

# The Long View: A Cost-Effectiveness Framework for Market Transformation Initiatives

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## ABSTRACT

Market Transformation (MT) programs differ fundamentally from Resource Acquisition (RA) programs by focusing on long-term, systemic changes in the market rather than immediate, transactional energy savings. While MT programs may include RA-like activities, their success is measured by whole-market effects and persistent changes. Traditional cost-effectiveness frameworks used for RA programs fall short in evaluating MT programs due to their short-term scope. This paper introduces a tailored framework for assessing MT program cost-effectiveness, emphasizing a 20-year evaluation horizon, full lifecycle analysis, and a societal perspective to better capture the broader impacts of market transformation efforts.

The framework is demonstrated through an initiative promoting electric heat pump water heaters, showcasing its ability to evaluate programs that traditional methods might misjudge. It incorporates a logic model to track progress and market indicators, ensuring alignment with long-term goals. By using the societal cost variant of the total resource cost test, the framework accounts for economic, environmental, and social externalities, aligning with public policy and maximizing societal welfare. This comprehensive approach enables more accurate investment decisions and reflects the true value of MT programs.

## Introduction

“Market Transformation is the strategic process of intervening in a market to create lasting change in market behavior by removing identified barriers or exploiting opportunities to accelerate the adoption of all cost-effective energy efficiency as a matter of standard practice” (NEEA 2025). Initiatives that use this framework to drive additional energy efficiency differ fundamentally from the traditional Resource Acquisition approach used by utilities and energy efficiency organizations, which focuses on directly obtaining energy savings as a transactional resource. The default cost-effectiveness framework used for energy efficiency has been designed and implemented with Resource Acquisition programs in mind.

Resource Acquisition energy efficiency programs are initiatives designed to reduce energy consumption by investing in cost-effective energy-saving measures instead of expanding energy supply infrastructure. These programs aim to “acquire” energy savings as a resource, much like utilities would acquire electricity or gas by funding or incentivizing improvements such as efficient lighting, HVAC systems, insulation, and industrial processes. The goal is to lower overall energy demand, reduce greenhouse gas emissions, and defer the need for new power plants, all while delivering long-term cost savings to consumers and utilities alike.

Both Market Transformation and Resource Acquisition are intended to generate cost-effective efficiency savings, but evaluating the cost-effectiveness of Market Transformation is not realistic through the traditional lens that has been employed by Resource Acquisition initiatives. The cost-effectiveness of Resource Acquisition programs has traditionally been done through one or more of five cost-effectiveness perspectives originally outlined in the California Standard Practice Manual. These perspectives are the Total Resource Cost Test (TRC), Societal Cost Test (SCT), Program Administrator Cost Test (PAC), Ratepayer Impact Measure (RIM), and Participant Cost Test (PCT) (CPUC 2001). Each of these

tests have different strengths and weaknesses and can be applied on a fixed period to evaluate the cost effectiveness of a Resource Acquisition program. Each of these tests can be used to look at the costs and benefits of a program over a fixed investment period, so they are often applied on an annual or short-term time scale. This is how regulatory bodies across the country have used these tests to evaluate if Resource Acquisition measures have succeeded in providing cost-effective efficiency.

In the case of Market Transformation programs, the investment and accrual of efficiency are not as directly connected as they are in a Resource Acquisition program. Using a short analysis time frame as is typically done with Resource Acquisition programs does not accurately capture the investment decision for a Market Transformation program. The scope of Market Transformation activities is not as focused on a single measure as an incentive or direct installation program. Furthermore, the wholistic nature of a Market Transformation program doesn't effectively map to each of the specific perspectives outlined in the California Standard Practice Manual. This paper outlines how the Northwest Energy Efficiency Alliance (NEEA) has modified the cost-effectiveness framework to effectively evaluate the cost-effectiveness of Market Transformation energy efficiency.

## Market Transformation Cost-Effectiveness Framework

There are three primary issues to address in modifying cost-effectiveness evaluation to assess whether the efficiency gained is cost-effective. First, the long time frame of Market Transformation means that the cost-effectiveness of an initiative cannot be accurately measured in a short-term analysis. Second, the broad range of activities in Market Transformation programs ranging from emerging technology demonstration and market barrier removal to advancing codes and standards makes the evaluation of individual measures for cost-effectiveness unrealistic. Third, applying narrow test perspectives doesn't effectively capture the nature of Market Transformation initiatives which are inherently broad and far reaching.

### 20-Year Evaluation Timeframe

To evaluate the long-term nature of a Market Transformation program NEEA evaluates all programs on a 20-year timeframe. Unlike the transactional nature of Resource Acquisition programs where investment and measure installation can be measured over a 1-5 year timeframe Market Transformation creates sustained changes in a market, which may not be fully realized for over a decade. NEEA's Market Transformation strategy utilizes a theory called Diffusion of Innovation , see

Figure 1, which structures the process of adoption of innovation and groups and classifies the adopters into: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards (Rogers 2003). Figure 2 shows the application of this theory to the lifecycle of a market transformation program where the largest investment occurs early in the initiative lifecycle and the largest efficiency gains occur at the end of the lifecycle.

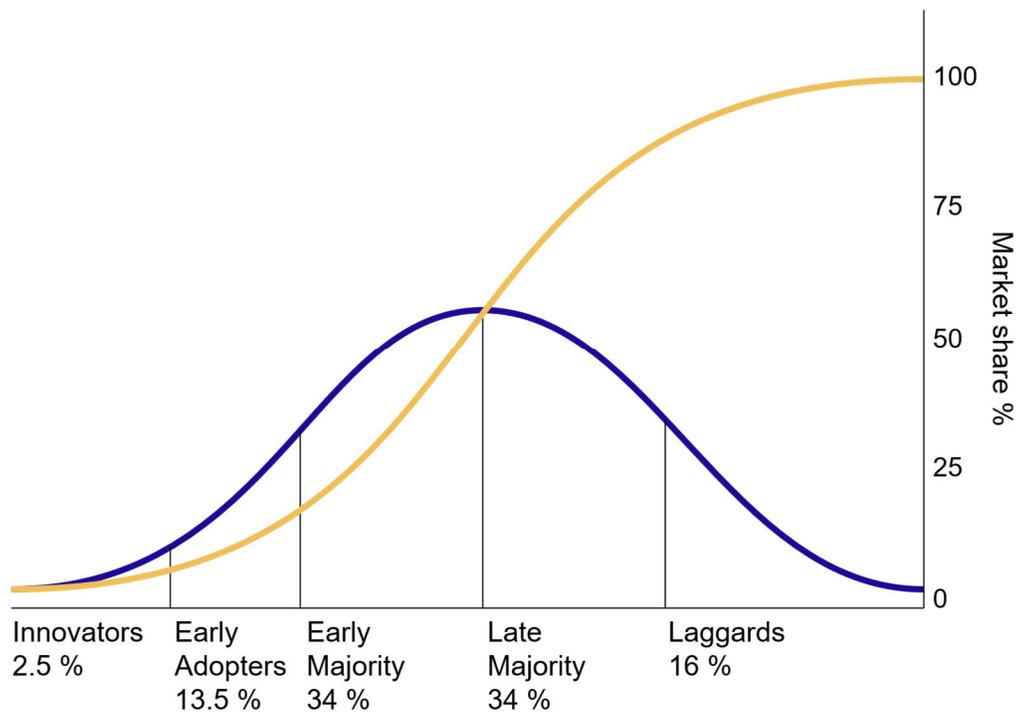


Figure 1: Diffusion of Innovations Theory

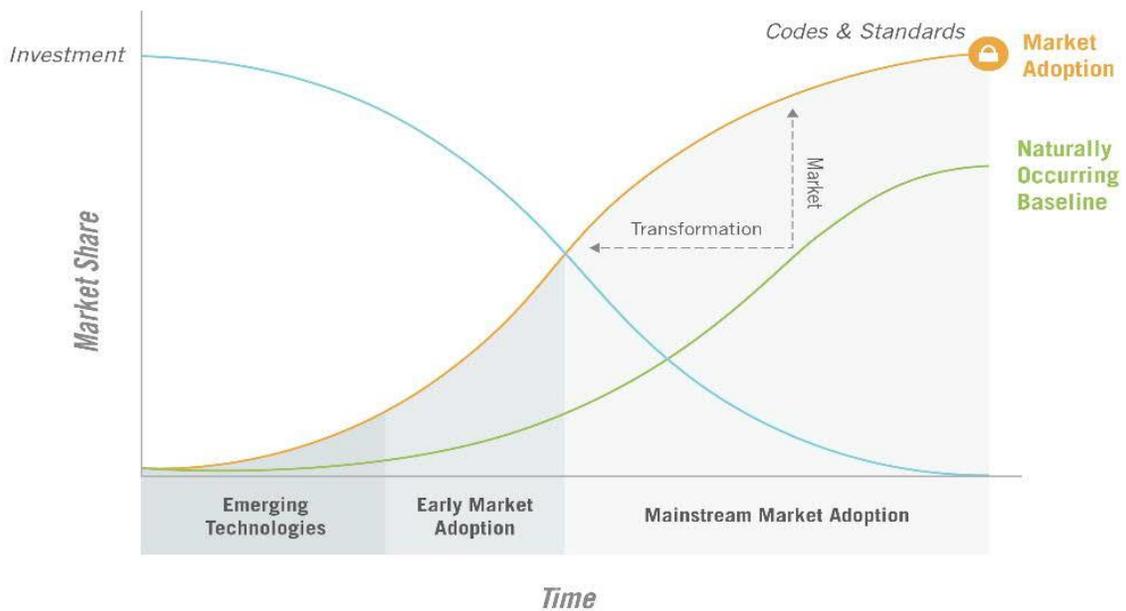


Figure 2 Diffusion of Innovation S-Curve Applied to Market Transformation

If the cost-effectiveness of the initiative was evaluated for an analysis period exclusively within the Emerging Technologies or Early Market Adoption phases, it would find that the efficiency gains were

not cost-effective. Likewise, if the analysis period was within the Mainstream Market Adoption phase, then the efficiency gains would be extremely cost-effective, but the early investment would not be taken into consideration. For this reason, NEEA uses a 20-year analysis period to best capture the full initiative lifecycle costs and benefits. The downside of this approach is that there is a higher degree of uncertainty when forecasting so far ahead. To mitigate this risk, NEEA develops market progress indicators which it regularly has reviewed by third party evaluators to track program activities and outcomes. These market progress indicators are designed to be measurable indicators that relate back to the logic model of a Market Transformation program (e.g. market share, manufacture offerings, purchaser satisfaction, efficiency specifications).

### Evaluation at the Program Level

Market Transformation programs utilize a wide range of program activities which can influence a wide range of efficiency measures. While a Resource Acquisition program can select specific measures to incentivize and evaluate the cost-effectiveness of each of those measures and remove measures based on their cost-effectiveness, Market Transformation activities may not be able to easily exclude specific measures and applications. For example, NEEA's Efficient Pumps program incentivizes efficient circulator pumps, but those pumps can be used by end users for either Hydronic Heating or Domestic Hot Water applications, with dramatically different savings and resulting cost effectiveness; however, since the incentive is at the mid-stream level NEEA can't select specific applications to incent (RTF 2024). For this reason, NEEA uses program level analysis as the primary level of analysis for cost-effectiveness. By aggregating all measures within a Market Transformation initiative, the cost-effectiveness analysis can capture all the impacts of the program's activities.

### Evaluation from a Societal Test Perspective

The direct nature and clarity of participants vs non-participants of Resource Acquisition programs leads itself to the variety of test perspectives outlined in the California Standard Practice Manual. Conversely, Market Transformation activities are inherently broad in scope, and participants versus non-participants are not easily defined because transforming a market affects all consumers, not just those who purchase an efficient measure. Over the lifetime of a program Market Transformation activities can shift the available technologies, change the incremental cost of efficient measures, and influence codes and standards. As a result, using a societal test perspective best allows a Market Transformation program to assess the total societal impact of transforming a market to ensure that the regional investment is an appropriate use of funds for the long term. By considering all incremental quantifiable costs and benefits of the total regional savings achieved through transformation, regardless of who accrues them, the total impact of the program can be evaluated.

### Heat Pump Water Heaters as an Example

NEEA has worked since 2005 to advance the technology and encourage adoption of Heat Pump Water Heaters and overcome market barriers to their widespread adoption (NEEA 2024). This work included collaborating with industry partners and ENERGY STAR® to develop a labeling system for water heaters as well as an ENERGY STAR® specification in 2007 (NEEA 2024). NEEA also developed an additional specification for Heat Pump Water Heaters in northern climates in 2009 (NEEA 2024). Following all of this work when NEEA launched its formal Heat Pump Water Heaters initiative in 2013, the regional market share for Heat Pump Water Heaters was 2% (NEEA 2024). At this point NEEA had been working on advancing this efficient technology for 8 years and significant savings had yet to

materialize. The work had focused on just developing the new technology and getting it into the hands of the innovators identified in the diffusion of innovation framework. A traditional cost-effectiveness analysis would have shown the work done to be wholly not cost-effective.

Over the following 10 years NEEA collaborated with manufactures and incorporated distributor, installer, and consumer education into the program strategy to drive regional market adoption to 18% (NEEA 2024). NEEA's work had begun to get the technology into the hands of the innovators and early adopters identified by the theory of diffusion of innovation but had not yet made it to the majority of consumers. At this point, an annual review of the initiative cost-effectiveness may have found the program nearing cost-effectiveness, but still not passing encouraging a program administrator to cancel investment. The analysis may have also shown that higher efficiency tiers were too costly to justify continued inclusion in the program, particularly when compared to the incremental energy savings they offered. Under typical program conditions, such findings would prompt a recommendation to remove or scale back support for these tiers. However, the integrated nature of the program, which included education, incentives, and supply chain coordination designed to promote a full range of product efficiencies, made it operationally and strategically infeasible to isolate and eliminate specific tiers without undermining the broader transformation goals.

In 2024, the Department of Energy elevated a federal water heater standard that would have made Heat Pump Water Heaters the industry standard in 2029 (NEEA 2024). If the initiative's cost-effectiveness was evaluated once the product was a federal standard the results would likely be highly cost-effective. A shorter cost-effectiveness evaluation timeframe wouldn't allow a Market Transformation program to ever realize the most cost-effective savings of the program lifecycle. The lifecycle of this initiative's savings shows why a much longer analysis period is needed for Market Transformation programs to capture decades of work and decades of market progress.

## Conclusion

Market Transformation programs require a fundamentally different lens for evaluating cost-effectiveness than traditional Resource Acquisition approaches. Their long-term, systemic nature means that short-term metrics often fail to capture the full value of the investment. NEEA's framework, anchored in a 20-year evaluation horizon, program-level analysis, and a societal cost test perspective, offers a more accurate and policy-aligned method for assessing these initiatives. By focusing on broad market impacts and long-term outcomes, this approach better reflects the true benefits of transforming markets toward energy-efficient practices.

The Heat Pump Water Heater initiative exemplifies the necessity of this framework. NEEA's early work, spanning nearly a decade before formal program launch, involved significant investment in technology development and market preparation. Traditional cost-effectiveness tests would have deemed these efforts inefficient due to the lack of immediate savings. However, over time, these foundational activities led to increased market adoption and ultimately influenced federal standards. Outcomes like these can only be appropriately valued through a long-view, societal-focused framework that accounts for both early investment and long-term market effects.

As energy efficiency goals evolve to support innovation, resilience, and widespread access to energy efficiency the need for robust evaluation frameworks becomes even more critical. NEEA's approach provides a replicable model for other regions and organizations seeking to invest in long-term market change. By aligning evaluation methods with the realities of Market Transformation work, stakeholders can make better-informed decisions, justify sustained investment, and ensure that public resources are used to maximize societal benefit.

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