Powering Smart Growth: Energizing Future Data Centers with Adaptive Program Design

Andrea Salazar and Jared Casey, Michaels Energy

ABSTRACT

Rapid growth in data center development is straining utility load planning and heightening the need for specialized energy efficiency programs. Data centers present unique challenges for program administrators: efficiency is often tied directly to profitability, and industry standard practice (ISP) evolves much faster than multi-year code revision cycles.

This paper details a market study conducted by Michaels Energy for an energy efficiency organization to assess the scale, timing, and nature of data center growth. Using literature reviews, expert interviews, and Monte Carlo simulations, the team identified 49 existing facilities and flagged a major metropolitan area in the Client's service area as the primary hub for future development. The research predicts that data center consumption in the Client's service area could reach nearly 25,000 GWh annually by 2035, with 332 GWh of defensible savings available primarily from liquid-cooling and electrical-loss reductions above and beyond business-as-usual practices.

Findings suggest the core challenge for efficiency programs is not the technical savings potential; rather, it is accurately assessing baselines against rapid ISP shifts and distinguishing genuine program influence from freeridership. To ensure savings are defensible and truly reduce grid demand, this paper argues for a strategy rooted in:

- **Early Engagement:** Intervening early and deep in the initial design process.
- **Flexible Eligibility:** Utilizing building-level and phased project approaches.
- **Technical Authority:** Providing expert support with a proven track record.
- **Iterative Baselines:** Maintaining an evolving baseline process that keeps pace with industry innovation.

Introduction

Data centers have quickly become one of the most consequential loads in utility resource planning. From the early 2000s through the 2010s, growth in total energy consumption in U.S. data centers was limited. While newly constructed data centers were coming online, technological advancements in the industry—such as improvements in computational efficiency and innovations in data center cooling—mitigated additional strain on the grid. This trend persisted until 2017, when increases in data center computational power demand began to outpace new efficiency gains, primarily driven by a sudden, rapid increase in the proportion of AI technologies in the installed server base. For utilities and energy efficiency program administrators, this growth creates both urgency and ambiguity. Data centers represent a large and growing opportunity for electric savings. Yet, they are a market where traditional new construction utility program assumptions can perform poorly: the pace at which data center technology evolves and the business models involved in this sector are unique and differ from those that typically anchor utility-sponsored new construction programs.

The problem is not that data centers lack opportunities for energy efficiency measures. On the contrary, these facilities can offer significant opportunities to improve electrical system efficiency, cooling system design, airflow management, controls, and implement emerging thermal storage strategies for demand management. The challenge is that many of those opportunities are tightly linked to the data ' 'center's financial interests. Lower electrical losses and higher efficiency mechanical cooling both reduce a data ' 'center's overhead costs, thereby increasing profit and optimizing the amount of available revenue-generating IT load. Colocation data centers that can efficiently and reliably produce more compute power while consuming less electricity are more competitive than other, similar data centers in the market. In the case of enterprise data centers, the owning entity can perform more operations at lower costs. As a result of these natural economic forces, the mere existence of technical savings does not automatically imply that a program can credibly claim influence over those savings. This trend is reflected nationwide by high freeridership and low realization rates in new construction data center programs. Evaluations consistently show that baseline standards are often set too low, and owners would have implemented these efficiency measures anyway—either to meet industry best practices or because they had already planned to do so before receiving incentives.The issue of an inherent efficiency incentive is compounded by the rapid pace of the new-construction data center market, where design practices, equipment options, electrical capabilities, and cooling strategies evolve far more rapidly than code update cycles. Central to this mismatch is Moore's Law—the empirical observation that the number of transistors on an integrated circuit doubles approximately every two years. This exponential increase in transistor density represents a continuous leap in computing efficiency that consistently outpaces the regulatory timeline of energy codes. In his seminal 1965 paper, Gordon Moore envisioned a future of "home computers" achieved by squeezing 65,000 components onto a single silicon chip.[1] By 2025, commercial architectures like Apple's M3 Ultra chip contained 184 billion transistors[2], demonstrating a compounding trajectory of technological refinement that standard code frameworks are unequipped to anticipate.

The friction between technology and regulation becomes clear when comparing these rapid chip iterations against three-year building code cycles. For example, prior to the release of ASHRAE 90.4-2025 earlier this year, the operative governing standard was ASHRAE 90.4-2022. Much of that 2022 edition was developed throughout 2021—just months before the public release of ChatGPT triggered an unprecedented global artificial intelligence race. In the short interval between these code cycles, the market shifted drastically toward high-density AI workloads, rendering previous baseline assumptions obsolete before the next code could even be published. Consequently, while a code-centric baseline offers administrative convenience, it fails to reflect current industry standard practice (ISP). In a market where maximizing the conversion of megawatt capacity to compute power is a core competitive driver, the gap between lagging code minimums and actual field deployment widens significantly and immediately.

This paper examines how utilities and efficiency organizations can design adaptive programs that account for data 'centers' inherent efficiency incentive while keeping pace with state-of-the-art design practices. Rather than offering only a conceptual discussion of data center program design, this paper focuses on the methods, results, and interpretation of an applied market study. This paper describes how the Michaels Energy team characterized a prominent energy efficiency ' 'organization's (The Client) data center market, forecasted future growth in

---

[1] Cramming More Components onto Integrated Circuits – Gordon E. Moore, 1965
[2] Apple reveals M3 Ultra, taking Apple silicon to a new extreme - Apple

new construction data center load, and quantified the energy efficiency opportunity therein. The Michaels Energy team then translated its findings into recommendations for program design, baseline development, iterative baseline maintenance, and best practices for programs to reduce evaluation risk. The intent of this paper is twofold: to document a practical analytical approach for one efficiency ' 'organization's service area and to draw broader conclusions for new construction data center programs in other regions.

Research Objectives and Methods

The Client engaged Michaels Energy to answer a set of practical program questions that extended beyond simple market characterization. The Client sought to understand where data center development is most likely to occur in its service area, how quickly that market might grow, what portion of the resulting load might be abated through its new construction program, and ensure that savings claims remain defensible as ISP evolves. To answer those questions, the study combined multiple methods rather than relying on a single forecast or code review.

To characterize the new construction data center market, the research team conducted a comprehensive market assessment utilizing three primary methods: a literature review of over 100 sources; a peer program review of five leading energy efficiency programs (representing the Midwest, Virginia, Arizona Public Service, Silicon Valley Power, and Rocky Mountain Power); and structured interviews with four subject-matter experts. These interviewees included program management and technical engineering staff from the Virginia and Midwest peer programs, the Client's program implementation outreach manager, and a prominent data center design expert active in the Virginia market. The Michaels Energy team designed these tasks to establish current and emerging practices in data center design, identify baseline approaches used by other successful new construction data center programs, and surface implementation issues and solutions. Across the peer program review, the team identified several program design best practices, including facility-level, rather than campus-level eligibility, engaging with data center design teams early and often, high incentive caps to "move the needle" longer project engagement timelines with annual measurement and verification (M&V) and incentive payout, the use of trusted and technically sophisticated market partners, and dedicated budget for program administrators to study, understand, and implement emerging technologies.

Second, Michaels Energy developed a service area-specific market characterization. The team combined publicly available listings from DataCenterMap.com (2026) and DataCenters.com (2026), removed duplicate or unverifiable entries, and visually cross-referenced the results against The Client's service area. Because published data center size segmentation schemes vary widely in the units they use to measure data centers and in what exactly constitutes a "large" data center, the team developed custom segmentation criteria to characterize the data center market specifically in the Client' 's service area, but this procedure is scalable and can be applied to other service areas.

Third, the team assessed typical facility siting considerations and the likelihood of regional data center development. This task included considering power and land availability in the Client' 's service area, electricity rates, economic development tax incentives, the energy generation mix for various utilities, proximity and access to internet cables, and climate-related operational advantages. The purpose was not to predict the exact location of every future facility, but to determine which geographic regions of the Client' 's service area are most likely to see additional data center development and, therefore, will be most significant throughout program planning.

Fourth, the study used Monte Carlo simulations to estimate future data center load growth and the associated energy efficiency savings from new construction through 2030. Michaels Energy selected the Electric Power Research ' 'Institute's (EPRI) state-level data center load growth forecasts as the basis for the model (Aljbour and Wilson 2024). The team considered this methodology preferable to relying on utility resource planning forecasts, which are more heavily influenced by utility interconnection queues. These forecasts often include speculative or duplicative interconnection requests and, as a result, are susceptible to overstating load growth.

Finally, the study translated forecasted load growth into potential program savings. To estimate the claimable energy efficiency savings opportunity, the team reviewed historical editions of ASHRAE Standard 90.4[3] (ASHRAE 90.4), tracked changes in its electrical loss component (ELC) and mechanical load component (MLC), and modeled how the code is expected to evolve over time. Additionally, the team modeled future liquid-cooling adoption in the data center industry over time using a Bass Diffusion Model-like shape in a separate Monte Carlo simulation. The modeled MLC, ELC, and liquid-cooling adoption trajectories were combined with forecasted new-construction energy consumption to estimate future savings. This approach enabled the study to link market growth, code evolution, and program opportunities within a single analytic framework.

Characterizing The Client's Data Center Market

The market characterization task quickly revealed that there is no single consistent or industry-accepted segmentation scheme for data centers. Some publications use the campus or facility's square footage to measure a data center's "size". Others use the square footage dedicated to servers (the "compute" area). Still others use the IT equipment load or even total power connected to the data center, both typically measured in megawatts (MW). In instances where two sources agreed on which units to use, they seldom agreed on the stratification of size categories, such as the point when a "medium" data center becomes a "large" data center. To make matters more confusing, data center business model terminology intermingles with segmentation schemes. For example, some publications use the term "hyperscale" to refer to data center size while others use it to refer to a specific a business model.

For The Client, Michaels Energy separated business models from size segments. Specifically, the team identified two major data center business models: colocation and enterprise data centers. Definitions of each are provided below.

Colocation: A data center owned and/or operated by one company but "occupied" (IT equipment and space leased or rented) by multiple third parties.

Enterprise: A data center owned, occupied, and often operated by the same company.

[3] ASHRAE published the first edition of Standard 90.4: Energy Standard for Data Centers (ASHRAE 90.4) in 2016 as a companion to Standard 90.1. Since 2016, ASHRAE has published an updated edition of Standard 90.4 once every three years. The purpose of Standard 90.4 is "to craft the standard in a manner that does not stifle innovation in the data center industry while simultaneously offering criteria to ensure energy savings." To ensure that the energy standard was not overly restrictive to the data center industry Standard 90.4 made the document "a performance-based design standard that offers the design components of mechanical load component (MLC) and electrical loss component (ELC)…"

Colocation firms include Flexential, QTS, and Digital Realty. Enterprise firms in the Client' 's service area include Google, Apple, Meta, OpenAI, and Lumen. Michaels Energy's subject matter expert interviews revealed that—while both business types can benefit from reducing the overhead costs associated with energy consumption—colocation firms, whose core business is providing reliable IT equipment capacity for their clients, are more likely to be interested in energy efficiency as it has a direct and visible impact on their bottom line. Enterprise data centers may also be interested in energy efficiency, but more often from the perspective of either reducing operating costs or public relations campaigns that demonstrate a given organization's commitment to sustainability. Michaels Energy's market characterization identified which types of data centers program administrators should devote more time to and how energy efficiency should be framed for each end-user type.

To assist The Client in segmenting their data center customers, Michaels Energy created the segmentation scheme shown in Table 1 based on the distribution of data obtained from publicly available information.

Table 1. Michaels Energy's Proposed Data Center Size Segmentation Scheme

Proposed Data Center Size Segmentation Definitions			
Size Segment	ITE Load (MW)	Compute Area (square feet)	Building Area (square feet)
Small	< 5	< 10,000	< 70,000
Medium	5 - < 10	10,000 - < 20,000	70,000 - < 100,000
Large	10 - < 20	20,000 - < 80,000	100,000 - <250,000
Massive	20 - < 40	80,000 - < 150,000	250,000 - < 500,000
Mega	40 - < 100	150,000 - < 350,000	500,000 - < 750,000
Hyperscale	> 100	> 350,000	> 750,000

The distribution of each type and size of data center currently operating in The Client's service area is shown in Figure 1 below.

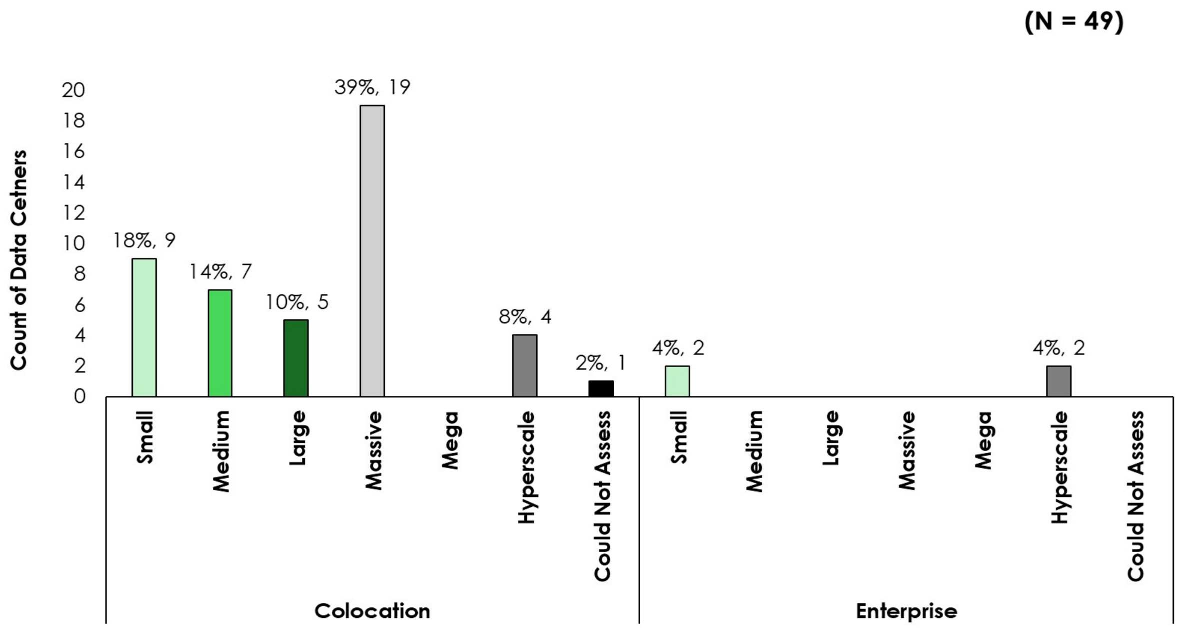

Figure 1. Type and size of existing data centers in The Client's service area

A major metropolitan area in the Client' 's service area is especially important to the regional data center market because it combines a large existing colocation data center presence with many of the attributes that data center developers typically prioritize: low energy costs, economic development tax incentives, a relatively clean energy mix, access to submarine internet cable infrastructure, and a temperate climate that can help reduce cooling electricity consumption via the use of economizers.

Additional siting attributes that are attractive to data center developers include: power availability and fast interconnection processes, availability of land, particularly land near airports, as airports have strong, redundant utility connections and are typically far from residential areas where the noise from a data center could be a cause for citizen complaint. The Michaels Energy team concludes that the attributes found in the identified major metropolitan area will continue to make the region a focus for data center developers looking to site in the Client's service area.

This finding has direct implications for efficiency programs and utility planning. Market engagement and technical intelligence should be concentrated in the area with the highest project likelihood rather than distributed evenly across the service area. In addition, The Client will benefit from working with the utilities serving the major metropolitan area, as grid constraints may become problematic if numerous data centers compete to site in a concentrated area. Utilities and The Client can work together to introduce programs that permanently or temporarily shift load, reducing the need for grid infrastructure upgrades driven by the growth of the data center market in the Portland-Hillsboro area.

Forecasting Load Growth and Efficiency Opportunity

A central element of the Michaels Energy study is that it moved beyond a descriptive market review and developed a structured forecast of data center load growth, yearly new construction data center load growth, and claimable energy efficiency savings from those newly constructed data centers. Because the timing and scale of future data center development remain uncertain, Michaels Energy used a Monte Carlo simulation to embrace and overcome that uncertainty rather than relying on a single deterministic growth path.

The Michaels Energy team used EPRI's state-specific data center growth cases as the starting point for the Monte Carlo simulation (Aljbour and Wilson 2024). When extrapolated and adjusted for the state in question, regional forecasts indicate that by 2035 data center energy consumption in the state will be equal to the state's total energy consumption in 2022). The Michaels Energy team found these growth forecasts less reasonable than EPRI's state-specific forecasts. Although EPRI claims that its four forecast cases are equally likely, the Michaels Energy team imposed a modified probability distribution to reflect the research team's judgment about plausible market behavior. The moderate-growth case had the highest likelihood, followed by the low and high cases. Finally, the highest-growth case was deemed the least likely for any given year. The model also prevented year-over-year load decline, allowing data center electricity consumption to increase or remain stagnant, in keeping with published long-term forecasts.[4] [5] The simulation was run 10,000 times, and the results were aggregated. Figure 2 shows an example run of the Monte Carlo simulation overlain against EPRI's four growth forecasts. Figure 3 shows the aggregate results from all 10,000 runs.

[4] Shehabi, A., Smith, S.J., Hubbard, A., Newkirk, A., Lei, N., Siddik, M.A.B., Holecek, B., Koomey, J., Masanet, E., Sartor, D. 2024. 2024 United States Data Center Energy Usage Report. Lawrence Berkeley National Laboratory, Berkeley, California. LBNL-2001637

[5] "Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption" – Electric Power Research Institute (EPRI)

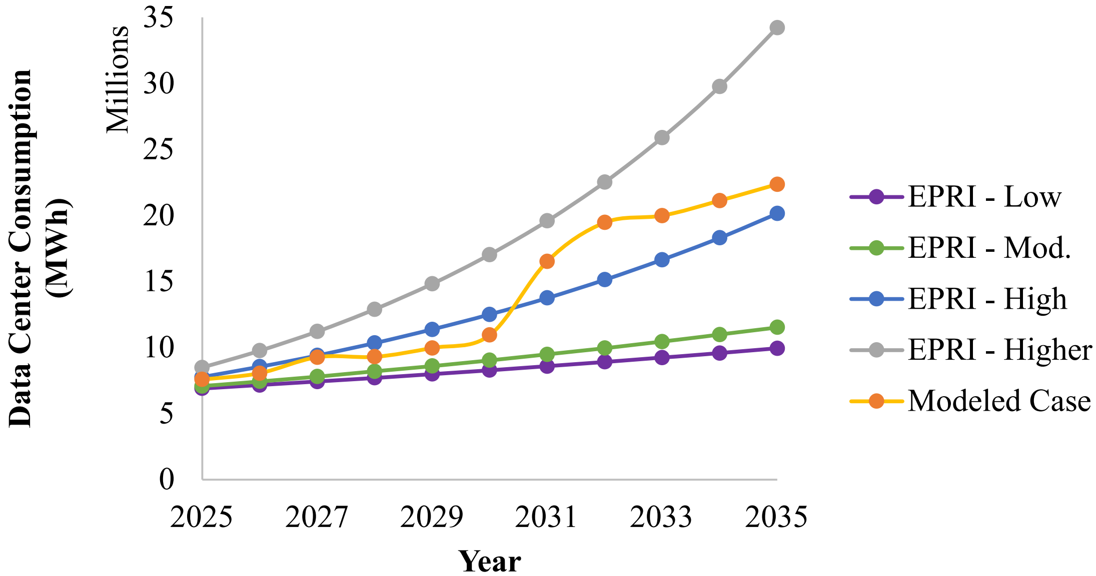

Figure 2. Example Monte Carlo run

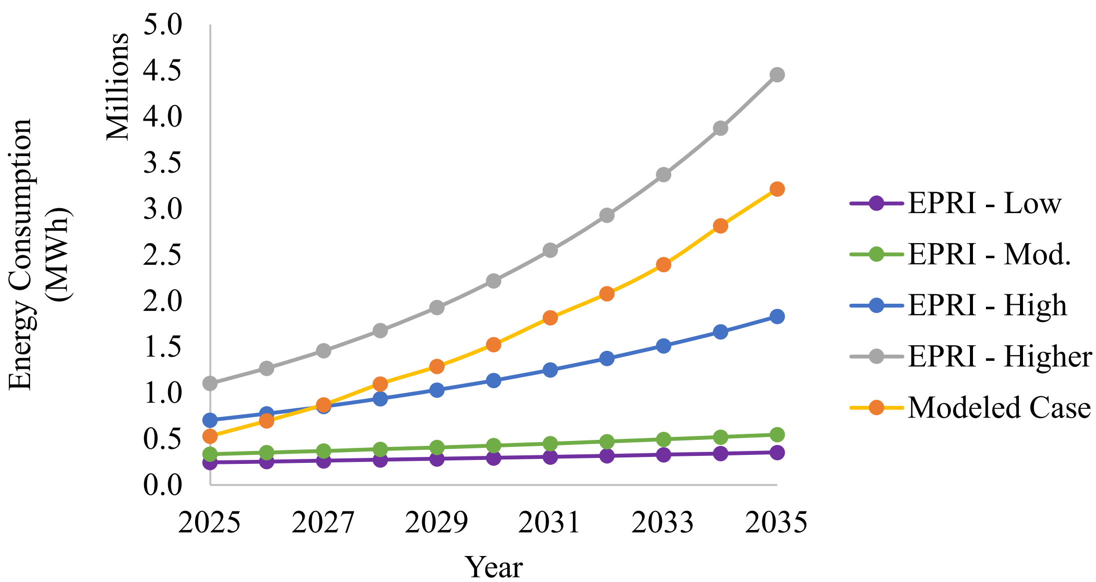

Figure 3. Aggregated results of 10,000 Monte Carlo runs

The Michaels Energy Monte Carlo simulation indicates that The Client's data centers could consume 25,000 GWh of electricity by 2035, equivalent to roughly 2.85 average gigawatts of load. In the modeled outcome, total data center growth follows EPRI's high case until roughly 2030, after which it accelerates toward the higher case. To isolate the energy consumption associated specifically with new construction, the team took the year-over-year difference in total forecasted data center energy consumption, assuming that annual increases were attributable to new facilities. The results of this analysis are visible in Figure 4.

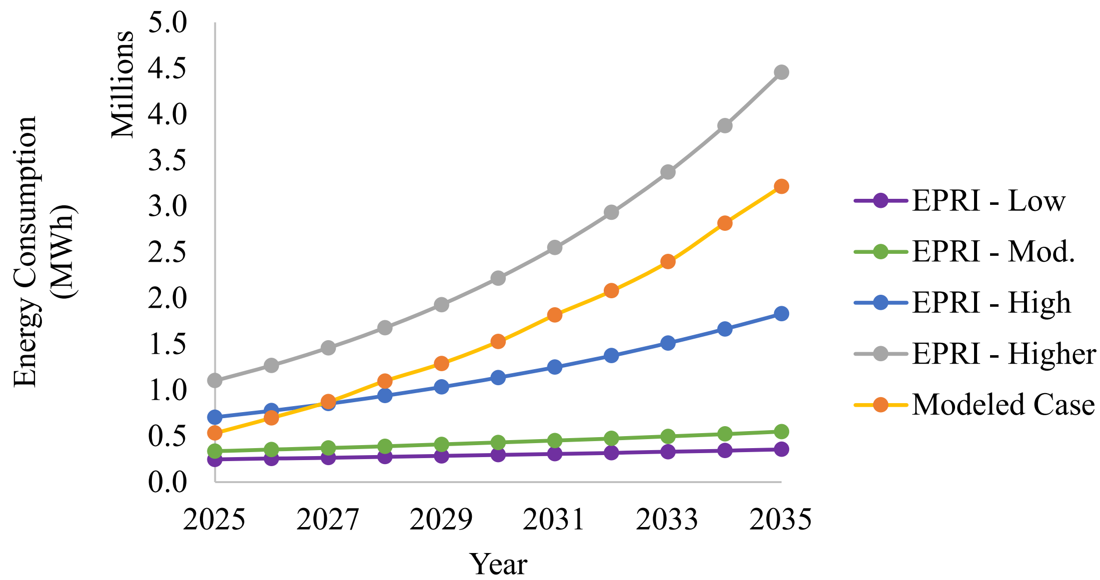

Figure 4. Forecasted new construction data center energy consumption by year

The study then translated this new construction forecast into an estimate of future energy efficiency opportunity. To do that, Michaels Energy reviewed all available editions of ASHRAE 90.4 and examined the historical changes to the ELC and MLC. Michaels Energy used this historical code analysis to create assumptions for a Monte Carlo simulation of future editions of the ASHRAE 90.4. The team modeled the ELC as declining by 50% in each new edition until it is effectively discounted from consideration in 90.4-2034, reflecting both the sharp reduction already observed between ASHRAE 90.4-2019 and 90.4-2022 and the fact that efficient UPS (uninterruptible power supply) technologies are already approaching theoretical maximum efficiency (100%). For the MLC, the historical trend was less clear, so the study used Monte Carlo simulations to approximate future values, assuming ranges that generally decreased over time.

With modeled future ELC and MLC values in hand, the team estimated the code-maximum energy consumption associated with electrical losses and cooling energy in new construction data centers for each year. Michaels Energy then used Monte Carlo simulations to estimate savings from two main sources: electrical loss reduction and adoption of liquid cooling. We note that currently, liquid cooling is considered industry standard only for a fraction of AI-specialized data centers, per a 2024 publication from Lawrence Berkeley National Laboratory (2024), as shown in Figure 5 (Shehabi, A., Smith, S.J., Hubbard, A., Newkirk, A., Lei, N., Siddik, M.A.B., Holecek, B., Koomey, J., Masanet, E., Sartor, D. 2024).

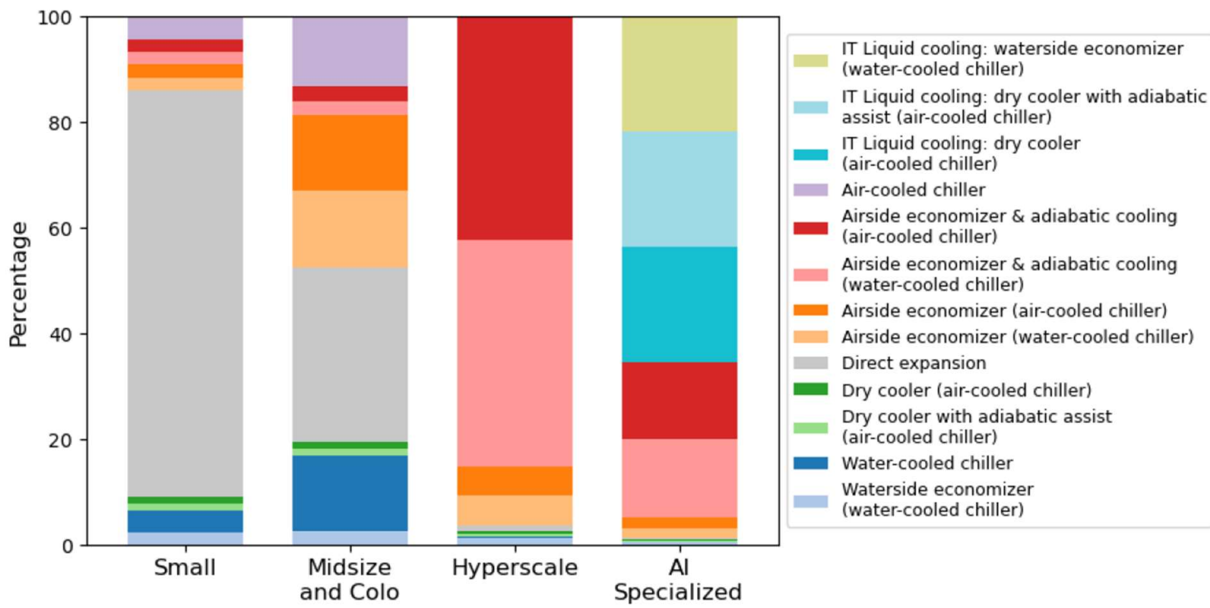

Figure 5. Data center cooling industry standard practice as of 2024 per LBNL

The Michaels Energy report concludes that The Client could see up to 332 GWh of savings beyond ASHRAE 90.4 from those two sources over the next decade, as shown in Figure 6. Importantly, the Michaels Energy team notes that this estimate excludes additional business-as-usual savings from established best practices, such as economizers and hot-aisle/cold-aisle air containment, a visualization of the latter of which can be seen in Figure 7. In other words, the modeled total is deliberately narrower than the full technical opportunity available to The Client. This narrowing of the potential savings opportunity was deliberately done because the Michaels Energy team cannot currently predict how ISP design will evolve or how The Client's evaluators may account for it.

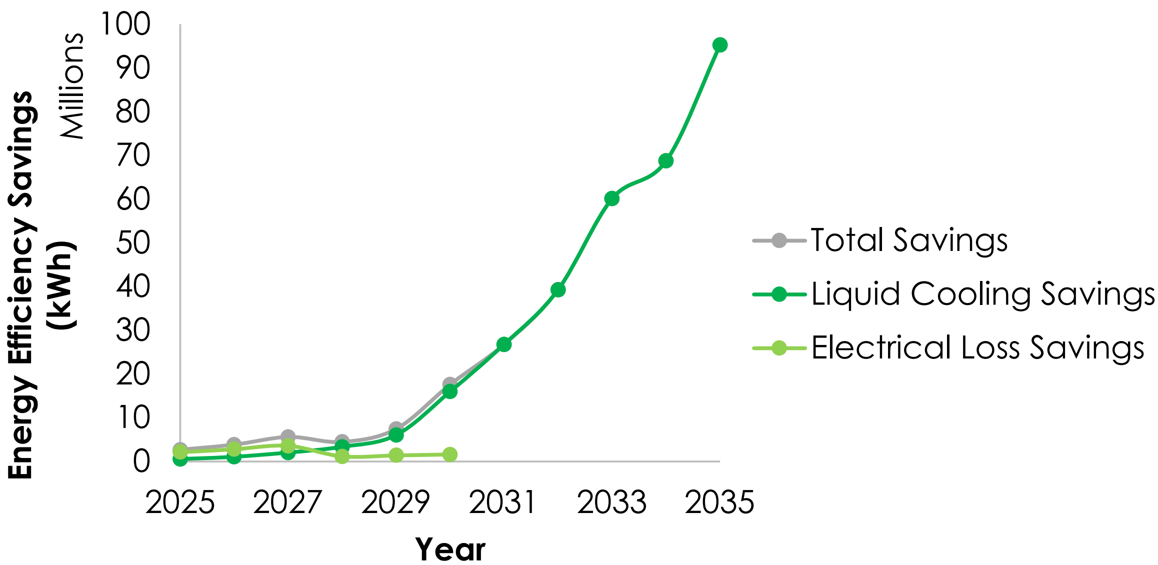

Figure 6. Forecasted new construction energy efficiency savings above ASHRAE 90.4 over time for The Client's market

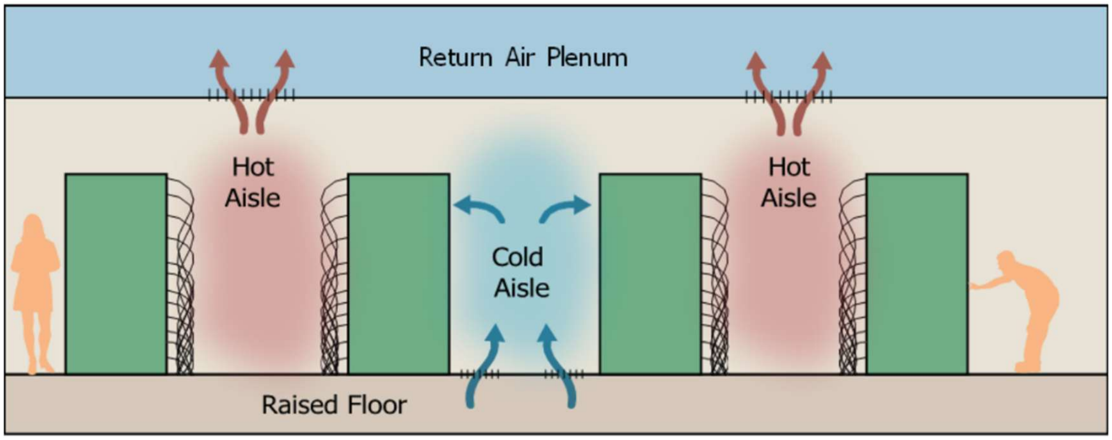

Figure 7. Hot/Cold Aisle Containment is an airflow management strategy designed to maximize HVAC efficiency in high-density data centers by physically preventing the mixing of intake and exhaust air

What the Findings Mean for Program Baselines and Influence

The Michaels Energy study points to a central conclusion: the biggest challenge in data center efficiency programs is not finding opportunities but distinguishing between ISP influence and the actual program influence. This distinction is especially important in new construction, where incentives are often based on the assumption that rebates induce better-than-code design choices. For data centers, that assumption can be fragile. As previously referenced, ISPs in the data center industry have historically evolved faster than code. This pace will only accelerate in the future.

Concerns related to the pace of data center innovation were reinforced by Michaels ' 'Energy's peer program review and subject matter expert interview findings. The Michaels Energy report describes one program implementer who cited a recent evaluation in which 91% of the program's gross savings were attributed to freeridership (Buege and Chittory 2023). This evaluation result was principally due to one large project, which accounted for a vast majority of the ex-ante savings claims but reported little to no program influence. Data center programs can end up claiming too much savings when the baseline is too lenient, especially for large, advanced, or AI-focused facilities.

The study recommends that The Client continue to use ASHRAE 90.4 as its baseline, as it is currently the most widely used published data center energy standard, is already embedded in program infrastructure, and enables flexible, performance-based treatment of mechanical and electrical trade-offs. The problem is not that ASHRAE 90.4 lacks value, but rather that the data center market can evolve faster than ' 'ASHRAE's three-year revision cycle. A baseline that is administratively appropriate today may become less representative of market reality over time.

The Michaels Energy study's findings regarding baselines are best read as a caution against static implementation of baselines, not as a rejection of code-based program design. The report suggests that The Client continue using ASHRAE 90.4 for now, adopt new editions as soon as they are released (rather than when the state or other programs may adopt them), monitor IECC's data center provisions, and pair the code baseline with stronger evidence on participant practices and program influence. In effect, the study recommends treating the baseline as an actively managed and regularly reviewed metric rather than a fixed assumption.

Program Design Implications

Because the Michaels Energy study links market structure, load forecasting, and baseline risk, the resulting program recommendations are actionable and practical. Our recommendations fall into several related themes.

First, The Client should align savings claims and incentives with actual IT load ramping rather than assuming that nameplate design conditions (or a static fraction thereof) are immediately realized (or at a specific, predeterminedpoint in time). Multi-year payouts for phased builds and annual M&V check-ins ensure that efficiency savings impact the grid when they are claimed and keep data center customers engaged with program staff over a prolonged period. This recommendation reflects the fact that campus development and colocation data center occupancy often occur gradually, making one-time post-construction savings assumptions vulnerable to over- or understatement.

Second, the program should engage projects earlier and more continuously. The Michaels Energy report recommends introducing design assistance incentives earlier and ensuring that credible engineering expertise (either internal or third-party contracted) be available throughout the early design stages (Kolwey 2025). It also recommends a strategic energy management (SEM) program-style engagement with owners, partners, and other market actors. This engagement style includes regular interaction throughout the life of the project design[6]. These recommendations are consistent with the broader finding that influence in data centers is most plausible when the program enters before key architectural, mechanical, and electrical decisions are finalized, and adaptation is possible.

Third, project eligibility should better reflect how data centers are actually built. The study recommends shifting eligibility from the campus to the building level. Building-level eligibility would simplify participation in large, phased data center developments and would allow the program to remain involved as additional buildings come online throughout the same campus, typically over a number of years as the utility approves interconnections. This practice would also increase the incentive available to customers, encouraging continued program engagement on large data center campuses. The peer program review and subject matter expert interviews also support longer engagement timelines and more flexible treatment of phased projects, including cases where efficiency may increase with each floor or phase that is built out.

Fourth, The Client should strengthen technical credibility and market reach. The Michaels Energy report recommends that credible engineering expertise be made available through program staff, a subcontractor, or a network of approved firms. It also recommends working through trusted partners already involved in data center development[7]. These recommendations are grounded in the practical reality that influence depends not just on incentives, but on whether a program can credibly recommend and implement a technically sophisticated, reliable data center design.

Fifth, the report suggests that incentives may need to be more consequential. Among the best practices identified in the peer program review are higher incentive caps, in some cases

[6] Interview with Midwest energy-efficiency program Technical Engineering Advisor, Program Implementation

[7] Interview with Midwest energy-efficiency program Technical Engineering Advisor, Program Implementation and interview with Virginia energy-efficiency program Program Manager, Implementation

around $1 million. Additionally, budget set-asides for emerging technologies, or an R&D-style track that can de-risk implementation of new measures through targeted modeling or feasibility analysis, can increase defensible savings and the technical savvy of the program as well as data center 'customers' trust in the program[8].

Taken together, these recommendations imply that the most effective strategy for the Client is not simply to pay rebates for efficient equipment, but to build an engagement model that can shape design decisions, document influence, and remain involved long enough to understand how performance is realized in each new construction project.

Evaluation and Baseline Maintenance

The Michaels Energy report's most transferable recommendation may be its proposed approach to ongoing baseline maintenance. Rather than assuming a one-time baseline decision will remain valid, the study outlines an iterative process for keeping program assumptions aligned with market evolution and multiple options for appropriate baselines.

ASHRAE 90.4 remains the anchor for a simpler code-based approach, but the report also makes clear that stronger participant research on design practices and program influence, along with a structured, ongoing baseline maintenance process, should be used. Alternatively, some highly successful programs use project-specific energy models for both the baseline and program-influenced designs. While this approach is more complex and requires additional technical savvy, there is little room for debate about the program's influence. The latter may be necessary to preserve defensibility in high-growth, highly sophisticated market segments.

If ASHRAE 90.4 remains the baseline for The Client's program, Michaels Energy recommends the following baseline maintenance process. The first step is an annual literature review that focuses on current data center practices and notable changes in electrical or cooling systems. If that review reveals meaningful shifts in ISP, the next step is to conduct an ISP study at most once every two years. Once every 3 years, a more comprehensive baseline literature review should be conducted (except in years when an ISP study is completed).

Michaels Energy recommends interviewing or surveying program participants to understand how they typically design their data centers and whether, and to what extent, the program changed those designs. This recommendation is a practical response to the challenge identified throughout the study: program participation alone is insufficient to establish attributable savings.

Broader Implications for Data Center Programs

Although this paper centers on The Client's service area and program context, the underlying lessons apply more broadly. Data centers are a striking example of what happens when utility programs attempt to leverage conventional new construction program design in a market where technology evolves rapidly, customer sophistication is high, and efficient design is deeply embedded in the end user's business case.

The first lesson is that large technical opportunities do not necessarily guarantee high attributable savings. In markets where customers already have strong motives to pursue efficiency, programs must place greater emphasis on timing, technical support, and documentation of influence.

[8] Interview with Virginia energy-efficiency program Program Manager, Implementation

The second lesson is that code remains necessary but is not always sufficient. A stable code-based baseline may still be the most workable foundation for many programs, but the Michaels Energy study shows that it should be paired with a disciplined process for assessing whether code remains a meaningful proxy for what the market would otherwise do in the absence of the efficiency program.

The third lesson is that program design needs to reflect how projects actually unfold. Data centers are frequently phased constructions, design-intensive, and influenced by a relatively small set of sophisticated partners. Engagement models built around late-stage rebates or one-time savings assumptions are less likely to succeed in this environment than models built around early influence, longer involvement, and adaptive measurement.

Finally, the study suggests that data centers may be a leading indicator of broader portfolio change. As utilities increasingly confront specialized large loads and rapidly evolving end uses, the distinction between industry standard practice and claimable program influence will become more important. The tools used in this study, market review and probabilistic forecasting, and the most critical recommendations, layered baseline management and extended design engagement, may have relevance even beyond data centers.

The implication is not that utilities should retreat from data center programs, but rather that they need a more adaptive approach. For The Client, this means continuing to use ASHRAE 90.4 and adopting the latest version upon release, strengthening participant research, engaging earlier in the design process, aligning incentives and eligibility with phased project development, working through credible technical partners, and maintaining an iterative baseline review process. For energy efficiency programs more broadly, Michaels ' 'Energy's study suggests that defensible savings in fast-moving, large-load markets will increasingly depend on a ' 'program's ability to demonstrate attributable influence in sectors with significant technical potential and an equally significant incentive to operate efficiently.

Data centers are not just a major load growth story. They are testing whether energy efficiency programs can update and modernize their processes quickly enough to remain both relevant, credible, and impactful.

References

Aljbour, J. and T. Wilson. 2024. *Powering Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption*. Palo Alto, CA: EPRI. https://www.epri.com/research/products/3002028905.

Buege, A. and K. Chittory. 2023. *Memorandum Regarding Net-to-Gross Research Results for the ComEd Custom Program and Data Center Subprogram - Final.* Guidehouse. https://www.ilsag.info/wp-content/uploads/ComEd-Custom-NTG-Memo-2023-09-27-Final.pdf.

Data Center Map. "Oregon Data Centers." Accessed November 2025. https://www.datacentermap.com/usa/oregon/.DataCenters.com. "Global Data Center Locations." Accessed November 2025. https://www.datacenters.com/locations?query=oregon.

Kolwey, N. and H. Geller. 2025. *Data centers: Power needs and clean energy challenges.* Southwest Energy Efficiency Project (SWEEP). https://www.swenergy.org/directory/data-centers-power-needs-and-clean-energy-challenges/.

NWPCC (Northwest Power and Conservation Council). 2024. *Pacific Northwest Power Supply Adequacy Assessment for 2029*. NWPCC. https://www.nwcouncil.org/fs/18853/2024-4.pdf

Shehabi, A., Smith, S.J., Hubbard, A., Newkirk, A., Lei, N., Siddik, M.A.B., Holecek, B., Koomey, J., Masanet, E., Sartor, D. 2024. *2024 United States Data Center Energy Usage Report*. Lawrence Berkeley National Laboratory, Berkeley, CA. LBNL-2001637

AI-assisted Tools: Disclosures and Responsibility

AI-assisted tools used: ChatGPT, Grammarly. Google Gemini.
Extent: content organization, copy editing.
Human review: The authors reviewed and verified all content, calculations, and citations.