

# Technology Priority Maps Preview: Lighting, Plug Loads, and Process Loads

November 9, 2022

# Presenters



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# Agenda

- 1 Recap on CalNEXT & TPMs

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- 2 Intro to Lighting

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- 3 Intro to Plug Loads & Appliances

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- 4 Intro to Process Loads

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- 5 How to Participate

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- 6 Feedback/Q&A

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# Recap on CalNEXT & TPMs



# About CalNEXT

CalNEXT's vision is to identify emerging technology trends and bring commercially available technologies to the energy efficiency program portfolio.



# Program Objectives

-  **Communicate** program priorities to stakeholder community.
-  **Scan, Prioritize, Evaluate** commercially available, emerging, or underutilized technologies and their applications to support increased adoption in the IOU EE portfolios.
-  **Broadcast** results to inform stakeholders, support technology transfer, and advance industry understanding to support large-scale commercial adoption.
-  **Advance** California's decarbonization, equity, and grid priorities by incorporating them into research priorities.
-  **Execute** emerging technology research projects that support the IOU energy efficiency portfolios.



# IOU Portfolios

Measure  
Development  
(aka Workpapers)

Program Integration

Codes & Standards  
(C&S)

Market  
Transformation

# What are the TPMs?



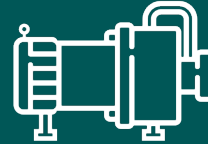
Appliances &  
Plug Loads



HVAC



Lighting



Process  
Loads



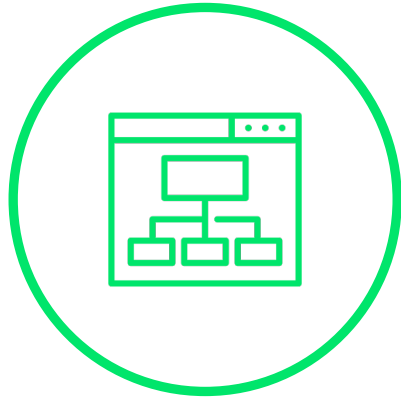
Water  
Heating



Whole  
Buildings



# What are the TPMs?



## High-Level Framework

Explains the CalNEXT program priorities with annual updates, sorted into six technology categories



## External Communications Tool







Defines what CalNEXT research topics we want to fund.



## Internal Tool for Screening

25% of score is based on alignment with TPMs

# TPMs – Glossary

-  **Technology Category:** One of Six Broad Categories (Whole Buildings, HVAC, Water Heating, etc.)
-  **Technology Family:** Functional grouping that describes program role, opportunities, barriers
-  **Subgroups / Example Technologies:** Common examples for each family
-  **Definitions:** Narrative to provide additional clarity on the technology family scope
-  **Opportunities:** Description of the potential impacts and potential research area
-  **Barriers:** Description of key barriers and potential barriers research



# 2022 TPMs: Major Changes



## Updated for recent policy changes

The 2022 TPMs incorporates several recent policy developments identified in the CEC's 2021 IEPR including new emphases on equity, embodied carbon of cement (SB-596), flexible demand technologies (SB-49), and CPUC's Total System Benefit ([D 21-05-031 R. 13-11-005](#))



## Reorganized Technology Families

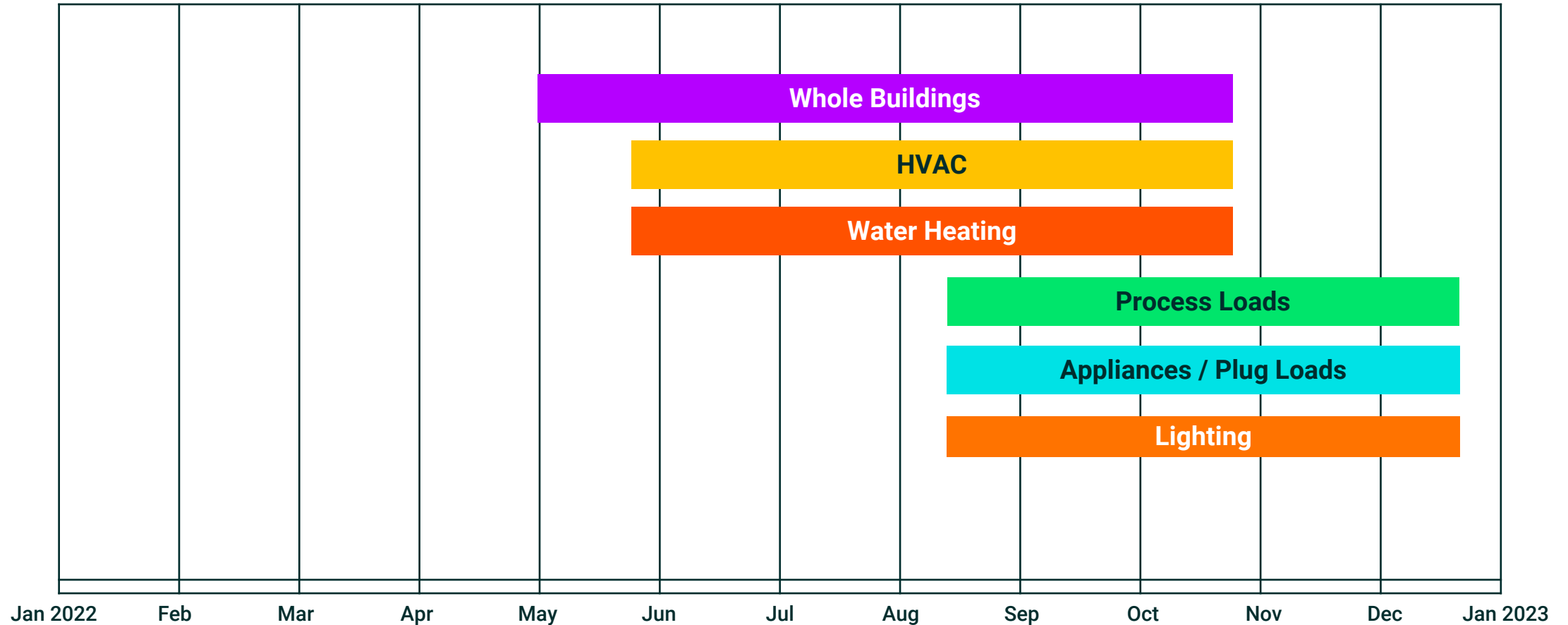
Technology Families have been reorganized to better differentiate new priorities and program emphasis.



## Emphasis on “actionable” projects

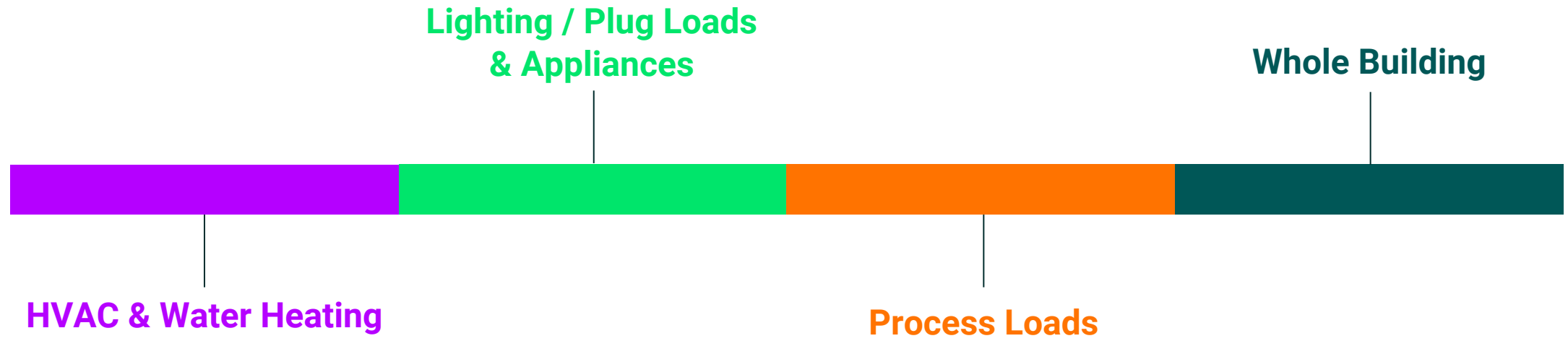
Under the 2022 version of the TPMs we are highlighting the “Barriers” and “Opportunities” sections of the TPM to provide transparency on what we'd like to see researched & developed for CalNEXT.

# TPMs - 2022 Update Schedule





# TPMs – 2023 Update Process\*



\* Tentative Schedule for 2023

## Poll #1

**Who is joining us today?**

Please respond to the Zoom poll

# 2022 Lighting TPM





# Lighting TPM Highlights

- Highlighted Technology Families:
  - Connectivity, Controls, and Integration
  - Horticultural Lighting

# Opportunities & Barriers

- Integrate data-rich lighting controls systems to inform and optimize building systems in commercial and residential buildings
- Integration comes with increase complexity and adds risks of occupant discomfort, security-related risks, and added costs.



# High Priority Family – Connectivity, Controls, and Integration

SUBGROUP / Example Technologies	DEFINITIONS
<ul style="list-style-type: none"><li>• Integrated Lighting Control Systems</li><li>• Advanced Daylighting Controls</li><li>• Examples include:<ul style="list-style-type: none"><li>• Networked Lighting sensors used for lighting and HVAC occupancy controls</li><li>• Advanced daylighting controls to integrate with fenestration systems such as electrochromic windows or automated blinds</li></ul></li></ul>	<p>Sensors, communication systems, and control algorithms that reduce energy consumption in lighting and other building systems, provide data for other purposes, or enhance occupant comfort and wellness.</p>



# Medium Priority Family – Horticultural Lighting

SUBGROUP / Example Technologies	DEFINITIONS
<ul style="list-style-type: none"><li>• High-efficacy horticultural luminaires and lamps</li><li>• Horticultural lighting controls</li><li>• Examples include:<ul style="list-style-type: none"><li>• Improving photosynthetic photon efficacy (PPE)</li><li>• Advanced controls for spectral tunability or daylighting harvesting of greenhouses</li></ul></li></ul>	<p>Systems producing light and non-visible electromagnetic radiation for plant growth and horticultural production in indoor facilities or for supplemental lighting in greenhouses, including specific design strategies, lighting technologies and control systems for optimizing productivity, energy efficiency, and resource conservation.</p>

# 2022 Plug Loads & Appliances TPM





# Plug Loads & Appliances TPM Highlights

- Highlighted Technology Families:
  - Electric Vehicle Supply Equipment (EVSE)
  - Decarbonizing Household Appliances



# Opportunities & Barriers

- EVSEs: Enormous load growth expected for EVSEs.
- New deployment strategies to decarbonize residential cooking and the residential & commercial clothes dryers



# High Priority Family – Electric Vehicle Supply Equipment (EVSE)

SUBGROUPS / Example Technologies	DEFINITIONS
<ul style="list-style-type: none"><li>• Level 1 Charging (AC)</li><li>• Level 2 Charging (AC)</li><li>• Level 3 DC Fast Charging</li><li>• Bi-directional Charging</li><li>• Local Management Technologies</li></ul>	<p>EVSE is defined as the conductors, connectors, related equipment, and control software that deliver energy to an electric vehicle (EV).</p>

# High Priority Family – Decarbonizing Household Appliances

SUBGROUP / Example Technologies	DEFINITIONS
<ul style="list-style-type: none"><li>• Residential Clothes Dryers (Heat Pump Dryers)</li><li>• Induction Cooktops &amp; Ranges</li><li>• Commercial Clothes Dryers</li></ul>	<p>This technology family focuses on decarbonization of large gas-powered appliances used in cooking and other housekeeping tasks, such as ranges, dryers, and ovens, that are capable of functioning with different fuel sources (natural gas, electric, or propane).</p>



# 2022 Process Loads TPM

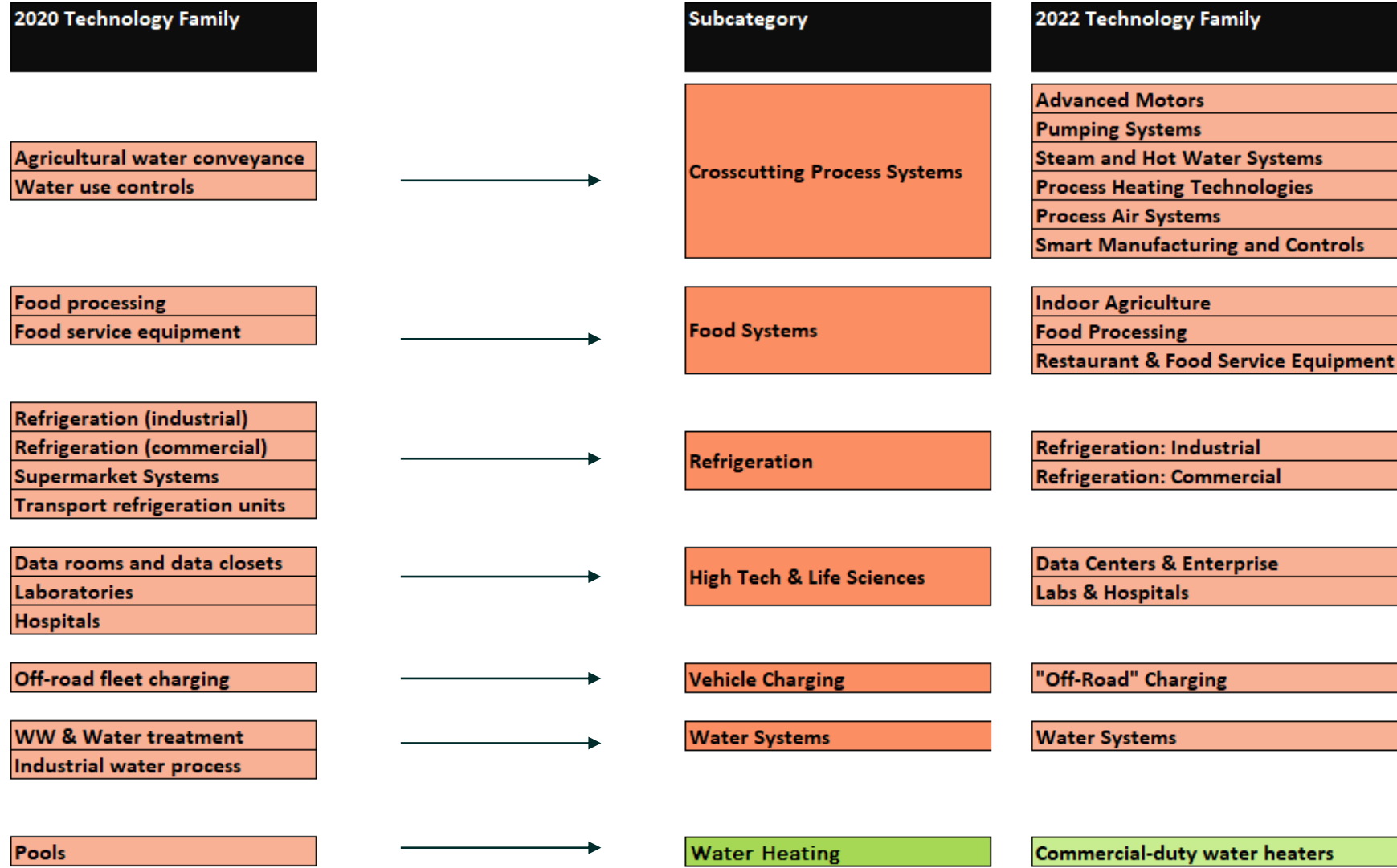




# Process Loads TPM Highlights

- Incorporates six new cross-cutting Tech Families (15 in total)
- Developed new technology family for indoor agriculture

# New Process Loads Technology Families



# Unique Opportunities & Barriers

- Most incentive programs are through custom programs leaving lots of room to develop new measure packages for process loads.
- Many process loads use specialized equipment or have custom-engineered systems which may misalign with more measure package development.



# 2022 Process Loads TPM: Cross-cutting Tech Families

Technology Family	Subgroups	Definitions	ETP Role
Advanced Motors	Switched reluctance motors, synchronous reluctance motors, permanent-magnet (PM) alternating current (AC) (PMA) motors, PM synchronous motors (PMSM), and motors with an integrated variable-	Advancement of highly efficient electric motor types and associated control technologies with an emphasis on enhancing new advanced electric motor market awareness, stocking, deployment, and scalability.	2-Collaborate
Pumping Systems	High efficiency pumps, advanced pump system monitoring and data analytics, load management controls.	This technology family is focused on a holistic approach to design and optimization advancements of all pumped liquid systems across process-based market segments, aimed at achieving peak efficiency and demand flexibility.	2-Collaborate
Steam and Hot Water Systems	Electric hot water heaters, hot-water heat pumps, steam generation equipment, heat recovery chillers, burner fan motor controls, thermal process integration, waste heat recovery, dual-fuel heat pumps,	Electrically-heated hot water and steam generation will be increasingly utilized to electrify and decarbonize traditionally natural gas fueled steam and hot water heating systems. Emerging technologies in heat pumps can increase efficiency and process optimization and waste heat recovery methods reduce the	2-Collaborate
Process Heating Technologies	Electrically-driven industrial process heating for plastics molding, glass manufacturing, cast metals, and other manufacturing processes.	Processes that dry raw materials, preheat process equipment or materials, cure or stabilize produced goods, especially in plastic, glass and materials manufacturing. <i>Note: This technology family excludes process heating used in Steam &amp; Hot Water as well as heating from specialized food</i>	3-Observe
Process Air Systems	Blowers, fans, variable speed drives, air filtration, air distribution systems, compressed air systems, vacuum systems, and the design, maintenance, & control of these systems.	Industrial processes systems that move air including fans, blowers, air compressors, and vacuums. This family includes treatment of air streams using filters, particulate separators, and the distribution infrastructure such as ducts, fittings, sensors, controls, and storage (compressed air).	2-Collaborate
Smart Manufacturing and Controls	Advanced sensors, controls, platforms, and modelling for manufacturing.	Deployment and integration of multiple technologies that together can enable EE improvements in manufacturing and deliver customer and grid benefits, significantly improving capacity for load flexibility and DR participation and GHG tracking and tracing for enterprise resource planning (ERP) reporting.	2-Collaborate

# 2022 Process Loads TPM: Refrigeration

Technology Family	Subgroups	Definitions	ETP Role
Refrigeration: Industrial	Industrial process cooling and freezing including spiral freezers, blast freezers, cryogenic freezers, freeze drying, refrigerated warehouses, large walk-in and drive-in refrigerated spaces, cooling for materials processing, pharmaceuticals, and others, and transportation refrigeration units.	Industrial cooling, refrigeration and freezing systems for food, materials, pharmaceuticals and other manufactured product applications, and refrigerated transportation distribution from manufacturing facility.	2-Collaborate
Refrigeration: Commercial	Self-contained and remote condensing retail refrigeration cases; centralized racks and micro-distributed systems; walk-ins and food prep rooms.	Commercial refrigeration equipment utilized for cooling and freezing applications in commercial and institutional end uses including stationary, low, medium and high temp refrigeration systems, supermarket food storage, food preparation rooms, and retail sales equipment. Includes compressor heat recovery systems, advanced controls, and scalable thermal storage systems.	1-Lead



# 2022 Process Loads TPM: Food Systems

Technology Family	Subgroups	Definitions	ETP Role
Indoor Agriculture	Stand-alone dehumidifiers, integrated HVAC and dehumidification units, chilled water systems for indoor agriculture, irrigation controls, integrated environmental controls, vapor pressure deficit controls, agricultural-specific envelope products, combined heat/power/CO2 enrichment applications.	Non-lighting equipment used to produce agricultural products in controlled environment horticulture spaces. This includes the Heating, Ventilation, Air Conditioning, and dehumidification (HVAC/D), irrigation, and controls systems associated with maintaining environmental conditions for growing.	1-Lead
Food Processing	Washing, peeling, dewatering, roasting, baking, drying, dehumidifier, process cooling and process heating systems.	Equipment used to transform agricultural products into food, or of one form of food into other foods such as value-added products.	2-Collaborate
Restaurant & Food Service Equipment	Commercial food preparation (cooktops, woks, ovens, steamers, fryers, broilers); sanitation operations (dipper wells, pre-rinse operations, dishwashing); kitchen and dishroom ventilation (makeup air unit and kitchen hoods); commercial refrigeration equipment (kitchen refrigerators and freezers, prep tables, salad bars, automatic ice machines, self-contained walk-in coolers & freezers).	<p>Electric equipment and systems typical of commercial kitchens (cafes, fast food, sit down) and institutional foodservice facilities (hospitality, and cafeterias).</p> <p><i>Note 1: Grocery display cases and remote-condensing systems are covered under the "Refrigeration, Commercial" technology family within this Process Loads TPM.</i></p> <p><i>Note 2: Water heating topics are covered under the Water Heating TPM and the "Steam &amp; Hot Water Systems" technology family within this Process Loads TPM.</i></p>	2-Collaborate

# 2022 Process Loads TPM: High Tech & Life Sciences

Technology Family	Subgroups	Definitions	ETP Role
Labs & Hospitals	Incubators, Autoclaves, Biosafety Cabinets, Ultra Low Temp Freezers (ULTs), Medical Fridges/Freezers, sterilizers, fume hoods, and imaging equipment.	Advancement of common laboratory and hospital-specific equipment that will improve the energy performance of this broad sector.	2-Collaborate
Data Centers & Enterprise Computing	Liquid-cooled systems, Data Center Storage, Enterprise Servers, Large Network Equipment (LNE), Uninterruptible Power Supplies (UPS) and computer room air conditioners or air handlers (CRAC / CRAH).	Energy-using equipment related to the functioning of dedicated information technology (IT) facilities, including the IT equipment (servers, storage, networking) itself. Other typical equipment include power infrastructure such as PDUs & UPS as well as specialized systems for airflow management and Air Conditioning.	2-Collaborate

# 2022 Process Loads TPM: Other Categories

Subcategory	Technology Family	Subgroups	Definitions	ETP Role
Vehicle Charging	Off-road fleet charging	Charging of golf carts, forklifts, pallet jacks, airport ground support equipment, automated guided vehicles, and other similar non-automotive vehicles.	<p>This family focuses on charging and charging management strategies to support the electrified transition of commercial and industrial vehicles used exclusively on-site to perform a variety of functions that would not be suitable for traditional "motor vehicles". Building energy uses occurs while charging batteries of these vehicles.</p> <p><i>Note: This technology family excludes personal mobility devices and traditional electric vehicles which are covered under separate technology families within the Plug Load TPM.</i></p>	2-Collaborate
Water Systems	Water Systems	<p>Equipment to convey, treat, distribute, recycle, and discharge water focused on the distribution system.</p> <p>Example technologies include water loss control, energy recovery turbines, hydraulic modeling and optimization, alternative water sourcing, controls, and treatment.</p>	<p>This technology family is focused on the water lifecycle in urban, agricultural, and industrial systems inclusive of all technologies deployed in potable water, wastewater, recycled water and desalination systems.</p> <p><i>Note: This technology family excludes pumping energy which is covered in the Cross-cutting Process Systems: Pumping Systems technology family of this Process Loads TPM.</i></p>	1-Lead

## Poll #2

**For which TPM are you interested in submitting a project?**

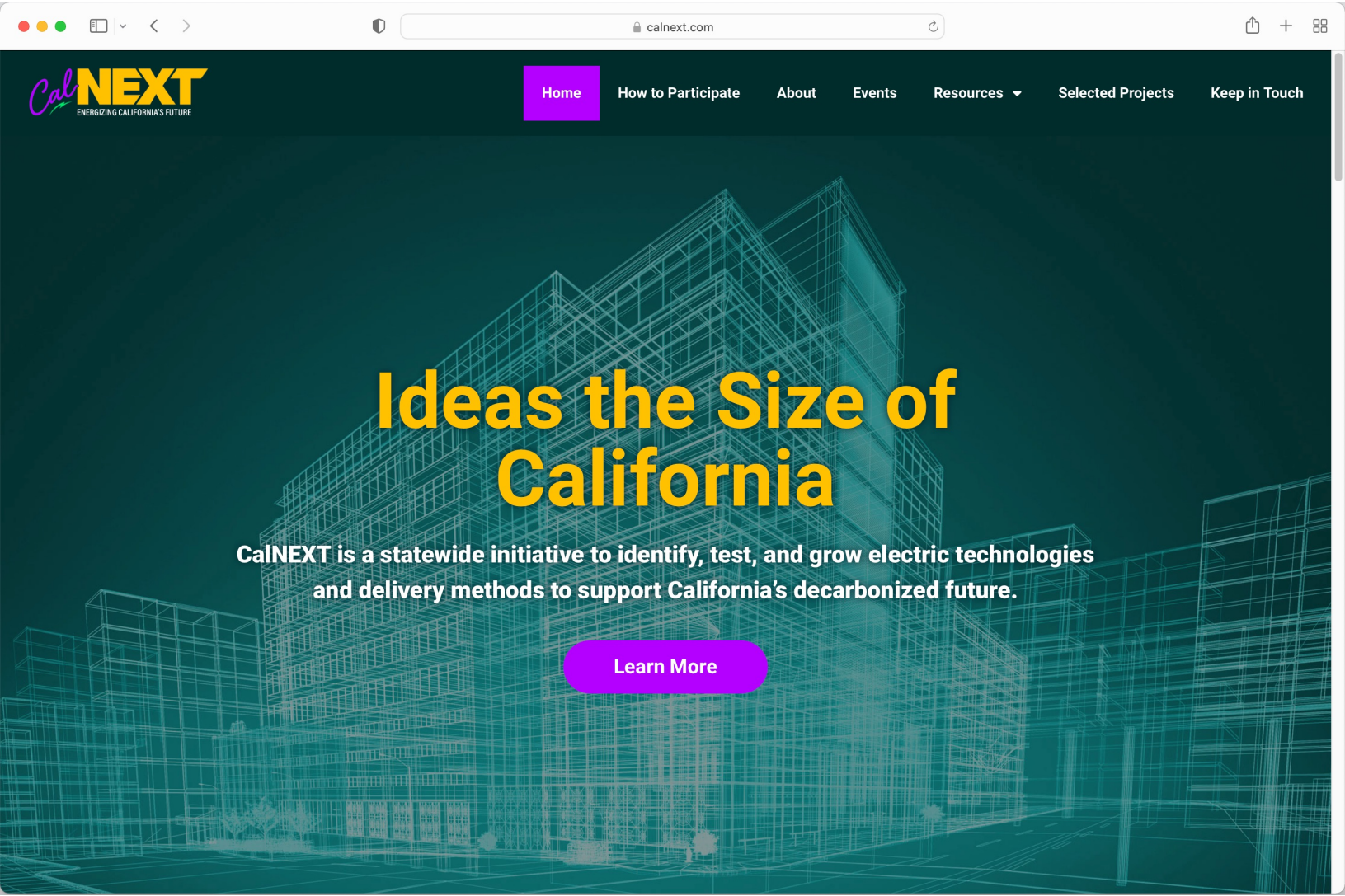
Please respond to the Zoom poll



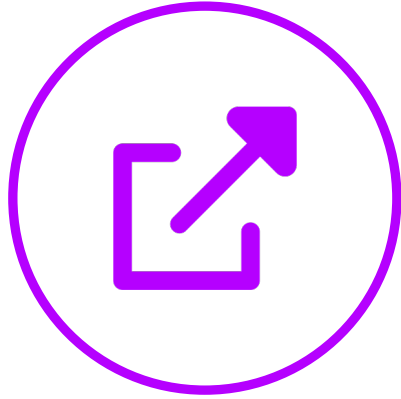
# How to Participate





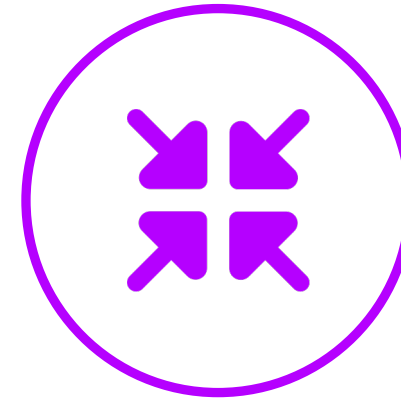


# Project Types



## Technology Support Research

Projects focused on addressing market barriers or developing the commercial capability of *market-ready technologies*.



## Technology Development Research

Projects focused on addressing market barriers or developing the commercial capability of *early-stage technologies*.

# Project Submission



**Submit an Idea**



**Submit a Project**



# Submission Process



# Prioritization Framework

Criteria	Weighting	Details
TPM Alignment	25%	How well the project aligns with the CalNEXT TPMs
Benefits	20%	Whether the project has benefits for the utilities and affects HTR/DACs
Quality of Idea	50%	Clarify of scope, how innovative it is, whether it's ready for implementation, has a clear market strategy, and has a reasonable timeline
Cost	5%	Estimated budget

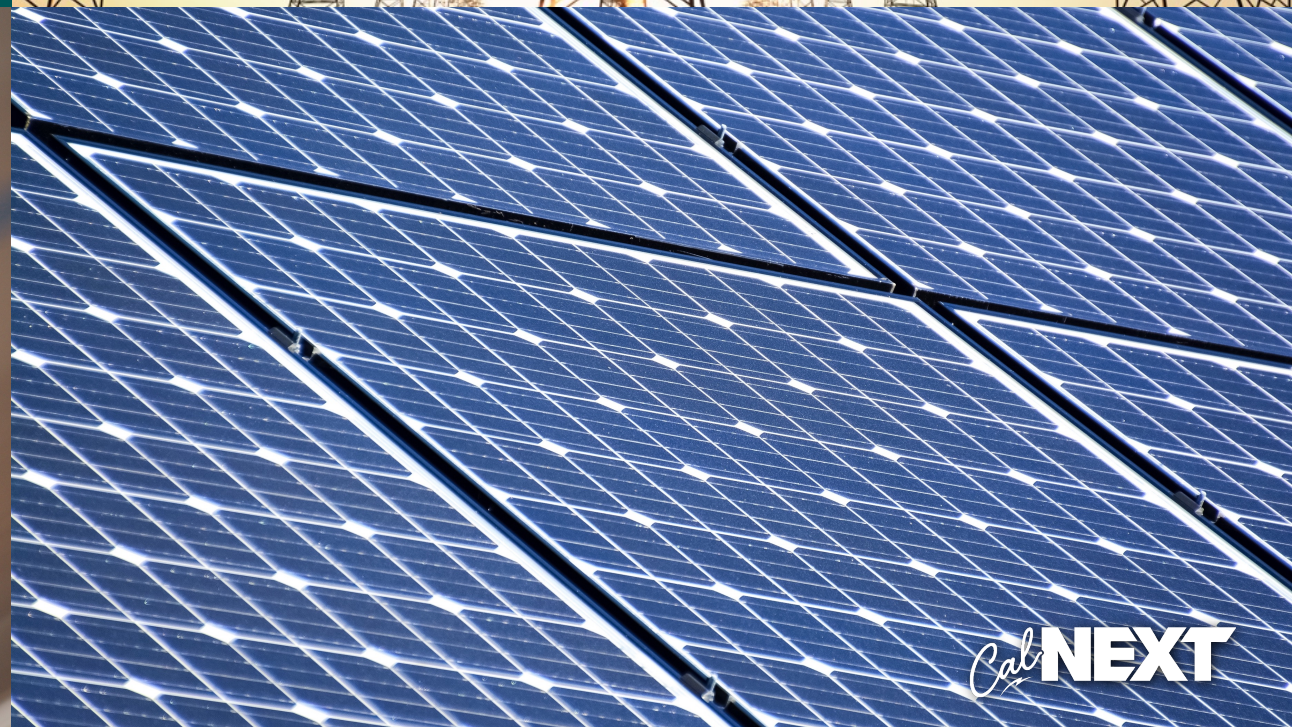
## Poll #3

**How long will your idea or project  
take to implement?**

Please respond to the poll



# Feedback/Q&A





# Upcoming Event



**CalNEXT**  
ENERGIZING CALIFORNIA'S FUTURE

## 2022 Projects Summit

Approved TSR and TDR Projects

**NOVEMBER** **WEBINAR**  
**29** **Tuesday**  
10:00am–12:15pm PT  
*Registration Requested*

[Sign Up](#)

Technology Priority Maps: Lighting, Plug Loads, Process Loads

# CA Statewide Gas Emerging Technology

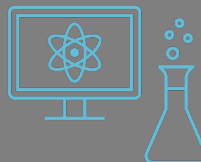
The Statewide Gas Emerging Technologies Program (GET) advances promising as potential measures for future energy-efficient programs. Working with cross functional stakeholders, the GET program sources and screens technologies at a TRL of 4 and higher to gather necessary technical and savings potential data, identify key market barriers to adoption, and develop strategies to overcome these barriers.



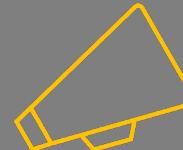
Scanning and  
Screening



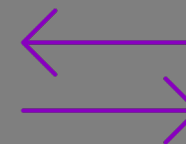
Planning and  
Prioritization



Technology  
Evaluation



Dissemination



Technology  
Transfer

For more info: <https://cagastech.com>





# Thank You!

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*Cal* **NEXT**