



California Statewide Gas Emerging Technologies

2023 Research Plan



09/19/2022

Agenda

- Background
- Today's Objective
- 2023 Research Goals
 - Water Heating
 - HVAC
 - Commercial Foodservice
 - Industrial and Agricultural Processes
 - Cross-Cutting
- Next Steps



Background

Background

Statewide Gas Emerging Technology Program

What

Is the primary vehicle to **evaluate emerging and/or underutilized natural gas technologies** to better understand their operating characteristics, efficiency performance, market barriers, etc.

Why

Has the goal of **facilitate the move of promising technologies up the market adoption curve** and increase their prevalence in the market.

How

Prepares a **research plan each year** to guide research efforts for the coming calendar year

Learn more at [CAGasTech.com](https://www.CAGasTech.com)

What's Different for 2023

Updates

- Water Heating
 - Existing water heating
 - Emerging water heating
- Commercial Foodservice
 - Existing commercial foodservice

Refined

- Industrial and Agriculture

New

- HVAC
- Cross-Cutting



Overarching Regulatory Policy Status



CALIFORNIA

Public Utilities Commission



CALIFORNIA
AIR RESOURCES BOARD

Staff proposal to phase out natural gas incentives in EE programs in stages from 2024 to 2028.

The CPUC is gathering public input for this proposal.

Approved the "Proposed 2022 State Strategy for the State Implementation Plan" that will set a zero-emission standard for space and water heaters to go into effect in 2030. It is unclear if zero emissions include CO₂ but most probably include NO_x.

Impacts of plan have not yet been determined

Overarching Regulatory Policy – Continued



South Coast Air Quality Management District

Regulations require Ultra-Low NOx emissions on water heaters

Currently in effect and based on anecdotal information is likely reducing participation levels of storage water heaters in EE programs.



CALIFORNIA
ENERGY COMMISSION

Title 24 2022 code updates include mandatory requirements for gas-fired water heating and space heating systems in single family homes to be ready for replacement of those systems with electric heat pump systems.

California CZ 3, 4, 13, and 14 required to use a heat pump system for space heating and HPWH in all CTZ's when using the prescriptive approach. Unclear if a gas heat pump would qualify.



Today's Objective

Our Objective

- Solicit **input and feedback** from industry stakeholders like yourselves to guide 2023 research efforts.
- Ensure **research efforts are focused in the right areas** to enact a positive impact on global climate change and achieve statewide greenhouse gas emissions reduction targets.





Water Heating

Water Heating – Goal 1

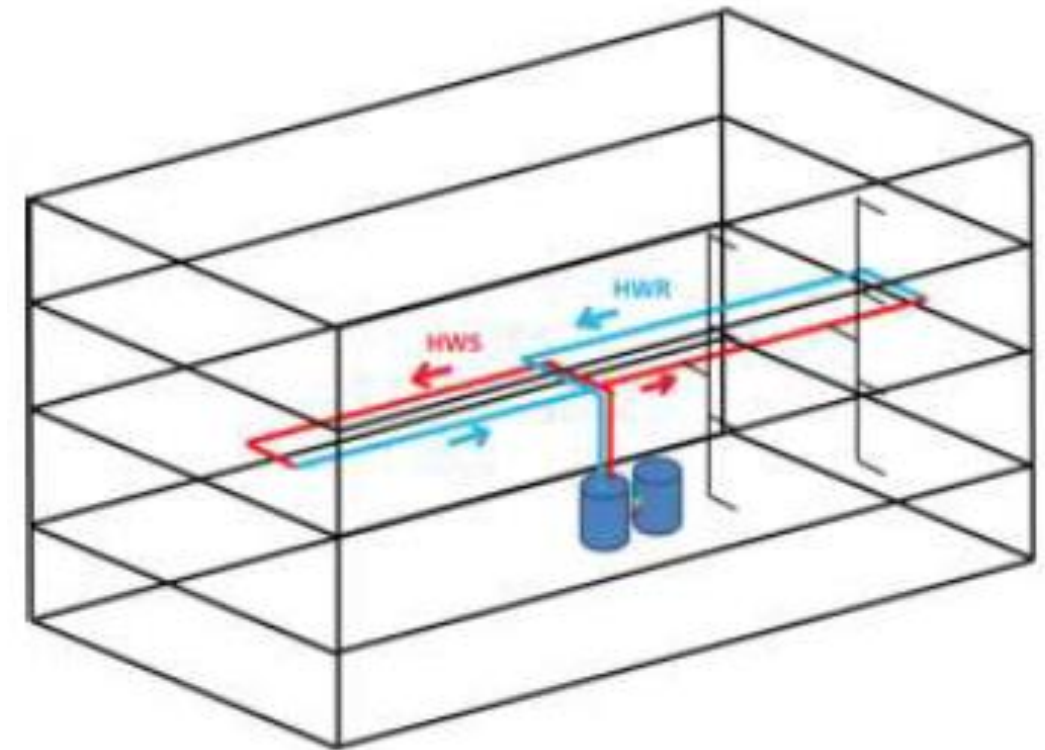
Improve adoption of existing water heating technologies in multiple market segments

Background

- Low participation of some technologies
- Gaps in therms savings

Objectives

- Field studies of existing water heating EE offerings where there is a data gap for therm savings



Source: https://title24stakeholders.com/wp-content/uploads/2020/01/2013_CASE-Report_Multifamily-Central-DHW-and-Solar-Water-Heating.pdf

Water Heating – Goal 2

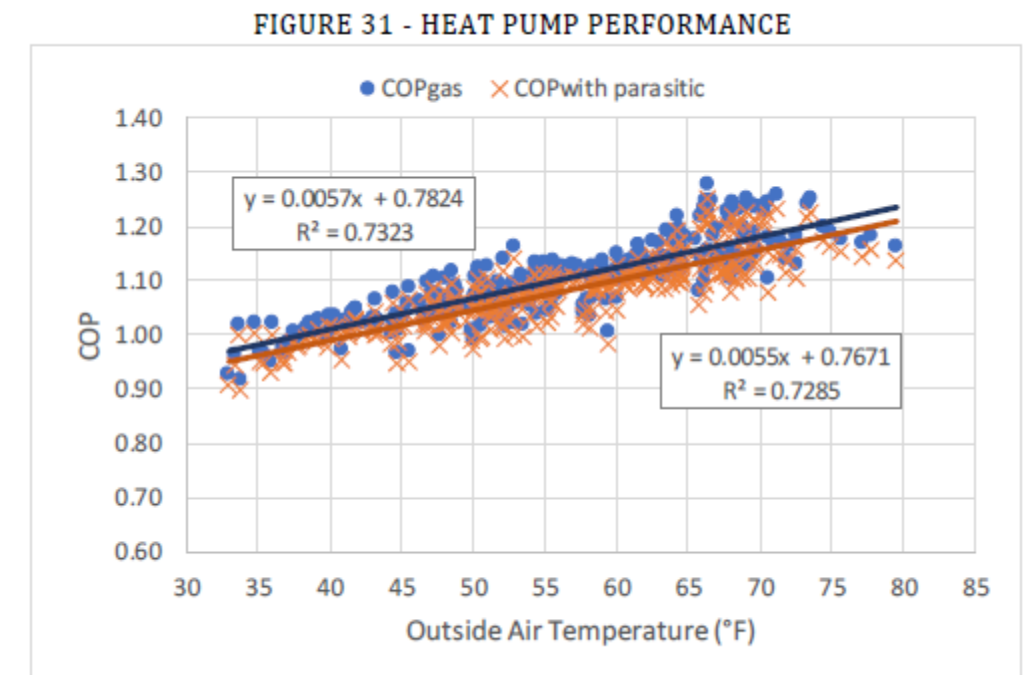
Provide data for updated and new measure offerings of emerging water heating technologies

Background

- 2022 research identified several needs to advance emerging water heating technologies

Objectives

- Steady-state and dynamic performance curves
- Generate operational understanding for measure package update
 - System sizing, real time operational issues, hourly CO2 emissions
- Gather system design, system sizing, and installation cost data
- Gather other information to facilitate technology transfer:
 - Typical applications
 - Typical installation configurations
 - Typical maintenance requirements
 - Required installation and maintenance contractor training
 - Case studies of successful field studies
- Create CO2 hourly load shapes for gas-fired heat pumps relative to electric heat pumps



Source: © Northwest Energy Efficiency Alliance. Robur Heat Pump Field Trial.

Water Heating – Goal 3

Provide modeling support and analysis for emerging water heating technologies

Background

- Local and national efforts expected to further enable adoption emerging technologies
- Understanding of impacts at scale would help policy makers understand the impacts

Objectives

- Facilitate testing of Energy Plus gas absorption heat pump model with field and lab data
- Calibrate model
- Use NREL's Restock/Comstock to project scale impacts in CA through 2030
- Provide outreach



Source: <https://energyplus.net/>



Source: <https://resstock.nrel.gov/>



Source: <https://comstock.nrel.gov/>



HVAC

HVAC – Goal 1

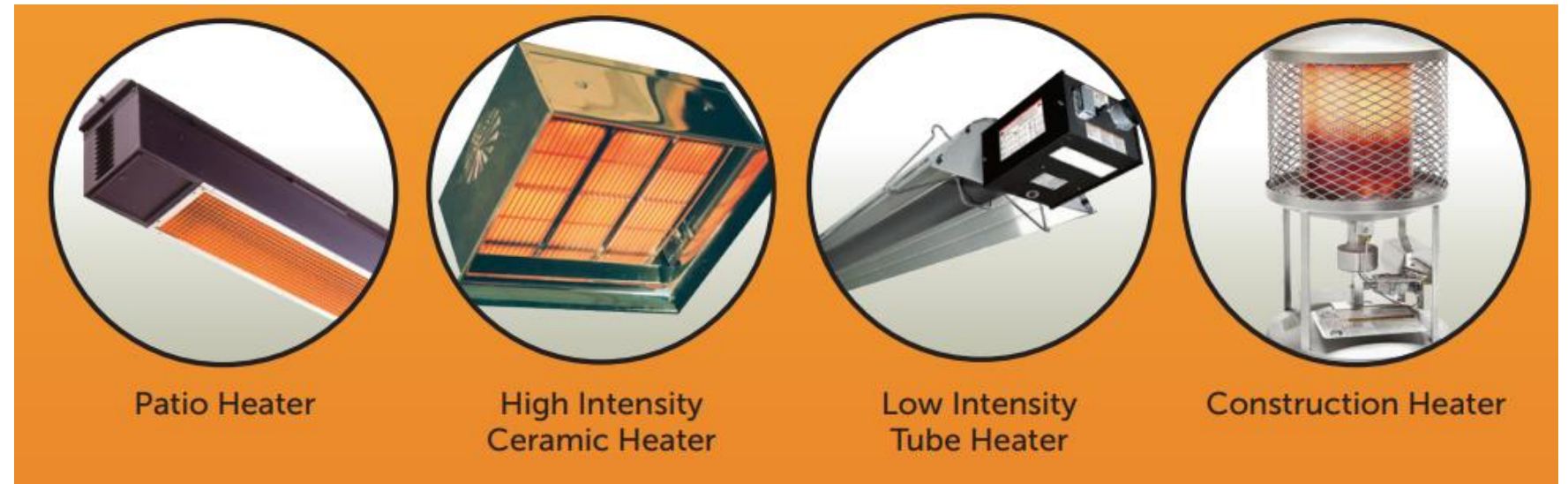
Develop better understanding of Infrared Red heating in commercial, agricultural & industrial (CIA) applications

Background

- Ongoing IR heater study
- Several applications, little to no market research

Objectives

- Finalize ongoing study
- Based on study output, determine if further work required
 - Field testing
 - Measure package development
 - Further market analysis



HVAC – Goal 2

Explore the application of combi systems

Background

- Multiple systems studied for DHW
- Same technologies can be leveraged for both space heating and cooling

Objectives

- Quantify applications where the water heating systems serve other loads
- Explore related applications and requirements



Patents
Pending





Commercial Food Service

Commercial Food Service – Goal 1

Increase the participation of CFS measures in EE programs

Background

- Lack of customer awareness is a barrier
- Drivers for EE
 - Improved performance
 - Labor savings
 - Consolidating kitchen

Objectives

- Field demonstration study(ies)
- Outreach event to present the findings to CFS industry partners.
- Support marketing collateral for EE CFS measures.





Industrial and Agriculture Processes

Industrial/Agriculture- Goal 1

Improve product/operational efficiency of industrial and agriculture process applications

Background

- On-going scanning & screening work

Objectives

- Identify “off the shelf” high efficiency solutions to existing applications
- Review the capability of dedicated IR heaters for drying processes.
- Perform field studies





Cross-Cutting

Cross-Cutting – Goal 1

Reduce the emissions of gas-fired equipment

Background

- Low NOx burners and equipment catalysts have been found across sectors
- They reduce or eliminate emissions

Objectives

- Scope technologies that can reduce emissions
- Determine the technology readiness level
- Determine which end-uses each technology applies
- Determine if the GET program can test



Cross-Cutting – Goal 2

Quantify Impacts of Catalysts

Background

- Technologies are currently in development but not commercially available.

Objectives

- Scan and review technologies
- Determine technology readiness levels
- Quantify potential for EE savings
- Quantify potential for emissions reduction
- Understand the dynamics of the supply chain



Cross-Cutting – Goal 3

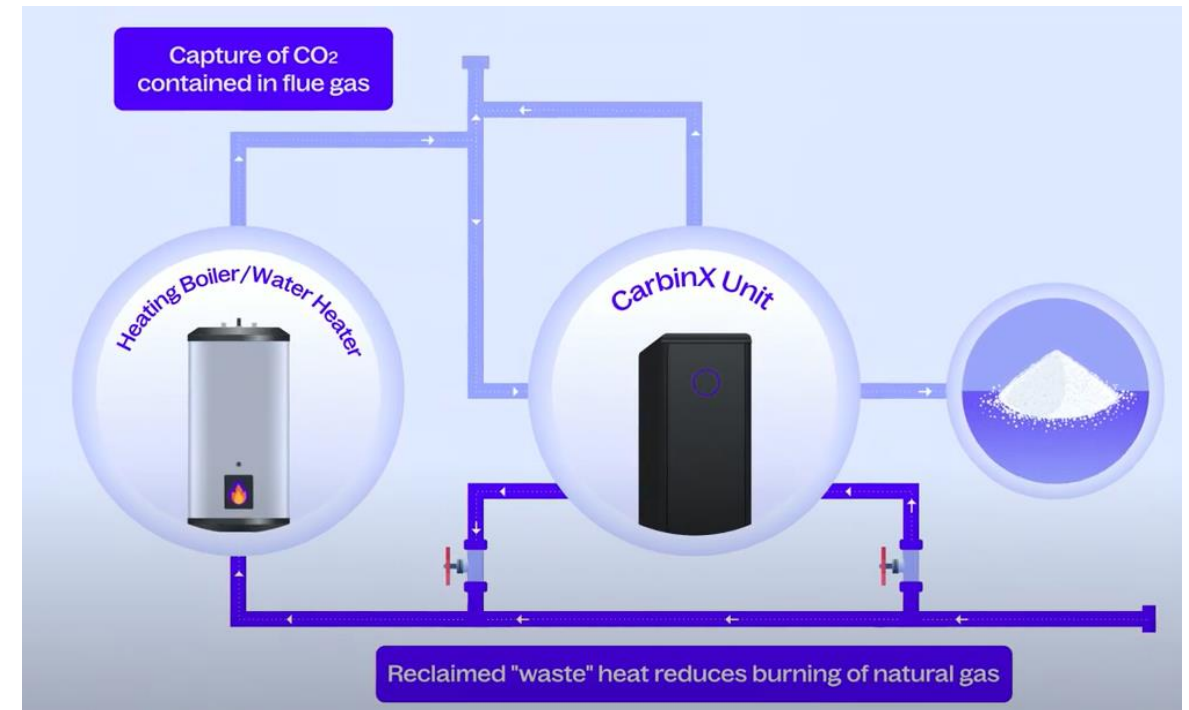
Quantify Carbon Capture Technologies

Background

- At least one technology that is commercially available to reduce carbon and increase energy efficiency of boiler
- Little data on field performance for efficiency gains and carbon reduction

Objectives

- Scan and review list technologies
- Determine technology readiness level
- Quantify potential for carbon reduction
- Understand the dynamics of the supply chain



Cross-Cutting – Goal 4

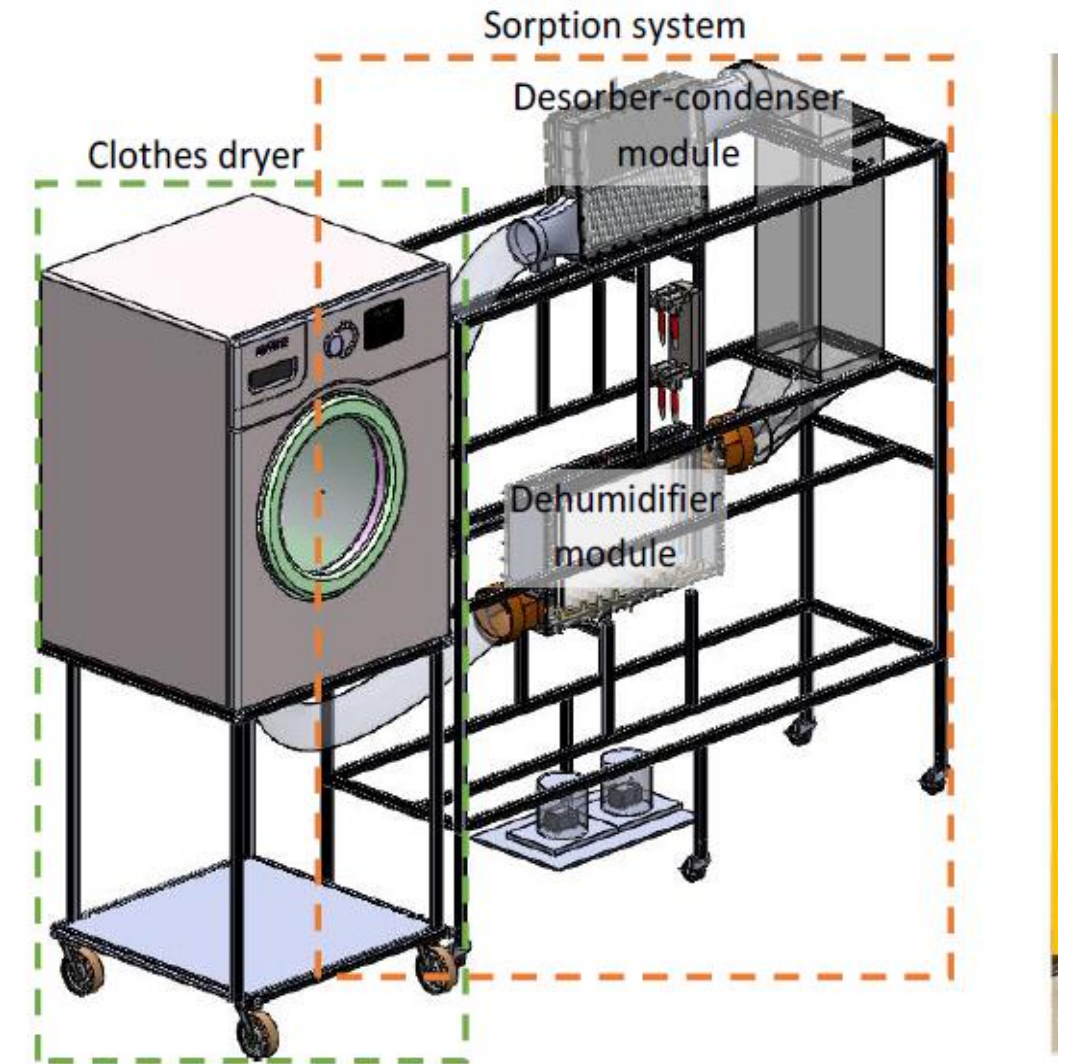
Quantify Sorbent Based Drying Technologies

Background

- There have been advances in sorbent-based drying technologies
- Nascent at this time

Objectives

- Monitor technologies in this space
- Determine technology readiness level



Michigan
Technological
University





Next Steps

Next Steps

Additional opportunities for input

- Stakeholder input accepted through November 18, 2022
- Submit comments to GET@caenergyprograms.com

Plan Development

- 2023 Research Plan to be finalized in December
- Final 2023 Research Plan will be posted on [GET website](#) in January

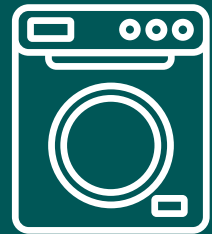
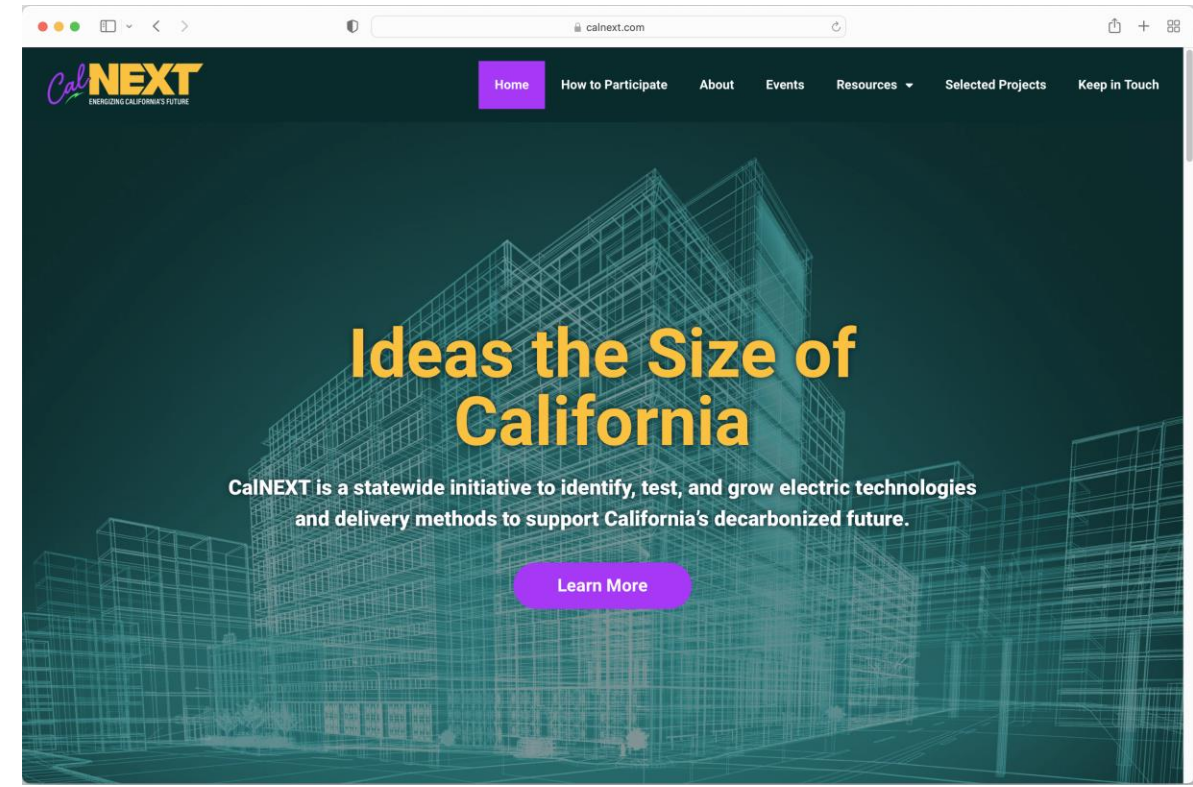


Additional Information

CalNEXT

CalNEXT's vision is to identify emerging electric technologies across six priority areas and bring them to the IOU energy efficiency programs portfolio.

To learn more and sign up for our email list, please visit calnext.com



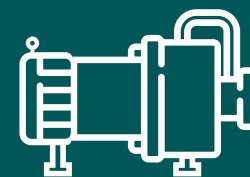
Appliances
& Plug
Loads



HVAC



Lighting



Process
Loads



Water
Heating



Whole
Buildings

Other California Emerging Technology Efforts



California Statewide Emerging Technologies Program assesses the performance of high-efficiency technologies and makes recommendations to customer funded programs as to whether these technologies are suitable.

For more information, visit ca-etp.com



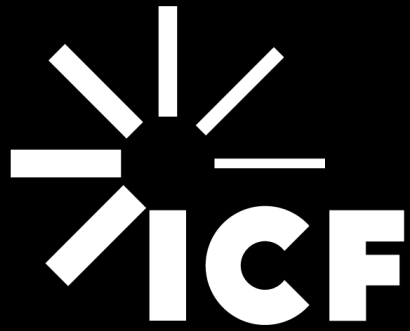
Demand Response Emerging Technologies Program is investing more than \$25 million over five years in scientific and technological research accelerating the market adoption of emerging demand response enabling technologies in all customer sectors to meet California's electric reliability and climate goals.

For more information, visit dret-ca.com



Emerging Technologies Coordinating Council was created to facilitate collaborations on emerging technologies projects. It was created by Pacific Gas and Electric Company, Southern California Edison, Southern California Gas Company, San Diego Gas & Electric, and the California Energy Commission and includes Sacramento Municipal Utility District and Los Angeles Department of Water and Power

For more information, visit etcc-ca.com



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Appendix

Goal 1: Improve adoption of existing water heating technologies in multiple market segments

There are several existing water heating technologies offered in EE programs which have historically seen low participation, and there are some measure offerings that have potential gaps in energy impacts.

- Objectives
 - Perform field studies of existing water heating EE offerings in the multifamily sector where there is a data gap for being able to claim gas savings for controls measures

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Goal 2: Provide data for updated and new measure offerings of emerging water heating technologies

- 2022 research indicated the need for performance curve data for current US equipment, installation configuration and cost data, maintenance requirement information, contractor training, contractor & customer awareness campaigns, and CO2 load shapes for these technologies.
- Objectives
 - Create steady state and dynamic performance curves for gas-fired heat pump technologies via lab work
 - Generate operational understanding of gas heat pump technologies as required for the measure package update and to better understand system sizing, real time operational issues, and provide an understanding of hourly CO2 emissions from realistic operating patterns.
 - Gather gas-fired heat pump system design system sizing, and installation cost data
 - Gather other information on gas-fired heat pumps to facilitate technology transfer to EE programs such as
 - Typical applications
 - Typical installation configurations
 - Typical maintenance requirements
 - Required installation and maintenance contractor training
 - Case studies of successful field studies
 - Create CO2 hourly load shapes for gas-fired heat pumps relative to electric heat pumps

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Goal 3: Provide modeling support and analysis for emerging water heating technologies (including multi-family and hospitality)

- Local and national efforts such as the North America Gas Heat Pump Collaborative (NAGHPC) are expected to further enable adoption of these new emerging technologies. An understanding of these combined impacts at scale would help policy makers understand the impacts of the changes
- Objectives
 - Facilitate testing of the GTI developed Energy Plus air cooled gas absorption heat pump model with field and lab data
 - Utilize field and lab test data to calibrate the GTI developed model
 - Use NREL's Restock/Comstock to project scale impacts in CA due to existing, emerging technologies and code gas savings and emissions through 2030.
 - Provide outreach on the availability of modeling tools and potential impacts.

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HVAC–Goal 1: Finalize understanding of IR heating in commercial, agricultural & industrial (CIA) applications in California

- There is an ongoing study to understand IR heaters as these have several applications but little to no California market research.
- Objectives
 - Finalize ongoing study to understand market penetration and application of linear and area IR EE measures.
 - Based upon output from this study, determine if field testing, measure package development or further market analysis is required.

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HVAC–Goal 2: Explore the application of combi systems

- There are multiple systems that have been studied for domestic hot water heating applications only; however, the same technologies can also be leveraged for both space heating and cooling. These are mostly proposed for residential applications but could be applied for commercial applications as well
- Objectives
 - As part of the field-testing work with water heating, quantify applications where the water heating systems serve more loads than just water heating.
 - Explore related applications and requirements for these systems to be applied in MF and commercial applications.

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CFS–Goal 1: Increase the participation of CFS measures in EE programs

- The CFS market characterization study showed that a lack of customer awareness is a barrier to energy–efficient equipment adoption which has been found in many previous studies. This study also showed that improved performance, labor savings, and consolidating kitchen operations are drivers for the participation of energy–efficient CFS equipment.
- Objectives
 - Field demonstration study(ies) to capture and quantify improved performance, labor savings, and consolidated kitchen operations from energy–efficient CFS equipment.
 - Outreach event to present the findings of study(ies) to CFS industry partners.
 - Data from field studies to support marketing collateral for EE CFS measures.

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Ind/Ag-Goal 1: Improve product/operational efficiency of industrial and agriculture process applications

- Objectives

- Identify technologies and controls that can provide “off the shelf” high efficiency solutions to existing applications especially for small Industrial and Agriculture customers. Something applied at scale such as underutilized existing boiler add-on technologies or new style of venturi steam traps may allow for a deemed or hybrid custom solution.
- Review the capability of dedicated IR heaters for drying processes.
- Perform field studies of emerging technologies in the industrial and agricultural sector.

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Cross-Cutting-Goal 1: Reduce the emissions of gas-fired equipment

- Low NOx burners and equipment catalysts have been found across the water heating, space heating, CFS and industrial sectors which reduce or eliminate emissions.
- Objectives
 - Scope technologies that can reduce the emissions of gas-fired HVAC equipment.
 - Determine the technology readiness level of each technology.
 - Determine which end-uses each technology applies.
 - Determine if the GET program can test each technology.

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Cross-Cutting-Goal 2: Quantify Impacts of Catalysts

- Technologies are currently in development but not commercially available.
- Objectives
 - Scan and review the full list of applicable technologies in this space.
 - Determine technology readiness level of each technology.
 - Quantify potential for EE savings.
 - Quantify potential for emissions reduction.
 - Understand the dynamics of the supply chain for these approaches.

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Cross-Cutting-Goal 3: Quantify Carbon Capture Technologies

- There is at least one technology that is commercially available and is intended to reduce carbon and increase energy efficiency of a boiler system. There is little data on field performance both in terms of efficiency gains and carbon reduction.
- Objectives
 - Scan and review the full list of applicable technologies in this space.
 - Determine technology readiness level of each technology.
 - Quantify potential for EE savings.
 - Quantify potential for carbon reduction.
 - Understand the dynamics of the supply chain for these approaches.

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Cross-Cutting-Goal 4: Quantify Sorbent Based Drying Technologies

- Objectives
 - Monitor the full list of applicable technologies in this space
 - Determine technology readiness level of each technology.

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