

The ISO 14 001 Environmental Management System in the Miravalles Geothermal Field

Hartman Guido Sequeira

Instituto Costarricense de Electricidad, Centro de Servicio Recursos Geotérmicos, Campo Geotérmico Miravalles, Guayabo de Bagaces, Guanacaste, Costa Rica

hguido@ice.go.cr

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ABSTRACT

There is no doubt about the need of a country of executing projects intended to invigorate its economy and improve their inhabitants' standard of living. The conservation of the environment cannot be sought sacrificing the development and well-being of a nation, since the conservation alone doesn't contribute to reduce poverty. For this reason the concept of sustainable development looks for a balance between development and environmental conservation. The present document shows the importance of the environmental administration systems based on the ISO 14000 family of standards on environmental management, as a tool to achieve the development of geothermal projects under the concept of sustainable development. It is showed how the main aspects of this standard have been applied in Miravalles during the initial phases of its implementation, and which are the benefits expected in the search for strengthening the environmental sustainability of the field and for the future development of new fields in Costa Rica.

1. INTRODUCTION

The Miravalles Geothermal Field is located at the Miravalles Volcano in Bagaces Guanacaste, between the basins of the rivers Blanco and Cuipilapa. The power plants Miravalles I and Miravalles II are located at the coordinates 298 000 N-405 700 E at 610 m.a.s.l and the power plant Miravalles III at the coordinates 300 150 N-407 050 E at 720 m.a.s.l. This field is a high-temperature liquid-dominated reservoir with temperatures of about 240 °C. The proven reservoir area is about 12 km², it is encountered at 700 m depth and the estimated thickness is between 1000–1200 m.

The geothermal energy represents an important percentage of the total energy production in the country (15%). As it is known the geothermal energy do not produce a big pollution problem, but it is necessary to take actions to minimize the risk of pollution and control the environmental impacts.

One of this actions include the implementation of a management system that allow to identify the potential environmental problems and make the necessary management and correction of the problems. At the Miravalles Geothermal Fields this began with the implementation of the Environmental Management System (EMS) according with the ISO 14000 standard.

The most important components of the EMS according with the ISO 14000 standard are the following:

- a. The environmental policies: These are the declaration of its commitment with the environmental conservation and recovering.
- b. The identifying of the environmental aspects: Its is necessary to know were the impacts are produced which are significant and which of them can be controlled and which not.
- c. Significant environmental aspects: In order to establish if the environmental aspects are significant it is necessary to identify the associated impacts and value their effects over the system.
- d. The legal and other requirements: The impact over the environment depends on the regulations and limits established by law. Costa Rica has many regulations related with the protection of the natural resources, the human health and other. This limit the action of the project development and increase the impacts of the projects.
- e. The environmental management programs: These are the action plans. They summarize the objectives and targets, the actions to be prevented, controlling or reducing the impacts, establish the priority, responsibilities, the resources needed, and the limit date to reach the objectives.
- f. Training: It is necessary to train all the employees because the people need to know how they can impact and how they can prevent o minimize the impacts.
- g. The emergency preparedness and response: The organization needs to be prepared to face non controlled situations that can impact the environment.
- h. The nonconformance, corrective and preventive action: After the planning is running, action's checking is necessary in order to correct and improve the plans and actions.
- i. The management review: The success of the EMS depends on the commitments of the organization's managers.
- j. The EMS documentation: The ISO 14000 standard demands the existence of procedures to identify the environment aspects, access the legal and other requirements, training, to communicate the EMS, document control, emergency preparedness and response, nonconformance and corrective and preventive action, EMS auditing and management review.
- k. The EMS auditing: In order to verify the implementation of the system and identify and solve deficiencies.

The preview steps allow to implement an effective EMS, but why should the organization have to implement an EMS? The main idea of the EMS is first of all to prevent all kind of contamination. If it is not possible it will try to reduce the contamination and if any of these solutions are possible, then it will focus on to mitigate the contamination. But there are another aspects associated with the implementation of the EMS. The organization can reduce the costs if it teaches the people about the importance of reduce the unnecessary use of material, electricity, water, paper, etc. It will represent a high efficiency and less production costs. The actual laws in Costa Rica and in most of the other countries penalize the environmental pollution, in most of the cases it means high quantities of money to pay and use of time and resources in reverting the damage. All this can be prevented if the organization implements an adequate EMS. Finally, it has to be taken into account that the communities have a lot of power. If they are against the project it will mean a lot of problems, that can be prevented and solved by a correct EMS.

2. THE MIRAVALLES EMS

The ISO 14001 EMS implementation at the Miravalles Field began in 2002, due to the new ICE environmental policies. Before 2002 Miravalles has an environmental monitoring system, but it was mainly focused in the monitoring of different environmental parameters established at the Environmental Impact Assessment, and does not include the management system of the ISO 14001.

In March 2002, the ICE directive council establishes the environmental policy for the organization and ten principles to define it. The ICE policy is as follows: *The Instituto Costarricense de Electricidad plans and develops its activities with the principle of sustainable development; the management is done according with the attitude of conservation, protection, recovering and adequate use of the environment.*

In order to implement the policy and principles the directive council selected five projects to implement the EMS, one of them in Miravalles.

2.1 The Implementation Planning.

The implementation was planned into different steps as follows:

- a. Initial EMS planning: In this step the revision of the resources was done. As a result the formation of an environmental collaborator group was formed. The members of this group have to coordinate the people on their working areas to help in the identification of environmental aspects, the impacts evaluation and the implementation of the actions contents in the environmental plan. Also, they have to conform a supporting environmental group with workers that know as well as possible the different process. It is very important that the people know the EMS.
- b. Initial system's evaluation: This step consists in the evaluations of the actual system in order to determine the necessary changes to comply with the ISO 14001 demands. Based on this information the initial EMS planning was established. The most important changes were related with the documentations of the system, because most of the actions were done but not in a documented way.

- c. Identifying environmental aspects: This step is maybe the most important because it allows to identify the origin of the environmental problems and is after that when the organization can plan the action to control the impacts. In Miravalles the supporting environmental group together with the environmental manager identify these aspects. It is done by checking the different process step by step, identifying the specific potential point of impact. Once the aspects were identified the group evaluated their impacts by using a value scale that contains the different ranges, considering the frequency of the action, the temporality of the potential impact, the extension, the effects over the people, over the natural flora and fauna and over the public relation with communities and environmental or social organizations. The Appendix 1 shows the matrix of the different environmental parameters evaluated.
- d. Identifying legal and other requirements: This is not an easy work, because there are a lot of laws and regulations related with the environment. In Miravalles most of the legal requirements are identified and actually the procedure is under revision.
- e. Establishing objectives and targets: When the significant impacts are identified it is necessary to establish objectives and targets. In Miravalles more than ten objectives were established, all of them related with negative and also positive impacts.
- f. Environmental Management Program: There is a management program focused in to get the proposed objectives. Now the different departments in Miravalles are working in specific actions to find out ways to control their impacts.
- g. Procedures: At this time most of the procedures are already documented or in the revision stage. There is an advantage because the existence of a quality system under the standard ISO 9000 that allows the use of this platform to help the EMS procedures and documentation.
- h. Environmental education: The relationship with the communities and other actors related with the environmental issues is maybe the most important thing in the environmental management. It is very important to ensure that the communities clearly know what exactly is the project, what are the negative and positive impacts over the natural, economical and social aspects, what the organization is doing to control these impacts, what are the social and economical benefits of the project and also the importance of the natural resources protection.

In the year 2005 will begin the external revision of the EMS, to obtain the ISO 14000 certificate in the year 2006.



Figure 1: Environmental education

2. CONCLUSIONS

The implantation of the EMS is not an easy step to do, because the diversity of the different activities and their relationships involved in the geothermal development mean a very complex work.

One of the most difficult step is to convince the people about the importance of the EMS implementation.

In Miravalles most of the resources for the implementation of the EMS were available. This allows to prepare the EMS faster.

The EMS implementation is a very important step in the way of the sustainable development, even if the organization decide not to apply for the ISO certification.

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MATRIX OF IDENTIFYING ENVIRONMENTAL ASPECTS AND EVALUATION																							
PROCESS - Activities / Environmental aspect	Frequency	Potential Impact																					
		Natural													Social								
		Flora y Fauna			Atmosphere			Water			Land				community								
		1. Deforestation	2. Habitat alteration	3. Effects over the landscape	4. Effects over the air quality	5. Noise pollution	6. Climate effects	7. Effect over the pH of the rain	8. Effect over the surface water quality	9. Effects over the underground water quality	10. Soil pollution	11. Land Use	12. Erosion	13. Land stability	14. Effect over the human health	15. Effect over the public relationship	16. Solid waste generation						
		<input type="checkbox"/> The activitie cause impact over the environment <input checked="" type="checkbox"/> The activitie produce waste																					
		<div style="display: flex; align-items: center;"> <table border="1" style="margin-right: 10px;"> <tr><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td></tr> </table> <div> <p>1: Intensity = Average of (Temporality + Extension)</p> <p>2: Severity = (10) Very high, (8) high, (6) half, (4) Low, (2) Very low, (1) Null</p> <p>3: There is legal requirements(y = Yes, n = No)</p> <p>4: Impact Value</p> </div> </div>																		1	2	3	4
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