Energy Research and Development Division
FINAL PROJECT REPORT

Energize Fresno

California Energy Commission

Edmund G. Brown Jr., Governor

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PREFACE

The California Energy Commission's Energy Research and Development Division supports energy research and development programs to spur innovation in energy efficiency, renewable energy and advanced clean generation, energy-related environmental protection, energy transmission and distribution and transportation.

In 2012, the Electric Program Investment Charge (EPIC) was established by the California Public Utilities Commission to fund public investments in research to create and advance new energy solution, foster regional innovation and bring ideas from the lab to the marketplace. The California Energy Commission and the state's three largest investor-owned utilities – Pacific Gas and Electric Company, San Diego Gas and Electric Company and Southern California Edison Company – were selected to administer the EPIC funds and advance novel technologies, tools and strategies that provide benefits to their electric ratepayers.

The Energy Commission is committed to ensuring public participation in its research and development programs that promote greater reliability, lower costs and increase safety for the California electric ratepayer and include:

- Providing societal benefits.
- Reducing greenhouse gas emission in the electricity sector at the lowest possible cost.
- Supporting California's loading order to meet energy needs first with energy efficiency and demand response, next with renewable energy (distributed generation and utility scale), and finally with clean conventional electricity supply.
- Supporting low-emission vehicles and transportation.
- Providing economic development.
- Using ratepayer funds efficiently.

The *Energize Fresno Final Report* is the final report for the Energize Fresno project (EPC-15-067) conducted by the Local Government Commission. The information from this project contributes to Energy Research and Development Division's EPIC program.

For more information about the Energy Research and Development Division, please visit the Energy Commission's website at www.energy.ca.gov/research/ or contact the Energy Commission at 916-327-1551.

ABSTRACT

The Energize Fresno program integrates advanced energy community strategies into current and future projects for increased grid reliability, efficiency, and resource conservation to overcome local and state level barriers to deployment of district scale advanced energy technologies.

The Energize Fresno program has been a coordinated, community-based planning initiative to design a roadmap for developing an energy opportunity zone (EOZ) - a concentration of projects, initiatives, and programs - along the Blackstone Corridor and within downtown Fresno.

The portfolio, which includes 15 building projects, two broader programs, and two electric vehicle charging infrastructure projects, involves commercial and residential projects across a range of building types and neighborhoods. Implementing the full portfolio is estimated to cost $35.1 million and save participants $4.6 million annually net of financing costs (average portfolio wide payback period of seven years), and generate nearly $1 million annually in positive cash flow from:

- 9.4 gigawatt-hours (GWh) in annual savings from energy efficiency.

- 296,000 terms of annual savings in natural gas.

- 17.2 GWh in on-site distributed solar.

- 9.4 MW in peak demand reduction from demand response and grid interactive on-site electricity storage.

- 7,340 metric tons (metric ton equals roughly 2,205 pounds) in annual greenhouse gas emissions reductions.

The Energize Fresno resources will be available to local government staff outside of the City of Fresno as a case study and tools, which can be replicated to expedite developing advanced energy communities in other localities in California.

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Introduction and Background

Fresno is at a crossroads. Fresno is an economic hub for California's San Joaquin Valley and an important political and cultural center for the region. The city has struggled for decades with chronic poverty, under-employment, and some of the most severe environmental burdens in the state. Climate change is increasing temperatures, water systems stress, grid reliability issues, and air quality problems on the area. These affect local communities and the region's agriculture-based economy. Fresno is at a competitive disadvantage to address these increasing concerns. Funding opportunities are also largely siloed, forcing Fresno to combine funding sources to cover project costs and meet state greenhouse gas emission reduction goals.

An *advanced energy community* is a community that uses technologies and strategies to improve electrical grid reliability and resiliency and increase energy efficiency, renewable energy, smart grid, and zero net energy technologies. The Energize Fresno design is intended to update aging infrastructure and energy systems with advanced energy community technology that minimizes the potential burdens. Key features include mixed land use, community engagement, and development within existing communities. The process also ensures alignment with local planning, programs, and development with state goals and funding resources. Advanced energy community strategies are built into current and future projects, creating opportunities for district-scale use. By using community plans and improvements, Energize Fresno offers an opportunity for Fresno and communities across the state to enter into a more sustainable energy and resource future.

Fresno has affordable land, opportunities for infill development, access to major highways, an airport, and the California High-Speed Rail line. Looking ahead, these resources help position Fresno to serve as a hub for emerging industries, a source of new jobs, and a leader in developing housing to help meet its own needs and those of California.

Project Purpose

Fresno spends more than $2.6 billion annually on imported electricity, natural gas, and petroleum for its energy uses. These costs will only increase with the changing climate. As an advanced energy community, Fresno could minimize community energy costs with more efficient buildings, increased self-generation, and increased use of electric vehicles. Research by the project team indicates that most of Fresno County's energy demand could be met through today's advanced energy technologies.

Large portions of Fresno, including the Energize Fresno project area, are ranked in the top 10 percent in CalEnviroScreen. The CalEnviroScreen is a mapping tool that helps identify California communities most affected by pollution and where the population is most vulnerable to pollution's effects. A score in the top 10 percent identifies Fresno as one of the most pollution-burdened cities in the state. This makes renewable energy and efficiency a public health and environmental justice issue as well as a climate goal.

Distributed generation (including solar photovoltaic panels, wind, and combined heat and power systems) and electric vehicle infrastructure (such as charging systems) have great potential to address years of automobile-dependent urban design, low urban efficiency, and disproportionately high energy cost burdens on some of the most disadvantaged populations in the state. However, Fresno's overburdened electrical grid places concrete constraints on any efforts to launch necessary grid-tied technologies. To build a thriving community, Fresno must adopt fundamental changes to the energy and environmental systems on which the community depends. The Energize Fresno Master Community Design clears a direct path toward achieving this vision.

Project Process

Launched with $1.5 million in grant funding from the California Energy Commission, the Energize Fresno program has been a coordinated, community-based planning initiative to design a roadmap for developing an energy opportunity zone in Fresno. The *energy opportunity zone* is a concentration of projects, initiatives, and programs along the Blackstone Corridor and within Downtown Fresno. This roadmap involved an extensive planning process of more than 18 months conducted by the Energize Fresno team. The goal was to identify a district-scale portfolio of projects based on input from a wide range of community stakeholders and robust technical analysis. The final portfolio includes 15 buildings, two activity centers, and electric vehicle infrastructure. The building improvement designs, buildings sites and activity centers, include a mix of energy efficiency, renewable energy, and energy storage.

The Energize Fresno process started with the analysis of stakeholder, developer, and financial capacity to create an advanced energy community through the *Energize Fresno Community Delivery Capacity Report* and the *Energize Fresno Community Scope Report*. The reports detailed community vision and capacity among various stakeholder groups to support the development of an advanced energy community. These two community reports guided the project selection process in the energy opportunity zone, with successful projects showing alignment with community priorities, vision, and need.

Based on the portfolio of projects selected, the Energize Fresno team created a series of reports and tools (such as a policy map and a nontraditional funding kit), and developed a framework for funding, measuring, and verifying projects and benefits. The Energize Fresno team engaged the community and industry stakeholders at every step of the process, conducting technical advisory committee meetings and one-on-one meetings, to ensure the results reflect a realistic community vision. Based on this stakeholder engagement, the team worked to create tools reflecting the requirements of various stakeholders. Such tools include a policy map, which will help local governments attribute resource savings to specific state-level policies, and a funding toolkit, which will help users find non-traditional funding sources for advanced energy projects.

These tools, a funding database and measurement and verification documentation, helped the team put together the final *Energize Fresno Comprehensive Project Pipeline Report*, and create

the *Energize Fresno Master Community Design* that provides a package of information for Fresno decision makers to shepherd along the development of an advanced energy community.

The tools and framework that informed the report can be used by future advanced energy communities to take the first steps along the development process before investing significant resources into a process that is uncertain. Moreover, the process is built on a real world scenario, alleviates identified barriers such as chronic poverty, underemployment, and environments problems in the area) and uses the standard municipal planning and policy framework showing future cities that the threshold to participating in creating an advanced energy community is lower than anticipated.

The Energize Fresno team formed a local technical advisory committee (TAC) and a statewide technical advisory committee. The local technical advisory committee included representatives from local government, regional government entities, nonprofits, community organizations, educational institutions, developers, and businesses to solicit broader local stakeholder input on specific items. While the primary purpose of the local advisory committee was to guide the strategy and focus of the overall Energize Fresno program strategy and help focus the program on suitable project types, technologies, and geographic areas, committee also served as an avenue to identify specific potential projects and engage new project partners to the program. The local TAC met on a quarterly basis to review project status and provide feedback. Between meetings, committee members were engaged on specific project elements, such as program design and community engagement strategies, and encouraged to continue engaging with their respective communities.

The statewide TAC composed of diverse thought leaders, gathered broad feedback on program design, replicability in other cities, and scaling the financial component of the program. The statewide TAC met quarterly to discuss topics such as the feasibility of rolling portfolios (projects that change with time) to fund advanced energy projects in future applications, the value of grid services, and the best approach to layering funding for commercial and municipal projects. Feedback and ideas generated during statewide technical advisory committee meetings were used to refine program goals, designs, and metrics

Project Results

The Energize Fresno Master Community Design offers Fresno a vision of becoming the kind of community necessary to address today's challenges while preparing for tomorrow's opportunities. The design provides a model for future cities to navigate creating complex advanced energy communities. Thanks to documentation and key templates, future cities will have the tools to help reduce project selection time, communicate the benefits of a specific project to assure local and state policy alignment, and craft innovative project financing portfolios that are necessary for district-scale installation of advanced energy community technologies.

Additional key results include a model policy for the Fresno. The modification of an existing policy to align with advanced energy community principles demonstrates how other cities already have the tools and vision to create their own policies, as well as a template to follow.

The model policy is a key step in the included discussion on integrating advanced energy community practices. This discussion outlines how the Master Community Design is only the first step in creating an advanced energy community – without a policy that encourages development to follow advanced energy community principles, we don't believe that ongoing development will continue. Future communities stand to gain considerably if they are able to use a modified policy to achieve their energy goals without new, burdensome policy creation.

Future development relies on the city's ability to align community vision with available funding sources and aggressive energy targets.

Included in the master community design is the Energize Fresno portfolio - which includes 15 building projects, two broader programs, and two electric vehicle charging infrastructure projects. The portfolio includes commercial, municipal, and residential projects across a range of building types and neighborhoods. The Energize Fresno project team will provide technical assistance and grant funding administration while projects in the portfolio will be implemented by private developers.

These tools, created in an iterative process during the Energize Fresno Phase I planning process, were created to address specific needs that were identified while creating the master community design. Combined these tools and resources alleviate much of the initial burden on municipal resources that prevents communities from developing an advanced energy community.

Benefits to California

The Master Community Design integrates the principles of an advanced energy community by providing a portfolio of projects and programs that contribute to grid reliability and resilience, increase energy efficiency and renewable energy, and use smart grid and zero-net energy technologies. The proposed portfolio, processes, and resources offer Fresno a strong and viable pathway towards becoming an advanced energy community. If implemented, the master community design will help position the city for sustainable growth. The master community design shows how clean energy investment in new and existing development can result in substantial energy and cost savings for the building owners, residents, and the city. Ratepayers in Fresno will be able to save on energy costs via lower bills while experiencing less pollution and increased energy security. The city will be better equipped to meet state decarbonization goals and serve as a model of renewable energy and resiliency for the San Joaquin Valley.

Implementing the full portfolio is estimated to cost $35.1 million, using various funding streams, save participants $4.6 million annually net of financing costs (average portfolio-wide payback period of seven years), and generate nearly $1 million annually in positive cash flow. It is also estimated to provide 26.6 gigawatt hours in annual savings from energy efficiency and on-site distributed solar, and reduce annual greenhouse gas emissions by 7,340 metric tons. These savings will encourage future California cities to replicate this process and similarly save money while reducing GHG emissions.

The complete proposed portfolio would require a range of city policies and a strong community stakeholder engagement process. Given the nature of the portfolio, it can serve as a model for future investments and support a more resilient and prosperous Fresno.

In addition to describing specific project proposals for near-term implementation, the Energize Fresno process and documentation are a resource for future stakeholders. The documentation provides a transparent description of the processes and tools used to identify, select, and analyze projects. It allows future decision-makers to continue to optimize the value of projects in Fresno past the scope of the original 15 building projects. Beyond Fresno, these tools - such as a funding database, project "prefilters," and process documentation-can be adapted for use in other cities, allowing future advanced energy projects to proceed more quickly and efficiently. The Energize Fresno team believes that these tools and the accompanying documentation have the potential to reduce or eliminate many of the barriers that communities face when contemplating creating an advanced energy community.

Communities are diverse and the path to becoming an advanced energy community can be obscure and complex. A common theme expressed by local stakeholders was the need for support coordinating, designing, and funding sustainable projects. The Energize Fresno team was able to provide the necessary level of support for Fresno; however, future communities may be limited in their capacity to address certain obstacles. The Energize Fresno resources are publicly available as a case study and tools at [Fresno Master Community Design](#). These resources can be used to replicate many of the processes developed in the Energize Fresno project, hopefully eliminating certain capacity barriers by reducing the amount of staff time and expertise needed to initiate development of an advanced energy community project, and providing clear input channels for outside technical assistance. Together, these resources and processes stand to expedite development of advanced energy communities in other localities in California and hopefully avoid many of the barriers, preventing advanced energy community development, and increase their chances of success. However, major barriers still remain if supplemental funding sources are not provided to increase adopting advanced energy communities.

CHAPTER 1:
Purpose

Need

The State of California is committed to reducing its greenhouse gas emissions to 1990 levels by 2020 and 40% below 1990 levels by 2030. To support its decarbonization goals, the state has been working towards achieving a 50% renewable energy portfolio by 2030, doubling of energy efficiency savings in existing buildings by 2030, and placing 1.5 million electric vehicles on the road by 2025. Meeting these goals depends on local governments taking a holistic approach to updating aging infrastructure and energy systems that will support emerging energy needs. Energize Fresno[1] wants to increase the ability of city governments to align local planning, programs, and development with state goals. This is especially critical for low-income regions with limited resources that struggle to keep up with new energy demands.

To date, there has not been a structured process at the state level for coordinating and navigating the disparate funding sources and development tools[2] available for construction and infrastructure projects. Most funding opportunities are sector-specific (such as energy, transportation, water) rather than dedicated to integrated climate mitigation and resilience efforts or whole building and project infrastructure demands, forcing communities to combine a variety of funding sources to cover project costs. Some funding streams result in gaps in funding for necessary non-capital investments in project selection and approval processes (for example. planning, and community engagement, outreach). Communities with fewer resources and lower overall capacity are at a competitive disadvantage for preparing grant applications that often require a high degree of technical knowledge and more staff time than can be allotted.

Moreover, the difficulty of coordinating siloed funding often impedes projects that provide multiple, holistic benefits. Most state grants specify a particular solution to achieve state goals, which could be limiting in the case that the funded solution is not the most effective way to meet state goals. State agencies also require significant staff time to review grant applications and reporting documents from grant recipients. Together, fragmented funding sources and development tools, combined with complex grant requirements, undermine the ability of local governments to respond effectively to community needs and create the right opportunities.

Fresno is a city of rich cultural, ethnic, and linguistic diversity that has been shaped by decades of unlimited sprawl, contributing to inequitable and disinvested neighborhoods and districts. Although a major economic hub for the Central Valley and an important political and cultural

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1 The Energize Fresno program integrates advanced energy community strategies into current and future projects for increased grid reliability, efficiency, and resource conservation to overcome local and state level barriers to using district-scale advanced energy technologies.

2 For example, design approaches that make it difficult to combine and value the installation of multiple distributed energy resource projects.

center for the region, Fresno has struggled for decades with some of the most severe environmental burdens in the state,[3] as well as chronic poverty and underemployment.[4] Energize Fresno consultants' estimate that Fresno County spends more than $2.6 billion annually on imported electricity, natural gas, and petroleum for its energy uses. These costs will only be exacerbated by a changing climate. It is estimated that total damages from climate change could cost Fresno County 6.1% of its regional gross domestic product (GDP[5]) and increase the county's energy consumption by 10% by the end of the century.[6] These concerns contribute additional pressures to the region's increased heat issues, water system stresses, and intensified air quality problems.

As an advanced energy community (AEC), Fresno could minimize an increase in community energy costs through more efficient buildings, increased self-generation and increased viability of electric vehicles. In fact, research by the project team indicates that most of Fresno County's energy demand could be met through today's advanced energy technologies. This determination has the potential to convert much of the county's energy cost into distributed energy resources[7] that create wealth in the form of jobs and locally owned assets. This conversion could be achieved through expanded infrastructure and a more automated, resource-efficient city with optimized building systems that can respond to grid events such as Flex Alerts[8] or summer critical peak pricing. With new infrastructure upgrades and technologies, Fresno would have the additional capacity necessary to attract redevelopment and catalyze economic growth, becoming a hub for innovation, revitalization, and prosperity for the San Joaquin Valley and California.

In total, the Energize Fresno portfolio is estimated to have an average, portfolio-wide payback of roughly seven years at a total cost of $35.1 million, save participants $4.6 million annually net of financing costs, and generate nearly $1 million annually in positive cash flow through the following components:

- 9.4 gigawatt hours (GWh) in annual savings from energy efficiency
- 296,000 therms of annual savings in natural gas
- 17.2 GWh in on-site distributed solar
- 9.4 megawatts (MW) in peak demand reduction from demand response and grid interactive on-site electricity storage
- 7,340 metric tons in annual greenhouse gas emissions reductions

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3 CalEnviroScreen: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30

4 City of Fresno Consolidated Plan: https://www.fresno.gov/darm/wp-content/uploads/sites/10/2016/11/PY-2015-2019-Final-Consolidated-Plan.pdf

5 For reference, Fresno's regional GDP in 2013 was $37 billion.

6 http://www.governing.com/topics/transportation-infrastructure/gov-counties-climate-change-damages-economic-effects-map.html

7 Distributed energy resources are defined by the Energy Commission as "small-scale power generation technologies (typically in the range of 3 to 10,000 kilowatts) located close to where electricity is used (for example, a home or business) to provide an alternative to or an enhancement of the traditional electric power system." http://www.energy.ca.gov/glossary/glossary-d.html

8 Flex Alerts are calls to consumers to voluntarily conserve electricity when there is a predicted shortage of energy supply.

Purpose of Agreement

With Fresno's desire to address its increasing economic and environmental burdens and state leaders calling for a more integrated approach to financing and funding infrastructure projects, former Fresno Mayor Ashley Swearengin and other local leaders approached the Local Government Commission (LGC) to lead the grant application effort to develop a new approach to scale out financing for sustainable growth. The City of Fresno, Fresno Metro Ministry, CALSTART[9], and Tierra Resource Consultants, LLC, partnered with LGC to form the Energize Fresno team.

The Energize Fresno effort was awarded by the California Energy Commission's Electric Program Investment Charge (EPIC) Advanced Energy Communities grant to fund the development of a roadmap for Fresno to build an AEC, including a project pipeline, funding platform, a master community design, and other resources for the pilot in Fresno. An *advanced energy community* (AEC) as defined by the Energy Commission, denotes communities that employ technologies and strategies to improve electrical grid reliability and resiliency, increase use of energy efficiency, renewable energy, smart grid, and zero net energy technologies. The Energy Commission was interested in an approach that could scale and accelerate AECs in the state, viewing this as a critical component to achieving California's clean energy and energy resiliency goals.

The Energize Fresno EPIC AEC agreement expected to:

- Develop a comprehensive business and financial model for Fresno that encourages coordinated funding, project integration, and deeper project savings.
- Allow decision makers, investors, and agencies to verify and report more comprehensive resource savings from projects completed within AECs.
- Enable more efficient and effective access to, and application of, state agency and private sector funds for developing comprehensive, district-scale business models and a financial model platform to expedite the development of AECs in California.
- Model implementing an AEC at a district scale as proof of concept that can be replicated in other areas of Fresno and in other cities.

Ranked as one of the most disadvantaged communities in California, Fresno is an ideal city in which to pilot Energize Fresno's Advanced Energy Community process. Along with being culturally, racially, and socioeconomically diverse, the city saw significant cuts to government energy capacity during the economic recession of 2007-2012. Through this pilot project, Energize Fresno could benefit this uniquely disadvantaged and culturally rich community by effectively capturing deep resource and cost savings, leveraging funding, and increasing local government energy capacity in Fresno. The Energize Fresno model has also been developed for future applications in similarly challenged California municipalities.

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9 CALSTART is an organization of more than 175 firms, fleets and agencies worldwide dedicated to supporting a growing high-tech, clean transportation industry. http://calstart.org/About-us/Who-We-Are.aspx.

For 18 months, the Energize Fresno team engaged in a holistic planning and analysis to identify a suite of policy approaches, projects, programs, and funding mechanisms that could collectively map initial stages of a district-scale AEC that would be aligned with the rich multicultural sense of the community's vision.

Energize Fresno is composed of:

- Project pipeline.
- Funding platform.
- Resource verification toolkit.
- Master community design.

CHAPTER 2:
The Energize Fresno Approach

The conditions in Fresno spurred local elected officials to initiate a strategic plan to attract and leverage investments in the city to support long-term, sustainable growth. With the loss of redevelopment agencies during the economic recession, however, came a major loss of financing, forcing community leaders to pioneer their own path forward. The City of Fresno and Fresno Council of Governments (COG) have undertaken activities with strong community and stakeholder support as well as political engagement that have resulted in sustainability-oriented plans and policies that support many of the goals of AEC development and have set the stage for the Energize Fresno project. For example, the City of Fresno's 2035 General Plan update promotes a holistic approach to development (such as through mixed land uses, community engagement, and development within existing communities) and advocates for more accessible streets and transit-oriented development to receive and integrate the new Blackstone Corridor Bus Rapid Transit system. Other Fresno planning activities, such as Fresno's housing plan, transportation and water resource management plans, and carbon action plan, also include strong sustainability components. Moreover, the High-Speed Rail will connect Fresno to the Silicon Valley by 2025, which necessitates strategic planning to sustainably support the anticipated growth.

Directed by Fresno's leadership, the Energize Fresno team, composed of LGC staff, Fresno city staff, community partners, and consultants, undertook a design process over 18 months to develop a district scale portfolio of advanced energy projects. The design process integrated the principles of an AEC[10] by contributing to grid reliability and resiliency, increased energy efficiency and renewable energy, smart grid deployment, and zero net energy technologies in a defined geographic focus area called the *energy opportunity zone* (EOZ). The project process is outlined graphically in the master community design and serves as a supplement to the following narrative description.

LGC selected each of Energize Fresno's project partners for key roles throughout the project process. The City of Fresno provided critical project support, guidance, and resources that made the redevelopment plans for the downtown planning area feasible. Tierra Resource Consultants, LLC, undertook a technical support role, performing specialized analysis and leading the development of the Energize Fresno funding platform. CALSTART provided valuable insight into energy systems as well as insider knowledge of the City of Fresno's development process. Finally, Fresno Metro Ministry[11], a local nonprofit, was critical to Energize Fresno's

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10 As defined by the California Energy Commission at http://www.energy.ca.gov/contracts/GFO-15-312/.

11 Fresno Metro Ministry is a nonprofit community-benefit organization founded by numerous churches to address the social, economic, health and safety issues experience by children and families that remain the underserved neighborhoods. http://www.fresnometmin.org/about/history.html.

inclusion of the community by using its extensive local networks to establish and maintain relationships with residents, businesses, developers, and other key stakeholders.

Local Assessment

The Energize Fresno team conducted a local assessment of the City of Fresno's local policies, demographics and energy market data, community organization capacity, and the local development community to ensure that the program design reflects the true needs of the community.[12]

To ensure Energize Fresno's program goals aligned with local policy and vision, the team reviewed Fresno's local planning documents which directed the team to focus on an Energy Opportunity Zone in Fresno's Blackstone-Downtown area, with centers of project activity at existing or planned transit sites. These planning and policy goals emphasized that focusing innovation and investment in clean energy and resource efficiency in the downtown area and along the Blackstone corridor is in line with local and state goals and takes advantage of currently planned initiatives. Prioritizing projects within a predetermined geographic area also provides an effective way of focusing funds to increase anticipated benefits such as improved grid reliability, reduced costs, and expanded economic opportunity.

Energize Fresno has incorporated many of the city's regional planning initiatives to help define Fresno as an AEC, including the *City of Fresno 2035 General Plan*, *Metropolitan Water Resources Management Plan, the San Joaquin Valley Plug-In Electric Vehicle (PEV) Readiness Plan, and the 2014 Regional Transportation Plan Sustainable Communities Strategy*. In addition, the California High-Speed Rail Authority (HSRA) plans to build a station in downtown Fresno, boosting the area's recognition as a major transit hub in Central California.

The team also included demographic and energy market data to identify current conditions in Fresno and guide Energize Fresno's program efforts and marketing strategy. A major takeaway was that Fresno decreased its overall annual energy consumption by 8 percent between 2005 and 2015, even with significant population growth – an indication that there are significant efficiency opportunities as well as community interest to undertake such programs. It was also clear from numerous stakeholder engagements that with the diversity of cultural backgrounds and languages present in the Fresno community, Energize Fresno required a multitude of communication channels available to reach different populations when collecting community input and soliciting participation.

Energize Fresno further assessed the capacity of Fresno's government agencies, non-governmental organizations, and the local trade and technical community to support developing an AEC in the city. Fresno has maintained core city services despite economic hardships, but with new community goals focused on sustainability and resource savings, city staff has been under increased pressure to meet those goals without an increase in funding or personnel. Through the capacity assessment, however, the Energize Fresno team found that

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12 These analyses are available in the Energize Fresno Community Scope Report and the Energize Fresno Community Delivery Capacity Profile.

non-governmental organizations in Fresno carry a strong outreach skillset and can be leveraged to optimize city program participation and resource savings. Furthermore, trade organizations contribute technical and financial expertise and, with many working in other locales nationwide, have experience with advanced energy technologies. With their capacity gaps counteracting each other, the strengths of non-governmental and trade sectors could be leveraged to help the city in reaching its AEC goals. Long-term AEC capacity is contingent on the city's ability to handle increased permitting and demands for strategic planning processes, as well as programs to train a local workforce to support AEC technologies. This analysis was important for Energize Fresno to consider in developing the project portfolio and master community design, and will carry great influence for implementing an AEC in Fresno.[13] For more information, please reference *Energize Fresno Community Capacity Profile,* a work product provided to the Energy Commission as part of the EPIC AEC grant.

Background research also yielded powerful illustrations of Fresno's need for an AEC, as demonstrated through CalEnviroScreen.[14] CalEnviroScreen is a mapping tool that analyzes census tract data to identify California communities most burdened with environmental pollution. The tool takes into account vulnerable populations, such as the poor or elderly, which are especially sensitive to the impacts of pollution. As shown in Figure 1, large portions of Fresno, including the Energize Fresno project area, are colored red, indicating its ranking in the top decile and inclusion as one of the most pollution- burdened cities in the state.

Figure 1: CalEnviroScreen 3.0 Results for Fresno, California

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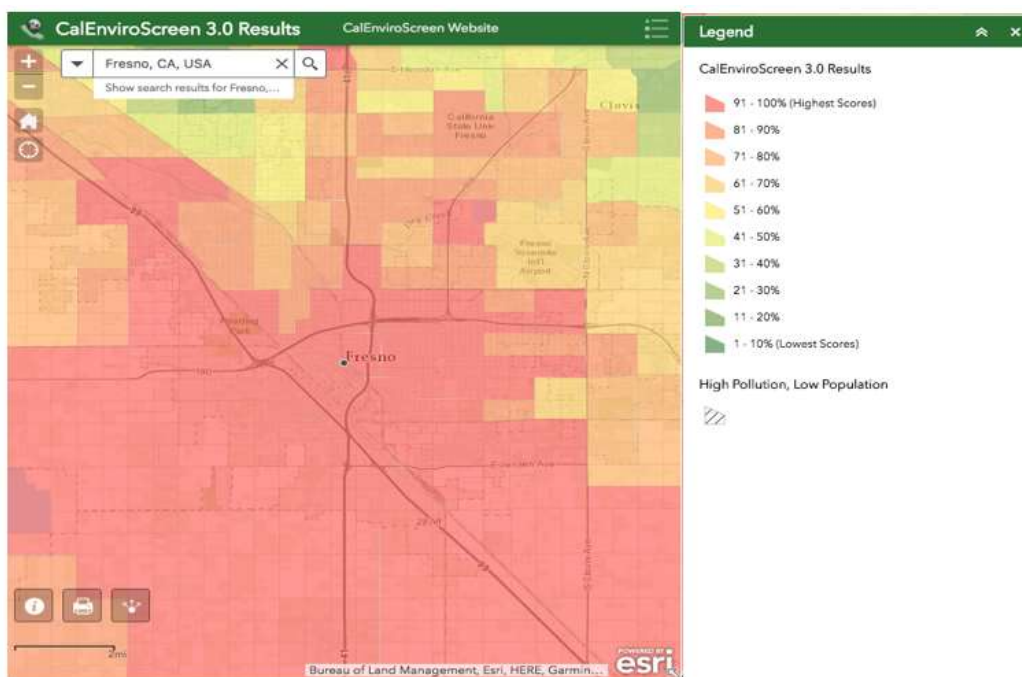
13 For more information, please refer to *Energize Fresno Community Capacity Profile* at https://www.lgc.org/energize-fresno/resources/#results.

14 https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30.

Moreover, Fresno's electrical grid infrastructure suffers from frequent reliability issues, indicating the need for an upgrade to accommodate future demand and additional stress from new energy technologies. The grid impacts of powering additional development are uncertain, as Fresno experiences high power demand on days during Fresno's notoriously hot summers. Figure 2 is from the Pacific Gas and Electric (PG&E) Solar Photovoltaic (PV) and Renewable Auction Mechanism (RAM) Program Map[15] showing the grid capacity of downtown Fresno during the summer of 2017. The colors indicate the relative line capacity, with red lines being the lowest (most overburdened) and green lines the highest (least burdened), and provided much of the impetus for Energize Fresno to focus on including grid benefits in the project portfolio to address Fresno's need for increased grid reliability and resiliency.

Figure 2: Grid Capacity of Downtown Fresno, Summer 2017

Despite its financial burden, Fresno has taken steps towards consistently reducing water and per-capita energy consumption and expanding its renewable energy infrastructure each year, although overall electricity consumption continues to rise along with population. In 2014, the City of Fresno adopted a forward looking 2035 General Plan, however the city has been slow to work toward building out its overall energy vision, including addressing its aging housing stock and high non-residential energy consumption. As such, while Fresno has taken some strides towards positioning the city for a vibrant future, more is required to address the future impacts on energy resources. Initiatives such as Energize Fresno provides the city with an opportunity to leverage its general plan, as well as other existing public plans, develop clean energy and

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15 https://www.pge.com/en_US/for-our-business-partners/energy-supply/solar-photovoltaic-and-renewable-auction-mechanism-program-map/solar-photovoltaic-and-renewable-auction-mechanism-program-map.page

resource efficiency, bolster infill development, and increase low-impact, high-mobility improvements.

As the city looks towards the middle of the 21st century, Fresno has the potential to accommodate emerging industries, new jobs, and housing to help meet its own needs and those of California. Fresno has all the attributes necessary for vibrant growth, including affordable land, infill opportunities, access to major highways, an international airport, and the imminent California High-Speed Rail line. The city's automobile-dependent urban form, low urban efficiency, and high concentrations of people living in poverty, on the other hand, must be addressed for the city to move forward toward a sustainable and prosperous future. To build upon a thriving community, Fresno must adopt fundamental changes to the energy and environmental systems on which the community depends.

Energy Opportunity Zone

Based on Fresno's policy and planning initiatives, Energize Fresno recognized clear value and alignment in focusing project efforts on the Blackstone Bus Rapid Transit (BRT) corridor[16] and downtown Fresno, two priority redevelopment areas identified in the City of Fresno's 2035 General Plan. These areas represent the diversity of developments and stakeholders that exist throughout Fresno, with transit hotspots to encourage the concentration of mixed-use and infill development, and using advanced energy technologies. Energize Fresno defined this geographic focus area as the EOZ, an area of approximately five square miles from E. Dakota Avenue to Divisadero Street between N. Van Ness Avenue and N. Fresno Street, and Divisadero Street to E. Hamilton Avenue between state Highway 99 and E. Parallel Avenue (Figure 3).

The final project portfolio includes projects from within the EOZ as well as other additional projects obtained through Energize Fresno's partnerships with Fresno Metro Ministry (specifically its Better Blackstone initiative) and Environmental Defense Fund (in other words its Power the Tower initiative). These additional, large-scale projects were included in the portfolio as they require minimal investment from Energize Fresno to be leveraged for deep energy resource savings. The portfolio yields an integrated opportunity for more comprehensive district-wide energy savings.

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16 http://fax-q.com/

Figure 3:. Energize Fresno Energy Opportunity Zone
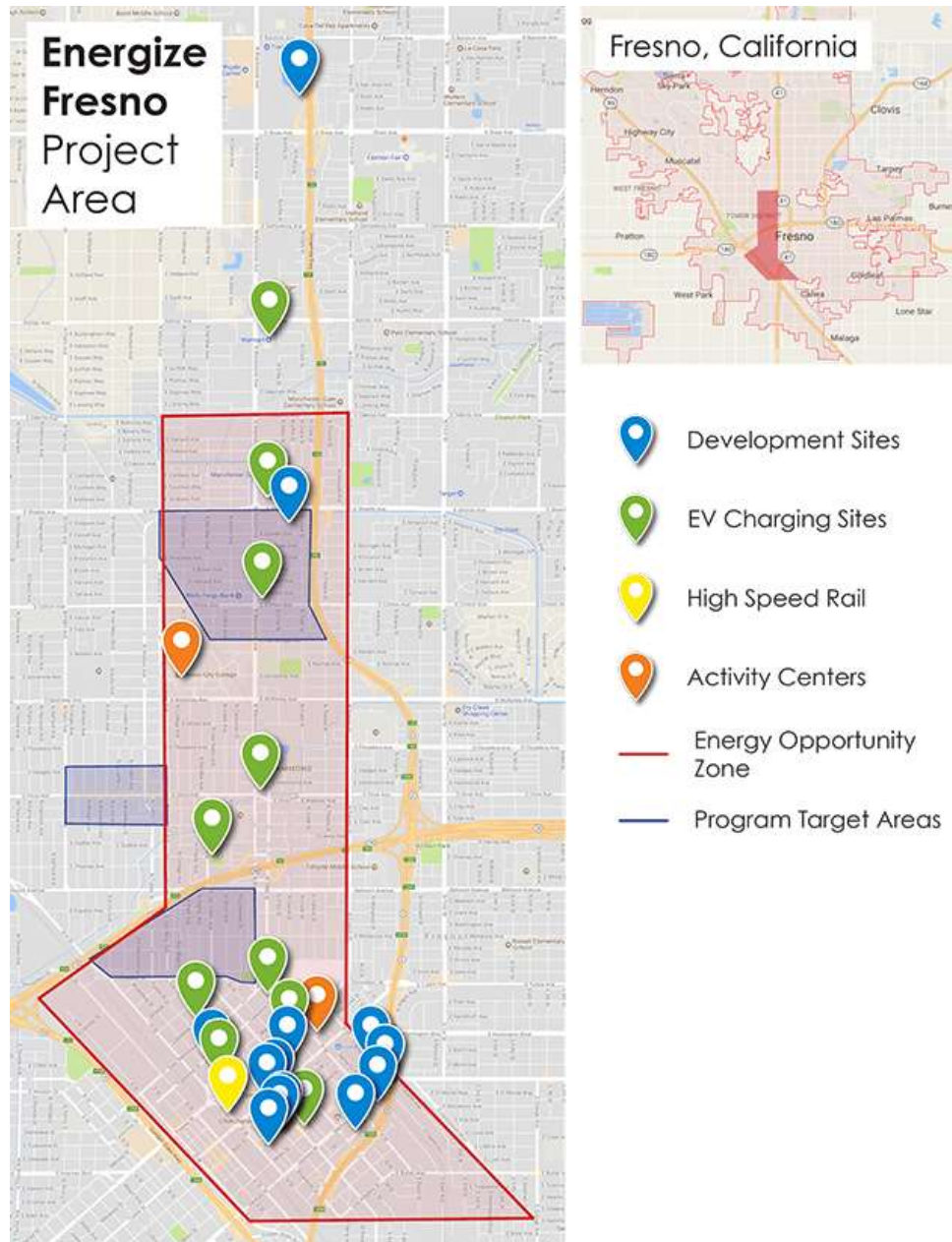
Source: Local Government Commission, Map data ©2018 Google

By applying the AEC concept at a district scale, Energize Fresno is able to concentrate projects in a zone that aligns with where the city sees optimal community benefits. Concentrating project efforts in this manner allows the program to propose a range of clean energy deployment and management solutions, leverage the city's existing planning infrastructure, connect the program with relevant stakeholder groups, and tie the program to market conditions as a basis to implement more sustainability-focused projects. Thus, the EOZ is able to accelerate developing an AEC and acts as a replicable demonstration zone that showcases a

pathway to reduce greenhouse gas emissions, increase energy efficiency, localize the economic benefits of development, and provide improved safety and reliability for community members.

Energize Fresno has also found that working at the district scale helps better focus and manage development efforts and allows the team to refine the processes and tools necessary for robust stakeholder engagement that can be scaled to any locality or region, regardless of unique needs and priorities. If the resources for Energize Fresno were spread across a wider geographic area, it is unlikely that the program could have the same resource savings impacts and benefits to the community. For future AEC projects, the team recommends continued focus on district-scale project efforts and does not see any impediments to scaling this approach.

Project Solicitation and Analysis

Sustainable Fresno, the City of Fresno's sustainability division, led the early project discovery efforts by collaborating with the mayor's office to gather public and private projects known to the city through their planning and permitting processes, and to solicit information on public works projects, initiatives, and projects that might align with Energize Fresno. The mayor's office was crucial from the standpoint of project momentum; the mayor's staff was able to provide information on potential projects, funding availability, and planning goals of the city. To do this, city staff members circulated an initial data request among city departments for input on projects both internal to the city (public) and external (private).

The Energize Fresno team then collected information from the City of Fresno's initial request and organized it into a project inventory consisting of buildings, programs, and initiatives (collectively referred to as "projects"). The team later added additional projects to this list based on known initiatives and project concepts that aligned with program goals. The project inventory included city and private projects, with 70% being private projects.

Filtering Process

The initial project discovery process uncovered more than 80 projects, initiatives, and project concepts. A significant number were non-energy public infrastructure projects and, therefore unlikely to be relevant to the goals of Energize Fresno. Based on the foregoing policy and profile information and the high number and variety of projects, initiatives, and programs that were initially collected, the project team decided to develop a streamlined, two-part filter process to quickly and easily score projects and prioritize only the projects that fit the basic criteria for the Energize Fresno program.

The two-part "Pre-Filter" consisted of questions that elicited the information necessary to determine if a project was suitable for a more detailed analysis and potential inclusion in the final project portfolio:

- **Phase I Pre-Filter** - Consists of nine high-level questions that can be completed with a basic understanding of local and state policies, energy technology, and building systems, and project timing. The team used the Phase I Pre-Filter during project solicitation to allow the team to quickly assess the feasibility of projects before submission. Moreover, the Phase I Pre-Filter created a transparent, easy, and trackable

method for eliminating unsuitable projects before moving forward with the more detailed analysis.

- **Phase II Pre-Filter** - Consists of more in-depth questions that refined the list of opportunities and allowed for the team to further assess and prioritize projects, incorporate expert input, and make a "yes" or "no" decision on moving a project forward for detailed modeling and analysis.

Energize Fresno's filter ranked projects on their ability to increase energy and water efficiency while reducing emissions, deploying clean technologies, and creating jobs. "Good fit" projects also aligned with local planning goals, had political support, or embodied goals of the Energy Commission's EPIC grant, including increased grid reliability and resiliency, improved energy efficiency, deployment of renewable energy, smart grid, and zero net energy technologies.

The filtering process uncovered 29 potentially suitable projects, including a mix of public works, planning initiatives, private projects, and energy and water efficiency advances across new construction, renovations, programmatic initiatives, and others. The costs for these projects ranged from a few hundred thousand to a billion dollars and were primarily in the downtown section of the EOZ, demonstrating a downtown-centric development emphasis that predates initiation of the Bus Rapid Transit corridor along Blackstone. The filtering mechanism was instrumental in allowing the Energize Fresno team to identify and organize projects that focus on resource conservation while enhancing mixed-use development and the smart growth vision set by local policy. This filter process also defined how the Energize Fresno platform could be scaled for future use in other communities.

Later, additional projects were solicited outside of the downtown planning area to ensure better geographic coverage across the EOZ and yield a more robust master community design. Energize Fresno's current project list includes new construction, renovation, and programmatic initiatives such as planning, code improvements, and others. Programs and initiatives are included in the project list because each of them represents implementing an advanced energy technology or adoption of an AEC practice that goes above and beyond traditional performance.[17]

Project Analysis

Energize Fresno conducted a deeper energy analysis on projects that passed through the filter to determine the projects with the most potential to increase resource savings and community benefits. Tierra worked with project developers to model projects based on the developers' specifications, to determine the baseline energy performance and make tailored recommendations. As a part of this process, each developer signed a memorandum of understanding and a non-disclosure agreement to establish a working relationship with Energize Fresno and provide them the confidence to work with a committed project team.

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17 For more information on this process, please refer to the *Energize Fresno Community Scope Report* at https://www.lgc.org/energize-fresno/resources/#results .

The energy analysis framework was a whole building approach, using the EnergyPlus building energy simulation tool and associated software (SketchUp and OpenStudio). The EnergyPlus tool allowed an annual hourly analysis that yielded profiles for each improvement scenario analyzed, which further enabled an impact analysis when comparing different energy consumption scenarios to baseline conditions. Collaborating with various electric battery vendors Tierra also developed a Python programming language based tool to define and optimize the potential for electric energy storage at each site to be equipped with solar generation. Energize Fresno developed multiple tiers of improvements to provide an array of options to developers and allow for various resource savings scenarios depending on the availability of funding. Within this analytic framework, assumptions about energy-consuming systems were altered to encompass these scenarios:

- **Baseline Energy Performance**. In conformance with the Title 24 energy code for new construction and major renovation projects.
- **Energy Efficiency Level 1**. At least 10% more efficient than the Title 24 baseline.
- **Energy Efficiency Level 2**. A higher level of energy efficiency compared to the baseline.
- **On-site Generation**. Solar electric generation.
- **Demand Management**. Typically using battery storage as the demand management technology.

Once the initial analysis was complete, the results were then presented to project owners and developers, and feedback was gathered on the energy consumption load shape models and project costs. The models were adjusted based on this feedback to assure that the analysis was consistent with the design intent and financial parameters of the project, and the revised modeling results were presented in a follow-up meeting.

This process yielded 15 building projects with high potential - 13 development sites and two activity centers - to include in the final Energize Fresno project pipeline:

- **Development sites** are individual medium to large buildings in the commercial sector that are in the early stages of planning and represent opportunities for the Energize Fresno team to collaborate with developers, and encourage the projects to incorporate energy efficiency designs that exceeded current Title 24 standards, maximize distributed generation potential for each site, and provide demand management capability that is grid interactive. These sites include a mixture of public works, planning initiatives, private projects, and energy and water efficiency advances across new construction, renovations, and retrofits.
- **Activity centers** include the City of Fresno municipal operations and Fresno City College, two major hubs of public, commercial or social activity that offer the opportunity to develop and demonstrate large scale resource savings projects in ways that can engage and influence large numbers of community stakeholders.

The team also developed enhancements of two operational, funded programs active in Fresno to help achieve AEC goals in the residential low income and small commercial markets, and

defined by a set of electric vehicle (EV) charging technologies for use to advance Fresno's electrification of transportation.

- **Program enhancements** to existing Home Energy Tune-Up (HETU) and Business Energy Tune-Up (BETU)[18] programs operating in Fresno were reviewed to identify gaps in service within the EOZ, tailored to address gaps in the project portfolio to direct resources to the most underserved populations (for example low-income residential, multifamily residential, and small commercial markets). This exercise allowed the team to define opportunities for refining continuing existing services, or new offerings that will be relevant to any future local government program administrative model by the California Public Utilities Commission (CPUC). Energize Fresno decided to pursue enhancements to the existing HETU and BETU programs operating in Fresno to address the city's aging housing stock and high non-residential energy consumption.
- **Electric vehicle charging technologies** include direct current fast chargers (DCFC) to be launched across five sites in downtown Fresno and the use of autonomous, solar-powered EV chargers in five locations along the Blackstone Corridor.

The results of the analysis of the highest level of recommended advanced energy technologies are seen in Table 1.

Table 1: Summary of Portfolio Resource Savings

Site ID	Electric Energy Savings (kWh/Yr.)	Natural Gas Energy Savings (Therms/Yr.)	Electric Energy Generation (kWh/Yr.)	Peak Demand Reduction (kW)	Annual Energy Cost Savings ($/Yr.)	Annual GHG Reduction (MT CO2e/Yr.)	Estimated Project Cost ($)
Development Sites							
1	275,461		225,284	140	$92,300	99	$438,400
2	497,319		300,342	172	$148,400	161	$484,800
3	175,669		309,269	55	$80,400	96	$533,700
4	232,427		213,300	78	$78,300	94	$324,200
5	129,712		263,358	73	$63,500	78	$427,800
6	245,947		294,956	148	$97,900	107	$508,600
7	196,758		85,010	71	$54,300	56	$220,100
8	277,219		494,022	122	$119,700	151	$620,300
9	141,238		282,102	71	$61,400	83	$352,400
10	96,412		125,697	71	$36,500	35	$321,700
11	138,510		226,155	81	$63,000	72	$386,600
12	157,997			58	$142,800	173	$987,500
13	533,917		412,675	185	$543,400	189	$1,832,200
Subtotal	**3,098,584**		**3,232,070**	**1,330**	**$1,581,900**	**1,395**	**$7,438,300**
Activity Centers							

Fresno City College	1,813,680		4,503,930	2,590	$1,314,700	1,240	$3,636,240
Municipal Operations and Facilities	1,161,390		9,467,390	1,242	$877,600	2,151	$14,022,360
Subtotal	**2,975,070**		**13,971,330**	**3,830**	**$2,192,300**	**3,391**	**$17,658,600**
Programs							
HETU Enhancement	2,779,900	294,600		3,180	$737,290	2,113	$2,007,500
BETU Enhancement	550,400	2,400		1,050	$108,500	121	$1,500,000
Subtotal	**3,330,300**	**297,000**		**4,230**	**$845,790**	**2,234**	**$3,507,500**
Transportation							
Solar Arc						73	$1,500,000
DC Fast Charge						247	$728,300
Subtotal						**320**	**$2,228,300**
Pipeline Total	**9,403,954**	**297,000**	**17,203,400**	**9,390**	**$4,619,990**	**7,340**	**$30,832,700**

Source: Local Government Commission

Through this process, Energize Fresno identified the most promising development projects and program offerings, focusing on optimizing resource savings in the EOZ. Each step in the process was critical to selecting the worthiest projects.[19]

Stakeholder Engagement

Using and maintaining the EOZ will require a robust set of stakeholders in the public, private, and community sectors to engage with and support the relevant technologies, practices, and infrastructure. Although stakeholders may not yet be fully aware of the benefits the Energize Fresno projects could yield, each sector may have the chance to engage with and experience new technologies as they are used, which Energize Fresno's local partners believe will increase local community capacity and technical expertise. This will help Energize Fresno meet its long-term goal of developing Fresno's capacity to self-use AEC components without the extended use of external experts.

As the Energize Fresno team conducts stakeholder outreach and engagement for Phase II of the EPIC grant, the team will align the strengths of each project with potential community organizations positioned to support or engage with the project. The findings of the *Energize Fresno Community Delivery Capacity Report* guide the alignment process by helping the team evaluate projects through the same lens and examining the initial assessment of the community's delivery capacity, as well as any existing gaps to successfully using advanced technologies across the EOZ. This will ensure that Energize Fresno is effectively leveraging

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19 For more information, please refer to the *Energize Fresno Project Pipeline Report* located at
https://www.lgc.org/energize-fresno/resources/#results.

Fresno's community capacity in the AEC model while providing a replicable approach for other cities to use.

Because the Energize Fresno program is a process through which an AEC can be deployed and scaled, the project team expects the pipeline of projects to continue to grow based on the following design attributes:

- Energize Fresno was developed in a way that leverages planning and permitting processes undertaken by nearly every city in California. These activities are dynamic and are continually being revised and updated, thus ensuring an ongoing and robust market for new projects.
- The project leverages existing and emerging funding and financing offerings, thus ensuring that participating projects can be matched with funding opportunities that will yield optimal financial performance.
- The portfolio of projects designed by Energize Fresno includes the full suite of distributed energy resources responsive to facility owners, financiers, and grid operators. Favorable cost and technical performance trends of distributed energy resources ensure that this approach to project development will provide increasing value across the spectrum of commercial stakeholders.
- California legislative and regulatory initiatives are continually evolving, and the processes designed by Energize Fresno are intended to provide a platform that can continually engage with and represent these initiatives as new opportunities.

Local stakeholder engagement and input have been a strong element of Energize Fresno's planning since its inception. The project team relied on stakeholders to help guide the strategy and focus of the program as project type, technology type, and geographic area to best serve the community. The Energize Fresno team itself consists of local stakeholders representing local government, community organizations, and residents. In addition to working directly with local stakeholders, the team solicited community and high-level input at every stage of the process.

Energize Fresno Project Team

The team includes local stakeholders representing local government (City of Fresno) and community organizations (CALSTART, Fresno Metro Ministry). Having local stakeholders involved in every facet of the program design and implementation were key to grounding the work in local needs and aligning with local opportunities.

Local Technical Advisory Committee

The Energize Fresno team formed a local technical advisory committee (TAC) that includes representatives from local government, regional government entities, non-profits, community organizations, educational institutions, developers, and businesses to solicit broader local stakeholder input on specific items. While the primary purpose of the TAC was to guide the focus of the overall Energize Fresno program strategy and help focus the program on suitable project types, technologies, and geographic areas, the TAC also served as an avenue to identify

specific potential projects and engage new project partners to the program. The TAC met quarterly (starting the last quarter of 2016) to review project status and provide feedback. Between meetings, committee members were engaged on specific project elements, such as program design and community engagement strategies, and encouraged to continue engaging with their respective communities.

Statewide Technical Advisory Committee

To gather broad feedback on program design, replicability in other cities, and scaling the financial component of the program, the team formed a statewide TAC of diverse thought-leaders. The statewide TAC also met quarterly (starting in the first quarter of 2017) to engage on topics such as the feasibility of rolling portfolios to fund advanced energy projects in future applications, the value of grid services, and the best approach to layering funding for commercial and municipal projects. Feedback and ideas generated during statewide TAC meetings were used to refine program goals, designs, and metrics.

City of Fresno

In addition to including the Sustainability Department on the Energize Fresno team, and including City of Fresno staff on the local TAC, the team worked closely with numerous other city staff members on various stages of the Energize Fresno program. Specifically, the team coordinated with the Mayor's Office, Sustainable Fresno, the City of Fresno Development and Resource Management, the City Manager's Office, and city councilmembers to develop the project pipeline, potential policy recommendations, and financially viable funding options for the City of Fresno projects. Throughout the program, relevant city contacts were consulted for research, including interviews on planning processes, feedback on policy recommendations, and crucial input on program design elements.

Fresno Developers

The project team, in addition to being on the local TAC, extended engagement with members of Fresno's developer community to select and analyze potential projects. The selection and analysis involved ongoing discussion to shape which advanced energy technologies might be suitable for their projects. Developer coordination focused on identifying and modeling technologies identified for installation that would complement the current design and yield significant resource savings. Once the building level improvements were identified and modeled, the team continued to work with developers to create attractive capital stacks[20] that would garner building and district-wide financial benefits[21].

Community Organizations

As the team prepared the final project list, specific community groups identified in the early stages of the program as potential allies were contacted and engaged in discussions about

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20 Legal organization of all capital (or funding) placed in a company or secured by a company asset through investment or borrowing.

21 A more detailed discussion is available in the *Energize Fresno Master Community Design*'s "Community Recommendations Funding Options" section https://www.lgc.org/energize-fresno/resources/

Energize Fresno's direction and activities for Phase II. Early engagement helped shape the final program enhancements, and continues with specific organizations. Specifically, early interaction with the Lowell Community Development Corporation about the targeted enhanced HETU program resulted in an expansion to include the entire EOZ, because of the low number of HVAC units (a prerequisite for the smart thermostats included in the enhanced HETU program), and low use of HVAC units where they are installed. The expanded engagement process is more thoroughly outlined in the "Potential Phase II Community Partners" section.

Policy Map

The Energize Fresno policy map demonstrates alignment between project outcomes (for example, resource savings) and local and state priorities. Such mapping is useful for local decision-makers who want to consider project proposals of specific local policies, and track local alignment with state goals. Furthermore, state decision-makers who want to see that funded projects directly support and contribute to state-level priorities and initiatives will find the process advantageous due to the resource attribution potential. The project team considers the policy map to be a living document that can be revised to reflect a continually evolving policy environment.

The policy map includes:

- A database of state and local goals and policies categorized using the same sector, goal, and resource metric "taxonomy" as was used to categorize projects and the funding library.
- A process to define how various state policies and goals relate to Fresno's core planning documents.
- A process by which project-level resource savings can be attributed to specific local and state policies and goals.

Database of State and Local Goals and Policies

To develop a process for state and local alignment, the Energize Fresno team compiled an inventory of state and local policies (*Energize Fresno Master Community Design*[22]) to systematically consider relevant links to specific projects. This inventory includes state policy priorities around energy, water, climate, equity, and other relevant development goals, as well as the *City of Fresno's Downtown Development Code*,[23] *Downtown Neighborhoods Community Plan*,[24] existing Fresno Green framework,[25] *Fulton Corridor Specific Plan*,[26] *2035 General Plan*,[27]

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[22] Energize Fresno Master Community Design, https://www.lgc.org/energize-fresno/resources/.

[23] https://library.municode.com/ca/fresno/codes/code_of_ordinances?nodeId=MUCOFR_CH15CIDECOINRE_PTIIBAOVDI_ART15DODI.

[24] https://www.fresno.gov/darm/wp-content/uploads/sites/10/2016/11/161020DNCPFinallowres1.pdf.

[25] https://www.fresno.gov/darm/planning-development/resource-efficiency-incentive-programs/.

[26] https://www.fresno.gov/darm/wp-content/uploads/sites/10/2016/11/The-Fulton-Corridor-Specific-Plan.pdf.

[27] https://www.fresno.gov/darm/general-plan-development-code/.

Metropolitan Water Resources Management Plan,[28] *San Joaquin Valley Plug-In Electric Vehicle Readiness Plan,*[29] *Fresno Council of Governments' Regional Transportation Plan/Sustainable Communities Strategy,*[30] and the *Tower District Specific Plan.*[31]

Tagging of Projects and Policies

The Energize Fresno team tagged each state and local initiative in the policy database with its relevant sustainability sector in the taxonomy (*Energize Fresno Master Community Design*)[32], which includes advanced energy technologies, water savings, climate adaptation, and equity and affordable housing measures. Policy goals that explicitly define resource metrics to be measured, such as resource savings in kilowatt hours (kWh), gallons of water, reductions in vehicle miles traveled (VMT), or greenhouse gas (GHG) emissions, are tagged with the relevant units. The team tagged each project in the Energize Fresno portfolio with the taxonomy based on key project components, such as including a photovoltaic (PV) solar system or advancing transit-oriented development in Fresno, using the same resource criteria. The result of this tagging process is an inventory of policies that can be directly matched with projects from the pipeline through the taxonomy, based on applicability and specific resource savings metrics.

State and Local Alignment Process

The Energize Fresno team then matched state level priorities to local policies and plans that were tagged with the same criteria, as seen in the Local Policy and State Level Priorities Matching Matrix (Table 2: State and Local Priorities Alignment). For example, the team tagged the Sustainable Communities Strategy with the following sustainability resource metrics:

- VMT Reduction
- Reduced Fuel Use
- Electric Vehicle (EV) Charging Availability
- Active Transportation
- Transit
- Shared Mobility
- Air Quality
- Health
- Transit-Oriented Development
- Affordable Housing
- Environmental Justice
- Community Development

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28 https://www.fresno.gov/publicutilities/wp-content/uploads/sites/16/2016/11/208754fresnometrodeirv120140213.pdf.

29 https://energycenter.org/sites/default/files/docs/nav/programs/pev-planning/san-joaquin/san_joaquin_valley_pev_readiness_plan-web.pdf.

30 http://www.fresnocog.org/sustainable-communities-strategy-development-and-outreach.

31 https://www.fresno.gov/darm/wp-content/uploads/sites/10/2016/10/Tower-District-Design-Guidelines.pdf.

32 *Energize Fresno Master Community Design*, https://www.lgc.org/energize-fresno/resources/.

These resource metrics are shared with the following state priorities:

- 50% Reduction in Petroleum Use in Vehicles
- Reduce Short-Lived Climate Pollutants
- Increase Affordable Housing
- Transit-Oriented Development
- Reduce Burdens on Disadvantaged Communities

In this way, Fresno's core policies and state level priorities cross-referenced in the matrix can be considered "aligned" by related particular criteria metrics.

Table 2: State and Local Priorities Alignment

| Local Policies & Plans	State Level Priorities								
	50% Renewable Electricity [kWh generated]	50% Reduction in Petroleum Use in Vehicles [GHG, VMT]	Double EE Savings at Existing Buildings [kWh saved]	Carbon Sequestration in the Land Base [GHG sequestered]	Reduce Short-Lived Climate Pollutants [GHG]	Safeguarding California [GHG]	Increase Affordable Housing [Units]	Transit-Oriented Development [VMT, Units]	Reduce Burdens on Disadvantaged Communities [location / audience]
Downtown Development Code								X	
Downtown Neighborhoods Community Plan	X		X	X			X	X	X
Fresno Green	X	X			X			X	
Fulton Corridor Specific Plan	X		X			X	X	X	X
General Plan	X	X	X	X	X	X	X	X	X
Metropolitan Water Resources Management Plan				X	X	X		X	
San Joaquin Valley Plug-In Electric Vehicle Readiness Plan	X	X			X				X
Sustainable Communities Strategy		X			X		X	X	X
Tower District Specific Plan							X	X	

Source: Local Government Commission

State or Local Resource Outputs

Once the Energize Fresno team established the links between the projects and state level policies, initiatives, and priorities, relevant resource savings could flow up from the projects and be attributed to specific state and local policy goals as necessary. The final output of this mapping – and the element most relevant to decision makers – is a project-level (or portfolio-level) linkage between resource savings and specific state or local policies and goals. Linking projects and policies through this tagging and matching process allows one to see how resources are contributing to specific policies and goals from a "top-down" (state level) and a "bottom-up" (local level) approach.

Figure 4 illustrates how the policy database and the project pipeline are "tagged" so they can be organized through the state and local alignment process to simplify reporting resource savings by state or local priorities.

Figure 4: Policy Map Process Diagram
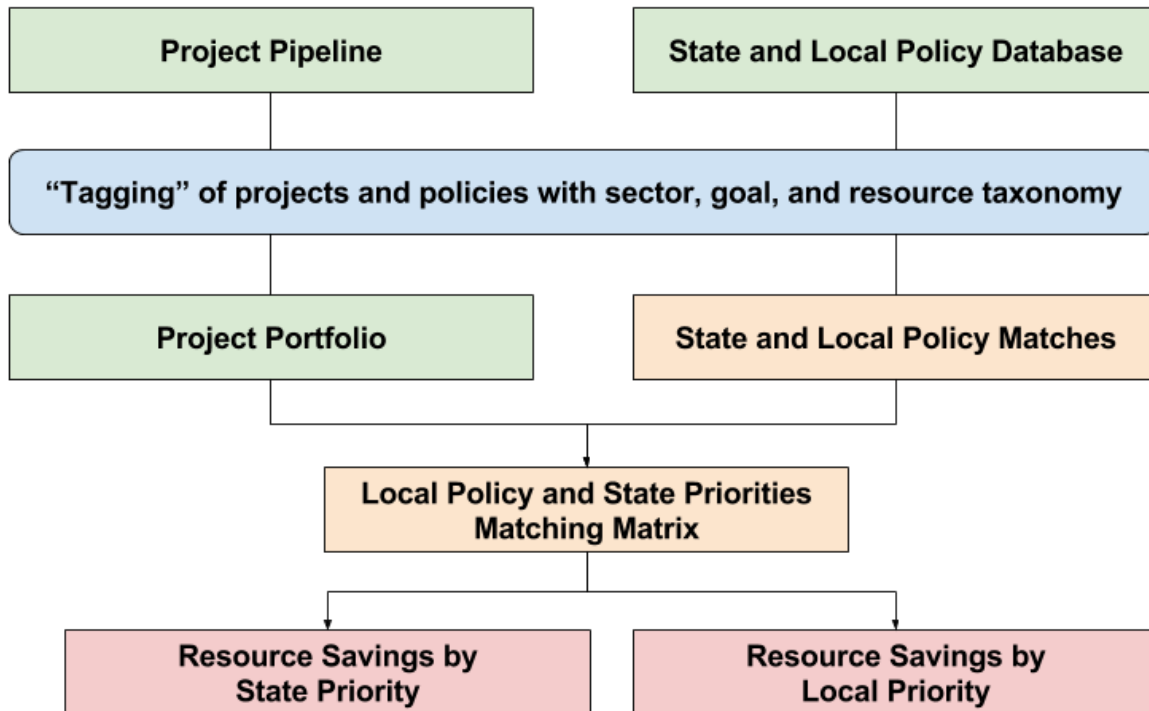
Source: Local Government Commission

Example

To model the policy mapping process in practice, the Energize Fresno team highlighted one project from the portfolio – The Park, Phase I. The Park is a new construction project designed for a current vacant lot just south of Chukchansi Park in Fresno. The Park will be a 4-story, 55-

unit multifamily residential building with 80% market-rate housing and 20% affordable housing[33] (for more project details, see the *Energize Fresno Master Community Design*).

Based on the presence of advanced energy technologies with efficiency upgrades and the inclusion of affordable housing at an infill location, The Park, Phase 1 aligns with these local priorities:

- Downtown Development Code
- Downtown Neighborhoods Community Plan
- Fresno Green
- Fulton Corridor Specific Plan
- City of Fresno 2035 General Plan
- San Joaquin Valley Plug-In Electric Vehicle Readiness Plan
- Fresno Council of Governments' Regional Transportation Plan/Sustainable Communities Strategy

The Park, Phase I further supports the following state policies and goals based on the associated savings, clean energy technologies, affordable housing, and infill development:

- 50% renewable electricity
- Increase affordable housing
- Reduce burdens on disadvantaged communities

Because the project does not include electric vehicle facilities, climate adaptation initiatives, nor retrofits an existing building, The Park, Phase I is not applicable to the remaining state goals in the matrix.

Taken together, implementing The Park, Phase I supports several key local policies and plans and aligns with several relevant state goals. Green cells indicate project alignment with local policies and plans, yellow cells indicate project alignment with state level priorities, and orange cells indicate coordinated alignment. This coordinated alignment is illustrated in Table 3:

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33 *Energize Fresno Master Community Design*, https://www.lgc.org/energize-fresno/resources/.

Table 3: The Park, Phase 1 – Local and State Alignment

Local Policies & Plans	State Level Priorities								
	50% Renewable Electricity [kWh generated]	50% Reduction in Petroleum Use in Vehicles [GHG, VMT]	Double EE Savings at Existing Buildings [kWh saved]	Carbon Sequestration in the Land Base [GHG sequestered]	Reduce Short-Lived Climate Pollutants [GHG]	Safeguarding California [GHG]	Increase Affordable Housing [Units]	Transit-Oriented Development [VMT, Units]	Reduce Burdens on Disadvantaged Communities [location / audience]
Downtown Development Code								X	
Downtown Neighborhoods Community Plan	X		X	X			X	X	X
Fresno Green	X				X			X	
Fulton Corridor Specific Plan	X		X			X	X	X	X
General Plan	X	X	X	X	X	X	X	X	X
Metropolitan Water Resources Management Plan	X	X		X	X	X		X	
San Joaquin Valley Plug-In Electric Vehicle Readiness Plan	X	X			X				X
Sustainable Communities Strategy		X			X		X	X	X
Tower District Specific Plan							X	X	

Source: Local Government Commission

Funding Toolkit

Successful distribution of advanced energy technologies also requires an aggregated portfolio view of funding opportunities to best layer and leverage available market-ready products, while providing a platform to capture emerging tools such as the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) Affordable Multifamily Financing Program being launched in 2018. To assess funding opportunities for Energize Fresno projects, the team developed a funding toolkit that includes a database of market-ready funding and financing products, a funding taxonomy defining the array of existing products in the market, and a funding layering method for launching advanced energy technologies. Using these tools, the team analyzed each project to identify options for funding advanced energy technology improvements. The funding toolkit is available as an offline Microsoft Access database that the team plans on piloting online as a publicly available platform as part of the Phase II AEC grant funding. The Microsoft Access database includes a user query function that provides users with the ability to generate a list of funding products based on a set of inputs that define their new building construction, rehabilitation, and retrofit projects.

The team also carried out a financial analysis of each project to examine energy cost savings, incremental measure cost, return on investment (as payback with and without funding incentives), and changes in the capitalized value of properties resulting from improvements in energy performance. The analysis focused on the use of the following market-ready funding and financing products such that the Energize Fresno project development approach can be replicated and scaled-up to further drive down costs.

- Funding opportunities
  - Grants
  - Rebates and technical assistance
  - Federal and state tax incentives
  - Fee waivers
  - Service contracts such as capital/financial leases or power purchase agreements (PPAs).

- Financing opportunities
  - Property Assessed Clean Energy (PACE) financing
  - PG&E on-bill financing (OBF)
  - Bonds and other non-PACE financing

Capital Stacks

Table 4 shows an example of the resulting capital stack components found using the Energize Fresno funding toolkit.[34] Energize Fresno refers to the "capital stack" as the collection of funding and financing products used in the financial analysis of each project. These products may or may not be what developers ultimately use. However, they represent market-ready products that exist now, have been used on similar projects, and allow the Energize Fresno

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34 Capital stacks are available for each project in the Energize Fresno portfolio. Details on each capital stack can be found in the Energize Fresno Master Community Design report.

team to develop a reasonable model of financial performance. The example provided is for the incremental improvements to The Park, Phase I.

Table 4: Capital Stack Details for The Park, Phase I ($1,000s)

Funding & Financing Product	Value
Phase II AEC Allocation	$305.9
Investment Tax Credit - Energy Credit	$161.1
IRS Low-Income Housing Tax Credit	$54.9
CA Low-Income Housing Tax Credit	$17.9
PACE	$139.1
PG&E Savings by Design	$45.5
Total	**$724.4**

Source: Local Government Commission

The financing and funding values presented in this report apply toward the *incremental costs* associated with the sustainability measures analyzed. These values provide a general indication of the availability and applicability of various products to support the sustainability measures of each project.

The capital stack is also used to define the overall investment opportunity for the portfolio as a whole. Table 5 shows how the estimated $35.1 million from various types of funding and financing mechanisms could be used to fund the incremental cost of above-code energy efficiency and the full cost of grid-interactive PV solar systems to be built with the portfolio of projects.

Table 5: Estimated Portfolio Pipeline Source of Funds and Value

Activity Centers and Development Sites	Value
Tax Free Bonds	$7,719,270
Phase II AEC Grant Allocation	$6,030,855
Energy Conservation Assistance Act Loans	$5,642,878
Investment Tax Credit - Energy Credit	$2,564,672
PACE Loans	$2,934,531
On-Bill Financing (OBF) Loans	$1,997,741
Cash Match Funding	$600,000
Self-Generation Incentive Program	$522,000
Fee Waiver (New Market Street Growth)	$520,000

PG&E Savings by Design	$469,871
PG&E Custom Incentives (kWh)	$190,689
Investment Tax Credit (ITC) - Rehabilitation Credit	$59,382
IRS Low Income Housing Tax Credit	$60,755
PG&E Custom Incentives (kW)	$37,400
CA Low Income Housing Tax Credit	$19,746
Activity Centers and Development Sites Subtotal	*$29,369,790*
Programs	**Value**
Phase II AEC Grant Allocation	$3,507,500
Programs Subtotal	*$3,507,500*
Transportation	**Value**
Phase II AEC Grant Allocation	$2,228,300
Transportation Subtotal	*$2,228,300*
Total Estimated Pipeline Capital Stack Value	**$35,105,590**

Source: Local Government Commission

The ability to look at the projects and funding at an aggregated portfolio level is important for community members to fund grid-level benefits successfully and achieve the administrative and financial benefits of streamlining. Phase II of the grant will explore how portfolio level financing might allow for cost efficiencies based on leverage and scale.

CHAPTER 3:
Results from Master Community Design

The Energize Fresno Master Community Design is the final product of Energize Fresno's comprehensive planning process and was based on input from a wide range of community stakeholders and robust technical analysis. It combines the outputs and resources from the Energize Fresno Phase I planning grant process into a complete package of information for Fresno decision makers. The design includes descriptions of specific project proposals for near-term implementation, by putting forward a robust portfolio of projects and programs that contribute to grid reliability and resiliency, increase energy efficiency and renewable energy, and use smart grid and zero net energy technologies. In addition to the project portfolio, the master community design includes policy recommendations to increase advanced energy technology use in Fresno, and a discussion on how to build upon the Energize Fresno program as a first step toward Fresno becoming an AEC. An outcome of the master community design will be to embed many of the processes developed in the Energize Fresno program such that the resources savings and community benefits will continue to grow and accrue over time as new projects, funding, and emerging technology opportunities emerge.

The master community design is an important presentation tool for community leaders, planners, and stakeholders looking to gain financial and political support for future advanced energy projects by clearly demonstrating the resource savings of a project and related alignment with local and state planning goals. The master community design is also an enduring resource for future AEC use that provides a transparent description of the processes and tools used to identify, select, and analyze projects as well as funding to continue optimizing the value of future projects. It is meant to leverage a city's ongoing efforts to become an AEC and provide a scalable, community-focused process to mobilize the development of high performance buildings, improve the security of a city's energy systems, and support reduced energy cost burdens for some of the most vulnerable populations in the state.

Resource Savings

Implementing the Energize Fresno portfolio involves commercial and residential projects across a range of building types and residential neighborhoods. The portfolio of 15 building projects and two electric vehicle charging proposals is estimated to cost $35.1 million and could provide the following resource savings within the EOZ:

$4.6 Million in Annual Energy Cost Savings. A breakdown of annual energy cost savings by scenario and project type is seen in Figure 5**.**

Figure 5: Aggregate Annual Energy Cost Savings by Scenario

Energy Cost Savings by Scenario

● EE L1 ● EE L2 ● Distributed Generation ● Demand Management ● BETU ● HETU
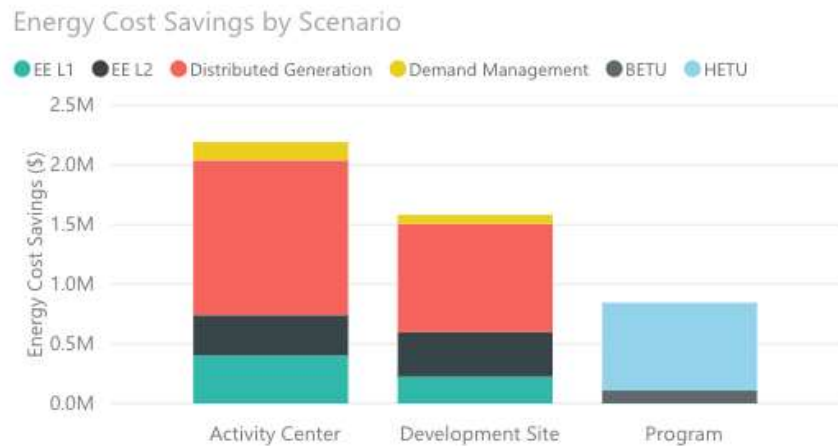
Source: Local Government Commission

26.6 Million KWh in Annual Electricity Savings. A breakdown of annual electricity savings by scenario and project type is depicted in Figure 6.

Figure 6: Aggregate Annual Electricity Savings by Scenario

Electricity Savings by Scenario

● EE L1 ● EE L2 ● Distributed Generation ● Demand Management ● BETU ● HETU
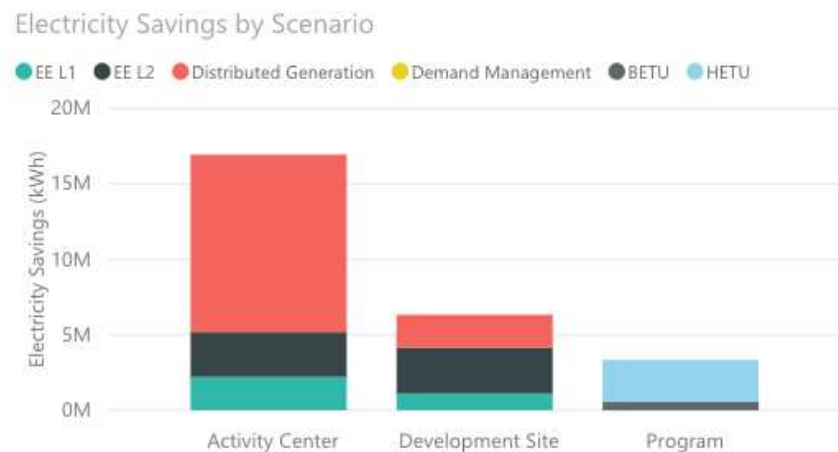
Source: Local Government Commission

7,250 Metric Tons of CO_2e in Annual Greenhouse Gas Emissions Reductions. A breakdown of annual GHG emissions savings by scenario and project type (Figure 7).

Figure 7: Aggregate Annual GHG Emissions Savings by Scenario

Avoided GHG Emissions by Scenario

● EE L1 ● EE L2 ● Distributed Generation ● Demand Management ● BETU ● HETU

Implementing this portfolio could also provide 296,000 therms of annual savings in natural gas and 9.4 MW in peak demand reduction from demand response and grid interactive on-site electricity storage.

Energize Fresno presents a viable method to incorporate California's required energy resource "loading order" - energy efficiency, demand response, renewables, and distributed generation - at the project and community level, and considered the following types of energy impacts for the project portfolio:

- **Energy efficiency improvements** that typically reduce overall energy consumption across facilities and help control effectively the flow of air and heat through buildings.
- **On-site generation** of electricity that reduces the facility variations in energy consumption during the time that the generation occurs. For solar electric installations, this occurs in the mid-day when the sun is shining.
- **Demand management technologies** that equip consumers with the means to use less energy during peak energy use hours, or move the time of energy use to off-peak hours such as at night and on weekends.
- **Electrification of transportation** has the effect of adding electric load to the system. When strategically applied, these technologies encourage energy use during off-peak hours and/or incremental change in energy consumption during all or most of the day.

Results of the energy analysis and financial analysis are shown in the Energize Fresno community level Power BI Dashboard. The Power BI dashboard shows the savings of each project by market sector, funding source, and resource type that is combined at the community level, and serves as a valuable visualization tool.

Implementing of Energize Fresno's Master Community Design could result in the ratepayer benefits of greater electricity reliability and lower costs by providing a platform that will drive more project development, incorporate deeper project savings in each project, and accurately verify and report communitywide resource savings. Energize Fresno demonstrates these

benefits through a template that can be used in future AEC's to coordinate project development with funding and investment strategies and drive aggressive use of clean energy infrastructure.

The collective impact of using advanced energy technologies in the EOZ also provides benefits outside individual project outcomes as Energize Fresno focused on developments that include the full technology stack that defines zero net energy performance.

- Reduced energy consumption
- Demand response potential
- Higher standard of living
- Self-generation of electricity
- Grid reliability

This technology stack includes the capacity for energy storage to function as a virtual microgrid. In coupling the use of battery storage with on-site renewable generation with the development sites in the EOZ, the Energize Fresno portfolio can enhance grid reliability and resiliency, and provide improved safety and energy security. Next to the direct benefits residents can experience lower energy bills from energy efficiency and grid reliability and resiliency. Some of the most visible community benefits include reduced downtime, decreased risk of blackouts or brownouts, and increased power quality.

Policy Recommendations

As part of the master community design, the Energize Fresno team investigated local barriers to advanced energy technology deployment and developed city-level policy recommendations to help address these barriers and advance AEC development in Fresno. Potential barriers were identified through interviews with members of Fresno's development community and other local partners; participants were asked to pinpoint any specific barriers that Fresno developers face in building and installing advanced energy technologies in the EOZ. In response, the Energize Fresno team researched best practices and solicited expert input to provide recommendations to the City of Fresno to help catalyze the city's transition into an AEC.

Findings from this process are organized into the following sections that discuss potential barriers identified by interviewees, the city's ongoing efforts to improve the development process, and Energize Fresno's policy recommendations to advance AEC development:

- Development review process

- Infrastructure

- Project costs

- Information on incentive programs

- Electric vehicle charger permit process

- Affordable housing incentives

- Technical expertise

- Additional recommendations to support AEC criteria

    o Solar ordinance

    o Modification of the Fresno Green Program

    o Data and benchmarking

Overall, the Energize Fresno team found that the City of Fresno had taken concrete steps to address many concerns raised by developers, but there were additional actions that could reduce impacts on desirable development. Use of the Accela online land management system in the future by the City of Fresno will further streamline the permitting process (a major source of contention) and allow more refined technical assistance for projects with advanced energy components.

Addressing current barriers to development will not put Fresno on the path to becoming an AEC – there must be additional guidance from the city. Working with the City of Fresno, the Energize Fresno team created an update to an existing "green building" program: Fresno Green. This update changes Fresno Green from a historic preservation-focused program to a program that creates performance tiers for developments based on a checklist. The checklist uses the AEC criteria and priorities from the *City of Fresno General Plan* to give specific items a point value, based on the associated value to an AEC, to the community, how much it costs, and how much it exceeds building code standards. The City of Fresno is currently reviewing the updated Fresno Green proposal and assessing its viability for implementation.

CHAPTER 4:
Conclusions

As Fresno's population continues to grow, increased pressures are placed on the current transportation system, local economy, housing stock, energy infrastructure, and other existing resources, exacerbating the city's large disparity in resident incomes. Energize Fresno has responded to these local challenges while leveraging the city's momentum by providing a community-focused roadmap for mobilizing the development of high-performance buildings, improving the security of Fresno's energy systems, and supporting reduced energy cost burdens for some of the most vulnerable populations in the state.

The results of the proposed Energize Fresno portfolio ($4.6 million in annual energy cost savings, 26.6 million kWh in annual electricity savings, and 7,250 metric tons of CO_2e in annual GHG emissions reductions) were driven by grant funding and are designed to be funded with a mixture of market-ready financial products and grant funds. By leveraging community plans and improvements, Energize Fresno integrates AEC strategies into current and future projects for increased grid reliability, efficiency, and resource conservation, thus creating significant opportunities for future district-scale deployment. Moreover, by advancing the use of existing and emerging market-based financing products and city sustainability efforts to decrease energy use, Energize Fresno offers an opportunity for Fresno to enter into a more sustainable energy and resource model, unaffected by potential burdens brought about by population growth and climate change.

The Energize Fresno resources are available to local government staff outside of the City of Fresno as a case study and tools that can be replicated to expedite developing AECs in other California localities.

Lessons Learned and Recommendations for Future Applications

The Energize Fresno program process has yielded templates, resources, and a platform to help local governments match, layer, and leverage funding sources with development projects to achieve comprehensive resource savings, identify an effective portfolio, and engage additional private investment. However, based on the capacity and expertise gaps identified during planning, the Energize Fresno team believes that developing AECs without additional tools or resources will not continue. Although future AECs will be distinct from Fresno, local government staffs can use Energize Fresno's tools and processes to build a custom and inclusive AEC that is aligned with local community vision – overcoming some of the capacity issues previously mentioned.

Even without dedicated funding to support the development of AECs across the state, the Energize Fresno team believes the processes and tools developed during this grant period can be replicated and leveraged to help communities move forward with their goals holistically.

For future applications, Energize Fresno recommends building the project portfolio around keystone projects, such as multiple buildings with a single owner. Focusing on municipal operations and multi-property owners and developers during the project identification and selection could help promote buy-in from the local government and better streamline construction schedules and project implementation through improved coordination with the developers.

These projects may come with specific challenges, such as the lack of political will to support large AEC projects or the limited funding and financing capabilities of project owners and developers necessary for large scale use of technologies that provide community benefits. Community benefits are crucial to ensuring that an AEC serves the community at large and not only the developers or property owners who upgrade their properties. The lack of standardized valuation makes many technologies with district-scale benefits, such as microgrids or community solar, difficult to value, and therefore difficult to fund.

More technical assistance is necessary to identify, coordinate, and cross-leverage the funding sources and programs available to obtain substantial deep resource savings. A common theme expressed by local stakeholders throughout Energize Fresno's community interaction was to have coordinating support in designing, and funding sustainable projects. In future applications, Energize Fresno recommends having a "concierge" or ombudsman role to help navigate the services available. A city staff member or contractor who understands the municipal process and incentive programs for advanced technology use could become the liaison and point of contact between the city and developers. In this manner, the local development community is well-educated and supported on opportunities that improves local permitting and financing processes.

In addition to leveraging the Energize Fresno platform, cities must recognize the importance of community and local government buy-in to sustain AECs. By engaging with the community and local government staff, Energize Fresno was able to conduct a more accurate assessment of Fresno's capacity and readiness to participate in an AEC project. This assessment, in turn, could lead to a more effective integration of community needs into the master community design, boost participation in the implementation phase, and provide assurance of community-wide benefits.

Communities are diverse and the path to becoming an AEC can be obscure and complex. By providing a set of technologies, design and analysis tools, financial perspectives and plan activities in one platform, the Energize Fresno approach provides an adaptable and scalable process that brings future cities one step closer to being able to cost-effectively use technologies and strategies that achieve AEC goals.

ACRONYMS AND ABBREVIATIONS

Term	Definition
AEC	Advanced energy community
BETU	Business energy tune-up
BRT	Bus Rapid Transit
CO_2e	Carbon dioxide equivalent
DCFC	Direct current fast charger
EOZ	Energy Opportunity Zone
EPIC	Electric Program Investment Charge
EV	Electric vehicle
GDP	Gross domestic product
GHG	Greenhouse gas
GWh	Gigawatt hour
HETU	Home Energy Tune-Up
HSRA	High-Speed Rail Authority
HVAC	Heating, ventilation, and air conditioning
IRS	Internal Revenue Service
kWh	Kilowatt hour
LGC	The Local Government Commission
MOU	Memorandum of Understanding
MT	Metric tons
NDA	Nondisclosure agreement
OBF	On-Bill Financing
PACE	Property Assessed Clean Energy
PEV	Plug-in electric vehicle
PG&E	Pacific Gas and Electric

Term	Definition
PPA	Power purchase agreement
PV	Photovoltaic
RAM	Renewable auction mechanism
TAC	Technical Advisory Committee
Tierra	Tierra Resource Consultants, LLC
VMT	Vehicle miles traveled