

Geothermal Education: A Campaign for Sustainability

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ABSTRACT

Geothermal projects and operations are besieged not only with technical challenges but also with concerns on regulatory compliance, economic, political as well as social aspects. Regulatory compliance may be resolved through technological measures implemented by the geothermal industry. Economic and political issues may be discussed and negotiated among corporate and government leaders. Social issues may be managed through company outreach programs, among which may be through Geothermal Education.

A pilot project on geothermal education campaign was launched in year 2000 in the geothermal community of Tiwi, Albay, Philippines, with the following objectives: 1) To promote safety practices among school children and residents in the geothermal community; 2) To raise awareness of geothermal operations, benefits and concerns; 3) To facilitate sharing of this geothermal learning with the school children's parents; and 4) To provide an avenue for proactive communication between the geothermal industry and its host community.

The Geothermal Education Campaign was triggered by safety concerns for children involving geothermal facility (pipeline and sump) related incidents. The geothermal industry solicited the support of the Department of Education and the local government, and then initiated geothermal workshops for the school teachers. The school teachers designed the geothermal education program, creatively integrating it with their respective grade school lessons in science, language arts, or other classroom teachings. The geothermal industry provided the materials and resource speakers during the workshops and initial classroom instructions.

This paper relates the Geothermal Education Campaign experience in the Philippines' first geothermal project area – the challenges, the benefits and the drawbacks. It also discusses how an effective Geothermal Education Campaign could promote and sustain the worldwide development of geothermal energy that is mutually beneficial to involved stakeholders: the local government, the regulatory agencies, the school institutions, the community residents and the geothermal industry.

The geothermal industry's desire for project sustainability can only be as strong as its Corporate Social Responsibility, and Geothermal Education is a valuable tool in realizing this goal.

1. INTRODUCTION

Prior to the era of energy sector privatization in the Philippines, the government had total control and ownership of the power generation and distribution in the country through the National Power Corporation (NPC). The Tiwi Geothermal Power Plant Complex (TGPP) located in the municipality of Tiwi, province of Albay in the Philippines was the first geothermal project that NPC developed. Through the Presidential Proclamation No. 739 in 1970, 17,661 hectares of land within Tiwi and its neighboring municipality of Malinao were declared as geothermal reservation.

The Tiwi geothermal project's transition from a perceived antagonist to a community partner was a long, difficult journey. Considering that it was the country's first geothermal project and no definite regulatory guidance and social framework were readily available during the project's initiation, numerous issues came about – environmental, health, safety, social, political, and other concerns.

The Philippines' promulgation of the Energy Regulations 1-94, also known as the Department of Energy Act of 1992, providing financial benefits to energy host communities, paved the way for the Tiwi project's social acceptance. With the use of technology, environmental management system and social development programs, NPC and its steam field contractor, Philippine Geothermal Inc. (PGI), demonstrated their commitment to serve as the community's partner towards sustainable development. (Note: NPC-TGPP has been privatized to Aboitiz Power Renewables, Inc. in 2008, and PGI is now Philippine Geothermal Production Co. Inc.)

However, in spite of the positive transition, challenges still remained. The geothermal steam field and facilities are distributed within a vast land area, interspersed with public and private infrastructures. Unlike any regular workplace, the steam field is not completely isolated from non-work related activities. The geothermal project shared the same ecosystem with its community residents. Hence, this resulted to the recurrence of unwanted incidents and unnecessary impact to both the geothermal industry and the community.

2. THE INTERCHANGE OF OCCUPATIONAL IMPACT AND SOCIAL IMPACT

Most reports about geothermal projects highlight the disturbance and impact brought about by the development and project operations. On the other hand, activities within the host community may likewise impact the geothermal project operations.

To protect the community from the heat of steam pipelines and to maintain operational thermal efficiency, pipelines are clad with insulating material. However, pipeline claddings were vandalized by some residents to use the pipeline's heat for drying clothes, wood or newly harvested abaca fiber thereby causing pressure drop and thermal losses for the geothermal operations. Wire fence installed in some of the well sumps were cut to enable short access to and from one's regular destination, or taken away for personal purpose. Water pipelines were punctured to access water supply for crops. Concrete canal covers were damaged for unknown reasons. On the other side, playful children would climb pipelines or play around the sumps, which at times result to accidents. Community information dissemination was undertaken to resolve the issue, but was not effective.

Eventually, geothermal drying stations were built over selected portions of the steam pipeline to resolve the pipeline cladding destruction issue. This somehow helped reduce the vandalism, but not totally. There were still reported incidents of children falling off pipelines, incurring burns, or accidentally falling into the sump. Though NPC and PGI immediately responded by providing medical assistance and support, yet it did not prevent recurrence of such incidents. Medical treatment and financial settlement did not address the root cause of the problem. Hence, the Geothermal Education Campaign Project was initiated.

3. THE GEOTHERMAL EDUCATION CAMPAIGN

3.1 Project Objectives

With the young children's safety in mind, NPC and PGI designed a new approach – to implement the information dissemination in the school classroom. The rationale was that young children were mostly left on their own while the parents were out in the fields working, and children related accidents occurred while at play or while on the way home from school. Geothermal Education may be a good way to enhance children's awareness of potential risks and to promote community safety practices within the geothermal area.

NPC and PGI came up with the Geothermal Education Campaign to achieve the following objectives:

- 1) To promote safety practices among school children and residents in the geothermal community.
- 2) To raise awareness of geothermal operations, benefits and concerns.
- 3) To facilitate sharing of this geothermal learning with the school children's parents.
- 4) To provide an avenue for proactive communication between the geothermal industry and its host community.

The Geothermal Education Campaign was in alignment with the government / regulatory requirement for promoting public information under Presidential Decree 1586, the Department of Environment and Natural Resources' DENR Administrative Order No. 37, and the Republic Act No. 8749.

3.2 Participants' Orientation

The approval and support of the Department of Education, Culture and Sports (DECS) schools division superintendent was solicited for the school teachers' involvement. The participants (principal and head teachers and science teachers) represented elementary schools not only from Tiwi but also from the nearby municipalities. An orientation meeting with the participants was initially held at NPC to explain the objectives of the project, and also to collect survey information on the participants' knowledge and perception of the geothermal project operations. The gathered information gave light to the following:

- 1) Participants had a negative perception of the geothermal project operations, attributed to its perceived environmental and social impact.
- 2) Participants were not aware of how the geothermal steam gathering system and power plants operate.
- 3) Participants were not aware of the measures applied by the geothermal industry to mitigate and manage the environmental concerns.
- 4) Most participants were not aware of the economic and social benefits contributed by the geothermal operations.
- 5) Participants confirmed that the Geothermal Education Campaign was an excellent project.
- 6) Participants signified strong support to achieve the Geothermal Education campaign objectives.

With the collected information as starting reference, NPC and PGI therefore planned for a series of geothermal awareness workshops to precede the education campaign. Recognizing that the school teachers were typically idolized and listened to by their young students, NPC and PGI looked up to the participants as the valued torchbearers for the Geothermal Education Campaign.

3.2 Geothermal Awareness Workshop I

The first workshop was held on May 22 – 24, 2000 at PGI conference room. Presentations were conducted by several personnel from PGI to explain the development and harnessing of geothermal energy, including the steam gathering system operations and delivery to the power plants. NPC resource persons explained the power plant operations and the distribution of electricity in the Luzon grid. The environmental and social impacts were likewise discussed, including the corresponding measures to address them (e.g., the effluent injection system to protect water quality, the mechanical gas extraction system that resulted to noise reduction and lowered gas emissions, reforestation projects to protect against landslides, remediation programs, solid waste management, etc.). NPC and PGI's contributions to the country's economy and the host community's social development were likewise presented.

Discussions, question and answer forums took place during the workshop, and tour of the facilities were provided to support the discussions and presentations.

3.3 Geothermal Awareness Workshop II

The second workshop was held on August 3 -4, 2000 at Saenz Resort, a local resort that used to be popular for natural hot springs baths prior to the geothermal development. When the supply of natural hot spring water ceased, NPC and PGI installed a steam pipeline to supply hot water to said resort.

The participants designed lesson plans to integrate environmental awareness, geothermal safety and behavioral concepts into the curriculum. NPC and PGI personnel's initial opinion was that the geothermal education may be integrated into the Science course. However, the participants' creativity exceeded expectations. They also came up with ideas and plans to alternatively integrate geothermal education through the following (in case the curriculum timing is inappropriate for discussion in Science):

- In Language Arts, use creative story telling about geothermal operations and safety. Young children learn lessons from short, simple stories. (Message: Geothermal energy produces electricity used in our homes, but children should avoid playing in wellsites, pipelines, sumps and any other geothermal facility for safety reasons.)
- In Physical Education, which is play time for children, teach playtime behavioral concepts. (Message: there are alternative and much better ways to have fun other than climbing pipelines and facilities, fishing in sumps, or risking safety for curiosity.)
- In Social Studies, using simple approach to raise children's awareness on the safety importance of maintaining (and not damaging) the pipeline cladding to prevent accidental burns, avoid impact to energy operations, and learn about the benefits brought about by the geothermal project, e.g., electricity for homes, social contributions like scholarship funding, etc. (Message: pass on information to parents on the value of pipeline cladding for children's safety).
- In Music, a teacher composed an upbeat song to impart geothermal safety message. (Lesson learned: geothermal education and safety could be integrated into the school curriculum in numerous, creative ways to help achieve the Geothermal Education Campaign objectives).

The Geothermal Education Campaign was initially launched in the following schools: the Tiwi Central School, the Cale Elementary School and the Naga Elementary School, which comprised of grade levels 1 – 6, with ages typically ranging from 7 – 12 years old. The criteria applied for the school selection were the student population and proximity to the power plants and steam gathering facilities.

3.4 Stakeholders' Perceptions of the Geothermal Education Campaign

Faculty and students responded positively to the campaign. NPC and PGI's support towards education made the experience exciting for the school. Likewise, establishing connection with young school children and faculty was a refreshing experience for the involved geothermal operations personnel.

Both NPC and PGI management strongly supported the Geothermal Education Campaign project conceptualization and its implementation.

The Department of Education, Culture and Sports schools division superintendent and workshop participants were happy about the success of the project launching. They also envisioned the possibility for geothermal education to be spread out to other schools in nearby municipalities / cities within the province. Another school teacher suggested that the geothermal education campaign should be further elevated to the high school level, to raise interest among high school students in pursuing a geothermal career for their college program.

The Department of Environment and Natural Resources commended NPC and PGI's new approach to strengthen the Community Information Dissemination program.

The Tiwi local government conveyed approval and endorsement of the project.

4. PROJECT DRAWBACKS

In spite of the positive response, acclamations and bright visions for the Geothermal Education Campaign project, its continuity was cut early. This may be attributed to the following possible factors:

4.1 Organizational Changes and Personnel Movement

Project continuity involves leadership, vision and commitment. A shift in key personnel may bring about a change in vision, a change in project commitment, and therefore a change in direction.

Thus, when the key people who conceptualized and pushed for the Geothermal Education Campaign project left the area of operation either due to retirement, relocation, or job transfer, the project lost leadership and was eventually discontinued.

4.2 Shift in Company/Management Priorities

Every new project takes a significant effort to design and launch. However, it takes a much stronger motivation and justification to ensure its continuity amid corporate concerns on timelines and multiple operational priorities. Based on the school's response, the geothermal education campaign showed possibilities of becoming a regular part of the geothermal project's community information

dissemination program, which would involve not only the geothermal company's community and environmental personnel but also its technical operations staff. Hence, corporate and management officials from various levels may have different perspectives on the value of the man-hours spent on this project.

4.3 Budget Concerns

The NPC-PGI's community relations department provided the fund allocation for the year 2000 Geothermal Education Campaign. The project expense involved food and resource materials during the workshops and school launching. If the geothermal education campaign was to be maintained annually and expanded to more schools, this will likewise mean an increase in budget requirement.

5. PROPOSED RESOLUTIONS TO PROJECT DRAWBACKS

To implement and continue the Geothermal Education Campaign, the following strategies may be adopted:

First, obtain top level management commitment and support. Refer to the regulatory requirements to justify approval for the continuity of the program. Enumerate the benefits to involved stakeholders. Ensure a win-win situation for parties concerned - the students and the schools, the community, the regulatory agency, the local government and the geothermal industry.

Second, establish a robust framework. Develop the Geothermal Education Campaign as an annual program, and as a foundation of all other related community information dissemination programs. Support the schools with tools to deliver the best quality of education. Promote interest and awareness for environmental, health and safety protection, and geothermal operations. The company's environmental system framework and its health and occupational safety framework should be strongly linked to the corporate social responsibility framework.

Third, implement company trainings and orientation to raise geothermal personnel's awareness on their corresponding social responsibility to ensure the community's health and safety, alongside with environmental preservation and protection. Rotate personnel's participation in the Geothermal Education Campaign. Designate Geothermal Education Campaign project coordinators to represent every supporting industry / agency – from the power plant company, the steam gathering system company, the education department and school institutions, and the geothermal subcontractors. If necessary, create a committee.

Fourth, the Geothermal Education Campaign fund requirements may be sourced from either the company's annual environmental budget allocation, safety maintenance budget and/or the community relations program funds.

Depending on budget allocation, the campaign may be simultaneously implemented in the same schools every year, or the schools may be rotated annually. Creativity in program implementation is also necessary to sustain the program.

Other than the locally available resources, materials for geothermal education and related support may be possibly obtained through different geothermal institutions and internet links, such as the:

Geothermal Education Office, California, U.S.A.

<http://geothermal.marin.org/>

<http://www.slideshare.net/guestecfd40/geothermal-education-office>

Southern Methodist University Geothermal Laboratory, Texas, U.S.A.

http://smu.edu/geothermal/education/teacher_material.html

The Government of South Australia, through its Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) has exemplified leadership in providing educational support by identifying educational resources for respective target audience, via its DMITRE link:

<http://www.pir.sa.gov.au/geothermal/ageg/resources>

Furthermore, the Geothermal Education Campaign may be tied to an annual school/community celebration, like "Earth Day", "Environment Month," "Safety Month," or a newly created one – the "Geothermal Week Celebration".

6. GEOTHERMAL EDUCATION CAMPAIGN PROJECT MOTIVATION: THE COST-BENEFIT ANALYSIS

The cost-benefit analysis of the Geothermal Education Campaign could be summarized as follows:

Cost = Corporate Social Responsibility

Benefit = Sustainable Development

Geothermal projects face strong opposition in many countries. Zepeda and Rodriguez (2005) cited that this could be an indication of unresolved social and environmental impacts. Likewise, current geothermal projects are strong showcases for new project development areas, from which prospective stakeholders base their information and assessment. Hence, the manner in which every ongoing geothermal project conducts its business is contributory to the fate of succeeding geothermal developments, worldwide.

Corporate Social Responsibility is defined by the European Commission as "the responsibility of enterprises for their impacts on society." The Commission cited that enterprises "should have in place a process to integrate social, environmental, ethical human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders". There also exists an international standard, ISO 26000, on social responsibility, to provide guidance to companies. Corporate Social

Responsibility may also mean going beyond what is required by regulations to improve people's quality of life. The Geothermal Education Campaign is a strong demonstration of the geothermal industry's Corporate Social Responsibility.

Also, several government, regulatory and international organizations advocate the people's rights to be informed of potential hazards arising from project activities, as well as encourage cooperation among various stakeholders. The Children's Rights and Business Principles published by the United Nations Children's Fund (UNICEF) cited that, "Respecting and supporting children's rights requires business to both prevent harm and actively safeguard children's interests." Along this line, the Geothermal Education Campaign is a very appropriate undertaking.

On the subject of sustainability, the World Business Council for Sustainable Development (WBCSD) defined sustainable development as, "forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs." The WBCSD also identified the value of providing information to promote sustainable behavior. Hence, the Geothermal Education Campaign is a valuable tool to promote safety and solicit cooperative behavior from the community.

The United States Environmental Protection Agency (EPA) also cited that, "Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations."

The Geothermal Education Campaign's beneficial impact may not be immediately visible. However, continual implementation of an effective Geothermal Education Campaign is projected to bring about significant contributions to sustainable development, and deliver mutual benefits to the following stakeholders:

To the Community, the Schools, the Government, the Regulatory Agency and the Geothermal Industry –

1. Attain the campaign's objectives - increase safety for children and community, raise the public's awareness of geothermal operations and establish open communication with community residents.
2. Build the foundation for the community information dissemination program and public relations projects.
3. Minimize conflicts between the geothermal industry and the community. The enhanced awareness of both parties: the community (students, teachers, parents) with geothermal operations, and the geothermal industry personnel with social responsibility, may lead to a more harmonious co-existence within the geothermal area.
4. Develop strong interest among the youth to pursue a geothermal career, and eventually create a pool of future geothermal experts who will further lead the advancement of geothermal technology and operations.
5. Open opportunities for the establishment of geothermal curricula in trade schools, community colleges and universities, with participation from geothermal experts (local and across the globe) and supported by the geothermal industry.
6. Open student scholarship opportunities for geothermal education.
7. Promote public understanding and social acceptance of geothermal energy projects.
8. Support compliance to government and regulatory requirements.
9. Support economic progress and sustainable development.

To the Financial Investors –

10. Prevent or reduce costly damages to pipeline insulation and related geothermal infrastructures.
11. Avoid costly delays and losses to project operations arising from incidents and investigations.
12. Avoid costly litigations arising from legal issues.
13. Prevent potential project suspension / termination and huge investment loss.

To the Geothermal World -

14. Support and promote geothermal development and project operations, locally and globally, onward to the next generations.

The sustainability of the geothermal project can only be as strong as its demonstrated Corporate Social Responsibility. This social responsibility encompasses the safety of all and every community resident, which likewise reflects an energy utility company's commitment to service.

7. CONCLUSION

Majority of the geothermal energy sector's focus is on technological advancement. The financial investors' primary interest is profit. The government's commitment is public service. The regulatory agencies' responsibility is to monitor industries' compliance. The public sector's role is usually recognized during the solicitation of social acceptance for planned energy development projects. However, the importance of the community's role should not stop when the energy project starts. The

geothermal industry should continuously maintain strong partnership with the host community as part of its social responsibility, and to support the productive, efficient and safe operations of the geothermal project activities.

Moreover, education is a strategic tool towards the implementation of Corporate Social Responsibility and reaping the benefits of sustainable development. Promoting public awareness of the potential hazards from geothermal project activities, and their understanding the industry measures to manage risks, are best realized through public education.

The geothermal energy project can be allegorically compared to a novel car. Symbolically, the geothermal industry is the trained car driver, and the community is the informed passenger. Sustainable development is supposed to be the mutual destination. However, unless the passenger understands that the car has improvised safety measures to assure safety during transport, the prospective passenger may resist taking the ride. In case the offer is accepted, the rider may still jump off when he/she feels threatened, or may fail to use the installed safety belt to further ensure his/her safety. If business owners do not advertise the salient features of the car, they may not succeed in capturing a good market. Hence, unless the community adequately understands the potential hazards, the management of risks, and the economic benefits of the geothermal project, social conflicts will continue to be an issue. If the geothermal world falls short of promoting geothermal education in current and prospective project areas, the rate of geothermal development will continue to be constrained by the lack of social acceptance. Without an effective Geothermal Education Campaign integrated in its operational framework, ongoing project operations may be inadequate to showcase to prospective geothermal energy development areas.

Therefore, the geothermal industry and the government institutions need to work together to lay the foundation for geothermal education, such as:

- Geothermal Education Campaign in school classrooms, to include power plant and steam gathering system tours for children, parents and teachers.
- School and community participation in geothermal environmental monitoring activities and projects.
- School and community representation in geothermal forums, locally and globally.

It is further highlighted that a continually strong Geothermal Education will bridge the gap between the geothermal industry and the community. Geothermal Education will provide the anchor for harmonious cooperation, to realize sustainable development within the host community and the country endowed with this natural, renewable resource – geothermal energy.

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Figure 1: Tiwi Geothermal Education Campaign, Geothermal Workshop 1 (May 22 – 24, 2000), teacher participants pose with geothermal industry personnel (the power plant's switchyard area in the background).



Figure 2: Tiwi Geothermal Education Campaign, Geothermal Workshop 2 (August 3 – 4, 2000), workshop participants visited the geothermal view deck.



Figure 3: Sample of certificates issued to Workshop 1 & Workshop 2 participants consultants / speakers, signed by the National Power Corporation (NPC) manager, the Philippine Geothermal, Inc. (PGI) manager and the Department of Education, Culture and Sports (DECS) schools division superintendent.