ENERGY TRANSITION PARTNERSHIP

Powering Prosperity and Enabling Sustainability in South East Asia

The Southeast Asian Energy Transition Partnership is a multi-donor Forum that brings together government donors, philanthropies, and Southeast Asian governments to accelerate the energy transition in Southeast Asia.

Smart Grid Transformation in the Power Distribution Sector

The Philippines

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This technical assistance (TA) instigates a holistic approach to smart grid transformation of the distribution sector and contributes to the deployment of renewable energy (RE) through embedded generation. The implementation of this TA will identify the key issues and propose solutions to smart grid adoption on the power distribution side, which can allow for more variable RE in the network. It will also present a financing framework and investment options that the Electric Cooperatives may consider for smart grid upgrading. Capacity building activities are integrated accordingly to ensure the sustainability of the project outputs and that they can be replicated in future smart grid upgrades. Ultimately, this TA resolves key smart grid issues, which currently prohibit the uptake of RE. This TA is aligned with ETP's second, third, and fourth strategic outcomes: de-risking RE investment, extending smart grids, and building knowledge and awareness.

UNOPS AFD Federal Ministry for Economic Affairs and Climate Action Environment and Climate Change Canada / Environnement et Changement climatique Canada Department for Business, Energy & Industrial Strategy CIFF CHILDREN'S INVESTMENT FUND FOUNDATION IKEA Foundation WINDWARD Fund

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I. Introduction

1 The Southeast Asia Energy Transition Partnership (ETP) brings together governments and philanthropies to work with partner countries in the region. ETP supports the transition towards modern energy systems that can simultaneously ensure economic growth, energy security, and environmental sustainability. To contribute to the achievement of the UN's Sustainable Development Goals (SDGs) and the Paris Climate Agreement objectives, ETP initially works in three priority countries, namely Indonesia, the Philippines, and Vietnam. ETP's strategy is built around four interrelated pillars of strategic engagement that are squarely aligned to address the barriers to the energy transition. These are (i) policy alignment with climate commitments, (ii) de-risking energy efficiency and renewable energy investments, (iii) extending smart grids, and (iv) expanding knowledge and awareness building.

II. Summary

2 This TA targets the distribution sector, specifically for the Electric Cooperatives (EC) through the National Electrification Administration (NEA). Currently, smart grid transformation is hampered by the unavailability of the Geographic Information System-based (GIS) distribution network map due to lack of capacity. Furthermore, there is a lack of technical capability within NEA and the EC's to utilize the smart grid system for renewable energy (RE) system optimization. As such, this program has been designed to enable smart grid transformation (distribution network side) and demonstrate its applicability to increase RE in the power generation mix.

3 The proposed TA consists of three components. The first component focuses on enabling smart grid transformation in accordance with the Smart Distribution Utility Roadmap (SDUR) by conducting an assessment of the barriers to smart grid adoption, specific to the EC's, and developing the GIS-based map of the on-grid, backbone distribution network. Beyond the identification of the barriers, the assessment study will also provide pragmatic solutions that the ECs and NEA may consider continuing with the smart grid transition. The second component is designed to provide guidance for smart grid financing and investing in fulfilling the upgrades defined in the SDUR. The third component demonstrates the applicability of the GIS-based maps in contributing to the RE targets of the Philippines. The provision of capacity building is also embedded accordingly in each of the project components. This TA is aligned with ETP's second, third, and fourth strategic outcomes: de-risking RE investment, extending smart grids, and building knowledge and awareness.

III. Project Details

A. Rationale and Impact

4 The Philippine government envisions a smart grid system by 2040. In the Philippine Energy Plan (PEP) 2020-2040, the government affirmed its commitment to implement the Smart Grid Policy Framework as one of the strategies to achieve its sustainable energy agenda.

5 The National Smart Grid Policy Framework released by the Department of Energy through Department Circular (DC) no. 2020-02-0003 institutionalizes the development and implementation of a smart grid in the Philippines. It provides an overall smart grid framework for the electric power industry covering generation, transmission, distribution, and market governance.

6 The Smart Grid Policy Framework defines a smart distribution utility as reliable, flexible, resilient, securely automated, and integrated with decentralized energy sources. It gives emphasis on the distribution sector, through which a Smart Distribution Utility Roadmap (SDUR) is provided to guide the distribution utilities of the network and metering infrastructure upgrades they need to implement to be able to become a smart grid by 2040. Annex 1 summarizes these requirements.

7 To act in accordance with the Smart Grid Policy Framework and to help achieve the Philippines' sustainable energy goals[1], NEA instituted the National Mapping Program for EC's. NEA directs the ECs to transition to smart grids by developing the GIS-based maps of their distribution network and integrating Supervisory Control and Data Acquisition (SCADA) into their system.

8 The development of the GIS-based distribution network map is a basic but critical first step in becoming a smart grid for distribution utilities. It will help them efficiently manage data for daily operations, applications in asset management i.e. CAPEX planning and embedded RE generation, and disaster response. While NEA initiated the National Mapping Program and issued several memorandum circulars to institutionalize its implementation, only 25% of the EC's have developed their GIS distribution network map while only around 30% have proficiency in using GIS software.

9 Beyond smart grid transformation, the use of GIS-based distribution network maps for asset management can contribute to increasing RE in the power generation mix through embedded generation.[2] This enables a distribution utility to take part in power generation business within its franchise area by operating an embedded generation facility (EGF). However, this is regulated under the Implementing Rules and Regulations of NEA Reform Act of 2013[3] since power generation is not the main mandate of a distribution utility. Should EC's engage in power

[1] The Clean Energy Scenario in the PEP 2020-2040 aims for 35% by 2030 and 50% by 2040 renewable energy in the power generation mix
[2] refers to power from generating units indirectly connected to the grid through the distribution system
[3] DOE DC 2013-07-0015

generation, they must ensure that their operations will be more efficient while maintaining quality electricity services.

10 The Renewable Portfolio Standards (RPS)[4] requires the EC's to source a portion of their energy supply from eligible RE facilities. In March 2022, the DOE adopted an increase in the annual incremental RE percentage from 1.00% to 2.52% to be able to meet the 35% by 2030 and 50% by 2040 clean energy scenario targets defined in the PEP 2020-2040.

11 The development of RE embedded generation facilities (EGF) is one of the major plans of NEA in 2023 to comply with RPS requirements and to address high electricity rates. Several guidelines have been developed to support NEA's plan such as the Guidelines on EC Investment[5] and Advisory on EC's RE Project Investment with Private Sector Participation,[6] while several others have been drafted[7] subject to NEA Board approval. However, NEA and the ECs currently do not have the technical capability to implement an RE EGF project.

12 The successful implementation of this project will kickstart the transformation of the distribution network to a smart grid and contribute to the Philippines' RE goals. It will also improve the capacity and build the capability of NEA and the ECs with respect to smart grid transformation.

B. Objectives

13 The proposed TA aims to achieve the following objectives to:

a. enable smart grid transformation of the power distribution sector;

b. contribute to the achievement of the clean energy scenario targets of the Philippines; and

c. build the capacity and develop the capability of the NEA and the EC's for smart grid adoption.

C. Outputs and Specific Activities

14 This project consists of three components for implementation: Components 1 and 2 focus on smart grid transformation and Component 3 highlights the practical use of Component 1's outputs towards RE technologies and investments. The associated tasks of each component are detailed in the Terms of Reference.

[4] DOE DC No. 2017-12-0015 for on-grid areas

[5] NEA Memorandum no. 2022-12

[6] NEA Memorandum no. 2022-51

[7] Implementing Guidelines for RE EGF and Guidelines for JV Agreements between ECs and Private Entities

a. **Component 1: Facilitating Smart Grid Transformation.** This component will assist NEA and the EC kickstart the process of transforming the distribution system to a smart grid by tackling the initial steps in its implementation.

    i. Task 1.1: Conduct an assessment of EC's readiness for smart grid adoption within the context of the SDUR. The assessment study aims to provide an understanding of the gaps and challenges encountered by the EC's in upgrading to a smart grid system. As a result, the study will recommend pragmatic solutions that NEA and the EC's may consider to continue with the smart grid transformation following the development of the GIS maps and Investment Plan. A Technical Working Group (TWG) shall be created to ensure a cohesive, consistent, and consultative approach.

    ii. Task 1.2: Map out in GIS the on-grid, backbone distribution network of EC's. The GIS-based map is a foundational component in transforming into a smart grid. Scoping and data collection will be crucial in the process, while capacity building sessions shall be integrated accordingly.

b. **Component 2: Enabling Smart Grid Investments.** This supports the sustainability of the results of Component 1 by identifying appropriate financing and investment schemes for the ECs' smart grid upgrading. These should be aligned with the SDUR and consider the results of the Assessment Study, rules and regulations that govern EC operations, GIS maps as an asset management tool, and EC performance.

    i. Task 2.1: Prepare a roadmap for a financing framework that identifies the type and amount of resources needed for smart grid upgrades according to the SDUR, as well as where these should be obtained and when these should be utilized. The financing framework should be able to bring resource planning altogether, where a roadmap for each finance framework shall be developed. This should consider the nature of a cooperative's equity and ownership. The TWG will be convened for this task.

    ii. Task 2.2: Develop an Investment Plan that will serve as a guide to NEA and the EC's for their asset management specific to smart grid upgrading and REG EGF implementation, using the financing sources identified in Task 2.1. It will reflect, among others, technology transfer mechanisms and appropriate business models to comply with the SDUR. The Investment Plan should consider a cooperative's business model i.e. expected return for the member-owners. The TWG will also be convened for this task.

    iii. Task 2.3: Conduct a series of Invest Forums that will showcase available resources and mechanisms for accessing financing and technological upgrades to the smart grid. Three Invest Forums will be held with expected participants

from relevant NEA divisions, EC representatives, financial institutions, donor partners, and technology providers.

c. **Component 3: Accelerating Renewable Energy Deployment through Embedded Generation.** This Component builds on the results of Components 1 and 2, to support the accelerated deployment of renewable energy sources through embedded generation. This entails building the capability of NEA[8] and select EC's[9] in planning for an RE EGF through simulation. An important input to the simulation is the GIS map geodata developed in Component 1 and the results will determine optimal RE system configurations and its potential connection point within the distribution system that have the least life cycle cost of energy over a defined analysis period and will meet the electricity demand. With this information, the ECs may then refer to the Finance Framework and Investment Plan developed in Component 2 to determine the best financing tool for implementing their RE EGF. The simulation shall be done in collaboration with NEA[10] and the selected EC's to ensure capability building, allowing them to replicate it in future CAPEX planning.

15 The primary outputs of the activities discussed above are summarized in Table 3.

Table 3. Summary of project outputs

Component No.	Outputs
Component 1: Facilitating Smart Grid Transformation	Output 1.1 • Assessment Report for Smart Grid Implementation Output 2.1 • GIS Map of the on-grid, backbone distribution network[11] • Knowledge materials on GIS mapping
Component 2: Enabling Smart Grid Investments	Output 2.1 • Roadmap for Smart Grid Finance Output 2.2 • Investment Plan Framework for Smart Grid Upgrading Output 2.3 • Conduct of three Investment Forums • Event Reports
Component 3: Accelerating Renewable Energy Deployment	Output 3.1 • Optimal RE System Design Report

[8] Renewable Energy Development Division (REDD)

[9] refers to EC's who have submitted a Letter of Intent to adopt an EGF

[10] NEA REDD

[11] estimated at 170,590 circuit-kilometers for all 121 EC's as of September 2022

Component No.	Outputs
through Embedded Generation	• Knowledge materials on RE EGF simulation

D. Timeline for the Program

16 The project will require 20 months for implementation. The tasks, outputs, and deliverables are carried out based on the indicative timeline in Table 4.

Table 4. Timeline for project implementation

	Details	Output	Project deliverable	Month																		
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Component 1: Facilitating Smart Grid Transformation																							
Task 1.1	Conduct an assessment of the EC's readiness for smart grid adoption within the context of the SDUR	Assessment Report for Smart Grid Implementation in the Distribution Sector	Inception report	X																			
Task 1.2	Map out in GIS the on-grid, backbone distribution network of EC's	GIS Map of the on-grid, backbone distribution network	First interim report						X														
Component 2: Enabling Smart Grid Investments																							
Task 2.1	Develop a roadmap for financing framework	Roadmap for Smart Grid Finance	First Interim Report																				
Task 2.2	Develop an Investment Plan framework for the ECs	Invest Plan Framework for Smart Grid Upgrading	Second Interim Report												X								
Task 2.3	Conduct Investment Forums	Conduct of the Investment Forums																					
Component 3: Accelerating Renewable Energy Deployment through Embedded Generation																							
Task 3.1	Capability building for RE EGF Simulation	Optimal RE System Design Report and Knowledge materials	Draft final and Final project Reports																		X		X

IV. Implementation Arrangements

17 The project activities will be delivered by an implementing partner (Consultant), selected through the UNOPS competitive call for proposals procurement process. They will maintain regular coordination with the ETP Secretariat throughout the project's duration. Simultaneously, the Consultant will work closely and must coordinate properly with the NEA Engineering Department, Renewable Energy Development Division (REDD), and EC's. The focal points for coordination per project Component are as follows:

a. Component 1 - NEA Engineering Department and REDD
b. Component 2 - NEA Engineering Department and REDD
c. Component 3 - NEA REDD

18 The consultation meetings with NEA can be conducted virtually, but an in-person meeting shall be required during project inception, project closeout, and during major stakeholder meetings. A TWG for the distribution sector smart grid shall be created to ensure a consistent and consultative approach.

19 It is expected that the implementing partner will be in the field for the data collection activities related to the GIS mapping, except for when the EC has established clear digital copies of their distribution network drawings, or when they have an alternative method for more efficient data collection. The corresponding capacity building activities shall be conducted in person for effective delivery, clustering together ECs within a geographical area. The grouping/ clustering and schedule shall be coordinated with NEA.

20 The Investment Forums will be held in person, in coordination with NEA. Stakeholders from the private sector such as technology providers and financial institutions, as well as other development partners, will be invited to the Forum.

V. Stakeholders and Donor Activities

21 The primary stakeholders of this project include

a. National Electrification Administration as one of the main beneficiaries of this project, which has the mandate to empower and enable the ECs to cope with the changes brought about by the electric power industry reform.

b. Electric Cooperatives as one of the main beneficiaries of this project, being the end-user and owner of the GIS-based maps.

c. Department of Energy's Electric Power Industry Management Bureau as the supervisory entity in the implementation of electric power industry restructuring to establish a competitive, market-based environment, and encourage private-sector participation;

ensures adequate, efficient, and reliable supply of electricity, and formulates plans, programs and strategies relative to rural electrification.

22 There are no externally supported projects related to the proposed technical assistance with NEA. ETP recognizes the other programs for energy transition and ensures collaboration and cooperation in each others' projects. These programs include:

a. **German Clean, Affordable and Secure Energy for Southeast Asia (CASE)** supports an energy transition with ambitious climate goals in the Southeast Asian region. This Project is developing evidence-based solutions and building societal support to address the challenges faced by decision-makers. CASE is also supporting coordination in the region's power sector by providing technical and policy support and facilitating dialogue concerning energy issues. [12]It has developed a knowledge platform and is also participating in the regional specialist dialogue as part of the ETP.[13]

b. **USAID's Energy Secure Philippines (ESP)** has focused work on smart grids and capacity building. The ESP is a flagship project of USAID to support a more competitive, secure, and resilient Philippine energy sector. In its five-year implementation, which started in 2021, it will work with the Philippine government and private sector partners to improve the performance and efficiency of energy utilities, deploy renewable energy systems, enhance competition in the power sector, and address energy sector cybersecurity. ESP will mobilize more than USD 740 million in private sector investment and help develop at least 500 megawatts of clean energy generation capacity.[14]

VI. Results-Based Monitoring Framework and Risks

A. Results-Based Monitoring Framework

23 The Results of the technical assistance are monitored through the Results-based Monitoring Framework of ETP presented in Table 5.

[12] CASE (n.d.)

[13] International Climate Initiative (2022).

[14] USAID (2021).

Table 5. Results-Based Monitoring Matrix

ETP Results	Project Output(s)	Indicator	Target	Data Source and Means of Verification
Impact: The TA will enable smart grid adoption of the distribution sector that is aligned with the Smart Grid Policy Framework. It will also contribute to the Clean Energy Scenario targets defined in the Philippine Energy Plan 2020-2040, which is 50% RE in the power generation mix by 2040.				
Long-Term Outcome: EC's achieve a Level 4 smart grid status by 2040 and increase embedded RE generation to at least 62 MW by 2040[15]				
Intermediate Outcome 2: De-risking renewable energy and energy efficiency investment				
Short-Term Outcome 2.2 De-risked project finance is accessible via financial institutions generating a pipeline of large-scale RE/EE projects	Output 3.1: Optimal RE System Design Reports covering all EC's with RE EGF plan	Indicator 1: # of RE System Design Project Report submitted to NEA	Target 1: <62	Project report
	Output 2.1: Roadmap for Smart Grid Finance covering 121 EC's	Indicator 2: # of Report on Roadmap for Smart Grid Financing applicable to 121 EC's	Target 2: 1	Project report
Intermediate Outcome 3. Extending smart grids				
Short-Term Outcome 3.1 National energy strategy and sectoral plans involve evidence-based planning for an improved national-smart-grid system along with related infrastructure and innovative technologies	Output 1.1: Assessment Report for Smart Grid Implementation covering 121 ECs accepted by NEA	Indicator 3: # of Assessment Report	Target 3: 1	Project report
	Output 1.2: GIS-based distribution network map for ECs	Indicator 4: # of ECs with GIS maps	Target 4: <63	Project report
	Output 2.2: Investment Plan Framework for Smart Grid Upgrading	Indicator 5: # of Investment Plan Framework submitted to NEA	Target 5: 1	Project report
Intermediate Outcome 4. Knowledge and awareness building				

[15] Based on ERIA study, projected additional capacity from RE embedded generation is ~ 55 MW by 2040 and NEA indicates minimum of 1 MW capacity for each RE EGF

ETP Results	Project Output(s)	Indicator	Target	Data Source and Means of Verification
Short-Term Outcome 4.1 Stakeholders (relevant Government entities, Public sector companies, Financial institutions, Private entities, Academia, and Consumers) involved in the RE/EE value chain, are knowledgeable and better informed to advance the energy transition agenda	Output 2.3: Investment Forums	Indicator 6: # of Investment Forums	Target 6: 3 Investment Forums	Event report
	Output 1.3: Workshop on GIS mapping	Indicator 7: # of participants	Target 7: <126 participants from EC's <15 participants from NEA Technical Services Department (Engineering and REDD)	Workshop report
	Output 3.2: Workshop on RE EGF simulation	Indicator 8: # of participants	Target 8: <124 participants from EC's <10 participants from NEA REDD	Workshop report
	Output 1.4: Guidance document for GIS mapping	Indicator 9: # of Guidance document on GIS mapping developed	Target 9: 1	Project report
	Output 3.3: Guidance document for RE EGF simulation	Indicator 10: # of Guidance document on RE EGF developed	Target 10: 1	Project report

B. Risks and Mitigation Measures

24 Table 6 shows the potential risks for the program. The mitigation actions to address these risks are provided.

Table 6. TA Risk matrix and mitigation measure

Risk description	Probability	Severity	Risk level	Mitigation Measure
Project delay due to uncooperative ECs, which can affect the delivery of the GIS-based map and capacity building	Likely	Severe	High	The implementing partner and ETP will work closely with NEA to ensure the cooperation of the ECs. The NEA can issue a Memorandum Circular to the ECs, directing them to cooperate and collaborate for technical assistance.
Project delay due to inability to reach far areas, which can affect completion of the GIS-based map	Less Likely	Severe	Medium	It has been confirmed with NEA that the distribution lines of the backbone network are along major roads and highways, and thus easy to access. The Implementing Partner should be prepared to explore other methods for gathering data.
Project delay due to restrictions such as further lockdowns	Less likely	Severe	Medium	The current administration announced in his first State of the Nation Address that the Philippines will not undergo any more lockdowns for economic reasons. The project will always follow any health guidelines and protocols. Should there be any restrictions, the implementing partner will be asked to explore other options for conducting activities, such as virtual/hybrid training, or use of available data from government agencies and databases for their analysis.
Project delay due to natural hazards during the time of implementation	Less likely	Severe	Medium	Natural hazards are difficult to predict and so, the implementing partner will be required to plan their itinerary in coordination with NEA and develop a risk matrix to be included in their Inception Report.

Risk description	Probability	Severity	Risk level	Mitigation Measure
Project delay due to social and cultural restrictions in an area	Likely	Severe	High	The implementing partner is encouraged to plan their itinerary in coordination with NEA and develop a risk matrix to be included in their Inception Report. Moreover, it has been confirmed with NEA that the on-grid, backbone distribution network is accessible through major roads. The team will also ask NEA for assistance from local government unit (LGU) intervention if needed. Alternatively, the latest available data from NEA Engineering Department may be used.
Duplication of efforts with other donor programs	Less likely	Severe	Medium	It has been confirmed with NEA that no other development partners or programs are working with them and the ECs on the smart grid transformation and embedded generation. ETP and the implementing partner will regularly coordinate with other development partners to ensure that there will be no redundancy of efforts.

Risk matrix:

Probability / Severity	**Low**	**Moderate**	**Severe**
Less likely to happen	Low	Low	Medium
Likely to happen	Low	Medium	High
Most likely to happen	Medium	HIgh	High