

DOST-PCIEERD Call for Proposals under its Priority Programs



Department of Science and Technology
Philippine Council for Industry, Energy and Emerging Technology
Research and Development (PCIEERD)

I. ENERGY SECTOR

A. TRANSITIONING MSMEs THROUGH LOW-CARBON AND ENERGY-EFFICIENT TECHNOLOGIES

Call Rationale

Medium, Small and Micro Enterprises (MSME)s play a vital role in driving the Philippine economy. They help reduce poverty through job creation in line with the country's growing workforce and stimulate economic development in rural community areas. MSMEs also provide support services on large enterprises and serve as breeding groundcreative for new entrepreneurs and large corporations.¹

According to the Philippine Statistics Authority 2018 Report, the total number of establishments operating in the country is recorded around 1,003,111 business enterprises where 99.52%) are MSMEs. Micro, Small and Medium enterprises constitute 88.45%, 10.58% and 0.49%, respectively.² The top five (5) industry sectors constituting 83.62% of the total number of MSME establishments are: (1) Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles; (2) Accommodation and Food Service Activities; (3) Manufacturing; (4) Other Service Activities; and (5) Financial and Insurance Activities.

In 2018, the PCIEERD conducted a research with Wattsmart Technology to install energy monitoring system for selected DOST-SETUP supported MSMEs and found out that the highest energy consumption is attributed to Wood, Food, and Metal Industries. Most of the consumption is used for air conditioning, lighting, and other motor loads which is typical for micro, small, and medium business companies. The research study results created an avenue to expound the energy load profiling of MSMEs in the Philippines.

One of the current issues involving MSMEs is the establishment of accurate energy baseline data/information system. This information is important to determine the energy use, efficiency, and technology cost-competitiveness that can be used for better policy development. Most common challenges faced by MSMEs are accessing low carbon and energy efficient technologies due to high upfront cost and investment. Moreover, financial support for low carbon technology is not common since MSMEs are too small for financial backing that leads them to implement energy intensive traditional processes. In addition, there is lack of awareness in energy management, and energy efficient practices are not prioritized.

To address the challenges in establishing the energy profile of MSMEs and technology access, the program aims to link energy researchers, Energy Service Companies (ESCOs), and other energy technology providers with the MSMEs. Through provision of viable low-carbon and energy-efficient technologies, the technology providers can serves as a catalyst in promoting low-

¹ The MSME Sector at a Glance, 2012, Senate Philippines

² Department of Trade and Industry, www.dti.gov.ph, 2018

carbon and energy-efficient technologies to MSMEs and proliferate the awareness and importance of energy conservation and management.

Call Objectives

Generally, the call aims to benchmark and capture the current energy load profile of MSMEs in the country for policy recommendations.

Specifically, it aims to provide S&T intervention support through low carbon technology adoption, energy consumption reduction, increased energy management awareness.

- 1) The research program is open for private and state universities, ESCOs, and other companies engaged in providing energy-efficient technologies.
- 2) The project should directly benefit the MSME eventually by being cost- competitive, reduce electricity dependence and lower carbon emission. Interested proponents must provide a partner MSME which will utilize, adopt and sustain the technologies to be developed herein.
- 3) The proponent should present the actual energy load profile of the MSMEs collaborating company and highlight the advantages of the low carbon technology intervention. Determining the MSME's product/s carbon footprint shall likewise be included in the project deliverables.

Total Allocation for 2022 – 2023: PhP 60,000,000.00

Call Scope

Monitoring, Detection, Analysis and Control of Energy Utilization of MSME

The project should utilize existing technologies or develop new technologies that can monitor energy utilization of a facility i.e. fuel and electricity. The system should be capable of detecting anomalies on power and fuel utilization and must be able to present relative actions to control improper use of energy. The energy monitoring system should have an integrated control mechanism to regulate energy consumption (i.e. fan speed reduction vs cooling requirements, lighting control for tasks/non-tasks area, motor speed regulation, etc) based on the recorded energy data and set parameters.

Low-Carbon Technologies for MSMEs

The project should design, develop or utilize low-carbon technology in order to reduce energy utilization of MSMEs. The low-carbon technology should be incorporated into the existing production/processing facility, and should showcase low-emission, clean technologies, which significantly reduce the MSME's greenhouse gas emission, enhance productive use of energy and reduce electricity and fuel consumption.

Energy Efficient and Energy Conservation Technologies

The project should focus on developing energy recovery technologies i.e. waste-heat recovery integrated with software, sensors, etc. that will increase the energy efficiency and conservation of an MSME. Software may include monitoring and planning of energy use and attached activities. Sensors will be used to detect forms of energy leakage, and waste energy recovery technologies will be used to utilize waste energy (heat, mechanical, chemical) form which the MSME has in its production/processing facility.

Additional Call Document Requirements

- 1-2 years project duration
- Partnership and commitment with identified MSME required, actual implementation and monitoring of the system to MSME beneficiary
- Highlight business model for possible implementation of system to interested MSMEs
- Open to private companies thru professional and industry associations

B. MICROGRID RENEWABLE ENERGY SYSTEMS FOR COST-COMPETITIVE INNOVATIVE SYSTEM APPLICATIONS

Call Rationale

The Philippines is an archipelagic country which consists of 7,641 islands, where only 2,000 islands are inhabited¹. Due to this geographical condition, the main key challenges of the country are providing reliable source of energy and affordable cost of electricity. The Department of Energy 2016 Annual Report stated that the country's household electrification level stands at 89.6 percent which is equivalent to 20.36 million out of the potential 22.72 million households². It means that there are still 2.36 million households that is unserved and underserved and mostly situated in remote island communities.

Energy sources of these off-grid island areas are mostly coming from diesel-fired generator running not more than 6 hours daily which makes electricity cost expensive and non-eco-friendly. The introduction of renewable energy (RE) such as solar, wind, hydro, biomass, and ocean, hybrid technologies enable the integration of fossil-based and renewable energy for microgrid applications. The IEEE international standards identified microgrid as a group of interconnected loads and distributed energy resources with clearly-defined electrical boundaries that act as a single controllable entity with respect to the grid and can connect and disconnect from the grid to enable it to operate in both grid-connected or islanded modes³. In the Philippines, several microgrid projects have been implemented for rural areas as part of the national electrification program of the government.

Most research challenges in microgrid system are attributed to electricity cost and sustainability due to high upfront cost of renewable energy system and unavailability of local parts and components. In addition, renewable energy generation is intermittent and may not be suitable for stable power generation needing additional integration of energy storage system. Bulk transportation of RE systems to isolated areas also remains a challenge that affects accessibility and logistics.

Call Objectives

Generally, the call aims to develop innovative solutions that is not being used in existing microgrid facilities in the Philippines, and addressing the following:

- 1) Cost-effectiveness and efficiency improvement of control system/ balance-of-system (BOS)
- 2) Commercial technology supply chain analysis (generation, transmission, distribution, storage)
- 3) Demand-side management through data analytics integration
- 4) Accessibility for microgrid services and maintenance as part of project sustainability
- 5) Policy support through recommended S&T-based information.

Specifically, it aims to provide S&T intervention support through local technology development.

- 1) The research program is open for private and state universities, research and development institutes, and private organizations engaged in microgrid RE research and development.
- 2) The project should directly benefit the off-grid communities and RE suppliers through cost-competitive electricity generation.
- 3) The proponent should identify potential off-grid community area and present an energy load profile and other substantial information to justify the selection of the area.

Total Allocation for 2022 – 2023: PhP 100,000,000.00

Call Scope

Control System, Demand-Side Management, Balance-of-System (BOS)

Development of cost-effective and efficient control system from generation, distribution, and utilization of energy, and localization of BOS parts and components in accordance with existing standards.

Supply Chain Analysis of Commercially Available Microgrid RE Technologies

Commercial technology supply chain analysis from generation, transmission, distribution, and storage. Development of system sustainability through innovative technologies.

Data Analytics Integration for Microgrid Energy Flow and Safety

Optimization of energy use, energy guide, safety, and payment scheme which is untried and untested in Philippine local condition.

Microgrid Service Accessibility Platform System

End-user's access to microgrid RE suppliers, repair and maintenance, parts and components acquisition, and other services.

Additional Call Document Requirements

- 18-24 months timeline for implementation of project activities
- Actual partnership (commitment letter) with identified stakeholders (community, electric coops etc.)
- Integrate sustainability components for the post project operation and maintenance

C. REVITALIZING THE MICRO HYDRO POWER INDUSTRY THROUGH S&T

Call Rationale

The present policy under the RA 9513 or the Renewable Energy Act is geared towards harnessing indigenous and renewable energy resource which can offer clean, abundant, and efficient supply of energy.

The Philippines has pushed for rural electrification in the past years. Recently, it has achieved 100% electrification at the village level. At the household level, however, many areas are still unelectrified, including off grid, and unviable areas in parts of Regions 5 (Bicol), 4B (MiMaRoPa) and 8 (Eastern Visayas) and in Mindanao. Several agencies and organizations have developed programs to provide electricity to these areas. These, however, this did not attain sustainability.

Most of the technologies used in rural electrification rely on micro hydro due to its ability to produce 24-hr electricity, applicability to mountainous and rainfall fed areas and ease of installation and operation. Currently, there are about 102 micro-hydro operational installations, while 490kW of micro hydro power is planned in the coming years. A more strategic and comprehensive action plan to address and support the technology need for the micro hydro industry is largely to be seen and in order to support the development of the 27MW resource potential scattered over the country.

However, micro hydro development in recent years started to decline since developers who choose to invest in micro hydro face many risks, even though the risks in every stage of the project's life cycle and their cost implication have been identified. It is believed that a micro-hydropower project implemented by private group would be successful once these risks are effectively managed. Some identified risks associated with micro hydro power are social, economic, sustainability, technical, supply chain and market problems.

Through this intervention, the program will contribute to the current uptake of the technology via the development and improvement of the local industries to support MHP development, utilization of small stream and river for larger generation capacity, introduction of hybrid MHP microgrid system to off grid and island community and turbine design innovation. Furthermore, it is expected that the program will push for a more comprehensive policy to support MHP in the country.

Most of the challenges in developing micro hydro system, specifically in remote community is the availability of technology, including equipment and components. Several installed systems in the country rely on importing electro-mechanical components from nearby Asian countries, including Indonesia and Nepal. Localization of these components would provide useful in reducing supply chain cost, greater control and flexibility of in dealing with the needed technology.

Call Objective

The objective of this call is to provide S&T intervention in the development and deployment of micro hydro power technology through localization, standards development, and innovative technologies and equipment in order to provide energy to unserved and unelectrified communities.

Total Allocation for 2022 – 2023: PhP 120,000,000.00

Call Scope

The R&D initiatives should address/cover the following identified research areas:

- Localization of micro hydro components (Turbine development and fabrication, Load Controllers, Ballast, etc.)
- Cascading MHP system for improve energy and capacity generation
- Hybrid MHP & Other RE resources for micro grid application
- Low head/low flow and siphon type turbine development

Additional Call Document Requirements

- Duration of activities to be covered within 24months
- Partnership and commitment with identified stakeholders (community, electric coop, relevant gov't agency)
- Identify sustainability aspect of the facility or installed system
- Target implementation in off-grid/ unserved community, pre-feasibility study incorporated in the proposal

D. FUEL DIVERSIFICATION USING LIGNITE COAL INDIGENOUS ENERGY SOURCE

Call Rationale

The Country has some 19-coal district that contains deposits ranging from Eocene to Pleistocene in age. These coal districts include: (1) Catanduanes (Eocene): (2) Cebu, Zamboanga Sibuguey, Bukidnon, Maguindanao, Sarangani, and Surigai (Oligocene to Miocene): (3) Batan Island, Masbate, Semirara (including Mindoro), and Quezon-Polilio (lower-upper Miocene): (4) Davao, Negros, and Sorsogon (middle-upper Miocene): (5) Cotabato (lower Miocene-lower Pliocene), Cagayan-Isabella, and Quirino (upper Miocene -Pliocene): (6) Sultan Kudarat (upper Miocene-Pleistocene): (7) Samar-Leyte (lower Pliocene-Pleistocene).

Total coal resources in these 19 coal districts, which are compiled by the Geothermal and Coal Resources Development Division (GCRDD) of the Department of Energy (DOE) of the Philippines, are estimated at a minimum of 2,268.4 million metric tonnes (MMT) (approximately 2.3 billion metric tons. The largest resource (550 MMT) is the subbituminous coal in the Semirara (including Mindoro) coal district, and the smallest (0.7 MMT) is the lignite-subbituminous coal in the Quirino coal district. The combined lignite and subbituminous coal resources, using the classification by GCRDD and including Semirara and Surigao coal districts, are about 1,899.2 MMT, which make up about 84 percent of the total coal resources of the Philippines. Samar and Cagayan lignite, which record a higher storage capacity of adsorbed methane than the Semirara subbituminous coal, potentially contain more gas volume than the Semirara coal. The remaining resources are composed of bituminous and semi-anthracite coal.

The Philippines cannot meet the demand for coal from its domestic coal resources in Semirara, and exploration and exploitation elsewhere is limited. Increasingly, the country's large consumers of coal are relying on imports.

The ability of the Philippine coal to store methane is a function of rank – that is, the storage capacity drops off considerably with decreasing rank. Lignite and subbituminous coal have similar methane storage capacities, which are from 2.8 scm to 5.7 scm/t; these are higher than storage

capacity of adsorbed methane for lignite in North Dakota, USA, which ranges from 1.0 to 5.4 scm/mt (31 to 173 scf/t). This high gas storage capacity of adsorbed methane for Philippine lignite is an important consideration when evaluating the potential gas content of this coal.

The proposed activity on determining and validation of the lignite coal resource as a liquid fuel in the country will be undertaken in order to establish critical issue on R&D and its policies. This activity is seen to be beneficial and inclusive and will help facilitate the government initiatives through effective policymaking and investment based on what the industry needs.

Call Objective

The objective of this call is to provide S&T intervention in the assessment and development of a technology on the use of lignite coal into liquid fuel which might improve in achieving the country's energy diversification program goal by increasing use of indigenous energy resources.

Total Allocation for 2022 – 2023: PhP 80,000,000.00

Call Scope

The R&D initiatives should address/cover the following identified research areas:

- Develop a localize technology in determining the lignite coal deposit and its storage capacity of absorbed methane
- Lignite Coal Methane assessment in the Philippines
- Validation and evaluation of lignite coal available in the country and its coal potential gas content
- Determine cost-competitiveness of conversion technologies and using lignite coal as alternative source of liquid fuel and/or methane gas
- Develop R&D components, equipment & technology related to lignite coal utilization

Additional Call Document Requirements

- 1-2 years project duration
- Commitment letter from relevant agency and stakeholder (DOE, industry stakeholders)
- Open to private companies thru industry associations