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Geothermal Energy Association Comments

Additional submitted attachment is included below.

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California Energy Commission
Dockets Office, MS-4
Re: Docket No. 15-IEPR-01
1516 Ninth Street
Sacramento, CA 95814-5512

Dear California Energy Commission Staff,

The Geothermal Energy Association (GEA) would like to submit the following public comments on Draft 2015 Integrated Energy Policy Report Scoping Order. The GEA is a trade association comprised of U.S. companies that support the expanded use of geothermal energy and are developing geothermal resources worldwide for electrical power generation and direct-heat uses. GEA advocates for public policies that promote the development and utilization of geothermal resources, provides a forum for the industry to discuss issues and problems, encourages research and development to improve geothermal technologies, presents industry views to governmental organizations, provides assistance for the export of geothermal goods and services, compiles statistical data about the geothermal industry, and conducts education and outreach projects.

In the Energy Commission's (CEC) final integrated energy policy report GEA requests the CEC consider some of the major energy issues and trends facing the geothermal sector in California outlined throughout these comments. In addition, GEA would like to highlight to the Energy Commission of some of the additional economic values geothermal power provides to the State of California listed below.

- Geothermal power plants employ about 1.17 persons per MW at each operating power plants. These are permanent jobs over that last the entire 30-50 year lifetime of the power plant.
- In total, adding governmental, administrative, and technical related jobs, the geothermal industry employs about 2.13 persons per MW.
- In 2013, geothermal power producers paid $29 million dollars in annual property taxes, including $21 million dollars to the State of California.
- Geothermal paid about $24 million in Rents and Royalties to state, federal and local governments nationwide in 2014 with about $10 million of that going to the state or local counties governments in California.
- Over the course of 30 to 50 years an average 20 MW facility will pay nearly $6.3 to $11 million dollars in property taxes.
- Geothermal plants during construction employ about 3.1 person-years per MW and the manufacturing of the equipment requires an additional 3.3 person-years per MW.
- GEA estimates producing electricity using geothermal resources as opposed to fossil fuels or natural gas provides an environmental externality benefit of $0.01 compared to natural gas and $0.035 for coal per kWh.

Renewables

"Identification of issues and potential solutions for reaching Governor Brown's goal of renewables for 50 percent of California's electricity use by 2030."

The Geothermal Energy Association supports the CEC's efforts to study how a 50% RPS can be achieved. We would like to highlight to the CEC of geothermal power's value as a firm and flexible power source. As a firming resource, geothermal energy is one of the only true baseload renewable energy sources. Geothermal plants are not subject to fuel costs and can produce sustainable electricity 24 hours a day. Historically, geothermal energy sources have made electricity grids more resilient to blackouts, kept electricity prices low as a baseload power source, achieved cost-effective emissions reductions, and used existing transmission infrastructure efficiently because of their high capacity factors.

In addition, geothermal power can be engineered to be a flexible source of power. Geothermal power plants can provide regulation, load following or energy imbalance, spinning reserve, non-spinning reserve, and replacement or supplemental reserve. For example, some geothermal binary power plant can ramp up and down very quickly. These plants can be ramped up and down multiple times per day from 10% to 100% of nominal output power. The normal ramp rate for dispatch (by heat source valve) is 15% of nominal power per minute. The ramp rate for dispatch in Flexible Operation Mode is 30% of nominal power per minute.

Despite previous misconceptions there are more geothermal resources available in California to provide firm and flexible benefits. According to the United States Geological Survey, California likely has 5,000 MW of identified geothermal resources and 11,000 MW of undiscovered resources that could be identified with further funding to exploration. These resources are available to help California meets its 50% RPS goal.

Additionally, GEA encourages the CEC to tackle some or all of these questions in its 2015 Integrated Energy Policy Report that will be relevant to addressing the 50% RPS.

- What combination of renewable technologies has lowest system-wide costs at a 50% RPS?
- What mix will have the lowest cost considering both replacement costs and operation and maintenance costs over a period of several decades?
- What combination of resources provides the best total emissions profile?
- Which mix of technologies provides the best system reliability?
- What mix of technologies provides the most efficient use of limited capital in achieving long-term climate goals?

Lastly, GEA and some of its member companies believe parts of the CPUC valuation process for renewable energy contracts may tilt the scale against geothermal technologies in certain circumstances. As a result, California has underappreciated the economic and environmental value of developing geothermal resources for electricity generation. By tackling the questions listed above Geothermal Energy Association hopes the California Energy Commission will continue to promote a transparent process in which all energy technologies are valued fairly against each other when bidding for power contracts. GEA encourages the California Energy Commission to investigate the valuation process.

Electricity

"Roles for preferred resources (distributed generation, storage, demand response, and energy efficiency) in California's future electricity generation resource mix."

In addition to looking at individual resources, the analysis should address the value over the short, medium and long-term value of incorporating a diversity of resources in California's electricity grid. Historically, resource diversity was viewed as important to address the uncertainties and volatilities of

energy markets as well as unforeseen circumstances. Determining how and when to incorporate diversity as a value could be important for successful planning and implementation.

"Impacts that continuing drought conditions and changing water policies could have on electricity supply and demand."

In the scenarios where drought gets more severe, decreasing the possibility of hydropower resources available to the state of California. GEA encourages the CEC to consider or study flexible geothermal resource as an alternative. Some geothermal operators who use Organic Rankine Cycle (ORC) technology report to GEA its simple for them to build or operate power plants flexibly technologically speaking, but it doesn't make sense economically. If a sufficient economic incentive could be devised or guaranteed a return on investment greater than operating at 99% availability many ORC geothermal power plants could be designed or adapted to be more flexible. In addition, GEA suggests research into coupling storage technologies with geothermal power plants also would aid flexibility.

"Continuation of the analysis of Southern California electricity reliability due to loss of San Onofre Nuclear Generation Station and retirements of once-through cooling power plants. The analysis will continue to examine California's need for new electricity infrastructure (transmission and conventional power plants), preferred resources, and electricity contingency planning."

GEA encourages the CEC to consider the locations of geothermal resources in its analysis of transmission and conventional power plant planning. Its imperative transmission is located near to geothermal resources. In order for a typical 50-MW geothermal project to be economical a viable transmission grid interconnection point must be within 20–30 km of the plant depending on local conditions. The location of identified geothermal resources in California and their mean resource amounts is attached as an appendix to these comments. GEA estimates only about half of these resources are currently used to generate electricity.

"Strategic Transmission Investment Plan (as required by Senate Bill 1565 [Bowen, Chapter 692, Statutes of 2004]), including a discussion of deliverability and western regional planning activities."

California should see geothermal resources as an economic opportunity to develop and export to surrounding states while keeping the economic benefits through employment, royalties, and property taxes at home. GEA encourages the CEC to study the economic benefit and possibility of developing these resources. As emphasized in the earlier section survey data estimates the geothermal power plants are incredible job intensive. On-site employment at geothermal power plants is about 1.17 permanent jobs per megawatt installed. In addition, geothermal power plants create an additional .96 permanent jobs per megawatt installed of non-on-site employment. Lastly, geothermal power plants pay an estimated 3.59 $/MWh in property taxes, royalties and rents to local, state and federal governments.

Works Cited & Further Geothermal Resources

For more information on the potential for Enhanced Geothermal Systems potential please read "The Future of Geothermal Energy" published in 2006 by Massachusetts Institute of Technology.

For more information on the values and benefits of geothermal power when compared to other technologies please read "The Values of Geothermal Energy: A Discussion of the Benefits Geothermal Power Provides to the Future U.S. Power System" published in October of 2013 by Geothermal Energy Association.

For more information of the potential for conventional geothermal power resources in the U.S. see "Assessment of Moderate- and High-Temperature Geothermal Resources of the United States" published in 2008 by the United States Geological Survey.

For more information on the key and necessary ingredients to develop a geothermal power project read the "Best Practices for Geothermal Power Risk Reduction Workshop Follow-Up Manual" published by Geothermal Energy Associations and the U.S. State Department in July of 2014.

For more information on the externality benefits of geothermal power see Promoting Geothermal Energy: Air Emissions Comparison and Externality Analysis, published in May 2013 by GEA.

For more information on the economic values and benefits of geothermal power see Geothermal Energy Association Issue Brief: Additional Economic Values of Geothermal Power published in February 2015 by GEA.

Sincerely,

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Appendix 1: List of Identified Geothermal Sites in California and their Location

Note this list is of identified geothermal sites. The USGS expects, based on its research, there is an additional 11,000 MW on average of undiscovered geothermal resources in California.

Name	County	Latitude	Longitude	Power Potential (MWe) Mean
Fort Bidwell	Modoc	41.8633	-120.16	9.1
Lake City Hot Springs	Modoc	41.6712	-120.2047	100.7
Leonards Hot Sps./Seyferth HS	Modoc	41.6012	-120.0857	10
Medicine Lake (Glass Mt.)	Siskiyou	41.57	-121.57	365.6
Surprise Valley HS	Modoc	41.5333	-120.0767	7.8
Kelly HS	Modoc	41.4583	-120.8333	9.5
Canby (I'SOT)	Modoc	38.5817	-122.5733	9.4
Little Hot Spring (Fall River)	Modoc	41.23	-121.4033	3.9
West Valley Reservoir	Modoc	41.1917	-120.385	12.6
Kellog HS	Lassen	41.1258	-121.0258	5.4
Big Bend HS	Shasta	41.0217	-121.9183	4.9
Wendel	Lassen	40.3573	-120.255	11.4
Amedee	Lassen	40.3	-120.1833	7.8
Indian Valley Hot Springs	Plumas	40.1414	-120.9339	3.5
Marble Hot Well	Plumas	39.7563	-120.36	3.5
Sierra Valley	Plumas	39.7117	-120.3217	3.5
Brockway Hot Springs	Placer	39.2267	-120.0125	2
Wilbur Springs	Colusa	39.0367	-122.42	29.3
Clear Lake (Sulphur Bank mine)	Lake	39.0167	-122.65	29.2
Geysers	Sonoma	38.8	-122.8	519.7
Geysers Hi T Reservoir	Sonoma	38.8	-122.8	517.9
Carson River	Alpine	38.77	-119.715	15.7
Grovers HS	Alpine	38.6983	-119.86	2.9
Calistoga HS	Napa	38.5817	-122.5733	16.9
Fales HS	Mono	38.3333	-119.4	2.9
Boyes HS	Sonoma	38.3145	-122.4864	8.4
Sonoma Mission Inn	Sonoma	38.3138	-122.4823	6.3
Travertine HS	Mono	38.2467	-119.2017	2.8
North Shore Mono Lake (Black Rock Point HS)	Mono	38.04	-119.08	2.3
Long Valley caldera - deep	Mono	37.65	-118.9	47.5
Long Valley shallow	Mono	37.65	-118.9	15
Tassajara HS	Monterey	36.2337	-121.5492	3

Coso area	Inyo	36.05	-117.7833	419.2
Tecopa HS	Inyo	35.8867	-116.2367	9
Paso Robles	San Luis Obispo	35.657	-120.6945	3.4
Randsburg area	San Bernardino	35.3833	-117.5333	6.6
Sespe HS	Ventura	34.595	-118.9983	10.7
Arrowhead HS	San Bernardino	32.1867	-117.265	7.1
Imperial Spa (Pilger Estates HS)	Riverside	33.4333	-115.685	3
Salton Sea area	Imperial	33.2	-115.6	2,209.90
North Brawley	Imperial	33.0153	-115.5153	138
East Brawley	Imperial	32.99	-115.35	358.5
South Brawley (Mesquite)	Imperial	32.9061	-115.54	42.3
Dunes	Imperial	32.8033	-115.0133	18.5
East Mesa (Deep)	Imperial	32.7833	-115.25	60.3
East Mesa (Shallow)	Imperial	32.7833	-115.25	142.4
Heber Deep	Imperial	32.7167	-115.5283	34.5
Heber Shallow	Imperial	32.7167	-115.5283	125.1
Mt. Signal	Imperial	32.65	-115.71	14.7

Source: USGS "Assessment of Moderate- and High-Temperature Geothermal Resources of the United States"