

PROJECT INFORMATION DOCUMENT (PID)

CONCEPT STAGE

Report No.: PIDC29269

Project Name	Geothermal Resource Risk Mitigation Project (P155197)
Region	LATIN AMERICA AND CARIBBEAN
Country	Nicaragua
Sector(s)	Other Renewable Energy (80%), General energy sector (20%)
Theme(s)	Infrastructure services for private sector development (50%), Climate change (50%)
Project ID	P155197
Borrower(s)	Republic of Nicaragua
Implementing Agency	Cerro Colorado Power (CCP)
Environmental Category	A -Full Assessment
Date PID Prepared/Updated	07-Jul-2015
Estimated Date of Board Approval	30-Jan-2018

I. Introduction and Context

Country Context

1. Nicaragua is geographically the largest country in Central America, and it is characterized by large lakes and a chain of active volcanoes. The country has a population of approximately six million people and a gross domestic product (GDP) of about US\$11,800 in 2015¹. Over the past decade, GDP growth has averaged about 3.9 percent, which has accelerated over the past four years to above five percent. With general political stability and an improving investment climate, Nicaragua could be poised for a period of robust economic growth, but its high cost of electricity could sap this momentum by dragging down productivity and undermining competitiveness.

2. The majority of Nicaragua's GDP is driven by the services sector that includes trade and tourism. Taken together with manufacturing, it makes up nearly 70 percent of GDP, and represents sectors such as trade, tourism, financial services, transport and communication. These are sectors where efficient, reliable, and cost-effective electricity supply is a critical input to growth and economic sustainability. An enterprise survey² identified electricity as the most significant obstacle for conducting business in Nicaragua, exceeding the rate at which it was identified as an issue across the rest of the Latin America and Caribbean region. Some key reasons are the high and volatile cost of electricity, and addressing such issues will be essential for Nicaragua to enhance its competitiveness and to sustain, and even boost, its economic

¹ Central Bank of Nicaragua website

² Business Enterprise Survey, World Bank Group

growth. It will be an important measure for alleviating poverty.

3. The high and volatile cost of electricity also affects the lives of all Nicaraguans, especially the poor. Nicaragua is the second poorest country in the Latin America and Caribbean region³. For those who have access, payments for electricity amounts to a considerable portion of their incomes. With over 42 percent of the population living below the poverty line⁴, the poor are estimated to spend about 45 percent of their household income on electricity⁵. While considerable progress has been made to provide greater access to those without electricity⁶, it will also be challenging to maintain this momentum, to connect even poorer households, if the cost of electricity remains high and the service unaffordable to many of the poor.

Sectoral and Institutional Context

4. Power demand in Nicaragua has grown at around five percent per year over the past decade due to steady economic growth and success in expanding access to electricity. Forecasts indicate that steady growth will continue. Much of this demand has been met through a significant and progressive expansion of fuel oil-based capacity⁷. Efforts to develop other power generation sources include the introduction of biomass from sugarcane bagasse; the extension of an existing brownfield geothermal operation at San Jacinto-Tizate; and, a steady increase in wind power during the past several years.

5. Nicaragua faces a number of challenges in the vital power sector including a significant need to rationalize pricing, continue expansion of access to around two million people that still remain without electricity, and take advantage of the Central American Electric Interconnection System (SIEPAC), to name some. However, underlying many of these challenges is the sub-optimal generation mix to reduce excessive reliance on fossil fuel-based capacity and increase penetration of cost effective renewable energy.

6. There are a number of consequences to the heavy dependence on fuel oil for power generation. Primary among them, Nicaragua has one of the highest electricity prices in Central America as well as across the Latin America and Caribbean region. The price has also proved to be highly volatile as it is strongly correlated with the international price of oil. This undermines the competitiveness of Nicaragua within the region as well as globally. Furthermore, electricity prices for many consumers are below the actual cost of supply. In such instances, it leads to financial losses for electricity distribution companies or places fiscal pressure on the government budget where there are subsidies⁸. When unrecoverable costs lead

³ Global Finance website (<https://www.gfmag.com/global-data/economic-data/the-poorest-countries-in-the-world>)

⁴ According to the V Encuesta de Medición de Nivel de Vida (V EMNV) de 2009, the value of monthly consumption of the poor or “poverty line” was C\$977.09 or US\$47.39 per month.

⁵ Centrales Hidroeléctricas de Nicaragua S.A. “Estudio del Mercado Energético de Nicaragua”. September, 2012.

⁶ The electricity access rate, which in 2006, was at 56% has reached 79% by end 2014. Data from Empresa Nacional de Transmisión Eléctrica (ENATREL) website

⁷ Fuel oil includes heavy fuel oil (bunker fuel), high speed diesel, and other similar petroleum products

⁸ A significant part of these “losses” are financed through a loan from the Cooperativa de Ahorro y Crédito Caja Rural Nacional (CARUNA). This creates a future liability, which the GoN expects will be repaid by consumers in the future through delaying possible tariff declines.

to losses, it also creates a disincentive for the distribution companies to further expand access to the grid; while high costs that are passed through creates considerable hardship to electricity consumers.

7. The Government of Nicaragua (GoN) has recognized the need to better diversify its power generation mix, and minimize the utilization of imported fuel oil. Therefore, it has decided to increase its utilization to as much as 91 percent in the overall generation mix⁹. While Nicaragua has significant potential in hydro, geothermal, wind, and biomass, overall little over 10 percent is presently being exploited to produce electricity. The recent endorsement by the Climate Investment Fund of Nicaragua's investment plan submitted to the Scale-Up Renewable Energy Program (SREP) is an acknowledgement of GoN's commitment and efforts to increase the utilization of renewable energy. SREP funds of \$30 million is allocated to complement the GoN's efforts in this regard, especially in sectors that have been challenged to scale-up.

8. Geothermal provides one of limited options for meeting base-load power requirements from renewable resources¹⁰. Once developed, it can provide reliable, non-intermittent power on a 24/7 basis, with plant capacity factors commonly exceeding 95%. It is an indigenous resource that also serves as a natural hedge against the volatility of commodity prices. Geothermal is also a clean energy that will reduce the local environmental impacts of fuel oil based generation and also contribute towards the reduction of global pollution that leads to climate change. Nicaragua has a long history of developing geothermal since the early 70's, and considerable expertise in the sector. However, the presently nominal installed capacity of 149 Megawatts (MW)¹¹ is only 10 percent of the total potential of more than 1,500 MW identified across twelve fields in the GoN's Geothermal Master Plan.

9. Despite the advantages of the technology and the significant potential, geothermal development in Nicaragua has faced a number of challenges. They include: a) difficulty mobilizing risk capital for geothermal exploration to confirm resources in the next generation green field developments, b) challenges attracting technically and financially qualified developers in light of the sector and country risks, c) constraints to achieving quick closure for large scale financing even after significant investments have been made to confirm geothermal resources, and d) ensuring that developments follow industry practices and meet international standards.

10. The GoN has requested the World Bank Group's assistance to address some of these barriers including facilitating the mobilization of risk capital and financing for urgent development of priority investments. To this end, the GoN has allocated an initial \$30 million in IDA resources and an additional \$15 million in SREP funds to catalyze and leverage private funds towards sector development.

⁹ MEM, 2013 – Plan Indicativo de Expansión de la Generación Eléctrica 2013-2027.

¹⁰ A large part of the hydropower in Nicaragua is run-off the river without storage, which does not allow dispatch control, while wind and solar are intermittent and cannot serve as base load power. The biomass potential for significant additional expansion is limited, and a scale-up during recent years have plateaued.

¹¹ 72 MW at San Jacinto - Tizate and 77 MW at Momotombo geothermal fields. However, actual available capacity is less (approximately 75-80 MW) due to declining reserves in Momotombo and lower than listed operations at San Jacinto-Tizate.

Relationship to CPS

11. The proposed Project and overall focus on developing geothermal to diversify the power generation mix is fully consistent with the World Bank's most recent Country Partnership Strategy (CPS) for Nicaragua (FY13-17) and falls under the second Priority Area of the recently completed Systematic Country Diagnostic (SCD), provision of infrastructure (transport, energy, and water) and public service delivery. Specifically, the aim of the proposed Project is to support the GoN's strategy for improving access to affordable and reliable basic services like energy and improving competitiveness and productivity, while also increasing private investments in renewable power generation is aligned with the policy actions recommended under the second Priority Area of the SCD, which prioritize strengthening and modernizing the energy sector and taking additional steps towards the diversification of the energy matrix. The proposed Project also leverages IDA resources with SREP and private funds, as envisioned in the CPS, and does so by also creating greater synergies with IFC. In addition, the proposed Project contributes to the global development objectives in the Sustainable Energy for All (SE4ALL) initiative led by the United Nations, which, among other things, aims to double the share of renewable energy in the global mix.

II. Proposed Development Objective(s)

Proposed Development Objective(s) (From PCN)

12. The development objective of the proposed Project is to help confirm resources and speed-up geothermal development in the field by mitigating risks and leveraging funds through a public-private partnership (PPP) arrangement. The proposed Project will initially lead to the construction of a small demonstration power plant that will confirm the operational capability of the geothermal field. By doing so, it will also open up the prospects for the progressive modular expansion of power generation capacity within the field, which is preliminarily estimated at 215 MW¹².

Key Results (From PCN)

13. The following are key results from the proposed Project:
- Confirmation of geothermal resources through exploration drilling
 - Leveraging of private funds through public support
 - Informed decision made regarding the feasibility of the field for expansion and further development
 - Expected geothermal power generation potential
 - Expected Greenhouse Gas (GHG) reduction potential

III. Preliminary Description

Concept Description

14. The GoN's primary initiative for scaling-up geothermal in Nicaragua include the development of the Casita-San Cristobal field. Casita was identified as the most promising

¹² Geothermal Master Plan, MEM, 2001

green field geothermal development prospect in Nicaragua. To date, the advances in project preparation/development has largely been due to the efforts and funding from Cerro Colorado Power (CCP) – a public private partnership between Polaris Energy Corporation and *Empresa Nicaragüense de Electricidad* (ENEL)¹³. CCP was awarded the exploration concession for the Casita-San Cristobal geothermal field.

15. The proposed Project is designed to confirm the resource base and develop the first operational power plant in the Casita-San Cristobal field. The resource confirmation and the establishment of the first modular expansion of 15-25 MW of capacity would mitigate the development risks and increase the prospects of additional investments to unlock the potential in the field. The proposed Project will be developed in two project phases covering the multiple stages (1-4) of the geothermal development cycle.

16. **PROJECT PHASE A: Exploration Drilling for Resource Confirmation [Estimated cost \$42.5 million (includes \$10 million already invested by CCP)]**

- **Stage I: Surface Studies and Reconnaissance** – This includes the first set of activities undertaken in a geothermal development. They consist of surface reconnaissance, geological, geophysical and geochemical studies, and in the case of Casita, the drilling of a slim/core hole that has confirmed the availability of a steam resource. CPP, utilizing its own funds, has already completed this activity, providing a sound basis for moving forward with stage II development.
- **Stage II: Exploration Drilling Program** – An exploration drilling program of 3-5 wells is being considered in order to ascertain the steam capacity (i.e. resource base) for producing electricity and to estimate the cost of extracting the resource. The exploration program will significantly improve the understanding of the geothermal resource and provide better estimates as to the cost of the project, whereby, risks would be considerably reduced.
- **Technical Assistance for Resource Confirmation** – Following the exploratory drilling, an industry standard (bankable) feasibility study and an Environmental and Social Impact Assessment (ESIA) that meets international standards and complies with World Bank Group requirements will be prepared. These important studies will evaluate and confirm the commercial viability of the project and its prospects for sustainability. It will form the basis for making an informed investment decision as to how to proceed with Project Phase B activities.

17. **PROJECT PHASE B: Steam Field and Power Plant Development [Illustrative cost ≈\$73.0 million]**

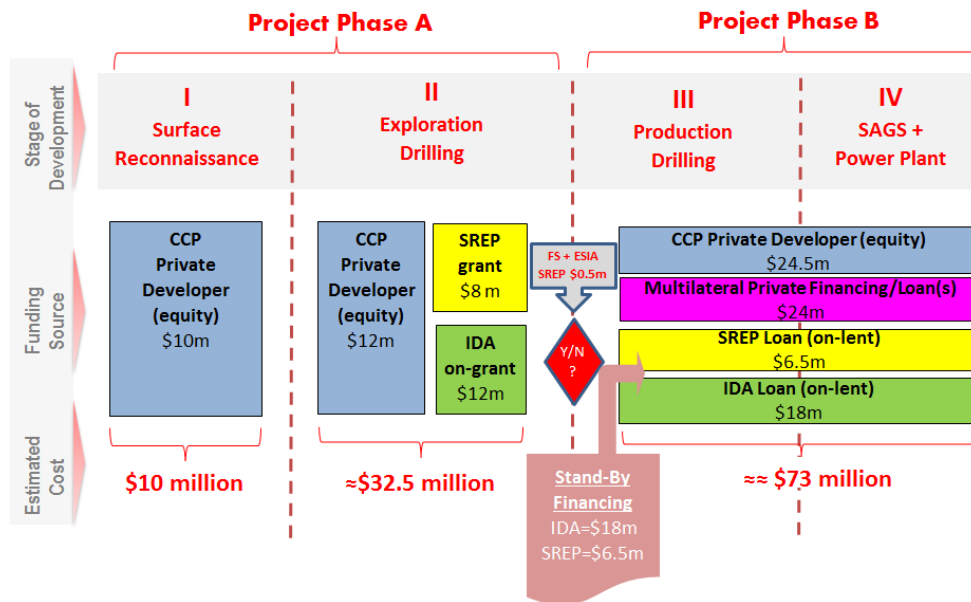
- **Stage III: Production Drilling and Steam Field Development** – On the basis of the resource estimate and the initially proposed expansion, the well field would be further developed with additional drilling of production and injection wells; and the Steam Above-Ground System (SAGS) that will transport the steam from the wells to the power plant will be constructed.
- **Stage IV: Construction of Power Plant** – Also based on the feasibility and ESIA studies, an initial small geothermal power plant expected to be in the range of 15MW-25MW will be constructed in line with industry standards. It will

¹³ The Geothermal Law in Nicaragua (Law No. 443 “Ley de Exploración y Explotación de Recursos Geotérmicos, con sus reformas incorporadas”, November 17, 2014) stipulates that at least 10% of geothermal concessions will be owned by the GoN represented by ENEL.

demonstrate the viability of sustainably generating power from the geothermal steam resource in the Casita-San Cristobal reservoir; and open up prospects for further modular expansion at the field in the future.

18. **Project Financing through PPP Arrangement:** Activities described in the proposed scope will be funded through additional equity from the private developer, SREP grants and credit up to \$15 million, IDA credit up to \$30 million, and potential private financing from other multilateral sources. The initially proposed funding arrangements, is depicted in the following figure:

Illustration of Proposed Project Funding Structure across Multiple Geothermal Development Stages



IV. Safeguard Policies that Might Apply

Performance Standards Triggered by the Project	Yes	No
PS 1: Assessment and Management of Environmental and Social Risks and Impacts	X	
PS 2: Labor and Working Conditions	X	
PS 3: Resource Efficiency and Pollution Prevention	X	
PS 4: Community Health, Safety, and Security	X	
PS 5: Land Acquisition and Involuntary Resettlement	X	
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	X	
PS 7: Indigenous Peoples		X
PS 8: Cultural Heritage	X	
Projects on International Waterways OP/BP 7.50		X
Projects in Disputed Areas OP/BP 7.60		X

V. Financing (in USD Million)

Total Project Cost:	115.50	Total Bank Financing:	30.00
Financing Gap:	48.5 (private funds for Project Phase B, tbc following Project Phase A)		
Financing Source			Amount
BORROWER/RECIPIENT			0.00
International Development Association (IDA)			30.00
Scaling-up Renewable Energy Program (SREP)			15.00
Multilateral Development/Private Financing			24.00
Private Developer (Cerro Colorado Power)			46.50
Total			115.50

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