**The Shell Petroleum Development Company of Nigeria Limited**

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| **PROJECT INITIATION NOTE**  **Provision of Electrical Power from Etelebou Remote Integrated Facility (RIF) to Etelebou Flow Station Project.** |

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| **GBARAN UBIE Electrical Maintenance**  **(UPO/G/PCG)**              **Subject: Power Interconnectivity from ETELEBOU RIF to ETELEBOU FS Project.**    **Prepared by:**  **Abdul, MOHAMMED**  **Reviewed by:**  **Anongo, SESUGH**  **Godfrey, ALOZIE**  **Approved by:**  **Obinna, Ozurigbo/Ofori, Kebin** |
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**Revision 1.0**

# Main Decisions Required

1. Approval to initiate the **Provision of Electrical Power from ETELEBOU RIF to ETELEBOU Flowstation Project** to enhance low opex for the facility towards sustained top quartile performance.
2. Support and approve resources for maturation of this project.

# Project Details

**B1. Summary**

**The project seeks to supply electrical power to Etelebou flowstation** tapping from the surplus power from CPF gas turbines, at Etelebou RIF. The project is to be executed in phases. Phase-1 will involve Excavation of trench of **1.5ft x 2ft** and length **300 meters** from ETELEBOU RIF to ETELEBOU flowstation. Phase-2 will involve laying and termination of 4 x 95mm2 armored cable with 70mm2 Parallel Earth Conductor (PEC) and revamping of Etelebou flowstation earthing system, while phase-3 will involve the termination of installed cables, installation of associated switchgears, testing & commissioning of the project.

The ETELEBOU RIF & ETELEBOU flowstation Electrical power interconnectivity project is premised on the proximity and availability of surplus electrical power in ETELEBOU flowstation. This will parmanently eliminate the need for both the gas and diesel generators currently installed in the ETELEBOU flowstation.

**B2. Cost & Phasing**

1. Material ordering and provision; to be completed in **May, 2017**.
2. Cable laying & termination to be completed in **May, 2017**.
3. Commissioning of project; **June, 2017.**

**B3. Associated Production from Etelebou Flowstation.**

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**B4. Schedule**

Table 1 shows proposed project schedule, from feasibility studies to commissioning.

**Table 1:** Project Development Plan

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| --- | --- | --- | --- |
| S/N | EVENT | TARGET DATE | COST |
| 1 | Feasibility Studies | **Completed** |  |
| 2 | Material Delivery | May, 2017 |  |
| 3 | Revamping of AMF panel at Etelebou flowstation | May, 2017 |  |
| 4 | Excavation & backfilling of cable trench | May, 2017 |  |
| 5 | Laying and termination of cables | May, 2017 |  |
| 6 | Commissioning | June, 2017 |  |

**BACKGROUND**

Etelebou flow station is an SPDC production station located in some 120km northwest of Port-

Harcourt (OML 28), situated about 3 km East of Gbaran in Bayelsa. It was discovered in 1971 and started producing in 1973 as a double bank 2-stage (HP - LP) separation station with a nominal capacity of 40Mbpd gross liquid and 40MMScf/d gas. The current average production is ca 2514 bopd and 1.3mmscfd gas that is being currently flared (No AGG). It is one of the four flowstations currently existing in the kolocreek district facility.

The station had undergone environmental upgrade but most of the productions are diverted to Gbaran Ubie Gas plant. Crude transfer is via 2 Cat gas engine driven double acting duplex pumps (one runs, other on standby). The facility is unmanned but visited daily for O&M activities. Logistics support is from Gbaran Ubie Filed Logistics Base (FLB).

The total power requirement for the flow station is supplied from one gas engine driven generator G3306, 80KVA (G0101) – under normal conditions or from one diesel engine driven generator 80KVA D3304 (G0102) – providing power for the station when the gas generator is down. The power supply is rated 415V 3 phase 50 Hz. The generators are connected via an automatic mains failure (AMF) panel to the main switchboard mounted in the generator house. The system design ensures that paralleling of the generators is not possible. Distribution is via the main switchboard and its integral sub distribution boards. Power is mainly for lighting as well as FLKO pumps, closed drain pumps, ultrasonic flare meters, Telecommunication equipments and Sumo pump.

Increased production and compliance to KPIs & statutory lagaislations in the district has been hampered by unstable power supply due to obsolete CAT generator sets.

**Key considerations to Project Cost/schedule** (Including mitigation measures):

1. **Project Funding**

This project shall be funded by the CENTRAL HUB FACILITY MAINTENANCE BUDGET

1. **Inadequate Work Scoping**

Project Cost overrun might be caused by inadequate work scoping-due to worksite unavailability and inflation.

1. **Local Content Implementation Requirement**

This is a **DIY PROJECT**.

1. **Key Project Issues**
2. Community FTO
3. Initiation and approval of Management of Change (E-MoC No.: **38272**).
4. Procurement of 95mm2 4-core XLPE Armored cable and 70mm2 PEC.
5. Procurement of 70mm2 PEC.
6. Estimated time of delivery.
7. Labour cost
8. Security of buried underground armoured cable.
9. **Security of people and Asset**

Land 2 District SOL is applicable.

**B5. Resources**

The Gbaran Ubie district Electrical Team shall be responsible for complete supervision of the project execution. The resources required at this stage have been identified and are:

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| --- | --- | --- | --- |
| **Pool** | **Role in Team** | **Name** | **Full time/**  **Part time** |
| GBU Operations Superintendent | Project Sponsor | Obinna Ozuruigbo/Ofori Kebin | PT (1%) |
| GBU Maintenance | Maintenance Team Leader | Anongo Sesugh | PT (1%) |
| GBU Electrical Discipline | Senior Electrical Supervisor | Alozie Godfrey | FT (25%)? |
| GBU Electrical Discipline | Electrical Supervisors | Nelson Okolo/Ebieto Hendrix | FT (25) |
| GBU Electrical Discipline | Electrical Technicians | All Team Members | FT (100%) |
| Operations | Facilities Operations | AHSS | PT (40%) |
| GBU HSE/PCF | HSE Documents Approval | District HSE Adviser | PT (10 %) |
| CRO | CRO | District CRO | PT (2%) |
| Security | District Security Adviser | District Security Adviser | PT (2%) |
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**B6. Business Objectives**

1. **SOx and GHG Compliance**

At the completion of this project, USM availability will be improved due to stable power supply. The two generators, diesel and gas will be removed from the facility thereby reducing the GHG emission caused by these gen sets. Also, delay in monthly well testing completion shall be a thing of the past due to unavailability of stable power from both generators.

1. **Reduction in Plant Trip on Compressor Failure**

It is expected that the project will provide stable power to the SF-11electrical air compressors, which are the heart beat of the facility and as such prevent station trip due to compressor failure as a result of power failure.

1. **OPEX savings from diesel supply**

The monthly diesel requirement for diesel generator- D3304 at Etelebou flowstation is **6,120** liters at an average of **200** liters per day and only one of the equipments running. The cost of diesel for power generation is borne by Kolo Creek district. This implies that for the total annual diesel consumption is 73,440 liters (assumes you run diesel gen 24/7 throughout the year). Actual **2016** consumtion was 31142 litres at a price of N200 per liter of diesel, applying the conversion rate of N180: $1 implies that SPDC will incur an annual diesel procurement cost of approximately $91, 800 to ensure the continued operation of the diesel generator set. Instances abound when SPDC has defaulted in the supply of diesel to Etelebou flowstation due to logistitic and security challenges in the area. Presently, Etelebou flowstation is on SOL of RED. Unavailability of the generating set has resulted in non conformance with SoX / (GHGEM) interms of gas and oil measurements.

Finally, this project will definitely reduce the GHG footprint of the company in addition to actual obvious cost savings. Using actual 2016 diesel consumption at Etelebou FS, $**38,927.5** will be saved in a year on AGO alone. With this project commissioining, Z6 notification shall be raised to deactivate the maintenance plans for the D3304 and G3306 generators; this will also reduce the man hour cost and maintenance spares spent on these units. This cost will be further skyrocketed when the units go for major overhauls which normally cost in the range of $50,000 which will also be eliminated. All these savings will be realized by the company simply by the district having implemented this project and optimized the excess generating capacity at CPF, via Etelebou RIF to power Etelebou FS. From the records of **2016**, it clearly shows that the station depended on diesel for an average of **5.1** months.

**B7. Estimation of ETELEBOU RIF and ETELEBOU FS Power Requirement**

The Gbaran Ubie District Electrical Discipline team carried out a preliminary estimate of the electric power to be consumed by the ETELEBOU flowstation. The load estimation is reviewed and currently the D3304 unit is being used to power the station entire load. The distance between ETELEBOU RIF and ETELEBOU FS station is about **300** m.

**B8. Voltage Drop Verification and Cable Selection**

Supply Voltage = 415V AC

Load Current = 45A

Length of Run = 300m

For three phase A.C circuit, the Voltage Drop calculation shall be determined based on the following formula:

**Vdrop = 1.732 \* Ib \* L \* (Ru \* cos ø + Xu \* sin ø) / 103**

Where,

**Ib** is the user absorbed current.

**Ru** is Resistance per km at 900C (Ohm /km) for XLPE.

**Xu** is Reactance at 50HZ (Ohm/Km).

**L** is length of cable run.

**Note:** Using Kabel metal chart for 4 Core Copper Armoured Power Cables, we obtained corresponding values for Resistance Ru and Reactance Xu.

From above Formula we have:

**Ib = 45A, L = 300m, Ru = 0.247, cos ø = 0.8, Xu = 0.0668, sin ø = 0.6**

Therefore,

**1.732 \* 45 \* 300 \* (0.247 \* 0.8 + 0.0668 \* 0.6) / 103Vdrop =**

**Vdrop = 23382 \* (0.1976 + 0.04008) / 103**

**Vdrop = 23382 \* (0.23768) / 103**

**Vdrop = 5557.4 / 103**

**Vdrop = 5.6V**

To calculate the percentage voltage drop (%**Vdrop**):

%**Vdrop = Vdrop in Volts \* 100/ Circuit Voltage**

%**Vdrop = 5.6 \* 100 / 415**

%**Vdrop = 560 / 415**

%**Vdrop = 1.35** (Which is less than 5% of maximum allowable voltage drop, DEP 5.3.2)

**Note:** From Manufacturer’s Technical Brochure for Kabel metal cable selection chart, it is stated that Maximum permissible current rating values for cables laid underground are based on a load factor of 0.7 and for cables installed in air, a load factor of 1.0.

Then,

**Installed Rating = [Maximum Permissible Current Rating x Load Factor]**

**=196 x 0.7= 137.2A**

We selected and sized the power cable to be used, with installed rating **137.2A** in ground @ 700C close to the load current of **45A + 43A (Future Air Compressor) = 88A**, as **4C x 95mm2 XLPE/SWA/PVC**.,

This cable is selected because of its low voltage drop, high current rating and to make provision for full supply at ETELEBOU flow station.