

**Final Summary**  
2006 California Tribal Geothermal Workshop  
Susanville, California  
June 9, 2006

California Geothermal Energy Collaborative  
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# 1 OVERVIEW

On June 9, 2006, the California Geothermal Energy Collaborative (CGEC), in cooperation with the Inter-Tribal Council of California, conducted the 2006 California Tribal Geothermal Workshop. The event, funded by the California Energy Commission, was co-sponsored by the Council of Energy Resource Tribes and the U.S. Department of Energy's (DOE) GeoPowering the West (GPW) Program. The meeting was held at the Susanville Rancheria's Diamond Mountain Casino in Susanville, California. The purpose of the workshop was to bring together industry and agency representatives and California's Native American Tribes to discuss how geothermal resources could be developed on tribal lands.

The objectives of the Workshop were carried out through presentations to meeting participants, facilitated discussion sessions and field trips to local, small-scale geothermal power plants. The following sections summarize the presentations and discussions. Over 40 people attended the workshop. The meeting agenda is provided in Appendix A, field trip information in Appendices B and C, the attendee sign-in list is provided in Appendix D, and a summary of the meeting evaluations is included in Appendix E. Copies of all the presentations provided at the workshop can be found on the CGEC web site at: <http://cgec.ucdavis.edu>

## 2 WORKSHOP SUMMARY

### 2.1 MORNING SESSIONS

The workshop commenced at 8:30 a.m. with Bill Glassley of the California Energy Commission welcoming the attendees and thanking all the parties involved. He stated that he would like to see workshops such as these throughout the state.

#### 2.1.1 Welcoming Remarks and Introducing of Attending Tribes and Opening Invocation by Tribal Leader

*Honorable Chair Stacy Dixon, Susanville Rancheria*

Theresa Dixon, as a representative for Chairman Stacy Dixon of Susanville Rancheria, welcomed all the attendees to their facilities and gave an opening prayer for the workshop.

#### 2.1.2 ITCC's Role in Tribal Renewable Energy

*Connie Reitman, Executive Director, Inter-Tribal Council of California*

After the opening remarks and prayer, Connie Reitman, Executive Director of the Inter-Tribal Council of California (ITCC) took the podium. She welcomed everyone attending,

and began with an introduction of Atta Stevenson, the Vice President of ITTC. Ms. Reitman stated that the Inter-Tribal Council of California was formed in 1968 by nine tribes with the focus on bringing the tribes together, supporting capacity-building, expanding linkages and supporting the dreams of tribes. In the early years, late 60's to 70's, the tribes were proactive about economic development, and ITCC supported their efforts to help develop an economic program, including a California Indian Manpower Consortium, which she thought was initiated by the Fort Bidwell Indian Community. Although ITCC is a small nonprofit association, it has a membership of 47 out of 109 California tribes. They continue to encourage other tribes to join or rejoin the organization. Ms. Reitman posed the question: what is it that we can do as a tribal association to determine what path to continue? One of the key roles of the association is to provide current information. The most up-to-date information that is available in the area of renewables is on geothermal. This is why ITCC was interested in the opportunity to provide a geothermal outreach program that entails communication between the state governmental agencies and tribal membership.

ITCC has an inclusive policy about how to do its work and considers communication and creating links very important. What projects are viable that can get tribal membership interested? That is why linking is important. The tribes are creating the linkages today through this type of venue or workshop. Next are resources, identifying the kind of resources that can be engaged to begin moving to viable outcomes? Sometimes, when different departments venture into another venue, they discover that there may be other interests between departments and tribes. The tribes know what their dreams are, so ITCC feels that it is each tribe's responsibility and obligation to support its own dream. If change has to happen, it has to happen because that tribe wants it to happen. This kind of venue provides an opportunity for tribes to consider how their respective priorities match with available funding and technology options. Such opportunities can help empower tribes to establish for themselves the most appropriate path forward to accomplish their respective goals. These types of workshops will help tribal capacity development. ITCC is committed to tribal capacity building and that is how ITCC contributes to promoting the idea of renewable energy.

Next began a brief question and answer session.

Q> How come the tribes aren't getting all the information they would like from the regulatory entities? What is needed?

A> One experience was in 2001. ITCC was called by FEMA to provide training on Emergency Management Planning, so ITCC was given \$50,000 to provide this training. The association was able to take a little bit and make it go a long way and first started out by doing an analysis. It went to the Office of Emergency Services but the doors would not open because the agency felt that it had no responsibility to the tribes in California. ITTC had to get FEMA to call them and say that they did have an obligation to help the tribes. It was devastating that none of the jurisdictions in the State of California included the tribal people in their original plans. Therefore, ITCC traveled throughout the state doing workshops that spread this information.

At the federal level, the problem is different. California has the largest tribal population (109 tribes –with a total population of 600,000). One of the policies of the federal government is to fund the tribes. When you look at the federal level, where do California tribes fit into that matrix? Now there is a California Tribal Nations Emergency Management Council and tribes can contribute to the economy of a state.

- Q> What kind of relationships do you have within the tribes in regard to geothermal?  
A> These types of venue are the first steps towards starting relationships. ITCC thinks it should just have this information available for tribes. It will be up to the tribes to decide where they want to take it.

### **2.1.3 Tribal Cultural Values as Part of Our Environment**

*Ray Brown, Tribal Chairman, Elem Indian Colony*

Frank Ramirez attended on behalf of Tribal Chairman Ray Brown to bring up the topic of overlapping regions and boundaries from the cultural perspective. He believed that part of the arsenal of the tribe has to be a clear understanding of their ancestral boundaries and sacred sites. Issues involve how geothermal impacts medicinal and basket-making resources and burial grounds. What is the impact of recharge? Where is the water coming from? Under SB18, counties are required to consult with tribes. Counties plan within county jurisdictions, but tribes have sacred territories that cross county lines. Preservation of historical sites doesn't end at the county line. At Mt. Shasta, the Pitt River Tribe said that there was no official standing for non-federally recognized tribes. SB18 finally recognized the California Native American Indian Heritage Commission.

Originally there were territories that sustained tribal communities. In the Gold Rush days there were literally bounties paid for Indians. Tribes still suffer from post-traumatic stress syndrome from the genocide. In some states, tribes ceded territory in treaties. But in California, small rancherias were developed, and there are recognized and non-recognized tribes. Across the country, some reservations were formed under the Indian Reorganization Act and have boilerplate Constitutions and Bylaws. In other states, some of these reservations cover millions of acres. This type of Boilerplate talk from other states doesn't apply in California. People can only get education about California tribes from local tribal people. There should be training for government entities on cultural competency.

California tribes were migratory. In some cases, rancherias were near their original cultural areas, sometimes not. Tribes must have a clear understanding of their cultural ancestral territory.

Sean Hagerty noted that sometimes counties have a misunderstanding of tribes as sovereign nations and think that the county has no jurisdiction. Historical relationship between county and tribe has been law enforcement.

Templates are available to help tribes define ancestral territories and resources within them. Hot springs were an important part of traditional life. The tribes' relationship to Earth is stewardship, not ownership. They don't contaminate or degrade; Earth is here for future generations.

## **Funding, Financing, & Resource Assessments**

### **2.1.4 Geothermal Planning for Geothermal Power Plant – Ft. Bidwell Case Study**

*Honorable Chairman Lawrence Harlan, Ft. Bidwell Indian Reservation*

Next, the Honorable Chairman Lawrence Harlan, tribal leader of Fort Bidwell, took the podium. Chairman Harlan started his presentation with an analogy about what "green Indian" used to mean and that it now means Indians who are looking at renewable energy and want to promote green energy use. They are concerned with global warming and the energy demand that is rising.

Ft. Bidwell is a favorable place to develop geothermal energy, since water plays an important role in geothermal. Water transfers the heat from the interior of the earth to the surface. At Fort Bidwell, geothermal resources have been used for practical purposes: heating of a school, bathing, and prayers. FB-1 was the first geothermal well funded by the CEC in the 1980s. FB-2 was a second well that, once established, had a high of 96°F and flow of 1,500 GPM. FB-3 was at 209°F, 400 GPM. Fort Bidwell has the highest helium 3 numbers in the entire Basin and Range, suggesting a deep-seated magmatic heat source.

The proposed site for FB-4 was shown on a map. The mapped location was determined on the basis of intersecting fault patterns and helium-3 values. The site for well FB-4 was selected as the most likely location for reaching the upflow zone in the fault system. The purpose of the well is to determine whether there is a resource hot enough to produce electricity. Some tribes have gaming and other natural resources. Ft. Bidwell is blessed with a geothermal resource.

The Fort Bidwell Indian Community (FBIC) tribal council consists of nine members. The following were questions asked during Chairman Harlan's presentation.

- Q> What is the size of the potential power plant?  
A> FB was thinking 1 MW, unsure that value is net or just available. Game plan is to start with just 1MW and see where it goes from there.
- Q> The water coming out of the wells, do you cap those to save the water?  
A> Yes.
- Q> Plan to use the electricity for the tribe or sell?  
A> Both, use and sell.
- Q> Is binary technology used, with an injection well?

- A> Yes, an injection well avoids subsidence.
- Q> Is recharge another concern?
- A> Recharge means the natural recharge of a system. We should be more concerned with re-injection. Basically, all we want to take out is heat.
- Q – Is noise a concern?
- A. At Steamboat Nevada, for example, within ¼ mile, the wind is louder than the plants!

### 2.1.5 Overview of Indian Community and Economic Development Utilizing Geothermal Resources

*Roger Hill, Sandia National Laboratories, and the Department of Energy’s GeoPowering the West (GPW) Program*

Roger Hill provided a overview of the GeoPowering the West Program. The GPW is trying to make renewable energy meet the challenges of a limited energy supply. Therefore, enabling tribes to develop renewable energy resources is in the national interest. Mr. Hill showed a map of the western US and its load growth. Regional power plant emissions in California are not as dramatic as in other states. Mr. Hill showed maps where GPW thinks geothermal resource is available and a list of reservations with known or suspected geothermal resources:

<p><u>Nevada</u></p> <ul style="list-style-type: none"> <li>• Pyramid Lake</li> <li>• Walker River</li> <li>• Fallon</li> <li>• Duckwater</li> <li>• Yerrington</li> <li>• Summit Lake</li> <li>• Lovelock</li> <li>• Duck Valley</li> </ul> <p><u>Oregon</u></p> <ul style="list-style-type: none"> <li>• Warm Springs</li> <li>• Umatilla</li> <li>• Klamath</li> <li>• Burns</li> </ul> <p><u>California</u></p> <ul style="list-style-type: none"> <li>• Morongo</li> <li>• Fort Yuma</li> <li>• Upper Lake</li> <li>• Ft. Bidwell</li> </ul> <p><u>Utah</u></p> <ul style="list-style-type: none"> <li>• Newcastle</li> </ul>	<p><u>Washington</u></p> <ul style="list-style-type: none"> <li>• Yakima</li> <li>• Fort Hall</li> <li>• Nez Perce</li> </ul> <p><u>Montana</u></p> <ul style="list-style-type: none"> <li>• Crow</li> <li>• Northern Cheyenne</li> </ul> <p><u>Wyoming</u></p> <ul style="list-style-type: none"> <li>• Wind River</li> </ul> <p><u>New Mexico</u></p> <ul style="list-style-type: none"> <li>• Acoma</li> <li>• Jemez</li> <li>• Navajo</li> <li>• Jicarilla Apache</li> </ul> <p><u>South Dakota</u></p> <ul style="list-style-type: none"> <li>• Rosebud</li> <li>• Yankton</li> </ul> <p><u>Colorado</u></p> <ul style="list-style-type: none"> <li>• Southern Ute</li> </ul> <p><u>Alaska</u></p> <ul style="list-style-type: none"> <li>• TBD</li> </ul>
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Mr. Hill explained that geothermal resources are typically found where hot rock or magma has come near the surface through geologic activity. Access is gained to the resource by drilling into it. It can be used directly, such as in a spa or indirectly for power generation. Some of the geothermal applications include: electricity generation,

mineral recovery, and heat production among other applications. Transmission issues must be considered as part of the process to get the power out. Some of the attributes of geothermal power are:

<u>Advantages</u>	<u>Disadvantages</u>
<ul style="list-style-type: none"> <li>• Enormous potential</li> <li>• High, reliable plant capacity factor</li> <li>• Greenhouse gas reduction</li> <li>• Low environmental impact</li> <li>• Much mature technology</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive drilling</li> <li>• Regional resource</li> <li>• Resource uncharacterized</li> <li>• Threshold plant size</li> <li>• Plant prefers constant load</li> <li>• Environmental perception</li> </ul>

Some of the challenges to geothermal development are: competition with fossil fuels, siting and permitting, industry focus overseas, large projects at high costs, and exploration cost and risk. Some of the criteria for geothermal development are: need to have a good geothermal resource, must have access to transmission grids, the land must be developable, and most importantly, you must have a buyer. There was a question asked at the end of his presentation.

Q> Are there a lot of tribes in other states wanting geothermal? Will it be for sale or use?

A> Usually for use, but if possible, for sale as well.

### **2.1.6 Federal Funding and Private Sector Financing**

*Roger Fragua, Deputy Director, Council of Energy Resource Tribes (CERT)*

Roger Fragua, Deputy Direct at Council of Energy Resource Tribes began his presentation by thanking the attendees and organizers. CERT was founded back in 1975 as a national organization. CERT’s mission is to support member Tribes as they develop their management capabilities and use their energy resources as the foundation for building stable, diversified self-governing economies (according to each Tribe’s own values and priorities). One program that CERT sponsors is the Tribal Resource Institute in Business, Engineering, and Science (TRIBES) summer program (held at the University of New Mexico) for recent high school graduates. CERT sponsors a black-tie event to fundraise college funds for Indian high school students who transition to colleges.

The national strategic tribal energy vision by 2010 is that each Sovereign Indian Tribe will have a sufficient and reliable supply of electricity at reasonable costs to support its social and economic well-being. However, Mr. Fragua asked the following question: How are we going to implement a National Tribal Energy Vision, with all tribes to be self-sufficient? Energy efficiency is a concern in Indian country and now is a good time for renewable energy. Mr. Fragua listed these four reasons as to why now is a good time:

- Energy market fundamentals means renewables are hot



- Tribal Energy Resource Development opportunities under the new Energy Policy Act of 2005 have never been better
- Tribal enthusiasm for taking control of the energy future is strong
- CERT partnerships ensures Tribes have technical expertise to assess the real option value of Tribal energy resources

CERT has developed various measures to promote renewable development. The following are a few of them:

- Title V §502 Funding Authorization supports Tribal Energy Resource Development
- Title V §2602 Indian Energy Resource Development Program
- Title V §2602 Energy Education, Planning and Management
- Title V §2602 Tribal Energy Loan Guarantee Program
- Title V §2603 Indian Tribal Energy Resource Regulations
- Title V §2604 Leases, Business Agreements and Right of Way
- Title V §2604 Requirements for DOE Approval of Tribal Energy Resource Agreements

When industry is in the driver's seat, they face federal/state/Indian taxes - when Indians are owner-operators – no tax. Give the tribe 100% control. Build trust. The tribe can form its own utility: an actual hardhat utility or a paper utility. Access to the grid is a white-hot issue.

Indian gaming is the most over-regulated industry in the U.S. We can do partnerships. Now that there is an Indian voice, the process and price of renewable development has changed as each tribe forms its own utility. Developments are geared more toward success. However, some of the issues regarding geothermal development on tribal lands are: value, decision-making, sovereignty, impacts, financial resources, institutional issues, and information. Some of these issues can be avoided with strategic planning that creates a comprehensive vision and implementation plan. Mr. Fragua concluded his presentation listing CERT's Facilitation Services and Proposal. Real benefit comes through tribal and industry partnership.

The following question was asked at the end of his presentation.

Q> Can we get an idea of what things cost? If a tribe was arraigned financing, does the major operator grid have to let you tie in or are you automatically admitted to the grid?

A> The states have some say so (Federal Energy Regulatory Commission - FERC) If you look at the development, the grid system has gone around the tribes. You need an interconnect agreement. Technically, there may be room; politically, there may not be room on the grid.

## 2.1.7 Resource Assessment Technology

*Jim Combs, Geo Hills Associates*

Dr. Jim Combs from Geo Hills Associates explained that in geothermal energy, the commodity is heat. There must be four characteristics that are exploitable for geothermal resources: a heat source which may be a magma body or simply hot rocks at depth in the earth's crust; a fluid to carry heat to the surface and/or a well; permeable and/or fractured rocks to function as a reservoir; and so-called cap rocks to act as impermeable and insulating barriers for the fluid flow.

The objectives of any geothermal program is to locate areas underlain by hot rocks; to estimate the volume, temperature, and permeability at depth; to predict the chemical composition of the produced fluid; and to predict whether wells will produce dry steam or a mixture of water and steam. Since each geothermal prospect is unique, a combination of technologies must be used. All of these technologies and previous exploration are available on public domain. It is important to look at maps with the regional fault patterns because you need to be in a stress regime that has tension and identify all the hydrothermal locations. A key is to provide an early structural, stratigraphic, petrologic and hydrological model to serve as a guide to further exploration and drilling.

Geochemical surveys are very important to allow calculation of the temperature of the reservoir. In hot springs, the bubbles are non-condensable gasses. Composition of water also needs to be inspected. Geochemical surveys provide initial estimates of subsurface geothermal fluid temperatures and the chemical composition of the geothermal fluids. Geophysical surveys are used to look at where to site a drill hole.

Dr. Combs discussed some of the technical aspects of a geophysical survey. A conceptual model needs to be put together that includes a description of: reservoir volume, heat source, permeability structure, fluid source, etc., of the geothermal reservoir. The model is based on the data obtained from the hydrological, geological, geochemical, and geophysical surveys. Final phase of any geothermal program is the drilling of exploratory wells.

Dr. Combs closed his presentation by saying that the fundamental nature of most known geothermal systems is rather poorly understood. Much work remains to be done. The extraordinary differences that exist between known geothermal reservoirs indicate that continued investigation and research will be rewarding. Nevertheless, the results are already leading to a rapid acceleration in the growth of the geothermal industry worldwide. The following question was posed at the end of his presentation.

- Q> How big are the holes in the core and cracks?  
A> Core diameter was about 3".

## 2.2 AFTERNOON SESSIONS

### 2.2.1 Direct Use Applications

*Dale Merrick, ISOT, Inc.*

Dale Merrick started by giving examples on how geothermal could be used for direct use. In 2001, at Canby, California, a geothermal well was drilled to provide district heating to 35 homes and supply domestic water at about 35gpm. Currently, the wells discharge 13.3 gpm into a little river, and the buildings being served total 53,000 square feet.

During a preliminary study, the project had warm wells and a convenient location as well as solid support from the community. These were funded by NREL at \$307,000, CEC at \$304,500, ISOT Inc. at \$300,000, Idaho Operations Office, DOE at \$204,000, and donations of \$72,000. The project total was about \$1.2M. Project savings for last three years was about \$68,000. Some of the current projects are a 5,000 sq. ft. food warehouse, a central laundry, radiant floor heating, a clothes dryer, and a commercial greenhouse. Some of the future projects include a 5,500 sq. ft. geothermal production well to generate between 250kW – 2 MW electrical power, then cascading it down to direct use such as expanded district heating, space-heated future greenhouses and aquaculture—all of which would be productive businesses that provide jobs. In short, the projects can capitalize on generating electricity, then cascade the resource down to direct use. In the area, Ft. Bidwell has a planned FB-4 well, which is a higher temperature geothermal resource.

### 2.2.2 Resource Utilization Options

*Andrew Chiasson, Oregon Institute of Technology, Geo-Heat Center (OIT, GHC)*

Andrew Chiasson, from the Oregon Institute of Technology, presented some of the common uses of geothermal and its industrial applications. There are numerous options for geothermal that can theoretically applied to any process that requires a heat source. However, the options are limited by temperature and well yields. The users should depend on what is valuable to the owner, such as sustainability, economic, and environmental concerns. Optimal resource utilizations are cascaded from high, medium, to low. At higher temperatures (+220°F), geothermal resource could provide electric power and be used for industrial applications. At medium temperatures (+100°F), geothermal resource could be used for space heating and cooling, greenhouses, aquaculture, spas, and snow melting. At lower temperatures (ambient), the geothermal resource could be used for heat pump applications. Here is a summary of the geothermal options at the various temperature levels.

High	Medium	Low
<ul style="list-style-type: none"><li>• Electricity</li><li>• Evaporation</li><li>• Dehydration (fish, grain, timber, fruit, vegetables)</li><li>• Distillation (ethanol)</li></ul>	<ul style="list-style-type: none"><li>• Space heating &amp; cooling, domestic hot water</li><li>• Snow melting</li><li>• Greenhouses</li><li>• Mushroom growing</li></ul>	<ul style="list-style-type: none"><li>• Providing space conditioning for numerous applications:<ul style="list-style-type: none"><li>▶ Homes</li><li>▶ Commercial buildings</li><li>▶ Restaurants</li></ul></li></ul>

<ul style="list-style-type: none"> <li>• production)</li> <li>• Refrigeration</li> <li>• Washing and sterilization</li> <li>• Chemical extraction (salt, boric acid, silica)</li> <li>• Pulp and paper manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>• Aquaculture</li> <li>• Spas &amp; swimming pools</li> <li>• Crop drying</li> <li>• Milk pasteurizing</li> <li>• Sludge digestion</li> <li>• Beer brewing</li> </ul>	<ul style="list-style-type: none"> <li>▶ Hotels</li> <li>▶ Schools</li> <li>▶ Greenhouses</li> <li>▶ Aquaculture tanks</li> <li>▶ Ice Rinks</li> </ul>
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Mr. Chiasson discussed the 10/15/25 rule in direct use applications, explaining how much heat loss occurs when transferring heat from one piece of equipment to another. Using low temperature geothermal reduces system economic costs, and a person will typically be able to see benefits within a two-year payback (with federal incentives), or three years without. There was a question asked at the end of his presentation.

Q> What are the efficiency and cost effectiveness?

A> It is relative to the surface heat exchanger versus the down hole. A lot depends on how you make it and how long the tubing is. As far as costs, down hole pumps may be a little more costly.

## **Agencies Roles in the Permitting Process**

### **2.2.3 BLM Role in Permitting Exploration & Development on Tribal Lands**

*Sean Hagerty, Bureau of Land Management (BLM)*

Sean Hagerty from the Bureau of Land Management presented BLM’s role in permitting, exploration and development on tribal lands. BLM responsibility is implemented through BIA regulations in some cases. The BIA Code of Regulations is Title 25 CFR Part 211 – Leasing of Tribal Lands for Mineral Development. If the developer is a consultant for the tribe, BLM’s responsibility is limited and will only assist when requested from the tribe. BLM *leasing* regulations do not apply to tribal land, BIA leasing regulations would apply. If the developer is a lessee, BLM’s responsibility is very broad in terms of permitting and regulating operations. In the case of a lease to a developer, BLM's regulations would apply, as follows:

- 43 CFR 3250 – Geophysical Permitting, Including TGH Drilling
- 43 CFR 3260 – Production and Injection Well Permitting
- 43 CFR 3270 – Power Plant and Direct Use Permitting
- 43 CFR 3280 – Unitization Approval

The BLM would review and approve all operational permits, inspection of operations and enforcement of standards, and verify production. The overall intent on the regulatory purpose of 25 CFR 211.1 is “to ensure that Indian mineral owners desiring to have their resources developed are assured that they will be developed in a manner that maximizes their best economic interests and minimizes any adverse environmental or cultural

impacts resulting from such development.” There were two questions asked at the end of the presentation.

Q> What is the size of geothermal plant at Mammoth Lakes?

A> They are two 15 MW plants.

Q> In regard to land transfer back to tribes about the Mud Springs, they have not gotten a response back (Big Rock in Mendocino county). They wanted to know that during the land transfer, they did not want any commercial development.

A> I will look into it.

## **2.2.4 BIA Role in Permitting Exploration & Development on Tribal Lands**

*Roger Knight, Bureau of Indian Affairs, Division of Energy and Mineral Development (BIA, DEMD)*

Roger Knight from Bureau of Indian Affairs discussed the BIA’s role in permitting on tribal land. Division of Energy and Mineral Development (DEMD) has three primary program functions: Trust Asset Management, Technical Services, and Policy and Legislative. The Division also does training for the tribes and is restarting a program focusing on three to four people at a time. DEMD has staff located in Denver, Colorado, which is centrally located near the tribes and is close to Federal agencies with trust responsibilities for Indian energy and mineral development. Some of the responsibilities of DEMD are to:

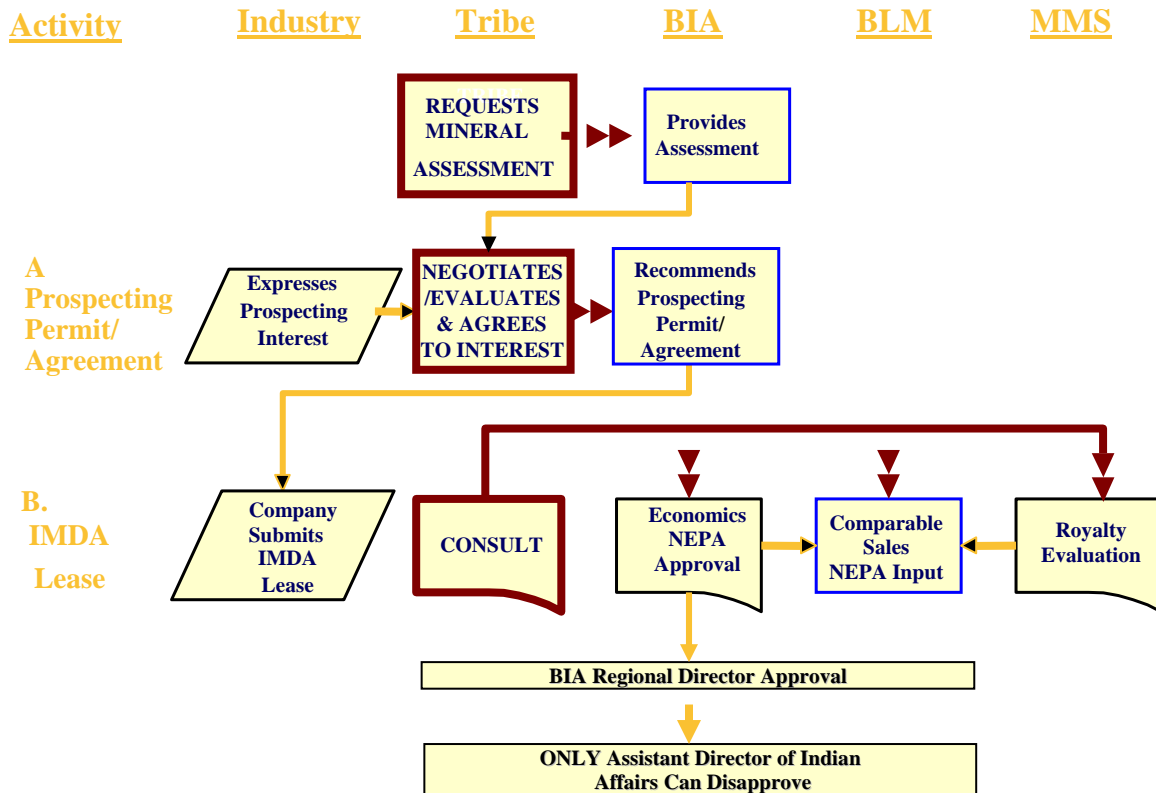
- Provide technical, engineering and economic advice to manage and develop energy and mineral resources,
- Generate effective energy and mineral development strategies
- Assist Indian mineral owners during IMDA negotiations
- Provide technical data & interpretations for exploration and development of resources
- Manage & maintain existing Indian energy & mineral data

IMDA (Indian Minerals Development Act) mandates that energy and mineral information and economic data related to energy and mineral development on Indian Trust lands are proprietary. IMDA eliminated any restrictions for the tribes to develop an agreement with all aspects of the agreement open to negotiation. The one draw back is that the BIA regional director still has to approve it. There are no restrictions during negotiation, except those that are set forth within the regulations. IMDA also has to notify BIA of ongoing negotiations or reduce delays in obtaining approval. BIA is not involved in the negotiations without a direct request from the tribe. However, under the IMDA, the United States is not liable for losses. The Secretary of the Interior has a trust responsibility to ensure that the rights of a tribe are protected and that new agreements are IMDA agreements. Here is a summary of agency responsibilities:

- BIA – Advisory/Approval
- BLM – Regulatory
- MMS – Auditing

- OST – Distributes Monies

Mr. Knight then stepped through the IMDA process.



The 25 CFR 225 deals with Mineral Agreements. During the lease negotiation, if assistance is requested by a tribe, DEMB/BIA determines the tribal role, goals, and financial position. During Lease negotiation the DEMB/BIA involvement includes finance, loans, grants, technical reviews, and geology, geophysics, engineering, and feasibility studies. At the time of the Lease Negotiation, BIA will verify the identity of Lessee, do an economic evaluation, and compare lease valuation (such as royalties, rentals and terms). BIA can suggest the following alternatives: tribal joint venture, back-in participation, and carried participation. All IMDA's must comply with NEPA, conform to all federal laws, and obtain federal approvals. Each of the parties must know what its financial stake is. In conclusion, DEMD/BIA is there to assist tribes with advice, planning, and negotiations. The following were questions asked at the end of the presentation.

- Q> Can any tribe create its own management plan?  
 A> The regional director has the final say; you will have to take it up with them.

Q> If a tribe asks for a technical or economic review, is BIA backlogged? How soon can one get the review out?

A> We are always backlogged, but will get work out as soon as possible.

## 2.2.5 CEC State PIER Geothermal and GRDA Programs – Tribal Resources

*William Glassley, California Energy Commission (CEC)*

Dr. William Glassley from California Energy Commission (CEC) discussed the role of the Energy Commission, which is to provide a funding source for a project that has an appropriate application whether it is for electricity generation or direct use. According to the RPS, the state renewable energy goals are to achieve 20% of renewable generation by 2010, and 33% of renewable generation by 2020. California currently has 1,884 gross MW of geothermal installed capacity, but has the potential of 3,015 gross MW available for development. The potential direct use applications could displace an additional 1,000 MW. The CEC’s Geothermal Resources Development Account (GRDA) and Public Interest Energy Research (PIER) programs fund geothermal efforts. The GRDA mission (since 1980) has been to promote the research, development, demonstration and commercialization of California’s geothermal resources. GRDA acquires funds from geothermal leases in California. PIER’s Mission (since 1996) has been to conduct public interest energy research that improves the quality of life for California’s citizens by providing environmentally sound, safe, reliable and affordable energy services and products.

Who is eligible to apply for GRDA and PIER funds?

- GRDA
  - Businesses, cities, counties, any unit of Indian government, school districts, special districts.
- PIER
  - Universities, utilities, businesses, cities, counties, any unit of Indian government, school districts, special districts

Following is a list of the minimum project requirements to apply for funds:

<b><u>GRDA</u></b>	<b><u>PIER</u></b>
<ul style="list-style-type: none"> <li>• Must directly relate to geothermal resource development, geothermal planning, or the mitigation of the adverse impacts of the development of geothermal energy</li> <li>• If a private entity, project must provide tangible benefits to a local jurisdiction</li> <li>• Projects must be in California or be sponsored by a California-based company</li> </ul>	<ul style="list-style-type: none"> <li>• Must improve energy cost, environment, public health and safety</li> <li>• Improve electricity reliability/quality/sufficiency</li> <li>• Strengthen California economy</li> <li>• Enhance consumer choice</li> </ul>

There are two types of GRDA funding, GRDA grants and GRDA loans. Projects expected to produce a profit within five years should apply for loans, others should apply for grants. In previous years, there were \$4.3 million available. For GRDA projects, a match share is required. An applicant's "match share" can be cash, equipment, and/or in-kind services. Private for-profit entities must match-share at least 50%, and local jurisdictions must match-share 20% of the overall project cost. Some examples of possible GRDA projects include cascaded systems, innovative designs that enhance economics, and distributed generation plans. The application package can be downloaded at [www.energy.ca.gov/geothermal](http://www.energy.ca.gov/geothermal). It will probably take about nine months to complete the application. The next solicitation is anticipated in Spring of 2007. The following are questions asked at the end of the presentation.

Q> Do those projects take into account load escalation?

A> Specifications are based on current production.

Q> Assuming the tribe has a project for its own use, does it count in meeting the portfolio standard?

A> If the community was already on the grid, then it would count. However, if power was being consumed, it would be important to emphasize how that use of power is contributing – by displacing electricity and greenhouse gases, propane. The more explicit you are about the project the better.

## **2.2.6 Q&A Wrap-up and Closing Remarks: A window of Opportunity**

*Roy Mink, U.S. Department of Energy and Roger Hill, Sandia National Labs*

In the final session, Roy Mink and Roger Hill both thanked the California Geothermal Energy Collaborative and the California Energy Commission for organizing the workshop. They noted how homegrown sustainable energy was more desirable. The DOE GeoPowering the West program promotes projects that need additional support and development. So last year, both the Geo Heat Center and Millennium Energy agreed to provide \$10,000 to \$15,000 worth of consultant services to look at geothermal sites.

During the Question and Answer wrap-up session, the following questions, answers, and comments were exchanged by the attendees and presenters.

Q> Suppose tomorrow is a better day, and DOE funding is restored. What are your priorities?

A> Exploration and high-risk projects. There are two priorities, 1) eliminate the exploration development risk, 2) fund GeoPowering the West, and look at barriers such as transmission issues, environmental issues, and running into wells that are dry.

Q> When will you actually know whether you will be funded for next year?

A> The 27<sup>th</sup> of June. Congress has marked that date.

Q> What services or assistance can the Federal government provide?



A> All the services listed today.

Q> What are the concerns about the sacred lands and so forth?

A> Some tribes expect to see vertical cooling towers that are vertical. They are more concerned about noise output during plant operation. Further, their priorities always include preservation of culture, leaving the land as is. Tribes will need to identify places that need to be left undisturbed.

Q> Are there any health concerns about the animals and purity of the water?

A> In the Mammoth project, they have an extensive monitoring service.

At the end of the session, attendees provided a series of comments:

Comment> Some tribes would like a tour of heat pump systems. They would like to see something a tribe can manage on their own and which eventually could become more commercial. They can always use technical assistance, since some of the wording may be too technical. They would like to see solutions to deal with sacred sites.

Comment> They would like a “one-sheet” of all the contact persons to various geothermal departments and all presentations available.

Comment> The main problem is that there is a lack of definitive consultation for tribal members – no policy on how to work with tribes. Tribal members want to speak to those in charge of the programs; they do not want to speak with the underlings that promise them the world, but can’t deliver. When the tribal members talk with governmental leaders, they are the ones who can get things done and know the program inside out.

Comment> You can look at President Clinton’s definition of consultation, because the state gets federal money. Actually, the state receives a lot of money, but doesn’t provide adequate consultation. As a tribe becomes more economically self-sufficient, the benefits of its projects flow over to the community. Their projects will enhance the revenue streams to other jurisdictions. As projects grow, that growth really affects the surrounding communities.

Comment> In Nevada there is a liaison official. Maybe there should be a liaison official in California to serve as a conduit between the tribal liaison official and state agencies.

Comment> One of the things that wasn’t really touched on was availability of information. Administrators should try to provide more information dissemination.

Comment> Another level of clarification that might be helpful is the size and capacity of tribes. Many of the tribes don’t have staffing that can support the level of research/information needed. It gets difficult when there is only a three- or four-person staff to fill heavy responsibilities.

Comment> "Do I have a geothermal resource? If so, how should I develop it?" Each tribe has a different way of doing business.

Comment> One of the things that helped at Fort Bidwell was informational meeting. But the attendance was only about a dozen people. It would help if the council would promote members to attend.

Comment from Atta Stevenson> The tribes would not want to enter an agreement with a timetable that cannot be met. As Vice President of the ITTC, I meet regularly with eight different tribes, and relay what they need, their deadlines etc. They are always on a schedule. When it comes to something major, the best advocates are persons who have spent years developing trust.

Concluding remarks were given by Connie Reitman. She indicated that she was pleased to make the closing remarks and was happy with the first step in providing information on geothermal energy to this group. Other tribal representatives will talk to their councils. What are the next critical steps and what can you do? What is your continued interest and what can you contribute? It is advised that during the next workshop, the same representatives attend so there is continuity. She noted that many things were discussed and that it will be important to come back and proceed with the next steps. She encouraged everyone to think about what is their interest.

### **2.2.7 Closing Invocation by Tribal Elder**

William Glassley from the Energy Commission thanked everyone for his or her participation.

At 4:25 PM, there was a closing invocation prayer. That concluded the California Tribal Geothermal Workshop.

## Appendix A: Meeting Agenda

# CALIFORNIA TRIBAL GEOTHERMAL WORKSHOP

SPONSORED BY THE  
CALIFORNIA GEOTHERMAL ENERGY COLLABORATIVE



IN COOPERATION WITH THE  
INTER-TRIBAL COUNCIL OF CALIFORNIA

FUNDED BY THE CALIFORNIA ENERGY COMMISSION



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**SUSANVILLE DIAMOND MOUNTAIN CASINO**  
**WILLOW ROOM**  
**900 SKYLINE DRIVE**  
**SUSANVILLE, CALIFORNIA 96130**

**THURSDAY-FRIDAY, JUNE 8 - 9, 2006**

California Indian Tribes have a variety of renewable energy resources available for development. The California Tribal Geothermal Workshop focuses on one type of renewable energy which can be developed by tribes in areas of the state with geothermal reserves and resources. The workshop presents the benefits and tribal environmental issues for both small geothermal power plants and direct use applications such as space heating, greenhouses and fish farming. It also covers the steps necessary for tribal geothermal development and the role of federal and state agencies in the process. A tour of two small geothermal power plants will provide an introduction to the technology.

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**Cosponsors:**  
**GeoPowering the West**  
**Council of Energy Resources Tribes**



# CALIFORNIA TRIBAL GEOTHERMAL WORKSHOP AGENDA

## Thursday Afternoon, June 8th FIELD TRIP

1 p.m. **Attendee Check-in:** the Welcome Tent at the Diamond Mountain Casino

**Tour of two geothermal power plants led by Jim Ausmus.**

1. Wineagle power plant (2 x 350 kW)
2. Amedee power plant (2 x 1 MW)

4 p.m. **Return to Susanville**

## Friday, June 9<sup>th</sup> Morning Sessions Willow Room

8:00 a.m. **Attendee Check-in**

8:30 a.m. **Opening Invocation by Tribal Elder**

8:45 a.m. **Welcoming Remarks and Introduction of Attending Tribes**  
*Honorable Chair Stacy Dixon, Susanville Rancheria*

9:05 a.m. **ITCC's Role in Tribal Renewable Energy**  
*Connie Reitman, Executive Director, Inter-Tribal Council of California*

9:25 a.m. **Tribal Cultural Values as Part of Our Environment**  
*Jim Brown, Tribal Administrator, Elem Indian Colony*

10:00 a.m. **Break**

### FUNDING, FINANCING & RESOURCE ASSESSMENTS

10:15 a.m. **Geothermal Planning for Geothermal Power Plant - Ft. Bidwell Case Study**  
*Honorable Chair Lawrence Harlan, Ft. Bidwell Indian Reservation*

10:45 a.m. **Overview of Indian Community and Economic Development Utilizing Geothermal Resources**  
*Roger Hill, Sandia National Laboratories, GeoPowering the West*

11:05 a.m. **Federal Funding and Private Sector Financing**  
*Roger Fragua, Deputy Director, Council of Energy Resource Tribes (CERT)*

11:35 a.m. **Resource Assessment Technology**  
*Jim Combs, Geo Hills Associates*

12:00 p.m. **Lunch Provided**

## **Afternoon Sessions**

1:00 p.m. **Direct Use Applications**  
*Dale Merrick, ISOT, Inc.*

1:25 p.m. **Resource Utilization Options**  
*Andrew Chiasson, Oregon Institute of Technology, Geo-Heat Center*

### **AGENCIES ROLES IN THE PERMITTING PROCESS**

1:50 p.m. **BLM Role in Permitting Exploration & Development on Tribal Lands**  
*Sean Hagerty, Bureau of Land Management*

2:15 p.m. **BIA Role in Permitting Exploration & Development on Tribal Lands**  
*Roger Knight, Bureau of Indian Affairs, Division of Energy & Minerals*

2:40 p.m. **Break**

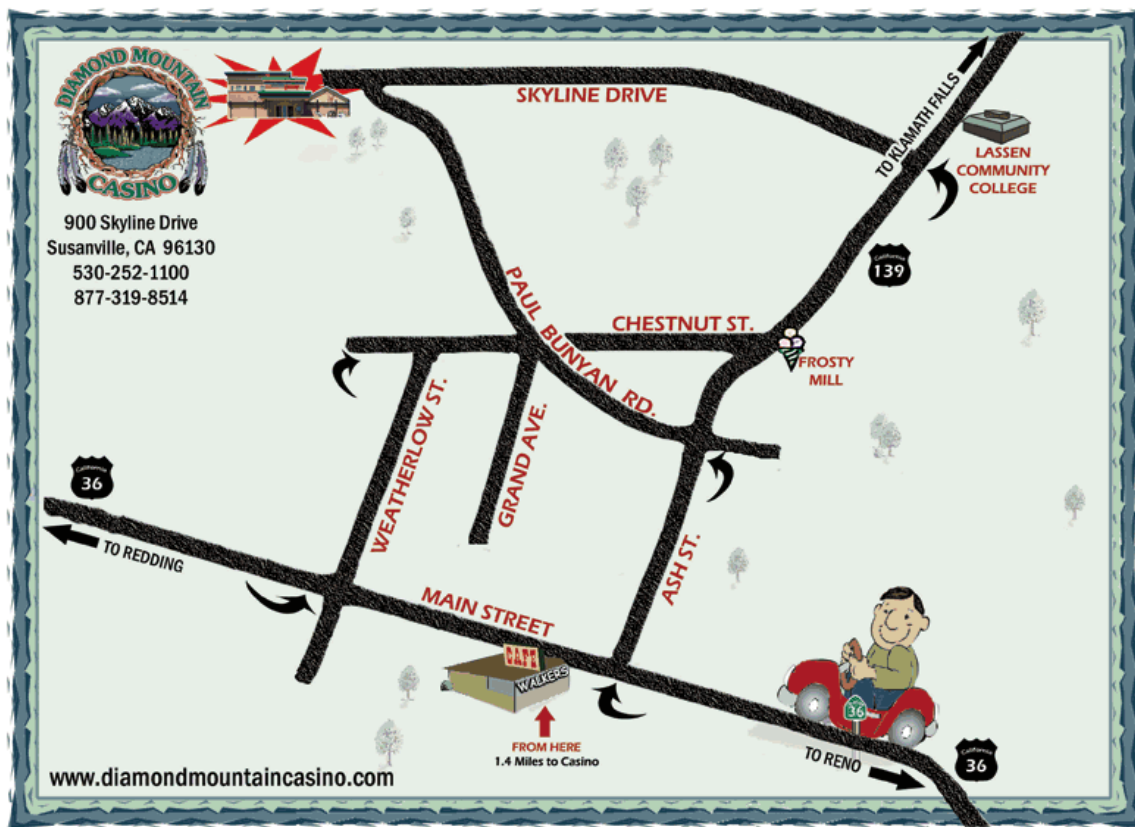
3:00 p.m. **CEC State PIER Geothermal and GRDA Programs – Tribal Resources**  
*William Glassley, California Energy Commission*

3:25 p.m. **Q&A Wrap-up and Closing Remarks: A Window of Opportunity**  
*Roy Mink, U.S. Department of Energy and Roger Hill, Sandia National Labs*

4:00 p.m. **Closing Invocation by Tribal Elder**



MAP  
TO  
DIAMOND MOUNTAIN CASINO  
WILLOW ROOM  
900 SKYLINE DRIVE  
SUSANVILLE, CALIFORNIA 96130



## Appendix B: Amedee and Wineagle Plant Information

### Amedee and Wineagle Geothermal Plants

The Amedee and Wineagle Power Generation Modules (PGM) are designed for unattended operation. A daily inspection is required by a local operator. In case of problem, the PGM will shut down and notify the operator. The PGM includes three main systems: the Rankine Engine, the electrical system, and ancillary equipment.

The Wineagle PGMs were originally designed to use Refrigerant 114 as a working fluid. These PGMs have been refitted to use isobutane in place of Refrigerant 114. This change was made when production of Freon 114 was discontinued. The Amedee PGMs were also designed to use Refrigerant (Freon) 114. Only one PGM is currently in operation. The other PGM was taken off-line when Freon 114 production was discontinued.

The main components of the Rankine Engine are high temperature heat exchangers (comprised of a pre-heater and evaporator) which transfer heat from the geothermal fluid to the isobutane working fluid. The brine fluid heats the working fluid to a relatively high pressure vapor (up to 110 psi for the Amedee plant and 145 psi for the Wineagle plant). The high pressure vapor is expanded through a turbine where shaft power is produced to driver the electrical generator. The working fluid leaving the turbine is a vapor at low pressure and temperature. This vapor flows to the condenser where heat is rejected to the atmosphere and the vapor is condensed to a liquid. The liquid flows by gravity to a feed pump where pressure is raised to evaporator pressure and the working fluid flows back into the heat exchangers to complete the cycle.

For Amedee, the generator in each PGM is a 1.5 MW, 1800 rpm, 4160 Vac, 60 Hz 3-phase Synchronous generator. A reduction gearbox is used to reduce the turbine speed (3600 rpm) to the operating speed of the generator (1800 rpm).

For Wineagle, the generator in each PGM is a 350 kWe, 3600 rpm, 480 Vac, 60 Hz 3-phase induction generator. A reduction gearbox is used to reduce the turbine speed (5200 rpm) to the operating speed of the generator (3600 rpm).

A single geothermal well supplies hot water to the PGM at the Amedee plant. The downhole pump is driven by a 250 HP shaft driven motor. The maximum flow with this system is approximately 2100 gpm. The geothermal water is delivered through a 10 inch pipeline to the PGM and is discharged through a pipe to a surface ditch that returns it to the original hot springs channel, and into a wildlife wetland area near Honey Lake.

A single geothermal well supplies hot water to the PGMs at the Wineagle plant. The downhole pump is driven by a 75 HP shaft driven motor controlled by a variable frequency drive (VFD). The maximum flow with this system is approximately 1200 gpm. The geothermal water is delivered through an 8 inch pipeline to the PGMs. Each PGM receives approximately 550 gpm under normal running conditions. The flow can be adjusted using the VFD. The used geothermal water is discharged through a pipe to a surface ditch that returns it to the original hot springs channel, and into Honey Lake.

Cooling water for the Amedee turbine and gearbox oil coolers and for the BAC condensers is provided by diverting some of the discharged water to a series of cooling ponds. Approximately 250 gpm of cooling water is used to serve the PGMs requirements.

At Wineagle, a separate cold water pump is used to provide cooling water for the turbine and gearbox oil coolers, and for the BAC condensers. Approximately 75 gpm of cooling water is used to serve the PGMs requirements.

The average power output of the Amedee PGMs is 1.2 MW. The net power averages between 400 and 700 kW. The output is higher in the winter, and less during the summer months.

The average power output of the Wineagle PGMs is 500 kW. The output is higher in the winter, and less during the summer months.

At both plants, normal maintenance consists of checking oil, water and flow levels, checking for abnormal noises and vibrations, and air, water and working fluid leaks. There are two scheduled maintenance shutdowns each year. One shutdown is performed prior to the start of the summer season to insure operation through the peak power period. The second shutdown is performed after the summer season to prepare for the cold weather.

During these maintenance shutdowns, the turbine is disassembled to replace the seals and bearings. The drive belts for the condenser fans are replaced. The condensers are drained and cleaned. The temperature and pressure gauges and switches are recalibrated, and the electrical connections are checked and tightened. Other changes and repairs that could not be performed with the PGM on-line are taken care of during these shutdowns.

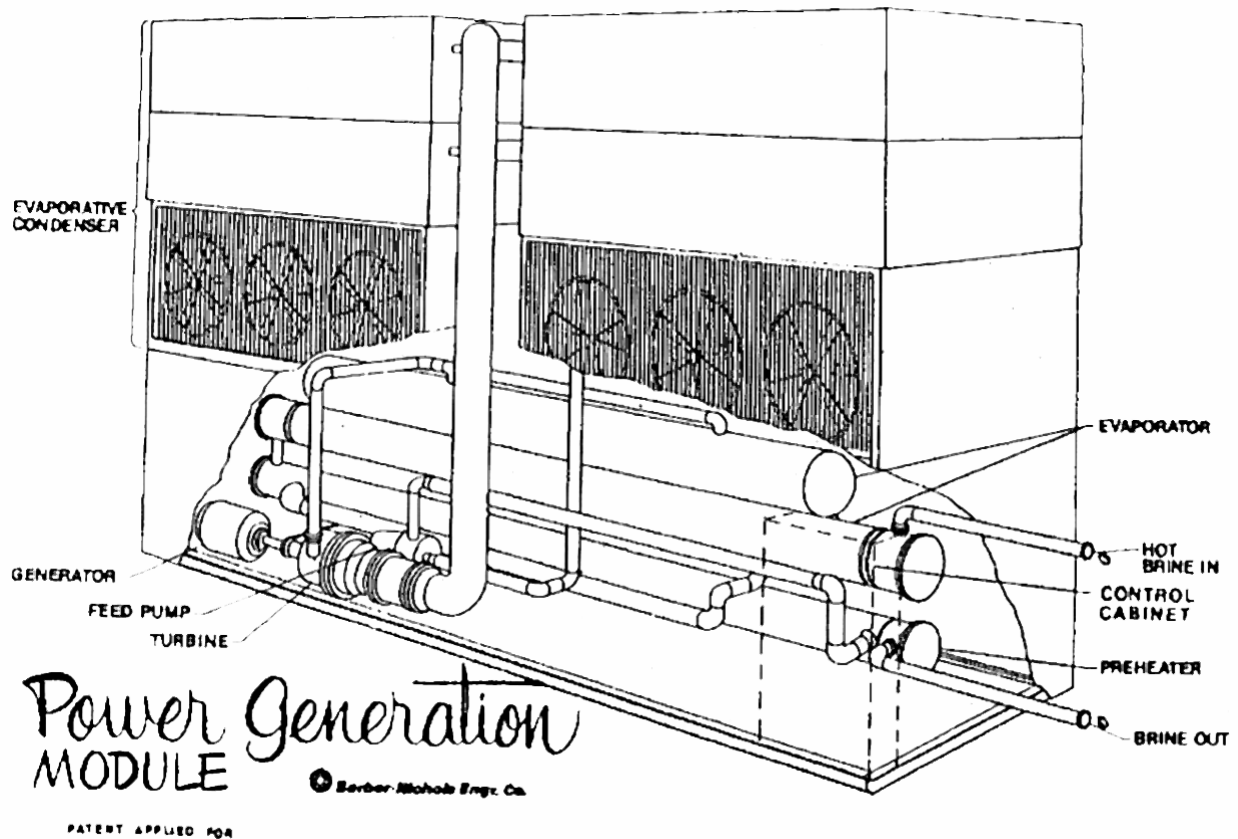


Image of Power generation model used at both Amedee and Wineagle geothermal sites



## Appendix C: Plant Tour Images

### *Wineagle Geothermal Power Plant*



Wineagle Power Plant –  
only one generator is online



Wineagle turbine setup



Wineagle Pump System  
driven by a 75 HP motor



Discharge to original hot springs  
channel

## ***Amedee Geothermal Power Plant***



Amedee Geothermal Plant – Only one generator is online



Amedee Cooling Fan in operation



Amedee Control Room

## Appendix D: Attendee List

Last Name	First name	Organization
Archer	Stephen	Inter-Tribal Council of California
Ausmus	James	AGV-1 Inc. - Wiweachi Development Co.
Barker	Ben	Barker Geothermal & Petroleum Engineering
Boyd	Toni	Geo-Heat Center, OIT
Brown	Steve	Round Valley Indian Tribes
Carter	Anna	Geothermal Support Services
Chiasson	Andrew	OIT Geo-Heat Center
Combs	Jim	Geo Hills Associates, LLC
Davis	Ron	Davis Power Consultants
Degarmo	Dana	Ft. Bidwell Indian Community
Dixon	Teresa	Susanville Indian Rancheria
Dollarhide	Melinda	Cedarville Rancheria
Fischette	Judy	California Geothermal Energy Collaborative
Fragua	Roger	Council of Energy Resource Tribes
Garcia	Douglas	DOI, Bureau of Indian Affairs, Pacific Region
Glassley	William	California Energy Commission, Geothermal Programs
Hagerty	Sean	U.S.D.I. Bureau of Land Management
Harlan	Lawrence	Ft. Bidwell Indian Community Council
Hill	Roger	Sandia National Laboratories
Hoops	Richard	BLM, Nevada State Office
Jackson	John	Pyramid Lake Paiute Tribe
Johnson	Elizabeth	Calif. Div. of Oil, Gas, & Geothermal Resources
Johnson	Melany	Susanville Indian Rancheria
Knight	Roger	U.S.D.I. Div. of Energy & Mineral Development
LeFleur	Joe	Geologist Extraordinaire
Merrick	Dale	I'SOT, Inc
Mink	Roy	DOE Geothermal Technologies
Morris	Christy	Nevada Division of Minerals
Noel	Donna Marie	Pyramid Lake Paiute Tribe
Olivas	Laura	Pit River Tribe, Atsugewi
Pollard	Denise	Ft. Bidwell Indian Community
Quach	Billy	Davis Power Consultants
Rafferty	Keven	Mechanical Engineer
Ramirez	Frank	Elem Indian Colony
Reeves	Christopher	DOI, Bureau of Indian Affairs, Pacific Region
Reitman	Connie	Inter-Tribal Council of California
Sahme	Sal	Ft. Bidwell Indian Community
Stevenson	Atta	Laytonville Rancheria, ITCC Vice President
Thomas	Terry	Environmental Management Associates, Inc.
Wasson	Rebecca	DOI, Bureau of Indian Affairs, No. CA. Agency

# Appendix E: Workshop Evaluation

## California Tribal Geothermal Workshop June 8-9, 2006 Evaluation Form

### Rate the overall Workshop: 1 (poor) to 10 (excellent)

The Workshop provided you with information about geothermal energy \_\_8.8\_\_

**June 8<sup>th</sup> Tour of Power Plants** – Tour was helpful \_\_9\_\_

### *Sessions - rate from 1 (poor) to 10 (excellent):*

#### **Tribal Cultural Values as Part of Our Environment**

- Presentation helpful\_\_8.5\_\_
- Presenter knowledgeable \_\_9.2\_\_

#### **Geothermal Planning for Geothermal Power Plant - Ft. Bidwell Case Study**

- Presentation helpful\_\_8.3\_\_
- Presenter knowledgeable \_\_8.9\_\_

#### **Overview of Indian Community and Economic Development Utilizing Geothermal Resources**

- Presentation helpful\_\_8.2\_\_
- Presenter knowledgeable \_\_8.9\_\_

#### **Federal Funding and Private Sector Financing**

- Presentation helpful\_\_7.5\_\_
- Presenter knowledgeable \_\_8.6\_\_

#### **Resource Assessment Technology**

- Presentation helpful\_\_7.8\_\_
- Presenter knowledgeable \_\_8.8\_\_

#### **Direct Use Applications**

- Presentation helpful\_\_8.2\_\_
- Presenter knowledgeable \_\_8.6\_\_
- 

#### **Resource Utilization Options**

- Presentation helpful\_\_8.3\_\_
- Presenter knowledgeable \_\_8.6\_\_

#### **BLM Role in Permitting Exploration & Development on Tribal Lands**

- Presentation helpful\_\_7.8\_\_
- Presenters knowledgeable \_\_8.8\_\_

### **BIA Role in Permitting Exploration & Development on Tribal Lands**

- Presentation helpful\_\_7.7\_\_
- Presenter knowledgeable \_\_8.3\_\_

### **CEC State PIER Geothermal and GRDA Programs – Tribal Resources**

- Presentation helpful\_\_8.3\_\_
- Presenter knowledgeable \_\_8.9\_\_

### **Q&A Wrap-up and Closing Remarks: A Window of Opportunity**

- Presentation helpful\_\_8.3\_\_
- Presenter knowledgeable \_\_8.5\_\_

### **What information did you find the most helpful at the Workshop?**

- All
- Tribal lack of policy from agencies to work with tribes
- Technical
- CEC Funding
- Native American Perspective
- Tribal concerns – cultural, noise (of power plants) business, etc.
- Good workshop
- BIA and BLM regs.
- This was well-rounded
- Good information – helpful – as information and ideas were presented.
- The Ft. Bidwell discussion by Chairman Harlan.
- Tribal perspective on use of geothermal and the ITCC role in CA

### **What additional material would you have liked to see covered?**

1. Blueprint for example startups including all funding sources
2. More applications
3. Would like to have copies of all PowerPoint slides made available (this could be electronic) either at the meeting or subsequently by email attachment or download from FTP site.
4. Get final list of attendees with contact information
5. "One sheeters" – outlines, easy to read stuff
6. Market information
7. The development process which requires long term commitment.
8. CFR 25 & 43 CD's
9. An example of a successful Tribal operation, mineral related and preferable geothermal, where a developer has/is working with a tribe.
10. Would have been nice to have visited the hybrid biomass/geothermal plant.

Thank you for your input! Please return to Judy Fischette at [fischette@sbcglobal.net](mailto:fischette@sbcglobal.net)