

AB 2339 WORKING GROUP DRAFT DOCUMENT

**Draft Energy Commission Policy
for
Ground Source Heat Pumps
April 19, 2013**

California Energy Commission

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Introduction:

Public Resources Code, section 25228 (added by Assembly Bill 2339, Chapter 608, Statutes of 2012), requires the Energy Commission, in consultation with the California Public Utilities Commission, cities, counties, special districts, and other stakeholders, to evaluate policies to overcome barriers to the use of geothermal heat pump and geothermal ground loop technologies, and to include its evaluations and recommendations in the 2013 Integrated Energy Policy Report (2013 IEPR).

In evaluating these policies and strategies, the Energy Commission shall consider all of the following:

1. The quantitative benefits and costs to ratepayers specific to safer, more reliable, or less costly gas or electrical service and through greater energy efficiency, reduction of health and environmental impacts from air pollution, and reduction of greenhouse gas emissions related to electricity and natural gas production and use, through the use of geothermal heat pump and geothermal ground loop technologies.
2. The existing statutory and permit requirements that impact the use of geothermal heat pumps and geothermal ground loop technologies and any other existing legal impediments to the use of geothermal heat pump and geothermal ground loop technologies.
3. The impact of the use of the geothermal heat pump and geothermal ground loop technologies on achieving the state's goals pursuant to the California Global Warming Solutions Act of 2006 (Health & Safety Code, § 38500 et seq.) and achieving the state's energy efficiency goals.

Public Resources Code Section 25302 requires the Energy Commission to prepare an integrated energy policy report every two years for submittal to the Governor that provides an overview of major energy issues and trends facing California. The report makes energy policy recommendations based on the Energy Commission's energy assessments and forecasts with the intent of conserving resources, protecting the environment, providing reliable energy, enhancing the state's economy, and protecting public health and safety.

This Working Group will review, comment and make independent suggestions for the Energy Commission staff to consider in recommending policies that may overcome barriers to the use of geothermal heat pump and geothermal ground loop technologies, which may ultimately be adopted by the Energy Commission and included in the 2013 IEPR.

The Energy Commission staff is especially interested in the participation of technical subject experts from the geothermal heat pump and geothermal ground loop industries (manufacturers, installers, and distributors), the California Public Utilities Commission, the Air Resources Board, and interested cities, counties, and special districts.

Initial Proposed Policies:

Staff recommends the following policies as a "first cut" based on the previous work done in the PIER funded Project Negatherm For Ground Source Heat Pumps. However, one proposal (number 3 below) is not feasible and is only being discussed in order to clarify the rationale.

Issue 1. AB 2334 (Cortese, Chapter 581, Statutes of 1996) amended Sections 13700, 13701, 13750.5, 13751, and 13752, added Sections 13713 and 13800.5 and repealed Section 13750 of the California Water Code Public.

- Defines "geothermal heat exchange borewell" as any uncased artificial excavation that uses the heat exchange capacity of the earth for heating and cooling, in which excavation the ambient ground temperature is 30 degrees Celsius (86 degrees Fahrenheit) or less, and which excavation uses a closed loop fluid system to prevent the discharge or escape of its fluid into surrounding aquifers or other geologic formations. [The bores shall be designed and constructed according to IGSHPA standards.](#)
- Defines "geothermal heat exchange well" as any uncased artificial excavation that uses the heat exchange capacity of the earth and its aquifers for heating and cooling, in which excavation the ambient ground and water temperature is 30 degrees Celsius (86 degrees Fahrenheit) or less, and which excavation uses an open loop fluid system which does not add any chemicals (for HVAC water treatment or for other reason) to the water removed and injected from the wells. [At least two wells shall be used for this purpose, a source well that is used to draw water and an injection well that is used to return water to the ground after it is used for HVAC heat exchange. The source and injection wells shall be designed and constructed according to IGSHPA standards.](#)
- Requires DWR to develop recommended standards for the construction, maintenance, abandonment or destruction of geothermal heat exchange [bores and wells](#) and by July 1, 1997 [\(?\)](#) to submit the recommended standards to the SWRCB.

- Authorizes a local agency with authority over geothermal heat exchange bores and wells to adopt temporary regulations applicable to geothermal heat exchange bores and wells that the local agency determines to be consistent with the intent of existing DWR standards.
- Requires the SWRCB, by January 1, 1998, to adopt a model geothermal heat exchange bore and well ordinance to implement DWR's recommended standards. Requires the SWRCB to circulate the model ordinance to all cities and counties.
- Requires each county, city, or water agency where appropriate, by April 1, 1998, to adopt a geothermal heat exchange well ordinance that meets or exceeds the recommended standards developed by DWR. If an appropriate local agency fails to adopt such an ordinance, the model ordinance adopted by the SWRCB shall take effect on May 1, 1998, and shall be enforced by the county or city.

After AB 2334 passed, the Interagency Task Force (DWR, CEC, SWRCB, CGA and representatives from the GSHP industry) met to develop standards for GSHPBs. The draft standards, Bulletin 74-99, were completed in April 1999 and were to be included in a revision of Bulletin 74-81/74-90. However, these standards were not adopted as final nor were they sent to the SWRCB.

Currently, the Department of Water Resources is re-developing the Bulletin 74-99. The Energy Commission will assist DWR in the development of these standards and ensure that they are consistent with Energy Commission policy and Building Energy Efficiency Standards.

Proposed Policy:

As the Department of Water Resources completes the original work of AB 2334, the Energy Commission staff will participate and assist with that effort.

As a sub issue, we would like the working group to submit comments on the Bulletin 74-99 definitions.

Issue 2. With Staffs presentation at the March 21, 2013 Workshop, altering the way that ground source heat pumps are modeled under Building Energy Efficiency Standards requirements would come in two phases. Industry representatives, not Energy Commission Staff, must undertake these tasks. The first phase is to use the site design engineer to verify the proper installation and confirm the energy efficiency of the ground source heat pump ground loop(s) and all associated above ground device installations. The second phase is to develop new modeling rules for ground source heat pumps.

Design Engineers site verification

- Would use existing rule set in computer modeling tools
- Requires development of site inspection protocols
- Gives final word on site acceptance to design engineer
- Use IGHSPA or other existing standard as a minimum standard of care to protect clients from engineers/contractors that may not have the appropriate experience.
- Make test bore (per ASHRAE standard) mandatory before design and construction of closed loop geothermal fields are undertaken.

New modeling rules specific to Ground Source Heat pumps

- Potentially more accurate modeling (standardize and improve current calculation methodologies to include soil water/moisture migration, this being the largest heat transfer mechanism – use soil diffusivity, precipitation, known aquifer data, and other water sources).
- Could include Domestic Hot Water
- Much longer review time and extensive staff report required
- Adds need for program to insert code and verify
- Many more technical obstacles to validate
- Would include site verification (test bore/well data is critical)

Update:

Technical staff have engaged with representatives from the CaliforniaGeo organization to advise the industry on likely successful strategies for completing this task.

Proposed Policy:

The Energy Commission encourages the ground source heat pump industry representatives to either propose protocols for a site design engineer to use for verification of the efficiency of a ground source heat pump on site after construction or develop a new Building Energy Efficiency Standards modeling rule set specific to ground source heat pumps.

Issue 3. One possible solution to the overall issue of the cost of installation for the ground loop portion of a ground source heat pump system is for a utility to own the loops (possibly more of the system), lease the system to the home owner and possibly recover that capital investment with on-bill repayment over the life of the ground loop (typically 50 years). Under this scenario, it has been suggested that the Energy Commission could grant the utility an RPS credit.

However, it is not possible to grant RPS credits to non-generating energy efficiency measures such as Ground Source Heat Pumps. The Renewables Portfolio Standard program is evaluated based on the generation of electricity from eligible renewable energy resources compared to the total retail sales of a utility, as stated in the Public Utilities Code 399.12(i) “ ‘Renewables portfolio standard’ means the specified percentage of electricity generated by eligible renewable energy resources that a retail seller or a local publicly owned electric utility is required to procure pursuant to this

article.” Non-generating energy efficiency measures would be incapable of producing any renewable electricity and could only provide a decrease in the retail load served by a utility.

To further confound any attempt to include a non-generation technology in the RPS program the law defines a renewable energy credit, the measure of compliance, as “a certificate of proof associated with the generation of electricity from an eligible renewable energy resource, issued through the accounting system established by the Energy Commission pursuant to Section 399.25, that one unit of electricity was generated and delivered by an eligible renewable energy resource” (PUC 399.12(h)(1)). It is also required that a ‘Renewable energy credit’ includes all renewable and environmental attributes associated with the production of electricity from the eligible renewable energy resource, except for an emissions reduction credit issued pursuant to Section 40709 of the Health and Safety Code and any credits or payments associated with the reduction of solid waste and treatment benefits created by the utilization of biomass or biogas fuels” (PUC 399.12(h)(2)).

While a Ground Source Heat Pump does use a geothermal energy resource, it does not generate electricity with that resource and thus is not an renewable electrical generating facility or eligible renewable energy resource.

Update:

From the last meeting of the Working Group; CARB staff brought up the point that a utility-base ground loop lease program would affect the RPS requirement for a utility in that it would reduce of the overall electricity production needs.

[Geothermal heat pump systems are considered a renewable energy technology. This allow it to qualify for federal tax credits and accelerated depreciation. The fact that this technology reduces the electrical energy needed for a structure to operate should be seen as more important than generating electricity from a renewable energy source since a unit of energy not used in addition saves the energy inefficiencies and transmission losses, etc., not incurred! This represents a larger upstream energy impact.](#)

Conclusion (This will not be a stated policy):

The Energy Commission will not consider the possibility of granting utility owned Ground Source Heat Pumps a Renewable Portfolio Standards Credit.

Issue 4. The Energy Commission currently uses time dependent valuation (TDV) calculations to estimate the upstream impact of energy efficiency measures for the Building Energy Efficiency Standards on an hourly basis. During the rulemaking phase for the Building Energy Efficiency Standards, the TDV calculations are used to estimate the energy savings and associated greenhouse gas emission savings of the efficiency

measures on an hourly basis over California as a whole. However, the current methodology would not be applicable to individual installations of ground source heat pumps (or any efficiency measure). While the energy savings estimated correspond to local climate zones within California, the estimated greenhouse gas savings apply to California only as a whole. To predict the impacts on greenhouse gas emissions from a single installation of any efficiency measure would require knowledge of the hourly electric energy resource mix of the utility supplying that power. Such an effort is currently impractical. Therefore, the Energy Commission can estimate statewide greenhouse gas emission savings from predicted ground source heat pump installations, but not individual installations.

The California Air Resources Board has designed a California cap-and-trade program that is enforceable and meets the requirements of AB 32. Offset credits are greenhouse gas emission savings that meet regulatory criteria (see Sub-article 13 of the Cap and Trade Regulations) and may be used by a regulated entity to meet compliance obligations under the Cap-and-Trade Program. The Energy Commission encourages the ground source heat pump industry to pursue and satisfy the significant requirements for Greenhouse Gas Offset Credits under the Cap and Trade Program.

Proposed Policy:

The Energy Commission should consider the potential impacts of ground source heat pumps on greenhouse gas emissions using the TDV calculation methodology if estimated installations can be obtained or developed.

Additionally, the Energy Commission should work with the California Air Resources Board to evaluate under what conditions that a ground source heat pump installation can be granted carbon credits (by CARB) under the Greenhouse Gas Cap-and-Trade Program.

Update:

From the last working group meeting, CARB staff indicated that this was likely to be unfruitful for the industry given the significant requirements set for a credit under the Cap-and-Trade program. However, they reiterated the point that a GSHP would reduce the electricity generation needs of a utility and thus reduce the need for carbon credits.

Issue 5. The concept of a utility-based loop lease program is that a utility installs, maintains, and owns the ground source heat pump loop-piping network for the heat pump system, while the customer owns and maintains the heat pump itself. The utility charges customers either a monthly fee or a usage charge based on a BTU meter reading to supply geothermal energy.

Plumas-Sierra Rural Electric Cooperative

Plumas offers a 30-year, non-transferrable, interest free loan for ground source heat pump installations. The monthly payment is added to the customer's monthly electric bill and the amount of the loan is based upon the size of the GSHP loop installed.

- Installations total over 450 systems to date.
- Monthly loop payments for a 4-ton system would be \$14.95 for a horizontal loop and \$29.95 for a vertical bore field.
- As an incentive, a new 85-gallon water heater is offered free of charge. The addition of "de-super-heater" waste heat capacity further reduces energy usage.
- Plumas-Sierra calculates annual heating savings of over \$2,000 versus propane.

Update:

Staff has been recently contacted by a consulting firm representing a local utility in California interested in a pilot project for a new subdivision of residential buildings that would be based on GSHP technology for heat and cooling.

Proposed Policy:

In conjunction with the California Public Utilities Commission, the Energy Commission should investigate the extent to which utility-based loop lease programs with on-bill repayment for both residential and nonresidential applications can be encouraged.

Issue 6: Currently, the State of California does not collect well log data in a systematic way. Other states (Missouri, New Jersey, Idaho, Washington and Oregon) not only collect well log data on a state level, they are generally made public via a web-portal.

Well logging, also known as borehole logging is the practice of making a detailed record (a well log) of the geologic formations penetrated by a borehole. The log may be based either on visual inspection of samples brought to the surface (geological logs) or on physical measurements made by instruments lowered into the hole (geophysical logs). Well logging can be done during any phase of a well's history; drilling, completing, producing and abandoning. Well logging is performed in boreholes drilled for the oil and gas, groundwater, mineral and geothermal exploration, as well as part of environmental and geotechnical studies. Such data would be extremely useful to ground source heat pump installations.

Update:

Energy Commission staff has been seeking a likely repository for a well-log database. Likely candidates include the Department of Water Resources and the Department of Oil, Gas and Geothermal.

Proposed Policy:

The Energy Commission staff, working with the Department of Water Resources, will investigate the feasibility of developing a web-based well log resource for California.

Additionally, the Energy Commission will continue to add case studies of ground source heat pumps to the existing Negatherm web site as they become available.

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