

## Cover Page for CTF Project/Program Approval Request

1. <b>Country/Region</b>	Mexico	2. <b>CIF Project ID#</b>	(CIF AU will assign ID.)
3. <b>Project/Program Title</b>	Geothermal Financing and Risk Transfer Facility		
4. <b>Terms and Amount Requested in million USD equivalent</b>	<p><b>Public sector</b>  <i>IP:</i>  Loan/guarantee  Harder terms: 31.5  Softer terms:  Grant: 2.8  Fee: 0.0  Total IP: 34.30</p> <p><i>DPSP:</i>  Contingent Recovery Grant: 20.0  Total DPSP: 20</p> <p><b>Total IP and DPSP: 54.3</b></p>		
5. <b>Implementing MDB(s)</b>	Inter-American Development Bank		
6. <b>National Implementing Agency</b>	Nacional Financiera (NAFIN)		
7. <b>MDB Focal Point</b>	calatorre@iadb.org		
8. <b>Brief Description of Project/Program (including objectives and expected outcomes)</b>	<ol style="list-style-type: none"> <li>1. The objective of the program is to increase power production from geothermal sources and to reduce both the dependency on fossil fuels and GHG emissions in Mexico. The program intends to scale up private investment in geothermal power generation projects by making available financial mechanisms tailored to meet the specific needs of each project's stage of development, and targeted at reducing Value at Risk for developers and removing the main barrier to investment. The IDB considers this the most effective structure to mobilize continued financing for the development of geothermal projects.</li> <li>2. CTF resources under the <a href="#">Mexico Revised Investment Plan</a> (IP) in the form of a harder concessional loan are requested to be blended with IDB/NAFIN resources for financing at all stages of the development of the projects. In the construction and operation phase (once sufficiency and stability of the resource have been proven), only standard financing tools (ordinary, subordinate or concessional debt, but also contingent finance and guarantees) will be used. Loans will also be approved for projects in earlier stages, with the support of CTF contingent recovery grant resources and Government of Mexico (GoM) budgetary resources.</li> <li>3. CTF resources from the <a href="#">Dedicated Private Sector Programs</a> (DPSPs) are requested in the form of a contingent recovery grant to support the deployment of risk mitigation instruments specifically designed to maximize leverage and to back the financing of the projects, making them bankable and diminishing the VAR, namely: <ul style="list-style-type: none"> <li>• Loans convertible to grants will be used for projects in exploration and test drilling phases, where specific incremental risks (i.e. resource risks) are highest. IDB/NAFIN/CTF exploration loans will be made available through NAFIN to developers for early drilling. CTF contingent recovery grant funding will cushion the risks operating</li> </ul> </li> </ol>		

as a guarantee. In case of success, the project will become eligible for financing in the next stage. However, support on an individual project basis will be capped and should not mount up as the project progresses through a refinancing operation that will lead to the next stage of development, where the project will be eligible for further (not additional) support. Any upside will be captured by the CTF through a recovery clause based on the share of CTF in the financing of the development. In case of partial or total exploration failure, the guarantee will be called and the share of capital required will increase in further stages, if the project remains at all eligible.

- Grants to partially cover insurance and insured loan premiums and/or rates will be used in the field development, production and re-injection drilling phases. Because insurance policies are still in the process of development, the costs for a project to assume the associated premiums are fairly high and a subsidy is needed to make insured exploration financially viable. CTF contingent recovery grant funding (together with GoM funds) will offset these upfront costs, sharing with developers the cost of the insurance premium for a policy to cover IDB/NAFIN/CTF or commercial exploration loans. Success cases will return the support received.
4. A graphic description of the design can be seen in the Financing Scheme Flowchart enclosed (Annex 1) and a brief account of the choice of instruments in Annex 2. The specific modalities of support (convertible loans and/or insured loans), the amount of CTF/GoM support in each of those and the share of risk to be borne by developers will be determined on a case by case basis depending on the characteristics of the project. The program is designed to optimize the use of funding available in terms of leverage and sustainability, investing grant resources only where they are most efficient and where they leverage the most financing.
  5. CTF contingent recovery grant resources to support projects shall be administered through a special account at NAFIN. This account will receive any income from the investment of its funds as well as reimbursements from sub projects (including upside windfalls) and fees charged for their use. Preliminary calculations put a reasonable target in using the total resources (CTF+GoM) in 15 technically and financially viable projects over the execution period, their revolving nature will however be limited by the success/failure rates of projects. Any remaining grant funds after 10 years shall be returned to the CTF.
  6. Private developers will always be asked to take on substantial risk. Minimal capital requirements range from 25 to 75%, depending on risk levels and track record (support capped per project). These requirements, together with a thorough technical, economic and underwriting due-diligence of projects by an independent expert/ insurance company, will limit moral hazard.
  7. Regulatory barriers associated with the current lack of concessional regime will be removed once the Mexican Congress passes the Geothermal Law due in April 2014, which will give greater certainty to both investors and financiers.
  8. The program is classified as public as it will be implemented by the public sector arm of the IDB, with a sovereign guarantee from the Government of Mexico (for the loan component). However the program targets private and private-led PPP projects.
  9. The program will receive additional public support in several forms: (a) grant resources from

the Energy Transition Fund (FOTEASE) will aim at overcoming geothermal reservoir risks and enabling projects to advance towards subsequent phases of development through grants to partially cover private insurance and insured loans premiums and rates; (b) the creation of a Center for Geothermal Excellence, aimed at creating and transferring knowledge, and (c) the development of a business unit within CFE to promote Public Private Partnership's (PPP) and to engage the private sector more broadly.

10. IDB is also submitting the “Chile Geothermal Risk Mitigation Program” proposal, and is planning to submit a geothermal proposal for Colombia. The simultaneous execution of these geothermal risk mitigation programs will offer opportunities for the exchange of experiences between the different stakeholders.

### 9. Consistency with CTF Investment Criteria

See Annex I “Fit with CTF Investment Criteria”

- (1) Potential GHG Emissions Savings: see Annex I, p. 1
- (2) Cost-effectiveness: see Annex I, p. 1
- (3) Demonstration Potential at Scale: see Annex I, p. 1
- (4) Development Impact: see Annex I, p. 2
- (5) Implementation Potential: see Annex I, p. 3
- (6) Additional Costs and Risk Premium: see Annex I, p. 4

### 10. Stakeholder Engagement

The geothermal development industry has been actively involved in the promotion of financial instruments, and has been engaged in the definition of challenges and barriers. In addition to the engagement through SENER, a firm was hired by IDB to support the preparation of the project and performed extensive interviews with the developers.

In the framework of the Revision of the Investment Plan in March 2013 and the preparation of the Second Investment plan in August 2013, meetings with relevant stakeholders from civil society and the private sector were held.

### 11. Gender Considerations

See Annex I “Fit with CTF Investment Criteria”, p. 6

### 12. Co-financing Indicators and Targets (consistent with results framework)

Core Indicators	Targets
(a) New Geothermal Capacity installed as a result of the intervention	300 MW
(b) GHG emission reductions (in 30 years of operation)	33 MtCO <sub>2</sub>
(c) Total Financing Mobilized (including both successful and unsuccessful projects and equity)	1145.7 MUSD

<b>Development Indicator(s):</b>		
Jobs created by the development of the technology <sup>1</sup>		5,400
Security of Supply		Reduction of a 2% of the imports of natural gas in 2020
<b>13. Co-financing</b>		
	Please specify as appropriate	Amount (in million USD)
• Government	NAFIN, SENER and others	65.8
• MDB		54.3
• Private Sector		1025.6
• Bilateral		
• Others		
<b>Total</b>		1145.7
<b>14. Expected Date of MDB Approval</b>		
April 2014		

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<sup>1</sup> The construction of geothermal generation plants means employment opportunities, especially but not only, during the construction phase. This indicator will be estimated but not directly measured, since a valid figure for indirect jobs is uncertain. NAFIN will gather information on social/developmental effects as projects progress.

**MEXICO**

**CTF – GEOTHERMAL FINANCING AND RISK TRANSFER FACILITY  
(ME-L1148)**

**CTF – GEOTHERMAL FINANCING AND RISK TRANSFER FACILITY  
(ME-G1005)**

**FOURTH INDIVIDUAL OPERATION UNDER THE CONDITIONAL  
CREDIT LINE FOR INVESTMENT PROJECTS (CCLIP)  
(ME-X1010)**

**PROPOSAL FOR OPERATION DEVELOPMENT**

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## ABBREVIATIONS

CCLIP	Conditional Credit Line for Investment Projects
CFE	<i>Comisión Federal de Electricidad</i> (Federal Commission of Electricity)
CO <sub>2</sub>	Carbon Dioxide
COPAR	<i>Costos y parámetros de referencia para la formulación de proyectos de inversión del sector público</i> (Reference costs and parameters for the formulation of public sector investment projects)
CTF	Clean Technology Fund
ESMAP	Energy Sector Management Assistance Program
ESMS	Environmental and Social Management System
GHG	Greenhouse Gas
IDB	Inter-American Development Bank
IEA	International Energy Agency
IGA	International Geothermal Association
IIE	<i>Instituto de Investigaciones Eléctricas</i> (Electric Research Institute)
INECC	<i>Instituto Nacional de Ecología y Cambio Climático</i> (National Institute of Ecology and Climate Change)
IPP	Independent Power Producer
kWh/MWh/GWh	Kilowatt-hour/Megawatt-hour/Gigawatt-hour
LGCC	<i>Ley General de Cambio Climático</i> (Climate Change Law)
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
PwC	Price Waterhouse Coopers
RE	Renewable Energy
SENER	<i>Secretaría de Energía</i> (Ministry of Energy)
TC	Technical Cooperation
tCO <sub>2</sub> e	Ton of Carbon Dioxide Equivalent
UNFCCC	United Nations Framework Convention on Climate Change



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

<b>Financial Terms and Conditions</b>				
<b>Borrower and Executing Agency:</b> Nacional Financiera S.N.C				
<b>Guarantor:</b> United Mexican States				
Source	Amount	%		
IDB ME-L1148 (OC CCLIP ME-X1010)	54.3	45.2	<b>Flexible Financing Facility*</b>	
			Amortization / Grace period:	24 / 6.5 years
			Original weighted average life:	15,25 years
			Disbursement period:	6 years
			Interest rate:	LIBOR based
			Inspection and supervision fee / Credit fee:	**
			Currency: U.S. dollars from the Ordinary Capital	
CTF LOAN ME-L1148	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	
CTF GRANT ME-G1005 ***	22.8	19.0	<b>CTF Non reimbursable</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 precedent to the first disbursement:</b> prior to the first disbursement of the program, the Executing Agency (EA) will provide evidence, to the Bank's satisfaction of the entry into effect of the program's Operating Regulations (OR) agreed with the IDB (¶2.9) ) and the eligibility conditions for all components of the program must have been met.</p>				
<p><b>Exceptions to Bank policies:</b> None</p>				
<p><b>Project consistent with country strategy:</b> Yes [x] No [ ]</p>				
<p><b>Priorities of the Lending Program:</b> Lending to support climate change initiatives, renewable energy and environmental sustainability.</p>				

(\*) 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 (20MUSD) and 2.8MUSD grant from the Investment Plan.

## 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 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 a study carried out by the National Institute of Ecology and Climate Change (*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>2</sub>e, 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 1.1).

**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); 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

<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](#) (<http://bit.ly/StatusGeo>)(<http://bit.ly/StatusGeo>)

<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) ([http://bit.ly/Invest\\_Parameters](http://bit.ly/Invest_Parameters)) 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](#) (<http://bit.ly/PotentialMex>) 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.

*Comisión 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. First, 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 40 years. However, due to its legal obligation to produce electricity at the lowest possible price, CFE has lately underinvested in

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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 ([http://bit.ly/Survey\\_2010](http://bit.ly/Survey_2010))

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 recently approved Energy Reform<sup>17</sup> (December 2013) 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>18</sup>. Finally and most importantly, a concessional regime will be passed by Law within the month of April 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> See ([http://bit.ly/Reform\\_Summary](http://bit.ly/Reform_Summary))

<sup>18</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>19</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 to be ready for approval in April 2014. Ultimately however, even if these ongoing efforts were to overcome every legal issue<sup>20</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>21</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 while; (iii) the construction and operation phase (only once sufficiency and stability of the resource have been proven) 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>22</sup>.
- 1.15 IDB's previous experience with development banks in Mexico –specifically NAFIN– in the development of financing solutions for clean energy projects has proven viable and effective with a number of programs under the CCLIP ME-X1010 (ME-L1051, ME-L1081, ME-L1109 and ME-L1119, with CTF<sup>23</sup>

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<sup>19</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>20</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>21</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) for as much as three decades. 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>22</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.

<sup>23</sup> Clean Technology Fund. See ¶2.1 for details.

- cofinancing), all of which had objectives related to the support of private sector investment in power generation plants using renewable sources<sup>24</sup>.
- 1.16 **Magnitude of resources needed.** Investment costs for a high heat 30 MW plant with 2,000 m deep wells in Mexico are estimated on US\$120 million (US\$4 million per MW) (PwC, 2012)<sup>25</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.
- 1.17 **Alignment to the development goals and country strategy.** The program is aligned with the [Ninth Capital Increase](#) (GCI-9), in the areas of "Environmental protection, response to climate change and food security", contributing to the reduction of GHG emissions, and "Institutions for growth and social welfare", contributing to the development of the financial markets. In addition, it qualifies under the financing priority "Lending to support climate change initiatives, renewable energy and environmental sustainability". The program is also consistent with the IDB Integrated Strategy for Climate Change Adaptation and Mitigation, and Sustainable and Renewable Energy (GN-2609-1) and the Sector Strategy Institutions for Growth and Social Welfare (GN-2587-2).
- 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 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 Energia 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

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<sup>24</sup> These interventions have contributed to wind sources having already gained momentum. 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>25</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>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.

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](#), approved by Congress (December 2013), 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<sup>29</sup>. The reform puts forward the intention to promote the diversification of sources for power generation (including renewables)<sup>30</sup>. Within this overhaul, the geothermal legislation is expected in April<sup>31</sup>. On the other hand, the Financial Sector Reform<sup>33</sup> 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 mechanisms as well as various forms of financing for exploration, drilling, field development and construction and operation phases of projects (see Annex IV List of Instruments).

**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 Clean Technology Fund (CTF) to share drilling costs 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>34</sup>), will aim at overcoming geothermal reservoir risks and enabling projects to advance towards subsequent phases of development also through grants to partially cover private insurance and insured loans premiums and rates. The instruments to be used are presented in Table 1.2

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

<sup>29</sup> See ([http://bit.ly/Power\\_and\\_Gas\\_reform\\_Analysis](http://bit.ly/Power_and_Gas_reform_Analysis))

<sup>30</sup> It is expected that primary and secondary legislation on geothermal will be passed after Congress’ decision.

<sup>31</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.

<sup>33</sup> See [http://bit.ly/Reforma\\_Financiera\\_MEX](http://bit.ly/Reforma_Financiera_MEX)

<sup>34</sup> *Fondo de Transición Energética y el Aprovechamiento Sustentable de la Energía*, [Solicitud FOTEASE](#).



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

Fund source	Eligible expense	Instrument	Pre-conditions for sub projects
Clean Technology Fund (CTF) - DPSP / Contingent Recovery Grant <sup>35</sup>	Exploration and test drilling activities of a geothermal power generation project.	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 <sup>36</sup> .
CTF-DPSP plus Local - FOTEASE SENER Grant	Partial payment of premium/interests for insured loan	Grant	Loan agreement between NAFIN and the developer + Insurance policy + a grant agreement between the grant fund and the developer to reimburse a share of the premium/interest payments.

- 1.22 **Component II. Financing adapted to different phases of project exploration and development:** NAFIN will use IDB resources from the CCLIP ME-X1010<sup>37</sup> along with CTF loan resources 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 PPP geothermal projects<sup>38</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 the private sector, and mobilizing capital to grow the industry in the long term (demonstration effect).
- 1.23 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 Annex I Financing Schemes Flowchart)..
- 1.24 **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. SENER is committed to establishing an office with the technical capacity and competence over future activities. Resources for information sharing, project structuring (supporting CFE

<sup>35</sup> 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).

<sup>36</sup> Grant is only disbursed if the debt is partially or totally condoned due to failed drilling.

<sup>37</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>38</sup> Power generation projects under the IPP, small producer or self-supplier modalities.

- in its search for a new PPP business model), technical studies and other minor costs are also considered in this envelope.
- 1.25 The intended beneficiaries of the program will be private developers of geothermal projects<sup>39</sup>. Privately led PPPs 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 ¶2.5). 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.
- 1.26 This program is linked to a number of TCs (including ME-T1161, ME-T1204, ME-T1168 and ME-T1089, 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>40</sup>. In addition, the Regional TC “*Apoyo Técnico a Bancos de Desarrollo con Estrategias de Financiamiento para la Mitigación al Cambio Climático*” (ATN/MC-13341-RG) may 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.
- 1.27 **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.
- 1.28 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>41</sup>. Based on estimated reductions of CO<sub>2</sub> emissions over the course of a 30 year lifetime of projects financed, and using indicative

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<sup>39</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>40</sup> A new TC (US\$100,000) is expected to be approved in the first quarter of 2014 to address remaining regulatory gaps for geothermal development in Mexico. A Regional Cooperation Program (US\$500,000 to US\$1,000,000) to promote geothermal development through technical studies and financial advisory is also under preparation.

<sup>41</sup> Estimations use an average emissions factor for electricity in Mexico (0.5 kgCO<sub>2</sub>/kWh) and a 84% load factor.

total resources of US\$54.3 million from the CTF, 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 are considered.

- 1.29 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<sup>42</sup> 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: (i) renewable energy; (ii) sustainable transport; and (iii) energy efficiency are eligible under the CTF. CTF resources 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>43</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

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<sup>42</sup> As of 2012, contributors had pledged US\$5.2 billion for the CTF (CIF 2012 Annual Report).

<sup>43</sup> See [CTF financial products, terms and procedures](#) for public sector operations.

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 The program will be executed under the two components previously described:

**Table 2.1.- Costs of the program by source and component (USD million)**

Cost component	IDB	CTF	Local <sup>44</sup>	Total
<b>Component I. Risk mitigation for early drilling phase</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>

- 2.5 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>45</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 Annex III 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.
- 2.6 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 ¶1.26).
- 2.7 **Disbursement and execution periods.** CTF/IDB resources are to be fully committed and disbursed within six years from the effective date of the loan agreement. Due to the phased approach of the program, resources from the IDB may be disbursed in a different schedule than CTF resources. In view of the need to preserve the leverage ratios required by the CTF and taking into consideration the need to provide the program and NAFIN with a certain degree of flexibility, the contract will establish a mechanism for non-simultaneous disbursements.

<sup>44</sup> 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>45</sup> Additional financing could be provided by NAFIN, commercial banks and/or other donors and multilateral institutions.

- 2.8 **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.
- 2.9 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 Optional Document 3 Sub-project Expense Recognition). In addition to the conditions prescribed in General Norm Article 4.01, it is a condition prior to the first disbursement of the program that NAFIN provides evidence of the entry into effect of the OR agreed with the IDB.
- 2.10 The IDB may recognize eligible expenditures incurred by the beneficiary as of the date of approval of the POD by QRR and up to 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 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.
- 2.11 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**

- 2.12 **Environmental and social safeguard risks.** According to Directive B.13 of the Environment and Safeguards Compliance Policy (GN-2208-20 and OP-703 Manual), 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>46</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 (see Annex VI).. 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 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.

- 2.13 **Development risks.** Although substantial capacity already exists in Mexico, a medium risk of having limited or insufficient human capacity (specific geothermal technical expertise) to accompany the pace of development of projects supported has been identified. Several aspects are considered for mitigation of this risk, including overseeing with SENER the advances 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 knowledge transfer from third party technical expertise to develop local competences.
- 2.14 **Fiduciary risks.** No risks are foreseen. NAFIN has extensive experience with the Bank<sup>47</sup>. 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.

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<sup>46</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.

<sup>47</sup> Loans 2843/OC-ME (ME-L1119), 2226/OC-ME (ME-L1051), and 2671/OC-ME (ME-L1081) –also involving renewable energy projects– from the CCLIP ME-X1010, and 2631/TC-ME (ME-L1109) which includes CTF resources, have been successfully implemented.

### III. IMPLEMENTATION AND MANAGEMENT PLAN

#### A. Summary of implementation arrangements

- 3.1 The borrower and executing agency 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>48</sup>. In this sense, NAFIN has been working on: (i) the development of a portfolio of eligible projects; (ii) improving their technical, financial and environmental capabilities, in both the energy and infrastructure sectors and with IDB support<sup>49</sup>; and (iii) strengthening their network of intermediaries with capacity to channel funding to high risk projects.
- 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>50</sup>, proving to be an executor with extensive experience in the management of resources to support private sector projects focused on energy efficiency, energy generation from renewable sources and, in general, to promote sustainable development.
- 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.
- 3.5 **Financial Statements.** During the disbursement period, NAFIN is required to submit audited financial statements of the program within 120 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 120 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.

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<sup>48</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>49</sup> In August 2013 the IDB granted US\$135,000 of nonreimbursable funds to NAFIN as part of the Regional TC ATN/MC-13341-RG (see ¶1.26).

<sup>50</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, and participation 13 financial intermediaries.

**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 specific reporting obligations to the CTF<sup>51</sup>. Based on the Results, the Monitoring and Evaluation Plan and the fulfillment of the eligibility criteria at the project and program level, all these 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.

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<sup>51</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 at a programmatic level. Such internal mechanism is a work in progress.



## FIT WITH CTF INVESTMENT CRITERIA

### *Fit with Mexico's Investment Plan and with the Dedicated Private Sector Programs*

Mexico's Investment Plan, revised in May 2013 and endorsed by the TFC of the CTF, includes USD34.3 M for a geothermal risk mitigation program.<sup>1</sup> Additionally, USD20 M resources from the Dedicated Private Sector Programs, endorsed in October 2013, were allocated to Mexico for the development of further instruments to promote private geothermal development in the country. **This proposal combines the two sources in a comprehensive Facility that offers a range of financial and risk mitigation mechanisms tailored to meet the specific needs for each project's stage of development**, namely: (i) exploration and test drilling, where risk and/or cost sharing instruments are combined with lending to reduce Value at Risk for developers, hence removing the main barrier to investment; (ii) field development, production and re-injection drilling, where risk mitigation instruments may be developed with the private sector (insurance) to deal with the still relatively high risk levels, and can be combined with lending; (iii) construction and operation phase (only once sufficiency and stability of the resource have been proven), which requires more standard financing tools (ordinary, subordinate or concessional debt, but also contingent finance and guarantees). CTF resources from DPSP (together with Government funds) are used to reduce risk and back the financing of the projects, a role that is deemed especially critical in the early exploration phase, while resources from the IP will contribute to financing projects at all stages, even after risk levels are reduced and projects are closer to commercial financing.

### *Potential for GHG Emissions Savings*

The Results Matrix (Annex I) outlines the indicators and the means to verify the accomplishment of the program's targets. Using conservative estimates, the program is expected to finance 6 geothermal power plants producing electricity by 2024, with a capacity of 50 MW each. This would lead to emissions savings of around **1.10 MtCO<sub>2</sub>** per year<sup>2</sup>. With these, the total resources invested (CTF IP + IDB +CTF DPSP) would deliver estimated emissions reductions of **33 MtCO<sub>2</sub> in 30 years of operation of the plants**.

### *Cost-effectiveness*

Based on estimated reductions of CO<sub>2</sub> emissions over the course of a 30 year lifetime of projects financed, and assuming US\$54.3 million from the CTF, the investment per ton is USD1.64 per ton of CO<sub>2</sub>e, considering only the CTF resources; USD3.64/tCO<sub>2</sub>e considering the resources from the CTF, the IDB and the government, or USD 36.36/tCO<sub>2</sub>e, considering overall investment (USD 1,200M, including private sources).

An assessment of the Marginal Abatement Cost (MAC) for geothermal power in Mexico was carried out as part of the [Low Carbon Development Study for Mexico](#) (2009)<sup>3</sup>. The result is a MAC of 11USD per tCO<sub>2</sub>e (positive).

### *Demonstration Potential at Scale*

Scope for avoided annual GHG emissions. A [recent study](#) commissioned by SENER conservatively estimates the potential capacity to be installed in the medium term at 2,200 MW<sup>4</sup>, although estimations

<sup>1</sup> This amount has been modified by IDB from 34.4M, as an update of the Revision of the IP allocated 2.1 (instead of 2.0 M ) to the FIRA Green Line project.

<sup>2</sup> Estimations made using the average emissions factor for electricity in Mexico (0.5 kgCO<sub>2</sub>/kWh) and a 84% load factor.

<sup>3</sup> <http://bit.ly/lcdmex>.

<sup>4</sup> See [analysis of the sector in Mexico](#) (SENER/PwC, 2012).

vary widely. According to the same source, such geothermal development would allow capture 14% of the abatement potential in the energy sector CO<sub>2</sub> emissions in 2020, decreasing **8.4 MtCO<sub>2</sub>** in that year.

**Transformation Potential.** This program combines CTF concessional resources (US\$ 54.3 million) with IDB (US\$ 54.3million) and resources from the Mexican Government (US\$ 11.5 million), **leveraging an USD 1145.7 million from third party sources<sup>5</sup> up to a total of US\$1,200 million total resources** (including program and third party, public and private financing plus capital resources). The goal of the Program is to trigger investment in geothermal energy in Mexico, helping project developers overcome financial barriers, creating security for investors and advancing knowledge for financial institutions so that a track record for private intervention is established and the enormous potential of Mexico is unlocked. The Program includes a technical cooperation component that will ensure the building of capacity within NAFIN and SENER in order to guarantee the sustainability of the Program, as well as foster synergies with other related initiatives, such as the Geothermal Excellent Training center in El Salvador and the recently presented Geothermal Excellence center in Mexico. **The innovative approach of the Program**, using a multiple array of instruments and combining support from the Government, as well as incentives for private developers for the first time in Mexico, **will trigger an increase in the participation of geothermal energy in the energy matrix.**

The program also has **a multiplier effect**, as it is designed to optimize the use of funding available in terms of leverage and sustainability investing grant resources only where they are most efficient and where they leverage the most financing. Continuing these efforts should allow for the development of a sustainable framework in the long term, after demonstration of the benefits of investing in geothermal with the support of risk mitigation instruments 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 that could help facilitate the development of solutions for geothermal energy projects in the long term. Finally, the regulatory reform to which the program contributes should also multiply geothermal investment as it removes the last roadblocks for developers.

If successful, the comprehensive intervention will be used as a model for additional projects in the Region and in other parts of the world. The IDB is currently preparing two Geothermal Development Programs with CTF resources in Colombia and Chile, and the synergies will be sought and knowledge transfer will be guaranteed. In addition, the IDB is participating in the Geothermal Development Facility in Latin America (GDFLA), coordinated by KfW, which aims at supporting early exploration drilling in the Region. The Programs in Mexico<sup>6</sup> will be an integral part of the facility and the experience will be transferred to the pipeline of projects under development.

### ***Development Impact***

Geothermal energy 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. 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 technologies. The construction of the plants is more labor intensive than comparable energy sources (See Green Jobs through Geothermal Energy (GEA, 2010<sup>7</sup>) (resulting in benefits for local population. From an energy and environmental perspective, the expansion of geothermal in Mexico is fully justified.

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<sup>5</sup> Additional estimations based on a 70:30 debt to equity ratio, investment costs of US\$5 million per well and US\$4 million per MW installed, and US\$120.1 million financing from the program. Financing may come from NAFIN, and from other public or private banks.

<sup>6</sup> And Chile and Colombia.

<sup>7</sup> <http://bit.ly/Geojobs>

Developing additional 300 MW have positive impacts on economic and social terms<sup>8</sup>:

- a. It would impact the GDP an equivalent to 0.10% of the 2011 GDP.
- b. Generate more than 5.400 jobs.
- c. It would increment the security of supply by reducing a 2% of the imports of natural gas in 2020.

### ***Implementation Potential***

In the last decade, Mexico has successfully 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>9</sup>.

The Energy Reform (whose general guidelines were approved in December 2013) will further improve the framework for renewable energy generation, as it has among its objectives the expansion of clean technologies, the development of new infrastructure and the strengthening of the regulation to create security for investors<sup>10</sup>, as well as the creation of new market mechanisms.

Currently, it is the water resource regulations which govern access to geothermal resources. However, defined **concession areas for geothermal –which would avert the risk of free riders exploiting the same area– do not yet exist**. In order to address this problem, the Mexican Congress announced in the Energy reform the **development of a concessional regime** to be mandated by Law within the month of April 2014<sup>11</sup> according to the calendar envisaged, giving greater certainty to both investors and financiers<sup>12</sup>.

**SENER has strongly supported the design and preparation of the project and has taken geothermal development as a priority in the new administration**, as shown in the Geothermal Energy Forum organized in October in Mexico City, together with the IDB, the World Bank and other organizations.

The government has made progress in the promotion of technology development and has announced the creation of a Center of Excellence on Geothermal, endowed with an estimated budget of USD77 million<sup>13</sup>.

The borrower and executing agency for the program, Nacional Financiera, S.N.C. (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. In this sense, NAFIN has been working on: i) the development of a portfolio of eligible projects, ii) improving their technical, financial

<sup>8</sup> Quantification of the macroeconomic impact has been carried out using the Input-Output methodology, based on the latest Input-Output matrix prepared by the INEGI (Instituto Nacional de Estadística y Geografía de México). (<http://bit.ly/IOModel>)

<sup>9</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>10</sup> The involvement of non-fossil fuels in the generation for public service was app. 18.3% of the energy generated in 2012 (SENER, 2013), so the Energy reform requires investments diversify energy sources and increase the installed generation capacity in Mexico.

<sup>11</sup> The IDB has supported the Government with technical inputs for the Law.

<sup>12</sup> Article 27 establishes the right of private actors to engage in generation and distribution of electric energy under the modality of contract with the Mexican State. Transitory disposition number 3 establishes the CFE, while the Reform is finalized, may enter into contracts for electricity transmission and distribution. Transitory Disposition number 11 establishes that the Mexican Congress shall provide by law the modalities for recruitment for individuals on behalf of the Nation, carried out, among others, financing, installation, maintenance, management, operation and expansion of the infrastructure to provide public service broadcasting and distribution of electricity.

<sup>13</sup> <http://thinkgeoenergy.com/archives/17380>

and environmental capabilities, in both the energy and infrastructure sectors and with IDB support , and iii) strengthening their network of intermediaries with capacity to channel funding to high risk projects.

**NAFIN is a solvent institution with exemplary 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 cofinanced approximately USD400 million and managed more than USD3,000 million in total financing of renewable energy projects, proving to be an executor with extensive experience in the management of resources to support private sector projects focused on energy efficiency, energy generation from renewable sources and, in general, to promote sustainable development.

Regarding the evaluation of the technical proposals, the Program includes support to NAFIN to (i) define the technical documentation required to conduct due diligence ; (ii) perform technical due diligence of evaluating the quality geothermal projects geothermal-consistency model and the technical feasibility of the proposed project and (iii) analyze the drilling program indicating whether (1) the procedures for drilling and safety systems are implemented to achieve the correct safety requirements and environmental protection, (2) the specific objectives, the minimum expectations and expected outcomes geothermal are consistent with the proposed preliminary geothermal model.

The Energy Regulatory Commission (CRE) plays a relevant role and has a 12 year experience in the development of regulations for Renewable Energy in Mexico. As a promoter of electricity generation by private developers, it has issued permits for renewable energy generation and will play a very relevant role in the expansion of geothermal energy in Mexico.

The Federal Electricity Commission (CFE) is the fourth producer of geothermal energy in the world and has 40 years of experience in developing geothermal fields in the country. This program seeks to build on this expertise by fostering PPP business models, taking advantage of the impressive body of knowledge that the institution has gathered.

Even though the geothermal development industry is practically at a nascent stage in Mexico, there are already several firms that are investing resources in exploratory studies and exploration drilling. These firms have vast experience internationally and are backed by solid technology providers<sup>1415</sup>.

### ***Additional Costs and Risk Premium***

The Program aims to develop a pipeline of geothermal projects in Mexico and tackle the financial barriers encountered by private developers to access to financing sources. Lack of knowledge and absence of a performance record negatively affects investors and financiers. **As long as financial institutions do not understand the economics of geothermal technologies and develop methodologies to evaluate the feasibility of the projects, risk will be perceived as unbearable even after discovery**, financing will be unavailable and developments will have to rely exclusively on scarce and expensive capital resources, slowing down or precluding investment in the sector.

CTF resources will be able to provide financing **currently not available in the market**. Through the generation of a track record and knowledge for investors, financial institutions, institutions and developers, the perceived risks will be lower and additional finance will be available to further develop the sector in Mexico. The option of a public sector company was extremely successful in Mexico for at least 40 years. However, die to the scarcity of public resources and the stringent requirements for their

<sup>14</sup> <http://bit.ly/1fgSfhT>

<sup>15</sup> <http://www.energias-renovables.com/articulo/alstom-construira-en-mexico-una-central-geotermica-20131219>

use, **CFE has lately underinvested in geothermal vis-a-vis fossil fuel plants with shorter lead times and higher returns.** Hence, consensus on the need for financial support to develop geothermal power generation has been reached.

Consistent with its principles and objectives, **CTF funding will take risks that commercial lenders are not able to bear**, crowding in the private sector by catalyzing investment that would not have happened otherwise. Resources from the Utility-Scale Renewable Energy Program (DPSP) will be concentrated on riskier phases of exploration, following its objective to prioritize available concessional funds towards exploratory drilling and geothermal resource validation.

While IDB/NAFIN/CTF concessional loans will be made available for early exploration, these are not expected to significantly alter the risk/reward ratio of the exploration, and lending needs to be combined with risk sharing instruments. The IDB considers this a most effective structure to mobilize financing for the early phase of development of geothermal projects, where specific incremental risks (i.e. resource risks) are high. The involvement of NAFIN and the private banking and insurance sectors should maximize leverage from public and private sources, accelerate and scale-up finance to a larger number of private projects, enable the conditions for a sustainable development of the geothermal sector and reduce the need for subsidies in the future.

Specifically, the resources will be used as follows:

**CTF IP** resources in the form of a harder concessional loan are requested to be blended with IDB/NAFIN resources for financing at all stages of the development of the projects.

**CTF DPSP** resources will be requested in the form of a contingent recovery grant<sup>16</sup> to support the deployment of risk mitigation instruments, specifically designed to maximize leverage of CTF resources and to back the financing of the projects, making them bankable and diminishing the need of capital, namely:

*Loans convertible to grants.* IDB/NAFIN/CTF IP exploration loans will be made available through NAFIN to developers for early drilling (first slim holes or wells). CTF DPSP funding will cushion the risks by operating as a guarantee, fully or partially guaranteeing these loans. DPSP resources will only cover resource risks. The sponsor would have recourse to an agreement with the grant fund (managed by NAFIN) and present a request for it to cover the debt service in the event that any of the specific technical triggers occur.

CTF DPSP funding will cushion the risks by operating as a guarantee, fully or partially guaranteeing these loans. The sponsor/lender would have an recourse to an agreement with the grant fund (managed by NAFIN) and present a request for it to fully or partially cover the debt service in the event of (once technical triggers is ascertained).

*Grants to partially cover insurance and insured loan premiums and/or rates.* Because insurance policies are still in the process of development<sup>17</sup>, the costs for a project to assume the associated premiums are fairly high and a subsidy is needed to make insured exploration financially viable. CTF DPSP grant funding will off-set these upfront costs, sharing with developers the cost of the insurance premium for a policy to cover IDB/NAFIN/CTF IP or commercial exploration loans<sup>18</sup>.

<sup>16</sup> According to the CTF Financing Products, Terms, and Review Procedures, grant financing can be considered on a case-by-case basis for project components with significant risks and innovative financing instruments.

<sup>17</sup> The introduction of an insurance mechanism would bring an important component of financial innovation to the program, as experiences in LAC are fairly limited.

<sup>18</sup> As part of its strategy for the development of geothermal energy, the Government of Mexico has allocated 150 million pesos, to be managed by NAFIN. CTF resources will top up this existing allocation.

**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<sup>19</sup>. These funds will be available to support as many projects as are technically and financially viable over the execution period, the revolving nature will however be limited by the success/failure rate of projects. Any remaining funds after the execution period shall be used in support of geothermal projects consistent with the objectives of the program until resources are fully utilized, under the supervision of NAFIN and SENER. In all cases, a thorough due-diligence of projects by an independent expert/ insurance company is expected to reduce the risk of moral hazard.

Regarding the potential reduction in costs of geothermal development, the industry in Mexico is currently well developed and established, so that in the short term no drastic price changes are expected to occur. However, with the increased support in the Region and worldwide due to the current initiatives under development it is expected that, in the medium to long term the overall cost will be reduced.

### ***Gender Issues***

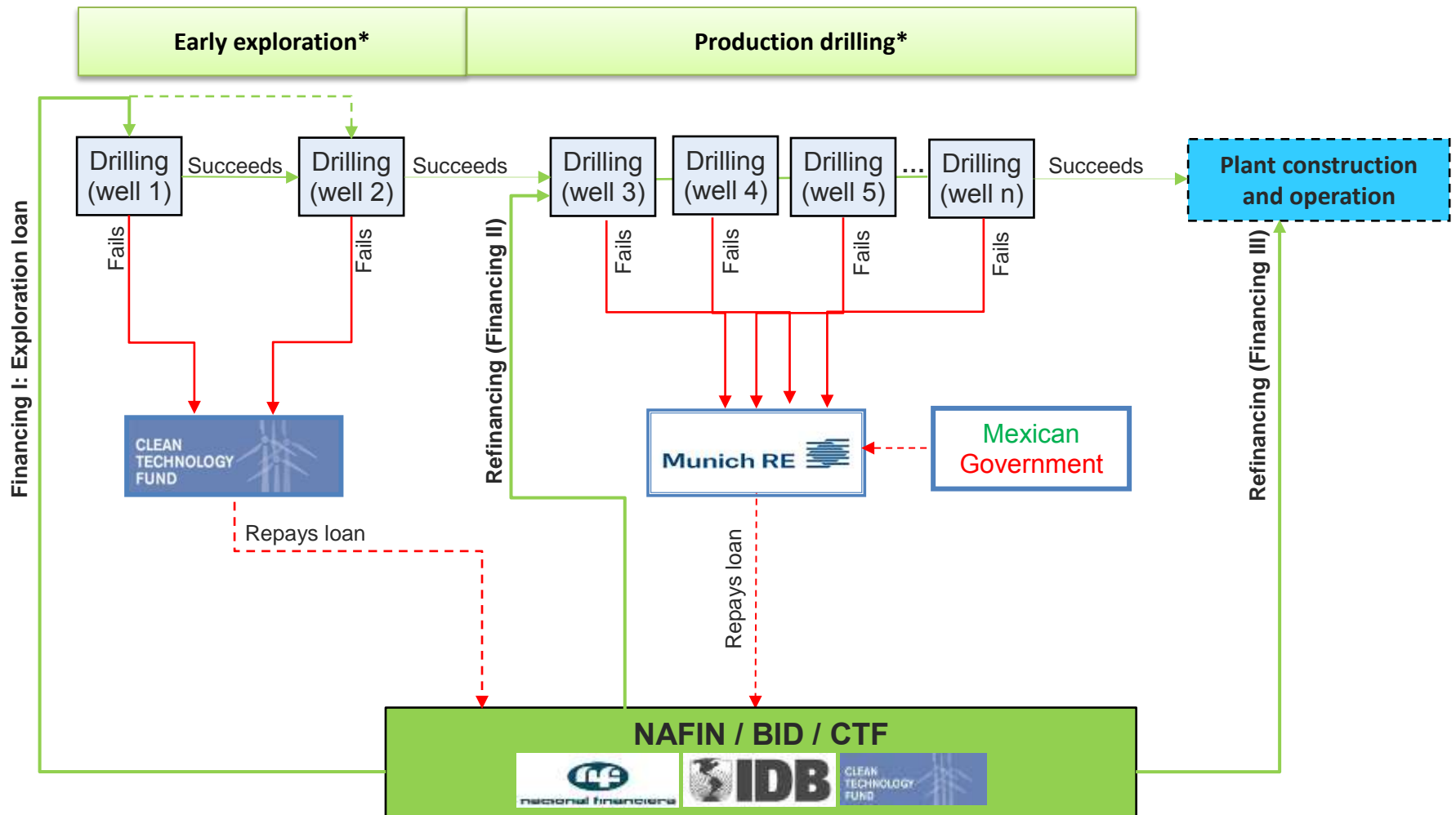
NAFIN will develop a Social and Environmental Management System (SGAS) as required by the IDB, where measures for the removal of any barriers to the equal participation of men and women in the benefit of the projects will be included. NAFIN will also comply with the requirements for consultation and compensation, and will actively promote the inclusion of women in the workplace.

In addition, SENER is currently developing a new framework for public consultation for private sector power generation projects, and seeks to consider women's participation as an important element of such framework.

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<sup>19</sup> A sustainability analysis of costs and optimal conditions on revolving mechanisms for these resources are under study. Specific criteria, including the size of the subsidy, will depend on each type of instrument and will also have an impact on the number of projects that the program is able to support.

**FINANCING SCHEMES FLOWCHART**



\*The number of wells shown is indicative and should not be taken as decisive. The actual number of wells supported per project may vary depending on demand, size of projects financed, type of instrument used, etc., and will be assessed on a case-by-case basis.

## INDICATIVE INFORMATION ON TECHNICAL ELIGIBILITY CRITERIA

The following criteria are preliminary and their purpose is solely to provide the proposal with a guideline. The definitive eligibility requirements will be included in the Operations Regulations (OR) of the program in agreement with NAFIN, the executing agency.

1. Project information:
  - a) Location of the project
    - Detailed description of the planned drilling location(s)
    - Map of planned drilling location(s) and neighboring wells
    - Overview map of concession area and corresponding documentation
  - b) Description of the energy utilization concept (heat/electricity, flash/binary)
  - c) Detailed budget (including contingencies): estimated costs of the project
  - d) Calendar/schedule for project development
  - e) Current status of project development (see Figure 1)
2. Information on all involved parties: project owner, holder of concession and permits, project management, technical team (engineers, geologists, etc.), drilling companies, insurance companies.
3. Geological information:
  - a) Geological setting
  - b) Reservoir system
  - c) Target formation (lithology, depth, thickness, porosity, permeability)
  - d) Expected parameters (temperature, flow rate, draw down, thermal output)
  - e) Geochemical analysis
  - f) Reference data (measured depth, true vertical depth, temperature, flow rate, draw down, inclination, reservoir formation) and production test data of neighboring wells (if available)
  - g) Feasibility studies (due diligence report)
  - h) Other reports/studies/models (e.g report/interpretation of seismic analysis, processing, reprocessing and reinterpretation of old seismic data)
4. References on participation any additional planned projects by the developer



## BRIEF NOTE ON RISK MITIGATION AND FINANCING INSTRUMENTS

- 1.1 The following instruments have been conceptualized to serve as an indicative reference only. Specific financing criteria will be defined as an integral part of the credit regulations.
- 1.2 **Risk mitigation instruments.** The financial instruments available to projects will be loans convertible to grants as well as grants to partially cover insurance and insured loan premiums and rates.
- 1.3 **Grants** may be allocated to projects as a means to share costs of early phase drilling. Relatively straightforward to document, this mechanism would involve the direct disbursement from the grant fund of a percentage amount on the total required investment costs during the early drilling phase based on the fulfillment of specific technical criteria [to be defined]. The biggest advantage of grants as a means to share costs lie on their simplicity. However, the use of CTF resources in this way has been in principle discarded. Although they could be useful and have been used in the past, in the context of available lending for the private sector, their use should be limited to non bankable projects deemed worthy of grant support on account of their broad technical and financial prospects, a category difficult to define. Moreover, the reason for this general limitation is that there are other more efficient ways to use CTF resources, which tend to generate a stable and reliable public and private support system (guarantees and insurance products).
- 1.4 **Loans convertible to grants.** This instrument would be used to provide continuity to the financing of the different phases of development in a project. Each loan tranche would cover investment costs for a phase and be refinanced as the different stages are reached. The loan amount covers a predefined share of the total investment cost, so as to assure that sponsors are sufficiently committed to invest into the project. Only in case that the drilling is unsuccessful would the loan be partially/totally condoned (i.e. become a grant). Threshold standards based on technical results will act as a trigger to conversion from loan to grant.
- 1.5 The grant would hence be documented as a full or partial credit guarantee agreement (up to 100% coverage if considered indispensable) on the expected early drilling financing. Once the pre-established technical trigger is attained, [the sponsors and/or the borrowers] will have the option to request repayment of the current outstanding principal [and interest (if considered indispensable)] through a reimbursement request, which will involve a procedure to assess, document and validate, through an expert independent third party review, the fulfillment of the aforementioned conditions. Once clearance is obtained and all associated costs are paid by the sponsor [if applicable], the reimbursement request is deemed valid, the funds are drawn from the grant fund and disbursed in favor of the borrower to cancel the loan.
- 1.6 The positive aspect of this mechanism is that grant component would only be triggered in the event of failure to develop a viable project; whereas in case of success the financing component would provide sufficient leverage to ease the pressure on capital for developers.
- 1.7 **Grants to partially cover insurance and insured loan premiums and rates.** A similar instrument to the cost sharing drilling mechanism, a grant to partially cover insurance and

- insured loan premiums and/or rates, is fairly straightforward to document and predictable to program in relation to a payment schedule.
- 1.8 In addition, the introduction of an insurance mechanism would bring an important component of financial innovation to the project, as experiences in LAC are fairly limited. Because the insurance policies are still in the process of development, the costs for a project to assume the associated premiums are still fairly elevated and therefore necessitate for a subsidy/concessional component to be financially viable.
  - 1.9 An important consideration from the structuring side relates to the coverage provided by the insurance policy, which requires a proper technical definition and assessment to validate its overall effect on the project's financial viability.
  - 1.10 Both means of support, convertible loans and insured loans, allow for the establishment of mechanisms to recover the support provided, including to share on the upside risks. While equity is the appropriate financial instrument to fully share risk in any venture, the specificity of the risks involved, the complexity of risk capital programs and the fact that public sector involvement in this particular program is in fact targeting the development of a private sector, makes the provision of equity a bad idea.
  - 1.11 **Advanced phases of project development.** The finance structure instruments available to projects will range from direct loans, contingent loans, subordinated loans, first loss guarantees and insured loans.
  - 1.12 *Direct loans.* From a financial perspective, direct loans would involve a loan structured in accordance with the project phase to properly associate the repayment with the cash flow generation of the projects. With a concessional rate component, the direct loan instrument would allow for lower financial costs to facilitate economic viability, but would not mitigate the associated technical risks of the projects.
  - 1.13 *Contingent loans.* A similar financial structure to the direct loan, the contingent loans would allow for the fulfilment of technical conditionality to trigger the execution and disbursement of a loan, therefore assuring repayment in a tenor that would be coherent to the project's future cash flow generation.
  - 1.14 *Subordinated loans.* A similar financial structure to the direct loan, the subordinated loan would imply a lesser priority than the senior loans that also finance the project, but with a higher priority than any capital position. This instrument would be particularly useful in a situation where other lenders need specific comfort on their senior loan.
  - 1.15 *First loss guarantees.* The first loss guarantees is a useful instrument to assume an initial portion of allocated risk with the objective of promoting a potential project that would otherwise not be viable. Typically involving potential losses for a specific threshold, the sponsor would have recourse to a guarantee agreement with the grant fund and present a reimbursement request in the event that any of the specific technical triggers [to be defined] occur.
  - 1.16 *Insured loans.* Insured loans would necessitate for a direct loan to be supported by an insurance policy, based on the conditionality of technical triggers [to be defined] which would allow for a reimbursement to the lender. Technical assessment and validation of the claims would be forthcoming by the insurance appraiser to justify whether the claim can be paid.

## TECHNICAL COOPERATION ACTIVITIES

### 1. Background

- 1.1 The objective of this Technical Cooperation (TC) is to provide support to the CTF – Geothermal Financing and Risk Transfer Facility (ME-L1148). 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 thus reduce both 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 phases of private geothermal projects.
- 1.2 The expected impacts of the program are: (i) electricity production from geothermal sources; (ii) tons of GHG emissions avoided and (iii) geothermal capacity installed. 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.
- 1.3 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 sustainable framework in the long term, after demonstration of the benefits of investing in geothermal has permeated the economy. Moreover, since it is expected that the Program is successful, 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.

### 2. Components of the Technical Cooperation Activities

- 2.1 The CFT Geothermal Financing and Risk Transfer Facility includes technical cooperation activities that can be divide into four components:
- 2.2 **Component 1: Capacity Building:** The barriers that geothermal development encounters are from varied nature, and include financial barriers, regulatory barriers, technical barriers and risk perception barriers. The proposed program targets financial and risk perception barriers though the design of risk mitigation and flexible financing instruments targeted for the different phases in geothermal development, building a track record and triggering investment in the sector. In order to maintain the sustainability of the Program and guarantee the permanence and transfer of the knowledge generated by it, technical workshops for NAFIN, SENER<sup>1</sup> and other Financial Institutions are envisioned. This component would seek synergies with the Geothermal Center for Excellence under creation in Mexico, as well as with the Center for Regional Geothermal Training in El Salvador<sup>2</sup> to

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<sup>1</sup> Or any other Government Agency as determined by SENER

<sup>2</sup> In the framework of the Geothermal Development Facility in LA coordinated by KfW

deliver short-duration workshops and seminars in relevant aspects of geothermal development (regulatory aspects, environmental and social safeguards, financial incentives, risk management, among others) as well as to promote policy dialogue and exchange with other countries with geothermal expertise, such as Chile, Nicaragua, Costa Rica, among others.

- 2.3 **Component 2: Support to the Federal Electricity Commission (CFE).** This component aims at preparing the CFE to develop alternative business models that allow the participation of CFE together with private developers in geothermal projects, taking advantage of the body of expertise in geothermal development generated by CFE in over 40 years. Advisory services would be provided to support CFE in evaluating its assets (i.e. previous studies, permits, land rights, etc.), providing alternatives to optimize the return on those assets in the face of private sector interest and considering the public sector legal constraints and the context of the energy reform. The consultancy would also deliver suggested business structure, standard contracts, procedures and best international practice to have CFE become an active player in the geothermal market through its engagement with the private sector through PPPs or other means.
- 2.4 **Component 3: Support to the GoM in the development of policies and regulations:** The IDB has been supporting SENER in the drafting of specific regulation for geothermal development, which results in the estimated approval in April 2014 of the first Geothermal Development Law in the country. This component envisions the extension of this support in order to further develop the geothermal legislation and includes the following: (i) providing technical inputs to SENER for the development of geothermal legislation, as well as to other agencies (such as CONAGUA) as needed; (ii) providing SENER with a suggested structure and human resources policy for the administrative units that will become necessary for the application of the new regulations and (iii) integration of environmental and social considerations into geothermal projects: this will support the development of environmental and social regulation specifically targeted at complying with the challenges associated with geothermal projects. The development of a protocol for best practice in integrating environmental and social considerations into geothermal products is envisioned, among others specific needs of the Government on a case by case basis.
- 2.5 **Component 4: Technical Evaluation of the proposals, Due diligence of the Projects and Knowledge Transfer activities:** The implementation of the program will include the contracting of third party expertise to support NAFIN in (i) defining the technical documentation required to conduct due diligence ; (ii) performing technical due diligence of evaluating the quality geothermal projects geothermal-consistency model and the technical feasibility of the proposed project ; (iii) analyzing the financial viability of the proposals (iv) analyzing the drilling program indicating whether (1) the procedures for drilling and safety systems are implemented to achieve the correct safety requirements and environmental protection, (2) the specific objectives, the minimum expectations and expected outcomes are consistent with the proposed preliminary geothermal model. However, the expertise needs to be not only contracted to a third party but transferred and shared in order to maintain the sustainability of the program in the long term and ensure the demonstration effect of the Program
- 2.6 For that purpose, the company would also be tasked with the design of a national mechanism to evaluate the financial and technical feasibility of the projects that can be

implemented by NAFIN and the corresponding Government institution (SENER<sup>3</sup>) after the company is no longer involved in the program in order to maintain its sustainability. The mechanisms would be targeted to the different needs and audiences accordingly. The products would include specific training to technical staff at NAFIN and to the Mexican Government. SENER has committed own resources to establishing a coordination unit within SENER in order to continue the promotion and development of geothermal projects even after the Programs has used the resources.

### 3. Structure and resources of the Technical Cooperation Activities:

3.1 The technical cooperation activities will be implemented using resources the CTF Investment Plan.

#### *Indicative Budget and timeframe:*

Technical cooperation components	IP Grant Resources	Execution by
Component 1: Capacity Building for NAFIN, SENER and other Financial Institutions	100,000	December 2015
Component 2: Support to the Federal Electricity Commission (CFE).	300,000	December 2015
Component 3 : Support to GoM in the development of policies and regulations	100,000	December 2015
Component 4: Technical Evaluation of the proposals and Due diligence of the Projects	2.300,000	December 2020
<b>TOTAL (USD)</b>	<b>2.800,000</b>	

<sup>3</sup> Or any other Government Agency as determined by SENER