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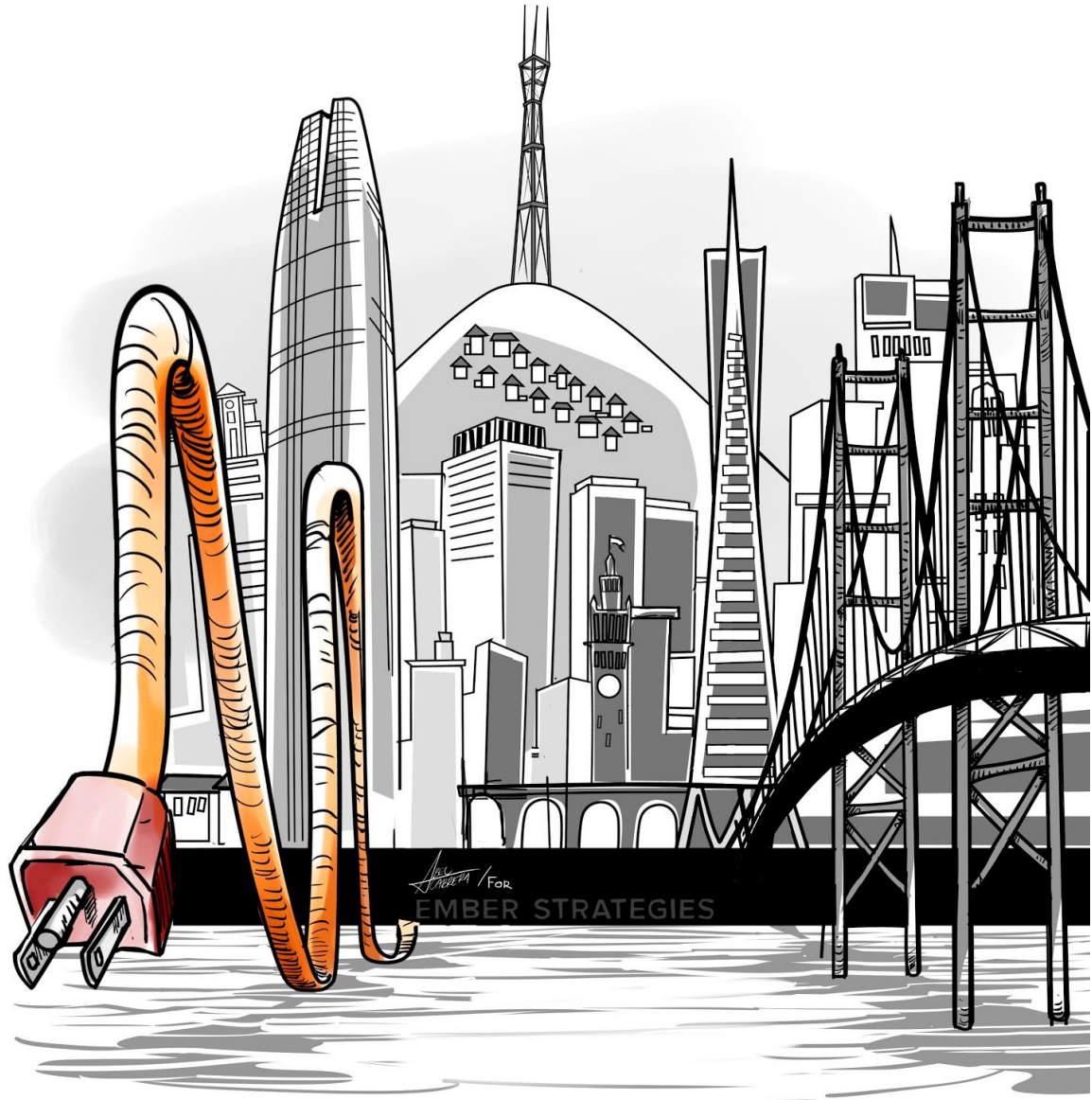
START A NEW FIRE.

Findings of the Work Groups Supporting Mayor Breed's Zero Emission Building Taskforce: Distillation and Cross Cutting Themes

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EXECUTIVE SUMMARY

The San Francisco Department of the Environment (SFE) has been deeply engaged with local stakeholders in support of Mayor Breed's [Zero Emission Building Taskforce](#) (ZEBT). Four Work Groups focused on individual real estate segments: New Construction, Existing Municipal Buildings, Existing Residential Buildings, and Existing Commercial Buildings. Ember Strategies worked with SFE staff to distill input from the Work Groups and identify cross cutting themes relevant to SFE's forthcoming Roadmap to Zero Emission Buildings.

The City of San Francisco is on track to reach zero emissions by 2050, having already halved total building emissions since 1990. Continued building decarbonization is only possible, however, by broadening the focus to also include eliminating carbon emissions from the burning of fossil fuels. Today's challenge is marked by realizing an accessible, affordable, and just transition to the full electrification of all buildings through space and water heating, cooking, and clothes drying while improving racial and social equity.

Each Work Group outlined, with remarkable consistency across the four market segments, how the City can facilitate building decarbonization. The San Francisco real estate community urged clear communication about present day and future expectations, including the consequences of inaction, informed by a firm understanding of building owners' needs, challenges, and timelines. Participants emphasized the importance of leveraging the available time and acknowledged the City's imperative to advance economic inclusion, social and racial equity, health, and affordability. The Work Groups also emphasized that a coherent, planned approach, backed by sector-specific support, will realize benefits more quickly and equitably. Each Work Group dove deeper, providing sector-specific insights into how the City can best support building decarbonization.

Stakeholders preferred a 'proactive empowerment' path to citywide building decarbonization which limits heavy-handed City interventions in favor of the City acting as a partner that helps building owners effectively plan and invest to achieve shared goals. A thirty-year timeline for electrifying all buildings in San Francisco is both achievable and a sound investment in a healthy, resilient, more prosperous, and more equitable future.

Owning a building in San Francisco is, essentially, owning a share in the city's future. When the city thrives, so too do building sector stakeholders. The ZEBT process has helped to identify and highlight the key considerations, concerns, and opportunities the City must navigate in order to swiftly, effectively, and equitably achieve shared building decarbonization goals.

BACKGROUND

“An all-electric City for buildings, residences and transportation is how the City leads the way towards an emissions-free future.”

- Mayor London Breed

April 22, 2019

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BACKGROUND

In September, 2018, Mayor Breed and Governor Brown hosted the [Global Climate Action Summit](#) in an effort to catalyze action towards the fulfillment of the Paris Climate Agreement by non-national governments, including companies, cities, and states. At the summit, more than 100 state and national governments, 70 large cities, and dozens of major companies committed to carbon neutrality by mid-century. These commitments built on early momentum established by the [Carbon Neutral Cities Alliance](#) (CNCA), a coalition of cities aimed at achieving carbon neutrality before 2050; San Francisco was a founding member.

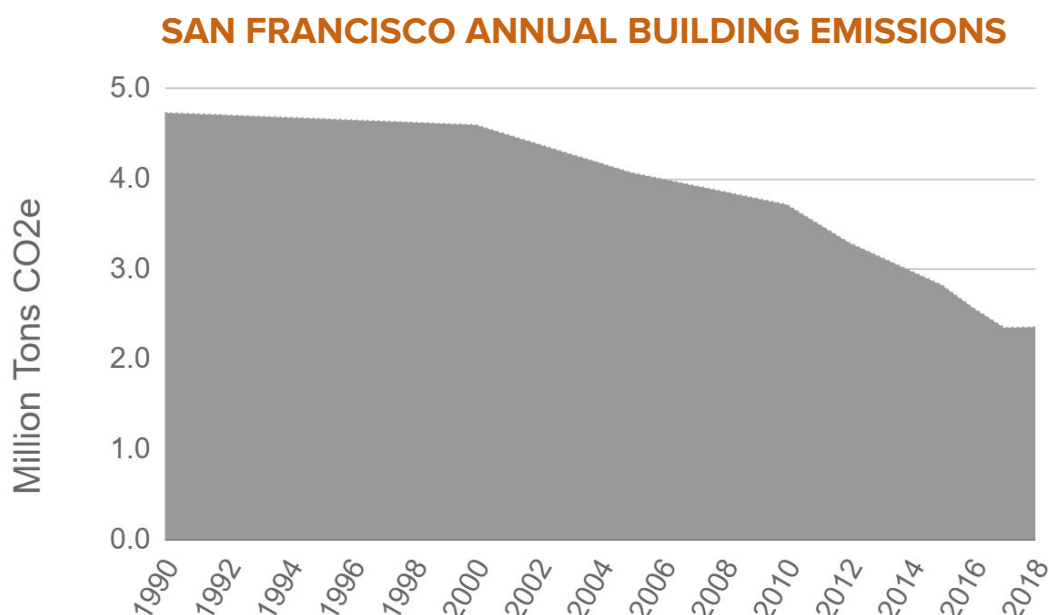
In pursuit of full decarbonization citywide, Mayor Breed joined 23 mayors from around the world in signing C40's [Net Zero Carbon Buildings Declaration](#), committing to eliminate carbon emissions from all new building construction in the city by 2030. In 2019, the San Francisco Board of Supervisors approved a [Declaration of Climate Emergency](#).

As cities across the globe begin to chart paths to a zero carbon future, leadership will be proven in the speed, efficacy, and equity of the transition. With a focus on the Triple-Bottom Line, San Francisco has an obligation to ensure that its environmental stewardship and its impressive economic growth in recent decades are not eclipsed by rising inequalities and the decline of affordability, access, and social justice. A San Francisco that has achieved full decarbonization in a just, inclusive, and equitable way will provide a leading example for the world to follow.

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BUILDINGS AND THE PATH TO ZERO CARBON

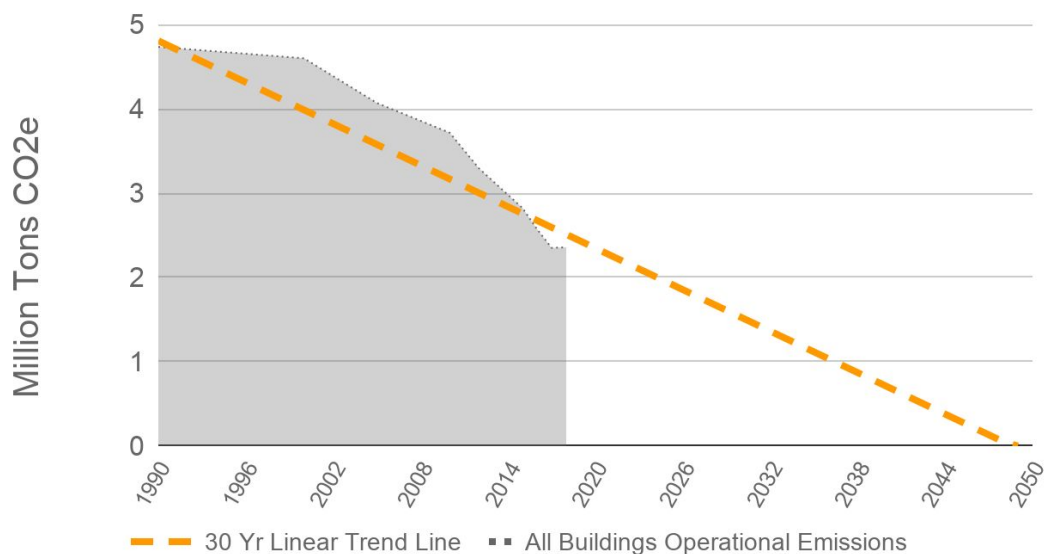
For decades, the City and County of San Francisco, its businesses, and its residents have worked together to reduce the environmental footprint of the built environment. Reducing greenhouse gas (GHG) emissions has required the participation of building owners, tenants, financiers, designers, builders, and service professionals, and with impressive results. Already, building efficiency and on-site renewable energy efforts by San Francisco businesses and residents have slashed emissions from buildings by 51% since 1990 ([SF Environment, 2020](#)).



Given progress to date from 1990, San Francisco is roughly on track to achieve full decarbonization by 2050; yet the strategies that have succeeded in getting this far are not compatible with the road ahead. The energy, policy, and technology landscape in 2020 is very different from what it was in 1990, 2000, or even 2010. The City of San Francisco must chart a new path forward, building upon the collective successes of the past while enabling and empowering the leadership actions of the future.

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SAN FRANCISCO BUILDINGS' 30-YEAR DECARBONIZATION PACE



Decarbonization of grid-supplied electricity is happening rapidly. San Francisco committed to 100% renewable electricity in 2008 ([Ordinance 81-08](#)) and recommitted in 2010 ([Mayoral announcement](#)). The Mayor's Renewable Energy Task Force, convened in 2011, published its [recommendations](#) in 2012. The San Francisco Department of the Environment (SFE) [Climate Storyboard](#) shows an 80% increase in electricity supplied from renewable sources from 2012 to 2018, from 38% to 69%. And, since 2016, community choice aggregation through [CleanPowerSF](#) has accelerated renewable energy supply.

Outside of the city, California's grid is decarbonizing. In late 2018, [SB 100](#) established a statewide goal of 100% carbon free electricity by 2045. Development of utility-scale renewable electricity means that the share of emissions resulting from the use of fossil fuels in buildings is increasing every year.

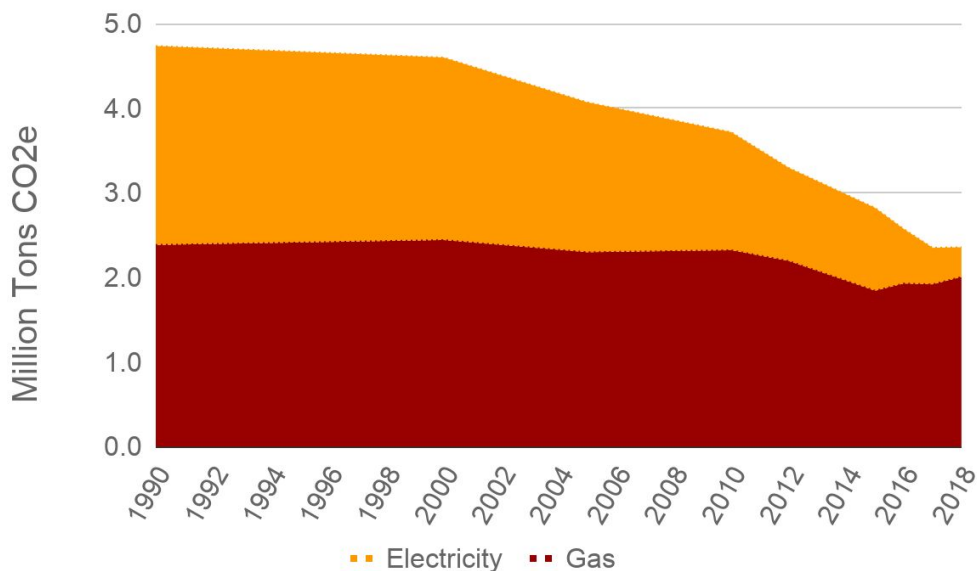
Electricity supplied to the City and County of San Francisco is already cleaner than natural gas, and increasingly so. The two electric utilities serving San Francisco are each making progress. Pacific Gas & Electric (PG&E), California's largest utility sources a growing proportion of electricity from renewable sources: 33% in 2017 and a state-mandated target of 50% by 2026 ([PG&E, 2018](#)). But even more dramatic has been the growth of the

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community choice aggregation program [CleanPowerSF](#) which through a partnership with PG&E has assumed responsibility for the vast majority of electricity supply in recent years. CleanPowerSF is managed by the San Francisco Public Utilities Commission (SFPUC), which also manages Hetch Hetchy Power, an independent electric utility that exclusively provides 100% carbon-free electricity. Between Hetch Hetchy and CleanPowerSF, SFPUC supplies more than 375,000 city residents and businesses with low-carbon or carbon-free electricity ([SFPUC, nd](#)), and is on track to meet San Francisco’s goal of supplying only 100% renewable electricity citywide by 2030.

Emissions from electricity use by buildings are on the path to zero. Recognizing that all electricity customers in San Francisco have the option to switch to 100% renewable electricity simply by selecting the cleanest product offered by their electricity provider, in 2019, Mayor Breed introduced an ordinance requiring the largest commercial buildings in the city to source all electricity from renewable energy by 2022. The law also requires commercial buildings greater than 250,000 square feet to convert to 100% renewable energy by 2024, and commercial buildings 50,000 square feet and larger to convert by 2030 ([SF Mayor, 2019](#)).

SAN FRANCISCO ANNUAL BUILDING EMISSIONS BY FUEL TYPE

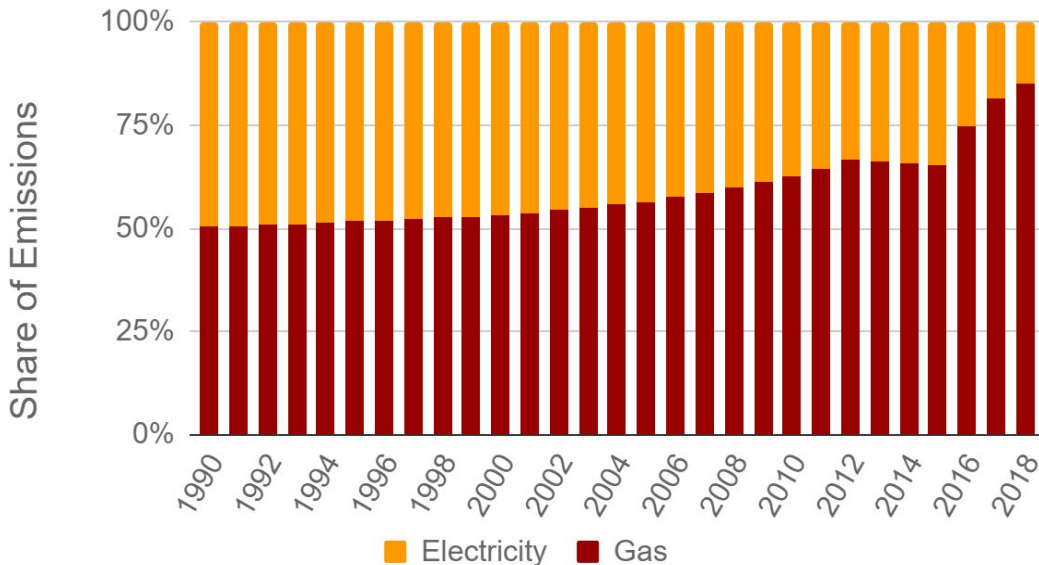


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Electrification of the remaining fossil fuel energy uses in San Francisco buildings is necessary to reach zero emissions. The total share of building emissions from on-site use of fossil fuels was 50% in 1990, but thanks to grid decarbonization site-burned fossil fuels now represent 85% of all emissions from all buildings in San Francisco.

In the near future, natural gas-fired boilers, water heaters, furnaces, ovens, ranges, and clothes dryers will comprise virtually all the greenhouse gas emissions from San Francisco’s buildings. Eliminating these emissions by switching to carbon-free, electric space and water heating, and creating what the Mayor has called an ‘all electric city,’ is now the clear path to zero emissions. Buildings can further facilitate the transition to an all-electric city by providing charging infrastructure for electric vehicles, generating renewable electricity on-site, making renewable energy go farther by continuing to invest in energy efficiency. Further, broad electrification will yield resilience benefits in terms of seismic preparedness – particularly when augmented by battery storage.

PROPORTION OF SAN FRANCISCO TOTAL ANNUAL BUILDING EMISSIONS BY FUEL TYPE



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These steps at the state and city levels are driving San Francisco and California towards meeting its goal of 100% clean electricity by 2030. In September, 2018, Mayor Breed pledged to work with the San Francisco real estate community to enact policies and regulations to ensure all new buildings are designed and built to operate at net zero emissions by 2030, and all existing buildings throughout the city meet the same zero emissions standard by 2050 ([SF Mayor, 2019](#); [SFE, 2018](#)). To do this, stakeholders and the City must wean themselves off of fossil fuels.

THE DECARBONIZATION GAME-CHANGER: A ROADMAP TO ZERO EMISSION BUILDINGS

San Francisco was awarded a “[Game Changer](#)” grant by the CNCA to develop a Roadmap to Zero Emission Buildings (Roadmap). The Roadmap is intended to align and build upon efforts already in place, underway, and envisioned. San Francisco departments and stakeholders will opportunistically implement actions and programs in order to inform their decarbonization plans with experience, proven concepts, and refine plans based on results.

The Roadmap will differentiate itself from other efforts through a focus on two key concepts: proactive empowerment and inclusive stakeholder engagement. If successful, San Francisco will achieve a zero emissions from the building sector well before 2050 as a result of thousands of individual decisions made by San Franciscans striving to improve their buildings, supported by regulation, public investment, and partnership between the City and San Francisco building owners.

The Roadmap will be built on a foundation of stakeholder input. SFE is utilizing Ember Strategies’ Empowerment Method, an evolutionary policy-setting approach developed with support from the Energy Foundation. The explicit goal of the Empowerment Method is to help government succeed by altering the social and legal contexts in which goals shared with the private sector are identified and collaboratively pursued. The Empowerment Method helps the City identify and focus on the unique issues and challenges faced by different building and ownership segments, driving action in areas where long-term interests are aligned. To guide development of the Roadmap, Mayor Breed convened the Zero Emission Building Taskforce.

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THE PATH TO EQUITABLE DECARBONIZATION: MAYOR BREED'S ZERO EMISSION BUILDING TASKFORCE

To reach zero emissions while ensuring equity and a just transition, the [Zero Emission Building Taskforce](#) (ZEBT) brought together diverse leaders across sectors. The Taskforce's objective has been to provide critical input to chart the course to zero emissions in the Roadmap, and inform the 2020 update to the Climate Action Plan.

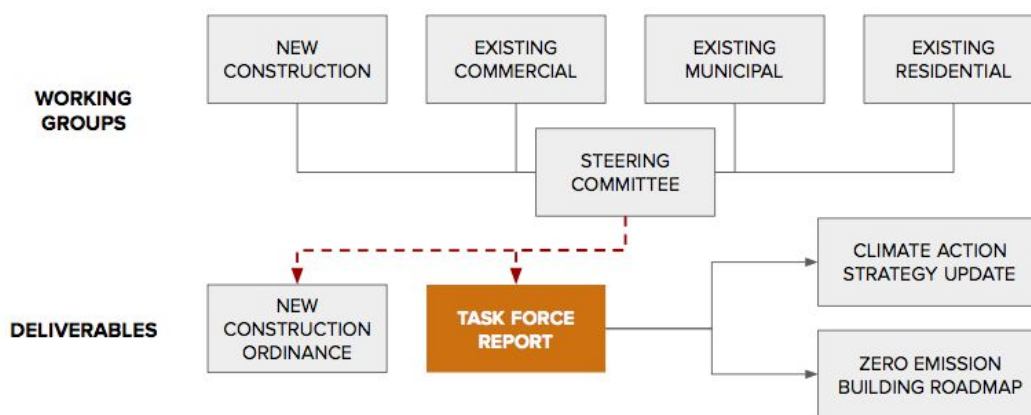
Through the ZEBT, the City solicited input on how to support local building owners' continued leadership in energy efficiency and clean energy, and to accelerate progress toward zero emissions buildings across the city by 2050. The ZEBT provides the critical input needed from across San Francisco real estate sectors to inform the development of the Roadmap to Zero Emission Buildings and an update to the Climate Action Plan. The feedback provided by the ZEBT will inform the development of policy solutions for all possible paths to decarbonization.

Four Work Groups comprised the ZEBT, each representing segments of the local real estate market -- new construction, existing commercial buildings, existing municipal buildings, and existing residential buildings. Coordinated by SFE, these four groups were organized under a broad Steering Committee, with public and private representation, that oversees the final set of findings and recommendations that will inform the Zero Emission Building Roadmap and the update to the Climate Action Strategy (see also [Acknowledgments](#)).

This report has been developed by Ember Strategies for SFE as a distillation of findings from the work groups and cross cutting themes. This report is a snapshot of what, in some cases, is an ongoing process, and aims to facilitate the transfer of the Taskforce's recommendations to SFE for consideration in the development of the Roadmap.

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MAYOR BREED'S ZERO EMISSION BUILDING TASKFORCE



The Work Groups met 16 times in total, in addition to seven public workshops. In all, more than 250 individuals participated, representing a wide range of professional, community, and organizational perspectives. Unfortunately, the process itself was forced online by the CoVid-19 pandemic, and some meetings were delayed or cancelled. Fortunately, the Work Groups had substantially completed their tasks before the shelter-in-place orders, and all groups benefited from in-person workshops early in the year.

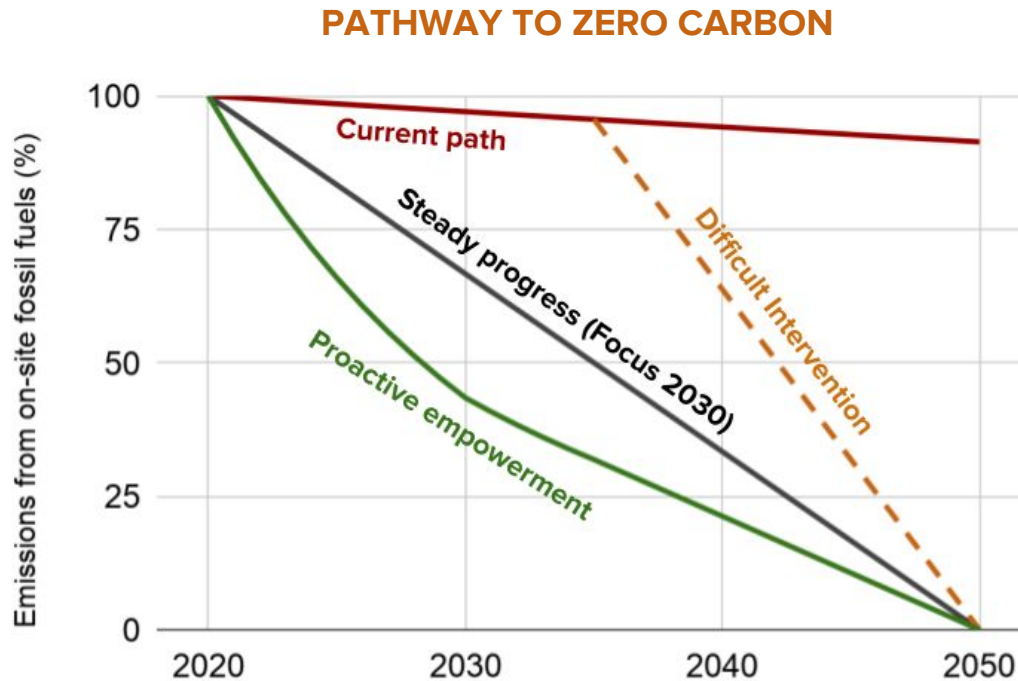
FRAMING THE PATHWAYS TO ZERO CARBON

Each Work Group tackled a version of the same question:

→ **How should the City support this sector in decarbonizing between now and 2050?**

In Work Group discussions, SFE prompted the consideration of multiple, plausible trajectories to zero and solicited sector-specific interpretations. The implications on emissions of some Work Group discussions were more explicit than others but in each Work Group participants accepted that electricity in San Francisco is already cleaner than fossil fuel use, and growing cleaner. Participants across all groups confronted the central challenge of transitioning on-site fossil fuel use (where carbon emissions can be reduced but not eliminated) to electricity use (where both efficiency and renewable electricity enable the elimination of carbon emissions). Success requires a focus on the reduction in emissions from the use of on-site fossil fuels.

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Realistically, the City must be prepared for all possible decarbonization trajectories and monitor progress to understand how and when to take action. The **‘current path’** trajectory is not sufficient to meet the City’s goal, and therefore intervention is required. Linear **‘steady progress’** simply visualizes the City’s carbon reduction goals over time, aligned with the trajectory outlined in 2019 in the [Focus 2030 report](#), but it is unclear how the city would achieve the “steady progress” trajectory through policy alone. The **‘difficult intervention’** path is the least desirable, where aggressive policy is the primary or sole approach and City regulators assume a more central role to achieve the goal. The difficult intervention path would require investment of greater resources for enforcement that could be better invested supporting San Francisco residents, building owners, and decision makers based on need, including racial inequity.

Conversely, buildings are real estate and require investment over time. Equipment must be maintained, and inevitably wears out. Facades decay. Land uses change. These practicalities create investment cycles – which provide opportunities. If the City aligns these existing ongoing investments with decarbonization, a faster, less resource-intensive trajectory of **‘proactive empowerment’** is plausible. This trajectory offers significant benefits

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beyond the ‘steady progress’ placeholder. Empowering building owners and decision makers to make decarbonization decisions where it is readily achievable and economically beneficial will yield health and resilience benefits more quickly and require less city resources. The returns on “**proactive empowerment**” effectiveness can be redeployed to support San Franciscans without the information and means to plan for decarbonization. These trajectories manifest differently in each market segment, with different implications for each Work Group.

The City must prepare for these plausible futures, and therefore regular evaluation of progress will be essential to recalibrate policies, programs and tools, and assure overall effectiveness. The Roadmap can transparently establish the mechanisms by which the City will determine if a sector is on track to decarbonize or, alternatively, if a change or policy intervention is required to reach the goal. The City can give stakeholders a window into City decision making and reinforce expectations for future action.

Decarbonization pathways are distinct in each sector. Each Work Group focused on distinct workstreams relevant to decarbonizing the sector. These include:

- The New Construction Work Group was asked to inform a proposal to require new buildings to be ‘all-electric’, including guidance on timing, applicability, implementation, equity implications, outreach, and workforce education. A prior ordinance prohibits natural gas in municipal buildings built after January 1, 2020.
- The Existing Residential Work Group was composed of participants in a pre-existing “[Anchor Partner Network](#)” (APN) aimed at developing strategies and goals for the equitable transition to zero emission residential buildings that will inform the 2020 update to San Francisco’s Climate Action Plan. The effort focused on complementary goals of residential building decarbonization, racial equity, and just transition.
- The Existing Municipal Buildings Work Group was asked to consider the financial planning process, prioritization, and funding needs for decarbonizing City buildings.

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- The Existing Commercial Buildings Work Group was asked to continue to lead on energy and carbon management. It was specifically asked how and how quickly the sector can decarbonize, and what tools and programs would be required to incorporate decarbonization into existing financial planning.

Professional facilitation and partners. The ZEBT enlisted the help of professional facilitators to get the most out of the private sector group discussions. [PODER](#) and the [Emerald Cities Collaborative](#) facilitated the Residential group discussion. [Common Spark Consulting](#) facilitated both the New Construction and Existing Commercial group discussions.

TASKFORCE FEEDBACK

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TASKFORCE FEEDBACK

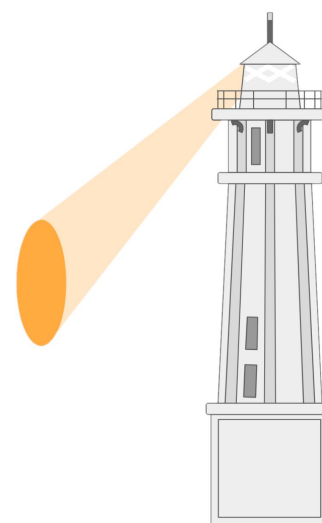
CROSS-CUTTING THEMES

Common themes emerged across the sixteen meetings held by the four Work Groups of the ZEBT effort, hosted over more than six months between 2019 and 2020.

THEME	FINDING	*FINE PRINT
CLARITY AND COMMITMENT	We must communicate about the future and eliminate barriers to action if we want to be effective.	<i>All building owners and decision makers need to know what will be expected of them, without ambiguity or City created barriers.</i>
TIME AND TIMING	Anticipation, planning, and resourcing are required.	<i>Missed opportunities must be avoided. Support for action is required, in sync with real estate cycles.</i>
VALUE AND VALUES	Electrification brings health, resilience, and decarbonization benefits.	<i>Processes, tools, and metrics must guide decision making to support racial equity and shared benefits for all.</i>
49 SQUARE MILES	We need a decarbonization masterplan that includes every neighborhood.	<i>Equitable decarbonization, modernizing the grid, attaining seismic benefits, and lowering costs all require a coordinated plan.</i>

Clarity and Commitment. Achieving zero emission buildings citywide by 2050 (or sooner) is possible, but it will require all stakeholders to understand expectations, roles and responsibilities. Clear, unambiguous, and consistent signals must be sent by the City (including all City offices and departments) to all relevant audiences about building electrification, the steps required to achieve it, and the costs of inaction. The City must communicate about the future, and be understood.

The City and County of San Francisco has a platform for communicating clearly and regularly with building owners about

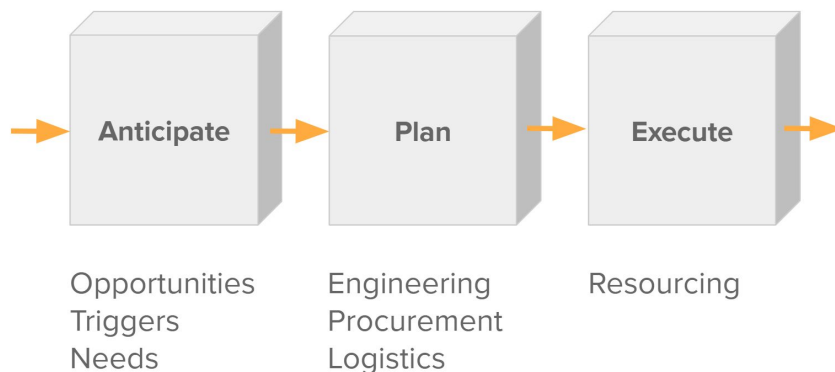


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decarbonization. Building owners will interact with the City countless times and ways over the next thirty years. In those moments, the City has an opportunity to send clear messages to support action, rather than mixed messages that encourage delay. The lack of clarity about the future is itself a barrier to decarbonization. The City must be a partner for the duration, ensuring that building owners, trades, and communities have the education and resources needed to make the transition as seamlessly and as equitably as possible. The City must evaluate its own impact and strive to improve policy and performance.

Time and Timing. All buildings in San Francisco will experience opportune moments for building electrification over the next thirty years. Every type, typology, and scale of building will be sold, substantially renovated, seismically retrofitted, or require new equipment or appliances. Thirty years is sufficient time for electrification opportunities to arise on their own across the building stock. These opportunities cannot be missed, and therefore planning is essential to ensure that all building owners are prepared to act upon opportunities that are part and parcel to existing real estate cycles.

The idealized process:

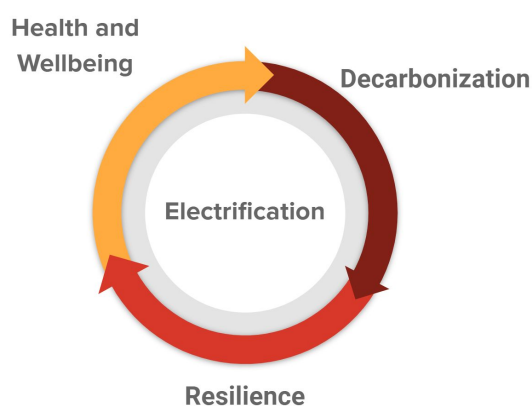


Planning is distinct for each sector and it also varies by ownership structure. Even so, all building owners navigate the various life cycles of building systems and equipment, As well as occupancy. The fundamentals of real estate management exist in all market segments, albeit in different forms, so the City’s expectations and support for planning must be tailored to each segment of the market. The City can support building owners and decision makers in planning and ultimately lower the cost of action for each building.

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The City can help educate building owners, and ensure that resources are available at the right time. The City has time, and all San Franciscans can benefit from advanced planning and early, proactive action.

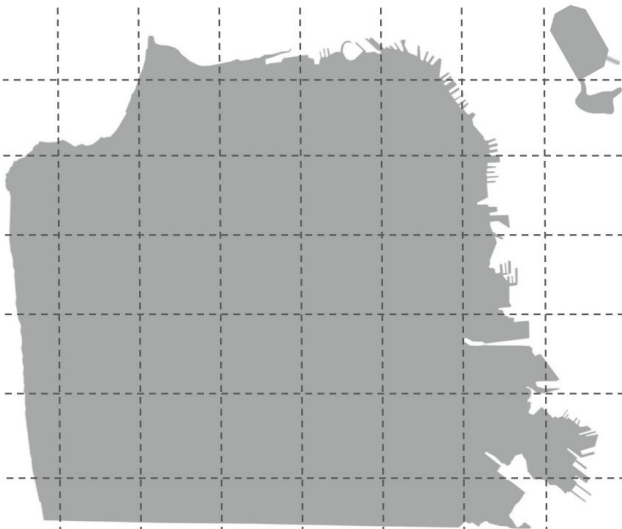
Value and Values. The road to decarbonization is lined with myriad opportunities to reinforce the City’s established priorities of economic inclusion, social and racial equity, health, affordability, livability, and more. Decarbonization favors electrification, but the additional benefits of healthier indoor air and seismic resilience reinforce that the future is electric. The City must ensure that the transition to all-electric is equitable and just, providing support and resources to those who need it most and strengthening pathways to good-paying, high road jobs. Broadening our conception of value to include health and wellbeing, resilience, and reducing carbon emissions helps to more clearly illuminate the many ways building electrification can produce co-benefits for San Franciscans.



The Triple Bottom Line – people, planet, and profit – can be combined with an innate sense of fairness. Through this lens it also becomes clear that ‘business as usual’ or doing nothing entails a **cost of inaction** financially, and when value is defined, more broadly as a Triple Bottom Line. When opportunities arise to replace or upgrade equipment, appliances, or building systems, the costs of action to respond to those opportunities are often clear, yet it is common to incorrectly assume the costs of inaction – of inadequate response – are ‘zero’. Failure to consider the cost of inaction results in missed opportunities, by exaggerating the cost of decarbonization, which must be avoided. For example, when a boiler must be replaced – whether due to imminent failure, decline in reliability, safety, or compliance with air pollution regulations, continued use of the boiler is tacit acceptance of maintenance cost, fuel cost and carbon emissions, health or safety compromise, and risk of failure – the cost of inaction is not zero. The City has a unique perspective from which it can support building owners and decision makers in identifying and quantifying the costs of inaction, both now and in the future.

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49 Square Miles. A full transition away from natural gas to all-electric buildings across the entire city will require substantial coordination and planning. Partnering and planning with the utility is essential so that a clear plan for phasing out natural gas infrastructure can complement individual decarbonization decisions. A piecemeal approach will only go so far since those who are slowest to electrify will bear increasing shares of the gas system's fixed costs as these costs are shared by fewer users, potentially exacerbating inequity for those without the resources to electrify. While every building decarbonized reduces climate risk, geographic coordination will be essential for equitable decarbonization. The resilience benefits of decarbonization multiply when an entire block or neighborhood eliminates the use of gas, thereby reducing fire risk and recovery time following seismic events.



Cities create masterplans when building new infrastructure. It would follow that decommissioning natural gas infrastructure and scaling up electric infrastructure capacity will require planning and coordination of a similar scale. The workgroups identified the need for a comprehensive, citywide approach to the transition to all-electric buildings akin to a masterplan.

Each of these themes is revisited, alongside many other insights and considerations, in the findings of the four Work Groups, summarized in the next four sections:

- [New Construction](#)
- [Existing Residential Buildings](#)
- [Existing Municipal Buildings](#)
- [Existing Commercial Buildings](#)

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WORK GROUP FEEDBACK

NEW CONSTRUCTION

The New Construction Work Group of the ZEBT was established to inform Supervisor Rafael Mandelman’s proposal to require new buildings in San Francisco to be “all-electric” (see [scope](#)). The City requested guidance on timing, applicability, implementation, and equity of the ordinance, as well as support and follow up necessary to successfully transition to all-electric new construction. The All Electric New Construction ordinance is part of a strategy to eliminate the health and safety risks from natural gas in all buildings, starting with new construction. Both Mayor Breed and Supervisor Mandelman demanded inclusivity in the process, and equity in implications.

From 2017-2019, Marin County, Palo Alto, San Francisco, and other California jurisdictions adopted local laws to incentivize all-electric design. These laws increased energy efficiency requirements for buildings that use natural gas, while maintaining requirements for all-electric buildings. In the past year, more than 30 local governments around California passed similar policies supporting electrification in new construction.

Several cities, including Berkeley, San Jose, and Menlo Park went further , eliminating natural gas – primarily in single-family homes and low-rise multifamily buildings. In 2020, San Francisco adopted an ordinance eliminating gas in newly constructed municipal buildings, and Supervisor Mandelman sought to take the next step: an ordinance eliminating natural gas from new construction altogether for the benefit of public health, fire safety, and climate action.

The group brought together participants from key perspectives, including community and neighborhood advocacy groups, affordable housing developers, commercial and residential owners and developers, investors, design professionals, environmental advocates, workforce and labor representatives, and City departments. Outreach spanned more than a dozen meetings and public events involving more than 750 people over six months (see [Acknowledgments](#)).

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Input provided by the New Construction Work Group is summarized in the following matrix, and further expanded in the paragraphs below, with a summary of relevant group discussions. See also a [summary of findings](#) published by Ember Strategies and SFE in June 2020 to support the advancing ordinance.

NEW CONSTRUCTION WORK GROUP INPUT	FINDING	*FINE PRINT
ACT NOW. DELAY WILL NOT MAKE TRANSITION EASIER.	Efficient zero emission technologies are available and fossil fuel systems in new construction will become liabilities for owners.	<i>An All-Electric City will take time to build. The Climate Emergency is underway. Stop adding to the problem. Demand spurred by new construction requirements will help the workforce evolve.</i>
HEALTH AND RESILIENCE ARE EQUITY IMPERATIVES.	Health, wellbeing and resilience support eliminating fossil fuels.	<i>After seismic events, electric service will recover much faster than gas - with implications for building operations. Electrification must not thwart housing development.</i>
FACILITATE SMART DECISIONS.	Projects in development will benefit from early warning; a clear, unambiguous message from the City will help.	<i>A rapid change in requirements will be felt strongly by a handful of projects already in design – but fixing the problem now avoids the need to retrofit in the future. Communicate now, so they have time to act.</i>
WORKFORCE DEVELOPMENT AND STAKEHOLDER EDUCATION ARE ESSENTIAL.	Zero emissions is a significant shift in design and construction practice.	<i>Successful implementation of the ordinance will require the City to invest resources in outreach and education, and to support workforce training.</i>

Act now. Delay will not make transition easier. The future is electric. It is urgent to halt future emissions by no longer constructing buildings that use natural gas. Leaders in design and construction are aware of the case for electrification and how to deliver it, but direct and consistent messaging from the City on the ‘all-electric’ future must continue. Costs are competitive and technology is available. Complexities for some use types (e.g. power supply for small in-fill projects, restaurant cooking methods, and complex process loads) may require exceptions in some cases. Clear and urgent communication from the City will spur already permitted projects (where a new mandate cannot apply) to consider electrification to avoid future re-engineering costs (e.g. if the building is to be sold).

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Health and resilience are equity imperatives. It is estimated that after a 7.9 earthquake it would take six months to restore service citywide, while electricity could be restored in a week ([San Francisco Lifelines Council, 2014](#)). Many stakeholders were not aware of the risk of extended outage for the gas network after a seismic event, or the health impacts of indoor fossil fuel combustion – the consequences of which are magnified for low-income communities and communities of color that suffer greater prevalence of asthma. The co-benefits of reducing these risks join carbon reduction to justify electrifying new construction. A focus on health and resilience also underscores that electrification must not delay the development of much-needed affordable housing.

Facilitate smart decisions. As San Francisco buildings decarbonize, natural-gas-using equipment will become a liability to be addressed. The City must communicate now, and repeatedly, with project teams and developers about this shift. Compared to all existing buildings, few projects are impacted, but the impact on individual projects nearing completion of design could be significant. Project costs grow with delay and redesign – and early notice mitigates the impact. By aligning City policies and programs, the City can send and reinforce a clear message of electrification and find creative ways to help owners and developers make timely, cost-effective decarbonization decisions. Coordinating with PG&E and SFPUC to ensure grid capacity and to provide a clear map of utility infrastructure can further inform building applicants' plans.

Workforce development and stakeholder education are essential. Growth of all-electric projects will spur the workforce to evolve. To support the growth and retention of a diverse workforce, as well as a just transition, it will be necessary for construction training and workforce development programs to train workers on installation and maintenance of zero carbon electric equipment and provide the pathways to employment necessary to construct the All-Electric City. In parallel, design and construction professionals understand the City's message that policy has changed and electrification is necessary, cost effective, and technically feasible. This City must invest in education and partner with local institutions and utilities to support a successful transition.

For more detailed meeting agendas, notes, presentations and information on the ordinance, see SF Environment's web page: [Zero Emission Building Taskforce](#).

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WORK GROUP FEEDBACK

EXISTING RESIDENTIAL BUILDINGS

The Existing Residential Buildings Work Group of the ZEBT was established to inform the City's plans to decarbonize all residential buildings through building electrification by mid-century. To more deeply explore opportunities, challenges, needs, and aspirations across the community, the San Francisco Department of the Environment convened an [Anchor Partners Network](#) (APN) and relied upon this existing initiative as an enhanced, residential Work Group.

Co-facilitated by Emerald Cities San Francisco and PODER, two organizations that focus on the intersection of equity and clean energy, the APN worked collaboratively on identifying the path to an equitable transition to all-electric homes across San Francisco by 2050. The group focused its discussions on building electrification and its intersection with the workforce, affordable housing, single family and multifamily housing, and social and racial equity. The APN fostered constructive dialogue among residents, community organizations, advocacy groups, engineers, contractors, labor representatives, and various City departments. In addition to the feedback collected that will inform the Roadmap to Zero Emission Buildings, APN discussions covered a wider array of issues, opportunities, and recommendations that will inform the City's forthcoming update to the Climate Action Plan.

The APN convened for its discussions beginning in November 2019, hosting four in-person workshops in various locations across the city. Due to the onset of the COVID-19 pandemic, the concluding public workshop summarizing stakeholder recommendations was held online in May 2020. The results are documented in the *Anchor Partner Network Strategies for Building Decarbonization and Equity in San Francisco*, which will inform both the Climate Action Plan update and the Roadmap to Zero Emission Buildings.

The following matrix and discussion are a distillation of recommendations from the APN, highlighting cross-cutting themes and findings relevant to the entire Taskforce.

EMBER STRATEGIES

EXISTING RESIDENTIAL WORK GROUP INPUT	FINDING	*FINE PRINT
FIRST. DO. NO. HARM.	Prevent pass-through to tenants of inappropriate costs and allow decarbonization benefits to accrue to all residents.	<i>Maintain affordability. Prevent unintended consequences of inflation and displacement. No “renovictions.”</i>
HEALTHY, SAFE, AND RESILIENT HOUSING FOR ALL.	The future will bring heat, smoke and seismic events. Electrification and efficiency are the right things to do.	<i>In-home combustion is a health and resilience problem. A minimum housing standard should not include fossil fuels.</i>
HELP THOSE WHO NEED IT MOST.	Direct funding and technical assistance to bridge the gap between need and means. Tailor policy triggers & tools to the needs of each segment.	<i>Low-income homeowners and affordable housing require particular focus, including removing barriers to supplying housing.</i>
BUILD THE HIGH ROAD WORKFORCE.	Increase expertise of local contractors and prioritize disadvantaged workers.	<i>Today’s workforce will need to learn and evolve, and everyone should have a path to join.</i>
PROTECT AND BUILD EQUITY WHILE DECARBONIZING ENERGY INFRASTRUCTURE.	As we electrify, those left behind may bear a greater share of gas infrastructure costs. Partner and plan to fix this.	<i>The road to electrification is an opportunity to be inclusive, leave no one behind, and prioritize racial and social equity.</i>

First. Do. No. Harm. The City is in a housing affordability crisis as it embarks on decarbonization. Protecting vulnerable residents from undue cost inflation, displacement, or other harms is essential. To electrify, some occupant disruption is expected but the City must protect low- and moderate-income residents and owners from harassment and evictions caused by renovations (“renovictions”), inappropriate cost pass-throughs, and other wrongs known to deepen existing housing insecurity and racial inequality.

Healthy, safe, and resilient housing for all. Low-income populations and communities of color are affected “first and worst” by the impacts of climate change. Clean air is essential for health and wellbeing. Frequent hot days and wildfires only increase the importance of clean indoor air, and we now have better energy options than burning natural gas indoors. Building electrification also reduces fire risks and speeds up recovery from predictable earthquake disruptions. San Franciscans deserve good quality housing that is safe and healthy, and this is an opportunity to make improvements for all residents and communities, citywide.

EMBER STRATEGIES

Help those who need it most. Some San Franciscans will need more assistance with building decarbonization than others, particularly low-income owners and owners of deed-restricted affordable housing. Voluntary approaches are preferred and new funding sources, programs, and incentives can help ensure timelines are met. The City must also take proactive measures to ensure renters don't see increased housing and utility costs. Building decarbonization can also provide an opportunity for local economic development. Coordinating across departments and with the state, the City should partner with residents to find the lowest cost, highest reward opportunities at the right time and remove barriers to bringing affordable housing to market.

Build the high road workforce. Building electrification is an opportunity to cultivate and expand the workforce for jobs with pathways to financial security (“high road”). Decarbonization must channel investment into local businesses, including Minority, Women, and Disabled Veteran Business Enterprises (MWDVBEs). Culturally competent education and training is needed. New City programs (e.g. a “Clean Energy Buildings Hub”) can help, prioritizing disadvantaged workers while also generating demand for work.

Protect and build equity while decarbonizing energy infrastructure. Building electrification must be inclusive and just, and create opportunities for all. A proactive, collaborative decarbonization masterplan is needed to prioritize social and racial equity and ensure real protections for all residents, especially for communities of color, low-income owners, and minority residents. As we decarbonize, the City must not allow those who remain connected to the natural gas network to bear the burden of long-term fixed system costs.

For more detailed meeting agendas and notes, see SF Environment’s web page:

[Zero Emission Building Taskforce.](#)

EMBER STRATEGIES

WORK GROUP FEEDBACK

EXISTING MUNICIPAL BUILDINGS

The Existing Municipal Buildings Work Group of the ZEBT was established to map the pathway and policy changes required for full decarbonization of municipal buildings by mid-century. Municipal buildings have received 100% GHG-free electricity since 2011, and new municipal buildings built after January 1, 2020 are being designed and constructed all-electric (without natural gas).

The municipal buildings stock in the City and County of San Francisco includes a wide range of building types - from MUNI stations, jails, and the airport to utility structures, schools, and office buildings. Common challenges in these buildings include deferred maintenance, large boilers, and long leases with few opportunities to renegotiate, among others. In addition, the Municipal Code grants authority over building management decisions to San Francisco Public Works for many projects but not all, resulting in decentralized decision making authority. Several departments and commissions oversee buildings in their domains, including the Municipal Transportation Agency, Airport, Port, Public Utilities, and Recreation and Park Commissions. As a result, representatives from these and several other city departments collaborated in the Work Group's discussions.

The Work Group convened for a total of four meetings, and will continue to meet to inform the Roadmap. Given the complex interdepartmental collaboration required, participants spent considerable time mapping process flows necessary to plan and execute decarbonization across a decentralized portfolio, including early steps like reconnaissance, scoping and feasibility, funding and optimizing and, ultimately, implementation.

Input provided by the Existing Municipal Buildings Work Group is summarized in the following matrix and further expanded in the paragraphs below, with a summary of relevant group discussions.

EMBER STRATEGIES

EXISTING MUNICIPAL WORK GROUP INPUT	FINDING	*FINE PRINT
KNOW THE PORTFOLIO.	To plan decarbonization, staff need easy access to integrated data sources describing municipal buildings	<i>Information is available, but it will be an effort to integrate datasets, fill in gaps, and perform assessments. Selection and deployment of a shared platform or common schema will be a significant lift.</i>
BE STRATEGIC AND OPPORTUNISTIC.	Align departments to capture easy wins, address complex situations, and fulfill emissions commitments.	<i>With proper guidance, evaluative frameworks, and feedback loops, the City can learn continually and improve with every iteration.</i>
SEEK THE HIGHEST VALUE, INCLUDING CO-BENEFITS.	Integrated planning is not just about operations, but excellence.	<i>The economic, health and resilience impacts of public investments are as important as technology selection.</i>
EVOLVE THE FUNDING MODEL.	There will always be financial constraints. We need to find creative solutions.	<i>Total Cost of Ownership is critical to capturing avoided cost and delivering value to the taxpayer.</i>
PURSUE A GEOGRAPHIC APPROACH.	Leverage development patterns and relationships with private sector partners in decarbonization masterplanning.	<i>The City needs to leverage development patterns and relationships with private sector partners. Engagement with PG&E, early and often, will be critical.</i>

Know the portfolio. The disaggregation of building system data and decision making authority across agencies is a barrier to decarbonization. The City must collaborate to combine data sets in a centralized bank of building information data (not limited to electrification) and fill gaps. A software solution with common language made accessible to all relevant departments could help communicate project priorities and support decision making for facility needs assessments (FNAs).

Be strategic and opportunistic. Simple decarbonization projects can be quickly identified and implemented. Other, more complex projects may yield significant emissions reductions but require additional planning, e.g. maintaining services for vulnerable populations. Not falling behind will require City processes, metrics, training, and tools to identify and pursue both types of projects, while utilizing feedback to inform continuous improvement. The City should leverage its position and lead the way, making the most of funds invested in building electrification by aiming to achieve broader strategic goals.

EMBER STRATEGIES

Seek the highest value, including co-benefits. Using public tax dollars is a hefty responsibility. With limited resources and competing demands, the City must deliver the highest possible value - for carbon reduction and its health and resilience co-benefits. This requires the right solutions to the right problems in the right order, avoiding half measures. Like-for-like equipment replacement is insufficient. Triple-Bottom Line accounting can ensure that electrification also yields economic and social dividends.

Evolve the funding model. Limited funding availability can limit the pursuit of truly strategic projects, keeping big projects that deliver even bigger benefits from serious consideration. A revised, 4-part funding model (reconnaissance, scoping and feasibility, funding and optimizing, and implementation) could help navigate departmental constraints. Including the cost of inaction and/or the Total Cost of Ownership (e.g. building resilience and avoiding loss of functionality) can spur creative solutions.

Pursue a geographic approach. Utility-side planning is complicated for the City, as SFPUC and PG&E both have roles to play. Synchronizing electrification efforts in municipal buildings with those of the utility and of neighboring buildings will support utility infrastructure investment planning and maximize the benefits of decarbonization. City departments are not always in a position to initiate collaboration, but they would support and participate, helping to facilitate an orderly transition.

For more detailed meeting agendas and notes, see SF Environment's web page: [Zero Emission Building Taskforce](#).

EMBER STRATEGIES

WORK GROUP FEEDBACK

EXISTING COMMERCIAL BUILDINGS

The Existing Commercial Buildings Work Group of the ZEBT was established to inform how to most effectively implement the Mayor’s vision of an all-electric city by 2050, including fully decarbonized commercial buildings. The City sought input on how commercial buildings would electrify over time within the context of capital planning cycles. Participants articulated how the City could assist commercial building owners in the transition.

The energy transformation is well underway in San Francisco’s commercial buildings. Already supplied by electricity that is increasingly sourced from renewable energy, large existing commercial buildings citywide will eliminate emissions from electricity consumption by 2030 (see [page 9](#)). Owners of commercial buildings of all sizes are exploring how to begin planning their switch to all-electric for space- and water-heating.

The group included commercial real estate owners, tenants, designers, and consultants; local and national environmental groups, utility representatives, and various city departments. The group was professionally facilitated by [Common Spark Consulting](#). In addition, a public workshop was hosted in March, via webinar, to solicit further feedback and ideas.

Input provided by the Existing Commercial Buildings Work Group is summarized in the following matrix, and further expanded in the paragraphs below, with a summary of relevant group discussions.

EMBER STRATEGIES

EXISTING COMMERCIAL WORK GROUP INPUT	FINDING	*FINE PRINT
SEND A STRONG, CLEAR SIGNAL.	Large commercial buildings must decarbonize by 2035.	<i>Large buildings may have resources, but struggle with complexity and timing. Small buildings can act, but lack resources.</i>
PLANNING IS KEY.	The City must help owners create an electrification plan, and implement that plan over strategically, leveraging investment over time.	<i>The economic, health and resilience impacts of investments are as important as technology selection.</i>
BE REASONABLE.	City-supported pilots and case studies are needed. Technologies and approaches must improve. Capital planning cycles are key.	<i>The City must provide options and flexibility. Systems outside owner's direct control (district steam, tenant equipment, etc.) are known issues.</i>
REWARD AND VALIDATE SUCCESS.	Motivate building decarbonization with credible recognition of success.	<i>The recognition needs to be public in the local market and recognized by ESG reporting mechanisms likeGRESB.</i>
INVESTIGATE A COMPLEMENTARY GEOGRAPHIC APPROACH.	We need a decarbonization masterplan.	<i>Network and resilience benefits accrue block by block. Gas rates are driven by fixed costs, creating equity concerns as the system shrinks.</i>

Send a strong, clear signal. Decarbonization of the largest, most complex buildings in the city is feasible by 2035, but only if the City sends a clear, unambiguous signal. Without the signal, the transition will not happen. A 15 year period includes a full capital planning cycle – leveraging investment in maintenance and improvements is key to progress towards the goal, and budgeting over time affords opportunity to improve time to streamline technical and engineering resources, align other government policies and incentives, and develop new electric solutions for some use cases. Smaller buildings will more commonly be able to directly adopt common technology, but may need time to identify financial resources.

Planning is key. San Francisco building owners plan for many future needs, but do not currently plan for decarbonization. The City should partner with building owners and decision makers to plan for electrification, supporting the development of plans consistent with – and building upon – commercial real estate capital planning processes. Pilots and case studies can be very helpful, as can supporting technology development for use cases where the current solutions are inadequate.

EMBER STRATEGIES

Be reasonable. Every building is different. Complexities present real challenges, especially for small- and medium-sized businesses. Building owners do not always control all the building's energy-using equipment and tenants also have preferences. Significant systems outside owners' direct control (e.g. district steam infrastructure as well as tenant gas equipment, such as restaurants) present complexities, and mutual responsibilities. Build momentum by requiring planning and recognizing efforts to execute – and provide flexibility where needed.

Reward and validate success. Buildings are apt to fully decarbonize if their achievements can be officially validated in a way that can be used in ESG (environment, social, governance) reporting and visible to the public, such as the Global Real Estate Sustainability Benchmark (GRESB) scheme, which has demonstrated the ability to motivate action by influencing investment. Building upon ESG reporting will help commercial buildings continue to demonstrate sustainability performance while influencing the maturation of ESG investment programs.

Investigate a complementary geographic approach. Grid capabilities and service requirements inform the engineering solutions to electrify a facility or campus, and electric utilities study those requirements in response to a request by a customer – and grid capacity allocated to one building influences infrastructure available to its neighbors. A block-by-block plan for decarbonization can help building owners and utilities plan and prepare. City-utility collaboration and planned phasing is essential to ensure that natural gas ratepayers are not burdened with the system cost as other ratepayers disconnect from the system. When gas is removed from a block, all buildings benefit from reduced fire risk.

For more detailed meeting agendas and notes, see SF Environment's web page:

[Zero Emission Building Taskforce](#).

EMBER STRATEGIES

NEXT STEPS

“Gas has no place in San Francisco.”

- Mayor London Breed

San Francisco Energy Fair, February 25, 2020

EMBER STRATEGIES

NEXT STEPS

The ZEBT Work Groups convened for sixteen meetings and public workshops over more than six months. The collaborative discussions provided a strong, early foundation for partnership between the City and various industry and community stakeholders as San Francisco lights the path toward becoming an all-electric city.

This document provides a snapshot of a public engagement and policy development process that, in due course, will inform the development of:

- 1. The Roadmap to Zero Emission Buildings** (the City's plan, led by the San Francisco Department of the Environment, to decarbonize and electrify all buildings in San Francisco by 2050);
- 2. Draft legislation by the Board of Supervisors** (an effort, led by Supervisor Mandelman, prohibit the use of natural gas in newly constructed buildings, in support of the City's commitment to zero emission buildings by 2050); and
- 3. An update to the San Francisco Climate Action Plan** (the City's comprehensive plan on greenhouse gas emissions reduction from transportation, waste, urban forestry, and -- with the help of the ZEBT -- buildings).

Presently, all three are expected to move forward in the remaining months of 2020.

Owning a building in San Francisco is, essentially, owning a share in the city's future.

When the city thrives, so too do building sector stakeholders, but the path towards that prosperous future will vary. Drawing from the wide-ranging Work Group discussions, the ZEBT process has helped to identify and highlight the key considerations, concerns, and opportunities the City must navigate in order to swiftly, effectively, and equitably achieve its shared building decarbonization goals.

A thirty-year timeline for electrifying all buildings in San Francisco is achievable. It's best to start right away.

EMBER STRATEGIES

APPENDIX

EMBER STRATEGIES

ABOUT EMBER STRATEGIES

Ember Strategies is a boutique strategy consulting firm located in San Francisco. Ember has been supporting leading companies, cities, NGOs and philanthropies thinking long term about real estate and the built environment since 2013. This report was written by Lane Wesley Burt, P.E., and Jeremy Sigmon.

ACKNOWLEDGMENTS

The Zero Emission Building Taskforce would not have been possible without generous time commitments and contributions from hundreds of people, including members of the public, city staff from several departments and offices, and key partners and stakeholders in the San Francisco real estate community. Their efforts will have laid the foundations for the next thirty years of collaborative work towards a fully decarbonized and all-electric city. Many more opportunities for constructive engagement lie ahead.

To view the list of participants in the Taskforce and Work Groups, visit SF Environment's web page: [Zero Emission Building Taskforce](#).

SUMMARY MATRICES

Input from each of the four Work Groups of the Zero Emission Building Taskforce, and a summary of the cross-cutting themes, have been compiled into a one-page matrix.

Matrices are presented in the following order:

- [Cross-Cutting Themes](#)
- [New Construction](#)
- [Existing Residential Buildings](#)
- [Existing Municipal Buildings](#)
- [Existing Commercial Buildings](#)

EMBER STRATEGIES

CROSS-CUTTING THEMES

THEME	FINDING	*FINE PRINT
CLARITY AND COMMITMENT	We must communicate about the future and eliminate barriers to action if we want to be effective.	<i>All building owners and decision makers need to know what will be expected of them, without ambiguity or City created barriers.</i>
Achieving zero emission buildings citywide by 2050 (or sooner) is possible, but it will require all stakeholders to understand expectations, roles and responsibilities. Clear, unambiguous, and consistent signals must be sent by the City (including all City offices and departments) to all relevant audiences about building electrification, the steps required to achieve it, and the costs of inaction. The City must communicate about the future, and be understood.		
TIME AND TIMING	Anticipation, planning, and resourcing are required.	<i>Missed opportunities must be avoided. Support for action is required, in sync with real estate cycles.</i>
All buildings in San Francisco will experience opportune moments for building electrification over the next thirty years. No matter the building type, buildings will be sold, substantially renovated, seismic retrofitted, and require new equipment or appliances. Thirty years is sufficient time for ample electrification opportunities to arise through replacement and renovation. These opportunities cannot be missed, and therefore planning is essential to ensure that all building owners are prepared to act within existing cycles.		
VALUE AND VALUES	Electrification brings health, resilience, and decarbonization benefits.	<i>Processes, tools, and metrics must guide decision making to support racial equity and shared benefits for all.</i>
The road to decarbonization is lined with myriad opportunities to reinforce the City's established priorities of economic inclusion, social and racial equity, health, affordability, and livability. Decarbonization motivates electrification, but the benefits of healthier indoor air and seismic resilience reinforce that the future is electric. The City must ensure that the transition to all-electric is equitable and just, providing support and resources to those who need it most and strengthening pathways to good-paying, high road jobs. Broadening our conception of value to include health and wellbeing, resilience, and carbon helps to more clearly illuminate the many ways that building electrification can produce many co-benefits for San Franciscans.		
49 SQUARE MILES	We need a decarbonization masterplan that includes every neighborhood.	<i>Equitable decarbonization, modernizing the grid, attaining seismic benefits, and lowering costs all require a coordinated plan.</i>
A full transition away from natural gas to all-electric buildings across the entire city will require substantial coordination and planning. Partnering and planning with the gas utility is essential so that a clear plan for phasing out natural gas infrastructure can complement individual decarbonization decisions. A piecemeal approach will only go so far since those without the resources to electrify will bear increasing shares of the gas system's fixed costs as these costs are shared by fewer users. As a result, geographic coordination is also essential for equitable decarbonization. All of this underscores the need for a comprehensive, city-wide approach to the transition to all-electric buildings akin to a masterplan.		

EMBER STRATEGIES

NEW CONSTRUCTION

NEW CONSTRUCTION WORK GROUP INPUT	FINDING	*FINE PRINT
<p>ACT NOW. DELAY WILL NOT MAKE TRANSITION EASIER.</p>	<p>Efficient zero emission technologies are available and fossil fuel systems in new construction will become liabilities for owners.</p>	<p><i>An All-Electric City will take time to build. The Climate Emergency is underway. Stop adding to the problem. Demand spurred by new construction requirements will help the workforce evolve.</i></p>
<p>The future is electric. It is urgent to halt future emissions by no longer constructing buildings that use natural gas. Leaders in design and construction are aware of the case for electrification and how to deliver it, but direct and consistent messaging from the City on the 'all-electric' future must continue. All-electric technology is available and its costs are competitive. Complexities for some use types (e.g. power supply for small in-fill projects, restaurant cooking methods, and complex process loads) may require exceptions in some cases. Clear and urgent communication from the City will spur already permitted projects (where a new mandate cannot apply) to consider electrification to avoid future re-engineering costs (e.g. if the building is to be sold).</p>		
<p>HEALTH AND RESILIENCE ARE EQUITY IMPERATIVES.</p>	<p>Health, wellbeing and resilience support eliminating fossil fuels.</p>	<p><i>After seismic events, electric service will recover much faster than gas - with implications for building operations. Electrification must not thwart housing development.</i></p>
<p>Many stakeholders are not aware of outage times for the electrical systems compared to the gas network after a seismic event, or the health impacts of indoor combustion of fossil fuels – the consequences of which are magnified for low-income communities and communities of color that already suffer greater prevalence of asthma due to indoor and outdoor air quality. It is estimated that after a 7.9 earthquake it would take six months to restore gas services citywide, while electricity could be restored in less than a week (San Francisco Lifelines Council, 2014). These co-benefits join carbon reduction to justify electrifying new construction. A focus on health and resilience also underscores that electrification must not delay the development of much-needed affordable housing.</p>		
<p>FACILITATE SMART DECISIONS.</p>	<p>Projects in development will benefit from early warning; a clear, unambiguous message from the City will help.</p>	<p><i>A rapid change in requirements will be felt strongly by a handful of projects already in design – but fixing the problem now avoids the need to retrofit in the future. Communicate now, so they have time to act.</i></p>
<p>As San Francisco buildings decarbonize, any new natural-gas-using equipment will become a liability for building owners. The City must communicate now, and repeatedly, with project teams and developers about this shift. Compared to all existing buildings, few projects are impacted, but the impact on individual projects nearing completion of design could be significant. Project costs grow with each delay and any time redesign is required. In all cases, earlier notice mitigates the impact. By aligning City policies and programs, the City can send and reinforce a clear message of electrification and find creative ways to help owners and developers make timely, cost-effective decarbonization decisions. Coordinating with PG&E and SFPUC to ensure grid capacity and to provide a clear map of utility infrastructure can further inform building applicants' plans.</p>		
<p>WORKFORCE DEVELOPMENT AND STAKEHOLDER EDUCATION ARE ESSENTIAL.</p>	<p>Zero emissions is a significant shift in design and construction practice.</p>	<p><i>Successful implementation of the ordinance will require the City to invest resources in outreach and education, and to support workforce training.</i></p>
<p>Projects transitioning to all-electric new will spur the workforce to evolve. To support the growth and retention of a diverse workforce, as well as a just transition, it will be necessary for construction training and workforce development programs to train workers on installation and maintenance of zero carbon electric equipment and provide the pathways to employment necessary to construct the All-Electric City. In parallel, design and construction professionals understand the City's message that policy has changed and the necessary electrification is both cost effective and technically feasible. This City must invest in education and partner with local institutions and utilities to smooth out the learning curve and support a successful transition.</p>		

EMBER STRATEGIES

EXISTING RESIDENTIAL BUILDINGS

EXISTING RESIDENTIAL WORK GROUP INPUT	FINDING	*FINE PRINT
FIRST. DO. NO. HARM.	Prevent pass-through to tenants of inappropriate costs and allow decarbonization benefits to accrue to all residents.	<i>Maintain affordability. Beware the unintended consequences of inflation and displacement. No “renovictions.”</i>
The City is in the midst of a housing affordability crisis as it embarks on decarbonization. Protecting residents from possible risks of undue cost, displacement, or other harms is essential. The City must protect low- and moderate-income residents and owners from harassment and evictions caused by renovations (“renovictions”), inappropriate cost pass-throughs, and other wrongs known to deepen existing inequality.		
HEALTHY, SAFE, AND RESILIENT HOUSING FOR ALL.	The future will bring heat, smoke and seismic events. Electrification and efficiency are the right things to do.	<i>In-home combustion is a health and resilience problem. A minimum housing standard should not include fossil fuels.</i>
Clean air is essential for health and wellbeing. Frequent hot days and wildfires only increase the importance of clean indoor air, and we now have better energy options than burning natural gas indoors. Building electrification also reduces fire risks and speeds up recovery from predictable disruptions from earthquakes. San Franciscans deserve good quality housing and this is an opportunity to make improvements for all residents and communities, citywide.		
HELP THOSE WHO NEED IT MOST.	Direct funding and technical assistance to bridge gaps between need and means. Tailor policy triggers & tools to the needs of each segment.	<i>Low-income owners and affordable housing may require particular focus, including removing barriers to supplying housing.</i>
Some San Franciscans will need more assistance with building decarbonization than others, particularly low-income owners and owners of deed-restricted affordable housing. New funding sources, programs, and incentives can help ensure timelines are met. Building decarbonization can be an opportunity for local economic development. Coordinating across departments and with the state, the City should partner with residents to find the lowest cost, highest reward opportunities at the right time and remove barriers to bringing affordable housing to market.		
BUILD THE HIGH ROAD WORKFORCE.	Increase expertise of local contractors and prioritize disadvantaged workers.	<i>Today’s workforce will need to learn and evolve, and everyone should have a path to join.</i>
Building electrification is an opportunity to cultivate new jobs with pathways to financial sustainability (“high road”). Decarbonization can channel investment into local business, including Minority, Women, and Disabled Veteran Business Enterprises (MWDVBEs). Culturally competent education and training is needed. New City programs (e.g. a clean energy buildings hub) can help, prioritizing disadvantaged workers.		
PROTECT AND BUILD EQUITY WHILE DECARBONIZING ENERGY INFRASTRUCTURE.	As we electrify, those left behind may bear a greater share of gas infrastructure costs. Partner and plan to fix this.	<i>The road to electrification is an opportunity to be inclusive, leave no one behind, and prioritize racial and social equity.</i>
Building electrification must be inclusive and just, and create opportunity for equitable advancement. A proactive, collaborative decarbonization masterplan is needed to prioritize social and racial equity and ensure real protections for all residents, especially for communities of color, low-income owners, and minority residents. As we decarbonize, the City must not allow those who remain connected to the natural gas network to bear undue burden.		

EMBER STRATEGIES

EXISTING MUNICIPAL BUILDINGS

EXISTING MUNICIPAL WORK GROUP INPUT	FINDING	*FINE PRINT
KNOW THE PORTFOLIO.	To plan decarbonization, staff need easy access to integrated data sources describing municipal buildings	<i>Information is available, but it will be an effort to integrate datasets, fill in gaps, and perform assessments. Selection and deployment of a shared platform or common schema will be a significant lift.</i>
The disaggregation of building system data and decision making authority across agencies is a barrier to planning for decarbonization. The City must collaborate to collect and integrate building information data (not limited to electrification). A software solution with common language made accessible to all relevant departments could help communicate project priorities and support decision making for facility needs assessments (FNAs).		
BE STRATEGIC AND OPPORTUNISTIC.	Align departments to capture easy wins, address complex situations, and fulfill emissions commitments.	<i>With proper guidance, evaluative frameworks, and feedback loops, the City can learn continually and improve with every iteration.</i>
Simple decarbonization projects can be quickly identified and implemented. Other, more complex projects may yield significant emissions reductions but require additional planning, e.g. maintaining services for vulnerable populations. Not falling behind will require City processes, metrics, training, and tools to identify and pursue both types of projects, while utilizing feedback to inform continuous improvement. The City should leverage its position and lead the way, making the most of funds invested in building electrification by aiming to achieve broader strategic goals.		
SEEK THE HIGHEST VALUE, INCLUDING CO-BENEFITS.	Integrated planning is not just about operations, but excellence.	<i>The economic, health and resilience impacts of public investments are as important as technology selection.</i>
With limited resources and competing demands, the City must deliver the highest possible value - for carbon reduction and its health and resilience co-benefits. This requires the right solutions to the right problems in the right order, avoiding half measures. Like-for-like equipment replacement is insufficient. Triple-Bottom Line accounting can ensure electrification yields economic and social dividends.		
EVOLVE THE FUNDING MODEL.	There will always be financial constraints. We need to find creative solutions.	<i>Total Cost of Ownership is critical to capturing avoided cost and delivering value to the taxpayer.</i>
A revised, 4-part funding model (reconnaissance, scoping and feasibility, funding and optimizing, and implementation) could help navigate departmental constraints. Including the cost of inaction and/or the Total Cost of Ownership (e.g. building resilience and loss of functionality) can spur creative solutions.		
PURSUE A GEOGRAPHIC APPROACH.	Leverage development patterns and relationships with private sector partners in decarbonization masterplanning.	<i>The City needs to leverage development patterns and relationships with private sector partners. Engagement with PG&E, early and often, will be critical.</i>
Utility-side planning is complicated for the City, as SFPUC and PG&E both have roles to play. Synchronizing electrification efforts in municipal buildings with those of the utility and of neighboring buildings will support utility infrastructure investment planning and maximize the benefits of decarbonization. City departments are not always in a position to initiate collaboration, but they would support and participate, helping to facilitate an orderly transition.		

EMBER STRATEGIES

EXISTING COMMERCIAL BUILDINGS

EXISTING COMMERCIAL WORK GROUP INPUT	FINDING	*FINE PRINT
SEND A STRONG, CLEAR SIGNAL.	Large commercial buildings must decarbonize by 2035.	<i>Large buildings may have resources, but struggle with complexity and timing. Small buildings can act, but lack resources.</i>
Decarbonization is feasible by 2035, but only if the City sends a clear, unambiguous signal. Without the signal, the transition will not happen. This 15 year period includes a full capital planning cycle to progress towards the goal, and allows time to streamline technical and engineering resources, align other government policies and incentives, and develop new electric solutions for some use cases. Smaller buildings may be able to use currently available technology, but may need time to identify financial resources.		
PLANNING IS KEY.	The City must help owners create an electrification plan, and implement that plan strategically, over time.	<i>The economic, health and resilience impacts of investments are as important as technology selection.</i>
San Francisco building owners plan for many future needs, but do not currently plan for decarbonization. The City should partner with building owners and decision makers to plan for electrification, supporting the development of plans consistent with commercial real estate capital planning processes. Pilots and case studies can be very helpful, as can supporting technology development for use cases where the current solutions are inadequate.		
BE REASONABLE.	City-supported pilots and case studies are needed. Technologies and approaches must improve. Capital planning cycles are key.	<i>The City must provide options and flexibility. Systems outside owner's direct control (district steam, tenant equipment, etc.) are known issues.</i>
Every building is different – and this variation presents real challenges, especially for small- and medium-sized businesses. Building owners do not always control all the building's energy-using equipment and tenants also have preferences. There will be complexities (e.g. emissions from district steam, tenant demand for gas, and restaurants). The City should consider exemptions or extensions for those with plans showing efforts to execute.		
REWARD AND VALIDATE SUCCESS.	Motivate building decarbonization with credible recognition.	<i>The recognition needs to be public in the local market and recognized by ESG reporting mechanisms like GRESB.</i>
Buildings are far more apt to fully decarbonize if their achievements are officially validated in a way that can be used in ESG (environment, social, governance) reporting to inform investment in resilience, and are visible to the public. GRESB is a great example – and a valuable potential partner. Helping commercial buildings continue to demonstrate fiduciary responsibility through sustainability improvement will help attract investment in a shared and prosperous future.		
INVESTIGATE A COMPLEMENTARY GEOGRAPHIC APPROACH.	We need a decarbonization masterplan.	<i>Network and resilience benefits accrue block by block. Gas rates are driven by fixed costs, creating equity concerns as the gas network shrinks.</i>
Coordinating highly localized plans for decarbonization can help building owners and utilities plan and prepare. Building owners need to understand grid capacity and service requirements for electrification. Presently, utilities engineer distribution upgrades in response to requests by individual customers. City-utility collaboration and planned phasing are essential to ensure natural gas ratepayers are not burdened with undue cost as other ratepayers disconnect from the system. The benefit of reduced fire risk accrues to an entire block when gas piping serving the block is decommissioned – which only occurs when the final gas user on that block disconnects.		

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