



2030

BEYOND

THE NUMBERS

Accelerating the Path to Zero Operating Emissions



Vincent Martinez
Hon. AIA, EIT
Chief Executive Officer
Architecture 2030

This year marks the twentieth anniversary of the 2030 Challenge — a beacon for the design industry that ignited a movement across the globe, charting a path for the building sector to reverse its course from a major source of climate pollution to a central solution to the climate crisis. The destination was clear: new construction and major renovations should eliminate their operating emissions by 2030. Yet only by walking the path could its milestones be appreciated and its accelerators come into focus.

Our industry has accomplished something few envisioned possible two decades ago. We have decoupled the growth in new building floor area from corresponding increases in energy consumption and emissions. Through practice and policy we have made significant progress towards our shared destination, yet we have further to travel and limited time in which to arrive. The Acceleration Pathway outlined in this report, and its corresponding Accelerators, are more than a guide for the next stage of our journey. They provide a framework for accountability, appropriate measurement, and value creation that can be applied to the evolving and interrelated goals that the design community is rapidly embracing in pursuit of a more equitable, healthy, and climate-positive built environment.

This report stands on the experience and insight of 39 practitioners across 31 firms who shared what two decades of work have taught them about what accelerates progress, what holds it back, and what the next five years demand. Their candor shapes every page that follows. Architecture 2030 is honored to carry that knowledge forward, and we invite you to read, engage, and join us in closing the last mile.



Carole Wedge
FAIA, NOMA, LEED AP
Executive Vice President / Chief Executive Officer
American Institute of Architects

Inspired by Architecture 2030 and Ed Mazria's 2030 Challenge, AIA formally adopted the 2030 Commitment in 2005. Since then the program has shown steady growth in firm adoption with over 1,400 signatories, in annual reported project square footage, and in global geographic footprint. The 2030 Commitment program has also significantly expanded the scope of progress metrics beyond the original net zero goals of the Challenge, to include reporting metrics on embodied carbon, electrification uptake, and renewable expansion. While in 2024 predicted energy use intensity showed its greatest reduction of the Commitment to date, there is still a long way to go. As architects remain committed to further reductions in energy usage and emissions via more thoughtful design decision-making and adoption of novel technology, the 2030 Commitment now calls for an update and refresh as we approach the year 2030. This will include adopting many of the recommendations found throughout this report, including surfacing more grid data in project reporting via AIA's Design Data Exchange (DDx), working towards a combined operation and embodied carbon metric, and offering enhanced visualization tools for firm benchmarking.

AIA remains firmly committed to demonstrating how our members push the boundaries of efficiency and innovation in design, moving beyond what is possible today. We see the ravages of climate change all around us, from more powerful storms, to prolonged droughts and megafires. AIA will continue to equip architects, clients, and communities to do their part to create a more resilient, healthy, and equitable world. This report represents a joint recommitment, from AIA and Architecture 2030, to accelerate the efficiency and emissions reductions goals the original 2030 Challenge made twenty years ago, and to move towards a more regenerative future. Join us as we forge a new path forward, together.

Significant Figures

Authors

Erin McDade, Assoc. AIA — *Lead Author* | Senior Program Director, Architecture 2030

Vincent Martinez, Hon. AIA, EIT — *Contributing Author* | Chief Executive Officer, Architecture 2030

Jesse Walton, AIA LEED-AP BD&C — *Contributing Author, Data Analysis* | Architecture 2030 Senior Fellow / Associate Principal, Mahlum Architects

Melissa Wackerle, LEED AP — *Contributing Author* | Consultant

This report represents far more than an analysis of data. It is a synthesis of the lived experience of practitioners who have dedicated years — in some cases, decades — to the difficult, often thankless work of pursuing zero operating emissions within the realities of architectural practice. The insights in these pages were hard-won, earned in design studios, client presentations, and advocacy arenas across the continent.

We extend our deepest gratitude to the 39 practitioners from 31 architecture and engineering firms and the American Institute of Architects who generously participated in our research interviews. This cohort represents the breadth of professional practice, from large, multi-national firms to boutique studios; from the Pacific Northwest to the Southeast; and from specialists in healthcare and laboratories to leaders in housing, higher education, and civic design. Through over 17 hours of direct conversation representing more than 60 billable hours of practitioner time, they shared not only their strategies for success, but also the frustrations, trade-offs, and hard-won lessons that rarely appear in published awards and accolades. They occupy the crucial intersection between high-level climate ambition and on-the-ground project delivery, acting as translators of climate mandates into buildable solutions, of building performance into client value, and of project-level success into firm-wide practice. Their willingness to speak openly about both achievements and barriers made this analysis possible.

Interview Participants

AIA 2030 Commitment Working Group Co-Chairs

Daniel Overbey, AIA, NCARB, LEED Fellow, WELL AP | Associate Principal / Director of Sustainability, *Browning Day*

Jacob Werner, AIA, LEED, WELL, CPHC | Principal, *Ellenzweig*

AIA Committee on the Environment (COTE) Representatives

Michelle Amt, FAIA | Principal / Director of Sustainability, *VMDO Architects* (2024 COTE Chair)

Lyndley Kent, AIA, LFA | Principal, *Neumann Monson Architects*

Jeremy Knoll, AIA, LEED Fellow | Director of Sustainability & Regenerative Design, *BNIM*

Ellen Mitchell | Director of Sustainability, *LPA Design Studios* (2026 COTE Chair)

Joyce Raybuck, AIA, LEED AP | Principal, *BNIM*

Large Firm Roundtable (LFRT) Sustainability Committee Representatives

Chris Chatto, AIA, LEED AP BD+C, LFA | Principal, High Performance Design, *ZGF*

Carlos Cerezo Davila | Director, Head of Sustainable Design, *KPF*

Keith Hempel, FAIA | President / Chief Design Officer, *LPA Design Studios*

Daniel Jaconetti, AIA, Fitwel Amb, LFA, LEED AP | Principal & National Sustainable Design Leader, *HED*

Nick Lassek | Practice Lead, High Performance Design, *Leo A Daly*

Paul McKeever | Director of Sustainability, *TVS Architecture & Interiors*

Julia Siple, AIA, LEED AP BD+C, WELL AP | Principal / Director of Sustainability, *Quinn Evans*

Prem Sundharam | Chief Climate Officer, *DLR Group*

Sustainable Design Leaders (SDL) Representatives

Kjell Anderson, Principal | Director of Sustainable Design, *LMN Architects*

Catherine Callaway, AIA, LFA, LEED AP BD+C, ID+C | Director of Sustainability and Building Performance, *Kirksey*

Heather DeGrella | Associate Principal / Sustainable Design Director, *Opsis Architecture*

Gwen Fuertes, AIA, LEED AP BD+C | Associate Principal, *Leddy Maytum Stacy Architects*

Jim Hanford | Principal / Building Performance Leader, *Miller Hull*

Seonhee Kim, AIA, LEED AP BD+C, WELL AP | Principal / Director of Sustainability, *Design Collective, Inc.*

Kelli Kimura | Sustainable Design Coordinator, *Opsis Architecture*

Timothy Lock, AIA, CPHD | Management Partner, Director of Ecological Design, *OPAL*

Mark Maddalina, AIA, LEED AP BD+C | Principal / Sustainable Design Director, *SWBR*

Sam Miller | Partner, *LMN Architects*

Alison Nash, AIA, LEED AP ID+C, CPHC, WELL AP | Senior Associate / Sustainability Coordinator, *Sasaki* (2026 President, Boston Society of Architects / AIA)

Z Smith | Principal / Director of Sustainability & Building Performance, *EskewDumezRipple*

Erica Weeks, LEED Fellow, AIA, ASHRAE CDP | Director of Green Building Certifications, *Paladin, Inc.*

Individual Firm Interviews

Katie Ackerly | Principal / Sustainable Design Director, *David Baker Architects*

David Arkin, AIA, LEED AP | Principal / Co-Founder, *Arkin Tilt Architects*

Marc Brune, PE, LFA, LEED AP | Senior Principal, *PAE Consulting Engineers, Inc.*

Kit Elsworth | Associate, Building Performance Researcher, *KieranTimberlake*

Nate Kipnis, FAIA, LEED BD+C | Principal / Founder, *Kipnis Architecture + Planning*

Brian Johnson, PE, BEMP, CDP, LEED AP, WELL AP | Senior Associate, Senior Project Engineer, *HOK*

Anica Landreneau, Assoc. AIA, LEED Fellow, WELL AP, Fitwel, Sr Principal | Global Director of Sustainable Design, *HOK*

Vanessa Hostick Rempe, AIA, LEED AP, Fitwel | Sr Assoc., Sustainable Design Leader, *HOK*

Colin Rohlfing, LEED AP BD+C, LFA | Director of Sustainable Development, *HDR*

Jesse Walton, AIA LEED-AP BD&C | Associate Principal, *Mahlum*

Rachel Wrublik, PE, LEED AP | Associate, *PAE Consulting Engineers, Inc.*

We also wish to acknowledge the foundational role of the AIA and the thousands of signatory firms whose ongoing participation in the 2030 Commitment has generated the dataset that made this analysis possible, and whose sustained commitment to zero operating emissions is helping transform the building sector from a major source of emissions to a climate solution.

We are especially grateful to **Rand Ekman**, FAIA, LEED Fellow | Chief Sustainability Officer, Emeritus, & Partner, *HKS* and **Luke Leung**, PE, ASHRAE Fellow, LEED Fellow, BEMP, P Eng | Principal, *SOM* for their extensive review, insights, and contributions to this report. Their technical insight and sustained engagement strengthened both the analysis and its recommendations.

Finally, this work was made possible through the longstanding partnership between Architecture 2030 and the American Institute of Architects, whose shared commitment to building decarbonization continues to shape the trajectory of our profession. We are particularly grateful to AIA staff for their leadership of the 2030 Commitment program and their extensive collaboration throughout this effort, specifically:

Melanie De Cola, LEED Green Associate | Director, Climate Action Pledge Programs

Kathleen Lane, AIA, LEED AP | Managing Director, Climate Action and Design Excellence

Lisa M. Ferretto, AIA, LEED AP, WELL AP | Sr. Director, Climate Action and Design Excellence

Ellie Falcon | Manager, Climate Action and Design Excellence

Andrew Hassan | Manager, Climate Action Pledge Programs

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Executive Summary

The architecture profession is in the last mile of the path to zero operating emissions in new buildings and major renovations. Two decades of sustained engagement with the 2030 Challenge have systematized energy efficiency across the profession, demonstrating its capacity for deliberate, portfolio-wide transformation. The path ahead is extending that same systematic approach to electrification and renewable energy.

The perceived multi-year plateau in predicted Energy Use Intensity (pEUI) reductions reported through the AIA 2030 Commitment is a signal of success, not evidence of stagnation. At the national level, building sector operating emissions have dropped 31.2% from 2005 to 2024, even as the United States added roughly 70 billion square feet of new construction. Signatory firms have achieved widespread proficiency in energy efficiency, the decarbonization lever most squarely within designer control. The 2030 Challenge, however, called for the elimination of fossil fuel energy consumption — an outcome that requires efficiency, electrification, and renewable energy working in concert. The additional gains delivered by electrification, renewable energy, and grid decarbonization are not yet fully visible in the industry's prevailing progress narrative. The AIA's annual reporting has begun

expanding its scope to capture these levers — progress that this report's Acceleration Pathway builds upon. Activating these levers across the profession is the path of the last mile.

Drawing on over 17 hours of interviews with 39 practitioners from 31 architecture and engineering firms, an independent quantitative analysis of over 30,000 U.S. design projects, and an extensive literature review, 2030 Beyond the Numbers charts an Acceleration Pathway for the last mile. The pathway comprises three sequential accelerators:

Accelerator 1: Institutionalize Cultural Accountability

The foundation. Firms that have embedded performance targets into their governance, project management, and incentive structures describe a consistent shift: performance becomes a firm-wide expectation rather than a project-by-project variable. Without this organizational commitment, the accelerators that follow remain aspirational.

Accelerator 2: Adopt an Emissions-Centric Measurement Approach

The expanded lens. With accountability systems in place, the next step is ensuring that what firms measure reflects the full scope of their commitment. Tracking operating

emissions alongside energy efficiency captures the contributions of electrification, renewable energy, and grid decarbonization — the levers that Energy Use Intensity (EUI) alone does not reach. This accelerator also calls for honest assessment of the baselines and benchmarks against which progress is measured, so that metrics inform strategy accurately and do not obscure achievement.

Accelerator 3: Implement the Path to Zero Operating Emissions.

The action. With accountability structures and an accurate measurement lens in place, firms can systematically pursue zero operating emissions on every project: defining internal standards for zero operating emissions readiness, developing renewable energy procurement literacy, and creating client roadmaps that delineate what is within designer control and what requires client action. This is the culmination: translating commitment and comprehension into a repeatable protocol applied across the full portfolio.

Each accelerator is grounded in strategies already in practice across the research cohort, and accompanied by recommendations for coordinated industry action — from evolving primary metrics to include operating emissions, to standardizing emissions accounting while

updating outdated baselines and coordinating with regional advocacy networks.

This report is centered on what firms can do now. The industry-level actions require wider collaboration across professional organizations, program administrators, tool and platform developers, and practitioners. Architecture 2030 is committed to serving as an honest broker and catalyst in that effort.

The 2030 deadline was always a waypoint. The deeper objective is to establish zero operating emissions – buildings that use no fossil fuel energy to operate – as the default professional standard for new construction and major renovations, and ultimately to extend that standard to the full lifecycle of buildings. The practitioners who contributed to this report have shown that the path to zero operating emissions is viable. The work of the last mile is making it universal.

Introduction

The urgency of the climate crisis demands decisive action from the building sector, [which is responsible for a significant portion of global greenhouse gas emissions](#). In 2005, Architecture 2030 launched the [2030 Challenge](#) in direct response, establishing a 25-year roadmap for the sector's transformation from a major source of emissions to a central solution to the climate crisis. The Challenge set an ambitious and specific goal: zero operating emissions for all new buildings and major renovations by 2030, with incremental fossil fuel energy reduction targets along the way. The American Institute of Architects adopted the Challenge in 2006 and in 2009 launched the [2030 Commitment](#) program to enable its implementation across professional practice.

Since 2005, progress has been substantial. U.S. building sector operating energy consumption has declined by 8% and corresponding emissions have [dropped by 32%, even as the United States added roughly 70 billion square feet of new construction](#). This decoupling of emissions from floor area growth reflects the combined effects of energy efficiency gains, expanding electrification, growing renewable energy deployment, and a decarbonizing electricity grid.

Yet this macro-level achievement is not fully reflected in the industry's prevailing measure of progress. Data from the 2030 Commitment – the profession's most comprehensive performance tracking effort – indicates a multi-year plateau in predicted Energy Use Intensity (pEUI) reductions that appears inconsistent with the steady decline in national emissions trends. This perceived leveling has fueled skepticism about the feasibility of meeting the 2030 targets and created a narrative that undermines both recruitment of new signatory firms and morale among those already committed.

2030 Beyond the Numbers investigates this divergence. The report finds that the plateau is not evidence of stalled progress, but a reflection of two related conditions: the inherent ceiling of energy efficiency as firms approach its practical and technical limits, and a measurement system designed primarily to track one lever of a multi-lever challenge. The 2030 Challenge called for the elimination of fossil fuel energy consumption in buildings – an outcome achievable through three interdependent strategies: reducing energy demand through efficiency, eliminating on-site fossil fuel combustion through electrification, and sourcing renewable energy.

Energy efficiency – the lever most squarely within a designer's control – has been the primary focus of the industry's tracking

conventions and the metric around which the profession's progress narrative has centered. Firms have achieved genuine proficiency in energy efficiency, and the plateau in EUI reductions reflects that proficiency's maximum potential. The remaining levers – electrification and renewable energy – along with the trajectory of the decarbonizing electricity grid, are not yet fully captured by this metric. The AIA's By the Numbers reports have begun expanding their scope to include electrification rates, fuel source data, renewable energy, and embodied carbon; this report's Acceleration Pathway builds on that evolution by charting the firm-level strategies and industry actions that would activate these levers across the profession. (See AIA's 2030 By the Numbers Reports to Date.)

The profession is in the last mile – close enough to see the finish line, and to map the path forward. Energy efficiency has been refined and established as standard practice through two decades of sustained commitment amongst an engaged vanguard of firms, demonstrating the profession's capacity for deliberate, portfolio-wide change. The challenge now is extending that same systematic approach to electrification, renewable energy, and the strategic positioning of buildings on a decarbonizing electricity grid.

Drawing on over 17 hours of interviews with 39 practitioners from 31 architecture and

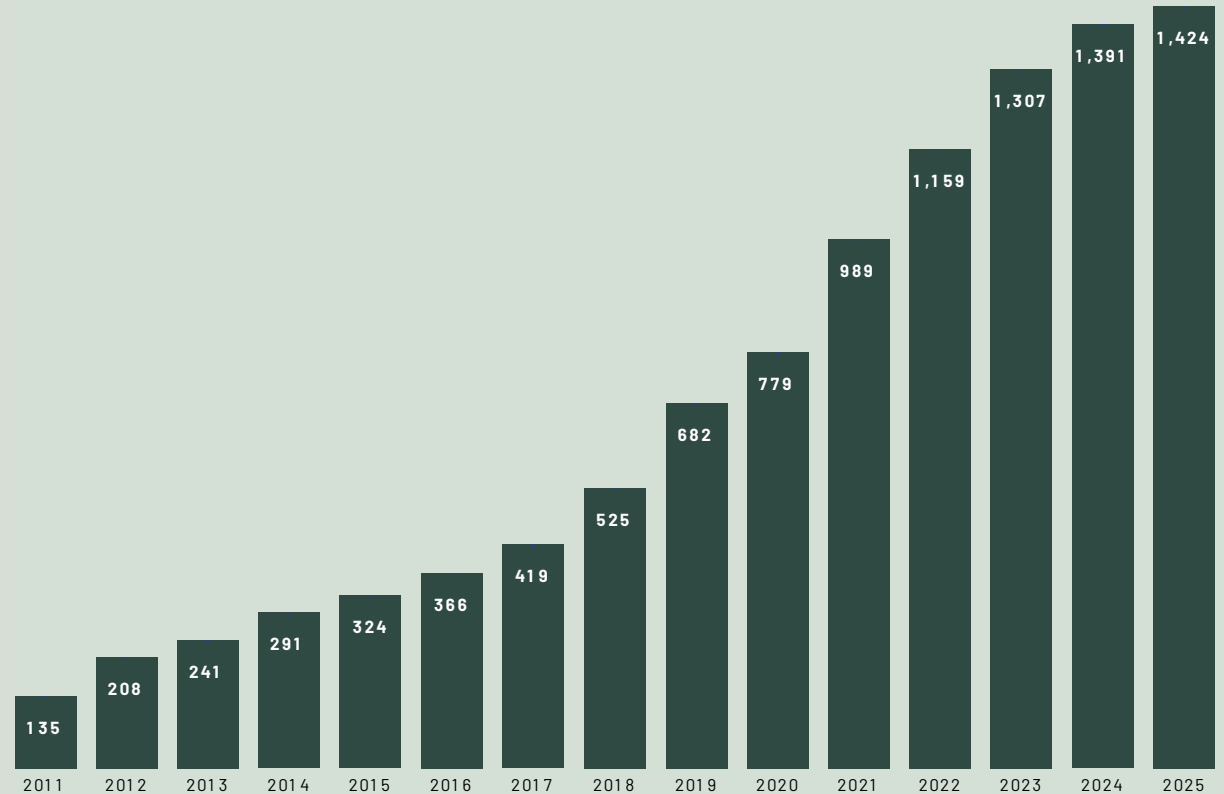
engineering firms, an independent quantitative analysis of over 30,000 U.S. design projects, and an extensive literature review, this report charts an Acceleration Pathway for the last mile to zero operating emissions. The pathway comprises three sequential accelerators — systematizing firm-wide accountability, adopting an emissions-centric measurement approach, and implementing the path to zero operating emissions as standard design protocol — each grounded in strategies already in practice across the research cohort, and supported by recommendations for coordinated industry action.

Scope and Intent

This report is a state-of-the-industry assessment at a pivotal moment. The 2030 deadline is now less than five years away, and the scale of change needed between now and 2030 demands clarity on where the profession stands, what conditions shape its trajectory, and what coordinated action — at both the firm and industry level — would close the remaining distance.

The report focuses exclusively on operating emissions — the original scope of the 2030 Challenge and a domain sufficiently complex to warrant dedicated analysis. Embodied emissions represent a significant and growing share of a building's lifecycle impact, and

AIA 2030 COMMITMENT SIGNATORY GROWTH 2011-2015



Growth of AIA 2030 Commitment Signatory Firms over time. All signatory firms, not just those reporting data, are represented.

Data Source: AIA 2030 Commitment 2010-2024 Reporting Year Data

The AIA 2030 Commitment

The AIA 2030 Commitment has been central to the analysis in this report and to the broader advancement of zero operating emissions through architectural practice. Since its launch, the program has grown to over 1,480 signatory firms, generating one of the profession's most valuable strategic assets: a unique, longitudinal dataset of the predicted energy performance of tens of thousands of design projects. The program's continued contribution to establishing a culture of measurement and accountability within the profession — and the data infrastructure it has created — are central to the analysis in this report.

the broader conversation about whole-life emissions accountability is ongoing and essential.

Finally, this report is a diagnostic foundation and a practitioner resource; the work of prioritizing industry-level actions, establishing timelines, and allocating resources requires a broader collaborative effort across professional organizations, tool and platform developers, and practitioners.

From Challenge to Transformation

The 2030 Imperative: From "Architects Pollute" to Action

The 2030 Challenge emerged from a stark and provocative revelation about the architectural profession's role in the climate crisis. In a pivotal *2003 Metropolis Magazine* issue [Architects Pollute!](#), Architecture 2030 founder Edward Mazria detailed his finding that architects, together with the wider building industry, were responsible for nearly half of all U.S. energy consumption and greenhouse gas emissions. This recalculation of the energy and emissions pie reframed the built environment not merely as a contributor to global greenhouse gas emissions, but as the primary source.

In 2005, Architecture 2030 issued the 2030 Challenge as a direct, science-driven response. Architecture 2030 subsequently extended this vision by issuing parallel challenges for existing buildings and embodied emissions, but the original Challenge — focused on operating emissions from new construction and major renovations — remains the focus of this report.

From Challenge to Culture

The 2030 Challenge set ambitious targets. Translating those targets into standard practice across the profession required a mechanism through which firms could institutionalize performance goals, track progress across their full portfolios, and hold themselves accountable over time. The AIA 2030 Commitment, launched in 2009, provided that mechanism. Through the Commitment, over 1,480 firms have formalized their engagement with the Challenge's goals, with varying levels of engagement — reporting firms represent approximately half of total signatories. For firms that have engaged most deeply, the Commitment has driven the development of internal tracking systems, accountability structures, and reporting practices that embed the pursuit of zero operating emissions into the rhythms of everyday practice.

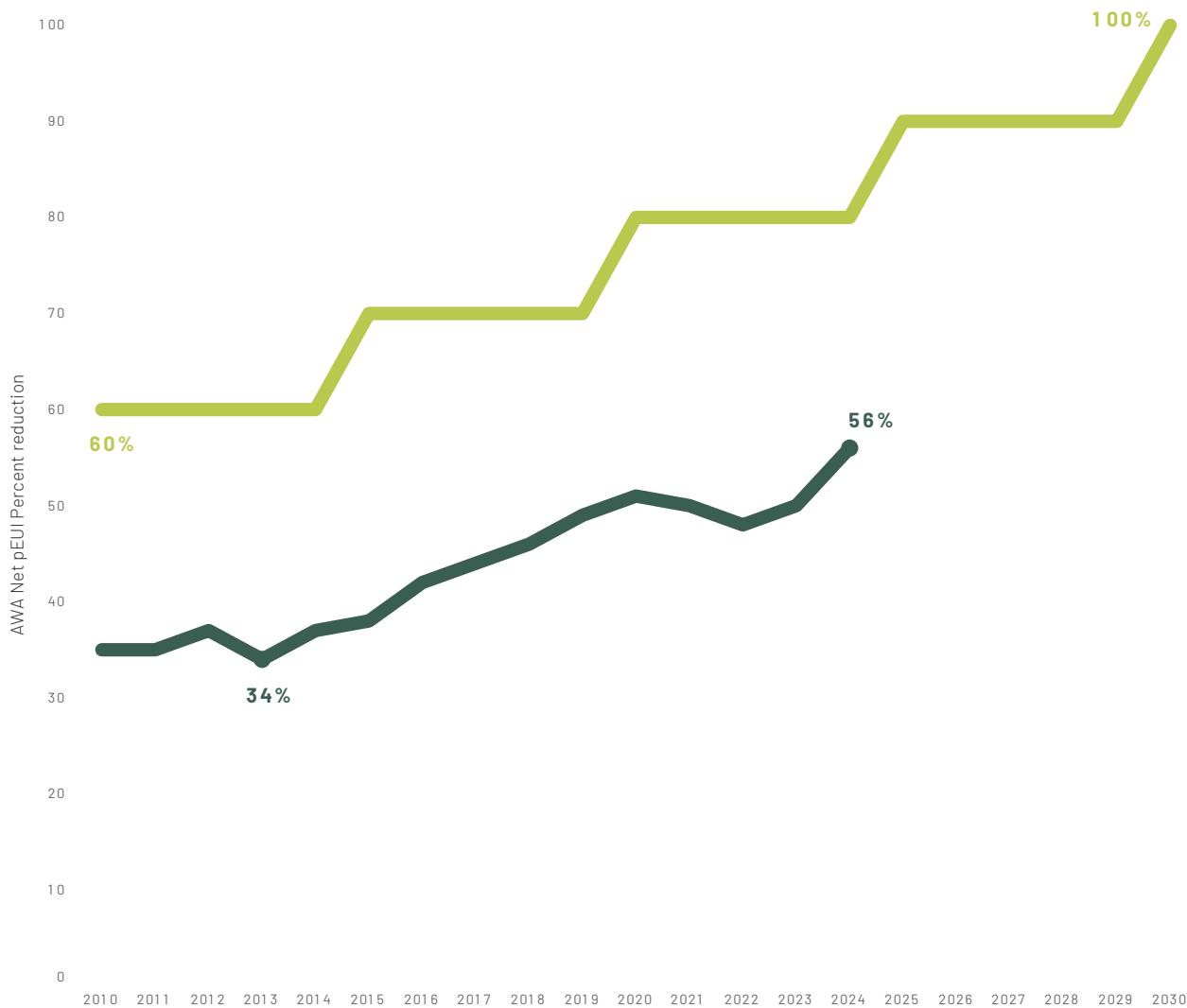
The result is a cultural foundation — built through fifteen years of reporting, accountability, and evolving practice — that makes the Acceleration Pathway that follows achievable. Fifteen years of engagement have developed the organizational capacities, internal commitments, and professional cultures that the next phase of action requires.

EARLY SUPPORT FOR THE 2030 CHALLENGE

The American Institute of Architects became the first major adopter in 2006. The [Congress for the New Urbanism](#), the [National Governors Association](#), and other professional and civic organizations followed, and in February 2007, Architecture 2030's [2010 Imperative: A Global Emergency Teach-In](#) brought the Challenge directly into architecture schools and firms across the country. In May 2007, Architecture 2030, the AIA, [ASHRAE](#), [USGBC](#), and [IES](#) (then IESNA) — with support from the [U.S. Department of Energy](#) — formalized a shared benchmark agreement, establishing [CBECS 2003](#) as the common baseline for measuring progress. This industry-wide consensus on a shared starting point meant that the coalition was not merely aspirational — it was building shared measurement for accountability.

At the policy level, states including Minnesota, Illinois, New Mexico, Washington, and California adopted the Challenge's targets into legislation and energy planning. The [U.S. Conference of Mayors](#) unanimously adopted the 2030 Challenge targets in June 2006, and in December 2007, the [Energy Independence and Security Act \(EISA\)](#) became federal law, with Section 433 requiring all new and renovated federal buildings to meet the Challenge's performance targets, translating the profession's voluntary commitment into binding national policy. Internationally, the [Royal Architectural Institute of Canada](#) adopted the Challenge in 2006, and cities from Sarasota, Florida to Vancouver, BC began integrating its goals into local policy.

2030 CHALLENGE TARGETS & pEUI REDUCTIONS 2010-2030



Reported AIA 2030 Commitment area weighted average pEUI reductions compared to the 2030 Challenge targets by year.

Data Source: AIA 2030 Commitment 2010-2024 Reporting Year Data

A Pivotal Moment

The 2030 deadline is now less than five years away. This closing window heightens the urgency to evaluate progress and accelerate action.

Data from the AIA 2030 Commitment shows predicted Energy Use Intensity (pEUI) reductions improving from approximately 35% in 2010 to 56% in 2024 – progress that exceeded the [ASHRAE Standard 90.1](#) progression in EUI reduction over the same period. Yet reductions remained relatively stagnant from 2019 to 2023, well below the current 90% reduction target.

The plateau reflects an aggregate trend across the reporting cohort, not a uniform condition – our quantitative analysis shows meaningful variation across typologies, with some approaching maximum technically achievable efficiency and others retaining substantial room for improvement.

The reported leveling in EUI reductions stands in contrast to steady sector-wide progress documented by national sources: U.S. building sector operating energy consumption has decreased by 8% and corresponding emissions have dropped by 32% since 2005, even as the nation added approximately 70 billion square feet of new construction. This is a global phenomenon: [while the world](#)

added an estimated 320 billion square feet of new building stock between 2018 and 2023, emissions growth did not keep pace – a break from the historical pattern in which floor area, energy, and emissions rose in lockstep.

A significant portion of this progress is attributable to increasingly stringent energy codes, which raise the performance floor for all projects regardless of individual firm effort – a testament to the power of policy advocacy, and a reminder that the industry’s progress has always depended on the interplay of design practice and enabling policy.

The divergence between reported pEUI reductions and macro-level emissions progress is not a contradiction, it is a signal. The profession has made energy efficiency standard practice over two decades; we have not yet done the same for electrification and renewable energy. 2030 Beyond the Numbers charts an Acceleration Pathway for that last mile – rooted in the evidence of what is already working at the firm level, and identifying the coordinated industry actions that would extend those strategies across the profession.

AIA's 2030 By the Numbers Reports to Date

Since its inception, the AIA's annual 2030 By the Numbers report has served as the primary lens through which the 2030 Commitment measures collective progress. These reports trace the sector's deepening engagement with building decarbonization, from a foundational focus on energy efficiency to a scope that now encompasses the full pathway to zero emissions: electrification, renewable energy, and embodied emissions. Throughout, the reports have emphasized firm culture transformation as a core outcome of the program, and the enabling role of policy advocacy.

2010-2014

Building a Culture of Reporting

The initial reports centered on energy efficiency and energy modeling, establishing predicted EUI percent reduction from CBECS 2003 baselines as the shared standard for measuring progress. Over 100 firms were reporting by 2011, building the foundation for one of the profession's most valuable strategic assets: a longitudinal dataset of predicted energy performance across thousands of design projects.

SCOPE

Efficiency

Electrification

Renewable Energy

Operating Emissions

Embodied Emissions

2015-2018

Measuring the Distance

This period benchmarked the scale of transformation required. In 2015, when the target was a 70% pEUI reduction, reporting firms averaged 38%. By 2019, over 300 firms had raised the average to 49% – sustained progress, but the cohort average remained roughly 30 percentage points below the 80% target. The data revealed how far the profession still had to travel.

SCOPE

Efficiency

Electrification

Renewable Energy

Operating Emissions

Embodied Emissions

2020-2024

Beyond the Energy Metric

As the 2030 deadline drew closer, the program's analytical scope expanded to match the full decarbonization challenge. While pEUI reduction remained central, the reports began tracking electrification rates, fuel source data, renewable energy, and embodied carbon. The 2024 data confirmed two consistent patterns: regions with stringent energy codes produce higher-performing projects, and nearly every project meeting current targets incorporates renewable energy.

SCOPE

Efficiency

Electrification

Renewable Energy

Operating Emissions

Embodied Emissions

2025 & Beyond

The Last Mile

The profession has established energy efficiency as standard practice; the path ahead is extending that same rigor to electrification and renewable energy. Tracking operating emissions alongside energy efficiency is emerging as standard practice – capturing the contributions of all three decarbonization levers and representing the first step toward whole-life emissions accounting.

SCOPE

Efficiency

Electrification

Renewable Energy

Operating Emissions

Embodied Emissions

ACCELERATION PATHWAY

The Last Mile to Zero Operating Emissions



THREE SEQUENTIAL ACCELERATORS

The efficiency plateau is not evidence of stagnation; it is evidence of proficiency— and a signal that the remaining distance to zero operating emissions requires activating the additional levers that build on the profession’s hard-won efficiency gains. This report synthesizes insights from 39 practitioners across 31 firms to chart an Acceleration Pathway for the last mile.

The Last Mile to Zero Operating Emissions

Firms that signed on to the 2030 Commitment made a public pledge to pursue the elimination of fossil fuel energy consumption across their portfolios. Fifteen years later, those firms have built something remarkable: an enduring culture of measurement, accountability, and design excellence that is pushing energy efficiency toward its practical and technical limits. The efficiency plateau is not evidence of stagnation; it is evidence of proficiency — and a signal that the remaining distance to zero operating emissions, while achievable, requires activating the additional levers that build on the profession's hard-won efficiency gains. The industry has made energy efficiency standard practice over two decades of commitment; we have not yet done the same for electrification and renewable energy. That is the path of the last mile.

Practitioners describe this shift as already underway. Firms across the research cohort are adapting their internal systems, metrics, and client engagement strategies to pursue zero operating emissions through the full set of decarbonization levers. Leddy Maytum Stacy achieved portfolio-wide electrification within two years of making it a primary internal metric. LMN Architects established "solar-

ready" specifications as standard practice across all applicable projects. KieranTimberlake provides every client with a visual roadmap that delineates the contributions of efficiency, electrification, on-site renewables, and off-site procurement to zero operating emissions. These are not isolated innovations; they represent a pattern documented across the 31 firms interviewed for this report.

This report synthesizes insights from 39 practitioners across those 31 firms to chart an Acceleration Pathway for the last mile to zero operating emissions. The pathway comprises three sequential accelerators — each building on the last:

Accelerator 1: Institutionalize Cultural Accountability

The foundation. Firms that have embedded performance targets into their governance, project management, and incentive structures describe a consistent shift: performance becomes a firm-wide expectation rather than a project-by-project variable. Without this organizational commitment, the accelerators that follow remain aspirational. This is where the pathway begins: with the decision to own the targets, hold the firm accountable, and make zero operating emissions a shared professional expectation.

Accelerator 2: Adopt an Emissions-Centric Measurement Approach

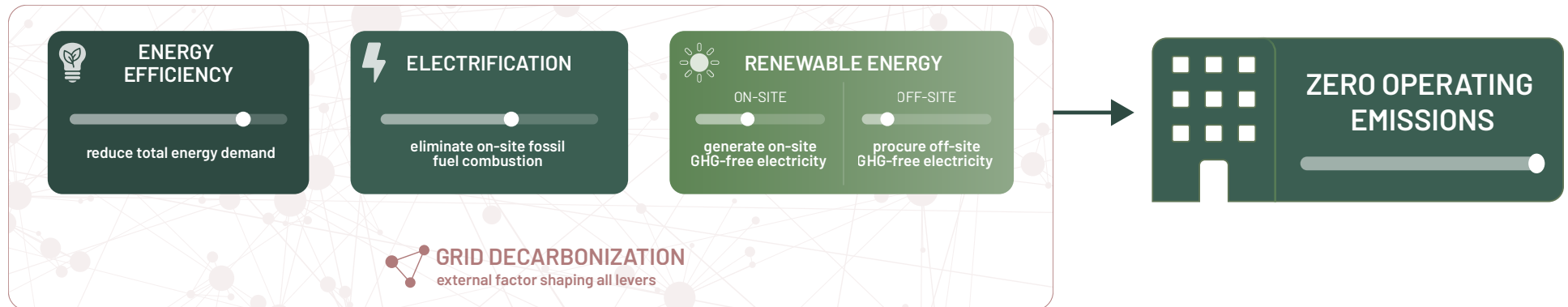
The expanded lens. With accountability systems in place, the next step is ensuring that what firms measure reflects the full scope of their commitment. Tracking operating emissions alongside energy efficiency captures the contributions of electrification, renewable energy, and grid decarbonization — the levers that EUI alone does not reach. This accelerator also calls for honest assessment of the baselines and benchmarks against which progress is measured, so that metrics inform strategy accurately and do not set up unrealistic expectations or obscure achievement.

Accelerator 3: Implement the Path to Zero Operating Emissions

The action. With accountability structures and an accurate measurement lens in place, firms can systematically pursue zero operating emissions on every project: defining internal standards for zero operating emissions readiness, developing renewable energy procurement literacy, and creating client roadmaps that delineate what is within designer control and what requires client action. This is the culmination: translating commitment and comprehension into a repeatable protocol applied across the full portfolio.

Beyond the Energy Metric

The 2030 Challenge calls for buildings that "use no fossil fuel GHG-emitting energy to operate" by 2030. Achieving this goal requires action across three interdependent levers:



A fourth factor – the decarbonization of the electricity grid – links these levers to actual emissions outcomes. As regional grids decarbonize, the emissions associated with electricity consumption in buildings decline. Grid decarbonization is largely outside designer control, and its pace varies significantly by region. In areas served by high-emissions grids, electrification without concurrent energy efficiency and renewable energy strategies may not yet yield immediate emissions reductions, though the long-term trajectory of grid decarbonization favors all-electric buildings regardless of current grid composition. This reality underscores the importance of pairing electrification with energy efficiency and

on-site or off-site renewable energy, and the urgency of grid advocacy. Where grids are already decarbonizing, an efficient, all-electric building is on a path toward zero operating emissions, even without on-site or off-site renewable energy procurement.

The 2024 [National Definition of a Zero Emissions Building](#) codified the three-lever approach at the federal level. While the Definition was rescinded in December 2025, the underlying technical consensus remains unchanged and continues to guide practitioners and standard-setting organizations. The emerging [ICC/ASHRAE Standard 240P](#) builds on this consensus, establishing a methodology

for calculating operating emissions that incorporates future grid emissions projections and accounts for all three levers and the trajectory of the decarbonizing grid – formalizing at the industry level the same integrated, emissions-based approach to performance measurement that this report's Acceleration Pathway charts for individual firms.

01

ACCELERATOR

Institutionalize Cultural Accountability

Firms that have embedded performance targets into their governance, project management, and incentive structures describe a consistent shift: performance becomes a firm-wide expectation rather than a project-by-project variable. Without this organizational commitment, the accelerators that follow remain aspirational.

SEE IN PRACTICE

[The Incentive Aligner • DLR](#)

Institutionalize Cultural Accountability

The Condition

The 2030 Challenge targets are ambitious by design. Meeting them requires ongoing, portfolio-wide commitment – not episodic achievement on individual projects. Yet firms with strong sustainability leadership and deep technical expertise still report inconsistent performance across their portfolios. The gap is not one of knowledge or ambition. It is structural: when performance targets exist outside the systems through which staff are assessed, projects are reviewed, and professional advancement is determined, high performance remains discretionary, pursued on select projects by motivated teams but never the firm's baseline expectation.

Architecture has not historically connected performance outcomes to individual compensation and career progression in the way that other industries connect organizational objectives to financial rewards and advancement. Performance goals in practice frequently remain aspirational, detached from the evaluation and incentive structures that shape daily behavior. The firms

in this cohort that demonstrate consistent portfolio-wide progress share a common characteristic: they have closed this gap through intentional organizational design – leadership mandates, integrated workflows, transparent data, and incentives tied directly to performance outcomes.

This is the foundation upon which the last mile to zero operating emissions depends. Expanding the measurement lens and implementing zero operating emissions protocols are only as durable as the accountability systems that sustain them.

In Practice

1. Secure Leadership-Driven Mandates

When firm leadership holds principals accountable for the performance outcomes of their portfolios, zero operating emissions ceases to be an optional pursuit. Top-down commitment creates the conditions for project teams to prioritize performance throughout the design process – not as an add-on, but as a core expectation alongside budget and schedule.

From Practice: *At LPA and HOK, principals carry direct accountability for their portfolios' performance outcomes.*

“ Embedding design performance into every single design professional's roles and responsibilities as their key performance metrics...that's a big journey, and we're finally here.

— Prem Sundharam, Chief Climate Officer, DLR Group

2. Integrate Performance into Project Management

Performance tracked alongside budget and schedule from project inception becomes a core deliverable; performance introduced late or tracked separately becomes an afterthought. Fee templates that prioritize sustainability and energy modeling hours, performance as a standing item in project reviews, and explicit performance milestones in project plans all serve the same function: they position performance as a managed project outcome with the same structural support as cost and timeline.

From Practice: *Leo A Daly includes EUI as a standing agenda item in monthly project financial reviews, creating routine accountability at the project manager level. DLR Group protects sustainability hours within standard fee templates, ensuring that performance strategies are not the first casualty of value engineering.*

3. Create Data Transparency and Visibility

When performance data is visible across offices and studios – through dashboards, visual displays, or recurring firm-wide presentations – teams that might otherwise operate without reference to the firm's overall performance gain both context and motivation. Visibility also creates constructive pressure: when every office can see how its performance compares,

the professional culture shifts toward shared accountability.

From Practice: *HDR's "Project Pulse" business intelligence dashboard draws real-time project data from accounting systems and presents performance by office and sector across the firm's global network. Sasaki holds firm-wide performance presentations that make portfolio trends visible and identify both achievements and areas for focused improvement.*

4. Build Firm-Wide Performance Literacy

Performance literacy develops fastest when it is treated as a core professional competency rather than a specialization. Staff who learn to interpret energy model outputs, iterate performance strategies, and evaluate consultant recommendations bring that capacity into every project – not just the ones with a sustainability specialist on the team. Onboarding is the most direct pathway for building this fluency at scale: new staff who contribute to portfolio reporting and performance tracking as part of their standard training carry that literacy into every team they join, gradually raising the firm's baseline. Beyond performance literacy, portfolio familiarity is itself a professional asset: practitioners who know their firm's full body of work bring that knowledge into client conversations, design decisions, and new business pursuits.

From Practice: *Mahlum rotates emerging professionals through its annual data collection and reporting process, building familiarity with performance metrics and portfolio tracking as a component of early professional development. At KPF, project managers receive training to interpret energy model outputs, evaluate consultant recommendations, and identify when additional analysis is needed – embedding this literacy directly into the project management role.*

5. Align Incentives with Outcomes

When meeting performance targets influences compensation and career progression, achieving those targets becomes a professional expectation rather than an individual choice. This is the most direct mechanism for connecting organizational priorities to individual behavior – and the step that many firms have not yet taken. Importantly, this approach also surfaces the barriers that prevent targets from being met. When a team cannot achieve a performance target due to conditions outside designer control – prohibitive utility fees, an unfavorable grid, client constraints – that gap becomes visible, documented, and attributable to its actual source rather than absorbed as an undifferentiated shortfall in firm performance.

From Practice: *DLR Group connects project-level performance achievement to staff performance management decisions.*

Industry Actions to Enable This Accelerator

Provide Implementation Models

Industry organizations can document and disseminate detailed accounts of how firms of different sizes and specializations have embedded accountability systems, providing adaptable models that reduce the implementation barrier for firms beginning this work.

Develop Standard Evaluation Criteria

Industry organizations can establish sample performance criteria for staff evaluation that firms can incorporate into existing review processes, providing a starting point for firms that have not yet connected performance outcomes to professional development.

02

ACCELERATOR

Adopt an Emissions-Centric Measurement Approach

With accountability systems in place, the next step is ensuring that what firms measure reflects the full scope of their commitment. Tracking operational emissions alongside energy efficiency captures the contributions of electrification, renewable energy, and grid decarbonization – the levers that EUI alone does not reach.

SEE IN PRACTICE

[The Realist on the Efficiency Plateau • HDR](#)

[When Metrics Match Mission • LMS](#)

[The Emissions-Centric Pioneer • KieranTimberlake](#)

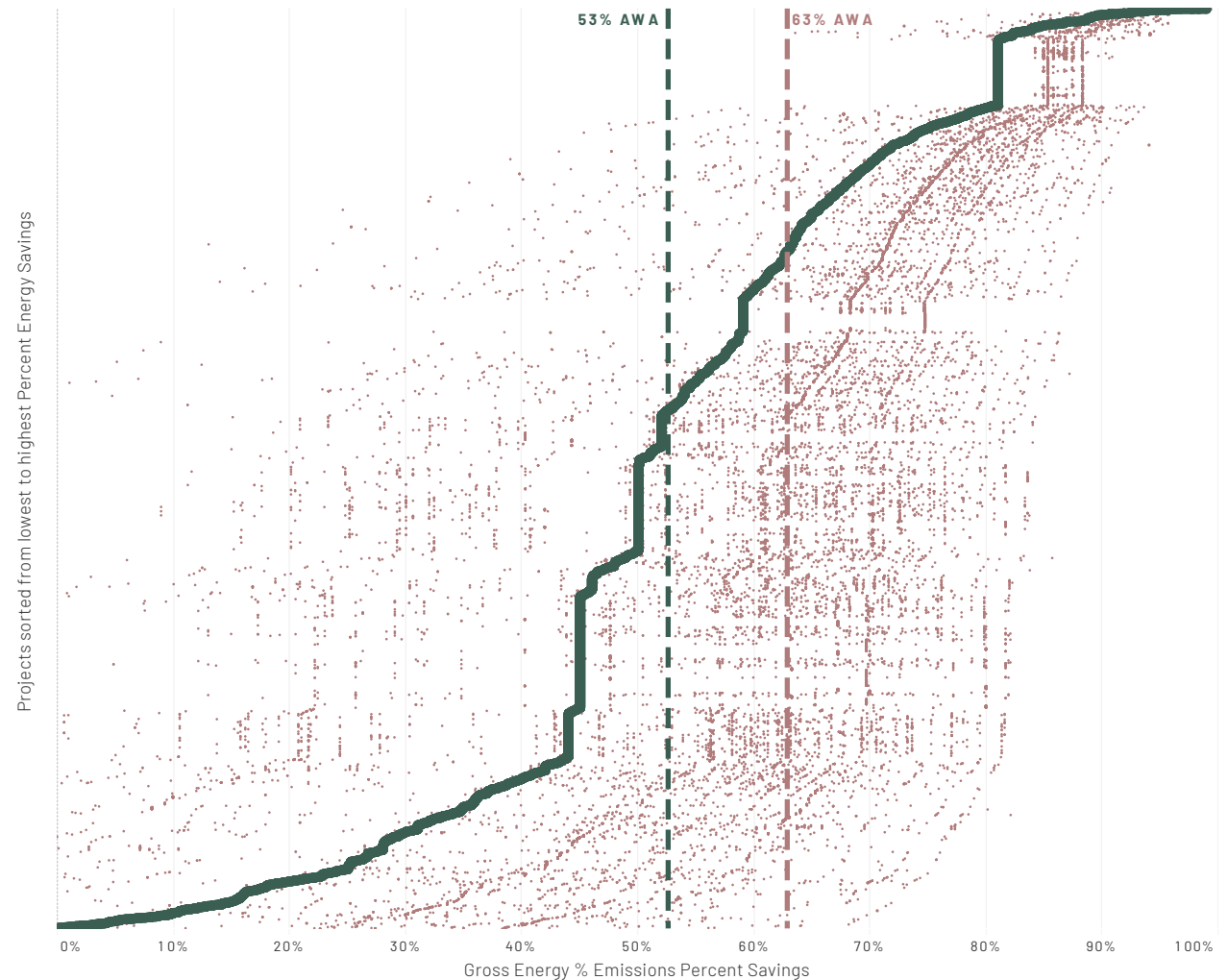
Adopt an Emissions-Centric Measurement Approach

The Condition

The next question is whether firms are measuring what they have committed to achieve. EUI does not distinguish between fuel sources: an all-electric building and a gas-fired building with identical EUIs appear to perform equivalently, masking fundamentally different emissions trajectories. Net EUI – which subtracts on-site renewable energy generation – captures one additional lever, but still does not distinguish between fuel sources or account for grid decarbonization. As regional electricity grids shift toward renewable sources, the emissions associated with efficient all-electric buildings decline, yet neither EUI nor net EUI register that change.

Compounding this, the CBECS 2003 baselines against which EUI reductions are measured are increasingly misaligned with contemporary code requirements and operational patterns. Large-volume athletic facilities (such as indoor practice fields or natatoria) start from baselines so low that deep percentage reductions are mathematically improbable energy efficiency

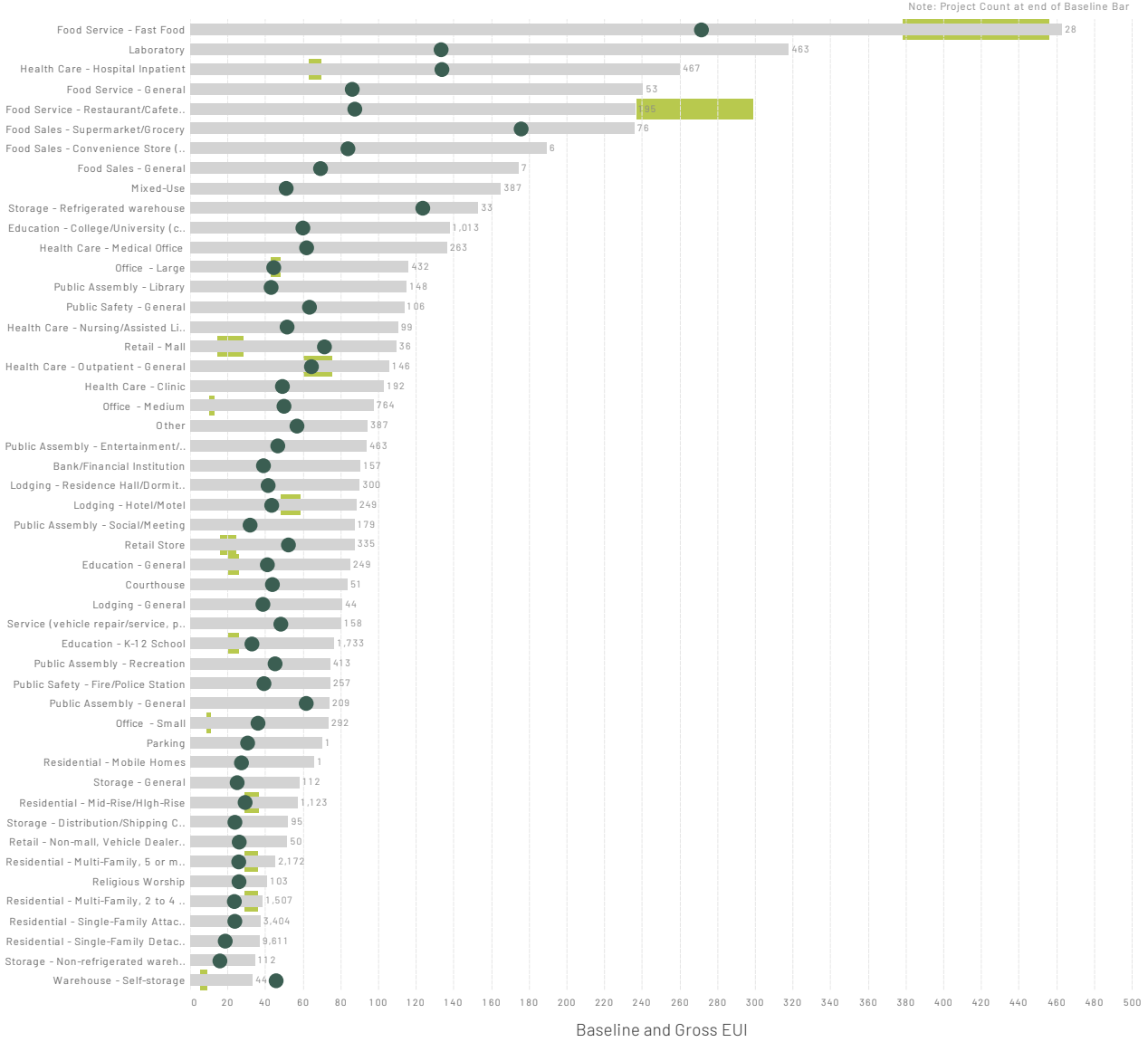
ENERGY SAVINGS COMPARED TO EMISSIONS SAVINGS



Gross energy reductions compared to gross emissions reductions for all reported 2030 Commitment projects, sorted by gross energy reduction. Dashed lines show area-weighted averages for each. Most projects achieve greater emissions reductions than energy reductions, indicating progress toward emissions targets that goes beyond what energy efficiency alone can capture.

Data Source: AIA 2030 Commitment 2024 Reporting Year Data

BASELINE, GROSS, & THEORETICAL MAX TECH EUI



Area-weighted averages by detailed typology. Most typologies show 30-70% gross pEUI reductions from their CBECS 2003 baselines. Typologies with significant process loads show limited progress, and gaps between reported and theoretical EUI in several typologies suggest room for further technology implementation, and raise questions about the granularity of typology categories.

Data Source: AIA 2030 Commitment 2024 Reporting Year Data

even with significant efficiency gains. The healthcare baseline predates the 2008 adoption of [ASHRAE Standard 170](#), which mandated substantial ventilation increases; healthcare projects are measured against energy profiles that no longer reflect code-minimum practice. even with significant efficiency gains. The healthcare baseline predates the 2008 adoption of ASHRAE Standard 170, which mandated substantial ventilation increases; healthcare projects are measured against energy profiles that no longer reflect code-minimum practice.

“Healthcare is challenging...the baseline for the 2030 Commitment is pre-ASHRAE 170... you’re swimming upstream on healthcare a little bit.” – Anica Landreneau, Global Director of Sustainable Design, HOK

Binary electrification tracking presents a similar limitation: a project that electrifies all major systems but retains minimal gas service – for emergency backup, cooking, or other context-specific end uses – is categorized as “Not All-Electric,” even when it may eliminate 95% of on-site fossil fuel combustion.

The result is a measurement convention that has not kept pace with the strategies it was designed to track. Outdated baselines, binary electrification tracking, and a single-lever metric combine to produce a perception of stalled progress – when firms have in fact achieved genuine proficiency in

energy efficiency and are actively pursuing electrification and renewable energy. An emissions-centric measurement approach captures the combined contributions of all three decarbonization levers while retaining EUI as a guardrail metric for energy efficiency, ensuring that the profession’s hard-won efficiency gains remain visible and that the foundational role of demand reduction is not diminished.

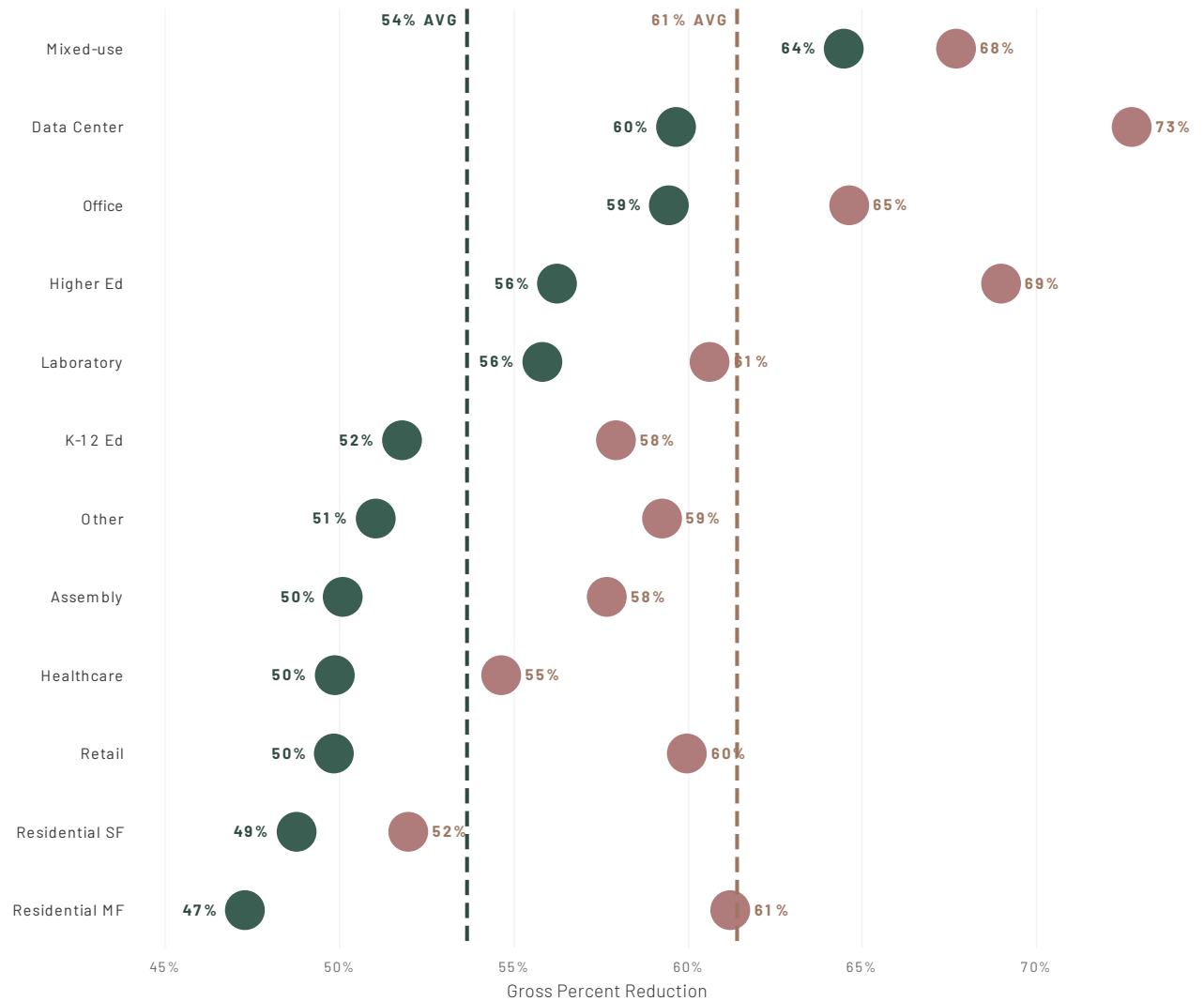
In Practice

1. Track Operating Emissions as a Primary Metric

Calculating and tracking operating emissions for every project using regional grid data measures progress toward the 2030 Challenge’s fossil fuel elimination goal. Sources such as [EPA eGRID](#) and [NREL Cambium](#) provide current and projected grid emissions factors, allowing firms to understand how a project’s emissions profile will evolve as the grid decarbonizes.

An operating emissions metric reveals the combined impact of efficiency, electrification, and renewable energy – the full scope of progress that EUI alone cannot capture. EUI continues to serve an important function as the metric for tracking energy efficiency and communicating energy cost implications to clients – a role that operating emissions tracking complements but does not replace.

GROSS ENERGY & EMISSIONS REDUCTIONS



Area-weighted average gross energy reductions compared to gross emissions reductions by typology. The difference between the two reflects the emissions intensity of regional electricity grids. Typologies with higher electrification rates (e.g., Data Centers, Higher Ed), or that may be concentrated in lower-emissions grids (e.g., Residential Multifamily, Assembly, Retail), show larger emissions reductions relative to energy reductions.

Data Source: AIA 2030 Commitment 2024 Reporting Year Data

Energy modeling provides the fuel source breakdowns, hourly load profiles, and scenario comparisons that make emissions-based decision-making possible.

From Practice: *KieranTimberlake uses Cambium to project how each project's emissions will change with grid decarbonization and analyzes hourly marginal emissions rates to prioritize design strategies based on both climate impact and energy savings.*

2. Measure Incremental Progress on Each Lever

Tracking incremental interventions — such as percent of building systems electrified or electric- and solar-ready design — supports the sequential reality of the path to zero operating emissions. A project that electrifies all major systems while retaining gas for cooking or emergency backup has made fundamentally different progress than one that has not addressed electrification at all. Similarly, solar-ready design — a low-cost commitment that materially increases the likelihood of future renewable installation — represents meaningful preparatory progress toward zero operating emissions.

3. Apply Professional Judgment on Baselines and Benchmarks

When CBECS 2003 baselines are misaligned with project realities, use professional

judgment to identify more appropriate reference points. Alternative baselines include comparable projects within a firm's own portfolio, industry databases for specialized typologies such as the [Laboratory Benchmarking Tool \(LBT\)](#) and the [Cornell Hotel Sustainability Benchmark Index \(CHSB\)](#), and typology-specific targets from [ASHRAE Advanced Energy Design Guides](#). Firms can also track proximity to zero by measuring absolute EUI or emissions performance rather than percent reduction from an outdated baseline.

Benchmarks that evolve with industry progress — such as [ASHRAE Standard 100](#), percent improvement beyond the applicable project energy code, achievement of the latest national model code, and peer performance comparison — provide additional context for evaluating progress.

From Practice: *Leddy Maytum Stacy abandoned EUI percent reduction as an internal metric and began tracking "percent towards electrification" and proximity to zero. The result was a portfolio-wide shift: within two years, all projects were all-electric.*

4. Position Efficiency as the Foundation, Not the Finish Line

Rigorous energy efficiency remains the foundation; passive strategies, optimized envelopes, and right-sized systems reduce the scale of electrification and renewable energy

// We really need to think about this as an emissions story.

— Kit Elsworth, Associate,
Building Performance Researcher,
KieranTimberlake

needed to reach zero operating emissions. But efficiency is a means to the end, not the end itself. Communicating this framing internally clarifies the full pathway to zero operating emissions and orients firms toward the strategies – electrification and renewable energy – that close the remaining distance.

Industry Actions to Enable This Accelerator

Evolve Primary Metrics

For programs, tools, and platforms currently using energy efficiency as the primary measure of performance, elevate operating emissions to the primary metric while maintaining EUI as a core measure of energy efficiency.

Standardize Operating Emissions Accounting

Establish industry alignment on grid emissions data sources (such as EPA eGRID for historical and current average emissions factors and NREL Cambium for marginal emissions rates and future emissions projections), calculation methodology, and data exchange standards. Consistent operating emissions tracking across tools, platforms, and programs requires a coordinated alignment effort: convening professional organizations, program administrators, platform developers, and standards bodies to create a shared operating emissions schema equivalent to the ECHO Project schema for embodied carbon.

“Practitioners can get framework fatigue trying to keep up with various reporting commitments... We need a tech solution here. Reporting tools need to be integrated into common workflows and delivery platforms.”

– Daniel Overbey, Director of Sustainability, Browning Day

Update Critical Baselines

Audit and replace CBECS baselines for typologies in which misalignment is most acute – healthcare, data centers, multifamily residential, higher education, retail, sports venues, and athletic facilities – to reflect contemporary code requirements, modern equipment loads, and current operational patterns.

Develop Benchmarking Guidance

Provide clear guidance on when and how to apply alternate benchmarking approaches, including code compliance, peer performance comparison, and proximity-to-zero tracking.

03

ACCELERATOR

Implement the Path to Zero Operating Emissions

With accountability structures and an accurate measurement lens in place, firms can systematically pursue zero operating emissions on every project: defining internal standards for zero operating emissions readiness, developing renewable energy procurement literacy, and creating client roadmaps that delineate what is within designer control and what requires client action.

SEE IN PRACTICE

[The Technology & Implementation Gap • PAE](#)[The Community Connector • PAE](#)

Implement the Path to Zero Operating Emissions

The Condition

With accountability structures and an expanded measurement lens in place, the question becomes practical: how does a firm systematically pursue zero operating emissions on every project in its portfolio?

Energy efficiency strategies are well-established across the profession – the product of two decades of effort by firms committed to the 2030 Challenge. Closing the remaining distance to zero operating emissions requires technical expertise, internal standards, and client conversations that the profession's efficiency-first era did not demand.

Many firms treat electrification and renewable energy as supplemental strategies, pursuing them opportunistically when client budgets or project contexts align, rather than integrating them as standard practice on every project.

The technical pathway to zero operating emissions is well-understood, but the protocols, internal standards, and client engagement tools needed to pursue it systematically across

a full portfolio have not yet become standard practice.

Closing this gap – between the technical viability of zero operating emissions and its reliable implementation across full portfolios – is the work that defines the profession's final approach to 2030.

In Practice

1. Define a Zero Operating Emissions Ready Standard

Defining and applying a clear internal standard for what constitutes a zero operating emissions ready project creates a consistent baseline across all of a firm's work, regardless of whether individual clients immediately pursue renewable energy strategies. This standard may include:

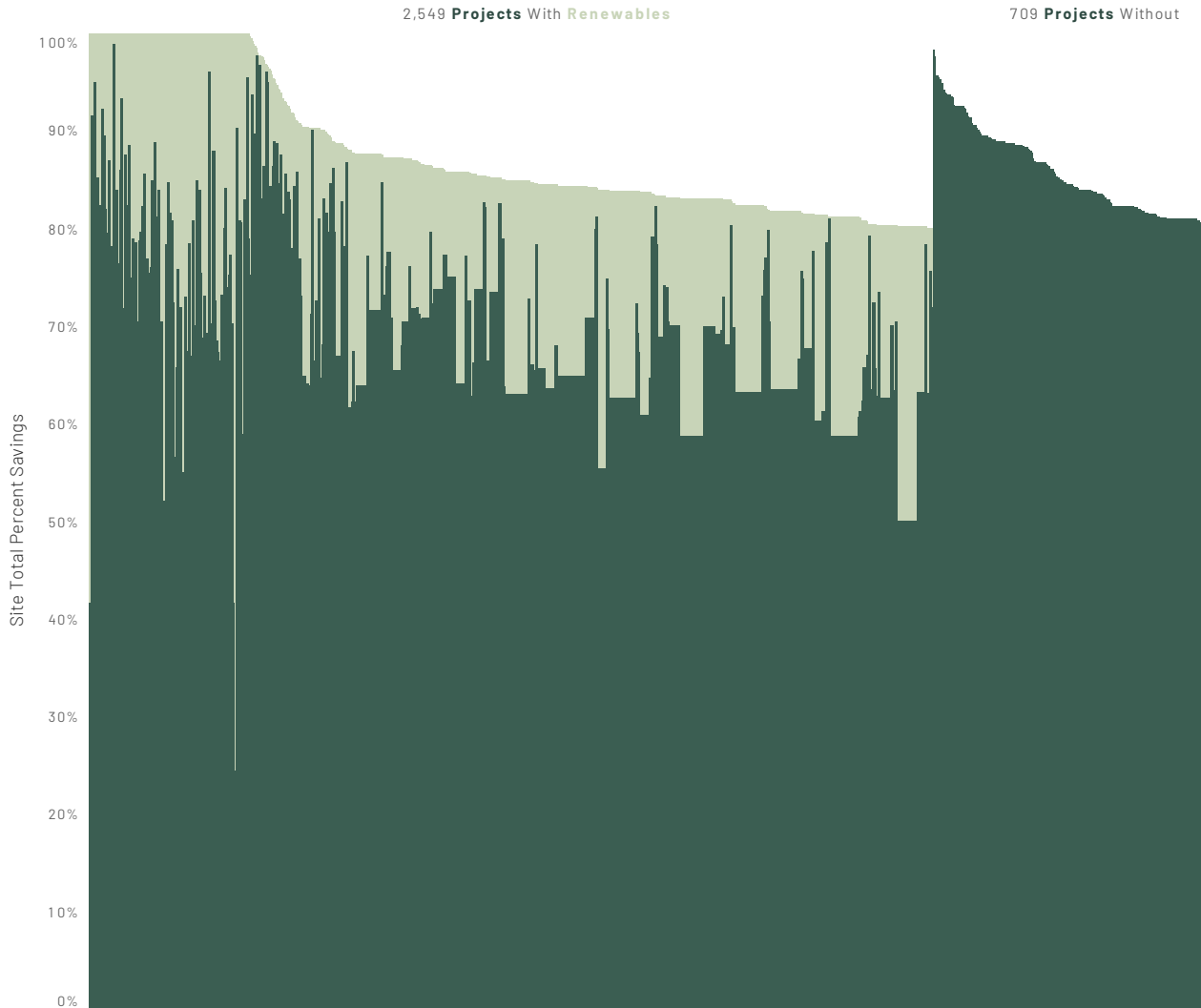
- All-electric systems and appliances
- Sizing electrical capacity to meet full building loads plus future on-site generation
- Solar-ready design: roof structure rated for panel loads, conduit pathways from roof to electrical room, and electrical panels sized for solar backfeed

This approach maximizes the decarbonization strategies most fully within designer control – efficiency and electrification – while positioning buildings to benefit from grid

“ Making everything solar-ready primes nearly all of our buildings to meet 2030 targets. With the lower costs and increasing benefits of solar, many of our clients make late decisions to install solar as part of construction, or install it shortly after construction.

– Kjell Anderson, Principal /
Director of Sustainable Design,
LMN Architects

PROJECTS REPORTING >80% ENERGY REDUCTIONS, WITH RENEWABLE ENERGY CONTRIBUTION



Projects reporting gross or net energy reductions above 80%, with renewable energy contributions shown in yellow. Nearly all projects reaching this threshold incorporated on-site or procured renewable energy – efficiency alone does not achieve the 2030 Challenge targets.

Data Source: AIA 2030 Commitment 2024 Reporting Year Data

decarbonization and future client investment in renewable energy.

Without these provisions, adding all-electric systems or rooftop solar after occupancy may require electrical upgrades and structural modifications that could have been avoided entirely. Specifying electric- and solar-ready design during initial construction costs a fraction of retrofitting later.

From Practice: HDR defined a "Zero Operating Emissions Ready" standard that focuses on what they can implement – aggressive modeled efficiency, full electrification, and maximum feasible on-site renewables – positioning buildings for future grid decarbonization and client investment in off-site procurement. This standard clearly delineates where architectural agency ends and where client responsibility begins.

Renewable energy procurement is unfamiliar territory for many architectural practices, yet it is necessary for achieving zero operating emissions when on-site generation is constrained by site limitations, historic district restrictions, or grid infrastructure barriers. The procurement landscape includes direct and virtual power purchase agreements, community solar, utility green tariffs, and renewable energy certificates – each with different cost structures, contract requirements, regional availability, and emissions impacts.

Developing internal expertise in renewable energy procurement pathways enables firms to present clients with clear options, realistic cost projections, and informed recommendations – bringing procurement guidance into the design process instead of leaving it to later project phases or outside consultants.

Resources: Architecture 2030's [Zero Code](#) website provides guidance on off-site procurement pathways, technical documentation comparing approaches, and model language for procurement agreements.

3. Create Client Roadmaps to Zero Operating Emissions

Translating the technical pathway to zero operating emissions into clear, actionable roadmaps tailored to specific client priorities makes the pathway navigable rather than abstract. Multiple pathways can be presented – immediate all-electric with on-site solar, phased electrification with future renewable procurement, zero operating emissions ready – each with transparent cost implications, timeline requirements, and performance outcomes.

The most effective approach connects zero operating emissions strategies to outcomes clients already prioritize: operational cost savings, institutional mission alignment, occupant health and well-being, and climate resilience.

The Zero-Ready Protocol

Define and apply a clear internal standard for zero operating emissions-ready projects, to create a consistent baseline across all firm work. This approach maximizes the decarbonization strategies most fully within designer control – efficiency and electrification – while positioning buildings to benefit from grid decarbonization and future client investment in renewable energy.

ROOF

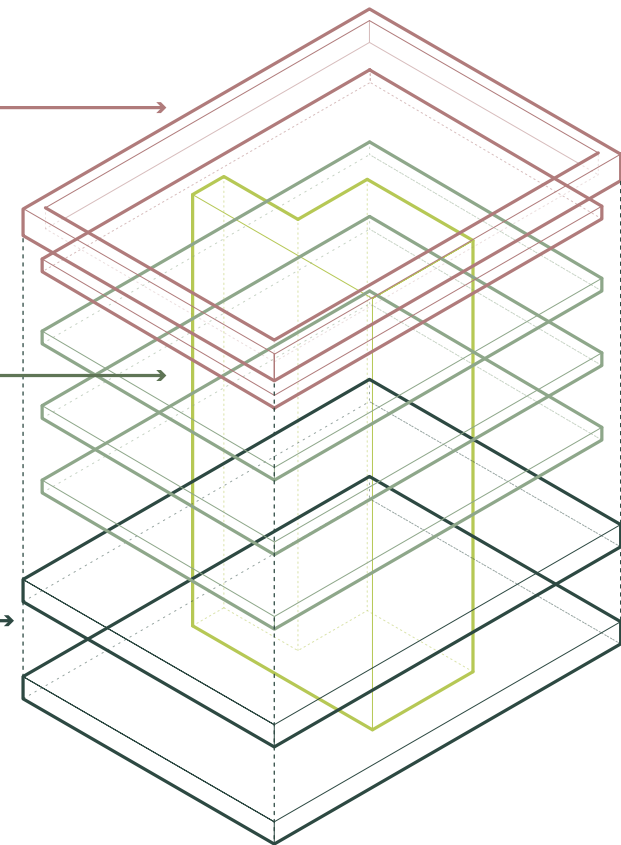
Install On-Site Solar
(or design for Solar-Readiness)

SYSTEMS

Use All-Electric Systems
(or design for Electric-Readiness)

ENVELOPE

Maximize energy efficiency
within technical limits



A high-performance envelope can be framed as an investment in occupant comfort and passive survivability. Electrification can be presented not as a cost premium but as a hedge against fossil fuel price volatility and future regulatory requirements. On-site solar, paired with battery storage, can be positioned as both a visible expression of institutional values and a direct investment in operational resilience.

This translation work — from technical pathway to strategic value — determines whether zero operating emissions becomes a client priority or remains a design aspiration.

From Practice: *KieranTimberlake provides every client with a “steps to zero” roadmap — a visual graphic that delineates contributions from efficiency, electrification, on-site renewables, and off-site procurement. Using Cambium data to project how each building’s emissions will change as the grid decarbonizes, these roadmaps make the path to zero operating emissions tangible, and clearly communicate both designer and client contributions to the end goal.*

Industry Actions to Enable This Accelerator

Develop a Zero Operating Emissions Ready Standard

Create an industry-wide definition and specification for zero operating emissions

ready projects, including minimum requirements for high-performance envelope and systems, all-electric infrastructure, electrical capacity sizing (including electric vehicle readiness), and renewable-ready design. A shared definition would connect existing fragmented standards, replace the ad hoc definitions firms are developing independently, establish a credible and consistent understanding of the term across client conversations and industry reporting, and give tracking programs a way to recognize design decisions that position buildings for zero operating emissions even when on-site renewables or off-site procurement are not yet in place.

Expand Renewable Energy Procurement Guidance

Build on existing materials such as Architecture 2030’s Zero Code resources to develop region-specific procurement guidance that addresses local utility structures, policy environments, and program availability, equipping firms to provide clients with actionable recommendations tailored to their jurisdiction.

Establish Model Client Communication Tools

Develop template presentations, cost calculators, and roadmap visualizations that translate the path to zero operating emissions into client-facing value propositions, connecting technical strategies to outcomes

including operational cost savings, resilience, mission alignment, and regulatory compliance.

Coordinate Regional Advocacy Networks

Some barriers to zero operating emissions cannot be overcome through design excellence alone. Prohibitive utility interconnection fees can render solar projects economically impossible regardless of client commitment. Grid capacity constraints can block new renewable interconnections. The absence of viable procurement mechanisms can eliminate pathways to off-site renewable energy.

Creating regional networks to connect firms that face similar policy barriers — and partnering with established advocacy organizations such as the [Building Decarbonization Coalition](#) — would enable coordinated advocacy on the local conditions that most directly affect whether design intent translates into emissions outcomes. Favorable policy environments in progressive jurisdictions are the product of sustained advocacy by architects and allied professionals — in Minnesota, architects at the [Center for Sustainable Building Research](#) partnered with state agencies to update energy codes on a regular cycle, demonstrating the value of institutionalized advocacy relationships. Coordinated industry support would extend such advocacy capacity to the regions in which systemic barriers remain most entrenched.

Expand Architect-MEP Engineer Collaboration

Facilitate deeper collaboration between architectural firms and mechanical, electrical, and plumbing engineers with proven expertise in all-electric systems and renewable integration. This may include creating forums for sharing lessons learned, developing MEP firm selection best practices for architects, and establishing mentorship programs pairing experienced engineers with firms building capacity in all-electric systems and renewable integration.

Beyond the Targets: Translating Zero Operating Emissions Into Client Value

Clients rarely arrive motivated by the 2030 Commitment or industry decarbonization goals. Yet the same strategies that advance zero operating emissions — efficient envelopes, right-sized systems, electrification, renewable energy — often align with what clients do care about: managing costs, meeting institutional commitments, strengthening resilience, and demonstrating care for people and communities.

Across the research cohort, firms translate zero operating emissions strategies into one of four value-based approaches:

The Business Case: First-cost savings through load reduction and right-sized systems, operational cost savings, risk mitigation against future carbon regulations and fuel price volatility, tenant attraction, and asset value protection. Demonstrating how envelope investment reduces mechanical system cost resonates across client types. Industry data reinforces the case: high-performance buildings consistently achieve higher rental

premiums and stronger resale values, lower operating expense ratios, and improved tenant retention — outcomes that translate directly into long-term portfolio value.

Mission Alignment: Connect to the client's existing public commitments — environmental, social, and governance (ESG) goals, climate pledges, health and wellness initiatives, or stewardship values. Higher education, healthcare, and corporate clients increasingly arrive with stated sustainability goals; the designer's role is showing how zero operating emissions strategies deliver on those commitments.

Proof of Care: Frame investments in efficiency, indoor air quality, and passive survivability as evidence of caring for building occupants, the surrounding community, and the environment.

Resilience and Asset Protection: Position high-performance design as protection against extreme weather and supply disruptions — protecting occupants during outages, reducing damage to building assets, and maintaining operational continuity under adverse conditions.

From Practice: HOK's "Three Buckets" approach diagnoses whether a client's primary motivation falls into business case, mission alignment, or proof of care, then tailors the value proposition accordingly.

BNIM uses a "language filter," systematically analyzing client RFPs to reframe sustainability goals in the client's own terminology.

The exception: firms like Kipnis Architecture and Arkin Tilt leverage their signatory status as part of their brand identity to attract clients already aligned with performance goals.

Cases in Point

Six cases, each illustrating distinct aspects of the transition toward zero operating emissions.

A	DLR GROUP	<i>The Incentive Aligner</i>	ACCELERATOR 1
B	HDR	<i>The Realist on the Efficiency Plateau</i>	ACCELERATOR 2 ACCELERATOR 3
C	LEDDY MAYTUM STACY ARCHITECTS	<i>When Metrics Match Mission</i>	ACCELERATOR 2
D	KIERANTIMBERLAKE	<i>The Emissions-Centric Pioneer</i>	ACCELERATOR 2 ACCELERATOR 3
E	PAE ENGINEERS	<i>The Technology and Implementation Gap</i>	ACCELERATOR 3
F	PAE ENGINEERS	<i>The Community Connector</i>	ACCELERATOR 3

CASE IN POINT A

The Incentive Aligner

DLR Group – Global, Integrated Design Firm & Original 2030 Challenge Signatory

ILLUSTRATES

Accelerator 1

Institutionalize Cultural Accountability

The Context

DLR Group is a global, integrated design firm with over 1,900 employees across 30+ offices, and one of the original signatories to the 2030 Challenge in 2006. Meeting 2030 targets consistently requires ongoing, portfolio-wide commitment – not episodic achievement on individual projects. For firms of this scale, that means embedding performance into the rhythms and incentives of everyday practice until it becomes a firm-wide expectation rather than a project-by-project variable.

The Journey

DLR Group has spent nearly two decades building the systems to operationalize this shift. After hearing Architecture 2030's Edward Mazria speak to the AIA Large Firm Roundtable in 2006, the firm invested heavily in an automated database for tracking project performance. But the real transformation came when the firm began using that data to tie 2030 target achievement to staff performance management. Prem Sundharam, Chief Climate Officer, describes the process as "a six, seven year journey."

The Model

DLR Group now directly ties project-level achievement of 2030 Commitment targets to staff performance management conversations. This transforms meeting targets from a cultural aspiration to an individual incentive – a clear signal that these outcomes matter.

But the firm also recognizes that overly compliance-driven accountability can backfire, dampening engagement and limiting long-term adoption. Sundharam advocates for a "four to one ratio of celebrating progress to reinforcing expectations," maintaining momentum while ensuring consistent follow-through.

Supporting Approaches

Other large firms have developed complementary strategies. At Leo A Daly, pEUI is now a standing agenda item in monthly project-level financial reviews, creating routine project manager accountability. At HOK, performance data is presented annually to the Board of Directors, with resources directed toward closing performance gaps across studios. Mahlum uses pEUI "speedometer" slides in biannual leadership reviews to maintain visibility.

The Takeaway

Moving 2030 target achievement from a specialist concern to a firm-wide accountability structure is a powerful way to accelerate transformation. When meeting targets is tied to staff performance management, it becomes the default rather than the exception.

CASE IN POINT B

The Realist on the Efficiency Plateau

HDR – Global A/E Firm Specializing in Healthcare, Laboratories, & Data Centers

ILLUSTRATES

Accelerator 2

Accelerator 3

Emissions-Centric Measurement

Zero Operating Emissions Ready Standard

The Context

HDR has built a rigorous, data-driven performance management culture. Their custom “Project Pulse” business intelligence dashboard pulls real-time project data from accounting systems, visualizes performance by office and sector, and creates constructive visibility across the firm’s global network. They mandate energy modeling on over 90% of projects, with dedicated hours built into standard fee templates. By every measure of internal process, HDR represents deeply committed practice – yet the industry’s primary performance metric does not reflect the scope of their effort.

The Challenge

Energy efficiency as a proxy for emissions reduction creates challenges across all building types as firms approach an efficiency ceiling, but for high-process-load buildings like HDR’s core portfolio of hospitals, laboratories, and data centers, the misalignment becomes acute. These typologies consume energy primarily through non-negotiable, mission-critical equipment – medical imaging, laboratory and server systems –

where deep energy reduction is often technically impossible. Yet a viable path to zero operating emissions exists through the combined levers of efficiency, electrification, and renewable energy.

The Strategic Adaptation

Confronted with this misalignment, HDR defined a “Zero Operating Emissions Ready” standard – focusing on the levers most within designer control: aggressive modeled efficiency, full electrification, and maximizing on-site renewables. This positions buildings to benefit from future grid decarbonization and client investment in off-site procurement, clearly delineating where architectural agency ends and where client responsibility begins.

The Takeaway

HDR’s pivot to “Zero Operating Emissions Ready” illustrates the value of recognizing sequential progress – tracking efficiency, electrification, and renewables as distinct contributions towards the emissions targets. This approach opens the full path to zero operating emissions – recognizing that the efficiency ceiling is not the end of the road, but the point at which the remaining levers become essential.

//

If I go and I tell a team that they have to hit a 90% reduction, they immediately stop listening... We’re done. This is as far as we can go.

– COLIN ROHLFING, DIRECTOR OF SUSTAINABLE DEVELOPMENT, HDR

CASE IN POINT C

When Metrics Match Mission

Leddy Maytum Stacy Architects (LMS) – Mid-size, Mission-Driven Firm – San Francisco

ILLUSTRATES

Accelerator 2

Emissions-Centric Measurement

Incremental Progress on Each Lever

The Context

By 2017, LMS had 8 years of 2030 Commitment reporting. Yet, the percent pEUI reduction metric had become abstract and, for some project types, misleading. Multifamily housing, for instance, consistently appeared as a "poor performer" despite making solid energy efficiency gains. This misalignment was demoralizing and obscured the real progress towards zero operating emissions.

The Breakthrough Strategy

LMS made a decisive internal pivot to metrics that matched the agency of their designers and the ultimate goal of zero operating emissions. As Associate Principal Gwen Fuertes explains, they abandoned the focus on percent reduction, which "was turning everybody around." Instead, they began tracking three clear, actionable metrics: percent towards electrification, absolute EUI, and proximity to zero energy, visualizing absolute performance against the finish line, not an inaccurate baseline.

The Result

The clarity was transformative. "I thought it would be a slow ramp," Fuertes noted, "but within two years, all of our projects were all electric." The singular focus on electrification cut through design-phase complexity, creating rapid portfolio-wide change on one of the most important

decarbonization levers. By reframing success, they turned a perceived underperformer (multifamily) into a visible part of the zero operating emissions journey.

//

We started just focusing ourselves on percent towards electrification... within two years, all of our projects were all electric. This signaled a transformative milestone to the firm, and emboldens us to continue that streak.

– GWEN FUERTES, ASSOCIATE PRINCIPAL, LEDDY MAYTUM STACY

The Takeaway

This case illustrates that progress accelerates when metrics align with designer agency and a tangible end-state. A percent reduction approach may ask, "How efficiently are we consuming fossil fuels?" – a question with diminishing returns. LMS's pivot asked, "Are we still consuming fossil fuels at all, and how close are we to zero?" This shift redirected creative energy from optimizing within a limited scope to transforming the scope itself.

CASE IN POINT D

The Emissions-Centric Pioneer

KieranTimberlake – Research-Driven Firm with a 100% 2030 Commitment Reporting Rate – Philadelphia

ILLUSTRATES

Accelerator 2

Accelerator 3

Emissions-Centric Measurement

Client Roadmaps to Zero Operating Emissions

The Shift

KieranTimberlake has fully moved beyond a sole focus on EUI. As Research Associate Kit Elsworth explains, "In reviewing our own portfolio...the 2030 goal has become less meaningful because the industry is so close to zero. We are trying to shoot for zero emissions at this point." The firm now treats EUI as an energy efficiency "guardrail" while using operating emissions as the primary metric for design decisions.

The Method

This emissions-centric approach drives more sophisticated analysis. The firm uses Cambium – NREL's dataset for forecasting future grid emission factors – to project how each project's emissions will change as the grid decarbonizes. They study hourly marginal emission rates to identify peak emissions times (such as winter evenings in California), and prioritize electrification and demand-shaping strategies based on emissions impact rather than energy savings alone. Every project receives a "steps to zero" roadmap – a visual graphic delineating contributions from efficiency, electrification, on-site renewables, and off-site procurement.

The Reframe

KieranTimberlake's analysis reframes the industry's energy efficiency plateau not as evidence of stagnation, but as the expected outcome of deploying standard high-performance strategies. As Elsworth notes,

"What we now call the plateau is the limit of architectural, mechanical strategies that we can really squeeze out of a project." An even more encouraging story is in emissions: as regional grids decarbonize, the emissions associated with all grid-connected buildings decline – progress that EUI cannot capture.

The Takeaway

KieranTimberlake illustrates what emissions-centric practice looks like in action – and why the shift matters. When operating emissions become a primary metric, new optimization strategies emerge, the energy efficiency plateau becomes contextualized rather than demoralizing, and the path to zero operating emissions becomes clearer for both designers and clients.

CASE IN POINT E

The Technology and Implementation Gap

PAE Engineers – Leading MEP Firm & Implementation Partner for Architects

ILLUSTRATES

Accelerator 3

Implementation Challenges Beyond Design Intent

The Context

From the engineering frontline, PAE provides a crucial lens on the limits of current technology:

Electrification Technology Readiness

Principal Marc Brune reports widespread "equipment failures and problems" with early air-source heat pump and VRF systems, stating that some of the technology may have been brought to market "before they were quite fully baked." This creates legitimate client risk aversion to electrification. The issue is not electrification itself however; simpler, more robust heat pump systems perform reliably. The challenge lies in complex systems with intricate refrigerant management that the market rushed to deploy before fully maturing.

“

Air source heat pumps...may have been brought to market before they were quite fully baked, to be honest.

– MARC BRUNE, PRINCIPAL / DIRECTOR OF TECHNOLOGY, PAE ENGINEERS

The Plug Load Frontier

Engineers emphasize that unmanaged plug and process loads are a growing challenge – and one largely outside designer control. As Rachel Wrublik notes, "if we're going to get to zero, we really have to tackle the plug loads." As buildings become more efficient, plug loads represent a growing portion of total energy use. These loads affect performance while typically remaining outside the designer's scope: they are difficult to predict in modeling, vary based on occupant behavior, and lack uniform equipment efficiency standards. Without progress on modeling assumptions, real-world monitoring, plug load controls, occupant engagement, and technology standards, plug loads will become an increasingly significant barrier to achieving zero operating emissions.

The Takeaway

Better technology standards, equipment market readiness, and strategies for the plug load frontier are industry-level challenges that extend beyond any individual firm's control – and they represent essential enabling conditions for the last mile.

CASE IN POINT F

The Community Connector

PAE Engineers – [PAE Living Building](#) – Portland, OR

ILLUSTRATES

Accelerator 3

Renewable Energy Procurement Literacy

The Context

For many projects, on-site solar generation alone cannot meet full energy demand – whether due to limited roof area, shading, historic district restrictions, or utility constraints on grid feedback. Off-site renewable energy procurement can close the gap, but options vary widely by region and often remain complex or legally restricted.

The Constraint

For their own new headquarters in Portland's historic Skidmore/Old Town District, PAE confronted multiple barriers. Historic District restrictions limited available roof space for solar panels. The downtown utility area-network does not allow standard net metering – PAE negotiated a limited feedback allowance of just 50kW, only 40% of their rooftop generation capacity. On-site solar alone could not meet energy demand.

The Innovative Solution: Donated Community Solar

PAE implemented a creative workaround suggested by their contractor, Walsh Construction. In addition to maximizing on-site generation, they funded an off-site solar array installed at Renaissance Commons, an affordable housing development operated by REACH Community Housing and built by Walsh. PAE retains the Renewable Energy Credits (RECs) needed for [Living Building](#) certification, while the affordable housing residents receive free on-site renewable energy. The result: the PAE

Living Building is 61% more efficient than code, and through combined on-site generation and the renewable energy certificates from the off-site array, accounts for 113% of its annual energy needs.

//

Could you start to put together partnerships to share the costs? And then maybe the building owner gets the PR benefit of potentially being net zero energy and being a really good community partner.

– MARC BRUNE, PRINCIPAL / DIRECTOR OF TECHNOLOGY, PAE ENGINEERS

The Takeaway

This initiative reframes renewable energy procurement as an opportunity for place-based investment and community benefit – demonstrating that when site, regulatory, or utility constraints prevent on-site generation from meeting full energy demand, creative partnerships can close the gap while delivering wider social value.

Our Qualitative Inquiry: Capturing the "How" and "Why" Behind the Data

To move beyond aggregate statistics and understand the firm-level how and why of progress towards the 2030 Challenge targets – including the key barriers, successes, and innovations shaping firm practice – this report employed a targeted qualitative methodology.

Interviews

Participant Profile

Our team conducted 15 semi-structured interviews with 39 practitioners from 31 distinct architecture and engineering firms who provided institutional perspectives on the program's evolution and data infrastructure. Each interview lasted 60 to 90 minutes, generating over 17 hours of direct conversation and representing more than 60 billable hours of practitioner time. Participants were selected to form a strategically representative cohort:

- **Seniority:** The group included 20 firm principals, partners, or senior executives who set strategic direction, 17 sustainability directors and program managers who

oversee implementation, and two technical specialists providing project-level insight.

- **Firm Representation:** Interviewees represented 31 distinct architecture and engineering firms of varying sizes – from large, international practices to small, specialized studios.
- **Industry Leadership:** Participants were drawn from influential industry networks, including the [Large Firm Roundtable](#) (LFRT), the [Sustainable Design Leaders](#) (SDL), the 2030 Commitment Working Group, and the [Committee on the Environment](#) (COTE), ensuring insights reflected both grassroots experience and organizational leadership.
- **Geographic Diversity:** Participant firms maintain offices spanning all major U.S. climate zones from Zone 1 (Very Hot) through Zone 7 (Very Cold), though interview discussions focused primarily on projects in the most active regions for new construction (Zones 3–6).

Unifying Archetype: The Translator

Across all these sub-groups, participants described a shared core function: translation. Translating climate science into buildable design, translating design value into client language, and translating project-level successes into portfolio-level strategy and advocacy. These practitioners embody the expertise necessary to evaluate industry

evolution, asking from a position of hard-won experience, "Will this change actually work in a firm?"

Interview Protocol

The interview protocol was structured to explore the strategies, drivers, and obstacles shaping firms' progress towards meeting the 2030 Challenge targets and transforming their practice. Core questions investigated:

- **Adoption and Evolution:** The initial motivation for adopting the 2030 Challenge targets and how the firm's internal approach to implementation has evolved over time.
- **Client Collaboration:** Strategies for aligning with client values and advancing performance goals through client-facing communication.
- **Data and Trends:** Surprising outcomes from portfolio tracking, areas of notable progress, and points at which progress has plateaued.
- **Success Factors:** The key drivers and institutional practices that correlate with progress towards the 2030 targets.
- **Barriers:** The most significant barriers to progress, including project-level, firm-level, and systemic constraints.
- **Future Needs:** The data, resources, or insights firms wish they had to accelerate progress towards the targets.

Analysis and Synthesis

All interview transcripts and notes underwent a rigorous thematic analysis. This process combined structured review by the research team with AI-assisted text analysis to identify, categorize, and validate recurring themes. The analysis focused on extracting:

1. **Successful Practices:** Replicable strategies, firm-level protocols, and engagement with enabling policies that drive performance towards the 2030 targets.
2. **Persistent Barriers:** Systemic and project-level obstacles, including restrictive or lagging policies, that impede progress.
3. **Innovative Approaches:** Emerging solutions and adaptations that advance progress towards zero operating emissions.
4. **Actionable Recommendations:** Strategies for firm practice, supported by industry-level recommendations for enabling conditions.

These findings inform the three accelerators of the Acceleration Pathway and the accompanying industry-level recommendations presented in this report.

Literature Review: Situating Firm Insights Within Industry Dialogue

To ground our primary interview data within the wider industry conversation, our research included an extensive literature review. This review examined a wide range of published materials to identify established challenges, emerging solutions, and prevailing narratives surrounding the 2030 targets.

Scope and Sources

The review encompassed both general industry publications and firm-specific sustainability and climate action plans, articles on the 2030 Challenge and the 2030 Commitment, and proprietary in-house resources shared by participating firms.

Synthesis and Integration

This body of literature served as essential context, informing the development of the interview protocol and establishing a baseline of published industry positions against which interview findings could be compared. Key themes, recurrent barriers, and successful practices identified in the literature were used to test whether interview findings confirmed, contradicted, or elaborated upon the published discourse, strengthening the validity and depth of the final analysis.

Integration with Quantitative Analysis

This qualitative inquiry is the heart of the report's research effort. Where the quantitative analysis of reported data reveals what is happening — industry-wide efficiency gains, regional and typological variation, and the contours of the last mile to zero operating emissions — these interviews explain why those patterns exist and how practitioners are navigating the last mile. These findings ground the quantitative trends in practitioner experience and inform the Acceleration Pathway and its three accelerators.

Conclusion

The profession is in the last mile of the path to zero operating emissions for new construction and major renovations. Two decades of sustained engagement with the 2030 Challenge have systematized energy efficiency across the profession, demonstrating the capacity for deliberate, portfolio-wide change. The AIA 2030 Commitment has been central to that effort, providing the measurement framework and professional community through which over 1,480 firms have tracked and shared their progress. The path ahead is extending that same rigor to electrification and renewable energy. The Acceleration Pathway charted in this report identifies three sequential accelerators for closing that remaining distance – institutionalizing firm-wide accountability, adopting an emissions-centric measurement approach, and implementing the path to zero operating emissions as standard design protocol. These accelerators are not aspirational. They are grounded in strategies already in practice, documented across the 31 firms interviewed for this report.

The organizational capacity for this next phase already exists. The accountability structures, performance cultures, and professional commitments built over two decades of engagement are the foundation – what remains is ensuring that the industry's shared

systems of measurement, recognition, and communication evolve to match the full scope of the decarbonization challenge.

This report is centered on what firms can do now. The industry-level actions identified alongside each accelerator – evolving primary metrics to include operating emissions, standardizing emissions accounting, updating outdated baselines, coordinating regional advocacy networks – require wider collaboration across professional organizations, program administrators, tool and platform developers, and practitioners. Architecture 2030 is committed to serving as an honest broker and catalyst in that effort.

The 2030 deadline was always a waypoint. The deeper objective is a profession in which zero operating emissions is the baseline expectation for new construction and major renovations – and ultimately, extending that standard to encompass embodied emissions and the full lifecycle of buildings. The practitioners who contributed to this report have shown that the path is viable, the strategies are replicable, and the remaining distance is closeable. The work of the last mile is making it universal.

Definition of Terms

2030 Challenge

A voluntary initiative launched by Architecture 2030 in 2005 calling for all new buildings and major renovations to achieve zero operating emissions by 2030, with incremental fossil fuel energy reduction targets along the way. The Challenge established the overarching goal; the AIA 2030 Commitment is the implementation program.

2030 Commitment

The AIA program launched in 2009 that enables architecture firms to track and report their progress toward the 2030 Challenge goals. Signatory firms submit annual data on their project portfolios through the Design Data Exchange (DDx).

Baseline

A reference point representing typical energy consumption for a given building type, against which a project's performance is measured. In the 2030 Commitment, baselines are derived from the 2003 Commercial Buildings Energy Consumption Survey (CBECS 2003).

Benchmark

A performance reference point derived from comparable projects or contemporary standards, used to contextualize a project's performance relative to current practice rather than historical norms.

CBECS (Commercial Buildings Energy Consumption Survey)

A national survey conducted periodically by the U.S. Energy Information Administration that collects data on the stock of U.S. commercial buildings, their energy-related characteristics, and their energy consumption. CBECS 2003 data provides the baselines against which 2030 Commitment projects measure percent reductions.

DDx (Design Data Exchange)

The AIA's online platform through which 2030 Commitment signatory firms submit project data and track portfolio performance. The DDx replaced earlier spreadsheet-based reporting systems.

Electric-Ready (Electrification-Ready)

A building design approach that installs the electrical infrastructure (wiring, conduit, panel capacity, and designated equipment space) needed to support future conversion from fossil fuel systems to electric alternatives, even if gas appliances are installed initially. Electric-ready design minimizes the cost and complexity of future electrification retrofits. Sometimes referred to as "heat pump ready" when applied specifically to HVAC systems.

Electrification

The process of replacing fossil fuel-powered building systems (such as gas furnaces, boilers, and water heaters) with electric alternatives, typically heat pumps. Electrification is one of three primary levers for achieving zero operating emissions, alongside energy efficiency and renewable energy.

Embodied Emissions / Embodied Carbon

The greenhouse gas emissions associated with the materials and construction processes throughout a building's life cycle, including raw material extraction, manufacturing, transportation, construction, maintenance, and end-of-life disposal. Distinct from operational emissions, embodied emissions are released before and after the building's use phase.

Energy Efficiency

Strategies that reduce a building's total energy demand through design decisions. Passive strategies—such as building orientation, optimized envelope, thermal mass, natural ventilation, and daylighting—reduce loads without mechanical input. Active strategies—such as efficient HVAC systems, LED lighting, and energy recovery ventilation—minimize energy consumption for loads that remain. Energy efficiency is one of three primary levers for achieving zero operating emissions.

EUI (Energy Use Intensity)

A metric expressing a building's energy consumption relative to its size, calculated by dividing total annual energy use (in kBtu or kWh) by gross floor area (in square feet or square meters). Expressed as kBtu/ft²/yr or kWh/m²/yr. EUI allows comparison of energy performance across buildings of different sizes and types. In the 2030 Challenge, EUI is calculated based on site, not source, energy.

Grid Decarbonization

The transition of electricity generation from fossil fuel sources to renewable sources. As the grid decarbonizes, the emissions associated with electricity consumption in buildings decrease, even without changes to the building itself.

Gross EUI Reduction

The percentage reduction in energy use intensity achieved through energy efficiency measures alone, without accounting for renewable energy contributions. In 2030 Commitment reporting, gross pEUI reduction reflects the building's designed energy demand relative to the CBECS baseline, capturing savings from envelope optimization, efficient systems, and load reduction strategies. This metric isolates the energy efficiency lever from the renewable energy lever.

kBtu (Thousand British Thermal Units)

A unit of energy commonly used in building performance metrics. One kBtu equals 1,000 BTUs. Used in EUI calculations to normalize energy consumption across different fuel types (electricity, natural gas, etc.).

kgCO₂e / lbCO₂e (Kilograms / Pounds of Carbon Dioxide Equivalent)

A standard unit for measuring greenhouse gas emissions, expressing the global warming potential of various gases relative to carbon dioxide. Used in operational and embodied emissions calculations. 1 kgCO₂e ≈ 2.2 lbCO₂e.

Marginal Emissions Rate

The emissions intensity of the electricity added to or displaced from a regional grid in response to a change in demand at a given time. Average emissions rates divide total grid emissions by total generation, producing a blended value; marginal emissions rates instead capture how grid emissions change with each incremental shift in demand, varying by hour, season, and region. This distinction enables strategies such as demand shaping and load shifting based on when electricity consumption has the greatest emissions impact. NREL's Cambium dataset provides projected marginal emissions rates by grid region.

Net Metering

A utility billing mechanism that credits building owners for excess electricity that their on-site renewable energy systems (typically solar) send to the grid. When a building generates more electricity than it consumes, the meter effectively runs backward, providing credits that offset future electricity purchases. Net metering policies vary significantly by state and utility, and some jurisdictions have replaced traditional net metering with alternative compensation structures.

Net EUI / Net Energy Use Intensity

A building's energy use intensity after subtracting the contribution of on-site renewable energy generation. Expressed in the same units as EUI (kBtu/ft²/yr or kWh/m²/yr). In the 2030 Commitment, renewable energy can only offset grid-supplied electricity, not fossil fuel consumption — a structure that incentivizes electrification, since only all-electric buildings can achieve a net EUI of zero through a combination of efficiency and renewable energy.

Net EUI Reduction

The percentage reduction in energy use intensity after subtracting the contribution of on-site renewable energy generation. In the 2030 Commitment, renewable energy can only offset grid-supplied electricity, not fossil fuel consumption — a structure that incentivizes

electrification, since only all-electric buildings can achieve 100% net pEUI reduction through a combination of efficiency and renewable energy. Net pEUI reduction represents the building's combined progress across the energy efficiency and renewable energy levers.

Net-Zero Energy / Zero Energy Building

A building that produces enough renewable energy to meet its own annual energy consumption requirements. The U.S. Department of Energy's common definition (2015) states: "An energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy." The terms "net-zero energy," "zero net energy," and "zero energy" are used interchangeably. This definition focuses on energy balance, not emissions.

Operating Emissions / Operating Carbon

The greenhouse gas emissions associated with the energy used to operate a building, including heating, cooling, lighting, ventilation, and plug loads. Operating emissions occur throughout the building's use phase and can be reduced through efficiency, electrification, and renewable energy.

pEUI (Predicted Energy Use Intensity)

The projected EUI of a building based on energy modeling during the design phase, as opposed to measured EUI from actual building

operation. pEUI is the primary metric used in 2030 Commitment reporting, as most reported projects have not yet been constructed or occupied.

Plug and Process Loads

Energy consumed by equipment and devices that are not part of a building's core systems (HVAC, lighting, water heating). Process loads include computers, office equipment, kitchen appliances, elevators, medical equipment, laboratory ventilation, data center servers, and other mission-critical equipment. Unlike regulated loads, process loads are largely outside the designer's direct control and represent a growing share of total building energy consumption—particularly in high-performance buildings where HVAC and lighting loads have been minimized.

Renewable Energy

Energy generated from sources that are naturally replenished, such as solar, wind, and hydropower. In the context of building decarbonization, renewable energy is typically categorized as on-site (generated at the building, such as rooftop solar) or off-site (procured through mechanisms like Power Purchase Agreements or green tariffs).

Site Energy

The energy consumed at a building's location as reflected in utility bills.

Solar-Ready

A building design approach that incorporates structural capacity, roof layout, and electrical infrastructure to enable future installation of photovoltaic panels, even if solar is not installed at the time of construction. Solar-ready provisions—such as conduit runs, panel space, and unshaded roof area—significantly reduce the cost and complexity of adding solar later.

Source Energy

The total amount of raw fuel required to operate a building, incorporating all generation, transmission, and distribution losses.

Whole-Life Emissions / Whole-Life Carbon

The total carbon / greenhouse gas emissions associated with a building across its entire life cycle, combining both embodied and operating emissions. Increasingly used in building performance frameworks to account for the full climate impact of construction and operation.

Zero Emissions Building Part 1 (Operating Emissions)

A building whose operations result in no greenhouse gas emissions from energy use. The U.S. DOE's proposed definition (2024) specifies that a zero emissions building must be: (1) energy efficient, (2) free of on-site emissions from energy use (i.e., all-electric), and (3) powered solely from renewable energy. An all-electric, efficient building powered by a decarbonizing grid can achieve zero operational

emissions even without on-site renewable generation.

Zero Operating Emissions Ready

A building designed to achieve zero operating emissions through future grid decarbonization and client investment in renewable energy, without requiring major physical retrofit.

Minimum provisions typically include all-electric systems, electrical capacity sized for full building loads plus future on-site generation, and solar-ready design.

Quantitative Analysis Technical Documentation

This appendix provides the detailed data sources, calculation methodology, and filtering criteria used in the quantitative analysis presented in this report.

A.1 Data Sources

The following data sources were used to evaluate the AIA 2030 Commitment Reporting Year 2024 Data:

#	Description	Use in Analysis	#	Description	Use in Analysis
1	<p>AIA 2030 Commitment Reporting Year 2024 Data</p> <p>Submitted to AIA by signatory firms and shared with Architecture 2030 under a Non-Disclosure Agreement. Individual firm identities were not disclosed and no project names were identified.</p>	Primary dataset for all project-level analysis	4	<p>US EPA ENERGY STAR Technical Reference: Estimating Fuel Mix and Energy Cost (Current Version)</p> <p>Page 3, Figure 1: % Electricity Use by Property Type and US Census Region</p>	Estimated reported % Electricity by typology and location for projects without fuel split data
2	<p>ASHRAE 1651-RP: Development of Maximum Technically Achievable Energy Targets for Commercial Buildings, Ultra-Low Energy Use Building Set</p> <p>Prepared by Jason Glazer, Principal Engineer, for ASHRAE MTG.ET Energy Targets Committee</p>	Established maximum energy efficiency thresholds by building type and climate zone	5	<p>EPA Power Profiler Emissions Tool 2023</p> <p>Tab: Zip-subregion</p>	Mapped eGRID Subregions to project postal codes
3	<p>US EPA ENERGY STAR Technical Reference: Estimating Fuel Mix and Energy Cost (August 2016)</p> <p>Page 3, Figure 1: % Electricity Use by Property Type and US Census Region</p>	Estimated baseline % Electricity by typology and location	6	<p>eGRID 2002 Version 2.01: Location (Operator) Based eGRID Subregion File (Year 2000 Data)</p> <p>Tab: EGRDSRL00, Field: SRC02RTA (eGRID subregion average 2000 annual CO2 output emission rate, lbs/MWh)</p>	Calculated baseline electricity emissions (values converted to kg/MBtu)
			7	<p>ENERGY STAR Portfolio Manager Technical Reference: Greenhouse Gas Emissions</p> <p>Figure 5: Indirect Greenhouse Gas Emission Factors for Electricity in the U.S.</p>	Calculated reported electricity emissions

#	Description	Use in Analysis
8	ENERGY STAR Portfolio Manager Technical Reference: Greenhouse Gas Emissions Figure 1: Direct GHG Emissions Factors for the U.S. and Canada	Calculated baseline and reported natural gas emissions

A.2 Data Filtering and Quality Control

A.2.1 Data Filtering Thresholds

Metric	Threshold	Justification	Projects Affected
Location	U.S. projects only	Aligns with macro data comparison and limits scope to U.S.-based policy and market drivers	2,269 removed
Gross Floor Area: Upper	1.8 million ft ²	Approximate size of second largest building in world; values above this threshold indicate likely data entry error	96 removed
Gross pEUI % Reduction: Lower	-1000%	Professional judgment; values below this threshold indicate likely baseline or data entry issues	7 removed
Gross pEUI % Reduction: Upper	99%	Professional judgment; values at or above this threshold warrant scrutiny for baseline misalignment	49 removed

Metric	Threshold	Justification	Projects Affected
Calculated Gross pEUI	<1	Professional judgment; values at or below this threshold warrant scrutiny for Gross pEUI	63 Removed

A.2.2 Data Quality Issues Identified

Gross/Net pEUI Value Switching

177 total projects (176 U.S. projects) reported Gross pEUI values less than Net pEUI. Since this is logically impossible (Net pEUI includes on-site renewable energy credits and therefore cannot exceed Gross pEUI), these values were assumed to be data entry errors and were switched for the analysis.

High Gross pEUI Reduction Values

134 U.S. projects reported Gross Energy Percent Savings greater than 90%. Upon investigation:

- 73 of these are Mixed Use projects (out of 235 total Mixed Use projects in the dataset), suggesting potential baseline misalignment for this typology
- These projects warrant additional scrutiny and may indicate that Mixed Use baselines do not align well with prototype model pEUI values

Duplicate Projects

Initial duplicate analysis identified potential duplicate entries, particularly concentrated in residential project types. The methodology for duplicate identification and treatment is documented below.

A.3 Calculation Methodology

A.3.1 Calculated Fields from Reported Data

Calculated Field	Methodology
Calculated Gross pEUI	Captured directly if Gross pEUI was provided. If not provided, calculated as: Energy baseline (kBtu/ft ²) × (1-Energy Percent Reduction/100)
Calculated Net pEUI	Captured directly if Net pEUI was provided. If not provided, assumed equal to Calculated Gross pEUI
Calculated Onsite RE pEUI	Calculated Gross pEUI – Calculated Net pEUI
Calculated Has Renewable Energy Sources	"YES" if Calculated Onsite RE pEUI > 0; "NO" otherwise

A.3.2 Fuel Split Conversions

When fuel split data was provided, the following unit conversions were applied:

Original Field	Converted Field
Fuel source grid electricity [kWh]	Fuel source grid electricity [kBtu]
Fuel source gas [Therms]	Fuel source gas [kBtu]
Fuel source electricity from on-site renewables [kWh]	Fuel source electricity from on-site renewables [kBtu]

Original Field

Fuel source electricity from off-site renewables [kWh]

Converted Field

Fuel source electricity from off-site renewables [kBtu]

Calculated Fields from Fuel Splits:

Calculated Field	Methodology
Calculated Gross pEUI from Fuel Splits	Sum of: Fuel source grid electricity [kBtu] + Fuel source gas [kBtu] + Fuel source district [kBtu] + Fuel source other fossil [kBtu]
Calculated Net pEUI from Fuel Splits	Sum of: Fuel source grid electricity [kBtu] + Fuel source gas [kBtu] + Fuel source district [kBtu] + Fuel source other fossil [kBtu] + Fuel source electricity from on-site renewables [kBtu]
Calculated Offsite Renewables from Fuel Splits	Fuel source electricity from off-site renewables [kBtu] ÷ Total area (GSF)

A.3.3 Baseline Calculations

All baseline calculations use the prefix "BASELINE: WBUS:" (Whole Building, U.S.).

Field	Calculation
Region Column Identifier	U.S. Census Region derived from State

Field	Calculation
% Electricity	Indexed from Data Source 3 using Use Type 1 and Region Column Identifier. Note: EPA Property Types are mapped to AIA 2030 DDx Use Types.
% Natural Gas	100% – % Electricity
SITE Electricity [MMBtu/yr]	(% Electricity × Energy baseline (kBtu/ft ²) × Total area (GSF)) ÷ 1,000
SITE Natural Gas [MMBtu/yr]	(% Natural Gas × Energy baseline (kBtu/ft ²) × Total area (GSF)) ÷ 1,000
SITE Energy Total [MMBtu/yr]	SITE Electricity + SITE Natural Gas
eGRID Subregion	Indexed from Data Source 5 using Postal code
US Electricity Emissions Factor	Indexed from Data Source 6 using eGRID Subregion
US Natural Gas Emissions Factor	Indexed from Data Source 8 using Country
SITE Electricity Emissions	SITE Electricity × US Electricity Emissions Factor
SITE Natural Gas Emissions	SITE Natural Gas × US Natural Gas Emissions Factor
SITE Total Emissions	SITE Electricity Emissions + SITE Natural Gas Emissions

A.3.4 Reported Performance Calculations

All reported calculations use the prefix "REPORTED: WBUS:" (Whole Building, U.S.).

Energy Calculations:

Field	Calculation
% Electricity	<p>If fuel split provided: Fuel source grid electricity [kBtu] ÷ Calculated Gross pEUI from Fuel Splits. Note: On- and off-site RE is credited separately.</p> <p>If no fuel split: Indexed from Data Source 4 using Use Type 1 and Region Column Identifier.</p>
% Natural Gas	<p>If fuel split provided: Sum of (Fuel source gas + district + other fossil [kBtu]) ÷ Calculated Gross pEUI from Fuel Splits. Note: District and other fossil fuels treated as natural gas equivalents.</p> <p>If no fuel split: 100% – % Electricity</p>
Calculated Onsite Renewable Electricity (for credit) [MMBtu/yr]	<p>If fuel split provided: Calculated Onsite RE from fuel splits × Total area (GSF) ÷ 1,000</p> <p>If no fuel split: Calculated Onsite RE pEUI × Total area (GSF) ÷ 1,000</p>
SITE Electricity [MMBtu/yr]	Calculated Gross pEUI × % Electricity × Total area (GSF) ÷ 1,000
SITE Natural Gas [MMBtu/yr]	Calculated Gross pEUI × % Natural Gas × Total area (GSF) ÷ 1,000
SITE Gross Energy Total [MMBtu/yr]	SITE Electricity + SITE Natural Gas

Field	Calculation
SITE Net Energy Total [MMBtu/yr]	SITE Gross Energy Total – Calculated Onsite Renewable Electricity (for credit)

Energy Savings Calculations:

Field	Calculation
SITE Total Gross Energy Savings	BASELINE: SITE Energy Total – REPORTED: SITE Gross Energy Total
SITE Total Net Energy Savings	BASELINE: SITE Energy Total – REPORTED: SITE Net Energy Total
SITE Total Gross Energy Percent Savings	SITE Total Gross Energy Savings ÷ BASELINE: SITE Energy Total
SITE Total Net Energy Percent Savings	SITE Total Net Energy Savings ÷ BASELINE: SITE Energy Total

Emissions Calculations:

Field	Calculation
Onsite Renewable Electricity Emission Reduction [for credit]*	Calculated Onsite Renewable Electricity (for credit) × -US Electricity Emissions Factor
Offsite Renewable Electricity Emissions Reduction [for credit]*	Calculated Offsite Renewables from Fuel Splits × Total area (GSF) ÷ 1,000 × -US Electricity Emissions Factor

Field	Calculation
SITE Electricity Emissions	SITE Electricity × US Electricity Emissions Factor
SITE Natural Gas Emissions	SITE Natural Gas × US Natural Gas Emissions Factor
SITE Total Gross Emissions	SITE Electricity Emissions + SITE Natural Gas Emissions
SITE Total Net Emissions	SITE Total Gross Emissions + Onsite RE Emission Reduction [for credit]
SITE Total Emissions (incl. Renewable Electricity Procurement)	SITE Total Gross Emissions + Onsite Renewable Electricity Emission Reduction [for credit]* + Offsite Renewable Electricity Emissions Reduction [for credit]*

**these are negative values*

A.3.5 Area-Weighted Average Calculations

Area-weighted averages (AWA) were calculated in Tableau using the following formulas:

Metric	Tableau Calculation
AWA Gross pEUI Reduction Percent	SUM([REPORTED: WBUS: SITE Total Gross Energy Percent Savings] × [Total area]) / SUM([Total area])
AWA Net pEUI Reduction Percent	SUM([REPORTED: WBUS: SITE Total Net Energy Percent Savings] × [Total area]) / SUM([Total area])

Metric	Tableau Calculation
AWA Gross Emissions Reduction Percent	$\text{SUM}([\text{Gross Emission Reduction}] \times [\text{Total area}]) / \text{SUM}([\text{Total area}])$

A.3.6 Maximum Energy Efficiency Threshold Calculations

Data from ASHRAE 1651-RP (Development of Maximum Technically Achievable Energy Targets for Commercial Buildings: Ultra-Low Energy Use Building Set) provides Max Tech Site EUI by Climate Zone (kBtu/ft²-yr).

Use Type Mapping:

Report Use Type	ASHRAE 1651-RP Building Types (Averaged)
Healthcare	Average of Hospital and Outpatient Health
K-12 Education	Average of School Primary and School Secondary
Multi-family Residential	Average of Apartment High Rise and Apartment Mid Rise
Office	Average of Office Small, Office Medium, and Office Large
Retail	Average of Retail Stand Alone and Retail Strip Mall

Tableau Calculations:

Metric	Tableau Calculation or Definition
MT High EUI	Maximum EUI across Climate Zones from ASHRAE 1651-RP Table 7d
MT Low EUI	Minimum EUI across Climate Zones from ASHRAE 1651-RP Table 7d
Max Tech High EUI Reduction Percent	$1 - ([\text{MT High EUI}] / [\text{Energy baseline (kBtu/ft}^2\text{/yr)}])$
Max Tech Low EUI Reduction Percent	$1 - ([\text{MT Low EUI}] / [\text{Energy baseline (kBtu/ft}^2\text{/yr)}])$

A.4 Property Type Crosswalk

The following table maps EPA ENERGY STAR Property Types (used in Data Sources 3 and 4) to AIA 2030 DDx Use Types (provided in the Use Type 1 field):

DDx Use Type 1	EPA ENERGY STAR Property Type
Assembly	Entertainment/Public Assembly
College/University	College/University
Data Center	Data Center
Healthcare	Hospital (General Medical & Surgical)
Hotel	Hotel

DDx Use Type 1	EPA ENERGY STAR Property Type
K-12 Education	K-12 School
Laboratory	Laboratory
Library	Library
Mixed Use	Mixed Use Property
Multi-family Residential	Multifamily Housing
Office	Office
Retail	Retail Store
Single-family Residential	Single Family Home
Warehouse	Non-Refrigerated Warehouse
Worship	Worship Facility

Note: Some mappings required professional judgment where direct equivalents were not available. Additional use types not shown may use "Other" or regional averages.

Our Underwriters

This report was made possible through the generous support of Architecture 2030's 2025–2026 underwriters.

Anchor Underwriters

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