CAPACITY BUILDING FOR POWER SECTOR AGENCIES

1. The project implementation and capacity building component supports three aspects of the proposed investment program. First, it will provide implementation support consultants to supervise the implementation of the Tranche 1 projects. This support is required only for the power plant conversion, hence for Bangladesh Power Generation Company (BPDB) and North-west Power Generation Company Limited (NWPGCL). Capacity assessments showed that Power Grid Company of Bangladesh (PGCB) has adequate capacity for implementing transmission component in Tranche 1. Second, it will provide consultant support for preparation of Tranche 2 and Tranche 3. Third, it will provide a variety of training programs aiming for better management of the power sector. Annex 1 provides the estimated costs of the capacity building component.

A. Implementation Support for Tranche 1

2. Tranche 1 of the multitranche financing facility (MFF) on Power System Expansion and Efficiency Improvement Investment Program, has the following power plant upgrades: (i) BPDB power plants (Sylhet, Shajibazar and Baghabari), and (ii) NWPGCL power plant (Khulna). The brief scope of work and summary terms of reference (TOR) for the implementation support consultant for each component, are as follows.

3. Scope of services for implementation consultant for power plant upgrades: The consultant will report to the client implementing agency (BPDB or NWPGCL), and assist the client by: (i) assisting the client’s evaluation committee for the analysis and interpretation of the bids received, (ii) assisting the client in preparation of contract documents and reviewing the draft contract, (iii) conducting supervision of the site work and inspection of equipment on behalf of the client, (iv) review designs and drawings prepared by the contractor(s), (v) reviewing progress and special technical reports such as type test and factory test reports, (vi) witnessing commissioning tests and performance tests, (vii) ensuring all defects are attended to and supervision of rectification of defects, and (viii) preparation of a completion report.

4. Qualifications and TOR for the Implementation Consultant: The consultant shall have a higher degree in engineering together experience in providing similar consultancy services for the implementation of retrofits to open cycle power plants, or in the implementation of combined cycle power plants. The TOR will include but will not be limited to the following:

(i) Upon decision by the client, review the draft contract for compliance with the Asian Development Bank (ADB) guidelines, the conditions in the successful bid and the client’s special considerations.

(ii) Ensure that the pre-requisites for the commencement of work on site are completed, including environmental and other clearances required.

(iii) Review the conceptual design for the power plant and all auxiliary systems and for the grid interconnection, and review the ensuing detailed engineering specifications and designs.

(iv) Supervise the construction of the power plant extensions by way of frequent site visits, regular meetings with the contractor and client, to ensure the equipment and workmanship are to the accepted standards and quality, and to enable the client to monitor project implementation schedule.

(v) Review contractor’s progress reports, prepare summary monthly progress reports, and reports on deviations and defects.

(vi) Participate in all the key meetings on the progress of site work and planned work.
(vii) Review all the relevant factory test reports and commissioning reports, and bring any issues to the attention of the client through regular reports or special reports.

(viii) Ensure the commissioning tests conducted by the client comply with the industry best practices and the relevant standards, such that the guaranteed capacity, heat rate and other key parameters are demonstrated by the contractors during commissioning, performance and reliability tests, as appropriate.

(ix) Review all commissioning test reports, and bring any shortcoming to the client’s notice.

(x) Prepare reports on defects and supervise the rectification of defects.

(xi) Endorse payments of bills submitted by the contractor, on the basis of the contract document, and the progress of work. and

(xii) Any other activity related to the implementation support as requested by the executing agency.

5. The consultants' person-month effort will be as follows: BPDB projects (Shajibazar and Baghabari) 25 person-months of international consultants, in total for both power plants. For the NWPGL project (Khulna), there will be 15 person-months of international consultants’ effort.

B. Due Diligence for Tranche 2 and Tranche 3

1. Preparation of Tranche 2

6. The Power Division of Ministry of Power Energy and Mineral Resources (MOPEMR) is responsible for preparation of the Periodic Financing Request (PFR) 2 and PFR 3. Resource required for preparation of the PFRs for the two tranches are included in the Tranche 1 budget. The proceeds will be applied to recruit consultants to conduct due diligence on the components of the Project proposed by the Government of Bangladesh (the government) for inclusion in the PFR. The consulting team will comprise the following international consultants: (i) Power System Development Specialist, (ii) Power Economist, (iii) Financial Specialist, (iv) Environmental Specialist, (v) Social Safeguard/Development Specialist, (vi) Solar Irrigation Specialist, and their national counterparts. A total of 46 person-months of consultancy services will be engaged to prepare the project. The consultants will be recruited directly or through a firm. The outline TOR for the consultants is described in Table 1. The consultants are expected to conduct due diligence on the following components in Tranche 2: Component 1: Transmission development in the south west; Component 2: Transmission system strengthening and substation development; Component 3: Distribution development in Dhaka; and Component 4: Irrigation using off-grid solar PV.

<table>
<thead>
<tr>
<th>Name of Positions</th>
<th>International</th>
<th>Person-months</th>
<th>National</th>
<th>Person-months</th>
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<tr>
<td>Power System Engineer/ Team leader</td>
<td>5</td>
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<td>Energy Economist</td>
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<td>Financial Specialist</td>
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<td>Environment Specialist</td>
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<tr>
<td>Social Safeguard / development Specialist</td>
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<td>Social Safeguard / development Specialist</td>
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<tr>
<td>Solar Power Specialist</td>
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<tr>
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<td><strong>19</strong></td>
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<td><strong>27</strong></td>
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</table>
7. **Power System Development Specialist and Team Leader** (international, 5 person-months, national, 5 person months). The international power system development specialist and team leader, with the assistance from national consultant, will be responsible for the overall quality and implementation of the technical assistance assignment, providing the required support for the executing agency and reporting to ADB project officer. With national power system development specialist as well as other consultant team members, the international power system development specialist and team leader will provide technical and management expertise in the application of energy efficiency practices and technologies in the development of priority investment projects. The tasks of the power system development 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 executing agency to oversee the consulting team, and compile, edit, and ensure the quality of reports to be prepared under the TA;
   (ii) Identify, analyze and evaluate various potential investment project components according to technical perspective and operating conditions;
   (iii) Prepare the scope, capital and operating cost estimates, implementation schedule, contracting, and implementation arrangements, and formulate suitable procurement packages;
   (iv) Based on the above reviews and analyses and in coordination with the other members of the team, recommend necessary policy, investment, and capacity building institutional needs to be addressed under the ensuing project;
   (v) Prepare final project report consisting of information needed for ADB to bring the investment proposal for its Board consideration; and
   (vi) Assist in preparation of relevant sections of the ADB’s Report and Recommendation of the President (RRP) for the ensuing project.

8. **Energy (Power) Economist** (international, 3 person-months, national, 4 person-months). In accordance with ADB’s *Guidelines for the Economic Analysis of Projects*, the international energy economist, with assistance of the national energy (power) economist, will undertake economic analysis of the proposed investment components and assess their economic viability. Working in collaboration with the financial analysts to ensure the use of consistent approach and assumptions across the financial and economic analyses, the energy (power) economists will carry out, but not be limited to the following tasks:

   (i) Provide the economic rationale for the project including an analysis of alternatives;
   (ii) Update the demand analysis for power in Bangladesh;
   (iii) Estimate the economic capital and operating costs, and carry out least-cost, analysis of the proposed project components;
   (iv) Assess economic feasibility of various investment components, for efficient development of power supply systems;
   (v) In collaboration with the Solar Power Specialist, undertake an assessment on the feasibility of financing solar irrigation pumps using avoided energy subsidies for water pumping;
   (vi) In consultation with the Social Development Specialist, incorporate poverty reduction impacts in accordance with ADB’s *Handbook on Integrating Poverty Impact Assessment in the Economic Analysis of Projects*;
   (vii) Undertake benefit-cost analysis to assess the overall viability of the proposed project in terms of economic internal rates of return;
   (viii) Identify the risk factors of the project and undertake sensitivity analysis; and
   (ix) Evaluate the proposed project’s direct and indirect environmental impacts, and carry out economic analysis of these impacts in terms of net present value and internal rates of return in accordance with ADB’s *Handbook on Economic Evaluation of Environmental Impacts*. 
9. **Financial Analyst (international, 3 person-months, national, 4 person-months).**

In accordance with ADB’s Guidelines for the Financial Analysis and Management of Projects (2005), the Financial Management Assessment Questionnaire (2005), and the Financial Due Diligence Methodology Note (2005), the International Financial Analyst will undertake financial analysis of the proposed investment components and assess the financial performance and the financial management capabilities of the executing/implementing agencies, with assistance of the national financial analyst. Working in collaboration with the Energy (power) Economists to ensure the use of consistent approach and assumptions across the financial and economic analyses, the financial analysts will carry out, but not be limited to, the following tasks:

(i) Prepare a preliminary project cost table for the proposed investment components;

(ii) Prepare a financing plan for the investment components, including proposed ADB lending, any prospective co-financing, and appropriate counterpart funds for local currency and expenditures;

(iii) Carry out in-depth financial analysis of the proposed investment components, including preparing cash flows forecasts that identify specific sources and projecting revenues for the proposed investment components that would ensure its financial viability;

(iv) Carry out a financial evaluation of the proposed investment components over the construction and operating periods by calculating the financial internal rate of return and comparing it with a weighted average cost of capital in accordance with the ADB Guidelines;

(v) Identify all risks to project revenues and costs, conduct relevant sensitivity analysis, and identify potential risk mitigation strategies and approaches;

(vi) Undertake a financial management assessment of the proposed executing/implementing agencies, including, funds flow and disbursement arrangements, a review of corporate planning and budgetary control, financial management accounting and reporting, internal control and audit systems, and data processing, to identify any financial issues that could affect project implementation and/or sustainable operations of project investments and suggest mitigation strategies;

(vii) Review the executing/implementing agencies’ financial statements to assess its historical financial performance, retail tariff levels, and capital structure and ensure that it can generate sufficient internal funds to ensure the sustainability of ongoing operations;

(viii) Prepare *pro forma* financial statements, including a balance sheet, income statement, and cash flow statement for each of the executing/implementing agencies for the next 10 years, and identify appropriate financial performance indicators;

(ix) Study the proposed Project’s financial impact on the executing/implementing agencies and options for sharing the financial burden, recommend measures for improving their financial performance, suggest appropriate financial covenants to monitor the Project’s financial performance, and recommend ways to improve their corporate governance in light of ADB’s policy on governance; and

(x) Based on the above recommend financial related governance improvement measures to ensure project funds are utilized for the intended purpose.

10. **Environmental Specialist (international, 3 person-months, national, 4 person-months).**

In accordance ADB Safeguard Policy Statement (2009) and other relevant guideline documents for environmental assessment, the international environmental specialist, with assistance of the national environmental specialist will undertake, but not be limited to, the following tasks:
(i) Review of institutional capacity of the proposed executing and implementing agencies to prepare environmental impact assessment (EIA) reports for the future project components and the required EMP to determine mitigation measures in the design, construction, and maintenance phases of the future investment subprojects, their components and national regulatory requirements;

(ii) Prepare Rapid Environmental Assessment Checklist and determine environmental category for each project component;

(iii) Prepare project descriptions and a summary of environmental issues identified for each project component to support the determination of the project environmental categorization;

(iv) Prepare EIA or IEEs depending on the subproject categorization (environmental category A or B) assigned by ADB;

(v) Prepare EMP and Monitoring Plan for each project component and a combined EMP and monitoring plan for the entire project. The project component EMPs and the combined EMP shall include a cost estimate plan for implementation the proposed mitigation measures;

(vi) Undertake necessary consultations with the project stakeholders on relevant environmental issues and impacts; and

(vi) Assist the Energy Efficiency Policy Specialist in identification of potential financing through the Clean Development Mechanism (CDM) or sales of Verified Emissions Reduction Credits in non-CDM carbon markets.

11. Social Safeguard/Development Specialist (international 3 person months, national 4 person-months). In accordance with all relevant policies, in particular with the relevant laws and policies of Bangladesh and ADB Safeguard Policy Statement (2009) the tasks of the international social development specialist, with assistance of national social development specialist will include, but not be limited to, the following:

(i) Review the national legal policies on land acquisition and involuntary resettlement to verify adequacy and consistency with ADB's Involuntary Resettlement Policy and Indigenous People Policy and if gaps are found, recommend measures to bridge the gap. Analyze and confirm the following aspects (at national and local levels) that will apply to land acquisition and resettlement in the project area: (a) laws and regulations, including local practices; (b) budgetary processes (tentative agreement from concerned authorities on provision of outlays necessary for land acquisition and resettlement); and (c) relevant administrative arrangement and requirements;

(ii) If the project components involve resettlement, prepare a resettlement plan with full stakeholder participation including participation of the executing and implementing agencies. The resettlement plan should be implementable in the Bangladeshi context and still meet ADB policy requirements;

(iii) Determine the replacement costs of all categories of losses; and prepare an indicative budget for land acquisition and resettlement costs with specific sourcing and approval process;

(iv) Assess the need for an Indigenous Peoples Development Plan (IPDP); and carry out any further indigenous people-targeted surveys as necessary;

(v) Prepare a socioeconomic analysis, including a poverty profile and characteristics and determinants of primary project beneficiaries in the target areas of the proposed investment components based on a review of existing studies, data, and development plans. The analysis will include a review of poverty by gender and ethnic minority and propose specific actions to benefit vulnerable indigenous peoples and minorities;
(vi) Analyze access to electricity, affordability, consumption levels, and consumer satisfaction across socioeconomic groups in target project areas, assess the determinants and elasticity of the demand for power by different socioeconomic groups, categorize areas where electrification would have the largest growth and poverty reduction impacts given the underlying potential of those areas; and assess the implications on employment generation for poor;

(vii) Define groups that would benefit from the proposed investment components, prepare an estimate of the distribution of the project’s financial and economic benefits, and summarize the likely net benefits for each group in accordance with ADB’s Handbook for Integrating Poverty Impact in Economic Analysis for Projects. Given the available dataset, assess the direct, indirect, and distributional impacts of the project under different growth scenarios with and without the project, summarize the distributional impacts in a matrix, calculate the poverty impact ratio, and carry out appropriate risk and sensitivity analyses with respect to the poverty impact ratio;

(viii) Assess and recommend ways to improve gender equity;

(ix) Review land acquisition and relocation plans of project components that involve resettlement, and assess their conformity with ADB Guidelines for Involuntary Resettlement, including (a) time-bound arrangements, public consultation, public disclosure, relocation, compensation for affected inhabitants, and (b) costs related to relocation, compensation for land acquisition, and right-of-way;

(x) Incorporate all mitigation measures into the cost estimates of the proposed components;

(xi) Prepare a Gender Action Plan (GAP), if needed; and

(xii) Prepare the terms of reference for the non government organization/consultant who will be in charge of the implementation of the resettlement plans, IPDP and GAP.

12. **Solar Power Specialist (international, 2 person-month, national, 2 person months).** Solar power specialist should have a thorough knowledge on application of solar power for irrigation water pumping. He/she should assess the technical, financial and economic feasibility of use of solar power for irrigation water pumping in Bangladesh. The main tasks of the solar power specialist include, but not limited to, the following:

(i) Assess the national level power and diesel subsidies at present and forecast the subsidies for next 20 years, in collaboration with the PPTA Economist.

(ii) Examine the savings of government subsidy on irrigation water pumps and feasibility of using such savings to finance solar irrigation water pumps, taking into consideration of cost of solar powered irrigation pumps, in collaboration with the PPTA Economist and Financial Specialist.

(ii) Review the information on pilot solar power irrigation schemes to examine the technical, financial, economic feasibility and success or failures of the pilot schemes.

(iii) Identify the reasons, if the pilot schemes have failed, for such failures and recommend remedial measures.

(iv) Identify appropriate solar technologies for irrigation water pumping in Bangladesh giving consideration to local conditions, capacity to undertake repair and maintenance and any other relevant considerations.

(v) Develop a strategy for mainstreaming solar powered irrigation pumps in Bangladesh. and

(vi) As a part of the implementation of the solar irrigation strategy, prepare an extended pilot project as a component of the Power Sector Efficiency Improvement Project.
2. Preparation of Tranche 3

13. Similar to the tranche 2, the proceeds will be applied to recruit consultants to conduct due diligence on the project components proposed for inclusion in the PFR2. The consulting team will comprise the following international consultants: (i) Power System Development Specialist (team leader), (ii) Energy Economist, (iii) Financial Specialist, (iv) Environmental Specialist, (v) Social Safeguard/Development Specialist, and their national counterparts. A total of 17 international consultant man months and 28 national consultant man months will be made available for preparation of the Tranche 3. The TORs given above will be applicable for the corresponding expertise. Table 2 provides the consultant requirements.

<table>
<thead>
<tr>
<th>International Name of Positions</th>
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<td></td>
<td></td>
<td>development Specialist</td>
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<td><strong>Total</strong></td>
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C. Training and Capacity Building

1. Financial Management, Auditing and Governance for Executing Agencies

14. Executing agencies under this MFF are the BPDB, NWPGCL, PGCB, Dhaka Power Distribution Company (DPDC) Dhaka Electricity Supply Company (DESCO), and Rural Electrification Board (REB). Despite improvements in financial management, auditing and governance of these agencies in recent years, several limitations and weaknesses still exist and that practices need to be further improved to be at par with international standards.

15. The capacity building activities could be differentiated for each executing agency. BPDB has an established system for financial management, internal auditing and corporate governance while NWPGCL on the other hand, being a newly created company, still has to develop its chart of accounts, set up processes for financial projections and prepare business plans as well as strengthen its internal auditing system. The capacity building process needs to: (i) assess the present level of skill of the employees of the relevant departments of each EA and prepare a gap analysis, (ii) design a training course syllabus in consultation with relevant departments, (iii) prepare course materials, (iv) carry out the training program, and (v) evaluate the effectiveness of the capacity building program.

16. Common weaknesses of these executing agencies relate to weak and/or lack of management information systems, financial projections and business plans. A financial management capacity building program needs to be introduced to strengthen executing agencies in the preparation of financial projections and business plans which are crucial to their decision-making process and in identifying new investments. Training activities will focus on techniques, tools and analysis related to financial planning, control and decision making.
17. Another area that needs to be further strengthened is the executing agencies’ internal audit system. Public utilities are capital intensive and they are highly dependent on government borrowings. In order to be compliant with the requirements of various donors and lending institutions, executing agencies need to further improve its internal audit system. The internal audit training program would aim to strengthen the executing agencies capacity to evaluate and improve effectiveness of risk management, control and governance processes. Training activities will focus on: (i) techniques and standards in monitoring and reporting, (ii) on methodologies and approaches in assessing and analyzing organizational risk and controls, and (iii) compliance with policies, procedures and laws.

18. Most executing agencies, being registered under the Company Act and recipient to public sector borrowings are expected to be transparent and observant to the principles of good corporate governance. The capacity building program would ensure that executing agencies processes adhere to the principles that promote integrity and fairness in business management, transparency, disclosures and decision-making, compliance with legal and regulatory requirements, accountability and responsibility and commitment to ethical business conduct. While the governance theme is broad, the training activities on good governance could focus on key utility management practices: (i) institutional and regulatory structures; (ii) tender/bid processes and evaluation criteria; (iii) power purchase agreement and associated tariff structures; and (iv) financing.

19. BPDB carries out its training activities under the Training Directorate while for PGCB under the Human Resources Department. The capacity building activities will take into consideration the training of trainers (TOT) to ensure that skill development can continue even after the MFF supported capacity building program.

20. Power Division, MPEMR will be provided a 6 person-month international consultant to support the implementation of the capacity building. The outlined TOR for capacity building implementation support consultant is given below:

21. International consultant should have a an advanced degree in power system engineering/ planning together with more than 5 years of international experience in designing and conducting power sector capacity building and training activities. His/her tasks include:

   (i) Undertake a detail capacity building needs assessment of the EAs of the investment program;
   (ii) Identify in-house as well as overseas training opportunities to build the capacity in the power sector;
   (iii) Design the in-house as well as overseas training program modules;
   (iv) In case of in house training develop the TOR and help recruit consultants to undertake the training;
   (v) Help the Power Division, MOPEMR to get nominations and select suitable candidates for different types of training;
   (vi) Liaise with the overseas training institute to organize training and provide logistic support for local and overseas training; anf
   (vii) Undertake any other activity related to capacity building as assigned by the Power Division, MOPEMR.

2. Capacity Building for BPDB in Generation Planning, Investment Appraisal, and Power Plant Management/Operation

22. BPDB is performing the functions of (i) the single buyer, and (ii) owner and operator for about 46% of generation. The single buyer is required to develop the long-term generation plan for the country. Presently, generation investment decisions are on the basis of long-term master plans prepared at discrete intervals. The most recent master plan was
supported by the Japan International Cooperation Agency (JICA). \(^2\) BPDB requires to conduct more detailed and regular studies, update previous master plans and studies, to meet the growing demand for electricity, at the highest possible reliability. Constraints faced by BPDB as the single buyer are the investment limitations and delays, causing limitations of installed capacity. The capacity building initiatives in BPDB’s generation planning functions are targeted to achieve the following objectives: (i) address the key requirements to establish a regular activity for generation expansion planning, and (ii) provide the tools and equipment for operations training on combined cycle power plants. These objectives cover capacity building in both investment planning and in power plant operations.

23. The summary scope of work for generation expansion planning is as follows: (i) review the status of generation expansion and investment planning activities at BPDB, in comparison with international best practices, (ii) propose the improvement to the approach, staff capacity and modeling inputs required to establish a regular planning function and an associated report, (iii) establish a mechanism for monitoring of generation project implementation, and to address project scheduling and contingency planning, (iv) use of natural gas most efficiently by building power plants most appropriate to meet the load profile of Bangladesh, and (v) providing power plant simulators to train BPDB power plant staff for efficient control and operations of combined cycle power plants.

24. The power sector development proposals are reviewed and approved by the Planning Commission. Appraising power sector projects has become complicated with power projects having serious environmental impacts, requiring them to be increasingly energy efficiency oriented. Training power sector professionals on state of the art power sector investment planning and appraisal would not make much difference if planning commission officials who evaluate project proposals are not trained. Therefore, a few officials from the planning division would also be included in the proposed training programs.

3. Enhancing the Network Planning and Economic Dispatch Functions of PGCB

25. PGCB has successfully implemented industry standard network planning software for the analysis of the transmission grid at 132 kV and above. Staff capability has been established to conduct modeling of the transmission network to conduct load flow, short-circuit and stability analyses. The planning staff has been trained in conducting the required studies and to examine alternatives for network expansion, to improve reliability of the transmission network. Operational limitations including gas resource limitations, supply limitations, and shortages of generating capacity owing to plant breakdowns, require new initiatives in modeling the power system for operations planning.

26. The capacity building requirements of the transmission planning unit of PGCB would be to further improve the analytical functions in the following areas: (i) conduct reliability analyses of the existing transmission network and evaluate improvements required, (ii) conduct optimal load flow studies and determine the most important improvements that would improve the loss performance of the network, reliability improvements and optimal use of fuel, especially gas, (iii) extend the analysis to the sub-transmission level (33 kV), to prepare an inclusive optimal plan for transmission development, considering locations for new substations, and (iv) establish an effective tool for security constrained operations planning, to optimize the operation of the generating system to minimize gas use to meet the system demand, subject to gas and power transmission constraints.

27. The summary scope of work will be the following: (i) review the status of transmission expansion planning at PGCB, current staff strengths and level of training, software used and the level of modeling, in comparison with the industry best practices, (ii) assess the

requirements of the planning team in terms of software, modeling and training requirements, to conduct reliability assessment and optimization of losses, (iii) assist in the implementation of the models to conduct one cycle of transmission planning activity, (iv) prepare a comprehensive transmission planning document, listing the inputs, assumptions, planning indices and recommended plan, along with an investment plan and financial/economic evaluation, and (v) establish a system where the plan is updated once in two years and published after the necessary management and regulatory approval for the plan.

28. The summary scope of work for capacity building in power system operations planning is as follows: (i) review the present practice of dispatch modeling of the power system, to meet the forecast customer demand at the declared reliability and efficient use of fuel, comparing with international best practices, (ii) establish the requirements for a security-constrained operations planning model, to enable the load dispatch centre staff to conduct system security analysis and to develop an operational and dispatch plan for year ahead, month ahead, day ahead and the hour ahead, (iii) incorporate the characteristics and limitations of the gas and other fuel supply networks, to enable the development of a hybrid (gas and electricity) network optimization tool for planning and decision-making in the dispatch of generating plants and configuring the transmission network, (iv) preparation of specifications and assistance to PGCB to procure the required software models and training to implement the model, and (v) develop an operating manual on how the model is to be used for decision-making in the context of the capacity constrained generating system in the medium term, and a more flexible generating system envisaged once the capacity shortages are adequately addressed. The scope also includes the cost of procuring of the software model, and associated training for implementation.


29. Investment planning and operations planning of the distribution networks of DPDC and DESCO are conducted using manual techniques, mostly on the basis of line currents measured, and reports of overloading and line tripping. Accordingly, the distribution network topology has not been mapped into a database, to enable systematic network planning, data acquisition, maintenance planning and operations. Line and substation capacities are identified in a manual system of data collection. All 33 kV substations are metered, but there is no remote transfer of meter readings to a database to identify overload situations or load profiles, and to conduct a meaningful energy balance on a routine basis. A few recent initiatives have been observed: (i) DPDC has already initiated action to recruit a consultant to establish a GIS-based database of the company distribution network for one district in Dhaka; (ii) DESCO has already initiated action to recruit a consultant to write a TOR for a GIS-based database of the company distribution network for one district in Dhaka; (iii) A pilot project is in progress to install pre-paid meters to customers in DPDC areas and (iv) In DESCO areas, remote reading facilities through GSM are being installed in 27 substations 33 kV/11kV, as of June 2012

30. The planning and monitoring function requires to be upgraded to reflect state of the art, which would help optimize the investments, to provide an improved and reliable service, and improved network efficiency. The key to improve planning, management and auditing of energy flows in a distribution network is a comprehensive GIS. Additionally, the benefits of a GIS-based facility for network planning are many. Through its GIS database on each element of the network, a utility may extend the analysis to conduct routine load flow studies and identification of weak areas or segments of the network, by way of service voltage and energy losses. The network planning model would be used to develop a distribution investment plan, enumerating the outputs of the plan.

31. The summary scope of work for enhancing the planning skills of DPDC and DESCO will be the following: (i) review the on-going work if any to develop a GIS-based data storage
system and propose improvements, (ii) develop the requirements including but not limited to, network planning tools, load flow and reliability analyses, loss analysis, (iii) procure consulting support for DPDC and DESCO to implement the model with the necessary software, (iv) procure software licenses, install and conduct the required training (v) collect data about the existing distribution network and develop the database, (vi) conduct basic system studies such as load flow analysis for 33 kV and 11 kV networks, and assessment of losses, for each year over a 10-year planning window, (vii) identify new network assets required such as lines, substations and switchgear, to ensure that the capacity, service voltage, reliability and losses are within accepted industry norms, (viii) develop a cost-benefit analysis of the network improvements proposed over a 10-year planning window, and justify the investment proposals, (ix) develop a 10-year distribution development plan, documenting the network status and improvements/investments recommended, and their economic/financial justification, and (x) prepare a report to summarize the status, studies, results and recommendations, suitable for management and regulatory approval, and subsequent updates and publication by DPDC and DESCO at least once in two years.

32. The summary scope of work for enhancing energy management, energy auditing and loss monitoring of DPDC and DESCO will be the following: (i) review the present approach to metering and recording of energy flows in all segments of the distribution network, (ii) recommend and implement improvements to metering, information collection and analysis software and hardware, (ii) establish a pilot energy management system for a district within the DPDC service area, to comprehensively monitor energy flows from the point of purchase from BPDB to the point of delivery to customer, (iv) compare loss performance of the pilot network in relation to the estimated losses in planning studies established above, and address any discrepancies, (v) conduct an energy audit for the selected district to address any discrepancies between the measured energy flows and those provided by the planning models, and leakages identified through metering, (vi) prepare a monthly energy management report for the selected district, in a suitable format for replication in other districts, and eventually, for the entire DPDC and DECSO service areas, and (vii) prepare the mechanism for information flow, analysis and publication of the report, to enable its publication as a monthly energy management report.
## Cost estimates for Capacity Building Component

<table>
<thead>
<tr>
<th>Description</th>
<th>Person months</th>
<th>US$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Tranche preparation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Due diligence for Tranche 2(^a)</td>
<td>17</td>
<td>24</td>
</tr>
<tr>
<td>1.2 Due diligence for Tranche 3</td>
<td>17</td>
<td>24</td>
</tr>
<tr>
<td><strong>2 Implementation Support for Tranche 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 BPDB Projects: Baghabari, Shajibazar, and Sylhet</td>
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</tr>
<tr>
<td>2.2 NWPGCL Project: Khulna</td>
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</tr>
<tr>
<td><strong>3 Capacity building</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Implementation consultant for capacity building</td>
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<td>5</td>
</tr>
<tr>
<td>3.1 Training on financial management, auditing and governance</td>
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<td></td>
</tr>
<tr>
<td>3.2 Capacity building for BPDB in generation planning, investment appraisal, and power plant management/operation</td>
<td></td>
<td></td>
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<tr>
<td>3.3 Capacity building for PGCB on power system planning, security constrained dispatch modeling and operations</td>
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<tr>
<td>3.4 Capacity building for DPDC for distribution planning, energy management, energy auditing and loss monitoring</td>
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<tr>
<td>3.5 Capacity building for DESCO for distribution planning, energy management, energy auditing and loss monitoring</td>
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<tr>
<td><strong>Sub Total for Capacity Building</strong></td>
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</tr>
<tr>
<td><strong>Grand Total</strong></td>
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</tr>
</tbody>
</table>

\(^a\)Tranche 2 and Tranche 3 preparation will be financed by ADB loan while the rest of the capacity building will be supported by a $7 million grant from European Investment Bank.