Industrial Energy Consumers of America (IECA)

The Voice of the Industrial Energy Consumers

Manufacturing Behind the Meter Generation Loads Should Not be Treated Like Data Center Loads

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Executive Summary

AI-focused data center large loads and manufacturing large load facilities such as chemical plants, steel mills, pulp and paper mills, and automobile assembly plants are increasingly discussed together as “large loads” on the electric grid as if they are the same. They are not. Doing so threatens existing behind the meter generation facilties, prevent new capacity addtions, thereby threatening manufacturing competititveness, investment and job creation. The manufacating sector employs 12 million people and contributes to $3 trillion in GDP.

At a time when more, not less generation is needed, federal and state policy makers should advance policy to support increased manufacturing self generation, not policy changes that directly or indirectly damages the economics of these facilities. It is for this reason that manufacturers oppose FERC Order (EL25-49), a rule whose purpose is to address data center large loads but changes long standing treatment of behind the meter manufacturing generation in PJM. The self generation of power and steam to operate manufactruing facilities at lower costs is a foundational competitiveness issue.

While both type of loads can consume substantial electricity, they differ fundamentally in how much power they draw at a single location, how continuously they operate, and how electricity fits into their overall energy profile. AI data centers are electricity-dominant facilities characterized by high load factors and rapidly scalable demand, whereas industrial manufacturing sites typically combine electricity with large amounts of thermal energy and exhibit more process-driven variability. Additionally, there are important differences between AI data centers and traditional industrial facilities in how they interact with fundamental aspects of electric grid stability. These differences have important implications for grid planning, interconnection timelines, and local energy policy.

Therefore, any legislation, regulation or other directive should recognize this difference and ensure policy provisions intended to address the unique characteristics of AI-focused data centers do not apply to existing and/or future large industrial manufacturing facilities. Utilizing peak demand as the only metric to define a large load does not meet this objective. We recommend that policy makers use NAICS codes to distinguish data center loads from manufacturing industries when implementing a change in policy.

Defining an AI data Center Versus an Manufacturing Facility

There is no formal standards-based definition for an “AI data center”. In practice, the term refers to facilities optimized for accelerated computing workloads such as AI training and inference, relying heavily on GPUs or other specialized processors. These facilities are designed around high-density IT loads, advanced cooling systems, redundant power infrastructure and, in some cases, on-site generation, such as combined heat and power facilities. Industrial manufacturing facilities, by contrast, are defined by their production processes—chemical reactions, metal melting and forming, pulping and drying, or vehicle assembly—and electricity is only one of several energy inputs, alongside fuels such as natural gas, coal, coke, or biomass.

Electricity as the Dominant Energy Input

A defining distinction between the two facility types is the role electricity plays in total energy consumption. For AI data centers, electricity is effectively the sole operating energy input. Nearly all site energy use is captured in electrical demand measured in kilowatts (kW) and energy use measured in kilowatt-hours (kWh). As a result, increases in computing capacity translate almost directly into increases in both peak demand and annual electricity consumption.

Industrial facilities often rely heavily on non-electric energy sources. The U.S. Energy Information Administration’s 2022 Manufacturing Energy Consumption Survey (MECS) shows that sectors such as chemicals, steel, and pulp and paper consume very large quantities of natural gas, coal, or byproduct fuels for process heat, with electricity representing only a portion of total site energy use. Consequently, electricity demand alone does not fully represent the scale or operational importance of an industrial facility.

Single-Site Electricity Usage in Industrial Manufacturing

MECS 2022 data illustrates how electricity use varies widely by industrial sector and by establishment. Here are some examples: The chemical manufacturing sector consumed approximately 150 billion kWh of electricity across more than 10,000 establishments, yielding an average of roughly 15 GWh per site per year, equivalent to an average continuous demand of about 1.7 MW if usage were evenly distributed across the year. Primary metals manufacturing consumed about 99 billion kWh across fewer than 2,700 establishments, implying a much higher average of approximately 37 GWh per site per year, or roughly 4 MW on a continuous basis. Iron and steel mills stand out as particularly electricity-intensive on a per-site basis. MECS reports roughly 54.5 billion kWh of electricity consumption across only 162 iron and steel establishments, implying an average of more than 300 GWh per site annually. This corresponds to an average continuous electrical demand on the order of 35–40 MW. Automobile manufacturing plants, while large and visible electricity consumers, tend to fall below steel and pulp mills on a per-site basis. MECS data indicate roughly 38 GWh per establishment annually for motor vehicle manufacturing, equivalent to an average continuous demand of about 4–5 MW, reflecting the intermittency of assembly-line operations and shift-based production. That said, these are average numbers. There are significant industrial facilities, especially in the steel, aluminum, and paper sectors, that are much larger. These larger facilities have developed over the course of many decades and represent sizeable employers and drivers of local, regional, if not national economic growth. In some cases, industrial manufacturing facilities have invested in on-site generation that is closely integrated into their manufacturing processes.

Single-Site Electricity Usage in AI Data Centers

By contrast, AI data centers are designed to support extremely high and relatively constant electrical loads. Recent analysis by Lawrence Berkeley National Laboratory for the U.S. Department of Energy estimates that total U.S. data center electricity consumption reached approximately 176 TWh in 2023 and could rise to between 325 and 580 TWh by 2028, driven largely by AI workloads. While these figures are national totals, they reflect a trend toward much larger single-site and campus-scale facilities.

Industry surveys by the Uptime Institute show that average rack densities remain under 10 kW for many operators, but a growing share of deployments report rack densities exceeding 30–50 kW, with some extreme AI installations exceeding 100 kW per rack. When multiplied across thousands of racks in a single facility or campus, this results in site-level electrical average continuous demands that can reach hundreds of megawatts. Unlike many industrial plants, AI data centers are often operated at high utilization rates for extended periods, resulting in very high load factors and sustained kWh consumption close to peak capacity. The electrical load at an AI data center can also be added very quickly as new racks are installed. In contrast, significant new electric loads at manufacturing facilities are generally planned for years in advance.

Implications for Demand (kW) and Energy (kWh)

The key difference between AI data centers and industrial manufacturing facilities lies not only in the magnitude of electricity demand, but in its temporal profile. AI data centers tend to exhibit high and steady demand, with limited daily or seasonal variation, because computing workloads are designed to run continuously when capacity is available. Industrial plants, even very large ones, are more likely to experience cyclical demand tied to production schedules, maintenance outages, and market conditions. As a result, two facilities with similar annual electricity consumption may have very different peak demands and grid impacts.

Grid Stability and the Role of Rotating Mass

Industrial manufacturing sites, especially heavy process facilities, typically include large electric motors that drive pumps, compressors, conveyors, and other mechanical loads. These motors contribute some rotating mass and thus add to system inertia. While the collective inertia from individual industrial motors is small compared with large power plant generators, it nonetheless plays a role in the overall stability landscape of a regional grid, especially in grids with many such sites.

AI data centers, in contrast, do not typically use large mechanical motors driving heavy rotating equipment as part of their core operations. Their electrical loads are almost entirely electronic — servers, storage, networking, and cooling systems — with the largest rotating machines often limited to fans or chillers rather than high-inertia industrial drives. Because these non-motor loads lack significant mechanical inertia, they do not contribute to the grid's ability to resist rapid frequency changes. This absence of rotating mass becomes relevant in power systems where traditional inertia is declining due to the retirement of conventional generators and the increasing penetration of inverter-based resources such as wind, solar, battery storage, and highly electronic loads like data centers that inherently do not provide inertia in the conventional sense.

Conclusion

At a single location, AI data centers represent a new class of electricity-intensive facility distinguished by electricity's dominance in their energy mix, high load factors, and rapid scalability of demand. Heavy industrial manufacturing facilities such as iron and steel typically integrate electricity with large thermal energy systems and exhibit more variable electricity operating profiles. None of this means AI data centers are bad or that industrial plants are better. Both are essential to the modern economy. As decisionmakers plan for future AI data center loads, understanding these structural differences is essential for effective energy policy. Data center larage load policy should not impact manufacturing self generation economics.

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