APPLICATION OF KYOTO MECHANISMS TO THE NORTHEAST ASIAN ELECTRICITY GRID

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1. Introduction

1.1. Background: Moving Forwards to Common, but Differentiated Burden Sharing under the Climate Change Convention

Since the U.S. Bush administration took its position against the Kyoto Protocol, growing concerns for the facts behind and security of the United Nations Framework Convention on Climate Change (UNFCCC) have appeared on the horizon. However, this pessimistic mood will not stay long, once the global community pays attention to what the intention of the U.S. is. The U.S. never refused the Climate Change Convention (UNFCCC), but the Kyoto Protocol, which implies binding commitment of the developed nations, so-called countries listed in Annex I list of the Convention.

The Climate Change Convention has legal terms of common, but differentiated, burden sharing among the parties on greenhouse gas mitigation and emphasizes the leading role of the Annex I countries in policy & measure, national communication, and application of mechanisms. It is meant to promote technology transfer and capacity building under the Kyoto scheme. Apparently, it is based on environmental concerns. However, the fact is that all the parties are juggling carrots and sticks on the broad meaning of binding commitment. There are also increasing and diverse regional demands being made by developing countries, and those voices often reflect their own national and regional interests. Some of the interests are in conflict within negotiating groups of the parties, which delays consensus in the details of climate change negotiation. Therefore, there is no doubt that developing countries are frustrated with the future uncertainties of their own sustainable development under the changing climate. However, the role of the developing countries is important in the negotiation process because the responses of developing countries ultimately influence not only the tension between the two major negotiating powers, the EU and the Umbrellas, but also the balance in the greenhouse gas market. Furthermore, the heterogeneous composition of the non-Annex B member states adds more complexity to finding resolution of disputes on policy & measures, financial matters, capacity building, and mechanisms. Part of the disturbances in negotiation mainly reflects national interests and a myopic view on burden sharing in greenhouse gas emission reductions.

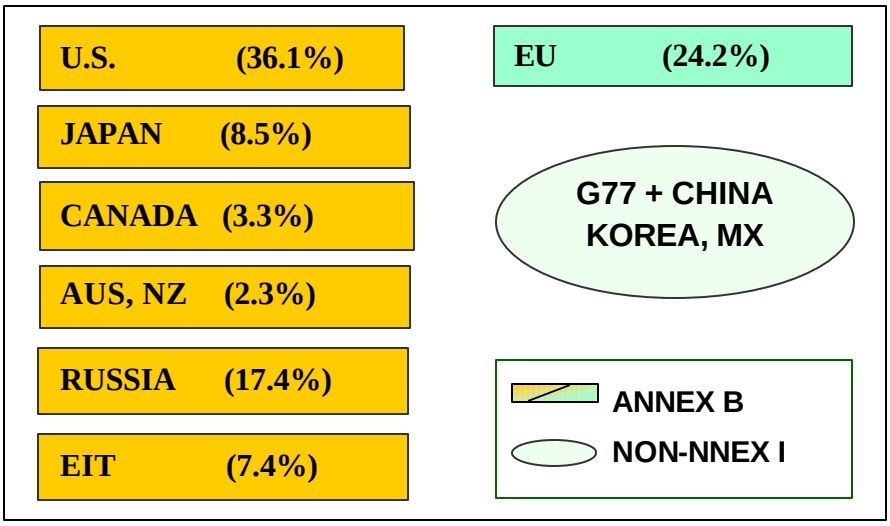
However, the good news is that Mr. Pronk's proposal is still alive on the negotiation table, and will be continued at the next COP/MOP. Therefore the future of the convention is dependent on the awareness of the urgency of the extraordinarily changing climate and the efforts of the parties to mitigate greenhouse gas emissions.

1.2. Position of Northeast Asia in Climate Change Negotiation

Among the obstacles to building consensus, major hurdles are mainly associated with necessary requirements for ratification. As it is shown in Figure 1, the umbrella group shares tension with the European Union, in particular, on the mechanisms, how to limit the use of mechanisms for binding commitment, how to define the liability on emissions trading, and so forth. However, the gap in views between fund providers and recipients is getting more serious and complicated. Furthermore, among the developing parties there exist diverse groups, which often delay the consensus building process.

Within the composition diagram of the parties, each member from Northeast Asia spreads out and takes a distinguished role in each negotiating group. Russia and Japan are major Annex B parties, while China, Mongolia, and the two Koreas are considered as the parties not ready to play for binding commitment. Even in the same Annex B group, Russia is expected to supply hot air in the greenhouse gas market, while Japan would wish to buy the offset credits including hot airs. Therefore, the objective functions for Russia and Japan could never be the same due to different constraints, such as marginal abatement costs, energy substitution, industrial structure, and economic growth. Furthermore, the Non-Annex B parities in Northeast Asia all have different characteristics of their own, and derive their own negotiating positions with respect to the climate change treaty.

<Figure 1> The Description of the Parties of the Conference[1]



Northeast Asia is the place that needs to ensure energy self-reliance and to increase economic growth. At the same time, this area is vulnerable to environmental detriments from fast growing economic activities. It is true that incoherent environmental policy has been a major obstacle to implementing advanced policy and measures in most developing countries. Therefore, curbing greenhouse gas emissions entails a financial burden to the nations, industries, and companies in this region. For policy efficiency, financial schemes should follow national climate policies. The pretext for development aid is another issue, so the global community should pay attention. Since capital stock has to be growing in developing countries in order to reduce the gap between GDP growth and carbon index, Northeast Asia needs to put a great deal of effort into legislation on climate policy with financial incentives.

1.3. Scope of the Study

[1] Parentheses in the figure represent the share of CO_2 emissions of each party for 1990 in the total CO_2 emissions for 1990 of Annex I. The Protocol shall enter into force on the ninetieth day after the date on which not fewer than 55 Parties to the Convention, incorporating Parties included in Annex I, which accounted in total for at least 55 percent of the total carbon dioxide emissions for 1990 of the Parties included in Annex I, have deposited their instruments of ratification, acceptance, approval, or accession.

As a member of the convention parties, the Northeast Asian community has the same "common, but differentiated" responsibility to convene along the theme of the convention with the rest of the world. The political issues are the first priority in this region, and have always exceeded the economic and social needs of the regional community due to geopolitical reasons. That is, the ground for building partnership has never been mature enough to link with economic cooperation among the members of the Northeast Asian regional community. With recognition of the fact that there exist vast economic and environmental asymmetries across the world, and the intrinsic instability of environmental agreements, an immature market environment is one of the huge obstacles in Northeast Asia. Furthermore, financing of the Northeast Asian electricity grid would be quite challenging due to high capital cost and various risks.

Therefore, this study intends to find financing mechanisms for the Northeast Asian power grid in the Kyoto Mechanisms, and mainly to focus on the following tasks:

1) to check the feasibility of application of the Kyoto mechanisms to the Northeast Asian power grid project

2) to identify the barriers and risks associated with implementation of the Kyoto mechanisms in Northeast Asia.

2. Application of the Kyoto Mechanisms to the Northeast Asian Grid

2.1. 3E(Economy, Energy, Emission) Status in Northeast Asia

To be certain, the Asian community consists of a wide range of negotiating parties. And large numbers of parties are not listed on the Annex B list. This community is very sensitive to insecure framing and adverse effects due to lack of regional governance for further economic and social development.

<Table 1> Status[2] of Northeast Asia in 3E (Economy, Electricity, Emission)

	GNP		Electricity		CO_2 Emissions		
	Billion $	%	Quad. BTU	Billion kWh	MtC	MtC/$1990	MtC/pop
China	1,130	7.5-8.0	31.8	1,178	668.7	0.72	0.53
Japan	4,800	1.5-2.0	21.7	1,018	306.6	0.09	2.4
S. Korea	406.7	8.2-10.0	7.4	221	107.5	0.25	2.3
N. Korea	21.8	6.2	1.5	32	33.4	1.7	1.5
Russia	593.4	3.2-5.0	26.0	772	400.1	1.1	2.7

Source: www.eia.doe.gov

Table 1 describes the status of the major Asian parties in terms of the three Es (3E): economy, energy, and greenhouse gas emissions. Over the last decade, the Chinese economy has boosted up with a growth rate of more than 8%. This economic growth has resulted in electricity consumption reaching 1,178 billion kWh, equal to 668.7 million tones of carbon. The climate characteristic of the Asian community is that the carbon intensity is relatively high reflecting high dependence on fossil fuel in primary energy demand and electricity generation. With the lack of energy infrastructure and ground for economic cooperation among the Asian parties, the regional imbalance between energy demand and supply hurts the level of sustainable development, which is far behind Europe and North America. In this regard, the political stance of the two Koreas

[2] Data shown in Table 1 represents those estimated for 1999.

became critical to the harshness of the region-wide network project. In detail, the political stances of the two Koreas have never helped any economic, energy, or environmental cooperation. Therefore, this special region needs great care when it comes to capacity building with strong governance such as setting sustainable development priority, policy & measure, and institutional framework.

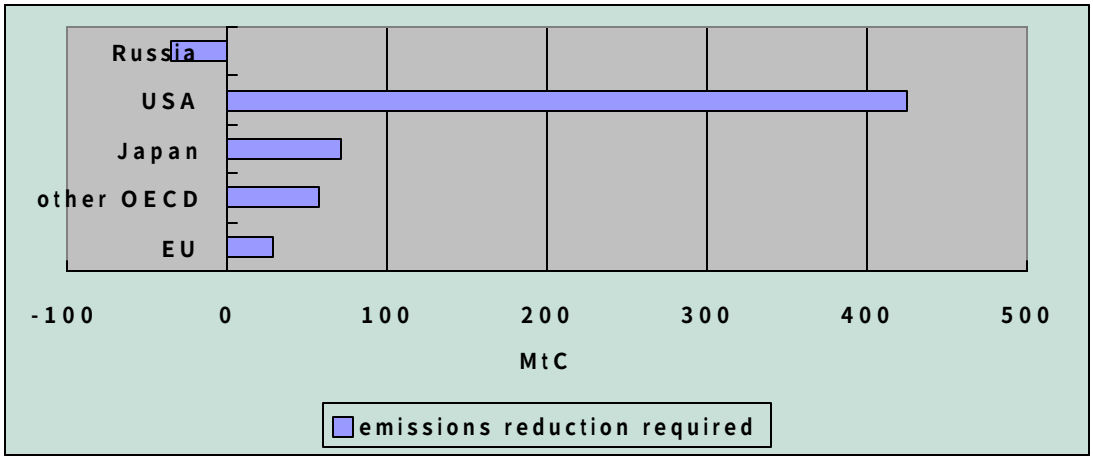
2.2. Potentials of Offsets in the Northeast Asian Energy Market

The greenhouse gas offset market is more likely a buyer's market, so that market exists as long as someone needs cheaper credits than domestic abatement costs. According to an OECD study, G-Cube, the Clean Development Mechanism (CDM) cost per credit is presumed to be $13 to $26/tC. This is based on the cost including sunk offsets; therefore, cost contributed solely to energy related projects is expected to be above $20/tC. However, in reality, the abatement cost varies project by project, so that it is hard to be determined as a single numerical value. In one of the previous studies on the CDM and JI, Zhang (1999) articulated the impacts of the abatement cost on the size of each market player. From his summary of National Communication, the U.S., the biggest CO_2-emitter, will have more than 400MtC to be reduced from the BAU projection in 2010 (Figure 2). However, the abatement costs Zhang used are far from realistic.

Under this uncertainty, it would be better to derive the maximum level of the whole offset credits (project-based credits), rather than distinguish individual mechanisms. And the fungibility will be mostly likely be supported by a large number of market participants in the long-term, so that the integrated size of offsets would represent the pure meaning of potential flexible mechanisms. However, there should be an assumption regarding the criteria for decision-making on the selection of mechanism. The following assumptions are required: costs for JI and IET are lower than CDM, and a player with higher demand for credits has bigger possibility to have transactions in the mechanisms. According to these assumptions, the maximum size of offsets by major players (Russia, the U.S., Japan, the OECD other than USA[3] and Japan, and the European Union) under three scenarios based on the results beyond the 14th Subsidiary Body are as shown in Figure 3.

[3] In long run, the late participation of the U.S. is expected in both Kyoto and Non-Kyoto type of greenhouse markets. Therefore, this study counts the U.S. as a significant role player in the greenhouse offset market.

<Figure 2> Emission Reductions Required for Major Players in 2010

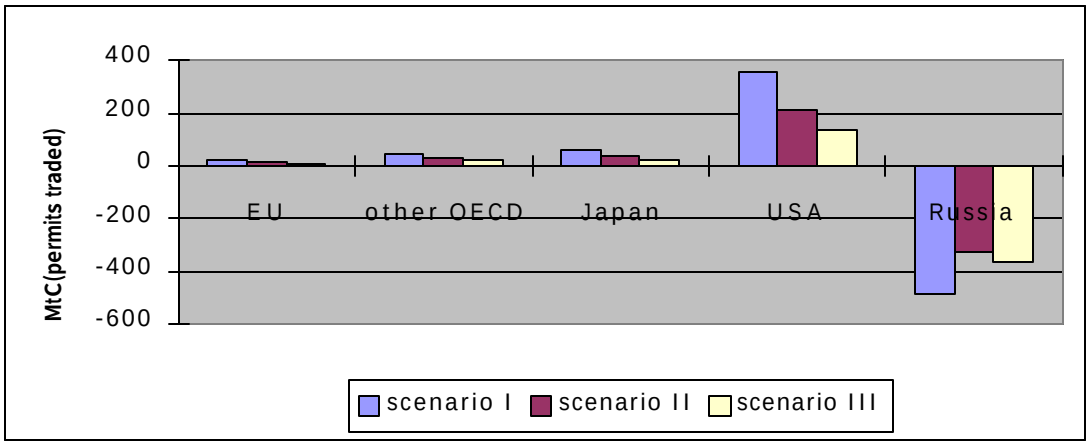


source: Zhang (1999)

Scenario I assumes no limits on participation and supplementarity of the Kyoto Mechanisms, with hot air allowed. Scenario II includes the possibility of 50% limits on supplementarity, with Annex B countries the only participants in emissions trading, and no contribution of hot air. Scenario III represents transaction costs on CDM trades set at $30 per tonne with same assumptions as Scenario II. Preliminary study of offsets in major players is shown in Figure 3. As a primary result of this, at least 300MtC of offsets can be generated in Northeast Asia if hot air is not allowed with restricted domestic programs.

According to Vrolijk (2000), it is estimated that at least 14 MtC of offsets can be generated annually from new gas distribution by the Irkutsk pipeline in Northeast Asia, based on a current observation of the size of reserves (32 Bcm/year).

<Figure 3> Size of Greenhouse Gas Offset Credits Tradable by Major Players in 2010



However, the recent withdrawal by the Bush administration from the Kyoto commitment discourages market expansion in the short-term. Thus, the offset market, including a second market, will be shrink by at least one-third of the total expected from the study above in the first commitment period, as long as the U.S. stays out of the ratification of the Kyoto Protocol. For the same reason, the greenhouse gas offset projects in Northeast Asia will get less motivation from reduced demand of a smaller group of Annex B countries (without U.S. participation).

2.3. Applications of the Kyoto Mechanisms in the Northeast Asian Power Grid

The Kyoto Mechanisms are proposed for cost-effective greenhouse gas reductions. Applications of the Kyoto protocol in the Northeast Asian power grid will provide following benefits:

1) Increase in the load factor or energy efficiency of the current power facilities by eliminating old power plants with high carbon intensities

2) Promoting switching from high-carbon to lower-carbon intensity fuels

Among the Kyoto Mechanisms, clean development mechanisms and joint implementation are meant to provide capacity building and technology transfer through the mechanisms. The clean development mechanism encourages host countries (Non-Annex B countries) to demand sustainable development priorities of the investing countries (Annex B countries), while the benefits of joint implementation remain within Annex B countries.

The potentials in CDM type offsets seem to be huge in Northeast Asia because this region is relatively high in carbon intensity. In addition, an emissions trading scheme is expected to be a cost-effective way to mitigate greenhouse gas emissions and to be a means to provide the fundamental synergies required for market based mechanisms in this region.

The fundamental requirements for implication of the Kyoto Protocol on Northeast Asian energy and environmental policy are critical. Those fundamentals are as follows:

1) Capacity building for sustainable development with priorities in economic development

2) Energy-environment policy integration by internalising externalities,

3) Cost-effective reduction through market instruments, incentives to promote voluntary commitment with financial incentives, and technology transfer under the Kyoto frame.

2.3.1. Mapping the Feasibility of CDM in Northeast Asia

With consideration of the fundamentals for implementation of project type of Kyoto Mechanisms, the following are the necessary steps to proceed with the CDM approach to Northeast Asia, as described as in Figure 4. The system it may envisage requires identification of the project, baseline study, additionality assessment, validation, monitoring, verification, and certification.

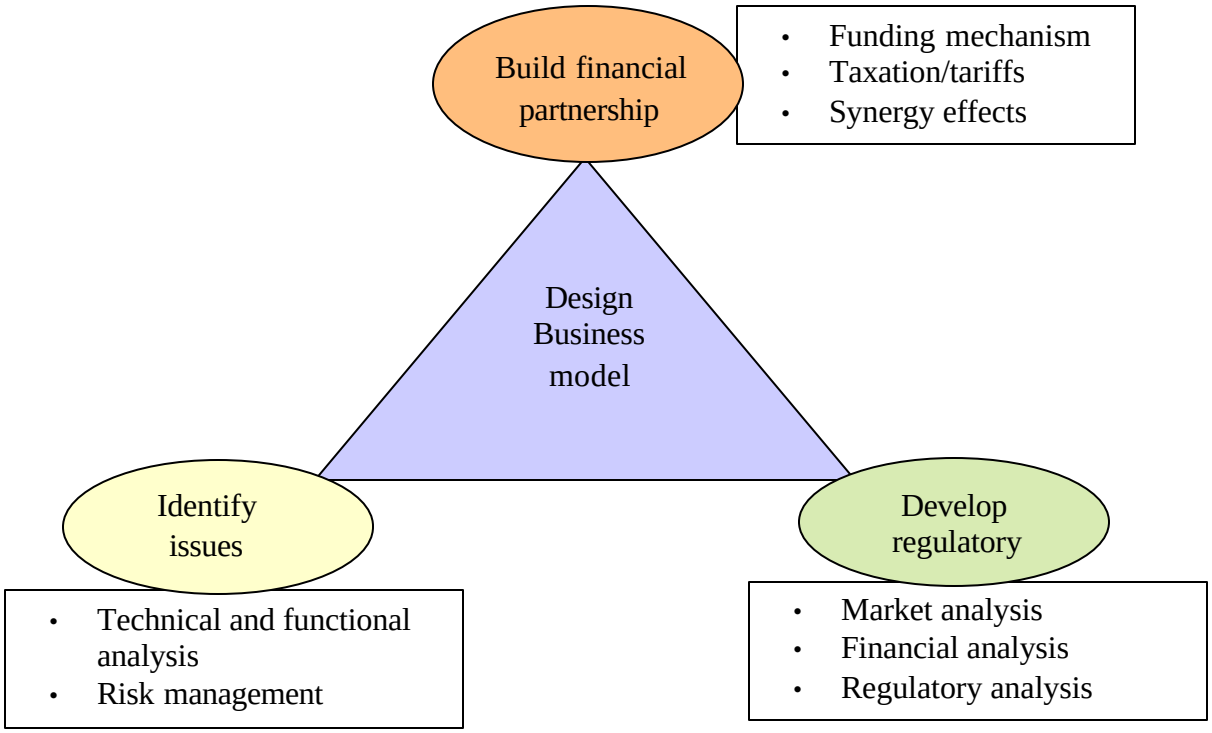
Project design starts with identification of the project with conducting feasibility. A baseline study is a necessary step to figure the potential environmental and economic benefits and costs, which are often called additionalities. If the outcomes of the baseline study are shown to be positive and to attract investors, it is time to discuss how to finance the project. At this stage, the project developers contact banks, potential investors, and national CDM agencies under government authorization. The host government should assure that the project meets the demands of its own sustainable development priorities before approval.

The validation process follows, with baseline/additionality approval by independent third parties authorized by CDM Executive Board. This validation ensures adequate monitoring provisions with public commitment. This will track the project performance during operation. Project operators keep records regarding additionality, and this data should be open to the public to ensure transparency. Then, independent third party assessors must verify the additionalities, especially the quantity of emissions reductions achieved by the project. After this verification process, the emissions reductions are ready to be converted to Certified Emissions Reductions (CERs) by CDM Executive Board approval through registration.

The Northeast Power grid project can adopt the Clean Development Mechanism funding structure partially or fully and consider the offset credits as a joint product with electricity. The flow of resources and technology transfer under the CDM need to be monitored by a third party. Sustainable development priorities in Northeast Asia will be one of the hot issues, since the community comprises heterogeneous member countries. However, this can be less complicated if the project manager divides the power grid project into several small projects covering short distances. In this case, monitoring and auditing additionality become simpler and the needs of the local communities within the narrowed-down boundaries will be definitely much easier to fulfill due to the relatively homogeneous characteristics of short distance power grids. In addition, a bundle of several small projects more easily meet the necessary conditions for "small-scale project for prompt start"[4] than one big project.

[4] In Pronk's text, small-scale projects are urged to proceed for prompt start of CDM.

<Figure 4> Clean Development Mechanism Type of Project Design



In the case of Northeast Asia, it is theoretically possible to calculate the baseline based on rates, tCO_2/GWh, as suggested in various studies. However, it is difficult at this moment to aggregate the data into one figure due to missing data in non-OECD member countries in Northeast Asia. Therefore, this study limits the work scope only to qualitative analysis and leaves the quantitative work for a future study.

Baseline determination

Compared to energy efficiency project or sequestration project, a utility type CDM project is, in general, amenable to the application of a multi-project baseline. However, a fixed baseline would be riskier than changing-over-time baseline for areas like Northeast Asia because of market immaturity, an unstable economy, and the political situation. Therefore, an inflated baseline approach would be more feasible than a static baseline approach, especially in an emerging market. The timing of baseline updates is critical; therefore, periodically updating electricity multi-project baselines would be desirable. Since technical, economic, financial, and crediting lifetimes are all

different, it is hard to set one baseline figure for one project. Usually the economic lifetime of power plants varies depending on their maintenance. However, based on the literature, it is reasonable to specify a crediting lifetime for utilities of around 10 to 15 years. This is much shorter than any other lifetime, but this time frame is most likely to be defined with certainty.

Additionality

There are two distinguished additionalities necessary to CDM monitoring, reporting, verification, and CER tracking.

1) Financial additionality: the funding for CDM projects should be additional to ODA.

2) Environmental additionality: local level of awareness of sustainable development is a key

The Northeast Asian power grid project can be a candidate for project-type Kyoto mechanisms as long as it satisfies financial and environmental additionality constraints. The following are the results of the simulation assuming that a new power plant is designed as a CCGT gas plant with OECD average conversion efficiency (52.9%) and load factor (0.75). Table 2 represents the expected offset potentials in a conservative way based on simulation using data on neighboring countries with baseline data currently available.

In the case of a power grid connecting East Siberia and China, it would generate about 19MtC when 15 years is assumed for crediting lifetime. The most politically challenging project, connecting Far-east Russia to Seoul through North Korea is expected to generate offset credits of around 18MtC over its crediting lifetime. However, the reality will be totally dependent on which fuel-type of power plants will be up to the accessibility of natural gas and the decisions made by the Russian and North Korean governments, although the gas reserve is abundant enough to meet the demand. Therefore, the feasibility should consider the linkage with a natural gas pipeline project and national policies and measures of Russia and North Korea. In this sense, KEDO will play an important role in implementing sustainability in this special region.

In contrast, the Sakhalin project would generate fewer offset credits (around 11MtC) due to the relatively high baseline of Japan. But this project is the most feasible of the Northeast Asian power grid candidates. The reason is that this area has infrastructure, skilled labor, and technology-holding investors. This will certainly ease the financing even at a corporate level. Therefore, project financing, as well as Joint Implementation, is a worthy way to try for funding.

<Table 2> Characteristics of Potential Northeast Power Projects by Region

Section	Characteristics			Type
	Distance	Capacity	Offset potential (MtC/year)	
East Siberia-China	3500km	3.5GW	0.6-1.7	Multilateral CDM
Far-east Russia-North Korea-South Korea	1100km	4GW	0.8-1.9	Multilateral CDM
Sakhalin-Japan	470km	4GW	0.7-1.5	Joint Implementation

These simulation results do not reflect the distinction between baselines for green field and refurbishment projects. Therefore, further study is needed to provide practical definition of additionality for decision on CDM application to power grid projects in Northeast Asia.

Credit allocation

This gigantic power grid project would engender disputes over who takes the largest slice of the pie of the additional benefits of the project. Investors in power grid projects may consider natural gas a reliable option only if the natural gas pipelines pass through the geographical boundaries of a project. That implies a CDM project using natural gas as fuel for power plants cannot proceed without natural gas infrastructure. Therefore, pipeline investors may find it possible to claim the credits for greenhouse gas offsets. However, this will be dependent on timing: which comes first, the pipeline project or the power grid project. If a pipeline already exists in the region, only power plant investors would take in charge of the whole design for CDM. On the other hand, if there is no existing gas pipeline, then the project manager would consider natural gas as one of the options to establish a power grid, and both sides, investors in the power grid project and investors in the gas pipeline, would have the right to claim the additional credits from the baseline status.

In this project, it would be wise to design the power grid with consideration of linkages with a natural gas pipeline project. This will ultimately save the economic and financial burdens for investors.

2.3.2. Mapping the Feasibility of the Emissions Trading Scheme in Northeast Asia

The positive consequences of the emissions trading scheme in NEA are expected as follows:

1) Cost-effective reductions: Emissions trading is considered a tool for high energy-intensity industry to achieve cost-effective reductions. Through the experience with trading platforms, the goal of regional sustainable energy use would be achieved with less change in domestic industrial structure.

2) Private sector involvement: This policy tool is meant to drive private sector participation with economic and financial incentives.

3) Policy efficiency through integration of energy and environmental markets

Although the bright side of emissions trading, the emissions trading scheme in Northeast Asia is the most challenging policy option in Northeast Asia in the short term due to the current lack of software and hardware to support such kinds of market mechanism. Even energy commodity trading and an electricity pool do not exist in Northeast Asia.

Through the capacity building of Non-Annex B, policy development would lead the market player to the trading platform in the long-term. An energy pool needs to be developed in advance of emissions trading. In this sense, the Northeast Asian power grid would provide the fundamental requirements for an electricity pool. Then, experience and lessons learned from electricity trading can be extended to implementation of emissions trading in Northeast Asia with a solid compliance scheme.

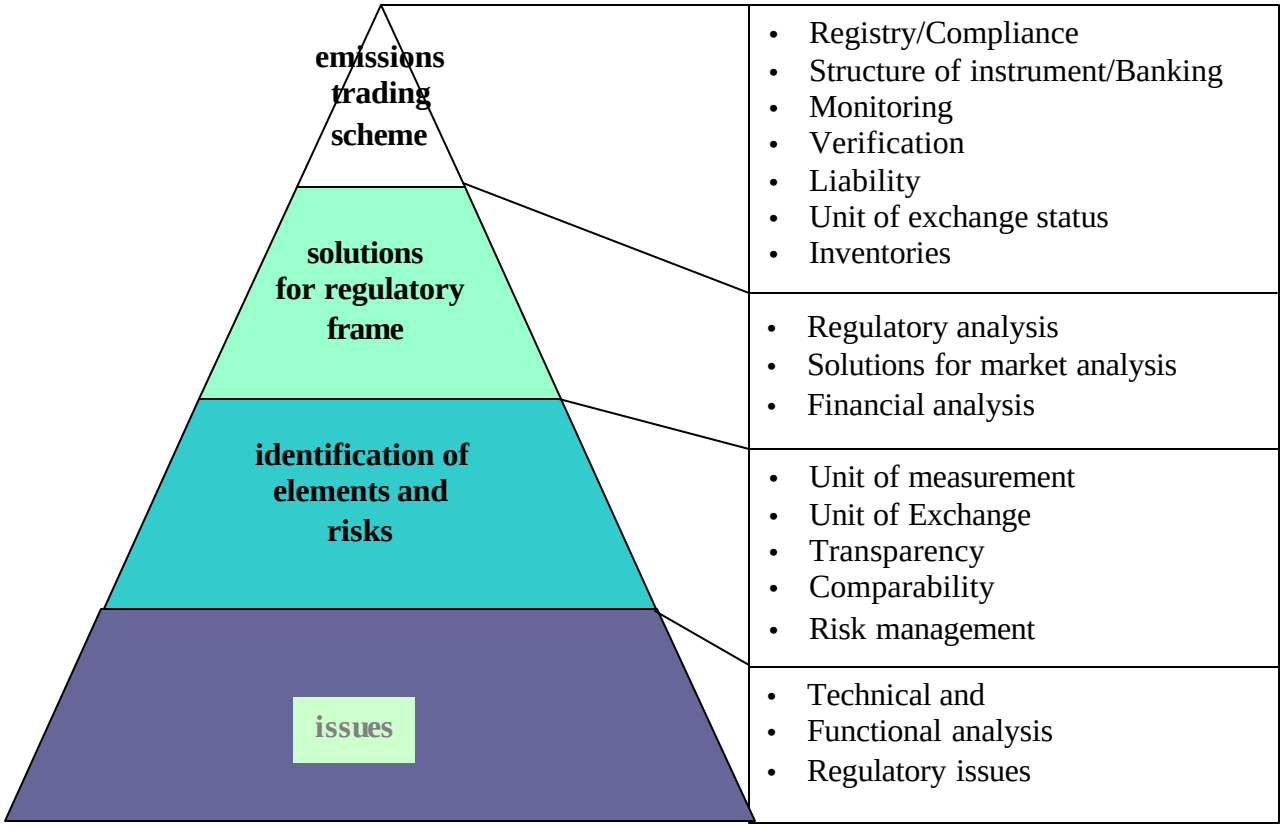
In order to implement emissions trading, policy makers should pay attention to critical issues involved with trading transactions and deal flow with identification of primary business and financial risks. The next step will be a rule setting on the trading scheme in Northeast Asia. Compared to other regions, Northeast Asia possess serious country/political risks and uncertainties involved with trading schemes due to emerging characteristics of this region. Therefore, decision-making on liability would be critical to secure the trading scheme. Seller's liability would be more practical and secure in long-term commitments. A compliance regime needs to be

developed in terms of ensuring the market itself and policy effectiveness. Each market participant is required to build a credible inventory with third party validation.

As seen in EU-wide and national emissions trading schemes, emissions trading is operated on a voluntary basis and is then expanded to sectors that the policy maker intends to cover. But the Northeast Asian case may face difficulties in expanding with legally binding compliance due to lack of governance.

However, this attempt to implement an emissions trading market in Northeast Asia will accelerate to pervade the market mechanisms in regional environmental policy, as this region suffers from transboundary acid rain and dust problems. To build a broader emissions trading platform linked with an electricity trade, the pilot stage of emissions trading would be beneficial to market players through learning-by-doing. However, credit allocation within the emissions trading scheme will take time and effort until it is settled down in terms of compatibility of emissions trading with other policy tools such as carbon tax, subsidies, and voluntary commitment in countries located in Northeast Asia. Unlike the European Union, there is no directive or court for justice to restrict economic activities and resolve disputes in Northeast Asia. Therefore, the efforts to build a foundation should be initiated before looking for market opportunities.

<Figure 5> Emissions Trading and Its Risk Management



In Northeast Asian-wide emissions trading, CERs will take important roles in terms of ensuring market security as well as market liquidity. Once CERs are verified, these credits are relatively safer than AAUs or other offset credits beyond the Kyoto framework. The market players will tend to hold credible credits in early stages of emissions trading in order to minimize the noncompliance risks.

3. Risks Identification and Management

The typical hurdles, i.e., regulatory, legal, technical, and market risks, to implementing the Kyoto type of policy tools are expected in the Northeast Asian electricity grid, just as they are found in any other regional project. Most risks associated with Northeast Asia occur mostly from the huge gaps in political backgrounds of market players. Therefore, the role of the public sector is important in policy and market efficiency. However, the main drivers of risk management tools are the private sectors. Furthermore, the development efforts of financial risk management

institutions (such as insurance) absorbing the gaps among the regional member countries are highly recommended.

Risks associated with the CDM type of project and emissions trading in Northeast Asia are sovereign/political risk and business risk, such as convertibility risk. Multilateral CDM commitments may face convertibility risks, which will hinder agreements to convert emission reductions into valid compliance units. . Lack of governance would generate sovereign risk that host governments renege on their agreements for convertibility.

As many long-term energy plans are often accounted as BAU projects, some energy projects may fail to obtain certification. In this case, the offsets will remain as offset credits without CDM certification, but eligible to be traded in the second market or national/regional market. Insurance tools will be necessary to take care of the losses in case of not-certified situations.

Risk management for implementation of emission trading and CDM in Northeast Asia includes:

1) Financial risk management: insurance/reinsurance, derivatives, and risk transfer mechanisms are the key tools.

2) Portfolio management: diversification of projects would minimize the risks. In order to formulate stable portfolios, value and profit under the worst case should be considered for assessment.

In addition, project managers should pay attention to prioritisation of risk management and transfer tools. It will be safe to obtain feedback from third parties. In this sense, legal definitions and the nature of the tradable/transferable credits are the most important due diligence to make agreements among governments in order to ensure cross-border compliance.

4. Building Partnership: Financing Structure with/without the Kyoto Frame

Funding options for the Northeast Asian electricity grid within and beyond the Kyoto framework include the following:

1) Conventional financing mechanisms

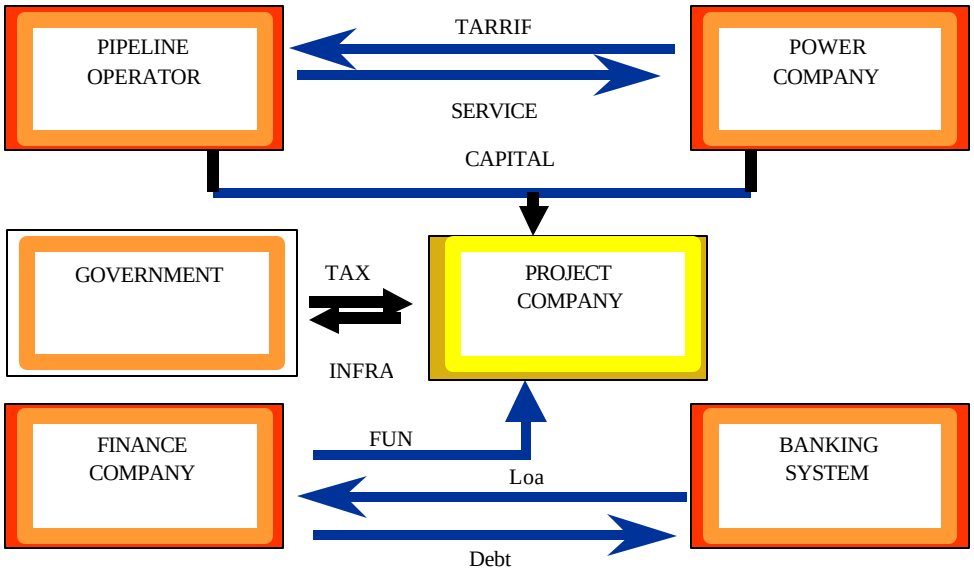
- Financing options for the Northeast Asian power grid beyond the Kyoto framework include formulating conventional financing mechanisms such as co-financing by the IFC climate program, the World Bank and ADB, and project financing.

- Project financing is used as a means of funding major projects off the balance sheet. A Special Purpose Vehicle (SPV)—an independent legal entity formed of consortium shareholders who may be investors or have other interests in the project (such as contractor or operator—can play the necessary roles in economic and financing commitments. Therefore, project financing will definitely promote private participation.

- In this regard, the proposal for establishment of the Northeast Asian Development Bank (so called) is meaningful to add an additional financial stream specializing in regional economic development in Northeast Asia.

- In addition, links with the natural gas pipeline grid would lessen financial burdens, as guarantees among gas suppliers, pipeline operators, and power companies will reduce business risks. However, this financial mechanism may require high transaction costs due to many stakeholders involved (Figure 6).

<Figure 6> Flow of Project Financing



2) Special climate change fund, fund for least developed countries, and adaptation fund

- Utilizing UNFCCC and Kyoto Protocol resources, an adaptation fund (2% of CERs generated according to new proposal by Mr. Pronk) is available. This fund can be used to build capacity in Northeast Asia with establishment of a policy and regulatory framework for inventory, monitoring, and emissions trading tools.

- The Kyoto framework urges prompt start of projects such as small-scale power projects in accordance with the Clean Development Mechanism. The Chairman's text limits these small-scale projects to projects under 5MW for energy efficiency and 15MW for renewable energy. Also, it restrains development of nuclear power under the Kyoto Mechanisms.

- According to the Chairman's text, CDM in least developed countries is promoted with financial and economic incentives. That is, investing parties that implement projects in least developed countries are waived from climate tax (resource). Therefore, power grid projects would generate additional benefits for investors when the additional power grid is extended to Mongolia or North Korea, which are least developed countries in Northeast Asia.

3) Bilateral arrangements for CDM with private sector involvement

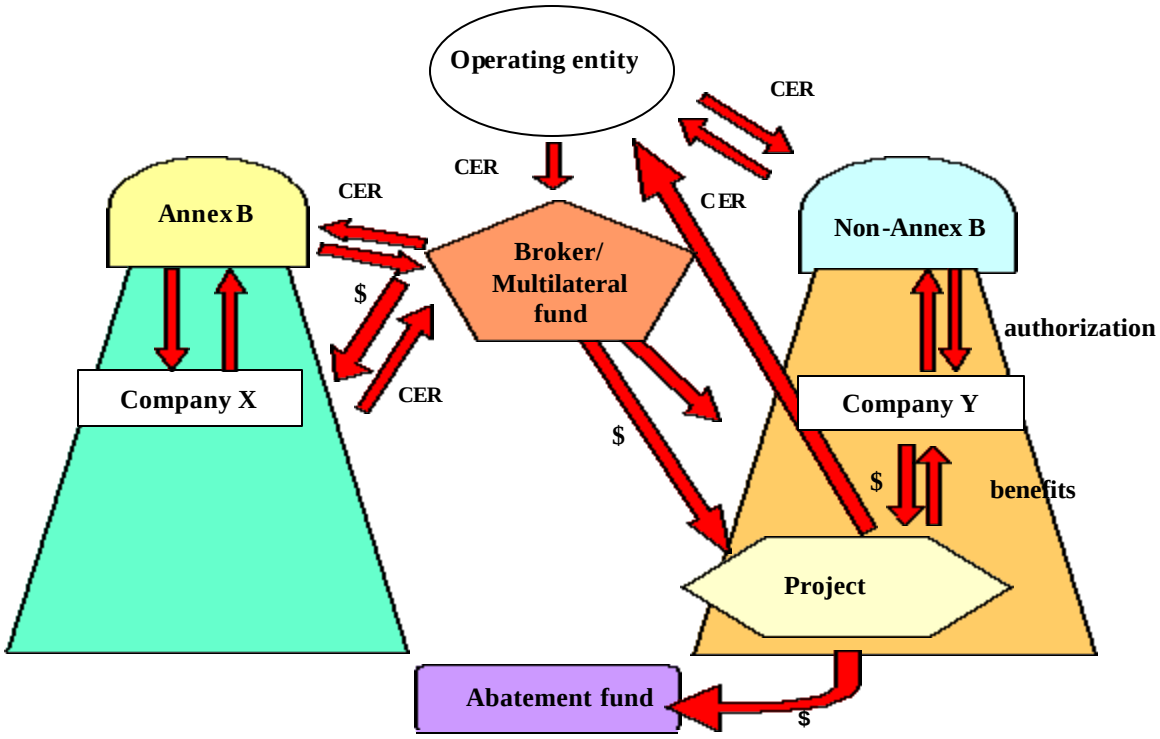
- Typical bilateral arrangements for CDM can be made in Northeast Asia. However, the project boundaries will be limited to within a country or local area which is part of the Northeast Asian power grid and can be funded under bilateral CDM commitments.

- Therefore, bilateral commitments depend on business structure.

4) Multilateral commitments with participation of legal entities:

- To establish and to run carbon funds: a broad range of carbon funds will enhance the greenhouse gas market liquidity. In order to make this happen, full-scale fungibility and banking of the offset credits should be guaranteed. In addition, this kind of carbon fund (mutual fund-like in financial market) would provide opportunities to venture on projects unfamiliar to investors. Therefore, this carbon fund will attract conservative investors who wish to diversify their portfolios (i.e. large scale-energy companies or legal entities who have high pressure to reduce domestic emissions).

<Figure 7> Multilateral Clean Development Mechanism



Source: ETC Energy

- To coordinate south-south-north commitments for CDM crediting: with consideration of the large Non-Annex I population in Northeast Asia, south-south-north partnerships will generate positive synergies such as employment, infrastructure, and capacity building on policy and regulatory frameworks in energy and climate policy. To promote the participation of legal entities, legal and fiscal foundations are required to lessen the risks in advance.

The economic and financial gains from CDM commitments for financing the Northeast Asian power grid would be limited by the Kyoto rules to be completed in detail in 2002. In order to ease financing, cross-border issues such as taxation, subsidies, and regulatory gaps between different countries require resolution.

The mission of electricity networking in Northeast Asia is a long-term task to create synergies harmonizing economic, financial, and environmental schemes. A great deal of effort by the regional community on building consensus will be catalysts of concrete business partnerships in Northeast Asia. Therefore, the regional pool of experts in economy, electricity, and environment (3E) will be a gear to achieve the mission of building a sound electricity grid in Northeast Asia in the near future.

5. Conclusions and Recommendations

As the International Energy Agency (IEA) predicted, the electricity sector will grow significantly, especially in non-OECD member countries. And world CO_2 emissions from the electricity sector account for over one-third of world annual energy-related CO_2 emissions, with 2.7 per cent of annual growth between 1995 and 2020. With over half of the world total polulation, the energy consumption of the three major Northeast Asian members, China, Korea, and Japan, cover only 28.9% of the world total. Electricity is even worse, only remaining as 22.6% of world total. However, the predicted energy shortage will become a reality due to the high energy growth rate. In particular, the recent fast growing economy of China will face energy scarcity despite its own huge undiscovered endownment. This implies that future capital expenditures on new power facilities in Non-Annex B member countries will be expanded and that the Clean Developement Mechanism would be part of the financing.

This study explores various barriers to implementation of Kyoto mechanisms in the Northeast Asian electricity grid: lack of market experience, imbalance between supply and demand within the greenhouse gas market, high transaction costs caused by government-oriented processes, and risks associated with different fiscal and legal systems limiting the positive consequences of the electricity networking in this region. Therefore, efforts offering market liquidity, a cross border regulatory framework, and governance should be initiated and sustained by the member countries of this region.

The barriers associated with application of the Kyoto mechanisms to the Northeast Asian power grid are as follows.

1) Lack of environmental market experience: most, virtually all, of the member countries in Northeast Asia are not familiar with environmental markets, because their environmental regulations are under governmental control. Even in energy markets, privatization and deregulation have not yet been fully completed. This kind of circumstance limits the chance for individuals supposed-to-be market players to get experience in both energy and environmental markets. Furthermore, this governemnt-oriented system would take more administration and transaction costs through the whole CDM process than a market oriented system. It is true that a government-oriented environment often distracts investors from implementation of the CDM-type project in many developing countries.

2) Imbalance between supply and demand in energy and greenhouse gas markets: unlike the European Union, Northeast Asia consists of various types of energy users. China's high energy growth rate will force that country to face difficulties in meeting the domestic energy demand due to a fast growing economy. Although China has its own energy resources, it will take a decade to be ready to feed the economy. On the other hand, Russia has excess supply in far east Siberia, which is accessible right now. In order to stablize the high demand in China and excess supply in Russia, energy pooling is necessary. In this sense, a power grid will definitely accelerate the speed of energy market liberalization and eventully will offer the ground for a regional greenhouse gas trading platform. However, this greenhouse gas trading platform is expected to perform poorly, as market liquidity will not be sufficient due to market concentration.

3) Risks associated with different fiscal and legal systems: especially in Northeast Asia there had been few comercial commitments before Russia and China opened their markets along with their cold war moods. Unfortunately, many foreign investors experienced expropriation resulting from misunderstanding of local fiscal and legal systems. This area is not the exception; it even happened often due to language barriers. Therefore, the gap between expectations and outcomes were changed into the worst scenarios.

4) Policy efficiency vs. Market efficiency: policy makers in Northeast Asia have been seriously working on domestic policy designs based on their own sustainable economic development priorities. It is predictable that the time for implementing homogenous fiscal systems will come someday, not soon, as few countries have achieved market maturity in Northeast Asia. Therefore, the decision-making on regional/global policy efficiency may not always result in market efficiency in the short time period. However, the efforts to learn process will lead the sophisticated market players familiar with market mechanisms and complying with global climate policy.

Recognition of the barriers and considertion of a realistic definition of baseline and additionality, it is found in this study that the Northeast Asian power grid project will contribute a large portion to greenhouse gas mitigation, as well as economic development and energy security, regardless of links with the Kyoto mechanisms.

This study suggests the followings recommendations to the potential policy makers and market players in Northeast Asia:

1) Kyoto mechanisms are meant to reduce economic and financial burdens for greenhouse gas emissions reduction. However, immature market behavior would be harmful to local or national economies, as well as hurting market liquidity. Therefore, the policy makers in developing countries should pay attention to the comparability of market mechanisms with existing policy.

2) Building partnerships between south and north with local experts involved will be a catalyst to ease the financial burdens of this challenging project.

3) Ensuring governance with domestic and regional legal foundations along with an international framework is the most momentous fundamental required to move forward with sustainable development in Northeast Asia.

Future study will extend the discussion on the business structure of the power grid projects and will include quantitative comparisons between multi-project baseline and national/regional specific baseline with different variables, such as load factor, for possible power grid projects in Northeast Asia.

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