TECHNICAL ASSISTANCE ON  
CAPACITY BUILDING FOR CLEAN POWER DEVELOPMENT

I.  INTRODUCTION

1. Asian Development Bank's (ADB) country operations business plan (2012-2014)\(^1\) for Sri Lanka envisages financing of the Clean Energy and Network Efficiency Improvement Project. This proposal for technical assistance (TA) is based on discussions and consultation with the Government of Sri Lanka and studies conducted during a project preparatory TA\(^2\) for the Clean Energy and Network Efficiency Improvement Project. The proposed TA will support key initiatives of the government, Ceylon Electricity Board (CEB) and Sustainable Energy Authority (SEA) of Sri Lanka in developing clean energy generation from renewable sources, primarily wind and solar, in a comprehensive and planned manner and complements renewable energy interventions of the Clean Energy and Network Efficiency Improvement Project.

II.  ISSUES

2. Sri Lanka's power sector struggles to meet the growing demand for electricity at sufficiently low cost and acceptable reliability. The share of thermal energy in the power generation mix has increased from 6% in 1995 to 54% in 2011 as demand growth has been generally met by oil-fired thermal generation. This type of power generation makes electricity expensive because of high fuel prices, and poses a serious threat to the country’s energy security and the environment. There is an urgent need to develop clean energy and indigenous renewable energy sources. The government plans to increase share of in-grid energy supply from nonconventional renewable energy sources from 4.1% in 2007 to 7.0% by 2012, 10.0% by 2016, and 20.0% by 2020. To achieve this goal, the transmission system should have sufficient capacity to meet the growing demand in the regions, but also to absorb additional capacity from intermitted power generation sources, such as wind and solar, without any negative impact on system stability. In this context, it is important to (i) undertake system stability and network planning studies for development of the renewable wind and solar potential, (ii) develop a country master plan for non-conventional renewable energy sources, (iii) create a business model for developing wind and solar power on a sustainable basis, and (iv) build institutional capacity for wind and solar power generation in the country. The proposed TA will provide support to the government to devise a systemic approach to renewable energy development, including wind and solar, in Sri Lanka.

3. The TA is consistent with ADB’s country partnership strategy (CPS) for Sri Lanka.\(^3\) A predominant feature of the CPS, among others, is focus on (i) renewable energy development including wind and other clean energy sources, (ii) transmission system enhancement to remove grid constraints on absorbing additional capacity from the renewable energy sources, (iii) creating an enabling environment for the clean power development, particularly through public-private partnerships (PPP) and greater private sector participation. The CPS identifies provision of technical assistance for the clean power development as one of the focus areas for country assistance.

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\(^2\) ADB. 2011. *Technical Assistance to the Democratic Socialist Republic of Sri Lanka for Clean Energy and Network Efficiency Improvement Project*. Manila (TA 7837-SRI, for $1 million, approved on 20 July 2012, and financed on a grant basis by ADB’s Technical Assistance Special Fund \(\sim\) TASF-IV)).

III. THE PROPOSED TECHNICAL ASSISTANCE

4. SEA is a government body with responsibility for developing and implementing energy efficiency and renewable energy policy and initiatives in Sri Lanka. In exercising this responsibility, SEA has identified renewable energy resources, which can be developed in the long term. CEB plays a key role in the transmission planning and is responsible for the development of transmission network in an integrated manner that addresses the requirements of additions in generation capacity, including those from non-conventional renewable energy resources, while ensuring system security and stability. The purpose of this TA is to (i) assist in conducting system stability and network planning studies for smooth integrating intermittent wind and solar power generation in the system, and (ii) support SEA in developing the wind and solar potential on a sustainable basis, including through attracting the private sector in power generation from the wind and solar resources.

A. Impact and Outcome

5. The anticipated impact of the TA will be increased sustainable, cleaner and reliable power supply. The anticipated outcome of the TA will be increased clean energy generation, and economic benefits from improved utilisation of the renewable resources and better energy security through reduction of reliance on imported fuels. Implementation of clean energy development measures supported by this TA will result in meeting the renewable energy targets set by the government, specifically 10% of energy from renewable resources by 2016 and 20% by 2020 and reduction in Green House Gas emissions.

B. Methodology and Key Activities

1. System Stability and Network Planning Studies

6. The key constraint in the scale up of the renewable energy development has been primarily to address the issues of renewable energy variability and the ability to maintain the grid stability. Both CEB and SEA have to address this aspect and to draw upon the experiences in other countries, which have high wind and solar deployment. There is a need to consider, resource specific unpredictable changes and their implications on the grid by considering the state-of-the-art information and technologies, and technical and regulatory standards and specifications for the renewable energy sources to interconnect to the grid that are developed in other countries.

7. To develop the renewable energy potential, CEB will be required to start including high renewable energy availability areas as potential generation sites and start planning for development of the transmission infrastructure there. Opportunities for interregional trade of generated wind power in the future may be also explored. In the process, CEB will need to consider power system stability related issues and dispatch of variable power. It would be also important to take into consideration specific features of Sri Lanka’s power system and load regimes to devise concrete recommendations for achieving the objective of absorbing intermittent wind and solar in an efficient and reliable way.

8. The TA will build the relevant capacity and assist CEB in undertaking the system stability and network planning studies for development of the renewable energy potential with specific focus on incorporation in the system intermittent wind and solar power generation and taking into consideration the potential power interconnection between India and Sri Lanka in the future.
2. Preparation of Renewable Energy Master Plan

9. SEA needs to have a detailed and comprehensive nationwide renewable master plan which (i) addresses short-term transmission network stability and security issues, (ii) prepares a medium-term road map to achieve the targets set by policy makers, and (iii) provides a long-term direction to the development of the renewable energy sector in the country. SEA has prepared a draft resource energy development plan in January 2012, which identifies the overall renewable potential in the country based on initial studies. The preparation of the renewable energy master plan for Sri Lanka would facilitate better coordination amongst the stakeholders and also facilitate each of them in planning and aligning their respective targets for overall growth of the renewable energy sector.

10. The overall master plan will address development of the renewable energy resources such as wind, solar, mini hydro, biomass, etc. The key activities to be covered under the preparation of the renewable energy master plan would include prioritization of the renewable resources for development, feasibility of development of wind parks in Sri Lanka, applicability of a solar park concept in context of Sri Lanka’s power sector, etc. Some regions in Sri Lanka have a good potential for developing concentrated wind projects. Similarly, development of solar resources is also important and various alternate options (photovoltaic, solar thermal, solar rooftop, etc.) need to be evaluated. Based on the identified resources and the master plan for the renewable resource development, SEA would be able to prepare its business plan. The business plan could be developed based on the review of the transmission system capabilities and network plan.

3. Preparation of Master Plan and Business Model for Wind Park

11. A key focus area for the future development of renewable resources in Sri Lanka would be development of wind parks with specific focus on the proposed Mannar wind park, which is currently considered in the Northern province. According to the recent SEA estimates, the wind potential that could be tapped in the Mannar region, taking into consideration land limitations and environmentally sensitive areas, is about 260 megawatt (MW). The government is currently considering establishing the wind park of about 100 MW. The TA will help to develop a feasibility study and a master plan for the proposed wind park in the Mannar region.

12. The TA will also help to examine potential PPP options and prepare of a business model for developing the wind park. This will also include drafting model bidding documents and associated documentation for commercial arrangements to attract the private sector in wind power development based on the wind park concept that is new for Sri Lanka.


13. A limiting factor for developing wind and solar power generation projects are insufficient institutional capacity and inadequate experience and knowledge among CEB and SEA personnel on system stability implications, their mitigation and relevant project development. The TA will address this shortfall (i) by providing comprehensive training and workshops relating to specific matters on incorporation of the intermittent renewable power to the grid and renewable project development, and (ii) through on the job-training, know-how and knowledge transfer from consultants to CEB and SEA counterpart staff during the TA activities relating to the system stability study and preparation of the master plans and wind park business model. These activities will create awareness and facilitate innovation from a local perspective.
14. In order to rollout the solar rooftop power generation pilot envisaged under the Clean Energy and Network Efficiency Improvement Project and also leverage the outcomes for future development in the area, SEA would require institutional capacity support during the initial pilot phase. The capacity building will focus on development of the framework for selection of private developers and service providers, preparation of commercial agreements, support for the bidding process including relevant documentation, etc.

C. Cost and Financing

15. The ADB will provide $900,000 equivalent in grant financing from ADB’s Technical Assistance Special Fund (TASF-IV). The government will provide in kind contribution, including counterpart staff and office accommodation for consultants. The TA cost estimates and financing plan are in Appendix 1.

D. Implementation Arrangements

16. The Ministry of Power and Energy (MOPE) will be the executing agency of the TA. CEB will be implementing agency for the system stability and network planning studies component. SEA will be the implementing agency for the other components. The TA will be implemented over a 24-month period commencing January 2013 and finishing in December 2014. The TA will require total of 42 person-months of consulting services (20 international and 22 national) in the areas of transmission system planning, management and operation, renewable energy development, commercial arrangements and transaction support for renewable energy projects. The consultants will be engaged by ADB through quality and cost based selection using a simplified technical proposal in accordance with the ADB’s Guidelines on the Use of Consultants (2010, as amended from time to time). The TA-financed equipment will be procured under ADB’s Procurement Guidelines (2010, as amended from time to time). The disbursements under the TA will be made under ADB’s Technical Assistance Disbursement Handbook (May 2010, as amended from time to time). Outline terms of reference for consulting services is in Appendix 2.

17. The consultants will prepare inception, mid-term and final reports. Findings and outcomes from the components of the TA will be disseminated through a combination of consultant produced project reports and stakeholder workshops.
COST ESTIMATES AND FINANCING PLAN

1. ADB will provide $900,000 equivalent in grant financing from ADB’s Technical Assistance Special Fund (TASF-IV). The government will provide in kind contribution, including counterpart staff and office accommodation for consultants. The detailed cost estimates and financing plan are in Table 1.

Table 1: Cost Estimates and Financing Plan

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| **A. Asian Development Bank Financing**
| 1. Consultants |
| a. Remuneration and Per Diem | 610.0 |
| b. International and Local Travel | 94.0 |
| c. Reports and Communications | 10.0 |
| 2. Equipment | 10.0 |
| 3. Training, Seminars, and Conferences | 20.0 |
| 4. Surveys | 10.0 |
| 5. Miscellaneous Administration and Support Costs | 36.0 |
| 6. Representative for Contract Negotiations | 10.0 |
| 7. Contingencies | 100.0 |
| **Subtotal (A)** | **900.0** |

Note: The total cost of the technical assistance (TA) amounts to an equivalent of $900,000 of which contributions from ADB are presented in the table above. The government will provide counterpart support in the form of relevant counterpart staff, office accommodation, including office facilities and communication (telephone lines and internet access), and utilities (air conditioner(s) in the consultant’s office, electricity and water charges), and necessary data, whose value estimated to account for 20% of the total TA cost.

a To be financed on a grant basis from ADB’s Technical Assistance Special Fund (TASF-IV).

b Includes (i) Asian Development Bank standard rates plus per diem while in the field for 20 person-months of international consulting services amounting to $456,000 and (ii) 22 person-months of national consulting services amounting to $154,000.

c The equipment will include computers, printers, etc. All equipment will become the property of the implementing agency on completion of the technical assistance.

Source: Asian Development Bank estimates.
OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

Part A. System stability and network planning studies

1. Part A of the technical assistance (TA) will require 14 person-months of consulting services (8 international and 6 national). Consulting services will be provided by a consulting firm since system stability and network planning studies would require specific experience and expertise. In particular, the consultants should have extensive experience in the power system analysis and power system operational aspects with wind and solar integration, transmission and generation planning and operation. The consulting firm should be able to deploy staff with good knowledge in wind power technology and other embedded generation such as mini hydro, solar and biomass based generation. The firm should have extensive experience in power system analysis using the Power System Simulator for Engineering (PSS/E) network analysis software and power system operational aspects with wind integration, transmission and generation planning and operation, standards and specifications development and cost estimation. The consultants’ outline terms of reference will include, but not necessarily be limited, to the following tasks.

1. Transmission System Planning Specialist and Team Leader
   (international, 4 person-months)

2. An international transmission system planning specialist/team leader will be responsible for the overall quality and implementation of the TA assignment, providing the required support for the executing agency (EA)/implementing agency (IA) and reporting to an Asian Development Bank (ADB) project officer. The specialist should have a master’s degree in engineering or economics and at least 15 years of experience in the energy sector including in transmission system planning. In particular, the tasks of the international transmission system planning specialist and team leader will include, but not be limited, to the following:

   (i) As team leader, coordinate with other team members to develop a detailed work plan and implementation schedule, work with the EA/IA to oversee the consulting team, and compile, edit, and ensure the quality of reports to be issued under the TA.

   (ii) Review previous studies on wind resource assessment, grid integration of wind and other embedded generators, and power generation expansion plan and transmission plans.

   (iii) Identify the operational and technical issues pertaining to the Sri Lanka’s power system due to the intermittent nature of wind-based electricity generation including operating reserve, unit commitment, economic dispatch, resource forecasting, load following, system stability, power quality, reactive power requirements, voltage control, transmission bottlenecks, etc. taking into consideration the total capacity of non-dispatchable power.

   (iv) Develop scenarios and conduct modeling analyses to study the impacts of wind power, under steady state, transient and short circuit conditions using appropriate dynamic models of wind turbines, at suitable intervals over the period 2013-2025.

   (v) Develop scenarios, and conduct analyses for the Sri Lanka’s power system using the PSS/E software, which is available with and being used by CEB.
(vi) Analyze the impacts of progressively increasing wind power generation on the power system along with the existing and increasing capacity of mini hydro and other embedded generation. In particular, identify potential situations where system-wide transient (inertial) stability and frequency oscillation could be a problem given the characteristics of the CEB system.

(vii) Carry out power system studies to determine operative measures including maintaining spinning reserves, incorporation of AGC systems, adjustment to conventional power plants to cost-effectively and prudently maximize wind and other embedded generation absorption capability of the grid during the period 2013-2025. The use of emerging wind and solar energy output forecasting techniques (e.g. hour(s), day, week ahead and longer), and its impact on maximizing wind and solar power penetration should be taken into consideration.

(viii) Estimate the feasibility limits of non-dispatchable generation in the Sri Lanka’s power system including wind power and other embedded generation; mini hydro, solar and biomass-based generation given current generation and transmission system expansion plan and existing and planned systems operations and controls.

(ix) Conduct on the job training and train CEB counterpart staff to incorporate methods of analyzing the impact of wind and solar power into the regular transmission planning process, with a view to incorporating updates to wind and solar power development plans and transmission developments, and to issue updates to system requirements at regular intervals.

(x) Prepare a comprehensive report with input from other consultants including the Wind Power Development Plan for Sri Lanka over the period 2013-2025 taking into consideration the maximum prudent absorption limits of the other embedded generation, mainly wind, solar and mini hydro. The report should cover for the period 2013-2025 (a) estimate of the prudent capacity limits of non-dispatchable generation in the Sri Lanka’s power system including wind power and other embedded generation such as mini-hydro and solar; (b) estimate of the prudent wind penetration levels, its spatial distribution in the Sri Lanka’s transmission network that can be absorbed by the power system; c) estimate of the prudent solar penetration levels, its spatial distribution in the Sri Lanka’s transmission network that can be absorbed by the power system; and (d) identify and specify the network upgrades, standards and procedures and other improvements necessary to allow for the maximum prudent wind and solar power absorption including cost estimates of such upgrades.

(xi) Disseminate the study findings among the CEB staff and prospective wind developers through arranging relevant workshops.

2. **Transmission System Planning Specialist**
   (national, 2 person-months)

3. The national transmission planning specialist will be responsible for local inputs and support the international transmission planning specialist and team leader in conducting the above-mentioned tasks. The specialist should have a bachelor’s degree in engineering and at least 7 years of experience in the energy sector including in transmission system planning.
3. **Transmission Specialist**  
   (international, 2 person-months)

4. The transmission specialist will assist CEB in preparation of system upgrade requirements as well as specifications, standards and practices. The specialist will coordinate with the team leader and provide the required support and information in a timely manner for the preparation of reports. The specialist should have a bachelor’s degree in engineering and at least 10 years of experience in the energy sector. In particular, tasks of the transmission specialist will include, but not be limited, to the following:

   (i) Estimate any additional facilities and equipment (metering, protection and control equipment, remote monitoring, SCADA, telecommunications, etc.) required to improve results from key areas of forecasting, frequency control, voltage control and overall network management. Evolving modern and smart grid technologies for maximizing transmission network efficiency and reliability should be taken into consideration, as possible, in identifying the additional facilities and equipment.

   (ii) Determine the need for any reinforcement and/or grid strengthening and/or generation strengthening to accommodate the estimated wind penetration levels.

   (iii) Prepare technical specifications and requirements for new tools that should be acquired by CEB for forecasting wind and electricity generation of wind power plants.

   (iv) Recommend changes, if any, to utility practices and procedures for data collection, real time control, dispatch, operations and planning required for integrating estimated level of determined wind penetration.

   (v) Provide recommendations that should be incorporated in an update of the current Long Term Transmission Development Plan for 2013-2025 for connecting the estimated maximum prudent level of wind penetration by 2025.

   (vi) Review the “Grid Interconnection Requirements for Wind Power Plants” currently provided by CEB to developers, and revise as necessary. Presently these requirements are provided as an amendment to the “CEB Guide for Grid Interconnection of Embedded Generators”, December 2000.

   (vii) Specify any essential changes needed to the Grid Code of CEB.

   (viii) Estimate the cost of grid strengthening.

4. **Transmission Specialist**  
   (national, 2 person-months)

5. The national transmission specialist will be responsible for local inputs and support the international transmission specialist in conducting the above-mentioned tasks. The specialist should have a bachelor’s degree in engineering and at least 7 years of experience in the energy sector.

5. **Power Economist**  
   (international, 2 person-months)

6. The international power economist will assist CEB in estimating and analyzing costs of system upgrades and integration of the intermittent power sources in the system. The specialist will coordinate with the team leader and provide the required support and information in a timely manner for the preparation of reports. The international power economist should have a master’s degree in engineering or economics and at least 10 years of experience in the energy sector.
sector including in economic analysis of power projects. In particular, tasks of the power economist will include, but not be limited, to the following:

(i) Estimate all relevant system integration costs including the generation upgrades, operational measures and ancillary services required for increased integration of wind and other embedded generation.

(ii) Evaluate the most economical wind absorption level after introducing improvements to the network as well as to the system operations.

(iii) Carry out economic analysis to justify the increase in wind absorption level while maintaining high spinning reserves.

6. Power Economist
   (national, 2 person-months)

7. The national power economist will be responsible for the local inputs and support the international power economist in conducting the above-mentioned tasks. The national power economist should have a bachelor’s degree in engineering or economics and at least 7 years of experience in the energy sector including in economic analysis of power projects.

Part B. Preparation of Renewables Development and Wind Park Master Plans and Business Model for Wind Park

8. Part B of the TA will require 28 person-months of consulting services (12 international and 16 national). Services will be provided by a consulting firm with expertise in preparing renewable energy master plans, commercial arrangements and transaction support for renewable energy (specifically wind) projects. The consultants’ outline terms of reference will include, but not necessarily be limited to, the following tasks.

1. Renewable Energy Specialist and Team Leader
   (international, 4 person-months)

9. The renewable energy specialist and team leader should have a master’s degree in engineering or business administration, 15 years of experience in the energy sector and should have extensive knowledge of the technical, regulatory and policy aspects of the renewable energy sector. Prior experience in developing sector specific plans would be preferable. Relevant experience for the wind and solar sector would be of added advantage. The renewable energy specialist will be responsible for the overall quality and implementation of the TA assignment, providing the required support for the executing agency and/or implementing agency (the EA/IA) and reporting to ADB’s project officer. In particular, tasks of the renewable energy specialist and team leader will include, but not be limited, to the following:

(i) As team leader, coordinate with other team members to develop a detailed work plan and implementation schedule, work with the EA/IA to oversee the consulting team, and compile, edit, and ensure the quality of reports to be issued under the TA.

(ii) Consult with EA/IA counterpart staff in relation to the project objectives, design and implementation.

(iii) Direct local consultants in the day to day operational management of the project;
(iv) Review the existing renewable plans, regulatory and policy environment to assess the sector’s current status, objectives, medium and long term envisioned status and strategy.

(v) Analyze the existing renewable resource database and relevant studies done in the past to assess the renewable potential for solar, wind, biomass and small hydro. The analysis would cover all the provinces. Prioritize and rate the development potential of various renewable resources across geographical locations.

(vi) Review the efficacy of development of renewable parks (wind, solar, etc.) in context of Sri Lanka’s power sector.

(vii) Review the existing constraints, which may affect the development of renewable resources. This would include coordination with CEB and technical consultants on the network stability studies to analyze the system constraints.

(viii) Assist SEA in developing the framework for the preparation of master plan studies, which addresses the long term requirements of the country.

(ix) Develop a 10 year renewable resource master plan, which would have medium term targets for development of various technologies.

(x) Prepare a long term roadmap for the implementation of the renewable master plan identifying the key barriers, which need to be overcome and key issues which need to be addressed.

(xi) Arrange capacity building activities, workshops and training relating to development of renewable energy projects.

(xii) Prepare required project reports with inputs from other consultants.

(xiii) Arrange dissemination of project findings and recommendations at a dissemination workshop and/or stakeholder conference.

2. **Renewable Energy Specialist**

(national, 5 person-months)

10. The national renewable energy specialist will be responsible for the local inputs and support the international renewable energy specialist in conducting the above-mentioned tasks. The specialist should have a bachelor’s degree in engineering and at least 7 years of experience in the energy sector including on the technical, regulatory and policy aspects of the renewable energy sector.

3. **Wind Resource Program Specialist**

(international, 3 person-months)

11. The wind resource program specialist should have at least a bachelor’s degree in engineering with at least 10 years of experience in the energy sector. He or she should have extensive experience of working in the wind power sector and preferably involved in wind project development studies or project implementation. The wind resource program specialist will assist SEA in undertaking the required steps to support implementation of a wind park program in Sri Lanka. The specialist will coordinate with the team leader and provide the required support and information in a timely manner for the preparation of reports. In particular, tasks of the wind resource program specialist will include, but not be limited, to the following:

(i) Discuss with CEB, SEA as well as other stakeholders the potential for the wind park program for and review available studies on the subject.

(ii) Advise SEA and MOPE on the various prerequisites that need to be put in place to develop the wind park plan.
(iii) Assess the steps to be taken for the development of the Mannar wind park based on the technical and environmental assessment studies available with various agencies.
(iv) Assist team leader in assessment of wind potential as part of renewable master plan identifying the geographies and possible locations of wind farms.
(v) Identify capacity building requirements for SEA for development of the wind park concept.
(vi) Develop recommendations on assessing the potential of wind park development in future while identifying any policy and regulatory interventions, which may be required for implementation.
(vii) Conduct with support of the national consultant surveys of the proposed wind park as necessary.
(viii) Support SEA in preparing a feasibility study for the proposed wind park.
(ix) Prepare a master plan for the proposed wind park.
(x) Assist the team leader in conducting capacity building activities, training and workshops.

4. **Wind Resource Specialist**  
   (national, 4 person-months)

12. The national wind resource specialist will be responsible for the local inputs and support the international wind resource program specialist in conducting the above-mentioned tasks. The national wind resource specialist should have at least a bachelor's degree in engineering with at least 7 years of experience in the energy sector.

5. **Commercial Specialist**  
   (international, 2 person-months)

13. The consultant should have a degree in engineering or economics or business administration with at least 12 years of experience in the energy sector. He or she should preferably have experience of working on the commercial aspects of renewable energy. The specialist will assist the renewable energy specialist and team leader in preparation of the commercial framework for the development of the wind power sector in Sri Lanka, which would be aligned to the proposed renewable master plan. In particular, tasks of the commercial specialist will include, but not be limited, to the following:

   (i) Analyze prospects, viability and suitability of potential public-private partnership options in Sri Lanka, specifically focusing on wind and solar power development.
   (ii) Prepare a wind power business plan incorporating the existing and proposed plans for wind parks.
   (iii) Prepare a business model and develop commercial arrangements for the wind power park.
   (iv) Prepare draft commercial documentation including draft agreements, which may be required for the wind park indicatively between wind park promoter and project developer, etc.
   (v) Assist SEA on commercial aspects of the solar rooftop power generation pilot roll out, including preparation of the contractual arrangements for the PPP mode.
6. **Commercial Specialist**  
   (national, 3 person-months)

14. The national commercial specialist will be responsible for the local inputs and support the international commercial specialist in conducting the above-mentioned tasks. The consultant should have a degree in engineering or economics or business administration with at least 7 years of experience in the energy sector.

7. **Bid Advisor/Transaction Specialist**  
   (international, 3 person-months)

15. The consultant should have a degree in business administration with at least 12 years of experience in the energy sector. He or she should preferably have worked on the competitive bidding framework specifically in the renewable energy. The specialist will assist SEA in preparation of a competitive bidding framework for the private sector participation in the renewable energy sector with a specific focus on the wind power development. In particular, tasks of the international bid advisor/transaction specialist will include, but not be limited, to the following:

   (i) Preparation of competitive bidding guidelines for the private sector participation in the wind sector.
   (ii) Preparation of bidding documents (request for qualification, request for proposal, etc).
   (iii) Support to SEA for selection of private developers through a competitive bidding process.
   (iv) Assist SEA in preparation of qualification criteria, selection framework for the proposed solar rooftop power generation pilot.

8. **Transaction Specialist**  
   (national, 4 person-months)

16. The national transaction specialist will be responsible for the local inputs and support the international bid advisor/transaction specialist in conducting the above-mentioned tasks. The consultant should have a degree in engineering or business administration with at least 7 years of experience in the energy sector.