**Annex 1.1 (b): Leguan** **Island Energy Profile**

1. **Energy Demand**

The electricity generated from GPL is distributed to the entire island by Eastern, Northern and Western feeders. The loads on Western and Northern feeders are higher than on Eastern feeders. Actual power generation data was collected from the Leguan GPL and a summary of the data is provided in Table 1.

Table 1: Summary of Power generation data of Leguan GPL site

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Day** | **Voltage** | **Current** | **Power factor** | **Average Power, kW** | **Daily Energy generation, kWh** |
| Monday | 480 | 375 | 0.84 | 261.5 | 6275 |
| Tuesday | 482 | 358 | 0.85 | 253.6 | 6093 |
| Wednesday | 481 | 380 | 0.84 | 266.5 | 6397 |
| Thursday | 482 | 381 | 0.84 | 266.7 | 6401 |
| Friday | 482 | 370 | 0.84 | 259.8 | 6236 |
| Saturday | 481 | 361 | 0.84 | 252.6 | 6064 |
| Sunday | 482 | 367 | 0.84 | 257.2 | 6174 |

Only one generator set was generating the entire power with a peak loading of 73% and an average loading of 55%. The daily power generation profile of the station is presented in Figure 1

Figure 1: Power generation load profile pattern at Leguan GPL site

The trend in Figure 1 shows that the peak load occurs between 7 PM to 10 PM every day. During the daytime (between 6 AM to 4 PM), on average, the load is around 234 kW. The consumer demand for energy has been steadily increasing and by the end of October 2021, peak demand had risen to 0.43 MW. In 2024, the daily load was 306 to 341 kW (peak hours). The details of the fuel consumption for daily power generation as collected during the study are given in Table 2.

Table 2: Details of fuel consumption and power generated

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Day** | **Daily Energy generation, MWh** | **Daily fuel consumption,**  **Gallons** | **Specific Fuel consumption**  **(SFC), Gallon/ MWh** | **Generation set loading range**  **(%)** |
| Day 1 | 6.16 | 366.08 | 59.4 | 42 to 72 |
| Day 2 | 6.30 | 378.56 | 60.0 | 45 to 71 |
| Day 3 | 6.59 | 378.56 | 57.4 | 46 to 68 |
| Day 4 | 6.49 | 378.56 | 58.3 | 45 to 71 |
| Day 5 | 6.63 | 403.52 | 60.8 | 43 to 69 |
| Day 6 | 6.11 | 353.6 | 57.9 | 43 to 69 |
| Day 7 | 6.03 | 361.92 | 60.0 | 43 to 69 |

Based on the above table, it can be seen that the specific fuel consumption is in the range of 59 ± 2 Gallons per MWh for a generator loading range of 45 to 75%.

1. **Current Scenario**

Guyana is almost entirely dependent on imported fossil fuels for its energy needs. In Leguan, electricity is provided on a 24-hour basis by an isolated grid with an installed capacity of 1.23 MW that is owned and operated by Guyana Power and Light Inc. (GPL). The power station installed in Leguan has three generating units of 513 KVA (410 kW) each, using diesel as input fuel. During normal operations, one generator operates to meet the 220 and 365 kW loads during the day and night, respectively. Fuel is the most expensive input accounting for approximately 65 percent of GPL’s total operation cost of power generation in Leguan.

Overall, the existing diesel generators at Leguan have insufficient or low redundancy power generation, which makes it unreliable, unstable and costly to maintain. Given that the Leguan grid is isolated, any new source of energy (diesel, solar or wind) should be interconnected to the existing grid. The Government of Guyana is already installing a 600 kW solar PV power plant with a battery energy storage system to meet the daytime electrical energy demand of Leguan Island. In light of the challenges of electricity generation experienced on the island, renewable energy generation is of utmost priority to improve system reliability as well as to reduce the carbon emissions from increasing power generation.

In order to generate enough electricity to meet the isolated grid power demand both during the day and store it for consumption during the night, it needs twice as many solar panels, and even more batteries to provide renewable energy all day. The big plus of wind energy is that it is a more constant source of energy. Integration of wind power will properly cover the energy gaps during the day. The islands like Leguan where sufficient wind potential as a resource is available, the generation of wind energy is several times cheaper than storing solar energy in batteries.

1. **Solar PV Farm On-going Project**

GEA and GPL are facilitating the development of grid-connected solar photovoltaic (PV) systems. The main objectives are minimizing fossil fuel usage and cost reduction, increasing energy security and promoting a low-carbon economy.

With the supplementary benefits of solar PV plants, the GoG is installing a solar PV farm at Leguan, considering the energy needs/requirement of the community. The Solar PV farm has a capacity of 600 kW with 1200 kWh of battery storage. The system is capable of generating approximately 853 MWh annually, resulting in annual savings of USD 212,094 and an annual reduction in CO2 emissions of 703,953 kilograms. The capacity factor and performance ratio of the proposed PV farm is 20.2% and 83%, respectively. The LCOE unit cost of the SPV farm works out to be around 0.14 USD/kWh.