High Penetration VRE's in Pacific Island Countries:
Small grids and Off-grid

Technical and Planning Challenges and Opportunities

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SolomonPower
energising our nation

Population 611,303
GDP $1.3bn USD
Area 248000 sq. km
900 islands
Honiara Grid, 90% of SI generation and Consumption, 64% Grid Connected
90% Population outside Honiara
6% Connection nationally

Solomon Power

The Solomon Islands Electricity Authority (SIEA) trading as Solomon Power

Vertically integrated SOE- Owns, operates and maintains the national electricity grid in the Solomon Islands

Capital infrastructure development (SBD $1bn)- improve reliability, accessibility, and affordability


Choiseul:
Taro
8 provinces, 12 sites
Western:
Noro, Munda, Gizo, Seghe
Isabel:
Buala
Malaita:
Auki, Malu'u
Central:
Tulagi
Guadalcanal
Honiara
Temotu:
Lata
Pacific Ocean
Pacific Ocean
Pacific Ocean
Pacific Ocean
Pacific Ocean
Aerial

Grid

33/11/0.4kV electricity network
MD approx. 16 MW.
Lungga and Honiara-34.4MW
1 MW Solar Farm
16,000 customers
Diesel 70% of generation costs
Total =90.65GWh
PV =1.5GWh
1.6% Renewable

Renewable Energy Roadmap

2015
- Buala Hydro Recommissioning 150kW

2016
- Henderson 1MW PV

2017
- Taro 224kW and Seghe 150kW Hybrids

2019
- Hybrid Conversions (5 sites)

2020
- Henderson 2MW Expansion

2022
- Tina River 15MW

- New Hybrid Sites: 3-5 sites per year
- BESS

2030- 100% Renewable

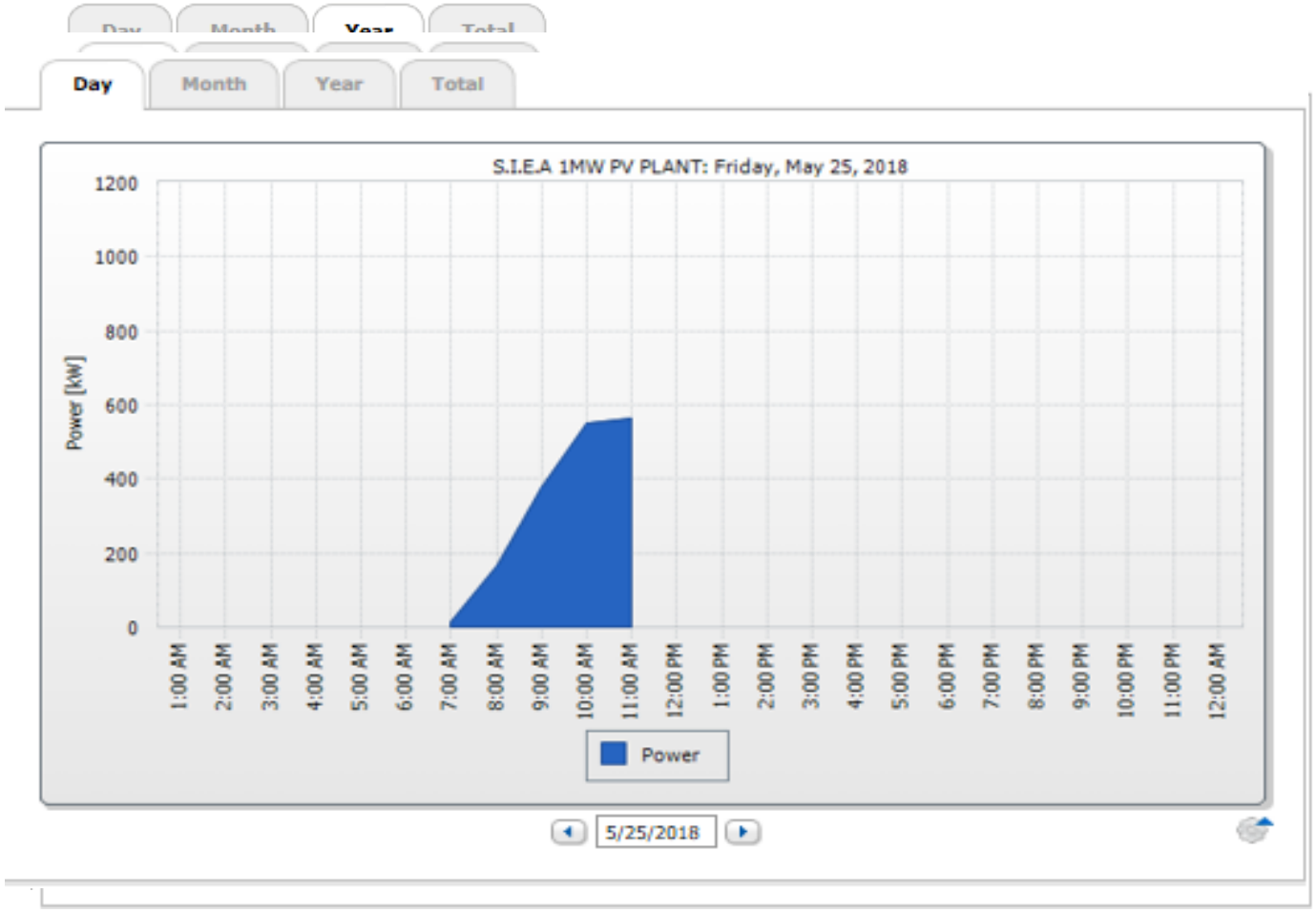
Henderson Solar Farm

Location: Honiara, approx. 6kms form Lungga Power Station
Capacity: 1020kWp
Grid Connected at 11kV
PV Modules: TRINA 275W/265W
Inverter: 17 x Sunny Tripower 60
Comms: Inverter Manager, Dual Radios
Funding: Aid UAE 60%, NZ 40%
Commissioned June 2016

Henderson Solar Farm Grid Connection

Issues-Henderson Solar Farm

Road Access
Quality Issues
Site Security
Weak Grid Connection
Communications
Vegetation Management



Taro Hybrid Scheme

Ex provincial government site
Existing network and customer
Land reclamation

Location:	Honiara, Solomon Islands
Operator:	Solomon Power
Commissioning:	5/13/2017

PV system power:	224.000 kWp
Annual Production:	approx. 336,000 kWh (1,500 kWh/kWp)
CO2 avoided:	Approx. 235.2 tons per annum

Modules:	800 x Trina Solar Energy TSM-280DD05.082 (II)
Azimuth angle:	0°
Angle of inclination:	10°
Communication:	SMA Cluster Controller
Inverter:	6 x Sunny Island 8.0H
	8 x Sunny Tripower 25000TL-30

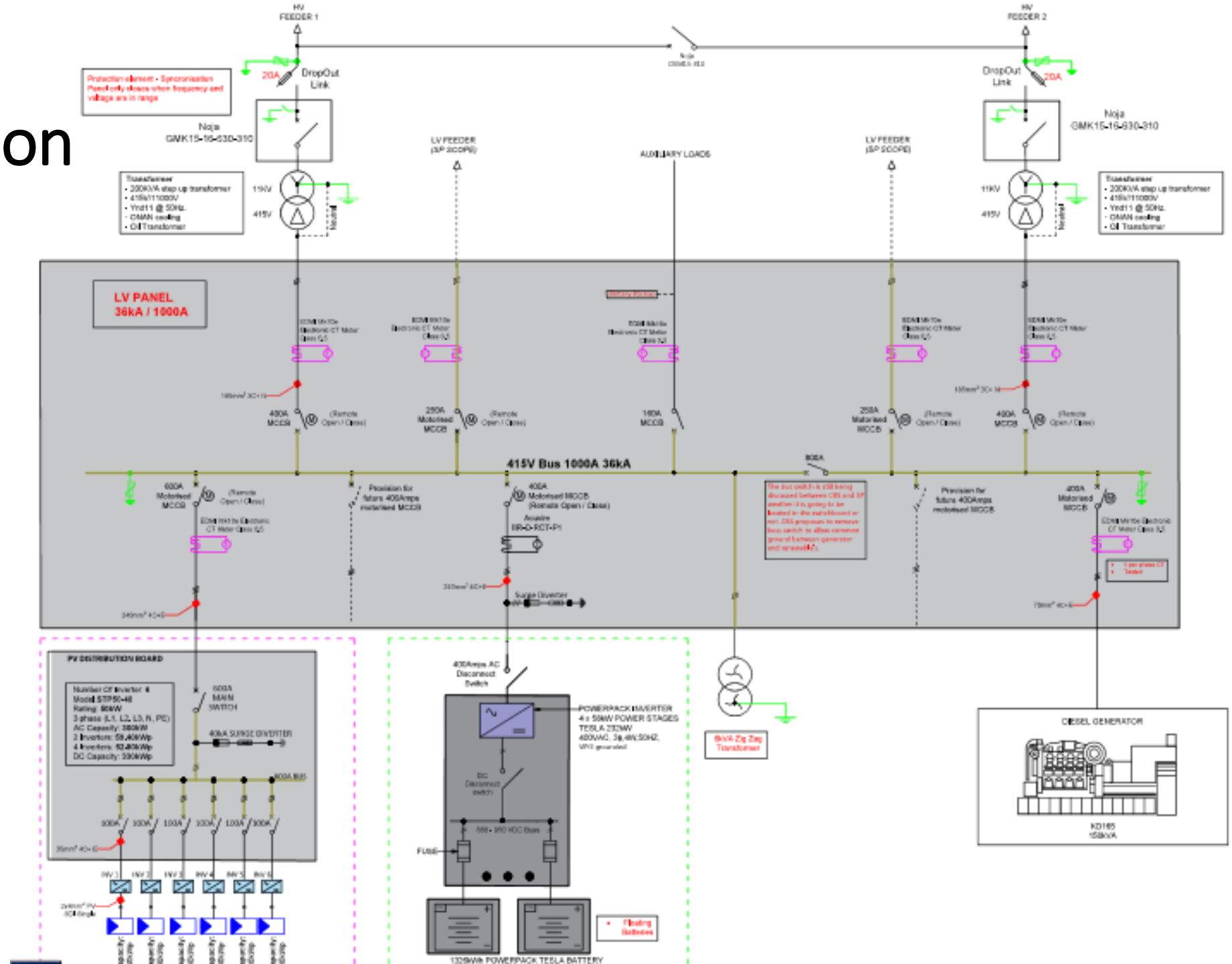
Seghe

Statistics	
PV System Rating	168kWp
PV Inverters	150kW
Battery Inverters	90kW
Battery- SLA	0.77MWh
Standby Genset	165kVA/132kW
Max Demand	9kWp
Total Battery Charging	30kW
Number Customers	86

Hybrid Conversion

Munda, Kirakira, Lata, Tulagi, Malu

Anti-Islanding
Protection schemes
LV/HV Feeders paralleling
Fault levels, high impedance faults
System Configuration, split bus
Control & Integration
Inrush Current

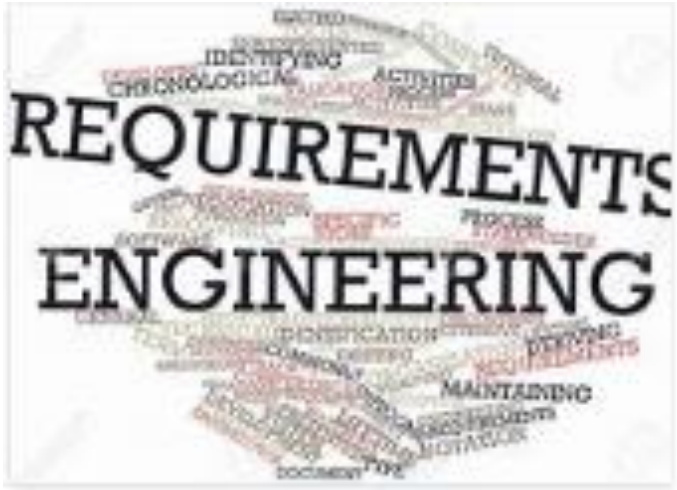


Challenges

- Land availability and access, complex land owning and administration
- Long term planning, unavailability of credible data
- Diverse and scattered population and load centres
- Consumer behavior, affordability
- Procurement procedures, purchasing local materials
- Cost of doing business, including fuel
- Shipping and logistics, heavy equipment, containers etc
- Accommodation
- Site security during construction and ongoing
- Unexploded Ordinances (UXO’s)
- Expertise
- Non- standard solution, increased OPEX
- Documentation, as built drawings, user manuals etc.

What do we as a Utility need to do better?

- Grid connection study
- Long term strategic planning
- Stakeholder engagement (internal, external)
- Design and implementation standards
- Industry collaboration, research, best practice
- Project delivery, design review, execution
- Standardised solution and products



Capability & Expertise

Stakeholder Group	Key actions from the other stakeholder groups that would better support our work?
Utilities	Review Electricity Act, Process and Procedure, Consultation, Collaboration
Consultants	Recognize the unique nature of PIC's environment One size does not fit all Local Engagement Sustainable Solutions KISS
Government	National Energy Policy Review SOE Act, Land Reform
Research	Into issues relevant to PIC's Economic model off grid systems for remote communities
Donors/Finance	Output based aid rather than $'s as measure for success Common Approach

Opportunities

Engineering and Technology	Economic and Planning	Finance and Investment	Policy and Governance
• Training and Accreditation • Standardization • BESS, G-1 • Hydro/PHES • Biomass • Renewable Integration • SCADA • Plug and Play Systems • Dispatchable VRE • EV's	• Local Community Group Involvement • Tariff • Increase PV% • Local Employment	• Business Model • Life Cycle Costing vs Capital Cost • IPP/PPA • Rooftop PV's • Incentives	• Tariff Structure • Fuel Tax • Facilitate IPP Arrangement • Land Reform • Regulatory reform

Tina River


Signing Ceremony for the Tina River Hydropower Project
HYUNDAI
IDA
TINA HYDRO DAM
MAP

Thank you

Tangio tu mus! (pidgin)

UNSW THE UNIVERSITY OF NEW SOUTH WALES

itp ITP Renewables Consulting | Engineering | Implementation

USP THE UNIVERSITY OF THE SOUTH PACIFIC

CSIRO

GSES global sustainable energy solutions