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IRENA - Renewable Energy Applications for Island Tourism: The Business Case for PV Systems - Fiji



**Presenter:
Bruce Clay
Clay Energy Fiji**



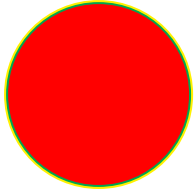
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Off-Grid Island RE Power

01/

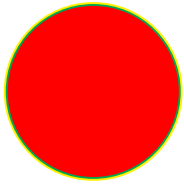
PV/Diesel Hybrid systems without energy storage

Simple grid connect PV systems

May have PV power control to increase penetration on diesel grids

Limited to <20% of diesel substitution

Levelised cost of energy well below diesel generation



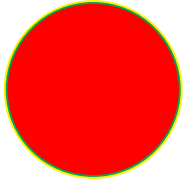
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PV/Diesel Hybrid systems without energy storage

Cost of generation

	Capital Cost Range \$/kWp	LCOE Range \$/kWh
Roof Mount	\$1,300 - \$1,500	\$0.08 - \$0.13
Ground Mount	\$2,000 - \$2,500	\$0.12 - \$0.21
Avoided Cost of Diesel \$/kWh		\$0.30 - \$0.55



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Off-Grid Island RE Power

02/

PV/Diesel Hybrid systems with energy storage

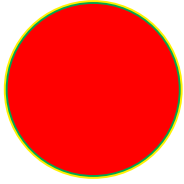
Financial optimum system;

Solar Contribution: 85-95%

Battery Capacity: 1.5 - 2 days (of consumption)

LCOE: \$0.45 - \$0.55

At fuel costs < \$1.20 diesel generation may be the best financial option



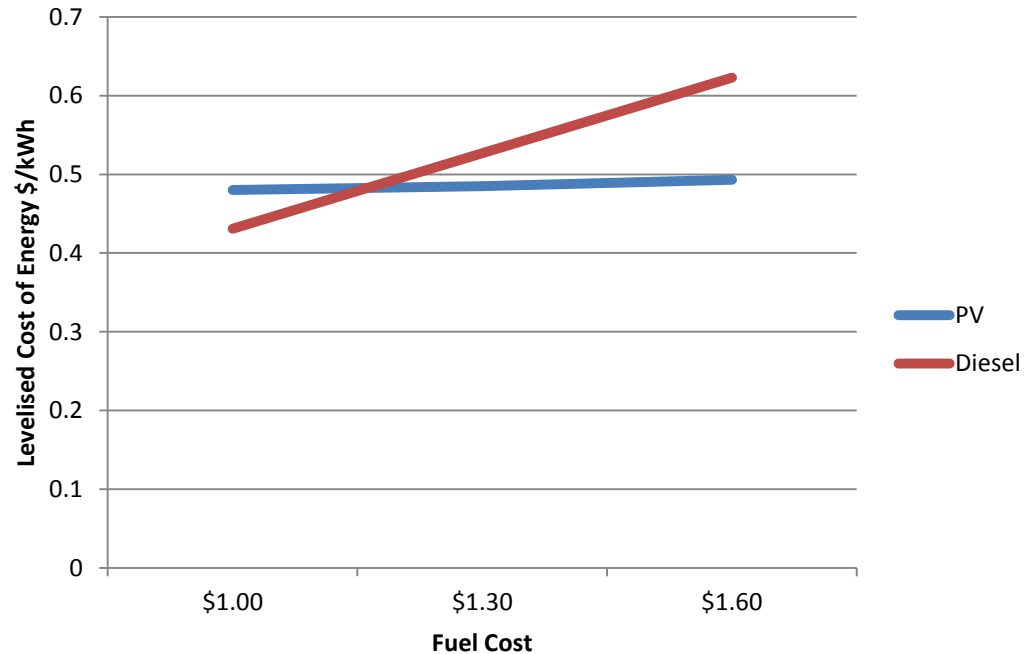
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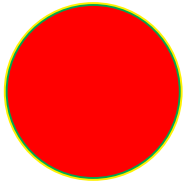


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PV/Diesel Hybrid systems with energy storage

Diesel Price Sensitivity





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Large PV Diesel Hybrid Turtle Island Fiji

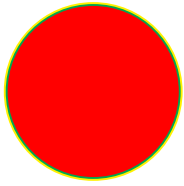
Private island premium resort with 14 villas

Situated on the Blue Lagoon in the Yasawa Island Group
100km NW of Nadi



TURTLE ISLAND
Once Discovered, Never Forgotten
FIJI





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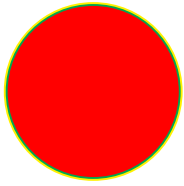
Large PV Diesel Hybrid Turtle Island Fiji



Selected PV/Diesel Hybrid Solution:

SMA Multicluster
solution
228kWp PV
120kW Battery
inverter/chargers
1.1 MWh storage
120kW diesel



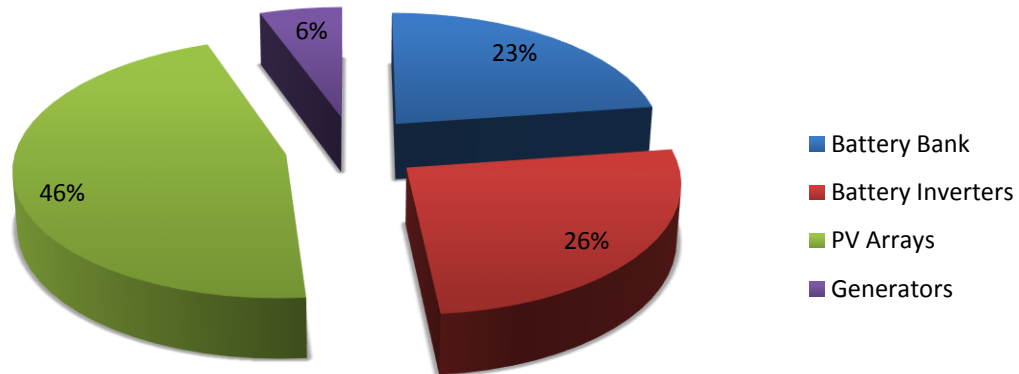


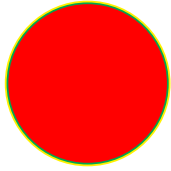
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Large PV Diesel Hybrid Turtle Island Fiji



System Capital Cost \$1,065,000





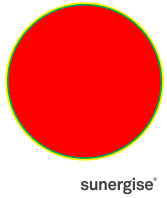
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Large PV Diesel Hybrid Turtle Island Fiji



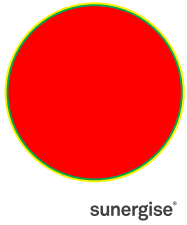
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Large PV Diesel Hybrid Turtle Island Fiji





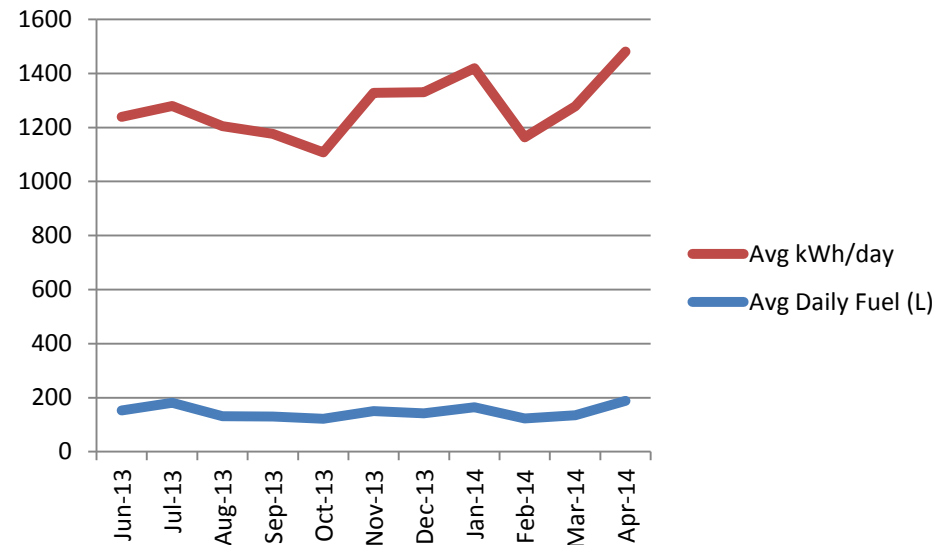
Large PV Hybrid - Turtle Island Fiji Actual System Performance

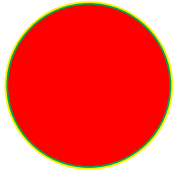


Island electricity consumption increased 29% from original design

Average daily energy use: 1126 kWh

Annual Fuel use: 53,735 L





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Large PV Hybrid - Turtle Island Fiji

Actual Financial Performance

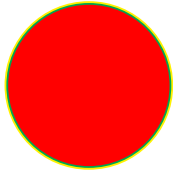
	Actual	Design
Daily Energy Use (kWh/day)	1126	870
Diesel Price (\$/L)	\$1.60	\$1.60
System Capital Cost (\$)	\$1,065,000	\$1,065,000
Annual Fuel Use (L)	53,735	22,300
Annual Generator Hours	~2600	~1000
Solar fraction of generation	56%	77%
Levelised Cost of Energy (\$/kWh)	\$0.578	\$0.548

24/7 Diesel Generation Comparison

Annual Fuel Use (L)	131,140	104,620
Levelised Cost of Energy (\$/kWh)	\$0.623	\$0.672

* Discount Rate 6%

* Project Life 15 years



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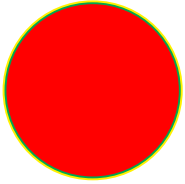
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Grid Connect PV Lease/PPA Model for Commercial & Tourism Properties

Grid Connected Solar PV costs have reduced significantly and are below utility tariffs

	Capital Cost Range \$/kWp	LCOE Range \$/kWh
Roof Mount	\$1,300 - \$1,500	\$0.08 - \$0.13
Ground Mount	\$2,000 - \$2,500	\$0.12 - \$0.21
	Utility Tariff	\$0.22

Solar power system capital costs though are still significant
How to overcome the capital cost issue for businesses?

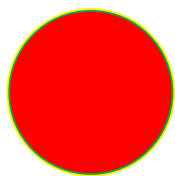


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Grid Connect PV Lease/PPA Model for Commercial & Tourism Properties



-
1. Lease Finance - Fixed repayments per period for a contracted number of years. Customer owns the plant and would be responsible for maintenance and insurance.
 2. PPA (Power Purchase Agreement) - Payments per period are based on a fixed \$/kWh for solar power produced.
Contract periods are 10+ years.
Customer doesn't own the PV plant but may have an option to purchase at the end of the contract.
Provider is responsible for maintenance and insurance



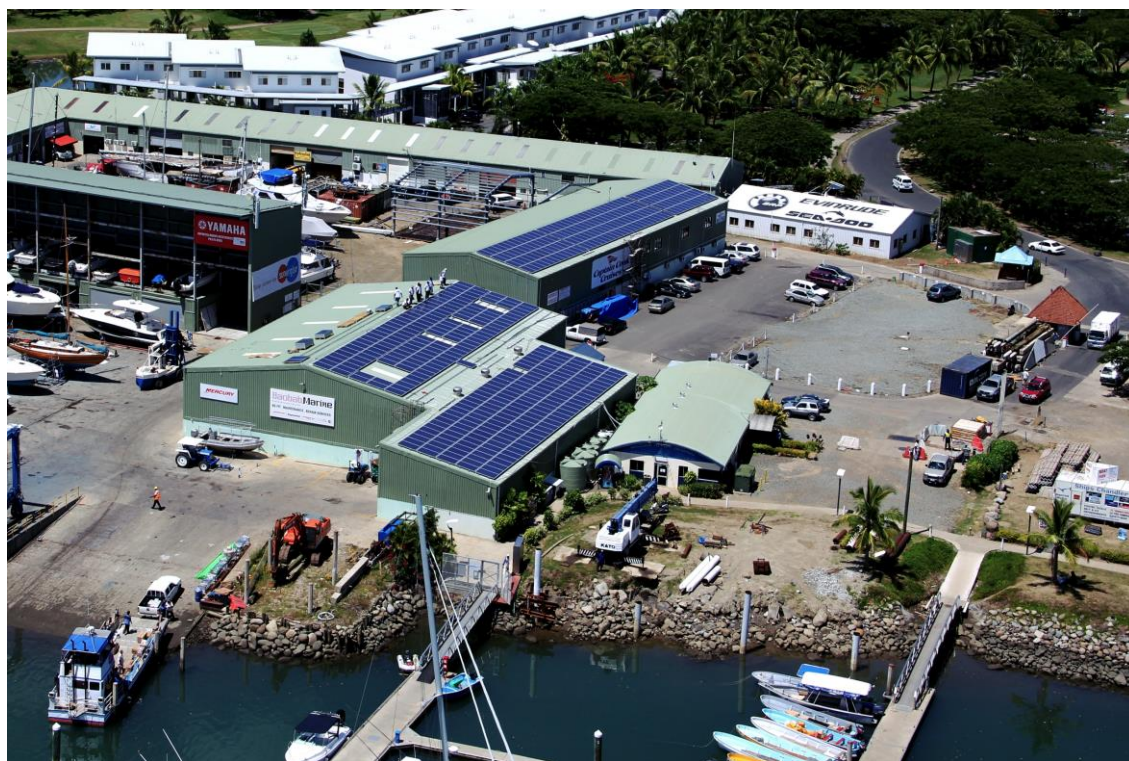
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Case Study

Port Denarau PVGC 190kW



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Sunergise PPA Solution

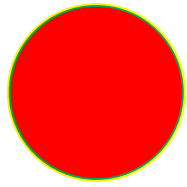
Reduced the Marina's carbon footprint

No capital outlay

Fixed tariff for 15 years

No technical, maintenance or insurance risk

Guaranteed Production



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Vinaka Vakalevu - Thank you!



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