City of Merced

PROGRAMMATIC CLIMATE ACTION PLAN

ATTACHMENT A

CITY OF MERCED

PROGRAMMATIC CLIMATE ACTION PLAN

ADMINISTRATIVE DRAFT

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Prepared for
the City of Merced

by
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LIST OF ABBREVIATIONS

AB 32: Assembly Bill 32 (The California Global Warming Solutions Act)
ADC: alternative daily cover
C&D: construction and demolition
CALGreen: California Green Building Code
Caltrans: California Department of Transportation
CAP: Climate Action Plan
CARB: California Air Resources Board
CEC: California Energy Commission
CEQA: California Environmental Quality Act
CH_4: methane
CNG: compressed natural gas
CO_2: carbon dioxide
CPUC: California Public Utilities Commission
CSI: California Solar Initiative
EV: electric vehicle
FTE: full-time employee
GHG: greenhouse gas
GVC: Great Valley Center
HERO: Home Energy Renovation Opportunity
HVAC: heating, ventilation, and air conditioning
ISR: Indirect Source Rule
kW: kilowatt
kWh: kilowatt-hour
LCFS: Low Carbon Fuel Standard
LEED: Leadership in Energy and Environmental Design
MCAG: Merced County Association of Governments
MID: Merced Irrigation District
NEV: neighborhood electric vehicle
NOx: NO (nitric oxide) and NO_2 (nitrogen dioxide)
N_2O: nitrous oxide
PACE: Property Assessed Clean Energy
PCAP: Programmatic Climate Action Plan
PG&E: Pacific Gas and Electric Company
PM_{10}: particulate matter smaller than 10 microns in diameter
PV: photovoltaic
RPS: Renewables Portfolio Standard
SJVAPCD: San Joaquin Valley Air Pollution Control District
TDM: Transportation Demand Management
UDM: Unified Design Manual
VMT: vehicle miles traveled
ZNE: zero net energy

List of Abbreviations

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Introduction

This Programmatic Climate Action Plan (PCAP) serves as the City's tool to implement the Climate Action Plan (CAP) adopted by the Merced City Council in 2012. Specifically, this PCAP demonstrates consistency with California Environmental Quality (CEQA) Section 15183.5 to provide options for streamlining the review of new projects that are subject to CEQA. Building on the values and goals of the City's adopted CAP, the PCAP provides additional technical analysis and tools that maximize benefits to the City from the existing regulatory framework while achieving consistency with City Council directives.

In addition to meeting CEQA guidance, the PCAP supports the City's General Plan. Analysis in the PCAP is consistent with the General Plan's key assumptions. The PCAP also implements General Plan policies and mitigation measures that address greenhouse gas (GHG) emissions. Accordingly, the PCAP is an important step to support the City's ongoing progress in implementing and maintaining the General Plan.

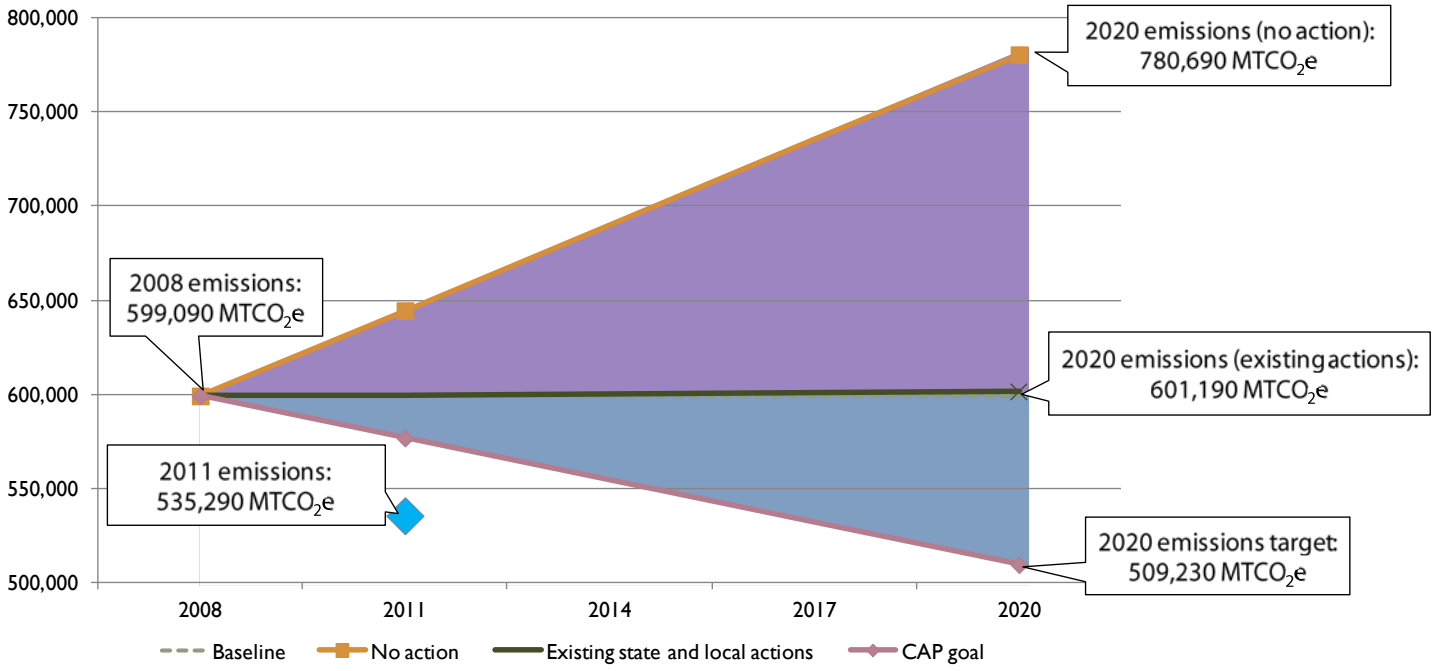
PCAP Outcomes

The PCAP serves as the City's comprehensive strategy to achieve 1990 GHG emissions levels by 2020, the GHG reduction target adopted by the City Council. This level of reduction is equivalent to a 15% reduction below community-wide 2008 GHG emissions by 2020. The PCAP consolidates existing state and local policies and programs that address greenhouse gas emissions. This approach includes an

evaluation of the community's progress to date, including the results of enacted state regulations and programs. By consolidating existing policy and program requirements, the PCAP shows credit for early efforts while also providing a simple summary of additional actions that are necessary to achieve the GHG reduction target.

Figure ES-1 summarizes the strategies that will allow the community to achieve the GHG reduction target of 509,230 metric tons of carbon dioxide equivalent ($MTCO_2e$). Existing state and local strategies play an important role to achieve the 2020 target.

Figure ES-1: City of Merced 2008–2020 Community GHG Emissions Forecast and Reduction Target



Ultimately, the PCAP serves as a clearinghouse for the community's climate action planning efforts. Measures in the PCAP identify the City's strategy to close the gap and achieve the 2020 target. In addition to providing technical information used in the analysis of these measures, the PCAP provides the City's plan for moving forward and achieving the 2020 GHG emissions reduction target. Strategies in the PCAP include concrete performance metrics and time frames for completion. Performance metrics in the PCAP consist of targets such as the number and size of solar photovoltaic panels in the community. With such information, City staff is equipped to work toward transparent objectives that both decision-makers and the public can easily evaluate and comprehend.

To achieve the 2020 target, the PCAP presents 31 measures that implement the adopted measures of the CAP. The measures provide a diverse array of City actions, programs, and incentives to achieve a 15% reduction in community-wide GHG emissions by 2020. In addition, the measures provide a path to sustain ongoing reductions toward 2030 in support of long-term state reduction targets. In addition to achieving GHG reductions, measures support other community values, such as clean energy resources and cost savings. The largest source of GHG reductions comes from a performance-based measure for new development that outlines options for new projects to achieve

a minimum level of GHG reductions in a manner consistent with regional guidance from the San Joaquin Valley Air Pollution Control District (SJVAPCD).

Plan Development

The City prepared this PCAP with extensive involvement from community members, City staff, and key stakeholders. In addition to hosting a public workshop and one-on-one meetings with the development community, the City facilitated an ad hoc advisory group for the effort, the PCAP Focus Group. This group reviewed key deliverables and vetted ideas and priorities for the project. Focus Group priorities for the PCAP included an emphasis on providing flexible, user-friendly tools to enable private initiative while reducing costs. The Focus Group also identified the importance of providing options for PCAP implementation while establishing an accurate system to track progress to PCAP targets.

Drawing on this input, City staff and the project team developed the PCAP as a comprehensive framework to achieve GHG reductions in a flexible manner that complements the local community. This approach led to a focus on consolidating existing policies and strategies, simplifying the process for new development, and equipping City staff with the tools to review new projects and account for accomplishments. The PCAP serves as a living document, outlining options for implementation and providing tools to prioritize and reconsider strategies that will achieve the CAP reduction target as resources and conditions change.

What is the PCAP?

A plan with tools to save money for Merced residents and businesses.

A plan to help conserve water, clean air, and other key resources.

A strategy to help ensure a healthy living and working environment.

An approach to take advantage of clean energy opportunities.

A means of streamlining permit approval and reducing regulatory barriers

PCAP Tools

Ultimately, the PCAP serves as a user-friendly guide to City staff, the development community, and the public. Rather than establishing a rigid plan for implementation, the PCAP offers tools and options that can accommodate changing funding and legislative considerations while equipping the City to attain the 2020 target. Tools that support this PCAP include the following:

- Project Options Checklists to identify discrete, project-level options for new development seeking consistency with the PCAP. The checklists are described throughout this PCAP and included as **Appendix A**.

Executive Summary

- A Unified Design Manual (UDM) to illustrate relevant visual aspects of project design that also support GHG reductions outlined in this PCAP. The UDM is described further throughout the PCAP and is also available on the City's website.
- A Work Program for City staff to achieve the GHG reduction target, provided in **Chapter 3**.
- A Monitoring and Implementation Tool for City staff. This Excel-based tool allows staff to track progress and prioritize measures for implementation based on key considerations in the PCAP. The tool also equips staff to conduct evaluation for regular updates to the City Council and other decision-makers, supporting ongoing input to guide implementation and prioritization of staff efforts.

Introduction and Purpose

In 2012, the City of Merced City Council adopted a Climate Action Plan (CAP). The CAP provides context for climate action, a greenhouse gas (GHG) emissions inventory and forecast, and strategies to reduce local GHG emissions. State and regional guidelines and programs provide incentives to cities with climate action plans. Key among these incentives is the ability to conduct a programmatic analysis of GHG emissions to simplify the review of new development.

The 2012 CAP was an important step toward the City providing streamlining benefits to new development. The CAP also identifies four values for the community: Healthy Communities, Quality Natural Resources, Clean Energy Resources, and Leaders and Partners. The purpose of this Programmatic Climate Action Plan (PCAP) is to support the CAP, help implement the four community values, and demonstrate the City's consistency with the California Environmental Quality Act (CEQA) Guidelines Section 15183.5 for programmatic GHG reduction plans. By meeting the guidance of the CEQA Guidelines, the City has conducted an upfront analysis of community-wide GHG emissions, providing the option for new projects subject to CEQA to streamline the GHG emissions analysis.

Relationship to the CAP

Merced's CAP was adopted in October 2012 following an extensive planning effort by City staff. The CAP provides a clear statement of community values as they relate to climate conditions. The key purpose of the CAP is to provide a plan to achieve 1990 GHG emissions levels by 2020. The CAP includes strategies to reduce GHG emissions and attain the 1990 GHG emissions levels, drawing on

and building on the policies included in Merced's General Plan. In addition to providing an approach to GHG reductions, the CAP also seeks to (1) save residents and businesses money by reducing energy bills, (2) provide opportunities for the City to apply for grant funding, and (3) allow streamlining of development projects.

Analysis in this PCAP shows that to attain 1990 GHG emissions levels, the community must achieve a reduction in community-wide GHG emissions by 91,960 metric tons of carbon dioxide equivalent ($MTCO_2e$) by 2020. While the CAP represents the targets and strategies that reflect and align with core community values, this PCAP is intended to achieve the reduction target with the following priorities and approach:

- Consistency with the intent of the 2012 CAP.
- Implementation of the City Council's adopted community-design goals and policies.
- Implementation of environmental commitments the City Council adopted in the environmental impact report for the Merced General Plan, including mitigations to improve air quality and protect environmental resources.
- Permit streamlining based on CEQA Guidelines Section 15183.5(b) that supports the type and quality of development envisioned by the Merced General Plan.
- Alignment of development codes with existing air pollution control district requirements.
- The PCAP demonstrates consistency with these objectives. Ultimately, the PCAP creates tools to achieve CAP targets, protect natural resources, encourage appropriate development, and streamline environmental review.

PCAP Objectives

This PCAP provides the option for CEQA streamlining while achieving the CAP reduction target by 2020 and establishing a plan for the City to achieve long-term, post-2020 targets consistent with state guidance. This section describes CEQA streamlining and target attainment considerations.

Allow CEQA Streamlining

Under CEQA Guidelines Section 15183.5(b), GHG reduction plans, such as a climate action plan, that can demonstrate consistency with the guidelines can be considered "qualified." A qualified GHG reduction plan is designed to streamline the GHG emissions component of the environmental review process of future projects.

In order for projects to use a CAP or other GHG reduction plan for the environmental review under state law for purposes of GHG emissions, a CAP or other GHG reduction plan must satisfy the six requirements contained in CEQA Guidelines Section 15183.5(b):

1) Quantify GHG emissions, both existing and forecast over a set time period, resulting from activities within a defined geographic area.

2) Based on substantive evidence, establish a level below which GHG emissions from activities covered by the plan are not cumulatively considerable.

3) Identify and analyze the GHG emissions as a result of specific actions or categories of actions anticipated within the defined geographic area.

4) Specify measures or a group of measures, including performance standards, which substantive evidence demonstrates would collectively achieve the specified emissions level if implemented on a project-by-project basis.

5) Establish a mechanism to monitor the plan's progress toward achieving the level and to require revisions to the plan if it is not achieving the specified levels.

6) Be adopted in a public process following environmental review.

Lead agencies may use adopted GHG reduction plans that are consistent with CEQA Guidelines Section 15183.5(b) in order to analyze and mitigate the significant effects of GHGs under CEQA at a programmatic level. Following adoption of the CAP, as individual projects are proposed in a jurisdiction with a qualified CAP, environmental documents for individual projects may tier from and/or incorporate by reference the existing programmatic GHG review into their cumulative impact analysis. Projects that are consistent with the general plan, GHG reduction plan, and other planning documents may rely on the programmatic analysis of GHGs in the reduction plan for their project-specific environmental analysis.

Achieve 2020 GHG Reduction Target

As noted above, the CEQA Guidelines require qualified plans to prepare a GHG inventory of existing emissions and a forecast of future emissions and to identify a target for reducing emissions to a point where they are not cumulatively considerable. The City prepared a 2008 inventory to establish existing GHG emissions levels, updated to be consistent with the most recent guidance and best practices. City staff used the 2008 inventory to forecast emissions for future years and to prepare a reduction target consistent with state guidance, enabling the CAP and this Work Plan to continue to be consistent with CEQA Guidelines Section 15183.5(b).

How to Use the PCAP

This PCAP serves to provide clear direction to City staff and members of the community for achievement of the 2020 CAP targets. General information about climate change and City priorities are available in the 2012 CAP. The PCAP also serves as a work plan to guide City staff with the implementation of the CAP. The remainder of this chapter provides basic context for the PCAP. Plan users that are interested in program implementation of development project CAP consistency should skip to the following chapters:

- Chapter 2: Reduction Measures, including performance targets and implementation actions for City staff, other agencies, residents, and businesses, to attain GHG reductions. This chapter provides a summary of all City strategies to achieve the 2020 reduction target, including actions for new and existing development.

- Chapter 3: Work Program, with guidance for City staff to implement the PCAP, understand costs and benefits, identify prioritization of measures implementation, and track progress.
- Appendix A: Project Options Checklists, which provides checklists that City staff will use to determine the consistency of new projects with the CAP and the PCAP. This appendix also includes:
  - Criteria, or "design elements" in the checklists, which show how reduction measures in Chapter 2 apply on a project level.
  - A menu of several options for projects seeking CAP consistency and provisions for CEQA streamlining, providing both flexibility and predictability to new projects subject to CEQA.
  - Additional resources for City staff and project applicants to further understand criteria for CAP consistency, including key terms, recommended guidance, and cross-references to indicate issues further addressed by the City's Unified Design Manual.
- Appendix B: Inventory and Forecast Update, including data, methods, and sources for the inventory and forecast, in addition to reduction measures.
- Appendix C: Technical Data, which explains the assumptions, data sources, and performance metrics used in the calculations for the reduction measures and the cost-benefit analysis.
- The City prepared five technical memos in support of this PCAP. In order to keep this document user friendly, the PCAP presents the findings of the technical memos. Some of the information from these memos has been incorporated into this PCAP and into the three appendices: **Appendix A** (Project Options Checklists), **Appendix B** (Inventory and Forecast Update), and **Appendix C** (Technical Data).

Regulatory Purpose of the PCAP

Although state laws and regulations do not require local agencies to prepare climate action plans, agencies are responsible for preparation of other types of planning documents that may deal with greenhouse gas emissions and climate change. State and/or federal law directs communities to prepare certain types of planning documents; for example, the California Government Code requires communities to have a general plan. Cities and counties are not required to have a CAP under state or federal law, although a local government may have a policy in its general plan or other guiding document directing the community to prepare a CAP.

Local and regional plans and programs address GHG emissions in new development. The City of Merced General Plan and its associated environmental impact report commit to strategies that reduce GHG emissions. The City is also responsible for analyzing GHG emissions of projects subject to CEQA prior to project approval. Following project approval, certain types of projects are further subject to the Indirect Source Review (ISR) Program administered by the San Joaquin Valley Air Pollution Control District (SJVAPCD). To meet ISR regulations, projects must pay a fee based on the volume of other types of air quality emissions such as criteria air pollutants or demonstrate reductions in project emissions using strategies that also reduce GHG emissions.

State regulations and guidance also require certain types of new projects to address greenhouse gas emissions and climate change. In March 2010, new amendments to the state CEQA Guidelines became effective, requiring projects subject to CEQA to analyze impacts on GHG emissions and climate change. Lead agencies have the option to analyze the significant effects of climate change at a programmatic level to simplify the subsequent review of projects for purposes of GHG emissions. One option to streamline the environmental review of GHG emissions for later project-level analysis is the development, adoption, and implementation of a community-wide climate action plan.

With adoption of this PCAP, the City of Merced provides simplified option for new projects to address the multiple requirements pertaining to GHG emissions. Projects subject to CEQA can now rely on the City's PCAP and CAP to assist in complying with the CEQA requirements for GHGs. Measures in the PCAP will also help new projects identify appropriate measures that meet the guidance of the ISR program, with the potential to reduce emissions and fees to the SJVAPCD.

Inventory and Forecast

The inventory and forecast serve as the foundation for the CAP and the PCAP by providing a summary of current and future GHG emissions in the city of Merced. The inventory and forecast allow elected officials, City staff, and community members to understand what activities contribute to their GHG emissions and how these emissions are expected to change in the future. This information gives decision-makers the ability to focus GHG reduction efforts on the largest sources of emissions and those that have the greatest potential to achieve reductions, maximizing the effective use of City resources.

Baseline 2008 GHG Inventory

The City of Merced prepared a GHG inventory for calendar year 2008, which City staff used to prepare the 2012 CAP. The Great Valley Center later prepared a second inventory for Merced for the calendar year 2011. The 2011 inventory uses updated methods that reflect the latest best practices and guidance. In response to the 2011 inventory, staff revised the 2008 inventory to ensure that it follows the most recent guidance in the US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, the first protocol developed for community-wide GHG inventories that provides the most widely accepted methods for preparing inventories. This update also helps to ensure that the inventory meets the standards allowing the 2012 CAP to be used to streamline environmental review under CEQA, allowable under CEQA Guidelines Section 15183.5(b), and is consistent with the inventory prepared by the Great Valley Center, allowing a more accurate comparison between the 2008 and 2011 inventories. **Appendix B** provides details about how the forecast was updated since the 2012 CAP.

In 2008, the community of Merced emitted approximately 599,090 $MTCO_2e$. Of these emissions, 95% resulted from only three sectors: vehicle travel on local roads and state highways within Merced (transportation), energy use in residential buildings, and energy use in nonresidential buildings. Transportation was the single largest sector, contributing approximately 39% of GHG emissions in 2008. Combined, energy use in both the nonresidential and residential sectors contributed 55% of emissions in 2008. Community-wide emissions in 2008 are shown in **Table 1**. **Appendix C** provides technical details on inventory calculations.

Table 1: City of Merced 2008 Community GHG Emissions

Sector	$MTCO_2e$	Percentage
Transportation	235,570	39%
Nonresidential energy	216,680	36%
Residential energy	115,110	19%
Solid waste	18,750	3%
Water and wastewater	6,670	1%
Off-road equipment	6,310	1%
Total	**599,090**	**100%**

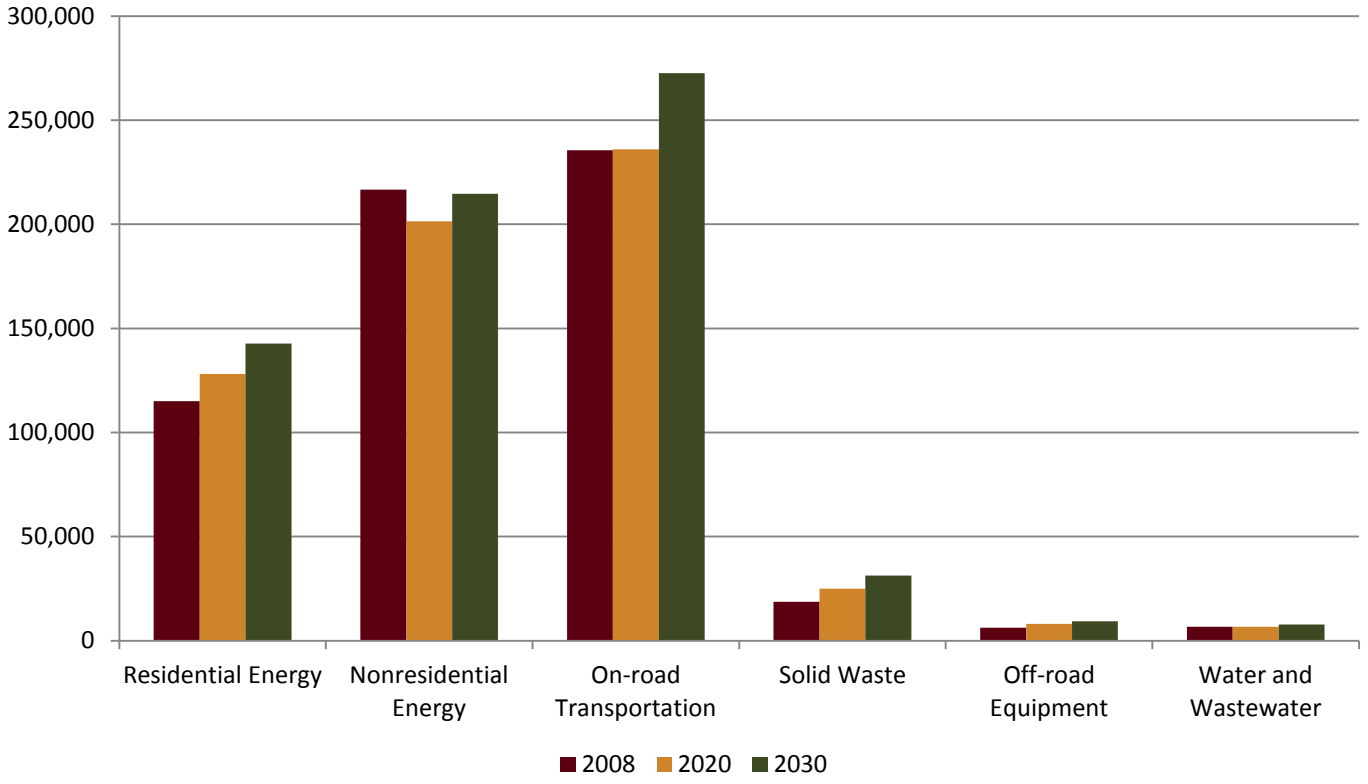
GHG Emissions Forecasts

The City forecast emissions for future years as a basis of calculating a reduction target. Like many other communities in the San Joaquin Valley, Merced's population and employment are expected to increase substantially over the next few decades. Without any action taken at the federal, state, or local level to reduce emissions, Merced's GHG emissions are expected to rise significantly as the city experiences growth in the number of new residential and nonresidential buildings, more residents, and more people working and conducting activities in the community. This growth scenario is a "worst-case" scenario, based on the growth assumptions of the City's General Plan.

California has already implemented a number of programs that reduce GHG emissions locally. The forecast is adjusted to account for GHG reductions from state actions.[1] In 2020, with state actions, the city's GHG emissions will reach 605,390 $MTCO_2e$, a 1% increase above baseline 2008 levels. By 2030, the emissions forecast will increase by 13% from 2008 levels, reaching 678,330 $MTCO_2e$. The transportation sector will remain the largest GHG emissions sector in 2020 and 2030, with total growth of 36,970 $MTCO_2e$ from 2008 to 2030, even after accounting for the impact of state actions. **Figure 1** presents GHG emissions for 2008, 2020, and 2030 by emissions sector. A technical summary of the City's updated GHG inventory and forecast is provided in **Appendix B**.

[1] The impact of state actions is sometimes referred to as the adjusted business-as-usual forecast, or ABAU approach. The ABAU forecast is adjusted for state actions that require little or no local action to reduce emissions. For this reason, state-mandated actions that give discretion to local governments on specific implementation actions, such as implementation of state recycling requirements or adopting complete street standards, are not included in the ABAU forecast. For more information, refer to Appendix A.

Figure 1: 2008–2030 Community Emissions in Merced by Sector with State Actions ($MTCO_2e$)

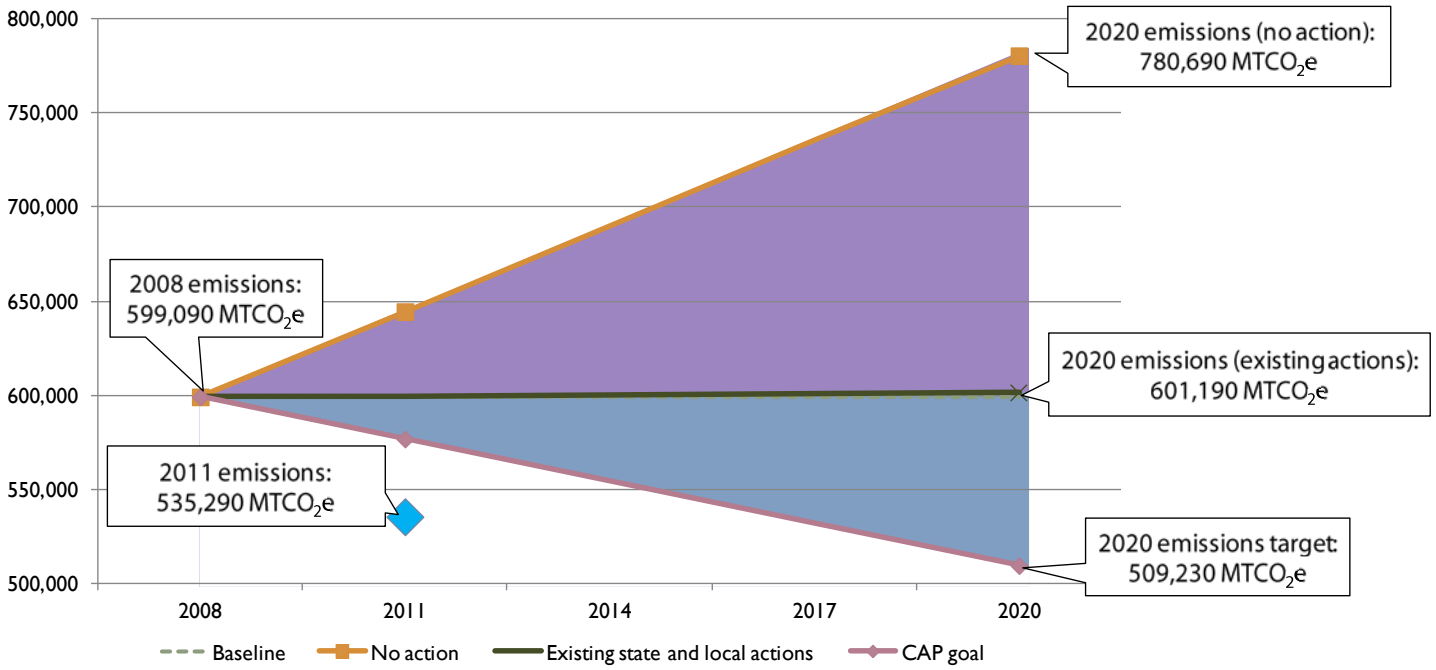


GHG Reduction Target

To establish a programmatic CAP that provides CEQA streamlining to new development, plans must identify a level of GHG emissions below which GHG emissions would not be cumulatively considerable. This level is typically referred to as a reduction target. With the Merced CAP, the Merced City Council adopted a community-wide GHG reduction target of 1990 levels by 2020. This target is equivalent to a 15% reduction below the baseline year of 2008 by 2020, consistent with the statewide target established by Assembly Bill (AB) 32. A key outcome of this PCAP is to provide a group of measures that are demonstrably capable of achieving the target adopted by the Merced City Council, consistent with the standards for a qualified GHG reduction strategy identified in state CEQA Guidelines Section 15183.5(b).

Figure 2 illustrates the adopted 2020 reduction target and 2020 GHG emissions forecast. With actions implemented by the State only, the City must close a gap of 96,160 $MTCO_2e$. Accounting for existing local accomplishments, the City must still close a gap of approximately 91,960 $MTCO_2e$. The shaded blue area in **Figure 2** represents the GHG emissions that the City must reduce with CAP measures to achieve the adopted CAP target. The City must address the outstanding 91,960 $MTCO_2e$ that remain after state efforts and existing accomplishments with actionable CAP tools and programs, which are presented in **Chapter 2**.

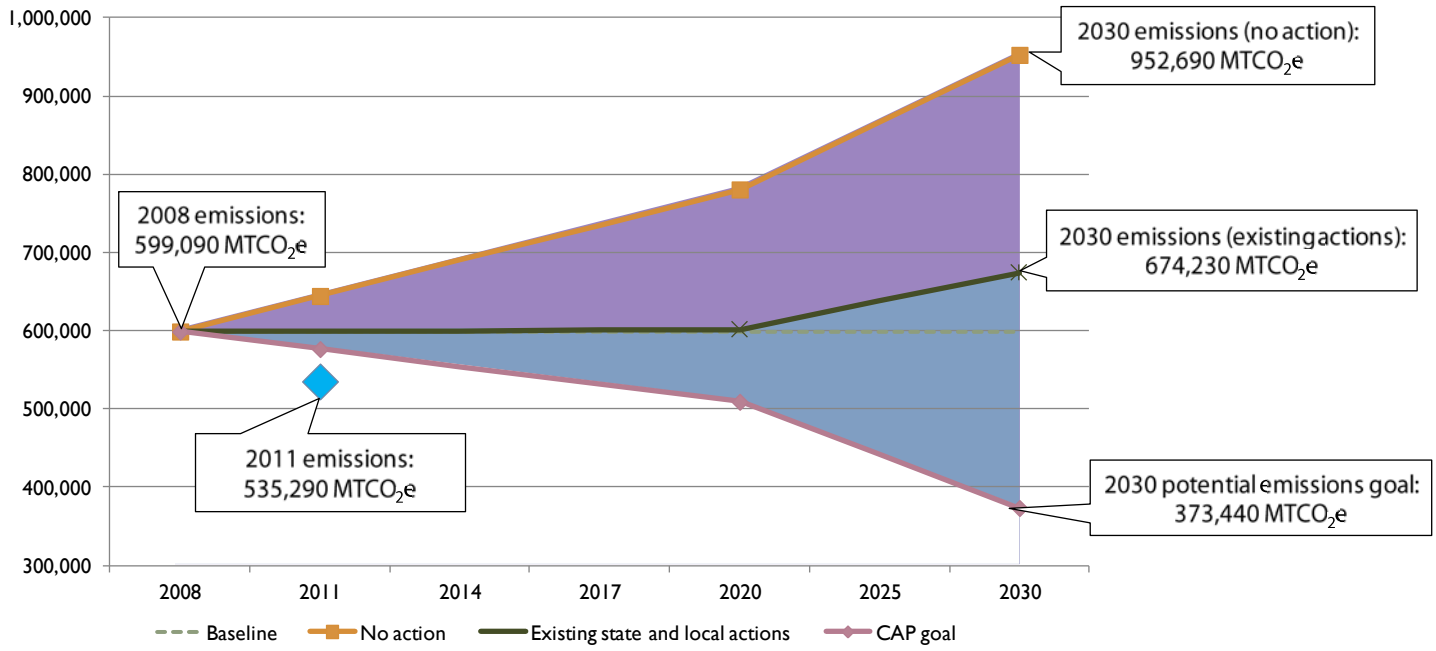
Figure 2: City of Merced 2008–2020 Community GHG Emissions Forecast and Reduction Target



The CAP does not provide a target beyond 2020. State guidance in the recently updated AB 32 Scoping Plan emphasizes the importance of establishing a post-2020 goal but does not recommend a specific target.[2] Executive Order (EO) S-3-05, signed in 2005, set a 2050 reduction goal of 80% below 1990 levels for the state, but this target has not been formally adopted. The trajectory toward the 2050 target is equivalent to a 2030 target of approximately 38% below baseline levels. The provisional 2030 target, a 38% reduction below baseline 2008 levels, is provided here to illustrate the commitment that would be needed to be on a trajectory to achieve the 2050 reduction target identified in EO S-3-05. A provisional 2030 target also shows emissions associated with the Merced General Plan horizon year. To achieve a reduction of approximately 38% below baseline 2008 levels, the City would need to increase the pace of reductions post-2020. **Figure 3** illustrates the provisional 2030 reduction target of 38% below baseline levels by 2008. The City would need to achieve an additional reduction of 300,790 $MTCO_2e$ beyond state and existing local actions by 2030 to achieve a reduction of approximately 38% below baseline levels to maintain a trajectory toward California's long-term 2050 GHG reduction goals. This is one potential 2030 target, and the City may wish to consider others, as discussed in greater detail in **Chapter 2**.

[2] California Air Resources Board. 2014. Scoping Plan Update.

Figure 3: City of Merced 2008–2030 Community GHG Emissions Forecast and Reduction Target



Summary of Early Progress Toward the Reduction Target

A number of actions undertaken by the State of California to reduce statewide GHG emissions are already under way, which helps to reduce emissions within the community of Merced. Four of these existing state actions collectively reduce 2020 emissions by 175,300 $MTCO_2e$ below the "no action" level:

- Assembly Bill 1493 and the Low Carbon Fuel Standard, which improve fuel efficiency in most passenger vehicles and reduce carbon intensity for transportation fuels
- Heavy Duty Vehicle GHG Reduction, which requires retrofits to large freight vehicles to improve fuel efficiency
- The Renewables Portfolio Standard, which requires electricity providers to obtain at least 33% of their electricity from eligible renewable sources by 2020
- Title 24 of the California Building Code, which establishes energy efficiency standards for new buildings

UC Merced Sustainability

UC Merced (UCM) has completed a number of actions to reduce GHG emissions to date, including:

- Building an 8.5-acre solar array that meets 20% of the campus's electricity needs.
- Receiving LEED green building certification on all buildings, the only campus in the US to achieve this distinction.
- Creating a composting program at the cafeteria, keeping 40,000 pounds of waste out of landfills annually.

Because UCM is not located within the Merced city limits, these actions do not result in direct GHG reduction credits for the CAP. Nonetheless, UC Merced is identified in this PCAP as an important partner to help the City implement transportation demand management programs for student housing in the city. Additional information is available in Chapter 2.

Source: https://sustainability.ucmerced.edu/area-stakeholders

The City of Merced has also initiated additional steps beyond the statewide actions that reduce GHG emissions locally with early action. These local actions reduce 2020 GHG emissions by an additional 4,200 $MTCO_2e$:

- Community solar panels: Merced has promoted the widespread use of rooftop and other smaller-scale solar energy systems, in large part due to incentives offered by the California Solar Initiative (CSI). Under this program, residents and businesses in Merced have installed approximately 200 solar energy systems since 2008.
- Green Facilities Project: The Green Facilities Project is an extensive retrofit of City-owned facilities to improve energy efficiency. The project was completed in July 2012 and saves approximately 3.6 million kilowatt-hours (kWh) of electricity each year.
- Commute Connections: Commute Connections is a vanpool program that provides an alternative for people driving to and from work in their personal vehicles. At the end of 2013, over 350 Merced residents participated in this program.
- Digester gas capture: Merced's wastewater treatment plant routinely produces digester gas as a by-product of the treatment process, which contributes to City GHG emissions. The digester gas capture program collects this gas and uses it for alternative purposes, preventing it from escaping into the atmosphere.

The list identifies only key actions with available data that provide certainty for early and ongoing GHG reductions. Other policies and regulations may contribute to GHG reductions, but the volume of reductions cannot be clearly identified at a community scale due to a lack of data or calculation methods. Where relevant, other state and local codes or policies that help new development achieve consistency with the CAP are addressed throughout this document. In these instances, complying with existing regulations may help a project implement the measures in **Chapter 2** and **Appendix A**. More information follows throughout this document.

To achieve the adopted 2020 target, the community of Merced must reduce emissions 271,460 $MTCO_2e$ below its "no action" emissions forecast. The state and local actions identified above collectively reduce emissions by 179,500 $MTCO_2e$ in 2020, equal to 66% of the necessary reductions. In order to achieve the 2020 reduction target, the City must accomplish the remaining 34% of necessary reductions and achieve a reduction of approximately 91,960 $MTCO_2e$ to reach the 2020 reduction target. The 91,960 $MTCO_2e$ is also referred to as the emissions "gap" that must be

Interim 2020 Targets – Annualized Progress Objectives

For illustrative purposes, if the 2020 emissions gap were averaged annually from 2008 to 2020, the annualized reduction equivalent would be approximately 7,660 $MTCO_2e$ in addition to the reductions achieved from the state actions and local reductions presented here. While this annualized reduction amount does not reflect the ramp-up time often needed for reductions or phasing of state programs, it serves to provide an early benchmark of progress. To achieve the informational 2030 target, the City would need to reduce GHGs by approximately 13,670 $MTCO_2e$ per year (from 2008 to 2030) above the reductions already counted by state actions and local accomplishments.

eliminated to achieve the target. This is equivalent to a 15% reduction below the adjusted emissions forecast (with local accomplishments) for 2020, as shown in **Table 2**. By 2020, state actions and local accomplishments are expected to achieve annual reductions equivalent to 179,500 $MTCO_2e$, or at a rate of 14,960 additional $MTCO_2e$ per year from 2008 to 2020.

Table 2: Future GHG Emissions and Reduction Targets, 2020 and 2030

	2020	2030
Baseline (2008) emissions ($MTCO_2e$)	599,090	599,090
Emissions forecast ($MTCO_2e$)	780,690	952,690
State actions ($MTCO_2e$)	-175,300	-274,360
Local accomplishments ($MTCO_2e$)	-4,200	-4,100
Emissions forecast with state actions and local accomplishments ($MTCO_2e$)	601,190	674,230
Emission target ($MTCO_2e$)	509,230*	373,440†
Local reduction needed to achieve target ($MTCO_2e$)	-91,960	-300,790
Local reduction needed to achieve target (percentage)	-15%	-45%

Notes:
**15% below baseline emissions*
†Approximately 38% below baseline emissions

Monitoring Progress and Plan Implementation

Monitoring plan progress toward reduction targets is one of the required criteria for qualified GHG reduction plans as outlined by CEQA Guidelines Section 15183.5. The City will conduct annual monitoring and reporting to track CAP measure progress on an annual basis through 2020. The City will use a monitoring and reporting tool to estimate changes in GHG emissions and track implementation of CAP measures. The tool will allow the City to prepare interim estimates of progress toward the 2020 goal, which can be presented to the Merced City Council, members of the public, and other key stakeholders. The tool also equips City staff to track the outcome of actual growth versus forecast growth on GHG emissions, allowing City staff to understand potential credits based on the community not collectively achieving its GHG reduction targets.

City staff will also support PCAP implementation by use of the Project Options Checklists in **Appendix A**. These checklists present several options for residential and nonresidential development to attain consistency with the PCAP. The checklists guide project applicants and City staff to additional resources to understand the key performance objectives and range of potential solutions to meet consistency with the checklists. A key resource is the City's Unified Design Manual (UDM). Available as a separate document, the UDM provides guidance for the visual aspects of project design that reduce GHG emissions and support the reduction measures in this plan. More information is available throughout this PCAP and in **Appendix A**.

Chapter 1

Public Engagement

The City facilitated a collaborative process to prepare the PCAP. City staff, stakeholders, the public, and an appointed ad hoc advisory committee, the PCAP Focus Group, provided ongoing input on project development. Stakeholders in the community vetted and recommended appropriate strategies reflective of the community. The outreach process served to develop a plan that responds to community leadership and priorities. The strategies in this PCAP reflect those community priorities and recommendations. Engaging the community also allowed the City to build and nurture partnerships necessary to implement the CAP.

Resource Efficiency Fair

The City hosted the PCAP Resource Efficiency Fair for the PCAP on February 27, 2014, at the Senior Center. The fair served as the public kickoff event for the PCAP and as an educational event for Merced residents and business owners. The event was intended to inform members of the public about the PCAP project, including project purpose, components, and timeline. In addition, the City used the fair as an opportunity to invite individuals interested in joining the project's ad hoc advisory focus group. Attendees also participated in a number of activities to determine support for various resource efficiency actions and barriers that exist to implementing these items.

The Resource Efficiency Fair did not focus solely on the PCAP. In addition to staff from the Merced Planning Division and the project's consultants, representatives from 31 other organizations were in attendance to share information about resource efficiency with event attendees. These participants included other government agencies and departments (such as the City's Public Works Department), various community groups such as the Merced Bike Coalition and the Master Gardeners of Merced County, private companies and utilities that are key stakeholders in resource efficiency such as PG&E, and numerous representatives of community institutions, including multiple groups from UC Merced. Each organization hosted a table to display information, provide demonstrations, and conduct activities.

Including the representatives from the various organizations, approximately 120 people attended the fair. The City Manager and key project staff provided brief presentations. City staff and the project consultant presented a brief overview of the PCAP effort. Following these presentations, attendees were invited to visit the organization tables that were set up around the room. At

On February 27, 2014, over 100 individuals participated in the City's Resource Efficiency Fair to kick off the PCAP effort.

the PCAP Activity Table, participants provide input by voting on priorities using "issue buckets" and selecting recommended strategies on activity posters.

Key input from participants at the fair included the following:

- Water resource protection was identified as the most important priority issue for residents, visitors, and business participants.
- Participants identified costs and lack of information as key barriers to conducting home and building improvements that reduce energy use.
- The majority of responding participants already recycle, and use energy-efficient light bulbs and appliances.
- Respondents identified interest in installing renewable energy.
- Participants identified incentives as important tools to encourage additional actions .

City Staff Engagement

Interdepartmental engagement was essential in the development of the PCAP to ensure that strategies were attainable and appropriate for the community. The project team relied on input from key City staff to provide input and guide PCAP content development. The Technical Advisory Committee (TAC), including staff from Public Works and Planning and Building, reviewed deliverables and participated in working meetings to provide input. The TAC also was invited to attend and participate at Focus Group meetings.

Focus Group

The City established a Focus Group to review the PCAP and provide feedback as a vital means of ensuring that the PCAP reflects the values of the diverse interests and organizations in Merced. City staff invited Focus Group members from the Merced business community (including representatives from developers, real estate professionals, and local companies providing "green jobs"), advocacy groups, and City officials, including the mayor and a Planning Commission representative. The Focus Group reviewed PCAP policies and associated products, including the GHG reduction measures and their prioritization, the monitoring programs, the cost-benefit analyses, and the development code language and the UDM. The Focus Group met seven times between March 2014 and September 2015. All Focus Group meetings were open to members of the public, and all meeting materials were posted on the City's website. Community members who were unable to attend the meetings had the opportunity to submit comments electronically.

At each meeting, Focus Group members and other attendees received an update on the status of the PCAP and the work that had been done since the previous meeting. City staff then presented information on the next stage of PCAP development and brought up specific issues for the Focus Group to discuss and provide feedback on. The meetings also allowed additional discussion of other items, including issues submitted to the members by City officials, ensuring that the Focus Group could offer valuable input on all items rather than a limited set. Members of the public in attendance had the opportunity to offer comments on the PCAP at these meetings.

During the seven Focus Group meetings, members offered critical feedback on a wide range of items to guide PCAP development, including emphasis on the following issues:

- Focus on priorities to help Merced residents and businesses save money, conserve resources, and reduce GHG emissions.
- Identify measures that help Merced achieve its GHG reduction target in a cost-effective manner that encourages and does not hinder business.
- Provide options for implementation approaches to simplify the process for new development.
- Evaluate and disclose the cost-effectiveness and applicability of various proposed reduction measures, and show ways to reduce the cost of implementation.
- Support partnerships with the community and other agencies to educate the public and foster community achievement of PCAP objectives.

Additional Engagement

City staff conducted one-on-one meetings with other stakeholders in the community. These meetings provided the opportunity to share project updates and invite feedback. City staff invited developers and builders to attend open office hours for discussion of suggestions for PCAP measures related to new development. Additionally, the project team coordinated with staff from the San Joaquin Valley Air Pollution Control District. The intent of this additional outreach was to engage key stakeholders and identify opportunities to leverage efforts or share information.

Introduction

The GHG reduction measures are intended to reduce Merced's emission, closing the gap of 91,960 $MTCO_2e$ between community emissions after state and local existing accomplishments and the City's adopted GHG reduction goal of returning to 1990 levels by 2020. The reduction measures accomplish this goal by combining voluntary programs for existing residents and businesses with a flexible, performance-based approach that identifies existing regulations or new opportunities for new development. The combination of these two approaches and the way they are implemented allows residents, businesses, and developers a high degree of flexibility to implement the measures in the way that makes the most sense for their goals and values, while also demonstrating predictable GHG reductions to City staff to ensure that Merced can achieve its adopted GHG reduction target.

Relationship to Measures in Existing CAP

Merced's adopted CAP includes 8 goals and 24 strategies to reduce GHG emissions. These goals and strategies identify opportunities for GHG emission reductions, directing City staff and other stakeholders to focus GHG reduction efforts on these items. The measures in this chapter build on the strategies in the adopted CAP, providing additional implementation details to identify the volume of GHG reductions achieved by each measure and to allow the City to effectively track CAP implementation. The measures also included opportunities and available programs for GHG emission reductions that are applicable to Merced, but were not available at the time the adopted CAP was

prepared or were not included in the adopted document. This chapter lists 31 reduction measures, which correspond to the strategies in the existing CAP as shown in **Table 3**.

Table 3: Relationship Between Existing CAP Strategies and PCAP Measures

CAP Strategy	Applicable PCAP Measure(s)
EM 1.1: Site design planning	1, 31
EM 1.2: Transit planning	2, 3, 4, 6, 31
EM 1.3: Bicycle planning and projects	3, 6, 31
EM 1.4: Pedestrian planning and projects	1, 31
SC 2.1: Compact urban form and infill	1, 31
SC 2.2: Mixed use and transit-oriented development	1, 6, 31
SC 2.3: Growth management planning	1, 31
SC 2.4: Community appearance	1, 31
WC 3.1: Water conservation and technology	21, 22
WC 3.2: Reduce groundwater pumping	21, 22, 25, 31
WC 3.3: Water-efficient landscapes	24, 31
AR 4.1: Reduced vehicle trips	2, 3, 4, 6, 7, 31
AR 4.2: Clean trips – clean vehicles	8, 9, 31
AR 4.3: Reduce non-vehicular emissions	29, 30
WR 5.1: Reduce, reuse, and recycle	26, 27, 28
RE 6.1: Renewable energy systems	17, 18, 19, 20, 31
BE 7.1: Green City facilities and infrastructure	14, 15, 16
BE 7.2: Energy efficiency in new development	10, 11, 31
BE 7.3: Residential energy efficiency	12, 13, 15
BE 7.4: Commercial and industrial energy performance	14, 15, 16
BE 7.5: Urban forestry and heat island effect	15, 31
PO 8.1: Community resource	3, 6, 10, 11, 12, 13, 14, 15, 20, 26, 27, 28
PO 8.2: Support a green economy	2, 3, 4, 5, 14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 27, 28, 31
PO 8.3: Support sustainable neighborhoods	1, 2, 3, 4, 5, 6, 7, 8, 9, 31

Measure Structure

The measures presented in this chapter include the following information:

- The basic measure language, identifying the overarching intent of the measure.
- The 2020 GHG reduction from fully implementing the measure.
- The performance indicators, which specify the number of participants needed to fully implement the measure.
- The recommended actions, which are specific mechanisms to implement the measure.
- The types of developments to which the measure is applicable.
- The values and priorities that the measure supports.

GHG Reduction Calculations

All measures, including the performance-based approach, rely on the baseline GHG inventory and forecast. These calculations serve as the foundation for the quantification of the new reduction measures to identify GHG reduction potential. Quantification begins with activity data from the inventory, including community-wide vehicle miles traveled (VMT), kilowatt-hours (kWh) of electricity or therms of natural gas used, and tons of waste disposed, among others. Various data sources, including government agency tools and reports, case studies in similar jurisdictions, and scholarly research, were used to determine the amount of activity data that can reasonably be reduced per individual participant (e.g., a household, an employee) following the actions identified in the reduction measure. These data sources were also used to help determine a reasonable participation rate (the percentage of participants in the community who are expected to implement the measure), known as a performance target, which was adjusted to match local conditions based on community values and the presence of any mandates or incentives in the specific action items. The performance targets and reductions per participant were combined to identify the estimated total reduction in activity data from the implementation of a measure. Lastly, activity data reductions were converted to GHG reductions using emissions factors from the forecast. GHG emission reductions, performance targets, and reductions per participant for individual measures are given in **Appendix C.**[3]

Applicability

All measures can fall into one or more of four categories, depending on how they are applied:

- New development (performance-based approach): The measure is implemented through the development review process for new construction. The performance-based approach does not prescribe mandatory measures on new development, but instead provides options for

[3] These metrics do not include reductions or participation levels from implementation through the performance-based approach. New projects have multiple options to choose from when implementing the performance-based approach, and so it is impossible to specify the specific reductions or participation levels for any individual measure implemented through the performance-based approach.

projects to demonstrate CAP compliance and achieve GHG reductions using various design features or by participating in key programs. The performance-based approach is discussed in greater detail below.

- New development: The measure will be implemented during the construction and/or occupancy phase of a new development and is not a condition of the design and development review process. These types of actions are not included as performance-based options in the Project Options Checklists, but would eventually be implemented by new development in a voluntary capacity.
- Existing development: The measure is implemented by individual building owners and occupants of existing buildings that are already constructed and in operation.
- City government: The measure is implemented through budgets, workflow planning, capital improvements, coordination of educational or program efforts, and other planning and construction activities for City facilities and operations.

Performance-Based Approach

The performance-based approach allows new development projects to demonstrate compliance with the CAP by implementing a selection of specific reduction measures. Projects can choose to implement one of the options outlined in **Appendix A**, each of which contains design criteria based on reduction measures from the CAP and the PCAP. Projects can demonstrate compliance with the CAP by implementing all reduction measures in the selected option. Each option shows the criteria that would reduce the project's GHG emissions 29% below baseline levels consistent with the San Joaquin Valley Air Pollution Control District's recommended CEQA Assessment Guidance.

While new projects will implement these measures on a case-by-case basis, when the total impact of each new project's GHG reductions is aggregated, collectively new development would achieve a measurable reduction in GHG emissions that helps the City achieve its adopted GHG reduction target of returning to 1990 GHG emissions levels by 2020. Additionally, the measure options allow projects to achieve GHG reductions that also meet the requirements of the San Joaquin Valley Air Pollution Control District (SJVAPCD) Indirect Source Review Program for new development. The SJVAPCD's Indirect Source Review rule requires that most projects reduce emissions of other air pollutants below specified levels or pay mitigation fees. The measures in the Project Options Checklists are intended to help facilitate compliance with the ISR rule and other regulations; however, projects that fully comply with the CAP are not necessarily fully compliant with SJVAPCD rules.

The performance-based approach already accounts for credit from regulatory actions that are under way. The following reductions from state-mandated actions are already attributed as credits toward the project for GHG reductions and cannot be claimed as additional credits to meet the performance-based options below:

- Compliance with California's Renewables Portfolio Standard (RPS), mandating that utilities procure 33% of their electricity from eligible renewable sources by the end of 2020.

- Vehicles with fuel efficiencies compliant with California's AB 1493 standards and using fuel that meets the requirements of the State's Low Carbon Fuel Standard.
- Compliance with the mandatory items of the California Building Standards Code, including all minimum energy efficiency requirements of the California Green Building Standards Code (CALGreen).

Projects cannot count these actions as additional credits for CAP consistency. Note that the performance-based approach also does not address reductions from reduced solid waste generation and off-road equipment use; reductions from these items are achieved on a citywide basis year by year through other CAP implementation measures, which apply to both existing and new developments. The City implements these measures through other methods, rather than as conditions of approval on new development or remodels.

Values and Priorities

In 2010, the City established a Climate Action Plan Ad-Hoc Advisory Committee to guide the development of the adopted CAP. As part of these efforts, the committee wanted to emphasize the overarching values of the adopted CAP to establish a broad guiding framework for GHG reduction strategies. The committee ultimately established four goals:

- Healthy communities
- Quality natural resources
- Clean energy resources
- Leaders and partners

The GHG reduction measures identified in this PCAP support the four values identified by the committee. This PCAP also adds a fifth value of cost savings, supporting long-term financial sustainability for both residents and businesses, and continuing the adopted CAP's established objective of being a business-friendly plan. The entry for each measure identifies which of these five values the measure supports, using the icons shown below.

Clean energy resources

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measures by Topic Area

The 31 measures fall into 11 categories, as shown in **Table 4**.

Table 4: Measures and Reductions by Topic Area

Topic Area	Included Measures	2020 $MTCO_2e$ Reduction
Land use and transportation – density and connections	1, 7	4,410
Land use and transportation – alternative transportation	2, 3, 4, 5, 6	2,570
Land use and transportation – alternative fuels	8, 9	5,550
Energy efficiency – new construction	10, 11	0*
Energy efficiency – existing buildings	12, 13, 14, 15, 16	21,530
Energy – renewable energy	17, 18, 19, 20	10,120
Water and wastewater – water conservation	21, 22, 23, 24	630
Water and wastewater – alternative water sources	25	70
Solid waste – increased diversion	26, 27, 28	17,190
Off-road equipment	29, 30	160
Performance-based approach†	31	31,320

** Because all energy efficiency measures from new construction are implemented through the performance-based approach, reductions from these measures are included as part of the reductions from the performance-based approach.*

† The performance-based approach is a means of applying the reduction measures to new development. As a result, it does not occupy a single category, since it implements reductions across all topic areas.

Land Use and Transportation Measures

Providing alternatives to vehicle use helps to save fuel and reduce GHG emissions. The City of Merced can establish programs that make it easier to use alternative forms of transportation such as public transit and bicycling, can encourage development patterns that make it easier for community members to have multiple transportation options to reach their destinations, and can promote the use of vehicles and transportation infrastructure that reduce fuel use. These items also help support cleaner air and make it easier for community members to use active transportation, promoting a healthy community.

Measure 1: Develop higher-density and mixed-use development to support alternative travel in downtown Merced and appropriate neighborhood centers.

2020 GHG Reduction: 2,730 $MTCO_2e$

2020 Performance Indicators:

- 3.1 housing units per acre
- 4.0 jobs per acre
- 4,260 new multifamily housing units
- 5,140 households in newly developed areas
- 2,540 jobs in newly developed areas

Recommended Actions:

1) Continue to conduct land use surveys to identify underutilized parcels for residential and nonresidential uses.
2) Evaluate the feasibility of a Transfer of Development Rights (TDR) program to concentrate development near existing and future centers while preserving agricultural land within the sphere of influence.
3) Coordinate future zoning with transit plans to enable mixed-use transit-oriented developments at rail stations and other key transportation nodes.
4) Work with regional transit providers to ensure that future transit routes connect to mixed-use neighborhoods.

California High-Speed Rail

Merced is set to be a stop on California's high-speed rail network, currently under construction. The City is preparing a plan for a 503-acre area located within half a mile of the proposed Merced station. Under this plan, this area is set to include higher-density mixed-use developments and business/research parks, focusing on providing easy access to both the high-speed rail station and local transportation. High-speed rail service to Merced is set to begin in 2022.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Healthy communities

Leaders and partners

Measure 2: Support a 30% increase in per-person intracity and intercity transit use by 2020.

2020 GHG Reduction: 180 $MTCO_2e$

2020 Performance Indicator:

- 1,164,170 Merced County Transit trips taken by Merced residents

Recommended Actions:

1) Coordinate with transit providers to identify and implement improvements to local and regional transit service, including expanded operating hours, new and adjusted routes, and increased frequency.
2) Coordinate with transit providers to allow riders to easily transfer from one provider to another, including synchronized schedules, free or reduced-cost transfers, and a unified fare schedule.
3) Subsidize low-cost/free transit passes to residents of new multifamily developments of at least 20 units.
4) Designate key streets as transit corridors and implement Complete Street guidelines to facilitate walking, biking, and transit use.
5) Work with UC Merced to improve transit ridership among the student population.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 3: Promote carpool and car-share systems.

2020 GHG Reduction: 510 $MTCO_2e$

2020 Performance Indicators:

- 20 shared cars
- 4,900 citywide employees eligible for car sharing

Recommended Actions:

1) Work with community employers to establish a unified carpool system for commute trips.
2) Work with car-share providers to enable car sharing in Merced.
3) Explore establishing designated car-share spots in City-owned or publicly accessible private parking lots and garages.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 4: Increase the feasibility and use of bicycles in Merced for commute and recreation through new bicycle infrastructure and education.

2020 GHG Reduction: 230 $MTCO_2e$

2020 Performance Indicator:

- 540 bike commuters

Recommended Actions:

1) Fully implement the infrastructure improvements identified in the 2013 Bicycle Transportation Plan, including additional bike lanes, street treatments, traffic signal sensors, and appropriate signage.
2) Incentivize bicycle parking for all new multifamily developments of at least 10 units and all new nonresidential developments of at least 50,000 square feet.
3) Offer free bike safety and maintenance classes to Merced residents, including UC Merced students.
4) Encourage new and existing employers and multifamily developments to provide secure bicycle parking, showers, and lockers.
5) Coordinate with surrounding communities to link the Merced bicycle network with regional trails.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 5: Promote telecommuting as a viable commute alternative for 3% of Merced employees an average of 1.5 days per week by 2020.

2020 GHG Reduction: 160 $MTCO_2e$

2020 Performance Metrics:

- 730 employees telecommuting an average of 1.5 days per week

Recommended Actions:

1) Work with local and regional employers to allow telecommuting for employees, including offering incentives to telecommute-friendly local employers.
2) Establish one or more telecommuting centers in Merced with appropriate workspace and telecommunication infrastructure.
3) Promote telecommuting to Merced residents through education and outreach campaigns.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 6: Work with UC Merced to establish a Transportation Demand Management (TDM) program for new student housing located in the city.

2020 GHG Reduction: 1,490 $MTCO_2e$

2020 Performance Indicator:

- 5,420 students living off campus

Recommended Actions:

1) Educate developers working on projects for UC Merced about ways to reduce vehicle miles traveled and the resultant benefits.
2) Publicize developments and businesses with successful TDM programs.
3) Reduce permit fees and/or streamline review as feasible for new projects that commit to achieving a long-term trip reduction.
4) Work with regional partners to fund successful TDM strategies for existing developments that can be implemented with little or no cost to property owners (e.g., City- or University-subsidized transit passes).
5) Require new student housing located in the city to implement a suite of TDM strategies.

Applicability:

- New development

Cost savings

Healthy communities

Leaders and partners

Quality natural resources

Measure 7: Synchronize traffic signals along 10 miles of major roads, convert at-grade railroad crossings to underpasses, and replace four-way stops in downtown with roundabouts to improve fuel efficiency.

2020 GHG Reduction: 1,680 $MTCO_2e$

2020 Performance Indicators:

- 10 road miles with synchronization
- 25% of downtown streets with traffic calming

Recommended Actions:

1) Continue synchronization of traffic signals at key intersections.

2) Update the Capital Improvement Program to include funding for additional four-way stop signs, traffic signal synchronization equipment, and vehicle roundabouts.
3) Seek grant funding for additional infrastructure and traffic signal equipment to improve vehicular flow.

Applicability:

- New development
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Measure 8: Support the use of neighborhood electric vehicles (NEVs, such as lower-speed, street-safe golf carts) by 3% of households by 2020.

2020 GHG Reduction: 630 $MTCO_2e$

2020 Performance Indicator:

- 900 households with an NEV

Recommended Actions:

1) Adopt a NEV strategy for Merced, including identifying appropriate NEV corridors, use of NEV-specific signage and street treatments, and requiring designated NEV parking spaces, with charging stations in new multifamily and nonresidential developments along NEV corridors.
2) Provide education to Merced residents and businesses about purchasing an NEV.
3) Coordinate with NEV manufacturers to make NEVs available for test drives at public events.
4) Explore offering incentives to Merced residents and businesses that purchase an NEV.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Measure 9: Support the increased use of passenger plug-in electric vehicles (EVs) and other alternative fuels to 5% by 2020.

2020 GHG Reduction: 4,920 $MTCO_2e$

2020 Performance Indicators:

- 1,500 households with a full EV
- 15 publicly accessible EV chargers

Recommended Actions:

1) Provide education to Merced residents and businesses about purchasing an EV.
2) Coordinate with EV manufacturers to make EVs available for test drives at public events.
3) Explore offering incentives to Merced residents and businesses that purchase an EV.
4) Incentivize multifamily projects of at least four units or nonresidential projects of at least 10,000 square feet to pre-wire designated parking spaces in a desirable location for EV chargers at time of new construction or significant retrofits.
5) Encourage new multifamily projects of at least four units or nonresidential projects of at least 10,000 square feet to install designated parking spaces, with charging stations, for EVs.
6) Offer expedited and reduced- cost/free permits to applicants seeking to install an EV charging station.
7) Explore offering EV charging stations in public parking lots and garages. Work with charging station operators to offer subsidized electricity to EV owners.
8) Encourage the construction of alternative fuel stations in Merced to meet demand.

Electric Vehicle Charging

Although electric vehicles (EVs) are still relatively rare in Merced, lower costs and increased supply are expected to make them a more common sight throughout California. Cities can promote EV adoption by making it easier for community members to charge their vehicles. There are three types of EV charging stations:

- Level 1: This form of charging involves plugging an EV directly into a wall outlet. Full charging can take up to 17 hours.
- Level 2: This form of charging uses dedicated equipment and a special circuit. Full charging can take 6 to 8 hours.
- Level 3: Also called DC Fast Charging, Level 3 charging requires an advanced type of charging station and a high-capacity circuit. Full charging can take 30–45 minutes or less.

The Unified Design Manual provides additional detail on EV charging stations.

Source: http://driveclean.ca.gov/pev/Charging.php

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Energy Efficiency Measures

Virtually all buildings use electricity and natural gas for lighting, heating and cooling, cooking, and to power appliances and machinery. However, as the cost of energy continues to rise, inefficient use of energy can have a significant financial impact on community members as well as increasing GHG emissions. The City can promote energy-efficient design, infrastructure, and actions in both new and existing buildings through a variety of cost-effective measures, from small-scale changes to complete building retrofits. These measures help to save GHG emissions and reduce energy costs, which in turn promote a strong local economy by keeping more money in the pockets of Merced residents and businesses.

Measure 10: Encourage new buildings to exceed the minimum energy efficiency requirements under the state CALGreen standards.

2020 GHG Reduction: This measure is implemented entirely through the performance-based approach in Measure 31.

2020 Performance Indicator: Because this measure is implemented through the performance-based approach in Measure 31 and there is no forecast community-wide participation rate, there are no community-wide performance indicators for this measure. Average performance indicators for individual participants are identified in **Appendix C**.

Recommended Actions:

1) Develop and adopt an incentive-based energy efficiency performance code which goes beyond minimum CALGreen standards and includes plug load.

CALGreen Energy Efficiency

California requires all new buildings to meet minimum standards for energy efficiency, which are updated every few years. The current standards, which went into effect in 2014, require increased insulation, cool roofs, high-efficiency lighting, and other energy efficiency items.

The State encourages new buildings to implement voluntary items to go beyond these minimum standards, resulting in increased cost savings and other benefits. Tier 1 buildings exceed minimum standards by 10%–15%, while Tier 2 buildings exceed minimum standards by 20%–30%.

California's minimum standards are set to be updated again in 2017. The State plans to require new buildings to meet zero net energy efficiency standards beginning in 2020.

2) Educate property owners, developers, and contractors about exceeding the minimum CALGreen energy efficiency standards, including discussion of potential cost savings and increases in building value.
3) Provide training to all City plan check and code enforcement staff to ensure that the minimum CALGreen energy efficiency standards are being implemented.
4) Encourage building owners to seek green building certification through systems such as GreenPoint Rated, Leadership in Energy and Environmental Design (LEED), Green Globes, and others.

Applicability:

- New development (performance-based approach)

Clean energy resources

Cost savings

Leaders and partners

Measure 11: Site new buildings to take advantage of natural solar resources for heating and cooling.

2020 GHG Reduction: This measure is implemented entirely through the performance-based approach in Measure 31.

2020 Performance Indicator: Because this measure is implemented through the performance-based approach in Measure 31 and there is no forecast community-wide participation rate, there are no community-wide performance indicators for this measure. Average performance indicators for individual participants are identified in **Appendix C**.

Recommended Actions:

1) Offer incentives to new single-family homes to include passive solar design features, including proper building orientation, appropriately sized and positioned fenestration, appropriate shading, and use of thermal mass and insulating materials to minimize active heating and cooling. Encourage new multifamily and nonresidential buildings to use passive solar design features.
2) Offer reduced-cost and/or expedited permitting to applicants who integrate passive solar design features into significantly retrofitted buildings.
3) Educate Merced residents about the cost savings associated with passive solar design features.

Applicability:

- New development (performance-based approach)

Clean energy resources

Cost savings

Leaders and partners

Measure 12: Support improved energy efficiency in existing multifamily units, rental units, and affordable households through voluntary retrofits.

2020 GHG Reduction: 1,890 $MTCO_2e$

2020 Performance Indicators:

- 810 existing low-income or renter-occupied single-family homes undergoing basic energy retrofits
- 160 existing low-income or renter-occupied single-family homes undergoing advanced energy retrofits
- 400 existing multifamily homes participating in retrofits
- 3,240 existing multifamily, low-income, or renter-occupied single-family homes upgrading appliances

Recommended Actions:

1) Collaborate with utility providers and energy contractors to provide free home energy audits to low-income households and reduced-cost energy audits to moderate- and above moderate-income multifamily and rental units.
2) Offer free or reduced-cost home weatherization to low-income households and mobile homes.
3) Work with property owners of multifamily and rental units to establish a financing mechanism for energy efficiency retrofits, including appliance upgrades, HVAC efficiencies, and increased insulation.
4) Establish an education and incentive program to promote behavioral energy efficiency and low-cost energy-efficient infrastructure (e.g., energy-efficient lights and smart power strips) in multifamily and rental units.
5) Encourage property owners to disclose home energy performance to potential buyers/tenants prior to time of sale or rent.
6) Require landlords to replace appliances older than 10 years with newer models that meet or exceed current energy efficiency standards prior to occupation by new tenants.

Applicability:

- Existing development

Clean energy resources

Cost savings

Leaders and partners

Measure 13: Facilitate energy efficiency through voluntary retrofits in 15% of single-family homes, and promote low-cost opportunities to reduce energy use in single-family households.

2020 GHG Reduction: 1,990 $MTCO_2e$

2020 Performance Indicators:

- 120 owner-occupied existing single-family homes with variable frequency drive pool pumps
- 900 owner-occupied existing single-family homes undergoing basic energy retrofits
- 450 owner-occupied existing single-family homes undergoing advanced energy retrofits
- 2,260 owner-occupied existing single-family homes upgrading appliances

Recommended Actions:

1) Improve financing opportunities for energy retrofits, including participation in a Property Assessed Clean Energy (PACE) program and other efforts such as bulk buying programs and low- and no-interest loans for retrofits.

HERO Program

Merced participates in an innovative type of financing effort called Property Assessed Clean Energy (PACE), which helps property owners afford energy efficiency retrofits, water efficiency retrofits, and renewable energy systems. Instead of paying an upfront cost for the item, participants pay through a temporary increase on their property taxes until the item is paid off. PACE programs allow property owners to make upgrades without staying in the building until the payments are finished, as the new owner assumes responsibility for any remaining payments.

In September 2014, Merced joined HERO, one of the largest PACE programs. As of July 2015, over 320 communities throughout California are part of the HERO program.

2) Educate homeowners about the benefits of residential retrofits and how to participate, including availability of any PACE programs. Host outreach events and workshops, and distribute information online and at public buildings.
3) Offer incentives beyond PACE or other financing opportunities for single-family homeowners to include energy efficiency retrofits in a renovation or expansion of an existing house, including reduced-cost building permits.

4) Offer low-cost retrofits to homeowners to identify opportunities for residential retrofits.
5) Promote energy efficiency improvements to swimming pools and other outdoor residential energy uses.
6) Provide homeowners with education and materials necessary to reduce energy use through free and low-cost actions.
7) Establish neighborhood competitions to incentivize homeowners to track and reduce their residential energy use.
8) Encourage single-family homeowners to disclose home energy performance to potential buyers prior to time of sale.

Applicability:

- Existing development

Clean energy resources

Cost savings

Leaders and partners

Measure 14: Improve energy efficiency through voluntary retrofits in 16% of businesses and other energy efficiency strategies in existing commercial and industrial facilities.

2020 GHG Reduction: 16,790 $MTCO_2e$

2020 Performance Indicators:

- 1,790,270 retrocommissioned existing nonresidential square feet
- 1,193,510 nonresidential existing square feet with basic energy retrofits
- 716,110 nonresidential existing square feet with deep energy retrofits
- 1,790,270 nonresidential existing square feet with energy-efficient appliances

Recommended Actions:

1) Incentivize energy retrofits for commercial and industrial facilities at time of significant expansion or renovation.
2) Develop or join a financing mechanism for commercial and industrial energy efficiency retrofit projects such as the HERO revolving loan fund and a Property Assessed Clean Energy (PACE) program.
3) Provide reduced-cost or free energy audits to nonresidential property owners and occupants to identify energy efficiency opportunities.

4) Work with commercial and industrial landlords to offer green leases, allowing lessees to partially or entirely finance energy efficiency retrofits.
5) Encourage nonresidential building owners to disclose building energy performance to potential buyers/lessees prior to time of sale or lease.
6) Educate commercial and industrial property owners and tenants about ways to reduce energy use through free and low-cost actions.
7) Educate nonresidential property owners about available rebates for energy efficiency.

Applicability:

- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Measure 15: Use cool roofs and shade trees to reduce the urban heat island effect in Merced.

2020 GHG Reduction: 140 $MTCO_2e$

2020 Performance Indicators:

- 750 existing houses with cool roofs
- 61,230 existing nonresidential square feet with cool roofs
- 500 new mature shade trees

Recommended Actions:

1) Incentivize existing buildings to integrate light-colored roofs and surfaces into significant retrofits and expansions.
2) Work with local businesses and volunteer organizations to expand and maintain the Merced urban forest.
3) Encourage private property owners to maintain trees which provide a shade benefit to buildings and to replace shade trees that need to be removed.
4) Encourage private property owners to plant shade trees at time of new construction or significant retrofits.
5) Plant at least two new trees for every tree on public property that is removed.

Applicability:

- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Measure 16: Support retrofits to outdoor public lighting in Merced to reduce energy use.

2020 GHG Reduction: 540 $MTCO_2e$

2020 Performance Indicator:

- 3,580,540 existing nonresidential square feet with energy-efficient outdoor lighting

Recommended Actions:

1) Pursue funding to replace streetlights and traffic signals with LED models, and carry out replacements as soon as funding becomes available.
2) Encourage property owners to use energy-efficient bulbs in existing outdoor signs and other outdoor publicly visible lighting.
3) Explore powering streetlights and traffic signals with renewable electricity generated by pole-mounted solar panels.

Applicability:

- New development (performance-based approach)
- Existing development

Clean energy resources

Cost savings

Leaders and partners

Renewable Energy Measures

Renewable energy is becoming increasingly widespread and affordable due to technological advances, a variety of financing options, and economic incentives. Community members can install renewable energy systems on their own property or they can participate in options that allow them to buy renewable energy from off-site facilities. By increasing the amount of energy supplied by renewable sources in Merced, community members not only reduce GHG emissions but reduce their own utility bills and gain more local control over where their energy comes from.

Measure 17: Increase the amount of renewable electricity generation for on-site residential use.

2020 GHG Reduction: 5,090 $MTCO_2e$

2020 Performance Indicator:

- 1,250 existing households with on-site solar photovoltaic (PV) systems

Recommended Actions:

1) Educate property owners about benefits associated with on-site renewable energy, available rebates and financing options, and ways to participate.
2) Offer incentives to new residential buildings to include rooftop solar panels.
3) Incentivize multifamily residential units with covered carports to include solar panels on carports at time of new construction or significant renovation.
4) Identify and implement financing opportunities for residential on-site renewable energy systems, including participation in a Property Assessed Clean Energy (PACE) program and a municipal finance district.
5) Offer incentives for new houses to work toward or meet zero net energy (ZNE) standards, generating as much energy as the home uses.

Applicability:

- New development (performance-based approach)
- Existing development

Clean energy resources

Cost savings

Lancaster Residential Solar Programs

The City of Lancaster, located in the high desert of Los Angeles County, has a goal of being the first zero net energy city for electricity in the world. To meet this ambitious goal, Lancaster plans to reduce electricity demand through extensive energy efficiency measures and then to offset the remaining electricity needs through renewable energy systems.

One program to achieve this objective is Solar Lancaster, an effort to make solar photovoltaic systems on existing buildings more affordable through reduced costs and increased financing options. Solar Lancaster was launched in 2010 as a partnership with solar panel manufacturer and installer SolarCity. As part of their role, SolarCity designs the installation to meet the participant's needs, provides free installation of the renewable energy system, and helps process the permitting and rebate paperwork. Property owners lease the solar panels for a monthly rate and purchase the electricity produced by the installation at a fixed cost, often for less than the local utility charges.

Lancaster also developed a program to install solar energy systems on new homes, called Solar Community. This program was a partnership between the City, homebuilder KB Home, and the solar manufacturer Build Your Dream. The program began in 2010 at KB Home's Alamosa development, which included new homes with pre-installed solar energy systems. A second development with pre-installed solar energy systems followed in 2011, and by early 2013 over 200 homes in Lancaster had solar panels installed at time of construction. Through the Solar Community partnership, home developers demonstrated the economic feasibility of pre-installing solar panels on new homes.

The Solar Community program showed that developers were able to install solar panels on new homes and that such efforts made economic sense. This program led to the development of Lancaster's residential solar mandate, also called Ordinance 994, which requires that all new homes permitted after January 1, 2014, install a solar photovoltaic system. Depending on the type of home, the array must be at least 0.5 kW to 1.5 kW per unit. New subdivisions have increased flexibility when installing these energy systems, as long the overall number of solar energy systems work out to an average of at least 0.5 kW to 1.5 kW per home. While a typical array costs $12,000 to $15,000 to install, or an additional $75 to $100 per month on mortgage payments, the added cost is more than offset by ongoing savings in household electricity bills. Preliminary data suggests that in the first year, over 100 new homes received solar photovoltaic energy systems as a result of this program.

Another Lancaster program that encourages new renewable energy installations is the Better Built Home Program, which launched at the beginning of 2015. New homes can reduce their impact fees by up to 25% (as much as $3,000 per home) by including features that reduce GHG emissions and demonstrate a commitment to preserving natural resources. Solar energy systems and home energy storage systems are among the most effective ways for new homes to meet the requirements of the program.

Measure 18: Facilitate renewable energy for on-site commercial and industrial uses.

2020 GHG Reduction: 2,630 $MTCO_2e$

2020 Performance Indicator:

- 245,420 existing nonresidential square feet with solar PV arrays

Recommended Actions:

1) Incentivize nonresidential buildings to install rooftop solar energy panels, especially at time of significant renovation.
2) Identify and implement financing opportunities for on-site renewable energy systems in collaboration with local lenders, including participation in the HERO Property Assessed Clean Energy (PACE) program.
3) Pursue funding to install renewable energy systems on municipal facilities.
4) Offer incentives for nonresidential building owners with parking lots to use solar panels as shading at time of new construction or significant renovation.
5) Incentivize new commercial and industrial buildings to approach or meet zero net energy (ZNE) standards, producing as much energy on-site as the building uses.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Measure 19: Support the use of solar energy to meet on-site water heating needs for domestic and nonresidential uses and swimming pools, exceeding minimum state CALGreen standards.

2020 GHG Reduction: 510 $MTCO_2e$

2020 Performance Indicators:

- 500 existing homes with domestic solar water heaters
- 122 existing nonresidential square feet with solar water heaters

Recommended Actions:

1) Incentivize existing homes and nonresidential buildings to install rooftop solar water heaters.
2) Seek funding to install solar water heaters at municipal buildings.
3) Offer incentives for homes and nonresidential buildings to install solar water heaters at time of significant renovation or new construction.
4) Ensure that solar water heating is included in any other financing opportunities established in the community, including financing districts, a Property Assessed Clean Energy (PACE) program, revolving loan funds, or other mechanisms.
5) Provide education about solar water heating to residents and businesses through outreach events, workshops, online and in electronic media, and at public facilities.

PG&E Green Tariff

PG&E's Green Tariff Shared Renewables program will allow customers to receive an increased amount of electricity from renewable sources without having to install their own renewable energy system. The program will offer customers the chance to buy either 50% or 100% of their electricity from renewable sources for an increased fee, compared to the 27% renewable electricity PG&E offers by default. PG&E's program will also include an option called Enhanced Community Renewables, which will allow customers to purchase renewable electricity directly from a third-party developer. PG&E's Green Tariff program is expected to launch in late 2015 or early 2016.

Applicability:

- New development (performance-based approach)
- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Measure 20: Create a community shared solar program to produce renewable energy for off-site use in Merced.

2020 GHG Reduction: 1,890 $MTCO_2e$

2020 Performance Indicators:

- 2,500 kW of community shared solar
- 1,230 kW from PG&E Green Tariff program

Recommended Actions:

1) Work with solar developers, property owners, and local financing institutions to establish a member-owned community shared solar system allowing Merced residents and businesses to own a share in local solar energy arrays and receive credit on their electricity bills.
2) Encourage new developments to fund improvements to the community shared solar system.
3) Promote community shared solar programs that allow residents and businesses to buy into medium-scale solar energy facilities.
4) Actively promote developer participation in the existing California Homebuyer Solar Program to provide on-site community solar for new subdivisions.
5) Support and promote Green Tariff programs and community solar programs operated by the Pacific Gas and Electric Company (PG&E) with distribution of information through digital media and at in-person events.

Applicability:

- New development
- New development (performance-based approach)
- Existing development
- City government

Clean energy resources

Cost savings

Leaders and partners

Water and Wastewater Measures

In addition to being vital for life and basic hygiene, water resources are also critical for the agricultural activities that support a large portion of the economy of Merced and the wider Central Valley. By reducing water use, Merced residents and businesses can help conserve critical sources of water for future needs. Because water requires significant amounts of energy to transport and process, water conservation also reduces energy use and decreases GHG emissions.

Measure 21: Install water meters on remaining unmetered housing units to promote awareness and conservation.

2020 GHG Reduction: 530 $MTCO_2e$

2020 Performance Indicator:

- 10,800 unmetered homes converted to metered homes

Recommended Actions:

1) Develop and implement a tiered water rate structure for all Merced water customers.
2) Require all City of Merced water customers to be connected to a water meter.

Applicability:

- Existing development

Water-Energy Grant Program

In June 2015, the City of Merced received a $2.5 million grant from the California Department of Water Resources Water-Energy Grant Program, a statewide effort to conserve water and reduce energy use, decreasing GHG emissions in the process. Much of the funding will be used to install water meters at approximately 10,800 homes in the city that are still unmetered, increasing awareness of residential water use and leading to water conservation efforts. Some funding will also be used to upgrade software on 10,100 existing water meters in Merced, eliminating the need for City staff to drive through the community to read the meters and further reducing GHG emissions.

Quality natural resources

Measure 22: Promote indoor water conservation through retrofits to existing buildings.

2020 GHG Reductions: 80 $MTCO_2e$

2020 Performance Indicator:

- 10,090 existing houses with water efficiency retrofits

Recommended Actions:

1) Provide Merced residents and business owners with information about water-efficient sinks, dishwashers, showerheads, and other fixtures and appliances. Continue to provide free retrofit kits to City residents.
2) Offer incentives for residents and businesses to replace old fixtures and appliances with water-efficient models.
3) Encourage building owners to replace old fixtures and appliances with water-efficient models at time of sale and/or significant renovation.

4) Continue to coordinate with the Merced Irrigation District to promote water conservation.
5) Offer low-cost or free water audits to commercial and industrial customers to identify key opportunities for water conservation.
6) Establish neighborhood competitions to incentivize homeowners to track and reduce their water use.

Applicability:

- Existing development
- City government

Cost savings

Leaders and partners

Quality natural resources

Measure 23: Improve indoor water efficiency in new buildings

2020 GHG Reductions: This measure is implemented entirely through the performance-based approach in Measure 31.

2020 Performance Indicator: Because this measure is implemented through the performance-based approach in Measure 31 and there is no forecast community-wide participation rate, there are no community-wide performance indicators for this measure. Average performance indicators for individual participants are identified in **Appendix C**.

Recommended Actions:

1) Provide information about fixtures and appliances that exceed the minimum state water efficiency standards to building owners and developers.
2) Promote voluntary participation in CALGreen Tier 1 for purposes of water efficiency.

Applicability:

- New development (performance-based approach)

Cost savings

Measure 24: Reduce the amount of water used for landscaping.

2020 GHG Reduction: 20 $MTCO_2e$

2020 Performance Indicators:

- 16,230 residents in existing homes with landscapes watered by smart irrigation systems
- 5,020 people in existing nonresidential buildings with landscapes watered by smart irrigation systems

Recommended Actions:

1) Develop incentives to reduce water use in residential and nonresidential landscaping, including rebates for turf replacement and subsidies for high-efficiency irrigation systems.
2) Limit the amount of turf used in new landscapes.
3) Offer reduced-cost landscape audits to customers with large landscaped areas.
4) Design new and replacement City-owned landscaping to use drought-tolerant plants, minimal or no turf, and high-efficiency irrigation.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Measure 25: Promote individual graywater and rainwater catchment systems to reduce potable water demand.

2020 GHG Reduction: 70 $MTCO_2e$

2020 Performance Indicator:

- 4,060 residents in existing homes with graywater systems

Recommended Actions:

1) Educate building owners about graywater and rainwater catchment systems, and develop incentives to reduce the installation costs.
2) Encourage/incentivize multifamily and nonresidential buildings to include graywater piping at time of construction or significant renovation.
3) Explore using permeable paving and other features to allow infiltration on City streets.

Applicability:

- New development (performance-based approach)
- Existing development

Cost savings

Leaders and partners

Quality natural resources

Solid Waste Measures

Waste measures are intended to help keep material out of landfills, either by providing alternative options for processing trash (such as recycling and composting) or by reducing the amount of waste generated to begin with. While these items may not lead to direct cost savings, they reduce significant quantities of GHG emissions and help prevent natural resources from being wasted. Waste reduction programs also provide Merced residents and businesses with a low-cost and highly effective way to focus on comprehensive sustainability efforts and increase awareness of their individual impacts on the environment.

Measure 26: Reduce the amount of waste sent to landfills, excluding recyclables and construction and demolition (C&D) material, by 33%.

2020 GHG Reduction: 4,290 $MTCO_2e$

2020 Performance Indicator:

- 15,960 tons of material reduced

Recommended Actions:

1) Collaborate with the Merced County Regional Waste Management Authority to investigate and implement cost-effective composting programs.
2) Promote backyard composting in homes and schools through free workshops and subsidies for composting equipment.
3) Explore developing a voluntary curbside composting program, with incentives as deemed necessary, to be integrated into existing waste service, particularly for households, restaurants, and other activities that generate large volumes of organic waste.
4) Explore ways to use compost generated from locally produced organic waste in the community, including selling discounted compost to local residents, using the compost in City-owned parks and other landscapes, or donating it to local gardens and farms.

5) Coordinate with UC Merced to explore creating a unified composting system for the community and surrounding areas.

Applicability:

- New development
- Existing development

Leaders and partners

Quality natural resources

Measure 27: Increase recycling in Merced with a goal of improving diversion of recyclables by 25%.

2020 GHG Reduction: 8,400 $MTCO_2e$

2020 Performance Indicator:

- 9,990 tons of waste recycled

Recommended Actions:

1) Conduct education and outreach efforts to ensure recycling bins are being used properly.
2) Replace any stand-alone trash bins on City property with combination trash and recycling units.
3) Implement recycling at all residential and nonresidential buildings in the community.
4) Strive to minimize waste at all City-sponsored or City-hosted events, including events held at public parks.
5) Reduce the amount of waste generated by city residents through friendly neighborhood competitions, incentivizing households to minimize waste production and the volume of landfilled waste.
6) Provide ways for residents and businesses to easily recycle items not currently accepted in blue curbside bins, including polystyrene, plastic bags, and electronic waste.
7) Collaborate with the Merced County Regional Waste Management Authority to require solid waste haulers to achieve a diversion rate of 75% as a condition of future solid waste hauling franchise agreements.

Applicability:

- New development
- Existing development

Leaders and partners

Quality natural resources

Measure 28: Divert 50% of construction and demolition (C&D) waste from new construction projects and renovations.

2020 GHG Reduction: 4,500 $MTCO_2e$

2020 Performance Indicator:

- 14,060 tons of C&D waste recycled

Recommended Actions:

1) Establish a recycling target for all C&D waste from projects involving the construction of any new structure or addition, or renovations to existing structures with a cost of at least $10,000.
2) Work with contractors and buildings to identify C&D material recovery facilities, opportunities for material exchange, and reuse and recycling opportunities for C&D materials.
3) Support efforts to increase recycling rates and expand markets for C&D materials.

Applicability:

- New development
- Existing development

Leaders and partners

Quality natural resources

Off-Road Equipment Measures

Off-road equipment, such as construction and landscaping equipment, presents a prime opportunity for communities to reduce GHG emissions and promote healthier air. A wide variety of alternative-fuel options are available to replace conventional gasoline- and diesel-powered equipment. Reducing emissions from off-road equipment not only encourages sustainable thinking and can help reduce costs but can also reduce concentrations of air pollution, which is especially important for sensitive populations such as children, the elderly, and individuals with chronic respiratory disease

Measure 29: Reduce emissions from lawn mowers and leaf blowers by 10%.

2020 GHG Reduction: 10 $MTCO_2e$

2020 Performance Indicators:

- 1,090 lawn mowers replaced
- 280 leaf blowers replaced

Recommended Actions:

1) Purchase hybrid and alternative-fuel landscaping equipment for City use.
2) Conduct an outreach campaign to city residents promoting the use of hybrid and alternative-fuel landscaping equipment.
3) Develop incentives for individuals who replace conventional landscaping equipment with hybrid and alternative-fuel models.
4) Work with landscaping companies and contractors to promote the use of hybrid and alternative-fuel landscaping equipment.

Applicability:

- New development
- Existing development

Cost savings

Quality natural resources

Measure 30: Use alternative-fuel and fuel-efficient construction equipment, and reduce construction equipment idling time.

2020 GHG Reduction: 150 $MTCO_2e$

2020 Performance Indicators:

- 25% of development projects using 25% alternative-fuel or hybrid construction equipment

- 4-minute maximum of idling time for construction equipment

Recommended Actions:

1) Promote the availability of alternative-fuel (electric, compressed natural gas (CNG), biofuels, etc.) and fuel-efficient (including hybrid) construction equipment to local contractors.
2) Replace City-owned construction equipment with fuel-efficient and alternative-fuel models as available.
3) Establish a citywide idling time restriction of 3 minutes for construction equipment after 2020.

Applicability:

- New development

Quality natural resources

Performance-Based Approach

As discussed earlier, the performance-based approach allows new development projects to demonstrate consistency with the CAP by choosing from one of several options. This avoids creating a mandatory set of actions that all new projects must meet for CAP consistency, and instead allows projects seeking CAP consistency to choose measures that best meet the project's needs. It also assists new developments in complying with the SJVAPCD's Indirect Source Rule (ISR).[4]

The performance-based approach does not create any new reduction strategies or implementation actions; rather, it applies the reduction strategies from many of the other measures to new development. It is built upon the same assumptions and calculations presented for other measures in **Appendix B**, but whereas the other measures present performance

Indirect Source Rule

The SJVAPCD's ISR is a program implemented at the project level to reduce air pollution. It requires projects to identify and implement appropriate mitigation standards or to pay fees to the SJVAPCD that the air district uses to fund emission reduction projects. While the ISR rules are intended to reduce air pollution levels by focusing on nitrogen oxides (NOx) and particulate matter (PM_{10}), GHG emissions from on-road transportation are likely to be reduced by this effort. The current ISR fees are $9,350 per ton of NOx and $9,011 per ton of PM_{10}.

The ISR does not specifically regulate GHG emissions, but some of the suggested mitigation efforts reduce GHG emissions as a co-benefit. Many of the example strategies to comply with the ISR also support implementation of the performance-based approach.

[4] The measures implemented through the different options of the performance-based approach are consistent with the measures recommended by the SJVAPCD to comply with the ISR. As a result, the performance-based approach helps to implement the ISR. However, projects that implement an option of the performance-based approach do not necessarily meet the standards of the ISR.

indicators, activity reductions, and GHG reductions for all participants in an aggregated way, the performance-based approach calculates indicators and reductions for individual participants.

Measure 31: Implement a performance-based approach for new development, allowing developers to select from applicable CAP measures that satisfy mitigations of the SJVAPCD Indirect Source Rule and reduce SJVAPCD permit fees.

2020 GHG Reduction: 31,320 $MTCO_2e$

2020 Performance Indicators: The performance-based approach does not have community-wide performance indicators as most of the other measures do. New projects have multiple options to choose from when implementing the performance-based approach. It is impossible to specify the specific reductions or participation levels for any individual measure implemented through the performance-based approach.

Recommended Actions: There are no specific actions associated with the performance-based approach.

Applicability:

- New development (performance-based approach)

Implementation Resources:

New projects can selection from 12 options to demonstrate compliance with the performance-based approach: six for residential projects and six for nonresidential projects.[5] These options are shown in **Table 5** and **Table 6** below. **Appendix A** includes additional details about implementing the performance-based approach and identifies the relationship between the various options and the UDM.

Table 5: Residential Options for the Performance-Based Approach

Issue	Residential Option					
	1	2	3	4	5	6
Renewable Energy	✓	✓			✓	
Energy Efficiency			✓	✓	✓	✓
Transportation		✓	✓	✓	✓	✓
Land Use			✓			✓
Water						✓

[5] Mixed-use projects should apply a residential option to the residential portion of the project and a nonresidential option to the nonresidential portion.

Table 6: Residential Options for the Performance-Based Approach

Issue	Nonresidential Option					
	1	2	3	4	5	6
Renewable Energy		✓	✓	✓		
Energy Efficiency	✓	✓	✓		✓	✓
Transportation	✓	✓	✓		✓	✓
Land Use	✓					✓
Water						✓

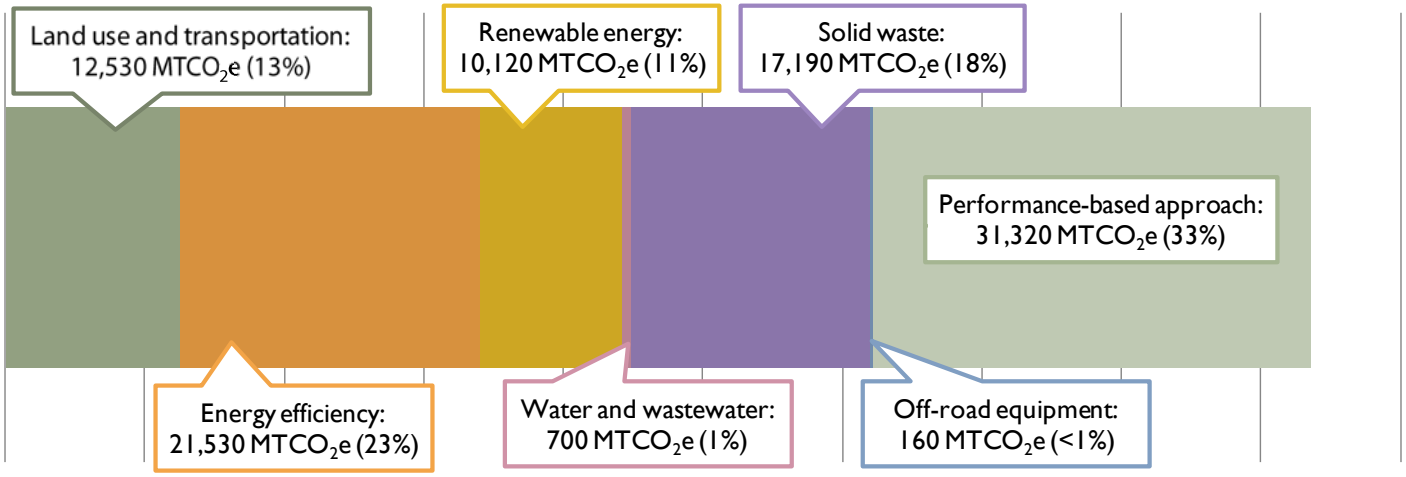
Plan Outcomes

When fully implemented, the above measures will be able to reduce GHG emissions to the City's adopted 2020 reduction target without requiring too great a reduction from community members or any specific activity. **Table 7** shows the 2020 reductions achieved by these measures in relation to the emissions forecast and the adopted 2020 reduction target, while **Figure 4** shows the volume and percentage of reductions from each measure category.

Table 7: 2020 GHG Reductions with PCAP

	2020
Baseline emissions ($MTCO_2e$)	599,093
2020 forecast with existing state and local accomplishments ($MTCO_2e$)	601,190
Adopted target ($MTCO_2e$)	509,229
Gap to adopted target without PCAP ($MTCO_2e$)	91,960
2020 Forecast with PCAP ($MTCO_2e$)	507,640
Target met?	Yes
Reductions beyond adopted target ($MTCO_2e$)	1,590
Percentage reduction beyond baseline with PCAP ($MTCO_2e$)	-15.27%

Figure 4: 2020 GHG Reductions by Measure Category



These measures also set a trajectory for future and continued GHG emission reductions beyond 2020. Although it is not the intent of this PCAP to reduce emissions to a specified level in any year beyond 2020, the PCAP does provide the City with a scope describing what needs to be accomplished. **Table 8** identifies forecast GHG emissions, potential targets, and the necessary degree of reductions for 2030. This table is provided for informational purposes. Merced has not yet adopted a GHG reduction target for 2030, and there is no state or regional guidance recommending or specifying a target for local communities for 2030 or any other post-2020 year.

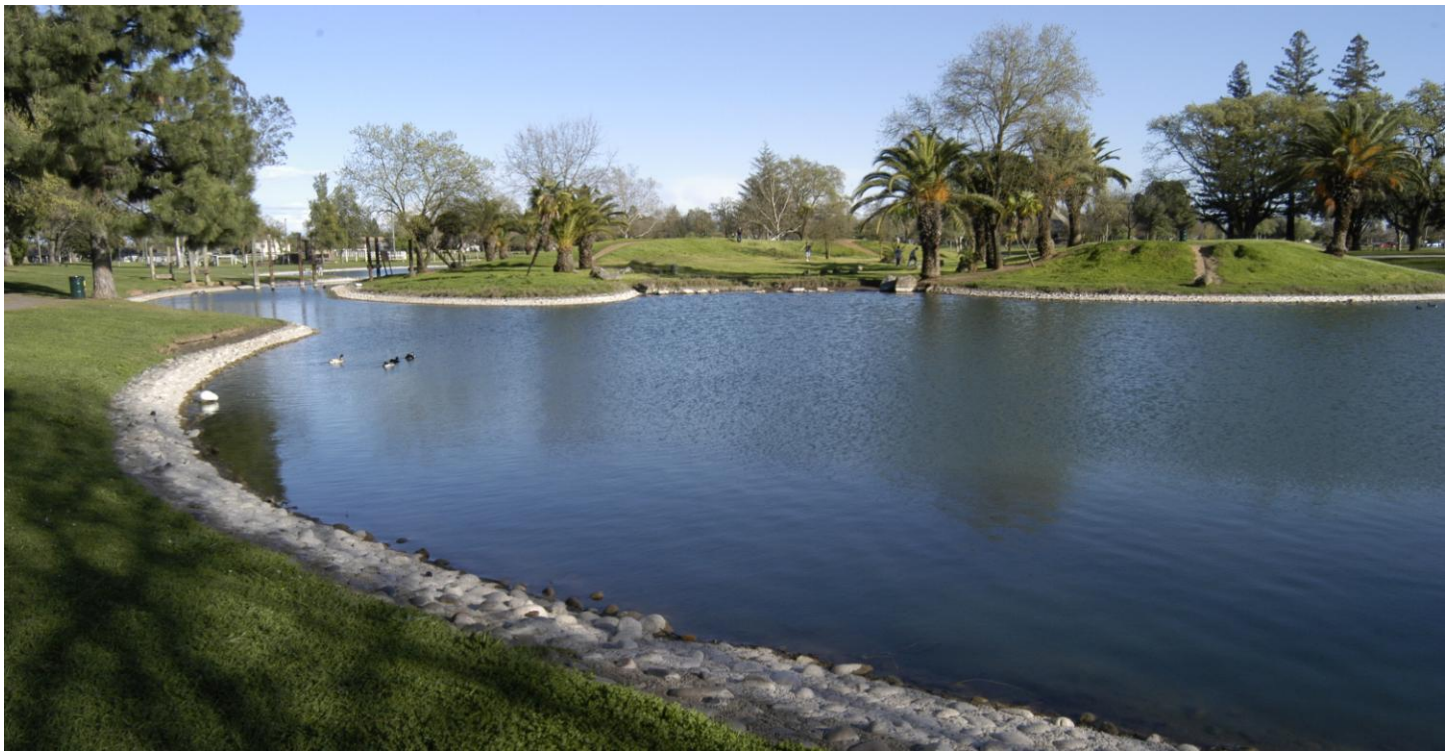
Table 8: 2030 GHG Emissions and Targets

	Potential Target 1*	Potential Target 2†
Baseline emissions ($MTCO_2e$)	599,090	599,090
2030 forecast with no action ($MTCO_2e$)	952,690	952,690
2030 forecast with state and local accomplishments ($MTCO_2e$)	674,230	674,230
2030 target ($MTCO_2e$)	373,440	305,540
2030 percentage reduction from 1990 levels	-27%	-40%
2030 gap ($MTCO_2e$)	300,790	368,690

** Executive Order (EO) S-03-05 identified a statewide 2050 target of 80% below 1990 levels. This target is a linear interpolation between the adopted 2020 target and the 2050 target in EO S-03-05.*

† EO B-30-15 identified a statewide 2030 target of 40% below 1990 levels.

Note: As of July 2015, California does not have any adopted target for a post-2020 year. However, a bill is currently pending in the State Legislature that would establish a target of 40% below 1990 levels for 2030 and 80% below 1990 levels for 2050.



Introduction

To ensure the success of the adopted CAP and this PCAP, the City of Merced will integrate the goals and strategies of this PCAP into the CAP and other local plans, and implement the programs and activities identified herein. As the City moves forward with updating other planning documents such as the General Plan, the Merced Municipal Code, or specific plans, staff will ensure that these documents support and are consistent with the CAP.

Implementing the PCAP

Implementing the CAP and PCAP will require City leadership to execute these measures and report progress. This plan identifies a Work Plan that includes responsible departments, time frames, and relative costs associated with each measure. Staff will monitor progress using an implementation and monitoring tool on an annual basis and will provide an annual update to City decision-makers. The measures in this CAP are accompanied by a list of recommended actions, selected by City staff, members of the Technical Advisory Committee, and members of the public. Not all of the listed actions may be necessary for the City to achieve its target. As part of the implementation of this PCAP, the City may elect to alter or remove individual measures and actions so as to allow Merced to meet its GHG reduction goal in a manner that matches community needs and values. Designated City staff will serve as ongoing advisors for CAP implementation. As part of annual progress reports, City staff will evaluate the effectiveness of each measure to ensure that anticipated emissions

reductions are occurring. In the event reductions do not occur as expected, the City can modify and add additional measures to the CAP to ensure the reduction target is achieved.

The following programs are designed to guide the City of Merced in successfully implementing the CAP.

Implementation Program 1: The City will integrate CAP measures and actions into existing policies and programs, including revising other local and regional plans, developing new programs, and initiating new activities together with local leaders.

Recommended Actions:

1) Adhere to the CAP Implementation Matrix, including integration of CAP measures and action items into departmental work to guide CAP implementation.
2) As part of the annual monitoring process, update action priorities.
3) Encourage and incentivize voluntary participation in programs to reduce GHG emissions with implementation of CAP measures.
4) Use the Project Options Checklists to guide the design of new development projects for consistency with the CAP through the permitting process, including use of the visual guidance in the Unified Design Manual (UDM), which further illustrates key CAP concepts for new development.

Implementation Program 2: Seek and develop collaborative partnerships with agencies and community groups that support CAP implementation.

Recommended Actions:

1) Continue formal membership and participate in local and regional organizations that provide tools and support for energy efficiency, energy conservation, GHG emissions reductions, adaptation, public information, and implementation of this plan.
2) Partner with community leaders and partners to track program successes, such as the San Joaquin Valley Air Pollution Control District, the Merced Unified Public School District, UC Merced, PG&E, and the Merced Irrigation District (MID).
3) Ongoing collaboration may also yield new funding or staff resources that can be leveraged to provide regional benefit.

Implementation Program 3: Secure necessary funding to implement the CAP.

Recommended Actions:

1) Identify grant funding sources for priority CAP measures as part of annual reporting, as well as key staff responsible for identifying these funding sources.
2) Include information on CAP program successes in department work planning and in other plans as appropriate.

3) Identify and strategize regional, state, and federal programs that provide staff resources or funding for issues addressed by CAP measures.

Implementation Program 4: Monitor and report progress toward target achievement.

Recommended Actions:

1) Identify key staff responsible for annual reporting and monitoring.
2) Use the monitoring and reporting tool to assist with annual reports.
3) Monitor annual demographic changes in comparison to General Plan buildout expectations as included in the CAP, allowing staff to gauge actual growth in GHG emissions versus anticipated growth progress toward 2020 emission targets.
4) Prepare a progress report for review and consideration by the City Manager.

Implementation Program 5: Update the baseline emissions inventory and CAP.

Recommended Actions:

1) Prepare an emissions inventory for 2014 or another recent year no later than 2016.
2) Review and monitor evolving state guidance for post-2020 targets for 2030, 2050, or other horizon years identified by the State, as new legislation and guidance is available.
3) By 2018, review and consider adoption of post-2020 reduction targets consistent with long-term state GHG reduction goals.
4) Update the CAP no later than 2018 to incorporate new technologies and measures to reduce emissions, and present strategies to achieve any adopted post-2020 reduction target.
5) Update and amend the CAP, as necessary.

Cost-Benefit Analysis

Project staff have prepared a cost-benefit analysis to assess priority CAP measures on five variables. The analysis informs the feasibility assessment for measure implementation and uses costs and benefits along with other variables that indicate the viability of a measure. Factors include other partners and programs that would lead implementation or consistency with community values.

For purposes of this cost-benefit analysis, five variables categorize the financial impacts to the City of Merced and community members or other entities that will be involved in measure implementation. For many of the measures, financial impacts to the City and the community were estimated based on case studies and professional experience, using the scale shown in **Table 9.**

Table 9: Financial Impact Rubric for Feasibility Analysis

Score	Description
1	Net costs
2	Limited investment
3	Cost neutral
4	Limited return on investment
5	Significant return on investment

All measures were analyzed for cost-benefit criteria that include estimates of savings to community members and estimates of City staff time and costs. Twelve reduction measures received a more thorough cost-benefit analysis with estimated costs to community members, payback periods, and other methods associated with implementing the measure. Together, the information in the cost-benefit analysis informed the cost-related scores for the feasibility rankings. Measures with a full cost-benefit analysis represent plan-level cost estimates where reliable case studies, research, and literature are available. A full list of references is provided in **Appendix C**.

The 12 measures selected for the detailed cost-benefit analysis represent a diverse range of the measures. This list includes measures whether expected to be high or low in terms of financial impact, which apply to various sources of greenhouse gas emissions and are implemented through various programs and collaboration with external agencies. The team selected measures for the detailed cost-benefit analysis based on anticipated importance in terms of contribution to the CAP target, potentially high or low financial impact that represent outliers for implementation, or availability of other resources to leverage against anticipated costs. These measures are expected to have among the greatest financial impacts.

A summary of the results of the basic cost-benefit analysis is presented in **Table 10.** Additional cost-benefit information, including details on the methods and results of the analysis, is included in **Appendix C**.[6] Metrics in **Table 10** are provided for illustrative purposes to compare the likely scale of community savings to potential City staff time for implementation. Overall, **Table 10** provides a basis to compare benefits and costs of priority measures. Due to the high-level nature of these estimates, the full-time employee (FTE) values in **Table 10** show City staff time as total annual FTE values for the five-year period through the 2020 target year. For example, the anticipated five-year FTE for Measure 1 is one FTE, which means an anticipated FTE of 0.2 each year for five years. These anticipated FTEs may not require additional staff, as some measures may be implemented as part of current staffs' regular work plans or in conjunction with other measures. Each FTE estimate is based on the average anticipated level of effort for measure implementation. Actual staff efforts and ramp-up time will vary due to various factors such as departmental priorities, availability of external funding, and support of regional agencies.

[6] Cost-benefit information is also available in PCAP Technical Memorandum 3 on the City's website: https://www.cityofmerced.org/depts/cd/planning/programmatic_climate_action_plan.asp.

Table 10: Results of Basic Cost-Benefit Analysis

Measure	City Staff Five-Year FTE	Annual Total Community Savings
1: High density and mixed use	1	$1,416,900
2: Increased transit use	2.25	$94,900
3: Carpool and car share*	0.5	$293,800
4: Increased bicycle use	1.5	$121,700
5: Telecommuting*	0.5	$80,780
6: TDM program for UC Merced*	1	$770,150
7: Synchronization and traffic flow*	1.5	$783,860
8: Neighborhood electric vehicles	1	$334,800
9: Electric vehicles	2.25	$2,640,100
10: CALGreen*	0.75	$2,520/participant*
11: Passive solar design	1.25	$180,700
12: Multifamily unit, rental unit, and affordable housing energy retrofits	2.5	$724,300
13: Residential energy retrofits*	2.5	$755,250
14: Nonresidential energy retrofits*	0.75	$6,304,480
15: Cool roofs and shade trees*	1	$60,090
16: Commercial outdoor lighting retrofits	0.5	$229,300
17: Residential renewable energy*	1.75	$2,337,900
18: Nonresidential renewable energy*	2.25	$1,122,820
19: Solar water heating	0.75	$116,900
20: Community shared solar*	1	$349,190
21: Water metering	0.75	$223,430
22: Indoor water conservation retrofits	1.5	$31,100
23: Water efficiency in new buildings	0.25	$12,900
24: Landscaping water efficiency	0.75	$7,000
25: Graywater and rainwater catchment	0.75	$25,900

Measure	City Staff Five-Year FTE	Annual Total Community Savings
26: Waste reduction	0.75	$0
27: Improved recycling*	1.5	$0
28: Construction and demolition waste recycling	0.5	$0
29: Lawn and garden equipment efficiency	1	$29,100
30: Construction equipment efficiency	0.5	$68,200
31: Performance-based approach	0.5	N/A

** These measures received a more extensive cost-benefit analysis, presented in **Appendix C**.*

Note that the information in **Table 10** depicts the relative level of effort and potential savings for measures. Data in this table serves as a basis for staff to prioritize efforts for implementation. Although FTE is shown for each measure, it is likely that staff time can be leveraged across multiple measures for greater efficiencies. Rather than present staff time in a cumulative manner, this table informs the evaluation of relative staff time and resources. In many instances, the five-year FTE shown in **Table 10** can be offset through regional or state programs, or the efforts of other agencies. Further information on prioritization of measures for implementation follows.

Prioritization

Prioritization is the process of ranking each measure based on implementation considerations. This results in a simple, user-friendly summary of the multiple variables that determine the feasibility of any particular GHG emissions reduction measure from the CAP, such as capital cost, effectiveness, and co-benefit for other community values. Prioritization helps to guide the work efforts of City staff and can be updated based on City Council direction or other considerations at a future time. Five variables are used to prioritize the CAP measures:

1) Annual GHG reduction ($MTCO_2e$) in 2020
2) Partners and programs available to support measure implementation
3) Consistency with CAP values (as identified in the adopted CAP)
4) Financial impact to community (negative impact, neutral, positive return on investment)
5) Financial impact to City (negative impact, neutral, positive return on investment)

The scores for each criterion are weighted into an average score. The average score is shown in the table as the weighted average score for each measure. Those measures with the highest score indicate the highest priority for implementation. The prioritization calculations take place in the City's monitoring tool (discussed in a later section), where prioritization can be updated as needed. The results of the prioritization scoring are shown in **Table 11**.

Table 11: Measure Priority Scoring Results

Priority	Weighted Average Score	Measure Number and Measure Language
1	3.8	Measure 31: Implement a performance-based approach for new development, allowing developers to select from applicable CAP measures that satisfy mitigations of the SJVAPCD Indirect Source Rule and reduce SJVAPCD permit fees.
2	3.4	Measure 14: Improve energy efficiency through voluntary retrofits in 16% of businesses and other energy efficiency strategies in existing commercial and industrial facilities.
3	3.0	Measure 17: Increase the amount of renewable electricity generation for on-site residential use.
3	3.0	Measure 18: Facilitate renewable energy for on-site commercial and industrial uses.
5	3.0	Measure 16: Support retrofits to outdoor commercial lighting in Merced to reduce energy use.
6	2.8	Measure 3: Promote carpool and car-share systems.
6	2.8	Measure 13: Facilitate energy efficiency through voluntary retrofits in 15% of single-family homes, and promote low-cost opportunities to reduce energy use in single-family households.
6	2.8	Measure 19: Support the use of solar energy to meet on-site water heating needs for domestic and nonresidential uses and swimming pools, exceeding minimum state CALGreen standards.
9	2.6	Measure 2: Support a 30% increase in per-person intracity and intercity transit use by 2020.
9	2.6	Measure 12: Support improved energy efficiency in existing multifamily units, rental units, and affordable households through voluntary retrofits.
11	2.6	Measure 1: Develop higher-density and mixed-use developments to support alternative travel in downtown Merced and appropriate neighborhood centers.
11	2.6	Measure 4: Increase the feasibility and use of bicycles in Merced for commute and recreation through new bicycle infrastructure and education.
11	2.6	Measure 6: Work with UC Merced to establish a Transportation Demand Management (TDM) program for new student housing located in the city.
11	2.6	Measure 9: Support the increased use of passenger plug-in electric vehicles (EV) and other alternative fuels to 5% by 2020.
11	2.6	Measure 22: Promote indoor water conservation through retrofits to existing buildings.
11	2.6	Measure 27: Increase recycling in Merced with a goal of improving diversion of recyclables by 25%.
17	2.4	Measure 7: Synchronize traffic signals along 10 miles of major roads, convert at-grade railroad crossings to underpasses, and replace four-way stops in downtown with roundabouts to improve fuel efficiency.
17	2.4	Measure 20: Create a community shared solar program to produce renewable energy for off-site use in Merced.
17	2.4	Measure 24: Reduce the amount of water used for landscaping.
20	2.4	Measure 8: Support the increased use of neighborhood electric vehicles (NEVs, such as lower-speed street-safe golf carts) to 3% of households by 2020.

Priority	Weighted Average Score	Measure Number and Measure Language
20	2.4	Measure 15: Use cool roofs and shade trees to reduce the urban heat island effect in Merced.
22	2.2	Measure 21: Install water meters on remaining unmetered housing units to promote awareness and conservation.
22	2.2	Measure 25: Promote individual graywater and rainwater catchment systems to reduce potable water demand.
22	2.2	Measure 28: Divert 50% of construction and demolition (C&D) waste from new construction projects and renovations.
25	2.2	Measure 26: Reduce the amount of waste sent to landfills, excluding recyclables and construction and demolition (C&D) material, by 33%.
26	2.0	Measure 5: Promote telecommuting as a viable commute alternative for 3% of Merced employees an average of 1.5 days per week by 2020.
26	2.0	Measure 29: Reduce emissions from lawn mowers and leaf blowers by 10%.
28	1.2	Measure 30: Use alternative-fuel and fuel-efficient construction equipment, and reduce construction equipment idling time.

Note: Measures 10, 11, and 23 are implemented with Measure 31 and are not included in this table. Measures associated with new development are presented in the table for completeness, but these measures will be implemented on a project-by-project basis using a performance-based approach. This approach provides flexibility for new development. Rather than analyze each measure for new development separately, the City's overall approach to implementing performance-based options for new development is ranked comprehensively for feasibility as Measure 31.

Implementation Responsibility

Various City departments and related agencies are responsible for implementing different measures. These responsible departments are identified in **Table 12.**

Table 12: City Departments Responsible for Measure Implementation

Measure Language		Key Department or Agency	Supporting Departments and Agencies
1	Develop higher-density and mixed-use development to support alternative travel in downtown Merced and appropriate neighborhood centers.	Planning	Housing
2	Support a 30% increase in per-person intracity and intercity transit use by 2020.	MCAG	Planning, Engineering
3	Promote carpool and car-share systems.	Commute Connection	Planning, Economic Development
4	Increase the feasibility and use of bicycles in Merced for commute and recreation through new bicycle infrastructure and education.	Planning	Engineering, Police
5	Promote telecommuting as a viable commute alternative for 3% of Merced employees an average of 1.5 days per week by 2020.	Economic Development	Planning, Engineering

	Measure Language	Key Department or Agency	Supporting Departments and Agencies
6	Work with UC Merced to establish a Transportation Demand Management (TDM) program for new student housing located in the city.	Planning	Housing
7	Synchronize traffic signals along 10 miles of major roads, convert at-grade railroad crossings to underpasses, and replace four-way stops in downtown with roundabouts to improve fuel efficiency.	Engineering	Planning
8	Support the use of neighborhood electric vehicles (NEVs, such as lower-speed, street-safe golf carts) by 3% of households by 2020.	Planning	Engineering
9	Support the increased use of passenger plug-in electric vehicles (EV) and other alternative fuels to 5% by 2020.	Planning	Economic Development, Engineering
10	Encourage new buildings to exceed the minimum energy efficiency requirements under the state CALGreen standards.	Building	Planning, Housing, Engineering
11	Site new buildings to take advantage of natural solar resources for heating and cooling.	Building	Planning, Housing, Engineering
12	Support improved energy efficiency in existing multifamily units, rental units, and affordable households through voluntary retrofits.	Housing	Building
13	Facilitate energy efficiency through voluntary retrofits in 15% of single-family homes, and promote low-cost opportunities to reduce energy use in single-family households.	Housing	Building
14	Improve energy efficiency through voluntary retrofits in 16% of businesses and other energy efficiency strategies in existing commercial and industrial facilities.	Economic Development	Building
15	Use cool roofs and shade trees to reduce the urban heat island effect in Merced.	Public Works	Planning, Building, Housing, Engineering, Economic Development
16	Support retrofits to outdoor public lighting in Merced to reduce energy use.	Economic Development	Building, Housing, Public Works
17	Increase the amount of renewable electricity generation for on-site residential use.	Building	Planning, Housing
18	Facilitate renewable energy for on-site commercial and industrial uses.	Building	Planning, Economic Development
19	Support the use of solar energy to meet on-site water heating needs for domestic and nonresidential uses and swimming pools, exceeding minimum state CALGreen standards.	Building	Planning, Housing, Economic Development
20	Create a community shared solar program to produce renewable energy for off-site use in Merced.	Planning	Building, Economic Development

	Measure Language	Key Department or Agency	Supporting Departments and Agencies
21	Install water meters on remaining unmetered housing units to promote awareness and conservation.	Public Works	
22	Promote indoor water conservation through retrofits to existing buildings.	Public Works	Building, Housing
23	Improve indoor water efficiency in new buildings.	Building	Planning, Housing
24	Reduce the amount of water used for landscaping.	Public Works	Building, Planning
25	Promote individual graywater and rainwater catchment systems to reduce potable water demand.	Public Works	Building, Planning
26	Reduce the amount of waste sent to landfills, excluding recyclables and construction and demolition (C&D) material, by 33%.	Public Works	
27	Increase recycling in Merced with a goal of improving diversion of recyclables by 25%.	Public Works	
28	Divert 50% of construction and demolition (C&D) waste from new construction projects and renovations.	Building	Public Works
29	Reduce emissions from lawn mowers and leaf blowers by 10%.	Public Works	
30	Use alternative-fuel and fuel-efficient construction equipment, and reduce construction equipment idling time.	Building	Planning, Public Works
31	Implement a performance-based approach for new development, allowing developers to select from applicable CAP measures that satisfy mitigations of the SJVAPCD Indirect Source Rule and reduce SJVAPCD permit fees.	Planning	

Monitoring Tool

Monitoring plan progress toward reduction targets is one of the required criteria for qualified GHG reduction plans as outlined by CEQA Guidelines Section 15183.5. The City will conduct monitoring and reporting to track CAP measure progress on an annual basis through 2020. The tool will automatically calculate progress toward community-level GHG targets based on aggregate-level data and reductions from individual measures. Using the same technical data that informed development of the CAP, the tool will allow City staff to evaluate CAP progress using quantitative data and qualitative progress information. The City will use this tool to track its progress reducing emissions, vehicle miles traveled (VMT), waste generation, and energy use over time with readily available data. The monitoring tool will provide examples and instructions on how to gather relevant inventory activity data for GHG tracking. The monitoring and reporting tool uses this data to estimate emissions changes in the city year by year using publicly available activity data, and tracks progress for each measure including initiation dates and key metrics. The tool will enable the City to sort measures based on timing, responsible department, and level of success, progress, or completion.

Annual updates created by the monitoring and reporting tool are not intended to be a replacement for a full re-inventory. Annual monitoring allows interim estimates of progress.

As part of annual progress reports, staff will evaluate the effectiveness of each measure to ensure that anticipated emissions reductions are occurring. For example, certain measures may exceed expectations and provide more cost-effective options to reduce emissions. Other measures may not meet anticipated reductions. City staff will use the monitoring and reporting tool to provide updates to decision-makers in order to reassess funding decisions and allocation of staff time. In the event that reductions do not occur as expected, the City can modify and add additional measures to the CAP to ensure the reduction target is achieved.

By using the tool to track GHG emissions, City staff will also monitor Merced's demographic growth. The City and the Merced County Association of Governments (MCAG) anticipate a high rate of growth in the community between 2008 and 2020, which is used in the Merced General Plan. This rapid growth rate informed the development of Merced's 2020 GHG forecast (higher population levels generally result in higher emissions). Merced's demographic projections anticipate an average population growth of approximately 2.8% from 2008 to 2020. However, as of 2014, Merced's population growth since 2008 has been approximately 0.6% annually. If Merced continues along this slower growth trajectory, 2020 emissions may be less than forecast. The monitoring tool will allow Merced to track community demographics and how GHG emissions are changing as a result and to adjust implementation of CAP measures accordingly to achieve the 2020 goal. The CAP uses the higher growth rate for all calculations for consistency with the Merced General Plan.

Chapter 3

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APPENDIX A: PROJECT OPTIONS CHECKLIST

This appendix discusses in greater detail the new performance-based development approach and its role in implementing the measures in the CAP that apply to new development projects. The Residential and Nonresidential Project Options Checklists in this appendix summarize the criteria for a project to claim consistency with the CAP and thereby access CEQA permit streamlining for purposes of analyzing GHG emissions. Projects that demonstrate consistency with the CAP by meeting "design element" criteria on these checklists are eligible to rely on the City's analysis of GHG emissions for purposes of CEQA. Rather than prescribe a mandatory set of actions that all new projects must meet for CAP consistency, projects can choose from one of several options in the applicable checklist, also referred to as design elements. Where certain CAP performance measures also have a visual component, the City provides further guidance in the UDM. Together, the Project Options Checklists and the UDM use a performance-based approach to identify measures and performance requirements for new projects seeking consistency with the CAP. The minimum options a project must meet for CAP consistency are summarized in the Project Options Checklists. Additional information and suggestions are provided in the UDM to help the City further communicate desired outcomes to project applicants.

If new projects are subject to CEQA but do not wish to comply with the CAP or the UDM, they may elect to conduct an analysis of GHG emissions and climate change as required by CEQA. Such projects are expected to meet all CEQA requirements.

The performance-based approach allows projects seeking CAP consistency to choose measures that best meet the project's needs. These measures have already been analyzed by the City and would result in new development as a whole achieving reductions that would contribute toward the City's

GHG reduction target. The Project Options Checklists summarize the options for new projects to comply with CAP measures. The checklists also identify where the UDM provides additional guidance to support projects as they seek to meet the criteria in the Project Options Checklists. City staff will use the Project Options Checklists and the UDM as a basis for identifying conditions of approval for new projects seeking to demonstrate CAP consistency.

Method and Applicability

New development projects can demonstrate compliance with the CAP by choosing to implement one of the options outlined in the tables below, each of which contains design criteria based on reduction measures from the CAP and the PCAP. Projects can demonstrate compliance with the CAP by implementing all design element measures in the selected option. Each option shows the criteria that would reduce the project's GHG emissions 29% below baseline levels consistent with the San Joaquin Valley Air Pollution Control District's recommended CEQA Assessment Guidance. While new projects will implement these measures on a case-by-case basis, when the total impact of each new project's GHG reductions is aggregated, as a whole new development would achieve a measurable reduction in GHG emissions that helps the City achieve its adopted GHG reduction target of returning to 1990 GHG emissions levels by 2020. Additionally, the measure options allow projects to achieve GHG reductions that also meet the requirements of the SJVAPCD's Indirect Source Review Program for new development. The SJVAPCD's Indirect Source Review rule requires that most projects reduce emissions of other air pollutants below specified levels or pay mitigation fees. The design element measures in the Project Options Checklists are intended to help facilitate compliance with the ISR rule and other regulations; however, projects that fully comply with the CAP are not necessarily fully compliant with SJVAPCD rules.

As stated above, to demonstrate consistency with the CAP, each project must fully implement all design element measures in one of the applicable options. However, projects are not prohibited from implementing individual measures that enable the project to potentially achieve reductions beyond those required in the CAP.

The design element measures in the options are not a complete list of City requirements applicable to new development that reduce GHG emissions. For example, if a project chooses to demonstrate consistency by selecting Option 1, which only requires a renewable energy system of the specified size, the project may still be required to comply with existing City requirements that also help to reduce emissions. Reductions from City requirements have already been accounted for in the PCAP.

Residential and Nonresidential Project Options Checklists

The applicant will be asked to indicate the option the proposed project will include. Note that in addition to the options for CAP consistency shown below, the City assumes credit for projects based on numerous regulations already under way. The following reductions from State-mandated actions are already attributed as credits toward the project for GHG reductions and cannot be claimed as additional credits to meet the performance-based options below.

- Compliance with California's RPS, mandating that utilities procure 33% of their electricity from eligible renewable sources by the end of 2020.
- Vehicles with fuel efficiencies compliant with California's AB 1493 standards and using fuel that meets the requirements of the State's Low Carbon Fuel Standard.
- Compliance with the mandatory items of the California Building Standards Code, including all minimum energy efficiency requirements of CALGreen.

Projects cannot count these actions as additional credits for CAP consistency. Note that the performance-based approach also does not address reductions from reduced solid waste generation and off-road equipment use; reductions from these items are achieved on a citywide basis year by year through other CAP implementation measures, which apply to both existing and new developments. The City implements these measures through other methods, rather than as conditions of approval on new development or remodels.

The options for performance-based compliance with the CAP are provided below in the Project Options Checklists. The design element criteria for each option vary based on project type or the assumed level of participation. Each option provides a level playing field for new projects to select the types of GHG reduction measures that are most cost-effective or applicable to the project. While each option presents different design element criteria, each option would achieve a similar relative reduction of GHG emissions. Based on analysis in the CAP, the City has determined that projects consistent with the criteria below are meeting the level of GHG reductions for new development identified in the CAP and contribute to the City's achievement of GHG reduction targets. Accordingly, the City will provide the opportunity for streamlining to projects that are consistent with one of the following options. **Table A-1** and **Table A-2** show residential options, while **Table A-3** and **Table A-4** show nonresidential options.

Table A-1: Residential Project Options Checklist

Residential Project Options and Design Elements								
#	Design Elements for Residential Projects	CAP Measure #	Option Set					
			1	2	3	4	5	6
1	Install a solar water heating system for indoor use for all units and for any swimming pools included in the project.	19		✓	✓			
2	Construct all new buildings to CALGreen Tier 1 energy efficiency standards.	10				✓		✓
3a	Establish an on-site renewable energy system: The system should be capable of producing at least 7,000 kWh annually for every residential unit (for a solar photovoltaic system, this is a 5 kW system per home).	17, 20	✓					
3b	Establish an on-site renewable energy system: The system should be capable of producing at least 4,300 kWh annually per unit (for a solar photovoltaic system, this is a 3 kW system per home).	17, 20		✓				
3c	Establish an on-site renewable energy system: The system should be capable of producing at least 2,900 kWh annually per unit (for a solar photovoltaic system, this is a 2 kW system per home).	17, 20					✓	

Appendix A

Residential Project Options and Design Elements								
#	Design Elements for Residential Projects	CAP Measure #	Option Set					
			1	2	3	4	5	6
4a	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 15% reduction below average for project occupants should be 2,910 vehicle miles traveled (VMT) per person annually.*	2, 3, 4		✓				
4b	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 20% reduction below average for project occupants should be 2,730 vehicle miles traveled (VMT) per person annually.*	2, 3, 4			✓			
4c	Reduce through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 25% reduction below average for project occupants should be 2,550 vehicle miles traveled (VMT) per person annually.*	2, 3, 4					✓	
4d	Reduce vehicle trips (VMT) through measures that support alternative transportation options such as carpooling, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 28% reduction below average for project occupants should be 2,460 vehicle miles traveled (VMT) per person annually.*	2, 3, 4						✓
5	Utilize passive solar design techniques.	11			✓		✓	
6	Be located in an area of moderate road connectivity with small block sizes, using concepts illustrated in the City's Unified Design Manual.†	1			✓			
7	Provide one EV charging station (Level 2 or Level 3) per unit.	9				✓		
8	Plant trees to provide shade to the building.	15				✓	✓	
9	Be located in a mixed-use residential/commercial building, with no less than 25% of floor space devoted to either type of use.	1						✓
10	Use an NEV for trips when feasible, and provide design elements that support NEV use.	8						✓
11	Install a graywater system to reduce water consumption.	25						✓

** The per-person average VMT for project occupants is based on the average VMT for residents and employees in Merced. Depending on the specific size and land use of the development projects, actual per person VMT for individual project occupants may be higher or lower than the target average presented here. This data would typically be available in the common types of project analysis that applicants must submit to the San Joaquin Valley Air Pollution Control District for compliance with the Indirect Source Rule.*

† "Moderate road connectivity," as identified by the California Air Pollution Control Officers Association, is at least 45 intersections per square mile.

Table A-2: Residential Project Option Selection

Residential Project: Applicant Selection of Option with Measures		
Option	**Design Elements**	**Selection: The applicant signs here to denote which option and design elements will be used for the project.**
1	3a	
2	1, 3b, 4a	
3	1, 4b, 5, 6	
4	2, 7, 8	
5	3c, 4c, 5, 8	
6	2, 4d, 9, 10, 11	

Table A-3: Nonresidential Project Options Checklist

Nonresidential Project Options and Design Elements								
#	**Design Elements for Nonresidential Projects**	**CAP Measure #**	**Option Set**					
			1	**2**	**3**	**4**	**5**	**6**
1	Install a solar water heating system for indoor use for all buildings.	19			✓			
2	Construct all new buildings to CALGreen Tier 1 energy efficiency standards.	10	✓	✓			✓	
3a	Establish an on-site renewable energy system: The system should be capable of producing at least 5.9 kWh annually for every square foot of building space (for a solar photovoltaic system, this is 1 kW for every 245 square feet of building space).	18, 20				✓		
3b	Establish an on-site renewable energy system: The system should be capable of producing at least 2.9 kWh annually for every square foot of building space (for a solar photovoltaic system, this is 1 kW for every 500 square feet of building space).	18, 20		✓				
4a	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 15% reduction below average for project occupants should be 2,910 vehicle miles traveled (VMT) per person annually.*	2, 3, 4, 5		✓				

Appendix A

Nonresidential Project Options and Design Elements								
#	Design Elements for Nonresidential Projects	CAP Measure #	Option Set					
			1	2	3	4	5	6
4b	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 25% reduction below average for project occupants should be 2,550 vehicle miles traveled (VMT) per person annually.*	2, 3, 4, 5	✓					
4c	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 20% reduction below average for project occupants should be 2,700 vehicle miles traveled (VMT) per person annually.*	2, 3, 4, 5					✓	
4d	Reduce vehicle trips through measures that support alternative transportation options such as carpooling, telecommuting, walking and bicycling, and increased transit use. The project should use applicable designs from the UDM. A 12% reduction below average for project occupants should be 3,030 vehicle miles traveled (VMT) per person annually.*	2, 3, 4, 5						✓
5	Utilize passive solar design techniques.	11			✓			✓
6	Provide an EV charging station.	9			✓		✓	
7	Be located in a mixed-use residential/commercial building, with no less than 25% of floor space devoted to either type of use.	1	✓					✓
8	Plant trees to provide shade to the building.	15					✓	
9	Be located in an area of moderate road connectivity with small block sizes, using concepts illustrated in the City's Unified Design Manual.†	1						✓
10	Use smart irrigation systems and controllers for all irrigated landscape areas.‡	24						✓
11	Install showers, toilets, and sinks that use less water than required under state standards.	23						✓

** The per-person average VMT for project occupants is based on the average VMT for residents and employees in Merced. Depending on the specific size and land use of the development projects, actual per person VMT for individual project occupants may be higher or lower than the target average presented here. This data would typically be available in the common types of project analysis that applicants must submit to the San Joaquin Valley Air Pollution Control District for compliance with the Indirect Source Rule.*

† "Moderate road connectivity," as identified by the California Air Pollution Control Officers Association, is at least 45 intersections per square mile.

‡ Compliance with this item may potentially be achieved with the 2015 State Model Water Efficient Landscape Ordinance.

Table A-4: Nonresidential Project Option Selection

Nonresidential Project: Applicant Selection of Option with Measures		
Option	**Design Elements**	**Selection: The applicant signs here to denote which option and design elements will be used with the project.**
1	2, 4b, 7	
2	2, 3b, 4a	
3	1, 5, 6	
4	3a	
5	2, 4c, 6, 8	
6	4d, 5, 7, 9, 10, 11	

Project Option Resources

This section presents possible resources that applicants can use to help implement the various options identified in the different Project Options and for City staff to learn more about the items in the performance-based approach in order to better ensure compliance with the Project Options. This is not intended to be a comprehensive list of all potential resources, nor is it meant to serve as a list of required resources for applicants to use. **Table A-5** shows resources for the various issues in the performance-based approach for both residential and nonresidential developments.

Table A-5: Project Option Resources

Issue	Potential Resources
Renewable Energy	• California Solar Permitting Guidebook: http://www.opr.ca.gov/docs/California_Solar_Permitting_Guidebook_2014.pdf • Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • New Solar Homes Partnership: http://www.gosolarcalifornia.org/about/nshp.php • UDM Chapter 5
Energy Efficiency	• Home Energy Rating System (HERS): http://www.energy.ca.gov/HERS/index.html • Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • New Building Energy Efficiency Standards: http://energy.ca.gov/title24/ • UDM Chapter 4 • UDM Chapter 5

Issue	Potential Resources
Transportation	• California Plug-In Electric Vehicle Collaborative: http://www.pevcollaborative.org/ • Commute Connection: http://www.commuteconnection.com/ • US Department of Transportation List of Transportation Strategies: http://www.fhwa.dot.gov/environment/air_quality/conformity/research/mpe_benefits/mpe09.cfm • DriveClean Buying Guide: http://www.driveclean.ca.gov/ • Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • UDM Chapter 2 • UDM Chapter 3
Land Use	• Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • UDM Chapter 2 • UDM Chapter 3
Water	• California State Model Water Efficient Landscape Ordinance: http://www.water.ca.gov/wateruseefficiency/landscapeordinance/ • EPA WaterSense Program: http://www.epa.gov/WaterSense/index.html • Indirect Source Rule Mitigation Measures: http://www.valleyair.org/ISR/ISROnSiteMeasures.htm • State Water Resources Control Board Water Conservation Portal: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/ • UDM Chapter 4

Definitions

The performance-based approach uses the following terms. Additional details about these items are included in the Unified Design Manual.

- **CALGreen:** A set of mandatory and voluntary standards for all new buildings in California to conserve resources and ensure public safety.
- **Graywater:** Wastewater from comparatively clean sources (e.g., sinks, clothes washing machines, and dishwashers) that can be filtered and reused for landscape irrigation, toilets, and other uses not intended for human consumption.
- **NEV:** Neighborhood electric vehicle, a small and inexpensive street-legal electric vehicle with a limited top speed, suitable for short local trips.
- **On-site energy use**: Energy generated on a property that is primarily used on the property or on an adjacent parcel under the same ownership.
- **Passive solar:** Design features of a building that use the heat from the sun to maintain a comfortable interior temperature without any mechanical or electricity systems.
- **Smart irrigation:** Irrigation systems that monitor soil moisture and only irrigate plants when the ground is dry, avoiding irrigation during or shortly after rainfall events.

APPENDIX B: INVENTORY AND FORECAST UPDATE

Summary of 2008 Inventory and Forecast Updates

The City of Merced prepared the 2008 inventory, which analyzed GHG emissions for electricity and natural gas use in residential and nonresidential buildings, on-road transportation, and solid waste deposited in a landfill (not including alternative daily cover, or ADC). Inventory revisions reflect methods in a new inventory prepared by the Great Valley Center (GVC) for the baseline year of 2011.[7] Updates also ensure that the inventory follows the most recent guidance in the US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, the first protocol developed for community-wide GHG inventories that provides the most widely accepted methods for preparing inventories.[8]

Updates also sought to ensure that the inventory was a reasonably complete summary of the sources of GHG emissions attributable to the City of Merced consistent with state guidance. The California Environmental Quality Act Guidelines also indicate the scope of activities to be included in the inventory for purposes of streamlining. Under CEQA Guidelines Section 15183.5(b), a CAP should quantify GHG emissions, both existing and forecast for activities within a defined geographic area.

[7] Great Valley Center. 2014. City of Merced 2011 Inventory of Community and Government Operations Greenhouse Gas Emissions.

[8] ICLEI-Local Governments for Sustainability USA. 2013. US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions.

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GHG emissions from the residential and nonresidential energy sectors were recalculated using more recent emission factors. Activity data and GHG emissions from the on-road transportation, solid waste, and water and wastewater sectors were recalculated, following the methods used in the 2011 GVC inventory and the US Community Protocol. The off-road equipment sector was not included in the 2011 GVC inventory and so was added for consistency with the US Community Protocol. Data sources for activity data and emission factors varied by sector, but generally included utility companies, state agencies, local and regional governments, and the US Community Protocol. **Table B-1** identifies the sectors in the 2008 inventory and their relation to the sectors in the US Community Protocol, data sources, and a description of the updates. **Table B-2** summarizes activity data and GHG emissions for each sector and subsector for the updated 2008 inventory. Emission factors for the updated 2008 inventory and their sources are given in **Table B-3.**

Table B-1: 2008 Inventory Scope and Updates

Sector	Data Source	Notes	US Community Protocol Corresponding Sector
Residential energy	PG&E, MID, Community Protocol	Emissions were recalculated, using updated emission factors from PG&E and the Community Protocol, as well as the US Environmental Protection Agency and discussions with MID, for consistency with the Protocol and the 2011 GVC inventory	Built environment
Nonresidential energy	PG&E, MID, Community Protocol	Emissions were recalculated, using updated emission factors from PG&E and the Community Protocol, as well as the US Environmental Protection Agency and discussions with MID, for consistency with the Protocol and the 2011 GVC inventory	Built environment
On-road transportation	CARB, Caltrans	Activity data and emissions were recalculated using CARB and Caltrans data, for consistency with the 2011 GVC inventory	Transportation and other mobile sources
Solid waste	MCRWMA, CalRecycle	Activity data and emissions were recalculated with MCRWMA and CalRecycle data, for consistency with the Protocol and the 2011 GVC inventory	Solid waste

Sector	Data Source	Notes	US Community Protocol Corresponding Sector
Off-road equipment	CARB	This sector was added, using CARB data, for consistency with the Protocol	Transportation and other mobile sources
Water and wastewater	City of Merced, PG&E, MID, Community Protocol	Activity data and emissions were recalculated for consistency with the Protocol and the 2011 GVC inventory	Wastewater and water

CARB: California Air Resources Board
MCRWMA: Merced County Regional Waste Management Authority
MID: Merced Irrigation District
PG&E: Pacific Gas and Electric Company
CalRecycle: California Department of Resources Recycling and Recovery

Table B-2: 2008 Activity Data and GHG Emissions

Sector	Subsector	Activity Data		$MTCO_2e$
Residential energy	Residential electricity use	185,883,530	kWh	65,000
	Residential natural gas	9,418,610	therms	50,100
Nonresidential energy	Nonresidential electricity use	326,357,620	kWh	179,260
	Nonresidential natural gas	7,034,990	therms	37,420
On-road transportation	On-road passenger vehicles	349,593,380	VMT	235,570
Solid waste	Solid waste disposal	50,570	tons of waste	18,750
Off-road equipment	Lawn & garden	140,270	gallons of fuel	1,190
	Construction	425,999	gallons of fuel	5,120
Water and wastewater	Indirect water emissions	5,880,300	kWh	3,010
	Direct emissions	—	—	320
	Indirect wastewater electricity	4,699,340	kWh	3,340
Total*		**—**	**—**	**599,090**

**Due to rounding, the total may not equal the sum of component parts.*

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Table B-3: 2008 GHG Emission Factors

Sector	Subsector	2008 Emission Factor		Source
Residential energy	Residential electricity use	0.000350	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Residential natural gas	0.005320	$MTCO_2e$/therm	PG&E
Nonresidential energy	Nonresidential electricity use	0.000549	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Nonresidential natural gas	0.005320	$MTCO_2e$/therm	PG&E
On-road transportation	On-road passenger vehicles	0.000674	$MTCO_2e$/VMT	CARB (EMFAC 2011 model)
Solid waste	Solid waste disposal	0.370689	$MTCO_2e$/ton	CARB (landfill model)
Off-road equipment	Lawn & garden	0.008462	$MTCO_2e$/gallon	CARB (OFFROAD 2007)
	Construction	0.012024	$MTCO_2e$/gallon	CARB (OFFROAD 2007)
Water and wastewater	Indirect water emissions	0.000513	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Direct emissions	—	—	N/A
	Indirect wastewater electricity	0.000711	$MTCO_2e$/kWh	MID, US Community Protocol, USEPA

Emissions are forecast to 2020 and 2030. 2020 is the year for achieving GHG reduction targets established by the Merced City Council; a 2020 forecast will indicate the size of the GHG reduction Merced must achieve to meet this goal. 2030 is the completion (buildout) year for the Merced General Plan; a 2030 forecast allows an estimate of emissions upon full implementation of the General Plan. Forecasts are made using indicators, demographic data that suggests how emissions in a particular sector will change. For example, the projected increase in the number of households in Merced is used as an indicator for residential energy and off-road equipment. Indicators are provided by the City of Merced, supplemented with data from MCAG or state agencies as needed. Forecast indicators and their sources are given in **Table B-4**.

Table B-4: Forecast Indicators, 2008–2030

Indicator	Applicable Sectors	2008	2020	2030	Source	Percentage Change, 2008–2030
Number of households	Residential energy, off-road equipment (lawn & garden)	25,230	35,870	45,800	CA Department of Finance, MCAG	82%
Number of new households	Off-road equipment (construction)	250	890	990	CA Department of Finance, MCAG	296%
Number of jobs	Nonresidential energy	24,420	29,340	33,680	City of Merced	38%
Service population	On-road transportation, solid waste, water and wastewater (all subsectors)	102,520	136,939	171,081	CA Department of Finance, MCAG, US Census	67%

Emissions are forecast under a business-as-usual (BAU) scenario that assumes no GHG reductions from federal, state, or local/regional activities. Forecast emissions are shown in **Table B-5**.

Table B-5: GHG Emissions, 2008–2030 (BAU Scenario)

Sector	2008 $MTCO_2e$	2020 $MTCO_2e$	2030 $MTCO_2e$	Percentage Change, 2008–2030
Residential energy	115,110	163,640	208,950	82%
Nonresidential energy	216,680	260,380	298,920	38%
On-road transportation	235,570	314,660	393,110	67%
Solid waste	18,750	25,040	31,280	67%
Off-road equipment	6,310	8,060	9,290	47%
Water and wastewater	6,670	8,910	11,140	67%
Total*	**599,090**	**780,690**	**952,690**	**59%**
Percentage change from baseline		30%	59%	—

**Due to rounding, the total may not equal the sum of component parts.*

The BAU scenario is useful for illustrating a high-emissions forecast, but it fails to account for actions to reduce GHG emissions that are planned or already under way. A number of actions taken by the State of California reduce statewide GHG emissions, which helps to reduce emissions from the City of Merced. The state efforts are described below.

Assembly Bill 1493 and the Local Carbon Fuel Standard

Assembly Bill 1493 (the Pavley Standards) establishes GHG emission standards for passenger cars, light-duty trucks (up to 5,750 pounds), and medium-duty trucks (up to 8,500 pounds) from 2009 to 2016. The LCFS calls for a 10% reduction in carbon intensity in California's transportation fuels by 2020 and is expected to reduce GHG emissions for all vehicles, including those not covered by the Pavley Standards.

GHG reductions from the Pavley Standards and the LCFS were calculated using the publicly available EMFAC model provided by CARB for Merced County, which estimates VMT and GHG emissions for various classes of cars. The EMFAC model estimates that these standards are expected to reduce Merced's on-road transportation GHG emissions by 25% in 2020 and by 30% in 2030. In addition, the fuel efficiency benefits of the Pavley Standards may reduce fuel costs for drivers.

Heavy Duty Vehicle GHG Reduction

The Heavy Duty Vehicle GHG Reduction is a regulation approved by CARB in 2008 to reduce emissions from long-haul tractors and box-trailers at least 53 feet long. Owners of vehicles covered by the regulation must retrofit their vehicles to be more aerodynamic and to use low-resistance tires, or must replace vehicles with models that incorporate these features.

GHG reductions from the Heavy Duty Vehicle GHG Reduction were calculated using CARB's forecast for statewide reductions from this action. CARB estimates that this measure will reduce emissions from these vehicles by approximately 1.45%. Using estimates of VMT and GHG emissions for Merced, as provided by the EMFAC model, the proportion of emissions from vehicles covered by this regulation was estimated. The reduction of 1.45% was applied to heavy vehicle emissions to identify the savings from this measure. This measure is expected to reduce Merced's on-road transportation emissions by less than 1% in both 2020 and 2030.

Renewables Portfolio Standard

California's RPS mandates that utility providers obtain 33% of their electricity from qualified renewable sources by 2020. Both PG&E and the Merced Irrigation District must meet this requirement. In 2008, approximately 11.9% of PG&E's electricity came from qualified renewable sources; this percentage is not definitively known for the Merced Irrigation District but is estimated to be 6% based on data supplied to the CEC and discussions with the MID's power suppliers. While utility companies have made significant strides to achieve the 2020 goal, the CPUC has indicated that electricity provides may not meet the 33% target due to transmission and permitting issues that have proven significant barriers to the development of renewable energy.

In recent reports on the Renewables Portfolio Standard, the CPUC observes that utility companies are on track to receive 33% of their electricity from renewable sources in 2020. Currently, there is no requirement to procure additional supplies of electricity from renewable sources beyond 2020. As a result, the forecast assumes that utility companies receive 33% of their electricity from renewable sources in both 2020 and 2030. The RPS is expected to reduce GHG emissions from electricity use by 25% in 2020 and by 29% in 2030.

California Building Code, Title 24

Title 24 of the California Code of Regulations provides standards for new buildings and (in the 2013 update) substantial renovations/additions to existing buildings. It includes requirements for structural, plumbing, electrical, and mechanical systems, as well as for fire and life safety, energy conservation and sustainable design, and accessibility. The 2013 update to Title 24 is the current version and applies to all new structures that applied for a building permit on or after July 1, 2014. The 2016 update to Title 24 is set to go into effect on January 1, 2017. This forecast focuses on two sections of Title 24: Part 6 (California Energy Code) and Part 11 (California Green Building Standards Code, also known as CALGreen). These sections require reductions in energy use for all applicable structures. Title 24 is a statewide standard implemented by local agencies through project review.

This forecast incorporated the net energy benefits of each new Title 24 update that did not exist in the baseline year (2008), based on CEC studies that compare each new update of Title 24 to its former version. Past updates to Title 24 have resulted in efficiency increases equal to or higher to those forecast in the CEC studies, but such studies have been used in this forecast as a more cautious approach. Future standards are assumed to result in reductions equal to 70% of the reductions achieved in the 2013 update. Reductions from renovations and additions have not been modeled due to uncertainty. Title 24 is expected to reduce GHG emissions from total building energy use by 4% in 2020 and by 9% in 2030.

Table B-6 shows forecast GHG emissions when reductions from state actions are taken into account. **Table B-7** shows specific reductions from statewide activities. Emission factors with the statewide actions are given in **Table B-8**.

Table B-6: GHG Emissions, 2008–2030 (State Actions)

Sector	2008 $MTCO_2e$	2020 $MTCO_2e$	2030 $MTCO_2e$	Percentage Change, 2008–2030
Residential energy	115,110	128,130	142,750	24%
Nonresidential energy	216,680	201,490	214,650	-1%
On-road transportation	235,570	236,000	272,540	16%
Solid waste	18,750	25,040	31,280	67%
Off-road equipment	6,310	8,060	9,290	47%
Water and wastewater	6,670	6,690	7,800	17%
Total*	**599,090**	**605,390**	**678,330**	**13%**
Percentage change from baseline		1%	13%	—

**Due to rounding, the total may not equal the sum of component parts.*

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Table B-7: GHG Reductions from State Actions, 2020–2030

	2008 $MTCO_2e$	2020 $MTCO_2e$	2030 $MTCO_2e$
BAU Emissions	599,090	780,690	952,690
Pavley and LCFS	—	-77,470	-118,770
Heavy Duty Vehicles	—	-1,190	-1,800
Renewables Portfolio Standard	—	-78,790	-107,520
Title 24	—	-17,850	-46,280
Total State Reductions*	**—**	**-175,300**	**-274,370**
Emissions with State Reductions*	599,090	605,390	678,330
Percentage Change from 2008	—	1%	13%

**Due to rounding, the total may not equal the sum of component parts.*

Table B-8: GHG Emission Factors, 2008–2030

Sector	Subsector	2008 and BAU	State Actions (2020)	State Actions (2030)	Unit	Source
Residential energy	Residential electricity use	0.000350	0.000271	0.000265	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Residential natural gas	0.005320	0.005320	0.005320	$MTCO_2e$/therm	PG&E
Nonresidential energy	Nonresidential electricity use	0.000549	0.000404	0.000379	$MTCO_2e$/kWh	PG&E, MID, US Community Protocol, USEPA
	Nonresidential natural gas	0.005320	0.005320	0.005320	$MTCO_2e$/therm	PG&E
On-road transportation	On-road passenger vehicles	0.000674	0.000505	0.000467	$MTCO_2e$/VMT	CARB (EMFAC 2011 model)
Solid waste	Solid waste disposal	0.370689	0.370689	0.370653	$MTCO_2e$/ton	CARB (landfill model)
Off-road equipment	Lawn & garden	—	—	—	N/A	CARB (OFFROAD 2007)
	Construction	—	—	—	N/A	CARB (OFFROAD 2007)
Water and wastewater	Indirect water emissions	0.000513	0.000382	0.000360	$MTCO_2e$/kWh	PG&E, US Community Protocol
	Direct emissions	—	—	—	N/A	GVC
	Indirect wastewater electricity	0.000711	0.000519	0.000477	$MTCO_2e$/kWh	MID, US Community Protocol, USEPA

APPENDIX C: TECHNICAL DATA

This appendix summarizes data sources, assumptions, and performance metrics used to calculate greenhouse gas emissions reductions for the City of Merced Programmatic Climate Action Plan. The sources and metrics are organized by measure and rely on four primary types of data and research: (1) Merced's GHG emissions inventory and forecast, (2) government agency tools and reports, (3) case studies in similar jurisdictions, and (4) scholarly research.

Further, the quantification approaches are consistent with guidance provided by CEQA Guidelines Section 15183.5(b) for development of a qualified GHG reduction strategy. The baseline GHG inventory and forecast serve as the foundation for the quantification of the City's GHG reduction measures. Activity data from the inventory form the basis of measure quantification, including vehicle miles traveled (VMT), kilowatt-hours (kWh) of electricity or therms of natural gas consumed, and tons of waste disposed. Activity data was combined with the performance targets and indicators identified by the City and consultants. The activity data and performance targets and indicators were used throughout the quantification process to calculate the emissions reduction benefit of each measure. This approach ensures that Merced's GHG emissions reductions are tied to the baseline and to future activities occurring within the city.

Constants

The emissions factors used to calculate reductions by each measure and the sources for each factor are given in **Table C-1.** The constants used in the cost-benefit analysis are given in **Table C-2**.

Appendix C

Table C-1: Emission Factors for Work Plan Measures

	2008	2011	2020	2030
$MTCO_2e$ per mile driven (with Pavley)	0.000674	0.000559	0.000505	0.000467
$MTCO_2e$ per kWh (with RPS)	0.000479	0.000378	0.000355	0.000334
$MTCO_2e$ per therm	0.005319	0.006122	0.005319	0.005319
$MTCO_2e$ per ton of waste	0.370773	0.382215	0.370688	0.370660

Table C-2: Constants for Cost-Benefit Analysis

Metric and Unit	2020 Estimated Value
Miles per gallon (mpg) for personal vehicles	17
Cost per kilowatt-hour (kWh) for residential electricity	$0.16
Cost per kWh for nonresidential electricity	$0.15
Cost per therm for natural gas	$1.08
Cost per gallon of gasoline	$4.54
Cost per hour of City staff time	$78.00
Work hours per year (for a full-time employee)	2,080
Years of measure implementation	5

Methods and Assumptions for GHG Quantification of Reduction Measures

Measure 1

Develop higher-density and mixed-use development to support alternative travel in downtown Merced and appropriate neighborhood centers.

Assumptions

	2020	2030
Percentage increase in people per acre	15%	20%
Percentage increase in jobs per acre	10%	15%
Percentage of future housing that is multifamily	40%	40%

Activity and GHG Reductions

	2020	2030
VMT Savings	5,410,110	8,562,650
Emissions Reduction ($MTCO_2e$)	2,730	4,000

Performance Indicators

	2020	2030
Number of housing units per acre	3.1	3.5
Number of jobs per acre	4.0	4.2
Number of new multifamily housing units	4,260	8,230
Number of households in newly developed areas	5,140	11,480
Number of jobs in newly developed areas	2,540	5,080

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

City of Merced. 2012. City of Merced General Plan: Land Use Element. https://www.cityofmerced.org/depts/cd/planning/merced_vision_2030_general_plan.asp.

Pacific Gas and Electric Company. 2014. "City of Merced Residential Energy Overview."

Measure 2

Support a 30% increase in per-person intracity and intercity transit use by 2020.

Assumptions

	2020	2030
Percentage increase in transit ridership per person	30%	50%
Percentage of developments within 1/4 mile of transit	25%	25%

Activity and GHG Reductions

	2020	2030
VMT Savings	362,410	604,000
Emissions Reduction ($MTCO_2e$)	180	280

Performance Indicators

	2020	2030
Number of Merced County Transit trips taken by Merced residents	1,164,170	1,343,260

GHG Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Federal Transit Administration. 2009. National Transit Database 2008 Profile: Merced County Transit. http://www.ntdprogram.gov/ntdprogram/pubs/profiles/2008/agency_profiles/9173.pdf.

Merced County Transit. 2012. Final Short Range Transit Plan, 2012–2017 - Volume 3: Market Research. http://www.mercedthebus.com/DocumentCenter/Home/View/28.

Measure 3

Promote carpool and car-share systems.

Assumptions

	2020	2030
Number of shared cars	20	40
Percentage of Merced employees eligible for carpooling	20%	35%

Cost-Benefit Assumptions

- Annual car-share membership: $55
- Annual cost of vehicle maintenance and gas: $1,330

Activity and GHG Reductions

	2020	2030
VMT Savings	1,003,380	1,657,430
Emissions Reduction ($MTCO_2e$)	510	770

Performance Indicators

	2020	2030
Number of shared cars	20 (reduction of 1,610 VMT per car-share member)	40 (reduction of 1,570 VMT per car-share member)
Number of citywide employees eligible for car sharing	4,900 (reduction of 100 VMT per eligible employee)	7,870 (reduction of 100 VMT per eligible employee)

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Measure 4

Increase the feasibility and use of bicycles in Merced for commute and recreation through new bicycle infrastructure and education.

Assumptions

	2020	2030
New bike miles (post-2013)	35	68

Activity and GHG Reduction

	2020	2030
VMT Savings	464,580	715,220
Emissions Reduction ($MTCO_2e$)	230	330

Performance Indicators

	2020	2030
Number of bike commuters	540 (reduction of 860 VMT per bike commuter)	630 (reduction of 1,130 VMT per bike commuter)

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

City of Merced. 2012. City of Merced General Plan: Land Use Element. https://www.cityofmerced.org/depts/cd/planning/merced_vision_2030_general_plan.asp.

———. 2013. City of Merced Bicycle Transportation Plan. https://www.cityofmerced.org/civicax/filebank/blobdload.aspx?BlobID=13321.

Measure 5

Promote telecommuting as a viable commute alternative for 3% of Merced employees an average of 1.5 days per week by 2020.

Assumptions

	2020	2030
Percentage of employed residents telecommuting	3%	5%

Cost-Benefit Assumptions:

- Telecommute centers are privately built and operated, with City support as needed.
- No membership fees for use of telecommute centers.
- No increased utility costs for individuals telecommuting from home.

Activity and GHG Reductions

	2020	2030
VMT Savings	308,560	514,260
Emissions Reduction ($MTCO_2e$)	160	240

Performance Indicators

	2020	2030
Number of employees telecommuting an average of 1.5 days per week	730 (reduction of 420 VMT per telecommuting employee)	1,120 (reduction of 460 VMT per telecommuting employee)

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Measure 6

Work with UC Merced to establish a Transit Demand Management (TDM) program for new student housing located in the city.

Assumptions

	2020	2030
Percentage of UC Merced students living off campus	65%	65%
Trip reduction from off-campus students	25%	25%

Cost-Benefit Assumptions:

- No capital or program-level costs to City or community members.
- Measure is primarily implemented by UC Merced, with City support as needed.

Activity and GHG Reductions

	2020	2030
VMT Savings	2,940,520	7,805,870
Emissions Reduction ($MTCO_2e$)	1,490	3,650

Performance Indicators

	2020	2030
Number of students living off campus	5,420 (reduction of 540 VMT per student)	14,710 (reduction of 530 VMT per student)

Sources

Sustainable Endowments Institute. 2011. Report Card 2010: University of California - Merced. http://www.greenreportcard.org/report-card-2010/schools/university-of-california-merced/surveys/campus-survey.html.

University of California, Merced. 2009. *Long Range Development Plan: University of California, Merced*. http://lrdp.ucmerced.edu/lrdp/Final_UCM_LRDP_2009.pdf.

Measure 7

Synchronize traffic signals along 10 miles of major roads, convert at-grade railroad crossings to underpasses, and replace four-way stops in downtown with roundabouts to improve fuel efficiency.

Assumptions

	2020	2030
Road miles with traffic synchronization	10	15
Percentage of VMT occurring downtown	25%	25%

Cost-Benefit Assumptions:

- To be completed with actual capital costs from City staff, based on completed and planned capital projects.
- Although cost savings for community participants are zero, drivers are expected to experience a small cost savings for reduced fuel use resulting from reduced car idling time.

Activity and GHG Reductions

	2020	2030
VMT Savings	291,850	364,610
Fuel Savings (Gallons)	155,820	286,730
Emissions Reduction ($MTCO_2e$)	1,680	2,980

Performance Indicators

	2020	2030
Road miles with traffic synchronization:	10 (reduction of 155,820 gallons of fuel	15 (reduction of 286,730 gallons of fuel
Downtown streets with traffic calming	25%	25%

Sources

Argonne National Laboratory. n.d. *Which is Greener: Idle, or Stop and Restart? Comparing Fuel Use and Emissions for Short Passenger-Car Stops*. http://www.afdc.energy.gov/uploads/publication/which_is_greener.pdf.

California Air Resources Board. 2013. "EMFAC Emissions Database." http://www.arb.ca.gov/emfac/.

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Halkias, J., and M. Schauer. 2004. "Traffic Signal Retiming Programs Across the Country." Public Roads Journal. http://www.itsbenefits.its.dot.gov/its/benecost.nsf/ID/8D5E4B72F890856C8525733A006D547C?OpenDocument&Query=Bapp.

ICLEI-Local Governments for Sustainability USA. 2012. *US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions*. http://www.icleiusa.org/tools/ghg-protocol/community-protocol.

Measure 8

Support the increased use of neighborhood electric vehicles (NEVs, such as lower-speed street-safe golf carts) by 3% of households by 2020.

Assumptions

	2020	2030
Percentage of households with a NEV	3%	5%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	331,010	551,680
Effective VMT Savings	1,484,340	2,473,900
Emissions Reduction ($MTCO_2e$)	630	970

Performance Indicators

	2020	2030
Number of households with a NEV	900 (1,650 VMT per NEV, each using 370 kWh)	1,530 (1,620 VMT per NEV, each using 360 kWh)

Sources

California Energy Commission. 2002. *Demonstration of Neighborhood Electric Vehicles (NEVs)*. http://www.energy.ca.gov/reports/2002-08-28_600-02-020F.PDF.

Measure 9

Support the increased use of passenger plug-in electric vehicles (EV) and other alternative fuels to 5% by 2020.

Assumptions

	2020	2030
Percentage of households with an EV	5%	8%
Number of publicly accessible EV chargers	15	40

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	4,347,080	6,069,410
Effective VMT Savings	12,785,520	17,851,200
Emissions Reduction ($MTCO_2e$)	4,920	6,310

Performance Indicators

	2020	2030
Number of households with a full EV	1,500 (8,510 VMT per EV, each using 2,890 kWh)	2,450 (7,240 VMT per EV, each using 2,460 kWh)
Number of publicly accessible EV chargers	15 (4,700 VMT and 1,600 kWh per charging station)	40 (4,700 VMT and 1,600 kWh per charging station)

Sources

California Air Resources Board. 2013. "EMFAC Emissions Database." http://www.arb.ca.gov/emfac/.

Davies, J. 2014. "How Assumptions About Consumers Influence Estimates of Electric Vehicle Miles Traveled of Plug-in Hybrid Electric Vehicles." UC Davis Institute of Transportation Studies. http://www.its.ucdavis.edu/wp-content/themes/ucdavis/pubs/download_pdf.php?id=2036.

ICLEI-Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.

Merced County Association of Governments. 2012. San Joaquin Valley Demographic Forecasts 2010 to 2050. http://www.mcagov.org/DocumentCenter/View/262.

US Environmental Protection Agency. 2012. "Fuel Economy and Environment Labels – Electric Vehicles." http://www.epa.gov/carlabel/electriclabelreadmore.htm.

Measure 10

Encourage new buildings to exceed the minimum energy efficiency requirements under the state CALGreen standards.

Assumptions

Because this measure only applies to new development and is implemented at a project level, participation is dependent upon the number of projects that elect to implement this measure. Therefore, no participation assumptions are anticipated for this measure.

Cost-Benefit Assumptions

- Cost premium to build a 2,500-square-foot single-family house to Tier 1: $1,300
- Cost premium to build a 960-square-foot multifamily unit to Tier 1: $550 per unit
- Cost premium to build a 50,000-square-foot office/warehouse space, capable of supporting approximately 3 businesses, to Tier 1: $11,200 ($3,700 per business)
- Cost premium to build a 25,000-square-foot retail space, capable of supporting 1–2 businesses, to Tier 1: $6,700 ($4,400 per business)
- Cost premium to build a 52,000-square-foot high-rise office, capable of supporting approximately 16 businesses, to Tier 1: $27,600 ($1,700 per business)

Activity and GHG Reductions

Because this measure only applies to new development and is implemented at a project level, all activity and GHG reductions from Measure 10 are included in the performance-based approach and are dependent upon the number of projects that elect to implement this measure. Therefore, no specific activity and GHG reductions are anticipated from this measure.

Performance Indicators

	2020	2030
Energy savings from houses exceeding state standards	Reduction of 130 kWh and 20 therms per house	Reduction of 80 kWh and 20 therms per house
Energy savings from nonresidential buildings exceeding state standards	Reduction of 630 kWh and 20 therms per job	Reduction of 390 kWh and 10 therms per job

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Measure 11

Site new buildings to take advantage of natural solar resources for heating and cooling.

Assumptions

Because this measure only applies to new development and is implemented at a project level, participation is dependent upon the number of projects that elect to implement this measure. Therefore, no participation assumptions are anticipated for this measure.

Activity and GHG Reductions

Because this measure only applies to new development and is implemented at a project level, all activity and GHG reductions from Measure 11 are included in the performance-based approach and are dependent upon the number of projects that elect to implement this measure. Therefore, no specific activity and GHG reductions are anticipated from this measure.

Performance Indicators

	2020	2030
Energy savings from new houses built with passive solar design features	Reductions of 180 kWh per house	Reductions of 120 kWh per house
Energy savings from new nonresidential buildings built with passive solar design features	Reductions of 1.9 kWh per square foot	Reductions of 1.2 kWh per square foot

Sources

Fosdick, J. 2012. Passive Solar Heating. http://www.wbdg.org/resources/psheating.php.

Measure 12

Support improved energy efficiency in existing multifamily units, rental units, and affordable households through voluntary retrofits.

Assumptions

	2020	2030
Low-income/renter-occupied single-family homes participating in basic retrofits and operational changes	10%	20%
Low-income/renter-occupied single-family homes participating in advanced retrofits	2%	5%
Multifamily homes participating in retrofits	5%	10%
Home appliance infiltration rate	50%	50%
Units participating in appliance upgrades	20%	35%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	3,751,230	7,280,700
Natural Gas Savings (Therms)	104,480	221,200
Emissions Reduction ($MTCO_2e$)	1,890	3,610

Performance Indicators

	2020	2030
Number of existing low-income/renter-occupied single-family homes undergoing basic energy retrofits	810 (reduction of 1,120 kWh and 60 therms per house)	1,620 (reduction of 1,120 kWh and 60 therms per house)
Number of existing low-income/renter-occupied single-family homes undergoing advanced energy retrofits	160 (reduction of 2,980 kWh and 150 therms per house)	410 (reduction of 2,980 kWh and 150 therms per house)
Number of existing multifamily homes participating in retrofits	400 (reduction of 1,250 kWh and 80 therms per house)	810 (reduction of 1,250 kWh and 80 therms per house)
Number of existing multifamily and low-income/renter-occupied single-family homes upgrading appliances	3,240 (reduction of 570 kWh per house)	5,670 (reduction of 570 kWh per house)

Sources

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. *U.S. Building-Sector Energy Efficiency Potential*. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf.

California Energy Commission. 2010. "Residential Appliance Saturation Study." http://www.energy.ca.gov/appliances/rass/.

Energy Upgrade California. 2012. *Best Practices Case Study, Energy Upgrade California's Multifamily Initiative: Best Practices for Multifamily Energy Retrofit Program Design*. http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/MultifamilyCaseStudy_California.pdf.

———. 2014a. "Merced County – Home Upgrade." http://tools.energyupgradeca.org/county/merced/about_basic.

———. 2014b. "PG&E Home Upgrade - Advanced Program." http://www.energyupgradeca.org/en/find-programs-and-assistance/find-a-program/programs/advance-pge.

Measure 13

Facilitate energy efficiency through voluntary retrofits in 15% of single-family homes, and promote low-cost opportunities to reduce energy use in single-family households.

Assumptions

	2020	2030
Homes participating in variable frequency drive (VFD) pool pump upgrades	8%	20%
Homes participating in basic retrofits	10%	20%
Homes participating in advanced retrofits	5%	10%
Home appliance infiltration rate	50%	50%
Units participating in appliance upgrades	25%	40%

Cost-Benefit Assumptions:

- Net cost for a basic home retrofit, including improved air conditioner, air sealing, leak-free duct work, and $1,500 PG&E rebate: $3,700
- Net cost for an advanced home retrofit, including $4,500 PG&E rebate: $15,700
- Cost for a variable frequency drive pool pump, including $100 PG&E rebate: $1,500
- Cost per home to upgrade half of basic appliances: $2,300
- Home audits are paid for by the utility company.

Appendix C

Activity and GHG Reduction

	2020	2030
Electricity Savings (kWh)	3,849,450	7,273,290
Natural Gas Savings (Therms)	118,330	236,500
Emissions Reduction ($MTCO_2e$)	1,990	3,690

Performance Indicators

	2020	2030
Owner-occupied existing single-family homes with VFD pool pumps	120 (reduction of 1,630 kWh per home)	300 (reduction of 1,630 kWh per home)
Owner-occupied existing single-family homes undergoing basic energy retrofits	900 (reduction of 1,120 kWh and 60 therms per home)	1,810 (reduction of 1,120 kWh and 60 therms per home)
Owner-occupied existing single-family homes undergoing advanced energy retrofits	450 (reduction of 2,980 kWh and 150 therms per home)	900 (reduction of 2,980 kWh and 150 therms per home)
Number of owner-occupied existing single-family homes upgrading appliances	2,260 (reduction of 580 kWh per home)	3,610 (reduction of 580 kWh per home)

Sources

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. U.S. *Building-Sector Energy Efficiency Potential*. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf.

California Energy Commission. 2010. "Residential Appliance Saturation Study." http://www.energy.ca.gov/appliances/rass/.

Energy Upgrade California. 2012. "Best Practices Case Study, Energy Upgrade California's Multifamily Initiative: Best Practices for Multifamily Energy Retrofit Program Design." http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/MultifamilyCaseStudy_California.pdf.

———. 2014a. "Home Upgrade." http://www.energyupgradeca.org/en/save-energy/home/take-control-for-savings-and-comfort/get-a-home-upgrade-and-increase-comfort.

———. 2014b. "PG&E Home Upgrade - Advanced Program." http://www.energyupgradeca.org/en/find-programs-and-assistance/find-a-program/programs/advance-pge.

Pacific Gas and Electric Company and Southern California Gas Company. 2006. *Codes and Standards Enhancement Initiative: Draft Report – Residential Swimming Pools*. http://www.energy.ca.gov/title24/2008standards/prerulemaking/documents/2007-02-26-27_workshop/supporting/PGE-DRAFT_REPORT_RESIDENTIAL_SWIMMING_POOL.PDF.

Measure 14

Improve energy efficiency through voluntary retrofits in 16% of businesses and other energy efficiency strategies in existing commercial and industrial facilities.

Assumptions

	2020	2030
Businesses participating in retrocommissioning	15%	20%
Standard retrofit participation rate	10%	15%
Deep retrofit participation rate	6%	10%
Commercial appliance infiltration rate	40%	40%
Appliance upgrade participation rate	15%	20%

Cost-Benefit Assumptions:

- Businesses pay the cost of audits.
- Cost for a Level I audit, comprising 40% of all audits: $0.002 per square foot ($30 per businesses)
- Cost for a Level II audit, comprising 50% of all audits: $0.15 per square foot ($2,500 per business)
- Cost for a Level III audit, comprising 10% of all audits: $0.31 per square foot ($5,100 per business)
- Cost for retrocommissioning: $0.41 per square foot ($6,700 per business)
- Cost for a standard business retrofit: $2 per square foot ($32,900 per business)
- Cost for a deep business retrofit: $25 per square foot ($410,400 per business)[9]
- Cost per business to upgrade 40% of commercial-grade appliances, including rebates for water heater, oven, and refrigerator from PG&E: $8,000
- Retrofit and retrocommissioning costs do not include any tax rebates or rebates from utility companies.

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	36,124,200	53,735,430
Natural Gas Savings (Therms)	783,440	1,164,650
Emissions Reduction ($MTCO_2e$)	16,970	24,140

[9] Costs for deep retrofits are generally amortized across multiple years. Deep retrofits are also often conducted as part of more extensive building-wide retrofits that include non-energy-related improvements, and so the costs presented here may include additional work that does not result in improved energy efficiency.

Performance Indicators

	2020	2030
Number of retrocommissioned existing nonresidential square feet	1,790,270 (reductions of 6 kWh and 0.1 therms per square foot)	2,387,030 (reductions of 6 kWh and 0.1 therms per square foot)
Number of nonresidential existing square feet with basic energy retrofits	1,193,510 (reductions of 10.9 kWh and 0.2 therms per square foot)	1,790,270 (reductions of 10.9 kWh and 0.2 therms per square foot)
Number of nonresidential existing square feet with deep energy retrofits	716,110 (reductions of 14.2 kWh and 0.3 therms per square foot)	1,193,510 (reductions of 14.2 kWh and 0.3 therms per square foot)
Number of nonresidential existing square feet with energy-efficient appliances	1,790,270 (reductions of 1.2 kWh and 0.03 therms per square foot)	2,387,030 (reductions of 1.2 kWh and 0.03 therms per square foot)

Sources

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. *U.S. Building-Sector Energy Efficiency Potential*. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf.

California Energy Commission. 2006. *California Commercial End-Use Survey*. http://www.energy.ca.gov/2006publications/CEC-400-2006-005/CEC-400-2006-005.PDF.

Pacific Gas and Electric Company. 2014. "City of Merced Nonresidential Energy Overview."

Pacific Northwest National Laboratory. 2011. *Advanced Energy Retrofit Guides – Office Buildings*. http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20761.pdf.

Measure 15

Use cool roofs and shade trees to reduce the urban heat island effect in Merced.

Assumptions

	2020	2030
Percentage of existing houses with a cool roof	3%	5%
Percentage of existing nonresidential buildings with a cool roof	0.5%	2%
Number of new shade trees planted	500	1500

Cost-Benefit Assumptions:

- Cost premium of a residential cool roof: $1,900 per house
- Cost premium of a commercial cool roof: $8,400 per business
- Cost to plant and maintain a tree: $140 annually
- Private individuals plant half of shade trees, City plants the other half.
- Capital costs to City are City's share of tree planting and maintenance.

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	386,070	896,880
Emissions Reduction ($MTCO_2e$)	140	300

Performance Indicators

	2020	2030
Number of existing houses with cool roofs	750 (reduction of 310 kWh per household)	1,250 (reduction of 310 kWh per household)
Number of existing nonresidential square feet with cool roofs	61,350 (reduction of 0.8 kWh per square foot)	245,420 (reduction of 0.8 kWh per square foot)
Number of new mature shade trees	500 (reduction of 200 kWh per tree)	1,500 (reduction of 200 kWh per tree)

Sources

California Energy Commission. 2012. *California Cool Roofs*. http://www.energy.ca.gov/2012publications/CEC-400-2012-003/CEC-400-2012-003-BR.pdf.

ICLEI-Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.

Sacramento Municipal Utility District. 2014. Cool Roofs. https://www.smud.org/en/residential/save-energy/rebates-incentives-financing/cool-roofs.htm.

Measure 16

Support retrofits to outdoor commercial lighting in Merced to reduce energy use.

Assumptions

	2020	2030
Percentage of existing nonresidential buildings with energy-efficient outdoor lighting	30%	50%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	1,517,560	2,529,270
Emissions Reduction ($MTCO_2e$)	540	840

Performance Indicators

	2020	2030
Number of existing nonresidential square feet with energy-efficient outdoor lighting	3,580,540 (reduction of 0.4 kWh per square foot)	5,967,570 (reduction of 0.4 kWh per square foot)

Sources

Brown, Rich, Sam Borgeson, Jon Koomey, and Peter Biermayer. 2008. *U.S. Building-Sector Energy Efficiency Potential*. Ernest Orlando Lawrence Berkeley National Laboratory, University of California. http://btech.lbl.gov/sites/all/files/lbnl-1096e.pdf.

Measure 17

Increase the amount of renewable electricity generation for on-site residential use.

Assumptions

	2020	2030
Percentage of existing (2014 and earlier) households with on-site solar panels	5%	5%

Cost-Benefit Assumptions:

- Cost per kW for a residential solar array: $5,000
- Size of residential solar array: 8 kW
- Average rebate size: $4,500

GHG Reduction

	2020	2030
Effective Electricity Savings (kWh)	14,343,670	14,343,670
Emissions Reduction ($MTCO_2e$)	5,090	4,790

Performance Indicators

	2020	2030
Number of households with on-site solar PV systems	1,250 existing households (8 kW PV array per house, with an average production of 11,470 kWh)	1250 existing households (8 kW PV array per house, with an average production of 11,470 kWh)

Sources

Go Solar California. 2014. "Current Working Dataset – California Solar Initiative." http://www.californiasolarstatistics.ca.gov/current_data_files/.

National Renewable Energy Laboratory. 2014. PVWatts Calculator. http://pvwatts.nrel.gov/.

Measure 18

Facilitate renewable energy for on-site commercial and industrial uses.

Assumptions

	2020	2030
Percentage of existing (2014 and earlier) commercial buildings with solar PV arrays	2%	3%

Cost-Benefit Assumptions:

- Cost per kW for a commercial solar array: $4,600
- Size of commercial solar array: 52 kW
- Average rebate size: $28,000

Activity and GHG Reductions

	2020	2030
Effective Electricity Savings (kWh)	7,431,080	11,146,620
Emissions Reduction ($MTCO_2e$)	2,630	3,720

Performance Indicators

	2020	2030
Number of existing nonresidential square feet with solar PV arrays	245,420 square feet (average PV array size of 52 kW, with an average production of 74,090 kWh)	368,120 square feet (average PV array size of 52 kW, with an average production of 74,090 kWh)

Sources

Go Solar California. 2014. "Current Working Dataset – California Solar Initiative." http://www.californiasolarstatistics.ca.gov/current_data_files/.

National Renewable Energy Laboratory. 2014. PVWatts Calculator. http://pvwatts.nrel.gov/.

Measure 19

Support the use of solar energy to meet on-site water heating needs for domestic and nonresidential uses and swimming pools, exceeding minimum state CALGreen standards.

Assumptions

	2020	2030
Existing houses with domestic solar water heaters	2%	5%
Existing nonresidential buildings with solar water heaters	1%	3%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	157,710	398,480
Natural Gas Savings (Therms)	85,370	219,440
Emissions Reduction ($MTCO_2e$)	510	1,300

Performance Indicators

	2020	2030
Number of homes with domestic solar water heaters	500 existing homes (average reduction of 300 kWh and 150 therms per existing house)	1,250 existing homes (average reduction of 300 kWh and 150 therms per existing house)
Number of existing nonresidential square feet with solar water heaters	122,710 square feet (average reduction of 0.1 kWh and 0.1 therms per square foot)	368,120 square feet (average reduction of 0.1 kWh and 0.1 therms per square foot)

Sources

California Energy Commission. 2010. "Residential Appliance Saturation Study." http://www.energy.ca.gov/appliances/rass/.

ICLEI-Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.

US Department of Energy. 2003. *Heat Your Water With the Sun: A Consumer Guide*. http://www.nrel.gov/docs/fy04osti/34279.pdf.

Measure 20

Create a community shared solar program to produce renewable energy for off-site use in Merced.

Assumptions

	2020	2030
kW of community shared solar	2,500	3500
Participation multiplier for green tariff	1.5	1.5

Cost-Benefit Assumptions:

- City does not establish solar arrays, but works with utilities, nonprofits, or other third parties to do so.
- Annual cost per participant exceeds annual savings.
- Costs for participation in the PG&E Green Tariff program are not calculated due to uncertainty about these costs at the time of analysis.

Activity and GHG Reductions

	2020	2030
Effective Electricity Savings (kWh)	5,344,240	6,777,240
Emissions Reduction ($MTCO_2e$)	1,890	2,260

Performance Indicators

	2020	2030
kW of community-shared solar	2,500 (average production of 3,582,500 kWh, equivalent to the annual electricity use of 440 homes)	3,500 (average production of 5,015,500 kWh, equivalent to the annual electricity use of 900 homes)
kW from PG&E Green Tariff program	1,230 (average production of 1,761,740 kWh, equivalent to the annual electricity use of 270 homes)	1,230 (average production of 1,761,740 kWh, equivalent to the annual electricity use of 270 homes)

Sources

California Energy Commission. 2015. Electricity Consumption by Entity. http://www.ecdms.energy.ca.gov/elecbyutil.aspx.

California Public Utilities Commission. 2015. *Decision Approving Green Tariff Shared Renewables Program for San Diego Gas & Electric Company, Pacific Gas and Electric Company, and Southern California Edison Company Pursuant to Senate Bill 43*. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M146/K250/146250314.PDF.

National Renewable Energy Laboratory. 2014. PVWatts Calculator. http://pvwatts.nrel.gov/.

Measure 21

Install water meters on remaining unmetered housing units to promote awareness and conservation.

Assumptions

	2020	2030
Percentage of residential units remaining unmetered	0%	0%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	1,370,730	1,370,730
Direct Emissions Savings ($MTCO_2e$)	40	40
Emissions Reduction ($MTCO_2e$)	530	500

Performance Indicators

	2020	2030
Number of unmetered homes converted to metered homes	10,800 (reduction of 94,270 gallons per unit)	10,800 (reduction of 94,270 gallons per unit)

GHG Sources

Baptista, Johnnie. 2014. Water Division Manager, Public Works Department. Personal correspondence to Eli Krispi, PMC assistant planner.

Measure 22

Promote indoor water conservation through retrofits to existing buildings.

Assumptions

	2020	2030
Percentage of existing houses conducting water efficiency retrofits	40%	75%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	190,640	451,140
Direct Wastewater Emission Savings	10	20
Emissions Reduction ($MTCO_2e$)	80	170

Performance Indicators

	2020	2030
Number of existing houses with water efficiency retrofits	10,090 (reduction of 8,420 gallons per house)	18,920 (reduction of 8,420 gallons per house)

Sources

ICLEI-Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.

Measure 23

Improve indoor water efficiency in new buildings.

Assumptions

Because this measure only applies to new development and is implemented at a project level, participation is dependent upon the number of projects that elect to implement this measure. Therefore, no participation assumptions are anticipated for this measure.

Activity and GHG Reductions

Because this measure only applies to new development and is implemented at a project level, all activity and GHG reductions from Measure 23 are included in the performance-based approach and are dependent upon the number of projects that elect to implement this measure. Therefore, no specific activity and GHG reductions are anticipated from this measure.

Performance Indicators

	2020	2030
Water reduction per person in new buildings with beyond-code water fixtures	Average reduction of 1,320 gallons per person	Average reduction of 1,320 gallons per person

Sources

California Building Standards Commission. 2013. *California Green Building Standards Code, Appendix A4: Residential Voluntary Measures*. http://www.ecodes.biz/ecodes_support/free_resources/2013California/13Green/PDFs/Appendix%20A4%20-%20Residential%20Voluntary%20Measures.pdf.

California Department of Housing and Community Development. 2013. *2013 CALGreen Residential Mandatory Measures*. http://www.documents.dgs.ca.gov/bsc/documents/2013/2013-Green-Residential-Mandatory.pdf.

US Environmental Protection Agency. n.d. *USEPA Water Conservation Plan Guidelines, Appendix B: Benchmarks Used in Conservation Planning*. http://www.epa.gov/WaterSense/docs/app_b508.pdf.

Appendix C

Measure 24

Reduce the amount of water used for landscaping.

Assumptions

	2020	2030
Percentage of existing (2014 and earlier) landscapes with smart irrigation systems	20%	25%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	44,600	55,750
Emissions Reduction ($MTCO_2e$)	20	20

Performance Indicators

	2020	2030
Number of people in buildings with landscapes watered by smart irrigation systems	16,230 residents in existing homes and 5,020 people in existing nonresidential buildings (average reduction of 2,810 gallons per person)	20,280 residents in existing homes and 6,280 people in existing nonresidential buildings (average reduction of 2,810 gallons per person)

Sources

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*.

Heaney, J. P., W. DeOreo, P. Mayer, P. Lander, J Harpring, L. Stadjuhar, B. Courtney, and L. Buhlig. n.d. Nature of Residential Water Use and Effectiveness of Conservation Programs. http://bcn.boulder.co.us/basin/local/heaney.html.

Measure 25

Promote individual graywater and rainwater catchment systems to reduce potable water demand.

Assumptions

	2020	2030
Percentage of houses with graywater systems	5%	10%
Amount of graywater used	90%	90%

Activity and GHG Reduction

	2020	2030
Electricity Savings (kWh)	158,700	405,300
Direct Wastewater Emission Savings	10	20
Emissions Reduction ($MTCO_2e$)	70	160

Performance Indicators

	2020	2030
Number of residents in existing homes with graywater systems	4,060 (average reduction of 13,150 gallons of potable water per year)	8,110 (average reduction of 13,150 gallons of potable water per year)

Sources

California Department of Housing and Community Development. 2009. *2007 California Plumbing Code, Chapter 16A: Nonpotable Water Reuse Systems*. http://www.hcd.ca.gov/codes/shl/2007CPC_Graywater_Complete_2-2-10.pdf.

Measure 26

Reduce the amount of waste sent to landfills, excluding recyclables and construction and demolition (C&D) material, by 33%.

Assumptions

	2020	2030
Reduction in waste generation	33%	33%

Activity and GHG Reduction

	2020	2030
Reduced Waste Generation Savings (Tons)	15,960	19,940
Emissions Reduction ($MTCO_2e$)	4,290	5,360

Performance Indicators

	2020	2030
Amount of materials reduced	15,960 tons (31,917,800 pounds) of material reduced (reduction of 230 pounds per person)	19,940 tons (39,874,900 pounds) of material reduced (reduction of 230 pounds per person)

Sources

California Air Resources Board. 2014. Landfill Emissions Tool Version 1.3. http://www.arb.ca.gov/cc/landfills/landfills.htm.

California Department of Resources Recycling and Recovery. 2014. 2008 Jurisdiction Diversion/Disposal Rate Detail: Merced County Solid Waste Regional Authority. http://www.calrecycle.ca.gov/LGCentral/reports/diversionprogram/JurisdictionDiversionDetail.aspx?JurisdictionID=301&Year=2008.

California Integrated Waste Management Board. 2009. *California 2008 Statewide Waste Characterization Study*. http://www.calrecycle.ca.gov/Publications/Documents/General/2009023.pdf.

Measure 27

Increase recycling in Merced with a goal of improving diversion of recyclables by 25%.

Assumptions

	2020	2030
Target pounds of recyclable waste per person per day (excluding construction and demolition (C&D), non-divertable waste, and organics)	0.4	0.1

Cost-Benefit Assumptions:

- Potential for any costs to be passed on to waste customers through increased rates.

Activity and GHG Reductions

	2020	2030
Recyclable Waste to Landfill Savings (Tons)	9,990	21,840
Emissions Reduction ($MTCO_2e$)	8,400	18,370

Performance Indicators

	2020	2030
Amount of waste reduced	9,990 tons (19,974,530 pounds) of waste recycled (reduction of 150 pounds per person)	21,840 tons (43,687,560 pounds) of waste recycled (reduction of 260 pounds per person)

Sources

California Department of Resources Recycling and Recovery. 2014. 2008 Jurisdiction Diversion/Disposal Rate Detail: Merced County Solid Waste Regional Authority.

http://www.calrecycle.ca.gov/LGCentral/reports/diversionprogram/JurisdictionDiversionDetail.aspx?JurisdictionID=301&Year=2008.

California Integrated Waste Management Board. 2009. *California 2008 Statewide Waste Characterization Study*. http://www.calrecycle.ca.gov/Publications/Documents/General/2009023.pdf.

ICLEI-Local Governments for Sustainability. 2013. Recycling and Composting Emissions Protocol, v 1.0. http://www.icleiusa.org/tools/ghg-protocol/recycling-and-composting-emissions-protocol.

Measure 28

Divert 50% of construction and demolition (C&D) waste from new construction projects and renovations.

Assumptions

	2020	2030
C&D recycling rate	50%	65%

Activity and GHG Reductions

	2020	2030
C&D Waste to Landfill Savings (Tons)	14,060	22,830
Emissions Reduction ($MTCO_2e$)	4,500	7,310

Performance Indicator

	2020	2030
Amount of waste reduced	14,060 tons (28,114,380 pounds) of C&D waste recycled (reduction of 210 pounds of C&D waste per person)	22,830 tons (45,660,510 pounds) of C&D waste recycled (reduction of 270 pounds of C&D waste per person)

Sources

California Department of Resources Recycling and Recovery. 2014. 2008 Jurisdiction Diversion/Disposal Rate Detail: Merced County Solid Waste Regional Authority. http://www.calrecycle.ca.gov/LGCentral/reports/diversionprogram/JurisdictionDiversionDetail.aspx?JurisdictionID=301&Year=2008.

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Measure 29

Reduce emissions from lawn mowers and leaf blowers by 10%.

Assumptions

	2020	2030
Percentage of lawn mowers replaced	10%	15%
Percentage of leaf blowers replaced	10%	15%

Activity and GHG Reductions

	2020	2030
Electricity Savings (kWh)	87,250	130,880
Emissions Reduction ($MTCO_2e$)	10	20

Performance Indicators

	2020	2030
Number of lawn mowers replaced	1,090 (reducing 100 pounds of direct GHG emissions and using 60 kWh per lawnmower)	2,080 (reducing 100 pounds of direct GHG emissions and using 60 kWh per lawnmower)
Number of leaf blowers replaced	280 (reducing 50 pounds of direct GHG emissions and using 220 kWh per leaf blower)	540 (reducing 50 pounds of direct GHG emissions and using 220 kWh per leaf blower)

Sources

California Air Resources Board. 2011. OFFROAD model. http://www.arb.ca.gov/msei/categories.htm

Salem Electric. n.d. *Home Energy Use Guide*. http://www.salemelectric.com/residential/pdfs/energy_saving_tips/home_energy/HomeEnergyUseGuide.pdf

Measure 30

Use alternative-fuel and fuel-efficient construction equipment, and reduce construction equipment idling time.

Assumptions

	2020	2030
Percentage of development projects using 25% alternative-fuel or hybrid construction equipment	25%	25%
Maximum minutes of idling time for construction equipment	4	3

Activity and GHG Reductions

	2020	2030
Emissions Reduction ($MTCO_2e$)	150	260

Performance Indicators

	2020	2030
Percentage of development projects using 25% alternative-fuel or hybrid construction equipment	25%	25%
Maximum minutes of idling time for construction equipment	4	3

Sources

California Energy Commission. 2007. "Full Fuel Cycle Assessment: Wells-to-wheels Energy Inputs, Emissions, and Water Impacts." http://cafcp.org/sites/files/sites/default/files/shared/CEC%20Appendices.pdf.

Nealon, S. 2013. "Hybrid Not Always Greener." University of California, Riverside. http://ucrtoday.ucr.edu/18506.

US Environmental Protection Agency. 2009. Potential for Reducing Greenhouse Gas Emissions in the Construction Sector. http://www.epa.gov/sectors/pdf/construction-sector-report.pdf.

Measure 31

Implement a performance-based approach for new development, allowing developers to select from applicable CAP measures that satisfy mitigations of the SJVAPCD Indirect Source Rule and reduce SJVAPCD permit fees.

Method and Background

Reductions for Measure 31 are calculated differently than the other methods, owing to Measure 31's unique structure and scope. Measure 31 allows new development projects to demonstrate consistency with the CAP by choosing from one of several options. This avoids creating a mandatory set of actions that all new projects must meet for CAP consistency, and instead allows projects seeking CAP consistency to choose measures that best meet the project's needs.

Measure 31 does not create any new reduction strategies; rather, it applies the reduction strategies from many of the other measures to new development. It is built upon the same assumptions and calculations presented for other measures in this appendix, but whereas the other measures present performance indicators, activity reductions, and GHG reductions for all participants in an aggregated way, Measure 31 calculates indicators and reductions for individual participants.

For example, Measure 19 (solar water heaters) identifies a reduction of 300 kWh and 150 therms for an average existing house in Merced that installs a solar water heater. These values are calculated using data from the California Energy Commission, ICLEI-Local Governments for Sustainability, and the US Department of Energy, as discussed in Measure 19's entry in this appendix. Using the same sources, Measure 31 identifies a reduction of 130 kWh and 60 therms for an average new house in Merced that installs a solar water heater; the values are lower because new houses are more energy-efficient. While Measure 19 presents GHG reductions from the sum of all participating existing houses that install a solar water heater, Measure 31 relies on GHG reductions from each individual participant.

Options

Measure 31 offers new development projects 12 different options to achieve CAP consistency, six for residential projects and six for nonresidential projects. Each option uses different combinations of CAP measures to achieve the desired reductions.

Issue	Residential Option					
	1	2	3	4	5	6
Renewable Energy	✓	✓			✓	
Energy Efficiency			✓	✓	✓	✓
Transportation		✓	✓	✓	✓	✓
Land Use			✓			✓
Water						✓

Issue	Nonresidential Option					
	1	2	3	4	5	6
Renewable Energy		✓	✓	✓		
Energy Efficiency	✓	✓	✓		✓	✓
Transportation	✓	✓	✓		✓	✓
Land Use	✓					✓
Water						✓

Assumptions and GHG Reductions

Measure 31 is designed to reduce the GHG emissions from new projects by 29% below baseline levels. This level of reduction is consistent with the San Joaquin Valley Air Pollution Control District's guidance, as identified in Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA. [10] Note that, unlike for other measures, there are no 2030 assumptions and GHG reductions for Measure 31.

	2020
Percentage of emissions for new development to reduce	29%
GHG emissions from new development ($MTCO_2e$)	108,010
Service population of new development	30,700
GHG emissions to reduce per new person ($MTCO_2e$)	1.02
Total reductions from Measure 31 ($MTCO_2e$)	31,320

Performance Indicators

Due to the nature of Measure 31, performance indicators will vary depending on which option the developer selects. All projects must indicate that they will meet the 29% reduction of approximately 1.02 $MTCO_2e$ per person relative to baseline levels.

Sources

Measure 31 is built on the same calculations and sources for the other measures. The sources for these other measures, identified elsewhere in this appendix, are the sources for Measure 31.

[10] http://www.valleyair.org/Programs/CCAP/12-17-09/3%20CCAP%20-%20FINAL%20LU%20Guidance%20-%20Dec%2017%202009.pdf.

Appendix C

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