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Docket Number:	19-BSTD-01
Project Title:	Draft 2019 Alternative Calculation Method Reference Manuals and Compliance Software Tools
TN #:	226350
Document Title:	BayREN Comments - Requests for T24 2019 ACM and Software
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Requests for T24 2019 ACM and Software

This document was erroneously filed in Docket 17-BSTD-02

Additional submitted attachment is included below.

DOCKETED	
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Project Title:	2019 Title 24, Part 6, Building Energy Efficiency Standards Rulemaking
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Requests for T24 2019 ACM and Software

Additional submitted attachment is included below.

BAYREN

Local Governments Empowering Our Communities

November 20, 2018

California Energy Commission
Dockets Office MS-4
1516 Ninth Street
Sacramento, CA 95814-5512
docket@energy.ca.gov

Re: Docket No. 17-BSTD-02

Dear Commissioners and Staff,

The BayREN Codes & Standards Program is a joint effort of the Bay Area cities and counties to increase compliance with the California Energy Code. As the CEC prepares updates to the Alternative Calculation Method and the energy code compliance software to support the 2019 Title 24 Building Energy Efficiency Standards, BayREN has two requests.

First, BayREN would like to encourage the CEC to move forward with development and adoption of the ACM and software as expeditiously as possible. We are hearing from Bay Area local governments that timing is important and that they are more likely to adopt reach codes when they can take effect at the same time as the new 2019 Building Standards, in January 2020. In order for that to happen, the software needs to be finalized in the first half of 2019 so that cost-effectiveness studies can be prepared with enough time remaining for local governments to engage stakeholders and develop and adopt reach codes. The CEC's current planned completion date in May 2019 will allow this timing, and BayREN would like to ask the CEC to make every effort to keep with that timeline.

Second, a number of the cities and counties in BayREN's region have adopted or are considering local ordinances and policies to facilitate the installation of electric appliances for thermal loads (i.e., space heating and water heating) and thereby reduce the site greenhouse gas emissions generated by the homes and business in

their jurisdiction. Whether these ordinances and policies are voluntary or mandatory, the BayREN Codes & Standards Program is committed to working with these jurisdictions, the California Energy Commission, and other key stakeholders to help ensure understandable and consistent compliance pathways for the installation of efficient electric appliances that meet or exceed the requirements of Title 24. To do this, BayREN encourages the CEC to prioritize the following items:

- Establish a framework in the ACM, compliance software, and Compliance Manuals that will allow the CEC to approve a prescriptive compliance path for efficient electric water heating systems that serve multiple dwelling units in low-rise and high-rise residential new construction and existing buildings.
- Establish independent electric baselines for: space heating in high-rise residential, hotels/motels, and nonresidential (irrespective of ASHRAE 90.1); central domestic hot water systems; and nonresidential service water heating.
- Develop performance compliance options to effectively model electric space heating and water heating appliances with appropriate efficiencies, a high degree of confidence, and user-friendliness, considering real-world scenarios and building configurations. Technologies of concern include:
    - In low-rise residential buildings: ductless heat pumps, air-to-water heat pumps, three-function heat pumps, and efficient central electric domestic hot water systems.
    - In high-rise residential buildings and hotels/motels, dormitories, and assisted living: variable refrigerant flow (VRF) heat pump systems and efficient central electric domestic hot water systems.
    - In nonresidential buildings: variable refrigerant flow (VRF) heat pump systems.

BayREN understands that the CEC is prioritizing updates to the ACM and compliance software based on finite funds, multiple needs, and limited regulatory flexibility. Given this need to prioritize, BayREN recommends the above items as ones that will be particularly valuable. These recommendations are based on the analysis shown in the attached matrix, which assesses the provisions for prescriptive and performance approaches for key electric appliances in the 2019 Standards for Low-Rise Residential, High-Rise Residential, and Non-Residential use types.

We appreciate the opportunity to provide this input, and thank the CEC for its careful consideration of the BayREN's comments.

Respectfully Submitted,

Gerald L. Lahr
Assistant Director -- Energy Programs

Cc: Larry Froess, Senior Mechanical Engineer
Veronica Olvera, Electrical Engineer and CEC-BayREN Liaison
Martha Brook, Advisor to Commissioner McAllister

California Title 24 2019 and Electric Appliances

California's Title 24 Building Energy Efficiency Standards set the bar for energy efficiency in new construction and alterations. California Energy Commission staff and commissioners have stated the intent to provide developers, designers, and builders the option to use cost-effective electric appliances for thermal loads, in order to enhance options for realizing California's Zero Net Energy goals, allow design flexibility, and facilitate reduction in site GHG emissions. In addition, local governments have an interest in ensuring that efficient electric appliances have a level playing field under Title 24 as they work to enforce the building standards while also reducing GHG emissions.

This document is provided by the Bay Area Regional Energy Network in response to requests from local governments for a summary of which efficient electric appliances for space heating and domestic hot water heating will be permitted under California's 2019 Title 24 in three major components of requirements:

- **Energy Standards** – The Title 24 Part 6 2019 Building Energy Efficiency Standards were adopted May 9, 2018, and will be effective for all projects that apply for permit starting in January 2020.
- **Alternative Calculation Method** Reference Manuals (Nonresidential and Residential) or ACM – Rules for how to define energy use of a proposed design in order to compare it to a standard design, and to verify that the project proposes to use no more energy than the standard design.
- **Software –** Energy Commission-certified software must be used to model all building features that affect energy performance; such software incorporates California Building Energy Code Compliance (CBECC) components. This software includes both rules (the ACM translated into computer code) and many types of reference data.

Some projects simply comply with all requirements ("Prescriptive Compliance"). Projects that propose tradeoffs between the energy use of different building systems to meet an overall energy use target for the building ("Performance Compliance") depend upon the combination of the Energy Standards, ACM, and Software, so only when all three components are complete will it be possible to confirm when and how efficient electric thermal appliances will be permitted. This document is "draft" because at the time of most recent update (see footer), the 2019 "Code" was finalized May 9, 2018 but revisions to the ACM are pending, and software remains in development. The table below can only be "final" when all three components have been completed and approved by the CEC.

Once approved by the Commission, the Energy Standards, ACM, and the calculation method in CBECC all become essentially unchangeable during the 3-year duration of a code cycle. However, even after CBECC is approved, the Commission may issue updates ("service packs") to fix bugs – or to update reference data, such as in recognition of new credible data about performance specifications of specific equipment. Therefore, it may be necessary to update even a finalized version of this document.

Development of the CA Energy Standards is a complex process, and we salute the CEC for its hard work and leadership.

* This document summarizes common technologies/end uses options; it does not address all potential technologies/end uses (especially within nonresidential occupancies).

California Title 24 2019 and Electric Appliances

Occupancy	Application	Prescriptive Compliance	Performance Compliance	**Discussion** (all Code References are to 2019 Title 24 Part 6 Building Energy Efficiency Standards)
Low-Rise Residential	HVAC / Space Heating	Generally permissible.	Compliance software discounts (or "derates") the efficiency of ductless heat pumps and has limitations for modeling advanced electric space conditioning systems.	2019 Standards provide pathway(s). Compliance software does not: • Effectively account for performance of ductless heat pumps given their performance compared to ducted systems and viability for a wide range of applications. • Provide effective options to model advanced electric space conditioning systems such as air-to-water and three-function heat pumps with confidence. Users of CBECC report the software uses default values for the performance and these systems and that the algorithms are modeling them incorrectly. *Code Reference: Prescriptive - §150.1(c); Performance - §1501(b); Additions/Alterations - §150.2(a, b)*
	Water Heating	Generally permissible for systems serving individual dwelling units. For systems serving multiple dwelling units: • There is no explicit permission for efficient electric water heating. • 20-30% solar thermal SSF is required, which limits options for solar PV offset for efficient electric water heating.	Compliance software does not provide reasonable means to model central electric systems. Compliance software does not offer an independent electric baseline for central water heating. (*ACM Proposes a Solution) Compliance software penalizes electric water heating systems that use solar thermal.	2019 Standards provides pathway(s) for systems serving individual dwelling units. For systems serving multiple dwelling units: • Efficient electric option not explicitly approved for prescriptive approach. • Compliance software does not allow for an independent electric baseline. ACM (2016) currently applies gas Standard Design to low rise residential central systems, regardless of proposed fuel type. • Software does not provide reasonable options for modeling an efficient central electric system. • Solar thermal savings fraction (SSF) is input as an annual average value. The compliance software uses this annual average value for every hour of the year. However, during peak TDV summer hours, real SSF would be ≥100% (i.e. 0 electrical usage to meet DHW demand). Update the model to apply hourly SSF to mitigate this unrealistic TDV penalty for efficient electric DHW systems with solar thermal. *Code Reference: Prescriptive - §150.1(c); Performance - §150.1(b); Additions/Alterations - §150.2(a, b)*
High-Rise Residential **Hotels/Motels**	HVAC / Space Heating	Few large capacity efficient electric systems are eligible.	Compliance software discounts the efficiency of heat pump systems (including VRF and custom/built-up systems). Draft ACM and nonresidential software assume gas baseline for HVAC; T24 2019 does not offer independent electric baseline.	For high rise residential, 2019 Standards provide limited pathways for efficient electric compliance. Similar non-residential uses, such as hotel/motel, dormitory, and assisted living, do not have viable efficient electric compliance pathways. Few options for large capacity electric appliances are included within Title 20 MAEDBS Database (https://cacertappliances.energy.ca.gov/Login.aspx). In addition, building professionals have limited experience with large variable capacity electric heating systems. Compliance software does not credit proposed systems with rated efficiencies for variable refrigerant flow (VRF) heat pump systems; currently, compliance software assumes VRF systems utilize minimum efficiency heat pumps. Draft ACM aligns T24 baselines for central systems with ASHRAE 90.1 – setting gas as the baseline fuel for central systems. Compliance software assumes gas boiler, 4-pipe fan coil for Standard Design in Residential or Hotel/motel Guestrooms in a building with 4 or more floors regardless of Proposed Design. *Code Reference: Prescriptive - §140.4; Performance - §140.1; Additions/Alterations - §141.0*

California Title 24 2019 and Electric Appliances

Occupancy	Application	Prescriptive Compliance	Performance Compliance	**Discussion** (all Code References are to 2019 Title 24 Part 6 Building Energy Efficiency Standards)
	Water Heating	For systems serving multiple dwelling units: • There is no explicit permission for efficient electric water heating. • 20-30% solar thermal SSF is required, which limits options for solar PV offset for efficient electric water heating.	Compliance software does not provide reasonable options to model central electric systems. Compliance software does not offer an independent electric baseline for central water heating. (*ACM Proposes a Solution) Compliance software penalizes electric water heating systems that use solar thermal.	Limited viable pathways in 2019 Standards. For systems serving multiple dwellings: • Efficient electric option not explicitly approved for prescriptive approach. • Compliance software for non-residential occupancies does not allow an independent electric baseline. ACM (2016) currently applies gas Standard Design to high rise residential central systems, regardless of proposed fuel type. • Software does not provide reasonable options for modeling an efficient electric central system. • Solar thermal savings fraction (SSF) is input as an annual average value. The compliance software uses this annual average value for every hour of the year. However, during peak TDV summer hours, real SSF would be ≥100% (i.e. 0 electrical usage to meet DHW demand). Update the model to apply hourly SSF to mitigate this unrealistic TDV penalty for efficient electric DHW systems with solar thermal. Central heat pump with PV can function similarly to solar thermal: both require a large storage tank, and both can charge the tank using only solar energy during peak TDV hours. ACM should allow controls to minimize heat pump operation during peak demand periods, and maximize heat pump operation when site and/or grid PV generation is plentiful. *Code Reference: Prescriptive - §140.5; Performance - §140.1; Additions/Alterations - §141.0*
Nonresidential	HVAC / Space Heating	Few large capacity efficient electric systems are eligible.	Compliance software discounts the efficiency of heat pump systems (including VRF and custom/built-up systems). Draft ACM and nonresidential software assume gas baseline for HVAC; T24 2019 does not offer independent electric baseline.	Few options for large capacity electric appliances are included within Title 20 MAEDBS Database (https://cacertappliances.energy.ca.gov/Login.aspx). In addition, building professionals have limited experience with large variable capacity electric heating systems. Compliance software does not credit proposed systems with rated efficiencies for variable refrigerant flow (VRF) heat pump systems; currently, compliance software assumes VRF systems utilize minimum efficiency heat pumps. Compliance software assumes gas boiler for Standard Design regardless of Proposed Design. *Code Reference: Prescriptive - §140.4; Performance - §140.1; Additions/Alterations - §141.0*
	Water Heating	Generally permissible.	Nonresidential software does not offer independent electric baseline for service water heating.	Compliance software assumes gas for Standard Design regardless of Proposed fuel type. This contradicts prescriptive code (2016), which is fuel neutral. *Code Reference: Prescriptive - §140.5; Performance - §140.1; Additions/Alterations - §141.0*

Legend

T24 2019 provides a level playing field for electric appliances
Significant remaining concerns that can be addressed in regulatory tools such as ACM and compliance software
T24 2019 strongly disfavors electric appliances
T24 2019, market availability of equipment, and lack of standardized or referenceable performance standards limit options to serve this end use with electric appliances

(*ACM Proposes a Solution) indicates that pending proposed updates to the ACM address this issue.

Revised: October 5, 2018