Creating Resilience

Generative AI and Data Center Decentralization

3 Promising Areas for Decentralization

REPORT

CBRE RESEARCH
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Contents

This report is the third in a three-part series analyzing the link between the proliferation of generative AI and the geographical diversification of data center locations throughout Japan (this issue is in bold in the table of contents).

Summary

- Key criteria for the assessment of an area's suitability as a location for the decentralization of data centers include the following: (1) renewable energy generation potential, (2) electricity costs, (3) industrial density, (4) status of key infrastructure, and (5) risk of major earthquakes. Based on these factors, the areas most amenable to the construction of data centers are Hokkaido, Tohoku, Chubu, and Kyushu.

- Innovative Optical and Wireless Network (IOWN) technology being developed by NTT has the potential to further accelerate data center decentralization. As a technology that will support next-gen communication infrastructure, it should allow for ultra-high communication capacity with ultra-low latency, along with ultra-low power consumption. The implementation of this technology will allow geographically distant data centers to coordinate virtually with one another. The advantages that major metropolitan areas have over regional areas as data center locations should gradually erode due to such technological innovations.

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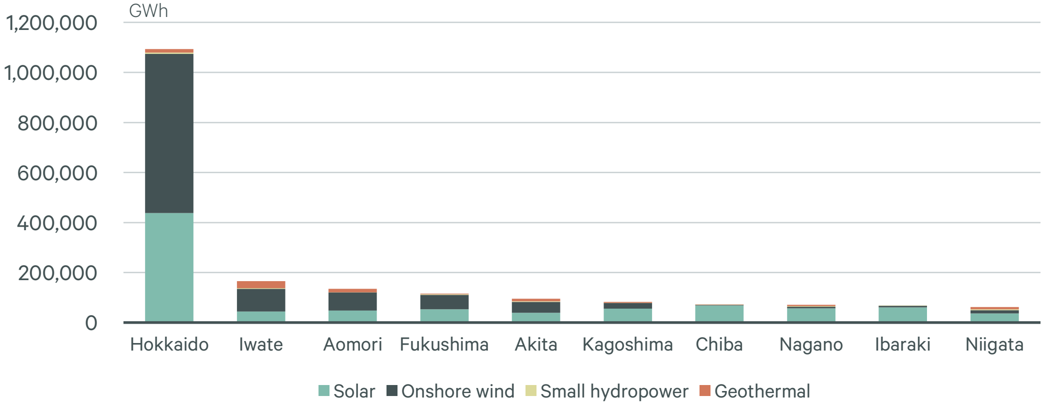
A combination of factors including power supply issues in major cities and a desire to make effective use of renewable energy sources have created an environment conducive to the increased development of latency-tolerant AI data centers in regional areas of Japan. When considering potential sites for AI data centers, the following five criteria will be of the greatest importance: (1) renewable energy generation potential, (2) electricity costs, (3) industrial density (factories, etc.), (4) infrastructure status, and (5) risk of major earthquakes. Based on these factors, the regional areas most amenable to the construction of data centers are Hokkaido, Tohoku, Chubu, and Kyushu. The reasons for this contention are provided in detail below.

(1) Renewable energy generation potential

When assessing the latent renewable energy generation potential of a location, the key criteria that must be factored into any calculation are maximum installation area and resource amounts such as wind speed and river flow rates. The Ministry of the Environment releases data estimating the potential for introducing renewable energy, excluding energy sources that are impractical to use with current technology or restricted by legal or land-use constraints.*7 Among the top 10 areas for total renewable energy introduction potential, including the sum of all potential renewable energy sources such as solar power, onshore wind power, small-scale hydropower (not requiring the construction of dams), and geothermal power, Hokkaido is the clear leader, with solar and wind power making up the majority of its potential. Other areas with significant potential include multiple prefectures in the Tohoku region, as well as Kagoshima Prefecture in Kyushu (Figure 5-1). Common to all of these regions are large, flat areas of land, with reasonable expectations for certain amounts of sunshine and wind throughout the year. For offshore wind power, Hokkaido and Tohoku again lead the way, while Kyushu also has significant potential (Figure 5-2). All of these regions feature marine environments with strong and stable winds.

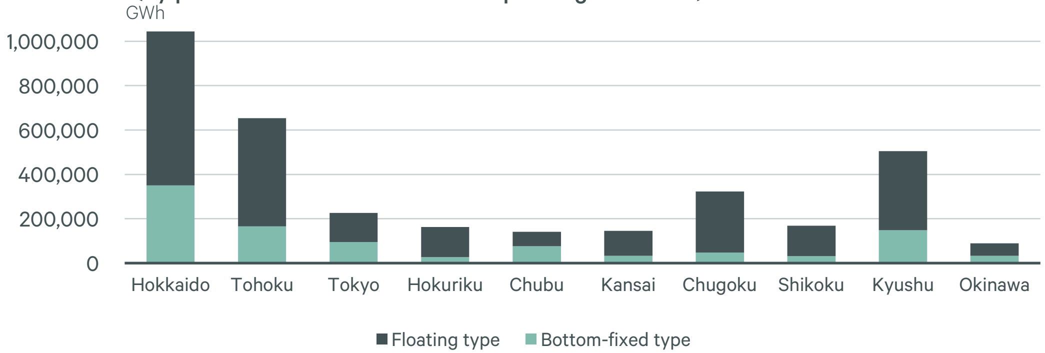
*7 "REPOS", Ministry of the Environment

Figure 5.1: Renewable Energy Introduction Potential by Prefecture (top 10 by potential annual solar, onshore wind, small hydropower, and geothermal power generation)



Source: Created by CBRE based on "REPOS", Ministry of the Environment, June 2025.

Figure 5-2: Offshore Wind Power Introduction Potential by Region (by potential annual offshore wind power generation*)



*Offshore wind power generation can be divided into two categories: bottom-fixed and floating.
Bottom-fixed type: Foundational structures are embedded directly in the seabed, with wind turbines built on top of this foundation. Typically used in shallow depths of 50 to 60 meters.
Floating type: Wind turbines are mounted on a structure that floats on the surface of the sea and is attached to an anchor affixed to the seabed.
Source: Created by CBRE based on "REPOS", Ministry of the Environment, June 2025.

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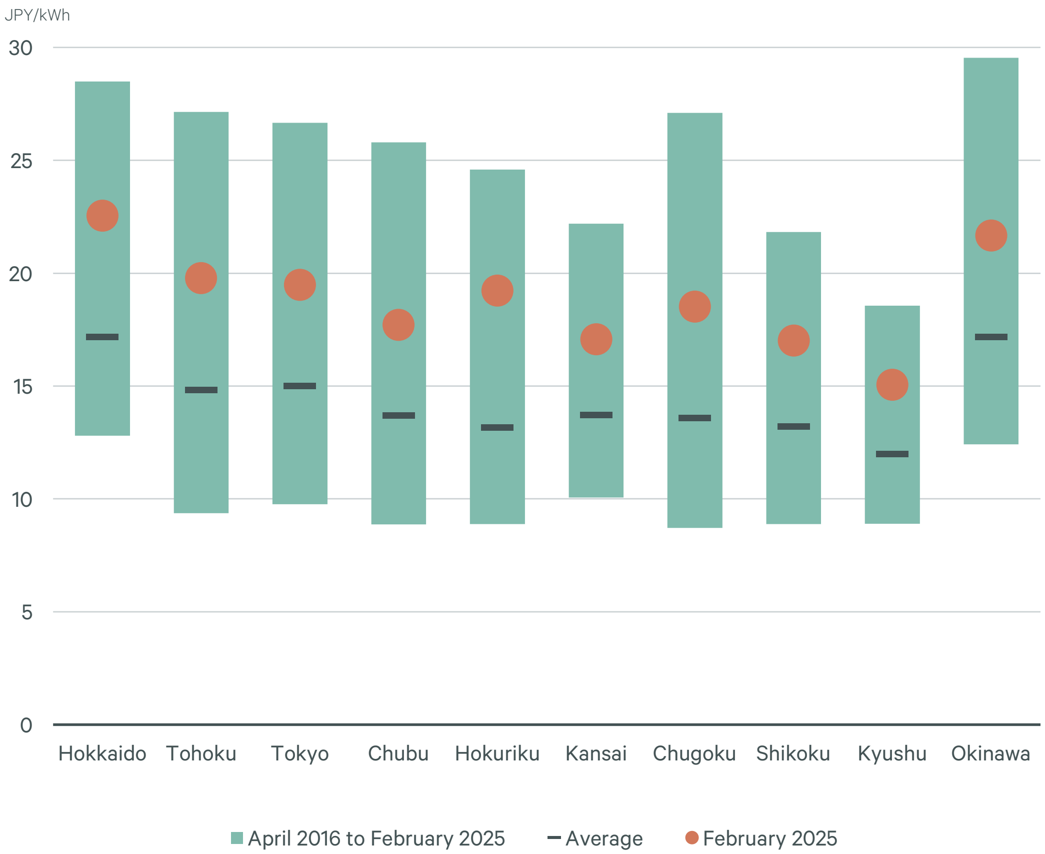
(2) Electricity costs

As AI data centers require substantial amounts of electrical power, electricity costs have a significant impact on their productivity. A comparison by region of per-unit costs for super-high-voltage electricity, the primarily source of power for data centers, shows that as of February 2025, the Kyushu area was the cheapest in the country (Figure 5-3). In addition to being less reliant than other areas on thermal power generation, which is particularly prone to absorbing the effects of fuel cost increases, Kyushu offers an abundant range of decarbonized energy sources, such as nuclear power and renewable energy. Hokkaido, meanwhile, was the most expensive, with per-unit costs some 1.5x those of Kyushu. Factors contributing to the exorbitant cost of electricity in Hokkaido include the significant power consumption required by its cold winters, the transmission costs incurred due to its extensive land area, and the fact that its nuclear power plants are currently not in operation.

However, cold regions such as Hokkaido and Tohoku do enjoy an advantage in terms of data center operation, in that they can utilize cooling configurations that use the outside air, thus reducing the amount of power required. As cooling systems account for between 30 and 40 percent of the total electricity consumption of most data centers, and even those using liquid cooling often employ some air cooling, this is a significant advantage in terms of power consumption reduction. In fact, several data centers in Hokkaido boast power usage effectiveness (PUE) scores well below the average of 1.5, largely due to their use of external air in their cooling systems. New data centers opening from 2029 onwards will also be required to adhere to stricter power efficiency rules, with those failing to achieve a PUE of 1.3 or lower likely to be subject to monetary fines.*8 This should make locations with cooler climates even more attractive for data center development.

Figure 5-3: Average Unit Prices for Super-High Voltage Electricity by Region



Source: Created by CBRE based on the Energy Information Center's official website "Shin Denryoku Net", June 2025.

*8 "Energy Saving Requirements for Data Centers; METI to Implement Penalties for Non-Compliant Facilities after FY 2029", Nihon Keizei Shimbun, June 1, 2025.

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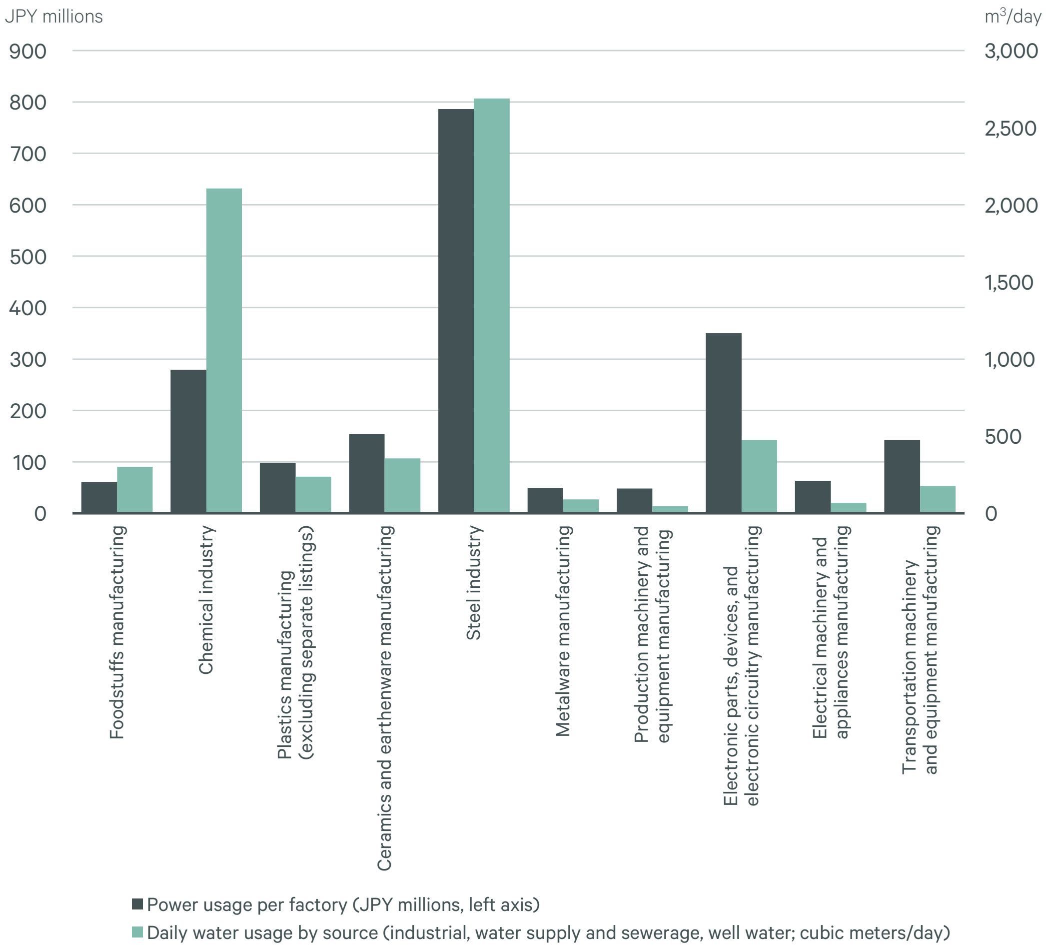
(3) Concentration of factories and other production bases

Areas with a high concentration of factories and other production bases are also considered to have an advantage as future AI data center locations. There are two major reasons for this. The first is that existing factories can be relatively easily converted into AI data centers, as many are already equipped with the necessary facilities for supplying large quantities of electricity and water. Particularly suited to conversion to AI data centers are steel, chemical, and electrical parts and devices plants, whose usage of power and water is already significant (Figure 5-4). According to the results of the Economic Census for Economic Activity by the Ministry of Economy, Trade and Industry (METI), the areas other than Greater Tokyo or Osaka where tangible fixed asset values were lost the most through the retirement or sale of establishments (factories) were the Chubu region, where many steel and chemical plants are concentrated, along with Hyogo and Fukuoka. In terms of factories manufacturing electrical parts or devices, many closures were observed in Mie, Yamagata, and Hokkaido (Figure 5-5). In recent times, several closed factories or former factory sites have been converted to data centers, with some scheduled to open as AI data centers (Figure 5-6). While the risk of soil contamination must be considered, in certain regions of the country, an increasing number of old or underperforming factories may be repurposed as data centers.

Figure 5-4: Electricity and Water Usage Per Factory*
(establishments with manufacturing facilities) by industrial sector



*Factories with at least 30 employees.
Source: Created by CBRE based on “2023 Economic Structure Survey: Manufacturing Industry Survey”, Ministry of Economy, Trade and Industry, June 2025.

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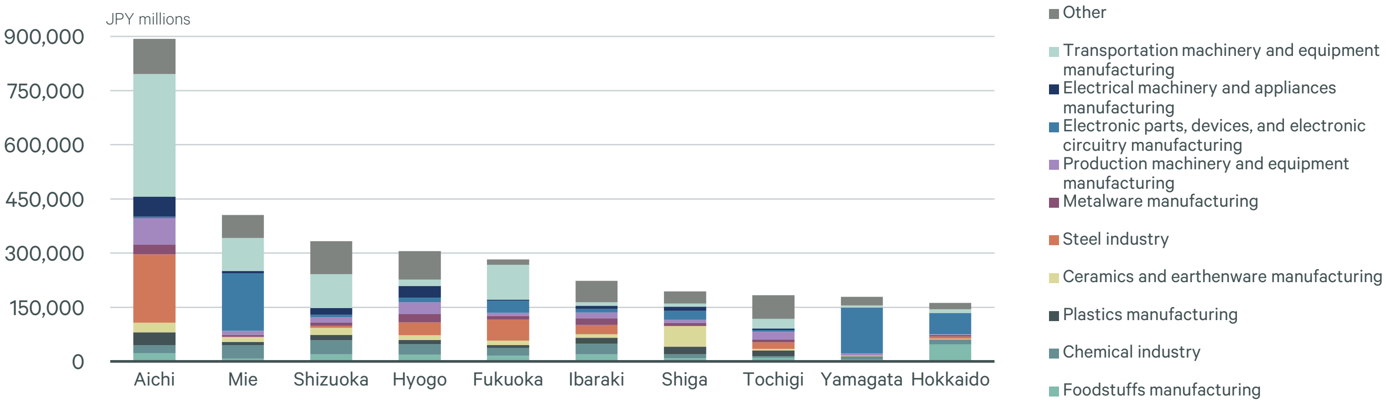
The second reason why areas with high industrial concentration have an advantage as future AI data center locations is that demand for AI-powered edge data centers is expected to increase. With the spread of 5G wireless technology and the development of smart factories, the use of so-called edge computing, where the vast amounts of data collected by sensors and devices within factories can be processed on-site, is becoming increasingly critical. Data collected within a factory need to be processed in real time and secured to avoid leakage. For this reason, edge data centers have merits in terms of latency and cost over large-scale cloud-based processing. In addition to the potential to utilize power and electricity infrastructure left behind by former factory sites, areas with high industrial density also have the significant advantage of being able to attract user demand for edge data centers.

Figure 5-5: Decrease in Tangible Fixed Asset Values due to Retirement or Sales of Manufacturing Assets in Regional Areas (top 10 prefectures outside of Greater Tokyo and Osaka; total value including land value from 2018 to 2022 inclusive*)



Source: Created by CBRE based on Economic Census Activity Surveys, Industrial Statistics Surveys, and Economic Structure Surveys, Ministry of Economy, Trade and Industry, June 2025.

Figure 5-6: Major Instances of Repurposing of Factories or Factory Sites as Data Centers

Announcement date	Operator	Land/building	Site area (m²)	Total floor area (m²)	Planned opening
Apr. 2025	KDDI	Sharp Sakai Plant land and buildings (part)	App. 33,000㎡	App. 57,000㎡	2025
Mar. 2025	SoftBank	Sharp Sakai Plant land and buildings (part)	App. 450,000㎡	App. 840,000㎡	2026
Mar. 2025	JFE Holdings, Mitsubishi Corporation	Keihin Ohgishima District (site of JFE Steel's East Japan Works)	—	—	2030
Feb. 2025	Japan Display	Mobara Plant	—	—	—
Sep. 2023	Mitsui Fudosan	Hino Motors Hino City Plant (part)	114,118㎡	162,360	2031

Source: Created by CBRE based on publicly available materials, June 2025.

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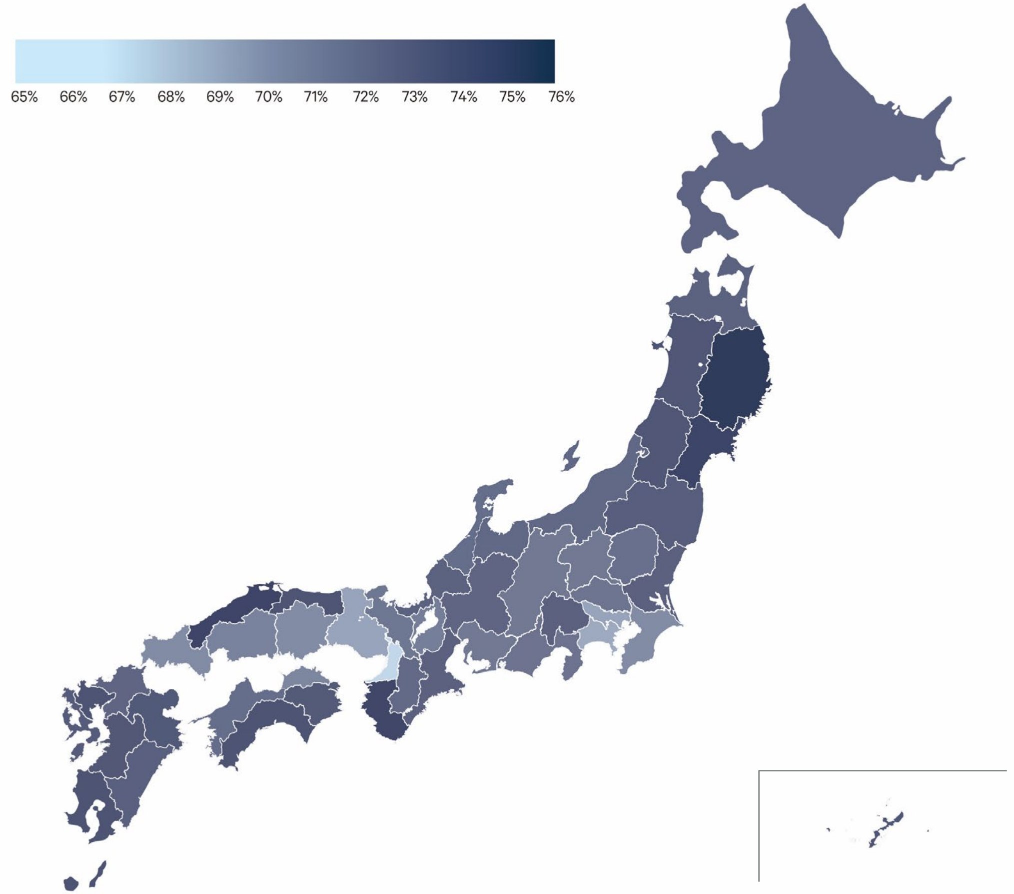
(4) Status of infrastructure

Regardless of whether they are optimized for generative AI, data centers require optical fiber networks for telecommunications, in addition to reliable electricity and water supply. Optical fiber cables are usually connected to buildings either through above-ground conduits along roads or using utility poles, or through sewerage tunnels and other underground conduits. Susceptibility to natural disasters such as floods, high tides, and landslides must therefore be considered when assessing data center locations. For this reason, the status of social infrastructure, including water and sewerage systems, embankments, revetments, and dams, is a key consideration. The presence of all necessary infrastructure at a standard that has not significantly degraded will make a significant contribution to reducing the risks associated with the establishment and operation of data centers.

Figure 5-7 illustrates net capital stock as a percentage of gross capital stock by prefecture, for the major categories of social capital considered particularly important for data center operations, including roads, water and sewerage systems, flood control, and industrial wastewater systems. Net capital stock is the total value of the area's fixed assets still in use after accounting for depreciation, or their residual economic value. The darker areas on the map represent those with a higher percentage of net capital stock value, indicating that depreciation, or deterioration of infrastructure stock, is relatively insignificant. Certain areas of the Tohoku, Chugoku, and Shikoku regions, as well as Wakayama Prefecture and the Kyushu region, feature a high percentage of net capital stock value, while Tokyo, Osaka, and other major cities have a lower percentage.*9

Figure 5-7: Residual Value of Capital Stock (Net Capital Stock Value) as a Percentage of Gross Capital Stock by Prefecture



Source: Created by CBRE based on "Measuring Infrastructure in Japan 2023", Cabinet Office

*9 One of the primary factors behind the high percentage figures recorded for the Pacific Ocean side of the Tohoku region is that infrastructure stock was widely renewed following the Great East Japan Earthquake of 2011.

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(5) Earthquake risk

When considering the risk of natural disasters, the probability of an earthquake striking the area is of the utmost importance. This is particularly crucial in the case of regional AI data centers, which are also expected to play a role as backup bases in the event of a large-scale earthquake. A comparison of the probabilities of earthquakes of an intensity of a lower-6 or higher on the Japanese seismic scale striking within the next 30 years shows that the top 10 cities least likely to be struck are Sapporo, several cities in the Tohoku region, and cities on the Sea of Japan coast (Figure 5-8).

Figure 5-8: Probability of an Earthquake of Lower-6 or Higher on the Japanese Seismic Intensity Scale Within the Next 30 Years

City	Probability
Sapporo	2.2%
Nagasaki	3.0%
Yamagata	4.2%
Matsue	4.9%
Aomori	5.0%
Toyama	5.2%
Nagano	6.1%
Fukuoka	6.2%
Morioka	6.3%
Yamaguchi	6.3%

*Data is for the location of the city hall in each prefectural capital, Tokyo Metropolitan Government Building in Tokyo, and Subprefectural Bureaus in Hokkaido. The list represents the 10 cities with the lowest probabilities.
Source: Created by CBRE based on “Nationwide Earthquake Predictions 2020: Creation Criteria and Calculation Results”, Headquarters for Earthquake Research Promotion, Earthquake Research Committee.

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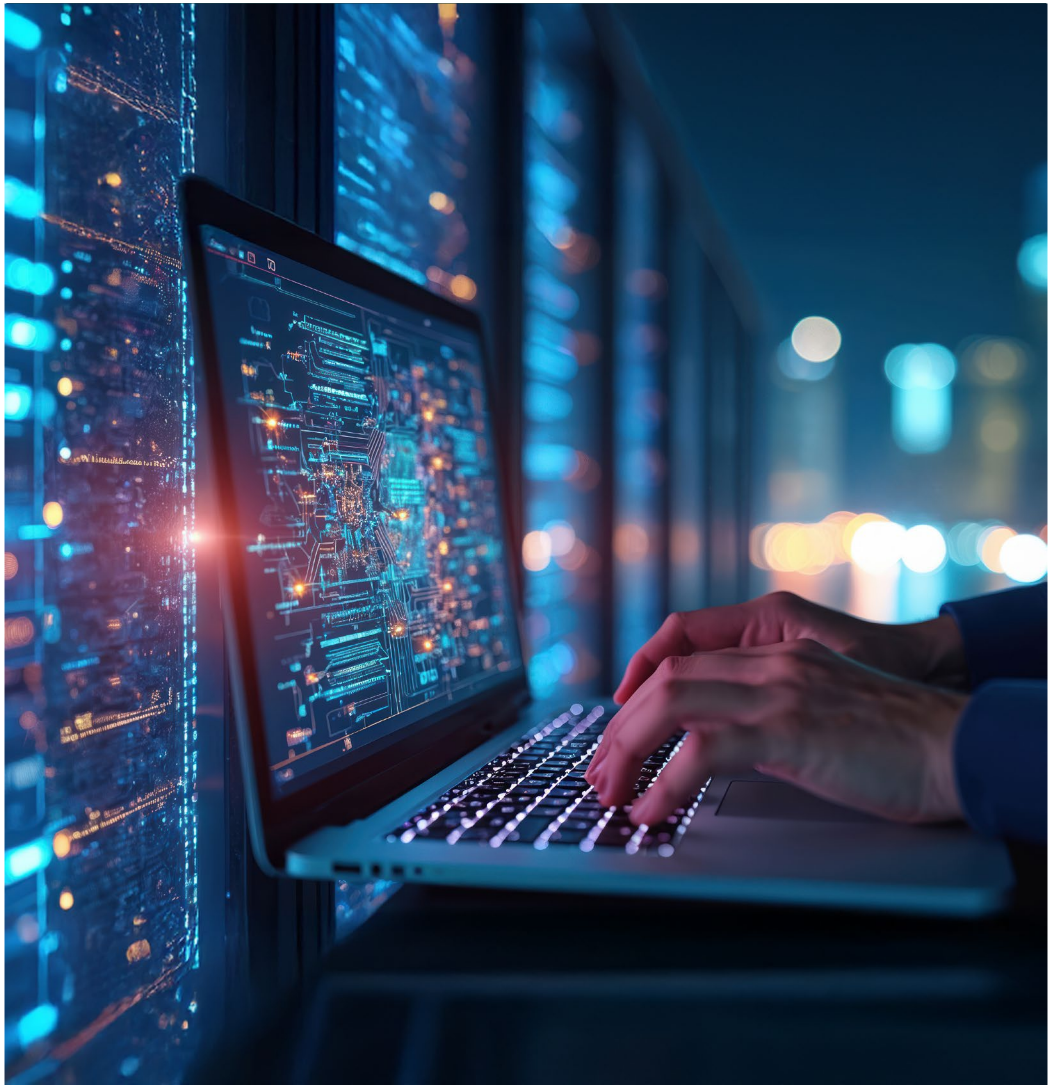
Technological innovation and further acceleration of data center decentralization

6. Technological Innovation and Further Acceleration of Data Center Decentralization

Future technological innovations may further accelerate the decentralization of data centers. At present, the technology attracting the most attention is NTT's Innovative Optical and Wireless Network (IOWN)*[10]. IOWN seeks to replace the digital technology used in current communication networks with photonic technology for ultra-high capacity (communication capacity could reach 125 times current levels), ultra-low latency (one two-hundredth of current levels), and ultra-low power consumption (100 times the power efficiency of current technology). The implementation of IOWN technology, targeted for 2030, is expected to enable the virtual integration of data centers, even when they are geographically dispersed, and optimize workload placement based on the amount of renewable energy generated and the power usage of each data center.*[11] In addition to improving the efficiency of renewable energy use, prone as it is to major fluctuations in output, this technology should also serve to broaden the range of options for data center locations, eroding the advantage of metropolitan areas over regional areas. More fundamental criteria, such as availability of renewable energy, social capital infrastructure, and earthquake resilience, should assume increasing importance in identifying locations suitable for new data center development.



*10 NTT R&D Website

*11 NTT "Successful Demonstration of Optimized Workload Allocation Between Remote Data Centers Using IOWN APN - Contributing to carbon neutrality through the proactive use of renewable energy"

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