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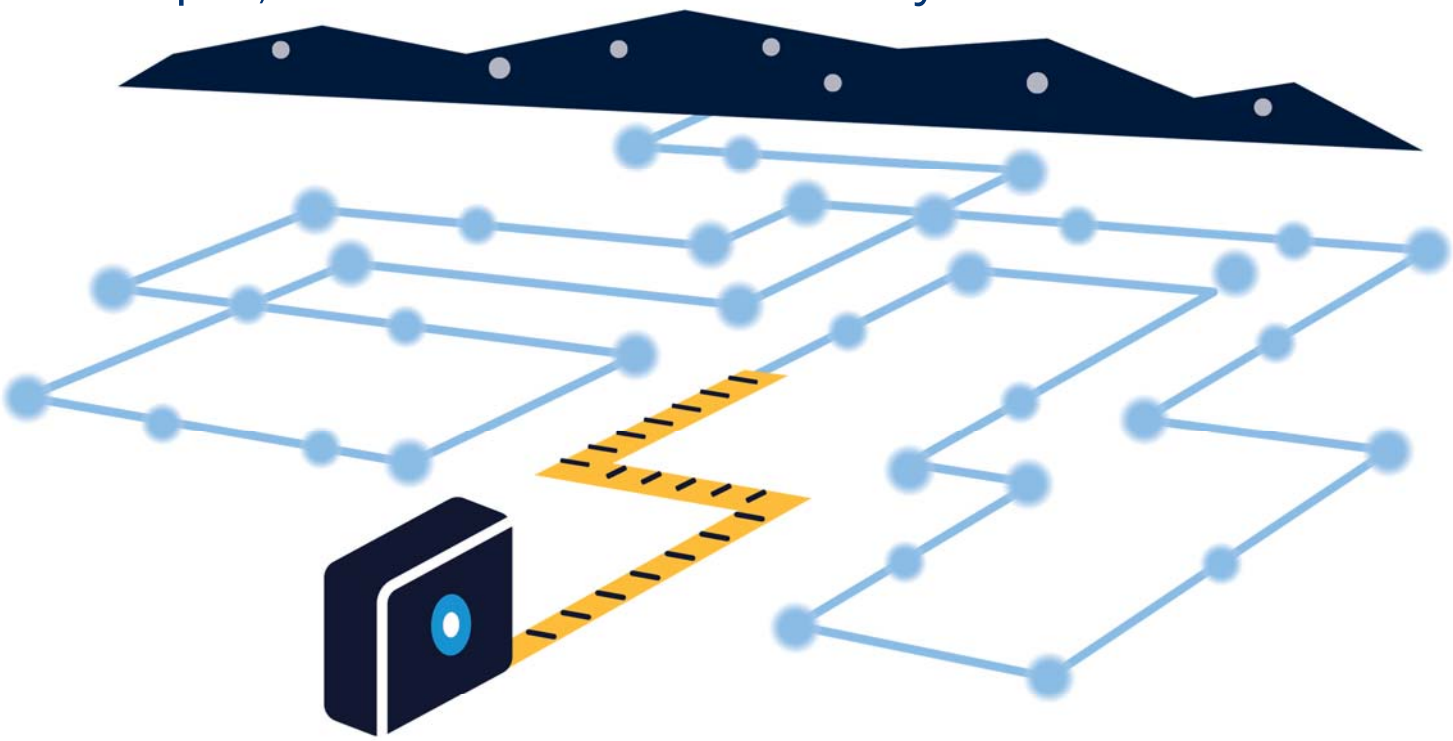
Peninsula Clean Energy and Silicon Valley Clean Energy Joint Reach Code Initiative

Group B, Deliverable 33 Case Study 3



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1. Executive Summary

This case study documents the efforts of two community choice aggregators (CCAs)--Peninsula Clean Energy (PCE) and Silicon Valley Clean Energy (SVCE)--to support the State's goals for achieving statewide carbon neutrality in the building sector by 2045 through a Joint Electrification Reach Code Initiative across their combined service territories. The aim of this study is to identify best practices and lessons learned through review of the initiative background and efforts.

On January 1, 2020, 13 cities in San Mateo and Santa Clara counties enacted electrification reach codes that exceed California's Title 24 statewide building energy efficiency and green building standards by encouraging or requiring the use of all electric appliances in buildings, prohibiting natural gas end uses, and specifying enhanced requirements for electric vehicle charging. In 2020, three more neighboring cities followed suit, bringing the total to 16 out of the 34 local governments spread across the two counties For PCE, these include the cities of Brisbane, Burlingame, Menlo Park, Pacifica, and San Mateo, as well as the County of San Mateo. For SVCE, these include the cities of Campbell, Cupertino, Los Altos Hills, Los Gatos, Milpitas, Monte Sereno, Morgan Hill, Mountain View, Palo Alto, and Saratoga. This *en masse* reach code initiative represents half (16/32) of all cities and counties adopting building electrification reach codes across the State of California.

The initiative, which began in the summer of 2018, focuses on providing five major deliverables: 1) model reach codes for building electrification and electric vehicle charging; 2) grant funding to local governments to consider the codes; 3) one-on-one technical assistance for local governments and developers; 4) tools, time, and expertise to support municipal adoption; and 5) tools, time, and expertise to support code implementation.

The initiative consisted of several phases. Phase 1 involved stakeholder outreach through a series of in person public workshops and smaller meetings to educate and solicit feedback from different audiences. Phase 2 covered technical and cost-effectiveness analyses, as well as drafting the model reach codes (summarized in Table 1 below). Phase 3 focused on stakeholder discussions regarding the proposed reach code language and public education about what the new codes would mean on a practical implementation level. Phase 4 concentrated on providing city staff and elected officials with the support they needed to consider and pass reach codes for their jurisdiction. Phase 5, which continues through 2020, provides ongoing implementation support to help building departments with permitting and enforcement and provides ongoing technical support to help builders and developers with challenges associated with meeting the new codes.

Table 1 Model Code Summary

Code Element	Reach Code Summary
Building Electrification	• Provides 3 tracks for developers: all-electric, mostly electric, or mixed-fuel • All-electric (preferred) is less expensive, delivers more benefit • Mixed-fuel allows natural gas but has higher efficiency requirements • Details vary by building segment
Electric Vehicle Readiness	• Provides "plug and play" access to vehicle charging • Single family: Level 2 (dryer outlet power) and Level 1 (standard 110v outlet) • Multi-unit dwellings: one "EV Ready" space per unit* • Office: 10% Level 2, 10% Level 1, and 30% EV Capable • Other Commercial: 6% Level 2 installed and 5% Level 1 installed

In addition to exploring the design and implementation reach code initiative, this case study also yielded key best practices and lessons learned that can be applied to other building decarbonization efforts, including:

Best Practices

- **Encourage code innovation.** By providing model codes as templates and ample support encouraging cities to pass reach codes at the same time, the team gave their member agencies the tools and the forum they needed to customize the ordinances to meet their own needs. In the process they fostered a more diverse and more aggressive set of codes than they had originally planned.

- **Be flexible and open to new ideas.** The joint initiative team worked for months preparing model reach codes to share with their member agencies, doing their best to accomplish the desired objectives while minimizing the likelihood of legal challenges. Yet, when Menlo Park developed a more innovative approach requiring electrification in new construction without the option to install natural gas appliances, they shifted gears to include and promote the new alternative as an integral part of their proposed model codes.

- **Engage with stakeholders early and often.** A reach code initiative touches a wide range of stakeholder audiences with differing viewpoints, needs, and purviews. Recognizing this, the joint team built a comprehensive approach to outreach and engagement that combined open public forums with more segmented stakeholder meetings designed to discuss topics from a particular perspective, be that of a city employee, a developer, or an advocacy group representative.

- **Use the power of inclusion**. A central part of the team's stakeholder engagement strategy focused on including as many people as possible in the process. They set up repeated opportunities to engage people in dialogue and responded to their concerns in a constructive manner that gradually converted skepticism and resistance into support and advocacy. For example, developers like SummerHill Apartment Communities, began as concerned participants and ended up as actively engaged supporters setting an example for fellow builders.

- **Plan to iterate.** Because stakeholder feedback was so integral to the effort, so too was the plan to make multiple updates rather than strive for perfection the first time. When the joint initiative team met with stakeholders, they took copious notes and worked diligently to address any concerns. For example, in response to multifamily housing developer feedback, they worked with the California Building Standards Commission to rewrite their proposed EV code language to limit developer costs to $4500 per multifamily parking spot and to incorporate load management software for EV charging to prevent the expense and extra square footage required for additional transformers.

- **Use the power of example.** The joint initiative team also strove to promote collaboration, cooperation, and friendly competition by leveraging the power of peer examples. Berkeley and Menlo Park provided motivational examples of fellow cities taking innovative steps to achieve their climate action goals, and the joint team elevated those efforts to encourage other cities to appreciate what was possible and to encourage them to take similar actions. This created a "safety in numbers" scenario whereby each city could point to the others who were also working on reach codes thereby making their efforts look mainstream and reasonable.

Lessons Learned

- **Be bold.** When PCE and SVCE conceived of the joint reach code initiative they could not predict how their member agencies would respond, so they played it safe by developing reach codes that still allowed for natural gas end uses. They were surprised by the overwhelming preference for electric only options, and even more delighted by the large number of municipalities passing electrification reach codes. As a result, they encourage other CCAs to think bigger and to act boldly to set even greater precedents for the future.

- **Comprehensive teams can provide comprehensive services.** When PCE and SVCE began the effort, they started with a gap analysis to identify how they might best provide the resources necessary for their member agencies to pass reach code ordinances. Between the team's own internal resources and the expertise of external partners hired to join them, they addressed the most important needs of technical support, code development, stakeholder engagement, financial funding, and the creation of time-saving tools and templates. In hindsight, the team might have been further augmented by providing building officials and attorneys as well.

- **Plan for both public and private consultation.** While the joint initiative team planned and executed a wide range of public events, they discovered that some stakeholders were hesitant to speak in public forums for fear of disclosing their strategies or project details. Likewise, some issues required extensive discussion that need not involve a large group of people. To address these needs, the team also held an extensive series of one-on-one and small group conversations.

- **Give yourself enough time.** The joint initiative team planned for a sustained effort of 18 months from start to finish. Although the December 31, 2019 deadline to align with statewide building code updates served a useful purpose to motivate action, the timeframe was just minimally long enough to accomplish each of the phases of the effort. Some team members and city representatives indicated that stakeholder engagement and city deliberation could have benefited from further outreach and additional time.

- **Use technology to promote stakeholder collaboration and self-sufficiency.** The joint initiative team relied upon the strong relationships that the CCAs had with their member agencies and the member agencies had with each other. This fostered communication and collaboration through in person discussions, as well as by telephone and email. The team also created an online library of downloadable resources. However, this could have been further enhanced with the creation of Microsoft Teams channels that enabled stakeholders to exchange ideas, help one another, and learn from conversations where they were not originally included.

2. Introduction

Beginning in 2018, two community choice aggregators (CCAs)[1], Peninsula Clean Energy (PCE) and Silicon Valley Clean Energy (SVCE) collaborated on a Joint Electrification Reach Codes Initiative to promote electrification codes within their service territories. In 2019, due largely to the efforts of this joint initiative, 13 municipalities in San Mateo and Santa Clara counties adopted electrification reach codes to take effect on January 1, 2020. These local building code ordinances exceed California's Title 24 statewide building energy efficiency and green building standards by encouraging or requiring the use of all electric appliances in buildings, prohibiting natural gas end uses, and specifying enhanced requirements for electric vehicle charging. Since January 2020, three more jurisdictions in San Mateo and Santa Clara counties have also adopted reach codes, bringing the total to 16, or half of the 32 local governments that have currently passed electrification reach codes across the state of California.

The impetus for this *en masse* reach code adoption stemmed in part from a September 2018 Executive Order[2] issued by then California Governor Jerry Brown, who set out an ambitious goal for statewide carbon neutrality by 2045. That same year Governor Brown also signed into law SB100 that set a world-leading precedent by committing to 100% clean energy in California by 2045 and two other bills, SB 1477 and AB 3232, related to reducing greenhouse gas emissions from buildings. These landmark statewide directives in turn motivated cities and counties to meet their climate action goals and spurred Peninsula Clean Energy and Silicon Valley Clean Energy to provide additional resources to help them do so.

The PCE and SVCE joint reach code initiative provided all 34 of their member agencies (city and county governments) with a comprehensive set of resources to encourage the adoption of electrification reach codes. Those resources included cost-effectiveness analysis, technical analysis, model reach code language, and supporting letters and templates for submission to the California Energy Commission (CEC) and the Building Standards Commission (BSC). They also offered their member agencies the services and expertise of their CCA staff and outside consultants for technical advising. In addition, PCE and SVCE facilitated a large number of stakeholder engagements, public workshops, and informal meetings that were targeted at elected officials, government staff, and members of the public, including developers, builders, and advocates. The initiative also offered grant funding to local governments to financially support city staff members pursuing the activities necessary for their councils to consider adopting reach codes. Lastly, they created a library of checklists and tools for cities to use as they considered, adopted, and implemented reach codes.

2.1 Forming the Joint Initiative Team

The genesis of the reach code initiative arose from decarbonization efforts already underway at PCE. "Carbon reductions are built into our mission," explained Rafael Reyes, Director of Energy for PCE. "We have aggressive goals to help San Mateo County reach comprehensive decarbonization by 2045 to comply with the executive orders by Governor Brown." After PCE was formed in 2016, the CCA initially focused its attention on electric vehicles since transportation represents the single largest source of carbon in San Mateo County, but by the summer of 2018, Reyes and his colleagues were looking to expand their decarbonization efforts.

[1] Community Choice Aggregators (CCAs) are local, not-for-profit public agencies that pool or aggregate local community electric load in order to purchase clean energy and develop local projects and programs on behalf of their residents and businesses. Aggregators set up governing boards composed of local elected officials from constituent jurisdictions who make decisions regarding power supply purchases, electric rates, programs and initiatives. CCAs work in partnership with the region's existing Investor-Owned Utility (IOU), which continues to deliver power and maintain the grid.

[2] EO B-55-18 2018

That summer Reyes met with Aimee Bailey, Director of Decarbonization and Grid Innovation at SVCE to brainstorm ways they might collaborate. Building electrification quickly surfaced as the leading contender for a joint initiative since natural gas emissions from buildings represents the second largest source of carbon emissions in both counties. The two CCAs zeroed in on new construction as the best place to start for two primary reasons. First, building electrification for new construction is less costly than it is for retrofitting existing buildings. Second, and perhaps more importantly, the next round of statewide building code updates was scheduled to occur on January 1, 2020. That gave the team an approximate 18-month window during which they could launch a joint effort to develop and promote electric vehicle and building electrification reach codes that could be incorporated into the next round of municipal building code revisions under consideration by the local governments within their service territories.

The two CCAs agreed to partner and to lead different aspects of the initiative. Since PCE had a head start on electric vehicles, they took point on the EV reach codes, while SVCE took the lead on building electrification. While each CCA intended to work directly with the municipalities in their service territory, they also planned to host joint meetings and to co-develop resources to be shared by all participants. By the fall of 2018, a partnership plan and cost-sharing agreement had been inked, and the joint reach code initiative had been approved by the governing boards of both CCAs. PCE served as the principal administrator for the initiative, handling all contracts, administration, and oversight.

Early on, the joint initiative team brought in an outside consultant and a PG&E representative to talk about statewide reach code efforts and the results of two recent statewide cost-effectiveness studies funded by the IOUs.[3] Those discussions helped the CCAs to better understand what could be done through reach codes and what the adoption process would be like. It also became apparent that the existing statewide efforts would be insufficient to mobilize all the resources necessary for widespread adoption of electrification reach codes. "The services they were providing, particularly the cost effectiveness study, were fundamental components to a reach code effort, but it was clear there were no existing mechanisms for stakeholder engagement. It was also clear that no one was going to be available to help city councils by providing examples, explaining options, and answering questions. So, we saw some of the gaps that we would need to fill," said Bailey's SVCE colleague, John Supp, Manager of Account Services.

After conducting this gap analysis, PCE and SVCE decided to take on the heavy lifting of drafting model codes and reviewing and distilling the statewide cost-effectiveness study to summarize things into easily digestible handouts for use at stakeholder meetings. To help with the code development and technical considerations, PCE and SVCE prepared an RFP and hired TRC and DNV-GL. TRC brought considerable experience with code development and cost-effectiveness analysis since they led the Nonresidential New Construction Reach Code Cost Effectiveness Study for the state of California.[4] They also had previous experience consulting with local governments about reach codes. DNV-GL brought engineering expertise that would be essential to reviewing the types of technologies under consideration, addressing technical challenges, and providing technical advising and support. According to TRC's Senior Project Manager, Farhad Farahmand, they were excited about joining the groundbreaking initiative team. "What they were asking for had never been attempted. Individual cities had looked at reach codes before, but there had never been a regional effort. That was unique," he said.

With the necessary technical experts on board, the two CCAs turned their attention to addressing stakeholder engagement. They planned to leverage their already strong relationships with their municipal members, as

[3] Frontier Energy and Misti Bruceri & Associates, 2019 Cost-Effective Study: Low-Rise Residential New Construction, California Energy Codes and Standards Statewide Utility Program; TRC and EnergySoft, 2019 Nonresidential New Construction Reach Code Cost Effectiveness Study, California Energy Codes and Standards Statewide Utility Program

[4] TRC and EnergySoft, 2019 Nonresidential New Construction Reach Code Cost Effectiveness Study, California Energy Codes and Standards Statewide Utility Program

well as partnering with other organizations to better engage the diverse range of constituencies that would be affected by the reach codes. Because PCE was lightly staffed, they partnered with the San Mateo County Office of Sustainability (SMC OOS) to lead stakeholder outreach in the County. SMC OOS was particularly well positioned to take on this role since they have a robust track record of interagency collaboration on climate action planning, energy efficiency, and other sustainability efforts. “Another reason PCE wanted to partner with us was because of our work with BayREN. Since 2013 we had been working with BayREN to talk to every building official in the county about code compliance, understanding energy codes and how to implement them,” said Rachael Londer, Senior Sustainability Specialist with SMC OOS.

Meanwhile in Santa Clara County, Supp and colleagues worked closely with SVCE's member agency working group to conduct outreach to elected officials and city staff in their service territory. Like PCE, SVCE also sought another group to help engage other important constituencies. They contracted with Joint Venture Silicon Valley, a nonprofit agency that specializes in private-public partnerships. "They had relationships with the local development community, labor unions, and others. We knew they had existing relationships and that they could establish conversations with these different groups to talk about the potential building code changes," said Supp.

Table 2 below lists the primary and secondary initiative team members and their roles.

Table 2 Initiative Team Member Roles

Primary and Secondary Initiative Team Members	Roles
Peninsula Clean Energy	Regional partner, project administrator, lead electric vehicle code development, member agency outreach
Silicon Valley Clean Energy	Regional partner, lead building electrification code development, resource library and tool creation, member agency outreach
TRC	Lead consultant
DNV-GL	Technical support
San Mateo Office of Sustainability	Stakeholder facilitation and support
Joint Venture Silicon Valley	Stakeholder outreach to public and private community groups
Energy Solutions	Electric vehicle cost-effectiveness analysis

3. Initiative Design and Execution

With the main team members in place and an implementation strategy mapped out, the joint initiative team formally launched their effort in January 2019. The initiative consisted of several phases. Phase 1 involved stakeholder outreach through a series of in person public workshops and smaller meetings to educate and solicit feedback from different audiences. Phase 2 covered the technical and cost-effectiveness analyses, as well as drafting the model reach codes. Phase 3 focused on stakeholder discussions regarding the proposed reach code language and public education about what the new codes would mean on a practical implementation level. Phase 4 concentrated on providing city staff and elected officials with the support they needed to consider and pass reach codes for their jurisdiction. Phase 5, which continues through 2020, provides ongoing implementation support to help building departments with permitting and enforcement and to provide ongoing technical support to help builders and developers with challenges associated with meeting the new codes. Table 3 presents a timeline of key activities and important milestones.

Table 3 Reach Code Initiative Timeline and Major Milestones

Date/Timeline	Primary Activity/Milestone
June to December 2018	Strategic planning and preparation
January 2019	Reach code kickoff event for city staff
February 2019	Statewide building electrification cost-effectiveness studies
March 2019	Building reach code workshops
April 2019	Draft model reach codes and measures available
April & May 2019	City-specific stakeholder engagements
May 2019	Last input into model code measures
June 2019	Model reach code language shared
June to August 2019	Outreach and adoption technical assistance
July 2019	Berkeley bans natural gas
July to October 2019	City councils vote on desired reach codes (depends on city workplan)
September 2019	Menlo Park passes all electric reach code
August to October 2019	Cities submit code packet for CEC approval
December 2019	Start of training for city staff
January 1, 2020	Reach codes to go into effect at the same time as statewide code update
2020	Ongoing training and implementation support for cities and builders
2020-2022	Opportunities to adopt reach code throughout three-year code cycle.

3.1 Stakeholder Engagement and Input

The joint team knew that public involvement would be central to the success of the initiative and they sought to actively engage elected officials and local government staff, such as sustainability managers, building department officials, and community development managers. They also drew up plans to engage a full spectrum of stakeholders including: developers, architects, engineers, contractors, labor union representatives, energy consultants, low income advocates, environmental groups, homeowners, business people, representatives from various regional and state agencies. Their engagement strategy was designed to stimulate interest, generate support, identify barriers, and address concerns. Awareness-building activities included: council meeting announcements, newspaper articles, social media, and email messages to all permit applicants for new construction projects. They also planned to host and attend dozens of public events, webinars, roundtables, and meetings with a wide range of audiences throughout the year. "Over-communication is an asymmetric risk," said Girish Balachandran, Chief Executive Officer of SVCE. "If you over-communicate you will be fine, but under-communicating can quickly stop the process. From the beginning we planned to reach out to as many stakeholders as possible as early and as often as we could to get them involved in the dialogue and engaged in the process."

To kick things off in January 2019, PCE and SVCE hosted a combined meeting with elected officials, city managers, building departments, and others to formally announce the launch the joint initiative and to educate them about their plans over the coming year. This initial meeting led to further joint meetings and webinars to discuss the cost effectiveness studies and the potential pathways for achieving the reach codes. In addition

to these joint meetings, the CCAs also each hosted three stakeholder charrettes[5] in their service territories for a total of six between the two CCAs. The first charrette focused on city employees, including city sustainability staff, building department officials, city managers, and other staff who might be involved in the reach code effort. The second meeting covered similar topics from the perspective of developers and builders. The third meeting was open to advocacy groups and others from the general public. The charrettes were designed to both present information and to gather feedback in order to better understand the interests and concerns of the various stakeholder group. As might be expected, some people were strongly supportive calling for aggressive changes, while others were tentative or resistant.

Aside from the charrettes, PCE and SVCE also held numerous one-off meetings with individual municipalities, labor representatives, affordable housing advocates, and developers to get a sense of how potential reach codes could affect these different constituencies. In all, the joint initiative team engaged with more than 400 people across 15 major public events and scores of meetings with city councils, commissions, working groups, and interested parties. "It wasn't unusual to average three or four engagements per jurisdiction that was considering the codes. We probably had between 80 and 100 meetings over the January to December 2019 timeframe across the two jurisdictions," said Reyes. "There were different audiences and a lot of it was educational, but it was also bidirectional. We learned a lot and we had many dialogues where people raised concerns that needed to be addressed. For example, central heat pumps were a big technical issue and there was quite a bit of discussion on that from an engineering standpoint. Electric vehicle infrastructure also required considerable technical discussion," he added.

Other concerns came from affordable housing and other real estate developers who felt their business models could be compromised, and from single-family homeowners who feared being told they would need to remove existing gas appliances. Many topics needed simple clarification or education, such as explaining utility and equipment costs. "In some cases, people assumed the use of electric resistance for water and space heating, which would be outrageously expensive. However, heat pump technology is extremely efficient, and the costs are much lower than electric resistance heating," said Reyes. "The statewide cost-effective studies reviewed different scenarios and different building types and, while in some circumstances there was a marginal increase in cost, they generally showed costs for all electric construction were lower or a wash."

Other common topics requiring education included 1) explaining that all electric technologies are tried and true (heat pumps were invented in 1857; heat pump water heaters began in the 1950s; and induction cooking was introduced in the 1970s), 2) explaining the difference between higher efficiency and lower costs, 3) explaining that while natural gas is cleaner than coal it is still a fossil fuel that releases emissions when it burns, and 4) explaining that gas fired appliances do not provide more resiliency than all electric appliances during Public Safety Power Shutoff (PSPS) events since they still require electricity to run fans and ignite the gas.

3.2 Technical Analysis

Although the concept of building electrification technically comprises all end uses within a building structure, for the purpose of preparing the draft codes, the joint initiative team focused on four primary end uses: space heating, water heating, cooking, and clothes drying. Heat pumps played a central role in the recommended technology options for both space heating and water heating. Compared to GHG-emitting gas-fired furnaces and water heaters that can reach a maximum of 96% thermal efficiency, heat pumps can operate with coefficiencies of performance often greater than 350% and they can be powered by 100% carbon free electricity. To supplant gas cooktops, the team looked toward induction cooktops, rather than older electric

[5] Charrettes are facilitated meetings with a variety of stakeholders to discuss goals and outcomes, concerns, potential issues, and other considerations.

resistance stove tops, since induction cooking offers a greater degree of efficiency, speed, control, and safety that compare favorably with natural gas. For laundry, gas-fired clothes dryers could be replaced by either electric resistance or heat pump units. Newer heat pump dryers can be 35% to 50% more efficient than older electric resistance technologies.

Although most use cases for these technologies were fairly straightforward, the team also investigated some highly technical design challenges such as central heat pump water heaters and transformer upgrades for large multifamily complexes, as well as other challenging situations including high-capacity heating for laboratories and large commercial buildings. In some of these instances, a viable technical solution was found. In other situations, it became clear that the team would need to draft reasonable exemptions to the proposed model reach codes.

3.3 Cost-Effectiveness

When local governments adopt reach codes that exceed the minimum standards of the State's Energy Code (Title 24, Part 6), they must demonstrate to the CEC that they have provided a cost-effective compliance path that does not represent an unreasonable burden to residential and nonresidential applicants. To support the new reach codes, the joint initiative team knew they could rely on two statewide cost-effectiveness studies for Energy Code reach codes funded by the four investor-owned utilities for the California Statewide Codes and Standards Program; one for residential homes and another for nonresidential buildings.[6] This pair of statewide cost-effectiveness studies compared performance-based approaches for new construction using multiple combinations of all electric and mixed fuel (natural gas and electricity) efficiency measures, solar panels, and electric battery storage. The studies analyzed the cost-effectiveness of these combinations across all 16 California climate zones and across a range of building prototypes including: one-story and two-story single-family homes, two-story multifamily structures, three-story office buildings, single-story retail, and four-story hotels. The two most important findings from the studies were: 1) mixed fuel new construction can achieve cost-effective energy performance through a combination of high efficiency measures, solar, and battery storage; and 2) all electric new construction saves GHG emissions while achieving cost-effective performance at a lower cost than mixed fuel construction due to the avoided costs of natural gas infrastructure. In other words, the studies identified cost-effective combinations of measures that would be suitable for the drafting of building electrification reach codes.

Yet, as helpful as these statewide cost-effectiveness studies were, they only addressed half of the joint initiative team's desired plan for their model codes. They also wanted to exceed statewide Title 24 and CalGreen minimum standards for residential and nonresidential electric vehicle capabilities (see Table 6 on p 16). Local reach codes can require more EV parking spaces and higher standards of EV charging than these minimum requirements, but here too, any local reach codes must be supported by a cost effectiveness study assessing the costs of installing EV charging systems and associated infrastructure on both the customer and utility side of the meter.

In this case, the joint initiative team felt they needed to conduct their own cost analysis. "We felt comfortable relying on the statewide IOU-sponsored cost-effectiveness study for building electrification," said Reyes. "But we felt it would be essential to do our own cost-effectiveness study for electric vehicles since the approach we were taking was so fundamentally different than the State code or other similar local EV codes."

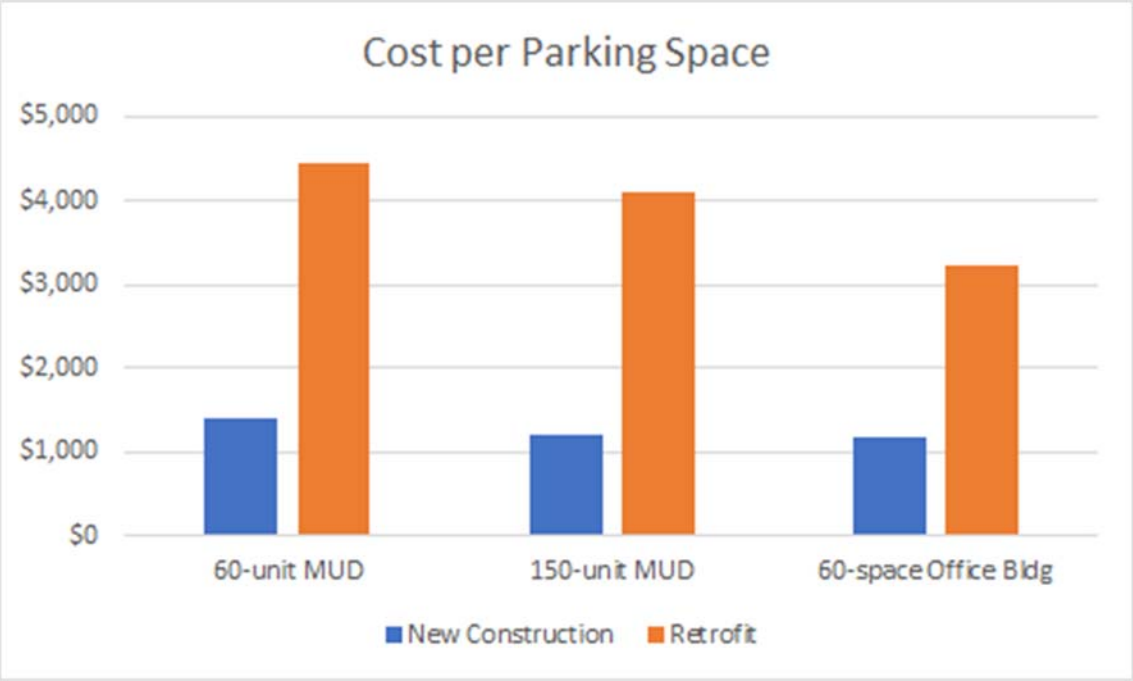
[6] Frontier Energy and Misti Bruceri & Associates, 2019 Cost-Effective Study: Low-Rise Residential New Construction, California Energy Codes and Standards Statewide Utility Program; TRC and EnergySoft, 2019 Nonresidential New Construction Reach Code Cost Effectiveness Study, California Energy Codes and Standards Statewide Utility Program

For instance, CalGreen nonresidential code minimum standard requires "EV capable" parking spaces fitted with conduit and electrical panel capacity for a 40 ampere, 208/240-volt circuit, but it does not require that finished parking spaces come equipped with appropriate wiring and electric vehicle supply equipment (EVSE) to actually provide the EV charging. The joint initiative team wanted its model codes to go beyond "EV capable" and specify "plug and play" charging for single-family, multifamily, office, and other commercial buildings with varying percentages of Level 1 (standard 110 V outlet) and Level 2 (220 V outlet) charging. So, they hired Energy Solutions to conduct an electric vehicle infrastructure cost analysis[7] for the PCE and SVCE service territories.

Analyzing cost-effectiveness for electric vehicle charging can be challenging due to the number of variables that can be involved. In addition to factors involving upfront capital expenditures, ongoing operational costs vary significantly depending on the type of vehicle, the level of charging, the amount of charging required, and when charging occurs. So, the joint initiative team decided to construct a simpler cost argument since new construction is the least expensive time to install charging infrastructure rather than during a future retrofit. With this in mind, Energy Solutions analyzed the costs associated with installing EV infrastructure in new construction and compared them with the analogous costs of retrofitting existing structures. Their model considered the cost of wiring, switch gear, conduit, trenching, and transformers for a commercial office with 60 parking places, a multifamily complex with 60 parking places, and a multifamily complex with 150 parking places. Their model compared customer-side and utility-side of the meter costs during new construction with similar costs for retrofit activities that also included additional costs for demolition and electric infrastructure replacement. The study found that EV infrastructure installation costs for new construction were up to four times less expensive per parking spot compared to retrofit costs (Figure 1). Although the Energy Solutions study was not finalized until September 2019, it helped justify the model EV reach codes and provided a great source for messaging for those advocating for the EV codes. In the interim, the joint initiative team relied on other similar studies, including one for Oakland, CA, as they drafted their model codes.

[7] Energy Solutions 2019. "Electric Vehicle Infrastructure Cost Analysis Report." Peninsula Clean Energy & Silicon Valley Clean Energy. peninsulareachcodes.org/wp-content/uploads/2020/03/PCE_SCVE-EV-Infrastructure-Report-2019.11.05.pdf

Figure 1 Comparison of New Vs. Retrofit EV Infrastructure Costs



3.4 Model Code Development

Once the joint initiative team knew the varying combinations of cost-effective options, they had the remaining information they needed to draft model Title 24 and CalGreen code language for both building electrification and EV charging. They combined it with their preliminary technical analysis and the feedback that they had received from their initial stakeholder engagement and began to draft the model codes and the rationale to support them. Their initial code language drew upon previous reach codes drafted by the City of Palo Alto and Marin County, which had implemented electrification codes during the 2016 code update cycle and, importantly, had not faced any legal challenges.

3.4.1 Building Electrification

The team developed two primary compliance paths (Table 4) for building electrification. Option 1 called for all electric building design in which case the new structure did not need to exceed state energy codes. Option 2 was a mixed fuel option that allowed for both electric and natural gas end uses, with additional requirements for GHG emissions to be offset with higher efficiency standards of 5% to 30% beyond statewide energy codes, as well as solar water heating or battery storage, and the prewiring of circuits and receptacles to reduce retrofit costs for the future replacement of natural gas appliances with electric appliances. The premise behind this two-path, "electric preferred" approach was twofold. First, while the team ideally wanted to promote higher efficiency all electric buildings, their first priority was to disrupt the business-as-usual practice of constructing mixed fuel buildings. So, they prioritized carbon savings rather than simultaneously requiring higher energy savings. By aligning Option 1 with current statewide energy codes they sought to make the compliance path for all electric buildings less expensive and hence more of attractive than the mixed fuel option. Second, they wanted to provide a mixed fuel compliance path that acknowledged builder and customer preferences for natural gas end uses, while promoting higher efficiency requirements that come at somewhat higher cost.

Table 4 Reach Code Comparison

Building Type	2019 CalGreen	Reach Code	
		All-Electric	Mixed-Fuel
Single-Family Two-Family Townhome	Meet Title 24 Energy Requirements using: • Performance or • Prescriptive	Meet Title 24 Energy Requirements using: • Performance or • Prescriptive	Exceed Title 24 Energy Requirements using: • Performance (10 EDR points) or • Prescriptive (additional measures)
	Require solar generation	Require solar generation	Require solar generation and: • Solar water heating or • 1.5 kWh battery
	Required adjacent outlet for future electric replacement: • Gas water heaters	Use electric appliances	Required adjacent outlet for future electric replacement: • Gas water heaters • Gas clothes dryers • Gas ranges and stoves
Multifamily	Meet Title 24 Energy Requirements using: • Performance or • Prescriptive	Meet Title 24 Energy Requirements using: • Performance or • Prescriptive	Exceed Title 24 Energy Requirements using: • Performance (10 EDR points) or • Prescriptive (additional measures)
	Require solar generation	Require solar generation	Require solar generation and: • Solar water heating or • 2.75 kWh battery
	Required adjacent outlet for future electric replacement: • Gas water heaters	Use electric appliances	Required adjacent outlet for future electric replacement: • Gas water heaters • Gas clothes dryers • Gas ranges and stoves
Nonresidential	Meet Title 24 Energy Requirements using: • Performance or • Prescriptive	Meet Title 24 Energy Requirements using: • Performance or • Prescriptive	Exceed Title 24 Energy Requirements using: • Performance (9% compliance margin) • Prescriptive (additional measures)
	Solar generation ready zone	Solar generation ready zone	Solar generation ready zone
	Required adjacent outlet for future electric replacement: Gas water heaters	Use electric appliances	Required adjacent outlet for future electric replacement: • Gas water heaters • Gas clothes dryers • Gas ranges and stoves

By May 2019, the joint initiative team began to circulate the proposed codes for feedback from member agencies and other stakeholders throughout the PCE and SVCE service territories. While they received meaningful comments on their draft codes, it was an external event that changed the trajectory of the joint reach code initiative effort. In July 2019, the City of Berkeley became the first city in the United States to pass a natural gas ban prohibiting any new gas infrastructure to be installed in new buildings within city limits. This decision was not only the first of its kind, it was also unusual in that it applied to developers applying for initial land-use permits rather than building permits, which come later in the development process. Moreover, rather than working through the city's local building and energy codes, the ban relied upon the city's local policing powers for enforcement. Although Berkeley later also passed electric-preferred energy codes that apply to

building permits, the initial decision to use their policing powers to ban new natural gas laterals brought lawsuits challenging its legality.

Interestingly, Berkeley's ban on natural gas also marked an important milestone with PG&E, which came out in support of cost-effective all-electric new construction at Berkeley's council meeting. "Their public support of decarbonization was important to our reach code effort," said Bailey of SVCE. "Before that point, we didn't know whether or how much resistance PG&E might have to our initiative because they hadn't made public statements about it."

As municipalities in San Mateo and Santa Clara counties watched this unfold, they were emboldened by Berkeley's groundbreaking efforts and PG&E's supportive stance, yet they were also eager to avoid any legal difficulties. The City of Menlo Park also set a historic precedent when it passed an electrification reach code that mandated that all new construction projects must install electric space heating and water heating, while still allowing natural gas for other end uses such as cooking and fireplaces. Unlike Berkeley's approach, Menlo Park focused on building permits and relied upon the statewide cost-effectiveness studies. They argued that all electric appliances represented a cost-effective approach and that they were not required to provide a mixed fuel option.

"When we looked at the menu of policy choices presented, we didn't see a path toward greater building electrification uptake," said Rebecca Lucky, Sustainability Manager for the City of Menlo Park. "PCE's model codes disincentivized natural gas by requiring higher efficiency standards to attempt to motivate people toward all electric, but it was not clear to us if that would work or if people would still result in the desired outcome. In fact, there were case studies that the two-path approach does not greatly motivate building permit applicants to go all electric. We began looking at how can we just require all-electric for new buildings as a start. The main barrier right off the bat was overcoming potential legal challenges regarding federal energy efficiency standards" that Berkeley was being sued over. So, Menlo Park reached out to the nonprofit Building Decarbonization Coalition who had hired a legal firm, Shute, Mihaly & Weinberger, to provide analysis assessing the legal framework within which local governments can decarbonize new and existing residential and commercial buildings in California.[8] "When we initially talked to the California Energy Commission, we were informed that requiring all electric would be in violation of the federal energy efficiency standards. But we started to question this based on the information from the Building Decarbonization Coalition, and we came to the conclusion that there was not a great risk of violating the federal standard since we were not setting energy efficient requirements for appliances, but rather determining the energy source for an appliance. If we only passed an all-electric pathway without regulating the efficiency of any appliances, then we would be compliant. It would be in people's interest to use high-efficiency all electric appliances but any cost-effective all electric appliance would be permissible," she said.

The joint initiative team applauded this streamlined approach and supported Menlo Park as it sought approval from the California Energy Commission, which eventually came December 11, 2019. The team added Menlo Park's "mostly electric" approach to their list of recommended model code options. After Menlo Park's approach was recognized as viable by the CEC the conversation changed, and the Menlo Park model became the front runner for other municipalities who were investigating reach code options. "Menlo Park demonstrated a way to limit natural gas use in new construction while still working within the state's existing framework," said TRC's Farahmand. "It really got things moving by creating a situation where rather than the CCAs going to cities with a suggestion for how they could do something, a city, one of their peers, came up with a fairly aggressive idea based on feedback from their own building department and legal counsel. It was a powerful

[8] Elison Folk, Building Decarbonization: Legal Opportunities and Hurdles for Local Governments, Shute Mihaly, Weinberger, San Francisco, 2019

example, and a lot of cities felt motivated to pass something as well. Of course, it also helped that the deadline was fast approaching for any new codes to be ready for the first of the year."

Another consideration driving interest in Menlo Park's approach to allowing only all electric water heating and space heating was a concern with implementation costs. When building department representatives provided feedback on the original model codes proposed by the CCAs, they pointed out the extra staff time necessary to monitor compliance with multiple implementation options. Limiting the options to all electric requires less initial staff training and less effort and expertise on each jobsite. In short, the Menlo Park approach enabled municipalities to cut approximately 80% of greenhouse gas emissions from new construction without the need to invest the effort, expense, and political capital to fight for the remaining 20%. Of course, some cities were interested in curbing more than 80% of greenhouse emissions, and other municipalities had different ideas about the path that would work best for their constituents. Table 5 below summarizes the building electrification reach code options presented to cities for their consideration.

Table 5 Reach Code Summary

Code	Cost-Effective	W/in CEC Guidelines	Included in PCE/SVCE recommendation
Base Title 24	Yes	Yes	Yes
All-Electric	Yes	Yes	Yes – Pathway 1
Mixed-Fuel	Yes	Yes	Yes – Pathway 2
Mostly Electric (residential only)	Not as a standalone pathway	Yes	Yes – Pathway 2A
CalGreen Tier 1 or Tier 2	Not as a standalone pathway	Yes	No
Ban on Natural Gas	Yes	No[1]	No
[1] A ban utilizes a city's police power, not via a local amendment to Energy Code.			

3.4.2 Electric Vehicle Infrastructure

From the beginning, the joint initiative team recognized that EV's represent a significant percentage of load in new construction, and they felt strongly that prewired "plug-and-play" charging of EV's at home and at work needed to be incorporated into the electrification reach codes. "The state code for electric vehicles is very incremental and it mostly calls for EV capable infrastructure. But it's not actually changing access to charging," said Reyes. "Our approach was fundamentally different. We wanted every residential unit to have access to charging, but we needed to keep the infrastructure costs as low as possible. So, our central feature ensures Level 1 charging which is dramatically less expensive and still meets the needs of drivers on a day-to-day basis."

This meant exceeding the mandatory 2019 CalGreen requirements for EV charging that specify that all new construction must be EV capable, and that nonresidential buildings provide Level 2 charging in 6% of parking spaces; multifamily complexes provide 10% of parking spaces with Level 2 charging, and single-family residences provide one parking space with Level 2 charging. To understand these requirements necessitates a bit of background.

The CalGreen requirements rest on four primary parameters: charging level, readiness, building type, and quantity of spaces. Charging level refers to the speed of the charge. Level 1, sometimes called trickle charging, uses standard household outlets (15 – 20 Amp, 120 V AC) and provides approximately 3 to 4 miles of driving distance per hour of charging. Level 2, sometimes called standard charging, uses "dryer outlet" levels of power (40+ Amp, 208/240 V AC) and provides approximately 25 to 30 miles of driving distance per hour of charging. Level 3, sometimes called DC fast charging, uses 24 to 350 kW power and provides between 72 and 1200 miles of driving distance per hour of charging.

EV readiness also comes in three types. The first type, EV Capable, essentially means "some assembly required." It calls for extra capacity in the electric panel and the installation of conduit that is ready to accept electrical wiring since wall and underground spaces will be inaccessible in the future. The second type, EV Ready, is basically "plug-and-play." It calls for a complete electrical circuit from breaker to receptacle, as well as signage. The third type, EV Charging Station, has everything necessary to deliver electricity into the vehicle at Level 2 speed. CalGreen also makes distinctions based on building type: single-family homes, multifamily complexes, office buildings, and other commercial buildings. The percentage of spaces specifies the amount of parking spaces at any given building type that must meet the charging level and readiness requirements.

With this in mind, the joint initiative team set out to establish higher standards for the percentage of spaces required for EV capability, EV readiness, and EV charging stations by building type. They wanted reach codes that would ensure that new buildings are prepared to meet the increasing need for electric vehicle charging capabilities when at home and away, while also minimizing costs and allowing for reasonable exceptions. For example, they foresaw that future households are likely to have two electric vehicles and that while both cars may need to charge simultaneously, only one of them is likely to need Level 2 charging. Multifamily complexes presented more of a challenge since the team wanted 100% of residents to have access to EV charging. While providing Level 2 charging for all parking spaces was desirable, it was not practical either from a cost-effectiveness standpoint nor based on the fact that the physical space required for the additional secondary transformers would necessitate a reduction of the number of parking spaces available for residents. After back-and-forth conversations with developers and affordable housing advocates, the team ultimately recommended a mix of Level 1 and Level 2 spaces and the use of automated load management systems to adjust the amount of power available at each parking spot depending upon the number of vehicles being simultaneously charged. When it came to office buildings and other nonresidential building parking lots, the team advocated for a mix of readiness levels and charging speeds based on an acknowledgment that vehicles are parked for differing periods of time and that some drivers will also have access to charging at home. Table 6 below shows how the 2019 CalGreen code compares to the proposed EV reach codes.

Table 6 EV Code Comparison

Readiness Level	2019 CalGreen*	Reach Code Initiative*
EV Capable (electrical conduit and panel space in place)	SF: 1 space L2 MF: 10% spaces L2 NR: 6% spaces L2	Offices: 30% spaces L1
EV Ready (fully wired receptacle ready for charging)	None	SF: 1 space L2 + 1 space L1 MF: 25% spaces L2 + 75% spaces L1 Office: 10% spaces L1 NR: 5% spaces L1
Electric Vehicle Charging Station (EVCS)	None	Office: 10% spaces L2 NR: 6% spaces L2
*Abbreviations: SF = single-family, MF = multifamily, NR = nonresidential, L1 = level 1, L2 = level 2		

3.5 Feedback, Code Modifications and Exceptions

When the draft codes were ready to be circulated, the initiative team reached out to municipalities and stakeholders to gather feedback, allay concerns, and prepare to make any necessary modifications. “We hosted about 30 different community events to get feedback while we were drafting the model codes, and then, after they were written, we had even more events with the building community to ensure people understood them and to find out where we needed to refine things. We captured everyone’s feedback on a poster board and then had a conversation to hash out challenges and concerns,” said Londer from SMC OOS. Interestingly, they encountered more people complaining about the complexity of the State’s newly proposed standard building codes than with the proposed model codes. Nonetheless, there were a number of concerns raised by both building department staff and the developer community.

Among building departments, the main concerns were implementation of the reach codes and ability for building industry to rise to the challenge. “Building officials tend to be traditionalists for good reason since it’s their job is to protect immediate health and safety. Reach codes can be difficult to prioritize since inspectors tend to focus on immediate health and safety and they may not see their role in regards to the bigger health and safety considerations of communities in the face of climate change and how buildings can be a part of

the solution," said Lucky of Menlo Park, explaining their focus on compliance with electrical and ventilation safety requirements as opposed to long term health considerations from natural gas burners inside the home or worldwide carbon emissions. She also observed building officials from various communities expressing concern about the potential difficulty meeting the energy efficiency requirements for mixed use yet not expressing similar concerns regarding the all-electric option. That helped clarify the decision to move forward with an all-electric only pathway.

Among developers, concerns focused on cost, technological complications, and the real-world implications of implementing the codes. The proposed model codes "set off an alarm bell since it could really increase our cost and liability on our projects," said Eric Hansen, Vice President of Construction for SummerHill Apartment Communities, a developer of market rate residential and mixed-use properties in the Bay Area. "We wanted to be good partners and do the right thing by building sustainably, but initially we had a lot of concern about the financial and logistical impacts of implementing reach codes on our projects."

One issue that Hansen brought up was the inapplicability of the cost effectiveness study. He felt it did not accurately represent the costs associated with providing natural gas to multifamily facilities. "Their study focused on single-family developments where every home needs an individual gas lateral. We only need to bring in one lateral to serve all of the residential units through a single meter, so our costs are much lower. But even though we disagreed with the cost effectiveness studies we didn't use that as a reason to fight the move away from natural gas," he said. "We know people prefer gas ranges, but if we have to go with electric ranges we will." However, Hansen did raise an issue when it came to the increased electric load and the increased costs associated with additional transformers and underground electrical. "Between the extra load associated with domestic water heating and the EV charging, we needed to bring in one or two additional transformers per project. That's costly and it directly affects the number of units we can build," he added.

Hansen and the technical consultants spent considerable time addressing centralized heat pump water heating without resolving all the technical issues. But the joint initiative team did successfully address the issues that Hansen and others raised regarding EV charging. To mitigate concerns about secondary transformer costs, the initiative team worked with the California Building Standards Commission and the Department of General Services to modify their proposed EV codes by adding an electrical load management provision.

According to Farahmand of TRC, "The version of the code we had written said that if more than one car in a multifamily facility was charging at the same time, they all needed to be able to have full Level 2 charging capabilities at all times. We talked with them about writing something that would address this without conflicting with what CalGreen says about Level 1 and Level 2 charging, and we revised it to allow for the use of an automatic load management software system. By allowing for the use of the load management software, we gave developers more latitude. This way if one car was charging it would have Level 2 charging, but if more cars were charging at once we could guarantee that all four of them on the same charging circuit would at least be able to charge at Level 1. This was crucial because it set a minimum floor for charging levels while lowering the ceiling on the requirement." To keep overall costs down, the team also made an additional change by writing in a cap specifying that if the infrastructure costs exceed $4500 per parking space for utility service or on-site transformer capacity, then builders don't have to add more spaces beyond that.

The extra costs associated with EV readiness and charging speeds were also of particular importance to affordable housing providers. To address those concerns, the joint initiative team hosted a workshop with the Housing Leadership Council of San Mateo County and facilitated an in-depth meeting with MidPeninsula Housing. Their first main points of contention involved a lack of familiarity on the part of contractors, so the joint initiative team agreed to provide training and technical support. The second issue involved the additional cost of providing EV charging, which the CCAs agreed to address with additional financial incentives.

These are just a few examples among the many issues addressed by the joint initiative team. Perhaps not surprisingly, they could not successfully address them all. For instance, other stakeholders, such as those whose livelihoods involve natural gas, were not particularly happy. Although the joint initiative team did their best to accommodate stakeholders, in the end the reach code initiative was an exercise in advocating for forward progress while mitigating the most difficult aspects of change.

3.6 Financial, Technical and Adoption Support

In addition to the joint team's investment in technical and cost effectiveness analysis, model code development, and stakeholder engagement, they also recognized that municipalities would need to invest a substantial amount of their own staff time and money to do the work necessary to bring their own version of reach codes to a vote before their city councils, including preparing reports, drafting their preferred code language, and conducting a legal review. Any efforts made by city staff would necessarily come at the expense of other city initiatives. So, the joint initiative team decided to lower the risk of considering the adoption of reach codes by offering municipalities a grant of $10,000 payable to the city's general funds to help cover these costs. Grant recipients were required to prepare a viable building electrification and/or electric vehicle infrastructure reach code for a council vote, but they were not obligated to ultimately adopt a reach code ordinance.

The initiative team also developed an extensive suite of tools and templates and made them available via an online resource library.[9] The library provides:

- Sample ordinance language and a reach code template
- Templates for staff reports, letters
- Sample submission documents for the California Energy Commission
- A PowerPoint slide library
- Sample code facts and findings
- Links to all relevant cost-effectiveness analysis and electric vehicle cost studies
- Discussion materials on carbon emissions savings and cost-effectiveness
- A 13 page frequently asked question document
- Case studies
- A flyer for homeowners
- Suggested timelines for adoption
- Building department checklists
- Online videos
- Reach code training presentations
- A set of links to external resources

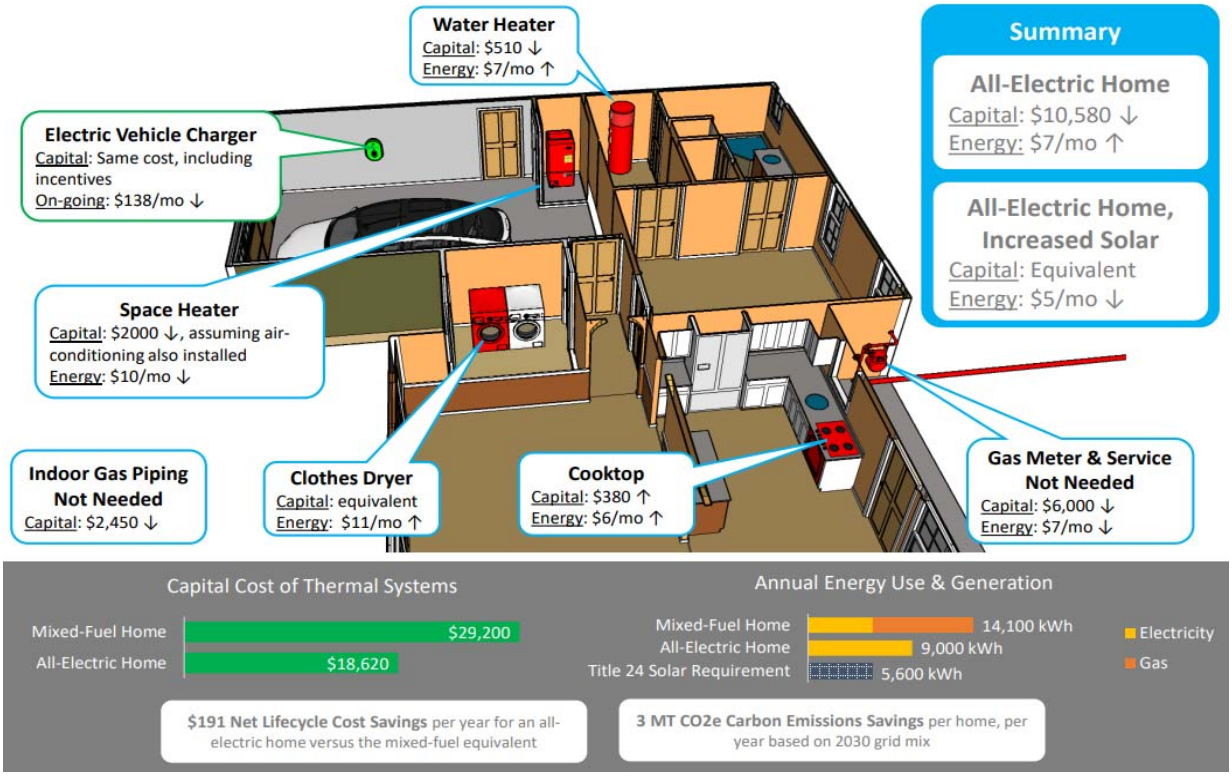
As different municipalities have passed their own ordinances for electric vehicles, electric appliance preferred, all electric only, or natural gas bans, those examples have been added to the library as well.

Although the list of resources that the joint initiative team provided is extensive, the joint team does not claim credit for creating everything on their own. "There are a number of efforts happening across the state, including one coordinated by the Building Decarbonization Coalition. So, rather than reinvent the wheel we collaborated closely with them to develop a shared set of implementation tools, including checklists, training, and other materials," explained Reyes. Two examples from the resource library are shown below.

[9] The online library can be accessed at https://peninsulareachcodes.org/#resources

Figure 2 provides an example of an infographic[10] used in a variety of slide presentations. It illustrates the capital and ongoing energy costs associated with each primary all electric end use. It also explains how an all-electric home can remain cost-effective over 30 years despite a monthly energy bill of $7 more per month when compared to a mixed fuel home due to the estimated $10,580 difference in upfront capital construction costs. When those capital costs are invested in additional solar panels beyond those currently required by California Energy Code, the all-electric homeowner can save $5 per month compared to a new mixed fuel home.

Figure 2 Electrification Cost Infographic



[10] Graphic prepared by TRC using information within the state-wide cost-effectiveness study, E3's Residential Building Electrification in California and the Rocky Mountain Institute's The Economics of Electrifying Buildings.

The initiative team also prepared outreach materials for a general audience. Figure 3 provides an example of a flyer prepared to educate builders and single-family homeowners using simple benefit language and explanations.

Figure 3 Public Educational Handout

2019 Energy Reach Code Amendments
Promoting Healthy, Safe Homes & Buildings

What Are Reach Codes?

Reach codes provide an opportunity for local governments to amend the 2019 state building code for new homes and commercial buildings. The amendments or "reach codes" are designed to encourage low-cost all-electric new construction of healthier, safer, and zero emission buildings while making it easier to charge electric vehicles.

Why Reach Codes?

- Incentivize lowest-cost construction options
- Encourage development of healthier, safer, lower emission buildings
- Reflect the sustainability-related values of our community
- Improve indoor air quality and reduce the risk of fires

New all-electric homes and apartments can save thousands!

Single Family Home Reach Code Options

Builders and developers can choose between an all-electric or mixed fuel construction option. The code encourages the all-electric option as it is less expensive, provides a healthier, safer residence while significantly reducing pollution.

Construction Options	All-Electric Construction	Mixed Fuel Construction (Electric & Natural Gas)
Efficiency required above state code (compliance margin)	0%	Additional 17 to 29%
Estimated increase in construction cost	$0	Extra $6,800 to $7,000
Emissions from gas	Zero	4+ metric tons of CO_2 per year
Indoor air quality	Best	Worse
Equipment utilized	All electric appliances	Gas connection, gas meter, gas furnace and water heater, CO monitor, electrical wiring to all gas appliances for future switch to electric with additional options for additional PV/solar and storage required

PENINSULA CLEAN ENERGY

OFFICE OF SUSTAINABILITY
COUNTY OF SAN MATEO

To learn more, visit
PeninsulaReachCodes.org

3.7 Code Adoption

By the summer of 2019, jurisdictions began to consider and pass reach codes one after another. San Mateo was first, passing their reach codes on September 3, 2019. Others followed. Some of the quickest took the proposed model codes with modest modifications and moved from start to finish it a matter of a few months. Others were more deliberative, holding extensive stakeholder workshops and roundtables of their own. Although the timing of their adoption and the level of support that they asked for and received from the joint initiative team varied from city to city, the appreciation expressed by the various municipalities was close to universal. In the preparation of this case study, we spoke with several of them to learn more about their perspectives.

In 2015 the City of San Mateo adopted reach codes addressing solar and electric vehicles, so they were already familiar with the process. "Back then we had to do it all ourselves, including leading our own cost effectiveness study. This time we got to rely on the statewide cost effectiveness studies and on PCE for their support," said Andrea Chow, Sustainability Analyst for the City of San Mateo. "Building electrification was a new topic for us so their recommendations and technical support were really helpful. So was not having to pay for everything ourselves." San Mateo adopted an electric preferred reach code based on the model code proposed by the joint initiative team. "I know they were aiming for cohesion across the region, but what we ended up adopting was a bit different from their template," she said. "We really appreciated TRC's expertise to review our ordinance and to answer technical questions from stakeholders and council members. PCE was very helpful hosting webinars, round tabling everyone, creating templates, and responding to emails, but it was their one-on-one consultant support that was really valuable. They spent a lot of time with us to review the cost-effectiveness studies, evaluate options, and finalize our ordinance."

Municipalities in the SVCE service territory also echoed those sentiments. Tony Eulo, Community Services Program Administrator for the City of Morgan Hill said that the support he received from SVCE was essential for his city's efforts to pass reach codes because their budgets are too small to support many administrative planning efforts. "My colleagues in Mountain View and Cupertino have literally twice the discretionary and general fund revenue that we do. We scrape by and try to focus our energies where we can get the biggest bang for the buck. Reach codes are a perfect example since we can adopt an ordinance that will have a huge impact on new development with very low ongoing administrative costs," he said. To keep things simple Morgan Hill opted to pass an outright ban on natural gas.[11] "It was the easiest way to get there since we didn't need to use the cost-effectiveness analysis or wait for CEC approval," Eulo said. "SVCE staff were instrumental in providing data and backup studies. They also came to our Council hearing to explain what other jurisdictions were doing. There's safety in numbers, and they explained that our actions were reasonable since we were not the only ones doing it."

Adrienne Etherton, Sustainability Manager for the City of Brisbane also credits the reach code initiative with smoothing the way for her city to pass its reach code ordinances. Brisbane opted for codes that required all electric space heating and water heating while allowing for other natural gas and uses, making their codes similar to the Menlo Park approach with minor modifications. "As a small city we tend to rely on outside expertise wherever we can. We were glad to have the technical help, policy language, and financial support from PCE. Without their encouragement and resources, I doubt we would have come up with something as strong as we did, and I know it would have taken longer. They made it much more palatable for everybody to move forward."

Lucky from Menlo Park also complimented the joint initiative team. "It took our external team and other communities a few weeks to come to terms with our mostly electric approach since it was different from what

[11] As of September 2020, unlike Berkeley, Morgan Hill had not faced any legal challenges.

they had been working on, but once they understood it they were very supportive, and they authorized their consultants to do the analysis and help us with our new direction. Luckily, they were open to it. I can see that it might be a pitfall for other CCAs who might feel obligated to their previous scope of work based on what other communities had originally committed to supporting," she said.

Lucky also praised to California Energy Commission. "They played a crucial role. They were always available for a conversation, even to our challenging stakeholders. They were open to challenging their previous thoughts and opinions, and they were nimble in addressing code barriers. Without their ability to build a solid relationship that really listened to our concerns, we wouldn't have achieved a successful outcome," she said.

With so many municipalities considering reach codes all at the same time, a friendly competition began to develop between them, and that too spurred cities to take steps they might not have felt comfortable with if they were acting on their own. "For three or four months, we were all competing with each other about what we were going to put before our councils and get adopted." said Howard Miller, Mayor of Saratoga and SVCE board member. "My own city went farther than I expected. We're pretty conservative. So, I was expecting us to pre-wire for electric vehicles and that's about it. Next thing I knew we were banning natural gas for space heating and water heating. I was pleasantly surprised and impressed."

While comments such as these are illustrative of the appreciation that municipalities felt for the joint initiative team's support, their efforts did not always lead to cities passing reach codes. In some cases, such as with Redwood City, deliberations are still underway. In other cases, jurisdictions decided not to pass them. For instance, Gilroy in Santa Clara County and the town of Woodside in San Mateo County decided against electrification. "Woodside has challenges with homes in remote locations where electric distribution is poor and they were concerned about not being able to run additional power up to those homes. They were also concerned with resilience," explained Reyes. Nonetheless, the joint team's efforts led to the largest sweep of new reach code ordinances in the state of California to date.

4. Measuring Success

The natural measure of success for PCE and SVCE's joint electrification reach code initiative is the number of jurisdictions that considered and ultimately adopted building electrification and electric vehicle reach codes for their jurisdiction. As of August 2020, seven of 21 local governments in San Mateo County considered reach code ordinances and six jurisdictions approved some version of electrification reach codes. In Santa Clara County, 12 of 13 local governments formally considered electrification reach codes and 10 cities adopted them. This represents a 47% (16/34) adoption rate, with 11 more jurisdictions across the two CCAs service territories still in the process of considering or adopting their own version of electrification reach codes.

According to the Building Decarbonization Coalition, of the 58 counties and 482 cities in California, a total of 32 have adopted some form of building electrification reach codes. This means that PCE and SVCE's joint electrification reach code initiative directly supported the adoption of half (16/32) of all building electrification reach code initiatives in the state. Moreover, several other entities have leveraged the materials developed for the initiative including East Bay Community Energy, the City of San Luis Obispo, and the city of Santa Clara's municipal utility Silicon Valley Power.

Table 7on the next page lists the jurisdictions in the PCE and SVCE service territories that have adopted building electrification reach codes. The table also provides counts of the code approach, type of system, type of building, additional solar and electric vehicle requirements, and the year of adoption. As shown in the table, there were variations in code adoption based on local considerations. However, the codes are highly consistent in a way that would not have been possible without the coordinating efforts of the joint initiative.

Table 7 Reach Code Adoption Summary

Jurisdiction	Approach			Systems			Building Types								Add-On		CCA		Adopted	
	Natural Gas Infrastructure Moratorium	All-Electric Reach	Electric-Preferred	Whole Building	Water Heating	Space Heating	Low Rise Residential	High Rise Residential	City-Owned Properties	Hotel	Retail	Office	Restaurant	Life Sciences	Additional Solar	Electric Vehicles	Peninsula Clean Energy	Silicon Valley Clean Energy	2019	2020
Count	1	12	4	10	7	7	16	13	13	12	12	13	11	5	4	12	6	10	13	3
Brisbane		X			X	X	X	X	X	X	X	X	X			X	X		X	
Burlingame		X		X	X	X	X	X	X	X	X	X		X			X			X
Campbell		X			X	X	X									X		X		X
Cupertino		X		X			X	X	X	X	X	X	X			X		X	X	
Los Altos Hills		X			X	X	X	X	X	X	X	X	X					X	X	
Los Gatos		X		X			X									X		X	X	
Menlo Park*		X			X	X	X	X	X	X	X	X	X		X	X	X		X	
Milpitas			X	X			X	X	X	X	X	X	X	X				X	X	
Monte Sereno			X	X			X	X	X							X		X	X	
Morgan Hill	X			X			X	X	X	X	X	X	X	X				X	X	
Mountain View*		X		X			X	X	X	X	X	X	X		X	X		X	X	
Pacifica		X			X	X	X	X	X	X	X	X	X		X	X	X		X	
Palo Alto		X	X	X			X	X	X	X	X	X	X	X		X		X	X	
San Mateo			X	X			X					X			X	X	X		X	
San Mateo County		X		X			X	X	X	X	X	X	X			X	X			X
Saratoga		X			X	X	X	X	X	X	X	X	X	X		X		X	X	

Click on city name for web link to code summary.

*City council opted to go beyond staff recommendation.

Source: Building Decarbonization Coalition http://www.buildingdecarb.org/active-code-efforts.html

When the two CCAs conceived the initiative one of their objectives was to encourage a uniform set of reach codes throughout their service territories to make it easier for builders and others who work in multiple jurisdictions to comply. While that did not happen, Lucky of Menlo Park thinks that is actually a good thing. "If you want things to be standardized, they need to be simple like a municipal bag ordinance prohibiting plastic bags and charging a fee for paper bags. Once you start thinking about building standards for different building types, you are almost certainly going to have cities deciding what will work best for them, and that's good," she said. "By giving cities a model to work from and lots of support encouraging them to pass reach codes at the same time, they actually spurred innovation and kept us moving forward. That would not have happened if they hadn't been pushing us."

That innovation arose naturally as municipalities sought to address the overlapping and sometimes competing environmental, political, economic, and social interests of their communities. It's what led Menlo Park to pioneer the mostly all-electric "middle path" that addressed the majority of GHG emissions while continuing to allow some mixed fuel end uses. It's also what enabled Morgan Hill to follow Berkeley's lead and opt for an outright ban on new natural gas laterals.

Likewise, cities also took a diverse approach with their electric vehicle reach codes, with some opting for modest requirements and others pushing for more aggressive code. "Mountain View is a good example," noted Blake Herrschaft, Director of Building Decarbonization at DNV-GL. "They required all commercial EV charging to be Level 2, which is significantly more than elsewhere because, like Berkeley's decision to pass the first outright natural gas ban, they wanted to shift public perceptions by moving the Overton Window," he said, referring to the concept of shifting political discourse in a more aggressive direction to increase its general acceptability. In fact, the entire reach code initiative has moved the Overton Window by demonstrating widespread adoption of reach codes that will make a meaningful impact on regionwide carbon reductions.

Other measures of success may be equally qualitative, such as the gradual conversion of those who are uninterested, or worse, skeptics, into supporters, or better, advocates. "We are essentially transitioning the entire ecosystem and that's a process," said Reyes. "Initially there was a significant education process with key stakeholders. Some issues raised were addressable with education, but also a number of concerns led to changes in and exceptions to the codes that were important. So, a soft metric we're tracking is how stakeholder engagement and response changes over time."

Tracking this and similar effects may be more akin to observing ripples in a pond. That is, watching to see how the strategies, concepts, tools, and templates developed by the joint initiative team are taken up, emulated and improved upon by other CCAs, RENs, local governments, advocacy groups, and other market actors. Another continuing measure of success will be the increasing number of other jurisdictions that adopt electrification reach codes before the next Title 24 code update on January 1, 2023.

5. Barriers and Opportunities

For CCAs and other organizations who may try to pursue a similar regionwide reach code initiative, this joint initiative illustrates the importance of delivering a minimum of five major deliverables: 1) model reach codes; 2) grant funding to local governments to consider the codes; 3) one-on-one technical assistance; 4) tools, time, and expertise to support adoption; and, 5) tools, time, and expertise to support implementation. Although this list encapsulates the key activities conducted by the initiative, the joint team members, and others that we interviewed also shared some thoughts about how future initiatives might improve upon their efforts.

"Looking back, I realize we set our bar quite low. We thought if we could get just two cities to pass reach codes that would be a phenomenal success and we actually ended up with a lot more," said Balachandran of SVCE. "So, with 20/20 hindsight I would say to be bold and to set ambitious targets." Farahmand of TRC agreed.

"The model code we drafted was not particularly aggressive. We played it safe because we were concerned about technical considerations and legal challenges. As it turned out Menlo Park created a better model and we ended up advocating for it," he said. Both men concurred that launching the initiative required foresight to envision what cities might ultimately decide to do. While they underestimated this, the joint initiative team maintained an open-minded perspective, persevering and adapting as circumstances changed.

That open-mindedness applied to cities as well. "I was fortunate to work with a reasonably new city attorney and a reasonably new building official, and they were open-minded about what we were trying to do because they weren't yet steeped in what was and was not possible," said Lucky of Menlo Park. That willingness to consider new possibilities is what led them to seek out help and advice from other external resources beyond the joint initiative team, including Shute, Mihaly & Weinberger, the Building Decarbonization Coalition, and the CEC.

Lucky made another important observation as well, emphasizing the importance of recognizing a team's inherent strengths and weaknesses. "They had a strong cost-effectiveness and technical consulting team. They also had good support for what cities needed to bring to their councils. But we needed our own staff to write code that would work for us. I would suggest future efforts include a building official and an attorney on their team to support technical code writing and provide more comprehensive advice," she said.

Despite the initiative's extensive stakeholder engagement efforts, that too presented opportunities for improvement. Several city representatives indicated they had rushed their own efforts along on a tight timeline that did not fully engage their stakeholders before making a final decision. Londer of SMC OOS also spoke to the difficulty of getting people to attend stakeholder events and to share their insights in public forums. "I think we did a fairly good job with the bigger developers, but we had a harder time reaching people who build one or two homes a year," she said. Beyond people having busy schedules, "I also think a lot of people didn't want to publicly share their thoughts. They preferred to have more confidential one-on-one meetings since they didn't want to publicly discuss their strategies or the projects they were working on."

Hansen of SummerHill Apartment Communities had no such hesitancies. His primary suggestion for improvement focused on CCAs taking a more active role to educate city officials and staff about the impacts of the time and planning required by builders to implement any new code changes. "I was generally happy with how they listened to us and tried to help, but that didn't always translate from the CCAs and consultants to the cities. For some it was a philosophical movement, and they were less concerned about the details of actually implementing it."

City staff also had thoughts about improving city-to-city communication. "In San Mateo County we all tend to know each other, and we feel comfortable calling or emailing, but it would have been nice to have a centralized hub for conversation. They put together a website with resource documents, but it would have been helpful to set up a Microsoft Teams channel for cities where we could ask each other questions, share documents, and get feedback. That way we would have been better able to follow what other cities were doing," suggested Etherton of Brisbane.

Lastly, when asked why a higher percentage of municipalities in Santa Clara County passed reach codes than in San Mateo County, Londer provided an interesting insight. "I think adoption was faster in Santa Clara County because they took more of a top-down approach of working first with city councils who then gave direction to city staff. In San Mateo County, we took more of a bottom up approach of working first with city staff since they had to do the work to prepare for council," she said. "I think we also took some of the time pressure off by telling them they could adopt reach codes anywhere in the three year cycle since we wanted them to be thoughtful about the process and not rush things." While this may be true, it is also important to note that

there were 13 jurisdictions in SVCE territory and 21 in the PCE service territory, so PCE had many more to work with.

Finally, it is important to recognize that the above comments represent insights for improvement on a highly successful initiative. In fact, in July 2020, the Joint Reach Code initiative was nominated as a finalist for the Smart Electric Power Alliance's Power Players Award that recognizes efforts that have demonstrated innovation and leadership to accelerate the adoption of clean energy resources and technologies at scale.

6. Next Steps

Although the initial phases of the reach code initiative were focused on encouraging regional municipal reach code adoption prior to January 1, 2020, local governments can pass reach codes at any time during the three-year code cycle. So, the reach code initiative team continues to provide ongoing support for jurisdictions still in the consideration phase. These include the cities of Belmont, Daly City, East Palo Alto, Foster City, Hillsborough, Millbrae, Portola Valley, Redwood City, and San Bruno in PCE's territory, and the cities of Los Altos and Sunnyvale in SVCE territory. The team also continues to support local government staff with implementation and compliance. To help the building industry, the initiative team is collaborating with the statewide Reach Codes Program, BayREN, other CCAs, and the Building Decarbonization Coalition to provide an ongoing technical assistance program to builders and developers with a technical "hotline," roundtable discussions, and in-depth project assistance focused on all-electric construction. In addition, the project is providing contractor training.

The team is also looking beyond new construction reach codes and preparing efforts that focus on retrofitting existing buildings. This is where the true carbon savings will come from since new construction represents only 1%-2% of building stock compared to 98%-99% for existing building stock. PCE is moving forward with several existing building programs. Plans include a technical assessment of building electrification, incentives for installation of heat pump water heaters, a low-income home upgrade program, and innovation pilots. The water heater incentive will be layered into the BayREN Home+ program to provide a seamless customer experience that provides consulting through the Home+ Energy Advisors, BayREN-directed incentives, and the PCE incentives. The low-income home upgrade program will provide a turnkey offer for home upgrades that include electrification measures, as well as other health, safety, and comfort measures such as roof repairs. The innovation pilots now under consideration include an advanced space and water heating system with single water storage tank that reduces install costs and allows for load shifting across both applications.

Building decarbonization also continues to be a high priority for SVCE as it works on a multiprong approach to electrify the build environment. In 2020, the SVCE focused on drafting a Building Decarbonization Joint Action Plan in conjunction with its member agencies in order to prioritize future incentives, building codes, permitting, rates, and other activities. While the Joint Reach Code Initiative arose as a timely opportunity to be pursued with PCE, SVCE is now in the act of fitting the reach code initiative into a more comprehensive strategy for communitywide decarbonization that spans all building types and end uses. Drafting of the new building decarbonization joint action plan is currently underway as SVCE works with its stakeholders to identify critical needs and high-priority opportunities for building decarbonization, including the daunting task of retrofitting of existing buildings, as the CCA and its local member jurisdictions continue their efforts to curb emissions.

7. Key Takeaways

The Joint Electrification Reach Codes Initiative sponsored by Peninsula Clean Energy and Silicon Valley Clean Energy represents a precedent setting example of how community choice aggregators can partner together to work with their local jurisdictions in a unified regional effort to pass electrification reach codes designed to

exceed the statewide standards for Title 24 and CalGreen in order to decarbonize new construction and promote the adoption of electric vehicles. Best practices and lessons learned from this initiative include the following:

Best Practices

- **Encourage code innovation.** By providing model codes as templates and ample support encouraging cities to pass reach codes at the same time, the team gave their member agencies the tools and the forum they needed to customize the ordinances to meet their own needs. In the process they fostered a more diverse and more aggressive set of codes than they had originally planned.

- **Be flexible and open to new ideas.** The joint initiative team worked for months preparing model reach codes to share with their member agencies, doing their best to accomplish the desired objectives while minimizing the likelihood of legal challenges. Yet, when Menlo Park developed a more innovative approach requiring electrification in new construction without the option to install natural gas appliances, they shifted gears to include and promote the new alternative as an integral part of their proposed model codes.

- **Engage with stakeholders early and often.** A reach code initiative touches a wide range of stakeholder audiences with differing viewpoints, needs, and purviews. Recognizing this, the joint team built a comprehensive approach to outreach and engagement that combined open public forums with more segmented stakeholder meetings designed to discuss topics from a particular perspective, be that of a city employee, a developer, or an advocacy group representative.

- **Use the power of inclusion**. A central part of the team's stakeholder engagement strategy focused on including as many people as possible in the process. They set up repeated opportunities to engage people in dialogue and responded to their concerns in a constructive manner that gradually converted skepticism and resistance into support and advocacy. For example, developers like SummerHill Apartment Communities, began as concerned participants and ended up as actively engaged supporters setting an example for fellow builders.

- **Plan to iterate.** Because stakeholder feedback was so integral to the effort, so too was the plan to make multiple updates rather than strive for perfection the first time. When the joint initiative team met with stakeholders, they took copious notes and worked diligently to address any concerns. For example, in response to multifamily housing developer feedback, they worked with the California Building Standards Commission to rewrite their proposed EV code language to limit developer costs to $4500 per multifamily parking spot and to incorporate load management software for EV charging to prevent the expense and extra square footage required for additional transformers.

- **Use the power of example.** The joint initiative team also strove to promote collaboration, cooperation, and friendly competition by leveraging the power of peer examples. Berkeley and Menlo Park provided motivational examples of fellow cities taking innovative steps to achieve their climate action goals, and the joint team elevated those efforts to encourage other cities to appreciate what was possible and to encourage them to take similar actions. This created a "safety in numbers" scenario whereby each city could point to the others who were also working on reach codes thereby making their efforts look mainstream and reasonable.

Lessons Learned

- **Be bold.** When PCE and SVCE conceived of the joint reach code initiative they could not predict how their member agencies would respond, so they played it safe by developing reach codes that still allowed for natural gas end uses. They were surprised by the overwhelming preference for electric only options, and even more delighted by the large number of municipalities passing electrification reach codes. As a result, they encourage other CCAs to think bigger and to act boldly to set even greater precedents for the future.

- **Comprehensive teams can provide comprehensive services.** When PCE and SVCE began the effort, they started with a gap analysis to identify how they might best provide the resources necessary for their member agencies to pass reach code ordinances. Between the team's own internal resources and the expertise of external partners hired to join them, they addressed the most important needs of technical support, code development, stakeholder engagement, financial funding, and the creation of time-saving tools and templates. In hindsight, the team might have been further augmented by providing building officials and attorneys as well.

- **Plan for both public and private consultation.** While the joint initiative team planned and executed a wide range of public events, they discovered that some stakeholders were hesitant to speak in public forums for fear of disclosing their strategies or project details. Likewise, some issues required extensive discussion that need not involve a large group of people. To address these needs, the team also held an extensive series of one-on-one and small group conversations.

- **Give yourself enough time.** The joint initiative team planned for a sustained effort of 18 months from start to finish. Although the December 31, 2019 deadline to align with statewide building code updates served a useful purpose to motivate action, the timeframe was just minimally long enough to accomplish each of the phases of the effort. Some team members and city representatives indicated that stakeholder engagement and city deliberation could have benefited from further outreach and additional time.

- **Use technology to promote stakeholder collaboration and self-sufficiency.** The joint initiative team relied upon the strong relationships that the CCAs had with their member agencies and the member agencies had with each other. This fostered communication and collaboration through in person discussions, as well as by telephone and email. The team also created an online library of downloadable resources. However, this could have been further enhanced with the creation of Microsoft Teams channels that enabled stakeholders to exchange ideas, help one another, and learn from conversations where they were not originally included.

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