Republic of Kazakhstan

Data Collection Survey on Environment and Energy Efficiency Sectors in Kazakhstan

Final Report

June 2011

Japan International Cooperation Agency (JICA)

Tokyo Electric Power Company (TEPCO)

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Appendix

Abbreviation

AAU	Assigned Amount Unit
ACC	Advanced Combined Cycle
bbl	barrel
CAREC	Regional Environmental Center for Central Asia
CCGT	Combined Cycle Gas Turbine
CDM	Clean Development Mechanism
C4	Climate Change Coordination Center
CHPP	Combined Heat and Power Plant
CNG	Compressed Natural Gas
COP	Conference of the Parties
DFP	Designated Focal Point
DNA	Designated National Authority
EAEC	Eurasian Economic Community
EBRD	European Bank for Reconstruction and Development
ECCJ	Energy Conservation Center, Japan
EE&C	Energy Efficiency and Conservation
EMS	Energy Management System
ESCO	Energy Service Company
ERU	Emission Reduction Unit
ETS	Emissions Trading Scheme
EU	European Union
FDI	Foreign Direct Investment
FEC	Final Energy Consumption
GCC	Gas Combined Cycle
GDP	Gross Domestic Produc
GIS	Green Investment Scheme
GJ	Giga Joule
GTZ	Gesellschaft fur Technische Zusammenarbeit
GWh	Giga Watt Hour
HHV	High Heat Value
HPP	Hydro Power Plant
IACE	Information and Analytical Center for the Environment
IEA	International Energy Agency
IET	International Emissions Trading
IGCC	Integrated Coal Gasification Combined Cycle
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer

JI	Joint Implementation
JICA	Japan International Cooperation Agency
JISC	Joint Implementation Supervisory Committee
KEGOC	Kazakhstan Electricity Grid Operating Company
KfW	Kreditanstalt fur Wiederaufbau
kl	kiloliter
koe	Kilo Oil Equivalent
KOREM	Kazakhstan Operator of Electricity Market
KSRIEC	Kazakhstan Scientific and Research Institute for Environment and Climate
ktoe	Kilo Ton Oil Equivalent
kWh	Kilo Watt hour
KZH	Kazakhstan
LHV	Low Heat Value
LOE	Letter of Endorsement
MACC	More Advanced Combined Cycle
MEP	Ministry of Environmental Protection
METI	Ministry of Economy, Trade and Industry (Japan)
NEDO	New Energy and Industrial Technology Development Organization
MINT	Ministry of Industry and New Technology
Mtoe	Million Ton Oil Equivalent
O&M	Operation and Maintenance
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PDD	Project Design Document
PES	Primary Energy Supply
PIN	Project Idea Note
PPP	Purchasing Power Parity
R&D	Research and Development
R/P	Resources / Production
SOx	Sulfur Oxide
Tcf	Trillion cubic feet
TEPCO	Tokyo Electric Power Company
toe	Ton Oil Equivalent
UNDP	United Nations for Development Program
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollar
WB	World Bank
WHO	World Health Organization

Executive Summary

1. Introduction

1.1 Background

The Republic of Kazakhstan (hereinafter "Kazakhstan") ratified the Kyoto Protocol in March 2009 and burdened the duties to make efforts to reduce CO2 emissions in accordance with the Protocol. However, at this moment, CO2 emissions per energy volume of Kazakhstan indicates at 3 times of the average of the OECD countries due to old technology and facilities in the industrial sector. It is said that Kazakhstan is positioned at one of the lowest countries in energy efficiency.

The Presidential Edict, "Environment Safety Concept of the Republic of Kazakhstan 2004-2015 (2003)", stipulated that countermeasures against climate change were set at one of the important issues and especially set a high priority on improvement of energy efficiency. as high priority issues.

The Government of Kazakhstan already prepared the Division of Kyoto Protocol in the Ministry of Environmental Protection and established a communication line with United Nations Framework Convention on Climate Change (UNFCCC). Under the circumstances, in May 2009, it was stated that the Government wished to join the "Annex I Country". In this context, Kazakhstan is required for quick actions such as establishment of an appropriate environment standards and implementation structure.

With regard to the assistance principle of Japan International Cooperation Agency (hereinafter "JICA") for Kazakhstan, cooperation by Official Development Assistance (ODA) loan is the main tool because the country has already joined into "Middle Income Country". The purpose of the project to be assisted by the JICA's ODA loan is also limited to 4 categories, namely "Human Resources Development", "Prevention and Relief Disaster Prevention", "Assistance for Correction of Gap", "Environment".

This survey (hereinafter the "Survey") was undertaken by JICA, focusing on the above "Environment" sector and collects the sector information regarding environment and energy efficiency to suggest JICA's assistance principle for this sector.

1.2 Scope and Objective of the Survey

The Survey started from January 2011 and ended at June 2011, based on the scope of work prepared by JICA. The Survey collects the comprehensive information in environment and energy efficiency sector and suggests the JICA's assistance principle for the sector.

2. Environment

2.1 Principles on Global Environment

(1) Framework of Efforts on Global Environment Protection

The Government of Kazakhstan ratified the United Nations Framework Convention on Climate Change (UNFCCC) in May 1995 and the Kyoto Protocol to the Framework Convention on Climate Change (hereinafter referred to as "Kyoto Protocol") in April 2009. Based on those international frameworks, Kazakhstan began efforts to meet requirements of the UNFCCC and the Kyoto Protocol at the national level.

In Kazakhstan, the legal framework to meet the requirements of the UNFCCC and the Kyoto Protocol has been under preparation. Furthermore, legislation works have been underway by the relevant ministries, including the Ministry of Environment Protection (MEP) and the Ministry of Industry and New Technology (MINT).

In the legal system of Kazakhstan, the Constitution of the Republic of Kazakhstan is the superlative law over any legislation in the country. According to the Constitution, the parliament approves the laws of the Republic of Kazakhstan. For detailed regulations, the orders by the President of the Republic, the Government, and the Ministries are legislated based on the governing laws of the Republic. Since any orders by the Government or any ministry without a standing law cannot be legally binding, the implementation of an effective legal system always requires legislation of the laws of the Republic.

The basis of the national policy on environmental protection is "the Conception on Environmental Safety of Kazakhstan" which was approved by the Presidential Order of April 30, 1996. After that, the Presidential Order No. 1241 of December 3, 2003, approved "the Conception of Environmental Safety of Kazakhstan for 2004-2015", which aims at ensuring national efforts for environmental safety and sustainable environmental development in the country. The conception addresses the global environmental problems to be tackled by the country, including climate change, ozone depletion, conservation of biodiversity, and land desertification and degradation.

In January 2007, the Ecological Code was legislated as the law of the Republic. By the code, regulations on global warming including emissions of greenhouse gas (GHG) were introduced in the country for the first time. In July 2009, by the initiative of the President Nazerbayev, the Department of the Kyoto Protocol was established in the Ministry of Environmental Protection (MEP) in order to enhance institutional capacity.

(2) Legislation on Ratification of the Kyoto Protocol

For the framework of the Kyoto Protocol, amendments of the Ecological Code are being processed. Therefore, there is no legal standing in the law for carbon trading. The enforcement of the amended Ecological Code enables the implementation of internal carbon trading and JI

projects. However, the approval of the amended Ecological Code by parliament which was expected to be done by September 2010 was delayed and as of March 2011is still not yet completed.

(3) Legislation on Reduction of GHG Emissions

The procedures and requirements on the reduction of GHG emissions were approved by the Ministry Order No. 70-p of the Ministry of Natural Resource and Environment Protection at the time. However, since Kazakhstan did not ratify the Kyoto Protocol, the Ministry of Justice did not approve it as an effective law. Therefore, for the implementation of the Ecological Code, regulations on the source of GHG emissions and the consumption volume of ozone depletion required Governmental Resolution No. 124 of February 28, 2008.

2.2 Policies on Global Environmental Protection

(1) Policies on Reduction of GHG Emissions

It has been pointed out that the largest source of GHG emissions in Kazakhstan is the oil industry which is the most important sector in the Kazakh economy. As a countermeasure of GHG emissions, the oil industry was required to utilize associated gas since most of the associated gas in the oil exploitation field were flared and caused enormous volume of GHG emissions.

Kazakhstan participates in “the Global Gas Flaring Reduction-A Public-Private Partnership” which is led by the World Bank (WB) and has been made efforts to reduce the flaring and venting of associated gas.

Since the Petroleum Code was amended on July 1, 2006, the flaring and venting of associated gas is prohibited. The sustainable utilization of associated gas is required.

By these regulations, all the petroleum production companies, including the state-owned company KazMunaiGas, were required to take measures to utilize associated gas. The major utilization measures are as follows:

- Utilization for power generation and heat supply by small gas turbines
- Collection of associated gas and stockpiling at natural gas facilities
- Reinjection into the ground
- Production of Liquefied Petroleum Gas (LPG)

(2) Policies on Harmonization of Environment and Development

(a) Green Growth Program 2010-2014

In 2010, the Government of Kazakhstan approved “the Green Growth Program 2010-2014”. The Program aims at implementing national efforts for climate change, low carbon economy, and increasing energy efficiency. MEP is responsible for implementing the program.

The Green Growth Approach was proposed at the 5th Ministerial Conference of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). It is a strategy framework to realize sustainable development as well as achieve harmonization of those activities

concerning the Millennium Development Goal (MDG) 1 of poverty reduction and MDG 7 of sustainability of the environment.

The Green Growth Program of Kazakhstan introduces the concept of the Green Growth Approach proposed for the international community.

(b) Green Bridge Initiative

In October 2010, "The Astana Green Bridge Initiative" (hereinafter referred to as "the Astana Initiative") was adopted by the 6th Ministerial Conference on Environment and Development in Asia and the Pacific of ESCAP, which was held in Astana, the capitol city of Kazakhstan.

The Astana Initiative proposes a number of areas and activities suitable for programs to begin implementation of the Europe-Asia-Pacific partnership. As the host country for the 7th Ministerial Conference "Environment for Europe" in September 2011, Kazakhstan, which is a country located in the center of Eurasia connecting between Asia and Europe, intends to facilitate the process of bridging environmental policies and best practices between the Europe, Asia and the Pacific regions. The proposed areas for cooperation under the Astana Initiative are as follows:

- Eco-efficient use of natural resources and investment in ecosystem services
- Low-carbon development and adaptation to climate change
- Promotion of sustainable urban development
- Promotion of green business and green technology
- Promotion of sustainable lifestyles and improvement of quality of life

Kazakhstan has been promoting the implementation of the Astana Initiative with the establishment of the Green Bridge Office in MEP. The Green Bridge Office prepared "the Preparation Partnership Program on the Realization Astana Initiative "Green Bridge for 2010-2020" which is a kind of action plan of the Astana Initiative, by the cooperation of ESCAP and UNDP.

The action plan was just completed and has started the first stage to send request letters for the countries expressing their interests in the Astana Initiative to call project proposals. Since MEP does not specify budgets for project implementation, the utilization of funds from donors including UNDP is under discussion in order to conduct feasibility studies for project implementation.

2.3 Policy on Energy

(1) Kazakhstan 2030 Strategy

The national development policy on Kazakhstan was adopted in 1997 as the "Kazakhstan 2030 Strategy". The strategy set up 7 long term priority fields as follows.

- National Security
- Domestic Political Stability and Societal Consolidation
- Economic Growth Based on an Open Market Economy with a High Level of Foreign Investments and Internal Saving

- Health, Education and the Well-Being Of Kazakhstani Citizens
- Energy Resources
- Infrastructure, more Particularly Transport and Communication
- Professional State

Regarding "Energy Resources" in the above priority fields, the following strategies have been further set up.

- Kazakhstan has large deposits of coal, uranium, gold and other valuable minerals.
- Kazakhstan has significant solar and wind energy potential.
- Regardless, Kazakhstan cannot satisfy the internal demands for a number of years. It is the result of a system of distribution, which goes back to the Soviet epoch and also the lack of a required infrastructure.
- Similarly, the shortage of required communications for exporting oil and gas to the world markets sharply reduces the opportunity to recover sufficient sources
- Strategy of energy resources utilization will include the following components.
  - Kazakhstan shall sign the long-term partnership with main overseas oil companies to attract the best state-of-the-art technology, know-how, and large capital for quick and effective utilization of our resources.
  - The system of pipelines for oil and gas exporting should be created.
  - The strategy on the utilization of fuel resources is directed to the attraction of interests of large countries to Kazakhstan and its role as a world fuel supplier.
- With the attraction of overseas investments, Kazakhstan shall accelerate the creation and development of the domestic energy infrastructure, and settle the problem of self-sufficiency and competitive independence.
- Efficient and expedient utilization of future profits drawn out of these resources.

(2) Strategic Plan 2020

The "Strategic Plan 2020", approved in February 2010 by the President, is the middle term strategic plan for the period from 2010 to 2019 to realize the fundamental strategy, "Kazakhstan 2030 Strategy". The Strategic Plan 2020 includes the following description.

(a) Achievement of the Previous Strategy, "Strategic Plan 2010"

The following items were achieved during the period of Strategic Plan the 2010.

- The annual average GDP growth 8.5 %, having exceeded the initial value 2.3 times over in 2008.
- In 2007, industrial production had already achieved the object of the ten years' period on doubling, and the agricultural production has grown 1.4 times.
- Considerable reformations have occurred in the spheres of public health services, education and the social protection of the population.
  - Disease of tuberculosis has decreased 30 %.

- The population share with incomes below a living wage was reduced from 31.8 % in 2000 to 12.7 % in 2008.
- Expected life expectancy has increased from 65 to 68 years.

(b) Key Directions of the Strategic Plan 2020

The strategy set forth the following principles during the period.

- Kazakhstan in 2020 will become the country which left the world crisis stronger and competitive, with a diversified economy and a population actively involved in the new economy.
- Kazakhstan will already be among the fifty of the most competitive countries in the world with a favorable business climate, allowing it to attract considerable foreign investments in the non-oil and gas sectors of the national economy.
- Kazakhstan will possess the human resources necessary for the development of a diversified economy, and also will have an infrastructure necessary to serve domestic entrepreneurs and exporters.
- The economy of Kazakhstan will increase in real expression for more than a third in relation to the 2009 level.
- The levels of gold and exchange currency reserves will not be lower than three months of imports or volume of short-term (up to 1 year) external debt of the state and corporate sectors of the country.
- Assets from the National Welfare Fund will not be less than 30 % of the GDP.
- A share of the population with incomes below a living wage will decrease to 8 %.

Besides, the strategy raised the following directions.

- Preparation for post crisis development.
- Maintenance of steady economic growth at the expense of the acceleration of diversification through industrialization and infrastructure development.
- Investments into the future – increase of competitiveness of human capital to achieve steady economic growth, prosperity and social well-being for the Kazakhstani people.
- Provision of qualitative social and housing and public utility services for the population.
- Strengthening the interethnic consent, safety, stability of international relations.

(c) Direction on Energy in Strategic Plan 2020

Direction on energy in the Strategic Plan 2020 is described in the second direction "diversification through industrialization and infrastructure development"

- Domestic industries also have considerable potential of energy savings.
- Along with the implementation of measures on the increase of the efficient use of energy escalating its manufacturing to satisfy internal requirements, especially in the western and southern regions is required.

- Work on the expansion and reconstruction operating and building of new capacities of power sources and the electro network enterprises will be spent.
- Within the limits of the development of the power sector, Kazakhstan will promote the achievement of the global purpose to reduce the emissions of greenhouse gases.
- One way to achieve the reception of cheaper, non-polluting energy is atomic engineering development. Nuclear power complexes will allow for the usage of available fuel and mineral resources optimally and sustainably.
- The share usage of alternative energy sources in the power consumption of the total amount comprises less than 1 %. The use of renewable energy such as hydro power and wind power will increase.
- In the electric power industry sector, the prices and rate-making reforms which will allow for the development branch in market conditions will be carried out.

2.4 Main Measures for Energy Efficiency

(1) Measure to Promote Renewable Energy

The Law on Renewable Energy was adopted in 2009 in order to promote the installation of renewable energy.

The law stipulates the obligation of taking renewable energy as follows.

- Regional electricity grid companies, which have directly connected Renewable Energy Sources into the network, shall purchase the full volume of renewable electricity generated by respective qualified energy production organizations to cover up to 50 percent of electricity loss in the respective distribution network.
- If the renewable electricity generated by the qualified energy production organization exceeds the volume of 50 percent electricity loss corresponding to the regional electricity grid company, then the rest of such renewable electricity volume shall be purchased by the system operator to cover the electricity losses of the national electricity network.

The law does not clearly mention the replenishment for the cost recovery deficit of renewable energy and technical possibility to connect to the grid system. At this moment, the Government reviews the law to clearly stipulate these issues in a revised law.

(2) Progress of Development of Wind Power and Hydro Power

Regarding wind power, a 500 MW capacity was planned in April 1999 via the “Electricity Development Program until 2030”. After that, the UNDP conducted a project, the “Wind Power Market Development Initiative”, to formulate a framework for wind power development and identify potential sites. Based on the project, the Kazakhstan Government created a “National Program on Wind Energy Development”.

Besides, the said “Electric Power Industry Development Program in the Republic of Kazakhstan 2010-2014” indicated the promotion of renewable energy such as wind power and hydro power

step by step and planned the wind power project, Shelek Corridor in Almaty (50 MW), and a hydro power project, Koksu river in Almaty (42 MW) as private projects.

(3) Measure to Promote Energy Saving and Efficiency

Regarding energy saving and efficiency, Ministry of Industry and New Technology (MINT) is now preparing the "Law on Energy Saving and Increasing Energy Efficiency" (hereafter, "Energy Saving Law") and discussing the draft version of the law within the Ministry (as of March 2011). The Energy Saving Law aims at establishment of obligatory rules and incentives as follows.

- Individuals and legal entities which consume a certain amount of total energy expenses in a year are designated as State energy sector entities.
- State energy sector entities must annually submit a report including energy consumption, an energy saving plan based on energy audits, energy intensity, etc. The State energy register entities shall create, launch and organize an energy management system in accordance with the international energy management standard ISO 50001.
- The design of buildings, structures, and constructions shall meet the energy efficiency requirements set forth by the Government of the Republic of Kazakhstan.
- The technical documentation and labeling of household energy consuming equipment sold on the territory of the Republic of Kazakhstan shall contain information on energy efficiency.
- Government support in the field of energy saving and energy efficiency improvements shall be provided in the following ways:
  - Promoting the use of energy saving equipment
  - Providing assistance in training activities in the field of energy saving and energy efficiency improvements and information support of energy saving and energy efficiency improvement events
  - Allocating budget funds for: implementation of energy saving and energy efficiency improvement programs; energy audits of public institutions; thermal modernization of public institutions; procurement and installation of metering devices, etc.

3. Assistance by the Donors

The assistance for renewable energy development and improvement of energy efficiency by the major donors who will provide or have already provided assistance for those subsectors, are summarized below.

The largest donor for the two subsectors is EBRD. The bank funded 14 projects, including pipelines for the last decade. The total amount of commitment is over USD 1.1 billion. Out of those projects, five projects aim at improving the energy efficiency of CHP. Projects for increasing the efficiency of the transmission system and for improving the energy efficiency of public transport in the City of Almaty are four each.

In terms of the amount of commitments in the energy sector, WB is in second place after EBRD.

WB financed three projects totaling USD 226 million. All of the three projects aim at strengthening the transmission system in an economically and environmentally sustainably manner.

In terms of the number of projects, UNDP is the second donor after EBRD. UNDP supported 11 projects with technical assistance from the GEF fund. The amount for projects supported by UNDP is around USD 10 million, which is much smaller than projects funded by EBRD and WB. On the other hand, for climate change issues, the UNDP covered a wide range of subsectors, including increasing energy efficiency and the reduction of GHG emissions in the sectors of energy and transport, renewable energy development, and international frameworks such as the Kyoto Protocol.

USAID has provided assistance to the power sector in Kazakhstan as a part of the Central Asian regional program, but there have been no projects for energy efficiency and renewable energy development so far. However, USAID conducted a study on energy efficiency and the environment in the country in 2010. In addition, there are plans to conduct studies on the impact of renewable energy on climate change under CAEWD, which is initiated by WB. Therefore, it is expected that USAID is going to support those subsectors.

Despite there being no projects supported by ADB for renewable energy and energy efficiency, ADB is now conducting an energy sector study and is going to support those areas in the coming country program for Kazakhstan.

4. Analysis of Issues to be Addressed

4.1 Emissions Trading: Issues and Countermeasures

Despite the fact that Kazakhstan ratified the UNFCCC shortly after it had gained independence, there still isn't a functioning GHG emissions trading market in the country. A short summary of the currently identified issues and proposed countermeasures is presented below.

Issues on Emission Trading and Mitigation Countermeasures

Field	Issues	Expected Countermeasures
Status of Kazakhstan under the Kyoto Protocol	• The Marrakesh accords allowed Kazakhstan to be considered an Annex I country for the purposes of the Kyoto Protocol, while it remains a non-Annex I country under the UNFCCC. However, Kazakhstan has not officially joined Annex B of the Kyoto protocol yet, as it requires the support of 3/4 of the parties to this treaty, and the prospects for its accession until the end of 2012 are becoming vaguer.	• Allow Kazakhstan to implement JI projects under Track 2 (approved at COP 16). • Conduct extensive lobbying before the start of COP 17 (to be held in Durban, South Africa at the end of 2011) and attempt to gain support for "special treatment" under the Kyoto Protocol. One possible development is to allow issuance of ERUs even before the ratification of Kazakhstan's accession by 3/4 of the parties. • In case this is not achievable, consider withdrawing Kazakhstan's application for joining Annex B. • Consider participation in voluntary markets（VCS, VER+ and others）and bilateral schemes (e.g. Japan).
Position of Kazakhstan towards the post-Kyoto period	• Although Kazakhstan took a voluntary target of a 25% GHG emission reduction by the end of 2020 (compared to the 1992 level), it does not have a clear negotiation position on the post Kyoto period. • For example, it is currently designing a domestic ETS, yet it is not clear how it is going to be linked to the EU ETS and other schemes and how this system is going to be treated under the successor of the Kyoto Protocol.	• Streamline climate change policy at a national level. • Come up with a clear position on the post-Kyoto framework. • Aim at clarity on the overall role of domestic mitigation and emissions trading policies.
Capacity for development of GHG offset projects	• As Kazakhstan has completely developed only one GHG offset project (a JI project), therefore, it virtually possess no capacity and experience in the GHG emissions reduction project development.	• Develop pilot projects for the voluntary markets or under bilateral offset agreements • Improve national consulting capacity (KazCarbon, C4) • Strengthen the capacity of government entities
GHG emission reduction potential	• The First and Second National Communications of Kazakhstan to the UNFCCC assess the GHG emission reduction potential of the country, but they lack analysis for particular industries taking into consideration the JI and GIS rules. • There is an industry-level or national GHG emission reduction strategy.	• Develop a national carbon market strategy • Assess the GHG emissions reduction potential of particular industries on a micro level.

4.2 Issues in Renewable Energy Development

Institutional and technical issues in renewable energy development are summarized as follows.

Institutional and Technical Issues in Renewable Energy Development

Field	Issues	Expected Countermeasures
Renewable Energy with High Generation Cost (wind and solar power)	• A tariff system to recover high cost has not been established. • This leads to an unbalance of benefits and costs.	• EBRD is now conducting technical assistance to propose a proper tariff system to recover high costs. • MINT is also preparing the revision of the Law on Renewable Energy for the new tariff system.
Guideline for Grid Connection	• Responsibilities in the grid connection between the buyer and developer are not clear. • Developers individually negotiate with the buyer. • There is not enough information and data to study how to have developers connect the grid.	• Guidelines for grid connection should be prepared to clarify the responsibilities of the buyer and developer. • A contract format between the buyer and developer should be prepared. • A buyer's initiative procurement of renewable energy (like IPP) is effective for the promotion of renewable energy.
Large wind power	• Strengthening skills for the study of the effects on grid connection of wind power.	• Training of system engineers for capacity building for a grid connection study. • Implementation of a pilot project and review of the effects of grid connection by measurement.
All renewable energy	• Lack of information on new technology.	• Information dissemination of new technology in the Russian language. • Dissemination through workshops and seminars.

4.3 Issues in Energy Efficiency

(1) Demand Side Sector

Institutional and technical issues in the demand side sector have been summarized as follows.

Institutional and Technical Issues in Energy Efficiency (Demand Side Sector)

Field	Issues	Expected Countermeasures
Industry Sector	• The industry sector consumes much energy, especially the heavy chemical industry. The energy intensity of Kazakhstan is 5.3 times that of Japan in terms of final energy consumption. • There are less incentive schemes for the modernization of old facilities.	• MINT is now preparing an energy management scheme for large consumers based on a Law on Energy Efficiency (draft). • This law will include energy audits for large consumers which can contribute to energy saving. • Financial incentives for modernization should be considered.
Commercial and Service Sector	• Electricity consumption per GDP in the commercial and service sector, the value of Kazakhstan is lower than Japan. However, it is forecasted that the value will increase with economic growth.	• The draft law also targets this sector using building codes for design and construction.
Resodential Sector	• Electricity consumption per capita in the residential sector of Kazakhstan is 21 % to Japan. It is forecasted that the value will increase with economic growth. Energy efficiency is required for heating in the winter season, cooling in the summer season, lighting and insulation for homes.	• The draft law also targets this sector using a labeling system for energy consumption equipment and building materials. • Information provision for high efficiency equipment. • Utilization of heat pump technology.

(2) Supply Side Sector

Institutional and technical issues in the supply side sector have been summarized as follows.

Institutional and Technical Issues in Energy Efficiency (Supply Side Sector)

Field	Issues	Expected Countermeasures
Power and Heat Supply Sector	• Power and heat are generated by coal and gas. Especially the share of coal in this sector occupies 90 %.	• Efficiency of CHPP using gas is higher than that of CHPP using coal (according to the pilot project conducted by NEDO, the total efficiency of the plant improved from 50 % to 70 %). • Incentive schemes for investment to countermeasures such as the leakage protection in transmission system for heat supply and installation of the monitoring system.
Transmission and Distribution Sector	• There is room for the reduction of technical power loss caused by long distance transmission lines and old facilities in distribution	• High voltage transmission line and the renewal of distribution facilities.
Coal Sector	• Main fuel for power and heat is coal. • Clean coal technologies such as coal liquefaction, coal gasification, and high efficiency coal power stations are required.	• Study for coal liquefaction, coal gasification, and the study for super critical coal power generation.
Oil and Gas Sector	• Further utilization of accompanied gas for energy.	• Utilization of high efficiency gas turbines and the cogeneration system. (In 2005, “Program for Utilization of Accompanied Gas” was established and oil relating companies must submit an installation plan for the cogeneration system.)

5. Consideration for JICA's Assistance

5.1 Review of the Assistance Field

The technical needs identified through the interviews of each organization are reviewed via the acceptability of a JICA loan scheme, the possibility of overlap with other donor assistance, and the advantages of Japanese technology, as shown below.

Results of the Review

Technical Needs Identified Through Interviews	Acceptability of JICA Loan Scheme	Possibility of Overlapping with Other Donors' Assistance	Advantage of Japanese Technology
Rehabilitation for a hydro power project	A government guarantee is necessary if a governmental agency/company is an executing agency.	At this moment, the possibility is low.	It is a conventional technology. No specific advantage is expected.
Gas cogeneration project (switching coal to gas)	Ditto	In case the project has a short pay back period, there is the possibility that local private banks might have concerns about the project.	The technology is widely used in Japan, Europe and USA. A Japanese manufacture has a record to provide this technology in Kazakhstan.
Compact cogeneration project using accompanied gas	A government guarantee is necessary if a governmental agency/company is an executing agency. A scale of one project is supposed to be small. Packaging multiple projects may be necessary.	The possibility is low.	Japanese technology has a high advantage in a small cogeneration system (Less than 10 MW class).
Grid connected wind power project	A government guarantee is necessary if a governmental agency/company is an executing agency.	There is a possibility to overlap with EBRD or a local development bank.	It is a conventional technology. No specific advantage is expected.
High voltage transmission line project	Ditto	In the past, WB and EBRD assisted for this field.	Japanese technology has reliable records in this field, especially substation system.
Modernization project for distribution facilities	Ditto	At this moment, the possibility is low.	Japanese technology has an advantage in high efficiency transformers, SCADA and distribution automation systems, etc.

5.2 Next Steps for Formation of JICA Loan Project

During the second local mission, the survey team requested relevant agencies of Kazakhstan to submit a project summary including the identified technical needs from the interviews if they are concerned about the JICA loan.

From this process, when projects which expects a JICA loan can be identified, such projects are evaluated by contribution of global environment and energy efficiency, correspondence with the JICA loan scheme, avoidance of overlapping with other donors' assistance, advantage of Japanese technology, negative impact on environment, etc. And then JICA HQ will discuss with the relevant agencies to formulate JICA loan project(s).

Chapter 1 Introduction

1.1 Background

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1.2 Scope and Objective of the Survey

1.2.1 Scope of the Survey

The Survey started from January 2011 and ended at June 2011, based on the scope of work prepared by JICA.

1.2.2 Objective

The Survey collects the comprehensive information in environment and energy efficiency sector and suggests the JICA's assistance principle for the sector.

1.3 Scope of Work

The scope of work of the Survey is shown below. Local surveys are conducted twice.

1) First Domestic Work (Japan)
- General information regarding Kazakhstan
- Records of other donor's assistance
- Creation of Inception Report (only Japanese)

2) First Local Survey (Kazakhstan)
- Collection of information regarding Kazakhstan's policy in global warming issue
- Collection of information regarding Kazakhstan's policy and implementation structure in carbon trading
- Collection of information regarding Kazakhstan's policy in energy efficiency
- Identification of issues and needs regarding implementation of countermeasures in global warming and energy efficiency
- Interview with other donors

3) Second Domestic Work (Japan)
- Macro data analysis for energy efficiency and global warming
- Review of policy and carbon trading of Kazakhstan
- Review of the assistance principle for energy efficiency and global warming
- Creation of Progress Report (only Japanese)

4) Second Local Survey (Kazakhstan)
- Discussion on the assistance principle for energy efficiency and global warming
- Explanation of the contents of Progress Report

5) Third Domestic Work (Japan)
- Creation of Draft Final Report (only Japanese)
- Creation of Final Report (Japanese, English and Russian)

1.4 Implementation Plan of the Survey

1.4.1 Schedule

The Survey is conducted as shown below.

Table 1- 1 Schedule

	2011					
	Jan	Feb	Mar	Apr	May	Jun
First Domestic Work (Japan) ● General information regarding Kazakhstan ● Records of other donor's assistance ● Creation of Inception Report (only Japanese)	▬	▬				
First Local Survey (Kazakhstan) ● Collection of information regarding Kazakhstan's policy in global warming issue ● Collection of information regarding Kazakhstan's policy and implementation structure in carbon trading ● Collection of information regarding Kazakhstan's policy in energy efficiency ● Identification of issues and needs regarding implementation of countermeasures in global warming and energy efficiency ● Interview with other donors		▭				
Second Domestic Work (Japan) ● Macro data analysis for energy efficiency and global warming ● Review of policy and carbon trading of Kazakhstan ● Review of the assistance principle for energy efficiency and global warming ● Creation of Progress Report (only Japanese)			▬			
Second Local Survey (Kazakhstan) ● Discussion on the assistance principle for energy efficiency and global warming ● Explanation of the contents of Progress Report				▭		
Third Domestic Work (Japan) ● Creation of Draft Final Report (only Japanese) ● Creation of Final Report (Japanese, English and Russian)				▬	▬	▬
Submission of Report	Ic/R	Pr/R			Df/R	F/R

1.4.2 Implementation Structure

The Survey is conducted by Tokyo Electric Power Company (hereinafter "TEPCO") consisting of the following members.

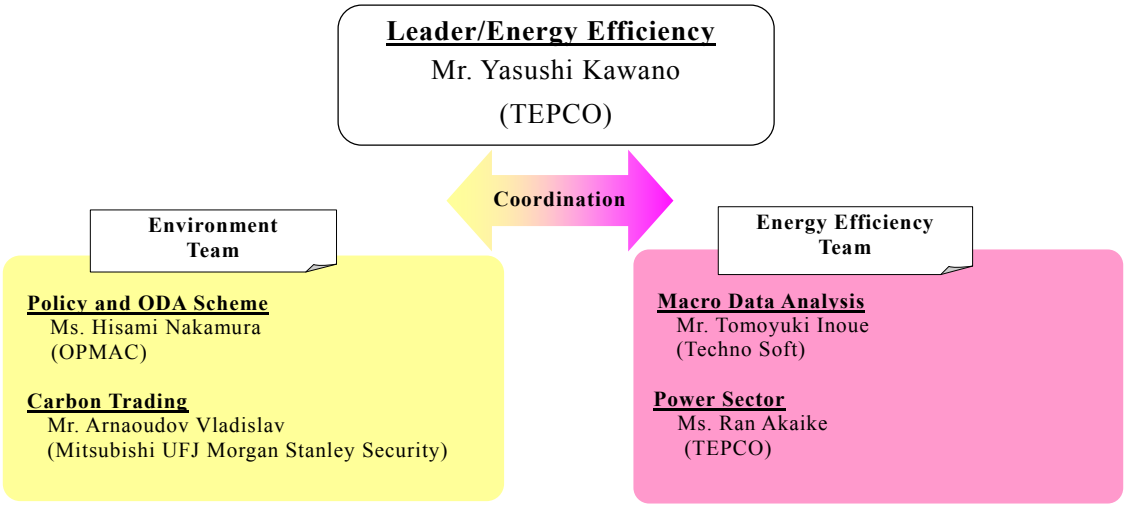


Figure 1- 1 Team Member

Chapter 2 Energy Efficiency Policy in Japan

2.1 Energy Efficiency Policy

2.1.1 Overview of the Policy

Energy policy-making in Japan is conducted under the authority of the Ministry of Economy, Trade and Industry (METI). The "Basic Energy Plan" (March 2007) and the "New National Energy Strategy" (May 2006) were both enacted under the "Basic Act on Energy Policy" (June 2002). The Basic Act promotes the following three basic objectives: "Securing of Stable Supply", "Environmental Suitability", and the third one, which is strongly undergirded by the first two is "Utilization of Market Mechanisms". The "Basic Energy Plan", formulated under the "Basic Act on Energy Policy", was introduced as one of the important energy demand policies promoting an economy and society based on energy and natural resource conservation.

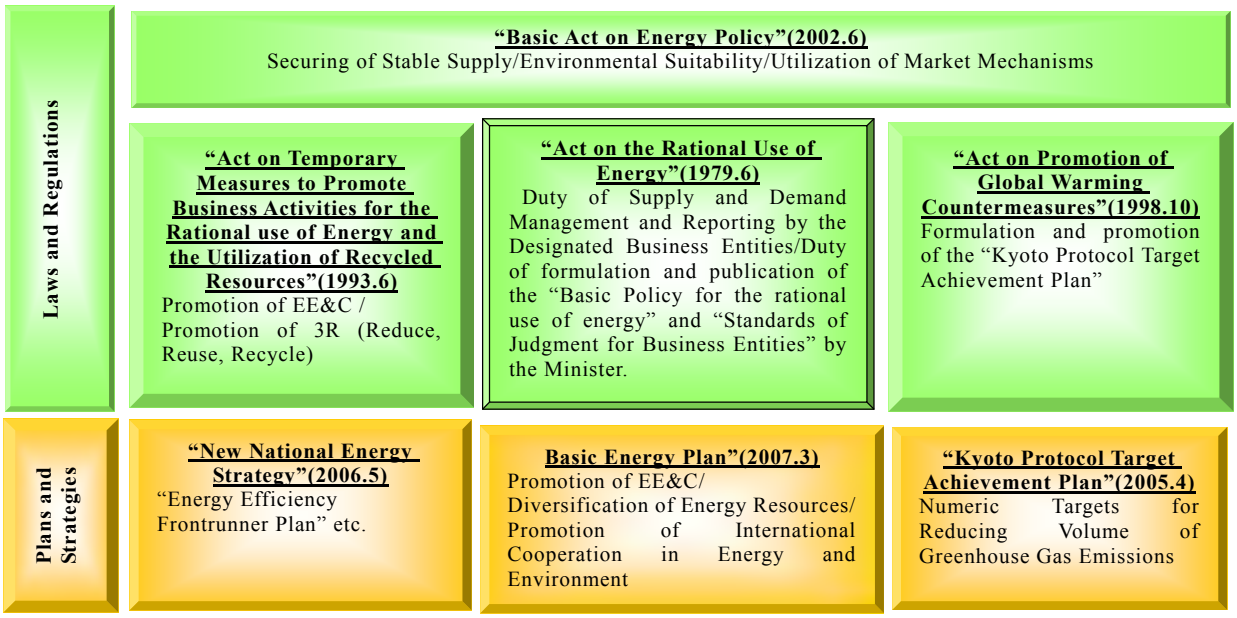


Figure 2- 1 Basic Policy and Strategies Concerning Energy Efficiency and Conservation

Prior to this, the "New National Energy Strategy" was announced in 2006 targeting reduced oil dependence lower than 40 % of present levels by 2030 and had presented specific programs that included an "Energy Efficiency Frontrunner Plan" which aimed for 30 % increased energy efficiency by 2030 as its target. In addition, from the perspective of promoting countermeasures to protect the earth from the potentially disastrous consequences caused by global warming, efficient energy management is required to lessen the emission of greenhouse gases. Accordingly, the "Kyoto Protocol Target Achievement Plan" was formulated under the "Act on Promotion of Global Warming Countermeasures", resulting in concrete action plans and numeric targets being set.

The "Act on the Rational Use of Energy (Energy Conservation Law)" (enacted in 1979.6 and

revised in 2008.5 respectively) contains stipulations specifying systems and regulations for carrying out the aforementioned Energy Efficiency and Conservation (hereinafter, "EE&C") activities. The Energy Conservation Law lies at the heart of Japan's EE&C system, and in accordance with the law, EE&C activities in Japan are being promoted.

2.1.2 Energy Conservation Law

(1) History

The Energy Conservation Law stipulates concrete systems and regulations to be adhered to during the implementation of EE&C activities. The "Heat Management Act" (1951), which precedes this Act, has similar laws that serve as the foundation for current regulations, such as regulations designating the number of business entities to be regulated, the Heat Manager to be appointed in the designated business entities, publication of Evaluation Criteria, and Certified heat managers (predecessors of certified energy managers) etc. After the second oil crisis in 1979, the "Heat Management Act" was converted to the "Act on the Rational Use of Energy" resulting in electricity becoming the target of regulation.

The purpose of the Act is to implement rational energy usage measures required for business entities including factories and buildings, thereby contributing to the sound development of the national economy. This act also consequently gave birth to related laws and regulations, cabinet orders and ministry ordinances. Through the "Act on the Rational Use of Energy", it is the responsibility of the METI to formulate and publicize a "Basic Policy for the rational use of energy" and "Evaluation Criteria" with accompanying measures to be implemented by energy consumers. In response to global energy volatility and increasing environmental awareness, this Act has been amended six times to improve measures concerning EE&C strategy promotion, management and the reporting system. In 2005, the act was amended to unify energy control of heat and electricity that up until then had been controlled separately. In particular, the rules were amended to define levels of designated business Entities by last year's total energy consumption (fuel, heat and electricity usage amounts were converted into their crude oil equivalent). Further, regarding Energy Managers and Energy Management Officers, a centralized system unifying the management of heat and electricity was introduced in place of the previous system, which had separated the management of heat and electricity. In addition, EE&C measures pertaining to transportation were introduced and EE&C measures pertaining to building and residence construction were strengthened.

The latest 2008 amendment introduced a system of management that in terms of measuring energy consumption treats all of the fixed assets (factories, buildings etc.) of a corporate entity as one whole unit as opposed to the old system, which evaluated each asset individually. Further, the new "Specified Chain Business Entities System" act essentially allows the same principle to be applied to franchises such as convenience stores when the total energy consumption level of all the branches as a whole exceeds a certain designated level. Substantive introduction of new regulations took place in April 2010. Therefore, this report is primarily restricted to the previous

regulations before April 2010.

(2) Target and Regulatory Range of the Energy Conservation Law

The term “Energy” as defined in the Energy Conservation Law refers to “Fuel”, “Heat” and “Electricity”. The term “Fuel” as used in the Act refers to any oil products such as crude oil, volatile oil, heavy oil (naphtha, kerosene, diesel oil, asphalt made by oil, oil coke, and oil gas), combustible natural gas, coal, coke and other coal products (coal tar, coke-oven gas, blast furnace gas, and converter gas), all of which individually or collectively are used for combustion and /or fuel battery generation. The law’s usage of the term “Heat” refers to heat (Steam, Hot Water, Cold Water, etc.) generated from any of the aforementioned “Fuels” and excludes any heat that is NOT “fuel-based” such as solar heat and geothermal heat etc.

The law’s usage of the term “Electricity” refers to electricity generated from any of the aforementioned “Fuels” and excludes electricity generated from non-fossil energy sources. Non-fossil energy sources refer to photovoltaic generation, wind power generation, waste power generation, all of which have been deemed as “NON-FOSSIL Fuels”.

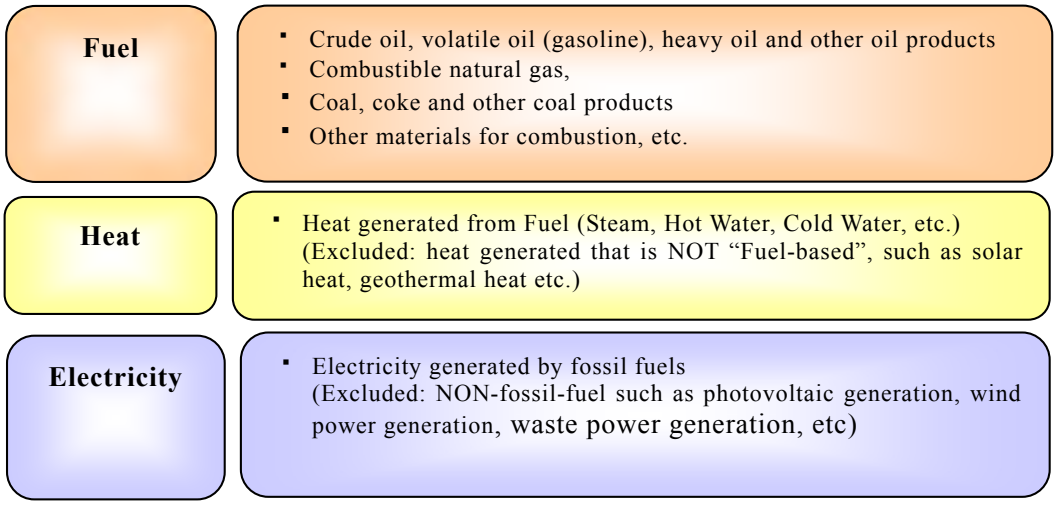


Figure 2- 2 Targeted Energy under the Energy Conservation Law

The Energy Conservation Law covers four sectors, namely “Large Consuming Factories and Buildings”, “Transportation”, “Houses and Buildings” and “Machinery and Equipment”. Fields and business entities targeted under the law are as follows.

Table 2- 1 Fields and Business Entities Targeted under the Energy Conservation Law

Fields	Business Entities
Large Energy Consuming Factories and Buildings (Designated Organizations)	Business entities in possession of factories (manufacturing, mining, electricity supply, gas supply, heat supply) for business operations Business entities in possession of buildings (including headquarters, branches, factory business offices and buildings other than factories such as hospitals, hotels, and/or schools etc.) used to operate business
Transportation	Carriers: Business entities that operates freight or passenger transportation (including freights for personal business usage) Consigners: Business entities in possession of freight carriers to transport their freight (Includes personal business usage)
Houses and Buildings	Construction Period: Construction client(s) who intend(s) to construct buildings and/or residences Extension or Reconstruction Period: the owner of the buildings or residences
Machinery and Equipment	Manufacturers and importers of machinery and equipment that consume energy

2.1.3 Main Measures for Energy Efficiency

(1) Energy Management System

(a) Schematic Overview

This is one of the schemes stipulated in the Energy Conservation Law. The measure regulates large energy consumers in industry and commercial sectors by periodical monitoring.

The Japanese Energy Management System consists of the following four activities. The first activity is regulatory in nature consisting of policy making and establishing laws and regulations. The second activity consists of monitoring and instruction which includes overseeing EE&C activities in designated large energy consuming factories and buildings (hereinafter “Designated Organizations”) via report and inspections (or issuing penalties) when deemed necessary. The third activity deals with energy conservation and includes data collection/analysis, identification of barriers, resolution etcetera initiated by the Energy Manager in a designated organization. The fourth activity consists of examination training for the energy manager qualification, which will be required under a nationally established system.

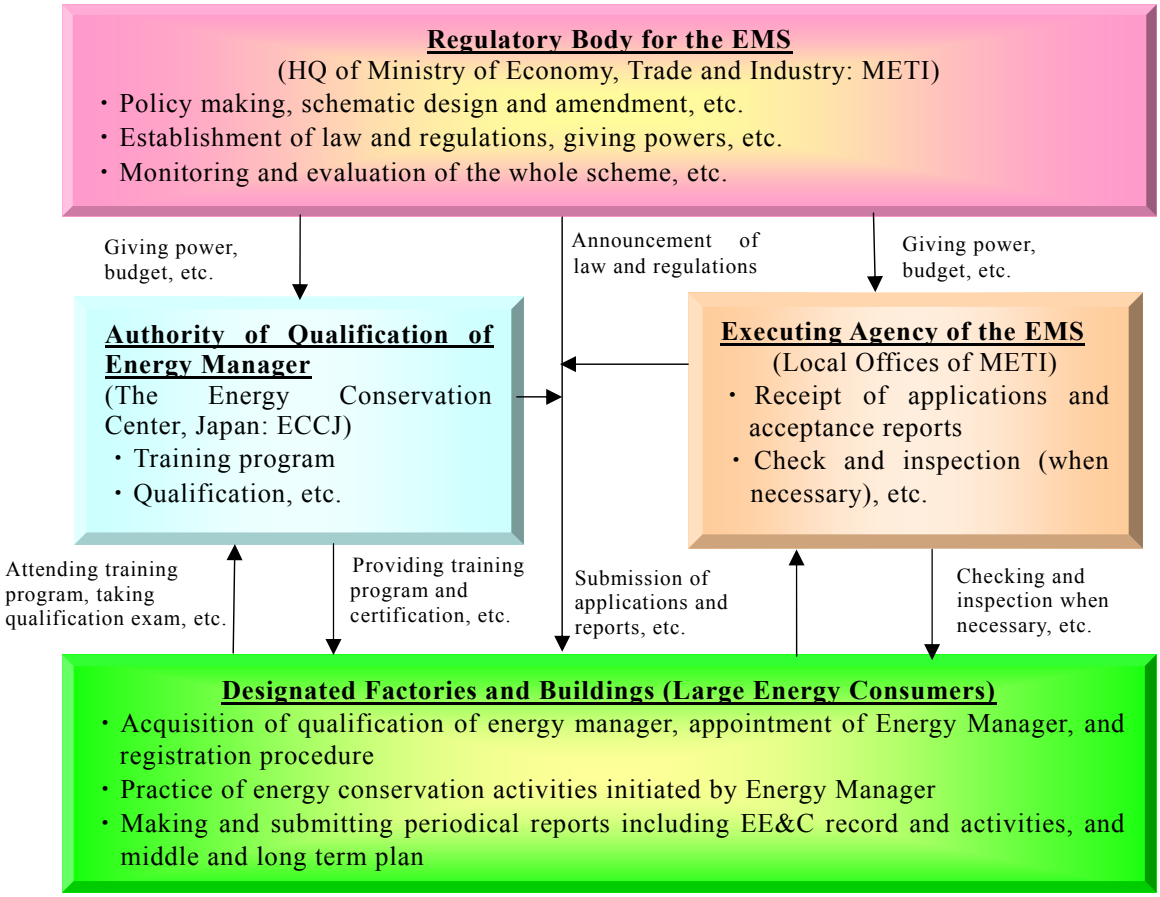


Figure 2- 3 Overview of Japanese Energy Management System

(b) Periodical Report

Designated Organizations must submit Periodical Report to the Executing Agency (METI Local Offices) once a year. To respond to these report submissions, the Designated Organization(s) will appoint registered Energy Manager(s) who will initiate onsite EE&C activities. On the other hand, the Executing Agency will determine whether or not certain EE&C activities are to be conducted through checking the contents of the reports and conducting inspections when necessary.

Periodical Report consisting of the EE&C Results Report and the Middle and Long Term Plan Report are to be submitted once a year. EE&C Results Report as shown below includes an energy consumption record, product output, energy intensity (=consumption / product output), compliance checklist with legally established evaluation criteria and so on.

Table 1: Quantity of energy use and quantity of energy sold or by-product

Type of energy			Unit	(Fiscal year)					
				Quantity of use		Quantity of energy sold or by-product			
						Quantity of energy sold		Quantity not contributing to own production	
				Quantity	Calorie GJ	Quantity	Calorie GJ	Quantity	Calorie GJ
Fuel and heat	Crude oil (excluding condensate)		kl						
	Condensate included in crude oil (NGL)		kl						
	Gasoline		kl						
	Naphtha		kl						
	Kerosene		kl						
	Diesel oil		kl						
	Fuel oil A		kl						
	Fuel oils B/C		kl						
	Asphalt		t						
	Other fuels	City gas	1000m³						
		( )							
	Industrial steam		GJ						
	Non-industrial gas		GJ						
	Hot water		GJ						
	Cool water		GJ						
	Sub-total		GJ						
Electricity	Ordinary electric power supplier	Daytime purchased power	1000kWh						
		Nighttime purchased power	1000kWh						
	Others	Purchased power other than the above	1000kWh						
		Private power generation	1000kWh						
	Sub-total		1000kWh/GJ						
Total GJ									
Crude oil equivalent kl					(a)		(b)		(c)
Comparison vs. previous fiscal year (%)									

Figure 2- 4 Energy Consumption Calculation Sheet

Table 4: Unit energy consumption

		(Fiscal year)	Comparison vs. previous fiscal year (%)
Unit energy consumption	= Quantity of energy used (crude oil equivalent kl) ((a) − ((b)+(c))) / Values closely related to energy consumption such as production quantity, gross floor space or others (d)		

Table 5: Status of change in unit energy consumption for past five years

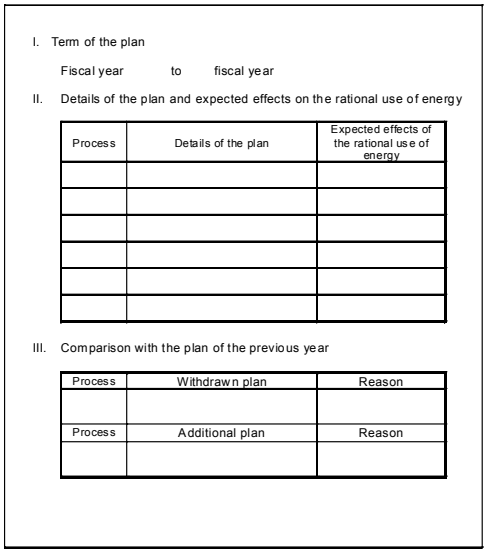
	(Fiscal year)	(Fiscal year)	(Fiscal year)	(Fiscal year)	(Fiscal year)	Change in average unit energy consumption for past five years
Unit energy consumption						
Comparison vs. previous fiscal year (%)						

Table 6: Reasons for (A) a case where unit energy consumption for past five years was not improved by 1% or more or (B) a case where unit energy consumption for past five years was not improved from the previous fiscal year

Reasons for (A) above
Reasons for (B) above

Figure 2- 5 Energy Intensity Calculation Sheet

The Middle and Long Term Plan Report contains an energy efficiency investment plan forecasting the next 3-5 years. Sample of the Report is shown below.



I. Term of the plan

Fiscal year to fiscal year

II. Details of the plan and expected effects on the rational use of energy

Process	Details of the plan	Expected effects of the rational use of energy

III. Comparison with the plan of the previous year

Process	Withdrawn plan	Reason
Process	Additional plan	Reason

Figure 2- 6 Middle and Long Term Plan Report

(2) Training System for Energy Management

(a) Training Program Classification

In Japan, the Energy Conservation Center, Japan (hereinafter, "ECCJ") provides various training programs regarding EE&C (1 day – several days program). These programs are categorized into the following two groups.

(i) Training program with the certification examination for Energy Manager candidates

(ii) General training programs for proper implementation of the Energy Management System (EMS)

The above (i) is a training program including an examination to acquire the national Energy Manager license. So the provider of this program, the ECCJ, by law will be able to issue out valid certifications. The above (ii) are voluntary training programs targeting general engineers or technicians who will assist the Energy Manager in his/her routine tasks

Table 2- 2 Classification of Training Program regarding EE&C

Classification	Contents
(i) Training program with certification examination for candidates of Energy Manager	● Lecture of law and regulations of the EMS ● Basic knowledge of heat and electricity ● Theory and practice of EE&C activities within a business unit ● Measurement and data collection, and analysis ● How to make Periodical Report ● (Certification examination)
(ii) General training programs for proper implementation of the EMS	● Lecture of law and regulations of the EMS ● How to make Management Standards ● Theory and practice of EE&C activities within a business unit ● Measurement and data collection, and analysis ● Theory of heat and electricity in EE&C ● Lecture for individual technology (pump, AC, boiler, etc.)

(b) Training Program with Certification Examination for Energy Manager

The training program with the certificate examination is conducted once a year and lasts seven days. In Japan, there are two types of qualified Energy Managers designated by field, namely the Energy Manager (Heat) and Energy Manager (Electricity). The applicants for Energy Manager can select a suitable subject in light of their expertise. The training program consists of a common subject and an individual subject (the heat course or the electricity course). In order to be eligible to attend the program, one prerequisite is that an applicant has to have more than 3 years experience in energy management activities.

The certificate examination requires sufficient mastery of four subjects including a common subject. Even if an applicant does not pass all four subjects in that year, the applicant will have the opportunity to retake a class the following year.

The following table is a sample of the training program conducted in Japan.

Table 2- 3 Training Program with Certification Examination (Japanese Case)

	Subjects			Contents	Lecture Time
Common	I	Outline of Energy Management and Law and Regulations		1 Outline of energy management 2 Energy Conservation Law and Regulations	7 hours 2 hours
Heat Field (optional)	II	Basic Theory in Heat and Fluid		1 Basic theory in thermodynamics 2 Basic theory in fluid mechanics 3 Basic theory in heat transfer mechanics	8 hours 5 hours 5 hours
	III	Fuel and Combustion		1 Fuel and combustion management 2 Calculation of combustion	4 hours 3 hours
	IV	Heat Utilization Facility and its Management		1 Measurement and control 2 Boiler, steam transmission and stock facility, steam mover, internal combustion engine, gas turbine 3 Heat exchanger, heat recovery, chiller, air conditioner 4 Incinerator, material of heat facility 5 Distillation/boiling/condenser facility, drier facility, carbonization and gasification facility	5 hours 4 hours 3 hours 3 hours 3 hours
Electricity Field (optional)	II	Basic Theory in Electricity		1 Basic theory in electricity and electronics 2 Automatic control and information processing 3 Measurement of power	3 hours 3 hours 2 hours
	III	Facility and Equipment	Distribution in Factory	1 Planning of distribution in factory 2 Operation of distribution in factory 3 EE&C in distribution in factory	2 hours 2 hours 2 hours
			Electric Equipment	1 Outline of electric equipment 2 Rotating and stationary machine 3 EE&C in electric equipment	2 hours 2 hours 2 hours
	IV	Application of Electricity	Application of Electric Power	1 Outline of application of electric power 2 Facility of application of electric power 3 EE&C in application of electric power	2 hours 3 hours 2 hours
			Electric Heating	1 Theory of electric heating and its facility 2 EE&C in electric heating	2 hours 2 hours
			Electrochemical	1 Theory of electrochemical and its facility 2 EE&C in electrochemical	2 hours 2 hours
			Lighting	1 Theory of lighting and its facility 2 EE&C in lighting	2 hours 2 hours
			Air Conditioning	1 Theory of air conditioning and its facility 2 EE&C in air conditioning	2 hours 2 hours

(Source: ECCJ Website)

(c) General Training Programs

There are various general training programs conducted by the ECCJ, such as a program for the promotion and enlightenment of the Energy Management System to facilitate its implementation and programs for basic knowledge and methods of EE&C on heat and electricity etcetera. These programs can be applied for based on each theme. Samples of the training programs are shown below.

Table 2- 4 Training Program of Heat Course

	Duration	Theme	Contents
First Term	2 days	EE&C Technology of Heat and Combustion Management	**EE&C Technology of Heat** ● Outline of law and regulation, and energy management ● EE&C technology and its application to site ● Practical calculation method of heat **Fuel** ● Fuel **Combustion Calculation** ● Calculation method of combustion **Hands on Practice of Combustion** ● Combustion and hands on practice of explosion ● Hands on practice of combustion
Second Term	2 days	Steam Management and Steam Trap	**EE&C of Steam** ● Necessity of EE&C ● Improvement of stream system in Energy Conservation Law ● EE&C by utilization of steam ● EE&C measures in steam utilization field **Hands on Practice of Steam** ● Measure of drain recovery ● Practice of engineering software
Third Term	2 days	Energy Assessment of Heat Facility	**Heat Balance Calculation and Assessment** ● Introduction of heat balance calculation ● Practical assessment method ● Cast study of heat balance calculation ● Answer of heat balance calculation **Practice of Finding Potential of EE&C** ● Introduction of good practice factory ● Finding potential of EE&C (group discussion)
Fourth Term	2 days	Good Practice of EE&C of Heat	**Introduction of Good Practice of EE&C in Heat** ● Improvement of combustion ● Improvement of heat transmission ● Improvement of heat radiation ● Improvement of heat recovery **Site Visit of EE&C Technology Application** ● Site visit ● Introduction of EE&C sample in building ● Q&A

(Source: ECCJ Website)

Table 2- 5 Training Program of Electricity Course

	Duration	Theme	Contents
First Term	2 days	EE&C of Building	**EE&C of Building** ● Outline of law and regulation, and energy management ● Outline of EE&C of building ● EE&C of lighting ● EE&C of AC ● EE&C of transformer ● Cogeneration **Measurement of Electricity** ● Measurement of voltage and current ● Measurement of electric power ● Measurement of pressure, flow volume and temperature ● Measurement method of each facility **Hands on Practice of Electricity Measurement** ● Practice of measurement of pump ● Practice of measurement of fan ● Practice of measurement of lighting ● Practice of measurement of high efficiency transformer ● Practice of measurement of AC ● Data arrangement and observation
Second Term	2 days	EE&C of Compressor	**EE&C of Compressor** ● Type of compressors and their characteristics ● Axis power of compressor ● Protection of leakage and its effect ● Pressure loss of pipe ● Measurement tool and how to use ● EE&C of compressor equipment ● EE&C by control method ● EE&C of compressor **Hands on Practice of Compressor** ● Hands on practice of compressor ● Data arrangement
Third Term	2 days	EE&C of Pump and Fan	**EE&C of Pump and Fan** ● Type of pumps ● Characteristics of pump ● Operation and control of pump ● EE&C of pump ● Consideration points on installation and maintenance ● Type of fans and blowers ● Performance of fan ● Parallel operation and series operation ● EE&C of fan ● Diagnosis of faults **Hands on Practice of Pump and Fan** ● Measurement of performance of pump ● Measurement of performance of fan ● Data arrangement
Fourth Term	2 days	Good Practice of EE&C of Electricity	**Introduction of Good Practice of EE&C in Electricity** ● Good practice of AC ● Good practice of lighting ● Good practice of compressor ● Goof practice of pump and fan ● Good practice of transformer **Site Visit of EE&C Technology Application** ● Site visit ● Introduction of EE&C sample in building ● Q&A

(Source: ECCJ Website)

(3) Top Runner Program (Minimum Energy Performance Standard)

The Top Runner Program is the one kind of Minimum Energy Performance Standard that enforces manufacturers to catch up a standard efficiency. That is stipulated in the Energy Conservation Law.

The program has been introduced since 1998 in order to reduce energy consumption especially in commercial and transportation sectors by introduction of high efficiency equipment.

Top runner product in energy efficiency at a period is set at the minimum performance target, and other products have to catch up and exceed in terms of energy efficiency within several years after the target setting. As shown below, a manufacture has to make the weighted average of their all products clear the top runner energy efficiency performance within the target period.

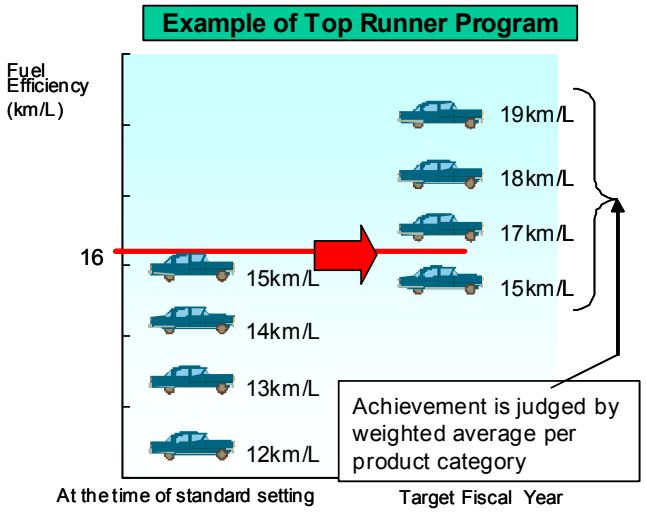


Figure 2- 7 Example of Top Runner Program

Since 1999, target products have been added. As of July 2009, the following 23 products are designated in the Top Runner Program.

Passenger vehicles, Freight vehicles, Air-conditioners, TV sets, Video-cassette recorders, Fluorescent lights, Copiers, Computers, Magnetic disc units, Electric refrigerators, Electric freezers, Space heaters, Gas cooking appliances, Gas water heaters, Oil water heaters, Electric toilet seats, Vending machines, Transformers, Electric rice cookers, Microwaves, DVD recorders, Routers, Switching units

Relating to the Top Runner Program, the Labeling System has been introduced. The system indicates the level of energy efficiency. Normally products which have already exceed the efficiency of Top Runner product are indicated by 5 stars.

Figure 2- 8 Label Sheet (Sample)

(4) Support Scheme for the Industry and Building Sector

(a) Overview

Categorizing support schemes for the industry and buildings by the Japanese government in respect of financial options, there are subsidies, financial support, and tax incentives. The table below shows what these schemes are for industry and buildings. Energy audits, Energy Service Company (ESCO) project support and low-interest rate loans have been conducted targeting medium and small-scale enterprises which are financially weak.

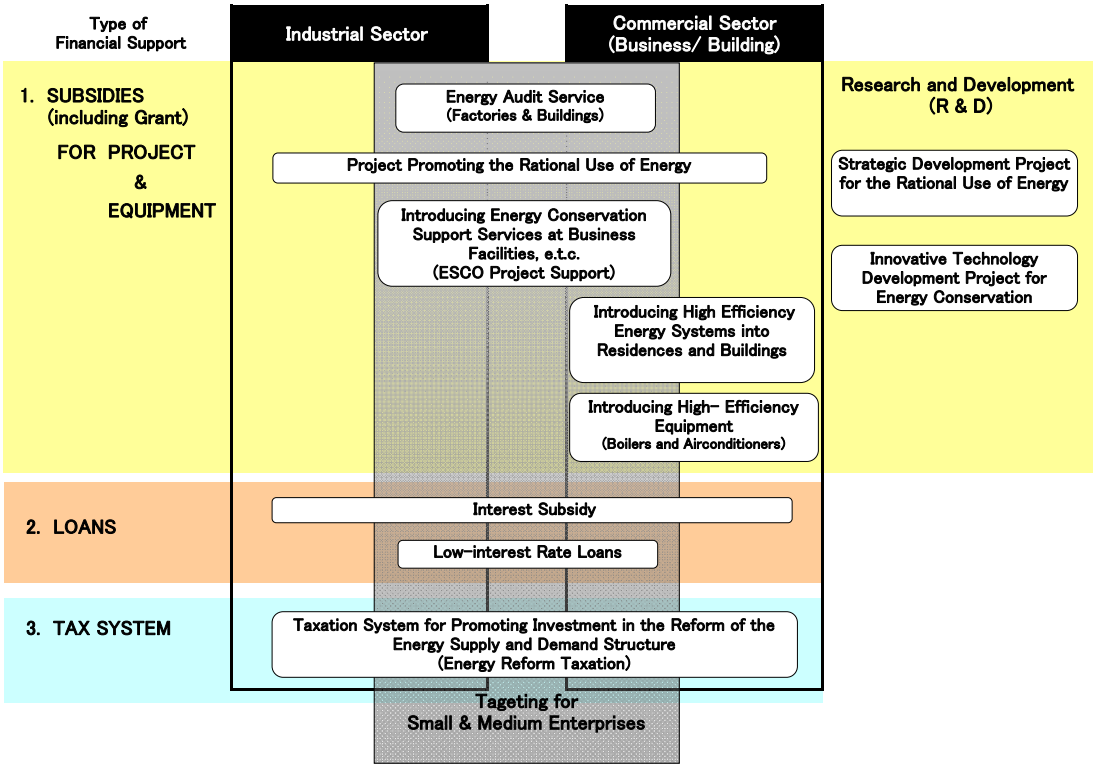


Figure 2- 9 Financial Support Scheme for Industry and Commercial Buildings Conceptual Map

(Source: Table made from the documents from Ministry of Economy, Trade and Industry and Agency for Natural Resources and Energy "Financial Support with Subsidy FY2008" and others)

(b) Support by Subsidy

(i) Energy Audit Service

With subsidies by the Resources and Energy Agency, Ministry of Economy, Trade and Industry (METI), ECCJ is in charge of this service and implements it for factories or buildings for free of charge. For 11 years from the year 1997 to 2007, the ECCJ executed energy audit services for about 2,700 factories and 2,400 buildings.

Table 2- 6 Summary of Energy Audit Service for Factory and Industry by ECCJ

Content	Conducting energy audit services for factories, office buildings, and others, including examining the potential of introducing energy efficient technologies Factories and Office buildings
Target	Type 2 designated energy management factories and buildings by the Energy Conservation Law, and also undesignated factories which annual energy consumption is, as a principle, 100kL and more in terms of crude oil equivalent
Audit Scheme	Experts dispatched by ECCJ visit factories and buildings directly and make recommendations. They conduct surveys and diagnosis on the current situation of energy management, data survey for energy use, electricity, heat, air-conditioning, boilers etc. and prepare an audit report.
Type of recommendations for improvement	Recommendations are made from the following 3 perspectives: Category I : Feasible recommendation by operation Category II: Feasible recommendation by investment Category III: Feasible recommendation upon renewal

(Source: ECCJ Website as of November in 2009)

Beside ECCJ, New Energy and Industrial Technology Development Organization (NEDO) implemented free-of-charge energy audit service for large-scale factories and others, on average 30 to 40 cases yearly by fiscal year 2007. As of the fiscal year 2009, however, it is no longer conducted.

(ii) Subsidy for EE&C Projects

As for the study and implantation of EE&C projects, there are “Project Promoting the Rational Use of Energy” by NEDO and “Introducing Energy Conservation Support Services at Business Facilities, etc. (ESCO Project Support)” for small and medium scale enterprises by Medium and Small Scale Enterprises Development Organization (until FY 2008, ECCJ was executing agency). Moreover, for energy efficiency systems for buildings, “Introducing High Efficiency Energy Systems into Residences and Buildings” are being implemented by NEDO. Details on the content of these projects are described in the following table.

Table 2- 7 Examples for Subsidy for EE&C Projects

Program Title	Project Promoting the Rational Use of Energy	Introducing High Efficiency Energy Systems into Residences and Buildings	Introducing Energy Conservation Support Services at Business Facilities, etc. (ESCO Project Support)
Implanting Agency	New Energy and Industrial Technology Development Organization（NEDO）		Medium and Small Scale Enterprises Development Organization
Implementing period	FY 1998 - 2009[1)]	FY 1999-2010	FY 2008-
Target entities	Private enterprises or organization in any sector	Such as owners of construction project of introducing high efficient energy system for houses and buildings in Japan (comprising of air conditioner, hot water supply, lightening, and heat insulating materials and others) in existing, newly constructing, enlarging or reconstructing ones	Middle ranking enterprises (their capital is 100 million yen and more, less than 1 billion yen) Medium and small size enterprises (their capital is 10 million and more, less than 100 million yen)
Target projects	Projects which introduce EE&C equipment and technology with expectation of high energy efficiency and very cost effective	Projects which introduce high efficient energy systems for construction and introduce also BEMS (Building Management System) in order to conduct optimum energy demand management, etc.	ESCO projects in existing factories and offices, with expectation of high energy efficiency and very cost effective
Number of approved projects for a year (Number of applied projects) [1)]	385 projects (585 projects)	593 projects (631 projects)	21 projects
Maximum amount of subsidy (Subsidy ratio)	Single project: 500 million Yen / project (1/3 and less) Multiple coordination projects: 1.5 billion yen/ project (1/3 and less) Large-scale project: The same as above (1/2 and less)	100 million yen/ project (1/3 and less)	30 million yen / project (1/2)
Yearly budget [2)]	29.646 billion yen	4.79 billion yen	Approx. 450 million yen

(Source: NEDO Website, ECCJ Website, Medium and Small Scale Enterprises Development Organization Website as of September in 2009)

(Note1) Japanese fiscal year, from April to March

(Note 2) Executed in the fiscal year of 2008

(iii) Subsidy for Energy Efficient Equipment

There is a partial-cost subsidy for introducing high-efficiency hot water supply (boilers) and air conditioners compared to other equipment which has a larger energy efficiency effect and cost effectiveness in comparison with conventional ones. The budget allotment for this subsidy was 14.5 billion yen for FY2009. This allotment is provided by private associations, entrusted by the Agency for Natural Resources and the Energy of METI.

Table 2- 8 Examples of Subsidy for Energy Efficient Equipment

Target Equipment	High-efficiency Boilers	High efficiency Air conditioner
Eligible Entity	Individuals and private enterprise owners	The Same as the left
Executing Agencies	private associations and others (Japan Electro-Heat Center and others)	The Same as the left
Subsidy Amount/ Ratio	(1) CO2 Refrigerant Heat-pump Boiler：42 thousand yen. (2) Latent-heat Recovery Boiler：23thousand yen (3) Gas Engine Boiler：132 thousand yen	1/3 and less of the price difference between the new and conventional machines (for new installment) 1/3 of purchase prizes for high-efficiency machines (for existing installment)

(Source: Agency for Natural Resources and Energy, METI)

(c) Support for Credit Scheme

(i) Interest Subsidy

Under this scheme the “Interest subsidy for finance of designated facilities and equipment for rational use of energy” by Agency for Natural Resources and Energy, METI (for details, refer to the table below), introduction of energy efficiency facilities and equipment is promoted by interest subsidy for financial institutions that implement credit for measures for EE & C, that is, financing with lower interest for private enterprises’ owners. Planned budget for FY 2009 was approximately 500 million yen, increased by 5 times from about 100 million in the year 2007.

Table 2- 9 Interest Subsidy for Designated Facilities and Equipment for Rational Use of Energy

Target Project	Content	Target Entities	Interest Subsidy Rate
Designated Facilities and Equipment for Rational Use of Energy	Introduction of large-scale energy efficient facilities and equipment and investment in necessary EE&C projects for buildings in order to achieve medium and long-term plans prepared by enterprises based on “the Law Concerning the Rational Use of Energy	Private enterprise owners	1.0 %
Designated high performance energy consumption facilities	Introduction of designated high-efficiency energy consumption facilities in medium and small-scale enterprises	Private enterprise owners	0.15 %

(Source: Energy Efficiently and Conservation Division, Agency for Natural Resources and Energy, METI)

(ii) Low-interest Rate Loans

The Japan Finance Corporation (JFC) provides the loans with a policy interest rate for EE & C projects of medium and small enterprises under "the loan program for medium and small enterprises support" and "the loan program for micro business and individual"(for details, refer to the table below)

Table 2- 10 Loans for Medium and Small Enterprises Investing in EE&C Project

Target projects	Lending Period (Grace period) Limitation of Lending Amount	Interest rate[1)] (reference as of August, 2008) [1)]
1. Facilities for EE&C (1) Necessary finance for acquisition of EE&C facilities (including ESCO's acquisition for lease and rentals) (2) Necessary finance for acquisition of for self-propelled operation machinery by leasing / rental companies	15 year and less (2 years) 720 million yen (direct lending)	Special Interest B (1.55-2.45%)
2. Designated high performance energy consumption facilities (1) Necessary finance for installment of high performance industrial furnace and boilers (2) Necessary finance for high performance industrial furnaces replaced from current ones and boilers, or for special additional facilities to increase performance up to the same level as high performance industrial furnaces	The same as the above	Special Interest J (1.15-2.05%)
3. Use of alternative energy to oil Necessary finance for acquisition of facilities which use or supply alternative energy to oil (including upgrades and replacements)	The same as the above	Special Interest B or C (1.3-2.2%)

(Source: ECCJ website, JFC website as of November 2009)

(Note 1) According to special interest rate category A to Z, determined by JFC.

In the past, financial supports for the following projects were implemented for large enterprises although these are not conducted any more as of 2009.

- EE&C countermeasures projects
- Industry Sector EE&C promoting projects
- Building EE&C promoting projects (only for ESCO and ESP projects)
- Acquisition of machinery and equipment which satisfy the criteria of judgment as designated ones based on energy conservation law (Top runner equipment)
- Electric-load leveling projects

(d) Tax Incentives

In the context of tax system, enterprises or individuals who obtain designated energy efficiency facilities and use them within one year for their business can have special depreciation of equipment or special tax exemption of corporation tax (or income tax). This is stipulated in "the Taxation System for Promoting Investments in the Reform of Energy Supply and Demand Structure (Taxation System for the Energy Reform)" (for details, refer to the table below). Tax exemption is, however, applicable to only medium and small enterprises. At the time of establishing this system, this system had a limited period of validity until FY 2007. After

implementation, this system has been proven effective, therefore the validity period was extended to another two years.

Table 2- 11 Tax Incentive System for EE&C Projects

Title of System	Taxation System for Promoting Investments in the Reform of Energy Supply and Demand Structure (Taxation System for the Energy Reform)
Validity period	FY 1992 to 2009
Target entities	Entrepreneurs including judicial persons or individuals
Scheme	Those who purchase designated facilities (88 in FY 2008) directly and use them with in one year can apply for either of the following measures. Only medium and small enterprises can apply for tax exemptions. 1. Tax exemption which is equivalent to 7 % of the reference purchase value (base price for calculation). It is applicable to only medium and small enterprises. 2. Special depreciation that is not greater than 30% of the reference purchase value, in addition to the normal depreciation of the equipment.

(Source: ECCJ Website as of November 2009 and others)

(5) Awarding system of EE&C

ECCJ implements awarding system for individuals, groups, factories, project sites or enterprises and equipment or systems that contributed to promoting EE&C. By issuing awards in public, ECCJ intends to disseminate the spirit of EE&C among the nations and to promote EE&C implementation. Awarded persons are: “persons of merit in energy management” or “excellent skilled workers in energy management” those who made efforts to promote energy management for many years and have remarkable performance records, and “excellent factories in energy management (including project sites)” that attempted to rationally use energy and had great results in promoting energy management. Besides the awards for individuals, factories and others, there are several awards such as: “excellent cases of EE&C at national competition” which is an award system for groups, technical development staff, and others in any factories and/or project sites regardless of business type and scale, and the “EE&C Prize” which issues out awards for personnel, organizations, equipment and systems through public participation.

Cases of excellent EE&C are inputted into the database so that anyone can search them on the website.

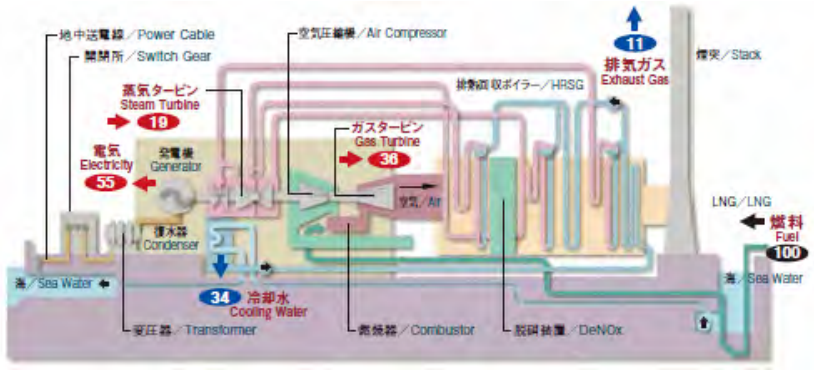
2.2 Energy Efficient Technology

The following are the technologies which are expected to be applicable in Kazakhstan. All the technologies are already established and utilized in Japan.

2.2.1 Power Generation Facilities and CHP Facilities

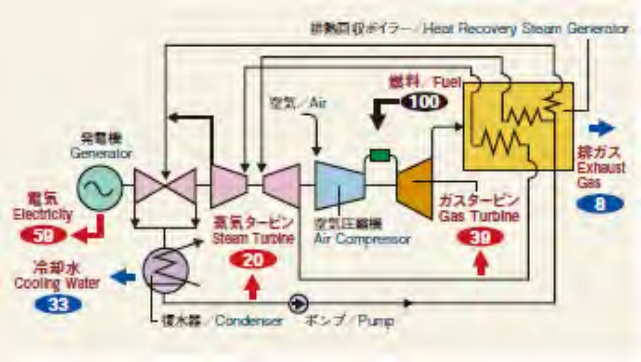
(1) 1,300 °C Advanced Combined Cycle Power Generation (ACC)

Table 2- 12 1,300 °C Advanced Combined Cycle Power Generation (ACC)

Technology Outlines	With the advanced combined cycle (ACC) power generation, the inlet gas temperature of the gas turbine is raised to 1,300°C, higher temperature and pressure levels are established as in the steam conditions for steam turbines, and a reheating cycle is also employed to improve thermal efficiency. These enhancements increase the thermal efficiency of ACC power generation to LHV 55 % (HHV approx.50%). 
Advantage	■ Saving fuels and reducing CO_2 emissions ■ Reduction of impacts on environment (NOx, heated effluent)
Disadvantage	■ In the warm regions the output may lower than designed.
Effect of Fuel Reduction	Comparison of Annual Use of Fuels ■ The assumed facility utilization is 70% at both facilities. ■ The amount of fuel use of the conventional unit (350MW) with assumed efficiency 38% 350MW×8,760h×0.7×100/38×3,600kJ/kWh＝20,332 TJ 20,332 TJ×1/41.868ktoe/TJ＝485.6ktoe ■ The amount of fuel use of ACC unit with assumed efficiency 55% 350MW×8,760h×0.7×100/55×3,600kJ/kWh＝14,048 TJ 14,048 TJ×1/41.868ktoe/TJ＝335.5ktoe **Fuel Reduction 150.1 ktoe/year**
Price Level	Generally the unit price of a plant is estimated at approximately 500 US$/kW excluding the fuel facilities and the civil facilities. The price depends on the size and the location conditions of the facility.
Maturity of Technology	The technology is fully established. TEPCO started introducing the technology after 1998 to Yokohama Thermal Power Stations, Chiba Thermal Power Station, Futtsu Thermal Power Station Group 3, and Shinagawa Thermal Power Station.
Competitive Edge of Japanese Technology	Japanese heavy industries are competitive in the market of combined cycle power generation technologies utilizing natural gas. Mitsubishi Heavy Industries, Hitachi (GE), Toshiba (GE) are the major manufacturers
Others	Combined cycle power generation technologies over 1,500°C have come into use.

(2) 1,500 °C Advanced Combined Cycle Power Generation (MACC)

Table 2- 13 1,500 °C Advanced Combined Cycle Power Generation (MACC)

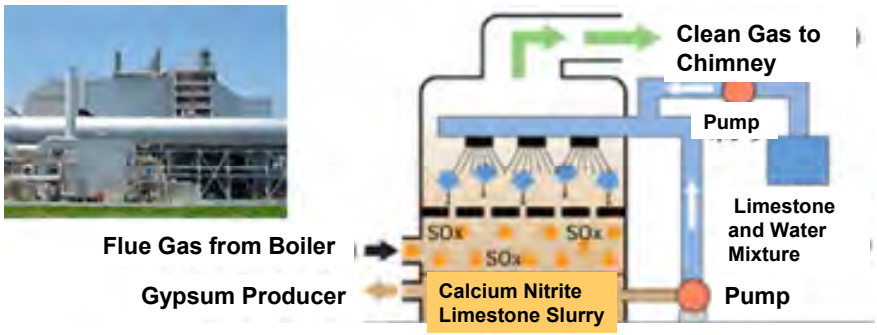
Technology Outlines	This system is based on the ACC power generation system and achieves even higher efficiency and capacity by raising the inlet gas temperature of the gas turbine to even higher levels. By raising the temperature to 1,500°C through such technical innovations as the development of heat-resistant materials for the gas turbines and gas turbine steam cooling, the thermal efficiency has been improved up to approximately LHV 59% (HHV approx. 53%). 
Advantage	■ Saving fuels and reducing CO_2 emissions ■ Reduction of construction costs by expanding capacity ■ Reduction of environmental impact (Nox, heated effluent)
Disadvantage	■ Management of the construction quality and maintenance ■ In the warm regions the output may be lower than designed.
Effect of Fuel Reduction	Annual Usage Comparison of Fuels ■ The assumed facility utilization is 70% at both facilities. ■ Fuel usage amount of the conventional unit (500MW) with an assumed 38% efficiency rate 500MW×8, 760h×0.7×100/38×3, 600kJ/kWh＝29,046 TJ 29,046 TJ×1/41.868ktoe/TJ＝693.8 ktoe ■ Fuel usage amount of an ACC unit with an assumed 59% efficiency rate 500MW×8,760h×0.7×100/59×3,600kJ/kWh＝18,708 TJ 18,708 TJ×1/41.868ktoe/TJ＝446.8ktoe **Fuel Reduction　247.0 ktoe/year**
Price Level	Generally the price is a few % higher than a 1,300°C ACC unit
Maturity of Technology	The technology is fully established. TEPCO started commercial operation of a 500MW unit at Kawasaki Power Station in 2007. In 2010 another unit came into operation at Futtsu Power Station.
Competitive Edge of Japanese Technology	Japanese heavy industries are competitive in the market of combined cycle power generation technologies utilizing natural gas. The turbine of the MACC system is manufactured by Mitsubishi Heavy Industries.

(3) Ultra Supercritical Pressure Coal-Fired Thermal Power Plant Technology

Table 2- 14 Ultra Supercritical Pressure Coal-Fired Thermal Power Plant Technology

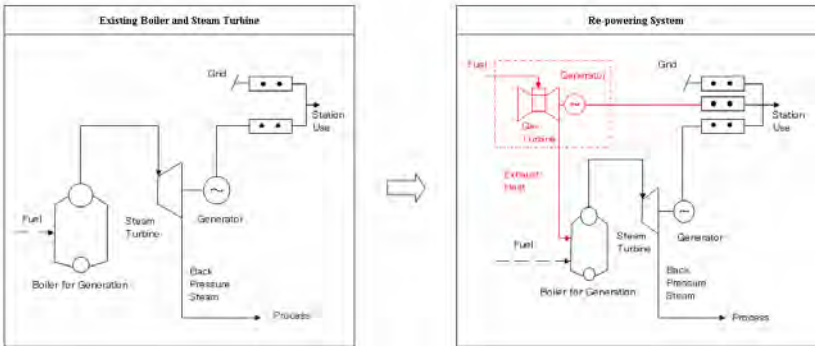
Technology Outlines	By increasing the steam conditions at the entrance of the turbine up to 593°C (over 24.1Mpa (246k)), power generation efficiency is improved. Power generation with high steam temperature and pressure was enabled by the development of materials which can withstand a long period of use under the high temperatures.  (Source: TEPCO Hitachinaka Thermal Power Plant)
Advantage	■ Reduction of CO^2 by improving thermal efficiency
Disadvantage	■ Unlike the conventional (Super Critical Pressure Coal-Fired Thermal Power Plant) technology, materials which are resistant to corrosion under high temperature and steam oxidation need to be utilized.
Effect of Fuel Reduction	Annual Fuel Usage Comparison ■ The assumed facility utilization is 70% at both facilities. ■ Fuel usage amount of the conventional unit (1,000MW) with an assumed 38% efficiency rate 1,000MW×8,760h×0.7×100/38×3,600kJ/kWh＝58,093 TJ 58,093 TJ×1/41.868ktoe/TJ＝1,387.5ktoe ■ Fuel usage of an USCC unit with an assumed 45% efficiency rate 1,000MW×8,760h×0.7×100/45×3,600kJ/kWh＝49,051 TJ 49,051 TJ×1/41.868ktoe/TJ＝1,171.3 ktoe **Fuel Reduction 216.2 ktoe/year**
Price Level	Generally the unit price of a plant is estimated at approximately 1,400 US$/kW excluding the port facilities. The price depends on the size and the location conditions of the facility.
Maturity of Technology	The technology is fully established. TEPCO introduced the technology to Hitachinaka Power Plant in 2003 and to Hirono Power Plant in 2004.
Competitive Edge of Japanese Technology	Japanese manufacturers are competitive in the market of USCC. The major ones are Mitsubishi Heavy Industries Hitachi, Toshiba, and Ishikawajima Harima Industries.

Table 2- 15 Flue Gas Desulfurization

[Reference]	Flue Gas Desulfurization : A technology to eliminate Sox from the power generation boiler - Advantages Elimination of Sox largely emitted from the coal power generation boiler, which causes air pollution and acid rain. Generally devices installed on power generation boilers adopt a method to eliminate Sox. Gypsum is formed by combining slurry (lime stone and water) and Sox contained in the exhaust gas. - Disadvantages There is less incentive for introduction in countries lacking in Sox emission regulations. - Maturity of Technology In order to conform to the Air Pollution Control Act and other regulations, it is generally adopted in thermal power stations in Japan. The rate of desulfurization of Japanese products is approximately 95%. The producers have installation experience in Europe and Asia.  (Source: TEPCO Website)

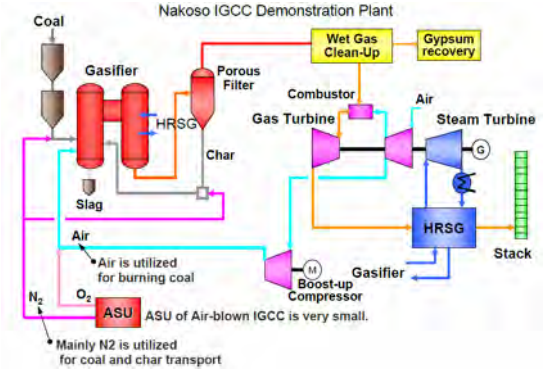
(4) Exhaust Afterburning Type Combined Cycle Repowering Plant

Table 2- 16 Exhaust Afterburning Type Combined Cycle Repowering Plant

Technology Outlines	This is a measure to improve the efficiency of a conventional thermal power station by installing a high-performance gas turbine in an old thermal power station and utilizing the high-temperature exhaust gas as combustion air for the conventional boiler. 
Advantage	■ Cost-efficiency compared to scrapping a conventional power station to increase the output
Disadvantage	■ The capacity of the gas turbine for power generation as a repowering facility needs to match the capacity of the boiler of the conventional thermal power station.
Effect of Fuel Reduction	Comparison of Annual Use of Fuels ■ The assumed facility utilization rate is 70% at both facilities. ■ The fuel usage amount of the combined cycle repowering plant with an assumed 46% efficiency LHV rate (Combination of a conventional steam power generation system (350MW) and a gas turbine power generation system(126MW)) 476MW×8,760h×0.7×100/46×3600kJ/kWh＝22,845 TJ 22,845 TJ×1/41.868ktoe/TJ＝545.5ktoe ■ The fuel usage amount in the case of steam power (350MW 42% (LHV)) and a gas turbine power generation system (126MW 33% (LHV)) operated separately. 350MW×8,760h×0.7×100/42×3,600kJ/kWh＝18,396 TJ 18,396TJ×1/41.868ktoe/TJ＝439.3ktoe 126MW×8,760h×0.7×100/33×3,600kJ/kWh＝8,428 TJ 8,428TJ×1/41.868ktoe/TJ＝201.3ktoe **Fuel Reduction　95.1 ktoe/year**
Price Level	N/A (Depends greatly on the installing conditions)
Maturity of Technology	There are several examples in major plants in Japan. There is an example of a model project by NEDO in Kazakhstan. (Tohoku Electric Power Company / Hitachi)
Competitive Edge of Japanese Technology	Japanese manufacturers are competitive in the market. The major Japanese manufacturers are Mitsubishi Heavy Industries, Hitachi, Toshiba, etc.

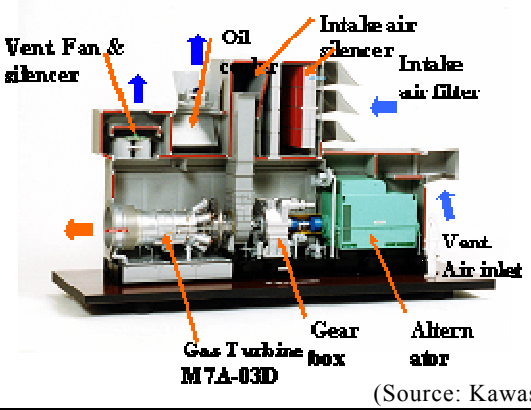
(5) 1,300 °C Integrated Coal Gasification Combined Cycle (IGCC) Power Generation Technology

Table 2- 17 1,300 °C Integrated Coal Gasification Combined Cycle Power Generation Technology

Technology Outlines	In the high-temperature and high-pressure gasification furnace, pulverized coal is gasified and purified The gas is combusted to drive the turbine for power generation. At the same time, combustion heat from the gasification furnace and exhaust heat from the gas turbine are utilized to exchange heat with water to produce steam. The steam is led to drive the steam turbine for power generation.  (Source: Clean Coal Power R&D Website)
Advantage	■ Saving fuels and reducing CO_2 emissions ■ Reduction of heated effluent ■ Reduction of coal ash emissions (Slag is emitted instead.) ■ Utilization of coal with low ash melting temperatures
Disadvantage	■ Management of the quality of construction and maintenance
Effect of Fuel Reduction	Annual Fuel Usage Comparison ■ The assumed facility utilization is 70% at both facilities. ■ The fuel usage amount of the conventional unit with an assumed 38% efficiency rate 400MW×8,760h×0.7×100/38×3,600kJ/kWh＝23,237 TJ 23,237 TJ×1/41.868ktoe/TJ＝555.0 ktoe ■ The fuel usage amount of an IGCC unit an assumed efficiency rate of 46% 400MW×8,760h×0.7×100/46×3,600kJ/kWh＝19,196 TJ 19,196 TJ×1/41.868ktoe/TJ＝458.5ktoe **Fuel Reduction　96.5 ktoe/year**
Price Level	No data. (The technology is under test operations)
Maturity of Technology	The technology is under development. A 250MW unit is now operating in a verification test (1/2-size of the commercial unit, 1,200°C class). The test is scheduled to be completed at the end of March, 2011. The verification test will continue until 2013 to validate its reliability, economic efficiency, and coal applicability.
Competitive Edge of Japanese Technology	Air-Blown Gasification System has been introduced only in Japan. (Manufactured by Mitsubishi Heavy Industries)
Others	Examples of commercial operations in Japan are not existing.

(6) Compact Gas Turbine Cogeneration System

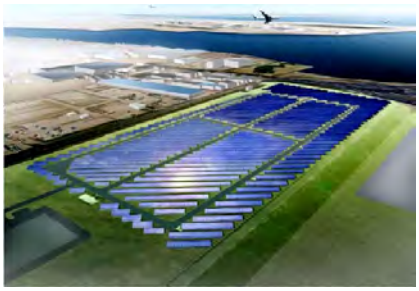
Table 2- 18 Compact Gas Turbine Cogeneration System

Technology Outlines	Generally systems with a 10MW power output or below are classified as compact systems. Among cogeneration systems, combusted gas spins the turbine for power generation. Additionally, the exhaust heat is utilized to exchange its heat with water for heat supply facilities.  (Source: Kawasaki Heavy Industries)
Advantage	■ If there are full demands for both power and heat, the total efficiency reaches about 80 % (power 32 %, heat 48%) ■ Systems with 7 MW of output or below can be transported in compact packages by trailers from the factories to the sites. (Efficient in terms of work period and costs) ■ Combining the compact systems is a measure for efficient operations.
Disadvantage	■ The sites should be selected and designed to meet the demands for both heat and electricity.
Effect of Fuel Reduction	Annual Fuel Usage Comparison (in case of flaring gas) ■ Compared to the case in which the associated gas is flared (not energy-converted), the cogeneration system contributes to energy efficiency by generating both electricity and heat. ■ The amount of fuel used in a system alternative to a cogeneration system with an assumed output for power is 7.4 MW and 11 MW for heat (annual utilization rate: 75 %). The thermal efficiency of the system is assumed to be 38 % for power and 85 % for heat). Power: 7.4 MW×8,760h×0.75×100/38×3,600kJ/kWh＝460 TJ 460 TJ×1/41.868ktoe/TJ＝11.1 ktoe Heat: 11MW×8,760h×0.75×100/85×3,600kJ/kWh＝306 TJ 306 TJ×1/41.868ktoe/TJ＝7.3ktoe **Fuel Reduction　18.4 ktoe/year**
Price Level	Approximately 1.0 million US$/MW（total output of power and heat）, though it depends on the site and design conditions.
Maturity of Technology	The technology is established.
Competitive Edge of Japanese Technology	Japanese manufacturer (Kawasaki Heavy Industries) is competitive in 10MW (or lower) markets (power output).

2.2.2 Renewable Energy

(1) Mega Solar Technology (Large-scale Solar Power Generation Technology)

Table 2- 19 Mega Solar Technology

Technology Outlines	A power generation system to convert sunlight energy to electricity. The mega solar system consists of solar panels, electric cables, cradles, inverters (for inversion of DC electricity to AC electricity), and measurement and control systems. The conversion efficiency rate is approximately 15% in the case of the polycrystalline silicon type on the market.  TEPCO Ukishima Power Station （7MW Planned to be completed in 2011）
Advantage	■ No greenhouse gas emissions during power generation ■ Easy to install and maintain ■ The output of the solar power generation peaks when the sunlight reaches the surface of the panel vertically, which correlates with the power demand.
Disadvantage	■ High initial cost. The price of the facility can be lowered by improving the thin-film type solar panels and absorbing the increase of the price of silicon. ■ Wide spaces needed for installation because the energy density is low. ■ The output fluctuates depending on the weather. It cannot serve as a base power supply system. ■ Possibility of voltage fluctuations, which can affect the customers connected to the large-scale integrated power system.
Effect of Fuel Reduction	All the electricity generated by solar power contributes to the reduction of CO_2 emissions. In Japan, the annual power generation of 1kW of solar energy amounts to 1,000kWh/year. (Depending on the hours of the sunshine)
Price Level	Generally 60 million USD/kW (excluding the cost for land-use)
Maturity of Technology	The technology is established. In Japan, experimental study of stabilization of the power system for a large-scale power supply in Wakkanai, Hokkaido, and Kitanomori, Yamanashi.
Competitive Edge of Japanese Technology	The total sales performance of Japanese manufacturers in 2008 is the 3rd largest after China and Germany. (18%, Source: Wikipedia).
Others	JICA is assisting the University of Nazarbayev, Kazakhstan in introducing an 800kW solar power generation system, which is comparatively large.

(2) Wind Power Generation Technology

Table 2- 20 Wind Power Generation Technology

Technology Outlines	Wind power generation system converts the kinetic energy of the wind to electricity through windmills. It is difficult to stabilize output, because the wind direction and the wind velocity constantly fluctuate. In order to obtain a stable output or to increase the power generation efficiency, it is important to construct the windmills at sites with good wind conditions. Recently, the scale of the wind farms is becoming larger, because output can be increased and stabilized by installing bigger and more windmills and therefore lower the unit generation cost.  TEPCO Hachijojima Power Station (500 kW)
Advantage	■ No CO2 emissions during power generation
Disadvantage	■ Wind power generation affects the quality of electricity such as the voltage and frequency, especially at sites connected to small scale power systems, because it is an intermittent power source whose output fluctuates greatly. ■ In some cases output-stabilizing systems such as storage batteries and flywheels (facilities to convert energy to rotational energy and store it) need to be introduced.
Effect of Fuel Reduction	All the electricity generated by wind power contributes to CO_2 emissions reduction.
Price Level	According to NEDO “Renewable Energy Technologies (2010)”, the construction costs for an onshore wind power generation facility in Japan is approximately 200-300 thousand yen/kW.
Maturity of Technology	Wind power generation has come into practical use, because it is less expensive compared with other renewable energies.
Competitive Edge of Japanese Technology	The European and American companies such as Vestas (Denmark) and GE (USA) have large shares in the world market. As a Japanese company, Mitsubishi Heavy Industries has the world’s 9th largest share (as of 2008).
Others	In Japan offshore wind turbines are under research and development.  Image of an Implanted Floating Wind Turbine (Source: TEPCO)  Image of Floating Wind Turbines (Source: TEPCO)

2.2.3 Transmissin Facilities

(1) Ultra High Voltage Transmission Lines

Table 2- 21 Ultra High Voltage Transmission Lines

Technology Outlines	Ultra high voltage transmission lines lower the transmission losses by increasing the transmission voltage. The same amount of electricity can be transmitted with 1/2 electricity flow and 1/4 transmission loss by doubling the electricity voltage. TEPCO has developed and constructed the ultra high voltage transmission lines (1,000 kV). 
Advantage	■ Reduction of transmission loss
Disadvantage	■ Increase of the size of pylons and their construction cost
Effect of Fuel Reduction	Effects of the Reduction of Losses (Increase of transmission voltage from 275kVto 550kV) In the case of 275kV one circuit 20km ACSR410×4 current 1500MW The amount of transmission loss reduction by increasing the voltage from275kV to 550kV (x2) is 9.75MW (=13.0MW - 3.25MW). Assuming that the load factor is 60%, from the Buller-Woodrow formula, Loss Coefficient: L＝0.3×0.6＋0.7×0.6×0.6＝0.432 Loss reduction effects =9.75MW×8,760h×0.432＝36.9GWh/year Assuming that the combustion loss rate at the coal thermal power station is 40%, 36.9 GWh / 0.4 x 3,600 kJ/kWh= 356 TJ 356 TJ x 1/41.868 ktoe/TJ= 8.5 ktoe **Fuel Reduction 8.5 ktoe/year**
Price Level	Depending on the conditions of sites and scales, a transmission line (2 circuits) itself costs more than 10 million US$/km.
Maturity of Technology	500kV transmission lines have been adopted in many countries including Japan, but not many countries have 1,000kV class transmission lines.
Competitive Edge of Japanese Technology	Japanese manufacturers are competitive.
Others	1,150kV transmission lines have already been adopted in Kazakhstan.

(2) Improvement of Power Factor of Transmission Lines

Table 2- 22 Improvement of Power Factor of Transmission Lines

Technology Outlines	Transmission losses can be reduced by improving the power factor of the transmission lines' currents. Transmission losses increase (transmission losses increase in proportion to square value of electricity current) when the power factor is not appropriate because the electric current including legging current flows through the lines.
Advantage	■ Reduction of transmission losses
Disadvantage	■ Installation costs of power capacitors
Effect of Fuel Reduction	Loss reduction effects (Improvement of power factor 0.8 to 0.95) In the case of 275kV one circuit 20km ACSR410×4 current 1500MW Transmission loss reductions in the case the power factor is improved from 0.8 to 0.95 is 5.35MW (=18.35MW - 13.0MW). In this case, the required capacity of the power capacitor is 632MVA. Assuming that the load factor is 60%, from the Buller-Woodrow formula, Loss Coefficient : L＝0.3×0.6＋0.7×0.6×0.6＝0.432 Loss reduction effects =5.35MW×8,760h×0.432＝20.2GWh/year Assuming that the combustion loss at the coal thermal power station is 40%, 20.2 GWh / 0.4 x 3,600 kJ/kWh= 182 TJ 182 TJ x 1/41.868 ktoe/TJ= 4.3 ktoe **Fuel Reduction　4.3 ktoe/year**
Price Level	The price of a power capacitor is several thousand yen/kVA.
Maturity of Technology	The technology is fully established.
Competitive Edge of Japanese Technology	No distinct competitive advantage

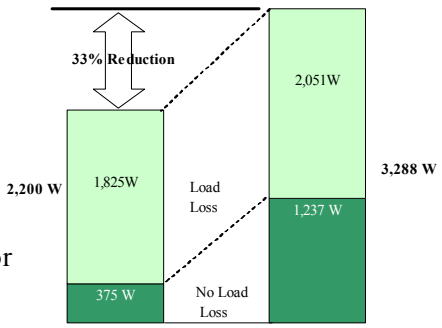
(3) Improvement of Power Factor of Distribution Lines

Table 2- 23 Improvement of Power Factor of Distribution Lines

Technology Outlines	Improvement of the power factor of the distribution lines will serve to reduce distribution losses because both the resistive losses and required capacity of the equipment decrease is in inverse proportion to the square of the power factor. Power capacitors are utilized in order to improve the legging power factor and reactors are utilized to improve the leading power factor.  (Source: Nissin Electric Website)
Advantage	■ By reducing the resistive losses of the lines and major equipment, CO2 reduction, expansion of distribution capacity, and voltage drop reductions (improvement of voltage) can be expected.
Disadvantage	■ Initial cost for power capacitors, possibilities of excess installment of power capacitors, and possibilities of voltage rises under low load conditions
Effect of Fuel Reduction	Loss reduction effects (Improvement of power factor 0.8 to 0.95) Assuming 6.6kV one current 10km ACSR120mm^2 electricity current 100A Distribution loss reductions in case the power factor is improved from 0.8 to 0.95 is 11.4kW (=39.3kW - 27.9kW) Assuming that the load factor is 60%, from the Buller-Woodrow formula, Coefficient of Loss: L＝0.3×0.6＋0.7×0.6×0.6＝0.432 Loss reduction effects =11.4kW×8,760h×0.432＝43.1MWh/year Assuming that the combustion loss rate at the coal thermal power station is 40%, 0.0431 GWh / 0.4 x 3,600 kJ/kWh= 0.39 TJ 0.39 TJ x 1/41.868 ktoe/TJ= 0.009 ktoe **Fuel Reduction 0.009 ktoe/year**
Price Level	Depends on the specifications including the capacity. A power capacitor (6,600V voltage, 500kVar capacity, L＝6%) may cost approximately several million yen.
Maturity of Technology	Widely prevalent in Japan
Competitive Edge of Japanese Technology	No distinct competitive advantage
Others	The power capacitors need to be installed systematically in consideration of the whole power system. Furthermore, institutions should be developed to clarify who will be responsible for their installation.

(4) Amorphous Transformers

Table 2- 24 Amorphous Transformers

Technology Outlines	Transformers made with amorphous alloy core. Amorphous alloy is a non-crystalline alloy which has an irregular atom arrangement, made by rapidly-chilled alloys like iron. Amorphous alloy core, when utilized instead of the conventional silicon steel core, contributes greatly to the reduction of no-load losses (losses which are caused just by applying voltage)  (Source: Hitachi)
Advantage	■ The lower the transformer load, the more the reduction of losses, because no-load loss is greatly lowered.
Disadvantage	■ The higher the transformer load, the less the reduction of losses.
Effect of Fuel Reduction	Loss Reduction Effects Assuming that the load factor is 50%, a three-phase transformer (1,000 kVA) contributes to the reduction of 1,088 W losses. Assuming that this situation continues for one year, Loss Reductions = 1.088 kW × 8,760 h = 9.5 MWh/year  Comparison of an amorphous transformer and a conventional transformer (Source: Hitachi) Assuming that the combustion loss at the coal thermal power station is 40%, 0.0095 GWh / 0.4 x 3,600 kJ/kWh= 0.086 TJ 0.086 TJ x 1/41.868 ktoe/TJ= 0.002 ktoe **Fuel Reduction 0.002 ktoe/year**
Price Level	Approximately 20% more expensive than the conventional product
Maturity of Technology	Amorphous transformers for power producers and general distribution systems came into commercial use in the 1990's. Japanese manufacturers have been successful in the dissemination of this technology resulting in its established market penetration.
Competitive Edge of Japanese Technology	Very competent. Hitachi is the major manufacturer in Japan.

2.2.4 Demand–side Facilities

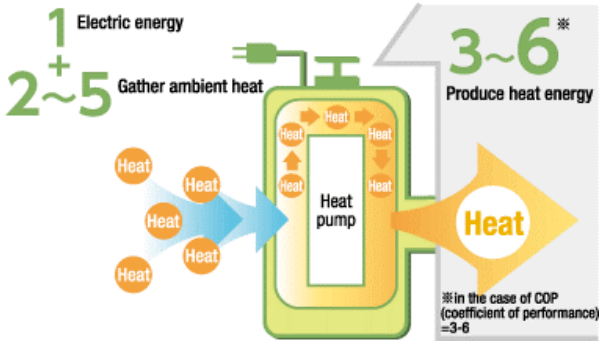
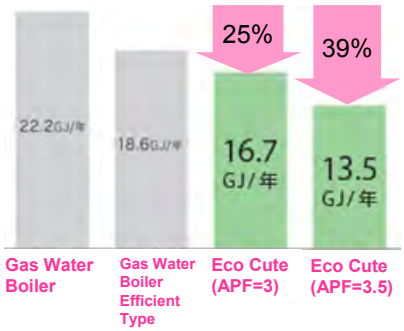
(1) Highly-efficient Heat Pump Technology (Industrial Air Conditioner)

Table 2- 25 Highly-efficient Heat Pump Technology (Industrial Air Conditioner)

Technology Outlines	Repeating contraction, concentration, expansion, and evaporation of the refrigerant, the heat energy from the air can be utilized for air-conditioning (cooling and heating). A 1-to-3 energy input/output ratio can be achieved. The definition of the heat pump technology is; ➢ The chilling ability of the equipment itself is 28kW or more. ➢ No ozone-depleting refrigerant ➢ Energy efficiency is more than the values shown below. Air-cooling equipment / Chilling unit (3.58) Multi Air-conditioner (3.90) 
Advantage	■ The latest ultra-efficient heat pumps have 5.0 or more COP.
Disadvantage	■ To cover the initial cost and encourage their adoption, subsidies are provided in Japan.
Effect of Fuel Reduction	Reduction Fuels (Comparison of a gas absorption type cooling and a heating machine with a chilling ability of 600kW and a highly-efficient turbo refrigerator (COP 6.4) Assuming that each piece of equipment is operated 8 hours/day, 100 days/year Final energy consumption of a gas absorption type cooling/heating machine: 600kW X 1/1.6 X 100 X 8= 300MWh 300MWh x 3,600 kJ/kWh= 1.1 TJ Final energy consumption of a highly-efficient turbo refrigerator : 600kW X 1/6.4 X 100 X 8 = 75MWh Assuming that the combustion loss at the coal thermal power station is 40%,75MWh / 0.4 x 3,600 kJ/kWh= 0.68 TJ Reduction of the annual primary energy is 0.42TJ 0.42TJ x 1/41.868 ktoe/TJ= 10.03 toe **Fuel Reduction 10.03 toe/year**
Price Level	Depends on the conditions including the capacity. The latest ultra-efficient equipment (Chilling ability 600kW) costs approximately 50 billion yen.
Maturity of Technology	In order to achieve the target number of units set in the “Kyoto Protocol Target Achievement Plan”, 1.41 million ton of refrigeration is aimed.
Competitive Edge of Japanese Technology	Japanese manufacturers have high-level heat pump technology. However, because of the cost of the equipment, their competitiveness depends on the electricity tariff in the country.

(2) CO^2 Heat Pump Water Heater (Eco Cute)

Table 2- 26 CO^2 Heat Pump Water Heater (Eco Cute)

Technology Outlines	Repeating the contraction and expansion of the refrigerant, the heat energy from the air can be utilized for heating water. A 1-to-3 energy input/output ratio can be achieved.  (Source: TEPCO Website)
Advantage	■ The latest efficiency rate of Eco Cute (COP) is 4.0 or more (Annual average 3.0)
Disadvantage	■ Space is needed for the outside unit and the water storage tank.
Effect of Fuel Reduction	Reduction Fuels (Comparison of a gas water heater and Eco Cute) Annual primary energy consumption Conventional combustion type water heater (town gas): 22.2GJ Eco Cute: 13.5GJ Reduction of annual primary energy consumption is 8.7GJ. 0.0087 TJ x 1/41.868 ktoe/TJ = 0.2 toe  (Source: TEPCO Website) **<u>Fuel Reduction 0.2 toe/year</u>**
Price Level	Fully automated type (double drum type / water storage amount 300L): approximately 600 to 800 thousand yen
Maturity of Technology	About 2.25 million “Eco Cutes were installed at the end of 2009. The target number of units set in the “Kyoto Protocol Target Achievement Plan” at the end of 2020 is 10 million units.
Competitive Edge of Japanese Technology	Japanese ultra-efficient systems are competitive in terms of their productivity, but less so when compared to the foreign products which are less efficient but inexpensive.
Others	According to the catalogues of the manufacturers, it cannot operate where the temperature drops to -25°C or below.

(3) Electric Vehicle

Table 2- 27 Electric Vehicle

Technology Outlines	A vehicle powered by electricity, generally supplied from an external electricity charger or replaceable batteries. In a broad sense, solar cars, fuel cell electric vehicles (FCEV), hybrid electric vehicles (HEV), and trolley buses powered by overhead wires are included in Electric Vehicles.  (Source: TEPCO website)
Advantage	■ Reduction of CO2 and fuels
Disadvantage	■ Relatively high price level, Limited mileage per charge
Effect of Fuel Reduction	Reduction Fuels (Comparison between a light gasoline vehicle and a light electric vehicle) Assuming that the average annual mileage is 10,000km, Fuel consumption of a gasoline vehicle: 15 km/L 10,000 / 15km/L = 666 L 0.67 kL x 34.6 MJ/L = 23,182 MJ Fuel Consumption of an electric vehicle: 0.1 kWh / km x 10,000km = 1,000 kWh Assuming that the combustion loss at the coal thermal power station is 40%, 1.0 MWh / 0.4 x 3,600 kJ/kWh=9,000 MJ The difference of fuel consumption between a gasoline vehicle and an electric vehicle 14.2GJ x 1/41.868 ktoe/TJ = 0.34toe **Fuel Reduction 0.34 toe/year**
Price Level	Several million yen per one vehicle
Maturity of Technology	The estimated number of electric vehicles owned in FY 2009 is 1,941 (excluding motor cycles, Next Generation Vehicle Promotion Center). The Japanese government aims to own 2.07 million vehicles by 2020.
Competitive Edge of Japanese Technology	Japanese manufacturer advanced battery technology.
Others	Sufficient number of battery charging stations need to be built.

Chapter 3 Climate Change Policy in the World

3.1 Japan's Involvement in Climate Change Policy

3.1.1 Background

Anthropogenic climate change is phenomena considered to be a result of a number of developments observed in the modern world, such as a decrease of forest areas due to population growth and improved living standards, increased use of fossil fuels, or rapid industrial growth. In 1988, the Intergovernmental Panel on Climate Change (IPCC) was established as part of international efforts to combat climate change, evaluate its effects and design mitigation and adaptation policies based on scientific, technical and socio-economic research. As a next step, in 1992, the United Nations Conference on Environment and Development was held. The conference adopted the United Nations Framework Convention on Climate Change (UNFCCC), which came into force in 1994. The convention established goals to stabilize atmospheric concentrations of greenhouse gases and protect the current and future climate of the Earth, thus forming the foundation of the Kyoto Protocol.

The Japanese government has also been actively participating in international efforts to combat climate change. At the third Conference of the Parties to the UNFCCC held in Kyoto (Japan) in 1997, the Kyoto Protocol was adopted (currently ratified by 194 countries and 1 regional organization, EU). It set up legally binding targets for GHG emissions and was ratified by Japan in 2002. Following the signing of the Kyoto Protocol, in 1998 Japan adopted a Law on Promotion of Measures against Climate Change. This law was amended in 2002 following Kyoto Protocol's ratification by Japan. Additionally, a 'Kyoto Protocol Target Accomplishment Plan' as well as a 'Climate Change Policy Concept' were approved. These further triggered the development of voluntary global warming action plans by the Japanese industry and new amendments to the Law on Energy Efficiency. In addition, during the UN General Assembly in September 2009, the Japanese Government announced a 25 % GHG emission reduction target (against 1990 levels), and committed to further GHG emission reductions.

As parts of its efforts to achieve economic growth with reduced GHG emissions, in June 2010 the Government of Japan adopted the 'New Growth Strategy (Basic Principles)', which identified domestic and international environmental business as a growth area. Under this strategy Japan aims at becoming a leader in the environment and energy through 'green innovation'. It is additionally projected to establish a new 50 trillion yen-worth environmental market with 1.4 million new jobs.

The Japanese Cabinet proposed a draft "Global Warming Countermeasures Basic Act" on March 31, 2010 in order to streamline the direction of government measures against global warming, and submitted it to the Diet. The draft law summarizes Japan's climate change policy principles, local and national governmental bodies' as well as business and public responsibilities, and the country's mid-term GHG emissions reduction target. This draft is currently undergoing

parliamentary deliberations.

3.1.2 Japan's Domestic Measures against Global Warming

The draft 'Global Warming Countermeasures Basic Act' proposes, among others, the establishment of a domestic GHG emission trading scheme, feed-in tariffs and adjustments in the climate change tax, as well as the introduction of policy measures to support the wider use of renewable energy (solar, wind, hydro, geothermal, biomass and others). Additionally, it provides options for 'low carbon' transformation of Japanese society and the economy through 'low-carbon' investments, use of IT technology, as well as the advancement of state-of-the-art technologies such as the new-generation of batteries and cars, highly efficient coal-fired TPP, low power consumption IT systems and others. Additionally, the law aims to reduce GHG emissions in the housing and transportation sectors through the promotion of modal shifts and the wider introduction of energy efficient electric appliances.

3.1.3 International Climate Change Negotiations and the Kyoto Protocol

In 1997 Japan signed the Kyoto Protocol (adopted at COP3) and subsequently ratified it in 2002. In this way, the country joined the EU member states, Russia, Ukraine and other developed countries in making a legally binding commitment to reduce GHG emissions domestically and internationally.

Regarding post-Kyoto negotiations, Japan announced the 'Hatoyama Initiative' at COP15 held in Copenhagen in 2009 and proposed the establishment of a fair and efficient international framework with the participation of major global emitters and, in front of the entire international community, committed to an ambitious target to reduce Japan's GHG emissions by 25 % compared to the 1990 level. As part of the path for achieving this target, Japan is leveraging its resources to provide capacity building and other support to developing countries.

3.2 Current Status and Future Prospects in Emission Trading

3.2.1 Background

'Emissions trading' is a system, under which GHG (or air pollutant) emission quotas (*a cap*) are defined for each company or country and countries/companies with surplus allowances can trade with countries/companies that exceed their emissions allowances. Such a system was first introduced via the SOx emissions certificate trading in the U.S. (in the early 1990s), and set the stage for the first-ever international GHG emissions trading system established under the Kyoto Protocol.

The Kyoto Protocol mechanisms are for the cost-efficient reduction of greenhouse gas emissions. Depending on the type of activity and participating countries, they are classified as

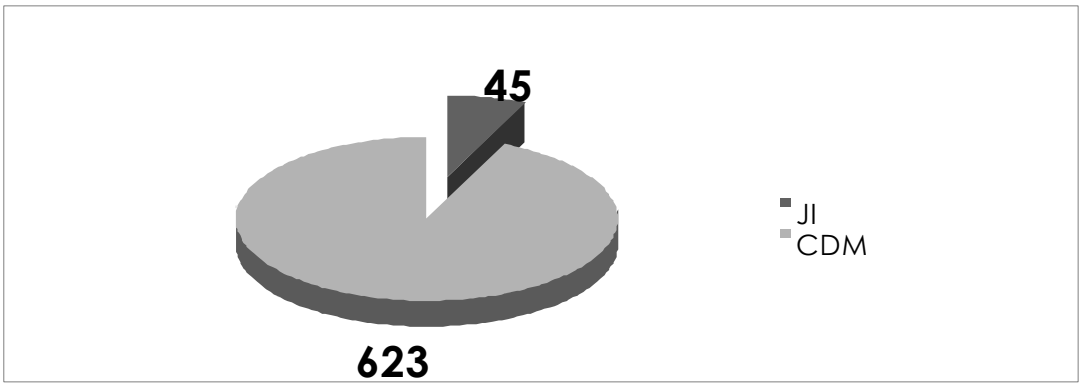
Clean Development Mechanism (CDM), Joint Implementation (JI), and International Emissions Trading (IET). These mechanisms are generally also called 'emissions trading' and are considered an important complementary tool to the achievement of the Japanese national target for GHG emissions reduction.

Kyoto Mechanisms

- **CDM (Clean Development Mechanism):** A mechanism, under which a developed country (Annex I country) can invest in a developing country (non-Annex I country) and claim the achieved emission reductions as part of its own efforts to achieve a GHG emission reductions target.
- **JI (Joint Implementation):** Mechanisms, under which one developed country can invest in another developed country (usually an economy in transition) and claim the achieved emissions reductions as part of its own efforts to achieve a GHG emissions reduction target.
- **IET (International Emission Trading):** A system under which developed countries can trade among themselves through GHG emission allowances.

3.2.2 Kyoto Protocol Implementation

The first CDM and JI projects started development in 2000. As of January 25, 2011, 2,773 CDM projects and 241 JI projects were registered. It is expected that only from the CDM projects registered up to date approximately 1,920 mil tCO_2e equivalent of emission reductions will be achieved. Among them, Japan is involved in 668 CDM projects and 45 JI projects, which are expected to generate emission reductions of approximately 160 mil ton-CO_2.



(Source: Kyoto Protocol Mechanism Information Platform)

Figure 3- 1 Japan's Involvement in CDM and JI Projects (Number of projects)

Additionally, Japan has been involved in IET and bought a total of 75.5 mil tCO_2e (AAU) from Ukraine, Latvia, Czech Republic and Poland. The purchases took place under an IET supplementary scheme called the 'Green Investment Scheme' or GIS, under which the seller country is obliged to invest revenue from the sale of its allowances into environmental or GHG emission reduction projects. GIS is expected not only to assist Japan in meeting its target, but also to promote the transfer and application of state-of-the-art Japanese technologies.

Japan is facing an increase of its own GHG emissions and the Kyoto mechanisms provide a real opportunity for cost-efficient emission reductions.

3.2.3 COP16 Outlook

After much deliberation, the Conference of the Parties to the UNFCCC (COP16 held in Cancun, Mexico), reached an agreement (called 'Cancun Agreement') regarding the policy direction for the post-Kyoto period. Among others, this agreement seeks to establish a new comprehensive global emission reduction framework that will involve countries like the US that did not ratify the Kyoto Protocol or China and India that have no obligations under the protocol. However, the decision on the unconditional extension of the Kyoto Protocol is vehemently opposed by Japan, or the creation of new agreements that would replace it, was postponed for the next COP17 to be held in Durban (South Africa) at the end of 2011. The main reasons why Japan opposed the extension of the Kyoto Protocol were, on one side, the flaws of the current Kyoto Protocol framework (not including major emitters like the US, or not imposing any emission reductions on other major emitters like the China and India) and, on the other side, the limitations of the CDM as a major Kyoto mechanism (complex approval process, long project review, limited application of Japanese technology). The inclusion of the US, China and India in the Cancun agreement was a success, but the fact that China strongly supports the extension of the Kyoto Protocol and the conflicting interest of the different parties to the international negotiations, cast doubt on the final outcome.

3.2.4 Bilateral Trading

The draft 'Global Warming Countermeasures Basic Act' clearly stipulates a 25 % GHG emissions reduction target (compared to the 1990 levels), under the assumption that major emitters like the US and China would join a binding post-Kyoto agreement. Thus, although Japan opposes a simple extension of the Kyoto Protocol, it is still committed to the reform of the existing CDM framework and proposed as an alternative a new mechanism called 'Bilateral Trading'. The development of such a new mechanism was made possible under the Copenhagen Accord (adopted at COP15) which allowed each country to design their own new emission trading mechanisms. Under the bilateral trading, a Japanese company develops GHG emission reduction projects abroad with the use of state-of-the-art technologies and receives emission reduction credits in return. In 2010, the Japanese government, represented by the Ministry of Economy, Trade and Industry (METI), started the identification of potential pilot projects with the aim of identifying the

potential issues in the establishment of an operational bilateral trading scheme. The first call for the projects was open in August 2010, resulting in the selection of 15 projects, mainly from South-East Asia, in the field of thermal power generation, steel production, cement and others. An additional 15 projects were selected under the second call in October 2008. It is interesting to note that among these projects, there was a nuclear power project, as well as a carbon capture and storage (CCS) project, both types not covered under the existing CDM framework. In 2011 it is expected that the Ministry of Environment of Japan and the New Energy and Industrial Development Organization (NEDO) will open similar calls.

Although there is still no decision concerning the exact design of the bilateral trading scheme, a pilot idea, presented in the figure below, is being discussed inside METI.

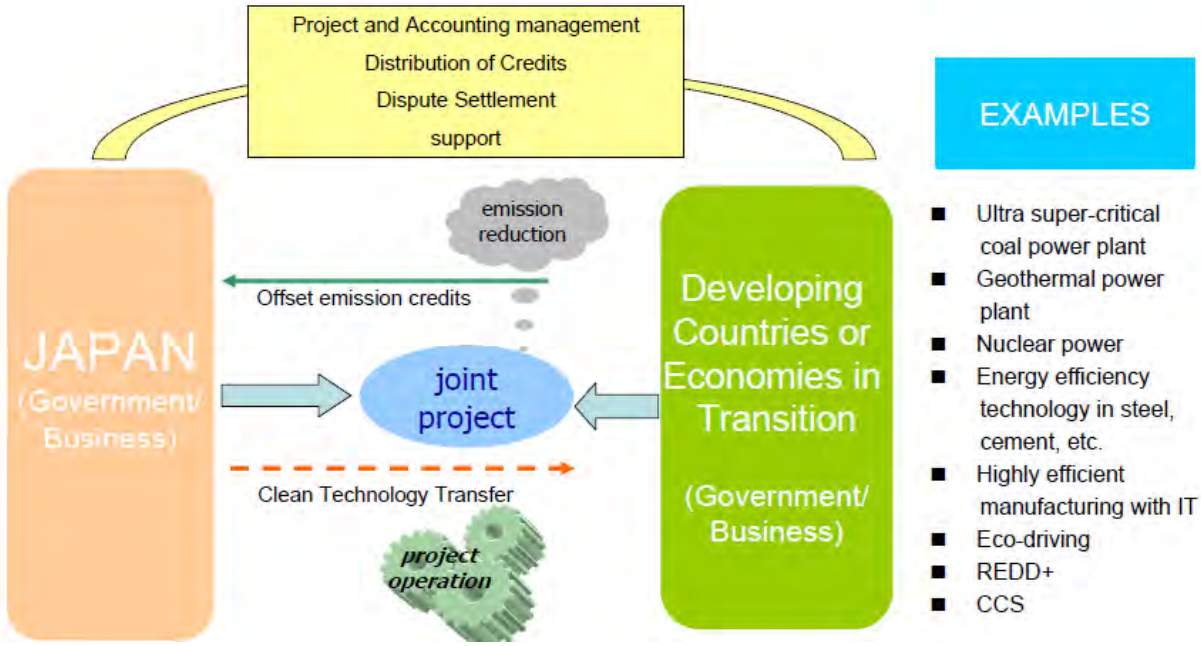


Figure 3- 2 Bilateral Trading (Idea)

The first step in establishing bilateral trading is the conclusion of a Memorandum of Understanding (MoU) between the Governments of Japan and the partner country. Under the MoU, a project using Japanese low-carbon technology will be implemented in the host country and it will be the bases for the emission trading. The achieved GHG emission reductions will be evaluated and carbon credits will be issued under a specially designed system. This is expected to provide new opportunities for the development of Japanese businesses abroad, technology transfers and the financing of projects in developing countries and economies in transition.

Japan has already started negotiations concerning the establishment of such a scheme with some South-East Asian nations, covering the measurement of GHG emission reductions, approval of carbon credits and their distribution.

3.3 Experience of Kazakhstan in Emission Trading

Kazakhstan ratified the UNFCCC as a non-Annex I country on May 17, 1995, but on May 23, 2000 it declared unilaterally its decision to join Annex I. In 2009, it ratified the Kyoto Protocol as a non-Annex I country and is currently in the process of joining Annex B of the Kyoto Protocol. However, in order to achieve that status, Kazakhstan's accession has to be ratified by 3/4 of the Kyoto Protocol signatories and only then it can fully participate in the GHG emission trading and offset mechanisms.

Kazakhstan inherited from the Soviet Union aging industrial facilities; the economy of the country is characterized by low energy efficiency, increasing energy demand, and rapid development of the oil and gas industry, providing huge potential for emission reductions. During COP 16 in December 2010, a special decision was taken that allowed Kazakhstan to submit JI projects for review and approval by JISC, which is expected to increase Kazakhstan's role in the international carbon market.

Reference

Annex I Countries: Most of the OECD member-states, as well as part of the CIS and Central and Eastern European (CEE) countries. Under the UNFCCC, these countries have a leading position as, unlike developing countries, they committed to implement policies and measures that will stabilize their GHG emissions at the 1990 level by year 2000, combat against climate change together with other signatories of the convention, submit annual inventories of their GHG emissions by sources and others. The name originates from Annex I of the UNFCCC, where these countries are listed. The obligations of the CIS and CEE countries are less stringent to reflect the economic transition taking place there. OECD members that joined later, like Mexico and the Republic of Korea or CEE states, like Poland and the Czech Republic are not included. A non-Annex I country usually means a developing country.

Annex II Countries: Most of the OECD member countries, which have agreed to provide financial support to developing countries, in addition to their obligations under Annex I of the UNFCCC. The name originates from Annex II of the UNFCCC, where these countries are listed. OECD members, like Turkey, Mexico and the Republic of Korea or Central European states like Poland and the Czech Republic are not included.

Annex A: An annex to the Kyoto Protocol that includes the lists of the targeted GHG and sector/source categories.

Annex B Countries: Countries that have taken numerical targets for GHG emission reductions under the Kyoto Protocol. These are 38 countries including Japan, US, EU member states and the European Community (as a regional organization). The name originates from Annex B of the Kyoto Protocol, where these countries are listed. Almost equivalent to Annex I of the UNFCCC, with the exception of Turkey and Belarus who had not ratified the UNFCCC at the time of COP 3 and were not included in the list.

Chapter 4 Information on Environment and Energy in Kazakhstan

4.1 General information

4.1.1 Geography and Natural Environment

(1) Land

Kazakhstan is located in the center of the Eurasia continent. The land area's size is ninth in the world (2.72 million km^2: 7 times larger than Japan's land area). At the same time, Kazakhstan is an inland country.

The length of the international border line is 13,394 km, and the country borders Russia(7,591km), Uzubekistan (2,354km), China (1,782km), Kyrgystan (1,241km) and Turkmestan (426km). Therefore, it is easy for Kazkhstan to engage in energy trade with these bordering countries.

Figure 4- 1 Country Map of Kazakhstan

Most of the country is in a steppe area, and it is provided to three kinds of areas; Kazak high land area including the Altai mountains; the Kazak steppe area located in the central area of Kazakstan; and the Westen low land area along the Caspian Sea. In the steppe area, Saryishikotrau desert and Kyzylkum desert are included. The climate is dry and there is a big difference in temperature between the summer and winter seasons. Monthly average temperature and rainfall level in metropolitan Astana are listed in the following table.

Table 4- 1 Temperature of Astana (High/Low: Degrees C, Rainfall: mm)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Astana	High	-11	-10	-4	10	20	25	27	25	18	9	-2	-9
	Low	-17	-18	-12	0	8	13	15	13	7	0	-9	-15
	Rainfall	13	11	16	18	22	29	38	26	15	17	17	16

(Source: Web Site of MSN Weather)

Speaking overall from an energy perspective, as the country is cool in the summer season and cold in the winter season, much energy is used for the space heater (heat supply facilities). On the other hand, energy for air-conditioning equipment is comparatively small. Furthermore, there are so many suitable sites for hydro power, wind power and solar energy. At the same time, Kazakhstan is a country producing oil and coal, thereforce the country is suitable for oil, coal and a gas-fired power generation system. In terms of energy supply, Kazakhstan is a rich country.

(2) Population and Nationality

After becoming an independent nation in 1991, the population of the country has decreased due to a declining birth rate and migration. The population decrease came to a halt during the years of 2003 − 2004 due to an influx of laborers from Uzbekista, Kyrgystan and Tajikisatan by the economic growth of Kazakhstan.

Most of the population in Kazkhstan (15.64 million in 2009) are spread out over several areas of the country. The population density is only 5.6 person per square kilo meter, the percentage of those who are “Under 14 years old” are 23 %, “14- 64 years old” are 69 % (the age persons are labor population), and “Over 65 years old” are 8 %. The average age is 28.8 years old. This is comparitively younger than other developed countries.

Table 4- 2 Population of Kazakhstan

	Unit	1999	2000	2001	2002	2003	2004	2005
Population	million	15.08	14.96	14.91	14.93	15.00	15.09	15.19
Growth rtae	%		-0.8	-0.3	0.1	0.5	0.6	0.7
	Unit	2006	2007	2008	2009	2010	10/99	10/05
Population	million	15.30	15.41	15.52	15.64	15.75		
Growth rate	%	0.7	0.7	0.7	0.8	0.7	0.4	0.7

(Source: IMF Statistics, Average growth rate in the past 5 years is applied to 2010)

Table 4- 3 Changes of Average Ages of Referential Countries

	2000	2050
USA	36.5 old years	41.1 old years
France	38.9	44.3
Italy	42.0	50.4
Japan	42.9	54.9
China	32.5	45.0
Kazakhstan	28.8 old years in 2009	

(Source: WHO HP)

Ethnic composition is Kazakhs (53.4 %: 9.00 million), Russians (30 %: 3.96 million), Ukrainians (3.7 %: 0.45 million), Uzbeks (2.5 %: 0.43 million), Uygurs (1.4 %), Tatars (1.7 %), Germans (2.4 %) (Source: CIA The World Factbook in 2009). Kazkh is a country language and Russian is one of the official languages. Religious beliefs can be separated into Sunni Muslim (47 %) and Russian Orthodox Church (44 %) (Source: CIA The World Factbook in 2009).

Kazakhstan is a multi-ethnic and multi-religious country. In 1995, after independence, “Kazakhstan ethenic conference” that is an advisory panel of the Kazakhstan president was established. The main purpose of the conference is to “Resolve the problems among multi ethnic and multi religious groups”, the members of the conference are representatives of Government organizations and ethnic and cultural groups. The activities seek to promote international social and cultural understanding.

4.1.2 Political System

(1) History

Kazakhstan restored its sovereignty from the former Soviet Union on 25th October in 1990. The country was named "Republic of Kazakhstan" on 10th December in 1990. In the same year, Kazakhstan declared "Independence".

Under a national election, Kazakhstan adopted a new constitution in August 1995. The political system whereby the president is elected via a nationally held election. The current president is Mr. NAZARBAYEV, Nursultan Abishevich, who became a lifetime president under the "First president law" enacted in July 2000. The parliament consists of the Upper house (Senate) and the Lower house (Majlis).

(2) Government and Related Organizations

The main governnmental organizations consist of Ministries, Government agencies, Governmental organizations, President's offices and president direct organizations and so on, as shown below.

Table 4- 4 Ministries in Government Administrative System

1	Prime Minister	11	Environment Protection Ministry
2	Prime Minister Office	12	Labor& National Social Security Ministry
3	Foreign Affairs Ministry	13	Agriculture Ministry
4	Defence Ministry	14	Education & Science Ministry
5	Interior Ministry	15	Transportation Ministry
6	Law Ministry	16	Culture Ministry
7	Finance Ministry	17	Information & Comminucation Ministry
8	Economy, Development & Trade Ministry	18	Tourism & Sports Ministry
9	Industry And New Technology Ministry	19	Health Ministry
10	Oil & Gas Ministry	20	Emergency Ministry

Table 4- 5 Government Agencies

1	Statistic agency	4	Space agency
2	Land& Resource management agency	5	Competitiveness protection agency
3	Natural monopoly reglatory agency	6	Construction & Housing public welfare agency

Table 4- 6 Main Government Organizations

1	Central Bank of Kazakhstan
2	Development Bank of Kazakhstan(DBK)
3	National Welfare Fund
4	National Oil Company Kazakhstan / KazMunaiGas (KMG)
5	National Atomic Company / Kazatomprom(KAP)
6	National Railway (KTZh)
7	National Cominucation company (Kazakh TeleCom)

(3) Local Administration

The capital of Kazakhstan moved from Almaty to Astana on 10th December, 1997. The local administration government is separated into 2 cities and 14 provinces. Each province has a city, town, village, autonomous region and a rural settlement. The province names and the provincial capital are as shown in the following table.

Table 4- 7 Provinces of Kazakhstan

	Province	Capital & Administrative District
1	Astana city	National capital since October 1997, 3 % of the whole population lives in the city. .
2	Almaty city	Almaty is the largest city in the country, the city used to be the capital of Kazakhstan during 1929-1997. 8% of the whole population lives in the city.
3	Akomla province	The capital of the province is Kokshetau. The province has 10 towns, 14 villages, 17 autonomous regions and 712 rural settlements.
4	Almaty province	The capital of the province is Taldkorgan. The province has 10 cities, 16 autonomous regions and 234 rural settlements.
5	Aktobe province	The capital of the province is Aktobe. 40 % population in the province lives in Aktobe. The province has 8 cities, 12 autonomous regions and 441 rural settlements.
6	Eastern Kazakhstan province	The capital of the province is Kamenogorsk. 21 % population in the province lives in Kamenogorsk. The province has 10 cities, 15 autonomous regions and 857 rural settlements.
7	Karaganda province	The capital of the province is Karaganda. 31 % population in the province lives in Karaganda. The province has 11 cities, 9 autonomous regions and 556 rural settlements.
8	Kostanai province	The capital of the province is Kostanai. 22 % population in the province lives in Kostanai. The province has 5 cities, 16 autonomous regions and 799 rural settlements.
9	Pavlodar province	The capital of the province is Pavlodar. 40 % population in the province lives in Pavlodar. The province has 2 cities, 10 autonomous regions and 164 rural settlements.
10	Northern Kazakhstan	The capital of the province is Petropavlovsk. 28 % population in the province lives in Petropavlovsk. The province has 5 towns, 16 villages, 13 autonomous regions and 774 rural settlements.
11	Zhambyl province	The capital of the province is Taraz. Tarza population is 330,000 in 1999. Taraz after Soviet Unions collapsed in 1991 is renamed to “Aulie-Ata”, after that, the city name came back to the original city name of Tarza.
12	Western Kazakhstan province	The capital of the province is Uralsk, 37 % population in the province lives inUralsk. The province has 1 city, 4 villages and 154 rural settlements.
13	Kyzylorda province	The capital of the province is Kyzylorda. 32 % population in the province lives in Kyzylorda. The province has 3 cities, 7 autonomous regions and 269 rural settlements.
14	Southern Kazakhstan province	The capital of the province is Shymkent, 24 % population in the province lives in Shymkent. The province has 9 cities, 12 autonomous regions and 933 rural settlements.
15	Atyrau province	The capital of the province is Atyrauy. 43 % population in the province lives in Atyraucity. The province has 3 autonomous regions and 57 rural settlements.
16	Mangystau province	The capital of the province is Aktau. 50 % population in the province lives in Aktau. The province has 3 towns, 4 autonomous regions and 26 rural settlements.

(Source: Kazakhstan Embassy Handbook and Others)

4.1.3 Economic Activities

(1) History of Economy Growth after the National Independence

Regarding the structure of Kazakhstan's industry sector, the mining & manufacturing sector which has an abundance of energy and mining resources is developed. As sub-sectors in the mining & manufacturing sector, coal industry, oil and gas industry, iron & steel industry, and nonferrous metal industry are important positions in the structure of the industry. Along with the mining and manufacturing industry, large scale agriculture businesses that produce grains developed in the northern part (around Astana) of Kazakhstan during the latter half of 1950.

As mentioned above, Kazakhstan has been a well-functioning republic country. However, the country suffered setbacks such as the loss of customers and suppliers for raw materials, machines and equipment due to the breakup of the former Soviet Union. Under such circumstances, material and machine industries such as the oil industry and nonferrous metal industry are being continuously developed. At present, the Government is seeking to develop high value added industries out of a resource-dependent industry. After achieving national independence, it cannot be said that Kazakhstan's economy is sound. It started with the economic crisis during 1992-1995, and 3,000% hyper-inflation in 1992. Meanwhile, the Tenge, a new currency, was introduced in November 1993, and a new banking system was also established. The economic revolution has revitalized foreign direct investment. In 1991, 75 % of workers had worked in the public sector. However, in 1996, a reversal happened with 76 % of workers moving to the private sector.

Kazakhstan was officially recognized as a market economy country by the EU in 2001 and by the US in 2002. After the year 2000, GDP growth increased rapidly with the average annual growth rate being 10 % during 2000-2006.

Table 4- 8 Main Economic Indicators of Kazakhstan

	Exchange Rate	Refinancing Rate	Treasury Bill Rate	Lending Rate to Company	Number of Employees	Unemployment Rate
	Tenge/USD	%	%	%	1,000	%
1998	78.3	25.00	23.59		6,128	13.1
1999	119.5	18.00	15.63		6,105	13.5
2000	142.1	14.00	6.59		6,201	12.8
2001	146.7	9.00	5.28		6,699	10.4
2002	153.3	7.50	5.20		6,709	9.3
2003	149.6	7.00	5.86	14.9	6,985	8.8
2004	136.0	7.00	3.28	13.7	7,166	8.4
2005	132.9	8.00	3.28	13.0	7,244	8.1
2006	126.1	9.00	3.28	12.2	7,404	7.8
2007	122.6	11.00	7.01	14.8	7,632	7.3
2008	120.3	10.50	7.00		7,855	6.6
2009	147.5	7.00	7.00		7,905	6.6
2010	147.4	7.00	7.00		8,029	6.2
2010/05	2.1%				2.1%	

Note) Refinancing Rate: near to official discount rate in Japan
Treasury Bill Rate: near to ordinary deposit interest in Japan
Employees and Unemployment Rate in 2010 are values in the first quarter of 2010.
(Source:1998 - 2008 data from International Financial Statistics of IMF, 2009 and 2010 data from Ministry of Finance of Kazakhstan and the National Bank of the Republic of Kazakhstan)

Table 4- 9 GDP and GDP per Capita of Kazakhstan

	Nominal GDP	Real GDP (2005price)		Deflator		GDP Based on USD		GDP per capita
	Billion Tenge	Billion Tenge	%	2005=100	%	Billion USD	%	USD/capita
1998	1,653	3,882	-2.5	42.6		21.1		1,383
1999	2,015	3,990	2.7	50.5	18.6	16.9	-20.1	1,118
2000	2,590	4,424	9.8	58.5	15.9	18.2	8.1	1,218
2001	3,158	5,114	13.5	61.7	5.5	21.5	18.1	1,444
2002	3,529	5,670	9.8	62.2	0.8	23.0	6.9	1,542
2003	4,465	6,251	9.3	71.4	14.8	29.8	29.7	1,990
2004	5,873	6,915	9.6	84.9	18.9	43.2	44.7	2,862
2005	7,658	7,658	9.7	100.0	17.7	57.6	33.4	3,793
2006	10,262	8,477	10.7	121.1	21.1	81.4	41.2	5,319
2007	12,602	9,181	8.3	137.3	13.4	102.8	26.3	6,670
2008	16,307	9,475	3.2	172.1	25.3	135.6	31.9	8,734
2009	15,574	9,589	1.2	162.4	-5.6	105.6	-22.1	6,751
2010	17,801	10,260	7.0	174.3	7.3	120.8	14.4	7.669
2010/05	18.4%	6.0%		11.8%		16.0%		15.1%

Note） Real GDP growth rate in 2010 is estimated by well-known person in Kazakhstan (None official estimation)

(Source: IMF statistics and EBRD Economic Indicators)

Table 4- 10 Trends of Foreign Debt, Government Expenditure and Debt

	Nominal GDP		Foreign Debt		Government Expenditure		Government Debt	
	Billion USD	Growth Rate	Billion USD	Growth Rate	Billion USD	Growth Rate	Billion USD	Growth Rate
2001	21.5		13.0					
2002	23.0	6.9	20.8	60.0				
2003	29.8	29.7	22.9	10.1	6.65		4.47	
2004	43.2	44.7	32.9	43.7	9.81	47.6	4.92	10.2
2005	57.6	33.4	43.4	31.9	12.84	31.0	4.67	-5.3
2006	81.4	41.2	74.1	70.7	16.44	28.0	5.45	16.9
2007	102.8	26.3	96.7	30.5	24.88	51.3	5.96	9.3
2008	135.6	31.9	106.1	9.7	34.58	39.0	9.22	54.6
2009	105.6	-22.1	117.9	11.1			15.00	62.6
2010	120.8	14.4	112.8	-4.3			21.91	46.1
2010/05	16.0%		21.0%				36.2%	

*1: Foreign Debt includes foreign company debt and short debt. When the two debts exempted, 56.0 in 2006, 80.0 in 2007, 88.0 in 2008 (unit: Billion USD)

(Source: EBRD Economic indicators, Ministry of Finance of Kazakhstan, National Bank of Kazakhstan Jan 2011）

Table 4- 11 Ratios of Foreign Debt, Government Expenditure & Government Debt to GDP (Unit %)

	Foreign Debt Ratio to GDP	Government Expenditure Ratio to GDP	Government Debt Ratio to GDP
2003	69.7	22.3	15.0
2004	53.0	22.7	11.4
2005	57.1	22.3	8.1
2006	53.3	20.2	6.7
2007	72.1	24.2	5.8
2008	71.3	25.5	6.8
2009	100.5		14.2
2010	93.4		18.1

(Source: EBRD Economic indicators, Ministry of Finance of Kazakhstan, National Bank of Kazakhstan Jan 2011）

Kazakhstan has maintained high economic growth at around 10 % under world high crude oil prices since 2000. However, the current economic growth rate has slowed down due to the world monetary crisis in 2008. Especially, the GDP has had low growth rates down to 3.2 % in 2008 and 1.2 % in 2009. However, there is the possibility of a substantial economic rebound at a 7.0 % growth rate in 2010. However, this is just an estimate.

During that period, Government expenditure increased more rapidly than the nominal GDP, as the results, the Government debt ratio to GDP increased from around 6 % during 2006 - 2008 to 14.2 % in 2009 and 18.1 % (estimation) in 2010.

The Government makes an effort to ensure that the Government debt ratio does not become over 15 %. The Government faces a difficulty in handing their expenditures in parallel with attempts to resolve domestic monetary sector problems.

(2) Current Economy Situation

The current Kazakhstan economy is unstable due to the lingering effects of the world monetary crisis. According to Kzakhstan Central Bank (Report in March 2010), the current economy of Kazakhstan is affeted by a delay of world economic recovery, low prices on the international commodity market and uncertainty in the international monetary market. This have all had a negative impact to Kazakhstan's economy.

According to statistics, Kazakhstan's GDP growth rate was at 1.2% and the reduced prices of the raw materials and reduced energy prices worked in favor of the manufacturing sector. However, for an energy exporting nation like Kazakhstan, the brent crude oil price that decreased from $97/bbl in 2008 to $62/bbl in 2009 had a strong negative impact on exports with the amount of exports decreasing from 7.2 billion USD (from the export component in GDP) in 2008 to 4.3 billion USD in 2009. In other words, this reveals that Kazakhstan's exports are greatly affected by fluctuation of international energy prices.

After the monetary crisis, three domestic commercial banks in Kazakhstan declared a "Default" in order that foreign debt repayments of banks are required by foreign banks. Therefore, the Government makes depositors regulate withdrawal of their deposits. It is limited to obtaining capital funds from the current monetary market in Kazakhstan, at the same time, foreign banks and monetary institutes close their doors to the monetary sector in Kazakhstan. Therefore, the Government makes efforts find new monetary resources.

After 2009, investment in Kaskhstan decreased rapidly, Foreign Direct Investment (FDI) in 2009 decreased 20 % compared to 2008. As for the reasons of the decrease, there are shrinking investments in the manufacturing and monetary sectors, especailly FDI in the manufacturing sector decreased in iron & steel and non-ferrous steel industries. When looking at FDI trends of the central bank, the values are 11.1 billion USD in 2007, 14.6 billion USD in 2008 and 11.7 billion USD in 2009. A big decrease can be seen in 2008 and 2009. However when comparing FDI to other emerging countries, as the FDI is not so high, it can be considered that the FDI is affected

by delays of one or two big projects in Kazakhstan.

According to the "Current situation on Politics & Economy in Kazakhstan (March 2010)" published by the Japan Association for Trade with Russia & Central-Eastern Europe, the following items have been pointed out as problems concerning the economy and investments in Kazakhstan.

① Inefficency of FDI Promotion Activities

The Government established "KAZNEX invest" for improving the inefficiency of FDI promotion activities. The purposes of the KAZNEX invest are promotion of FDI and supporting the export of Kazakhstan companies.

② Exsiting Structual Economic Risks

It is pointed out that the economy is influenced by international energy prices. Although oil producing countries have the same problems, it is required that the Kazakhstan economic structure be changed from an oil and energy oriented economy to a high value added economy.

③ High Ratio of Underground Economy

According to Kazakhstan documents, it is said that the size of the underground economy is 20 % - 30 % of GDP, even though this is an unofficial estimate. There is another estimate stating that the size will reach 40 % of the GDP. (In Indonesia, one third of imported goods was smuggled goods 20 years earlier) Measures to halt this undergroud economy are required.

④ Start EAEC from January 2010

The Eurasian Economic Community (EAEC, the members will be Russia, Belarus, Kazakhstan, kyrgystan and Tajikistan) will be established with the purpose being the promotion of free trade among the countries. EAEC at the initial stage was started by three countries; Russia, Belarus and Kazakhstan since 2010. However, the free trade agreement sometimes brings about industry stagnation and foreign debt in the foreign trade balance if the country does not have a competitive advantage that will allow it to thrive in the international marketplace.

⑤ Geological Imbalance of Investment Activities

Past investments were concentrated in Almaty city, Astan city, Caspian sea area, Western Kazakhstan province, Atyrau province, Mangystau province and Kyzylorda province. The shares total 60 %. It is said that 80 % of 8,300 foreign companies (the data in 2009) operates in this area.

⑥ Sector Imbalance of Investment Activities

In Kazakhstan, there are 38 companies in the energy sector from among 100 big companies. The shares of oil and gas industry carries much weight in the economy. In the future, multi and diversified development are required and export-oriented business are required because the domestic demand of a 15-million population is so small.

⑦ Low Level of Fixed Capital Formation

The ratio of fixed capital formation to GDP in Kazakhstan has been kept at 17 % - 18 % for a long time. However it went down to 5 % - 7 % in 2009. There are emerging countries where the share of fixed capital formation to GDP reaches 40 %. In the future, the increase of savings by people and investments for fixed capital formation are required by the country.

4.1.4 Policy on Industry

(1) National Programs for Industry Innovation and Development Promotion up to 2014

The Government approved "National Programs for Industry Innovation and Development Promotion up to 2014" in Feburuary 2010. The following targets in the period are shown in the program.

① Enhance GDP growth with a 50% increase from 2008 to 2014(the growth rate is 7.0 % per year)
② Enhance labor productivity in the manufacturing sector with a 50 % increase from 2008 to 2014
③ Enhance the non raw material export ratio with a 40% increase from 2008 to 2014
④ Inhibit energy consumption per GDP with a 10% decrease from 2008 to 2014

(2) Focused Investment Projects

For achieving the five year industry plan, the Government approved around 30 projects in September 2009, even though the order of the announcement is upset to "National program for industry innovation and development promotion up to 2014". In the projects, the following 12 projects are energy and energy intensive projects.

① Expansion and renovation of No.2 fired power station in Ekybastauz
② Expansion and renovation of No.1 fired power station in Ekybastauz
③ Construction gas chemical plants in Atyrau province
④ Construction a fired power station in Barhasi
⑤ Construction a hydro power plant in Moinak
⑥ Construction a hydro power station and a fired power station in Akshabrak
⑦ Construction a hydro power station and a fired power station inUralsk city
⑧ Modernization of power grid networks in the counytry wide
⑨ Modernization and renovation of an oil refinery plant in Atyrau province
⑩ Modernization and renovation of an oil refinery in Pavlodar province
⑪ Production of potassium fertilizer
⑫ Production of sulphuric acid

Regarding the number of projects per sector, the power sector is 7 projects, the oil sector is 2

projects and the chemical sector is 3 projects. By implementing the above projects, achieving an annual 7 % GDP growth, increase of labor productivity in the process industry, promotion of the chemical and construction material industry and the improvement of energy efficiency in the power sector are attempted.

4.2 Environment

4.2.1 Principles on Global Environment

(1) Framework of Efforts on Global Environment Protection

The Government of Kazakhstan ratified the United Nations Framework Convention on Climate Change (UNFCCC) in May 1995 and the Kyoto Protocol to the Framework Convention on Climate Change (hereinafter referred to as "Kyoto Protocol") in April 2009. Based on those international frameworks, Kazakhstan began efforts to meet requirements of the UNFCCC and the Kyoto Protocol at the national level. The framework for global environmental protection of the Government of Kazakhstan is as shown below.

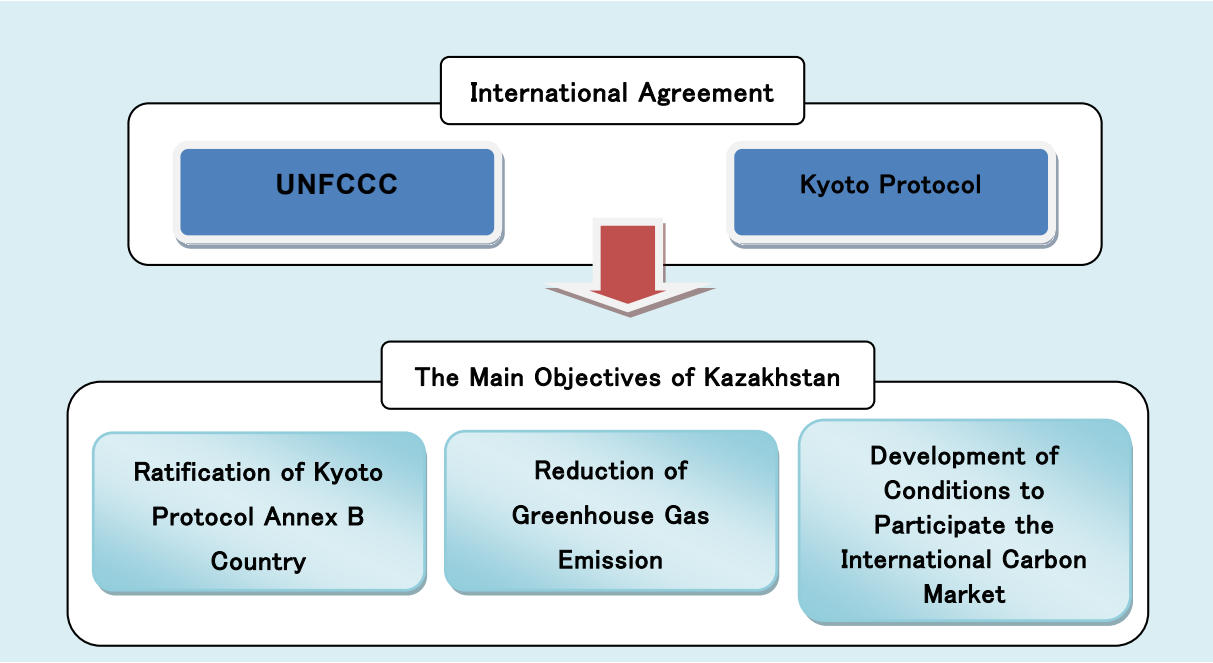


Figure 4- 2 Framework of Global Environment Protection

In Kazakhstan, the legal framework to meet the requirements of the UNFCCC and the Kyoto Protocol has been under preparation. Furthermore, legislation works have been underway by the relevant ministries, including the Ministry of Environment Protection (MEP) and the Ministry of Industry and New Technology (MINT).

In the legal system of Kazakhstan, the Constitution of the Republic of Kazakhstan is the superlative law over any legislation in the country. According to the Constitution, the parliament

approves the laws of the Republic of Kazakhstan. For detailed regulations, the orders by the President of the Republic, the Government, and the Ministries are legislated based on the governing laws of the Republic. Since any orders by the Government or any ministry without a standing law cannot be legally binding, the implementation of an effective legal system always requires legislation of the laws of the Republic.

The basis of the national policy on environmental protection is "the Conception on Environmental Safety of Kazakhstan" which was approved by the Presidential Order of April 30, 1996. After that, the Presidential Order No. 1241 of December 3, 2003, approved "the Conception of Environmental Safety of Kazakhstan for 2004-2015", which aims at ensuring national efforts for environmental safety and sustainable environmental development in the country. The conception addresses the global environmental problems to be tackled by the country, including climate change, ozone depletion, conservation of biodiversity, and land desertification and degradation.

In January 2007, the Ecological Code was legislated as the law of the Republic. By the code, regulations on global warming including emissions of greenhouse gas (GHG) were introduced in the country for the first time. In July 2009, by the initiative of the President Nazerbayev, the Department of the Kyoto Protocol was established in the Ministry of Environmental Protection (MEP) in order to enhance institutional capacity.

The current development of a legal framework on global environmental protection in Kazakhstan is summarized in the following table.

Table 4- 12 Legal Framework on Global Environmental Protection in Kazakhstan

Responsibility	Ratification of Kyoto Protocol Annex B Country	Reduction of GHG	Participation to International Carbon Market
The law of the Republic of Kazakhstan	・The Ecological Code (under amendment) ・The Law of the Republic of Kazakhstan "About Support of Use of Renewable Sources of Energy" ・The Law of the Republic of Kazakhstan "on Energy Saving and Increasing Energy Efficiency" (under discussion in MINT)		
Government Order		・Government order on the Law of the Republic of Kazakhstan "About support of use of renewable sources of energy" ・ Government order on prohibiting gas flaring and venting into the atmosphere (Amendments of the Petroleum legislation)	
Ministry of Environmental Protection	The Ecological Code (under amendment)		
Ministry of Industry and New Technology		The Law of the Republic of Kazakhstan "on Energy Saving and Increasing Energy Efficiency" (under discussion in MINT)	
Ministry of Oil and Gas		The Gas Utilization Program	

(Source: Made by the JICA Study Team)

(2) Legislation on Ratification of the Kyoto Protocol

For the framework of the Kyoto Protocol, amendments of the Ecological Code are being processed. Therefore, there is no legal standing in the law for carbon trading. The enforcement of the amended Ecological Code enables the implementation of internal carbon trading and JI projects. However, the approval of the amended Ecological Code by parliament which was expected to be done by September 2010 was delayed and as of March 2011is still not yet completed[1].

(3) Legislation on Reduction of GHG Emissions

The procedures and requirements on the reduction of GHG emissions were approved by the Ministry Order No. 70-p of the Ministry of Natural Resource and Environment Protection at the time. However, since Kazakhstan did not ratify the Kyoto Protocol, the Ministry of Justice did not approve it as an effective law. Therefore, for the implementation of the Ecological Code, regulations on the source of GHG emissions and the consumption volume of ozone depletion required Governmental Resolution No. 124 of February 28, 2008.

For the use of renewable energy, the Law on Support for Use of Renewable Energy (hereinafter referred to as the "Law on Renewable Energy") was enacted in July 4, 2009 since it is key to redeeming the obligations by UNFCCC. It stipulates that legislation of the country in the area of renewable energy sources utilization support is based on the Constitution and consists of the Law and other normative legal acts of the Republic. It also refers to the rules of the international treaty stating that they shall apply in those cases where an international treaty ratified by the country establishes other rules than the present Law. In addition, the Government Order No. 1529 of October 5, 2009 was enforced for the rules of realization of monitoring for the use of renewable energy according to subparagraph 3) article 5 of the Law on Renewable Energy.

Besides that, MINT prepared a draft law on energy saving and increasing energy efficiency which is under discussion within MINT as of March 2011.

4.2.2 Policies on Global Environmental Protection

(1) Policies on Reduction of GHG Emissions

It has been pointed out that the largest source of GHG emissions in Kazakhstan is the oil industry which is the most important sector in the Kazakh economy. As a countermeasure of GHG emissions, the oil industry was required to utilize associated gas since most of the associated gas in the oil exploitation field were flared and caused enormous volume of GHG emissions.

Kazakhstan participates in "the Global Gas Flaring Reduction-A Public-Private Partnership" which is led by the World Bank (WB) and has been made efforts to reduce the flaring and venting of associated gas.

[1] It is expected that the approval on the amended ecological code by the parliament will be further delayed because of the presidential election scheduled on April 3, 2011. In February 2011, the President Nazarbayev expressed to set the presidential election before the presidential term by the end of 2012.

Since the Petroleum Code was amended on July 1, 2006, the flaring and venting of associated gas is prohibited. The sustainable utilization of associated gas is required.

By these regulations, all the petroleum production companies, including the state-owned company KazMunaiGas, were required to take measures to utilize associated gas. The major utilization measures are as follows:

- Utilization for power generation and heat supply by small gas turbines
- Collection of associated gas and stockpiling at natural gas facilities
- Reinjection into the ground
- Production of Liquefied Petroleum Gas (LPG)

(2) Policies on Harmonization of Environment and Development

(a) Green Growth Program 2010-2014

In 2010, the Government of Kazakhstan approved "the Green Growth Program 2010-2014". The Program aims at implementing national efforts for climate change, low carbon economy, and increasing energy efficiency. MEP is responsible for implementing the program.

The Green Growth Approach was proposed at the 5th Ministerial Conference of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). It is a strategy framework to realize sustainable development as well as achieve harmonization of those activities concerning the Millennium Development Goal (MDG) 1 of poverty reduction and MDG 7 of sustainability of the environment.

The Green Growth Program of Kazakhstan introduces the concept of the Green Growth Approach proposed for the international community.

(b) Green Bridge Initiative

In October 2010, "The Astana Green Bridge Initiative" (hereinafter referred to as "the Astana Initiative") was adopted by the 6th Ministerial Conference on Environment and Development in Asia and the Pacific of ESCAP, which was held in Astana, the capitol city of Kazakhstan.

The Astana Initiative proposes a number of areas and activities suitable for programs to begin implementation of the Europe-Asia-Pacific partnership. As the host country for the 7th Ministerial Conference "Environment for Europe" in September 2011, Kazakhstan, which is a country located in the center of Eurasia connecting between Asia and Europe, intends to facilitate the process of bridging environmental policies and best practices between the Europe, Asia and the Pacific regions. The proposed areas for cooperation under the Astana Initiative are as follows:

- Eco-efficient use of natural resources and investment in ecosystem services
- Low-carbon development and adaptation to climate change
- Promotion of sustainable urban development
- Promotion of green business and green technology
- Promotion of sustainable lifestyles and improvement of quality of life

Kazakhstan has been promoting the implementation of the Astana Initiative with the establishment of the Green Bridge Office in MEP. The Green Bridge Office prepared "the

Preparation Partnership Program on the Realization Astana Initiative "Green Bridge for 2010-2020" which is a kind of action plan of the Astana Initiative, by the cooperation of ESCAP and UNDP.

The action plan was just completed and has started the first stage to send request letters for the countries expressing their interests in the Astana Initiative to call project proposals. Since MEP does not specify budgets for project implementation, the utilization of funds from donors including UNDP is under discussion in order to conduct feasibility studies for project implementation.

4.2.3 Implementation Structure of Climate Change Policy in Kazakhstan

(1) Ministry of Environmental Protection (MEP)

Kazakhstan's national policy in the area of the environment and climate change is implemented, supervised and coordinated by the Ministry of Environmental Protection of Kazakhstan.

The work of the MEP is guided by its Statute (http://eco.gov.kz/ministerstvo/min1.php) and the prescription of the Kazakhstan laws and Government decrees. Box 1 and Box 2 below describe the responsibilities and tasks of the MEP in the area of climate change as stipulated in the Statute.

Box 1. Responsibilities of the Ministry of Environmental Protection of Kazakhstan

- ✓ improvement of environmental quality, environmental safety and the achievement of reasonable levels of environmentally sustainable development;
- ✓ supervision and inter-sectoral coordination of the implementation of state policy in the sphere of environmental protection, environmental management and sustainable development;
- ✓ improvement of existing legislation in the field of environmental protection, natural resources and environmentally sustainable development;
- ✓ improvement of the functioning of public administration in the field of environmental protection and state environmental control, including improvement of economic and financial methods of environmental protection, as prescribed by law;
- ✓ optimization of the system for environment protection and environmental systems for sustainable development;
- ✓ promotion of international cooperation in the area of environmental protection and sustainable development;
- ✓ development of an information and capacity building system in the field of environmental protection;
- ✓ execution of state environmental monitoring in compliance with environmental laws, regulations and requirements.

Box 2. Tasks of the Ministry of Environmental Protection of Kazakhstan in the field of climate change (Source: Statute of the MEP)

- ✓ Promotion of international cooperation in the area of environmental protection and sustainable development, including the implementation of international treaties;
- ✓ Coordination of activities of individuals and entities in the field of climate change and ozone layer protection, biodiversity, desertification and land degradation;
- ✓ Establishment of the rules of procedure for preparation of inventory of greenhouse gases and ozone-depleting substances;
- ✓ Development of procedures for limiting, bans or reduction of greenhouse gas emissions and emission permit trading;
- ✓ Development of lists of best available technologies;
- ✓ Management of the national greenhouse gas inventory and the national inventory of ozone-depleting substances;
- ✓ Approval of the methodology for calculation of payment of emissions;
- ✓ Establishment of standards for maximum emissions of greenhouse gases and ozone-depleting substances;
- ✓ Establishment of limits for greenhouse gas emissions of individual sources of greenhouse gas emissions;
- ✓ Determination, in cooperation with the Kazakhstan national statistical authorities, of a list of regional and national organizations engaged in the data collection in the field of climate change and ozone layer protection across Kazakhstan;
- ✓ Conduct of an annual national inventory of greenhouse gas emissions and absorption;
- ✓ Establishment of procedures for the preparation of inventory of greenhouse gases and ozone-depleting substances;

The structure of the MEP is presented in the following figure (departments related to climate change marked in red).Two departments, namely the Department of Ecological Policy and Sustainable Development and Department of Kyoto Protocol, are actively involved in the implementation of climate change policy and are further supported by the work of two affiliated state-owned enterprises.

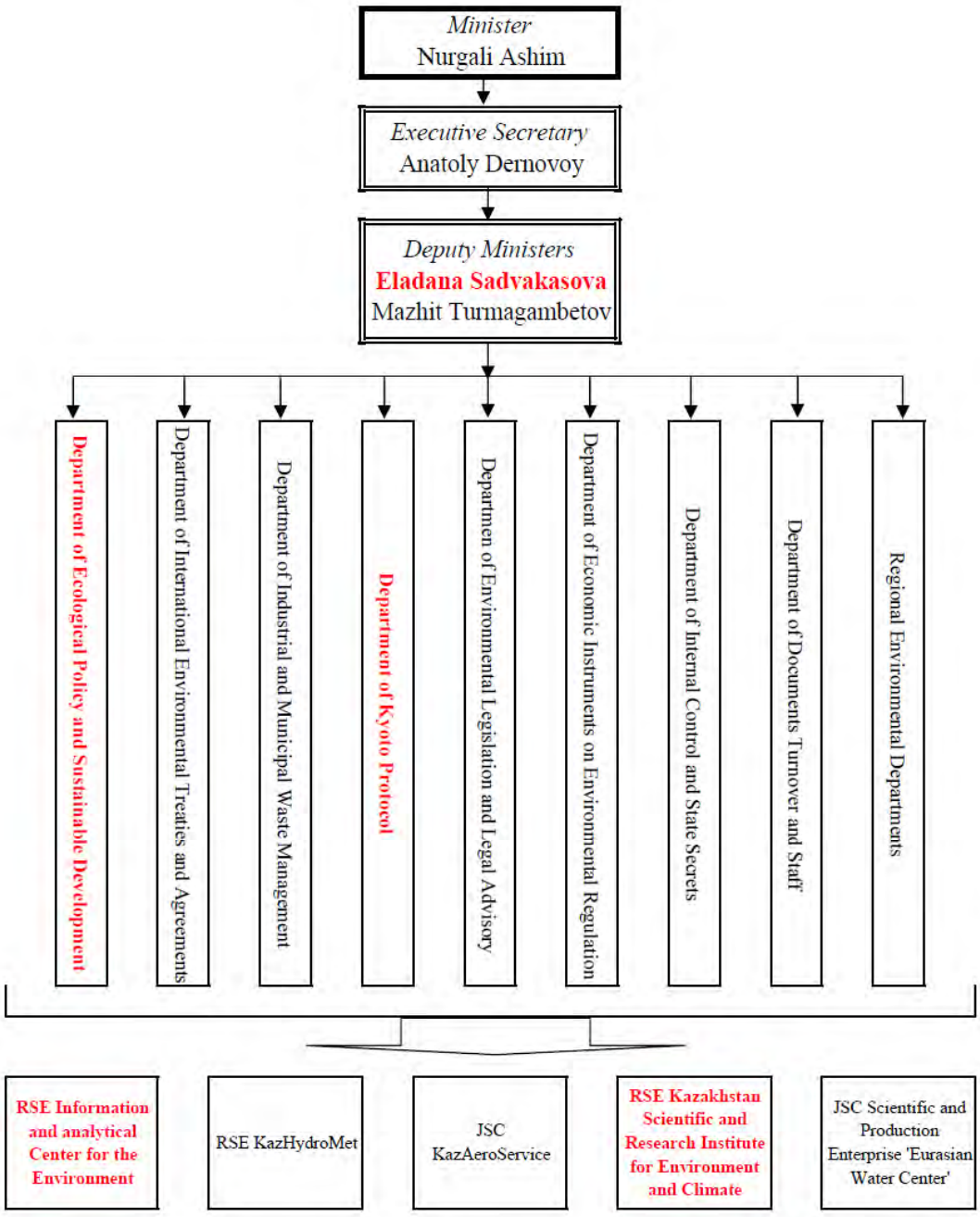


Figure 4- 3 Structure of the Kazakhstan Ministry of Environment (As of February 2, 2011)

- **Department of Ecological Policy and Sustainable Development** is responsible for environmental policy. The department coordinates the implementation of the 'Low Carbon Development Strategy of Kazakhstan', 'Sustainable Development Strategy of Kazakhstan' and 'Environmental Safety Strategy of Kazakhstan', which are indispensable elements of the country's overall climate change policy.
- **Department for International Environmental Treaties and Agreements** coordinates the work of Kazakhstan under all international conventions and treaties in the area of the environment that the country is a part of, except for the work under the Kyoto Protocol, which is coordinated by a separate department.
- **Department of Industrial and Municipal Waste Management** is in charge of coordinating and supervising the work related to waste management. They also set standards for landfill operations and management.
- **Kyoto Protocol Department** was formed after the ratification of the Kyoto Protocol by Kazakhstan in 2009 and coordinates the work of the MEP under this treaty. It took over the work that was conducted until then by the then-powerful NGO, C4. The department is in charge of controlling the implementation of the Kyoto Protocol, the process of meeting the eligibility requirements, including preparation of annual greenhouse gas inventory, operations of the Kazakhstan national registry, and others. The department is also coordinating the approval process for JI projects in Kazakhstan and is currently supporting the development of a national emission trading system.
- **Department of Environmental Legislation and Legal Advisory** is in charge of drafting environmental laws and providing legal support in the area of environmental protection.
- **Department of Economic Instruments on Environmental Regulation** is in charge of setting fines and taxes for the emissions of different pollutants controlled under the mandate of MEP.
- There are two other administrative departments that do not directly influence the policy implementation process of the Ministry.

(2) Governmental Organization

Under Kazakhstan laws, government entities, including ministries, are not allowed to conduct any economic activities, such as consulting. To overcome this limitation, each ministry, including MEP, establishes a set of state-owned companies (called republican-level state enterprises) under the direct subordination of the ministry, that are allowed, among others, to conduct economic activities in a particular area. MEP has established five affiliated companies.

- ✓ Information and Analytical Center for the Environment (IACE, www.iacoos.kz)
- ✓ KazHydroMet (www.meteo.kz)
- ✓ KazAeroService (www.kazairservcie.kz)
- ✓ Kazakhstan Scientific and Research Institute for Environment and Climate (KSRIEC, www.ecoclimate.kz)
- ✓ Scientific and Production Enterprise 'Eurasian Water Center'

(a) Kazakhstan Scientific and Research Institute for Environment and Climate (KSRIEC)

Kazakhstan Scientific and Research Institute for Environment and Climate (KSRIEC), based in Almaty, plays a pivotal role in designing the infrastructure needed for Kazakhstan to meet its commitments under the Kyoto Protocol. The institute is conducting research on the environment and climate change issues. Currently, it is also proposed to be the appointed working entity of Kazakhstan's Designated Focal Point under the Kyoto Protocol.

The institute has prepared draft laws on GHG inventory preparation; proposed changes in existing laws to allow Kazakhstan to fulfill its obligations under the Kyoto Protocol, including draft rules for JI project approval. It has also developed a draft law on the Green Investment Scheme in Kazakhstan.

The preparation of the national greenhouse gas inventory, a crucial element in the participation of Kazakhstan in the Kyoto Protocol system and capturing the dynamics of GHG emissions over time, is supervised by MEP, but has been executed by the KSRIEC. Kazakhstan has already submitted its National Inventory Report for the period 1990 – 2008 and it is undergoing review by the UNFCCC Secretariat.

The institute is currently in charge of preparing the Third National Communication of Kazakhstan to the UNFCCC and supports the Government in the international negotiation process. It has developed a website of the Kazakhstan DFP.

(b) Information and Analytical Center for the Environment (IACE)

Another relevant entity in the area of climate change is the Information and Analytical Center for the Environment (IACE). IACE is in charge of consulting and information support in the area of environment, including climate change. The center maintains and updates a number of environmental databases, including an environmental registry and a Geo Information System that monitors the environmental performance of different sectors of the Kazakhstan economy.

Following the 6th Ministerial Conference on the Environment and Development in Asia and the Pacific in 2010, a new environmental initiative called 'Green Bridge' was launched. The initiative aims at creating a platform for sustainable and environmentally friendly 'green' economic development, technology transfer and financing. The 'Green Bridge' is a possible alternative for the post-Kyoto period and can provide a drive for the successful development of emissions reduction projects. The management office of the 'Green Bridge' initiative is within IACE.

4.2.4 GHG Emission Trading: Regulations and Experience

In the area of emissions trading, Kazakhstan is working in two directions. On one hand, the country has developed procedures for approval of the Joint Implementation (JI) project under Article 6 of the Kyoto Protocol. On the other hand, it is currently actively working on the development of a national emission trading scheme. The ensuing section describes both developments.

(1) JI Project Implementation Procedures

(a) Outline

MEP is the Designated Focal Point (DFP) for JI projects in Kazakhstan. A draft JI project approval procedure called “Rules for verification, approval, registration and monitoring of GHG emission reduction projects” is published on the MEP website. However, due to the delays in the approval of amendments to the Environmental Code, the approval of the JI rules has also been delayed. According to the draft rules, JI projects are approved in two stages. In the first stage the project developer submits a Project Idea Note (PIN), which is reviewed and endorsed by MEP, and in the second stage a positively determined PDD is submitted, based on whether the project receives the final approval. A summary of the approval process is presented below.

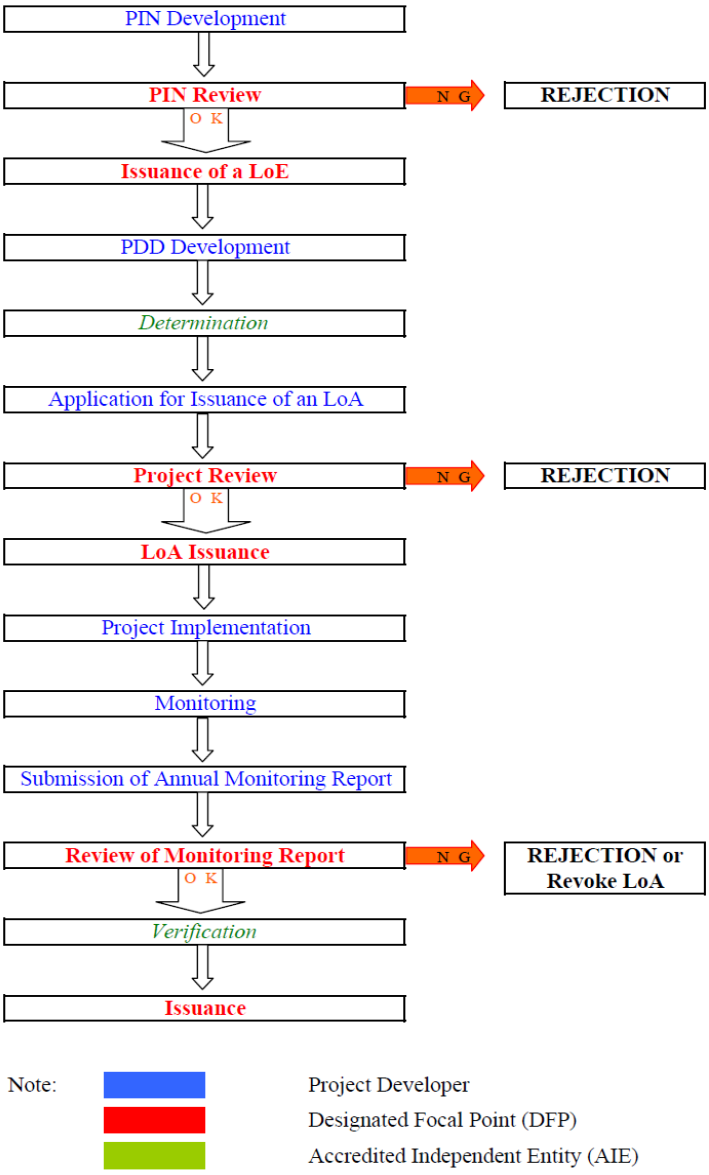


Figure 4- 4 Draft JI Project Approval Procedures in Kazakhstan (as of February 20, 2011)

(b) PIN Review and Project Endorsement

Project developers prepare a Project Idea Note (PIN) following the format included in the annex to the draft Kazakhstan JI rules and submit it to the Kazakhstan DFP. The DFP reviews the PIN and issues an opinion within 30 calendar days from the day of submission. The review is based on data from energy audits or scientific research to assess the project's potential for GHG emissions reduction. In the event that the DFP considers the further development of the project appropriate, it will issue a Letter of Endorsement (LoE). The following projects have not been reviewed by the DFP:

- ✓ Projects claiming emission reductions after December 31, 2012.
- ✓ Project not following the relevant guidelines

(c) PDD Development, Project Approval and Registration

Projects that have received an LoE are allowed to start developing a Project Design Document (PDD). The PDD should be developed in accordance with the JISC guidelines and following the approved formats. The project should undergo a determination and once it receives a positive determination opinion, it has to be submitted to the DFP for approval.

The application for approval consists of the following documents:

- ✓ Cover letter, including name, ownership and legal address of the applicant, and the economic sector where the project is implemented.
- ✓ PDD
- ✓ Final determination report

The DFP registers each application for project approval within 15 days of its submission and sends it to the relevant ministries and government entities for comments. The ministries who will be providing comments are to be selected depending on the project type. Within 30 calendar days, relevant government entities should review the projects and send to the DFP a positive or negative opinion accompanied by a justification note. Stakeholders, individuals and legal entities are also allowed to submit comments to projects.

Project approval is based on:

- ✓ information in the application documents;
- ✓ the determination opinion;
- ✓ comments by relevant ministries and government agencies;
- ✓ comments by stakeholders.

JI Project approval can be refused in the following cases:

- ✓ application for project approval is incomplete, incorrectly submitted or contains false information;
- ✓ the project did not receive a positive determination opinion.

Other reasons for project rejection may include:

- ✓ starting date of project operation is after December 31, 2012;
- ✓ there is a justified negative opinion on the project by one or several ministries or

government agencies;

- ✓ Expected emissions reductions from the project are more than the emissions reduction amount allocated for the particular industry/project type. The limits should be officially published by the DFP.

Within 10 days after project approval, the DFP informs the national registry operator regarding project approval and the registry operator reserves the amount of AAUs necessary for ERU issuance within the commitment period.

(d) Registration under JI Track 1 and Track 2

JI projects can be registered under two different procedures called Track 1 and Track 2. In case the host country (e.g. Kazakhstan) does not meet all eligibility criteria under the Kyoto Protocol, it should apply the Track 2 procedure; under which final project determination and approval for ERU issuance is provided by the JISC. On the other hand, if the host country meets all eligibility criteria, JI projects are approved under a bilateral process called Track 1, which does not involve any JISC approval. Currently, most JI projects are implemented under Track 1.

The Kazakhstan draft national regulations do not differentiate between Track 1 and Track 2 projects. Under the decision of COP 16, projects from Kazakhstan can be submitted to JISC under the Track 2 procedure, although issuance can be completed only after Kazakhstan officially joins Annex B of the Kyoto Protocol. Therefore, procedure-wise, Track 2 presently remains the only option for JI projects in Kazakhstan as of now.

(e) Project Monitoring

Kazakhstan has introduced a preliminary monitoring report screening by the DFP. All projects have to be submitted to the DFP annual monitoring reports by the end of March of the year following the monitoring period year. Among others, monitoring reports should contain explanation of the differences between the emissions reductions estimated in the PDD and the actual emissions reductions. Monitoring reports are reviewed by an inter-ministerial committee. Only projects that have received a positive opinion by the committee can be submitted for verification. The inter-ministerial committee can reject monitoring reports, and, in extreme cases, decide to revoke the approval of JI projects. Project approval can be revoked due to the following reasons:

- ✓ several prolonged delays in submission of the monitoring reports;
- ✓ inclusion of false information in the monitoring reports;
- ✓ failure to achieve the originally estimated emission reductions;
- ✓ lack of an identified buyer (no signed ERPA) for more than 12 months after the date of project approval by the DFP;
- ✓ revoked project approval by the investor country;
- ✓ bankruptcy of the project developer.

(2) Domestic Emission Trading Scheme (ETS)

The development of a domestic emission trading scheme in Kazakhstan is another priority of the country on the road to meeting its obligations under the Kyoto Protocol. The Environmental Code of Kazakhstan stipulates in Ar. 313 limits on the amount of GHG emissions. The exact limits and the organization of an emission trading scheme are to be regulated under separate future Government decrees.

Currently a draft law amendment of the Environmental Code has been submitted to the Parliament of Kazakhstan. The amendment is aimed at creating a clearer and stronger legal foundation for the operation of the Kazakhstan domestic ETS with the aim of connecting it to the EU ETS in the future.

Parallel to the legislative process, capacity building for emissions trading is gaining impetus. For example, a Dutch consulting company, Climate Focus (www.climatefocus.com), together with the Regional Environmental Center for Central Asia (CAREC, www.carecnet.org) is assisting MOEP in the establishment of a Kazakhstan domestic ETS.

A Kazakh NGO, C4, in cooperation with the German Federal Ministry of Environment, Environmental Protection and Nuclear Security organized a series of seminars on emissions trading in 2010. In these seminars, representatives of the German government entities, EU ETS verifiers and carbon exchanges took part.

4.2.5 Kazakhstan's Experience with JI Project Implementation

The most significant role in the formation of the current climate change policy of Kazakhstan and JI approval rules was played by the Coordination Center for Climate Change (C4). Originally, C4 was supported by a USAID's program "Kazakhstan Initiative on Greenhouse Gas Reduction", which was active under the Clinton administration. Under the influence of C4, Kazakhstan initiated an amendment to the UNFCCC to include Kazakhstan in the group of Annex I parties for the purpose of the Kyoto Protocol (COP 5). This was the first example of a non-Annex I country to transit to Annex I.

C4 was also a temporary DFP of Kazakhstan, participating in project identification, approval, and promotion. However, due to uncertainty with Kazakhstan's status under the Kyoto Protocol, no JI project has been implemented as of now. At the same time, several attempts were made to develop JI projects.

The first ever JI project in Kazakhstan was developed in cooperation with Japan as a model energy-saving project at Uralsk CHP plant. On the Kazakhstan side, the then-Ministry of Energy and Mineral Resources was involved. The expected GHG emissions reductions from this project were approximately 62,000 ton-CO_2/yr. The project has received approval by the Kazakhstan and Japanese governments. It is expected that once the Kazakhstan officially attains Annex I status, the generated emissions reductions will be transferred.

After the ratification of the Kyoto Protocol by Kazakhstan in 2009, it has been reported that EBRD, WB and the Clean Technology Fund have identified 17 potential JI projects (HPP and

small CHP using associated gas). Additionally, negotiations are being conducted with the German Federal Ministry of Environment, Environmental Protection and Nuclear Security for development of JI projects in the area of renewable energy and waste management.

A list of potential JI projects has been currently uploaded on C4's website.

Table 4- 13 JI Project Ideas Uploaded on C4's Website

№	Project	Preliminary CO2 emissions reductions ton/year
1.	Program of tree-planting of for semi-abandoned and barren lands on the territory of Kazakhstan	1,500,000
2.	Building of gas turbine power station 126 MW in Almaty	756,000
3.	Construction of centralized heating source, main and district heating systems in Saran, Karaganda region	50,000
4.	Merke hydro power station – 3 on Merke river, Zhambyl oblast	12,000
5.	Constructing of Kandyagash gas turbine power station with capacity 127 MW in Kadyagash city, Aktobe oblast	380,000
6.	Constructing of gas turbine power station in Atyrau city	445,000
7.	Issyk small hydro power station - 1	20,000
8.	Issyk small hydro power station - 2	28,144
9.	Issyk small hydro power station – 3	7,020
10.	Bartogay small hydro power station -28	100,000
11.	Shelekskaya small hydro power station -27	92,000
12.	Shelekskaya small hydro power station -29	105,000
13.	Shelekskaya small hydro power station -26	68,000
14.	Shelekskaya small hydro power station -25	76,000
15.	Shelekskaya small hydro power station -24	54,600
16.	Shelekskaya small hydro power station -23	94,800
17.	Shelekskaya small hydro power station -22	58,300
18.	Shelekskaya small hydro power station -21	43,300
19.	Shelekskaya small hydro power station -20	69,400
20.	Shelekskaya small hydro power station -19	35,100
21.	Small hydro power station on Kara River	20,600
22.	Small hydro power station on Shezhe river	23,500
23.	Small hydro power station on Tentek river (Komek)	33,377
24.	Reconstruction of sewage-purification facilities in Shymkent city	32,300
25.	Using of mobile compressor stations during the repair of on gas pipeline	157,114
26	Disposal of high-B.T.U. waste gases from high-carbon ferrochrome production in DC closed-top furnace at Aktobe Ferroalloy Plant	237,064

Examples of Project Idea Notes (PIN) for the following projects have also been published on the same website.

1. Access to information and promoting public participation in implementation of projects related to GHG emission reduction
2. Rehabilitation of Hydro Power Plants (HPPs) on the Charyn River: Aktogay #2 HPP (1000 kW) and Aktogay #1 HPP (800 kW).
3. Improvement of the efficiency of the heat-supply system
4. Development of a heat supply system
5. 5 MW Wind Power Station in Yereymentau
6. Use of methane from the mines of the Karagandy Coal Basin
7. Construction of Kerbulak HEPP of 49.5 MW capacity
8. Nurly 500MW Wind Power Station

Project origination and development work under JI, and possibly GIS, has been recently taken over by private business organizations. An active player in the carbon market is a newly formed company, KazCarbon (www.kzc.kz). The main activity of KazCarbon is the realization of flexible Kyoto protocol mechanisms, the integration of new tools and mechanisms of the post-2012 regime aimed at the modernization of the carbon intensive economy, improvement of the environment, mitigation of impact from climate change and the improvement of the quality of life in Kazakhstan. KazCarbon is backed by KazEnergy, an association of companies in the oil and gas sector. It is expected that private sector will start playing a more significant role in the formation of the carbon market in Kazakhstan.

4.3 Policy on Energy

4.3.1 National Policy

(1) Kazakhstan 2030 Strategy

The national development policy on Kazakhstan was adopted in 1997 as the “Kazakhstan 2030 Strategy”. The strategy set up 7 long term priority fields as follows.

- National Security
- Domestic Political Stability and Societal Consolidation
- Economic Growth Based on an Open Market Economy with a High Level of Foreign Investments and Internal Saving
- Health, Education and the Well-Being Of Kazakhstani Citizens
- Energy Resources
- Infrastructure, more Particularly Transport and Communication
- Professional State

Regarding "Energy Resources" in the above priority fields, the following strategies have been further set up.

- Kazakhstan has large deposits of coal, uranium, gold and other valuable minerals.
- Kazakhstan has significant solar and wind energy potential.
- Regardless, Kazakhstan cannot satisfy the internal demands for a number of years. It is the result of a system of distribution, which goes back to the Soviet epoch and also the lack of a required infrastructure.
- Similarly, the shortage of required communications for exporting oil and gas to the world markets sharply reduces the opportunity to recover sufficient sources
- Strategy of energy resources utilization will include the following components.
  - Kazakhstan shall sign the long-term partnership with main overseas oil companies to attract the best state-of-the-art technology, know-how, and large capital for quick and effective utilization of our resources.
  - The system of pipelines for oil and gas exporting should be created.
  - The strategy on the utilization of fuel resources is directed to the attraction of interests of large countries to Kazakhstan and its role as a world fuel supplier.
- With the attraction of overseas investments, Kazakhstan shall accelerate the creation and development of the domestic energy infrastructure, and settle the problem of self-sufficiency and competitive independence.
- Efficient and expedient utilization of future profits drawn out of these resources.

(2) Strategic Plan 2020

The "Strategic Plan 2020", approved in February 2010 by the President, is the middle term strategic plan for the period from 2010 to 2019 to realize the fundamental strategy, "Kazakhstan 2030 Strategy". The Strategic Plan 2020 includes the following description.

(a) Achievement of the Previous Strategy, "Strategic Plan 2010"

The following items were achieved during the period of Strategic Plan the 2010.

- The annual average GDP growth 8.5 %, having exceeded the initial value 2.3 times over in 2008.
- In 2007, industrial production had already achieved the object of the ten years' period on doubling, and the agricultural production has grown 1.4 times.
- Considerable reformations have occurred in the spheres of public health services, education and the social protection of the population.
  - Disease of tuberculosis has decreased 30 %.
  - The population share with incomes below a living wage was reduced from 31.8 % in 2000 to 12.7 % in 2008.
  - Expected life expectancy has increased from 65 to 68 years.

(b) Key Directions of the Strategic Plan 2020

The strategy set forth the following principles during the period.

- Kazakhstan in 2020 will become the country which left the world crisis stronger and competitive, with a diversified economy and a population actively involved in the new economy.
- Kazakhstan will already be among the fifty of the most competitive countries in the world with a favorable business climate, allowing it to attract considerable foreign investments in the non-oil and gas sectors of the national economy.
- Kazakhstan will possess the human resources necessary for the development of a diversified economy, and also will have an infrastructure necessary to serve domestic entrepreneurs and exporters.
- The economy of Kazakhstan will increase in real expression for more than a third in relation to the 2009 level.
- The levels of gold and exchange currency reserves will not be lower than three months of imports or volume of short-term (up to 1 year) external debt of the state and corporate sectors of the country.
- Assets from the National Welfare Fund will not be less than 30 % of the GDP.
- A share of the population with incomes below a living wage will decrease to 8 %.

Besides, the strategy raised the following directions.

- Preparation for post crisis development.
- Maintenance of steady economic growth at the expense of the acceleration of diversification through industrialization and infrastructure development.
- Investments into the future – increase of competitiveness of human capital to achieve steady economic growth, prosperity and social well-being for the Kazakhstani people.
- Provision of qualitative social and housing and public utility services for the population.
- Strengthening the interethnic consent, safety, stability of international relations.

(c) Direction on Energy in Strategic Plan 2020

Direction on energy in the Strategic Plan 2020 is described in the second direction "diversification through industrialization and infrastructure development"

- Domestic industries also have considerable potential of energy savings.
- Along with the implementation of measures on the increase of the efficient use of energy escalating its manufacturing to satisfy internal requirements, especially in the western and southern regions is required.
- Work on the expansion and reconstruction operating and building of new capacities of power sources and the electro network enterprises will be spent.
- Within the limits of the development of the power sector, Kazakhstan will promote the achievement of the global purpose to reduce the emissions of greenhouse gases.

- One way to achieve the reception of cheaper, non-polluting energy is atomic engineering development. Nuclear power complexes will allow for the usage of available fuel and mineral resources optimally and sustainably.
- The share usage of alternative energy sources in the power consumption of the total amount comprises less than 1 %. The use of renewable energy such as hydro power and wind power will increase.
- In the electric power industry sector, the prices and rate-making reforms which will allow for the development branch in market conditions will be carried out.

Targets in the power sector have also been set forth as follows.

Table 4- 14 Targets on Power Sector (Strategic Plan 2020)

Year	*Expected Achievement*
By 2020	• *Manufacturing of energy from my own sources, satisfying the requirements of the economy, will comprise 100 %.* • *The usage share alternative energy sources in power consumption total amount will make more than 3 %.* • *The atomic power stations and the Balkhash Heat & Power Station are constructed and placed in operation.* • *The vertically-integrated company with a nuclear fuel cycle is created.* • *The existing generation power capacities and the distribution power networks are reconstructed and modernized.*
By 2015	• *The usage share of alternative energy sources in the total power consumption will comprise more than 1.5 %.* • *The first construction stage of Balkhash Heat & Power Station has been completed.*
By 2012	• *The long-term tariff policy of formations of the prices for the electric power and tariffs on transfer and electric power distribution has been developed and introduced.*

(3) Electric Power Industry Development Program in the Republic of Kazakhstan 2010-2014

The middle term plan for the power sector, "Electric Power Industry Development Program in the Republic of Kazakhstan 2010-2014", was developed by the Ministry of Industry and New Industry, based on the Strategic Plan 2020. The plan was approved by Government Decree issued by the Republic of Kazakhstan dated October 29, 2010, No. 1129. The plan set up the numerical targets and projects to be implemented as follows.

(a) Targets

The targets are aiming at stable and well-balanced growth of economics via the effective development of the electric power industry. Concrete targets are shown below.

- Electric power generation shall be brought up to 97.9 billion kWh in 2014 with 96.8 billion kWh forecast consumption (actual record in 2009: 78.4 billion kWh).
- The volumes of coal extraction shall be raised up to 123 million tons in 2014 (actual record in 2009: 94 million ton).
- The volumes of electric power generated by renewable energy sources shall be raised up to

1 billion kWh a year in 2014 (actual record in 2009: 0.37 billion kWh). The share of renewable energy sources usage shall be over 1.0 % out of total electric power consumption volume in 2015.

(b) Project List

The project list planned in the Electric Power Industry Development Program in the Republic of Kazakhstan 2010-2014. Sources of financing are categorized into 3 groups, namely the republican budget, owned funds and borrowed funds.

Table 4- 15 Project List (1/2) (million Tenge)

Ser.No	Action	Responsible for execution	Execution period	Assumed expenditures						Sources of financing
				2010	2011	2012	2013	2014	Total	
TOTAL:				202 673	272 634	238 799	160 877	76 673	951 656	
1. Building of new power producers.										
1	Uralskaya gas turbine power plant shall be built	"Management of a gas turbine power plant under construction in Uralsk" LLP	2010-2012	300	300	300			900	Own and borrowed funds
2	Gas turbine power plant in Akshabulak deposit shall be built	"Kristal Management» LLP	2007-2011	11 682	5 205				16 887	Own and borrowed funds
3	Balhashskaya thermal power plant shall be built	"Samruk Kazyna National Wealth Fund" JSC	2010-2015	39 700	89 218	83 076	50 283	36 830	299 107	Own and borrowed funds
3.1.				3 239	3 000	7 758	10 965		24 962	The republican budget
4	Moynakskaya hydropower plant shall be built	"Samruk Kazyna National Wealth Fund" JSC	2006-2011	10 332	12 996				23 328	Own and borrowed funds
5	Generating unit No. 3 at Ekubastuzskaya power plant-2 shall be built	"Samruk Kazyna National Wealth Fund" JSC "	2009-2013	15 136	44 144	44 615	10 335		114 230	Own and borrowed funds
2. Modernization and reengineering of current power producers.										
1	Expansion and reengineering of Atyrauskaya CHP shall be expanded and reengineered	"Atyrauskaya CHP" JSC	2006-2010	5 028					5 028	Own funds
2	Generating unit No. 2 at Aksuskaya power plant shall be reconstructed	"Eurasian Energy Corporation" JSC	2009-2011	6 790	858				7 648	Own and borrowed funds
3	Generating unit No. 8 at Ekibastuzskaya power plant-1 shall be reconstructed	"Ekibastuzskaya power plant-1" LLP	2010-2012	7 008	9 722	4 861			21 591	Own funds
4	Shardarinskaya hydropower plant shall be modernized	"Samruk Kazyna National Wealth Fund" JSC	2009-2015	3 563	2 319	2 200	2 457	2 273	12 812	Own and borrowed funds
5	Thermal power grid of Kazakhstan shall be expanded	MINT, MoF, akimats of oblasts, Astana and Almaty cities	-	63 056	47 243	64 066	50 234		224 599	The republican budget
6	Almatynskaya CHP-2 (phase 3,boiler house) shall be reconstructed and expanded	"Samruk Kazyna National Wealth Fund" JSC	2009-2012	203	9 099				9 302	The republican budget
7	Ash-and-slag disposal system and ashponds at Almatinskaya CHP-1 and CHP-3 shall be reconstructed and expanded	"Samruk Kazyna National Wealth Fund" JSC	2009-2012	1 597	1 061				2 658	The republican budget
3. Building and modernization of power grid objects.										
1	Transformer substations in Almaty and Almatynskaya oblast for the Asian Winter Games 2011 shall be built	"Samruk Kazyna National Wealth Fund" JSC "	2010-2012	12 848					12 848	The republican budget
2	5 transformer substations in Almaty and Almatynskaya oblast for an underground system shall be built	"Samruk Kazyna National Wealth Fund" JSC	2009-2011	6 153	9 813				15 966	The republican budget
3	"Alma" substation with 500 KV, connecting with the unified energy system of Kazakhstan with the voltage lines of 500, 220 KV shall be built	"KEGOC" JSC	2009-2014.		11 700			1 183	12 883	Own and borrowed funds
4	Scheme of power distribution of Moynakskaya hydropower plant	"KEGOC" JSC	2010-2012							Own and borrowed funds
5	The national electric grid, stage 2 (re-equipment at 55 substations) shall be modernized	"KEGOC" JSC	2009-2014							Borrowed funds

Table 4- 16 Project List (2/2) (million Tenge)

Ser.No	Action	Responsible for execution	Execution period	Assumed expenditures						Sources of financing
				2010	2011	2012	2013	2014	Total	
4. Building of infrastructure, increasing the capacities in coal-mining industry.										
1	"Bogatyr" open pit mine transport scheme reconstruction, switching to new motor and conveyer technology shall be completed	"Bogatyr Komir" LLP	2010-2014	4498	7714	13765	12410	13554	51941	Own funds
2	Technical projects concerning the coal production capacity expansion in "Severny" open pit mine from 10 to 18 mln tons a year, in "Vostochny" from 20 to 22 mln tons a year, "Ekibastuzsky" from 4 to 8 mln tons a year, "Maykubensky" from 5.3 to 8.5 mln tons a year, "Karazhyra"	"Bogatyr Komir" LLP, "Eurasian Energy Corporation" JSC, "Angrensor" LLP", "Maykuben vest" LLP", "Karazhyra LTD" LLP, "Saryarka - ENERGY" LLP	2010-2014	11487	18183	18158	24193	22833	94854	Own funds
5. Proposed for construction on conditions that funding sources are available.										
1	Distribution grids in Almaty and Almatynskaya oblast shall be reconstructed and built	"Samruk Kazyna National Wealth Fund" JSC	2010-2014							
2	Ash-and-slag disposal system in CHP-2 shall be reconstructed and expanded	"Samruk Kazyna National Wealth Fund" JSC	2009-2012							
3	Almatynskaya CHP-2 (phase 3, steam generating unit No. 8) shall be reconstructed and expanded	"Samruk Kazyna National Wealth Fund" JSC	2009-2013							
4	5 transformer substations in Almaty and Almatynskaya oblast for housing and public itilities shall be constructed and modernized	"Samruk Kazyna National Wealth Fund" JSC	2011-2013							
5	Kerbulakskaya hydropower plant shall be constructed	"Samruk Kazyna National Wealth Fund" JSC	2010-2014							
6	National electric grid shall be modernized, step 2 (aerial lines of 220 KV shall be constructed)	"KEGOC" JSC	2014-2016							
7	Aerial lines of central 220 KV substation in Oskarovka shall be reconstructed	"KEGOC" JSC	2010-2014							
8	Scheme of power distribution at Balkhashskaya CHP (first phase)	"KEGOC" JSC	2010-2014							
9	Intergovernmental aerial line of 500 KV in Kemin-Almaty (Kazakhstan-Kyrgyzstan) shall be constructed	"KEGOC" JSC	2012-2015							
10	Connection of the Pavlodarsky energy power node with the unified energy system of Kazakhstan shall be expanded	"KEGOC" JSC	2012-2017							
11	Aerial line of 500 KV - Ekibastuz-Shulbinskaya hydropower plant-Ust-Kamenogorsk (North-East) shall be constructed	"KEGOC" JSC	2012-2018							
12	Aerial line of 500 KV – Shulbinskaya hydropower plant –Aktogay-Taldykorgan-Alma (East-South) shall be constructed	"KEGOC" JSC	2014-2021							
13	Aerial line of 220-250 KV shall be rehabilitated	"KEGOC" JSC	2013-2020							
14	Objects in area of the renewable energy sources shall be constructed	MINT	2010-2014							
6. Development of regulatory and technical documentation in a sphere of the electric power industry										
1	Legal base in area of renewable energy sources shall be analyzed	MINT								
2	Normative-technical base in a sphere of electric power industry and coal industry shall be analyzed	MINT	2010-2011	53	59				112	The republican budget
3	"Concerning the making changes and additions in certain legal acts of Kazakhstan in electric power industry, investment activity of natural monopoly and controlled market subjects" legislation of Kazakhstan shall be developed.	AREM, MINT, MoF, Ministry of Economic Development and Trade, "KOREM" JSC, "KEGOC" JSC	December, 4-th quarter of 2010							Not required

4.3.2 Main Measures for Energy Efficiency

(1) Measure to Promote Renewable Energy

The Law on Renewable Energy was adopted in 2009 in order to promote the installation of renewable energy. Based on this law, renewable energy is defined as follows.

- Solar Power
- Wind Power
- Hydro Power (25 MW without modification of river system)
- Geothermal Power
- Ground Heat
- Heat of Underground Water, River and Water Basin
- Anthropogenic Resources of Primary Energy Sources (biomass, bio gas, other organic waste fuel)

The law stipulates the obligation of taking renewable energy as follows.

- Regional electricity grid companies, which have directly connected Renewable Energy Sources into the network, shall purchase the full volume of renewable electricity generated by respective qualified energy production organizations to cover up to 50 percent of electricity loss in the respective distribution network.
- If the renewable electricity generated by the qualified energy production organization exceeds the volume of 50 percent electricity loss corresponding to the regional electricity grid company, then the rest of such renewable electricity volume shall be purchased by the system operator to cover the electricity losses of the national electricity network.

The law does not clearly mention the replenishment for the cost recovery deficit of renewable energy and technical possibility to connect to the grid system. At this moment, the Government reviews the law to clearly stipulate these issues in a revised law.

(2) Progress of Development of Wind Power and Hydro Power

Regarding wind power, a 500 MW capacity was planned in April 1999 via the “Electricity Development Program until 2030”. After that, the UNDP conducted a project, the “Wind Power Market Development Initiative”, to formulate a framework for wind power development and identify potential sites. Based on the project, the Kazakhstan Government created a “National Program on Wind Energy Development”.

Besides, the said “Electric Power Industry Development Program in the Republic of Kazakhstan 2010-2014” indicated the promotion of renewable energy such as wind power and hydro power step by step and planned the wind power project, Shelek Corridor in Almaty (50 MW), and a hydro power project, Koksu river in Almaty (42 MW) as private projects.

(3) Measure to Promote Energy Saving and Efficiency

Regarding energy saving and efficiency, Ministry of Industry and New Technology (MINT) is now preparing the "Law on Energy Saving and Increasing Energy Efficiency" (hereafter, "Energy Saving Law") and discussing the draft version of the law within the Ministry (as of March 2011). The Energy Saving Law aims at establishment of obligatory rules and incentives as follows.

- Individuals and legal entities which consume a certain amount of total energy expenses in a year are designated as State energy sector entities.
- State energy sector entities must annually submit a report including energy consumption, an energy saving plan based on energy audits, energy intensity, etc. The State energy register entities shall create, launch and organize an energy management system in accordance with the international energy management standard ISO 50001.
- The design of buildings, structures, and constructions shall meet the energy efficiency requirements set forth by the Government of the Republic of Kazakhstan.
- The technical documentation and labeling of household energy consuming equipment sold on the territory of the Republic of Kazakhstan shall contain information on energy efficiency.
- Government support in the field of energy saving and energy efficiency improvements shall be provided in the following ways:
  - Promoting the use of energy saving equipment
  - Providing assistance in training activities in the field of energy saving and energy efficiency improvements and information support of energy saving and energy efficiency improvement events
  - Allocating budget funds for: implementation of energy saving and energy efficiency improvement programs; energy audits of public institutions; thermal modernization of public institutions; procurement and installation of metering devices, etc.

4.3.3 Implementation Structure of the Energy Industry

(1) Government and Governmental Agencies

(a) Ministry of Oil and Gas

The Ministry of Oil and Gas has been newly established for a responsible body for supervising oil and gas relating industries since March 2010, separating the sections of industry, electricity, and nuclear power from the former Ministry of Energy and Mineral Resources. On the other hand, the sections (industry, electricity, and nuclear power) have been merged into the newly established, Ministry of Industry and New Technology.

The Ministry of Oil and Gas is responsible for the following activities regarding oil and gas, petrochemical industries and the transport of raw hydro-carbons, etc.

- Pursue state policy and approve policy documents, normative legal acts.
- Along with the state body that administers in the area of natural monopolies and in regulated markets, confirm investment programs and/or investment projects to be

considered when approving tariffs (prices or fee rates) or their limits, and tariff estimates.

- By commission of the Government of the Republic of Kazakhstan, hold negotiations and conclude agreements with relevant bodies of other countries which enable the execution of contracts, construction, and operation of pipelines and other means of oil exporting transportation.
- Approve employment of main pipeline capacities and railroad trestles following the principle of fairness of each subsoil user.

Development of oil and gas, production, refinery and sales are mainly implemented by KazMunayGas which is one of the Government Organizations established by Samruk Kazyna as a 100 % shareholder. Samruk Kazyna has also been established by the Government on a legal basis since 2008.

KazMunayGas has 44 mining areas in Mangistau and Atyrau. The land transportation of oil is conducted by KazTransOil, gas transportation is conducted by KazTransGas and marine transportation is conducted by KazMorTransFlot. KazMunayGas is the main share holder of these companies (share stocks 65 %, 100 % and 50 % respectively).

In 2005, the Government established a “Program for Utilization of Accompanied Gas” that stipulates a utilization of accompanied gas. KazMunayGas has taken actions to install a cogeneration technology to use as much accompanied gas as much as possible.

(b) Ministry of Industry and New Technology: MINT

Ministry of Industry and New Technology (MINT), that was established in March 2010, is responsible for industry and industrial innovation, technological development, state support of investment, safety of machinery and equipment and chemical products, electricity, mineral resources, atomic energy, support of renewable energy, energy efficiency, and so on.

The Ministry consists of management (Minister, Vice Minister, etc.), the secretariat and other departments as shown below.

- Department of Industrial Policy
- Department of New Technologies
- Department of Local Contents and Analysis of Projects
- Department of Electricity and Coal Industry
- Department of Atomic Energy and Industry
- Department of Mining
- Department of International Cooperation
- Department of Protection of State Secrets and Mobilization Training
- Department of Strategic Planning
- Legal Department
- Department of Asset Management
- Finance Department
- Department of Personnel and Documentation Services

Department of Electricity and Coal Industry control the national power development plan including renewable energy, and power market development. The Department of New Technologies controls the policy framework such as laws on renewable energy and energy efficiency, etc.

(c) Agency for Regulation of Natural Monopolies

The Agency is responsible for the establishment and supervision of regulations to protect the mutual benefit of both customers and business operators regarding services where it is difficult to introduce to be competitive due to economic constraints. The Agency develops and approves non-discriminatory methodologies of rates (prices, charge rates) calculation or their maximum levels in the sphere of a natural monopoly.

The sectors to be targeted include the transport of oil and oil products, storage and transport of gas, transmission and distribution sectors, the production and transport of heat energy, railway sectors, airport sectors and the water sector, etc.

Regarding electricity tariffs, based on the law that was revised in 2007, the wholesale tariff from the generation sectors was liberalized because competitive circumstances were introduced.

(2) Governmental Organization

(a) Samruk Kazyna

The National Welfare Fund (Samruk Kazyna), a governmental asset control organization, was established merging "Kazakhstan Holding for the Management of State Assets Samruk" and "Kazyna Sustainable Development Fund" in order to efficiently implement national strategic projects via Presidential Decree in 2008.

Main companies under the Samruk Kazyna are shown below (% are Samruk stock shares). The underlined companies are those companies related to the power and oil/gas industries.

- **AES-Ekibastuz (50%)**
- Air Astana (51%)
- Aktobe Airport (100%)
- Astana Finance (26%)
- Kazakhstan Development Bank (100%)
- **Kazakhstan Electricity Grid Operating Company (100%)**
- Kazakhstan Mortgage Company (91%)
- Kazakhstan Temir Zholy (100%)
- KazakhTelecom (45.9%)
- Kazatomprom (100%)
- Kazmortransflot (50%)
- **KazMunayGas (100%)**
- Kazpost (100%)
- Kazyna Capital Management (100%)
- Maikainzoloto (100%)

- National Innovation Fund (100%)
- Pavlodar Airport (100%)
- **Samruk-Energo (93.42%)**
- SK-Pharmaceuticals (100%)

Samruk Kazyna participates in industry development programs initiated by the Government. As previously indicated, the national program, "Electric Power Industry Development Program in the Republic of Kazakhstan 2010-2014", shows that the Samruk Kazyna is a responsible body for some energy-related projects listed in the program.

(b) Samruk Energo

Samruk Energo was established in May 2007 and is responsible for modernizing existing power generation industries and development of new power generation in accordance with the national long term strategy. Samruk Energo, which is a subsidiary of Samruk Kazyna, holds major shares of some generation companies, mining companies and distribution companies. The main companies under Samruk Energo are shown below.

- Ust-Kamenogorsk Hydroelectric Power Station
- Ekibastuz 2 Coal Power Station
- Zhambyl State District Power Station
- Shulbinsk Hydroelectric Power Station
- Buhtarminsk Hydroelectric Power Station
- Bogatyr Komir Coal Mining Company
- Shardarinsk Hydroelectric Power Station
- Moinak Hydroelectric Power Station（Under Construction）
- Balkhash Coal Combined Heat and Power Station (Under Planning)
- AlmatyEnergoSbyt (Power Supply Company)
- Ala Tau Zharyk Kompanijasy (Transmission and Distribution Company)
- Mangistau City Distributive Electronetwork Company (Transmission and Distribution Company)

(c) Kazakhstan Electricity Grid Operating Company: KEGOC

Kazakhstan Electricity Grid Operating Company (KEGOC) was established in 1996 and is now a subsidiary company of the Samruk Kazyna. KEGOC has functions in construction, operation and maintenance of the national grid and central dispatching.

KEGOC has the power demand and supply data for the whole country and creates the draft power development plan including the transmission line to be submitted to the responsible body, MINT.

Transmission prices (wheeling charge) of KEGOC had been set up by having them divided up into 8 regional areas. However, since August 2010, a universal price (0.94 Tenge/kWh) was introduced regardless of regional areas.

KEGOC owns 220 kV – 1,050 kV high voltage transmission lines.

(d) Operator of Kazakhstan Operator of Electricity Market: KOREM

The Kazakhstan Operator of Electricity Market (KOREM) was established in 2000 and started the power trading market. KOREM is a 100 % subsidiary company of Samruk Kazyna.

The power trading market has two types of trading, namely "Short/middle/long term trading (spot, weekly, monthly and yearly)" and "Balance Trading". The former method is a scheduled trading system and the latter is an on-demand trading system that is to be quickly balanced between supply and power demand. Market trading can be conducted among generation companies, Regional Electric Grid Companies, Power Supply Companies and legal entity users which have more than 5 MW of demand.

According to the report of USAID (Report on the Development of Cross Border Trading Activity in Central Asia & Recommendations for Remap Further Assistance, 2007), the total volume of trading in the market was about 4,800 GWh in 2006. This was equivalent to about 7 % of total electricity sales in the whole of Kazakhstan (71,881 GWh in 2009, Source: Statistical Yearbook of Kazakhstan 2009).

(e) Regional Electric Grid Companies

In Kazakhstan, there are 21 Regional Electric Grid Companies by area. These companies receive electricity from KEGOC and power generation companies, etc. and operate distribution business (less than 220 kV) in each territory. A retail function was spun off from these companies to the Power Supply Companies since 2005 (partial electricity is directly sold to end users through the power trading market).

(f) Power Supply Companies

There are 45 Power Supply Companies which have retail functions to supply electricity to end users. These companies receive electricity from Regional Electric Grid Companies and power trading markets, etc. and sell it.

(3) Others

(a) KazEnergy

KazEnergy was established in 2005 as an independent non-commercial union of legal entities, which is challenged to promote the creation of favorable conditions for the dynamic and sustainable development of the fuel and energy sector. This association is operated with support from members in the oil and gas industries. There are 50 supporting members for KazEnergy.

The main activities of KazEnergy are lobbying activities for draft laws and programs representing the members, information sharing among the members, development and support of cooperation and entrepreneurship projects on local, regional and international levels etcetera.

KazCarbon is one of the subsidiaries of KazEnergy. KazCarbon has been established for the development of a carbon trading market and conducted surveys and analysis for carbon trading

affairs including Kyoto Protocol.

(b) Kazakhstan Electricity Association

Kazakhstan Electricity Association was established in 1999 as an NPO concerning power business industries. There are 33 members as of now. The association conducts coordination among members, protection of members' common benefits, lobbying for government programs and laws, international conferences, and so on.

4.3.4 Implementation Structure of Power Industry

(1) History of Power Industry

After achieving independence from the former Soviet Union, a national power utility, GEK Kazakhstan Energo, was established in 1992 and operated the whole power industries in Kazakhstan under a vertical integrated structure from generation to distribution. In 1996, the Government Decree adopted a restructuring plan for power business to introduce competitiveness in generation, transmission and distribution businesses via the horizontal separation of whole power industries. .

Via this restructuring, power industries were reformed as follows.

- All power stations were independent corporations.
- Facilities of primary transmission lines and dispatching functions were transferred to KEGOC.
- Regional distribution businesses were independent by area.

In addition to that, the power trading market was introduced since 2002.

(2) Current Implementation Structure

The current implementation structure of the power industry is shown below. The Ministry of Industry and New Technology basically manages the whole power sector. Only the tariff system has been regulated and supervised by the Agency for the Regulation of Natural Monopolies.

Power generation companies have been legal entities as corporation. However, the status of these companies is varied. Some companies are held by governmental organizations like Samruk Kazyna and the Samruk Energo, and others are privatized.

Power plants are categorized into 4 groups as follows, by scale and purpose.

- National Level Power Plants
- Local Level Power Plants
- Surplus Power of Power Plants for Industrial Use
- Heat and Power Plants

Electricity generated in the above plants is supplied to end users through KEGOC, Regional Electric Grid Companies and Power Supply Companies. There are various flows of electricity trading because the power trading market enables electricity trading among these players.

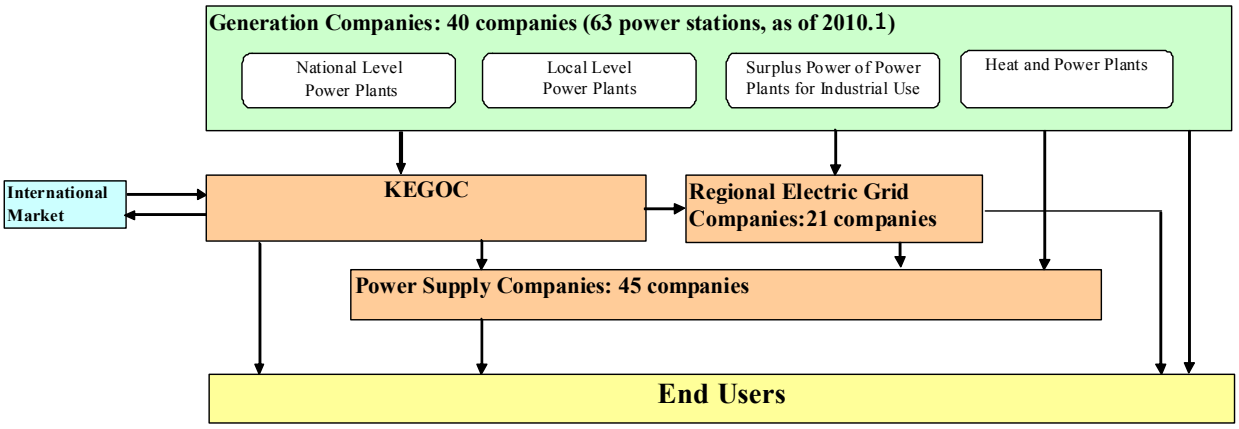


Figure 4- 5 Structure of Power Industry

The power industry can be categorized by function as follows.

Table 4- 17 Roles of Main Players by Function

	Generation	Transmission	Distribution	Retail
Authorization of Planning	MINT	KEGOC, etc.	Regional Electric Grid Companies	-
Operator	Generation companies	KEGOC, etc.	Regional Electric Grid Companies	Power Supply Companies
Status of the Operator	Governmental organizations, private entities, etc.	Governmental organizations	Private entities	Private entities

4.4 Structure of Energy Supply and Demand

4.4.1 Energy Reserves and Production

It has been estimated that proved reserves of oil is 39.8 billion bbl (Resources / Production R/P: 65 years), coal 31.3 billion tons (R/P: 308 years), natural gas 1.82 trillion cubic meters (R/P: 56 years)at the end of 2009. From 1999 to 2009, the proved reserves have seen an increase, which confirms Kazakhstan's potential as an eminent energy exporter.

Table 4- 18 Proved Reserves of Oil, Coal, and Natural Gas of Kazakhstan

	1999	2009	R/P*	Share in the International Market
Oil	25 bln bbl	39.8 bbl	65 Y	3.0%
Coal		31.3 bln tons	308 Y	3.8%
Natural Gas	1.78 tln ㎥ (63Tcf)	1.82 tln ㎥ (64Tcf)	56 Y	1.0%

* R/P: Resource/Production. A criterion of the amount of the reserves (Source: BP Statistics 2010)

Kazakhstan is rich in natural resources increasing its production of crude oil by 2.72 times,coal by 1.56 times, and natural gas by 4.28 times in the decade from 1998 to 2008. Regarding the primary energy composition in Kazakhstan in 2008, the respetive percentage of crude oil, coal, natural gas are: crude oil (48 %), coal (33 %); natural gas (19 %). The rest are hydro power and renewable energy. In the past decade, crude oil and natural gas increased their production by + 8 or + 9 %, while coal decreased its rate by - 16 %. However, revealing its R/P of 308 years, coal is particularly rich in its reserves. Presumably the expanding demand of curde oil and natural gas has reduced the relative share of coal. From another perspective, coal can be highly utilized through clean coal technologies.

Table 4- 19 Primary Energy Production and Composition in Kazakhstan

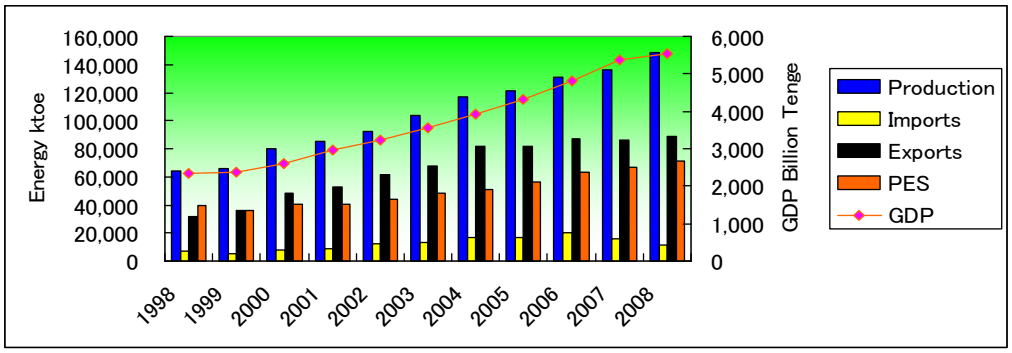
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Coal	31,271	26,371	34,130	34,859	32,465	37,297	38,198	38,071	42,311	43,014	48,837
Crude oil	26,066	30,267	35,438	40,272	47,485	51,685	59,759	61,751	65,837	67,413	70,976
Naturalgas	6,439	8,341	9,680	9,737	11,832	13,919	18,329	21,115	22,125	24,792	27,571
Hydro power	528	527	648	695	765	742	693	676	668	703	642
Renewable	73	73	73	87	101	80	44	78	61	94	164
Primary total	64,377	65,579	79,969	85,650	92,648	103,723	117,023	121,691	131,002	136,016	148,190
Coal	49	40	43	41	35	36	33	31	32	32	33
Crude oil	40	46	44	47	51	50	51	51	50	50	48
Naturalgas	10	13	12	11	13	13	16	17	17	18	19
Hydro power	1	1	1	1	1	1	1	1	1	1	0
Renewable	0	0	0	0	0	0	0	0	0	0	0
Primary total	100	100	100	100	100	100	100	100	100	100	100

(Source: IEA Statistics 2008)

4.4.2 Primary Energy Supply

Primary Energy Supply in Kazakhstan (PES) has seen a steady increase during between 1998 and 2008 in proportion to the GDP. However, in spite of the growth in the production of primary energy, the amount (substantial, not financial) of exports of crude oil, coal, and natural gas has not increased, which means the increase in the production of primary energy was consumed within the country.

The growth in the energy consumption seems reasonable in Kazakhstan, where they promote the chemical industry, steel industry, building-products industry, as well as high-value added agriculture. Nevertheless, the energy elasticity between 1998 and 2008 calculated based on the Purchasing Power Parity GDP (GDP-PPP) and PES is 0.68, which is rather low compared to the other developing countries. Kazakhstan takes up a policy to produce additional energies and implement an effective utilization of energies to promote energy intensive industries.



(Source: ADB Key Indicators and IEA Statistics 2008)

Figure 4- 6 Primary Energy Supply in Kazakhstan

4.4.3 Energy Conversion Sector

The following table shows the energy balance in Kazakhstan. Both electricity and heat are produced mostly by combusting coal and partly gas.

Table 4- 20 Energy Balance in Kazakhstan

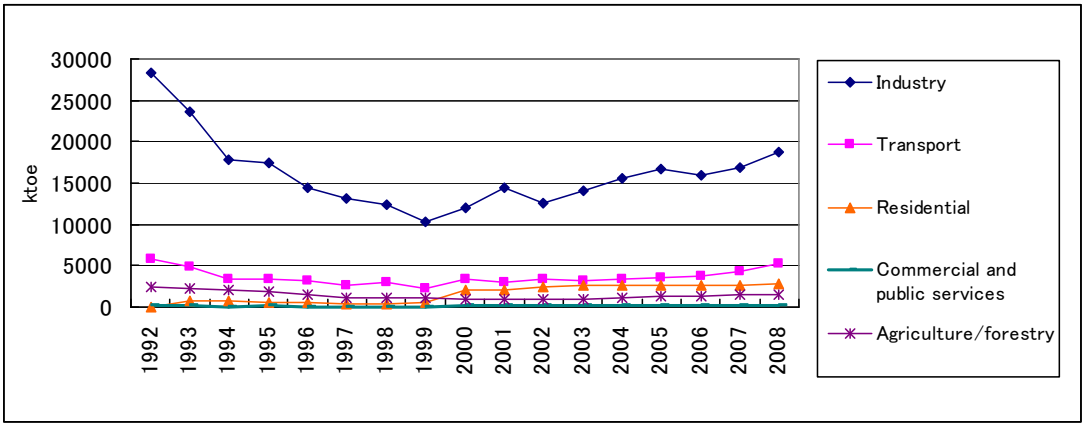
(ktoe)

SUPPLY and CONSUMPTION	Coal and Peat	Crude Oil	Oil Products	Gas	Hydro	Renewables	Electricity	Heat	Total
Production	48,837	70,976	0	27,571	642	164	0	0	148,190
Imports	577	3,203	2,524	5,198	0	0	238	0	11,740
Exports	-19,190	-60,373	-4,056	-5,231	0	0	-214	0	-89,063
International Aviation Bunkers	0	0	-327	0	0	0	0	0	-327
Stock Changes	-7	0	389	0	0	0	0	0	381
Total Primary Energy Supply	**30,216**	**13,806**	**-1,470**	**27,538**	**642**	**164**	**25**	**0**	**70,921**
Statistical Differences	74	-22	117	-1,625	0	0	0	0	-1,456
Electricity Plants	0	-48	0	0	-642	0	642	0	-48
CHP Plants	-19,515	0	-827	-2,147	0	0	6,266	9,463	-6,760
Oil Refineries	0	-13,020	12,709	0	0	0	0	0	-311
Coal Transformation	-1,617	0	0	0	0	0	0	0	-1,617
Energy Industry Own Use	0	0	-362	-4,713	0	0	-1,601	0	-6,676
Losses	-491	-713	-50	-826	0	0	-612	-1,196	-3,887
Total Final Consumption	**8,668**	**3**	**10,118**	**18,226**	**0**	**164**	**4,719**	**8,267**	**50,166**
Industry	**8,090**	**0**	**2,950**	**780**	**0**	**0**	**2,842**	**4,043**	**18,704**
Transport	**0**	**0**	**4,883**	**0**	**0**	**0**	**202**	**99**	**5,185**
Other	**0**	**0**	**1,739**	**17,446**	**0**	**164**	**1,675**	**4,125**	**25,150**
Residential	0	0	193	0	0	0	639	2,009	2,841
Commercial and Public Services	0	0	239	0	0	0	0	0	239
Agriculture / Forestry	0	0	981	0	0	0	594	0	1,575
Non-Specified	0	0	326	17,446	0	164	443	2,116	20,495
Non-Energy Use	**578**	**3**	**545**	**0**	**0**	**0**	**0**	**0**	**1,126**

(Source: IEA Statistics 2008)

4.4.4 Sectoral Final Energy Consumption

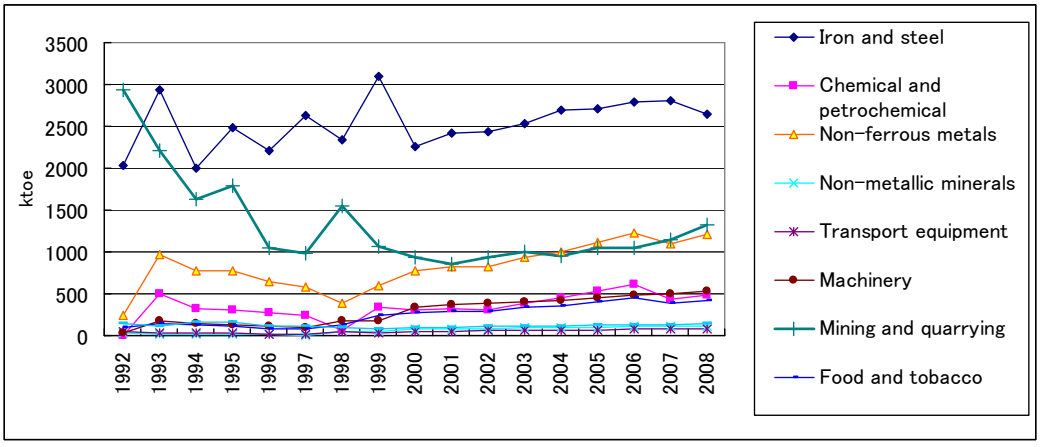
Final energy consumption in the industry sector in 2008 was 18.7 Mtoe, which accounted for 37.3 % of the total final energy consumption 50.3 Mtoe. The amount of expenditure in the industry sector has been gradually increasing since 1999 despite the downward trend due to the recession after the breakup of the former Soviet Union. Consumption in the transportation sector remains 10.3 % of the total. As much as 40.9 % is expended for unspecified usage.



(Source: IEA Statistics 2008)

Figure 4- 7 Transition of Final Energy Consumption in Kazakhstan

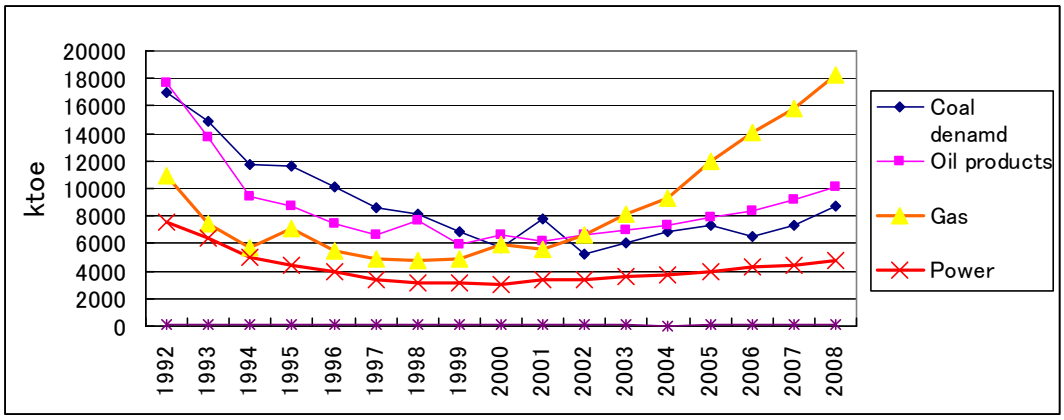
The following figure shows the breakdown of final energy consumption in the industry sector. Iron and steel represent 14.1 % of the total. Mining and quarrying decreased its consumption in the 1990's, although gradually recovering in recent years. Non – ferrous metals has also been on an upward trend in the 2000's and reached 6.4% in 2008.



(Source: IEA Statistics 2008)

Figure 4- 8 Transition of Final Energy Consumption in the Industry Sector

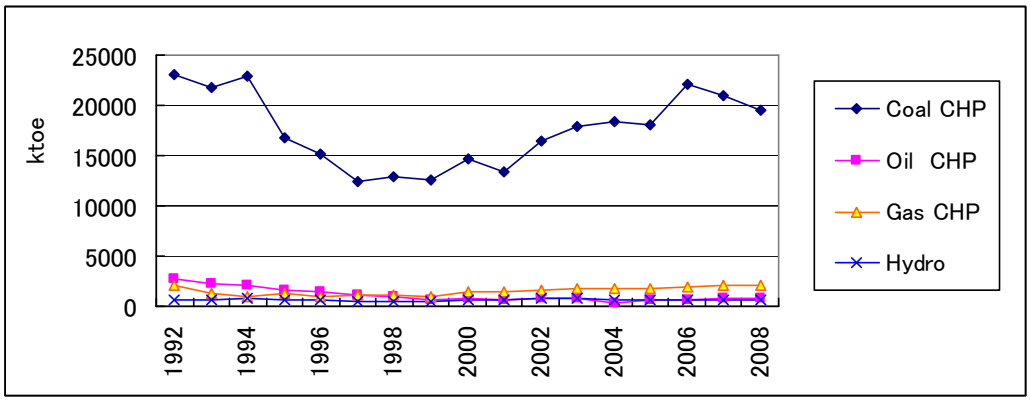
The energy demand in the industry sector experienced a major decline throughout the 1990's. However, it started on a recovery trend after 2000, especially in the consumption of gas followed by coal and oil products.



(Source: IEA Statistics 2008)

Figure 4- 9 Breakdown of Final Energy Consumption in Kazakhstan

Regarding the consumption of primary energy for electricity generation, coal has been and still remains the major fuel. In 2008 the respetive percentage of crude coal, gas, oil, and hydropower are: coal (84.4 %), gas (9.3 %), oil (3.6 %), hydropower (2.8 %). There has been a gradual rise in the usage of gas, while oil consumption has been falling steadily since the 1990's.



(Source: IEA Statistics 2008)

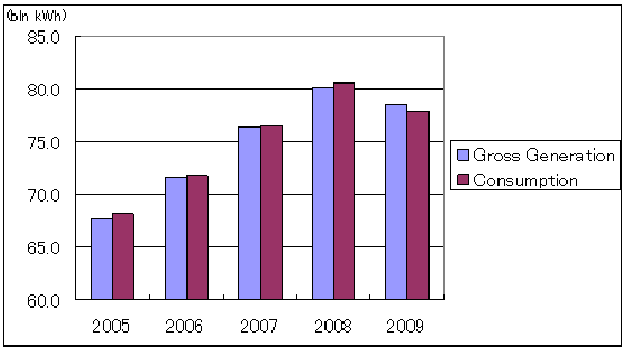
Figure 4- 10 Consumption of the Primary Energy for Electricity Generation

4.5 Overview of the Power Sector

4.5.1 Overview

The electricity consumption in Kazakhstan recorded 104.7 GWh in 1990, dropping sharply in 1999 to 47.5 GWh as a result of the breakup of the former Soviet Union and the recession due to the Russian Economic Crisis. After 2000 it reversed the downward trend and increased up to 80.6 GWh in 2008. Consumption was stagnant and remained 77.9 GWh in 2009 due to decreased

production in the industry sector.



(Source: KEGOC Annual Report 2009)

Figure 4- 11 Transition of Power Generation and Consumption

In Kazakhstan there exists an uneven distribution of electricity demand and supply. The nation is divided in to three zones: the North, South, and West. Power plants and large consumers are concentrated in the North. Almost 70 % of the electricity is consumed in the North, 20 % in the South, and 10 % in the West.

Table 4- 21 Electricity Consumption in Each Zone of Kazakhstan

	Consumption	
Total	77,959.6 mln kWh	100.0 %
Zone North	53,916.5 mln kWh	69.1 %
Zone South	15,016.3 mln kWh	19.3 %
Zone West	9,026.8 mln kWh	11.6 %

(Source: KEGOC Annual Report 2009)

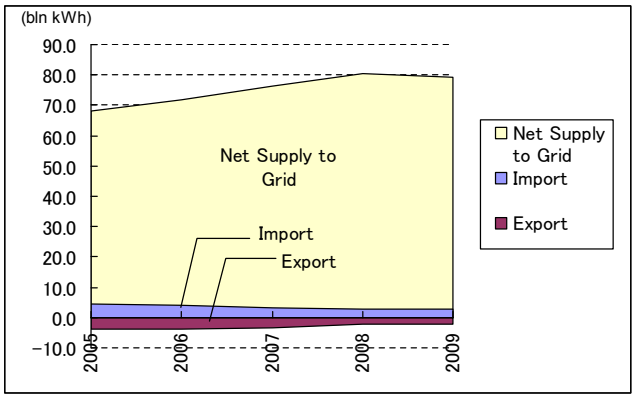
The uneven electricity supply found in each zone is one of the big issues in the power sector of Kazakhstan, as referred to the aging of the power plants and the lack of the distribution lines in the Electric Power Industry Development Program 2010-2014. The North, which has a sufficient supply of electricity, exports electricity to Russia, while the South and the West, which suffer chronic power shortage, rely on imports from Russia, Uzbekistan, and Kyrgyzstan. In 2009, the amount of electricity imported was 3.0 GWh and the export was 2.3 GWh.

Table 4- 22 Transition of Electricity Import and Export

(bln kWh)

	2005	2006	2007	2008	2009
Gross Generation	67.6	71.5	76.4	80.1	78.5
Import	4.6	4.0	3.4	2.8	3.0
Export	-4.0	-3.8	-3.3	-2.2	-2.3
Net Supply to Grid	68.2	71.7	76.5	80.7	79.2
Consumption	68.1	71.8	76.5	80.6	77.9

(Source: KEGOC Annual Report 2009)



(Source: KEGOC Annual Report 2009)

Figure 4- 12 Transition of Electricity Supply and Import / Export

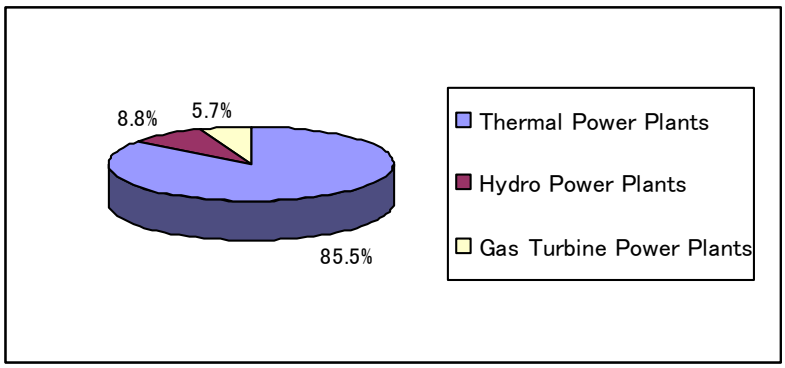
4.5.2 Power Facilities (Power Plants and CHPs)

The electricity generation sector was fully deregulated under the governmental decree "Reorganization and privatization Plan of Electric Power Industry" converting all power plants into joint stock companies. Some of the former national large scale power plants were sold to Eurasian Energy (domestic company) or AES (American capital company), although some of these power plants' stocks have been re-purchased back by state-owned enterprises or the government itself. In 2009, the total installed capacity of power generation facilities in Kazakhstan was 19,127.9 MW, while the supply capacity was 14,821 MW. The peak demand in 2009 was 12,400 MW. 85.5 % of the total electricity supply was generated using thermal power, out of which about 74 % is coal power.

Table 4- 23 Power Output Composition by Energy Sources（2009）

	Generation	
Total	78,433.7 mln kWh	100.0 %
Thermal Power Plants	67,096.7 mln kWh	85.5 %
Hydro Power Plants	6,859.4 mln kWh	8.8 %
Gas Turbine Power Plants	4,477.6 mln kWh	5.7 %

(Source: KEGOC Annual Report 2009)



(Source: KEGOC Annual Report 2009)

Figure 4- 13 Power Output Composition by Energy Sources

The following list shows the large scale power plants whish are classified into “National-level Power Plants” and “Industrial Power Plants”.

Table 4- 24 Major Power Plants in Kazakhstan

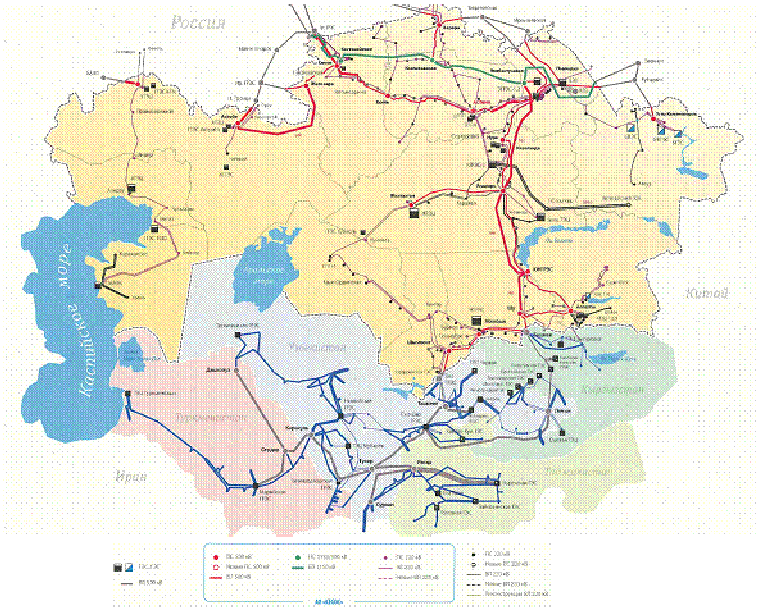
No	Power Plants	Type	Installed Capacity (MW)	Units
	Total		19,127	
	National-level Power Plants			
1	Ekybastuzskaya Power plant-1	Thermal	4,000	500 x 8
2	Ekybastuzskaya Power plant-2	Thermal	1,000	500 x 2
3	Eurasian Energy Corporation (Aksuskaya power plant)	Thermal	2,110	300 x 7
4	"Kazahmys Corporation" power plant	Thermal	608	-
5	Zhambylskaya power plant	Thermal	1,230	200 x 3, 210 x 3
6	"Kazoink" JSC Buhtarmynskaya hydropower oomplex	Hydro	675	75 x 9
7	Ust-Kamenogorskaya hydropower plant	Hydro	331	82.8 x 4
8	Shulbynskaya hydropower plan	Hydro	702	117 x 6
	Industrial Power Plants			
9	"Tengizchevroil" LLP gas turbine power plant	Gas Turbine	-	-
10	"Petro Kazakhstan Kumkol Resources" JSC Kumkol gas turbine power plant	Gas Turbine	-	-
11	"Karachaganak Petroleum Operating" gas turbine power plant	Gas Turbine	-	-
12	"Karaganda-Zhilu" LLP CHP-3	CHP	-	-
13	"Arselor Mittal Temirtau" JSC	Steam Turbine	-	-
14	Rudnenskaya CHP ("SSGPO" JSC).	CHP	-	-
15	"Kazahmys Corporation" LLP Balhashskaya CHP, Zhezkazganskaya CHP	CHP	-	-
16	"Aluminium of Kazakhstan" JSC Pavlodarskaya CHP-1	CHP	-	-
17	Shymkentskaya CHP-3	CHP	-	-

(Source: “Electric Power Industry Development Program 2010 - 2014”, Japan Electric Power Information Center “Electric Power Industries Overseas 2010”)

4.5.3 Transmission and Distribution Facilities

(1) National Grid

The national grid of Kazakhstan consists of the inter-regional grid, international connecting grid between the neighboring countries (Russia, Uzbekistan, and Kyrgyzstan), and the connecting grid between each power plant and the wholesalers.



(Source: KEGOC Annual Report 2009)

Figure 4- 14Grid Map of Kazakhstan

(2) Transmission Facilities

The national grid of Kazakhstan is operated by KEGOC, Kazakhstan Electricity Grid Operating Company. The facilities being controlled by KEGOC are the inter-regional grid, international grid, and other transmission lines mainly exceeding 220 kV, substations, and the switchgears.

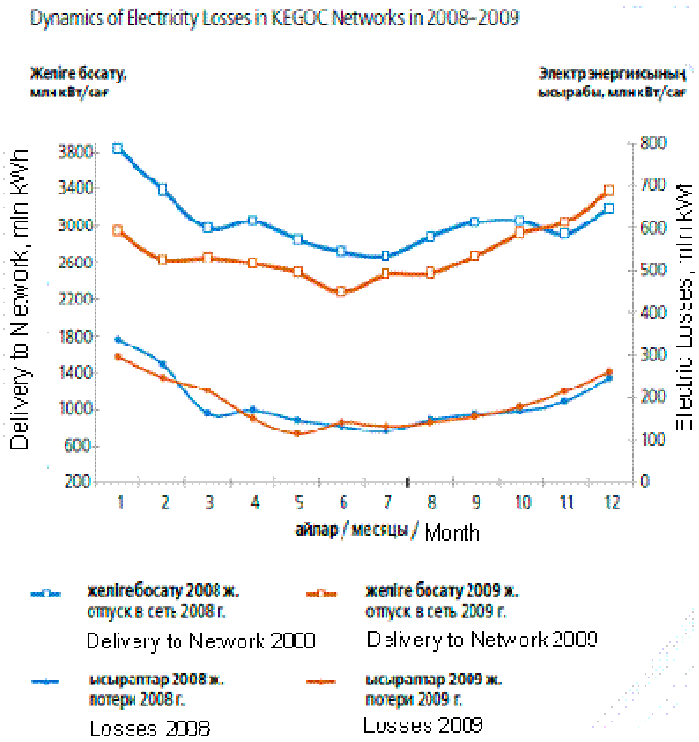
The total length of KEGOC transmission lines at the beginning of 2010 was 24,374.060 km and its total capacity was 33,699.65 MVA. The total capacity of the substation facilities (35 kV-1,150 kV) was 33,699.65 MVA. The voltage of KEGOC's transmission lines are from 220 kV to 1,150 kV. The following table is an overview of KEGOC's facilities.

Table 4- 25 Transmission Facilities of KEGOC

Филиал	кВ	Протяженность линий, км	Количество подстанций	Мощность, МВА	Коэффициент готовности линии электропередачи (мин-макс), %	Средневзвешенный коэф-т использования пропускной способности линий в/в: среднегодовой	Средневзвешенный коэф-т использования пропускной способности линий в/в: максимальный
Name of the MES Branch	kV	Line Length, km	Number of Substations	Capacity, MVA	Line Availability (Min-Max), %	Weighted Factor of Transmission line Capacity, Utilization, %: Annual	Max
АлматыЖЭТ Алматинские МЭС / Almatinskye MES	35-500	1 746,852	9	3 221,35	75,*-99,9	37,4	79,1
АкмолаЖЭТ Акмолинские МЭС / Akmolinskye MES	220-1150	4 225,519	10	7 484,60	87,3-100	27,1	66,7
АктобеЖЭТ Актюбинские МЭС / Aktyubinskye MES	220-500	1 200,020	6	1 946,50	77,0-100	58,4	75,5
ШымкентЖЭТ Шымкентские МЭС / Shymkentskye MES	110-500	1 039,200	5	3026,50	95,3-100	70,8	91,5
БатысЖЭТ Западные МЭС / Zapadnye MES	220	1 679,500	5	9 50,00	48,*-98,3	13,8	56,7
ОртаныЖЭТ Центральные МЭС / Tsentralnye MES	220-500	3 477,180	10	3 720,10	88,0-100	45,7	94,5
СарыбайЖЭТ Сарбайские МЭС / Sarbaiskye MES	110-1150	2 417,936	8	6 566,00	77,0-100	33,0	91,4
СолтүстікЖЭТ Северные МЭС / Severnye MES	110-1150	3 386,551	8	3 520,60	77,1-100	4*,6	116,8
ШымкентЖЭТ Шымкентские МЭС / Shymkentskye MES	220-500	4 201,303	13	3 256,10	44,6-99,9	22,3	95,0
«КЕGOC» АК бойынша барлығы / Итого по АО «KEGOC» / Total for KEGOC		24 374,060	74	33 699,65	74,*-99,8	32,5	81,7

(Source: KEGOC Annual Report 2009)

The transmission losses (the amount of electricity loss at the end of the transmission line when the assumed power supply at the transmission end is 100) of KEGOC's facilities in 2009 rose to 10.08 % in January, while dropping to 4.61 % in May. The annual average is 5.38 %. In order to diminish transmission losses, KEGOC takes measures such as outages of power transformers in the low load conditions and the reduction of the auxiliary consumption of substations.



(Source: KEGOC Annual Report 2009)

Figure 4- 15 Power Delivery and Transmission Losses

(3) Distribution Facilities

Regional distribution lines which are below 220 kV are operated by regional distribution companies. In Kazakhstan, there are 14 states, some of which are divided into more than one region. Eventually there exist 21 distribution companies, which have monopolies in their respective regions.

4.5.4 Electricity Sales and Tariffs

(1) Sectoral Electricity Sales

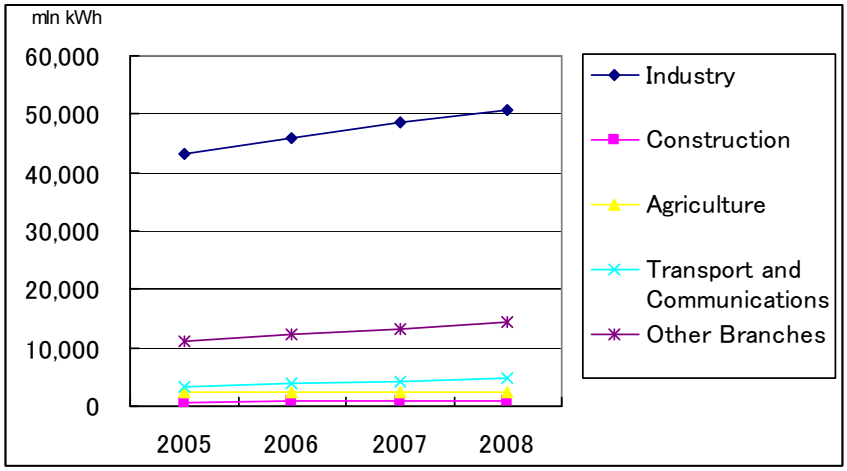
According to the sectoral breakdown of energy sales by the Agency of Statistics of Kazakhstan, most of the electricity is consumed in the industry sector. In 2008, sales from industrial use accounted for 67.2 % of the total. It remains the largest buyer of electricity, although sales maintain upward trends on the whole.

Table 4- 26 Transition of the Electricity Sales

(bln kWh)

2005	2006	2007	2008	2009
68.1	71.8	76.5	80.6	77.9

(Source: KEGOC Annual Report 2009)



(Source: Statistical Yearbook of Kazakhstan 2009)

Figure 4- 16 Sectoral Electricity Sales

(2) Electricity Tariffs

Electricity supply organizations have vertical monopolies region by region over electricity sales to end-users. The electricity tariffs are controlled by the Agency for Regulation of Natural Monopolies. The tariffs are set for each region to cover the following expenses borne by the participants in the electricity market.

- "Generation Charge" by power plants
- "Wheeling Charge" by KEGOC
- "Wheeling Charge" by regional distribution companies
- "Sales Administrative and Operation Charges" by Electricity Supply Organizations

The unit prices of electricity are at low levels compared to other nations, but they have shown a rapid rise in recent years. According to the Agency of Statistics, the average price per 100 kWh was 745 Tenge, that is, the price per kWh is 7.45 Tenge, increasing greatly from 4.18 Tenge in 2005.

Table 4- 27 Transition of Electricity Tariff for the Residential Customers

(Tenge / 100 kWh)

2005	2006	2007	2008	2009
418	475	591	678	745

(Source: Statistical Yearbook of Kazakhstan 2009)

There are tariffs per volume and tariffs per time of usage for residential customers in Astana city. In March 2011, as for the tariff per volume, the unit price was 7.11 Tenge/kWh for customers using electric stoves. The unit prices rises up to 10.36 Tenge/kWh when the customer usage exceeds a given limit. The price and the volume limit are set per person, allowing a lower unit price and more volume for a customer that uses an electric stove. The unit prices and the volume limits vary from region to region. As for the time-of-use tariff, the unit price is: 10.99 Tenge/kWh (7:00 - 23:00); 2.53 Tenge/kWh (23:00 - 7:00).

Table 4- 28 Regional Electricity Price for Residents (2011.3)

(Tenge / kWh), excluding VAT

Volume Tariff*1	Minimum rate	Maximum rate
	7.11	10.36
TOU*2 Tariff	Day - time rate (7:00 – 23:00)	Night - time Rate (23:00 – 7:00)
	10.99	2.35

*1 For a customer who uses an electric stove (Source: Astana Energo Service)

*2 TOU: Time-of-Use

The Time-of-Use (TOU) tariff with three time zones is adopted for the companies. The unit prices set for each time zones are: 10.99 Tenge/kWh (7:00 - 19:00); 17.85 Tenge/kWh (19:00 – 23:00); 2.53 Tenge (23:00 – 7:00). The highest unit price is applied from 19:00 to 23:00, when presumably the electricity consumption reaches its peak for the day.

Table 4- 29 Regional Electricity Price for Companies (2011.3)

(Tenge / kWh), excluding VAT

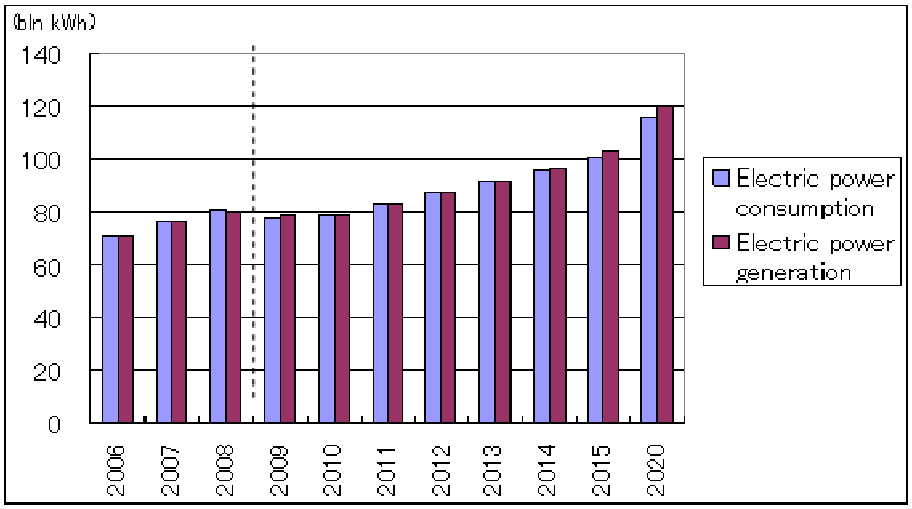
TOU* Tariff	Day - time rate (7:00 – 19:00)	Evening - time rate (19:00 – 23:00)	Night - time Rate (23:00 – 7:00)
	8.63	17.85	2.35

*TOU: Time of Use (Source: Astana Energo Service)

4.5.5 Electricity Demand Forecast and the Development Plan of the Power Plants

(1) Electricity Demand Forecast

According to the “Electric Power Demand and Supply Forecast within the Unified Power System of Kazakhstan” formulated by the Ministry of Industry and New Technologies, power demand in Kazakhstan will reach 95.95 billion kWh in 2014, growing as much as 116.0 billion kWh in 2020. (In the Electric Power Industry Development Program in the Republic of Kazakhstan 2010-2014, it was forecasted that power supply will rise up to 97.9 billion kWh while demand will reach 96.8 billion kWh.).



(Source: "Electric Power Demand and Supply Forecast within the Unified Power System of Kazakhstan")

Figure 4- 17 Electricity Demand-Supply Forecast (- 2020)

(3) Development Plan of the Power Plants

The Ministry of Industry and New Technologies incorporated the development plan of the power plants until 2020, which is expected to realize the above supply forecast, in "Electric Power Demand and Supply Forecast within the Unified Power System of Kazakhstan". The following are the major projects of the development plan (See the next page for details). Development of small hydro power stations and wind power stations (0.02 billion kWh in 2020) are included in the plan.

- Rehabilitation of Existing Large-scale Thermal Power Plants
  - Ekibastuzskaya Power Plant No.1 (500 MW x 3)
  - Urasian Energy Thermal Power Plant (325 MW)
- Construction of New Power Plants
  - Balkhashskaya Thermal Power Plant (1,320 MW)
  - Aktauskaya Atomic Power Plant (600 MW)
  - Moinakskaya Hydropower Plant (300 MW)
  - Agip KCO Gas Turbine Power Plant (230 MW)
  - Astana city CHP-3 (120 MW x 2)
- Plant Extension
  - Ekibastuzskaya Power Plant No.2 (525 MW)
  - Astana City CHP-2 (120 MW x 2)
  - Almaty City CHP-2 (120 MW x 2)

According to the forecast by the Ministry of Industry and New Technologies, it is planned that Kazakhstan will eliminate the power shortage, which at the moment supplemented by imports from neighboring countries, will turn to a net exporter of electricity. In 2008, imports exceeded exports by 0.53 billion kWh, but in 2020, exports are expected to exceed imports by 4.20 billion kWh

Table 4- 30 Electricity Demand Forecast and Development Plan

(bln kWh)

No.	Name	Report			Forecast							
	United Power System of Kazakhstan	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2020**
1	**Electric power consumption**	**71.77**	**76.44**	**80.62**	**77.80**	**79.33**	**83.19**	**87.64**	**91.79**	**95.95**	**100.50**	**116.00**
2	**Electric power generation, including:**	**71.55**	**76.36**	**80.09**	**78.72**	**79.31**	**83.27**	**87.49**	**92.09**	**96.59**	**103.45**	**120.20**
2	**Electric power generation by current power plants**	**71.55**	**76.36**	**80.09**	**78.47**	**77.66**	**79.39**	**82.02**	**86.52**	**88.65**	**89.89**	**94.11**
	National-level power plants	***33.02***	***35.90***	***38.70***	***35.82***	***35.37***	***37.37***	***38.85***	***41.95***	***43.35***	***43.85***	***47.90***
	"Ekibastuzskaya Power Plant 1" LLP, taking into account rehabilitation of energy block No.8 (500 MW - 2013), No.1 (500MW - 2015), No.2(500MW - 2020)	*9.11*	*9.43*	*11.04*	*10.50*	*11.00*	*12.00*	*12.50*	*14.50*	*16.00*	*16.50*	*18.00*
	"Ekibastuzskaya Power Plant 2" JSC	*5.30*	*5.30*	*6.20*	*6.00*	*5.50*	*6.00*	*6.00*	*6.00*	*6.00*	*6.00*	*6.00*
	Power Plant owned by "Eurasian Energy Corporation" JSC taking into account the rehabilitation of Block No.2 (325 MW – 2015)	*11.50*	*12.12*	*11.64*	*11.00*	*11.00*	*11.00*	*12.00*	*12.00*	*12.00*	*13.00*	*15.00*
	"Jambylskaya Power Plant" JSC	*1.47*	*3.00*	*4.20*	*2.57*	*2.12*	*2.42*	*2.40*	*3.50*	*3.40*	*2.40*	*2.40*
	Bukhtarminsky Hydropower Complex owned by "KazZinc" JSC	*2.53*	*2.73*	*2.55*	*2.60*	*2.60*	*2.70*	*2.70*	*2.70*	*2.70*	*2.70*	*2.60*
	"AES Ust-Kamenogorskaya Hydropower	*1.54*	*1.65*	*1.50*	*1.60*	*1.60*	*1.65*	*1.65*	*1.65*	*1.65*	*1.65*	*1.60*
	"AES Shulbinskaya Hydropower Plant" LLP	*1.57*	*1.67*	*1.57*	*1.55*	*1.55*	*1.60*	*1.60*	*1.60*	*1.60*	*1.60*	*2.30*
	Regional-Level Electric Power Plants	***38.53***	***40.46***	***41.39***	***42.65***	***42.29***	***42.02***	***43.17***	***44.57***	***45.30***	***46.04***	***46.21***
2	**Electric power generation by new generating capacities to be commissioned**	**0.00**	**0.00**	**0.00**	**0.25**	**1.65**	**3.88**	**5.47**	**5.57**	**7.94**	**13.56**	**26.09**
	Northern Zone	**0.00**	**0.00**	**0.00**	**0.05**	**0.75**	**1.25**	**1.65**	**1.75**	**2.50**	**4.87**	**8.92**
	New construction	***0.00***	***0.00***	***0.00***	***0.05***	***0.10***	***0.20***	***0.40***	***0.50***	***0.60***	***0.80***	***2.35***
	Astana city CHP-3 - 2x120 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.20*
	Bulakskaya Hydropower Plant (68 MW)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.20*	*0.30*
	Kandyagash Gas Turbine Power Plant - 130	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.20*	*0.30*	*0.40*	*0.40*	*0.60*
	Gas Turbine Power Plant owned by "SNPS AktobeMunaiGas"- 45 MW	*0.00*	*0.00*	*0.00*	*0.05*	*0.10*	*0.20*	*0.20*	*0.20*	*0.20*	*0.20*	*0.25*
	Plant extension	***0.00***	***0.00***	***0.00***	***0.00***	***0.65***	***1.05***	***1.25***	***1.25***	***1.90***	***4.07***	***6.57***
	Astana city CHP-2 - 2x120 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.60*	*0.60*	*1.20*
	Ust-Kamenogorskaya CHP– (ÏÒ- 80 MW)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.40*	*0.40*	*0.40*	*0.40*	*0.40*	*0.40*
	Semipalatinskaya CHP-1	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.07*	*0.07*
	Power plant owned by "Kazakhmys Corporation" LLP - 55MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.30*	*0.30*	*0.30*	*0.30*	*0.30*	*0.30*	*0.30*
	Karagandinskaya CHP-3, Karagandy-Zhylu - 120 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.70*
	Rudnenskaya CHP - 63 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.35*	*0.35*	*0.35*	*0.35*	*0.35*	*0.35*	*0.35*
	Ekibastuzskaya Power Plant-2 - 525 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*2.00*	*3.00*
	Aktubinskaya CHP - 2x29 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.05*	*0.15*	*0.30*
	Zhanazhol Gas Turbine Power Plant 56 owned by "AktobeMunaiFinance" JSC -	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.20*	*0.20*	*0.20*	*0.20*	*0.25*
	Western Zone	***0.00***	***0.00***	***0.00***	***0.20***	***0.55***	***2.10***	***2.28***	***2.28***	***2.70***	***3.05***	***7.00***
	New construction	***0.00***	***0.00***	***0.00***	***0.20***	***0.40***	***1.65***	***1.83***	***1.83***	***2.25***	***2.35***	***6.35***
	Agip KCO Gas Turbine Power Plant -230 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.20*	*1.38*	*1.38*	*1.40*	*1.45*	*1.38*
	Kashagan Gas Turbine Power Plant -120 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.72*
	Gas Turbine Power Plant in Uralsk city - 54	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.35*	*0.35*	*0.35*
	Aktauskaya Atomic Power Plant - 600MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*3.50*
	Kalamkas Gas Turbine Power Plant 2x45MW	*0.00*	*0.00*	*0.00*	*0.20*	*0.40*	*0.45*	*0.45*	*0.45*	*0.50*	*0.55*	*0.40*
	Plant extension	***0.00***	***0.00***	***0.00***	***0.00***	***0.15***	***0.45***	***0.45***	***0.45***	***0.45***	***0.70***	***0.65***
	Atyrauskaya CHP - 75 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.15*	*0.45*	*0.45*	*0.45*	*0.45*	*0.50*	*0.45*
	Gas Turbine Power Plant ÊÎÊ	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.20*	*0.20*
	Southern zone	**0.00**	**0.00**	**0.00**	**0.00**	**0.35**	**0.53**	**1.54**	**1.54**	**2.74**	**5.64**	**10.17**
	New construction	***0.00***	***0.00***	***0.00***	***0.00***	***0.35***	***0.53***	***1.54***	***1.54***	***2.74***	***5.14***	***9.09***
	Balkhashskaya Thermal Power Plant -1,320	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.20*	*3.60*	*7.40*
	Moinakskaya Hydropower Plant - 300	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
	Kerbulakskaya Hydropower Plant- 50	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.15*
	Small hydropower and wind power	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*
	Gas Turbine Power Plant Kumkol-Akshibulak -87MW of "CristalManagement" LLP (3x29MW)	*0.00*	*0.00*	*0.00*	*0.00*	*0.35*	*0.53*	*0.53*	*0.53*	*0.53*	*0.53*	*0.53*
	Plant extension	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.50***	***1.08***
	Almatinskaya CHP-2 – 2x120 MW	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.50*	*1.08*
3	**deficit (+), surplus (-),**	**0.22**	**0.07**	**0.53**	**-0.92**	**0.02**	**-0.08**	**0.15**	**-0.30**	**-0.65**	**-2.95**	**-4.20**
4	**Electric power flows along the lines,**	**0.22**	**0.07**	**0.53**	**-0.92**	**0.02**	**-0.08**	**0.15**	**-0.30**	**-0.65**	**-2.96**	**-4.20**
	Electric power flows between the Northern Zone and the Russian Unified Energy System, import (+), export (-)	*-2.26*	*-1.54*	*-0.35*	*-1.84*	*-0.30*	*-0.37*	*-0.22*	*-0.60*	*-0.49*	*-3.00*	*-3.15*
	Electric power flows between the Western Zone and the Russian Unified Energy System, import (+), export (-)	*0.40*	*0.40*	*0.33*	*0.32*	*0.32*	*0.30*	*0.37*	*0.30*	*-0.15*	*0.05*	*-1.05*
	Electric power flows between the Southern Zone and the Central Asian Unified Energy System, import (+), export (-)	*2.09*	*1.22*	*0.55*	*0.60*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
5	**Deficit (+), surplus (-) (3-4)**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

(Source: Electric Power Demand and Supply Forecast within the Unified Power System of Kazakhstan)

4.6 Other Sectors

4.6.1 Industrial Sector

(1) Positioning of Industry in GDP

The economy of Kazakhstan has grown its GDP by increasing oil and gas production and raising the prices of these products. The GDP breakdown is shown below. Trade, transportation of oil and gas, the service sector including real estate occupies more than 50 %.

Table 4- 31 Breakdown of GDP

NATIONAL ACCOUNTS At Current Prices (billion Tenge; calendar year)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
GDP by industrial origin at current market prices	2,600	3,251	3,776	4,612	5,870	7,591	10,214	12,850	16,053	16,100
Agriculture	211	284	302	363	418	484	561	727	853	1,003
Mining	339	372	458	558	800	1,199	1,647	1,935	3,004	2,647
Manufacturing	429	535	547	656	782	914	1,188	1,477	1,890	1,815
Electricity, gas, and water	80	91	108	128	138	148	184	224	269	304
Construction	135	178	239	276	356	595	1,001	1,213	1,299	1,292
Trade	324	393	460	537	732	898	1,165	1,588	1,966	2,069
Transport and communications	299	363	438	571	691	897	1,179	1,482	1,769	1,756
Finance	81	112	131	146	172	246	476	762	849	787
Public administration	61	66	75	86	128	158	191	250	272	349
Others	495	672	804	1,050	1,411	1,750	2,263	2,888	3,509	3,876
Less: Financial intermediation services indirectly measured	24	37	56	71	110	166	306	614	751	542
Taxes less subsidies on products	172.7	224.6	271.8	313.0	353.3	467.8	665.8	919.6	1125.3	745.6
Structure of Output percent of GDP at current basic prices										
Agriculture	8.6	9.3	8.5	8.3	7.4	6.6	5.7	5.8	5.4	6.3
Industry	40.1	38.4	38.0	37.0	36.9	39.2	40.8	38.7	41.2	38.1
Services	51.3	52.4	53.5	54.7	55.7	54.2	53.5	55.6	53.3	55.6

(Source: ADB Key Indicators 2010)

(2) Output of Each Sub-Industry

Output by each sub sector in the mining and industry is shown below.

Table 4- 32 Output of Each Sub-Industry

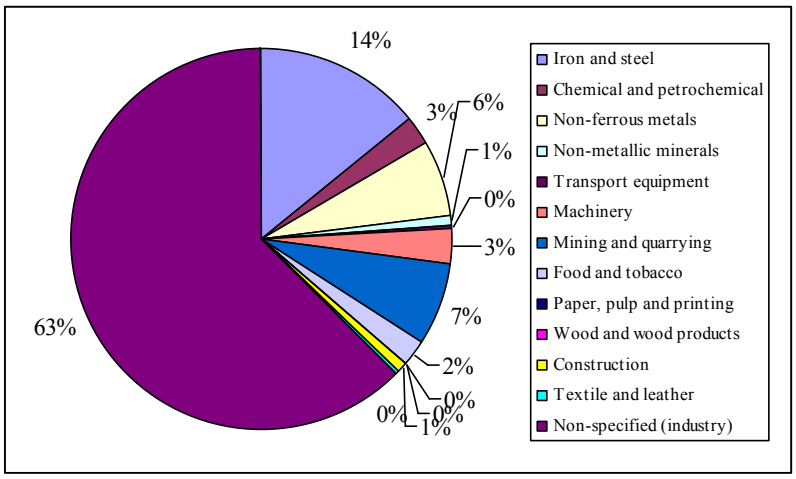
at current prices, mln. tenge

	2005	2006	2007	2008	2009
Total industry	5 253 000	6 509 896	7 815 865	10 196 233	9 121 525
Mining	3 121 064	3 761 259	4 445 405	6 229 758	5 502 014
mining of coal and lignite, extraction of peat	64 713	64 374	71 817	123 952	106 920
extraction of crude petroleum and oil-well gas	2 645 996	3 214 760	3 776 625	5 267 346	4 605 039
extraction of natural (fuel) gas	27 159	31 666	25 140	38 968	37 595
mining of metal ores	201 910	231 938	304 264	419 520	419 863
mining of iron ores	111 497	93 425	117 222	178 972	135 190
mining of non- ferrous metal ores	90 414	138 514	187 043	240 548	284 673
other branches of mining	34 018	42 318	63 977	94 788	57 061
Manufacturing	1 851 566	2 406 501	2 955 881	3 427 640	2 945 966
processing of food products, including beverages and tobacco	463 098	518 506	637 253	801 798	…
manufacture of food products, including beverages	417 405	466 695	573 838	734 052	…
manufacture of tobacco products	45 693	51 811	63 414	67 746	70 310
textile and sewing products	39 759	39 564	28 548	24 720	…
manufacture of leather, products of leather and manufacture of footwear	1 786	2 135	2 581	2 965	2 757
treatment of wood and manufacture of wood products	5 899	6 439	8 377	10 313	9 150
manufacture of paper and paperboard; publishing	46 052	56 448	69 918	72 569	…
manufacture refined petroleum products	165 881	179 902	193 098	239 322	…
refined petroleum products	154 632	154 114	168 668	210 559	211 456
chemical industry	53 912	54 064	72 258	110 642	85 542
production of rubber and plastic products	29 037	38 083	56 833	63 836	59 728
manufacture of other non-metallic mineral products	109 674	151 479	247 184	220 849	182 587
metallurgy industry	683 106	1 003 807	1 191 136	1 385 273	1 078 293
ferrous metallurgy	275 874	280 611	441 657	665 177	474 740
manufacture of non-ferrous metals	396 852	708 060	717 061	645 676	596 890
manufacture of fabricated metal products	50 082	88 484	115 047	128 031	105 329
machine-building	179 491	228 732	281 243	302 771	281 310
Production and distribution of electricity, gas and water	280 370	342 136	414 579	538 835	…
production and distribution of electricity	176 314	224 068	275 301	377 777	417 282
production and distribution of gaseous fuel	13 246	16 592	21 980	26 326	32 686
steam and hot water supply	72 493	80 520	93 789	108 700	124 508
collection, purification and distribution of water	18 318	20 957	23 510	26 032	37 728

(Source: Statistical Yearbook of Kazakhstan 2009)

(3) Final Energy Consumption in the Industrial Sector

Final energy consumption in the industrial sector (2008) is shown below. Non-specific data occupies at 63 %. Iron and steel, non ferrous metals and mining sub-sectors share a large portion.



(Source: IEA Database)

Figure 4- 18 Final Energy Consumption in the Industrial Sector (2008)

(4) Programs for Energy Efficiency for Industrial Sector

The Energy Saving Law (draft), which was prepared by MINT, stipulates the obligation of energy management with a periodical report to designated consumers (individuals or legal entities) which exceed a certain amount of expense for energy consumption. In other words, this law targets the industrial sector which expects to use a certain amount of energy.

4.6.2 Transportation Sector

(1) Overview of Transportation Sector

The following table shows the transportation facilities of Kazakhstan. This sector is categorized into railways, river transports, motor roads and city electric cars. With the high growth of the economy, holders of passenger cars had drastically increased up to 2009. Currently, the growth rate has slowed down.

Table 4- 33 Numbers of Transportation Facilities

	2005	2006	2007	2008	2009
(1) Railway transport:					
Locomotives	1,659	1,696	1,714	1,720	1,684
Steam	36	26	26	26	26
Diesel	1,071	1,078	1,093	1,094	1,106
Electric	552	592	595	600	579
Freight railroad cars	86,921	90,529	96,225	94,917	100,242
Passenger railroad cars	1,874	2,768	2,740	2,188	2,307
Luggage railroad cars	100	118	115	116	60
(2) River transport:					
Self-propelled cargo vessels	9	11	10	9	…
Barges	69	63	53	57	…
Tug boats, pushers	49	49	46	51	…
Passenger and cargo/passenger vessels	8	7	7	8	…
(3) Motor road transport:					
Trucks	281,538	311,828	359,194	414,332	410,793
Buses	65,698	75,042	83,372	89,220	94,824
Passenger cars	1,405,325	1,745,073	2,183,131	2,576,625	2,656,773
(4) City electric:					
Trams	263	263	248	245	246
Trolley buses	365	351	329	334	305

(Source: Statistical Yearbook of Kazakhstan 2009)

(2) Measures to Promote Energy Efficiency

(a) Infrastructure

Due to the drastic increase of passenger cars, congestion often occurs in main cities like Astana and Almaty. To mitigate such a situation, the following mass transit system has been planned and constructed.

- A subway line in Almaty will be commissioned in 2011.
- A high speed commuting line in Astana will be commissioned in 2012.
- Renovation of railways between Almaty and Astana has been planned.

(b) Program

In 2006, the President approved a strategic plan for the transportation sector by 2015. As a result, EU standards for the emission of air pollution were introduced for imported cars. The

standards have a category ranging from EURO 1 to EURO 6 (the strictest standard). For Kazakhstan, EURO 3 has been adopted for all types of cars since January 1st 2011. It is planned to introduce EURO 4 in 2014. Because cars satisfying the standards can raise the efficiency of fuel, it can expect to contribute to the reduction of global warming gas emissions.[2]

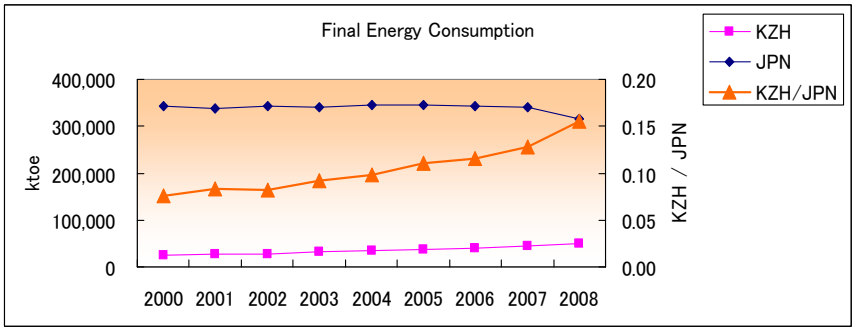
[2] According to the Second National Communication of Kazakhstan to the UNFCCC, the introduction of EURO 3 standard alone is expected to lead to approximately 3% of reduction in the overall GHG emissions in the transportation sector.。

Chapter 5 Macro Data Analysis on Energy Efficiency

5.1 Energy Efficiency of Kazakhstan

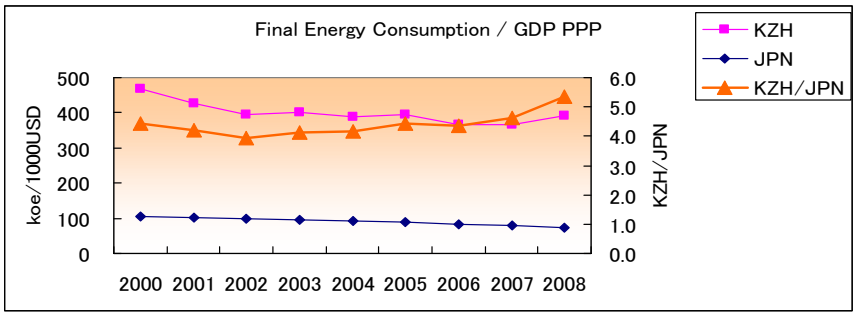
5.1.1 Energy Efficiency in Final Energy Consumption

Kazakhstan consumed final energy consumption with 50 Mtoe (million ton oil equivalence) in 2008. Japan consumed 317 Mtoe in the same year, and the final energy consumption in Kazakhstan was 16 % to Japan. While GDP-PPP of Kazakhstan is 177.8 billion USD in 2008 and Japan is 4,322 billion USD, Kazakhstan's GDP-PPP is 4.1 % to Japan's in 2008. When looking at final energy consumption per GDP-PPP, Japan is 73 koe per 1,000 USD (koe: kilo oil equivalence) and Kazakhstan is 282 koe per 1,000 USD. The final energy efficiency of Japan is around 3.9 times higher than Kazakhstan. Regarding final energy consumption per capita in 2008, Kazakhstan is 3,232 koe per capita and Japan is 2,480 koe per capita. The final energy consumption per capita of Kazakhstan is 1.3 times higher than Japan. Kazakhstan is a more energy intensive country than Japan. At the same time, it can be pointed out that energy utilization of Kazakhstan is less efficient than Japan.



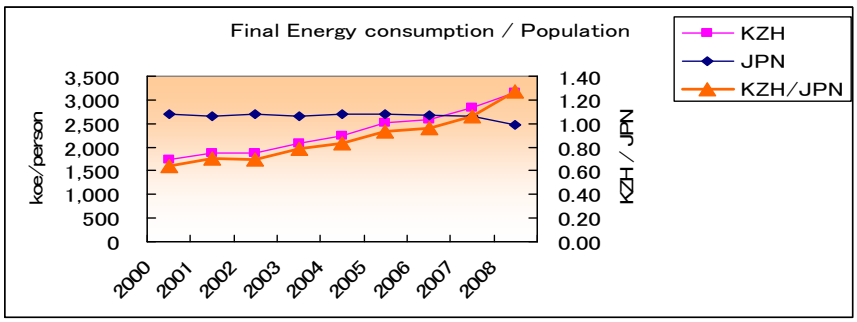
(Source: IEA Statistics)

Figure 5- 1 Final Energy Consumption



(Source: IEA Statistics)

Figure 5- 2 Final Energy Consumption per GDP-PPP



(Source: IEA Statistics)

Figure 5- 3 Final Energy Consumption per Population

5.1.2 Efficiency of Electric Power

Power consumption was 80 TWh (Tera Watt hours) in Kazakhstan and 1,071 TWh in Japan in 2008. When comparing the size of power consumption between the two countries, Kazakhstan is 7.5 % of Japan. During 8 years from 2000 to 2008, the power consumption in Japan did not increased, however Kazakhstan increased by 5.1 % per year. When looking at power consumption per GDP-PPP in 2008, Japan was 248 kWh per 1,000USD and Kazakhstan was 453 kWh per 1,000USD. Japan is 1.3 times more efficient than Kazakhstan. It seemed that the power consumption per GDP-PPP of Kazakhstan has improved from 753 kWh per 1,000U SD in 2000 to 453 kWh per 1,000 USD in 2008 even when considering USD devaluation by USA inflation. On the other hand, regarding power consumption per capita in 2008, Kazakhstan was 5,194 kWh per capita and Japan was 8,391 kWh per capita. The power consumption per capita of Japan is 1.6 times more than Kazakhstan. As an important reminder, Japanese power consumption per capita did not increase from 2000 to 2008, Kazakhstan's however has increased by 4.6 % as well as the growth rate of final energy consumption.

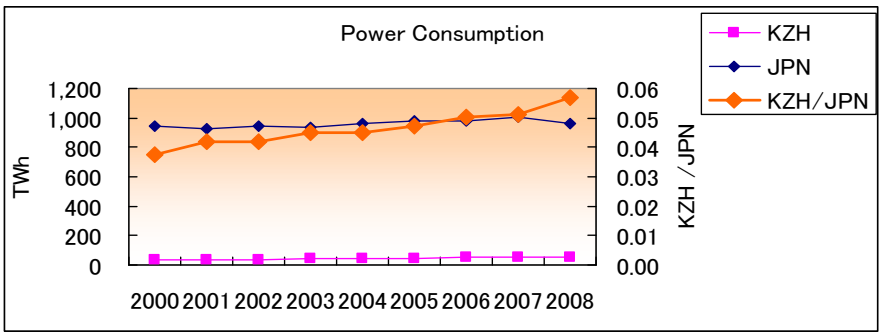
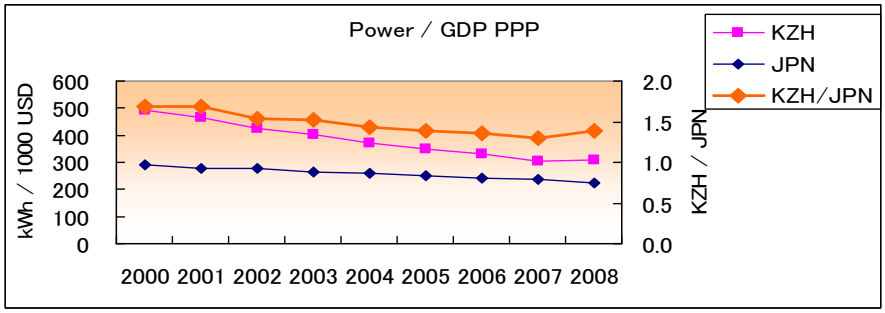


Figure 5- 4 Power Consumption (Source: IEA Statistics)



(Source: IEA Statistics)

Figure 5- 5 Power Consumption per GDP-PPP

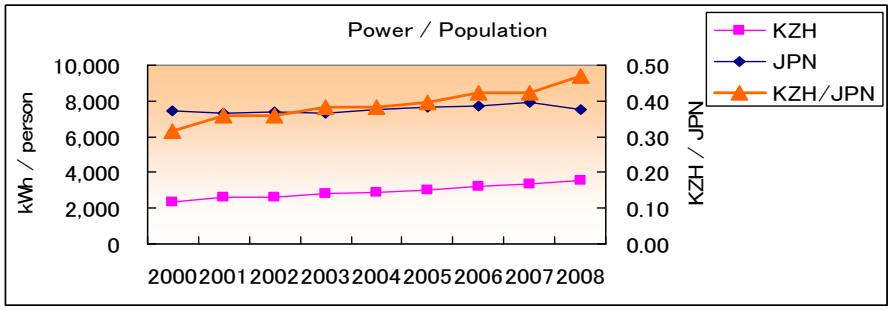
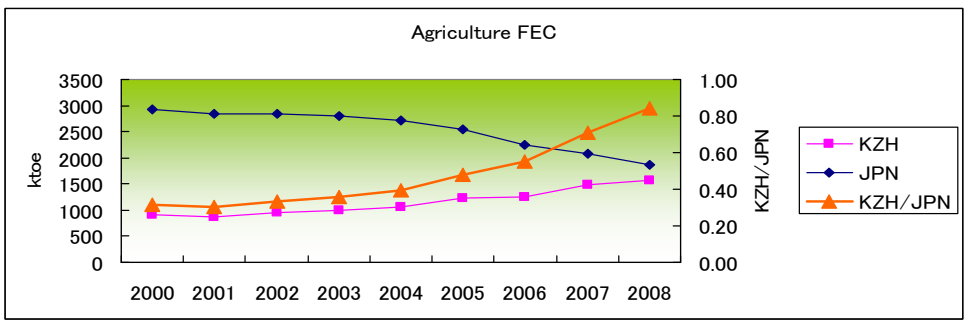


Figure 5- 6 Power Consumption per Population (Source: IEA Statistics)

5.1.3 Energy Efficiency in Each Sector

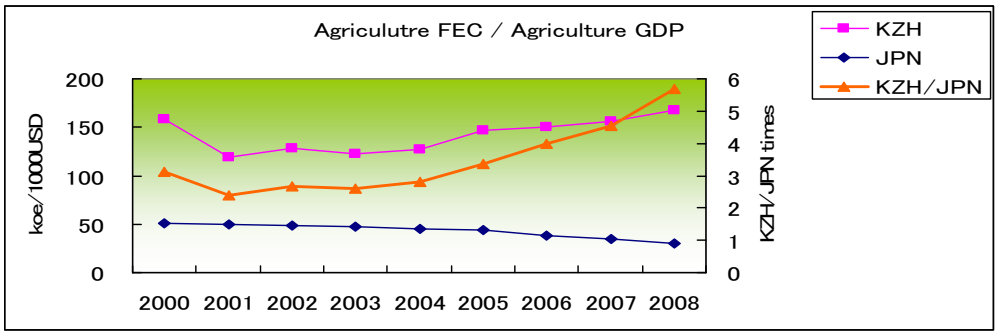
(1) Energy Efficiency in the Agriculture Sector

Energy consumption in the agriculture sector in 2008 was 1.57 Mtoe in Kazakhstan and 1.86 Mtoe in Japan. GDP-PPP in the agriculture sector in 2008 was 9.4 billion USD in Kazakhstan and 63 billion USD in Japan. Japanese GDP in the agriculture sector was 6.7 times more than Kazakhstan. Regarding energy consumption per GDP in the agriculture sector in 2008, Japan was 30 koe per 1,000USD and Kazakhstan was 168 koe per 1,000USD. The value of Kazakhstan is 5.6 times more than Japan. On the other hand, regarding power consumption per GDP in the agriculture sector in 2008, Japan was 14 kWh per 1,000USD and Kazakhstan was 735 kWh per 1,000 USD. The value of Kazakhstan is 52 times more than Japan. The difference between the two countries is mainly due to the different agriculture products and agriculture prices. It cannot discuss the energy efficiency using only energy consumption per GDP.



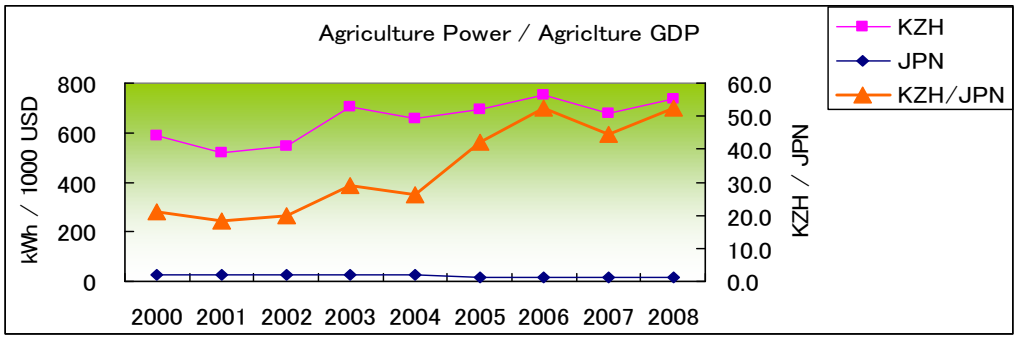
(Source: IEA Statistics)

Figure 5- 7 Energy Consumption in the Agriculture Sector



(Source: IEA Statistics)

Figure 5- 8 Energy Consumption Efficiency in the Agriculture Sector



(Source: IEA Statistics)

Figure 5- 9 Power Consumption Efficiency in the Agriculture Sector

(2) Energy Efficiency in the Industry Sector

Energy consumption in the industry sector in 2008 was 20 Mtoe in Kazakhstan and 123 Mtoe in Japan. The energy consumption of Kazakhstan is 16% to Japan. GDP-PPP in the industry sector in 2008 was 71.8 billion USD in Kazakhstan and 1,203 billion USD in Japan. Regarding energy consumption per GDP-PPP in the industry sector in 2008, Japan was 103 koe per 1,000USD and Kazakhstan was 276 koe per 1,000USD. The value of Kazakhstan was 2.7 times more than Japan. On the other hand, regarding power consumption per GDP-PPP in the industry sector in 2008, Japan was 252 kWh per 1,000USD and Kazakhstan was 460 kWh per 1,000USD. The value of Kazakhstan is 1.8 times more than Japan. It can be considered that the energy efficiency in the industry sector of Kazakhstan improved when analyzing their yearly trends. However, it seemed that yearly trends are evaluated little bit over efficient due to the fact that the nominal GDP of Kazakhstan is converted by PPP exchange rates.

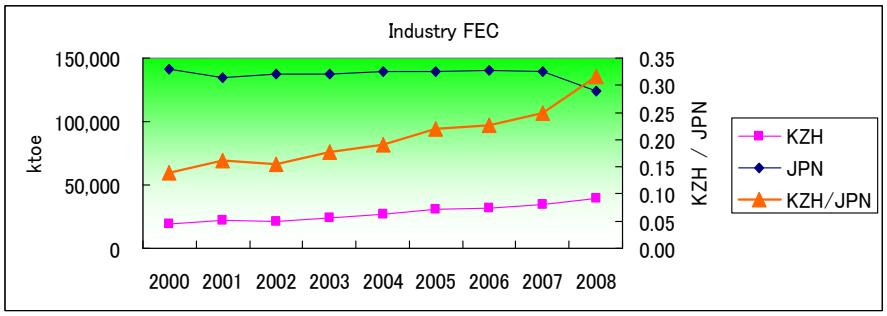
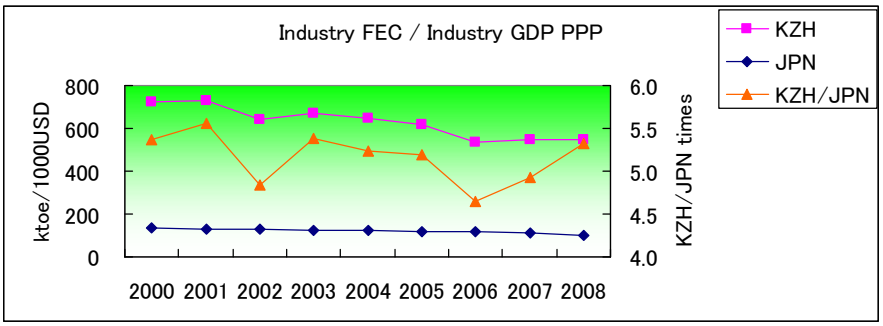


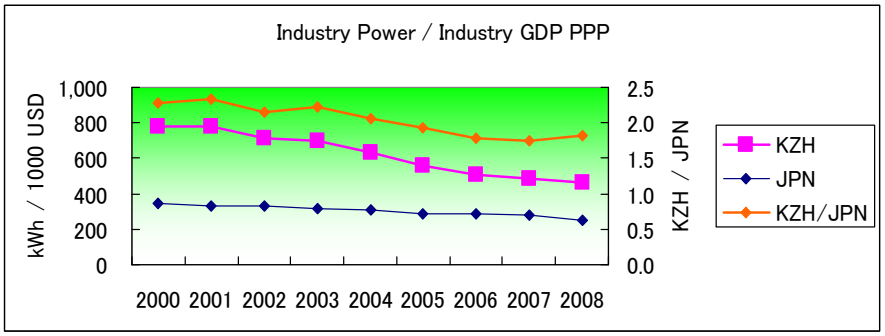
Figure 5- 10 Energy Consumption in the Industry Sector

(Source: IEA Statistics)



(Source: IEA Statistics)

Figure 5- 11 Energy Consumption Efficiency in Industry Sector

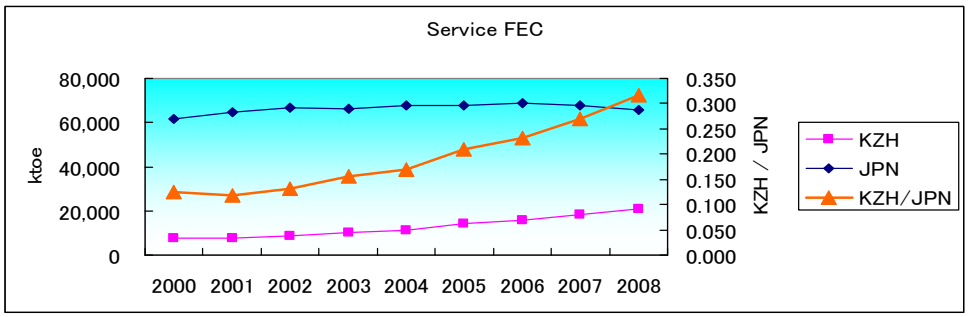


(Source: IEA Statistics)

Figure 5- 12 Power Consumption Efficiency in the Industry Sector

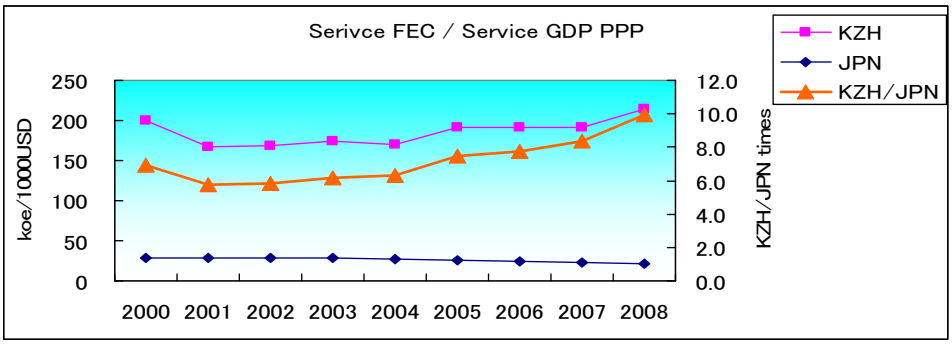
(3) Energy Efficiency in the Commercial, Service & Other Sector

Energy consumption in the commercial, service & other sector in 2008 were 21 Mtoe in Kazakhstan and 66 Mtoe in Japan. Energy consumption in the sector of Kazakhstan is 32 % to Japan. GDP-PPP in the commercial & service sector in 2008 was 96.7 billion USD in Kazakhstan and 3,055 billion USD in Japan. The GDP-PPP of the Japanese commercial & service sector is 31 times larger than Kazakhstan. Regarding energy consumption per GDP-PPP in the commercial & services sector in 2008, Japan was 22 koe per 1,000USD and Kazakhstan was 214 koe per 1,000USD. The value of Kazakhstan is 9.7 times more than Japan. On the other hand, regarding power consumption per GDP-PPP in the commercial & service sector in 2008, Japan was 115 kWh per 1,000USD and Kazakhstan was 53 kWh per 1,000USD. The value of Japan is 2.1 times more than Kazakhstan. As an additional condition, power consumption of Kazakhstan includes that of the other sector.



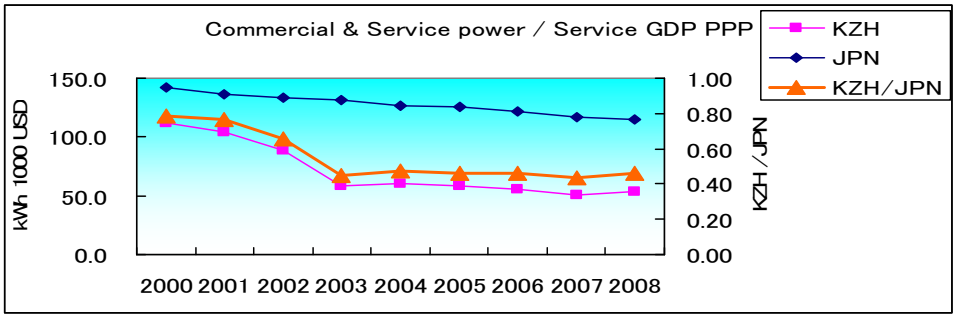
(Source: IEA Statistics)

Figure 5- 13 Energy Consumption in the Commercial, Services and Other Sector



(Source: IEA Statistics)

Figure 5- 14 Energy Consumption Efficiency in the Commercial, Services and Other Sector

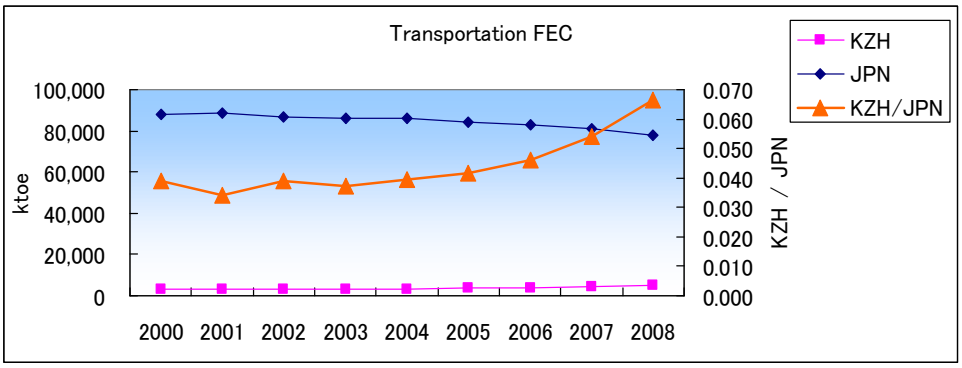


(Source: IEA Statistics)

Figure 5- 15 Power Consumption Efficiency in the Commercial, Services and Other Sector

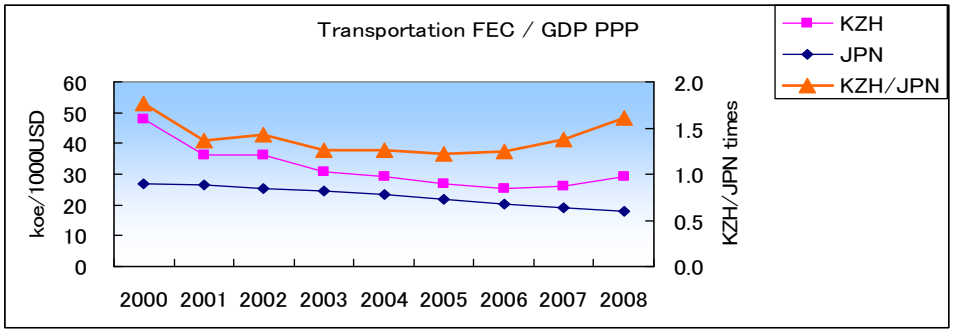
(4) Energy Efficiency in the Transportation Sector

Energy consumption in the transportation sector in 2008 was 5.1 Mtoe in Kazakhstan and 78 Mtoe in Japan. Energy consumption in the sector of Kazakhstan is 7.6 % to Japan. Regarding energy consumption in the transportation sector per GDP-PPP (GDP is the whole country) in 2008, Japan was 18 koe per 1,000USD and Kazakhstan was 29 koe per 1,000USD. The value of Kazakhstan is 1.6 times more than Japan. On the other hand, regarding power consumption in the transportation sector per GDP-PPP (GDP is the whole country) in 2008, Japan was 4 kWh per 1,000USD and Kazakhstan was 13 kWh per 1,000USD. The value of Kazakhstan is 3.2 times more than Japan. General speaking, energy consumption in the transportation sector is in relation to the land scale and the population density.



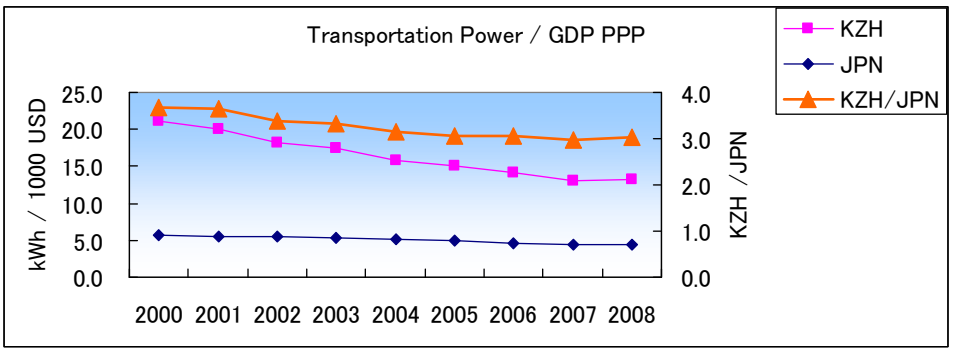
(Source: IEA Statistics)

Figure 5- 16 Energy Consumption in the Transportation Sector



(Source: IEA Statistics)

Figure 5- 17 Energy Consumption Efficiency in the Transportation Sector

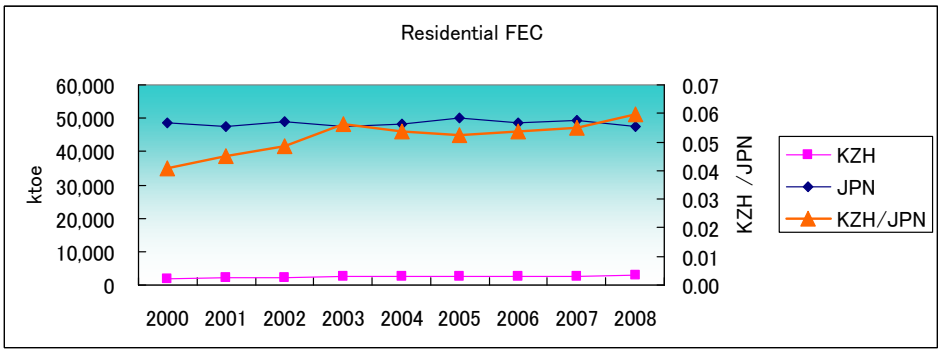


(Source: IEA Statistics)

Figure 5- 18 Power Consumption Efficiency in the Transportation Sector

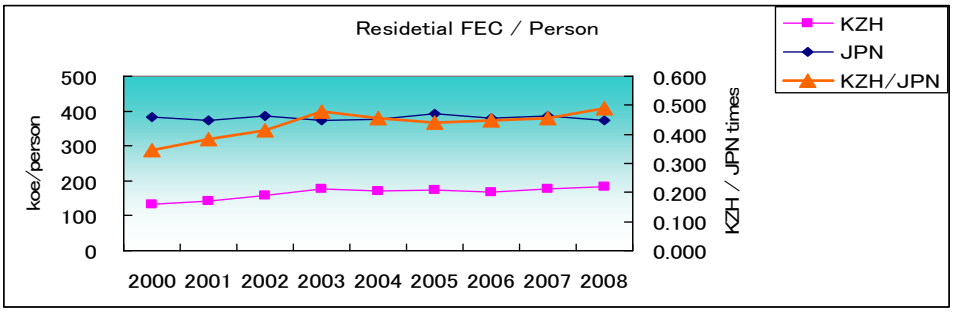
(5) Energy Efficiency in the Residential Sector

Energy consumption in the residential sector in 2008 was 2.8 Mtoe in Kazakhstan and 47 Mtoe in Japan. Energy consumption in the sector of Kazakhstan is 6.0 % to Japan. Regarding population in the countries, Kazakhstan was 15.5 million and Japan was 127 million. Energy consumption per population in the residential sector in 2008, Japan was 372 koe per capita and Kazakhstan was 183 koe per capita. The value of Kazakhstan is 49 % to Japan. On the other hand, regarding power consumption in the residential sector per capita in 2008, Japan was 2,252 kWh per capita and Kazakhstan was 479 kWh per capita. The value of Kazakhstan is 21 % to Japan. In the future, energy consumption in the residential sector will be increased in conjunction with increasing national income.



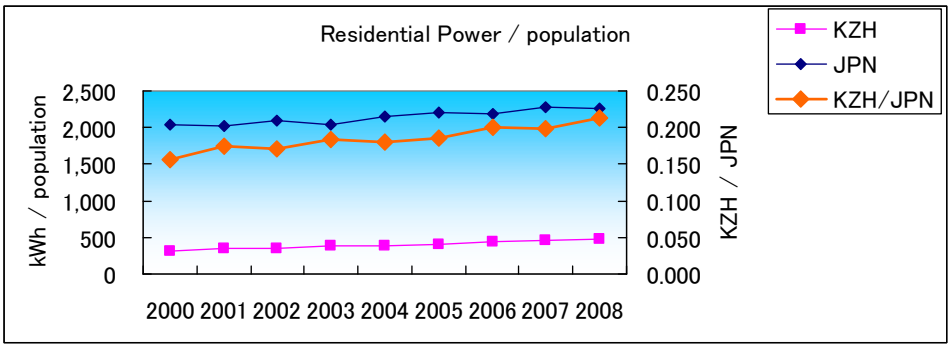
(Source: IEA Statistics)

Figure 5- 19 Energy Consumption in the Residential Sector



(Source: IEA Statistics)

Figure 5- 20 Energy Efficiency in the Residential Sector



(Source: IEA Statistics)

Figure 5- 21 Power Efficiency in the Residential Sector

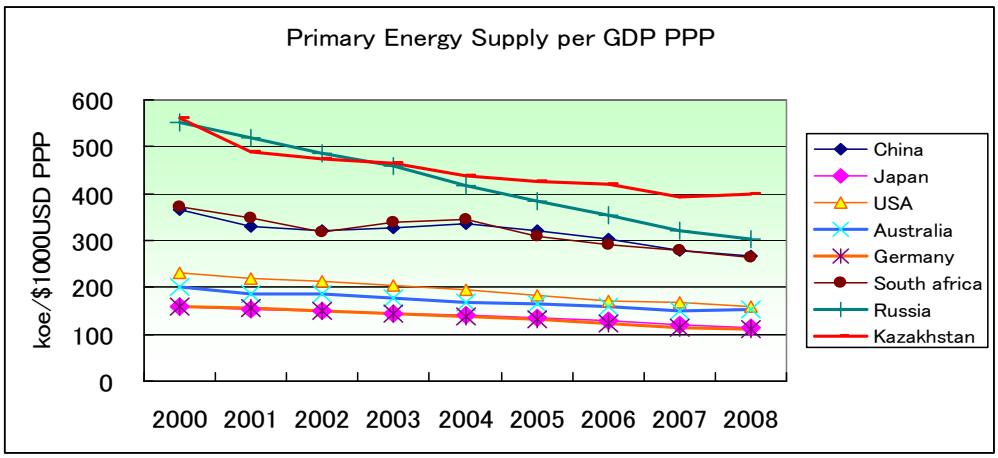
5.2 Comparison to Other Countries

5.2.1 Comparison of Primary Energy Intensity

As an indicator showing national energy efficiency, the primary energy intensity to the GDP is used. Recently, the GDP converted by purchasing power parity exchange rate based on the dollar is used frequently. It is based on the consideration that the PPP exchange rate can reveal the economic situation more accurately than the market exchange rate. There are cases where the recent market exchange rate is formulated by international money games, in the case of the market exchange rate, it cannot show the actual economic situation when comparing economic activities among multi countries. In the case of the smaller value of primary energy consumption intensity per GDP, it shows better energy efficiency to the economy.

In the following figure, the energy intensities of Kazakhstan after 2004 has been positioned at a higher level than Germany and Japan, when comparing it among the countries, Kazakhstan's intensity is around 4 times more than Germany and Japan that have high energy performance. It means that Japan and Germany use 100 koe (0.7 bbl as crude oil) for producing 1,000 USD of GDP, however Kazakhstan uses 400 koe (2.8 bbl as crude oil) for 1,000 USD of GDP. The GDP of the following figure is the values converted nominal GDP of each country per PPP exchange rate. Therefore, the efficiencies of the intensities are a little bit higher than the real efficiencies in the countries, because international USD includes inflation (2.5 % per year). Therefore, it can be seen

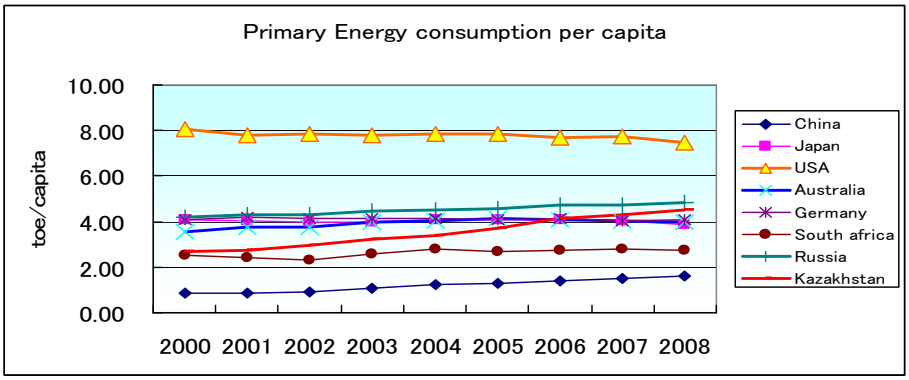
that like the intensities of all of the countries in the figure are improved year by year.



(Source: IEA Statistics)

Figure 5- 22 Primary Energy Supply per GDP-PPP

Primary energy consumption per capita in the following table is decided by income per capita and the national land size. It means that the size of economic production per capita decides the size of primary energy consumption per capita, and at the same time, the size of national land per capita makes the size of energy consumption per capita. When looking at the view points of the above mentioned, the primary energy consumption per capita in the USA is the highest out of all the countries. Though the USA does not seem to be an energy efficient country at a glance, a quick conclusion cannot be drawn when considering the land scale and its economic activities. As carefully as the recent primary energy consumption per capita in Kazakhstan increases rapidly, it can say that it shows a typical pattern among emerging countries. As additional information, China's primary energy consumption per capita is the lowest in the countries that will increase primary energy consumption in conjunction with increasing their national income in the future.

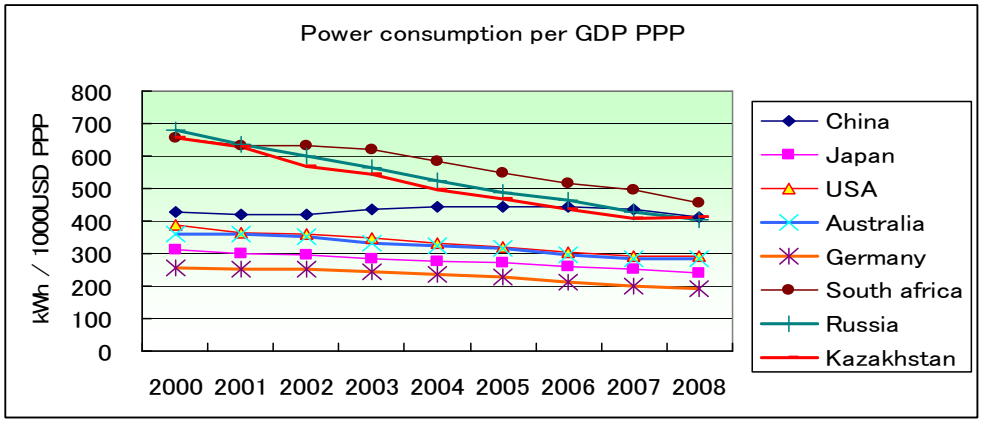


(Source: IEA Statistics)

Figure 5- 23 Primary Energy Consumption per Capita

5.2.2 Comparison of Electric Power Consumption Intensity

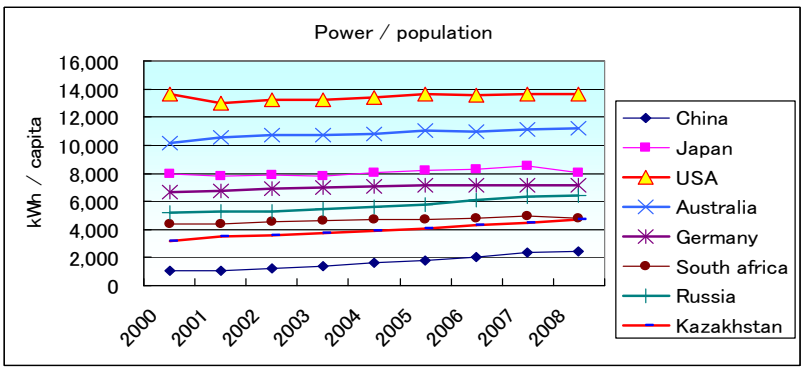
Power consumption intensity to GDP is different per industrial structures in countries and energy utilization in the residential sector. It cannot be said that the power consumption intensity to the GDP shows right and wrong for power consumption efficiency. For example, electric power and gas and kerosene are used in most Japanese households. However, gas and kerosene are not used so much in South African and Saudi Arabian households. Most of the households in the countries use electric power. Generally, the households in East and Southeast Asia use electric power and gas, Middle east countries use electric power, and East Europian countries use electric power and heat. When looking at the following figure from the above perspectives, the electric power consumption per GDP in South Africa is 450 kWh/ 1,000USD in 2008, it is the highest among the countries. The lowest out of the countries is Germany, and it was 200 kWh/1,000USD in 2008 which is around half of South Africa. This shows that the South African economy strongly depends on electric power, and adversely, power dependence of the German economy is the weakest of the countries.



(Source: IEA Statistics)

Figure 5- 24 Power Consumption per GDP-PPP

The following figure is electric power consumption per capita. The order of the electric power consumption per capita in the figure is the difference to electric power consumption per GDP, that is, the USA and Australia are higher, and Kazakhstan and China are lower. Electric power consumption per capita is an indicator to show the “Economic size” as well as the “Life style level”. For an example of Japan, electric power consumption in agriculture, industry and the transportation sectors have not increased, but power consumption in the commercial and residential sectors increased although the growth rate is low.



(Source: IEA Statistics)

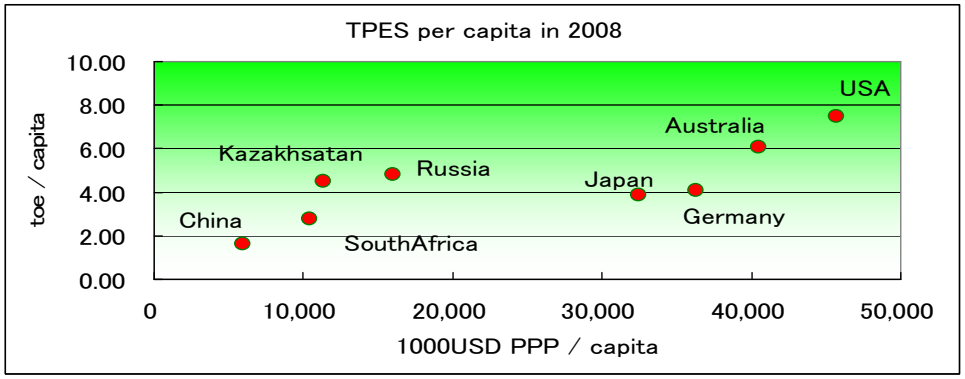
Figure 5- 25 Power Consumption per Capita

5.2.3 GDP per Capita and Energy Consumption per Capita

A country with a high GDP per capita is the high energy consumption per capita. This becomes a leading indicator for emerging countries that increase energy consumption in conjunction with their GDP growth. When looking at the values in 2008 in the following figure, China, South Africa, Kazakhstan, Russia, Japan, Germany, Australia and USA are arranged in the ascending order to the GDP per capita in 2008. At the same time, the energy consumption per capita is the same order as the GDP per capita.

According to the following figure, the difference of GDP per capita between the USA and China is 7.6 times, the difference of the primary energy consumption per capita between the two countries is 4.6 times, the elasticity between the GDP per capita and the primary energy consumption per capita is "0.5". This means that when the GDP per capita becomes 2 times, primary energy consumption increases 1.5 times.

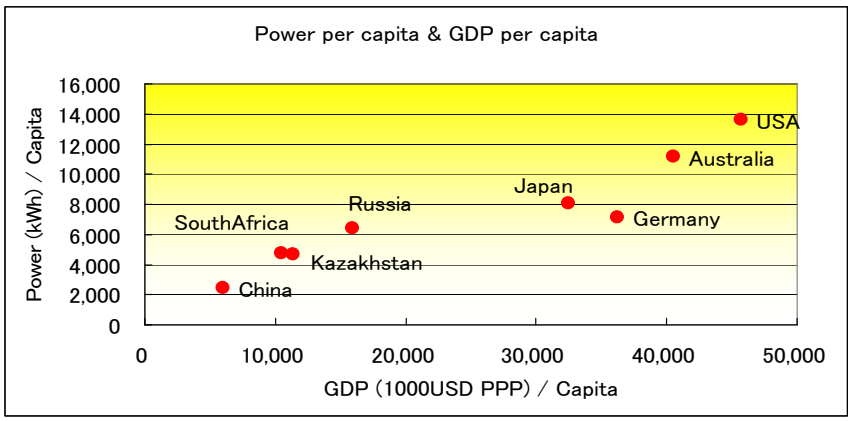
When looking at the trend line in the following figure, if Kazakhstan's GDP per capita at 11,300 USD (PPP base, but 8,700 USD in market exchange rate) becomes 2 times, the primary energy consumption per capita is increased to 5.0 toe per capita. However, the primary energy per capita in Kazakhstan had already reached 4.5 toe per capita in 2008, and it is required that Kazakhstan introduces policies of energy efficiency and conservation in all of the sectors



(Source: IEA Statistics)

Figure 5- 26 GDP per Capita and Primary Energy Consumption per Capita

Electric power consumption per capita shows the same trend as primary energy consumption per capita. However the elasticity between the two is larger than primary energy consumption per capita. The difference of GDP per capita between the USA and China is 7.6 times, and the electric power consumption per capita between the two countries is 5.5 times. The elasticity between the GDP per capita and the electric power consumption per capita is "0.7". When the GDP per capita becomes 2 times, electric power consumption per capita becomes 1.7 times. According to the following figure, if Kazakhstan's GDP per capita in 2008 becomes 2 times, electric power consumption per capita is increased to 7,000 kWh per capita from 4,600 kWh per capita in 2008.

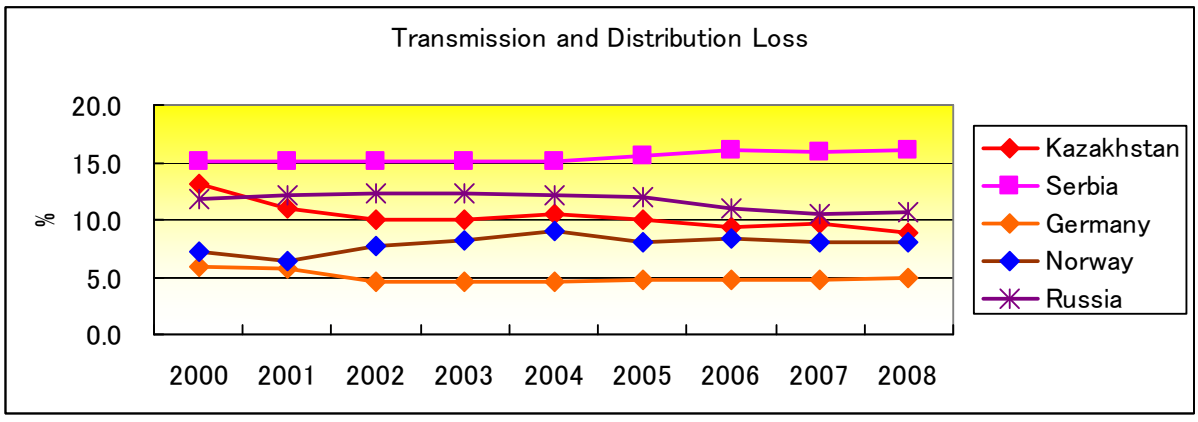


(Source: IEA Statistics)

Figure 5- 27 GDP per Capita and Electric Power Consumption per Capita

5.2.4 Transmission and Distribution Loss

Transmission and distribution loss in European countries are shown below. There is a room for improvement of the loss rate of Kazakhstan.



(Source: IEA Statistics)

Figure 5- 28 Transmission and Distribution Loss in European Countries

5.3 Issues Identified by Energy Data

5.3.1 Issues in the Demand Side Sectors

(1) Structure of Final Energy Consumption

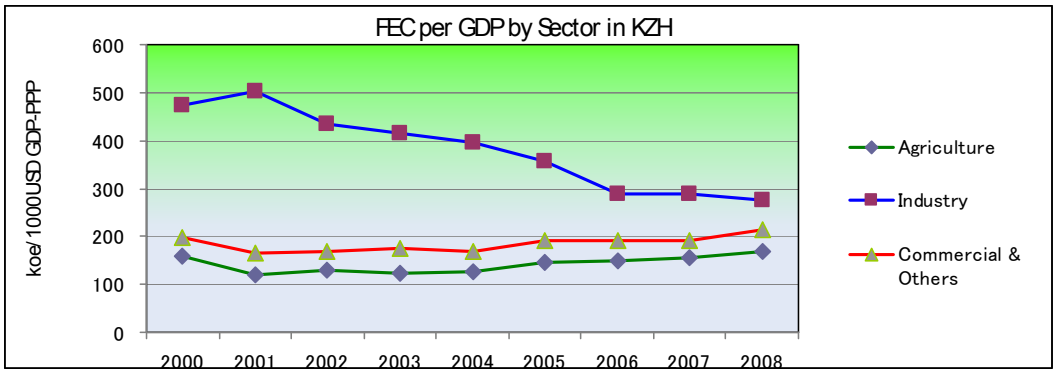
The energy consumtion and its contribution of agriculture, industry (mining and manufacturing), commercial and service, transportation and residential sectors from 2000 to 2008 are as followings.

Table 5- 1 Final Energy Consumotion by Sector in Kazakhstan

Unit: Upper Mtoe (consumotion), lower % (contribution)

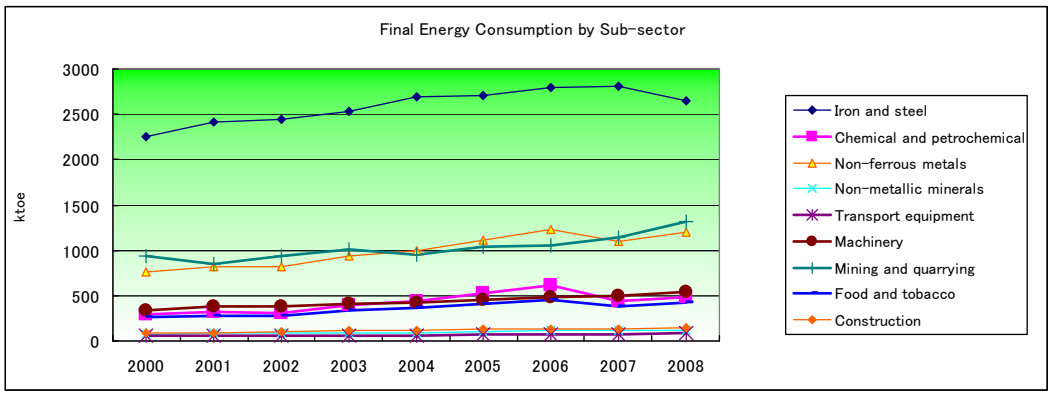
Consumption(Mtoe)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Agriculture	0.9	0.9	0.9	1.0	1.1	1.2	1.2	1.5	1.6
Industry	12.9	15.1	14.5	15.1	16.4	17.7	17.1	18.3	19.8
Service&Other	7.7	7.7	8.8	10.3	11.4	14.1	15.9	18.2	20.7
Transportation	3.4	3.0	3.4	3.2	3.4	3.5	3.8	4.4	5.2
Residential	2.0	2.1	2.4	2.7	2.6	2.6	2.6	2.7	2.8
Final Total	26.9	28.8	30.0	32.3	34.8	39.2	40.8	45.1	50.2
Contribution(%)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Agriculture	3.4	3.0	3.2	3.1	3.0	3.1	3.1	3.3	3.1
Industry	47.7	52.5	48.3	46.8	47.0	45.2	42.1	40.5	39.5
Service&Other	28.7	26.6	29.4	31.9	32.7	36.0	39.1	40.4	41.3
Transportation	12.7	10.5	11.2	9.9	9.8	9.0	9.4	9.8	10.3
Residential	7.4	7.4	7.9	8.3	7.4	6.7	6.4	6.0	5.7
Final Total	100	100	100	100	100	100	100	100	100

(Source: IEA Statistics)



(Source: IEA Statistics)

Figure 5- 29 Final Enegy Consumption per GDP by Sector



(Source: IEA Statistics)

Figure 5- 30 Final Energy Consumptin by Sub-sector in Industry

(2) Identified Issues

From the above table and figures, the following issues are identified.

Industry Sector

- Kazakhstan promoting the heavy chemical industry used 40 % of the total final energies in the industry sector in 2008. It is presumed that there is much room to achieve energy efficiency and conservation in the industry sector.
- Final energy consumption per GDP in the industry sector was 5.3 times to Japan's in 2008. Then highly enhanced energy efficiency and conservation policies are expected in the industry sector, especially the heavy and chemical sub-sectors in Kazakhstan.

Commercial,Service & Other Sector

- The final energy consumption in the commercial, service & other sectors consumed 40 % of the total final consumption in 2008. The sectors are large consumers of final energy consumption as well as the industry sector, and the final energy consumption contribution of the sectors has increased since 29 % in 2000. As predicted, the sector's energy consumption in the future will increase in conjunction with economic growth. It is required to create energy efficiency and conservation activities for buildings, lightings and air-conditioners.
- When looking at the power consumption per sectoral GDP in the commercial and service sector, Japan was 115 kWh / 1,000USD and Kazakhstan was 53 kWh / 1,000USD in 2008. Japanese power consumption per the sectoral GDP is around 2.1 times to Kazakhstan. As usual, the electric power consumption per GDP in the sector increases in conjunction with economic growth. Kazakhstan requires energy efficiency and conservation policies targeted towards electric power consumption in the commercial and service sector.

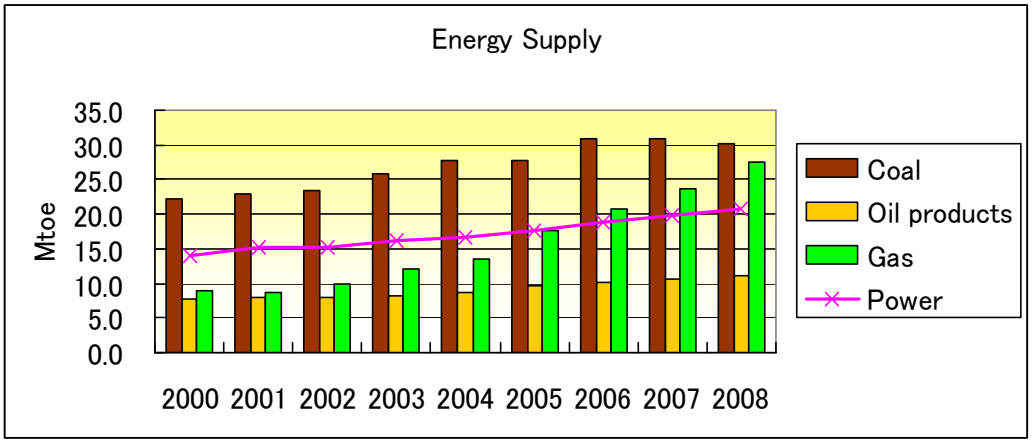
Residential Sector

- Kazakhstan does not consume so much energy in the residential sector in comparison to other countries. This is one of the reasons that Kazakhstan has a limited population of as little as 15 million. The final energy consumption in the residential sector in 2008 was 2.8 Mtoe, and 2.0 Mtoe in consumption was the heat supplied to the residential sector, it means that most of the final energy consumption in the residential sector is heat. Energy efficiency and conservation to heat supply systems are required to improve energy efficiency in the residential sector.
- When looking at electric power consumption per capita in the residential sector, Japan was 2,252 kWh per capita and Kazakhstan was 479 kWh per capita in 2008. Kazakhstan was 21 % of Japan. As it is believed that the residential sector in Kazakhstan will increase electric power consumption in the future, it is required to introduce energy conservation of heating in the winter season, air- conditioner use in the summer season, lighting in houses and develop insulation materials for houses.

5.3.2 Issues in the Supply Side Sector

(1) Energy Supply

In Kazakhstan, coal, natural gas and oil are supplied in the domestic market, as other primary energies, hydropower and renewable energies are available in Kazakhstan. However, the volumes of energy are not so big. Coal and oil supply over the past 8 years did not increase, while natural gas supply rapidly increased for the industry and power sectors. Much coal is supplied to the combined heat and power stations, and it reveals an outstanding point of energy consumption structure in cold weather countries. Furthermore, the line in the following figure shows the heat values required for power supply (conversion heat value is 2,400 kcal per kWh). It is clear that the increase of power generation stations is dependent on the increase of natural gas utilization power plants. It may be considered that the energy efficiency of natural gas fired power plants may become an issue.



(Source: IEA Statistics)

Figure 5- 31 Supply of Coal, Petroleum Products and Natural Gas

(2) Electric Power Supply

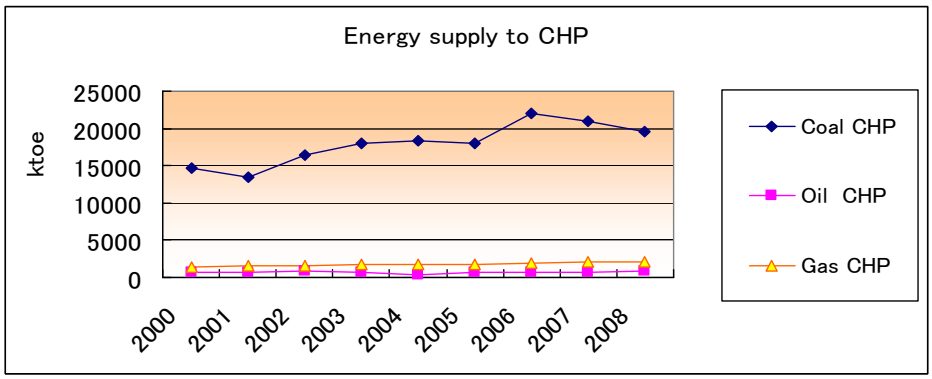
The following table reveals electric power demand and supply. In power generation (power total in the following table) with 80Twh in 2008, power was consumed by contributing 41 % in the industry sector, 32 % self-consumption and losses, 9 % in the agriculture sector, 6 % in the commercial & service sector and 9 % in the residential sector. Much self-consumption and losses are one of the typical patterns of socialist countries, power consumption in governmental entities and organizations are accrued in the category. The phenomenon does not mean inefficient power utilization in Kazakhstan. However, if the Kazakhstan government wants to introduce foreign funds for IPPs and promote more power generation capacity, it will be a challenge to introduce new power supply and accounting systems including self-consumption changes to power sales and current power supply institutions.

Table 5- 2 Power Demand and Supply in Kazakhsta

Power consumtion （TWh）	2000	2001	2002	2003	2004	2005	2006	2007	2008
Agriculture	3.4	3.8	4.1	5.7	5.4	5.8	6.2	6.5	6.9
Industry	21.2	23.4	23.8	25.3	26.0	27.7	29.9	31.0	33.0
Commercial & service	4.3	4.8	4.6	3.5	4.1	4.3	4.7	4.8	5.2
Transport	1.5	1.7	1.7	1.8	1.8	2.0	2.1	2.2	2.3
Residential	4.8	5.3	5.3	5.7	5.8	6.2	6.7	7.0	7.4
Own use & loss	19.2	19.7	19.3	20.5	21.5	22.5	23.6	24.8	25.7
Power total	54.3	58.7	58.7	62.4	64.8	68.5	73.2	76.3	80.6
Contribution(%)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Agriculture	6.3	6.4	6.9	9.2	8.4	8.5	8.5	8.5	8.6
Industry	39.0	39.9	40.5	40.5	40.2	40.5	40.8	40.6	41.0
Commercial & service	8.0	8.2	7.8	5.6	6.3	6.3	6.4	6.3	6.4
Transport	2.8	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Residential	8.8	9.0	9.1	9.1	9.0	9.1	9.2	9.1	9.2
Own use & loss	35.2	33.7	32.8	32.8	33.2	32.8	32.3	32.6	31.9
Power total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source: IEA Statistics)

Most of the power supply in Kazakhstan comes from combined heat and power stations (CHP), and 90 % of CHPs use coal-fired power generation. As typical countries introduce many coal-fired power generation plants, China, Indonesia and Australia can be pointed out. However, countries with many CHP plants like Kazakhstan are not so many. As CHPs frequently are built up near big cities, countermeasures against smoke dust and SOx from the plants and energy efficiency improvements of power plants are required.



(Source: IEA Statistics)

Figure 5- 32 Energy Consumption in CHP Plants

(3) Coal Sector

Coal production in Kazakhstan has been increasing. However, domestic coal consumption has not increased since 2006. Coal in Kazakhstan is consumed by iron and steel companies and CHP stations. As the introduction of natural gas power generation plants are being planned by the Government, massive coal consumption in the domestic market of Kazakhstan is not desired in future. If it can be estimated that crude oil prices will exceed $80/bbl in the future, the utilization of coal for coal liquefaction as a crude oil substitute can be considered for countries such as South Africa. Coal liquefaction technologies in South Africa, Germany and Japan are well known throughout the world. Otherwise if coal is used as fuels for power plants, coal utilization in coal gasification GCC is preferential for environmental protection. Nevertheless, in Kazakhstan, coal

high technology is considered to be a challenge.

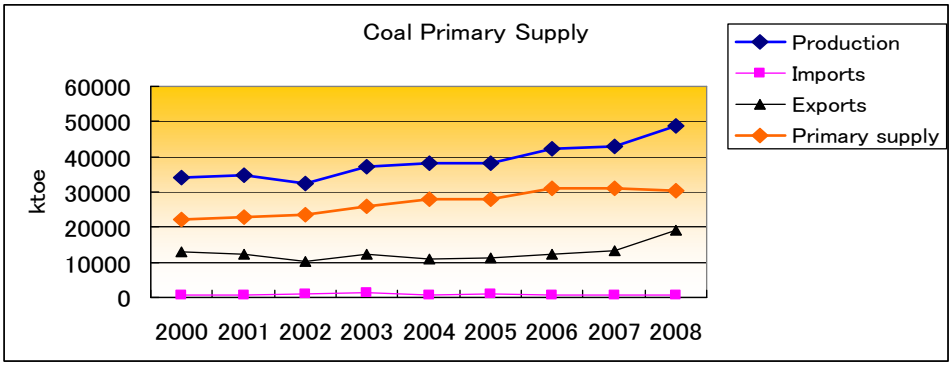


Figure 5- 33 Coal Primary Supply Balance (Source: IEA Statistics)

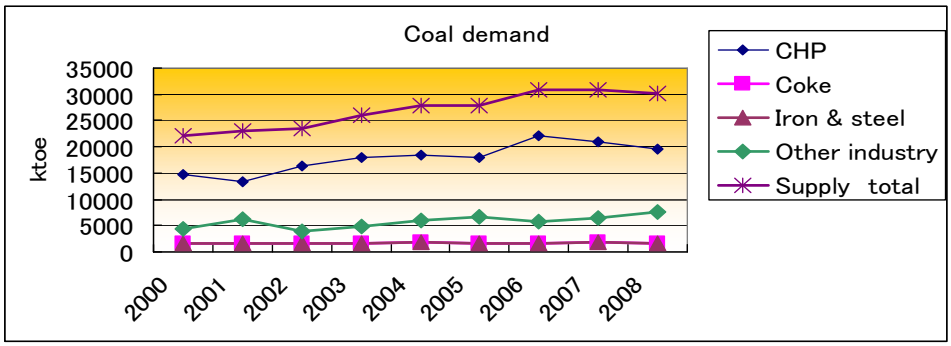


Figure 5- 34 Coal Demand by Sub-sector (Source: IEA Statistics)

(4) Oil and Gas Sector

Kazakhstan is a crude oil production and exporting country. Oil refinery capacity in the country is expected to increase in the future. Furthermore, as the R/P of crude oil is 65 years at the end of 2009, it is expected that crude oil production will increase. Therefore, the export of oil products from Kazakhstan will increase instead of crude oil. At the time, since it is predicted that heavy oil will be a surplus, it is used in power plants in several cases of other countries. These become issues needing to be tackled by SOx counter-measures and high performance oil-fired power generation plants from the perspective of energy efficiency and environmental protection.

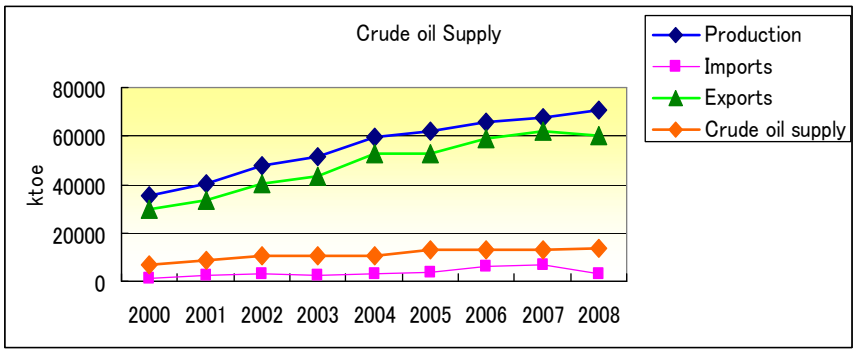
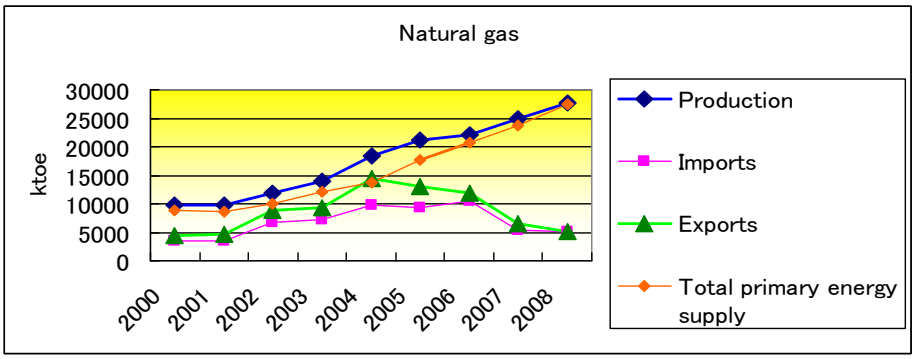


Figure 5- 35 Cude Oil Demand Supply Balance (Source: IEA Statistics)

Natural gas was exported until 2005. After 2006, natural gas had been used for the chemical industry as raw material and gas-fired power stations. In the future, natural gas will be used in GCC plants according to government policy. Furthermore, as predicted natural gas in conjunction with LPG will be used much more in the residential sector. The introduction plans of the infrastructures are challenges that the government is facing. Meanwhile, when considering the promotion of natural gas vehicles in countries such as Japan, the Philippines and India, gas transportation systems such as the gas filling system and the compressed natural gas system (CNG system) are required. Japanese know-how and technologies are useful to promote the introduction of such systems



(Source: IEA Statistics)

Figure 5- 36 Natural Gas Primary Energy Balance

Chapter 6 Assistance by the Donors

6.1 Past ODA Assistance by Japan

6.1.1 Japanese ODA Loans in Kazakhstan

Kazakhstan has received six loans, which are quite large in number compared to the other countries in Eastern Europe and Central Asia. Regarding the loan amount provided to Kazakhstan, it has reached 95.14 billion yen. Regarding the target of the six loans, five are provided to the transportation sector (road, airport, bridge, and railroad) and one to the social services sector (waterworks). No assistance has been provided to the electricity sector so far.

Table 6- 1 Japanese ODA Loan to Kazakhstan

Project Name	Sector	Business	Contract Date	Loan Amount (million yen)	Implementation Organization
CAREC Transport and Trade Corridors Project	Transportation	Road	2010/8/23	6,361	Ministry of Transport and Communications
Water Supply and Sewerage System for Astana City	Social Services	water and sewerage	2003/7/8	21,361	Astana City
Western Kazakhstan Road Reconstruction Project	Transportation	Road	2000/12/21	16,539	Ministry of Transport and Communications
Astana Airport Reconstruction Project	Transportation	Airport	1998/12/24	22,122	International Astana Airport
Construction of Bridge over Irtish River	Transportation	Bridge	1997/3/12	21,530	State Government of East Kazakhstan
Enhancement of Railway Transportation Capacity	Transportation	Railway	1995/12/5	7,236	Kazakhstan National Railways

6.1.2 Examples of Japanese ODA Loans for Energy Efficiency and Conservation

The following are the examples of Japanese ODA loans for energy efficiency and conservation provided to India and to Vietnam.

(1) India [Micro, Small and Medium Enterprises Energy Saving Project]

Project Objectives
The purpose of this project is to promote energy-savings measures among MSME by providing them with the mid-/long-term financing necessary for energy-saving measures as well as supporting Small Industries Development Bank of India (SIDBI) and other intermediary financial institutions in India – the executing agency – by strengthening their capabilities to finance loans. It will raise awareness of energy saving in MSME, and promote efficient energy use, and contribute to improving the environment, sustainable economic development and climate change measures by promoting an improvement in energy efficiency in India.
Project Site / Name of the Target Area
Nationwide in India
Project Outline
This project will provide the end user MSMEs with the necessary capital via two-step sub-loans from the SIDBI or via three-step sub-loans through further intermediary financial institutions. Additionally, it will implement awareness raising activities aimed at promoting capital expenditures, etc. on energy saving and provide support to SIDBI and other intermediate financial institutions based on experience in Japan to strengthen their capability to evaluate loans to MSME for energy-saving related items. 1) Provision of necessary funds for subproject implementation (Japanese ODA loan) a) Sub-loan financing period: 3 ~ 10 years b) Sub-loan interest rate: Set by SIDBI or the intermediary financial institution (However, it is expected to be set at a lower rate than the preferential interest rate for general financing) c) Target industries: Focused on industries that consume a lot of power (Excluding illegal industries such as arms and narcotics.) 2) Technical support (strengthen the financial institution's capability to appraise loans for energy saving related items, raise energy saving awareness. Not part of the ODA loans)
Total Project Cost/Loan Amount
31,593 million Yen (Including 30,000 million Yen in Japanese ODA loan)
Schedule
October 2008 – September 2011 (36 months)
Project Implementation Structure
1) Borrower: Small Industries Development Bank of India: SIDBI 2) Guarantor: The President of India 3) Executing Agency: As per 1) 4) Operation / management: As per 1)

(2) Vietnam [Energy Efficiency and Renewable Energy Promoting Project]

Project Objectives
The objective of this project is to promote Energy Efficiency (EE) activities and Renewable Energy (RE) investments in enterprises (End-borrowers) in Vietnam, by promoting an awareness campaign, and providing financial assistance to End-borrowers through the Vietnam Development Bank (VDB), and to strengthen the appraisal capacity of VDB through technical assistance (TA), utilizing the experience of environmental financing in Japan. In doing so, the Project will contribute to Vietnam's sustainable development and the mitigation of global climate change through reducing Greenhouse Gases (GHG).
Project Site/Target Area
Nationwide in the Socialist Republic of Viet Nam
Project Component(s)
a) Two-Step Loans: Provision of medium- and long-term loans through the Viet Nam Development Bank b) Consulting Service: Promotion of business operations, technical support, etc.
Project Cost (Loan Amount)
5,520 million yen（Loan amount: 4,682 million Yen）
Schedule
November 2009 - December 2012 (38 months)
Project Implementation Structure
1) Borrower：The Government of the Socialist Republic of Viet Nam 2) Executing Agency：VDB: The Viet Nam Development Bank 3) Operation and Maintenance System: To invest in equipment and activities which contribute to the promotion of energy-saving and renewable energy, based on the results of the financial screening and technical review by Viet Nam Development Bank.

6.2 United Nations Development Programme (UNDP)

6.2.1 Country Strategy

Since the Standard Basic Assistance Agreement (SBSS) signed by the Government of Kazakhstan and UNDP in 1994, UNDP has provided assistance to Kazakhstan based on a five-year country programme. The UNDP's country program is formulated according to the United Nations Development Assistance Framework (UNDAF) which serves as the basis for individual UN Agencies' Country Programs, including UNDP.

Priority areas in the UNDAF and UNDP Country Programme for 2005-2009 are shown in the following table. In the UNDP Country Programme 2005-2009, the program for environment management corresponded to the priority area of "Ensuring quality of life for all" in the UNDAF. Under the strategy for environment management, UNDP supported national efforts in addressing the threats of global warming and climate change.

Table 6- 2 Priority Areas of UNDAF and UNDP Country Programme 2005-2009

UNDAF	UNDP Country Programme
■ Developing pro-poor policies ■ Ensuring quality of life for all ■ Promoting and enabling environment for democratic governance and the broadest participation of citizens in national development	■ Poverty Reduction ■ Environment Management ➢ Sustainable Development ➢ Water Management ➢ Ozone-depleting substances (ODS) and persistent organic pollutants (POPs) ➢ Disaster Management ➢ Biodiversity Conservation ➢ Energy Efficiency ➢ Sustainable Local Development ■ Good Governance

(Source: UNDP in Kazakhstan website, http://www.undp.kz/ , as of April 2011)

UNDP assistance was provided for those projects to promote improved energy efficiency in heat and water supply systems and to increase the use of renewable energy sources with funding from the Global Environment Facility (GEF). Specific projects focused on wind energy development and energy efficiency in municipal heating systems. In particular, using funds from GEF and UNDP intensively supported the investment promotion of wind energy development, including wind resource and energy assessment as well as pre-feasibility studies on promising sites for wind power farms. In addition, the UNDP actively supported the Government of Kazakhstan in the ratification process for the Kyoto Protocol, including the preparation and implementation of a national sustainable development strategy and environmental legislation.

In the latest UNDAF and the UNDP Country Program for 2010-2015, “Environmental Sustainability” is one of the focus areas of interventions as follows.

Table 6- 3 Priority Areas of UNDAF and UNDP Country Programme 2010-2015

UNDAF	UNDP Country Programme
■ Economic and social well-being for all ■ Environmental Sustainability ■ Effective Governance	■ Economic and Social Well-being for All ■ Environmental Sustainability ➢ Sustainable management of natural resources ➢ Mitigation and adaptation to climate change ➢ Mitigation and prevention of natural and man-made disasters ■ Effective Governance

(Source: UNDP in Kazakhstan website, http://www.undp.kz/ , as of April 2011)

One of the priority areas to be addressed by the UNDP program for “Environmental Sustainability” is mitigation and adaptation to climate change. The expected outputs and targets by UNDP interventions in the climate change area are as follows:

- ✧ Comprehensive national climate change strategies which are further integrated into national development plans and sustainable development strategies
  - ➢ Target: National low-carbon development policy and principles mainstreaming into a national development strategy
- ✧ The Government and energy consumers better equipped with the knowledge, policies

and pilot cases on renewable energy market regulations;

- ➢ Target: Enabling the policy and institutional framework in place of on-grid renewable energy

✧ The Government and energy consumers better equipped with knowledge, policies and pilot cases on energy efficiency in sectors with high carbon dioxide emission levels

- ➢ Target: Legal and regulatory framework supportive of energy efficiency

✧ Improved regulations and practices developed for Public Transport in the City of Almaty

- ➢ Target: GHG emissions form the ground public transport in Almaty

6.2.2 Country Performance

Projects addressing climate change which were formulated by UNDP assistance were mostly funded by GEF. The list of those projects, which were completed, is on-going and the pipelines are shown in the following table.

Table 6- 4 UNDP's Assistance for Climate Change (1/2)

Project	Period	Status	Amount	Objectives	Funding
Transport					
Sustainable Transport in the City of Almaty Executing Agency: Almaty Electrotran (Private)	2010 - 2015	Ongoing	USD 11.126 million	Reduction of GHG emissions from transport in the City of Almaty	GEF EBRD
Energy Efficiency					
Reducing GHG Emissions through a Resource Efficiency Transformation Programme for Industries in Kazakhstan Executing Agency: MINT	N.A.	Approved (2010)	USD 14.18 million	Reduction of energy consumption and GHG emissions by promotion to apply more efficient technology and production process in the industries.	GEF
LGGE Promotion of Energy Efficient Lightning in Kazakhstan Executing Agency: MEP and MINT	N.A.	Approved (2010)	USD 6.87 million	Reduction of GHG emissions through promotion of energy efficient lightning	GEF
Energy Efficient Design and Construction in Residential Sector Executing Agency: Agency for Construction, Housing and Utilities	2010 - 2015	Ongoing	USD 4.569 million (USD 0.05 million by UDNP)	Reduction of GHG emissions by improvement of energy efficiency in newly constructed houses	GEF
Removing Barriers to Energy Efficiency in Municipal Heat and Hot Water Supply Executing Agency: MINT	2007 - 2011	Ongoing	USD 3.29 million	Removing barriers to implement selected measures for energy efficiency in municipal heat and hot water supply	GEF

Table 6- 5 UNDP's Assistance for Climate Change (2/2)

Project	Period	Status	Amount	Objectives	Funding
Renewable Energy					
Wind Power Market Initiative Executing Agency: MINT	2004 -2011	Ongoing	USD 2.55 million	Support for development of a national wind power development program, provision of information and capacity development in the wind power development program and funding, and investment promotion for wind power development projects.	GEF
Renewable Energy Use for Potable Water Supply in Remote Villages of Depressed Region in Kazakhstan Executing Agency: Initiative Support Center (NGO)	2002 -2003	Completed	USD 0.115 million	Pilot project to overcome clean drinking water problem in remote villages as well as to pilot and advance renewable energy use for such purposes in rural areas in the country	
Climate Change					
Integration of Climate Change Issues Into Strategic Planning Executing Agency: MEP	2009 -2010	Completed	USD 0.2 million	Enhancing capacity to ratify the Annex B country of the Kyoto Protocol, supporting efforts for the post-Kyoto Protocol after 2012, and so on.	
Support for the Implementation of the Concept on Transition of the Republic of Kazakhstan to Sustainable Development Executing Agency: MEP	2007 -2008	Completed	USD 0.195 million	Enhancing capacity of MEP in implementation of the Concept on Transition of the RK to Sustainable Development	
Enabling activities for the preparation of Kazakhstan's Second National Communication to the UNFCCC Executing Agency: MEP	2005 -2009	Completed	USD 0.405 million	Strengthening capacity by increasing and improving institutional coordination for development of national plans of action, programs on adaptation to the climate change and mitigation measures	

(Source : UNDP in Kazakhstan Website, http://www.undp.kz, as of April 2011)

The "Wind Power Market Initiative" project contributed to the promotion of wind power development in the country. It supported a wide range of components, including framework development, basic information collection such as wind resource and energy assessment, and pre-feasibility studies for candidate sites. Due to the project, it is highly expected that wind power development would move forward in Kazakhstan. Although the project also provided assistance for legislation on renewable energy development, there are still issues needed to introduce renewable energy in the regional grid systems. One of the critical issues for renewable energy development is the establishment of a financial mechanism, including the power purchasing price

for renewable energy. The in formations on wind power development collected by the project are accessible on the website of *Kazakhstan Wind Power Market Development Initiative* (www.windenergy.kz).

6.3 World Bank (WB)

6.3.1 Country Strategy

The latest WB's country strategy is "the Country Partnership Strategy" (CPS) developed in 2004. CPS set out the following four pillars in order to support the national development strategies of the Government of Kazakhstan.

- ✧ Reducing losses in competitiveness through prudent management of the oil windfall and the increase of public sector efficiency
- ✧ Promoting competitiveness by strengthening the government's capacity to identify and reduce barriers to businesses and private investors
- ✧ Building the foundation for future competitiveness by investing in human capital and basic infrastructure
- ✧ Ensuring future growth will not harm the environment and past liabilities are mitigated

Through the fourth pillar of "ensuring future growth not harming the environment", WB supported national efforts on global environment protection by country. In particular, WB provided assistance for the development of environment strategies and natural environment management, including forest management and semi-dry land management.

In addition, WB supported regional efforts on global environment protection in Central Asia. In the region, it has been essential to link energy and water for regional stability and economic growth since abundant water and energy resources are concentrated in one country and another. Thus, as an approach to issues of water and energy at the regional level of Central Asia, WB initiated the "Central Asia Energy-Water Development Program" (CAEWDP)[3] which aims to support a stable supply of energy and water by improvements in water resource management for the entire region. CAEWDP is a four-year program, which is composed of energy development, energy-water linkage and water productivity. In the framework of CAEWDP, it has planned to conduct studies to examine the economic viability of the energy mix via various scenarios based on climate change simulation until 2050. The studies will consider the impact of the introduction of renewable energies, carbon markets, carbon tax and so on.

Regarding assistance for the energy sector[4], WB has a general policy to support hydropower

[3] CAEWDP also aims at coordination of assistance for water and energy sector in Central Asia with donor partners, including ADB, the Islamic Development Bank, the European Commission (EC), USAID, and so on. WB has been working with ADB for co-chairing the Energy Action Plan of the Central Asia Regional Economic Cooperation Energy Sector Coordinating Committee for Central Asia and also started discussions about multi-donor trust fund with other donors.

[4] The WB's new energy sector strategy is under preparation.

development in those cases minus environmental problems in light of WB's environmental safeguards. On the other hand, WB did not provide loans for coal-fired power plants which had a heavy environmental load before 2010[5]. However, WB showed the direction to support coal-fired power plants where it is the only option for the poor, such as India and countries in Sub-Saharan Africa. For Kazakhstan, it is not realistic to apply this exceptional policy to support coal power plants. While the country has alternative clean energy sources, coal power plants are considered to be "a pollutant industry" by international standards because of no existing regulations to reduce the environmental load for coal-fired power plants, including the installation of Flue Gas Desulfurization (FGD).

6.3.2 Country Performance

During the period from July 1992 to the end of 2009, WB provided 35 loans to Kazakhstan for the total amount of more than USD 4.2 billion. In the 1990's, 66% of the WB's project portfolio was accounted for by three major areas: state management (budget support), finance management, and energy. In recent years, the main focus areas of WB support shifted to agriculture, environmental protection and infrastructure.

It was because of improvements in the budget balance and the trade balance of Kazakhstan through the implementation of key structural reforms in the country. In addition, while the share of WB's loan in project funding, the budget from the Government of Kazakhstan became the main source of investment projects due to the improved budget balance of the Government.

However, it is expected that WB will maintain the same level of investments in the past. The sharp increase in loans to Kazakhstan in 2009 attributed to the budget support to respond to the financial crisis in 2008.

The major projects for the energy and environment sector supported by WB are shown in the following table.

[5] WB provided a loan for the super-critical coal-fired power plant in South Africa, which is the cleanest technology available in the country, after a massive blackout in 2008.

Table 6- 6 WB's Assistance for Energy and Environment Sector (1/2)

Project	Period	Status	Amount	Objectives
Energy				
Kazakhstan North-South Electricity Transmission Project Executing Agency: KEGOC	2005 -2011	Ongoing	USD 100 million	Ensuring that the Kazakhstan population and enterprises has access to reliable, economically effective, and high quality electricity supply
Moinak Electricity Transmission Project Executing Agency: KEGOC	2009 -2012	Ongoing	USD 48 million	To increase and improve the supply of electricity to business enterprises and households in southern Kazakhstan in an economically and environmentally sustainable manner. Project components: construction of 220 kV overhead transmission lines (OHTLs) between Moinak HPP and substations, modernization of the substations, construction of outdoor switchyard at the Moinak HPP, and consulting and technical services.
Alma Electricity Transmission Project Executing Agency: KEGOC	2011 -2015	Approved	USD 78 million	To improve the reliability and quality of electricity supply to consumers in the Almaty region in an environmentally responsible and financially sustainable manner through expansion of the capacity of the Almaty Oblast transmission network. Project components: construction of 500 kV and 220 kV overhead transmission lines between the substations, construction of Alma substation, extension and modernization of Almaty and YuKGRES substations, and consulting and technical services

Table 6- 7 WB's Assistance for Energy and Environment Sector (2/2)

Project	Period	Status	Amount	Objectives
Environment				
Syr Darya Control and Northern Aral Sea Project Executing Agency: Committee of Water Resources, Ministry of Agriculture	2001-2010	Completed	USD 64.5 million	Reviving and securing agricultural production and fisheries in the Syr Darya River basin, and preserving environmental conditions of the Northern Aral Sea.
Nura River Cleanup Project Executing Agency: State Committee For Water Resources	2003-2010	Completed	USD 40.39 million	Improving living conditions of people residing in the Nura River basin, and providing alternative water supply sources in the region.
Forestry Rehabilitation and Reforestation Project Executing Agency: Forestry and Hunting Committee, Ministry of Agriculture	2005-2012	Ongoing	USD 30 million	Supporting economically viable and sustainable rehabilitation of environment and management of forests and associated rangelands with a special focus on pine tree forests of Irtysh river, dry Aral Sea bed, and planning os saksaul.
Ust-Kamenogorsk Environmental Rehabilitation Project Executing Agency: Committee of Water Resources, Ministry of Agriculture	2007-2013	Ongoing	USD 24.29 million	Cleaning underground waters of Ust-Kamenogorsk city from solid and liquid industrial wastes, and improving environmental conditions in the city and adjacent territories.
Syr Darya Control and Northern Aral Sea Project (Phase 2) Executing Agency: Committee of Water Resources, Ministry of Agriculture	N.A.	Proposed	USD 14 million	To improve water resources management in the Kazakh part of the Syr Darya Basin in order to increase the timely irrigation water supply to agriculture areas, increase fisheries production, and enhance human safety, the environment, and the general well-being of the population living around the Northern Aral Sea.
Tien Shan Ecosystem Development Project Executing Agency: Environmental Agencies	2010-2014	Proposed	-	Proposed grant from GEF Trust Fund

(Source: World Bank website, http://web.worldbank.org/, as of April 2011)

6.4 European Bank for Reconstruction and Development (EBRD)

6.4.1 Country Strategy

EBRD has developed "the Strategy for Kazakhstan" for its country strategy of financing activities in Kazakhstan. The latest one was approved by the EBRD board meeting in January 2010. EBRD's operational priorities in the strategy are as follows:

- ✧ Fostering diversification of the economy
- ✧ Contributing to the transformation of the financial sector
- ✧ Fostering modernization in the infrastructure sector, and
- ✧ Implementing a Sustainable Energy Action Plan (SEAP) in the power and energy sector

The fourth priority area is closely linked to national efforts of global environmental protection.

It focuses support for the implementation of SEAP through investments in modern and "clean" power generation and transmission companies. EBRD's financial involvement includes the following components:

- Review and improvements of draft legislation
- Strengthening of regulatory agencies and specialized bodies
- Tariff levels, metering and methodology improvements
- Focus on priority investments and financings

In 2006, EBRD initiated the "Sustainable Energy Initiative (SEI)"[6] and provides investments and technical cooperation for the following six focus areas.

- Large-scale industrial energy efficiency
- Sustainable energy financing facilities through financial intermediaries
- Cleaner energy in the power sector
- Renewable energy
- Energy efficiency in the municipal infrastructure
- Carbon market support

In EBRD's overall strategy for sustainable energy, EBRD is selective in its investment strategy to help bridge regional energy imbalances and alleviate endemic power shortages in Kazakhstan. In 2008, EBRD signed the 1st SEAP[7] aiming at liking high-level priority policy objectives of the Government of Kazakhstan to EBRD financing instruments to reduce the energy intensity of the Kazakh economy. Therefore, EBRD provides financial supports for projects that comply with SEAP and facilitates the transition to a low carbon economy by meeting the following key selection criteria:

- Utilizing the best available technique (BAT) structured to meet EU environmental and energy efficiency performance for new and existing coal-fired power plants with strong industry sponsors
- Utilizing associated gas, reducing gas flaring and improving the efficiency of gas-fired power plants beyond current standard practices in the sector
- Targeting significant efficiency improvements and power supply reliability through the rehabilitation of existing plants or the construction of new plants
- Reducing commercial and technical losses, and improving efficiency in electricity and gas transmission and distribution networks
- Supporting renewable energy generation, namely mini-hydro and wind projects.

EBRD will keep providing technical cooperation for the implementation of SEAP, including technical cooperation for amendment works on "the Law on Renewable Energy" by the Ministry

[6] EBRD established a dedicated energy efficiency team in 1994 and has financed energy efficiency projects since its earliest days. In 2006, those activities were scaled up to create of a new Energy Efficiency and Climate Change department along with the launch of the SEI.

[7] EBRD signed SEAP with Bulgaria, Ukraine and Russia in 2009 after signing with Kazakhstan.

of Industry and New Technology (MINT) which will be completed by the end of 2011. The EBRD's technical cooperation for the legislation work on renewable energy is planned to be completed by the end of March. Behind EBRD's support for it, there is current stagnant renewable energy development in the country despite the establishment of "the Law on Renewable Energy" in 2009.

Besides that, EBRD will also support a framework for the rehabilitation of thermal power plants in the country. In addition, in the area of climate change, the EBRD has a plan to support the establishment of legal systems of national carbon funds via contributing to the development of the Carbon Finance Framework according to Kyoto Protocol.

In the EBRD's country strategy for Kazakhstan, the main target for its investment is the private sector. However, EBRD also finances district heating projects operated by local governments or public utilities.

6.4.2 Country Peformance

Since 1991, EBRD funded 140 projects in Kazakhstan, including regional projects for gross disbursements of EUR 2,156.1 million, as of January 2011. 57 % of the country's EBRD portfolio is accounted for by the private sector. EBRD is the largest investor outside the oil and gas sector in Kazakhstan.

Looking at EBRD's portfolio as of the third quarter in 2009, the current portfolio stock was EUR 1.427 billion. By sector, the financial sector was the single largest in the portfolio which amounted to EUR 451 million (32 %). After the financial sector, the portfolio was allocated to the corporate sector with EUR 387 million (27 %) and the energy sector with EUR 324 million (23%). The infrastructure sector accounted for 19 % with EUR 265 million.

The energy and power sector has been increasing in EBRD's portfolio: its share expanded 9 basis points from 14% in 2006. The major projects funded by EBRD are as follows:

- KEGOC (the national transmission company): EUR 127.5million loan
- Pavlodarenergo (a private company, a subsidiary of TSATEK): EUR 20.5 million equity stake
- CAEPCO (a private company, a subsidiary of TSATEK): EUR 46 million equity stake

The EBRD's funding was used to promote efficiency, clean energy and the use of best available technologies (BAT).

On the other hand, EBRD made a decision to decline to participate in the financing of the Ekibastus-2 (Unit 3) power station rehabilitation project from the perspective of energy efficiency and environmental performance since the SEAP was signed between EBRD and the Government of Kazakhstan in 2008.

In addition, EBRD is one of the channels for Climate Investment Funds (CIF)[8] and operates

[8] CTF is a multi-donor fund pledged by 14 donor countries, including Japan, for helping developing countries pilot low-emissions and climate-resilient development. The CIF are channeled through the African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank, and World Bank

two credit lines of the Clean Technology Fund (CTF): the Renewable Energy Development and the Municipal Energy Efficiency and District Heating System Modernization. EBRD will provide concessional loans based on a master plan prepared by EBRD according to the Clean Technology Fund Investment Plan for Kazakhstan in November 2010.

For renewable energy development, USD 110 million will be financed by CTF while EBRD will provide loans and equity of USD 280 million in total. The CTF interventions of the renewable energy development will focus on the following three areas:

- Constructing and restoring small hydropower installations
- Constructing wind power installations
- Constructing and strengthening electric power lines connecting renewable energy installations to the power grid

The interventions will also cover waste-to-energy, biogas for heating and electricity generation and solar power.

For district heating system modernization, CTF will provide USD 40 million of concessional loans and EBRD will finance loans of USD 100 million. The interventions in district heating system modernization will target the following three areas:

- Modernization of central heat exchanger substations (CHS) and/or installation of automated building-level substations (BLS) and liquidation of CHS
- Installation of heat and hot water metering equipment at the building level
- Installation of modern variable flow pumps at boiler plants

Since heating systems using fossil fuel are not eligible for the CTF intervention, EBRD will finance the replacement of boilers for heat supply facilities.

Besides that, EBRD will provide co-financing of USD 60 million for the project of ”Sustainable Transport In Almaty City” which is supported by UNDP with funding from GEF.

The list of projects supported by EBRD is shown in the following table.

Group.

Table 6- 8 EBRD's Portfolio in Energy Efficiency and Renewable Energy (1/2)

Project	Period	Status	Amount	Objectives
Energy Efficiency in Power and Heating				
KEGOC Osakarovka Restructuring Loan Executing Agency: KEGOC	-	Approved (2011)	Up to USD 166 million	Rehabilitation of the Osakarovka electricity transmission line to contribute to the overall system reliability and support development of the Akomola region, and refinancing of KEGOC debt including two loans from EBRD to optimize KEGOC's cashflow and balance sheet and prepare the Company for a new role as Single Buyer (capacity market operator) in the context of the Kazakh power sector reform
District Heating Modernization Framework Executing Agency: TOO "Teplotransit Karaganda" and CAEPCO (Private)	-	Approved (2010)	USD 100 million (CTF: USD 42 million)	Rehabilitation and improving energy efficiency of existing heat distribution networks in several cities in Kazakhstan.
CAEPCO District Heating Executing Agency: CAEPCO (Private)	-	Approved (2011)	USD 30 million (CTF: USD 10 million)	Reduction in heat losses, CO2 emissions and coal savings and contribution to market transformation towards sustainable energy use in district heating through rehabilitation and improving energy efficiency of existing heat distribution networks in Pavlovdar, Ekibastuz and Petropavlovsk which is operated by a private company.
AES Sogrinsk CHP Executing Agency: Sogrinsk CHP LLP (Private)	-	Approved (2011)	Up to KZT 4 billion (equivalent to EUR 22 million)	Improving the availability and utilization factor of the CHP, enhanced energy efficiency, reduction in losses and improvements in environmental standards.
CAEPCO (Northern Lights) Executing Agency: CAEPCO (Private)	-	Signed	-	Rehabilitation investments aiming at enhancing energy efficiency and improving the environmental standards of power generation and distribution assets of a private power corporation.
Aktobe CHP Rehabilitation Executing Agency: Aktobe CHP Joint Stock Company (Public)	-	Singed	Up to USD 40 million	Increasing generation capacity and improvement of the plant's efficiency and environmental performance.
KEGOC Modernization II Loan Executing Agency: KEGOC (Public)	-	Singed	EUR 127.5 million	Providing an efficient, reliable and non-discriminatory access to the grid thus ensuring operating efficiencies and smooth functioning of the system through the modernization of substations and high-voltage equipment.
Pavlodar Energo Executing Agency: Pavlodar Energo (Private)	-	Signed	USD 30 million	Upgrading of the coal fired combined heat and power plant
KEGOC: Ekibastuz-YukGres Power Transmission Executing Agency: KEGOC (Public)	-	Signed	USD 87.8 million	Addressing energy and peak supply deficits in South Kazakhstan, improving electricity transmission reliability, reducing transmission losses and contributing to development of regional electricity trade in Central Asia
KEGOC: North-South Power Transmission Executing Agency: KEGOC (Public)	-	Singed	USD 60 million	Addressing energy and peak supply deficits in South Kazakhstan, improving electricity transmission reliability, reducing transmission losses and contributing to development of regional electricity trade in Central Asia

Table 6- 9 EBRD's Portfolio in Energy Efficiency and Renewable Energy (2/2)

Project	Period	Status	Amount	Objectives
Energy Efficiency in Transport				
Almaty LRT Executing Agency: Almaty Electrotrans	-	Pipeline (to be approved in 2011)	Up to EUR million	Construction of the Light Rail Transit (LRT) system. (PPP project)
Almaty Bus Sector Reform Executing Agency: Almaty Electrotrans	-	Signed	Up to KZT 5,100 million (equivalent to USD 34.8 million)	Assisting the City of Almaty in reforming the regulatory framework for bus service provision
Almaty Electro Tran Executing Agency: Almaty Electrotrans	-	Singed	USD 10 million	Modernization of power substations of the electric transport network in the city and support for commercialization of the municipal tram and trolleybus company.
Almaty Development of Electric Transport Executing Agency: Almaty Electrotrans	-	Singed	USD 37 million	By introduction of new energy efficient low-floor trolleybuses, increasing the capacity and standards of public transport services as an alternative to car usage and to provide an overall balanced approach to urban mobility with viable travel choices for users through integrating various transport modes into one properly functioning City transport system.
Renewable Energy				
Kazakhstan Renewable Energy Financing Facility Executing Agency: Not Decided	-	Pipeline (to be approved in 2011)	EUR 50 million	Realization of early renewable energy projects, which will demonstrate the benefits of utilization of renewable energy sources, and encouraging policy dialogue and institutional capacity building in respect of renewable energy in order to foster development of a favorable environment for the implementation of projects.

* "Approved" means "Approved by the board members of EBRD", "Signed" means "Loan Agreement was signed".

(Source: EBRD website, as of April 2011)

6.5 United States Agency for International Development (USAID)

6.5.1 Country Strategy

USAID started to provide assistance to Kazakhstan in 1992 just after the country become independent from the former Soviet Union. USAID has been supporting the country through the following four-part strategy:

- Economic transition
- Energy resources and environmental issues
- Democratic institutions
- Health improvements

The main objectives of assistance for energy resources and environmental issues are helping to create a viable energy market and enabling the country's institutions to address key environmental problems. The main focuses of those programs for 2006-2010 are as follows:

- Economic Growth
- Investing in people
- Governing democratically and justly

Under the USAID strategy, energy and environment sectors are positioned in programs for economic growth. For joint efforts by the both governments of Kazakhstan and U.S., the Kazakhstan – U.S. Program for Economic Development (PED) was formally signed on May 2006. PED is a multi-year bilateral initiative designed to promote broad based economic development and diversification in Kazakhstan.

In February 2010, both governments signed an amendment to the original PED Memorandum of Understanding to extend PED from 2010 to 2012. To finance the program, the Government of Kazakhstan will provide USD 3 million a year and the U.S. Government will provide USD 1.5 million a year through 2012.

6.5.2 Country Performance.

USAID have provided approximately USD 550 million of programs in the economic sector, healthcare system and democratic institutions since 1992. However, no assistance program for energy efficiency and climate change was implemented by USAID while only limited assistance for energy and environment sectors have been provided.

In 2010, USAID compiled a report on “Kazakhstan Energy Pre-Assessment” in order to consider key areas in the energy sector, mainly energy efficiency and renewable energy development for a assistance program in Kazakhstan. It contains the following items: energy sector structure and policies, market structure and supply/demand analysis, energy price, tariff and financial viability of the sector, stakeholders in the energy sector, past energy efficiency programs and lessons learned, analysis of barriers. Based on those analysis, the report presents consideration and recommendations for USAID technical cooperation programs in energy efficiency and renewable energy development.

Through the loan support program, which USAID is working with private banks in Kazakhstan (Alpha Bank and Eurasia Bank), the part of the loan portfolio of those private banks is used for the improvement of energy efficiency at the residential sector.

In addition, USAID is going to provide support for studies on the impacts of the introduction of renewable energy on climate change in the three countries of Kazakhstan, Turkmenistan and Kyrgyz under the Central Asia Energy – Water Development Program (CAEWD) which is led by WB.

Table 6- 10 Energy and Environment Programs Supported by USAID

Program	Period	Status	Amount	Objectives
Energy				
Regional Electricity Markets Assistance Program (REMAP) Executing Agency: TBD	2006-2008	Completed	N.A.	Establishment of a transparent, competitive electricity market in Central Asia, an increase in electricity trade in the region, introduction of market-based solutions for current and future disputes related to hydropower facilities and reservoirs, building the capacity of Central Asia's electricity regulators
REMAP II Executing Agency: TBD	2009-2012	Ongoing	USD 16.5 million	Creating a market-driven, cost-based electricity trading system among Central Asian countries, strengthening the operations of the Regional Transmission System Operator, development and implementation of mechanisms for establishing the economic value of water-regulating services, support for increased and more reliable supply of electricity available for export to South Asia
Environment				
Master of Science in Environmental Management and Engineering for Central Asia Executing Agency: Eurasia National University	2005-2009	Completed	USD 1.445 million	Providing facilities and personnel to conduct applied environmental research for industrial corporations, government agencies and NGOs. The Ms program is at Eurasian National University in Astana.

(Source: USAID website, as of April 2011)

6.6 Asian Development Bank (ADB)

6.6.1 Country Strategy

In the latest Country Strategy Program (2005-2008) for Kazakhstan, ADB emphasized the following four focal areas:

- ✧ Inclusive growth through private sector development
- ✧ Human development
- ✧ Environmentally sustainable development
- ✧ Regional cooperation

In the third focal area of "environmentally sustainable development", ADB provided assistance for the environment project, in particular combating land degradation and desertification.

The coming country strategy program has been under preparation since February 2011 and it will be approved by the ADB Board Meeting. Since Kazakhstan is a middle income country and the Government of Kazakhstan has had a negative attitude towards new external borrowing, ADB will shift from the conventional approach according to the rolling plan of projects to a more flexible approach based on a partnership framework in order to quickly correspond to the

Government's requests. The priority areas in the coming program are energy, urban (infrastructure), transport and finance. There is some overlap between the energy and urban infrastructure because the latter one includes electricity and heating.

ADB is currently conducting the "Energy Sector Assessment" in Kazakhstan from May 2011. The scope of the study is summarized as follows.

Outline of the Energy Sector Assessment:

1. To acquire complete and reliable data on the supply side of the energy sector in KAZ, including: fossil- and nuclear-fuel reserves, and extraction and transformation capabilities; the electricity-generation capacity (installed and commissioned), both fossil and renewable; the layout, capacity and state of the energy-distribution networks, including transnational ones.

2. To determine the state of the demand side of the energy sector in KAZ, and notably: the overall energy demand, by fuels (energy mix) and sectors; the energy and carbon intensity of the economy, and the contribution of the different sectors; the role of CHP and extent of district heating; the identification of energy-isolated regions; the use of biomass for thermal applications.

3. To obtain a detailed, up-to-date and reliable account of the policy and regulatory framework, including: governance; legal and institutional frameworks; the role of the public and private sectors; national priorities and policies in the energy sector; energy-pricing and cost-recovery issues.

4. To summarize the above assessment in the form of a set of compact of indexes that place the energy sector in the context of those of similar countries.

ADB has also been dispatching two consultants to the Department of Energy Efficiency of MINT for Technical Assistance (TA) in order to assess energy efficiency needs. Based on the needs assessment, a technical paper will be compiled by a package of expected energy efficiency measures (The technical paper will be completed in April 2011).

6.6.2 Country Performance

During the period between 1994 and 2010, the total amount of loans by ADB to Kazakhstan is USD 965 million. The major areas of the projects supported by ADB during the period were education, pension reform, road rehabilitation, agriculture sector reform, water and land reform and water supply and sewage. No project in energy or environmental protection was included in the completed projects so far.

ADB also provided loans for five projects to promote the regional economies of Central Asia through the framework of the Central Asia Regional Economic Cooperation (CAREC). Four of them were road rehabilitation projects while one project aimed at small and medium enterprise development.

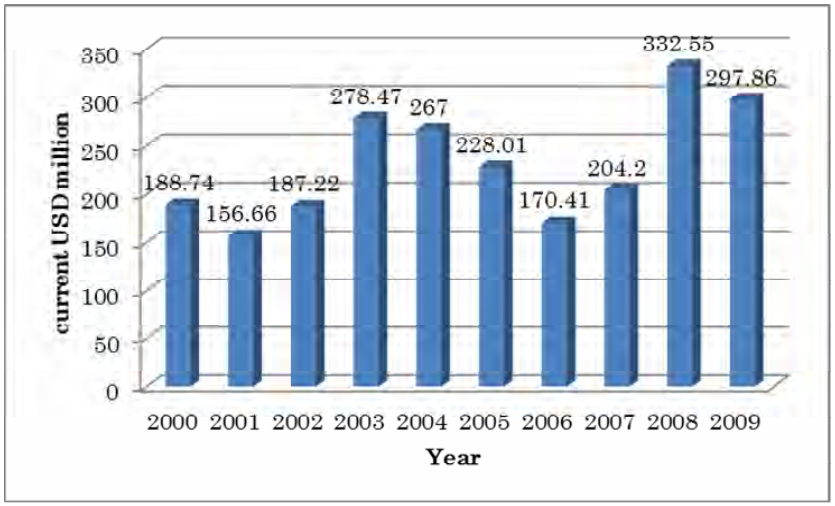
6.7 Overview of Donors' Assistance

6.7.1 ODA Trends in Kazakhstan

Looking at overall donor assistance to Kazakhstan since 2000, the amount of ODA inflows to Kazakhstan fluctuated year by year. According to the international development statistics by the Organization for Economic Cooperation and Development (OECD), the ODA inflows (commitments) increased from USD 188.74 million in 2000 to USD 278.47 million in 2003 and USD 267 million in 2004. Despite the decline during the period between 2005 and 2007, it surged to USD 332.55 million in 2008 and USD 297.86 million in 2009 because Kazakhstan was also adversely affected by the global financial crisis in 2008.

According to the Credit Reporting System Database of OECD Development Assistance Committee (OECD/DAC), the major donors for Kazakhstan are the United States, Japan, the European Union (EU), and Germany. Furthermore, the Union of Arab Emirates (UAE), which is a non-DAC member country, is one of the major development partners in the country.

Based on gross disbursements, the top donor for 2006-2009 is the United States. The gross disbursement by the United States in 2009 was USD 97.3 million. In second place, Japan disbursed USD 63.4 million. The gross disbursement by UEA in the same year was USD 22.4 million which was larger than the disbursements by Germany (USD 19.2 million) and EU (13.3 million).



(Note) The amount of ODA inflow is commitments by donors.
(Source: OECD Credit Reporting System Database, http://stats.oecd.org/, as of April 2011)

Figure 6- 1 ODA Inflow to Kazakhstan (2000-2009)

6.7.2 Donors' Assistance for Global Environment and Energy Sector

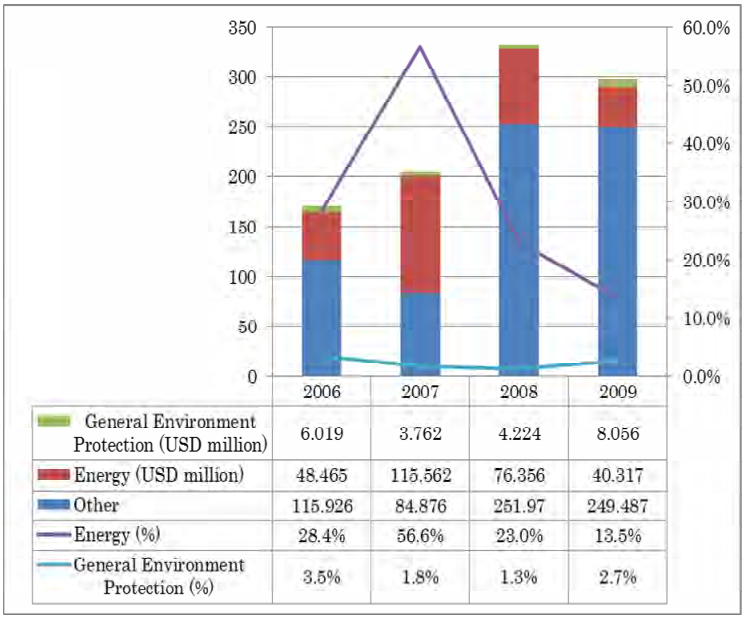
(1) Overview

The major donors focused on global environment protection including climate change in their country strategies for Kazakhstan. On the other hand, according to the Credit Reporting System database of OECD/DAC, ODA for the energy sector aiming at support for energy efficiency and

renewable energy development accounted for the larger proportion. In 2006, the amount of assistance for the energy sector was USD 48.5 million which accounted for 28 % of the total ODA inflows to the country while the amount of assistance for the general environment protection was approximately USD 6 million which accounted for 3.5 %. In 2007, the assistance for the energy sector expanded to approximately USD 115 million by 2.4 times from the previous year. The share of the energy sector in ODA for Kazakhstan was over 56 %. However, the amount for the energy sector decreased to USD 76.4 million in 2008 and USD 40.3 million in 2009 while the total amount of ODA inflows to the country increased. Therefore, the share of the energy sector dramatically dropped to 13.5% in 2009.

On the other hand, assistance for general environmental protection has been increasing in the amount of commitments. After decreasing to approximately USD 3.8 million accounting for only 1.8 % in total ODA inflows, the amount of assistance for the sector expanded to over USD 8 million. The share also increased to 2.7 %.

It must be recognized that the data from the Credit Reporting System of OECD/DAC does not reflect the assistance by multilateral development banks, including EBRD and WB, who have been actively provided support for the energy sector in the country. Hence, it can be presumed that the proportion of assistance for the energy sector can be much larger in those cases where the assistance by EBRD and WB are added.



	2006	2007	2008	2009
General Environment Protection (USD million)	6.019	3.762	4.224	8.056
Energy (USD million)	48.465	115.562	76.356	40.317
Other	115.926	84.876	251.97	249.487
Energy (%)	28.4%	56.6%	23.0%	13.5%
General Environment Protection (%)	3.5%	1.8%	1.3%	2.7%

(Note 1) The amount of ODA inflow is commitments by donors.
(Note 2) The amount of ODA by sector is based on reporting by donor
(Source: OECD Credit Reporting System Database, http://stats.oecd.org/, as of April 2011)

Figure 6- 2 ODA Inflow to Kazakhstan by Sector (Energy and General Environment Protection)

(2) Assistance for Renewable Energy and Energy Efficiency

The assistance for renewable energy development and improvement of energy efficiency by the major donors who will provide or have already provided assistance for those subsectors, are summarized below.

The largest donor for the two subsectors is EBRD. The bank funded 14 projects, including pipelines for the last decade. The total amount of commitment is over USD 1.1 billion. Out of those projects, five projects aim at improving the energy efficiency of CHP. Projects for increasing the efficiency of the transmission system and for improving the energy efficiency of public transport in the City of Almaty are four each.

In terms of the amount of commitments in the energy sector, WB is in second place after EBRD. WB financed three projects totaling USD 226 million. All of the three projects aim at strengthening the transmission system in an economically and environmentally sustainably manner.

In terms of the number of projects, UNDP is the second donor after EBRD. UNDP supported 11 projects with technical assistance from the GEF fund. The amount for projects supported by UNDP is around USD 10 million, which is much smaller than projects funded by EBRD and WB. On the other hand, for climate change issues, the UNDP covered a wide range of subsectors, including increasing energy efficiency and the reduction of GHG emissions in the sectors of energy and transport, renewable energy development, and international frameworks such as the Kyoto Protocol.

USAID has provided assistance to the power sector in Kazakhstan as a part of the Central Asian regional program, but there have been no projects for energy efficiency and renewable energy development so far. However, USAID conducted a study on energy efficiency and the environment in the country in 2010. In addition, there are plans to conduct studies on the impact of renewable energy on climate change under CAEWD, which is initiated by WB. Therefore, it is expected that USAID is going to support those subsectors.

Despite there being no projects supported by ADB for renewable energy and energy efficiency, ADB is now conducting an energy sector study and is going to support those areas in the coming country program for Kazakhstan.

Chapter 7 Analysis of Issues to be Addressed

This chapter describes those issues identified by the survey team through information obtained from and interviews conducted with concerned parties and donor agencies in Kazakhstan along with potential countermeasures.

7.1 Issues Identified through Information obtained and Interviews conducted with Concerned Parties and Donor Agencies in Kazakhstan

7.1.1 Overview

(1) Establishment of Legal Framework

Global environmental protection, including climate change in Kazakhstan, is based on the international frameworks of UNFCCC ratified in 1995 and the Kyoto Protocol ratified in April 2009.

Although Kazakhstan ratified the international treaty on climate change soon after its independence and approved “the Conception on Environmental Safety of Kazakhstan” in 1996, national efforts didn’t gain actual momentum until the late 2000’s. Therefore, the establishment of a legal framework to fullfill the requirements of the international treaties is still in progress.

Although global environmental protection requires a wide range of efforts from both industry and civil society, necessary legislation for related activities has not yet been completed. At the ministry level, each ministry concerned develops programs to reduce GHG emissions and increase energy efficiency. However, those programs are not effective because they are not legally binding unless the legislation works are completed. In addition, concerned parties including donor agencies in the country pointed out that there are confluences and conflicts of interests among various stakeholderes when it comes to implementing these different programs minus any clear responsibilities and coordination among the ministries as well as a legal binding.

For example, the Government of Kazakhstan approved “the Green Growth Program 2010-2014” in 2010 and create a policy to enhance efforts concerning climate change, a low carbon society and higher energy efficiency. However, although MEP would be the responsible ministry to implement the program, the feasibility of implementing such a program is in question because MINT is responsible for increasing energy efficiency and reducing GHG emissions in the industry sector and no legislation on energy efficiency and saving has yet to be completed.

Here is another example of “the Law on Renewable Energy”. Since there is no project to develop renewable energy after the execution of the Law, EBRD has been providing technical assistance to amend the Law in order to operationalize. The case indicates that legislation is not enough to realize and operationalize efforts on global environment protection and donor support is necessary to achieve viable legislation. Therefore, it is essential to fullfil the requirements of international treaties to establish a viable legal framework and to develop an implementation system as preconditions for the implementation of climate change projects.

Namely, the most critical issue is to develop an implementation system for effective programs that contribute to global environment protection and are prepared under legal binding force and coordination among the ministries and stakeholders after the prompt establishment of effective legal frameworks.

(2) Improvement of Institutional Capacity and Human Resource Development

As mentioned above, national efforts on climate change and global environment protection in the country started in the late 2000's. The enactment of the Ecological Code was in 2007 and the establishement of the Department of the Kyto Protocol in MEP was in 2009 just after the ratification of the Kyoto Protocol by Kazakhstan.

Before the establishment of the Department of the Kyoto Protocol, activities for climate change under the framework of UNFCCC were just project-based with support from the donors including UNDP. The main executing agency for those projects used to be the Climate Change Cooperation Center (C4) which is the first non-governmental organization (NGO) in Kazakhstan aiming at activities concerning UNFCCC and the Kyoto Protocol. The C4 has also been participating in the process of drafting the laws on international treaties as a specialist.

Due to the establishment of the Department of the Kyoto Protocol in 2009, the roles to develop laws concerning climate change and global environmental protection along with project implementation (a former C4 responsibility), were transferred to this department. However, many concerned parties point out the insufficient institutional capacity including the number of capable staff. In addition, although the Green Bridge Office was also established in MEP in order to materialize the Astana Green Bridge Initiative proposed at the Ministerial Conference of ESCAP, the Office does not have enough budget and staff and needs support from ESCAP and UNECE specialists in order to formulate and implement projects. MINT has the same problem: the departments responsible for renewable energy and energy efficiency in the industry sector were just set up and do not have enough capacity and staff. As an example of the technical assistance EBRD for the amendment of the Laws on Renewable Energy Promotion, MINT also needs donor assistance.

Since such limited human resources and institutional capacity are obstacles to establishing a necessary legal framework and to operationalize the activities mentioned above, the development of human resources and the institutional capacity in the ministries is an urgent issue for the country.

(3) Development of Financial Mechanism using Donor Funds

For renewable energy development and increasing energy efficiency using new technologies, the development of a sustainable financial mechanism including a tariff system which enables the introduction of a financially sustainable technology in order to cover not only initial investment costs but also operation and maintenance costs is inevitable. However, although there are potential investment needs, no project has yet been realized due to lack of a system and regulation necessary for implementation as well as the underdeveloped legal systems.

For example, wind power development projects have not been implemented because of unclear financial feasibility attributed to lack of regulation on the pricing mechanism for wind power generation in the Laws on Renewable Energy Promotion though promising projects were identified via UNDP technical assistance. On the other hand, the energy or technology shift to the power plants with a lower environmental load and higher energy efficiency is still limited despite the fact that the power supply in Kazakhstan depends heavily on conventional coal-fired plants without any countermeasures to reduce environmental load such as FGD. That is because of no regulation and obligation against the coal-fired power plants to take environmental countermeasures.

Therefore, the development of an innovative system is an urgent issue to promote renewable energy development and increase energy efficiency.

On the other hand, since a system conceptually designed at the desk will not necessarily translate into effective implementation out on the field, rigorous examination of the feasibility of project execution is of vital importance. In the case of wind power development, individual negotiations between investors and KEGOC cannot ensure a purchase price level feasible for investors. This has been pointed out as being one of obstacles blocking the implementation of wind power projects. In order to solve such problems, the first wind power development project should be a pilot project in order to develop a functional financial mechanism to apply to any wind power development projects rather than individual projects. At the same time, it is necessary to reflect the financial mechanisms developed by the pilot project into the legal system.

However, since it is difficult for private investors to implement such a pilot project aiming at development of the financial mechanism for the entire sector, donor assistance can play a key role in encouraging the Government of Kazakhstan to take appropriate actions.

(4) Impact on Formation of JICA Loan Project

Currently a judgment on investment for energy or energy efficiency project are made by its economic feasibility without an additional benefit by a carbon trading because the carbon trading ssystem has not been established yet. If such system has been established, some projects might have economic feasibility and become candidate projects of JICA loan.

7.1.2 Kazakhstan's Issues Identified from a Comparison with Other Countries

(1) Issues Identified from a Comparison of Other Countries' Energy Data

Kazakhstan's issues identified from indicators in the international comparison are shown in the following table. The selected countries for comparison are Kazakhstan, Japan, USA, Germany, South Africa, China, Australia and Russia.

Table 7- 1 Issues Identified from Comparison Analysis of Energy Data

Item	Issues
Primary energy consumption per GDP	• In primary energy consumption per GDP, smaller value shows better energy efficiency when it comes to economic activities. • When the value of primary energy consumption per GDP in Kazakhstan is compared to Japan and Germany, it was 4 times in 2008. It means that when value added with 1,000USD is produced in Japan and Germany, the countries use energy with 100 koe (0.7bbl as crude oil). While Kazakhstan uses energies with 400 koe (2.8 bbl as crude oil). • More energy efficiency policies in a company with higher value added industry policy in Kazakhstan are required.
Power consumption per GDP	• Power consumption per GDP in the countries is different per industry structure and energy consumption in the residential sector. Power consumption per GDP does not determine the efficiency of power consumption in a country. For example, the households in Japan use power, gas and oil, Southeast Asia countries use power and gas, Middle East countries use mainly power and East Europe countries use power and heat. • According to the international comparison, power consumption per GDP in South Africa is 450kWh/1,000USD, the value is the highest in the countries. Germany is 2000 kWh/1,000USD, it is the lowest of the countries. It means the German economy is the least power dependent of the countries. A high-power dependent economy means high primary energy consumption per GDP. • As energy efficiency and conservation activities on power utilization are a most effective policy for creating energy efficiency and conservation, it is an important agenda for Kazakhstan.
Primary energy consumption per capita	• Primary energy consumption per capita depends on income per capita and country land. The primary energy consumption per capita in large economic countries is generally high. • The primary energy consumption per capita of the USA is the highest of the countries. However, when taking into account the scale of the nation's economic activities and its land size, it cannot be concluded that USA energy efficiency is not so good. Meanwhile, Kazakhstan has been rapidly increasing its primary energy consumption per capita in recent years. • The increase of primary energy consumption per capita is evidence of economic growth in Kazakhstan and it is now required to enhance its efficient energy supply and utilization.
Power consumption per capita	• Power consumption per capita shows the scale of the economy and the richness of lives in the countries. • Power consumption per capita is higher in USA and Australia, on the other hand it is lower in Kazakhstan and China. • As power consumption per capita in Kazakhstan will be increased in concert with increasing national income, energy efficiency and conservation will become a challenging agenda in the commercial, service and residential sectors.
Primary energy consumption per GDP and per capita	• High primary energy consumption per GDP in nations is correlated with high primary energy consumption per capita. It has become a leading indicator for emerging countries. • In 2008, the ascending order of GDP per capita (PPP international dollar) is China, South Africa, Kazakhstan, Russia, Japan, Germany, Australia and USA. At the same time, primary energy consumption per capita is also the same order to GDP per capita. • When the GDP per capita with 11,300 USD (PPP base GDP per capita) in 2008 increases twofold, it is estimated that primary energy consumption per capita will become 5.0toe per capita. However, as the primary energy consumption per capita in Kazakhstan in 2008 is 4.5 toe per capita, therefore, increased energy efficiency and conservation than the current situation are required for Kazakhstan.

7.1.3 Individual Issues

(1) Emissions Trading: Issues and Countermeasures

Despite the fact that Kazakhstan ratified the UNFCCC shortly after it had gained independence, there still isn't a functioning GHG emissions trading market in the country. A short summary of the currently identified issues and proposed countermeasures is presented below.

Table 7- 2 Issues on Emission Trading and Mitigation Countermeasures

Field	Issues	Expected Countermeasures
Status of Kazakhstan under the Kyoto Protocol	• The Marrakesh accords allowed Kazakhstan to be considered an Annex I country for the purposes of the Kyoto Protocol, while it remains a non-Annex I country under the UNFCCC. However, Kazakhstan has not officially joined Annex B of the Kyoto protocol yet, as it requires the support of 3/4 of the parties to this treaty, and the prospects for its accession until the end of 2012 are becoming vaguer.	• Allow Kazakhstan to implement JI projects under Track 2 (approved at COP 16). • Conduct extensive lobbying before the start of COP 17 (to be held in Durban, South Africa at the end of 2011) and attempt to gain support for "special treatment" under the Kyoto Protocol. One possible development is to allow issuance of ERUs even before the ratification of Kazakhstan's accession by 3/4 of the parties. • In case this is not achievable, consider withdrawing Kazakhstan's application for joining Annex B. • Consider participation in voluntary markets（VCS, VER+ and others）and bilateral schemes (e.g. Japan).
Position of Kazakhstan towards the post-Kyoto period	• Although Kazakhstan took a voluntary target of a 25% GHG emission reduction by the end of 2020 (compared to the 1992 level), it does not have a clear negotiation position on the post Kyoto period. • For example, it is currently designing a domestic ETS, yet it is not clear how it is going to be linked to the EU ETS and other schemes and how this system is going to be treated under the successor of the Kyoto Protocol.	• Streamline climate change policy at a national level. • Come up with a clear position on the post-Kyoto framework. • Aim at clarity on the overall role of domestic mitigation and emissions trading policies.
Capacity for development of GHG offset projects	• As Kazakhstan has completely developed only one GHG offset project (a JI project), therefore, it virtually possess no capacity and experience in the GHG emissions reduction project development.	• Develop pilot projects for the voluntary markets or under bilateral offset agreements • Improve national consulting capacity (KazCarbon, C4) • Strengthen the capacity of government entities
GHG emission reduction potential	• The First and Second National Communications of Kazakhstan to the UNFCCC assess the GHG emission reduction potential of the country, but they lack analysis for particular industries taking into consideration the JI and GIS rules. • There is an industry-level or national GHG emission reduction strategy.	• Develop a national carbon market strategy • Assess the GHG emissions reduction potential of particular industries on a micro level.

(2) Issues in Renewable Energy Development

Institutional and technical issues in renewable energy development are summarized as follows.

Table 7- 3 Institutional and Technical Issues in Renewable Energy Development

Field	Issues	Expected Countermeasures
Renewable Energy with High Generation Cost (wind and solar power)	• A tariff system to recover high cost has not been established. • This leads to an unbalance of benefits and costs.	• EBRD is now conducting technical assistance to propose a proper tariff system to recover high costs. • MINT is also preparing the revision of the Law on Renewable Energy for the new tariff system.
Guideline for Grid Connection	• Responsibilities in the grid connection between the buyer and developer are not clear. • Developers individually negotiate with the buyer. • There is not enough information and data to study how to have developers connect the grid.	• Guidelines for grid connection should be prepared to clarify the responsibilities of the buyer and developer. • A contract format between the buyer and developer should be prepared. • A buyer's initiative procurement of renewable energy (like IPP) is effective for the promotion of renewable energy.
Large wind power	• Strengthening skills for the study of the effects on grid connection of wind power.	• Training of system engineers for capacity building for a grid connection study. • Implementation of a pilot project and review of the effects of grid connection by measurement.
All renewable energy	• Lack of information on new technology.	• Information dissemination of new technology in the Russian language. • Dissemination through workshops and seminars.

(3) Issues in Energy Efficiency

(a) Demand Side Sector

Institutional and technical issues in the demand side sector have been summarized as follows.

Table 7- 4 Institutional and Technical Issues in Energy Efficiency (Demand Side Sector)

Field	Issues	Expected Countermeasures
Industry Sector	• The industry sector consumes much energy, especially the heavy chemical industry. The energy intensity of Kazakhstan is 5.3 times that of Japan in terms of final energy consumption. • There are less incentive schemes for the modernization of old facilities.	• MINT is now preparing an energy management scheme for large consumers based on a Law on Energy Efficiency (draft). • This law will include energy audits for large consumers which can contribute to energy saving. • Financial incentives for modernization should be considered.
Commercial and Service Sector	• Electricity consumption per GDP in the commercial and service sector, the value of Kazakhstan is lower than Japan. However, it is forecasted that the value will increase with economic growth.	• The draft law also targets this sector using building codes for design and construction.
Resodential Sector	• Electricity consumption per capita in the residential sector of Kazakhstan is 21 % to Japan. It is forecasted that the value will increase with economic growth. Energy efficiency is required for heating in the winter season, cooling in the summer season, lighting and insulation for homes.	• The draft law also targets this sector using a labeling system for energy consumption equipment and building materials. • Information provision for high efficiency equipment. • Utilization of heat pump technology.

(b) Supply Side Sector

Institutional and technical issues in the supply side sector have been summarized as follows.

Table 7- 5 Institutional and Technical Issues in Energy Efficiency (Supply Side Sector)

Field	Issues	Expected Countermeasures
Power and Heat Supply Sector	• Power and heat are generated by coal and gas. Especially the share of coal in this sector occupies 90 %.	• Efficiency of CHPP using gas is higher than that of CHPP using coal (according to the pilot project conducted by NEDO, the total efficiency of the plant improved from 50 % to 70 %). • Incentive schemes for investment to countermeasures such as the leakage protection in transmission system for heat supply and installation of the monitoring system.
Transmission and Distribution Sector	• There is a room for the reduction of technical power loss caused by long distance transmission lines and old facilities in distribution	• High voltage transmission line and the renewal of distribution facilities.
Coal Sector	• Main fuel for power and heat is coal. • Clean coal technologies such as coal liquefaction, coal gasification, and high efficiency coal power stations are required.	• Study for coal liquefaction, coal gasification, and the study for super critical coal power generation.
Oil and Gas Sector	• Further utilization of accompanied gas for energy.	• Utilization of high efficiency gas turbines and the cogeneration system. (In 2005, “Program for Utilization of Accompanied Gas” was established and oil relating companies must submit an installation plan for the cogeneration system.)

7.2 Recommendation

7.2.1 Emissions Trading and Mitigation Measures

The preceding sections demonstrated that Kazakhstan has significant potential for GHG emissions reductions, but at the same time it faces a number of issues on the road to the successful development of emissions reduction projects. Additionally, a number of candidate projects for JICA ODA loan were also identified and these projects can also additionally benefit from carbon financing, should Kazakhstan manage to successfully join the carbon market. However, in order to avail itself of that opportunity, Kazakhstan has to resolve the issues described below. Additionally, a few recommendations to further capture existing GHG emission reduction potential and develop a working carbon market are provided in this section.

(1) Status of Kazakhstan under the Kyoto Protocol

Kazakhstan is in a unique position among the signatories of the Kyoto Protocol. Although Kazakhstan remains a non-Annex I country, COP 7 at Marrakesh recognized it as an Annex I

country for the purposes of the Kyoto Protocol. Kazakhstan ratified the Kyoto Protocol only in 2009 as a non-Annex I country and the final decision on its inclusion in Annex B of the Kyoto Protocol is still pending. Most market analysts expect that such a decision will be taken during COP 17 in Durban at the end of 2011.

In terms of the implementation of emissions reduction projects, under the current situation Kazakhstan cannot develop CDM projects, because it officially declared that it was joining Annex B. On the other hand, Kazakhstan was allowed to develop JI projects under JI Track 2 as a result of a special decision taken at COP 16, but it cannot issue any ERUs until it joins Annex B officially.

Interviews during this study, as well as an analysis of relevant publications showed that government officials and representatives of the business are still positive about Kazakhstan joining Annex B and there is still interest in the development of JI projects. At the same time, however, there is a rising awareness that Kazakhstan may not be able to join Annex B during the first commitment period, i.e. until the end of 2012 it will not be able to issue any ERUs.

Kazakhstan has already started working on other segments of the carbon market through the development of a domestic emission trading scheme and the launch of the "Green Bridge Initiative" which is expected to serve as a platform for technology and knowledge transfer. However, in order avoid being completely shunned from the international carbon offset market, Kazakhstan is recommended to look into various options for the development of emission reduction projects such as voluntary carbon markets or bilateral schemes that are currently being developed by Japan and some EU countries. Thus, it will not only help avoid the regulatory uncertainties of the existing international emission trading framework under the Kyoto Protocol, but will allow project developers to gain access to other carbon financing opportunities that will stimulate on their side the faster development of renewable energy and energy efficiency projects.

(2) GHG Emissions Reduction Project Development Capacity

Kazakhstan has been able to develop completely only a single JI project, although some other projects have reached the PIN or PDD development stage. Therefore, currently it has no experience with the full project development cycle, neither at the governmental level, nor at the local consulting level. This is considered a major impediment on the road to development of any future JI or other emission reduction projects, due to the complexity of the existing offset mechanisms and the lack of sufficient understanding of their practical implications.

As for now, the successful development of new GHG emissions reduction projects, Kazakhstan should rely on the support of international consultants with rich experience that can work together with some of the existing domestic consulting companies. However, this is an unsustainable mid- and long-term solution, as international companies would be able to handle only a limited number of projects. Therefore, it is recommended that domestic consulting companies like KazCarbon in cooperation with international consultancies start to immediately build up domestic project development capacity though the development of pilot JI projects under Track 2, or projects in the voluntary markets or under a bilateral carbon scheme.

This will also be a good training platform for government officials, especially from the DFP of Kazakhstan (Ministry of Environmental Protection) for the endorsement, approval and monitoring of carbon offset projects. The processing of real projects will allow improvements to be made to project approval procedures and will demonstrate I practical terms the extent of necessary government involvement.

(3) Assessment of the Real Emission Reduction Potential of Kazakhstan

The most comprehensive analysis of the emissions reduction potential of Kazakhstan as of now has been presented in the Second National Communication to the UNFCCC. However, the analysis there is presented on a macro level. Conversely, neither is there an industry-based or micro analysis of the emissions reduction potential, nor any strategy for project development under JI/CDM/GIS or other offset schemes exists. Without such strategies or analyses, potential project developers will have very little direction as to where to move to, or how to further develop carbon offset projects. This is especially relevant for big national companies under Samruk Kazyna, which has a large number of potential emission reduction projects.

Therefore, it is recommended that a national strategy for the development of the carbon market be prepared. In parallel, industry level strategies and analysis should be carried out to provide a clear understanding of what emission reductions projects can be developed in Kazakhstan and what their real emission reduction potential is. Similar analyses have been prepared in various countries around the world and have proved to be extremely successful in terms of stimulating JI and CDM project development.

7.2.2 Renewable Energy

In general, the further utilization of renewable energy requires a tariff system to fill a gap between the generation and retail costs and a technical guideline for a grid connection to clarify the responsibilities between the buyers and developers. It is recommended that a soft component showing the following items included for capacity building via a pilot project using a JICA loan.

- A format of contract between the buyer and developer
- Clarification of the responsibilities between the buyers and developers
- Capacity building for the grid connection study and a review of the effects of the grid connection by measurement

7.2.3 Energy Efficiency

(1) Demand Side Sector

In order to promote energy efficiency in the demand side sector, regulations or any other institutional schemes are, in general, used as nation-wide measures. As of today, a draft law (Law on Energy Efficiency) is under preparation by MINT to introduce an energy management scheme for large consumers and a labeling system for energy consuming equipment.

Based on Japan's experience to steadily implement these schemes, it is recommended that a new organization which has the responsibility to implement such measures be established. With regards to the Energy Management Scheme in Japan, the local offices of Ministry of Economy, Trade and Industry (METI) handle and check periodical reports from designated consumers, and the Energy Conservation Center, Japan (ECCJ) conducts national examinations and training programs for the Energy Manager on behalf of METI.

As for the labeling system, ECCJ also assisted in making label sheets for labeling in retail shops and providing information for such high efficiency equipment.

(2) Supply Side Sector

In the supply side sector, the improvement of existing CHPP, changes to gas co-generation and the utilization of accompanied gas are to be further promoted.

In Kazakhstan, a high efficiency coal power station which uses the rich coal of Kazakhstan is one of the most effective methods to achieve energy efficiency. However, at this moment, there aren't any regulations that mandate the installation of environmental equipment such as Flue Gas Desulfurization (FGD). This might lead to air pollution regardless of its high efficiency.

High voltage transmission lines and the modernization of old distribution facilities also contribute to energy efficiency due to reduced technical loss.

Chapter 8 Consideration for JICA's Assistance

8.1 Review of the Assistance Field

8.1.1 Methodology of Review

(1) Primary Review

This section reviews an assistance principle of JICA for the renewable energy and energy efficiency of Kazakhstan. Assistance fields are raised from the past experience of the JICA loan in energy efficiency or the reduction of GHG emissions and then they are screened under the following criteria.

- Technical needs identified through interviews with the energy and environment-related agencies
- Environmental friendliness

(2) Secondary Review

After the screening of the primary review, the assistance fields will be further reviewed for their potential to become a JICA loan project under the following criteria:

- Matching to the conditions for the JICA loan scheme
- Avoiding redundant assistance with other donors
- Advantages of Japanese technology

8.1.2 Primary Review

(1) Technology on Energy Efficiency and the Reduction of GHG Emissions

Project type assistance has been raised from the past experience of JICA loans and new technology utilized in Japan in the energy efficiency or the reduction of GHG emissions as follows.

- Hydropower
- High efficiency gas power generation (including heat supply facilities)
- High efficiency coal power generation (including heat supply facilities)
- Wind power
- Geothermal power
- Solar power
- Biomass power
- Transmission lines
- Distribution lines
- Afforestation
- Mass transit (transportation)

(2) Screening

From the above selected technology, the technical needs identified through interviews and environmental impacts have been considered for the screening.

Table 8- 1 Screening Results

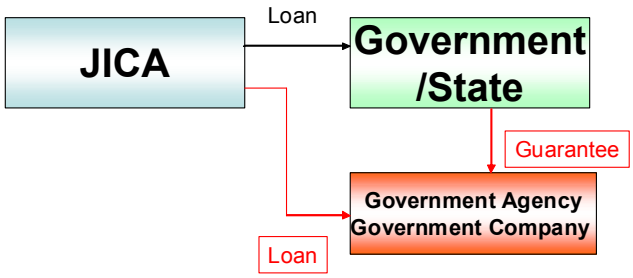
Technology on Energy Efficiency and Reduction of GHG Emission	Technical Needs Identified Through Interviews	Environment Friendliness
Hydropower	Rehabilitation for a hydro power project	In case of rehabilitation projects, negative impacts such as the settlement of people and deforestation are not expected.
Rehabilitation of CHPP	Gas cogeneration project (switching coal to gas)	In case that the existing site is used, impacts are not expected. Gas utilization is better than coal in terms of the environment.
Utilization of Accompanied Gas	Compact cogeneration project using accompanied gas	Negative impact is low (Situation is improved).
High Efficiency Coal Power Generation	N.A.	In case of new construction, the consideration of environmental equipment such as Flue Gas Desulfurization is required.
Wind Power	Grid connected to the wind power project	In general, the impact is low. However, an environmental assessment is conducted to check for bird strikes and noises
Geothermal Power	N.A.	The consideration of the impact on underground water is required.
Solar Power	N.A.	Negative impact is low.
Biomass Power	N.A.	It should be confirmed that deforestation is not expected.
Transmission Line	High voltage transmission line project	In the event that a large scale of deforestation and settlement of people are not expected, the impact may not be so large.
Distribution Line	Modernization project for distribution facilities	In the event that a large scale of excavation of underground and settlement of people are not expected, the impact is low.
Afforestation	N.A.	Positive impact.
Mass Transit	N.A.	In case that the large scale settlement of people and properties, and deforestation are not expected, the impact will not be so significant.

8.1.3 Secondary Review

(1) Scheme of JICA Loan

A JICA loan project is formulated as a "Government to Government" relationship. A borrower of a JICA loan must be a government (or state) or a governmental agency/company (with a

government guarantee). In general, the amount of a JICA loan ranges from several tens of million US$ to several hundred million US$.



Case 1: JICA directly provides a loan to Government without Guarantee.

Case 2: JICA provides a loan to Government Agency/Government Company with Government Guarantee.

Figure 8- 1 Scheme of JICA Loan Project

When a recipient government officially requests a JICA loan, a feasibility study and an Environment Assessment Impact (EIA) are required. However, in the event that these documents have not been prepared yet, JICA can assist with the formulation of a JICA Loan project through technical assistance that is the "Preparatory Survey".

(2) Other Donors' Assistance

Other donors' assistance in renewable energy and energy efficiency from 2000 has been summarized as follows.

Table 8- 2 Assistance of Other Donors (From 2000)

	Renewable Energy			Energy Efficiency				
	Wind	Other	Institutional	Heat Supply and CHP	Power Station	Transmission	Demand Side	Institutional
EBRD	L (CTF)		T	L (CTF)	L	L		T
WB/IFC						L	L (CTF)	
ADB								T
UNDP	T	T					TL	
USAID		T						

T: TA, L: Loan
L (CTF): Possible Area covered by Clean Technology Fund

EBRD and WB have been on-going projects for renewable energy and energy efficient fields. EBRD manages the Clean Technology Fund (Budget: 200 million US$) funded by WB and assists

the renewable energy and energy efficiency of the private and municipality sector through soft loans. EBRD will conduct a study to identify individual projects for the renewable energy field. This means that no specific projects have yet to be officially identified. On the other hand, for the field of energy efficiency, a rehabilitation project for the heat supply transmission system has been already committed to be assisted by EBRD. Apart from the Clean Technology Fund, EBRD has individually provided a loan for a transmission project for KEGOC. WB has also assisted the transmission projects of KEGOC.

From these circumstances, when JICA considers the avoidance of the overlapping of other donor assistance, JICA should pay attention to the rehabilitation projects in heat supply facilities and high voltage transmission projects to avoid overlap assistance. However, it is estimated that there are some similar projects in these fields and it is possible to avoid overlapping via elaborate donor meetings.

(3) Results of Secondary Review

The technical needs identified through the interviews of each organization are reviewed via the acceptability of a JICA loan scheme, the possibility of overlap with other donor assistance, and the advantages of Japanese technology, as shown below.

Table 8- 3 Results of Secondary Review

Technical Needs Identified Through Interviews	Acceptability of JICA Loan Scheme	Possibility of Overlapping with Other Donors' Assistance	Advantage of Japanese Technology
Rehabilitation for a hydro power project	A government guarantee is necessary if a governmental agency/company is an executing agency.	At this moment, the possibility is low.	It is a conventional technology. No specific advantage is expected.
Gas cogeneration project (switching coal to gas)	Ditto	In case the project has a short pay back period, there is the possibility that local private banks might have concerns about the project.	The technology is widely used in Japan, Europe and USA. A Japanese manufacture has a record to provide this technology in Kazakhstan.
Compact cogeneration project using accompanied gas	A government guarantee is necessary if a governmental agency/company is an executing agency. A scale of one project is supposed to be small. Packaging multiple projects may be necessary.	The possibility is low.	Japanese technology has a high advantage in a small cogeneration system (Less than 10 MW class).
Grid connected wind power project	A government guarantee is necessary if a governmental agency/company is an executing agency.	There is a possibility to overlap with EBRD or a local development bank.	It is a conventional technology. No specific advantage is expected.
High voltage transmission line project	Ditto	In the past, WB and EBRD assisted for this field.	Japanese technology has reliable records in this field, especially substation system.
Modernization project for distribution facilities	Ditto	At this moment, the possibility is low.	Japanese technology has an advantage in high efficiency transformers, SCADA and distribution automation systems, etc.

8.2 Next Steps for Formation of JICA Loan Project

During the second local mission, the survey team requested relevant agencies of Kazakhstan to submit a project summary including the identified technical needs from the interviews if they are concerned about the JICA loan.

From this process, when projects which expects a JICA loan can be identified, such projects are evaluated by contribution of global environment and energy efficiency, correspondence with the JICA loan scheme, avoidance of overlapping with other donors' assistance, advantage of Japanese technology, negative impact on environment, etc. And then JICA HQ will discuss with the relevant agencies to formulate JICA loan project(s).