Federated States of Micronesia
Energy Sector Development Project (P148560)
Terms of Reference
Engineering & Supervision Consultancy
for the Kosrae Genset

I. Purpose and Scope

1. The FSM National Department of Resources and Development ("DRD") will contract an Engineering and Supervision Consultant ("ESC") to provide support for the installation and commissioning of a new diesel generator to be funded under the International Development Association (IDA) grant for the Energy Sector Development Project (ESDP). The WB-financed diesel generator is to be delivered to and installed in Kosrae Utilities Authority's (KUA's) Power Plant in Kosrae State, FSM, as part of the ESDP Project (the "Project"). ESC will report to and consult - as provided in its contract and these terms of reference – with the DRD's Division of Energy and the ESDP Implementation Team. For day to day work the ESC will coordinate with the sub-project manager (the "SPM") of KUA, but will keep the Division of Energy and the ESDP Project Coordinator informed of the development.

2. The KUA genset will be a 600kW continuous operation diesel generator financed under a separate WB-financed ESDP supply and install contract (the "supply contract")[1]. The supply contract will include design, manufacture, supply, erection, installation, integration tests, trials & commissioning of one diesel generator set with all necessary peripherals including cabling and mechanical works for fuel systems, exhaust, lube oil systems, air system, and all necessary temporary and enabling works. Also included is design, manufacture, supply, erection, installation, integration tests, trials & commissioning of the 4.16kV switchgear with all necessary peripherals including cabling and civil/mechanical works and all necessary temporary and enabling works.

3. The installation work under the supply contract will include, but not be limited to
   - Move Genset and Switchgear from the dock to the Power Plant
   - Setting up, bolting, aligning, securing unit, tightening of connections of the Generator
   - Civil works for new radiator supports, muffler support and stand, fuel tank and twin lube tanks as needed.
   - Piping Works for fuel lines, Cooling system, Exhaust system and vents, Drains, including supports, insulations, and the like.
   - Installation of radiator, piping, foundation, supports, motor controls, and accessories
   - Installation of new switchgear at the existing control room at the power plant and interconnections
   - Wiring interconnection of Genset to the new switchgear at the control room

[1]Under a separate agreement JICA will finance two 600kW 900rpm diesel generators in a new generator house adjacent to the existing Tofol power station.

- Electrical Testing of wirings, (megger test, continuity tests, etc.), pressure testing of piping, Leak test of system, etc.
- Start up and no load test of unit
- Load Test / Commissioning of System
- Integration of diesel generator controls into the current system and enabling installed diesel generator to be safely and reliably started, run and stopped when running in parallel with existing diesel sets.
- Provision of Operations and Maintenance manuals
- Training of the staff and technicians in operation, maintenance and defect diagnosis of the installed systems.
- A Guarantee against damage or failure due to defects in design, material and workmanship for the duration of the Defect Liability Period.

4. The ESC will (i) verify the technical specifications and supervise the complete installation of the WB- financed genset, (ii) supervise the connection of the WB-financed diesel generator to the new switchgear and its incorporation into the existing power system, (iii) supervise the performance testing and commissioning and acceptance of the WB-financed diesel generator, ensuring that it complies with the required performance and manufacturer's commissioning checklist at a minimum and (vi) provide reports to the DRD as may be required.

5. The composition of the ESC team, its required qualifications and projected Level of Effort of each of the assigned international specialists is presented below:

International Specialists	Person-days
Team Leader	30
Power System Engineer	60

II. Tasks and Outputs of International Specialists

1. The terms of reference, summary of tasks and required qualifications for the international specialists are presented below:

2. **Team Leader,**(international,30person-days). Activities to be undertaken will include, but not be limited to, the following:

   (i) Ensure that the ESC team perform their tasks with due and professional diligence satisfying their terms of reference.
   (ii) Prepare a Project implementation schedule, update it as necessary, and ensure that the Contractor performs its obligations in accordance with that schedule.
   (iii) Through the SPM, act as interface between the DRD and the supply contract contractor (the "Contractor") to ensure that all aspects of the installation and commissioning are well coordinated with the activities of KUA, and the objectives of the Project.
   (iv) Oversee or ensure ESC oversight in the acceptance of goods as they are received, ensuring that they are the correct goods as per the specification and show no shipping damage.

(v) Oversee or ensure the oversight of the transport of goods from the port of entry in Kosrae, FSM, to the site.
(vi) Ensure that the appropriate electrical standards are met and that the appropriate health and safety measures are always followed.
(vii) Ensure proper and complete installation of the WB-financed diesel generator and switchgear, and its incorporation into the existing power system
(viii) Ensure proper supervision of the performance testing and commissioning of the WB-financed diesel generator, and ensure that the Contractor addresses any defects in the diesel generator, its installation, its synchronization and proper load-sharing with other diesel generators, its incorporation into the existing power system, its performance, and any other defects attributable to the Contractor or the goods it supplied, that occurs or will foreseeably occur.

Required qualifications of the Team Leader are an engineering degree, and a minimum of 10 years' experience in the implementation of power projects, and substantial core experience in the implementation of diesel power stations and related assets.

3. **Engineer (power systems),** (international, 60 person-days). The activities to be undertaken will include, but not be limited to, the following:

(i) Review the data sheets of the goods offered by the Contractor to ensure that they are compliant with the required technical specifications and quantities.
(ii) Assist in the acceptance of goods as they are received, ensuring that they are the correct goods and show no shipping damage.
(iii) Supervise and ensure the proper and complete installation of the WB- financed diesel generator, and ensure that it properly synchronizes and load-shares with all other diesel generators in KUA's Power Plant, and ensure that it is properly incorporated into the existing system.
(iv) Supervise the performance testing and commissioning of the WB- financed diesel generator, and ensure that Contractor cures any defects in the WB-financed diesel generator, its installation, its synchronization and proper load-sharing with other plants, its incorporation into the existing system, its performance, and any other defect attributable to Contractor or the goods it supplied, that occurs or will foreseeably occur. Produce a commissioning plan for the commissioning of the WB-financed diesel generator that includes the manufacturer's commissioning checklist and ensure that the commissioning of the WB-financed diesel is performed according to such plan at a minimum.
(v) Ensure that the commissioning of the WB-financed diesel generator includes such tests as may be necessary to determine that the genset functions and load-shares properly as part of an integrated system.

Required qualifications of the Engineer includes a Mechanical or Electric Engineer degree, complementary with the degree of the Team Leader, a minimum of 10 years' experience in the implementation of power projects, and substantial core experience in the design, preparation of documentation, installation and commissioning of diesel power stations and related assets.

III. Project Phases, Milestones, and Reporting Requirements

The ESC will be involved in the following phases of Project implementation:

Phase 1 Inception

Familiarization visit to FSM/Kosrae. Examination of Contractor's bid and the Supply Contract.

During the Supply Contract pre-bid visits, KUA advised that neutrals of existing generators are solidly grounded and they would like to continue with the same design, including the new genset. However, one of the bidders noted that bonding the generators solidly to earth may push the potential rise above the acceptable limits. The ESC shall conduct a fault level and earthing system study to confirm compliance and safety. If based on these studies, Neutral Earthing Resistor or Transformer has to be installed, the ESC shall write a specification and assist in the procurement process.

Phase 2Supply

(i) Assist in responding to the Contractor's questions and review the Contractor's drawings.
(ii) Inspect the supplies as they are received, and ensure they are free of shipping damage, and that they meet the technical specifications and quantities.
(iii) Ensure that Contractor addresses problems, damage, or defects, if any, with the goods as they are received.

Phase 3 Installation

(i) Ensure that the Contractor addresses items in the Contract such as the Environmental Management Plan
(ii) Supervise the installation of the WB-financed diesel generator.

Phase 4 Commissioning

(i) Supervise the incorporation of the WB-financed diesel generator into the existing power system at KUA.
(ii) Supervise the performance testing and commissioning of the WB-financed diesel generator.
(iii) Ensure that Contractor cures any defect in the WB-financed diesel generator, its installation, its correct synchronization and load-sharing with other diesel generators, its incorporation into the KUA's existing power system, its performance, and any other defect attributable to Contractor or the goods it supplied, that occurs or will foreseeably occur.
(iv) Ensure that Contractor provides any relevant documentation such as operation and maintenance manuals and guidelines.
(v) Expedite preparation of as-built drawings by the Contractor, review and file a permanent record within two months on project completion.
(vi) Ensure that Contractor provide adequate training/guidance on operation of the WB-financed generator and associated systems as well as any integration and control system changes.

IV. Milestones and Reporting Requirement

The SEC shall provide the following Reports upon completion of

- Phase 1 Inception milestone: Inception Report, including fault level and earthing system study
- Phase 2 Supply milestone, Report on Phase2.
- Phase 3 Installation milestone, Report on Phase 3
- Phase 4 Commissioning milestone, Report on Phase 4.

V. Timing and Duration of the Assignment

The assignment is expected to be carried out over a period of 400 days, with four trips to Kosrae: (i) Phase 1, Inception Mission, (ii) Phase 2, Goods Inspection Mission, (iii) Phase 3, Installation Inspection Mission and (iv) Phase 4, Commissioning Mission.

VI. Support from KUA and DRD

KUA will provide support to ESC, including (i) arranging meetings with the DRD and other stakeholders, (ii) providing access to all relevant data, (iii) providing a suitably furnished office with utilities and telecommunications access, (iv) providing access to meeting facilities in Kosrae, and (v) local transport.

It is understood that office facilities will offer:

- An air-conditioned office space with desks and chairs for each ESC member (when in the field).
- A reliable Internet connection while in the office.
- Access to printing facilities.

It is expected that the SPM, in coordination with the DRD, will assist with the following activities:

- Communication with the ESC team leader to keep them informed of all activities relevant to the work package.
- Communication with other ESC consultant's representatives as relevant to their particular work stream.

Data and information

ESC consultants will be provided access to all relevant reports, studies, permits and other data that has been collected, details of the operation of the power station and individual diesel generators, and the local power system.

Safety equipment, cultural awareness and site inductions

KUA shall provide:

- Appropriate safety equipment for ESC consultants and local personnel assisting them. This will comply with local requirements but include at a minimum hard hats, high-visibility vests and safety glasses for construction sites and operating power stations.
- Site inductions for ESC consultants at relevant locations (such as operating power stations, office locations, government buildings) so that they are familiar with evacuation plans, emergency exits, first aid officers and equipment (if available), locations of toilets, tea/coffee facilities (if available)
- Cultural training so that ESC consultants are made aware of local customs and don't antagonize or cause issues with locals.

General requirement to provide support and advice

ESC is expected to perform any other tasks that the SPM may reasonably request and that it can reasonably implement. ESC is also expected to respond to reasonable requests for information, provided that any request for information does not alter the Scope of Work in these terms of reference.