

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

**MEXICO**

**GEOHERMAL FINANCING AND RISK TRANSFER PROGRAM  
(ME-L1148)**

**FOURTH INDIVIDUAL OPERATION UNDER THE CONDITIONAL  
CREDIT LINE FOR INVESTMENT PROJECTS (CCLIP) TO SUPPORT BUSINESS  
DEVELOPMENT IN MEXICO  
(ME-X1010)**

**AND**

**INVESTMENT GRANT FOR THE GEOHERMAL FINANCING AND RISK  
TRANSFER PROGRAM  
(ME-G1005)**

**LOAN PROPOSAL**

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## ABBREVIATIONS

AMDEE	<i>Asociación Mexicana de Energía Eólica</i>
CCLIP	Conditional Credit Line for Investment Projects
CFE	<i>Comisión Federal de Electricidad</i>
CO <sub>2</sub>	Carbon Dioxide
COPAR	<i>Costos y parámetros de referencia para la formulación de proyectos de inversión del sector público (Reference Costs and Parameters for the Formulation of Public Sector Investment Projects)</i>
CTF	Clean Technology Fund
DPSP	Dedicated Private Sector Programs
EA	Executing Agency
ENCC	<i>Estrategia Nacional de Cambio Climático 2013</i>
ENE	<i>Estrategia Nacional de Cambio Climático 2013-2027</i>
ESMAP	Energy Sector Management Assistance Program
ESMS	Environmental and Social Management System
FOTEASE	<i>Fondo de Transición Energética y el Aprovechamiento Sustentable de la Energía</i>
GHG	Greenhouse Gas
IDB	Inter-American Development Bank
IEA	International Energy Agency
IGA	International Geothermal Association
IIE	<i>Instituto de Investigaciones Eléctricas</i>
INECC	<i>Instituto Nacional de Ecología y Cambio Climático</i>
IPP	Independent Power Producer
kWh/MWh/GWh	Kilowatt-hour/Megawatt-hour/Gigawatt-hour
LGCC	<i>Ley General de Cambio Climático</i>
MDB	Multilateral Development Banks
Mt	Mega ton (millions of tons)
MtCO <sub>2</sub> e	Mega ton of Carbon Dioxide Equivalent
MW/GW	Megawatt/Gigawatt
MWe/GWe	Megawatt Equivalent/Gigawatt Equivalent
NAFIN	<i>Nacional Financiera S.N.C.</i>
OR	Operating Regulations
PCR	Project Completion Report
POD	Proposal for Operational Development
PPP	Public-Private Partnerships
PwC	Price Waterhouse Coopers
RE	Renewable Energy
SENER	<i>Secretaría de Energía</i>
TC	Technical Cooperation
tCO <sub>2</sub> e	Ton of Carbon Dioxide Equivalent
UNFCCC	United Nations Framework Convention on Climate Change

**PROJECT SUMMARY**  
**MEXICO**  
**GEOTHERMAL FINANCING AND RISK TRANSFER PROGRAM**  
**(ME-L1148; ME-G1005; ME-X1010)**

<b>Financial Terms and Conditions</b>					
<b>Borrower, Beneficiary and Executing Agency:</b> Nacional Financiera S.N.C (NAFIN)					
<b>Guarantor:</b> United Mexican States					
<b>Operation</b>	<b>Source</b>	<b>Amount (US\$ Million)</b>	<b>%</b>		
ME-L1148	OC (CCLIP ME-X1010)	54.3	45.2	<b>Flexible Financing Facility*</b>	
				Amortization / Grace period:	24 / 6.5 years
				Original WAL:	15,25 years
				Disbursement period:	6 years
				Interest rate:	LIBOR based
				Inspection and supervision fee / Credit fee:	**
	Currency:	U.S. dollars chargeable to the Ordinary Capital			
ME-L1148	CTF (LOAN)	31.5	26.2	<b>CTF Financing</b>	
				Amortization / Grace period:	20 / 10 years
				Disbursement period:	6 years
				Interest rate:	0.75%
				MDB upfront fee:	0.45%
	Currency:	U.S. dollars			
ME-G1005***	CTF GRANT	22.8	19.0	<b>CTF Investment Grant</b>	
				Currency:	U.S. dollars
Local		11.5****	9.6		
<b>Total</b>		<b>120.1</b>	<b>100</b>		
<b>Project at a Glance</b>					
<p><b>Project objective:</b> the objective of the program is to increase power production from geothermal sources so as to contribute to the diversification of the energy matrix and reduce dependency on fossil fuels and GHG emissions in Mexico. To this end, the program intends to scale up investments in geothermal power generation projects by making available a range of financial mechanisms tailored to meet the specific needs for each project's stage of development. This will include risk mitigation mechanisms as well as various forms of financing for exploration, drilling, field development and construction and operation phases of private geothermal projects.</p>					
<p><b>Special conditions prior to the first disbursement:</b> In addition to the conditions prescribed in General Norm Article 4.01, it is a special condition prior to the first disbursement of the program that the Executing Agency (EA) provides evidence, to the Bank's satisfaction, of the entry into effect of the program's Operating Regulations (OR) agreed with the IDB and the eligibility conditions for all operations of the program must have been met (¶2.10).</p>					
<b>Exceptions to Bank policies:</b> None					

- (\*) Under the Flexible Financing Facility (document FN-655-1), the borrower has the option of requesting changes to the amortization schedule, as well as currency and interest rate conversions. The Bank will take market conditions and operational and risk management considerations into account when reviewing such requests.
- (\*\*) The credit fee and inspection and supervision fee will be established periodically by the Board of Executive Directors as part of its review of the Bank's lending charges, in accordance with the applicable provisions of the Bank's policy on lending rate methodology for Ordinary Capital loans.
- (\*\*\*) This amount includes both the Contingent Recovery Grant (US\$20M) and the non reimbursable grant from the Investment Plan (US\$2.8M).
- (\*\*\*\*) Approximate US dollar value of 150 million Mexican pesos, using an average conversion rate of 13 Mexican pesos per US dollar.

## I. DESCRIPTION AND RESULTS MONITORING

### A. Background and justification

- 1.1 Governments in emerging economies need to solve the complex puzzle of securing a supply to cover increasing demands for energy while maximizing their system's cost efficiency and its sustainability, ever more important in the face of global climate change. Investments in power generation from clean sources play a large role in this process, contributing to diversifying the countries' energy matrixes and mitigating the negative environmental impacts of fossil fuel technologies.
- 1.2 According to its Fifth Communication to the United Nations Framework Convention on Climate Change (UNFCCC), Mexico is the 12th largest emitter globally –and the first in Latin America– of Greenhouse Gas (GHG) emissions derived from the combustion of fossil fuels. The country has voluntarily committed to reducing its GHG emissions up to 30% by 2020, with respect to the business as usual scenario (*Ley General de Cambio Climático*, LGCC).<sup>1</sup> Almost 60% of the potential for these reductions comes from the energy sector, mainly transport and power generation. The LGCC also sets the specific target of achieving 35% of power generation from non-fossil-fuel-based sources of energy by 2024.<sup>2</sup> But over 80% of Mexico's electricity production still comes from fossil fuels, imposing the need for a transformation of the country's power generation system in a sustainable and cost efficient way.
- 1.3 According to the *Instituto Nacional de Ecología y Cambio Climático* (INECC),<sup>3</sup> the potential for GHG emissions abatement through clean energy generation by 2020 is 86 MtCO<sub>2e</sub>, equivalent to 23% of the theoretical reduction potential identified. The study also shows that the marginal cost of abatement of some of these technologies (geothermal) is very low. But despite Mexico's great potential for the use of clean power sources, most of it still remains relatively untapped.
- 1.4 Geothermal energy<sup>4</sup> indeed offers one of the most effective renewable and low carbon alternatives for power generation. Furthermore, it is a power source that entails significant economic and social benefits, such as high quality employment creation and the potential to reduce the need to import gas.<sup>5</sup> A recent study comparing jobs created in energy sectors states that geothermal energy supports and generates a significant number of jobs when compared to other energy

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<sup>1</sup> [Ley General de Cambio Climático](#), 2012.

<sup>2</sup> Renewable sources –including large hydro– currently represent 20.5% of the total estimated capacity but only 14.9% of the total electricity generated. [Informe sobre la participación de las energías renovables en la generación de electricidad en México al 31 de diciembre de 2012](#) (SENER).

<sup>3</sup> [Bases para una estrategia de desarrollo bajo en emisiones de México](#) (INECC, 2012).

<sup>4</sup> Energy stored in rock and in trapped vapors or liquids, such as water or brines (available as heat contained in or discharged from the earth's crust) IEA.

<sup>5</sup> See [analysis of the sector in Mexico](#) (SENER/PwC, 2012).

technologies.<sup>6</sup> From an energy and environmental perspective, the expansion of geothermal in Mexico is fully justified:

- 1.5 First, geothermal provides stable and reliable base load power at a relatively low cost. As it does not depend on weather conditions, geothermal generation can deliver load factors hovering around 90%,<sup>7</sup> significantly higher than other renewables such as wind or solar, which range below 50%. In addition, it is a mature technology with production costs well within the average price of MWh in Mexico.<sup>8</sup> Beyond these facts, a steady output with almost no interruptions, lasting usually for several decades (planned economic lifetimes of geothermal plants are typically 20 to 30 years, though they usually operate for much longer), at competitive costs, indirectly opens up the possibility of increasing the share of the other, less reliable or efficient (such as wind or solar), clean sources in Mexico's energy matrix.<sup>9</sup>
- 1.6 Second, Mexico is located in one of the regions with highest geothermal potential in the world, estimated in reserves equivalent to almost 10 GW. From these, proven (additional capacity that can be installed in already developed fields) and probable (capacity for which development is likely to be commercially viable with current technologies) add up to a total of 2.3 GW (see Table I.1).

**Table 1.1- Geothermal potential in Mexico<sup>10</sup>**

Type of reserve	Potential (GW)
Proven	0.2
Probable	2.1
Possible	7.4
<b>Total</b>	<b>9.7</b>

Source: Adame (2010); C.A. Ordaz Méndez et al., (2011); and SENER/PwC (2012).

- 1.7 Finally, Mexico holds a comparative advantage as a pioneer in the use of these resources. With full knowledge of all stages of development of geothermal power projects, Mexico ranks fourth in geothermal electricity production in the world.<sup>11</sup> Nonetheless, this represents only 2.5% of the country's total power generation capacity<sup>12</sup> and is operated entirely by the state electric company, the *Comisión*

<sup>6</sup> See [Green Jobs through Geothermal Energy](#) (GEA, 2010).

<sup>7</sup> Average in Mexico is 84%. Gutiérrez-Negrin et al., 2010, [Current Status of Geothermics in Mexico](#).

<sup>8</sup> For medium sized plants (around 50 MW), levelized costs of generation are typically between US\$0.04 and US\$0.10 per kWh (ESMAP, 2013). In Mexico, the COPAR 2012 (CFE) reports levelized costs between US\$0.07 and US\$0.12 per kWh for its 25 MW plants. O&M costs are a small percentage of total costs because geothermal requires no fuel, which increases economic viability significantly.

<sup>9</sup> As the system increases its load base power with the use of geothermal, it expands its ability to use other technologies that are inherently intermittent in order to better respond to peaks in demand with cleaner energies.

<sup>10</sup> Adame, 2010, [Potencial Nacional de las Energías Eólica y Geotérmica](#); C.A. Ordaz Méndez et al., 2011, [Potencial geotérmico de la República Mexicana](#); SENER/PwC, 2012.

<sup>11</sup> Data from 2010 indicates 958 MWe of capacity installed and 7,047 GWh per year production in Mexico. IIE and IEA, 2012.

<sup>12</sup> IIE, 2013. Geothermal production ranges from 6,500 to 7,000 GWh annually, which represents almost 2.5% of the total electricity production, due to its high load factor.

*Federal de Electricidad* (CFE), with no participation of the private sector. The forces that forged this status quo follow.

## **B. Barriers to geothermal development<sup>13</sup>**

- 1.8 Investment in geothermal power generation is a high risk-high return venture with very specific characteristics. The level of risk involved is high because of:
  - a. The inability to determine ex-ante (without drilling) the geological resource that can be obtained. A combination of geological, geochemical and geophysical surface surveys may provide information about the possible reservoir (i.e. temperature, type of fluid, areal extent) but its presence and real characteristics can only be proven by drilling slim holes or commercial wells (through well-log and well-testing analysis).
  - b. High upfront capital costs (exploratory drilling phase) imply that value at risk is extremely high in the early stages. At least 35% to 40% of the total investment (around US\$4 million per MW) is needed without certainty on the availability or sufficiency of the resource. Furthermore, costs for each development vary significantly, as they depend on specific characteristics of the resource, location, drilling markets, size of the project, and type of plant (dry steam, flash, binary), imposing added uncertainty on ex ante cost estimations.
  - c. Long maturity periods. Geothermal projects can take at least 5 to 7 years from resource discovery to commercial development (return on investment).
- 1.9 These characteristics result in the inexistence of financing options for developers. Moreover, lack of knowledge and absence of a performance record negatively affects investors and financiers in more subtle and permanent ways. Financing is of course dependent on a “bankable” geothermal reservoir but financial institutions do not understand the economics of geothermal technologies and do not evaluate the feasibility of the projects, risk is perceived as unbearable even after discovery. Hence financing is unavailable and developments rely exclusively on scarce and expensive capital resources, slowing down or precluding investment in the sector until the construction and operation phase is imminent.
- 1.10 These are the reasons why geothermal power has been developed worldwide with public sector backing of one type or another.<sup>14</sup> The Geothermal Exploration Best Practices (IGA, 2013) report presents a number of alternatives. The option of a public sector company is among the most popular (Indonesia, Philippines, among the largest producers) and was extremely successful in Mexico for at least

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<sup>13</sup> PwC analysis, based on sixty interviews with the main stakeholders of the geothermal sector in México; Renewable Energy Essentials: Geothermal, IEA; ESMAP, 2013; Geothermal Energy Association; Latin American geothermal, Electric Power Intelligence Series, BNamericas, 2012.

<sup>14</sup> *Experiencia internacional en la mitigación del riesgo y desarrollo de la energía geotérmica*. GeothermEx for the World Bank, June 2010.



40 years. However, due to its legal obligation to produce electricity at the lowest possible price, CFE has lately underinvested in geothermal vis-a-vis fossil fuel plants with shorter lead times and higher returns. Showing only marginal growth over the last decade (only 1.2% from 2000 to 2010) and using roughly 10% of its estimated reserves, geothermal remains the renewable source with the largest untapped potential in Mexico. Hence, consensus on the need for financial support to develop geothermal power generation led the [analysis of the sector in Mexico](#) (SENER/PwC, 2012) to consider some actions<sup>15</sup> that can reduce the levelized cost of geothermal energy in over 20%. The International Energy Agency (IEA) also suggests the development of financial instruments to promote geothermal exploration (by governments, development banks and commercial banks) among their recommendations for market facilitation and transformation of the sector ([Technology Roadmap for Geothermal Heat and Power](#), 2011).

- 1.11 Besides the financial problem, the regulatory framework for the exploitation of geothermal resources in Mexico increases the perception of risk by investors and imposes an additional barrier to investment. In the last decade, Mexico has promoted Renewable Energy (RE) in power generation through tenders for projects of Independent Power Production (IPP) and favorable regulations for self-supply and cogeneration projects.<sup>16</sup> However, defined concession areas for geothermal –which would avert the risk of free-riders exploiting the same area- do not yet exist. The government has made progress in the promotion of technology development and has announced the creation of a center of excellence on geothermal. Moreover, the [Energy Reform](#) approved on December 2013 by the Congress, already addresses some other regulatory risks (energy tariff and rules on access to the transmission network) that are considered important inputs for investment decision making.<sup>17</sup> Finally and most importantly, a concessional regime will be passed by law during the first semester of 2014 according to the calendar envisaged in the approved Energy Reform, giving greater certainty to both investors and financiers.

### **C. Problem addressed and intervention proposed**

- 1.12 The diagnosis described above identifies two broad aspects affecting the pace of development of geothermal power production in Mexico: (i) lack of funding, both capital and financing, associated to the uncertainty and costs involved in the projects; and (ii) a need to improve regulation, specifically with regard to the exploitation and use of fields and underground water for geothermal purposes.

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<sup>15</sup> This study recognizes actions related to regulatory reinforcement (mainly, changes in the concession regime) and to the reduction of uncertainty and costs during the exploration phase (specifically, establishing funds to mitigate risk in geothermal activities).

<sup>16</sup> Private sector projects can be developed under four modalities: independent power producer (IPP, under a tender-based system), small producers (capacity under 30 MW), self-suppliers and cogenerators. IPPs and small producers sell all the electricity they generate to CFE.

<sup>17</sup> Other issues yet to be addressed include a proper access to knowledge generated by CFE and its wealth of data that could prove useful for future projects of private sector.

- 1.13 As part of its ongoing Technical Cooperation (TC)<sup>18</sup> activities in the field of geothermal, the IDB has worked to support Mexico in developing legal and regulatory instruments, through the provision of inputs for the preparation of draft legislation (including the provision of certainty in the use of concessions) to be ready for approval by Congress during the first semester of 2014 (see ¶1.11 and 1.20). However, even if these ongoing efforts were to overcome every legal issue,<sup>19</sup> the absence of financial mechanisms for geothermal projects will continue to deter investment. With that in mind, the proposed program seeks to address financial barriers so as to deliver an integrated solution for geothermal development.
- 1.14 **Intervention proposed.**<sup>20</sup> The risk levels involved in geothermal (broadly described in ¶1.8) vary in fact overtime since they are inherent to each phase of project development, hence they call for different financing instruments. Consistently and using a phased approach, the program will provide a range of financial products to private developers, customized for each phase of their projects, namely: (i) exploration and test drilling, where risk sharing or risk management instruments are called for; (ii) field development, production and re-injection drilling, where risk mitigation instruments (insurance) can be combined with lending to deal with the still relatively high risk levels; and (iii) the construction and operation phase (only once sufficiency and stability of the resource have been proven), which requires financing that may more directly be aimed at matching the return profile (ordinary, subordinate or concessional debt, but also contingent finance and guarantees).<sup>21</sup>
- 1.15 **Lessons learnt.** IDB's previous experience with NAFIN in the development of financing solutions for clean energy projects has proven viable and effective with a number of operations under the CCLIP ME-X1010 (ME-L1051, ME-L1081, and ME-L1119), all of which had objectives related to the support of private

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<sup>18</sup> Including ME-T1161 and ME-T1204, in addition to TCs that provide strengthening of NAFIN's capacities in the field of renewables, such as ME-T1089 and ME-T1168.

<sup>19</sup> Even if status quo remains, the country has a strong institutional framework for incentivizing the participation of the private sector in electricity generation (see ¶1.11). For other RE (e.g. wind) the self-supply market and the IPP tenders have led to a thriving industry.

<sup>20</sup> The Geothermal Handbook ([ESMAP, 2013](#)) provides a good recount on evidence of exemplary models of support for geothermal development. In Iceland, a government funded insurance scheme for geothermal drilling proved to be critical to the development of geothermal in the country (currently representing 25% of its total electricity production). France and Germany have also established risk insurance funds (providing one-off guarantees or combining it with project financing via credit); despite their lack of resources, they are currently the countries with the 5<sup>th</sup> and 6<sup>th</sup> largest geothermal capacity in Europe ([GEOELEC, 2013](#)). In the 80s, the US Federal government agreed to guarantee of the value of loans taken by private geothermal companies (up to 80%) for well/field development and plant construction, effectively increasing their ability to raise money via credit at lower costs. The government also promoted an insurance scheme, which did not take off commercially, presumably due to high cost of premiums ([GeothermEx, 2010](#)). This proposal takes on all these experiences in the design and operation of geothermal funds in Europe and the U.S., as well as some recently implemented programs in Central Asia and Africa, and uses their valuable lessons to better structure the financial mechanisms proposed.

<sup>21</sup> Initial surface exploration phases (geothermal resource studies, field surveys and detailed geothermal exploration surveys) are not included, as they can generally be financed by the developer.

sector investment in power generation plants using renewable sources.<sup>22</sup> The use of these resources has contributed to open RE markets, such as wind, enabling other actors (investment funds, private banks) to finance projects.<sup>23</sup> The fourth individual operation builds on that experience, this time setting the goal on developing another technology, i.e. geothermal. The experience gained by NAFIN with these previous operations contribute to the strengthening of the institution's capacity for structuring and implementing financial schemes and leveraging financing from an array of funding sources. Moreover, experience has shown the need to incorporate a sound environmental and social perspective in the management of sustainable energy projects by both developers and financiers, not only to meet the Bank's requirements but also to maximize the positive impacts and prevent conflict. With this, NAFIN is becoming a key agent in the promotion and support of low-carbon projects and the creation of more efficient local financial services.

- 1.16 **Magnitude of resources needed.** Investment costs for a high heat 30 MW plant with 2,000 meters deep wells in Mexico are estimated on US\$120 million (US\$4 million per MW) (PwC, 2012).<sup>24</sup> Based on this, and considering the 2.3 GWe of proven plus possible potential reserves (see ¶1.6), the total investment needed would reach US\$9,200 million over the medium to long term.<sup>25</sup>
- 1.17 **Alignment to the development goals and country strategy.** The program is aligned with the report on the [Ninth Capital Increase](#) (GCI-9) (AB-2764) lending program priority target of “lending to support climate change initiatives, renewable energy and environmental sustainability”. It will contribute to the regional goal of: (i) institutions for competitiveness and social welfare by increasing the percent of firms using Banks to finance investments; and (ii) protecting the environment, responding to climate change, promoting renewable energy and enhancing food security by reducing CO<sub>2</sub> emissions per \$1 GDP.
- 1.18 The program is consistent with the Country Strategy with Mexico (GN-2749), specifically with its objectives to: (i) “increase the level of finance to the real economy”, contributing directly to its expected outcome “increased bank

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<sup>22</sup> The first operation (ME-L1051) of US\$100 million approved in 2009 and the second operation (ME-L1081) of \$50 million approved in 2011 were fully disbursed. The third operation (ME-L1119), approved in 2012 for \$100 million had 64% of its funds disbursed as of March 2014; it also served to engage the Clean Technology Fund (CTF) in a program to co finance these operations with concessional funding (ME-L1109).

<sup>23</sup> Wind installed capacity in Mexico has risen from levels below 100 MW in 2006-08, to almost 600 MW in 2011 and over 1,000 MW in 2012. According to the *Asociación Mexicana de Energía Eólica* (AMDEE) this is the result of a combination of factors, including the existence and availability of sources of financing, a solid legal and regulatory framework, and the high efficiency of the plants due to the quality of the resource in the country. Production costs have decreased significantly during the last 15 years, becoming competitive with conventional sources of energy (PwC, citing AMDEE).

<sup>24</sup> Smaller plants can be more costly because of the lack of economies of scale in drilling. Worldwide, costs are in the range of US\$2 million and US\$4 million per MW for a condensing flash plant and US\$2.4 million and US\$5.9 million per MW for a binary plant (IEA).

<sup>25</sup> Program resources will be used to maximize leverage of additional private and public funds. Expected investments to be mobilized by the program are in the order of at least US\$1,200 million (see ¶1.31).

financing to the nonfinancial private sector by development banks”; and (ii) “support the implementation of national climate change policy mechanisms fostering adaptation measures taking a long-term approach”.

- 1.19 The program also contributes to the development goals of the Government of Mexico. The [Estrategia Nacional de Energía 2013-2027](#) (ENE)<sup>26</sup> includes the promotion of RE –including geothermal– as a priority line of action. Moreover, the general targets set out in the new government initiative called “[México Próspero](#)” incorporate the need to: (i) facilitate appropriate funding to the private sector;<sup>27</sup> (ii) promote and lead green and inclusive growth; and (iii) provide power at competitive prices and quality and efficiency along the supply chain. The [Estrategia Nacional de Cambio Climático 2013](#) (ENCC) sets a long term climate change agenda for Mexico, along with medium to long term goals for adaptation and mitigation. One of its pillars for the development of national policy related to climate change is to “develop fiscal policies and economic and financial instruments with a climate approach”.<sup>28</sup> Moreover, it specifically includes as one of its lines of action the goal to “promote the technological development of geothermal energy with schemes that reduce exploration risks and offer guarantees over the resource exploitation rights.”
- 1.20 The [Energy Reform](#) amended three constitutional articles to increase private participation in electricity generation and to allow private participation in the hydrocarbons sector. In a broader sense, the proposed changes to the sector are complex, deep, and many, and the enabling legislation, regulation and institutional changes will take some time. The reform puts forward the intention to promote the diversification of sources for power generation (including renewables).<sup>29</sup> Within this overhaul, the geothermal legislation is expected during the first semester of 2014.<sup>30</sup> On the other hand, the [Financial Sector Reform](#) gives greater flexibility and incentives to local development banks in an effort to expand credit, focusing on the strategic areas for national development.

#### **D. Objectives, components and key results indicators**

- 1.21 The objective of the program is to increase power production from geothermal sources so as to contribute to the diversification of the energy matrix and reduce dependency on fossil fuels and GHG emissions in Mexico. To this end, the program intends to scale up investment in geothermal power generation projects by making available a range of financial mechanisms tailored to meet the specific needs of each project’s stage of development. This will include risk mitigation

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<sup>26</sup> The ENE is included in the context of a much larger strategic plan called the [Plan Nacional de Desarrollo 2013-2018](#) (PND).

<sup>27</sup> In this particular point the initiative seeks to reinforce the role of development banks to leverage growth.

<sup>28</sup> According to the ENCC, geothermal generation, mini hydro and solar photovoltaic represent solid mitigation alternatives among RE interventions.

<sup>29</sup> It is expected that primary and secondary legislation on geothermal will be passed after Congress’ decision.

<sup>30</sup> While this reform is expected to give impulse to the demand for resources from the program, its approval is not a condition for the program. The mechanisms to address the financing problem identified have been designed based on existing legislation and institutional framework.

mechanisms as well as various forms of financing for exploration, drilling, field development and construction and operation phases of projects (see [Descriptive List of Instruments](#)).

1.22 **Component I. Risk mitigation for geothermal projects in the early stages of exploration and test drilling.** NAFIN will use IDB resources and will channel contingent recovery grant funds from the CTF to share drilling risks with developers in case of unsuccessful drilling at the initial stage. Moreover, CTF resources together with existing funding from the Government of Mexico (allocation from the FOTEASE<sup>31</sup>), will aim at overcoming geothermal reservoir risks via guarantees or insurance mechanisms, to enable projects to advance towards subsequent phases of development through grants to partially cover private insurance and guaranteed loans premiums, fees and rates.

1.23 The two main tools to be used under this component are presented in Table 1.2:

**Table 1.2- Characteristics of instruments included in Component I: Risk Mitigation**

Fund source	Eligible expense	Instrument	Pre-conditions for sub projects
CTF - DPSP / Contingent Recovery Grant*, plus Local - FOTEASE/SENER Grant	Exploration and test drilling activities of geothermal power generation projects	Loan convertible to grant	Certification from the independent technical expert. Loan agreement between NAFIN and the developer + Certification of failed drilling from the independent technical expert**
CTF DPSP, plus Local FOTEASE/SENER Grant	Partial payment of premium/interests for insured loan	Grant	Loan agreement between NAFIN and the developer with clause to reimburse a share of the premium/interest payments + Insurance policy

\* The Operations Regulations will establish maximum limits to the use of support per project so as to avoid “over concessionality” (i.e. caps on grant impact on IRR of projects).

\*\*Grant is only disbursed if the debt is partially or totally condoned due to failed drilling

1.24 **Component II. Financing adapted to different phases of project exploration and development.** NAFIN will use IDB resources from the CCLIP ME-X1010 along with CTF loan resources<sup>32</sup> to provide direct financial support to private developers during early, intermediate and advanced stages (field development, production drilling, and construction) of private or privately led Public-Private Partnerships (PPP) geothermal projects,<sup>33</sup> including through direct loans, contingent loans, subordinated loans, first loss guarantees, and insured loans. This Component intends to scale up public and private efforts to develop a portfolio of bankable projects, familiarizing market actors (developers, banks, insurers) with this type of investments, leveraging additional financing from both the public and

<sup>31</sup> *Fondo de Transición Energética y el Aprovechamiento Sustentable de la Energía*, [Solicitud FOTEASE](#).

<sup>32</sup> The overall leverage ratio of the facility requires that the CTF resources be matched with at least equal amounts from the IDB CCLIP and from NAFIN’s own resources. IDB co financing may come from resources approved under this operation or from the remainder of the previous approved operation under the CCLIP, the Renewable Energy Financing Facility (REFF) ME-L1119.

<sup>33</sup> Power generation projects under the IPP, small producer or self-supplier modalities.



the private sector, and mobilizing capital to grow the industry in the long term (demonstration effect).

- 1.25 For Components I and II, the specific financing mechanism to be used will be determined on a project by project basis, assessing the risks involved and the best suited product (see [Financing Schemes Flowchart](#) and ¶1.27).
- 1.26 **Implementation costs and technical assistance activities.** CTF resources will finance independent third party expertise to provide advice on the technical validation of eligibility of projects and to carry out the required studies, as well as verifying success and failures on drillings. These resources will help guarantee a sound and efficient program, while also ensuring local capacity building so that a permanent mechanism remains in place after its conclusion. The *Secretaría de Energía* (SENER) is committed to establishing an office with the technical capacity and competence over future activities. Resources for information sharing, project structuring (supporting CFE in its search for a new PPP business model), technical studies and other minor costs are also considered in this envelope (see link [Implementation Costs and Technical Assistance activities](#)).
- 1.27 The intended beneficiaries of the program will be private developers of geothermal projects.<sup>34</sup> Privately led PPP will be eligible and the program will seek to build with CFE and SENER a PPP business model that may maximize return on the public sector accumulated assets (i.e. know how, studies, land permits) and scale up private sector opportunities. On account of the high investment costs, only a limited number of projects may benefit from these resources, though the program will seek to maximize its impact in terms of the number of ventures. Eligibility will be determined by NAFIN and the IDB, based on technical reports, according to a pre-established set of conditions to be specified in the program's Operating Regulations (OR) (see ¶2.6). The expansion of the electricity generation infrastructure will also enable final consumers to benefit from greater and better availability of cleaner energy at competitive prices. Finally, all Mexicans should benefit from positive externalities associated to the environmental and economic impacts of the program.
- 1.28 This program is linked to a number of TCs (including ME-T1161; ATN/TC-12469-ME, ME-T1204; ATN/TC-13989-ME, ME-T1168; ATN/TC-13019-ME and ME-T1089; ATN/OC-11073-ME, in execution both by the IDB and by NAFIN) intended to improve the regulatory framework on RE –and geothermal specifically–, as well as to expand the diagnosis on the geothermal sector in Mexico, and to design innovative risk mitigation and financial products. Activities related to capacity building and dissemination of knowledge can also be financed with these TCs.<sup>35</sup> In addition, the regional TC (RG-T2160) may

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<sup>34</sup> The program is mainly focused on power generation projects. Nonetheless, geothermal projects are not limited to electricity production but they can have numerous applications (IEA).

<sup>35</sup> A new TC (ME-T1251) for US\$207,000 is expected to be approved in the second quarter of 2014 to address remaining regulatory gaps for geothermal development in Mexico. A regional TC (US\$500,000 to US\$1,000,000) to promote geothermal development through technical studies and financial advisory is also under preparation.

complement this program with: (i) the design and implementation of methodologies for assessment of geothermal projects by financing banks, including environmental and social due diligence and management; (ii) information and awareness of the various actors (financiers and potential investors) about the benefits associated with geothermal and effective ways to value them; and (iii) compliance with national standards and IDB's environmental and social safeguards policies.

- 1.29 **Indicators.** The expected impacts of the program products and expected results, which include CTF core outcome indicators of new installed capacity and leveraged finance, are detailed in the Results Matrix ([Annex II](#)).
- 1.30 The proposed program is expected to finance some 300 MW of additional geothermal capacity in the long term, which could lead to emissions savings of around 1.10 MtCO<sub>2</sub> per year.<sup>36</sup> Based on estimated reductions of CO<sub>2</sub> emissions over the course of a 30 year lifetime of projects financed, the cost of abatement is estimated at some: (i) US\$1.64 per tCO<sub>2</sub>e considering CTF financing; (ii) US\$3.63 considering total program financing (CTF, IDB and local); and (iii) US\$36.24 when all project investment costs (including all public and private funds leveraged) are considered (see [Economic Analysis](#)).<sup>37</sup>
- 1.31 The proposed program seeks a transformational intervention by building a track record of geothermal projects and providing the possibility to replicate successful outcomes in other countries in the region and the world. The program also has a multiplier effect, as it is designed to optimize the use of funding available in terms of leverage and sustainability. Continuing these efforts should allow for the development of a permanent support framework in the long term, after demonstration of the benefits of investing in geothermal has permeated the economy. Moreover, in the scenario where the insurance industry would evolve into building risk management instruments that make sense for geothermal technologies, the proposed program could contribute to improve data on historical loss patterns and technical information that could help facilitate the development of solutions for geothermal energy projects in the long term.

## II. FINANCING STRUCTURE AND MAIN RISKS

### A. Financing instruments

- 2.1 The [Clean Technology Fund](#) (CTF) provides scaled-up financing for public and private sector projects that contribute to the demonstration, deployment, and transfer of low-carbon technologies with significant potential for GHG emission reductions. Investments for the promotion of renewable energy, sustainable

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<sup>36</sup> Estimations use an average emissions factor for electricity in Mexico (0.5 kgCO<sub>2</sub>/kWh) and an 84% load factor.

<sup>37</sup> These abatement costs are well within the range of the CTF (US\$200 per tCO<sub>2</sub>e) and to that extent, are proof of the cost effectiveness of the program. The threshold of cost-effectiveness was established for projects/programs in the CTF investment criteria with a view to maximizing the impact of the limited resources.

transport and energy efficiency are eligible under the CTF. Resources from the CTF are transferred to the IDB, acting as implementing agency, under a Financial Procedures Agreement and are administered by the IDB in a trust fund created at the IDB (IDB-CTF Trust Fund).

- 2.2 Mexico’s CTF Investment Plan (IP) was presented for approval by the Government of Mexico, and endorsed by the CTF Trust Fund Committee (TFC) in January 2009. The IP outlines the strategy, sectors, and objectives of projects to be implemented by the IDB and the World Bank Group. A [revision of this IP](#), endorsed by the TFC in May 2013, includes US\$34.4 million of concessional CTF resources for a geothermal risk mitigation program.<sup>38</sup>
- 2.3 In October 2013, the TFC approved funding for [Dedicated Private Sector Programs](#) (DPSP) to be deployed in addition to the current country driven IP modality. Under the DPSP, a utility-scale renewable energy program proposes to focus initially on geothermal energy and more specifically on addressing the geothermal resource risk through well drillings. Consistent with CTF practice, DPSP is intended to make use of a range of financing instruments taking risks that commercial lenders are not able to bear. An initial US\$115 million were assigned to existing CTF countries, namely Chile, Colombia, Turkey, and Mexico.
- 2.4 This program is the fourth individual operation under the CCLIP ME-X1010 (of up to US\$1.2 billion), conceived as a flexible instrument with the general objective of strengthening the competitiveness of Mexican companies by channeling medium and long term financing for investment projects in different sectors. It is in compliance with all the criteria for Individual Loan Operations, as established in document GN-2246-4, regarding: (i) consistency with sectors and components defined under the credit line (see ¶1.21–1.24); (ii) country program alignment (see [CPD 2014](#)); (iii) executing agency (see ¶3.1–3.2); and (iv) previous projects performance, use of funds, compliance of contractual conditions and reporting (see ¶1.15 and footnote #22).
- 2.5 The program will be executed under the two components previously described:

**Table 2.1- Costs of the program by source and component (US\$ million)**

<b>Cost component</b>	<b>IDB</b>	<b>CTF</b>	<b>Local*</b>	<b>Total</b>
<b>Component I. Risk mitigation for geothermal projects in the early stages of exploration and test drilling</b>	---	20	≈11.5	31.5
<b>Component II. Financing adapted to different phases of project exploration and development</b>	54.3	31.5	---	85.8
<b>Implementation costs and technical assistance activities</b>	---	2.8	---	2.8
<b>Total</b>	<b>54.3</b>	<b>54.3</b>	<b>11.5</b>	<b>120.1</b>

\*Approximate US dollar value of 150 million Mexican pesos, using an average conversion rate of 13 Mexican pesos per US dollar. Additional NAFIN’s own resources will be used for financing of Component II and will be determined for each project on a case-by-case basis.

<sup>38</sup> See [CTF financial products, terms and procedures](#) for public sector operations.



- 2.6 The program will fund projects deemed eligible over the basis of a number of conditions established in the program's OR. These conditions will include a maximum amount of resources from the program to be used per project,<sup>39</sup> a minimum amount of capital required from the developer, the preexistence of all necessary permits and compliance with environmental and social safeguards, and the financial and technical capacity necessary to develop a project of this nature (see [Indicative Eligibility Criteria](#)). NAFIN and IDB will call for expressions of interest and select a portfolio of eligible projects. There will be no targets for the proportion of the resources that has to be disbursed under each financing alternative, which allows both NAFIN and developers to opt for the alternative best suited to their financing needs. The deployment of various financial instruments under a phased approach is intended to distribute the risk associated to the use of resources between developers, donors, the government and the private sector (financiers, insurance companies, etc.) and across multiple investments, so as to maximize the impact of the use of concessional resources.
- 2.7 As already mentioned, ongoing TCs will complement the program with regards to regulatory aspects, capacity building, knowledge dissemination, and creating synergies with other donors/institutions working with similar focus (see ¶1.28).
- 2.8 **Disbursement and execution periods.** CTF/IDB resources are to be fully committed and disbursed within 6 years from the effective date of the loan agreement.
- 2.9 CTF contingent recovery grant resources to support projects shall be administered through a special account. This account will receive any income from the investment of its funds as well as the reimbursements from sub projects and the fees charged for their use. Any remaining grant funds after 10 years shall be returned by NAFIN to the CTF.
- 2.10 NAFIN may request disbursement as an advance of funds or as reimbursement of expenses. The non-reimbursable portion of the resources will be part of the first disbursement and will be transferred to and managed by NAFIN exclusively for the execution of the program, together with the existing government allocation of 150 million Mexican pesos in a dedicated account (see [Sub-project Expense Recognition](#)). In addition to the conditions prescribed in General Norm Article 4.01, **it is a special condition prior to the first disbursement of the program that NAFIN provides evidence, to the Bank's satisfaction, of the entry into effect of the program's OR agreed with the IDB and the eligibility conditions for all operations of the program must have been met.**
- 2.11 **Retroactive Financing.** The IDB may recognize eligible expenditures incurred by the beneficiary as of the date of approval of the Proposal for Operational Development (POD) on April 9, 2014 and up to the date of approval of the loan proposal by the Board of Executive Directors (in no case will the IDB recognize

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<sup>39</sup> Additional financing could be provided by NAFIN, commercial banks and/or other donors and multilateral institutions.

payments made 18 months before Board's approval), for the equivalent up to 20% of the approved amount, provided that all requirements established in IDB procurement policies and in the loan agreement have been substantially met. Subsequent expenditures may be committed and disbursed anytime within the established loan disbursement period, in accordance with IDB policies.

- 2.12 The IDB will disburse ordinary capital resources via advances or reimbursements, based on a scheduled portfolio or a portfolio undertaken by NAFIN, respectively. The IDB will also disburse CTF resources –except the non-reimbursable portion– via advances or reimbursements according to standard practice. However, the volume of CTF advanced resources will be limited by contract on account of the concessional element involved and the relatively long disbursement period for the overall facility. The exchange rate for conversions of expenditures made in local currency to US\$ shall be the one used by NAFIN on the day of transfer to or contract signature with the intermediary or final borrower (official exchange rate in Mexico on the effective date of payment). Returns from the program, including payments, prepayments, cancellations or terminations of sub-loans shall be used by NAFIN to repay the loan to the IDB or to finance new projects consistent with the objectives of the program, within five years from the date of the last disbursement. The IDB may request a special audit or review of this requirement.

## **B. Main risks and mitigation measures**

- 2.13 **Environmental and social safeguard risks.** According to Directive B.13 of the Environment and Safeguards Compliance Policy (OP-703), this program does not require classification. Geothermal projects deliver long term GHG emission reductions and are considered environmentally friendly projects as they entail cleaner energy production. However, most geothermal projects can be considered high-risk (including initial drilling) and can have adverse environmental or social impacts that can be significant and which need to be assessed and managed on a project by project basis.<sup>40</sup> The IDB will define an Environmental and Social Management System (ESMS), integral to the OR, that will enable the identification of potential impacts and risks and ensure that the beneficiaries of the financing will implement environmental and social assessment, prevention, mitigation and management measures consistent with IDB safeguard policies. The ESMS will integrate all applicable Mexican norms. The loan agreement will include the following environmental and social requirements and the respective enabling, reporting and monitoring conditions: (i) NAFIN and the Bank will agree on an ESMS as further detailed in the ESMR to be included in the OR; (ii) NAFIN will coordinate with SENER, the CFE and other pertinent agencies to

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<sup>40</sup> The main environmental and social impacts and risks related to geothermal projects are: pollution caused by drilling fluids and cuttings that may contain oil-related contaminants and chemical additives that may need special treatment and disposal; air emissions mainly hydrogen sulfide and mercury; solid waste generation that in occasions may be hazardous; well blowouts and pipeline failures which can release toxic substances, hydrogen sulfide gases and polluted steam; increase in surface water extraction and consumption; exposure to geothermal gases, heat and noise, and soil subsidence due to fluid abstraction and reinsertion, induced micro-seismicity with the possibility of the construction and operation of the project to exacerbate certain types of natural disasters.

facilitate the implementation of the ESMS; (iii) NAFIN will obtain the Bank's non-objection to the categorization of each project and to the final approval and E&S management plans of all category A and High Risk Category B projects (including review of independent experts as required by the Bank) and will ensure that all projects financed by the program are implemented in full compliance with the requirements of the ESMS; and (iv) NAFIN will supervise the environmental and social performance of each project, provide the Bank with all pertinent reports and notifications and, in case of non-compliance, engage with beneficiaries to ensure that a corrective action plan is developed and implemented to the satisfaction of NAFIN and the IDB.

- 2.14 **Development risks.** Although substantial capacity already exists in Mexico, the project identifies a medium risk of having limited or insufficient human capacity (specific geothermal technical expertise) to accompany the pace of development of projects supported. Several aspects are considered for mitigating this risk, including overseeing with SENER the progress in the implementation of a Center of Excellence on Geothermal Energy, engaging IDB's own Center for Geothermal Training in El Salvador, using existing knowledge from CFE and ensuring transfer from third party technical expertise to develop local competences.
- 2.15 **Fiduciary risks.** No risks are foreseen. NAFIN has extensive experience with the Bank (see ¶1.15). The institutional analysis conducted in 2009 in the context of the loan 2226/OC-ME (ME-L1051) granted NAFIN a weighted average rating of 97.94 indicating a satisfactory level of development and low risk to project implementation. The level of development of their fiduciary systems has been confirmed during the visits made to NAFIN by the Bank.
- 2.16 Other key issues and risks are included in detail in the [Risk Matrix](#).

### III. IMPLEMENTATION AND MANAGEMENT PLAN

#### A. Summary of implementation arrangements

- 3.1 The borrower and EA for the program will be *Nacional Financiera, S.N.C.* (NAFIN), with the United Mexican States serving as guarantor. NAFIN is a national credit institution established to promote savings and investment and to channel financial and technical support for Mexico's industrial and economic development. NAFIN's corporate goals and mandate include supporting projects related to the use of clean and efficient energy.<sup>41</sup> NAFIN has been working on: (i) developing a portfolio of eligible projects; (ii) improving their technical, financial and environmental capabilities, with IDB support;<sup>42</sup> and (iii) strengthening their network of intermediaries with capacity to channel funding to high risk projects.

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<sup>41</sup> The Mexican government has designated NAFIN as one of the entities that will support its emission reduction efforts, mainly through their *Dirección de Proyectos Sustentables*.

<sup>42</sup> In August 2013 the IDB granted US\$135,000 of nonreimbursable funds to NAFIN as part of the regional TC RG-T2160 (ATN/MC-13341-RG) (see ¶1.28).

- 3.2 NAFIN is a solvent institution with sound risk management practices and the full backing of the Mexican government. NAFIN also has an excellent record of cooperation with the IDB, contributing actively to the country program of the IDB with Mexico. So far, NAFIN has processed three operations for a total of US\$250 million from the CCLIP ME-X1010,<sup>43</sup> sharply improving its capacity to support private sector projects focused on energy generation from renewable sources and, in general, to promote sustainable development (see ¶1.15).
- 3.3 **Execution and administration framework.** NAFIN will execute the program under its current organizational structure. The provisions governing program execution, financial intermediaries' participation, and eligibility of each financial instrument that will be used on a project by project basis, will be established in the OR agreed by the IDB and NAFIN, in accordance with NAFIN and IDB standards and policies, Mexican laws, and Mexico's financial industry practice.
- 3.4 **Procurement of goods and services.** Procurement actions will follow the Procurement Policies established in documents GN-2349-9 y GN-2350-9. Since the program is mainly demand-driven, the proposal does not include a Plan of Activities or a Procurement Plan (see [Annex III](#)).
- 3.5 **Financial Statements.** During the disbursement period, NAFIN is required to submit audited financial statements of the program within 180 days after the closing of each fiscal year, duly audited by an independent firm acceptable to the IDB and designated by the *Secretaría de la Función Pública*. The last report shall be submitted within 180 days after the end of the disbursement period. NAFIN's audited financial statements are published on their website so its submission is not deemed necessary.

## **B. Arrangements for monitoring and evaluation**

- 3.6 The program will apply the standard procedures established by the IDB for monitoring and evaluation of investment operations but will also be consistent with reporting obligations to the CTF.<sup>44</sup> Based on Annex II, the Monitoring and Evaluation Plan and the fulfillment of the eligibility criteria at the project and program level, agreed between the IDB and NAFIN, the evolution of indicators should be reported by NAFIN to the IDB periodically during program execution. Upon completion of the program, NAFIN will prepare a final evaluation report.
- 3.7 **Information.** In accordance with legal obligations of record keeping, NAFIN will compile and maintain all information, indicators and parameters, including annual plans, midterm review and final evaluation, necessary for the preparation of the Project Completion Report (PCR) and any ex-post assessment the IDB or the CTF may wish to conduct (see [Monitoring and Evaluation Plan](#)).

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<sup>43</sup> To this date, the results of these operations include: US\$5,371 million investment in electricity generation from RE detonated, US\$440 million of financing by third parties mobilized, 2,622 MW of RE installed capacity financed.

<sup>44</sup> In order to fully comply with the [CTF Results Framework](#) approved in December 2012, the Mexican Government and the participating MDB are working in the development of procedures to report on the CTF IP Results.

Development Effectiveness Matrix			
Summary			
<b>I. Strategic Alignment</b>			
<b>1. IDB Strategic Development Objectives</b>		Aligned	
Lending Program	Lending to support climate change initiatives, renewable energy and environmental sustainability.		
Regional Development Goals	i) Percent of firms using Banks to finance investments, and ii) CO2 emissions (kilograms) per \$1 GDP (PPP).		
Bank Output Contribution (as defined in Results Framework of IDB-9)	Percentage of power generation capacity from low-carbon sources over total generation capacity funded by IDB.		
<b>2. Country Strategy Development Objectives</b>		Aligned	
Country Strategy Results Matrix	GN-2749	i) Increase financing to the real economy; and ii) Support the implementation of national climate change policy mechanisms fostering adaptation measures focusing on the long-term.	
Country Program Results Matrix	GN-2756	The intervention is included in the 2014 Country Program Document.	
Relevance of this project to country development challenges (If not aligned to country strategy or country program)			
<b>II. Development Outcomes - Evaluability</b>			
	Evaluable	Weight	Maximum Score
	8.1		10
<b>3. Evidence-based Assessment &amp; Solution</b>			
	8.4	33.33%	10
3.1 Program Diagnosis	3.0		
3.2 Proposed Interventions or Solutions	2.4		
3.3 Results Matrix Quality	3.0		
<b>4. Ex ante Economic Analysis</b>			
	8.5	33.33%	10
4.1 The program has an ERR/NPV, a Cost-Effectiveness Analysis or a General Economic Analysis	4.0		
4.2 Identified and Quantified Benefits	1.5		
4.3 Identified and Quantified Costs	0.0		
4.4 Reasonable Assumptions	1.5		
4.5 Sensitivity Analysis	1.5		
<b>5. Monitoring and Evaluation</b>			
	7.5	33.33%	10
5.1 Monitoring Mechanisms	2.5		
5.2 Evaluation Plan	5.0		
<b>III. Risks &amp; Mitigation Monitoring Matrix</b>			
Overall risks rate = magnitude of risks*likelihood		Medium	
Identified risks have been rated for magnitude and likelihood		Yes	
Mitigation measures have been identified for major risks		Yes	
Mitigation measures have indicators for tracking their implementation		Yes	
Environmental & social risk classification		B.13	
<b>IV. IDB's Role - Additionality</b>			
The project relies on the use of country systems			
Fiduciary (VPC/PDP Criteria)			
Non-Fiduciary			
The IDB's involvement promotes improvements of the intended beneficiaries and/or public sector entity in the following dimensions:			
Gender Equality			
Labor			
Environment	Yes	This project will benefit the environment by helping to reduce emissions. The intervention has positive externalities for the environment and will strengthen the entities involved.	
Additional (to project preparation) technical assistance was provided to the public sector entity prior to approval to increase the likelihood of success of the project	Yes	Complementing the financial support provided by the program, recommendations for draft legislation on geothermal, as well as a diagnosis on the current regulatory framework, were provided to the Ministry of Energy through technical assistance operations.	
The ex-post impact evaluation of the project will produce evidence to close knowledge gaps in the sector that were identified in the project document and/or in the evaluation plan			

The document presents the problems to be addressed by the project, the factors that contribute to these problems, and identifies the beneficiaries of the operation. The dimensions of the problems are presented and the proposed interventions are linked to the problems identified in the diagnosis.

The results matrix has vertical logic. The matrix has impact, outcome and output indicators that are SMART. All indicators have baselines, targets and sources of information.

The project is analyzed using a cost-benefit analysis. The benefits are adequately quantified. On the cost side, the analysis only uses investment costs. It does not include the operation and maintenance costs required to produce geothermal power. It is not clear whether the investment costs include all the costs required to generate the benefits used. In addition, it is not clear if the costs represent financial costs or economic costs. The assumptions used were presented and a sensitivity analysis was performed.

The project has a monitoring and evaluation plan. The outputs have annual targets and the costs of the project are broken down by project outputs. The monitoring plan presents a budget allocation for the monitoring activities of the project. The evaluation plan follows the DEM guidelines. The operation will be evaluated using an ex-post cost benefit analysis

## Results Matrix

<b>Program's objective:</b>	The objective of the program is to increase power production from geothermal sources so as to contribute to the diversification of the energy matrix and reduce dependency on fossil fuels and GHG emissions in Mexico. To this end, the program intends to scale up investments in geothermal power generation projects by making available a range of financial mechanisms tailored to meet the specific needs of each project's stage of development.
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Indicators	Unit <sup>1</sup>	Baseline	Y1	Y2	Y3	Y4	Y5	Y6	Target <sup>2</sup> (Y10)	Description / Source of verification
<b>OUTPUTS COMPONENT I</b>										
Grants (in the form of loan guarantees) provided to geothermal projects with resources from the program.	Number	0	2	5	7	8	9	10	n.a.	Values based on guarantee agreements. Target is inclusive of all projects supported, both successful and failed. Source: Program report from NAFIN. Estimations consider that a beneficiary project that is successful during early exploration may be eligible for support from the program in the production drilling phase.
Insurance premiums for geothermal projects subsidized with resources from the program.	Number	0	---	1	2	4	4	5	n.a.	Values based on insurance policies issued. Target is inclusive of all projects supported, both successful and failed. Source: Program report from NAFIN. Estimations consider that a beneficiary project that is successful during early exploration may be eligible for support from the program in the production drilling phase.
<b>OUTPUTS COMPONENT II</b>										
Loans granted to geothermal projects by the program at any stage of development.	Number	0	2	5	8	11	13	15	n.a.	Values based on loan agreements for financing funded with resources from the program. Figures consider loans at any stage of development including loans convertible to grants, insured loans, soft loans, and/or refinancing of projects that move on from early exploration to production drilling and to construction stages. Target is inclusive of all projects financed, both successful and failed. Source: Program report from NAFIN.

<sup>1</sup> All figures are accumulated.

<sup>2</sup> Due to the long-term nature of geothermal project development, some of the results will only happen after the end of the execution period. A long-term target is set for a timeframe of ten years from the beginning of the program. Financing from sources other than those of the program may be used at later stages of development of projects included in these targets.

Indicators	Unit	Baseline	Y1	Y2	Y3	Y4	Y5	Y6	Target (Y10)	Description / Source of verification
<b>RESULTS</b>										
Geothermal projects financed that moved on from early exploration to production drilling.	Number (%)	0						5 (50)	9 (60)	Percentage measured over the total amount of projects financed (at any stage).
Geothermal projects financed that moved on from production drilling to construction.	Number (%)	0						3 (30)	6 (40)	Percentage measured over the total amount of projects financed (at any stage).
Total geothermal power projects financed at some stage by the program that are in operation (producing electricity).	Number	0						3	6	Includes the total number of projects that are functioning in the year indicated. Due to the long maturities associated to these projects, projects financed from early exploration may not be fully operational until past the timeframe of monitoring (see target Y10). Source: Program report from NAFIN.
Geothermal power generation capacity installed in projects financed at some stage by the program.	MWe	0						150	300	Includes only capacity ready for production. Due to the long maturities associated to these projects, capacity resulting from projects financed from early exploration may not be installed until past the timeframe of monitoring (see target Y10). Source: Program report from NAFIN. Verified with authorities from the Comision Reguladora de la Energia (CRE) and the Comision Federal de Electricidad (CFE).
Electricity production from geothermal projects financed at some stage by the program.	GWh/yr	0						1,104	2,207	Source: Program report from NAFIN. Estimations based on the expected capacity installed, an average production factor in Mexico, 24 hours/day, 365 days/yr.

Indicators	Unit	Baseline	Y1	Y2	Y3	Y4	Y5	Y6	Target (Y10)	Description / Source of verification
Greenhouse gas (GHG) emissions avoided by geothermal projects financed at some stage by the program.	MtCO <sub>2</sub> e /yr	0						0.55	1.1	Tons of GHG emissions that will be reduced or avoided once the plants financed by the program are commissioned. Source: Estimations made following IDB methodology, based on installed capacity (see indicator above), envisaged production, and a 0.5 average conversion factor for electricity generation in Mexico. MtCO <sub>2</sub> e = Millions of tons of CO <sub>2</sub> equivalent.
Additional financing from third parties mobilized to complete geothermal projects financed at some stage by the program.	Millions of USD	0						491	1,091	Volume of third-party direct finance leveraged by the program for projects supported (both successful and failed). Includes all financing from sources other than the IDB/CTF funding (government, NAFIN and other financial institutions) plus capital/equity. Source: Program report from NAFIN. Estimations based on a 70:30 debt to equity ratio, investment costs of US\$5 million per well and US\$2 to US\$4 million per MW installed.
<b>IMPACTS</b>										
Total geothermal capacity installed in Mexico.	MWe	958 <sup>3</sup>						1,108	1,258	Source: SENER, Balance Nacional de Energia.
Electricity production from geothermal sources in Mexico.	GWh/yr	5,817 <sup>4</sup>						6,921	8,024	Source: Public information from CRE and CFE. Estimations based on the average production factor in Mexico.
Greenhouse gas (GHG) emissions in the Mexican energy sector.	Mt CO <sub>2</sub> e	503.8 <sup>5</sup>						377.85	352.66	Source: IDB estimations based on Estrategia Nacional de Cambio Climático (ENACC) and Contribución sectorial a las emisiones, Quinta Comunicación al UNFCCC. MtCO <sub>2</sub> e = megatons of CO <sub>2</sub> equivalent.

<sup>3</sup> Total capacity at end-2012 (SENER).

<sup>4</sup> CFE. Sector Eléctrico Nacional. Generación Bruta. 2012.

<sup>5</sup> Mexico's Fifth National Communication to the UNFCCC. Data from 2010.



## FIDUCIARY AGREEMENTS AND REQUIREMENTS

**Country:** MEXICO  
**Project number:** ME-L1148  
**Name:** Geothermal Financing and Risk Transfer Program  
**Executing agency:** Nacional Financiera S.N.C. (NAFIN)  
**Fiduciary team:** Gloria Coronel, Fiduciary Financial Management Lead Specialist; Víctor Hugo Escala, Fiduciary Procurement Lead Specialist; and Miriam Garza, Fiduciary Operations Analyst

### I. EXECUTIVE SUMMARY

- 1.1 NAFIN is an autonomous government financial agency founded in 1934. It has extensive experience with the Bank as an executing agency and financial agent and presently is executing loans 2631/TC-ME (ME-L1109) and 2843/OC-ME (ME-L1119).
- 1.2 This operation is the fourth loan under the conditional credit line for investment projects (CCLIP) ME-X1010. Its objective is to help diversify Mexico’s energy matrix, which would reduce greenhouse gas emissions and dependency on fossil fuels in Mexico.
- 1.3 **The executing agency’s fiduciary context.** For financial matters, NAFIN uses a dual currency (US\$ and Mex\$) accounting system; the daily exchange rate recorded in its system will be used to convert payments made in Mex\$ to US\$, as that rate was in effect in the borrower's country on the date the payment was made. For lending to first-tier and second-tier banks, NAFIN uses the Sistema Institucional de Recuperación y Administración de Cartera [Institutional Portfolio Recovery and Administration System] (SIRAC). Each day NAFIN’s summarized information is posted and reconciled in the Sistema Integral Financiero [Integral Financial System] (SIF). NAFIN, as a bank regulated by the National Banking and Securities Commission (CNBV), must perform account reconciliation daily. In the last two operations under CCLIP ME-X1010—loans 2671/OC-ME (ME-L1081) and 2843/OC-ME (ME-L1109)—the Bank's financial fiduciary team confirmed the institutional capacity assessment system (ICAS) results in the areas of accounting and internal control environment, as was done for the first operation under the CCLIP (loan 2226/OC-ME, ME-L1051) in 2009. For more details on the ICAS, please see IDBDOCS 37048160.
- 1.4 As in other operations with NAFIN, in general no procurement is expected to be carried out by NAFIN, and procurements by intermediaries will follow private sector practices, in accordance with paragraphs 3.12 and 3.14 of the Policies for the Procurement of Goods and Works (document GN-2349-9) and the Policies for the Selection and Contracting of Consultants (document GN-2350-9), respectively.

## II. FIDUCIARY RISK EVALUATION AND MITIGATION ACTIONS

- 2.1 **ICAS:** The 2009 ICAS found a weighted average of 97.94%, reflecting its institutional capacity, which was verified during the fiduciary visits made to the operations currently in execution. The results of the seven systems evaluated by the ICAS (based on a questionnaire for each system) are presented below:

Capacity	System	Quantification			Development (no development, incipient, medium, satisfactory)	Risk level (high, significant, medium, low)
		Score %	IR %	Weighted %		
Planning and organization	Activities planning (SPA)	<a href="#">100</a>	50	50	Satisfactory	<a href="#">Low</a>
	Organizational management (SOA)	<a href="#">96.3</a>	50	48.15	Satisfactory	<a href="#">Low</a>
<b>TOTAL</b>				98.15	Satisfactory	Low
Execution	Personnel management (SAP)	<a href="#">94.44</a>	30	28.33	Satisfactory	<a href="#">Low</a>
	Goods and services management (SABS)	<a href="#">96.77</a>	30	29.03	Satisfactory	<a href="#">Low</a>
	Financial management (SAF)	<a href="#">97.73</a>	40	39.09	Satisfactory	<a href="#">Low</a>
<b>TOTAL</b>				96.46	Satisfactory	Low
Control	Internal control (SCI)	<a href="#">100</a>	80	80	Satisfactory	<a href="#">Low</a>
	External control (SCE)	<a href="#">100</a>	20	20	Satisfactory	<a href="#">Low</a>
<b>TOTAL</b>		97.94		100	Satisfactory	Low

## III. CONSIDERATIONS FOR THE SPECIAL PROVISIONS OF CONTRACTS

- 3.1 In order to streamline the contract negotiation process on the part of the project team and mainly the Legal Department (LEG), the agreements and requirements that need to be addressed in the special provisions are presented below:
- a. Conditions precedent to the first disbursement: The program Operating Regulations (previously approved by the Bank) have entered into effect.
  - b. There is agreement with the executing agency that, for accounting purposes, the exchange rate will be the rate on the day of payment recorded in NAFIN financial and accounting systems in accordance with the regulations of the Mexican government, as that is the rate in effect in the borrower's country on the effective date of the payment.
  - c. Retroactive financing of expenditures: Eligible expenditures incurred by the beneficiary can be recognized from the date the Proposal for Operation Development

was approved (April 9, 2014) until the date of approval of the loan proposal by the Board of Executive Directors (in no case will the IDB recognize payments made 18 months before Board's approval), for up to the equivalent of 20% of the total amount approved, provided requirements substantially similar to the Bank's procurement policies have been met.

- d. Since the program is mainly demand-driven, at present no procurement of works, goods, or nonconsulting services has been identified, although it is possible that in the course of execution the operation may require the contracting of consulting services. When the end borrowers are private entities, normal market procurement procedures acceptable to the Bank will be used, in accordance with Appendix IV of the Bank's procurement policies. When the end borrowers are public agencies other than those mentioned in paragraphs 3.12 and 3.14 of the procurement policies (documents GN-2349-9 and GN-2350-9), the respective sections of the Bank policies for the selection and contracting of consultants (document GN-2350-9) or for the procurement of goods and works financed by the Bank (document GN-2349-9) will be applied.
- e. If applicable, prior to any procurement process, the executing agency will present the corresponding procurement plan to the Bank for review and approval, in accordance with the provisions of the above-mentioned procurement policies. This plan will be updated at least every 12 months during program execution, and each updated version will be submitted for Bank review and approval. Procurements will proceed in accordance with this plan, and the plan will also indicate which contracts will be reviewed ex ante and ex post.

#### IV. AGREEMENTS AND REQUIREMENTS FOR PROCUREMENT EXECUTION

- 4.1 If the need arises to effect procurement with loan proceeds, the fiduciary agreements and requirements in procurement establish the applicable provisions:
  - a. **Procurement execution: Procurement of works, goods, and nonconsulting services:** Contracts for works, goods, and nonconsulting services<sup>1</sup> generated under the project and subject to international competitive bidding (ICB) or to national competitive bidding (NCB) will be executed using the bidding documents harmonized between the Civil Service Department (SFP) and the Bank, available at: (<http://www.funcionpublica.gob.mx/unaopspf/credito/normace.htm>). The project's sector specialist will be responsible for reviewing the technical specifications for procurement during preparation of the selection processes.
  - b. **Selection and contracting of consulting firms:** Contracts to hire consulting firms financed with project resources will be executed using the Standard Request for Proposals agreed on by the Bank and the SFP, which can be viewed at: (<http://www.funcionpublica.gob.mx/unaopspf/credito/normace.htm>). The project's

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<sup>1</sup> Policies for the Procurement of Goods and Works Financed by the Inter-American Development Bank (document [GN-2349-9](#)) paragraph 1.1: Nonconsulting services are treated similarly to goods.

sector specialist will be responsible for reviewing the terms of reference for contracting consulting services.

- c. **Selection of individual consultants:** Contracts to hire individual consultants will use the individual consultant contract model agreed upon with the Bank (available at: <http://www.funcionpublica.gob.mx/unaopspf/credito/normace.htm>).
- d. **Other:** It is envisaged that 100% of the loan proceeds will be allocated to NAFIN, as a first-tier or second-tier financial institution, to channel resources for lending. When the end borrowers are private entities, regular market procurement procedures acceptable to the Bank will be used, in accordance with Appendix IV of the Bank’s procurement policies. In addition, Section III, Other Methods of Selection, paragraphs 3.12 and 3.14 of the policies (documents GN-2349-9 and 2350-9, respectively) will be observed (corresponding to contracting with loan funds by financial intermediaries).

**1. Table of threshold amounts (US\$ thousands)**

4.2 If the need arises for any procurement with loan proceeds, the thresholds are as follows:

Works			Goods <sup>2</sup>			Consultancy	
International competitive bidding	National competitive bidding	Price comparison (shopping)	International competitive bidding	National competitive bidding	Price comparison (shopping)	International advertising consultancy	Shortlist 100% national
≥15,000,000	<15,000,000 and ≥500,000	< 500,000	≥3,000,000	<3,000,000 and ≥100,000	<100,000	≥200,000	< 500,000

**2. Main procurement items**

4.3 There are no provisions for the executing agency to effect procurement, except for the possible contracting of consulting services, in the event the need arises. Such services could consist of: advising on the technical validation and eligibility of projects under consideration for financing and technical and feasibility studies, among other things. Currently, and since these consultancies will depend on the type of projects proposed and their eligibility, it is planned that 100% of loan proceeds will be allocated for NAFIN to channel resources for loans.

**3. Procurement supervision**

4.4 Considering the project's low fiduciary risk, and to the extent that there are procurement needs, an annual inspection visit would be made. In addition, to establish the supervisory framework, the executing agency's experience in previous operations (as executing agency or as financial agent) was considered.

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<sup>2</sup> Includes nonconsulting services.

- 4.5 To review the program's external audit and overall monitoring, the ex post review of procurement will be conducted by an external auditing firm that will present a special logbook with the procurement report, if there are procurements, in accordance with the terms of reference agreed upon by the IDB and the SFP.

Ex post review threshold		
Works	Goods	Consulting services
15,000,0000	3,000,000	500,000

**Note:** Ex post review threshold amounts are based on the executing agency's fiduciary capacity of execution and can be modified by the Bank to that extent that its capacity changes.

#### 4. Special provisions

- 4.6 **Measures to reduce the likelihood of corruption:** The executing agency will diligently observe the provisions on fraud and corruption established in the Bank's procurement policies.

#### 5. Records and files

- 4.7 The original basic documentation for verification of expenditures to the Bank will remain at NAFIN. The Dirección de Proyectos Sustentables [Sustainable Projects Office] will be responsible for consolidating the program's financial and procurement information and will maintain relations with the Bank.

### V. FINANCIAL MANAGEMENT

#### 1. Programming and budget

- 5.1 NAFIN's fiduciary systems have an advanced level of development, and it must comply with the national standards established in the annual budget law issued by the Department of Finance (SHCP). The planning and programming functions and responsibilities are documented in the financial planning and programming manual as well as in its planning policies that are authorized by NAFIN's Board of Directors and by Congress, in accordance with the organic law. Clear programming and budgetary procedures, certified under ISO 9001-2000, have been established. NAFIN has a corporate governance structure to monitor compliance with the plan and holds meetings in different settings to monitor the indicators that are submitted to the Board and the different operating committees for each process.

#### 2. Accounting and information systems

- 5.2 NAFIN has a financial information system (SIF) for accounting and financial records. This system integrates the data from SIRAC utilized for management and supervision of NAFIN's loan portfolio. All transactions related to the IDB loan will be entered by NAFIN into its own systems, using that day's exchange rate for conversion of payments in Mex\$ to US\$. As a government agency, NAFIN applies International Public Sector Accounting Standards (IPSAS) and also complies with CNBV standards for banks in

Mexico. NAFIN's credit and operating manual, approved by its Board of Directors, specifies the nature of the operations and the purpose and results of each operation and describes the procedures for operation, authorization, movements, and record-keeping and control of operations.

- 5.3 NAFIN is audited by (a) the Superior Audit Office (ASF); (b) the CNBV; and (c) an external auditing firm. According to IDB policy, during the disbursement period, NAFIN will submit annually, within 180 days, an audited financial statement on the use of the loan proceeds.

### **3. Disbursements and cash flow (coordinated with the use, or not, of the National Treasury System)**

- 5.4 Program resources will be deposited in a special account or allocated to the program.
- 5.5 NAFIN will establish a bank account and an accounting entity for handling and recording the payments from this operation. Loan disbursements may be made in the form of (1) funds advances or (2) reimbursement of expenditures. Recognition of expenditures will be for: (a) payments made to intermediaries/beneficiaries for eligible activities. Disbursements for expenditures actually paid by NAFIN will be reviewed ex post.

### **4. Internal control and auditing**

- 5.6 The Ley Federal de Responsabilidades Administrativas de los Servidores Públicos [Federal Civil Servant Administrative Responsibilities Act] regulates the performance of personnel who work in federal government agencies and institutions. NAFIN also has a code of conduct applicable to all of its staff, together with an internal control body (OIC). The OIC management are SFP officials and its staff are NAFIN personnel or individuals contracted for occasional activities. The SFP approves the work plan of the OIC annually, and there are procedures for reporting and monitoring these activities. The OIC is responsible for monitoring compliance with the observations or recommendations made by the ASF, the CNBV, and/or the external auditing firm. The new government administration issued a law in January 2013 indicating that the SFP will disappear in 2013; however, no significant changes are foreseen that would affect program supervision.
- 5.7 As previously mentioned, NAFIN is audited by the ASF, the CNBV and an external auditing firm designated by the SFP. Under the law establishing the SFP's responsibilities, to date the Dirección General de Auditorías Externas [External Audit Bureau] (DGAE) in the SFP has been responsible for coordinating the appointment of external auditors for projects financed by international financial institutions (IFIs).
- 5.8 NAFIN will submit an audited financial statement to the Bank annually, within 180 days after the close of the accounting period, audited by IDB-eligible firms with terms of reference previously agreed upon by the IDB and the SFP. Since NAFIN posts its audited financial statements on its website, it is not considered necessary to request that they be submitted.

## 5. Financial supervision plan

Supervisory activity	Supervision Plan			
	Nature and scope	Frequency	Party responsible	
			Bank	Third party
OPERATIONAL	Review of technical progress of lending activities Disbursements. Inspection visits to the works based on samples	Annual	Fiduciary-financial and technical team	
FINANCIAL	Visit to review/validate control processes for proper recording and monitoring of eligible activities	Biannual	Fiduciary-financial team	External auditor
	Ex post review of disbursements and financial audits	Annual		External auditor
	Review of requests for disbursements and annexed reports	Periodic	Fiduciary-financial team	
	Submission of audited financial statements	Annual	Fiduciary-financial and technical team	Executing agency/ External auditor
	Conditions precedent to the first disbursement	One time	Technical and Fiduciary-financial team	

## 6. Execution mechanism

- 5.9 The technical and financial execution mechanism will be centralized in NAFIN; the operation's commitments and payments will be carried out by the respective technical and financial areas in NAFIN. Coordination with the Bank will be through NAFIN's Dirección de Organismos Internacionales [International Organizations Division], which also functions as financial agent for operations with the federal government of Mexico.