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Energy Cooperation in Northeast Asia

A Study on the Oil Pipeline Construction in Northeast Asia

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Summary

Oil Demand and Supply Status in Northeast Asia

○ Northeast Asia economy, mainly including Korea, Japan and China, plays a crucial role in world economy, especially in oil use and trade.

○ Currently the main energy source is coal in Northeast Asia economy's energy use.

- Coal is the main fuel, its share in total energy use comes up to 43%, and the share of oil is 38%.
- The China's high share of coal in energy use, its share of coal is 62%, accounts for this high dependency on coal.
- In Korea and Japan, oil is the main energy source in total energy consumption, the oil share of Korea is 52%, and that of Japan 48%.
- Northeast Asia 3 countries are more dependent on oil than other economy blocks such as EU, NAFTA.
- Lack of diversified energy development makes the Northeast Asia economy be more dependent on oil.

○ Northeast Asia 3 countries consume about 1,297 ten thousand b/d in 2002, their share of world oil use is 17.1%, and they are the third largest consumer in world oil use, following 2,348 ten thousand b/d in NAFTA, 1,340 ten thousand b/d in EU.

- Northeast Asia economy imports oil about 987 ten thousand b/d, following 1,769 ten thousand b/d in Western Europe and 1,319 ten thousand b/d in NAFTA.

- China is the second oil consumer, Japan is the third, and Korea is the sixth oil consumer.

Problems in demand and Supply Structure in Northeast Asia

○ Although Northeast Asia Economy have a important role in world oil demand and supply, the structure of oil demand and supply in Northeast Asia is in the poor condition, comparing with other regions.

- The dependency on the Middle East for oil imports in Northeast Asia economy is 64.1%, especially for crude oil imports is 76.1%.
- Comparing with Western Europe or NAFTA, Northeast Asia economy have a remarkably high dependency on Middle East for oil import.

○ Northeast Asia economy is facing the many problems in oil supply cost and security for the high dependency on Middle East crude oil.

- Northeast Asia oil market is operating as supplier market, so Middle East crude oil supplies differentiate Northeast Asia oil market.
- Because of "East Asia Premium" which is ordinarily considered as $1/bbl, the price of crude oil in East Asia region is higher than any other regions.
- Since the political situation of Middle East still contains insecurity factors, it is possible that the tension in supply security or supply disruption like the second oil crisis from the Iranian Revolution will happen.

○ Also, there is a problem in oil transportation for high dependency on Middle East for crude oil.

○ Many Problems from Northeast Asia economy's high dependency on Middle East crude oil arise from the fact that there is no dominant crude oil supplies near Northeast Asia region.

○ Problems from Northeast Asia economy's high dependency on Middle East crude oil seem not to be solved in few years because of the China's fast oil use growth.

Potential Crude Oil Supply regions in Northeast Asia

○ To improve the current oil supply system of Northeast Asia Economy, large supply sources should be developed.

- Possible candidate areas near Northeast Asia region for that matter could be Southeast Asia, East Siberia, Sakhalin, or Central Asia.
- As mentioned before, potentials of Southeast Asia is known to be decreased while Russia and Central Asia are rising as new potentials.

○ East Siberia region, which covers geographically Baikal Lake to the Arctic Ocean for the north and south and Lena river to Enisei river for the east and west, is presumed to have oil reserves of 21.4 billion barrels and probably more.

- In the early 1930s, when the exploration of East Siberia began, most reserves in this area were known to be gas reserves, but, since 1969, after Yaraktinskoye field is found, other oil reserves have been actively developed such as Yurubcheno-Tokhomskaya field in 1982 and Kovyktinskoye field in 1987.
- Oil or Gas fields in East Siberia region are located mainly in three regions, which are Krasnoyarsk Krai(more than 12.2 billion barrels), Irkutsk Oblast(more than 1.7 billion barrels), and Sakha Republic(more than 2.4 billion barrels).

○ Sakhalin is a 950km long and about 100km wide island located in the southeast of Sea of Okhotsk. Sakhalin is one of the potential area for the future oil supply to Northeast Asia region.

- In many cases, reserves on the sea are actively exploited. Sakhalin can be divided into four sub-regions from Region I to Region IV, and specifically the regions I, II, III are being actively developed.
- At present, total reserves in Sakhalin I~III region is estimated to be 4.7 billon barrel of oil and 53 trillion cf of gas.

○ The Caspian sea is inland-sea near by five countries, namely, Azerbaijan, Iran, Kazakhstan, Russia, Turkmenistan. Large reserves located in those countries and the Caspian sea will be important oil/gas supply sources for the whole world besides Asia.

- The amount of reserved oil in the Caspian sea is 30 billion barrels and is presumed to be 260 billion barrels on top including possible reserves that can be exploited.

○ Northeast Asia countries already participated in exploiting these area. China have been developing oil resources in East Siberia and Central Asia since the middle of 1990s.

○ Japan, which has its long history in developing foreign resources, recently show interest in larger exploration activities.

○ Russia will use the resources in their East Siberia region to maximize their interest.

- Russia made clear that they would use their resources for their political reason as well as economic interest in their "Russia Energy Strategy 2020", which outlined Russian policy for the East Siberian Oil/Gas development and export.

- Russia is trying to tighten its relationships with Northeast Asia countries through East Siberian oil producing and exporting. Russia has interest in setting relationships with Northeast Asian countries by supplying oil resource.

Northeast Pipeline Route and Securing Oil Reserves in Russia

○ In the December of 2003, Transneft, which holds monopoly of oil pipelines in construction and management, internally decided the pipeline route for Northeast region and asked the government its review for that matter.

- The provisional route of Transneft is one that starts from Tayshet located northeast from Angarsk via Baikal lake northern area and the China-Russia border along East Siberia railroad finally to Nakhodka bounded by the Pacific ocean.
- The matter of connection of the route to Daqing in China, which might be branched from some place near the border, is not yet discussed with China. Russian government postponed its final decision due to the diplomatic aspect of this pipeline project.

○ Friction between China and Japan for the Russian pipeline route might be an typical example of competition among countries for securing Russian resources.

○ Two procedures should be taken before the Transneft route is finally confirmed. One is the technical verification from Federal Construction Committee, and the other is the permission from the Ministry of Natural Resource, Environmental Committee.

○ The oil source for Northeast pipeline with the transportation capacity of 50 million ton a year is planned to be supplied from reserves near Angarsk, and more oil, if necessary, will be supplied by additional exploration of East Siberia of The Far East region.

○ According to Transneft, which will operate the pipelines, the construction of pipelines will accelerate additional developments of oil resources, so securing oil reserves should not be the first consideration. In the long run, the amount of oil from East Siberia will be about 80 million ton a year, and such development will be completed in five years once started.

○ Transneft projects that necessary investment will amount to six billion dollars and will mostly be funded by Japan. However, such arrangement with Japan government is not completely settled yet.

○ Specific ways of funding from Japan, which will amounts to 5 billion dollars for the pipeline construction and 2 billion dollars for fields development/exploration, could be (1) commercial loan and cash repayment (2) repayment by reduction of pipeline fee (3) long-term loan and repayment on installment plan.

○ Due to the current problems such as the matter of cooperation between countries, the amount of oil reserves, and funding matter, Northeast pipeline project will take some time to be a clearly outlined project.

Economic Assessment of the Pipeline project

○ Transportation fee of pipeline is determined by dividing sum of operational cost, interest cost and depreciation cost and proper returns on investment by transportation quantity.

○ In this study, transportation fee of the East Siberia pipeline project is determined by

$$TC = \frac{\sum_{t=1}^{n}[(O_t + D_t + T_t + I_t + R_t)/(1+r)^t]}{\sum_{t=1}^{n}[(Q_t \cdot km)/(1+r)^t]}$$

- Where TC = transportation cost per barrel, O = operation cost, D = depreciation cost, T = tax, I = interest cost, R = the proper return on investment, r = the discount rate and Q = amount of transportation per km.

○ Assumptions in economic assessment of Caspian Sea pipeline project[4]are applied for estimation of investment cost in this study. Unit investment cost is assumed as :

- Pipeline investment cost : US $32,500/mile/inch
- Storage tank : $12/barrel
- Booster station : $1,000/HP, number of Booster station : 1unit/150km
- Monomooring : $10million/unit
- Unloading and measuring facilities : $250million

○ In this study, we examine the possible alternatives of Korea's crude oil imports by reviewing each pipeline route that China and Japan proposed each other.

○ In Daqing route, 3 alternatives are considered.

4) Ronald Soligo & Any Jaffe, "The Economics of Pipeline Routes: The Conundrum of Oil Exports from the Caspian Basin, 1998.

- First alternative is the plan to construct the pipeline to Daqing field, its annual transportation capacity is 600 thousand b/d. China consume the all the imported crude oil form Russia(Currently this case is under discussion in Yukos and CNPC).
- Second alternative is the plan to construct the pipeline additionally from Daqing field to Dliah. By the additional contruciton, Korea import 200 thousand b/d by sea(Demand of Daqing feild 600 thousand b/d, Dliah 200 thousand b/d).
- Third alternative is the plan that Korea import 200 thousand b/d from Daqing via North Korea(Demand of Daqing feild 600 thousand b/d, Dliah 200 thousand b/d). It is assumed that the existing pipeline is used for pipeline from Daqing field to North Korea border by repairing.

○ In Nakhodka route, 1 alternative is considered

- This alternative is the plan to construct pipeline of a million b/d transportation capacity to Nakhodka, then supply the crude oil to Korea, Japan, and so on. Korea import the crude oil of 200 thousand b/d(Currently this alternative is under discussion in Russia and Japan).

<Table 1> Assumption of pipeline project by alternatives

	Daqing route			Nakhodka route
	Daqing field	Dliah	via North Korea	
Distance	2,285	3,282	3,438	3,878
Daimeter(inch)	40	42	42,20	42
Transportation capacity	0.6 million b/d	1million b/d	1 million b/d	1 million b/d
storage tank(Mb/d)	upstream: 2.8 downstream : 2.8	upstream: 4.7 downstream: 4.7	upstream: 4.7 downstream: 4.7,2.8,1	upstream: 4.7 downstream: 4.7
Booster station	20	30	33	35
Monomooring	0	2	0	3
Import Volume of Korea	0	0.2 million b/d	0.2 million b/d	0.2 million b/d
Investment cost	$2.42 billion	$3.75 billion	$3.36 billion	$4.37 billion
Operation cost (30 years)	$2.31 billion	$3.66 billion	$4.46 billion	$4.49 billion

○ Daqing field :

- Crude oil transportation cost is $1.843/barrel in China-Russia border.
- Production cost of Crude oil is ordinarily $5-10/barrel in Russia.
- Production and transportation cost by pipeline connection in Russia area is about $7-10.

<Table 2> Pipeline transportation cost of Daqing field route

	$/barrel		$/ton	
Russia				
Angarsk	0.023		0.172	
Ulan-Ude	0.669		4.902	
Chita	1.327		9.724	
China-Russia border	1.843	1.843	13.510	13.510
China				
Daqing	0.928	0.928	6.800	6.800
Total cost		2.771		20.310

○ Dliah route:

- Crude oil transportation cost is $1.38/barrel in China-Russia border.
- Production and transportation cost of crude oil export of Russia is about $6-12.
- The transportation cost of Dliah route is lower than Daqing field route for economy of scale, which is resulting from the rising quantity of transport.
- If Korea imports crude oil from Russia via Dliah, total crude oil import cost is the sum of import price which is determined by Korea-Russia price negotiation(Russia-China border), transportation cost in China area, $1.89/barrel and Dliah-Korea transportation cost by sea.

<Table 3> Pipeline transportation cost of Dliah route

	$/barrel		$/ton	
Russia				
Angarsk	0.018		0.129	
Ulan-Ude	0.502		3.677	
Chita	0.994		7.289	
China-Russia border	1.382	1.382	10.127	10.127
China				
Daqing	0.788		5.777	
Dliah	1.890	1.890	13.857	13.857
Total cost		3.272		23.984

○ Via North Korea route :

- Crude oil transportation cost is $1.38/barrel in China-Russia border.
- If Korea imports crude oil from Russia via North Korea, total crude oil import cost is the sum of import price which is determined by Korea-Russia price negotiation(Russia-China border), transportation cost in China and North Korea area, $2.27/barrel(excluding transit fee of North Korea).

<Table 4> Pipeline transportation cost of via North Korea

	$/barrel		$/ton	
Russia				
Angarsk	0.018		0.129	
Ulan-Ude	0.502		3.677	
Chita	0.994		7.289	
China-Russi border	1.382	1.382	10.127	10.127
China				
Dliah	0.788		5.777	
N.Korea-China border	1.121	1.121	8.215	8.215
South--North border	1.149	1.149	10.405	10.405
Total cost		3.652		28.747

○ Nakhodka route:

- Total crude oil transportation cost is $2.98/barrel from Angarst to Nakhodka.
- Although Nakhodka route have a higher transportation cost than Daqing route in the aspect of Russia, it play a role in gaining many consumers(Korea, Japan, North America) or diversification of demand.
- Transportation cost from Nakhodka port to Northeast Asia countries including Korea is projected to be below $0.76/barrel.
- At present, crude oil transportation cost from Sakhalin II is $0.76/barrel and transportation cost from Middle East is about $1/barrel.

<Table 5> Pipeline transportation cost of Nakhodka route

	$/barrel		$/ton	
Russia				
Angarsk	0.014		0.105	
Tynda	1.359		9.961	
Urgai	1.650		12.091	
Khabarovsk	2.240		16.416	
Nakhodka	2.980		21.844	
Total cost		2.980		21.844

○ In case of Dliah route, which is under discussion between Yukos in Russia and CNPC in Chain, China wants to supply the crude oil for domestic oil refinery facility by connection of pipeline to Daqing field, which has shown the reduction in production.

○ Nakhodka pipeline route is the most economic for Korea

- In the economic aspect, Nakhodka pipeline route has no additional transportation cost by land for the transit of China or North Korea.

- Nakhodka route has no need of long run import contract in the aspect of demand and supply(currently spot market is more popular than long run contract in world crude oil market) and ensures the flexibility of imports.
- Korea bears only the transportation cost by sea from direct crude oil contract in Korea-Russia. Because we have no use of additional constructed pipeline in China or North Korea to import the crude oil from Russia, we can escape from long run facility utilization contract.

The Impact of the pipeline construction on Oil Markets

○ IF the newly rising potential supply region in Northeast Asia such as East Siberia in Russia is regularly developed, supplies oil to the Northeast Asia Economies, it is expected to have a substantial effect.

- First of all, if the supply of crude oil in this region is brisk, the current structure of crude oil supply which is mainly supplied by Middle East countries will be improved.

○ These newly supplies in Northeast Asia will contribute to the Northeast crude oil market activation.

- According to the utilization of purchasing system on the new crude oil supplies, Northeast oil markets have a possibility that may be changed over from the long-term contracts system which have already been used, into the spot transaction system which is contributing to the crude oil market activation.

The real constraints on the pipeline construction

○ Currently, the development of the oil resources of the East Siberia in Russia and Central Asia, where are good potential crude oil suppliers to Northeast Asia economies, have some constraints.

○ It needs large funds to develop East Siberia oil resource. The Russian experts expect that these investigations will require huge funds more than tens billion dollars to explore un-revealed region, thus Russian government estimates that it costs hundreds billion dollars to develop oil resource.

○ Russian government have not yet provided the overall policies on the development of oil resources in East Siberia.

○ Currently, it is suggested that the oil resource development in East Siberia may have a possibility of excess competition among the interests countries.

The participation plans for the pipeline projects

○ The interests countries need an active participation for the development of oil resource in this region because it will be expected considerable changes and benefits in the structure of oil balances in Northeast Asia region, if the potential suppliers in Northeast Asia region, such as East Siberia, begin supplying oil.

○ In relation with negotiations to take part in this region, the cooperation with the governments must be important, comparing with other regions.

○ Finally, it is also important to maintain close cooperations with related countries and companies on the participation process in this region.