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A UK-Indonesia Low Carbon Energy Partnership

The application of smart meters and demand side management for centralised solar PV in Indonesia

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The MENTARI Programme (Towards Indonesia's Low Carbon Energy Transition) is a cooperation between the Ministry of Energy and Mineral Resources (KESDM) of the Republic of Indonesia and the British Embassy Jakarta to develop low carbon energy in Indonesia.

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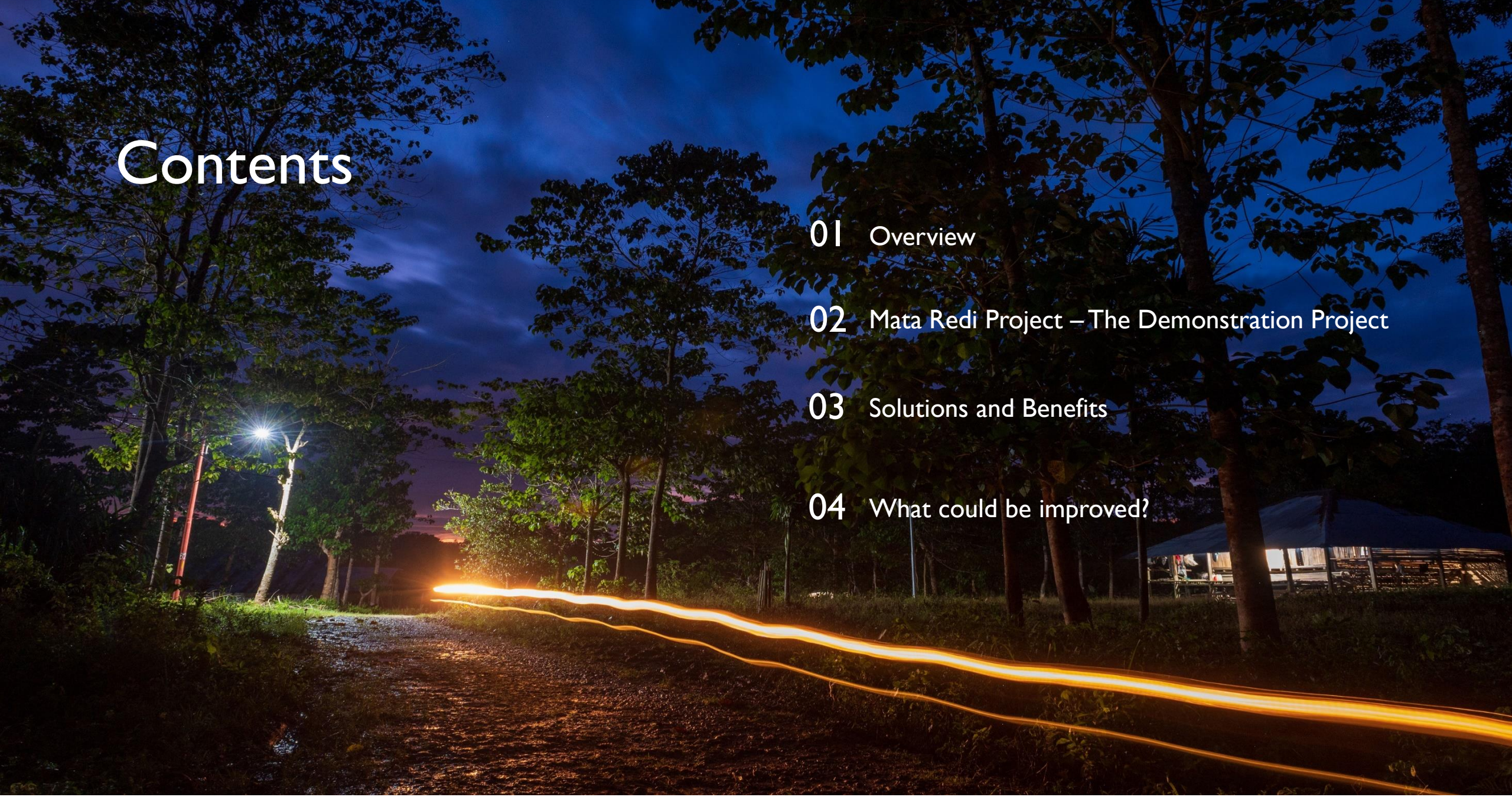

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01 | Indonesia's PV Off-grid Overview

- Close to 700 units (villages) of PV mini-grid across the archipelago
- More than 75,000 households, minimum of 2,000 jobs creation
- Close to 50 MW capacity added, offsets around 2,610 tons CO2 per year
- Growing opportunities for skilled employment through Engineering, Procurement and Construction (EPC) services
- Sustainability is a huge challenge

Source: https://geoportal.esdm.go.id/ebtke/

Challenges

- Difficulty to find an adapted metering solution in locations with no signal/flaky/ internet coverage; satellite service is too expensive in the long run
- Energy limiter limits the utilization of energy (400-600 Wh/daily) leads to dump load not being used
- Lack of a "Time-Based" metering solution to promote daytime energy usage
- High cost of O&M as skilled personnals are located in the cities
- Demand load is not well studied or documented leads to unmatched demand forecast
- Strategy to maintain the battery health at night versus managing peak demand
- Failing business model from people not paying fees and lack of billing system

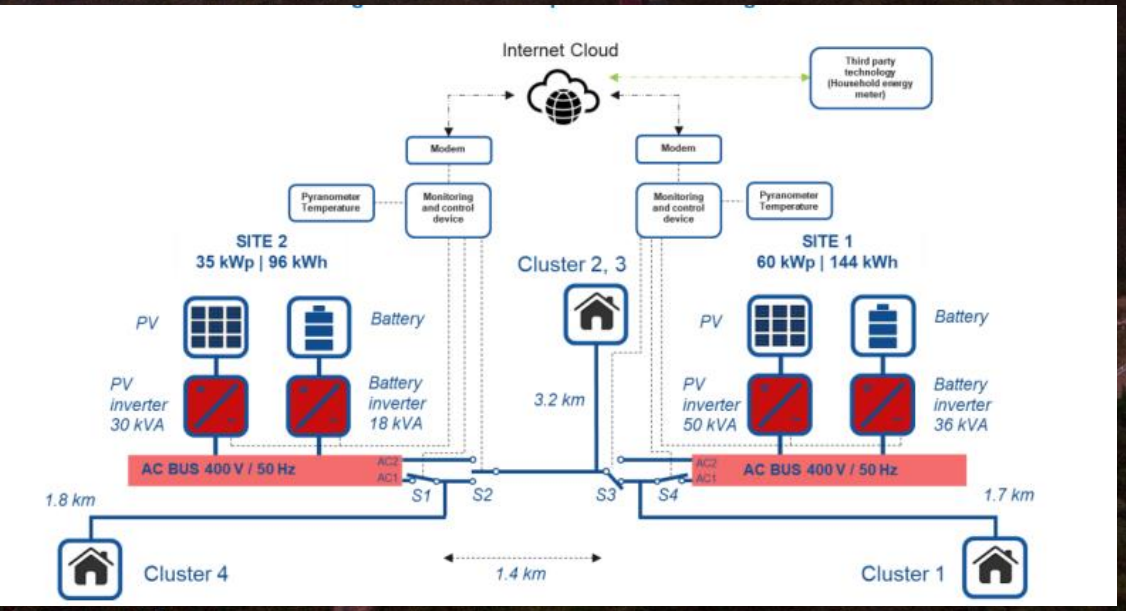
02 | The main features of the Mata Redi Project

- Asset management
  - Land donated by the local community and handed over to the village administration
  - PV systems will be handed over to the village administration
- Institutional and skill development
  - BUM Desa Hali Dewa and 10 young people (including women) were trained on solar PV O&M and productive use of energy, they obtained SKKNI certification
  - BUM Desa received assistance on better governance systems and procedures
- Local government corporation
  - Mata Redi village has issued village regulation on iuran/ fee for electricity service, asset management, equity participation to support BUM Desa to ensure operation of the plants
  - Collaboration with Central Sumba Pokja to leverage additional support for the project
- Community contributes up to 80% of the cost of household cabling installation – paid to BUM Desa
- Operational and Maintenances (O&M)
  - EPC is responsible for three years O&M,
  - Contract was drawn based on lessons learned and most common failures for PV systems in Indonesia
- Innovation
  - Utilization of day-load especially for productive use
  - The two system were connected to each other to allow transfer of load (working in progress) and the use of localized network to support smart meter that allows the operator to regulate dynamic load
- Planning
  - Accelerated demand load increase and working with PAW and Agradaya to improve local agriculture products that utilize electricity and allow access to market
- Business model
  - Electricity service will be taken care by BUM Desa and productive use of energy is in the B2B agreement with offtakers
- Gender and inclusion
  - Deliver three stages of G&I training including for women-led entrepreneurs

The 60 and 35 kWp PV+BESS system in Mata Redi Project

- Interconnected
- 100% RE
- Different load division
- Smart meter (mesh-network application) and remote monitoring
- Containerized

Parameter	Site 1	Site 2
PV module capacity	60 kWp	35 kWp
Grid inverter capacity	46 kVA	27 kVA
Battery inverter capacity	36 kVA	18 kVA
Battery capacity	148 kWh	96 kWh
Total PV production	97917 kWh/year	57118 kWh/year
Load consumption	47420 kWh/year	31236 kWh/year
Excess energy	46405 kWh/year	23880 kWh/year
Capacity shortage	444 kWh/year	313 kWh/year
Autonomy	24.5 hours	24 hours
Annual battery throughput	27542 kWh/year	13080 kWh/year
Average SOC range	45%–100%	50%–100%



03 | Solutions and Benefits

>> Smart meter that can tackle flaky internet access, thus cut the cost of internet

>> Regulated load– future load forecast for similar project – low and max consumptions, between different types of residents, residents with businesses, anchor business

>> Time of use

>> Schedule load limit

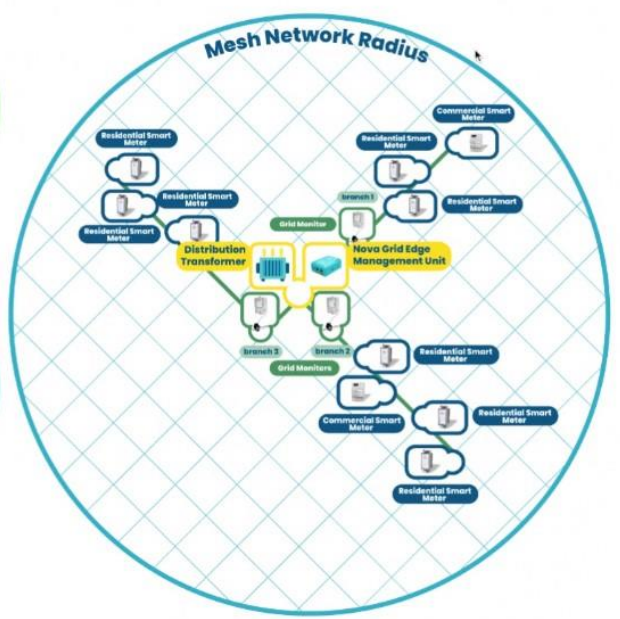
>> Load shedding

>> Power quality

>> Grid management

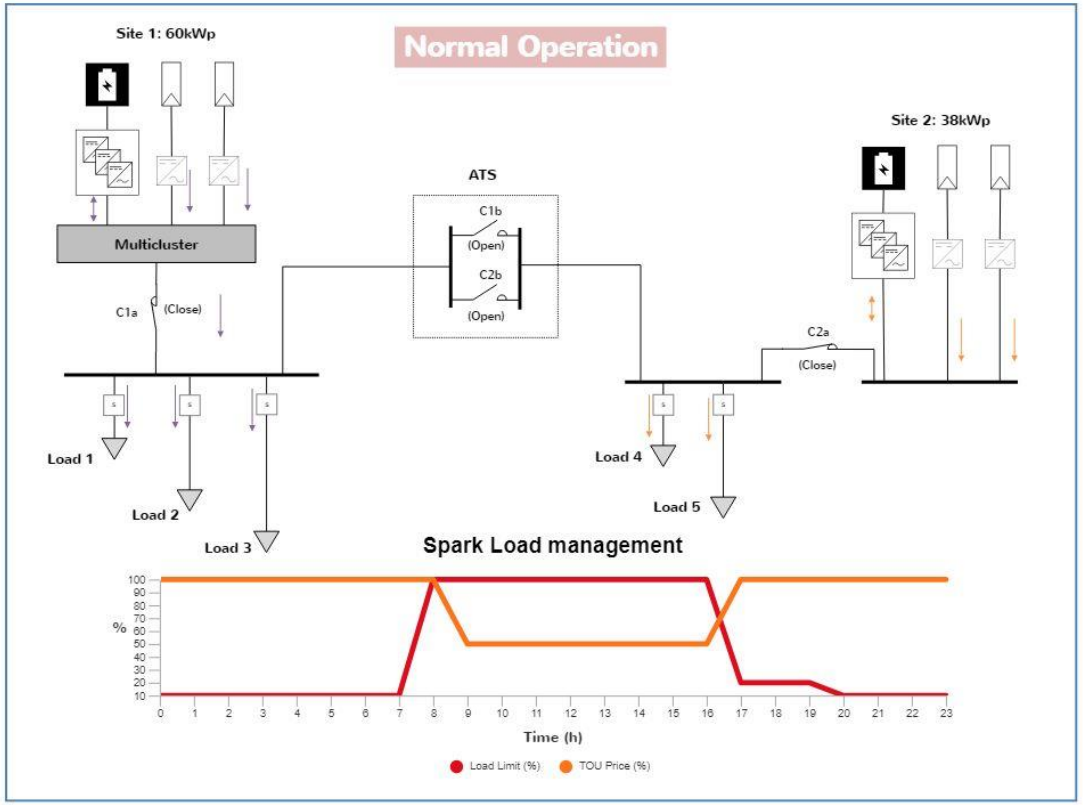
>> Multilevel load Monitoring

>> Billing platform



Source: SPARK Meter

03 | Solutions and Benefits



- The application of Sparkload management in Mata Redi Project

03 | Solutions and Benefits

>> Increased data reliability and accuracy with 5min time step monitoring on each meter

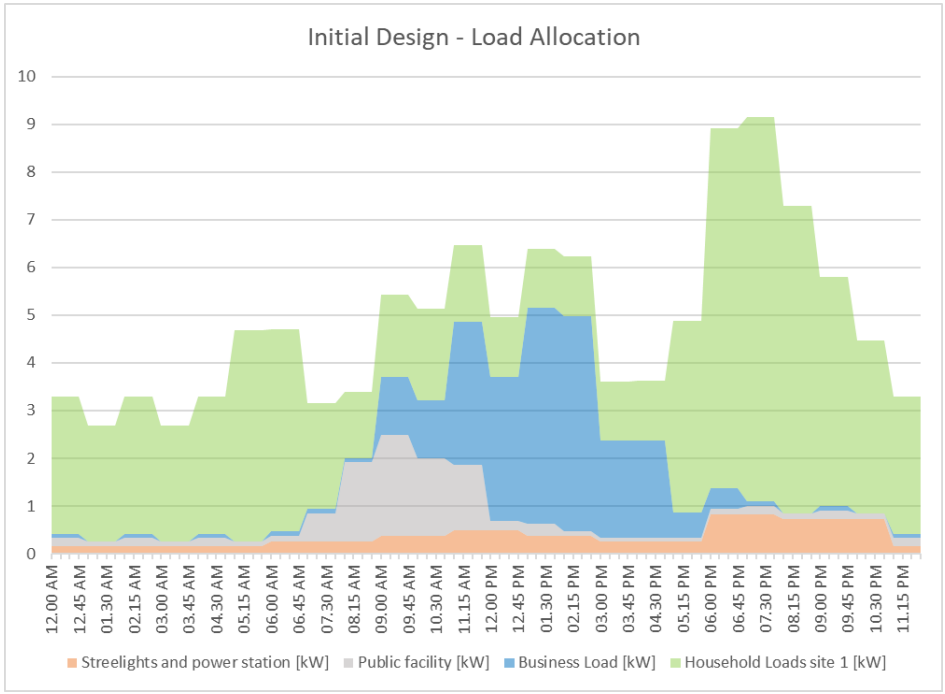
>> Each meter act as a simple grid monitor which reduce the cost of O&M- thus reduce the carbon emission from people travelling to the ground; furthermore, help to tackle the problem on the availability of skilled personnels on the ground

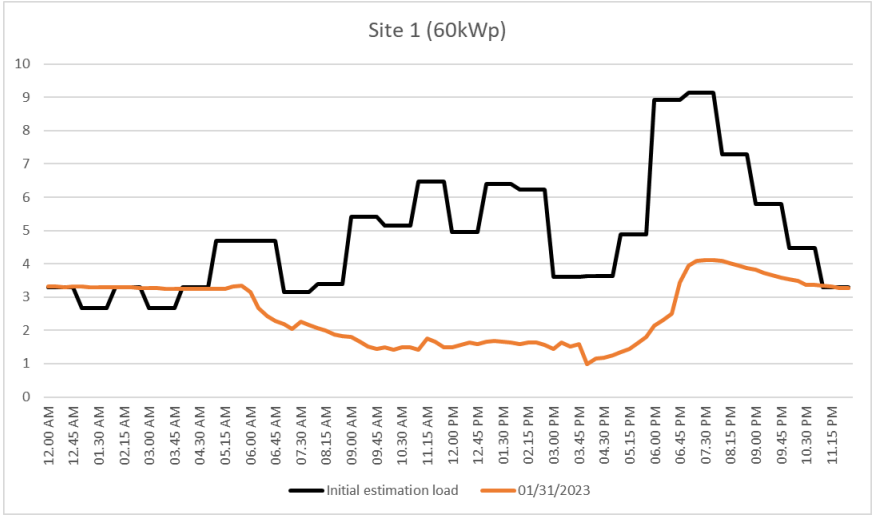
>> Maximizing the life time of the battery –also maintain the health, PV and BESS by limiting and optimizing the demand.

>> Prevent early failure and future use for better planning on similar projects or allows increase the response time for diagnose and troubleshooting

- Obtain data of operation parameters, state of health of each components and environmental data/ conditions

>> Easy top-up of the electricity fees as it is centralized at the power station and kiosks (implemented soonn a





04 | What could be improved?

- Customer - Meter engagement. The design needs to ensure customers able to interact with the meter to monitor their load and their energy allocation at any given times
- Integration of meter and the power system to improve network management - a universal system integrator
- Automatic billing that can be sent in a digital form to increase transparency and to reduce the paper work
- Lack of a “network Maintenance” dedicated page in the smart meter platform using already available data. (Ex: Map of the network)

Thank you

Connect with MENTARI team
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