

Geothermal Capacity Building in Nicaragua

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ABSTRACT

The Icelandic International Development Agency, ICEIDA, is currently implementing a five year capacity building project for the geothermal sector in Nicaragua. Iceland GeoSurvey is the main consultant for the project. Nicaragua has a considerable geothermal potential of which only a small fraction has been utilized. Nicaragua is heavily dependent on imported fossil fuel for power production and further utilization of the countries indigenous energy sources is a priority of the government. The aim of ICEIDA's geothermal project is facilitate the utilization of the local geothermal resources by increasing technical capacity within the public sector. This is important because the government has a critical role in granting exploration and production permits and supervising and monitoring utilization and limited capacity of the involved government institutions will slow down the geothermal development in the country.

The capacity building project rests upon three main pillars; direct technical assistance, education and training, and infrastructure and equipment support. The technical assistance involves expert consultation on specific topics. Education and training involves long term training at the UNU-GTP in Iceland and a variety on shorter courses. The infrastructure and equipment support is mainly directed at equipping the Geothermal Unit at the Ministry of Energy and Mines of which the most significant part is the installation of a new chemical laboratory.

1. INTRODUCTION

Nicaragua depends on imported fossil fuels for generation of electricity. However, the electrical peak demand needs, currently at about 500 MW could be easily furnished by domestic renewable energy sources as the harnessable hydroelectric power could produce around 3,280 MW and geothermal energy in the geothermal areas could produce about 1,200 MW (Geothermex, 2001). More than 65% of the electricity produced in the country in 2005 was generated by burning diesel or crude oil; this increased to 73% in 2007 (MEM, 2007). In 2008, was approximately a 65 % but only 18% of electricity produced was created with hydroelectric power, 10% through geothermal power and 7% by the burning of biomass. As a result, the government of Nicaragua has made increasing the use of indigenous, renewable energy sources for electricity production a national priority (MEM, 2007).

In this context the Icelandic International Development Agency (ICEIDA) and the Government of Nicaragua initiated a five year geothermal capacity building project in Nicaragua in January 2008. The aim of the project is to

assist the administration in building up sufficient knowledge in order to manage the geothermal resources in the country. The project involves collaboration with two agencies: the Ministry of Energy and Mines (MEM) and the Ministry of the Environment and Natural Resources (MARENA). MEM is both responsible for granting exploration and exploitation permits as well as overseeing exploited geothermal areas. MARENA is responsible for environmental impact assessments and for reviewing assessment reports.

ICEIDA's geothermal projects rest on three main pillars, direct institutional support, education and training, and the formation of a geothermal research group within MEM.

2. TECHNICAL ASSISTANCE

The institutional support or direct technical assistance is the largest component of the geothermal capacity building project, which involves ICEIDA sending geothermal experts, both Icelandic and from other countries, depending on each case, to work on specific projects which fall under MEM or MARENA. These projects will be undertaken for the most part in Nicaragua, in cooperation with staff members of the institutions concerned. The aim is twofold: on the one hand to complete the projects already underway, thus expediting the development of the geothermal energy sector and on the other hand to share expertise and experience of Icelandic and international experts with the Nicaraguans. The staff of Iceland GeoSurvey plays a key role in the institutional support to MEM and the staff of the Environment Agency of Iceland and the Icelandic National Planning Agency in the support to MARENA. The Icelandic National Energy Authority is also involved in these projects and it is expected that experts from Icelandic universities will be approached in regard to particular parts of the work.

Projects to be carried out in this way are diverse and they are designed to help the Nicaraguan institutions fulfill their legal mandate with respect to the geothermal sector. A significant component of the institutional support involves working with MEM personnel on reviewing and assessing reports submitted to MEM by permit holders. These reports will include reports on surface exploration at Managua-Chiltepe and El Hoyo-Mote Galan, drilling and well testing reports from San Jacinto and mainly training Nicaraguan specialists in the evaluation of the different stages of geothermal projects, from the exploration phase, through power plant construction phase, and eventually the geothermal power plant operation. Other institutional support projects include identifying which factors need to be considered for an assessment of the environmental impact in regard to geothermal power plants, as well as environmental planning for the areas where exploitable geothermal energy is found. Finally, an appraisal of the regulations and criteria, which are in force in other

countries has been made and this will form the foundation for technical norms to be adopted in Nicaragua.

3. EDUCATION AND TRAINING

Education and training form an important part of ICEIDA's geothermal project. This is divided into four main components: extended study periods abroad, one- to two-week courses in Nicaragua, field training, and meetings or conferences in Nicaragua. The UN University Geothermal Training Programme (UNU-GTP) in Iceland will play a key role in the education of specialists. Three individuals have already attended the 6 weeks training at the UNU-GTP and three more have participated in a part of the program. Over the next three years, two students per year will attend courses at UNU-GTP and, subsequently, a further three to four attend a MS degree program at the University of Iceland, in cooperation with the UNU-GTP. Training at the UNU-GTP will be offered to the staff of MEM and MARENA, as well as university teachers who are interested in including geothermal energy in their courses.

Several specialized courses have been instigated for MEM and MARENA staff in Nicaragua and more are in preparation. These courses cover a wide variety of topics including chemical analyses, use of Arc View, borehole geology, reservoir engineering, geothermal aspects of environmental impact assessments, and Clean Development Mechanism. Some of these courses are given in Spanish, without the participation of Icelandic specialists.

The mandate of MEM includes conducting prefeasibility studies of the country's geothermal resources. This requires field studies in several areas and the MEM personnel will be joined by experienced Icelandic geothermal experts for field work and subsequent data processing and interpretation. This involves traditional geological mapping and geochemical sampling at high temperature areas as well as exploration of the less well known low temperature systems.

ICEIDA will organize meetings and smaller conferences on geothermal matters where experts from Nicaragua's neighboring countries will share their experiences. Important knowledge exists in Costa Rica, El Salvador and Mexico and it will therefore be productive to establish extensive relations between experts dealing with these matters in Nicaragua and their colleagues in neighboring countries. Natural and social conditions are in many ways similar in these countries and a common language in this area helps. Relations with experts from neighboring countries are therefore no less important than those with their Icelandic colleagues.

Staff from MEM and MARENA, as well as university teachers, have a priority access to courses and meetings, which will be held in connection with ICEIDA's geothermal project, but Nicaraguan employees of private

geothermal industry have been invited to take part whenever possible. Although the aim of the project is first and foremost to increase knowledge within government agencies, it is nevertheless very important to disseminate knowledge as widely as possible within the country's geothermal sector. No less important will be to provide individuals, who are employed by the state on the one hand and private bodies on the other, with as many opportunities to meet as possible.

4. EQUIPMENT SUPPORT

The increased emphasis on geothermal utilization by the Nicaraguan government is manifested in the invigoration of the MEM Geothermal Division. Currently the group consists of 8 specialists, including geologists, chemists and a civil engineer. ICEIDA supports the expansion of the geothermal division by providing financial support to pay for the necessary equipment.

The most significant equipment cost of the MEM Geothermal Division is related to a new chemical laboratory. This laboratory is fully equipped for traditional geothermal water and steam analyses. The laboratory will play a key role in prefeasibility studies of both high and low temperature geothermal systems in the country. The laboratory will also offer services to the operators of the geothermal power plants that are already active in the country.

Other equipment that ICEIDA has provided for the MEM Geothermal Division includes office furniture and equipment, binocular and petrographic microscopes, hardware and software for GIS data management, field equipment, and a pickup truck.

CONCLUSIONS

The primary objective of the geothermal capacity building project is to increase the capacity of the public sector in Nicaragua to handle the administrative aspects of geothermal utilization in the country and thereby facilitate the development of the country's geothermal resources. A secondary objective is to disseminate knowledge of geothermal energy within universities. A significant progress has been made on both fronts, manifested primarily by the expanded capacity of the geothermal unit at MEM. This has already made geothermal development in the country more feasible but the increased geothermal utilization, which is the goal of the government will depend on several other factors that are external to the project.

REFERENCES

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