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COLOMBIA

NATIONAL PROGRAM TO ENSURE A SUSTAINABLE AND EFFICIENT ENERGY SUPPLY

(CO-L1217)

LOAN PROPOSAL

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ABBREVIATIONS

BTU	British thermal units
Col$	Colombian pesos
CREG	Comisión de Regulación de Energía y Gas [Energy and Gas Regulatory Commission]
DNP	Departamento Nacional de Planeación [National Planning Department]
GWh	Gigawatt hours
IRR	Internal rate of return
kW	Kilowatt
kWh	Kilowatt hours
LIBOR	London interbank offered rate
MBTU	Millions of BTU
MHCP	Ministry of Finance and Public Credit
MME	Ministry of Mines and Energy
MW	Megawatts
NCRE	Nonconventional renewable energy sources
NPV	Net present value
PBP	Programmatic policy-based loan
PROURE	Programa de Uso Racional y Eficiente de Energía [Program for Rational and Efficient Energy Use]
SIEPAC	Sistema de Interconexión Eléctrica de los Países de América Central [Central American Electric Interconnection System]
SIN	Sistema Interconectado Nacional [National Interconnected System, the “national grid”]
SINEA	Sistema Interconectado Eléctrico Andino [Andean Electrical Interconnection System]
TJ	Terajoule
UPME	Unidad de Planeación Minero Energética [Mining and Energy Planning Unit]
ZNI	Zona(s) No Interconectada(s) [Non-Interconnected Zone(s)]

PROGRAM SUMMARY

COLOMBIA
NATIONAL PROGRAM TO ENSURE A SUSTAINABLE AND EFFICIENT ENERGY SUPPLY
(CO-L1217)

<table>
<tr><th colspan="5">Financial Terms and Conditions</th></tr>
<tr><td colspan="3" rowspan="2">Borrower: Republic of Colombia</td><td colspan="2">Flexible Financing Facility[a]</td></tr>
<tr><td>Amortization period:</td><td>8 years</td></tr>
<tr><td colspan="3" rowspan="2">Executing agency: Ministry of Finance and Public Credit (MHCP) in technical coordination with the National Planning Department (DNP) and the Ministry of Mines and Energy (MME)</td><td>Original WAL:</td><td>8 years</td></tr>
<tr><td>Disbursement period:</td><td>1 year</td></tr>
<tr><td>Source</td><td>Amount (US$)</td><td>%</td><td>Grace period:</td><td>8 years</td></tr>
<tr><td rowspan="2">IDB (Ordinary Capital)</td><td rowspan="2">300,000,000</td><td rowspan="2">100</td><td>Interest rate:</td><td>LIBOR-based</td></tr>
<tr><td>Inspection and supervision fee:</td><td>[b]</td></tr>
<tr><td rowspan="2">Total</td><td rowspan="2">300,000,000</td><td rowspan="2">100</td><td>Credit fee:</td><td>[b]</td></tr>
<tr><td>Currency of approval:</td><td>U.S. dollars from the Ordinary Capital</td></tr>
<tr><th colspan="5">Project at a Glance</th></tr>
<tr><td colspan="5">Project objectives/description: The general objective is to contribute to the sustainability of Colombia's energy sector through policy reforms that will ensure the efficient supply of electric energy in the National Interconnected System (the national grid) and the non-interconnected zones, to reduce the sector's vulnerability to the effects of climate change and increase access to electric power. The specific objectives are to: (i) ensure a macroeconomic setting consistent with the program's objectives; (ii) help guarantee energy supply from the national grid by diversifying the energy matrix with nonconventional renewable energy sources and increasing international trade in energy, while establishing measures to increase and guarantee the supply of natural gas for power generation, to manage energy demand, and to optimize the functioning of the wholesale energy market; and (iii) promote access to energy in the non-interconnected zones through the use of nonconventional renewable energy sources.

This operation is the first of two consecutive single-tranche loan operations. They are technically linked but are being financed independently under the programmatic policy-based loan modality.</td></tr>
<tr><td colspan="5">Special contractual conditions precedent to the first disbursement: The single loan disbursement will be contingent on compliance with the policy reform measures established in the Policy Matrix (Annex II) and the Policy Letter, and with the conditions established in the loan contract (paragraph 3.3).</td></tr>
<tr><td colspan="5">Exceptions to Bank policies: None.</td></tr>
<tr><th colspan="5">Strategic Alignment</th></tr>
<tr><td colspan="2">Challenges:[c]</td><td colspan="3">SI ☑ PI ☑ EI ☑</td></tr>
<tr><td colspan="2">Crosscutting themes:[d]</td><td colspan="3">GD ☐ CC ☑ IC ☑</td></tr>
</table>

[a] Under the Flexible Financing Facility (document FN-655-1), the borrower has the option of requesting changes to the amortization schedule, and currency and interest rate conversions. When considering such requests, the Bank will take operational and risk management considerations into account.

[b] 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 applicable policies.

[c] SI (Social Inclusion and Equality); PI (Productivity and Innovation); and EI (Economic Integration).

[d] GD (Gender Equality and Diversity); CC (Climate Change and Environmental Sustainability); and IC (Institutional Capacity and Rule of Law).

I. DESCRIPTION AND RESULTS MONITORING

A. Background, problem to be addressed, and rationale

1.1 **Macroeconomic situation**. Over the period 2010-2014, Colombia's gross domestic product (GDP) grew at an average annual rate of 4.5%, with inflation remaining within the long-term target range of 2%-4%, and a steady decline in unemployment, which fell to 9.1% in 2014 as a result of sound economic policies and a favorable external setting that allowed the country to achieve a per capita income of US$12,715.[1] Nevertheless, the drop in international oil prices affected economic activity in the country. As a result, GDP growth fell to 3.1% in 2015 and 1.2%, on an annual basis, in the third quarter of 2016; tax revenues from oil dropped by 3.4 percentage points of GDP; the peso was devalued by 71%; inflation reached 6.8%; and the current account deficit rose to 6.6% of GDP. In the course of 2016, growth continued to slow, recording 1.2% on an annual basis in the third quarter, although the exchange rate stabilized and inflation closed at 5.8% per annum at the end of December. The fiscal policy framework implemented by the Government of Colombia has allowed public finances to adjust gradually (greater deficit and adjustment), softening its recessionary impact on economic activity. The central bank (Bank of the Republic) raised its benchmark interest rate by 325 basis points to combat inflationary pressures, and the inflation rate is forecast to return to the target range in 2017. Growth is estimated to have been close to 2.0% per annum in 2016, with fiscal and current account deficits of 3.9% and 4.9% of GDP respectively. For 2017, an upturn in the economy is expected, with annual growth of 2.5%, and fiscal and current account deficits of 3.4% and 4.25% of GDP.

1.2 **The power sector**. In 2015, Colombia had installed power generating capacity of 16,420 MW—66.6% of this is from hydro generation, which makes the country vulnerable to cyclical climatic variations such as the El Niño phenomenon. Thermal generating capacity represented 28.4% of the total installed (9.4% with natural gas, 11.3% with liquid fuels, and 8.5% with coal). Nonconventional renewable energy sources (NCRE)[2] accounted for less than 0.6% of capacity. The power grid is supplemented with electricity traded through interconnections with Ecuador and Venezuela.

1.3 **Organization of the sector**. The industrial and operational organization of the Colombian power market is based on the vertical separation of activities in the chain (production/generation, transmission/transportation, distribution and marketing), pursued by State-owned, private, and/or mixed enterprises. The sector is governed by Law 142 of 1994 (the public utilities law) and by Law 143 of 1994 (the electricity law). The Ministry of Mines and Energy (MME), the National Planning Department (DNP) and the Mining and Energy Planning Unit (UPME, part of the MME) establish the policies and the indicative planning for the sector. The Energy and Gas Regulatory Commission (CREG) is responsible for economic and technical regulation. The Superintendency of Public Utilities supervises and oversees service delivery. For the "non-interconnected zones" (ZNIs),[3] the Institute for Planning and

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1 Purchasing power parity at 2011 prices (World Development Indicators).

2 NCRE include biomass, small hydroelectric plants, wind, geothermal, solar and tidal energy. Other sources may be considered NCRE, as determined by the Mining and Energy Planning Unit (UPME).

3 Towns, villages, and hamlets that are not connected to the national grid.

Promotion of Energy Solutions is tasked with identifying, preparing, and promoting energy access projects and making them viable.

1.4 The National Interconnected System (SIN)—the national grid—is organized around a wholesale energy market, in which different power generating technologies compete to supply demand under scenarios of reliability, market price formation, and contracts and incentives (economic, dispatch, marketing, etc.) resulting from sectoral and regulatory policy decisions. In this wholesale market of marginal prices, the equilibrium price for each hour is set by the client with the highest price required to supply the respective demand. Price formation in the market is based on the prices offered by generators, which reflect their variable costs, including fuel and the opportunity cost of water, collection of the "reliability charge,"[4] and their perception of the risk associated with dispatch.

1.5 **International power interconnections**. Colombia recognizes the potential benefits of international interconnections:[5] (i) access to generating sources that may be more economical; (ii) increased system reliability, with more generating options; (iii) a source of support in emergency situations; (iv) reduced carbon emissions if the supplier generates with cleaner sources; and (v) revenues from energy exports. At present, the Colombian national grid is interconnected with the systems of Ecuador and Venezuela. The total capacity of the interconnection between Colombia and Venezuela is 336 MW, and for that between Colombia and Ecuador it is 535 MW. During the 2015-2016 El Niño, Colombia imported 420 gigawatt hours (GWh) from Ecuador, where the grid had surplus power. Colombia is part of the Andean Electrical Interconnection System (SINEA), which promotes interconnections between Colombia, Ecuador, Peru, and Chile.

1.6 **The share of natural gas in the electricity matrix**. Demand for natural gas totaled 1,078 million cubic feet per day in 2015, and has been growing at an average annual rate of 3.4% since 2009,[6] within the market framework established by Law 142 of 1994. It is expected to continue playing a key role in the national energy matrix for thermal electric generation, given its price advantage over other liquid fuels. Natural gas demand for thermal generation represented 33.5% of the total, followed by the industrial and commercial sectors with 29.7%, residential with 12.4%, refining and petrochemicals with 19.2%, and vehicles with 4%. Natural gas demand for power generation has risen sharply since September 2015, driven by higher consumption

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4 The "reliability charge" was introduced to ensure the viability of investment in generating plants needed to meet demand efficiently under critical water supply conditions (CREG Resolution 071 of 2006). It stabilizes revenues for the generator in return for a commitment (firm energy obligations) to produce firm power during critical supply conditions, under scenarios of high demand, when the market price exceeds a previously established threshold, called the scarcity price. The "reliability charge" is financed and collected through the rates paid by the end user.

5 Operation RG-T2056 (technical cooperation in support of Andean power interconnection studies) financed a first phase of studies on regulatory harmonization and infrastructure planning for the Andean region. The studies concluded that establishing a Regional Power Market in the Andean countries would bring total net benefits exceeding US$1.5 billion in the first 10 years of integration. The Análisis ex post del Sistema de Interconexión Eléctrica de los Países de América Central (SIEPAC) [Ex post analysis of the Central American Electric Interconnection System (SIEPAC)], looking at only the first circuit of the SIEPAC, confirms cost savings of up to US$1.444 billion in 2011, of which US$1.180 billion represented reduced investments and US$264 million represented lower operating costs.

6 Plan Transitorio de Abastecimiento de GN 2016 [Transitional Plan for Natural Gas Supply 2016].

in the thermal power sector as El Niño intensified.[7] The UPME's projections to 2029 place the share of natural gas in thermal generation at between 16.7% and 24.4%.

1.7 **Access to energy**. The Energy Coverage Index nationwide rose from 94.9% in 2009 to 96.96% in 2015.[8] In the urban-rural breakdown, coverage stood at 99.72% in urban and 87.83% in rural areas, for a deficit of 425,212 dwellings nationwide that were without electric power service. To achieve universal access to the service, the UPME's Indicative Plan for Extending Electricity Coverage 2016-2020 estimates that 52% of users not now covered could be connected to the national grid, 39% through stand-alone solutions using NCRE and 9% using diesel.

1.8 **Problems in the power sector**. The challenges facing Colombia's power sector have to do with the following weaknesses: (i) the risk of not being able to guarantee an efficient supply of power in the face of systemic stress, particularly climatic episodes such as El Niño; and (ii) low coverage in ZNIs that cannot be connected to the national grid. The supply risk results primarily from an energy matrix that is highly concentrated in hydro; restrictions in the market of natural gas for generation; rigidities in the functioning of the wholesale energy market; and limited use of efficient electricity demand management practices for energy savings. Low electricity coverage in the non-interconnected zones is due to the low availability of investment funds, and the difficulty guaranteeing the financial and operational sustainability of the electrification solutions installed. The causes underlying the two main problems in the sector are discussed below in detail.

1.9 **Concentration of the energy matrix on hydro resources**. In all, 66.6% of the national grid's capacity depends on water resources for generating power (paragraph 1.2). This makes the system vulnerable to reduced hydrological conditions, as occur with the El Niño phenomenon, which causes severe droughts that reduce the country's availability of water resources for power generation.[9] When water levels shrink, the opportunity cost of water tends to be higher, and thermal plants may be needed to generate energy. These thermal plants (diesel, natural gas, and coal-fired) have higher generating costs than do hydro stations in normal conditions. For example, in 2015 the trading price for generating liquid fuels was US$0.31/kWh, compared to US$0.08/kWh with hydro resources. Nevertheless, if it were not for these generating resources as backup, electricity service would have to be rationed, with the attendant costs to the national economy and the well-being of the population. Higher generating costs under drought scenarios could be attenuated by diversifying the generating mix and boosting the share of NCRE, the variable costs of which are close to zero. Yet the current generating capacity using NCRE is very small and inadequate to make up for lower hydro generating capacity in the case of droughts, given the high investment costs of these generating

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[7] For gas from the Guajira field (Caribbean coast) the price increased by 13%, from US$5.45/million BTU (MBTU) to US$6.17/MBTU. For the Cupiagua field, it rose 26%, from US$3.45/MBTU to US$4.35/MBTU, while in Cusiana (Interior) it fell by 3%, dropping from US$3.4/MBTU to US$3.34/MBTU.

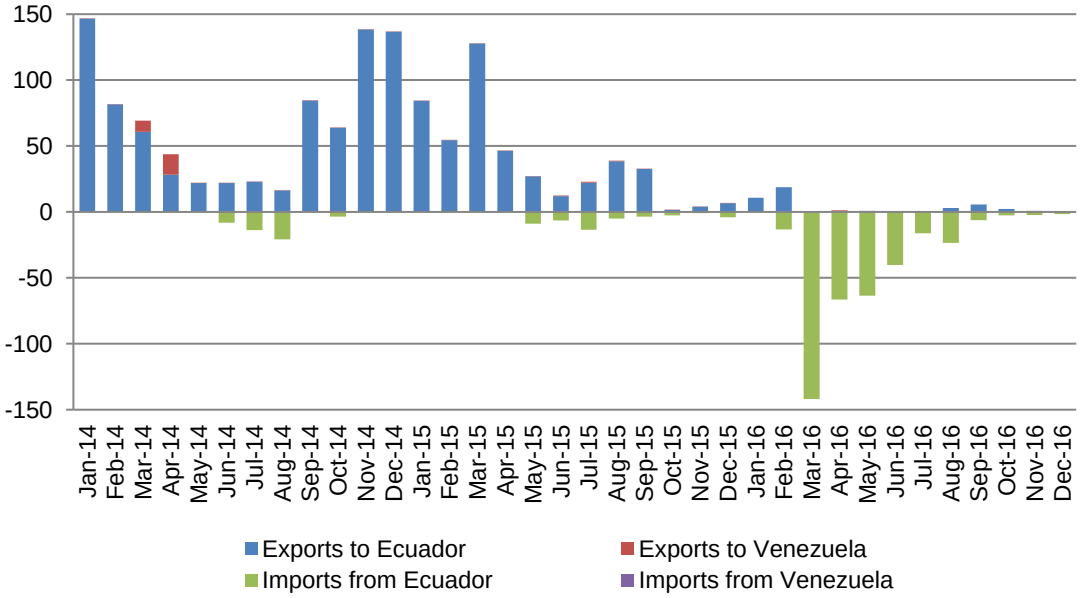
[8] UPME. Plan Indicativo de Expansión de la Cobertura Eléctrica 2016-2020 [Indicative Plan for Extending Electricity Coverage 2016-2020].

[9] During the 2015-2016 El Niño, water flows reached a historic low point in January 2016, at 50.7% of the monthly average.

technologies compared to those based on natural gas or coal.[10] Consequently, the further development of NCRE-based generating resources will require the definition and implementation of regulations governing the incentives that were proposed in Law 1715 of 2014 (paragraph 1.17), but that are not yet operational.

1.10 Access to international power exchanges also makes it possible to diversify the sources of supply in the matrix, to seize the natural advantage of watersheds that are shared between countries, and to reduce the risks of power shortages. Figure I-1 shows the volumes of power imports and exports between Colombia and Ecuador. International interconnections, however, require the formalization of operational and institutional frameworks for expanding the use of regional power interconnections to maximize the advantages of integration.

Figure I-1
Colombia - International Energy Transactions 2014-2016 (GWh)



Source: Data from www.xm.com.co

1.11 **Supply restrictions on natural gas for power generation**. Natural gas as a fuel is a fundamental source for lending reliability and efficiency to the power generation system. The UPME projected natural gas prices for thermal power generation for the period 2016-2035, under various scenarios of local and external supply and demand, and found price advantages for natural gas-fired generation. However, the natural gas market betrays some serious shortcomings that prevent a smooth and predictable supply for power generation, posing a risk to its further development despite its economic advantages. On one hand, total natural gas supply has

[10] In its Energy Outlook 2015, the International Energy Agency estimated the generating plant installation cost in US$/kW for Colombia, using Brazil as the benchmark. It showed that the cost of installing a natural gas generating plant was US$400/kW, and that of a subcritical coal-fired plant was US$1,300/kW, while the cost of a biomass plant was estimated at US$2,250/kW, a photovoltaic solar plant at US$1,980/kW, and a wind-powered plant at US$1,380/kW.

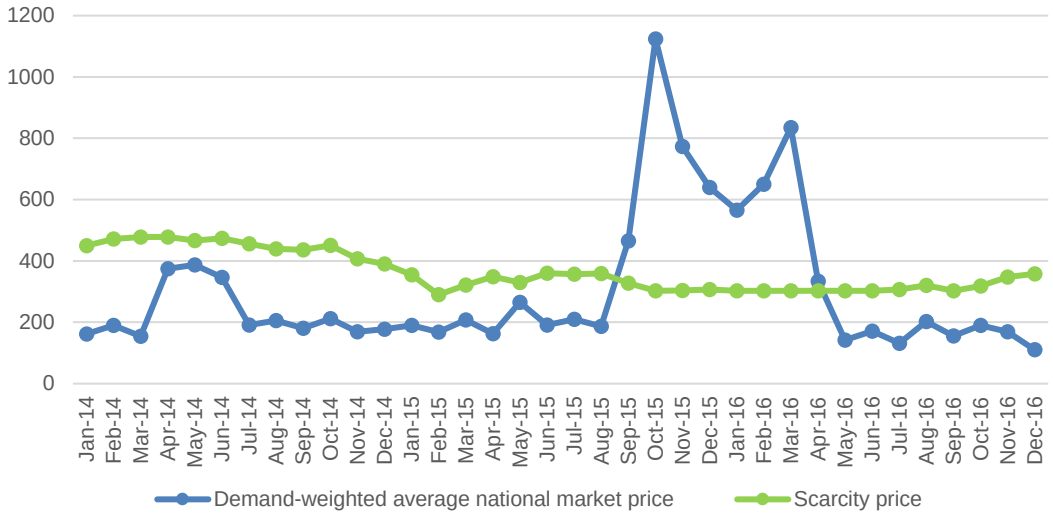
declined over time. According to the National Hydrocarbons Agency, natural gas reserves fell by 8% between 2014 and 2015, to 5,443 giga cubic feet per day, and production was 1,078 million cubic feet per day, or 8.5% less than in 2014. On the other hand, natural gas supply in Colombia has a regionalized structure, reflecting the geographic separation of the two supply sources (Interior and Caribbean coast), and a transportation system that has limited capacity to supply the generating plants. As a result, there are restrictions on the availability of natural gas for generation, and the firmness of gas-fired power generation cannot be guaranteed. The development of alternatives for increasing the supply of natural gas for generation has not kept pace with market needs. For example, (i) there are no projects to expand transportation from the interior to the Caribbean coast, and (ii) commissioning of the Cartagena LNG regasification plant, near the gas-fired generating plants, was delayed by 14 months to November 2016, after the El Niño crisis. The limitations of natural gas for power generation have become more acute in recent years, due to increased natural gas consumption in other sectors such as refining and petrochemicals (8.4%) and commerce (4.5%) during the 2015-2016 El Niño phenomenon. As an emergency measure, the MME ordered suspension of natural gas use in the manufacturing and petrochemical sectors in order to meet power-generating demands.

1.12 **Rigidities in the functioning of the wholesale energy market**. During the El Niño crisis of 2015-2016, the price formation mechanisms on which the wholesale energy market[11] relies for providing energy during water shortages have not lived up to the objective of their design. Liquid fuel-fired generating plants registered high prices that even exceeded the rationing price (the scarcity price set by the regulator). Regulation allows thermal plants to be remunerated at a maximum price equal to the scarcity price, the low level of which vis-à-vis the cost of fuel during the crisis affected the financial situation of those thermal power generators by drastically reducing their operating margins.[12] Figure I-2 shows the market price differential with respect to the scarcity price that occurred during this time. These plants did not operate in these circumstances as anticipated through the reliability charge. The sector had to increase use of hydro generation, placing the country at high risk of rationing. By resorting to imports from Ecuador, Colombia was able to surmount the crisis and did not have to ration demand. Thus, the signal of prices permitted to the thermal plants in placing their offers on the market must be revised, as well as the scarcity price that sets the maximum value for remuneration of the generating plants.

[11] Footnote 4 describes the mechanism.

[12] As an extreme example, the Termocandelaria company (230 MW) was unable to deliver the contracted power for lack of funds to pay for its fuel.

Figure I-2
Colombia – Demand-weighted Average National Market Price (Col$kWh) vs. Scarcity Price (Col$kWh)



Source: Prepared by the authors with data from the XM Report "Informe de Operación del SIN y Administración del Mercado 2016."

1.13 **Limited use of efficient electricity demand management.** Despite the benefits of efficient electricity demand management, Colombia has no regulatory or strategic instruments for seizing its potential for energy savings, resulting from the capacity of demand to react to economic incentives and induced changes in consumer habits. Colombia's Energy Balance Sheet estimates that the country's energy consumption reached 1,219,827 terajoules (TJ)[13] in 2015, of which 16% corresponded to electric energy from the national grid (approximately 197,000 TJ or 54,000 GWh). During the 2015-2016 El Niño phenomenon a 5% reduction was achieved through voluntary rationing of consumption, using temporary efficient electricity demand management mechanisms, which could be kept in place in the long run if there were a strategy for efficient energy consumption. The use of energy efficiency measures could produce estimated electricity consumption savings on the order of 1,751.34 TJ or 486.72 GWh by 2021.

1.14 **Low electricity coverage in the non-interconnected zones**. It is estimated that more than 12% of the country's most isolated rural population has no electricity service. Most of that population is in areas far removed from the national grid, making it financially unfeasible to extend grid service. NCRE-based technologies can supply electricity under these conditions, although public resources are inadequate to expand the service and achieve coverage for these communities within a reasonable timeframe. In addition, these non-interconnected zones are poor rural areas, with unprofitably low levels of power consumption and little repayment capacity, and they pose difficulties in managing the service. These conditions affect the capacity to sustainably operate and maintain NCRE systems.

[13] Energy measure equivalent to 2.7778x10-4 watt/hour.

1.15 **Country strategy in the sector**. The 2014-2018 National Development Plan calls for measures to improve the factors that determine productivity, enhance competitiveness and reduce the country cost,[14] and boost incomes and living standards for the population. The plan assigns a key role to the energy sector in guaranteeing sustainable and inclusive economic development. Its task is to ensure that the economy has competitive sources of energy that will allow it to grow and to create jobs and contribute directly to reducing poverty.

1.16 The general objective of the country's energy policy, as set forth in the long-term National Energy Plan to 2050 (Plan Energético Nacional: Ideario Energético 2050), is to achieve domestic and external energy supply in an efficient manner, with minimum environmental impact and with added value for the regions and their populations. With this objective, the government seeks to improve energy security and equity, incorporating environmental sustainability criteria. To this end, the plan has set five specific objectives: (i) to provide a reliable energy supply and diversify the energy basket; (ii) to promote efficient electricity demand management in all sectors and incorporate clean transportation technologies; (iii) to enhance the country's energy equity, by guaranteeing access to service through electrification systems that simultaneously have a low environmental impact and are affordable for consumers; (iv) to encourage investments in international interconnections and in infrastructure for selling strategic resources; and (v) to enable the generation of value in the power sector for the development of the regions and their populations.

1.17 The government has been pursuing a policy of diversifying power generation sources over recent years. Law 1715 of 2014 seeks to promote the development and use of NCRE in the national energy system, through its integration into the power market, its participation in the ZNIs and in other energy uses, as a necessary means for sustainable economic development, the reduction of greenhouse gases, and the security of energy supply. With this law, the government is seeking to promote efficient electricity demand management through measures to boost energy efficiency and meet demand.

1.18 Given the difficulties with natural gas supply that arose during the El Niño event, the government has made it a priority to increase reliability in natural gas delivery and supply by addressing infrastructure shortcomings. To this end, the MME issued guidelines for developing the natural gas supply plan, which contains needed projects to be carried out over the next 5 to 10 years, to enhance the reliability and security of natural gas supply for all uses. In addition, the government has identified the need for an independent manager of the natural gas market, to provide timely operational and commercial information on the sector. That manager would be responsible for compiling, centralizing and publishing transactional and operational information on the sector, to optimize use of the supply and transportation infrastructure, and make the market more transparent.

1.19 The government regards improvements in efficient electricity demand management as an important supplement to the strategy for diversifying and guaranteeing the power supply. In the course of formulating a new energy efficiency policy, the MME, with support from the UPME, is drafting the Indicative Action Plan for Energy Efficiency 2016-2021 under the Program for Rational and Efficient Energy Use

[14] This refers to high logistics, transportation, energy, and other costs.

(PROURE) in order to improve energy consumption efficiency. The plan calls for simultaneous action on two fronts: (i) how users value energy, applying energy prices that reflect its relative scarcity, production costs, and possible negative externalities flowing from production; and (ii) how users use energy, promoting the adoption of better energy consumption habits and new technologies. The plan identifies potential savings nationwide of 9.2% in energy consumption over the life of the action plan.

1.20 The Indicative Plan for Extending Electricity Coverage 2016-2020 presents the government's goals for electrification in the ZNIs, by technology, and identifies a total of 168,880 dwellings that are un-serviced in these zones and could access the service with NCRE. To meet the government's energy equity goal (paragraph 1.16), a number of financial support funds have been created to promote power and residential gas supply in regions that are not economically viable for private service providers.[15]

1.21 **Sector knowledge**. The Bank has broad experience and familiarity with the Colombian energy sector, thanks to the ongoing support it has provided through technical cooperation and financing for energy access initiatives, smart grids, efficient electricity demand management measures, and hydro and geothermal power projects, as well as regional power integration initiatives.[16] The Bank has been working with the Clean Technology Fund on operations that promote energy efficiency measures and renewable energy in Colombia, with three operations approved for US$40 million.[17] In 2015, the Bank approved the Water, Basic Sanitation, and Electrification Program for the Colombian Pacific Region (loan 3610/OC-CO), for US$231 million, including a US$91 million subprogram for sustainable electrification, with a focus on rural areas. Sustained dialogue between the Bank and the country during the design of these operations revealed the need to prepare this program of reforms and measures designed to optimize sustainable management of the sector and to strengthen analytic work in areas that affect the system's vulnerability over the medium and long term. The most recent studies supported by the Bank have examined El Niño's impact on the sector.[18] They show the need to adjust the "reliability charge" so that the generating plants that are intended to operate during low-water times can and must do so under conditions of efficiency.

1.22 The Bank has extensive experience supporting policy reforms in the sector. The most recent examples are: in Nicaragua (loan 3068/BL-NI), Suriname (loan 2848/OC-SU), Peru (loan 2847/OC-PE), Honduras (loan 3619/BL-HO), and Ecuador (loan 3420/OC-EC). The project completion report for the Peruvian operation concludes that programmatic operations are suitable instruments for supporting sectoral reforms that involve multiple stakeholders and that, with a diversified and sustainable energy supply, end consumers will be the main

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15 Fondo de Apoyo Financiero para la Energización de las Zonas Rurales Interconectadas; Fondo de Apoyo Financiero para la Energización de las ZNI; Sistema General de Regalías.

16 Nonreimbursable technical cooperation operations in execution in Colombia: ATN/KK-14254-CO; ATN/OC-13351-CO; ATN/CM-12805-CO; ATN/CM-12825-CO; ATN/TC-14531-CO; and ATN/OC-14807-RG

17 IDB-Clean Technology Fund (2983/TC-CO), (3661/TC-CO), and (3747/TC-CO).

18 McRae-Wolak (2016). Diagnosing the Causes of the Recent El Niño Event and Recommendations for Reform. García-Oren (2016) *Análisis económico medidas El Niño 2015-2016. Lecciones aprendidas.*

beneficiaries of these interventions. The report highlights the following lessons learned, which were taken into account in the design of this programmatic policy-based loan (PBP): (i) institutional and regulatory reforms alone are not sufficient to guarantee the efficient functioning of the sector. It is essential that institutions be able to exercise their legal functions independently. In Colombia, the regulatory framework for the sector establishes and respects the role assigned to each sector entity in terms of policy setting, regulation, planning and execution (paragraph 1.3); (ii) policies and, in particular, regulatory measures must be implemented gradually, but they must have a definite timetable and clearly assigned responsibilities. The Means of Verification Matrix and the Output Indicators in the Results Matrix show the timetable and the responsible parties for the measures included; and (iii) the Bank must work very closely with the government and provide technical assistance when implementing institutional changes and policy measures. The Bank will continue its efforts to ensure fulfillment of commitments and identify new areas of support (paragraphs 2.5 and 3.4).

1.23 **Program strategy**. The structure of the PBP, proposed as a series of two loans, supports the government's reform agenda for the power sector by implementing a series of sequential short and medium-term measures (document CS-3633-1). The program will help to: (i) enhance the response capacity of the national grid (SIN) in the face of crisis situations and stress, with cost efficiency that will contribute to the country's competitiveness and the quality of life of its people; and (ii) increase access to electricity for communities in the ZNIs.

1.24 To address the main vulnerabilities of the national grid, this program seeks to: (i) promote diversification of the energy matrix, reinforcing a legal framework that will facilitate incorporation of NCRE into the wholesale energy market and increase regional power integration; and (ii) introduce measures to improve the operation and liquidity of the natural gas market, to set policy guidelines for promoting efficient electricity demand management and improving the functioning of the wholesale market. The first operation in the series supports developing and strengthening the regulatory framework setting the conditions and incentives for increasing efficient supply of electricity. The second operation complements that framework with regulations formalizing the institutional and operational framework for the reforms.

a. **Diversification of the matrix.** To reduce dependency on thermal generation during periods of drought, it is essential to diversify the generating matrix with other technologies, such as NCRE and greater international connections. The program promotes the regulation of technical guidelines, procedures and incentives to foster a greater NCRE share in the energy matrix and will encourage the country to sign onto projects and agreements that promote greater exchanges of energy with neighboring countries, in particular Ecuador.

b. **Improvements in the natural gas market for generation, in efficient electricity demand management, and in the wholesale energy market:** (i) the program will support development of a natural gas supply and regulation plan that identifies projects that can guarantee the reliability and security of this service, the operation of a market manager, and a wholesale marketing system; (ii) it will promote adoption of the Indicative Action Plan for the PROURE and mechanisms for savings and efficient electricity demand management; and (iii) it will support diagnostic assessment and analysis and

proposals to modify the functioning of the wholesale market on measures that will ensure the reliability of power supply and of updated plans for expanding transmission and generation. These reforms are expected to produce a 43% increase in the supply of natural gas by program's end.

1.25 To expand coverage in the non-interconnected zones by promoting the use of NCRE, at the policy level, the program will support development of a regulatory framework that complements public resources and promotes private participation, with business or service arrangements exclusive to these zones, so as to ensure the sustainable operation and maintenance of community and individual systems as essential instruments for financing the expansion of the service in the ZNIs with NCRE. This is expected to triple the installed capacity of NCRE in the ZNIs.

1.26 **Program rationale**. Over the last seven years, the IDB has been actively supporting the Republic of Colombia in developing its electricity sector, primarily through rural electrification, energy efficiency, NCRE, smart grids, and efficient electricity demand management. This support has been in coordination with other agencies, such as the German bank (KfW), Carbon War Room, local agencies, and other partners who together have helped to consolidate the sector, taking into account the fundamental role that the power sector plays as a productive input and as a service for boosting economic development and living standards. This sector support program consolidates Bank support for the country, bearing in mind the economic benefits in terms of marginal costs and/or level costs of power generation, resulting from increased use of natural gas for generation or of NCRE in the grid. These benefits have been analyzed extensively in countries including Chile, Mexico, Bolivia and the United States, where the share of these sources in the energy matrix has increased. In the case of Colombia, a comparison of operating costs by generating source has revealed the advantages of using natural gas and NCRE, and is documented in the evaluation of characteristic projects in execution.[19] As evidence of the effectiveness of the proposed intervention, McCarthy and Henderson (2014)[20] analyzed the growth impact of NCRE and of a variety of instruments to promote these sources in the regulatory framework of 27 countries, including Colombia, over a 10-year period. The study found that the greatest growth impact is achieved through tax incentives, combined with measures that guarantee access for NCRE to the grids. Measures of this kind are included in the reforms supported by the program. The study analyzes other measures that, while effective, have a lesser impact, such as subsidies, duty-free imports, contracts etc. The Bank's support increases the prospects of success of this reform process, given its extensive experience in the region and in-depth knowledge of the sector from its long track record spearheading sectoral technical support (paragraph 1.22).

1.27 **Bank strategy with the country**. The program is consistent with the IDB Country Strategy with Colombia 2015-2018 (document GN-2832), through the strategic area of social mobility and consolidation of the middle class, contributing to the strategic objective of increasing equitable access to quality basic services. It contributes to the strategic area of effectiveness of public management, under the objective of

[19] FEDESARROLLO (2013). Análisis costo-beneficio FNCER en Colombia [Cost-benefit analysis of NCRE in Colombia].

[20] McCarthy & Henderson (2014). The Role of Renewable Energy Laws in Expanding Energy from Non-Traditional Renewables, IDB Working Paper Series IDB-WP-540.

increasing the quality of expenditure and the capacity to manage public investment at all levels of government.

1.28 **Strategic alignment**. The program is consistent with the Update to the Institutional Strategy 2010-2020 (document AB-3008) and is aligned with the development challenges of: (i) social inclusion and equality, by promoting the expansion of access to energy in the ZNIs; (ii) productivity and innovation, by promoting improved functioning of the natural gas and electricity markets, so as to avoid price fluctuations that can affect industrial competitiveness; and (iii) economic integration, under the criterion of multinational targeting, by promoting integration of the Colombian market into regional markets, and national subsidiarity through support for the SINEA initiative (optional electronic link 5). The program is aligned with the crosscutting areas of: (i) climate change and environmental sustainability, through the promotion of policy reforms that will reduce greenhouse gas emissions, and promote the development of renewable energies and energy efficiency. Approximately 68.4% of funds from the operation will be associated with policies to promote climate change adaptation and mitigation, following the joint methodology of the multilateral development banks for estimating climate finance. These funds will contribute to the IDB Group's target of boosting financing for climate change-related projects to 30% of operation approvals by the end of 2020; and (ii) institutional capacity and rule of law, by promoting reforms that will build the capacities of institutions in the Colombian power sector. The program is aligned with the Corporate Results Framework (CRF) 2016-2019 (document GN-2727-6) via the output indicator, "number of regional, subregional and nonregional integration agreements and cooperation initiatives supported," through the indicator for the program on "Analysis of regulatory harmonization for regional power integration with at least one bordering country."

1.29 The program is consistent with the Energy Sector Framework (document GN-2830-3) in the thematic areas of energy access, sustainability, security and governance, by promoting policy reforms that will encourage: (i) the provision of energy in the ZNIs, (ii) sustainable development of the sector, (iii) diversification of the energy matrix through the use of NCRE, (iv) efficient use of energy, and (v) regional integration. The program is consistent with the Climate Change Sector Framework (document GN-2835-3), as the proposed energy policy reforms will lead to a reduction in greenhouse gas emissions.

1.30 **Consistency with the Sector Strategy to Support Competitive Global and Regional Integration (document GN-2565-4).** The program will contribute to the following aspects of this strategy: (i) cross-country focus. Component 2 includes reforms that will contribute to internationalizing the Colombian energy sector, with cross-border impacts. The program is expected to help increase bilateral energy trade between Colombia and Ecuador; and (ii) national subsidiarity. The program will provide direct support for incorporating local regulatory measures that promote regional power integration and strengthening of the domestic market for natural gas for power generation (optional electronic link 5). The program is aligned with the priority areas of the Strategy for Sustainable Infrastructure for Competitiveness and Inclusive Growth (document GN-2710-5), through reforms that will promote rationalization in the use of energy infrastructure via efficient electricity demand management, regional integration, and expansion of the ZNIs.

1.31 **Public Utilities Policy (document GN-2716-6).** The program is consistent with the objectives of the public utilities policy. The policy reforms, in keeping with the Public Utility Policy's principles, will promote conditions for economic assessment and financial sustainability, and will contribute to the technical, operational, and financial sustainability of the energy sector and of natural gas, by encouraging competition in the domestic and regional markets and improving rate-setting schemes and processes (optional electronic link 4).

B. Objectives, components, and cost

1.32 **General objective**. The general objective is to contribute to the sustainability of Colombia's energy sector through policy reforms that will ensure the efficient supply of electric energy in the national grid (SIN) and in the ZNIs, to reduce the sector's vulnerability to the effects of climate change and increase access to electric power. The specific objectives are to: (i) ensure a macroeconomic setting consistent with the program's objectives; (ii) help guarantee energy supply from the national grid by diversifying the energy matrix with NCRE and increasing international trade in energy, while establishing measures to increase and guarantee the supply of natural gas for power generation, to manage energy demand, and to optimize the functioning of the wholesale energy market; and (iii) promote access to energy in the ZNIs through the use of NCRE.

1.33 **Beneficiaries**. Achieving greater security and efficiency in power supply using cleaner sources is expected to benefit people in all sectors of demand. Lower electricity costs will have a positive impact on consumers' incomes, as well as on fiscal savings, thanks to lower subsidies to low-income users. Better energy prices represent competitiveness gains by lowering the country cost, to the benefit of both trade and industry. The ZNIs will have access to electricity through sustainable schemes for implementing clean technologies. The reduction in greenhouse gas emissions will improve environmental quality for the entire population.

1.34 **Component 1. Macroeconomic stability**. The objective of this component is to maintain a stable macroeconomic setting consistent with the program's objectives, as established in the Policy Matrix and the Sector Policy Letter.

1.35 **Component 2. Support for the reliability of power supply from the national grid**. Under this component, the program will support the following measures to reduce the risk of power shortages in the national grid: it will promote diversification of the energy matrix with NCRE, and will support greater regional electrical integration; and it will support measures to improve the operation of the electricity market. It includes the following subcomponents:

1.36 **Subcomponent 2.1. Support for diversifying the energy matrix and for regional electric power integration**. The program will support the adoption of policies aimed at diversifying the energy matrix by promoting and incorporating NCRE into the national grid, and promoting regional power interconnections with the objective of ensuring power supply from the national grid. The following programmatic commitments, corresponding to the first operation, have been agreed: (i) for promoting NCRE, the following regulations to Law 1715 of 2014 will have been approved and be in force: (a) establishment of guidelines for applying the incentives set forth in Chapter III of the law, "Incentives for investment in nonconventional energy source projects"; (b) procedures and requirements for accessing incentives

for investment in NCRE projects; (c) establishment of conditions for connecting large-scale autogenerators to the grid and measuring their input; and (ii) a draft regulatory framework decision will have been designed for subregional interconnection of power systems and community exchange of electricity under the Andean Electrical Interconnection System (SINEA).

1.37 In this subcomponent, the proposed triggers for the second loan are: (i) for the promotion of NCRE, the following regulations to Law 1715 of 2014 will have been approved and be in force: (a) implementation of a computerized information system for processing the incentives contained in Law 1715 of 2014; (b) the Nonconventional Energies and Energy Management Fund will have earmarked financing; (c) the program of tax incentives for NCRE will be in place; and (d) conditions will have been established for the connection, measurement, and delivery to the grid of the surpluses of large-scale autogenerators; and (ii) implementation will have begun of the SINEA roadmap and the supplementary studies on binational interconnections, referred to in the studies from the first program in the framework of the SINEA.

1.38 **Subcomponent 2.2. Strengthening the electricity market**. The program will support adoption of reforms and policies for strengthening the electric power market, including measures to: (i) guarantee the supply of natural gas for power generation; (ii) promote efficient electricity demand management; and (iii) optimize the functioning of the wholesale energy market.

1.39 For this first loan, the following commitments have been agreed: (i) implementation criteria will have been designed for making adjustments to the wholesale marketing system for natural gas; the natural gas transitional supply plan will have been adopted, including the investments needed to boost transportation capacity; and the natural gas market manager will be operational; (ii) technical, legal, economic and financial, planning and information instruments will have been developed and implemented for the Program on Rational and Efficient Use of Energy (PROURE) for 2017-2022, indicating that: the indicative action plan for development of the PROURE will have been adopted, with the required funding; a manual will have been prepared for formulating and implementing efficient electricity demand management plans in public entities; the consumer labeling and information system on energy efficiency will have been adopted; the roadmap for implementing smart grids in Colombia will have been published; provisions will have been adopted for implementing mechanisms to respond to demand; and mechanisms for voluntary disconnection will have been designed as a means for making the grid more reliable; and (iii) analytical and diagnostic studies and proposals for modifying the functioning of the wholesale energy market will have been completed; and the 2015-2029 plan for expanding generation and transmission will have been issued and adopted.

1.40 In the second loan, the triggers for this subcomponent are intended to: (i) strengthen the functioning of the natural gas market through: regulation that incorporates adjustments to the wholesale marketing mechanisms for natural gas; adoption of the indicative plan for expanding natural gas coverage; and the market manager will have stabilized operations and will be generating market indicators; (ii) move forward with the efficient electricity demand management agenda, with guidelines for updating the legal framework for granting tax incentives for efficient electricity demand management projects; presentation by selected public entities of the design

of their energy management plans, in accordance with the guidelines in the manual produced by the Mining and Energy Planning Unit (UPME); design of tools (dissemination, training) for implementing labeling, once the second stage of labeling comes into effect (2017); a study of the functionality of smart metering; implementation and adjustments to the demand response mechanisms; establishment of mechanisms for voluntary disconnection in order to make the national grid more efficient and reliable; and (iii) approval of the CREG Regulatory Agenda 2017 for implementing the recommendations on reform of the wholesale energy market; and adoption of the 2017-2031 plan for expanding generation and transmission in the power sector.

1.41 **Component 3. Promoting access to energy in the ZNIs through NCRE**. This component will support the adoption of measures to boost access to energy in the ZNIs through NCRE. For this first loan, the following commitments have been agreed: (i) the following energy policy guidelines, set forth in Law 1715 of 2014, will have been established and approved, with respect to the use of NCRE in the ZNIs: regulation for the registry of generating projects with NCRE connectable to the grid and in the ZNIs; and (ii) policy guidelines adopted for expanding coverage of power service in the national grid and in the ZNIs through NCRE.

1.42 The triggers for the second loan include the following: (i) the registry of power projects for NCRE is operational; and (ii) at least one ZNI has been concessioned, under a business framework.

C. Key results indicators

1.43 Achievement of program objectives will be measured against the indicators and targets presented in the Results Matrix, which reflects the scope of the two operations in this programmatic series. The program's expected outcomes are: (i) diversification and a greater share of NCRE in the national grid and in binational energy transfers with Ecuador; (ii) a stronger wholesale energy market, with measures that guarantee the supply of natural gas, manage demand, and improve the functioning of that market; and (iii) greater access to energy in the ZNIs through the use of NCRE. As to its impact, the program is expected to ensure and increase the efficient supply of electric energy, and to reduce greenhouse gas emissions.

1.44 Table I-1 presents the expected outcomes and their indicators.

Table I-1. Expected Outcomes and Indicators

Impact	Indicator
Efficient supply of electric power	Nominal generating capacity in the SIN
	Marginal long-term cost of operating the system
Reduced greenhouse gas emissions	Greenhouse gas emissions by the power sector (tCO_2e/millions)
Outcome	**Indicator**
Diversification of the energy matrix and promotion of regional energy integration	Installed capacity for NCRE in the SIN
	Effective net large-scale autogeneration capacity in the SIN
	Volume of electric energy traded bilaterally with Ecuador, per year
Strengthening of the electricity market	Annual supply by volume of natural gas for power generation
	Electricity consumption in the industrial sector
Installed capacity for NCRE in ZNIs	Installed capacity for NCRE in ZNIs

1.45 **Economic evaluation.** An economic assessment was conducted to evaluate the economic benefits of diversifying the energy matrix with a greater share for NCRE and natural gas, thereby lowering generating costs and reducing CO_2 emissions. The net present value (NPV) of the benefits resulting from lower generating costs amounts to US$5.748 billion, while the NPV of environmental benefits is US$213 million. The main assumptions underlying the analysis are: a marginal cost differential of US$13.8/megawatt hour, a discount rate of 12%, and a value of US$6.93[21] per ton of CO_2. An analysis was conducted of sensitivity to changes in the assumptions on the marginal costs of generation and the monetary value of a ton of CO_2, with robust results. A cost-benefit analysis was conducted of the energy efficiency measures, with an estimated NPV of US$1.237 billion and an IRR of 36%. This result is robust to an analysis of sensitivity to changes in the power rate, assuming a reduction of up to 30%.

1.46 For the component concerning access to electrification in the ZNIs, an efficiency cost analysis was conducted to justify the solution of using NCRE. It was found that the use of NCRE, compared to conventional fuel (diesel), yields a savings of 40% in the unit cost per kilowatt hour supplied.

II. Financing Structure and Main Risks

A. Financing instruments

2.1 The program is structured as a programmatic policy-based loan (PBP). A PBP is the most appropriate IDB instrument for supporting further government progress in sustainable management of the sector, as it facilitates policy dialogue between the country and the Bank, provides the necessary time for the reforms to be implemented, and offers the opportunity to review progress under the first operation (document CS-3633-1). The amount of each loan is set based on the development

[21] NCRE information from https://www.investing.com/ and https://www.theice.com/products. Exchange rate from the European Central Bank.

financing needs of Colombia, and its borrowing limit with the Bank. The first operation will be for US$300 million from the Bank's Ordinary Capital.

2.2 **Dimensioning of the operation.** Pursuant to paragraph 3.27(b) of, "Policy-Based Loans: Guidelines for Preparation and Implementation" (document CS-3633-1), the operation has been dimensioned in light of the country's fiscal needs. For 2017, the central government's financing needs stand at 8.1% of GDP. The amount of the operation would cover a portion of that financing, representing 1.2% of total financing needs and 10.7% of financing from multilateral sources.

B. Environmental and social risks

2.3 Pursuant to Directive B.13 of the Bank's Environment and Safeguards Compliance Policy (document GN-2208-20 and OP-703), the environmental impact of this program does not need to be classified. The proposed reforms will not generate any adverse environmental or social impacts.

C. Fiduciary risks

2.4 Colombia has a long track record in handling external loan resources, and no financial management risks are foreseen. The Ministry of Finance and Public Credit (MHCP) has broad experience in implementing reforms and will offer support to the sector authorities heading up the process that this PBP is supporting in the power sector.

D. Other project risks

2.5 The medium-level risks identified have to do with potential delays in completing the proposed reforms, and the possibility that the new government, to be elected in 2018, will not give priority to the reforms proposed for the second operation of the program. To mitigate these risks, the Bank will continue to hold follow-up meetings, at least every six months, to track the program's evolution and outcomes, identify any additional support needed to meet the conditions, comply with the program's Monitoring and Evaluation Plan (paragraph 3.4), and achieve the triggers for the second loan. As there is political consensus on the reforms to the energy sector, the commitments under the first operation include regulatory reforms and legislative regulations and, under the second operation, include commitments related to progress in implementing the reforms and the new regulations, thereby mitigating the execution risk posed by the electoral process. The Bank will continue to support the government in building the institutional capacity of the agents involved, through a technical cooperation operation (CO-T1438) aimed at offering the authorities technical support in implementing the series of reforms.

III. Implementation and Management Plan

A. Summary of implementation arrangements

3.1 The borrower will be the Republic of Colombia. Program execution and use of the loan proceeds will be carried out by the borrower through the MHCP, as executing agency. The MHCP is responsible for: (i) advancing achievement of the policy objectives; (ii) providing evidence that the agreed policy conditions have been met; and (iii) compiling and providing information with which the government and the Bank can measure and evaluate program results.

3.2 The MHCP will hold regular meetings for analysis and monitoring and, working with the DNP, the MME, the CREG and the UPME, will coordinate preparation and fulfillment of the programmatic commitments for the second PBP, and for consolidation of the sector reform (paragraph 3.4).

3.3 The transfer of funds for this operation will constitute direct budgetary support. The resources will be transferred to the MHCP in accordance with financial administration procedures established in national legislation. A single disbursement is planned, following signature of the loan contract, once fulfillment of the special and general conditions precedent to disbursement has been verified. **The single loan disbursement will be contingent upon fulfillment of the policy reform measures as established in the Policy Matrix (Annex II) and the Policy Letter, and the conditions established in the Loan Contract.** This compliance will be confirmed using the instruments identified in the Means of Verification Matrix. The Bank may request an external audit of the program if it deems this necessary.

B. Summary of results monitoring arrangements

3.4 A detailed Monitoring and Evaluation Plan has been prepared. It includes indicators of medium and long-term outcomes and impacts, consistent with the policy reform process agreed in the Policy Matrix (Annex II). These indicators are reflected in the Results Matrix. The Monitoring and Evaluation Plan calls for follow-up and coordination meetings between the government agencies involved in implementing the policy reforms, to determine the evolution and results of the reforms. The government and the Bank have agreed to hold regular meetings to monitor and evaluate the Results Matrix. Before processing the second PBP, the Bank will produce a progress report reviewing the program's evolution, progress with the reforms, and the triggers, and it will identify any changes or adjustments that may be required to achieve the program's targets.

3.5 Once the second operation has been implemented, there will be an ex post evaluation of program results. The methodology to be used will be similar to the ex ante economic evaluation (cost-benefit analysis) conducted at the outset of each loan in the series. The project team will prepare a project completion report, following Bank guidelines (OP-1242-5), evaluating the impacts obtained, and will use the cost-benefit analysis as input.

IV. POLICY LETTER

4.1 The government has agreed with the Bank on the macroeconomic and power sector policies to be supported by the program. These are spelled out in the Policy Letter submitted to the Bank by the MHCP and the DNP, which describes the main components of the strategy for the PBP, and confirms the government's commitment to these agreements.

Development Effectiveness Matrix		
Summary		
I. Corporate and Country Priorities		
1. IDB Development Objectives	**Yes**	
Development Challenges & Cross-cutting Themes	**-Social Inclusion and Equality -Productivity and Innovation -Economic Integration -Climate Change and Environmental Sustainability -Institutional Capacity and the Rule of Law**	
Country Development Results Indicators	**-Reduction of emissions with support of IDBG financing (annual million tons CO2 e)* -Installed power generation from renewable energy sources (%)* -Regional, sub-regional and extra-regional integration agreements and cooperation initiatives supported (#)***	
2. Country Development Objectives	**Yes**	
Country Strategy Results Matrix	**GN-2832**	**Increase equitable access to quality basic services.**
Country Program Results Matrix		**The intervention is not included in the 2017 Operational Program.**
Relevance of this project to country development challenges (If not aligned to country strategy or country program)		
II. Development Outcomes - Evaluability	**Evaluable**	
3. Evidence-based Assessment & Solution	**9.0**	
3.1 Program Diagnosis	**2.4**	
3.2 Proposed Interventions or Solutions	**3.6**	
3.3 Results Matrix Quality	**3.0**	
4. Ex ante Economic Analysis	**10.0**	
4.1 The program has an ERR/NPV, a Cost-Effectiveness Analysis or a General Economic Analysis	**4.0**	
4.2 Identified and Quantified Benefits	**1.5**	
4.3 Identified and Quantified Costs	**1.5**	
4.4 Reasonable Assumptions	**1.5**	
4.5 Sensitivity Analysis	**1.5**	
5. Monitoring and Evaluation	**6.2**	
5.1 Monitoring Mechanisms	**1.3**	
5.2 Evaluation Plan	**5.0**	
III. Risks & Mitigation Monitoring Matrix		
Overall risks rate = magnitude of risks*likelihood	**Low**	
Identified risks have been rated for magnitude and likelihood	**Yes**	
Mitigation measures have been identified for major risks	**Yes**	
Mitigation measures have indicators for tracking their implementation	**Yes**	
Environmental & social risk classification	**B.13**	
IV. IDB´s Role - Additionality		
The project relies on the use of country systems		
Fiduciary (VPC/FMP Criteria)		
Non-Fiduciary		
The IDB's involvement promotes additional improvements of the intended beneficiaries and/or public sector entity in the following dimensions:		
Gender Equality		
Labor		
Environment		
Additional (to project preparation) technical assistance was provided to the public sector entity prior to approval to increase the likelihood of success of the project		
The ex-post impact evaluation of the project will produce evidence to close knowledge gaps in the sector that were identified in the project document and/or in the evaluation plan		

Note: (*) Indicates contribution to the corresponding CRF's Country Development Results Indicator.

The main objective of the project is to contribute to the sustainability of the country's energy sector through a set of policy reforms that will allow an efficient supply of electricity of the National Interconnected System and Non-Interconnected Zones. The specific objectives are: (i) to ensure a macroeconomic context consistent with the objectives of the program; (ii) to contribute to ensuring energy supply by diversifying the energy matrix with Non-Conventional Renewable Energy Sources, increasing energy exchanges with neighboring countries and increasing the supply of natural gas for energy generation; and (iii) to promote access to energy in Non-Interconnected Zones using Non-Conventional Renewable Energy Sources.

The project presents a complete diagnosis; it includes a precise description of the country's energy sector, the obstacles that currently exist to be able to diversify the country's energy matrix with Non-Conventional Renewable Energy Sources and the difficulties that exist to serve localities that are part of the Non- Interconnected Zones. It also mentions the Bank's experience in supporting similar interventions in other countries of the Region.

In terms of the results matrix, indicators reported are SMART and have means of verification.

The cost-benefit analysis (CBA) is consistent with the program logic, it has reasonable assumptions and uses a rigorous methodology. The second component is analyzed through a CBA, while the third component is analyzed through a cost-effectiveness analysis. The latter shows that the photovoltaic and hybrid options are the most cost-effective in the areas of the country that the program aims to reach.

The project includes a monitoring and evaluation plan. The effectiveness of the proposed intervention will be measured following different methodologies: an ex-post cost benefit analysis, and a before and after approach.

Finally, the risks identified in the risk matrix are rated for magnitude; they include mitigation measures and related metrics to track their implementation.

POLICY MATRIX

Objective: The general objective is to contribute to the sustainability of Colombia's energy sector through policy reforms that will ensure the efficient supply of electric energy in the National Interconnected System (the national grid) and the noninterconnected zones (ZNIs), to reduce the sector's vulnerability to the effects of climate change and increase access to electric power. The specific objectives are to: (i) ensure a macroeconomic setting consistent with the program's objectives as set out in the Policy Matrix and the Sector Policy Letter; (ii) help guarantee energy supply from the national grid by diversifying the energy matrix with nonconventional renewable energy sources (NCRE) and increasing international trade in energy, while establishing measures to increase and guarantee the supply of natural gas for power generation, to manage energy demand, and to optimize the functioning of the wholesale energy market; and (iii) promote access to energy in the ZNIs through the use of NCRE.

Objectives	Commitments Programmatic loan I	Triggers Programmatic loan II
Component 1. Macroeconomic stability		
Stability of the general framework of macroeconomic policies.	Macroeconomic framework consistent with the program's objectives as established in the Policy Matrix and the Sector Policy Letter.	Macroeconomic framework consistent with the program's objectives as established in the Policy Matrix and the Sector Policy Letter.
Component 2. Support for the reliability of the power supply from the national grid (SIN)		
Subcomponent 2.1. Support for diversifying the energy matrix and for regional electric power integration		
Help guarantee the supply of energy by diversifying the energy matrix with NCRE and increasing international energy exchanges.	**Nonconventional renewable energy sources (NCRE)**	
	Regulations to Law 1715 of 2014 (the purpose of which is to promote development and use of NCRE in the national energy system), for: ➢ Setting guidelines for application of "incentives for investment in NCRE projects" (Chapter III of Law 1715 of 2014).	Additional regulation to Law 1715 of 2014, for: ➢ Implementing a computerized information system for handling the incentives contained in Law 1715 of 2014. ➢ Regulating the Nonconventional Energies and Energy Management Fund (FENOGE).
		The FENOGE is operational and has earmarked financial resources.
	➢ Regulation establishing procedures and requirements for backing projects and accessing incentives for investment in NCRE projects.	Regulation and validity of a program of tax incentives for NCRE.
	➢ Regulation setting the conditions for the connection, measurement and delivery to the grid of the surpluses of large-scale autogenerators.	Regulation establishing the conditions necessary for connection of **NCRE** to the SIN, through: ➢ Establishment of technical requirements for facilities that use NCRE for power generation (solar, wind, geothermal), and procedures for the connection and operation of autogenerators. ➢ Establishment of procedures for marketing energy from autogenerators.

Objectives	Commitments Programmatic loan I	Triggers Programmatic loan II
	Regional energy integration	
	Design of the draft decision on the Regulatory Framework for Subregional Interconnection of Electricity Systems and Community Electricity Exchange.	Implementation of SINEA roadmap activities and design of complementary studies of binational interconnections referenced in the studies from the first program in the framework of SINEA.
Subcomponent 2.2. Strengthening the electricity market		
Strengthen the wholesale energy market with measures that can increase and guarantee the supply of natural gas for generation and manage energy demand.	**Natural gas**	
	Design of the execution criteria under which adjustments will be made to the wholesale marketing of natural gas.	Regulation incorporating adjustments to the natural gas marketing mechanisms.
	Adoption of the Transitional Plan for natural gas supply.	Adoption of the Indicative Plan for Extending Natural Gas Coverage.
	The natural gas market manager is operational and is responsible for managing primary and secondary natural gas markets, and for compiling, centralizing, and publishing transactional and operational information on the sector.	The market manager has stabilized operations and is generating market indicators.
	Efficient energy demand management	
	Development of technical, legal, economic and financial, planning and information instruments for the Program for Rational and Efficient Energy Use (PROURE) for 2017-2022; which includes: ➢ Adoption of an indicative action plan for development of the PROURE, with its associated funding.	Guidelines for updating the legal framework for granting tax incentives for efficient energy management projects.
	➢ Preparation of the manual for formulating and implementing efficient energy demand management plans in public entities.	Design of energy management plans by public entities in accordance with guidelines in the manual produced by the UPME.
	➢ Adoption of the consumer labeling and information system on energy efficiency.	Design of tools (dissemination, training) for implementing the labeling system. (Computerized information systems for revising the labeling system). Adoption of the second stage of the labeling system (2017).
	➢ Publication of the road map for implementing smart grids that will produce energy savings.	A study on the functionality of smart metering.
	Adoption of provisions for implementing demand response mechanisms.	Implementation and adjustments to demand response mechanisms.
	Design of mechanisms for voluntary disconnection as a way of making the SIN more reliable.	Approval of mechanisms for voluntary disconnection as a way of making the SIN more reliable.

Objectives	Commitments Programmatic loan I	Triggers Programmatic loan II
	Functioning of the wholesale energy market	
	Publication of diagnostic studies, analyses and proposals for modifying the functioning of the Colombian wholesale energy market.	The 2017 CREG regulatory agenda (which contains the regulatory projects of highest priority) includes regulations for implementing the recommendations for reform of the wholesale energy market.
	Adoption of the Generation and Transmission Expansion Plan 2015-2029.	Adoption of the Power Generation and Transmission Expansion Plan 2017-2031.
Component 3. Promoting access to energy in the ZNIs		
Promote access to energy in the ZNIs through the use of NCRE.	Regulations to Law 1715 of 2014 on the use of NCRE in the ZNIs: ➢ Regulated registry of generation projects using NCRE connectable to the grid and in ZNIs	Regulations to Law 1715 of 2014 on the use of NCRE in the ZNIs: Operational registry of generation projects using NCRE connectable to the grid and in ZNIs.
	Adoption of policy guidelines for expanding power service coverage in the SIN and in the ZNIs using NCRE.	Concessioning of at least one ZNI as an exclusive service area, under a business framework model.

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

PROPOSED RESOLUTION DE-__/17

Colombia. Loan ____/OC-CO to the Republic of Colombia
National Program to Ensure a Sustainable,
Efficient Energy Supply

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the Republic of Colombia, as Borrower, for the purpose of granting it a financing to cooperate in the execution of a national program to ensure a sustainable, efficient energy supply. Such financing will be for the amount of up to US$300,000,000 from the resources of the Bank's Ordinary Capital, and will be subject to the Financial Terms and Conditions and the Special Contractual Conditions of the Project Summary of the Loan Proposal.

(Adopted on __ _____ ____)

LEG/SGO/CAN/EZSHARE-1274791288-2882
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