TC Document

I. Basic Information for TC

▪ Country/Region:	HONDURAS
▪ TC Name:	Smart grid assessment for Guanaja Island as part of “Guanaja Green Island Program”
▪ TC Number:	HO-T1406
▪ Team Leader/Members:	Jacome Montenegro, Carlos Alberto (INE/ENE) Team Leader; Cuervo, Javier (INE/ENE) Alternate Team Leader; Barragan Crespo, Enrique Ignacio (LEG/SGO); Contin Steinemann, Christian Alberto (VPC/FMP); Del Puerto Correa, Maria Cecilia (VPC/FMP); Jorge Luis Malpartida (INE/ENE); Kim, Jongwoo (INE/ENE); Loana Vega (INE/ENE); Marzolf, Natacha (INE/ENE); Mejia Reyes, Edwin Orlando (INE/ENE); Moran Matute, Carlos Gilberto (CID/CHO); Nicolas Tulande (INE/ENE); Paredes, Juan Roberto (INE/ENE); Urquia Erazo, Liliam Ninoska (INE/ENE)
▪ Taxonomy:	Client Support
▪ Operation Supported by the TC:	N/A
▪ Date of TC Abstract authorization:	14 Feb 2022.
▪ Beneficiary:	Republic of Honduras
▪ Executing Agency and contact name:	Inter-American Development Bank
▪ Donors providing funding:	Korea Poverty Reduction Fund(KPR)
▪ IDB Funding Requested:	US$500,000.00
▪ Local counterpart funding, if any:	US$0.00
▪ Disbursement period (which includes Execution period):	30 months
▪ Required start date:	18 Sept 2022
▪ Types of consultants:	Firm and individual consultants
▪ Prepared by Unit:	INE/ENE-Energy
▪ Unit of Disbursement Responsibility:	CID/CHO-Country Office Honduras
▪ TC included in Country Strategy (y/n):	Yes
▪ TC included in CPD (y/n):	No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Productivity and innovation; Environmental sustainability

II. Objectives and Justification of the TC

2.1 The objective of this technical cooperation (TC) is to support the government of Honduras (GoH) in planning the Guanaja Green Island Program in order to: (i) evaluate the existing distribution grid infrastructure; (ii) conduct energy demand-side management assessments, including the evaluation of terrestrial and maritime electric mobility options; (iii) evaluate the applicability of smart grid technologies considering the aforementioned grid and demand-side assessments as inputs, as well as the expansion and investment plans for renewable energy generation; and (iv) document lessons learned and make suggestions on regulatory and legal considerations that can be implemented at a national level.

2.2 The National Electric Energy Company (ENEE) is the most important actor in the electricity sector in Honduras. It is a public company which practically owns the entire transmission and distribution systems and 20% of the installed power generation

capacity.[1] ENEE covers approximately 94% of the residential and commercial users that currently have access to the electricity service. The remaining 6% is served by municipal and private companies, which mainly operate in isolated regions in the departments of Gracias a Dios and Islas de la Bahía. Within the General Law of the Electrical Industry framework (LGIE) approved in 2014, which began the process of reforming the electricity sector, ENEE is responsible for managing the Social Fund for Electricity Development (FOSODE), aimed at financing the studies and electrification works of social interest. This is highly relevant considering the national electricity access is 85.2%.[2] This makes Honduras the second country in Latin America with the least electricity coverage. The new Special Law to guarantee the service of electrical energy as a public good of national security and a human right of economic and social nature, approved in May 2022, highlights the importance of rural electrification, and authorizes FOSODE to develop a massive rural electrification program.

2.3 The department of Islas de la Bahía is the most important tourist destination in Honduras. It has a high ethnic diversity as well as important coastal-marine ecosystems that make up the Mesoamerican barrier reef. Islas de la Bahía is formed by the three main islands, Roatán, Utila and Guanaja, as well as islets and cays surrounded by the Caribbean Sea. The socioeconomic conditions of the three main islands are quite different. Roatán is the most prosperous, while Guanaja has the greatest socioeconomic difficulties, which have been intensified by its limited infrastructure and the impact of natural phenomena such as Hurricanes Mitch,[3] ETA and IOTA, and a recent fire that caused damages to 40% of the urban area of the Bonacca cay (simply called “El Cayo” by locals) in the island.[4] According to reports from the Permanent Contingency Committee (COPECO), the fire affected 136 homes, harming 120 families, causing electrical, structural and material damage to 100% of Bonacca. The Bank supported the Guanaja island to mitigate the immediate damage caused by the fire and help the most affected population,[5] redirecting TC resources and using administrative funds for about US$1,102,380, for humanitarian aid and technical assistance in productive and energy areas.

2.4 Despite having a high tourism potential, an evaluation of sustainable tourism (IDB, 2016)[6] reported that the main structural barrier to the development of Guanaja is the high cost of electricity, which has repercussions on the management of the basic services of the island’s infrastructure such as drinking water supply and wastewater treatment. Given that Islas de la Bahia is not connected to the mainland’s grid, electricity is generated through private thermal generation plants which use imported fossil fuels. In Guanaja, the electricity service is provided by a private company which has an installed generation capacity of around 2.5 MW in diesel generators. The company provides the service to about 1,600 users, most of whom live on Bonacca Cay, the largest and most populous in the island. Logistics and transportation costs increase the final price of diesel, thus increasing the operation and maintenance

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1 Boletín Estadístico ENEE, January 2022.
2 Electricity Coverage and Electricity Access Report, Dirección de Electricidad y Mercados. SEN, 2021.
3 When Hurricane Mitch hit Honduras, it affected a substantial portion of Guanaja Island affecting the touristic infrastructure and fishing businesses.
4 The main cay in Guanaja is Bonacca Cay which clusters people under limited socio-economic conditions. Bonacca Cay. This cay experienced a severe fire on October 2, 2021.
5 Using the agreement signed with the Honduran Council of Private Enterprise (COHEP) as an immediate execution mechanism.
6 Rivera, Y & Erazo, B. (2016). Informe del diagnóstico del sector turismo en Honduras. IDB.

(O&M) costs of the power plants, which translates into a higher cost of electricity. Currently, the electricity price in Guanaja is higher than 17 HNL/kWh[7] (Honduran lempira/kilowatt-hour); while the service provided by ENEE in the mainland has a price of 5.74 HNL/kWh on average. Moreover, the local utility has faced numerous problems due to electricity thefts and a poorly reliable grid.

2.5 The GoH requested support to the IDB to prepare a plan to reduce gradually the consumption of fossil fuels and to eradicate its use in the long-term, as a strategy to reduce the cost of electricity, increase competitiveness, and protect the sensitive ecosystem. As a result of this effort, the IDB executed between 2015 and 2018, the TC "Renewable Energy Resource Evaluation in the Bay Islands (ERIBA)" (ATN/NV-14824-HO). Through the ERIBA project it was possible to: (i) conduct renewable resource assessments in the main islands, specifically for wind and solar resources; (ii) carry out pre-feasibility studies; (iii) create environmental awareness; (iv) strengthen the institutional framework; and (v) encourage local engagement of key stakeholders to support the development of renewable energy projects of the islands. The results of the ERIBA project helped Independent Power Producers (IPPs) from Roatán and Utila to start renewable energy power generation projects to reduce fossil fuel consumption. Nevertheless, in Guanaja there was no interest considering that the utility operator has no financial strength, and its contract has already expired. The Electricity Regulatory Commission (CREE)[8] is preparing the international bidding process to hire a new private operator within the framework of the provisions of the LGIE.[9]

2.6 In 2016, the GoH received the support of the Korea's Knowledge Sharing Program (KSP) "Renewable Energy and Energy Storage Deployment on Islas de la Bahia". This project conducted the prefeasibility studies for Guanaja Green Island Project and provided capacity building sharing experiences of South Korea in microgrids development. To increase its participation, the KSP proposed to develop the renewable energy projects in Guanaja in three phases as follows: (i) a first phase up to 20% of renewable energy penetration of power generation; (ii) a second phase up to 80%; and (iii) a third phase of 100% of renewable energy including smart grid technology. In the three phases a capacity building program would be executed in parallel to the renewable energy development.

2.7 While the KSP project was running, the Climate Investment Fund (CIF), through the Scaling up Renewable Energy in Low Income Countries Program (SREP), allocated resources for the "Remote Area Rural Electrification Program" (GRT/SX-17123-HO), the so-called PERLA Program, administrated by IDB. The executing agency of this program is ENEE through the FOSODE. The program includes building microgrids in Guanaja and Brus Laguna, a community located in the Honduran Mosquitia, as well as individual solar photovoltaic systems in the department of Choluteca. The Program will also strengthen the capacities of GoH officials for expanding the electricity access nationwide, as part of the national "Universal Electricity Access in Honduras Program." The microgrids developed by this program will be the first experience for Honduras

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7 BELCO, June 2022. In addition, there is a charge for fuel price adjustment.

8 The Bank has been supporting the institutional strengthening of the CREE with transactional resources and the TC HO-T1249.

9 The operator of an isolated grid, such as in Guanaja, can provide the services of generation (photovoltaic + storage + thermal, in this case), distribution and commercialization, in accordance with the provisions of the LGIE for isolated systems.

with this type of systems and will contribute to reaching universal access in the country. Under PERLA, Guanaja microgrid will integrate solar photovoltaic energy (600 kWp) with energy storage (540 kWh) and thermal power generation as back up aiming to reduce up to 15% the diesel consumption in its first phase, contributing to what is planned in the KSP plans. Currently, the microgrid project is under construction phase and according to the contract, it will begin operations in November 2022.

2.8 In 2019 FOSODE, with the support of IDB, prepared the proposal "Guanaja Green Island: Renewable Energy Microgrid and Energy Storage in Guanaja" for the Korea Institute for Advancement of Technology (KIAT). This project aims to increase the renewable energy penetration up to 75%, which will increase the photovoltaic capacity (3 MWp) and energy storage (9 MWh). The program will also include a capacity building program for the design, construction, operation, and maintenance of microgrids. The project was approved by KIAT program, and it is also under execution.

2.9 The above actions show a comprehensive planning in the development of an investment program in renewable energies for the island of Guanaja that has the support of international cooperation. This will be an exhibition program for the purposes of the GoH to show the positive impact of microgrids in rural areas and/or isolated places to contribute to the goals of universal access to electricity in the country and protection of fragile environment.

2.10 **Smart grids.** The smart grid is the next-generation power system network that integrates information technology into the existing power grid to optimize energy efficiency through a two-way exchange of electricity information between suppliers and consumers in real time.[10] Through open, bi-directional, and real time communications between suppliers and consumers, smart grids are able to achieve energy system efficiency, facilitate the integration of variable renewable energy (VRE) sources and various energy-related services. Today, many challenges in Guanaja Island related to grid reliability have the potential to be solved innovatively through smart grids, which have many applications for small island electrical systems.[11] Additionally, smart grids have the potential to enhance the penetration of renewables, which perfectly aligns with the objectives of the Guanaja Green Island Program.

2.11 **Lessons learned.** The IDB has been supporting the development of renewable energy in Honduras, and particularly in Islas de la Bahía (¶2.5, ¶2.6, ¶2.8), as well as strengthening capacities for planning and developing rural electrification projects (¶2.7). As part of this effort, in October 2016 an intra-regional TC was approved for the Exchange of Experiences in the Introduction of Renewable Energy in Island Systems (ATN/OC-15734-HO) so that stakeholders linked to the planning and development of renewable energy projects in isolated territories could exchange experiences with their counterparts. The exchange of experiences was carried out in the Galapagos archipelago of Ecuador, where the Zero Fossil Fuels Program for the Galapagos Islands is executed, with microgrid solutions and integration of solar, wind and thermal generation with biofuels. From this TC and other similar regional projects financed by the Bank (3059/OC-SU) and (GRT/NV-14258-BO), the following lessons learned were considered to ensure an effective execution: (i) incorporate actively the local authorities in the design and execution of the activities; and (ii) encourage the participation of the operator that works in the area of influence.

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10 Korea's Smart Grid Roadmap 2030.
11 IEEE, 2019.

2.12 **Strategic alignment.** The TC is aligned with the IDB Second Update to the Institutional Strategy 2020-2023, specifically with the development challenge of Productivity and Innovation since the applicability of modern digital technologies such as smart grids will be evaluated and can contribute to improve the quality of the electricity supply. The TC will also promote the introduction of Distributed Energy Resources (DER) in Guanaja, such as energy storage, demand-side management, energy efficiency and electromobility, which will contribute to the cross-cutting issue of Climate Change and Environmental Sustainability. The TC will explore an innovative solution with very little experience and big potential of replication in the country. Additionally, this TC is aligned with the IDB Group Country Strategy with Honduras 2019-2022 (GN-2944), which includes IDB support for power sector's efforts to improve efficiency and develop resilient sustainable infrastructure for climate change. The TC specifically contributes to two priorities of investment of IDB Group's Vision 2025 "Reinvest in the Americas": (i) digital economy; and (ii) climate change action aiming to reach the strategic goals of promoting social progress and reactivate the productive sector. The TC is consistent with the Energy Sector Framework (GN-2830-7) and with the Climate Change Sector Framework with the principle "innovation for climate-resilient and low carbon development".

2.13 Moreover, this TC will make it possible to expand the ongoing actions in the Guanaja Green Island Program by building a baseline and a future scenario assessment, assessing smart grid technology options, and disseminating knowledge and suggestions for regulatory proposals to be implemented at the national level to foster energy access through renewable energy.

III. Description of Activities/Components and Budget

3.1 **Component I: Baseline and future scenario assessment (US$ 150,000).** The first activity financed under this Component consists of a power infrastructure evaluation, including power generation and distribution infrastructure. This study will assess the power generation expansion plans to be developed with the support of international financial organizations (¶2.6; phase 1 and phase 2) and local stakeholders such as ENEE and consumers (distributed generation and green building). It will also assess the distribution infrastructure expansion plan. The assessment will also evaluate operation safety measures to protect existing power infrastructure. The second activity in this Component is a techno-economic assessment of the potential of demand-side management on the island. This assessment will consider different energy efficiency programs for various energy uses including, electricity utilization, heating and cooling applications, water pumping, transportation and electromobility options (land and maritime solutions), and their influence on power generation.

3.2 **Component II: Smart grid technology options assessment (US$ 285,000).** Finance two activities. The first activity consists of an Information and Communication Technology (ICT) assessment. Based on the results of Component I first activity, it will propose the requirements for the next generation network that will transport electricity and collect information from suppliers and consumers in real time, evaluating the capacity of different generation power sources, networks, and communication infrastructure. The second activity involves the development of a smart grid investment plan, considering the previous assessments from Component I and II. This plan should include investments in grid infrastructure for electricity and data, and should consider the following alternatives: Advanced Metering Infrastructure (AMI), Energy Management Systems (EMS) for buildings, Electric Vehicles (EV) charging infrastructure, data management, and DERs management. It will also evaluate the

local capacities and the investment required to conduct the future O&M work of smart grids in the island. The results of the investment plan will be used for the preparation of future IDB loan operations.

3.3 **Component III: Knowledge dissemination and recommendations for regulatory elements to implement nationwide to foster smart grids (US$45,000).** Finance the preparation of technical information to systematize lessons learned, share experience and knowledge with South Korea, and communicate technological improvements. Furthermore, as part of the national strategy for energy transition, the TC will contribute to energy decision makers, including regulatory and planning agencies, providing a route map for improving the existing legal and regulatory framework to foster the development of smart grid technologies.

3.4 **Administrative support**. To support the adequate coordination of the different activities from the components and the different local stakeholders of the program a local consultant will be hired.

3.5 **Budget.** The total cost of the project is US$500,000, which will be financed with resources from the Korea Poverty Reduction Fund (KPR). Resources of the Bank's Ordinary Capital and counterpart financing by the GoH are not contemplated for this TC. Nevertheless, there would be contribution of ENE staff in Honduras and headquarters, and the participation of FOSODE as well as the Secretary of Energy.

Indicative Budget

Activity/Component	Description	KPR	Counterpart Funding	Total Funding
Component 1	Baseline and future scenario assessment	US$ 150,000	-	US$ 150,000
Component 2	Smart grid technology options assessment	US$ 285,000	-	US$ 285,000
Component 3	Knowledge dissemination and recommendations for regulatory elements to implement nationwide to foster smart grids	US$45,000	-	US$45,000
-	Administrative support	US$ 20,000		**US$ 20,000**
Total		**US$ 500,000**	**-**	**US$ 500,000**

3.6 The team leader for the execution of this TC is Carlos Jacome (INE/ENE), senior energy specialist and will be based in the country office of Honduras. The project team will report progress annually, by March 15th, using the IDB systems standard (Monitoring and Reporting System - M&R system). The progress report will include information about the actual inputs, output delivery, and outcome achievement, among others, as of the last day of the reporting period, which closes on December 31st of the reporting year. The project team will also submit to the KPR Coordinator any additional information needed for annual reports to the Donor. The TC final evaluation report will be submitted according to the schedule established in IDB systems and will be financed using funds from the TC.

IV. Executing Agency and Execution Structure

4.1 At the request of GoH (Annex I), the IDB, through the Energy Division (ENE/CHO) will be the Executing Agency (EA) of this TC, due to its experience in the preparation and development for both technical and operational instruments proposed for this type of operations. The beneficiary of this TC is the GoH, represented by ENEE. In

accordance with the Operational Guidelines for Technical Cooperation Products (GN-2629-2), being the Bank the EA of this TC is justified under Annex 10 of the aforementioned guidelines, as the TC responds to a request from the beneficiary – and exceptionally at the request of the beneficiary – the Bank has the responsibility for the contracting of consultancies. Furthermore, the Bank and the beneficiary agree that contracting by the Bank would enhance independence under the impartiality criteria.

4.2 The IDB will be responsible for the selection and contracting of consulting firms and individual consultants. Activities to be executed are included in the Procurement Plan and will be contracted in accordance with Bank policies as follows: (i) Hiring of individual consultants, as established in the regulations AM-650; (ii) Policy for the Selection and Contracting of Consulting Firms for Bank-executed Operational Work according to GN-2765-4 and its associated operational guides (OP-1155-4); and (iii) contracting of logistics services and other services other than consulting, according to the policy GN-2303-28. The beneficiary may provide technical inputs to the terms of reference and reports of the consultants. Such inputs should be provided directly to the Bank. This dynamic will facilitate proper articulation between the various actors within the framework of the technical dialogue of this TC. The TC does not present fiduciary management risks as it will be implemented by the Bank. Therefore, no financial audit is required.

V. Major issues

5.1 The main risk of this TC is the lack of coordination among key national stakeholders. The Bank will convene technical roundtables with key stakeholders in each of the components, under the leadership of the FOSODE/ENEE and Secretary of Energy. These institutions will also coordinate all the individual consultants and consulting firms that will participate in this technical assistance. Additionally, it may be difficult or require lengthy periods of time to collect all the information necessary to carry out the studies. To mitigate this risk, work will be done from the beginning of the TC execution to identify all the data that will be necessary and prioritize its management. Another important risk is the possible limitations for the execution of the activities and visits to the island of Guanaja derived from COVID-19 restrictions. To mitigate this risk, the use of digital tools will be sought to monitor and supervise the activities.

VI. Exceptions to Bank policy

6.1 The TC does not require exceptions to the Bank policy.

VII. Environmental and Social Strategy

7.1 This TC will not finance feasibility or pre-feasibility studies of investment projects with associated environmental and social studies; therefore, it is excluded from the scope of the Bank's Environmental and Social Policy Framework (ESPF).

Required Annexes:

Request from the Client - HO-T1406

Results Matrix - HO-T1406

Terms of Reference - HO-T1406

Procurement Plan - HO-T1406