

Country:	Thailand
Request Identification Number:	2015000088

Title:	Energy efficient street lighting technologies and financing models in Thailand
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Summary of the CTCN Technical Assistance

This technical assistance will support establishing Thailand’s linkages between past and on-going energy efficient street lighting projects and initiatives to provide feasible financial models and recommend changes in regulations to overcome barriers to implement energy efficient technologies for in street lighting. This technical assistance will catalyse the development and investment of practical and affordable energy efficient street lighting technologies in Thai municipalities to enhance the efforts towards energy efficiency done by Provincial Electricity Authority (PEA). CTCN technical assistance will carry out a techno-economic study of the implemented energy efficient street lighting projects and also evaluate commercially available new technologies, yet to be implemented, in Thailand. Outputs of the CTCN assistance detailed within the project description below includes comparative techno-economic assessment of relevant technologies and design options of energy efficient street lighting and development of a financial model to support the implementation. The CTCN assistance will take place over 8 months’ time period, starting from the final contracting of the implementer. It will involve Thai municipalities, public and private sector partners, and international technical expertise.

Signatures

Signatures of the requesting country

NDE

Request Proponent

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Name: Mr. Lertchai Kaewwichian

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Title: Director of Alternative Energy Encouragement and Efficiency Department. Provincial Electricity Authority of Thailand

Date: May 15, 2017

Date: July 12, 2017

Signature:



Signature:



Signatures of the CTCN

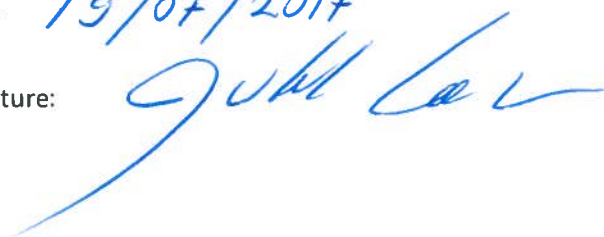
CTCN Director

Name: JUKKA UOSUKAINEN

Title: DIRECTOR

Date: 19/07/2017

Signature:



1. Overview of the CTCN Technical Assistance

Technology aspects

Street lighting technologies are improving rapidly and new products are introduced to the market every year. Thailand has implemented various Energy Efficient Street Lighting Projects since 2006. The most relevant modern technologies being LED (Light Emitting Diode) Technology and Energy Efficient High Pressure Sodium Vapor Lamps and control devices like electronic dimmers and transformer dimmers, on/off switch and astronomical switch. 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. The technical assistance shall develop the confidence and enable the stakeholders by building capacity in implementation of energy efficient street lighting with validated energy saving potential. The assistance shall also help develop the possible financial models for implementation of energy efficiency in street lighting projects that suit well with the Thai municipal context. Presently, in Thailand, the electricity cost of street lighting for each municipality is subsidized by PEA, however the operation and management of the street lighting is the responsibility of municipalities, this has been considered as one of the key barrier for PEA to invest in energy efficient street lighting. The technical assistance will evaluate the regulatory framework and financial models for feasible approaches.

Post technical assistance, the next phase of PEA implementation will be based on the outcomes of the technical assistance. The technical assistance will be disseminated and shared amongst stakeholders to maximize the potential for implementation of energy efficiency measures for public street lighting improvement in municipalities.

1. Objectives (outcomes)

The objective of the technical assistance is to remove barriers to increase adoption of energy efficient street lighting technologies in Thai municipalities through targeted findings and recommendations for PEA, municipalities and other third-party stakeholders contributing to greater investments in energy efficient street lighting technologies in Thailand.

2. Results (outputs expected from CTCN assistance)

The expected outputs of the technical assistance is captured in a report for energy efficient street lighting for PEA, Thai municipalities and other third-parties. The report will include the following outputs:

- Analytical results and findings from relevant Thai municipalities on existing energy efficient technologies for street lighting;

- Comparative techno-economic assessment of energy efficient street lighting technology design options;
- Financing model(s) to support the implementation of the energy efficient technologies for street lighting;
- Road map and recommendations for the implementation of the energy efficient technologies for street lighting.

4. Expected use of outputs

The outputs of the proposed study will help to address:

- Suitable energy efficient street lighting technologies for Thai municipalities to reduce electricity consumption and minimize operations and maintenance costs;
- Suitable financial mechanisms that would facilitate the mobilization of funding to support energy efficient street lighting technology investments in Thai municipalities; and
- Recommend steps for effective implementation of energy efficient technologies for street lighting in short-, medium- and long-term.

2. Description of the Assistance

2.1. Activities

Mandatory CTCN activities: Developing the mandatory implementation planning and closure documents

i) A detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organizations and detailed budget to implement the Response Plan. The detailed work plan and budget must be based directly on this Response Plan;

ii) Based on the workplan, a monitoring and evaluation plan with specific, measurable, achievable, relevant, and time-bound indicators used to monitor and evaluate the timeliness and appropriateness of the implementation. The monitoring and evaluation plan must enable the implementer to complete the technical assistance Closure and Data collection report (see item iv below);

iii) A two-page CTCN Impact Description formulated in the beginning of the technical assistance and update/revised once the technical assistance is fully delivered (a template will be provided).

iv) CTCN technical assistance Closure and data collection report completed at the end of the assignment (a template will be provided).

Deliverables	Delivery
i) A detailed work plan and budget for the implementation of the Response plan	First step of the implementation
ii) A monitoring and evaluation plan	First step of the implementation
iii) CTCN Impact Description	In the beginning and at the end of the assignment
iv) CTCN Technical Assistance Closure and data collection report	At the end of the assignment

Response Plan

Activity 1: Implementer shall carry out a survey based on a questionnaires and potential telephone interviews. The primary objective of the survey is to develop thorough understanding of the experiences and perceptions of municipalities with regard to the energy efficiency projects already implemented in Thailand. The phone interviews shall involve discussions of different street lighting systems adopted in the municipality and collection of in-depth information. The interviewer shall collect the views on barriers and feedback on adoption of energy efficient street lighting technology in other areas of the Municipality.

Total 20-30 telephone interviews shall be carried out with municipal corporation officers in charge of projects mentioned below:

- Installation of energy efficient lighting technologies (electronic dimmers and transformer dimmers) in PEA service area in 2006
- Installation of energy efficient lighting technologies (power electronics , voltage dimmer, high efficiency reflectors , High Pressure Sodium (HPS) 50 Watt , and Metal Halide (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 2007-2013
 - Installation of voltage dimmer in Kasetsart University in 20089
 - Delamping with high efficiency reflectors in Burapha University in 2010
- Installation of High Pressure sodium (HPS) SON 50 W and Metal Halide (MH) 110 Watt with reflector in Kasetsart university during 2011- 2013Replacement of fluorescent lamp street lighting (2x36Watt) with HPS 50Watt in Ratchaburi, Pattaya and Chonburi during 2011-2013
- Small scale demonstration of LED street lighting technologies in Banpong, Lumpoon, Trang, Nongkhai, Udonthani and Karbi municipalities , as well as conduct of review and identification of financing options for the pilot municipal energy efficiency projects and for large scale implementation in 2012
- Medium scale demonstration of LED Technologies in Chiengmal, Lampang, Nakornsawan (North), Nakornratchasima (Northeast), Pathumthani (Central), and Phuket and Koh Samui (south) in 2014

The questionnaire shall be prepared in consultation with PEA. The purpose of the questionnaire is to evaluate the technical awareness of municipalities with regard to the energy efficient street lighting and to gather the information regarding any issues of the operation and maintenance requirements of the efficient technologies specifically for the energy efficient street lighting project. The questionnaire shall also collect information for measurement and verification protocol being followed in the energy efficient project.

The questionnaire shall highlight on following aspects of street lighting:

- Energy saving
- Reduced maintenance cost

- Increasing safety through better street lighting
- Reducing pollution and greenhouse gas emission
- Barriers to adoption of advanced energy efficient street lighting technologies

The interviews shall primarily be qualitative in nature; however a short quantitative survey shall be conducted at the end of each interview to allow for preparing the profile of respondents and quantification of overall findings.

Activity 1 – Deliverables

Deliverables	Delivery date
Report and analytical findings from interviews and questionnaire survey	Week 8

Activity 2: Bidder shall carry out study of national regulations and guidelines, energy performance standards, standards of road design, illumination requirements of different categories of roads, standard and labeling requirements of lamps, lighting fixtures, accessory and control gears, installation standards. At municipal level bye-laws shall be studied (selection of study of municipal bye laws shall be done in consultation with PEA based on size and population of municipality). The objective of the study is to develop set of standardized design parameters for which energy efficient design and retrofit options can be recommended in activity 3.

Activity 2 – Deliverables

Deliverables	Delivery date
Study of regulation standards and guidelines	Week 12

Activity 3: Bidder shall carry out a techno-economic assessment of the energy efficient technologies¹ in selected 4 municipalities. The techno-economic assessment will include key parameters for PEA future decision making. Techno-economic parameters shall include lighting illumination levels and uniformity ratio, Color Rendering Index (CRI), development of energy consumption baseline pre and post retrofit of energy

¹ LED (Light Emitting Diode) Technology and Energy Efficient High Pressure Sodium Vapour Lamps and control devices like electronic dimmers and transformer dimmers on/off switch and astronomical switch, etc. implemented in selected the energy efficient street lighting projects

efficient technologies, cost-benefit analysis, and return of investment calculations. The assessment must provide recommendations for installation of typical street lighting retrofit schemes for standardised design parameters (including necessary electrical apparatus to prevent premature failures of LED lighting, e.g., surge arrestors), control and management, and cost effective Measurement & Verification (M&V) of energy savings and lighting quality. In addition, the implementer shall provide recommendations on appropriate technologies for Operations and Maintenance (O&M) and M&V including but not necessarily limited to remote monitoring and control systems that are suitable for large-scale implementation in Thailand.

Activity 3 – Deliverables

Deliverables	Delivery date
Techno economic study of energy efficient street lighting project in 4 Municipalities	Week 18

Activity 4: Based on the findings from items 1-3, a financial model to support the implementation of most relevant technologies in Thai municipalities shall be designed. The financial model shall be based on existing regulatory framework in Thailand i.e. Government Co-investment program, Revolving Fund Program, Tax incentives and direct subsidy. The implementer shall prepare detailed design of a scalable and sustainable financial model in consultation with PEA, municipalities, and other relevant parties to discuss appropriate financing model and regulatory framework.

Activity 4 – Deliverables

Deliverables	Delivery date
Development of financial model for implementation of energy efficient street lighting technologies	Week 24

Activity 5: Based on outputs from activity 3 and 4, recommendations for PEA, municipalities and other third-party stakeholders shall be provided for installation of typical street lighting retrofit schemes for standardized design parameters, control and management, and cost effective Measurement & Verification (M&V) along with a suitable financial model. The document shall also provide road map for large scale implementation energy efficient street lighting technologies in Thai municipalities

Deliverables	Delivery date
Road map and recommendation document	Week 28

2. Synergies and Baseline Setting

The assistance will build on and link to the project sites where energy efficient street lighting technologies have already been implemented, through qualitative and quantitative interview based survey. The assistance will also carry out techno-economic assessment of energy efficient street lighting project and will develop baseline and evaluate the energy saving potential of street lighting.

3. Timeline

Provide an overall timeline for the CTCN assistance and list specific milestones for each activity. The timeline should show the roll out of the activities and sub-activities to be conducted, throughout the whole duration of the CTCN assistance.

Activity	Months						
	1	2	3	4	5	6	7
Mandatory activities							
Activity 1 Report on interview based survey							
Activity 2 Study of regulation standards and guidelines							
Activity 3 Techno-economic study of energy efficient street lighting project in 4 Municipalities							
Activity 4 Development of financial model for implementation of energy efficient street lighting technologies							
Activity 5 Development of road map and recommendations							

4. Expertise required

Please list the expertise, materials and other resources required to successfully implement the CTCN technical assistance and reach the expected objectives. This will constitute the basis for developing the activity-based budget of the CTCN assistance (as per Annex 2).

Activity 1 Report on interview based survey	- Energy Expert
Activity 2 Study of regulation standards and guidelines	- Senior Energy Expert
Activity 3 Techno economic study of energy efficient street lighting project in 4 Municipalities	- Senior Energy Expert
Activity 4 Development of financial model for implementation of energy efficient street lighting technologies	- Senior Energy Expert
Activity 5 Development of road map and recommendations	- Senior Energy Expert

The **Senior Energy Expert/ Team leader** will be an energy efficiency specialist with more than 10 years of experience on energy efficiency projects, at least 5 years of which were dedicated to energy efficient street lighting. Specific and significant experience on Thailand would be highly valued. The senior energy expert must also have demonstrated experience managing large projects involving multidisciplinary teams. An advanced degree in engineering, economics, management, or a related field is required.

The **Energy Expert** will be an energy efficiency specialist with 5 years of experience on energy efficiency projects, minimum 2 year of which was dedicated to energy efficient street lighting. Specific and significant experience on Thailand would be highly valued. An advanced degree in engineering, economics, management, or a related field is required.

5. Main partners

Using the table below, please list and describe the role of in-country partners who will be involved in the implementation of the CTCN assistance. The table should complement what was proposed in the request through defining a more precise role on what is expected from their engagement and/or suggesting additional partners.

Stakeholder	Role to support the implementation of the CTCN assistance
PEA	Main/ Lead Entity
Municipalities	Provide Feedback and Implement EE measures
Department of Local Administration	Advise and comment on regulatory framework, disseminate findings and results of the study
Thailand Greenhouse Gas Management Organization	Disseminate findings and results of the study
Electricity Generating Authority of Thailand	Disseminate findings and results of the study
National Municipal League of Thailand	Disseminate findings and results of the study
Banks	Advice and comment of financial models
Department of Alternative Energy Development and Efficiency	Advise and comment on regulatory framework, disseminate findings and results of the study
Thai Industrial standards Institute	Advise and comment on energy performance and safety standards of lighting products
Electrical and Electronics Institute	Advise and comment on energy performance and safety standards of lighting products
Illuminating Engineers Association of Thailand	Disseminate findings and results of the study, implement awareness and activities on more EE lighting technology usage and its national environmental and social benefits
Street Lighting Technologies Suppliers	Manufacture quality lighting systems for the Thai market, provide after sales service and accelerate deployment
ESCOs	Provide Feedback and implement EE Measures
International Institute for Energy Conservation	Provide Technical Assistance for assessment for EE street lighting technologies and financial models

2.6 Indicative budget

Please set out an indicative amount of resources required to implement the CTCN assistance, including mandatory activities, using the table below. Once the Response Plan is completed, a Response Implementation partner(s) will be selected by the by Climate Technology Centre (CTC). An activity-based budget for the CTCN assistance will be finalized by the CTCN with the Response Implementer

Activities	Estimated Budget (USD)
Mandatory Activity	2,250
Activity 1	7,875
Activity 2	6,675
Activity 3	14,550
Activity 4	7,500
Activity 5	4,200
Other Costs (travel, DSA, workshop)	6,900
Total	49,950

Implementation of this Response Plan will be led by the Climate Technology Centre (including selection, contracting, and supervision and monitoring of implementation partners) in close coordination with the corresponding National Designated Entity and relevant national actors. Implementation will be led by an International Consortium or Network Partner of CTCN.

2.7 Gender considerations

Bidder shall give consideration of equal employment opportunity while constituting a team for the project.

2.8 Risk identification and risk mitigation

Please identify any risks that could jeopardize the realization of the CTCN assistance outcomes and any expected impact of such risks, their probability and how the CTCN assistance will mitigate these perceived risks.

Risk	Consequence	Probability	Mitigation measure
Non-availability of reports and standards in English	May delay Activity 2 : Study of regulation standards and guidelines	Medium	Have a designated team member from Thailand

3. Long-term impacts of the assistance

3.1 Expected climate change-related benefits

Please describe the impacts (i.e. anticipated long-term effects) that are foreseen to be produced by the CTCN assistance, including its contribution towards mitigating and adapting to climate change. If possible, identify specific targets. Indicate in the table below how the CTCN assistance will contribute to one or more of the core CTCN climate technology impacts. (Note that the list of CTCN climate technology impacts as set out in the table below is not definitive and subject to refinement/change).

	CTCN climate technology impact	Anticipated contribution from CTCN assistance
1	Climate technologies adapted to national context are identified and prioritized to enable their deployment and/or transfer in the requesting countries	Widespread improvement of public and street lighting systems and/or adopting more efficient technologies in municipalities will help provide significant reductions in national energy consumption.
2	New national Technology Needs Assessment (TNA) and Technology Action Plan (TAP) as a result of the response	
3	Progress made against mitigation objectives (i.e. energy and carbon intensity reduction) as a result of the response	Improvement of public and street lighting systems and/or adopting more efficient technologies in municipalities will help provide significant reductions in Green House Gases (GHG) emissions from the current public lighting loads; including improvement of national energy security.
4	Progress made against adaptation or resilience objectives (e.g. climate vulnerability index improvement) as a result of the response	

	CTCN climate technology impact	Anticipated contribution from CTCN assistance
5	New mitigation or adaptation technology projects/initiatives implemented as a result of the response	
6	New or strengthened policies/ laws developed, approved and enacted as a result of the response	
7	New policies/laws where climate change was mainstreamed as a result of the response	
8	Country integrating climate change mitigation and/or adaptation issues into its planning and policies as a result of the response	
9	New or strengthened Public-Private Partnerships (PPP) created directly as a result of the response	
10	New or strengthened twinning arrangement created as a result of the response	
11	Capacities to access and attract public and private finance increase to enable financing of technology deployment	
12	Post-response intervention funding attributable to the response.	
13	Framework and analysis of local production developed to enable deployment of national production of climate technologies	

3.2 Co-benefits

Please describe the anticipated economic, social, and environmental co-benefits of the CTCN assistance. Indicate in the table below how the CTCN assistance will contribute to one or more of the Sustainable Development Goals (SDG)².

	Sustainable Development Goal	Contribution from CTCN assistance
1	End poverty in all its forms everywhere	
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	
3	Ensure healthy lives and promote well-being for all at all ages	
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	
5	Achieve gender equality and empower all women and girls	
6	Ensure availability and sustainable management of water and sanitation for all	
7	Ensure access to affordable, reliable, sustainable, and modern energy for all	Technical Assistance will lead to adoption of energy efficient street lighting technologies at municipal level reducing the energy demand.
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	The study aims to raise confidence in investing in new technologies in a large scale in high energy efficient street lighting technologies and designing project financing models.
10	Reduce inequality within and among countries	

²Please note that the SDGs as listed here reflect their current status and may be subject to change.

	Sustainable Development Goal	Contribution from CTCN assistance
11	Make cities and human settlements inclusive, safe, resilient and sustainable	The study will include evaluation and validation of energy savings results and other benefits like safety, security; from past efforts and energy saving potential of advances energy efficient technologies for widespread improvement of street lighting systems across Thailand.
12	Ensure sustainable consumption and production patterns	
13	Take urgent action to combat climate change and its impacts	At municipal level, it is found that public street lighting systems account for 60-70% of total electricity consumed by the municipality annually. The study aims to enhance national capacities to implement energy efficient street lighting technologies and practices.
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	

3.3. Post-assistance plans and actions

The results of the study will be disseminated and shared amongst stakeholders to maximize the potential for implementation of energy efficiency measures for public lighting improvement in municipalities. Specific follow-up actions that will be undertaken by PEA after disseminating project results:

- Development and procurement specifications for PEA's implementation in the next phase;
- Consultation with the regulatory authorities for implementation of suitable financial mechanisms;
- Carry out awareness programs.

3.4 Monitoring and reporting of Technical Assistance results and impacts

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation (see Output 1 in section 3). The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance using the TA closure report template; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.

Performance indicators of CTCN Assistance					
Response output (linking to sec 1.2)	How output will be used to ensure creation of result	Expected result	Expected outcome of result (linking to sec 1.1)	Anticipated impact that outcome will produce (linking to section 3)	
<p>The output of the study will be a report for energy efficient street lighting for PEA, Thai municipalities and other third-parties.</p> <p>The report will include the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Comparative techno-economic assessment of energy efficient street lighting technology design options <input type="checkbox"/> Financing models <input type="checkbox"/> Road map and recommendations 	<p>The report of results of the study will be disseminated and shared amongst stakeholders to maximize the potential for implementation of energy efficiency measures for public street lighting improvement in municipalities.</p>	<p>The Technical Assistance will provide targeted findings and recommendations for PEA, municipalities and other third-party stakeholders</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Suitable energy efficient street lighting technologies for Thai municipalities to reduce electricity consumption and minimize operations and maintenance costs. <input type="checkbox"/> Suitable financial mechanisms that would facilitate the mobilization of funding to support energy efficient street lighting technology investments in Thai municipalities; and <input type="checkbox"/> Recommend steps for effective implementation in short-, medium- and long-term. 	<p>Enhance national capacities to implement energy efficient street lighting technologies and practices.</p>	

Annex 1: Response Log frame

Activity (link to sec 2)	Description of sub-activities conducted by the CTCN	Output/ Deliverable (link to sec 2.9)	Expected Outcome (link to sec 3)	Main national partners involved	Objectively Verifiable Indicator (See Annex 5 guidance)	Means of Verification (data source, method of collection, responsibility and periodicity)
Activity 1	Report on key findings from interview based survey	Outcome of the survey results in the form of a report	Energy saving potential in street lighting in Thailand, insights on Operation and Maintenance protocols, barriers to adoption of energy efficient street lighting technologies, potential reduction of greenhouse gas emissions	PEA, Municipalities	Interview based survey results, evaluation and feedback	Feedback forms and minutes of interviews.
Activity 2	Study of regulation standards and guidelines	Report on existing regulations, standards and design guidelines	Development of standardized design parameters for which energy efficient design and retrofit options can be recommended	PEA, Municipalities	Matrix of assessed energy efficient street lighting design and retrofit options and parameters	Verified results from Activity 1

CTCN Technical Assistance Response Plan

Activity (link to sec 2)	Description of sub-activities conducted by the CTCN	Output/ Deliverable (link to sec 2.9)	Expected Outcome (link to sec 3)	Main national partners involved	Objectively Verifiable Indicator (See Annex 5 guidance)	Means of Verification (data source, method of collection, responsibility and periodicity)
Activity 3	Techno economic study of energy efficient street lighting project in 4 Municipalities	Report on techno-economic assessment of energy efficient street lighting technologies	Recommendations for installation of typical street lighting technology, Operation & Maintenance, Measurement & Verification	PEA, Municipalities	Matrix of comparative assessment of various energy efficient street lighting technologies	Verified results from Activity 1
Activity 4	Development of financial model for implementation of energy efficient street lighting technologies	Design of financial model for implementation of energy efficient street lighting	Recommendation of financial model for implementation of energy efficient street lighting projects	PEA Municipalities Banks Energy Service Companies (ESCOs)	Review and feedback of stake holders	Minutes of meeting on agreement of most efficient financing model.
Activity 5	Development of road map and recommendation	Document containing roadmap and recommendations for PEA, municipalities and other third-party stakeholders	Through targeted findings and recommendations for PEA, municipalities and other third-party stakeholders greater investments in energy efficient street lighting technologies in Thailand can be expected	PEA Municipalities Banks Energy Service Companies (ESCOs)	Document containing roadmap and recommendations	Feedback forms

Annex 2: Response Budget

The budget template is based on the format required for legal agreements with the CTCN. This is only indicative. The activity-based budget will be finalized by the Response Implementer, in collaboration with the CTC, based on the resources and needs listed in this response plan.

Activity	Notes	Quantity	Unit	Unit Cost (\$)	Cost	Total Cost (\$)
Mandatory activity		6	Person day	x	x	2250
Activity 1 Report on interview based survey		24	Person day	x	x	7875
Activity 2 Study of regulation standards and guidelines		18.5	Person day	x	x	6675
Activity 3 Techno economic study of energy efficient street lighting project in 4 Municipalities		41	Person day	x	x	14550
Activity 4 Development of financial model for implementation of energy efficient street lighting technologies		16	Person day	x	x	7500
Activity 5 Development of Road map and recommendation		8	Person day	x	x	4200

Activity	Notes	Quantity	Unit	Unit Cost (\$)	Cost	Total Cost (\$)
Describe the role of the staff						
Senior Energy Expert	Team leader of the project, review of reports	20	Person day	x	x	15000
Energy Expert	Data collection and analysis, conduction inter personal interviews, development of financial model, report preparation	93.5	Person day	x	x	28050
Ticket for 4 provinces	Round trip ticket for 4 provinces in Thailand	4	Ticket	300	x	1200
DSA for 4 provinces	DSA (4 provinces of Thailand)	16	DSA	120	x	1920
Tickets for consultant	Round trip ticket from India to Bangkok Thailand	4	Ticket	450	x	1800
Boarding and Lodging	2 days for each visit of consultant from India	8	days	160	x	1280
Stakeholder Consultation Meeting	Rental meeting room and equipment	1	Day	700	x	700

Annex 3: Indicative list of performance indicators

Overall Activity	Specific Activity	Indicator
Activity 1	Report on key findings from interview based survey	<input type="checkbox"/> Interview based survey results, evaluation and feedback
Activity 2	Study of regulation standards and guidelines	<input type="checkbox"/> Matrix of assessed energy efficient street lighting design and retrofit options and parameters
Activity 3	Techno economic study of energy efficient street lighting project in 4 Municipalities	<input type="checkbox"/> Matrix of comparative assessment of Various energy efficient street lighting technologies
Activity 4	Development of financial model for implementation of energy efficient street lighting technologies	<input type="checkbox"/> Review and feedback of stake holders
Activity 5	Road map and recommendation	<input type="checkbox"/> Report with recommendations