Geothermal Energy Association Issue Brief: Additional Economic Values of Geothermal Power

Highlights

- Geothermal power plants employ about 1.17 persons per MW at each operating power plants. These are permanent jobs that last the entire 30-50 year lifetime of the power plant.
- In some circumstances, GEA estimates the persons per MW employed is 19 times the reported onsite employment of wind or solar PV project and 5 times reported onsite employment for concentrating solar project.
- In total, adding governmental, administrative, and technical related jobs, the geothermal industry employs about 2.13 persons per MW.
- An average 50 MW facility will create permanent employment for about a 100 people.
- 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 $26 million in Rents and Royalties to state, federal and local governments nationwide in 2014 of which quarter (about $19.5 million) is returned to benefit state and local county governments.
- Developing the remaining identified geothermal resources estimated to exist in California by the United States Geologic Survey could add 2500 permanent on-site jobs in the State of California, generate another 20-30 million dollars in property tax revenue for the state, and generate almost 15,000 construction and manufacturing jobs.
- 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.
- A 50 MW geothermal plant will require 310 person-years of construction and manufacturing employment.
- Measured in person-years of employment, and given their long lifetime geothermal plants produce stable, long-term, local employment.
- 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.
- GEA estimates that geothermal provides approximately $117 million in externality benefits per year to the states of Nevada ($29 million) and California ($88 million) by avoiding fossil fuel emissions based on current geothermal generation.

Background

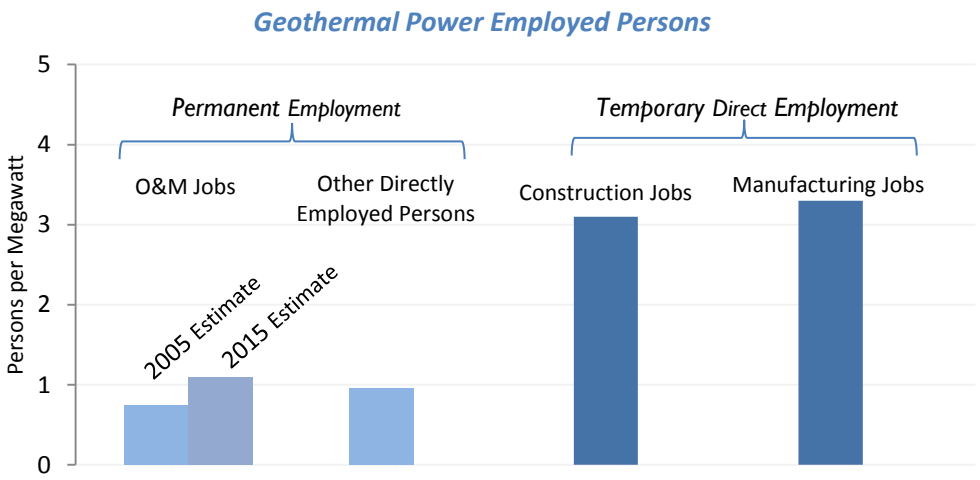
GEA prepared the following Issue Brief, in light of many policy initiatives around the United States aimed at expanding the renewable energy base, to remind policy makers of the economic values of geothermal power. Overall, geothermal projects bring significant economic value to communities across the Western United States through their job creation and tax revenue for communities in which plants operate. The new data presented in this Issue Brief was derived from a survey conducted by GEA of the major geothermal power producers in the United States.

Geothermal Power Employment: Stable Employment for Rural Communities

Like all infrastructure projects there are two phases of employment for geothermal power plants, the construction phase and the operation and maintenance phase. During the construction phase, direct employment corresponds to the total jobs associated with power plant construction. During the operation and maintenance phase, it relates to all jobs associated with power plant operation and maintenance. The geothermal power industry is unique in that it employs a wide variety of personnel of many education and training levels. Geothermal power plants need all types of labor in order to enable their construction including but not limited to the following. Types of employment associated with geothermal power plants:

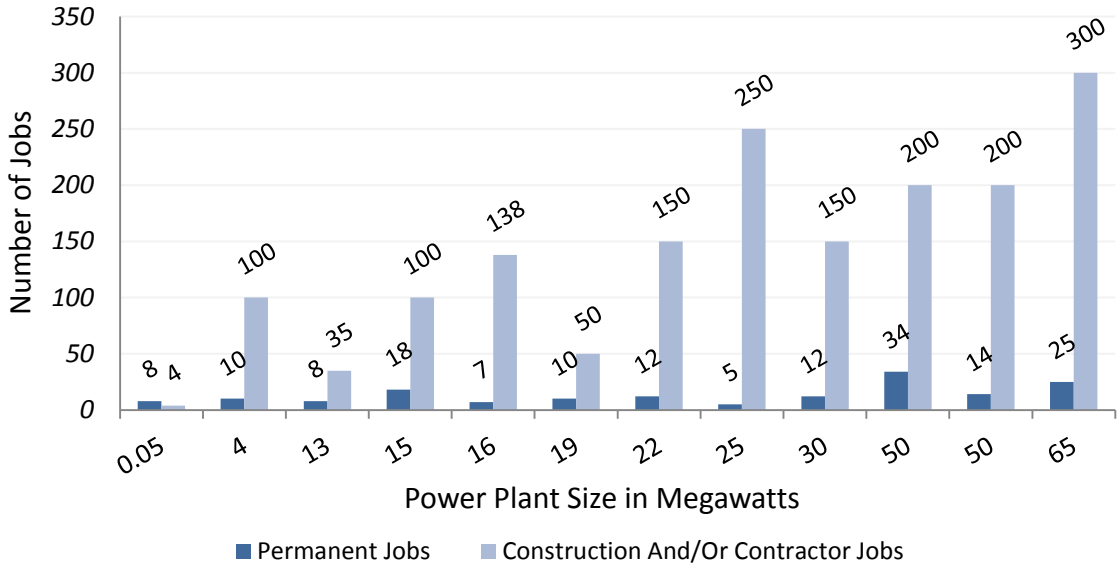
welders,
mechanics,
pipefitters,
plumbers,
machinists,
electricians,
carpenters,
construction equipment operators,
surveyors,
architects,
geologists,
hydrologists,
electrical,
HVAC technicians,
drilling equipment operators,
GIS specialists,
exploration drillers,
sample analysts,
consultants,
clerical staff,
management staff,
rig hands,
mud loggers,
cementing personnel,
casing crew,
directional drillers,
rig transport crews,
mechanics,
service repairmen,
structural engineers,
managers,
attorneys,
regulatory and environmental consultants,
accountants,
computer technicians,
government regulators,
wildlife biologists,
archeologists,
adjudicators,
paralegals,
geophysicists,
geochemists,
aquaculture specialist,
horticulture specialists,
and mechanical engineers

While industry surveys show geothermal power plants employ about .74 – 1.17 persons per MW to maintain and operate a facility; an additional .96 persons per megawatt is generated for every power plant built. These jobs are created in supporting organization, companies and government agencies that are necessary to build and regulate a plant but do not necessarily operate the power plants directly. These jobs include geologist, engineers, government officials, etc. Additionally, there are temporary jobs in the manufacturing and construction sectors created by the plants as well. Over the 17-33 months in which a plant is constructed about 3.1 persons per MW of full time employment is needed to construct the plant, and 3.3 persons per MW are needed to manufacture the plant equipment.



The chart below displays 13 of the 17 utility scale and new (not expansions or EGS) plants completed over a five year period (2009-2013) and their publically reported or estimated jobs numbers for O&M employees and construction jobs generated. These numbers come from company press releases, public statements, and numbers reported to state and local governments. Geothermal power plants are very jobs intensive not only to build the plants but to operate them as well. Generally, the larger facility the more staff needed to keep the plant running smoothly.

Jobs Created by Actual Geothermal Power Plants in 2009 -2013



A Revenue Generator: Geothermal Property Taxes, Rents and Royalties

Geothermal exploration and the location of geothermal resources often required developers and plant operators to lease land from local, state and federal governments or purchase land from private land owners. As a result they pay significant property taxes, royalties, and rents which governments then use to fund education and infrastructure projects for their constituents.

A GEA survey of the major geothermal independent power producers showed in 2013 geothermal developers paid $29 million dollars in property taxes to seven states where large geothermal power plants operated. About three quarters or $21 million of that property tax was paid to the State of California alone.

In addition, GEA survey data showed the average geothermal plant pays about $10,000 dollars per MW of power in property taxes per year. Therefore, over the 30-50 year lifetime of a plant, the average 20 MW geothermal facilities will generate $6.3 to $11 million dollars in property taxes for state and local governments.

Rent and Royalty payments are the revenues generated from energy and mineral leases and other monies owed for the use of public natural resources by geothermal power and direct-use developers to the federal government. Currently, the distribution of geothermal revenues to federal, state, and county governments is 25%, 50%, and 25%, respectively.

That often means rural communities, where geothermal resources are located, like Sonoma, Imperial, and Lake County in California; geothermal operators are the largest or second largest tax payer in their respective counties. In total according to Office of Natural Resource Revenues geothermal activities paid a total of $26 million dollars in rents and royalties in 2014 with $19.5 million of that revenue going to state and county treasuries.

In total current geothermal operations generate about over $55 million dollars in revenue from property taxes, federal royalties and rents per year.

Environmental Externalities

When compared to other energy sources such as coal, natural gas, and even some renewables, geothermal energy emerges as one of the cleanest and most environmentally benign forms of energy. In general, geothermal plants have small land footprints and low air emissions. GEA concluded in its May 2013 report, the "externality benefits of producing electricity using geothermal resources, as opposed to fossil fuels to be $0.01 for natural gas, and $0.035 for coal per kWh." Additionally, "GEA estimates that geothermal provides approximately $117 million in externality benefits per year to the states of Nevada and California by avoiding fossil fuel emissions."

Sources, Works Cited and Further Resources

GEA has published several reports regarding employment and geothermal power. In January of 2015, GEA conducted a survey of US geothermal power plant operators. The results of that survey added and/or confirmed the underlying data and estimates of previous GEA publications on employment and property tax information. The new data collected in 2015 related primarily to property tax payments and on-site, permanent employment. The results of that survey are reflected in this Issue Brief. Further resources include:

- GRC Transactions, Vol. 29 "*Employment Involved in the U.S. Geothermal Industry*" by C. Nathanaël Hance published in 2005.
- Geothermal Energy Association's "*Geothermal Industry Employment Survey Results & Analysis*" by C. Nathanaël Hance and Karl Gawell published in 2005.
- Geothermal Energy Association's "*Green Jobs through Geothermal Energy*" by Dan Jennejohn published in 2010.
- Williams, Colin F., Reed, Marshall J., Mariner, Robert H., DeAngelo, Jacob, Galanis, S. Peter, Jr., 2008, *Assessment of moderate- and high-temperature geothermal resources of the United States*: U.S. Geological Survey Fact Sheet 2008-3082, 4 p.
- Geothermal Energy Association's, *Promoting Geothermal Energy: Air Emissions Comparison and Externality Analysis*, published in May 2013.
- Office of Natural Resources Revenue's "Statistical Information" page published in 2014.

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