CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

CTCN Technical Assistance
Request Submission Form

Please fill in the form in the grey spaces, by following the instructions in italic.

Requesting country:	Thailand

Request title:	Assessment of energy efficient street lighting technologies and financing models for Thai municipalities

Contact information:

{Please fill in the table below with the requested information. The request proponent is the organization that the request originates from, if different from the National Designated Entity (NDE).}

	National Designated Entity	**Request Applicant**
Contact person:	Mr. Surachai Sathitkunarat	Mr. Lertchai Kaewwichian
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Technology Needs Assessment (TNA):

{Select one of the three boxes below:}

☒ *The requesting country has conducted a TNA **in 2012***

☐ *The requesting country is currently conducting a TNA*

☐ *The requesting country has never conducted a TNA*

{If the requesting country has completed a TNA, please indicate what climate technology priority this request directly relates to. Please indicate reference in TNA/TAP/Project Ideas.}

CTCN Request Incubator Programme:

{Please indicate if this request was developed with support from the Request Incubator Programme:}

☐ *Yes*

☒ *No*

Geographical focus:

{Select below the most relevant geographical level for this request:}

☐ *Community-based*
☐ *Sub-national*
☒ *National*
☐ *Multi-country*

{If the request is related to the sub-national or multi-country level, please indicate here the areas concerned (provinces, states, countries, regions, etc.)}

Theme:

{Select below the most relevant theme(s) for this request:}

☐ *Adaptation to climate change*
☒ *Mitigation to climate change*
☐ *Combination of adaptation and mitigation to climate change*

Sectors:

{Please indicate here the main sectors related to the request. e.g. energy, industry, transport, waste, agriculture/fisheries, forestry, water, ecosystem/biodiversity, coastal zones, health, education, infrastructure/human settlement, tourism, businesses, early warning/disaster reduction, institutional design and mandates, cross-sectorial}

Energy

Problem statement *(up to one page):*

{Please describe here the difficulties and specific gaps of the country in relation to climate change, for which the country is seeking support from the CTCN. Please only provide information directly relevant to this request, and that justifies the need for CTCN technical assistance.}

The Provincial Electricity Authority (PEA) estimated that about 2.1 GWh (2,100 million kWh) of electricity were consumed by street lighting nationwide in 2014; this is equivalent to 1.4 million metric tons of CO2. At the municipal level, it is found that public lighting services account for about 60%-70% of the total electricity consumed by the municipality annually. Electricity demand at the municipal level is forecasted to continue to rise over the coming years. Various energy efficient technologies for street lighting are commercially available offering up to 60% energy savings. If only one third of the total potential savings can be reached in this sector, this would account for approximately US$150 million per year nationwide.

Street lighting technologies are improving rapidly and new products are introduced to the market every year. In addition to energy savings, most technology suppliers also claim benefits from lower operating and maintenance costs in the long-term. Although there is clear evidence about the benefits supported by positive results from PEA's demonstration projects, adoptions of energy efficient street lighting technologies at the municipal level have been still very slow. The key barriers that contribute to the slow uptake are the lack of confidence in investing these new technologies in a large scale and limited access to investment finance. Thus, raising confidence in saving results and long term performance of high energy efficient street lighting technologies, and designing project financing models that suit well with the Thai municipal context is the crucial step for promoting energy efficiency (EE) within the cities.

Status of public lighting in Thai municipalities:
Currently, all Thai municipalities combined have a total of around 3 million street lamps, many of them still use conventional Mercury Vapor (MV) lamps and other types of lamps such as fluorescent tube lamps (FTL), High Pressure Sodium (HPS) and Metal Halide (MH). In an effort to improve EE in municipalities, PEA initiated a demonstration program on high efficiency public street lighting systems; in which different EE technologies such as HPS dimming and LED technologies were installed to showcase energy savings and improve lighting quality. Although regular measurements and verification (M&V) activities were implemented during the PEA's project implementation period, these M&V activities were not properly followed up after the project completion. As a result, the positive results from these EE initiatives are not adequate to serve as concrete justifications for the long term investments.

It should be noted that each Thai municipality is entitled for a free electricity quota for the operation of street and outdoor lighting in its responsible areas. From 2008-2010, it is estimated that a total of free electricity for all municipalities nationwide amounted to 1,200 GWh annually, and this is equivalent to an annual electricity cost of 3,840 million Baht shouldered by PEA. This subsidy scheme has undermined interests and motivation of the Thai municipalities in pursuing investment in EE street lighting, and this is considered as the key barrier unless new and innovative financial mechanisms to stimulate EE street lighting investments in Thai municipalities are introduced.

Therefore, to systematically enhance PEA's efforts in development of EE public street lighting improvement projects in Thai municipalities, comparative assessment of different EE technologies for street lighting, and evaluation of effective financing models that will catalyze EE street lighting investments at the municipal level will enable PEA to address the mentioned barriers. Results of this study would be used to plan relevant activities such as details on best available specifications/options to be procured to improve EE in street lighting under the present circumstances and near future including a proposed implementation plan that maintain an effective balance of investments in advanced technologies for both short- and long-term.

Past and ongoing efforts *(up to half a page):*

{Please describe here past and on-going processes, projects and initiatives implemented in the country to tackle the difficulties and gaps explained above. Explain why CTCN technical assistance is needed to complement these efforts, and how the assistance can link or build on this previous work.}

The CTCN technical assistance will establish linkages between implementers of relevant past and ongoing EE street lighting projects and initiatives in Thailand to explore synergies and avoid overlaps. A list of past efforts and pilot projects undertaken includes:

- Installation of energy efficient lighting technologies (electronic dimmer and transformer dimmers) in PEA' service area in 2006.
- Installation of energy efficient lighting technologies (power electronics, voltage dimmer, high efficiency reflectors, HPS 50 watt, and MH 110 watt with reflector) in universities and surrounding areas during 2007- 2013
    - Installation of power electronics in King Mongkut's University of Technology Thonburi during 2007 – 2008
    - Installation of voltage dimmer in Kasetsart University in 2009
    - Delamping with high efficiency reflectors in Burapha University in 2010
    - Installation of HPS SON 50 watt and MH 110 watt with reflector in Kasetsart University during 2011 - 2013
- Improvement of fluorescent lamp street lighting (from 2x36 watt to 1x36 watt plus reflector) in Chonburi in 2010
- Replacement of fluorescent lamp street lighting (2x36 watt) with HPS 50 watt in Ratchaburi, Pattaya and Chonburi during 2011 - 2013
- Small-scale demonstration of LED street lighting technologies in Banpong, Lumpoon, Trang, Nongkhai, Udornthani and Krabi municipalities, as well as conduct of review and identification of financing options for the pilot municipal EE projects and for large scale implementation in 2012.

- Medium-scale demonstration of LED technologies in Chiengmai, Lampang, Nakornsawan (North); Nakornratchasima (Northeast); Pathumthani (Central); and Phuket and Koh Samui (South) in 2014

Based on these past pilot projects, technical assistance in conducting a study on comparative techno-economic assessment of different EE street lighting technologies, and effective financing models for municipal street lighting will provide guidance and recommendations on concrete actions to scale up the public street lighting improvement program nationwide. This will not only provide opportunities to reduce national electricity consumption level and improve energy security, but also direct benefits associated with cost savings and better lighting quality in municipalities.

Assistance requested *(up to one page):*

{Please describe here the scope and nature of the technical assistance requested from the CTCN and how this could help address the problem stated above and add value vis-à-vis the past and on-going efforts. Please note that the CTCN facilitates technical assistance and is not a project financing mechanism.}

This technical assistance requested from the CTCN includes: 1) conduct of the comparative techno-economic assessments of different EE street lighting technologies; and 2) design of financial mechanisms for implementation of EE street lighting projects at the municipal level. This will catalyze the development and investment of practical and affordable EE lighting technologies in Thai municipalities and will complement the efforts done to date by PEA.

Specific objective of this study is to remove barriers to increase adoption of EE street lighting technologies in Thai municipalities through the two components below:

1. **Comparative techno-economic assessment** – This component will conduct a techno-economic assessment of various EE street lighting technologies implemented in Thailand to date. The assessment will also include commercially available EE street lighting technologies that are yet to be implemented in the country. The scope will include: evaluation and validation of energy saving results and other benefits (e.g. lighting quality, social benefits, etc.) from the past efforts; and energy saving potential of advanced EE street lighting technologies. This will be performed through site visits and field data collections, and experiments in which existing street lighting technology and compare alongside more efficient street lighting technologies. The sample size for site visits and field data collections for validation of energy saving results will be limited to the project sites where EE street lighting has been implemented, estimated 30 project sites in 25 provinces nationwide. In addition, 250-300 municipalities will be contacted to collect data for identification of appropriate EE street lighting technologies for different scale of implementation and local conditions, using quantitative and in-depth qualitative interviewing approaches. The impact of technology maturity will be also assessed. M&V activities for the previous demonstration projects will be conducted focusing on operation and maintenance works; energy performance and cost effectiveness. Feedback from the community will be collected.

2. **Design of financial mechanisms** – This component will conduct a review of the relevant regulatory, institutional and legal frameworks that would have an impact on an investment in EE street lighting in municipalities and recommendations for suitable financial mechanisms for EE street lighting investments by PEA, municipalities and third-parties.

The outcomes of the proposed study will help address (1) suitable EE street lighting technologies for Thai municipalities to reduce electricity consumption and minimize operations and maintenance costs; (2) suitable financial mechanisms that would facilitate the mobilization of funding to support EE street lighting technology investments in Thai municipalities; and (3) recommended steps for effective implementation in short-, medium- and long-term.

Expected benefits *(up to half a page):*

{Please outline here the medium and long-term impacts that will result from the CTCN technical assistance, including how the assistance will contribute to mitigate and/or adapt to climate change.}

Medium-term impacts:

- Enhance national capacities to implement EE street lighting technologies and practices

Long-term impacts:

PEA's cost of public lighting subsidy has been on a raising trend due to higher costs (of tariff purchased from the generation utility in Thailand, i.e., the Electricity Generating Authority of Thailand or EGAT) and more extensive public lighting networks. Widespread improvement of public and street lighting systems and/or adopting more efficient street technologies in municipalities will help provide significant reductions in national energy consumption and GHG emissions from the current public lighting loads; including improvement of national energy security

The expected output of the study is a report for EE street lighting for PEA, Thai municipalities and other third-parties. The report will include the followings:

- Comparative techno-economic assessment of EE street lighting technology design options
- Financing models
- Road map and recommendations

The outcomes shall include adoption of findings and recommendations by PEA, municipalities and other third-party stakeholders leading to greater investments in EE street lighting technologies in Thailand.

Post-technical assistance plans *(up to half a page):*

{Please describe here how the results of the CTCN technical assistance will be concretely used by the applicant and national stakeholders, to pursue their efforts of resolving the problems stated above after the completion of the CTCN intervention (list specific follow-up actions that will be undertaken).}

Results of the study will be disseminated and shared among stakeholders to maximize the potential for implementation of EE measures for the public street lighting improvement in municipalities. The partners such as the Department of Local Administration (DOLA) and the National Municipal League of Thailand (NMT) will be requested to help circulate news and information among their networks. Specific follow-up actions that will be undertaken after disseminating project results:

- Develop procurement specifications for PEA's implementation in next phase
- Consult with the regulatory authorities to provide the regulatory push
- Carry out awareness programs

Key stakeholders:

{Please list in the table below the main stakeholders who will be involved in the implementation of the requested CTCN technical assistance, and what their role will be in supporting the assistance (for example, government agencies and ministries, academic institutions and universities, private sector, community organizations, civil society, etc.). Please indicate what organization(s) will be the main/lead counterpart(s) of CTCN experts at national level, in addition to the NDE.}

Stakeholder	Role to support the implementation of the assistance
Provincial Electricity Authority of Thailand	Main/lead entity
Municipalities	Provide feedbacks and implement EE measures
Department of Local Administration (DOLA)	Advise and comment on regulatory framework; disseminate findings and results of the study
Thailand Greenhouse Gas Management Organization (TGO)	Disseminate findings and results of the study
Electricity Generating Authority of Thailand (EGAT)	Disseminate findings and results of the study
National Municipal League of Thailand (NMT)	Disseminate findings and results of the study
Banks	Advise and comment on financing models
Department of Alternative Energy Development and Efficiency (DEDE)	Advise and comment on regulatory framework; disseminate findings and results of the study
Thai Industrial Standards Institute (TISI), Ministry of Industry	Advise and comment on energy performance and safety standards for lighting products
Electrical and Electronics Institute (EEI)	Advise and comment on energy performance and safety standards for lighting products
Illuminating Engineering Association of Thailand	Disseminate findings and results of the study; implement awareness activities on more EE lighting technology usage and its national environmental and social benefits
Street lighting technology suppliers	Manufacture quality lighting systems for the Thai market; provide after sales service and accelerate deployment
ESCOs	Provide feedbacks and implement EE measures
International Institute for Energy Conservation (IIEC)	Provide technical assistance for assessment of EE street lighting technologies and financing models

Alignment with national priorities *(up to half a page):*

{Please demonstrate here that the technical assistance requested is consistent with documented national priorities (examples of relevant national priorities include: national development plans, poverty reduction plans, technology needs assessments (TNAs), LEDS, NAMAs, TAPs, NAPs, sectorial strategies and plans, etc.). For each document mentioned, please indicate where the priorities specifically relevant to this request can be found (chapter, page number, etc.).}

This request aims to identify appropriate EE street lighting technologies and financing models for the municipal sector, and to develop a roadmap to accelerate investment of EE street lighting

technologies in Thailand. Promotions of EE in general, and EE lighting in the public lighting sector in particular, are reflected in the following national plans:

- **Thailand 20-Year Energy Efficiency Development Plan 2015 – 2036 (EEP 2015):** EEP 2015 specifies adoption of LED Technology in residential, industrial, commercial buildings and public services (street lighting) as one of 10 EE measures. It divides implementation strategies into 3 programs: (1) Compulsory Program; (2) Voluntary Program; and (3) Complementary Program. Measure of adoption of high EE lighting technologies is included into the voluntary program. This measure indicates adoption of LED technology in public buildings (2 million bulbs) and public street lighting services (3 million bulbs) *(Voluntary Program, page 4)*
- **Power Development Plan of Thailand 2015 - 2036 (PDP2015):** PDP 2015 concentrates on the conservation and efficient use of electricity as well as the reduction of CO2 emission resulting from electricity generation. This plan mentions strategic frameworks underlying an economy factor must be considered in terms of EE improvements and appropriate electricity generating costs towards economic and social development in the long term. This is to slow down of building new power plants and to reduce energy imports (*Chapter 5.2 - Framework of Development of Power Development Plan, page 5-2).*

In addition, it refers to the 20-Year Energy Efficiency Plan 2015 - 2036 (EEP 2015), that one of EE measures to be promoted is adopting EE lighting technologies, i.e. LED lighting system technology *(Table 3.1 - EEDP's energy savings target categorized by end-use sectors by 2036 and Table 3.2 - EEDP's energy savings target by year, page 3-4)*

- **Technology Needs Assessment (TNA):** TNA indicates that EE improvement on the demand side is one of four main groups of technology in the energy management sector to mitigate climate change impact. Encouraging energy conservation and efficiency in the household, industrial, service and transport sectors is also included into Thailand' strategic and action plan. *(1.3.3.2 Strategic and action plan on energy, (i) Thailand's Energy Policy, page 14).*

In addition, adoption of more efficient lighting technology is specified as one of energy management strategies/options that will help improve EE *(Table 9 – Technology options in each group and their competiveness with energy management, page 38)*

Development of the request *(up to half a page):*

{Please explain here how the request was developed at the national level and the process used by the NDE to approve the request before submitting it (who initiated the process, who were the stakeholders involved and what were their roles, and describe any consultations or other meetings that took place to develop and select this request, etc.)}

As described above, the Government of Thailand has given priority to EE lighting promotions. It is also found that public lighting services in Thai municipalities account for 60%-70% of the total electricity consumption by all municipal end-uses every year. EE street lighting will offer an excellent opportunity for Thailand to improve its energy security and decrease the rate of GHG emissions.

At present, adoption of EE street lighting technologies cannot be scaled up due to lack information and confidence in the long-term cost effectiveness of EE street lighting investments in municipalities. PEA decided that external assistance is needed to address these critical issues, and technical assistance in techno-economic assessments and design of financing models will lead to creating of an enabling environment for implementation on a large scale.

PEA has been coordinating with one of the CTCN's network members, i.e., the International Institute for Energy Conservation (IIEC) in the previous development and implementation of EE street lighting projects in Thailand. Considering IIEC's experience and expertise in the EE street lighting in Thailand, PEA therefore strongly recommends that IIEC be the entity to provide technical assistance to this request.

In the development process of this request, consultations were also carried out with the relevant government agencies, lighting manufacturers and other stakeholders.

Expected timeframe:

{Please propose here a duration period for the assistance requested.}

6 months

Background documents:

{Please list here relevant documents that will help the CTCN understand the context of the request and national priorities. For each document, provide weblinks if available, to attach to the submission form while submitting the request. Please note that all documents listed/provided should be mentioned in this request in the relevant question(s), and that their linkages with the request should be clearly indicated.}

Past efforts:

- Thailand: Mainstreaming Energy Efficiency Measures in Thai Municipalities Project *(http://www.adb.org/projects/41326-012/main)*

National priorities

- Power Development Plan of Thailand: 2015 - 2036 (PDP2015) – Thai language *(http://www.egat.co.th/index.php?option=com_content&view=article&id=325&Itemid=207)*
- Thailand: Technology Needs Assessment Report for Climate Change – Mitigation *(http://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TNR_CRE/e9067c6e3b97459989b2196f12155ad5/42aac2790d8944b38c267c9f6a81bec0.pdf)*
- Draft Thailand 20-Year Energy Efficiency Plan 2015– 2036 (EEP 2015) - Thai

(Presentation - http://www.eppo.go.th/encon/EEP2015/EEP2015_FG.pdf)

(Draft EEP 2015, Thai language - http://www.eppo.go.th/encon/EEP2015/Draft-EEP2015.pdf)

Monitoring and impact of the assistance:

{Read carefully and tick the boxes below.}

☒ By signing this request, I affirm that processes are in place in the country to monitor and evaluate the assistance provided by the CTCN. I understand that these processes will be explicitly identified in the Response Plan in collaboration with the CTC, and that they will be used in the country to monitor the implementation of the CTCN assistance.

☒ I understand that, after the completion of the requested assistance, I shall support CTCN efforts to measure the success and effects of the support provided, including its short, medium and long-term impacts in the country.

Signature:

NDE name: Mr. Surachai Sathitkunarat

Date: Nov 25, 2015

Signature:

THE COMPLETED FORM SHALL BE SENT TO THE CTCN@UNEP.ORG

Need help? The CTCN team is available to answer questions and guide you through the process of submitting a request. The CTCN team welcomes suggestions to improve this form.

>>> Contact the CTCN team at ctcn@unep.org