



How much money is your port losing by not installing a large solar system?

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Image from google maps, Tuas port, Singapore



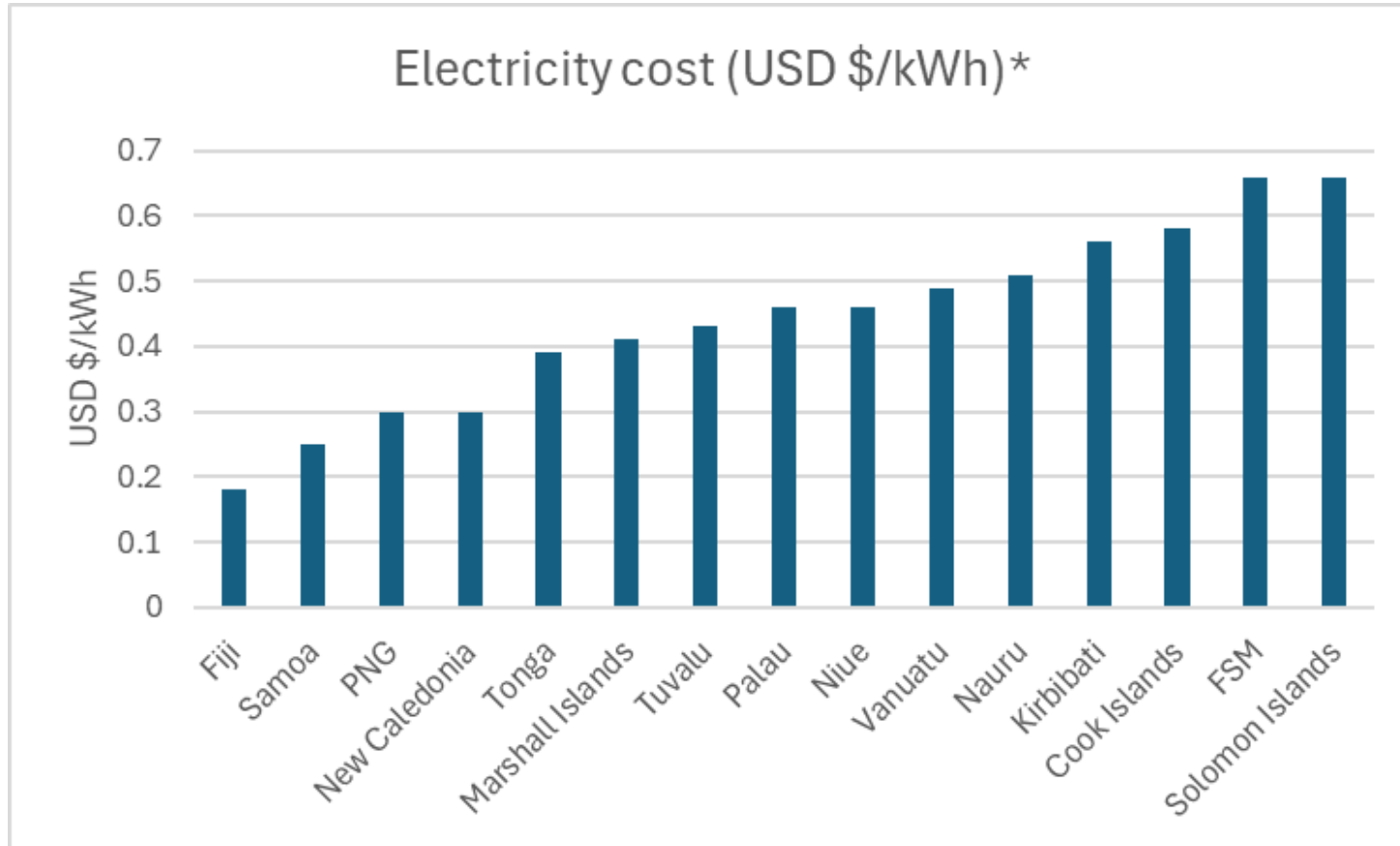


# Disclaimer

- The conclusions in this presentation are based on a desktop analysis with various assumptions. Benefits and costs may vary to what has been estimated, and depend on specific site conditions.



# Pacific Island ports have very high electricity costs

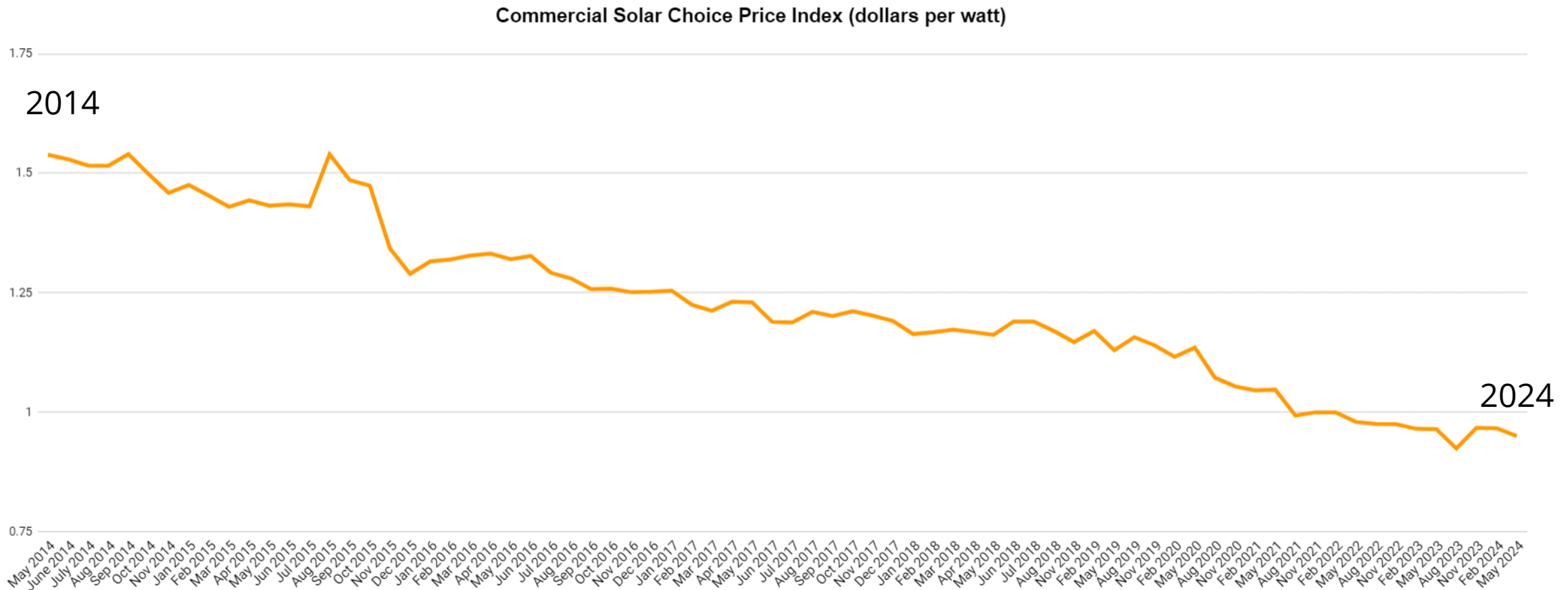


\* Using data extracted from <https://ura.gov.vu/media/attachments/Electricity Price Report - Pacific Area March 2023.pdf>



# The price of solar PV systems continues to decline, and is now below USD \$1/kW (grid-connected)

USD \$/watt, installed in Australia, grid-connected solar PV system



Graph from solar choice: <https://www.solarchoice.net.au/solar-panels/solar-power-system-prices/>



**High electricity costs  
+ Low cost grid-connect solar PV  
= A GREAT INVESTMENT**



# Grid connect solar system

- Exports any excess solar production to the electricity grid.
- The vast majority of solar systems installed globally are grid-connect.





# Grid connect constraints

- The utility must allow grid-connect solar PV systems.
  - It appears that almost all Pacific Island countries allow grid connect solar. Nauru: unknown; Kiribati: “on a small scale”.
- The feed-in tariff (FIT) is often low in relation to the cost of electricity, or could even be zero:
  - E.g. Fiji:
    - the FIT is FJD \$0.15,
    - but the cost of electricity is FJD \$0.41.
- Therefore grid-connect systems are often sized only to export a small amount of energy.

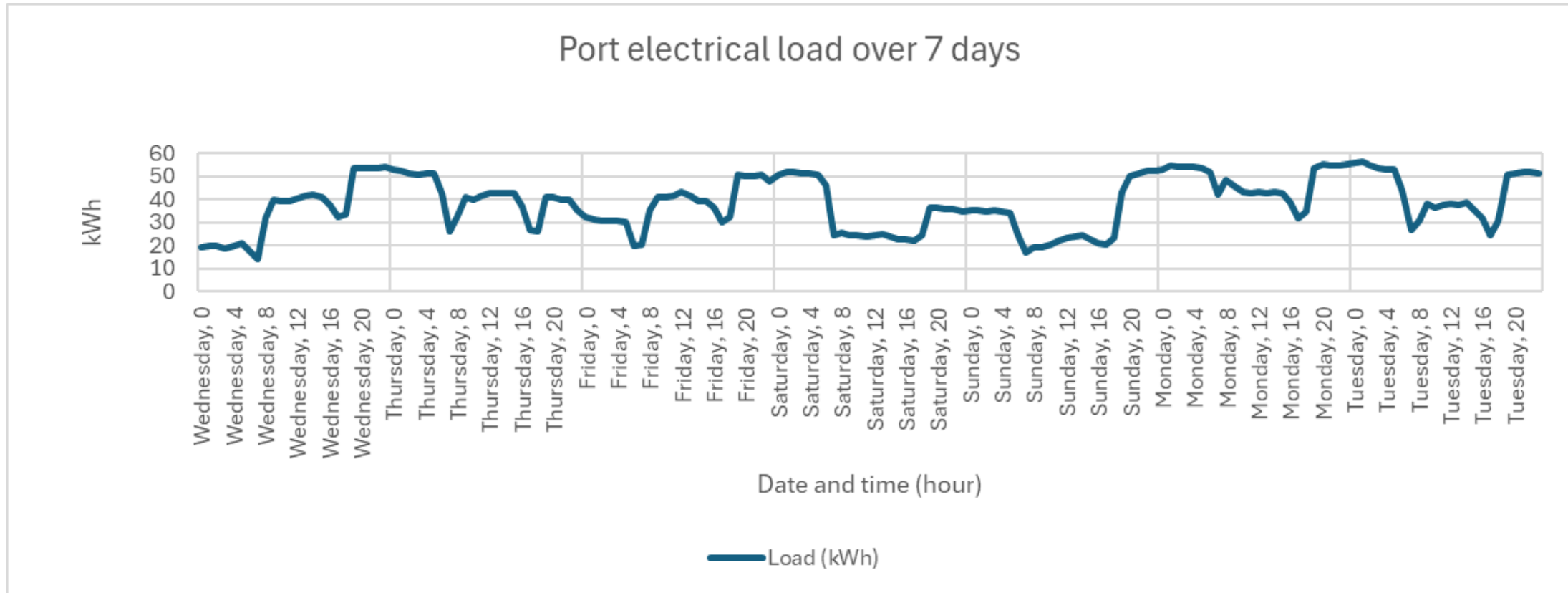


# Tarawa example





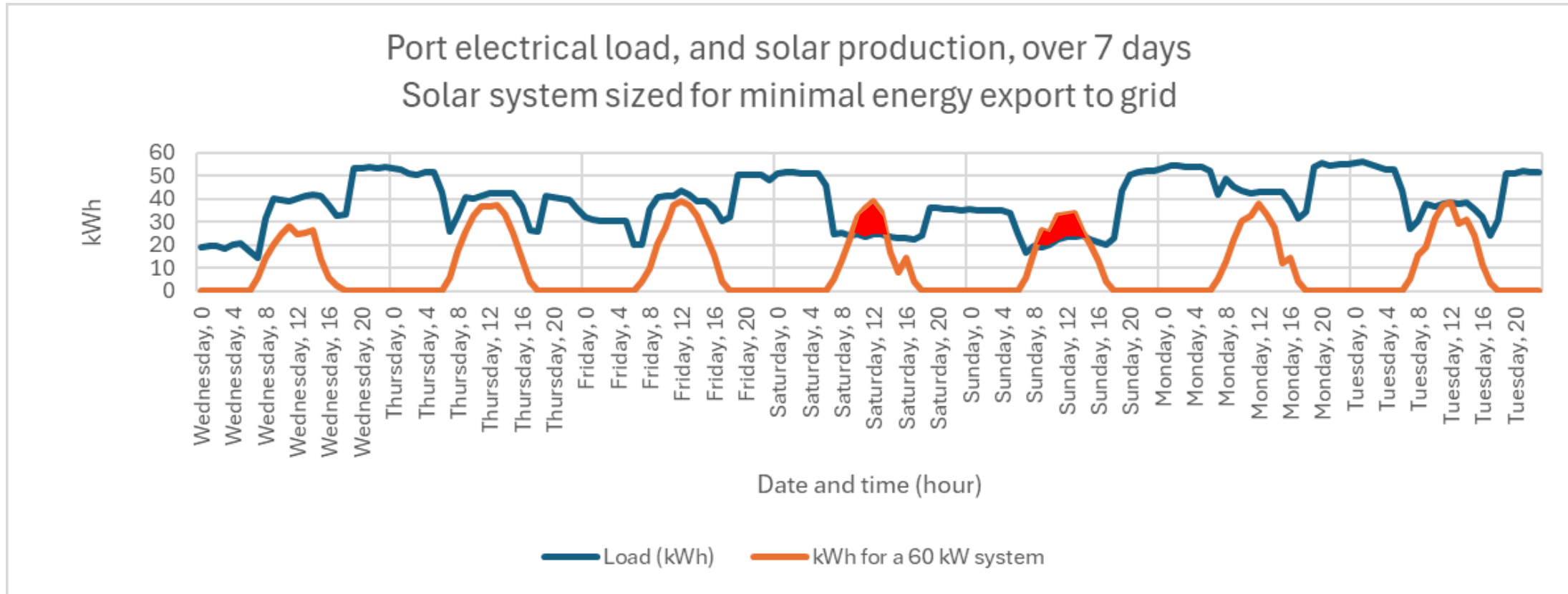
# Electrical load



- SPC is gratefully acknowledged for funding energy audits of Betio port, Kiritabi Port Authority, which enabled the collection of this data.



# Electrical load and low-export solar





A 60 kW  
rooftop solar  
system on the  
office building

New  
Workshop

[Blue callout box]



# Benefits

- Reduced electricity costs - by 20% to 25% a year.
- Reduced GHG emissions.
- Reduced dependence on imported diesel.
- Less local air pollution.

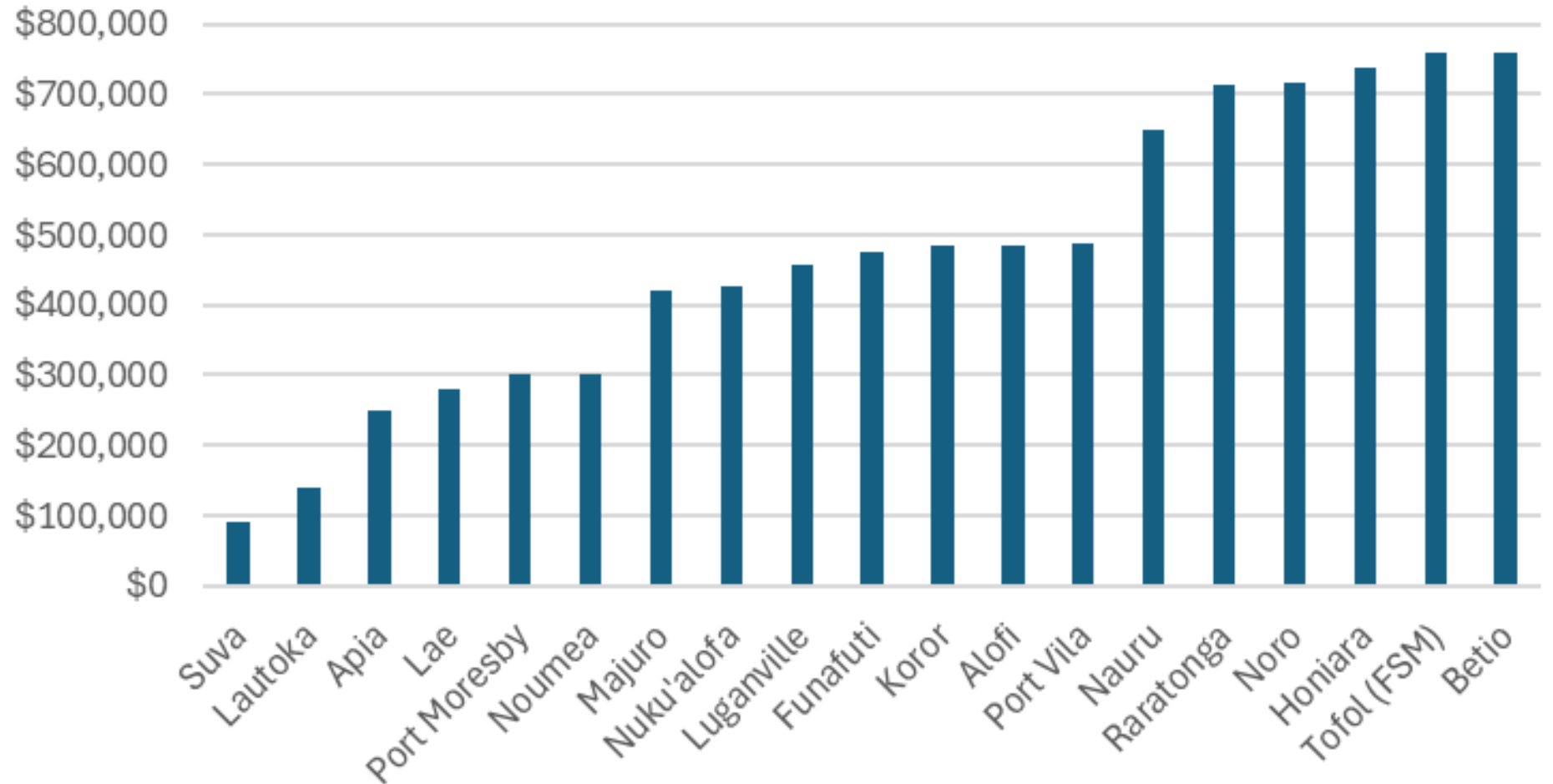


**Net present value (NPV) of \$100,000 spent on grid-connect solar - sized for zero or low energy export, at Pacific Island ports**



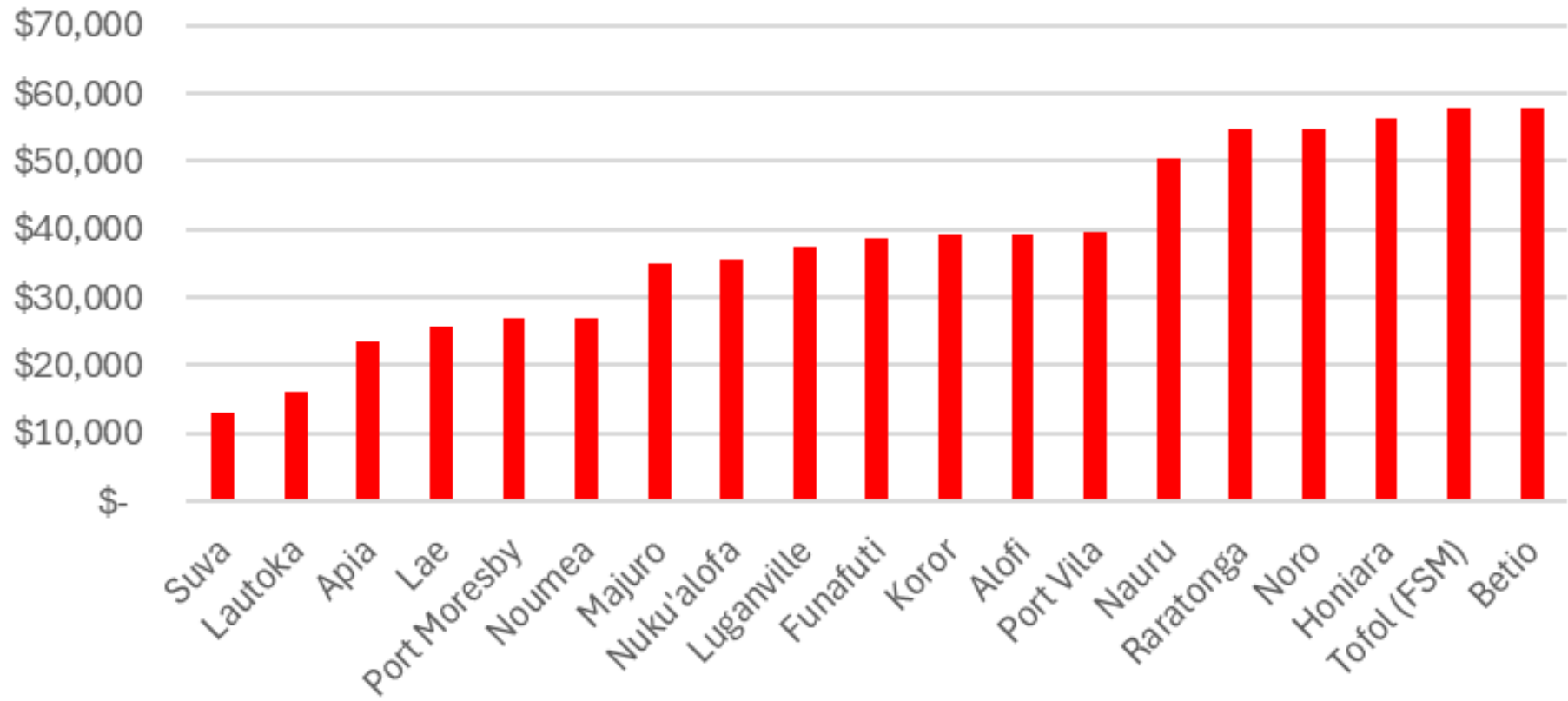
NPV shows the overall value, taking into account the up-front cost, and annual savings over the system lifetime

NPV of \$100,000 spent on a grid-connect system





### Annual amount the port is losing by not investing \$100,000\* in a grid-connect solar PV system



\* For smaller ports \$100,000 may result in an oversized system that exports energy, reducing the benefit



# Such a system

- Will reduce electricity costs (and associated GHG emissions) by 20% to 30%, depending on the demand for energy at different times of the day.
- Will reduce utility diesel imports and air pollution.
- Should be relatively easy to connect as existing electrical infrastructure will not be overloaded.





**Super-size a grid-connect solar system  
to get to net zero electricity emissions**



# Put in the largest possible solar PV system\*

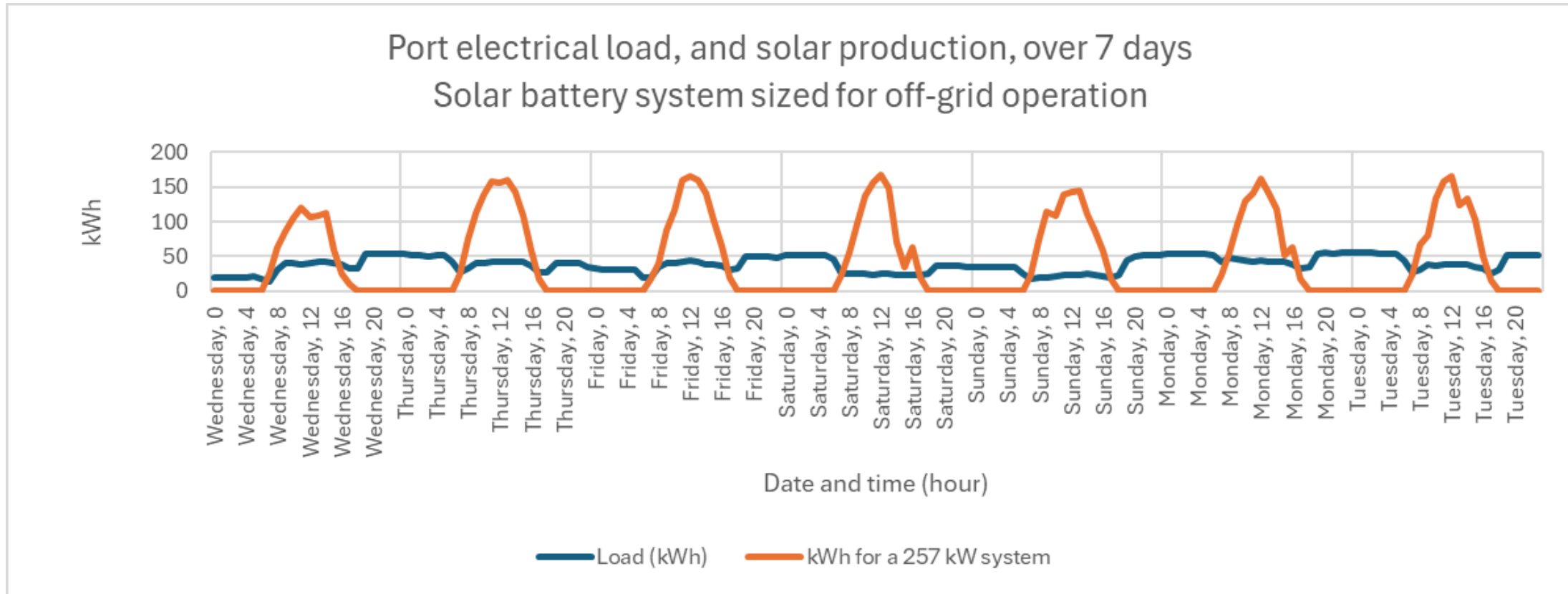


Solar system designation	Approx capacity (kW)	
	Meter 33281792	Meter 021253
Workshop 33281792	25	
Workshop 021253		126
Generator shed		14
Store		12
DNC building	10	
Office building**		89
<b>Total</b>	<b>35</b>	<b>241</b>

Google



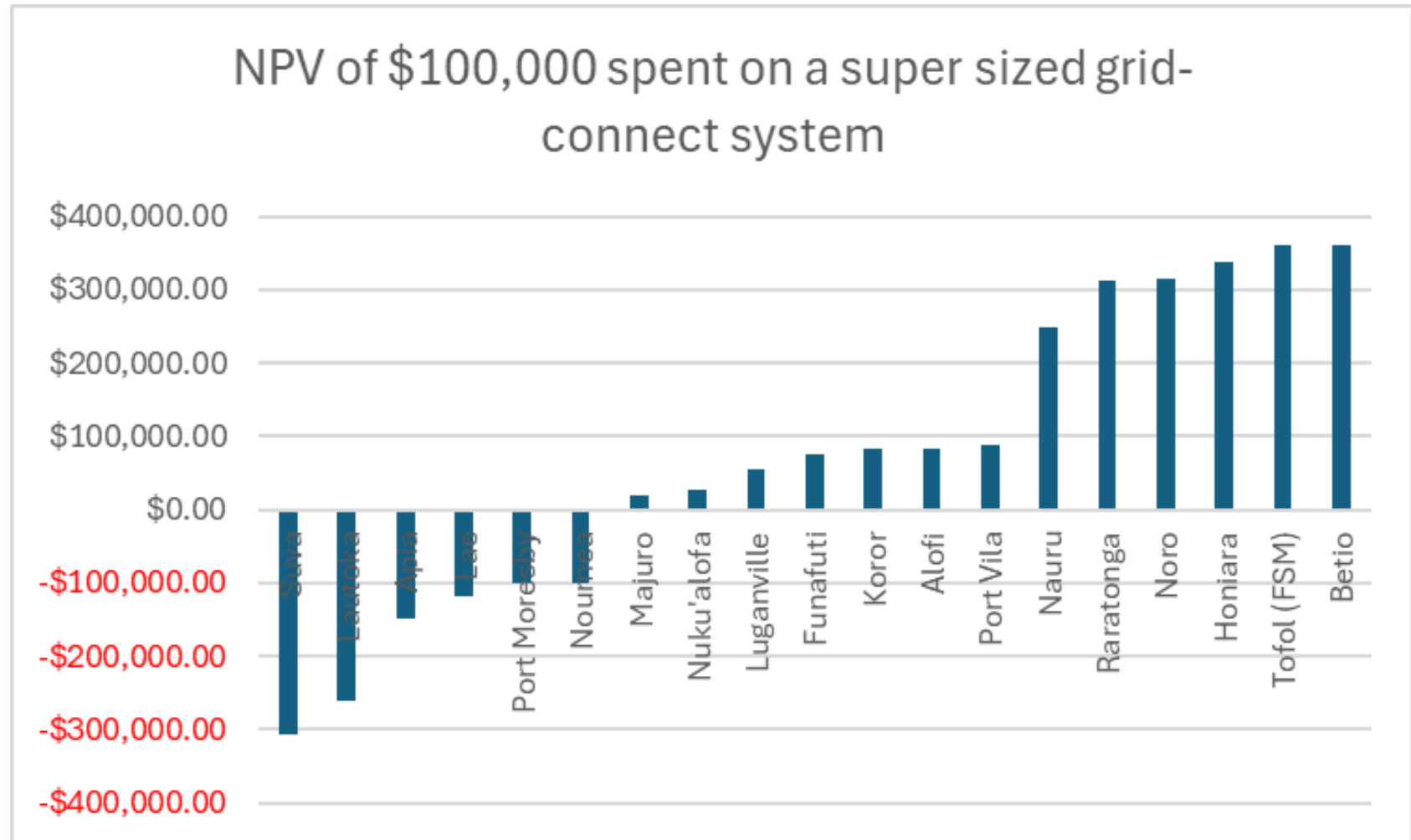
# System sized for net zero energy imports





# NPV of a super-sized system

- Assuming a feed-in tariff of \$0.00.





# Benefits

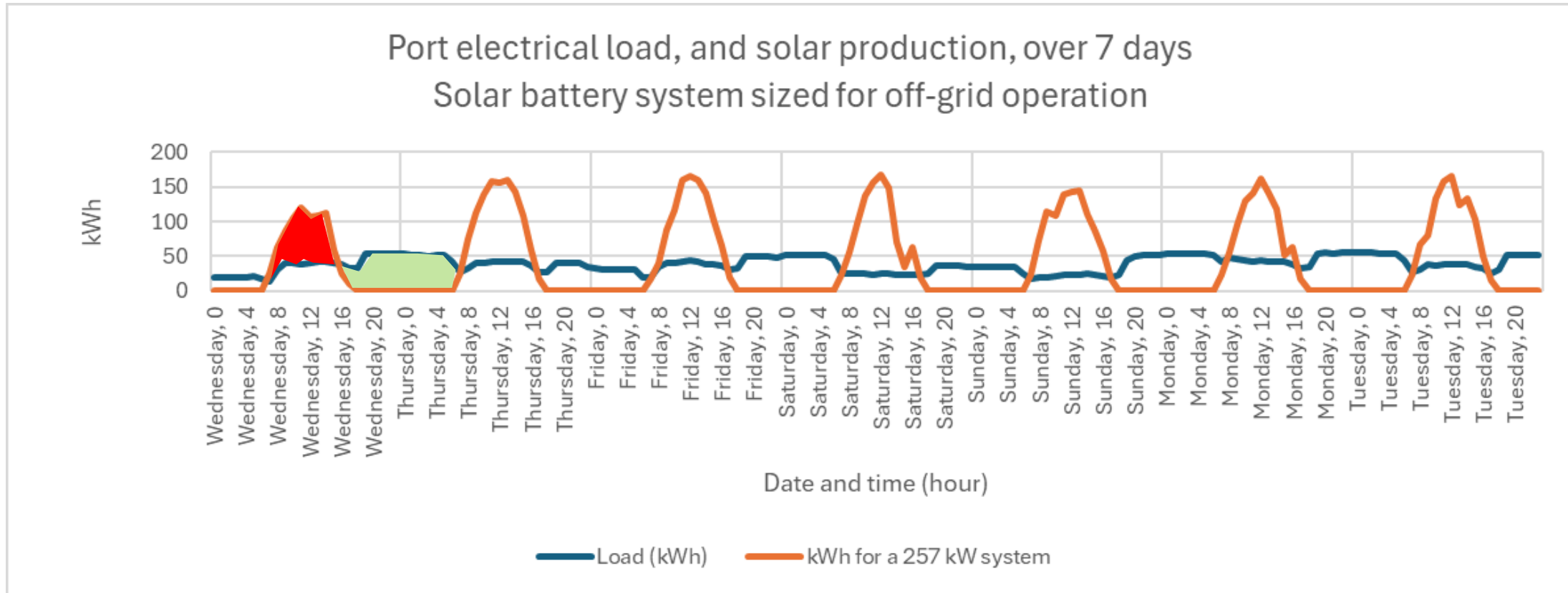
- Net zero electricity GHG emissions for the port.
- Reduced electricity costs (20% to 30%)
- Reduced utility diesel consumption and diesel imports
- Reduced air pollution



**Super-size the system and add batteries (if not allowed to export energy) to make an off-grid system.**



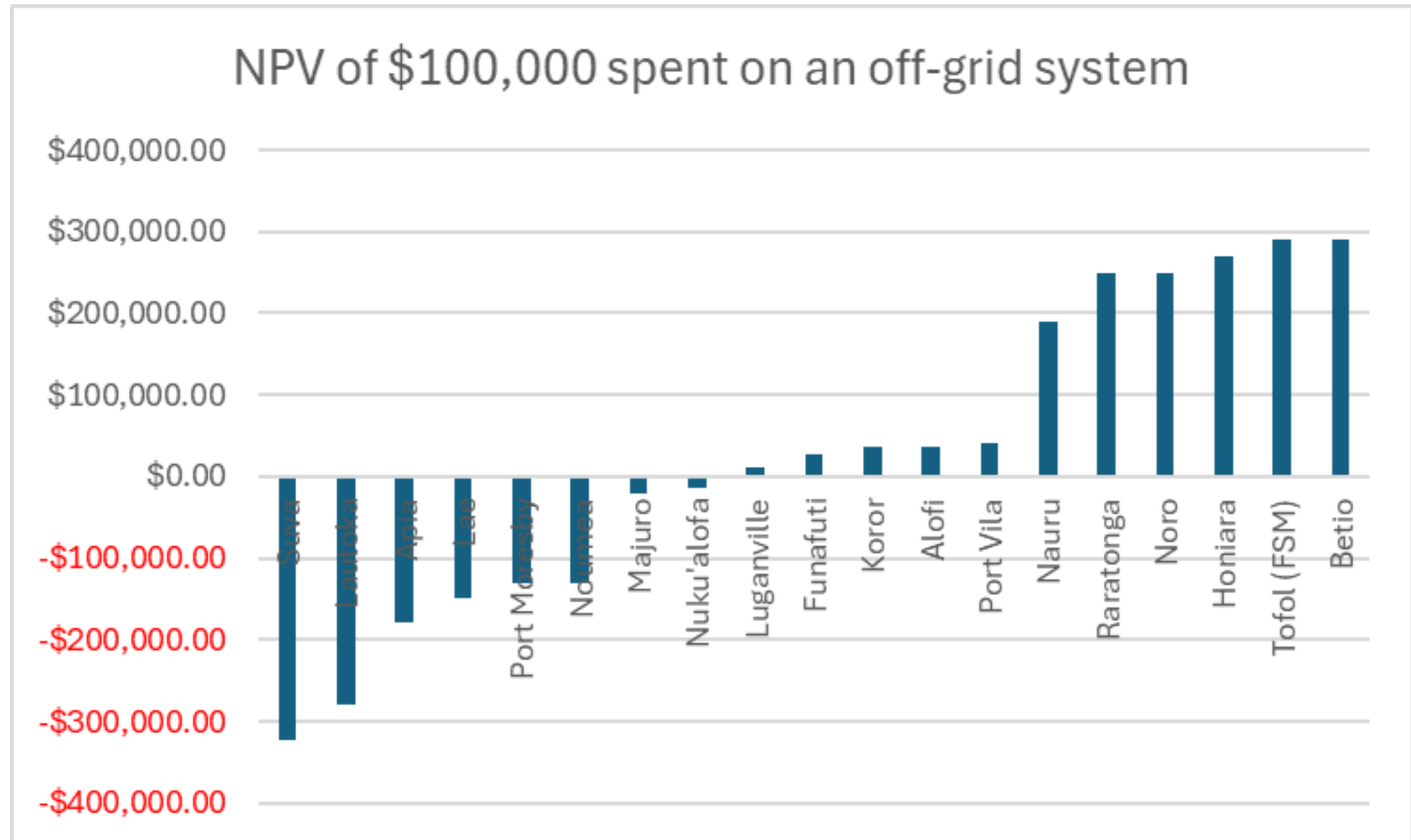
# System sized for net zero energy imports





# NPV of a hybrid off-grid system

- A hybrid offgrid system doesn't use the grid but remains connected to it as a back-up.







# Benefits

- As above, plus:
- Energy security. A hybrid off-grid system, when well maintained, will always keep the lights on (grid-connect systems lose power when the grid goes down).
- Very low electricity bills.



# Conclusion



# Conclusion

- **All** Pacific Island ports are **losing money** by not installing large grid-connect solar systems that are sized to not export energy.
- Ports in the **Marshall Islands, Vanuatu, Tuvalu, Palau and Niue** could install super-sized grid-connect solar systems and **achieve net zero electricity emissions**, and be **better off financially** than if they did nothing.
- Ports in **Nauru, Cook Islands, Solomon Islands, FSM and Kiribati** are **losing money** and the opportunity to have **zero net electricity emissions** and **improved energy security** (i.e. resilience) by not installing super-sized hybrid off-grid systems that meet all their electricity needs.



# 8020Green

- The 8020 principle states that effort and reward are unbalanced.
- 8020Green helps organizations apply the 8020 principle to massively improve business and environmental performance, with a focus on energy usage and supply.
- First solar system installed 14 years ago and still going strong.





# Thank you

Visit us at [8020green.com](http://8020green.com)

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# Assumptions



# Assumptions: Grid-connect

- No shading, panels with good orientation
- System is sized to have zero, or near-zero, energy export to grid
- System cost is 70% higher than what it would cost in Australia
- A 20 year lifespan (many manufacturers offer a 25 year warranty on panels).
- A 3% discount rate when calculating the net present value



# Assumptions: Super sized grid-connect

- As per grid-connect, plus:
- System is 4 times larger than a system that doesn't export energy
- There is enough roof space
- There is zero feed in tariff (if there is a FIT, the benefit will be higher)
- An additional \$100,000 is spent on switchboard upgrades.





# Assumptions: super sized off-grid

- As per a supersized system
- System cost is 4 times higher per kW of solar.
- System is well maintained.
- An existing gen-set is used as a back-up.