Solomon Power

Design, Installation and Commissioning of Hybrid System In Solomon Islands

Presentation by Pradip Verma /Hemant Kumar

August 2017

Solomon Islands Electricity Authority
Trading as Solomon Power

Solomon Islands (Background)

- Nine Provinces
- Over 900 small islands spread over 1 million sq. km of sea
- Population @ 600,000. Honiara – @80,000.

- Footprint of electricity - very small.
  - Access in Urban Honiara – 64%
  - Access in rest of the country – 16%

- Cost of electricity –highest in South Pacific

Solomon Islands (Background)

- Goal – Increase Footprint -Access to all by 2050
- Strategy
  - Mini grid system ideal
  - Large sub-transmission and distribution system not suitable
  - Hybrid technology – (Solar, battery and diesel as backup)

Taro Hybrid system

Project : **TAR**-G99-0515

TARO

SOLAR HYBRID GENERATION PROJECT

SolomonPower

energising our nation

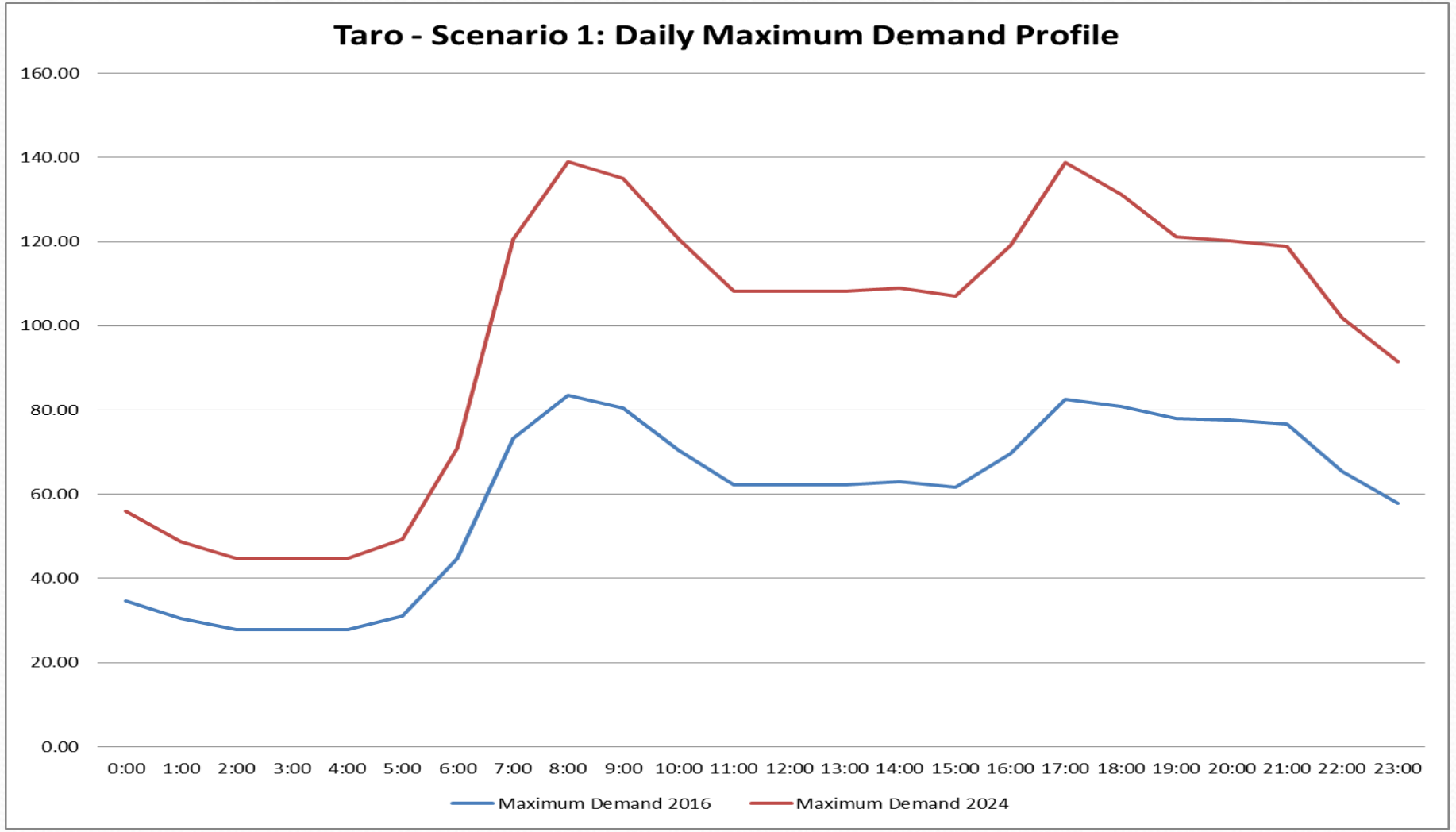
Taro Hybrid Station

Design Process

- Demand Forecast :
  - Model developed for outer islands
  - Financial analysis –tool – payback – 7 years

- Concept Design – 75% renewables (solar/batteries)

Taro Concept Design



Taro Key Design Parameters

Energy Forecast	260,000 kWh per year
PV Array	224kWp-800 X Trina Honey 280W
String Inverters	200 kW – 8 X STP25000TL-30
SMA Sunny Islands	108 kW – 6 Clusters of S18.OH
Battery Bank	1.58 MWh -12 strings BAE 14PVV2660
PV Contribution	86.3%
Generator hours /year	362
Diesel litres/year	10,270
Battery design life (years)	9.9 (35 degs C)
Battery Bank Autonomy to 40% SOC	31.9 hours

Taro Design – PV – 800 panels

Taro Design - String Inverters

Taro Design – Battery System 2X strings

Taro Design - SMA Grid Forming Inverters

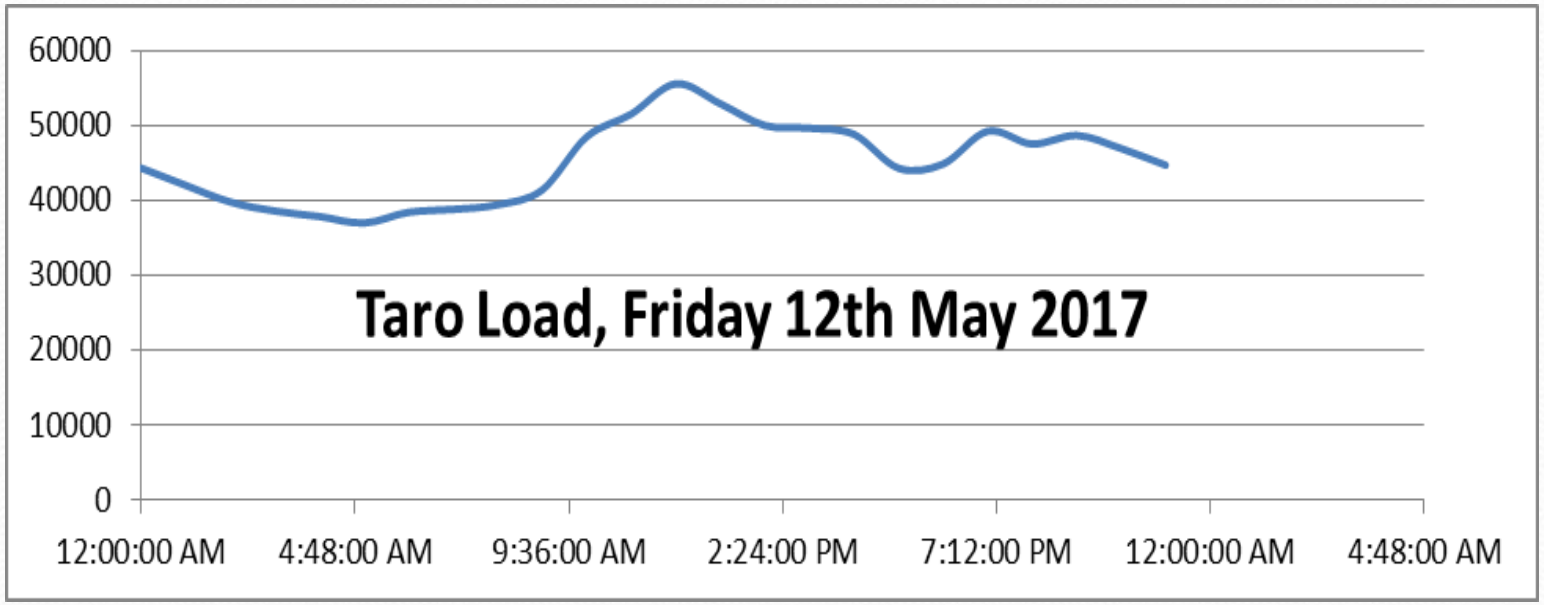
Design Drawings

- design layout drawings.pdf

Seghe Key Design Parameters

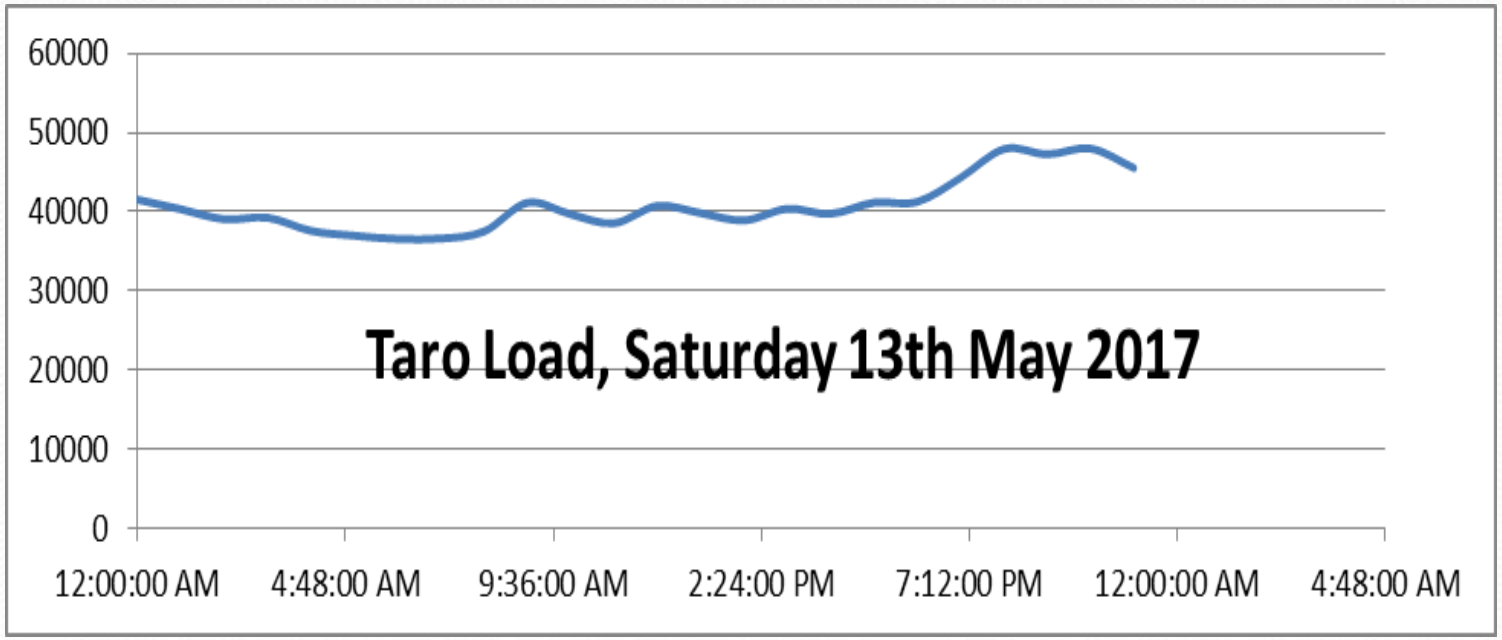
Energy Forecast	200,000 kWh per year
PV Array	168kWp-600 X Trina Honey 280W
String Inverters	150 kW – 6 X STP25000TL-30
SMA Sunny Islands	90 kW – 5 Clusters of S18.OH
Battery Bank	1.01 MWh -5 strings BAE 22PVV4180
PV Contribution	87.7%
Generator hours /year	291
Diesel litres/year	7,109
Battery design life (years)	8.9 (35 degs C)
Battery Bank Autonomy to 40% SOC	26.6 hours

Actual Performance Load profile Weekday



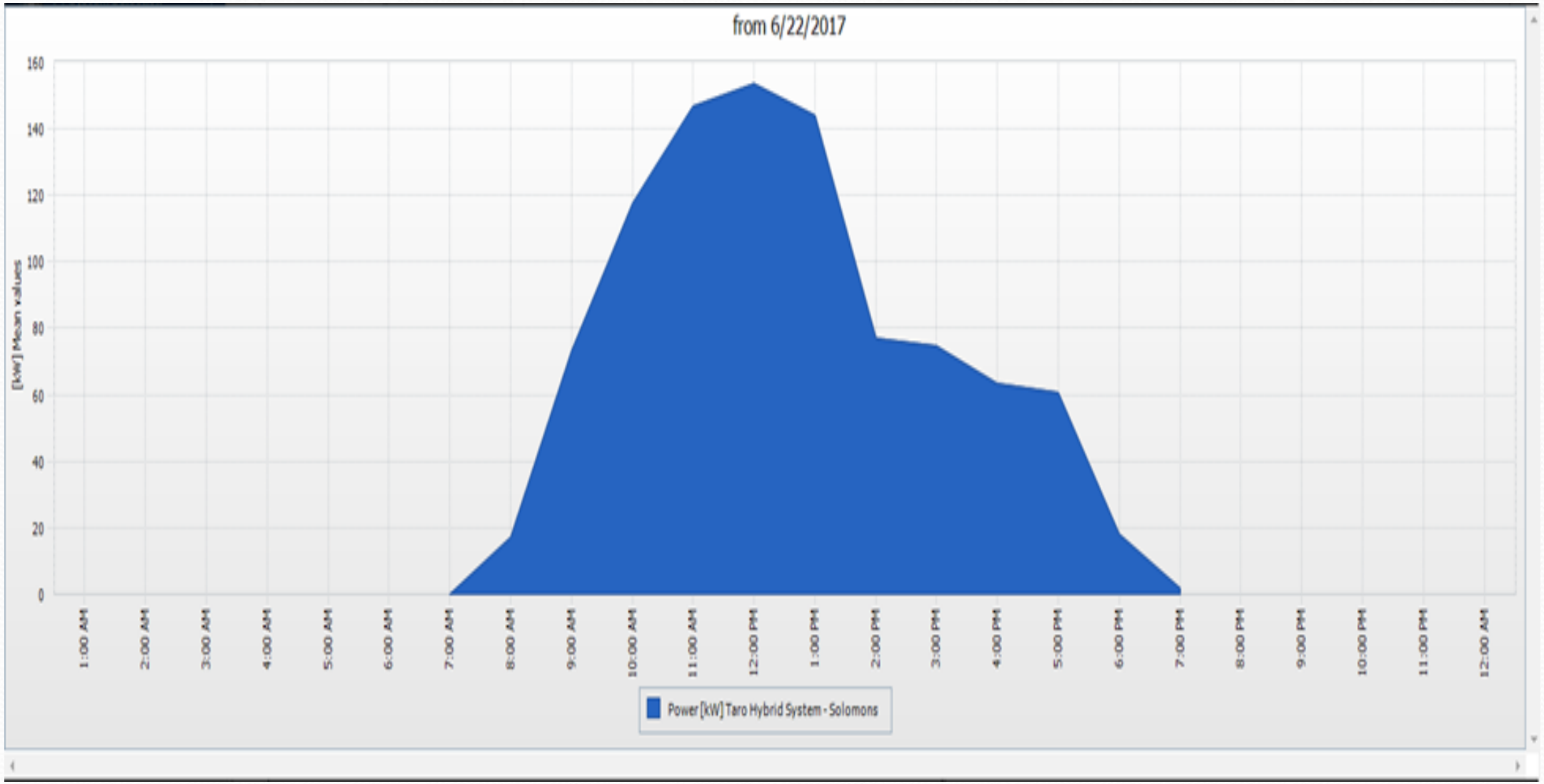
- Total energy consumed for 24hr period - 1080 kWh

Actual Performance -Load profile (weekend)

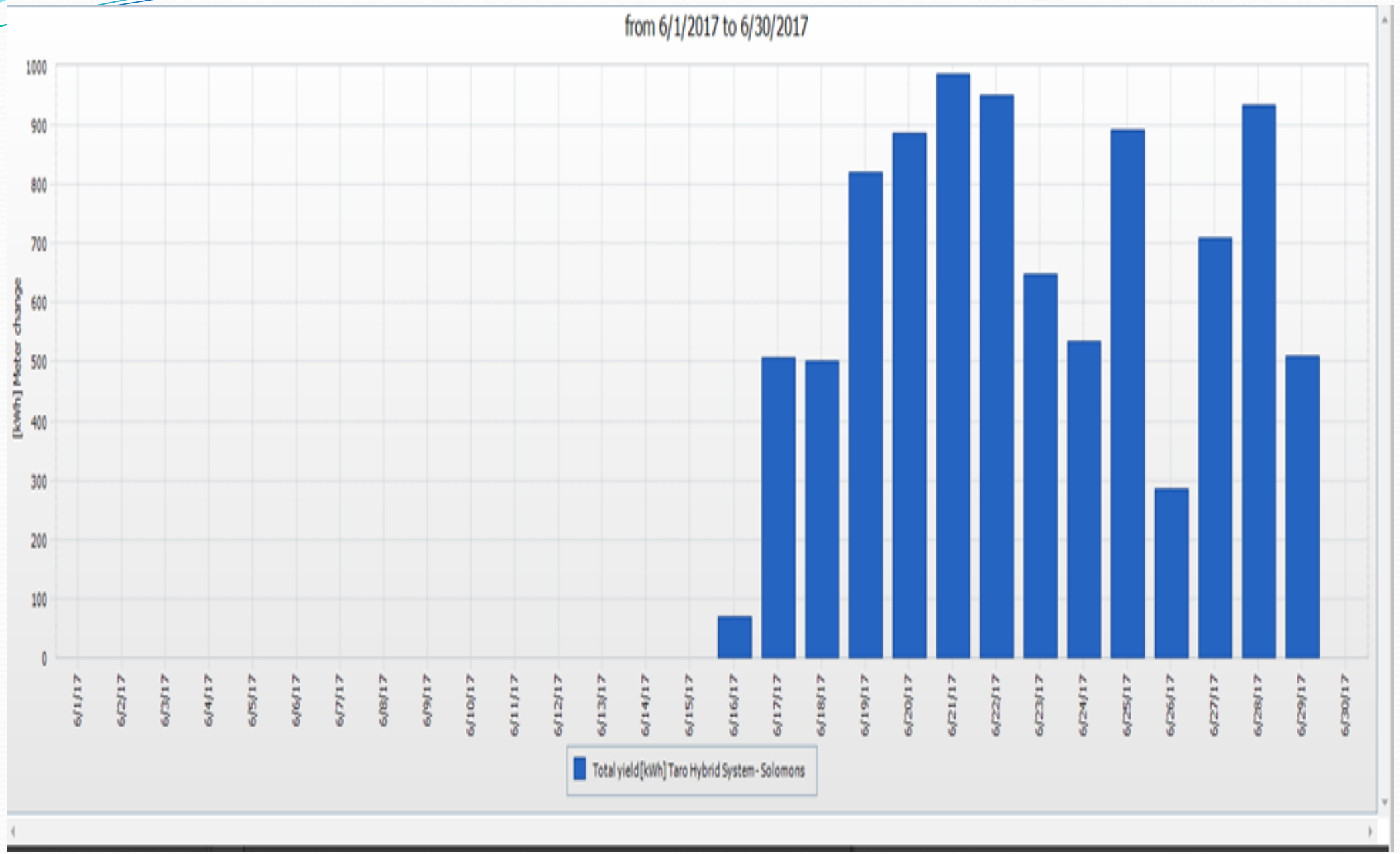


- Total energy consumed – 980 kWh

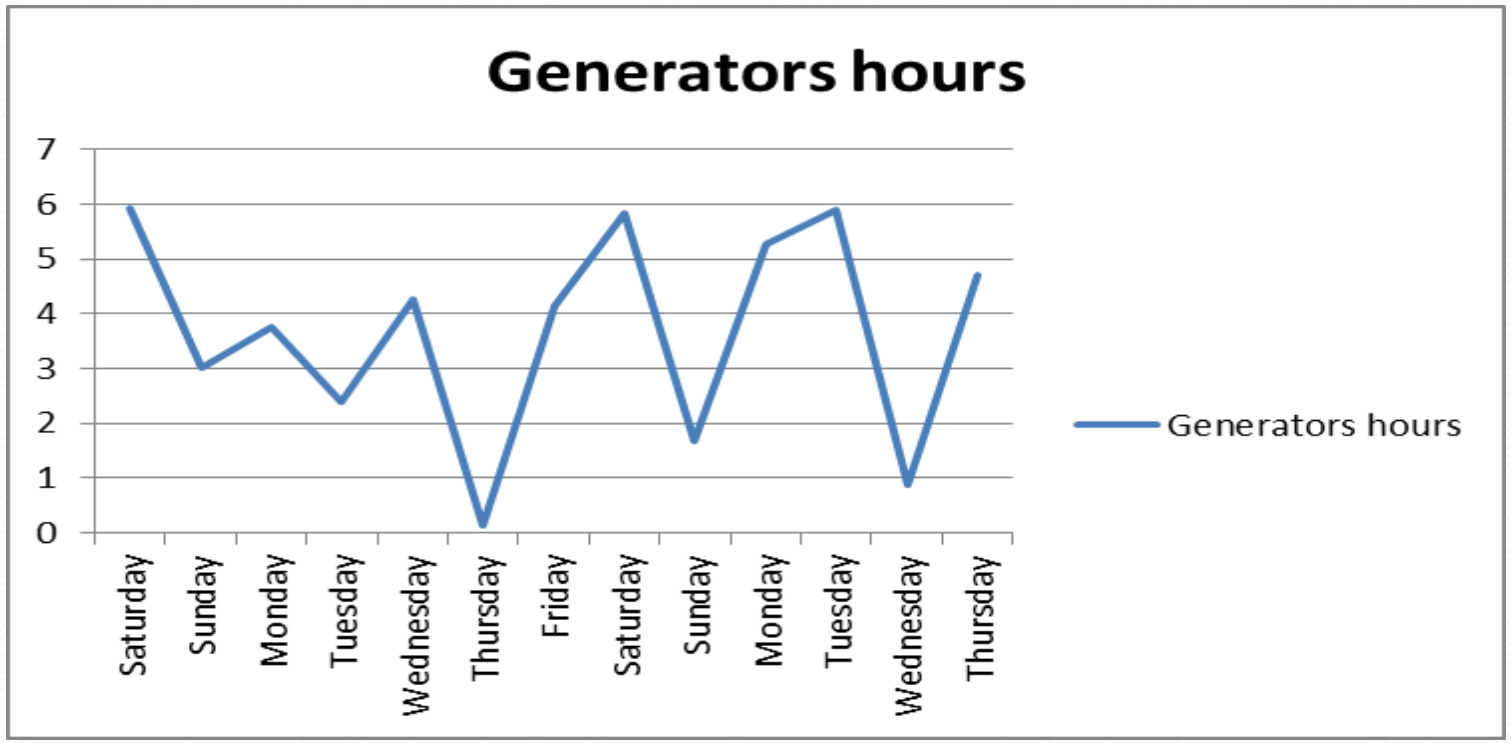
PV power produced –Peak @ 160kW- curtailing from 1 – 2pm not enough demand/battery full



Daily PV Energy (kWh)



Actual Generator Operational -Hours



- Average generator operational hours – 3.68 – 15%
- PV Contribution – 85% - will improve if SOC is revised to 40% from 50% at the moment

Lessons Learned

- Approval , Tender, Design construction/ installation /commissioning .
  - 2 years – first one – moving forward –projection is – 12 -18 months.
  - Remote location- weather, materials, logistics
- Civil contractors- capability.
- Finding local staff
- Up skilling for operational staff

Lesson Learned

- Generator Back-feed issues
  - Settings critical when commissioning.
  - Charging of battery up to 80% - PV to charge rest
- SOC settings - 40%
- Sizing of PV to match the load profile – curtailing effort (demand low and battery sizing)

Summary

- Renewal sources of energy will reduce the price
- Micro – grid – Mini grid – Hybrid 415V generation systems (Solar, Batteries, back up diesel). Cash Power pre-pay meters
- Only two staff per site
- Modular design for scalability - @150 + connections
- 40 Mini Hybrid Systems planned in the Islands
- 2 already implemented. 38 prioritised.
- planning studies commenced for additional ten sites.