



California Energy Commission Building Decarbonization Activities

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Legislative and Regulatory Context

- SB 32** Reduce statewide GHG emissions 40% below 1990 levels by 2030 (2016)
- AB 3232** Assess potential to reduce building GHG 40% by 2030
- SB 100** 100% zero carbon resources by 2045
- SB 1477** Low-emissions building technology deployment incentives
- SB 350** 50% RPS, EE Doubling, Integrated Resource Planning, priority for equity

CEC, CPUC, CARB, and other agencies taking action to assess and implement strategies to reduce building GHG

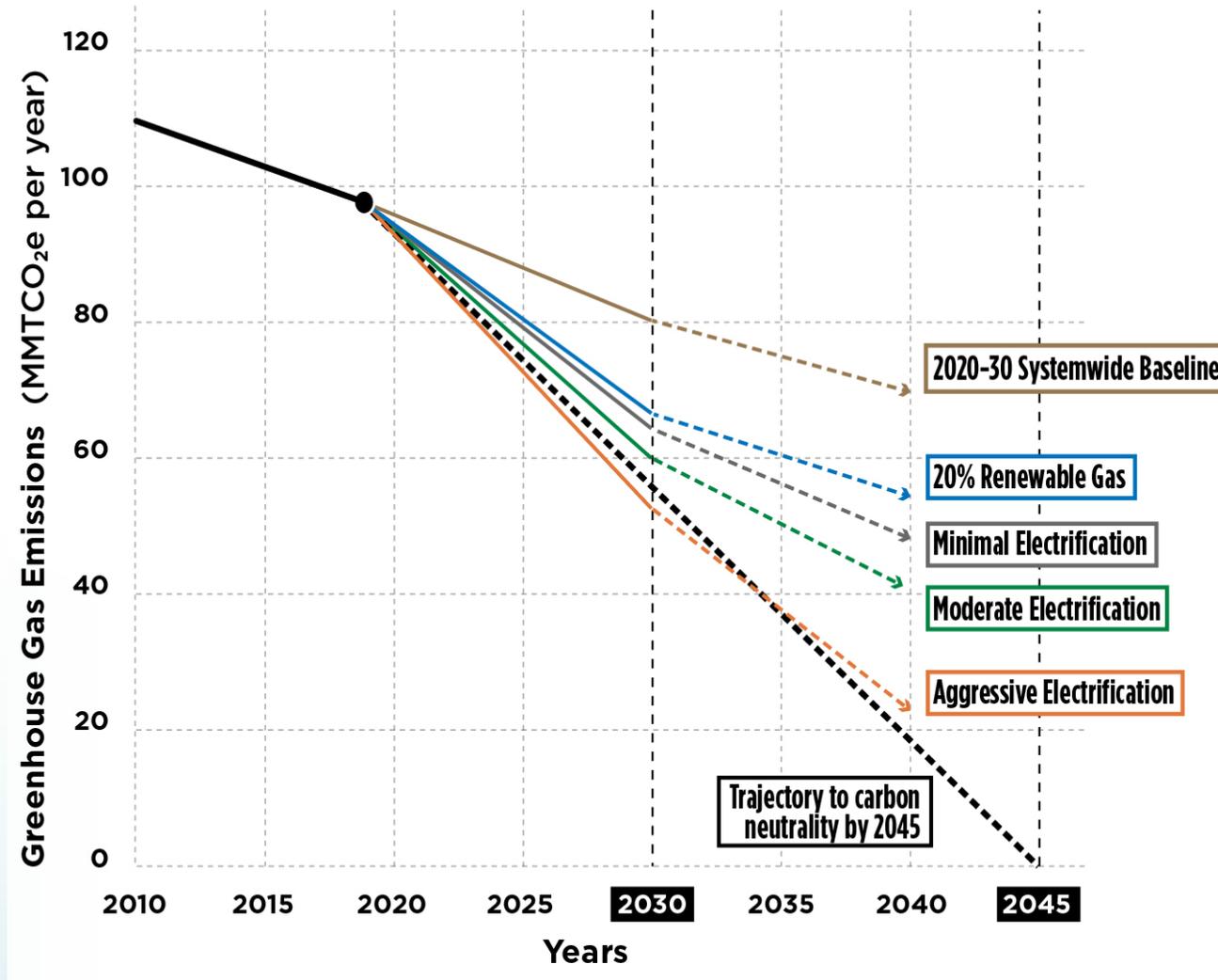


Seven Broad Strategies of Building Decarbonization

1. Building end-use electrification
2. Decarbonizing electricity generation system
3. Energy efficiency
4. Refrigerant conversion and leakage reduction
5. Distributed energy resources
6. Decarbonizing gas system
7. Demand flexibility



Decarbonization Trajectories





AB 3232 Assessment Conclusions

- Achieving GHG reduction is feasible under aggressive scenarios
- Large-scale deployment of electric heat pumps necessary
- Newly constructed buildings have low decarbonization costs
- Large investments in existing buildings needed
- Further long-term reliability impacts need assessing
- Refrigerant leakage reduction is critical
- Gas system role and incentives need further review



Warren-Alquist Act

Warren-Alquist Act

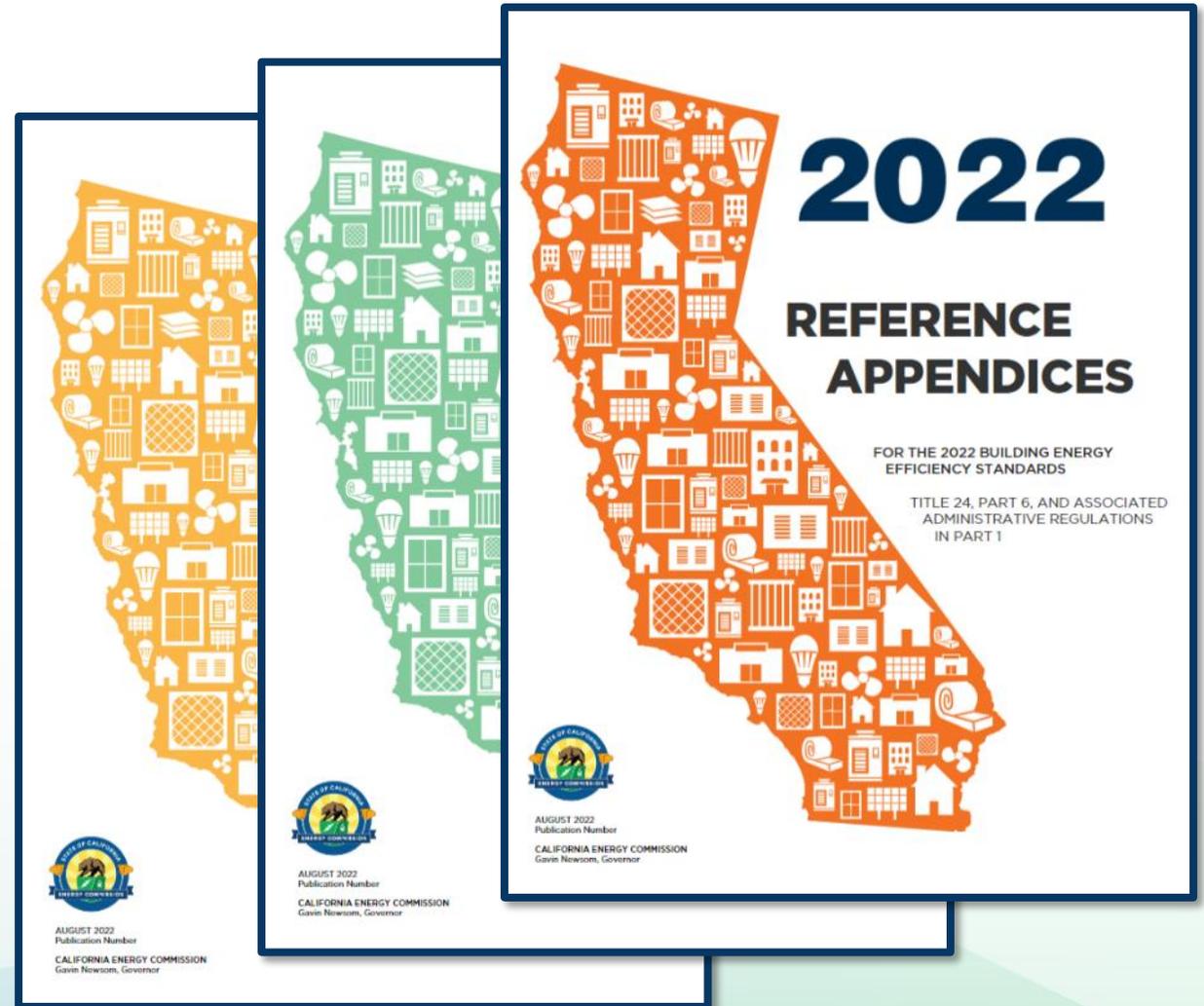
- Established CEC in 1974 to reduce wasteful, uneconomic, inefficient, or unnecessary consumption of energy
 - Update the Building Energy Code every three years and assist local jurisdictions with enforcement
 - Develop efficiency standards for appliance energy and water consumption on products not covered by federal standards
- **Outcome** – California uses 31% less electricity per capita than the rest of the United States





2022 Energy Code Highlights

- Heat pump baselines
- Solar + storage baselines
- Electric-ready requirements
- Ventilation requirements
- Multifamily restructuring





2025 Energy Code Potential Themes

- Heat Pump Baselines & Refrigerants
- Additions & Alterations
- Process & Industrial
- Energy Storage & Load Flexibility – Res, Nonres
- Electric Vehicles – Readiness, EV Credits
- Energy Accounting – Bills Impacts, Metrics, Climate Data
- Health & Safety Coordination
- Affordable New Housing Program Coordination



Recent Appliance Efficiency Standards

Standard	Effective Date	Savings Estimates
General Service Lamps	January 1, 2020	4,000 to 13,600 GWh per year
Portable Air Conditioners	February 1, 2020	369 GWh per year
Spray Sprinkler Bodies	October 1, 2020	543 GWh per year 152 billion gallons of water per year
Replacement Pool Pump Motors	July 1, 2021	451 GWh per year
Commercial & Industrial Air Compressors	January 1, 2022	322 GWh per year



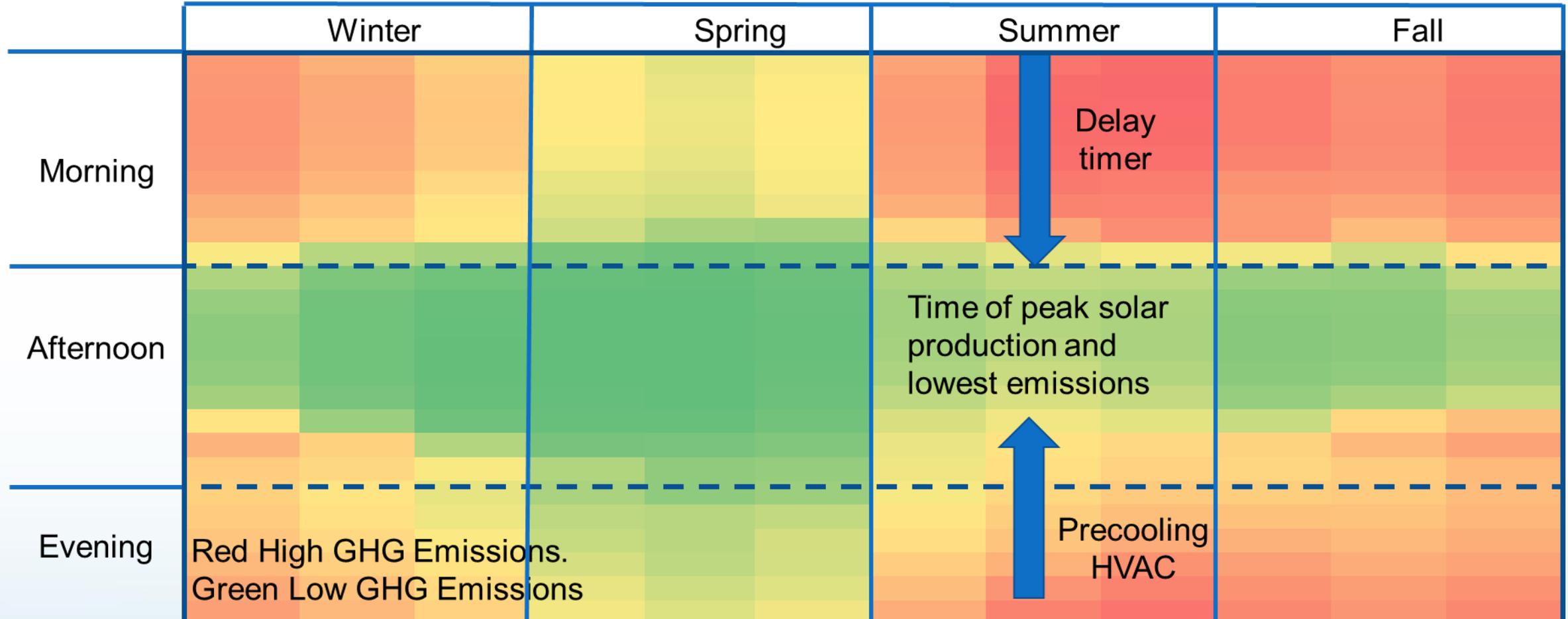
Ongoing Appliance Efficiency Standards

Standard	Status	Savings Estimates
Federally-Exempt Linear Fluorescent Lamps	Formal rulemaking to start in mid-2022	2,895 GWh per year
Air Filters	Formal rulemaking in early 2022	38 GWh and 6.1 million therms per year
Commercial and Industrial Fans and Blowers	Formal rulemaking in early 2022	1,427 GWh per year
Landscape Irrigation Controllers	Formal rulemaking in mid-2022	92 billion gallons of water and 328 GWh per year
Dipper Wells	Order Instituting Rulemaking adopted at October business meeting	19.6 GWh , 25 million therms , and 5.5 billion gallons of water per year



Load Flexibility - Schedule, Shift, and Curtail

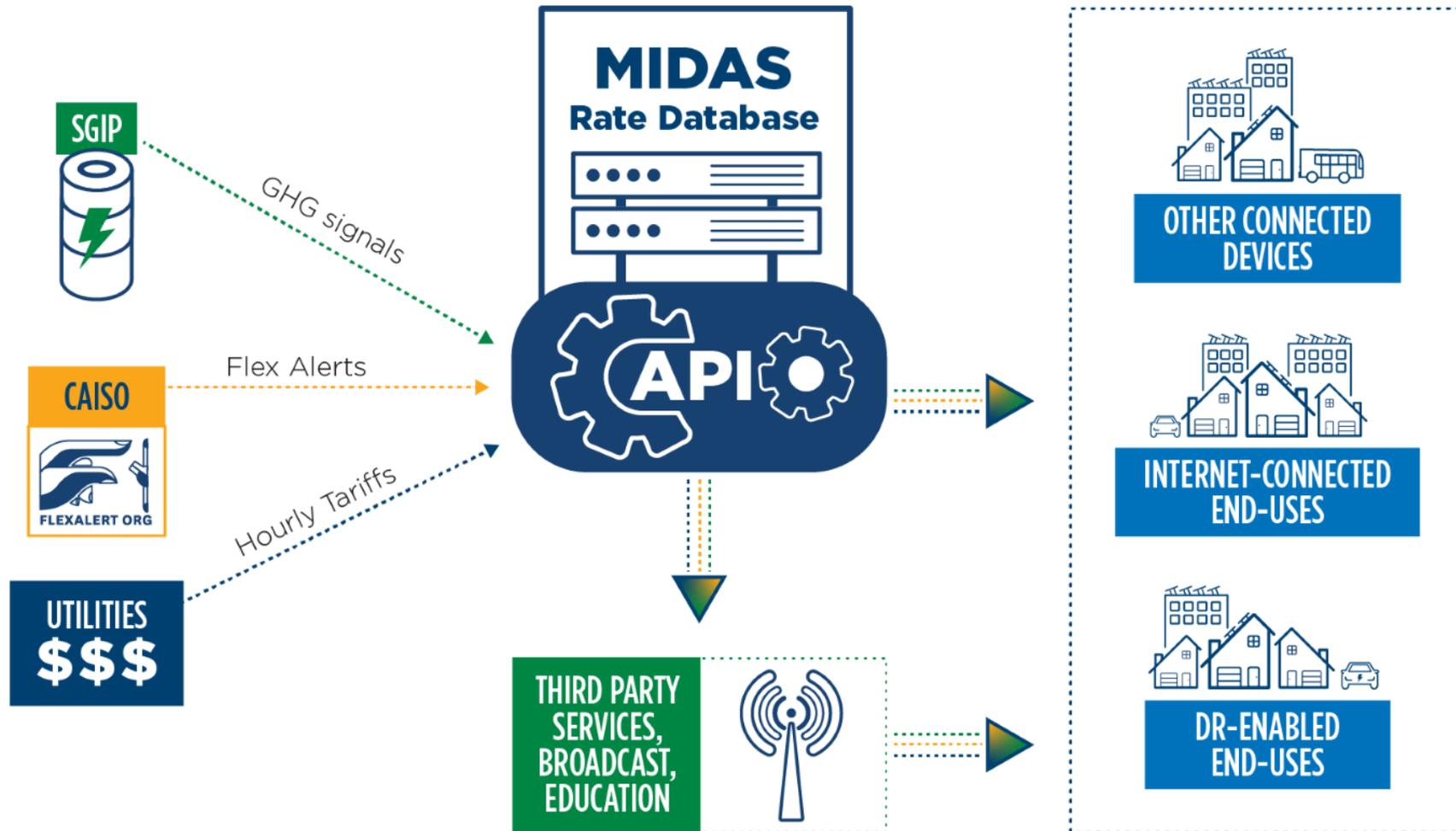
GHG Emissions by Hour and Season (2030)



Flexibility is key to reducing emissions from homes and businesses



Load Management and MIDAS

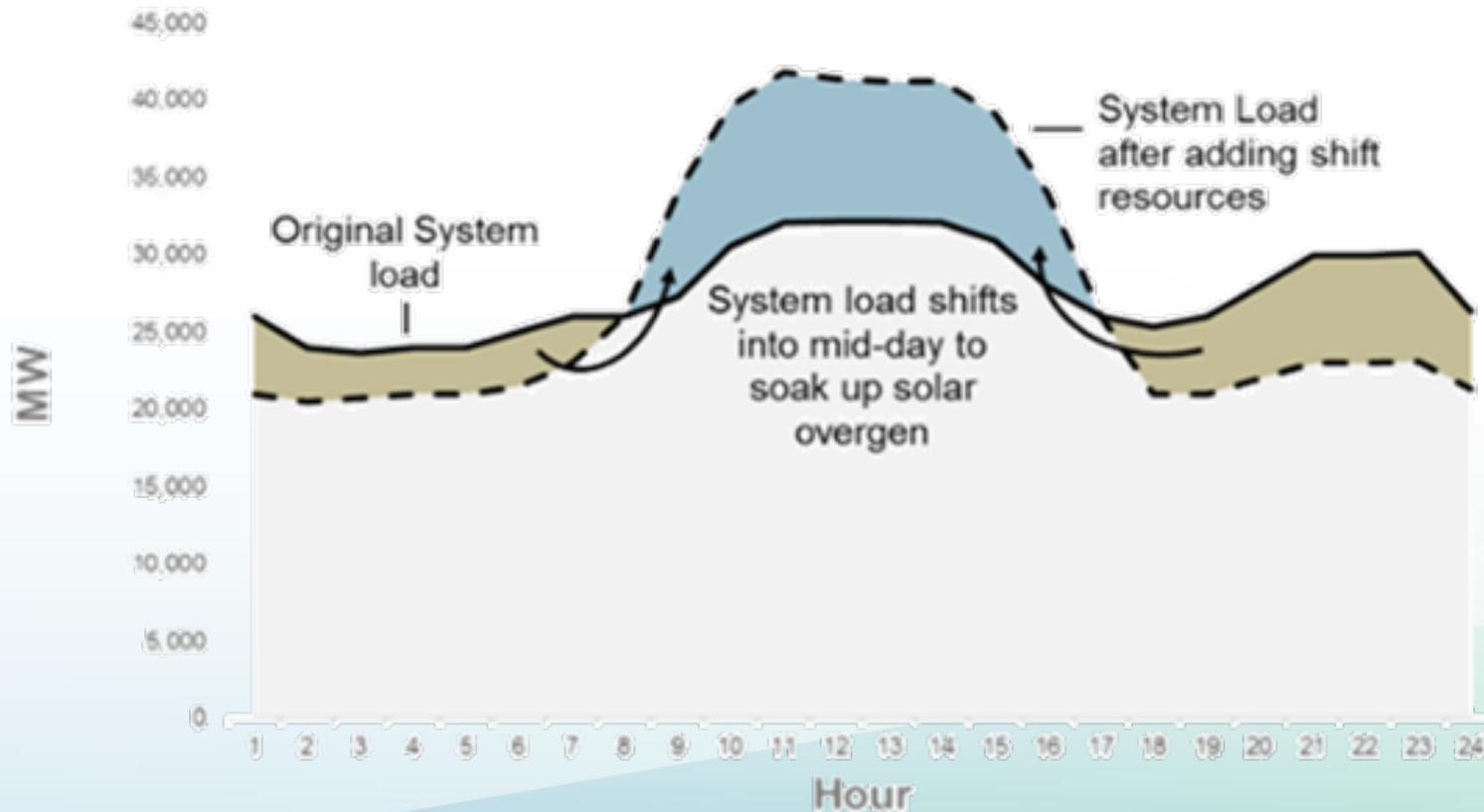




Flexible Demand Appliances



Shift Service Type: Shifting load from hour to hour to alleviate curtailment/overgeneration



Grid Connected Heat Pump Water Heater



BUILD Program: “At A Glance”

Goal	Deploy near-zero emission building technologies to reduce GHG emission -- while ensuring no negative bill impact for low-income occupants.
Eligibility	<ul style="list-style-type: none">• All-electric new residential construction• Located in gas IOU territory
Budget	\$80 million
LI/DAC Component	<ul style="list-style-type: none">• ≥ \$60 million for new low-income residential housing incentive• Technical assistance• Education and Outreach
Eligibility	<ul style="list-style-type: none">• Multifamily:<ul style="list-style-type: none">• At least 2 deed-restricted units AND• In DAC/LI community OR 80% of units are 60% or less AMI• Individual low-income residence (<i>Public Utilities Code §2852(a)(3)(C)</i>)

IEPR Building Decarbonization Recommendations

1. Focus on Existing Buildings
2. Agency Coordination
3. Efficient Electric New Buildings
4. Load Management and Demand Flexibility
5. Reduce and Recycle Refrigerants
6. Data and Analysis
7. Compliance and Enforcement
8. Support Local Leadership and Workforce
9. Embodied Carbon
10. Industrial and Agricultural Process Decarbonization



Focus on Existing Buildings

Cost estimate range to achieve AB 3232 goal (likely underestimate)

- \$2.9 - \$40 billion; or \$39 - \$142 per metric ton

Focus on existing buildings should prioritize equity at its core

- Alleviate energy burden
- Consider split incentives
- Rural and tribal areas
- Housing stock and affordability
- Consider non-energy benefits



Residential Units

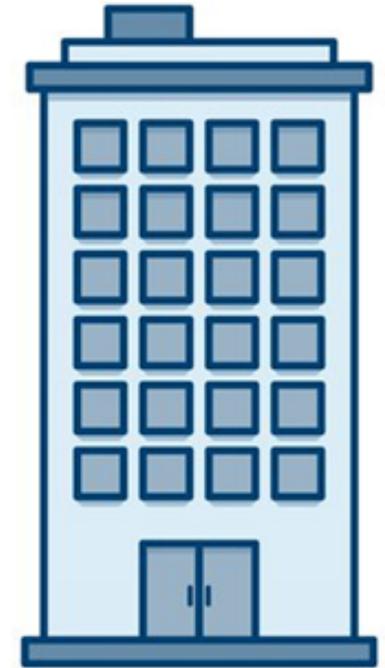
13.7 million

Annual Electricity Consumption

93,522 GWh

Annual Gas Consumption

4,562 MM therm



Commercial Space

7,392 million sq. ft.

Annual Electricity Consumption

105,174 GWh

Annual Gas Consumption

2,130 MM therm

Supporting Local Governments

- Collaborate and partner with community-based organizations and local and tribal governments to advance decarbonization knowledge and acceptance
- Support of local planning efforts and reach codes to advance statewide decarb
- Focus funding to support just transition and community-focused clean energy jobs



Energy R&D Funding Programs

Core mission: strategically invest funds to catalyze technology innovation and accelerate achievement of policy goals.

- Electric Program Investment Charge (EPIC),
\$133 million annually
- Natural Gas Research, Development and Demonstration Program,
\$24 million annually



<https://www.energy.ca.gov/programs-and-topics/programs/electric-program-investment-charge-epic-program>

<https://www.energy.ca.gov/programs-and-topics/programs/natural-gas-program>