Net Metering Pilot Project at BFRI, Bagerhat-Evaluation Report

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Introduction

The goal of the pilot project is to showcase a net metering connection and small-scale solar connected to the grid in Bangladesh. As net metering and decentralized generation are new in Bangladesh, stakeholders like the utilities, but also government regulatory bodies are concerned about technical and safety issues that might arise from these installations and the electricity that they feed into the grid. At the same time, the processes around net metering application, system connection and acceptance are new to the utilities as well as the end users and solar companies, so the goal of the pilot project is also to go through these processes in practice and document where and how they can be improved or what is important so that they can be smooth.

Site description

The site is part of a research institute, the BFRI (Bangladesh Fisheries Research Institute). The specific location is the shrimp research station of the institute. It consists of x buildings and its main consumers are the pumps of several experimental ponds

The installed solar system is of 25.8 kWp total solar power, with a 25 kVA inverter by Fronius. The solar panels had been installed earlier at the site by the client, but were not in proper usage any more. GIZ contracted Rahimafrooz to transfer 10 kWp of ground-mounted panels to the roof and completely re-wire the total rooftop system and connect it to a new Fronius inverter.

The following figure shows the SLD of the site.

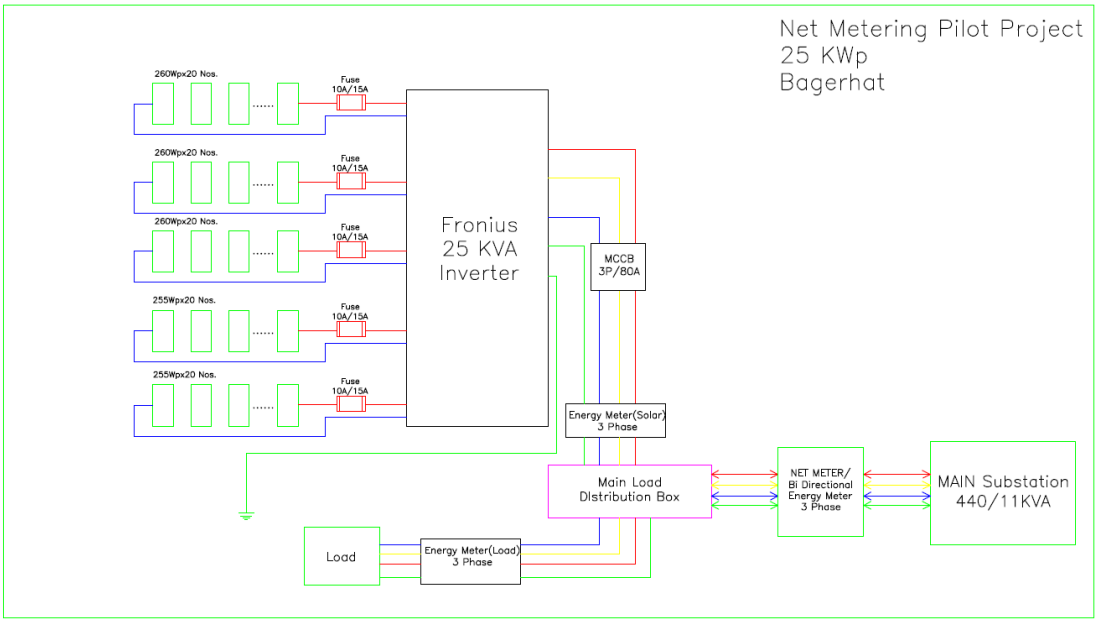

Figure 1: SLD of the solar installation at BFRI, Bagerhat

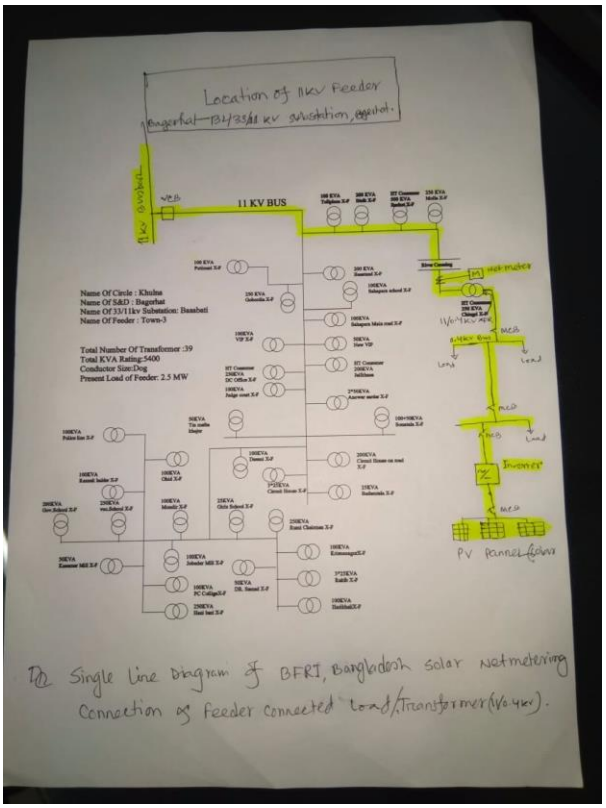

Figure 2: SLD of the 11kV feeder line where the solar system at Bagerhat is connected.

Figure 3: Pictures of the solar installation

Data assessment

Solar data:

The inverter offers data retrieval via an online data portal, which is important for easy remote analysis of the system output.

Consumption data:

The best solution would have been to have a separate meter for own consumption, or a smart meter for net consumption which is compatible with the solar inverter. Unfortunately, time constraints did not allow for a proper planning and settling for one of these options. So the meter installed was a smart meter logging the net consumption purchased and installed by the utility, BREB. So the only data which

is available is the net consumption, logged in a different system and by a different entity than the solar data. Still, both can be related to each other via the time stamp.

Results

The following chart shows the gross consumption, solar generation and net consumption for the 25th of October, 2018. For the reasons described above, the gross consumption data was calculated as sum of net consumption and solar generation.

It needs to be mentioned that the institute was running at partial load during that time period, as only two water pumps were running, while under normal operation, there are more than that. As information about loads and load pattern are low, it cannot be said in what way the chart shown in the figure would vary at other times.

The solar output is characteristic for a solar plant and shows a clear day output (no clouds). The output seems quite good with a noon peak of about 19kW for a 25kWp plant in October. However, a proper efficiency analysis can only be made based on inclination angle and more plant and weather data. The solar output will vary throughout the year, with higher outputs in summer and lower ones in winter.

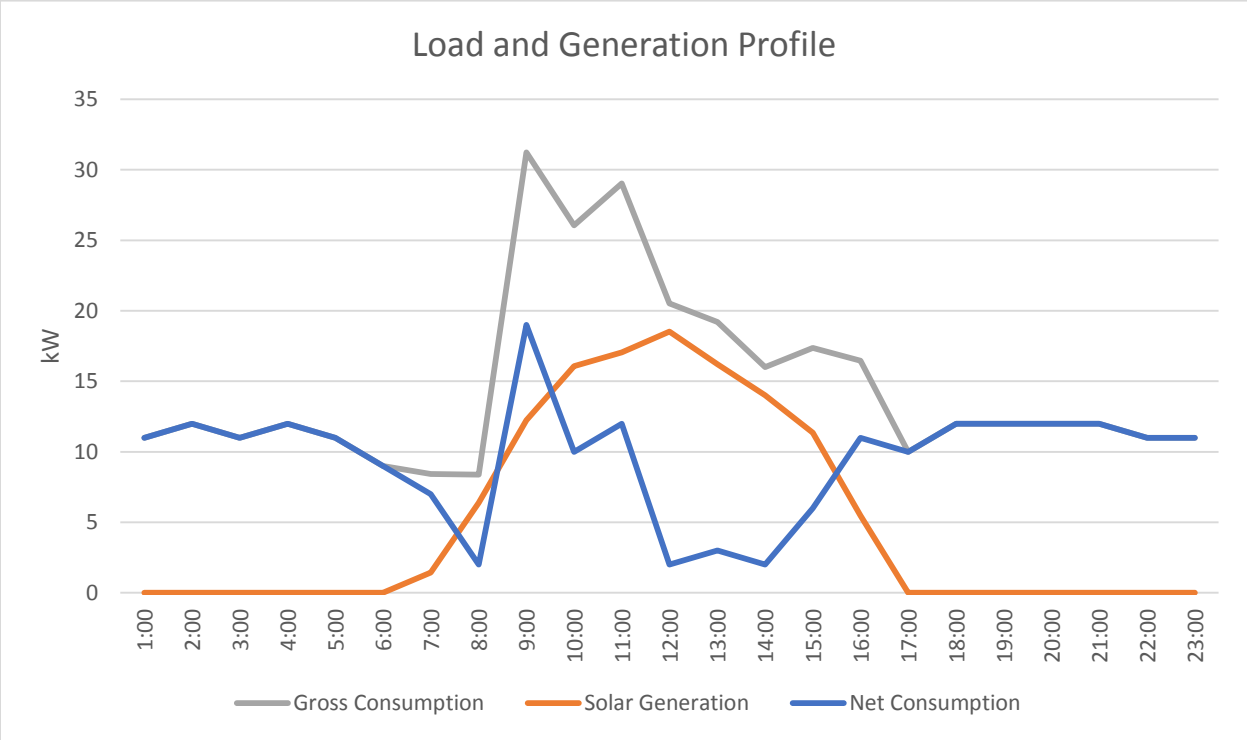

Figure 4: Gross consumption, solar generation and net consumption on 25th of October, 2018 (hourly values)

Evaluation

Evaluation from the customer point of view

For the customer, the benefit can clearly be seen in the chart in the reduction of the net consumption and therefore the electricity bill. In this case, 118 kWh were generated within one day, so the customer has saved the electricity retail price of 118 kWh. A full economic analysis is not possible as the cost is not

known. Taking into consideration that the solar panels were present on site before but not being used, the costs were mostly those of the inverter and the new wiring and the payback rate of that investment is certainly very good.

In technical terms, the solar system fits very well with the load curve of the Institute: the peak of the day can considerably be reduced from 30 to 20 kW in this case, and the consumption is at times close to zero, but always positive, meaning that the actual moments of an electricity export to the grid are rare. As the load of that particular day was only partial load as mentioned above, it is clear that for days with full load, the remaining consumption but be higher. On the other side, on days of public holidays, there might be moments of actual electricity export to the grid.

Evaluation from the utility point of view

For the utility, it can be seen that the impact in terms of actual electricity export to the grid is very low. On this particular day, at no moment, electricity is actually exported, but only the consumption of the customers reduced. On public holidays, it can be expected that there will be some export to the grid, but these moments will be very rare as the pond circulation pumps which are a major load of the site normally run continuously on a 24/7 basis.

In terms of harmonics and power quality impact to the grid, no measurement data was available. However, as the inverter is a standard model by a reputed brand, complying with all relevant international standards, it would be rare if any negative impact on the grid should be the case.

Summary

The installed system shows the functioning of a 25kWp rooftop solar net-metering plant in practice. The system works well and the output is as expected. The generation profile at the site matches well with the consumption, reducing both the peak demand at the site and the electricity bill of the customer. No negative impact on the grid is noticed.