

CASE STUDY

Choosing renewable energy for industrial park in Nalaikh, Mongolia

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Key Takeaways

Due to the state's inability to rapidly increase energy sources, private investors are looking at installing a distributed renewable energy plant as an alternative solution

In order to accelerate the transition to green energy a clear support mechanism and procedure is required for private investors

Despite the cumbersome approval processes there are many private investors who are willing to invest in renewable energy sources to ensure their business continuity

It is necessary to calculate and highlight the indirect cost of electricity generated by using coal and create a fair comparison between the different types of energy sources

Context

Nalaikh is one of 9 districts of Ulaanbaatar with a population of around 38.7 thousand residents. Located in the southeast of the Mongolian capital Ulaanbaatar, Nalaikh was home to the very first coal mine in Mongolia. Coal mining started in Nalaikh in 1915, and at its peak in 1981, about 1,500 people were employed and one million tons of coal were produced annually in the mine. Nalaikh was the center of industrialization in Mongolia at the time and supplied coal for Ulaanbaatar's Thermal power plant #1. In 1932, first a 60kW and then in 1936 a 120kW capacity coal power plant was built and in use until 1939 when a 35kW transmission line was built between central power plant and Nalaikh, which enabled supplying electricity to many factories located in Nalaikh. Today, Nalaikh's electricity is supplied through the thermal power plant by

the state-owned Ulaanbaatar Electricity Distribution Network's (UEDN) which is part of the Central Region Energy System.

After a fatal methane gas explosion that killed 20 miners in 1990, the mine was closed, without any proper phase out plan or support from the government. Nalaikh had a large number of unemployed miners and due to a lack of alternatives and other skills, some of them started illegal mining with minimal safety standards. Due to an absence of coordination between mining teams and a lack of safety measures, cave-ins became more frequent. For this reason, since the formal closure in 2017, a total of 735 people have been injured and 240 people have died in mining accidents in the region.

Due to its proximity to the capital city and location next to the main road and transmission line, Nalaikh is considered a good location for industrial development. Therefore, the Nalaikh Industrial and Technological Park of Building Materials was established in 2017. While the legal entity has already been established for the industrial park, the transmission infrastructure is still missing. Until now, the industrial park is waiting for budget approval for the construction of the main transmission line connecting it with the Central Region Energy System. This lack of electricity supply is limiting the prospects of the industrial park, restricting its development.

Meanwhile, independent of the government's effort to develop the Nalaikh Industrial and Technological Park of Building Materials, one of the nation's top corporations, MAK (Mongolyn Alt) started developing its own industrial park near Nalaikh in a 90-hectar area, consisting of a building block, window and door and air duct factory. Currently MAK's industrial park is operating in two shifts, with 250 employees per shift. Due to increasing investment and rapid expansion of MAK's industrial park in Nalaikh, MAK's energy demand is rapidly increasing so that the existing electricity supply of 3,2MW, is barely enough for the existing two factories. A request to the UEDN to increase the current supply up to 5MW had been on hold as it was technically impossible due to grid constraints. The need for additional energy sources became critical for the planned further expansion of the MAK's industrial park.

Image 1. MAK's industrial park and solar power plant area



Source: Author's diagram.

Mongolia's energy system has reached its limits with an all-time high peak load of 1,469MW in December 2022. 53% of this peak capacity was generated by the Thermal Power Plant #4 which regulates the power supply. Other producers were not able to contribute with additional capacity as they had already reached their maximum capacity themselves. The missing amount of energy was imported from Russia. According to the statistical data, electricity consumption in Mongolia increases 7-8% each year. As the transmission line between Russia and Mongolia has also reached its maximum capacity, it will become a "bottleneck" since the amount of imported electricity cannot be increased further with the existing infrastructure. Therefore, without adding additional energy sources to the system, the distribution network will be forced to perform regional cut-outs in the future, to avoid a crash of the entire system. As renewable energy generation fluctuates, additional renewable energy sources should be connected to the grid with great caution to avoid its collapse.

JET Dimensions

The Mongolian energy system as a whole is reaching its maximum capacity limit. This is impacting corporate entities such as MAK, unable to expand its manufacturing facilities due to energy system limitations. Driven by the need for expansion due to market demands made the company look for other solutions which can reduce the dependency on the distribution network.

For MAK it became clear that the domestic energy system cannot support the private sector's industrialization effort, and hence the company has to find ways to cover its energy supply on its own. The current lack of capacity therefore risks limiting the economic development and diversification of the region.

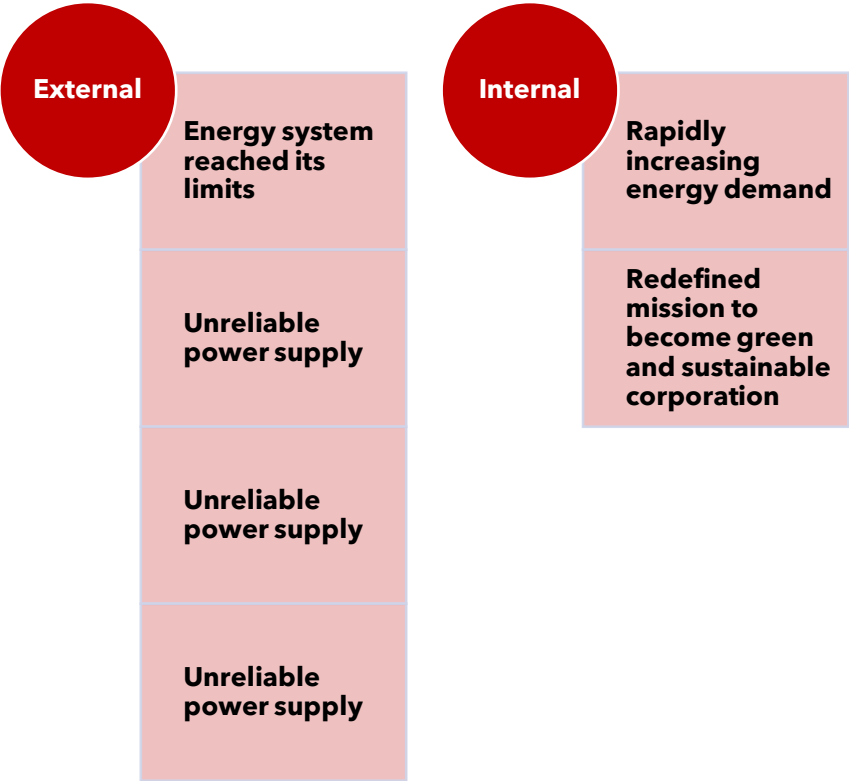
Instead of waiting for the government's slow but highly politicized effort to increase the capacity of the power system, MAK started to look for alternative sources of energy that would meet its industrial park's increasing demand. The company chose to invest in a solar power plant, which was in line with its effort to make the company a sustainable development-oriented company within the next three decades. MAK decided to supply its ongoing expansion of factories with renewable energy and planned for future plants to be supplied by renewable energy as well (7.2MW additional capacity is required by the end of 2024 according to the MAK expansion plan).

As a first try-out the company is building a solar power plant with 1.6MW capacity next to their industrial park to meet the anticipated additional energy usage until the end of 2024. The system would operate as an on-grid system and would supply the unused electricity to the central grid. The supplied electricity will then be deducted from the used electricity from the central grid (instead of receiving reimbursement for the fed in electricity). Eventually the solar power plant's capacity will be increased to 4.9MW, as special government licenses are required for any additional capacity above 5MW.

Key Drivers

The key drivers for developing renewable energy sources to meet the increasing energy demands were both external and internal for MAK, a corporation which is rapidly expanding its industrial activities.

Figure 1. Key drivers for looking for additional electricity source and choosing renewables



Source: Author’s diagram.

Due to rapid growth of the population, Mongolia’s energy system has reached its limits and the development of new energy generation is delayed. These limitations made it impossible for large energy consumers such as MAK to cover their energy needs through the distribution network only.

The government has kept the electricity prices intentionally low, using it as a sort of “social aid” for the population. This has led to electricity producers working at a loss for a long period. Many criticize the sector for taking such a role as it results in huge economic losses: the thermal power plants and distribution networks made 168 billion MNT of loss in 2022 alone. This resulted in the inability to invest in any kind of renovation or maintenance of existing plants and has already resulted in frequent power cuts for MAK or other companies.

In 2020, the Ministry of Energy approved a procedure which enables the supply of electricity to the central grid by distributed renewable energy sources. According to this procedure, corporate entities can install on-grid systems with a capacity of up to 50% of their technical permission. This regulation makes it possible to supply the surplus electricity to the grid and deduct it from the company’s usage, which results in a reduction of cost for the companies.

In October 2022, the Energy Regulatory Commission¹ introduced a new, increased tariff which meant an increase of 14% to 38% in price for corporate entities based on their usage and sector of activity. In the future, prices are expected to rise further and having an independent electricity supply will be beneficial for MAK over the long-term, due to its reliability.

Both these external drivers of a risk of missing capacity as well as the company's goal to become a sustainable corporation pushed MAK to choose renewable energy as a solution for their challenges.

Main challenges and lessons learned

MAK's effort to build grid connected solar power plants to supply their industrial park still faces several challenges:

- **Price advantage of coal** – The price for electricity coming from coal is artificially kept low. This led to the price of the electricity generated using renewable energy seemingly high compared to the electricity generated using coal. Renewable energy therefore becomes a seemingly bad investment and unfavorable at policy level.
- **Lack of support and capacity from local government** – During the permit application and the land preparation works MAK did not receive any support from the local authorities and even faced some difficulties as their land permit application process coincided with the land permit registry system update when they applied for the additional land for the solar power plant.
- **Regulation** – Due to rapid increase in their electricity demand MAK was looking into building a solar power plant with larger capacity. However, renewable energy power plants larger than 5MW require a special permission and lengthy procedure, including several approval procedures from different authorities. Due to the urgency and lack of resources to follow the procedure, they had to limit their plant capacity at 5MW.
- **Unclear energy storage policy** – Furthermore, due to fluctuation in the system state regulation authorities demand that the new renewable energy sources to be connected to the grid must have storage capacity in battery energy storage system (BESS) form. However, it is still unclear how authorities want the BESS to operate.

Based on the challenges faced by MAK it is clear that in order to support the transition to greener energy source:

- It is necessary to **remove barriers for economic development** by creating clear regulation and procedures that ease the development of large capacity in-house use of renewable energy sources.

¹ The Energy Regulatory Commission is a government agency which regulate generation, transmission, distribution, dispatching and supply of energy. Commission' objective is to issue the operational licenses, to review and approve the tariffs of the licensees, to protect equally the rights of the consumers and licensees as well as to create condition for fair competition among the generators and suppliers in accordance with the Law on Energy. - (erc.gov.mn)

- Governmental support for efforts from the private sector in pushing regional economic development is necessary. Although the state is supportive the development of the industrial park in the Nalaikh area and established the Nalaikh Industrial and Technological Park of Building Materials, due to the lack of energy the park is not operating at the moment. To achieve successful operation of the park the government needs to financially support efforts from the private sector to **enhance grid capacity** and provide them with similar advantages for investing in such industrial parks.

Furthermore, there is a need for **better cooperation** between the local government and private sector entities. With better understanding for the needs of the private sector, the local government can support and accelerate the development of such private sector initiatives and incentivise using renewable energy for their factories..

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Image 1. MAK's industrial park and solar power plant area. Image was created by combining the google map picture of the area and land ownership information available on egazar.gov.mn

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