

# Energy Cooperation in Northeast Asia

Shixian GAO

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## Abstract

Northeast Asia is one of the most dynamic regions in the world. With the rapid economic growth in the region, energy demand has maintained a certain growth rate. For every country, energy is related to economic security and sustainable development. Energy security has been paid more and more attention by the international community. At present, regional conflicts in Northeast Asia have moderated, thus, it is of great significance to strengthen regional energy cooperation to promote the sustainable development, regional peace and stability of Northeast Asia. The resource conditions and the level of economic and social development in Northeast Asia determine that regional energy cooperation has great potential.

## 1 Energy present situation in Northeast Asia and the energy development trend in the world

With further economic globalization, regional economic cooperation has become a trend. Northeast Asia is in the thoroughfare of trade and transportation linking Europe and North America. Its economic growth and sustainable development play an important role in the whole world economy. Since the 1990s, driven by globalization, Northeast Asian countries have carried out international exchanges and cooperation under the guidance of inter-state cooperation and sub-regional economic cooperation at various levels, in various fields and in various forms, based on their advantages and complementary advantages of resources. They have made achievements in trade, investment and regional economic cooperation. Significant achievements have been made in improving the regional political environment, making remarkable progress in regional social development, and making regional economic and trade ties closer.

The rapid economic growth in Northeast Asia has led to a sustained increase for energy demand, in particular oil and gas. Moreover, oil excessive dependence on the Middle East, maritime transport security, Asian oil premiums and environmental issues continue to have a great impact on energy security in Northeast Asia. Strengthening regional energy cooperation is the best choice to ensure regional energy security.

### 1.1 Energy present situation in Northeast Asia

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<sup>1</sup> Energy Research Institute, National Development and Reform Commission, China

Northeast Asia has both net energy importers (such as Japan, China and ROK) and net energy exporters (Russia and Mongolia), and shows potential for cooperation in terms of resource conditions.

### 1.1.1 General energy map in Northeast Asia

Levels of energy self-sufficiency differ considerably among nations in Northeast Asia. Mongolia, DPRK, and Russia are exporters, while Japan, ROK and China are importers.

**Table 1** Energy self-sufficiency of Northeast Asia in 2016

Country	Energy production (Mtoe)	Energy Consumption (Mtoe)	Self-sufficiency (%)
China	2360	2958	80
DPRK	21.3	8.8	242
Japan	35.4	426	8
Mongolia	20.8	5.0	416
ROK	51	282	18
Russia	1374	732	188
Total	3863	4412	88

Source: IEA 2017

### 1.1.2 Energy consumption and its breakdown by fuel

China, Russia, Japan and ROK rank first, fourth, fifth and eighth respectively in the world in energy consumption, with the four countries' energy consumption listed as 4582.8 Mtoe, accounting for 34% of the total world in 2017.

Total energy consumption in Northeast Asia rose from 3923.0 Mtoe in 2010 to 4582.8 Mtoe in 2017, an average annual growth of 2.2%, which is higher than the world average of 1.6%. Therefore, the global share of energy consumption of Northeast Asia rose from 32.4% in 2010 to 33.9% in 2017.

Moreover, the proportion of coal consumption in Northeast Asia, 47.8% in 2017, far exceeds the world average of 27.6%. China leads the region in energy consumption, resulting in the higher proportion of coal in the energy consumption structure of Northeast Asia.

**Table 2** Energy consumption in North East Asia in 2017

	Structure						Amount	
	Oil	Natural Gas	Coal	Nuclear energy	Hydro electric	Renewables	Mtoe	Share in the world
Russia	21.9%	52.3%	13.2%	6.6%	5.9%	0.0%	698.3	5.2%
China	19.4%	6.6%	60.4%	1.8%	8.3%	3.4%	3132.2	23.2%
Japan	41.3%	22.1%	26.4%	1.4%	3.9%	4.9%	456.4	3.4%
ROK	43.7%	14.3%	29.2%	11.3%	0.2%	1.2%	295.9	2.2%
Sub-total of four countries	23.5%	15.6%	47.8%	3.1%	7.0%	2.9%	4582.8	33.9%
Total World	34.2%	23.4%	27.6%	4.4%	6.8%	3.6%	13511.2	100.0%
Total Asia Pacific	28.6%	11.5%	48.4%	1.9%	6.5%	3.0%	5743.6	42.5%

Source: "BP Statistics Review of World Energy June 2018"

### 1.1.3 Energy production

#### (1) Crude oil production

Russia is the third largest oil producer in the world, with China the seventh largest. Their combined oil production was 678 Mt in 2017, accounting for 17.3% of the total world, up 3.8 percentage points from 2000.

**Table 3:** Crude oil production in North East Asia

Unit: Mt

	2000	2005	2010	2015	2016	2017
Russia	326.7	474.8	512.5	541.9	555.9	554.4
China	162.6	181.4	203.0	214.6	199.7	191.5
Sub-total two countries	489.3	656.2	715.5	756.4	755.6	745.9
Total World	3616.2	3936.1	3981.4	4355.2	4377.1	4387.1
Share	13.5%	16.7%	18.0%	17.4%	17.3%	17.0%

Source: "BP Statistics Review of World Energy June 2018"

As world leading producers of natural gas, Russia and China rank second and sixth, respectively. In 2017, the two countries produced 784.8 billion cubic meters of natural gas, amounting to 21.3% of the global total, down 2.2 percentage points from 2000.

**Table 4:** Natural Gas Production in North East Asia

Unit: Billion cubic meters

	2000	2005	2010	2015	2016	2017
Russia	537.1	589.5	598.4	584.4	589.3	635.6
China	27.4	49.7	96.5	135.7	137.9	149.2
Sub-total two countries	564.5	639.2	694.9	720.1	727.2	784.8
Total World	2405.5	2764.9	3169.3	3519.4	3549.8	3680.4
Share	23.5%	23.1%	21.9%	20.5%	20.5%	21.3%

Source: "BP Statistics Review of World Energy June 2018"

The world's first and sixth largest coal producers are China and Russia, respectively. Mongolia, ROK and Japan also extract coal. In 2017, China, Russia, Mongolia, Korea and Japan produced 3,986.7 Mt of coal, accounting for 51.6% of the world total, up 16.5 percent from 2000.

**Table 5:** Coal Production in North East Asia

Unit: Mt

Country	Rank in 2017	2000	2005	2010	2015	2017
China	1	1384.2	2365.1	3428.4	3746.5	3523.2
Russia	6	262.1	300.0	322.9	372.6	411.2
Mongolia	14	5.2	7.5	25.2	24.2	49.5
ROK	33	4.2	2.8	2.1	1.8	1.5
Japan	34	3.1	1.1	0.9	1.2	1.4
Sub-total of four countries		1658.7	2676.6	3779.5	4146.3	3986.7
Total World		4725.6	6103.2	7479.1	7954.2	7727.3
Share of sub-total		35.1%	43.9%	50.5%	52.1%	51.6%

Source: "BP Statistics Review of World Energy June 2018"

China, Russia, Japan and ROK are respectively the world's first, fourth, fifth and ninth largest power producers. In 2017, they collectively generated 9178 TWh of power, or 35.9% of the world's total, up 12.7 percentage points from 2000.

**Table 6** Power Generation in Northeast Asia

Unit : TWh

	Rank in 2017	2000	2005	2010	2015	2017
China	1	1355.6	2500.3	4207.2	5814.6	6495.1
Russia	4	877.8	954.1	1038.0	1067.5	1091.2
Japan	5	1099.7	1153.1	1156.0	1030.1	1020.0
ROK	9	290.4	389.5	495.0	547.8	571.7
Sub-total of four countries		3623.5	4996.9	6896.2	8460.0	9178.0
Total World		15555.0	18459.0	21577.7	24289.5	25551.3
Share of sub-total		23.3%	27.1%	32.0%	34.8%	35.9%

Source: "BP Statistics Review of World Energy June 2018"

**1.1.4 Fossil energy trade**

Although Russia is the world's largest exporter of natural gas and a leading oil exporter, non-OPEC countries also have a certain voice in the world's oil prices; China, Japan and ROK are the world's largest oil and gas importers.

In 2017, Russia produced 554.4 Mt of crude oil, consumed 147.88 Mt, and was able to export 406.6 Mt; Japan used up 181.3 Mt, ROK consumed 122.6 Mt, and China net imported 420 Mt of oil in 2017.

In 2017, Russia's natural gas output was 635.56 billion cubic meters, it consumed 424.8 billion cubic meters, and was able to export 210.8 billion cubic meters. Its actual natural gas net export totaled 212.1 billion cubic meters, comprised of 15.5 billion cubic meters of LNG and 196.6 billion cubic meters of PNG. Japan's and Korea's respective gas consumption, of 117.1 and 49.4 billion cubic meters, are entirely dependent on LNG imports; China's net import of natural gas in 2017 was 92.0 billion cubic meters, combining 52.6 and 39.4 billion cubic meters of LNG and PLG, respectively.

In addition, Mongolia has exported coal in recent years, with its export figures increasing rapidly.

**1.2 The energy development trend in the world**

At present, the global energy industry is in a critical period of transformation, and the global energy pattern is being rebuilt quickly. Climate change, oil price fluctuations, the energy revolution and other events promote energy to usher in an unprecedented transformation; that of green, low-carbon, efficient and renewable energy, which is the inevitable trend of future energy development.

**1.2.1 Global energy demand will continue to grow at a certain rate**

Since the first global energy crisis, oil importing countries have adjusted their industrial structure to reduce the dependence of economic development on energy.

Greenhouse gases have caused global climate change. The major developed countries, led by those in Europe, have actively developed low-carbon energy strategies and proposed the goal of "decoupling economic growth from carbon emissions".

**Table 7: Changes in energy consumption by region**

	Consumption, Mtoe			Growth rate per annum		
	2000	2010	2017	2000-2010	2010-2017	2000-2017
North America	2699.4	2720.7	2772.8	0.1%	0.3%	0.2%
South & Central America	476.1	632.5	700.6	2.9%	1.5%	2.3%
Europe	1932.1	2001.1	1969.5	0.4%	-0.2%	0.1%
CIS	888.5	967.8	978.0	0.9%	0.1%	0.6%
Middle East	414.9	714.3	897.2	5.6%	3.3%	4.6%
Africa	273.4	386.9	449.5	3.5%	2.2%	3.0%
Asia Pacific	2671.9	4696.1	5743.6	5.8%	2.9%	4.6%
<b>World</b>	<b>9356.4</b>	<b>12119.4</b>	<b>13511.2</b>	<b>2.6%</b>	<b>1.6%</b>	<b>2.2%</b>
OECD	5418.0	5574.9	5605.0	0.3%	0.1%	0.2%

Note: CIS comes from Commonwealth of Independent States.

Source: "BP Statistics Review of World Energy June 2018"

**Table 8: World primary energy demand by region in the new policy scenario (Mtoe)**

	2000	2017	2025	2030	2035	2040	2017-2040	
							Change	CAAGR
<b>North America</b>	<b>2 678</b>	<b>2 624</b>	<b>2 675</b>	<b>2 667</b>	<b>2 661</b>	<b>2 693</b>	<b>69</b>	<b>0.1%</b>
United States	2 271	2 148	2 185	2 162	2 139	2 149	1	0.0%
<b>Central and South America</b>	<b>449</b>	<b>667</b>	<b>730</b>	<b>784</b>	<b>847</b>	<b>916</b>	<b>249</b>	<b>1.4%</b>
Brazil	184	285	315	338	363	391	106	1.4%
<b>Europe</b>	<b>2 028</b>	<b>2 008</b>	<b>1 934</b>	<b>1 845</b>	<b>1 779</b>	<b>1 752</b>	<b>-256</b>	<b>-0.6%</b>
European Union	1 693	1 621	1 512	1 404	1 321	1 274	-347	-1.0%
<b>Africa</b>	<b>490</b>	<b>829</b>	<b>980</b>	<b>1 086</b>	<b>1 192</b>	<b>1 299</b>	<b>470</b>	<b>2.0%</b>
South Africa	103	131	133	132	135	138	7	0.2%
<b>Middle East</b>	<b>353</b>	<b>740</b>	<b>846</b>	<b>957</b>	<b>1 085</b>	<b>1 200</b>	<b>460</b>	<b>2.1%</b>
<b>Eurasia</b>	<b>742</b>	<b>911</b>	<b>943</b>	<b>960</b>	<b>986</b>	<b>1 019</b>	<b>108</b>	<b>0.5%</b>
Russia	621	730	745	744	754	769	39	0.2%
<b>Asia Pacific</b>	<b>3 012</b>	<b>5 789</b>	<b>6 803</b>	<b>7 344</b>	<b>7 798</b>	<b>8 201</b>	<b>2 412</b>	<b>1.5%</b>
China	1 143	3 051	3 509	3 684	3 787	3 858	807	1.0%
India	441	898	1 238	1 465	1 683	1 880	982	3.3%
Japan	518	428	415	403	390	379	-48	-0.5%
Southeast Asia	383	664	826	923	1 018	1 110	446	2.3%
<b>International bunkers</b>	<b>274</b>	<b>404</b>	<b>476</b>	<b>525</b>	<b>578</b>	<b>635</b>	<b>231</b>	<b>2.0%</b>
<b>Total</b>	<b>10 027</b>	<b>13 972</b>	<b>15 388</b>	<b>16 167</b>	<b>16 926</b>	<b>17 715</b>	<b>3 743</b>	<b>1.0%</b>
Current Policies			15 782	16 943	18 125	19 328	5 356	1.4%
Sustainable Development			14 146	13 820	13 688	13 715	-257	-0.1%

Notes: CAAGR = Compound average annual growth rate. International bunkers include both marine and aviation fuels.

Source: World Energy Outlook 2018, IEA

Energy demand changes in Northeast Asian countries are different based on the projection. The growth rate of energy demand in China keeps step with the world total at 1%, Russia is below the world total at 0.5%, and Japan is far lower at -0.5%.

### 1.2.2 Clean fossil energy and renewable energy will maintain a relatively high growth rate

In order to cope with global warming, carbon emissions need to be reduced. Therefore, in line with the current world consensus on energy development, major countries are carrying out energy transformation strategies, moving from high carbon to low carbon, from polluting to clean, and from fossil fuels to renewable energy sources. In the long term, the development of renewable energy is the goal, but in the near and medium term, natural gas will play a major role in the increment of energy demand. State support as well as scientific and technological progress provide good conditions for the development of clean fossil energy and renewable energy. First, the support of the state enables the development of low-carbon and carbon-free energy to obtain the policy and legal guarantee of priority development. Second, scientific and technological progress has reduced the cost of low-carbon and carbon-free energy development, increased competitiveness and increased the scope of application, and they can be used in wider fields.

**Table 9:** World primary energy demand by fuel and scenario

(Mtoe)

			New Policies		Current Policies		Sustainable Development	
	2000	2017	2025	2040	2025	2040	2025	2040
Coal	2 308	3 750	3 768	3 809	3 998	4 769	3 045	1 597
Oil	3 665	4 435	4 754	4 894	4 902	5 570	4 334	3 156
Gas	2 071	3 107	3 539	4 436	3 616	4 804	3 454	3 433
Nuclear	675	688	805	971	803	951	861	1 293
Renewables	662	1 334	1 855	3 014	1 798	2 642	2 056	4 159
Hydro	225	353	415	531	413	514	431	601
Modern bioenergy	377	727	924	1 260	906	1 181	976	1 427
Other	60	254	516	1 223	479	948	648	2 132
Solid biomass	646	658	666	591	666	591	396	77
<b>Total</b>	<b>10 027</b>	<b>13 972</b>	<b>15 388</b>	<b>17 715</b>	<b>15 782</b>	<b>19 328</b>	<b>14 146</b>	<b>13 715</b>
<i>Fossil fuel share</i>	<i>80%</i>	<i>81%</i>	<i>78%</i>	<i>74%</i>	<i>79%</i>	<i>78%</i>	<i>77%</i>	<i>60%</i>
<b>CO<sub>2</sub> emissions (Gt)</b>	<b>23.1</b>	<b>32.6</b>	<b>33.9</b>	<b>35.9</b>	<b>35.5</b>	<b>42.5</b>	<b>29.5</b>	<b>17.6</b>

Notes: Mtoe = million tonnes of oil equivalent; Gt = gigatonnes. Solid biomass includes its traditional use in three-stone fires and in improved cookstoves.

Source: World Energy Outlook 2018, IEA

### 1.2.3 The competitiveness of energy supply will further intensify

Due to the sluggish world economy, insufficient growth in energy consumption, especially fossil energy demand, and relatively adequate energy supply, the world energy supply pattern will change.

The competitiveness of exports will mainly be manifested in:

First, the competition of oil and gas export share. For example, the U.S is now changing from a major oil and gas importer to a country both importing and exporting, and will become an export-dominant country in the future. Second, the competition between non-traditional oil and gas (shale oil, shale gas, oil sands, etc.) and traditional oil and gas resources. Third, the competition between renewable electricity, nuclear power, non-fossil energy, electricity and fossil energy power.

#### **1.2.4 Summary of energy policies in the Northeast Asian countries**

Following trends in global energy development, energy policies in Northeast Asia are set based on this energy transition. The key points of energy policies are listed as the following:

To ensure energy security: Japan, Korea and China, the region's net energy importers, are prioritizing stable energy supply; Russia and Mongolia are net energy exporters who seek foreign exchange via exporting energy, as an important part of their economic security.

To improve energy efficiency: most countries in Northeast Asia are including energy efficiency as an essential element of their energy policies based on the current conditions of energy resources and energy efficiency.

To develop renewable energy: all countries are actively developing non-fossil fuels including hydropower, wind power, solar, and nuclear power in order to ensure their energy supply and address climate change.

To push energy innovation: technical innovation is the driver of energy transition, and countries in Northeast Asia are making headway in fields such as clean coal technologies, electric vehicles, energy storage, hydrogen energy, renewable energy and electricity transmission technologies.

#### **1.2.5 Fossil energy import and export in the Northeast Asian countries**

Generally speaking, the current trends of fossil energy import and export in Northeast Asia are set to continue. Russia plays the role of crude oil and natural gas exporter, and Mongolia is the coal exporter; China, Japan, Korea are importers of crude oil, natural gas and coal.

**Table 10: Fossil energy trade in the New Policies Scenario in Northeast Asia**

Oil Trade								
	Net Imports (mb/d)				As share of demand (%)			
	2000	2017	2025	2040	2000	2017	2025	2040
China	1.7	809	12.2	13.3	34.0	69.0	77.0	79.0
Japan and Korea	7.3	6.2	5.9	4.5	97.0	95.0	97.0	96.0
Russia	-3.9	-8.2	-7.9	-5.9	59.0	71.0	69.0	62.0
Natural gas Trade								
	Net Imports (bcm)				As share of demand (%)			
	2000	2017	2025	2040	2000	2017	2025	2040
China	1	106	243	369	5.0	43.0	52.0	52.0
Japan and Korea	97	162	145	166	97.0	98.0	98.0	99.0
Russia	-185	-234	-288	-328	32.0	34.0	38.0	41.0
Coal Trade								
	Net Imports (Mtce)				As share of demand (%)			
	2000	2017	2025	2040	2000	2017	2025	2040
China	-58	209	159	81	6.0	8.0	6.0	3.0
Japan and Korea	192	291	241	196	97.0	100.0	100.0	100.0
Russia	-14	-144	-255	-182	74.0	82.0	73.0	54.0

Source: World Energy Outlook 2018, IEA

## 2 The significance and role of energy cooperation in Northeast Asia

### 2.1 Increasing trust and interpretation

Due to the great differences in social systems and ideologies, unbalanced economic development and the concentration of the interests of states in Northeast Asia, there is no close economic community and cooperation is still in its initial stage. Energy cooperation covers a wide range of areas, including tariff concessions, joint development, free trade, and the flow of capital, commodities and people, which is conducive to promoting regional cooperation in a step-by-step manner in a region of complexity and particularity like Northeast Asia. Of particular interest are cooperation and investment structure, both of which are required to construct the planned interconnected network of oil and gas pipelines in Northeast Asia. These pipelines are huge cross-century investment projects costing billions or tens of billions of dollars, "promoting political cooperation by economic cooperation" and "promoting foreign affairs by economy." Extensive cooperation in the energy sector, which is multilateral, long-term and large-scale, can enhance coordination

among governments, enhance dialogue and exchanges, and enhance mutual trust and interdependence among countries.

The smooth progress of regional cooperation in Northeast Asia needs some pillar areas as a focal point, and energy cooperation has the potential to become a pillar which brings nations in Northeast Asia together. Energy is the common export-oriented demand of Northeast Asian countries and also the intersection point of their respective interests. Reducing the mutual competitiveness of energy importing, balancing energy market demand, expanding the fields of energy development and utilization, and strengthening cooperation between energy exporters and importers will promote the convergence of mutual interests and expand the basis of common interests.

In the long term, the establishment of a "Northeast Asian Energy Community" will be an important factor in regional cooperation in Northeast Asia. Energy cooperation in Northeast Asia requires the formation of a stable energy supply and marketing system among the relevant countries: a community of energy interests, while strengthening coordination in the process of obtaining extraterritorial energy supplies, which will promote development in the Northeast Asian sub-region. The overall development of the region will also push the process of integration, and energy cooperation will play a key role in deepening relations between Northeast Asian neighbors. Moreover, energy cooperation can help to overcome political issues among countries, promote regional peace, and promote regional economic integration and political cooperation.

## **2.2 Promoting coordinated economic development in Northeast Asia**

The level of economic development of the countries in Northeast Asia is roughly vertical, with obvious grading differences. The first level is developed countries, with Japan and ROK as OECD members; the second level is China and Russia as emerging economies, though there is a certain gap in economic levels between Eastern Russia and Northeastern China, which are underdeveloped areas, and other domestic regions; the third level is Mongolia and DPRK, both economically underdeveloped countries who operate in different levels and different ladders. The region has good complementarities and docking in the process of economic regionalization and globalization and shows great potential for cooperation. To strengthen energy cooperation in the region, the development of rich energy resources in eastern Russia, Mongolia and DPRK should be encouraged, thus, promoting the positive development of all countries and achieving coordinated economic development in Northeast Asia.

## **2.3 Ensuring common energy security in Northeast Asia**

Oil supply is greatly affected by external factors. First, China, Japan and ROK are heavily dependent on oil imports from the Middle East, and natural gas imports are large. In particular, the internal contradictions in the Middle East region have greatly affected the security and stability of the region, adding new insecurity and uncertainty for Northeast Asian countries. Second, there are many hidden dangers

in the way of oil and LNG transportation based on sea transportation. China, Japan and ROK mainly import energy by sea and are far away. Their transport routes are heavily dependent on the Indian Ocean-Malacca Strait. The Malacca Strait is one of the busiest waterways in the world. Therefore, the security risks of imported energy transport routes have become a common dilemma facing Northeast Asian countries. With the rapid growth of energy demand in Northeast Asian countries, the degree of integration in the global energy market is deepening and the interdependence of global energy security is gradually increasing. Consequently, Northeast Asian countries are more and more closely related in terms of energy strategy and energy security.

Through regional energy cooperation, vicious competition among energy-importers can be avoided, market risks caused by large fluctuations in oil prices can be averted, the "Asian premium" can be eliminated, and energy transport security can be guaranteed. Energy cooperation in Northeast Asia not only brings benefits to China, Japan and ROK and other net energy importers, but also conforms to Russian and Mongolian interests as energy exporters. It can improve Russia's over-reliance on Europe's energy export structure, disperse the risk of Russia's energy supply, and to a certain extent solve the shortage of much-needed funds for the development of Russia's energy industry to promote the economic development of Eastern Russia. For Mongolia, increased coal exports, improvements in electricity and renewable energy as well as continued rapid economic growth are potential benefits of improved cooperation. Therefore, energy cooperation is a sound approach to ensure energy security and achieve common development in Northeast Asia. Furthermore, the interconnection of energy infrastructure will be strengthened to further ensure the security of regional energy supply.

### **3 The challenges for energy cooperation in Northeast Asia Although the potential for energy cooperation in Northeast Asia is huge and significant, it faces many challenges.**

#### **3.1 Lack of political trust among countries in Northeast Asia**

The degree of strategic mutual trust among countries in Northeast Asia is low, and the uncertainty of security directly leads to the stagnation of energy cooperation in the region. Energy issues involve a national strategic core security, so countries have always been very cautious and sensitive toward energy issues, leading to the often viewed "zero-sum game" phenomenon in energy competition. Therefore, close energy cooperation requires a high degree of political mutual trust among countries, but mutual political and strategic trust between countries in Northeast Asia is lacking at present. There are many obvious disputes and potential conflicting points in Northeast Asia because of the confluence of interests in Northeast Asia, the existence of historical problems, territorial problems, geopolitical factors and Cold War thinking. The countries in Northeast Asia have, to a certain extent, various or explicit or implicit contradictions and competitions with each other. It is not easy

to achieve energy security cooperation in Northeast Asia with open disputes, suspicion and even hostility. Due to the low degree of political mutual trust and uncertainty of future security among Northeast Asian countries, energy cooperation cannot be further strengthened, and some countries take a cautious attitude into the process of participating in energy cooperation in Northeast Asia.

### **3.2 Lack of effective energy cooperation mechanism in Northeast Asia**

Establishing a feasible and effective energy cooperation mechanism is the basis of energy cooperation in Northeast Asia. Although some preliminary ideas and practices of multilateral energy cooperation have been put forward in Northeast Asia, they are not mature or perfect. At present, Northeast Asian countries' understanding of multilateral energy cooperation is still more limited to the simple form of dialogue, oil and natural trade. There are no macro-policy coordination and institutional arrangements for energy trade, development and utilization among countries. At the same time, the establishment of regional energy markets, a common oil strategic reserve and the formation of international energy development consortia and other forms of cooperation has not yet officially started. What's more, there is no energy cooperation project in the region that can integrate the energy security interests of all countries in the region, promote and deepen mutual understanding and communication among countries. The concept of energy cooperation in Northeast Asian countries is basically the traditional concept of "zero-sum game," rather than the concept of interdependence in the context of economic globalization and regional integration. Therefore, in the process of energy acquisition among Northeast Asian countries, more is not mutual coordination and cooperation, but mutual competition and suppression. This is manifested in two aspects of competition outside the region and within the region. Outside the region, Northeast Asian countries lack coordination in energy competition in Africa, the Middle East and other regions, each fighting for its own, which not only increases the regional energy transaction costs, but also to some extent leads to vicious competition among countries in Northeast Asia, so that the oil exporting countries outside the region can profit from it. The lack of a truly effective energy cooperation mechanism in Northeast Asia has seriously hindered the further deepening of energy cooperation in and harmed the economic interests of energy consuming countries.

### **3.3 Insufficient preliminary study on regional energy cooperation in Northeast Asia**

Some studies should be conducted in order to implement regional energy cooperation in Northeast Asia under sustainable development and multilateral benefits, mainly covering the following aspects:

**Regional energy markets:** Complementarity of resources and markets is an important basis for energy cooperation. Energy cooperation in Northeast Asia needs to consider the balance of energy supply and demand from the region as a whole.

**Feasibility study of projects:** Investment, trade and mechanism cooperation are the main contents of energy cooperation in Northeast Asia. In the process of project

cooperation, it is necessary to carry out an in-depth feasibility study, encompassing a systematic study of the technology, cost, environmental impact and other elements of a project. Such projects include the Northeast Asia Super Grid, as well as natural gas pipeline development in Northeast Asia.

**Opportunity cost comparison:** There are crude oil, natural gas and coal trades within Northeast Asia. With the development of the Northeast Asia Super Grid, there will be a new choice: coal, natural gas or power transmission. Which model will be better economically and environmentally, the transmission of natural gas or/and coal-fired electricity or the direct export of natural gas or/and coal?

#### **4 The strategic options for energy cooperation in Northeast Asia**

Energy cooperation in Northeast Asia should be based on the principle of mutual benefit and a win-win situation, with reasonable institutional arrangements as the guarantee, after which countries in the region gradually expand the scope of energy cooperation, promote the interconnection of energy infrastructure, maintain regional energy security, and ultimately promote the process of energy integration. To promote regional cooperation in Northeast Asia, first, we should respect the diversity of Northeast Asian countries, realize the principles of equal participation, consensus, step-by-step process, mutual benefit and a win-win situation. Second, we should select economic and energy cooperation as the forerunner to promote political cooperation, create a favorable environment for economic cooperation with political security, and accumulate common interests with economic and energy cooperation as the basis for political security cooperation.

##### **4.1 Goals of energy cooperation in Northeast Asia**

Energy cooperation in Northeast Asia is a process of steady progress. It must pass through various stages, from bilateral to multilateral, from market-oriented to mechanism-guaranteed. Ultimately, the institutionalization of energy security cooperation should promote the cooperation of multilateral energy security in the region.

At present, energy cooperation in Northeast Asia is mainly bilateral in nature, and multilateral cooperation is basically in the initial stage of consultation. Therefore, the short-term goal of energy cooperation in Northeast Asia should be to coordinate bilateral and multilateral energy cooperation among member countries. In order to achieve the goal of energy market liberalization and integration in Northeast Asia, it is necessary to formulate plans including specific measures, such as gradually reducing tariff and non-tariff barriers to energy, liberalizing and facilitating trade and investment in the energy sector, and eventually building a unified large market covering the whole of Northeast Asia and the whole energy industry. The long-term goal is to reach a stable and effective multilateral treaty and establish corresponding institutions. Regional energy cooperation, on the basis of the current Northeast Asian Intergovernmental Energy Cooperation Framework, promotes the

formulation of “the Charter of the Northeast Asian Energy Community” which is binding on international law, and restricts the actions of member states by formulating rules and regulations on the qualifications, rights and obligations, and terms of reference of each member state. The institutionalized basis for promoting cooperation ensures the smooth development of energy cooperation in Northeast Asia and eventually establishes the Northeast Asian Energy Community.

#### **4.2 Key areas of cooperation**

If Northeast Asian countries carry out comprehensive, diversified and all-round energy cooperation, it a solution for regional energy problems will be found. Besides the soft-factor in energy cooperation mechanism, comprehensive energy cooperation should also be included, covering related fields such as the development of energy resources, oil refining, energy conservation and emission reduction, the development of renewable energy sources, the interconnection of electricity, oil, natural gas infrastructure, an oil and gas trading center, and technology R & D.

##### **4.2.1 Establishment of energy cooperation mechanism in Northeast Asia**

Strengthening inter-governmental dialogue to improve political relations is vital. Strengthening political mutual trust is conducive to enhancing mutual trust and interests as well as eliminating barriers and suspicions, which are prerequisites for promoting energy cooperation in Northeast Asia. All parties should seek consensus, seek common ground while reserving differences, respect and understand the interests of all parties concerned, strengthen energy cooperation, safeguard common interests, and realize the long-term interests and mutual benefit of all parties.

To promote actively the establishment of a Northeast Asian energy cooperation mechanism must be an area of priority for deepening comprehensive economic cooperation in Northeast Asia. The countries concerned should sign a framework agreement on regional energy cooperation in Northeast Asia, which is binding on international law, and make clear the major issues of regional energy cooperation. Among them, the most critical content is to establish the Northeast Asian energy cooperation organization, and to clarify its basic purpose, operating principles, organizational structure, terms of reference, the rights and obligations of member states, and decision-making procedures. In addition, there should be clear provisions on such important issues as energy trade, market opening and investment protection, intellectual property protection and technology transfer, an implementation and supervision mechanism for organizational resolutions, a dispute settlement mechanism, construction of a regional energy information database and information sharing.

##### **4.2.2 Establishment of common energy market in Northeast Asia**

To accelerate construction of a Northeast Asian common energy market, it is necessary to improve the bargaining power in the international energy market and eliminate the "Asian premium". In a period of relatively tight global energy supply, countries with large imports may have some disadvantages in market bargaining,

and sometimes even must accept a certain premium. But in a period of relative surplus of global energy supply, countries with large imports will have obvious bargaining advantages, and energy exporters will compete for a stable export market. Therefore, China, Japan and ROK should make full use of the favorable opportunity of global energy pattern adjustment, and jointly transform the regional market scale advantage into a realistic bargaining power advantage to strive for a fairer and more reasonable energy purchase price for themselves. Northeast Asian countries should promote the construction of regional common energy markets on this basis, gradually realize the liberalization of energy trade and investment facilitation in addition to improving operational efficiency of regional energy markets.

To strengthen the analysis and study of energy exports and imports in the region, one must first balance the regional market in advance, and stabilize the price and quantity.

#### **4.2.3 Joint development of energy resources**

All countries will jointly develop conventional and unconventional energy resources to achieve shared risk and revenue. China, Japan and ROK can jointly participate in energy development in Russia's East Siberia, the Far East, the Arctic and Mongolia. To a great extent, they can avoid delays caused by various zero-sum game competitions and implement relevant energy development plans as soon as possible, realize the expansion of energy exports to the Asia-Pacific region, then diversify the goals of the export market. Of course, the partners involved in overseas conventional energy development are not limited to Russia, but also in the Middle East, Africa and South America. In addition, alternate fields such as nature gas hydrate, shale oil and gas and tidal energy can be included. Northeast Asian countries can carry out various forms of technical exchanges and cooperation to jointly promote the technological revolution of unconventional energy development.

#### **4.2.4 Interconnection of energy infrastructure in Northeast Asia**

Northeast Asia must promote the interconnection of its energy infrastructure and work together to build a comprehensive energy network covering the Northeast Asian Super Grid, oil pipeline network and natural gas pipeline network. Russia's East Siberia and Far East and Mongolia are rich in fossil energy resources and have favorable conditions to develop renewable energy such as solar and wind energy. China and Korea, on the other hand, have the advantages of capital and ultra-high voltage transmission technology. China, Russia and Mongolia can take the lead in interconnecting power grids and realizing large-scale cross-border power transmission. This will not only drive the economic growth of Russia and Mongolia, but also help China, Japan and Korea to promote energy conservation, emission reduction and environmental pollution control. In the near future, China, Russia and Mongolia can show the way in building a comprehensive energy network, interconnect power networks through the construction of ultra-high voltage transmission lines, integrate fossil fuel-fired power generation with renewable electricity, and fuse Chinese, Russian and Mongolian energy networks with Northeast Asian neighbors such as Japan

and ROK through land or submarine ultra-high voltage transmission lines. Network docking, the construction of a wider range of Northeast Asia Super Grid system is required. Steps to accelerate the development of oil and gas resources in Russia's East Siberia and the Far East include building Russia's oil and gas pipeline network for export to China, ROK and Japan, carrying out further project studies, planning routes, and fully considering the participation of Mongolia and DPRK.

#### **4.2.5 Jointly carry out energy-saving and environmental protection technology and industry development**

Japan and ROK have advanced energy-saving and environmental protection technology and management levels. Northeast Asia, especially China and Russia have a huge demand in energy-saving and environmental protection. Strengthening the exchange experience and technical cooperation of energy-saving and environmental protection can reduce the pressure of energy supply and ensure common energy security. And in this respect has a good foundation for cooperation, such as the energy-saving training between China and Japan in which Japan ODA loans support China's development of energy-saving technologies.

#### **4.2.6 Jointly promote the reform of the global energy and environmental governance system**

Global energy governance began in the 1970s when developed countries responded to the oil crisis, and gradually moved to promote the healthy operation of the global energy market, formulate energy trade and investment rules, develop clean energy and address climate change and other areas. At present, global energy governance, with the International Energy Agency (IEA) as its core organization, is still a club of developed countries, which cannot fully reflect the voice of developing countries and lack the universality of participation; there is a lack of adequate policies on energy poverty and climate change; and there is a lack of diversity in governance content. Therefore, it is necessary to jointly promote the reform of the global energy governance system to make the international energy organization more inclusive, diverse and diversified.

Northeast Asia has a variety of countries, including developed economies, the world's largest developing countries and poor countries, as well as major energy producers and exporters, energy consumption and importers. Regarding the reform of global energy governance, various interests and voices can be fully reflected in Northeast Asia. Countries in Northeast Asia should strengthen communication and exchanges, reach consensus on major issues that fully reflect the interests and concerns of all parties, and make joint efforts to promote reform of global energy governance on this basis, jointly safeguard the healthy development of energy markets and promote global sustainable development.