CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512

DATE: May 23, 2008

TO: Interested Parties

FROM: Donna Stone, Compliance Project Manager

SUBJECT: **CALISTOGA POWER PLANT (81-AFC-1C)**

- **NOTICE OF RECEIPT OF PETITION TO AMEND THE ENERGY COMMISSION DECISION TO MODIFY BIOLOGICAL RESOURCES CONDITION OF CERTIFICATION BIO 5-4 REGARDING BORON DRIFT MONITORING, AND**
- **PUBLIC REVIEW OF THE STAFF ANALYSIS**

On April 21, 2008, the California Energy Commission (Energy Commission) received a petition from Geysers Power Company, LLC to amend the Energy Commission Decision for the Calistoga Power Plant (Formerly known as the Occidental (OXY) Geothermal Power Plant No. 1) Project.

BACKGROUND

The 80 megawatt geothermal power plant was certified by the Energy Commission on February 1, 1982, and is located on the east side of the Mayacmas Mountains at approximately 3660 foot elevation and in the headwaters of Anderson Creek, in the Lake County portion of the Geysers Known Geothermal Resources Area. The power plant began commercial operation April 10, 1984.

DESCRIPTION OF PROPOSED MODIFICATION

The petition requests revisions to Biological Resources Condition of Certification 5-4 (COC BIO 5-4) to allow the suspension of boron drift monitoring.

STAFF ANALYSIS

Energy Commission staff reviewed the petition and assessed the impacts of this proposal on environmental quality, public health and safety, and proposes minor revisions to Condition of Certification Bio 5-4. Biological Resources is the only technical area impacted by this petition. It is staff's opinion that with the implementation of the revised condition, the project will remain in compliance with applicable laws, ordinances, regulations, and standards pursuant to Title 20, California Code of Regulations, Section 1769, and no significant environmental impacts will result from this change.

Condition of Certification Bio 5-4, as written in the Energy Commission Decision for the project, requires monitoring the boron drift effects on the vegetation surrounding the power plant, annually for the first three years of operation and then at five-year intervals. That monitoring has taken place through 2003 and has not demonstrated measurable deleterious effects.

PROPOSED REVISIONS TO CONDITION(S) OF CERTIFICATION

(Deleted text is in ~~strikethrough~~, new text is **bold double-underlined**):

Protection of Vegetation from Boron Deposition and Uptake

5-4. ~~Occidental~~**The project owner** shall monitor drift effects on the vegetation surrounding the power plant. Monitoring shall be conducted for one year prior to operation, annually for the first three years of operation, and then at five-year intervals for the life of the power plant **or until the CEC Compliance Project Manager determines the monitoring can be suspended with possible re-initiation at a future date. Any future** ~~M~~monitoring shall include large-scale (not smaller than 1:3000) false color infrared photographs (one stereo pair), taken in June, coupled with ground sampling at permanent study plots. Ground sampling ~~will~~**shall** include examination by a qualified biologist for visible foliar injury and collection of foliar samples which ~~will~~**shall** be analyzed for boron content at a qualified laboratory.

Verification: ~~Occidental~~**The project owner** ~~shall~~**will** submit annual reports to the CEC in those years in which the monitoring takes place. These reports ~~shall~~**will** include copies of all laboratory analyses, field survey work, and a stereo pair (full color copy) of aerial photographs of the leasehold.

RECOMMENDATIONS

Energy Commission staff intends to recommend approval of the petition at the July 2, 2008 Business Meeting of the Energy Commission.

PUBLIC REVIEW PROCESS

The petition to amend the project is available on the Energy Commission's webpage at www.energy.ca.gov/siting_pre-1999_compliance/index.html. Staff's analysis is enclosed for your information and review. If you would like to receive a hard copy of the petition, and/or the Energy Commission Order if the changes are approved, please complete the enclosed Information Request Form and return it to the address shown. If you have comments on this proposed modification, please submit them to Donna Stone, Compliance Project Manager, at the address on this letterhead, or by fax to (916) 654-3882, or by e-mail at dstone@energy.state.ca.us no later than 5:00 P.M., June 20, 2008. Staff's analysis and the Energy Commission Order (if approved), will also be posted on the web page.

For further information on how to participate in this proceeding, please contact the Energy Commission Public Adviser's Office, at (916) 654-4489, or toll free in California at (800) 822-6228, or by e-mail at pao@energy.state.ca.us. If you require special accommodations, please contact Lourdes Quiroz at (916) 654-5146. News media inquiries

should be directed to the media office at (916) 654-4989, or by e-mail at mediaoffice@energy.state.ca.us.

Enclosures:
Staff Analysis
Information Request Form

Mail List # 772

BIOLOGICAL RESOURCES
Marc Sazaki

Setting

The Calistoga Geothermal Power Plant (CGPP) has been in commercial operation since April 10, 1984. It was formerly known as the Oxy Geothermal Plant No. 1.

The CGPP is located on the east side of the Mayacmas Mountains at approximately 3660 feet (1115.6 meters) elevation and in the headwaters of Anderson Creek. It is about 2.8 air miles northwest of the community of Anderson Springs in the Lake County portion of The Geysers Known Geothermal Resources Area (KGRA). The local topography at the power plant site is characterized by steeply sloping hillsides in a non-urbanized and sparsely populated landscape. Vegetation surrounding the power plant is composed of chaparral, oak-bay woodland and mixed-evergreen forest (Figure 1). This natural environment provides quality habitat for an array of animal species.

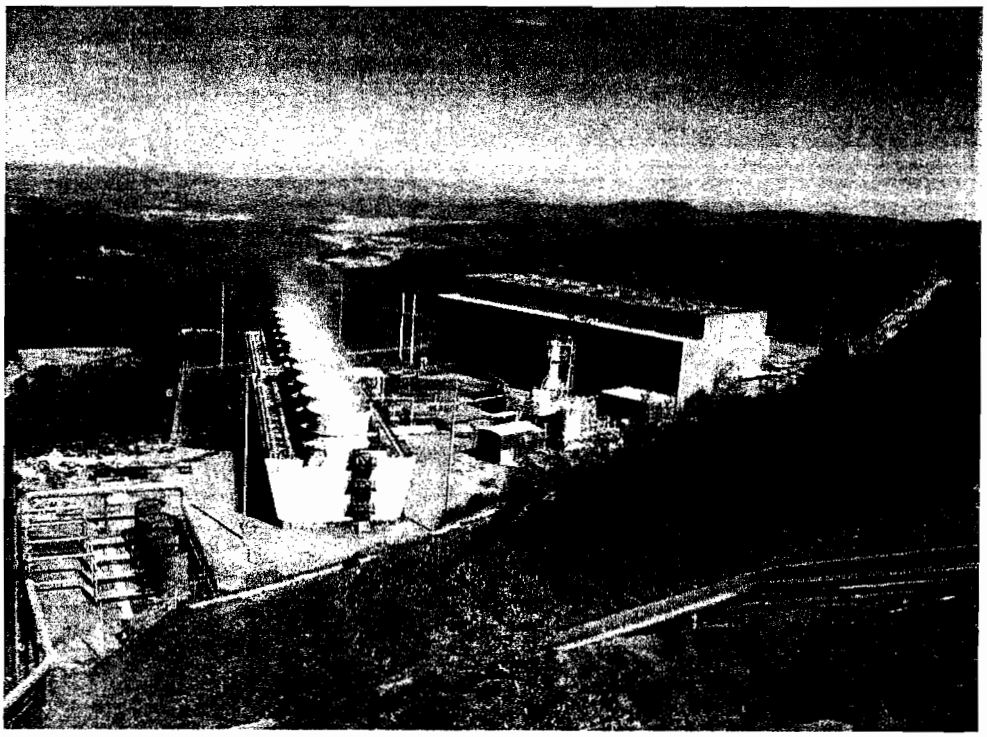

Figure 1 – View to ESE from ridge-line road towards Collayomi Valley with Calistoga Geothermal Power Plant in foreground.

Applicable Laws, Ordinances, Regulations and Standards (LORS)

FEDERAL

• Endangered Species Act of 1973
Title 16, United States Code, section 1531 et seq., and Title 50, Code of Federal Regulations, part 17.1 et seq., designate and provide for protection of threatened and endangered plant and animal species, and their critical habitat.

• Migratory Bird Treaty Act
Title 16, United States Code, sections 703-712, prohibit the take of migratory birds.

STATE

• California Endangered Species Act of 1984
Fish and Game Code sections 2050 et seq., protect California's rare, threatened and endangered species.

• Nest Or Eggs-Take, Possess, or Destroy
Fish and Game Code section 3503 protects California's birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto.

• Birds of Prey or Eggs-Take, Possess, or Destroy
Fish and Game Code section 3503.5, protects California's birds of prey and their eggs by making it unlawful to take, possess, or destroy any birds of prey or to take, possess, or destroy the nest or eggs of any such bird, except as otherwise provided by this code or any regulation made pursuant thereto.

• Migratory Birds-Take or Possession
Fish and Game section 3513 protects California's migratory birds by making it unlawful to take or possess any migratory non-game bird as designated in the Migratory Bird Treaty Act or any part of such migratory non-game bird.

• Fully Protected Species
Fish and Game Code sections 3511, 4700, prohibit take of animals that are classified as Fully Protected in California. Both Section 3511 (b)(1) lists American peregrine falcon (*Falco peregrinus anatum*), and, Section 4700(b)(5) lists ring-tailed cat (genus *Bassariscus*) as fully protected.

• Native Plant Protection Act of 1977
Fish and Game Code Section 1900-1904 state that "The intent of the Legislature and the purpose of this chapter is to preserve, protect and enhance endangered or rare native plants of this state.", and; Section 1911 states that "All state

departments and agencies shall, in consultation with the department, utilize their authority in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered or rare native plants. Such programs include, but are not limited to, the identification, delineation and protection of habitat critical to the continued survival of endangered or rare native plants.

Analysis

The original assessment of impacts of the CGPP identified a concern for boron deposition and its potential detrimental effects on vegetation near the power plant cooling towers. This concern was based on the destruction of trees, shrubs, and other vegetation next to some of the original geothermal power plants built and operated in The Geysers KGRA. The loss of this vegetation has many implications related to the loss of habitat which provides life requisites for animals and other organisms. Food, cover, and reproductive structure (for nesting birds) can be severely degraded or eliminated affecting resident and migratory nesting birds, and fully protected species. The ring-tailed cat is known to utilize tree cavities as dens.

Another potential impact associated with the loss of vegetation is soil erosion. The soils in The Geysers are highly erodible. With the loss of vegetative cover, erosion rates would likely increase causing sedimentation into local streams and rivers. Sedimentation in streams can negatively affect the survival of fish eggs and other bottom dwelling organisms.

Since the original concern for cooling tower drift impacts associated with geothermal power plant development was identified in The Geysers area, measures were developed to address the problem. Cooling towers were designed to minimize cooling water mist and the associated drift of constituents, such as boron, that are concentrated in the cooling system while in operation. Concentrations of boron in plant tissue can be deleterious in various concentrations depending on the species taking up this element.

Monitoring boron concentration in plant leaf tissue and visible leaf injury was required by permitting authorities to assess the effectiveness of the drift reduction measures instituted at some of the geothermal power plants in the KGRA. Concentrations >500 ppm were considered to be harmful to vegetation in the vicinity of the CGPP (Nix 1992). Approximately 3.3 miles to northwest is the Bottle Rock Geothermal Power Plant where similar boron deposition monitoring was done from 1985 through 1992. Here, boron concentrations in leaf tissue was considered "less than toxic" if <200 ppm (DWR 1993). It is uncertain what the basis for this disparate perspective is between the two monitoring efforts. More than likely, this reflects the wide range in which investigators believe various plant species respond to this element in nature.

Table 1 shows four years of monitoring results for boron concentration in various plants at ten transects around the CGPP. These data are compiled from drift monitoring reports prepared in 1992 and 2003. For the location of the transects, refer to the false color aerial photos included in the Douglas Nix report (Nix 2003) submitted with the petition to amend the CGPP decision. This monitoring data is based on results provided in two drift monitoring reports for CGPP. One prepared in 1992 by Nix, and one again prepared by Nix in 2003 (Nix 2003). There is a great deal of variability in boron leaf concentrations among plant species at each transect, as well as among years for each plant species.

There is one instance where the boron leaf concentration for California bay (*Umbellularia californica*) is greater than 500 ppm. This was in 1996 at Transect 2, but 7 years later, it was dramatically lower at 83 ppm. Conversely, at Transect 5 the monitoring results are 87 ppm for 1996 and 254 ppm for 2003. These concentrations may or may not be related to the transects' proximity to the cooling tower or Well Pad B as seen in the aerial photographs.

There are several instances over the years monitored and among plant species at various transects when and where boron leaf concentration is not less than 200 ppm. This may be important based on the level of concern established in the boron drift monitoring done at the Bottle Rock Geothermal Power Plant, but visual assessment of leaf damage was variable and did not appear to be directly related to boron leaf concentration in 2003 as reported in the Nix report for CGPP. Much of the leaf damage was attributable to insects rather than boron damage (Nix 2003). There is no discussion about the possibility that vegetation could be weakened by boron deposition and subsequently become more susceptible to insect infestation and damage.

Musk brush *(Ceanothus jepsonii)* only appears in years 1986 and 1992 for Transects 9 and 10. Both transects are located in cut and fill areas at the project site where vegetation restoration efforts were applied. Possibly, this species that was selected for monitoring has not survived the attempted establishment due to its unsuitability for this purpose.

Overall, the false color infrared aerial photos taken in June 2003 show no apparent gross vegetation losses or foliar damage in areas around the CGPP where monitoring transects were located.

It appears that the periodic monitoring for boron drift deposition on selected vegetation near the power plant over the long term has not demonstrated measurable deleterious effects. Continued monitoring for boron drift deposition at the established transects around the CGPP should be suspended until further notice by the Energy Commission Compliance Project Manager.

Two rare plants identified by the California Native Plant Society on their 1B.2 list, Sonoma manzanita (*Arctostahylos canescens ssp. somomensis*) and Snow

Mountain buckwheat (*Eriogonum nervulosum*) have been located in the area within a mile of the Calistoga power plant (CNDDB 2008). It is uncertain what affect boron deposition would have on these plants. They were not sampled in the monitoring program most likely because of their rarity and the reluctance to do destructive sampling if found. Sans any species specific information regarding boron deposition effects on these plants, the monitoring findings for vegetation in general are considered applicable. Any newly developed information can be factored into future examination of this issue as warranted.

Conclusions and Recommendations

Staff concludes that the Calistoga Geothermal Power Plant can comply with all state, federal, and local laws, ordinances, regulations, and standards, if staff's proposed language change for Condition of Certification BIO 5-4 is adopted.

Staff recommends adoption of the new Condition of Certification BIO 5-4 with approval of the petition to amend the final decision for the Calistoga Geothermal Power Plant.

Mitigation Measures and Conditions

Text to be deleted is shown as ~~strike-through~~, while the text to be added is shown as underline.

Protection of Vegetation from Boron Deposition and Uptake

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analyses, field survey work, and a stereo pair (full color copy) of aerial photographs of the leasehold.

REFERENCES

CNDDB 2008. California Natural Diversity Data Base. State of California Department of Fish and Game. BIOS Portal. May 19, 2008.

DWR 1993. Vegetative Response to Geothermal Drift at the Bottle Rock Geothermal Power Plant 1984-1992. State of California, The Resources Agency, Department of Water Resources, Northern District. Technical Information Record. May 1993.

Nix, Douglas 1992. 1992 Drift Monitoring Summary for the Santa Fe Geothermal Power Plant. November 17, 2003.

Nix, Douglas 2003. 2003 Boron Drift Monitoring Summary for the Calpine Geothermal Power Plant #19. September 2, 1992 (Revised December 15, 1992).

TABLE 1

LEAF BORON CONCENTRATIONS (PPM) MEASURED AT CALPINE GEOTHERMAL DRIFT MONITORING STATIONS "CALISTOGA GEOTHERMAL POWER PLANT"

	Transect 1				Transect 2				Transect 3				Transect 4				Transect 5			
SPECIES	1986	1992	1996	2003	1986	1992	1996	2003	1986	1992	1996	2003	1986	1992	1996	2003	1986	1992	1996	2003
Arctostaphylos (manzanita)	25	300	86	36	39	50	14	44	350	50	300	35	120	30	80	24	32	36	21	86
Ceanothus jepsonii (musk brush)	65	120	88	27													11	24	38	29
Pseudotsuga menziesii (Douglas fir)	59	150	77	71									37	27	30	33				
Pinus sabiniana (digger pine)	18	34	65	29																
Pinus attenuata (knob cone pine)	28	80	23	47													70	45	86	27
Quercus durata (leather oak)	82	120	83	37													110	46	71	45
Rhamnus californica (coffeeberry)	58	30	24	58													110	23	77	43
Ceanothus cuneatus (buck bush)					38	54	75	56												
Cerocarpus betuloides (mountain mahogany)					60	51	80	73	63	42	64	46								
Quercus chrysolepis (canyon live oak)					98	290	57	229	140	95	27	85	105	48	46	44				
Quercus wislizenii (interior live oak)					63	36	300	74					132	60	24	35				
Adenostoma fasciculatum (chamise)													28	22	18	33				
Umbellularia californica (bay)					330	320	540	83									130	44	87	254
Ceanothus integerrimus (deer bush)													123	45	54	50				
Arbutus menziesii (madrone)																				
Polystichum munitum (sword fern)																				
Quercus kelloggii (black oak)																				
Trifolium hirtum (rose clover)																				

	Transect 6				Transect 7				Transect 8				Transect 9				Transect 10			
SPECIES	1986	1992	1996	2003	1986	1992	1996	2003	1986	1992	1996	2003	1986	1992	1996	2003	1986	1992	1996	2003
Arctostaphylos (manzanita)	75	190	84	76	36	78	31	31	71	20	36	49								
Ceanothus jepsonii (musk brush)													22	28			47	130		
Pseudotsuga menziesii (Douglas fir)																				
Pinus sabiniana (digger pine)																				
Pinus attenuata (knob cone pine)	74	61	78	41					38	66	36	30								
Quercus durata (leather oak)	360	390	140	85																
Rhamnus californica (coffeeberry)	140	170	40	118																
Ceanothus cuneatus (buck bush)					51	40	48	38												
Cerocarpus betuloides (mountain mahogany)					46	38	26	35												
Quercus chrysolepis (canyon live oak)	32	350	140	152	120	240	58	43	135	58	52	47								
Quercus wislizenii (interior live oak)					43	57	35	33												
Adenostoma fasciculatum (chamise)					22	24	16	35												
Umbellularia californica (bay)	170	270	120	161	120	56	30	34	150	40	39	54								
Ceanothus integerrimus (deer bush)																				
Arbutus menziesii (madrone)									54	29	39	34								
Polystichum munitum (sword fern)									71	48	15	30								
Quercus kelloggii (black oak)									150	73	54	55								
Trifolium hirtum (rose clover)													68	36	36	27	54	44	98	78

Source: Nix 1992 and Nix 2003

STATE OF CALIFORNIA **CALIFORNIA ENERGY COMMISSION**

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INFORMATION REQUEST FORM

COMPLETE & MAIL TO: CALIFORNIA ENERGY COMMISSION
COMPLIANCE UNIT
ATTN: DONNA STONE
1516 NINTH STREET, MS-2000
SACRAMENTO, CA 95814

OR FAX TO: (916) 654-3882

NAME AND/OR TITLE (AS IT IS TO APPEAR ON MAIL LABEL)

ORGANIZATION (IF APPLICABLE)

STREET ADDRESS OR P.O. BOX

CITY STATE ZIP CODE

PROPOSED AMENDMENT TO THE COMMISSION DECISION FOR THE CALISTOGA POWER PLANT (FORMERLY OXY GEOTHERMAL) TO SUSPEND THE BORON DRIFT MONITORING AS REQUIRED IN BIOLOGICAL CONDITION OF CERTIFICATION BIO – 5-4.

PLEASE CIRCLE THE DOCUMENTS YOU WOULD LIKE TO RECEIVE:

- PETITION TO AMEND
- ENERGY COMMISSION ORDER

PROJECT: CALISTOGA POWER PLANT
DOCKET NO: 81-AFC-1C
MAIL LIST NO: 772