Presented at "SDG Short Course I on Sustainability and Environmental Management of Geothermal Resource Utilization and the Role of Geothermal in Combating Climate Change", organized by UNU-GTP and LaGeo, in Santa Tecla, El Salvador, September 4-10, 2016.

CDM APPLIED TO A GEOTHERMAL PROJECT IN EL SALVADOR AND VISIONS FOR THE FUTURE

Rubén Antonio Loy
LaGeo S.A. de C.V.
15 Av. Sur, Colonia Utila, Santa Tecla, La Libertad
EL SALVADOR
rloy@lageo.com.sv

ABSTRACT

As part of the strategy to increase generation LaGeo has developed a series of projects of geothermal energy to generate clean, green and renewable energy, using the current installed capacity and development of new geothermal areas, with a view to reduce the share of the energy matrix generation based on petroleum products. Because our projects have reduced emissions of greenhouse gases effectively as a contribution to the mitigation of climate change, we process this opportunity to certify projects and market reducing emissions in the process of Clean Development Mechanism (CDM). In this paper we share our experience in the CDM, methodology, results and current progress and future according to recent Paris Agreement in the COP21/CMP11. Aware that the development of the project cycle waves in the CDM and other existing facilities is high cost, long term and very uncertain.

1. INTRODUCTION

The scientific recognition in the 80s of the relationship between emissions of greenhouse gases (GHGs) and risks of global climate change and global warming (Figure 1), prompted in 1992 at the Earth Summit in Rio de Janeiro, It signed the United Nations Framework Convention on Climate Change (UNFCC), in order to adopt measures to stabilize GHG concentrations in the atmosphere at a level that prevents any dangerous upheaval of the climate system. In 1997 the Kyoto Protocol was adopted at the third Conference of Parties (COP3).

The Kyoto Protocol entered into force on 16 February 2005, defined the Clean Development Mechanism (CDM) and opened a window of opportunity to point out that "the reductions obtained between 2000 and the beginning of the first compliance period (2008-2012) may be used to help achieve the commitments of that period". Providing countries make trade of portions of their assigned amounts, to meet their reduction commitments and targets, using financial instruments to transfer carbon offsets in the international market.

Countries and/or companies that run projects, certified and actually successful in reducing emissions of greenhouse gases (GHGs) have been able to sell them and thereby generate an additional source of income to contribute to the viability of the projects and the acceleration of implementation. These projects were subject to a verification process established by the Convention.

FIGURE 1: Some effects of climate change

On December 31, 2012 ended the first period of compliance with binding commitments, CER were marketed according to contracts of sale in effect, from that date to present the market has diversified into regional markets and/or volunteers. Reducing the attractiveness and incentive to certify projects, this should not obscure the main vision of obtain a certification from a competent authority as UNFCCC, that our projects contribute to sustainable development and reduce global warming.

For acceptance of projects under the emerging market potential in the CDM set criteria as a basis to consider issues including:

- Acceptability for both the host government and the investor government under their sustainable development criteria;
- Environmental additionality, which means that the proposed project should generate emission reductions that are additional to all that would occur in the absence of the project activity; and
- Financial additionality refers to the financial evaluation of alternatives based on opportunities for lower cost or higher return for the project.

2. SEVEN KEY POINTS ABOUT THE PARIS AGREEMENT

The Paris Agreement is expected to come into force from 2020 (and will replace the Kyoto Protocol). The agreement was approved in the COP21 / CMP11 held in Paris between November 30 and December 11, 2015, signed by 174 countries and the European Union at the United Nations, New York on April 22, 2016 (Figure 2). I would like to highlight seven key points that you may not know about, and that could help for better understanding of the agreement.

FIGURE 2: COP21 Plenary where the Paris Agreement was adopted

2.1 The 2°C goal

The agreement sets an ambitious goal of holding global warming to "well below 2°C" and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels. To achieve this long-term target, countries are to peak their greenhouse gas (GHG) emissions "as soon as possible" and then undertake reductions thereafter to achieve a balance between emissions and removals by sinks of GHG in the second half of this century. In other words, the agreement establishes that from 2050 onwards countries are to have net-zero emissions as soon possible and for that they will rely on carbon sinks (like forests) to offset any emissions they produce.

2.2 NDCs

The Paris Agreement establishes a 'bottom up' approach as opposed to a 'top down' one, where standards and targets are set internationally for states to implement. NDCs are high-level policy plans or pledges showing how countries will reduce emissions and contribute to the 2°C goal. NDCs are to be revised every five years (the first one is expected in 2025) in order to see how their level of ambition could be enhanced.

2.3 Mitigation and carbon markets

The deal allows the use of markets to allow countries collaborate with each other through "internationally transferred mitigation outcomes" (ITMOs) to fulfill their NDCs commitments (provided there is no double counting of emissions reductions). The way ITMOS will operate in practice will be clarified in the future by the Parties of the Agreement (a body to be known as the CMA).

2.4 Adaptation and loss and damage

Under the agreement, countries are to implement national adaptation planning processes and activities which includes assessing their vulnerability and building resilience. Small island states, which are particularly vulnerable to climate change, pushed for including the responsibility of developed countries for loss and damage suffered from climate change consequences. The agreement included a reference on this issue but did not create any legal liability or rights to compensation.

2.5 REDD+

While avoided deforestation has been controversial and generally been excluded in the UN climate change policy arena, the Paris Agreement included an explicit provision on REDD+, which represents a breakthrough on how forests were addressed in the past. Parties to the agreement are encouraged to implement and support activities related to REDD+ and "alternative policy approaches (…) for the integral and sustainable management of forests".

2.6 Climate finance

Developed countries shall provide financial resources to assist developing countries for mitigation and adaptation activities. Other ´wealthier developing countries´ are called to provide resources but on a voluntary basis. The Paris Decision sets a floor of USD 100 billion per annum to be mobilized each year after 2025. Nevertheless, the agreement does not include any binding new or specific figures.

Banks have provided US $ 81.000 million in 2015 to Climate Change, direct funding 25,000 million and 56,000 million in combined funds, according to information from the Inter-American Development Bank (IDB). To mitigate most of the funding was to renewable energy, low carbon transport and energy efficiency activities. These efforts help countries meet their commitments under the Paris Agreement, moving to a low-carbon and more sustainable future.

2.7 TT and capacity building

The deal calls for technology transfer, capacity building and mutual cooperation to improve climate change resilience and reduce GHG emissions.

3. MEASURES, POLICIES AND INSTRUMENTS TO STABILIZE CLIMATE CHANGE

3.1 Mitigation of climate change

Mitigation measures consist of those actions to reduce emissions and to increase the absorption of greenhouse gases. Examples: Energy efficiency, use of renewable resources for electricity production, efficient use of firewood, improvements in public transport, reforestation, etc.

3.2 Climate change adaptation

Climate change adaptations are the measures and actions undertaken to reduce and / or avoid adverse impacts of climate change on the population, infrastructure and habitats.

Adaptation involves learning to: Addressing the current risks, increased variability and emerging trends, manage risk and uncertainty, and develop resilience.

3.3 REDD+

REDD+ projects are in mitigation measures. Its goal is to reduce greenhouse gas emissions due to deforestation.

REDD+ projects involve the implementation of measures to reduce deforestation in the project area, such as education, increased local governance, efficient use of firewood. It also includes sustainable forest management.

3.4 Carbon markets

Carbon markets are an instrument of international policy for mitigating climate change effectively economically. They emerged from the ratification of the Kyoto Protocol and continue to expand, subject to the forces of demand and supply and to economic and political factors. Carbon markets comprise the compliance schemes (including the European System Transactions) and voluntary markets.

Voluntary markets arise on the initiative of companies and organizations that seek responsibly neutralize their greenhouse gas emissions.

3.5 NAMA

Mitigation actions appropriate to each country (NAMAs, for its acronym in English) were formalized as a mitigation option for developing countries in the context of the negotiations on cooperative long-term action under the Convention, under the Bali Action plan adopted at the 13th session of the COP held in Bali, Indonesia in 2007.

NAMAs's running a government entity of a developing country and its implementation to channel resources from a country of Annex I to finance its implementation. We do not generate carbon certificates.

NAMAs may include projects, programs, policies, financial incentives, etc. And they can have several components.

4. LAGEO'S CDM PROJECT

LaGeo has 204 MW installed in Berlin and Ahuachapán geothermal fields. Thus, LaGeo has contributed with 25% of energy demanded by the national electrical market.

All LaGeo projects will effectively reduce greenhouse gases emissions. So, LaGeo will have the opportunity to increase profitability by marketing CO_2 reductions according to the CDM´s procedures. LaGeo has two projects registered in the Executive Board of the Clean Development, the Berlin Geothermal Project Phase Two, registered on March 25th 2006 under the reference number 0297, reducing 176,543 ton CO_2 equivalent per annum and the Berlin Binary Cycle power plant, registered on November 30th 2007 under the reference number 1218, reducing 44,141 ton CO_2 equivalent per annum.

The Berlin Geothermal Project Phase Two is an extension of the Berlin geothermal power plant through the drilling of additional geothermal wells. The Project exploits the resource of the Berlin geothermal field, characterized by a reservoir depth between -1,000 and -1,500 masl, temperature in the range of 280 to 300°C, 115 bar pressure, and good rock permeability.

The Berlin Binary Cycle is a renewable energy project that will increase the power generation capacity in 9.2 MW at the Berlin Geothermal field, by means of the conversion of thermal energy of low pressures geothermal brine into electrical energy. The technology of binary cycle is used for first time in El Salvador in this new plant.

Furthermore, LaGeo is processing CDM projects such as Berlin Binary Cycle II, Chinameca Project

San Vicente Project.

LaGeo is entirely identified with the objectives and the outlook of the convention on climatic change of the United Nations in adopting the perspective end commitment, which establish the concentrations of greenhouse gases (GHGs) in the atmosphere at a level that impedes all the dangerous perturbation of the world climatic system.

FIGURE 3: Fauna species reclaimed, protection and conservation in platforms, live in a shared natural environment with the geothermal structures

Also included is the social projection program, whose objective is to support the initiatives of local sustainability development in the nearby communities of the geothermal fields. This program of commitment to the communities tends to create an equilibrium and constructive environment to the municipalities of Berlin and Ahuchapan, in this case. The fundamental elements of this program, used to maximize the benefits for the community, is the generation of local temporary and/or permanent work opportunities, social inversion activities, development of small sustainable business and protection of local environment (Figure 3).

4.1 Registration and certification of projects in the CDM

The registration and certification process is shown in Figure 4.

FIGURE 4: CDM project cycle

4.2 Validation objectives

The purpose of validation is to ensure, through the analysis of a third party, that the proposed project activity under the CDM for registration meets all requirements of the CDM. Among the most important requirements are:

- Reduction of greenhouse gas emissions that can be quantified according to a baseline methodology approved;

- Additionality; and
- Contribution to sustainable development.

Registry is the formal, legal and formal acceptance of a validated project by the CDM Executive Board. This is a condition for verification, certification and issuance of CERs the project.

4.3 Verification objectives

The purpose of verification is to ensure, through the analysis of a third party, the amount of emission reductions reported by project participant occurred within the verification period, and were monitored and calculated according to the Monitoring Plan PDD and registered CDM requirements.

Certification is a written guarantee from the DOE that during a specific period of time (1 year), the CDM project reached verified emissions reductions. The DOE prepares the Certification Report based on the Verification Report. The Certification Report is submitted to the CDM Executive Board UNFCCC and is a formal request for issuance of CERs.

The issuance of CERs occurs automatically 15 days after the board has received the Certification Report, unless a review is requested.

4.4 Quality assurance of information by LaGeo

To obtain RECs, LaGeo has implemented a system to ensure and control the quality of the information of the parameters that are monitored for calculating emission reductions.

Emission reductions are calculated using the following equation:

$$ER = baseline\ emissions - emissions\ of\ the\ project\ activity \quad (1)$$

4.5 Quality systems in monitoring of electricity delivered to the grid

Compliance with regulations from the power grid operator Transactions Unit (UT): using measuring equipment that meet ANSI Standards 12:20 and periodic audit of the measurement system by a third party.

- Monitoring procedures for reading and recording data from energy meters; and
- Monitoring procedures for the review of the data recorded by LaGeo against UT readings.

4.6 Quality system in monitoring emissions from the project activity

The generation of electricity through geothermal resources involves the emission of CO_2 and CH_4 to the atmosphere, because a small percentage of geothermal steam does not condense. A geochemical laboratory in LaGeo measures the fraction of these gases in the geothermal steam.

4.7 Quality system in monitoring the amount of geothermal steam

Geothermal steam measurement is performed by measuring Annubar type, the accuracy of which is periodically reviewed by laboratory personnel from LaGeo measurements department.

5. REMARKS

Given a market for carbon certificates (Figure 5), which does not encourage processing projects in the CDM, even as renewable energy projects are being planned to develop, because both the CDM and other initiatives Gold Standards certification, own markets, voluntary markets, NAMAs, etc. The certification process is long term, high cost and uncertain but there are other incentives, even economical is not daunting, when the Paris Agreement from 2020 which comes into force, other more attractive prices are expected, so the CER can be saved in an account or sold in the voluntary market or made available on platform for voluntary cancellation of CER UNFCCC. We can also opt for soft loans to implement renewable energy projects by providing CER generated financial resources. What is more important, we must not lose sight of, is to certify the process and never abandon the vision and spirit of reducing energy matrix displacing thermal generation as a direct cause of global warming.

Contract	Close	Variation	%
EUA spot	4,60 €	-0,10 €	-2,13 %
EUA Dec16	4,61 €	-0,10 €	-2,12 %
EUA Dec17	4,64 €	-0,10 €	-2,11 %
CER spot	0,41 €	-0,01 €	-2,38 %
CER Dec16	0,40 €	-0,01 €	-2,44 %
CER Dec17	0,38 €	0,00 €	0,00 %
California Dec16	12,88 $	+0,04 $	+0,31 %
Hubei	14,61 ¥	0,00 ¥	0,00 %

FIGURE 5: CO_2 Market news (25 August 2016)

ACKNOWLEDGEMENTS

The author would like to thank Mauricio Grande, Alaide González and other, for their assistance and technical support in the preparation of this paper.