

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

HONDURAS

CAÑAVERAL–RÍO LINDO HYDROPOWER COMPLEX REHABILITATION AND UPRATING PROJECT

(HO-L1102)

LOAN PROPOSAL

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| 3. | Assessment study of the generation component, Francisco Daniel Urbano – November 2014 http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=39307608 |
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ABBREVIATIONS

| | |
|---------|--|
| AWP | Annual work plan |
| CORE | Cofinancing of Renewable Energy and Energy Efficiency Projects |
| CREE | Comisión Reguladora de Energía Eléctrica [Electric Power Regulatory Commission] |
| EIRR | Social internal rate of return |
| ENEE | Empresa Nacional de Energía Eléctrica [National Electric Power Company] |
| FIRR | Financial internal rate of return |
| GHG | Greenhouse gas |
| H | Hours |
| ICAS | Institutional Capacity Assessment System |
| JICA | Japan International Cooperation Agency |
| kV | Kilovolts |
| LGIE | Ley General de la Industria Eléctrica [Electric Power Industry Act] |
| masl | Meters above sea level |
| MER | Mercado Eléctrico Regional [Regional Electricity Market] |
| MVA | Megavolt amperes |
| NCRE | Nonconventional renewable energy |
| NPV | Net present value |
| ONADICI | Oficina Nacional de Desarrollo Integral del Control Interno de las Instituciones Públicas [National Office of Integral Development of Internal Control of Public Institutions] |
| ONCAE | Oficina Normativa de Compras y Adquisiciones del Estado [Regulatory Office of Government Purchasing and Procurement] |
| PAASS | Plan de Acción Ambiental y de Salud y Seguridad [Environmental and Health and Safety Action Plan] |
| PCBs | Polychlorinated biphenyls |
| PCU | Project coordination unit |
| PPA | Power purchasing agreement |
| PROMEF | Proyecto de Mejora de la Eficiencia del Sector de Energía [Power Sector Efficiency Enhancement Project] |
| RE | Renewable energy |
| SEFIN | Secretaría de Estado en el Despacho de Finanzas [Ministry of Finance] |
| SIAFI | Sistema de Administración Financiera Integrada [Integrated Financial Administration System] |
| SIEPAC | Sistema de Interconexión Eléctrica de los Países de América Central [Central American Electric Interconnection System] |
| SIN | Sistema Interconectado Nacional [National Interconnected System] |
| SREP | Scaling Up Renewable Energy Program |
| TSC | Tribunal Superior de Cuentas [Superior Audit Court] |

PROJECT SUMMARY

HONDURAS

CAÑAVERAL–RÍO LINDO HYDROPOWER COMPLEX REHABILITATION AND UPRATING PROJECT (HO-L1102)

| Financial Terms and Conditions | | | | | |
|---|------------------------|--------------|---------------------------------|-------------|----------------|
| Borrower: Republic of Honduras Executing agency: Empresa Nacional de Energía Eléctrica [National Electric Power Company] (ENEE) | | | | OC | FSO |
| | | | Amortization period: | 30 years | 40 years |
| Source | Amount | % | | | |
| IDB (OC) 60% | US\$13,800,000 | 8.2 | Disbursement period: | 5.5 years | 5.5 years |
| IDB (FSO) 40% | US\$9,200,000 | 5.5 | Grace period: | 6 years | 40 years |
| JICA (see paragraph 2.1) | US\$135,364,000 | 81.0 | Credit fee: | * | N/A |
| Local | US\$8,816,000 | 5.3 | Inspection and supervision fee: | * | N/A |
| | | | Interest rate: | SCF Fixed** | 0.25% |
| Total | US\$167,180,000 | 100.0 | Currency of approval: | US\$ | US\$ |
| Project at a Glance | | | | | |
| Project objective/description: The objective of the project is to restore and conserve electrical power generating capacity from a renewable source, thus contributing to the country's energy supply security. The specific objectives are: (i) to rehabilitate the generating infrastructure of the Cañaveral–Río Lindo hydroelectric power plants; (ii) to rehabilitate the power transmission assets connecting the power plants to the National Interconnected System (SIN); and (iii) to improve the operational and business efficiency of the ENEE's power generation operations. | | | | | |
| Special contractual clauses: (i) The entry into force of a subsidiary agreement between the borrower, represented by the Ministry of Finance, and the ENEE for the transfer of resources and project execution obligations (see paragraph 3.1); (ii) signature by the borrower and entry into force of the loan contract with JICA for the additional resources necessary to finance the project (see paragraph 2.1); and (iii) approval of the project Operating Manual agreed upon with the Bank (see paragraph 3.3). | | | | | |
| Special execution conditions: (i) the ENEE's core staff will be maintained, with qualifications acceptable to the Bank, in the project coordination unit (see paragraph 3.2); and (ii) the ENEE will fulfill the environmental and social obligations established in detail in the environmental and social management report (ESMR) and implement the actions envisaged in the Environmental and Health and Safety Action Plan (PAASS) (see paragraph 2.8). | | | | | |
| Exceptions to Bank policies: None. | | | | | |
| Project qualifies as: | | SEQ [] | PTI [] | Sector [] | Geographic [] |
| | | | | | Headcount [] |

* 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.

** The Borrower will pay interest on the outstanding balances of this portion of the Ordinary Capital loan at a LIBOR-based rate. Whenever the balance owed reaches 25% of the approved net amount, or US\$3 million, whichever is the greater, the base rate will be set on the basis of this balance.

I. DESCRIPTION AND RESULTS MONITORING

A. Background, problem to be addressed, and rationale

- 1.1 **The electricity sector in Honduras.** In 2013 Honduras's installed capacity for electricity generation was 1,669 MW, maximum power demand was 1,380 MW, and energy demand was 7,976 GWh. Of this, 58% was supplied from thermal power generation, 29% from hydroelectric power generation, 12% from nonconventional renewable energy (NCRE) sources and 1% from the regional electricity market (MER). In recent years energy demand has grown at an average rate of 4% a year and power at 32 MW/year, reflecting progress on increasing electricity supply coverage, in line with the Government of Honduras's targets, from 45% in 1995 to 89% at end-2013.
- 1.2 **Institutional development of the sector and progress of reforms.** The sector has been undergoing reform since July 2013, leading to the issuing of the Electric Power Industry Act (LGIE) (Decree 404-2013), passed in January 2014 and effective as of 4 July 2014. This law aims to remedy the sector's institutional, regulatory and operational weaknesses and reduce its fiscal impact. The institutional framework established by the LGIE comprises the Autoridad Superior del Sector Eléctrico [Electricity Sector Authority] as policy formulator, the Comisión Reguladora de Energía Eléctrica [Electric Power Regulatory Commission] (CREE) as regulator, and the Operador del Sistema Eléctrico Nacional [National Electricity System Operator] as responsible for ensuring the continuity and security of electricity supply, and system operation.
- 1.3 The National Electric Power Company (ENEE), the main operator in the electricity sector, is a public enterprise organized and operating under national law that owns almost all the country's transmission and distribution systems and 30% of its generating capacity. The ENEE is the market's sole energy buyer, responsible for operation of the National Interconnected System (SIN) and participation in the Regional Electricity Market (MER). The ENEE is in critical financial condition that has led to indebtedness to private generators to the tune of US\$423 million as of August 2014 and dependence on fiscal transfers for its operation, equivalent to 1.8% of GDP in 2013. Its difficulties stem from high levels of energy losses on the order of 31% in 2013, inefficient management of bill collection, low rates, and untargeted subsidies over recent years ([optional electronic link 1](#)). Given the lack of investment, the quality of service has deteriorated, such that equivalent outage times are 41.8 hours/year, which exceeds the industry's recommended standards.
- 1.4 Pursuant to the LGIE, the ENEE has embarked on a process of institutional change, adopting the necessary measures to ensure the technical and fiduciary skills of the human resources required for its proper operation. One of the measures is its being divided into a generating company, a transmission and system operation company, and at least one distribution company, as government-owned companies with the ENEE as parent holding company. The LGIE highlights the importance of modernizing the new generating company so as to make full use of renewable

resources and to compete actively in the market. For other activities it is seeking the support of private operators.

- 1.5 The Government of Honduras has made significant progress in the reform process, introducing a series of measures that have succeeded in reducing the impact of ENEE's financial position on the consolidated deficit of the public sector from 1.8% of GDP at the close of 2013 to 1.3% GDP at the close of 2014. The principal adjustment actions include: (i) correcting the fuel adjustment formula in the busbar price, which increased rates by 3.7% to 5%; (ii) correcting the cross-subsidy in the residential sector, which led to a rate adjustment in the range of 0 to 300 kWh/month; (iii) recovering the public- and private-sector past-due portfolio; (iv) reducing the debt to private thermal generators; and (v) cutting staff. The recent decline in international oil prices facilitated the first two adjustments. Progress has been made on preparing regulations for implementation of the LGIE and on the bidding documents for selection of the private operator responsible for reducing distribution losses. In 2014 the NCRE installed capacity increased 58% over 2013 as hydropower, biomass, and wind projects came into operation.
- 1.6 The ENEE is executing the Power Sector Efficiency Enhancement Project (PROMEF), financed by the World Bank. One of its main objectives is to reduce power losses. Advances include the installation of 5,000 automated “smart” meters for major consumers that represent some 45% of energy billed; installation of an Integrated Management System; replacement of 1,000 distribution transformers; and adoption of annual progress targets on business management indicators ([Implementation Status](#)). The Government of Honduras expects to reduce losses by 9% in the next three years. The government reviewed the power purchasing agreements (PPAs) expiring in 2014 and is reviewing the rate schedule and subsidies. The ENEE is currently implementing financial restructuring measures aimed at enhancing the efficiency of public management, through a functional organizational structure that helps eliminate unfavorable practices, such as the direct purchase of power from private generators without competitive processes, poor management of generation projects, and weaknesses in financial management. It is therefore essential to strengthen the new generating company's technical and financial capacity.
- 1.7 Honduras is a signatory to the Framework Treaty on the Central American Electricity Market and took part in implementation of the Central American Electric Interconnection System (SIEPAC) project. Its participation in the MER helps to reduce energy costs. Honduras has implemented the regulatory interfaces for the MER, including the policies and procedures for coordinated operation, economic dispatch, access to the transmission network, and administration of the wholesale market. Power sold on the MER increased 174% in 2013.
- 1.8 **Electricity generation.** Private sector companies, mostly thermal power generators, are engaged in generation activities alongside the ENEE. The three largest of such companies are: Electricidad de Cortés (ELCOSA), Grupo Terra y Luz and Fuerza de San Lorenzo (LUFUSSA), which have signed PPAs with the ENEE. Of the

558 MW of installed capacity for hydroelectric generation in Honduras, 464 MW belongs to ENEE, which has the following hydroelectric power plants: Francisco Morazán–El Cajón (300 MW), in operation since 1985; the Cañaveral (29 MW) - Río Lindo (80 MW) hydropower complex, in operation since 1964; the El Nispero plant (22.5 MW); and the Santa María plant (1.2 MW).

- 1.9 The cost of electricity produced by thermal power plants in Honduras has reached 18cUS\$/kWh, given the volatility of oil prices, whereas the cost of NCRE generation is 12.5cUS\$/kWh, and power from the MER costs between 16 and 18cUS\$/kWh. The cost of energy produced by government-owned hydroelectric power plants, meanwhile, under current conditions where only the cost of operation and maintenance is recouped, is below 3cUS\$/kWh. This cost structure means that, even in scenarios of low oil prices, the government-owned hydropower plants are vital to reducing the average cost of the country's power, either by replacing thermal power generation or imports from the regional market. With more generating capacity, Honduras could increase its share of transactions on the MER.
- 1.10 The Government of Honduras has taken steps to promote renewable energy resource investments and project development and reduce dependence on oil and its impact on electricity prices. The Electrical Power Generation from Renewable Resources Promotion Act was passed in 2007, and amended in 2013, introducing fiscal incentives for NCRE generation that enabled the share of generation from nonconventional sources to rise from 5% in 2007 to 12% in 2013, and reducing thermal energy's share from 63% to 58%. These incentives include a tax exemption on sales, imports, and income; signing of PPAs with the ENEE; a clear formula for calculating energy prices; and priority dispatch for NCRE. These incentives favor new projects promoted by the ENEE, and those relating to the rehabilitation of existing hydroelectric power plants, through the exemption for equipment, materials, and services associated with such works.
- 1.11 The ENEE's forecasts for electric power and demand for the next 15 years show an annual growth rate for both variables of around 3.9% for the period and 4.3% for the next five years. The expansion plan for the generation system projects that these needs will be met mainly from hydroelectric power generation (2,000 MW) and NCRE (600 MW) in 2028, while maintaining around 1,000 MW with thermal, thereby diversifying the generating matrix.
- 1.12 **The Cañaveral–Río Lindo hydropower complex.** The complex is located in the region of Cortés, 130 km to the northeast of Tegucigalpa. Construction began in 1960, and the first two units of the Cañaveral power plant, of 14.5 MW each, went into operation in 1964, making it the country's first hydroelectric power plant. In 1971 the first two, 20 MW units of the Río Lindo power plant went into operation, and units three and four (also 20 MW) also came on line in 1978, bringing total installed capacity to 109 MW. The complex operates in cascade, utilizing Lake Yojoa, located at 637 meters above sea level (masl), as a natural reservoir. The water first drives the Cañaveral power plant's turbines at a height of 490 masl and then those of the Río Lindo power plant at 80 masl. The complex contributes 35%

of the government's hydroelectric power and 9.6% of the national power supply. Table I-1 shows the main characteristics of each of the power plants and their average annual generation between 2009 and 2013.

Table I-1. Characteristics of Cañaveral–Río Lindo Hydropower Complex

| | Units | Turbines | In operation | Capacity (MW) | Average generation (GWh) |
|-----------------------|----------|----------|--------------|---------------|--------------------------|
| Cañaveral power plant | 2 | Francis | 1964 | 29 | 188 |
| Río Lindo power plant | 4 | Pelton | 1971/78 | 80 | 583 |
| Complex total | 6 | | | 109 | 771 |

- 1.13 The Cañaveral power plant has a step-up substation raising the voltage from 13.8 kV to 138 kV. This comprises two 20 MVA power transformers connected by a 138 kV transmission line, with a capacity of 151.8 MVA, to the Piedras Azules substation on the National Interconnected System (SIN). Río Lindo has a step-up substation raising the voltage from 13.8 kV to 138 kV, with four 30 MVA power transformers, connected by two 138kV, 151.8 MVA capacity transmission lines to the El Progreso and Villanueva substations on the SIN. The two power plants are interconnected via a 138 kV, 151.8 MVA capacity line.
- 1.14 **Importance for the National Interconnected System (SIN).** The Cañaveral–Río Lindo hydropower complex is vital for power generation and operation of the SIN, as well as its synchronization with SIEPAC, as it produces the country's cheapest electricity in terms of generating costs. These power plants are the first to start up when restoring the system after a national outage, backing up the Francisco Morazán–El Cajón power plant. During periods of low hydroelectric output in the region, the complex's power plants are able to maintain maximum power due to the altitude differential between Lake Yojoa and the location of the power plants. This contrasts with the Francisco Morazán–El Cajón power plant, whose capacity is limited when the level of its reservoir drops. The operation of these power plants reduces the operation of thermal power plants, decreasing energy purchases from private generators, the average cost of generation, and CO₂ emissions.
- 1.15 **Current condition of the Cañaveral–Río Lindo hydropower complex.** A number of major overhauls have been carried out over the time the complex has been in operation. The first was in 1971, affecting unit one of the Cañaveral power plant. In 1978 units one and two of the Río Lindo power plant were overhauled. The last major overhaul took place between 1991 and 1993, including all the units of both power plants, with inspections and testing of all the equipment, and replacement of certain components using the same type of technology as used in the original construction. This maintenance made it possible to extend the complex's service life and restore levels of generation.
- 1.16 The main activities carried out during this most recent overhaul included replacement of the turbine bearings at the Cañaveral power plant; rewinding a

generator at Río Lindo; replacing the voltage regulators; maintenance on the intake channels and replacing their valves; and rehabilitation and maintenance of the civil works. Insulation tests were performed on all the power transformers at the step-up substations, and the control cables were replaced. Both power transformers at Cañaveral were replaced.

- 1.17 After more than 20 years of continuous operation since the last major overhaul, various studies indicate a high risk of equipment and power plant failure as a result of fatigue and operational deterioration of many parts of the turbine-generator unit and other equipment,¹ some of which is close to the end of its service life. This includes the four turbines of the Río Lindo power plant, which have been in operation for 43 years, while their service life is 30 to 40 years. The bearings of the Cañaveral turbines also show signs of serious cavitation damage. Other equipment is obsolete, given that it is either original or uses original technology, such the mechanical/hydraulic speed regulators dating from 1962 and the control systems of each of the power plants.
- 1.18 Some major items of substation equipment, such as switches, isolators, protection systems, and current and power transformers have been in operation for over 40 years and their current condition does not guarantee system reliability. Some equipment requires urgent replacement, and in some cases spare parts are not available on the market and there is no manufacturer support. The isolation tests on the transformers showed signs of deterioration and that they were at the limits of their service life. The transformers have exceeded their capacity limits and are saturated, making the power and energy readings ineffective. The lines lack lightning conductors to protect them from atmospheric phenomena.
- 1.19 Given the state of the power plants, the number of failures and amount of corrective maintenance has increased due to faults on the main equipment, affecting the plants' availability and reducing their efficiency. According to the ENEE's records, 10% of faults at Río Lindo between June 2007 and June 2010 affected the turbines, and 43% the generator and its auxiliary equipment, accounting for 29% and 40% of unavailability, respectively ([optional electronic link 8](#)). The difficulty obtaining spares results in longer stoppage times during maintenance ([optional electronic link 3](#)). In Cañaveral the hours (H) spent maintaining the turbines, generator, and auxiliary services were 85 hours in 2008, 73 hours in 2009, 72 hours in 2010 and 109 hours in 2011.
- 1.20 Studies done on other similar power plants near the end of their service life, show there to be a reduction in power plant availability ([required electronic link 9](#)). The analysis of the amount of power generated annually in the period between the maintenance in 1978 and that in 1993 shows that generation dropped at the end of the period by 35 GWh and 75 GWh at the Cañaveral and Río Lindo power plants,

¹ In 2002 an assessment study by Siemens found deterioration to the turbine bearings at the Río Lindo power plant. Subsequently, between 2010 and 2012, studies by the Taiwan Power Company and manufacturers of the existing equipment reported more substantial equipment wear.

respectively. The studies cited estimate that if no rehabilitation is carried out, the power plants' performance factors will decrease significantly in the coming years, decreasing the availability of the Cañaveral power plant from 97% in 2012 to 60% in 2021, and that of the Río Lindo power plant from 97% to 70% over the same period. Thus, the load factors would go from 74% to 40% at Cañaveral, and 84% to 60% at Río Lindo. Other factors, such as the poor functioning of the hydraulic sluice gates and the lack of systems to clean the grilles on the intakes, lead to a reduction in generating capacity, due to a loss of hydraulic head of around 3% due to the build-up of debris, at a cost equivalent to almost US\$100,000 a month.

- 1.21 As a result of the current condition of the complex, its age, and the lack of a recent overhaul, the power generated by the hydropower plants is expected to continue to decline. This state of affairs also represents a high risk of a major failure that may lead to the generating units being taken out of operation irreversibly, jeopardizing the energy supply and system stability. The plants' unavailability would be reflected in higher generating costs, with power having to be supplied by thermal power plants or increased imports from the MER. Fluctuations or failures of the Honduran electricity system may have repercussions for systems in neighboring countries given their joint operation through SIEPAC.
- 1.22 **Project design.** The project envisages a major overhaul to repair, replace, and improve the components and facilities of the Cañaveral–Río Lindo hydropower complex, in order to extend its service life by at least 30 years, guarantee the electricity supply at lower cost and eliminate the risk of failure, loss of energy supply, and system instability. Rehabilitation will enable the power plants' technology to be upgraded, with the installation of higher performance turbines and digital technology control equipment, making better utilization of the flow and improving turbine efficiency by around 2%. Uprating will increase the installed capacity of the generators to increase utilization of the complex at times of peak demand. The complex's total installed capacity will be increased by around 20.8 MW.² Work will be done on the two power plants' substations, replacing the transformers and other power equipment. The control and protection systems will be modernized, and maintenance done on the civil works to ensure this equipment remains operable to deliver power to the SIN.
- 1.23 The rehabilitation and uprating will reduce purchases of thermally generated power at peak times nationwide and enable the operation of the complex to be extended. Renewable energy generation will increase its share by almost 1.5%, thus avoiding

² The flow at Cañaveral will increase from 11.5 m³/s to 12.1 m³/s, and efficiency will improve by 2%. Along with the increase in the maximum power of the generators, this will enable the power of each unit to be increased from 14.5 MW to 16.1 MW, for a total increase of 3.2 MW. The flow at Río Lindo will increase from 6.75 m³/s to 7.3 m³/s, efficiency will improve by 2%, and the power of each unit will be increased from 20 MW to 24.4 MW, for a total increase of 17.6 MW.

the emission of approximately 86,000 tons of CO₂ a year.³ Without this resource, the ENEE would have to purchase power from other, more expensive alternatives to ensure firm capacity, worsening its financial position and impacting the country's fiscal condition. The project will benefit the entire Honduran population in general by meeting 9.6% of demand at lower cost and with greater reliability across the system as a whole.

- 1.24 **The country's sector strategy.** The reform process begun in 2013 to improve the sector's financial sustainability has achieved progress in the following areas: focusing of subsidies on low-consumption residential consumers; raising charges for high-consumption users; reducing the cost of buying thermally generated power, through a review and negotiation with private thermal power generators; recovery of the ENEE's past-due portfolio; and the recent entry into force of the LGIE, which aims to attract investments into the private sector in electricity transmission and distribution and reduce losses; and a major effort to increase the share of renewable energy (RE) in the country's energy matrix. The objectives of the Country Vision 2010-2038, framed by Legislative Decree No 286-2009 of 2 February 2010, envisage RE's share of the matrix rising from 65% in 2017 to 80% in 2022.
- 1.25 **The Bank's sector strategy and engagement.** The operation is consistent with the Bank's country strategy with Honduras 2015-2018 (document GN-2796-1), which places priority on the sustainability and competitiveness of the energy sector by supporting the electricity sector reform process and considering investments in the sector as progress is made on implementing reforms to facilitate efficiency and financial sustainability. It aims to: (i) improve the efficiency and quality of electricity service and diversify the power generation matrix; and (ii) increase access to electricity service. The country strategy identifies climate change as a crosscutting area, with a focus in the power sector on vulnerability reduction, incorporation of climate change adaptation and mitigation into the design of viable systems, renewable energy actions, and actions to improve coverage. The Bank regards the sector's progress on the reforms as significant (see [optional electronic link 11](#), and paragraphs 1.4 and 1.5). It is currently financing loan HO-L1070, Support for Structural Reforms in the Electricity Sector, under which measures are being taken to implement reforms and sector policies to improve financial sustainability, operational efficiency, and security of electricity supply.⁴
- 1.26 The Bank is financing loan HO-L1039, Support for the Integration of Honduras in the Regional Electricity Market, to improve the technical and management capacity of the national dispatch center and build the La Entrada 230kV/34.5kV electrical

³ Preliminary estimate by the ENEE's environmental unit, using an emission factor for 2011. The most effective methodology for estimating emissions will be determined with the support of technical cooperation operation HO-T1210.

⁴ As evidence of such progress, in late 2014 the country had fulfilled all programmatic commitments listed in the Policy Matrix as required for the full disbursement of US\$130 million, which took place on 22 December 2014.

substation connecting Honduras with SIEPAC. Together with the increase under the present project, this will enable Honduras to participate more fully in the MER.

- 1.27 The Bank provides technical cooperation assistance to the Government of Honduras and the ENEE in the preparation of operations as well as ad hoc assistance at the request of the Honduran government. The Bank's support addresses processes of improving the sector's energy efficiency through ongoing dialogue and specialized technical assistance on targeting subsidies, purchasing power from private generators, evaluating the ENEE's financial risks, and cleaning up balance sheets; and programs to increase the share of RE sources in the energy matrix, such as the Scaling up Renewable Energy Program (SREP) through the Climate Investment Fund, administered by the Bank. Recent technical cooperation operations include: HO-T1200 Improvement of Macroeconomic Governance in Honduras; HO-T1192 Strategic Dialogue: Notes on Public Policy in Honduras; HO-T1184 Institutional Strengthening for Energy Sector Stakeholders; and HO-T1178 Strengthening the RE Policy and Regulatory Framework, SREP for Honduras.
- 1.28 The Bank has experience with rehabilitation of other hydroelectric power plants in the region, in particular Guri in Venezuela, Furnas and Luis Carlos Barreto in Brazil, Péligre in Haiti and Carlos Fonseca and Centroamérica in Nicaragua. Through these programs and studies of the issue, the Bank has identified benefits and lessons learned applicable to this type of project. These include the importance of ensuring the economic and financial viability of the project being considered, as well as the investments required, the stoppage time necessary to carry out the rehabilitation work, and the cost of supplying power from more expensive sources; a precise diagnostic assessment by experts to determine the specific rehabilitation needs in order to establish the proper scope of the works; and the financial structuring of the project to ensure sources of financing during its execution.⁵ In the study conducted for the IDB ([optional electronic link 9](#)), evidence was presented of the effectiveness and advisability of this type of intervention as one of the most cost-effective alternatives for supplying power from renewable sources without causing environmental or social impacts when compared to others, such as the construction of new power plants. Moreover, it concludes that rehabilitation is an opportunity to incorporate more up-to-date and efficient technologies, better utilize water resources and increase generating capacity. The results obtained from previous major overhauls of the Cañaveral-Río Lindo complex (see paragraph 1.14), have demonstrated the effectiveness of this type of intervention at extending the power plants' service life and enabling levels of generation to be restored ([optional electronic link 2](#)).

⁵ "Renovation, Modernization and Upgrading of Hydro Power Plants – Guidelines for Residual Life Assessment and Life Extension, Er. Amrik Singh and Er. Ashok Thapar;" IEA Technical Guidelines for Upgrades of Existing Hydropower Plants, and IEEE, 1991; "IEEE Guide for the Rehabilitation of Hydroelectric Power Plants," Energy Development and Power Generation Committee of the IEEE Power Engineering Society.

- 1.29 **Strategic alignment.** The program will contribute to two of the financing priorities of the Ninth General Increase in Resources of the Inter-American Development Bank, or Ninth General Capital Increase (GCI-9) (document AB-2764): (i) lending to small and vulnerable countries; (ii) climate change, renewable energy, and environmental sustainability initiatives through changes to the energy matrix; and (iii) regional infrastructure integration through its contribution to the development of regional generating capacity. Under the Bank's Sector Strategy to Support Competitive Global and Regional Integration (document GN-2565-4), and in accordance with the Guidelines for the Classification and Validation of Operations Eligible for the GCI-9 Regional Cooperation and Integration Lending Priority (documents GN-2650 and GN-2733), the project is consistent with this objective, being an infrastructure investment project of national scope with a multinational focus that contributes to the strengthening of the Honduran electricity system, while enabling participation in the MER, as discussed in [optional electronic link 7](#). The project will also contribute to the regional targets for the percentage of power generation capacity from low-carbon sources over total generation capacity funded by IDB.
- 1.30 The project is aligned with the Bank's priority areas of the Bank's Infrastructure Strategy: Sustainable Infrastructure for Competitiveness and Inclusive Growth (documents OP-1012, GN-2710-5) through its support for building and maintaining socially and environmentally sustainable infrastructure that contributes to raise the quality of life. The project is consistent with the objectives established in the Policy on Public Utilities (document GN-2716-6), as described in paragraphs 1.2 to 1.9, 1.23 to 1.26, and the analysis of compliance with this policy ([optional electronic link 6](#)). The project satisfies the financial sustainability and economic evaluation conditions reflected in the investment analysis (see paragraph 2.5), primarily due to the fact that sale of the power generated will enable investment and operation and maintenance costs to be recouped, on top of the benefits of the thermal generation avoided.

B. Objectives, components, and costs

- 1.31 The objective of the project is to restore and conserve electrical power generating capacity from a renewable source, thus contributing to the country's energy supply security. The specific objectives are: (i) to rehabilitate the generating infrastructure of the Cañaveral-Río Lindo hydroelectric power plants; (ii) to rehabilitate the power transmission assets connecting the power plants to the National Interconnected System (SIN); and (iii) to improve the operational and business efficiency of the ENEE's power generation operations. The following activities will be financed:
- 1.32 **Component 1. Upgrading and rehabilitation of generation and transmission (US\$121.5 million: IDB US\$15.4 million; JICA US\$106.1 million).** The project will finance the supply of equipment, labor for replacement and installation of the new equipment, necessary adjustments, and works supervision through the following subcomponents:

- 1.33 **Subcomponent 1. Upgrading and rehabilitation of the generation units.** This subcomponent will finance the total or partial replacement of the components of the two generation units at the Cañaveral power plant and the four units at the Río Lindo power plant, including the turbines of the six generation units and the main components of the generators at the Río Lindo plant. Digital technology will be installed in the turbine governors, excitation systems, generator voltage regulators, and unit supervision and control systems, allowing the plants to be operated automatically in real time. Electrical equipment will be installed for the operation of the hydraulic sluices, inlet grille cleaning systems, the inlet channels will be painted, the valves in the inlet channel will be replaced, and reservoir monitoring and flow rate measurement systems will be installed.
- 1.34 **Subcomponent 2. Rehabilitation of the 13.8/138 kV electrical substations.** The main electrical equipment will be replaced, and maintenance and adaptation work will be done on the civil works at the Cañaveral and Río Lindo power substations. This will include the two power transformers at the Cañaveral power plant and two of the four transformers at the Río Lindo power plant. The adaptation work necessary to change the transfer busbar scheme to double busbar-double circuit breaker will be carried out at Cañaveral. This modification will enable the duration of outages during future maintenance to be shortened. The power switches, isolators, lightning conductors, potential and current transformers, service transformers, insulators, and power cables will all be replaced. The control equipment and protection systems will be relocated, leaving the man-machine interface controls in the power plant control centers. The communications systems and associated equipment will be adapted and installed. The support structures for the power equipment and their concrete foundations will be replaced, and the buildings and other existing facilities remodeled.
- 1.35 **Component 2. Strengthening of the ENEE generation company (IDB US\$1.3 million).** Actions will be financed to strengthen business capacity, financial and operational management capacity, planning capacity and the ability to supervise the generation systems operating under the responsibility of ENEE, supplementing the support provided to the control center under operation HO-L1039. This includes: (i) support for the generation contracts, operations, and business management departments through: (a) implementation of the strategic plan for their strengthening; (b) equipping them with information technology systems to enhance management, facilitating results-based evaluation and expanding accountability; and (c) purchase of power contract management software; (ii) preparation of an investment plan for the implementation of flagship government hydroelectric projects; and (iii) supply of equipment to strengthen supervision activities during execution of the project and subsequent maintenance, increasing the sustainability of the investments.
- 1.36 **Other costs (US\$45.3 million: IDB US\$6.3 million; JICA US\$29.3 million; and ENEE US\$9.8 million).** The costs of engineering, supervision and works; administration; contingencies; and financial costs will be financed.

Table I-2. Costs and financing (US\$000s)

| Investment category | Total 2015-2021 | | | |
|---|-----------------|----------------|--------------|----------------|
| | IDB (blend) | JICA | Local ENEE | Total US\$ |
| 1. Direct costs | 15,406 | 106,098 | - | 121,504 |
| 1.1.1 Generation | - | 106,098 | - | 106,098 |
| 1.1.2 Transmission and other | 15,406 | - | - | 15,406 |
| 2. Strengthening ENEE generation | 1,347 | - | - | 1,347 |
| 3. Engineering, Supervision and administration | 1,810 | 6,235 | 8,816 | 16,861 |
| 3.1 Engineering and supervision | 925 | 6,235 | - | 7,160 |
| 3.2 Project administration (PCU) | 665 | - | 8,816 | 9,481 |
| 3.3 External audit, Environmental and evaluations | 220 | - | - | 220 |
| 4. Contingencies | 4,437 | 21,225 | - | 25,662 |
| 5. Finance charges* | - | 1,806 | - | 1,806 |
| Total | 23,000 | 135,364 | 8,816 | 167,180 |

* The finance charges of the IDB loan will be assumed by the borrower.

- 1.37 **Cost and financing.** The estimated total cost of the project is US\$167.2 million. JICA will finance US\$135.4 million for the uprating and rehabilitation of the generation units. The IDB will finance US\$23 million for rehabilitation of the electrical substations and strengthening of the ENEE generating company. The local counterpart will be supplemented by US\$8.8 million for a total of US\$144,180 (see Table I-2).

C. Expected outcomes

- 1.38 The expected outcomes of the project investments are to: (i) increase the share of power from renewable energy sources; (ii) guarantee the availability of hydroelectric power plants and improve their operational performance; (iii) reduce CO₂ emissions; (iv) improve transmission reliability; and (v) strengthen the business management capacity of electricity generation. The main expected impact of the project is an increase in electrical power generation from renewable energy sources, benefiting the company and the Honduran population in general. The Results Matrix (Annex II) sets forth the impact, outcome, and output indicators to contribute to project evaluation. These indicators have been agreed upon with the ENEE, which will contribute by collecting data and verifying achievements.

II. FINANCING STRUCTURE AND MAIN RISKS

A. Financing instruments

- 2.1 The Bank and JICA will finance the project under the framework agreement for the Cofinancing of Renewable Energy and Energy Efficiency Projects (CORE),

established between the Bank and JICA in 2012 and amended in 2014.⁶ The cofinancing will be done in parallel, and JICA will manage its own resources. **Signature by the borrower and entry into force of the loan contract with JICA for the additional resources necessary to finance the project will be a special contractual condition precedent to the first disbursement.** The Bank's financing will take the form of a specific investment loan, which will be executed over five and a half years, running from 2015, in accordance with the tentative disbursement schedule ([Table II-1](#)).

B. Viability and sustainability

- 2.2 **Technical viability and sustainability.** The ENEE has 57 years of experience in generation, transmission, distribution, and sale of electrical power in Honduras and has been responsible, through its engineering division, for the design, construction, and supervision of works similar to those envisaged in this project, including several Bank-financed programs (see paragraph 1.27). The modernization of the substations at Cañaveral and Río Lindo take place on existing infrastructure owned by the ENEE. The substations will be built by contractors selected through international competitive bidding, using the designs prepared by the ENEE's Engineering Division, which has performed this type of work under previous loans. The ENEE will engage an external works supervision firm to ensure compliance with the technical specifications, quality, construction deadlines, and budget.
- 2.3 The project's investment cost was calculated by the ENEE based on its experience with works of similar scope. The Bank reviewed and adjusted the costs and works schedule to reflect more conservative criteria ([optional electronic links 3 and 4](#)). The project is deemed highly viable given that: (i) the work has been developed drawing upon the preliminary analysis by JICA – NewJec ([optional electronic link 8](#)) and the ENEE itself; (ii) the works will be built in accordance with good practices for design and construction following international quality standards; (iii) the ENEE has considerable experience in the sector and in the construction of similar works; (iv) the equipment to be supplied is standard; (v) the budgeted costs are in line with market costs; (vi) contingencies have been estimated, based on the variances observed in other projects executed by the Bank in the country and rehabilitations of generation plants by JICA, including allowances to cover the exchange risk; and (vii) the proposed timetable is consistent with the scale of the works.
- 2.4 The project envisages strengthening the technical and financial management capacity of the ENEE for the operation and maintenance of its investments and for

⁶ Under CORE, in five years JICA will provide up to US\$1 billion in highly concessional loans in the form of cofinancing with the Bank to support renewable energy and energy efficiency in countries of Central America and the Caribbean. JICA has reported to the bank that the loan is in the final stage of negotiation with the Government of Honduras on the following terms: currency in Japanese yen, 40 years maturity, 10 years grace, interest rate 0.3%. For JICA, the Bank financing sends an essential signal of confidence in the sector reform process and in the project design.

the sustainable management of generation resources, in the new role assigned to it by the Electric Power Industry Act (LGIE). The ENEE will have a modern generation company enabling it to participate in the market competitively, ensuring that it is financially self-sustainable by generating operating income from the sale of electrical power, and managing costs in an operationally efficient way. Component 2 of the project and the resources of operation HO-T1210 are aimed at this strengthening.

- 2.5 **Economic and financial evaluation.** A cost/benefit analysis was performed ([optional electronic link 2](#)), considering the results of the project compared with a base-case scenario in which the required investments were not made, with decreasing availability of generation from the power plants and an increasing number of failures. The resulting benefits are associated with: (i) increased generation of hydroelectric power and reduced generating costs due to the decrease in generation from thermal energy, assuming levels are maintained, the availability of the power plants is ensured by their rehabilitation, and there is additional renewable energy production from the greater installed capacity; (ii) lower operation and maintenance costs; (iii) improved reliability of the Honduran electricity system and cost of rationing avoided; and (iv) reduced CO₂ emissions from the thermal power generation avoided. Considering the total project investments for both power plants, the analysis yielded an economic internal rate of return (EIRR) of 22% and a net present value (NPV) of US\$72 million, discounted at 12%.
- 2.6 With the forecasted expenditures and income evaluated at market prices, the financial internal rate of return (FIRR) is estimated at 17.7% for the total project, 17.2% for Río Lindo, and 18% for Cañaveral. The availability of cheaper renewable energy will help restore the ENEE to financial health. The evaluation included a sensitivity analysis on critical variables, such as investment costs, the system's economic costs of energy, and estimated plant availability. The EIRR and FIRR exceed 12% and the NPVs are positive for both the economic and financial evaluations.

C. Environmental and social risks

- 2.7 As established in the Bank's Environment and Safeguards Compliance Policy (Operational Policy OP-703), this operation was classified as Category "B," due to its potential to generate low to moderate environmental and social impacts and risks, such as pollution due to mishandling of wastes (PCBs and asbestos) during construction, for which effective mitigation measures are readily available. On the basis of the available information, it has been determined that the project complies with all the applicable IDB policies and guidelines and has no other adverse or cumulative impacts.
- 2.8 As a special execution condition, the ENEE will fulfill the environmental and social obligations included in the environmental and social management report (ESMR) and implement the actions envisaged in the Environmental and Health and Safety

Action Plan (PAASS). The IDB will verify compliance with the environmental and social obligations established in the ESMR annually.

D. Fiduciary risks

- 2.9 The ENEE will execute the project using its organizational structure and fiduciary management systems. The analysis on the ENEE's institutional and fiduciary risk indicated that the ENEE's fiduciary system has a medium level of risk. This assessment relates to the ENEE's operational capacity and its knowledge of Bank policies, with the support of the project coordination unit (PCU) within the ENEE (see paragraph 3.2), in line with the recommendations of the Institutional Capacity Assessment System (ICAS) analysis done in June 2013 ([optional electronic link 10](#)).
- 2.10 The Risk Matrix ([required electronic link 5](#)) identifies the fiduciary risks as medium, and lists their potential impacts and the planned mitigation measures. These risks include insufficient budgetary allocations, breach of contract by contractor firms, and changes in the rules on tax exemptions. A reduction in the technical and fiduciary competency of the executing agency was identified as a medium risk for public management and governance. The PCU currently in charge of execution of the Energy Sector Support Program I and II (loans 1584/SF-HO and 2016/BL-HO) is regarded as having demonstrated experience and the capacity to manage the mitigation measures for the risks identified and to facilitate project execution. In addition to the mitigation measures envisaged in the project, the fiduciary risk and procurement risk are expected to be partially reduced with the implementation of the business and commercial management system at the ENEE, financed by the World Bank under the Power Sector Efficiency Enhancement Project (PROMEF) to improve process monitoring and management.

III. IMPLEMENTATION AND ACTION PLAN

A. Execution mechanism

- 3.1 **Borrower and executing agency.** The Borrower will be the Republic of Honduras, and the executing agency will be Empresa Nacional de Energía Eléctrica [National Electric Power Company] (ENEE). **The entry into force of a subsidiary agreement between the Borrower, represented by the Ministry of Finance, and the ENEE for the transfer of resources and project execution obligations will be a special contractual condition precedent to the first disbursement.** This agreement will include: (i) the form in which the loan proceeds will be transferred; (ii) the ENEE's commitment to execute the project's activities in accordance with the terms and conditions of the loan contract; (iii) the commitment to use the loan proceeds and local counterpart resources solely for the purposes of the project; and (iv) the ENEE's commitment to make the contribution provided as the local contribution in the cost table.

- 3.2 The ENEE will be responsible for project execution, administration, monitoring, and evaluation, with the support of the project coordination unit (PCU). The core staff of the PCU will comprise a general coordinator, a technical coordinator, a monitoring specialist, a generation specialist, a financial specialist, a procurement specialist, and an environmental specialist. As a special execution condition, the core staff will be maintained, with qualifications acceptable to the Bank, in the PCU.
- 3.3 As executing agency, the ENEE will be responsible for implementing and supervising the project, establishing and approving the annual work plans (AWPs), providing information for the Bank to monitor and evaluate the project's impacts, coordinating and managing disbursements, and keeping accounting and financial records, including the required annual financial statements for the project. Execution of the operation must comply with the project Operating Manual previously agreed upon with the Bank. **Approval of the project Operating Manual agreed upon with the Bank will be a special contractual condition precedent to the first disbursement.**
- 3.4 **Procurement management.** The procurement of works, goods, and consulting services financed by the IDB will be conducted in accordance with the IDB Policies for the Procurement of Goods and Works Financed by the IDB (document GN-2349-9) and Policies for the Selection and Contracting of Consultants Financed by the IDB (document GN-2350-9). The supervision method will be a combination of ex post and ex ante, as established in the procurement plan. All procurements must be included in the procurement plan approved by the Bank and follow the methods and ranges established in it. A procurement plan will be agreed upon for the first 18 months of execution. This plan will be monitored, executed, and updated using the tools agreed upon with the Bank. In accordance with the Bank's procurement policy (document GN-2350-9), the PCU staff may be engaged by single-source contracting for continuity of their services provided under previous Bank-financed operations executed by the ENEE, subject to positive performance evaluations.
- 3.5 **Financial management.** The ENEE, acting through the PCU, will be responsible for financial management and will deliver audited financial statements on the Bank financing and local counterpart within 120 days after the close of each fiscal period. The last such report will be delivered within 120 days following the date of the last disbursement. The ENEE will contract for external audit services based on terms of reference previously approved by the Bank. Disbursements will be made according to the financial plan, in accordance with the Financial Management Guidelines for IDB-financed Projects (document OP-273-6) and its updates.
- B. Summary of monitoring and evaluation arrangements**
- 3.6 The project has a monitoring and evaluation plan. Administrative monitoring and control will focus on compliance with the rules on administration, finance,

accounting, and legal matters, in accordance with the national and IDB guidelines and the loan contract.

- 3.7 The monitoring and evaluation plan ([required electronic link 3](#)) includes the project's economic, social, and environmental performance indicators. The ENEE will deliver a progress report to the Bank no later than 60 days after the end of each six-month period. These reports will state the degree of fulfillment of the output indicators and progress towards the outcomes in the Results Matrix and will enable monitoring of these indicators using the IDB's project monitoring report (PMR) tool. Any problems encountered will be identified, and an action plan prepared with corrective measures to enhance performance. No later than 30 November of each year, the ENEE will provide the Bank with the AWP, procurement plan, and cash flow programming for the following year. External financial audits will be conducted on the project.
- 3.8 The monitoring and evaluation plan includes the project evaluation mechanisms, the aim of which is to verify that the agreed targets in the Results Matrix are met. The ENEE will select and engage consulting services to perform: (i) a midterm evaluation, once 50% of the project and counterpart (JICA) resources have been disbursed and justified, or after 33 months of execution, whichever occurs first. This evaluation will concentrate on analyzing the progress made; coordination and execution; the degree of fulfillment of the contractual obligations; recommendations to meet the proposed targets and the sustainability of investments; gains in institutional and corporate development and financial solvency of the ENEE; and (ii) a final evaluation no later than 90 days before the date of the last disbursement, with the final report submitted no later than 30 days after the final disbursement justification for both loans, which will include: determination of the degree to which the targets set in the Results Matrix have been met, an ex post cost-benefit analysis, the executing agency's performance, factors impacting the implementation, and recommendations for future operations.

| Development Effectiveness Matrix | | | | |
|---|---|---|--------|---------------|
| Summary | | | | |
| I. Strategic Alignment | | | | |
| 1. IDB Strategic Development Objectives | | Aligned | | |
| Lending Program | -Lending to small and vulnerable countries -Lending to support climate change initiatives, renewable energy and environmental sustainability -Lending to support regional cooperation and integration | | | |
| Regional Development Goals | -CO2 emissions (kilograms) per \$1 GDP (PPP) | | | |
| Bank Output Contribution (as defined in Results Framework of IDB-9) | -Percentage of power generation capacity from low-carbon sources over total generation capacity funded by IDB | | | |
| 2. Country Strategy Development Objectives | | Aligned | | |
| Country Strategy Results Matrix | GN-2796-1 | To improve the efficiency and quality of electricity service and diversify the power generation matrix. | | |
| Country Program Results Matrix | Not available | Document under revision. | | |
| Relevance of this project to country development challenges (If not aligned to country strategy or country program) | | | | |
| II. Development Outcomes - Evaluability | | Highly Evaluable | Weight | Maximum Score |
| | | 9.1 | | 10 |
| 3. Evidence-based Assessment & Solution | | 9.7 | 33.33% | 10 |
| 3.1 Program Diagnosis | | 3.0 | | |
| 3.2 Proposed Interventions or Solutions | | 4.0 | | |
| 3.3 Results Matrix Quality | | 2.7 | | |
| 4. Ex ante Economic Analysis | | 10.0 | 33.33% | 10 |
| 4.1 The program has an ERR/NPV, a Cost-Effectiveness Analysis or a General Economic Analysis | | 4.0 | | |
| 4.2 Identified and Quantified Benefits | | 1.5 | | |
| 4.3 Identified and Quantified Costs | | 1.5 | | |
| 4.4 Reasonable Assumptions | | 1.5 | | |
| 4.5 Sensitivity Analysis | | 1.5 | | |
| 5. Monitoring and Evaluation | | 7.5 | 33.33% | 10 |
| 5.1 Monitoring Mechanisms | | 2.5 | | |
| 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 | | |
| IV. IDB's Role - Additionality | | | | |
| The project relies on the use of country systems | | | | |
| Fiduciary (VPC/FMP Criteria) | Yes | Financial Management: Budget, Treasury, Accounting and Reporting. Procurement: Information System. | | |
| 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 | Yes | Tecnical Cooperation HO-T1210 was aproved to support the project's technical design and assist the beginning of the implementation phase. | | |
| The ex-post impact evaluation of the project will produce evidence to close knowledge gaps in the sector that were identified in the project document and/or in the evaluation plan | | | | |

The program's goal is to recover and preserve the capacity to generate electricity from renewable sources, contributing to the security of energy supply in Honduras. For this, the operation proposes to: (i) rehabilitate the generation infrastructure of the hydroelectric centrals Cañaveral - Rio Lindo; (ii) rehabilitate the transmission assets that connect the centrals to the National Interconnected System (SIN); and (iii) improve the operational and commercial efficiency of the generation management of ENEE.

The project presents sufficient empirical evidence about the rehabilitation needs of the Cañaveral-Rio Lindo hydroelectric complex, highlighting its importance for the domestic energy demand and its potential to generate environmental benefits. Since this is an operation jointly funded between IADB and JICA, the results matrix clearly differentiates the products and timelines for each institution. In spite of this, the vertical logic of the matrix could be strengthened so that it is consistent with the objectives and expected results outlined in the POD. In particular, given the project's contribution to the integration of the regional electric market, the outcome indicator "Number of traded energy in the MER / Energy available" should be considered as an impact indicator, consistently with the IDB Country Strategy (GN-2796-1). Outcome indicators related to the management capacity of ENEE could also be strengthened. The project has a solid economic analysis and an evaluation plan based on an ex post economic analysis. The risks identified are sound and include mitigation measures and metrics for monitoring.

**CAÑAVERAL-RÍO LINDO HYDROPOWER COMPLEX REHABILITATION AND UPRATING PROJECT
HO-L1102**

RESULTS MATRIX

| | |
|------------------|--|
| OBJECTIVE | The objective of the project is to restore and conserve electrical power generating capacity from a renewable source, thus contributing to the country's energy supply security. The specific objectives are: (i) to rehabilitate the generating infrastructure of the Cañaveral-Río Lindo hydroelectric power plants; (ii) to rehabilitate the power transmission assets connecting the power plants to the National Interconnected System (SIN); and (iii) to improve the operational and business efficiency of the ENEE's power generation operations. |
|------------------|--|

| Impact | Indicator | Baseline 2014 | Final target 2021 | Means of verification |
|---|---|---------------|-------------------|--------------------------------|
| Increase the share of renewable sources in the electric power generation matrix | Generation from REs / Total generation (%) ¹ | 38% | 55% | ENEE Monthly Operations Report |

| Outcomes | Indicator | Unit | Base 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 ² | Final target | Means of verification |
|--|--|--------------------|-----------|-------|-------|-------|-------|-------|-------|-------------------|--------------|--------------------------------|
| Improved operational performance of the plants | Cañaveral availability factor ³ | % | 98.47 | 98.4 | 98.5 | 98.5 | 98.7 | 98.7 | 98.7 | 98.7 | 98.7 | ENEE Monthly Operations Report |
| | Río Lindo availability factor | % | 98.30 | 98.2 | 98.2 | 98.2 | 98.2 | 98.5 | 98.6 | 98.7 | 98.7 | |
| | Performance Cañaveral ⁴ | kWh/m ³ | 0.330 | 0.330 | 0.330 | 0.330 | 0.343 | 0.343 | 0.343 | 0.343 | 0.343 | |
| | Performance Río Lindo | kWh/m ³ | 0.840 | 0.840 | 0.840 | 0.840 | 0.840 | 0.847 | 0.855 | 0.855 | 0.855 | |
| Improved reliability of transmission | Faults per year - Cañaveral substation | # incidents | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | Monthly report on faults |
| | Average duration of faults per year - Cañaveral substation | Hours | 0.08 | 2.30 | 2.30 | 2.30 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | |
| | Faults per year - Río Lindo substation | # incidents | 8 | 9 | 9 | 9 | 2 | 2 | 2 | 2 | 2 | |
| | Average duration of faults per year - Río Lindo substation | Hours | 16.69 | 17.5 | 17.5 | 17.5 | 4 | 4 | 4 | 4 | 4 | |

¹ This indicator is in terms of power generated, rather than installed capacity, so as to show the effective output from renewable energy sources.

² The final year includes the delivery of the JICA loan outputs. The IDB disbursement period will be 5.5 years.

³ Availability factor (%) = ((Total hours per year – Total hours unavailable for scheduled maintenance per year – Hours unavailable for unscheduled maintenance per year) / Total hours per year)) x100.

⁴ Performance (kWh/m³) = Total power generated per year (kWh) / Total volume of water passing through turbines per year (m³).

| Outcomes | Indicator | Unit | Base 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 ² | Final target | Means of verification |
|---|---|--------------------------------------|-----------|------|------|------|------|------|------|-------------------|--------------|---|
| Reduction in greenhouse gas (GHG) emissions from electricity generation | Annual CO ₂ emissions from electricity generation in Honduras. | Tons CO ₂ equivalent/year | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a ⁵ |
| Increase in power transactions in the Regional Electricity Market (MER) | Amount of power traded in the MER / Power available | % | 2.85 | 3.14 | 3.45 | 3.79 | 4.17 | 4.59 | 5.05 | 5.55 | 5.55 | Reports by regional operating body (EOR) |
| Improved electricity generation business management capacity | Power from ENEE renewable energy projects | MW | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 198 | 198 | ENEE Monthly Operations Report |
| | Purchase of thermal energy through competitive processes | MWh | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | ENEE Monthly Operations Report ⁶ |
| | Purchase of renewable energy through competitive processes | MWh | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | ENEE Monthly Operations Report ⁷ |

⁵ A methodology for estimating emissions will be prepared in the first year as part of technical cooperation operation HO-T1210. The baseline and projection for this indicator will be established, along with the mechanisms for compiling the information.

⁶ The targets for the outcome indicators listed for each year of execution will be set once the Strategic Plan has been completed in the first year, with the support of technical cooperation operation HO-T1210.

⁷ Idem.

| Outputs | Unit | Base 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | Final target | Means of verification |
|--|------|--------------|------|------|------|------|------|------|------|-----------------|---------------------------------|
| COMPONENT 1. Uprating and rehabilitation of generation and transmission | | | | | | | | | | | |
| Subcomponent 1 - JICA ⁸ | | | | | | | | | | | |
| Generation unit rehabilitated – Cañaveral plant | # | 0 | | | | 2 | | | | 2 | Project monitoring report (PMR) |
| Generation unit rehabilitated – Río Lindo plant | # | 0 | | | | | 1 | 2 | 1 | 4 | |
| Subcomponent 2 - IDB | | | | | | | | | | | |
| Cañaveral plant substation rehabilitated | # | 0 | | | | 1 | | | | 1 | Project monitoring report (PMR) |
| Río Lindo plant substation rehabilitated | # | 0 | | | | 1 | | | | 1 | |
| COMPONENT 2. Strengthening of the ENEE generation company | | | | | | | | | | | |
| Investment plan prepared for the development of flagship government hydroelectricity projects | # | 0 | | | 1 | | | | | 1 | Project monitoring report (PMR) |
| Equipment acquired for strengthening supervision during execution and subsequent maintenance | # | 0 | | | | 1 | | | | 1 | |
| Information technology systems purchased and implemented for management, results-based evaluation, and expanded accountability | # | 0 | | | | 1 | | | | 1 | |
| Power contract administration software and hardware implemented | # | 0 | | | | 1 | | | | 1 | |
| Strategic Plan prepared | # | 0 | | | | | 1 | | | 1 | |

⁸ JICA will be responsible for delivery of the outputs of subcomponent 2.

FIDUCIARY AGREEMENTS AND REQUIREMENTS

| | |
|--------------------------|--|
| Country: | Honduras |
| Project: | HO-L1102, Cañaveral-Río Lindo Hydropower Complex Rehabilitation and Upgrading Project |
| Executing agency: | Empresa Nacional de Energía Eléctrica [National Electric Power Company] (ENEE) |
| Fiduciary team: | Kelvin Suero (Financial Management FMP/CHO); Juan Carlos Martell (Procurement FMP/CHO) |

I. EXECUTIVE SUMMARY

- 1.1 Risk factors exist in relation to the institutional capacity of the public sector in Honduras for the execution of the projects to be financed during implementation of the Bank's current strategy in the country. To mitigate this risk, the Bank will continue to pursue various technical support and public sector strengthening activities. Recent diagnostic assessments of fiduciary management systems in Honduras reflect significant progress toward international standards and good practices, principally in terms of modernizing the institutional structure and integrating budgetary, treasury, and government accounting systems. The Bank supported the development and implementation of the SIAFI/UEPEX module and is currently supporting its strengthening. As neither the governmental internal control system nor the external control system is used in executing the Bank's portfolio, external audit services are used in Bank-financed operations. Nevertheless, during 2014 a strategic partnership agreement was signed with the Tribunal Superior de Cuentas [Superior Audit Court] (TSC) that will enable gradual progress to be made on use of the institution to perform external audit services for Bank-financed operations in the country. As regards the public procurement system, the MAPS/OECD diagnostic assessment in 2010 found the country to have strengths, particularly in terms of a legal framework that conforms to the majority of international best practice. Nevertheless, challenges persist in the country in terms of meeting standards that will allow the Bank to use the country system for the operations it finances.

II. FIDUCIARY CONTEXT OF THE EXECUTING AGENCY

- 2.1 The executing agency for the operation is Empresa Nacional de Energía Eléctrica [National Electric Power Company] (ENEE). ENEE has implemented the SIAFI Integrated Financial Administration System, with its budget, accounting, and cash management subsystems, and the UEPEX module for generating reports on

operations with external financing. This system is being used for the financial and accounting management of Bank-financed operations in the Honduran public sector. In relation to procurement, the ENEE has the necessary experience in publishing procurement processes financed by the Bank in HONDUCOMPRAS, the official website for posting government procurement and contracting opportunities. It also uses standard documents for national competitive bidding and shopping, both for the procurement of goods and works, agreed upon by the Bank and the Regulatory Office of State Contracting and Procurement (ONCAE).

III. FIDUCIARY RISK EVALUATION AND MITIGATION MEASURES

- 3.1 Based on the available information, the fiduciary team determined that the project risk associated with financial management and procurement is MEDIUM. The conclusion relates basically to the knowledge of Bank policies and operational capacity of the executing agency that will support fiduciary management, with the assistance of the project coordination unit (PCU).
- 3.2 The main fiduciary risks and their respective mitigation measures are identified in the Risk Assessment Matrix, which is included as an electronic link in the proposal for operation development (POD). The executing agency has prior experience with financial and accounting management, and its capacity has been confirmed during the execution of Bank-financed operations (1584/SF-HO, 2016/BL-HO and 3103/BL-HO), for which it uses the SIAFI/UEPEX system and all the national controls deriving from its use. Additionally, the planned fiduciary oversight arrangements includes annual audit services, with six-monthly preliminary reports, which will support close monitoring of fiduciary management and the evolution of risks in this area.
- 3.3 The procurement risks identified will be mitigated by the capacity of the ENEE's PCU to make purchases using IDB procedures, retaining the specialized personnel who currently form part of the PCU for this new operation. An oversight and monitoring system will be implemented that includes planning the procurements required for the project using the Procurement Plan Execution System (SEPA) agreed upon with the Bank. The PCU will keep close tabs on the dates agreed upon with the ENEE's technical departments for the delivery of technical specifications, with the required quality, which will mitigate possible delays in the processes.

IV. CONSIDERATIONS FOR THE SPECIAL PROVISIONS OF THE CONTRACT

- 4.1 The main agreements and requirements to be included in the Special Provisions of the loan contract are as follows:
 - a. **Conditions precedent to the first disbursement.** Submission of evidence of the following will be conditions precedent to the first disbursement: (i) the entry into force of a subsidiary agreement between the borrower, represented by the Ministry of Finance (SEFIN), and the ENEE for the transfer of resources and project execution obligations; and (ii) approval of the project Operating Manual

agreed upon with the Bank; and (iii) signature and entry into force of the loan contract with JICA for the additional resources necessary to finance the project.

- b. **Special execution conditions.** (i) the ENEE will maintain the project coordination unit (PCU) at all times throughout project execution with the core staff with qualifications acceptable to the Bank; and (ii) the ENEE will fulfill the environmental and social obligations established in detail in the environmental and social management report (ESMR) and implement the actions envisaged in the Environmental and Health and Safety Action Plan (PAASS).
- c. **Exchange rate agreed upon with the executing agency/borrower for accountability reporting.** For the purposes of Article 3.06(b) of the General Conditions of the loan contract, the applicable exchange rate will be as stated in point (b)(ii) of the aforementioned article. In such case, the interest rate applicable will be the rate in effect on the date on which the beneficiary, executing agency, or any other person or corporation authorized to effect expenditures makes the relevant payments to the contractor or supplier.
- d. **Financial statements and other audited reports.** The executing agency will deliver the following reports: The audited financial statements for the project, as regards the IDB financing and the local counterpart, with an opinion issued by independent auditors acceptable to the Bank, within 120 days after the close of each fiscal year for the executing agency (1 January to 31 December of each year) during the disbursement period for the financing. The last such report will be delivered within 120 days after the date stipulated for the last disbursement of the loan proceeds. The Bank may require preliminary reports to be delivered on a six-monthly basis or other frequency, based on changes in the fiduciary risk. Upon sufficient review, the Bank may consider using the services of the Superior Audit Court (TSC) for some or all of the scheduled audits.

V. PROCUREMENT AGREEMENTS AND REQUIREMENTS

- 5.1 The fiduciary agreements and requirements for procurement establish the provisions applicable to the execution of all project procurements.

1. Procurement execution

- 5.2 The ENEE, acting through the PCU, will be responsible for the selection, competitive bidding, contracting, supervision, and acceptance processes for project procurements. These will be conducted pursuant to the Bank procurement policies established in documents GN-2349-9 and GN-2350-9, as well as the procurement plan for the operation, which describe: (i) the contracts for works, goods and consulting services required to carry out the project; (ii) the proposed methods for procurement of goods and selection of consultants; and (iii) the procedures followed by the Bank for review of each of the procurement processes. For procurement planning, the executing agency will update the procurement plan annually, or according to program needs, using the procurement plan execution and monitoring system determined by the Bank, both for planning and to report progress. Any and

all changes to the procurement plan must be submitted to the Bank for approval. The PCU will agree upon a procurement plan with the Bank for the first 18 months of execution.

- 5.3 **Procurement of works, goods and nonconsulting services.** Contracts for works, goods, and nonconsulting services¹ generated under the program and subject to international competitive bidding (ICB) will be conducted using the standard bidding documents (SBDs) issued by the Bank. Procedures subject to national competitive bidding (NCB) will use national bidding documents agreed upon with the Bank and published on the website of the Regulatory Office of State Contracting and Procurement (ONCAE), www.honducmpras.hn.
- 5.4 **Selection and contracting of consultants.** Consulting service contracts generated under the project will be executed using the standard request for proposals (RFP) issued by or agreed upon with the Bank.
- Selection of individual consultants. At the executing agency's discretion, local or international publicity may be used to prepare a short list of qualified individuals for the contracting of individual consultants. In accordance with the Bank's procurement policy (document GN-2350-9, paragraph 5.4(a)), the consultants contracted to assist the executing agency during execution may be engaged by single-source contracting for continuity of their services provided under previous Bank-financed operations executed by the ENEE: HO0224, HO-L1019 and HO-L1039, subject to positive performance evaluations.
- 5.5 **Advance procurement.** The operation does not call for advance procurement
- 5.6 **Domestic preference.** No domestic preference is involved.
- 5.7 **Other.** The Operating Manual will contain the details of the project execution mechanism and instruments, as well as internal procedures and approval flows within the ENEE, for the timely monitoring of processes.

2. Thresholds (US\$000s)

- 5.8 The thresholds for the use of ICB and the inclusion of international consultants in the shortlist will be made available to the executing agency online at www.iadb.org/procurement. Below these thresholds, the selection method will be determined according to the complexity and features of the procurement, which must be reflected in the procurement plan approved by the Bank.

3. Main procurements

- 5.9 The ENEE will be responsible for preparation of the procurement plan.²³ The Bank's procurement specialist will provide assistance to ensure that procedures are

¹ "Policies for the procurement of goods and works financed by the Inter-American Development Bank" (document [GN-2349-9](#)), paragraph 1.1: Nonconsulting services are treated as goods.

² Policy documents [GN-2349-9](#), paragraph 1.16, and [GN-2350-9](#), paragraph 1.23: Before loan negotiations, the borrower shall prepare and furnish to the Bank for its approval, a procurement plan acceptable to the Bank for the initial period of at least 18 months.

in accordance with the Bank's procurement policies. The main procurements envisaged in the operation are summarized below. The [General Procurement Plan](#) for the project is included as a link.

Table V-1. Main Procurements

| Activity | Type of bidding | Estimated date | Estimated amount (US\$) |
|--|-----------------|----------------|-------------------------|
| Works | | | |
| Rehabilitation of the Cañaveral–Río Lindo/ Transmission substations | ICB | 2nd half 2016 | 15,405,837 |
| Consulting firms⁴ | | | |
| Supervision of rehabilitation of the Cañaveral–Río Lindo substations | QCBS | 1st half 2015 | 925,000 |
| Implementation of the strategic plan for strengthening of the generation contracts department, operations department, and business management department | QCBS | 2nd half 2016 | 326,000 |
| Goods | | | |
| Purchase of universal testing device for diagnostics of electrical equipment | ICB | 1st half 2016 | 300,000 |
| Purchase of a dielectric oil processor and oil treatment machine | ICB | 1st half 2016 | 192,500 |
| Purchase of a partial discharge meter and battery bank discharge unit | ICB | 1st half 2016 | 166,000 |

4. Procurement supervision

- 5.10 Based on the analysis of fiduciary risk for procurement, the supervision method will be a combination of ex post and ex ante, as established in the procurement plan.
- 5.11 All single-source selection of consulting services by firms or individuals, and the procurement of nonconsulting services, goods or works, will be subject to ex ante supervision by the Bank, regardless of the contract value.

5. Special provisions

- 5.12 **Measures to reduce the likelihood of corruption.** Adherence to the provisions of documents GN-2349-9 and GN-2350-9 regarding prohibited practices (multilateral agencies' lists of ineligible companies and persons).
- 5.13 **Other special procedures.** The Bank may change the procurement supervision method at its discretion, based on execution experience and institutional capacity updates or fiduciary visits.

³ See [Guidelines for the preparation and application of the procurement plan \(PP₁₈\)](http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=39307352)
<http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=39307352>.

⁴ For consulting services, this means the short list may comprise firms of different nationalities. See policy document [GN-2350-9](#), paragraph 2.6.

6. Records and files

- 5.14 The UCP will be responsible for maintaining the files and original supporting documentation for all procurement processes conducted with project resources, as well as for keeping records using the established procedures. The Operating Manual will document the internal workflows and segregation of functions.

VI. FINANCIAL MANAGEMENT AGREEMENTS AND REQUIREMENTS

1. Programming and budget

- 6.1 **Programming and budget.** The implementation of the Integrated Financial Administration System (SIAFI) and the general treasury account has achieved more prudential and disciplined management of cash resources and greater decentralization of the treasury function. Within certain limits, budget reprogramming and expansion of externally funded projects do not require legislative approval. Instead, agreements and amendments can be approved at the level of the Ministry of Finance (SEFIN), subject to budgetary availability. The Bank's financial parameters for the country allow 100% of a project or program to be financed.
- 6.2 **Accounting and information systems.** The SIAFI/UEPEX module is used for financial reports and accountability reporting on Bank-financed projects. The project's financial and accounting transactions will employ the practices of this country system. Accounting records will be kept on a cash basis. Progress continues on implementation of the International Public Sector Accounting Standards (IPSAS) under Article 96, point 1, of the Budget Act, which establishes that accounting plans and manuals must comply with the IPSAS applicable to the public sector.
- 6.3 **Disbursements and cash flow.** For the advance of funds modality, the executing agency will open a special account in the project's name at the Central Bank of Honduras (BCH) for the disbursement of funds. The maximum value of advance of funds will be set by the Bank, according to the cash flow analysis submitted by the executing agency.
- 6.4 **Internal control and internal audit.** The Bank and the National Office of Integral Development of Internal Control of Public Institutions (ONADICI) are coordinating efforts to improve the internal control environment at entities responsible for Bank-financed operations in Honduras. In this specific case the executing agency will perform its fiduciary functions with the support of the PCU established for such purpose as part of the Bank-financed operations in this sector, and in accordance with the Operations Manual for the operation.
- 6.5 **External control and reports.** The Superior Audit Court (TSC) is the external control body for public resources in Honduras. The Bank is currently in the process of initial implementation of the strategic partnership signed with the TSC such that, in principle, the external audit function for the operation will be performed by a firm of independent auditors acceptable to the Bank, financed with the loan proceeds. It is

anticipated that, as implementation of the strategic partnership progresses, the use of some or all of the TSC's services may be considered in this operation.

- 6.6 On the basis of the foregoing, the following financial agreements and arrangements have been established:
- External financial audit services for the project annually. The Bank may consider the submission of preliminary reports on a six-monthly basis.
 - For the Bank, the policies to be used in this operation are the "Financial Management Policy for IDB-financed projects" (document OP-273) and the "Financial Management Operational Guidelines for IDB-financed projects" (document OP-274), in the versions in force at the time of operation approval.
 - The total estimated cost of the audit services is US\$130,000, which will be financed with the loan proceeds. The mechanism for the selection and contracting of the firm of independent auditors will be based on document AF-200, according to the established guidelines.
- 6.7 **Financial supervision plan.** The Bank will supervise project financial management, monitoring the actions to be taken by the executing agency or the borrower to rectify any observations and findings identified as part of external audits. Additionally, implementation of the recommendations of external audits and fiduciary risks will be monitored through meetings and visits. This supervision will be performed by the Bank financial management specialist assigned to the operation, with the support of the external auditor services and consultants, in coordination with the Project Team Leader, the other members of the project team, the Bank's Country Office authorities, and the Operations Financial Management and Procurement Services Office (VPC/FMP).
- 6.8 **Execution mechanism.** The ENEE will be responsible for project execution, acting through the PCU, which will comprise, at least, a general coordinator for the project, a technical coordinator, a monitoring specialist, a generation specialist, a financial specialist, a procurement specialist, and an environmental specialist with qualifications acceptable to the Bank. This executing unit will coordinate with the ENEE's administrative and technical units responsible for the different components. A detailed description of the execution mechanism will be given in the project Operating Manual.
- 6.9 **Other financial management agreements and requirements.** The fiduciary risks identified during project development will be monitored, and the necessary strengthening activities proposed to ensure, with reasonable certainty, proper and efficient use of resources. Modifications will be made to the fiduciary arrangements where necessary to safeguard this objective.

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

PROPOSED RESOLUTION DE-___/15

Honduras. Loan ____/BL-HO to the Republic of Honduras
Cañaveral-Rio Lindo Hydropower Complex
Rehabilitation and Repowering Project

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 Honduras, as Borrower, for the purpose of granting it a financing to cooperate in the execution of the Cañaveral-Rio Lindo Hydropower Complex Rehabilitation and Repowering Project. Such financing will be for the amount of up to US\$13,800,000 from the resources of the Single Currency Facility of the Bank's Ordinary Capital, corresponds to a parallel loan within the framework of the multilateral debt relief and concessional finance reform of the Bank, 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 _____, 2015)

LEG/SGO/CID/IDBDOCS#39404219
HO-L1102

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

PROPOSED RESOLUTION DE-___/15

Honduras. Loan ____/BL-HO to the Republic of Honduras
Cañaveral-Rio Lindo Hydropower Complex
Rehabilitation and Repowering Project

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 Honduras, as Borrower, for the purpose of granting it a financing to cooperate in the execution of the Cañaveral-Rio Lindo Hydropower Complex Rehabilitation and Repowering Project. Such financing will be for the amount of up to US\$9,200,000 from the resources of the Bank's Fund for Special Operations, corresponds to a parallel loan within the framework of the multilateral debt relief and concessional finance reform of the Bank, 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 _____, 2015)

LEG/SGO/CID/IDBDOCS#39404220
HO-L1102