

GTI Energy Cooperation Programme in Northeast Asia

CAPACITY BUILDING TRAINING PROJECT ON ENERGY: POLICIES AND PROSPECTS
FOR REGIONAL ENERGY COOPERATION

Regional Report



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FOR REGIONAL ENERGY COOPERATION**

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Regional Report is prepared as part of GTI “Capacity Building Training Project on Energy: Policies and Prospects for Regional Energy Cooperation” by Dr. Ryu Ji Chul.

The Study has been carried out to assess general situation, bottlenecks and potential areas and projects for energy cooperation in Northeast Asia and in the Greater Tumen Region in 2015 in accordance with the decisions of GTI Consultative Commission and GTI Energy Board. The set of Study Reports consists of four individual country reports: China, Mongolia, ROK and Russia: and Regional Report. The Study results and conclusions served as basis for development of joint agenda in energy cooperation by GTI.

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Abbreviation Glossary

ACE	ASEAN Centre for Energy
ACUT	Agreement on Coal Use and Trade
ADB	Asian Development Bank
AEBF	ASEAN Energy Business Forum
AERN	ASEAN Energy Regulators' Network
AGCC	ASEAN Gas Consultative Council
AIMS	ASEAN Interconnection Master Plan
AMEM	ASEAN Ministers on Energy Meeting
APAEC	ASEAN Plan of Action for Energy Cooperation
APEC	Asia-Pacific Economic Cooperation
APERC	Asia Pacific Energy Research Centre
APP-CDC	Asia-Pacific Partnership on Clean Development and Climate
APSA	ASEAN Petroleum Security Agreement
ASCOPE	ASEAN Council on Petroleum
ASEAN + 3	Association of Southeast Asian Nations + China, Japan and the Republic of Korea
ASEM	Asia-Europe Meeting
ASG	Asian Super Grid Initiative
Bcm	Billion cubic meter
BOO	Build, own, operate basis
CBM	Coal Bed Methane
CCTV	Closed circuit television
CDM	Clean Development Mechanism
CES	Central Energy System
CFB	Circulating Fluidized Bed
CFBC	Circulating Fluidized Bed Combustion
CHP	Combine Heat Power
CNOOC	China National Offshore Oil Corporation
CNPC	China National Petroleum Corporation
CO ₂	Carbon dioxide
COM	Conference of Ministers
COMESA	Common Market for Eastern and Southern Africa
DB.	Database
DPRK	Democratic People's Republic of Korea
DRC	Democratic Republic of Congo
E&P	Exploration and Production
EA	Energy Authority
EAP	GTI Energy Action Plan
EAPP	Eastern Africa Power Pool
EAS	East Asia Summit

EBN	EWG Business Network
EC	European Commission
ECNEA	Intergovernmental Collaborative Mechanism on Energy Cooperation in North-East Asia
ECPA	Energy and Climate Partnership of the Americas
ECT	Energy Charter Treaty
EE&C-SSN	Energy Efficiency and Conservation Sub-Sector Network
EES	Eastern Energy System
EIAG	Energy Industry Advisory Groups
EPGG	Energy Policy Governing Group
ERA	Energy Regulatory Authority
ERDC	Energy Research and Development Center, now Energy Authority, Mongolia
ERI, NDRC	Energy Research Institute, National Development and Reform Commission, China
ESCAP	United Nations Economic and Social Commission on Asia and the Pacific
ESCAP SRO- ENEA	Economic and Social Committee for Asia and Pacific Sub-Regional for East and North East Asia
ESI SB RAS	Energy Systems Institute, Siberian Branch of the Russian Academy of Sciences
ESPO	Eastern Siberia - Pacific Ocean
ETITF	Task Forces on Energy Trade and Investment
EU	European Union
EUR	European currency unit EURO
EWG	Energy Working Group
FDI	Foreign Direct Investment
GBD	Government – Business Dialogues
GECF	Gas Exporting Countries Forum
GEF	GTI Energy Forum
GHG	Greenhouse Gases
GTI	Greater Tumen Initiative
GTR	Greater Tumen Region
HAPUA	Heads of ASEAN Power Utilities/Authorities
HPP	Hydropower plant
IA	Implementing Agency
IAEA	International Atomic Energy Agency
IDB	Inter-American Development Bank
IEA	International Energy Agency
IEF	International Energy Forum
IGCC	Integrated Coal Gasification and Combined Cycle
IGMOU	Inter-Governmental Memorandum of Understanding
IPO	Initial Public Offering
IRENA	International Renewable Energy Agency

IrOC	Irkutsk Oil Company, Russian Federation
JBIC	Japan Bank for International Cooperation
JI	Joint implementation
JICA	Japan International Cooperation Agency
JODI	Joint Oil Data Initiative
JOGMEC	Japan Oil, Gas and Metals National Corporation
KEEI	Korea Energy Economics Institute
KEPCO	Korea Electricity Power Corporation
KNOC	Korea National Oil Corporation
KOGAS	Korea Gas Corporation
kV	kilo-volt
kWh,	kilo-watt-hour
LNG	liquefied natural gas
LOI	letter of intent
MFE	Ministry of Fuel and Energy, now MMRE
MMRE	Ministry of Mineral Resources and Energy, Mongolia
MNT	Mongolian Togrog
MOTIE	Ministry of Trade, Industry and Energy Republic of Korea
MOU	Memorandum of Understanding
MW	Megawatt
NAEF	Northeast Asia Economic Forum,
NAGPF	North-East Asia Gas and Pipeline Forum
NDRC	National Development and Reform Commission
NEA	Northeast Asia
NEAEF	North-East Asia Economic Forum
NEC-SSN	Nuclear Energy Cooperation Sub-Sector Network
OAS\	Organization of American States
OLADE	Latin America Energy Organization
OPEC	Organization of Petroleum Exporting Countries
OT	Oyu Tolgoi (Copper mining)
PNG	Pipeline natural gas
PPA	Power Purchase Agreement
PRC	People's Republic of China
PSC	Production-sharing contract
PV	Photovoltaic
RE-SSN	Renewable Energy Sub-Sector Network
RESP	Renewable Energy Support Program
ROK	Republic of Korea
SAP	GTI Strategic Action Plan
SAPP	Southern Africa Power Pool
SCO	Shanghai Cooperation Organization

SIEG	Shanxi International Energy Group
SOC	Senior Officials Committee
SOM	Senior Officials Meeting
SOME	ASEAN Senior Officials Meeting on Energy
SPR	Strategic petroleum reserve
TAGP	Trans-ASEAN Gas Pipeline
Tcf	Trillion cubic feet
toe	Tons oil equivalent
TOR	Terms of Reference
TRADP	Tumen River Area Development Programme
TT	Tavan Tolgoi (Coal mining)
UGSS	United Gas Supply System
UHV	Ultra High Voltage
UNDP	United Nations Development Programme
UNEP	United Nations Environment Program.
US	United States
USA	United States of America
USD	US Dollar
USSR.	Union of Soviet Socialist Republics
WANO	World Association of Nuclear Operators Association
WB	World Bank
WES	Western Energy System
WG	Working group
WG-C	Working Group on Coal
WG-EPP	Working Group on Energy Planning and Policy

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Executive Summary

Project Overview

Objective of the Study

The objective of this Study is to develop the GTI Energy Cooperation Programme in Northeast Asia (NEA) to;

- build a common ground in understanding the potential of regional energy cooperation, issues of mutual concerns and the other countries' perception of the challenges to energy collaboration,
- formulate common approaches and prioritize the areas and sectors of mutual interests to pursue energy cooperation under the GTI framework
- identify and profile possible projects to be initiated under the GTI umbrella in the near-term, including the design of the training programs for policy makers,
- develop measures to enable the effective implementation of the GTI energy activities and obtain proper financial support to this end.

Structure of the Report

- Energy Profiles in NEA
- Review on Energy Cooperation in NEA
- Survey on Regional Energy Cooperation in Other Region: Implication for NEA
- Strategy for Promoting Regional Energy Cooperation in NEA
- Frame and Structure of the GTI Energy Cooperation Programme

Energy Profiles in NEA

Energy Demand Growth

Total energy demand in NEA significantly increased about two times over the last two decades from 2,125.7 million toe in 1990 to 4,041.8 million toe in 2012, notably led by China.

Energy Supply

NEA is in deficit in terms of energy supply-demand balances. Russia is the only country in the region currently showing self-sufficient energy supply-demand structure. Due to the scarcity of indigenous energy resources, Republic of Korea and Japan highly depended on imports from overseas in energy supply, and in China, the incremental energy demand increases were largely met by imports. Current major supply sources for these energy importing countries are outside of the region.

Fuel Mix Changes

Structural change in energy mix also was an important aspect occurred in the countries in NEA. The share of coal in total primary energy supply generally has decreased, while those of natural gas, nuclear and renewable energy have increased due to fuel diversification and energy security reasons as well as increasing environmental concerns in the NEA countries.

Regional Energy Cooperation in NEA

Opportunity

Regional energy cooperation projects in NEA can be divided into roughly four categories:

- Enhancing cooperation in upstream, midstream, and downstream for the oil, gas, coal and electricity sectors, including constructing cross-border energy supply infrastructure,
- Cooperation for energy conservation/efficiency improvement and renewable energy,
- Cooperation for nuclear power generation safety, and
- Promoting policy cooperation at the multilateral level

Energy Resource & Infrastructure Development

There are energy development projects implemented within the framework of regional cooperation in the NEA region for coal, oil, natural gas, and power.

- Coal: Tavan Tolgoi coal mines in Mongolia; DPRK–China cooperation for coal mine development in DPRK; Development of coal mines in East Siberia and the Russian Far East region,
- Oil: Oil development in Eastern Siberia, Sakha Republic (Yakutia), and in the shelf of the Sakhalin Island in Russia; Eastern Siberia-Pacific Ocean (ESPO) pipeline with a branch pipeline to China (Daqing); Oil development in Mongolia in collaboration with China; Strong bilateral cooperation between China and Russia; Oil development in DPRK in collaboration with Mongolia; Cooperation for strategic petroleum stockpiling between China and ROK
- Natural gas: Russia's UGSS Eastern Program; Strong bilateral China-Russia gas cooperation; Russia – DPRK – ROK natural gas pipeline project; Gas plant construction cooperation between ROK and China
- Power interconnection: Power Interconnection between Russia and China; Power Interconnection in Mongolia with Russia and China; Russia's Initiatives for Power interconnection Projects in NEA; Gobitec and Asian Super Grid *initiatives*.

Energy Cooperation under the Multilateral Mechanisms in NEA

Recognizing the necessity for creating an institutional cooperation mechanism at the multilateral level in the NEA region, the countries in NEA began to stride towards the establishment of the regional cooperative body in NEA since the mid 1990's. Those efforts include;

- The Greater Tumen Initiative: an intergovernmental cooperation mechanism, supported by the United Nations Development Programme with membership of four countries: China, Mongolia, Republic of Korea and Russian Federation, created in 1995,
- Intergovernmental Collaborative Mechanism on Energy Cooperation in North-East Asia (ECNEA): Created in 2005 with membership of four countries, DPRK, Republic of Korea (ROK), Mongolia and Russia and China with a observer status.
- Tripartite Consultation Mechanism between China, Mongolia and Russia

Lesson from Other Region's Experiences

- Strong leadership in initiating the creation of regional energy cooperation body
- Enhancing mutual understanding
- Creation of an institutionalized multilateral mechanism
- Realization of energy cooperation at the multilateral basis by identification of cooperative projects at the practical and regional level

Strategy for Promoting Regional Energy Cooperation in NEA

Main Goal for Regional Energy Cooperation in NEA

- Enhancing Energy Security
- Development of energy trade infrastructures in NEA
- Contribute to the establishment of peace mechanism in NEA

- Eliminating the Asian Price Premium
- Establishing a Regional Common Energy Market
- Enhancing Complementarities among the Countries through Energy Cooperation
- Harmonization of Energy Standards

Major Obstacles in Energy Cooperation with Countries in NEA

- High capital requirement and lack of infrastructure,
- Project uncertainty,
- Lack of market compatibility and of multilateral mechanism for regional energy cooperation,
- Intensified Competition for Energy Security, and
- Conflict between multilateral versus bilateral relationships

Roadmaps towards for multilateral energy cooperation in NEA

The short term agenda, to be implemented urgently as soft policy agenda in non-binding manners, include:

- Establishment of policy dialogues channel between governments in the NEA region for creating confidence building environment
- Promotion of information/data exchange and sharing mechanisms
- Joint research/study with identification of possible cooperative energy projects: Natural gas pipelines, power interconnection, oil stockpiling
- Capacity building projects for developing countries in the region
- Encourage energy expert/business dialogues & participation
- Assistance to/cooperation with the DPRK for resolution of energy shortage problem

The long term agenda, which require a consensus as well as more preparatory joint efforts between the countries in NEA, include:

- Creation of institutionalized frameworks for multilateral regional energy cooperation by enacting a treaty, charter or regional energy community at the regional basis
- Introduction of policy coordination functions with the established institutional arrangement
- Development of joint policy agenda for common goals/task sharing
- Reliance an domestic energy financing mechanisms

Frame and Structure of the GTI Energy Cooperation Programme

Develop the GTI Energy Board as an effective cooperative mechanism

The priority areas under this approach may include the followings:

- Introduction of policy dialogues into the Energy Board meeting to enhance mutual understanding among the NEA countries
- Inclusion of DPRK and Japan – nonmember countries of the GTI, as observers/guests in the Energy Board Meeting and encourage their active participation in the GTI energy cooperation activities.
- Creation of working groups with targeted objectives and tasks, as necessary, under the Energy Board
- Development and facilitation of research activity for themes of common interests in the NEA countries.
- Feasibility study of creating a mechanism and conducting the GTI Energy Ministerial Meetings *plus* creation of the institutionalized legal framework for regional energy cooperation in NEA, such as the GTI Energy Cooperation Declaration, the NEA Energy Charter, or the GTI Energy Agreement.
- Connect the GTI energy cooperation activity with other GTI activities, i.e., transportation and financing, in views of their relevance to the energy sector issues in NEA, and also with other international organization, i.e., the UNESCAP and the ADB.

Create a cooperation network through the establishment of a regional Energy Forum

The priority areas under this approach may include the followings:

- Create the GTI Energy Forum as policy-business dialogue forum under the Energy Board to enlarge and encourage the business and expert participations.
- Creation of the Energy Industry Advisory Groups (EIAG), as necessary, under the Energy Board to foster energy cooperation at the industrial levels, namely, oil & gas, coal, power industry, renewable energy and energy conservation.
 - Major industrial companies will be allowed to commit the financial contribution to the relevant GTI activities.
- Creation of the NEA Research Consortium (Multilateral institution) or the NEA Energy Research Institute Network to conduct consultation research projects regarding the challenges and business opportunities in energy cooperation in NEA.

Promote human capacity building on energy

Capacity building projects need to be identified through a selection process. Energy-related institutes and agencies may be selected based on their need and potential for contribution to regional energy cooperation.

- Identify institutions and agencies involved in energy cooperation and their capacity-building needs regarding energy market development and policy design/planning
- Conduct training, workshops, study tours, etc. for personnel dealing with various aspects of energy cooperation (technical, economic and financial, legal, political, social, and other aspects)
 - Expert workshop to identify regional cooperation agenda for energy developments and trades among the countries in NEA –coal, natural gas, and power interconnection
 - Expert workshop to improve/develop the methodology and energy statistics and outlook in developing countries in NEA
 - Expert workshop to enhance research capability for economic analysis for the proposed energy cooperative projects in NEA
 - Expert workshop to improve/develop the measures for energy conservation, efficiency improvement and renewable energy sources.

Support transparency in the institutional environment to reduce non-physical barriers

Strengthening regional institutions at the policy and technical level, exchange information, develop congruous grid codes and operation procedures, would contribute to the reduction of non-physical barriers and facilitate regional energy cooperation.

- Creation of the ‘Energy Transit Security Dialogue’ mechanism under the GTI energy Board at the *ad hoc* basis;
- Study on ways to reduce the barriers, but to increase trade and investment in the energy sector, especially for energy interconnection with business sector participation.
- Study other issues on cross-border trade such as taxation and tariff, regulatory and legal frameworks, institutional and contractual arrangement for energy trade.

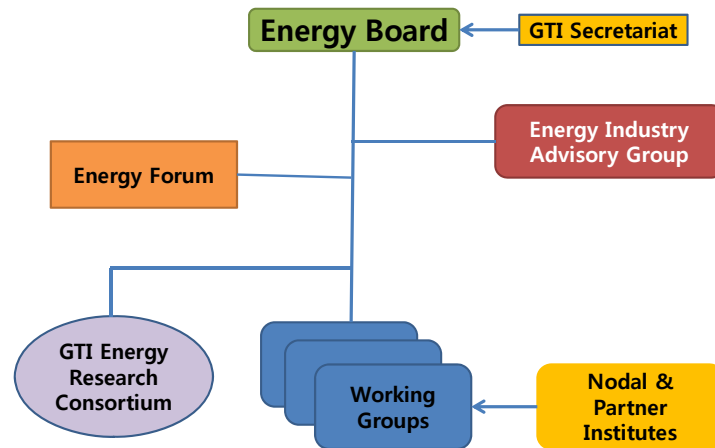
Develop a GTR region-specific database

- Creating the GTR Energy Project Directory with the coverage of the upstream, midstream and downstream industry projects for oil, natural gas, coal, electricity and renewable energy where appropriate.
- Creating a common database (DB) of energy balance tables and time series data for the countries in the GTR, including non-member countries, DPRK and Japan, where appropriate

Design of Implementation Structure

The structure for implementing the GTI regional energy cooperation in the GTR can be designed as shown in the figure;

[Figure] GTI Energy Cooperation Implementation Structure



Chapter 1. Introduction

1.1 Background

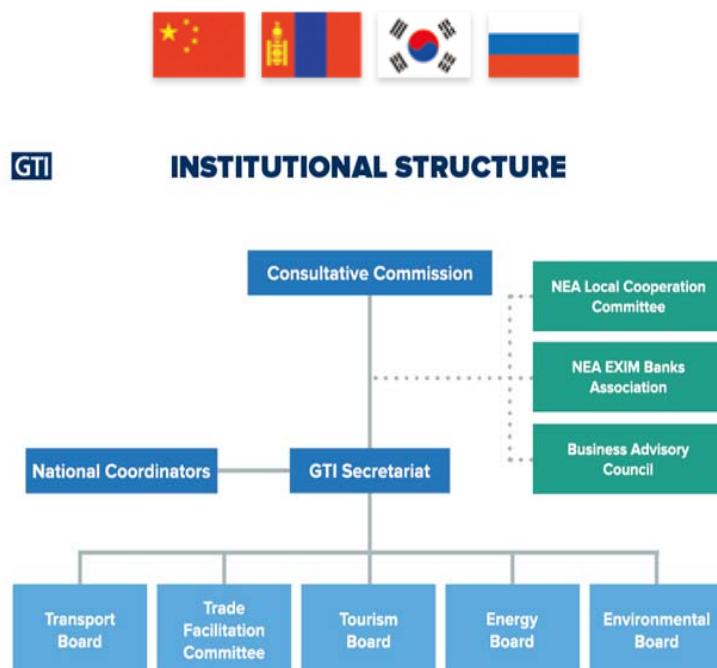
The 13th Greater Tumen Initiative Consultative Commission Meeting, held in October 2012 in Vladivostok, Russia, adopted the ‘**GTI Strategy Action Plan for the years 2012 – 2015**’. According to this Plan, the GTI will take the following approaches to realize cooperation in the energy sector:

- Develop the GTI Energy Board as an effective cooperative mechanism for coordinating energy policies in the region;
- Create a cooperation network among governments, the private sector, think tanks, financial institutions, etc. through the establishment of a regional Energy Forum;
- Promote human capacity building on energy through the organization of education and training programmes, joint studies and workshops;
- Support transparency in the institutional environment to reduce non-physical barriers; and
- Develop a GTR region-specific database on energy resources, and supply and demand to share information among regional stakeholders.

The Great Tumen Initiative (GTI) and Energy Board

The Greater Tumen Initiative (GTI) is an intergovernmental cooperation mechanism among four countries: China, Mongolia, Republic of Korea and Russian Federation, supported by the United Nations Development Programme (UNDP). In 1995, GTI member governments signed agreements to establish this mechanism, aimed at strengthening economic and technical cooperation, and attaining greater growth and sustainable development in Northeast Asia (NEA) and specially the Greater Tumen Region (GTR), which includes China's three Northeast provinces and Inner Mongolia, three eastern provinces of Mongolia, the eastern ports of ROK and the Primorsky Territory of Russia.

[Figure 1] GTI Member and Institutional Structure



[Figure 2] The Greater Tumen Region (GTR)



Energy is taken as one of the GTI's priority areas for regional cooperation among the member countries. The GTI Energy Board was established in 2009 to address regional energy issues on a policy and strategy basis while also including private sector expertise and resources. The following objectives have been identified for cooperation in the energy sector:

- Enhance energy policy coordination and cooperation;
- Reduce non-physical barriers for energy trade and investment in the GTR; and
- Promote exchange of information on energy among GTI member countries.

Source: The GTI homepage, <http://www.tumenprogram.org/>

At the Second Meeting of the GTI Energy Board, held in May 2013 in Vladivostok, Russia, the '**GTI Energy Action Plan for 2013-2014**' was adopted (See for details in the Appendix: GTI Energy Action Plan for 2013 – 2014). The project implemented for the energy sector under the GTI includes the '**Capacity Building Training on Energy: Policies and Prospects for Regional Energy Cooperation**'. The objective of this project is

- to strengthen the capacity of national policy makers to promote regional energy cooperation in Northeast (NEA) by improving awareness and deepening knowledge on the areas of common interests, complimentary policy priorities and possible mutually beneficial activities at the regional level.

For the implementation of this project, the Terms of Reference (TOR) was developed by the GTI Secretariat in cooperation with the GTI National Coordinators and Energy Board members. The TOR includes the following two activities for the outputs to be delivered upon the completion of the GTI Capacity Building Training project;

- *National Reports on Energy Cooperation in NEA is to*
 - describe the national energy status and its energy program and plan,
 - elucidate present national commitments towards energy cooperation in NEA through both bilateral and multilateral frameworks,

- identify and articulate the national perception of the various issues and obstacles hindering the energy cooperation in the region,
 - provide options and guidelines from the national perspective on how to overcome the barriers and
 - properly address the issues pertaining to the energy cooperation in NEA,
 - highlight from the national perspective the areas and sectors to be the near-term focus for pursuing energy cooperation in NEA, in particular that in the multilateral format.
- *GTI Energy Cooperation Program in NEA* is to
 - build a common ground in understanding the potential of regional energy cooperation, issues of mutual concerns and the other countries' perception of the challenges to energy collaboration,
 - formulate common approaches and prioritize the areas and sectors of mutual interests to pursue energy cooperation under the GTI framework
 - identify and profile possible projects to be initiated under the GTI umbrella in the near-term, including the design of the training programs for policy makers,
 - develop measures to enable the effective implementation of the GTI energy activities and obtain proper financial support to this end.

1.2 Objective of the Study

Following the recommendation from the GTI Energy Action Plan for 2013 – 2014 and also as defined by the TOR, the objectives of this Study is to develop the 'GTI Energy Cooperation Programme in Northeast Asia'.

In order to achieve this objective, this Study will identify further steps for the GTI to enhance regional energy cooperation in the GTR by designing the frame and structure of regional energy cooperation programmes within the GTI framework and also by developing necessary tasks to implement at the multilateral level in future.

1.3 Methodology for the Study

Methodology for undertaking this Study includes policy survey, statistical analysis, desk research, and consultation with the National Consultants of the GTI members, namely China, Mongolia, ROK and Russia and also with the GTI Secretariat through expert workshops to share and discuss preliminary and final outcomes, etc.

This report was prepared by an International Consultant from ROK, being based on the compilation of the drafts of National Reports of China, Mongolia, ROK and Russia submitted by the National Consultants from the GTI member countries in November 2014 and was finalized after the reviews from the National Consultants.

1.4 Structure of the Report

This report consists of seven chapters including this Introduction Chapter. Chapter 2 reviews on energy profiles in NEA, and Chapter 3 on energy cooperation in NEA for the existing projects. In Chapter 4, regional energy cooperation experiences in other regions are surveyed. In Chapter 5, strategy to facilitate regional energy cooperation in NEA will be addressed, and in Chapter 6, policy recommendation for frame and structure of the GTI energy cooperation programme will be presented. This report will be completed by a conclusion in Chapter 7.

APPENDIX: The GTI Energy Action Plan for 2013-2014

Second Meeting of the GTI Energy Board

28th May 2013,
FEFU Campus on Russky Island, Vladivostok, Russia

The GTI Energy Action Plan for 2013-2014

1. Background

The *GTI Strategic Action Plan (SAP)* for 2012-2015 adopted at the 13th meeting of GTI Consultative Commission on 10 October 2012 in Vladivostok, Russia, defined the strategic objective in the energy sector as follows:

"The GTI seeks to establish an institutional framework for consultations and policy support in the energy sector at government level for member countries. This framework should provide the opportunity for a full exchange of information among member governments and the private sector and lay the basis for reducing or removing non-physical barriers to energy trade in the Greater Tumen Region (GTR)".

The SAP identified the objectives in the energy sector as follows:

- Enhance energy policy coordination and cooperation;
- Reduce non-physical barriers for energy trade and investment in the GTR; and
- Promote exchange of information on energy among member countries.

The GTI will take the following approaches to realize cooperation in the energy sector:

- Develop the GTI Energy Board as an effective cooperative mechanism for coordinating energy policies in the region;
- Create a cooperation network among governments, the private sector, think tanks, financial institutions, etc. through the establishment of a regional Energy Forum;
- Promote human capacity building on energy through the organization of education and training programmes, joint studies and workshops;
- Support transparency in the institutional environment to reduce non-physical barriers; and
- Develop a GTR region-specific database on energy resources, and supply and demand to share information among regional stakeholders.

In accordance with these objectives, cooperation in the regional energy sector in 2013 - 2014 will focus on the following activities:

- *Energy policy coordination and co-operation:* developing the GTI Energy Board as an effective cooperative mechanism for coordinating energy policy in the region; and identification and further promotion of energy cooperative activities in the region.
- *Capacity building:* further assistance to GTI member countries in human capacity building through organizing education and training programmes, joint studies and workshops.
- *Reduction of non-physical barriers:* support of the transparency of the institutional environment in the member countries to accelerate all types of regional energy cooperation.
- *Partnership building:* creation of an effective cooperative network with other the international organizations including ESCAP, research institutions, companies, and other relevant organizations and setting up Energy Forum for NEA; promotion of the establishment and development of a region-wide database on energy resources, supply and demand to ensure an exchange of the relevant information.

2. Activities proposed for 2013 – 2014

In accordance with the strategic objectives and approaches for promoting cooperation in the energy sector of GTR (Greater Tumen Region) and NEA (North East Asia), as specified in the SAP 2012 – 2015 (Strategic Action Plan), the Energy Board of GTI will concentrate its activities in the medium-term of years 2013 - 2014 as follows.

2.1 Institutional Arrangement – GTI Energy Board developed and strengthened

The GTI Energy Board will be developed and strengthened as an effective cooperative mechanism for consulting and coordinating energy policy and cooperation in the region through the meeting and negotiating for the further promotion of energy cooperative activities in the region. The board will evaluate and identify the possible cooperation project based on the recommendations from the Consultative Committee (CC)

Meeting and National coordinators' meeting.

In order to develop the GTI institutional arrangement, it is proposed to consider to build the network among the energy research institutes in China, Mongolia, RO Korea and Russia.

2.2 Capacity Building Training Programs for the GTI countries

This component of the framework project continues the previous GTI activities in this area. At the GTI National Coordinators Meeting (3 March 2011, Beijing), the member governments agreed to "consider the processing with **60,000 USD** from the surplus [of the GTI Common Fund accumulated from the past years] to finance the selected energy project" (as per *Meeting Report*). The objective of this project is to strengthen the capacity of national policy makers to promote regional energy cooperation in NEA by improving awareness and deepening knowledge on the areas of common interests, complimentary policy priorities and possible mutually beneficial activities at the regional level.

2.3 NEA Energy Database and Regular Energy Overview/Statistical Yearbook

The GTI member countries are required to have the consistent and updated information on the performance of the energy sector of the GTI countries' territories within Northeast Asia region, and it can be supported by establishing a NEA energy database and releasing an energy overview and/or statistical yearbook for the NEA territories (provinces) of GTI member countries. The details plan will be consulted with the members of the GTI Energy Board.

2.4 Energy Forum or Seminar for Northeast Asia

It is for the promotion of networking among policy makers, energy companies, and experts in the region and its planned activities are to hold the Energy Forum for NEA as an open region-wide cooperative platform for information and views sharing, partnership building and public-private dialogue. It is needed to have the consultation with the members of the GTI Energy Board and officials of ESCAP SRO-ENEA (Economic and Social Committee for Asia and Pacific Sub-Regional for East and North East Asia) office.

2.5 Partnership activities with ESCAP SRO-ENEA

The ESCAP is organizing recently the activities for cooperation in the area of energy in the North East Asia region, and GTI is planning the partnership programme with the ESCAP SRO ENEA in future. The detailed plans will be discussed further with the ESCAP SRO-ENEA Office.

Other Activities

Other proposals on GTI energy activities may be submitted to the Tumen Secretariat by the members of the Energy Board, local governments and energy companies at any time. The Tumen Secretariat will analyze the proposals submitted and refer them to the GTI Energy Board for consideration and, if appropriate, approval at the next regular meeting.

The activities proposed may be of any duration and may be regional in nature, or may focus on specific GTI member states or on a particular area within the GTR. The proposals offered should address, at least, one of the strategic objectives specified in the SAP 2012 – 2015, and should have a strong impact on the development of the cooperation in the energy sector of the region.

3. Project Procedures for energy cooperation

3.1 Identification of Priority Areas for Cooperation

The identification of priority areas of cooperation is a first step in organizing further work on the development of new activities by the GTI Energy Board.

The members of the Energy Board will decide what kinds of activities should be initial targets for joint realization, based on the principles of providing mutual benefits for GTI countries and addressing the practical needs to carry out the specific activities in order to promote energy cooperation in the GTR, while making the best use of limited human and financial resources.

The Action Plan will be updated on an annual basis at the GTI Energy Board's meetings.

3.2 Implementation Steps

Once the priority activities are identified, the Tumen Secretariat should prepare Concept Notes, Terms of Reference (TOR) and detailed plans to implement the selected activities. Afterwards, the Tumen Secretariat should proceed with the identification of funding resources.

If the independent consultant needs to be recruited, a detailed TOR and budget will be prepared to do so.

The prepared documents would be endorsed by the Energy Board at its meeting or through an exchange of correspondence among the Energy Board members, undertaken by the Tumen Secretariat.

5. Role of the Parties Involved

The practical implementation of GTI activities in the energy sector will be undertaken by the GTI Energy Board in cooperation with local authorities, international organizations and energy companies. These parties will act in a supporting role to the Energy Board in the practical implementation of the Board's projects and in identification of funding sources. The Tumen Secretariat will serve as an Energy Board interim secretariat facilitating the current working activities of the Board.

- **GTI Energy Board:**

Identify, submit, deliberate on, and approve proposals for GTI energy activities and projects
Undertake practical actions required for the implementation of the activities
Monitor and evaluate the results of GTI energy activities and projects
Provide information on energy policy and energy statistics from each country
Make efforts to mobilize financial resources

- **The Tumen Secretariat:**

Draft related documentation on the GTI energy activities
Develop networking among relevant structures and partners
Identify and attract funding resources
Recruit consultants
Coordinate implementation of the projects

- **Local Authorities:**

Identify and submit proposals on GTI energy activities and on concrete energy projects
Provide information on the status and pending issues of the agreed concrete energy projects
Cooperate in promotion and advertisement of the energy activities within their territories

- **International organizations:**

Build and strengthen partnerships with the GTI Energy Board
Provide statistical data on the energy industry in the NEA region
Provide financial support

- **Energy companies:**

Play active roles in the implementation of GTI energy activities and in energy project realization
Provide financial support

Source: The GTI homepage, <http://www.tumenprogram.org/>.

Chapter 2. Energy Profiles in Northeast Asia

The energy sector in Northeast Asia (NEA) significantly changed over the past decades, as the region has experienced a rapid increase in energy consumption along with fast economic growth in China, Mongolia, Republic of Korea and Russia, thus increased energy imports from the outsides of the region, and also significant structural changes in energy mix in the region, as a whole. In this Chapter, we review briefly the energy profile in Northeast Asia, which will provide with policy insight in deriving issues to promote the regional energy cooperation.

The coverage of country for the analysis in this chapter basically includes the GTI member countries, namely, China, Mongolia, the Republic of Korea (hereafter, simply ROK or Korea) and Russia, as the analysis is mainly based on the National Reports' prepared by the National Consultants from the GTI member countries in 2014. However, the other countries in the region, namely the Democratic People's Republic of Korea (DPRK) and Japan are included, where it necessary or if the relevant information are available, for more comprehensive regional analysis for NEA. Time scope for the analysis covers the period between 1990 and 2012.

2.1 Energy Demand in Northeast Asia

Energy Demand Growth

Total energy demand in Northeast Asia significantly increased about two times over the last two decades from 2,125.7 million toe (tons of oil equivalent) in 1990 to 4,041.8 million toe in 2012. Notably, this increase was led by China, in which total energy demand increased 3.7 times during the period of 1990 – 2012 from 690.9 million toe to 2,532.1 million toe. Korea's total energy demand also significantly increased 3.0 times from 93.2 million toe in 1990 to 278.7 million toe in 2012.

However, total energy demand in DPRK and Russia decreased over the period of 1990 – 2012 due to the effect of the economic downturn in the 1990's and to the energy efficiency programs in Russia in late 2000's, from 24.0 million toe to 15.7 million toe in DPRK and from 879.2 million toe to 756.6 million toe in Russia. In Mongolia, total energy demand was decreasing by 2005, began to increase rapidly thereafter, and reach 8.5 million toe in 2012. Total energy demand in Japan steadily increased by 2005, and began to decrease thereafter, and was recorded 450.2 million toe in 2012. Thus, China and Korea contributed to 96.1 % and 9.7% in the net increase of energy demand in NEA during the period of 1990 – 2012, respectively.

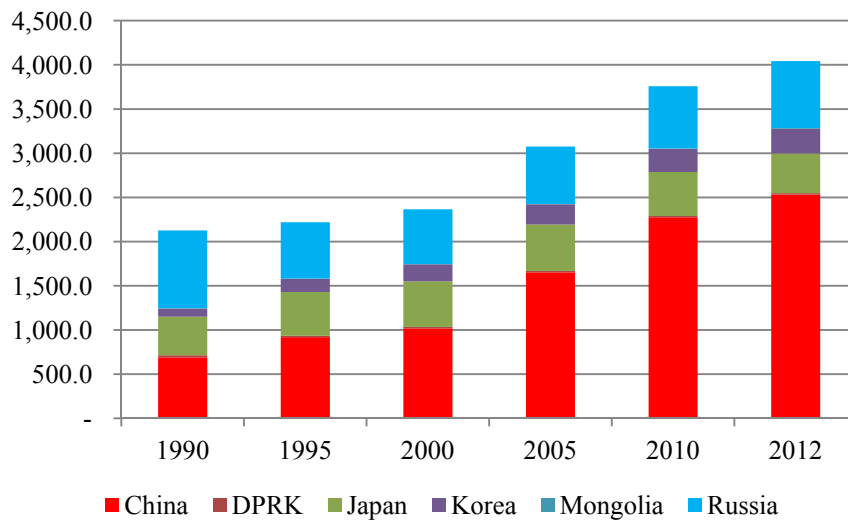
<Table 1> Energy Demand in Northeast Asia (Unit: million toe)

	1990	1995	2000	2005	2010	2012	'12 / '90	growth p.a.(%)	Contribution (%)
China	690.9	918.2	1,018.7	1,652.0	2,274.6	2,532.1	3.7	6.1	96.1
ROK	93.2	150.4	192.9	228.6	263.8	278.7	3.0	5.1	9.7
Mongolia	3.7	2.3	2.6	2.8	3.5	8.5	2.3	3.8	0.2
Russia	879.2	636.7	619.3	651.7	703.6	756.6	0.9	- 0.7	- 6.4
DPRK	24.0	17.3	15.7	17.1	15.7	15.7	0.7	- 1.9	- 0.4
Japan	434.6	493.2	515.8	523.9	496.9	450.2	1.0	0.2	0.8
NEA Total	2,125.7	2,218.1	2,364.9	3,076.1	3,758.0	4,041.8	1.9	3.0	100.0
Total World	8118.1	8580.6	9342.1	10714.4	11955.6	12483.2	1.5	2.0	
NEA/World (%)	26.2	25.8	25.3	28.7	31.4	32.4			43.9

Source: National Report for China, ROK, Mongolia, and Russia. Energy Info for DPRK. APEC Energy Database for Japan, and BP World Energy Statistics for 'Total World'.

China dominates the energy demand in NEA in terms of volume, accounting for 62.6% in the region's total energy demand in NEA in 2012. Russia is the second largest energy consuming country in the region with the share of 18.7% in the region's total energy demand, followed by Japan and Korea with the shares of 11.1% and 6.9%, respectively. The share of NEA in world total energy demand significantly increased from 26.2% in 1990 to 32.4% in 2012.

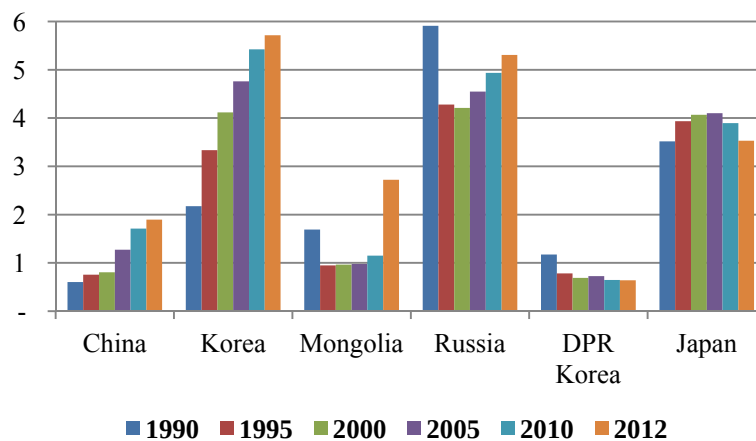
[Figure 3] Energy Demand in Northeast Asia (Unit: million toe)



Energy consumption per capita is varied over the countries in NEA. ROK showed the highest level of energy per capita, 5.57 toe in 2012, followed by Russia with 5.27 toe, Japan with 3.61 toe, Mongolia 2.97 toe, China with 1.87 toe, and DPRK 0.65 toe.

Energy consumption per capita in China and ROK significantly increased during the period of 1990 – 2012, 3.7 times in China and 3.0 times in ROK, while those in DPRK, Mongolia and Russia decreased significantly by 2000. Thereafter, Russia and Mongolia began increasing it. Energy consumption per capita in Japan appeared to decrease from 2005. The lower energy consumption per capita in China and the DPRK implies that NEA has a large potential for further increase in energy demand in future.

[Figure 4] Energy consumption per capita (Unit: toe)



<Table 2> Energy consumption per capita (Unit: toe)

	1990	1995	2000	2005	2010	2012	2012 /1990
China	0.60	0.76	0.80	1.26	1.70	1.87	3.7
Korea	2.17	3.34	4.10	4.75	5.34	5.57	3.0
Mongolia	1.74	1.03	1.06	1.09	1.27	2.97	2.3
Russia	5.93	4.30	4.23	4.55	4.94	5.27	0.9
DPRK	0.90	0.80	0.69	0.73	0.65	0.65	0.7
Japan	3.52	3.94	4.07	4.10	3.89	3.61	1.0
NEA Average	1.12	1.09	1.14	1.54	1.94	2.12	1.9
World	1.54	1.51	1.53	1.65	1.74	1.80	1.2

Source: National Report for China, Korea, Mongolia, and Russia. Energy Info Korea for DPRK and Japan.

Energy Intensity Changes

Except for Korea, the other GTI member countries, namely, China, Mongolia and Russia, showed the decline of energy intensity¹, which indicates overall energy efficiency in the countries, was improved. Notably, China achieved 87% of decline in energy intensity during the period of 1990 – 2012. This can be interpreted as a result not only from national strong policy efforts for energy conservation and efficiency improvement but also from fuel substitution effect from less efficient fuel, namely coal, to more efficient fuel such as oil and natural gas and also from the effect of the relatively higher expansion of the less energy industry.

Energy intensity in Mongolia and Russia appeared to decline by 12% and 26%, respectively, during the period of 1990 – 2012. However, energy intensity in Korea significantly increased during the early 1990's attributing to the expansion of the energy intensive industry, such as steel-making, petrochemicals and cement industry for the establishment of industrial development basis, but began to gradually decline from 1995.

Thus, Korea's energy intensity changes reflected the effect of the industrial structural changes during the economic development process, although the country achieved the technical energy efficiency improvement significantly.

<Table 3> Energy-GDP Intensity changes (Unit: 2000 = 100 Index)

	1990	1995	2000	2005	2010	2012	2012/1990
China	360.4	147.0	100.0	87.0	55.2	47.5	0.13
Korea	91.0	100.4	100.0	95.1	91.1	90.9	1.00
Mongolia	145.9	104.1	100.0	82.8	69.7	128.7	0.88
Russia	95.4	111.9	100.0	78.0	70.6	70.6	0.74

Source: National Report for China, Korea, Mongolia, and Russia.

Note: 1) For a cross-country comparison purpose, energy intensity shown in the National Reports is recalculated by index with the base year of 2000 = 100 for a common unit over the countries. 2) DPRK and Japan were not included due to the lack of comparable information.

2.2 Energy Supply in Northeast Asia

Domestic Production

¹ Energy intensity is defined by a ratio of total energy demand to GDP, and is often used for an indicator to represent the overall improvement of energy efficiency at the national economic level.

Total coal production in NEA, as a whole, increased from 765.9 million toes in 1990 to 2,003.1 million toe in 2012. The increase was led by China, of which coal production significantly increased from 539.8 million toe in 1990 to 1,777.0 million toe in 2012. In fact, China is the largest coal producer, consumer, and also importer in the world. Russia is also a major producer of coal in the world. Since 2000 the overall trend in the development of Russia's coal industry has been positive. The volume of coal production is increasing and production efficiency of many coal companies and many mines has improved significantly with widespread use of more efficient technologies. Siberian Coal Energy Company's (OAO SUEK11) Kotinskaya mine, reaches productivity of over 8,800 tones/man-year that is one of the best levels of productivity seen in the world².

Recently, coal production in Mongolia began to rapidly increase from 1.7 million toe 2005 to 11.0 million toe in 2012, while coal production in Korea, DPRK and Japan decreased over the period of 1990 – 2012 due to the economic reason or the deterioration of coal mining conditions. Coal production in DPRK began to increase recently from 10.4 million toe in 2010 to 12.7 million toe in 2012 as coal mines facilities were reportedly improved with the collaboration with a Chinese company. Total coal production in NEA accounted for 51.9% in world total coal production and its share drastically increase since the early 2000's from 36.6% thanks to the high increase in China.

Russia is a major producer of oil among the countries in NEA. In fact, Russia is the world's third largest producer of oil after Saudi Arabia and the United States, its oil production decreased from 526.3 million toe in 1990 to 323.3 million toe in 2000, and thereafter increased significantly to 521.3 million toe in 2012. China steadily increased oil production from 138.2 million toe in 1990 to 206.7 million toe in 2012.

There was no oil production in ROK and DPRK, and a small production of oil was observed in Mongolia and Japan. NEA, as a whole, accounted for 17.7% in world total oil production in 2012 and its share decreased from 20.9% in 1990.

Natural gas is produced in China, ROK, Japan, and Russia in the NEA countries. However, the production in ROK and Japan is very minor. No natural gas production is observed in DPRK or in Mongolia. In the NEA region, Russia is a large producer of natural gas, followed by China. In fact, Russia is the largest producer and exporter of natural gas in the world, and its production of natural gas increased from 516.8 million toe in 1990 to 540.8 million toe in 2012.

Natural gas production in China significantly increased, in particular since 2000, from 25.5 million toe in 2000 to 99.9 million toe in 2012. Thus, total natural gas production in NEA increased from 533.2 million toe in 1990 to 643.9 million toe in 2012. However, the NEA's share in world total natural gas production decreased from 29.7% in 1990 to 21.3% in 2012 due to more rapid increase in natural gas production in other regions including Australia, Central Asia, particularly North America and the Middle East.

<Table 4> Domestic Energy Production in Northeast Asia (Unit: million toe)

	Country	1990	1995	2000	2005	2010	2012
Coal	China	539.8	680.1	692.0	1,174.5	1,592.1	1,777.0
	ROK	8.9	2.4	1.9	2.0	1.2	1.0
	Mongolia	2.3	1.6	1.7	2.5	8.3	11.0
	Russia	192.4	130.7	128.5	157.4	180.0	200.7
	DPRK	16.6	11.9	11.2	12.0	10.4	12.7
	Japan	5.9	3.6	1.7	0.6	0.5	0.7
	NEA Total	765.9	830.3	837.0	1,349.0	1,792.5	2,003.1
	Total World	2,250.0	2,240.0	2,286.9	2,942.9	3,547.8	3,862.2
	NEA Share (%)	34.0	37.1	36.6	45.8	50.5	51.9
Oil	China	138.2	149.9	181.5	181.6	203.7	206.7

² RosInform Ugol, 2009.

	ROK	-	-	-	-	-	-
	Mongolia	na	na	na	na	na	0.5
	Russia	526.3	306.6	323.3	468.7	506.5	521.3
	DPRK	-	-	-	-	-	-
	Japan	0.6	0.8	0.6	0.8	0.8	0.7
	NEA Total	665.0	457.3	505.4	651.1	711.0	729.2
	Total World	3175.4	3286.1	3620.4	3947.5	3979.3	4119.8
	NEA Share (%)	20.9	13.9	14.0	16.5	17.9	17.7
Natural Gas	China	14.5	17.2	25.5	45.4	87.3	99.9
	ROK	-	-	-	0.5	0.5	0.4
	Mongolia						
	Russia	516.8	480.6	470.7	515.8	540.2	540.8
	DPRK	-	-	-	-	-	-
	Japan	1.8	2.0	2.2	2.9	3.2	2.8
	NEA Total	533.2	499.7	498.4	564.6	631.1	643.9
	Total World	1792.9	1909.1	2175.9	2508.3	2878.0	3016.6
	NEA Share (%)	29.7	26.2	22.9	22.5	21.9	21.3

Source: National Report for China and Korea. Energy Info Korea for DPRK. APEC Energy Database for Japan and Russia, and BP World Energy Statistics for 'Total World', US EIA homepage for coal production in Mongolia.

Energy Imports

Northeast Asia is in deficit in terms of energy supply-demand balances. As shown in Table 5, Russia is the only country in the region currently showing self-sufficient energy supply-demand structure. Russia is, in fact, a major energy exporting country in the world. As of 2012, Russia exported about 74.7% of its total energy production abroad. However, due to the scarcity of indigenous energy resources in the country, ROK and Japan highly depended on imports from overseas in their energy supply, and their overseas dependence rate in energy supply are more than 95 % with nuclear energy included.

China, in particular, very rapidly increased energy imports over the period of 1990 – 2012, and its energy import dependency increased from 1.3% in 1990 to 18.4 % in 2012. Thus, in China, ROK and Japan, due to the limited availability of indigenous energy resources in the countries, the incremental energy demand increases were met by imports. Major supply sources for these energy importing countries are outside of the region, mainly the Middle East, Australia and Southeast Asian countries. DPRK and Mongolia highly depend on domestically produced coal, but the countries import oil, so that their energy import dependency was relatively low, recording 4.5% and 15.5% in 2012, respectively.

<Table 5> Energy Import Dependency (%)

	1990	1995	2000	2005	2010	2012
China	1.3	4.2	9.9	11.4	17.2	18.4
ROK	87.9	96.8	97.2	96.6	96.5	96.0
Mongolia	22.3	16.2	19.4	21.4	25.6	15.5
Russia	- 46.9	- 49.5	- 56.4	- 82.8	- 82.1	- 74.7
DPRK	7.2	6.4	7.1	6.0	4.5	4.5
Japan	94.6	95.5	95.8	96.0	95.6	95.5

Source: National Report for China, Korea, Mongolia, and Russia. Energy Info Korea for DPRK. APEC Energy Database for Japan.

As coal demand rapidly grew for the power generation and industrial use, coal imports in NEA were also rapidly increasing although the regional production increased. Coal imports in NEA, as a whole, increased 4.7 times during the period of 1990 – 2012, from 148.0 million tons to 693.8 million tons. China became the largest coal importer in the world, having taken over Japan in 2011.

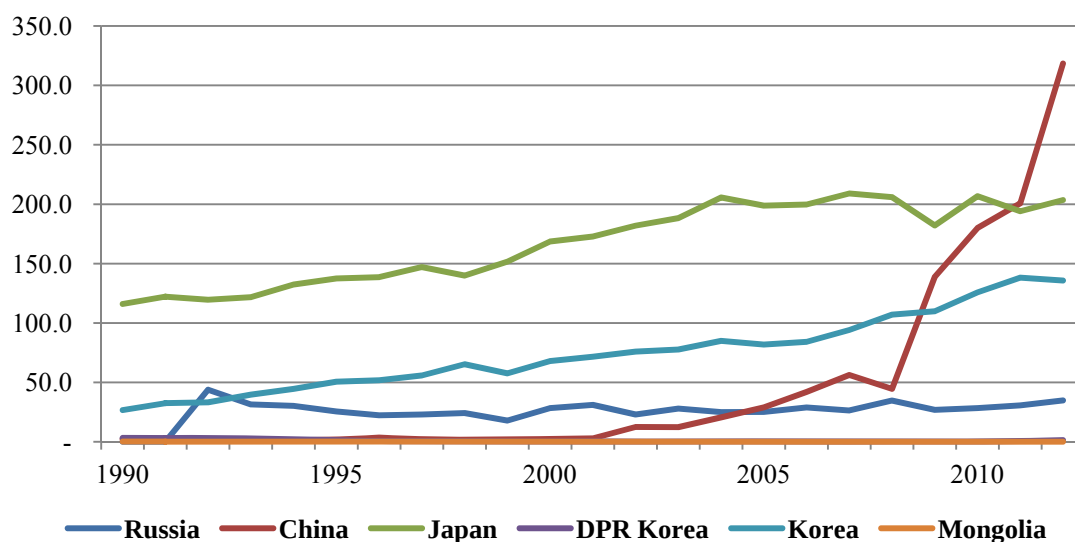
<Table 6> Coal Imports in Northeast Asia (Unit: million tons)

	1990	1995	2000	2005	2010	2012	2012/1990
China	2.2	1.8	2.4	28.9	179.9	318.5	144.2
ROK	26.6	50.6	67.9	81.8	125.8	135.7	5.1
Mongolia	0.1	0.2	0.0	-	-	-	-
Russia	na	25.4	28.3	25.1	28.4	34.8	1.4
DPRK	3.2	1.4	0.2	0.3	0.3	1.4	0.4
Japan	115.9	137.4	168.6	198.7	206.7	203.5	1.8
NEA Total	148.0	217.0	267.5	334.8	541.1	693.8	4.7

Source: U.S. Energy Information Administration, Homepage <http://www.eia.gov/>

China's coal imports significantly increased in particular from the late 2000's, from 2.2 million tons in 1990 to 144.2 million tons in 2012. Coal imports in ROK also rapidly increased from 26.6 million tons to 135.7 million tons in 2012, about five times increases during the period. Japan's coal imports increased 1.8 times from 115.9 million tons in 1990 to 203.5 million tons in 2012. Coal import volumes in Mongolia and DPRK appeared to be small compared with other countries. Major import sources of coal for the NEA countries include Australia, Indonesia, South Africa, Russia and the United States.

[Figure 5] Coal Imports in Northeast Asia (Unit: million tons)



Crude oil imports increased 2.4 times in NEA, as a whole, from 245.9 million toe in 1990 to 585.5 million toe in 2012. Also, China has led the increase in oil import in the region, of which net increases in crude oil imports recorded as 268.1 million toe during the period of 1990 – 2012. China's crude oil imports particularly began to rapidly increase from the late 1990's, as shown in the Figure 4. ROK's oil imports rapidly growing until the late 1990's, when the country heavily expanded the petrochemical industry, thereafter the growth slowed down. ROK's oil imports increased about 3 times from 42.7 million toe in 1990 to 131.1 million toe in 2012. Crude oil imports in Japan steadily

increased by 1995, but began to decrease thereafter, and Japan's crude oil imports decreased from 200.3 million toe in 1990 to 183.5 million toe in 2012.

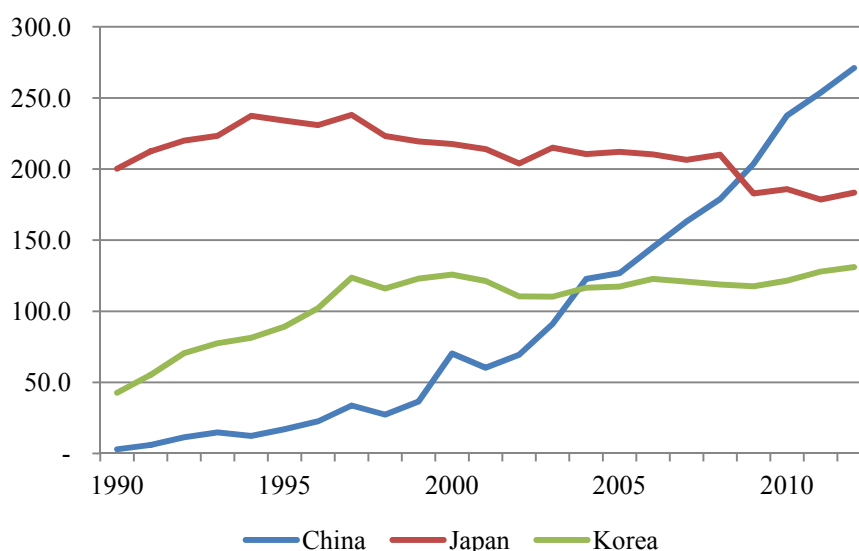
<Table 7> Crude Oil Imports in Northeast Asia (Unit: million toe)

	1990	1995	2000	2005	2010	2012	2012/1990
China	2.9	17.1	70.3	126.8	237.7	271.0	92.6
Japan	200.3	234.1	217.6	212.1	185.9	183.5	0.9
ROK	42.7	89.2	125.8	117.3	121.6	131.1	3.1
NEA Total	245.9	340.4	413.7	456.3	545.1	585.5	2.4

Source: APEC Energy Database

NEA is the largest oil importer in the world, as three countries, namely, China, Japan and ROK ranked as the first, third and fifth positions of oil importer, respectively, in the world, as of 2012, in terms of oil import volume. The crude oil import dependence rate in China reached 58.3% in 2012, while that in ROK and Japan is 100.0 %. A major import source of oil imports for the countries in NEA is the Middle East. Dependency of oil imports on the Middle East in ROK and Japan is extremely high, recording more than 85 % in total oil imports in the countries.

[Figure 6] Crude Oil Imports Northeast Asia (Unit: million toe)



China, ROK and Japan are major countries importing natural gas in the world. China imports natural gas through pipeline from the Central Asia and Southeast Asia as well as in type of the liquefied natural gas (LNG), while ROK and Japan import natural gas only in LNG type. China began to import natural gas from 2006. Thereafter, China increased the import volume of natural gas rapidly and its importing volume reached to 39.4 million toe in 2012.

Natural gas import dependence rate in China recorded as 25.5% in 2012. Korea began to import natural gas from 1987, and very significantly increased import of natural gas from 2.7 million toe in 1990 to 42.9 million toe in 2012, 16 times increase during the period. Japan steadily increased natural gas import until 2010 from 41.7 million toe in 1990 to 82.2 million toe in 2010. However, after the Fukushima nuclear power plant accident, occurred in March, 2011, Japan stopped the operation of nuclear power plants in the country, and thus significantly increased gas-fired power generation to substitute nuclear. So that natural gas import in Japan significantly increased by about 50% in during

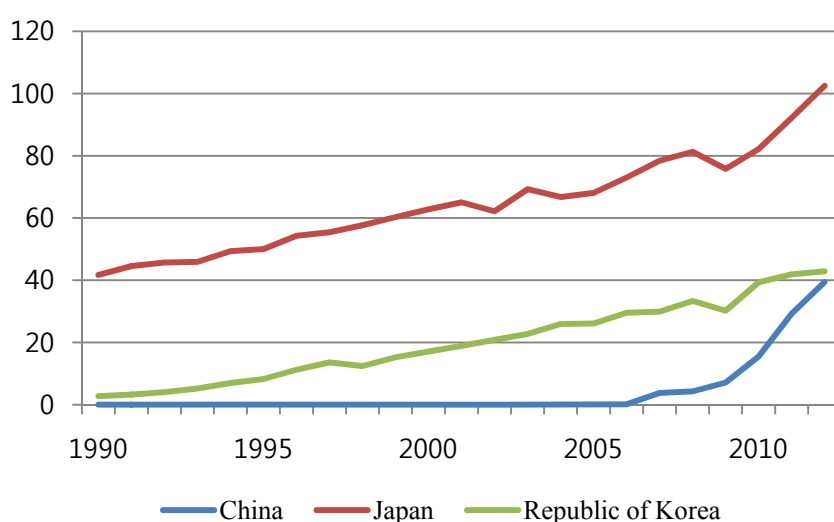
the period of 2011–2012, and the import volume of natural gas in Japan reached 102.5 million toe in 2012.

<Table 8> Natural Gas Imports in Northeast Asia (Unit: million toe)

	1990	1995	2000	2005	2010	2012	2012/1990
China	-	-	-	-	15.5	39.4	-
Japan	41.7	50.0	62.8	68.1	82.2	102.5	2.5
ROK	2.7	8.3	17.1	26.1	39.3	42.9	16.0
NEA Total	44.4	58.3	79.8	94.2	137.0	184.8	4.2

Source: APEC Energy Database

[Figure 7] Natural Gas Imports in Northeast Asia



Fuel Mix Changes

Each country in NEA showed a different type of energy mix in total primary energy supply structure. The most important factor in shaping energy mix in the countries in NEA is the availability of indigenous energy resources in the countries. China, Mongolia and DPRK have a huge coal reserve in the country, so that coal plays a significant role in supplying the primary energy to the economy. Thus, coal accounts for more than 65% in energy mix in China, DPRK, and Mongolia.

Russia also shows a high consumption of natural gas, more than 50% since 2000, as the country has a great reserve and production of natural gas and established the natural gas transportation infrastructure, i.e. the nation-wide as well as cross-border pipeline system to trade natural gas with neighbouring countries. The countries in NEA also aggressively developed hydro-power and renewable energy sources for power generation in order to maximize the use of indigenous energy resources and to achieve the self-sufficiency (or energy independence) at the maximum level. DPRK, Russia, and China showed a relatively high share of hydro-power in their energy mix, 21.4% in DPRK, 6.1% in Russia in 2012.

<Table 9> Energy Demand Mix by Country in NEA: The Share in Total Primary Energy (%)

	Energy Source	1990	1995	2000	2005	2010	2012
China	Coal	76.2	74.6	69.2	70.8	68.0	66.6
	Oil	16.6	17.5	22.2	19.8	19.0	18.8

	Natural Gas	2.1	1.8	2.2	2.6	4.4	5.2
	Others	5.1	6.1	6.4	6.8	8.6	9.4
ROK	Coal	26.2	18.7	22.3	24.0	29.2	29.1
	Oil	53.9	62.4	52.0	44.4	39.5	38.1
	LNG	3.2	6.1	9.8	13.3	16.3	18.0
	Hydro	1.7	0.9	0.7	0.6	0.5	0.6
	Nuclear	14.2	11.2	14.1	16.1	12.1	11.4
	Renewable	0.9	0.7	1.1	1.7	2.3	2.9
Mongolia	Coal	63.1	73.2	70.1	67.7	65.6	80.7
	Oil	32.2	14.9	18.4	20.9	24.8	15.1
	Hydro	-	-	0.0	0.0	0.1	0.1
	Renewable	4.7	12.0	11.4	11.5	9.5	4.1
Russia	Coal	21.7	20.2	19.3	17.3	16.3	17.6
	Oil	30.0	22.4	20.4	19.8	19.9	22.3
	Natural Gas	41.7	49.6	51.4	53.6	54.4	51.1
	Hydro	3.5	4.1	5.5	6.0	6.3	6.1
	Nuclear	1.6	2.3	2.2	2.3	2.0	1.9
	Others	1.4	1.3	1.1	1.1	1.0	1.0
DPRK	Coal	69.2	68.6	71.7	70.2	66.1	-
	Oil	10.5	6.4	7.1	6.0	4.5	-
	Hydro	15.6	20.5	16.2	19.2	21.4	-
	Others	4.7	4.5	5.0	4.6	8.0	-
Japan	Coal	17.4	16.8	17.9	21.7	22.8	24.9
	Oil	57.3	54.2	49.9	46.9	40.9	47.1
	Natural Gas	10.0	10.5	12.6	13.6	17.3	23.4
	Hydro	1.8	1.4	1.5	1.4	1.6	1.5
	Nuclear	11.7	15.2	16.2	14.7	15.4	1.0
	Others	1.7	1.8	1.9	1.9	1.9	2.1

Source: National Report for China, Korea, Mongolia, and Russia. Energy Info Korea for DPRK. APEC Energy Database for Japan.

However, in a resource-poor country like ROK and Japan, the role of domestic indigenous energy sources was very minor and limited. In ROK and Japan, energy supply almost totally depended on imports from overseas and they secured energy supply from the international energy market. The openness of the energy system to the international energy market, without being stick to domestic energy sources, was a key factor in formulating energy security in the country during the economic development process.

They considered all possible energy options other than oil, namely, nuclear, coal, and natural gas, and introduced them into their energy mix. This diversification effort of energy sources through importing from abroad contributed to the establishment of more robust and economic energy system given the lack of indigenous energy resources. This obviously indicates that the lack of indigenous energy resources cannot be a bottleneck for the economic development in any country, once the country established its energy supply system open to the international market.

Another important factor in shaping the energy mix in the countries in NEA is the energy security policy effort and the economics related to the energy sources. Nuclear and coal fired power generation systems were introduced in order to reduce oil demand and to minimize the effect of the so-called ‘oil shock’ mainly occurred by the geopolitics in the Middle East.

Supply of coal and nuclear source, i.e. uranium, is much more stable in the international energy market, and this price fluctuation is much less volatile than oil. Also, coal and nuclear are major fuel for base-load power generation, so that they can play an important role in power production in the country.

China, ROK, Japan, and Russia introduced nuclear in their energy mix over the last decades and will continue to promote nuclear power generation in future. In fact, the Russian nuclear industry is an undisputed leader in advanced nuclear technologies and generates about 18% of country's total power output³. Russia possesses world's most advanced enrichment technologies, and nuclear power plants with VVER water-moderated water-cooled power reactors which have proved their reliability in the course of one thousand reactor years of trouble-free operation. High quality of manufactured products and offered services is also confirmed by the successes in international tenders for nuclear fuel supplies and NPP construction abroad.

Recently, environment became an important factor in shaping the energy mix structure in the countries in NEA. The importance of less carbon intensive fuel or carbon-free energy sources, namely, natural gas and renewable energy sources, is well-recognized in order to minimize the environmental effect caused by the fossil fuel use. Natural gas consumption and deployment of renewable energy sources increased with this reason in China, ROK and Japan. Renewable energy power generation facility notably increased in China, Korea, and Mongolia since 2000, and its share in total generation capacity is 5.7% in China, 3.0% in Mongolia and 4.1% in ROK. In 1990, there was no renewable power generation facility in the countries.

Structural change in energy mix also was an important aspect occurred in the countries in NEA. China reduced significantly the share of coal in total primary energy supply from 76.2% in 1990 to 66.6% in 2012, while the share of natural gas increased from 2.1% in 1990 to 5.2% in 2012. ROK and Japan reduced the share of oil in their total primary energy supply mix, from 53.9% in 1990 to 38.1% in 2012 in ROK and from 57.3% in 1990 to 47.1% in 2012 in Japan. Instead of oil, ROK increased the share of natural gas significantly from 3.2% in 1990 to 18.0% in 2012.

Japan also increased the shares of natural gas and coal in total primary supply during the period of 1990–2012, from 10.0% to 23.4% and from 17.4% to 24.9%, respectively. A notable change in energy mix in Japan is that the share of nuclear very significantly dropped to 1.0% in 2012 as an effect of the Fukushima nuclear power plant accident. The share of natural gas in Japan's total primary energy supply drastically increased from 17.3% in 2010 to 23.4% in 2012, since natural gas substituted nuclear in power generation in Japan.

In Mongolia, the share of coal drastically increased in recent years from 65.6% in 2010 to 80.7% in 2012, while the share of oil declined from 32.2% in 1990 to 15.1% in 2012. DPRK also experienced the structure change in the energy mix structure in total primary energy supply, as the share of hydro increased from 15.6% in 1990 to 21.4% in 2011 at the expense of oil, of which share declined from 10.5% in 1990 to 4.5% in 2011.

2.3 Energy Exports and Trades

China

China used to be a large coal exporter in the NEA region with destination mainly to ROK and Japan. However, coal exports in China drastically dropped since 2004 after it reached the peak with the

³ <http://www.atomenergoprom.ru/nuclear/rus/>

volume of 61.0 million toe in 2003. This decline was due to rapid increase in coal demand in China and also to the Chinese government policy to constrain coal exports introduced in the late 2000's. Thus, China's coal export is recorded only 5.9 million toe in 2012.

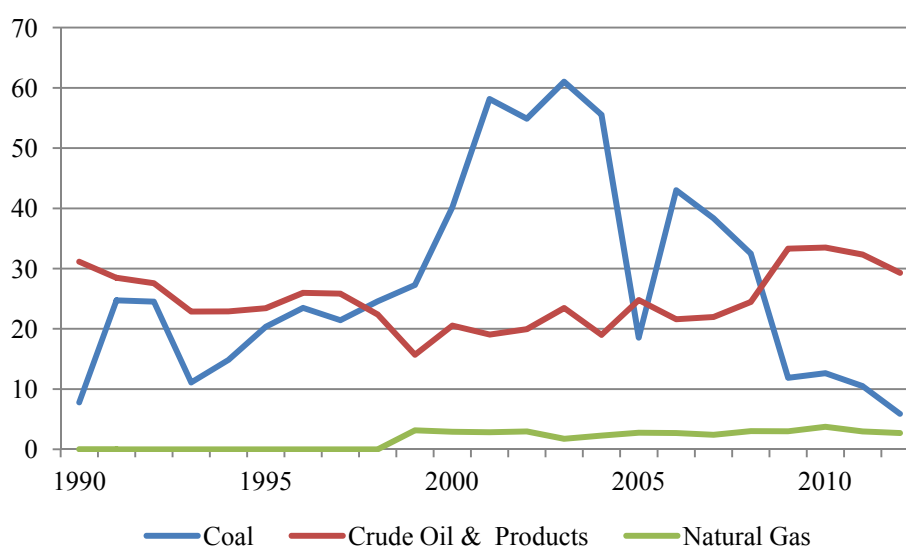
China appeared to export oil and natural gas, although those export volumes were small. China maintained oil export volume within the range between 20.0 – 33.5 million toe, and natural gas export volume between 2.7 – 3.8 million toe during the period of 1990 – 2012. Major oil exporting country in China includes DPRK and Southeast Asian countries.

<Table 10> Primary Energy Exports in China (Unit: million toe)

	1990	1995	2000	2005	2010	2011	2012
Coal	7.8	20.3	40.1	18.5	12.6	10.5	5.9
Crude Oil & Products	31.1	23.4	20.5	24.8	33.5	32.3	29.3
Natural Gas	0.0	0.0	2.9	2.8	3.8	3.0	2.7
Total	38.9	44.3	64.4	46.9	51.5	47.4	39.4

Source: APEC Energy Database

[Figure 8] Primary Energy Exports in China (Unit: million toe)



Japan

Japan is exporting oil products. Japan's total exports of oil products increased from 4.0 million toe in 1990 to 12.8 million tons in 2012.

<Table 11> Oil Products Exports in Japan (Unit: million toe)

	1990	1995	2000	2005	2010	2012
Crude Oil & Petroleum Products	4.0	9.5	4.4	8.6	17.2	12.8

Source: APEC Energy Database

ROK

ROK is one of the major exporting countries of oil products in the world. ROK imports crude oil, refines the crude oil to the oil products and exports them to overseas including the NEA countries.

ROK's total exports of oil products significantly increased from 4.2 million tons in 1990 to 59.1 million tons in 2012 and the NEA region accounts for 35.3 % in ROK's total export of oil products. Exports to China and Japan have increased significantly over the last decade to 11.75 million tons and 8.98 million tons in 2012, respectively. Mongolia and Russia also import oil products from ROK, although their import volumes are small.

<Table 12> Oil Product Exports in ROK (Unit: million ton)

	1990	1995	2000	2005	2010	2012
China	0.00	3.25	10.25	10.48	11.26	11.75
Russia	-	0.34	0.08	0.06	0.14	0.09
Japan	3.24	5.53	14.06	7.87	5.30	8.98
Mongolia	-	0.00	0.00	0.01	0.01	0.03
NEA total	3.24	9.12	24.40	18.41	16.71	20.84
(NEA share)	77.1%	55.2%	61.6%	52.2%	35.7%	35.3%
Total	4.20	16.52	39.63	35.28	46.78	59.12

Source: Korea International Trade Association (KITA), Homepage <http://www.kita.net>

ROK is a major importer of energy sources in the world and thus in the NEA following China and Japan, ROK ranked the fifth-largest importer of oil in the world after the US, China, Japan and India, and the second largest importer of LNG, and the third-largest importer of coal after China and Japan. ROK paid US\$ 178.7 billion in 2013 only for energy imports in 2012.

<Table 13> ROK's Energy Imports from the NEA region

	1990	1995	2000	2005	2010	2012
Oil (million ton)	1.00	2.36	1.91	2.09	7.21	4.56
(NEA share)	2.4%	2.8%	1.6%	1.8%	6.1%	3.5%
Coal (million ton)	3.22	9.39	25.78	24.70	16.42	17.08
(NEA share)	13.3%	21.3%	40.2%	32.0%	13.8%	13.5%
LNG (million ton)	0.00	0.00	0.00	0.00	2.93	2.16
(NEA share)	0.0%	0.0%	0.0%	0.0%	9.0%	6.0%
Uranium (ton)	0.0	20.0	76.0	106.0	130.0	70.0
(NEA share)	0.0%	6.5%	13.2%	14.8%	15.8%	9.4%

Source: Korea International Trade Association (KITA), Homepage <http://www.kita.net>

However, ROK's energy imports from the countries in NEA are still meagre. The NEA's share in total oil imports in ROK was recorded only as 3.5% in 2012, while the share of the Middle East was 85.1%. Among the NEA countries, Russia is the major oil import source for ROK. ROK's crude oil imports from Russia steadily increase from 0.35 million tons in 1995 to 6.73 million tons in 2010 and 4.46 million in 2012. No crude oil import from China was recorded in 2012.

ROK's import of coal from the NEA region was recorded as 17.08 million tons in 2012, and NEA accounted for 13.5% in ROK's total coal imports, which drastically declined from 40.2% in 2000, due to the significant decline in coal imports from China. ROK's import of natural gas from Russia was 2.16 million tons in 2012 with the share of 6 - 9 per cent in ROK's total natural gas imports. Russia's exports of uranium to Korea significantly increased from 20 tons in 1995 to 130 million tons in 2010 with the share of 15.8 per cent in ROK's total uranium imports in 2010. The volume was shown to

decrease to 70 tons in 2012. ROK has never experienced electricity trade with neighbouring countries so far.

Mongolia

Mongolia imported electricity from Russia and exported coal and crude oil to China. The volume of Mongolia's electricity imports from Russia to the its Central and Western Energy Systems were within a range of 300 – 400 GWh per annum (393 GWh in 2012 and 413,6 GWh in 2013) with 160 MW capacity, which accounted for about 4% in total demand in the Central Energy System (CES) and 15% in total demand in the Western Energy System (WES). Electricity imports from Russia were very important for the energy reliability and security for Mongolia.

<Table 14> Electricity Import in Mongolia from Russia (Unit: GWh)

	2002	2004	2006	2008	2010	2012
CES	116.3	131.6	126.5	134.8	165.6	318.5
WES	38.2	41.1	49.1	62.1	56.0	85.5

Coal exports contributed to about 40 – 50% of Mongolia's total export revenues, i.e. 47% in 2011, over 10% of budget revenues and 80 % of foreign direct investment. Coal exports in Mongolia is mainly to direct to China. Major coal exporters are located in the southern part of Mongolia, close to China 50 - 270 km. Coking coals exports from Mongolia to China have greatly increased since 2009. From 2011, export volume of coking coals to China surged, and thus China became the biggest coal export market for Mongolia with export volume accounting for two-third of total coking coal production in Mongolia.

Mongolia's coal exports to China were recorded to be about 18 million tons in 2013. However, problems facing on coal exports included the lack of infrastructure such as transportation system and qualified personnel and equipment as well as the limited border station capacity. Chinese companies participated in the exploration and development of oil field in Mongolia, and produced crude oil of 4.3 million barrels in 2012 and exported to China.

Russia

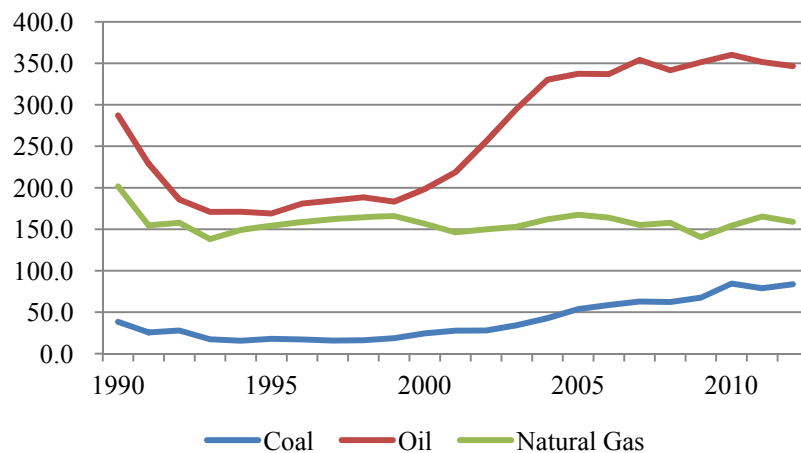
Russia is an only net exporting country of energy resources in NEA, and energy exports constitutes a substantial part of total Russia's budget, given its high oil and gas production and continuous international demand.

<Table 15> Primary Energy Source Export in Russia (Unit: million toe)

	1990	1995	2000	2005	2010	2011	2012
Coal	38.1	17.9	24.4	53.8	84.4	78.8	83.5
Oil	287.2	169.0	198.4	337.4	360.3	351.6	346.7
Natural Gas	201.7	154.0	156.6	167.4	154.2	165.3	158.8
Total	527.0	340.9	379.4	558.6	598.8	595.7	589.1

Source: APEC Energy Database

[Figure 9] Energy Export by Energy Source in Russia (Unit: million toe)



Russia's energy exports significantly decreased, particularly oil exports in the 1990's, when the country underwent through major economic restructuring and the international oil price was low. Russia's total oil exports began to rebound since 2000, and increased from 198.4 million toe in 2000 to 346.7 million toe in 2012. Total natural gas exports in Russia remained stable at the level of around 150 – 167 million toe. Russia increased coal exports from 38.1 million toe in 1990 to 83.5 million toe in 2012. Russia also exported electricity to China, Mongolia and European neighbouring countries. In 2012, Russia's total electricity exports reached 650 billion kWh.

However, until recently, the destination of Russia's oil and natural gas exports mostly oriented to the European market. Namely, 79% of Russia's crude oil exports went to European countries, while only around 18% of Russia's crude oil exports were destined for Asia including the NEA, and the remainder went mostly to the Americas. Russia exported about 76% of its total natural gas exports to Western Europe mostly through pipelines. Russia is also an exporter of liquefied natural gas (LNG) to the NEA market. The Sakhalin Energy's LNG plant has been operating since 2009, and the majority of the LNG has been contracted to Japanese and Korean buyers under long-term supply agreements. In 2012, Sakhalin LNG exports went to Japan (76%), Korea (20%), China (3.5%), and Taiwan (0.6%).⁴

DPRK

In recent year, DPRK began to increase coal exports to China, as the coal mines in the country were renovated with collaboration with a Chinese company and its coal production capacity was significantly upgraded. In 2012, DPRK exported 11.8 million tons of anthracite coal to China, which is accounting for 34.7% in China's total anthracite imports of 34 million tons. In 2013, anthracite coal exports to China increased to 16.48 million tons accounting for 41.6% in total anthracite import in China of 39.66 million tons.

2.4 Policy Survey in the NEA Countries

The countries in NEA appeared to pursue common goals in their energy policy, which include the energy security, the improvement of energy efficiency, the expansion of renewable energy development and deployment, and so on.

This section briefly reviews energy policy in each country in NEA.

China

Main Objectives of the energy policy in China, shown in the Twelfth Five-Year Plan for Energy Development (2011 – 2015), which is the national key special plan for the energy sector, are as follows

- Total Consumption of Primary Energy: Control objective in 2015 is 4 billion tons of standard coal.
- Combined Efficiency of Energy: Increase to 38% in 2015
- Energy Consumption of Unit Gross Domestic Product: Decline by 16% in 2015 compared to 2010
- Proportion of Non-fossil Energy Consumption: Reach to 11.4% in 2015
- Production Capacity of Domestic Primary Energy: Reach to 3.66 billion tons of standard coal in 2015
- National Comprehensive Energy Base: Establish five major national comprehensive energy bases in Shanxi, Ordos Basin, Eastern Inner Mongolia, Southwest and Xinjiang.
- Carbon Dioxide Emissions of Unit Gross Domestic Product: Decline by 17% in 2015 compared to 2010
- Emission Intensity of Fine Particulate Matter (PM2.5) Generated by Energy Development and Utilization: Decline by more than 30% in 2015 compared to 2010
- Significant Improvement of the Level of Basic Public Services of Energy: Solve the electricity issue of population in the areas without electricity.
- Formulation of Area Reform: Strengthen energy industry management in 2011-2015.

Nine key tasks were identified for the policy implement to achieve the energy policy objectives, which include;

1. Strengthening for the Exploration and Development of Domestic Resource: The coal and oil and gas resources shall be exploited intensively and efficiently, with the hydropower developed actively and orderly, nuclear power developed safely and efficiently, and the development of wind energy, solar energy and other renewable energy accelerated.
2. Promotion for the Conversion of Energy with High Efficient and Clean Way: The coal power shall be developed in a high efficient and clean way, which facilitates the upgrading demonstration of the washing and deep processing of coal, and the oil refining and processing industry shall be intensively developed, and the natural gas power generation developed orderly.
3. Promotion for Change of Energy Supply Mode: Distributed energy shall be developed, and the construction of smart power grids shall be facilitated, and the construction of energy facilities for new-energy vehicles shall be strengthened.
4. Acceleration of Energy Storage and Transportation Facilities Construction: Reservation emergency support capability shall be enhanced.
5. Implementation of Energy Livelihood Projects: The equalization of basic public services of urban and rural energy shall be facilitated.
6. Controlling for Total Consumption of Energy: The energy management shall be strengthened, which comprehensively facilitate the efficiency of energy conservation.
7. Promotion for the Reform of Electricity, Coal, Oil and Gas and Other Key Areas: The energy price mechanism shall be rationalized.

8. Acceleration of Ability Building of Science and Technology Innovation: The major science and technology demonstration projects shall be implemented, and the equipment automation shall be improved.
9. Deepening of International Cooperation of Energy: Actively participate in the development of overseas energy resources, with expanding the foreign trade and technical cooperation of energy, and maintaining energy security.

Thus, major policy concerns in China are the energy supply security, energy conservation and efficiency improvement, environmentally friendly energy system establishment, energy technology development, and facilitating international energy cooperation.

Mongolia

The Mongolian government aims to create a sustainable energy sector that provides broad access to cost-effective energy and that enables the energy sector to serve as a foundation of economic development. Policy goals include improved energy efficiency, the promotion of renewable energy, and continued restructuring of the energy sector as part of the transition to a market economy, in order to improve the effectiveness of energy supply.

Mongolia also hopes to introduce new technology through regional cooperation. *Sustainable Energy Strategies Toward 2020* has been formulated, which emphasizes increased private sector participation, commercialization and long-term growth, improved efficiency, consumer choice and environmental sustainability.

Mongolia also has a short-term energy strategy (2002-2010) based on five main principles:

- Provide a stable and independent financial system for the energy sector to ensure its viability
- Full implementation of energy sector restructuring
- Improve energy conservation and efficiency by providing the necessary legal framework, ensure that the private sector is increasingly involved and that the benefits are enjoyed by the public
- Improve capacity building to develop policies at the regulatory level that are compatible with the requirements of a market economy
- Improve energy supply in rural areas and introduce price and tariff mechanisms that reflect the ability of consumers to pay, greater utilization of renewable energy sources

Coal is the main energy source in Mongolia, and the coal mining industry plays a significant economic role. The introduction of new coal processing technology, coal liquidation for liquid fuel production, the generation of electricity with gasified coal and various other forms of cleaner coal technology would benefit Mongolia's energy industry and self-sufficiency, and would have a positive environmental impact.

The government is keen to take advantage of new technologies that promote economic efficiency and environmental sustainability, including energy conservation technology and more efficient energy sector management. It is supportive of environmentally sustainable sources of energy, and aims to increase the share of renewable energy in the fuel and energy balance.

Mongolia is very supportive of regional energy cooperation and development because of the country's landlocked situation. The government is actively working to develop the necessary institutional framework for investment promotion and protection, the development of free and fair trade between countries in the region, and policies aimed at improving environmental protection and developing clean energy technologies, in order to participate and contribute effectively to multilateral energy

cooperation in the region. It has expressed interest in cooperation opportunities in, among other areas, the processing of oil and development of renewable energy sources.

ROK

The primary goals of the ROK energy policy defined in the Second National Energy Basic Plan (2014 – 2035) are:

- Strengthening Energy Industry and Policy Sustainability
- Improving People's Life Quality

Five major energy strategies are developed under the plan, which will be pursued in future:

1. Enhancing Energy Conservation
2. Establishing Distributed Power Supply System
3. Harmonizing Environment and Safety
4. Strengthening Energy Security: Stable Energy Supply System
5. Increasing People's Participation

For the strategy to enhance energy conservation, a target is set to reduce 13 per cent of total energy demand as well as 15 per cent of electricity demand by 2035 with respect to the business-as-usual (BAU) scenario. Major implementation policy for this strategy includes:

- Tax reform, electricity tariff revision, and ICT-based demand management

For establishing distributed power supply system, a target is defined to increase power from distributed generation to more than 15 per cent by 2035. Major implementation policy for this strategy includes;

- Secure sufficient transmission capacity: Provide information on available sites for new plants in advance
- Expand distributed generation: Integrated energy systems, renewable energy, and in-house generators
- Improve transmission network: Develop integrated plans, raise public acceptance, and establish an independent body to manage and supervise the power grid

For the strategy for harmonizing environment and safety, the following implementation policy includes;

- Strengthen climate change response: Apply GHG reduction technologies, such as USC and CCS, to thermal power plants as soon as they are available
- Improve safety: Expand investment, improve management of aged plants, and carry out planned and preventive inspections
- Promote innovation in the nuclear industry: Introduce observation, monitoring, openness, and competition into the value chain of the nuclear industry

For strengthening energy security, a target is set to build overseas resource development capacity as well as to achieve a renewable energy deployment rate of 11% by 2035. Major implementation policy for this strategy includes;

- Reinforce public resource development enterprises and reorient public enterprises toward high risk areas and long-term investment.

- Renewable energy deployment: Extend deployment policies currently applied to electricity to heat and transportation
- Oil: Diversify oil import routes and establish a Northeast Asian oil hub
- Gas: Respond to the emergence of shale gas, and expand supply infrastructures
- Integrated energy: Expand the role of integrated energy as a form of distributed power and convert to a low-cost structure
- Electricity: Secure a stable supply capacity at times of supply-demand imbalance
- Nuclear: Downward revision of the nuclear energy share from 41 per cent in 2030 (the 1st Plan) to 29 per cent in 2035 (the 2nd Plan)

For strategy to increase people's participation and reflect public opinion, implementation policy includes in order to improve energy welfare as well as to respond pro-actively to energy-related controversies:

- Introduce the 'Energy Voucher System' in 2015
- Improve energy welfare: Expand energy efficiency projects for vulnerable households, and eradicate welfare blind spots by expanding welfare systems
- Respond proactively to energy-related controversies (e.g. transmission network, spent fuel management, nuclear energy)

Russia

The energy strategy of Russia until 2030 (hereinafter - ES 2030) is currently being updated and a new draft of Energy Strategy 2035 is already published on the Russian Ministry of Economic Development website. Major energy policy objectives are:

- Development of the domestic energy infrastructure (overcoming the traditional imbalance in favor of the export projects);
- Development of domestic energy market (reduce degree of monopolisation, introduce more effective regulation, work on the development of competition and exchange trade);
- Improvement of the efficiency of mining and energy resources processing industries to meet domestic and international demand;
- Improve accessibility (price, availability and reliability) and the quality of energy goods and services (introduce advanced technological standards, reduce costs of energy companies, introduce effective state regulation, continue infrastructure modernization);
- Ensure increased flexibility and diversification of export activities (enter new markets and develop new export routes, as well as new export products);
- Improve competitiveness of energy companies in international markets;
- Introduce principles of sustainable development (social and environmental responsibility, the use and development of human capital for innovation and energy efficiency) in the management of energy companies and government regulations.

These objectives and directions are implemented in three successive stages, consistent with the long-term forecast of socio-economic development of the Russian Federation for the period until 2030:

- The first stage (2014-2020) requires internal restructuring, aimed at bridging the "bottlenecks" in the development of energy infrastructure and lays the groundwork for the development of innovative energy sector
- The second stage (2021-2025) is a stage of resource and innovation development and formation of the new economy infrastructure. The dominant feature of the second phase will

be to increase energy efficiency, implement innovative and capital-intensive energy projects in Eastern Siberia and the Far East, on the continental shelf and on the Yamal Peninsula.

- The third stage (2026-2030) assumes further and deeper development of the innovative economy. The main content of this stage will be a gradual transition to new methods of generating energy, relying on highly efficient use of traditional energy resources as well as new hydrocarbon and non-hydrocarbon energy sources, development of smart energy systems.

Development of markets for energy resources, on a domestic level the ES-2030 points out the ‘necessity of design and improvement of marketplace trading for all types of primary energy sources as well as energy carriers’.

- Oil: Creation of a (national) system of price indicators for oil and oil products; oil refining industry modernization
- Electricity: Unified Energy System to work on "smart grid" network development, growth of the decentralized generation, comprehensive modernization of heating systems, etc.
- Gas: In the gas market, measures such as incentivising the development of independent producers; non-discriminatory access to GAZPROM’s infrastructure; price marker for the internal market; transition from regulating the wholesale price to regulating transportation tariffs are listed as requisite;
- Coal: Russian coal industry is to address the following challenges: focused on innovation; 160% increase in coal exports from 2008 to 2020; three-fold increase in domestic capacity of hard coal processing plants by 2020, reflecting an increase in the domestic use of coal for electricity production, necessity to raise investment funds for the implementation of large-scale infrastructure development projects and development national coal-mining machinery, address the growing need in qualified coal sector engineers and miners.
- Renewable energy: Renewable energy is to be integrated into the country electricity market and into the strategic plans for energy industry development (in accordance with the draft ES- 2035)

On an international level, the priorities are

- Further development of common energy markets within the Eurasian economic space and common regulatory principles.
- Overcome the crisis in relations with European consumers of natural gas by means of adaptation of the contract system with higher regard to Russia’s interests.
- Accelerate entry into the Asian Pacific market in line with the product diversification of exports.

Main policy concerns in energy policy in Russia are energy security, energy efficiency, economic efficiency and sustainable energy development. An important characteristic of the strategy is a necessity to ensure environmental energy security and sustainable energy development. It includes the requirements of social responsibility and environmental safety.

The strategy also takes into account the transformation of the global energy market in the post-crisis period and acceleration of the shift in global demand for energy in developing countries, where currently Russia has a limited presence and a perspective of a long-term decline of demand in traditional Russian markets. According to the strategy, “Russia will remain a leading player on the hydrocarbons market, cautiously boosting its exports. It will actively participate in the development of electric power and coal markets and will strengthen its positions in the global nuclear power.”

Chapter 3. Review on Regional Energy Cooperation in Northeast Asia

3.1 Opportunity for Regional Energy Cooperation in NEA

Overview

Given the differences in energy resource endowments and in current energy market structures among countries in the region, NEA has a tremendous potential for greater regional energy cooperation. As discussed in Chapter 2, in NEA there are three big energy importers, namely China, ROK and Japan, and two big energy producers, namely China and Russia in NEA.

Energy trades among the countries in NEA still remain at the meager level, in the sense that the energy importing countries in NEA heavily depend on imports from the other regions than NEA, while the unique net energy exporting country in NEA, namely Russia, currently exports energy mostly to the European region. However, Russia has actively started to increase its presence in the Asia Pacific market and NEA and this is a very positive movement for all partner countries in the region.

In recent years, a number of discussions and negotiations have occurred between energy producing and exporting countries (e.g. Russia and Mongolia) and energy consuming and importing countries (e.g. ROK, China, and Japan); mostly of these have taken place on a bilateral level but some have also involved multilateral governmental and industrial cooperation. These cooperation projects can be divided into roughly four categories:

- Enhancing cooperation in upstream, midstream, and downstream for the oil, gas, coal and electricity sectors, including constructing cross-border energy supply infrastructure, such as pipelines and interconnected power networks to facilitate intra-regional energy trades in NEA,
- Cooperation for energy conservation/efficiency improvement and renewable energy,
- Cooperation for nuclear power generation safety, and creating new capacities,
- Promoting policy cooperation at the multilateral level, including information sharing, facilitating policy dialogues, enhancing mutual understanding in the energy sector

This Chapter reviews the existing and/or proposed energy cooperation project in NEA.

Energy and Infrastructure Development Cooperation

In NEA, there exists a great potential for oil and gas exploration and development in the Russian Far East as well as coal in China and Mongolia. China, ROK and Japan have shown increasingly its interest in developing huge untapped energy resource reserves in remote areas in neighboring countries.

Development of such huge energy reserves in NEA is, if accomplished and penetrated in the huge demand market in NEA, expected not only to fundamentally change the regional energy patterns but also to significantly affect international energy market. Table 16 highlights cooperation projects that have occurred or proposed on issues related to a range of energy source exploration and development in upstream to construction of energy grid networks in midstream, including on efforts more specifically targeting coal, oil, gas, electricity and other resources in the NEA region.

Some mid-stream projects to construct pipelines and power grid networks are already undertaken on the bilateral basis, but need to be implemented at the multilateral basis, if they penetrated multi-countries in the region. Railway system also needs to be included as the coal mid-stream activity, as it is an important transport mode for coal. More details on cooperation activities among the countries in the NEA region will be discussed in the following section.

<Table 16> Cooperative Project by Energy Sources in Northeast Asia

	Petroleum	Natural Gas	Coal	Electricity & Renewable
Upstream (E&P)	• Joint oil development in the Russian Far East / Equity participation	• Joint gas development in the Russian Far East / Equity participation • Unconventional gas development	• Joint coal development in the Russian Far East • Joint coal development of South Gobi desert in Mongolia	• Joint construction of electricity supply facility (e.g. power plant and transmission grid) in the Russian Far East • Joint renewable
Midstream	• China-Russia oil pipeline connection and construction • Import of Russian oil through pipeline and oil tanker • Commercial use of the North Pole Route	• Construction of gas transport network among the NEA countries (China-Russia, Japan-Russia, Korea-China, . ROK-Japan, Russia-China-ROK, Russia-DPRK-ROK) • Gas pipeline connection among ROK, DPRK, and Russia • Participation in liquefaction facility construction in Russia • Import of Russian gas through pipeline and LNG carrier • Commercial use of the North Pole Route	• Construction of railway for transporting mineral resource of Mongolia • Expansion/Repair and maintenance of DPRK's transport facility • Railway connection between Russia and two Koreas. • Railway connection between China and Mongolia • Import Russian and Mongolian coal through railway and barge	• Discussions on Asian Super Grid (China-Russia, Japan-Russia, Russia-Mongolia, ROK-China, ROK-Japan, China-Mongolia) • Power grid connection among two Koreas and Russia • Import of Russian electricity
Downstream	• China-Russia refinery construction / Petroleum product trades	• Enter the market of city gas business	• Clean coal, CTL technology cooperation	• Power end-use efficiency

Source: Sungkyu Lee and Ahhyun Park (2014)

Cooperation for energy conservation/efficiency improvement and renewable energy

As discussed in the section for policy survey in Chapter 2, all the countries in NEA were shown to implement strongly policies for energy conservation and renewable energy development in pursuits of creation the sustainable future energy system and thus achieving the green economic growth. The development of renewable energy resources, saving energy and improving the efficiency of energy use can greatly save the investment in energy development, reduce energy consumption and improve economic efficiency, which is in turn an effective way to guarantee energy security.

The countries in NEA need to develop a cooperation mechanism, which actively facilitates energy saving and comprehensive utilization of renewable energy resources, so as to carry out project cooperation in renewable energy development/deployment and the improvement of energy efficiency. ROK and Japan are recognized world champions in having very energy efficient economies and effective dissemination of their best practices should bring full results in many energy efficiency

measures, which China, Mongolia or Russia could undertake. Appropriate technology and information exchange mechanisms need to be established in NEA.

Cooperation for Nuclear Power Generation Safety

In the wake of Fukushima nuclear accident occurred in Japan, March 2011, there has been growing serious concerns on the safety of nuclear power in the world. The ramifications of a large scale nuclear accident seriously affect beyond the borders the neighboring countries. Given the vulnerability of nuclear facilities to natural disasters in Japan and also the ambitious expansion of nuclear power plants in China, in particular, the need for regional coordination for the safety of nuclear power plant in Northeast Asia significantly increases. Thus the multilateral coordination and cooperation to ensure safety of nuclear power plant should be a regional energy cooperation agenda in NEA.

Accelerating Multilateral Approach for Regional Energy Cooperation

Construction and also operation of the cross-border energy transportation networks requires for multilateral cooperation, if they involve several countries in the project at the regional basis in case of necessity of transit via the natural gas pipelines.

The rational energy cooperation in NEA is to build an interconnected system among the countries, which needs the countries to conduct policy coordination and cooperation in term of the investment and requires the governments of the countries to participate directly, so as to enhance the inter-government coordination capacity based cooperation in NEA, improve the levels and standards of the multilateral, long term and huge-scale energy cooperation, consolidate and develop the material foundation of the NEA cooperation, strengthen the international mutual trust, facilitate the economic development and politic stability in NEA, accelerate the regional integration progress in Northeast Asia, and achieve the better regional economic effects.

While achieving the better regional economic effects, the multilateral energy cooperation may help the productive elements and economic elements in Northeast Asia form the optimal portfolio, so as to produce the favourable energy economic effects. The energy cooperation involves the energy resources, development capital, labour costs, transportation routes, machinery, relevant technique and relevant industrial development and environment protection and other productive elements and economic elements, technical elements etc. These elements are distributed unevenly with varied qualities in NEA countries. Only through the multilateral cooperation, could realize the optimal portfolio of these elements in the energy development process.

3.2 Cooperation Projects for Energy and Infrastructure Development

3.2.1 Coal

Coal development is an important energy project for the countries in NEA, particularly for China, DPRK, Mongolia and Russia. Also, coal demand in NEA is expected to continue to increase in future as the major fuel for power generation. Accordingly, coal will be one of the most significant fuel to lead the increase in energy demand in NEA.

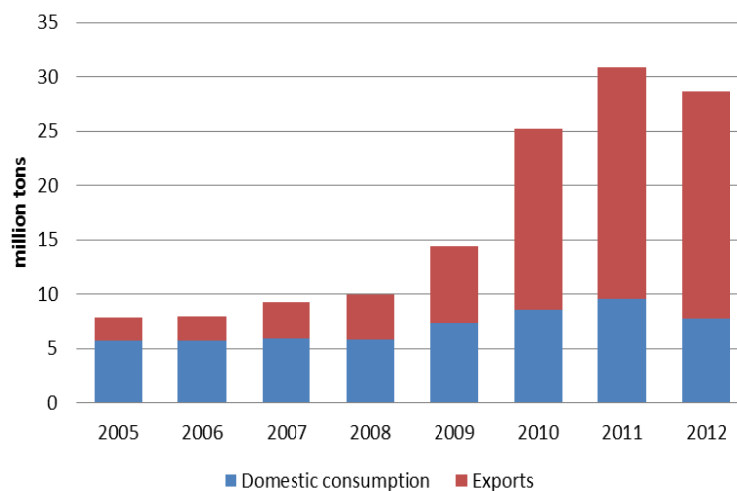
There are some coal development projects implemented in the context of regional cooperation in DPR K, Mongolia and Russia, mainly on bilateral basis, while coal development in China is implemented on a unilateral basis by the country alone. This section reviews the coal development projects which are undertaken at the regional cooperation basis.

Mongolia

Mongolia is rich in coal reserves, having the fourth largest coal reserves in the world. Coal plays an important role in the Mongolian economy, as coal represents 40 – 50 % of Mongolia’s export revenues (47% in 2011), and over 10% of budget revenues and 80 % of foreign direct investment. As shown in Figure 8, the increase in coal production in Mongolia has been led by exports.

In particular, Mongolia has a huge coal reserve to be developed at the Tavan Tolgoi coal mine located in South Gobi, close to the border with China, which is one of the largest undeveloped coalfields in the world and is thought to contain 5 – 6 billion tons of coal. Operating at full capacity, Tavan Tolgoi has the potential produce 15 million tons of coal a year. The full-scale development of the Tavan Tolgoi mining complex would imply an investment of over US\$ 3 billion.

[Figure10] Coal Production and Export



Contracts for the development of this coal deposit are currently under negotiation. China, ROK and Russia are particularly interested in participating in the development of the Tavan Tolgoi coal mine. A consortium of some ROK companies wishes to participate in the development of Tavan Tolgoi coal mines with Korea’s equity participation of 20 %, although Mongolia has a land-lock problem for the transportation of coal to ROK. The Shenhua Group in China also has competed for the right to develop the Tavan Tolgoi coal mine, and won 40% of equity of the project, becoming the largest shareholder thereof.

However, Shenhua Group failed to successfully develop the coal mine due mainly to the lack of infrastructures in the mine field, which is the most serious bottleneck to commercialize large-scale projects. Rich mineral resources cannot be transported by efficient logistics system. In order to solve this coal transportation problem, the Shenhua Group signed a Memorandum of Understanding (MoU) in 2013 for the railway construction project connecting Mongolia up to a port in China.

According to the Government of Mongolia, there are a number of other projects under consideration in addition to the straight-forward coal mining option for Tavan Tolgoi. The Mongolia Government and a range of domestic and foreign companies are viewing the gasification potential of parts of the Tavan Tolgoi complex as well as other options such as coal-to-liquid fuels which could be used for the transport sector. Other options include the creation of a mine-mouth power plant for the export of electricity, a coal to gas plant (gaseous gas or LNG) option, etc. The amounts of inward investment for Tavan Tolgoi would ultimately depend on the selection of the projects and the configuration of

output e.g. coal only, coal and electricity, coal, electricity and gas etc. There is reportedly one tender outstanding for the creation of a metallurgical factory utilizing gas from coking coal at the complex.⁵

Russia

Russia develops coal deposits in East Siberia and the Russian Far East region, aiming to export coal to the NEA markets. It developed the Elga coal mines in Republic of Sakha (Yakutia) in East Siberia, which is one of the world's largest deposits of high-quality coking coal.

Elga's reserves amount to approximately 2.2 billion tonnes. In 2011, mining at the deposit was launched, and transport began at the 321 kilometer railway which was built by the Russian company Mechel. The first stage of the 9 million-tons washing complex's construction will be completed no later than August, 2017. The Mechel is interested in the supply of coal and expanding the range of coal products to the NEA market through promoting cooperation with the NEA countries' companies. In addition to the supply of coking coal, Mechel can supply anthracite and mixtures for pulverized coal injection production. Also, a Russian company "Kuzbass Fuel Company" wishes to promote its high-quality coal produced at the new concentrator 'Cascade-2' on the markets of NEA countries.

China has a strong wish to cooperate with Russia by ways of developing coal mines in the Russian territory and developing the transportation infrastructure. In 2014, Russia Technology Company and China Shenhua Group Co., Ltd. considered issuing IPO for their joint venture developing coal mine in Amur Oblast, Russia. On June, 2014, a subsidiary of Russia Technology Company concluded a memorandum of jointly developing ARGUS-McCloskey coal mine with an amount of U.S. 5 Billion Dollars. The coal storage of the coal mine is about 1.6 billion tons.

In 2009, Russia exported 300 thousand tons of coals to China through Port Manchuri and prepared for further expanding the railway transported volume. In 2010, China and Russia signed a memorandum, whereby China provided Russia with a loan of US\$ 6 billion for coal development and relevant infrastructure construction to secure the coal export. The conditions were that in next 5 years, Russia will provide China with 15 million tons of coals, and the quantity of coal supply per annum will be increased to 20 million tons.

DPRK

Coal is an important energy source in DPRK. Coal is a major fuel for power generation as well as for industrial and household uses in the country. DPRK has a large reserve of anthracite coal of good quality. In 2005, the China Minmetals Corporation and the Ministry of External Economic Affairs, DPRK has concluded an agreement on the establishment of a joint venture project for the development of coal mines in DPRK. DPRK is increasing the coal production and to export the anthracite coal to China.

3.2.2 Oil and Pipeline Development

Russia

Russia has huge oil reserves in the NEA region, and thus has significant potential to develop oil particularly in Eastern Siberia, Sakha Republic (Yakutia), and in the shelf of the Sakhalin Island. East Siberia has become the center of oil production growth for Russia.

The start-up of the Vankorskoye (Vankor) oil and gas field in August 2009 has dramatically increased production in the region and has been a significant contributor to Russia's increase in oil production since 2010. Vankor located at the north of Arctic Circle was the largest oil discovery in Russia in nearly three decades. In 2013, the field has produced about 430,000bbl/d. There are a number of other

⁵ Mongolian Ministry of Energy, 2014 Report of Energy Sector

fields in the region, including the Verkhnechonskoye oil and gas condensate field, Yurubcheno-Tokhomskoye oil and gas condensate field, and Agaleevskoye gas and condensate fields.

Sakhalin Island, located off Russia's eastern shore, is home to a number of large oil and gas fields. The areas of the island are being developed in phases, with Sakhalin I and II producing oil and gas. Continued growth is expected to come from the Odoptu and Arkutun-Dagi fields in Sakhalin Island. Odoptu started producing in 2010, and Arkutun-Dagi is expected to commence production in the first half of 2014. Other sizeable fields include Chaivo (Sakhalin I), Piltun-Astokhskoye, and Lunksoye (Sakhalin II), and Kirinskoye and Veninskoye (Sakhalin III). Russian exploration companies and international consortia are involved in the development of the Sakhalin Island resources.

The total gas resources of the Sakhalin III project are estimated at around 1.1 trillion cubic meters. C1 gas and gas condensate reserves of the Kirinskoye field amount to 162.5 billion cubic meters and 19.1 million tons accordingly. All of the consortia have extensive export plans via liquefied natural gas (LNG) terminals and export pipelines to the mainland.

Russia also established oil pipeline system in the NEA region, called the Eastern Siberia-Pacific Ocean (ESPO) pipeline, with a branch pipeline to China (Daqing), which created an outlet for East Siberian oil to the Asia-Pacific market.

[Figure 11] East Siberia-Pacific Oil Pipeline



The first phase of the ESPO pipeline was completed in December 2009 with distance of 2,757km from Taishet to Skovorodino, and the second stage construction was completed in 2012 with distance of 2,100 km from Skovorodino to Kozmino. A total of 400,000 bbl/d of crude oil was supplied to the pipeline in its first year of operation. Also, the Russia–China oil pipeline was constructed from Skovorodino to Daqing with distance of 997 km in September 2010. Amount of oil to be delivered through the ESPO pipeline to Kozmino port is expected to be 80 million ton per annum by 2020, and that of branch pipeline of Skovorodino - Daqing in China with capacity up to 25 - 30 million tons of oil per annum.

A leader of Russia's petroleum industry and the world's largest publicly traded petroleum company Rosneft, undertakes operation oil development and production business in the region and Transneft, a Russian state transport company, one of the largest pipeline companies in the world runs the ESPO pipeline system. There are 2 ports serving as export outlets for Russian oil and gas to the NEA region; one is Kozmino in Primorsky Krai which loads crude oil via the ESPO pipeline, and the other is

Prigorodnoye located on Sakhalin Island for LNG exports with 160 LNG vessels.. Russia also uses the railway system in exporting crude oil and oil products to China and Mongolia.

Oil Cooperation between China and Russia

Among the countries in NEA, China is most actively promoting energy cooperation with Russia, in particular, for oil development and trades. In 2005, Rosneft in Russia contracted with the CNPC for 15-year long term oil supply to export crude oil of 48.4 million tons to China from 2005 to 2010. In April 2014, Rosneft also signed an agreement with China to increase oil export to China by three times to the current level. Thus, China became the biggest crude oil importing country from Russia.

Another type of mutual oil cooperation between two countries appeared to be the equity participation of the Chinese company in the Russian oil company. In 2006, CNPC and Sinopec purchased the share of Rosneft and CNPC became the biggest shareholder of Rosneft, and Sinopec acquired 60% of assets of Udmurtneft, a subsidiary of TNK-BP, producing 5.8 million tons of oil per annum.

In 2007, China and Russia signed an agreement on promoting the establishment of cross-border pipeline between two countries, and in 2009 CNPC and two Russian companies, Rosneft and Transneft signed an agreement for a long-term crude oil supply of 15 million tons per annum by train by 2010 and through the pipeline from 2011. In addition, China provided Transneft with a loan to ensure the completion of the oil pipeline infrastructures. Thus, on completion of the Skovorodino-Mohe-Daqing oil pipeline with distance of 1,030 km in 2010, China's oil imports from Russia became to reach the level of 15 million tons per annum.

As for cooperation between China and Russia for oil and gas exploration and development, Sinopec and Rosneft created a joint venture company, Vostok Energy Ltd, to explore and develop three (3) promising fields in Irkutsk in East Siberia. In 2006, Sinopec entered Sakhalin Island to conduct the exploration and development of oil and gas. For the downstream refining business, CNPC and Rosneft Oil established the Refinery of China-Russia Eastern Petrochemical Co (Tianjin) in 2010 with CNPC share hold of 51% and Rosneft share hold of 49%.

Thus, oil cooperation between China and Russia covers a whole range of oil business from the upstream, mid-stream to the downstream, i.e. exploration, development, trade and investment, construction of cross-border pipeline and refining.

Oil Development in Mongolia

Mongolia's total oil resources are estimated to amount to 1,600 million tons. Tamsag basin alone has estimated reserves of 600 million tons. Mongolia has been divided into 25 oil exploration blocks (in total 528 thousand square kilometers). Currently 13 oil basins are under the exploration of which six fields are being intensively explored: Tamsag basin, Zuun Bayan, Tsagaan Els basins and Western Mongolia.

On December, 2009, China and Mongolia signed the Agreement of China and Mongolian Government on Cooperation in Mineral Energy Field. In 2014, Mongolia has reached an oil exploration agreement with China National Petroleum Corporation (CNPC). According to the agreement, CNPC would take the lead to oil exploration in eastern Mongolia.

At present, crude oil production in eastern Mongolia by Petro China Daqing amounts to about 1 million tons per annum. All production is exported for refining in China, and all petroleum products consumed in the country are currently imported.

Crude oil development in Mongolia is projected to rapidly increase in the coming years and, in anticipation, the Government of Mongolia will adhere to the policy of building a domestic refinery plant in addition to supplying the domestic market with petroleum products.

Oil Development in DPRK

Assuming there is a great potential of oil reserves onshore and off-shore, DPRK has made efforts to find and develop oil resources in its territory from the mid 1960's⁶. Three continental shelves in Seohan Bay, Donghan Bay and Onju/Gilju near Pyongyang are presumed to be areas potentially having oil reserves. Among the three areas, Seohan (West Korea) Bay is considered to be the most likely to have oil, of which the geological features are almost identical to those of Bohai Bay, where China found an oil reserve of about 5-6 billion barrels of oil. It is likely that Seohan Bay and Bohai Bay are linked to each other. According to an estimation made by experts in DPRK that up to tens of billions of barrels of oil are being reserved in the country.

DPRK has conducted joint surveys in the areas with Meridian Energy Limited, a New Zealand-based utility company, Beach Petroleum, oil and gas exploration company based in Australia, and Taurus Energy, a Swedish oil and gas exploration company. A London based company, Aminex, was involved from 2004 in oil development project in DPRK. However, no oil field was found yet.⁷ DPRK also signed the MOU with China in December 2005 for joint development oil fields in Seohan Bay between DPRK's Deputy Premier Doochul Roh and China's Deputy Premier Zeng Piayan.

Recently, a Mongolian oil company, the HB Oil JSC, an oil trading and refining company based in Ulaanbaatar, reportedly acquired 20 % of the state-run entity in DPRK operating the Sungri refinery in June 2013, and intended to supply crude oil to Sungri refinery and to export the refined products to Mongolia.⁸ The Mongolian company is also planning to attract foreign investors to oil development projects in DPRK by sharing with them geological data, which could indicate the presence of oil and gas resources in the country. This movement can contribute to developing onshore oil exploration in DPRK. This HBO's attempts to enter into DPRK's undeveloped oil and gas sector have led it to investing in projects that could give it access to upstream oil and gas production and downstream refinery capacity in the coming years.

ROK's Participation in Oil Development in NEA

Korea participated in oil development project in Russia mainly by the KNOC's initiatives from 2005.⁹

- Tigil: In November 2005, KNOC made a Share sale and purchase Agreement with CEP International Petroleum Ltd. for Tigil Block, an onshore block with an area of 3,264 km² through direct negotiation. Tigil Block is in the Western Kamchatka basin which is located in west offshore area of Kamchatka Peninsula. This project was reportedly not successful.
- Icha: In November 2005, KNOC made a Share sale and purchase Agreement with CEP International Petroleum Ltd. for Icha Block, an onshore block with an area of 3,100 km² through direct negotiation.
- West Kamchatka: The West Kamchatka block is located in the Okhotsk Sea. This block covers 62,680 square kilometers and its depth reaches less than 300 meters. KNOC works for exploration with Rosneft in the licensed area as well as plays a role of main shareholder in the Korea Consortium. Korean Consortium was composed of 7 companies performing essential oil business in Korea; KNOC, KOGAS, SK Energy, Daewoo international, GS Caltex, Hyundai Corporation and Korea Kumho Petrochemical. This project was cancelled by the Russian decision.

ROK is also participating in oil development/production projects in China; Mahuang-shan West Project: The KNOC has participated in the exploration of the Western mining area in Mahuang-shan, China, from 2001 and the construction work of production facilities was finished and the main

⁶ Keun Wook Paik, 2007, North Korea and Seabed Petroleum, available at <http://www.wilsoncenter.org>

⁷ Hankyore, Oct.8,2007, <http://english.hani.co.kr/>

⁸ Bloomberg News, June 2013, available at <http://www.businessweek.com/news/2013-06-17/mongolia-taps-north-korean-oil-potential-to-ease-russia-reliance>

⁹ KNOC Homepage

commercial production started from October 2007. KNOC has established a joint venture project with Samsung Corp. and a local Chinese company (Sinopec) and has 44 % of total shares. The KNOC's production is 70,000 barrels. Mahuang-shan west crude is a light, high-quality, low-sulphur crude with API gravity of 38.5°.

Cooperation for Strategic Petroleum Stockpiling between China and Korea

Since 2001, ROK and China continue to cooperate for 'Joint Stockpiling'¹⁰ of crude oil. From June 2001 to May 2002, a Chinese company, the UNIPEC (China International United Petroleum & Chemicals Co., LTD) used the KNOC's facility for storage of 2.0 million barrels of crude oil, and from December 2004 to October 2005, the Sinochem did so for 1.2 million barrels in the KNOC tanks. Since November 2003, the Chinaoil (China National United Oil Corporation) is also using the KNOC's storage facilities with 2.7 million barrels of crude oil at the peak.

3.2.3 Natural Gas Cooperation

Russia's natural gas and infrastructure development

The Russian Far East (Irkutsk, Yakutiya, Sakhalin Islands) includes one the largest unexplored natural gas bearing areas still left on earth. The area is a potential large source of natural gas in NEA for the market in Korea, China, and Japan. The development plan for natural gas in NEA also includes a project for the construction of cross-border pipeline networks as a part of a gas-export line from gas fields in Eastern Siberia to the NEA market.

The realization of these projects will provide the countries in the region with diverse energy sources (from coal and nuclear) while possibly improving environmentally friendly energy systems. Eventually, the project will contribute to the creation of an integrated regional energy system in NEA.

According to the Gazprom's plan on the United Gas Supply System (UGSS) Eastern Program, four gas production centers will be developed for the natural gas supply to the NEA and Asia-Pacific regions, which include;

- Krasnoyarsk center based on Sobinsko-Paiginsk and Yurubcheno-Tokhomskoye deposits
- Irkutsk on the basis of the Kovykta field and fields in the north of Irkutsk region
- Yakutsk based on Chayandinskoye field and neighboring oil and gas fields, and
- Sakhalin based on deposits of the shelf zone of the island.

¹⁰ Joint stockpiling of SPR among oil-consuming countries is a common practice among a part of EU member countries through bilateral stockholding agreements. In Northeast Asia, there is excess stockpile possessed by the KNOC in Korea and JOGMEC (Japan Oil, Gas and Metals Corporation) in Japan, and they can be leased to China or ASEAN countries. Or, it is possible for private companies to jointly use excess operational stocks to straight out supply and consumption.

[Figure 12] Gazprom's UGSS Eastern Program



The projected gas production in Eastern Siberia and the Russian Far East is assumed to be in the ranges of 44.9 – 88.2 bcm (billion. cubic meter) per annum in 2015 and of 76.6 – 133.8 bcm per annum in 2020, and to maintain a constant production until 2034. There is ongoing work for the formation of Yakutia gas production centre based on Chayandinskoye condensate field which is expected to be finished in 2017, of which natural gas production is expected to be 25 bcm in 2021

East-Siberia Gas Pipeline Projects

According to the Gazprom's plan, pipeline to transport natural gas will be constructed and connected systematically from East Siberia and Sakhalin to Vladivostok by 2020, and natural gas will be supplied to the domestic market in Russia and will be exported to neighboring countries via its trunk pipeline system (UGSS) as new gas fields are developed in future. Pipeline development includes,

- 1st stage: (1) Constructing a gas pipeline of Sakhalin-Khabarovsk section, (2) Building trunk line and supplying gas in Irkutsk area;
- 2nd stage: Development of Chayandinsk gas field (1) constructing a branch line for supplying gas to China at the Blagoveshchensk, (2) Connecting gas trunk line between Irkutsk and Tarshet, and (3) Connecting trunk line between Khabarovsk and Vladivostok and supplying natural gas to Korea;
- 3rd stage: Developing fields in the Krasnoyarsk region and connecting line to Tarshet region; and
- 4th stage: (1) Connecting gas fields between Irkutsk and Chayandinsk, (2) Connecting gas trunk line in Blagoveshchensk and Khabarovsk section (completion of UGSS).

The gas pipeline of Yakutia – Khabarovsk – Vladivostok running over a considerable distance in the same corridor with ESPO oil pipelines and combined with the Sakhalin – Khabarovsk – Vladivostok in future will form the Russian Far East gas pipeline infrastructure system.

The next step will be a full-scale development of the Kovykta field in the Irkutsk region and construction of gas pipeline between Irkutsk and Yakutia gas production centre of about 800 km.

Thus, a full scale of gas delivery system on Russia's Pacific coast will be constructed. Supplying Russian natural gas to the NEA market provides good energy security, which will rely on the gas produced from the Sakhalin shelf then from Yakutia, and in the long term from Eastern Siberia which has large reserves nearby. As an option to ensure export of the Russian gas to the NEA and Asia-Pacific markets, an LNG plant and exporting terminal are also planned to construct at Vladivostok.

China-Russia Gas Cooperation

In 2006, CNPC signed a memorandum of understanding with Gazprom, which becomes a basic framework of China-Russia gas cooperation. According to the memorandum, Russia plans to construct two gas pipelines (east bound and west bound) led to China.

The west bound starts from West Siberia passing Altai region and connects to the China's west-east gas transmission pipeline; the east bound gas is supplied from the Kovykta gas field in East Siberia and led to northeast China.

In May 2014, Gazprom in Russia and the CNPC in China signed the Sale and Purchase Contract for China-Russia East Line Gas. As stipulated in the Contract, Russia will begin to supply natural gas to China since 2018 and the gas supply increase year by year till 38 bcm per annum, and the contract period will be 30 years.

The Contract plays a strategic role in Russia and China, which may meet the demand on expanding a new market by Russian natural gas enterprises and also facilitate China economic development as well as enhance the ecological environment. After signing the Agreement, Gazprom expressed the intention to implement the Agreement of "Altai" Gas Pipeline (West Line) with China as soon as possible.

Meanwhile, Bank of China prepares to invest US\$ 20 billion in developing the liquefied natural gas factory on Yamal Peninsula, with the total value for the project of US\$ 27 billion. In May, 2014, the Vnesheconombank, Gazprom Bank, and the Yamal Liquefied Natural Gas Company signed a Memorandum of Understanding with China Development Bank, and a Contract that 3 million tons of liquefied natural gas will be supplied to China per annum under the project frame of the Yamal Liquefied Natural Gas.

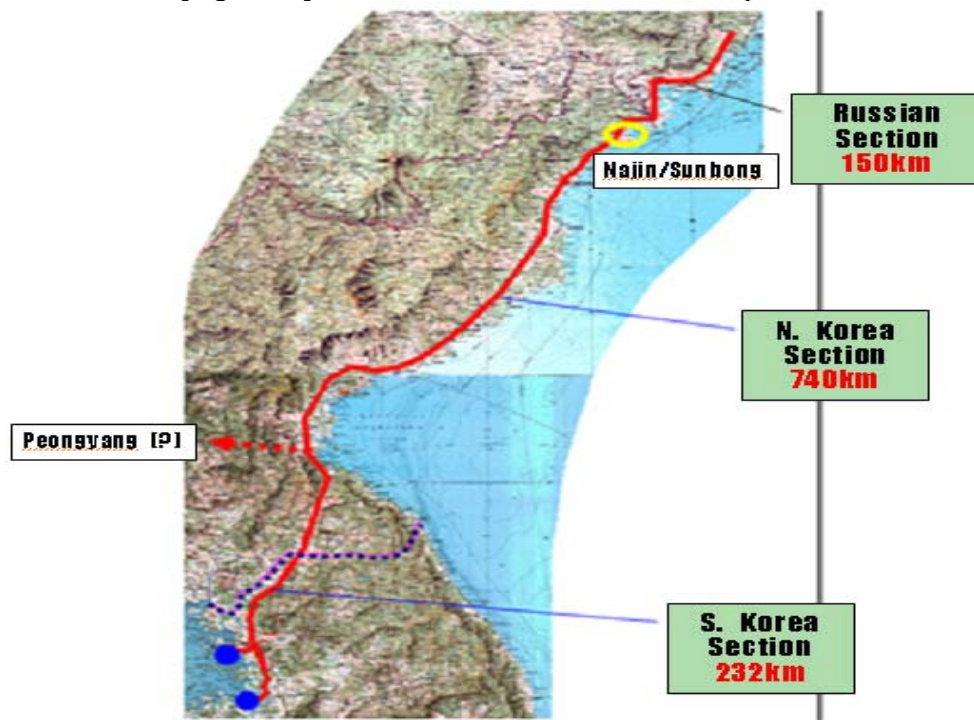
Russia – DPRK – Republic of Korea Natural Gas Pipeline Project

ROK hopes to import at least 10 bcm of the Russian natural gas from the year of 2017 at earliest in addition to import of 1.5 million tons of LNG from the Sakhalin II project from 2008. Actually, this is also what the Russian side indicated at the meeting for signing the inter-governmental agreement for natural gas cooperation between Korea and Russia in October 2006.

The KOGAS (the Korea Gas Corporation) and the Gazprom have had several consultation meetings since then on how to achieve the goal. A meaningful progress was made at the Summit Meeting between Korea and Russia in Moscow, September 2008. Korean President Lee Myung-bak and Russian President Dmitry Medvedev agreed to jointly undertake a \$100 billion project which will include the development of natural gas pipeline routes from Siberia to Korea.

It features a natural gas pipeline running through the Korean Peninsula. The proposal would call for ROK to import 10 billion cubic meters (bcm) of gas a year for 30 years as of 2015. ROK plans to buy nearly 20 % of its future natural gas from Russia through a pipeline which would pass through DPRK.

[Figure 13] Russia - Two Koreas Natural Gas Pipeline



A formal contract for the gas purchase was signed between the KOGAS (Korea Gas Corporation) and its Russian counterpart Gazprom in 2010. Construction of the envisioned pipeline from Vladivostok to ROK was scheduled to begin in 2011 and was supposed to complete by 2014, so that gas delivery can begin in 2015. Along with the gas deal, ROK and Russia also agreed to set up a joint gas-chemical industrial zone in Russia's Far-East, with the KOGAS and Russia's Gazprom taking the lead.

DPRK and Russia signed a MOU for the pipeline project in August 2011 in the occasion of the summit meeting between the DPRK's leader Kim Jong Il and the Russian President Dmitry Medvedev at Ulan Ude. Also, during the summit meeting between ROK and Russia on November 2011, two countries decided on the specific roadmap for the natural gas pipeline project passing through DPRK.

To realize the gas pipeline from Russia to ROK through DPRK territory it is absolutely necessary for the two Koreas to cooperate with each other closely. If the gas pipeline project completed successfully, both countries would benefit economically.

The DPRK can earn annual transit fees of US\$150 million, while also profiting from labor costs and regional development by participating in PNG construction, and alleviating its own power shortage problems by building gas-generated power plants in areas where the PNG passes through.

The Russian Federation can earn about US\$90 billion by procuring a stable gas market for 30 years, and may extend this project to economic development of the Far East region and gain access to new export markets in ROK, China and Japan.

ROK can obtain a stable supply of gas at prices 30-70% lower than LNG (excluding the costs of PNG construction) and can extend this cooperation in the energy sector to the economic and industrial sectors.¹¹ Thus this project can be expected to bring huge economic profits and other benefits for all three countries.

¹¹ Lee, Youn Seek, 2011. The Gas Pipeline connecting South Korea, North Korea, and Russia: Effects, Points

Gas Plant Construction Cooperation between Korea and China

For the cooperation in the gas sector, the Korea Gas Corporation (KOGAS), a state-owned company, which work for mainly on LNG import and distribution of natural gas in ROK, participates in the development of several LNG Re-gasification Terminal Projects in China, as follows.¹²

- Zhejiang LNG Re-gasification Terminal Project in China
 - Owner: CNOOC-Zhejiang LNG Co., Ltd.
 - Terminal Size : 160,000 kl x 3, Jetty
 - Send-out Capacity : 3MMTPA
 - Service Period : June, 2012 ~ December, 2012
 - KOGAS Service Scope : Commissioning Consulting
- Jiangsu LNG Re-gasification Terminal Project in China
 - Owner: PetroChina LNG Jiangsu Co.
 - Terminal Size : 160,000 kl x3, 200,000 kl x1, Jetty
 - Send-out Capacity : 3.5MMTPA
 - Service Period : August, 2012 ~ December, 2015
 - KOGAS Scope : Storage Tank Design
- Qingdao LNG Re-gasification Terminal Project in China
 - Owner: Sinopec Qingdao LNG Co., Ltd.
 - Terminal Size : 160,000kl x3, Jetty
 - Send-out Capacity : 3MMTPA
 - Service Period : May, 2014 ~ March, 2015
 - KOGAS Scope : Commissioning, O&M Consulting

3.2.4 Power Interconnection Cooperation

Power interconnection is an electrical grid at a regional scale or greater that operates at a synchronized frequency and is electrically tied together during normal system conditions.¹³ The benefits of power interconnection include pooling of generation, resulting in lower generation costs; pooling of load, resulting in significant equalizing effects; common provisioning of reserves, resulting in cheaper primary and secondary reserve power costs; opening of the market, resulting in possibility of long term contracts and short term power exchanges; and mutual assistance in the event of disturbances.

Accordingly, there are many power interconnection systems under the operation at the regional basis in the world, including Europe, North America, and Africa. However, in NEA, there is only limited power interconnection system established only between Russia and Mongolia, and recently China and Russia began to establish the system between two countries. There are also some proposals and studies for the establishment of power interconnection between three countries in NEA, namely Russia, DPRK and Republic of Korea. More ambitiously, the Asian Super Grid System is also under the review among the countries in NEA region.

Power Interconnection between Russia and China, countries in NEA

Deliveries of Russian electricity to China are carried out by Inter RAO Group and have a tendency to increase annually. In the period from 2002 to 2014 electricity export increased more than twenty times - from 151 million kW*h to 3.4 billion kW*h. It became possible as a result of construction and

of Contention, and Tasks, Policy Study 11-05, Korea Institute for National Unification. Available at <http://www.kinu.or.kr/upload/neoboard/DATA02/rps11-05.pdf>

¹² Kogas homepage, <http://www.kogas.or.kr/>

¹³ http://en.wikipedia.org/wiki/Wide_area_synchronous_grid

commissioning in early 2012 a new interstate transmission line “Amurskaya – Heihe” with nominal voltage of 500 kV and HVDC in the territory of China.

In February 2012 Inter RAO Group and State Grid Corporation of China (SGCC) signed a long-term contract for a period of 25 years with a total supply of 100 billion kW*h. Average annual volume of supply under this contract is 3.5-4 billion kW*h.

To ensure performance of the terms of the long twenty-five-year contract for the supply of electricity from Russia to China by Inter RAO Group is considering the possibility of construction of generation facilities of 600-700 MW on the base of Erkovetsk brown coal field deposits in the Amur region of Russia.

One of the promising directions of Inter RAO Group’s development is associated with the possibility of access to the markets of central provinces of China. Taking into account that electric power is to be transmitted over long distances, it becomes economically feasible to export electricity using the lines of the super - and ultra-high voltage, providing the necessary bandwidth. To ensure export in such a volume, new generating facilities with appropriate power capacity in the territory of Russia have to be constructed.

In March 2013 Inter RAO Group and State Grid Corporation of China signed an Agreement on joint development of feasibility study for expansion of the Russian-Chinese cooperation, which includes the construction of 40 000-50 000 MW of new generating capacity to export electricity to China.

In the framework of this Agreement the sides are studying the project of construction of Erkovetsk thermal power plant on the base of Erkovetsk brown coal field deposits in the Amur region of Russia, as well as the construction of the interstate transmission of direct current, which would make possible the export of electricity to the central provinces of China in the amount of up to 50 billion kWh per year. The decision on this project will be made according to the results of the feasibility study.

Power Interconnection in Mongolia with Russia and China

Mongolia imports electric energy from Russia through 10 interstate transmission lines of 220 kV. Mongolia imports 300-400 GWh of electricity per annum from Russia providing 160 MW capacity.

Mongolia is interested in establishing power interconnection system with China by constructing mine-mouth power plants on-site at coal mines in Mongolia to export electricity to China in future.

It is foreseen that the China North Grid, to which Inner Mongolia belongs, will be strongly interconnected to Beijing/Tianjin, China Central Grid and also to China Northeast Grid via a combination of 500 kV, 765 kV and ultra-high voltage (UHV) 1000 kV lines, including both AC and DC connections.

This will change the electricity market conditions, and open up a long-term prospect of interconnecting to ROK and Japanese markets as well.

Russia's Initiatives for Power Interconnection Projects in NEA

Currently, there is an existing but weak connection between electrical power systems in East Siberia and the Russian Far East (220 kV), between Russia and Mongolia with a capacity of 110.220 kV and length of 380 km long, as well as between Russia and China with a capacity of 110, 220, 500 kV and length of 206 km. Through this transmission lines, Russia exported to China 983 million kWh, and to Mongolia 206 million kWh of electricity in 2010.

In 2012, Russia launched a study on the modeling of new electrical connections (energy rings) in NEA, in preparation for the Asia-Pacific Economic Cooperation summit. A feasibility study for the creation of the effective interconnection between Russia and China was carried out. The next phase of the project was to find optimal solutions for the supply of electricity to the Republic of Korea. In

August 2013 the project was endorsed at the meeting of the Russian-Korean intergovernmental commission.

A joint research of the Skolkovo Technology Centre for Energy Systems and the Korean Energy Economic Institute (KEEI) was undertaken in 2014, which included the possibility of creating the Asian Energy Charter Treaty, which would form a legal framework for regional energy cooperation in the NEA

As for the power interconnection project between Russia, DPRK, ROK, the project was commenced for the implementation within the framework of a memorandum signed with Skolkovo Tech, En+Group and Korea's KEPCO (Korea Electricity Power Corporation) during the visit of the Russian President to Korea in November 2013. Several options of electricity transmission from Russia to NEA countries were considered:

- Transmission line from Vladivostok transit through DPRK to Seoul;
- Transmission line from Chita and Blagoveshchensk transit through China (Harbin, Shenyang) and DPRK to Seoul;
- Transmission line from Chita and Blagoveshchensk transit through China (Harbin, Shenyang, Dalian) and then an undersea cable to Seoul.

It was noted that Japan's participation would enhance the economic feasibility of the project. Electricity can be transmitted via the northern (submarine cable from Sakhalin), and the southern (from the Republic of Korea through a submarine cable via island Kyushu to Honshu) routes.

Final results of the study would be presented to the Government of Russia, as well as presented in the framework of the APEC summit in November 2014.

Gobitec and Asian Super Grid

The 'Gobitec' is a new industrial initiative, in which electricity is produced from renewable energy sources in the desert regions of Mongolia¹⁴ and China and brought to the industrial centers of Mongolia, China, the Republic of Korea and Japan via high-voltage lines, i.e. the Asian Super Grid. The Asian Super Grid Initiative aims to construct high-voltage transmission lines throughout NEA and interconnect the national grids of Japan, Korea, China, Mongolia and Russia so that abundant renewable energy sources in remote areas could be utilized, such as hydropower resources in East Siberia.

The ASG represents the strategy of connecting locations of high energy demand with regions of large renewable energy potential. Therefore, the proposed grid connects renewable energy sources in the Gobi Desert with Irkutsk in the North, incorporating hydropower electricity in the system. It is also connected to the locations of demand in Shanghai and Seoul in the South as well as Tokyo in the East of the ASG region.

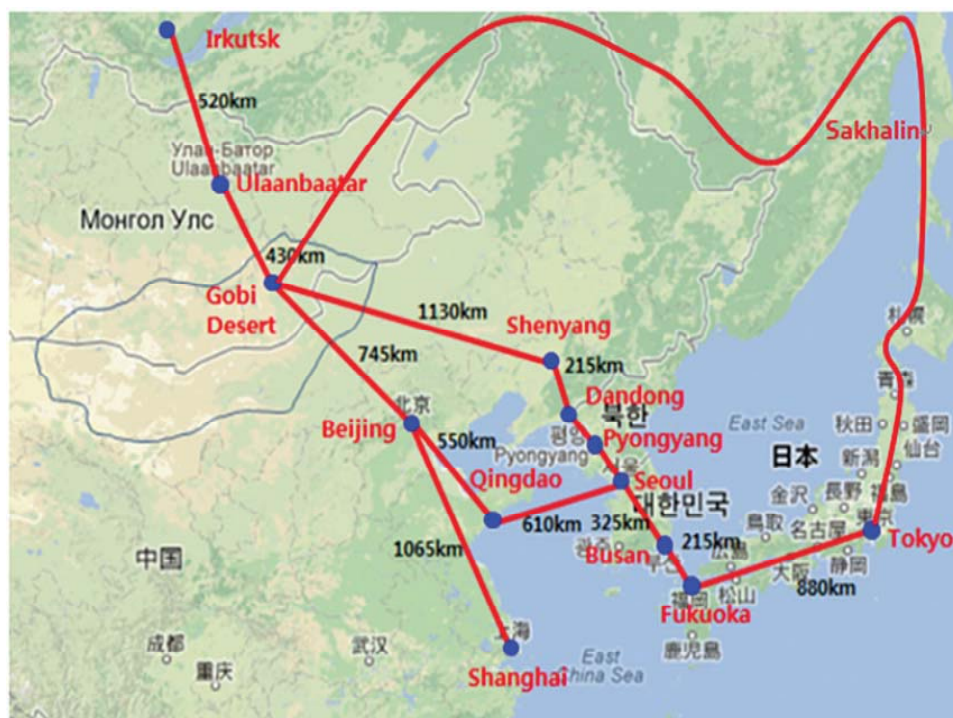
In March 2013 five partner organizations signed a memorandum of understanding to jointly prepare a regional study, Gobitec and the Asian Super Grid, for renewable energy sources in Northeast Asia.

These are as follows.

- Energy Charter Secretariat;
- Energy Economics Institute of the Republic of Korea;
- Ministry of Energy of Mongolia;
- Japan Renewable Energy Foundation;
- Energy Systems Institute of the Russian Federation.

¹⁴ The Gobi desert is estimated to be the third largest potential source of solar energy in the world and is also blessed with steady, strong wind speeds, making it ideal for both technologies.

[Figure 14] Possible Routes of the ASG



The core objective of the joint study is to provide Northeast Asian countries and the international community with reliable information and data concerning the potential of renewable energy sources in the region. The study also aims to stimulate the interest of the private sector and international investors, and to provide recommendations for maximizing international and regional cooperation in order to promote the Gobitec and the Asian Super Grid initiative. The study was completed in 2013 and presented to interested policy makers, the business sector and the general public to stimulate informed discussions and facilitate regional cooperation in the energy sector in NEA.

A super grid implies technical and political challenges because of the large geographical extent. The advantages, however, are that demand and supply can be balanced more easily because regional differences are leveled out by the size of the system. Also, energy conversion technologies can focus on places of high energy output and on the available land area, while the grid provides the connection to the places where the electricity is demanded. The ASG will allow for the free exchange of electricity between countries in NEA, thus providing large economic, social and environmental benefits.

3.2.5 Electricity Cooperation

China and Mongolia

In May 2014, the Power Construction Corporation of China signed with Mongolia an investment and cooperation memorandum of the coal-fired power plant project in Buluuljuut pithead of Mongolia.

China and Russia

China and Russia have a long history of cooperation in the power sector including nuclear power generation. In 1997, Jiangsu Nuclear Power Co., Ltd. funded by China National Nuclear Corporation, and Russia signed the biggest technical cooperation contract at that time. In 2010, China and Russia started to jointly build the Phase II project of Tianwan Nuclear Power Station. Both China and Russia

would adopt the most advanced technology in the world to reinforce cooperation in the field of nuclear power, based on cooperation experience in the Tianwan Nuclear Power Station.

After Amur Sirius Power Equipment Co., Ltd. had won the bidding in constructing a 175 megawatts solar power station, Rushydro had signed an agreement with Power Construction Corporation of China in Shanghai on May, 2014, and will cooperate with China to invest in constructing 35 small-scale hydropower stations (capacity below 25 megawatts) prior to 2020 with the estimated investment value about US\$ 3.5 – 5.0 billion with total installed capacity about 500 megawatts. Those hydropower stations will be constructed in regions such as Altai, Omsk Oblast, Murmansk Oblast, etc. The 70% - 80% amount of the project needs to be financed from Chinese financial institutions.

In addition, the Rushydro has already undertaken a cooperation agreement with China Dongfang Electric Corporation which will invest US\$ 2.23 billion in constructing a gas turbine for the second thermal power plant in the Russian Far East with total installed capacity of 96 megawatts and heating capacity of 8080GKal/h. The agreement thereof also includes cooperation in aspects regarding maintenance and reconstruction of the existing equipment and power network, joint development of wind power, etc.

China and ROK

As for the cooperation in the electricity sector, the Korea Electricity Power Corporation (KEPCO) has expanded its business to China. KEPCO has been involved in coal generation business in Shanxi province via a strategic alliance with Shanxi International Energy Group (SIEG). KEPCO laid the foundation to grow into a total energy service provider covering power generation, coal mining and new/renewable energy business by opening a local subsidiary in China in 2007 and by acquiring existing businesses as well as building new ones for further business expansion.

- Project: Shanxi Joint Venture Project in China
 - Host Entity: SIEG (Shanxi International Energy Group)
 - Project type: Joint Venture : (SIEG-KEPCO-Deutsche Bank-Japan consortium) for 50 years
 - Capacity & Fuel: 6,372 MW, Coal
 - KEPCO's Share: 34 %

ROK took part in building nuclear plants in China. Korea's Doosan Heavy Industries signed a letter of intent (LOI) with US-based Westinghouse Electric Co. to supply key components for two nuclear power facilities in China. According to the deal, Doosan will provide core components of the Chinese power plants such as steam generators, nuclear vessels and reactor heads. The deal is expected to be worth USD \$350 million. The signing of the LOI was done on the sidelines of the 2nd Nuclear Technology Forum between China and Korea in Shanghai in April 2007.

ROK and Russia

As for the cooperation for electricity grid modernization projects in Russia,¹⁵ the Russian government invites foreign investment to modernize power grid in the country. In particular, recognizing the high-standard quality of the Korean product for power transmission/distribution equipment manufacturing, the Russian government offered Korean company to participate in the project through the construction of production plant equipment. Accordingly, a Korean company, the Hyundai Heavy Industry, completed the construction of the equipment production plant in Artem city in Russia in January 2013, and the plant produces and supplies the equipment to the FGC, a Russian power transmission/distribution company, in next five years on the long-term contract basis.

¹⁵ According to the power industry development strategy in Russia by 2030, the Russian government set a target to reduce the transmission/distribution losses by 40 per cent from the current level with the budget of 5 – 7 billion dollars. Currently, 52 per cent of power grid system exceeds the designed life of the equipment.

3.2.6 Renewable Energy Cooperation

China and ROK

Most recently, on the occasion of the Chinese President Mr. Xi Jinping's state visit to ROK in July 2014, ROK and China signed two Memoranda of Understanding (MOU) to strengthen the mutual cooperation in energy conservation and the new advanced technology research and development between the Ministry of Industry, Trade and Energy in ROK and the National Development and Reform Commission in China. Both sides agreed to strengthen cooperation through the active implementation of the memorandum in areas such as energy conservation, new technologies, and to expand exchanges and technical cooperation between the two sides through cooperation among the enterprises and research institutes.

For the renewable energy cooperation between Korea and China, KEPCO started wind power business in September 2005 for the first time by establishing a joint venture with China Datang Corporation in Gansu Province, China, the region known for abundant wind power. KEPCO expanded wind power business to Inner Mongolia and completed phase one project (140MW) in June 2007 followed by phase two expansion project.

KEPCO is also involved in phase 3 ~ phase 7 projects in Inner Mongolia carried out as follow-up. In April 2010, KEPCO signed an agreement to develop 500MW wind farm with Liaoning province and is continuously expanding investment into wind power business through a joint venture with Gemeng International Co., Ltd. in Shanxi province. As of late 2012, KEPCO is the largest overseas power supplier in China operating 919MW wind power plants in Inner Mongolia, Gansu province and Liaoning province with another 396MW project to be added soon.

- KEPCO's Current Status of Overseas Renewable Power Projects in China
 - Total 1,315MW at 25 sites (871MW at 19 sites already in operation)
 - Build, own, operate basis (BOO)

Current Status of Overseas New Renewable Power Projects			
Location	Status	facilities	Total Capacity (MW)
Inner Mongolia	Operating	14	643
	Constructing	4	348
Liaoning Province	Operating	3	129
	Constructing	2	99
Gansu Province	Operating	2	96

Source: KEPCO homepage

ROK and Mongolia

Bilateral energy cooperation between Korea and Mongolia has consistently continued since the inaugural meeting of the 'Korea-Mongolia Joint Committee on Energy and Mineral Resources Consultation and Cooperation' in 1999.

Energy cooperation between two countries includes cooperation on power generation, renewable energy, and green energy, such as photovoltaic energy generation, wind power and clean coal technology. For example, the Korea Gas Corporation (KOGAS) and the Mineral Resources and Petroleum Authority of Mongolia signed a memorandum of understanding (MOU) on joint efforts to produce dimethyl ether (DME) from coal-bed methane (CBM) in 2008.

In addition, ROK's Daegu City Gas and the Mongolian government implemented a plan to jointly work on a renewable energy-based electricity supply system in Mongolia. Also, an MOU between the

POSCO, a Korean steel-manufacturer, and the Mongolia Consulting Service was concluded in 2008 for facilitating joint projects in the steel and energy sectors in Mongolia. .

China and Russia

In 2014, a China Solar Energy Company executed a mutually-beneficial cooperation protocol for construction of solar power station in Russia South Ural, with the Russia South Ural Micro-Energy Association. There is some energy shortage in Chelyabinsk Oblast and region is interested in the development of alternative energy. Both Parties also would research and discuss about constructing a cycle power station integrated with solar cell and natural gas power station in the region and jointly producing high-tech energy equipment, etc.

China and Japan

China and Japan reached a consensus on promoting cooperation in the energy field in various forms by holding the ‘China-Japan Ministerial Conference on Energy’, ‘China-Japan Comprehensive Forum on Energy Conservation and Environment Protection’, ‘China-Japan Negotiation on Energy’, etc.

In 2007, both countries held the first ministerial conversation on energy policies and together held the China-Japan Seminar on Energy Cooperation. Both countries signed an agreement of the Joint Statement of Enhancing Cooperation in the Energy Field, facilitating the cooperation in the aspects of energy conservation and environment protection, bio-fuel replacement, and new energy sources.

Energy conservation and environmental protection is a highlight and new growth point of China-Japan economic and trade cooperation. In particular, the ‘China-Japan Comprehensive Forum on Energy Conservation and Environment Protection’ had become an important platform of China-Japan economic and trade cooperation.

3.3 Energy Cooperation under the Multilateral Mechanisms in NEA

Most of the energy cooperation projects in NEA have been planned and/or implemented at the unilateral or bilateral level without considering the regional market characteristics as a whole. Thus, regional energy cooperation among the countries in NEA lags behind other regions of the world.

Recognizing the necessity for creating an institutional cooperation mechanism at the multilateral level in the NEA region, the countries in NEA began to stride towards the establishment of the regional cooperative body in NEA since the mid 1990's. Those efforts include;

- The Greater Tumen Initiative (GTI): an intergovernmental cooperation mechanism, supported by the United Nations Development Programme (UNDP) with membership of four countries: China, Mongolia, Republic of Korea and Russian Federation, created in 1995,
- Intergovernmental Collaborative Mechanism on Energy Cooperation in North-East Asia (ECNEA): intergovernmental cooperation mechanism created in 2005 with membership of four countries, DPRK, Republic of Korea, Mongolia and Russia and China with a observer status.
- Tripartite Consultation Mechanism between China, Mongolia and Russia

3.3.1 Greater Tumen Initiative:

The Greater Tumen Initiative (GTI) is an intergovernmental cooperation mechanism among four countries: China, Mongolia, Republic of Korea and Russian Federation, supported by the United Nations Development Programme (UNDP). In 1995, GTI member governments signed agreements to establish this mechanism, aimed at strengthening economic and technical cooperation, and attaining greater growth and sustainable development in Northeast Asia (NEA) and specially the Greater Tumen Region (GTR), which includes China's three Northeast provinces and Inner Mongolia, three eastern provinces of Mongolia, the eastern ports of ROK and the Primorsky Territory of Russia.

Energy is taken as one of the GTI's priority areas for regional cooperation among the member countries. The GTI Energy Board was established in 2009 to address regional energy issues on a policy and strategy basis while also including private sector expertise and resources. The following objectives have been identified for cooperation in the energy sector:

- Enhance energy policy coordination and cooperation;
- Reduce non-physical barriers for energy trade and investment in the GTR; and
- Promote exchange of information on energy among GTI member countries.

3.3.2 Intergovernmental Collaborative Mechanism on Energy Cooperation in North-East Asia

As for the regional energy cooperation in Northeast Asia, ROK has taken an initiative to create a governmental cooperation mechanism among the countries in Northeast Asia since 2001. In June 2001, at the International Symposium on Energy Cooperation in Northeast Asia, the creation of a senior officials committee to expand current energy cooperation issues into intergovernmental consultation level in Northeast Asia was proposed by the Minister of Commerce, Industry and Energy (MOCIE) of the Korean government.

As the first step toward the collaborative framework, an intergovernmental meeting was held in Khabarovsk, Russia in October 2001 attended by government officials and experts from six countries of the region, namely, China, Japan, Mongolia, Russia, DPRK and Republic of Korea. At the meeting, a declaration, the Khabarovsk Communiqué containing the objectives and basic principles of energy cooperation in Northeast Asia, was adopted.

The agreed objectives for the energy cooperation are as follows;

- (i) to increase the supply of energy from the Northeast Asian region;
- (ii) to optimize the efficiency of supply and use of energy;
- (iii) to minimize the environmental impact of energy projects through improved energy mix.

The basic principles manifested in the Communiqué include:

- (i) the recognition of sovereign rights over energy resources;
- (ii) development of free and fair trade;
- (iii) investment promotion and protection and environmental protection;
- (iv) free and non-discriminatory transit of energy products.

The Khabarovsk Communiqué also recommended institutional arrangements of a 'Senior Officials Meeting' for the six countries, a secretariat, and five 'Working Groups' on the areas such as the energy planning, programming and restructuring, the electric power interconnection and the interstate transit of fossil fuels.

After having several subsequent preparatory meetings and all the preparation process, the first Senior Officials Committee (SOC) Meeting held on November 16-17 in Ulaanbaatar, adopted the 'Ulaanbaatar Statement of Senior Officials on Energy Cooperation in North-East Asia' for the creation of the 'Intergovernmental Collaborative Mechanism on Energy Cooperation in North-East Asia' with membership of the DPRK, Mongolia, the Republic of Korea and the Russian Federation.

Under this mechanism, one working group, namely the Working Group on Energy Planning and Policy (WG-EPP) was created in order to implement the cooperative activities among the member countries.

China joined the WG-EPP activities, although it is not a member but an observer of the SOC. As for the activities for the regional cooperation, the WG-EPP prepared and published the Country Report for China, Mongolia, the Republic of Korea and the Russian Federation on 'Energy Policy Survey' and 'Energy Statistics Data Base'.

In 2007, the group developed a 'Regional Energy Demand/Supply Outlook for Northeast Asia' and organized the first 'Government – Business Dialogues (GBD)'. In 2008, the WG-EPP undertakes a

joint survey study on ‘Energy Production Potential and Development Plans in Northeast Asian Countries’.

3.3.3 Tripartite Consultation Mechanism between China, Mongolia and Russia

Most recently, the leaders of China, Russia and Mongolia launched a three-party summit in September 12, 2014, which was proposed by the Chinese President Xi Jinping as a three-way economic corridor featuring cross-border infrastructure and trade development. Calling their development highly complementary, Xi called for an economic corridor linking Beijing's proposed Silk Road economic belt, Russia's Trans-Eurasia railway and Mongolia's passage to grassland initiative. They should also extend interconnectivity by railway and road, facilitate customs clearance and study the construction of cross-border power grids.

Mongolian President Tsakhiagiin Elbegdorj said the country hopes to boost infrastructure and cross-border transportation through strengthening cooperation with the others. President of Russia, Putin said Russia, China and Mongolia should strengthen exchanges, dialogue, coordination with geographical proximity. The initiative which China proposed to build the Silk Road Economic Belt provides the new opportunities for trilateral cooperation.

The three party should establish long-term and stable cooperative relations in the energy and mine, traffic infrastructure construction and other fields by combining with their own development plans.

Other international initiatives

There exists multilateral regional cooperation mechanism for the NEA countries in which energy cooperation activities are included. The mechanisms are as follows;

- APEC-EWG (Energy Working Group),
- ASEAN + 3,
- Northeast Asia Economic Forum,
- International Energy Agency,

The specific energy subsectors are the following:

Oil and gas

- Joint Oil Data Initiative,
- Northeast Asia Gas and Pipeline Forum,
- Gas Exporting Countries Forum

Renewable energy

- International Renewable Energy Agency

Nuclear energy

- World Association of Nuclear Operators Association

These initiatives, which vary in their degree of development and level of accomplishments, are intergovernmental, partnerships, networks or associations, or programs, and have several accomplishments benefiting Northeast Asia in general or an NEA country in particular.

Chapter 4. Regional Energy Cooperation in Other Region: Lessons and Recommendation for Northeast Asia

4.1 Overview

This chapter is to survey on successful cases of the regional energy cooperation in other region than Northeast Asia, derives some implication of their experiences for the cooperation in Northeast Asia, and finally derives policy recommendation for the countries in Northeast Asia to facilitate the regional energy cooperation.

The mechanism for the regional energy cooperation can be categorized in several factors in terms of its characteristic;

- one is for cooperation with the public interest which includes policy cooperation, data/information exchanges, enhancing energy conservation and renewable energy development/deployment, and capacity building, and
- the other is for business cooperation for the regional energy projects, which includes the establishment/operation of cross-border pipeline networks and power interconnection grid systems.

The first category cooperation, which is implemented by the government level, can be, in turn, categorized in two natures; one is a non-binding cooperation mechanism, and the other is the policy-binding mechanism with the membership obligations.

In this chapter, the survey includes the Latin America Energy Organization (OLADE), the Energy and Climate Partnership of the Americas (ECPA), the Asia-Pacific Economic Cooperation (APEC) and the ASEAN for the first category, under which cooperation activities are undertaken by non-binding principles with volunteer basis. For the second category, business cooperation in a region, the Russia-Europe natural gas pipeline project and the power pool project in Africa.

The survey items for each regional energy body include 1) background, 2) characteristics of the organization, such as membership and structure, and 3) functions/activities, cooperation projects.

4.2 Survey on Regional Energy Cooperation

4.2.1 Latin American Energy Organization (OLADE)¹⁶

The Latin American Energy Organization (OLADE, Organización Latino-americana de Energía) is an inter-governmental organization for the regional energy cooperation in Latin America, dedicated to the coordination of its member countries on energy.

Background

OLADE was born in the context of the search for a new - more equitable - economic relationship between developed and developing countries at the early seventies whose scope was analyzed by the Latin American and the Caribbean countries. Consequently, the authorities of the Energy sector aiming at joint commitments to the defense of natural resources in the region and technical cooperation on policies for sustainable and comprehensive development and measures to address the crisis in oil prices, began an intense process of political mobilization that culminated on November 2, 1973 with the signing of the **Lima Agreement**, the constituent instrument of the Organization, which has been ratified by 27 countries in Latin America and the Caribbean.

¹⁶ Source: OLADE Homepage, <http://www.olade.org/en>

Members: Member Countries of the OLADE: 27 members plus one participant country

- **South America:** Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela
- **Caribbean:** Barbados, Cuba, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Trinidad & Tobago and Suriname.
- **Central America:** **Mexico:** Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama.
- **Participant Country:** Algeria
- **Secretariat:** Quito, Ecuador

Objectives

- Political and technical tool for prompting better regional energy integration.
- Manage official statistics, products and services and regional energy planning.
- Encourage training inside the Energy Ministries of the Member Countries.
- Promote regional energy cooperation among countries.

Vision:

- OLADE is the political and technical-support organization by means of which its Member States undertake common efforts to achieve regional and sub-regional energy integration, and to develop regional energy market.
- While promoting the creation of OLADE, the need for establishing a cooperation mechanism for the countries of the Region arose in order to develop their energy resources and jointly attend issues regarding their efficient and rational use attempting to contribute in the economic and social development of Latin America and the Caribbean.

Mission

- To promote agreements among its member states, and to take an action to meet their energy needs through sustainable development of different energy sources,
- To contribute to the integration, sustainable development and energy security in the Region, advising and promoting cooperation and coordination among its Member Countries.

Activity: OLADE Tools

- Energy-Economic Information System (SIEE)
- Legal Energy Information System (SIEL) Database
- OLADE Sustainable Energy Planning Manual
- OLADE Virtual Energy Training Program (CAPEV)
- OLADE-Geo-Information System Referenced Renewable Energy
- OLADE-Latin American and Caribbean Energy Efficiency Seminar
- OLADE-Solar Thermal World Portal
- Power System Generation and Inter-Connection Planning Model (SUPER)

Activity: OLADE Programs

- Initiative for the Transformation and Strengthening of the Solar Water Heating Market
- OLADE-Central America Climate Change Vulnerability Program
- Observatory of Renewable Energy for Latin America and the Caribbean

4.2.2 ASEAN: Regional Energy Cooperation¹⁷

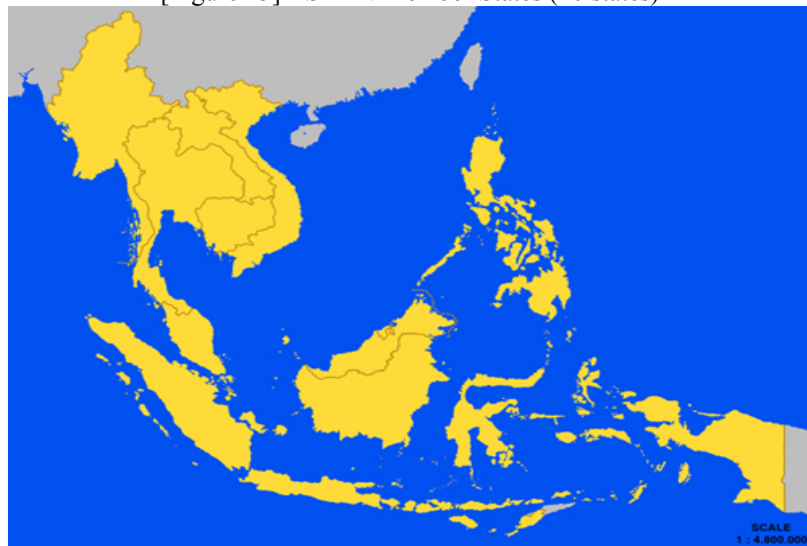
Establishment

The Association of Southeast Asian Nations, or ASEAN, was established on 8 August 1967 in Bangkok, Thailand, with the signing of the ASEAN Declaration (Bangkok Declaration) by the Founding Fathers of ASEAN, namely Indonesia, Malaysia, Philippines, Singapore and Thailand. Brunei Darussalam then joined on 7 January 1984, Viet Nam on 28 July 1995, Lao PDR and Myanmar on 23 July 1997, and Cambodia on 30 April 1999, making up what is today the ten Member States of ASEAN.

Member States (10 states)

- Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam

[Figure 15] ASEAN Member States (10 states)



Aims and Purposes

As set out in the ASEAN Declaration, the aims and purposes of ASEAN are:

1. To accelerate the economic growth, social progress and cultural development in the region through joint endeavours in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of Southeast Asian Nations;
2. To promote regional peace and stability through abiding respect for justice and the rule of law in the relationship among countries of the region and adherence to the principles of the United Nations Charter;
3. To promote active collaboration and mutual assistance on matters of common interest in the economic, social, cultural, technical, scientific and administrative fields;
4. To provide assistance to each other in the form of training and research facilities in the educational, professional, technical and administrative spheres;
5. To collaborate more effectively for the greater utilisation of their agriculture and industries, the expansion of their trade, including the study of the problems of international commodity

¹⁷ ASEAN Homepage: <http://www.asean.org>

- trade, the improvement of their transportation and communications facilities and the raising of the living standards of their peoples;
6. To promote Southeast Asian studies; and
 7. To maintain close and beneficial cooperation with existing international and regional organisations with similar aims and purposes, and explore all avenues for even closer cooperation among themselves.

Energy Cooperation Vision

The ASEAN Ministers on Energy Meeting (AMEM), held in Langkawi in July 2003, called for intensified cooperation in the development and exploitation of the energy resource potentials in the ASEAN region, as well as in attracting private sector participation and investment in the ASEAN energy sector.

The Ministers agreed to work collectively in moving forward the Trans-ASEAN Gas Pipeline (TAGP) and the ASEAN Power Grid Projects to provide greater stability and security of energy supply in the ASEAN region. The Ministers also agreed to enhance the ASEAN Energy Business Forum (AEBF) as an important platform for facilitating business interaction, technology exchange and project financing opportunities between ASEAN energy authorities and the private sector.

Governance for ASEAN Energy Cooperation

- The ASEAN Ministers on Energy Meeting (AMEM)'
 - ASEAN Senior Officials Meeting on Energy (SOME)
- ASEAN *plus* Three Energy Ministers (ASEAN + China, Japan and Korea)
 - ASEAN Senior Officials Meeting on Energy (SOME) Plus Three Energy Policy Governing Group (EPGG)
 - Five expert forums: energy security, natural gas, oil markets and oil stockpiles, renewable energy
- For industry
 - Gas: ASEAN Gas Consultative Council (AGCC)
 - Oil: ASEAN Council on Petroleum (ASCOPE)
 - Electricity Heads of ASEAN Power Utilities/Authorities (HAPUA)
 - ASEAN Energy Business Forum (AEBF): an platform for facilitating business interaction, technology exchange and project financing opportunities between ASEAN energy authorities and the private sector.
- ASEAN Centre for Energy (ACE)
 - Activity to serve a role in the facilitation of regional energy programmes and activities.

Cooperation Activities/Projects

- ASEAN Petroleum Security Agreement (APSA, 1986)
- Trans-ASEAN Gas Pipeline (TAGP)
- ASEAN Power Grid Projects: ASEAN Interconnection Master Plan (AIMS)
- HAPUA: implementation of projects in the areas of (a) renewable energy; (b) power interconnection; (c) research, development and engineering; (d) human resources management and development; (e) geothermal energy; (f) rural and urban electrification; (g) Electric Power Information Centre; (h) use of combined cycle power plants; and (i) deregulation and reform of power utilities.
- ASEAN Plan of Action for Energy Cooperation (APAEC)
- Harmonization of the Technical Standards, Codes and Guidelines
- Energy Efficiency and Conservation Sub-Sector Network (EE&C-SSN)
- Renewable Energy Sub-Sector Network (RE-SSN) and the Renewable Energy Support Program (RESP)

- Agreement on Coal Use and Trade (ACUT)
- Nuclear Energy Cooperation Sub-Sector Network (NEC-SSN)
- ASEAN Energy Regulators' Network (AERN)

4.2.3 Asia-Pacific Economic Cooperation (APEC)¹⁸

The Asia-Pacific Economic Cooperation, or APEC, is the premier forum for facilitating economic growth, cooperation, trade and investment in the Asia-Pacific region. APEC is an intergovernmental grouping that operates on the basis of non-binding commitments, open dialogue and equal respect for the views of all participants. Unlike the WTO or other multilateral trade bodies, APEC has no treaty obligations required of its participants. Decisions made within APEC are reached by consensus and commitments are undertaken on a voluntary basis.

Establishment

APEC was established in 1989 to further enhance economic growth and prosperity for the region and to strengthen the Asia-Pacific community. The idea of APEC was firstly publicly broached by former Prime Minister of Australia, Mr. Bob Hawke, during a speech in Seoul, Korea in January 1989. Later that year, 12 Asia-Pacific economies met in Canberra, Australia to establish APEC. The founding members were: Australia, Brunei Darussalam, Canada, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand and the United States.

Members

APEC has 21 members - referred to as "member economies" - which account for approximately 40 percent of the world's population, approximately 55 percent of world GDP and about 44 percent of world trade. APEC's 21 Member Economies are

- Australia; Brunei Darussalam; Canada; Chile; People's Republic of China; Hong Kong, China; Indonesia; Japan; Republic of Korea; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; The Republic of the Philippines; The Russian Federation; Singapore; Chinese Taipei; Thailand; United States of America; Viet Nam.

Purpose and Goals

APEC's vision are what are referred to as the 'Bogor Goals' of free and open trade and investment in the Asia-Pacific by 2010 for industrialized economies and 2020 for developing economies. These goals were adopted by Leaders at their 1994 meeting in Bogor, Indonesia.

Free and open trade and investment helps economies to grow, creates jobs and provides greater opportunities for international trade and investment. In contrast, protectionism keeps prices high and fosters inefficiencies in certain industries. Free and open trade helps to lower the costs of production and thus reduces the prices of goods and services - a direct benefit to all.

APEC also works to create an environment for the safe and efficient movement of goods, services and people across borders in the region through policy alignment and economic and technical cooperation.

Energy Cooperation Governance

The Energy Working Group (EWG), launched in 1990 under the APEC, seeks to maximize the energy sector's contribution to the region's economic and social well-being, while mitigating the environmental effects of energy supply and use.

¹⁸ APEC Homepage, <http://www.apec.org/>

The EWG is assisted by four Expert Groups (Clean Fossil Energy, Efficiency & Conservation, Energy Data & Analysis, New & Renewable Energy Technologies) and two Task Forces: one on Biofuels and the other on Energy Trade and Investment (ETITF).

The Energy Trade and Investment Task Force was established to facilitate cooperation and promote regional energy trade and investment liberalization, and in particular to consider climate change policies and approaches to reducing greenhouse gas emissions which includes carbon pricing across the region.

Recognizing that business can make an important contribution to the development and implementation of its work programme, the EWG established its own public-private sector dialogue mechanism - the EWG Business Network (EBN). The EBN advises the EWG on energy policy issues from an industry perspective and facilitates regular dialogues between energy policy-makers and business sector representatives.

Energy Cooperation Activity

APEC energy cooperation is conducted under the framework of the Energy Security Initiative (ESI), which was first put forward by the EWG in 2000. The objective of the ESI is to prepare the region for potential energy supply disruptions and subsequent impacts on economic activities. Many energy cooperation activities were established under the APEC-EWG Working group to assist economies meet climate change goals.

- The Energy Working Group: informs energy policymakers, draws advice from the business community and industry experts, and collaborates with other international bodies, including the IEA, the Renewable Energy and Energy Efficiency Partnership and the Energy Charter Secretariat. The Energy Trade and Investment Task Force has been established under the EWG to facilitate relevant cooperation in EWG.
- The Asia-Pacific Network for Energy Technology: enables economies to collaborate in energy research in the region, particularly in areas such as clean fossil energy and renewable energy resources.
- The Energy Security Initiative: comprises short-term measures and long-term policy responses to address the challenges facing the region's energy supply.
- The Joint Oil Data Initiative: is a collaborative oil information program undertaken by APEC, OPEC, the IEA, the International Energy Forum and the UN Environment Program.
- The APEC Peer Review Mechanism on Energy Efficiency: serves as a form of accountability while providing an opportunity for economies to share their respective policies, experiences, information and ultimately to improve energy efficiency.

4.2.4 Energy and Climate Partnership of the Americas (ECPA)¹⁹

The Energy and Climate Partnership of the Americas (ECPA) was announced by U.S. President Barack Obama at the Summit of the Americas in April 2009. The ECPA is conceived as a flexible mechanism to accelerate sustainable energy in the Americas. ECPA is built upon six pillars for energy cooperation, including renewable energy, energy efficiency, energy poverty, infrastructure, sustainable land use and forestry, and adaptation.²⁰

Establishment

At the April 2009 Summit of the Americas in Port of Spain, Trinidad and Tobago, leaders of the Western Hemisphere underscored that energy and climate change are among the most important

¹⁹ <http://www.ecpamerica.org/About-ECPA.aspx>

²⁰ http://en.wikipedia.org/wiki/Energy_and_Climate_Partnership_of_the_Americas

issues confronting our future and they reaffirmed their commitment to work together towards a clean energy future. Responding to these shared challenges, U.S. President Obama invited all governments in the Western Hemisphere to join in an Energy and Climate Partnership of the Americas (ECPA). President Obama said “our hemisphere has bountiful natural resources that could make renewable energy plentiful and sustainable, while creating jobs for our people.” An Energy and Climate Partnership of the Americas, he said, “will help us learn from one another, share technologies, leverage investment, and maximize our comparative advantage.”

When he invited countries to participate in ECPA, President Obama suggested ECPA focus on energy efficiency, renewable energy, cleaner and more efficient use of fossil fuels, energy poverty, and infrastructure. In the first year, nearly a dozen initiatives and projects began under ECPA in these areas, led by the United States, Brazil, Canada, Chile, Costa Rica, Mexico, Peru, and Trinidad and Tobago. Inter-American and regional institutions such as the Organization of American States (OAS), the Inter-American Development Bank (IDB), and the Latin American Energy Organization (OLADE), multilateral development banks such as the World Bank, private sector, civil society, and academia are supporting ECPA.

In April 2010, as part of ECPA, U.S. Secretary of Energy Steven Chu invited Western Hemisphere energy ministers to the Energy and Climate Ministerial of the Americas to highlight progress, announce new partnerships and facilitate the development of new initiatives among governments, institutions, private industry, and civil society. At this ministerial, U.S. Secretary of State Hillary Rodham Clinton proposed ECPA’s focus be expanded to also include initiatives regarding sustainable forests and land use, as well as climate change adaptation.

Activity

The ECPA’s energy cooperating Initiatives address:

- **Energy Efficiency:** Promote best policy practices through assistance in developing building codes and other standards in the industrial and residential sectors, as well as training for energy audits.
- **Renewable Energy:** Accelerate clean energy deployment via project support, policy dialogues, scientific collaboration, and the clean energy technology network.
- **Cleaner and More Efficient Use of Fossil Fuels:** Promote clean energy technologies to reduce both conventional pollution and the carbon footprint of fossil fuels, as well as best practices on land use management.
- **Energy Infrastructure:** Foster modernized, integrated, and more resilient energy infrastructure, particularly electrical grids and gas pipelines.
- **Energy Poverty:** Target urban and rural energy poverty with strategies to promote sustainable urban development and improve access to modern clean energy services and appropriate technologies in rural areas that can improve public health and reduce fuel wood use that benefits forest management.
- **Sustainable Forests and Land Use:** Reduce emissions from deforestation and forest degradation, and enhance carbon sequestration in the land use sector, including through the conservation and sustainable management of forests.
- **Adaptation:** Assist vulnerable countries and communities with strategies to understand and reduce their vulnerabilities to the impacts of climate change.

Under ECPA, the lead and/or participating governments and public and private sector partners contribute resources to implement the initiatives. ECPA’s initial focus and structure was developed at the June 2009 Americas Energy and Climate Symposium in Lima, Peru, co-hosted by the Peruvian and U.S. governments and the Institute of the Americas. Participants acknowledged the enormous potential to accelerate clean energy uptake in the Americas, identified opportunities for partnership under ECPA, and stressed that initiatives should produce tangible results, promote best policy and

regulatory practices, and build capacity in the design, evaluation, and implementation of clean and environmentally-sustainable energy policies and projects.

Secretariat: ECPA Clearinghouse:

The General Secretariat of the OAS (Organization of American States)²¹, through its Department of Sustainable Development (DSD), operates the ECPA Clearinghouse since 2009. The Clearinghouse is the coordinating body of ECPA, conceived as a mechanism to foster partnerships for greater dialogue, collaboration and awareness on energy and climate. The Clearinghouse is in charge of the Partnership's communications and outreach efforts and supports ongoing ECPA initiatives, in this capacity, it maintains the ECPA website, publishes quarterly newsletters, engages in partner engagement processes, holds roundtable discussions, and sustains social media presence, among others. In the same vein as ECPA, the Clearinghouse is not a rigid structure, but rather a flexible and straightforward mechanism which enables partnerships and an open dialogue on energy and climate.

4.2.5 The Eastern Africa Power Pool (EAPP)²²

Power pool²³ is a mechanism for interchange of power between two and more utilities which provide or generate electricity, which is used to balance electrical load over a larger network than a single utility. Power pooling is very important for extending energy control over a large area served by multiple utilities. The formation of power pools provides the following potential advantages:

- decrease in operating costs
- saving in reverse capacity requirements
- help from pool in unit commitment
- minimization of costs of maintenance scheduling
- more reliable operation

There exist many power pool cooperation projects at the sub-regional basis in the world. In this section, we briefly review the Eastern Africa Power Pool (EAPP), which has been established recently in East African region and also the Southern African Power Pool

Background

The East Africa region is endowed with significant economically developable hydro, geothermal, wind and solar energy generation potential. Sufficient interconnectivity and the mechanism for power trade are required to allow rational development as well as utilizations. Recognizing the mutual benefit to be derived from cross boarder energy exchange, countries in the region years ago embarked upon the development and operation of power system interconnection projects through bilateral arrangements.

Establishment

The Eastern Africa Power Pool (EAPP) is established in 2005 with the signing of an Inter-Governmental Memorandum of Understanding (IGMOU) by seven Eastern Africa countries, namely: Burundi, Democratic Republic of Congo (DRC), Egypt, Ethiopia, Kenya, Rwanda and Sudan.

EAPP is adopted as a specialized institution to foster power system interconnectivity by the heads of states of the Common Market for Eastern and Southern Africa (COMESA) region. Tanzania, Libya and Uganda have joined EAPP in March 2010, February 2011 and December 2012 respectively.

²¹ <http://www.oas.org/>

²² <http://eappool.org/>

²³ http://en.wikipedia.org/wiki/Power_pool

[Figure 16] The Eastern Africa Power Pool



Vision

- To be the most vibrant power market that provides a least cost, efficient and reliable electricity supply through fully integrated and interconnected regional system.

Mission:

EAPP's Mission is to interconnect all the Countries of Eastern Africa Region, So as to optimize Power Generation Resources Development in economically and environmentally sustainable manner and ensure efficient provision of adequate, secure and affordable quality power.

Objectives

- Secure power supply for the Region's countries;
- Optimize the usage of energy resources available in the Region by working out regional investment schemes in Power Generation, Transmission and Distribution, taking into account the socio-economic and environmental aspects;
- Increase Power supply in the Region in order to increase the access rate of the population to electricity.
- Reduce electricity cost in the Region by using power systems interconnection and increasing power exchanges between countries;
- Provide efficient co-ordination between various initiatives taken in the fields of power production, transmission as well as exchanges in the Region;
- Facilitate financing of integration projects in the fields of power generation and transmission in the Region
- Facilitate, in the long-term, development of electricity market in the Region

Organizational Structure

The EAPP Memorandum of Understanding (MOU) sets out the organisational purpose of the EAPP organisation which comprises of the Conference of Ministers (COM) responsible for electricity in respective countries with the participation of Chief executive offices of member utilities, three sub committees in planning, operations and environment and a coordination center. The EAPP organizational structure consists of the following organs and bodies:

- The Conference of Ministers: consists of Ministers responsible for electricity in the region.
- The Steering Committee: consists of the Chief Executive Officers of EAPP Active Members.

- The Independent Regulatory Board: Consists of nominees of national regulatory boards in the countries of the Parties.
- The Permanent Secretariat is led by an Executive Secretary: recommended by the Steering Committee as defined in the Bylaws and approved by the Conference of Ministers.
- Technical Sub-Committees in charge of specific issues. The Technical Sub-Committees of EAPP are operational arms responsible for the implementation of technical activities. As such they are one of the most important organs for the development and operation of the interconnected regional power system, and the regional power market. EAPP has now operationalised three subcommittees²⁴,
 1. Planning
 2. Operations
 3. Environment
- The Coordination Center: Under the guidance of the sub-committee on operation, a coordination center will be established. This center will handle, on a real time basis, collection of technical and commercial information necessary for the operation of the Regional interconnected power system and exchanges of power between EAPP members.
- Permanent Secretariat : EAPP Permanent Secretariat is based in Addis Ababa, Ethiopia with a mandate to facilitate bilateral and multilateral issues to enable development of the power pool.

Projects

The following projects are currently being undertaken in the EAPP;

- Master Plan Update (Under the Planning component in the twinning program)
- Pilot Project for Market Operations (Under the Market Component of the Twinning program)
- Renewable Energy Integration into EAPP Master Plan
- Capacity Building and Training project

4.2.6 The Southern Africa Power Pool²⁵

The Southern African Power Pool (SAPP) was created with the primary aim to provide reliable and economical electricity supply to the consumers of each of the SAPP members, consistent with the reasonable utilization of natural resources and the effect on the environment.

Establishment

The SAPP is governed by four agreements:

- The Inter-Governmental Memorandum of Understanding
- The Inter-Utility Memorandum of Understanding
- Agreement Between Operating Members
- Operating Guidelines

Vision

- Facilitate the development of a competitive electricity market in the Southern African region.
- Give the end user a choice of electricity supply.
- Ensure that the Southern African region is the region of choice for investments by energy intensive users.

²⁴ The activities of the subcommittee are financed by the Royal Norwegian Government

²⁵ <http://www.sapp.co.zw/>

- Ensure sustainable energy developments through sound economic, environmental and social practices.

Objectives

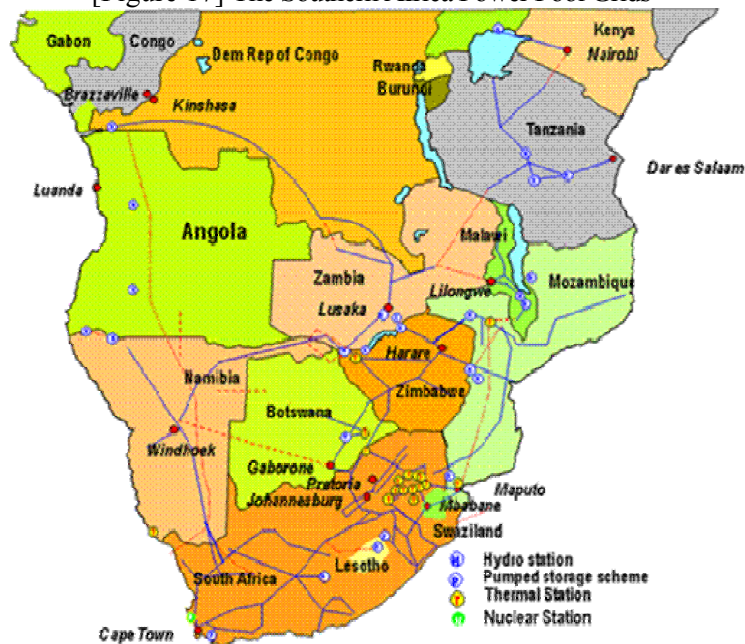
- Provide a forum for the development of a world class, robust, safe, efficient, reliable and stable interconnected electrical system in the southern African region.
- Co-ordinate and enforce common regional standards of Quality of Supply; measurement and monitoring of systems performance.
- Harmonize relationships between member utilities.
- Facilitate the development of regional expertise through training programmes and research.
- Increase power accessibility in rural communities.
- Implement strategies in support of sustainable development priorities.

Values

- Respect for others and develop mutual trust
- Honesty, complete fairness and integrity in dealing with issues
- Selfless discharge of duties
- Full accountability to the organization and its stakeholders
- Encourage openness and objectivity

SAPP Grid

[Figure 17] The Southern Africa Power Pool Grids



Mission Statement

- Aim to provide the least cost, environmentally friendly and affordable energy and increase accessibility to rural communities.

4. 3. Implication for Regional Energy Cooperation in Northeast Asia

In this Section, we will discuss lessons from regional energy cooperation in other regions in the world, being based on the survey done in the previous section and its implication for the regional energy cooperation in NEA.

Strong leadership

Many multilateral energy cooperation mechanisms at the regional level were shown to be initiated by a leadership of a country or of some countries in the region.

As surveyed in the previous section, for example, the creation of the Energy and Climate Partnership of the Americas (ECPA) was initiated by the United States alone, the APEC was jointly by Australia, the United States and Korea, and the ASEA was by the leaders of the countries in Southeast Asia.

The leadership is not only based on the political power but also strong economic values from the creation of the cooperative body in the region, so that the participating countries can share the economic/social benefits from the regional cooperation. In NEA, the leaderships of Russia and China, two big Giants in terms of energy supplier and consumer in the region, respectively, can have the capability to play a significant role to initiate promoting regional energy cooperation with the partnership with Japan, Korea, the DPRK and Mongolia.

Russia, as a big potential energy supplier in the region, can secure the exporting market in China, a largest energy market in the world, and China can enhance its energy security capability by expanding energy imports from Russia.

In particular, according the Russia's Energy Strategy 2030, the country will increase energy export to the Asia-Pacific region significantly by 2030 from the current level of 5 per cent to 28 per cent by 2030 in total Russia energy exports. Large energy importing countries in NEA, namely China, Japan and Korea will be a big market for Russia's energy exports, also the countries are rich in capital and technology, so that the partnership with those countries for the development of energy resources in the Russian Far East will be also beneficial for all the countries in the region.

If no country triggers the initiative to facilitate the regional energy cooperation, there will be no driving forces for regional cooperation in NEA. Historically, there are some different political positions as well as economical capabilities of China, Japan, DPRK and ROK and perhaps it will be beneficial to all parties if Russia becomes actively involved in promoting multilateral cooperation in NEA. Although it confronts with security and political tension with the DPRK, Korea can increase its role as an arbitrator to facilitate the regional energy cooperation given its geographical situation and the economic market size.

Enhancing mutual understanding

Reaching a consensus on facilitating regional cooperation requires enhancing mutual understanding among the countries in the region in the energy problem in each country as well as in the region. With this reason, many regional energy cooperation organizations, like, the OLADE, APEC, ASEAN, and ECPA established and operate the information exchange mechanism within the regional cooperation framework.

In particular, given the diversity of the region in terms of asymmetries of energy-resource endowment, population, economic development, political and economic systems among the countries in NEA, joint efforts to improve mutual understanding between among the countries should be of a high priority agenda for the regional energy cooperation.

Creation of an institutionalized multilateral mechanism

The creation of an institutionalized multilateral mechanism is a critical factor in initiating energy cooperation at the regional level. For example, the OLADE in Latin America was founded by the Lima Agreement in 1973, the ASEAN was established by the Bangkok Declaration in 1967, the

Energy Community in Europe was established in 2005 being based on a stronger legal framework defined by an international law treaty.

Even in promoting regional energy projects, like power pool and natural gas pipeline system, an institutionalized multilateral mechanism is required. For example, as shown in the previous section, the South Africa Power Pool (SAPP) is governed by four agreements, such as the Inter-Governmental Memorandum of Understanding, the Inter-Utility Memorandum of Understanding, Agreement between Operating Members, and Operating Guidelines

Thus, there is a strong need to create a concrete type of institutionalized multilateral mechanism for energy or economic cooperation at the regional level in Northeast Asia.²⁶

Identification of cooperative projects at the practical and regional level

Before reaching the creation of a solid type of an institutionalized multilateral energy cooperation mechanism, identification of cooperative projects to be implemented at the practical level will be necessary. There are lots of cooperative energy projects in Northeast Asia which can be pursued with common interest in NEA, which include:

- For Resource and Project Developments
 - Natural gas: Development of natural gas field in Russian Far East and China: Construction of cross-border pipeline networks
 - Electricity: Cross-border power interconnection grids
 - Oil: Oil field development and Crude oil pipeline construction , Joint strategic oil stockpiling
 - Coal development in Mongolia, China, and Russia and transport infra-structures (ports and railway system)
- For technology cooperation opportunity
 - Energy conservation/efficiency improvement,
 - Renewable energy for green growth,
 - Nuclear safety,
 - Non-conventional energy sources: Shale gas and CBM

As shown in other regions, a regional cooperative multilateral mechanism can be established at a project basis, like the Russia-Europe Pipeline project and power pool projects in Africa. However, as being observed in the case of the ASEAN, such a large scale energy investment/development projects can be involved in the regional economic cooperation mechanism.

For a cooperative project of public interests, such as energy conservation, renewable energy, nuclear safety, and energy security, an inter-government cooperation mechanism can be established with involvement of the private sector/industry, as being observed in cases of the OLADE, the ECPA, the APEC EWG, and the ASEAN.

²⁶ The Senior Officials Committee (SOC) Meeting, held on November 2005 in Ulaanbaatar, adopted the 'Ulaanbaatar Statement of Senior Officials on Energy Cooperation in North-East Asia' for the creation of the 'Intergovernmental Collaborative Mechanism on Energy Cooperation in North-East Asia (ECNEA)' with membership of the DPR Korea, Mongolia, the Republic of Korea and the Russian Federation. Under this mechanism, two working group, namely the Working Group on Energy Planning and Policy (WG-EPP) and the Working Group on Coal were created in order to implement the cooperative activities. China joined the Working Groups activities, although it is not a member but an observer of the SOC. Japan does not join any activity of the ECNEA. As one of the ECNEA activities, the Government – Business Dialogues (GBD) was organized and held at a regular basis.

Full participation/membership of the countries in the region

In NEA, there are only six countries in the region, namely, China, DPRK, Japan, Republic of Korea, Mongolia and Russia. In cases of other regions, the OLADE has twenty seven members, the ASEAN ten members, and the ECPA include all countries in the North & Latin America. This implies that the full participation of the countries in the region is a prerequisite for the success of energy cooperation at the regional level.

Furthermore, open regionalism needs to be pursued in a multilateral cooperation framework. As seen in the cases of the OLADE and the Energy Community in Europe, a country from the outside of Latin America, namely Algeria, is included as a member of the OLADE, and the Energy Community opens the membership to the non-EU countries. Also, the ASEAN included China, Japan and Korea in the ASEAN+3, so that it can broaden the cooperation area with relevant countries to energy projects.

Additionally, the participation of the private sector even in the inter-governmental cooperation mechanism is also a substantial factor in the implementation of regional energy cooperation.

Chapter 5. Strategy for Promoting Regional Energy Cooperation in Northeast Asia

Given the differences in energy resource endowments and in current energy market structures among countries in the region, NEA has a tremendous potential for greater regional energy cooperation. As discussed in Chapter 2, in NEA there are three big energy importers, namely China, Korea, and Japan, and two big energy producers, namely China and Russia in NEA. However, energy trades among the countries in NEA still remain at the meager level, in the sense that the energy importing countries in NEA heavily depend on imports from the other regions than NEA.

Thus, regional energy cooperation among the countries in Northeast Asia has shown a relatively slow progress compared with the other regions in the world. Despite the huge potentials for the multilateral cooperation, most of energy development cooperation projects in Northeast Asia has been planned and/or implemented at the bilateral level without considering the regional market characteristics as a whole. Accordingly, many projects for energy development and trades in NEA faced uncertainty related with investment risk, future market size and commercial feasibility, consequently they used to be delayed or cannot be materialized. There are some barriers in promoting energy cooperation among the countries in NEA.

Nevertheless, there is now growing interest in NEA in promoting regional energy cooperation, as the region has a great potential to improve energy situation by developing the untapped energy resources and constructing cross-border energy transport infrastructures to facilitate the intra-energy trade between the countries in the region. Also, NEA has the same problems the other regions are facing, which include energy security, energy efficiency improvement, and regional environmental conservation and so on. These problems are to be solved through multilateral cooperation at the regional level. This implies that a similar analogy of other regions energy cooperation experiences can be applied to the NEA region.

This Chapter will address the potentials for energy cooperation in NEA at the regional level, identify some obstacle against promoting regional energy cooperation, and then derive some policy recommendation for strategy to facilitate regional energy cooperation in NEA at the multilateral level.

5.1 Need for Regional Energy Cooperation in NEA

Enhancing Energy Security

In NEA, there are huge energy consuming and importing countries, China, Japan and Korea. They are facing with ever-lasting challenges against the energy security. Thus, major interests in promoting energy cooperation in NEA originally came from the countries' need for expanding the energy security capability by expanding energy trades with neighboring countries through promoting regional energy cooperation in NEA. There is a potential for oil and gas cooperation as well as cooperation in coal industry in Northeast Asia. However, sufficient investments are required for its development.

Development of such huge energy reserves in NEA is, if accomplished, expected not only to fundamentally change the regional energy patterns but also to significantly affect international energy market. Also, given the geographical proximity, the countries in NEA can gain much benefit by promoting energy trade with neighboring countries. For example, while it takes 20 days to transport oil from the Middle East to NEA, bringing supplies from Sakhalin facilities in Russia only requires 3 - 5 days.

Therefore, greater intraregional trade within NEA would significantly improve transport time and potentially also improve transport security as supply lines are shortened. Trading natural gas and/or electricity from neighboring countries through trans-boundary energy grid networks also can contribute to relieving the energy shortage problem in the region.

Development of energy trade infra-structures in Northeast Asia

In order to facilitate intra-regional energy trade, construction of cross-border energy supply infrastructure, in particular for natural gas pipelines and power transmission networks, will be required in NEA. The large energy importing countries, like China, Japan, and ROK are expected to gain much benefit in terms of economics and market efficiency, if it will be able to trade energy with the neighboring countries, if the countries are geographically connected with the energy grid network.

Also, countries in Northeast Asia can share the common benefit from the establishment of cross-border energy trade infrastructures between the countries in proactively responding to a number of challenges, including managing peak electricity demand periods such as the summer, addressing emergencies such as energy supply crises, advancing the effective exploration and utilization of regional energy resources, and improving the stability of long-term transport by sea.

A greater regional energy grid networks have been suggested as a measure for facilitating relatively cheaper and more optimal deployment of resources among the countries in the region and for securing markets for exports.

Eliminating the Asian Price Premium

Countries in Northeast Asia, namely China, Japan and ROK pay a higher price for crude oil imported from the Middle East, which is the so-called 'Asian Price Premium'. Also, the price gap between the gas markets of Asia and those of North America and Europe has significantly widened because of tightened Asian gas markets in Asia. Thus, it is expected that increased supply of non-Middle East oil, including Eastern Siberia-Pacific Ocean oil, contributes to easing the region's premium on oil prices to a considerable extent.

Governments and research institutions in China, Japan, and ROK have discussed relevant action plans for easing the Asian Price Premium, while China and Japan have also individually formed and managed bilateral and multilateral frameworks²⁷ for cooperation with other countries. To continue to further these efforts, it is time for countries in Northeast Asia to work together to jointly develop a new pricing mechanism that reflects current gas market situations and that offers more flexible conditions for gas imports.

Establishing a Regional Common Energy Market

As Northeast Asia seeks opportunities to strengthen regional energy cooperation, the establishment of an integrated energy market in the region could yield significant energy and economic benefits. Such benefits include providing for security of energy supply and demand; decreasing transaction costs in regional trade; promoting greater efficiency of scale in the energy sector; offering access to affordable modern energy; and reducing emissions from pollutants typically associated with energy production and use as countries have access to a greater range of lower-carbon sources.

Enhancing Complementarities among the Countries through Energy Cooperation

Countries in NEA have their own advantages in energy and high complementarities and much common interest. Benefit in cooperation far outweighs that in competition.

China is rich in coal resource and advantages in aspects regarding geographic location and oil & gas exploration technology and also a big country for energy production, and has a high demand on advanced new energy and energy-saving technology;

²⁷ On June 7, 2013, Japan's Ministry of Economy, Trade and Industry (METI) and the European Commission's Directorate-General for Energy decided to launch cooperation on gas and LNG market, expecting that it will contribute to promoting the development of transparent and liquid global gas market driven by supply and demand fundamental. Two parts agreed to sustainably discuss ways to improve oil-indexed gas prices used in European and Asian markets. In case of China, its state-owned CNPC has continued discussion and research jointly with companies of South Korea and Japan to deal with Asian Price Premium.

ROK has advanced science and technology, and management level, has much experience in oil reserve and good refining ability, and provides much successful experience in aspects regarding energy saving and market operation;

Russia is rich in coal and oil & gas resources and puts emphasis on developing East Siberia and Far East regions as well as actively expands the Asia-Pacific market in recent years, such as construction of main pipeline from East Siberia to Pacific Ocean (ESPO) to make crude oil from Russia entering into the energy consumption market in Northeast Asia regions regarding China, Japan and ROK more convenient and generate great benefit for countries in Northeast Asia.

In addition, countries in NEA have obvious complementarities in aspects of energy production, processing and transportation. Enhancing regional cooperation may produce the significant advantages in each region and learn from each other to achieve a win-win situation.

Harmonization of Energy Standards

There will be great benefits gained through international harmonization of technological and safety standards as a way of facilitating public private energy projects in the NEA region. Applying advanced technologies in modernization of existing energy infrastructure or building new facilities provides benefits for national energy independence as well as regional environmental preservation.

Currently, national variations in safety regulations and technological standards present an obstacle to internationally standardized project designs, which would aid the growth of all economies involved. The achievement of harmonization of industrial technology and safety standards could overcome this obstacle, facilitating the emergence of a regional market that offers a choice of mutually beneficial projects and positively influence realization of business-to-business cooperation across countries in the NEA region.

Different policies and industrial standards among the countries indicate that each NEA country has its own approach to energy prices influencing national energy mix, different emphasis of nuclear energy role, different policies aimed at reducing GHG emissions, national taxation policies and environmental standards, an investment framework and technological progress.

For a balanced NEA regional energy market development ideally the countries need to work on introducing harmonized commercial, regulatory and policy measures that translate into incentive for ensuring sufficient energy security for all.

5.2 Major Obstacles in Energy Cooperation with Countries in NEA

Regional energy cooperation among the countries in Northeast Asia has shown a relatively slow progress compared with the other region in the world. This was a result from the combination of various reasons, such as huge capital requirements for energy and infrastructure development, the lack of infrastructures, capital accessibility problem to energy development projects, uncertainty surrounding the development of energy projects due to the market conditions, market *inertia* of existing energy industry in each country in NEA region, and so on. This section briefly reviews those barriers hindering promotion of energy cooperation among the countries in NEA, including; .

- High capital requirement, lack of infrastructure, and resource nationalism,
- Project uncertainty,
- Lack of market compatibility and of multilateral mechanism for regional energy cooperation,
- Intensified Competition for Energy Security, and
- Conflict between multilateral versus bilateral relationships

Huge Capital Investment Requirements and Lack of Infrastructures

Energy development projects usually require huge capital investment, and are often characterized by a high risk and slow return. Also, constructions of energy production and delivery facilities, such as power plant and pipelines, are very capital-intensive as well as require a high level of technology application. Therefore, the energy projects should always be implemented subject to procuring capital and technology as required, and also to securing demand markets to guarantee the investment return.

In the NEA region, most of oil, natural gas and coal reserves are located in remote areas being isolated far away from demanding region. So that the development of those energy resources in NEA as well as the construction of transport infrastructures requires relatively higher capital investment compared to that in the other region. The region also suffers from the lack of infrastructures necessary for the energy development and trans-boundary energy transportation.

To share the current and future risks of the global markets economic downturns energy rich countries, namely Mongolia and Russia, wish to attract international investment into their energy sectors

In the case of Mongolia, the government implemented to a policy to attract the foreign direct investment (FDI) in order to overcome the obstacles and to commence energy projects, particularly for the development of its large coal mines at the Tavan Tolgoi fields, which has a great potential to become a major exporter of coking coal to the NEA countries. However, the coal mine fields in Mongolia has serious problem of lack of infrastructures, such as road, railway, power supply, which requires massive foreign investment to develop the large-scale infrastructure.

Russia also needs investments for the energy and infrastructure developments in the East Siberia and the Russian Far East. The government has completed the complex task of writing a large number of policy documents, defining the strategic development of economy and energy in East Russia until 2030, while taking into account the energy cooperation between Russia and the countries of NEA. Energy policy documents in Eastern Russia are fundamentals from which one can create conditions for greater international energy cooperation in the NEA region.

Project Uncertainty

Potentials to increase energy trades of oil, natural gas and to enhance regional energy cooperation in future will eventually depend on how much Russia will increase energy productions and supplies from the East Siberia, the Russian Far East and the Sakhalin Island and also how soon or fast the cross-border energy transport infrastructures will be established in the NEA region. According to the Russia's plan for the ESPO pipelines, Russia will supply 80 million tons of oil per annum to the Asia-Pacific region through the pipelines in future.

However, the high cost of new energy exploration is forcing investors to exercise great caution in risk management, responsive to changes in the political and economic situation. Therefore, in order to maintain the positive dynamics of the energy projects development and to strengthen energy security NEA countries must constantly improve the system of international control and cooperation in the sphere of the regional energy market functioning. There could be an Action Plan for regional cooperation drawn to enhance energy security and energy management in the NEA region.

Nevertheless, perhaps the Russian oil & gas supply projects to the NEA region should not be treated purely from the economic point of view in the short-run term, since these are strategic diversification projects, which could serve the interests of oil & gas consumption countries as well, meaning that the price and volume of exporting hydrocarbons to the NEA region are subjected to commercial negotiation process, special tax exemption measures could be applied to these projects, etc. Pipeline construction costs can also depend upon the favorable loan conditions, which exploration companies might obtain. Oil supply projects are two-way initiatives, which should include counteraction of both exporting and importing countries to ensure the best possible solution benefiting them all.

The Sakhalin Island is regarded as a strategically important oil and gas import source for the NEA countries because of its geographical proximity and it is expected that oil production from Sakhalin will be increased significantly in future. Russia also recognizes Sakhalin as a strategic region to diversify export markets and include not only Europe but also Asia-Pacific countries. Russia's

potential to supply gas to the NEA countries depends largely on the implementation speed of the UGSS Eastern Program and the ESPO Pipeline Plan.

Historically, NEA countries' incremental imports of energy sources have come mainly from the Middle East, Australia and the Southeast Asia. Possibility to import the Russian energy sources will be very positive option in the long-term perspective. In order to increase the attractiveness of energy projects, primarily to Asian investors, the Russian State Duma adopted a fundamentally new system of taxation of the gas industry. The new legislation will allow to double the benefits from the development of hard deposits of oil, increasing the profitability of the development of new offshore fields almost 2.5 times. A number of new measures also aim to encourage international participation in large-scale projects. Russian tax legislation has been modified with a view to creating the most attractive scheme of regulation of offshore fields in the world.

Lack of market compatibility among the countries in NEA

Countries in NEA have diversity of market system and structures, capacity of financing investment, human resources, and energy policy/planning, which are shown to be major factors to impede the facilitation of regional energy cooperation in NEA. Countries in the region will need to make concerted efforts to narrow such gaps by coordinating their policies.

Lack of multilateral mechanism for regional energy cooperation in NEA

At present, there is no concrete form for the formal and institutional frameworks for multilateral economic/energy cooperation among the countries in Northeast Asia. Most economic relations in the region are undertaken on a bilateral basis between the countries in the region.

Most of the energy projects undertaken by countries in Northeast Asian have been planned or implemented unilaterally or bilaterally. As a result, many projects for energy development and trade in the region have faced additional uncertainty relevant to financing, securing an export market, and addressing regional security issues such as the Korean peninsula security issue.

This situation makes it hard to materialize and timely promote projects and trade. In addition, this situation means that financing for energy projects tends to significantly depend on a government's financial support or company's own funds, rather than drawing on regional or global opportunities.

Intensified Competition for Energy Security

Some energy consuming powers and companies in NEA have been competing to secure energy resources. Their energy-related efforts have included conducting negotiations with the energy supply countries for the purpose of benefiting their respective economies.

Conflict between multilateral versus bilateral relationships

Given the absence of a concrete type of institutionalized framework for regional energy cooperation at the multilateral level in NEA, most of energy cooperative projects in the NEA region are under implementation at the bilateral basis. As discussed in Chapter 3, strong bilateral energy cooperation activities have been taken places particularly between China and Russia, covering all the oil, natural gas and electricity sectors.

China promoted bilateral cooperation with Mongolia and DPRK for coal development and infrastructure construction. Meanwhile, Korea and Japan appeared to play limited minor roles in promoting regional energy cooperation in NEA, although they have a great capability to participate in energy and infrastructure development projects in NEA and would gain some significant benefits from the cooperation.

Until recently, Russia continuously strengthened bilateral relationship with an individual country in promoting regional energy cooperation in NEA. However, recent developments demonstrate Russia's strong strategy to also intensify multilateral international cooperation in NEA.

Strong initiatives toward strengthening bilateral energy cooperation need to pursue facilitating

regional energy cooperation at the multilateral basis for the common energy and economic prosperity in NEA region.

5.3 Strategy to Facilitate Regional/Multilateral Energy Cooperation in Northeast Asia

This section is to develop a strategy to facilitate regional energy cooperation in NEA at the multilateral basis. As discussed in Chapter 3, most of energy cooperation projects in NEA are currently undertaken at the bilateral basis, in particular, strongly between China and Russia. And given the existing obstacles impeding regional energy cooperation in NEA, as identified in the previous section, the establishment of an institutionalized framework for regional energy cooperation in NEA at the multilateral level may not be feasible at least in the short-term perspective. Therefore, the strategy to be addressed in this Chapter is to identify strategy/policy agenda to be required for as well as a road-map towards promoting regional energy cooperation in NEA at the multilateral level by incorporating current political-economic situations in NEA and also by including the implications of the experiences of regional energy cooperation in other regions, which were discussed in Chapter 4.

5.3.1 Strategy/Design of a Multilateral Framework for Regional Energy Cooperation in NEA

The multilateral mechanism for the regional energy cooperation can be categorized in two factors in terms of its characteristic;

- one is cooperation with the public interest which includes policy cooperation, data/information exchanges, enhancing energy conservation and renewable energy development/deployment, and capacity building, and
- the other is business cooperation for the regional energy projects, which includes the establishment/operation of cross-border pipeline networks and power interconnection grid systems.

The first category cooperation, which is implemented by the government level, can be, in turn, categorized in two natures; one is a non-binding cooperation mechanism, and the other is the policy-binding mechanism with the membership obligations. From the survey analysis on the regional energy cooperation mechanisms in other regions, as discussed in Chapter 4, we can note that the first category, being undertaken by non-binding principles with volunteer basis, includes the Latin America Energy Organization (OLADE), the Energy and Climate Partnership of the Americas (ECPA), the Asia-Pacific Economic Cooperation (APEC) and the ASEAN.

The first category with applying the binding obligation/responsibility for the members includes the EU Energy Community which is stronger mechanism for the members.

At the initial stage, a regional energy cooperation mechanism in NEA can be a type of the first category with non-binding principles based on the member countries' volunteering participation. However, as for the business cooperation at the regional basis, the second category mechanism also needs to be pursued in parallel. A mechanism of the second category should be pursued in the long-term perspectives in the NEA region.

5.3.2 Strategy/Policy Agenda to Enhance Regional Energy Cooperation in NEA

Consensus Creation

The starting point of energy cooperation in NEA can be derived from a recognition, commonly by the regional countries, that the region is one single community in terms of energy use and environment, and that energy and environment resources are common assets, which are essentially valuable for facilitating economic growth and prosperity, not only for our generation but also for future generation. Establishment of a basis for mutual cooperation cannot be successful without sharing mutual interests

and exploring joint endeavors to pursue the common prosperity. In initiating the regional energy cooperation, the countries in the NEA region need at least to reach a consensus for common goals of:

- removing or reducing impediments to the efficient development, production, supply and use of energy resources,
- minimizing the adverse environmental consequence of energy development, production and use,
- enhancing regional energy security with common task sharing efforts.

Identification and Prioritization of Cooperation Projects for Common Interests:

This includes development of energy resources, oil, natural gas, and coal as well as the construction of energy network systems for cross-border pipelines and power grids for both short and long-term basis and for the multilateral level for common interests among the countries in NEA. Also, energy technology cooperation for the improvement of energy efficiency or energy conservation, and the development of renewable energy should be of high priority for regional cooperation among the countries in NEA. Thus the priority area includes

- Joint efforts for development of oil, gas and coal resources in NEA
- Utilization of renewable energy and energy efficiency improvement
- Oil and gas pipelines and grid interconnection: Development of policy, regulation for energy trades within the region.

Enhancement of Policy Cooperation among the Government and Business Sectors:

To enhance policy cooperation for the energy sector among the countries in NEA, the following cooperation agenda need to be defined for the cooperation implementation stage;

- Establishment of energy data and market/industry information sharing mechanism where appropriate
- Capacity building to enhance the market and policy compatibility between the countries
- Encouraging the private sector or industry participation

As for the information sharing mechanism establishment, noting each country in NEA has its own energy data/statistics system, which is not mutually compatible with other countries, it is necessary to study a possibility of creating a common database for the energy development project in each country for upstream and downstream of oil, gas, coal, and electricity industries. Priority areas include;

- Developing a common energy data bases and policy survey/sharing dialogues at the multilateral level
- Expansion of coverage of participating countries by adding Japan and the DPRK;
- Establishing and maintaining a communication mechanism

Capacity building activity for regional energy cooperation in NEA is required in the sense that the countries in the region differ from each other in terms of economic systems and the level of economic development, and therefore maintain different market systems including in the energy sector, so that the countries in the region need to make an effort to enhance market compatibility in order to implement energy cooperation at the regional basis. Priority areas include;

- Facilitation of a capacity building programmes
- A broad network among policy-makers, industries, researchers and investment communities
- A policy dialogue forum (GBD to be enlarged to encourage the business participations)
- Expansion of membership to include the DPRK and Japan

Improvement of investment environments:

Exploration and development of oil, natural gas, and coal and the construction of infrastructure to transport them from remote area in NEA to consuming areas require a massive investment. Additionally, formation of energy infrastructure to accelerate and improve the stability of economic cooperation with the countries of NEA requires an active promotion of a number of mutually beneficial energy projects. Therefore, multilateral cooperative approaches to create a more favorable environment for foreign and ideally multisided energy investments in the region will be necessary and help spreading market risks evenly among the partners. Priority areas include;

- Creating a more favorable environment and market-friendly policies for attracting foreign investment in hosting countries of the energy development
- Actively encouraging public private partnerships (PPPs) for the energy development investment
- Promoting joint ventures with foreign companies and use of funds multilateral development banks or international financial institutions for facilitating investment to a large-scaled energy projects
- Establishing inter-governmental committees for supporting energy infrastructure likely to conduct financial supports, technological inspection, and feasibility study in a consistent way.
- Establishment of a regional multilateral development bank such as the 'Northeast Asian Development Bank' and the 'Asian Infrastructure Investment Bank'²⁸ for the countries in Northeast Asia.

5.3.3 Strategy/Roadmaps towards for multilateral energy cooperation in Northeast Asia

Being based on the policy agenda identified in the previous section as well as on survey on successful experiences of the regional energy cooperation in other regions, policy agenda to facilitate regional energy cooperation in the NEA region can be implemented in two stages for a gradual step-by-step approach; one is those to be pursued in the short term, and the other is for the long term agenda. The short term agenda, which can be implemented urgently, as soft policy agenda, in non-binding manners, include:

- Establishment of policy dialogues channel between governments in the NEA region for creating confidence building environment
- Promotion of information/data exchange and sharing mechanisms
- Joint research/study with identification of possible cooperative energy projects: Natural gas pipelines, power interconnection, oil stockpiling
- Capacity building projects for developing countries in the region
- Encourage energy expert/business dialogues & participation
- Assistance to/cooperation with the DPRK for resolution of energy shortage problem

The long term agenda, which require a consensus as well as more preparatory joint efforts between the countries in NEA, include:

- Creation of institutionalized frameworks for multilateral regional energy cooperation by enacting a treaty, charter, regional energy community at the regional basis

²⁸ In October, 2013, China President Xi Jinping suggested the establishment of Asian Infrastructure Investment Bank during his tour to Southeast Asian countries, and the Chinese government has discussed its establishment with many countries, including the countries in NEA.

- Introduction of policy coordination functions with the established institutional arrangement
- Development of joint policy agenda for common goals/task sharing
- Address on an intra-regional energy financing mechanisms

Chapter 6. Frame and Structure of the GTI Energy Cooperation Programme

As discussed in Chapter 1, the approaches to realize energy cooperation in the GTR, defined in the ‘GTI Energy Action Plan for the years 2013 – 2014 (EAP)’, are

- Develop the GTI Energy Board as an effective cooperative mechanism for coordinating energy policies in the region;
- Create a cooperation network among governments, the private sector, think tanks, financial institutions, etc. through the establishment of a regional Energy Forum;
- Promote human capacity building on energy through the organization of education and training programmes, joint studies and workshops;
- Support transparency in the institutional environment to reduce non-physical barriers where it is necessary,
- Develop a GTR regional database on energy resources, and supply and demand to share information among regional stakeholders.

The approaches are well-designed to reflect the current status of regional energy cooperation in NEA and thus are well conceptualized to overcome the issues the region facing. Further steps for the GTI to enhance regional energy cooperation in the GTR include the design of the frame and structure of regional energy cooperation programmes within the GTI framework by identifying necessary tasks to implement at the practical level in future, which will be discussed in this Chapter.

In this Chapter, we will identify the priority areas for each approach and will develop tasks to be required for the realization of regional energy cooperation with the GTI framework. Then, the implementation structure of the GTI for regional energy cooperation in NEA will be presented.

6.1. Identification of Tasks under the GTI Energy Cooperation Frame

6.1.1 Approach: Develop the GTI Energy Board as an effective cooperative mechanism for coordinating energy policies in the region;

Background

The GTI Energy Board was established in 2009 to address regional energy issues on a policy and strategy basis while also including private sector expertise and resources. According to the GTI EAP, the role of the GTI Energy Board is to undertake the practical implementation of GTI activities in the energy sector in cooperation with local authorities, international organizations and energy companies. More specifically, its roles are defined as follows:

- Identify, submit, deliberate on, and approve proposals for GTI energy activities and projects
- Undertake practical actions required for the implementation of the activities
- Monitor and evaluate the results of GTI energy activities and projects
- Provide information on energy policy and energy statistics from each country
- Make efforts to mobilize financial resources

Priority Areas

The priority areas under this approach may include the followings:

- Introduction of policy dialogues into the Energy Board meeting to enhance mutual understanding among the NEA countries on energy planning and policies, electric power development and interconnection, inter-state transit of fossil fuel, energy efficiency, and renewable energy development/deployment,
- Inclusion of DPRK and Japan – nonmember countries of the GTI, as observers/guests in the Energy Board Meeting and encourage their active participation in the GTI energy cooperation activities.
- Creation of working groups with targeted objectives and tasks, as necessary, under the Energy Board
- Development and facilitation of research activity for themes of common interests in the NEA countries.
- Feasibility study of creating and conducting the GTI Energy Ministerial Meetings *plus* creation of the institutionalized legal framework for regional energy cooperation in NEA, such as the GTI Energy Cooperation Declaration, the NEA Energy Charter, or the GTI Energy Agreement.
- Interface the GTI energy cooperation activity with other GTI activities, i.e., transportation and financing in views of their relevance to the energy sector issues in NEA, and also with other international organization, i.e., the UNESCAP and the ADB.

Required Tasks

- Task 1: Organization of policy dialogues at the senior official level in conjunction with the Energy Board meeting to encourage mutual understanding
 - Scope of policy dialogues is defined for common interests and cross-border issues over the NEA region with DPRK and Japan included for exploring feasible energy cooperation projects in NEA.
 - Enrich the Energy Board meeting by interfacing with relevant experts/organization to the energy issues in NEA in the area of transportation and finance cooperation, for example.
- Task 2: Explore the possibility of upgrading in the long term the Energy Board Meeting to the Ministerial Level
 - Develop more concrete projects attractive to ministers' level by differentiating the GTI from other initiatives with the leadership of energy producing countries, namely the Russian Federation.
- Task 3: Facilitate research/survey cooperation activity among the GTI member countries for regional energy cooperation in NEA by creating working group, if necessary, related to the relevant issues, such as;
 - Survey on energy market structure, energy investment policies and regulations in each country
 - Design and development of common energy database (DB) for NEA (in collaboration with the coordinator of the APEC Energy Database and/or the WG-EPP of the ECNEA (Working Group on Energy Policy and Planning, the Intergovernmental Mechanism on Energy Cooperation in Northeast Asia to avoid the duplication)
 - Research on creation of regional multilateral energy cooperation framework
 - Survey/Research on the improvement of energy efficiency in NEA
 - Research on the construction of cross border energy infrastructure/network and the related project plans

- Research on joint measure for energy-environment projects at the regional basis, including renewable energy and energy conservation)

6.1.2 Approach: Create a cooperation network among governments, the private sector, think tanks, financial institutions, etc. through the establishment of a regional Energy Forum

Background

The GTI was launched as a non-binding collaborative mechanism for intergovernmental cooperation in NEA, and now is beginning to emerge as one of the important initiatives that are active in the region. There is a need to strengthen collaboration among policymakers, researchers, and the business community.

This would facilitate the development of potential cooperation projects in NEA. Ideally, there should be a strong interaction between policymakers, researchers, and the business community in promoting ventures such as a capital-intensive energy project.

The objective of this approach is that the countries in NEA will be able to share a common basis for energy cooperation for investment promotion, policy planning and research capacity to enhance the regional energy cooperation projects in the region.

Priority Areas

The priority areas under this approach may include the followings:

- Create the GTI Energy Forum (GEF) as policy-business dialogue forum under the Energy Board to enlarge and encourage the business and expert participations.
- Establish the partnership building for broad network among policy-makers, industries, researchers and investment communities: Energy companies, research institution and energy related government agencies will be more actively involved in the GTI energy cooperation activities to be undertaken.

Required Tasks

- Task 1: Organize the GTI Energy Forum to establish a broad network among policy-makers, industries, researchers and investment communities to enhance dialogues channel between governments and industries
 - The scope of participants in the Forum includes government ministry/agency, research institute, energy company and investor, other energy related organizations in the GTI member countries. Experts from non-member countries or international organization are invited, as necessary or relevant.
 - Encourage energy expert/business dialogues & participation through the activities of the Energy Board meetings in order to develop and implement more feasible policy agenda and road-map for multilateral energy cooperation in NEA.
 - Outcome of working group activities will be presented at the GBD and/or the business forum to encourage energy expert/business dialogues and participation as well as to foster capacity building for energy projects for developing countries in the region
- Task 2: Creation of the NEA Research Consortium (Multilateral institution) or Group to conduct consultation research projects regarding the challenges and business opportunities in energy cooperation in NEA.
 - Joint research/study for the improvement of energy security in the NEA region

- *Ad hoc* analysis for emerging special issues (Example: Coal development in Mongolia, Cross-border pipeline and power interconnection system, nuclear safety in NEA region)
- Develop fast-track pilot projects for the GTI energy cooperation projects (Example: Cooperation for energy conservation policy & practices, Renewable energy development)
- Consultation service to energy policy makers
- In the process of creation of the Consortium, the leadership of Russia and China is desirable *plus* with partnership with Korea, Mongolia, DPRK and Japan

6.1.3 Approach: Promote human capacity building on energy through the organization of education and training programmes, joint studies and workshops

Background

The countries in NEA are diverged in terms of economic system and the level of economic development, and thus are shown to be different market system including the energy sector. This implies that the countries in NEA need to do some efforts to enhance market compatibility among the countries in implementing energy cooperation at the regional basis.

Also, some of the member countries have insufficient R&D activities due to lacks of financial resources, technical expertise, and of operation know-how. The gap of the capacity to conduct R&D activities is large between one and another.

Through the capacity building program, the GTI member countries are expected to share a common basis for energy policy planning methodology and research capacity to enhance the regional energy cooperation projects in the region as well as for improving the business operation know-how.

Priority Areas

Capacity building projects need to be identified through a selection process. Energy-related institutes and agencies may be selected based on their need and potential for contribution to regional energy cooperation.

- *Training, workshops, and study tours:* Personnel dealing with various aspects of energy cooperation such as technical expertise, economics, finance, law, governance, etc. will be invited to various activities undertaken by the GTI energy cooperation programmes.

Required Tasks

- Task 1: Identify institutions and agencies involved in energy cooperation and their capacity-building needs regarding energy market development and policy design/planning
- Task 2: Conduct training, workshops, study tours, etc. for personnel dealing with various aspects of energy cooperation (technical, economic and financial, legal, political, social, and other aspects)
 - Expert workshop to identify regional cooperation agenda for coal developments and trades among the countries in NEA.
 - Expert workshop to improve/develop the methodology and energy statistics in developing countries in NEA
 - Expert workshop to enhance research capability for economic analysis for the proposed energy cooperative projects in NEA

- Expert workshop to improve/develop the methodology for regional energy outlook for NEA in developing countries in NEA

6.1.4 Approach: Support transparency in the institutional environment to reduce non-physical barriers

Background

As discussed in Chapter 5, there still exist various non-physical barriers hindering regional energy cooperation in NEA, which include resource nationalism, political instability, and lack of market compatibility among the countries in the region. This implies that many projects for energy development and trades in NEA faced uncertainty related with investment risk and commercial feasibility and viability, for example.

Reduction of political instability is critical for improving the environment for regional energy trade and cross-border investment. At the same time, increased cross border investments and trade and associated business interests would help to lower political tensions. Strengthening regional institutions, both at the policy and technical level, to coordinate policy measures, exchange information, coordinate investment planning, develop congruous grid codes and operating procedures, etc., would contribute to the reduction of non-physical barriers and thus to facilitating regional energy cooperation.

Priority Areas

- Study on trade/investment agreements among NEA countries and determine ways to strengthen cooperation in the energy sector in a multilateral level
- Establish and encourage a more favorable environment for intra-regional energy trade and investment in NEA by decoupling energy from the geopolitics as well as by ensuring market transparency for domestic/foreign investment and establishing affordable pricing mechanism for the contracts
- Exploring cross-border issues concerning the commercial and economic feasibility, construction, financing, operation and maintenance of oil, gas and electricity grids

Required Tasks

The main focus would be to establish and encourage a more favorable environment for trade and investment in energy cooperation, especially in interconnection projects.

- Task 1: Study on ways to reduce the barriers, but to increase trade and investment in the energy sector, especially for energy interconnection with business sector participation.
 - Collect data regarding financing and investment arrangements in NEA countries for the financing of the construction, operation and maintenance of energy grids
 - Recommendations for appropriate mechanism(s) to increased access to financing and investment opportunities
 - Study business practices in NEA countries and determine ways to facilitate cross-border trade especially energy interconnection.
- Task 2: Study other issues on cross-border trade such as taxation and tariff, regulatory and legal frameworks, institutional and contractual arrangement for energy trade.
 - The Energy Board can create an *ad hoc* Task Forces, on a temporary basis, for specific cooperative projects in NEA, namely coal development and natural gas pipeline projects.

6.1.5 Approach: Develop a GTR region-specific database on energy resources, and supply and demand to share information among regional stakeholders

Background

The GTR has experienced extensive changes in the energy sector in recent years and is also expected to do so even in future. For example, Russia already extended the ESPO oil pipeline and natural gas pipeline to the Primorsky Krai of Russia, and is implementing the plans for installation of other energy production/delivery facilities in the region.

Thus, information sharing regarding the energy situation in the GTR is substantially an important cooperation activity in the GTI framework, in the sense that it can provide the member countries with a basis for fostering mutual understanding of the energy sector in each country among the GTI members.

On the other hand, each country in NEA has its own energy data/statistics system, which is not mutually comparable with the other countries. So that common database for the member countries needs to be developed, based on the internationally comparable energy data system, within the GTI energy cooperation framework.

Through this approach, the countries in NEA will become more informed of the challenges and benefits of sub-regional energy cooperation.

Priority Areas

In order to facilitate the collection and dissemination of information and data regarding the energy situation in NEA, the following activities will be required:

- Publish the GTR Energy Project Directory with the coverage of the upstream, midstream and downstream industry projects for oil, natural gas, coal, electricity and renewable energy.
- Creating a common database (DB) of energy balance tables and time series data for the countries in the GTR, including non-member countries, DPRK and Japan
- Nominating a nodal and partner institutes: Implementation system for this activity should be through the nomination of a nodal institute and the partner institutions, which will be in charge of .developing and operating the database.

Required Tasks

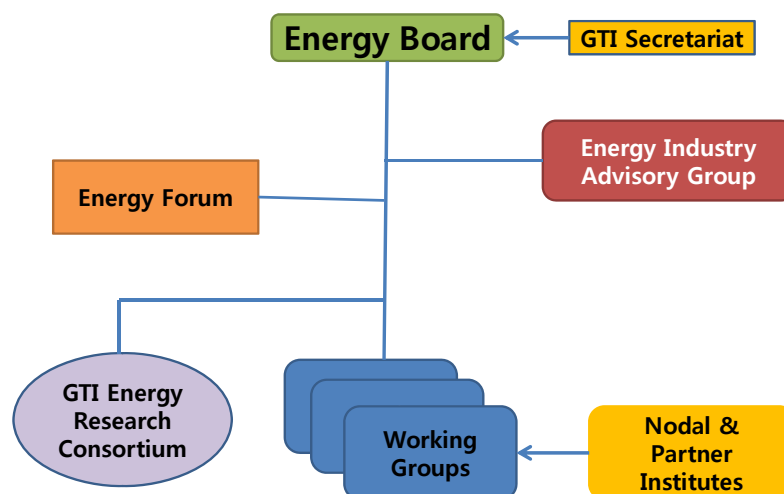
- Task 1: Consensus among the GTI member countries at the Energy Board to develop a GTR region-specific energy directory and database on energy resources, and supply and demand, as well as commitment for funding this project.
- Task 2: Establish of the implementation system for the creation of database
 - Creation of the GTI Energy DB Working Group under the GTI Energy Board to be responsible for the development of the database
 - Nomination of a nodal institution for the Working Group as well as the partner institution in each member country.
 - The role of nodal and partner institutions is to design the directory and database structure and to develop the GTR Energy Directory and the DB.
- Task 3: Conduct a ‘Capacity Building Energy Expert Workshop for the development of energy data/statistics system’ with participation of the DPRK and Japan.

- Proving with expert workshop to improve energy data/information collection and compilation
- Task 4: Complete the development of the GTI Energy Directory and DB and publish them.
- Task 5: Regularly updating and expansion of the scope of the Directory and DB in addition to existing data and information by including the following, for example;
 - Best practices of renewable energy development and energy efficiency improvements
 - Energy trade matrices among the member countries by source, oil, coal, natural gas and electricity
 - Long-term regional energy demand/supply outlook with extended time horizon, say by 2030 (every three year)
 - Continue collecting and analyzing comparable energy and related information and statistics for NEA countries including energy resources and supply, energy demand, status of infrastructure for energy interconnection including those relevant to energy development and utilization, policies and regulations on energy development and utilization including cross-border energy trade
 - Expansion of coverage of participating countries by adding Japan and the DPRK

6.2. Design of Implementation Structure

Following the discussion in the Section 6.1, the structure for implementing the GTI regional energy cooperation in the GTR can be designed as shown in the [Figure 21]. Under the GTI Energy Board, some working groups (WG) can be established to implement the relevant tasks, such as the development of database (DB), networking and research on various emerging issues in the GTR.

[Figure 18]] GTI Energy Cooperation Implementation Structure



The function of each entity can be described as follows:

- Energy Board: 1) Identify, submit, deliberate on, and approve proposals for GTI energy activities and projects; Undertake practical actions required for the implementation of the activities; Monitor and evaluate the results of GTI energy activities and projects; Provide information on energy policy and energy statistics from each country; Make efforts to mobilize financial resources
- Energy Forum: Communication network between government, think-tank and energy companies in the GTR to enhance mutual understanding and thus to develop common policy cooperation agenda to be pursued in the GTR region and thus to facilitate energy business investment and promoting multilateral energy projects, including cross-border infrastructures. . The Energy Forum can be held in conjunction with the Energy Board meeting, regularly.
- Working Groups (WG): A working group can be established, as necessary and thus plays a role of implementing the GTI energy cooperation programme, including database development, networking and research projects. Each working group has a nodal institute to lead the given project task with collaboration, participating institutes in the projects, i.e., with the partner institutes.
- Energy Industry Advisory Groups (EIAG): To expand and foster energy cooperation at the industrial levels, namely, oil & gas, coal , power industry, renewable energy and energy conservation. Thus, some large energy companies in NEA, e.g., the Rosneft, the Gazprom and the Inter RAO UES in Russia, the CNPC and Sinopec in China, and the KEPCO and KEMCO in Korea, are encouraged to actively participate in the GTI energy cooperation activities. Some companies can play a significant role by practicing the leadership in promoting the regional energy cooperation for the specific industry. Major industrial companies will be allowed to commit the financial contribution to the relevant GTI activities to their business.
- GTI Research Consortium (Multilateral institution): To conduct consultation research projects regarding the challenges and business opportunities in energy cooperation in NEA; joint research/study for the improvement of energy security in the NEA region; *Ad hoc* analysis for emerging special issues; Develop fast-track pilot projects for the GTI energy cooperation projects; Consultation service to energy policy makers

Chapter 7. Conclusion

This report identified strategy to enhance regional energy cooperation in NEA, in particular, within the GTI framework by identifying necessary tasks to implement at the practical level. Given the uncertainty on political stability surrounding the NEA region, the promotion of regional energy cooperation in NEA at the multilateral level is facing difficult challenges to overcome at least in the short run, although there is an urgent need for it in order to stabilize energy supply and demand structure in the region.

As a unique intergovernmental cooperation mechanism in NEA, the GTI has an advantage to practice its capability to provide the countries in NEA with a platform to initiate energy cooperation at the multilateral regional level in NEA. Energy is already taken as an important cooperative agenda for the GTI activities. This report proposes some policy recommendations for the GTI to strengthen its role and function as implementation mechanism for regional energy cooperation in NEA, which include as the near-term activities;

- Creation of the Working Groups, the GTI Energy Forum, the GTI Industry Support Group, and the GTI Energy Research Consortium in order to strengthen the function of the Energy Board
- Creation of the 'Energy Transit Security Dialogue' as an effort to reduce non-physical barriers
- Publish the GTR Energy Project Directory and develop a GTI common energy database (DB) to enrich the GTI energy activities, in addition to
- Capacity building on energy policy/measures and improvement research methodology in the areas of energy conservation, renewable energy, and cross-border energy grid networks.
- Invite non-members to the GTI activities as observer/guest as well as interface with other relevant international organizations.

The GTI also needs to expand its roles in pursuing the long-term goals in energy cooperation in NEA by continuing to implement such activities as;

- Research on upgrading the Energy Board Meeting to the Ministerial Level as well as the GTI Energy Summit meeting
- Preparation of the institutionalized frameworks for multilateral regional energy cooperation by enacting a treaty, charter, regional energy community at the regional basis
- Address on an intra-regional energy financing mechanisms

The success of the GTI energy cooperation activity will be subject to an appropriate funding mechanism as well as active participation of all the countries in NEA to the GTI activities by decoupling the energy cooperation from the geopolitics in NEA.

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