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MEMORANDUM

TOWN OF PORTOLA VALLEY

TO: Mayor and Members of the Town Council

FROM: Brandi de Garmeaux, Sustainability and Special Projects Manager

DATE: December 14, 2016

RE: Review and Adopt Proposed Amendments to the Green Building Ordinance and Related Findings.

RECOMMENDATION

Staff recommends that the Town Council review and adopt the proposed amendments to Chapter 15.10 (Green Building) of the Portola Valley Municipal Code and related findings, including the provisions that amend the 2016 California Energy Code, Title 24, Chapter 6, of the California Code of Regulations and the 2016 California Green Building Standards Code, Title 24, Chapter 11, of the California Code of Regulations (Attachment 1).

BACKGROUND & SUMMARY

Staff brought proposed amendments to the Green Building Ordinance to the Town Council at their October 26, 2016 meeting (Attachment 3). At that meeting, the Council directed staff to amend the Ordinance to include an individual category, with some exemptions, for Second Units (a.k.a. Accessory Dwelling Units) to encourage their production. Staff reviewed the Town's Second Unit Ordinance (Section 18.04.422) and the new State Laws regarding Accessory Dwelling Units (AB 2406, AB 2299 and AB 1069). In addition, staff compared potential Accessory Dwelling Unit (ADU) projects to the existing categories in the Ordinance. Based on this research, staff developed a new category for ADUs with a simplified process for meeting the green building requirements. This new category is outlined in blue in Attachment 2 and summarized below.

In addition to the GreenPoint Rated requirements, staff also looked at potential, additional requirements that would add minimal cost and effort to the project, but could provide benefit for the ADU as well as the existing home. For example, adding the space for conduit for a future photovoltaic system could provide a space for solar on a property that wasn't originally designed for it.

Summary of Accessory Dwelling Unit Requirements
Accessory Dwelling Unit projects will require completion of the Build It Green's GreenPoint Rated checklist, with self-certification allowed for all projects. The point requirements match with similar projects in the existing ordinance (outlined in Figure 1).

Detached ADU: a minimum threshold of 75 Build It Green points in the GreenPoint Rated New Home Single Family checklist is required. In addition, detached ADUs shall provide a pathway for conduit to support the installation of future solar photovoltaic infrastructure. The pathway for conduit and shall be routed from the attic space (or equivalent) to the point of interconnection with the electrical service panel.

Attached ADU: a minimum threshold of 50 Build It Green points in the GreenPoint Rated Existing Home Single Family checklist (Whole House Label) is required.

Interior Conversions: an interior conversion occurs when the applicant seeks to convert existing square footage in an existing dwelling into an ADU. A minimum threshold of 25 Build It Green points in the GreenPoint Rated Existing Home Single Family checklist (Elements Label) is required.

Laundry facilities: if the structure includes laundry hook-ups, include a diverter valve and an outside "stub-out" installation on the clothes washing machine hook-up, to allow separate discharge of graywater direct for irrigation.

In addition to the new ADU category, staff made minor additions to the language in the Greywater "Ready" Infrastructure requirements in Section 15.10.040 (F), at the request of the Water Conservation Committee, to clarify that subsurface irrigation was an option (outlined in blue in Attachment 2).

Figure 1

Proposed Portola Valley Green Building Ordinance					
Project Type	**Size**	**Points Required**	**Additional Points**	**GPR Certification Requirement**	**GPR Checklist Requirement**
New Construction	> 3,000 sf	75	1 for every **50** sf	GPR	New Home Single Family
New Construction	≤ 3,000 sf	**75**	NA	GPR	New Home Single Family
Whole House Project	≥ 400 sf	**50**	NA	GPR	Existing Home Single Family (Whole House Label)
Elements Project	≥ 400 sf	**25**	NA	Self	Existing Home Single Family (Elements Label)
Small Additions or Remodels	< 400 sf	NA (checklist completion only)	NA	Self	Existing Home Single Family (Elements Label)
Accessory Dwelling Units (ADUs)	Detached*	**75**	NA	Self	New Home Single Family
	Attached*	**50**	NA	Self	Existing Home Single Family (Whole House Label)
	Interior Conversions*	**25**	NA	Self	Existing Home Single Family (Elements Label)

**Square footage thresholds for Accessory Dwelling Units will be defined in the update to the Second Unit Ordinance.*

CEQA REVIEW

The Green Building Ordinance amendment is not subject to the California Environmental Quality Act pursuant to Section 15308 of the CEQA Guidelines because it is an action taken by a regulatory agency for the protection of the environment.

NEXT STEPS

Staff recommends that the Town Council adopt the proposed amendments to the Green Building Ordinance, including the new category for Accessory Dwelling Units. As mentioned in the October 26, 2016 Memo to the Council (Attachment 3), as new cost-effectiveness studies become available, staff will return to the Council with additional updates to the Ordinance to further address non-residential projects. In addition, the Sustainability Manager, Building Inspector and Town Manager have committed to meeting quarterly to review additional opportunities for advancing the town's building stock to meet the State's net zero energy goals and the Council's commitment to reducing greenhouse gas emissions. Staff will update the Council of the effective date of the Ordinance once the California Energy Commission has formally adopted it.

ATTACHMENTS

1. Proposed Ordinance Amending Chapter 15.10 (Green Building) of the Municipal Code
2. Proposed Code Amendments to Chapter 15.10 redlined (ADU revisions in blue)
3. October 26, 2016 Memo to Town Council Outlining Revisions to the Green Building Ordinance
4. Original Green Building Ordinance adopted in 2010
5. Build It Green's GreenPoint Rated checklist for New Home Single Family –Version 7.0 Draft
6. Executive Summary Proposed Updates to GreenPoint Rated Version 7.0
7. CA Statewide Codes and Standards Program CALGreen Cost Effectiveness Study
8. California Energy Code, Section 110.10 Mandatory Requirements for Solar Ready Buildings
9. CALGreen Code, Section 4.106.4 Electric Vehicle Charging for New Construction
10. Applied Water for Turf Calculator Summary

Approved by: Jeremy Dennis, Town Manager

ORDINANCE NO. 2016 –

ORDINANCE OF THE TOWN COUNCIL OF THE TOWN OF PORTOLA VALLEY AMENDING CHAPTER 15.10 [GREEN BUILDING] OF TITLE 15 [BUILDINGS AND CONSTRUCTION] OF THE PORTOLA VALLEY MUNICIPAL CODE

WHEREAS, the Town Council of the Town of Portola Valley desires to amend Chapter 15.10 [Green Building] of Title 15 [Buildings and Construction] of the Portola Valley Municipal Code to implement goals and objectives set forth in the Sustainability Element of the Portola Valley General Plan for reducing greenhouse gas (GHG) emissions, conserving water and energy, encouraging green building, protecting the natural environment, and protecting the health of residents and visitors;

WHEREAS, green building design, construction, restoration, operation and maintenance can have a significant positive effect on energy, water and resource conservation, waste management and pollution generation, and the health and productivity of a property's residents, workers and visitors over the life of a building and/or site;

WHEREAS, green building regulations comprise a significant component of a whole systems approach to the Town's sustainability program related to building and land use, other components of which include, but are not limited to, requirements for recycling of construction and demolition debris, storm water quality and flood protection, water conservation, protection against unstable slopes and earthquake faults, preservation of trees and natural landforms on building sites and open space conservation; and,

WHEREAS, the 2016 California Building Standards Code adopted by the California Building Standards Commission has set minimum Green Building Standards and, within the code, has expressly stated that the standards are viewed as "minimal" and that local government entities retain discretion, pursuant to Health and Safety Code Section 17958 to exceed the standards established by the code based on express findings relative to local climatic, topographical or geological conditions.

WHEREAS, the provisions of California Assembly Bill 32 (Global Warming Solutions Act) require action on the part of state and local governments to significantly reduce GHG emissions within prescribed time periods and the Town Council has taken actions to commit the town to pursue the requirements of AB 32;

WHEREAS, the Town Climate Protection Task Force, at the request of the Town Council, considered how best to achieve AB 32 objectives, and the Building, Energy and Efficiency and Transportation (BEET) Committee of the Task Force concluded that a building evaluation and rating system was appropriate for new buildings and major additions and remodeling of existing buildings to ensure these projects would make necessary contributions to the overall local program for meeting AB 32 objectives;

WHEREAS, based on the findings of the BEET Committee, the Town Council appointed a Planning Commission and Architectural and Site Control Commission subgroup to study, test and inform the community of appropriate green building regulations and this subgroup completed its work, including public workshops, and forwarded its recommendations to the Town Council in the March 4, 2010 report to Town Council from the Deputy Town Planner; and

WHEREAS, the Town Council held a duly noticed public hearing on October 23, 2016 and December 14, 2016 to review and consider the amendments to the Town's Green Building Ordinance; and

WHEREAS, the Town Council adopted Chapter 15.10 [Green Building] of Title 15 [Buildings and Construction] of the Municipal Code on May 12, 2010 and now seeks to amend Chapter 15.10 to reflect changes to the 2016 California Building Standards Code and add additional provisions to continue to meet AB 32 objectives.

NOW, THEREFORE, the Town Council of the Town of Portola Valley does **ORDAIN** as follows:

1. Findings. The Town Council of the Town of Portola Valley hereby finds and declares as follows:

A. CEQA Findings. This ordinance is exempt from the California Environmental Quality Act (CEQA) pursuant to Section 15308 because it is an action taken by a regulatory agency for the protection of the environment.

B. General Findings.

   a. The California Building Standards Code is contained in Title 24 of the California Code of Regulations, and consists of several parts that are based upon model codes with amendments made by various State agencies. The California Green Building Standards Code, also known as the CALGreen Code, is Part 11 of Title 24 of the California Code of Regulations, and the Town of Portola Valley has enacted the Portola Valley Green Building Ordinance as amendments to the California Green Building Standards Code.

   b. Local jurisdictions are required to enforce the California Green Building Standards Code, but they may also enact more stringent standards when reasonably necessary because of local conditions caused by climate, geology, or topography.

C. Findings Regarding Local Conditions Required by the California Health and Safety Code.

a. Section 17958 of the California Health & Safety Code provides that the Town may make changes to the provisions in the uniform codes that are published in the California Building Standards Code. Sections 17958.5 and 17958.7 of the Health & Safety Code require that before making any changes or modifications to the California Green Building Standards Code and any other applicable provisions published by the State Building Standards Commission, the governing body must make an express finding that each such change or modification is reasonably necessary because of specified local conditions, and the findings must be filed with the State Building Standards Commission before the local changes or modifications go into effect.

b. The Town Council expressly declares that the following amendments to the Portola Valley Green Building Ordinance are reasonably necessary due to local climatic, geological and topographic conditions as listed below.

c. The Town is located within the southern hillside portions of San Mateo County with elevations ranging from just below 300 feet to over 1,800 feet above sea level. The Town occupies approximately 5,785 acres consisting largely of a natural valley containing steep, rugged tree-covered slopes and open mountains on the west and lower more gently rolling hills on the east. The San Andreas Rift Zone, an area of past and probably future earth movement, follows the floor of the valley. Much of the land southwest of the San Andreas Rift Zone consists of active or geologically recent landslides. The Town has mapped the complex geology of the area and adopted land use regulations based on this mapping to reduce risk to residents and private and public improvements.

d. Due to its hillside location, the Town is in a climate zone that has precipitation averaging approximately 15 inches per year. Most precipitation falls during the months of November through April, with a relatively dry period extending over six months of the year in a non-drought year. Due to the amount of open space, the reliance upon potable water for irrigation, and vulnerability to wildfire, Portola Valley experiences the effects of the drought more than other communities. Efficient use of potable water and local storm water management are essential to ensuring against loss of natural vegetation and minimizing the impacts associated with erosion, sedimentation and ground-water pollution as well as protecting against unstable slopes.

e. The Sustainability Element of the General Plan recognizes that emission of GHG may impact weather patterns and sets forth goals that recognize energy and water efficiency in buildings as key components in reducing emissions. The burning of fossil fuels used in the generation of electric power and heating of buildings produces GHG emissions that contribute to climate change, which could result in rises in sea level, flooding, temperature increases, and wildfire that put at risk Portola Valley homes, businesses, public facilities and transportation routes. It is reasonably necessary to require building owners to take steps to reduce the energy and water consumed by building operations and reduce the use of potable water for irrigation in order to reduce GHG emissions and improve resiliency to climate change.

f. Pacific Gas and Electric Company prepared the September 2, 2016 CALGreen Cost Effectiveness Study to calculate the cost effectiveness of exceeding the 2016 California Building Energy Efficiency Standards, which go into effect January 1, 2017. This study identified the low incremental costs associated with exceeding the state standards as provided for in this proposed Green Building Ordinance for the Town. Based upon the findings of this cost-effectiveness study, the Town Council hereby determines that these local energy standards are cost-effective and will save more energy than the standards contained in the 2016 California Green Building Standards (CALGreen) Code (Title 24 Part 11) and the 2016 California Energy Standards (Title 24 Part 6).

g. The Portola Valley Green Building Ordinance will require buildings to be designed to consume no more energy than permitted by the 2016 California Energy Standards Title 24 Part 6. All permit applicants will continue to be required to demonstrate compliance with Title 24 Part 6 using the standard forms and calculation methods approved by the California Energy Commission. Nothing in this Ordinance is intended to duplicate, contradict, or infringe upon the provisions of state law, including the California Building Standards Code. The Ordinance and associated checklists provide many opportunities to achieve required points and credits that do not impact areas where the state has established building standards.

h. The Architectural Site & Control Commission considered the Ordinance at a noticed meeting on March 14, 2016 and recommended minor modifications. The Planning Commission considered the Ordinance with the modifications at a duly noticed public hearing on June 1, 2016 and adopted a resolution recommending approval by the Town Council.

i. Because the design, restoration, construction and maintenance of buildings and structures within the town can have a significant impact on the Town's environment, greenhouse gas emissions, resource usage, energy efficiency, waste management, and health and productivity of residents, workers, and visitors over the life of the building, requiring commercial, institutional and residential projects to incorporate green building measures is necessary and appropriate to achieve the public health and welfare benefits of green building. The proposed amendments are designed to achieve the following goals:

   i. Increase energy and water efficiency in buildings;

   ii. Increase resource conservation;

   iii. Provide durable buildings that are efficient and economical to own and operate;

   iv. Promote the health and productivity of residents, workers, and visitors to the town;

   v. Recognize and conserve the energy embodied in existing buildings; and

   vi. Reduce disturbance of natural ecosystems, vegetation and environments.

2. Amendment of Code. Chapter 15.10 [Green Building] of Title 15 [Buildings and Construction] of the Portola Valley Municipal Code is hereby amended in its entirety to read as follows:

CHAPTER 15.10 - GREEN BUILDING

Sections:

15.10.010 - Purpose.

The purpose of this chapter is to enhance the public health and welfare by promoting the environmental health of the town through the incorporation of green building practices in the design, construction, maintenance, operation and deconstruction of buildings and other

site development. The green building provisions in this chapter are designed to achieve the following goals:

(a) Encourage the conservation of natural resources and reduction of greenhouse gas emissions;

(b) Increase energy efficiency and lower energy usage;

(c) Increase water efficiency and lower water usage;

(d) Reduce waste generated by construction projects;

(e) Provide durable buildings that are efficient and economical to own and operate;

(f) Recognize and conserve the energy embodied in existing buildings; and

(g) Promote the health of residents, workers, and visitors to the town.

15.10.020 - Applicability.

This chapter applies to all projects defined as "covered projects," as defined in Section 15.10.030, except that it shall not apply to any project for which a planning entitlement application (except preliminary architectural review applications) or building permit application has been submitted prior to the effective date of this chapter.

15.10.030 - Definitions.

For purposes of this chapter, the following terms are defined as follows:

(a) "Accessory Dwelling Unit" as defined in Chapter 18.04 of the Portola Valley Municipal Code.

(b) "Addition" means new construction square footage added to an existing structure.

(c) "Applicant" means anyone that applies to the town for the applicable permits or approvals to undertake any covered project within the town, or any subsequent owner of the site.

(d) “Applied Water for Turf Calculator” is a tool that uses data and methodology from the California Department of Water Resources to estimate the irrigation water requirements for turf minus any water supplied by effective rainfall and effective ground water seepage. The calculator uses the evapotranspiration of applied water (ETaw) for cool-season and warm-season turf that was calculated based on a six-year period of climate data specific to a 4x4 km grid spacing within the town.

(e) “Build It Green” is a non-profit membership organization whose mission is to promote healthy, energy- and resource-efficient building practices in California. Build It Green created Green Building Guidelines that are a comprehensive resource of best practices for green building. The Build It Green Checklists are tools used to assess how environmentally friendly a proposed building project will be via the use of a point system.

(f) “CALGreen” is the California Green Building Standards Code.

(g) "Compliance threshold" means the minimum number of points or rating level of a green building rating system that must be attained for a particular covered project, as outlined in the standards for compliance in Section 15.10.040.

(h) "Covered project" means any planning entitlement application(s) or building permit application(s) for new non-residential construction, or for any new residential construction, addition or remodel subject to the standards for compliance outlined in Section 15.10.040.

(i) “Elements” means a project where a portion of the home is undergoing a remodel or addition (e.g., a kitchen remodel or master bedroom addition).

(j) "Good faith effort" means a project that has not met the required compliance threshold, but for extenuating reasons or reasons beyond the control of the applicant, the planning director or his/her designee has found that the project meets the good faith effort provisions of Section 15.10.060.

(k) “Graywater” means untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. “Graywater” includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers.

(l) "Green building" means a whole systems approach to the design, construction and operation of buildings that substantially mitigates the environmental, economic, and social impacts of buildings. Green building practices recognize the relationship between the natural and built environments and seek to minimize the use of energy, water and other natural resources and provide a healthy, productive indoor environment.

(m) "Green building project checklist" means a checklist or scorecard developed for the purpose of calculating a green building rating.

(n) "Green building rating system" means the rating system associated with specific green building criteria and used to determine compliance thresholds, as outlined in the standards for compliance in Section 15.10.040. Examples of rating systems include, but are not limited to, the GreenPoint Rated systems.

(o) "GreenPoint Rated" means a residential green building rating system developed by the "Build It Green" organization.

(p) "GreenPoint Rated verification" means verification of compliance by a certified GreenPoint Rater, resulting in green building certification by Build It Green.

(q) "Multi-family residential" means a building containing three or more attached dwelling units.

(r) "New non-residential construction" means the construction of a new or replacement retail, office, institutional, semi-institutional or similar building(s), or additions to such building(s).

(s) "New residential construction" means the construction of a new or replacement single-family or two-family dwelling unit or new or replacement multi-family residential building(s), or additions to such building(s).

(t) "Qualified green building professional" means a person trained through Build It Green as a certified green building professional, or similar qualifications if acceptable to the planning director or his/her designee. For projects requiring self-certification, the project architect or designer is considered a qualified green building professional.

(u) “Rainwater catchment system” means the collected precipitation from rooftops and other above-ground impervious surfaces that is stored in catchment tanks for later use.

(v) "Remodel" means any rehabilitation, repair, renovation, change, or modification to an existing building, where changes to floor area and the footprint of the building are negligible.

(w) "Self verification" means verification by the project architect, designer or a qualified green building professional certifying that the project has met the standards and has attained the compliance threshold as indicated for the covered project type as set forth in the standards for compliance outlined in Section 15.10.040.

(x) "Single-family or two-family residential" means a single detached dwelling unit or two units in a single building or two separate buildings on a single parcel, such as a main residence and second unit.

(y) “Solar zone” means an allocated space that is unshaded, un-penetrated, and free of obstructions. It serves as a suitable place that solar panels can be installed at a future date.

(z) "Square footage" means all new and replacement square footage, including basement areas (seven feet or greater in height) and garages, except that unconditioned garage space shall only count as fifty percent of that square footage. Areas demolished shall not be deducted from the total new construction square footage.

(aa) “Turf” means a ground cover surface of mowed grass. All of the following qualify as turf: annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and tall fescue (cool-season grasses). Bermuda grass, Kikuyu grass, Seashore Paspalum, St. Agustine grass, Zoysia grass, and Buffalo (warm-season grasses).

(bb) “Whole House” project means the homeowner is completing a gut remodel and replacing all of the systems. A gut remodel incorporates stripping less than 90% of the walls to the studs (leaving the foundation framing and exterior finish), which enables one to replace all systems and address the thermal envelope and insulate. If a home has removed significant framing and the exterior classing, leaving very little of the original home, it shall apply under the new residential construction.

15.10.040 - Standards for Compliance.

The standards for compliance are as follows:

1. New Residential Construction. New homes shall demonstrate GreenPoint Rated certification using certified professional raters. The number of Build It Green points required pursuant to this section shall be calculated in accordance with the GreenPoint Rated New Home Single Family checklist, with the exception that if California Building Code Title 24, Part 6 is updated after the effective date of this chapter to be more stringent, item J.5. in the GreenPoint Rated Single Family checklist shall not be included in calculating the number of points required until such time as the appropriate cost effectiveness study has been completed.

   A. For projects up to and including 3,000 sf. A minimum threshold of 75 Build It Green points, with GreenPoint Rated certification prior to building permit sign-off/occupancy.

   B. For projects over 3,000 sf. A minimum threshold of 75 Build It Green points with one additional point for each 50 sf over 3,000 sf, and with GreenPoint Rated certification prior to building permit sign-off/occupancy.

   C. Basement floor area. Basement floor area must be included in the total floor area for point calculations.

   D. Solar Photovoltaic and Solar Thermal "Ready" Infrastructure. "Section 110.10 Mandatory Requirements for Solar Ready Buildings" of the California Energy Code is added as mandatory and amended to read:

      (1) Solar zone. The solar zone shall be located on the roof or overhang of the building and have a total area of no less than 500 square feet. If the project applicant determines that the entire energy needs of the project can be met with a solar photovoltaic system that occupies less than 500 square feet, the project applicant can demonstrate this with the Title 24 Calculation and solar photovoltaic system plans.

      (2) Interconnection pathways. New residential construction projects shall provide a pathway for conduit and plumbing to support the installation of future solar photovoltaic and solar thermal infrastructure. The pathway for conduit and plumbing shall be routed from the attic space (or equivalent) to the point of interconnection with the electrical service panel and the water-heating system.

   E. Electric Vehicle "Ready" Infrastructure. "Section 4.106.4 Electric vehicle (EV) charging for new construction" of the California Green Building Standards Code is added as mandatory and amended with the additional requirements as outlined below.

(1) Service panel and/or subpanel shall provide, at minimum, capacity to install a 208/240v, 50 amperes grounded AC outlet and dedicated branch circuit.

(2) Raceway or wiring with capacity to accommodate a 100 ampere circuit; terminating in a listed cabinet box, enclosure, or NEMA receptacle.

(3) The raceway shall be installed so that minimal removal of materials is necessary to complete the final installation.

F. Graywater "Ready" Infrastructure. Install graywater "ready" systems as outlined below. Additional plumbing piping is installed to permit the discharge from all clothes washers and all applicable fixtures from bathrooms located above grade to allow for future installation of a distributed irrigation system, either subsurface or treated. All graywater "ready" systems must be installed in compliance with Chapter 16 of the California Plumbing Code.

(1) Identify an appropriate location for possible future installation of a graywater treatment system, including storage tanks.

(2) Include either a separate multiple pipe outlet or a diverter valve and an outside "stub-out" installation on clothes washing machine hook-ups, to allow separate discharge of graywater direct for irrigation.

(3) Include a building drain(s) for lavatories, showers, and bathtubs, segregated from drains for all other plumbing fixtures, connected to the black water pipe a minimum of three (3) feet from the building foundation.

(4) Provide power supply for future graywater treatment system.

(5) The graywater system shall be comprised of purple piping. The diverter valve on the clothes washing machine system shall be labeled as "LAUNDRY-TO-LANDSCAPE CAPABLE."

G. Reduction of Potable Water Use on Turf. For all projects with landscapes that include the use of turf, install rainwater catchment system. Irrigation needs of turf should be calculated using the Applied Water for Turf Calculator. All rainwater catchment systems must be installed in compliance with Chapter 17 of the California Plumbing Code.

(1) Rainwater Catchment System Size. The rainwater catchment system size shall be determined by using the Applied Water for Turf Calculator. The rainwater catchment system will need to be sized in order to satisfy 50 percent of the estimated annual water demands for the first 500 square feet of turf installed on the project. The rainwater catchment system will need to be sized in order to satisfy 100 percent of the estimated annual water demands for installed turf that is greater than 500 square feet.

(2) Alternative. A fully installed graywater system connected to an irrigation system that can satisfy all of the annual water demands of turf as identified in the Applied Water for Turf Calculator can be used as an alternative to installing a rainwater catchment system.

2. Residential construction additions and/or remodel projects 400 square feet or greater. The number of Build It Green points required pursuant to this section shall be calculated in accordance with the GreenPoint Rated Existing Home Single Family checklist.

   A. For whole house projects. A minimum threshold of 50 Build It Green points, with GreenPoint Rated certification prior to building permit sign-off/occupancy.

   B. For elements projects. A minimum threshold of 25 Build It Green points, with self-certification allowed.

   C. Basement floor area. Basement floor area must be included in the total floor area for point calculations.

3. Small residential additions or remodels. For small residential addition or remodel projects, which are projects less than 400 square feet, completion of the Build It Green GreenPoint Rated Existing Home Single Family (Elements Label) checklist shall be required as a working/learning document, but no minimum points are required and self-certification allowed.

4. Accessory Dwelling Units. The Town desires to encourage the production of accessory dwelling units and, therefore has identified a simplified process for green building requirements related to all accessory dwelling units. Specifically, although minimum points are required as set forth below, self-certification is allowed.

   A. Detached. A minimum threshold of 75 Build It Green points in the GreenPoint Rated New Home Single Family checklist is required.

      a. Solar Photovoltaic "Ready" Infrastructure. "Section 110.10 Mandatory Requirements for Solar Ready Buildings" of the California Energy Code is added and amended as follows: detached accessory dwelling units shall provide a pathway for conduit to support the installation of future solar photovoltaic infrastructure. The pathway for conduit and shall be routed from the attic space (or equivalent) to the point of interconnection with the electrical service panel.

   B. Attached. A minimum threshold of 50 Build It Green points in the GreenPoint Rated Existing Home Single Family checklist (Whole House Label) is required.

C. Interior Conversions. An interior conversion occurs when the applicant seeks to convert existing square footage in an existing dwelling into an accessory dwelling unit. A minimum threshold of 25 Build It Green points in the GreenPoint Rated Existing Home Single Family checklist (Elements Label) is required.

D. Laundry facilities. If the structure includes laundry hook-ups, include a diverter valve and an outside "stub-out" installation on the clothes washing machine hook-up, to allow separate discharge of graywater direct for irrigation. The diverter valve on the clothes washing machine system shall be labeled as "LAUNDRY-TO-LANDSCAPE CAPABLE."

5. Non-residential projects. New, non-residential projects shall comply with all mandatory CALGreen measures. The mandatory measures shall be verified by a third party approved by the Town for which the applicant will pay for the review.

A. Electric Vehicle "Ready" Infrastructure. "Section 5.106.5.3 Electric vehicle (EV) charging for new construction" of the California Green Building Standards Code is added as mandatory and amended with the additional requirements as outlined below.

(1) Service panel and/or subpanel shall provide, at minimum, capacity to install a 208/240v, 50 amperes grounded AC outlet and dedicated branch circuit.

(2) Raceway or wiring with capacity to accommodate a 100 ampere circuit; terminating in a listed cabinet box, enclosure, or NEMA receptacle.

(3) The raceway shall be installed so that minimal removal of materials is necessary to complete the final installation.

15.10.050 - Administrative Procedures and Implementing Regulations.

(a) The planning director shall promulgate any rules and regulations necessary or appropriate to achieve compliance with the requirements of this chapter. The rules and regulations shall provide, at a minimum, for the incorporation of green building requirements of this chapter into checklist submittals with planning entitlement and building permit applications, and supporting design, construction, or development documents to demonstrate compliance with this chapter.

(b) The procedures for compliance documentation shall include, but not be limited to, the following:

(1) Preliminary documentation. Applicants for a covered project are encouraged, but not required, to meet with the planning director or his/her designee, in advance of submittal of an application, to determine required green building thresholds for compliance and to review the proposed green building program and details to achieve compliance.

(2) Discretionary planning entitlements. Upon submittal of an application for any discretionary planning entitlement for any covered project, including, but not limited to, architectural review, site development permit, conditional use permit, or variance requests, application materials shall include the appropriate completed checklists, as required by the standards for compliance specified in Section 15.10.040, accompanied by a text description of the proposed green building program and expected measures and milestones for compliance.

(3) Building plan check review. Upon submittal of an application for a building permit, building plans for any covered project shall include a checklist and green building program description, reflecting any changes proposed since the planning entitlement phase (if a planning entitlement was required). The checklist shall be incorporated onto a separate plan sheet included with the building plans. A qualified green building professional shall provide evidence of adequate green building compliance or documentation to the planning director or his/her designee to satisfy the requirements of the standards for compliance outlined in Section 15.10.040, prior to issuance of a building permit.

(4) Final building inspection, verification, and occupancy. Prior to final building inspection and occupancy for any covered project, a qualified building professional shall provide evidence of adequate green building compliance or documentation to the director or his/her designee to satisfy the requirements of the standards for compliance outlined in Section 15.10.040. This information shall include, but is not limited to:

(i) Documentation that verifies incorporation of the design and construction related credits specified in the project approval for the covered project;

(ii) A letter from the qualified green building professional that certifies that the covered project has been constructed in accordance with the approved green building project checklist;

(iii) Any additional documentation that would be required by the GreenPoint rated manuals for GreenPoint rated certification (if required); and

(iv) Any additional information that the applicant believes is relevant to determining that a good faith effort has been made to comply with this chapter.

(5) Final determination of compliance and good faith effort to comply. Prior to the scheduling of a final building inspection for a covered project, the planning director or his/her designee shall review the documentation submitted by the applicant, and determine whether the applicant has achieved the required compliance threshold as set forth in the standards for compliance outlined in Section 15.10.040 and/or demonstrate that measures are in place to assure compliance not later than one year after approval of final building inspection. If the planning director or his/her designee determines that the applicant has met the requirements of Section 15.10.040 for the project, the final building inspection may proceed, provided the covered project has received approval of all other inspections required by the chief building official. If the planning director or his/her designee determines that the required green building rating has not been achieved, the planning director or his/her designee shall find one of the following:

(i) Good faith effort to comply: When an applicant submits a request in writing to the planning director or his/her designee for approval of a good faith effort to comply, the planning director or his/her designee shall determine that the applicant has made a good faith effort to comply with this chapter when finding that either a) the cost for providing green building documentation or assuring compliance is disproportionate to the overall cost of the project, or b) the green building materials and technologies on the green building checklist are no longer available or not yet commercially available, or c) at least eighty percent of the required green point credits have been achieved, and measures are in place to assure full compliance not later than one year after approval of the final building inspection. Determination of a good faith effort to comply shall be made separately for each item on the green building project checklist. Granting of a good faith effort to comply for one item does not preclude the need for the applicant to comply with the other items on the green building checklist.

(ii) Non-compliant project. If the planning director or his/her designee determines that the applicant has not made a good faith effort to comply with this chapter, or if the applicant fails to submit the documentation required within the required time period, then the project shall be determined to be non-compliant, and the final inspection and approval for the project shall be withheld. A final inspection shall not take place until the applicant has implemented equivalent alternate measures approved by the planning director or his/her.

(6) Non-compliance. If, upon inspection, the building official or planning director determines that the covered project does not comply with the approved plans or green building checklist, a stop order shall be issued if the planning director or his/her designee determines that continuation of construction activities will jeopardize the project's ability to meet the required compliance threshold. The stop order shall remain in effect until project has been brought into compliance with the approved plans and/or checklist.

(c) The planning director or his/her designee shall have the responsibility to administer and monitor compliance with the green building requirements set forth in this chapter and with any rules and regulations promulgated.

(d) Compliance with the provisions of this chapter shall be listed as a condition of approval on any architectural and site control review or other discretionary permit approval, and on the building plans for building permit approval, for any covered project.

15.10.060- Hardship or Infeasibility Exemption.

If an applicant for a covered project believes that circumstances exist that make it a hardship or infeasible to meet the requirements of this chapter, the applicant may request an exemption as set forth below. In applying for an exemption, the burden is on the applicant to show hardship or infeasibility.

(a) Application. Any request for an exemption must be included at the time of application submittal. The applicant shall indicate the maximum threshold of compliance he or she believes is feasible for the covered project and the circumstances that he or she believes create a hardship or make it infeasible to fully comply with this chapter. Circumstances that constitute hardship or infeasibility include, but are not limited to, the following:

(1) There is conflict with the compatibility of the green building rating system with other town goals, such as those requiring historic preservation;

(2) There is conflict with the compatibility of the green building rating system and the California Building Standards Code;

(3) There is conflict with the compatibility of the green building rating system and the town's zoning ordinance and/or architectural review criteria;

(4) The green building compliance standards do not include enough green building measures that are compatible with the scope of the covered project; and/or

(5) There is a lack of commercially available green building materials and technologies to comply with the green building rating system.

(b) Review by Architectural and Site Control Commission. For any covered project for which an exemption is requested and architectural and site control review is required, the Architectural and Site Control Commission shall provide a recommendation to the planning director or his/her designee regarding whether the exemption shall be granted, conditionally granted or denied, along with its recommendation on the project. For any project for which an exemption is requested based on the historic character of the building or site, the town historian shall provide a recommendation to the planning director or his/her designee regarding whether the exemption shall be granted or denied and shall determine whether the project is consistent with the Secretary of the Interior's Standards for Historic Rehabilitation.

(c) Decision by Planning Director (or his/her designee). The planning director or his/her designee shall make a determination based on the information provided. The planning director or his/her designee shall determine the maximum feasible threshold of compliance reasonably achievable for the project. The decision of the planning director or his/her designee shall be provided to the applicant in writing.

(1) If the planning director or his/her designee determines that it is a hardship or is infeasible for the applicant to meet the requirements of this chapter, the request shall be granted. Notwithstanding, the applicant shall be required to comply with this chapter in all other respects and shall be required to achieve, in accordance with this chapter, the threshold of compliance determined to be reasonably achievable by planning director or his/her designee.

(2) If the planning director or his/her designee determines that it is reasonably possible for the applicant to fully meet the requirements of this chapter, the request shall be denied. The project and compliance documentation shall be modified to comply with this chapter prior to further review of any pending planning or building application.

15.10.070 - Appeal.

(a) Any aggrieved applicant may appeal the determination of the planning director or his/her designee regarding: (1) the granting or denial of an exemption pursuant to Section 15.10.070; or (2) compliance with any other provision of this chapter.

(b) Any appeal must be filed in writing with the planning director or his/her designee not later than fourteen days after the date of the determination by the planning director or his/her designee. The appeal shall state the alleged error or reason for the appeal.

(c) The appeal shall be processed and considered by the planning commission de novo in accordance with the criteria outlined in this chapter.

3. Severability. If any part of this ordinance is held to be invalid or inapplicable to any situation by a court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of this ordinance or the applicability of this ordinance to other situations.

4. Effective Date; Posting. This ordinance is subject to review and approval by the California Energy Commission (CEC). This ordinance shall become effective immediately upon full CEC approval. This ordinance be posted within the Town in three public places.

INTRODUCED:

PASSED:

AYES:

NOES:

ABSTENTIONS:

ABSENT:

ATTEST:

_____ By: _____

Town Clerk Mayor

APPROVED AS TO FORM:

_____
Town Attorney

CHAPTER 15.10 - GREEN BUILDING

Sections:

15.10.010 - Purpose.

The purpose of this chapter is to enhance the public health and welfare by promoting the environmental health of the town through the incorporation of green building practices in the design, construction, maintenance, operation and deconstruction of buildings and other site development. The green building provisions in this chapter are designed to achieve the following goals:

(a) Encourage the conservation of natural resources and reduction of greenhouse gas emissions;

(b) Increase energy efficiency and lower energy usage;

(c) Increase water efficiency and lower water usage;

(~~c~~d) Reduce waste generated by construction projects;

(~~d~~e) Provide durable buildings that are efficient and economical to own and operate;

(~~e~~f) Recognize and conserve the energy embodied in existing buildings; and

(~~f~~g) Promote the health of residents, workers, and visitors to the town.

15.10.020 - Applicability.

This chapter applies to all projects defined as "covered projects," as defined in Section 15.10.030, except that it shall not apply to any project for which a planning entitlement application (except

~~for a~~ preliminary architectural review application~~s~~) or building permit application has been submitted prior to the effective date of this chapter.

15.10.030 - Definitions.

For purposes of this chapter, the following terms are defined as follows~~The following terms shall have the ascribed definition for the purposes of applying the criteria of this chapter~~:

(a) "Accessory Dwelling Unit" as defined in Chapter 18.04 of the Portola Valley Municipal Code.

(~~a~~b) "Applicant" means anyone that applies to the town for the applicable permits or approvals to undertake any covered project within the town, or any subsequent owner of the site.

(c) "Applied Water for Turf Calculator" is a tool that uses data and methodology from the California Department of Water Resources to estimate the irrigation water requirements for turf minus any water supplied by effective rainfall and effective ground water seepage. The calculator uses the evapotranspiration of applied water (ETaw) for cool-season and warm-season turf that was calculated based on a six-year period of climate data specific to a 4x4 km grid spacing within the town.

(d) "Build It Green" is a non-profit membership organization whose mission is to promote healthy, energy- and resource-efficient building practices in California. Build It Green created Green Building Guidelines that are a comprehensive resource of best practices for green building. The Build It Green Checklists are tools used to assess how environmentally friendly a proposed building project will be via the use of a point system.

(e) "CALGreen" is the California Green Building Standards Code.

(~~c~~f) ~~"Compliance official" means the town planner or his/her designee.~~

(~~d~~g) "Compliance threshold" means the minimum number of points or rating level of a green building rating system that must be attained for a particular covered project, as outlined in the standards for compliance in Section 15.10.040.

(~~e~~h) "Covered project" means any planning entitlement application(s) or building permit application(s) for ~~commercial~~ new non-residential construction ~~or renovations~~, or for any new residential ~~new~~ construction, addition or ~~renovation~~remodel subject to the standards for compliance outlined in Section 15.10.040.

(i) "Elements" means a project where a portion of the home is undergoing a remodel or addition (e.g., a kitchen remodel or master bedroom addition).

(~~f~~j) "Good faith effort" means a project that has not met the required compliance threshold, but for extenuating reasons or reasons beyond the control of the applicant, the ~~compliance official~~ planning director or his/her designee has found that the project meets the good faith effort provisions of Section 15.10.060.

(k) "Graywater" means untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing,

manufacturing, or operating wastes. “Graywater” includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers.

(~~g~~l) "Green building" means a whole systems approach to the design, construction and operation of buildings that substantially mitigates the environmental, economic, and social impacts of buildings. Green building practices recognize the relationship between the natural and built environments and seek to minimize the use of energy, water and other natural resources and provide a healthy, productive indoor environment.

(~~h~~m) "Green building project checklist" means a checklist or scorecard developed for the purpose of calculating a green building rating.

(~~i~~n) "Green building rating system" means the rating system associated with specific green building criteria and used to determine compliance thresholds, as outlined in the standards ~~of~~ for compliance in Section 15.10.040 ~~adopted by town council resolution~~. Examples of rating systems include, but are not limited to, the Leadership in Energy and Environmental Design ~~(~~LEED) and GreenPoint Rated systems.

(~~j~~o) "GreenPoint Rated" means a residential green building rating system developed by the "Build It Green" organization.

(~~k~~p) "GreenPoint Rated verification" means verification of compliance by a certified GreenPoint Rater, resulting in green building certification by Build It Green.

~~(l) "LEED®" means the "Leadership in Energy and Environmental Design" green building rating system developed by the U.S. Green Building Council.~~

~~(m)"LEED®/USGBC verification" means verification to meet the standards of the U.S. Green Building Council ("USGBC") and resulting in LEED certification of the project by the USGBC.~~

(~~n~~q) "Multi-family residential" means a building containing three or more attached dwelling units.

~~(o) "New building" means a new structure or a substantial addition/remodel to an existing structure where the remodel combined with any additions to the structure affects fifty percent or more of the exterior wall plane surface or affects fifty percent or more of the floor area as more particularly defined in section 15.04.010 of this Code.~~

(~~p~~r) "New non-residential construction~~, commercial~~" means the construction of a new or replacement retail, office, institutional, semi-institutional or similar building(s), or additions to such building(s).

(~~q~~s) "New residential construction~~, residential~~" means the construction of a new or replacement single-family or two-family dwelling unit or of new or replacement multi-family residential building(s), or additions to such building(s).

(~~s~~t) "Qualified green building professional" means a person trained ~~through the USGBC as a LEED-accredited professional or~~ through ~~"~~Build It Green~~"~~ as a certified green building professional, or similar qualifications if acceptable to the ~~compliance official~~planning director or his/her designee. For projects requiring ~~"~~self-certification,~~"~~ the project architect or designer is considered a qualified green building professional.

(u) “Rainwater catchment system” means the collected precipitation from rooftops and other above-ground impervious surfaces that is stored in catchment tanks for later use.

(~~sv~~) "~~Renovation~~Remodel" means any rehabilitation, repair, ~~remodeling~~renovation, change, or modification to an existing building, where changes to floor area and the footprint of the building are negligible. ~~The valuation of renovation improvements shall be determined by the town planner, upon recommendation of the chief building official. The chief building official may exclude from such valuation the cost of (1) seismic upgrades, (2) accessibility upgrades, or (3) photovoltaic panels or other solar energy or similar devices exterior to the building. Renovation valuation thresholds identified in the standards for compliance shall be adjusted annually to reflect changes in the town's valuation per square foot for new construction in town, using valuations in effect as of July 1, 2008, as the base index.~~

(~~tw~~) "Self verification" means verification by the project architect, designer or a qualified green building professional certifying that the project has met the standards and has attained the compliance threshold as indicated for the covered project type as set forth in the standards for compliance outlined in Section 15.10.040.

(~~ux~~) "Single-family or two-family residential" means a single detached dwelling unit or two units in a single building or two separate buildings on a single parcel, such as a main residence and second unit.

(y) “Solar zone” means an allocated space that is unshaded, un-penetrated, and free of obstructions. It serves as a suitable place that solar panels can be installed at a future date.

(~~vz~~) "Square footage" means all new and replacement square footage, including basement areas (seven feet or greater in height) and garages, except that unconditioned garage space shall only count as fifty percent of that square footage. Areas demolished shall not be deducted from the total new construction square footage.

(~~w~~)~~"Threshold verification by LEED AP" means verification by a LEED-accredited professional certifying that each LEED checklist point listed was verified to meet the requirements to achieve that point. The LEED AP shall provide supporting information from qualified professionals (e.g., civil engineer, electrical engineer, Title 24 consultant, commissioning agent, etc.) to certify compliance with each point on the checklist. Documentation of construction consistent with building plans calculated to achieve energy compliance is sufficient verification in lieu of post-construction commissioning.~~

(aa) “Turf” means a ground cover surface of mowed grass. All of the following qualify as turf: annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and tall fescue (cool-season grasses). Bermuda grass, Kikuyu grass, Seashore Paspalum, St. Agustine grass, Zoysia grass, and Buffalo (warm-season grasses).

(bb) “Whole House” project means the homeowner is completing a gut remodel and replacing all of the systems. A gut remodel incorporates stripping less than 90% of the walls to the studs (leaving the foundation framing and exterior finish), which enables one to replace all systems and address the thermal envelope and insulate. If a home has removed significant framing and the exterior classing, leaving very little of the original home, it shall apply under the new residential construction.

15.10.040 - Standards for Compliance.

~~The Town Council shall establish by resolution, and shall periodically review and update as necessary, green building standards for compliance. The standards for compliance shall include, but are not limited to, the following:~~

~~(a) The types of projects subject to regulation (covered projects);~~

~~(b) The green building rating system to be applied to the various types of projects;~~

~~(c) Minimum thresholds of compliance for various types of projects; and~~

~~(d) Timing and methods of verification of compliance with these regulations.~~

The standards for compliance are as follows:

1. New R~~r~~esidential C~~c~~onstruction. New homes shall demonstrate GreenPoint Rated certification using certified professional raters. The number of Build It Green points required pursuant to this section shall be calculated in accordance with the GreenPoint Rated New Home Single Family checklist, with the exception that if California Building Code Title 24, Part 6 is updated after the effective date of this chapter to be more stringent, item J.5. in the GreenPoint Rated Single Family checklist shall not be included in calculating the number of points required until such time as the appropriate cost effectiveness study has been completed.

   A. For projects up to and including 3,000 sf. A minimum threshold of 75 Build It Green points, with GreenPoint Rated certification prior to building permit sign-off/occupancy.

   B. For projects over 3,000 sf. A minimum threshold of 75 Build It Green points with one additional point for each ~~30 sf~~ 50 sf over 3,000 sf, and with GreenPoint Rated certification prior to building permit sign-off/occupancy.

   C. Basement floor area. Basement floor area must be included in the total floor area for point calculations.

~~D. LEED option. At the option of an applicant, the LEED for homes program may be used with a minimum threshold of silver LEED certification. Because LEED certification typically takes more time than is associated with BIG certification, the planning manager or his/her designee may as appropriate and in his/her sole discretion allow for some interim certification for occupancy prior to formal completion of the LEED process.~~

   D. Solar Photovoltaic and Solar Thermal "Ready" Infrastructure. "Section 110.10 Mandatory Requirements for Solar Ready Buildings" of the California Energy Code is added as mandatory and amended to read:

(1) Solar zone. The solar zone shall be located on the roof or overhang of the building and have a total area of no less than 500 square feet. If the project applicant determines that the entire energy needs of the project can be met with a solar photovoltaic system that occupies less than 500 square feet, the project applicant can demonstrate this with the Title 24 Calculation and solar photovoltaic system plans.
(2) Interconnection pathways. New residential construction projects shall provide a pathway for conduit and plumbing to support the installation of future solar photovoltaic and solar thermal infrastructure. The pathway for conduit and plumbing shall be routed from the attic space (or equivalent) to the point of interconnection with the electrical service panel and the water-heating system.

E. Electric Vehicle "Ready" Infrastructure. "Section 4.106.4 Electric vehicle (EV) charging for new construction" of the California Green Building Standards Code is added as mandatory and amended with the additional requirements as outlined below.

(1) Service panel and/or subpanel shall provide, at minimum, capacity to install a 208/240v, 50 amperes grounded AC outlet and dedicated branch circuit.
(2) Raceway or wiring with capacity to accommodate a 100 ampere circuit; terminating in a listed cabinet box, enclosure, or NEMA receptacle.
(3) The raceway shall be installed so that minimal removal of materials is necessary to complete the final installation.

F. Graywater "Ready" Infrastructure. Install graywater "ready" systems as outlined below. Additional plumbing piping is installed to permit the discharge from all clothes washers and all applicable fixtures from bathrooms located above grade to allow for future installation of a distributed irrigation system, either subsurface or treated. All graywater "ready" systems must be installed in compliance with Chapter 16 of the California Plumbing Code.

(1) Identify an appropriate location for possible future installation of a graywater treatment system, including storage tanks.
(2) Include either a separate multiple pipe outlet or a diverter valve and an outside "stub-out" installation on clothes washing machine hook-ups, to allow separate discharge of graywater direct for irrigation.
(3) Include a building drain(s) for lavatories, showers, and bathtubs, segregated from drains for all other plumbing fixtures, connected to the black water pipe a minimum of three (3) feet from the building foundation.
(4) Provide power supply for future graywater treatment system.
(5) The graywater system shall be comprised of purple piping. The diverter valve on the clothes washing machine system shall be labeled as "LAUNDRY-TO-LANDSCAPE CAPABLE."

G. Reduction of Potable Water Use on Turf. For all projects with landscapes that include the use of turf, install rainwater catchment system. Irrigation needs of turf should be

calculated using the Applied Water for Turf Calculator. All rainwater catchment systems must be installed in compliance with Chapter 17 of the California Plumbing Code.

(1) Rainwater Catchment System Size. The rainwater catchment system size shall be determined by using the Applied Water for Turf Calculator. The rainwater catchment system will need to be sized in order to satisfy 50 percent of the estimated annual water demands for the first 500 square feet of turf installed on the project. The rainwater catchment system will need to be sized in order to satisfy 100 percent of the estimated annual water demands for installed turf that is greater than 500 square feet.

(2) Alternative. A fully installed graywater system connected to an irrigation system that can satisfy all of the annual water demands of turf as identified in the Applied Water for Turf Calculator can be used as an alternative to installing a rainwater catchment system.

2. ~~Substantial R~~residential construction additions and/or ~~rebuilding~~ remodel projects 400 square feet or greater. The number of Build It Green points required pursuant to this section shall be calculated in accordance with the GreenPoint Rated Existing Home Single Family checklist. ~~For such projects make use of the BIG GreenPoint rated program for existing homes, with the threshold being the BIG minimum for a "whole house" project of 50 points and 25 points for a smaller "elements" project, both as defined by BIG. For a "whole house project" GreenPoint rated certification using certified professional raters shall be required and for an elements project, self-certification is allowed. In all cases, new basement area would be counted as provided for above for "new construction" projects.~~

   A. For whole house projects. A minimum threshold of 50 Build It Green points, with GreenPoint Rated certification prior to building permit sign-off/occupancy.

   B. For elements projects. A minimum threshold of 25 Build It Green points, with self-certification allowed.

   C. Basement floor area. Basement floor area must be included in the total floor area for point calculations.

3. Small residential additions or remodels. For ~~such~~ small residential addition or remodel projects, which are projects less than 400 square feet, completion of the ~~BIG~~ Build It Green GreenPoint Rated Existing Home Single Family (Elements Label) checklist shall be required as a working/learning document, but no minimum points are required and self-certification ~~is permitted~~ allowed. ~~This would be for projects less than 400 sf in area, i.e. below the threshold for Architectural and Site Control Commission review.~~

4. Accessory Dwelling Units. The Town desires to encourage the production of accessory dwelling units and, therefore has identified a simplified process for green building

requirements related to all accessory dwelling units. Specifically, although minimum points are required as set forth below, self-certification is allowed.

A. Detached. A minimum threshold of 75 Build It Green points in the GreenPoint Rated New Home Single Family checklist is required.

a. Solar Photovoltaic "Ready" Infrastructure. "Section 110.10 Mandatory Requirements for Solar Ready Buildings" of the California Energy Code is added and amended as follows: detached accessory dwelling units shall provide a pathway for conduit to support the installation of future solar photovoltaic infrastructure. The pathway for conduit and shall be routed from the attic space (or equivalent) to the point of interconnection with the electrical service panel.

B. Attached. A minimum threshold of 50 Build It Green points in the GreenPoint Rated Existing Home Single Family checklist (Whole House Label) is required.

C. Interior Conversions. An interior conversion occurs when the applicant seeks to convert existing square footage in an existing dwelling into an accessory dwelling unit. A minimum threshold of 25 Build It Green points in the GreenPoint Rated Existing Home Single Family checklist (Elements Label) is required.

D. Laundry facilities. If the structure includes laundry hook-ups, include a diverter valve and an outside "stub-out" installation on the clothes washing machine hook-up, to allow separate discharge of graywater direct for irrigation. The diverter valve on the clothes washing machine system shall be labeled as "LAUNDRY-TO-LANDSCAPE CAPABLE."

5. ~~Institutional and~~ N~~n~~on-residential projects. New, non-residential projects shall comply with all mandatory CALGreen measures. The mandatory measures shall be verified by a third party approved by the Town for which the applicant will pay for the review. ~~The threshold for institutional and non-residential projects shall be the appropriate LEED program and formal LEED certification. The minimum LEED levels shall be as follows:~~

~~A. For projects less than 2,000 sf the appropriate LEED or BIG checklist should be used and the points proposed verified though the self-certification process.~~

~~B. For new buildings between 2,000 sf and 3,000 sf LEED certification with no minimum level.~~

~~C. For new buildings between 3,000 and 5,000 sf, LEED silver certification.~~

~~D. For new buildings over 5,000 sf LEED gold certification.~~

A. Electric Vehicle "Ready" Infrastructure. "Section 5.106.5.3 Electric vehicle (EV) charging for new construction" of the California Green Building Standards Code is added as mandatory and amended with the additional requirements as outlined below.

(1) Service panel and/or subpanel shall provide, at minimum, capacity to install a 208/240v, 50 amperes grounded AC outlet and dedicated branch circuit.
(2) Raceway or wiring with capacity to accommodate a 100 ampere circuit; terminating in a listed cabinet box, enclosure, or NEMA receptacle.
(3) The raceway shall be installed so that minimal removal of materials is necessary to complete the final installation.

~~15.10.050 - Incentives for Compliance.~~

~~(a) In addition to the required standards for compliance, the town council may, through ordinance or resolution, enact financial, permit review process, or zoning incentives and/or award or recognition programs to further encourage higher levels of green building compliance for a project.~~

~~(b) For residential projects, the number of GreenPoint checklist points required shall be reduced by:~~

~~(1) Five points for maintaining a minimum of seventy-five percent of existing walls, floors, and roof of a structure;~~

~~(2) Five points (in addition to [subsection] (1) above) for maintaining a minimum of ninety-five percent of existing walls, floors, and roof of a structure; and/or~~

~~(3) Ten points (in addition to [subsections(s)] (1) and/or (2) above) when applied to a structure that is designated on the town's historic inventory or any contributing structure located within a designated historic district, subject to determination by the architectural and site control commission that such additions and/or renovations are consistent with the Secretary of the Interior's standards for rehabilitation.~~

15.10.~~060~~050 - Administrative Procedures and Implementing Regulations.

(a) The ~~town planner~~ planning director shall promulgate any rules and regulations necessary or appropriate to achieve compliance with the requirements of this chapter. The rules and regulations shall provide, at a minimum, for the incorporation of green building requirements of this chapter into checklist submittals with planning entitlement and building permit applications, and supporting design, construction, or development documents to demonstrate compliance with this chapter.

(b) The procedures for compliance documentation shall include, but not be limited to, the following:

(1) Preliminary documentation. Applicants for a covered project are encouraged, but not required, to meet with the ~~compliance official~~ planning director or his/her ~~designated~~

~~staff~~designee, in advance of submittal of an application, to determine required green building thresholds for compliance and to review the proposed green building program and details to achieve compliance.

(2) Discretionary planning entitlements. Upon submittal of an application for any discretionary planning entitlement for any covered project, including, but not limited to, architectural review, site development permit, conditional use permit, or variance requests, application materials shall include the appropriate completed checklists, as required by the standards for compliance specified in Section 15.10.040, accompanied by a text description of the proposed green building program and expected measures and milestones for compliance. ~~The compliance official may allow the use of alternative checklists for historic buildings or for buildings that retain or re-use substantial portions of the existing structure.~~

(3) Building plan check review. Upon submittal of an application for a building permit, building plans for any covered project shall include a checklist and green building program description, reflecting any changes proposed since the planning entitlement phase (if a planning entitlement was required). The checklist shall be incorporated onto a separate plan sheet included with the building plans. A qualified green building professional shall provide evidence of adequate green building compliance or documentation to the ~~compliance official~~ planning director or his/her designee to satisfy the requirements of the standards for compliance outlined in Section 15.10.040, prior to issuance of a building permit.

(4) Final building inspection, verification, and occupancy. Prior to final building inspection and occupancy for any covered project, a qualified building professional shall provide evidence of adequate green building compliance or documentation to the ~~compliance official~~ planning director or his/her designee to satisfy the requirements of the standards for compliance outlined in Section 15.10.040. This information shall include, but is not limited to:

(i) Documentation that verifies incorporation of the design and construction related credits specified in the project approval for the covered project;

(ii) A letter from the qualified green building professional that certifies that the covered project has been constructed in accordance with the approved green building project checklist;

(iii) Any additional documentation that would be required ~~by the LEED reference guide for LEED certification (if required), or~~ by the GreenPoint rated manuals for GreenPoint rated certification (if required); and

(iv) Any additional information that the applicant believes is relevant to determining that a good faith effort has been made to comply with this chapter.

(5) Final determination of compliance and good faith effort to comply. Prior to the scheduling of a final building inspection for a covered project, the ~~compliance official~~ planning director or his/her designee shall review the documentation submitted by the applicant, and determine whether the applicant has achieved the required compliance threshold as set forth in the standards for compliance outlined in Section 15.10.040 and/or demonstrate that measures are in place to assure compliance not later than one year after approval of

final building inspection. If the ~~compliance official~~ planning director or his/her designee determines that the applicant has met the requirements of Section 15.10.040 for the project, the final building inspection may proceed, provided the covered project has received approval of all other inspections required by the chief building official. If the ~~compliance official~~ planning director or his/her designee determines that the required green building rating has not been achieved, the ~~compliance official~~ planning director or his/her designee shall find one of the following:

(i) Good faith effort to comply: When an applicant submits a request in writing to the ~~compliance official~~ planning director or his/her designee for approval of a good faith effort to comply, the ~~compliance official~~ planning director or his/her designee shall determine that the applicant has made a good faith effort to comply with this chapter when finding that either a) the cost for providing green building documentation or assuring compliance is disproportionate to the overall cost of the project, or b) the green building materials and technologies on the green building checklist are no longer available or not yet commercially available, or c) at least eighty percent of the required green point credits have been achieved, and measures are in place to assure full compliance not later than one year after approval of the final building inspection. Determination of a good faith effort to comply shall be made separately for each item on the green building project checklist. Granting of a good faith effort to comply for one item does not preclude the need for the applicant to comply with the other items on the green building checklist.

(ii) Non-compliant project. If the ~~compliance official~~ planning director or his/her designee determines that the applicant has not made a good faith effort to comply with this chapter, or if the applicant fails to submit the documentation required within the required time period, then the project shall be determined to be non-compliant, and the final inspection and approval for the project shall be withheld. A final inspection shall not take place until the applicant has implemented equivalent alternate measures approved by the ~~compliance official~~ planning director or his/her designee~~or unless an exemption is granted for the project~~.

~~(6) Post final inspection requirement. Not later than one year after approval of the final building inspection, the applicant or current owner shall submit to the compliance official documentation detailing compliance with the operation, efficiency, and conservation related credits from the approved checklist documentation for any covered project, if required by the compliance official. The applicant may also provide any additional information the applicant believes is relevant to determining its good faith efforts to comply with this chapter.~~

(~~7~~6) Non-compliance. If, ~~as a result of any~~ upon inspection, the ~~town~~ building official or ~~compliance officer~~planning director determines that the covered project does not ~~or is unlikely to~~ comply with the approved plans or green building checklist, a stop order shall be issued if the ~~compliance official~~ planning director or his/her designee determines that continuation of construction activities will jeopardize the project's ability to meet the required compliance threshold. The stop order shall remain in effect until ~~the compliance official determines that the~~ project ~~will be~~ has been brought into compliance with the approved plans and/or checklist.

(~~87~~) ~~Interim compliance effort. For residential projects initiating construction not later than two years after the effective date of this chapter, a good faith effort shall be deemed to have been made when at least seventy-five percent of the required minimum green points have been achieved prior to final building inspection, and adequate remaining checklist points are outlined to demonstrate that at least ninety-percent of the minimum points and GreenPoint certification will be achieved not later than one year after final inspection. For purposes of this subsection "initiating construction" shall mean the date when a building permit is issued. If seventy-five percent of the required minimum green points are not achieved prior to the request for final building inspection, the final inspection shall be withheld unless an exemption is granted by the compliance official. Residential projects initiating construction more than two years after the effective date of this chapter shall comply in full with the requirements of this chapter.~~

(~~98~~) ~~Lack of inspectors. If the compliance official determines that there is a lack of third-party or town inspectors available to perform green building inspections within a timely manner, the compliance official may allow self-verification of the project and determine that green building requirements have been met.~~

(c) The ~~compliance official~~ planning director or his/her designee shall have the responsibility to administer and monitor compliance with the green building requirements set forth in this chapter and with any rules and regulations promulgated~~thereunder, and to grant exemptions from the requirements, where so authorized~~.

(d) Compliance with the provisions of this chapter shall be listed as a condition of approval on any architectural and site control review or other discretionary permit approval, and on the building plans for building permit approval, for any covered project.

15.10.~~070~~060- Hardship or Infeasibility Exemption.

~~(a) Exemption.~~ If an applicant for a covered project believes that circumstances exist that make it a hardship or infeasible to meet the requirements of this chapter, the applicant may request an exemption as set forth below. In applying for an exemption, the burden is on the applicant to show hardship or infeasibility.

(~~b~~a) Application. Any request ~~If an applicant for a covered project believes such circumstances exist, the applicant may apply~~ for an exemption must be included at the time of application submittal. The applicant shall indicate the maximum threshold of compliance he or she believes is feasible for the covered project and the circumstances that he or she believes create a hardship or make it infeasible to fully comply with this chapter. Circumstances that constitute hardship or infeasibility include, but are not limited to, the following:

(1) There is conflict with the compatibility of the green building rating system with other town goals, such as those requiring historic preservation;

(2) There is conflict with the compatibility of the green building rating system and the California Building Standards Code;

(3) There is conflict with the compatibility of the green building rating system and the town's zoning ordinance and/or architectural review criteria;

(4) The green building compliance standards do not include enough green building measures that are compatible with the scope of the covered project; and/or

(5) There is a lack of commercially available green building materials and technologies to comply with the green building rating system.

(~~c~~b) Review by Architectural and Site Control Commission~~(ASCC)~~. For any covered project for which an exemption is requested and architectural and site control review is required ~~by the ASCC~~, the ~~ASCC~~ Architectural and Site Control Commission shall provide a recommendation to the ~~compliance official~~ planning director or his/her designee regarding whether the exemption shall be granted, conditionally granted or denied, along with its recommendation on the project. For any project for which an exemption is requested based on the historic character of the building or site, the town historian shall provide a recommendation to the ~~compliance official~~ planning director or his/her designee regarding whether the exemption shall be granted or denied and shall determine whether the project is consistent with the Secretary of the Interior's Standards for Historic Rehabilitation.

(~~d~~c) ~~Granting of exemption~~Decision by Planning Director (or his/her designee). The ~~If the compliance official~~ planning director or his/her designee shall make a determination ~~determines that it is a hardship or is infeasible for the applicant to fully meet the requirements of this chapter~~ based on the information provided. T~~t~~he ~~compliance official~~ planning director or his/her designee shall determine the maximum feasible threshold of compliance reasonably achievable for the project. The decision of the ~~compliance official~~ planning director or his/her designee shall be provided to the applicant in writing.

(1) If the ~~compliance official~~ planning director or his/her designee determines that it is a hardship or is infeasible for the applicant to meet the requirements of this chapter, the request shall be ~~an exemption is~~ granted. Notwithstanding, the applicant shall be required to comply with this chapter in all other respects and shall be required to achieve, in accordance with this chapter, the threshold of compliance determined to be reasonably achievable by ~~compliance official~~ planning director or his/her designee.

(~~e~~2) ~~Denial of Exemption.~~ If the ~~compliance official~~ planning director or his/her designee determines that it is reasonably possible for the applicant to fully meet the requirements of this chapter, the request shall be denied ~~and the compliance official shall so notify the applicant in writing~~. The project and compliance documentation shall be modified to comply with this chapter prior to further review of any pending planning or building application.

~~(f) Council Review of Exemption. For any covered project that requires review and action by the town council, the council shall act to grant or deny the exemption, based on the criteria outlined above, after recommendation by the manager.~~

15.10.~~080~~070 - Appeal.

(a) Any aggrieved applicant may appeal the determination of the ~~compliance official~~ planning director or his/her designee regarding: (1) the granting or denial of an exemption pursuant to Section 15.10.070; or (2) compliance with any other provision of this chapter.

(b) Any appeal must be filed in writing with the ~~planning manager~~ planning director or his/her designee not later than fourteen days after the date of the determination by the~~compliance official~~ planning director or his/her designee. The appeal shall state the alleged error or reason for the appeal.

(c) The appeal shall be processed and considered by the planning commission ~~town council~~ de novo in accordance with the criteria outlined in this chapter.

MEMORANDUM

TOWN OF PORTOLA VALLEY

TO: Mayor and Members of the Town Council

FROM: Brandi de Garmeaux, Sustainability and Special Projects Manager

DATE: October 26, 2016

RE: Review and Adopt Ordinance and Related Findings to Amend Chapter 15.10 (Green Building) of the Portola Valley Municipal Code

RECOMMENDATION

Staff recommends that the Town Council review and adopt the proposed amendments to Chapter 15.10 (Green Building) of the Portola Valley Municipal Code and related findings, including the provisions that amend the 2016 California Energy Code, Title 24, Chapter 6, of the California Code of Regulations and the 2016 California Green Building Standards Code, Title 24, Chapter 11, of the California Code of Regulations (Attachment 1).

BACKGROUND

The Town of Portola Valley adopted a Green Building Ordinance (Ordinance) in 2010 (Attachment 3) to implement goals and objectives set forth in the "Sustainability Element" of the Portola Valley General Plan for reducing greenhouse gas ("GHG") emissions, conserving water and energy, encouraging green building, protecting the natural environment, and protecting the health of residents and visitors. This Ordinance was adopted in reference to the 2010 California Building Standards Code. Every three years, the State of California adopts new building standards that are codified in Title 24 of the California Code of Regulations. The 2013 California Energy Code (Title 24, Part 6), contained mandatory energy efficiency measures that were more restrictive than the Town's Ordinance. As a result of the higher mandatory measures included in the 2013 Energy Code, the Town's Ordinance became unenforceable. The 2013 code cycle also added a new California Green Building Standards Code (CALGreen), which contains mandatory sustainable design requirements.

Over the last two years, staff has been studying options to update the Town's Ordinance in light of the building code updates and current green building best practices. As part of this study, staff considered the following options:

- Deferring to the State minimum for CALGreen and the Energy Code
- Adopting CALGreen's Voluntary Measures, which are organized into tiers
- Adopting the current version of Build It Green's GreenPoint Rated Checklist
- Continuing with LEED for non-residential and as an option for residential projects

In addition, there were several, valuable green building measures that staff had identified since the original adoption of the Ordinance that would significantly reduce the cost of installation if included as part of the initial building design and construction (e.g., graywater). Staff reviewed

these measures against the current Buildings Standards Code to determine if they were already included, and if so, how they could be augmented to fit current practices in Portola Valley and provide the most opportunity for future building occupants. The State is currently concluding the code cycle for the 2016 California Building Standards Code, which has a target effective date of January 1, 2017. Throughout this process staff has been working closely with the County of San Mateo, PG&E, Build It Green and the California Energy Commission to coordinate the necessary documents required to adopt amendments to 2016 Building Standards Code as part of the Town's Green Building Ordinance. Staff also met extensively with the Town's Water Conservation Committee and industry experts to develop the water-related measures and held a study session with the ASCC and a Public Hearing with the Planning Commission to review the proposed amendments in their entirety.

The proposed Ordinance amendments continue reliance on the Build It Green GreenPoint Rated system for residential projects, with modifications to the existing point requirements outlined below. For non-residential projects, the proposed Ordinance defers to the State code until further study can be done on the cost-effectiveness of exceeding the code for those projects. The key revisions to the Ordinance are outlined below and explained in further detail in the discussion section. The proposed amendments would continue the Town's efforts in promoting sustainable building design, sustainable building construction, and resource conservation as well as begin preparing the Town to meet the State's goal of all new residential construction being net zero energy by 2020.

Summary of Proposed Amendments to the Green Building Ordinance

For new, single-family residential projects:

- Modifies point requirements to respond increased stringency of the Energy Code
  The increased stringency of the Energy Code, CALGreen and the updated GreenPoint Rated checklist made the point requirement in the 2010 Ordinance of one additional point for every 30 square feet above the 3,000 square foot threshold more difficult to achieve; however, adjusting the point requirements to one point for every 50 square feet over the 3,000 square foot threshold was found to be achievable for all of the projects that were reviewed.
- Increases the "solar zone" size from 250 square feet to 500 square feet
  Amends the Energy Code to require a solar zone for all new single-family homes and increases the solar zone size from 250 square feet to 500 square feet in order to better accommodate larger solar system installations. In response to the ASCC's comments, staff included a provision to allow the project applicant to request a reduced solar zone if they demonstrate how they will meet the entire energy needs of the project within the reduced space (because reducing the solar zone potentially reduced solar production depending on the efficiency of the panels).
- Provides solar "ready" infrastructure
  Requires providing space for conduit to support the future installation of solar photovoltaic systems.
- Provides electric vehicle "ready" infrastructure
  Amends CALGreen to augment the electricity and conduit requirements to provide users greater flexibility with all electric vehicle types.
- Provides graywater "ready" infrastructure
  Requires installation of additional segregated plumbing piping to allow the discharge from all clothes washers and all applicable fixtures from bathrooms located above grade

to be used for irrigation as well as identifying a location for discharge and supplying power to the identified location.

- Requires rainwater catchment systems for landscapes that use turf
  Requires installing a rainwater catchment system for new residential projects with landscapes that include the use of turf. The size of the system is based on the irrigation needs, which shall be calculated using a tool called the Applied Water for Turf Calculator.

For new, non-residential projects:

- Removes LEED thresholds and adds third-party verification of CALGreen mandatory requirements
  In response to the ASCC's comments, staff reviewed non-residential green building requirements in neighboring jurisdictions and concluded that in the absence of a cost-effectiveness study that compares the LEED energy efficiency requirements to the current Energy Code, the Town should defer to the CALGreen mandatory requirements for new, non-residential projects. However, to insure that the new buildings are constructed to the current building code requirements, staff recommends requiring third-party verification of CALGreen mandatory requirements.
- Adds an EV readiness requirement for new, non-residential
  Amends CALGreen to augment the electricity and conduit requirements to provide users greater flexibility with all electric vehicle types.

Committee & Commission Review
The Water Conservation Committee developed and reviewed the proposed water efficiency measures of the Ordinance through a sub-committee in the summer and fall of 2015. At their meeting on December 2, 2015, the Committee as a whole reviewed and approved the final version of the water efficiency measures.

On March 14, 2016, the ASCC voted 5-0 to recommend forwarding the updated Green Building Ordinance to the Planning Commission with the following suggested amendments:

- Offer an option to reduce the size of the solar zone if the project applicant can prove that less space is needed to cover the energy needs of the project.
- Explore increasing the size threshold of non-residential buildings for LEED certification requirements due to the cost of documentation and certification.

Staff revised the Ordinance to address these concerns, which are noted in the revisions outlined below and in green text on the attached, "redlined" Ordinance (Attachment 2). On June 1, 2016, the Planning Commission held a Public Hearing to review the Ordinance and adopted a Resolution recommending that the Town Council approve the proposed Ordinance amendments.

Code Amendment Process
Jurisdictions can adopt local requirements that are above and beyond what is included in the Building Code, referred to as a "reach code." All proposed reach codes must be filed with the State. The proposed amendments to Portola Valley's Ordinance would impact the California Green Building Code (CALGreen) and Energy Code portions of the Building Standards Code.

Amendments to the CALGreen Code must be filed with the Building Standards Commission, which will acknowledge receipt of the amendment documents and review findings in writing.

Amendments to the Energy Code are subject to a review process by the California Energy Commission (CEC), which requires that a cost-effectiveness study be conducted and filed. The cost-effectiveness study must demonstrate that the amendments to the code are financially responsible and do not represent an unreasonable burden to the non-residential and residential applicants. The Town's Ordinance is supported by a cost-effectiveness study that was completed by Pacific Gas and Electric Company (PG&E) on September 2, 2016.

The CEC requires cities to adopt the proposed Energy Code changes by ordinance and then submit them for review. The CEC will then administer a 60-day public comment on the proposed code changes. Town staff will be asked to respond to public comments on an as-needed basis. After the close of the 60-day public comment period, the CEC may request revisions to the Ordinance prior to approval by the Energy Commission. In the case of necessary revisions, staff would return to the Council to present the amended Ordinance.

DISCUSSION

Updating the Town's Green Building Ordinance aligns with several key local and State goals. First, the Town has a long history of promoting sustainability through design and education in order to reduce the community's impact on the environment. On January 28, 2009, the Town's Sustainability Element was adopted, which establishes the following goals: reducing greenhouse gas emissions; implementing green buildings for new and existing structures; protecting water resources; protecting the natural environment; and promoting community education and involvement throughout the process of implementing those goals. Furthermore, the Sustainability Element includes "overarching goals" to minimize the use of nonrenewable resources, to promote principles of green design, and to encourage resource efficiency and the use of sustainable materials in all building projects. Second, the Town is implementing policies that align with The Global Warming Solutions Act of 2006 ("AB 32"), which requires reducing greenhouse gas emissions by 80 percent below 1990 levels by 2050. Third, the Governor's Executive Order B-29-15 requires the community-wide reduction of water consumption below a 2013 baseline year and, although this requirement has changed from a 36 percent to a 10 percent reduction, due to the drought it is expected to continue into the foreseeable future. Fourth, based on 2009 goals established by the California Public Utilities Commission, the State will require all new residential construction projects to be net zero energy by 2020, which will require higher levels of energy efficiency and renewable energy systems that are sized large enough to meet each building's annual energy demands. It is with these sustainability goals in mind that staff proposes the amendments to the Ordinance outlined in detail below.

New Single-Family Residential Projects

Green Building

With this Ordinance amendment, the Town would adopt the green building compliance methodology for the most current version of Build It Green's GreenPoint Rated checklist for New Home Single Family. Staff recommends using the current version of the GreenPoint Rated checklist for the following reasons:

- the checklist is fully compliant with all mandatory State building codes, including CALGreen;
- it is flexible by providing a wide range of green building measures for projects to choose from and implement;
- it places a high emphasis on energy, water and waste while looking at the building holistically;

- it supplements the State's building codes and includes greater focus on indoor air quality and environmentally friendly building materials;
- residents, developers, and architects in Portola Valley are already very familiar with the GreenPoint Rated checklist, which has been used in the Town since 2009; and
- it provides a pathway to an all-electric home and a net zero energy home.

In addition, one of the key benefits of utilizing the Build It Green GreenPoint Rated checklist is third-party verification that all the green building measures are being implemented, including the current CALGreen mandatory measures.

The existing Ordinance, which is not currently enforceable, required 75 points from the GreenPoint Rated checklist (Version 4.2) for all new residential projects up to 3,000 square feet and one additional point for every 30 square feet over 3,000 square feet. After reviewing multiple new residential projects completed under the existing Ordinance (shown in Figure 1), staff concluded that continuing to require one additional point for every 30 square feet above a 3,000 square foot threshold would be difficult for many homes to achieve when using the most current version of the GreenPoint Rated checklist (Version 6.0.2). However, adjusting the point requirements to one point for every 50 square feet over a 3,000 square foot threshold was found to be achievable for all of the projects that were reviewed. This methodology was supported by Build It Green, which conducted an independent point analysis on the same projects.

Build It Green is updating its checklist to align with the 2016 California Building Code. The new checklist Version 7.0 (Attachment 4) represents minor updates that build upon the significant updates completed for Version 6.0.2, which is the version staff's analysis was based on. Version 7.0 deletes measures that have become code-required, addresses CALGreen mandatory measures and includes revised measures for current best practices and energy compliance pathways aligned with the 2016 Code. There are 14 new, proposed optional measures and 3 innovative measures in Version 7.0, which provide additional opportunities beyond Version 6.0.2 to meet the point requirements (Attachment 5). Therefore, staff recommends requiring 75 points from the GreenPoint Rated checklist for all new single-family residential projects up to 3,000 square feet and one additional point for every 50 square feet over 3,000 square feet.

Figure 1

GreenPoint Rated Comparison: > 3,000 sq ft						
		Version 4.2		Version 6.0.2 (1 pt/30 sq ft)		Version 6.0.2 (1 pt/50 sq ft)
Address	Square Footage	Points Required (30 sq ft)	Proposed Total Points	Points Required (30 sq ft)	Calculated Total Points	Points Required (50 sq ft)
50 Pine Ridge	6,571	194	201	194	156	147
9 Redberry	6,143	180	188	180	167	138
205 Cervantes	5,370	154	161	154	130	123
3 Thistle	4,098	112	173	112	134	97

Energy Efficiency

The amended Ordinance would require projects to exceed the California Energy Code by at least 10 percent for new single-family homes, as this is the requirement for certification under of Build It Green's GreenPoint Rated checklist. As mentioned above, exceeding the minimum standards of the California Energy Code requires a cost-effectiveness study to be conducted for the specific climate zone where exceeding the Energy Code is being proposed. On September 2, 2016, PG&E completed a cost-effectiveness study for low-rise residential buildings in the San Francisco Bay Area, Climate Zone 3 under the California Statewide Codes and Standards Program (Attachment 6). The study demonstrates that exceeding the Energy Code by 10 percent is cost effective for new single-family homes.

Solar

The 2016 California Energy Code has mandatory requirements for solar "ready" buildings that currently apply only to residences in subdivisions of ten or more. These solar ready requirements include a minimum "solar zone," which is an unshaded and un-penetrated space on the roof for future solar system installations, a pathway for routing conduit and plumbing within construction documents, and a main service panel with a minimum busbar rating of 200 amps (Attachment 7).

The proposed Ordinance amendment would require installing solar "ready" infrastructure on all new single-family residential projects in order to better facilitate the future installation of solar photovoltaic and solar thermal systems. Solar ready infrastructure includes providing a pathway for conduit and plumbing that shall be routed from the attic space (or equivalent) to the point of

interconnection with the electrical service panel and the water-heating system. Requiring solar ready infrastructure during initial construction process will reduce the cost of installing a solar system in the future.

Additionally, the proposed Ordinance amendment would require a solar zone for all new single-family residential projects and would also require increasing the solar zone size. Staff recommends amending the Energy Code and requiring the solar zone for all new single-family residential projects and increasing the solar zone size from 250 square feet to 500 square feet in order to better accommodate larger solar system installations. Staff does not recommend increasing the solar zone size for new multifamily projects as the California Energy Code already requires the solar zone to be 15 percent of the total roof area excluding skylights.

Electric Vehicles

As of July 1, 2015, the CALGreen Code was amended to include mandatory standards for electric vehicle infrastructure for new residential projects (Attachment 8). It requires installing a listed raceway (i.e., an enclosed conduit that forms a physical pathway for electrical wiring.) to accommodate a dedicated 208/240-volt branch circuit. Additionally, the service panel and/or subpanel shall provide capacity to install a 40-ampere minimum dedicated branch circuit.

In order to better facilitate the use of electric vehicles, staff recommends amending the Ordinance for all new single-family residential projects to include, at a minimum: (1) a panel capable of accommodating a dedicated branch circuit and service capacity to install a 208/240V, 50 amperes grounded AC outlet; and (2) raceway or wiring with capacity to accommodate a 100 ampere circuit; terminating in (3) a listed cabinet, box, enclosure, or NEMA receptacle. The raceway would need to be installed so that minimal removal of materials is necessary to complete the final installation. Staff's recommendation to increase the amperes from 40 to 50 is due to recommendations from Tesla Motors, Inc. that 50 amperes will give users greater flexibility with all electric vehicle types. Additionally, Tesla Motors, Inc. stated that increased amperes would likely be necessary in the near future as all major electric vehicle manufacturers increase vehicle battery sizes to improve the vehicle's range.

Water Efficiency

In order to mitigate the effects of California's ongoing drought, and to better conserve natural resources, the Town has made decreasing potable water use a high priority. The proposed Ordinance amendment would require installing graywater "ready" infrastructure to allow for the future installation of a graywater treatment system and distributed irrigation.

The State's current Plumbing Code only allows for untreated graywater to be used for subsurface irrigation. To allow for the most flexibility in utilizing graywater, the proposed measures require identifying an appropriate location for a graywater treatment system, including storage tanks for the graywater before and after it is processed. Additional, segregated plumbing piping would be required to allow for the discharge from all clothes washers and all applicable fixtures from bathrooms located above grade. The discharge pipe would be connected to the black pipe outside of the building foundation, in the location identified for the treatment system, to better facilitate a future connection to the graywater treatment system and/or irrigation system. A power supply to this location would also be required. Only above grade bathrooms are subjected to the requirements of this proposed Ordinance amendment to allow for the system to be gravity fed and negate the need for additional electrical or plumbing components.

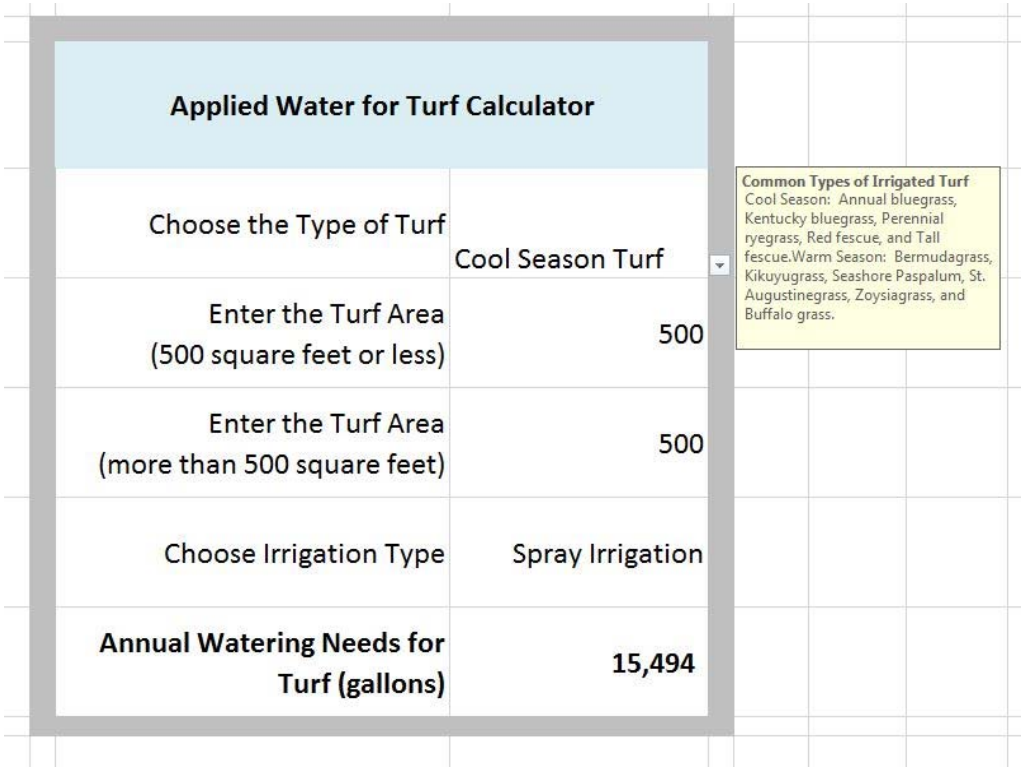
The graywater ready infrastructure requirements would not require any new residential projects to utilize graywater for irrigation systems. The requirements are meant to reduce the cost for implementing the graywater systems by establishing requirements during a project's initial construction.

In addition to utilizing graywater, staff worked with the Town's Water Conservation Committee to find other innovative ways to reuse water in order to relieve the current high demand for potable water in outdoor irrigation. As a result, the proposed Ordinance amendment includes a requirement for installing a rainwater catchment system for new residential projects with landscapes that include turf. Staff developed a calculator with the State Department of Water Resources that uses local climate data to determine the annual water needs of various kinds of turf in Portola Valley, called the Applied Water for Turf Calculator (Attachment 9).

Using the Applied Water for Turf Calculator, the rainwater catchment system would vary in size depending on the total square footage of the turf (Figures 2 & 3). For the first 500 square feet of turf, the rainwater catchment system would be sized in order to meet 50 percent of the calculated annual water needs. For landscapes with turf over 500 square feet, the rainwater catchment system would be sized in order to meet 100 percent of the calculated annual water needs over 500 square feet. The reduced rainwater catchment system requirements for landscapes with turf of 500 square or less is meant to better accommodate new residential projects that seek to have only a relatively small amount of turf.

As an alternative to installing a rainwater catchment system, new residential projects can install a fully operational graywater system that satisfies all of the annual water demands of the turf as identified in the Applied Water for Turf Calculator. This is complimentary to the newly adopted Water Efficient Landscape Ordinance, which allows for following prescriptive measures if the water needs of the landscape are met with graywater and/or rainwater.

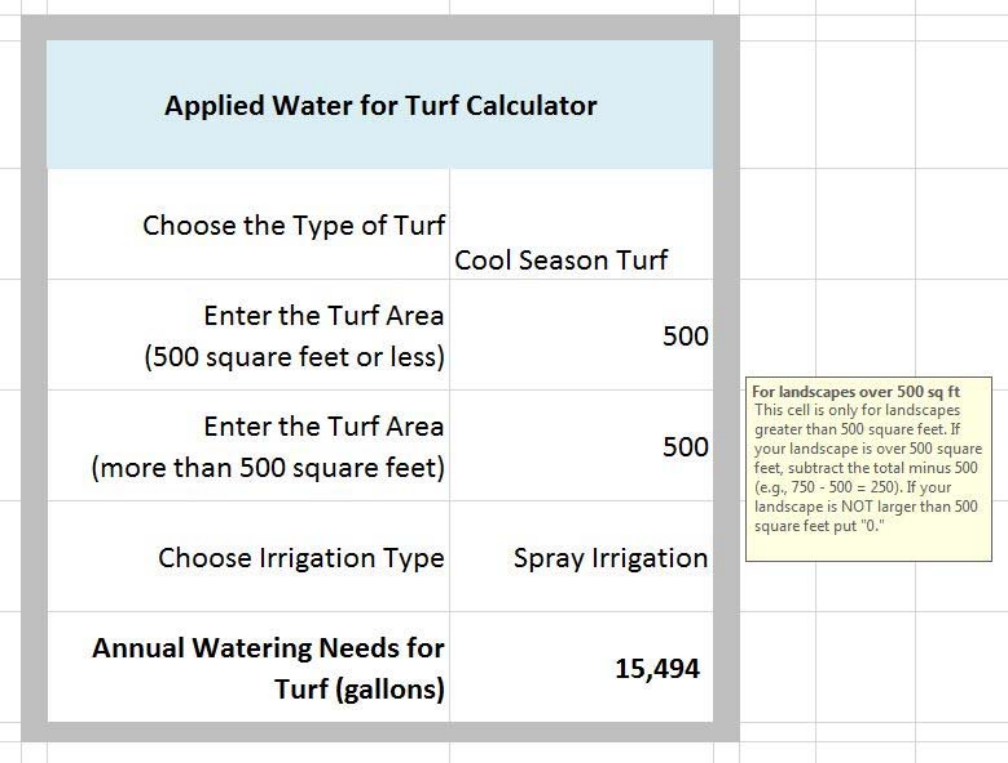
Figure 2



Applied Water for Turf Calculator	
Choose the Type of Turf	Cool Season Turf
Enter the Turf Area (500 square feet or less)	500
Enter the Turf Area (more than 500 square feet)	500
Choose Irrigation Type	Spray Irrigation
Annual Watering Needs for Turf (gallons)	**15,494**

Common Types of Irrigated Turf
Cool Season: Annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and Tall fescue.Warm Season: Bermudagrass, Kikuyugrass, Seashore Paspalum, St. Augustinegrass, Zoysiagrass, and Buffalo grass.

Figure 3



Applied Water for Turf Calculator	
Choose the Type of Turf	Cool Season Turf
Enter the Turf Area (500 square feet or less)	500
Enter the Turf Area (more than 500 square feet)	500
Choose Irrigation Type	Spray Irrigation
Annual Watering Needs for Turf (gallons)	**15,494**

For landscapes over 500 sq ft
This cell is only for landscapes greater than 500 square feet. If your landscape is over 500 square feet, subtract the total minus 500 (e.g., 750 - 500 = 250). If your landscape is NOT larger than 500 square feet put "0."

Residential Construction Additions and/or Remodel Projects 400 Square Feet or Greater
The requirements for residential construction additions and/or remodel projects remain equivalent to the original Ordinance. The language in the Ordinance has been amended for clarity and defines a trigger of 400 square feet or greater to align with the threshold for review by the ASCC. Residential construction additions and/or remodel projects are required to use the current version of Build It Green's GreenPoint Rated checklist for Existing Home Single Family. A "Whole House" project is required to achieve 50 points and 25 points for a smaller "Elements" project, both as defined by Build It Green. Additionally, for a Whole House project GreenPoint Rated certification using certified professional raters is still required and for an Elements project self-certification is allowed.

Small Residential Additions and/or Remodels
The requirements for small residential additions and/or remodel projects remain equivalent to the original Ordinance. Small residential additions and/or remodels are defined as projects less than 400 square feet and require completion of the Build It Green's GreenPoint Rated Checklist for Existing Home Single Family as a working/learning document, but no minimum points are required and self-certification is permitted.

New Non-Residential Projects
For non-residential projects, the proposed Ordinance amendment removes the requirement to meet a certain level of LEED certification based on square footage. Staff compared the LEED green building rating system to the voluntary "tiers" offered as options under the state's CALGreen Code. In response to the ASCC's comments, staff also reviewed non-residential green building requirements in neighboring jurisdictions and concluded that in the absence of a cost-effectiveness study that compares the LEED energy efficiency requirements to the current

Energy Code, the Town should defer to the CALGreen mandatory requirements for new, non-residential projects. However, to insure that the new buildings are constructed to the current building code requirements, staff recommends requiring third-party verification of CALGreen mandatory requirements. Staff is also recommending that new, non-residential projects are required to implement the additional electric vehicle readiness measures outlined for new residential construction projects to provide users greater flexibility with all electric vehicle types.

CEQA REVIEW

The Green Building Ordinance amendment is not subject to the California Environmental Quality Act pursuant to Section 15308 of the CEQA Guidelines because it is an action taken by a regulatory agency for the protection of the environment.

NEXT STEPS

In the face of the increased stringency of the 2013 California Building Standards Codes, the delay in the completion of needed cost-effectiveness studies and reduced building department staff, many jurisdictions abandoned their reach codes. With the September 2, 2016 cost-effectiveness study provided by PG&E, this amendment to the Green Building Ordinance was able to focus on new residential construction to reinstate the intentions of the original Ordinance. As new cost-effectiveness studies become available, staff will return to the Council with additional updates to the Ordinance to further address non-residential and multi-family projects. In addition, the Sustainability Manager, Building Inspector and Town Manager have committed to meeting quarterly to review additional opportunities for advancing the town's building stock to meet the State's net zero energy goals and the Council's commitment to reducing greenhouse gas emissions. Staff will update the Council of the effective date of the Ordinance once the California Energy Commission has formally adopted it.

ATTACHMENTS

1. Proposed Ordinance Amending Chapter 15.10 (Green Building) of the Municipal Code
2. Proposed Code Amendments to Chapter 15.10 redlined (ASCC/PC amendments in green)
3. Original Green Building Ordinance adopted in 2010
4. Build It Green's GreenPoint Rated checklist for New Home Single Family –Version 7.0 Draft
5. Executive Summary Proposed Updates to GreenPoint Rated Version 7.0
6. CA Statewide Codes and Standards Program CALGreen Cost Effectiveness Study
7. California Energy Code, Section 110.10 Mandatory Requirements for Solar Ready Buildings
8. CALGreen Code, Section 4.106.4 Electric Vehicle Charging for New Construction
9. Applied Water for Turf Calculator Summary

Approved by: Jeremy Dennis, Town Manager

demonstrated that exceeding State Building Energy Efficiency Standards as mandated by GreenPoint Rated checklist is achievable in a cost effective manner.

K. On March 10, 2010, at a publicly noticed meeting, the Town Council accepted the recommendations of the Planning Commission and Architectural and Site Control Commission subgroup for implementation of local Green Building Regulations as set forth in the March 4, 2010 report from the Deputy Town Planner.

L. On May 12, 2010, the Town Council held a duly noticed public hearing and heard testimony regarding the proposed Green Building Ordinance.

M. Because the design, restoration, construction and maintenance of buildings and structures within the Town can have a significant impact on the Town's environment, greenhouse gas emissions, resource usage, energy efficiency, waste management, and health and productivity of residents, workers, and visitors over the life of the building, requiring commercial, institutional and residential projects to incorporate green building measures is necessary and appropriate to achieve the public health and welfare benefits of green building.

2. Addition of Code. Chapter 15.10 [Green Building] is hereby added to Title 15 [Buildings and Construction] of the Portola Valley Municipal Code to read as follows:

CHAPTER 15.10
GREEN BUILDING

15.10.010 Purpose.

The purpose of this chapter is to enhance the public health and welfare by promoting the environmental health of the town through the incorporation of green building practices in the design, construction, maintenance, operation and deconstruction of buildings and other site development. The green building provisions in this chapter are designed to achieve the following goals:

(a) Encourage the conservation of natural resources and reduction of greenhouse gas emissions;

(b) Increase energy efficiency and lower energy usage;

(c) Reduce waste generated by construction projects;

(d) Provide durable buildings that are efficient and economical to own and operate;

(e) Recognize and conserve the energy embodied in existing buildings; and

(e) Promote the health of residents, workers, and visitors to the town.

15.10.020 Applicability

This chapter applies to all projects defined as "covered projects," as defined in Section 15.10.030, except that it shall not apply to any project for which a planning entitlement application (except for a preliminary architectural review application) or building permit application has been submitted prior to the effective date of this chapter.

15.10.030 Definitions

The following terms shall have the ascribed definition for the purposes of applying the criteria of this chapter.

(a) "Addition" means new construction square footage added to an existing structure.

(b) "Applicant" means anyone that applies to the town for the applicable permits or approvals to undertake any covered project within the town, or any subsequent owner of the site.

(c) "Compliance official" means the town planner or his/her designee.

(d) "Compliance threshold" means the minimum number of points or rating level of a green building rating system that must be attained for a particular covered project, as outlined in the standards for compliance in Section 15.10.040.

(e) "Covered project" means any planning entitlement application(s) or building permit application(s) for commercial new construction or renovations, or for any residential new construction or renovation subject to the standards for compliance outlined in Section 15.10.040.

(f) "Good faith effort" means a project that has not met the required compliance threshold, but for extenuating reasons or reasons beyond the control of the applicant, the compliance official has found the project meets the good faith effort provisions of Section 15.10.060.

(g) "Green building" means a whole systems approach to the design, construction and operation of buildings that substantially mitigates the environmental, economic, and social impacts of buildings. Green building practices recognize the relationship between the natural and built environments and seek to minimize the use of energy, water and other natural resources and provide a healthy, productive indoor environment.

(h) "Green building project checklist" means a checklist or scorecard developed for the purpose of calculating a green building rating.

(i) "Green building rating system" means the rating system associated with specific green building criteria and used to determine compliance thresholds, as outlined in the standards of compliance adopted by town council resolution. Examples of rating systems include, but are not limited to, the LEED and GreenPoint Rated systems.

(j) "GreenPoint Rated" means a residential green building rating system developed by the Build It Green organization.

(k) "GreenPoint Rated Verification" means verification of compliance by a certified GreenPoint Rater, resulting in green building certification by Build It Green.

(l) "LEED®" means the "Leadership in Energy and Environmental Design" green building rating system developed by the U.S. Green Building Council.

(m) "LEED®/USGBC Verification" means verification to meet the standards of the U.S. Green Building Council ("USGBC") and resulting in LEED certification of the project by the USGBC.

(n) "Multi-family residential" means a building containing three or more attached dwelling units.

(o) "New building" means a new structure or a substantial addition/remodel to an existing structure where the remodel combined with any additions to the structure affects 50% or more of the exterior wall plane surface or affects 50% or more of the floor area as more particularly defined in section 15.04.010 of this code.

(p) "New construction, commercial" means the construction of a new or replacement retail, office, institutional, semi-institutional or similar building(s), or additions to such building(s).

(q) "New construction, residential" means the construction of a new or replacement single-family or two-family dwelling unit or of new or replacement multi-family residential building(s), or additions to such building(s).

(r) "Qualified green building professional" means a person trained through the USGBC as a LEED accredited professional or through Build It Green as a certified green

building professional, or similar qualifications if acceptable to the compliance official. For projects requiring "self-verification," the project architect or designer is considered a qualified green building professional.

(s) "Renovation" means any rehabilitation, repair, remodeling, change, or modification to an existing building, where changes to floor area and the footprint of the building are negligible. The valuation of renovation improvements shall be determined by the town planner, upon recommendation of the chief building official. The chief building official may exclude from such valuation the cost of (a) seismic upgrades, (b) accessibility upgrades, or (c) photovoltaic panels or other solar energy or similar devices exterior to the building. Renovation valuation thresholds identified in the standards for compliance shall be adjusted annually to reflect changes in the town's valuation per square foot for new construction in town, using valuations in effect as of July 1, 2008, as the base index.

(t) "Self verification" means verification by the project architect, designer or a qualified green building professional certifying that the project has met the standards and has attained the compliance threshold as indicated for the covered project type as set forth in the standards for compliance outlined in Section 15.10.040.

(u) "Single-family or two-family residential" means a single detached dwelling unit or two units in a single building or two separate buildings on a single parcel, such as a main residence and second unit.

(v) "Square footage" means all new and replacement square footage, including basement areas (seven feet or greater in height) and garages, except that unconditioned garage space shall only count as 50% of that square footage. Areas demolished shall not be deducted from the total new construction square footage.

(w) "Threshold verification by LEED AP" means verification by a LEED accredited professional certifying that each LEED checklist point listed was verified to meet the requirements to achieve that point. The LEED AP shall provide supporting information from qualified professionals (e.g. civil engineer, electrical engineer, Title 24 consultant, commissioning agent, etc.) to certify compliance with each point on the checklist. Documentation of construction consistent with building plans calculated to achieve energy compliance is sufficient verification in lieu of post-construction commissioning.

15.10.040 Standards for Compliance.

The town council shall establish by resolution, and shall periodically review and update as necessary, green building standards for compliance. The standards for compliance shall include, but are not limited to, the following:

(a) The types of projects subject to regulation (covered projects);

(b) The green building rating system to be applied to the various types of projects;

(c) Minimum thresholds of compliance for various types of projects; and

(d) Timing and methods of verification of compliance with these regulations.

The standards for compliance shall be approved after recommendation from the town planner, who shall refer the standards for recommendation by the architectural and site control commission, prior to council action.

15.10.050 Incentives for Compliance.

(a) In addition to the required standards for compliance, the town council may, through ordinance or resolution, enact financial, permit review process, or zoning incentives and/or award or recognition programs to further encourage higher levels of green building compliance for a project.

(b) For residential projects, the number of GreenPoint checklist points required shall be reduced by:

(1) Five points for maintaining a minimum of 75% of existing walls, floors, and roof of a structure;

(2) Five points (in addition to (1) above) for maintaining a minimum of 95% of existing walls, floors, and roof of a structure; and/or

(3) Ten points (in addition to (1) and/or (2) above) when applied to a structure that is designated on the town's historic inventory or any contributing structure located within a designated historic district, subject to determination by the architectural and site control commission that such additions and/or renovations are consistent with the Secretary of the Interior's Standards for Rehabilitation.

15.10.060 Administrative Procedures and Implementing Regulations.

(a) The town planner shall promulgate any rules and regulations necessary or appropriate to achieve compliance with the requirements of this chapter. The rules and regulations shall provide, at a minimum, for the incorporation of green building requirements of this chapter into checklist submittals with planning entitlement and building permit applications, and supporting design, construction, or development documents to demonstrate compliance with this chapter.

(b) The procedures for compliance documentation shall include, but not be limited to, the following:

(1) Preliminary documentation. Applicants for a covered project are encouraged, but not required, to meet with the compliance official or his/her designated staff, in advance of submittal of an application, to determine required green building thresholds for compliance and to review the proposed green building program and details to achieve compliance.

(2) Discretionary planning entitlements. Upon submittal of an application for any discretionary planning entitlement for any covered project, including, but not limited to, architectural review, site development permit, conditional use permit, or variance requests, application materials shall include the appropriate completed checklists, as required by the standards for compliance specified in Section 15.10.040, accompanied by a text description of the proposed green building program and expected measures and milestones for compliance. The compliance official may allow the use of alternative checklists for historic buildings or for buildings that retain or re-use substantial portions of the existing structure.

(3) Building plan check review. Upon submittal of an application for a building permit, building plans for any covered project shall include a checklist and green building program description, reflecting any changes proposed since the planning entitlement phase (if a planning entitlement was required). The checklist shall be incorporated onto a separate plan sheet included with the building plans. A qualified green building professional shall provide evidence of adequate green building compliance or documentation to the compliance official to satisfy the requirements of the standards for compliance outlined in Section 15.10.040, prior to issuance of a building permit.

(4) Final building inspection, verification, and occupancy. Prior to final building inspection and occupancy for any covered project, a qualified building professional shall provide evidence of adequate green building compliance or documentation to the compliance official to satisfy the requirements of the standards for compliance outlined in Section 15.10.040. This information shall include, but is not limited to:

i. Documentation that verifies incorporation of the design and construction related credits specified in the project approval for the covered project;

ii. A letter from the qualified green building professional that certifies that the covered project has been constructed in accordance with the approved green building project checklist;

iii. Any additional documentation that would be required by the LEED reference guide for LEED certification (if required), or by the GreenPoint Rated manuals for GreenPoint Rated certification (if required); and

iv. Any additional information that the applicant believes is relevant to determining that a good faith effort has been made to comply with this chapter.

(5) Final determination of compliance and good faith effort to comply. Prior to the scheduling of a final building inspection for a covered project, the compliance official shall review the documentation submitted by the applicant, and determine whether the applicant has achieved the required compliance threshold as set forth in the standards for compliance outlined in Section 15.10.040 and/or demonstrate that measures are in place to assure compliance not later than one year after approval of final building inspection. If the compliance official determines that the applicant has met the requirements of Section 15.10.040 for the project, the final building inspection may proceed, provided the covered project has received approval of all other inspections required by the chief building official. If the compliance official determines that the required green building rating has not been achieved, the compliance official shall find one of the following:

i. Good faith effort to comply: When an applicant submits a request in writing to the compliance official for approval of a good faith effort to comply, the compliance official shall determine that the applicant has made a good faith effort to comply with this chapter when finding that either a) the cost for providing green building documentation or assuring compliance is disproportionate to the overall cost of the project, or b) the green building materials and technologies on the green building checklist are no longer available or not yet commercially available, or c) at least 80% of the required green point credits have been achieved, and measures are in place to assure full compliance not later than one year after approval of the final building inspection. Determination of a good faith effort to comply shall be made separately for each item on the green building project checklist. Granting of a good faith effort to comply for one item does not preclude the need for the applicant to comply with the other items on the green building checklist.

ii. Non-compliant project. If the compliance official determines that the applicant has not made a good faith effort to comply with this chapter, or if the applicant fails to submit the documentation required within the required time period, then the project shall be determined to be non-compliant, and the final inspection and approval for the project shall be withheld. A final inspection shall not take place until the applicant has implemented equivalent alternate measures approved by the compliance official or unless an exemption is granted for the project.

(6) Post final inspection requirement. Not later than one year after approval of the final building inspection, the applicant or current owner shall submit to the

compliance official documentation detailing compliance with the operation, efficiency, and conservation related credits from the approved checklist documentation for any covered project, if required by the compliance official. The applicant may also provide any additional information the applicant believes is relevant to determining its good faith efforts to comply with this chapter.

(7) Non-compliance. If, as a result of any inspection, the town determines that the covered project does not or is unlikely to comply with the approved plans or green building checklist, a stop order shall be issued if the compliance official determines that continuation of construction activities will jeopardize the project's ability to meet the required compliance threshold. The stop order shall remain in effect until the compliance official determines that the project will be brought into compliance with the approved plans and/or checklist.

(8) Interim compliance effort. For residential projects initiating construction not later than two years after the effective date of this chapter, a good faith effort shall be deemed to have been made when at least 75% of the required minimum green points have been achieved prior to final building inspection, and adequate remaining checklist points are outlined to demonstrate that at least 90% of the minimum points and GreenPoint certification will be achieved not later than one year after final inspection. For purposes of this subsection "initiating construction" shall mean the date when a building permit is issued. If 75% of the required minimum green points are not achieved prior to the request for final building inspection, the final inspection shall be withheld unless an exemption is granted by the compliance official. Residential projects initiating construction more than two years after the effective date of this chapter shall comply in full with the requirements of this chapter.

(9) Lack of inspectors. If the compliance official determines that there is a lack of third party or town inspectors available to perform green building inspections within a timely manner, the compliance official may allow self-verification of the project and determine that green building requirements have been met.

(c) The compliance official shall have the responsibility to administer and monitor compliance with the green building requirements set forth in this chapter and with any rules and regulations promulgated thereunder, and to grant exemptions from the requirements, where so authorized.

(d) Compliance with the provisions of this chapter shall be listed as a condition of approval on any architectural and site control review or other discretionary permit approval, and on the building plans for building permit approval, for any covered project.

15.10.070 Hardship or Infeasibility Exemption.

(a) Exemption. If an applicant for a covered project believes that circumstances exist that make it a hardship or infeasible to meet the requirements of this chapter, the applicant may request an exemption as set forth below. In applying for an exemption, the burden is on the applicant to show hardship or infeasibility.

(b) Application. If an applicant for a covered project believes such circumstances exist, the applicant may apply for an exemption at the time of application submittal. The applicant shall indicate the maximum threshold of compliance he or she believes is feasible for the covered project and the circumstances that he or she believes create a hardship or make it infeasible to fully comply with this chapter. Circumstances that constitute hardship or infeasibility include, but are not limited to the following:

(1) There is conflict with the compatibility of the green building rating system with other town goals, such as those requiring historic preservation;

(2) There is conflict with the compatibility of the green building rating system and the California Building Standards Code;

(3) There is conflict with the compatibility of the green building rating system and the town's zoning ordinance and/or architectural review criteria;

(4) The green building compliance standards do not include enough green building measures that are compatible with the scope of the covered project; and/or

(5) There is a lack of commercially available green building materials and technologies to comply with the green building rating system.

(c) Review by Architectural & Site Control Commission (ASCC). For any covered project for which an exemption is requested and architectural and site control review is required by the ASCC, the ASCC shall provide a recommendation to the compliance official regarding whether the exemption shall be granted or denied, along with its recommendation on the project. For any project for which an exemption is requested based on the historic character of the building or site, the town historian shall provide a recommendation to the compliance official regarding whether the exemption shall be granted or denied and shall determine whether the project is consistent with the Secretary of the Interior's Standards for Historic Rehabilitation.

(d) Granting of Exemption. If the compliance official determines that it is a hardship or is infeasible for the applicant to fully meet the requirements of this chapter based on the information provided, the compliance official shall determine the maximum feasible threshold of compliance reasonably achievable for the project. The decision of the compliance official shall be provided to the applicant in writing. If an exemption is granted, the applicant shall be required to comply with this chapter in all other respects

and shall be required to achieve, in accordance with this chapter, the threshold of compliance determined to be achievable by the compliance official.

(e) Denial of Exemption. If the compliance official determines that it is reasonably possible for the applicant to fully meet the requirements of this chapter, the request shall be denied and the compliance official shall so notify the applicant in writing. The project and compliance documentation shall be modified to comply with this chapter prior to further review of any pending planning or building application.

(f) Council Review of Exemption. For any covered project that requires review and action by the town council, the council shall act to grant or deny the exemption, based on the criteria outlined above, after recommendation by the manager.

15.10.080 Appeal.

(a) Any aggrieved applicant may appeal the determination of the compliance official regarding: (1) the granting or denial of an exemption pursuant to section 15.10.070; or (2) compliance with any other provision of this chapter.

(b) Any appeal must be filed in writing with the planning manager not later than fourteen days after the date of the determination by the compliance official. The appeal shall state the alleged error or reason for the appeal.

(c) The appeal shall be processed and considered by the town council.

3. Environmental Review. This ordinance is exempt from the California Environmental Quality Act pursuant to Section 15309 because it is an action taken by a regulatory agency for the protection of the environment.

4. Effective Date; Posting. This ordinance shall become effective thirty (30) days after the date of its adoption and shall be posted within the Town of Portola Valley in three (3) public places.

INTRODUCED:

PASSED:

AYES:

NOES:

ABSTENTIONS:

ABSENT:

RESOLUTION NO. 2490 -2010

A RESOLUTION OF THE TOWN COUNCIL OF THE TOWN OF PORTOLA VALLEY ADOPTING GREEN BUILDING STANDARDS FOR COMPLIANCE

WHEREAS, the Town Council of the Town of Portola Valley adopted Ordinance No. 2010-_____ adding Chapter 15.10 [Green Building] to Title 15 [Buildings and Construction] of the Portola Valley Municipal Code; and

WHEREAS, Section 15.10.040 requires the Town Council to establish by resolution, green building standards for compliance;

WHEREAS, the Town Council received and reviewed the recommendations of the Planning Commission and the Architectural & Site Control Commission subgroup regarding green building standards.

NOW THEREFORE, The Town Council of the Town of Portola Valley does hereby **RESOLVE** as follows:

The Town adopts the following green building standards for compliance:

1. New residential construction. New homes shall demonstrate GreenPoint rated certification using certified professional raters.

   A. For projects up to and including 3,000 sf. A minimum threshold of 75 BIG points, with GreenPoint rated certification prior to building permit sign-off/occupancy.

   B. For projects over 3,000 sf. A minimum threshold of 75 BIG points with one additional point for each 30 sf over 3,000 sf, and with GreenPoint rated certification prior to building permit sign-off/occupancy.

   C. Basement floor area. Basement floor area must be included in the total floor area for point calculations.

   D. LEED option. At the option of an applicant, the LEED for homes program may be used with a minimum threshold of silver LEED certification. Because LEED certification typically takes more time than is associated with BIG certification, the planning manager or his/her designee may as appropriate and in his/her sole discretion allow for some interim certification for occupancy prior to formal completion of the LEED process.

2. Substantial residential additions and/or rebuilding. For such projects make use of the BIG GreenPoint rated program for existing homes, with the threshold being the BIG minimum for a "whole house" project of 50 points and 25 points for a smaller "elements" project, both as defined by BIG. For a "whole house project" GreenPoint rated certification using certified professional raters shall be required and for an elements

project, self-certification is allowed. In all cases, new basement area would be counted as provided for above for "new construction" projects.

3. Small residential additions or remodels. For such projects completion of the BIG existing home checklist shall be required as a working/learning document, but no minimum points are required and self-certification is permitted. This would be for projects less than 400 sf in area, i.e. below the threshold for Architectural and Site Control Commission review.

4. Institutional and non-residential projects. The threshold for institutional and non-residential projects shall be the appropriate LEED program and formal LEED certification. The minimum LEED levels shall be as follows:

   A. For projects less than 2,000 sf the appropriate LEED or BIG checklist should be used and the points proposed verified though the self-certification process.

   B. For new buildings between 2,000 sf and 3,000 sf LEED certification with no minimum level.

   C. For new buildings between 3,000 and 5,000 sf, LEED silver certification.

   D. For new buildings over 5,000 sf LEED gold certification.

PASSED AND ADOPTED this ____ day of _____, 2010.

By:_____
Mayor

ATTEST:

_____
Town Clerk

Attachment 5

GreenPointRATED
A PROGRAM OF BUILD IT GREEN

NEW HOME RATING SYSTEM, VERSION 7.0 DRAFT

SINGLE FAMILY CHECKLIST

The GreenPoint Rated checklist tracks green features incorporated into the home. GreenPoint Rated is administered by Build It Green, a non-profit whose mission is to promote healthy, energy and resource efficient buildings in California.

The minimum requirements of GreenPoint Rated are: verification of 50 or more points; Earn the following minimum points per category: Community (2), Energy (25), Indoor Air Quality/Health (6), Resources (6), and Water (6); and meet the prerequisites CALGreen Mandatory, H6.1, J5.1, O1, O7.

The criteria for the green building practices listed below are described in the GreenPoint Rated Single Family Rating Manual. For more information please visit **www.builditgreen.org/greenpointrated**
Build It Green is not a code enforcement agency.

A home is only GreenPoint Rated if all features are verified by a Certified GreenPoint Rater through Build It Green.

Points Achieved: 0

Certification Level: None

POINTS REQUIRED

Single Family New Version 7 DRAFT

PROJECT NAME / MEASURES		Points Achieved	Possible Points: Community	Energy	IAQ/Health	Resources	Water	Status	NOTES
CALGreen									
TBD	**CALGreen Res (REQUIRED)**	0		1	1	1	1	Revised	Updated with 2016 CALGreen. Minor changes.
A. SITE									
TBD	**A1. Construction Footprint**					1			
	A2. Job Site Construction Waste Diversion								
TBD	A2.1 75% C&D Waste Diversion(**Including** Alternative Daily Cover)					2		Revised	Increase threshold to 75% to exceed CALGreen, which is 65%.
TBD	A2.2 65% C&D Waste Diversion (**Excluding** Alternative Daily Cover)					2			
TBD	A2.3 Recycling Rates from Third-Party Verified Mixed-Use Waste Facility					1		Revised	Add criteria that report from facility must be within the timeframe of submission.
TBD	**A3. Recycled Content Base Material**					1			
TBD	**A4. Heat Island Effect Reduction (Non-Roof)**			1					
TBD	**A5. Construction Environmental Quality Management Plan Including Flush-Out**				1				
	A6. Stormwater Control: Prescriptive Path								
TBD	A6.1 Permeable Paving Material						1		
TBD	A6.2 Filtration and/or Bio-Retention Features						1		
TBD	A6.3 Non-Leaching Roofing Materials						1		
TBD	A6.4 Smart Stormwater Street Design		1						
TBD	**A7. Stormwater Control: Performance Path**						3	Revised	Update criteria for qualification with design storm.
B. FOUNDATION									
TBD	**B1. Fly Ash and/or Slag in Concrete**					1			
TBD	**B2. Radon-Resistant Construction**				2				Add n/a as an option to accommodate compliance with EPA IAP when measure does not apply.
TBD	**B3. Foundation Drainage System**					2			
TBD	**B4. Moisture Controlled Crawlspace**				1				Add n/a as an option to accommodate compliance with EPA IAP when measure does not apply.
	B5. Structural Pest Controls								
TBD	B5.1 Termite Shields and Separated Exterior Wood-to-Concrete Connections					1			
TBD	B5.2 Plant Trunks, Bases, or Stems at Least 36 Inches from the Foundation					1			Provide clarification that this measure applies to planters on podiums with modified criteria.
C. LANDSCAPE									
	Enter the landscape area percentage								
TBD	**C1. Plants Grouped by Water Needs (Hydrozoning)**						1		
TBD	**C2. Three Inches of Mulch in Planting Beds**						1		
	C3. Resource Efficient Landscapes								
TBD	C3.1 No Invasive Species Listed by Cal-IPC					1			
TBD	C3.2 Plants Chosen and Located to Grow to Natural Size					1			
TBD	C3.3 Drought Tolerant, California Native, Mediterranean Species, or Other Appropriate Species						3		
	C4. Minimal Turf in Landscape								
TBD	C4.1 No Turf on Slopes Exceeding 10% and No Overhead Sprinklers Installed in Areas Less Than Eight Feet Wide						2		
TBD	C4.2 Turf on a Small Percentage of Landscaped Area						2		
TBD	**C5. Trees to Moderate Building Temperature**			1	1		1	Revised	Move 1 point to IAQ/ Health. Trees should be climatically appropriate to encourage survival.
TBD	**C6. High-Efficiency Irrigation System**						2		
TBD	**C7. One Inch of Compost in the Top Six to Twelve Inches of Soil**						2		

TBD	C8. Rainwater Harvesting System						2	Revised	Revise criteria to use water for indoor water use to supply toilets.
TBD	C9. Recycled Wastewater Irrigation System						1	Revised	Update criteria to limit application based on availability of recycled water.
TBD	C10. Submeter or Dedicated Meter for Landscape Irrigation						2		
TBD	C11. Landscape Meets Water Budget						2	Revised	Include 0.50, which is more stringent than the MWELO ordinanct of 0.55 ETAF. Maintain prerequisites. Reduced points to 1 point.
	C12. Environmentally Preferable Materials for Site								
TBD	C12.1 Environmentally Preferable Materials for 70% of Non-Plant Landscape Elements and Fencing					1			
TBD	C13. Reduced Light Pollution		1						
TBD	C14. Large Stature Tree(s)		1						
TBD	C15. Third Party Landscape Program Certification						1		
TBD	C16. Maintenance Contract with Certified Professional						1		
D. STRUCTURAL FRAME AND BUILDING ENVELOPE									
	D1. Optimal Value Engineering								
TBD	D1.1 Joists, Rafters, and Studs at 24 Inches on Center			1		2			
TBD	D1.2 Non-Load Bearing Door and Window Headers Sized for Load					1			
TBD	D1.3 Advanced Framing Measures					2			
TBD	D2. Construction Material Efficiencies					1			
	D3. Engineered Lumber								
TBD	D3.1 Engineered Beams and Headers					1			
TBD	D3.2 Wood I-Joists or Web Trusses for Floors					1			
TBD	D3.3 Engineered Lumber for Roof Rafters					1			
TBD	D3.4 Engineered or Finger-Jointed Studs for Vertical Applications					1			
TBD	D3.5 OSB for Subfloor					0.5			
TBD	D3.6 OSB for Wall and Roof Sheathing					0.5			
TBD	D4. Insulated Headers			1					
	D5. FSC-Certified Wood								
TBD	D5.1 Dimensional Lumber, Studs, and Timber					6			
TBD	D5.2 Panel Products					3			
	D6. Solid Wall Systems								
TBD	D6.1 At Least 90% of Floors					1			
TBD	D6.2 At Least 90% of Exterior Walls			1		1			
TBD	D6.3 At Least 90% of Roofs			1		1			
TBD	D7. Energy Heels on Roof Trusses			1					
TBD	D8. Overhangs and Gutters			1		1			
	D9. Reduced Pollution Entering the Home from the Garage								
TBD	D9.1 Detached Garage				2				
TBD	D9.2 Mitigation Strategies for Attached Garage				1				
	D10. Structural Pest and Rot Controls								
TBD	D10.1 All Wood Located At Least 12 Inches Above the Soil					1			
TBD	D10.2 Wood Framing Treated With Borates or Factory-Impregnated, or Wall Materials Other Than Wood					1			
TBD	D11. Moisture-Resistant Materials in Wet Areas (such as Kitchen, Bathrooms, Utility Rooms, and Basements)				1	1			
E. EXTERIOR									
TBD	E1. Environmentally Preferable Decking					1		Revised	Criteria clarifies that measure does not apply to patios.
TBD	E2. Flashing Installation Third-Party Verified					2			
TBD	E3. Rain Screen Wall System					2			
TBD	E4. Durable and Non-Combustible Cladding Materials					1			
	E5. Durable Roofing Materials								
TBD	E5.1 Durable and Fire Resistant Roofing Materials or Assembly					1			
TBD	E6. Vegetated Roof		2	2					
F. INSULATION									
	F1. Insulation with 30% Post-Consumer or 60% Post-Industrial Recycled Content								
TBD	F1.1 Walls and Floors					1			
TBD	F1.2 Ceilings					1			
	F2. Insulation that Meets the CDPH Standard Method—Residential for Low Emissions								
TBD	F2.1 Walls and Floors				1				
TBD	F2.2 Ceilings				1				
	F3. Insulation That Does Not Contain Fire Retardants								
TBD	F3.1 Cavity Walls and Floors				1				
TBD	F3.2 Ceilings				1				
TBD	F3.3 Interior and Exterior				1				
G. PLUMBING									
	G1. Efficient Distribution of Domestic Hot Water								
TBD	G1.1 Insulated Hot Water Pipes			1					
TBD	G1.2 WaterSense Volume Limit for Hot Water Distribution						1		
TBD	G1.3 Increased Efficiency in Hot Water Distribution						2		
	G2. Install Water-Efficient Fixtures								

TBD	G2.1 WaterSense Showerheads 1.8gpm with Matching Compensation Valve						2	Revised	Changed threshold 1.8gpm or less flow rate.
TBD	G2.2 WaterSense Bathroom Faucets 1.0 gpm						1	Revised	Changed threshold to to 1.0gpm.
TBD	G2.3 WaterSense Toilets								
	G2.3.1. WaterSense Toilets- 1.28 gpf with a Maximum Performance (MaP) Threshold of No Less Than 500 Grams						1		
	G2.3.2. WaterSense Toilets- 1.1 gpf with a Maximum Performance (MaP) Threshold of No Less Than 500 Grams						1	New	Add new measure for lower flow toilets that are still high performing.
TBD	**G3. Pre-Plumbing for Graywater System**						1		
TBD	**G4. Operational Graywater System**						3	Revised	Allow for indoor and outdoor. Focus on outdoor water use.
	G6. Thermostatic Shower valve or tubspout						1	New	Add thermostatic shower valve and/or anto-diversion tub spout with TSV.
H. HEATING, VENTILATION, AND AIR CONDITIONING									
	H1. Sealed Combustion Units								
TBD	H1.1 Sealed Combustion Furnace				1				
TBD	H1.2 Sealed Combustion Water Heater				2				
TBD	**H2. High Performing Zoned Hydronic Radiant Heating System**			1	1				
	H3. Effective Ductwork								
TBD	H3.1 Duct Mastic on Duct Joints and Seams			1					
TBD	H3.2 Pressure Balance the Ductwork System			1					
TBD	**H4. ENERGY STAR® Bathroom Fans Per HVI Standards with Air Flow Verified**				1				
	H5. Advanced Practices for Cooling								
TBD	H5.1 ENERGY STAR Ceiling Fans in Living Areas and Bedrooms			1					
	H6. Whole House Mechanical Ventilation Practices to Improve Indoor Air Quality								
TBD	H6.1 Meet ASHRAE 62.2-2016 Ventilation Residential Standards	N	R	R	R	R	R	Revised	Updated to 2016 standard.
TBD	H6.2 Advanced Ventilation Standards				1			Revised	Revised to included outdoor air ducted to Bedroom and Living Areas. Includes requirements for filter and efficiency.
TBD	H6.3 Outdoor Air Ducted to Bedroom and Living Areas				2			Deleted	Accounted for in Advanced Ventilation Standards.
	H7. Effective Range Hood Design and Installation								
TBD	H7.1 Effective Range Hood Ducting and Design				1				
TBD	H7.2 Automatic Range Hood Control				1				
TBD	**H8. High Efficiency HVAC Filter (MERV 13+)**				1			Revised	MERV 13 filter with static pressure test to meet manufacturers listing. Supply resident with 4 extra for change out.
TBD	**H9 Low Global Warming Potenial Refrigerants**				1			New	Provide credit for CO2 refrigerants that have a low GWP. This will also be accounted for in climate calculator.
TBD	**H10. No Fireplace or Sealed Gas Fireplace**				1				
TBD	**H11. Humidity Control Systems**				1				
TBD	**H12. Register Design Per ACCA Manual T**			1					
I. RENEWABLE ENERGY									
TBD	**I1. Pre-Plumbing for Solar Water Heating**			1					
TBD	**I2. Preparation for Future Photovoltaic Installation**			1				Revised	Update to reflect 2016 Code and best practices for panel and breaker capacity and fall arrest anchors.
	I3. Onsite Renewable Generation (Solar PV, Solar Thermal, and Wind)			25					
	I4. Net Zero Energy Home								
TBD	I4.1 Near Zero Energy Home			2					
TBD	I4.2 Net Zero Electric			4					
TBD	**I7. Energy Storage System**		1	2				New	Install energy storage system to address loads to support loads when PV production is not available.
J. BUILDING PERFORMANCE AND TESTING									
TBD	**J1. Third-Party Verification of Quality of Insulation Installation**				1				
TBD	**J2. Supply and Return Air Flow Testing**			1	1				
TBD	**J3. Mechanical Ventilation Testing**				1			Revised	Removed low leakage requirement
TBD	**J4. Combustion Appliance Safety Testing**				1				
	J5. Building Energy Performance								
0.00%	J5.1 Home Meets or Exceeds Energy Compliance Pathway	0		60				Revised	Update threshold and pathways to reflect 2016 code, all electric pathway, Whole ebuilding energy reduction pathway and Energy Design Rating.
TBD	**J6. Title 24 Prepared and Signed by a CABEC Certified Energy Analyst**			1					
TBD	**J7. Participation in Utility Program with Third-Party Plan Review**			1					
TBD	**J8. ENERGY STAR for Homes**			1					
No	**J9. EPA Indoor airPlus Certification**	0			1			Revised	For all IAP measures included in the checklist n/a will be included as an option.
TBD	**J10. Blower Door Testing**				2			Revised	Adding 3rd tier for 1.5 for unbalanced and 0.6 for balanced.

K. FINISHES										
	K1. Entryways Designed to Reduce Tracked-In Contaminants									
TBD	K1.1 Individual Entryways				1					
TBD	**K2. Zero-VOC Interior Wall and Ceiling Paints**				2					
TBD	**K3. Low-VOC Caulks and Adhesives**				1					
	K4. Environmentally Preferable Materials for Interior Finish									
TBD	K4.1 Cabinets					2				
TBD	K4.2 Interior Trim					2				
TBD	K4.3 Shelving					2				
TBD	K4.4 Doors					2				
TBD	K4.5 Countertops					1				
	K5. Formaldehyde Emissions in Interior Finish Exceed CARB									
TBD	K5.1 Doors				1					
TBD	K5.2 Cabinets and Countertops				2					
TBD	K5.3 Interior Trim and Shelving				2					
TBD	**K6. Products That Comply With the Health Product Declaration Open Standard**				2					
TBD	**K7. Indoor Air Formaldehyde Level Less Than 27 Parts Per Billion**				2					
No	**K8. Comprehensive Inclusion of Low Emitting Finishes**	0			1					
L. FLOORING										
TBD	**L1. Environmentally Preferable Flooring**					3				
TBD	**L2. Low-Emitting Flooring Meets CDPH 2010 Standard Method—Residential**				3					
TBD	**L3. Durable Flooring**					1				
TBD	**L4. Thermal Mass Flooring**			1						
M. APPLIANCES AND LIGHTING										
TBD	**M1. ENERGY STAR® Dishwasher**						1			
	M2. Laundry Appliances									
TBD	**M2.1 CEE-Rated Clothes Washer**			1			2			
TBD	**M2.2 Energy Star Dryer**			1				New	Credit for Energy Star dryers.	
TBD	**M2.3 Solar Dryer**			0.5				New	Credit for laundry lines of specific length.	
TBD	**M3. Size-Efficient ENERGY STAR Refrigerator**			2						
	M4. Permanent Centers for Waste Reduction Strategies									
TBD	M4.1 Built-In Recycling Center					1				
TBD	M4.2 Built-In Composting Center					1				
	M5. Lighting Efficiency									
TBD	M5.1 High-Efficacy Lighting			2				Revised	Lighting meets JA8 plus 70lpw efficacy.	
TBD	M5.2 Lighting System Designed to IESNA Footcandle Standards or Designed by Lighting Consultant			2						
	M6. Electric Vehcle Charging Stations and Infrastructure			1				New	Fully installed circuit for single family .	
N. COMMUNITY										
	N1. Smart Development									
TBD	N1.1 Infill Site		1			1				
TBD	N1.2 Designated Brownfield Site		1			1		Revised	Move points from IAQ to resources.	
TBD	N1.3 Conserve Resources by Increasing Density			2		2				
TBD	N1.4 Cluster Homes for Land Preservation		1			1				
	N1.5 Home Size Efficiency					9				
	Enter the area of the home, in square feet									
	Enter the number of bedrooms									
	N2. Home(s)/Development Located Near Transit									
TBD	**Within 1/2 Mile of a Major Transit Stop**		2					New	Measures must include reasonable access to transit to encourage use.	
TBD	**Within 1 mile of a Major Transit Stop**		1					Revised	Measures must include reasonable access to transit to encourage use.	
	N3. Pedestrian and Bicycle Access									
	N3.1 Pedestrian Access to Services Within 1/2 Mile of Community Services		2							
	Enter the number of Tier 1 services									
	Enter the number of Tier 2 services									
TBD	N3.2 Connection to Pedestrian Pathways		1							
TBD	N3.3 Traffic Calming Strategies		2							
	N4. Outdoor Gathering Places									
TBD	N4.1 Public or Semi-Public Outdoor Gathering Places for Residents		1							
TBD	N4.2 Public Outdoor Gathering Places with Direct Access to Tier 1 Community Services		1							
	N5. Social Interaction									
TBD	N5.1 Residence Entries with Views to Callers		1							
TBD	N5.2 Entrances Visible from Street and/or Other Front Doors		1							
TBD	N5.3 Porches Oriented to Street and Public Space		1							
	N6. Passive Solar Design									
TBD	N6.1 Heating Load			2						
TBD	N6.2 Cooling Load			2						
	N7. Adaptable Building									
TBD	N7.1 Universal Design Principles in Units		1		1					
TBD	N7.2 Full-Function Independent Rental Unit		1							
	N8. Resiliency									

TBD	N8.1 Assessment		1		1	1		New	Complete assessment protocol to evaluate vulnerability to climate change impacts.
TBD	N8.2 Strategies to Address Assessment Findings		1		1	1		New	Implement strategies that address findings from assessment to improve durability and resiliency of buildings.
TBD	**N9. Social Equity**		1					New	Based on community engagement outreach efforts, implement community services or workforce development to support local community.
O. OTHER									
TBD	**O1. GreenPoint Rated Checklist in Blueprints**	N	R	R	R	R	R		
TBD	**O2. Pre-Construction Kickoff Meeting with Rater and Subcontractors**			0.5		1	0.5		
TBD	**O3. Orientation and Training to Occupants—Conduct Educational Walkthroughs**			0.5	0.5	0.5	0.5		
TBD	**O4. Builder's or Developer's Management Staff are Certified Green Building Professionals**			0.5	0.5	0.5	0.5		
	O5. Home System Monitors						1		
TBD	O5.1 Energy Home System Monitors			1				Revised	Separate out energy and water.
TBD	O5.2. Water Home System Monitors			1				Revised	Separate out energy and water.
	O6. Green Building Education								
TBD	O6.1 Marketing Green Building		2						
TBD	O6.2 Green Building Signage			0.5			0.5		
TBD	**O7. Green Appraisal Addendum**	N	R	R	R	R	R		
TBD	**O8. Detailed Durability Plan and Third-Party Verification of Plan Implementation**					1			

Summary							
Total Available Points in Specific Categories	357.5	29	136.5	57	86	49	
Minimum Points Required in Specific Categories	50	2	25	6	6	6	
Total Points Achieved	0.0	0.0	0.0	0.0	0.0	0.0	

Executive Summary

Proposed Updates to GreenPoint Rated Version 7.0
New Single Family and Multifamily Programs

Introduction

With more than 43,000 certified units, GreenPoint Rated has emerged as the most trusted home rating system in California. Now that California has updated California Codes and Regulations and Building Energy Efficiency Standards (Title 24, Part 6) with stronger minimum standards, GreenPoint Rated is being updated in tandem. With Version 7.0, GreenPoint Rated will continue to reflect the leading edge of green building practices and certify buildings that go above and beyond CALGreen code.

As California sets its sights on net zero energy and low carbon homes, GreenPoint Rated provides a pathway for the market to achieve these goals. Public comment from a diversity of stakeholders is critical to ensuring the success of Version 7.0. This Executive Summary provides an overview of the changes and updates to help commenters more easily review the materials. Public comment will take place September 14–29. Version 7.0 will be finalized and released in October 2016, and will go into effect on Jan. 1, 2017, in conjunction with the updated state codes.

Version 7.0 presents the opportunity to add new measures to support our low carbon goals for building in California, as well as respond to climate change issues. Overall, Version 7.0 represents minor updates that build upon the significant update completed for Version 6.0. Updates include revised measures and energy compliance pathways to align with the 2016 California Code of Regulations (California Building Code), which will be effective January 1, 2017.

While the Existing Home Rating Systems for both single family and multifamily need to be updated, this update process is focused on the New Home Rating Systems. Comments are welcome on all rating systems, but the existing home systems will undergo a separate review process at a later date.

Program Checklists

The current checklists, GreenPoint Rated New Home Single Family (NHSF) and New Home Multifamily (NHMF) Version 6.1, are appropriate for projects permitted under the 2013 California Building Code.

This update process will result in the New Home Rating Systems advancing to Version 7.0. A project permitted under the 2016 Code will use the New Home Single Family Version 7.0 or New Home Multifamily Version 7.0 system.

The update process reviews measures on the checklists, current trends, future codes, and input from the public sector, building professionals, and selected stakeholder groups. This analysis has resulted in the following revisions to the program:

- Deleting measures that have become code-required
- Addressing CALGreen mandatory measures
- Adding new measures for current best practices
- Improving and clarifying definitions of current measures
- Clarifying criteria for qualification of current measures

The entire update process includes extensive stakeholder outreach and input from subject matter experts, as well as public comment periods. The process consists of two public comment periods of the proposed Version 7.0 GreenPoint Rated program for the New Home rating systems only. Build It Green has completed an annotated draft checklist for both single family and multifamily new homes rating systems to correspond with the 2016 California Green Building and Energy Efficiency Standards.

This second comment period includes the draft version 7.0 checklist for both Single Family and Multifamily New Homes and the summary of the new measures.

GreenPoint Rated Proposed Design Changes

- **Energy evaluation.** GreenPoint Rated establishes the energy performance threshold based on a cost-benefit analysis to meet and exceed code, as well as alignment with the program criteria of various stakeholders. Historically, the threshold has aligned with the energy performance thresholds of the Investor Owned Utilities. That said, as we move toward lower energy use and lower carbon homes, GreenPoint Rated is evolving and has developed four energy compliance pathways. Each of the four pathways will earn at least the minimum 25 points for compliance.

    1. GreenPoint Rated, as historically done, has a compliance pathway using a percentage compliance margin over the current, or in this case, 2016 Energy Code. This is for dual fuel homes.

        - Single Family: 10% compliance margin over 2016 Title 24
        - Multifamily:
            - Low rise – 10% compliance margin over 2016 Title 24
            - High rise - 10% compliance margin over 2016 Title 24
        - Photovoltaics cannot be used to meet compliance. Photovoltaics may be used to exceed the Energy Code budget

    2. In addition to the compliance margin, GreenPoint Rated will continue to provide a pathway for an all-electric home. The approach for compliance, for **both single family and multifamily**, is as follows:

        - 2% - 5% compliance margin (pending analysis)
        - Prescriptive requirements: water heating that includes either the installation of a HPWH with an energy factor of 3.2 or greater or a solar thermal system with a minimum 30% solar fraction
        - All electric homes must a photovoltaic system
        - Photovoltaics may be used to meet compliance

    3. Whole Building Energy Use Reduction

        - GreenPoint Rated will provide a pathway to zero net energy as a third alternative for program compliance. This alternative will conceptually require a project to demonstrate a percentage reduction over whole building use based on the GreenPoint Rated Energy and Water Calculator. It is anticipated that the percentage will be in the range of 25%.

    4. Energy Design Rating (EDR)

        - GreenPoint Rated will work to develop a compliance pathway using Energy Design Rating (EDR) provided through the compliance software. The EDR is the sum of the annual TDV energy consumption for energy use components included in the

performance compliance approach for the Standard Design Energy Provisions of the California Green Building Standards Code and the annual TDV energy consumption for lighting and components not regulated by Title 24, Part 6 (such as domestic appliances and consumer electronics) and accounting for the annual TDV energy offset by an on-site renewable energy system. The Design Rating is calculated by Compliance Software certified by the Energy Commission. This metric moves towards a whole building metric as well as the above option.

- **CALGreen.** CALGreen residential and non-residential mandatory measures will still be prerequisites for GreenPoint Rated. The CALGreen checklists have been updated to reflect the 2016 California Green Building Code. For New Home projects, points will continue to be allocated for CALGreen compliance as follows: four points (one in each Energy, IEQ/Health, Resources, and Water). Although GreenPoint Rated is a residential rating system, the non-residential standards have been included in the prerequisites for buildings where required, whereby the GreenPoint Rater will verify CALGreen Measures to facilitate verification of CALGreen compliance. The commercial portion of the building is not part of the GreenPoint Rated certification. This verification is not intended to replace code inspection (enforcement), unless authorized by the authority having jurisdiction. There are very minor changes to CALGreen from the 2013 standards. Some of the changes include reduction in flow rater for lavatory faucets, increase in recycling rate for C&D waste to 65%. Please see updated CALGreen checklists for Residential and Non-Residential.

- **Prerequisites.** Below is a summary of the prerequisites for New Home rating systems. There is no change in prerequisite measures, with the exception of changes within the CALGreen mandatory measures for code compliance. ASHRAE 62.2 - 2016 applies to all residential occupancies.

Table 1. Summary of Prerequisites

Measure Category	New Home Single Family	New Home Multifamily
CALGreen Residential	X	X
CALGreen Non Residential		If required
Energy Performance	See above	See above
GreenPoint Rated Checklist on Blueprints	X	X
ASHRAE 62.2-2016	X	X
Durable Roofing		X
Green Appraisal Addendum	X	X
Minimum points in each category	X	X
Minimum Total Points	50	50

- **Other Measures.** The annotated checklist identifies anticipated changes to specific measures for both Single Family and Multifamily. These changes have been vetted with subject matter experts and informed by the appropriate codes and standards.

  Below is a brief description of new measures that are being proposed for the version 7 checklist. Please see the pdf of Single Family and Multifamily Checklists.

  - **G2.3.2. WaterSense Toilets- 1.1 gpf with a Maximum Performance (MaP) Threshold of No Less Than 500 Grams.** An additional point for a high performance 1.1 gpf toilet.
  - **G6. Thermostatic Shower valve or tubspout.** One point for installation of thermostatic shower valves or anto-diverting tubspout with TSV in all bathrooms. This technology helps reduce water wasted after hot water arrives at the fixture (behavioral waste).
  - **H9. Low Global Warming Potential Refrigerants.** One point for low-GWp refrigerants in cooling equipment. Current refrigerants include HCFs which have no ozone depletion potential, but have global warming potential when released into the atmosphere. Ideal refrigerants have aero ODP, zero GWP, non-toxic, non-flammable, acceptable operating pressures, and volumetric capacity appropriate to the application.
  - **J11. Compartmentalization of units.** Two points are available for minimizing leakage between units by minimizing the uncontrolled pathways for indoor air pollutants between units. This includes prescriptive sealing requirements and performance testing using a blower door.
  - **I7. Energy Storage.** Credit awarded to providing on site energy storage to support a portion of household energy use when solar production is not viable. This includes both thermal and electrochemical storage. This measure may be moved to the innovation list to allow for further evaluation.
  - **M2.2 Energy Star Dryer.** One point is available for an Energy Star Dryer. Dryers have become an increasing portion of residential energy use as standards for heating, cooling and domestic hot water have increased and efficiencies have improved.
  - **M2.3 Solar Dryer.** Half a point will be awarded for providing a laundry line to support solar drying. The laundry line must be a minimum of 70 feet to support a load of laundry. This measure may be moved to the innovations list.
  - **M6. Electric Vehicle Charging Stations and Infrastructure.** One point will be awarded for installation of a full circuit for a single family home. Current code requires the raceway to be installed. For multifamily projects, one point of credit is available for installing infrastructure to support the future installation of charging stations to meet Tier 2 thresholds OR two points are available for installing the full circuit to support the Tier 2 thresholds.
  - **N2.1 Within 1 mile of a Major Transit Stop.** One additional point is available for developments within 1 mile of a major transit stop with reasonable access to encourage walking or biking to the transit point. This is to further encourage alternatives to driving.
  - **N8.1 Vulnerability Assessment.** Three points are available for conducting a vulnerability assessment for a project to understand implications from climate change. While this measure may evolve over time, it is important that we would like to include it on the main checklist.
  - **N8.2. Strategies to Address Assessment Findings.** Three points will be awarded to implement strategies that address the high potential impacts from the assessment findings to improve the resiliency and durability of buildings.
  - **N9. Social Equity.** Two points are available for projects that complete a community outreach effort to engage with local community and provide a percentage of jobs for the project to local residents or provide a service to meet local needs.
  - **O11. Tobacco free buildings.** One point is awarded for properties with a no smoking policy in the building to reduce the exposure of second hand smoke.

- **O12. IPM Management Plan.** One point is available for developing an IPM Management Plan and entering into a 5 year contract to fulfill those services as defined in the plan. A well-defined Integrated Pest Management (IPM) is a program that should be based on prevention, monitoring, and control which offers the opportunity to eliminate or drastically reduce the use of pesticides, and to minimize the toxicity of and exposure to any products which are used. IPM does this by utilizing a variety of methods and techniques, including cultural, biological and structural strategies to control a multitude of pest problems.

- **Innovation Measures.** There are several measures that Build It Green is investigating but will not be included on the main checklist at this time; they will be available through the innovations list. These measures are being developed and will evolve over time. Therefore, the innovation measure list affords this flexibility.

  Interested parties are welcome to contact Build It Green to engage in these discussions to support the evaluation of the measures below. Some of the measures that are being evaluated are:

  - **Decarbonization prescriptive approach by building type.** While GreenPoint Rated does capture and quantify the greenhouse gas emissions of green building with a code baseline, there is no set carbon footprint. In the long term, we will be evaluating the definition of the decarbonized/ low carbon home and look to align with research being undertaken by Air Resources Board. In the short term, we will be evaluating the opportunity to define a prescriptive approach to the fuel use for heating, cooling and domestic hot water for a low carbon home.
  - **Performance metric for dampness in home.** Dampness in a home has implications on durability as well as creating an environment for mold which can adversely affect health. We are evaluating the opportunity to provide a performance metric on the dampness of a home to support more durable and healthier homes.
  - **Encapsulation of spray foam in sealed attic conditions.** Studies have been completed on occupational hazards with application of spray foam. There are initial investigations on the conditions that may impact occupants.

CA Statewide Codes and Standards Program

Title 24, Part 11
Local Energy Efficiency Ordinances

CALGreen Cost Effectiveness Study

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LEGAL NOTICE

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Table of Contents

List of Tables

List of Figures

1 Introduction

The California Building Energy Efficiency Standards Title 24, Part 6 (Title 24) (CEC, 2016b) is maintained and updated every three years by two state agencies, the California Energy Commission (CEC) and the Building Standards Commission (BSC). In addition to enforcing the code, local jurisdictions have the authority to adopt local energy efficiency ordinances, or reach codes, that exceed the minimum standards defined by Title 24 (as established by Public Resources Code Section 25402.1(h)2 and Section 10-106 of the Building Energy Efficiency Standards). Local jurisdictions must demonstrate that the requirements of the proposed ordinance are cost effective and do not result in buildings consuming more energy than is permitted by Title 24. In addition, the jurisdiction must obtain approval from the CEC and file the ordinance with the BSC for the ordinance to be legally enforceable.

This report presents the results from analysis of the feasibility and cost-effectiveness of requiring new low-rise single family and multifamily residential construction to exceed the 2016 Building Energy Efficiency Standards, which become effective January 1, 2017. The analysis includes scenarios of compliance packages options and cost effectiveness analysis for all sixteen California climate zones. Four levels of building energy performance were examined:

(1) exceeding the minimum requirements by at least 15%, consistent with the voluntary Tier 1 Performance Standard in Title 24, Part 11 (CALGreen),

(2) exceeding minimum requirement by at least 30%, consistent with the voluntary Tier 2 Performance Standard in CALGreen,

(3) meeting minimum Title 24 efficiency performance targets plus on-site renewable energy generation sufficient to achieve an Energy Design Rating of zero (TDV-Zero), consistent with the voluntary Zero Net Energy Design tier in CALGreen,

(4) meeting minimum Title 24 efficiency performance targets plus on-site renewable energy generation sized to offset a portion of the total TDV loads of the building without risking sizing of the PV system larger than the estimated electrical energy use of the building.

2 Methodology and Assumptions

2.1 Building Prototypes

The CEC defines building prototypes which it uses to evaluate the cost-effectiveness of proposed changes to Title 24 requirements. There exist two single family prototypes and one multifamily prototype, all three of which are used in this analysis in development of the above-code efficiency packages. Table 1 describes the basic characteristics of each prototype. Additional details on the prototypes can be found in the ACM Approval Manual (CEC, 2016a).

Table 1: Prototype Characteristics

	Single Family One-Story	**Single Family Two-Story**	**Multifamily**
Conditioned Floor Area	2,100 ft^2	2,700 ft^2	6,960 ft^2: (4) 780 ft^2 & (4) 960 ft^2 units
Num. of Stories	1	2	2
Num. of Bedrooms	3	3	(4) 1-bed & (4) 2-bed units
Window-to-Floor Area Ratio	20%	20%	15%

Additionally, each prototype building has the following features:

- Slab-on-grade foundation
- Vented attic. High performance attic in climates where prescriptively assigned (CZ 4, 8-16) with insulation installed below roof deck. Refer to Table 150.1-A in Appendix A.
- Ductwork located in the attic for single family homes and in conditioned space for multifamily.
- Split-system gas furnace with air conditioner that meet the minimum federal guidelines for efficiency
- Tankless gas water heater that meets the minimum federal guidelines for efficiency; individual water heaters in each multifamily apartment.

Other features are defined consistent with the Standard Design in the Alternative Calculation Method Reference Manual (CEC, 2016d), designed to meet, but not exceed, the minimum requirements.

The CEC's standard protocol for the single family prototypes is to weight the simulated energy impacts by a factor that represents the distribution of single-story and two-story homes being built statewide, assuming 45% single-story homes and 55% two-story homes. Simulation results in this study are therefore characterized according to this ratio, which is approximately equivalent to a 2,430 ft^2 house[1].

2.2 Efficiency Measures & Package Development

The CBECC-RES 2016.2.0 ALPHA2[2] (833) compliance simulation tool was used to evaluate energy impacts using the 2016 prescriptive standards as the benchmark and the 2016 time dependent valuation (TDV) values. TDV is the energy metric used by the CEC since the 2005 Title 24 energy code to evaluate compliance with the Title 24 standards. TDV values energy use differently depending on the fuel source (gas, electricity, and propane), time of day, and season. TDV was developed to reflect the "societal value or cost" of energy including long-term projected costs of energy such as the cost of providing energy during peak periods of demand and other societal costs such as projected costs for carbon emissions. Electricity used (or saved) during peak periods of the summer has a much higher value than electricity used (or saved) during off-peak periods (Horii et al, 2014).

The methodology used in the analyses for each of the prototypical building types begins with a design that precisely meets the minimum 2016 prescriptive requirements (0% compliance margin). A table of prescriptive measures used in each base design by climate zone is located in Appendix A. Using the 2016 baseline as the starting point, prospective energy efficiency measures were identified and modeled in each of the prototypes to determine the projected energy (Therm and kWh) and compliance impacts. A large set of parametric runs[3] were conducted to develop packages of measures that exceed the minimum code performance level by 15% (CALGreen Tier 1), and 30% (Tier 2). The consultants authoring this study selected packages and measures based on decades of experience with residential architects, builders, and engineers along with general knowledge of the relative acceptance and preferences of many measures, as well as their incremental costs.

[1] 2,430 ft^2 = 45% * 2,100 ft^2 + 55% * 2,700 ft^2

[2] On June 14, 2016 the CEC approved CBECC-Res 2016.2.0 Version of the software. The version used for this study is nearly identical to the approved version with the exception of minor changes that do not affect the cost effective analysis of the measures evaluated.

[3] Using the "quick" simulation speed option.

Evaluation results for the selected packages show that meeting the performance targets for both single family and multifamily prototypes is feasible in most climate zones. In climates where it was not feasible, targets were relaxed to an appropriate level. It is important to note that the packages contained in this report are examples only; any project meeting requirements of a local ordinance, both single family and multifamily, must independently evaluate and identify the most cost effective approach based on project-specific factors.

Following are descriptions of each of the efficiency measures applied in this analysis.

Quality Insulation Installation (QII): HERS rater verification of insulation quality according to the procedures outlined in the 2016 Reference Appendices RA3.5 (CEC, 2016c). QII is included in all cases since it is a pre-requisite for all the voluntary tiers in 2016 CALGreen.

Reduced Infiltration (ACH50): HERS rater field verification and diagnostic testing of building air leakage according to the procedures outlined in the 2016 Reference Appendices RA3.8 (CEC, 2016c). The default infiltration assumption for single family homes is 5 air changes per hour at 50 Pascals (ACH50)[4] and the reduced level applied in this analysis is 3 ACH50. This measure was not applied to multifamily homes because the modeling software does not allow this credit unless each unit is modeled individually, which is not typical in the compliance process for multifamily buildings.

Window Performance: Reduce window U-value from the prescriptive value of 0.32 to 0.30 in all climates and reduce the solar heat gain coefficient (SHGC) from the prescriptive value of 0.25 to 0.23 in climate zone 2, 4, 6 through 16. In climate zones 1, 3, and 5 there is no prescriptive SHGC requirement and the default value of 0.50 is left as is.

Door Performance: Install insulated doors that meet a U-value of 0.20 at the front entry and doors between the house and garage. It's assumed there is a single 3' x 6'8" entry door per single family home and multifamily unit as well as a second 3' x 6'8" door to the garage per single family home.

Cool Roof: Install a roofing product that's rated by the Cool Roof Rating Council to have an aged solar reflectance of 0.20. This measure only applies to climates zones where this is not already required prescriptively.

Exterior Wall Insulation: Increase wall cavity insulation from R-19 to R-21 in 2x6 walls.

High Performance Attics (HPA): For climates where HPA is not already prescriptive under the 2016 code (CZ 1-3, 5-7), increase attic ceiling insulation to R-38 and add insulation under the roof deck between framing (R-13 for roof with air space, R-18 for roof without air space).

High Efficiency Furnace: Upgrade furnace to a condensing unit with an efficiency of 92% AFUE.

High Efficiency Air Conditioner: Upgrade air conditioner efficiency beyond federal efficiency minimum to either SEER 15 / EER 12.5 or SEER 16 / EER 13.

High Efficacy Fan: Upgrade the fan in the furnace or air handler using an electronically commutated motor (ECM) that meets an efficacy of 0.3 Watts / cfm or lower operating at full speed. Fan watt draw is verified by a HERS rater according to the procedures outlined in the 2016 Reference Appendices RA3.3 (CEC, 2016c). New federal regulations that go into effect July 3, 2019 are expected to result in equivalent performance for all newly manufactured furnaces provided that the ducts are sized properly.

[4] Whole house leakage tested at a pressure difference of 50 Pascals between indoors and outdoors.

Refrigerant Charge Verification: HERS rater verification of proper air conditioner refrigerant charge according to the procedures outlined in the 2016 Reference Appendices RA3.2 (CEC, 2016c). This measure only applies to climates zones where this is not already required prescriptively.

R-8 Duct Insulation: Increase duct insulation to R-8. This measure only applies to climates zones where R-8 ducts are not already required prescriptively.

High Efficiency Water Heater: Upgrade tankless water heater to a condensing unit with a rated Energy Factor (EF) of either 0.94 or 0.96.

Hot Water Pipe Insulation: Beginning in January 1, 2017 the 2016 California Plumbing Code will require pipe insulation levels that are close to that required if taking the Title-24 pipe insulation credit. This credit will be obsolete under the 2016 energy code, however, the HERS-Verified Pipe Insulation Credit, as defined in the 2016 Reference Appendices RA3.6.3 (CEC, 2016c), will remain. While CBECC-Res has not yet been updated to reflect this, for this analysis it was assumed that the revised HERS verified credit would be equivalent to the current credit for pipe insulation without HERS verification. This was determined based on simulations that demonstrated the HERS credit to be valued at roughly twice that for pipe insulation without verification in terms of TDV energy. This credit was only applied to single family residences. For costing purposes, 120 linear feet of 1/2in insulated pipe is assumed to be insulated.

Hot Water Compact Distribution: HERS rater verification of compact distribution system requirements according to the procedures outlined in the 2016 Reference Appendices RA3.6.5 (CEC, 2016c). This measure was applied to multifamily buildings only. Many multifamily buildings with individual water heaters are expected to easily meet this credit with little or no alteration to plumbing design. This measure also requires verification of pipe insulation per the HERS-Verified Pipe Insulation Credit. Assumption is 60 linear feet per dwelling unit of 1/2in insulated pipe.

PV Compliance Credit: To be eligible for this compliance credit a PV system with a minimum capacity of 2 kW DC per single family home with no more than 2,000 ft^2 of conditioned floor area and 1 kW DC per multifamily unit with no more than 1,000 ft^2 of conditioned floor area is required. For the single family 2,430 ft^2 prototype the minimum capacity as calculated by CBECC-Res is 2.0 kW to 2.4 kW depending on the climate zone. The multifamily apartment units in the prototype are all under 1,000 ft^2 and therefore require a 1 kW system. The credit was developed to give builders an option with which to trade-off High Performance Attics and Walls, and to begin preparing for ZNE requirements.

Table 2 below summarizes the measures evaluated along with cost assumptions.

Table 2: Measure Descriptions & Cost Assumptions

Measure	Performance Level	Incremental Cost Single Family	Incremental Cost MF – Per Unit	Source & Notes
QII	Yes	$519	$133	City of Palo Alto 2016 Reach Code Ordinance: http://www.cityofpaloalto.org/civicax/filebank/documents/52054
ACH50	3.0	$379	n/a	NREL measure cost database ($0.115/ft^2 for sealing) + HERS rater verification ($100).
Wall Insulation	R-21	$164	n/a	2016 CASE Report: Residential High Performance Walls and QII, 2016-RES-ENV2-F
Cool Roof	Aged Reflect = 0.20	$523	$131	$0-$0.50 / ft^2 of roof area per local industry expert at LBNL. Used average of $0.25/ft^2.
Window U-factor/ SHGC	0.30/0.23	$73	$20	EnerComp ($0.15/ft^2 of window area)
Doors	0.20 U-factor	$210	$140	NREL measure cost database ($3.50/ft^2) for doors between house and garage. Double cost ($7/ft^2) for front door assuming a premium product.
High Performance Attics (HPA)	R-15 under roof deck	$878	$219	For climate zones 1-3, & 5-7 only where HPA is not prescriptive. 2016 CASE Report: Residential Ducts in Conditioned Space / High Performance Attics, 2016-RES-ENV1-F
Furnace	92%	$389	$351	Local HVAC contractor, MF reduction for smaller capacity.
Air Conditioning	15/12.5	$78	$46	Local HVAC contractor, MF reduction for smaller capacity.
	16/13	$839	$699	Average of local HVAC contractor & NREL database costs. MF reduction for smaller capacity.
Fan Efficacy	0.3 Watts/cfm	$143	$104	Local HVAC contractor, MF reduction for smaller capacity.
Refrigerant Charge	HERS verified	n/a	$75	Local HERS rater.
Duct Insulation	R-8	$164	n/a	For climate zones 3, 6, & 7 where not prescriptive. 2016 CASE Report: Residential Ducts in Conditioned Space / High Performance Attics, 2016-RES-ENV1-F
Water heater	0.94 EF	$0	$0	Internet pricing and plumbing contractor input. Minimal incremental equip cost and lower cost to install PVC venting (condensing) vs stainless venting (standard). Slight premium going from 0.94 to 0.96.
	0.96 EF	$100	$100	
Hot water pipe insulation	HERS verified	$146	n/a	Roughly equivalent to code requirements effective Jan. 2017. 10% of $3.87 per ft (2013 SF DHW CASE study) for additional labor to pass HERS inspection. $100 for HERS verification per local HERS raters.
Hot water compact distribution	HERS verified	n/a	$112	Assume compact design already or easily achieved in MF units – no added cost. $100 HERS verification fee per local HERS rater. Pipe insulation cost per the pipe insulation measure assumptions.
PV	System size varies	$3.53 / kW DC	$3.21 / kW DC	Avg. system cost for systems < 10kW (for the last 12 months) of $5.29/Watt for single family (http://www.gosolarcalifornia.ca.gov/). For multi-family systems, an average of the < 10 kW and > 10kW system cost ($4.37/Watt) was used; systems are expected to be typically greater than 10 kW, although not as large as some commercial systems reported on in the database. In both cases cost was reduced by $0.25/Watt for the NSHP incentive & 30% for the solar investment tax credit.

2.3 Efficiency Packages

Three efficiency packages were developed for each climate zone where feasible, as described below. Since the federal government does not allow local or state government agencies to require the use of federally-regulated equipment that exceeds the minimum standard requirement, this analysis includes at least one package for each climate zone that does not require installing equipment with higher efficiencies than federally mandated. In climates where the PV Compliance Credit (PVCC) is available (all climates except 6 and 7) a package that includes the PVCC in addition to efficiency measures was evaluated to achieve Tier 2 performance levels.

1) **Envelope**: These packages focus on building envelope measures but also include efficient hot water pipe distribution and cooling fan efficiency measures that don't trigger federal preemption issues.
2) **Equipment**: Use of HVAC and water heating equipment that are more efficient than federal standards combined with efficient envelope measures if necessary.
3) **PV Credit**: Utilize the PV compliance credit (PVCC) available in all climate zones except 6 and 7.

2.4 PV Performance Packages

Using the Tier 2 efficiency package (or Tier 1 in cases where reaching Tier 2 wasn't feasible), the PV system was evaluated and sized to offset TDV loads for the following two conditions:

1) **PV-Plus**: Install a PV system sized to offset a portion of the total household energy use based on TDV energy. PV sizing is consistent with the methodology included in the California Energy Commission's proposed Solar PV Ordinance being developed by the CEC, and PV sizing calculations were developed such that PV size is to be equivalent to offsetting approximately 80% of total estimated building electricity use for a gas/electric home built to the 2016 Title 24. Table 3 summarizes the prescriptive PV sizing based on Climate Zone and home size.
2) **TDV-Zero**: Install a PV system sized to offset 100% of building energy use based on TDV energy, including appliances and plug loads. This is consistent with the requirements of the CALGreen Zero Net Energy Design tier.

In both these cases PV is evaluated in CBECC-Res according to the California Flexible Installation (CFI).

Table 3: Minimum PV System Size (kW_{DC}) required to meet Solar PV Ordinance by Climate Zone

Conditioned Space (ft2)	CZ1	CZ2	CZ3	CZ4	CZ5	CZ6	CZ7	CZ8	CZ9	CZ10	CZ11	CZ12	CZ13	CZ14	CZ15	CZ16
Less than 1000	1.6	1.4	1.5	1.3	1.4	1.5	1.3	1.5	1.4	1.4	1.7	1.5	1.8	1.3	2.1	1.3
1000 - 1499	2.0	1.7	1.7	1.5	1.6	1.7	1.5	1.8	1.7	1.7	2.2	1.9	2.3	1.6	2.8	1.6
1500 - 1999	2.4	2.0	2.1	1.8	1.9	2.0	1.8	2.1	2.0	2.0	2.7	2.3	2.8	2.0	3.5	1.9
2000 - 2499	2.8	2.3	2.4	2.1	2.1	2.3	2.0	2.4	2.3	2.3	3.2	2.7	3.4	2.3	4.2	2.3
2500 - 2999	3.2	2.6	2.7	2.4	2.4	2.6	2.3	2.7	2.6	2.7	3.7	3.1	3.9	2.7	4.9	2.6
3000 - 3499	3.6	2.9	3.0	2.6	2.7	2.9	2.5	3.0	2.9	3.0	4.2	3.4	4.4	3.0	5.6	3.0
3500 - 3999	3.9	3.2	3.2	2.9	2.9	3.2	2.7	3.3	3.2	3.3	4.7	3.8	4.9	3.4	6.3	3.3
4000 - 4499	4.3	3.5	3.5	3.2	3.1	3.4	2.9	3.6	3.5	3.6	5.1	4.2	5.4	3.7	7.0	3.6

2.5 Cost Effectiveness

A customer based approach to evaluating cost effectiveness was used based on past experience with Reach Code adoption by local governments. The current residential utility rates at the time of the analysis were used to calculate utility costs for all cases and determine cost effectiveness for the proposed packages. Annual utility costs were calculated using hourly electricity and gas output from CBECC-Res and applying the utility tariffs summarized in Table 4. Appendix C includes the utility rate schedules used for this study. The standard residential rate (E1 in PG&E territory, D in SCE territory, & DR in SDG&E) was applied to the base case and all cases without PV systems. The applicable residential time-of-use (TOU) rate was applied to all cases with PV systems. [5] Any annual electricity production in excess of annual electricity consumption is credited to the utility account at the applicable wholesale rate based on the approved NEM tariffs for that utility. The net surplus compensation rates for the different utilities are as follows:

- PG&E: $0.043 / kWh
- SCE: $0.0298 / kWh[6]
- SDG&E: $0.0321 / kWh[7]

Table 4: IOU Utility Tariffs used based on Climate Zone

Climate Zones	Electric / Gas Utility	Electricity (Standard)	Electricity (Time-of-use)	Natural Gas
1-5, 11-13, 16	PG&E	E1	E-TOU, Option A	G1
6, 8-10, 14, 15	SCE / SoCal Gas	D	TOU-D-T	GR
7	SDG&E	DR	DR-SES	GR

Cost effectiveness was evaluated for all sixteen climate zones and is presented according to lifecycle customer benefit-to-cost ratio. The benefit-to-cost ratio is a metric which represents the cost effectiveness of energy efficiency over a 30-year lifetime taking into account discounting of future savings and financing of incremental costs. A value of one indicates the savings over the life of the measure are equivalent to the incremental cost of that measure. A value greater than one represents a positive return on investment. The ratio is calculated as follows:

Lifecycle Customer Benefit-Cost Ratio =

*(Annual utility cost savings * Lifecycle cost factor) / (First incremental cost * Financing factor)*

The lifecycle cost factor is 19.6 and includes the following assumptions:

- 30-year measure life & utility cost savings
- 3% real discount rate
- No utility rate escalation (conservative assumption)

[5] Under NEM rulings by the CPUC (D-16-01-144, 1/28/16), all new PV customers shall be in an approved TOU rate structure. As of March 2016, all new PG&E net energy metering (NEM) customers are enrolled in a time-of-use rate. (http://www.pge.com/en/myhome/saveenergymoney/plans/tou/index.page?).

[6] SCE net surplus compensation rate based on 1-year average September 2015 – August 2016.

[7] SDG&E net surplus compensation rate based on 1-year average August 2015 – July 2016.

The financing factor is 1.068 and includes the following assumptions:

- 30-year financing term
- 4.5% loan interest rate
- 3% real discount rate
- 20% average tax rate (to account for tax savings due to loan interest deductions)

Simple payback is also presented and is calculated using the equation below. Based on the terms described above the lifecycle cost-to-benefit ratio threshold of one is roughly equivalent to a simple payback of 18 years.

Simple payback = First incremental cost / Annual customer utility cost savings

2.6 Greenhouse Gas Emissions

Equivalent CO_2 emission savings were calculated using the following emission factors. Electricity factors are specific to California electricity production.

Table 5: Equivalent CO_2 Emissions Factors

		Source
Electricity	0.724 lb. CO_2-e / kWh	U.S. Environmental Protection agency's 2007 eGRID data.[8]
Natural Gas	11.7 lb. CO_2-e / Therm	Emission rates for natural gas combustion as reported by the U.S. Environmental Protection agency's GHG Equivalencies Calculator.[9]

[8] https://www.epa.gov/energy/ghg-equivalencies-calculator-calculations-and-references

[9] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

3 Results

Cost effective analysis including evaluating three efficiency packages and two PV performance packages was completed for all sixteen climate zones. Evaluations looked to identify cost effective Tier 1 and Tier 2 packages for both single family and multifamily prototypes at the CALGreen performance targets of 15% and 30%. When initial proposed packages were found to not be cost effective, multiple iterations were conducted to identify a cost effective package. In certain climates it was not feasible, and targets were subsequently relaxed to something more appropriate. In other climates no cost effective package could be identified. In almost every climate there was no cost effective way to achieve Tier 2 efficiency levels without the PV compliance credit, therefore all Tier 2 packages include PV. Because the PVCC is not available in climate zones 6 and 7, no Tier 2 packages were developed for those climates.

Since the results from this analysis are intended to support mandatory energy efficiency requirements, the authors intentionally selected proven cost-effective measures with wide market acceptance in typical residential construction. Achieving greater performance is feasible using advanced design strategies and measures.

3.1 Single Family Results

3.1.1 Single Family Cost Effectiveness Analysis

A comparison of cost effectiveness for each climate zone and five cases is presented in Figure 1. Table 6 and Table 7 provide the results in tabular form along with energy and greenhouse gas (GHG) savings for each efficiency and PV performance tier. Cost effectiveness results are presented for all three efficiency packages described previously (Envelope, Equipment, and PV Credit) as well as for the two PV performance packages (PV-Plus and TDV-Zero). A summary of measures included in each package is listed in Appendix B.1. The lifecycle benefit-to-cost ratio threshold of one is roughly equivalent to a simple payback of 18 years. Shaded rows in the tables reflect those cases which are not cost effective. While using high efficiency equipment is shown to result in the highest return on investment in many climates, it was necessary to find cost effective packages that do not require specification of equipment with efficiencies better than federally mandated values to avoid federal preemption prohibitions.

Tier 1 Envelope packages were found to be cost effective in climate zones 1 through 5 and 9 through 16. The Tier 1 threshold in climate zone 4 was reduced to 10% to meet the cost effectiveness criteria without installing equipment more efficient than federally mandated. No cost effective Tier 1 efficiency packages were identified in climate zones 6 through 8.

Table 7 presents results for the two PV performance packages including the PV capacity necessary to offset the specified TDV energy. The PV system capacity for the PV-Plus packages is sized based upon the values in Table 3 to provide approximately 80% of estimated annual kWh consumption. The required TDV-Zero PV capacity (as required to generate a TDV=0 compliance simulation result) ranges from 3.1 kW DC in the mild climates (CZ5 and 7) to 7.7 kW DC in hot climates (CZ15). In all cases the measures in these packages reflect those in the Tier 2 package, with the exception of climate zones 6 & 7 where they are based on the Tier 1 envelope package.

The PV-Plus cases demonstrate cost effectiveness with a benefit-to-cost ratio ranging from 1.08 to 1.49. Adding PV beyond the amount needed to offset electricity use reduces cost effectiveness in all cases. The Zero-TDV cases are cost effective in only four climate zones and benefit-cost ratios are consistently lower in all climates. This is impacted by the fact that the compliance model is based upon a home with natural gas space and water heating, thus when sizing PV to offset total house TDV, PV electricity generation is offsetting natural gas consumption. The customer is paid for excess electricity generation beyond what is consumed by the dwelling but only at the wholesale rate which is substantially lower than the retail rate.

Greenhouse gas (GHG) savings range from 4.1% to 12.7% for the envelope and equipment Tier 1 packages. Including the PV compliance credit increases GHG reductions to 39% on average. GHG reductions for the two PV packages average 50% and 77% for the PV-Plus and TDV-ZERO cases, respectively.

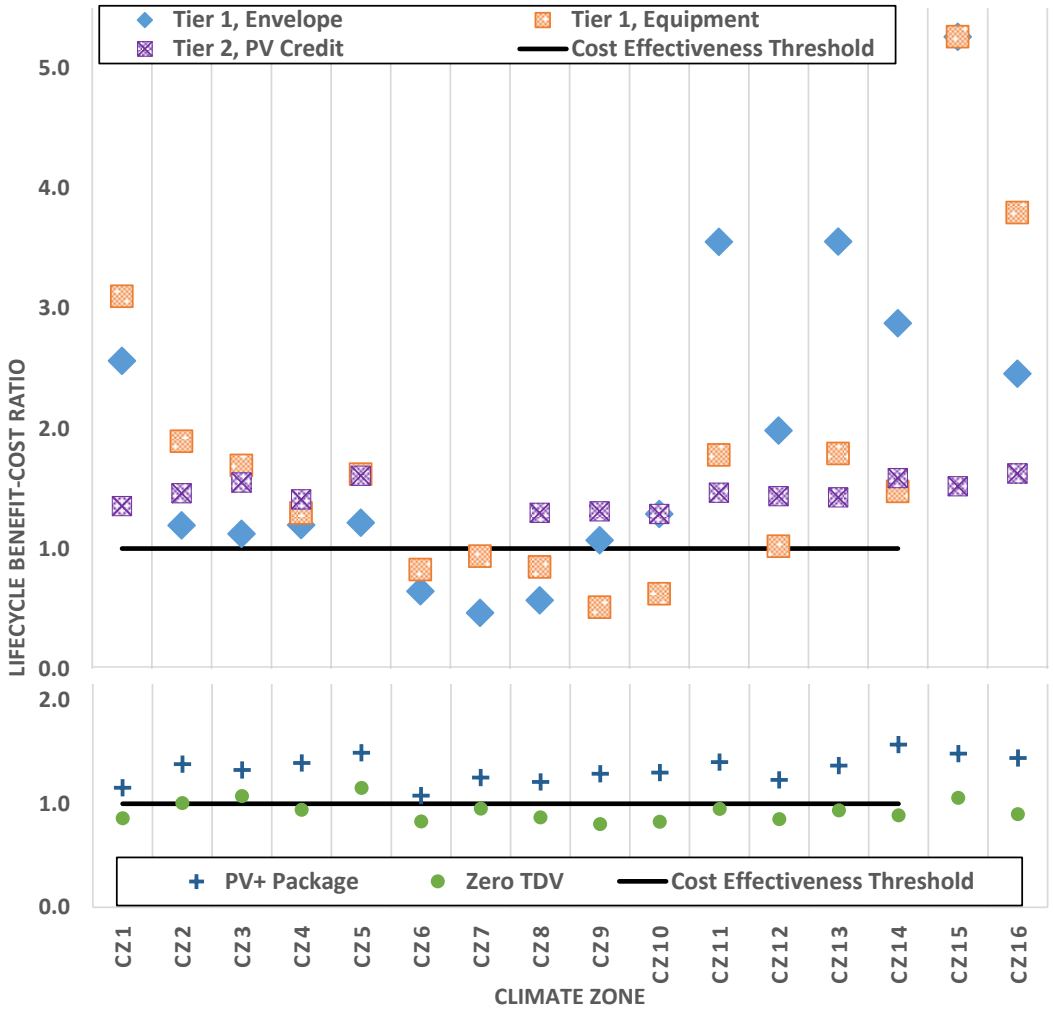

Figure 1: Single family cost effectiveness comparison

Table 6: Single Family Efficiency Package Cost Effectiveness Results[1]

Climate Zone	T-24 Comp. Margin	Elec Savings (kWh)	Gas Savings (therms)	% GHG Savings[2]	Package Cost[3]	Utility Cost Savings	Simple Payback	Lifecycle Benefit-Cost Ratio
Tier 1, Envelope Cases								
CZ1	16.1%	67	83.7	10.7%	$1,043	$146	7.2	2.56
CZ2	15.8%	146	49.1	8.2%	$1,617	$105	15.4	1.20
CZ3	15.5%	32	43.6	7.7%	$1,043	$64	16.3	1.13
CZ4	12.0%	114	18.8	4.1%	$808	$53	15.3	1.20
CZ5	15.2%	27	39.3	7.3%	$812	$54	15.1	1.22
CZ6	8.7%	20	17.1	3.6%	$571	$20	28.4	0.65
CZ7	7.0%	9	9.7	2.3%	$571	$15	39.3	0.47
CZ8	8.9%	37	10.2	2.6%	$571	$18	32.1	0.57
CZ9	17.2%	169	11.1	4.1%	$808	$47	17.2	1.07
CZ10	17.2%	213	12.9	4.7%	$808	$57	14.2	1.29
CZ11	16.9%	460	25.9	7.1%	$808	$156	5.2	3.55
CZ12	16.4%	222	24.2	5.4%	$808	$87	9.3	1.98
CZ13	17.4%	485	22.1	7.0%	$808	$157	5.2	3.56
CZ14	16.4%	441	24.4	6.9%	$808	$127	6.4	2.88
CZ15	15.2%	896	4.7	8.1%	$728	$209	3.5	5.26
CZ16	15.8%	296	80.4	9.8%	$1,456	$195	7.5	2.46
Tier 1, Equipment Cases								
CZ1	19.3%	47	101.7	12.7%	$999	$169	5.9	3.10
CZ2	16.8%	34	67.0	9.7%	$999	$103	9.7	1.89
CZ3	15.3%	23	45.4	8.0%	$681	$63	10.8	1.69
CZ4	17.0%	103	45.4	8.3%	$1,156	$82	14.2	1.30
CZ5	16.9%	22	46.0	8.4%	$681	$60	11.3	1.62
CZ6	15.5%	20	36.2	7.3%	$842	$38	22.2	0.83
CZ7	15.6%	9	25.7	5.8%	$681	$35	19.6	0.94
CZ8	17.4%	68	25.1	6.0%	$838	$39	21.6	0.85
CZ9	16.9%	159	12.2	4.2%	$1,650	$46	35.8	0.51
CZ10	16.6%	203	14.2	4.9%	$1,650	$56	29.4	0.62
CZ11	17.3%	473	26.0	7.2%	$1,650	$160	10.3	1.78
CZ12	16.0%	247	22.7	5.4%	$1,650	$92	18.0	1.02
CZ13	17.9%	507	21.5	7.1%	$1,650	$161	10.2	1.79
CZ14	17.1%	458	26.4	7.3%	$1,650	$133	12.4	1.48
CZ15	15.2%	896	4.7	8.1%	$728	$209	3.5	5.26
CZ16	17.6%	58	123.7	12.6%	$999	$207	4.8	3.80

Climate Zone	T-24 Comp. Margin	Elec Savings (kWh)	Gas Savings (therms)	% GHG Savings[2]	Package Cost[3]	Utility Cost Savings	Simple Payback	Lifecycle Benefit-Cost Ratio
Tier 2, Cases with PV Credit								
CZ1	32.2%	2,947	111.8	35.7%	$10,576	$781	13.5	1.36
CZ2	31.4%	3,227	132.7	46.9%	$10,158	$809	12.6	1.46
CZ3	21.8%	3,190	40.1	40.3%	$8,644	$731	11.8	1.55
CZ4	30.4%	3,353	21.8	36.6%	$8,801	$677	13.0	1.41
CZ5	22.0%	3,392	35.6	43.7%	$8,413	$737	11.4	1.61
CZ6	N/A - No PV Credit							
CZ7	N/A - No PV Credit							
CZ8	36.4%	3,290	10.2	44.0%	$8,721	$617	14.1	1.30
CZ9	35.0%	3,333	13.2	41.5%	$8,333	$595	14.0	1.31
CZ10	32.2%	3,517	15.4	42.3%	$8,721	$612	14.2	1.29
CZ11	31.2%	3,698	35.8	34.7%	$9,420	$752	12.5	1.47
CZ12	32.4%	3,386	27.9	33.8%	$8,721	$684	12.8	1.44
CZ13	31.3%	3,584	25.4	33.2%	$9,189	$715	12.9	1.43
CZ14	30.9%	4,366	26.4	39.4%	$9,265	$801	11.6	1.59
CZ15	32.2%	4,610	4.7	39.0%	$9,265	$767	12.1	1.52
CZ16	31.5%	3,881	80.4	31.8%	$9,606	$852	11.3	1.63

[1] Shaded rows reflect those cases which are not cost effective.

[2] Based on CA electricity production and equivalent CO_2 emission rates of 0.724 lbCO_2e / kWh & 11.7 lb-CO_2e / therm.

[3] Includes 10% markup for builder profit and overhead.

Table 7: Single Family PV Performance Package Cost Effectiveness Results[1]

Climate Zone	Compliance Margin	PV Capacity (kW)	Elec Savings (kWh)	Gas Savings (therms)	GHG % Savings[2]	Package Cost[3]	Utility Cost Savings	Simple Payback	Lifecycle Benefit-Cost Ratio
PV-Plus Package									
CZ1	32.2%	3.0	4,178	111.8	45.0%	$14,146	$889	15.9	1.15
CZ2	31.4%	2.5	3,798	132.7	51.9%	$11,575	$872	13.3	1.38
CZ3	21.8%	2.6	4,082	40.1	49.7%	$10,836	$784	13.8	1.33
CZ4	30.4%	2.3	3,619	21.8	39.2%	$9,441	$716	13.2	1.39
CZ5	22.0%	2.3	3,838	35.6	48.6%	$9,441	$768	12.3	1.49
CZ6	10.8%	2.5	3,912	17.1	48.9%	$10,294	$604	17.0	1.08
CZ7	10.6%	2.2	3,556	9.7	51.5%	$9,602	$655	14.7	1.25
CZ8	36.4%	2.6	4,026	10.2	53.4%	$10,525	$693	15.2	1.21
CZ9	35.0%	2.5	4,092	13.2	50.3%	$10,137	$713	14.2	1.29
CZ10	32.2%	2.5	4,202	15.4	50.0%	$10,351	$733	14.1	1.30
CZ11	31.2%	3.5	5,728	35.8	51.1%	$14,368	$1,097	13.1	1.40
CZ12	32.4%	2.9	4,673	27.9	45.2%	$11,903	$799	14.9	1.23
CZ13	31.3%	3.7	5,863	25.4	52.1%	$14,913	$1,111	13.4	1.37
CZ14	30.9%	2.5	4,941	26.4	44.1%	$10,507	$900	11.7	1.57
CZ15	32.2%	4.6	8,600	4.7	72.2%	$18,521	$1,497	12.4	1.48
CZ16	31.5%	2.5	4,501	80.4	35.6%	$11,022	$866	12.7	1.44
Zero-TDV Package									
CZ1	32.2%	4.8	6,560	111.8	62.9%	$21,054	$987	21.3	0.86
CZ2	31.4%	4.0	6,200	132.7	72.9%	$17,532	$960	18.3	1.01
CZ3	21.8%	3.5	5,557	40.1	65.2%	$14,465	$845	17.1	1.07
CZ4	30.4%	3.9	6,252	21.8	65.3%	$15,786	$808	19.5	0.94
CZ5	22.0%	3.2	5,411	35.6	65.9%	$13,070	$821	15.9	1.15
CZ6	10.8%	3.5	5,530	17.1	68.3%	$14,271	$644	22.2	0.83
CZ7	10.6%	3.1	5,083	9.7	72.4%	$13,221	$686	19.3	0.95
CZ8	36.4%	3.7	5,821	10.2	76.3%	$14,930	$705	21.2	0.87
CZ9	35.0%	4.3	7,090	13.2	85.4%	$17,258	$756	22.8	0.80
CZ10	32.2%	4.3	7,103	15.4	82.5%	$17,258	$776	22.2	0.83
CZ11	31.2%	6.1	9,908	35.8	85.0%	$24,555	$1,269	19.3	0.95
CZ12	32.4%	5.1	8,094	27.9	75.4%	$20,363	$944	21.6	0.85
CZ13	31.3%	6.4	10,075	25.4	87.1%	$25,488	$1,299	19.6	0.94
CZ14	30.9%	5.5	10,295	26.4	88.0%	$22,072	$1,068	20.7	0.89
CZ15	32.2%	7.7	13,811	4.7	115.5%	$30,610	$1,762	17.4	1.06
CZ16	31.5%	5.2	9,147	80.4	64.2%	$21,636	$1,061	20.4	0.90

[1] Shaded rows reflect those cases which are not cost effective.

[2] Based on CA electricity production and equivalent CO_2 emission rates of 0.724 lbCO_2e / kWh & 11.7 lb-CO_2e / therm.

[3] Includes 10% markup for builder profit and overhead.

3.1.2 Single Family Package Recommendations

Based on the single family cost effective analysis, two reach code packages were developed, an efficiency package and a PV package as described below. Table 8 and Table 9 summarize the measures used to cost effectively meet the performance targets for each package.

Tier 1 Efficiency only: Where cost effective packages were identified, the 15% compliance margin target, consistent with CALGreen Tier 1 were used. As stated earlier, a cost effective 15% package was not identified for climate zone 4, so a 10% compliance margin target was used. No cost effective efficiency only packages were identified for climate zones 6 through 8.

Table 8: Single Family Efficiency Only: Cost Effective Measures Summary

Climate Zone	Compliance Margin Target	QII	ACH50	Window U-value / SHGC	Door U-value	AH Fan W/cfm	HW Pipe Insul.
CZ1	15%	Y		.30/.50	0.20		Y
CZ2	15%	Y	3	.30/.23	0.20	0.30	Y
CZ3	15%	Y		.30/.50	0.20		Y
CZ4	10%	Y		.30/.23		0.30	
CZ5	15%	Y		.30/.50			Y
CZ6	No package						
CZ7	No package						
CZ8	No package						
CZ9	15%	Y		.30/.23		0.30	
CZ10	15%	Y		.30/.23		0.30	
CZ11	15%	Y		.30/.23		0.30	
CZ12	15%	Y		.30/.23		0.30	
CZ13	15%	Y		.30/.23		0.30	
CZ14	15%	Y		.30/.23		0.30	
CZ15	15%	Y				0.30	
CZ16	15%	Y	3	.30/.23	0.20	0.3	

PV-Plus: Cost effective packages with efficiency and PV were identified in all 16 climate zones, but the compliance margin targets were lowered to 20% for climates 3 and 5, and to 10% for 6 and 7. Table 9 summarizes the measures used in each climate zone to cost effectively meet the targets. It is assumed that the PV compliance credit can be used to meet all these targets, except in climate zones 6 and 7. It is also assumed that a PV system is installed per the methodology described in Table 3 and consistent with the CEC Solar PV Ordinance.

Table 9: Single Family PV-Plus: Cost Effective Measures Summary

Climate Zone	Compliance Margin Target	QII	ACH50	Window U-value / SHGC	Door U-value	HPA	AH Fan W/cfm	HW Pipe Insul.	PV Capacity (kW)
CZ1	30%	Y	3	.30/.50	0.20	Y		Y	3.0
CZ2	30%	Y		.30/.50	0.20	Y		Y	2.5
CZ3	20%	Y		.30/.50	0.20				2.6
CZ4	30%	Y		.30/.23					2.3
CZ5	20%	Y		.30/.50					2.3
CZ6	10%	Y					0.30		2.5
CZ7	10%	Y		.30/.23	0.20		0.30	Y	2.2
CZ8	30%	Y							2.6
CZ9	30%	Y							2.5
CZ10	30%	Y							2.5
CZ11	30%	Y		.30/.23	0.20				3.5
CZ12	30%	Y							2.9
CZ13	30%	Y		.30/.23					3.7
CZ14	30%	Y					0.30		2.5
CZ15	30%	Y					0.30		4.6
CZ16	30%	Y	3	.30/.23	0.20		0.30		2.5

3.2 Multifamily Results

It is generally more challenging to achieve equivalent savings targets for the multifamily cases than for the single family cases. With less exterior surface area per floor area the impact of envelope measures is diminished in multifamily buildings. The PV credit is also much smaller because it is offsetting only high performance walls; high performance attic is not applied to the multifamily prescriptive design because ducts are already assumed to be within conditioned space. Shaded rows in the tables below indicate cases that don't meet the 15% target for Tier 1 or don't have feasible Tier 2 packages.

3.2.1 Multifamily Cost Effectiveness Analysis

A comparison of cost effectiveness for the multi-family prototype is presented in Figure 2. Table 10 and Table 11 provide the results in tabular form, along with energy and greenhouse gas savings for the efficiency and PV performance tiers, respectively. *All multifamily results are presented on a per dwelling unit basis.* Cost effectiveness results are presented for all of the three efficiency packages described previously (envelope, equipment, and PV compliance credit) as well as for the two PV performance packages (PV-Plus and TDV-Zero). A summary of measures included in each package is listed in Appendix B.2. The lifecycle benefit-to-cost ratio threshold of one is roughly equivalent to a simple payback of 18 years. Shaded rows in the tables reflect those cases which aren't cost effective. While using high efficiency equipment is shown to result in an improved return on investment in many climates, it was necessary to find cost effective packages that do not require specification of equipment with efficiencies better than federally mandated values. It can be noted that since rental rates are determined primarily by location, tenants may not experience increased rents due to the cost of efficiency measures. If this is the case, the tenants have no costs and only the benefit of lower energy utility costs.

Tier 1, Envelope packages were found to be cost effective in climate zones 1, and 10 through 16, although the threshold for climate zone 10 was lowered to 10% to meet the cost effectiveness criteria. QII alone was found to be cost effective in climate zone 2 but a cost effective 10% package requires using the PV

compliance credit. No cost effective Tier 1, Envelope efficiency packages were identified in climate zones 3 through 9 without the addition of high efficiency equipment or PV.

Table 11 summarizes the cost effectiveness of the PV performance packages. PV capacity required to meet the required TDV energy offset for each case is also included. The PV capacity for the PV-Plus packages are sized the same as for the single family analysis and based upon the values in Table 3. The required TDV-Zero PV capacity per apartment ranges from 1.9 kW DC in the mild climates to 3.7 kW DC in hot climates (CZ15). For the multifamily prototype 8-unit apartment building, this is equivalent to 15.2 to 29.6 kW for the building. In all cases the measures in these packages reflect those in the Tier 2 package, with the exception of climate zones 6 & 7 where they are based on the Tier 1 envelope package.

The PV-Plus cases demonstrate cost effectiveness with a benefit-to-cost ratio ranging from 1.01 to 1. 66. Similar to the single family analysis, while PV is cost effective in offsetting electricity use, adding PV to meet a zero TDV design reduces cost effectiveness in all cases with only two climates having a value greater than 1.

Greenhouse gas (GHG) savings range from 2.2% to 8.6% for the envelope and equipment Tier 1 packages. Including the PV compliance credit increases GHG reductions to 34% on average. GHG reductions for the two PV packages average 49% and 78% for the PV-Plus and ZN-TDV cases, respectively.

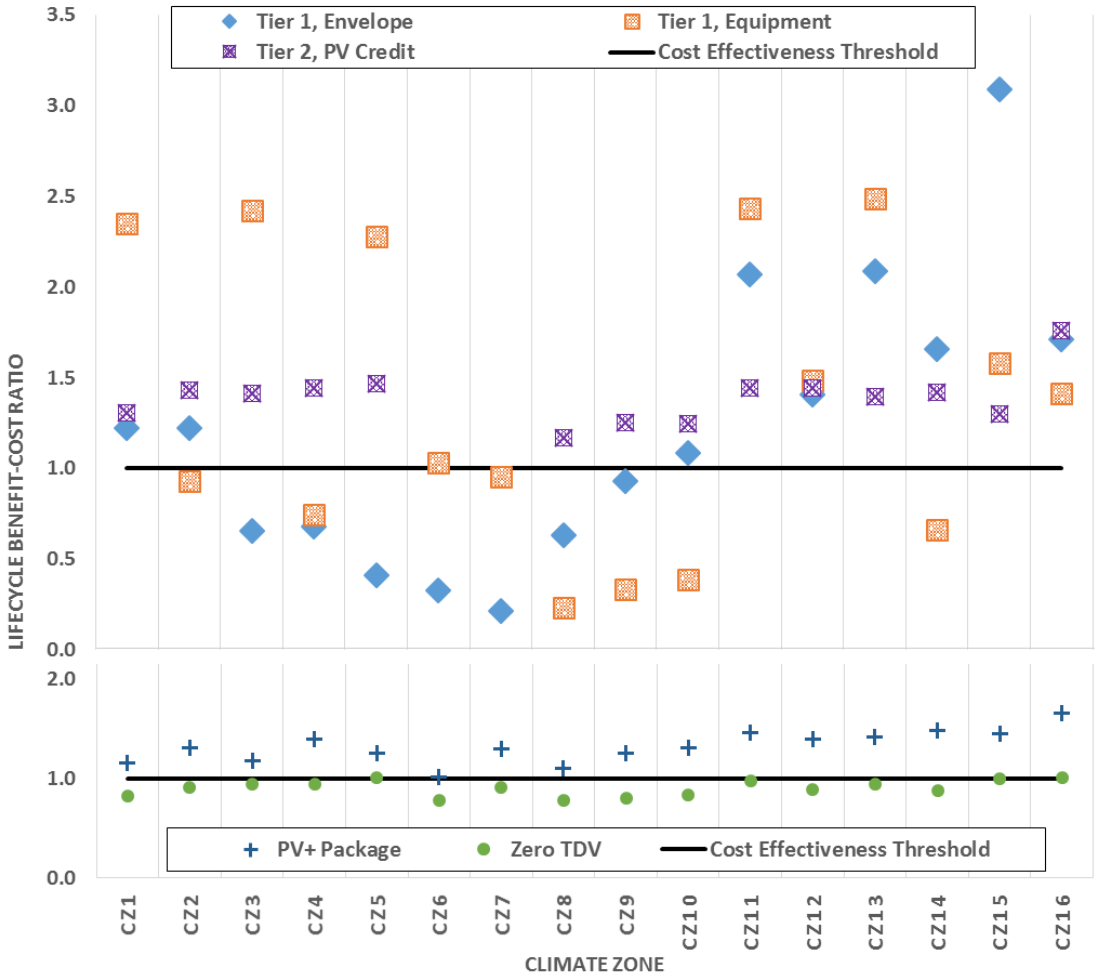

Figure 2: Multifamily cost effectiveness comparison

Table 10: Multifamily Efficiency Cost Effectiveness Results[1]

Climate Zone	T-24 Comp. Margin	Elec Savings (kWh)	Gas Savings (therms)	% GHG Savings[2]	Package Cost[3]	Utility Cost Savings	Simple Payback	Lifecycle Benefit-Cost Ratio
Tier 1, Envelope Cases								
CZ1	16.5%	31	28.0	8.0%	$559	$37	15.0	1.22
CZ2	4.8%	7	7.3	2.2%	$146	$10	15.0	1.22
CZ3	10.9%	-3	14.3	4.5%	$444	$16	28.1	0.65
CZ4	10.9%	45	4.6	2.3%	$364	$14	26.9	0.68
CZ5	10.2%	-4	13.3	4.2%	$641	$14	45.1	0.41
CZ6	11.7%	19	7.7	3.0%	$559	$10	55.7	0.33
CZ7	10.2%	10	4.3	1.7%	$641	$7	87.3	0.21
CZ8	10.5%	55	1.2	1.5%	$282	$10	29.0	0.63
CZ9	12.3%	79	2.0	2.2%	$282	$14	19.7	0.93
CZ10	10.1%	92	2.5	2.6%	$282	$17	16.9	1.08
CZ11	17.7%	186	13.2	6.5%	$436	$49	8.9	2.07
CZ12	17.1%	103	12.6	5.4%	$436	$33	13.1	1.41
CZ13	18.1%	200	11.3	6.3%	$436	$50	8.8	2.09
CZ14	17.8%	176	12.9	6.3%	$436	$39	11.1	1.66
CZ15	17.7%	426	0.6	6.8%	$436	$73	5.9	3.09
CZ16	16.3%	91	29.9	8.0%	$559	$52	10.7	1.71
Tier 1, Equipment Cases								
CZ1	16.7%	8	31.7	8.6%	$290	$37	7.8	2.35
CZ2	15.0%	7	27.3	8.0%	$642	$32	19.8	0.93
CZ3	12.4%	1	16.9	5.4%	$146	$19	7.6	2.42
CZ4	16.3%	11	25.5	8.0%	$765	$31	24.8	0.74
CZ5	11.8%	-3	16.6	5.3%	$146	$18	8.1	2.28
CZ6	12.1%	1	16.4	5.6%	$269	$15	17.8	1.03
CZ7	12.5%	-1	15.9	5.5%	$379	$20	19.3	0.95
CZ8	15.2%	83	1.2	2.1%	$1,133	$14	80.4	0.23
CZ9	15.7%	106	2.0	2.8%	$1,029	$19	55.4	0.33
CZ10	15.5%	124	2.5	3.2%	$1,029	$22	47.2	0.39
CZ11	16.5%	202	6.3	5.0%	$333	$44	7.5	2.43
CZ12	15.0%	109	6.1	3.6%	$333	$27	12.4	1.48
CZ13	15.4%	199	5.1	4.6%	$311	$42	7.4	2.48
CZ14	16.5%	201	6.1	4.9%	$1,029	$37	27.7	0.66
CZ15	20.4%	515	0.4	8.2%	$1,029	$89	11.6	1.58
CZ16	15.7%	86	29.8	7.9%	$668	$51	13.0	1.41

Climate Zone	T-24 Comp. Margin	Elec Savings (kWh)	Gas Savings (therms)	% GHG Savings[2]	Package Cost[3]	Utility Cost Savings	Simple Payback	Lifecycle Benefit-Cost Ratio
Tier 2, Cases with PV Credit								
CZ1	21.0%	1,370	28.0	30.2%	$4,085	$291	14.1	1.31
CZ2	20.4%	**1,608**	17.2	33.7%	$4,085	$318	12.8	1.43
CZ3	15.3%	1,585	14.1	35.7%	$4,085	$315	13.0	1.41
CZ4	26.9%	1,654	13.6	35.6%	$4,085	$321	12.7	1.44
CZ5	12.4%	1,677	13.3	37.7%	$4,085	$326	12.5	1.46
CZ6	N/A - No PV credit							
CZ7	N/A - No PV credit							
CZ8	21.0%	1,622	5.7	35.3%	$4,085	$260	15.7	1.17
CZ9	26.8%	1,719	4.0	35.4%	$3,963	$270	14.7	1.25
CZ10	26.2%	1,734	4.9	35.2%	$3,963	$269	14.7	1.25
CZ11	26.5%	1,778	13.2	32.6%	$3,963	$311	12.7	1.44
CZ12	26.5%	1,673	12.6	32.8%	$3,963	$312	12.7	1.44
CZ13	27.3%	1,746	11.3	31.8%	$3,963	$301	13.2	1.39
CZ14	26.0%	1,973	12.9	36.0%	$3,963	$307	12.9	1.42
CZ15	25.4%	2,100	0.6	33.0%	$3,963	$281	14.1	1.30
CZ16	25.7%	1,734	42.4	33.8%	$3,848	$369	10.4	1.76

[1] Shaded rows reflect those cases which are not cost effective.

[2] Based on CA electricity production and equivalent CO_2 emission rates of 0.724 lbCO_2e / kWh & 11.7 lb-CO_2e / therm.

[3] Includes 10% markup for builder profit and overhead.

Table 11: Multifamily PV Performance Cost Effectiveness Results[1]

Climate Zone	Compliance Margin	PV Capacity (kW)	Elec Savings (kWh)	Gas Savings (therms)	GHG % Savings[2]	Package Cost[3]	Utility Cost Savings	Simple Payback	Lifecycle Benefit-Cost Ratio
PV-Plus Package									
CZ1	21.0%	1.6	2,172	28.0	43.5%	$6,201	$393	15.8	1.16
CZ2	20.4%	1.4	2,234	17.2	44.9%	$5,496	$393	14.0	1.31
CZ3	15.3%	1.5	2,374	14.1	51.2%	$5,849	$377	15.5	1.18
CZ4	26.9%	1.3	2,137	13.6	44.8%	$5,143	$391	13.1	1.40
CZ5	12.4%	1.4	2,350	13.3	51.1%	$5,496	$375	14.7	1.25
CZ6	11.7%	1.5	2,388	7.7	52.5%	$5,849	$322	18.1	1.01
CZ7	10.2%	1.3	2,139	4.3	48.0%	$5,226	$369	14.2	1.30
CZ8	21.0%	1.5	2,413	5.7	51.6%	$5,849	$350	16.7	1.10
CZ9	26.8%	1.4	2,372	4.0	48.4%	$5,373	$369	14.6	1.26
CZ10	26.2%	1.4	2,386	4.9	47.9%	$5,373	$383	14.0	1.31
CZ11	26.5%	1.7	2,893	13.2	50.8%	$6,431	$514	12.5	1.47
CZ12	26.5%	1.5	2,457	12.6	46.5%	$5,726	$437	13.1	1.40
CZ13	27.3%	1.8	2,982	11.3	52.2%	$6,784	$525	12.9	1.42
CZ14	26.0%	1.3	2,512	12.9	44.9%	$5,021	$406	12.4	1.49
CZ15	25.4%	2.1	3,940	0.6	61.8%	$7,842	$618	12.7	1.45
CZ16	25.7%	1.3	2,244	42.4	40.9%	$4,906	$444	11.1	1.66
Zero-TDV Package									
CZ1	21.0%	2.5	3,415	28.0	64.2%	$9,476	$424	22.3	0.82
CZ2	20.4%	2.3	3,674	17.2	70.7%	$8,741	$433	20.2	0.91
CZ3	15.3%	2.0	3,233	14.1	68.1%	$7,767	$400	19.4	0.94
CZ4	26.9%	2.2	3,587	13.6	72.4%	$8,320	$429	19.4	0.95
CZ5	12.4%	1.9	3,189	13.3	67.8%	$7,254	$399	18.2	1.01
CZ6	11.7%	2.1	3,356	8.0	72.7%	$8,011	$341	23.5	0.78
CZ7	10.2%	2.1	3,383	4.0	75.0%	$7,903	$394	20.0	0.92
CZ8	21.0%	2.4	3,768	5.7	79.6%	$8,869	$379	23.4	0.78
CZ9	26.8%	2.5	4,124	4.0	83.1%	$9,154	$403	22.7	0.81
CZ10	26.2%	2.5	4,115	4.9	81.5%	$9,115	$415	22.0	0.84
CZ11	26.5%	3.0	4,979	13.2	84.9%	$11,052	$586	18.9	0.97
CZ12	26.5%	2.8	4,509	12.6	82.3%	$10,336	$503	20.6	0.89
CZ13	27.3%	3.2	5,129	11.3	87.6%	$11,681	$603	19.4	0.95
CZ14	26.0%	2.7	5,056	12.9	86.8%	$10,014	$482	20.8	0.88
CZ15	25.4%	3.7	6,571	0.6	102.9%	$13,389	$726	18.4	0.99
CZ16	25.7%	2.6	4,398	42.4	71.0%	$9,379	$514	18.2	1.01

[1] Shaded rows reflect those cases which are not cost effective.

[2] Based on CA electricity production and equivalent CO_2 emission rates of 0.724 lbCO_2e / kWh & 11.7 lb-CO_2e / therm.

[3] Includes 10% markup for builder profit and overhead.

3.2.2 Multifamily Package Recommendations

Based on the multifamily cost effective analysis, two reach code packages were developed, similar to the single family packages. Table 12 and Table 13 summarize the measures used to cost effectively meet the performance targets for each multifamily package.

Tier 1 Efficiency only: Where cost effective packages were identified, the 15% compliance margin target, consistent with CALGreen Tier 1 were used. As stated earlier, a cost effective 15% package was not identified for climate zone 10, so a 10% compliance margin target was used, and only QII was cost effective in climate zone 2. Additionally, no cost effective efficiency only packages were identified for climate zones 3 through 9.

Table 12: Multifamily Efficiency Only: Cost Effective Measures Summary

Climate Zone	Compliance Margin Target	QII	Window U-value / SHGC	Door U-value	AH Fan W/cfm	Refrigerant Charge	HW Comp. Dist.
CZ1	15%	Y	0.30/0.50	0.20	0.3		Y
CZ2	QII Only	Y					
CZ3	No package						
CZ4	No package						
CZ5	No package						
CZ6	No package						
CZ7	No package						
CZ8	No package						
CZ9	No package						
CZ10	10%	Y	0.30/0.23		0.3		
CZ11	15%	Y	0.30/0.23	0.20	0.3		
CZ12	15%	Y	0.30/0.23	0.20	0.3		
CZ13	15%	Y	0.30/0.23	0.20	0.3		
CZ14	15%	Y	0.30/0.23	0.20	0.3		
CZ15	15%	Y	0.30/0.23	0.20	0.3		
CZ16	15%	Y	0.30/0.23	0.20	0.3		Y

PV-Plus: Cost effective packages with efficiency and PV were identified in all 16 climate zones, but the compliance margin targets in all climates were lowered below 30% in all cases to be cost effective. Table 13 summarizes the compliance margin targets in each climate zone and the measures used to cost effectively meet the targets. As with the single family packages, with the exception of climate zones 6 and 7, it is assumed that the PV compliance credit can be used to meet these targets. It is also assumed that a PV system is installed per the methodology developed for the proposed Solar PV ordinance (Table 3).

Table 13: Multifamily PV-Plus: Cost Effective Measures Summary

Climate Zone	Compliance Margin Target	QII	Window U-value / SHGC	Door U-value	AH Fan W/cfm	HW Comp. Dist.	PV Capacity (kW)
CZ1	20%	Y	0.30/0.50	0.20	0.3	Y	1.6
CZ2	20%	Y	0.30/0.23	0.20	0.3	Y	1.4
CZ3	15%	Y	0.30/0.50	0.20	0.3	Y	1.5
CZ4	25%	Y	0.30/0.23	0.20	0.3	Y	1.3
CZ5	10%	Y	0.30/0.50	0.20	0.3	Y	1.4
CZ6	10%	Y	0.30/0.23	0.20			1.5
CZ7	10%	Y	0.30/0.23	0.20			1.3
CZ8	20%	Y	0.30/0.23	0.20	0.3	Y	1.5
CZ9	25%	Y	0.30/0.23	0.20	0.3		1.4
CZ10	25%	Y	0.30/0.23	0.20	0.3		1.4
CZ11	25%	Y	0.30/0.23	0.20	0.3		1.7
CZ12	25%	Y	0.30/0.23	0.20	0.3		1.5
CZ13	25%	Y	0.30/0.23	0.20	0.3		1.8
CZ14	25%	Y	0.30/0.23	0.20	0.3		1.3
CZ15	25%	Y	0.30/0.23	0.20	0.3		2.1
CZ16	25%	Y	0.30/0.23	0.20			1.3

4 Conclusions & Summary

This report evaluated the feasibility and cost effectiveness of "above code" ordinance performance tiers through the application of both efficiency measures and PV in all 16 California climates zones. For this analysis, PG&E rates were used for gas and electricity in climate zones 1 through 5, 11 through 13, and 16. SCE electricity rates and Southern California Gas rates were used for climate zones 6, 8 through 10, 14 and 15. SDG&E rates were used for electricity and gas for climate zone 7.

The following describes the recommended performance levels for the above-code ordinance packages. The original intent was to develop packages that align with the tiers as defined in the 2016 CALGreen code. Based on the analysis results, performance thresholds were reduced in some climates and eliminated altogether in other climates. Identifying cost effective efficiency (only) packages was particularly challenging in multifamily buildings. Table 14 and Table 15 summarize recommended cost effective ordinance criteria by climate zone for single family and multifamily buildings, respectively. Where cost effective packages exist, there is both a Tier 1 efficiency only package and the efficiency with PV (PV-Plus) package. The tables include the Title 24 compliance target needed to meet the criteria for each package. Tier 1 compliance targets are compliance margins for efficiency measures only and are designed to be met without using the PV Compliance Credit. The PV-Plus compliance targets are for projects that include PV. The efficiency targets are set higher, but assume that the PV compliance credit (PVCC) is used to meet the performance targets. The efficiency targets are set lower for climate zones 6 and 7 because projects built in these climate zones are not eligible to take the PVCC.

Following is a summary of the differences between the two packages defined in this analysis and the tiers defined in CALGreen.

Tier 1 Packages: CALGreen defines Tier 1 as showing a 15% or greater Title 24 compliance margin compared to the Standard Design. The intent of the Efficiency tier in this study was to find cost effective packages of measures that meet the CALGreen Tier 1 criteria without mandating the installation of PV or high efficiency equipment that exceed federal minimum levels. To encourage adoption of efficiency measures in preparation for the 2019 Title-24 code, the authors recommend that PV not be allowed as a means to meet the Tier 1 compliance requirements. Based on the lifecycle benefit-to-cost ratio metric applied in this analysis, cost effectiveness results for the single family and low-rise multifamily homes show that there exist multiple cost effective packages to meet Tier 1. There are several climates where the compliance margin targets are lowered to maintain the cost effectiveness criteria and other climates where no cost effective efficiency packages were identified.

PV-Plus Packages: CALGreen defines both Tier 2 and ZNE Tier performance levels. The ZNE Tier requires that the building meet the required efficiency targets as defined in Section A4.203.1.2.3 of 2016 CALGreen and size a PV system to offset 100% of the TDV energy of the building (achieve an Energy Design Rating of 0). The results of this work, based on dwellings with gas and electricity, found that sizing the PV system to meet the ZNE Tier criteria was generally not cost effective or in some limited cases, marginally cost effective. Instead a PV and efficiency package (PV-Plus) was developed that limited the size of the PV system to no larger than the annual estimated electricity use of the building and combine it with efficiency measures that are cost effective in all climate zones. Lifecycle benefit-to-cost ratio for the PV-Plus cases for both the single family and multifamily prototypes are all above one. In cases where PV capacity in the PV-Plus package is less than the minimum to meet the PV compliance credit, it's recommended that jurisdictions allow the smaller PV capacity be installed and still qualify for the PVCC to avoid sizing the PV systems larger than the estimated electricity use.

Table 14: Single Family Reach Code Package Recommendations

Packages	Climate Zones	T-24 Compliance Target	PVCC Allowed	PV
Tier 1 Efficiency Only Package	1-3, 5, 9-16	15%	No	n/a
	4	10%	No	n/a
PV-Plus Package	1,2,4, 8-16	30%	Yes	Yes
	3,5	20%	Yes	Yes
	6-7	10%	n/a	Yes

Table 15: Multifamily Reach Code Package Recommendations

Packages	Climate Zones	T-24 Compliance Target	PVCC Allowed	PV
Tier 1 Efficiency Only Package	1, 11-16	15%	No	n/a
	10	10%	No	n/a
	2	QII	No	n/a
PV-Plus Package	4, 9-16	25%	Yes	Yes
	1-2, 8	20%	Yes	Yes
	3	15%	Yes	Yes
	5	10%	Yes	Yes
	6-7	10%	n/a	Yes

Consistent with CALGreen, a pre-requisite for all packages includes HERS verification of Quality Insulation Installation (QII).

The recommended packages do not include a TDV-Zero option because these packages were generally not found to be cost effective. Lifecycle benefit-to-cost ratios for the single family TDV-Zero packages are 0.78 to 1.07. Limited cost effectiveness is largely a result of oversizing the PV systems relative to the house electricity load. With mixed fuel homes, PV electricity generation offsets natural gas consumption when sizing relative to zero TDV. The consumer is compensated by the utility for electricity generation in excess of annual consumption, but only at the wholesale rate which is substantially lower than the retail rate. Consideration of dwellings without gas was not in the scope of this study.

In conclusion, this report has identified cost effective options to meet above-code performance levels for dwellings using natural gas and electricity which can be adopted by cities and counties within investor-owned utility territories across California. Including PV to the level of offsetting electricity loads was found to be cost effective in all sixteen climate zones evaluated as summarized above.

5 References

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Appendix A – Prescriptive Package

The following presents the residential prescriptive package as printed in the 2016 Building Energy Efficiency Standards (CEC, 2016b).

TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN

						C												
						1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Building Envelope Insulation	**Roofs/ Ceilings**	**Option A (meets §150.1(c)9A)**	Continuous Insulation Above Roof Rafter	Roofing Type	No Air Space[1]	NR	NR	NR	R 8	NR	NR	NR	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8
					With Air Space[2]	NR	NR	NR	R 6	NR	NR	NR	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6
			Ceiling Insulation			R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier			NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
		Option B (meets §150.1(c)9A)	Below Roof Deck Insulation	Roofing Type	No Air Space	NR	NR	NR	R 18	NR	NR	NR	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18
					With Air	NR	NR	NR	R 13	NR	NR	NR	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13
			Ceiling Insulation			R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier			NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
		Option C (meets	Ceiling Insulation			R 38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant			NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR

TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN (CONTINUED)

					Climate Zone														
					1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Building Envelope Insulation	**Walls**	Above Grade	Framed[4]		U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.065	U 0.065	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051
			Mass Wall Interior[5]		U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.059 R 17
			Mass Wall Exterior[6]		U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.1025 R 8.0	U 0.125 R 8.0	U 0.070 R 13
		Below Grade	Below Grade Interior[7]		U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.066 R 15
			Below Grade Exterior		U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19
	Floors	Slab Perimeter			NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	U 0.58 R 7.0
		Raised			U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19
		Concrete Raised			U 0.092 R 8.0	U 0.092 R 8.0	U 0.269 R 0	U 0.269 R 0	U0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0
Building Envelope	**Roofing Products**	**Low-sloped**	Aged Solar Reflectance		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
			Thermal Emittance		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
		Steep Sloped	Aged Solar Reflectance		NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR
			Thermal Emittance		NR	NR	NR	NR	NR	NR	NR	NR	NR	0. 75	0.75	0.75	0.75	0.75	0.75	NR
Building Envelope	**Fenestration**	Maximum U-factor			0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
		Maximum SHGC			NR	0.25	NR	0.25	NR	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		Maximum Total Area			20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
		Maximum West Facing Area			NR	5%	NR	5%	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN (CONTINUED)

				Climate Zone															
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
HVAC SYSTEM	**Space Heating[11]**	**Electric-Resistance Allowed**		No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
		If gas, AFUE		MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		If Heat Pump, HSPF[9]		MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
	Space cooling	**SEER**		MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN	MIN
		Refrigerant Charge Verification or Fault Indicator Display		NR	REQ	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
		Whole House Fan[10]		NR	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR	NR
	Central System Air Handlers	**Central Fan Integrated Ventilation System Fan Efficacy**		REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
	Ducts[12]	**Roof/Ceiling Options A & B**	Duct Insulation	R-8	R-8	R-6	R-8	R-6	R-6	R-6	R-8	R-8	R-8	R-8	R-8	R-8	R-8	R-8	R-8
			§150.1(c)9A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Roof/Ceiling	Duct Insulation	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6	R-6
			§150.1(c)9B	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ
Water Heating	**All Buildings**			System Shall meet Section 150.1(c)8															

Footnote requirements to TABLE 150.1-A:[10]

1. Install the specified R-value with no air space present between the roofing and the roof deck.
2. Install the specified R-value with an air space present between the roofing and the roof deck. Such as standard installation of concrete or clay tile.
3. R-values shown for below roof deck insulation are for wood-frame construction with insulation installed between the framing members.
4. Assembly U-factors can be met with cavity insulation alone or with continuous insulation alone, or with both cavity and continuous insulation that results in an assembly U-factor equal to or less than the U-factor shown. Use Reference Joint Appendices JA4 Table 4.3.1, 4.3.1(a), or Table 4.3.4 to determine alternative insulation products to meet the required maximum U-factor.
5. Mass wall has a thermal heat capacity greater than or equal to 7.0 Btu/h-ft^2. "Interior" denotes insulation installed on the inside surface of the wall.
6. Mass wall has a thermal heat capacity greater than or equal to 7.0 Btu/h-ft^2. "Exterior" denotes insulation installed on the exterior surface of the wall.
7. Below grade "interior" denotes insulation installed on the inside surface of the wall.
8. Below grade "exterior" denotes insulation installed on the outside surface of the wall.
9. HSPF means "heating seasonal performance factor."
10. When whole house fans are required (REQ), only those whole house fans that are listed in the Appliance Efficiency Directory may be installed. Compliance requires installation of one or more WHFs whose total airflow CFM is capable of meeting or exceeding a minimum 1.5 cfm/square foot of conditioned floor area as specified by Section 150.1(c)12.
11. A supplemental heating unit may be installed in a space served directly or indirectly by a primary heating system, provided that the unit thermal capacity does not exceed 2 kilowatts or 7,000 Btu/hr and is controlled by a timelimiting device not exceeding 30 minutes.
12. For duct and air handler location: REQ denotes location in conditioned space. When the table indicates ducts and air handlers are in conditioned space, a HERS verification is required as specified by Reference Residential Appendix RA3.1.4.3.8.

[10] Single family buildings are modeled with Option B and multifamily buildings are modeled with Option C.

Appendix B.1 – Single Family Package Summaries

Table 16: Single Family Tier Packages

Climate Zone	QII	ACH50	Window U-value / SHGC	Door U-value	HPA	Furnace AFUE	AC SEER/EER	AH Fan W/cfm	DHW EF	HW Pipe Insul.	PV Credit Size (kW)	T-24 Comp. Margin
Tier 1, Envelope Cases												
CZ1	Y		.30/.50	0.20						Y		16.1%
CZ2	Y	3	.30/.23	0.20				0.30		Y		15.8%
CZ3	Y		.30/.50	0.20						Y		15.5%
CZ4	Y		.30/.23					0.30				12.0%
CZ5	Y		.30/.50							Y		15.2%
CZ6	Y											8.7%
CZ7	Y											7.0%
CZ8	Y											8.9%
CZ9	Y		.30/.23					0.30				17.2%
CZ10	Y		.30/.23					0.30				17.2%
CZ11	Y		.30/.23					0.30				16.9%
CZ12	Y		.30/.23					0.30				16.4%
CZ13	Y		.30/.23					0.30				17.4%
CZ14	Y		.30/.23					0.30				16.4%
CZ15	Y							0.30				15.2%
CZ16	Y	3	.30/.23	0.20				0.30				15.8%
Tier 1, Equipment Cases												
CZ1	Y					0.92						19.3%
CZ2	Y					0.92						16.8%
CZ3	Y								0.94			15.3%
CZ4	Y					0.92		0.30				17.0%
CZ5	Y								0.94			16.9%
CZ6	Y								0.94	Y		15.5%
CZ7	Y								0.94			15.6%
CZ8	Y							0.30	0.94			17.4%
CZ9	Y						15/12.5	0.30				16.9%
CZ10	Y						15/12.5	0.30				16.6%
CZ11	Y						15/12.5	0.30				17.3%
CZ12	Y						15/12.5	0.30				16.0%
CZ13	Y						15/12.5	0.30				17.9%
CZ14	Y						15/12.5	0.30				17.1%
CZ15	Y							0.30				15.2%
CZ16	Y					0.92						17.6%

Climate Zone	QII	ACH50	Window U-value / SHGC	Door U-value	HPA	Furnace AFUE	AC SEER/EER	AH Fan W/cfm	DHW EF	HW Pipe Insul.	PV Credit Size (kW)	T-24 Comp. Margin
Tier 2, Cases with PV Credit												
CZ1	Y	3	.30/.50	0.20	Y					Y	2.1	32.2%
CZ2	Y		.30/.50	0.20	Y					Y	2.1	31.4%
CZ3	Y		.30/.50	0.20							2.0	21.8%
CZ4	Y		.30/.23								2.1	30.4%
CZ5	Y		.30/.50								2.0	22.0%
CZ6	N/A – No PV Credit											
CZ7	N/A – No PV Credit											
CZ8	Y										2.1	36.4%
CZ9	Y										2.0	35.0%
CZ10	Y										2.1	32.2%
CZ11	Y		.30/.23	0.20							2.2	31.2%
CZ12	Y										2.1	32.4%
CZ13	Y		.30/.23								2.2	31.3%
CZ14	Y							0.30			2.2	30.9%
CZ15	Y							0.30			2.2	32.2%
CZ16	Y	3	.30/.23	0.20				0.30			2.1	31.5%

Appendix B.2 – Multifamily Package Summaries

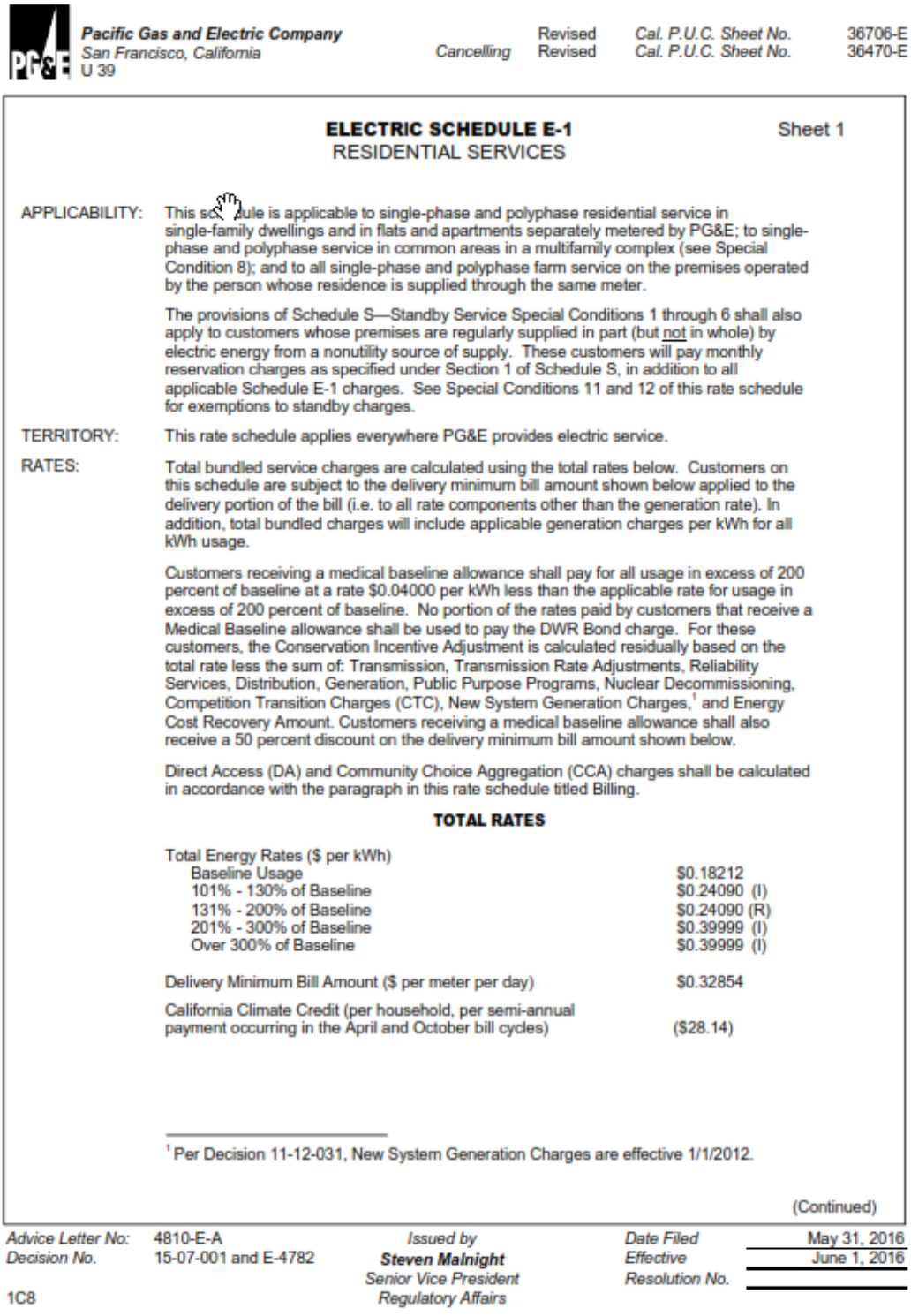
Table 17: Multifamily Tier 1 Packages

Climate Zone	QII	Window U-value / SHGC	Door U-value	Furnace AFUE	AC SEER/EER	AH Fan W/cfm	Refrigerant Charge	DHW EF	HW Comp. Dist.	PV Credit Size (kW)	T-24 Comp. Margin
Tier 1, Envelope Cases											
CZ1	Y	0.30/0.50	0.20			0.3			Y		16.5%
CZ2	Y										4.8%
CZ3	Y	0.30/0.50	0.20						Y		10.9%
CZ4	Y	0.30/0.23				0.3	Y				10.9%
CZ5	Y	0.30/0.50	0.20			0.3	Y		Y		10.2%
CZ6	Y	0.30/0.23	0.20			0.3			Y		11.7%
CZ7	Y	0.30/0.23	0.20			0.3	Y		Y		10.2%
CZ8	Y	0.30/0.23				0.3					10.5%
CZ9	Y	0.30/0.23				0.3					12.3%
CZ10	Y	0.30/0.23				0.3					10.1%
CZ11	Y	0.30/0.23	0.20			0.3					17.7%
CZ12	Y	0.30/0.23	0.20			0.3					17.1%
CZ13	Y	0.30/0.23	0.20			0.3					18.1%
CZ14	Y	0.30/0.23	0.20			0.3					17.8%
CZ15	Y	0.30/0.23	0.20			0.3					17.7%
CZ16	Y	0.30/0.23	0.20			0.3			Y		16.3%
Tier 1, Equipment Cases											
CZ1	Y	0.30/0.50						94	Y		16.7%
CZ2	Y			92				96			15.0%
CZ3	Y							94			12.4%
CZ4	Y			92				96	Y		16.3%
CZ5	Y							94			11.8%
CZ6	Y							94	Y		12.1%
CZ7	Y							96	Y		12.5%
CZ8	Y	0.30/0.23			16/13	0.3	Y				15.2%
CZ9	Y				16/13	0.3					15.7%
CZ10	Y				16/13	0.3					15.5%
CZ11	Y	0.30/0.23			15/12.5	0.3					16.5%
CZ12	Y	0.30/0.23			15/12.5	0.3					15.0%
CZ13	Y				15/12.5	0.3					15.4%
CZ14	Y				16/13	0.3					16.5%
CZ15	Y				16/13	0.3					20.4%
CZ16	Y	0.30/0.23		92		0.3					15.7%

Climate Zone	QII	Window U-value / SHGC	Door U-value	Furnace AFUE	AC SEER/EER	AH Fan W/cfm	Refrigerant Charge	DHW EF	HW Comp. Dist.	PV Credit Size (kW)	T-24 Comp. Margin
Tier 2, Cases with PV Credit											
CZ1	Y	0.30/0.50	0.20			0.3			Y	1.0	21.0%
CZ2	Y	0.30/0.23	0.20			0.3			Y	1.0	20.4%
CZ3	Y	0.30/0.50	0.20			0.3			Y	1.0	15.3%
CZ4	Y	0.30/0.23	0.20			0.3			Y	1.0	26.9%
CZ5	Y	0.30/0.50	0.20			0.3			Y	1.0	12.4%
CZ6	N/A – No PV Credit										
CZ7	N/A – No PV Credit										
CZ8	Y	0.30/0.23	0.20			0.3			Y	1.0	21.0%
CZ9	Y	0.30/0.23	0.20			0.3				1.0	26.8%
CZ10	Y	0.30/0.23	0.20			0.3				1.0	26.2%
CZ11	Y	0.30/0.23	0.20			0.3				1.0	26.5%
CZ12	Y	0.30/0.23	0.20			0.3				1.0	26.5%
CZ13	Y	0.30/0.23	0.20			0.3				1.0	27.3%
CZ14	Y	0.30/0.23	0.20			0.3				1.0	26.0%
CZ15	Y	0.30/0.23	0.20			0.3				1.0	25.4%
CZ16	Y	0.30/0.23	0.20							1.0	25.7%

Appendix C - Utility Rate Tariffs

Following are the PG&E electricity, both standard and time-of-use, and natural gas tariffs applied in this study. The PG&E monthly gas rate in $/therm was applied on a monthly basis for the 12-month period ending March 2016.



Pacific Gas and Electric Company *San Francisco, California* U 39 — *Cancelling* Revised *Cal. P.U.C. Sheet No.* 36706-E; Revised *Cal. P.U.C. Sheet No.* 36470-E

ELECTRIC SCHEDULE E-1 Sheet 1
RESIDENTIAL SERVICES

APPLICABILITY: This schedule is applicable to single-phase and polyphase residential service in single-family dwellings and in flats and apartments separately metered by PG&E; to single-phase and polyphase service in common areas in a multifamily complex (see Special Condition 8); and to all single-phase and polyphase farm service on the premises operated by the person whose residence is supplied through the same meter.

The provisions of Schedule S—Standby Service Special Conditions 1 through 6 shall also apply to customers whose premises are regularly supplied in part (but not in whole) by electric energy from a nonutility source of supply. These customers will pay monthly reservation charges as specified under Section 1 of Schedule S, in addition to all applicable Schedule E-1 charges. See Special Conditions 11 and 12 of this rate schedule for exemptions to standby charges.

TERRITORY: This rate schedule applies everywhere PG&E provides electric service.

RATES: Total bundled service charges are calculated using the total rates below. Customers on this schedule are subject to the delivery minimum bill amount shown below applied to the delivery portion of the bill (i.e. to all rate components other than the generation rate). In addition, total bundled charges will include applicable generation charges per kWh for all kWh usage.

Customers receiving a medical baseline allowance shall pay for all usage in excess of 200 percent of baseline at a rate $0.04000 per kWh less than the applicable rate for usage in excess of 200 percent of baseline. No portion of the rates paid by customers that receive a Medical Baseline allowance shall be used to pay the DWR Bond charge. For these customers, the Conservation Incentive Adjustment is calculated residually based on the total rate less the sum of: Transmission, Transmission Rate Adjustments, Reliability Services, Distribution, Generation, Public Purpose Programs, Nuclear Decommissioning, Competition Transition Charges (CTC), New System Generation Charges,[1] and Energy Cost Recovery Amount. Customers receiving a medical baseline allowance shall also receive a 50 percent discount on the delivery minimum bill amount shown below.

Direct Access (DA) and Community Choice Aggregation (CCA) charges shall be calculated in accordance with the paragraph in this rate schedule titled Billing.

TOTAL RATES

Total Energy Rates ($ per kWh)	
Baseline Usage	$0.18212
101% - 130% of Baseline	$0.24090 (I)
131% - 200% of Baseline	$0.24090 (R)
201% - 300% of Baseline	$0.39999 (I)
Over 300% of Baseline	$0.39999 (I)
Delivery Minimum Bill Amount ($ per meter per day)	$0.32854
California Climate Credit (per household, per semi-annual payment occurring in the April and October bill cycles)	($28.14)

[1] Per Decision 11-12-031, New System Generation Charges are effective 1/1/2012.

(Continued)

Advice Letter No: 4810-E-A
Decision No. 15-07-001 and E-4782
1C8
Issued by ***Steven Malnight*** *Senior Vice President Regulatory Affairs*
Date Filed May 31, 2016
Effective June 1, 2016
Resolution No.

Pacific Gas and Electric Company
San Francisco, California
U 39

Cancelling Revised *Cal. P.U.C. Sheet No.* 36713-E
Revised *Cal. P.U.C. Sheet No.* 36500-E

ELECTRIC SCHEDULE E-TOU Sheet 2
RESIDENTIAL TIME-OF-USE SERVICE

RATES
(Cont'd.):

OPTION A TOTAL RATES

Total Energy Rates ($ per kWh)	PEAK		OFF-PEAK	
Summer				
Total Usage	$0.40327	(I)	$0.32769	(I)
Baseline Credit (Applied to Baseline Usage Only)	($0.11709)	(R)	($0.11709)	(R)
Winter				
Total Usage	$0.28530	(I)	$0.27100	(I)
Baseline Credit (Applied to Baseline Usage Only)	($0.11709)	(R)	($0.11709)	(R)
Delivery Minimum Bill Amount ($ per meter per day)	$0.32854			
California Climate Credit (per household, per semi-annual payment occurring in the April and October bill cycles)	($28.14)			

Total bundled service charges shown on customer's bills are unbundled according to the component rates shown below. Where the delivery minimum bill amount applies, the customer's bill will equal the sum of (1) the delivery minimum bill amount plus (2) for bundled service, the generation rate times the number of kWh used. For revenue accounting purposes, the revenues from the delivery minimum bill amount will be assigned to the Transmission, Transmission Rate Adjustments, Reliability Services, Public Purpose Programs, Nuclear Decommissioning, Competition Transition Charges, Energy Cost Recovery Amount, DWR Bond, and New System Generation Charges[1] based on kWh usage times the corresponding unbundled rate component per kWh, with any residual revenue assigned to Distribution.*

[1] Per Decision 11-12-031, New System Generation Charges are effective 1/1/2012.
* This same assignment of revenues applies to direct access and community choice aggregation customers.

(Continued)

Advice Letter No: 4810-E-A
Decision No. 15-07-001 and E-4782
2C9

Issued by
Steven Malnight
Senior Vice President
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Pacific Gas and Electric Company
San Francisco, California
U 39

Cancelling Revised Cal. P.U.C. Sheet No. 32682-G
Revised Cal. P.U.C. Sheet No. 32620-G

GAS SCHEDULE G-1
RESIDENTIAL SERVICE

Sheet 1

APPLICABILITY: This rate schedule* applies to natural gas service to Core End-Use Customers on PG&E's Transmission and/or Distribution Systems. To qualify, service must be to individually-metered single family premises for residential use, including those in a multifamily complex, and to separately-metered common areas in a multifamily complex where Schedules GM, GS, or GT are not applicable. Common area accounts that are separately metered by PG&E have an option of switching to a core commercial rate schedule. Common area accounts are those accounts that provide gas service to common use areas as defined in Rule 1.

TERRITORY: Schedule G-1 applies everywhere within PG&E's natural gas Service Territory.

RATES: Customers on this schedule pay a Procurement Charge and a Transportation Charge, per meter, as shown below. The Transportation Charge will be no less than the Minimum Transportation Charge, as follows:

Minimum Transportation Charge:**	Per Day
	$0.09863

	Per Therm			
	Baseline		Excess	
Procurement:	$0.20960	(R)	$0.20960	(R)
Transportation Charge:	$0.81592		$1.30547	
Total:	$1.02552	(R)	$1.51507	(R)

Public Purpose Program Surcharge:

Customers served under this schedule are subject to a gas Public Purpose Program (PPP) Surcharge under Schedule G-PPPS.

See Preliminary Statement, Part B for the Default Tariff Rate Components.

The Procurement Charge on this schedule is equivalent to the rate shown on informational Schedule G-CP—Gas Procurement Service to Core End-Use Customers.

BASELINE QUANTITIES: The delivered quantities of gas shown below are billed at the rates for baseline use.

BASELINE QUANTITIES (Therms Per Day Per Dwelling Unit)

Baseline Territories***	Summer Effective Apr. 1, 2016	Winter Effective Nov. 1, 2015
P	0.46	2.15
Q	0.69	1.98
R	0.46	1.79
S	0.46	1.92
T	0.69	1.79
V	0.69	1.79
W	0.46	1.69
X	0.59	1.98
Y	0.85	2.55

* PG&E's gas tariffs are available online at www.pge.com.
** The Minimum Transportation charge does not apply to submetered tenants of master-metered customers served under gas rate Schedules GS and GT.
*** The applicable baseline territory is described in Preliminary Statement, Part A.

(Continued)

Advice Letter No: 3715-G
Decision No. 97-10-065 & 98-07-025
1C6

Issued by
Steven Malnight
Senior Vice President
Regulatory Affairs

Date Filed May 24, 2016
Effective June 1, 2016
Resolution No.

Following are the SCE electricity tariffs, both standard and time-of-use, and SoCalGas natural gas tariffs applied in this study.

EDISON

Southern California Edison — Revised Cal. PUC Sheet No. 59026-E
Rosemead, California (U 338-E) — Cancelling Revised Cal. PUC Sheet No. 58237-E

Schedule D — Sheet 2
DOMESTIC SERVICE

(Continued)

RATES

	Delivery Service Total[1]	Generation[2] UG***	Generation[2] DWREC[3]
Energy Charge- $/kWh/Meter/Day			
Baseline Service			
Summer	0.06799 (I)	0.06919 (I)	(0.00022)
Winter	0.06799 (I)	0.06919 (I)	(0.00022)
Nonbaseline Service*			
101% - 200% of Baseline - Summer	0.15997 (I)	0.06919 (I)	(0.00022)
Winter	0.15997 (I)	0.06919 (I)	(0.00022)
Over 200% of Baseline - Summer	0.22306 (R)	0.06919 (I)	(0.00022)
Winter	0.22306 (R)	0.06919 (I)	(0.00022)
Basic Charge - $/Meter/Day			
Single-Family Accommodation	0.031		
Multi-Family Accommodation	0.024		
Minimum Charge** - $/Meter/Day			
Single-Family Accommodation	0.329		
Multi-Family Accommodation	0.329		
Minimum Charge (Medical Baseline)** - $/Meter/Day			
Single-Family Accommodation	0.164		
Multi-Family Accommodation	0.164		
California Climate Credit[4]	(35.00)		
Peak Time Rebate - $/kWh		(0.75)	
Peak Time Rebate w/enabling technology - $/kWh		(1.25)	

* Nonbaseline Service includes all kWh in excess of applicable Baseline allocations as described in Preliminary Statement, Part H, Baseline Service.
** The Minimum Charge is applicable when the Delivery Service Energy Charge, plus the applicable Basic Charge is less than the Minimum Charge.
*** The ongoing Competition Transition Charge (CTC) of $(0.00015) per kWh is recovered in the UG component of Generation.
1 Total = Total Delivery Service rates are applicable to Bundled Service, Direct Access (DA) and Community Choice Aggregation Service (CCA Service) Customers, except DA and CCA Service Customers are not subject to the DWRBC rate component of this Schedule but instead pay the DWRBC as provided by Schedule DA-CRS or Schedule CCA-CRS.
2 Generation = The Generation rates are applicable only to Bundled Service Customers.
3. DWREC = Department of Water Resources (DWR) Energy Credit - For more information on the DWR Energy Credit, see the Billing Calculation Special Condition of this Schedule.
4. Applied on an equal basis, per household, semi-annually. See the Special Conditions of this Schedule for more information.

(Continued)

(To be inserted by utility)
Advice 3401-E
Decision 16-03-030

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R. O. Nichols
Senior Vice President

(To be inserted by Cal. PUC)
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Resolution

2C11

Southern California Edison
Rosemead, California (U 338-E)

Revised Cal. PUC Sheet No. 59059-E
Cancelling Revised Cal. PUC Sheet No. 58249-E

Schedule TOU-D-T
TIME-OF-USE TIERED DOMESTIC

Sheet 2

(Continued)

RATES

	Delivery Service Total[1]	Generation[2] UG***	Generation[2] DWREC[3]
Energy Charge - $/kWh/Meter/Day			
Summer Season - On-Peak			
Level I (up to 130% of Baseline)	0.10523 (I)	0.21660 (R)	(0.00022)
Level II (More than 130% of Baseline)	0.16352 (R)	0.21660 (R)	(0.00022)
Summer Season - Off-Peak			
Level I (up to 130% of Baseline)	0.10523 (I)	0.05311 (I)	(0.00022)
Level II (More than 130% of Baseline)	0.16352 (R)	0.05311 (I)	(0.00022)
Winter Season - On-Peak			
Level I (up to 130% of Baseline)	0.10523 (I)	0.09660 (R)	(0.00022)
Level II (More than 130% of Baseline)	0.16352 (R)	0.09660 (R)	(0.00022)
Winter Season - Off-Peak			
Level I (up to 130% of Baseline)	0.10523 (I)	0.04749 (I)	(0.00022)
Level II (More than 130% of Baseline)	0.16352 (R)	0.04749 (I)	(0.00022)
Basic Charge - $/Meter/Day			
Single-Family Accommodation	0.031		
Multi-Family Accommodation	0.024		
Minimum Charge* - $/Meter/Day			
Single-Family Accommodation	0.329		
Multi-Family Accommodation	0.329		
Minimum Charge (Medical Baseline)** - $/Meter/Day			
Single-Family Accommodation	0.164		
Multi-Family Accommodation	0.164		
California Climate Credit[4]	(36.00)		
California Alternate Rates for Energy Discount - %	100.00*		
Peak Time Rebate - $kWh		(0.75)	
Peak Time Rebate w/enabling technology - $/kWh		(1.25)	

* The Minimum Charge is applicable when the Delivery Service Energy Charge, plus the applicable Basic Charge is less than the Minimum Charge.
** Represents 100% of the discount percentage as shown in the applicable Special Condition of this Schedule.
*** The ongoing Competition Transition Charge (CTC) of $(0.00015) per kWh is recovered in the UG component of Generation.
1 Total = Total Delivery Service rates are applicable to Bundled Service, Direct Access (DA) and Community Choice Aggregation Service (CCA Service) Customers, except DA and CCA Service Customers are not subject to the DWRBC rate component of this Schedule but instead pay the DWRBC as provided by Schedule DA-CRS or Schedule CCA-CRS
2 Generation = The Gen rates are applicable only to Bundled Service Customers.
3 DWREC = Department of Water Resources (DWR) Energy Credit – For more information on the DWR Energy Credit, see the Billing Calculation Special Condition of this Schedule.
4 Applied on an equal basis, per household, semi-annually. See the Special Conditions of this Schedule for more information.

(Continued)

(To be inserted by utility)
Advice 3401-E
Decision 16-03-030
2C19

Issued by
R. O. Nichols
Senior Vice President

(To be inserted by Cal. PUC)
Date Filed May 2, 2016
Effective Jun 1, 2016
Resolution

SOUTHERN CALIFORNIA GAS COMPANY Revised CAL. P.U.C. SHEET NO. 52782-G
LOS ANGELES, CALIFORNIA CANCELING Revised CAL. P.U.C. SHEET NO. 52751-G

Schedule No. GR Sheet 1
RESIDENTIAL SERVICE
(Includes GR, GR-C and GT-R Rates)

APPLICABILITY

The GR rate is applicable to natural gas procurement service to individually metered residential customers.

The GR-C, cross-over rate, is a core procurement option for individually metered residential core transportation customers with annual consumption over 50,000 therms, as set forth in Special Condition 10.

The GT-R rate is applicable to Core Aggregation Transportation (CAT) service to individually metered residential customers, as set forth in Special Condition 11.

The California Alternate Rates for Energy (CARE) discount of 20%, reflected as a separate line item on the bill, is applicable to income-qualified households that meet the requirements for the CARE program as set forth in Schedule No. G-CARE.

TERRITORY

Applicable throughout the service territory.

RATES	GR	GR-C	GT-R	
Customer Charge, per meter per day:	16.438¢	16.438¢	16.438¢	
For "Space Heating Only" customers, a daily Customer Charge applies during the winter period from November 1 through April 30[1/]:	33.149¢	33.149¢	33.149¢	
Baseline Rate, per therm (baseline usage defined in Special Conditions 3 and 4):				
Procurement Charge: [2/]	34.536¢	34.536¢	N/A	I
Transmission Charge: [3/]	56.280¢	56.280¢	55.758¢	
Total Baseline Charge:	90.816¢	90.816¢	55.758¢	I
Non-Baseline Rate, per therm (usage in excess of baseline usage):				
Procurement Charge: [2/]	34.536¢	34.536¢	N/A	I
Transmission Charge: [3/]	82.280¢	82.280¢	81.758¢	
Total Non-Baseline Charge:	116.816¢	116.816¢	81.758¢	I

[1/] For the summer period beginning May 1 through October 31, with some exceptions, usage will be accumulated to at least 20 Ccf (100 cubic feet) before billing.

(Footnotes continue next page.)

(Continued)

(TO BE INSERTED BY UTILITY)
ADVICE LETTER NO. 4989
DECISION NO.
1C6

ISSUED BY
Dan Skopec
Vice President
Regulatory Affairs

(TO BE INSERTED BY CAL. PUC)
DATE FILED Jul 7, 2016
EFFECTIVE Jul 10, 2016
RESOLUTION NO. G-3351

Following are the SDG&E electricity, both standard and time-of-use, and natural gas tariffs applied in this study.

San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 27650-E
Canceling Revised Cal. P.U.C. Sheet No. 26948-E

Sheet 1

SCHEDULE DR

RESIDENTIAL SERVICE
(Includes Rates for DR-LI)

APPLICABILITY

Applicable to domestic service for lighting, heating, cooking, water heating, and power, or combination thereof, in single family dwellings, flats, and apartments, separately metered by the utility; to service used in common for residential purposes by tenants in multi-family dwellings under Special Condition 8; to any approved combination of residential and nonresidential service on the same meter; and to incidental farm service under Special Condition 7.

This schedule is also applicable to customers qualifying for the California Alternate Rates for Energy (CARE) Program and/or Medical Baseline, residing in single-family accommodations, separately metered by the Utility, and may include Non-profit Group Living Facilities and Qualified Agricultural Employee Housing Facilities, if such facilities qualify to receive service under the terms and conditions of Schedule E-CARE. The rates for CARE and Medical Baseline customers are identified in the rates tables below as DR-LI and DR-MB rates, respectively.

Customers on this schedule may also qualify for a semi-annual California Climate Credit $(17.44) per Schedule GHG-ARR.

TERRITORY

Within the entire territory served by the Utility.

RATES

Total Rates:

Description - DR Rates	UDC Total Rate		DWR-BC Rate	EECC Rate + DWR Credit	Total Rate		
Summer:							
Baseline Energy ($/kWh)	0.05480	I	0.00539	0.12965	0.18984	I	D
Above 130% of Baseline	0.25645	R	0.00539	0.12965	0.39149	R	
Winter:							
Baseline Energy ($/kWh)	0.10256	I	0.00539	0.06604	0.17399	I	D
Above 130% of Baseline	0.26737	R	0.00539	0.06604	0.35880	R	
Minimum Bill ($/day)	0.329				0.329		

Description -DR-LI Rates	UDC Total Rate		DWR-BC Rate	EECC Rate + DWR Credit	Total Rate		
Summer – CARE Rates:							
Baseline Energy ($/kWh)	0.05225	I	0.00000	0.12965	0.18190	I	D
Above 130% of Baseline	0.25390	R	0.00000	0.12965	0.38355	R	
Winter – CARE Rates:							
Baseline Energy ($/kWh)	0.10001	I	0.00000	0.06604	0.16605	I	D
Above 130% of Baseline	0.26482	R	0.00000	0.06604	0.35086	R	
Minimum Bill ($/day)	0.164				0.164		

(Continued)

1C10
Issued by
Dan Skopec
Vice President
Regulatory Affairs

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Resolution No. E-4787

Advice Ltr. No. 2861-E-A
Decision No. 15-07-001

San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 26962-E
Canceling Revised Cal. P.U.C. Sheet No. 26908-E

SCHEDULE DR-SES Sheet 1

DOMESTIC TIME-OF-USE FOR HOUSEHOLDS WITH A SOLAR ENERGY SYSTEM

APPLICABILITY

Service under this schedule is available on a voluntary basis for individually metered residential customers with Solar Energy Systems. Service is limited to individually metered residential customers with a Solar Energy System with domestic service for lighting, heating, cooking, water heating, and power, or combination thereof, in single family dwellings and flats. Qualifying California Alternative Rates for Energy (CARE) customers are eligible for service on this schedule, as further described under Special Condition 8 of this schedule.

Customers on this schedule may also qualify for a semi-annual California Climate Credit $(17.44) per Schedule GHG-ARR. I

TERRITORY

Within the entire territory served by the Utility.

RATES

Total Rates:

Description – DR-SES Rates	UDC Total Rate		DWR-BC Rate		EECC Rate + DWR Credit		Total Rate	
Energy Charges ($/kWh)								
On-Peak – Summer	0.12635	I	0.00539	I	0.33023	R	0.46397	R
Semi-Peak– Summer	0.12635	I	0.00539	I	0.09530	R	0.22904	R
Off-Peak – Summer	0.12635	I	0.00539	I	0.07332	R	0.20706	R
Semi-Peak – Winter	0.12635	I	0.00539	I	0.08159	R	0.21533	R
Off-Peak – Winter	0.12635	I	0.00539	I	0.06826	R	0.20200	R
Minimum Bill ($/day)	0.329						0.329	

(1) Total Rates consist of UDC, Schedule DWR-BC (Department of Water Resources Bond Charge), and Schedule EECC (Electric Energy Commodity Cost) rates, with the EECC rates reflecting a DWR Credit of $(0.00021) that customers receive on their monthly bills. I

(2) Total Rates presented are for customers that receive commodity supply and delivery service from Utility. Differences in total rates paid by Direct Access (DA) and Community Choice Aggregation (CCA) customers are identified in Schedule DA-CRS and CCA-CRS, respectively.

(3) DWR-BC charges do not apply to CARE or Medical Baseline customers.

UDC Rates

Description-DR-SES	Transm		Distr		PPP		ND		CTC		LGC		RS		TRAC		UDC Total	
Energy Charges ($/kWh)																		
On-Peak – Summer	0.02943	I	0.06367	R	0.01241	I	0.00052	I	0.00160	I	0.00039	I	0.00013	R	0.00000	I	0.12635	I
Semi-Peak – Summer	0.02943	I	0.06367	R	0.01241	I	0.00052	I	0.00160	I	0.00039	I	0.00013	R	0.00000	I	0.12635	I
Off-Peak - Summer	0.02943	I	0.06367	R	0.01241	I	0.00052	I	0.00160	I	0.00039	I	0.00013	R	0.00000	I	0.12635	I
Semi-Peak - Winter	0.02943	I	0.06367	R	0.01241	I	0.00052	I	0.00160	I	0.00039	I	0.00013	R	0.00000	I	0.12635	I
Off-Peak - Winter	0.02943	I	0.06367	R	0.01241	I	0.00052	I	0.00160	I	0.00039	I	0.00013	R	0.00000	I	0.12635	I
Minimum Bill ($/day)			0.329														0.329	

(Continued)

1C9

Issued by
Dan Skopec
Vice President
Regulatory Affairs

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Decision No.

SDGE

San Diego Gas & Electric Company
San Diego, California

Revised Cal. P.U.C. Sheet No. 21921-G

Canceling Revised Cal. P.U.C. Sheet No. 21908-G

Sheet 1

SCHEDULE GR

RESIDENTIAL NATURAL GAS SERVICE
(Includes Rates for GR, GR-C, GTC/GTCA)

APPLICABILITY

The GR rate is applicable to natural gas procurement service for individually metered residential customers.

The GR-C, cross-over rate, is a core procurement option for individually metered residential core transportation customers with annual consumption over 50,000 therms, as set forth in Special Condition 10.

The GTC/GTCA rate is applicable to intrastate gas transportation-only services to individually metered residential customers, as set forth in Special Condition 11.

Customers taking service under this schedule may be eligible for a 20% California Alternate Rate for Energy (CARE) program discount, reflected as a separate line item on the bill, if they qualify to receive service under the terms and conditions of Schedule G-CARE.

TERRITORY

Within the entire territory served natural gas by the utility.

RATES

	GR	GR-C		GTC/GTCA[1/]
Baseline Rate, per therm (baseline usage defined in Special Conditions 3 and 4):				
Procurement Charge:[2/]	$0.34561	$0.34561	I	N/A
Transmission Charge:	$0.90805	$0.90805		$0.90805
Total Baseline Charge:	$1.25366	$1.25366	I	$0.90805
Non-Baseline Rate, per therm (usage in excess of baseline usage):				
Procurement Charge:[2/]	$0.34561	$0.34561	I	N/A
Transmission Charge:	$1.08354	$1.08354		$1.08354
Total Non-Baseline Charge:	$1.42915	$1.42915	I	$1.08354

1/ The rates for core transportation-only customers, with the exception of customers taking service under Schedule GT-NGV, include any FERC Settlement Proceeds Memorandum Account (FSPMA) credit adjustments.

2/ This charge is applicable to Utility Procurement Customers and includes the GPC and GPC-A Procurement Charges shown in Schedule GPC which are subject to change monthly as set forth in Special Condition 7.

(Continued)

1C5

Issued by
Dan Skopec
Vice President
Regulatory Affairs

Date Filed Jul 7, 2016
Effective Jul 10, 2016
Resolution No.

Advice Ltr. No. 2489-G
Decision No.

(f) **Ballasts for residential recessed luminaires.** To qualify as high efficacy for compliance with Section 150.0(k), any compact fluorescent lamp ballast in a residential recessed luminaire shall meet all of the following conditions:

1. Be rated by the ballast manufacturer to have a minimum rated life of 30,000 hours when operated at or below a specified maximum case temperature. This maximum ballast case temperature specified by the ballast manufacturer shall not be exceeded when tested in accordance to UL 1598 Section 19.15; and
2. Have a ballast factor of not less than 0.90 for nondimming ballasts and a ballast factor of not less than 0.85 for dimming ballasts.

SECTION 110.10 MANDATORY REQUIREMENTS FOR SOLAR READY BUILDINGS

(a) **Covered occupancies.**

1. **Single-family residences.** Single-family residences located in subdivisions with ten or more single-family residences and where the application for a tentative subdivision map for the residences has been deemed complete by the enforcement agency shall comply with the requirements of Sections 110.10(b) through 110.10(e)
2. **Low-rise multifamily buildings.** Low-rise multifamily buildings shall comply with the requirements of Sections 110.10(b) through 110.10(d).
3. **Hotel/motel occupancies and high-rise multifamily buildings.** Hotel/motel occupancies and high-rise multifamily buildings with ten habitable stories or fewer shall comply with the requirements of Sections 110.10(b) through 110.10(d).
4. **All other nonresidential buildings.** All other nonresidential buildings with three habitable stories or fewer shall comply with the requirements of Sections 110.10(b) through 110.10(d).

(b) **Solar zone.**

1. **Minimum area.** The solar zone shall have a minimum total area as described below. The solar zone shall comply with access, pathway, smoke ventilation and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction. The solar zone total area shall be comprised of areas that have no dimension less than five feet and are no less than 80 square feet each for buildings with roof areas less than or equal to 10,000 square feet or no less than 160 square feet each for buildings with roof areas greater than 10,000 square feet.
   A. **Single-family residences.** The solar zone shall be located on the roof or overhang of the building and have a total area no less than 250 square feet.

      Exception 1 to Section 110.10(b)1A: Single-family residences with a permanently installed solar electric system having a nameplate DC power rating, measured under Standard Test Conditions, of no less than 1000 watts.

      Exception 2 to Section 110.10(b)1A: Single-family residences with a permanently installed domestic solar water-heating system meeting the installation criteria specified in the Reference Residential Appendix RA4 and with a minimum solar savings fraction of 0.50.

      Exception 3 to Section 110.10(b)1A: Single-family residences with three habitable stories or more and with a total floor area less than or equal to 2000 square feet and having a solar zone total area no less than 150 square feet.

      Exception 4 to Section 110.10(b)1A: Single-family residences located in climate zones 8–14 and the Wildland-Urban Interface Fire Area as defined in Title 24, Part 2 and having a whole house fan and having a solar zone total area no less than 150 square feet.

      Exception 5 to Section 110.10(b)1A: Buildings with a designated solar zone area that is no less than 50 percent of the potential solar zone area. The potential solar zone area is the total area of any low-sloped roofs where the annual solar access is 70 percent or greater and any steep-sloped roofs oriented between 110 degrees and 270 degrees of true north where the annual solar access is 70 percent or greater. Solar access is the ratio of solar insolation including shade to the solar insolation without shade. Shading from obstructions located on the roof or any other part of the building shall not be included in the determination of annual solar access.

      Exception 6 to Section 110.10(b)1A: Single-family residences having a solar zone total area no less than 150 square feet and where all thermostats comply with Reference Joint Appendix JA5 and are capable of receiving and responding to Demand Response Signals prior to granting of an occupancy permit by the enforcing agency.

      Exception 7 to Section 110.10(b)1A: Single-family residences meeting the following conditions:

      A. All thermostats comply with Reference Joint Appendix JA5 and are capable of receiving and responding to Demand Response Signals prior to granting of an occupancy permit by the enforcing agency.

      B. Comply with one of the following measures:

         i. Install a dishwasher that meets or exceeds the ENERGY STAR® Program requirements with either a refrigerator that meets or exceeds the ENERGY STAR Program requirements or a whole house fan driven by an electronically commutated motor; or

         ii. Install a home automation system capable of, at a minimum, controlling

the appliances and lighting of the dwelling and responding to demand response signals; or

iii. Install alternative plumbing piping to permit the discharge from the clothes washer and all showers and bathtubs to be used for an irrigation system in compliance with the *California Plumbing Code* and any applicable local ordinances; or

iv. Install a rainwater catchment system designed to comply with the *California Plumbing Code* and any applicable local ordinances, and that uses rainwater flowing from at least 65 percent of the available roof area.

B. **Low-rise and high-rise multifamily buildings, hotel/motel occupancies and nonresidential buildings.** The solar zone shall be located on the roof or overhang of the building or on the roof or overhang of another structure located within 250 feet of the building or on covered parking installed with the building project and have a total area no less than 15 percent of the total roof area of the building excluding any skylight area.

Exception 1 to Section 110.10(b)1B: Buildings with a permanently installed solar electric system having a nameplate DC power rating, measured under Standard Test Conditions, of no less than one watt per square foot of roof area.

Exception 2 to Section 110.10(b)1B: Buildings with a permanently installed domestic solar water-heating system complying with Section 150.1(c)8Ciii.

Exception 3 to Section 110.10(b)1B: Buildings with a designated solar zone area that is no less than 50 percent of the potential solar zone area. The potential solar zone area is the total area of any low-sloped roofs where the annual solar access is 70 percent or greater and any steep-sloped roofs oriented between 110 degrees and 270 degrees of true north where the annual solar access is 70 percent or greater. Solar access is the ratio of solar insolation including shade to the solar insolation without shade. Shading from obstructions located on the roof or any other part of the building shall not be included in the determination of annual solar access.

Exception 4 to Section 110.10(b)1B: Low-rise and high-rise multifamily buildings meeting the following conditions:

A. All thermostats in each dwelling unit comply with Reference Joint Appendix JA5 and are capable of receiving and responding to Demand Response Signals prior to granting of an occupancy permit by the enforcing agency.

B. In each dwelling unit, comply with one of the following measures:

i. Install a dishwasher that meets or exceeds the ENERGY STAR Program requirements with either a refrigerator that meets or exceeds the ENERGY STAR Program requirements or a whole house fan driven by an electronically commutated motor; or

ii. Install a home automation system capable of, at a minimum, controlling the appliances and lighting of the dwelling and responding to demand response signals; or

iii. Install alternative plumbing piping to permit the discharge from the clothes washer and all showers and bathtubs to be used for an irrigation system in compliance with the *California Plumbing Code* and any applicable local ordinances; or

iv. Install a rainwater catchment system designed to comply with the *California Plumbing Code* and any applicable local ordinances, and that uses rainwater flowing from at least 65 percent of the available roof area.

Exception 5 to Section 110.10(b)1B: Buildings where the roof is designed and approved to be used for vehicular traffic or parking or for a heliport.

2. **Orientation.** All sections of the solar zone located on steep-sloped roofs shall be oriented between 110 degrees and 270 degrees of true north.

3. **Shading.**

A. No obstructions, including but not limited to, vents, chimneys, architectural features and roof mounted equipment, shall be located in the solar zone.

B. Any obstruction, located on the roof or any other part of the building that projects above a solar zone shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane.

Exception to Section 110.10(b)3: Any roof obstruction, located on the roof or any other part of the building, that is oriented north of all points on the solar zone.

4. **Structural design loads on construction documents.** For areas of the roof designated as solar zone, the structural design loads for roof dead load and roof live load

shall be clearly indicated on the construction documents.

Note: Section 110.10(b)4 does not require the inclusion of any collateral loads for future solar energy systems.

(c) **Interconnection pathways.**

1. The construction documents shall indicate a location for inverters and metering equipment and a pathway for routing of conduit from the solar zone to the point of interconnection with the electrical service. For single-family residences the point of interconnection will be the main service panel.
2. The construction documents shall indicate a pathway for routing of plumbing from the solar zone to the water-heating system.

(d) **Documentation.** A copy of the construction documents or a comparable document indicating the information from Sections 110.10(b) through 110.10(c) shall be provided to the occupant.

(e) **Main electrical service panel.**

1. The main electrical service panel shall have a minimum busbar rating of 200 amps.
2. The main electrical service panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation.
   A. **Location.** The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.
   B. **Marking.** The reserved space shall be permanently marked as "For Future Solar Electric."

SECTION 110.11 MANDATORY REQUIREMENTS FOR ELECTRICAL POWER DISTRIBUTION SYSTEM

Certification by Manufacturers. Any electrical power distribution system equipment listed in this section may be installed only if the manufacture has certified to the Commission that the equipment complies with all the applicable requirements of this section.

(a) **Low-voltage dry-type distribution transformer** shall be certified by the Manufacturer as required by the Title 20 Appliance Efficiency Regulations.

EXCEPTION to Section 110.11(a):.

1. autotransformer;
2. drive (isolation) transformer;
3. grounding transformer;
4. machine-tool (control) transformer;
5. nonventilated transformer;
6. rectifier transformer;
7. regulating transformer;
8. sealed transformer;
9. special-impedance transformer;
10. testing transformer;
11. transformer with tap range of 20 percent or more;
12. uninterruptible power supply transformer; or
13. welding transformer.

3. Compliance with a lawfully enacted storm water management ordinance.

4.106.3 Grading and paving. Construction plans shall indicate how the site grading or drainage system will manage all surface water flows to keep water from entering buildings. Examples of methods to manage surface water include, but are not limited to, the following:

1. Swales
2. Water collection and disposal systems
3. French drains
4. Water retention gardens
5. Other water measures which keep surface water away from buildings and aid in groundwater recharge.

Exception: Additions and alterations not altering the drainage path.

4.106.4 Electric vehicle (EV) charging for new construction. New construction shall comply with Sections 4.106.4.1 and 4.106.4.2 to facilitate future installation and use of EV chargers. Electric vehicle supply equipment (EVSE) shall be installed in accordance with the *California Electrical Code,* Article 625.

Exceptions: On a case-by-case basis, where the local enforcing agency has determined EV charging and infrastructure are not feasible based upon one or more of the following conditions:

1. Where there is no commercial power supply.
2. Where there is evidence substantiating that meeting the requirements will alter the local utility infrastructure design requirements on the utility side of the meter so as to increase the utility side cost to the homeowner or the developer by more than $400.00 per dwelling unit.

4.106.4.1 New one- and two-family dwellings and townhouses with attached private garages. For each dwelling unit, install a listed raceway to accommodate a dedicated 208/240-volt branch circuit. The raceway shall not be less than trade size 1 (nominal 1-inch inside diameter). The raceway shall originate at the main service or subpanel and shall terminate into a listed cabinet, box or other enclosure in close proximity to the proposed location of an EV charger. Raceways are required to be continuous at enclosed, inaccessible or concealed areas and spaces. The service panel and/or subpanel shall provide capacity to install a 40-ampere minimum dedicated branch circuit and space(s) reserved to permit installation of a branch circuit overcurrent protective device.

4.106.4.1.1 Identification. The service panel or subpanel circuit directory shall identify the overcurrent protective device space(s) reserved for future EV charging as "EV CAPABLE". The raceway termination location shall be permanently and visibly marked as "EV CAPABLE".

4.106.4.2 New multifamily dwellings. Where 17 or more multifamily dwelling units are constructed on a building site, 3 percent of the total number of parking spaces provided for all types of parking facilities, but in no case less than one, shall be electric vehicle charging spaces (EV spaces) capable of supporting future EVSE. Calculations for the required number of EV spaces shall be rounded up to the nearest whole number.

Note: Construction documents are intended to demonstrate the project's capability and capacity for facilitating future EV charging. There is no requirement for EV spaces to be constructed or available until EV chargers are installed for use.

4.106.4.2.1 Electric vehicle charging space (EV space) locations. Construction documents shall indicate the location of proposed EV spaces. At least one EV space shall be located in common use areas and available for use by all residents.

When EV chargers are installed, EV spaces required by Section 4.106.4.2.2, Item 3, shall comply with at least one of the following options:

1. The EV space shall be located adjacent to an accessible parking space meeting the requirements of the *California Building Code*, Chapter 11A, to allow use of the EV charger from the accessible parking space.
2. The EV space shall be located on an accessible route, as defined in the *California Building Code,* Chapter 2, to the building.

4.106.4.2.2 Electric vehicle charging space (EV space) dimensions. The EV spaces shall be designed to comply with the following:

1. The minimum length of each EV space shall be 18 feet (5486 mm).
2. The minimum width of each EV space shall be 9 feet (2743 mm).
3. One in every 25 EV spaces, but not less than one, shall also have an 8-foot (2438 mm) wide minimum aisle. A 5-foot (1524 mm) wide minimum aisle shall be permitted provided the minimum width of the EV space is 12 feet (3658 mm).
    a. Surface slope for this EV space and the aisle shall not exceed 1 unit vertical in 48 units horizontal (2.083 percent slope) in any direction.

4.106.4.2.3 Single EV space required. Install a listed raceway capable of accommodating a 208/240-volt dedicated branch circuit. The raceway shall not be less than trade size 1 (nominal 1-inch inside diameter). The raceway shall originate at the main service or subpanel and shall terminate into a listed cabinet, box or enclosure in close proximity to the proposed location of the EV spaces. Construction documents shall identify the raceway termination point. The service panel and/or subpanel shall provide capacity to install a 40-ampere minimum dedicated branch circuit and space(s) reserved to permit installation of a branch circuit overcurrent protective device.

4.106.4.2.4 Multiple EV spaces required. Construction documents shall indicate the raceway termination point and proposed location of future EV spaces and EV chargers. Construction documents shall also provide information on amperage of future EVSE, raceway method(s), wiring schematics and electrical load calculations to verify that the electrical panel service capacity and electrical system, including any on-site distribution transformer(s), have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rated amperage of the EVSE. Plan design shall be based upon a 40-ampere minimum branch circuit. Raceways and related components that are planned to be installed underground, enclosed, inaccessible or in concealed areas and spaces shall be installed at the time of original construction.

4.106.4.2.5 Identification. The service panel or subpanel circuit directory shall identify the overcurrent protective device space(s) reserved for future EV charging purposes as "EV CAPABLE" in accordance with the *California Electrical Code.*

Notes:

1. The California Department of Transportation adopts and publishes the "California Manual on Uniform Traffic Control Devices (California MUTCD)" to provide uniform standards and specifications for all official traffic control devices in California. Zero Emission Vehicle Signs and Pavement Markings can be found in the New Policies & Directives Number 13-01. Website: http://www.dot.ca.gov/trafficops/policy/13-01.pdf
2. See Vehicle Code Section 22511 for EV charging space signage in off-street parking facilities and for use of EV charging spaces.
3. The Governor's Office of Planning and Research (OPR) published a "Zero-Emission Vehicle Community Readiness Guidebook" which provides helpful information for local governments, residents and businesses. Website: http://opr.ca.gov/docs/ZEV_Guidebook.pdf.

Applied Water for Turf Calculator

Summary

The Applied Water for Turf Calculator (Calculator) is a Microsoft Excel tool created in the fall of 2015 by Town staff with assistance from California Department of Water Resources (DWR) staff to demonstrate how much water is needed annually to irrigate turf based on square footage. The Calculator can determine roughly how much water will need to be stored in a rainwater catchment system or cistern in order to meet the annual watering needs of the turf. The following are the key inputs for the Calculator: (a) the evapotranspiration for applied water (ETaw) for warm-season and cool-season turf, (b) the irrigated landscape area in square feet, (c) the conversion factor for converting acre-inches/acre/year to gallons/ft^2/year, (d) and the irrigation efficiency for drip and spray irrigation.

The methodology used for calculating the annual water demands for turf is consistent with the methodology used by the DWR to estimate ET of applied water (ETaw) for grass on a 4 x 4 km grid using the daily soil water balance program "California Simulation of Evapotranspiration of Applied Water" or "Cal-SIMETAW."[1]

Cal-SIMETAW is a new tool developed by the DWR and the University of California, Davis to estimate daily water balance in the crop root zone to determine crop evapotranspiration (ETc) and evapotranspiration of applied water (ETaw) for use in California Water Plan Update 2018, which is mandated by the state law to be updated every five years.[1] Cal-SIMETAW was specifically designed to improve the department's estimates of ETc and ETaw for agricultural crops and other surfaces which account for most evapotranspiration losses and water contributions from ground water seepage, precipitation, and irrigation. The model requires weather data, soils, crop coefficients, rooting depths, seepage etc., that influence crop water balance.[1] The model uses daily PRISM weather data, which ere derived from monthly PRISM climate data and daily US National Climate Data Center climate station data to cover California on a 4 x 4 km grid spacing.[1]

The model also uses SSURGO soil characteristic data and crop information with precipitation and ETc data to generate hypothetical water balance irrigation schedules to determine ETaw, which is the amount of applied irrigation water that contributes to crop evapotranspiration or ETc assuming 100% application efficiency.[1] Therefore, ETaw is the amount of diverted water needed to produce a crop or maintain an urban landscape.[1]

[1] Orang, Morteza, "Assessment of Water Demand for Cool-season Grass in California Using CAL-SIMETAW," California Department of Water Resources, March 2015, p 2.