

Chapter IV

Energy Issues Endangering Economic Self-reliance

1. *The Pressing Energy Crisis*

Energy is the foundation of an economy. Regardless of the type of development strategy being pursued, whether priority is given to heavy industry, the orientation is toward overseas, or whatever, all will come to nothing if there are problems with the infrastructure for supplying energy. Consequently, ever since embarking on the goal of building a “self-reliant national economy,” Democratic People’s Republic of Korea (North Korea) has put the utmost effort into establishing an energy infrastructure as part of its overall program. However, one of the primary causes of North Korea’s present economic distress is energy issues.

It is considered to be a fact that North Korea is facing serious energy problems. The late Kim Il Sung, in his “last instructions” speech (Kim Il Sung, “On Bringing About New Revolutionary Changes as Part of Building a Socialist Economy,” Concluding Address to the Conference of the Cadres in Charge of the Economic Sectors, July 6, 1994, abbreviated below as “last instructions.” Excerpted translations of the portions dealing with energy are appended at the end of this chapter.), states frankly that these problems are both clear and serious.

This chapter provides an outline of the actual status of these energy problems faced by North Korea and attempts to examine the so-called “light-water reactor” issue from the viewpoint of the economy. When speaking of North Korea’s energy problems, the entire emphasis is generally on its insufficient volume. However, we must not overlook the qualitative aspect, for example the lack of balance that exists between the demand structure and the supply structure. Nevertheless, it is not always easy to analyze these things based on proven facts. We can only point out things based on isolated examples that may contain a large amount of conjecture. However, even in the case of the former, it is not a simple matter to obtain primary source material that is quantitatively rigorous, as we shall note again later.

2. *The Present Status of Energy Production*

Since becoming independent, self-sufficiency in energy has been a basic principle for North Korea. The first priority has been given to the development of water power and coal as sources of energy. Through the 1960s, efforts were made to build large-scale hydroelectric power stations, especially in the mountainous regions in the north. From the 1970s onward, however, there has also been an emphasis on the construction of coal-burning thermal power stations.

Since no petroleum at all can be produced inside the country, the use of automobiles, of course, as well as the development of a petrochemical industry, has been severely curtailed. In recent years, an electric power station fueled by heavy oil has been constructed. However, it still accounts for only a tiny percentage of the total energy supply.

With regard to North Korea’s energy supply, the result of the above-mentioned energy policies is that coal has been giving top importance as a fuel source and electricity has been giving top importance as a source of motive power. If we trace back to the fuel source of electric power as well, we find that there is a heavy dependence on coal (which accounts for roughly half of electric power generating capacity). This means that coal is the key energy source. Since, in addition to its use for generating electricity, large quantities of coal are consumed as fuel for industry, such as steel and chemicals, it is truly the lifeline of the North Korean economy.

However, there are many unclear points with regard to the actual state of energy production. North Korea’s third 7-year plan (1987-1993) states 100 billion KWH of electricity and 120 million tons of coal as production targets, but the figures given for actual production are simplified values: 1.3 times “reference year” for electricity and 1.4 times “reference year” for coal.⁽¹⁾ It is assumed that this “reference year” is 1984, which was the final

Table 4-1 North Korean Energy Production (National Unification Board Estimates)

Year	Coal production (million tons)	Electricity production (billion KWH)	Electric power capacity (million KW)	
			(Thermal)	(Hydroelectric)
1990	52.95	27.7	2.85	4.29
1991	47.04	26.3	2.85	4.29
1992	41.49	24.7	2.85	4.29
1993	36.85	22.1	2.85	4.29
1994	32.84	23.1	2.90	4.34
1995	23.70	23.0	2.90	4.34

Source: National Unification Board, *South/North Korea Economic Indicators for 1995* (Seoul, 1995).
 Figures for 1995 are from Bank of Korea, *Results of North Korean GDP Estimates for 1995* (Seoul, 1996).

year of the second seven-year plan (1978-1984), but the actual production figures for that year have never been made public in detail. In this way, the actual production figures for electricity and coal production, North Korea's two major energy targets, are the subject of a variety of speculations.

According to the *South/North Korea Economic Indicators for 1995*, published by the National Unification Board in South Korea, North Korea generated 22.1 billion KWH of electricity and produced 27.1 million tons of coal in 1993. These figures are, of course, far lower than the targets in the third 7-year plan, and, moving further upstream, they are lower than the absolute production figure values of 28 billion KWH of electricity and 50 million tons of coal announced in North Korea's 6-year plan (1971-1976). The National Unification Board estimates that energy production in 1995 was 23.0 billion KWH of electricity, which is a slight increase over 1993, and 23.7 million tons of coal, which is a decrease from the 1993 figure. (See Table 4-1).

On the other hand, according to the *Energy Statistics Yearbook 1993* published by the U.N., North Korea generated 38.0 billion KWH of electricity and produced 99.0 million tons of coal in 1993. According to this source, North Korea's energy production was 1.36 times the figure for 1976 in the case of electricity and approximately twice the figure for 1976 in the case of coal.

The discrepancy between the estimates of the National Unification Board and the United Nations data amount to 1.7 times for electricity generation and 3.6 times in the case of coal production. With large differences such as this between estimates for North Korea's two major energy indicators, it is inevitable that our evaluation of the energy prob-

lem and of the economy as a whole will change depending on which figures we use.

Chang Yung-Shik (of the Korea Development Institute) has made a detailed comparative study of the National Unification Board estimates and the United Nations data. He notes that the figures for coal (in 1990, 33.15 million tons according to the National Unification Board and 53.70 million tons according to the United Nations, a difference of 20.55 million tons) given by the National Unification Board were not the actual weight, but a conversion to the equivalent in tons of crude oil. This was the cause of the discrepancy in the figures, and the actual difference is not all that great. With regard to the figures for electricity (in 1991, 26.3 billion KWH according to the National Unification Board and 53.5 billion KWH according to the United Nations, the latter figure almost double the former), the United Nations assumed the capacity of all electrical generating facilities to be 9.5 million KW and calculated its figure on the basis of a work ratio of 64%, while the National Unification Board underestimated the total by assuming the capacity of all electrical generating facilities to be 7.14 million KW and using a work ratio of 42% for its calculations. Chang notes that the source of the data used by the National Unification Board to arrive at its estimates is not clear, and says that the figures from the United Nations are generally correct.⁽²⁾

However, United Nations statistics are not always reliable. Chang relied on the 1990 edition of the U.N., *Energy Statistics Yearbook*, but if one examines the 1992 or 1993 editions of the same data, there are significant discrepancies in the production figures for identical years. For example, the 1990 edition statistic for coal production is the above-quoted figure of 53.70 million tons (antra-

cite: 40.70 million tons, lignite: 13.00 million tons). The 1992 and 1993 editions, however, give a figure of 90.00 million tons (anthracite: 68.00 million tons, lignite: 22.00 million tons), 1.7 times the earlier statistic. (See Table 4-2.)

If we consider volume of heat per unit of weight, one ton of North Korea's lignite is equivalent to 0.6 tons of standard coal. If we use the same conversion value for anthracite as for lignite, the figure of 90.00 million tons is equivalent to 53.70 million tons. The 1990 United Nations data were not based on a conversion of the actual volume of coal to its equivalent in crude oil, but they may be based on a conversion to the equivalent in standard coal. The 1993 edition of the United Nations data uses a conversion value of 0.6 to get the equivalent in standard coal of lignite, but it uses a conversion value of 1.0 for anthracite. Also, the production volume quoted for anthracite is 1.00 million tons higher than the figure quoted in the 1992 edition, resulting in still more of an increase in the estimate of actual energy production.

Both the 1992 and 1993 editions of the United Nations data indicate that electricity production dropped sharply from 53.5 billion KWH in 1991 to 38.0 billion KWH in 1992 and 1993. Broken down by type, thermal dropped by 35.6% from 21.75 billion KWH to 14.0 billion KWH. Hydroelectric dropped by 24.4% from 31.75 billion KWH to 24.0 billion KWH. There was no change in the capacity of electrical generating facilities during this period. Electricity is North Korea's most important source of power. If coal production increased, the additional coal would have been used in the thermal power plants, one would think. This contradicts the UN statistics, which indicate a large drop in thermal power production.

Table 4-2 North Korean Energy Production (UN Estimates)

	Coal production (million tons)			Electricity production (billion KWH)		
	1990 edition	1992 edition	1993 edition	1990 edition	1992 edition	1993 edition
1990	53.7	90.0	—	53.5	53.5	—
1991	—	92.0	93.0	—	53.5	53.5
1992	—	94.0	95.0	—	38.0	38.0
1993	—	—	99.0	—	—	38.0

Source: UN, *Energy Statistics Yearbook*, 1990, 1992, and 1993 editions.

According to Chang Yung-Shik, North Korea's thermal electricity generation reached a level of 14.0 billion KWH in 1981 or 1982. At that time, coal production, converted into its equivalent in standard coal, was approximately 47.00 million tons (actual volume: 78.00 million tons)⁽³⁾. If thermal electricity generation was the same figure of 14.0 billion KWH in 1992 as well, the overall coal production volume for that year must have been less than that for 1981 and 1982, because it is unlikely that the decline in electricity production would be ignored and coal be diverted to other fields. The actual state of North Korea's two main energy indices is probably as follows: coal production at the level prevailing in the late 1970s, and electricity production at a lower level than that of the early 1980s. This situation matches the recognition of the top leader of the country at that time that many plants in the core industries were not able to operate normally due to a shortage of power and raw materials.

The production situation for energy crucial to the economy is another clear indication that the North Korean economy is in a state of crisis, and that it is shrinking steadily.

3. *The Causes of the Energy Problem*

The source of North Korea's energy problems can be found in the very concept of a self-reliant national economy. The index of a self-reliant national economy is said to be self-reliance in resources, capital (technology), and management (personnel). However, it would seem that behind the emphasis on domestic resources has been an overestimate of the endowment of energy resources such as hydraulic power and coal.

During the latter half of the colonial period, large amounts of Japanese capital were focused on the large-scale development of North Korea's hydraulic power and underground resources. It would seem that these resources provided the self-confidence that led to independent political power. Viewed in the context of the economic development goals initially envisioned, it seemed that the endowed resources alone would be sufficient, but this assessment turns out to have been unexpectedly superficial.

The problem is not only one of quantity. A tenacious attachment to endowed resources be-

comes a strong restraint on the economy and on industry. An energy supply structure in which electricity accounted for more than half of the power became a severe limitation on the distribution network and regional economic structure. The tilt towards railroads, which require large-scale investment and allow for high-volume shipping, as a means of transport was increased, and the severe restrictions on medium- and short-range transport, which are dependent on motor vehicles, were increased. With a transportation network of this type, distribution tends to become rigid and inflexible. As a result, regional economies inevitably assume a small-scale, self-sufficient structure.

The basic cause of the inefficiency of the North Korean economy is thought to be energy development policies of the sort described above and the regional structure of the national economy that accommodates them. In other words, though a large amount of energy is produced in comparison with the scale of the economy, it is thought that sufficient energy and raw materials often do not get through to individual production units, unfinished products are often left sitting in warehouses, and even when products are finished a situation arises in which only regionally-skewed distribution is available.

Overall, the operation of North Korea's planned economy is suffering from what might be called "energy rigidity syndrome." Kim Il Sung's "last instructions" demand that in order to break the energy rigidity syndrome, there is no other course but to supply enormous amounts of electricity. This requires purchasing coal and crude oil from abroad for use as fuel, even if it means putting on hold the basic principle of the self-reliant national economy.

Another factor that has made North Korea's energy problems more acute is a general deterioration of the country's energy resources and industry.

It was pointed out before by the National Unification Board and others that North Korea's power facilities, such as its electrical generating plants and electrical distribution network, have become very dilapidated. Chang, who we mentioned earlier, disputes this, saying that North Korea's power facilities are not all dilapidated. He notes that there are some newer facilities, such as hydroelectric plants provided by advanced countries. There is certainly room in this regard for study not only of electrical generating plants, but of electrical distri-

bution facilities as well. Unfortunately, however, there are no verifiable data available on this.

Rather, the real problem lies in the area of the production of raw materials for energy (hydraulic power and coal). First, with regard to coal, the proportion of poor-quality lignite is rising and deep-level coal mines are increasing. This imposes limitations on the quantity of production. According to United Nations data, North Korea's coal production increased from 46.00 million tons in 1980 to 53.50 million tons in 1990. This works out to a rate of yearly increase of only 1.5%. Also, during the same period the proportion of lignite has risen steadily from approximately 22% to approximately 24%. In 1993, the proportion of lignite rose even higher to 27%. We can also glean from the comment to the effect that lignite is not being sorted properly in Kim Il Sung's "last instructions" that the drop in quality is due to a decline in quality control.

With regard to hydraulic power, one problem is that building dams will not ensure a sufficient quantity of water if it does not rain. Many large-scale dams have already been constructed along the Yalu and Tumen rivers, which are the two largest rivers in North Korea. But they are all competing with each other for the limited flow of water. Also, accumulation of sediment, which could be called the deterioration of the lakes behind the dams, is also thought to be a problem. Considering the situation over the last several years with fields and villages being buried in silt from floods, it is easy to imagine to what degree of pressure North Korea's dammed lakes are being subjected by the silt building up year after year.

In addition to "hardware" problems of the sort mentioned above, we can also point out "software" problems in the system. In order to produce energy, cooperation is essential not only between the sectors directly involved in energy production, such as coal mines and power generating plants, but also between the industries that support them, such as steel and cement, as well as the distribution sectors, such as transport and storage.

However, the trend toward "linking" (a form of consolidation) of individual industries, which are burdened with the need to meet strict quotas and are even responsible for maintaining their workers' living conditions, is thought to weaken this cooperation and to aggravate selfish tendencies such as quantity-based thinking and hoarding of resources. The failure to properly sort lignite mentioned by

Kim Il Sung and the problem of management not allocating fuel even if there is a shortage are both examples of this.

Finally, the slump in trade in energy deserves mention. Imported energy such as oil and coke account for only a tiny proportion of North Korea's energy sources by volume. However, the importance of such imports is far from small. Their importance derives not from the fact that they are limited, but from the fact that they are imported out of the direst necessity.

For example, petroleum is a necessary fuel for urban transportation and for medium- and short-range transport. Coke is essential for steel production. The phaseout of "friendship trade" with the former Soviet Union and with China, which were the main sources of these imports, has caused a decisive worsening in North Korea's energy situation.

First, though the available data indicates a variety of figures for the volume of North Korea's imports of petroleum and coal, the former Soviet Union and China probably supplied approximately 3 million tons of crude oil annually through the 1980s. (Incidentally, the petroleum refining capacity of North Korea is 3.5 million tons according to United Nations data.) With the phaseout of friendship trade in 1991, crude oil imports from the former Soviet Union stopped completely. The resulting gap was filled partially through weapons exports from North Korea to countries in the Middle East. This gave rise to the so-called "missile trade issue."

In 1992, China also decided to phase out friendship trade, but annual imports from China of about 1 million tons of crude oil continue to this day. According to trade statistics from Russia, exports to North Korea of petroleum products totaled approximately 300,000 tons in 1993. In any case, it is clear that petroleum imports have now dropped by roughly half from the peak period. Such shortages of petroleum energy probably have had a significantly damaging effect on everyday life, of course, and also on the country's ability to respond to disasters.

Next, China and Russia are the sole sources of North Korea's imports of coke. Though there has been a declining trend in these imports after 1990, it is not as extreme as in the case of petroleum. This is because unlike oil, the suppliers are willing to provide coke in return for goods. In Kim Il Sung's

"last instructions," which we are quoting again and again, there is a place where he states specifically, "The foreign currency we need to buy coke can be raised by selling steel produced by our metal industry sectors." Based on this, there is no doubt that this idea had already been put into practice. However, this diversion of resources no doubt resulted in a reduction in the domestic supply, a drop in the capability to invest in other industries and social capital, as well as a weakening of interest in domestic energy sources.

The increasing vulnerability of North Korea's energy infrastructure described above has not resulted in major changes in the existing energy demand structure or in a reformation of the framework of the national economy. Instead, it has caused expectations for nuclear power, which is seen as a way to solve the energy problem at one stroke, to swell even larger.

4. *The Development of Nuclear Power and Future Energy Issues*

The nuclear suspicions concerning North Korea, which popped up all of a sudden in 1992, as well as the talks between North Korea and the United States, which began when North Korea announced in early 1993 that it was withdrawing from the Nuclear Nonproliferation Treaty, came to something of a conclusion with the announcement in October 1994 of a "framework agreement."

The essentials of the agreement were that the United States would provide North Korea with a 2 million KW light-water reactor by the year 2003, that the U.S. would provide 500,000 tons (50,000 tons in the initial year, 1995) of heavy oil each year as an alternative energy source until the first reactor went into operation, and that North Korea would honor the IAEA pact on security measures as provided for in the Nonproliferation Treaty.

This transaction was a no-loss deal for both sides. By protecting the nuclear management system implemented by the five nuclear powers, the United States proudly displayed itself as the protector of world security, and North Korea found a way out of its energy crisis. There was only one loose end: South Korea, which was left to foot more than half of the bill.

South Korea has long hoped for direct talks between the North and South as a way to encourage

the reform and liberation of North Korea and as a first step toward the reunification of the Korean peninsula under South Korea. However, it views North Korea's many recent provocations as far from reform and liberation, but rather a blatant expression of the old, unmodified, North Korean line on reunification.

North Korea began its nuclear power plant construction in the early eighties when the former Soviet Union promised to build a 1.8 million KW facility and to provide technical assistance as a condition to North Korea's participation in the Non-proliferation Treaty. Since then, North Korea has worked vigorously to foster nuclear-power-related technology and personnel while building test reactors for the purpose of technical training. One of these was a graphite-moderated reactor that produces plutonium as a byproduct. This was the source of the nuclear suspicions.

The former Soviet Union finally abandoned the agreement without ever implementing its provisions. At this point, North Korea decided to go ahead with the construction of a nuclear power plant by itself. In order to quell the nuclear suspicions that were beginning to be viewed as a problem in some quarters, North Korea in 1992 signed the IAEA pact on security measures, which had been pending, and agreed to permit inspections. In the course of the IAEA inspections, the nuclear suspicions increased. Then, as a result of the tight-rope walk of the negotiations between North Korea and the United States, the "framework agreement," which no one had anticipated, was arrived at. It was truly high drama.

Viewed from the perspective of the current electricity generating capacity of 7.14 million KW (National Unification Board) or 9.50 million KW (UN), the completion of a 2 million KW light-water reactor would definitely solve North Korea's energy problem in the volume sense. The current power generating facilities are operating at far below capacity and are unstable due to the weakness of the raw materials base, as mentioned above. When this is considered, the likely effects of a light-water reactor appear even more significant.

One issue is the period up to when the light-water reactor is completed. When it is considered that with the 500,000 tons of heavy oil to be delivered beginning in 1996, combined with the one million tons of crude oil China has been supplying for some years and oil supplied by other countries,

the total is 1.5 million tons or so, petroleum is likely to become an important energy source for North Korea in the years to come. With regard to demand for heavy oil, in order quickly to solve the problem of insufficient generation of electricity, there will be no alternative but to build oil-burning thermal power plants as stated by Kim Il Sung in his "last instructions."

However, the 500,000 tons of heavy oil will not even be enough to make up for the loss of petroleum that used to be supplied by Russia. We can expect that the present energy shortage will continue for some time. The trend of shrinkage of the North Korean economy that began after the energy shortage became apparent may accelerate in the years ahead. North Korea's self-reliant national economy, which was supported by the consumption of huge quantities of energy, will begin to show the contradictions that until now had been pushed out of sight. Can it hold out until the shot in the arm provided by the light-water reactor arrives? Will it be able to seek new assistance? The situation seems grim when viewed from the standpoint of the energy problem.

Notes:

1. "Report of the Plenum of the Central Committee of the Workers' Party of Korea on the Implementation Status of the Third 7-year Plan (1987- 1993)," *Rodong Sinmun*, December 9, 1993 (Radio Press, *Overview of North Korea, 1995*).
2. Chang Yung-shik, *North Korea's Energy Economy* (Korea Development Institute, 1994).
3. Chang, *Ibid*.

Reference:

"On Bringing About New Revolutionary Changes as Part of Building a Socialist Economy" (Kim Il Sung, "Concluding Address to the Conference of the Cadres in Charge of Economic Sectors," July 6, 1994)

(Beginning omitted)

Above all, we must solve the electric power problem quickly. Together with rail transport, electric power is what leads the people's economy. By first establishing electric power production and supplying plenty of electricity, we can normalize production by all sectors of the people's economy. If we have electricity, we can make not only our light industrial plants but also our heavy industrial

plants operate at full capacity. If we can solve the electric power problem, we will be able to continue forward using our present economic foundation.

However, we are not producing enough electricity now. The production of our plants and businesses is not being normalized. There is not enough electricity, we cannot produce enough fertilizer, and we cannot produce enough cement. Consequently, our first order of business with regard to the economy must be to solve the electric power problem.

In order to solve the electric power problem quickly, we must build heavy oil-burning thermal power plants.

As things stand now, it will be difficult to solve the electric power problem quickly by building nuclear power plants and hydroelectric plants. If we try to start building nuclear power plants now, it will take a long time before they are completed. And it is difficult to build more hydroelectric plants instead. The hydroelectric plants currently under construction remain uncompleted for lack of materials. Even if we succeed in building more hydroelectric plants, their usefulness is limited because they cannot be operated at sufficient capacity unless there is rain. Since coal production is insufficient, building more coal-burning thermal power plants is difficult. Under these circumstances, the only way to solve the electric power problem quickly is to build heavy oil-burning thermal power plants. Thermal power plants that use heavy oil are easy to build and simple to operate. The problem is whether we can obtain a supply of the crude oil we need to run the heavy-oil-burning thermal power plants. We must

find a way to guarantee the supply of oil, such as paying cash for it. We do not need that much money to buy the necessary heavy oil for our heavy-oil-burning thermal power plants.

(Middle section omitted)

In order to solve the electric power problem, we must institute policies that will make our current thermal power plants operate at maximum capacity. The power generating capacity of the Chongchongang Thermal Power Station, the June 16 Thermal Power Station, and the Chongjin Thermal Power Station is not small. But they are producing only a little power because we have not been able to supply them with enough coal and heavy oil. The Chongchongang Thermal Power Station has received lignite that was poorly sorted from the Anju District coal mining complex, and they are burning it. Even so, their turbines are not turning at full capacity because they cannot get enough. If those responsible knew of this, they should have supplied more coal – even if they had to buy it from abroad – but they did not. If we operate all of the thermal power plants we now have at sufficient capacity, we will be able to produce a few hundred thousand kilowatts more. If we produce an additional few hundred thousand kilowatts, we will not have to be uneasy about the electric power situation as we are now.

Source: Kim Il Sung, *Works of Kim Il Sung* No. 44, Workers' Party of Korea Publishing House, 1996.