NEA Engineering Company (NEC)
Terms of Reference
REGISTER OF SPECIALISTS AND EXPERT ENGINEERS AND INTERNATIONAL TEAM LEADER

1. Background

The NEA Engineering Company Limited (NEC) is under negotiation with VidhyutUtpadan Company Ltd for Feasibility Study of PhukotKarnali Hydro Electric Project (PKHEP) 426 MW at Kalikot District as well as other similar projects with several other organizations. This call for application is intended to establish a Register of Specialists and Senior Engineers and Experts, who may be called upon as required for assignments as mentioned below, subject to the Specialists availability and mutually agreed terms and conditions.

2. Objective of the Consultancy

The NEC intends to retain the services of National and International Experts and Specialists, for a Technical Support Group (TSG), who are experienced in the design and development of large hydraulic infrastructure to provide independent advice and guidance to the Projects. The Register of Specialists shall also form a Resource Pool for current and other consultancy works that NEC will engage on.

The objective of the Specialists is to review and guide the components of the Project, comply with international standards of excellence and safety, as reflected in the practice, and the legislation, regulations and guidelines of Nepal.TSG expert will be hired on daily or weekly or monthly or delivery basis based on the input requirement and the availability of experts. Same TSG resource can provide two or more expert services depending upon the specific cases.

Besides TSG for the Phukot Karnali Project, the specialists may be called upon for any other project study or investigation and design as NEC requires and may be engaged upon in the future.

3. Composition of the Specialists for the Register

Register is expected to contain specialists for the TSG as well as other assignments. It is envisaged that the TSG will comprise following experts:

1. Dam Engineer
2. Geotechnical Engineer
3. Tunnel Engineer/ Expert
4. Hydro-Mechanical Engineer/ Expert
5. Structural Engineer
6. Hydrologist/ Hydrology Experts
7. Hydropower Engineers/Experts
8. Seismological Expert
9. Electro-mechanical Engineer/ Expert
10. Financial/Economic Analyst
11. Power system Analyst
12. Construction Planner
13. Contract Expert
14. Transmission Line Engineer/Experts
15. EHV Substation Engineer
16. Team leader (National/International)

4. Scope of Services

The primary tasks of the TSGexpertwill include, but not necessarily be limited, to the following:

SN	Details	Duties	Education &Experience
1.	Dam Engineer	• Review and develop, oversee and interpret the geotechnical investigations primarily focused on hydro projects with dam/reservoir options • Preparation of design basis memo for dam (RCC, CFRD, Arch Dametc based on site condition) • Extensive exercise for the optimization of dam height and reservoir regulationand reservoir simulations • Review and design of dam stability for different loading conditions • Work as mentor for the NEC team member • Help NEC team leader for the preparation of reports • Must have demonstrable skill in the evaluation of technical performance, identifying potential improvements • Strong abilities to communicate both orally and in writing • Work together with hydrologist and reservoir simulation expert for floods and routing effects • Understanding of international dam regulations	• Master in Civil Engineering or Equivalent • Extensive experience with dam/weir foundation design activities • Understanding of international dam regulations is a plus • Experience with International consulting company or project is a plus • Preference for the involvement in current large project running inside the country with International Consulting/Contractor firms • Minimum of 15 years of experience working on engineering projects with 10 of those years having experience in hydropower projects preferably capacity more than 100 MW during feasibility and tender design or construction
2.	Geotechnical Engineer	• Develop and review design calculations, maps and drawings specific related to geotechnical analysis prepared by NEC team • Extensive guide and support the NEC team member for foundation design activities • Understanding of international dam regulationsfor design aspects. Review and performs calculations and analyse related to tunnel and underground structure design • Guide or help to manage local and regional geotechnical resources to support project work • Manage local and regional geotechnical resources to support project team under NEC • Inputs for the preparation of design basis memorandum	• Minimum of a M.S. in Geotechnical/Geological Engineering with preference given to advanced degrees and training • Minimum of 15 years of experience working on engineering projects with 10 of those years having experience in civil/geological engineering of hydropower projects preferably capacity more than 100 MW • Direct experience on at least one hydro projects with tunnel options under construction • Ability to travel nationally and work independently at remote sites. • Ability to lead and mentor younger

		• Ability to prepare or review technical reports • Strong abilities to communicate both orally and in writing	professionals. • Registered Professional Engineer or affiliated with professional organization
3.	Tunnel Engineer	• Responsible for coordination and productivity of subordinates and provides technical guidance to less experienced engineers, • Work closely with other disciplines and multi-discipline projects, • Guides and coordinates design development and assists in providing technical expertise in design works, • Review and performs calculations and analyse related to tunnel and underground structure design, • Performs calculations and analyses related to excavation support system, • Communicates effectively with Sr. Geotechnical/Tunnel leads on the job other discipline's designers, sub consultants and co-workers • Review and responsible for completion of discipline engineering project elements such as reports, designs, specifications and plans, • Inputs for design basis memorandum preparation	• Minimum of a M.S. in Geotechnical/Geological Engineering • Preference with MSC in geotechnical and PhD in tunnel engineering • Preferably minimum of 15 years of working experienceon tunnel for hydropower projects • Preferably worked as panel of expert or tunnel expert will be a plus • Have experience with Phase II design software for tunnel and support works • Experience with International consulting company or project is a plus • Knowledge of settlement estimates and monitoring requirements for soft ground TBM tunnel is value added, • Preference with experienced in Finite Soil-Structure interaction analysis & design software, FLAC2D, FLAC3D, Larsa4D, SAP2000, GT-Strudel, PLAX-3D and 2D modelling etc or similar are plus points • Registered Professional Engineer or affiliated with professional organization
4.	Hydro-mechanical Engineer/Experts	• Provides support for design review and quality assurance • Responsible for coordination and productivity of subordinates and provides technical guidance to less experienced engineers, • Works closely with other disciplines and multi-discipline projects • Review and guidelines for design development and assists in providing technical aspects,	• Minimum of a Master in Mechanical engineering • Minimum of 15 years of experience working on engineering projects with 10 of those years having experience of hydropower projects capacity preferably more than 50 MW • Direct experience on at least three hydro projects completed or under constructions

		• Performs calculations and analyses related to tunnel and underground structure design, • Review of hydro – mechanical components • Review and guide the hydraulic calculations prepared by NEC team member and work as mentor • Design and review of Penstock, Gate and valve • Design and review of steel liner and similar components • Well exposed with the performance of turbine and its accessories • Prepare deigns basins memorandum for hydro-mechanicalworks	
5.	Structural Engineer	• Reviews and guidance for site plans, specifications, design criteria, and other available data preparatory to the accomplishment of the structural design and the preparation of design analyses • Participates in pre-design conferences/meeting with NEC teamfor validating requirements, identifying project constraints, defining the problem, and determining applicable design criteria. • Review and coordinates structural design and foundation requirements with all other design disciplines to provide a coordinated and comprehensive design product conferring on such matters as survey and soil boring data, siting, phasing of construction included in contract specifications, etc. • Review and prepare guidelines/design basis memorandum for the project activities • Review and perform calculation for structural analysis for Dam, spillways, under sluice, bottom outlet gates, sediment flushing facilities, cofferdams, tunnel etc. • Review and prepare reports for different levels of the study	• Minimum of a Master in Structural engineering • Minimum of 20 years of experience working on engineering projects with 10 of those years having experience of hydropower projects capacity more than 20 MW • Preferably direct experience on at least three hydro projects completed or under constructions • Design confidence for the requirement of reinforcement and bending moment • Can analyse hydro-dynamic or live load effect on the structure • Experience with software like, SAP, Staad Pro, or similar • Preference for the involvement in current large project running inside the country with International Consulting/Contractor firms
6.	Hydrologist	• Review and develops surface water and hydrogeologic study designs, and site conceptual models. • Establishes, reviews, and evaluates water resource and water	• Minimum of a M.S. in Water Resource Engineering • Preference with PhD in water resources

		quality data collection and analysis. • Review and comments on major hydrogeologic projects or investigations for surface water and/or groundwater investigations as well as technical evaluations and their applications to hydrogeology • Review and cross check analysis of hydrogeologic data/information, prepares written reports of study findings, and presents oral and/or written briefings of findings and others as needed • Review and guides for the calculations of floods hydrographs and routing effects due to the rainfall pattern and catchment conditions	• Minimum of 20 years of experience working as hydrologist • Worked as expert or panel of expert for hydro projects preferably more than 100 MW • Experience with hydrological numerical modelling related to reservoir and catchment analysis • Preference for the research work done for Nepalese catchment especially non-gauged area • Preference for the involvement in large project running inside the country with International Consulting/Contractor firms
7.	Hydropower Engineers/Experts	• Review and guide civil, structural and hydraulic calculation and analysis done by NEC team • Review and comments on civil drawings and specifications • Review and comments on feasibility studies, alternative analysis, design criteria and other reports • Review the feasibility studies from the view point of overall engineering aspects in accordance with international best practices. • Review the reservoir sedimentation study carried out by the hydrological engineer to identify the least cost solution with minimum environmental impacts. Reflect the optimal design in the cost estimates and tender documents. • Help to plan a hydraulic model test on sediment flushing facilities • Review and prepare any disaster risk management plan including local flood control and early warning systems, with the hydrological engineer. • Revise and finalize a generation scheme based on the reservoir sedimentation study with the hydrological engineer. • Review and prepare reports for different levels of the study	• M.Sc. or higher degree in civil engineering; • Membership of a professional institution; • 15 years' experience in construction/contract management of dam or other related major civil infrastructure projects in hydropower sector • Fluency in communicating in the English language andGood report writing skills. • Experience in working in multi-national and multi-disciplinary work teams is plus • Experience with reservoir simulation and hydraulic design of spillways, gates, bottom outlets, energy dissipater, PH sizing and optimization etc • Preference for the involvement in large project running inside the country with International Consulting/Contractor firms • preferably experience in hydro projects more than 100 MW during feasibility and tender design or construction

		• Work and review the project documents with respect to FIDIC form of contracts	
8.	Seismological Expert	• Seismological study of project to derive seismic design parameters, to ensure earthquake safety of the major structures and its associated seismic hazard, the selected design and the risk of failure of the competent structure. Review of pertinent and available geological and seismological reports and data. • Establish database of historical earthquakes data near the project site with epicentre(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 • Seismic risk should be specified in terms 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. • Inputs for the preparation of design basis memorandum	• An advanced degree in Seismology, Earth Quake Engineering, or other relevant majors, • Minimum 15 years of experience in relevant professional works, • Preferably having worked as an Earth Quake expert in various projects • Extensive experience in Earth Quake data collection and analysis. • Preference for the involvement in current large project running inside the country with International Consulting/Contractor firms
9.	Electro-mechanical Engineer/ Expert	• Examine methods of electric equipment installation works, considering the site conditions. • Review the technical section for the electrical equipment in the tender documents. • Review the hydropower planning engineers prepare a	• MSE degree in Electrical Engineering, or other relevant majors, • Minimum 15 years of experience in relevant professional works and 10 years in hydro power projects.

		schedule for design, transportation, and installation works for the electrical equipment. • Review cost estimates for electrical equipment based on the construction schedule. • Review prepared 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 prepared by the NEC team. • Review construction power study for project construction and finalize construction power study of nearby substation, transmission line required including the preliminary design, components of construction power supply system prepared by the NEC team. • Review the implementation schedule for installation works of electric equipment. • Review the technical section for the electrical equipment and transmission lines in the tender documents. • Review all the tender documents for electrical equipments.	• Having worked as an Electrical Engineer expert in various Hydropower Projects preferably more than 50 MW • Extensive experience in Electrical Engineering data collection and analysis. • Experience in Electro-mechanical design and analysis for hydropower projects with international consultant or company inside the country or abroad will be highly preferred • Preference for the involvement in current large project running inside the country with International Consulting/Contractor firms
10.	Financial/Economic Analyst	• Review and finalize all indicators such as Net Present Value (NPV), Benefit Cost ratio, Internal Rate of return, Debit Service Coverage prepared by the NEC team. • Review and finalize financial analysis of the projects and the project entity such as, commercial merits of the projects under alternative power market conditions (electricity market and demand), financial packages and fiscal regimes prepared by the NEC team. • Review and identify risks associated with the project 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, prepared by the NEC team. • Identify and assess various financial sources including public funds from Nepal and other countries that may benefit from the projects, multilateral/ bilateral organizations, and commercial financial institutions prepared by the NEC team.	• MSE degree in Finance, or Engineering Economics or chartered accountant or other relevant majors, • Minimum 20 years of experience in relevant professional works, • Having worked as a Financial/Economic Analyst expert in various Hydropower Projects. • Extensive experience in Financial/ Economic Analysis, index data collection and analysis. • Experience in Financial/Economic Analysis of hydropower projects with international consultant or company inside the country or abroad will be highly preferred • Preference for the involvement in current large

		• Review sensitivity Analysis prepared by the NEC team.	project running inside the country with International Consulting/Contractor firms
11.	Power system Analyst	• Review power study in Nepal, seasonal variation of energy and capacity demand, the system load curves, seasonal variation of energy and capacity demand, and load forecast • Review the seasonal variation of energy and capacity demand and ability of the two power systems to meet the energy and capacity demand • Review the existing and planned additions and alternative supply options in Nepal. Establish the capital and operating costs for the alternative generation options. • Review Load flow analysis at local and regional level. • Review power evacuation study for PHKHEP • Review short circuit analysis and transient analysis	• Master degree in Electrical Engineering or other relevant majors, • Minimum 15 years of experience in relevant professional works, • Having worked as a Power System Analyst expert in various Hydropower Projects. • Extensive experience in Power System Analyst, index data collection and analysis. • Experience in Power System Analysis for hydropower projects with international consultant or company inside the country or abroad will be highly preferred • Preference for the involvement in current large project running inside the country with International Consulting/Contractor firms
12.	Construction Planner	• Assist in establishing and maintaining the project schedule in Primavera P6 or similar software • Monitor the critical path and report any issues impacting the critical path • Work with the project team to ensure that schedule activities are accurately updated • Provide progress reports in accordance with the project reporting calendar, including resource histograms, progress curves and current versus baseline comparisons • Assist in identifying schedule slippage mitigation strategies • Examine and finalize construction methods for civil works in consideration of the site conditions, and work with estimated BOQ and man power needed for the execution of project. • Review and finalize construction schedule for civil works prepared by the NEC team.	• Master degree in civil Engineering, or other relevant majors • Minimum 10 years of experience in relevant professional works, especially in hydropower projects. • Proven experience in project control, cost control and scheduling in the field of engineering and construction. • Preferably, advance Primavera P6 skills • Must have keen understanding of schedule & cost interfaces. • Knowledge of creating and developing baseline schedules; prior working experience with scheduling software (Primavera P6 or MS Project) • Must be able to monitor report and analyse

		• Coordinate with other experts concerned to prepare all the tender documents.	progress measurement and report performance. • Having worked as a Construction Planning expert in various Hydropower Projects preferablyof more than 50MW. • Extensive experience in Construction planning, and preparing schedule. • Experience in project planning and scheduling for hydropower projects with international consultant or company inside the country or abroad will be highly preferred. • Experience in planning schedule software, Primavera, MS Project, or similar.
13.	Contract Expert	• Review and guidance on contractual records and documentation such as receipt and control of all contract correspondence • Responsible for review all the contractual analysis required in the light of FIDIC clauses and technical specification. • Deal with clients to draw up procurement contracts to negotiates, administers, extends, terminates, and renegotiates contracts. • Review and comments on progress and performance to ensure goods and services confirming to the Contractual requirements. • Facilitating and negotiating contract variations and amendments in line with approved delegations. • Facilitating to identify and resolve disputes with contractor in a timely manner. • Review and guidance to work with accuracy of invoices and authorize payments consistent with the contract terms. • Review and guides the study reports as EPC level design documents with respect to FIDIC clauses and technical specification. • Draft, evaluate, negotiate, and execute contracts (various	• Master degree • Preference for the involvement in current large project running inside the country with International Consulting/Contractor firms • Experience in handling contracts & claims issues of project sites • Preferably Experience in construction projects in Nepal • Well exposed with insurance policy and general context of contract system in Nepal • Candidate should have experience in FIDIC Contract system • Familiar with PPMO's rules and regulations. • Familiar in QA/QC is an additional benefits. • Experienced in Arbitration of claims or complaints is a good

		types, including lump sum [firm, fixed price], time based, and multi-year contracts) • Must be work as a mentor for the NEC team • Fluent in PPA 2063 with latest amendments and the PPR 2064. • Familiar with PPMO's rules and regulations. • Familiar in QA/QC is an additional benefits. • Experienced in Arbitration of claims or complaints is a good choice	
14.	Transmission Engineer/Experts	• Review the transmission line routing and alternatives and the tower types and locations • Review the design of the tower types, the models used and their optimum design • Review and guide the Conductor type, schemes, specifications selection, and accessories and insulators selection and design • Review and guide the sub-station location and the switchyard design • The Transmission lines will be of 132 kV, 220 kV, 400 kV and similar voltages • Inputs for design basis memorandum preparations • Able to work independently in remote are if required	• MSE degree in Electrical Engineering or other relevant majors, • Minimum 15 years of experience in relevant professional works, • Having worked as an Transmission/Electrical Engineer expert in various Hydropower projects preferably more than 50 MW • Extensive experience in Electrical/Transmission Engineering data collection and analysis. • Experience in transmission line analysis for hydropower projects with international consultant or company inside the country or abroad will be highly preferred
15.	EHV Substation Engineer	• Review and guide the equipment selection and switchyard design for EHV (220/400 kV and higher) • Review and design the lightning and switching surges protection calculations for the towers and switchyard • Review and guide the Insulation coordination of the equipment in the substation • Review and guide the design calculations for EHV effects such as Corona and travelling waves and the transient stability due to such phenomenon as switching, power swing etc. • Review and design the Protection coordination and protection	• MSE degree in Electrical Engineering or High Voltage engineering preferably, or other relevant majors, • Minimum 15 years of experience in relevant professional works, • Having worked as a Power System Analyst or HV engineer expert in Utilities or HV equipment manufacturers. • Extensive experience in transmission line and substations,

		schemes	• Experience in Power System Analysis or transmission line design or substation design/ construction for with international consultant or company inside the country or abroad will be highly preferred.
16.	Team Leader (national/International)	• Lead both National and International Experts and co-ordinate with NEC Core Team Leader. • Provide project administration function in conjunction with the supporting staff and in co-ordination with Core Team Leader. • Track key indicators (input, output and outcome) of implementation schedule • Prepare schedules for staff assignments in co- ordination with Core Team Leader. • Recruitment of the international and national experts (TSG) on fixed short-term basis. • Manage and closely liaise with the Core Team Leader, the Design Managers and Key experts to ensure that all parties are updated on design/studyprogress and aware of any issues arising that could affect ongoing activities • Make Project site visits to discuss and resolve design issues with Experts • Participate in Board meetings when called upon and represent the client on technical and contractual issues and provide relevant expertise along with the Core Team Leader. • Supervise the overall monitoring and evaluation process to meet TOR requirements. • Ensure the sub-contractor complies with conditions as outlined in the contract and other relevant documents in co-ordination with Core Team Leader • Liaise with the client and its engineers on a day to day basis and attend meetings withthe core team, the client and contractor as required • Provide reports to management	• Master in Water Resource Engineering – Civil, Hydropower-Civil or Hydraulic Engineering • Registration with Nepal Engineering Council • Preference for the active members of International Engineering Associations/Society • Must have experience outside Nepal in hydropower at least 7 years or more, preferably non SAARC countries • At least 15 years professional experience in civil Engineering preferably on hydro projects • Have experience on one or more Feasibility Study of Reservoir/storage project with more than 150 MW capacity • Must have experience in detail design/ Tender Design for a reservoir/Storage project with capacity more than 500 MW • Must have experience on one reservoir project with more than 350 MW capacity During Construction phase • Preference will be given for experience on Feasibility, Tender Design and Construction for different projects outside Nepal. • Confidence on project layout and hydraulic implications with respect to site conditions and requirements. • Experience in Numerical Modelling (CFD) and Transient analysis • Experience in Reservoir simulations, dam break analysis and downstream re-regulations system • Experts in hydraulic design of Spillway, Dam, Energy dissipater, Tunnel, Surge shaft/tank and

			tailrace • Preferably experience or involvement in ongoing hydro projects in Nepal, Feasibility Study/Tender design and under construction with capacity more than 100 MW.