

**Memorandum of Understanding (MoU) between Department of Energy (DoE),
Ministry of Economic Affairs of the Royal Government of Bhutan and Central
Electricity Authority (CEA), Ministry of Power of the Government of India
regarding Consultancy Services for Preparation of National Transmission Grid
Master Plan (NTGMP) for Bhutan**

This Memorandum of Understanding (MoU) is made on the 22nd day of December 2009 between the Ambassador of the Kingdom of Bhutan to India on behalf of the Department of Energy (DoE), Ministry of Economic Affairs of the Royal Government of Bhutan (RGoB), having its Head Office at Thimphu, Bhutan (hereinafter called the First Party) and the Member (Hydro), CEA, on behalf of the Central Electricity Authority (CEA), Ministry of Power (MoP) of the Government of India having its office at Sewa Bhawan, R.K. Puram, New Delhi – 110066 (hereinafter called the Second Party).

WHEREAS, the First Party vide its letter No. DOE/PCD/GOI/2008-09/531 dated March 13, 2009 had conveyed its interest for obtaining Consultancy Services of the Second Party for Preparation of National Transmission Grid Master Plan (NTGMP) for Bhutan. The Second Party expressed its willingness to provide the requested services to the First Party vide its letter No. 73/20/2009-SP&PA/ dated 02-04-2009 which was officially conveyed to the First Party by the Embassy of India in Thimphu vide its letter No. THI/Eco/230/12/2008 dated April 9, 2009.

Now, therefore, in consideration of the terms and conditions contained herein, the parties to the MoU agree as under:

The expressions First Party and Second Party shall include its successors and assigns:

1. Nodal Officers

In order to carry out the work promptly, the Nodal Officers will be as follows:

First Party: National Project Manager
 NTGMP Project
 Planning & Coordination Division
 Department of Energy
 Ministry of Economic Affairs
 P.O. Box 106
 Thimphu, Bhutan
 Telefax: +975-2-324735

Second Party: Chief Engineer
 SP & PA Division
 Central Electricity Authority
 Sewa Bhawan, R.K. Puram
 New Delhi – 110066, India
 Tel: +91-26102045

2. Time Frame for completion of job

The consultancy time frame for the NTGMP study will be one and half years from the date of signing of this MoU.

3. Scope of Consultancy Services to be provided by the Second Party and Consultancy charges

The detail Scope of Works and Terms of Reference (ToR) for NTGMP are enumerated in the **Annexure-I**, which shall form a part of this MoU.

Consultancy Charges:

As enumerated in **Annexure-I**.

4. Payment for services

As per terms of payment as enumerated in **Annexure-I**.

5. Facilities/inputs and services to be provided by the First Party

In order to enable the Second Party to perform its functions and obligations efficiently, the First Party shall provide the following inputs at its cost.

- 5.1 The First Party would provide the available and relevant data/information required for undertaking the Master Plan study. In case any data/information are required from agencies other than DoE, Bhutan, the same would be obtained and made available to the Second Party by the First Party.
- 5.2 For traveling from Delhi to Bhutan and back and for travel within Bhutan associated with the consultancy works, the First Party would provide TA & DA to the officers of the Second Party at the applicable rates of the Second Party (as per the Government of India rules). DoE will bear the TA/DA expenses separately from the NTGMP budget maintained by it.
- 5.3 The First Party would organize co-ordination meetings in Bhutan. All expenses for organizing such meetings will be borne by the First Party from the NTGMP budget head maintained by it.
- 5.4 The First Party would inform the Second Party of the proposed meetings two weeks in advance to enable the officers to participate in the same.
- 5.5 The First Party would depute counterpart officers to the Second Party to enable transfer of skills and knowhow during the Master Plan study. The cost towards Salary, TA/DA, etc. of such First Party officers shall be borne by the First Party.

6. Time frame for completion

- 6.1 The Second Party shall endeavor to complete the job within the time frame mutually agreed enumerated at para 2 above by the two parties provided there is no change in circumstance beyond control. In the event of reasonable delays, the First Party shall neither be liable for payment of any additional charges to the Second Party nor the First Party shall be entitled for any compensation from the Second Party.
- 6.2 In the event of likely delay in the completion of work on account of change in scope / force majeure and other situation not attributable to the Second Party, the matter would be brought to the notice of the First Party in writing by the Second Party regarding the impending delays, the likely effect on the time for completion of work and extension in time for completion of task with justification thereof.

7. Validity of MoU

Validity of MoU shall be for three (3) years from the date of signing of the same. The validity of MoU may be extended by mutual consent of both the parties.

8. Amendments

Amendments of terms and conditions of the MoU, including any modification of scope of services shall be made by the written agreement between the parties. However, each party shall give due consideration to any proposals for amendments made by the other party.

9. Settlement of Disputes

In the event of any dispute or difference relating to interpretation and application of provisions of this MoU, the Parties shall settle such dispute by mutual agreement.

10. Terminations

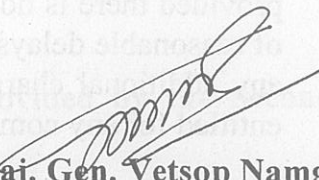
Both the parties are free to give notice of one month to terminate the MoU.

Before termination, all pending issues shall be resolved amicably between the Parties.

In witness thereof, the parties here-to have fully executed these presents through their authorized representatives on the day, month and year mentioned above.

Executed by:


(Shri Gurdial Singh)
Member (Hydro)
Ex-officio Additional Secretary
to the GoI &
Officiating Chairperson
Central Electricity Authority
New Delhi
(For and on behalf of Second Party)


(Maj. Gen. Vetsop Namgyel)
Ambassador of Bhutan to India
New Delhi
(For and on behalf of First Party)

Scope of Works and Terms of Reference for National Transmission Grid Master Plan Study (NTGMP)

1. Background

The Royal Government of Bhutan (RGoB) has set the target of development of 10,000 MW of hydropower by 2020 and the Government of India (GoI) has committed to provide assistance to realize this target. The two Governments are in the process of taking forward the implementation of the hydropower projects. At least ten mega hydroelectric projects have been decided to be constructed by 2020, amounting to a total installed capacity of 11,626 MW. The implementation models have been tentatively finalized and the projects have been awarded for their DPR studies to selected PSUs from India. The projects will require construction of numerous transmission infrastructures (both lines and substations) for export of surplus power and for meeting the energy needs of the country. Keeping in view the environmental impacts, difficulty in getting right-of-ways and for overall cost optimization, there is a need to have optimum transmission highways and corridors keeping also in view other future potential hydropower projects. There is also a need to identify pooling stations in Bhutan and/or in India keeping in view the power evacuation plan of India to wheel power to the load centers in India. In view of these, an overall transmission system master plan for the country needs to be framed that would provide a holistic and integrated road map to guide the construction of transmission lines for the hydroelectric projects in the country so as to ensure energy security for the nation and smooth evacuation of all surplus power to India. The "National Transmission Grid Master Plan" (NTGMP) has therefore been proposed to be framed in the 10th Five Year Plan (2008-2013) and the GoI has already agreed to provide the financing. The NTGMP needs to be in place before the completion of the DPRs of the hydroelectric projects making up 10,000 MW so that the power evacuation arrangements for the projects are available. The Department of Energy (DOE), RGoB has requested the Central Electricity Authority (CEA) to prepare the NTGMP which was agreed to by the CEA.

2. Scope

The following will be the scope of the NTGMP study:

- i) The study will consider existing hydropower stations and the associated transmission system already in place, the domestic demand at present and for the future, the upcoming hydroelectric projects making up the 10,000 MW, and the future potential hydropower sites that may be developed by 2030, and come out with optimal number of individual and common transmission lines and sub-stations/pooling stations for export of power to India and regional interlinking within Bhutan for reliable domestic supply of power.

- ii) The transmission system shall be of appropriate high voltage levels and have adequate capacity to evacuate power from the upcoming projects of 10,000 MW and future potential hydroelectric projects that may be developed by 2030. The NTGMP shall bring out the need for and identify location of pooling stations in Bhutan and/or in India keeping in view the power evacuation plan.
- iii) The corridor for transmission lines and locations of substations and pooling stations will be planned taking into consideration that minimum damages to environment and forests are inflicted and that alignment through the protected national parks and sanctuaries are avoided to the extent possible.
- iv) The study will include studies like load flow, system stability, contingency planning, and other necessary analysis to ensure reliability and stability of the national power system.

3. Terms of Reference

The CEA will carry out the following:

- i) Upon award of work, prepare and submit the Approach to be adopted for the study and work plan for approval by DOE, which will be presented by CEA to the Power Sector of Bhutan.
- ii) Constitute a study group comprising of engineers of DoE, other relevant power sector agencies from RGOB and members from CEA of Govt. of India for close interaction on the progress of the proposed studies.
- iii) Review and compilation of existing generation and transmission system, present and future projected electricity demands and, hydropower development plans by 2020 and rest of potential hydropower sites as per latest Power System Master Plan (PSMP) report that may be developed beyond 2020 up to 2030. DoE will provide requisite inputs for the above.
- iv) With respect to location of hydropower sites proposed for development by 2020 and potential projects that may be developed beyond 2020 up to 2030, assess the corridors for transmission lines and locations of substations and pooling stations taking into consideration that minimum damages to environment and forests are inflicted and that alignment through the protected national parks and sanctuaries are avoided to the extent possible.
- v) Site visit of the study team and interactions with the local bodies whenever required.
- vi) Study the Indian power system, particularly the North Eastern and Eastern grid of India and the power evacuation arrangement from the

North Eastern Grid to the Western and Northern grid, and study possible interconnection arrangements between Bhutanese and Indian power system. Identify the interconnection stations on the Indian side to connect the Bhutanese power system for effective evacuation of surplus power from Bhutan.

- vii) Based on the assessment carried out above (iii to vi), the study shall recommend transmission lines, associated substations and pooling stations that need to be constructed for meeting the domestic demand and evacuation of surplus power from Bhutan to India. The plan shall cover the requirements of transmission infrastructures required for the 10,000MW hydropower development by 2020 as agreed between the two Governments, and also keeping in view other potential hydroelectric projects that may be taken up beyond 2020 up to 2030.
- viii) While framing the transmission system master plan in vii) above, an integrated and holistic approach will be followed to have the optimal transmission infrastructures for evacuation of power to India and to meet the domestic energy needs. The plan shall contain, with respect to each river basin and its upcoming projects as well as future potential projects, individual transmission lines, main transmission trunk lines, pooling stations wherever required, delivery points and corresponding receiving stations on the Indian side. For example, for each river basin or region, the proposal shall have Loop-In-Loop-Out (LILO) arrangements or pooling substations, if necessary, which will be of adequate size and capacity to which individual lines from upcoming hydroelectric projects and future projects will be connected. From this pooling station, trunk lines with adequate capacity and reliability will take off either directly to India or to another major pooling station within Bhutan from which power will be evacuated to India finally. Consideration shall also be given to provide inter river basin or regional tie connections for reliability and to ensure alternative evacuation route of power to India.
- ix) The master plan shall also include the following:
 - a) the required capital investment plans, and the mechanism of apportionment of capital costs between the hydropower projects for transmission infrastructures. It shall also indicate schedule of construction in phased manner in line with the 10,000 MW hydropower development plan.
 - b) include system studies like load flow, stability and other relevant studies under different scenarios and contingencies.
 - c) shall explore various alternatives of transmission system design and technologies, and recommend the suitable technology option, considering the geographical terrain and other factors.
- x) The study shall be carried out as per the agreed Work Plan.

- xi) Prepare and submit the following reports to the DoE in both electronic (soft) and hard copies as per the work plan:
- a) Inception Report – 5 copies. Inception report shall be submitted within three months of the start of the consultancy work and shall contain initial findings and approach to be adopted for the study along with Work Plan.
 - b) Quarterly Reports – 5 copies. Quarterly Reports shall be submitted after every three months and latest by the third week of the 4th month. The report shall contain the progress of the consultancy assignment, milestone achieved with respect to the work plan and the work plan for the next quarter. At the time of submission of the fourth quarter report (15 copies), a presentation will be made by the CEA to the power sector officials of the RGoB for an interactive session so as to generate feedbacks and views on the findings of the study.
 - c) Draft Final Report – 15 copies. The draft final report will detail the CEA's findings and recommendations. The draft final report will be presented to the power sector officials of the RGoB. DOE shall provide comments within one month after the receipt of the Draft Final Report.
 - d) The Final Report in 20 copies shall be submitted within three months after the receipt of the comments on the Draft Final Report.
 - e) The CEA team will visit the project site as per the following tentative schedule:
 - 1. Interaction with DoE for collection of initial inputs/data for the preparation of inception report and site visits;
 - 2. For collection of detailed inputs from the DoE and site visits;
 - 3. For site visits;
 - 4. For the mid-term report discussions and site visits; and
 - 5. For the presentation of the draft final report.
- xii) The total charges for the NTGMP study to be paid by the DOE to the CEA will be INR 5.00 million excluding TA & DA and all other charges which will be borne separately by DoE from the NTGMP budget head maintained by it.
- xiii) The terms of payment will be as under:
- a) 20% as advance upon award of consultancy;
 - b) 50% on submission of draft final report; and,
 - c) 30% on submission of final NTGMP Report.
- xiv) The consultancy for the NTGMP study will be one and half years from the date of award of the consultancy.

