# CIF TA Facility for Clean Energy Investments

*First Call for Proposals*

# Proposal submission template

The proposals must follow the template below while submitting funding requests.

## Country/ region

Thailand

## Project Title

Asian Green Development Program: Scaling Smart Energy and Efficiency Solutions in Thailand

## Implementing MDB(s)

Asian Development Bank

## MDB client

The Provincial Electricity Authority (PEA), Thailand's state-owned electricity distribution utility under the Ministry of Interior, is responsible to distribute and sell electricity to business and industrial sectors, and general public in Thailand. The PEA's transmission and distribution network covers 74 provinces not including Bangkok, Nonthaburi, and Samut. In 2018, the PEA supplied 134,668 GWh to 19.13 million customers of which 17.1 million are residential and 1.7 million are commercial.

The PEA's objective is to transform into a Digital Utility by end-2023 to become one of ASEAN's leading state-owned enterprises by 2027. The organization aims to provide efficient and reliable electricity services for quality of life, sustainability of economy and society. The utility's strategic plan foresees investments to expand PEA's scope of business to behind the meter services and employ digital data and technology to improve efficiency and reduce cost.

## MDB focal point

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## Detailed description of proposed activity

The proposed knowledge and support technical assistance (the TA) will support PEA in Thailand to operationalize a sustainable utility energy efficiency services model to scale the implementation of energy efficiency measures in residential, commercial, public sector buildings and street lighting in Thailand. The major source of energy use in residential and commercial buildings are for ventilation, air-conditioning, lighting, and water heating. In street lighting the use of inefficient luminaires increases energy use. Energy efficiency measures that focus on (i) high-efficiency electrical lighting systems, (ii) high-efficiency cooling, ventilation, and water heating systems, (iii) controls such as programmable thermostats as well as daylight and occupancy sensors, and (iv) building fenestration and insulation systems that reduce heat gain can potentially achieve energy savings of 30% and more. The proposed TA is included in the Asian Development Bank (ADB) Thailand country operations business plan (COBP).

The TA will support the following outputs:

**Output 1: Utility energy efficiency services model designed and tested in Phuket, Khon Kaen, and Chonburi smart city.** The design of PEA's energy efficiency services model will include include (i) creating

standardized packages of energy efficiency measures that PEA offers to consumers[1]; (ii) determining consumer energy service payment mechanism; (iii) designing the product and service delivery model; and (iv) pilot testing the services model with consumers in Phuket, Khon Kaen smart city, and one additional city.[2]

**Output 2: Pilot digital energy management platform procured and tested.** Although retrofitting a significant number of the existing building and lighting stock as a stand-alone measure will already produce significant energy savings and emissions reductions, PEA wants to offer its customers a more comprehensive solution. A digital energy management platform will enable PEA and its customers to manage, measure and verify the performance of energy efficient equipment remotely, in real-time, and with a high degree of transparency to justify savings achieved and customer service payment. Moreover, the data can be linked with data gathered from different city departments, for cities to provide smart services to residents and businesses.

## Justification and theory of change

**Energy sector context.** With 193,860 gigawatt-hours of final electricity consumption in 2018, Thailand is the second largest consumer of electricity in the Southeast Asia region. The industry sector comprises 40% of Thailand's electricity consumption, followed by the commercial and public services sector (31%), and the residential sector (24%). To meet electricity demand, Thailand's electricity supply has increased on average 4% since 2015 to 208,831 gigawatt-hours. Thailand produces most its electricity domestically (89%). Electricity is mainly generated from combined-cycle (63.2%) and thermal power plants (28.5%). Natural gas (71.6%) and coal / lignite (19.5%) are the main sources of energy to generate electricity. Electricity generated from renewable sources represents 8%, including large hydro.

**Energy efficiency strategy.** In 1992 (amended in 2017), the country approved the Energy Conservation Promotion Act to (i) enforce energy conservation, (ii) promote the use of energy-efficient machinery, equipment and materials, and (iii) establish penalties for noncompliance with the regulations under this Act. Thailand's Energy Efficiency Plan, 2015-2036 sets the target for energy savings of 90,000 gigawatt-hours (GWh) by 2036 through interventions in the three major economic sectors – industry (13,000 GWh), residential buildings (13,000 GWh), and commercial and public buildings (44,000 GWh).

An energy service company (ESCO) market exists in Thailand. The Thai ESCO Association was established in 2008 and carries out tasks including accreditation of qualified ESCOs. Currently, there are 45 accredited ESCOs, but most are small scale and do not have the capacity to scale up investments to a level that can help meet the government objectives on energy efficiency.

[1] In order to develop standardized packages of energy efficiency measures, the TA will support PEA in (i) identifying and defining common energy consumption patterns and building design parameters typical for residential, commercial, public buildings and streetlights in the pilot locations and in Thailand; (ii) undertaking detailed energy audits for a sample of residential, commercial, public buildings, and streetlights in the pilot locations; (ii) identifying a long-list of potential appliance-specific and building-specific measures; and (iv) selecting the most appropriate measures considering (a) ease of installation (intrusiveness), (b) quantification of electricity and thermal energy savings, (c) investment cost, (d) operation and maintenance cost, (e) other value chain related aspects and cost such as sourcing, supplier warranty, disposal, ease of availability, and (f) level of monthly end-user energy service charge which needs to be lower than the monthly savings that can can be achieved.

[2] PEA is in the process of identifying a potential third city to be included in this activity.

**Challenges.** The uptake of energy efficiency measures by end-users, in particular individuals, commercial enterprises, and public entities is very limited due to structural challenges of existing financing mechanisms which include:

(i) *Upfront investment cost:* Even if it makes financial sense to implement solutions, upfront investment is burdensome on consumers; accessing rebates and financing might not be available or is complex;

(ii) *Debt financing:* Debt products for individuals to finance energy savings are not available. For commercial companies financing energy efficiency measures through loans involves comprehensive credit screening processes. Loans are often not transferrable and must be paid off should the home or business owner move;

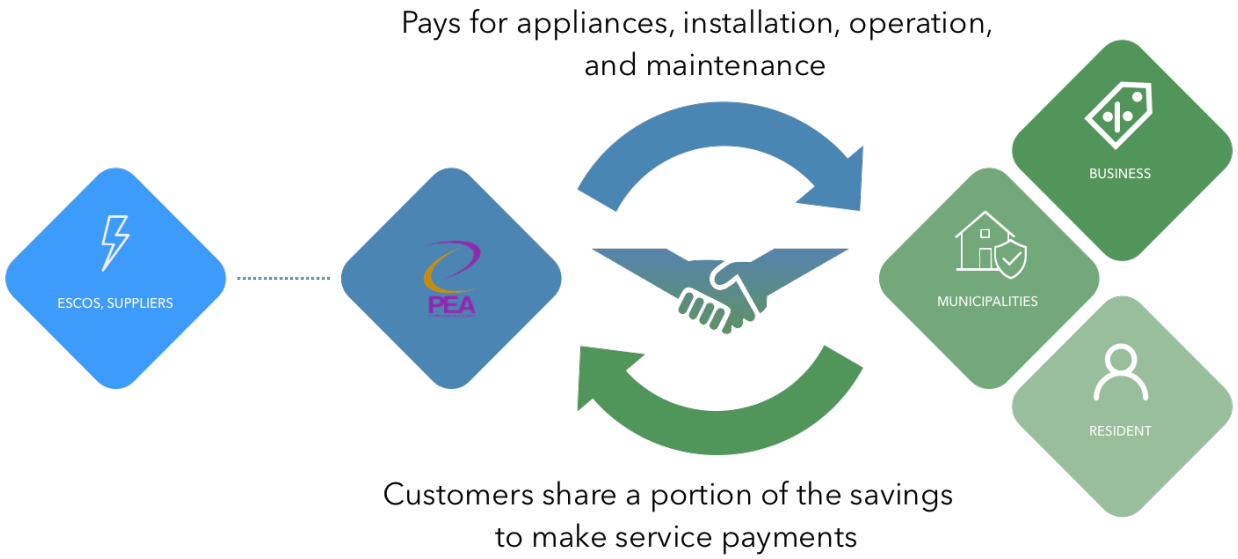
(iii) *Time and expertise:* Many consumers lack the expertise and time to make the right choice in selecting appliances and installers; consumers tend to have a low degree of confidence in expected paybacks and ESCOs are unable to provide reliable and transparent monitoring and verification services;

(iv) *Fragmented potential:* It is challenging for ESCOs to gain access to consumers and financing in order to service a fragmented (building) market and to achieve scale; and

(v) *Loss of revenue:* Energy efficiency contributes to flattening load growth. Electricity distribution utilities need to be able to diversify their revenue source (from electricity sales to revenues from energy savings) to continue investing in grid modernization.

An approach is needed that i) simplifies participation in energy efficiency programs though streamlined processes and ii) enables end-users to benefit from electricity bill savings without upfront investment and incurrence of debt. It could be enabled through a charge for energy service model involving the electricity distribution utility, the Provincial Electricity Authority (PEA), as a one-stop shop service provider. PEA can leverage its existing relationship with customers (marketing, funding, billing) to provide the financing, installation, operation and maintenance, monitoring and verification services for standardized packages of energy efficiency measures. The utility can partner with accredited ESCOs to enable efficient and focused service delivery (sales and installation management). The energy efficiency services model of PEA is not a finance model. Rather, it is a new revenue model for PEA in which consumers use a share of their electricity savings to pay for the service offered by the utility.

**Graph 1: PEA Energy Efficiency Services Model**




Source: ADB and PEA

The PEA energy efficiency services model represents a win-win solution for all stakeholders involved to scale investments in energy savings measures nationwide:

**Residents & Businesses & Municipalities (end-users):**

| ***Challenges with Existing Model*** | ***Benefit of PEA Energy Efficiency Services Model*** |
|---|---|
| Upfront investment cost | End-users benefit from energy savings with no upfront investment and no burden on budget; they share a portion of the savings to make service payments to the utility |
| Debt financing | Utility relies on meter payment history and turn-off ability to ensure payment; end-users are not required to incur debt; customers that are not eligible for debt products, such as low-income tenants and renters including households headed by women can participate. |
| Time & expertise | Utility provides one-stop solution (financing, energy efficiency products, operation, maintenance, monitoring, verification, warranty and payment); streamlined process allows for easy participation. |

**Utility:**

| ***Challenges with Existing Model*** | ***Benefit of PEA Energy Efficiency Services Model*** |
|---|---|
| Loss of revenue | Utility collects an energy service charge for the energy efficiency/management services provided; represents a |

| | |
|---|---|
| | new and diversified revenue stream for the utility while providing energy cost savings to end-users. |
| Fragmented potential | Utility can aggregate across customers to achieve economies of scale and provide capital providers with more stability; reduces financing costs of energy efficiency program; enables the opportunity for the utility to securitize revenue streams and raise financing for the energy efficiency program through the issuance of green bonds. |
| High-cost peak demands | Utility driven energy efficiency program can achieve scale contributing to reducing the utility's supply and overall system cost; enhances capacity to provide reliable and stable electricity service to end-users. |

**Government:**

| ***Challenges with Existing Model*** | ***Benefit of PEA Energy Efficiency Services Model*** |
|---|---|
| Financial support | The utility energy efficiency services model is self-sustaining; the utility covers its full costs without additional subsidies by recovering its investment from end-users through an on-bill energy service charge mechanism. |
| Sustainability goals | An energy efficiency program that reaches scale contributes to Thailand achieving its emission reduction goals; improves health and quality of life of its citizens. |
| Economic development | An energy efficiency program that reaches scale contributes to creating new economic opportunities and employment in manufacturing, installing, and innovating energy efficiency technologies; electricity bill savings reduces operating costs of businesses increasing their competitiveness. |

The Government requested support from ADB in designing a sustainable charge for energy service model involving the PEA to implement a nationwide energy savings in buildings and street lighting program.

## Consistency with selection criteria

| ***Selection Criteria*** | ***Consistency with Selection Criteria*** |
|---|---|
| Aligned with national low carbon priorities | Thailand's current policy targets include reduction of overall energy intensity of 30% by 2036; reduction of CO2 emissions from the power sector to 0.283 kg CO2 by 2037 (compared to 0.413 kg in 2018) |
| Contributing to mainstreaming MDB support | Builds on support provided by other MDBs (GGGI, UNEP); PEA model enables potential for scale (addressing key barriers) and embedded cash |

| | |
|---|---|
| | flow mechanism opportunity to mainstream financing for energy efficiency |
| Eliminating key barriers to scaling energy efficiency | Provides a solution to key barriers that so far limit scale of energy efficiency program including (i) upfront investment cost; (ii) no access to debt financing; (iii) cumbersome process to participate in energy efficiency program; (iv) loss of revenue for the utility; and (v) reliance on government support |
| Increasing private sector financing for energy efficiency | The PEA model creates the opportunity for the utility to explore new financing mechanisms such as securitizing its revenue stream from energy efficiency services to issue certified green bonds |
| Integrated approach to support market transformation | Collaboration among different organizations to provide support in building the PEA model (ADB, CIF, AFD, Government of Australia and Government of Japan) |
| Active partnership model | The PEA model involves active engagement from multiple stakeholders including end-users (residents, businesses, municipalities), product and service providers (ESCOs, manufacturers), long-term financing opportunity from private and public sector entities, government support to meet low carbon priorities and build new local economy to provide energy efficiency products and services; |
| Integrating gender/disadvantaged people design considerations | Core elements of the model will be designed and tested through gender- and low-income inclusive focus groups and consumer surveys (including the requirement for additional support to enable low-income households to participate in the energy efficiency program); at least 20 residential end-users participate in this pilot program of which 30% can be low income households headed by women. |

## Main focus area(s)

Transaction enablers (Utility business models)

## Complementarity and additionality

The government has set energy savings targets for residential buildings, public and commercial buildings at 57,000 GWh (63% of total energy savings target including industry). Funding support provided by the government in forms of soft loans, subsidies, and tax incentives is focused exclusively on industrial and designated large building applications. In addition, support provided by development partners is focused on the industry sector with limited involvement by the utility. The Global Green Growth Institute recently concluded a technical assistance to PEA to promote energy efficiency in small and medium-sized industrial

enterprises.[3] The United Nations Environment Program provided technical assistance to PEA to promote energy efficiency in households through behavioral changes and adoption of energy efficiency appliances. PEA's utility energy efficiency services model represents a new and innovative approach to build on these recent initiatives and further enable scaling of energy efficiency in residential, public and commercial buildings and for street lighting in partnership with private sector contractors including ESCOs.

## Transformational change and knowledge sharing.

Through this TA, ADB provides strategic knowledge support to contribute to Thailand's effort in building a globally competitive green growth economy that enhances energy security and reduces carbon emissions. Due to its potential for scale and its embedded solid cash flow mechanism, it will attract financing from a variety of lenders including ADB as well as other institutional investors. When PEA scales the energy efficiency model nationwide, beyond the pilot locations under this TA, it creates the opportunity for the utility to explore new financing mechanisms such as securitizing its revenue stream from energy efficiency services to issue certified green bonds. This TA supports the consulting services of a structured finance expert who will guide PEA in already exploring this potential of generating low-cost green financing from private institutional investors for its energy efficiency program. In general, a largescale energy efficiency program, enables the creation of a new economic sector as local resources are used to manufacture, construct or install, operate, service and innovate energy efficiency technologies, thereby creating well-paying, skilled employment opportunities. There is the opportunity that the utility energy efficiency services approach can be introduced to utilities in other countries within Asia to support green development.

## Budget

Technical assistances consultants will be engaged to support PEA in designing and piloting the operationalization of its energy efficiency services model. The consultants will support PEA in establishing the various components to build a financially viable and sustainable business model with focus on (i) creating standardized packages of energy efficiency measures that PEA offers to consumers (ii) determining consumer energy service payment mechanism; (iii) designing the product and service delivery model; and (iv) pilot testing the services model with consumers in Phuket, Khon Kaen, and Chonburi smart city. Opportunities to implement the business model will also be explored in other cities.

The services of a multidisciplinary team will be required over a period of twenty-four (24) months and will involve the participation of international specialists (30 person-months) and national specialists (19 person-months). The draft terms of reference are attached to this application. The envisaged composition of the technical assistance consultant team is as follows:

| **Positions** | **Number** | **Person- months** |
|---|---|---|
| **International** | | |
| Energy efficiency services model design manager | 1 | 6 |
| Energy efficiency expert – building and streetlights | 1 | 4 |
| Financial expert | 1 | 4 |
| Structured finance expert | 1 | 4 |
| Marketing and sales expert | 1 | 4 |
| Data management and EMV expert | 1 | 5 |

[3] GGGI supported PEA to connenct industrial SMEs with ESCOs.

| | | |
|---|---|---|
| Communication and knowledge dissemination expert | 1 | 3 |
| **National** | | |
| Energy efficiency services model design manager | 1 | 6 |
| Energy efficiency expert – building and streetlights | 3 | 4 |
| Marketing and sales expert | 1 | 4 |
| Legal expert | 1 | 5 |

The team of individual consultants will be financed with assistance received from the CIF TA Facility for Clean Energy Investments, Agence Francaise de Developpment, and ADB. Support from the CIF TA Facility for Clean Energy Investments is critical to ensure that the team composition can be in place for coherent and timely design and pilot testing of PEA's energy efficiency services model. In addition, support will be obtained from the ASEAN-Australia Smart Cities Trust Fund (Government of Australia), High-Level Technology Fund (Japan) to procure, install, pilot test, and enable knowledge transfer for operation, maintenance and data evaluation of the digital energy management platform. ADB will administer the implementation of the TA.

| Item | Amount |
|---|---|
| **A. Asian Development Bank** | |
| a. Remuneration and per diem | |
| i. International consultants | 181,440.0 |
| ii. National consultants | 254,940.0 |
| b. International and local travel | 50,000.0 |
| 2. Equipment | - |
| 3. Training, seminars, and conferences | - |
| 4. Surveys and studies | 2,500.00 |
| 5. Miscellanuous administration and support costs | 2,000.0 |
| 6. Contingencies | 9,120.0 |
| ***Subtotal (A)*** | 500,000.0 |
| **B. Agence Francaise du Development** | |
| a. Remuneration and per diem | |
| i. International consultants | 107,520.0 |
| ii. National consultants | 66,080.0 |
| b. International and local travel | 15,000.0 |
| 2. Equipment | - |
| 3. Training, seminars, and conferences | - |
| 4. Surveys and studies | 5,000.0 |
| 5. Miscellanuous administration and support costs | 2,000.0 |
| 6. Contingencies | 4,400.0 |
| ***Subtotal (C)*** | 200,000.0 |
| ***C. High-level Technology Fund*** | |
| a. Remuneration and per diem | |
| i. International consultants | |
| ii. National consultants | |
| b. International and local travel | |
| 2. Equipment | 350,000.0 |
| 3. Training, seminars, and conferences | |
| 4. Surveys and studies | |
| 5. Miscellanuous administration and support costs | |
| 6. Contingencies | 5,000.0 |
| ***Subtotal (C)*** | 355,000.0 |
| **D. ASEAN (Australia) Smart Cities Initiative** | |
| a. Remuneration and per diem | |
| i. International consultants | 85,000.0 |
| ii. National consultants | - |
| b. International and local travel | 10,000.0 |
| 2. Equipment | 150,000.0 |
| 3. Training, seminars, and conferences | - |
| 4. Surveys and studies | - |
| 5. Miscellanuous administration and support costs | - |
| 6. Contingencies | 5,000.0 |
| ***Subtotal (C)*** | 250,000.0 |
| **E. CIF TA Facility for Clean Energy Investments** | |
| a. Remuneration and per diem | |
| i. International consultants | 190,400.0 |
| ii. National consultants | 259,840.0 |
| b. International and local travel | 20,000.0 |
| 2. Equipment | - |
| 3. Training, seminars, and conferences | 10,000.0 |
| 4. Surveys and studies | - |
| 5. Miscellanuous administration and support costs | - |
| 6. Contingencies | 19,760.0 |
| ***Subtotal (C)*** | 500,000.0 |
| **Total (A+B+C+D+E)** | **1,805,000.0** |

## Implementation plan and timeline

**Output 1: Utility energy efficiency services model designed and tested in Phuket, Khon Kaen and Chonburi Smart City**

1.1 Mobilizing business model consultants (January 2020–December 2021)

1.2 Analyzing energy consumption patterns and energy efficiency potential for residential, commercial and public end-users, undertaking energy audits, evaluating and selecting viable energy efficiency measures for different customers (March 2020–July 2020)

1.3 Determining intervention costs, customer creditworthiness, sources of financing, and customer repayment model (March 2020–July 2020)

1.4 Determining operational structure within the utility and with external stakeholders including (i) legal and regulatory framework, (ii) product sourcing plan (manufacturers and suppliers), (iii) installation,

operation and maintenance plan (ESCO), (iv) quality assurance and quality control plan, (v) product offerings strategy including marketing and sales strategy which will involve active stakeholder engagement including participation of low income households and households headed by women (March 2020–September 2020)

1.5 Developing legal and contractual framework including i) legal and contractual agreements with customers and third-party providers, ii) legal and contractual agreements for data sharing (customer, utility, city) (March 2020–September 2020)

1.6 Piloting, testing, verifying, validating the energy efficiency services modelwith PEA customers in Phuket, Khon Kaen, and Chonburi City (October 2020–July 2021)

1.7 Sharing regular semi-annual progress reports on TA implementation with financiers of the TA (January 2020-December 2021)

1.8 Disseminating the results and key findings of the technical assistance with financiers of the TA and other utilities in Southeast Asis and Asia-Pacific region for potential replication (July 2021-December 2021)

**Output 2: Pilot digital energy management platform procured and tested in Phuket, Khon Kaen, and Chonburi Smart City**

2.1 Mobilizing data management, evaluation, measure and verification expert (March 2020–July 2020)

2.2 Designing before and after energy efficiency upgrades measurement, monitoring and verification protocols (March 2020–July 2020)

2.3 Preparing request for proposals and bidding documents to procure products and services for energy management system platform (March 2020–July 2020)

2.4 Procuring products and services for energy management system platform (July 2020–December 2021)

2.5 Designing and integrating energy management platform into utility, end-user and city level operational processes (September 2020–December 2021)

2.6 Pilot testing energy management platform among end-users in Phuket, Khon Kaen, and Chonburi City

## Stakeholder engagement and partnerships

The TA is included in Thailand country operations business plan. The conceptual design of the utility energy efficiency services model has been developed in close collaboration between ADB and PEA. Phuket and Khon Kaen smart city signed a MOU with PEA confirming to be involved as pilot locations to design and implement PEA's utility energy efficiency services model[4]. An important aspect of PEA's utility energy efficiency services model is to partner with ESCOs to enable efficient and focused service delivery. Core elements of the model will be designed and tested through end-users focus groups and consumer surveys including gender-and low-income households.

[4] A MOU with Chonburi city will be forthcoming.

## Results framework

| Results | Indicators | Baseline | Targets | Data source and means of verification |
|---|---|---|---|---|
| *Transformational Impact:* Countries assisted in accelerating investments and market development of clean energy (energy efficiency) | Volume of financing that utility in Thailand obtains from capital providers to provide energy efficiency services to end-users | 0 in 2020 | $250 million by 2036 | PEA annual report |
| *Outcome:* Increased adoption of business models and financing instruments that enable and de-risk clean energy (energy efficiency) investments (transaction enablers) | Volume of financing for energy efficiency products provided by the utility to end-users as result of adoption of the utility business model (PEA energy efficiency services model) | 0 in 2020 | $2.5 million by 2022 | PEA annual report and semi-annual project progress reports |
| *Outputs:*<br>(1) Utility energy efficiency services model designed and tested in Phuket, Khon Kaen, and Chonburi smart city<br><br>(2) Pilot digital energy management platform procured and tested in Phuket, Khon Kaen, and Chonburi smart city | Energy efficiency measures implemented in buildings and street lighting due to the benefits of PEA energy efficiency services model for end-users and utility | 0 end-users that adopt energy efficiency measures in 2020<br><br>0% low income households including those headed by women can participate in 2020<br><br>192,760 kWh per year of energy consumed by end-users in 2020 (based on the number of | 20 residential, 10 commercial, 20 municipal facility end-users that adopt energy efficiency measures by 2022<br><br>30% of residential end-users include low-income households including those headed by women by 2022<br><br>134,940 kWh per year of energy consumed by end-users in 2022 (30% of energy savings based on | PEA annual report and semi-annual project progress reports |

| | | | | |
|---|---|---|---|---|
| | | expected end-users that participate in the pilot program) | the number of expected end-users that participate in the pilot program)<br><br>26,886 kg of CO2 emissions saved per year by end-users in 2022 (based on the number of expected end-users that participate in the pilot program) | |

Note: Targets, which are currently rather conservative, will be updated during the implementation including the number of end-users that will participate in the program.

## Assumptions and risks/ risk management

During the detailed design and implementation of the utility energy efficiency services model, some of the activities may require reforms or approvals by the Government. Three initial pilot locations, Khon Kaen, Phuket and Chonburi smart city, agreed to be part of the TA to operationalize and pilot test PEA's utility energy efficiency service model. This approach will facilitate adjusting the model before nationwide role out. At the same time, it enables the Government to introduce regulatory changes to support PEA in scaling an energy efficiency program without relying on government subsidies.

## Co-financing, if any

Co-financing is being pursued from Agence Francaise de Developpment, ASEAN-Australia Smart Cities Trust Fund (Government of Australia), High-Level Technology Fund (Japan), and ADB. Project proposals have already been submitted to and are currently being reviewed by Agence Francaise de Developpment and ASEAN-Australia Smart Cities Trust Fund. Financing from ADB has already been allocated, consultants engaged who commence work in March 2020 with focus on identifying viable energy efficiency measures, determining consumer service charge model, and refining the PEA utility energy efficiency services model taking into account effective allocation of strengths and weaknesses among all stakeholders.[5]

## Gender considerations and expected results

PEA's utility energy efficiency services model does not require the end-user to invest upfront or incur debt which allows for different credit dynamics, easier participation, and easier transferability. End-users that are not eligible for debt products, such as low-income tenants and renters including households headed by women can participate. It is envisioned that at least 20 residential end-users participate in this pilot program of which 30% can be low income households headed by women. Core elements of the model will

[5] To jump start the work, an energy efficiency services model design manager has been engaged for currently 2.5 person-months, a finance expert has been engaged for 2 person months, and two national energy efficiency experts have been engaged for 2.5 person-months.

be designed and tested through gender- and low-income inclusive focus groups and consumer surveys (including the requirement for additional support to enable low-income households to participate in the energy efficiency program). Involving PEA will bring financing for the energy efficiency program to scale as loans are not tight to individuals, companies or properties but to the utility that relies on meter history and its disconnection ability to provide security.