
Government of Nepal
Ministry of Energy
Department of Electricity Development
Anamnagar

Expression of Interest (EOI)

For

Feasibility and Environmental Impact Assessment
(EIA) Study of Seti River (SR-6) Storage Project

Job No. : 2072/73-15

Budget Head: 308106

(1st Amendment on 10th June, 2016)



May, 2016

Government of Nepal
Ministry of Energy
Department of Electricity Development
Anamnagar

Invitation for Expression of Interest (EOI) for Consultancy Services

(Date of First Publication: May 7, 2016 (2073-01-25))

1. As per the annual program of fiscal year 2072/73, on behalf of Government of Nepal (GoN), Department of Electricity Development (DoED) intends to conduct the studies of following projects as indicated in the table below using funds allocated by GoN. Hence, Department of Electricity Development (DoED) intends to prepare separate lists of competent National consulting firm or International consulting firm or their JV for each of the Job indicated below. This Invitation for Expression of Interest (EOI) is made to invite applications from interested and eligible consulting firms.

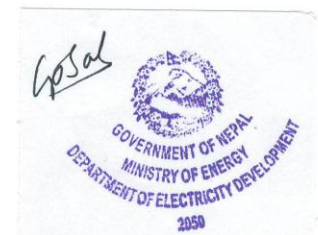
Job No.	Job Title
2072/73-13	Feasibility and EIA Study of Kimathanka Arun Hydropower Project
2072/73-14	Feasibility and EIA Study of Lower Arun Hydropower Project
2072/73-15	Feasibility and EIA Study of Seti River (SR-6) Storage Project

2. The consulting firm can apply either singly or in JV. The number of consulting firms in a JV should not exceed three including the lead firm. In addition, same consulting firm is not allowed to enter into more than one JV for the same Job.
3. EOI documents could be obtained free of cost during office hours on all government working days within 45th day of first date of publication of this notice from Procurement Unit of DoED or can be downloaded from the website **<http://www.doed.gov.np>** or **<http://www.moen.gov.np>**. The instructions to applicants, prescribed formats, evaluation criteria, and detail information as well as the indicative Terms of Reference for the Job is provided in Annex along with EOI document.
4. Duly completed EOI documents in hard copy should be submitted for each Job separately to the address mentioned below clearly mentioning the name of the Job in sealed envelopes before 12:00 Noon (NST-Nepal Standard Time) within 46th day of first publication of this notice :

The Director General
Department of Electricity Development
Anamnagar, Kathmandu
Tel:- +977-01-4479247, 4482130, 4480326 Fax:- 4480257
Email: info@doed.gov.np



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5. Duly completed EOI documents received after the due date & time, shall be considered late, summarily rejected and returned un-opened.
 6. The completed EOI documents received by the due date and within the specified time shall be opened at 14:00 (NST) on the 46th day of first date of publication of this notice in the presence of the applicants or their authorized representative who-so-ever wish to attend. Absence of the applicant or their authorized representatives, however, shall not obstruct or prevent the opening of the EOI in any way.
 7. The EOI documents received from the applicants will be evaluated on the basis of the approved eligibility and evaluation criteria. The evaluation of EOI application of JV consulting firm(s) will be done in cumulative basis. Only six top ranked consulting firms obtaining at least 50 % marks in the EOI evaluation process will be shortlisted for each Job and considered as qualified firms.
 8. Request for Proposal (RFP) for each Job will be issued to qualified short listed firms for respective Job for the submission of Technical and Financial Proposal. The Quality and Cost Based Selection (QCBS) procedure will be used for final selection of the consulting firm.
 9. Further information on this EOI can be obtained from above address of DoED during office hours in all working days prior to the deadline of submission of EOI.
 10. In case of Foreign Consultant or JV of only Foreign Consultants, a local agent shall be required to be involved.
 11. If the deadline of submission, specified herein, falls on a government holiday, the deadline shall be extended automatically to the next working day at the same hour.
 12. DoED reserves the right to accept or reject any or all EOI applications with or without giving any reason whatsoever.



1. INSTRUCTIONS TO APPLICANTS

1.1 INTRODUCTION

1.1.1 Scope of Qualification

Department of Electricity Development (DoED) intends to prepare separate lists of competent National consulting firm or International consulting firm or their JV for **“Feasibility and Environmental Impact Assessment (EIA) study of Seti Storage (SR6) Hydropower Project”**. Invitation for Expression of Interest (EOI) is made to invite applications from interested and eligible consulting firms.

1.1.2 Definition of Terms

Unless otherwise specified, the following terms used in this EOI have the following meanings:

“Applicant” means a consulting firm (national consulting Firm or international consulting Firm or their JV) that intends to submit or submitted EOI document as per the notice and this EOI document.

“Authorized Representative” means an individual authorized by the Applicant as the duly authorized entity to legally bind the Applicant to the EOI process, is the authorized signatory to the process, and is the point of contact for DoED in connection with the process.

“Bidder” means a successful Applicant those are short listed under this EOI and submits Technical and Financial proposal in response to RFP.

“DoED” means the "Department of Electricity Development".

“DPR” means Detailed Project Report

“EIA” means "Environmental Impact Assessment".

“EOI” means "Expression of Interest".

"EPA" means "Environment Protection Act, 1997".

"EPR" means "Environment Protection Regulation, 1997".

“Firm” means a national consulting firm or an international consulting firm or their JV.

“FS” means Feasibility Study.

“GoN” means "Government of Nepal".

“International Staff” means expert having experience(s) outside Nepal.

“IT” means "Income Tax".

“JV” means "Joint Venture".

“KAHP” means SR6Hydropower Project.

“Lead Firm” means an entity or firm that is the authorized leader of a team comprising the Lead Firm and its constituents to submit the EOI and perform the assignment.

“MOSTE” means "Ministry of Science Technology & Environment".

“MOEn” means Ministry of Energy.

“MPP” means multipurpose project.



“National Staff” means expert having experience(s) in Nepal.

“NEA” means Nepal Electricity Authority.

“NST” means Nepal standard Time.

“Project” means the Hydropower Project intended for study under this EOI and RFP.

"Public entity" means Public Entity defined in clause 2 of Public Procurement Act, 2063 (2007).

“QCBS” means Quality and Cost Based Selection.

“RFP” means a Request for Proposal.

"T/L" means Transmission Line.

“TOR” means "Terms of Reference".

“UAHP” means Upper Arun Hydropower Project.

“VAT” means "Value Added Tax".

1.2 GENERAL INSTRUCTION TO CONSULTANTS

1.2.1 Clarification on EOI Documents

A prospective Applicant requiring any clarification on this EOI document may seek clarification by contacting DoED during office hours on all working days prior to the deadline for submission of the completed EOI document at the address mentioned below

Contact person

Sandip Kumar Dev

Superintending Engineer

Procurement Unit

Department of Electricity Development

Anamnagar, Kathmandu

Tel:- +977-01-4479247, 4482130, 4480326 Fax:- 4480257

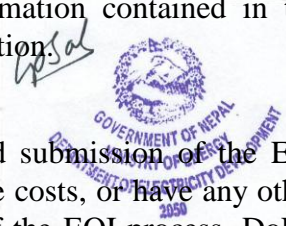
Email: info@doed.gov.np

1.2.2 Amendment to EOI Documents

1. At any time prior to the deadline for the submission of the completed EOI document, DoED may amend the EOI, for any reason, whether on its own initiative or in response to a clarification requested by an Applicant.
2. Amendment(s) will be notified through the website of Ministry of Energy and/or Department of Electricity Development, (<http://www.moen.gov.np>, <http://www.doed.gov.np>). DoED will assume that the information contained in the amendment is taken into account by the Applicant in its Application.

1.2.3 Cost of Preparation of EOI and Liability

Applicant shall bear all costs associated with the preparation and submission of the EOI document. DoED will, in no case, be responsible or liable for these costs, or have any other liability to any Applicant, regardless of the conduct or outcome of the EOI process. DoED



shall have no obligation to any Applicant to reimburse any costs incurred in preparing a response to this EOI.

1.2.4 Confidentiality of the Document

If an Applicant believes that any portion of the submittal is to be treated in confidence, he/she shall identify such information clearly in the submittal. DoED will make every effort to treat such documents in confidence as far as possible.

1.2.5 Joint Liability for Joint Venture Firms

By submitting an EOI in joint venture (JV), the Applicant represents that, if qualified and if awarded the contract after the RFP process, the Applicant with its constituent members shall be jointly responsible to perform the obligations of such contract.

1.3 SUBMISSION OF EXPRESSION OF INTEREST (EOI)

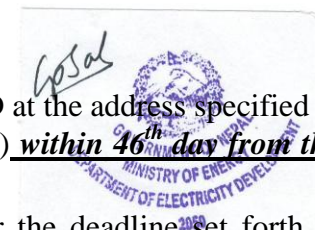
1.3.1 Sealing and Marking

1. The Applicant shall seal the one original and one copy of the completed EOI in separate envelopes, duly marking the envelopes as “Original” and “Copy”. These envelopes shall then be sealed in an outer envelope and marked as “Expression of Interest”. The inner as well as outer envelope shall clearly mention the Job number and title of consulting Job.
2. The inner and the outer envelopes shall be addressed to:

The Director General
Department of Electricity Development
Anamnagar, Kathmandu
Tel:- +977-01-4479247, 4482130, 4480326 Fax:- 4480257
Email: info@doed.gov.np
3. The envelopes shall also indicate the name and address of the Applicant for identification purposes.
4. The Applicant shall also submit an electronic copy of the EOI documents. However, the evaluation of the EOI document shall be done only based on the hard copy of the EOI application submitted by the applicant.

1.3.2 Deadline for Submission

1. The completed EOI document must be submitted to DoED at the address specified in Section 1.3.1 before 12:00 hr Nepal Standard Time (NST) within 46th day from the date of first publication of this notice.
2. The completed EOI documents received by DoED after the deadline set forth in Section 1.3.2 (1) shall be considered late and shall be summarily rejected and returned un-opened.



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3. If the deadline specified herein falls on a government holiday, the deadline shall be extended automatically to the next working day at the same hour.

1.3.3 Withdrawal of EOI document

An Applicant shall not be permitted to withdraw the EOI Application that has been submitted.

1.4 PUBLIC OPENING OF SUBMITTED EOI DOCUMENT

The completed EOI documents received by the due date and within the time specified in Clause 1.3.2 (1) will be opened at 14:00 hrs NST on the 46th day of first date of publication of this notice in the presence of the applicants or their authorized representative who-so-ever wish to attend. Absence of the Applicant or their authorized representative, however, shall not obstruct or prevent the opening of the EOI in any way. Applicants' each designated representative must bring a letter from the Applicant stating that he/she is authorized to represent the applicants for the public opening of the EOI document. Applicants or their authorized representatives who are present at the time of opening shall sign in a register evidencing their presence.

During the opening, an authorized representative of DoED will read out the names of the applicants who have submitted the completed EOI document and then will open the submitted EOI envelopes.

1.5 PREPARATION OF THE EOI DOCUMENT

Detail procedure for preparation of EOI documents is given in Section – 2(Preparation of EOI Application).

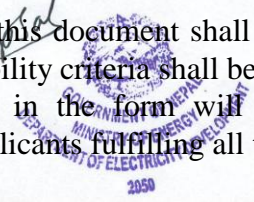
1.6 EVALUATION PROCESS

DoED will carry out evaluation of the EOI documents based on the criteria approved by DoED. Anything not mentioned in this document regarding the EOI process shall be governed by the prevailing laws of Nepal.

The evaluation of EOI documents will be done in two stages (i) Screening of EOI Document of all firms for eligibility; and (ii) Evaluation of EOI document of eligible firms.

1.6.1 Screening of EOI Documents

All EOI documents received and duly opened as per Clause 1.4 of this document shall be screened to determine the eligibility of the Applicant. The basic eligibility criteria shall be as given in the attached Form A-4. The information/data provided in the form will be scrutinized to determine the eligibility of the Applicant. Only the Applicants fulfilling all the requirements will be considered as eligible for further consideration.



1.6.2 Detailed Evaluation of EOI documents

Applicants fulfilling the eligibility requirements as mentioned in Clause 1.6.1 will be further evaluated based on financial capability, experience of the Applicant in similar projects and specific experience of experts proposed for the study. Ongoing and planned projects shall not be considered for evaluation.

A scoring system is adopted to rank the Applicants in the order of merit based on the criteria. The maximum overall score that any Applicant can obtain is set at **100 Marks** and is distributed as follows:

Table: Evaluation criteria

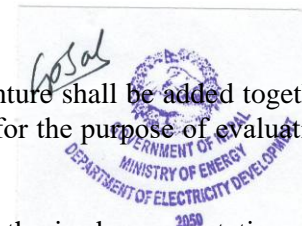
S No	Description	Weightage	Marks	
1	Financial Capability of the Firm Average Annual Turnover (AAT) in million NRs for best three years of last five consecutive fiscal years		20	
	Cumulative AAT for JV	Single Entity		
	More than 500	International firm > 400 National Firm > 200	100 %	
	More than 400 to 500	International firm: >300 to 400 National Firm: >150 to 200	85 %	
	More than 300 to 400	International firm: >200 to 300 National Firm: >100 to 150	70 %	
	Up to 300	International firm up to 200 National firm up to 100	0%	
2	Experience of the Firm		50	
2a	General Work Experience of the firm (Lead firm in case of JV) in Engineering Discipline		5	
A	More than 15 years of experience	100%		
B	10 to 15 years of experience	85%		
C	5 to less than 10 years of experience	70%		
D	Less than 5 years of experience	0%		
2b	Specific Experience of the firm		45	
2b-i	Work experience of the firm in Feasibility Study or Detailed Engineering Design (studies)/Detail Project Report (DPR) of Hydropower Projects in the last 5 Years. At least one project must be of more than 200 MW to obtain the marks under heading 2b-i. Only the projects having capacity more than 50MW and study cost (i.e. contract amount) having more than 5 Million US dollars for International Firm and 5 Million NRs for National Firm will be counted for cumulative purpose.		15	
A	Cumulative capacity of more than 400 MW hydropower project	100 %		
B	Cumulative capacity of more than 300 MW to 400 MW hydropower project	85 %		
C	Cumulative capacity of more than 200 MW to 300 MW hydropower project	70 %		
D	Cumulative capacity up to 200 MW	0%		

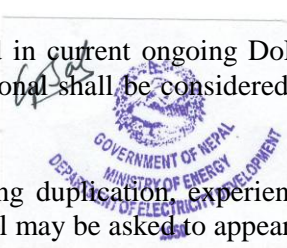
2b-ii	Work experience of the firm in Feasibility Study or Detailed Engineering Design (studies)/Detail Project Report (DPR) of Water Resources Projects with storage in the last 5 Years. Storage capacity of a project less than 0.5 Billion Cubic Meter (BCM) will not be considered for evaluation.		10
	Cumulative Storage capacity more than 2 BCM	100%	
	Cumulative Storage capacity more than 1.25 BCM to 2 BCM	85%	
	Cumulative Storage capacity more than 0.5 BCM to 1.25 BCM	70%	
	Cumulative Storage capacity up to 0.5 BCM	0%	
2b-iii	Work experience of the firm in EIA Study of hydropower projects in the last 5 Years. At least one project must be of more than 50 MW to obtain the marks under heading 2b-ii. Only the projects having capacity more than 20MW and study cost (i.e. contract amount) having more than 1.5 Million US dollars for International Firm and 1.5 Million NRs for National Firm will be counted for cumulative purpose.		10
A	Cumulative capacity of more than 400 MW hydropower project	100 %	
B	Cumulative capacity of more than 250 MW to 400 MW hydropower project	85 %	
C	Cumulative capacity of more than 50 MW to 250 MW hydropower project	70 %	
D	Cumulative Capacity up to 50 MW	0%	
2b-iv	Work experience of the firm in Supervision of Construction of Hydropower Projects in the last 5 Years. At least one project must be of more than 50MW to obtain the marks under heading 2b-iii. Only the projects having capacity more than 20MW and contract amount having more than 2 Million US dollars for International Firm and 2 Million NRs for National Firm will be counted for cumulative purpose.		10
A	Cumulative capacity of more than 400 MW hydropower project	100 %	
B	Cumulative capacity of more than 250 MW to 400MW hydropower project	85 %	
C	Cumulative capacity of 50 MW to 250 MW hydropower project	70 %	
D	Cumulative Capacity up to 50MW	0%	
3	Proposed Key Professionals for the Study (Qualification & Experience)		20
3-i	Qualification of the Key Personnel: Marks will be equally distributed among the list of key Personnel /Professionals		5

A	Ph. D. / Master Degree Holders	100 %	
B	Bachelor Degree Holders	85 %	
3-ii	Experience of the Key Professionals:		15
A	i. Team Leader -Should have minimum 20 years of experience after graduation. -Should have minimum qualification of Master degree in relevant Engineering subject.	0.96	
B	▪ EIA Coordinator (EIA Expert) - Should have minimum 15 years of experience after graduation. - Should have minimum qualification of Master Degree in relevant subject.	1x0.6=0.6	
C	i. Hydropower Engineer ii. Engineering Geologist iii. Geotechnical Engineer iv. Geophysist/ Seismologist v. Hydrologist/ Sedimentologist vi. Construction Planner vii. Economist (Financial Analyst) viii. Environmental Engineer/ Environmentalist ix. Sociologist/ Anthropologist x. Zoologist/Aquatic Life Expert xi. Botanist/ Ecologist/ Forest Expert xii. EMP Expert xiii. Resettlement Expert - Should have minimum 15 years of experience after graduation. (for i -xiii) - Should have minimum qualification of Master Degree in relevant subject.(for i –xiii)	13x0.48=6.24	
D	Remaining 15 key personnel - Should have minimum 15 years of experience after graduation - Should have minimum qualification of Bachelor Degree in relevant subject	15x0.48=7.2	
4	Equipment Owned		10
4-i	Core Drilling Equipment for Geotechnical Studies (Capacity of the equipment should be at least 100m otherwise it will not be counted for evaluation)		8
4-ii	ERT/SRT Equipment for Geotechnical Studies		2
	TOTAL MARKS		100

Note:

- The relevant figures/numbers of the each members of joint venture shall be added together to calculate cumulative figures/numbers of the joint venture's for the purpose of evaluation of experience and turnover of the firm(s).
- The consultant must make (put) the original signature of authorized representative and stamp of company on **each printed side of every page of EoI**. If otherwise, these pages will not be considered for evaluation.



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- c) The information furnished by the Firm(s) in the EOI document should be realistic. In the event of any discrepancy between the original and the copy, the original shall govern. If any faulty information is found, legal action may be taken as per prevailing rules and regulations.
- d) The experience of the firm should be supported with evidence/proof in the form of experience/ completion certificates which shall be duly notarized showing the project capacity, level of study and date of completion of the assignment. Otherwise such experience shall not be considered for evaluation.
- e) The work experience(s) of the firm not listed in [Form B-1/Form B-2/Form B-3/Form -B4](#) won't be counted for the evaluation purpose.
- f) Marks will be given only to the key professionals to be deployed for the study.
- g) Key personnel should not be proposed more than three times either by same firm or different firms (entity) for the any assignment of specified Jobs in the EOI notice published on The Rising Nepal daily on May 7, 2016 (2073/01/25) of this EOI notice. If proposed more than three times the respective professionals will not be considered for evaluation in any of the EOIs
- h) Only those professional is regarded as full time staff who has been working and remunerated as full time staff in the respective consulting firm for at least 1 month before the publication of this EOI notice.
- i) The professionals hired from outside or part time/resource person will be evaluated with only 80 % weightage.
- j) Employee of public entity needs to submit official no objection letter to provide consultancy services. Failure to submit no objection letter of these professionals, evaluation of such professional will not be done.
- k) Same key personnel should not be proposed for more than one designation for the same Job from an Applicant. If proposed so, marks will not be given for such professionals in any designation.
- l) Exchange rate shall be considered the rate as on the last date of submission of EOI.
- m) Graduation year and month of the key professional shall be mentioned in Form C. If the month of graduation is not mentioned, the month of December of mentioned year will be considered for evaluation.
- n) The consultant should submit the invoice and other relevant documents to prove the consultant as the owner of the Core Drilling and ERT/SRT equipment. Otherwise the marks allocated for the heading 4 of Evaluation Criteria will not be given.
- o) The professional proposed by the firm if found being involved in current ongoing DoED jobs either through same firm or different firm(s) such professional shall be considered as part time and will be evaluated with 80% weightage only.
- p) If DoED finds the proposed key professional doubtful regarding duplication, experience, part time/full time allocation or any issues then such professional may be asked to appear in DoED for verification. Failing to appear in such verification may cause disqualification of that key professional.
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- q) In case of experience in storage project, Consultant shall list all the storage capacity of the project where they are involved.

A. List of Key Personnel/Professionals – National Staff

1. Feasibility Study

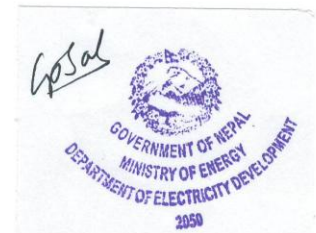
SN	Position
1	Team Leader
2	Hydropower Engineer
3	Senior Surveyor
4	Engineering Geologist
5	Geotechnical Engineer
6	Geophysist/Seismologist
7	Hydrologist
8	Highway Engineer
9	Electrical Engineer
10	Mechanical Engineer
11	Navigation/Transportation engineer
12	Fishery Expert
13	Cost Estimator (Civil Engg.)
14	Economist (Financial Analyst)

2. EIA Study

SN	Position
1	EIA Coordinator (EIA Expert)
2	Environmental Engineer/ Environmentalist
3	Sociologist/Anthropologist
4	Zoologist/Aquatic Life Expert
5	Botanist/Ecologist/Forest Expert
6	EMP Expert
7	Resettlement Expert

B. List of Key Personnel/Professionals – International Staff

SN	Position
1	Hydropower Engineer
2	Geologist/Geotechnical Engineer
3	Hydrologist/Sediment Engineer
4	Fishery Expert
5	Hydro Mechanical Engineer
6	Dam Engineer
7	Navigation Engineer
8	Seismologist



1.6.4 Short listing of the Applicants

Only six top ranked Applicants obtaining at least 50 % marks in the EOI evaluation process will be shortlisted and considered as qualified firms.

Request for Proposal (RFP) will be issued to qualified short listed firms for respective Job for the submission of Technical and Financial Proposal. The Quality and Cost Based Selection (QCBS) procedure will be used for final selection of the consulting firm.

1.6.5 Clarification during Evaluation by DoED

1. During the evaluation, DoED may request the Applicant for necessary clarifications. The Applicant shall furnish the necessary clarifications expeditiously by post/courier/fax/e-mail or by any other means of communication to DoED at the address given in Clause - 1.2.1.
2. Failure to provide information, essential clarification, or to provide timely clarifications or substantiation of the information furnished, DoED would be at liberty to declare such Applicant as non-responsive and reject his/her document.

1.6.6 Rejection of EOI Document of Applicant

1. DoED reserves the right to accept or reject any or all EOI proposals with or without giving any reason whatsoever and is not liable for any losses to Applicants due to such rejection.
2. Furnishing of false or wrong information, document or evidence by any firm or joint venture may result in rejection of the EOI document of the firm or their joint ventures. In addition in such cases, legal action shall be taken as per prevailing rules and regulations.

1.7 NOTICE OF RESULT OF EVALUATION

All applicants irrespective of the qualified or non-qualified will be notified the result of evaluation of qualification through publishing a notice in national daily newspaper and official website of Ministry of Energy and/or Department of Electricity Development in due course of time. Applicants listed in the short-listing will be considered as qualified firm and will be invited to participate in the Request for Proposal process.

1.8 SCOPE OF WORKS

The information regarding the project and project area, scope of work etc. are provided in Terms of Reference (ToR) at Annex-1.



2. PREPARATION OF EOI APPLICATION

The EOI document shall be structured in accordance with the outlines given in the EOI form and must contain accurate and complete information as requested in the EOI form. **The EOI document shall have no interlineations or overwriting, except as necessary to correct errors made by the Consulting Firm itself. Any such correction must be initialed by the person authorized to sign the application and stamped with the firm's seal.**

2.1.1 Documents for EOI

The completed EOI documents to be submitted by Applicant shall comprise of the following documents:

Information Regarding Technical & Financial Capability of the Consulting Firm

Form Type	Description/Content
Form A	General Information
Form A-1	Letter of Submittal
Form A-2	Joint Venture Information
Form A-3	Self-Declaration Form
Form A-4	Eligibility Status
Form A-5	Identification of the Consulting Firm
Form A-6	Financial Capability of the Consulting Firm
Form A-7	Detail of Local Agent
Form B	Relevant Work Experience of the Firm
Form B-1	Relevant Work Experience of the Firm in Feasibility Studies/Detailed Engineering Design (Studies)/DPR of Hydropower projects
Form B-2	Relevant Work Experience of the Firm in Feasibility Studies/Detailed Engineering Design (Studies)/DPR of Water Resource projects
Form B-3	Relevant Work Experience of the Firm in EIA Study of Hydropower Projects
Form B-4	Relevant Work Experience of the Firm in Supervision of Construction of Hydropower Projects.
Form C	Details of Key Professional Staffs to be Deployed for Study
Form C-1	Details of KEY PROFESSIONAL STAFF (National staff) to be Deployed for the Study
Form C-2	Details of KEY PROFESSIONAL STAFF (International staff) to be Deployed for the Study

Note: The EOI documents should be prepared and submitted in above mentioned sequence providing supporting documents with respective Form.

2.1.2 General Information

1. The Applicant shall provide a Letter of Submittal with completed forms as provided in the Format Forms A to C in the EOI document. All necessary information shall be presented to demonstrate the firm/joint venture's eligibility, capability, experience and professionals to be deployed for the study.
2. The Applicant shall enclose notarized copies of registration certificate, VAT certificate, and Tax clearance certificate. The Applicants shall also enclose notarized copies of experience certificate or completion certificate, audit report of last five years.



FORM A-1

LETTER OF SUBMITTAL

[Letterhead of the Applicant, In case of Joint Venture, of the Lead Firm)

Date:

To:
The Director General
Department of Electricity Development
Anamnagar, Kathmandu,
Nepal

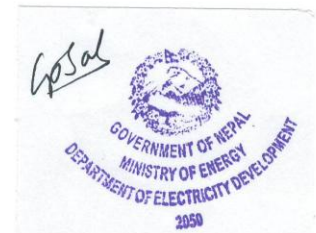
Sirs,

Being duly authorized to represent and act on behalf of

.....
.....
(hereinafter "the Applicant"), and having reviewed and fully understood all the information provided in EOI, the undersigned hereby apply for qualification by DOED as a consultant for the

1. DOED and its authorized representatives are hereby authorized to verify the statements, documents, and information submitted in connection with the submitted EOI. This Letter will also serve as authorization to any individual or authorized representative of any institution referred to in the supporting information, to provide such information deemed necessary and requested by you to verify statements and information provided in this EOI, or with regard to the resources, experience, and competence of the Applicant.
2. DOED and its authorized representatives are authorized to contact any of the signatories to this letter for any further information.
3. This application is made in the full understanding that all decisions by DOED related to this EOI are final, binding and not subject to review. DOED shall be under no obligation to inform the Applicant of the reasons for its decisions or actions.
4. The Applicant hereby provides willingness and commitment to abide by all applicable laws, regulations, and other requirements having the effect of law in the execution of this study, if selected.
5. All further communication concerning this EOI proposal should be addressed to the following person who is authorized to represent and to receive all communication on behalf of the Applicant and its constituents.

[Person & Designation]
[Company]
[Address]
[Phone, Fax, Email]



FORM A-2

JOINT VENTURE INFORMATION

If the EOI is being submitted in Joint Venture, provide Joint Venture Information

SN	NAME OF FIRM	Postal Address, TEL, FAX and E-mail	NAME OF CONTACT PERSON	TELEPHONE OF CONTACT PERSON	SHARE PERCENTAGE IN JV	Remarks
1.	Lead Firm:					Share percentages of each JV partners should be mentioned in the JV agreement
2.	Partner Firm:					
3.	Partner Firm:					

Note:

1. Maximum three (3) Firms can make a Joint Venture.
2. In case of JV, the minimum share percentage of lead firm shall be 40 and minimum share percentage of partner firm shall be at least 20. Also the lead firm should hold the power of attorney.
3. Provide duly signed and stamped Joint Venture Agreement and Power of Attorney of the signatories by each member in the JV.

Attachment

1. Joint Venture Agreement
2. Power of Attorney of the signatory (ies) of the Applicants



FORM A-3

SELF DECLARATION FORM

Date:.....

To,
Director General
Department of Electricity Development
Anamnagar, Kathmandu

Sir,

We,
(name of all Consulting Firm) declare that we are legally eligible to participate in the procurement process of consulting services for the (title of consulting service).

We also declare that we do not have any conflict of interest in the said assignment.

We hereby also declare that we have not received any punishment while doing any consulting business.

Note: (If any member of the consulting Firm is not eligible to participate in procurement process or has conflict of interest in the said assignment or has received any punishment while doing consulting business in the last five years, the same must be clearly mentioned in this form. Any history of litigation during the last five years shall also be declared here along with the relevant verdict.)

(Note: Each Consultant in JV need to submit Self Declaration document either jointly or individually with original signed and stamped with company seal together with EOI document)



FORM A-4

ELIGIBILITY STATUS

A. Eligibility Requirement

S No	Description	Status	Remarks
1	Notarized Copy of Valid Registration Certificate		
2	Notarized Copy of VAT Certificate		
3	Notarized Copy of Income Tax Clearance Certificate for FY 070/71 or FY 071/72		
4	Self-Declaration as per clause 40 – 2 (e) of Public Procurement Rule, 2064 mentioning their eligibility, non-conflict of interest, non-receipt of any punishment while doing consulting business		

Note: Each member of the JV shall submit the above eligibility documents.

In addition in case of Joint Venture, following documents should be provided

SN	Description	Status	Remarks
i	Joint Venture Agreement between the JV Partners duly signed & stamped with company seal by each member of the JV & clearly mentioning name of the lead firm, name of the JV partners, role and responsibility of each member, name and signature of the authorized signatories and share percentage of each JV partners. (In any case, the firms are not allowed to enter into more than one joint venture for same job)		
ii	Power of Attorney of authorized signatories of the JV Agreement from their respective firm with signature & seal for each member of the JV.		
iii	The total number of consulting firms including the lead firm should not exceed a maximum of three numbers in the JV		
iv	The minimum share percentage of the lead firm should be at least 40% and that of the other JV partners should be at least 20%.		
v	Power of attorney to lead firm from the JV partners		
vi	Form A-7 : Information of Local Agent (<i>in case of Foreign consultant or JV of only Foreign Consultants</i>)		
vii	The Average Annual Turnover (AAT) of the each firm in the JV or the single entity should be greater than NRs.50 million.		
viii	The total key professionals proposed should include at least 20% professional from each firms in the JV.		

Consulting firm or any member of the JV, failing to submit above basic criteria or if do not meet eligibility criteria mentioned above, the consulting firm will be considered as non-eligible and will not be considered for further evaluation.

The supporting documents in the form of notarized copies of registration certificate, VAT Certificate and Tax Clearance/Submission Certificate shall be attached here:

IDENTIFICATION OF THE CONSULTING FIRM

Full name of the Firm:

Address:

Telephone number: Fax number: E-mail: Others:	Year of Establishment: Number of Years since establishment:
Corporate Registration: Date of Registration: Registration No: Date of last renewal: Valid up to:	VAT Registration: Date of Registration: VAT Registration No:
Name and address of contact person: Name and Designation of Contact Person: Address: Telephone number (Office): Telephone number (Residence) : Mobile no: Fax: Email:	

Note:

1. *In case of the applicant being joint venture, provide similar information for each member in the joint venture separately.*
2. *The Name and complete address of local agent in case of foreign consultant or JV of only foreign consultants needs to be provided [\(Form A-7\)](#). Otherwise the applicant will be considered as non-eligible and will not be considered for further evaluation.*



FORM A-6

FINANCIAL CAPABILITY OF THE CONSULTING FIRM

Full name of the Consulting Firm:

FINANCIAL STATUS

Turn Over of last five consecutive fiscal years

Description	FY	FY	FY	FY	FY
Turnover (NRs.)					

Turn Over of best three years

Description	FY	FY	FY	Average Annual
Turnover (NRs.)				

Note:

1. Provide similar information for each member in case of joint venture.
2. Submit Audited Reports of last five consecutive fiscal years.



FORM A-7

INFORMATION OF LOCAL AGENT

(IN CASE OF FOREIGN CONSULTANT OR JV OF FOREIGN CONSULTANTS ONLY)

Name and address of the company:	
Name and designation of Contact person	
Address of contact person	
Telephone Number (office):	
Telephone Number (residence):	
Mobile:	
Fax:	
Email:	

Date:

Signature & Designation of Applicant:

Seal of the Firm:



FORM B-1

RELEVANT WORK EXPERIENCE OF THE FIRM IN FEASIBILITY STUDIES/DETAILED ENGINEERING DESIGN (STUDIES)/DPR OF HYDROPOWER PROJECTS (IN THE LAST FIVE YEARS)

S.N.	NAME OF PROJECT, LEVEL OF STUDY AND PROJECT CAPACITY	LOCATION	CLIENT	VALUE OF CONTRACT	YEAR OF COMPLETION	DESCRIPTION OF RELEVANT WORK CARRIED OUT
1.						
2.						
3.						
4.						

Date:

Signature & Designation of Applicant:

Seal of the Firm



FORM B-2

RELEVANT WORK EXPERIENCE OF THE FIRM IN FEASIBILITY STUDIES/DETAILED ENGINEERING DESIGN (STUDIES)/DPR OF WATER RESOURCE PROJECTS WITH STORAGE (IN THE LAST FIVE YEARS)

S.N.	NAME OF PROJECT, LEVEL OF STUDY AND PROJECT CAPACITY	LOCATION	CLIENT	VALUE OF CONTRACT	YEAR OF COMPLETION	DESCRIPTION OF RELEVANT WORK CARRIED OUT
1.						
2.						
3.						
4.						

Date:

Signature & Designation of Applicant:

Seal of the Firm



FORM B-3

**RELEVANT WORK EXPERIENCE OF THE FIRM IN EIA STUDY
OF HYDROPOWER PROJECTS (IN LAST FIVE YEARS)**

S. N.	NAME OF PROJECT AND ITS CAPACITY	LOCATION	CLIENT	VALUE OF CONTRACT	YEAR OF COMPLETION	DESCRIPTION OF RELEVANT WORK CARRIED OUT
1.						
2.						
3.						
4.						

Date:

Signature & Designation of Applicant:

Seal of the Firm



FORM B-4

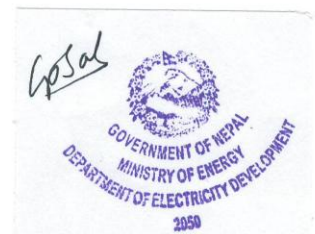
**RELEVANT WORK EXPERIENCE OF THE FIRM IN
SUPERVISION OF CONSTRUCTION OF HYDROPOWER
PROJECTS (IN LAST FIVE YEARS)**

S.N.	NAME OF PROJECT AND ITS CAPACITY	LOCATION	CLIENT	VALUE OF CONTRACT	YEAR OF COMPLETION	DESCRIPTION OF RELEVANT WORK CARRIED OUT
1.						
2.						
3.						
4.						

Date:

Signature & Designation of Applicant:

Seal of the Firm



FORM C-1

C1. DETAILS OF KEY PROFESSIONAL STAFF (NATIONAL STAFF) TO BE DEPLOYED FOR THE STUDY

1. Feasibility Study

S. N.	DESIGNATION	NAM E	QUALIFICATION (INCLUDING UNIVERSITY & YEAR AND MONTH OF DEGREE OBTAINED)	NAME OF AFFILIATED COMPANY AND YEARS OF AFFILIATION	TOTAL YEARS OF EXPERIENCE	FULL OR PART TIME	E-MAIL & MOBILE NO.
1	Team Leader						
2	Hydropower Engineer						
3	Senior Surveyor						
4	Engineering Geologist						
5	Geotechnical Engineer						
6	Geophysist/Seismologist						
7	Hydrologist						
8	Hydraulic Engineer						
9	Highway Engineer						
10	Electrical Engineer						
11	Mechanical Engineer						
12	Navigation engineer						
13	Fishery Expert						
14	Cost Estimator (Civil Engg.)						
15	Economist (Financial Analyst)						

2. EIA Study

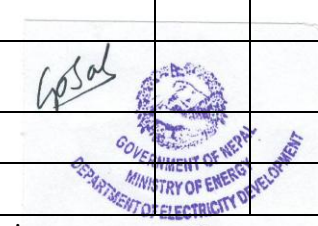
S. N.	DESIGNATION	NAM E	QUALIFICATION (INCLUDING UNIVERSITY & YEAR AND MONTH OF DEGREE OBTAINED)	NAME OF AFFILIATED COMPANY AND YEARS OF AFFILIATION	TOTAL YEARS OF EXPERIENCE	FULL OR PART TIME	E-MAIL & MOBILE NO.
1	EIA Coordinator (EIA Expert)						
2	Environmental Engineer/ Environmentalist						
3	Sociologist/Anthropologist						
4	Zoologist/Aquatic Life Expert						
5	Botanist/Ecologist/Forest Expert						
6	EMP Expert						
7	Resettlement Expert						

Note: *E-mail ID & Mobile number of the professionals shall be used for verification purpose.

Date

Signature & Designation of Applicant

Seal of the Firm



FORM C-2

C2. DETAILS OF KEY PROFESSIONAL STAFF (INTERNATIONAL STAFF) TO BE DEPLOYED FOR THE STUDY

S. N.	DESIGNATION	NAME	QUALIFICATION (INCLUDING UNIVERSITY & YEAR AND MONTH OF DEGREE OBTAINED)	NAME OF AFFILIATED COMPANY AND YEARS OF AFFILIATION	TOTAL YEARS OF EXPERIENCE	FULL OR PART TIME	E-MAIL & MOBILE NO.
1.	Hydropower Engineer						
2.	Geologist/Geotechnical Engineer						
3.	Hydrologist/Sediment Engineer						
4.	Fishery Expert						
5.	Hydro Mechanical Engineer						
6.	Navigation Engineer						
7.	Dam Engineer						
8.	Construction Planner						
9.	Seismologist						

Note: *E-mail ID & Mobile number of the professionals shall be used for verification purpose.

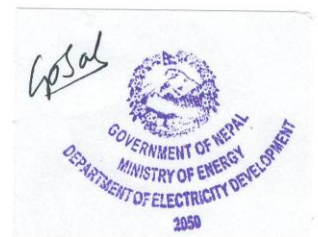
Date:

Signature & Designation of Applicant:

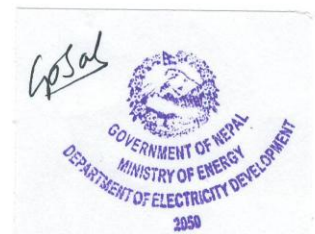
Seal of the Firm



Annex-1



TERMS OF REFERENCE (TOR)
for
Feasibility and Environmental Impact Assessment (EIA)
Study of
Seti River (SR-6) Storage Project



Terms of Reference for Feasibility and Environmental Study of Seti River (SR-6) Storage Project

1. Background

The Government of Nepal (GoN) intends to utilize water resources of Nepal in an economically efficient and sustainable manner to meet the growing power demand in the country along with navigational purpose, flood control, recreation and other uses of water. Currently the country has been facing huge power shortage. Electric power is the engine of economic growth of the country in absence of which, Nepal is facing sluggish economic growth. Besides this it affects development activities as well as the daily life of the people. In near future, development of Nepal's water resources triggers many possibilities in socio-economic development of Nepal.

The SR6 project was identified during master plan studies of the Karnali basin. The study focused the water resources development of the same river basin which was conducted by Japan International Cooperation Agency (JICA) in 1993. SR6 was identified as the storage project. The dam site is around 2 km downstream from the confluence of Budhi Ganga and Seti River. The dam site around 19 km upstream from the confluence of Seti River with Karnali River. The project was proposed on 3 Draft Rates of 0.6, 0.7 and 0.8 and the respective capacities identified were as 642 MW, 776 MW and 966 MW. The draft rate is basically the ratio of constant release from the reservoir through the year to the long-term average flow.

Thus GoN seeks to execute the feasibility study of SR6 hydropower project with prime focus on power development. Further, other uses like navigation, fisheries and other recreational water uses, can make the project financially and economically more attractive.

The services of the Consultant described in the following chapters shall be performed in close cooperation with the DoED personnel. In general the task to be performed by the Consultant has been outlined in this Terms of Reference (TOR). However, the Consultant shall bear in mind that the list of tasks and activities can by no means be considered as the complete and comprehensive description of the Consultant's duties. It is rather the Consultant's responsibility to critically verify the scope of services indicated and to extend, or amend it wherever necessary according to professional judgment and the knowledge during preparation of this proposal. It is understood that the Consultant performs all work as necessary to fulfill the objectives of the Project Study.

2. Project Information

Preliminary level of study and investigation of SR6 project was carried out up to some extent during master plan study of Karnali and Mahakali river basin. Based on that study base line information about the project is as under. This information provided below shall only be guiding details for the study.

2.1. Project Location

Seti River is the boundary of Doti and Accham districts where the project is located. The project boundary is 28°-58'-00" N to 29°-55'-30" N and 80°-55'-30" E to 81°-12'-30"E. The dam site of proposed storage project lies at around 2 km downstream from the confluence with the Budhiganga River. . The dam site is just downstream of the three river valley confluence thus it will be better location for reservoir project. Further, the proposed storage lies in between two proposed reservoir projects namely West Seti storage hydropower project (750 MW) at upstream and at toe of the dam the full supply level of Karnali Chisapani Multi-Purpose Project (10800 MW) at downstream as cascade. The proposed dam consists of power house at the dam toe because the full supply level KCMPP prolongs up to the dam toe level of this proposed project. During master plan study, the height

of Dam was proposed from 202 m to 238 m in different option of draft rate. The full supply level was fixed between 603 to 639 masl. The proposed location of the project is shown in Figure 1.

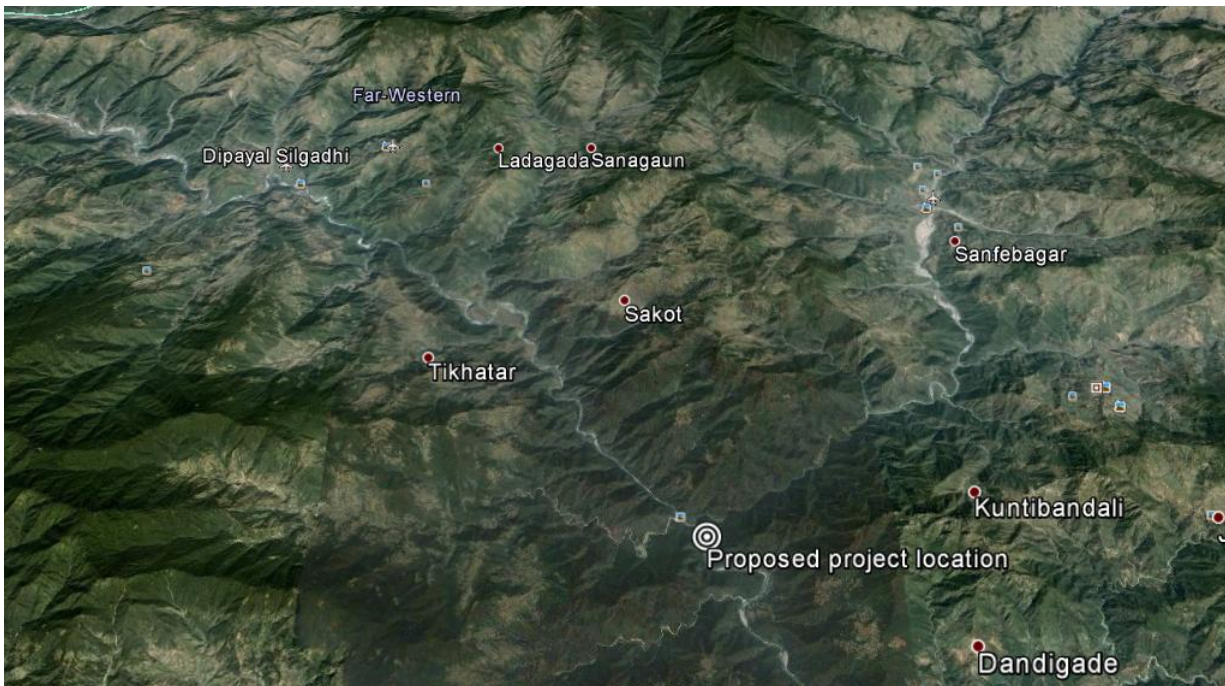


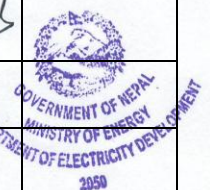
Figure 1 Proposed project location of SR6 in Google Map

2.2. Project features

The information presented here is solely based on the master plan study as mentioned earlier which was completed in 1993. Based on that study, the different parameters are presented in Table 1.

Table 1. Identified parameters of the master plan studies

S.N.	Parameters	Features at Draft Rate			Remarks
		0.6	0.7	0.8	
1	Plant Discharge (m ³ /s)	434	507	579	
2	Full Supply Level (Elevation, m)	603	613	639	
3	Minimum Operation Level (Elevation, m)	557	557	557	
4	Tail Water Level (Elevation, m)	401	401	401	
5	Installed Capacity (MW)	642	776	966	
6	Firm Energy (GWh per year)	1841	2240	2809	
7	Secondary Energy (GWh per year)	799	752	690	
8	Total Energy (GWh per year)	2,640	2,992	3,499	



3. Objective

The main objective of the consulting services is to conduct the Feasibility and Environmental Study of the SR-6 Hydropower Project. Including power benefits, the possibility of navigation, fisheries development, tourism as well as other recreation activities shall be carried out. The current consulting service seeks the attractiveness of the Project for investment/development. The Consultant needs to evaluate the viability of the project in technical, financial, socio-economic, institutional, and environmental along with other relevant aspects of project development based on detailed field surveys, investigations analysis, design, cost estimate. The study shall contain high dam on the Seti River focusing on power benefits including other benefits. However, consultant shall carry out all alternative studies to find optimum layout, location and height of dam for power, and other benefits. Also consultant shall carry out resettlement study and its plan.

The Feasibility Study shall include relevant baseline investigations, assessments and plans, alternative layout and optimization and cost estimates regarding technical, economic/financial, environmental, and socio-economic aspects, preparation of drawings, carry out economic and financial analysis within the stipulated time. Consultant need to perform cost allocation studies for different purposes. Financial and economic studies with and without multipurpose aspect shall be conducted.

The objective is also to conduct an Environmental Impact Assessment (EIA) Study based on the plan and design of the project proposed at feasibility level including social safeguard related studies. The output should be in the form of a bankable report that will analyze and document all important aspects required for the formal approval of the project by concerned government authorities of Nepal as well as potential financing partners.

The studies shall be carried out in an integrated manner taking other projects identified on the Seti and Karnali river basin such as West Seti, Budhiganga as well as Karnali Chisapani Multipurpose Project into consideration. As such, the projects shall be prepared as multipurpose projects, considering all relevant water uses both upstream and downstream.

A numerical model shall be developed for the river stretches in question which can be used as a tool for studying the environmental and economic impact of all existing and new projects and for optimizing the project layout, installation and mode of operation.

This Study should consider the overall electricity supply/demand balance of Nepal. The EIA constitutes an integral part of the Feasibility Study in conformity with the environmental legislation of Nepal as described in the scope of work.

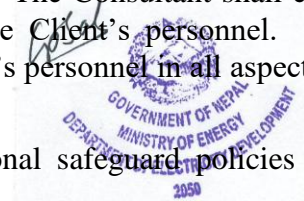
4. Project organization and methodology

4.1. Organization

The Consultant shall be responsible for carrying out all necessary fieldworks and investigations to compile data and information for the feasibility and Environmental study. The Consultant shall carry out the majority of the work in direct day-to-day co-operation with the Client's personnel. The Consultant's personnel shall make their best efforts in involving the Client's personnel in all aspects of the investigations, planning and design work to be carried out.

The Consultant shall indicate in their proposal with a set of international safeguard policies and standards they intend to follow during the course of the study.

Consultation, information-sharing and liaison with stakeholders and the public will be the responsibility of the Client. The Consultant shall, however, assist the Client in this endeavour and



participate in formal and informal meetings with stakeholders and the public in general to disseminate information about the work.

The work of the technical team and the work of the Environmental Impact Assessment team shall be done in an integrated manner so that:

- Due consideration is taken of environmental and social issues when selecting technical solutions; and
- Technical solutions, data and results are communicated early enough to the Environmental Impact Assessment team so that the required investigations can be arranged in a timely manner.

4.2. Project Implementation Arrangements

The DOED will be the Executing Agency for the Study. A Technical Support Group (TSG), consisting of GoN officials and other experts will monitor the progress and quality of work during all phases of study from time to time. The DOED will invite TSG members for meetings at each major milestones set forth by the Department or as deemed necessary by the DoED. Members of the TSG will be nominated by the DOED.

Upon receipt of any report from the Consultant, the DoED may ask the Consultant to make a brief presentation of the findings/ progress at DOED. The time and date of the presentation may be agreed mutually, but it is expected that the Consultant will prepare a presentation in advance.

Comments/suggestions from DOED/TSG on the Consultant's report will be compiled and communicated to the Consultant by DoED. The Consultant will be required to incorporate/ address the comments to the extent possible and up to the satisfaction of the DoED/TSG.

4.3. Office Establishment and Arrangements

The Consultant shall establish a project office in Kathmandu together with field offices as required. The Consultant shall hire / procure required articles, equipment and services as required including vehicles, computers, etc.

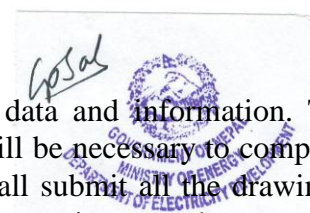
4.4. Work Plan

The time frame for the proposed Feasibility and Environmental Studies is 30 months effective from issue of the work order. The Consultant should note that some important elements of the study must, by their nature, span all phases of the project as identified below. These include the consultations and outreach programmes, the environmental assessments, socio-economic assessments, geotechnical study and hydrological and sedimentation studies.

The Consultant shall prepare a detailed work plan to accomplish the work including personnel deployment schedule, timing and man -month input on the project for each resource person showing all activities and shall be submitted to DoED.

5. Scope of Works

The Consultant shall collect and review all available, relevant reports, data and information. The Consultant shall then identify and recommend the extent of studies that will be necessary to complete the full feasibility study and EIA study of the project. The Consultant shall submit all the drawings, formats, engineering calculations and reports to DoED for review. If DoED requires any changes, they shall be incorporated accordingly. However, the Inception Report must be accepted by DoED before any further work is embarked upon. The plant capacity should be designed based on the optimization study.



Topographic surveys and field investigations shall be described in the proposal and a program for this work shall be further detailed and updated on in the Inception Report. The work plan prepared as part of the proposal shall be updated in light of the information collected, and shall be updated the program for surveys and field investigations. The work plan shall show all contemplated activities which will be performed during the course of the study work. The work shall be broken down into discrete elements and the duration, scheduling, and resources required for each element shall be displayed on Critical Path Method Scheduling.

The consulting service is divided into two components:

- a) Feasibility Study, and
- b) Environmental Impact Assessment (EIA) study including social safeguard related studies

Both of those services shall be carried out simultaneously. The Feasibility Study report shall contain, apart from other studies a short description of the EIA component, while the detailed report on EIA shall be presented separately. The Feasibility Study shall be carried out in accordance with this TOR. For any other matters not covered in the TOR, the Consultant should refer the Guidelines for Study of Hydropower Projects (December 2003) or equivalent study guideline for similar works and Design Guidelines, published by GoN. The EIA study will be carried out by the EIA team of the Consultant in conjunction with the technical team of experts for the feasibility study. The study shall be carried out in accordance with the TOR approved by the Ministry of Science, Technology and Environment (MoSTE), as per requirements of the prevailing Environment Protection Act, 2053 and the Environment Protection Rule, 2054 and its amendments. Approval on the EIA report from the MoSTE is required for making final payment.

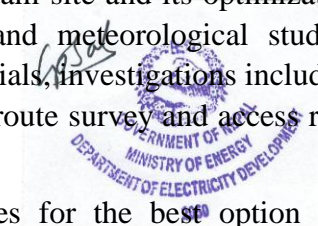
The scope of works and details of the work for the Feasibility Study and Environmental Study are described in the Chapter 6 and 7.

6. Feasibility Study

The feasibility study shall include study of high dam for the purpose of power generation at Seti river just downstream to the confluence with Budhiganga river. This feasibility study shall also include navigation continuation with the reservoir of the Karnali Chisapani Multipurpose Project. Karnali Chisapani Multipurpose Project is the largest proposed project of Nepal. Assessment of fishery benefits shall also be made. Respective costs and related benefits for each component shall be accessed and evaluated.

The scope of work for the Feasibility Study includes, but not limited to;

- a) Review of previous study, collection of other relevant information, maps and identify the investigation required.
- b) Conduct field investigations starting from suitable site selection for dam site and its optimization including appurtenant structures, hydrological surveys, sediment and meteorological studies, topographical surveys, geological, geotechnical and construction materials, investigations including drilling, seismic parameter study, logistics surveys, transmission line route survey and access road survey.
- c) Carry out alternative configuration studies and optimization studies for the best option and optimum use of resources.



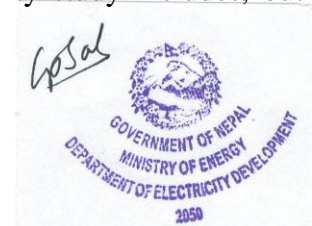
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- d) Assess power and energy, navigation and water transport, fisheries and recreational and rehabilitation and resettlement benefits costs from the project.
 - e) Conduct power evacuation study to the Integrated Nepal Power System.
 - f) Carry out project layout and design. Conduct hydraulic and structural design of civil structures such as dam, intake, waterways (diversion tunnel, power tunnel, surge tank, drop shaft), powerhouse with tailrace and switchyard.
 - g) Design power generating equipment and substation, including auxiliary equipment.
 - h) Design hydraulic steel structures such as gates, valves and penstock pipes.
 - i) Prepare construction plan and schedules for project implementation
 - j) Prepare cost estimates derived from rate analysis and quantity estimate, including cash flows in local and foreign currencies.
 - k) Carry out economic and financial analysis of the project and also perform the sensitivity analysis of the project, including cost allocation and cost sharing among project components.
 - l) Prepare feasibility study report with full documentation on the actual design including all design principle criteria, parameters and standards to which the project has been designed; all major calculations and analysis including all the drawings are to be handover to DoED in the form of both hard and soft copies.
 - m) Planning and design of water transport system in association with upstream and downstream reservoirs
 - n) Planning and design of Fisheries development plan
 - o) Planning and design of Recreation and Tourism development plan
 - p) Prepare Rehabilitation and Resettlement plan and associated costs

The details of works to be carried out as per the scope of work are as under:

6.1. Field Investigation

A field investigation program shall be prepared and submitted to DoED for approval before carrying out field investigation activities. This report shall contain the preliminary scope of field investigation program. In order to facilitate the earliest possible start of the field investigation program, the locations of a sufficient number of drill holes, 2D electrical resistivity tomography survey profiles and surface geological studies shall finalized in time. In general, the field investigation program/schedule shall follow the following sequence taking reference from the Feasibility Study Guidelines (2003) prepared by the DoED and flood control water transport, fisheries development, recreational and tourism development practices.

- a. The tentative field investigation to be carried out in this feasibility study includes, but not limited to: Topographical survey and mapping
- b. Hydro-meteorological and sediment study
- c. Geological and geotechnical investigation and tests
- d. Geophysical surveys
- e. Seismicity/seismic study
- f. Drilling/drifting, field testing and



-
- g. Construction material survey
 - h. Planning and design of Fisheries development plan
 - i. Planning and design of Recreation and Tourism development plan

6.1.1. Topographical Survey and Mapping:

Approximately 250 ha total project area covering all the project structures such as dam structure/spillway, headrace tunnel/canal, drop shaft, powerhouse, tailrace and switchyard, construction facilities including project road in the scale of 1:1,000 with contour intervals of 1 m for major structures and 5m for underground structures required for feasibility study of the multipurpose project. The surveys of the reservoir area shall be done for mapping in scale 1:5,000 with a contour interval of 5 m.. All the surveying must be tied with the levels of national trigonometric /geodesic points.

- Establishment of Reference Points of known position and elevation at different locations of the study area so as to act as Primary Control Points for all present and future surveying and mapping.
- Carry out Dam site survey and mapping in scale 1:1,000 with 1 m contour interval.
- Survey and mapping of other major structural components of the projects in scale 1:1,000, 1 m contour interval.
- Survey and mapping of quarry sites and borrow areas in appropriate scale.
- Survey and mapping of office and residential colony and base camp area of the projects in scale 1:1,000, 1 m contour interval.
- X-section of the river along dam axis
- X-sections of the river at 50 m interval upto 700 m upstream and downstream of the proposed dam axis
- L-section of the river covering a stretch of 1400m starting from 700 m upstream up to 700 m downstream of dam axis along river course. Longitudinal-section and cross-section survey at telemetry station site. The minimum coverage for L-section shall be 500m upstream and 500m downstream of the Gauge site,
- Topographic map covering at least 100-m corridor on each side (at least 50 m) from the centerline of the project road and canal /tunnel alignment should be prepared in the scale of 1:2500 with contour intervals of 5m.
- Conduct a walkover survey of transmission routes using the available 1:25,000 or 50,000 scale topographic sheets.
- The details of cross drainage should also be prepared and submitted.
- Carry out reservoir area mapping at 5 m contour interval, with scale 1:5000

The Consultant shall advise the Project office for any additional survey and investigation required to be carried out and the same shall be carried out after the approval of DoED.

The reduced level and co-ordinates should be transferred from the nearest permanent bench marks and triangulation points of third order, at least, established by the Department of Survey. Temporary benchmarks with assumed reduced level are not acceptable. Hence, the Consultant should establish permanent BMs at least 3 in number in each site nearby the intake, and powerhouse site. In case of canal / tunnel alignment and access road, project road, BMs should be established at an interval of 1.5

km. The Benchmarks/reference Points should be clearly defined in the Topographic Map as well as in the report. A separate BM reference sheet should be prepared and submitted.

The Consultant shall prepare a Topographic Survey and Mapping Report describing the activities undertaken including all necessary basic data and records relating to the topographic surveys. The details of reference point needs to be submitted in separate sheet which shall be useful during further survey and construction stage of the project. All the surveyed data and topographic map thus prepared shall be handed over the client in (Dwg/Dxf) format and also the project file of land development along with report.

6.1.2. Hydrographic and Navigation studies

Consultant should estimate the total volume of traffic including goods and equipment and human that has to pass towards the project reservoir area crossing the Karnali Chisapani Bridge as well as the export possibilities such as agricultural products, forest products, and construction materials such as stone, marble as well as other precious goods that has good market value. Thus, to conduct the feasibility of the water transportation, consultant should survey (Secondary Data) the water transport possibilities of river stretch from Karnali Chisapani Bridge to the proposed headworks area assuming the scenario of construction of Karnali Chisapani Hydropower project and without construction. Benefit cost analysis has to be done based on these two scenario for the water transportation possibilities. Consultant should further propose the headworks under different arrangement like ship lock or the shifting mechanism of goods and manpower. Consultant should submit a separate report for the navigation study.

6.1.3. Fishery

After the dam construction, there will be a reservoir length of more than 20 Km length. If the impounded water can be properly utilized, there is a chance of fishery development in that area. Consultant should prepare a separate volume of report mentioning the aquaculture possibility in the regulated poundage area. Consultant should suggest the best method for the fishery farm as well as the sustainability mechanism associated with fishery. In spite of this the fishery benefit after the reservoir area should also account for the benefit cost analysis.

6.1.4. Hydrological, Sedimentological and Meteorological Data Collection

Immediately after signing the agreement, the Consultant should install telemetry based automatic hydrological gauging station near the dam site to observe the river flow. Existing gauging station no 260 Barda can be used by the consultant throughout the entire study period by the Consultant which should be finally handed over to the DoED after completion of the study in working condition.

The Consultant should install at least one hydrological gauging and sediment sampling station at or near the dam site and prepare x-section of the river along Gauge and discharge (GD) site to observe the stream flow, sediment data . The Consultant can use DHM (Station number 260) Barda station located at around 17 km downstream from the proposed project to observe gauge height, discharge and sediment during the study period.

Similarly, the Consultant shall assess the quality and reliability of the available information and make necessary arrangements for the collection of reliable and qualitative data. The observed data pertaining to hydrology, sediment and meteorology are to be arranged in data base system and the same shall be utilized in order to finalize hydrological, meteorological and sediment parameters of the project.

Continuous discharge and sediment measurement shall be done till the end of the contract period. The Consultant shall validate the hydrological estimate at the project site with observed flow data at

established gauging station as mentioned above. The observed flow *Data Register book* in original with analysis should be submitted to DoED in hard copy and soft copy of the same.

6.1.4.1. Data Collection and review

The Consultant shall assess the quality and reliability of the available information and make necessary arrangements for the collection of reliable data. The field measurement of required hydrological, sedimentological and meteorological data and any necessary additions of information so as to enhance the database to ensure the appropriate information for final design shall be acquired as per the requirement.

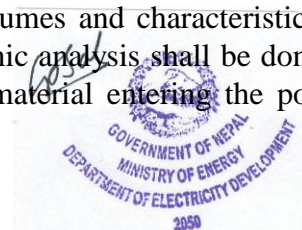
6.1.4.2. Establishment of Flow Sequences

The Consultant shall carry out hydrological and meteorological studies, consisting of field measurement & updating the data in order to estimate the firm flow, mean monthly flows and flood flows for the design of the diversion works and spillway. Additional requirements include confirmation of stage-discharge relationship and generation of an extended mean monthly and dry flow series for power and energy computation. In addition to routine observation extreme flood flows also needs to be measured and the same with analysis should be submitted to DoED.

Consultant shall arrange to use calibrated current meters and depth integrated sediment sampler for flow measurements & sediment sampling and follow the WMO standard procedures for computations of stream flow, sediment concentrations, sediment load computations.

6.1.4.3. Sediment and evaporation Studies

- Establish silt laboratory along with required equipment like sediment sampler, sieve of different size, decicator, filter paper, digital weighting machine, drying pan, oven/stove, conical flask, beaker as well as other articles and chemicals as per the requirement.
- collect the historical suspended and bed load sediment data/information on reservoir sedimentation at local, regional, national level and of neighbor countries;
- study the catchment characteristics from sediment point of view;
- Single sediment sample per day during four wet months and two samples per month during remaining dry months are to be collected on annual basis by suitable method. That means collection of one sample per day for eight months and two samples per month for twenty two months gives 284 samples in total over a period of 2.5 years for which observed data needs to be maintained in *Data Register book* along with day to day initial of the observer. If depth integrated sampler is used to measure sediment load, the sampler is to be lowered and raised up to surface at a uniform velocity at each segment.
- Based on discharge, sediment (coarse, medium and fine) observations and analysis, consultant should compute and submit the data of discharge and sediment yield on daily, monthly and annual basis. The analysis should be carried out in order to evaluate the volumes and characteristics of sediment transportation including, particle size distribution. Petrographic analysis shall be done to determine the hardness of particles, particle size and the nature of material entering the power waterways.
- develop a rating curve of suspended sediment load of the river;
- estimate the bed load contribution using suitable and appropriate method as per the site condition, estimate the possible ranges of sediment load to the power stations and recommend suitable value for design;



- Perform study of reservoir sedimentations showing probable delta propagations and their effects in live storage in time interval of at least five years from reservoir operations
- Establish Evaporimeter (United States Class A Pan) to measure evaporation from the water bodies near the reservoir area

The sample should be tested in the lab for the sediment concentration measurement, particle size distribution (PSD) analysis, petrographic analysis, mineral content as well as hardness of the particles.

6.1.4.4. Reporting on Hydrology and Sedimentation Study

The Consultant shall prepare a report describing the activities undertaken during the study and presenting the results of the hydrological and sediment studies. The report shall include annexure providing copies of data used in the analysis.

6.1.5. Numerical Model of River System

6.1.5.1. Establishment of Simulation Model

The Consultant shall develop a numerical simulation model of the overall Seti River system extending downstream up to confluence with Karnali River. The model shall use a monthly time interval such that the impacts of the downstream Karnali Chisapani Multipurpose Project and other projects can be definitely quantified, seasonally and annually, by investigating gains - increase in low-flow rates, and reduction of high-flow rates, from year to year throughout the simulation period.

Power generation should be simulated in detail for each multipurpose scenario and the firm and average energy output determined over the simulation period. Different project installations shall be investigated and included in the numerical model in order to arrive at an optimized scenario for the study. The model shall be such that different combinations of multipurpose uses and project scenarios can be studied in order to arrive at the optimum solution, and to calculate the economic benefits in the economic analysis for the SR6 project.

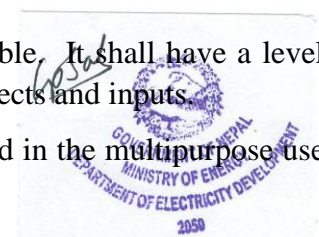
The Consultant should define the proposed numerical model they intend to use which shall preferably utilize readily available commercial software. Input to the numerical model shall include key project parameters from downstream multipurpose uses (both existing and planned) as well as possible changes in benefits to existing downstream facilities (e.g. possible increased hydropower production in downstream projects due to increased flow availability, etc.

The numerical model shall:

- a) include significant projects and be detailed enough to be a reliable tool for establishment of an optimum development for SR6 multipurpose project and give viability calculations of the various development scenarios;
- b) provide input to the overall economic analysis of the SR6 multipurpose project in terms of costs and benefits of the different scenarios; and
- c) be easy to update when new information and data becomes available. It shall have a level of detail simple enough to allow easy manipulation of the various projects and inputs.

The following shall be taken into consideration in the numerical model and in the multipurpose use of the water:

- a) Decrease in sediment flow in downstream reservoir.
- b) Sedimentation inflow in reservoirs.



-
- c) Potential for drought mitigation downstream.
 - d) Environmental and social mitigation
 - e) Climate Change effects

6.1.5.2. Optimization, Reservoir Operation and Power Generation

Based on the results of the water resources analyses, the technical designs and the various cost elements derived, an optimization of the layouts, sizing and mode of operation shall be carried out for the project.

Multipurpose use of the water shall be included in the optimization, including regulated flow benefits (like , sediment trap, navigation , fisheries and flood control benefits).

Attention should be paid to the study of the SR6 project in the inter-connected power grid. Detailed study and comparison need to be carried out to demonstrate the economic viability and possibility to increase the installed capacity. In addition, information on the characteristic of the power system, such as composition of power plants, specific cost and operation and maintenance costs of alternative thermal power plant, specific cost and operation and maintenance costs of transmission lines, etc., need to be collected and analyzed because such information relates to basic parameters for economic analysis of hydropower stations to be studied.

The water resources analysis and the determination of project layout and design shall go hand in hand and will include the testing out of various alternatives regarding technical solution, size/capacity and mode of operation of the plants with respect to peaking/no peaking, special operational mode to accommodate multipurpose use of reservoir water such as irrigation needs, volume reserve in the reservoirs to absorb floods, etc., including downstream release to India. The downstream positive and negative impacts on existing infrastructure shall be analyzed and included in the cost estimates.

6.1.5.3. Study of River Morphology and Identification of Affected Infrastructure

Based on the outcome of the technical studies regarding wet and dry season flows in downstream rivers, and discussions with experts having knowledge of river morphology changes, a field survey shall be carried out to identify infrastructure installations that might be affected. Assess if there is a need to carry out a more detailed morphology study for selected reaches of the river.

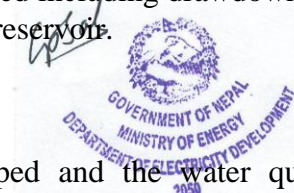
6.1.5.4. Reservoir Filling and Operation

The Consultant shall study different scenarios for reservoir life of SR6 Dam and its effect on the existing water usage downstream of the dams.

The study will lead to specific recommendations relating to the capacity, design and operation of low-level outlets, mid-level outlets, elevation of power system intakes and other features of each dam. Specific draft filling rules shall be developed for adoption during the reservoir filling period to form the basis for further discussion and negotiation and eventual inclusion in agreements relating to project implementation. Furthermore a reservoir operation strategy shall be proposed including drawdown and filling regime to ensure best possible control of sediment deposition in the reservoir.

6.1.5.5. Water Quality Study

A water quality simulation model for the reservoirs shall be developed and the water quality characteristics during first impoundment and during the operational period estimated. River water quality, soils and biomass data shall be utilized in the model to assist the project's final design and to recommend the amount and locations of reservoir basin clearance.



The Consultant shall also assess the probable changes in water quality downstream of the SR6 Multipurpose project following reservoir impounding and during operation of the projects. The analysis shall include, amongst other factors, water temperature, turbidity, sediment concentration, water chemistry and nutrient status.

6.1.5.6. Water Resources Management Report

The Consultant shall present the results of the reservoir simulation model in a Water Resources Management Report. The report shall provide a detailed description of the numerical model used for the study and shall present the basic input data for the reservoir or other component of the model. The results of the studies shall be presented both in tabular and graphic form as appropriate. The report shall also present the results of the River morphology studies, reservoir filling studies and water quality studies.

6.1.6. Geological and Geotechnical Investigations:

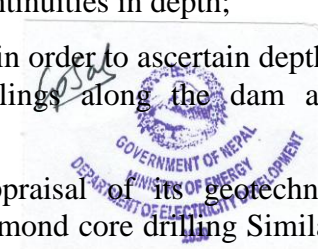
The Consultant shall carry out geological and geo-technical studies necessary for design point of view at feasibility level of all the project components.

The work shall be directed towards determining all relevant parameters as under but not limited to :

- Thickness of alluvial deposits in the riverbed;
- Occurrence and nature of joint sets and filling material
- Extent of weathering zones;
- Dipping of the rock,
- Presence of fault and shear zones,
- Permeability of the rocks and reservoir tightness;
- Shear resistance and bearing capacity
- Nature of contact zones of geological strata;
- Slide risks at steep valley sections;
- Groundwater level effects due to additional loads and pressures;
- Geomorphology of quarry areas within acceptable transport distances to draw construction materials.

It is necessary to clarify the geological and geotechnical conditions at the selected dam sites and powerhouse areas. The investigations shall include but not limited to the following work:

- Identification of the bedrock conditions on the river banks by means of trenches, boreholes, and seismic profiling; the purpose is to confirm the geometry and characteristics of the colluvial deposits and to assess the jointing pattern and the opening of discontinuities in depth;
- Exploration of the overall geometry of the bedrock in the riverbed in order to ascertain depth of alluvial deposits/overburden depth by means of borehole drillings along the dam axis, upstream/downstream and seismic profiling;
- Determination of the bedrock conditions at all structures, appraisal of its geotechnical characteristics (permeability, strength, alteration); by means of diamond core drilling Similarly drilling along the bank of river needs to be carried out in order to ascertain the rock properties and overburden depth;



- Assessment of the seismic risk at the Project site, including the determination of earthquake-induced stresses, accelerations, and forces to be taken into account for dam safety and other design work;
- Investigation of the grout curtain configuration and drainage at the dam foundation;
- Identification of quarry sites of construction materials for the dam and the powerhouse complex (including the identification and avoidance of environmental impacts due to borrowing and mining); local potential for concrete aggregates shall be ascertained.

The Consultant shall make a recommendation of the scope of site investigation works to be carried out during the feasibility study of the project.

It is envisaged that the geological investigations to be managed and supervised by the Consultant will comprise:

- Diamond Core drilling with appropriate wire line drilling machine, permeability test in rocky strata and logging of the core obtained from bore holes needs to be carried out,
- Laboratory tests needs to be carried out to determine the physical, chemical, and mineralogical characteristics of the samples obtained from the boreholes;
- Excavation of trenches, test pits and adits for logging, volume computation and determine the properties of materials;
- Seismic profiling

The Consultant shall record logging details of physical and geotechnical parameters and test results for presentation in the Geological Baseline Report.

6.1.6.1. Regional Geological Study (1:25,000)

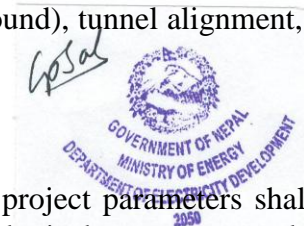
The Consultant shall collect and review available literature, topographical, geological maps and sections, aerial photographs and satellite imagery. Regional geological traverse shall be undertaken with standard practices of geological mapping with respect to the available new topographical maps. In the regional scale, the geomorphology and general geological features of the region shall be studied through remote sensing data. Suitable ground traverse shall be made for ground truth verifications. The collection and review of available literatures to assess any possibility of leakage from the reservoirs shall be done.

6.1.6.2. Geological Mapping of the project area

The Consultant shall prepare Engineering Geological maps (scale 1:10000) of the project area (dam site, reservoir area, powerhouse site, project road, canal/ tunnel alignment, etc). The geological mapping of the project shall include the geological information such as major joint sets, filler materials, trends of rock formations, types of surface deposits, faults, folds, shear zones, slide zones, water seepage zones, etc. The map shall be useable to establish suitability of the site for intended purpose such as dam (type and height), power house (surface and underground), tunnel alignment, etc. The map shall be basic for further detailed study.

6.1.6.3. Detailed Engineering Geological Survey

At the stage of investigation, geological expertise and knowledge of the project parameters shall be used to the maximum extent possible. Prior to detailed engineering geological survey general and specific needs shall be determined for geo-technical exploration, analysis & design to determine geo-technical parameter and prioritize them.



6.1.6.4. Engineering Geological Mapping

The detailed engineering geological mapping shall be prepared for the area around major hydraulic structures (dam site, tunnel alignment, power house site). The mapping, at a scale of 1:1,000, shall include details of geological conditions of various rock units, degree of weathering, attitude of rock, prominent and random joint systems and their persistency, slides, major and minor faults, shear and fracture zones, types of surface deposits or overburden, tracing of rock outcrops and overburden boundary, slope stability & ground water situation.

6.1.6.5. Discontinuity Survey

The Consultant shall conduct a discontinuity survey such as bedding/foliation planes, lithological contacts, major and minor joints, faults, thrusts and folds. The Consultant shall tabulate all measured discontinuity along with the location of their occurrence and conduct a discontinuity analysis by computer software or other method to define major orientation. Results should be presented in graphical format.

6.1.6.6. Rock Mass Classification

The Consultant shall classify the surface rock mass of major structure locations by using Q or RMR system and shall prepare rock mass classification for each underground hydraulic structure.

6.1.6.7. Data Evaluation for Reservoir

The geological map based on satellite images and aerial photo geological interpretation will be further refined through field reconnaissance. From this completed geological maps (so- called lithofacies map), the following item shall be evaluated:

Reservoir tightness

Slope stability and landslide distribution in reservoir area

Locations and lengths of significant faults existing in reservoir area

The geological map of the reservoir area should further provide useful data for sedimentation and seismological investigations.

6.1.6.8. Data Evaluation for Dam

All the investigation works will be organized in a manner that the geological evaluation of the dam site can cover as wide an area as practical and the investigation will be carried out in such a way that geotechnical overview of the area concerned will be obtained. The basic data of the dam site is the field geological map and the geological information from drilling and aditing will serve to support the map in more detail. The cores recovered by drilling will be evaluated according to standard rock classification. A foundation rock classified according to this standard is further evaluated geotechnically in connection with Lugeon values obtained by water pressure tests and uniaxial compression strength.

The geologic profile of a dam site would be defined in the following terms:

- Distribution of rock types
- Geotechnical characteristics of the rocks
- Discontinuities existing at the site
- Ground water elevation and permeability



The data evaluation for the powerhouse and other appurtenant structure sites will be evaluated in the same manner as for dam

6.1.6.9. Core drilling

The purpose of the core drilling is to obtain the subsurface information on foundation materials and conditions. About 13 rock core drillings consisting of 10 holes along dam axis and one each at intake, alignment and outlet of diversion tunnel and water conveyance system, with a total depth of around 1120 m, percussion drillings at aqueduct/ bridge sites This number of boreholes and the length is approximately estimated and can be varied as per available site conditions. If the required subsurface information is available at relatively shallow depth, the total length of boreholes can be less than that of 1120 meters in total. The payment of decreased length of borehole will be deducted on the basis of pro-rata. If deeper subsurface information is required the total length of boreholes can be greater than 1120 meters. However, DoED will not pay the cost of boreholes more than 1120 meters without its prior approval. The detail of Drill holes and their tentative locations is as under;

Dam Axis	10 (one each at Left bank/ Right bank water edge, two at the center, two at 50m upstream and two at 50 m downstream of the dam axis, one each at LB and RB abutment)
spillway and diversion tunnel	1+1
Intake area and power house area	1+1

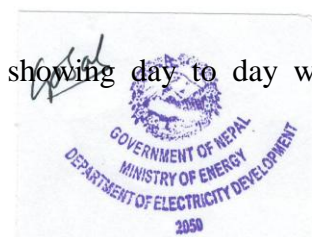
Total 14 holes @ 60 meter each in average = 840 m.

Exact location and required depth of drilling at various sites of the project structures shall be decided after completing geological mapping.

The Consent of DoED for drill depth, number of drill hole, drilling site and program/schedule, shall be taken before commencing drilling work. Similarly, the Consultant should require consent of Site Incharge /Engineer in order to determine the position of drill hole location at site before starting drilling and actual drill depth required in each hole during the course of drilling work.

The work to be performed shall include, but not limited to the following:

- Mobilization and demobilization of drill rig and its accessories.
- Platform construction and setting up of drill machine.
- Shifting of drill rig from one location to another including temporary access road construction.
- NQ size rock coring and water pressure testing.
- Maintaining of records like Daily Drilling Report (DDR) form showing day to day work progress
- Preparation of geological log of bore holes.
- Preparation of report with data analysis and interpretation.



Core drilling shall be conducted so as to obtain continuous cores with the maximum practicable amount of core recovery. Core barrels shall be double tube or triple tube, equipped with inner tubes

and diamond bits sized to produce "NQ size core. Every effort shall be made to recover the core within rock strata as 100 percent.

Three types of colored photographs: (a) photographs showing the site before drilling, (b) photographs showing the drilling operation at site and (c) photographs showing the stake after the completion of the investigation must be included in the report. Similarly colour photographs of each core boxes in digital and hard copy showing all the core recovered in each run needs to be submitted. In addition to photographs '*drilling work completion report*' from responsible Site Incharge/Engineer should also be submitted in the field investigation report. Failing to submit these requirements, payment against field work shall be deducted.

6.1.6.10. Core Boxes

Core sample taken from each borehole shall be placed in order inside the core box. After placement in core box, the core shall be photographed in color prints. All boxes shall be uniform in size. Each core box shall be capable of holding approximately 5 meters of core in parallel rows not exceeding one meter in length. Each core box shall contain partitions, which shall be arranged to allow for convenient marking and interpretation of core. Wooden core loose blocks and end of run blocks having a cross-section of 5 cm inside dimension shall be provided. Core losses shall be replaced in each run by the core loss blocks equal in length to the core loss. Wrapping in plastic shall preserve the soft soil or friable portions of core such as badly weathered and decomposed zone or joint fillings or other soil.

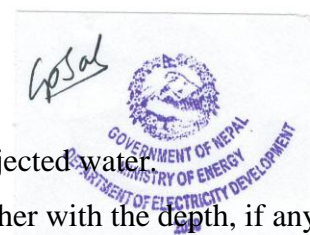
The Consultant shall be responsible for the cores and shall provide a suitable location for temporary storage of cores to protect them against theft, loss or damage during drilling of the hole. The Consultant shall manage to store securely the extracted cores properly in the specified core boxes in such way that these core boxes can be available for inspection at any time. The core boxes should properly maintain and sample to be placed inside starting from zero meter run up to termination of each hole. Similarly serial no of boxes, DH no, elevation, running meter including other necessary information needs to be written by enamel in each box and the same to be recorded in the register/computer.

After the completion of investigation work, all the cores and boxes will be the property of the Employer. The Consultant shall deliver all the core boxes to DoED without any additional cost.

6.1.6.11. Daily Drilling Report (DDR)

The Daily Drilling Rreport (DDR) shall include but not limited to the following items:

- Date:
- Location and hole no.
- Diameter of the hole:
- Depth and size of casing pipe
- Water level in the morning and evening
- Drilling time of each operation
- Drilling depth of each operation and daily progress
- Rate of water flow applied for drilling as well as return or loss of injected water
- Water loss and spring shall be recorded as detailed as possible together with the depth, if any.
- Color of water returned
- Diameter and type of drill bit.



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- Core recovery.
 - Description of subsurface conditions and all findings obtained during drilling
 - Model of drill machine used.
 - Name and signature of operator and recorder and the number of workers.

6.1.6.12. Bore Hole Logs

The Consultant shall prepare the geological logs of each of the bore hole simultaneously with drilling. The bore hole logs must be prepared by engineering geologist/geological engineer/geo-technical engineer in a standard format. The bore hole log shall contain at least the following information.

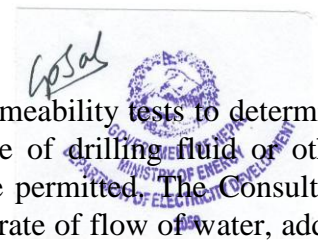
- Date (start and finish)
- Drill hole number
- Location
- Co-ordinates of DH location
- Elevation
- Drilling Machine
- Drilling method
- Casing type
- Depth of the hole
- Name of the Driller
- Core logging by:
- Core recovery %
- RQD
- Lugeon value
- Discontinuity characteristic
- Remarks

6.1.6.13. Borehole Locations

The pre-cast concrete pillar of size 10 cm x 10 cm x 100 cm long and marked with borehole number and elevation shall be driven at the location of borehole drilled. The height of the concrete pillar shall not be less than 1 m. However, if the Consultant have any noble ideas pertinent to the specific site, they are encouraged to put forward their investigation plan to DoED.

6.1.6.14. Water Pressure Tests

The Consultant shall measure the groundwater level and shall perform permeability tests to determine the water bearing characteristics of the overburden and rock layers. Use of drilling fluid or other substances that may affect the permeability of the overburden will not be permitted. The Consultant shall provide an adequate source of clear water, a means of measuring the rate of flow of water, added to the top of the hole and a means of measuring the depth of water in the hole.



The hole shall be advanced by driving casing to the required depth (s). Only flush joint casing shall be used and the casing shoe or bit shall have the same outside diameter as the casing. The objective of driving the casing is to obtain as tight seal as practical between the casing and the overburden to preclude leakage of water along the outside of the casing during testing. Drilling and casing techniques shall be oriented towards this goal. All cuttings shall be cleaned out to the bottom of the casing and the hole flushed with clear water. Clear water shall be added to fill the hole to the top of the casing, and the rate of fall of the water level in the casing with time shall be measured as required. Alternatively, clear water shall be added to the casing at a constant rate of flow and the rate of flow necessary to maintain the water level in the casing shall be measured as required. The following information shall be recorded:

- Hole number.
- Depth of bottom of hole.
- Depth of bottom of casing
- Diameter of hole, inside diameter of casing.
- Rate of fall of water level in the hole in centimeters per minute, or rate of flow of water added to the hole in liters per minute.
- Date and time of test.
- Name and signature of person conducting the test.
- Result of permeability test

At least 15 number of test should be carried out. However, if the Consultant feels any alteration shall submit alternative proposal to DOED for approval before commencing the work.

6.1.6.15. Permeability Tests

As required the Consultant shall measure the ground water level and shall perform water pressure tests (Lugeon tests) using suitable mechanical or pneumatic packers to determine the water bearing characteristics and rock mass condition of the rock. Use of drilling mud or other substances that may affect the permeability of the rock will not be permitted. The packer used shall be of double type.

The Consultant shall arrange an adequate source of clear water, pump(s) capable of delivering water at rates up to 130 liters/minute at pressures up to 10 kg/cm², packers capable of sealing off portions of the hole under pressures of up to 10 kg/cm², water meter(s) reading to the nearest 0.5 liters per minute with an accuracy within 10 percent, gauge(s) for reading water pressures up to 10 kg/cm² with an accuracy of 10 percent, a stopwatch, valves to allow regulation of flow pressure, and other equipment necessary to conduct the tests.

The hole shall be flushed with clear water prior to pressure tests. Tests may be conducted either progressively from the bottom of the hole upward for the entire portion of the hole in rock, or for isolated segments of the hole.

Water pressure tests shall be carried out in each borehole at 3 m intervals in general. Adequate reasons & evidences should be provided, if the number of such test has to be reduced due to some site specific conditions such as hole collapse. The test pressures for each section shall be changed at five steps. Prior to starting the test, three gauge pressures shall be selected, minimum, maximum and intermediate. Flow rate of injecting water shall be observed under each step of the pressure for 10 minutes after the flow rate becomes stable and shall be recorded at every minute.

The Consultant shall submit the daily report of the field permeability test for each test in suitable format. The report shall include, but not be limited to the following information.

-
- Date, hole no, test no, location
 - Packer type, hole diameter
 - Depth of packer setting and the bottom of borehole
 - Test length
 - Gauge height above the ground
 - Depth of water table
 - Pressure of water supply
 - Test period 10 minutes
 - Time of test
 - Name and signature of person conducting the test
 - Depth of casing
 - Pressure test results

6.1.6.16. Reports

The Feasibility Study reports shall contain short description of core drilling and its major findings and three copies of the detail report on core drilling shall be presented separately to DoED. However, if the Consultant have any noble ideas pertinent to the specific site, they are encouraged to put forward. The final location of drill holes should be presented in drawing.

6.1.7. 2D Electrical Resistivity Survey

6.1.7.1. General

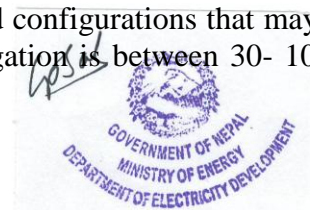
Unlike conventional electrical profiling in which only the lateral variation in the electrical resistivity is measured, the 2D electrical resistivity profiling is capable of showing both lateral and vertical variation in electrical resistivity. In this method, by increasing the distance between current and potential electrodes one can get information from deeper part of the sub-surface and by shifting both current and potential electrodes along a profile it is possible to record lateral changes in electrical resistivity. It shall be capable of detecting boundaries between unconsolidated material and rock, identifying weathered rock from fresh rock, contact between rocks of different lithology and different rock mass quality. A total of 9 km (approx.) survey shall be carried out at different component locations such as dam site, intake, powerhouse site and comprising weak zones as indicated by other means of investigations.

6.1.7.2. Data Acquisition

The 2D electrical profiling shall be conducted by using any of the standard configurations that may be varied according to the depth requirement. The planned depth of investigation is between 30- 100m depending upon the type of the structure to be considered.

6.1.7.3. Equipment

Measurements shall be conducted by using resistivity meter such as TERRAMETER SA300C (an ABEM product, Sweden) or other equipment having equivalent or better quality.



6.1.7.4. Data Processing

Data processing shall be done in two stages: electrical imaging and polygon modeling. Suitable computer software shall be used in each stage.

6.1.7.5. Analysis and interpretation

Geological interpretation shall be given to the electrical resistivity values obtained during polygon modeling. Final interpretation shall be presented in the form of geo-electric section showing both bed-rock overburden boundary and zones of different rock mass quality.

6.1.7.6. Reports

The feasibility study shall contain short description of 2D electrical resistivity survey and its major findings. Three copies of the detail reports on 2D electrical resistivity survey shall be presented separately to DoED.

6.1.8. Seismological / Seismicity Studies

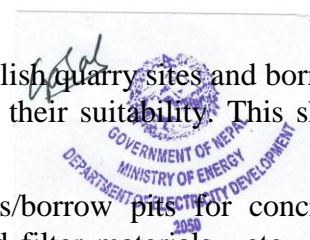
Seismological studies of project sites shall be performed to derive meaningful seismic design parameters that are necessary to ensure earthquake safety of the major structures under as required by the site location and its associated seismic hazard, the selected design and the risk of failure of the competent structure. The studies shall include but not limited to;

- Review of pertinent and available geological and seismological reports and data
- Establish database of historical earthquakes data in the vicinity of the project site with epicenter(s) and date(s) of occurrence, etc, based on details of seismological data collected from the seismological observatories installed by National Seismological Centre, Department of Mines and Geology and other available sources.
- Evaluation of seismic status of faults, thrusts and other weak features in the vicinity of the dam sites and within the region, etc.
- Seismic activity in the project area will be analyzed using history of earthquake that secured in and around Nepal.
- The result will be supplemented by the study of satellite images and aerial photos.
- Seismic risk should be specified in term of value and kinematic of co-seismic displacement and the return period in case of earthquake due to cross cutting of the active fault in the project structure.
- Based on the available information and assessment of local and regional seismicity, the seismic design criteria of structures shall be determined.

6.1.9. Construction Material Survey

The Consultant shall conduct construction material survey in order to establish quarry sites and borrow area. The Consultant shall also perform all the standard tests to confirm their suitability. This shall cover:

- Investigation for identification of locations of potential quarries/borrow pits for concrete aggregates, rock fill materials, impervious clay core materials and filter materials, etc., and preparation of maps identifying the borrow areas.



- Estimation of quantities of materials at different locations by geological mapping (plan and cross section) with pits/auger holes and drill holes as required. Various factors such as distance from the dam site, elevation and accessibility will be considered in selecting the quarry sites and borrow pits.
- Collection of samples
- Testing of samples and establishment of its suitability.
- Preparation of location maps showing the access road up to the quarries/borrow area & relating the same to the construction site(s).
- Investigation of materials that are available from necessary excavations for project structures during constructions

Laboratory tests must be conducted for construction materials as per ASTM or equivalent standards. Standard method of international standard must be employed for Sampling. Laboratory tests for cohesive materials includes the determination of grain size distribution, Natural moisture content, Optimum water content, Plasticity index, Permeability, Specific gravity. Laboratory tests for concrete aggregates includes the determination of grain size distribution, Fineness Modulus, Absorption, Sulphate soundness, Abrasion, Specific gravity, Alkali-aggregate reactivity, Hardness test etc.

6.1.10. Test pitting and trenching

The Consultant may be asked to carry out test pitting and trenching in order to establish sub-surface condition at some particular locations, if felt necessary. Test pits shall be excavated with minimum dimension of 1.5 * 1.5 m plan area at bottom. The number and depth (1 – 2 m) of the test pits and trenches shall be decided by DoED, nevertheless 5 number of test pits are assumed to be necessary for the project. The Consultant should also carry out standard penetration test/ dynamic cone penetration test (SPT/DCPT) as per the site requirement and must prepare Geological log of all the excavations made in the field.

The feasibility study reports shall contain short description of the test pitting, trenching and testing along with major findings and three copies of the detail reports on test pitting and trenching shall be presented separately to DoED. The final report shall contain original geological logs of all excavations. The report should also reflect the location of seismic refractive survey in the project layout plan.

6.1.11. Test on Core Samples

The following laboratory tests as applicable to type of sample must be conducted on the core(s) recovered from each drill hole. All of the tests must be repeated as per change in lithology and/or rock mass quality. However in any case the number of tests shall not be less than 5 sets in each hole. All of the tests shall be conducted as per ASTM or equivalent standards. Reasonable judgment shall be applied regarding type and number of following tests.

Point load index test

Absorption & Specific gravity test

Sodium Sulphate soundness test

Los Angeles abrasion test

Petrographic analysis



6.1.12. Interpretation of findings of geological and geo-technical studies

The synopsis of all the findings of geological, engineering geological and geo-technical investigations including engineering geological mapping, 2-D electrical resistivity tomography survey / seismic refraction survey, core drilling, water pressure tests and all other tests and analysis should be provided in a separate chapter under appropriate headings and sub-headings. This chapter should be provided in the main report as well as in the relevant appendices.

6.2. Flood Control Study (If applicable)

The proposed storage project will reduce the extent of floods in the downstream areas and thus could save life and properties in the downstream flood plain area. The suitable methods shall be applied to assess Average Annual Flood Damage (AAD). The downstream flood prone area may be divided into reaches (preferably 5 to 8). AAD shall to be calculated for each reach based on (i) Frequency-discharge, (ii) discharge-stage, and (iii) stage-damage relationships. With storage and without storage option are used to find annual saving on each reach. Suitable HEC model might be used for the assessment of flood benefit due to construction of reservoir projects at the upstream.

6.3. Access Road, Project Road and Transportation Study (Communication survey)

The Consultant shall carry out an assessment of existing infrastructure and transport facilities for the transportation of project materials/equipment like turbines and generators up to the project site from the India/Nepal border and shall propose for improvement wherever necessary to ensure transportation safely and effectively.

Similarly the consultant shall conduct assessment and survey for the project road to head works, powerhouse, access tunnels and quarry site. The access road and project road study should include the preliminary design, calculation of cost estimates and preparation of standard drawings of different components.

The Consultant shall carry out studies to identify the preferred road linkages for the project site with the existing road network of the area. The Consultant shall:

- carry out desk study for alignment selection proposing at least 3 alternate alignments;
- carry out pre-feasibility study of the alternate alignments and recommend best alignment for feasibility study; and
- carry out survey and feasibility level design and estimation of selected alignment including inventory of the cross drainage structures required.

6.4. Project Layout and Design

Feasibility level design shall be carried out based on the field investigations and optimization. Drawings for the main structures shall be prepared in such way that they can be readily converted into tender drawings at the detailed design phase.

The feasibility level design of the power facility shall include determining the optimum size and number of generation units in terms of capacity and energy generation in conjunction with the economic evaluation and the findings of the EIA taking into account the optimal installed capacity, transportation constraint and manufacturing capability. The Consultant shall determine the station control and power house substation arrangements and carry out the preliminary electrical and mechanical design. The design of project components will include, but may not be limited to the following:

-
- SR6 dam including reservoir, intake and spillway, penstock and power house
 - Navigation lock design for passage of ship from downstream to upstream of the project

Following components shall include for this study.

6.4.1. Regulation Works

This includes Diversion works (cofferdams, diversion tunnel/channel), permanent dams/weir/barrage, spillways/under sluice, bottom outlet gates, reservoir sediment flushing facilities, etc.

6.4.2. Ship Lock

This includes the ship lock for lifting of ship coming from downstream to upstream and vice versa safely for water navigation purpose.

6.4.3. Intake and Waterways

This includes headrace with intake trash racks, stop logs, gates, spillways, sediment traps, pressure shafts, and waterways consisting of canal/ tunnel, rock and sand traps, penstocks, valves, tailrace consisting of draft tubes or turbine pits, back water gates, surge arrangements, tailrace tunnels or canals, outlet works, etc.

6.4.4. Power Stations

This includes mechanical equipment such as turbines, regulators, cooling system, ventilation, drainage, cranes, etc. Electrical equipment such as generators, switchgear, transformers, auxiliary power supply, power cables, and control cables, communication system, protection and control equipment, switchyard etc. at powerhouse.

6.4.5. Transmission Line Works

The Consultant shall propose and carry out feasibility level design of transmission line from proposed power house site up to National grid or nearby sub-station whichever is shortest. The design shall include all necessary studies to confirm the adequacy of the design under static and dynamic conditions. The level of the preliminary design of the transmission line works shall be sufficient for the preparation of cost estimates of the project.

6.4.6. Auxiliary components

This includes access to project sites by roads/air lift (helipads), telecommunication, offices, workshop, housing facilities, utilities, recreation areas, construction camps, contractors' plants, borrow areas, etc.

6.4.7. Drawings

Before preparation of the drawing, the Consultant should approve the template from the DoED personnel. The drawing submitted by the Consultant should confirm DoED Guidelines



6.5. Construction Planning

Under this task a master schedule and construction program for development of the project shall be prepared. This work should define the pre-construction activities; access and transportation route and

method; contract packaging; locations of borrow areas for construction materials; construction methodologies; construction labor force requirements, construction camp and infrastructure facilities.

A project schedule shall be prepared which will highlight the key and major events. The critical activities and the critical path of activities in the schedule shall be illustrated. The Consultant shall also survey of contractor capacity in Nepal and discuss how the design can enhance by the use of local companies.

6.6. Cost Estimates

Feasibility level cost estimates of the projects shall be developed by adopting appropriate unit rates to the quantities of major items derived from the project drawings. In deriving quantities account shall be taken of anticipated site conditions as suggested by the site investigation activities.

For estimation purposes, unit rates shall be prepared based on the prevailing site conditions and will include direct (materials, plant and labor) and indirect costs. The cost of the electromechanical component shall be estimated on the basis of tentative quotations from qualified manufacturers and from the Consultant's database of cost of previous projects. All the unit prices shall be shown in local and foreign currencies.

The cost of mitigating environmental and social effects is to be included as a cost to the project. The cost of the construction management and engineering shall be included in the estimate as separate items. Appropriate contingencies will be adopted in account of those items cannot be adequately measure at the feasibility stage.

6.7. Power Market and Transmission Line Study

6.7.1. Power Market Studies

The Consultant shall conduct a market study to establish the potential future demand for energy and power in Nepal. The Consultant shall:

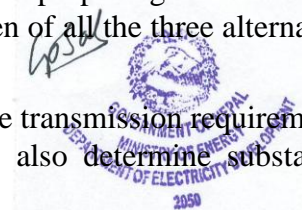
- review power market in Nepal;
- review the seasonal variation of energy and capacity demand and ability of the power systems to meet the energy and capacity demand;
- review the system load curves and load forecast;
- examine the existing and planned additions and alternative supply options in Nepal.
- Establish the capital and operating costs for the alternative generation options

6.7.2. Transmission Line and construction power study

The Consultant shall carry out a desk study for alignment/route selection proposing 3 alternatives alignments of transmission lines. A pre-feasibility study shall be undertaken of all the three alternative alignment in order to select the best one for feasibility study.

The Consultant shall carry out load flow and transient studies and determine transmission requirements to transmit power to the load centers in Nepal. The Consultant shall also determine substation requirements at interconnection points to the regional electricity network.

The feasibility study should include the preliminary design, calculation of cost estimates and preparation of standard drawings of different components of selected transmission line.



The consultant shall also conduct study for construction power supply required for project construction. The construction power study shall include study of nearby substation, transmission line required including the preliminary design, calculation of cost estimates and preparation of standard drawings of different components of construction power supply system.

6.8. Economic and Financial Evaluation

The Consultant shall prepare the necessary inputs for the economical evaluation and shall analyze the economic viability of the project taking into account the requirements of the integrated power system. The study shall carry out the assessment for multiple benefits from the project. The benefits shall include power benefits, irrigation benefits, flood control benefits, fish farming benefits and navigation benefits. While accessing these benefits the cost for accessing those benefits shall include for evaluation of the project

Indicators such as Net Present Value (NPV), Benefit Cost ratio, Return on Equity, FIRR, DSCR, discounted payback period and Economic Internal Rate of return shall be calculated.

Sensitivity analysis shall be applied on important parameters in order to check their impacts on the economic viability. The economic analyses shall be presented in sufficient detail to satisfy the requirements of the major lending agencies. In addition, the Consultant shall discuss how Clean Development Mechanism (Carbon dioxide Emission Reduction) credits can be included in the Projects. Also needs to calculate the quantum of CO₂ emission reduction, equivalent fuel wood produced by the area of forest land, saving equivalent to tons of LPG, Petrol, Diesel and foreign exchange saving per year by the development of this Project.

The Consultant shall carry out financial analysis of the projects and the project entity. In general, the financial analysis shall evaluate the commercial merits of the projects under alternative power market conditions (electricity market and demand), ownership models, financial packages and fiscal regimes. Several ownership scenarios should be presented, making reference to international experiences.

Risks associated with the project shall be identified and allocated to the party that is assumed to cover the risk in the most cost efficient way in order to minimize financial costs of the venture.

The various financial sources shall be assessed including public funds from Nepal and other countries that may benefit from the projects, multilateral/ bilateral organizations, and commercial financial institutions.

6.9. Reports for Feasibility Study

The Technical Reports shall comprise a series of Reports covering the main technical issues as listed in the Table below.

Each report shall complete with an Executive Summary and shall include salient features of the project, maps, drawings figures and diagrams as necessary. The reports shall include Annexes providing the basic data used in the analysis.

S. N.	Report	Submission Date (End of months)	No of Copies
1	Inception Report	3	20
2	Topographical Survey and Mapping Report	8	20
3	Geological Baseline Report	12	20
4	Hydrological, Sedimentation and GLOF Study Report	15	20
5	Power Market, Power Evacuation Study Report	18	20

6	Interim Design Report inclusive Power, Fisheries, Navigation and other recreational activities.	20	20
7	Cost Estimation Report	22	20
8	Economic and Financial Analysis Report	22	20
9	Draft Report	24	20
10	Draft Final Report	26	20
12	Draft Consolidated Report	28	20
13	Final Report–Consolidated Report (Feasibility Study and EIA)	30	30

6.9.1. Inception Report

The Consultant shall submit the Inception Report after completion of desk study, literature review and field reconnaissance. The Inception Report shall include the review of the desk study report and all other relevant reports, maps, data and information. The Consultant shall verify (or propose modification), through field reconnaissance as necessary, of the project layout and locations of main dams. Based on information collected, the project work plan (as presented in the Consultant's proposal) shall be updated and presented in the Inception Report. Any major modifications must be approved by the Client.

6.9.2. Topographical Survey and Mapping Report

The Report shall present details of the topographic survey activities and shall provide a complete description of all mapping prepared during the study. The co-ordinate of dam and appurtenant structures, drill hole location point, quarry site etc. shall be included. It shall include details of all reference points such that the information is readily available during future stages of project development. The topographic map shall be handover to the client in digital format (workable in AutoCAD/land development) eg. Dwg/Dxf. format for future work.

6.9.3. The Geotechnical Baseline Report

The Report shall include all results, data and interpretations recovered from the geotechnical studies and site investigations. The corresponding interpretations and recommendations shall be made in such a manner that it can be used as a stand-alone document for further development of the projects.

6.9.4. The Hydrology and Sedimentation Study Report

The Report shall describe the hydrological activities undertaken during the study including establishment of hydrometric stations, flow measurement and sediment sampling. The report shall also present the analysis of the hydrological data and present results and conclusions regarding magnitude and variability of flows and flood estimates.

6.9.5. The Power Market, Power Evacuation Study Report

The report shall describe the power market in Nepal, shall present the results of the power system studies and power evacuation studies.



6.9.6. The Interim Design Report

The report shall include the findings of project layout and optimization, hydraulic design, hydro-mechanical design, electro-mechanical design and electrical design, Fisheries, Navigation and other recreational activities. It shall include the progress of design works completed within the reporting period.

6.9.7. Draft Report

The report shall include the complete feasibility study reports of the projects including design, optimization, drawings, quantity and cost estimates, construction planning, power evacuation plan, economic and financial analysis and other details as mentioned in the scope of work.

6.9.8. Draft Final Report,

The Consultant shall submit the Draft Final Reports incorporating the comments made by DoED/TAG based on their professional knowledge and experience. The Consultant has to present the findings contained in the Draft Final Report to the TAG/DoED including concerned stakeholders. The venue and date of presentation will be fixed by mutual consultation. The name list of participants will be provided by DoED, which will include the representative from different organizations, professional experts and concerned stakeholders. The suggestions and comments provided at the presentation will also be duly incorporated by the Consultant in the final reports.

6.9.9. The Final Report

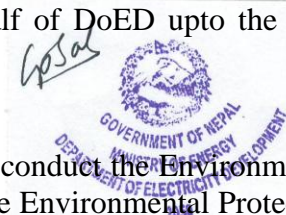
The Final Report shall include the complete feasibility study of the project including design, project optimization, drawings, quantity and cost estimates, construction planning, power evacuation plan, economic and financial analysis and other details as mentioned in the scope of work. It shall also incorporate the recommendations made in the approved EIA Report. This Final Report will, therefore, be the consolidated report based on both the Feasibility Study and EIA. The Consultant will also present the consolidated report to the DoED. The comments and suggestions made in presentation are to be duly incorporated in the Final Report. The Consultant shall submit two copies of electronic version of the complete report on compact disk in addition to the hard copies of the reports in requisite number as mentioned above. The electronic version of the report shall include the complete report, drawings and all calculations (in actual working format, xls, dwg, doc) compatible with mainstream software.

7. Environmental Impact Assessment (EIA) Study

The Consultant shall make a detail study of the project area and project affected area for the environmental impact (EIA) study including social safeguard related studies. The EIA study will be carried out by the EIA team of the Consultant in conjunction with the technical team of expert for the feasibility study. A separate detailed report of EIA shall be submitted to DoED. The consultant shall be responsible to incorporate comments from DoED/MoEn/MoSTE on behalf of DoED upto the final approval from MoSTE.

7.1. Objective

The objective of the Environmental Impact Assessment of the Project is to conduct the Environmental Impact Assessment of the Project in accordance with the requirements of the Environmental Protection Act, 2053 and Environmental Protection Rules, 2054 (with amendments) and safeguard policies with regard to environmental protection, resettlement and rehabilitation. The Consultant shall indicate in



their proposal which practice and policy they intend to follow in the study. In general, Consultant shall adopt National/international best practice including ADB/WB Guidelines on social analysis.

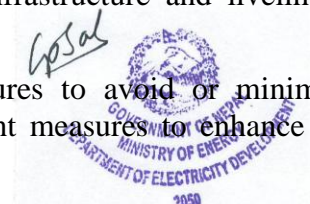
7.2. Scope of Work

The scope of work of the Environmental Impact Assessment study including social safeguard related studies of the SR6 Multipurpose Project(Hydropower component, Resettlement Study, Flood control Benefits, Water Transport, Fisheries and Recreational perspectives includes detailed field surveys, analyses and preparation of Scoping Report, TOR for EIA and EIA Report as per the Environmental Protection Act, 2053 and Environmental Protection Rules, 2054 (with amendment). The EIA study is to be carried out in two phases as follows:

- a) Preparation of Scoping Document and Terms of Reference
Environmental Impact Assessment.

The scope of work to be covered under the Environmental Impact Assessment shall include, but not necessarily be limited to, the following:

- Collect and review previous studies, existing project reports, drawings, maps, related legislation, policies, manuals etc.
- Delineate the project areas to be covered in the EIA study.
- Evaluate and analyze environmental and related legislation, environmental standards, policies, plans and international conventions for the EIA study.
- Identify the concerned authorities, interested organizations, affected communities and stakeholders to be consulted during the study.
- Collect baseline environmental data (physical, biological, socio-economic and cultural environment).
- Identify key environmental issues/impacts on physical, biological, socio-economic and cultural environment associated with project implementation.
- Analyze the significance of environmental impacts in terms of magnitude, extent and duration.
- Identify and analyze the various alternatives in planning and design of the projects from environmental considerations.
- Enable the authorities, stakeholders, local people, and affected communities to adequately participate in discussions/ hearings that dwell on the acceptability of the project, availability of alternatives, potential impacts and possible mitigation measures.
- Assess and estimate the number of families to be affected and displaced, and study their socio-economic conditions as well as ways for the betterment of their living status.
- Delineate the submergence areas due to the creation of reservoirs.
- Assess and estimate the loss of natural resources due to the creation of reservoirs; assess impacts on the physical, biological, socio-economic, cultural, infrastructure and livelihood aspects at different dam heights.
- Propose pragmatic, specific and cost-effective mitigation measures to avoid or minimize potential adverse environmental impacts and suggest enhancement measures to enhance the beneficial impacts.
- Prepare an environmental management plan to implement the proposed mitigation measures.
- Prepare environmental monitoring plans.



- Prepare environment auditing plans.
- Monitor water quality, air quality, and noise levels for establishment of baseline monitoring data.
- Identify the potential areas for resettlement of the displaced families.
- Prepare resettlement and rehabilitation plans for project affected and displaced families.
- Carry out soil suitability survey and plant species survey from agriculture perspective for implementation of possible agricultural livelihood enhancement programs.
- Conduct public hearings at least two in locations within the project areas.
- Inform decision-makers and interested parties about the environmental implications of the proposed projects.
- Prepare and submit Scoping, ToR and EIA Reports as per the requirements set forth in the environmental legislation.
- Present the Scoping Report, ToR and EIA Reports to TAG/DoED and Review Committees.
- Incorporate the comments provided by the client and agencies in authority.
- Organize workshops to disseminate the outcomes of the study.
- Meet the reporting requirement as specified in this ToR and environmental legislation.

7.3. Preparation of Scoping Document and TOR

The Consultant should prepare a scoping document. The Consultant should follow all steps as mentioned in the Environment Protection Rule, 2054 while preparing the Scoping document. The Consultant shall publish a public notice as per Rule – 2 of the Environment Protection Rule, 2054. Comments and suggestions received in response to the notice should be suitably incorporated in the Scoping Report. The Consultant should prepare a draft ToR based upon the draft scoping report as per the format mentioned in the Environment Protection Rule, 2054. The Consultant should consult/involve concerned and affected persons and parties while identifying the issues/impacts likely to be occurred during implementation of the project during the course of preparation of the Scoping document.

The Consultant should submit both the draft Scoping documents & ToR to DoED. DoED after reviewing the draft documents will send its comments on these documents to the Consultant and the Consultant shall incorporate these comments to the satisfaction of DoED. During the approval process of these documents, the Consultant shall be responsible for preparing and presenting the Scoping document & ToR on behalf of DoED in MoSTE. The Consultant shall incorporate all comments if any, to the satisfaction of MoSTE suggested and required by MoSTE during the approval process of Scoping document and TOR. Only after the approval of Scoping document and ToR by MoSTE as per Environment Protection Rule, 2054, the jobs of preparing Scoping document & ToR will be considered completed.

7.4. Environmental Impact Assessment

7.4.1. Baseline Study

The Consultant shall carry out a baseline study of the existing environmental parameters in the Impact Zones. All existing data shall be assessed and used directly in the EIA when relevant or used as basis for design of surveys and studies.



For the Impact Zones of the project the baseline study shall include, but not be limited to the followings:

- Description and classification of geology, topography, soils and vegetation;
- Description of flora and fauna, including identification of rare or endangered species. Any endemic, endangered species shall be identified;
- Identification of any existing and potential National Parks, wildlife sanctuaries and other protected areas with their borders, buffer zones and regulations imposed;
- Description of climate and information on temperature, precipitation and hydrology. Characteristic data with seasonal variations and for normal, wet and dry years shall be provided at important locations. The data will also include erosion and sediment transport characteristics, as well as flooding problems;
- Information on water quality (surface and subsurface) with physical and chemical characteristics;
- Description and classification of agriculture, including livestock and industry;
- Description and classification of fisheries and aquaculture, including temporal and spatial migration patterns of migratory fish species from SR6 dam to the upper reaches of the reservoir;
- Description of infrastructures including status of residential building
- Description of archaeological sites;
- Description and data on tourism;
- Description of water use (drinking water, irrigation, industry, hydropower);
- Description and data on transportation on the river;
- Identification of sources and types of pollution and assessment of recipient conditions of surface and subsurface water;

7.4.2 Impact Analysis and Quantification of Loss of Environmental Services

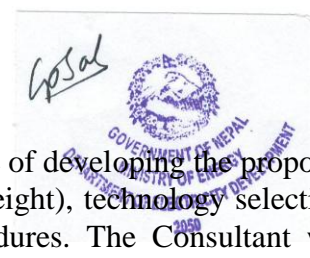
The EIA shall evaluate and quantify the value of the environmental services lost by building and operating the Projects with respect to the environmental services identified in the baseline study.

Impacts (positive and negative) shall be studied and analyzed based on information in the baseline survey and the interventions caused by the project implementation (construction) and subsequent operation. Any “red light warning signals” coming out of the baseline study shall be given special attention. The study shall also identify any externalities which may influence the outcome of the project and its effect on the environment.

All environmental and social risks shall be identified, analyzed and described. Loss of Environmental Services shall be identified and quantified.

7.4.3 Analysis of Alternatives

The Consultant shall describe alternatives that were examined in the course of developing the proposed project. The concept of alternatives extends to siting, design (e.g., dam height), technology selection, construction techniques and phasing, and operating maintenance procedures. The Consultant will compare alternatives in terms of potential environmental impacts; capital and operating costs; suitability under local conditions; and institutional, training and monitoring requirements. To the



extent possible, costs and benefits of each alternative will be quantified, incorporating the estimated costs of any associated mitigating measures.

7.4.4 Environmental Management Plan and Mitigation Measures:

The Consultant shall recommend feasible and cost-effective measures to prevent or reduce significant negative impacts to acceptable levels. The recommendations will be presented in the form of an Environmental Management Plan using the matrix method. Construction and post construction measure will be outlined.

The Consultant shall estimate the impacts and costs of implementing those measures, and set out the requirements and cost for institutional and training requirements to implement them. The Consultant will consider all issues related to compensation to affected parties for impacts which cannot be mitigated. The Environmental Management Plan will include proposed work programs, budget estimates, schedules, staffing and training requirements or other necessary support services to implement the mitigating measures.

7.4.5 Identification of Institutional Needs to Implement EIA Recommendations:

The Consultant shall review the authority and capability of institutions at local, regional, and national levels and recommend steps to strengthen or expand them so that the management and monitoring plans in the environmental assessment can be implemented. The recommendations may extend to new laws and regulations, new agencies or agency functions, inter-sectoral arrangements, management procedures and training, staffing, operation and maintenance training, budgeting and financial support.

7.4.6 Environmental Monitoring and Auditing

The Consultant shall prepare a detailed plan to monitor the implementation of mitigating measures and the impacts of the project during the construction phase and the operation phase. The plan will include an estimate of capital and operating costs and a description of other inputs (such as training and institutional strengthening) needed to carry out the monitoring activities.

7.5 Environmental Reports

The Environmental Reports shall comprise a series of Reports covering the main environmental and social issues as listed in the Table below. The report shall be complete with an Executive Summary and shall include maps, drawings and data collected and/or used in the analysis.

S. N.	Reporting	Submission Date (Months after Commencement)	No of Copies
1	Draft Scoping Report and ToR to DoED	15	20
2	Scoping Report and ToR to DoED	17	20
3	Submission of Scoping Report and ToR to MoSTE	19	20
4	Submission of Approved Scoping Report and ToR to DoED	20	20
5	Environmental Baseline Report	21	20
6	Draft EIA Report to DoED	22	20
7	EIA Report to DoED	25	20
8	EIA Report to MoSTE	27	30

9	Approved EIA report from MoSTE	30	30
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The Consultant shall submit 2 copies of the electronic versions of the approved Scoping, Terms of Reference, Environmental Baseline and EIA Reports in addition to the hard copies of the reports in requisite number as mentioned above. The electronic versions of these reports shall include the complete documents approved by the Ministry of Science, Technology and Environment, and shall include all the data in appropriate formats compatible with mainstream software.

The Consultant shall submit the Inception Report after completion of desk study, literature review and field reconnaissance. Based on information collected, the project work plan (as presented in the Consultant's proposal) shall be updated and presented in the Inception Report. Any major modifications must be approved by the Client.

The Environmental Baseline report shall provide a description and presentation of environmental and socio-economic Baseline conditions.

The Consultant shall prepare a table of contents for the Environmental Impact Assessment report and submit it to the Client for comments and approval. The Environmental Impact Assessment Report shall clearly recommend the measures required should the project be developed so that decision makers can use it as a document on which to base their decision whether to proceed with the Project.

8. Duration of Services

The estimated time for completion of the complete assignment shall be Thirty (30) months. Out of the total 30 months, 24 months in Feasibility and EIA study and remaining 6 months will be utilized to consolidate & finalize the EIA and Feasibility study reports.

9. Professional Requirement

The assignment shall be undertaken under the overall direction and management of an experienced Team Leader who will coordinate the activities of the technical and environmental teams and shall be the principal point of contact for the Client.

The Consultant's Technical Team shall comprise well qualified engineers and specialists in other disciplines, with extensive international experience, together with National professionals and support staff as appropriate.

The Consultant's Environmental Team shall work under the direction of a well-qualified Environmental Coordinator/Team leader. The team shall comprise national, regional and international experts in the necessary disciplines together with supporting staff.

A. Feasibility Study Team

i. International professional

S. N.	Job Title	Office work (A)		Field Work (B)	
		No.	MM	No.	MM
1	Hydropower Engineer				
2	Geologist/Geotechnical Engineer				
3	Hydrologist/Sediment Engineer				
4	Fishery Expert				

5	Hydro Mechanical Engineer				
6	Navigation Engineer				
7	Dam Engineer				
8	Seismologist				

ii. National professional

S.N.	Job Title	Office work (A)		Field Work (B)	
		No.	MM	No.	MM
1	Team Leader				
2	Hydropower Engineer				
3	Senior Surveyor				
4	Engineering Geologist				
5	Geotechnical Engineer				
6	Geophysist/Seismologist				
7	Hydrologist				
8	Hydraulic Engineer				
9	Highway Engineer				
10	Electrical Engineer				
11	Mechanical Engineer				
12	Navigation engineer				
13	Fishery Expert				
14	Cost Estimator (Civil Engg.)				
15	Economist (Financial Analyst)				

B. EIA Study Team

S. N.	Job Title	Office work (A)		Field Work (B)	
		No.	MM	No.	MM
1	EIA Expert (EIA Team Leader/Coordinator)				
2	Environmental Engineer				
3	Sociologist/Anthropologist				
4	Zoologist/Aquatic Life Expert				
5	Botanist/Ecologist/Forest Expert				
6	EMP Expert				
7	Resettlement Expert				

For every key position the Consultant shall provide a brief, approximately ¼ of a page, position description of the personnel stating functions, tasks and responsibilities and depict this staff-task relationship in a responsibility matrix showing clearly the assignments of each staff member. Experience and past achievements of each individual shall be presented exclusively in the CV. The

temporal assignment of the staff shall be shown on a Staff Time Schedule and will become part of the Consultant Contract.

10. Knowledge Transfer and Inspection/supervision of the study

In carrying out their duties the Consultant shall involve local consultants and DoED staffs with technical responsibility and the transfer of technology to strengthen institutional capabilities of DoED. The Consultant shall propose appropriate knowledge transfer methodologies to enhance the capacities of the relevant counterparts in all aspects of the investigation activities, planning, design, economic/financial analysis including environmental and social assessments of the project. Knowledge transfer will primarily be achieved through on-the-job training as well as short term internal courses and presentations on relevant subjects to the study.

The work shall include but not limited to the following activities:

- b) DoED engineers shall be involved with technical responsibility since the beginning of the project.
- b) Organize interaction program for technical discussion in presence of DoED Engineers during various phase of study such as field investigation, data collection, design, analysis, report preparation and so on.

Inspection and supervision of the study works comes under the responsibility of DoED. In this connection DoED will deploy Engineers at site since the beginning for which the consultant will arrange one vehicle for DoED in order to monitor and inspection/supervision of the work during entire study period. Keeping in view the concept of an integrated team, where the DoED counterpart staff performs an active role with shared responsibility, as of necessity training shall be geared to preparing the staff for the task assignments which is coupled with intensive on-the-job experience type know-how transfer occasionally supplemented by seminars and Home/Office interaction. A review meeting of the Project works by the engineers of DoED shall be conducted either in the home office of the Consultant or in DOED.

Knowledge transfer program comprises of the design methodology of the overall project as well as the following residential training for at least 5 Engineers in the major town of same river basin along with the site visit of that project as well as the study related project in vicinity of the project area with the field works. The training topic should be as follows:

1. Dam Design

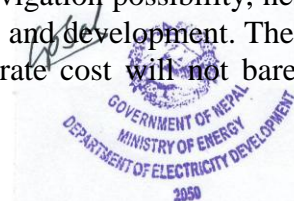
The dam design comprises of nature and type of dams that has been practicing in Nepal. This should incorporate the dam design methodology of concrete, rockfill, earthen as well as arch (single curvature, Double curvature). The training instructor for this topic is international expert Dam Engineer for managing training in this topic. The Dam Engineer should not stick on theoretical resources only. The field allowance and cost of the trainer has been already allocated in the manpower package.

2. River Navigation

The training resources under this topic is Navigation Engineer under international expert and has to manage the training program accordingly. The training shall include the navigation possibility, nessery investigation for Navigation, International practices as well as recent trends and development. The man days of the resources is already included under manpower cost so, separate cost will not bared by DoED. The study should also be the theoretical as well as practical basis.

3. Hydrological and Sediment analysis

The training Resource Persons under this topic must be the International expert on Hydrologist/Sedimentologist. The man days of the resources is already included under manpower cost so, separate cost will not provide by DoED.



The overall training days should include

SN	Training Type	Theory (Days)	Field work (Days)
1	Dam Design	4	3
2	River Navigation	3	2
3	Hydrological and sediment analysis	3	2

11. Handover of the equipment and articles

DoED lacks logistic support to handle the large projects because the annual logistic support is only sufficient for the regular tasks only. Therefore, it has to add some logistic support that has to be used by the study team only so that the study project can be implemented well. Besides this, timely monitoring and evaluation is the another task that has to handle by the DoED. Hence, DoED utilizes the facility under the study package in order to improve the efficiency of the project.

All other logistic supports and facilities such as laptops*, computers along with necessary accessories*, plotter*, furniture, and office equipment shall be purchased by the consultant and the cost of such facilities required by the consultant to carry out the assignment shall be included in the consultant's proposal. Additionally, the telemetric hydrological station, in proper working condition should be handed to DoED after the completion of the study. The consultant must submit the detail inventory & VAT bills of purchased equipment and articles for making payment. The item under provisional sums should be purchased with the specification provided by DoED.

**items to be purchased according to DoED specification, and after the completion of the assignment, these equipment and articles should be handed over to DoED. However, among them two computers along with necessary accessories, one laptop and one color plotter must be handed in advance to DoED at the time of submission of inception report*

12. Payment schedule

DoED will sign a single contract with the Consultant for the Feasibility Study and Environmental Impact Assessment Study of Seti River (SR6) Storage Project. As mentioned earlier, the study will have two separate components (1) Feasibility Study of Seti River (SR6) Storage Project and (2) Environmental Impact Assessment of Seti River (SR6) Storage Project. The Payment to the Consultant will be made based on the reporting requirements as mentioned below:

S. N.	Mobilization/ Submission of Reports	% of Payment
1	Inception Report for Feasibility study and its approval from DoED	15%
2	Topographic survey report, Geological baseline report, Hydrology and Sedimentation Report and their approval from DoED	20%
3	Interim Design Report including Power, Irrigation, Flood control Fisheries and Water Transport studies and its approval from DoED	20%
4	Draft Report including draft EIA report and its acceptance from DoED	15%
5	Draft Final Report and its acceptance from DoED	15%
6	Final Report-Consolidated Report (Feasibility Study and EIA Study) and its approval from DoED//MoSTE	15%