

A New Opportunity for Taiwan's AI Island: Grid Planning in the Era of Large Loads

Lai, Ching-Hsien | Assistant Research Fellow, The Third Research Division, CIER

AI Growth Is Driving New Large-Load Electricity Demand

The rapid expansion of AI applications is driving investment in wafer fabrication, advanced packaging, servers, and AI data centers, while also increasing electricity demand. The International Energy Agency estimates that global data center electricity consumption will rise from about 415 TWh in 2024 to around 945 TWh by 2030, with AI-related applications among the main drivers of this growth. In Taiwan, AI-related electricity demand is being driven not only by data centers, but also by semiconductor manufacturing, advanced packaging, and the server supply chain. As large-load demand grows, power availability and grid conditions are becoming increasingly important considerations in industrial investment and location decisions.

Large loads are not unique to the AI era, but the development and operating patterns of this new generation of large loads differ from those of traditional energy-intensive industries. AI data centers typically involve high levels of electricity demand, geographic concentration, and relatively short development timelines. Actual electricity use, however, may increase in stages as facilities are completed, servers are installed, and computing demand grows, creating a potential gap between requested capacity and actual demand during the early stages of operation. During AI model training, large numbers of GPUs may also change their power consumption rapidly in response to computing workloads and data transfers, resulting in more pronounced short-term load fluctuations. These characteristics mean that power system planning needs to consider not only peak demand, but also regional supply capability and system operating conditions.

New Challenges for Taiwan's Grid Planning

The growth of large loads means that power system planning can no longer focus solely on the overall national supply-demand balance. When semiconductor clusters or multiple data centers are concentrated in a particular area, local constraints in substation capacity, transmission lines, or regional grid conditions may arise even when the power system has sufficient supply capability. In addition, large data centers can be completed within relatively short timeframes, while transmission lines, substations, and other



supporting power infrastructure generally require longer development and construction periods. This timing mismatch may create a gap between industrial investment and the availability of electricity infrastructure.

In response to these changes, approaches to large-load management are gradually expanding beyond individual customer supply reviews to include demand verification, regional assessment, phased power supply, and clearer cost responsibilities. For projects whose full electricity demand has not yet materialized, capacity may be provided in stages according to project maturity and available grid capability. When multiple large loads are concentrated in the same area, their cumulative impact also needs to be assessed. Where dedicated lines, substations, or regional grid reinforcements are built in advance to serve specific large loads, issues such as capacity reservation, project delays, and the allocation of infrastructure costs are also becoming increasingly important in the design of related arrangements.

Taiwan has also begun to adjust its regulatory framework. Since November 2025, new or expanded hyperscale data centers and colocation data centers with planned power demand of 5 MW or more have been brought under the energy-use plan review process. Proposed revisions announced in 2026 would further incorporate considerations such as power-supply feasibility, investment, output value, employment, and industrial supply-chain effects. This indicates that the review of large data centers is gradually expanding beyond energy efficiency to include location, power-supply capability, and broader industrial benefits.

Taken together, the growth of AI-related large loads reflects the continued development of Taiwan's semiconductor, server, and AI hardware supply chains, while also strengthening the link between industrial development and grid planning. In addition to maintaining overall resource adequacy, future planning will need to pay closer attention to the location of large loads, the timing of actual electricity demand, and regional grid conditions, while improving coordination between industrial investment and electricity infrastructure development. These issues will be increasingly important for the development of Taiwan's AI industry and future grid planning.