

DOCKETED

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Ormat Comments on March 16 RETI 2.0 Workshop

Additional submitted attachment is included below.



March 30, 2016

Dockets Unit
 California Energy Commission
 1516 Ninth Street, MS-4
 Sacramento, CA 95814

Re: Docket No. 15-RETI-02 – Comments Related to March 16 RETI 2.0 Plenary Group Meeting

Ormat Nevada Inc. appreciates the opportunity to participate in the March 16 RETI 2.0 Plenary Group meeting on renewable resource areas that was held at the Energy Commission’s offices. These comments are submitted to expand on the presentation that Ormat made at the meeting and to address other issues raised. Ormat also notes that it supports the comments submitted by the Geothermal Energy Association as well.

Potential geothermal generation resources are geographically limited. As was noted by the US Geological Service¹ and summarized in Table 1 below, most of the geothermal resource potential in the western States is located in California, Nevada and Oregon. Because of this concentration, geothermal resources have significant potential to help meet California’s RPS requirements. The ability of geothermal resources to operate as base load or dispatchable generation with a high capacity factor means that a megawatt (MW) of geothermal capacity can produce three or four times as much energy as a MW of wind or solar generation, without requiring renewable integration support. Because of these valuable characteristics and their ability to provide increased resource diversity, potential geothermal development warrants particular attention in the RETI 2.0 process.

Table 1 - Geothermal Resources in Western US

State	N	Identified Resources (MWe)				Undiscovered Resources (MWe)				Enhanced Geothermal Systems (MWe)			
		F95	F50	Mean	F5	F95	F50	Mean	F5	F95	F50	Mean	F5
Alaska	53	236	606	677	1,359	537	1,428	1,788	4,256	NA	NA	NA	NA
Arizona	2	4	20	26	70	238	775	1,043	2,751	33,000	52,900	54,700	82,200
California	45	2,422	5,140	5,404	9,282	3,256	9,532	11,340	25,439	32,300	47,100	48,100	67,600
Colorado	4	8	11	30	67	252	821	1,105	2,913	34,100	51,300	52,600	75,300
Hawaii	1	84	169	181	320	822	2,027	2,435	5,438	NA	NA	NA	NA
Idaho	36	81	283	333	760	427	1,391	1,872	4,937	47,500	66,700	67,900	92,300
Montana	7	15	51	59	130	176	573	771	2,033	9,000	16,100	16,900	27,500
Nevada	56	515	1,216	1,391	2,551	996	3,243	4,364	11,507	71,800	101,300	102,800	139,500
New Mexico	7	53	153	170	343	339	1,103	1,484	3,913	35,600	54,400	55,700	80,100
Oregon	29	163	485	540	1,107	432	1,406	1,893	4,991	43,600	61,500	62,400	84,500
Utah	6	82	171	184	321	334	1,088	1,464	3,860	32,600	46,500	47,200	64,300
Washington	1	7	20	23	47	68	223	300	790	3,900	6,300	6,500	9,800
Wyoming	1	5	31	39	100	40	129	174	458	1,700	2,900	3,000	4,800
Total	248	3,675	8,356	9,057	16,457	7,917	23,739	30,033	73,286	345,100	507,000	517,800	727,900

¹ Assessment of Moderate and High Temperature Geothermal Resources in the United States - <http://pubs.usgs.gov/fs/2008/3082/pdf/fs2008-3082.pdf>

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Geothermal Resource Cost

The RPS Calculator relies on the Energy Commission's Cost of Generation Model and other available information. Table 2 summarizes the geothermal cost information included in the most recent version of the RPS calculator.

Table 2 - Geothermal Resource Costs from RPS Calculator

Component	Cost
2015 Capital Cost	\$6,633/kW
Interconnection cost	\$260/kW
Fixed O&M cost	\$263/kW year
Resulting Levelized Cost	\$115/MWh

A Department of Energy study presented at the February 22-24 Workshop on Geothermal Engineering at Stanford¹ and attached to these comments, used geothermal power purchase agreement pricing information from 2006 through 2015 to determine LCOE and found values ranging from \$40 to \$80 per MWh, well below the \$115/MWh LCOE in the Calculator. The Study also considered another approach using the DOE's Geothermal Electricity Technology Evaluation Model (GETEM).² The GETEM model was applied to available data from Ormat's Don A. Campbell units I and II in Nevada to estimate a total capital cost of about \$154 million for a total net capacity of 35,200 kW. This translates to capital cost of \$4,374 per kW, considerably lower than the value used in the RPS Calculator, and more consistent with the PPA prices reported in the study for the resources. Furthermore, the GETEM estimates O&M costs at about \$152/kW year, well below the \$263/kW year used in the RPS Calculator. In Ormat's experience, O&M costs are typically below the GETEM estimate.

Ormat looks forward to working with the CPUC's Energy Division over the next few months to refresh geothermal resource prices used in the RPS Calculator. We also encourage the Energy Commission to reevaluate its cost of generation study to more accurately reflect actual costs and thereby improve the quality of information used in the RETI 2.0 assessment process.

Regards,

Joshua Nordquist
Ormat Nevada Inc.

¹<https://pangea.stanford.edu/ERE/db/GeoConf/papers/SGW/2016/Hernandez1.pdf>

² <http://energy.gov/eere/geothermal/geothermal-electricity-technology-evaluation-model>