Advancing from Market Potential to Market Transformation: A Two-Phase Blueprint for Statewide Market Change

Jason Christensen and Katie Spillenkothen, Cadmus

ABSTRACT

States striving to move beyond short-term energy savings toward lasting market change face a common challenge: how to turn potential into sustained progress. In Wisconsin, a two-phase initiative represents a rigorous, comprehensive approach to introduce market transformation (MT) as a long-term strategy for achieving enduring energy savings and decarbonization goals. Phase 1 assessed the policy environment and key decisions required to integrate a MT framework and evaluated more than twenty emerging technologies for potential to drive systemic market change. To guide regulatory decision-making for MT investments, Phase 2 advanced the five highest potential opportunities—efficient rooftop units (ERTUs), residential air-source heat pumps (ASHPs), room heat pumps (RHPs), high-performance windows (HPWs), and luminaire-level lighting controls (LLLCs)—and developed actionable Market Transformation Potential Assessments. Quantitative modeling estimated adoption and achievable savings potential, while qualitative methods including in-depth interviews with manufacturers, distributors, and other market actors informed strategies, contextualized findings, and informed prioritization. Each technology faced distinct barriers, including costs, limited availability, lack of awareness and confidence in cold-climate performance, and contractor capacity constraints, alongside cross-cutting challenges such as consumer awareness, trust, and understanding of value propositions. Logic models mapped barriers and sequential outcomes, supported by milestone metrics to track progress over time. Early findings highlight strong near-term potential for LLLCs, while ERTUs may require deeper cost-reduction and value-demonstration efforts. This two-phase, evidence-driven process positions the state to strategically intervene and advance market transformation at scale. Furthermore, it lays the groundwork for coordinated, cross-state collaboration and provides a replicable model for other jurisdictions seeking to consider a Market Transformation approach to achieving energy savings and long-term decarbonization goals.

This paper summarizes an extensive report for Focus on Energy Wisconsin to provide an overview of an approach to consider MT investments. This paper does not focus on the specific details of Wisconsin-specific findings except to illustrate the decision-making process. Detailed Wisconsin findings, such as opportunity-specific logic models and savings forecasts, as well as specific policy questions and relevant findings from states with active MT initiatives are available in publicly available reports cited in the references.

Introduction

Across the country, states that have invested decades of effort in resource acquisition (RA) energy efficiency programs are increasingly asking a fundamental question: what comes next? Traditional RA programs, which provide incentives to customers for efficient equipment and practices, have matured in many markets. The low-hanging fruit has been picked, and the pipeline of cost-effective opportunities has grown thinner. At the same time, state energy and

climate policies are setting ambitious long-term decarbonization goals that require not just incremental savings, but systemic transformation of energy markets.

Market transformation (MT) programs represent one promising path forward. Unlike RA programs, which deliver short-term savings to known participants, MT programs aim to induce structural changes in markets—changing the products that are available, the knowledge and practices of market actors, and ultimately the choices that consumers make—so that more efficient products and practices become the new market norm. MT programs are inherently long-term investments with some risk: costs are incurred early, but the benefits are expected to accrue over many years as market changes take hold and persist without continued program support.

Despite the appeal of MT as a strategy, many utilities and program administrators face real obstacles to investing in it. Regulatory frameworks designed around RA programs do not always accommodate the longer time horizons and different evaluation methods that MT requires. Cost-effectiveness policies, performance goals, and compensation structures may inadvertently discourage MT investment. Additionally, program administrators who have built sophisticated RA delivery machinery may struggle to transition from transaction-based delivery with near-term certainty and immediately observable results.

This paper describes a systematic, two-phase effort by Wisconsin to assess and develop MT as a strategic component of its energy efficiency portfolio. Phase 1, completed in 2024, addressed both the policy landscape and an opportunity screening of more than 20 potential MT opportunities. Phase 2, completed in 2025, advanced the five highest-priority opportunities into detailed Market Transformation Potential Assessments (MTPAs) that included logic models, barrier analyses, strategic intervention frameworks, and quantitative adoption and savings forecasts. Together, the two phases provide a replicable, evidence-based blueprint that other states can adapt to explore incorporating Market Transformation into their own planning.

Background: Market Transformation in the Midwest

The Midwestern state examined in this paper—Wisconsin—has administered the Focus on Energy statewide energy efficiency program since 2001. Focus on Energy is funded through a utility public benefits charge and operates across the residential, commercial, industrial, and agricultural sectors. Over its two-decade history, the program has built strong market relationships and achieved substantial savings, but recent quadrennial planning decisions have signaled that the program needs to evolve (PSC 2022).

The Quadrennium IV planning decision (2023–2026) explicitly stated that Focus on Energy's RA programs have matured and directed the program to increase its emphasis on long-term MT by identifying ways to adapt the existing portfolio and develop new strategies to support market change. The decision also directed the program evaluator to develop an assessment of Focus on Energy's MT potential in coordination with the program administrator and Commission staff (PSC 2022).

Wisconsin is not alone in this journey. In recent years, several neighboring states have made significant investments in MT. Minnesota approved the Minnesota Efficient Technology

Accelerator (MNETA), administered by the Minnesota Center for Energy and Environment (MN CEE), in 2022 following an extensive stakeholder engagement process (MN CEE 2023). Illinois utilities have pursued MT initiatives through the Illinois Stakeholder Advisory Group (IL SAG) process, including Ameren Illinois's LLLC Market Transformation Initiative (AIC 2023). California created the California Market Transformation Administrator (CalMTA) through a 2019 CPUC decision, with an initial annual budget of $20 million scaling to $50 million (CalMTA 2024). The Northwest Energy Efficiency Alliance (NEEA) has administered regional MT programs for more than 27 years across the Northwest (NEEA 2024). These precedents provided Wisconsin with a rich body of experience to draw upon.

Phase 1: Policy Analysis and Opportunity Screening

Policy Analysis

The policy analysis identified key issues that the Wisconsin Public Service Commission (PSC) would need to address before MT could assume a larger role in Focus on Energy. The analysis reviewed enabling legislation, administrative code, and quadrennial planning decisions and drew on in-depth interviews with ten individuals experienced in MT program development in California, Minnesota, and Illinois.

The enabling legislation (Wisconsin Statute §196.374(3)(b)) was found to be broadly consistent with MT investment. The statute directs the program to include "initiatives and market strategies that address the needs of individuals or businesses facing the most significant barriers to creation of or participation in markets for energy efficient products" and to "facilitate markets and assist market providers to achieve higher levels of energy efficiency"—language that aligns well with MT strategy (PSC 2022).

Additionally, the last three of the Commission's final quadrennial planning decisions explicitly considered the appropriate balance between RA and MT as a policy priority for the subsequent quadrennium. The decision for the Quadrennium IV (2023-2026) marked a change in the Commission's stance on the appropriate program balance, which acknowledged the maturity of RA programs and directed the assessment of future MT program opportunities.

However, several policy issues need to be resolved to enable MT investment at scale:

Cost-effectiveness policy.

Current Wisconsin policy requires portfolio cost-effectiveness to be assessed on a quadrennial basis. Because MT programs typically take many years to become cost-effective, this policy disadvantages MT investments. Best practices across MT-adopting states and regions consistently support assessing MT cost-effectiveness over the program lifetime (10 to 20 years), not over a short planning cycle (Prahl and Keating 2014; CalMTA 2024; Illinois TRM 2024). However, the policy of requiring cost-effectiveness at the portfolio level could be interpreted to allow Focus on Energy to include program investments that are not forecast to be cost-effective within a quadrennium or other time period determined by the Commission—as long as the entire portfolio is cost-effective within a quadrennium.

Separate goals and compensation.

MT and RA programs have fundamentally different investment profiles. Without separate performance goals and compensation structures for MT, administrators face incentives to prioritize RA programs that generate immediate savings. The Evaluation Working Group (EWG) noted that MT effects "typically occur over a longer timeframe than the one-year and four-year periods over which savings are currently tracked" (PSC 2022), and that RA-focused incentive structures may cause cost-effective MT opportunities to be foregone.

Evaluation framework.

MT programs require evaluation approaches that differ substantially from RA programs. Rather than counting savings from known participants, MT evaluations must estimate adoption across entire markets and attribute market changes to program interventions. Illinois, Minnesota, California, and New York have all developed and documented MT evaluation frameworks that Wisconsin could adapt (Illinois TRM 2024; NYSERDA 2023; CalMTA 2024; MN CEE 2024). These typically include forecasting expected adoption of the target measure or practice within a defined market as a baseline, comparing observed total market adoption against the baseline, theory-based evaluation and refining of the program logic model, and tracking achievements of short, medium, and long-term market progress indicators.

Governance and administration.

MT requires specialized expertise in market characterization, supply-chain engagement, and long-term initiative development. Other MT administrators have formalized advisory committees, stage-gate initiative frameworks, and governance structures to manage these requirements. Wisconsin could leverage the existing Focus on Energy infrastructure while building in MT-specific governance elements.

Phase 1 Opportunity Screening

The evaluation team developed opportunity descriptions for 20 potential MT technologies, drawing on reviews of MT initiatives in other states, the 2021 Focus on Energy Potential Study, recent market research, and evaluation findings. Each opportunity was characterized by its technology definition, addressable market size, preliminary theory of market transformation, market barriers, leverage points, and mechanism for lastingness.

Eleven opportunities were scored on six criteria: (1) potential value to Focus on Energy; (2) compelling value proposition and non-energy benefits; (3) readiness of technology to scale; (4) identifiable market barriers; (5) possible market leverage points; and (6) mechanism for lastingness. Each criterion was scored on a 1–3 scale, for a maximum of 18 points. Nine of the 20 technologies were not scored for various reasons: insufficient market data, policy conflicts (e.g., codes and standards advocacy would implicate a lobbying prohibition), or program eligibility constraints (e.g., utility-owned streetlights).

Additional opportunities were consolidated within other opportunities as the scoring and market characterizations progressed.

Table 1 presents the scoring results for the top five opportunities, all of which scored between 14 and 16 out of 18 points.

Table 1. Top five MTI opportunity scores from Phase 1 screening

Scoring Criterion	Residential Heat Pumps (Ducted & Ductless)	Efficient Rooftop Units	LLLCs	High-Performance Windows	Packaged Terminal & Window Heat Pumps
Potential value to Focus on Energy	2	2	2	2	2
Compelling value proposition / non-energy benefits	2	3	3	2	2
Readiness of technology to scale	3	3	2	3	3
Identified market barriers	3	3	3	2	3
Possible market leverage points	3	3	3	3	2
Expected outcomes / mechanism for lastingness	3	2	3	3	2
Total Score	**16**	**16**	**16**	**15**	**14**

Note: Scores range from 1 to 3 on each criterion; maximum total score is 18. Packaged terminal and window heat pumps were later consolidated with the residential heat pump opportunity for Phase 2 development.

All four of the technologies with active MT initiatives in neighboring states—residential heat pumps, ERTUs, LLLCs, and HPWs—scored 15 or higher. These opportunities benefit from clearly articulated value propositions for market actors, publicly available MT business plans and evaluation frameworks, and the potential for multi-state collaboration to increase market leverage. The consolidated heat pump opportunity (which merged residential air-source heat pumps, ductless mini-splits, variable speed heat pumps, and packaged terminal/window heat pumps) and LLLCs tied for the highest score of 16.

Phase 2: Market Transformation Potential Assessments

Overview and Approach

Phase 2 developed full Market Transformation Potential Assessments (MTPAs) for the five opportunities identified in Phase 1: LLLCs, HPWs, ERTUs, ASHPs, and RHPs. Each

MTPA included: (1) a state-of-the-market analysis; (2) identification of the target market and key market actors; (3) a preliminary theory of market transformation; (4) a logic model mapping barriers, strategic interventions, and short-, medium-, and long-term outcomes; (5) milestone metrics and market progress indicators; and (6) quantitative adoption forecasts and cost-effectiveness estimates.

The Phase 2 market research combined multiple methods. The team reviewed literature from comparable MT initiatives in Minnesota, Illinois, and California; conducted in-depth interviews with MT program administrators in Minnesota; interviewed Focus on Energy program administrator staff; and conducted market actor interviews with manufacturers and distributors for each technology. This multi-source approach grounded the MTPAs in both regional experience and Wisconsin-specific market conditions.

Wisconsin Market Context

Wisconsin's energy landscape presents a distinctive context for MT. Cold winters and a predominantly natural gas-heated building stock create both challenges and opportunities for electrification-focused MT initiatives. More than two decades of Focus on Energy programming have built strong contractor and customer relationships and captured many accessible RA opportunities. At the same time, state priorities are increasingly emphasizing decarbonization and electrification, creating a supportive enabling environment for MT investments that can deliver lasting market change (Cadmus 2025b).

Wisconsin's commercial buildings provide significant HVAC and lighting efficiency opportunities. Rooftop units serve approximately 48% of commercial floor space, and commercial lighting represents the second-highest utility expenditure in the state. Wisconsin's below-average solar resource—ranking sixth lowest nationally for sunlight exposure, with only 20 clear days per year—makes electric lighting efficiency especially important. On the residential side, the cold climate raises performance concerns for heat pump technologies, but growing availability of cold-climate-rated equipment is gradually shifting this dynamic.

Logic Models and Milestone Metrics

A key methodological contribution of Phase 2 was the development of detailed preliminary logic models for each technology. The logic models, adapted from published frameworks used by CalMTA, MNETA, and Illinois utilities, and informed by primary research, map the causal chain from identified market barriers through strategic interventions to expected short-term (1–3 year), medium-term (3–5 year), and long-term (5–10 year) outcomes. For each outcome, the logic models specify illustrative Market Progress Indicators (MPIs) and concrete milestone outcomes.

Each logic model linking to specific interventions and a sequence of measurable outcomes establishes a causal framework that will ultimately be needed to attribute market changes to the MT initiative and evaluate its impact.

The milestone metrics serve multiple purposes: they provide a management tool for the program administrator to track initiative progress; they offer the Commission a basis for assessing whether MT investments are delivering expected market changes; and they create a structured basis for program evaluators to assess causality between program interventions and observed market outcomes. This milestone-based approach is consistent with practices in Minnesota, Illinois, and California.

A high-level overview of the strategies and expected outcomes included in the logic models are included for each of the opportunities below. Full details for each opportunity, including full logic models and expected outcomes, can be found in the Focus on Energy Phase 2 report.

Technology Opportunity Summaries

Luminaire-Level Lighting Controls (LLLCs).

LLLCs integrate sensors and wireless controls directly within each luminaire, enabling fixture-level control strategies including occupancy sensing, high-end trim, and daylight-responsive dimming. A DesignLights Consortium (DLC) study found LLLCs achieve approximately 63% energy savings compared to uncontrolled systems and 28% savings over networked controls without LLLC capability. LLLCs also offer significant non-energy benefits including reduced commissioning complexity (versus traditional networked controls), improved occupant comfort, simplified maintenance, and enhanced building management capability.

Despite these advantages, adoption remains very low. Connected lighting represents less than 1% of installed luminaires nationally, with similar patterns observed in Wisconsin. Market actor interviews with regional distributors suggested that LLLC market share in Wisconsin is below 5% of lighting projects. Key barriers include contractor unfamiliarity with commissioning and configuration, administrative complexity in identifying qualifying products, cost perceptions that overlook integrated sensor value, and inconsistent definitions and eligibility criteria across programs.

The Phase 2 logic model identified four strategic intervention clusters: (1) leveraging manufacturer representatives to build awareness and education campaigns for contractors and building owners; (2) simplification of incentive processes and alignment of product definitions; (3) flexible, low-barrier contractor training; and (4) coordination with neighboring states to create regional market signals.

MNETA’s experience in Minnesota—which shifted from new construction to retrofit as its primary focus after finding code enforcement too limited to drive lasting change—directly informed Wisconsin’s strategy to focus on the retrofit market rather than new construction.

High-Performance Windows (HPWs).

HPWs offer a compelling combination of energy savings and non-energy benefits including improved comfort, reduced condensation, and lower noise transmission. In Wisconsin's cold climate, HPWs can deliver significant heating savings, and their long expected useful life (20+ years) provides an extended stream of benefits. The technology is ready to scale—leading manufacturers already offer HPW product lines—but distribution through Wisconsin channels is limited, and contractor familiarity and sales practices have not yet shifted toward routinely proposing HPWs.

Key market barriers include an unclear manufacturer business case for increasing Wisconsin distribution, a lack of supply-chain awareness and training among contractors, high incremental cost relative to standard windows, and inconsistent or loosely defined incentive eligibility criteria. The Phase 2 logic model strategies focused on building demand signals through program alignment (including ENERGY STAR V7 tier alignment), supply-chain training and demonstration, and coordinated definition standardization with neighboring programs. The Partnership for Advanced Window Solutions (PAWS) provides a valuable regional collaboration platform to facilitate aligning standards and definitions.

Efficient Rooftop Units (ERTUs).

ERTUs incorporate multiple efficiency features including variable-speed compressors, high-efficiency heat exchangers, energy recovery ventilation (ERV), and—for some models—dual-fuel heat pump capability. These features can reduce commercial HVAC energy use by 25% to 40% compared to standard RTUs. Wisconsin's cold heating-dominated climate makes ERTUs particularly valuable, as ERV and condensing gas furnace features have been shown to deliver the largest savings in similar climates.

However, ERTU adoption faces significant barriers. Replacement decisions are typically made in emergency or near-failure situations, where immediate availability and like-for-like replacements dominate. Contractor and distributor awareness of ERTU features is very low. Cost premiums for dual-fuel heat pump RTUs remain substantial, and the installer workforce has limited experience with commissioning these systems. The Phase 2 logic model centers on building awareness and confidence among the HVAC contractor and distributor community, demonstrating value to building owners, reducing cost premiums by engaging manufacturers and scaling demand, and coordinating with MNETA's Next-Gen RTU initiative for regional leverage.

Air-Source Heat Pumps (ASHPs).

ASHPs provide efficient space heating and cooling using electricity, offering significant decarbonization potential in a state where most residential heating is currently gas-fueled. Cold-climate ASHP models capable of delivering heating down to -13°F have been commercially available for several years, addressing a historically significant barrier in Wisconsin. The residential heat pump market is growing nationally, driven by federal incentives under the Inflation Reduction Act and increasing contractor training investment.

Despite growing momentum, barriers remain significant in Wisconsin. Consumer skepticism about cold-climate performance is widespread. The installer base with cold-climate ASHP experience is limited. Distributor stocking of cold-climate models is uneven. And in a predominantly gas-heated market, the value proposition for switching fuels is less immediately obvious to consumers than in states with higher electricity-to-gas cost ratios. The Phase 2 logic model emphasizes contractor training and credentialing, distributor engagement to expand stocking, consumer education on cold-climate performance and total cost of ownership, and coordination with the MNETA heat pump initiative for regional market influence.

Room Heat Pumps (RHPs)

RHPs—sometimes called saddle heat pumps or window heat pumps—are plug-in or minimally invasive heat pump units that replace or supplement window air conditioners and electric resistance heaters. They offer a low-cost pathway for electrification in multifamily and rental housing where central HVAC replacement is not feasible. Products from manufacturers such as Gradient and others have begun to reach commercial scale in recent years.

RHPs face a distinctive set of barriers in Wisconsin. Consumer and market actor awareness of the technology is very limited. Performance skepticism in cold climates is significant. A split-incentive problem affects the multifamily rental market, where landlords who could install RHPs do not benefit directly from reduced tenant energy bills. The Phase 2 logic model addressed these barriers through consumer education campaigns, landlord engagement pilots, coordination with housing authorities, and advocacy for refrigerant regulation updates that would enable the use of lower-GWP refrigerants in RHPs.

Cross-Cutting Themes

Several themes emerged consistently across all five opportunities:

- Consumer awareness and trust are foundational barriers. For all five technologies, lack of consumer awareness and skepticism about performance—especially cold-climate performance for heat pump technologies—are significant obstacles. MT programs must invest in consumer education and demonstrated performance before market shares can shift materially.
- Contractor capacity is a binding constraint in multiple markets. The availability of trained contractors to install, commission, and service efficient technologies is a critical bottleneck, particularly for cold-climate ASHPs and ERTUs. MT programs need to invest in training infrastructure—and make training accessible and practical for busy contractors—before adoption can scale.
- Supply-chain engagement is necessary but not sufficient. Distributors and manufacturers are important leverage points for MT, but they will not change their stocking and product development decisions without clear and sustained demand signals. Programs need to build demand from the customer and contractor side while simultaneously engaging the supply chain.

- Non-energy benefits often drive adoption more than energy savings. Across all five opportunities, the value propositions that are most compelling to market actors—simplified commissioning for LLLCs, comfort and noise reduction for HPWs, decarbonization branding for heat pumps—are often non-energy benefits. MT program strategies should lead with these benefits rather than focusing primarily on energy savings messaging when working to stimulate demand.
- Regional coordination multiplies market leverage. Because most manufacturers, major distributors, and many contractors operate regionally or nationally, MT initiatives in Wisconsin will be more effective if they coordinate with neighboring programs in Minnesota and Illinois. Regional coordination can create consistent product definitions, scale manufacturer engagement, and share evaluation data and best practices.

Quantitative Adoption Forecasts and Cost-Effectiveness

Phase 2 developed quantitative adoption forecasts for each of the five opportunities, comparing expected market adoption with the MT initiative in place (Total Market Savings, TMS) against the natural market baseline (NMB) absent MT intervention. Incremental adoption above the NMB represents the savings attributable to the MT initiative, making net-to-gross adjustments unnecessary. Savings per unit were derived from the Wisconsin Technical Reference Manual (TRM) and secondary sources where Wisconsin-specific values were unavailable (Cadmus 2025b).

Cost-effectiveness was assessed using the modified Total Resource Cost (mTRC) test—Wisconsin's primary regulatory cost-effectiveness tool—and the Program Administrator Test (PAT). Consistent with best practices in other MT-adopting states, the analysis estimated costs and benefits over the full initiative lifetime (10–20 years) rather than over a single quadrennial period.

In simple terms, the benefit/cost value of the mTRC test is the ratio of avoided utility and environmental costs from avoided energy consumption to the combination of administrative costs, delivery costs, and net participant incremental measure costs. The PAT estimates the proposed measures' impacts on utility revenue requirements (the costs of providing service) by comparing the benefits of avoided utility costs from avoided energy consumption to the combined costs of operating the offering, such as incentive payments, administrative costs, and delivery costs. A benefit/cost ratio above 1.0 indicates that the measure improves an energy system's operational cost-effectiveness.

Table 2 summarizes the cost-effectiveness results for all five opportunities.

Table 2. Costs and benefits summary for five market transformation initiatives

Metric	Efficient Rooftop Units	Air-Source Heat Pumps	LLLCs	High-Performance Windows	Room Heat Pumps
mTRC Benefits ($)	$56,580,651	$104,993,544	$109,573,572	$45,336,400	$46,119,580
mTRC Costs ($)	$57,447,355	$85,513,840	$91,861,475	$29,740,964	$67,850,395

Metric	Efficient Rooftop Units	Air-Source Heat Pumps	LLLCs	High-Performance Windows	Room Heat Pumps
mTRC Ratio	**0.98**	**1.23**	**1.19**	**1.52**	**0.68**
PAT Benefits ($)	$52,280,333	$86,076,069	$78,148,033	$42,100,391	$19,660,596
PAT Costs ($)	$14,030,000	$14,030,000	$14,030,000	$14,030,000	$14,030,000
PAT Ratio	**3.73**	**6.14**	**5.57**	**3.00**	**1.40**

Note: All values are present-value lifetime estimates. Initiative cost assumed at $14,030,000 per MTI. mTRC = modified Total Resource Cost test; PAT = Program Administrator Test. Costs and benefits are discounted at 2%, consistent with Wisconsin Focus on Energy portfolio evaluation methodology. Source: Cadmus 2025b.

Three of the five initiatives (ASHPs, LLLCs, HPWs) achieve mTRC ratios above 1.0. The HPW MTI shows the strongest mTRC result at 1.52, driven by high capacity and gas benefits and a long expected useful life. ASHPs and LLLCs also show solid mTRC ratios of 1.23 and 1.19, respectively. ERTUs show a marginal mTRC of 0.98—just below the threshold—with results sensitive to the mix of dual-fuel heat pump, ERV, and advanced controls included in the initiative. Room heat pumps show the lowest mTRC at 0.68, driven primarily by high incremental measure costs and negative deemed summer peak savings for units replacing window air conditioners in the current Wisconsin TRM.

PAT ratios are substantially higher across all five opportunities, ranging from 1.40 for RHPs to 6.14 for ASHPs, reflecting the fact that the PAT does not count incremental measure costs—only program administration costs. These results suggest strong value from the program administrator's perspective for all five initiatives.

It should be noted that the ERTU mTRC result is sensitive to assumed cost reductions that are expected to occur as the market scales. The program theory for ERTUs explicitly incorporates strategies to reduce cost premiums by engaging manufacturers and demonstrating value at scale. Without assumed cost reductions, the ERTU mTRC ratio would be lower. Similarly, the ASHP mTRC result assumes some decrease in equipment costs as the market scales (Cadmus 2025b).

Key Findings

Technology-Specific Priorities

LLLCs emerge as the strongest near-term priority for MT investment. The technology is market-ready, available from a rapidly growing set of manufacturers, and supported by established MT frameworks in neighboring states. The non-energy benefits of LLLCs—including simplified commissioning, improved occupant comfort, and enhanced building management—create a compelling value proposition for commercial building owners and operators that goes well beyond energy savings. The Phase 2 analysis found that manufacturer representatives are the most effective leverage point for the retrofit market, a finding consistent with MNETA's experience in Minnesota.

HPWs also show strong cost-effectiveness, but the path to market transformation is somewhat longer, requiring supply-chain development and distributor engagement before broad availability can be achieved. The alignment of program incentives with ENERGY STAR V7 tiers and coordination with the Partnership for Advanced Window Solutions are near-term priorities.

ASHPs represent a strategically important opportunity for decarbonization, with strong PAT results and a growing national market. The primary near-term challenge is building contractor capacity and distributor stocking for cold-climate models. Coordinated regional engagement through MNETA provides a significant advantage.

ERTUs require deeper investment in cost reduction and value demonstration before they can achieve cost-effectiveness under the mTRC test. However, the opportunity is strategically important because commercial HVAC replacement decisions are largely reactive and near-term-cost-driven, making it difficult to capture this market through traditional RA incentives alone. MT strategies that engage manufacturers to integrate efficiency features and build contractor awareness have the potential to shift the default replacement choice.

RHPs show the most challenging cost-effectiveness picture under the current TRM assumptions. The negative deemed summer peak savings for units replacing window air conditioners significantly reduces the mTRC benefits. A revision to TRM savings values for RHPs, along with strategies to address the split-incentive barrier in rental housing, would be important prerequisites for a viable MTI.

Replicability and Implications for Other States

The two-phase approach described in this paper was designed from the outset to be replicable. Phase 1 established a structured screening methodology that can be adapted to any state's technology landscape, program policies, and market conditions. The scoring criteria—potential value, compelling value proposition, technology readiness, market barriers, leverage points, and mechanism for lastingness—are broadly applicable to any emerging technology MT opportunity.

Phase 2's MTPA framework, including logic models, milestone metrics, and the adoption/savings modeling approach, draws heavily on established frameworks from CalMTA, MNETA, and Illinois. The framework is modular: states can adopt the overall structure while tailoring the specific barriers, interventions, and milestones to their own market conditions. The explicit documentation of natural market baselines and total market savings, and the clear separation of MT impacts from RA program impacts, provides a defensible basis for regulatory review and approval.

Several elements of the Wisconsin study are particularly transferable:

- The policy analysis template, which identifies the specific legislative, regulatory, and administrative questions that any state needs to resolve before making significant MT investments, can be adapted for any state's enabling legislation and program structure.
- The opportunity screening framework provides a structured, evidence-based process for narrowing a large field of potential technologies to a manageable set for deeper development.
- The MTPA structure, combining qualitative market intelligence (logic models, barrier analysis, stakeholder interviews) with quantitative adoption forecasts and cost-effectiveness analysis, represents a comprehensive and credible framework for regulatory decision-making.
- The explicit connection to regional MT programs in neighboring states—particularly MNETA in Minnesota and the Illinois SAG initiatives—highlights the potential for multi-state collaboration to increase market leverage and reduce individual state program costs.

For states that are earlier in their MT journey, the Wisconsin study provides a proof of concept: it is possible to move systematically from a general policy direction to actionable, evidence-based investment cases within two years, using a structured research process that draws on existing knowledge from established MT programs.

Conclusions

Wisconsin's two-phase MT assessment represents one of the most comprehensive state-level efforts to assess and develop MT as a strategic energy efficiency investment. Phase 1 established a sound policy foundation and a structured opportunity screening that identified five high-priority technologies. Phase 2 developed detailed MTPAs that provide the PSC with the evidence base needed to make informed investment decisions for Quadrennium V.

The quantitative results are encouraging. Three of the five MTIs—LLLCs, ASHPs, and HPWs—show cost-effective mTRC ratios over the initiative lifetime, with HPWs leading at 1.52. ERTUs show marginal cost-effectiveness at 0.98, with significant potential to improve as cost barriers are reduced. All five initiatives show strong PAT ratios, suggesting substantial value from the program administrator's perspective. LLLCs are positioned as the strongest near-term priority, with market-ready technology, growing manufacturer availability, and established MT frameworks in neighboring states to build on.

The qualitative findings are equally important. The logic models, barrier analyses, and milestone frameworks developed in Phase 2 provide a roadmap for MT program design that goes beyond identifying opportunities to specifying the causal mechanisms by which interventions will drive market change. This causal specificity is necessary both for effective program management and for credible impact evaluation.

Looking forward, Wisconsin is well positioned to become a regional leader in MT—not by acting alone, but by building on and contributing to the growing network of Midwestern and national MT programs. The similarities in market structure, climate, and technology landscape between Wisconsin, Minnesota, and Illinois create natural opportunities for coordination that can

amplify the impact of each state's investments. The two-phase blueprint documented here offers other states a systematic path from policy aspiration to actionable MT investment.

Acknowledgments

[Author acknowledgments to be added in the final submission, including recognition of the Wisconsin Public Service Commission, Focus on Energy program administrator staff, and the many manufacturers, distributors, and market actors who participated in interviews.]

AI-assisted tools used: Claude (Anthropic). Used for: drafting and structuring text, formatting assistance. Extent: drafting sections from research materials provided by authors. Human review: The authors reviewed, edited, and verified all content against original content created by authors, calculations, and citations.

References

AIC (Ameren Illinois Company). 2023. Luminaire Level Lighting Controls (LLLC) Market Transformation Initiative Business Plan – 11.01.23 (Final Draft). ilsag.info/wp-content/uploads/AIC-LLLC-MTI-Business-Plan-11.01.23-Final-Draft.pdf

CalMTA (California Market Transformation Administrator). 2024. CalMTA Evaluation Policy and Framework. Sacramento: CalMTA.

Cadmus. 2025a. Focus on Energy Market Transformation Assessment Study Phase 1 Report. Prepared for the Public Service Commission of Wisconsin. assets.focusonenergy.com/production/inline-files/Focus-MT-Potential-Phase-I-Report.pdf

Cadmus. 2025b. Focus on Energy Market Transformation Assessment Study Phase 2 Report. Prepared for the Public Service Commission of Wisconsin. Madison, WI: Public Service Commission of Wisconsin. assets.focusonenergy.com/production/docs/evaluation/Focus-MT-Potential-Phase-2-Report.pdf

DLC (DesignLights Consortium). 2020. Energy Savings from Networked Lighting Control (NLC) Systems with and without LLLCs. designlights.org

Focus on Energy. 2024. Policy Manual. Madison, WI: Public Service Commission of Wisconsin.

Illinois TRM (Illinois Technical Reference Manual). 2024. Attachment C: Market Transformation Evaluation Policy. Chicago: Illinois Stakeholder Advisory Group.

Keating, K., and E. Fogel. 2014. Market Transformation: A Framework for Assessing Program Attribution, Cost-Effectiveness and Long-Term Market Change. Prepared for the California Public Utilities Commission.

MN CEE (Minnesota Center for Energy and Environment). 2023. Minnesota Efficient Technology Accelerator (META) Proposal. Minneapolis: MN CEE.

MN CEE. 2024. Energy Savings and Market Evaluation Plans for META Initiatives. Minneapolis: MN CEE.

NEEA (Northwest Energy Efficiency Alliance). 2024. NEEA 2025–29 Business Plan. Portland, OR: NEEA. neea.org/resources/read-neeas-2025-29-business-plan

NYSERDA (New York State Energy Research and Development Authority). 2023. Market Development Portfolio Evaluation Framework. Albany: NYSERDA.

Prahl, R., and K. Keating. 2014. "Building the Business Case for Market Transformation." In *Proceedings of the 2014 ACEEE Summer Study on Energy Efficiency in Buildings* 6:1–12. Washington, DC: ACEEE.

PSC (Public Service Commission of Wisconsin). 2022. Quadrennial Planning Process IV – Phase II Memo. PSC Docket 5-FE-104. Madison, WI: PSC. apps.psc.wi.gov/ERF/ERFview/viewdoc.aspx?docid=453081