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Geothermal Energy: an Opportunity of Dialogue in Pursuit of Sustainable Development in Peru

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ABSTRACT

During the last five years, Peru has managed to sustain a constant growing economy (more than 5% annual), and this fact places it as the main emerging economy in South America. This phenomenon directly results in an increase of the electricity demand, which according to estimates of the Ministry of Energy and Mines (MEM), is about 500 MW per year, which should be incorporated into the electrical network to satisfy the population needs and industrial growth. On the other hand, Peru is a country plenty of mineral and energy resources, such as geothermal energy, which despite having a potential of approximately 3000 MW, has not yet been exploited because of the lack of deep exploratory studies, imprecision of environmental standards and ignorance on the part of authorities, technicians and general public.

However, several institutions have been working to overcome these barriers, with expectations in the development of the geothermal sector. In this context, the MEM is the responsible of encouraging the investment, in order to cover certain aspects of national energy policy, they are governed by laws. According to this, the Law of Geothermal Resources was published in 1997, and its Regulations, in 2010, in order to ensure the rational development of the geothermal resources, promote the diversification of the energy sources, realize the monitoring of the exploration activities, and ensure the free of access and competition, according to the law.

Besides of the drafting of the regulatory framework, the Geological, Mining and Metallurgical Institute, INGEMMET, has been published several researches and papers about the Peruvian geothermal resources, such as the Geothermal Map of Peru (presented in the World Geothermal Congress, 2010). All these efforts have contributed to increase the interest of private companies to invest in exploration and exploitation of geothermal resources. A proof of this is that, since 2010 until now, MEM has granted 32 authorizations of exploration to 8 companies.

However, the current context shows that any investment project (especially those related to the use of the natural resources); will be successful if you do not have the social license and acceptance of the community. For this reason, in 2011, INGEMMET, in coordination with the Directorate General of Electricity (MEM) convened the Regional Directorates of Energy and Mines, DREM of the Tacna, Moquegua, Arequipa and Puno regions (areas with the highest geothermal potential in the country) and private sector companies in order to join forces and communicate together the geothermal issue, through itinerant workshops targeted at local authorities and community leaders of the areas with geothermal potential. These efforts, which had as main focus the horizontal communication, involvement and dialogue approach, allowed us to share and promote knowledge, applicability, advantages and potential of geothermal energy as a clean, renewable and sustainable alternative energy.

In concrete figures, thanks to the itinerant workshops we were able to exchange information and establish dialogue between two state institutions (INGEMMET and MEM), three regional organizations (DREM), 27 communities and 102 community leaders. This has contributed to: inform authorities, technical and general public about the concept of geothermal energy, generate the demand of spaces for dialogue and information on part of communities that surrounds the geothermal area; improve the image and legitimacy of regional and state institutions (which still have a very distant image in hinterland communities), take the first step in order to the private companies can request and obtain the community authorization to explore the geothermal resources on their lands, and communicate to the geothermal as a different kind of energy, not only in technical terms but in terms of approach and work with the company. These communicative and dialogical efforts done by the state, private enterprise and society are still being developed with the aim of generating profits for the three parts and achieve a concerted and inclusive development.

1. INTRODUCTION

In recent years, Peru has shown a substantial improvement in its economic development, to maintain stable growth. This country continued along the lines of economic policy, ensuring a prudent and responsible management of macroeconomic accounts. However, the great challenge for Peru is to achieve sustainable development combining economic growth, energy security, welfare of people and taken care about the environment.

Currently, the country along with economic growth, the energy sector the sector has contributed in satisfying the electric demand in terms of consumption growth with different energy sources (Fig. 1) (http://www.minem.gob.pe/minem/archivos/Avance%20Estadistico_Subsector%20Electrico%20-%20Enero%202014.pdf).

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However, towards the future, it is necessary to optimize the use of energy sources of low carbon emission such us hydroelectric, non-conventional renewable sources (solar, wind, geothermal, etc.) Uranium reserves, natural gas and bio-energy on a long-term

perspective that allows sustain economic growth with energy efficiency at competitive prices. In this regard, the Ministry of Energy Mines and of Peru made the study of New Sustainable Energy Matrix for the period 2010-2040 and the Strategic Environmental Assessment to guide the rational use of energy resources and to serve as an instrument of sectoral planning and development of tools for the National Energy Plan.

This study has as goals, in first place, to achieve the objectives of the Energy Policy 2010 - 2040 (Fig. 1), formulated and approved by Supreme Decree No. 064-2010 - EM. This policy poses to diversified, competitive energy matrix, with emphasis on the use of renewable resources and energy efficiency. Also, it has the objectives of achieve sourcing for sustainable development, universal access to energy supply, efficiency in supply and demand for energy, self-sufficiency in energy production, minimal environmental impact, the development of the gas industry, as well as institutional strengthening and integration of energy markets in the region (Ministry of Energy and Mines, R. García Consultants SA Consortium, ARCAN CENERGIA Engineering and Construction, 2012).

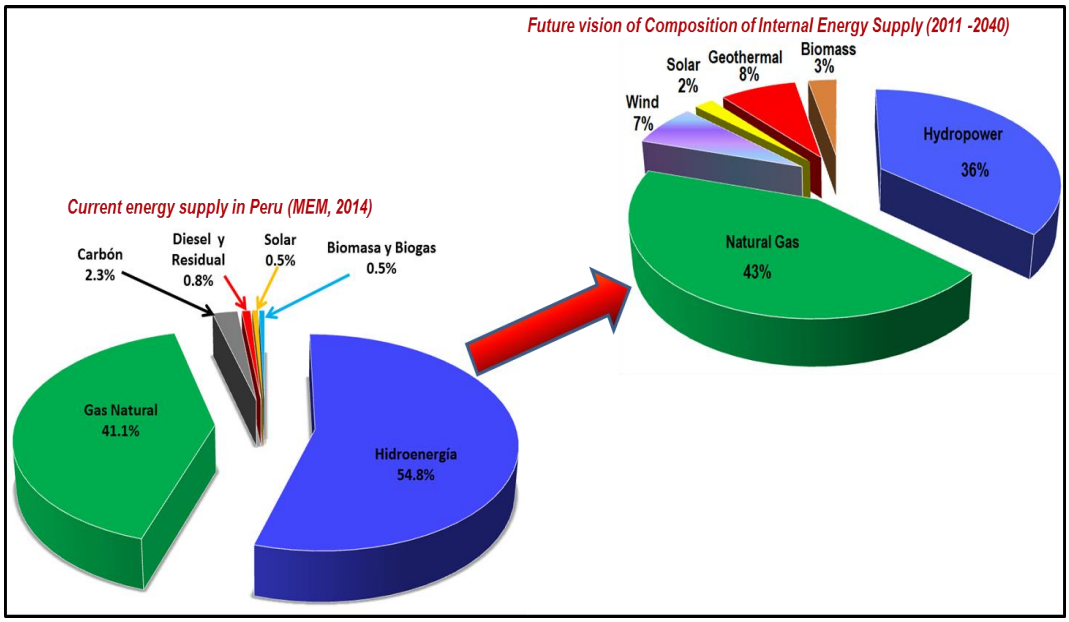

Figure 1: Production in the Electricity Market by Type of Energy Source with future vision (recently in May, 2014 the first wind park (32MWe) was inaugurated.

2. BACKGROUND

The evaluation of the Peruvian geothermal potential begun in 70´s, where government institutions undertook most of the studies, have carried out studies with some technical assistance of countries that have developed geothermal activities. An overview of the history of geothermal exploration in Peru can be summed up as follows:

- 1970: development began on the project "Assessment of Geothermal Potential of Peru" by the Geological Survey of Peru (INGEOMIN), currently INGEMMET, undertook studies to explore geologically and geochemically the geothermal manifestations, in order to assess the true geothermal potential of the country.

- 1975–1986: Geothermal recognition studies were conducted in southern Peru to identify the areas of interest, with the participation PERU MINIG, Geothermal Energy Research of Japan, INGEMMET, AQUATER, Geothermal Energy System Ltd, British Geological Survey, ELECTROPERU and CESEN of Italy.

- 1986: Geochemical investigations were carried out between the departments of Tacna and Moquegua with technical assistance from the International Atomic Energy Agency (IAEA) and the United Nations.

- 1994: The geovolcanic study and systematic inventory of geothermal manifestations of the Tutupaca were performed by INGEMMET and ELECTROPERU.

- 1995: An evaluation study was performed in hydrothermal areas in Pampas de Kallapuma and surrounding areas.

- 1996: "Analysis of geochemical data from geothermal areas in the South East of Peru" was conducted with the support of the Electrical Research Institute (IIE) of Mexico.

- 1997: CENERGÍA and IIE of Mexico and made the assessment of the information available studies by INGEMMET ELECTROPERU CENERGÍA, Special Project Tacna, IPEN and International Cooperation.

- 2007-2009: pre-feasibility studies developed with Japanese cooperation in Calientes and Borateras zones.

- 2009-2012: The Master Plan for Geothermal Energy Development was developed with international technical cooperation with the Japan International Cooperation Agency (JICA) support.

2.1 Regulatory Framework

There are several laws and decrees that apply to geothermal development in Peru:

• Law Nº 26848, Organic Law of Geothermal Resources;

• Supreme Decree Nº 019-2010-EM, which approves the Regulation of the Organic Law of Geothermal Resources;

• Decree-Law Nº 25844, Electric Concessions Law;

• Supreme Decree Nº 009-93-EM, Regulation of the Electric Concessions Law;

• Legislative Decree Nº 1002, Promotion for the investment in the generation of electricity through the use of renewable energy; and

• Supreme Decree Nº 012-2011-EM, Regulation of Generation of Electricity through Renewable Energy.

Supreme Decree N° 015-2013-EM, modifies the Regulation of the Law N°26848, Law of Geothermal Resources.

In the aforementioned regulations, the role is established for the State and the private sector to execute any electrical activity in general and particularly renewable energy within which geothermal energy is considered.

To develop geothermal energy, the MEM established the authorization licenses for the exploration of geothermal resources and the granting of concessions for the exploitation of these resources. The exploration consists in a period of three years. In the first phase (which consists in two years), superficial studies must be done and in the second phase (which consists in one year), at least three wells with a depth of 1000 meters must be drilled. Additionally, an environmental study should be approved and a sub-surface fee must be paid in order to start all the phases (Claros, 2014). If, because a major force case, the company not available of complete its schedule in the three year, and extension of two years may be requested.

Currently, MEM has awarded 32 geothermal authorizations for exploration to seven different companies (Table 1).

Nº	Companies	Geothermal Zones	Location	Directorial Resolution	Finished study
1	ANDES POWER PERÚ S.A.C.	TUTUPACA	Tacna	010-2011-EM/DGE (2011.03.18)	2015.07.12
2	ECO ENERGY S.A.C.	GERONTA II	Ayacucho	027-2011-EM/DGE (2011.05.19)	(*)
3	ECO ENERGY S.A.C.	UMACUSIRI I	Ayacucho	028-2011-EM/DGE (2011.05.19)	(*)
4	ECO ENERGY S.A.C.	UMACUSIRI II	Ayacucho	029-2011-EM/DGE (2011.05.19)	(*)
5	ECO ENERGY S.A.C.	GERONTA I	Ayacucho	030-2011-EM/DGE (2011.05.19)	(*)
6	ECO ENERGY S.A.C.	PINAYA I	Puno	002-2011-EM/DGE (2011.02.04)	(*)
7	ECO ENERGY S.A.C.	PINAYA II	Puno	003-2011-EM/DGE (2011.02.04)	(*)
8	ECO ENERGY S.A.C.	PINAYA III	Puno	036-2011-EM/DGE (2011.05.19)	(*)
9	HOT ROCK PERÚ S.A.	RUPHA	Ancash	006-2011-EM/DGE (2011.02.12)	2015.03.01
10	GEOTÉRMICA QUELLAAPACHETA PERÚ	QUELLAAPACHETA	Moquegua	031-2011-EM/DGE (2011.04.06)	2015.03.01
11	HOT ROCK PERÚ S.A.	CHOCOPATA	Puno	012-2011-EM/DGE (2011.03.18)	2015.03.01
12	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	LORISCOTA	Moquegua Puno	022-2011-EM/DGE (2011.04.13)	2015.02.01
13	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	CRUCERO	Moquegua Puno	025-2011-EM/DGE (2011.04.13)	2015.02.01
14	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	PASTO	Tacna Moquegua	034-2011-EM/DGE (2011.07.15)	2015.12.28
15	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	SARA SARA	Ayacucho y Arequipa	055-2011-EM/DGE (2011.09.14)	(*)
16	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	PANEJO	Moquegua	060-2011-EM/DGE (2011.09.14)	2015.12.11
17	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	ATARANI	Tacna Moquegua	076-2011-EM/DGE (2011.09.22)	2015.12.24
18	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	SUCHE	Tacna	092-2011-EM/DGE (2011.11.30)	(*)
19	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	TUTUPACA NORTE	Tacna Moquegua	091-2011-EM/DGE (2011.11.30)	(*)
20	HOT ROCK PERÚ S.A.	TURU	Arequipa Cusco	099-2011-EM/DGE (2011.12.05)	2015.07.05
21	HOT ROCK PERÚ S.A.	ACHUMANI	Arequipa	217-2012-EM/DGE (2012.10.17)	2016.02.22
22	ECO ENERGY S.A.C.	PINAYA I V	Puno	239-2012-EM/DGE (2012.12.12)	(*)
23	ECO ENERGY S.A.C.	PINAYA V	Puno	240-2012-EM/DGE (2012.12.12)	(*)
24	ECO ENERGY S.A.C.	PINAYA VI	Puno	249-2012-EM/DGE (2012.12.18)	(*)
25	ENEL GREEN POWER PERÚ	CARMEN	Ayacucho	009-2013-EM/DGE (2013.02.07)	(*)
26	HOT ROCK PERÚ S.A.	HUISCO	Ayacucho	010-2013-EM/DGE (2013.02.15)	2016.08.20
27	ENEL GREEN POWER PERÚ	CHILATA	Moquegua	067-2013-EM/DGE (2013.04.19)	(*)
28	EMX GEOTHERMAL PERÚ	TAMBOCHACA	Pasco	074-2013-EM/DGE (2013.04.26)	(*)
29	EMX GEOTHERMAL PERÚ	PUMAHUIRI	Ayacucho	075-2013-EM/DGE (2013.04.26)	(*)
30	EMX GEOTHERMAL PERÚ	SENGATA	Ayacucho	076-2013-EM/DGE (2013.04.26)	(*)
31	EMX GEOTHERMAL PERÚ	COROPUNA	Arequipa	146-2013-EM/DGE (2013.05.26)	(*)
32	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	PINCHOLLO LIBRE	Arequipa	278-2013-EM/DGE (2013.07.07)	2016.06.19
1	Transfer by RD 061-2013-EM/DGE Pub. 12.04.2013				
(*)	Awaiting for approval of the environmental management instrument or certificate in case does not				

Table 1: Authorizations to companies for geothermal exploration in Perú (Claros, 2014).

2.2 Key stakeholders in the Development of Geothermal Energy

The institutions involved in the development of geothermal energy in Peru, is the set of public institutions of national government, regional departments of Energy and Mines, local private sector companies as well as local and municipal authorities (Table 2).

Institutions	Functions
Electricity General Directorate (DGE - MEM)	Grant the rights (authorizations or concessions) to carry out electrical activities. Some cases require prior approval by DGAAE.
Energy Efficiency General Directorate (DGEE - MEM):	Propose the energy efficiency policy. It includes the use of renewable and non-renewable energies.
General Directorate of Energy-Related Environmental Affairs (DGAAE - MEM)	Evaluate and approve the environmental studies of electric power projects.
Committee for the Economic Operation of the National Interconnected System (COES)	Coordinate the operation of the National Interconnected Electric System (Sistema Eléctrico Interconectado Nacional - SEIN). It is formed by all stakeholders of the SEIN: generators, transmission companies, distributors, and free users.
Supervisory Agency for Energy and Mining Investment (OSINERGMIN)	Establishe the benchmark electricity rates based on the rate policy set by the Electrical Concession Law (LCE). It also supervises and fiscalizes the performance of electric power activities.
Agency of Environmental Evaluation and Auditing - MINAM (MINAM-OEFA)	Supervise and fiscalize the effects of electricity related activities in THE environment. Furthermore, it applies the relevant sanctions.
National Service of Protected Natural Areas by the State (SERNANP - MINAM)	Responsible for directing and establishing the technical and administrative for the conservation of protected areas.
Social Management Office (OGGS)	Supply the necessary support to keep a harmonious relationship between companies and local population to achieve a sustainable development of electrical projects.
Geological Metallurgical Mining Institute (INGEMMET)	One of the strategic objectives institutional is to prepare and disseminate knowledge about geology, mineral resource and energetics associated to the subsurface. For this reason, INGEMMET carried out the evaluation of the Peruvian geothermal potential begun in 70´s.
Regional and Local Governments	As the DGE, it grants electricity rights according to its authority and encourages electricity projects in their regions.
Sector Privates Companies	According the Regulatory Framework, only private companies are included in the geothermal energy exploration and generation. In the electricity transmission and distribution, private and public companies are included.
Local Communities	Group of people or families living near each other, whose members have communal relations among themselves, experiences, values and / or shared interests can interact with each other and care about mutual and collective welfare. In addition, they are organized with their respective representatives (local authority, community president, etc.).

Table 2. Summary of institutions related to geothermal sector in Peru.

2.3 Situation of the geothermal sector in Peru

Peru is a privileged country to generate electricity with geothermal energy, because it is located in the Ring of Fire, favored for the subduction between the Nazca and South American plates, which has controlled throughout the time, the geological evolution of the Peruvian territory. In this context the tectonic and magmatic processes have allowed to develop geothermal environments with great potential , one of the most promising is the zone V (Eje Volcánico Sur) (Vargas & Cruz, 2010) (Fig. 2) where are located the most active volcanoes, as well as areas with important geothermal manifestations (hot springs, geysers and fumaroles).

Peru has been receiving economical and technical assistance to start the development of geothermal energy. It was in this year that the Japanese government supported the pre-feasibility studies in two of the most promising geothermal fields in the country, Calientes and Borateras, where 150 MWe were estimated to be found. In 2010, the Japanese government also elaborated "The Master Plan for Development of Geothermal Energy in Perú" where they studied 15 geothermal fields, of which include pre-feasibility survey in Ancocollo and Tutupaca geothermal zones. 3,000 MWe was estimated as geothermal potential of the country (Fig. 3).

However currently the geothermal energy is not part of the energy matrix in Peru, but according to the Law of Renewable Resources, is an important alternative for generating electric power and is complemented by the Geothermal Energy Law and Regulations. According the energetic politics of the country, this energy stills not a priority given that Peru has other alternatives for energy from renewable sources such as hydroelectric generation.

Besides, there is a Geological Metallurgical Mining Institute (INGEMMET) that has preliminary prospective studies, which guide the actors in the development of geothermal energy. As well as there is active private sector participation in the exploration of geothermal resources, something that requires a large and high risk initial investment. However currently, only the private sector is participating in the development of geothermal generation and to date, 32 licenses have been granted for the exploration of geothermal resources (Table 1) (Claros, 2014).

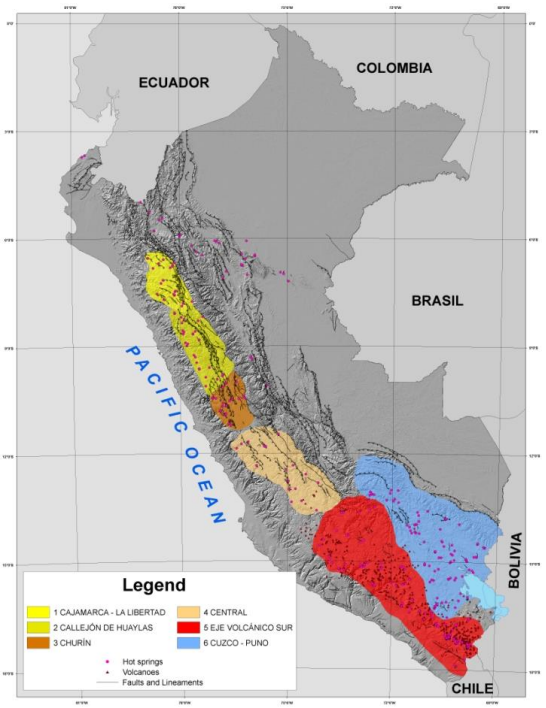

Figure 2: Peru Geothermal Manifestations Map (Vargas & Cruz, 2010).

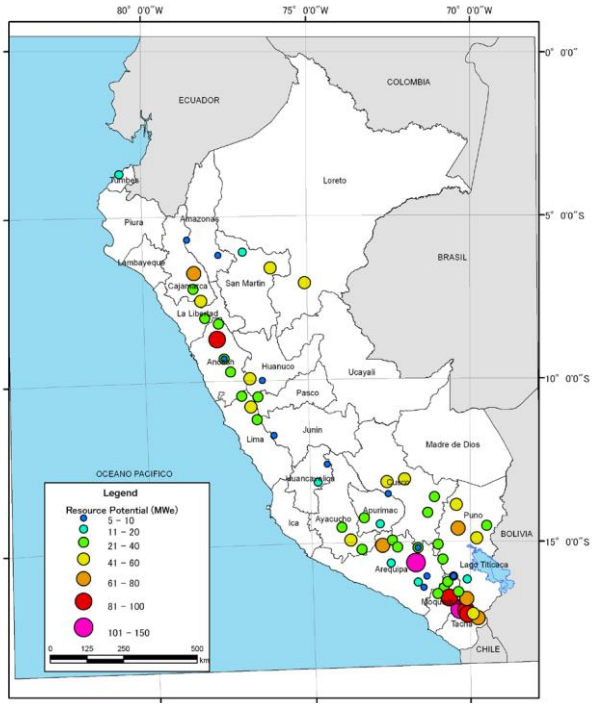

Figure 3: Peru Geothermal Potential Map (West Japan Engineering Consultants, 2012).

3. PRIVATE COMPANIES AND COMMUNITIES

In Peru, during 2013, about US$ 41 billion investment were stopped because of social conflicts (Peru 21, 2013). This phenomenon is a result of several situations. For example, the economic drastic differences between the citizens, the lack of opportunities of development for the local communities or of the lack of dialogue between the Government, the companies and the populations. For these reason, a good strategy of community relations is a key factor for the success of the projects. Nowadays, any project in Peru may be developed without the support of the communities, even if it has the support of the Government.

In addition, currently there are 136 social - environmental conflicts, of which 126, occur because the population is against activities of mining, oil or energy investment. Moquegua, Arequipa and Tacna (Fig. 4), the regions with major potential for geothermal energy in the country, deal with 15 social – environmental conflicts until now Defensoría del Pueblo, 2014

One of the most important factors in the relationship between the companies and communities is the ability of the stakeholders to communicate effectively each other. The companies and communities have their own and unique cultures, and the building of strong relationships between the groups, depends on that each of them understands that the other has a set of very different values. Without this shared understanding, it is difficult to develop durable and sustainable agreements and relationships that enable both cultures to coexist in harmony or to treat with efficiency the matters that arise when the companies and communities work together. Besides the challenge for the companies and the communities is to change the cultural practices into forms that answer to the important or essential needs from the point of view of the culture of a part, and to facilitate simultaneously, inside the possible thing, the aims of another part.

For this reason, in 2011 the Geological, Mining and Metallurgical Institute, INGEMMET in coordination with the Directorate General of Electricity of the MEM, the Regional Offices of Energy and Mines of Tacna, Moquegua and Puno, private sector companies and local authorities and community have organized and participated in Itinerant Workshops on Geothermal Energy. The same ones that were developed in order to inform and educate the public where there is geothermal resource on the benefits and potential of this type of alternative energy.

This first stage was an interaction of basic level with the regional authorities and local communities, that through workshops provided information about geothermal. Likewise, the information was facilitated across leaflets and posters. Use of this technique allowed spreading information about the features, modes of utilization and the benefits it can bring to our country the geothermal energy. The aim was to establish the basis of communication, as well as to recognize the realities and opportunities for geothermal development in Peru, since it is a renewable, indigenous energy inexpensive and friendly with the environmental.

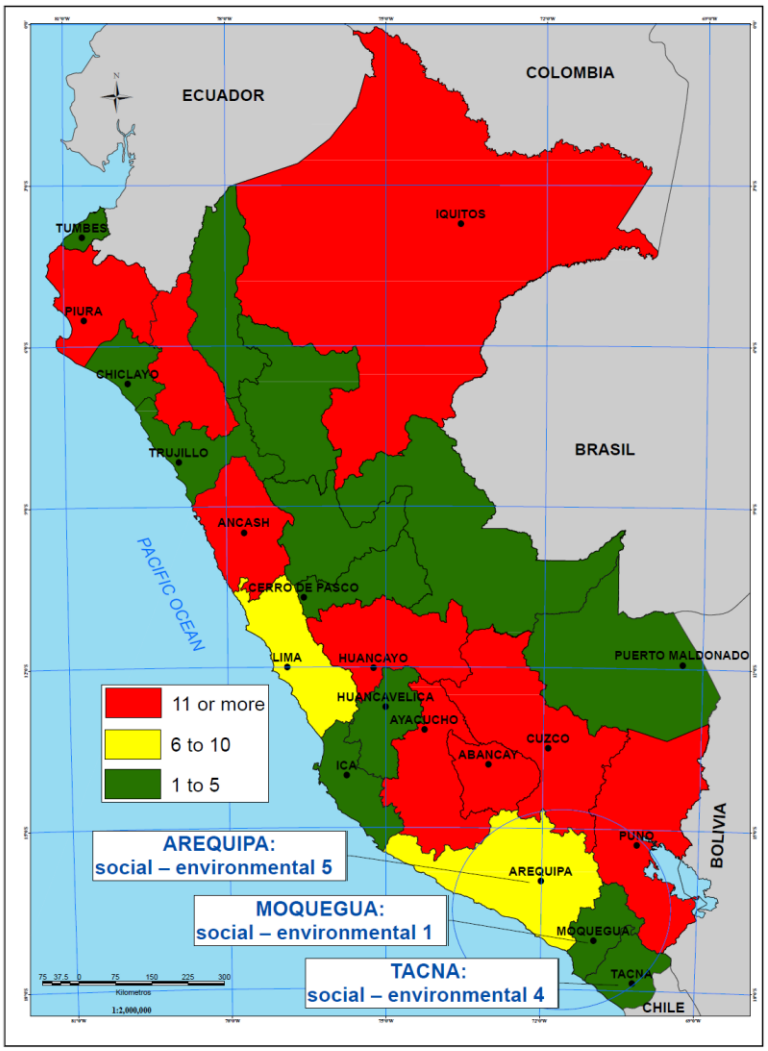

Figure 4. Map of social conflicts in Peru. The areas in the circle are Arequipa, Moquegua and Tacna (Defensoría del Pueblo, 2014).

4. ITINERANT WORKSHOPS: OPPORTUNITY TO DIALOGUE ABOUT GEOTHERMAL

Itinerant Workshops Communication were carried out following a methodology of coordinated work with all the actors involved (Fig. 5), those who received information and knowledge about geothermal, allowed to create a space for dialogue, where they expressed their doubts and concerns about this energetic option.

The working model was replicated in mobile workshops where they believe that empowering people is vital so that the best decisions are made for the benefit of communities. These workshops not only the specialist spoke, but participants (community, local authority, etc.) were invited to express their views and suggestions, being shown for the development of this activity were respected local idiosyncrasies.

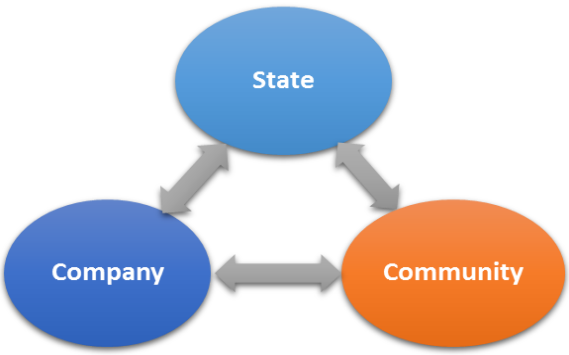

Figure 5. Communication scheme worked.

Between the main objectives of the Itinerant Workshops is: to promote, inform and educate local and regional communities about, explorations, potentialities, sustainability, cleaning and advantages of using geothermal energy. As well as to strengthen the relationship between the community and its authorities, with the purpose of forming persons capable of taking agreements,

commitments and decisions in the process of application of the Law of Previous Consultation, for the development of the communities.

Likewise other objective was to strengthen the institutions of state entities (such as INGEMMET and MEM), the municipalities and regions. The dialog with the community grants to the government organizations the opportunity to be visible before the communities, to develop coordinated actions, enhance your image and strengthen its social license.

	Tarata, Tacna	Carumas, Moquegua	Putina, Puno
Date	July 7	July 14	August 26
Attendees	27 representatives of communities	34 representatives of communities	41 representatives of communities
Communities	Candarave, Calientes, Susapaya, Yabroco, Palca y Cairani	Pasto Grande, Aruntaya, Ataspaya, Calacoa, Titire, Quebaya, Cuchumbaya, Soquesane, Sacuaya, Solajo y Salylapa	Jarpaña, Orduña, Coline, Pinaya, Santa Lucía, Paratía, Atecata, Llanca, Millo Cochapata, Lampa
Concerns and opinions of participants	• Who will perform exploration and studies where the budget is obtained. • The cost of the installation of geothermal plants and technology. • Where private enterprise carry out exploration and exploitation of geothermal resources, should benefit first to the development of their communities. • They will not allow contamination or deception.	• If the geothermal plants generate pollution or would affect aquifers, as well as surface waters that are used by the communities. • Geothermal energy will development communities and they will make their factories and small industries. • If the tourist areas will preserve, where are found the thermal sources that for the communities are of use balneological. • In the event that the private company does the exploration and exploitation of geothermal resources, it should benefit first to the development of their communities (which does not happen as the gas). • They will not allow contamination or deception, such as mining.	• Regarding the depth of the wells that are drilled for geothermal explorations. • Legal framework of geothermal energy (interest in knowing the process of authorization of exploration and award). • On how to learn the geothermal potential in the region Puno. • How ensure non-pollution of the waters or the ecosystem. • In addition, it should be noted that comparisons relating to mining, and many references were made since some communities have had bad experiences with mining companies in this area of the country.
Tips to maintain the initiative of geothermal energy to succeed	• Direct communication with the Community authorities. • Deepen the awareness. • The training must be in each area and workshops must be constant. • Availability of mobility to gather people in the Highlands. • The State should establish policies that allow you to prioritize the development of geothermal energy. • Involve other actors such as universities, schools, health centres, etc. • Promote a geothermal institute.	• Foreign investment. • Central, regional and local government support. • Count on the support of the locals • Workshops in affected areas / in the maternal language / in the communities themselves. • Further promotion. • Promote feasibility studies to see if the resource is sufficient.	• Conduct workshops to 100% of the population. • School workshops. • Consult the population for any activity. • That a single company to engage in the activity of production, transport and distribution of energy. • There is a canon. • Multilingual chats follow. • There are internships to other geothermal plants. • The Act and the regulations must be consulted residents where the resource exists. • In case of exploitation, the inhabitants of the area where the resource is presented must be shareholders of the companies. • Agreements on the table of dialogue.

Table 3. Summary of what happened and agreed at each workshop.

4.1 Methodology

Before the beginning of the workshops, meetings were realized with the workshops organizers for to define the methodology used in the workshops, the characteristics of the events, places, dates to be held and the agenda to be followed, considering the socio-cultural characteristics of each sector (language, cultural preferences, etc.) as the production material diffusion and education (Geothermal Education Office, 2004).

Likewise was realized a work of evaluation on the degree of knowledge of the authorities and the community with regard to geothermal energy, for which, were effected previous visits the zones and DREM offices, where was identified the need of the authorities and communities of have more information about geothermal energy and legislation.

It achieved to identify that the contacted persons had confused ideas related to the geothermal. Nevertheless, after doing the respective explanations, was consulted for the possibility of realizing some workshop or meeting, obtaining this way the positive reaction of the authorities and communities.

For these first workshops, which were pilots in the country, only invited community representatives, whom were gathered in a centric zone, close to the geothermal area of each region. With the results and suggestions made by them, was elaborated the methodology for workshops directly to communities, hence the name "Itinerant Workshops".

The workshops were divided into two phases: The first included a presentation by geothermal specialist, entitled “What is geothermal energy?” (This presentation was translated into Quechua and Aymara language). After the round of questions continued with the second phase, where teams that should develop the following questions were formed: 1) What is geothermal energy, 2) What are the advantages and disadvantages of geothermal energy?, 3) What actions must be realized for that initiative of the geothermal it successful in the country?, and 4) What suggestions would you make to improve the proposed organizers poster? (Table 3).

The workshops finished with the exhibitions of the groups, which were expressing his doubts, worries and suggestions in order to articulate better the policies of intervention in this new field of renewable energies.

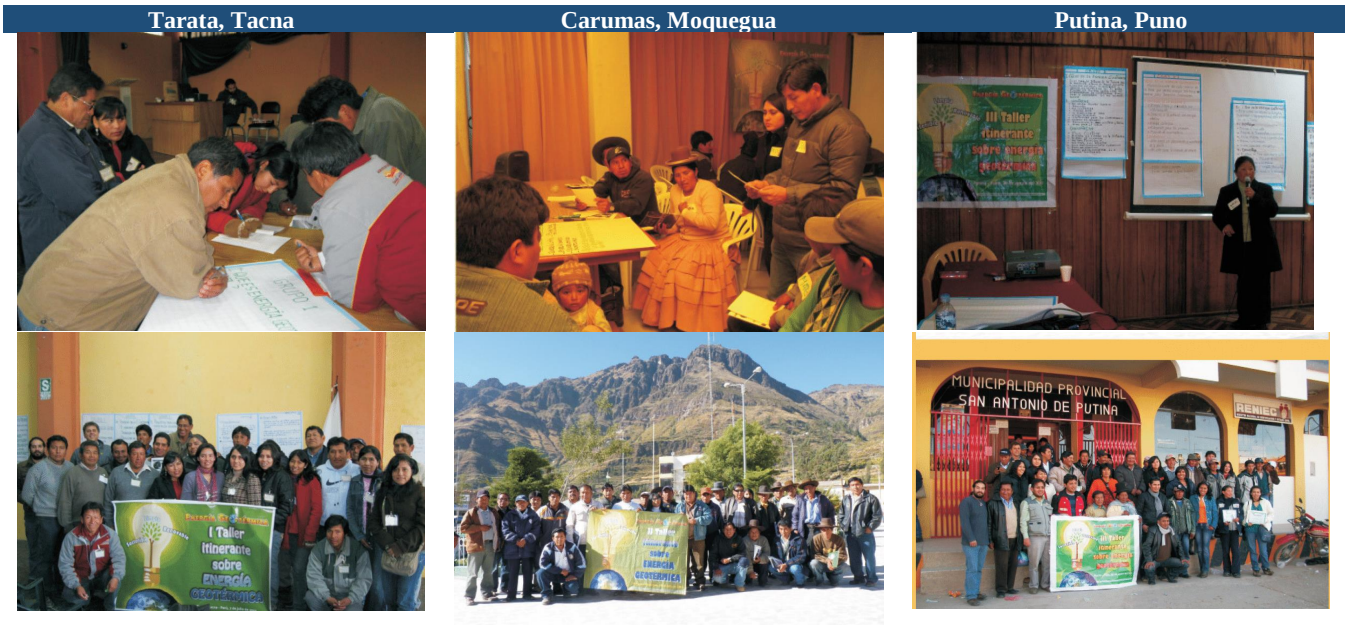

Figure 6. Pictures of the workshops.

4.2 Results

- Itinerant Workshops was developed, three in Tacna region specifically in the Tarata, Candarave provinces and Calientes Village, one in the Carumas province, region Moquegua, and finally in the Putina province San Antonio, Puno region.

- In the Itinerant Workshops of Geothermal have participated 120 representatives from 27 different communities of Tacna, Moquegua and Puno regions (Fig. 6), who us reported about geothermal, like potential resource, renewable, sustainable and friendly to the environment. This has created demand for information relating to geothermal topic for makes better decisions.

- It has been achieved to work of way coordinated and direct, to national, regional and local level, by means of the exchange of information between the MINEM, through the DGE, INGEMMET, DREM and community representatives. Likewise, has been produced and distributed communicative material elaborated with the contribution of every group participant in the workshops.

- Also has been patent the commitment of the State, the Government Regional, the scientific institution (INGEMMET) , private company and the community in the communication process , even before the reconnaissance and exploration of the geothermal resources.

5. CONCLUSION

The regional, local authorities and settlers has achieved have knowledge on the benefits that the geothermal energy offers and that its suitable use will allow to reach the sustainable development of the communities and of the country. What has created expectation between the communities, not only for the utilization in the production of electricity, but also in the direct use in systems of heating, greenhouse, etc., being of benefit to the economic activities of the zone.

As a consequence of the workshops, the participants have demonstrated to know, to understand and differentiate the geothermal of other activities that develop in the zone, such as the mining industry. Despite this success, we must recognize that many doubts exist on technical aspects and the legal framework.

In the population there is still distrust, for the bad experience that they have had from the part of companies, which have extracted their resources without informing them. What has created demand in order that these workshops develop in the communities where the geothermal resources are located, across different communicative instruments (printed and audio-visual material, etc.).

For to promote the geothermal activity in the country is necessary to continue with the Itinerant Workshops about Geothermal Energy, that will allow to facilitate reaching agreements and decisions between actors: State, Community and Private Companies. Likewise, is important to have the participation of multilateral institutions and international development agencies engaged in the development and advancement of this new activity in the country.

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