



This is a DRAFT version of this TPM.

2026 Portfolio Enhancements Technology Priority Map

Draft Report

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Abbreviations, Acronyms, and Glossary of Terms

Acronym	Meaning
ACA	American Cement Association
AEC	Architect, Engineering and Construction
ALD	Automated leak detection
CARB	California Air Resources Board
CPUC	California Public Utilities Commission
DAC	Disadvantaged communities
DER	Distributed energy resources
EE	Energy efficiency
ET	Emerging technology
ETP	Emerging Technology Program
GHG	Greenhouse gas emissions
GWP	Global warming potential
HTR	Hard-to-reach
HVAC	Heating, ventilation, and air conditioning
IOU	Investor-owned utility
LRM	Lifecycle Refrigerant Management
MRL	Market Readiness Level
NAPA	National Asphalt Pavement Association

Acronym	Meaning
NMEC	Normalized metered energy consumption
NRMCA	National Ready Mixed Concrete Association
NSSGA	National Stone Sand & Gravel Association
SCE	Southern California Edison
SMB	Small and medium businesses
SME	Subject matter expert
TAC	Technical Advisory Committee
TPM	Technology Priority Map
TRC	Total Resource Cost
TRL	Technology Readiness Level
TSB	Total System Benefit

Glossary Term	Meaning
Technology Category	One of six broad technology categories (Whole Buildings, HVAC, Water Heating, Lighting, Plug Loads and Appliances, Process Loads, and Portfolio Enhancements).
Technology Family	Functional grouping that provides description of program role, opportunities, and barriers.
Research Initiatives	Initiative in place of both subgroups and knowledge indices.
Research Initiatives Key	Visual aid explaining if each research initiative is at a level of high understanding, ranked on a low, medium, or high scale.
Rankings	Future Needs: Covers items that are not yet ready for consideration due to having high needs in performance validation, market analysis, measure development, and performance development. Programs should not be discouraged from submitting proposals for research initiatives with a “Future Needs” classification but instead focus on making a strong argument for how the project outcomes can help fill in the missing gaps for validation or market analysis. Low: Covers items that have lower industry interest and/or uncertain impacts for energy efficiency due to having an expansive data set or information readily available or not being pertinent to the research initiative. Medium: Covers items that are an evolution or offer promise to existing and common technologies for energy efficiency. This can be in the form of needs that are currently being addressed with existing projects or needs that may exist but are not critical to the objectives of meeting efficiency metrics. High: Covers items that have high industry interest and high impacts for energy efficiency.
Definitions	Narrative to provide additional clarification on the technology family scope.
Opportunities	Description of potential impacts and potential research areas.
Barriers	Description of key barriers and potential barriers research.
CalNEXT Priority	Communicates expected level of focus by CalNEXT SMEs. <i>Note: Priorities will change as research is completed.</i>
High	High: CalNEXT has highlighted this technology family as having high energy savings with any known barriers surmountable through targeted interventions within the Technology Category and will prioritize funding projects under this technology family.
Medium	Medium: CalNEXT has highlighted this technology family as having moderate to high overall energy savings with known barriers to entry that may be more challenging to address within the Technology Category and will consider funding projects under this technology family.

Glossary Term	Meaning
Low	Low: CalNEXT has highlighted this technology family as having moderate to high overall savings but faces difficult or unknown barriers to adoption within the Technology Category and will not prioritize funding projects under this technology family.

Introduction

The Technology Priority Maps (TPMs) provide the CalNEXT Program with a framework to externally communicate priorities of the program, clearly define the central focus areas of the program, and assist with project screening. They will document the impact potential, programmatic research needs, and market readiness of all technology families across each of the end-use topic areas, as well as drive product ideation and inform project selection. This DRAFT Report covers the revision process for the 2026 Portfolio Enhancements TPM.

2026 Key TPM Changes

The Portfolio Enhancements (PE) TPM is a revision to the 2025 PE TPM based on recent changes in policy and portfolio priorities for the Investor-Owned Utilities (IOUs) and the California Public Utilities Commission (CPUC). The PE TPM is designed to address issues which span individual end-use technologies and represent new emerging policies, market, or product trends. In interviews with emerging technology stakeholders about CalNEXT's research and pathway into the portfolio for promising emerging technologies, stakeholders report significant barriers as cost-effectiveness challenges for energy efficiency (EE) measures, programmatic barriers such as lack of availability of new measures, need for additional load shape research, lack of demand flexibility measures to meet fluctuating grid peak needs, affordability concerns for electricity and barriers to fuel substitution measures, and lack of adoption of low global warming potential (low-GWP) measures. In comparison to the barriers typically associated with a particular technology or end-use, these barriers arise from the overall parameters of EE programs that the CPUC funds and oversees. At the same time, programmatic opportunities arising from local, regional, and statewide policy developments such as building performance standards (BPS) may be undervalued as the landscape evolves.

To address these portfolio gaps, this TPM gathers a targeted list of portfolio opportunities and barriers into one document for consideration by the larger community of EE stakeholders and provides actionable suggestions on the types of portfolio-related research CalNEXT has interest in conducting. Additionally, the Portfolio Enhancements TPM aims to further clarify potential areas of study and offers definition, opportunities, and barriers for identified research families.

Notable drivers include:

- Inclusion of DAC/HTR within technology TPMs rather than as a separate topic
- Streamlining of topics to align with TAC feedback (i.e., primary focus on kWh, kW with secondary focus on other co-benefits, i.e., low-income, DR, demand flexibility, low-GWP, etc.)
- Focus on short-term (1-3 year) EE portfolio impacts
- Incorporation of Tech Transfer outcomes
- Incorporation of MRL/TRL framework
- Heightened focus on tasking PE TPM on identifying EE portfolio gaps and opportunities (e.g., measure assessments of high to low TRC, TSB, adoption, etc. so as to prioritize measures having more immediate portfolio benefit).
- Incorporation of ET stakeholder feedback both on portfolio benefits, tech transfer, but also of market and program barriers.

For the 2026 PE TPM with additional new content, the CalNEXT Program Team established a streamlined process for this TPM development and revisions. This year, the Project Team is incorporating a more targeted outreach push to ensure that feedback directly aligns with IOU and third-party implementer (3PI) needs with an increased focus on kWh savings, affordability, and technology transfer outcomes. The project team is comprised of representatives from each of the Program Team partners: VEIC, Franklin, TRC, UC Davis, and Energy Solutions, with The Ortiz Group adding stakeholder feedback at the Draft Report stage. The Portfolio Enhancements SME Team represents members that collectively support an array of EE programs using technologies covered by the various TPM domains; these emerging products are then contextualized into the priority maps through a markets and solutions lens.

Similar to the 2025 PE TPM, the 2026 PE TPM incorporates a simplified icon view in the Research Initiatives table that describes the three to five most important research areas the team can prioritize for subsequent versions. The intent was to demonstrate more clearly how the SME team assessed each research initiative’s maturity level.

Table 1: Rankings and their meanings.

Icon	Meaning
 Future Needs	Covers items that are not yet ready for consideration due to having high needs in validation, market analysis, measure development, or program development. Programs should not be discouraged from submitting proposals for research initiatives with a “Future Needs” classification but instead focus on making a strong argument for how the project outcomes can help fill in the missing gaps for validation or market analysis.
 Low	Covers items that have lower industry interest and/or uncertain impacts for energy efficiency due to having an expansive data set or information readily available or not being pertinent to the research initiative.
 Medium	Covers items that are an evolution or offer promise to existing and common technologies for energy efficiency. This can be in the form of needs that are currently being addressed with existing projects or needs that may exist but are not critical to the objectives of meeting efficiency metrics.
 High	Covers items that have high industry interest and high impacts for energy efficiency.

Stakeholder Feedback

- TBD

Energy Efficiency Success Opportunities

CalNEXT Priority: High

Definition

This research family is focused on identifying opportunities to increase cost-effectiveness, adoption, and participation in Energy Efficiency programs and identify ways that Energy Efficiency can mutually reinforce other initiatives and policies such as Building Performance Standards and building decarbonization programs.

Additionally, this technology family may focus on increasing awareness and understanding of the market and programmatic constraints of cost-effective EE solutions including assessment of measure energy savings, TRC and TSB benefits and cost implications, adoption rates, and other factors contributing to EE measure adoption. This research may also consider market constraints to program participation such as limited financing solutions for certain market segments. While California has a rich and diverse set of delivery approaches to measures, including deemed, custom, and normalized metered energy consumption (NMEC)—in addition to recent policy changes that encourage innovation under the TSB metric and NMEC solutions—overall measure utilization remains low. Some measures have inherent barriers to adoption and implementation. Shedding light on some of these barriers, research needs, and tools can enhance awareness and uptake for EE savings, TSB, NMEC, and other methods, which will also support and validate a more robust EE portfolio.

Research Initiatives

- TBD

Opportunities

- TBD

Barriers

- TBD

CalNEXT Related Projects

- TBD

Affordability and Fuel Substitution

CalNEXT Priority: High

Definition

This research family is focused on supporting affordability, electrification, fuel substitution from regulated fuels, and fuel switching from nonregulated fuels, as well as identifying critical barriers and developing consistent and effective solutions. The CPUC defines “affordability” fairly broadly in D. 20-07-032 as “the degree to which a representative household is able to pay for an essential utility service charge, given its socioeconomic status.” In this vein, CalNEXT focuses on the affordability for energy services related to electricity bills for residential customers (i.e., reference to “a representative household”). Non-residential customers (e.g., commercial, industrial, agricultural) are not directly implied based on the reference to “households” although there may be other interpretations of “affordability” from energy efficiency market actors including policy makers, program implementers and IOUs (e.g., program cost-effectiveness), supply chain actors such as manufacturers, distributors and contractors (e.g., whether or not it’s affordable or not to participate in the EE market), or other parties not mentioned. CalNEXT will focus on affordability from the point of view of end-customers in terms of their ability to afford electricity services.

California has some of the highest electric rates in the nation. The California legislature passed a suite of new bills to attempt to provide policy support that includes some directly targeting affordability concerns. However, ratepayers need more support from Emerging Technology Programs to identify additional pathways to help address energy affordability. Potential solutions should continue to encourage consumers to conserve energy as well as support investment in energy efficiency improvements, especially in populations experiencing the highest energy burden.

Decarbonization involves use of the most efficient conversion or fuel substitution strategies, switching from a carbon intensive fossil fuel source in buildings and transportation end-uses to electricity generated from a clean renewable energy source. Electrification is commonly achieved with individual end-uses but often requires a broader assessment of impact on the building, community, or utility infrastructure. Associated impacts can include necessary upgrades to a building and utility electrical infrastructure to accommodate the higher electric demand associated with increased electrification of building energy, transportation, and process loads in California homes and businesses as well as the incorporation of onsite renewable energy and energy storage.

Electrification of California’s buildings, end-uses and transportation will be essential to meet California goals to be carbon neutral by 2045, reducing carbon emissions by 85 percent from 1990 levels (AB 1279, statutes of 2022), and requiring 100 percent of electricity by 2045 to be from renewable energy and zero-carbon resources (SB 100, statutes of 2018). In addition, South Coast and the Bay Area air quality management districts have passed new rules regulating emissions from space and water heating appliances, which will be a significant driver of electrification. California is making significant investments in building electrification through statewide and regional efficiency programs, large heat pump market transformation efforts such as TECH Clean California, and other rebates that encourage higher-efficiency products and electrical upgrades.

Research Initiatives

- TBD

Opportunities

- TBD

Barriers

- TBD

CalNEXT Related Projects

- TBD

Integrated Demand Side Management (IDSM) including the Value of Load Flexibility

CalNEXT Priority: High

Definition

This research family is focused on adaptation in the EE portfolio to maximize decarbonization and TSB benefits by properly considering the time-dependence of energy consumption within the day and year. Currently, EE savings are attributed based on a limited set of load shapes, and load shifting, and demand management. Conversely, demand flexibility has not been included in EE measures (in terms of EE benefits) largely due to it being framed as part of Demand Response policy scope.¹ This technology family will assess opportunities to consider the co-benefits of demand flexibility for EE measures as part of an Integrated Demand Side Management (IDSM) strategy. This research family will investigate ways to incorporate demand management, load-shifting, and demand flexibility attributes as part of EE measures such as identifying necessary research, the potential costs and benefits of incorporating demand flexibility co-benefits with EE programs and ways to incorporate Demand Response and decarbonization approaches alongside of existing EE measures and programs.

Research Initiatives

- TBD

Opportunities

- TBD

Barriers

- TBD

CalNEXT Related Projects

- TBD

¹ The CPUC created a proceeding to address demand flexibility through rates in 2022 in [R.22-07-005](#) (Order Instituting Rulemaking to Advance Demand Flexibility Through Electric Rates). Subsequently, in [R.25-09-004](#) (Order Instituting Rulemaking to Enhance Demand Response in California) and in related staff proposals/Scoping Memo, the CPUC framed demand flexibility as a related concept within the broader demand response framework. While demand flexibility policy is still developing, particularly with ongoing pilots led by CalFUSE (California Flexible Unified Signal for Energy, this research family will monitor policy developments and consider how to support demand flexibility's benefit to both EE and DR portfolios.

Low-Global Warming Potential (GWP) Technologies²

CalNEXT Priority: Medium

Definition

The refrigerants used to heat and cool buildings efficiently with heat pumps often contribute significant GHG emissions over the lifetime of the equipment in which they are used. This concept is referred to as “global warming potential” (GWP), and all refrigerants are assigned a GWP index relative to that of CO₂ and which describes the cumulative radiative forcing of a given refrigerant on the climate over the lifetime of that refrigerant in the atmosphere. Because a significant amount of refrigerant may be released from equipment due to leaks during installation, decommissioning, or operations, when refrigerant GWP is considered in the context of the GHG resulting from operating a piece of equipment, a high-GWP refrigerant used in that equipment may partially or completely offset any GHG emissions reductions resulting from using that equipment in place of less efficient electric equipment or fossil fuel equipment.

Fortunately, many low-GWP refrigerants, many of which are natural refrigerants such as CO₂, ammonia, and propane, also deliver efficiency benefits compared to synthetic refrigerant alternatives which may have high-GWPs. This research family is focused on determining pathways to integrate low-GWP refrigerant technology within the EE portfolio while simultaneously identifying opportunities to reduce costs, energy use, and lifecycle emissions.

This research family focuses on technology strategy and policy frameworks that could impact multiple end-uses. The objectives include:

- Creating an actionable framework for reducing refrigerant emissions across end uses.
- Examining barriers to replacing refrigerants with low and ultra-low GWP alternatives.
- Aligning refrigerant emissions reductions calculations within the Total System Benefit (TSB) metric with current practices in the field.

Reducing leaks in existing refrigerant systems will complement the approaches within the HVAC, Water Heating, and Process TPMs, which will also drive active recovery, reclamation, and destruction of high-GWP refrigerants. Refrigerant emissions reductions should be pursued primarily as a co-benefit of broader energy efficiency investments, rather than as a standalone objective.

Opportunities such as early retirement and replacement of HVAC, water heating, and refrigeration equipment can provide an effective pathway for refrigerant recovery, reclamation, and low-GWP adoption.

This framework also emphasizes the need to expand consideration of disruptive innovations, such as non-vapor compression systems that avoid refrigerants entirely, eliminating the risk of leakage and the need for refrigerant management. It will also be important to more clearly define Lifecycle Refrigerant Management (LRM) within the California EE portfolio and incentive structures, which will create more cost-effective, impactful incentives and program interventions.

² This technology family is not intended to be a primary objective but rather a secondary (co-benefit) of focus alongside of existing EE opportunities such as conducting refrigerant swap-outs as part of overall EE upgrades (e.g., early retirement of HVAC equipment).

LRM broadly refers to the full lifecycle of refrigerants—from system selection and installation to refrigerant leak prevention, detection, and repair—during the operational life of equipment, as well as refrigerant recovery and reclamation or destruction at equipment end of life. Proper refrigerant charges are required for systems to operate at rated efficiencies, so LRM is essential to maximizing the performance of all systems that use refrigerants. LRM’s goal is to eliminate the GHG impact from refrigerant emissions, given these are primarily gases with global warming potential (GWP) values thousands of times higher than CO₂.

Research Initiatives

- TBD

Opportunities

- TBD

Barriers

- TBD

CalNEXT Related Projects

- TBD