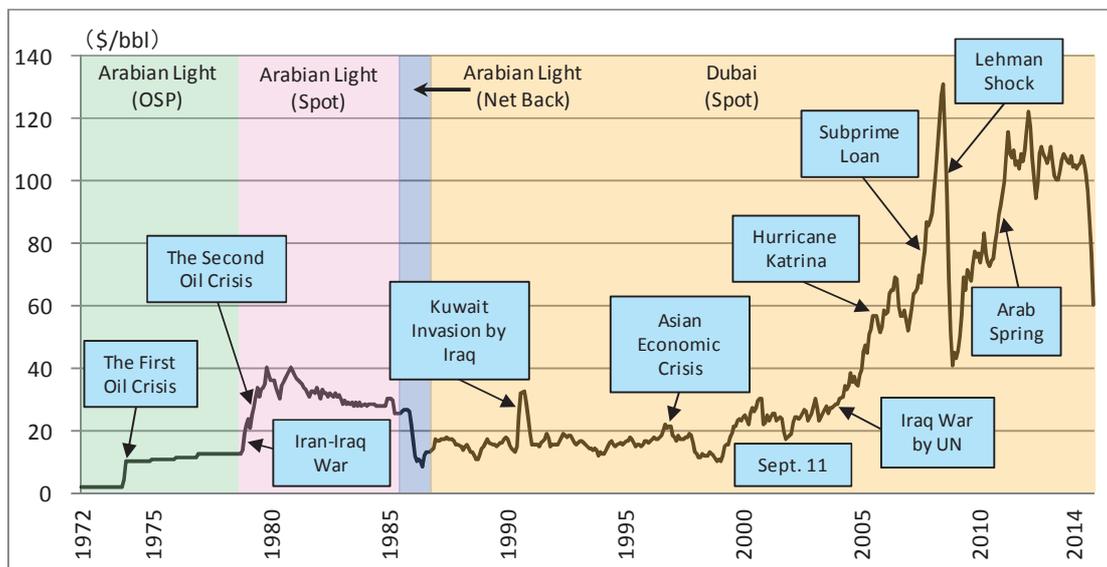
Through this accumulation, we conduct an analysis that contributes to the development of energy policies in the APEC region and the development of strategies in the energy industry and present suggestions for APERC's long-term energy supply and demand forecast.

Chapter 1: Background of the Crude Oil Price Drop and the Future Crude Oil Price Forecast

1-1. Changes in the Crude Oil Prices in a Long Term (1972 - 2014)

Figure 1 indicates how the crude oil price changed in the long-term trend from 1972 to 2014. The price, which was \$3/bbl in 1973, jumped to the \$40/bbl level in seven years because of the second oil shock and the outbreak of the Iran-Iraq War, and during the reverse oil shock in 1986, the price dropped to the \$10/bbl from the \$30/bbl level. After that, the price remained fluctuating because of the invasion of Kuwait by Iraq (August 1990), economic stagnation caused by the Asian economic crisis in 1998, and the outbreak of the Iraq War in 2003. In particular, during the collapse of Lehman Brothers in 2008, the price had a substantial fall of 77% from \$147/bbl to \$33/bbl. On the other hand, because of the psychological uncertainty that crude oil and natural gas might not be exported from the Middle East if the democratic movement (Arab Spring) that started in Tunisia in December 2010 were to spread into each country, including the Middle Eastern oil-producing countries (actually, there was no influence on passing through Suez Canal and the Hormuz Strait), the price soared. After that in 2011, the crude oil price stayed at around \$100/bbl until the middle of 2014.

Figure 1. Changes in the Crude Oil Price in a Long Term



Source: Created based on Today's Petroleum Industry 2015 by Petroleum Association of Japan

1-2. Changes in the Crude Oil Price in the Short Term (January 2014 to November 2015)

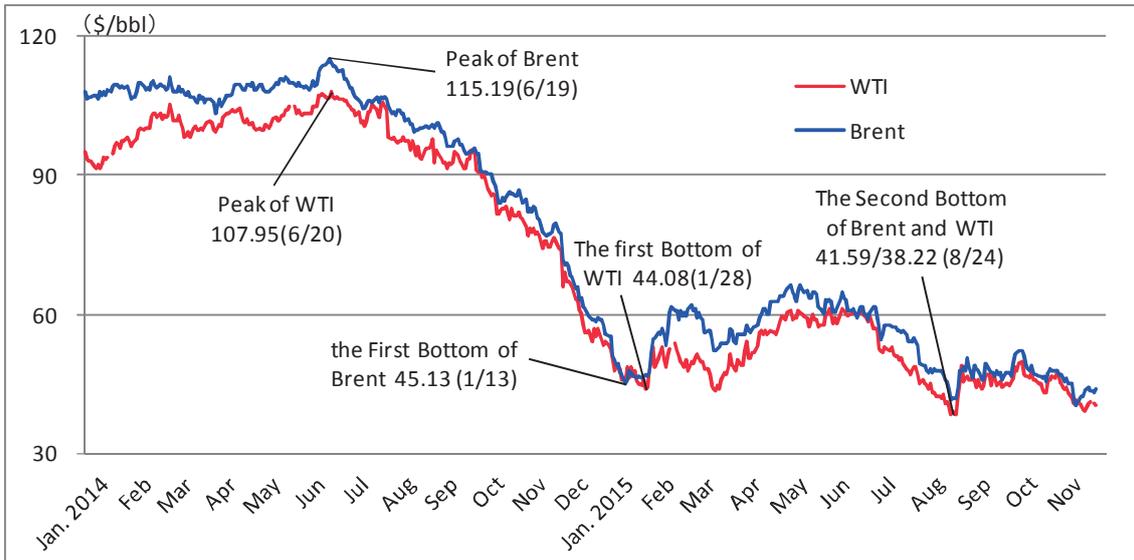
Figure 2 shows the changes in the crude oil prices (WTI crude oil and Brent crude oil)

since 2014. Until the middle of 2014, both crude oil prices stayed at around \$100/bbl. But because of the prediction that crude oil demand growth would slow over concerns about the effects associated with the economic slowdown in Europe on the export industry in the emerging countries/economies, such as China, coupled with the prediction of a surplus in the crude oil supply because of the drastic shale oil production increase in the United States and the reconstruction of Iraq, crude oil prices started to drastically drop in the middle of 2014, and the WTI price dropped sharply from the \$100/bbl level to the \$40/bbl level in just six months.

During this period, the invasion of major oil fields in Iraq by the Islamic State in and after May 2014 and the decrease in crude oil production due to the worsening of internal security in Libya and Nigeria curbed the decline in prices, but the fact that a production cutback was not agreed in the OPEC Meeting in late November of the year became the decisive trigger, and the crude oil futures market followed the path of a collapse all at once.

Crude oil prices during and after February 2015 continued to fluctuate at around \$50–60/bbl because of the mixed opinions that the supply-demand balance would be tight and that the supply-demand balance would be eased. Factors for the opinion that the supply-demand balance would be tight were the prospect for the shale oil production decline due to the decrease in the operating rates of drilling rigs in the United States, the prospect of a production reduction due to the media reports that the implementation of the Iraqi crude oil production plan in 2015 would be delayed or cancelled, supply concerns due to the tense situation in the Middle East (attacks on oil terminals by the Libyan armed groups and the aerial bombing on Yemen by Saudi Arabia), and the prospect for the recovery of oil demand due to the collapse of crude oil prices. On the other hand, factors that the supply-demand balance would ease were the prospect that the oversupply situation would be extended for a long period of time because crude oil production volume in Iraq would increase in the future and Iranian crude oil would return to the market in the future with the progress of consultations on the nuclear issue in Iran. But in July, there were concerns over the future global economy, including China, on the demand side, and shale oil production volume was maintained firmly while OPEC kept the production increase on the supply side, thus crude oil prices again dropped to the \$40/bbl level. (The WTI crude oil price dropped below the major \$40/bbl level on August 24.)

Figure 2. Changes in the Crude Oil Prices in a Short Term



Source: Created based on Spot Prices for Crude Oil and Petroleum Products by EIA

1-3. Factors in the crude oil price drop

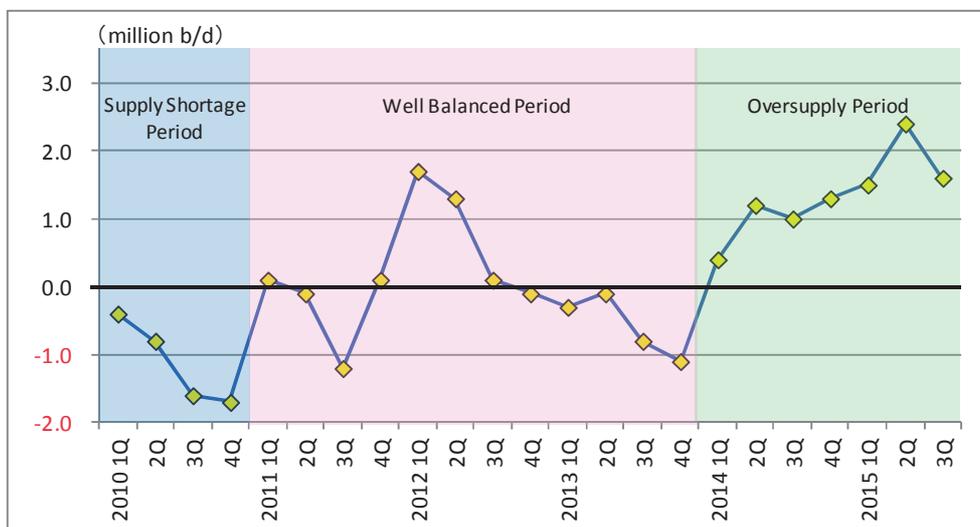
Figure 3 shows the global oil supply-demand balance in and after 2010. This simply represents the gaps between the crude oil supply and oil demand with respect to each quarter; 2010 was a supply shortage, the period from 2011 to 2013 was nearly balanced, and a complete oversupply has continued since 2014.

The factors that influence this supply-demand balance are *demand* and *supply*—Figure 4 indicates the demand side. This shows the gaps between demand in each quarter and the same period a year ago by dividing into North America, Europe, China, and others. In total volume, you can see that the demand in each quarter surpassed the same period a year ago, except for the fourth quarter in 2011, but the gaps had become smaller (growth had become smaller) since the fourth quarter in 2013, and the growth had become smaller in 2014. According to the regions, in addition to Europe in which oil demand had been continuously decreasing, the growth of China, which had been in excellent condition, started to show some weakness around 2013. In conjunction with these indications, the United States and others, which include many emerging countries/economies, showed some changes in growth.

Figure 5 shows the supply side as another factor. This shows the gaps in supply in each quarter and the same period a year ago by dividing into North America, Former Soviet Union, OPEC, and others. In total volume, supply growth had seemingly been fluctuating in harmony with demand growth, but after the growth in the first quarter in 2013 dropped below the growth in the same period a year ago, supply had been growing

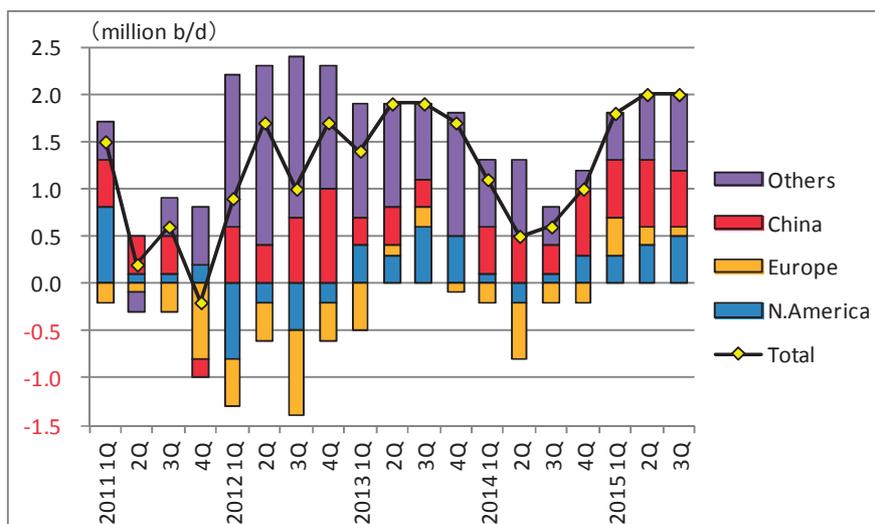
steadily despite the decrease in demand growth. But according to the regions, North America and OPEC had steadily increased supply up to 2012 partly because of the domestic situations in OPEC member countries, but you can see that in 2013, while OPEC's supply growth dropped below the previous year, only North America's supply steadily increased. So, US shale oil was the sole winner. This was said to be the factor in the maintenance of the crude oil production target of 30 million b/d as decided at the OPEC meeting at the end of November 2014 instead of implementing a production cutback.

Figure 3. Changes in the Oil Supply–Demand Balance in Recent Years



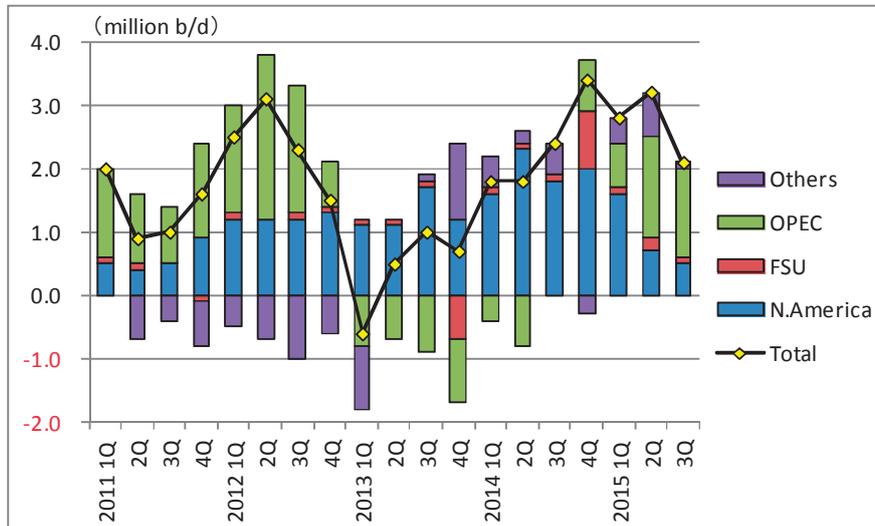
Source: Created based on IEA Oil Market Report, Table 1 “World Oil Supply and Demand”

Figure 4. Changes in the Growth of Oil Demand in Recent Years



Source: Created based on IEA Oil Market Report, Table 1 “World Oil Supply and Demand”

Figure 5. Changes in the Growth of Oil Supply in Recent Years



Source: IEA Oil Market Report, Table 1 “World Oil Supply and Demand”

In addition to the physical factors of the supply-demand balance, the psychological factor of the market players was also believed to add momentum to the crude oil price drop. In other words, until the OPEC meeting at the end of November 2014, the price drop was caused by statistics that indicated imbalances in supply and demand, but after the OPEC meeting, the psychological feeling of disappointment and speculation that prompted the price drop was not negligible. The psychological feeling of disappointment came from the fact that the market speculated that OPEC member countries would decide on production cutbacks at the OPEC meeting in order to apply brakes to the crude oil price drop by tightening the supply-demand balance. But the result was not to agree on production cutbacks, which resulted in shale oil as the sole winner as just described, but to aggressively go against shale oil, which was said to have relatively high production costs. Therefore, the crude oil market was bewildered and disappointed by the unexpected decision that gave rise to speculation that the supply-demand imbalance would further expand. The price dropped by \$20/bbl in one month after the meeting and dropped further by \$10/bbl the next month.

As another psychological factor, there might have been the attempt to try to see at what crude oil price the growth of shale oil production with its high production costs would stop (find out where the crude oil price would cease to fall). But with regard to this point, the correlation between the operating rate of the drilling rigs in the United States and shale oil production volume has not been identified as of now, and the marginal cost has not been verified.

On the other hand, the OPEC oil-producing countries' psychological factor was that they wanted to take the bold course of production cutbacks to apply brakes to the crude oil price drop but they did not agree on a production cutback, which would do nothing but show humanity even to their enemy (helping the production of shale oil, which has higher production costs, by maintaining the oil price) and would influence the oil supply-demand balance, and it could not be helped if the crude oil price further dropped. Saudi Arabia advocated that position and Kuwait and UAE went along. They made the decision to maintain the current production target at the OPEC meeting and accepted the crude oil price drop.

1-4. Future Crude Oil Price Forecast

In the crude oil price forecast, we already stated that there were physical factors and psychological factors, but in, unpredictable incidents and accidents can also be factors that influence price forecasts. Therefore, we need to bear in mind that it is difficult to discuss absolute figures in a price forecast by specialized institutions and research institutions at home and abroad on an equal footing because details of the factors to incorporate and the impacts on the price will vary according to the announcement period.

So, in this section, we clarify the announcement periods to the extent possible and then, we not only discuss the oil price as an absolute value, but also organize the information that has effects on future price formation in chronological order.

[Statements made by the market players]

Figure 6. Statements Made by the Market Players in Chronological Order

Statement Date	Speaker	Content of the Statement
November 28, 2014 (Right after the meeting)	Secretary General of OPEC	We maintained the production target of 30 million b/d. OPEC will pursue a fair price that can be accepted by the oil-producing countries as well as consumers. We would like to watch the progress of the market. We tolerated a certain level of the low price of crude oil.
December 22, 2014	Oil Minister Naimi	The influence of speculation and the fact that there was no cooperation from non-OPEC countries caused the crude oil price drop. Even if non-OPEC countries reduced oil production, Saudi Arabia would not reduce oil production in order to maintain the country's share.
December	Each leader of the	• Predicted the crude oil market in 2015 would be

Statement Date	Speaker	Content of the Statement
24, 2014	OPEC member countries	<p>\$70-80/bbl.</p> <ul style="list-style-type: none"> • The crude oil price was likely to be below the \$60/bbl level for several months. • Assumed that the price would go back to \$80/bbl in 8 month to 1 year. • The price would not go back to \$100/bbl within 2015 unless there was a supply crisis.
January 7, 2015	UAE's oil minister	The crude oil market is in oversupply. It needs time to absorb it. Resolution of the problems may be extended for a long period (taking several months – several years).
January 14, 2015	Kuwait's oil minister	We have to wait until the second half of 2015 for the excess portion to be absorbed and the world economy to improve. By the end of 2015, the price will be back to \$60/bbl.
January 21, 2015	Secretary General of OPEC	OPEC's decision is not to remove non-OPEC countries, such as the United States, Russia, etc. The crude oil price drop since June of last year has been caused by oversupply.
January 22, 2015	Secretary General of OPEC IEA chief economist	The crude oil price will rise within 2015 but cutbacks in development investment will be at risk of influencing the future crude oil supply.
January 27, 2015	Secretary General of OPEC	We will not change the production quota until the meeting in June.
January 28, 2015	Oil minister Naimi	The crude oil price will be controlled by supply and demand and economic rules. It will take time for the oversupply situation at the moment to be eliminated.
February 11, 2015	Executive Director of IEA	US shale oil is now playing the role of production adjustment on behalf of OPEC. If the crude oil price goes up, production of shale oil will rapidly increase.
March 4, 2015	Oil minister Naimi	OPEC's decision to maintain market share was right. There is no plan to hold OPEC extraordinary meeting until holding of the meeting in June.
March 9, 2015	Secretary General of OPEC	Demand in the second half of 2015 will increase by 1.2 million b/d and the supply-demand balance will be restored.
March 9, 2015	Kuwait's oil minister	Rebound of the crude oil price was triggered by the reduction of the US shale oil production but the price will not rise sharply as long as the slowdown of the global economy persists. The price level may stay at around \$50-60/bbl.

Statement Date	Speaker	Content of the Statement
March 19, 2015	Kuwait's oil minister	The low price of crude oil will have an impact on the national budget but in order to prevent OPEC from losing the share, we have no other option but to maintain the current production quota.
March 23, 2015	Oil minister Naimi	OPEC will not undertake all the roles to support the crude oil price. Everyone should cooperate if they want to improve the price.
March 27, 2015	Iraq's oil minister	The crude oil price hit the bottom in January. It will reach \$70/bbl by the end of the year. The price hike due to air raid on Yemen will be only temporary.
April 9, 2015	Iran's oil minister	If Iran resumes its crude oil export, OPEC should cooperate and respond to it to prevent the crude oil price from dropping sharply.
April 9, 2015	Advisor for the Ministry of Petroleum of Saudi Arabia	Global crude oil demand will increase by 1 million b/d every year. The current price drop and sluggish demand will be only temporary.
April 15, 2015	Iran's oil minister	In order to maintain the world's crude oil supply-demand balance and to secure Iran's quota in anticipation of removing sanction against Iran in the future, OPEC's production should be cut by 5%.
May 6, 2015	Leader of the OPEC member country	Major oil-producing OPEC member countries in the Persian Gulf have not changed the strategy to prioritize the maintenance of the market share over applying a brake to oil price drop.
May 7, 2015	Iran's deputy oil minister	The current \$68/bbl is the level that cannot be maintained from the commercial perspective and the price will increase to \$80/bbl by the end of 2016.
May 9, 2015	Oman's oil minister	He severely criticized Saudi Arabia's policy of not reducing the production in spite of the crude oil price drop. He suggested that Angola, Nigeria, Gabon, Venezuela, Iran, and Iraq might unilaterally cut back production. Building of strategic stockpile by consuming countries has reached the limit.
June 2, 2015	Oil minister Naimi	The policy to maintain market share is functioning, and I have a policy to leave the production target unchanged at the next OPEC meeting.
June 3, 2015	Iraq, Angola, and Venezuela's oil ministers	At this moment, \$75-80/bbl would be the appropriate crude oil price. The price of \$100/bbl until last year will lead to fiercer competition as the production of high-cost crude oil, such as US shale oil, etc. will increase.

Statement Date	Speaker	Content of the Statement
June 5, 2015	OPEC meeting's decision	Decided to leave the production target of 30 million b/d unchanged.
July 16, 2015	Iran's oil minister	With the final agreement on the comprehensive collective action plan on July 14, Iran will be able to respond to the crude oil export with the amount of 500,000-800,000 b/d right after lifting of trade embargo.
July 21, 2015	PIRA Energy	It is not as oversupply as the market thinks and in the future, it will be in a situation where supply will decrease and demand will not be met and it is highly likely that the crude oil price will increase to \$100/bbl again within the next five years.
July 30, 2015	Secretary General of OPEC	Although there are some concerns over the oil price slump in the past several months and price decline due to the increase in Iranian crude oil, there is no plan to reduce the crude oil production.
July 31, 2015	Leaders of the majors, etc.	BP: The crude oil price will drop for a long period. Shell: In preparation for a long-term market decline, we will curb investments. Total, Statoil, etc.: We predict a long-term slump in the crude oil price and will trim the capex in 2015 on a year-to-year basis. Chevron: We will lay off 1,500 people to reduce costs.
August 6, 2015	Goldman Sachs	With the recognition that not only the current price, resource-rich countries' currencies, and energy sector stocks have reached the lowest level since 2005 but also fallen credibility of the financial market and readjustment of the supply-demand balance have become far more difficult than what has been factored into the market, the crude oil price will fluctuate at a much lower level for a longer period of time.
August 21, 2015	Algeria's energy minister	I sent a letter of complaint that the crude oil price sharply declined after leaving the production target unchanged at the OPEC meeting in June to the OPEC Secretariat.
August 31, 2015	Leader of the OPEC member country	On the condition of not being named, the crude oil price will stay at \$40–\$50/bbl within the year. Assuming that the Chinese economy will recover, \$60/bbl may be possible.
September 1, 2015	OPEC Monthly Report	Toward the achievement of the fair price, OPEC expressed that they are ready to negotiate with other crude oil producing countries. To that end, the crude oil

Statement Date	Speaker	Content of the Statement
		price rose by \$4/bbl.
September 1, 2015	VITOL CEO	Because of the overproduction of crude oil, stockpiling of inventories will continue for the next several quarters, and it will be in and after 2017 at the earliest when excess inventories will be resolved; therefore, the crude oil price will continue to be in the \$40-60/bbl range in 2016.
October 2, 2015	Oil minister Naimi	In conjunction with the G20 Energy Minister Meeting held in Turkey, he had a meeting with Russia's Minister of Energy Novak and US Secretary of Energy Moniz. Details of the meeting was not disclosed but amid concerns over the sluggish upstream development investment under the low-price environment, oil minister Naimi remarked that Saudi Arabia would keep maintaining the investment amount in the future.
October 6, 2015	Secretary General of OPEC	As the rapid decline of the worldwide oil investments will curb supply, the crude oil price is expected to rebound. We are ready to discuss about the current oil market disruption with the United States.
October 12, 2015	Secretary General of OPEC (OPEC Monthly Report)	With the continuation of the low oil price, non-OPEC countries' crude oil production will decrease and the supply-demand balance will improve in 2016.
October 13, 2015	Venezuela's former oil minister Ramirez	He planned to propose to set a lower limit at \$70/bbl and discuss it at the OPEC technical specialist meeting on October 21 (eight non-OPEC countries were invited to the meeting and five countries participated) ⇒ Nothing was decided.
October 26, 2015	Executive Director of IEA	Crude oil supply may decrease in the middle of 2016, so the energy policy with the assumption of the low price of crude oil should not be formulated.
October 31, 2015	Iran's oil minister	Iran is planning to report an increase in crude oil production by 500,000 b/d at the OPEC meeting to be held in December. With this amount, there will be no oil price drop.
November 8, 2015	Kuwait's OPEC representative	With the production increase in the Middle East, the crude oil market is expected to continue in its oversupply situation for five years.
November 9, 2015	Oil minister Naimi	Oil demand will soon reflect the <i>attractiveness</i> of the current crude oil price level and Asia will become a driving force for economic expansion for several decades.

Statement Date	Speaker	Content of the Statement
November 10, 2015	Saudi Arabia's deputy oil minister (Prince Salman)	He anticipated that non-OPEC countries' willingness to make investments will be reduced because of the current low oil price and non-OPEC countries' production will decrease in 2016. Saudi Arabia will steadily continue energy investments.
November 10, 2015	Representative of the OPEC member countries	With the return of Indonesia, OPEC is examining a new production quota ceiling.
November 10, 2015	WEO-2015 (IEA)	The OPEC strategy to maintain oil production is likely to have a pressure on the crude oil price until 2020. Around \$80/bbl is assumed in 2020.
November 17, 2015	Iran's oil minister	If a sanction to Iran due to the doubt about nuclear weapon is lifted, there will be no change in the plan to increase oil production and promote exports even if the crude oil price will drop to \$30/bbl. This case is not the one to be discussed at the OPEC meeting and the market has already factored into it.
November 19, 2015	Oil minister Naimi	The Middle Eastern oil-producing countries need to make continuous crude oil development investments with the amount of 700 billion dollars over the next ten years.
December 1, 2015	Executive Director of IEA	The current oversupply will proceed to the balanced condition because of the worldwide demand increase and the oil price is expected to begin to go up in 2017 and hit \$80/bbl in several years.
December 4, 2015	Decision at the OPEC meeting (Secretary General of OPEC)	This time, we deferred setting the crude oil production target. This decision was postponed to the next meeting. By that time, the situation will be clarified.
December 4, 2015	Oil minister Naimi	Even if Iranian crude oil flows into the market in 2016, it can be consumed because of the worldwide demand increase.
December 4, 2015	Iran's oil minister	No production target means that unlimited production will be permitted. After Iran recovers the production level before the sanction, the country will be ready to discuss OPEC's production quota.
December 4, 2015	Iraq's oil minister	OPEC has the virtual production target according to the production capacity. Iraq will further increase the crude oil production volume in 2016, following this year. After lifting the sanction, Iraq also has the right to increase production volume.
December 7,	TOTAL CEO	Oil supply in 2016 will keep growing more than demand

Statement Date	Speaker	Content of the Statement
2015		and as a result, the supply-demand balance and price recovery will be delayed.

Source: Created from each information publication

[Price forecasts by professional institutions and research institutions (Units are all in \$/bbl)]

(1) Crude oil price forecast by EIA

In the April 2015 issue of the monthly newsletter, it was estimated that if crude oil exports increased by 700,000 b/d after the sanctions against Iran are lifted in the future, Brent price would drop by \$5–\$15/bbl from the benchmark price of \$75/bbl.

Also, in Outlook 2015 which was issued on April 14, 2015, a downward revision was made for the crude oil price forecast over the next ten years from the figure announced in the previous year (they revised the figures as follows: WTI in 2020 was \$94.57/bbl \Rightarrow \$73.00/bbl and WTI in 2025 was \$106.99/bbl \Rightarrow \$85.00/bbl. On the other hand, they revised the figures as follows: Brent in 2020 was \$96.57/bbl \Rightarrow \$79.00/bbl and Brent in 2020 was \$108.99/bbl \Rightarrow \$91.00/bbl).

Throughout the year, WTI price forecasts in 2016 gradually decreased from \$71.00/bbl in January, and in the announcement in December, it was \$50.89/bbl. They repeatedly made downward revisions.

Figure 7. Changes in WTI/Brent Price Forecasts by EIA (Reference Case)

Report		2013	2014	2015	2016	2020	2025	2030	2035	2040
Dec. 2014	WTI	97.91	93.82	62.75						
	Brent	108.64	99.54	68.08						
Jan. 2015	WTI		93.26	54.58	71.00					
	Brent		99.02	57.58	75.00					
Feb. 2015	WTI		93.26	55.02	71.00					
	Brent		99.02	57.56	75.00					
Mar. 2015	WTI		93.26	52.15	70.00					
	Brent		99.00	59.50	75.03					
Apr. 2015	WTI		93.26	52.48	70.00					
	Brent		99.00	59.32	75.03					
Outlook 2015	WTI	98.00				73.00	85.00	99.00	116.00	136.00
	Brent	109.00				79.00	91.00	106.00	122.00	141.00
May 2015	WTI	97.98	93.17	54.32	65.57					
	Brent	108.56	98.89	60.79	70.49					
Jun. 2015	WTI	97.98	93.17	55.35	62.04					

	Brent	108.56	98.89	60.53	67.04					
Jul. 2015	WTI	97.98	93.17	55.51	62.04					
	Brent	108.56	98.89	60.22	67.04					
Aug. 2015	WTI	97.98	93.17	49.62	54.42					
	Brent	108.56	98.89	54.40	59.42					
Sep. 2015	WTI	97.98	93.17	49.23	53.57					
	Brent	108.56	98.89	54.07	58.57					
Oct. 2015	WTI	97.98	93.17	49.53	53.57					
	Brent	108.56	98.89	53.56	58.57					
Nov. 2015	WTI	97.98	93.17	49.88	51.31					
	Brent	108.56	98.89	53.82	56.24					
Dec. 2015	WTI	97.98	93.17	49.08	50.89					
	Brent	108.56	98.89	52.93	55.78					

Source: Created based on each monthly newsletter of Short-Term Energy Outlook and Annual Energy Outlook 2015 by EIA

(2) Crude oil price forecast by the World Bank

World Bank announces the crude oil price forecast on a quarterly basis and with regard to the forecast in 2015, the forecast in October 2015 was lower than the forecast in January 2015 as the current oil price was reflected. The forecast in 2016 was lower than 2015 because they anticipated that a resolution of the oversupply situation would be delayed.

Figure 8. Changes in the Crude Oil Price Forecasts by the World Bank

Report	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Oct. 2014	104.1	101.5	95.7	96.6	97.4	98.3	99.2	100.2	101.3	102.3	103.4	104.5	105.7
Jan. 2015	104	96	53	57									
Apr. 2015	104	96	53	57									
Jul. 2015	104	96	57	61									
Oct. 2015	104.1	96.2	52.5	51.4	54.6	57.9	61.5	65.3	69.3	73.6	78.2	83.1	88.3

Source: Created based on each issue of Commodity Market Outlook by the World Bank

(3) Crude oil price forecast by OPEC

Every year, OPEC announces the average price of the member countries' 12 kinds of representative crude oil (OPEC Basket Price) in the *World Oil Outlook* as the assumed

price for case studies. This is believed to give the consideration that OPEC, as the oil producer's position, is not inducing the price in such a direction. In past results, the average price in 2012 was \$109.45/bbl, the average price in 2013 was \$105.87/bbl, and the average price in 2014 was \$96.29/bbl. This level was slightly higher than the average prices of WTI and Brent. *World Oil Outlook 2015* was finally announced on December 23 of this year. Figure 9 is the one that compared this announcement and the previous year's announcement.

Figure 9. OPEC Basket Price Forecast

	World Oil Outlook 2014		World Oil Outlook 2015	
	Nominal	Real(2013)	Nominal	Real(2014)
2015	110.0	105.7	55.0	
2020	110.0	95.4	80.0	70.7
2025	123.9	96.9		
2030	139.6	98.5	123.0	
2035	157.3	100.0		
2040	177.4	101.6	160.0	95.0

Source: Created based on the first section of the crude oil forecast up to 2040 in the World Oil Outlook 2015 by OPEC

In the *World Oil Outlook 2015*, the average price in 2015, which was the launch pad, was \$55/bbl, and this was half the price of the previous year's forecast of \$110/bbl. The factor in this significant reduction was explained that even though world demand growth in 2014 was up 1.1 million b/d from the previous year, crude oil production growth was up 2.4 million b/d as a result of making up the for the decline in production in Libya by a production increase in North America and Russia, and after that, while production in non-OPEC countries kept increasing, the forecast of the worsening of the global economy along with China and Russia was added. Furthermore, this situation continued in 2015, and the *Outlook* concluded that on the demand side, because of the facts that there were periodic maintenance at refineries, stockpiling of crude oil inventories on a global scale, such as the United States, predominant selling in the crude oil futures market, economic crisis-related matters in Greece and China, and a sense of a greater oversupply due to the lifting of trade sanction after resolving the suspicion of Iran having nuclear weapons, the price steadily dropped.

In the annual *Outlook*, price forecasts in every five years are announced in figures for both nominal and real but in this year's *Outlook*, mainly graphs were presented, and

figures were partially announced. The situation where OPEC struggled in announcing price forecasts in this year's *Outlook* is also observed in this part. As a result, the current crash will recover over the long term and the real price in 2040 will be comparable to last year's forecast.

However, according to OPEC's internal material as a short-term forecast for future prices, even if OPEC took the bold course of production cutbacks, crude oil's oversupply situation would not be resolved and warned of continuing pressure on the crude oil price for the time being.

(4) Crude oil price forecast by IEA

In the *World Energy Outlook 2015* by the IEA regarding the future crude oil price level, they have used the "Current Policy Scenario," which is based on the premise of implementing energy and environmental policies, such as subsidies, for fuel oil that each country has now adopted, the New Policy Scenario, which is based on the premise of implementing highly accurate policies that will be adopted within the next ten years, and the 450 Scenario based on the premise of implementing policies to limit the concentration of greenhouse gases to 450 ppm or lower as conventional scenarios. But this time, in addition to the above-mentioned three scenarios, they set the low oil price scenario to analyze impact this low price will have on the international energy market for a long period of time until 2040 on the basis of the crude oil market's new ordinary state of the crude oil price drop started in the middle of 2014 and the price slump up to the present date.

Figure 10. IEA Imported Crude Oil Price Forecast by Scenario

	Result	Current Policy			New Policy			450 Scenario			Low Oil Price		
	2014	2020	2030	2040	2020	2030	2040	2020	2030	2040	2020	2030	2040
Base Price	97	83	130	150	80	113	128	77	97	95	55	70	85
Nominal Price	97	92	176	246	89	153	210	85	131	156	61	95	140

Source: Created based on the Table 1.6 Fossil-Fuel Import Price by Scenario in World Energy Outlook 2015 by IEA

According to the *Outlook*, in the current policy scenario, the movement to reduce the use of fossil fuel was limited, and the combination of the increase in demand and the increase in supply cost would drive up the crude oil price. In the 450 Scenario on the other hand, as the demand for fossil fuel would be limited, the power to drive up the

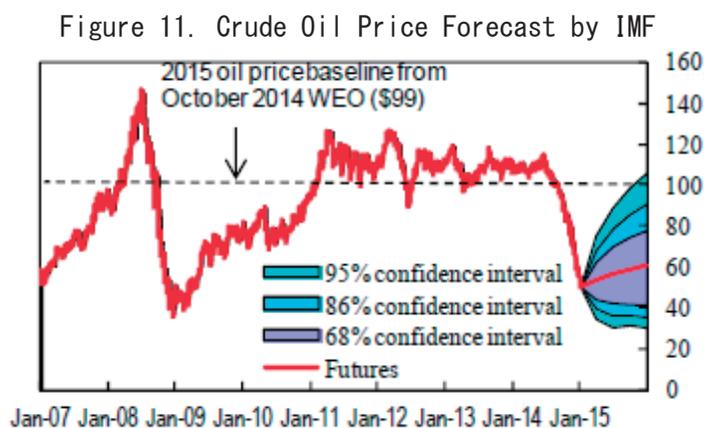
crude oil price would become weaker.

Last, in the low oil price scenario, on the supply side, OPEC would focus on the strategy to secure the market share and development of non-conventional resource developments, such as US shale oil, would be promoted even at a low price; therefore, the low price would continue. But on the demand side, their analysis was that demand expansion would be stimulated and accelerated by the low price. In other words, while the oil demand in 2040 in the new policy scenario, which was the standard, was 103.5 million b/d, the oil demand in the low oil price scenario was 107.2 million b/d, which was particularly noticeable. This seemed to be due to the effect of demand stimulation by the low price and the decrease in incentive for energy saving and alternative energy.

IEA issues the monthly report every month, and in the August 2015 issue, they said, “In spite of the worldwide oil demand expansion (in particular, China, Russia, and Brazil) and slowing of supply growth, the record-setting oil inventories will further increase and if the sanction against Iranian crude oil is lifted, oil inventories will not decrease until the fourth quarter in 2016 and there is a likelihood of delaying of such time and the world wide oversupply situation is expected to continue until the end of 2016” and indicated these matters have become the weight for the crude oil price increase.

(5) Crude oil price forecast by IMF

In the forecast in January 2015, they forecast that the crude oil price in 2015 would be \$57/bbl and return to \$72/bbl toward 2019, but in October 2015, they made downward revisions for the price in 2015 to be \$51.62/bbl and the price in 2016 to be \$50.36/bbl.



Source: IMF, Regional Economic Outlook Update, January 21, 2015

The background to such a forecast is that the element of tight supply and demand is obviously lacking because the intention to accept the current high production level was evident at the OPEC meeting in December 2015. In addition, although the momentum of the US shale oil production increase has shown the sign of weakening, returning of the Iranian crude oil to the market after lifting sanctions is regarded as being certain and Iraq is also showing the stance to increase production; therefore, the oversupply situation is expected to continue. Financial factors, such as the high value of the dollar, and decline of the Shanghai Stock Exchange, etc. have become obstacles for the crude oil price to increase and the view that oil price slump will continue for the time is now the mainstream.

Chapter 2: Effects on the Global Macro Economy

Generally, decline in the crude oil price will cause revenue transfer from oil-producing countries to oil-consuming countries with a high consumption prosperity and will become a factor for economic revitalization as a whole. In oil-consuming countries, a certain degree of the impact on stimulating consumption due to the increase in disposable income by the decline in the crude oil price can be expected. But it is believed that the long-term excessive decline in the crude oil price not only squeezes the economy in oil-producing countries (net exporting countries), such as the Middle Eastern countries, but also leads to decline in earnings by oil and gas upstream sections and associated adverse effects on the whole domestic economy in major oil-consuming and oil-producing countries/economies, such as the United States and China.¹

On January 15, 2015, IMF made a downward revision on the world economic growth rate in 2015-2016 forecast in the *World Economic Outlook (WEO)* announced in October 2014. This downward revision was made after re-evaluating the forecasts for China, Russia, Euro zone, and Japan and because of weakening of economic activities in some of the major crude oil exporting countries/regions due to the sharp decline in the crude oil price. On the other hand, the only major economic state/region that made an upward revision of the economic growth was the United States.² In the following WEO 2015 in April, 2015, although the worldwide economic growth forecast maintained 3.5%, upward adjustments on the forecasts of advanced countries/regions were made but downward adjustments were made for emerging market and developing countries/regions' growth rates by mainly reflecting the weakening of forecasts of some major emerging market countries/regions and crude oil-exporting countries.³ But in the review made in July 2015, while advanced countries/regions gradually took a favorable turn and conversely, emerging market countries and developing countries/regions reduced their speed, they forecasted that it would be 3.3%, which was below the forecast in 2014, and 3.8% in 2016 as growth would be strengthened.⁴ And in the WEO 2015 which was announced on October 6, 2015, while a slight upturn in GDP in some of the OECD countries, such as the United States and the UK, was expected, China and India's GDP growth rates would flounder because of the decrease in exports, and the GDP growth rates in the countries relying on crude oil exports, such as the OPEC member countries, would flounder because of the decrease in the annual government revenue. Furthermore, the Russian economy would have negative growth as against the

¹ IEEJ, The Eye to Look at the Global Energy Situation (198), December 11, 2014

² IMF, updated World Economic Outlook 2014 (October issue), January 15, 2015

³ IMF, World Economic Outlook 2015 (April issue), April 14, 2015

⁴ IMF, updated World Economic Outlook 2015 (April issue), July 9, 2015

growth in the recent years due to Europe and the US embargo, in addition to the low oil price. If an embargo is lifted, Iran will significantly grow in 2016. As a result, they said that this year and next year would go below the previous forecast.⁵

Figure 12. Changes in the Forecasts of the World Economic Growth by IMF

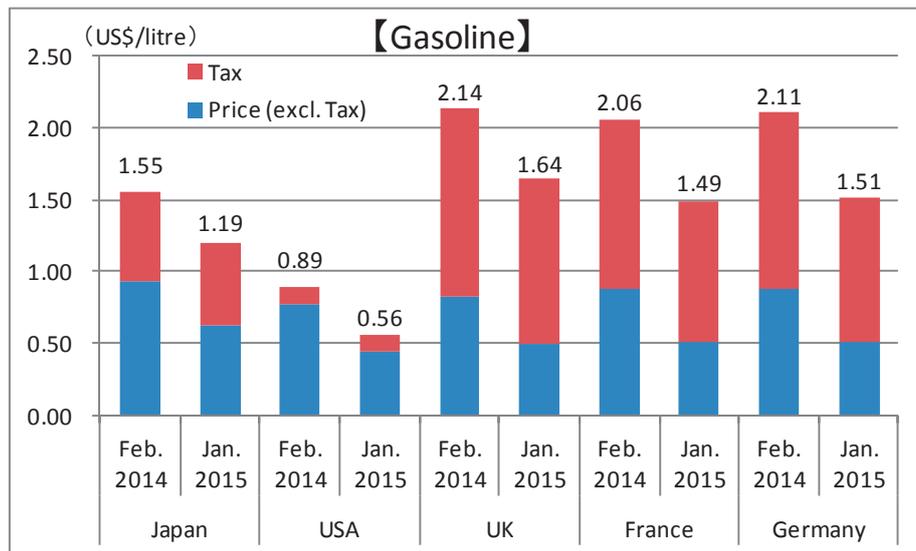
	WEO in October, 2014	Review in January	WEO in April, 2015	Review in July	WEO in October, 2015
2013	3.3%				
2014	3.3%	3.1%			
2015	3.8%	3.5%	3.5%	3.3%	3.1%
2016	4.0%	3.7%	3.8%	3.8%	3.6%

Source: Created based on the WEO 2014/WEO 2015 and outlook announcements by IMF during the fiscal year

2-1. Effects on Advanced Countries

As many of the advanced countries/economies are net crude oil importing countries/economies, the decline in the crude oil price in and after June 2014 had been driving down gasoline and diesel oil prices. Figures 13 and 14 show this.

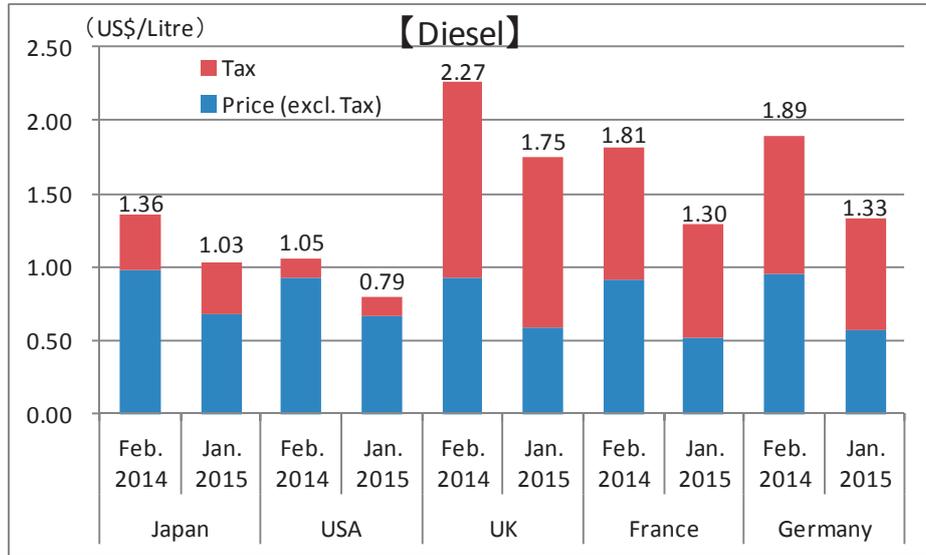
Figure 13. Changes in Gasoline Prices in Major Advanced Countries/Economies



Source: Created based on the March 2014 issue and February 2015 issue of Oil Market Report by IEA

⁵ IMF, World Economic Outlook (October issue), October 6, 2015

Figure 14. Changes in the Diesel Oil Prices in Major Advanced Countries/Economies

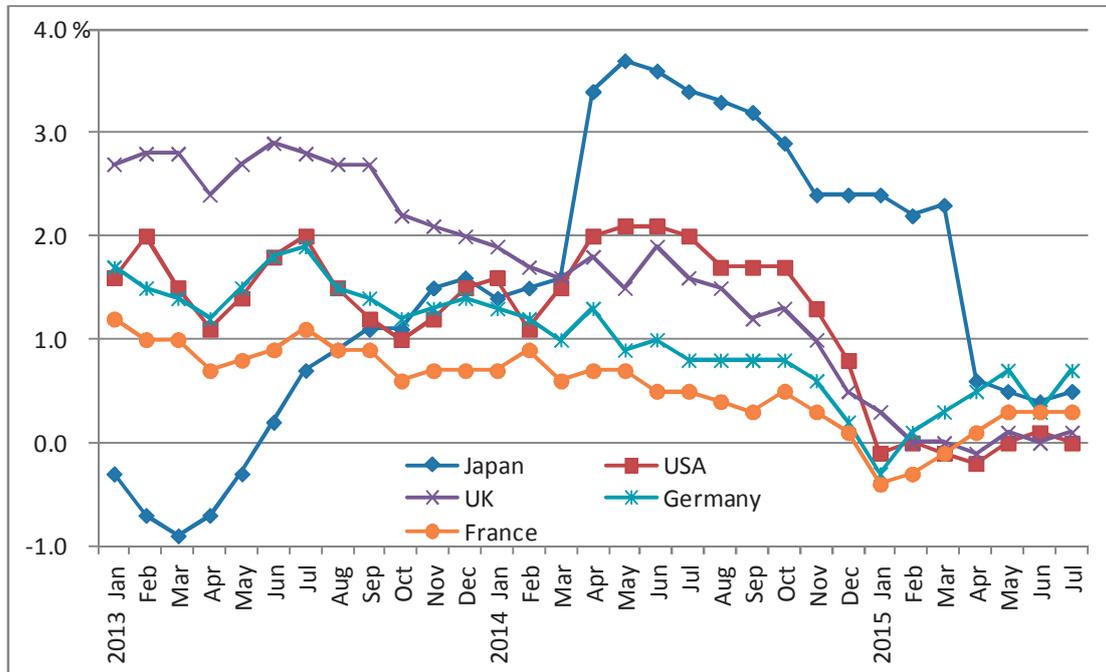


Source: Created based on the March 2014 issue and February 2015 issue of Oil Market Report by IEA

In the United States, the prices have been changing in a way that is similar to fluctuations in the crude oil price but in Japan, the UK, France, and Germany, changes in the oil product prices are smaller than the changes in the United States. This is because in addition to the base prices of gasoline and diesel oil, each country has taxes which are called gasoline tax and diesel oil delivery tax in Japan and differences in those taxes make differences in the range of oil product price drops. Even though there are some differences in the amount of taxes, gasoline in the United States dropped by 37%, 28% in France and Germany, and 23% in Japan and the UK. Likewise, diesel oil in Germany dropped by 30%, 28% in France, 25% in the United States, 24% in Japan, and 23% in the UK.

These fuel expense drops will head in the direction of an improvement in individual household budgets and company earnings. In this regard, Figure 15 shows the change rates of the monthly consumer price index in major advanced countries.

Figure 15. Changes in the Monthly Change Rates of the Consumer Price Index in Major Advanced Countries/Economies



Source: Created based on the base report in FY 2010 “Change Rates of the Consumer Price Index in Major Countries” by the Statistics Bureau, Ministry of Internal Affairs and Communications

According to the change rates of the consumer price index in major advanced countries/economies, each country/economy showed a declining trend from the middle of 2014 to year-end because of the crude oil price drop. Particularly in the United States and each European country, some months were found to have negative growth on a year-to-year basis. However, Japan showed movement different from the movements in Europe and the United States because the consumer price index rose sharply because of the consumption tax increase from April 2014 and the benefit of the crude oil price drop was smaller than Western countries because of the weaker yen from around October 2014.

The financial aspect is also indicated as the effect on advanced countries/economies. Therefore, each of the advanced countries/economies came up with the financial policy to respond to the declining appreciation rate of consumer prices. In the Euro zone, the European Central Bank decided on quantitative easing to prevent the declining appreciation rate of consumer prices from spreading to the downward pressure on the expected inflation rate and labor cost restraint. ECB President Draghi forecast that

commodity prices would gradually increase from the second half of 2015 to 2016 by this financial policy. In the UK, the Governor of the Bank of England sent the inflation report to the Chancellor of the Exchequer in February 2015, forecasting that the appreciation rate of the consumer price index would reach 2%, which was the medium-term target, in about two years, although the appreciation rate might further decline and have negative growth and indicating that if the downturn in the appreciation rate of the consumer price index would drive down the expected inflation rate, the Bank of England would be ready to cut interest rates. In the United States, they have not changed the forecast that it would gradually increase to 2%, which was the medium-term target, by the Federal Reserve Board (FRB) in the Federal Reserve System but the market viewed the normalization of financial policy (increase in interest rates) as a possibility to be implemented.

2-2. Effects on the Oil-Producing Countries/Economies

As described in the beginning of this chapter, when the IMF reviewed the World Economic Outlook for January 15, 2015, they focused attention on the weakened economic activities in part of the major crude oil exporting countries/regions due to the sharp decline in the crude oil price and made a downward revision in the economic outlook. Figure 16 indicates this. Iraq and Algeria reflected the results wherein the upturn in the domestic situation was determined to be greater than the effect of the oil price drop and economic growth outlook in major oil-producing countries became worse across the board because of the effect of the oil price drop.

Figure 16. Review of the Economic Growth Outlook in Major Oil-Producing Countries/Economies

	WEO 10/2014		Review 1/2015		Change	
	2015	2016	2015	2016	2015	2016
Saudi Arabia	4.4%	4.4%	2.8%	2.7%	▲1.6%	▲1.7%
UAE	4.5%	4.4%	3.6%	3.6%	▲0.9%	▲0.8%
Kuwait	1.8%	1.8%	1.7%	1.8%	▲0.1%	▲0.0%
Qatar	7.7%	7.8%	7.1%	6.6%	▲0.6%	▲1.2%
Iran	2.2%	2.2%	0.6%	1.3%	▲1.6%	▲0.9%
Iraq	1.5%	7.6%	2.5%	7.5%	1.0%	▲0.1%
Algeria	4.0%	3.8%	4.1%	4.0%	0.1%	0.2%
Libya	15.0%	18.3%	14.7%	18.2%	▲0.3%	▲0.1%
Nigeria	7.3%	7.2%	4.8%	5.2%	▲2.5%	▲2.0%

Russia	0.5%	1.5%	▲ 3.0%	▲ 1.0%	▲ 3.5%	▲ 2.5%
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Source: Created based on the announcement of WEO 10/2014 and review of WEO 1/2015 by IMF

The factor was the high ratio of the oil/natural gas exports to total exports. In the OPEC Annual Statistical Bulletin 2015 for June 24, 2015, OPEC member countries' total exports and oil/natural gas exports in 2014 were announced. According to the announcement, Iraq, which had the highest ratio of oil/natural gas exports, was 98.8%, followed by Kuwait, Saudi Arabia, Iran, and Qatar, and UAE, which was the lowest, was 28.4%. The reason why UAE's ratio was small was related to the amount of intermediate trade in the Jebel Ali Free Zone in Dubai.

Figure 17. Ratios of Oil/Gas Exports in each of the OPEC Member Countries (2014)

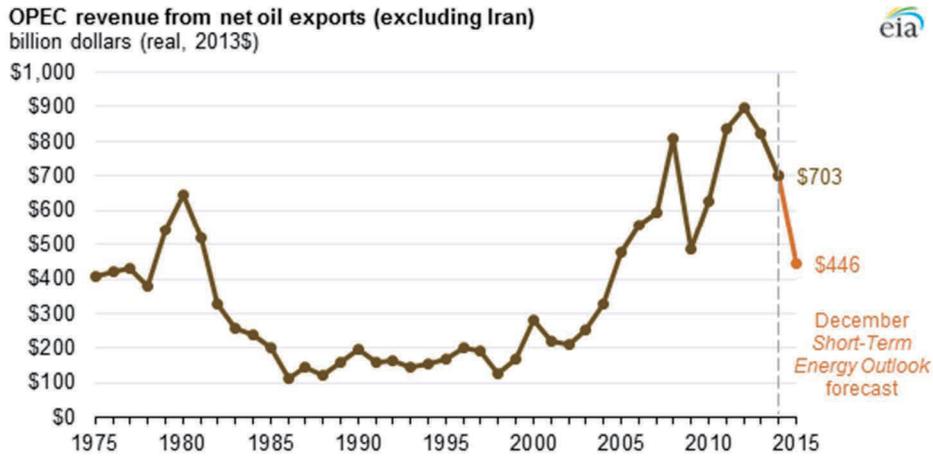
(Unit: million \$)

	Total Exports	Oil/Gas Exports	Ratio
Saudi Arabia	372,829	285,139	76.5%
UAE	380,347	107,853	28.4%
Kuwait	104,165	97,537	93.6%
Qatar	131,716	56,912	43.2%
Iran	98,981	53,652	54.2%
Iraq	85,298	84,303	98.8%

Source: Created based on OPEC Annual Statistical Bulletin 2015

As a result, the expectation is that the crude oil price drop will have a significant impact on the oil-producing countries' economy and national finances. In the Short-Term Energy Outlook for December 17, 2014 by EIA in the United States, changes in and outlook for oil revenues in OPEC oil-producing countries excluding Iran were announced. According to the outlook, oil-producing countries' oil revenues were expected to decline from 821 billion dollars in 2013 to 703 billion dollars in 2014 and 446 billion dollars in 2015 if trial calculations were made by setting the assumption of the benchmark Brent crude oil price set at \$109/bbl in 2013, \$100/bbl in 2014, and \$68/bbl in 2015.

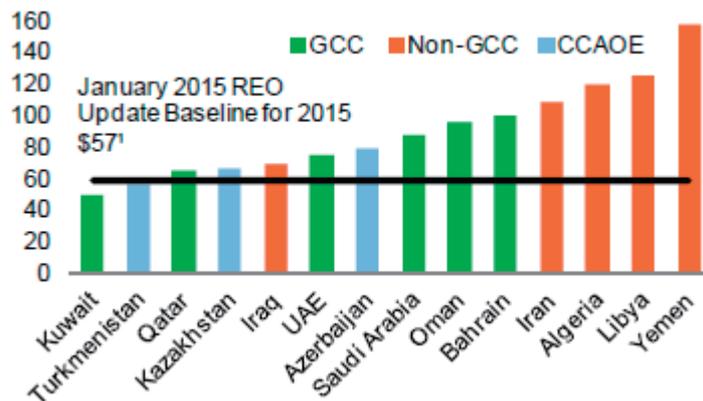
Figure 18. Changes in and Outlook for OPEC Oil-Producing Countries' Oil Revenues Excluding Iran



Source: EIA, Short-Term Energy Outlook, December 17, 2014

The IMF also did trial calculations of the crude oil price levels necessary for balancing each oil-producing country's fiscal revenues and expenditures on January 21, 2015. According to the trial calculations, if the average price of WTI, Brent, and Dubai crude oil in 2015 was \$57/bbl, it resulted in going below the crude oil price that would balance national finances in all of the oil-producing countries excluding Kuwait.

Figure 19 Oil-Producing Countries' Financial Equilibrium Crude Oil Prices (Unit: \$/bbl)



Source: IMF, Regional Economic Outlook Update, January 21, 2015

Figure 20 shows the changes in fiscal revenues and expenditures and the balance of current accounts in each Middle Eastern oil-producing country. Five countries other than Kuwait were all expected to put into budget deficit in 2015 and 2016 and financial

deterioration particularly in Bahrain and Oman was significant. With regard to the balance of current accounts, it was expected that each country would significantly cut down the existing black figures.

To supplement these financial deficits, countries having a large amount of reserve fund or overseas assets are expected to make a response by spending down minimum reserve fund or selling assets.

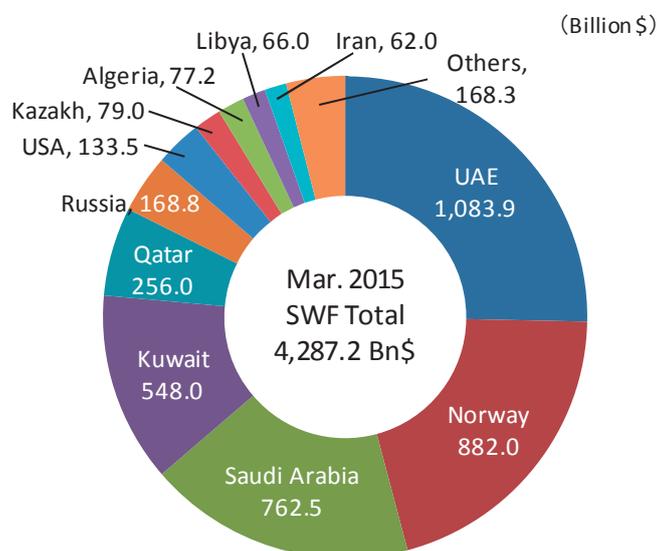
Figure 20. Fiscal Revenue and Expenditure/Balance of Current Account in the Middle Eastern Oil-Producing Countries

	Fiscal Revenue and Expenditure (Proportion of GDP, %)			Balance of Current Account (Proportion of GDP, %)		
	2014	2015	2016	2014	2015	2016
Saudi Arabia	1.1	▲ 10.1	▲ 6.3	14.1	▲ 1.1	2.8
UAE	6.0	▲ 3.7	▲ 0.5	12.2	5.4	7.3
Kuwait	21.9	11.1	10.0	35.3	14.7	18.2
Qatar	9.2	▲ 1.5	▲ 5.3	23.0	1.0	3.6
Oman	▲ 1.4	▲ 16.4	▲ 12.4	2.9	▲ 17.6	▲ 13.6
Bahrain	▲ 5.4	▲ 12.1	▲ 11.7	6.6	0.0	0.5

Source: Created based on the review of WEO 1/2015 by IMF

Figure 21 shows the amount of assets by country in the Sovereign Wealth Fund (SWF) that conducts overseas investment activities using oil revenues as the government funds for investment as of the end of March 2015. Up until now, they steadily increased the government funds with the crude oil price exceeding \$100/bbl and increased the total amount of assets by asset management, but now, changes came out with the situation. According to the oil information magazine *MEES* dated May 8, they reported that based on Saudi Arabian Monetary Agency's (SAMA) report in March, 2015, the country's foreign currency reserves decreased by about 50 billion dollars from 746 billion dollars as of September 2014, which was the highest amount ever, to 698 billion dollars as of the end of March 2015, six months later. Oddly enough, this means that about whopping 7% of their assets decreased in six months since the beginning of sharp crude oil price drop. This decreasing trend is believed to have no change in the directionality for the time being although the speed may slow down. In other words, this means that the SWF that can finance budget deficit will not last forever.

Figure 21. Each Country' s SWF Amount Derived from Oil Revenues



Source: Created based on the SWF Ranking by Sovereign Wealth Fund Institute

For SWF, withdrawing the funds that have been provided as the blood for the global economy will lead to the sluggish global economy and will be likely to decrease energy demand (in particular oil/natural gas demand). Therefore, withdrawal of the SWF funds is “two-edged sword” for the oil-producing countries: while it is a remedial measure for their countries’ economy, it may depress the global economy. From this perspective, they cannot proceed only with spending down of the SWF without limiting budgetary expenditures.

What has been discussed along with the spending down of the SWF is the policy to issue government bonds to make up financial deficit. This is the example of Saudi Arabia and because the country’s liabilities ratio against GDP in 2014 was 2.58% which was the low level in the world and while domestic financial institutions had a large amount of liquid funds, the financial environment that was favorable for the issuance of government bonds in the form that domestic banks would accept them was believed to be in place. The country’s Minister of Economy and Planning also remarked that in order to maintain the budgetary expenditure plan, the combined measure of borrowing and spending down of reserve funds are necessary.⁶ The country had not issued the government bonds with the period of maturity exceeding 12 months over the past 8 years but in July 2015, they issued the government bonds (5-year, 7-year, and 10-year bonds) worth SAR 15 billion (about 4 billion dollars) and SAR 20 billion (about 5.3

⁶ Saudi Press Agency, December 25, 2014

billion dollars) in the next month and announced the plan to issue government bonds once a month until the year end. The country was believed to have the policy to cover up to 40% of the fiscal deficit by government bonds and finance the remained portion by spending down foreign currency reserves.⁷

Among the Middle Eastern oil-producing countries, discussions were noticeable about value-added taxes (VAT) as the topic that emerged during the period when the decrease in budget revenues. This was also discussed at the meeting of vice ministers of economy and finance in the Middle Eastern and Gulf countries, which was held in Qatar in March 2015, and they agreed to create the framework for the introduction of VAT. Six Middle Eastern and Gulf oil-producing countries have been collectively proceeding with the preparations toward the introduction of VAT and there have been two proposals in regard to the tax rate that are 3% and 5% but they have not come to a decision. Under such a situation, UAE was reported to examine the introduction of VAT or consumption tax and corporate tax in August 2015.

Among the Middle Eastern and Gulf oil-producing countries, the movements to examine increasing of various kinds of service fees, not just VAT, as part of budget revenue increase had become noticeable. In January 2015, Kuwait reduced subsidies for heating oil and diesel oil but later, those subsidies were restored as public backlash was strong. Also, subsidies for automobile fuel was totally abolished in the UAE on August 1, 2015, the fuel price became the retail price linked to the international market price, and the price was decided to be reviewed monthly by the committee. Abu Dhabi in UAE increased electricity and water charges on January 1, 2015. Kuwait has decided to implement the impact study in regard to the subsidy problem on the automobile fuel that ended in smoke before implementing it again. On August 17, the IMF requested Saudi Arabia to review energy subsidies, control wages in the public sector, expand non-oil revenues, and introduce the value-added tax (VAT) and land tax, but the Saudi Arabian government responded that they do not have a plan to review the subsidies.

With regard to the elimination/abolition of subsidies that the Middle Eastern and Gulf countries have been either examining or implementing as the measure to control budgetary expenditures, if you look down upon the story so far, with the spreading of the “Arab Spring” in the Middle Eastern and African countries from 2010 to 2012, there was a period when the government in each country was eager to nip people’s

⁷ JIME Center, JIME News Report, August 14, 2015

anti-governmental consciousness in the bud by expanding subsidies and increasing public servants' salaries. But in recent years, the reduction of subsidies for utilities and fuel expenses has slowly begun. At this time, although the effects on the actual life of the people are minor, if movements toward the reduction of the subsidy coverage and abolition of subsidies will accelerate, the following scenario will be considered: social unrest will increase, which will lead to the occurrence of demonstrations, and the people will be easily affected by the Islamic State, and finally, antigovernment activities including terrorism will occur.

In the military actions by the Islamic State, there was an aspect of taking control of oil fields and oil refineries and using oil revenues as funds for their activities, and the government in each country may need to make decisions as they may have to compare the amount squeezed out by reducing subsidies and the cost to take measures against terrorism, which may occur with public backlash as a starting point.

However, development of policies that will not increase the public financial burden even with the reduction in subsidies may progress, instead of just being worried about the negative aspect that social unrest will increase because of the reduction in subsidies. For example, the Saudi Arabian deputy oil minister Prince Abdulaziz bin Salman said on April 8, 2015, "How energy saving can be achieved without changing fuel prices is important." According to this idea, there will be some expectation that a virtuous cycle would be created where even if subsidies were reduced or abolished, there would be no change in the public financial burden, and energy saving would progress in order to control the increase in energy prices. If financial resources for crude oil and oil product exports can be secured by reducing subsidies and promoting energy saving, the country's national income could be secured and social security in many ways would be promoted.

2-3. Effects on Asian Countries

The crude oil price drop is believed to have a positive economic effect on not only the advanced countries, but also the Asian countries. In other words, if Asian countries are net crude oil importing countries, as is the case with advanced countries, the crude oil price drop will reduce the trade deficit and head in the direction to improve individual household incomes and corporate earnings. In India and Thailand, which rely on the imported crude oil, the advantage is considered greater. Malaysia is a net crude oil exporting country/economy, but net export value is less than 1% of GDP; therefore, an adverse effect on exports due to the crude oil price drop is believed to be limited.

However, China is a net crude oil importing country/economy, and according to the World Bank's trial calculation in 2015, if the crude oil price decreases by 10%, China's GDP will be pushed up by 0.1% to 0.2%, but on the other hand, there are said to be some factors that will weaken the benefits of the low crude oil price. One is that the energy-intensive industries (non-ferrous metal, iron and steel, and non-metallic mineral products: cement and glass) have excessive production capacity, and it is difficult to generate new equipment investments. Another one is about personal spending; the introduction of the restrictions on purchasing automobiles aimed at reducing environmental pollution and traffic congestion mainly in large cities and the sluggish growth of the housing-related consumption due to the decrease in productive-age population and high inventory levels in provincial cities. These weakened expense items, which account for 40% of personal spending, have become matters of concern. Furthermore, sharp falls at Shanghai market, which occurred twice in July, have also become the matter of concern for the growth of personal spending.

Furthermore, in the case of China, devaluations of the RMB have been conducted in a systematic manner in August, but there is also a matter of concern about exports. The crude oil price drop is good material in terms of the global economy as a whole and is a boost to China's exports. But in the case of China, the degree of dependence on the countries and regions having adverse effects due to the price drop, such as oil-producing countries, is high. In the result in 2013, although the percentage of exports to oil-producing and resource-rich countries does not exceed 30% like India, United States, and EU but it still accounts for nearly 20%, and above all, the percentages of exports to Russia, Brazil, UAE, and Mexico are high. Therefore, if the crude oil price drop worsens the economy in oil-producing/resource-rich countries/economies, a certain amount of downward pressure is likely on exports from China to mainly Russia and the UAE, which import many final consumption goods.

The crude oil price drop has affected fuel subsidies, which have become a structural problem for national finances in many Asian countries/economies. Previously, if the crude oil price soared, the government in each country/economy controlled the domestic fuel retail prices to be lower than the international markets with fuel subsidies in consideration of the impact on people's living. But such a system caused rigid fiscal administration. Some movements are observed that following the crude oil price drop, each country/economy reduces the fuel subsidies and proceeds with restoring of fiscal health.

Figure 22. Movements of Reducing Fuel Subsidies in Asian Countries/Economies (August, 2014 - March, 2015)

Country Name	Upper Row: Amount of Subsidy in 2013 Lower Row: Ratio against GDP	Response of Subsidies for Fuel
Indonesia	\$116.6/Person 3.3%	<ul style="list-style-type: none"> ▪ Started the supply restriction of subsidized fuel on August 1, 2014 but Pertamina suspended the supply restriction in several weeks ▪ In October, the new President Joko Widodo prioritized the reduction of subsidies and establishment of an agency as an alternative to SKK Migas ▪ In November increased the prices of gasoline and diesel oil subject to subsidies ▪ Gasoline subsidies were abolished in January, 2015. The price was linked to the market ▪ In February, reduced the fuel subsidies to 1/4 in the supplementary budget in 2015 ▪ In March, introduced the new base price for biofuel
Malaysia	\$177.8/Person 1.7%	<ul style="list-style-type: none"> ▪ In October, 2014, increased the automobile fuel price to reduce the deficit ▪ In October, abolished the RON95 subsidy which was targeted to wealthy population ▪ In December, fuel subsidies were totally abolished and the new system was introduced
Thailand	\$54.2/Person 0.9%	<ul style="list-style-type: none"> ▪ In September, 2014, approved the price increase for automobile LPG and NGV for the Thai military government and reflected the current market price ▪ In December, abolished subsidies for LPG for household use and transportation

Source: Created based on IEA, JETRO, and various kinds of news reports

Chapter 3: Effects on the Oil Market

The crude oil price drop not only directly hit the economy of the Middle Eastern oil-producing countries which were based on the monoculture economy of oil but also brought about new and significant changes to the global oil market. Figure 23 compares the account settlements in the April-June quarter in 2015 and the results in the same period last year in the United States and European oil companies that are the core of the oil market. According to this, each company dramatically decreased revenues in the upstream sector (oil development sector) and as a result, they decreased revenues even as the total revenues. The reason why BP's total revenue was negative was believed to be that the reserves against the indemnity of the oil pollution accident in the Gulf of Mexico were allocated. On the other hand, you can see that each company increased revenues in the downstream sector (refining/sales sector).

Figure 23. European and American Major international oil Companies' Account Settlements in the April-June Quarter in 2015

	Profit (\$mn)			Upstream (\$mn)			Downstream (\$mn)		
	2Q/2015	2Q/2014	%	2Q/2015	2Q/2014	%	2Q/2015	2Q/2014	%
ExxonMobil	4,190	8,780	-52	2,078	6,688	-69	2,752	1,552	77
Chevron	571	5,665	-90	-2,219	5,264	na	2,956	721	299
Shell	3,361	5,147	-35	774	3,820	-80	2,746	1,271	116
Total	2,797	3,024	-8	1,051	3,022	-65	1,992	675	72
BP	-6,266	3,182	na	228	4,049	-94	1,628	933	74
ENI (€mn)	-159	663	na	571	1,151	-50	79	-204	na
Repsol (€mn)	209	515	-59	-48	145	na	439	162	171

Source: Created based on Petroleum Argus on July 31, 2015 and August 7, 2015

3-1. The U. S. A.

There are specialized manufacturers in the upstream and downstream sectors in the United States, and they indicated the tendency that is similar to that of gigantic oil companies (Majors). Figures 24 and 25 are the overview of the account settlements of the US companies specialized in refining and Figure 26 is the oil development company's account settlement. While the refining sector generated revenue by 50% or more on a year-to-year basis, revenues in the oil development sector decreased by half. Decreased revenues in the oil development sector were almost correlated to the oil price drop, and the recovery of the processing advantages due to the reduced raw material

procurement costs and reduced private fuel costs were cited as the reason for the increased revenues in the refining sector. In the United States, positive effects of the oil price drop were produced in the automobile, electricity, chemical goods, and transportation industries, which are energy-intensive industries, in addition to the refining industry.

On the other hand, the oil development company that had a worse balance sheet tries to respond to the situation by requesting that contractors to whom materials are supplied reduce costs by 20% to 30% and reduce development investments. It is also projected that the number of companies selling assets by the piece or moving toward the business merger with other companies will increase. In contrast, some of the major oil companies called the Majors are believed to be waiting for small- and medium-sized oil development companies to dump their prime assets and some are seeing that cases of M&A's in which the Majors with the immense amount of total assets are involved will proceed in the future. Following such movements, Schlumberger, which is the world's largest in the oil service industry, acquired Cameron in the United States for 14.8 billion dollars on August 26.

Figure 24. Overview of Philips 66' s Account Settlements in the January–March/April–June Periods in 2015

	2015 (\$mn)			2014 (\$mn)		Rate of Increase
	1Q	2Q	1Q+2Q	2Q	1Q+2Q	%
Midstream	67	48	115	108	296	-61
Chemicals	203	295	498	324	640	-22
Refining	495	604	1,099	390	696	58
Marketing and Specialties	194	182	376	162	299	26
Corporate and Others	-125	-127	-252	-121	-202	-25
Total	834	1,002	1,836	863	1,729	6

Source: Created based on Philips 66's website

Figure 25. Overview of Marathon Petroleum' s Account Settlements in the January–March/April–June Periods in 2015

	2015 (\$mn)			2014 (\$mn)		Rate of Increase
	1Q	2Q	1Q+2Q	2Q	1Q+2Q	%
Refining & Marketing	1,316	1,206	2,522	1,260	1,622	55
Speedway	168	127	295	94	152	94

Pipeline Transportation	67	79	146	81	153	-5
Items not allocated	-81	-77	-158	-66	-197	20
Total	1,470	1,335	2,805	1,369	1,730	62

Source: Created based on Marathon Petroleum's website

Figure 26. Overview of Apache Corporation's Account Settlements in the January–March/April–June Periods in 2015

	2015 (\$mn)			2014 (\$mn)		Rate of Increase
	1Q	2Q	1Q+2Q	2Q	1Q+2Q	%
Oil & Gas production revenues	1,630	1,977	3,607	3,289	6,677	-46
Oil revenues	1,280	1,599	2,879	2,797	5,442	-47
Gas revenues	300	295	595	505	1,065	-44
NGL revenues	58	58	116	169	355	-67
Others	-8	25	17	-182	-185	na
Cost & Expenses	9,154	7,669	16,823	2,378	4,486	375
Income before income taxes	-7,524	-5,692	-13,216	911	2,191	na

Source: Created based on Apache Corporation's website

US shale oil is said to have higher production costs than conventional Middle Eastern crude oil. Therefore, there was a view that the decision made at the OPEC meeting in November 2014 (leaving the production target of 30 million b/d unchanged) had the intention of accepting an oil price drop aimed at cutting into the cost of shale oil under the pretext of maintaining OPEC's market share and reducing shale oil production. In reality, the speed of the production increase slowed down but the gradual production increase has been continuing. What is cited as the reason is the existence of already drilled oil wells. In the general oil field development, the processes of exploration, exploratory drilling, development, and production are the fixed flow (those without having a large temporary difference between the processes) but in the development of shale oil, there is a temporary gap between the development process and production process. This means that as the shale oil production period is relatively short (the productive live is short), there are many wells that have completed the processes up to the development process are standing by. The processes that require significant development funds for shale oil production here are exploration, exploratory drilling, and development, and the operation cost required for doing the finish on production by the final hydraulic crushing is insignificant. There are many wells in the United States

that have completed the processes up to the development process and been standing by and oil development companies are said to be ready to produce shale oil for about 1 million b/d with very little costs at any time. As if to support this, in the IEA report in August, they indicated that there are some companies among the US light oil producers who can continue production, if it is for a short period of time, according to the oil price.

Another factor that the shale oil production does not drastically decrease is the financial factor of price hedging and low-interest credit. Price hedging is for example the right to sell at around \$80–\$90/bbl in the distant future that was secured when the crude oil price exceeded \$100/bbl long time ago. With this, even if the current market price becomes \$50/bbl, the right to sell at around \$80–\$90/bbl can be exercised; therefore, shale oil can be produced and sold free from the oil price drop. Low-interest credit is the way of promoting the business in the form of using low-interest fund and running the money that is greater than the fund in the hand which is so-called taking advantage of leverage and as it is necessary to secure the fund to pay the debt, it will become difficult to move toward production cutback even if it is cutting into cost. In addition, in a leasing contract in a mining area, a condition where a penalty will be imposed by the landowner if not continuing the production may be added which leads to the situation of being forced to continue the production even under the sluggish oil price.

But the standby wells of which the number of locations is believed to be 3,000 as of the beginning of 2015 and the number of financial products, such as price hedging, etc. are not infinite and if they run out of them, the shale oil production will be impacted.

3-2. Europe

In the North Sea, oil fields that have been the center of crude oil production in Europe have become a high-cost structure as a result of a number of development and investment plans being decided during the high oil price period from 2011 to the first half of 2014. This was because in the North Sea oil fields, which had entered maturity, the center of production was about to enter the stage called *enhanced oil recovery* in mining areas and the stage where they had to be engaged in the mining areas that had been challenging in terms of technical and environmental perspectives. As a result, high-cost developments and investments progressed, which were supported by the high oil price, and the total investment amount from 2013 to 2014 reached a record high. Currently, the break-even point for 70% or more of the projects planned in the European

region including the North Sea and Continental Shelf/Mediterranean region for which the Final Investment Decisions (FID) should be made is said to be \$60/bbl or higher. In particular, in the North Sea oil fields in the UK, the percentage of the projects of which the break-even point is \$60/bbl or higher is said to be nearly 80%. On the other hand, in the North Sea oil fields in Norway, the percentage of the projects of which the break-even point is \$60/bbl or lower is conversely said to be nearly 80%.

Figure 27 is the summary of part of the situations of not only the development projects by the European oil companies but also delays/postponement of the development schedules and the postponement of the FIDs around the world. Other than the cases below, there are also cases where acceleration of the closing time has been considered like Draugen oil field that is in production in Norway by Shell.

Figure 27. Current Status of the Major Investment Projects that had been scheduled in 2014–2015

Company Name	Project Name	Status	Investment Amount
BP	Mad Dog II (US Gulf)	FID deferred	\$14 bn
BP	Liberty (US, Alaska)	FID deferred	Na
Chevron	Rosebank (UK, North Sea)	FID deferred	\$10 bn
Chevron	Wafra (Neutral Zone)	FID deferred	Na
Chevron	Kitmat LNG (Canada)	FID deferred	\$28 bn
Chevron	IDD Phase 2 (Indonesia)	FID deferred	\$12 bn
Shell	Bonga Southwest (Nigeria)	FID deferred to 2016	\$12 bn
Shell/Inpex	Abadi LNG (Indonesia)	Rephased	Na
Shell	Arrow LNG (Australia)	Cancelled	Na
Shell/Total	Libra (Brazil)	FID deferred to 2016	\$80 bn
Statoil	John Castberg (Norway)	FID deferred to 2017	\$13.5 bn
Statoil	Snorre 2040 (Norway)	FID deferred	\$5.7 bn
Suncor	Corner (Canada)	FID deferred	Na
Total	Zinia 2 (Angola)	FID deferred	Na
Total	Khan-Asparuh (Bulgaria)	FID deferred to 2016	\$0.38 bn

Source: Created based on Petroleum Intelligence Weekly dated May 18, 2015 and each company's website

For these delays/postponement of the development schedules and the postponement of the FIDs, the UK government and Norwegian government became concerned about the upstream developments being stagnant and in the UK, the measure to ease the current taxation system in which burden on the companies are large has been proposed.

The proposal for the budget in 2015 made in December 2014 was said to be the reduction of supplementary tax, extension of the ring fence expenditure supplement from six years to ten years, and tax deduction targeted to super high-pressure and high-temperature gas fields.

On the other hand in Norway, Norwegian Oil & Gas Association and Norwegian Petroleum Directorate (NPD) expressed the opinion that if the low price would be extended for a long period of time, there would be concerns that investment decisions on the projects in which developments are planned would be inhibited although economic efficiency of the mining areas that are currently in production would be maintained even if the oil price was \$45–\$50/bbl. In the trial calculation by the NPD in January 2015, the investment amount in Norwegian continental shelf in 2015 would be about 19 billion dollars, down 15% and they indicated that the decrease in the investment amount would lead to the decrease in oil production in the future. Statoil cut down the amount of capital investment in April 2015 from the initial 20 billion dollars to 18 billion dollars in January of that year (furthermore, they came up with the reduction plan with the amount of 500 million dollars in July) but in contrast, NPD insisted on continuing the development of Trestakk mining area off the coast of the country as planned (recoverable reserves of 50 million bbl, scheduled to start in 2018) under the Norwegian Petroleum Act. So, in order to prevent a decrease in the oil production volume, the Norwegian government started accepting exploration operators in the Arctic Ocean located southeast of the Barents Sea in January, 2015 which was the first time since 1994 and in April, 2015, they expressed their intention to provide government support for the development costs for the Johan Castberg mining area development.

Figure 28 shows the reduction status of the European major oil companies' investment amounts and operating costs announced by the middle of 2015. To secure cash flow and improve financial affairs associated with the crude oil price drop, each company has taken measures to reduce expenditures.

In the future, it is believed that the strength and asset/project portfolios owned by each company will make the difference between winning and losing, selection and concentration of the core assets and disposition of non-core assets will progress, and M&A activities, such as the transfer of assets, integration of companies as is the case with the US oil market will increase. In terms of crude oil supply, although the effects on the immediate production volume, such as 2-3 is believed to be small in the future, because of the delays/postponement of the development schedules and the

postponement of the FIDs, it is believed that the production volume after that is likely to grow at a sluggish pace.

Figure 28. European Oil Companies' Cost Reduction Status

Company Name	Cost Reduction Status
Statoil (Norway)	<ul style="list-style-type: none"> ▪ 2015 capex cut from \$20 bn of original to \$175 bn ▪ 1,900 layoffs in 2014
BP (The UK)	<ul style="list-style-type: none"> ▪ 2015 capex cut from \$24-26 bn of original to less than \$19-20 bn, and keep this level till 2017 ▪ Controllable cash costs down 12% in first-half 2015 ▪ Accelerating restructuring program; related charges up 50%, to \$1 bn ▪ About 300 layoffs related North Sea Development in 2015 ▪ Asset sale in 2015:\$10 bn, in 2016:\$3-5 bn ▪ \$6 bn cost cut for development and production in 2017 from 2014 level
Shell (The UK and Netherlands)	<ul style="list-style-type: none"> ▪ 2015 capex cut again, from less than \$33 bn to \$30 bn ▪ 2016 capex post-BG acquisition cut from \$40 bn to \$35 bn ▪ Over 6,500 layoffs ▪ 2015 opex should fall \$4 bn, more reduction in 2016
Tullow (The UK)	<ul style="list-style-type: none"> ▪ 2015 exploration cost down 80% to \$200 mn ▪ Concentrate capex ongoing project mainly in West Africa
Total (France)	<ul style="list-style-type: none"> ▪ 2015 capex to come at low end of \$23-24 bn range ▪ After 2017 capex could fall to below \$20 bn ▪ \$300 mn net reduction in upstream costs in Q2 ▪ Ahead of schedule for full-year 2015 target of \$800 mn ▪ Upstream costs down 20% in first-half 2015
Lundin (Sweden)	<ul style="list-style-type: none"> ▪ 2015 capex cut 31% excluding ongoing project -Exploration : 27% cut -Development : 30% cut -Evaluation : 48% cut

Source: Created based on Petroleum Intelligence Weekly dated August 10, 2015 and each company's news reports

3-3. Russia

Russia had expanded resource and energy exports, mainly crude oil and natural gas, since 1993. As a result, the percentage of the total amount of crude oil, oil products, and natural gas exports in the total amount of exports had expanded from about 46% in 1992 to about 65% in 2013. However in recent years, Europe and the United States implemented economic sanctions on Russia (the first sanction: March, 2014, the second sanction: July, 2014, and the third sanction: September, 2014) due to the worsened

relations and intensified conflicts with Europe and the United States in regard to the conflict with Ukraine and integration of the Crimea into Russia and particularly in the third sanction, licensing of technology to the very deep sea, Arctic Ocean, and shale oil projects was prohibited by EU. If this becomes prolonged, the effects on the crude oil and natural gas production in the medium- to long-term will be unavoidable. This was coupled with the oil price drop since last year and Russia's natural resource-dependent economy has been significantly impacted.

Under such environments, Russia's budget for 2015 was approved on December 3, 2014, but with regard to the crude oil price, which forms the basis of exports, the single-year nominal oil price at \$100/bbl and the base oil price for budget expenditures at \$96/bbl were factored into the budget. This base oil price for budget expenditures is the oil price that becomes the benchmark for expenditures of the budget and refers to the average oil price in the past five years. After that, Russia's Ministry of Finance announced the outlook for oil prices at \$50/bbl and the natural gas export price at \$222/1000 m³ on February 5, 2015, but a review of the budget has not been made.

Russia also devalued ruble from 1 dollar = about 30 ruble to about 60 ruble in the second half of 2014 and on November 10 of that year, the country/economy shifted to the floating exchange rate system. In the meantime, the Central Bank of the Russian Federation took the fiscal action to support buying the ruble and gold/foreign currency reserves significantly decreased. The balance, which was 510 billion dollars at the beginning of 2014, was reported to be 386 billion dollars at the beginning of 2015.

In contrast to the financial situation, the oil/natural resources industries in Russia lack a sense of crisis, and no prominent act to downsize the projects in 2015 has been observed. The background factor is that the production cost is cheap and the break-even point is low, so they are resistant to the low oil price. However, massive investments and investments on the mineral deposits from which recovery is difficult have been postponed and in the medium-term, a decline in production (decrease by 15% in 2020) is expected.

Figure 29. Conditions of the Energy Companies in Russia

Company Name	Condition
Rosneft	• The production cost is a little over \$4/bbl which is the lowest level in the

	<p>world, so no production cutback will be made even if the oil price is low</p> <ul style="list-style-type: none"> ▪ Production is continued for the repayment obligation of \$20 billion in 2015 ▪ Continue exploration with the assumption of well digging in 2015-2017 in the EPNZ-2 mining area in the Kara Sea. ▪ Yurbcheno-Tokhomo oil field development in East Siberia requires a large amount of investment and has been postponed ▪ Development of the shale mineral deposits in the Bazhenov layer from which recovery is difficult has been terminated
Lukoil	<ul style="list-style-type: none"> ▪ The break-even oil price is \$25/bbl ▪ While the oil price decreased, the effect was minimal because of the depreciation of the ruble and taxation system revision ▪ In the production in 2015, efficient oil fields are prioritized (Western Siberia < the Caspian) ▪ The shale oil project with Total will be discontinued at \$60/bbl
Gazpromneft	<ul style="list-style-type: none"> ▪ Even if the oil price is \$40–\$50/bbl, domestic projects can be operated ▪ The investment amount in 2015 increased by 3.7% (No review of the large-scale oil field development) ▪ Production and refining volumes in 2015 increased on a year-to-year basis
Surgutneftgaz	<ul style="list-style-type: none"> ▪ The internal reserve is \$35 billion and there is no problem in terms of funds ▪ The oil production volume has been in upward momentum as the volume increased by 7% in Sakha Republic, etc.
Tatneft	<ul style="list-style-type: none"> ▪ Increased the investment amount in 2015 by 40% and the production volume in that year is the same as that of previous year

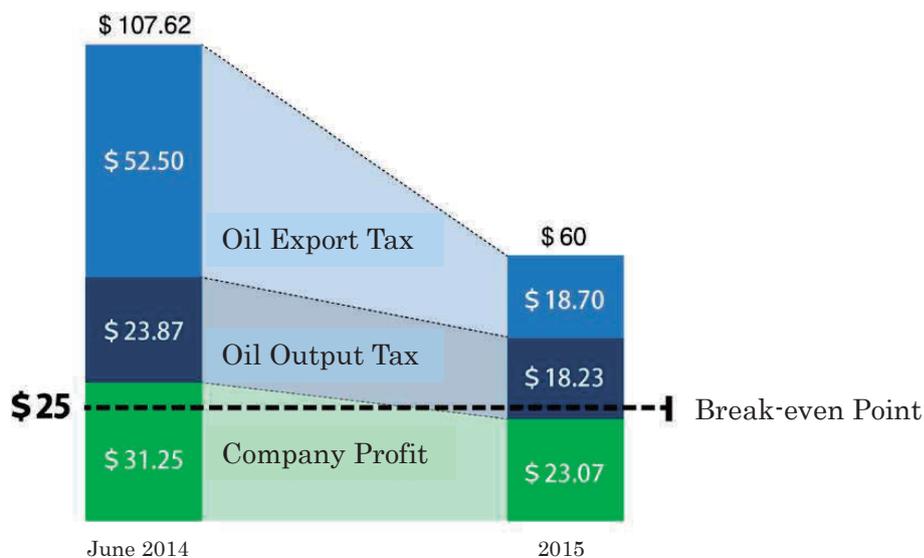
Source: Excerpt from the Effects of the Oil Price Drop on Oil Production in Russia by JOGMEC (January 19, 2015)

In the taxation system reform by the Russian government, while the export tax was decided to be lowered in a step-by-step manner in January 2015, the output tax increased in a step-by-step manner, and if the oil price decreased by 44% from \$107.62/bbl (the price of Urals crude oil in June, 2013) to \$60/bbl (the assumed price of the same crude oil in 2015), the companies' portion would decrease by 26%, the state tax revenue would decrease by 52% in 2015, and easing of the oil companies' revenue decrease would then become one of the factors for being able to continue production

even at the low oil price.

Figure 30. Conceptual Diagram of the Oil Taxation System Revision and Change in Tax Imposition in Russia

Oil Export Tax	Amount of tax = (Urals crude oil price - \$25/bbl) x 59% + \$4/bbl The past 59% will be reduced to 42% in 2015, 36% in 2016, and 30% in 2017
Oil Output Tax	Amount of tax = (Urals crude oil price - \$15/bbl) x Oil reserve depletion coefficient x 493 ruble/ton x The exchange rate against the dollar x 1/261 The past 493 will increase to 775 in 2015, 856 in 2016, and 918 in 2017 *The depletion coefficient will be 0.3 if the degree of depletion is greater than 1.0 and 1.0 if the degree of depletion is less than 0.8 *Converted at 1 ton = 7.33 bbl *Regarding the currency exchanges, figures were converted at \$1 = 30 ruble in 2014 and 60 ruble in 2015



Source: JOGMEC, the Effects of the Oil Price Drop on Oil Production in Russia (January 19, 2015)

The Russian government has started planning the budget for the next fiscal year since the end of August 2015 and the price level they will set as the single-year nominal unit price as the basis of the budget has been drawing attention.

3-4. Oil-Producing Countries in the Middle East

The fact that in the economy of oil-producing countries, a certain portion of the budget revenue depends more or less on the proceeds from oil/natural gas exports was described in 2-2. In this section, the impact of the crude oil price drop this time on the

oil industry in the Middle Eastern oil-producing countries will be discussed. To that end, these movements will be comprehensively discussed because the state-owned oil companies are the ones that assume the role in the oil industry in the Middle Eastern oil-producing countries, and the government or oil-related organizations have impacts on such state-owned oil companies' activities.

(1) Saudi Arabia

In Saudi Arabia, King Abdullah passed away in the early hours of January 23, 2015, and Crown Prince Salman ascended the throne as the seventh king of the country. New King Salman inaugurated his new cabinet on January 19 and Mr. Naimi stayed in the office of Minister of Petroleum. At this time, Prince Abdulaziz Bin Salman was promoted to Vice Minister from Deputy Chief.

At the same time, a number of committees and councils were dissolved and newly integrated into the Council of Political and Safety Affairs (Chairman: Minister of Defense Mohammad bin Salman) and Council of Economic and Development Affairs (Chairman: Minister of Interior Mohammad Bin Nayef). On the same day, King Salman abolished the Supreme Council for Petroleum & Minerals (SCPM), which had been the highest decision-making body, and newly established the Council for Economic and Development and appointed the Minister of Defense Mohammad Bin Salman as the chairperson. This council is positioned as the decision-making body pertaining to the narrowly defined economic developments and a wide range of economic policy issues.

In April 2015, the Supreme Council of Saudi Aramco, which consisted of ten members with the Minister of Defense Mohammad Bin Salman as the chairperson, was established in Saudi Aramco, the state-owned oil company in the country. As a result, oil policies that had been formulated by the company under the Ministry of Petroleum and Mineral Resources are now formulated and decided by the Supreme Council of Saudi Aramco. On behalf of SCPM, which was abolished, the Council for Economic and Development assumed the role of the final decision-making body. In conjunction with this, Mr. Naimi stayed in the office of the Minister of Petroleum but resigned as the Chairman of Saudi Aramco and the fact that the influence of new King Salman's family became stronger was particularly notable.

Changes produced in the process of deciding oil policies in Saudi Arabia could be said to be not only because of the timing that the new King of the country ascended the throne but also to strengthen the pathway to strongly reflect the opinions of the King's family because the situation of the sluggish oil price significantly impacted Saudi

Arabia's budget revenue. So far, under the new organization and Saudi Aramco's new structure in Saudi Arabia, no significant change in the policies as compared to the prior ones has seen. In other words, the intention of shifting from price-oriented to share-oriented, focusing on Asia as the export destination, and from a crude oil exporter to an oil product supplier has not changed. However in the future, because organizations were simplified, the response to the changes in the internal situation has become faster, and the king family's intentions have become easier to convey, a significant change in steering can be also conceivable.

Currently, the country's oil policies have been announced by the Minister of Petroleum Naimi that it is important to recover OPEC's market share and to that end, the crude oil production capacity will be maintained as well as the capacity must be enhanced in the future. Saudi Aramco raised the level of the confirmed crude oil recoverable reserves and in April 2015, they announced that the confirmed crude oil recoverable reserves reached 267 billion bbl from 260 bbl and natural gas reached 300 trillion cft from 288 trillion cft. In the country, foreign capitalization in the oil upstream sector is not allowed, except for the oil field developments in neutral zones. Therefore, oil field development funds have to be squeezed by the country, and to reduce the production costs, they had negotiations over extended contracts with drilling rig companies and reduced the contract prices. In conjunction with this, they stated that they need to achieve a reduction in energy consumption by 20% by 2030 (crude oil equivalent to 1.5 million b/d) based on the "Energy Efficiency Plan" set in 2012 and have been making efforts on securing the capacity to export.

In Saudi Arabia, Governor Fahad Al-Mubarak of SAMA requested the reform of subsidies for energy and water in February 2015. In April, 2015, The King Abdullah Petroleum Studies and Research Center, which is a non-profit independent think tank in the country, made a proposal to raise the fuel prices of ethane and diesel oil for domestic industries, which had been fixed at cheap prices, in a step-by-step manner and significantly raise the ratios of nuclear and renewable energy in power generation in order to maintain the current crude oil export volume. Deputy Minister of Water and Electricity Saleh Al-Awaji stated that eventually, raising domestic water and electricity charges should be considered to restrain the rapid consumption growth in the country. However, there is no sign of any policy responses, such as reducing subsidies for energy.

(2) Kuwait

While the disharmony between the government and national assembly continues in Kuwait, the country's financial administration can maintain the balance even with the relatively low oil price; therefore, there is no impression that they are cornered into a real situation. In such a situation, part of the subsidies for diesel oil and heating oil was abolished in January 1, 2015, but because of great opposition from the Kuwait National Assembly, the Ministry of Oil and Ministry of Commerce and Industry announced that there would be no price increase in gasoline, water, and electricity. After that, the flow of the energy subsidy reform is progressing because the UAE decided to abolish subsidies, but the Minister of Finance remarked on September 1 that he would wait for the verification result of the effects of the abolition of subsidies before making final decisions and took a forward-looking stance on the abolition of subsidies in the future.

The Kuwaiti government announced on January 11, 2015, that they were scheduled to invest 155 billion dollars in 523 important projects over the next five years, in spite of the low crude oil price. Behind this schedule is that the country has a large-scale Sovereign Wealth Fund (SWF) and funds, so the effects of the low crude oil price on the projects are small.

The country has a plan to increase crude oil and natural gas production volumes by about 40% from the current volumes to 4 million b/d. First, the state-owned Kuwait Oil Company (KOC) announced on March 9 that they would conclude Enhanced Technical Service Agreements (ETSAs) with BP, Shell, Total, and Chevron within 2015 in which they would invest 4 billion dollars over the next five years, excluding the neutral zones. Because the prior and existing agreement was Technical Service Agreement (TSA), which was based on the worker dispatch agreement, there was a disadvantage that they failed to achieve a result. So in the improved version in this time, it is the agreement on the wage per hour based on the achievement-oriented system.

Subsequently, after the exploration activities over the past two years, crude oil was discovered to the north of the Al-Manageesh oil field located in the west of the country and the Rawdhatain and Umm Neqa oil fields located in the north of the country on April 19. It is expected that the production in these oil fields will contribute to the future crude oil production increase. In conjunction with the production increase plan over the next five years including the above, they placed an order for pipeline design, material procurement, and construction with a British company for 780 million dollars in July 2015. The pipeline is expected to be completed by the end of 2017.

Furthermore, in the same month, the derailed plan of Kuwait National Petroleum Company's (KNPC) Al Zour refinery construction project with the refining capacity of 615,000 b/d that had been held up for years due to opposition by the royal family and national assembly started off. With regard to the total amount of investment, 2.6 billion dollars of additional investment was decided at the company's board meeting in June and the total amount of investment is 15 billion dollars.

Other than the above, the amount of investment directly for the oil field development is not disclosed but the country has been steadily proceeding with the crude oil production increase plan without being impacted by the sluggish oil price.

(3) UAE

The UAE is divided into two: Abu Dhabi, which is directly impacted by the sluggish oil price, and Dubai, which is indirectly impacted by the sluggish oil price. Because Abu Dhabi's original source of budget is based on oil revenues, but Dubai's budget hardly has any relation with oil revenues. The percentage of oil/natural gas exports to total exports is low as it is 28.4% and associated with the fact that the percentage of Dubai's exports through intermediate trade is large. Therefore, the effects of the oil industry in Abu Dhabi will be mainly discussed in this section.

Abu Dhabi increased electricity and water charges on January 1, 2015. Furthermore, they decided to adopt the international market price for the domestic retail price of fuel oil, such as gasoline, etc. to be sold domestically and abolished subsidies on August 1. Abolition of subsidies for fuel oil impacted the entire UAE as the sale to other emirates in UAE has been done by Abu Dhabi National Oil Company (ADNOC). It is unknown how much the budgetary expenditures could be reduced with reduction or abolition of subsidies but it was in no doubt that the amount would be substantial.

The crude oil development method in Abu Dhabi is the oil concession contract. For this reason, when major international oil companies acquire an interest in oil field development, they must pay the signing bonus. In 2015, Total, INPEX from Japan, and GS Energy from Republic of Korea made an entry into the interests in Abu Dhabi Onshore Concession (commonly known as ADCO Concession). Three companies acquired 18% of the interests of which the total amount was said to be over 4 billion dollars. It was said that ADNOC had a plan to grant 40% of the interests. The reason behind the situation where there was no progress for one or more years but suddenly in 2015 the interests were granted was that oil revenues decreased because of the sluggish

oil price, and they needed financial resources to continue investing in oil development.

With regard to the enhancement of the crude oil production capacity in Abu Dhabi, there was a plan to achieve 3.5 million b/d by 2017 but because of delayed grant of the ADCO Concession, which was one of the major oil field concessions, achievement by 2017 may be under threat. But at the moment, a reduction of investments for ADCO Concession, ADMA-OPCO Concession, and ZADCO Concession due to the sluggish oil price has not been made.

While Abu Dhabi has had the effect of a reduction in their oil revenues due to the sluggish oil price, the Emirates, such as Dubai, which have little oil, revenues decreased their energy spending in contrast to Abu Dhabi. By decreasing budgetary expenditures due to the decreased natural gas price, Dubai has been promoting investments in renewable energy using its financial resources.

(4) Iraq

Iraq has the Kurdish and Islamic State issues in addition to the sluggish oil price, and internal affairs in Iraq are more complicated and serious compared to other Middle Eastern oil-producing countries.

In the agreement on budget allocations from Iraq concluded with the Kurds at the end of 2014, the Iraqi government was supposed to send a remittance of the amount equivalent to 17% of the national budget to the Kurds in exchange for payment that the Kurds produce 250,000 b/d of crude oil for sale to Iraq and payment for transferring 300,000 b/d of Iraqi crude oil produced in northern Iraq to Ceyhan in Turkey using the Kurdish crude oil pipeline. Originally, Iraq transferred oil to Ceyhan in Turkey using the country's own pipeline but because of the attacks by the Islamic State, the oil field in northern Iraq, the refinery, and pipeline were damaged, which made it impossible to use. Despite the massive amount of funding needed for restoring these facilities, Iraq found it impossible to use in northern Iraq because of the sluggish oil price, and the country had a severe cash-flow problem.

For this reason, there were delays, and the outstanding balance accrued for the remittance to the Kurds in 2015 who took strong measures to sell crude oil under the name of the country and directly receive payments. Some of it was put into action around June 2015 but Iraq has stuck to the attitude of not accepting Kurds directly.

The pressure on reducing budgetary expenditures due to the rigors of financing has been placed on major international oil companies. Iraq has been officially upholding the

realization of a production capacity of 9 million b/d as of 2020 but in early February, the Iraqi government requested that the major international oil companies, which acquired mining areas in the first and second bidding held in 2009, to postpone or cancel the crude oil development operations that were scheduled for 2015 and to postpone/reduce the development costs and compensations specified in the agreements. As a result, it was reported in May that BP agreed to reduce the development budget in 2015 for the Rumaila oil field in the south from 35 billion dollars to 25 billion dollars. Later in June, Minister of Oil Abd-al Mahdi said that if the current production pace can be maintained, the production volume as of 2020 will be around 6 million b/d. The Iraqi government issued government bonds with the total amount of 12 billion dollars in March and payments for the service agreements with the major international oil companies, such as BP, Shell, ExxonMobil, Eni, and Lukoil, were reported to be completed at the end of August.

The country is placed under such conditions but subsidies for domestic fuel have been continued in the country.

(5) Iran

As the trade embargoes against Iran had been implemented by Europe and the United States because of the development of nuclear weapons before the oil price drop started in the middle of 2014, the country's national finances had been in a difficult phase over recent years. As a result, there were plans that required 100 billion dollars or more of investments toward 2018, such as the projects for oil fields development located close to the border with Iraq, South Pars gas field development located at the border with Qatar, and Persian Gulf Star refinery construction, but not every project progressed as planned. For this reason, the Iranian parliament approved in February, 2015 to withdraw 4.8 billion dollars from the national development fund in the fiscal 2015 and use it for the developments of oil/gas mining areas adjacent to Iraq, Qatar, etc. which needed to be started early.

As the domestic policy, the country planned to reduce subsidies for gasoline and diesel oil from May 26, 2015 and realize the reduction of subsidy obligation amount by 32 billion dollars annually.

In the talks on nuclear issues on July 14, 2015, Iran reached a final agreement on "Comprehensive Collective Action Plan" and the first step to lift economic sanctions by the European and the US side had begun. Based on this agreement, Iran started to request OPEC to cut production, have dialogue with the major international oil

companies and oil consumers, have preparations for bidding in the oil/natural gas development mining areas to be held at the end of the year, and review the contract conditions in hopes of securing the volume of sales/expanding the share after sanctions are lifted.

In the dialogue with the major international oil companies, the country restored the cooperative relationship with Total in France in the upstream development field at the end of July, had talks with Shell in August, and had interviews with an engineering company Foster Wheeler and Weir.

In the bidding explanatory meeting in December, North Pars, Golshan, and Ferdousi gas fields are said to be unveiled.

Floating storage with at least 19 large tankers by the state-owned tanker company in the county (NITC) had been conducted but NITC started to secure large tankers in March which was prior to the final agreement on the “Comprehensive Collective Action Plan” and loaded 40 million barrels of crude oil to large tankers secured in June with the assumption of the resolution of the nuclear weapon development problem to be ready to export at any time. According to Platt’s tanker tracking system cFlow, it became apparent that after being tied up in Kharg Island for 216 days, Staria (capable of loading 2.1 million bbl) owned by NITC unanchored and headed to Singapore on July 17.

As just described, in OPEC oil-producing countries, such as Saudi Arabia, restoring OPEC’s market share is important and to that end, they have to not only maintain the crude oil production capacity, but also enhance the capacity in the future. But with the current low oil price, willingness to invest is low, and management will be required in the situation of low budget revenue.

3-5. Future outlook (Price level and supply-demand balance)

After the OPEC meeting in November 2014, the Middle Eastern oil-producing countries, such as Saudi Arabia, have not consistently agreed to independently carry the burden of supporting the crude oil price by cutting supply but stated that non-member countries need to share the burden. In conjunction with this, they also stated that they are ready to negotiate with all other producing countries and show anew their stance of being ready to negotiate with other crude oil-producing countries toward the achievement of appropriate and reasonable prices.

However, at the Council of the Ministers of Petroleum for the Arab States in the Gulf held in Doha, Qatar, at the beginning of September, Saudi Arabia showed their intention to oppose the holding of an emergency oil-producing country leaders' meeting including OPEC/non-OPEC countries/economies proposed by Venezuela because of the concern that if specific measures could not be taken, it would lead to a further decline in the crude oil price.

Because of such a situation, it was widely thought that the talks among OPEC/non-OPEC countries/economies would not progress and as the opinion as of the beginning of September, the person concerned in an OPEC member country forecast that the crude oil price would remain at \$40–\$50/bbl within the year and would reach the \$60/bbl level, assuming that the Chinese economy recovers.

With regard to the crude oil demand, while there is an expectation that demand will increase because of the oil price drop, the increase in demand has peaked because of the economic downturn in China. On the other hand, with regard to supply, the production volume of shale oil, which is considered to have high production costs, would decrease because of the oil price drop. In fact, with the fading of development motivation, the number of drilling rigs operated in the United States has drastically decreased by 59% compared with the peak period. But the crude oil production volume has decreased by only 5%. As one of the reasons, improvement of productivity due to technological innovation has been indicated. According to the report released by the US EIA on September 14, each shale oil-producing company has been able to drill more oil wells in a shorter time than ever before, and rig productivity in August improved in all shale oil producing areas.⁸ For this reason, the decrease in the shale oil production volume has become smaller than the initial forecast. Nevertheless, according to IEA and OPEC's monthly reports in September, a downward revision was made to the non-OPEC countries' production increase and dependence on OPEC was about to increase to that extent.

But on the supply-demand balance, an oversupply has been continuing. Crude oil reserves in each country, such as OECD have reached the peak and as there is a forecast that it will take until the end of 2016 for the oversupply situation to be resolved by the future demand increase, it is considered that the sluggish oil price condition will continue on a long-term basis.

⁸ EIA, Short-Term Energy Outlook, September 14, 2015

Chapter 4: Effects on the Natural Gas Market

4-1. Characteristics of the Natural Gas Market

Natural gas is an important fossil fuel along with oil and coal. But because it is a gaseous body, the drawback is that the transportation cost is high; therefore, there is a tendency that the price is set at a level that can maintain price competitiveness with competing fuels. As natural gas is also generally transported through pipelines, the region of distribution has been limited; therefore, there is no international natural gas market, and if divided by consumption area, the markets are formed in three regions of North America, Europe, and Asia.

Because of the restrictions on the transportation method, a different pricing structure with respect to each regional market has been applied to natural gas.

(1) In the North American market, the pipeline network in which production areas and consuming areas are spread in a finely meshed pattern has been highly developed. At the hub locations, arbitrage transactions for price, quantity, date, and destinations of natural gas sent from each place have been conducted, and a high level of liquidity in the market has been secured. Henry Hub is considered representative, and this has become an index of the natural gas futures prices traded at New York Mercantile Exchange.

(2) In the Asian market, Japan and Republic of Korea are major areas of demand but as the natural gas output from both countries/economies is not sufficient, these countries/economies are forced to transport liquefied LNG by sea from Southeast Asia and the Middle East. Because expensive facilities for transportation are required, the long-term sale and purchase contract to make it a stable dealing has been mainly used. Hence, there is no liquid market like the one in North America and the natural gas price is linked to the crude oil price under negotiations of the long-term sale and purchase contracts.

(3) In the European market, the markets have been formed by diversified supply sources, such as the intraregional production along with supply through the pipelines connected from Russia, Algeria, and Norway to Europe and transportation of LNG by sea from the Middle East. Because the improvement of pipeline network had been delayed, formation of the competitive unified market was in the stage of development, and the markets were conventionally rigid: the price was linked to the North Sea Brent crude oil price on the basis of the long-term contracts like the Asian market but because of the liberalization of markets in and after the 1990s, intraregional transactions had become active and now, short-term transactions increased and formation of the price at the transaction hubs, such as NPB in the UK is about to be mainly used.

4-2. Effects on price

Figure 31 shows the North American Henry Hub price, the German border price of Russian natural gas in Europe, the French border price of Algerian LNG in Europe, the average LNG border price in Japan, and the average Japan Crude Cocktail (JCC).

First, according to the changes in the natural gas and LNG prices, the Henry Hub price has been cheaper than Europe and Japan since 2006. This was because the shale oil production in the United States contributed to the increase in natural gas supply and the supply-demand balance in the North American market was eased. This condition subsequently continued as the North American market that was the market segregated from other markets.

Second, if you look down upon the relationship with the crude oil price, you can see that the natural gas prices excluding Henry Hub gently changed with a slight time lag in association with the wild fluctuations of the crude oil price. This was because the element of the crude oil price was included in the natural gas price. Particularly in the trading of LNG, suppliers and destinations are required to have expensive facilities; therefore, a certain level of relative merits with the competing energy price (i.e. the crude oil price) was said to be necessary. In other words, this was to use the coefficient that had less degree of linkage with crude oil for the element of the crude oil price included in the LNG price formula when the crude oil price extremely and sharply increased or decreased. As a result, LNG followed the crude oil price and gently changed and this was a phenomenon called “S-Shaped Curve.”⁹ The sign clearly appeared in the changes in the price from the second half of 2007 to the first half of 2009.

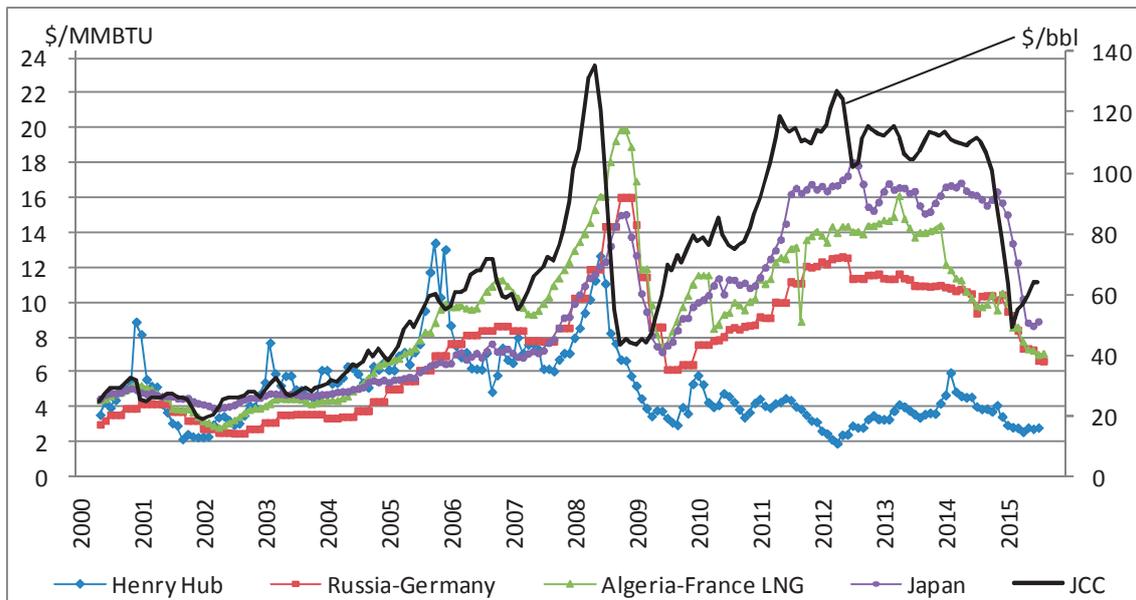
At the time of the crude oil price drop in and after June 2014, the natural gas prices excluding Henry Hub had the tendency similar to the past. Although the drop was not as significant as crude oil (dropped by 56%), the LNG border price in Japan dropped by 46% from \$16.2/MMBTU to \$8.7/MMBTU and the French border price of Algerian LNG dropped by 35% from \$10.7/MMBTU to \$7.0/MMBTU.

Assuming that the “S-Shaped Curve” phenomenon will be recreated in the future, if Japan Crude Cocktail will stay at around \$55/bbl, the LNG border price in Japan will

⁹ There are said to be many price formulas that are linked to the crude oil price at a certain percentage but if the degree of linkage remains constant, the LNG price would sharply drop which would impact on the sellers' revenues at the time of the extreme sluggish crude oil price or it would impact on the buyers' revenues at the time of the extreme crude oil price hike; therefore, either case would endanger the presence of the LNG projects which have large initial investments and is difficult to resale. Therefore, it is often the case that if it goes below or over the specific crude oil price specified in the individual LNG contract, the coefficient which has lower degree of linkage with crude oil (gentle inclination) than the generally applied one will be used. As a result, the LNG price curve will draw the S-shaped curve.

stay at around \$8/MMBTU (around \$50/bbl). And the prices of natural gas to Europe will stay at around \$6/MMBTU.

Figure 31. Comparison of the Changes in the Natural Gas Prices (left axis) and the Crude Oil Price (right axis)



Source: Created based on Trade Statistics of Japan and the US Energy Information Administration (EIA), and Energy Intelligence

4-3. Effects on Supply and Demand Sides

As just described in the previous section, the natural gas prices are said to be mostly impacted by the fluctuations of the crude oil price rather than being decided by its supply and demand. But in the background, there must be conditions that there is active demand for natural gas, there are ample natural gas resources, and its production and development are conducted on a continuous basis. So, in the Medium-Term Gas Market Report 2015 released by IEA in June 2015, a comprehensive analysis was made on the future supply and demand.

(1) Demand

First, the worldwide natural gas demand was forecasted to increase at an annual average rate of 2% toward 2020 although the rate was inferior to the annual average rate of 2.3% over the past 10 years. If you look at the demand by region,

- In the OECD countries, while steady growth of renewable energy continues, gas demand in the power generation sector will have limited room for the increase in gas

demand due to the pressure on thermal power generation and existence of nuclear power generation.

- In the non-OECD Asian countries, the very high import price from 2013 to 2014 had prevented the amount of natural gas consumption particularly in the electric power field from growing. And some Asian countries placed priority on the coal-fired power generation over the gas-fired power generation in the development of power sources. The current sharp drop in the oil/gas prices was expected to become a factor to change such situations but the demand sensitivity for the price drop is uncertain. In the short term, by positioning gas as the one to compensate for deficiency rather than by positioning gas as the fuel competing with coal, it is likely that gas imported at the reasonable price will lead to high consumption. But in order for gas to be positioned as the enduring fuel including the environmental policy in the energy mix in many of the developing countries in Asia in the medium term, it must prove that gas will be practically supplied at a low price.
- Gas demand in China drastically slowed down from the average annual rate of 14% over the past five years to the one-digit growth in 2014. Development of “Economic Structural Reform” and “Curb on Energy Consumption” that have been promoted in China has become the intense adverse wind for natural gas. But today’s low price increased the attractiveness of gas in addition to the environmental perspective. In comparison with coal, gas’ competitiveness still stays low but the price difference between these two has been significantly reduced. As the superiority in the environmental aspect when gas is used significantly contributes to the overall cost balance, the gas demand will gradually accelerate again from the low growth in 2014 and increase at the average annual rate of 10% in the next ten years.

(2) Supply

Gas that is directly and indirectly related to oil has no immunity to resist the significant magnitude of fluctuation like the oil industry. The low crude oil price obviously loses the willingness to invest in the upstream. Oil and gas companies have been trying to become adjusted to the new market environment by cutting capital investments, etc. Budgets in 2015 have already been squeezed, and while signs of a crude oil price recovery have not been shown, larger reductions are believed to continue in the future. While going through a number of strict screening procedures, companies have been trying to concentrate their large investments in the core assets. In the narrowed down cash flow, project that are more costly and have low recovery rates have been cancelled. As a result, the growth of gas production has slowed down worldwide.

Because of its capital-intensive character, the LNG industry has been facing uphill battle. The projects that are currently under construction have been on track as planned and in accordance with the prior investments that have already occurred. But subsequent new LNG plant construction has become difficult to carry into effect because the current LNG price cannot simply recover the construction costs. As a result, some projects have already been forced to be abandoned or postponed and if the LNG price does not recover, a number of projects will not see the light. The Final Investment Decisions (FID) that will be made in the next 24 months will be the initial investments in the next ten years, which will determine the amount of increase in the available LNG supplies. If the current low price continues, supply will start to become tight in the LNG market by 2020.

But at least in the next two years, the LNG market will have to deal with the new supply trend. The amount of increase in the LNG export capacity in the world by 2020 is equivalent to 40% of the facilities operated at this moment and is half of the amount of increase in 2016 and 2017. In the short term, as the operation cost is just a little compared with the construction cost of the entire plant, responsiveness of LNG supply to the price is said to be low. As long as it is the price that the operation costs can be recovered, operators will recover the cost of initial investments as much as they can; therefore, they will operate the LNG plant at full capacity. In that sense, excessive supply must be the one that absorbs the factors on the demand side that drive up the price. The LNG spot price in Asia had decreased by half since 2014 and the LNG price linked to crude oil has started to drop. The price-responsiveness of the gas demand under the new environment is about to being challenged.

Amid the price drop and budget cut, the US gas industry has been exerting the astounding (unmatched) power in absorbing the impact. The gas production volume in the United States in last year certainly increased and the upward trend has been continuing in 2015. Although companies' cash flow has been decreasing, producers have been made responses by squeezing profits in the downstream sector. The service costs have already significantly decreased and in order to further reduce the costs, they need to reduce the effects of the cheap crude oil price in their drilling projects. The entirely dynamic and flexible character of the US gas supply chain is designed to efficiently cope with the changes in the market environment. It has been proved that the increase in the production in the core regions having a gas structure with a large amount of gas reserves has resistance to the cheap crude oil price. Specifically, the forecast of production in Appalachian Basin remains as bright. Although the rig-operating rate in the region decreased in the beginning of 2015, this was believed to respond to a sharp

drop in the gas price in the excessive supply situation, rather than because of the low crude oil price.

With these results, the cheap crude oil price will lead to the gentle growth of gas production in the next five years.

(3) Logistics

Because of the geopolitical background, the European gas market has been facing an abstruse problem. The year 2014 was a time of heightened tensions between Russia, which is the largest exporter to Europe, and Ukraine, which is the most important intermediate country. This confrontation has affected the relationships in trade, money, and banking, and energy in the region. Urgency of enhancing safety assurance in energy supply in Europe has been heightened but public awareness of gas supply and the trust of policy makers have become worsened.

The Energy Alliance Framework Strategy launched by European Commission in the beginning of 2016 can be said to sufficiently cope with these new developments. Certainly moving ahead with the diversification of gas suppliers and connection of more robust infrastructure have been indicated as the two pillars in the future gas strategy in Europe. This report has the section that focused on and analyzed the progress of strengthening the gas infrastructure in Europe and remaining bottlenecks. One important conclusion was that securing of the major pipeline with two-way flow to utilize the existing LNG, tank facilities, and domestic production capacity in Europe at low costs at the time when the largest possible supply crisis occurs has not been made.

Similarly, a strategic shift in the major gas export policy has been made in Russia. Russia reflects the policy to diversify export destinations in Asia and put efforts to try to fix the gas export contract with China. Recently, Russia said that in the medium term, China will become the largest export market in advance of Germany and Turkey.

At the same time, the sudden cancellation of the construction of South Stream and the new proposal of the Turkish Stream can be said to be the great transformation of Gazprom's strategy for Europe. Gazprom dropped the idea to construct pipeline that goes through domains in Europe, leaving their will to go around Ukraine in the option of constructing a new route that goes through Turkey. For Gazprom, there was a new role created for the proposed Turkey Stream. In order to make a response in place of the infrastructure that is gone, Russian natural gas will be delivered to European buyers through the gas supply hub, which will be newly constructed at the border of Turkey and Greece. Currently, Gazprom has suggested that gas transportation via Ukraine will be suspended by December 2019. Gazprom's position has recently become more delicate

and while they have to respond to any type of change in shipping Russian gas in terms of the contractual obligation, they have indicated the recent facts will be new challenges in the relationship between Europe and major gas suppliers.

In contradiction to such a background, the degree of dependence on imported gas in Europe will keep increasing. The low price and strict self-imposed regulation in the production in the Netherlands will result in accelerating the decline of domestic production that is sooner than the expected result in the previous Medium-Term Gas Market Report. It is predicted that gas production in OECD Europe will be 25% lower than the level in 2010 by 2020. If the decreasing trend of production is added, demand will gently recover. Very gentle normalization of the irregular fluctuation in and after 2014 had played an important role in the improvement but the fact that the power generation industry had to use more gas to make up the shutdown of the coal-fired power plant became a driving force to increase gas demand. As a result, the export requirement in Europe is believed to increase by 1/3 between 2014 and 2020. As there is a large amount of LNG in the early stage of the projected period, which will be supplied at a low price, the increase in the required export amount in Europe will be at least welcomed as the LNG export destination that had been suffering as it had nowhere to go. This report predicted that LNG import amount in Europe will be nearly doubled during the period between 2014 and 2020. But even in this situation, Russian gas was not incorporated as the meaningful one.

Delivery of Russian gas to Europe has turned around after the collapse induced by the irregular fluctuations in 2014 and is expected to be fixed in the range of 150-160 bcm in the medium term.

On the other hand, the increase in demand in South America, Africa, and the Middle East will have a limitation because of the available supplies.

In all of these regions, the growth of production goes below the potential demand and in particular, if accessing to imported gas is regulated, supply deficiency will remain as a chronic problem. The upstream policy that has not been improved and combination of cheap crude oil/gas prices will put pressure on the production growth. In Africa, after seven years of unstable production that followed the declining trend, gas production is predicted to recover. Although production will grow, the tension between the promised export amount and response to domestic demand has not been solved. As a result, credibility on the export from Africa still bears a risk and it is unable to make any prediction on the consumption growth. In South America, the production growth has been mainly led by the countries other than Brazil and Argentina and it will

significantly decelerate compared with the results in recent years. In order to support the relatively gentle consumption growth, South America as a whole will be forced to depend on imports.

4-4. Future forecast (Demand, production, and LNG transportation)

Figures 32 to 34 are the ones announced in IEA Medium-Term Gas Market Report 2015. It was forecasted that import and export of LNG will increase by 45% along with the demand forecast from 2014 to 2020 and export destinations will be diversified.

Figure 32. Natural Gas Demand Forecast

Region/Country		2000	2010	2014	2016	2018	2020 (bcm)	CAAGR 14/20
OECD	Europe	473	567	458	489	493	500	1.5%
	America	794	850	945	968	991	1,006	1.0%
	Asia Oceania	132	198	237	242	243	245	0.6%
Non-OECD	Africa	57	106	123	131	139	147	3.0%
	Asia(excl. China)	153	289	298	315	335	355	2.9%
	China	28	110	178	219	270	314	10.0%
	FSU/Europe	597	680	674	668	673	679	0.1%
	Latin America	96	152	168	169	177	186	1.7%
	Middle East	176	368	414	435	464	493	3.0%
Total		2,505	3,320	3,495	3,635	3,785	3,926	2.0%

Source: IEA, Medium-Term Gas Market Report 2015

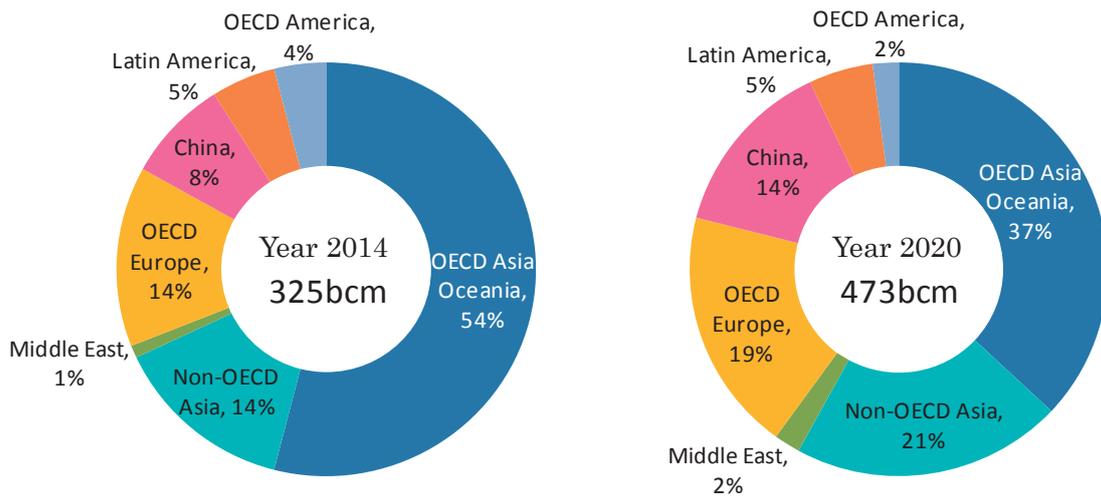
Figure 33. Natural Gas Production Forecast

Region/Country		2000	2010	2014	2016	2018	2020 (bcm)	CAAGR 14/20
OECD	Europe	302	301	254	246	238	227	-1.9%
	America	758	815	937	966	1,011	1,057	2.0%
	Asia Oceania	42	61	82	126	159	167	12.6%
Non-OECD	Africa	126	209	203	209	216	225	1.7%
	Asia(excl. China)	223	334	324	330	339	345	1.0%
	China	27	95	124	141	156	171	5.5%
	FSU/Europe	724	840	869	874	889	930	1.1%
	Latin America	105	161	178	180	183	185	0.7%

Middle East	198	462	546	566	593	621	2.2%
Total	2,505	3,279	3,517	3,638	3,785	3,927	1.9%

Source: IEA, Medium-Term Gas Market Report 2015

Figure 34. LNG Import Forecast by Region (2014/2020)



Source: IEA, Medium-Term Gas Market Report 2015

Chapter 5: Effects on Other Fields

5-1. Coal

According to the breakdown of the coal consumption volume in the world by use, 60% or more was for power generation in 2013 and the remaining portion was for making coke used for iron and steel production, the industries, such as papermaking, pulp, and ceramics, and others that almost equally accounted for 1/3 respectively. In this section, coal for power generation, which is the core, will be discussed.

(1) Characteristics of the coal market

The coal prices reflect supply and demand conditions in the market but the coal abundance and differences in quality that varies widely cause the price gap. In other words, if it is fuel coal which will be for power generation, the higher the calorific value, the higher the price (FOB price) at the shipping port and if it is coking coal which will be for producing iron and steel, the higher the coking property and the lower the volatility, the higher the FOB price. In addition to these differences in quality, the transportation cost will be added as is the case with oil and LNG and the final import price (CIF) will be set. Therefore, even if the import price is cheap, it may be because of the difference in the transportation cost or difference in quality.

When determining the coal price, the annual contract price determined by the talks between the coal exporting companies/economies in Australia which used to be the world's largest coal exporting country and steel companies and electric power companies in Japan became the benchmark price and by adding the actual difference in quality, the coal price had been determined until in the mid-1990s. But after that, with the progress of deregulation of electric power companies in Japan, competitive bidding for fuel coal began to be held and as a result, the percentage of the benchmark price for fuel coal decreased and in and after the fiscal 1998, unique contract prices were completely set between the coal exporting companies and electric power companies. Furthermore, in and after the fiscal 2003, the FOB price of fuel coal for electric power companies in Japan (on the basis of a long-term contract) was referred as the reference price.

On the other hand, apart from the price based on the long-term contract, there is a spot price for fuel coal which fluctuates based on the supply and demand conditions at the moment and both suppliers and purchasers started to have the consciousness of avoiding the risk from the fluctuations of the spot price from around 2000. They made contracts with the contract start month in July, October, and January, instead of having the contract start date in April and incorporated not only the term-fixed price but also the price linked to the market. Although the basis of the contract is the multi-year

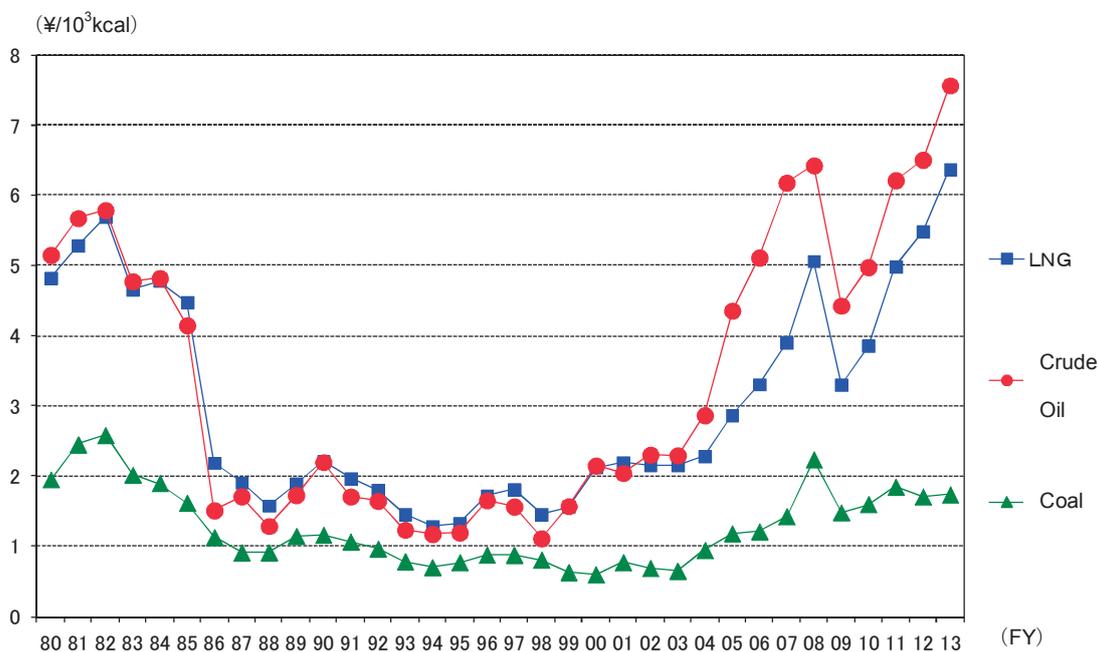
contract, with regard to the price, the one-year contract and the contract to review the price on a quarterly basis or per transaction have been made.

(2) Comparison of the CIF prices of fossil fuel per unit of heat

Figure 35 compares the coal price and other fossil fuel using the CIF prices per same calorific value (1,000 kcal). You can see that the coal price has more inexpensively and steadily transitioned than the crude oil and LNG prices. Until the early 1980s, the superiority of the coal (fuel coal) price was very high but in and after the fiscal 1986, the price gap decreased. But the price gap increased again in and after the fiscal 1999 and the superiority of coal increased. In and after the fiscal 2004, other fossil fuel prices increased in concert with the increase in the crude oil price but according to the comparison of CIF prices per calorific value, the rate of increase in coal was smaller than that of other fossil energy prices. The point worthy of special mention is in and after the fiscal 2012 and despite the increase in crude oil/LNG prices, the coal price slightly declined. This was because while the exporting countries' supply capacity increased, the growth of demand slowed down on a global scale because of economic unrest in Europe, etc. and the coal price in the fiscal 2012 declined. After that, the situation where coal supply capacity surpassed demand continued and the price continuously declined from the fiscal 2013 to the fiscal 2014.

The assumption derived from this trend is that the coal price is not impacted by the crude oil price drop and the coal price fluctuates only by the unique supply-demand balance.

Figure 35. Changes in Fuel Energy' s CIF Prices per Unit of heat



Source: Created based on “Energy and Economic Statistic Directory 2015” by The Institute of Energy Economics, Japan

(3) The theory that if the crude oil price drops, coal demand will decline

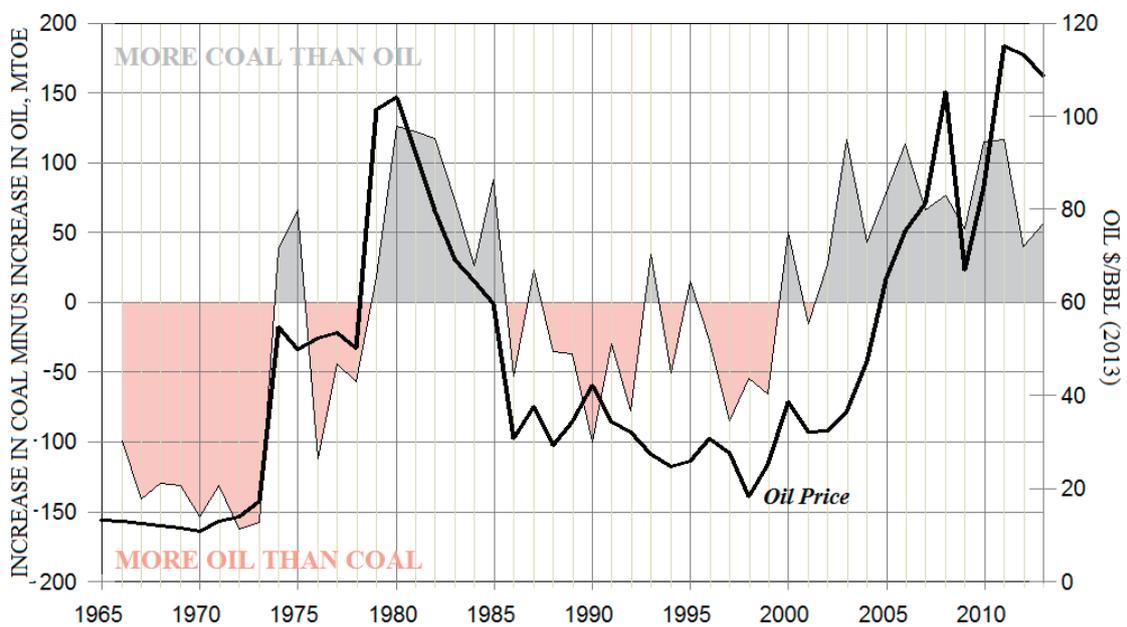
This theory is the hypothesis of Mr. Roger Andrews that the coal price is not directly linked to the oil price but coal demand is linked to oil demand. Mr. Andrews first showed the demand for oil, natural gas, coal, nuclear power, hydraulic, and renewable energy in the world for 50 years from 1965 to 2013 in ratios. Then he analyzed the percentage of the combined demand of oil and coal in all energy that gently declined from the 78% level to a little less than 63% and what made up the decline was natural gas (up 8%) and nuclear power (up 4%), and renewable energy (up 4%) in the case of recent years.

Next, he showed the idea that the scramble for the share between oil and coal in such a trend is linked to fluctuations in the crude oil price. In other words, if the crude oil price drops and oil demand increases, coal demand will decrease, and conversely, if the crude oil price increases and oil demand decreases, coal demand will increase. This relationship is shown in the Figure 36.

Last, he stated that the movement in and after 2000 was somewhat different from the past movement because coal-fired thermal power sharply increased in China but there has been no change in the basic trend. However, as the percentage of coal-fired thermal power, which used to be 25% in 1973, has now decreased to 5% or less, he believed that the trend of scrambling for the share between oil and coal would weaken because of the

change in the crude oil price. In conjunction with this, he indicated the difference in the means of transportation about the point that the demand correlation between oil and coal is strong but the correlation between natural gas and coal is weak. In other words, oil and coal can be replaced anytime and anywhere according to the change of the market (which price is advantageous) but natural gas is fixed by pipelines and liquefiers/vaporizers are installed for LNG; therefore, routes are fixed and it is not easy to determine a replacement.

Figure 36. Increase in coal & oil “new energy” by year versus oil price



Source: Energy Matters, 19 Oct. 2014, Oil and Coal: trends in global energy substitution

(4) Effects of the oil price drop on coal supply

With regard to the effects of the crude oil price drop on coal supply, IEA commented in the World Energy Outlook 2015 as follows.

Price fluctuations in oil products that are deeply involved in the coal supply chain are an important cost factor for coal producers. First in terms of production, the amount of oil products used is different from production by strip mining and underground mines but generally, the percentage of the oil product cost in the operating cost is in the range of 5% (underground mines) – 30% (strip mining). If the crude oil price drops by 30% within this range, the operating cost will decrease by 2% to 10%. In terms of transportation after production, because long-distance road transportation is uneconomic, if the distance from a mine is about 200 km, transportation will be by

trucks, and if the distance is longer, transportation will be by railway. The degree of dependence on truck transportation is 75% of the coal production volume in Indonesia, 25% in India, 20% in China, and 15% in the United States. Ships (fuel is oil) are used for 90% of the long-distance transportation of internationally traded coal.

From these standpoints, he stated that the crude oil price drop leads to a reduction in the oil and natural gas production/distribution costs and the enhancement of competitiveness of coal, but it will not be true enhancement of competitiveness unless the selling price of coal in the international market drops while the selling price of oil/natural gas in the international market significantly drops.

(4) Future forecast (Demand, production, and logistics)

Figure 37. Coal demand, production and trade by scenario (Mtoe)

		Results		New Policies		Current Policies		450 scenario	
		2000	2013	2020	2040	2020	2040	2020	2040
Demand	OECD	1,573	1,470	1,307	878	1,413	1,289	1,152	523
	Non-OECD	1,774	4,143	4,454	5,428	4,627	6,737	4,208	3,041
	World	3,347	5,613	5,762	6,306	6,040	8,026	5,360	3,565
	Steam coal	2,590	4,379	4,523	5,266	4,784	6,835	4,175	2,814
	Coking coal	452	940	929	785	941	851	903	601
	Lignite	304	295	309	254	315	341	282	151
Production	OECD	1,380	1,361	1,255	1,042	1,391	1,505	1,134	627
	Non-OECD	1,875	4,362	4,507	5,263	4,648	6,521	4,226	2,938
Trade	World	471	1,084	1,143	1,291	1,221	1,780	1,038	594
	Steam coal	310	814	847	984	913	1,447	759	373
	Coking coal	175	272	299	311	310	337	284	229
Share of World Demand	Non-OECD	53%	74%	77%	86%	77%	84%	79%	85%
	Steam coal	77%	78%	79%	84%	79%	85%	78%	79%
	Trade	14%	19%	20%	20%	20%	22%	19%	17%

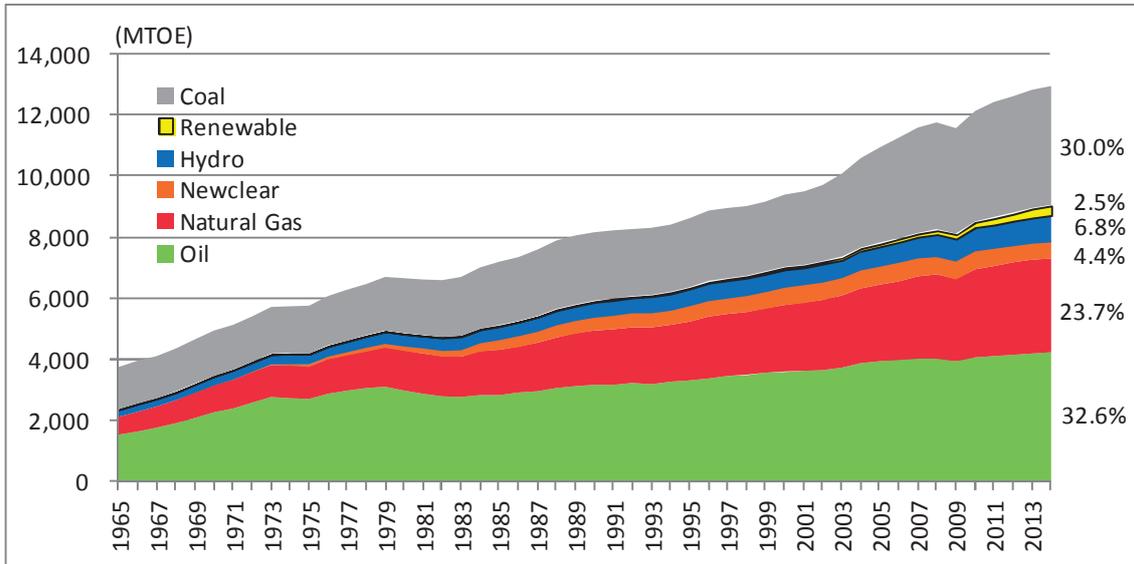
Source: IEA, World Energy Outlook 2015

5-2. Renewable Energy

World primary energy consumption in 2014 reached 12.9 billion tons of oil equivalent and its composition was that 32.6% was oil, followed by coal which was 30.0% and natural gas which was 23.7%. The remaining portion was hydraulic, nuclear, and

renewable energy. As the hydraulic, nuclear, and renewable energy is mainly used for power generation, this section discusses mainly about renewable energy (including hydraulic).

Figure 38. Changes in the Primary Energy Supply



Source: Created based on BP's statistics in 2015

(1) Characteristics of the renewable energy market

Power generation using renewable energy expanded at the fastest speed ever (130 GW) in 2014 and accounted for 45% or more of the amount of increase at power-generating facilities in the electricity sector in the world. This is because renewable energy in the electricity sector is different from oil, natural gas, and coal and is characterized by an introduction that is not rejected because its power-generating cost (power-generating facility construction cost) is high and its introduction is promoted as part of energy security and countermeasures against global warming in each country/economy. Therefore, support for the introduction of renewable energy has been provided in the form, such as feed-in tariff (FIT) in a number of countries/economies. Therefore, in the Medium-Term Renewable Energy Market Report 2015 (MTRMR2015) released by IEA on October 2, 2015, it was explained, "Even under the environment of the continued low crude oil price in recent years, having effects on the introduction of renewable energy will be sensuous rather than reality."

There is a wide variety of renewable energy, including ones under research and development, such as hydraulic, photovoltaic, solar thermal, wind (offshore and onshore), geothermal, biofuel, wave, and the temperature difference of seawater, and

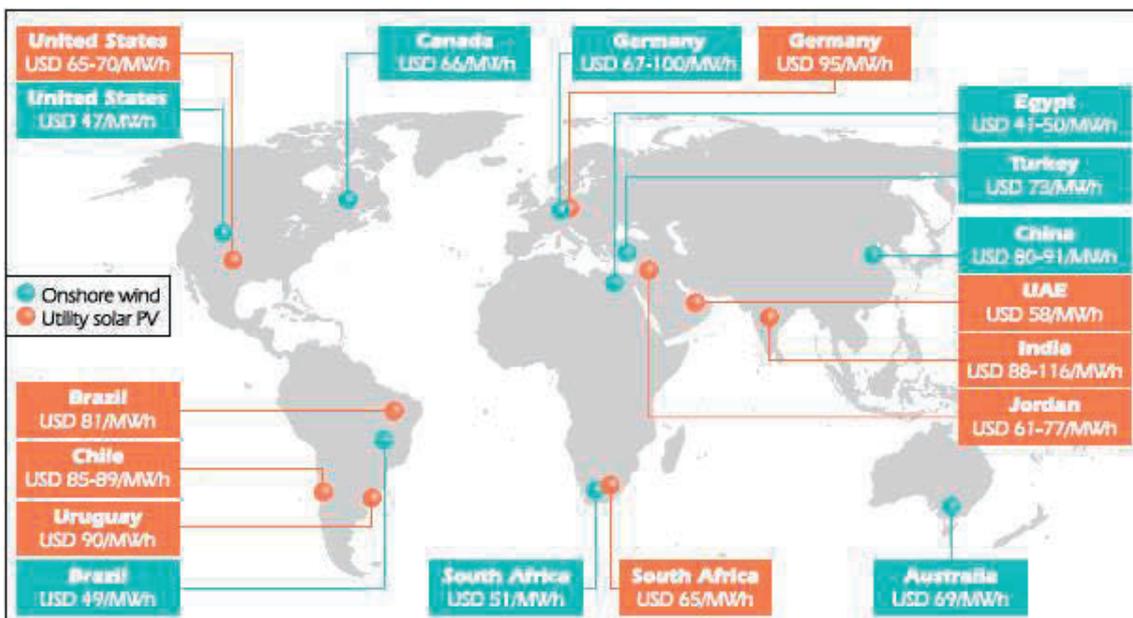
the combination of the sizes of power-generating facilities and sources can be considered depending on the presence or absence of an energy source due to geographical conditions and the size of regional demand in each country.

Furthermore, the power-generating facility construction cost has significantly decreased in recent years because of technological improvements, and for example, if the onshore wind power generation facilities in 2010 are expressed as 100, it is forecast that the number will decrease to 70 in 2015, and the number will decrease to a little more than 60 in 2020. Even in the case of photovoltaic power generation, it is forecast that the number will decrease to 40 or less in 2015 and 30 or less in 2020.

(2) Renewable energy' s cost competitiveness with existing energy

According to the recently announced long-term contracts on the electric power supply fees using renewable energy, onshore wind power generation in the United States, Brazil, South Africa, and Egypt and photovoltaic power generation in UAE (Dubai) were found to have levels that were below \$60/MWh. Considering the fact that the fees with the newly installed gas-fired power generation are now at this level, it can be forecast that the power generating cost of renewable energy will be able to realize lower power generating cost with technological improvement and better financing and continue expanding better resources and the new market.

Figure 39. Long-Term Contracts on the Electric Power Supply Fees Using Renewable Energy in Recent Years



Source: IEA, Medium-Term Renewable Energy Market Report 2015

As just described, it cannot be said that all of onshore wind and photovoltaic power generation is competitive and equal to or higher than fossil fuel at this moment, but the future onshore wind and photovoltaic power generation will be increasingly competitive in comparison to the cost of gas-fired power generation. But comparing with the low price gas markets, such as the United States, further cost reduction will be necessary. On the other hand, hydraulic, geothermal, and bio energy have significant competitiveness compared with fossil fuel but the risks of financing in the project development and reaching consensus with society will remain.

(3) Future forecast

IEA MTRMR 2015 forecast as follows.

A: Reference case

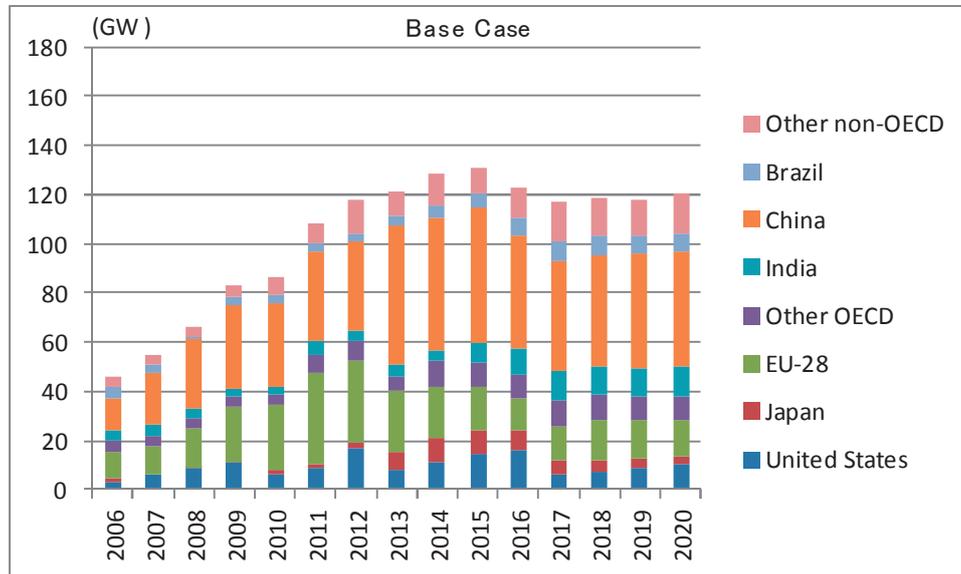
With regard to the reduction of power generating cost using renewable energy, further developments in many parts of the world will be promoted. Even under the environment of the low fossil fuel prices, the policy will continue to have the objectives of promoting power generation using renewable energy in order to promote energy diversification, local pollution problems, and decarbonization and hydrogen fuel. The future increase in countries, such as China and India, can be expected.

As a result, renewable energy will become the most significant electric power source in the net increase of power generating facility capacity in the medium term. In other words, the increase in power generation by renewable energy up to 2020 will account for 2/3 of the total, and only the renewable energy itself, which is other than electricity, will account for nearly half of the total. And the percentage of power generation by renewable energy will increase from 22% in 2013 to 26% in 2020, which will reach the level greater than the total demand in today's China, India, and Brazil.

But the movements of facility expansion particularly in Europe and Japan are believed to slow down because of uncertainty in the sustainable subsidizing policy for renewable energy, just like the access and integration of financing and electricity in developing countries/economies.

Therefore, the worldwide increase under the major cases in the Medium-Term Renewable Energy Market Report 2015 will not be as fast as forecast and may be insufficient to position renewable energy to suit the long-term countermeasures for climate change.

Figure 40. Forecasted Increase in Renewable Energy in Power-Generating Facility Capacity (Reference case)



Source: IEA, Medium-Term Renewable Energy Market Report 2015

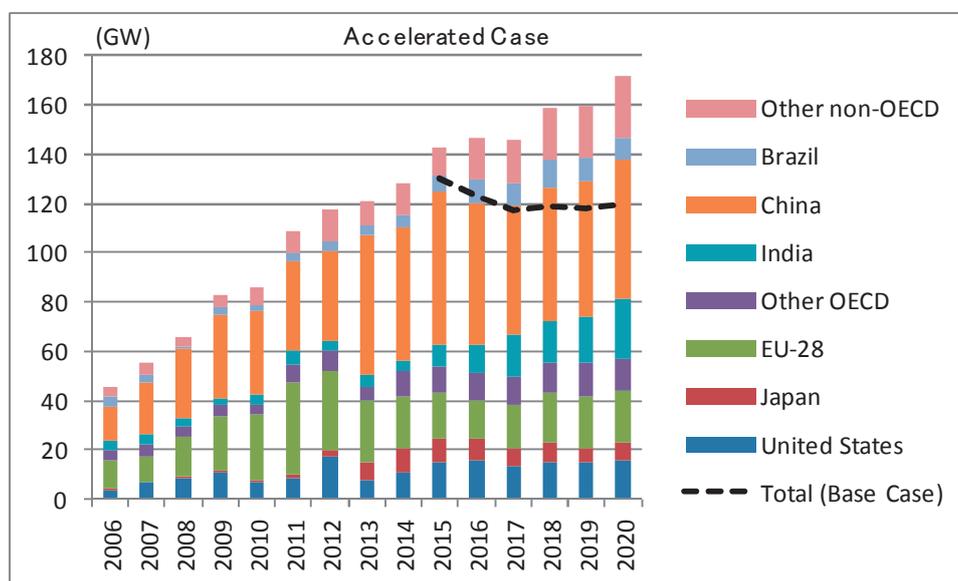
B: Promoting case

This is the case that by conducting policy changeover in the key countries/economies to the extent possible, renewable energy's power-generating facility capacity will increase year after year and if accumulated, it will accelerate the increase by 25%.

In the lecture by Mr. Sadamori of IEA held on October 5, 2015, the items cited as the policies to drive the promoting case are as follows:

- Enhancement of energy saving
- Expansion of investments in renewable energy
- Enhancement of the regulations on combustion efficiency in coal-fired thermal power
- Reduction or abolition of subsidies for fossil fuel
- Prohibition of methane emissions in the atmosphere

Figure 41. Forecasted Increase in Renewable Energy in Power-Generating Facility Capacity (Promoting case)



Source: IEA, Medium-Term Renewable Energy Market Report 2015

(4) Measures necessary for promoting the introduction of renewable energy

To realize the promoting case, Medium-Term Renewable Energy Market Report 2015 listed the following items as the necessary measures in OECD countries and developing countries.

A: OECD countries

- The United States should send a clear signal about the durability of preferential treatment for federal tax and Environmental Protection Agency’s (EPA) Clean Power Plan
- Regions in which introduction of renewable energy has been accelerating, such as Mexico and Turkey should clarify uncertain points in the renewable energy policy in the market
- Just like the governance and administration that EU-28 is aimed at, the framework of the more certain, stable, and persistent policy on the stream of long-term revenues of the renewable energy projects should be indicated
- Just like the Japanese and European markets, assured means to integrate variable renewable energy into the power grid and system should be implemented
- Just like Europe, when allocating the network cost, designs of the fair rules and appropriate electric power charges should be indicated to be able to secure the

distributed photovoltaic power generation that is rapidly growing

B: Developing countries/economies

- Just like India, credibility of the ambitious long-term policy framework in a market should be further secured
- Just like China and South Africa, assured means to abolish regulatory barriers and promote the power grid and system integration for variable renewable energy, particularly the distributed photovoltaic power generation, should be taken
- For example, through the use of well-designed price competition mechanism for abolishing fossil fuel subsidies and support cost reduction, market access in the electric power sector should be improved and persistence of the financial aspect should be enhanced
- At the time of designing the policy or at the time of an entry of a development agency, reduction of risks and easing of financial conditions should be improved upon consultation with large shareholders

(5) Biofuel

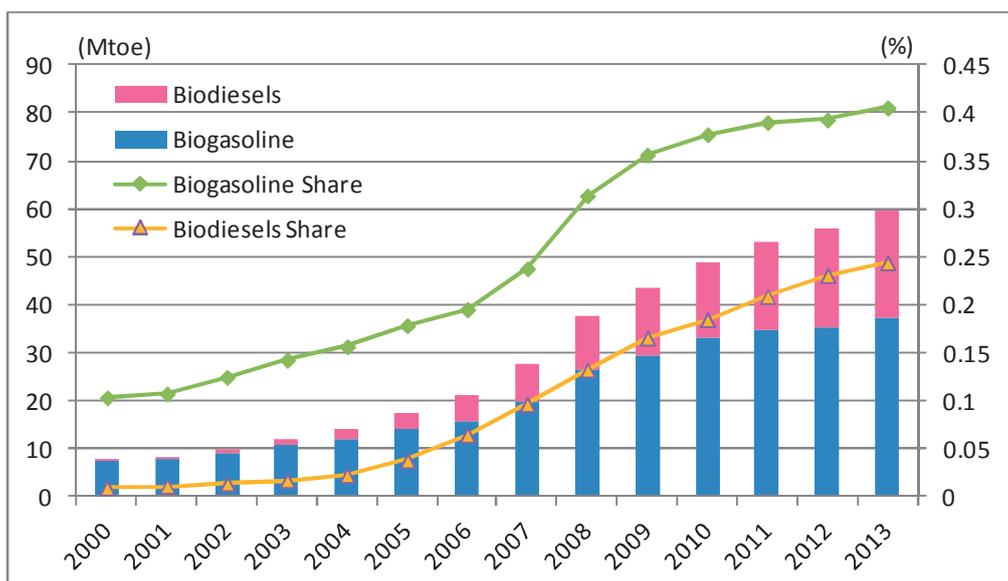
There are biological organic resources (biomass) in renewable energy that include firewood and charcoal. For these, the biomass-use ratio is believed to decline as the use of commercially supplied energy, such as heating oil, electricity, and city gas will increase mainly in association with the economic growth in developing countries/economies.

On the other hand, among the advanced countries/economies, such as the United States and Europe, the number of countries/economies promoting the introduction of biomass in terms of policy and from the standpoint of the response to climate change problems has been increasing. In the aspect of the expansion of use, policies particularly aimed at reducing dependence on oil in the traffic sector and controlling the greenhouse gas emission have been announced. For example, the EU has been upholding the target to use biofuel (and electricity using renewable energy, etc.) for about 10% of the fuel usage in the traffic sector by 2020. But as the main raw materials of biofuel are food, such as sugar cane and corn, it has been indicated that the exponential increase in the use of biofuel is likely to have serious effects, such as escalating food prices. Furthermore, the concern is that the movements to cut down forests and tropical rainforests for use as cultivated lands for producing biofuel, development of sustainability criteria (greenhouse gas reduction effect in LCA, etc.) to reduce the effects of biofuel production/consumption on natural environment and food markets,

and deliberations at international conferences have been made. Also, approaches on the development of biofuel that uses raw materials other than food (cellulosic raw materials, such as rice straw, timber, etc., algae, etc.) have been made.

Figure 42 shows the changes in final consumption of biogasoline and biodiesel that had transitioned under such environments. Even the share of the total biofuel in 2013 was less than 1% of the all energy consumption but its consumption increased by 7.5-fold from 8 Mtoe in 2000 to 59.5 Mtoe in 2013.

Figure 42. Changes in Biofuel Consumption in the World



Source: Created based on Energy Balances of Non OECD 2015 by IEA

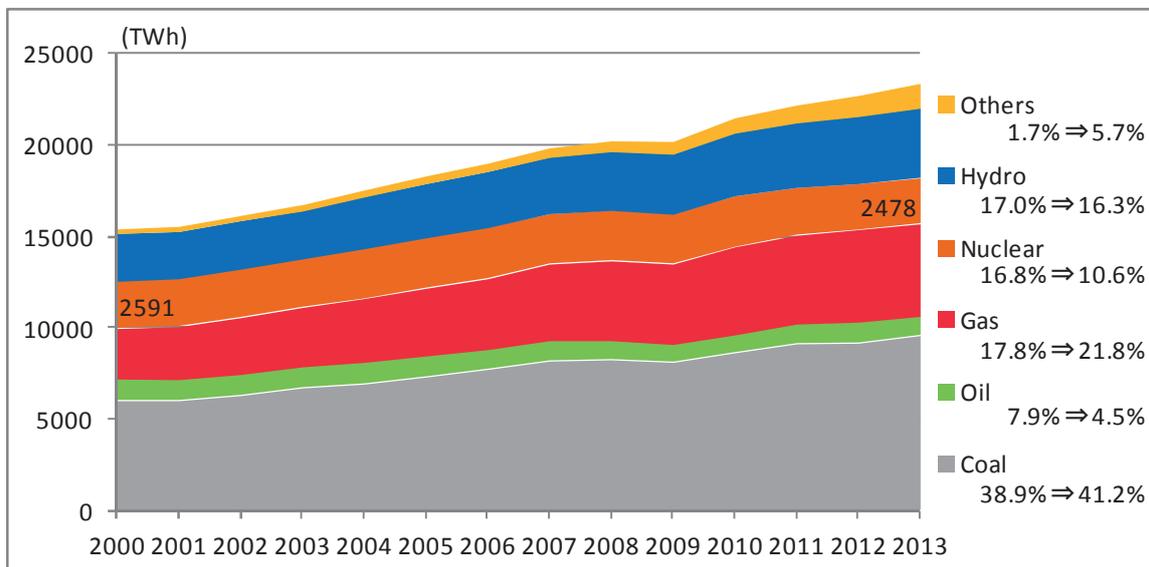
As just described, biofuel has been introduced in terms of policy, and the introduction will not be accelerated or delayed because of the fluctuations of competing fuel prices. However, although consumption itself is believed to continue increasing in the future, if the future transportation fuel demand will increase sharply because of the sharp decline in oil prices like the recent decline, a situation will be conceivable where biomass supply will fall behind the demand and the mix rate of ethanol, etc. and proportion of biofuel introductions will be reviewed (making downward revisions).

5-3. Nuclear Power

While the total electric power generation from 2000 to 2013 increased at the average annual rate of 3.2%, electric power generation by nuclear power decreased by 0.4%. The facts that discussions on the safety of nuclear power generation increased because of the

huge earthquake in Japan in 2011, the operation of nuclear power plants after the periodic inspection was not resumed, and breaking with the nuclear power generation accelerated in Germany are cited as contributing factors for this. In fact, electric power generation by nuclear power up to 2010 indicated an increasing trend although it was gradual but this has turned into a decreasing trend since 2011. Therefore, it should be viewed that the use of nuclear power generation was not affected by the oil price drop and use was restricted because of the problems of nuclear power generation. While the usage was restricted, power generation using oil and natural gas was conducted particularly in Japan.

Figure 43. Changes in Electric Power Generation and Composition of Electric Power in the World



Source: Created based on Energy Balances of Non OECD 2015 by IEA

But how electric power supply was affected by the recent oil price drop? If you look at the crude oil price in and after 2000, it gradually increased from the \$20/bbl level in the early 2000s, reached the level exceeding \$130/bbl right before the collapse of Lehman Brothers, and sharply dropped from that level to the \$40/bbl level. After that, when the Arab Spring occurred, it stayed at the level exceeding the \$100/bbl level again and it significantly fluctuated. But as shown in the Figure 43, no matter how the oil price fluctuated, power generation by oil nearly consistently declined from 7.9% in 2000 to 4.5% in 2013, so the oil price fluctuations did not push up oil's composition ratio in power generation.

But indirect impacts due to the prolonged sluggish oil price are conceivable. In other

words, the oil price drop facilitates the natural gas (imported LNG) price drop and the price competitiveness of gas-fired power generation improves. Because of this, scenarios of switching to gas-fired power generation from coal-fired power generation and cheap gas-fired power generation as an alternative to nuclear power during the period of solving the problems in the safety of nuclear power (delay in investments in nuclear power during the period) can be assumed.

5-4. Countermeasures against Global Warming

Finally, what kind of impact will recent oil price drop have on the countermeasures against global warming, in particular, controlling of CO₂ emissions? In the Outlook 2015 issued by the US EIA on April 14, 2015, case studies were conducted about how CO₂ emissions in the United States will change because of the fluctuations of the oil price.

First, it was the Reference Case and under the assumption that GDP from 2013 to 2040 will grow at the average annual rate of 2.4% and the WTI crude oil price will fluctuate from \$98/bbl to 136/bbl at the average annual rate of 1.2% during the period, it was estimated that the energy consumption during the period will increase from 97.14 quadrillion BTU to 105.73 quadrillion BTU at the average annual rate of 0.3%. As a result, CO₂ emissions will increase from 54.05 billion tons to 55.49 billion tons at the average annual rate of 0.1%.

In the low oil price case, it was estimated that if the oil price would fluctuate from \$98/bbl in 2013 to \$52/bbl in 2020, \$63/bbl in 2030, and \$72/bbl in 2040, CO₂ emissions would increase to 55.23 billion tons in 2020, 55.85 billion tons in 2030, and 56.71 billion tons in 2040. This was caused by the slight increase in the percentage of oil consumption while the total energy consumption was nearly unchanged.

Conversely in the high oil price case, it was estimated that if the oil price would fluctuate at \$142/bbl in 2020, \$188/bbl in 2030, and \$246/bbl in 2040, CO₂ emissions would increase to 54.41 billion tons in 2020, 54.61 billion tons in 2030, and 55.84 billion tons in 2040 (every figure was less than the Reference Case). This was because the use of natural gas would be promoted against the decrease in oil consumption and in the medium to long term, nuclear power and coal (countermeasures against reduction of CO₂ emissions, such as gasification of coal, etc. was considered to be taken) would be used.

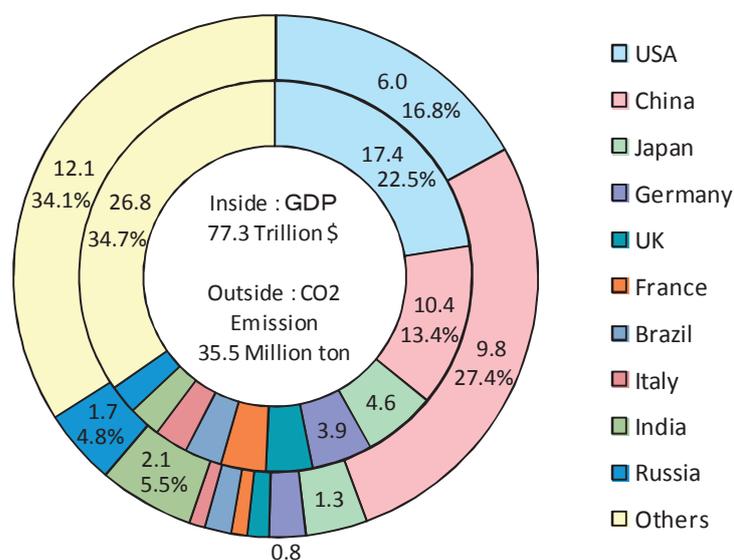
Figure 44. Forecast of the Changes in CO₂ Emissions in the United States due to Differences in the Oil Price

	2013	2020			2030			2040			AAGR
		Low	Ref.	High	Low	Ref.	High	Low	Ref.	High	Ref.
【GDP】 (Trillion 2009 dollars)											
	15.7	18.7	18.8	18.8	24.0	23.9	23.8	30.0	30.0	30.0	2.4%
【Price】 (2013 dollars per unit)											
WTI (\$/bbl)	98	52	73	142	63	99	188	72	136	246	1.2%
Henry Hub (\$/Mbtu)	3.73	4.30	4.88	4.61	5.49	5.69	7.89	7.15	7.85	10.63	2.8%
Coal (\$/ton)	37.2	37.2	37.9	39.8	42.1	43.7	47.4	46.4	49.2	52.7	1.0%
Electricity (¢/KWh)	10.1	10.4	10.5	10.5	11.0	11.1	11.8	11.5	11.8	12.9	0.6%
【Consumption】 (quadrillion Btu/year)											
Petroleum	35.9	37.8	37.1	35.8	37.8	36.5	33.7	38.6	36.2	32.9	0.0%
Natural Gas	26.9	26.8	26.8	28.0	28.4	28.8	30.2	29.6	30.5	31.8	0.5%
Coal	18.0	18.9	19.2	19.0	19.1	19.2	20.1	18.8	19.0	21.6	0.2%
Nuclear	8.3	8.4	8.4	8.4	8.5	8.5	8.7	8.5	8.7	9.8	0.2%
Hydro	2.5	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	0.4%
Biomass	2.9	3.0	3.0	3.1	3.1	3.2	3.4	3.3	3.5	4.0	0.7%
Other Renewable	2.3	3.2	3.2	3.4	3.5	3.6	4.0	4.1	4.6	6.4	2.7%
Others	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-0.7%
Total	97.1	101.2	100.8	100.8	103.6	102.9	103.3	106.1	105.7	109.7	0.3%
【Carbon dioxide emissions】 (million metric tons)											
	5,405	5,523	5,499	5,441	5,585	5,514	5,461	5,671	5,549	5,584	0.1%

Source: EIA, Annual Energy Outlook 2015

While GDP in the United States in 2014 ranked first in the world, which accounted for 22.5% of the total, CO₂ emissions ranked second in the world, which accounted for 16.8% of the total. As China's GDP ranked second, which accounted for 13.4% of the total and CO₂ emissions ranked first which accounted for 27.4% of the total, it cannot be said that the entire world will change at the ratios that are the same as the ones in the United States case studies. But there would be no change in the direction that if the crude oil price becomes cheaper, CO₂ emissions will increase and if the crude oil price becomes higher, CO₂ emissions will be controlled. However, even if the crude oil price is far different from the Reference Case, you can see that there would be no significant gap in CO₂ emissions.

Figure 45. Relationship between GDP and CO₂ Emissions



Source: Created based on the World Economic Outlook Database 2015 by IMF and Annual Energy Outlook 2015 by EIA

So, EIA further conducted interesting case studies. In other words, they estimated how CO₂ emissions would change by the economic growth. In contrast to the previous Reference Case, it was estimated in the low economic growth case that if GDP fluctuates from 15.7 trillion dollars in 2013 to 17.7 trillion dollars in 2020, 21.2 trillion dollars in 2030, and 25.8 trillion dollars in 2040 at the average annual rate of 1.8%, CO₂ emissions will decrease to 53.43 billion tons in 2020, 52.10 billion tons in 2030, and 51.60 billion tons in 2040. This was caused by the significant decrease in comparison with other energy sources in the consumption of energy, such as oil and coal, which are said to have large CO₂ emissions.

Conversely, it was estimated in the High Economic Growth Case that if GDP fluctuates from 15.7 trillion dollars in 2013 to 19.6 trillion dollars in 2020, 26.1 trillion dollars in 2030, and 34.1 trillion dollars in 2040 at the average annual rate of 2.9%, CO₂ emissions will increase to 56.31 billion tons in 2020, 57.91 billion tons in 2030, and 59.79 billion tons in 2040 (every figure significantly increased compared with the Reference Case). This is because natural gas has small CO₂ emissions and would be preferentially used for supplying the necessary energy, and although nuclear power and renewable energy would be promoted as the energy sources to fill up a deficiency, oil and coal have greater CO₂ emissions but would be used.

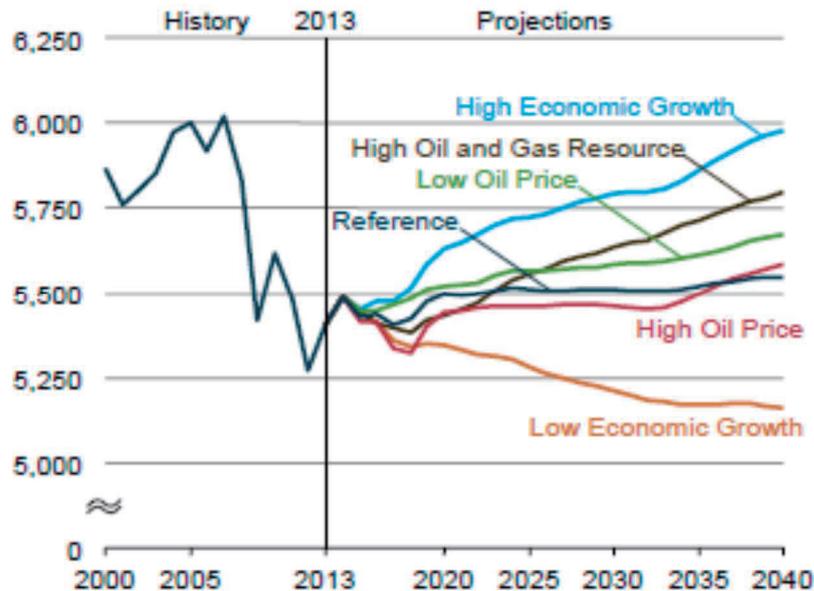
Figure 46. Forecast of the Changes in CO₂ Emissions in the United States due to a Difference in the Economic Growth

	2013	2020			2030			2040			AAGR Ref.
		Low	Ref.	High	Low	Ref.	High	Low	Ref.	High	
【GDP】 (Trillion 2009 dollars)											
	15.7	17.7	18.8	19.6	21.2	23.9	26.1	25.8	30.0	34.1	2.4%
【Price】 (2013 dollars per unit)											
WTI (\$/bbl)	98	72	73	74	97	99	102	132	136	140	1.2%
Henry Hub (\$/Mbtu)	3.73	4.53	4.88	5.03	5.43	5.69	6.02	7.46	7.85	8.45	2.8%
Coal (\$/ton)	37.2	37.5	37.9	38.0	43.6	43.7	44.1	49.0	49.2	50.3	1.0%
Electricity (¢/KWh)	10.1	10.3	10.5	10.6	10.7	11.1	11.1	11.4	11.8	12.3	0.6%
【Consumption】 (quadrillion Btu/year)											
Petroleum	35.9	36.2	37.1	37.9	34.1	36.5	38.5	32.9	36.2	39.8	0.0%
Natural Gas	26.9	26.4	26.8	27.7	27.0	28.8	30.9	28.6	30.5	32.7	0.5%
Coal	18.0	18.3	19.2	19.5	18.4	19.2	19.6	18.1	19.0	19.9	0.2%
Nuclear	8.3	8.4	8.4	8.4	8.5	8.5	8.6	8.5	8.7	9.5	0.2%
Hydro	2.5	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	0.4%
Biomass	2.9	3.0	3.0	3.1	2.9	3.2	3.6	3.1	3.5	4.4	0.7%
Other Renewable	2.3	3.2	3.2	3.4	3.5	3.6	4.2	3.7	4.6	6.7	2.7%
Others	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	-0.7%
Total	97.1	98.7	100.8	103.1	97.5	102.9	108.5	98.0	105.7	116.2	0.3%
【Carbon dioxide emissions】 (million metric tons)											
	5,405	5,343	5,499	5,631	5,210	5,514	5,791	5,160	5,549	5,979	0.1%

Source: EIA, Annual Energy Outlook 2015

As just described, the EIA forecast that the changes in the economic growth rate had a greater impact on the increase or decrease in CO₂ emissions than the changes in the crude oil price.

Figure 47. Forecast of CO₂ Emissions with Respect to Each Case



Source: EIA, Annual Energy Outlook 2015

Chapter 6: Summary and Implication

6-1. Summary/Analysis

(1) Crude oil

The crude oil price drop since the middle of 2014 has impacted many fields. First, in the oil-producing countries/economies, the problem of decreasing budget revenues has occurred, which made it difficult to secure/maintain funds for investments in oil development, and cost reductions and review of the development projects (slimming down, postponement, cancellation, etc.) have been made. Not only the oil-producing countries/economies, but also independent oil companies, such as major European and the US oil companies need to make similar responses, and each company has been actively selling their assets/concessions in the development mining areas. This is linked to concerns that reviews of the development and investment projects will create problems in securing crude oil supplies in the future. In addition to this, oil-producing countries/economies have been examining or implementing a reduction and/or abolition of subsidies for fuel, electricity, and water and disposition of the sovereign wealth funds that they had accumulated to make up for deficit financing.

On the other hand, as consuming countries/economies are able to procure cheap crude oil, oil consumption will be encouraged which will lead to the increase in oil demand in the future. With regard to the approach from this perspective, IEA, EIA, and OPEC commented, "The low price of crude oil will facilitate oil consumption" in their respective monthly reports. However, in the context of the increase in oil demand, the element of "Business Conditions" is required but a decline in oil-related industries' activities (decline of drilling rig operation, decline of orders for drilling pipes, oil well pipes, etc.) will stem from the decreased budget revenues in the oil-producing countries/economies, and the periphery industries (equipment maintenance, production of drilling chemicals, catering, etc.) will also have effects; therefore, it is a fact that there is an aspect where the crude oil price drop is not simply and directly connected to the increase in oil demand.

Improvement in the supply-demand balance is essential for the recovery of the crude oil price, but there are many opinions on the time. As of the end of 2015, there were many opinions saying that the improvement in the balance will be at the end of 2016 at the earliest, but in various professional bodies' forecasts and prospects in 2015, the actual conditions is that the time of the improvement in the supply-demand balance is moved back in each announcement. The major concern in predicting the supply-demand balance as of the end of 2015 was the time of Iranian crude oil returning to the market and the quantity after lifting the embargo against Iran. According to Iranian Minister of

Petroleum Zangeneh, they could increase production by 500,000-800,000 b/d right after lifting embargo. And they would increase production by 1 million b/d within six months.

In the beginning, the shale oil production cost was said to be \$80/bbl on average, but considering the fact that it finally indicated the gradual decrease after the international crude oil market went below \$50/bbl, the current average break-even price is assumed to be around \$50/bbl. And it is assumed that shale oil's break-even price will be much cheaper through rationalization and efficiency.

As a result, regarding the improvement in the supply-demand balance, while the amount of supply will increase because of the Iranian crude oil returning to the market and shale oil production cost reduction, on the demand side, because the Chinese economy which had been a driver has begun to decline, the time will be moved back.

But what you have to be careful about here is, as Saudi Arabian Ministry of Petroleum and Mineral Resources Naimi stated, the concern that if continued investments in oil development cannot be maintained, supply deficiencies may occur in the medium to long term because of the natural decline of the oil fields and annual increase in oil demand. The Minister said that in order to respond to the natural decline and increase in oil demand, the production capacity of 5 million b/d have to be newly added every year and investments of 70 billion dollars will be needed over the next ten years. To continue to provide a stable crude oil supply, continuous crude oil development and investments must be conducted.

(2) Natural gas

The natural gas price tends to be set at the level that maintains price competitiveness with competing fuel. Therefore, the crude oil price drop has an impact on the natural gas market. This is because the long-term contract prices in the Asian LNG market and European market are linked to the crude oil price, and as a result, the mechanism is that prices are affected by crude oil price fluctuations. Specifically, if the crude oil price rises sharply or drops sharply against the element of the crude oil price included in the LNG price formula, the LNG price will gently change to follow the crude oil price (draw the S-shaped curve) by using the coefficient linked to crude oil. Because of this relationship, the natural gas (LNG) price fluctuates in conjunction with the changes in the crude oil price with time difference.

As the natural gas (LNG) price drops in concert with the crude oil price drop, the natural gas industry has a tough situation investing in upstream development as is the case with the oil industry. In that situation, while carrying out the projects that are under construction according to the plan, natural gas suppliers make choices on the

assets to be invested in the future. Therefore, some projects have already been abandoned or postponed. If the current low price continues, it should be viewed that the LNG market will start to have tight supply by 2020 as IEA indicated in the Medium-Term Gas Market Report 2015.

On the other hand, it is believed on the demand side that natural gas will emerge as one option for energy in the electric power sector. This is because the high natural gas (LNG) price will be dragged down by the crude oil price, natural gas will start to be competitive against competing energy, and natural gas demand for power generation will emerge. In particular, in the relationship with the future countermeasures against global warming, an option to use natural gas that has less CO₂ emissions, instead of using cheap coal, which has more CO₂ emissions, is conceivable.

(3) Coal

Until the crude oil price dropped, coal had a cheaper price per unit of heat as compared to competing oil and natural gas. However, the crude oil price drop has increased the likelihood of coal being threatened by natural gas rather than oil particularly in the electricity market. Previously, the relationship that if the crude oil price dropped, coal demand would decrease, and if the crude oil price rose suddenly, coal demand would increase, but the percentage of oil-fired thermal power in the electricity market has decreased to 5% or less, and the competing energy is now natural gas.

But for transportation of natural gas, pipelines have to be installed, liquefiers and vaporizers for LNG have to be installed at the shipping port and recipient port, and the natural gas (LNG) distribution routes have been fixed; therefore, even though the natural gas price has become cheaper, replacement of the distribution routes is not as easy as coal and oil. However, as a recent trend, LNG exports and imports have been on an increasing trend and destinations have been diversified. Furthermore, in recent years, in terms of countermeasures against global warming and as the environmental policy, there has been a tendency exhibited to refrain from the use of coal, which has more CO₂ emissions.

(4) Renewable energy

The percentage of renewable energy in world primary energy consumption in 2014 was 2.5% but the fact that power-generating cost by renewable energy is high does not mean it would not be introduced, and there is a feature that as part of energy security and countermeasures against global warming in many countries/economies, introduction has been promoted. In the Medium-Term Renewable Energy Market

Report 2015 released by IEA, it was explained as “... even under the environment of the continued cheap crude oil price in recent years, having effects on the introduction of renewable energy will be sensuous rather than reality.” Furthermore, in recent years, construction costs of the electric power facilities using renewable energy have significantly decreased because of technological improvements.

Originally, renewable energy has been a policy that even under the environment of the low fossil fuel price, power generation using renewable energy should be facilitated to promote energy diversification, local environmental pollution problems, and low carbonization of energy and the future increase in countries/economies, such as China and India is expected. In the World Energy Outlook 2015 released by IEA on November 10, it was predicted that renewable energy will surpass coal and will be the largest electricity supply source in the early 2030s.

(5) Nuclear power

Changes in the use of nuclear power in the countries that had already introduced nuclear power were not affected by the crude oil fluctuations but it should be viewed as the safety problems that nuclear power generation itself was holding put a restriction on the use.

On the other hand, in the Middle Eastern countries, which are trying to introduce it, natural gas has been used for power generation to supply electricity and water because of the increase in population, but the countries are trying to introduce renewable energy and nuclear power to save energy resources and reduce consumption of the exporting revenue sources in home countries.

From these standpoints, it is thought that introduction of nuclear power will be promoted in the long term, but with regard to the period until nuclear power generation will be operated, the indirect impact can be considered if the sluggish oil price is extended for a long period of time. In other words, the oil price drop will promote the decline of natural gas (imported LNG) prices, and the price competitiveness of gas-fired thermal power will improve. Because of this, a scenario that switching from coal-fired thermal power to gas-fired thermal power and replacement with cheap gas-fired thermal power during the period of solving issues in regard to the safety of nuclear power plants (delay in investments in nuclear power during the period) can be assumed.

(6) Countermeasures against global warming

As is the case with the renewable energy policy and nuclear power policy, countermeasures against global warming are not affected by the crude oil price

fluctuations but the correlation that if oil energy consumption increases, CO₂ emissions will also increase cannot be denied.

But in the case studies conducted by the EIA in 2015, the result attracted attention that the factor of economic growth had larger impact on the increase or decrease in CO₂ emissions than the factor of the changes in the crude oil price. In other words, changes in the CO₂ emissions caused by the changes in the crude oil price was the replacement of the energy source, but as the changes in the economic growth would generate new energy consumption, such changes would directly lead to the net increase in CO₂ emissions. Therefore, how energy saving is addressed will be important in promoting the global warming prevention measures.

6-2. Implications on the long-term energy supply and demand forecast

(1) Choice and diversification of the energy source in the demand forecast

Total energy demand is dependent on the increase or decrease in population and the GDP growth rate. But when forecasting the demand by breaking it into each energy source, the following elements will have effects on it:

- Cost of acquiring energy (For example, cost comparison with the competing energy)
- The diffusion rate of each equipment that consumes energy (For example, forecast of the number of automobiles owned)
- Policies related to energy consumption in each country/economy (For example, global warming prevention measures and energy-saving policies)

For example, when choosing oil, natural gas, coal, nuclear power, hydraulic, or renewable energy as the energy source for power generation, all of the above three points will be involved. In other words, it is a truism that if the natural gas price drops because of the crude oil price drop, and as a result, it becomes cheaper than coal, coal demand will decrease and oil/natural gas demand will increase. The sluggish oil price this time will just lead to the encouragement of oil/natural gas demand.

But it will require the transformation of power-generating equipment; therefore, it does not mean that all of the coal-fired thermal power will be replaced with oil/natural gas. On the other hand, if global warming prevention measures will be prioritized, consumption of oil/coal will be controlled in terms of policy and use of renewable energy represented by wind and sunlight will be promoted. But it is not always the case where all countries/economies can at all times secure energy in nature, just like geothermal power generation; therefore, choice and diversification of the energy source will be necessary.

As is the case with energy for power generation, an example of choice and diversification of energy can be applied to automobiles. From the standpoint of the traditional concept, it is the choice in oil that is either gasoline or diesel oil. If you add the concept of the global warming prevention measures, biofuel that will be mixed into gasoline or diesel oil will emerge. Furthermore, new options, such as electricity and hydrogen, will emerge. On the other hand, hybrid automobiles that consolidate these kinds of fuel will emerge. These are significantly impacted by each country's energy policy, rather than the choice of energy by consumers.

(2) The relationship between each country's energy policy and energy supply and demand

The energy policy is to express what kind of thought a country has on energy and as measures will be implemented based on the policy, it is often the case that it will lead to the encouragement (controlling) of demand and promotion (controlling) of supply. In particular, it is often the case that with regard to energy supply and demand in the country that controls economy, numerical targets will be set annually with respect to each energy, status of the achievement will be checked every year along with the target, and the numerical targets will be set again.

As a representative example on the supply side, in the Chinese five-year plan, each energy's numerical target has been specified under the macroeconomic target. Furthermore, the country has been managing and supervising companies through the exercise of authority to give permission and utilization of the support system in order to be able to achieve the target with the state-owned companies being drivers. As just described, because there is an aspect where energy supply is controlled by the energy policy, it is important to check each country's energy policy. It is also important to check the laws and regulations that supplement the promotion of the energy policy not in only the countries that control the economy but in countries with a free economy. For example, Feed-in Tariff (FIT) in electricity supply is considered to have a significant impact on the composition of the future energy for power generation.

On the other hand, with regard to the demand side, the energy-saving policy will, for example, be a significant demand-determining factor. In advanced countries, a high level of fuel standard has been imposed to the automobile manufacturers and for consumers, old automobiles have been heavily taxed to promote the replacement with automobile having better fuel efficiency for the purpose of improving automobile fuel efficiency. In conjunction with this, the countries have been promoting the introduction by setting tax for hybrid automobiles, etc. at a cheaper rate to reduce CO₂ emissions.

As just described, the energy policy will be involved in the energy demand and supply forecast on all aspects; therefore, it is necessary to check each country's key energy policy.

(3) Supply forecast and competing energy

For the supplier side, how energy that they produce will compete with other energy is important. For example, there is much of competing energy for power generation but for hydraulic and geothermal energy, the energy source must exist and wind and sunlight basically exist everywhere but it must be consumed near the energy source. Oil and natural gas compete with each other in terms of the price but if you consider the aspect of transportation, the combination of the production area and consuming area is relatively free for oil but for natural gas, pipeline transportation is the main method and the infrastructure for LNG transportation is expensive; therefore, the relationship between the production area and consuming area is restricted to some extent. Coal's restrictions on the aspect of transportation is the same as that of oil but the competitive relationship between coal and oil has been almost broken off. If there is no competition, energy will be maximally supplied to match demand.

Other than the above, the intended purposes having large consumption are for industry, transportation, and household use; oil, natural gas, and coal compete with each other in these intended purposes. In particular, oil and natural gas has the competing elements in all intended purposes and if natural gas consumption increases, new transportation routes will be established and it is believed that restrictions on the aspect of transportation of natural gas will become less. Therefore, these three kinds of energy will be increasingly dependent not only on domestic demand but also on the moves of international demand and the supply-demand balance will be determined. And for the evaluation of the cost competitiveness for the occasion, superiority or inferiority is going to have to be evaluated not just between competing energy but by including the difference in quality and difference in logistics costs within the same energy.

Appendix: Report of the Field Study in Europe

- Schedule: January 18-20, 2016
- Destinations: London and Paris

I. Effects of the Crude Oil Price Drop

1. With regard to the effects of the crude oil price drop, we discussed how the effects of the Middle Eastern oil-producing countries would change in the future, what they thought was going to happen to the natural gas trade in Asia, and the possibility of a deceleration of the Japanese energy industry's structural reform. With regard to these, there were opinions; the Middle Eastern oil-producing countries' cost competitiveness is still superior, and although the importance as suppliers will not change, as long as the monoculture system is maintained, their vulnerable structure of their economy being significantly dependent on the oil price will continue and remain unchanged; in regard to the natural gas trade in Asia, if the oil price-linked LNG developments decelerates, the future tight supply-demand balance is likely to occur; and in regard to the Japanese energy industry's reform, although there is an area of uncertainty, it is a fact that uncertainty of demand has been growing and the existing electric power/gas companies may face a significant change.

2. It was indicated that because the oil price dropped, oil-producing countries/economies increased production to secure export revenues, and as a result, the oversupply situation worsened, which led to a further oil price drop. There was an opinion that for thinking about energy problems, the crude oil price has been the focus of discussions, but actually, the importance of the crude oil price will gradually decrease. It was also indicated that when thinking about the actual demand, we should think about what is happening with product retail prices, particularly in recent years, because the movements of the abolition of fuel subsidies have been observed in emerging countries/economies, and it is likely that demand in emerging countries will slow down more than ever.

II. Crude Oil Price Forecast

1. With regard to the short-term oil price forecast, there were many forecasts that

although it will slightly pick up in the second half of 2016, it will still take time for a full-scale recovery (up to around \$70/bbl).

2. With regard to the current situation, in addition to the fact that the supply-demand balance is very loose as inventory levels in advanced countries/economies have reached record-high levels, the fact that Iran will start supplying has significantly affected the oil price drop since the beginning of the year. In addition, many shale oil wells have already been drilled yet production has not begun, which in some ways will produce an effect that is the same as inventories.

3. The current international oil market has been trying to find the bottom price, and according to the technical analysis, it is believed to be around \$20–\$25/bbl. It will be in 2017 when excess supply will be resolved.

4. With regard to crude oil exports from Iran, in order to make an appeal that they can now freely export and proceed with the future production increase, they need to make some space in their domestic storage facilities, so they may symbolically release additional cargoes into the market, but after that, they may not supply a large amount to the market.

5. On the other hand, the crude oil market has been structurally changing and the oil price cycle in the short term that we have seen will not necessarily be realized. In other words, it is necessary to keep in mind that structural changes have been occurring in the current crude oil market, such as the emergence of shale oil which has a high value of elasticity over the price and OPEC has practically suspended its function, etc. and if it is based on this opinion, the crude oil price will continue to be sluggish for a long period of time.

6. Other than the above, in the interviews with individual experts, there was a concerned opinion on the relationship between Saudi Arabia and Iran. The current conflict between these two countries has become a contributing factor in provoking the crude oil price drop and the contributing factor of geopolitical tension produced by the conflict between these two countries is significant. The breaking of diplomatic ties with Iran by Saudi Arabia forces the United States to test their loyalty, and if the United States cannot be firmly involved in this, the future situation in the Middle East will become more difficult.

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