Commercial Building Efficiency Accelerator

Market Transformation Advancement Plan - Draft

CalMTA is a program of the California Public Utilities Commission (CPUC)
and is administered by Resource Innovations

Contents

List of Abbreviations

Abbreviation	Definition
ACEEE	American Council for an Energy-Efficient Economy
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BPS	Building Performance Standard
CBEA	Commercial Building Efficiency Accelerator
CBO	Community-based Organization
CEC	California Energy Commission
CPACE	Commercial Property-Assessed Clean Energy
CPUC	California Public Utilities Commission
CRE	Commercial Real Estate
DAC	Disadvantaged Community
DOE	Department of Energy
EIA	Energy Information Administration
ESCO	Energy Service Company
ESJ	Environmental and Social Justice
EUI	Energy Use Intensity
FDI	Flow-Down Incentive

GHG	Greenhouse Gas
HTR	Hard to Reach
HVAC	Heating, Ventilation, and Air Conditioning
IMT	Institute for Market Transformation
IOU	Investor-Owned Utility
MPI	Market Progress Indicator
MR	Market Research
MT	Market Transformation
MTAB	Market Transformation Advisory Board
MTI	Market Transformation Initiative
MUSH	Municipal, University, Schools, and Hospitals
NEB	Non-Energy Benefit
NEEA	Northwest Energy Efficiency Alliance
NEEP	Northeast Energy Efficiency Partnerships
NOI	Net Operating Income
NREL	National Renewable Energy Laboratory
NYSERDA	New York State Energy Research and Development Authority
PG&E	Pacific Gas and Electric
SB	Senate Bill
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric
SEM	Strategic Energy Management
SME	Subject Matter Expert
TA	Technology Assessment
TSB	Total System Benefit
WE&T	Workforce Education and Training

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1 Purpose

This Advancement Plan summarizes available information and essential research activities for the proposed Market Transformation Initiative (MTI) that CalMTA recommends advancing from Phase I: Concept Development into Phase II: Program Development. It represents the stage gate deliverable illustrated in Figure 1 that describes the scope of work for research, testing, and stakeholder engagement that will be needed during Phase II to develop a full MTI Plan for approval by the California Public Utilities Commission (CPUC) for Phase III: Market Deployment. The initial research efforts outlined in this Advancement Plan will inform the long-term potential of this initiative before CalMTA recommends whether to advance this MTI further. All MTI Advancement Plans are reviewed by the Market Transformation Advisory Board (MTAB) and the public before they are finalized by CalMTA. This draft Advancement Plan contains:

- Key characteristics of the Market Transformation (MT) idea (e.g., description, target market, initial MT theory, etc.).
- Identified gaps in knowledge that need to be filled before an MTI Plan could be written for CPUC approval.
- Estimated costs and workplan for activities in Phase II that will fill the knowledge gaps.

Figure 1: MTI development documents by phase

Additional information on CalMTA and the MTI development process can be found at https://calmta.org.

2 Executive summary

Commercial buildings are responsible for 35% of the electricity and 18% of the total energy consumed in the U.S. and represent a critical opportunity for reducing greenhouse gas (GHG) emissions and achieving California's long-term decarbonization goals.[1] These buildings vary widely in use, ownership, and energy needs – ranging from small rural elementary schools to large urban office towers.

The U.S. Environmental Protection Agency finds that, on average, 30% of the total energy used in all commercial buildings is wasted.[2] More specifically, benchmarking data shows that the most energy-intensive commercial buildings in California – which comprise one-fifth of the floorspace – consume far more energy than the average buildings of the same type.[3] Despite the clear potential for energy savings, these buildings struggle with energy upgrades for a variety of reasons: building owners may not see the complete financial value of energy upgrades; split incentives for leased buildings; and some owners, particularly of publicly-owned buildings, may not have access to capital.

CalMTA proposes to accelerate the adoption of energy efficiency, decarbonization, and demand response measures in California's commercial building sector through a series of interventions aimed at different market actors. This Commercial Building Efficiency Accelerator (CBEA) market transformation (MT) idea seeks to influence three different groups of market actors – building owners, energy professionals, and commercial real estate (CRE) finance professionals – to make energy, GHG, and demand response part of everyday asset management. Building owners could expect a higher net operating income (NOI) from lower utility costs and higher rental rates. Energy professionals could expect higher acceptance rates for their proposed projects because of a better financial projection. CRE finance professionals could expect lower risk from upgraded buildings with higher NOI and lower vacancy.

We propose to develop a retrofit playbook and a life cycle planning tool that clearly outline the business incentive to include energy concerns as part of asset management. Some market actors already do this, but many do not. A recent study found that decision makers from CRE management firms describe capital planning processes across portfolios as "all over the place."[4] Through education of energy professionals, and by showing CRE financial professionals – the ones who determine financing terms – the value and risk reduction of including energy concerns in financing, CalMTA hypothesizes that we can influence the entire market to do the same.

[1] https://www.energy.gov/eere/buildings/about-commercial-buildings-integration-program.
[2] *Ibid*.
[3] CalMTA analysis of benchmarking data from https://www.energy.ca.gov/media/10811.
[4] https://neea.org/wp-content/uploads/2025/03/BetterBricks-Commercial-Building-Decision-Maker-Study.pdf.

We also plan to increase the awareness of funding opportunities. Part of the playbook, geared towards publicly-owned buildings, will identify lower-cost financing and grant opportunities. CalMTA intends to educate owners with case studies and best practices for engaging with energy service companies (ESCOs). The initiative will also explore the role of tenant protection policies in advancing equitable outcomes, including strategies such as rent stabilization, right-to-return guarantees, and just-cause eviction protections to help prevent displacement during retrofit efforts.

CalMTA will further research all of these interventions during Phase II.

The timing is critical: California's Senate Bill 48 (SB 48), passed in 2023, tasks the California Energy Commission (CEC) with developing a strategy to track and manage the energy use and GHG emissions of buildings by 2026. This work may result in a building performance standard (BPS), which could provide a catalyst for change. Yet even if California does create a BPS, this doesn't guarantee energy reductions: other jurisdictions with BPS have struggled with compliance. As of last year, in the five jurisdictions furthest along in BPS implementation, less than a quarter of the buildings covered are projected to reach 2030 targets.[5]

Reducing the energy use in commercial buildings has been a goal for energy advocates for decades. Currently, there are several factors that change the financial situation and make this a unique time for market transformation. Benchmarking data, local and potentially state-wide BPS programs, rising energy costs, requirements from regional air quality districts, and demand response programs all affect the value proposition for building owners.

Through research and program development activities in Phase II, CalMTA plans to create an initiative plan that would deliver scalable solutions that support market-wide transformation. By embedding the financial value of energy, GHG, and demand response planning into everyday asset management, this initiative positions California's commercial building sector to meet statewide energy and climate goals. The result will be improved building performance, lower GHG emissions, stronger financial returns for owners, and healthier indoor environments for occupants.

3 Definition of the Initiative

If advanced to a full MTI, CBEA will accelerate reductions in energy use intensity (EUI) and GHG emissions in existing commercial and multifamily buildings over 20,000 ft^2 by advancing market adoption of life cycle planning practices that incorporate energy concerns into standard building

[5] https://imt.org/resources/lessons-from-the-ground-implementing-building-performance-standards/.

management and investment decision-making.[6] CBEA will work with energy professionals, building owners, and CRE finance professionals to develop a common language and understanding of the overall value proposition – including reduction in net operating income, increased asset value, and financial risk reduction.

The CBEA playbook will emphasize a building's full life cycle, operational strategy, and owner concerns to identify long-term, adaptable, market-friendly solutions that align with financial and investment cycles. Rather than focusing solely on immediate technology upgrades, life cycle planning involves integrating energy efficiency measures into the broader context of a building's lifespan, ensuring that retrofits are both sustainable and financially viable over time.

The CBEA MTI will prepare the market for a constructive and accelerated response to policies and laws aimed at reducing EUI and GHG emissions of the built environment in support of SB 48.

4 Market Transformation theory and opportunity

Commercial buildings in California represent one of the most significant opportunities for energy savings and emissions reductions. Addressing this sector is crucial to achieving California's ambitious climate goals, yet previous efforts have been insufficient.

4.1 Market opportunity

Commercial buildings are responsible for 35% of electricity consumed in the U.S. and 18% of total energy use.[7] California has nearly 88,000 commercial buildings over 20,000 ft^2, managed by a diverse set of actors with different motivations, constraints, and levels of access to capital.[8] In California, buildings 20,000-200,000 ft^2 consume 60% of the energy use of all commercial buildings. This size segment consists primarily of education, office, retail, warehouse, and multifamily buildings.[9] While CalMTA is not limiting this MT idea to these sizes or building types, it does indicate that focusing on a limited subset of buildings may allow us to have a large impact by refining interventions for certain segments and/or ownership structures.

Data from California's benchmarking program highlights the opportunity for commercial buildings to reduce their energy use and emissions. CalMTA's preliminary analysis shows that in

[6] While the statewide benchmarking program only requires data collection for buildings over 50,000 ft^2, some jurisdictions like Chula Vista require BPS for buildings over 20,000ft^2. CalMTA will refine the target size through Phase II research.

[7] https://www.energy.gov/eere/buildings/about-commercial-buildings-integration-program.

[8] NREL studies are available by searching "Understanding building energy use in California" at https://research-hub.nrel.gov/en/publications/.

[9] NREL created 12 building stock characterization studies to encompass all 16 of California's climate zones. CalMTA aggregated all of the data to determine a state-wide energy profile. One example of NREL's study is https://docs.nrel.gov/docs/fy23osti/86830.pdf. All of the studies are available by searching "Understanding building energy use in California" at https://research-hub.nrel.gov/en/publications/.

each building type, the most energy-intensive buildings – which account for one-fifth of the total commercial floorspace – consume between 65%-183% more than the average buildings.[10] Even after accounting for the variation in operating hours and other specific building requirements, this indicates a substantial potential for reducing consumption amongst the highest users.

In an effort to accelerate reductions in building emissions, policy is evolving. California SB 48 directs CEC to develop a statewide strategy by 2026 for tracking and managing energy use and GHG emissions in commercial buildings. While regulations like these create important levers for market change, experience from other jurisdictions nationwide shows that performance standards alone are not enough. As of last year, in the five jurisdictions furthest along in BPS implementation, less than a quarter of the buildings covered are projected to reach 2030 targets. Compliance is often low due to unclear penalties, misaligned requirements, and a lack of accessible, user-friendly tools that help building owners navigate mandates while still meeting their business objectives.[11]

Reducing the energy use in commercial buildings has been a goal for energy advocates for decades. There are several factors that CalMTA believes make this a unique timing for market transformation:

- SB 48 is poised to elevate the value proposition for building owners.
- Benchmarking data provides energy professionals with insights into high-savings candidates in a way not previously available.
- California energy costs continue to rise at a rate much higher than inflation and much higher than the national average.[12] These higher costs make energy upgrades a more attractive business proposition.
- Regional air quality districts and the California Air Resources Board are starting to impose stricter emissions requirements.[13]
- Demand costs and virtual power plants provide a potential revenue source for building owners.[14]

If advanced to market deployment, this MT idea aims to close a critical gap in California's commercial building sector. CBEA will equip the market with life cycle planning tools and practices that embed energy upgrades as a standard part of long-term building management. By

[10] https://www.energy.ca.gov/media/10811.
[11] https://imt.org/resources/lessons-from-the-ground-implementing-building-performance-standards/.
[12] https://www.eia.gov/todayinenergy/detail.php?id=63064.
[13] E.g., Bay Area Air District is requiring zero NOx commercial furnaces, even for replacements, as of Jan 1, 2029. https://www.baaqmd.gov/rules-and-compliance/rule-development/building-appliances.
[14] A virtual power plant (VPP) is a system that integrates multiple, possibly heterogeneous, distributed energy resources to provide power to the grid during high demand times. VPPs allow resources that are individually too small to be of interest to a utility to aggregate and market their power.

collaborating with commercial real estate financing professionals, CalMTA will find the right leverage point and validate the incorporation of energy considerations as part of financing commercial buildings. We will also help building owners integrate energy and emissions goals into capital planning and day-to-day operations. This initiative would strengthen the business case for proactive, strategic investment in building performance.

The life cycle planning tool will support this shift by aligning energy upgrades with equipment life cycles, financial planning timelines, and asset management strategies. To make these plans more actionable, the MTI will identify and promote financing solutions that lower upfront costs, reduce investment risk, and expand access – particularly for under-resourced building owners.

To ensure lasting impact, CalMTA will also serve as a strategic contributor to policy development, helping to shape performance standards and emissions regulations that are both ambitious and aligned with the practical needs of building owners.

In doing so, this initiative seeks to bridge the gap between policy and practice – ensuring that California's climate goals are not only achievable but supported by market-ready strategies and tools that empower building owners to take meaningful action.

Many tools have already been developed by organizations such as the Department of Energy (DOE), American Council for an Energy-Efficient Economy (ACEEE), Institute for Market Transformation (IMT), and New York State Energy Research and Development Authority (NYSERDA). As part of Phase II research, this MTI will compile an inventory of these existing resources and assess which tools can be used or adapted to meet California-specific needs.

4.2 Target market

The target market for CBEA is existing commercial buildings over 20,000 ft^2 with EUIs above the average for their building type. In Phase II of this initiative, we will segment and analyze the market by building type, building size, and ownership structure to focus efforts on where we think this MT idea will have the most impact and benefits.[15]

We have not identified any beachhead market segments yet. As mentioned before, California benchmarking data clearly shows that many buildings – in nearly every building type – have good potential for EUI and GHG reductions. Once we analyze data more and learn more about the barriers that each building type owner faces, we can identify beachhead markets.[16]

[15] Even though smaller buildings under 50,000 ft^2 are exempt from benchmarking requirements, we hope to include some segments of smaller buildings so we can equitably reach as many types of owners as possible.

[16] Specific research objectives are in Section 8.

This MTI will not target certain building types with pre-existing low EUIs like non-refrigerated warehouses and self-storage facilities.

4.3 Key market barriers

Despite the large opportunities that building upgrades offer, commercial building efficiency and decarbonization faces a series of complicated barriers. These include both market barriers and policy barriers.

- **Building owners don't see the value proposition for energy/decarb upgrades**
  Many building owners don't view efficiency measures as part of their long-term asset management. By looking at equipment life cycles, and planning for replacement, owners are more likely to see the business case of energy and GHG reduction. If energy professionals include more holistic, long-term financial plans with their analyses, and show results in financial terms that decision makers are familiar with, like discounted cash flows and net present values, building owners are more likely to take action.

  We need to show building owners how lowering their EUI, through a mixture of low-cost operational changes and capital expenditures, can improve their net operating income and raise the capitalization rate of their buildings.

- **Energy professionals don't understand the financial needs of building owners**
  Many energy professionals, whether they are retro-commissioning agents, or energy service companies, tend to communicate in terms of simple payback: only considering the cost of measures and the utility savings. This leads to cherry-picking of quick payback measures like lighting upgrades and retro-commissioning. More capital-intensive measures, like envelope and heating, ventilation, and air conditioning (HVAC) upgrades, are likely to fail simple payback criteria and quickly fall off the list of proposed measures. To meet the CPUC's goal of having 50% of existing commercial buildings be net zero energy by 2030, many building owners will need to implement these more impactful measures.

  Long-term financial planning is not an easy task, and not one that most energy professionals are equipped to perform. It's clear that these market actors need this type of framework and planning tool. Many other organizations that are interested in commercial building renewal have developed tools and frameworks along these lines. Rocky Mountain Institute created a guide: Best Practices for Achieving Zero over Time. NYSERDA has a Large Building Retrofit Playbook and financial analysis tool.[17] The DOE has developed workshops on helping energy professionals make the business case to chief financial officers.[18]

[17] https://retrofitplaybook.org/.
[18] https://betterbuildingssolutioncenter.energy.gov/solutions-at-a-glance/making-business-case-energy-efficiency-commercial-buildings.

- **High costs of deep retrofits and access to capital**
  Large-scale building retrofits that include envelope upgrades and HVAC upgrades tend to be very expensive – and rarely have quick paybacks covered by energy savings. To help overcome these financial barriers, CalMTA will focus on identifying and promoting low risk financing options such as commercial property-assessed clean energy (CPACE), pre-development loans, and green loans. By increasing market awareness of financing options and helping align them with building life cycle planning, this MTI will support more owners in accessing the capital needed to pursue comprehensive upgrades.
- **Split incentives in leased spaces**
  Split incentives are a common problem in energy efficiency programs. The costs and benefits of energy efficiency investments are misaligned when the property owners pay for improvements and tenants realize the savings. In commercial spaces, this may happen in office, retail, and other buildings with triple net leases and in many types of multi-family housing.

  This misalignment discourages energy-saving measures, resulting in missed opportunities for efficiency improvements.
- **Complex BPS**
  Currently, California doesn't have a statewide BPS. SB 48 may change that or may create some other form of standard that requires buildings to perform energy or emissions-based retrofits.

  Other jurisdictions that have implemented BPS have faced low compliance due to a variety of factors:
  - Lack of harmonization between state and local policies
  - Compliance timelines that change over time and create confusion for building owners
  - Ineffective consequences for noncompliance

4.4 Possible points of leverage and strategy interventions

We have identified a variety of intervention strategies as part of the CBEA initiative. The key strategies highlighted here could effectively drive market transformation, though they do not encompass all potential interventions. We will continue to examine and refine these strategies in the next phase of research. The possible strategies identified are:

- **Build a retrofit playbook and tool for commercial building upgrades**
  We plan to develop a retrofit playbook that lays out a guided decision-making process – tailored to specific building segments and types – to support building decision-makers, including those in environmental and social justice (ESJ) communities.

  CalMTA will develop a financial tool or leverage existing ones that incorporate holistic

planning upgrades based on life cycles. This tool will clearly demonstrate the value proposition of improving building performance and reducing GHG emissions.

To build awareness of this playbook and tool, we plan on creating a trusted hub to disseminate accessible resources such as a financial planning tool, playbook, case studies, and best practices for partnering with ESCOs. Hubs will provide multilingual support, technical assistance through physical and virtual formats, and proactive engagement opportunities, ensuring that building owners and tenants, particularly from under-resourced communities, can navigate upgrades equitably and benefit from improved health, comfort, and tenant protections.

To build demand for the playbook and tool, CalMTA has another intervention built on collaborating with CRE financial professionals.

- **Collaborate with CRE financial professionals**
  During Phase II research, CalMTA will collaborate with financial market actors – which may be large investors, banks that specialize in commercial building loans, building assessors, or commercial real estate brokers – who can act as leverage points for the CBEA playbook. We will determine how energy does, or could, play a part in valuing buildings. If banks, for instance, realize the reduced risk from energy upgrades (higher rents, higher occupancy, resale value, etc.),[19] they may incentivize an energy-inclusive life cycle plan as part of financing or refinancing. Building owners and energy professionals will then make it part of their standard practice.
- **Develop a qualified and enthusiastic pool of energy professionals**
  Influence training organizations, utilities, and community-based organizations to cultivate a highly skilled, community-rooted workforce of energy professionals. This initiative will prioritize inclusive access to training and certification pathways, preparing professionals to deliver critical services to building owners: enhancing benchmarking data, identifying and prioritizing retrofit measures, developing comprehensive cash-flow analyses, and promoting upgrades aligned with long-term building and equipment life cycles.
- **Collaborate with existing commercial utility programs**
  Work with existing utility strategic energy management (SEM) programs, performance-based programs, on-bill financing, and multi-family programs to understand how they include financial planning in their work, and how they might improve.
- **Increase awareness of financing opportunities**
  Identify and integrate available financing and bundling opportunities — such as green financing products, loan subsidies, utility on-bill financing, and cap-and-trade monies[20] — into

[19] 2015 RMI Path to a Deep Energy Retrofit, https://rmi.org/insight/practice-guide-the-path-to-a-deep-energy-retrofit-using-an-energy-savings-performance-contract/.
[20] https://content.govdelivery.com/accounts/CARB/bulletins/3df6487.

the financial planning tool to help decision-makers manage upfront costs, align upgrades with building life cycles, and promote long-term affordability, especially for owners in ESJ and affordable housing communities.

- **Green lease promotion**
  A green lease (or energy-aligned lease) is a lease agreement that includes provisions to encourage both building owners and tenants to invest in energy efficiency and sustainability measures. It aligns the financial incentives of both parties to share the costs and benefits of such investments.
- **National collaboration**
  Collaborate with DOE Better Buildings, Northwest Energy Efficiency Alliance (NEEA), IMT, ACEEE, NYSERDA, Northeast Energy Efficiency Partnerships (NEEP), and the Greenlining Institute to develop best practices and revise the playbook and financial planning tool.
- **Support market friendly policy development**
  Engage with state and local jurisdictions and community advocacy groups to align policy development (SB 48, reach codes) with market needs like timeline concerns and harmonization across jurisdictions. Coordinate outreach and engagement with existing BPS hubs to document lessons learned and best practices and identify gaps/interventions that CalMTA can help fill.

We believe the CBEA MTI has a clear role in advancing commercial building performance. Many other market actors are struggling to influence commercial buildings, and there's a great opportunity to not only lower energy use but also reduce GHG emissions. CalMTA is positioned to leverage and refine the work of these other market actors and influence energy professionals and business owners here in California.

5 ESJ communities and WE&T

CalMTA is committed to advancing equity by reaching ESJ communities — identified through tools like CalEnviroScreen, Disadvantaged Communities (DAC) status, and Hard-to-Reach (HTR) classifications — and expanding workforce education and training (WE&T) to serve those most affected by environmental and economic disparities.

Through the CBEA MTI, CalMTA will empower commercial building owners to reduce energy use and emissions by integrating energy efficiency and decarbonization into long-term capital planning and operational decision-making. This life cycle approach supports ESJ community stakeholders — building owners, businesses, and tenants — in realizing energy savings, improved asset performance, and enhanced indoor comfort without added financial strain.

To guide Phase II exploration, CalMTA is organizing its efforts around four interconnected focus areas: expanding access to investment benefits, increasing awareness of available resources,

supporting planning and implementation, and creating workforce opportunities that enable equitable participation statewide.

5.1 Accessibility to investment benefits

The CBEA MTI seeks to explore how it can meaningfully support ESJ communities by identifying and addressing the structural barriers that limit participation in energy efficiency programs. A key area of focus will be understanding how to expand access to tools, resources, and financing opportunities in ways that are culturally relevant, community-informed, and responsive to the lived realities of affordable housing providers, small business owners, and tenants.

As part of this process, we aim to consider what types of planning resources might best reflect the specific needs of ESJ communities across the state, and how such tools could empower more informed decision-making. One potential approach may involve the development of a Retrofit Playbook – a guided, building-type-aligned decision-making framework – that integrates life cycle capital planning with equitable access to resilient, healthy, and energy-efficient upgrades. This initiative will explore strategies to improve financial accessibility through inclusive and innovative financing mechanisms and how they might be integrated into a centralized, equity-informed financial planning tool. This tool is envisioned to be part of a broader market awareness hub, would need to be tailored to reflect the financial landscape of ESJ communities, supporting building owners in navigating upfront costs, long-term planning, and access to decarbonization benefits. This effort will also explore how commercial real estate financial professionals and lending institutions might tailor their approaches to support more equitable financing practices and risk reduction strategies for commercial building upgrades in ESJ communities.

Evaluating the effectiveness and usefulness of these tools and approaches will be conducted through ongoing stakeholder engagement and collaboration with community-based organizations (CBOs), CalMTA's Equity Sounding Board, and other existing partners and new allies to ground efforts in local knowledge and evolving priorities. This MTI will ensure ESJ community voices are incorporated into our market research and field demonstrations. Additionally, we recognize the importance of simplifying technical language to ensure resources are accessible and meaningful to a wide range of stakeholders.

Finally, the MTI team will consider how to best engage with state and local jurisdictions, as well as advocacy groups, to understand the evolving policy landscape. This will help inform the alignment of future tools and guidance with both regulatory expectations and community-defined goals.

5.2 Awareness of resources

Increased awareness is essential to equitable participation. This MTI will explore how to more effectively increase awareness of energy efficiency opportunities, benefits, and financing options in ESJ communities. The central focus of this research effort will be to understand how to partner

with equity-trained local coaches and trusted messengers — such as community leaders, CBO staff, and peer educators on how best to demonstrate comprehensive value propositions and share accessible information to building owners and decision makers in ways that resonate with local audiences.

This MTI, working in concert with local partners, will identify training and coordination approaches that build on existing community trust and aim to keep solutions grounded in community realities. One research approach may involve convening workshops and working groups with financial institutions and ESJ stakeholders. These forums would support the co-creation and iterative refinement of financial tools and outreach strategies, informed by both lived experience and emerging market research. Special attention will be given to understanding how such approaches might affect small businesses and ensuring they do not introduce unintended financial strain.

In parallel, CBEA will look at ways to align awareness-building efforts with existing SEM programs and identify opportunities to collaborate with utilities. The goal is to explore integrated strategies that connect energy performance with financial planning, supporting broader and more equitable participation.

5.3 Support for planning and implementation

Program success depends on responsive, consistent, and sustained engagement with ESJ communities upheld by a strong support infrastructure. One potential mechanism aimed at developing this support infrastructure is a market awareness hub sharing accessible resources — such as the Retrofit Playbook, financial planning tool, case studies, and best practices for engaging with ESCOs. This MTI will identify and leverage existing tools, resources and community feedback to explore and determine whether these hubs could meet the yet unknown diversity of needs of building owners and stakeholders in ESJ communities. Community-participatory research and engagement through multilingual materials, multiple formats (virtual and physical), and proactive outreach that lowers barriers to engagement will support this effort.

In designing program goals, the MTI will seek to work in partnership with communities to recognize and reflect the broader value of non-energy benefits (NEBs) — including improved health, comfort, and resilience. These benefits will be considered for inclusion in evaluation frameworks to help ensure a more holistic understanding of program impact. The initiative will also explore the role of tenant protection policies in advancing equitable outcomes, including strategies such as rent stabilization, right-to-return guarantees, and just-cause eviction protections to help prevent displacement during retrofit efforts.

To ensure the initiative remains informed by emerging best practices, the MTI team intends to participate in national and statewide collaborative efforts with partners such as DOE, NEEP, NYSERDA, ACEEE, IMT, and the Greenlining Institute. These relationships could help strengthen

the support ecosystem and guide ongoing refinement of tools like the Retrofit Playbook and Financial Planning Tool.

5.4 Workforce opportunities

The CBEA MTI presents an opportunity to strengthen community-based workforce capacity to support commercial building retrofits across the state. The MTI aims to collaborate with community colleges, apprenticeship programs, and local and regional workforce organizations such as SEI to explore strategies that expand training and certification pathways for high-demand roles like building energy analysts and energy managers. Efforts in aligning WE&T and job creation with the needs of the communities where retrofits will take place through collaborative discussions, aiming to support the development of a qualified, community-rooted workforce equipped to meet both technical performance goals and the evolving needs of building owners.

These energy professionals would be prepared not only in the fundamentals of building systems but also in providing value-added services such as benchmarking, retrofit prioritization, and financial analysis – key functions that help building owners make informed, cost-effective decisions.

To further support this workforce, existing planning tools and benchmarking software may be integrated or adapted to improve engagement between energy professionals and building owners. Additionally, broader policy and market shifts – such as the CPUC's 2030 Net Zero goals, updated benchmarking mandates, and emission regulations like Zero NOx – will help inform WE&T priorities and align them with future market demand.

A locally trained, community-based workforce will be critical to supporting small, rural, and under-resourced building owners in navigating retrofit processes, avoiding financial risk, and implementing meaningful energy improvements aligned with California's decarbonization goals.

6 Market vision/end-state

The average EUI and site CO2 emissions of commercial buildings will drop by 30% without increasing rent or energy burden in ESJ communities because building owners have adopted life cycle planning that includes energy, emission, and peak demand impacts.

6.1 Key market assumptions

Key market assumptions include:

- California will adopt legislation as part of SB 48 that will encourage building owners to reduce energy and GHG emissions. This MTI does not require a BPS, but any outcome from SB 48 will provide a leverage point.
- California continues to emphasize decarbonization goals. If decarbonization is financially incentivized, building owners will see a more immediate impact to their life cycle planning.

6.2 Diffusion and "lastingness" mechanism

Commercial real estate professionals who make decisions and hold the financial power will start expecting long-term financial plans that include energy considerations.

Market drivers such as building and equipment emissions limits set by air quality regulators, California's decarbonization goals, and code requirements will make this type of planning both necessary and helpful to building owners.

Business owners and energy professionals will adopt long-term, holistic financial planning of energy upgrades to commercial buildings because it will be a better way of doing business. Business owners will appreciate the inclusion of energy, emission, and demand response impacts. Once building owners adopt this method, CalMTA will no longer need to promote the playbook or tool. Building owners and energy professionals will develop and refine the playbook and tool to suit new market forces as they arise.

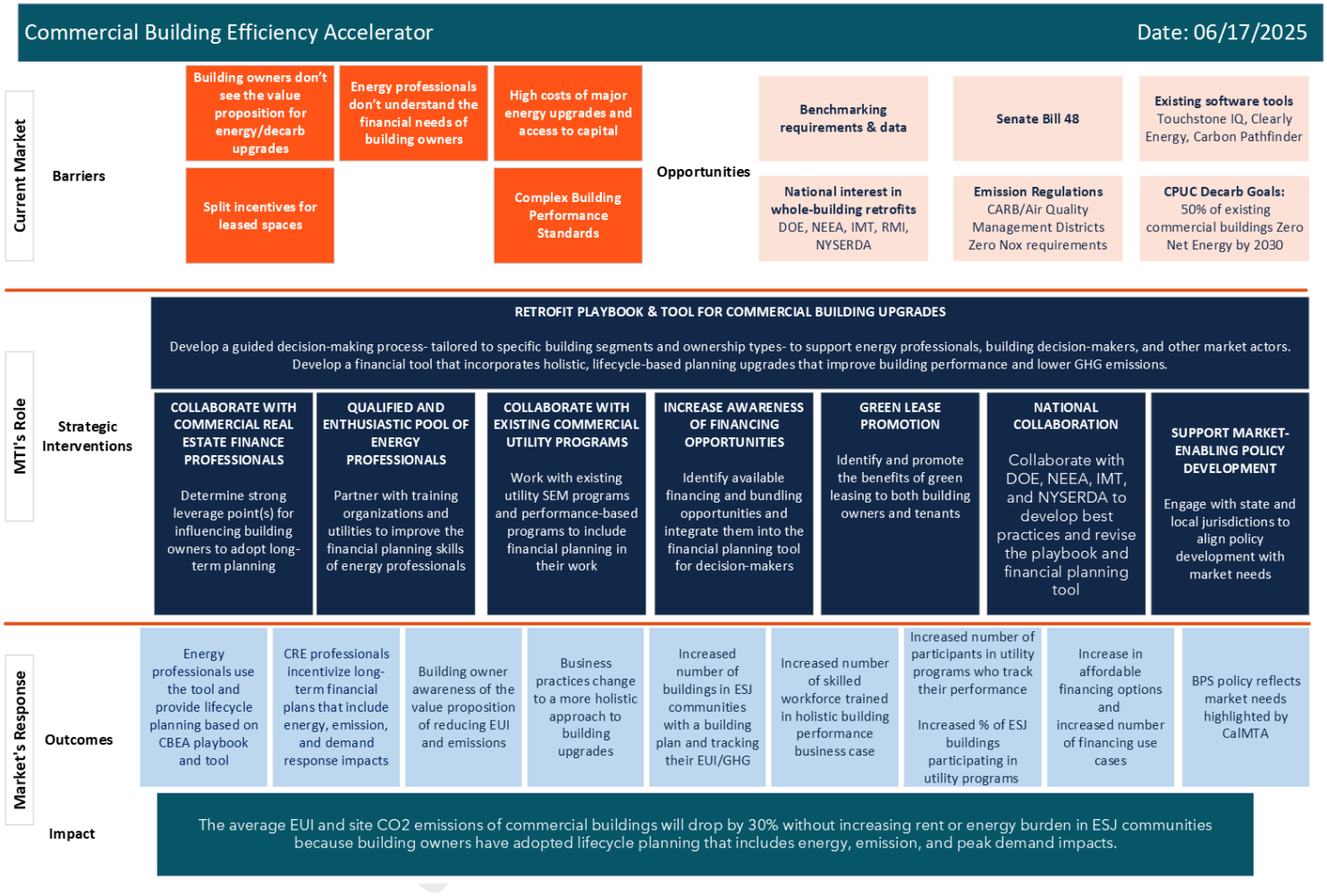
By collaborating with national market actors and existing utility programs, the CBEA playbook will spread throughout the market and become the de facto method of building planning.

6.3 Conceptual Logic Model

Once this work is completed in Phase II, CalMTA will develop a more refined and formal logic model for Phase III: Market Deployment.

Figure 2 on the following page features the logic model developed to provide a preliminary visualization of the CBEA MTI program theory.

Figure 2. CBEA Draft Logic Model



6.4 Measuring market outcomes

This section identifies a few preliminary market progress indicators (MPIs) for the initiative. A more comprehensive set of MPIs and equity metrics will be established during the development of a more refined and formal logic model for Phase III: Market Deployment.

Table 1. Possible MTI market progress indicators, equity metrics, and data sources

Preliminary outcome*	**Possible market progress indicator**	**Possible data sources**
Energy professionals use the tool and building owners use the developed plan to improve their building performance	Targeted programs use of the tool(s) developed: • Number of partners • Percentage and number of building engagements Unsolicited demand for the tool and downloads from MTI website CRE financial professionals require EUI when determining finance terms	Self-reports/surveys of MTI market partners MTI website tracking (and possibly registration requirement for tool downloads)
Building owner awareness of the value proposition of reducing EUI and emissions	Building decision-makers: • Report incorporation of life cycle energy costs in their financial calculations for (a) routine equipment replacements and (b) building improvements • Report consideration of EUI metrics in assessing building performance • Perceive a financial benefit to reduced carbon emissions For each of these, the metrics are (a) the # of entities reporting these practices and (b) total floor space represented by those entities	Tracking survey of building decision-makers (established panel and samples of full population)
Business practices change to a more holistic approach to building upgrades	Will need to develop a metric associated with the MTI definition of "holistic" and its incorporation into MTI interventions For now, using the life cycle energy cost metric in the row above	Tracking survey of building decision-makers
Increased number of buildings in ESJ communities with a building plan and tracking their EUI/GHG	Share of buildings in ESJ communities whose decision-makers: • Track and review energy consumption or cost at a building level • Report EUI internally • Use EUI to trigger consideration of efficiency upgrades • Track GHG emissions at a building level • Report GHG emissions internally	Oversample of building decision-makers tracking survey (based on portfolios in ESJs)

Preliminary outcome*	Possible market progress indicator	Possible data sources
	• Use GHG emissions to trigger consideration of building upgrades • Have an upgrade list or plan	
Increased number of skilled workforce trained in holistic building performance business case	Number of participants in training on holistic building performance business cases (compared to prior participant levels and to size of applicable workforce population)	Enrollment statistics from applicable training Secondary research or Delphi Panel (for workforce populations size)
Increased number of participants in utility programs who track their performance	Percentage of program participants who were doing the following at the time of program participation: • Tracking energy usage at a building level • Comparing energy usage to a standard at a building level • Reported an intention to improve energy performance as a factor in the building improvements they made as part of the utility program participation	Tracking added to partnering utility programs
Increased % of ESJ buildings participating in utility programs	• Number of buildings from ESJ communities participating in utility programs (annually) • Share of utility program-served buildings in ESJs (annually) • Scale of building improvements in ESJs being supported by utility programs annually (measured as projected energy savings and project costs)	Tracking added to partnering utility programs
Increase in affordable financing options and increased number of financing use cases	Number of projects and dollars borrowed (if available) using energy-specific financing offerings Increased number of mainstream commercial lenders advertising energy retrofit financing availability	Tracking added to partnering utility programs (and potentially other program partners) Market tracking (web searches of financing agents)
BPS policy reflects market needs highlighted by CalMTA	Unable to develop a meaningful metric until CalMTA defines what that market need is and how the direction of BPS ought to change to address it For now, a tentative metric is: California policy provides a meaningful incentive for building	Identification by MTI team of changes needed in California BPS policy trajectory

Preliminary outcome*	Possible market progress indicator	Possible data sources
	owners to track and improve EUI in their buildings that leads to increased tracking of EUI and increased use of existing offerings that support energy-related building retrofits (such as utility programs) Both of these metrics are tracked separately above – the new element here is a potential partial attribution of BPS policies to CalMTA if the MTI improves the direction of California policy in a meaningful way	Tracking of trajectory of BPS policy and CalMTA interventions in the policy-making process If feasible, interviews with observers of the policy-making process at CEC

*See Figure 2. Draft Phase I Conceptual MTI Logic Model

7 Gap analysis

This section describes the most critical data/information needs to be gathered through Phase II to make sure the MTI is viable and to create the full MTI Plan. Section 8 will provide more information on how we are going to gather this data.

This MTI is designed to encourage building owners to reduce energy and GHG emissions through the adoption of holistic building asset management that also incorporates life cycle planning for building and equipment renovations, replacements, and upgrades. The initiative will fill gaps in the marketplace related to tools, resources, and services that building decision-makers need to increase their focus on financially viable and prudent energy-related choices.

To design an effective MTI plan, the initiative team needs more clarity on several technical and market-related questions. These information gaps fall into the following overarching topic areas:

- Characteristics of the building market, building stock, ownership and decision-making patterns, and energy-saving opportunities
- Information sources, tools, and current and future inducements for building decision-makers' use when managing their buildings
- Current practices in valuing future energy savings and emission reductions when considering building upgrades, equipment, repairs, and maintenance
- Current and future market services and initiatives that support energy-saving building upgrades and what is needed to leverage them, accelerate them, and/or scale them
- Understanding potential market reaction to services, tools, and approaches that the MTI could create or enhance for accelerated adoption of building upgrades and efficiency improvements

- Identification of the intersection of current efficiency market practices, policies, and code requirements

The MTI team identified seven specific technology-oriented research needs and nine market research needs that fall into these overall topic areas. These information needs will be addressed with technology assessment and market research to inform MTI development and design. Section 8 lists the specific research questions to be addressed and methods which will be used to fill in these information gaps.

Among the research topics, understanding best practices and common approaches to asset management will be key to the design of this MTI and verifying its premise. For this reason, we will front-end research related to asset management practices, current tools and their use, and an assessment of gaps that the MTI will need to fill. Related to this research is an assessment of how segments differ in building valuation and asset management and how these correlate with cost-effective upgrade opportunities. Insights from this work will allow for refinement and prioritization of the remaining research questions.

8 Research and program development plan

8.1 Technology assessment

This section describes any assessment that might be needed to prove the viability of the initiative. Table 2 summarizes what and why the information is needed to complete the planning phase of the initiative and how the information will be collected. Table 3 summarizes the estimated cost per task and the time it will take to complete the task by the research team.

Technical assessment objectives: The CalMTA team identified the following technology assessment (TA) activities to address critical knowledge gaps, identify the target market, and inform the MTI strategy.

TA 1. Survey and evaluate existing datasets that could contribute to the CBEA MTI

a. Survey publicly available datasets available to inform CBEA MTI goal setting, tracking, compliance, and segmentation of building types
b. Summarize California state and local benchmarking data: which metric(s) are collected, what building segments are covered, whether the data is made publicly available and accessible, whether fuel usage is included, and how it can be sorted
c. Explain how buildings upgraded since year of original construction may differ in performance from contemporaries
d. Assess whether commercial building energy data is still representative post-COVID, and whether it needs to be normalized

TA 2. Identify trends across building types, upgrade opportunities, and segmentation strategies within the commercial building stock by analyzing existing building energy consumption data

a. Evaluate energy use and GHG emissions of the California commercial building stock by building sector, size, end uses, and ESJ characteristics
b. Identify major end uses that drive EUI in existing buildings and the potential to upgrade these end uses
c. Recommend how the CBEA MTI should segment the commercial building stock, in alignment with available data sets (conjointly with MR 1.a.)

TA 3. Define metrics and recommend a metric for tracking performance by the CBEA MTI

a. Define the metrics the CBEA MTI could use: site energy, site EUI, site emissions, source emissions, time-of-use, etc.
b. Summarize the metrics used by existing and upcoming BPS in California and elsewhere in the United States
c. Recommend metric(s) that align best with the CBEA MTI and intended outcomes of SB 48
d. Describe how the CBEA MTI could address water use and summarize available data and metrics on the water-energy nexus

TA 4. Assess tools that empower building owners to make informed, cost-effective performance and efficiency upgrades

a. Survey existing, publicly available tools available to inform building efficiency upgrades and retrofits; then categorize tools by market segment, location(s) covered, and intended users (energy auditors, building owners, etc.); and finally, summarize whether tools include financial information (costs and savings of measures) and long-term building planning components
b. Identify what tools are missing, and identify elements that will help building owners implement efficiency measures

TA 5. Identify areas for improving building efficiency and analyze potential GHG emissions and energy efficiency improvements

a. Identify the largest energy end uses for existing buildings, by segment
b. Identify the major pieces of equipment and/or building components that drive energy consumption for the largest end uses
c. Identify market segments that would benefit most from low- or no-cost upgrades
d. Perform analysis to determine the impact of building upgrades anticipated as a result of the MTI on energy consumption and GHG emissions
e. Explore the financial impacts to building owners of interventions proposed in the MTI plan

TA 6. Document the points of intersection between CBEA and energy codes and codes programs

a. Summarize California energy code decarbonization trajectory (building energy codes and appliance standards)
b. Describe when, why, and how permitting authorities enforce building codes and apply current building codes to new buildings during renovations and upgrades
c. Identify example events that are likely to trigger compliance with current energy codes
d. Clarify what savings can be attributed to CBEA MTI above incremental improvements resulting from compliance with energy codes and standards

TA 7. Review BPS and related policies to guide the CBEA MTI with best practices in existing building efficiency policies

a. Review existing BPS policies nationally and identify what metrics and targets they track, and major findings
b. Estimate percentage of buildings in California that will be covered by local BPS during the timeframe of the CBEA MTI. Determine the total floor area covered, estimated site energy use, source energy use, and GHG emissions
c. Summarize how California cap & trade program could affect or be applied to BPS.
d. Summarize how air quality regulations (i.e., NOx regulations) could affect compliance with BPS and the CBEA MTI

Technology Assessment Method(s):

Technology assessment methods will include literature review, data analysis, and discussions with subject matter experts (SMEs) and other key stakeholders. We will identify where we can leverage existing work and where to prioritize research efforts to fill knowledge gaps.

Table 2. Summary of technology assessment activities

Technology Assessment (TA) research objective	**Phase II research task**	**Deliverable(s) informed by research**				**Related market research**
		Literature & existing data review	Ongoing expert engagement	Engineering calculations		
TA 1. Survey and evaluate existing datasets that could contribute to the CBEA MTI		X			Product Assessment Report, MTI Plan	
TA 2. Identify trends across building types, upgrade opportunities, and segmentation strategies within the commercial building stock by analyzing existing building energy consumption data				X	Product Assessment Report, MTI Plan	**MR 1, MR 4**
TA 3. Define metrics and recommend a metric for tracking performance by the CBEA MTI		X			Product Assessment Report, MTI Plan	
TA 4. Assess tools that empower building owners to make informed, cost-effective performance and efficiency upgrades		X	X		Product Assessment Report, MTI Plan	**MR 6**
TA 5. Identify areas for improving building efficiency and analyze potential GHG emissions and energy efficiency improvements				X	Product Assessment Report, Market Forecasting and Cost-Effectiveness Modeling Approach, MTI Plan	
TA 6. Document the points of intersection between CBEA and energy codes and codes programs		X			MTI Plan	
TA 7. Review BPS and related policies to guide the CBEA MTI with best practices in existing building efficiency policies		X			Market Characterization Report, MTI Plan	

Table 3. Summary of technology assessment needs, cost, and estimated timeline

Assessment task	Schedule (estimated weeks)	Estimated cost	Deliverables informed by this task
Literature & existing data review, expert engagement	Weeks 1-39	$94,000	MTI Plan
Energy modeling & engineering calculations	Weeks 9-28	$151,000	MTI Plan
Total estimate:		**$245,000**	

8.2 Market research

This section describes the market research needed to inform the MTI planning. The objective of the proposed research, the methods by which the research is conducted and how the results of the research will be use are shown in Table 4. Table 5 summarizes the estimated cost per task.

Market research objectives:

Market research to inform the CBEA MTI initiative seeks to provide insights, reveal needs and opportunities, and test team hypotheses concerning existing commercial buildings in California, factors that influence choices to upgrade the buildings in ways that improve their performance, and market support and gaps to accelerate such upgrades. Market research outcomes will help the CalMTA team refine and structure the market transformation initiative for effective acceleration of building improvements.

To address these goals, the CalMTA team identified dozens of research questions. We have grouped the market research questions into nine main themes, each with specific research questions. Those themes and more specific research questions are:

MR.1: Characterize market landscape and baseline market conditions

a. What are the building ownership and operational types (municipal, university, schools, and hospitals (MUSH), other owner-occupied, major investor self-managed, small investor self-managed, hands-off investor with management company, etc.)? What

share of buildings and building space do they control? What share is multifamily versus commercial?

b. What is the distribution of restaurant buildings and space by ownership type?[21] Distinguish between owned and leased space and type of restaurant (individual, small chain, large chain-owned, large chain franchise-owned).[22]

c. What California Program Administrator (PA) efficiency programs exist to promote upgrades of existing buildings? Are they performance based, prescriptive, or custom rebate programs? What do they offer? To whom? Who offers and implements them? Which ones have been successful? (Focus is on creating a historical inventory of California programs for both context and possible partnering and coordination. Secondarily, we will look for example programs nationally that provide insights on approaches and strategy.)

d. What are the existing commercial building upgrade programs' pain points by type of program? What pain points are they addressing? What pain points are they not able to address or experiencing as barriers? What is their volume of activity compared to existing building space? What level of savings are they getting?

e. What is the state and direction of the ESCO market in California? How large is that market? What building types and sizes do they focus on?

f. What role do commercial real estate financial professionals play during building transactions and during regular building operations? In what ways are energy operational costs and condition of energy-using equipment incorporated in their interactions with building decision-makers? What openness is there to increase or enhance incorporation of energy operational costs and the state of energy-using equipment in buildings as part of valuing buildings or advising building owners and potential purchasers?

g. How does decision-making for building upgrades and equipment replacements work by type of ownership structure? Who decides what? What does the process look like? What outside influencers have input?

    1. Who and what influences decision makers (by market segment and by ESJ/non-ESJ geography)? Are energy professionals valued contributors? Are bank officers more influential?

[21] For classifications of restaurant buildings, we will consider buildings of all sizes, including those below 20,000 ft^2. The rationale behind this relaxed constraint is that restaurant energy intensity is particularly high, making it useful to look at smaller establishments, too.

[22] Some of this information may be available from the Foodservice Water Heating Systems MTI market research.

2. What share of buildings and building decision-makers (by market segment and by ESJ/non-ESJ geography) track energy usage and cost at a building level?
3. What share compare energy use to a standard?
4. What share consider EUI metrics in assessing building performance?
5. What share report EUI internally?
6. What share use EUI to trigger consideration of building upgrades?
7. What share report GHG emissions internally?
8. What share perceive a financial benefit to reduced carbon emissions?
9. What share incorporate life cycle energy costs in their financial calculations for (a) routine equipment replacements / maintenance and (b) building improvements?
10. What share have an upgrade list or plan?

h. What influence do local governments have to spur upgrades of existing buildings formally (through regulatory or plan reviews) or informally? How regularly do they affect existing building upgrades in some way? What role do they play behind the scenes (indirectly)?[23]

i. What public organizations or public-private partnerships could influence choices to upgrade existing buildings?[24]

j. What is the trajectory of energy use intensity and site-level GHG of targeted buildings without the MTI interventions?

MR.2: Assess current and untapped drivers for upgrades of existing commercial buildings

a. What triggers spur consideration of building upgrades? What is the process? What drivers most affect the ultimate choice on whether and how to upgrade?

b. How do triggers, processes, and drivers differ by ownership types (real estate investment trusts, MUSH, chains, individual owners)? What metrics are used to examine the financial implications?

[23] The relevance of this research questions depends on other investigations and further refinement of the initiative by the team. If we explore this question, we would stage it in second phase of the market research. We will label other research questions that are conditional in a similar way with a footnote that simply says "conditional."
[24] Conditional.

c. What non-energy benefits factor into decisions to make building improvements (water, climate, sustainability, indoor air quality, occupancy rate increases, etc.)? Which matters most? How important are they (e.g., what role do they play in choices)?

d. Who are the trusted information sources before and during upgrade decisions? What does it take to achieve comfort with new technology? What role does word of mouth play in technology changes?

MR.3: Characterize affordable housing structure and selected practices and policies

a. What are the different types of affordable housing? How much of each is there? Who owns/controls them and to what extent?

b. What roles do rent controls play in affordable housing's ability to fund upgrades? What funding mechanisms are there?[25]

MR.4: Characterize the state and role of BPS and policy[26]

a. What are compliance rates with benchmarking requirements? How reliable are the resulting building data on energy performance (for purposes of identifying buildings in need of improvement and types of improvements needed)?

b. What is the degree of awareness of benchmarking requirements among affected building owners? What role has the feedback aspect of benchmarking played in voluntary upgrades?

c. What are barriers to compliance?

d. What stakeholders may be missing in policy discussions related to SB 48?

MR.5: Determine relevant financial assessment practices and financing opportunities

a. How do building owners fund essential and non-essential building improvements (by type of building segment)? What other financing mechanisms are available?

b. Do changes in energy costs, related equipment upgrades, or broader "building performance" metrics affect borrowing costs? By what mechanism and how much?

c. How do building purchasers assess a building's financial value? What are the inputs? What role do energy (and related) performance play?

d. Do commercial buildings go through an appraisal process? Who appraises building value? How? What role does energy (and related) performance play?

e. What requirements and practices are there for disclosing building energy (or related) performance as part of building transactions?

[25] Conditional.
[26] Conditional.

f. What funding sources are available for the exploration of upgrades (audits etc.) and actual building improvements?

MR.6: Identify existing information sources and tools that inform building upgrades

a. What information sources and tools exist to inform building upgrade possibilities (for building owners, managers, and efficiency providers like ESCOs and auditors)? What building sectors do they cover? For whom? How and by whom are they used?

MR.7: Assess how market actors may react to key program concepts[27]

a. How do market actors react to our potential program offerings (once those are defined)?

b. How do market actors react to messaging and naming of offerings?

MR.8: Conduct targeted mini-investigations

a. To what extent (volume) have commercial office spaces been converted to multifamily spaces since the pandemic? To what extent is this still happening now?

b. Is there any data on the effect of building upgrades on the financial and functional lifespan of buildings (either as viable properties in their current class or any class)? What are building makers' perceptions?

MR.9: Assess workforce needs and gaps

a. What workforce skills are needed to address the efficiency upgrade opportunities in existing buildings?[28] How does the scale and nature of existing workforce skills compare to the needs?[29]

b. What workforce skills are needed to make a business case to the identified decision-makers for the upgrades identified as needed in the existing building sector? (This will require more information about the nature of the opportunities and results from research into decision-making.)

Market research methods:

The market research methods we will employ comprise:

- Secondary research
- Market observer interviews and expert interviews
- Stakeholder interviews/information requests

[27] Conditional.

[28] We cannot answer this question until the nature of the opportunities and building interventions is more clearly defined. We would explore this research question in a second research phase.

[29] Answering this research question requires an examination of the current workforce. We will need to weigh the appropriate balance of resources to answer this question against the value of the research.

- Market actor qualitative research (interviews, focus groups, listening sessions)
- Market actor baseline practice survey
- Case study

We describe the role of each in somewhat greater detail here:

Secondary research: Each major research question will entail a review of what is already known. In some cases, this entails a review of building and market-related data from public or private sources to quantify and characterize the existing commercial building stock, energy usage (which may be covered by technology research), ownership structures, and related questions. Secondary research also includes a review of industry studies that have examined building retrofit opportunities, programs, challenges, and practices. For some research questions, secondary research will be the primary data source; for others, secondary research will be the initial context-setting activity that will inform other activities that will serve as the primary information sources.

Market observer interviews: Multiple market actors have a direct lens into key aspects of commercial building industry practices and building upgrades. These may include industry associations, funders, contractors, and similar market actors. For some research questions, we will interview applicable market observers for an overview and further context, their observations, and their thoughts about opportunities and barriers related to building upgrades. A subcomponent of the market observer interviews will be dedicated to expert panel/Delphi Panel market estimates.

Stakeholder interviews and information requests: Stakeholders include such entities as investor-owned utilities with commercial building upgrade programs, the California Energy Commission, and others with whom CalMTA would collaborate on a commercial building upgrade initiative. We would conduct interviews about stakeholder activities, observations, and perspectives, and we may make information requests related to their activities, such as the nature and volume of existing activities or commercial building upgrades.

Market actor interviews and related qualitative data collection: We are defining market actors as those entities that would be direct targets of a market transformation initiative, including building owners and investors, building managers, and contractors who actively promote and support commercial building upgrades, and commercial real estate professionals. Data collection methods we envision including direct, one-on-one interviews, focus groups, and possibly group listening sessions. The data collection method will be based on whether hearing individual perspectives or group perspectives are more useful for answering the research question as well as whether the presence of other market actors will interfere with candor. For now, we are not planning any close-ended surveys because the quantitatively oriented questions in the market research plan are probably best answered with comprehensive available data rather than self-

reports from those who would respond to a survey. We could add surveys of market actors if needed during the market research stage after exhausting secondary research efforts.

Market Actor Baseline Practice Survey: A survey of key market actor practices will quantify the degree to which key practices associated with the MTI strategy and with MTI metrics are currently in place. These metrics will inform planning and serve as a baseline for evaluation and measurement. The sample frame and questions will be informed by secondary and qualitative research. Targeted market actors are likely to focus on building decision-makers, segmented by a combination of market segment, ownership structure, and building size.

Case studies: The development of illustrative case studies can help demonstrate the range of financial decision-making that informs, supports, or provides barriers to building upgrades. We are planning the development of such case studies as a means to understand the financing and financially driven processes involved in considering building upgrades.

Table 4. Market research objectives, tasks, and deliverables

Market Research (MR) objective	**Phase II research task**							
	Secondary research	Market observer interviews	Stakeholder interviews/ information requests	Market actor[a] interviews	Market actor[a] focus groups/ listening sessions	Market actor survey	Case study development	**Deliverable(s) informed by research**
MR.1: Characterize market landscape and baseline market conditions	X	X	X	X		X		MTI Plan, Market Characterization, Baseline Market Forecast (and related cost-effectiveness and evaluation plans)
MR.2: Assess current and untapped drivers for upgrades of existing commercial buildings	X	X	X	X	X		X	MTI Plan, Market Characterization, Baseline Market Forecast (and related cost-effectiveness and evaluation plans)
MR.3: Characterize affordable housing structure and selected practices and policies	X	X	X			X		MTI Plan, Market Characterization, Baseline Market Forecast (and related cost-effectiveness and evaluation plans)
MR.4: Characterize the state and role of BPS and policy	X[b]	X[b]	X[b]					MTI Plan, Market Characterization, Baseline Market Forecast (and related cost-effectiveness and evaluation plans)
MR.5: Determine relevant financial assessment practices and financing opportunities	X	X	X	X		X	X	MTI Plan, Market Characterization, Baseline Market Forecast (and related cost-effectiveness and evaluation plans)
MR.6: Identify existing information sources and tools that inform building upgrades	X	X	X		X	X		MTI Plan
MR.7: Test program concepts		X[b]	X[b]		X[b]	X		MTI Plan
MR.8: Conduct targeted mini investigations	X	X	X	X				MTI Plan
MR.9: Assess workforce needs and gaps								MTI Plan

[a] Market actors will be primarily building decision-makers, including portfolio managers, investors, managers, and facility staff representing organizations that own relevant buildings or manage them for hire.

[b] Task is conditional on emerging initiative design; tasks are a best guess of what might be needed for research questions that will need to be defined later.

Table 5. Market research, estimated cost, and estimated timeline

Research task	Schedule (estimated weeks)	Estimated cost	Deliverables informed by this task
Secondary research/sales data analysis	Weeks 1-16 Planning 1-4 Doing 3-12 Reporting 11-16	$115,00	MTI Plan, Market Characterization, Baseline Market Forecast
Market observer interviews	Weeks 1-20 Planning 1-6 Doing 9-16 Reporting 17-20	$45,000	MTI Plan, Market Characterization, Baseline Market Forecast
Stakeholder interviews/ information requests	Weeks 1-20 Planning 1-6 Doing 9-16 Reporting 17-20	$35,000	MTI Plan, Market Characterization
Market actor interviews	Weeks 1-28 Planning 1-6 Doing 13-24 Reporting 25-28	$90,000	MTI Plan, Market Characterization, Baseline Market Forecast
Market actor focus groups / listening sessions	Weeks 1-28 Planning 1-6 Doing 17-24 Reporting 25-28	$25,000	MTI Plan, Market Characterization, Baseline Market Forecast
Market actor survey	Weeks 1-28 Planning 1-6 Doing 13-24 Reporting 25-28	$180,000	MTI Plan, Market Characterization, Baseline Market Forecast
Case studies (financial)	Weeks 1-32 Planning 1-6 Doing 21-28 Reporting 29-32	$85,000	MTI Plan
Total estimate:		**$575,000**	

The market research activities will conclude with an estimation of base year saturation and market share of the MTI technology or related indicators.

The technology and market research activities described in this plan will inform an updated forecast of market adoption with and without the MTI and development of Phase II Total System Benefit (TSB) and cost-effectiveness estimates. These revised estimates will be developed upon the completion of the market characterization and will be submitted as part of the full MTI Plan.

8.3 Strategy tests

CalMTA has concluded that this MTI needs further research before strategy tests can be identified.

9 External program coordination and alignment

This section identifies a few key program stakeholders CalMTA needs to coordinate with as we determine the MT idea viability and develop the full MTI Plan. This list is a subset of a larger list and more stakeholders will be identified to coordinate with during Phase II.

During Phase I, CalMTA identified a preliminary set of local, state, and national programs that offer potential alignment with the CBEA idea. In addition, we have closely tracked and, when possible, participated in early market activities with relevance to this work, including early coordination with the CEC on the California Building Energy Action Plan and the California Building Energy Performance Strategy Report and Recommendations required per SB 48 as well as the CalBPS working group led by the U.S. Green Building Council (USGBC) California and Noresco. CalMTA also participated in introductory conversations with entities outside of California who are leading BPS-aligned activities, including NEEA, IMT, a discussion with SEI about workforce development related to BPS implementation in Washington State, and members of CalMTA's MTAB.

CalMTA will prioritize coordination with the following programs and stakeholder groups as we conduct the activities identified in this Advancement Plan.

Table 6. CBEA Phase II external program coordination approach

Program – organization/ stakeholder segment	Coordination approach
Local energy codes program (statewide reach codes)	Continue ongoing series of coordination meetings with the statewide codes and standards team to understand current work and/or upcoming activities related to this idea Provide relevant information and insight to drive alignment on key areas of interest as the program assesses, plans, and maps out potential BPS scenarios that may complement CBEA activities Review and share data as appropriate to enhance investor-owned utilities (IOUs) Explorer "Building Estimates" tool for future leverage

Program – organization/ stakeholder segment	Coordination approach
Performance-based commercial sector incentive programs (e.g., the Commercial Strategic Energy Management Programs administered by Southern California Edison (SCE) and SoCalGas and the IOUs' Market Access Programs)	Leverage market knowledge and established industry relationships to inform the design of planned research activities and interventions If applicable, coordinate on identification of case study sites
Whole building multifamily optimization programs like the IOUs' Multifamily Energy Savings Program (Energy Savings Assistance Multifamily Whole Building Program)	Leverage market knowledge and established industry relationships to inform the design of planned research activities and interventions If applicable, coordinate on identification of case study sites
CEC Building Energy Performance Strategy activities related to SB 48, including leverage of the existing Building Energy Benchmarking Program	Participate in Building Energy Performance Strategy workshops to identify areas of coordination or opportunities to better align CBEA goals with statewide strategy Establish a regular check-in process between the CEC Efficiency Division and CalMTA to identify additional information-sharing and coordination opportunities Seek to review draft versions of the California Building Energy Performance Strategy Report and Recommendations to provide market-informed suggestions and ensure CBEA activities support statewide objectives
USGBC CA's CalBPS working group and related efforts to support BPS adoption statewide Local municipalities who have plans or have already adopted BPS and their support for high-performance building hubs	Support standardization of BPS-aligned commercial building efficiency optimization practices across the state and identify resources needed to move these efforts forward Track and support efforts to adopt BPS at the city/county level, including documentation of best practices and success stories, as a potential point of leverage or coordination
National laboratories (Pacific Northwest National Laboratory, Lawrence Berkeley National Laboratory, and the National Renewable Energy Laboratory)	Review existing research findings and conduct 1:1 outreach to the team's SMEs to understand questions and areas of future research Maintain regular cadence of meetings to explore opportunities for research collaboration and cost-sharing
American Society of Heating, Refrigerating and Air-	Collaborate on targeted efforts to educate the market about aligned building performance optimization strategies and

Program – organization/ stakeholder segment	Coordination approach
Conditioning Engineers (ASHRAE)	recommendations for ASHRAE's BPS guide and code-enforceable BPS standard

As the MTI moves into Phase II: Program Development, CalMTA will further refine this list and engage key Program Administrators and implementation teams to gain deeper knowledge about other program efforts and how they relate to the developing MTI. Ongoing coordination with critical program teams will ensure that we avoid duplication of efforts, facilitate mutually beneficial information/data-sharing, and identify key leverage opportunities to enhance each other's work in this market.

10 Risks and mitigation

Table 7 describes potential risks, their assumed severity, and how we plan to track and mitigate the risks if needed.

Table 7. Hypothesized MTI risk review

Initiative risk	Severity	Mitigation approach
Reliance on ENERGY STAR Portfolio Manager due to uncertainty around future funding and program support	Low/ Medium	Monitor program funding status; identify and evaluate alternative benchmarking tools; establish contingency plans for data continuity
Stakeholder perception of CalMTA's role and involvement in policy	High	Maintain clear and consistent communication around CalMTA's role in policy; engage stakeholders early and transparently; establish feedback loops to address concerns proactively
Risk of displacement or renoviction resulting from building upgrades	High	Partner with housing justice organizations to identify at-risk buildings and communities Monitor and report on tenant impacts and implement corrective actions when needed Explore policy alignment with local housing regulations to protect tenant rights
Increased energy burden on remaining gas customers due to electrification	Low	Develop equitable transition plans that address cost impacts for customers remaining on gas Provide targeted electrification support and incentives for hard-to-electrify buildings

Initiative risk	Severity	Mitigation approach
		Monitor gas system cost trends and identify vulnerable customer groups early
Aggressive savings estimates or financial projections by ESCOs	High	Conduct thorough due diligence and background checks on ESCOs prior to contracting Establish third party verification of work Provide guidance for building owners on identifying reliable ESCOs
Uncertainty in energy rate impacting building performance costs	Medium/ High	Monitor energy rate trends and adjust program incentives to address potential financial barriers
Economic downturn reducing investment in building performance	High	Develop flexible program delivery models that allow for phased upgrade or deferred investments Focus on long-term opportunities and value

11 Estimated cost, timing and expected results

Table 8 summarizes the estimated costs to complete the technology assessment, and market research described in Section 8.

Table 8. MTI Advancement Plan estimated cost summary

Section	Estimated cost $
Technology Assessment	
(1) Literature & Existing Data Review, Expert Engagement	$94,000
(2) Energy Modeling & Engineering Calculation	$151,000
Market Research	
(1) Secondary research / sales data analysis	$115,000
(2) Market observer interviews	$45,000
(3) Stakeholder interviews / information requests	$35,000
(4) Market actor interviews	$90,000
(5) Market actor focus groups / listening sessions	$25,000
(6) Market Actor Survey	$180,000
(7) Case studies (financial)	$85,000
Total	**$820,000**

Figure 3 in this section shows a rough timeline of this phase's activities to develop the full MTI Plan.

Figure 3. Overall timeline/schedule of activities

Activity	Duration (Weeks)	Timeline (Months)													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Technology Assessment															
(1) Literature & existing data review, expert engagement	1 - 39														
(2) Energy modeling & engineering calculations	9 - 28														
Market Research															
(1) Secondary research/sales data analysis	1 - 16														
(2) Market observer interviews	1 - 20														
(3) Stakeholder interviews / information requests	1 - 20														
(4) Market actor interviews	1 - 28														
(5) Market actor focus groups / listening sessions	1 - 28														
(6) Market Actor Survey	1 - 28														
(6) Case studies (financial)	1 - 32														

Table 9 shows a rough estimate of the initiative should it advance to the Market Deployment phase and what the high-level estimates initiative results would be.

Table 9. Initiative market deployment budget and expected results

Initiative cost ($)	>25 million
Initiative timeline (years)	> 10 years
Expected results	TSB: $566 TSB Energy: $148 TSB Grid: $223 TSB GHG: $195

Appendix A: Preliminary Benefits and Cost-Effectiveness Estimation Approach

The information provided in this appendix summarizes the approach and methodologies used for the preliminary estimation of market adoption, total system benefit (TSB), and cost-effectiveness during stage 2 scoring. The target markets, idea definition, and other criteria have shifted during the development of this advancement plan. The information contained in this appendix will be updated at the end of Phase II as part of the MTI Plan development to ensure the estimates better reflect the most current MTI design.

Market transformation initiatives (MTIs) generate energy savings and related benefits by accelerating and increasing market adoption of energy-efficient technologies and practices. Estimating the energy impacts and cost-effectiveness of MTIs requires developing a market adoption forecasting model and using model outputs to estimate incremental system benefits and cost-effectiveness.

This document details the approach, methods, assumptions, and data sources CalMTA used to develop a preliminary estimate of incremental impacts that would result from implementation of the Commercial Buildings Efficiency Accelerator (CBEA) MTI and summarizes findings from the analysis. This forecast is required as part of the MTI life cycle during Phase I: Concept Development, in order for the idea to advance to Phase II: Program Development.[30] After CalMTA completes the MTI Phase II research described in this Advancement Plan, it will refine and update the forecasting approach, as required for advancement to Phase III: Market Deployment.

CBEA market definition

Table A1 A1 summarizes the Phase I CBEA market definition and characteristics used to develop the market adoption and cost effectiveness forecasts.

Table A1. Phase I MTI definition and assumed addressable market

CBEA idea definition	The Commercial Buildings Efficiency Accelerator (CBEA) MT idea would accelerate building owners' and managers' adoption of lifecycle energy and emissions planning as part of standard practice building management, which would result in accelerated compliance with Building Performance Standards (BPS) in jurisdictions that adopt a BPS-type policy or goal.
Addressable market segments	Commercial (non-federal) buildings greater than 20,000 ft^2.

[30] For additional information about the MTI Lifecycle, see https://calmta.org/phase-i-concept-development/.

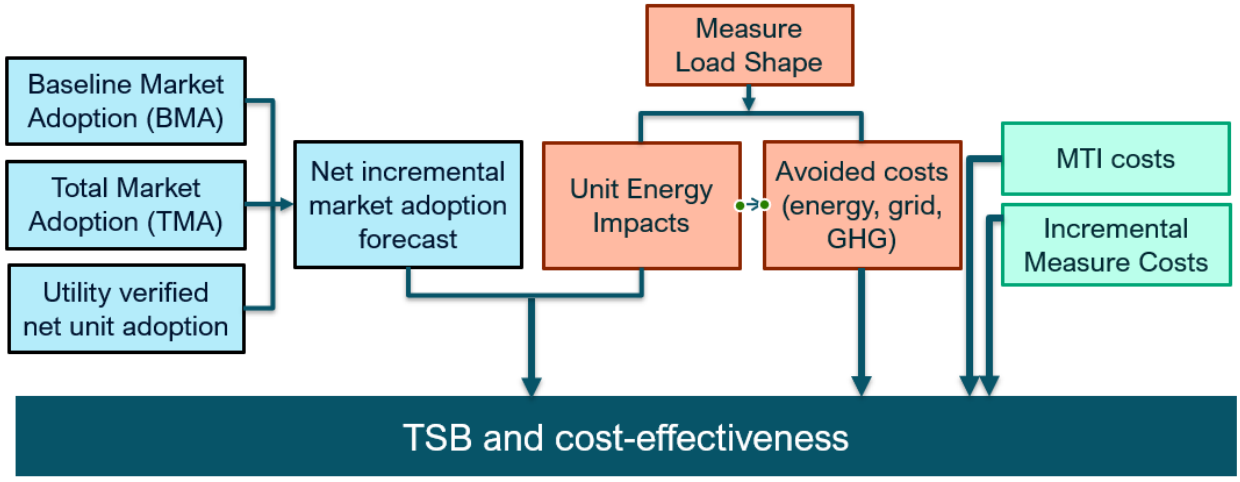
Overview of estimation approach

To estimate incremental impacts and cost-effectiveness from the CBEA MTI, CalMTA developed these inputs:

- Baseline market adoption (BMA) forecast
- Total market adoption (TMA) forecast
- Measure load shape
- Unit energy impacts estimate
- Avoided costs
- Costs required to calculate benefit-cost ratios using the total resource cost (TRC), program administrator cost (PAC), and societal cost test (SCT) tests, as prescribed by the California Public Utilities Commission (CPUC):
    - initiative costs
    - Incremental measure cost (IMC)

Figure A1 illustrates the relationship among these analysis components and the resulting outputs. The remainder of this document describes the approach and sources for each of these components and summarizes the outputs.

Figure A1: Forecasting inputs



BMA and TMA forecast

The Team first developed the BMA forecast of building compliance with BPS policies based on current and expected market trends and regulatory factors, assuming no intervention by CalMTA. Next, we developed the TMA forecast of compliance with BPS, assuming the CBEA MTI is

deployed. Finally, the team used incremental adoption (TMA minus BMA) to estimate cost-effectiveness and TSB.

Adoption forecast inputs

CalMTA developed the BMA and TMA based on these key inputs:

- Affected building square footage
- BPS adoption schedule
- BPS compliance schedule

Affected building square footage

The team first estimated the square footage of commercial buildings that would be covered by a statewide BPS regulation. Based on experience to date with BPS, we assumed that California buildings subject to a BPS would include commercial and industrial buildings greater than 25,000 ft^2 and exclude federal buildings. Chula Vista, the only California city to have adopted a BPS policy at the time of analysis (2023), includes buildings over 50,000 ft^2 in its initial implementation scope, and expands to those over 20,000 ft^2 by 2026. Other states such as Oregon and New York use a threshold of 25,000 ft^2 or 35,000 ft^2. Accordingly, this analysis defined the addressable market as buildings 25,000 ft^2 or larger.

Based on a 2021 California Energy Commission Report,[31] there are 7.5 billion ft^2 of commercial floor area in California. Using data from the U.S. Energy Information Administration's (EIA) 2018 Commercial Buildings Energy Consumption Survey,[32] CalMTA estimates that 62% of this floorspace is in buildings over 25,000 ft^2. Thus, the **addressable market** is 4,642 million ft^2 of commercial floor area in California belonging to buildings 25,000 ft^2 or larger. This analysis assumes a steady state distribution of commercial floor area over time.

BPS adoption schedule

CalMTA assumes jurisdictions (cities and counties) will adopt a BPS over time, eventually leading to statewide adoption. CalMTA assumed regions that are a member[33] of the National BPS Coalition would adopt BPS sooner than cities/counties that are not members. In addition, CalMTA assumed jurisdictions adjacent to adopting localities would be influenced to adopt similar policies. Table A2 shows the **adoption schedule by jurisdiction** assumed in the Stage 2 forecast. When compared to the BMA, the TMA shows accelerated adoption by jurisdictions (e.g. the nine bay area counties) and by the State of California. CalMTA also assumes once a jurisdiction adopts a BPS, the policy is not reversed, and that over time BPS policies apply to more buildings.

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[31] https://efiling.energy.ca.gov/GetDocument.aspx?tn=239311.

[32] EIA Table B3.

[33] BPS members include California State, Chula Vista, Sacramento, Berkeley, City and County of San Francisco, Los Angeles, Los Angeles County, San Diego, Santa Monica, West Hollywood.

Table A2. BPS adoption schedule for BMA versus TMA forecasts

Initial adoption year	Adopting jurisdictions in BMA	Adopting jurisdictions in TMA
2023	Chula Vista/Brisbane/San Jose	Chula Vista/Brisbane/San Jose
2024	Berkeley/City and County of San Francisco	Berkeley/City and County of San Francisco
2025	San Diego	San Diego/Sacramento/Santa Monica
2026	City of Los Angeles	City and County of LA
2027	Marin and San Mateo and Santa Clara Counties	All Bay Area Counties
2028	Sacramento/Santa Monica/Manhattan Beach/Santa Barbara/Folsom/Rancho Cordova	Sacramento County/San Diego County
2029	Burbank, Pasadena, South Pasadena	Santa Cruz County/Santa Barbara
2030	Rest of Bay Area (Alameda, Contra Costa, Solano, Napa, etc.)	California State
2031	Los Angeles County	n/a
2032	San Diego County	n/a
2033	California State	n/a

Next, CalMTA translated adopting jurisdictions to commercial floor space. To allocate the addressable commercial floor space to the adopting jurisdictions, CalMTA used a jurisdiction's share of multifamily housing as a proxy, specifically using the share of housing units belonging to buildings housing five or more units as provided by the Department of Finance.[34] **Table A3**A3 shows the covered floorspace by year.[35]

Table A3. Covered area by year (millions of square feet)

Year	BMA	TMA
2023	159	159
2024	298	298
2025	289	399
2026	972	1,661
2027	400	669
2028	142	263
2029	65	62
2030	246	1,132
2031	1,594	0

[34] Table E-5 for 2023 https://dof.ca.gov/forecasting/demographics/.

[35] CalMTA will update this information during Phase II.

Year	BMA	TMA
2032	51	0
2033	427	0
2034 and beyond	0	0
Total	**4,642**	**4,642**

BPS compliance

BPS sets targets for building performance that must be achieved over time. As such, CalMTA assumes maximum compliance will be achieved over a span of seven years. Table A4 shows the incremental compliance for each year in the BMA and TMA, with the TMA achieving a higher cumulative compliance due to the MTI.[36]

Table A4. Compliance rates for BMA and TMA

Adoption Year	BMA Rate (incremental)	TMA Rate (incremental)
1	10%	10%
2	15%	15%
3	15%	20%
4	20%	20%
5	10%	10%
6	10%	10%
7	5%	5%
8 and beyond	0%	0%
Cumulative Compliance	**85%**	**90%**

Annual adoption (in millions of square feet) is forecasted with the following equation:

$$Adoption_i = \sum_j Compliance\ Rate_t \times Covered\ Area_j$$

The covered area is provided in **Table A3**. **Error! Reference source not found.** shows compliance rates for the BMA and TMA. BPS policies set long term performance targets, as such the share of buildings that comply gradually increase over time. CalMTA assumes a compliance timeline of 7 years.

i = adoption year

[36] CalMTA will update this information during Phase II.

j = adopting jurisdictions in year *i* and previous years

t = years since the jurisdiction, *j*, adopted policy; used to look up compliance rate in **Error! Reference source not found.**

Adoption forecast outputs

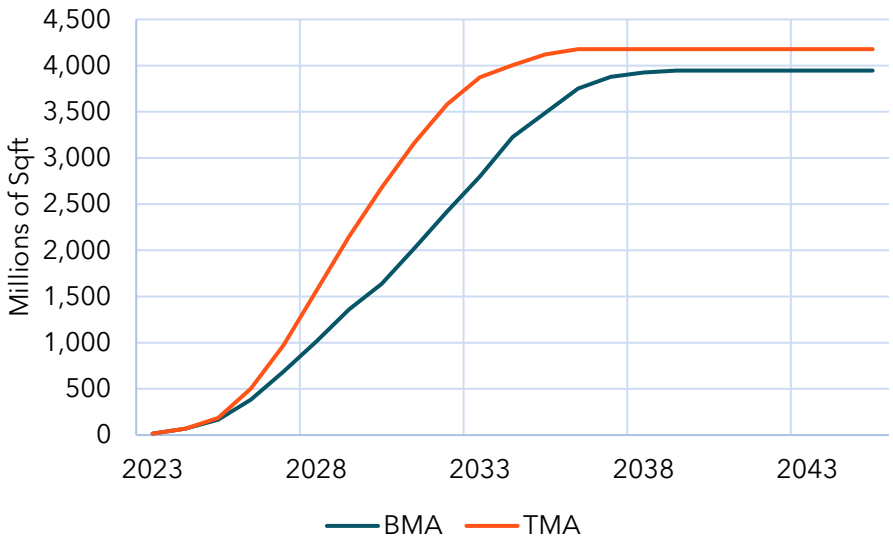
Table A5 shows annual adoption for the BMA and TMA cases from 2025 through 2045.

Table A5. Incremental adoption in millions of square feet

Year	BMA	TMA
2023	16	16
2024	54	54
2025	97	116
2026	217	317
2027	304	471
2028	323	584
2029	349	589
2030	277	530
2031	386	488
2032	397	415
2033	379	292
2034	429	133
2035	262	116
2036	262	57
2037	128	0
2038	45	0
2039	21	0
2040	0	0
2041	0	0
2042	0	0
2043	0	0
2044	0	0
2045	0	0
Total	**3,946**	**4,178**

Figure shows cumulative adoption in the BMA and TMA scenarios. Ultimately more square footage is affected in the TMA scenario, as well as being affected sooner than the BMA scenario.

Figure A2. Cumulative adoption



Load shape

Load shape is defined as the hourly probability of activity for commercial buildings and is based on a set of variables including equipment runtimes, operating characteristics, and other factors, such as occupancy patterns. The team used load shape ratios from National Renewable Energy Laboratory's (NREL) ComStock database for medium offices prototype (Source 1), and applied EIA commercial building monthly energy consumption estimates to develop an 8760 hourly model in Excel. The team then applied that load shape to determine UEIs and avoided costs on an hourly basis for each year.

Unit Energy Impacts

The team developed annual consumption estimates based on EIA Commercial Building Energy Consumption Survey (CBECS) energy use intensities for buildings ranging from 5,001-10,000 ft^2 which is similar to the NREL ComStock medium commercial office building prototype building area of 20,000 ft^2 with upgrades to achieve 20% greater energy savings than baseline.[37] The team referenced existing BPS policies and reports to estimate annual savings and assigned a conservative 20% reduction in whole building energy consumption to quantify hourly impacts for successful implementation of BPS policies in California commercial buildings.[38] The average annual electric savings for the installation condition were -1.51 kWh per square feet. Average

[37] CalMTA will update these estimates during Phase II.

[38] Reports referenced include: https://imt.org/news/building-performance-standards-beyond-the-meter/; https://www.urbangreencouncil.org/what-we-do/driving-innovative-policy/ll97/; https://www.sciencedirect.com/science/article/abs/pii/S0378778823002190.

annual gas savings were 0.01 therms per square feet for an average of $0.26 per sq ft. in total avoided cost across all cases (Table A7).[39]

Table A7. Unit Energy Impacts

Fuel	Average annual Baseline consumption per square foot	Average annual Savings per square foot
Electric (kWh)	7.53	-1.51
Gas (therms)	0.064	-0.01

The team applied these UEIs to the load shape and avoided costs to determine the TSB generated by an HPWH adopted because of the MTI.

Avoided costs

Avoided costs are defined as the marginal costs that participating IOUs would avoid in any given hour through lower energy consumption. The electric avoided costs include those associated with cap and trade, GHG adder, GHG rebalancing, energy, generation capacity, transmission capacity, distribution capacity, ancillary services, losses, and methane leakage. The gas avoided costs include transmission and distribution, commodity, nitrogen oxides, carbon dioxide, and methane emissions.

The team developed avoided costs using the avoided cost calculator (2022) for three utilities: Pacific Gas and Electric (PG&E), SCE, and San Diego Gas & Electric (SDG&E).[40] We developed avoided costs based on a square foot of upgraded commercial office or large multifamily building space in each utility's territory. Since the MTI is implemented for California as a whole, avoided costs for just PG&E, SCE, and SDG&E cannot fully represent the state. We included a separate category, "other," to represent the other utilities in California, developed through population proportions and utility territory maps. Specifically, we overlayed the utility territory maps with county boundaries and assigned an appropriate proportion of the county's population to the respective utility. We developed avoided costs for the "other" category by applying population-weighted average avoided costs for the three utilities when generating statewide TSB and Cost-Effectiveness results. We applied avoided costs to the incremental adoption for PGE, SCE, SDG&E, and "other" utilities in each year.

Cost inputs

The cost-effectiveness model requires the following cost inputs to develop TSB estimates and assess cost-effectiveness. TSB is a representation in dollars of the lifecycle energy, ancillary

[39] CalMTA will update these savings estimates during Phase II.
[40] The 2022 ACC was the most recent version available at the time of analysis.

services, generation capacity, transmission and distribution capacity, and greenhouse gas (GHG) benefits of the market transformation initiative.

Initiative *costs*

Initiative costs are related to the implementation of the MTI and include MTI administration, research and evaluation, marketing, and other related costs. Flow-down incentives (FDI's) are included in initiative costs if they are part of the MTI, but CBEA does not anticipate incentives. Table X provides the assumed initiative costs for the CBEA initiative.

Incremental measure cost

Incremental measure costs are the additional cost of installing an MTI qualified measure versus the baseline alternative and may include components such as higher product price, installation costs, and any other costs that would not be borne if the baseline alternative were chosen. The team conducted secondary research to develop estimates of incremental costs for energy upgrades required to comply with a BPS. To determine these cost estimates, we researched the costs of energy efficiency upgrades installed in commercial buildings, primarily using California based studies.

After determining the average costs for products currently in the market, we extrapolated the costs in future years by subtracting 1% of the first-year incremental cost from each subsequent year in the MTI. We assumed that IMC would decrease over time due to economies of scale (that is, the price of the efficient technology is cheaper over time) and move closer to the price of the baseline technology. The incremental measure cost in the first year of adoption for commercial office buildings adopting a minimum of 20% more efficient energy consumption was $1.41 per square foot. This was based on a proposed average measure mix cost for energy efficiency upgrades to heating, cooling, weatherization, lighting, water measures and controls of $70,452[41] per commercial building with an assumed size of 50,000 ft^2.

TSB and cost-effectiveness forecast

As depicted previously (Figure A1), there are six primary inputs required to estimate TSB and cost-effectiveness: incremental market adoption, load shape, UEIs, initiative costs, avoided costs, and IMCs. Each of these inputs must have consistent units of analysis. For this MTI the unit was defined in terms of square footage.

The team applied all inputs on a yearly basis, incorporating the Effective Useful Life (EUL) and the MTI lifetime. The Phase I analysis included these EUL and lifetime assumptions for BPS:

MTI lifetime = 20 years (2025 to 2045)

[41] Bay Area Regional Energy Network Integrated Commercial Retrofits (BRICR) Project Final Technical Report prepared for Building Technologies Program Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, January 2022.

EUL = 10 years[42]

For incremental market adoption and initiative costs over the course of the MTI, we used two assumptions:

- Incremental adoption begins in 2025
- Initiative costs were modeled to decline over time from 2025 through 2045

CalMTA applied a discount rate of 6% over the MTI lifetime to account for the time value of money.[43] There are three outputs for reporting on the MTI: TSB, the TRC ratio, and the PAC. As with the inputs, we broke down outputs by baseline installation condition. The team evaluated the TSB, TRC, and PAC for each of the two installation conditions for the MTI, determining the total for TSB, TRC, and PAC.

Cost-effectiveness analysis

Total System Benefit

CalMTA calculated incremental annual TSB in accordance with the CET, using the following formula:[44]

$$(ElectricBenefits + GasBenefits + NumberOfUnits$$
$$* (Net\ kWh + MarketEffectsBenefits)$$
$$* RefrigerationBenefits)$$
$$- (ElectricSupplyCost + GasSupplyCost)$$
$$+ NumberOfUnits * (Net\ kWh + MarketEffectsCosts)$$
$$* UnitRefrigerationCosts)$$

To generate MTI TSB over the measure's EUL and MTI lifetime, we discounted annual benefits back to the first year of the initiative (2025). We then disaggregated TSB into three components: energy, grid, and GHG benefits (**Table**).

[42] CalMTA will update these estimates during Phase II.
[43] CalMTA initially used a 6% discount rate when this analysis was performed in late 2023. In order to estimate a statewide discount rate, we derived this value from the CPUC's WACC values for the three IOUs. We have since updated our estimates using the specific values provided in the Cost-Effectiveness tool (CET) for IOUs. Phase II estimates for TSB and cost-effectiveness will be calculated based on IOU benefits.
[44] https://pda.energydataweb.com/api/view/2530/DRAFT%20TSB%20Tech%20Guidance%20081621.pdf.

Table A8. Stage 2 preliminary lifetime TSB estimate

Idea name	TSB ($M)	Energy ($M)	Grid ($M)	GHG non refrigerant ($M)	GHG refrigerant ($M)
Commercial Building Efficiency Accelerator	566	148	223	195	0

As shown in Table, the Phase I model estimates that the CBEA MTI will generate approximately $566 million in lifetime TSB. The largest share of the benefit can be attributed to grid savings, with an estimated $223 million in TSB. The smallest share of TSB is driven by energy benefits, with $148 million in TSB. Finally, GHG benefits driven by savings related to electricity and natural gas reductions generate nearly $195 million in lifetime TSB.[45]

Cost-effectiveness

CalMTA calculated benefit-cost ratios using the TRC and PAC tests, in accordance with the CET, as required by D.19-12-021.[46]

Total Resource Cost test. The TRC test compares the lifecycle incremental TSB benefits that the MTI will deliver to the costs associated with achieving those benefits from the perspective of the MTI administrator and the participant. Net benefits, initiative costs, and IMC were used to determine TRC. The non-FDI initiative costs are summed together with the IMC and discounted over the MTI's lifetime. The discounted incremental life cycle benefits are divided by the sum of the discounted IMC and non-FDI Initiative costs. Below is the CET-based formula used by the tool to determine TRC.

$$TSB/TRCCost$$

Program Administrator Cost test. The PAC test compares the lifecycle benefits that the MTI will deliver to the costs associated with achieving those benefits from the perspective of the MTI administrator. Net benefits, and Initiative costs (including FDIs) were used to determine PAC. The initiative costs are discounted in respect to the period of the MTI's implementation. The discounted net life cycle benefits are divided by the sum of the initiative costs to determine PAC. Below is the CET-based formula used by the tool to determine TRC.

$$TSB/PACCost$$

[45] CalMTA will update these estimates during Phase II.

[46] https://calmta.org/wp-content/uploads/sites/263/MT-Policy-Manual-Final-August-2023.pdf.

The team calculated preliminary TRC and PAC ratios of 1.35 and 12.67, respectively, for the CBEA MTI.

Table A9. Cost tests

	TRC	PAC
TSB ($M)	566.4	566.4
Cost ($M)	419.2	44.7
Ratio	1.35	12.67

About CalMTA

CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations. We work to deliver cost-effective energy efficiency and decarbonization benefits to Californians through a unique approach called market transformation. Market transformation is the strategic process of intervening in a market to create lasting change by removing market barriers or exploiting opportunities, accelerating the adoption of identified technologies or practices. CalMTA-developed market transformation initiatives also aim to advance state goals on demand flexibility, workforce development and equity. Learn more at www.calmta.org.