DOCKETED	
Docket Number:	19-IEPR-06
Project Title:	Energy Efficiency and Building Decarbonization
TN #:	227731
Document Title:	Bill Martin Comments Comment following the 4-8-19 Building De-carbonization workshop tied to SB-1477 and CPUC R.19-01-011.
Description:	N/A
Filer:	System
Organization:	Bill Martin
Submitter Role:	Public
Submission Date:	4/17/2019 8:30:12 AM
Docketed Date:	4/17/2019

Comment Received From: Bill Martin
Submitted On: 4/17/2019
Docket Number: 19-IEPR-06

Comment following the 4-8-19 Building De-carbonization workshop tied to SB-1477 and CPUC R.19-01-011.

Additional submitted attachment is included below.

Docket Statement for CPUC R.19-01-011 4-14-19
Bill Martin

The policy roll-out to any signed California legislation that promotes de-carbonization of buildings is an exciting thing. At first glance, it seems that all of California's long-term goals to clear the air of health robbing emissions and to promote energy efficiency and distributed energy resources is becoming a harmonious effort. Action against climate change needs to be bold and immediate.

The SB 1477 workshop in Los Angeles on April 8th seemed to back electrification as a priority, and induction cooking, heat pumps, and heat pump hot water heaters received a lot of attention. But things are not harmonious. They are not even coherent.

A quick check of the Title-24, 2019 Building Energy Efficiency Standards shows that required incorporation of Time Dependent Valuation of Electricity is still part of the performance compliance approach for building plan approval. This is unchanged from the 2016 Standards.

So, with 2020 state goals for solar PV on all new homes, for 50% renewable grid electricity by 2030 and 100% by 2045, we are ignoring more reduced electricity cost from renewable sources. But we're going to take a "snapshot calculation" at the front-end of a building project and be more likely to suffer carbon emissions throughout the life of that building far beyond 2045? It could have been 100% powered by a renewable resource. The word "de-carbonization" portends removal of it from

> *Page 88, 2019 Building Energy Efficiency Standards*
>
> **SECTION 100.2 – CALCULATION OF TIME DEPENDENT VALUATION (TDV) ENERGY**
>
> Time Dependent Valuation (TDV) energy shall be used to compare proposed designs to their energy budget when using the performance compliance approach. TDV energy is calculated by multiplying the site energy use (electricity kWh, natural gas therms, or fuel oil or LPG gallons) for each energy type times the applicable TDV multiplier. TDV multipliers vary for each hour of the year and by energy type (electricity, natural gas or propane), by Climate Zone and by building type (low-rise residential or nonresidential, high-rise residential or hotel/motel). TDV multipliers are summarized in Reference Joint Appendix JA3. TDV multipliers for propane shall be used for all energy obtained from depletable sources other than electricity and natural gas.
>
> **NOTE:** Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, and 25943, Public Resources Code

buildings, but TDV rules and the historic pattern of thousands of new homes in a single project all getting piped gas as sure as they are provided water and sewer service says something else.
Will this continue to happen even though supplying gas to new developments is more expensive than the grid power we already know will be there? Will the PV on those roofs become more of a decoration or green badge than an integral distributed energy resource for the grid?

One technology that wasn't featured last Monday was that of geothermal (or ground source) heat pumps (GHPs). Having lived with both air source (ASHPs) and ground source (GHPs) in my Climate Zone 16 community, I can testify that geo is far better.

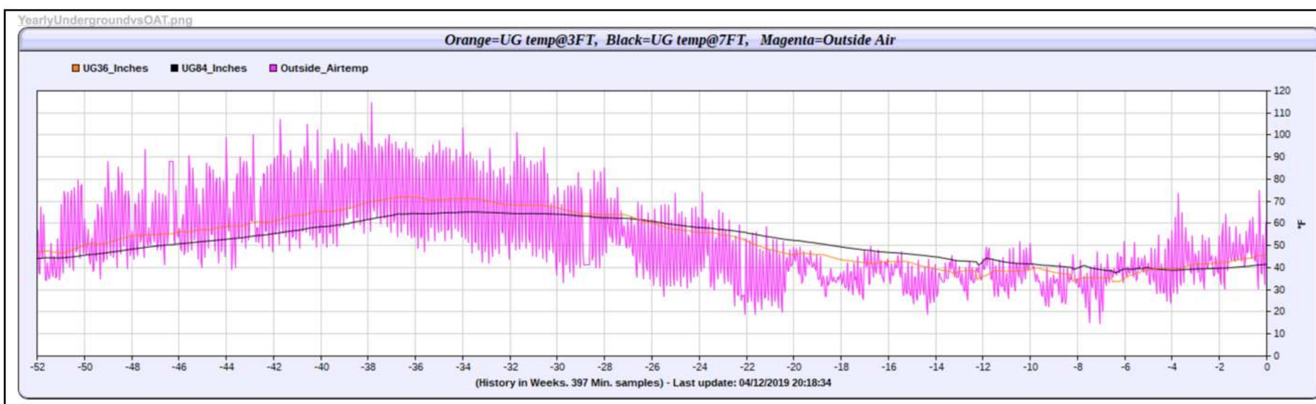
There was a lot said about air source heat pumps last Monday. They use ambient air as their heat source and heat sink. There isn't a building orientation in which they don't suffer efficiency reductions during operation.

Insulation and curtains are only a delaying factor in the heat loss from or heat gain to the interior of a building. And when your thermostat feels the need for heat, your ASHP won't be tapping the warmest air outside, or from the coolest source when your house gets too hot by late afternoon.

The heat exchange for each these operations is also dependent upon ***convection*** action upon the outdoor coils. Of three methods of heat transfer, this is second best. And in winter, an ASHP's outdoor coil will have to undergo defrost cycles to melt frost or ice off those coils to maintain air flow. That's an efficiency penalty.

Geo heat pumps (GHPs) work differently through ***conduction***, where liquid from an underground heat exchanger reaches the inside the GHPs main heat exchanger in close contact with refrigerant. A cross-section of three sequential loops at right show where turbulent water passes on the pipe's inside and either refrigerant liquid (evaporation for heating) or refrigerant gas (condensation for cooling) makes for conductive heat exchange in the narrow spaces. GHPs don't need defrost cycles and their heat exchangers are inert, underground, not exposed to weather or vandalism. The above ground units have long operating lives of 25 years.

When your insulation is finally overwhelmed by cold or heat, GHPs are working with a very stable thermal medium, underground, not the highs or lows of ambient air at inopportune times, day and night.



Yearly plot (above) of ambient air versus underground temps at 3 & 7 feet in Quincy, California.

Residential GHP units in two-to-six ton sizes are reaching COPs (coefficient of performance) of 6.0 these days, and dual loop, heat recovery chillers for **larger building complexes** can reach a COP of 8.0. The EERs (energy efficiency ratios) are usually in the high 20s. Geo heat pumps move more heat with less demand load than anythiing else can. And when ASHPs and standard air conditioners are warming the neighborhood next summer by all trying to export unwanted heat at the same time—GHPs are making free hot water and shipping the excess underground where it won't boost city temperatures, serving better as boosted thermal storage for next year's heating season.

Individual residences like **THIS ONE** can really benefit from a GHP, a solar net-metered intertie, and an on-site heat exchanger. However, with the focus on more multi-family and affordable housing, a common looped heat exchanger enables different buildings or occupancy units to exchange heating and cooling loads, improving efficiency further while enabling an underground heat exchanger that's smaller and less expensive.

One of the more recent common loop projects is **Whisper Valley** outside Austin, Texas, where 7,500 residential units will pull from and push to a common loop while each carries its own solar PV.

Are geo heat pumps exotic? No. But few know about or understand them. Half the time in conversation I learn that others think we're talking hot rocks and steam as in geysers. They think I was so lucky to have such a resource underneath the land I bought and built on. GHPs can work anywhere, including underwater. There are even heat exchangers developed to work with raw sewage in dense city neighborhoods. (Wake up, California, the Sharc® was developed by Canadians, and a large installation serving 750,000 square feet was recently completed in Washington, D.C.)

A new standard for GeoExchange® called ANSI/CSA/IGSHPA C448 was completed and adoped in the U.S. and Canada, and is about to be considered for adoption by IMC (the International Mechanical Code) and UMC (the Uniform Mechanical Code). I've condensed this standard's **Table of Contents** for your review. You'll see it covers all phases of geo heat pump deployment to insure productive and trouble-free installations.

If California's regulators are serious about carbon-free heating and the most efficient and long lasting cooling, our team is ready to present at a future workshop if requested.

Thank you,

s/s Bill Martin

Bill Martin, President (530) 394-8224
CALIFORNIA GEO
California Geothermal Heat Pump Association
www.CaliforniaGeo.org