Effective State and Utility Programs to Accelerate Industrial Electrification

September 2025

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Summary

Electrification of low- to medium-temperature[1] industrial process heat is one of the most promising and accessible pathways for manufacturers to increase competitiveness, improve efficiency, modernize facilities, and save energy in the near term. Electrification can also help states and utilities meet energy goals, manage energy sources, and reduce air pollution. Industrial heat pumps (IHPs), for example, can reduce energy use associated with generating industrial process heat by up to one-third (Rightor et al. 2022). Deployment of electrified solutions will move faster when utility and state programs adequately support implementation. This brief identifies the most important and promising state and utility program and policy ideas—both those that already exist and those that are in development. We recommend best practices for program administrators to encourage industrial electrification and the acceleration of IHP adoption[2] while considering knowledge gaps, geographical differences, co-benefits, and other issues with the aim of simplifying the steps to cost-effective program design. In the appendix, we note the early opportunity best fits for IHP deployment as well as typical market allies needed to connect with large commercial and industrial end users. Some of our best practice recommendations for both states and utilities focus on:

- Raising market awareness about the status of available technologies.
- Planning for added electrical load.
- Providing financial assistance.
- Coordinating closely between state energy offices, utilities, public utility commissions (PUCs), and other stakeholders.

These recommendations and others are detailed in the discussion section. Our findings are based on interviews we conducted with program administrators from three utilities and three state energy offices (see table 1).

[1] For the purpose of this work, low- to medium-temperature applications of industrial process heat refer to temperatures up to approximately 200°C (400° F).

[2] We focused this paper on industrial heat pumps (IHPs) rather than other electric technologies because IHPs are broadly representative of the commercially available electrification technologies for low-medium temperatures, able to deliver high efficiencies, and a host of co-benefits.

Our interviews uncovered five motivations for program administrators engaged in industrial electrification:

- Meet mandates
- Meet state/utility carbon emissions goals
- Satisfy customer demand
- Maximize grid flexibility and reliability (on both sides of the meter)
- Ensure cost effectiveness of programs for both end users and program administrators

Table 1. Summary of programs [ctrl+click on program to navigate to it directly]

Programs	Type	Distinguishing factors – context for selection
California Energy Commission (CEC) Industrial Decarbonization and Improvement of Grid Design (INDIGO) Program	State	• High spark gap (electricity to gas price ratio) ~3.8–5 • Technology readiness level requirement (TRL)[3] 8 or higher • Most ambitious state climate goal: net zero by 2045
Colorado Energy Office (CEO) Clean Air Program, Colorado Industrial Tax Credit Offering	State	• One of four U.S. states with a Clean Heat Standard • Wider eligibility (beyond manufacturing facilities) • Legislation in place for emissions-intensive industries
New York State Energy and Research Development Authority (NYSERDA) Heat Recovery Program	State	• Low spark gap ~2 • Statewide Clean Energy Fund for meeting climate goals • Market transformation focus: TRL 6 or higher
Con Edison Commercial and Industrial (C&I) Incentives	Utility	• Compact service territory covering NYC, Westchester (county just to north) • Program complements NYSERDA funding • Smaller industrial sector so mainly commercial programs
Salt River Project (SRP) in Arizona; Electrification Incentives	Utility	• Nonregulated utility covers central Arizona, with plans for more hydropower generation • Electrification is a core utility goal (300 MW by 2035) • Operates in state where fuel switching is discouraged
Tennessee Valley Authority (TVA) EnergyRight	Utility	• Large territory covering areas in seven states • Nonregulated utility covering all of Tennessee and parts of six other states • Views electrification as an energy efficiency measure • Works with local power companies on projects

[3] Technology readiness levels (TRLs) are a system used to measure the maturity of a technology from observing basic principles in research (1) to full deployment (11—or 9/10 in some cases depending on scale used).

Many major industrial firms are committed to electrification, with growing momentum in key industrial sectors with low-medium temperature process heat needs including food and beverage manufacturing, lumber, chemicals, and refining. Electric supply and demand are now rapidly growing. Four global manufacturers of IHPs and other heat pump components have committed to scale up U.S. production, while 15 others have begun to import product and to investigate potential avenues to manufacture IHPs in the United States (IHP Alliance 2024). On the demand side, potential end users are becoming increasingly interested in IHPs, and there are more than 27 IHP projects currently in development around the country (Hoffmeister, Omotesho, and Chen 2025).

As the market continues to develop, states and utilities are exploring ways to meet efficiency and electrification goals while also better serving their manufacturing sectors. Effective program design can help states, utilities, and industrial players reach energy and emissions goals.

Lessons learned from exemplary state and utility programs

We chose the organizations and agencies to interview based on our knowledge of existing programs that have supported industrial electrification. We considered the market conditions of the interviewees (in terms of energy prices and regulations) as well as other influencing factors (such as clean heat standards and other guiding legislation). Our criteria for identifying “best practice” programs were the explicit inclusion of industry within the purview of their program design. Additionally, we looked for programs with significant enough funding awards to move the needle on electrification project feasibility, close cooperation between multiple stakeholder groups, and consideration of renewable or storage assets.

The lessons learned from each of these interviews are summarized below in one-page case studies and should be used to inform effective program design in other states and service territories. Note that we did not repeat some lessons learned that came up in multiple interviews but emphasize these repeated learnings in the discussion section.

California Energy Commission's (CEC) Industrial Decarbonization and Improvement of Grid Operations (INDIGO) Program

Program description

INDIGO. Status: Funds fully spent with possibility of renewal at the time of writing. Provided $40 million in cost share for existing industrial facilities implementing decarbonization, energy-saving, and/or grid enhancement projects, including electric technologies. The program awarded funds to several IHP deployments (Hoffmeister, Omotesho, and Chen 2025).

Criteria evaluated for eligibility[4]

(see their Project Narrative Form for more information):

- Experienced end users, strong project team
- Potential for onsite generation and/or renewable assets
- Energy audits
- High-efficiency integration, use of both heating and cooling, onsite storage
- Priority to projects close to disadvantaged communities

State and program context

California has ambitious emissions targets: 40% below 1990 levels by 2030 and carbon neutrality by 2045. California's industrial sector is the second-largest emitter within the state, and accounts for more than 30% of gas use. The state has one of the country's highest spark gaps (3.8-5); funding and incentives are critical to encourage industrial electrification.

Assembly Bill 209 established INDIGO in 2022, with the possibility of expansion if Assembly Bill 1280 is passed. Building on the success of California's Food Production Investment Program (FPIP), INDIGO extends its support beyond food and beverage to encompass a broader range of manufacturing sectors.

Interactions with utilities

INDIGO has limited collaboration with utilities; its primary focus is on funding targeted capital investments, while utility regulation is managed by the California Public Utilities Commission (CPUC).

Interactions with stakeholders

CEC collaborates with a broad network of stakeholders—industrial facilities, technology developers, labs, universities, other state energy offices, and international leaders—to share knowledge, promote best practices, and accelerate technology deployment.

Lessons learned

- Minimizing downtime is crucial, particularly for 24/7 operations, as unexpected disruptions can impact profitability.
- Electrification in industrial projects is often hindered by high upfront costs, spark gap, and infrastructure limitations, such as insufficient transformer capacity for added loads.
- High electricity costs can deter fuel switching due to increased usage and demand charges. Onsite energy generation, renewables, and storage can alleviate costs, reduce demand charges, and support infrastructure needs with proper planning for increased loads (awarded projects include the use of biogas from anaerobic digesters, solar thermal energy, a solar photovoltaic array with battery energy storage) (CEC 2024).
- Electrification in the food and beverage sector can face additional challenges due to food safety regulations, such as required certified equipment models that meet aseptic heat delivery standards.
- Key opportunities that indirectly support electrification and directly advance decarbonization include recovering waste heat and producing biogas from biological waste.
- Industrial facilities are often risk averse due to high capital costs, so driving broader adoption requires well-designed demonstration projects with robust measurement, verification, and proven economic benefits.

[4] Key considerations include, but are not limited to, this list.

Colorado Energy Office's (CEO) Clean Air Program Grants and Tax Credits

Program description

Colorado's **Clean Air Program (CAP)** grant. Status: now complete. Has been successful in funding four industrial electrification projects, via a two-pronged approach:

- A technical assistance offering that includes an in-depth onsite energy and emissions audit through a contractor. These assessments are performed at no- to low-cost to applying manufacturers.
- Project implementation, where funds are dispersed through a typical grant process.

The $168 million refundable **Colorado Industrial Tax Credit Offering** (CITCO—ongoing) operates as a refundable incentive, offering companies the ability to write off tax liabilities (as opposed to direct funding).

Criteria evaluated for eligibility

(see their scoring document for more information):

- Need for funding—projects that would not otherwise proceed without funding
- Other resources leveraged—stacking funds and other engineering or contracting resources
- Annual emissions avoided—projects that include hard-to-abate industrial processes
- Co-benefits—projects that benefit impacted communities, for example, in nonattainment zones
- Project readiness—intended technology readiness levels 6–8
- Willingness to share data—case studies are a key program outcome

State and program context

Both programs were created to help move the state toward its goals of carbon neutrality by 2050, and a baseline goal for the industrial sector of 20% (compared to a 2015 baseline) GHG emissions reductions by 2030.

Colorado's Air Quality Control Commission adopts rules to reach the industrial sector emissions reduction goal and has established Greenhouse Gas Emissions and Energy Management for Manufacturing (GEMM) 1 and 2 designations for the top industrial emitters in the state. In addition to regulations, Colorado's Senate Bill 22-193 provided $25 million for CAP. Ongoing incentives include technical assistance offerings through remaining CAP funds along with CITCO and other resources. Colorado also established a clean heat standard in 2021 (Senate Bill 21-264) that requires all gas utilities to reduce their GHG emissions (by 4% by 2025 and 22% by 2030, compared to 2015 levels) and file Clean Heat Plans to show they are meeting targets.

Interactions with utilities

CEO interacts with utilities to let account managers know that state funds can be stacked with rebates to further reduce capital burdens on end users.

Interactions with stakeholders

CEO has made all their program materials public so that other states and program administrators can replicate.

Lessons learned

- Broader state and sector-based goals have helped organize funding and directed/informed the market.
- A focus on processes that would not be possible to decarbonize without funding support, like many IHP projects, ensures the highest return on investment.
- Stacking funds is critical for project affordability and requires interaction with utilities and other resources like the Department of Energy's (DOE) Industrial Training and Assessment Center (ITAC) program.
- Making energy-as-a-service companies eligible for funds under the tax credit provides some financial flexibility and broadens the applicant pool.

New York State Energy Research and Development Authority's (NYSERDA) Heat Recovery Program

Program description

The **Heat Recovery Program**. Status: ongoing, see website for funding details. Intended to reach large industrial users of process heat and administered through four categories:

- Categories 1 and 2: up to $120,000 for feasibility studies (including pinch analysis*) and project design.[5]
- Category 3: demonstration funding (up to $2 million) for heat recovery measures (i.e., IHPs and thermal storage)
- Category 4: $100,000 for heat recovery equipment for solutions providers to expand their business in the state

Criteria evaluated for eligibility

- Energy savings and emissions reductions—to enable projects that move end users to a low-carbon future
- Technology readiness levels (TRLs) of 6 or above required for technologies in applications to ensure feasibility
- Persistent long-term benefits—energy, emissions, and cost savings, lower pollution, and other benefits
- Future planning—electrification measures as step changes for facilities

State and program context

The New York Climate Leadership and Community Protection Act (Climate Act 2019) aims to reduce economy-wide GHG emissions 40% below 1990 levels by 2030 and net zero by 2050. The buildings and industrial sectors account for 31% and 9% of total statewide emissions, respectively (New York State Department of Environmental Conservation 2024), making them critical targets for achieving the Climate Act's goals.

The Heat Recovery Program is intended to help move large commercial and industrial (C&I) end users toward Climate Act goals. The program, along with NYSERDA's C&I Carbon Challenge and Empire Building Challenge, are funded by the Clean Energy Fund, which is based on a 10-year budget cycle, administered by the New York PSC, and funded by a system benefit charge paid by utility customers. NYSERDA offers additional funding and resources for industrials through FlexTech and Onsite Energy Manager to help mitigate barriers to high capital projects.

Interactions with utilities

NYSERDA formally collaborates with utilities in New York State on potential electrification projects. Several utilities offer incentives and rebates for electric technologies that may be stacked with NYSERDA funding, while others have complementary programs (not stackable).

Interactions with stakeholders

NYSERDA met with the Renewable Thermal Collaborative (RTC) on industrial project uptake. NYSERDA held roundtables to share information about available technologies. They also published a playbook for retrofits using best practices learned from the Empire Building Challenge (NYSERDA et al. 2025).

Lessons learned

- Prioritizing projects that maximize efficiency potential, reduce energy consumption, recover waste heat, and partially electrify industrial processes can all support future project development towards complete electrification.
- Quick-win opportunities include waste heat from ventilation, condensing towers, cooling towers, and wastewater.
- End users with an internal cost of carbon, or those with emissions reduction targets, had more favorable business cases.
- Many large industrials already have significant plans for growing power demand.

[5] High-level feasibility studies are essential for determining the efficacy of IHPs and other electric technologies in various industrial applications. This cost-share program is an example of how states can help offset the costs of such studies and help their manufacturers access savings opportunities.

Con Edison in New York—Clean Heat and Industrial Program Incentives

Program description

Con Edison's C&I **Clean Heat Program** supports electrification of space and water heating. The incentive varies in dollars per million British thermal unit (MMBtu) and cannot exceed 50% of the project cost for eligible measure(s) or 100% of each C&I measure cost. Total incentives are capped at $1 million for all projects, per account per year.

Con Edison also offers Custom Electric Measures under their **C&I Energy Efficiency Program** at $0.35/kWh as a performance-based incentive for efficiency savings.

There are also limited time offers and bonus incentives.

Criteria evaluated for eligibility

- Engineering—validation, pre- and post-inspection of installations
- Energy modeling—assessments (with measurement and verification as needed) of energy savings

Program context

Con Edison serves the most utility customers in the state of New York, covering New York City (Bronx, Brooklyn, Manhattan, Queens, Staten Island) and Westchester County. Although Con Edison covers mainly urban areas, their territory includes some industrials like cement/aggregates, sugar, and food service distribution.

In support of larger state climate goals, Con Edison's Clean Energy Commitment includes the following:

- Incentives to all customers—residential, commercial, and industrial—to help reach climate goals.
- Research and development (R&D) support for clean energy technologies, including heating alternatives.
- Goal to reduce Con Edison's scope 1 emissions to net zero by 2050, including exploring the potential to deploy decarbonization technologies like industrial heat pumps (IHPs) at their own facilities.
- Prioritization of equitable distribution of benefits in program design and implementation.

Interactions with states agencies and other stakeholders

All Con Edison programs are authorized via the New York Public Service Commission (PSC), whose oversight is critical to effective program design. There are explicit rules against stacking funding—Con Edison's incentives cannot be appropriated for the same programmatic goal as another funding source. As such, Con Edison works with NYSERDA to provide complementary offerings, for example, NYSERDA's funding for feasibility studies can be paired with incentives to defray equipment costs.

Con Edison forms long-term partnerships with large energy users so that projects and service adequacy can be planned for ahead of time through higher levels of internal and external coordination with the customer.

Lessons learned

- Phased or partial electrification strategies are often preferred because electrification projects become very difficult if they require replacement of all fossil fuel equipment, and decommissioning boilers can increase complexity significantly.
- Helping end users navigate the service upgrade process for increased load is often as valuable as incentives.
- It is important to provide case studies and lend credibility to deployed technologies.
- Customers with internal emissions reduction targets have a stronger motivation for projects.
- The potential to integrate other technologies alongside heat pumps to manage peak demand, such as advanced controls, waste heat recovery, and thermal storage, should be evaluated. They can help end users manage peak demand.

Salt River Project (SRP) in Arizona—Electric Technologies Program

Program description

SRP's **Electric Technologies Program** helps customers implement emissions reduction and/or electrification projects, providing a $0.10/kWh rebate that maxes out at $100,000 per customer. SRP also offers no-cost third-party energy assessments as a noncash incentive.

Criteria evaluated for eligibility

- Energy savings—kWh saved through project design

Baseline measurements for comparisons—savings are evaluated against a year of anticipated energy use

Program context

The goal of SRP's program is to help end users reduce carbon emissions. SRP has 2035 sustainability goals including to achieve 320,000 MWh of total annual energy consumption through an expanded Electric Technology program (SRP 2025). The program does not have a technology readiness level (TRL) requirement, allowing customers the freedom to explore emerging technologies. To date, this program has enabled the installation of electric boilers, electric arc furnaces, and a number of other technologies, including IHPs. SRP's territory covers different industries including mining, defense, and food service.

Arizona is one of 11 states with regulations against fuel switching (Kresowik et al. 2025). However, because SRP is technology agnostic, they encourage customers to "explore solutions that meet their needs and sustainability goals," which may be electric technologies or other alternatives (J. deGraft-Johnson, senior product manager, SRP, pers. comm., March 24, 2025). SRP provides data and analyses so that customers can make informed decisions to choose projects that will help overall production while reducing energy use.

Interactions with states or federal agencies and other stakeholders

SRP is nonregulated and operates based on its own standards and program design. However, there is close collaboration with the Arizona Corporation Commission. Stacking SRP funds with federal opportunities is feasible and important for mitigating cost barriers to the greatest possible extent. SRP collaborates closely with the Electrified Processes for Industrial eXCellence (EPIXC) Institute at Arizona State University on research initiatives and customer identification for electrification projects.

Lessons learned

- C&I customers are entrenched in incumbent processes and technologies. Proving the technology works is essential, along with careful identification of best-fit markets and applications.
- Trade allies like contractors are an excellent conduit for outreach to potential end users. They also work with strategic energy managers (who help businesses deploy energy efficiency management programs) to do outreach.
- Moving from custom to prescriptive incentives is a long-term process but an important part of scaling a program. That includes careful evaluation, measurement, and verification (EM&V) of energy savings, inclusion into the technical resource manual (TRM), and enough projects/data to prove deemed savings.

Tennessee Valley Authority (TVA)—EnergyRight Custom Incentives

Program description

Through its **EnergyRight Program**, TVA provides custom incentives of up to $0.15 per kilowatt-hour (kWh) of energy savings achieved during the first year after installation of qualifying electric technologies. Funding minimum is $1,500 and is capped at $3 million per customer per project, with 30% applicant cost share. Applicants front the cost of the project and then are reimbursed in a model similar to a technology rebate.

Criteria evaluated for eligibility

- Energy savings—detailed kWh saved compared to an electric boiler baseline through project design and may require additional M&V

Program context

Although TVA was established through the New Deal in the 1930s, it is now funded fully through power sales. TVA serves more than 50 large industrial customers directly (“Direct-Serve”), while others are served through their local power companies (LPCs). TVA, with the University of Tennessee, conducted the Valley Pathways Study to uncover ways for the valley to meet a goal of net-zero emissions by 2050. Energy efficiency and electrification are key pathways, and TVA is working toward managing unprecedented load growth through programs like the EnergyRight custom incentives. With TVA territory covering all of Tennessee and parts of six other states, their custom framework allows for projects to work feasibly within challenges that come with different policy landscapes.

Interactions with member utilities, states, or federal agencies

TVA interacts with its LPCs to ensure that additional loads from electrification projects are tenable. Typically for large projects there will be a load study supported by engineering teams. The LPCs partner with TVA to offer energy efficiency and demand response programs. Both LPC customers and Direct-Serve industrial facilities are eligible for incentives and can use a preferred partner through TVA’s EnergyRight program. The opportunity for end users to stack funding with any member utility programs, federal programs, or state programs is dependent on the ruleset of stacking funds. TVA is not regulated by the public service commission.

Lessons learned

- Industrial heat pumps are considered an energy efficiency measure, and the incentive is intended for end users who have already decided on electrification: End users can electrify with less costs and electricity because TVA encourages adoption of the most efficient technology, which is typically a heat pump. This incentive can be, and has been, the difference in customers choosing IHP projects over an electric boiler, helping them overcome the initial barrier of high capital and installation costs for implementation.
- TVA continues to work on discovering and bridging technical and maintenance knowledge gaps to help build end-user confidence in electric alternatives. Incumbent technologies are reliable and easy to repair—these characteristics need to be proven for electric technologies.
- Flexible financing options, in which preferred vendors and suppliers can join applications and help end users afford the initial costs of projects, ensure that small- and medium-sized manufacturers are not left out of electrification potential.

Discussion

Our interviews revealed commonalities and differences between state and utility program design. For example, a critical commonality is that they all identify electrification as an accessible, existing measure to save energy, and are working with energy consumers to identify pathways within electrification that can also maximize efficiency. Key differences include award processes, evaluation criteria, and flexibility, among others (see table 2). The rest of the discussion section details shared factors.

Table 2. Differences between state and utility programs

	State electrification programs	Utility electrification programs
Project award process	Competitively awarded	Typically awarded based on calculated energy savings
Evaluation criteria	Considers additional priorities such as onsite generation, full-site electrification, and emissions reductions	Primarily focused on cost effectiveness and energy savings (e.g., kWh equivalent saved)
Program drivers	Shaped by state policy goals, technology readiness levels (TRLs), and climate targets	Driven by regulatory cost-effectiveness tests and ratepayer impact considerations
Flexibility	Can fund emerging technologies and pilot projects	Often constrained by fuel-switching rules or existing regulatory frameworks
Funding scope	May support integrated site-wide decarbonization strategies	Focused on specific equipment or process upgrades that yield quantifiable savings
Stakeholder influence	More likely to incorporate input from diverse public stakeholders and planning bodies into design	Primarily governed by utility filings and regulatory commission approvals

State policies, technology readiness requirements, and cooperation between stakeholders are three shared factors that can drive differences in program design and implementation, as discussed below.

State Policy Environment

The state policy environment is a significant determining factor in program design (for both state programs and utility programs). We found that the policy environment of the states and the utilities we interviewed was a significant determining factor for their program design. States with ambitious climate goals are well positioned to introduce incentives (and regulations) that help industry work toward electrification. With the exception of Arizona, all the states we interviewed encourage fuel switching. Those states also all had existing energy efficiency programs such as strategic energy management (SEM)[6] and workforce training and are therefore well positioned to offer broader support for industrial projects. Additionally, state climate goals are often expressed in utility regulations, so public utility or service commissions (PUC/PSCs) are a good place to engage on electrification-oriented program design.

Technology Readiness

Technology readiness is a key consideration in program design for states. State energy offices are principally charged with encouraging market transformation of key technologies, while utilities are responsible for encouraging implementation and energy savings, agnostic of specific technologies. It is up to administrators in both settings to determine the intended result(s) of their particular program, which can be different based on energy prices and other regional factors.

For example, while both Colorado and New York's programs had TRL requirements of 6 or higher for applications, California's INDIGO program required later-stage technologies at 8 or higher. The INDIGO requirement of a higher, commercially available level may be due to California's other programs that include focuses on lower TRL opportunities. Meanwhile, none of the utilities we interviewed had explicit TRL requirements, focusing instead on cost effectiveness and energy savings.

Coordination

There are significant opportunities to incentivize many more electrification projects through cooperation between states and utilities. Broader state and sector-based goals are important in organizing funding and informing the market. Both states and utilities prioritize projects that support environmental justice and serve disadvantaged communities. Designing programs that allow for stacking complementary funds can help projects become immediately viable. Effective program design should account for the interests of industry, PUCs/PSCs, air quality advocates, and others. By coordinating across the complex IHP supply chain, administrators and implementers can ensure that their offerings facilitate projects from concept to execution as smoothly as possible.

Below, the lessons learned from the interviews above are matched to the specific opportunities they create. We conclude with general recommendations for program administrators.

[6] A holistic and long-term approach to energy efficiency that emphasizes energy management across organizational principles and practices.

How State and Utility Programs Can Create IHP Opportunity

IHP adoption has made major strides over the past two years. There is much greater awareness of IHPs, supply has coalesced, and lead times have dropped from approximately 24 months to 12−18 months. State and utility program administrators can use the following strategies that we identified during our interviews to further accelerate industrial electrification programs.[7] These central recommendations (bolded) are not universal and depend on industrial sector, facility, and regional context.

Market awareness and technology performance

Raise market awareness about the state of the technology: Many end users and even electrification program administrators may be unaware of the market availability and status of technologies like IHPs.

Even program administrators who are aware of electric technologies may be uncertain about their performance. Many utilities offer custom commercial and industrial (C&I) incentives for electrification projects, but IHP-specific, or even process-heat-specific, programs have not yet been established due to lack of performance data.

Unawareness and uncertainty about industrial process heat technologies can lead to prioritization of other sectors over the industrial sector; many current programs focus on energy efficiency of residential buildings or build-out of electric vehicle infrastructure due to proven, available solutions to mitigate often higher contribution of emissions from these sectors over the industrial sector, especially with limited grid assets (see next section). Additionally, many states and utilities combine commercial buildings and industrial facilities into the same program as they are both large energy users. Thus, available budgets from states and utilities may not flow to industrial projects.

Based on our interviews, we recommend state and utility program managers consider the following strategies:

- Share information between state agencies to ensure alignment on complementary program design.
- Continue and expand custom industrial offerings to provide flexible funding for industrial electrification projects.
  - Multiple funding rounds with as long a window for applications as possible ensure that industrials have time to consider budgets and write strong applications.
- Leverage learnings from residential and commercial heat pump programs to help electric technologies become a prescriptive measure and standard offering in the long term.
- Use business development teams who work with specific subcategories of end users to ensure that project opportunities are extended to all potential applicants (based on learnings from ConEd's commercial program where a long-term partnership has been formed with hospitals within their service territory as a venue to plan for future projects).
- Publish case studies on successful projects from programs.

[7] For broader industrial electrification policy considerations, please see Esram, Johnson, and Elliott (2024).

Another important issue to consider is **evaluation, measurement, and verification (EM&V) of savings**. It is often difficult to determine the boundaries of the measurement for proven performance and savings. Key questions to ask when considering EM&V: Where is input energy measured, and where is output energy measured? What happens if the customer leaves the gas boiler in place for backup or for peak demand reduction? Pathways to accommodate EM&V were outside the scope of this brief.

Planning for added electrical load

Electrification often requires significant load increases, which in turn typically necessitates both front of and behind the meter service upgrades, including transformers, switchgears, and even substation-level infrastructure buildout (Nadel 2023; RTC 2024). A single IHP can add anywhere from half a megawatt of electrical load to over 15 MW, depending on project size and application. There are pathways to ensure adequate electricity load at electrifying sites and to ensure that new loads do not obstruct or even prevent projects from advancing.

Recommendations based on our interviews:

- Prioritize the most efficient electric technologies, like IHPs, before electric boilers; prioritize projects with the potential to incorporate onsite renewable generation and/or thermal storage.
- Encourage close collaboration between state policymakers, regulators, and utility program designers to
    - Reward industrial users who provide flexible loads.
    - Coordinate on resource planning and energy prices.
- Defray costs and/or rebates for electric infrastructure upgrades behind the meter.
- Offer dynamic pricing options reinforced with the regulatory framework to incentivize and support utility rate design to shift consumption off peak (opportunity increased by storage and hybrid systems). This can also help project economics, detailed in the next section. Some utilities offer programs that signal sites to turn down large loads during grid emergencies. A large IHP with gas boiler backup could respond well to such signals.
    - Provide publicly available rate case dockets for beneficial electrification—see the California open docket on demand flexibility ratemaking.

Industrial electrification project economics

States and utilities can design programs that work together to improve the economics of industrial electrification. Because electric technologies are only now gaining momentum in the market, their capital costs are significantly higher than their fossil fuel counterparts. For example, an industrial heat pump may have a price tag 4−10 times more than a natural gas boiler. Related soft costs such as integration and engineering expenses add to the cost of new equipment installation. Electric boilers are similar in price to natural gas boilers; IHPs are ~3−8 times more expensive but overcome this disparity due to efficiency gains in many applications.

Well-designed programs can also reduce the impact of the spark gap (the price ratio of natural gas to electricity). Spark gaps vary by state and can change significantly due to dynamic energy prices, from ~1.6−2 in Washington, to ~3.3−9 in Texas. For a program example, California has a higher spark gap, yet ambitious state climate goals and appropriations of funds have led to the awarding of multiple IHP projects over the past two years.

Recommendations based on our interviews:

- Provide incentives, rebates, or no-cost energy assessments and feasibility studies to help offset engineering study costs and leverage existing programs and institutions for technology agnostic energy assessments, feasibility studies, basis of design diagrams, and so on.
- Allow for stacking of federal funds, including DOE’s Industrial Training and Assessment Center (ITAC) Implementation Grants (if available).
- Incentivize suppliers to bring production to the program administrator’s territory to help meet overall domestic market demand.
- Establish more flexible requirements such as
    - Expanded funding timelines.
    - More flexible project timeline requirements (to accommodate corporate budgeting discussions and timelines).
- Utilize user-friendly applications with fewer administrative burdens, less stringent company/facility size eligibility requirements, and expanded eligibility to energy-as-a-service for financial flexibility.
- Expand early and frequent public promotion of available programs to industrial facilities.
- Design programs to offer incentives and funding before project completion, helping to offset upfront costs for end users, for example, milestone-based incentive payments.

Fuel switching is another factor to consider in program design, and its importance cannot be understated. Fuel switching refers to the replacement of a heating or cooling technology by an alternative that uses a different energy source. Eleven states limit, discourage, or directly prohibit programs in support of fuel switching.* However, there are **strategies employed by utilities and other stakeholders to promote investments in higher-efficiency electrification options that do not violate fuel-switching policies:**

Recommendations based on our interviews:

- Encourage electrification as an energy efficiency, or broad energy savings measure as IHPs are often four or more times more efficient than alternatives. Using utility funds to motivate fuel changes is restricted; however, use of funds to acquire energy efficiency or energy conservation as a resource is often permitted.
- The selection of baselines for comparing savings is critical. Electric resistance boilers will typically serve as the default baseline as the least-cost, least-efficient option for industrials that have decided to electrify.
- Design flexible programs for IHPs/electric technologies as additional or elective retrofit measures into existing natural gas systems for reliability or to improve efficiency, and for equipment replacements (i.e., new construction, end of useful life), as both scenarios may be encountered.

Additional recommendations:

- Fund electrification programs through the Regional Greenhouse Gas Initiative (RGGI) in Connecticut, Delaware, Maine, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Rhode Island, and Vermont (Berg 2022).
- Work with air quality districts on stretch rules for zero-emissions electric technology, establishing them as best available control technologies, and incentivizing their deployment, especially for nonattainment zones.
- Claim savings as co-benefits, prorate savings, or include them only in cost-effectiveness modeling.
- Use dual-fuel or total energy impact cost tests (e.g., Societal Cost Test (SCT), or Modified Total Resource Cost (TRC) Test**) that evaluate total site energy use (not just one fuel) and include GHG reductions, other co-benefits, and added grid flexibility.
- Raise awareness through coordination with regional advisory bodies, technical committees, and other groups who can provide critical, unbiased supportive evidence for the importance and efficacy of electric technologies.

*The 11 states are: Arkansas, Arizona, Kansas, Louisiana, Oklahoma, Pennsylvania, South Carolina, Texas, Virginia, Washington, and West Virginia (see Kresowik et al. (2025)). In these states, industrial electrification projects must use an electric baseline rather than a natural gas baseline to calculate savings.

**These tests and others like them quantify program benefits and evaluate them using various metrics. A modified TRC is a cost-effectiveness assessment that includes energy efficiency, avoided emissions, and other co-benefits. An SCT includes impacts to society at large.

Conclusion: Collaboration between state energy offices and utilities is critical to effective program design

Together, states and utilities can collaborate closely on program rollout. They can jointly reach out to individual manufacturers as well as industry associations to advertise their programming. They can work together to ensure that adequate clean electricity load is available in a timely manner for end users that are planning to electrify, and plan for greater load growth in areas with higher industrial density. They can ensure that funding windows are complementary, and that they coincide with industrial budget decision-making timelines. Many utilities are mandated by PUC/PSC to deliver beneficial programs for low-to-moderate income households, and while these come in the form of direct residential programs, industrial facilities near underserved communities should try to mitigate project impacts.

Close coordination between states, PUC/PSCs, and utilities is needed to qualify savings and reach all customer sectors. It is critical that program administrators look to the lessons learned from the programs that already exist, and the recommendations that we have outlined above, to ensure that as many industrials as possible can access the emerging competitiveness, energy savings, and jobs created by new electric technologies.

Below are some additional general recommendations from ACEEE’s work on IHPs and beneficial electrification. These are proven approaches and practices being employed by companies currently navigating electrification project implementation.

Recommendations:

- Stay in touch with groups like the IHP Alliance[8] who are working on transforming the domestic market for IHPs.
- Perform regular market studies to keep track of market trends.
- Promote close collaboration between stakeholders to update integrated resource and system planning regularly to include industrial electrification scenarios and, use learnings from data center growth.
- Quantify the co-benefits of electrification, such as reduced boiler maintenance and improved air quality, to help potential end users more accurately assess additional cost savings (Hoffmeister, Chen, and Eisen 2024).
- Create in-depth regional and sector-specific electrification roadmaps to identify clusters and storage opportunities to help end users identify ways to mitigate costs (see Appendix).
    - Targeted outreach to early opportunity, highest-efficiency applications of IHPs (e.g., water heating for pasteurization, cleaning in place, and drying, preheating, chemical concentration).

[8] The IHP Alliance is a collaboration between ACEEE, the National Electrical Manufacturers Association, and the Renewable Thermal Collaborative dedicated to advancing market transformation for IHPs.

Acknowledgments

This topic brief was made possible through the generous support of our sponsors: Eversource, Avangrid, Los Angeles Department of Water and Power, Commonwealth Edison, the Northwest Energy Efficiency Alliance, and Energy Trust of Oregon. The authors gratefully acknowledge external reviewers, internal reviewers, colleagues, and sponsors who supported this brief. External expert reviewers included Eric Braddock at the Energy Trust of Oregon, Adam Gage at the Northwest Energy Efficiency Alliance, and Daffodil Robles and Maychelle Lee at Los Angeles Department of Water and Power. We also received support and advice from Lauren DeLaFuente and Thomas Yeh at the New York State Energy Research and Development Authority, Rachel Shepherd and Ilia Krupenich at the California Energy Commission, Wil Mannes at the Colorado Energy Office, Steve Martin at the Energy Smart Industrial Program of Cascade Energy, and Todd Amundson of the Bonneville Power Administration. Internal reviewers included Steve Nadel, Richard Hart, Anna Johnson, and Neal Elliott. External review and support do not imply affiliation or endorsement. Lastly, we would like to thank Mariel Wolfson and Ben Somberg for editorial guidance, Kate Doughty for her graphic design support, Jacob Barron for copyediting, Roxanna Usher for proofreading, and Ethan Taylor for his help in launching this topic brief.

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Appendix: near-term opportunities and resources to consider for programming

The best near-term IHP opportunities are particular industrial processes and circumstances wherein the efficiencies of applications can offset the costs of implementation, integration, and the spark gap to the greatest possible extent. Those opportunities typically have:

- Dual loop systems, co-located waste heat recovery opportunities.
- Process heating operations >4,000 hours per year. Heat pumps demonstrate maximum efficiency when operating at their full speed and operative temperatures.
- Opportunities to redesign thermal loads from boiler systems, rightsizing (especially in greenfields).
- Opportunities to create co-benefits through more precise controls, modularity, resource conservation, and reduced insurance and permitting costs.
- Opportunities to leverage other technologies, including thermal energy storage, to permit load shifting and demand flexibility to reduce electricity costs.

Our research indicates that the applications in which most of the opportunities above intertwine are:

- Water heating for pasteurization and drying
- Preheating boiler feedwater
- Preheating sanitation water (especially at food processing, meat processing, dairy)
- Commercial comfort heat

The programs we interviewed identified multiple ways of connecting with industrial and commercial customers who fit the criteria outlined above. One of the most critical was market allies. They sought out and cultivated close working relationships with:

- Industrial associations and trade groups.
- Regional energy efficiency groups and energy efficiency contractors.
- IHP suppliers and IHP supplier groups (such as the National Electrical Manufacturers Association).
- Engineering services (implementers/integrators).
- Contractors with HVAC and high-pressure refrigerant experience.