

Good afternoon, everyone. Thank you for the opportunity to present today. The title of my presentation is "Liberalization of the Energy Market in Japan: Regional Characteristics of Renewable Energy and the Impact of Urban Gas Deregulation."

The energy sector in Japan has undergone significant changes in recent years, particularly with the liberalization of both the electricity and gas markets. These reforms aim to encourage competition, reduce costs for consumers, and enhance the sustainability of energy production. However, regional differences in renewable energy resources and the specific characteristics of urban gas markets have led to unique challenges and opportunities across the country. Today, I will focus on two key aspects: the regional characteristics of renewable energy development and the impact of deregulating urban gas markets.

In Japan, the energy market had long been characterized by regional monopolies, a structure justified by the economies of scale in energy production and distribution. However, global trends toward the unbundling and liberalization of energy markets, combined with domestic issues such as the high cost of energy under the cost-plus pricing system, led to a gradual push for market reform. The primary goal of these reforms was to introduce competition, reduce costs, and create a more efficient energy system.

As a result, Japan achieved full liberalization of its electricity market in 2016 and its urban gas market in 2017. These changes allowed for full retail competition in both sectors. Despite this, the unbundling process ensured that the infrastructure—such as power transmission lines and gas pipelines—remained under the management of traditional utility companies, while the retail side was opened to new market entrants.

Japan's electricity market is interconnected by a national grid, allowing for the transmission of power across the entire country. Since the electricity grid is connected nationwide, retail electricity companies can operate across the whole country, treating Japan as a single market.

On the other hand, the urban gas market is more regionally fragmented, largely due to Japan's mountainous terrain. Gas pipeline networks are divided into regional areas. This regional division of infrastructure makes it less cost-effective to supply gas to sparsely populated areas.

In areas with lower population density, such as suburban regions, propane is often used instead of urban gas. This creates competition between urban gas and propane. Propane is delivered directly to customers via gas delivery trucks that refill gas tanks at each household, whereas urban gas is typically piped in. Generally, urban gas is more cost-efficient than propane, with the price of propane being 1.8 to 2 times higher than that of urban gas.

In the wake of energy market liberalization in Japan, numerous new power companies, often referred to as “regional new power companies” were established across the country. Many of these companies were founded with the involvement of local governments, aiming to provide locally sourced energy, support regional economies, and increase energy self-sufficiency.

However, these regional power companies have faced significant challenges, particularly since 2022. The depreciation of the yen and growing concerns about the stability of the power supply have led to sharp fluctuations in electricity procurement costs, which have risen significantly. Compared to the period shortly after liberalization (2016–2020), procurement costs have increased by approximately 2.5 times in the 2020s. As a result, many regional new power companies have either suspended operations or gone out of business.

Despite these difficulties, there have been success stories among regional new power companies. Those that have effectively integrated locally sourced renewable energy, such as wind and geothermal power, into their supply portfolios have found greater stability. Additionally, companies that have secured large supply areas through wide-area partnerships or those that have signed contracts with large-scale consumers, such as agricultural cooperatives (JA) have also managed to thrive. Some regional new power companies that serve public facilities with high electricity consumption have also demonstrated successful operations, due in part to stable demand from these facilities.

Aomori Prefecture, located at the northernmost tip of Honshu, is one of the coldest regions in Japan. Due to its harsh winters, the region experiences high electricity demand during the colder months, particularly for heating purposes. In contrast, the majority of Japan sees its peak electricity demand during the summer, driven by air conditioning use. This seasonal variation in energy consumption patterns leads to

fluctuations in electricity procurement prices, with prices tending to rise in the summer and fall in the winter.

For regions like Aomori, this dynamic can create a unique opportunity. During the winter months, when local electricity demand is high but national demand is relatively low, procurement prices tend to be lower. This allows local power companies in Aomori to purchase electricity at a lower cost during the peak consumption period, leading to higher profit margins. By capitalizing on the region's specific climate and seasonal demand fluctuations, Aomori can benefit from both lower procurement costs and increased efficiency in meeting its energy needs.

Let's now consider the four main stakeholders in regional power companies: local residents, businesses, governments, and external power companies. Local residents provide base demand and often access renewable resources but may lack knowledge on how to best utilize them. Local businesses play a key role as both consumers and producers of energy, but financing and technology access remain challenges. Collaboration between businesses and local governments is crucial to overcome these hurdles. Local governments act as mediators and policy creators, helping promote renewable energy adoption. External power companies bring expertise and financial resources, but long-term partnerships, beyond short-term contributions, are needed for sustainable growth.

Please take a moment to review the chart for a more detailed breakdown of these relationships.

Now, let's turn to the challenges related to the liberalization of Japan's urban gas market. The gas market in Japan is divided into two segments: urban gas and propane gas. Urban gas is supplied through pipelines connected to gas holders, primarily serving densely populated areas with high demand. On the other hand, propane gas is delivered by distributors to individual gas storage facilities for each consumer, which is more common in less densely populated areas, such as rural regions or suburban areas.

One of the key issues is that Japan's urban gas pipelines are regionally fragmented. Expanding the pipeline network would give urban gas a competitive advantage over propane gas in terms of market reach. The challenge arises with market liberalization. As the urban gas market grows, competitors may attempt to enter the market by "free-riding" on existing pipeline infrastructure, without contributing to the cost of

building these pipelines. This creates a risk similar to the "free-rider problem" seen in the underprovision of public goods.

Furthermore, Japan is facing a rapid population decline, particularly in rural areas. As the population density decreases, there is a growing concern that maintaining pipelines at an efficient scale will become more difficult, which could hinder the sustainable expansion of the urban gas market in these regions.

In conclusion, the liberalization of Japan's energy markets, particularly in the context of regional power companies and the urban gas market, presents both opportunities and challenges. It is essential to navigate these carefully by leveraging local resources, fostering collaboration among stakeholders, and addressing the complexities of market competition and infrastructure.

Thank you very much for your attention. I would also like to acknowledge that this research has been supported by a grant from the Japan Society for the Promotion of Science (JSPS).