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Measuring What Matters: A New Framework for Data Center Performance

A New Era of Data Center Growth Requires New Rules

Data centers that run AI workloads are among the fastest-growing sources of electricity demand in the United States. In many regions, data centers are already straining grid infrastructure, raising costs for ratepayers, and inciting strong community opposition.

As demand accelerates, policymakers, utilities, and communities are increasingly asked to evaluate projects without a consistent, credible way to assess the impacts of data centers on the electric grid, climate goals, economic development, or local communities. In response, more communities and states are setting moratoria on further data center buildout, which pushes data center development into less-regulated regions of the country.

The lack of effective measurement of responsible data center design and operational practices has created a critical obstacle to data center development that balances the interests of data center owners, utilities, and surrounding communities. Without shared metrics, standards, and performance targets, stakeholders often pursue competing priorities. This leads to fragmented decision-making and missed opportunities to align data center growth with energy goals, climate objectives, and risk-mitigation for surrounding communities.

Measure what matters.

NBI's technical report "The Data Center Energy Performance Evaluation Framework (DC-EPEF): Practical Standards for Facilities, the Grid, and Communities," summarizes current data center standards and metrics, identifies key gaps and opportunities, and outlines ways to leverage existing regulations and incentives to advance technologies that strengthen the grid and protect the environment. NBI proposes a **future-ready data center evaluation framework** as the best way to support state and local decision-makers.

The framework targets four dimensions of performance:

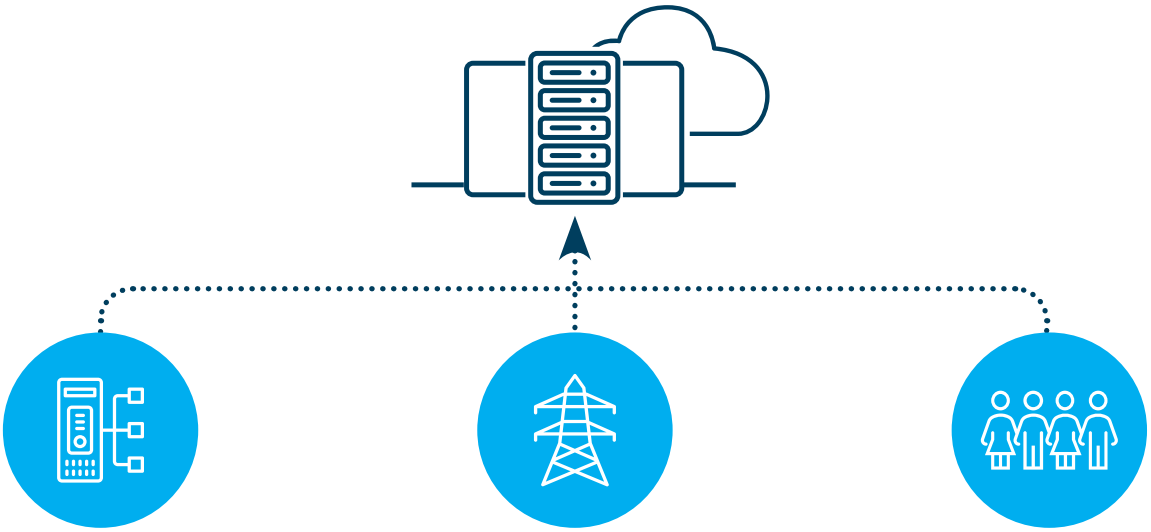
1. **Energy, water, and emissions metrics** that go beyond mechanical and electrical system efficiency to capture total resource consumption and environmental impact.
2. **Grid stress and demand flexibility targets** that measure a data center's ability to adjust workload and energy demand in response to grid conditions—which are increasingly critical as large loads multiply.
3. **Local flexibility and technological adaptability** to account for regional grid, water, climate, and community conditions while keeping standards current with rapid industry change.
4. **Tiered requirements** combining mandatory minimums tied to grid interconnection with more ambitious targets linked to financial incentives and certification—driving cost-effective adoption at scale without sacrificing ambition.

Data center growth is outpacing current codes, standards, and rating and certification systems.

To address this need, NBI is initiating a **Data Center Energy Performance Evaluation Framework (DC-EPEF).** The DC-EPEF is not meant to replace existing codes and standards, or rating and certification systems for data centers. Instead, it builds upon the robust and ongoing efforts across industry, government, utilities, and standard-setting organizations. The DC-EPEF will allow policymakers and other key stakeholders to holistically benchmark data center performance and clarify how data center energy performance translates into benefits across energy, water, emissions, and grid reliability criteria, resulting in data centers that are facility-optimal, grid-optimal, and community-optimal.

To reinforce and replicate best practices, there is a need for more effective and comprehensive metrics and evaluation criteria to establish a consistent baseline of social and environmental accountability, and to set expectations around data center impacts on energy, water, and emissions.

Data Center Energy Performance Evaluation Framework (DC-EPEF)



Facility Optimal

Mechanical Efficiency
Existing efficiency standards

IT Efficiency
Existing standards and certifications

Electrical Efficiency
Existing standards

Server Utilization
Existing evaluation frameworks

Grid Optimal

Peak-Time Reduction
Ongoing research

Energy Arbitrage
Ongoing research

Community Optimal

Local Water Impacts
Addressing energy-water tradeoffs

Local Energy Benefits
Rewarding onsite renewables, storage, micro-grid, heat exchange

On-Site Emissions
Existing federal, state, and local air regulations

Today's complex landscape of codes and standards faces three major challenges:

- Energy codes focus primarily on the efficiency of mechanical and electrical systems, while excluding other key factors related to data center system impacts.
- The fragmented codes adoption landscape complicates comparisons of data center performance across jurisdictions and risks free ridership.
- The pace of code development cannot keep up with the pace of innovation in the data center industry.

Building energy codes and standards originally intended to promote energy efficiency were not written to address the explosive electricity demand growth associated with data centers, or to mitigate impacts on grid reliability and resilience. They fall short in capturing measurable reductions in energy demand that can result from integrating hardware efficiency, operational controls, and load management strategies.

The challenges of large and dynamic data center loads make it necessary to move beyond efficiency. Modern data center standards must encourage operational flexibility that (1) helps make data center energy consumption responsive to grid conditions and (2) improves alignment of electricity demand with the availability of clean energy.

Furthermore, modern data center standards will need to recognize inherent performance tradeoffs. For example, advances in energy efficiency may increase water consumption, or flexibility measures may affect operational reliability. The most beneficial data center operational outcomes will likely vary by geography and local resource constraints. As a result, standards should support site-specific optimization.

Making performance easier to compare.

Because sustainability rating and certification systems for data centers rely primarily on existing energy codes and standards, especially ASHRAE Standard 90.4, the strengths and limitations of the standards carry over to the rating and certification systems. Some certification systems establish prerequisite requirements, while most allow projects to pursue sustainability improvements across multiple categories of their choosing. As a result, projects can achieve similar certification levels through varied combinations of sustainability measures—making it difficult if not impossible to conduct accurate comparisons across data center facilities.

Policymakers need to set not only consistent baselines—which in turn will establish necessary guardrails for all data center development—but also consistent performance targets that incentivize leaders to deliver the positive outcomes that matter most to their regions and communities. Using a consistent framework for both minimum requirements and optimal performance targets can create a clear pathway for continuous improvement over time.

Building on what is already working.

Recent efforts, including the Green Grid's Data Center Resource Effectiveness metric, the iMasons Climate Accord's Maturity Model, and the PNNL/ASHRAE/NEMA Data Center Energy Performance Framework all demonstrate movement away from single-purpose energy metrics towards more integrated and systematic approaches to measuring data center performance. These approaches incorporate such considerations as the intersection of energy, water, and climate impacts, considering carbon emissions not just from facility energy demand but also from grid power consumed and the materials incorporated into data centers; they aim to assess efficient performance across the entire lifecycle of data center development and operation. The next step is to integrate these promising

new developments into a consistent framework that connects comprehensive metrics, comparable baselines, minimum requirements, high-performance targets, and measurement and verification methods that are readily accessible to policymakers, utilities, data center operators and investors, and communities.

A variety of policy mechanisms already exist that could advance stronger performance expectations.

A data center evaluation framework must establish both "do no harm" baseline standards while enabling states and jurisdictions to provide higher incentives for improved performance—and both tasks should be done through pre-existing regulatory pathways, such as building performance standards, interconnection agreements, energy procurement requirements, land-use permitting, and disclosure and reporting requirements. A coordinated framework will also be essential for overcoming key gaps in the policymaking landscape, including the difficulty of comparing across programs that entail inconsistent performance metrics, limited operational visibility and fragmented oversight approaches, and limited opportunities to update performance expectations for existing facilities.

Standards should make room for innovation.

Rapid technological advancement enables data center designers and operators to meet strong performance expectations. Standards that do not support integrative technological approaches risk driving system performance to overemphasize a narrow range of dimensions and miss key environmental, grid, economic, or climate impacts and opportunities. Forward-looking, performance-based standards can help ensure that efficiency, reliability, and sustainability goals remain relevant even as the underlying technologies evolve. Server efficiency and utilization, cooling and electrical system efficiency, waste heat reuse, and load management strategies can all be integrated into high-performing data centers, with intelligent control systems supporting alignment between data center operational decisions and relevant grid and climatic conditions. Data center demand flexibility,

demonstrated in test environments, promises pathways to mitigate grid stress while maintaining strong business models for data center operators.

Align the market around better outcomes.

A framework leading to stronger and more comprehensive data center performance standards requires reinforcement across the market. Pressure from data center investors, customers, and regulators can push larger facilities to initially require stronger performance and to set precedents. Building these expectations into policy decisions and requirements shapes project outcomes more broadly. Finally, accountability through verified reporting and public transparency builds community trust and supports the ongoing evolution of standards. Market and policy mechanisms should operate in a complementary fashion, resulting in the coordinated growth of data centers towards performance that is facility-optimal, grid-optimal, and community-optimal.

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New Buildings Institute (NBI) is a nonprofit organization advancing energy efficiency and decarbonization in the built environment. For over 25 years, NBI has been a trusted and independent resource helping to create buildings that are better for people, communities, and the planet. Our efforts are imperative to cutting emissions fueling climate change, keeping energy costs affordable, and delivering improved health, safety, and resiliency pathways for everyone. We work collaboratively with industry market players—governments, utilities, advocates, design professionals, consumers, and more—to drive leading-edge design, curate innovative technologies, and create public policies and programs that scale with communities. To learn more about NBI and our work, visit newbuildings.org.