

**Comments of the Geothermal Energy Association  
Submitted to the California Energy Commission  
Workshop on Jobs and Renewable Energy in California, Docket Number 12-IEP-1D  
June 6, 2012**

GEA appreciates the efforts of the California Energy Commission in conducting this integrated energy planning and policy process. GEA believes that this undertaking is particularly important as California seeks to meet its clean energy goals under AB 32, the California Renewable Portfolio Standard, and other related electric power supply and environmental initiatives.

The workshop will “seek input from experts, stakeholders, and the general public on issues related to job creation and economic development associated with renewable energy development in California.” In particular, the workshop plans to address: 1) employment needs by renewable technology; the number, type, and location of jobs that have been created in California by renewable energy businesses; and expectations of job creation by 2020; 2) effectiveness of current job training programs and the benefits of connecting those programs with local economic development efforts; and 3) challenges faced by renewable businesses in creating California jobs.

These comments supplement those submitted June 5, 2012 for the workshop on costs which covered: the full value of geothermal power, comparative job creation, pricing impacts and policy, system integration, and transmission.

#### **Geothermal Energy and California Job Creation**

Geothermal power plants provide a substantial number of permanent jobs and an even larger number of construction and drilling-related jobs. A recent example is the new Energy Source Hudson Ranch 1 geothermal power plant, which recently was brought on-line in Southern California. This 49.9 MW project created more than 200 jobs during construction and will employ more than 55 full-time during operations (see March 1 press release at <http://www.energysource.us.com/>). Further, if the efforts to extract minerals from the geothermal brine at this site are commercially successful, significant additional economic and employment benefits will result.

The Hudson Ranch 1 Project is not alone. CalEnergy has plans to build a new power complex in California’s Imperial Valley, one of the state’s highest unemployment areas. This nearly \$1 billion investment will boost the local economy. The project will take almost four years to build, during which time an average of 323 construction workers will be employed. When the project is completed it will offer 57 full time positions for operations, engineering, maintenance, and administration. Employment opportunities at this 235 MW geothermal plant compare favorably with either a gas or wind project, which CalEnergy notes would each require only about 18 full time employees for a project of similar size (see *Why Support Geothermal Energy?*, February 2012, available at: <http://geo-energy.org/reports.aspx>).

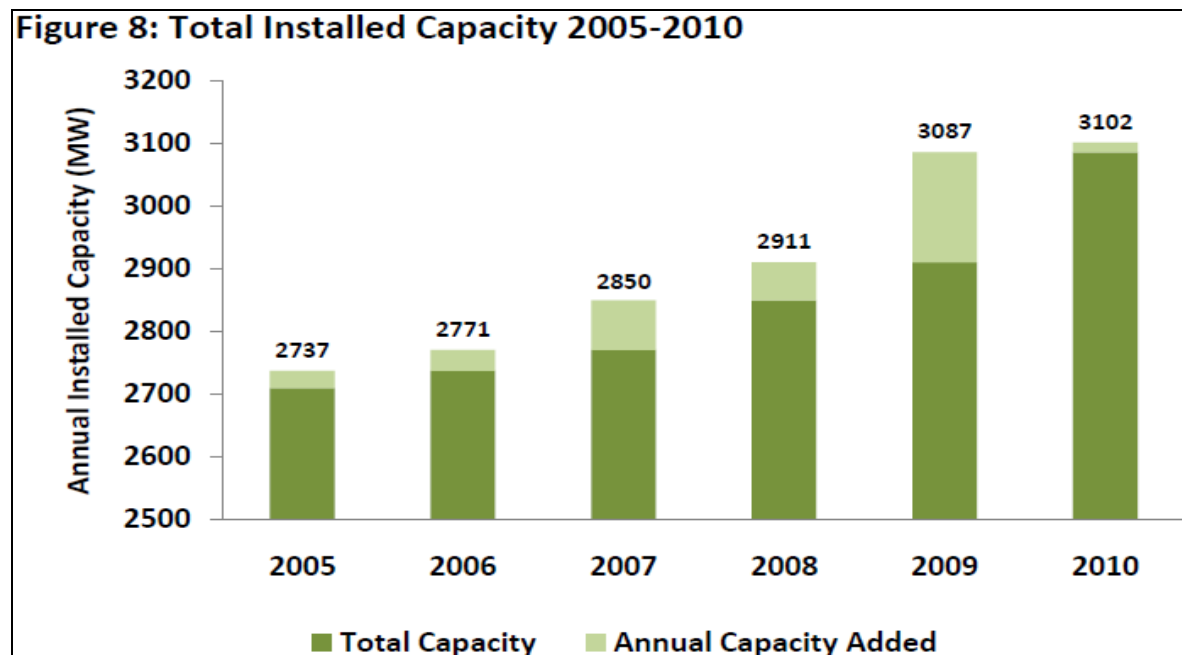
#### **Geothermal Employment Status**

California is the leading state for geothermal power production in the United States, and has historically been viewed worldwide as a leader in geothermal power development and technology.

According to an employment survey conducted several years ago by the Geothermal Energy Association (GEA), the total number of jobs supported by the existing geothermal industry in 2004 was 11,460. Most of these were in California. This job estimate includes direct, indirect, and induced employment. Power plant or direct employment was estimated to be 4,583 full-time positions. This corresponds to 1.7 permanent jobs per megawatt (MW) of capacity installed. As the report notes, "Employment in the industry was probably at a historic low since power plant construction had been minimal between 1993 and 2004 as state and federal policies underwent significant changes. Also, because federal research support was at a historically low level, associated research employment is low" (see ***Geothermal Industry Employment Survey***, September 2005, at <http://geo-energy.org/reports.aspx>).

Since 2004, Congress has passed significant new tax incentives for geothermal development, and has funded a more significant DOE geothermal research program. As a result, there has been steady growth in the industry. However, and unfortunately, there has not been a new employment survey to capture the increased employment now provided by the industry. While NREL has developed the JEDI model to provide more sophisticated employment estimates for wind and solar projects, we understand that a contract with DOE to provide JEDI employment figures for geothermal energy was cancelled.

The figure below from the ***GEA Industry Update*** shows the growth in US installed geothermal power capacity since 2005:



### Job Potential

To the best of our knowledge, the US Department of Energy and the Western Governors' Association (WGA) produced the most recent estimate of job growth potential for geothermal energy in 2006. The

Geothermal Task Force Report of the WGA's Clean and Diversified Energy Advisory Group estimated the state by state benefit of achieving what was estimated by experts to be the potential growth in the industry by 2020. For California, the Task Force estimated that 2,400 MW of new geothermal electrical capacity could be added. This additional capacity would produce 10,200 direct, indirect and induced jobs, as well as 38,400 person-years of employment in the manufacturing, drilling and construction industries. Further, the report estimated the direct economic value of these new geothermal projects at \$36 billion (see Table IV, page 18 of *A Handbook on the Externalities, Employment, and Economics of Geothermal Energy*, October 2006, available at <http://geo-energy.org/reports.aspx>).

### Geothermal Job Characteristics

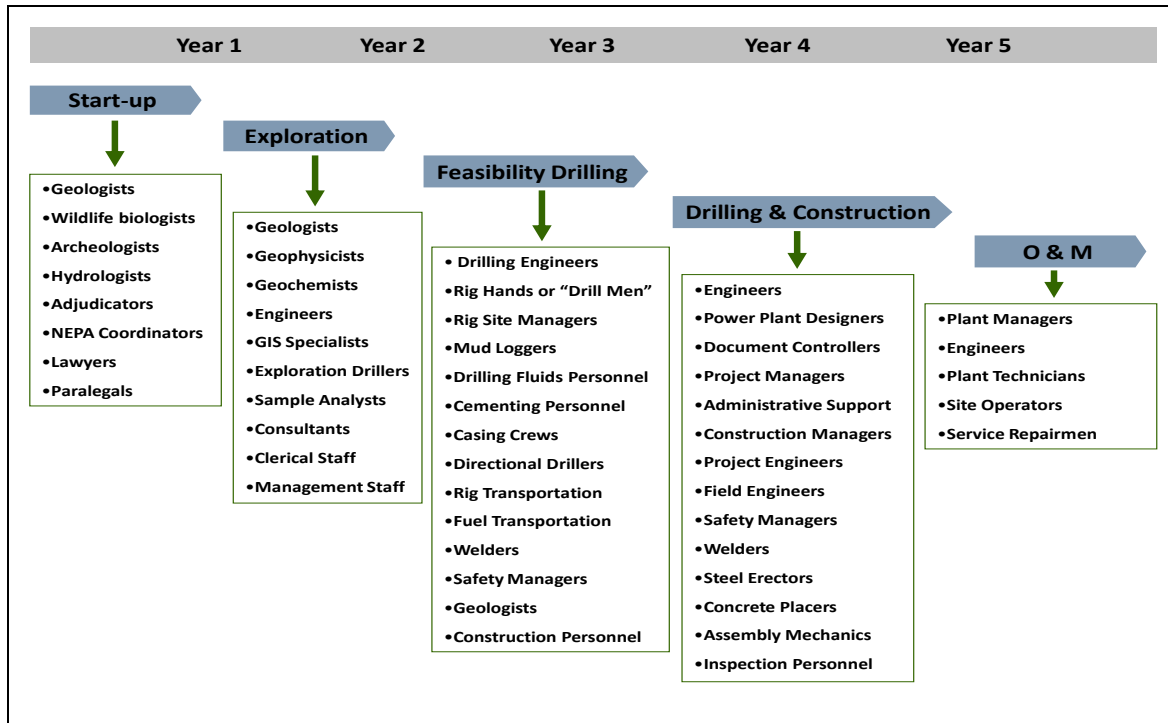
The Geothermal Energy Association (GEA) is often asked: How many jobs will a new geothermal power plant create? What kind of jobs? Where? When? These questions are being asked about all new energy technologies. The answers you read about job creation can be confusing. Driving past an operating geothermal power plant, one would see few actual employees despite claims of thousands of new jobs being created through geothermal development! In its recent report, *Green Jobs Through Geothermal Energy*, GEA breaks down the numbers that the industry uses in job generation statements, and provides a picture of the nearly one thousand people whose jobs are involved in a typical geothermal project (see *Green Jobs Through Geothermal Energy*, October 2001, available at: <http://geo-energy.org/reports.aspx>). The table and chart below break out 1) the number of jobs involved in each phase of geothermal project development, and 2) some of the types of jobs required at each phase of a project timeline:

**Table 1: Jobs Involved in Geothermal Development (50 MW)**

Stage of Development	No. of jobs
Start-up	10 – 13
Exploration	11 – 22
Drilling	91 – 116
Plant Design and Construction (EPC)	383 – 489
Operation and Maintenance	10 – 25
Power Plant System Manufacturing	192 – 197
<b>Total</b>	<b>697 – 862</b>

Source: GEA

Figure 1: Job Types throughout the Project Timeline



## Job Quality

Not only does geothermal energy provide more jobs than conventional energy technologies, it also provides quality, long-term jobs. According to the EIS/EIR for the proposed Telephone Flat geothermal development project located in the "Glass Mountain Known Geothermal Resource Area" in California, the average wage at the facility will be more than double the average wage in surrounding counties. According to the U.S. Census Bureau, the average per capita income in 1999 in the surrounding counties was around \$21,000, \$2,000 lower than the average California per capita income at the time. The average projected wage related to operation at the Telephone Flat facility would be higher than both the county and state averages, totaling between \$40,000 and \$50,000 (in 1998 dollars).

In addition to providing high-paying jobs, geothermal energy projects support long-term employment. Geothermal developers, who typically negotiate 10- to 30-year agreements with purchasers, provide jobs that can be guaranteed for decades. The overwhelming majority of geothermal jobs are permanent (95%), and most are also full-time (see *Green Jobs Through Geothermal Energy*, October 2010, available at: <http://geo-energy.org/reports.aspx>).

## Rural Employment Benefits

Geothermal resources tend to be located in rural areas and require the support of the local workforce. For example, of the staff employed directly by one company at the Geysers Geothermal Complex in California, 425 full-time and 225 part-time employees are residents of the local community. Rural communities face many unique challenges. The lack of stable, secure, long-term jobs leads many young adults (usually those with the most education and the greatest earning potential) to emigrate, leaving a poorer, older, and smaller population behind. Many rural communities, including those in which geothermal facilities tend to be located, suffer from significantly higher unemployment rates than the general population. In 2004, California's unemployment rate was 6.2%, but Siskiyou County, near the proposed Telephone Flat geothermal power plant, had an unemployment rate of 9.3%, more than one-third higher than the California average. The Center for Mental Health Services (CMHS) found that "many rural Americans are at or below the national poverty level." Unemployment in rural communities makes residents particularly susceptible to high levels of social and health-related problems—more so than their urban counterparts (see *Green Jobs Through Geothermal Energy*, October 2010, available at: <http://geo-energy.org/reports.aspx>).

## Wide Range of Jobs Created

The development of geothermal resources provides long-term income for people with a diversity of job skills. This includes welders; mechanics; pipe fitters; plumbers; machinists; electricians; carpenters; construction and drilling equipment operators; surveyors; architects and designers; geologists; hydrologists; electrical, mechanical, and structural engineers; HVAC technicians; food processing specialists; aquaculture and horticulture specialists; managers; attorneys; regulatory and environmental consultants; accountants; computer technicians; resort managers; spa developers; researchers; and government employees who all play an important role in bringing geothermal energy online.

While many of the types of jobs mentioned here are directly involved in developing a geothermal resource, growth in many of the industry's "behind-the-scenes" sectors has been picking up. The increase in on-line geothermal capacity over the last ten years has similarly spurred growth in geothermal research and development activity by academic and government institutions. While it is currently unclear precisely how many additional jobs have been created in these sectors as a result of geothermal industry growth, it is apparent that more and more people are becoming involved in areas beyond direct power plant development. A Federal Interagency Geothermal Working Group, for example, is composed of 13 representatives from various offices within six government agencies. Also significant are the numerous colleges and universities around the country that are engaging in geothermal-related research extending from geological assessment to Enhanced Geothermal System (EGS) development. The jobs involved in these areas are not within the scope of this report, but the increased attention being paid to geothermal energy in stages prior to and outside of resource development and construction are important to consider in characterizing geothermal employment. In short, the development of geothermal resources requires the support of many skilled laborers and professionals from different sectors during different stages of resource development. See, in particular,

Section 2 of *Green Jobs Through Geothermal Energy*, October 2010, available at: <http://geo-energy.org/reports.aspx>.

### **California Leads the Industry**

California hosts some of the leading US and worldwide geothermal companies representing the full spectrum of employment possibilities in geothermal-related activities. Much of this employment is provided by the principal power producers and project developers including CalEnergy, Calpine, Energy Source, Ormat and Terra-gen Power. But beyond these project operators, other employers in the state providing various types of supporting services include in , which also include ThermaSource, Atlas Copco, Baker Hughes, GeothermEx, Worley Parsons, SAIC, Geothermal Resource Group, and Stoel Rives.

### **Supporting Policies**

Despite somewhat limited funding, for many years the state of California has provided one of the most consistent sources of support for the geothermal industry through the Geothermal Resource Development Account. GRDA is funded through federal royalty receipts, and has been an important contributor to policy continuity. More recently, the state has also supported efforts of the California Geothermal Energy Collaborative to support expanded use of the state's underutilized geothermal resources.

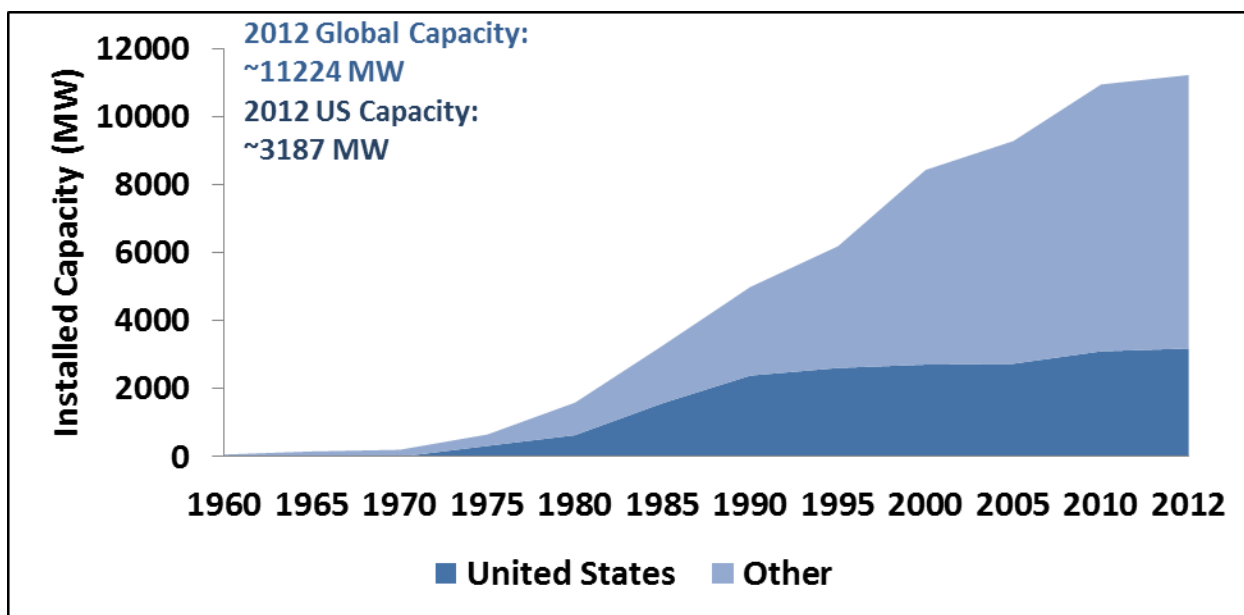
In addition, the state's overall renewable energy policies (including the Renewable Portfolio Standard and the enactment of AB32) have created a climate generally favoring renewable technologies, although these policies have been more helpful to other renewable technologies than they are to geothermal. Also, the state's geothermal community has had support from the DOE national laboratories and important University programs at Stanford, Berkeley, UC Davis, UC Riverside, and other institutions. Together, state and federal policies need to support the fundamental conditions for a progressive market – sustained industry growth together with sustained technology innovation and advancement.

### **Educational and Workforce Needs**

As geothermal energy production and use become more prominently recognized in today's renewable energy landscape, academic institutions are taking note. The recent dramatic increase in geothermal development in the United States has resulted in a shortage of trained industry professionals – especially higher-level geothermal power plant managers, geologists, resource analysts, permitting staff, drillers, engineers, and geothermal heat pump installers. As the industry grows, so too does the need for geothermal education and training. A number of colleges and universities across the country are emerging with undergraduate, graduate, and certification programs related to geothermal. Supporting education programs are needed across the educational spectrum, from graduate level university programs to community college and company training programs. GEA recently published a ***US Geothermal Education and Training Guide***, which is available at: <http://geo-energy.org/reports.aspx>.

## World Market/Export Opportunities

The world market for geothermal power has shown strong growth in recent years and is expected to outpace the US market for the immediate future. For example, the European Geothermal Energy Council recently estimated that Europe will surpass both California and the US in geothermal power production in a decade or so, despite the fact that it is generally viewed as having lower grade geothermal resources (according to the presentation by EGEC at the GEA International Geothermal Showcase, May 2012). Today, over two dozen countries are developing new power projects, each involving hundreds of megawatts and more (see ***Geothermal International Market Overview Report***, April 2012, at <http://geo-energy.org/reports.aspx>). GEA has recently identified 70 countries considering expanding their geothermal efforts (see ***Geothermal Energy International Market Update***, May 2010, at <http://geo-energy.org/reports.aspx>). The figure below from the ***Geothermal International Market Overview Report*** shows the growth in US and global installed geothermal power capacity:



California has benefited from the international geothermal market in the past, and the current growth offers significant economic and job opportunities for the state's geothermal companies. Notably, the California Energy Commission has had programs in the past supporting US exports to Indonesia, the Philippines and other countries that resulted in billions of dollars in US goods and services being sold.

GEA has estimated, based on an internal industry survey, that over 60% of the geothermal companies in the US are active in the world market today. To mention just a few examples, Atlas Copco manufactures power plants in California for shipment to international markets including Turkey; ThermaSource provides geothermal drilling services to projects in Chile; and the Geothermal Resource Group, GeothermEx and SAIC provide expert consulting/engineering services in numerous countries in Europe, Asia, Latin America, Africa and the Western Pacific.

The Obama Administration has been actively engaged in promoting renewable energy exports. The Administration launched a Renewable Energy Export Initiative, and a range of federal agencies have been actively supporting US and California firms in the global market. According to the US Department of Commerce, geothermal energy is one of only two renewable technologies in which the US exports more than it imports (see <http://www.renewableenergyworld.com/rea/partner/geothermal-energy-association-4102/news/article/2010/12/secretary-of-commerce-launches-national-renewable-energy-export-initiative>). Unfortunately, the State of California's efforts have not been well coordinated with federal efforts to promote geothermal energy and its tremendous export potential. But, as part of the IEPR process the California Energy Commission can initiate steps to correct this situation.

## **Conclusion**

Geothermal power has been and can continue to be an important source for economic growth and new jobs in California, through projects in the US and internationally.

Thank you for considering our views.

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