Collaboration on Energy and Environmental Markets

Tariffs & Distributed Energy Resources

Anna Bruce

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UNSW SYDNEY

Tariff Challenges and Design Principles

- **Electricity provides an essential service**

- **Cost recovery:** Required for utility sustainability - commercialisation of utilities creates further imperative
- **Efficiency:** Tariffs should be designed to incentivise efficient behaviour and investment from energy consumers/IPPs
- **Equity:** Electricity should be affordable and prices ideally stable

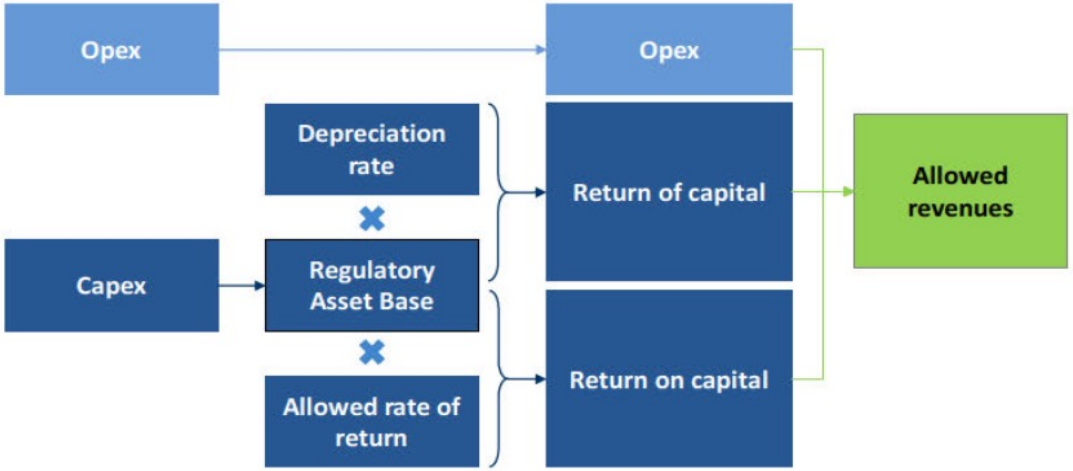
- Conflicts between cost-recovery, efficiency and equity

- Monopoly regulation required to set revenue recovery and allocation of costs amongst customers

Tariff setting

OPERA (2023) Energy Regulatory Survey and Assessment Report for the Pacific Islands

- For revenue, most PICTs use Cost of Service building block approach (also used in Australia), with:
  - Mostly multi year tariffs 1-5 years with price caps



Source: CEPA

- Some use a ‘Cash Needs’ approach (based on debt servicing costs)
- Fuel components of tariffs are adjusted more regularly in fuel-dependent countries
- Some use of performance incentives for fuel efficiency, reliability etc.

Cost Recovery Challenge in PICTs

OPERA (2023) Energy Regulatory Survey and Assessment Report for the Pacific Islands

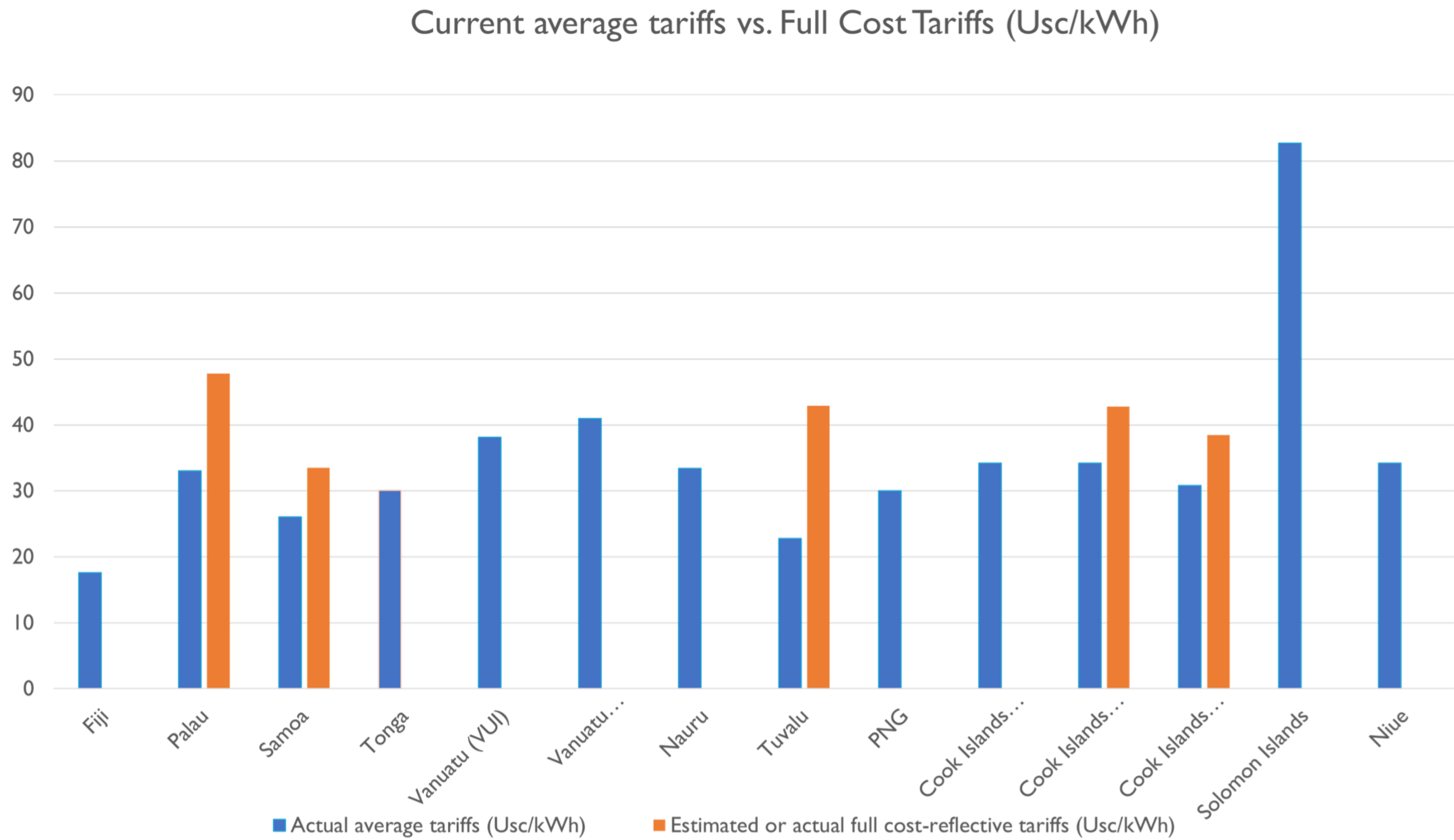


Figure 3. Range of electricity tariffs by customer class (US$/kWh)

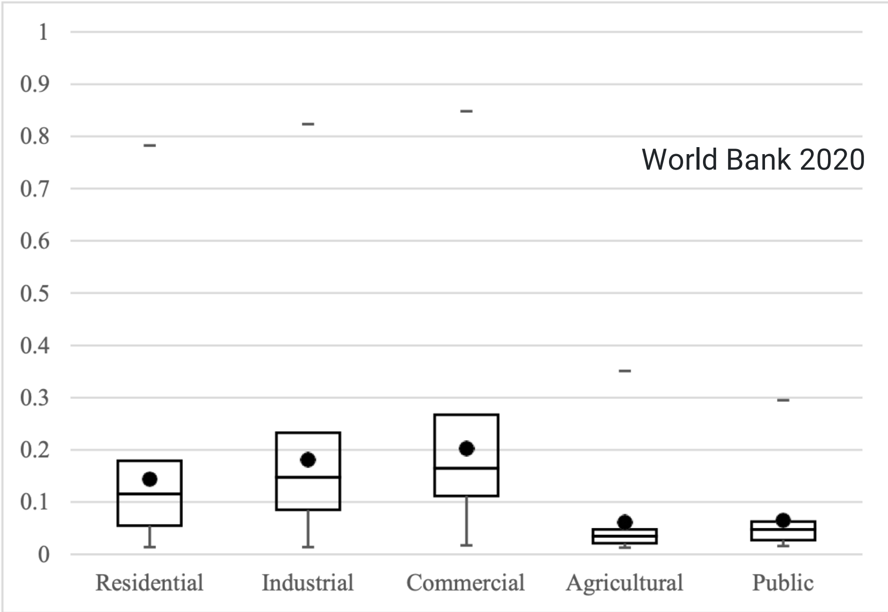


Figure notes: Bottom whisker cap = minimum; bottom box margin = 1st quartile; mid box bar = median; top box margin = 3rd quartile; top whisker cap = maximum.

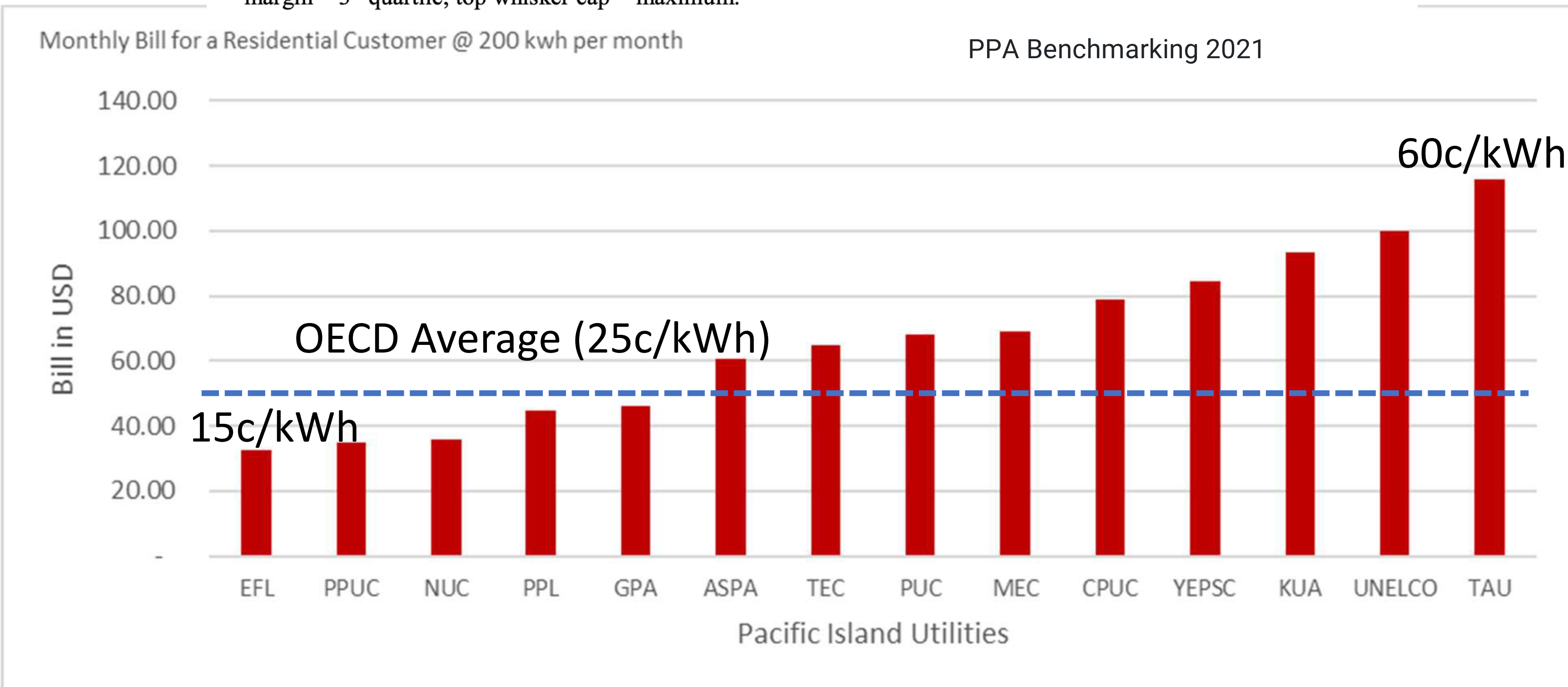
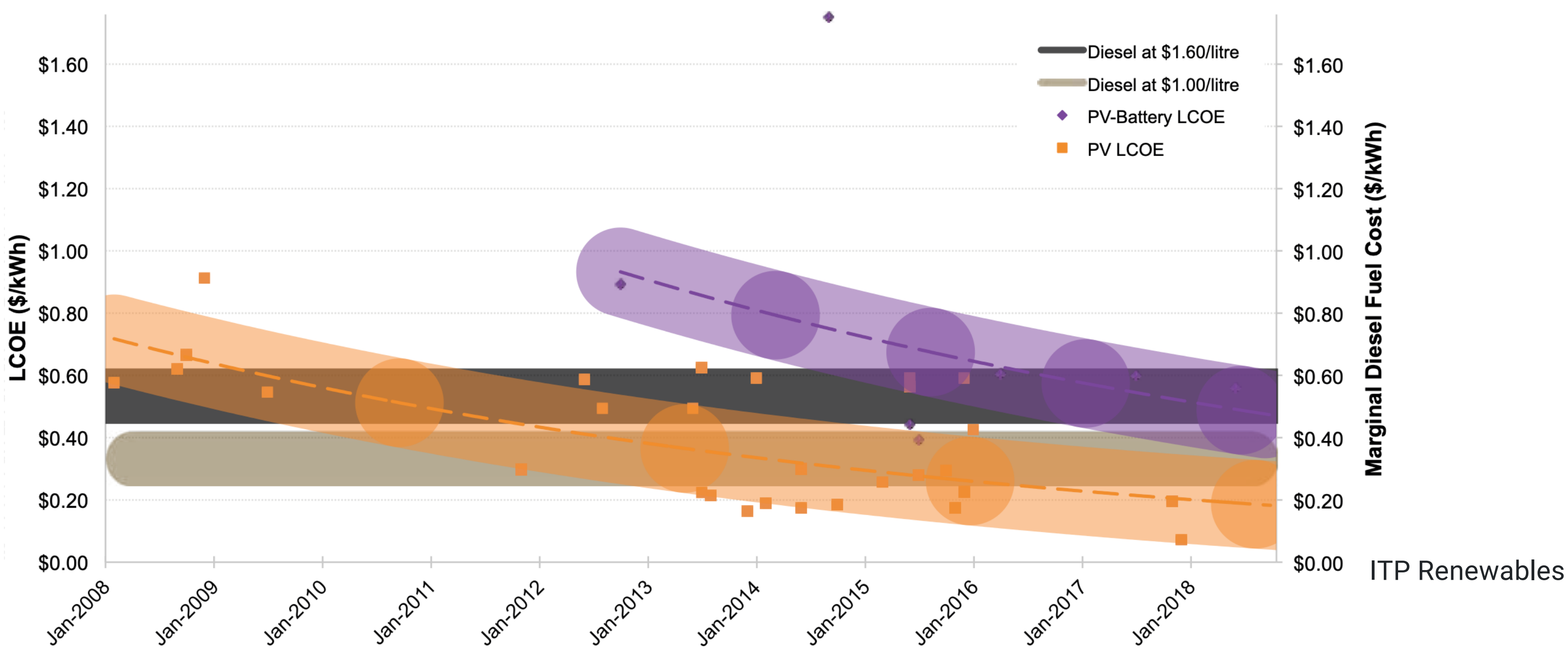


Figure 7: Estimated $/kWh LCOE of Pacific PV projects and PV-battery projects compared to the marginal diesel fuel cost of generation



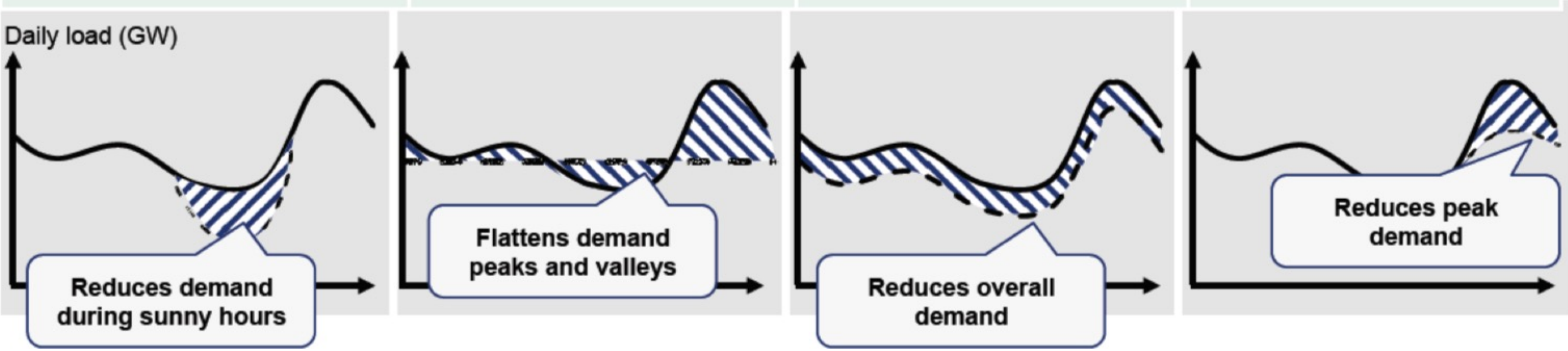
Country	Diesel price (local $/L)	Effective date	Notes/source
Fiji	FJD **2.30**	1 Sep 2025	FCCC's September 2025 regulated prices; diesel rose from FJD 2.23 to 2.30/L. (FijiLive)
Tonga (Tongatapu)	TOP **3.20**	1 Aug 2025 (unchanged for Sep)	TCA August review set TOP 3.20/L; MTED advised retail prices unchanged for September. (Talanoa O Tonga)
Samoa	WST **3.16**	1 Sep 2025	Ministry of Finance monthly price schedule. (MOF Samoa)
Papua New Guinea (Port Moresby)	PGK **4.079**	8 Sep 2025	ICCC indicative maximum retail price: **407.92 toea/L**. (ICCC)
Solomon Islands (main ports)	SBD **10.04**(retail)	1 Sep 2025	Government statement via Island Sun: wholesale SBD 7.99/L; retail SBD 10.04/L. (The Island Sun)
Vanuatu (Port Vila)	VUV **165**	7 Apr 2025	DoE retail diesel price as at April 2025 (latest posted). (Department of Education)

COUNTRY	FISCAL INCENTIVES	FEED-IN TARIFF	NET-METERING/ BILLING
Fiji	• 10-year tax holiday for RE developers • No import duty on RE equipment • Financial grants and direct investment for RE development from Fiji Development Bank • Requirement for commercial banks to loan 2% of portfolio to RE projects • Subsidized borrowing and grant funding through Reserve Bank of Fiji	Under development (23)	Under development (24)
Kiribati	• Government-funded RE projects are exempt from import duty • Development partners have provided direct grants for RE development	No	No
Marshall Islands	• Equipment for RE generation is exempt from import duty • Development partners have provided direct grants for RE development	No	No
Micronesia, Federated States	• Interest-free loans have been provided to the utility • Financial grants have been offered for RE development	Yes	No
Nauru	• Development partners have provided direct grants for RE development	Yes	No
Palau	• Equipment for RE generation is exempt from import duty • Subsidized loans and grants have been provided for RE development	Yes	Yes
Papua New Guinea	• Development partners have provided direct grants for RE development • 10-year tax holiday in free-trade zones • Import duty exemption on RE equipment	No	Yes
Samoa	• Equipment for RE generation is exempt from import duty • Development partners have provided direct grants for RE development	Yes	No
Solomon Islands	• Equipment for RE generation subject to 10% import tax can apply for exemption • Development partners have provided direct grants for RE development	No	No
Tonga	• Equipment for RE generation is exempt from import duty • Equipment for RE generation is exempt from consumption tax • Development partners have provided direct grants for RE development	Yes	Yes
Tuvalu	• The utility receives a grant from the government • Development partners have provided direct grants for RE development	No	No
Vanuatu	• Equipment for RE generation is subject to lower tiers of import duties • Development partners have provided direct grants for RE development	Yes(25)	Yes

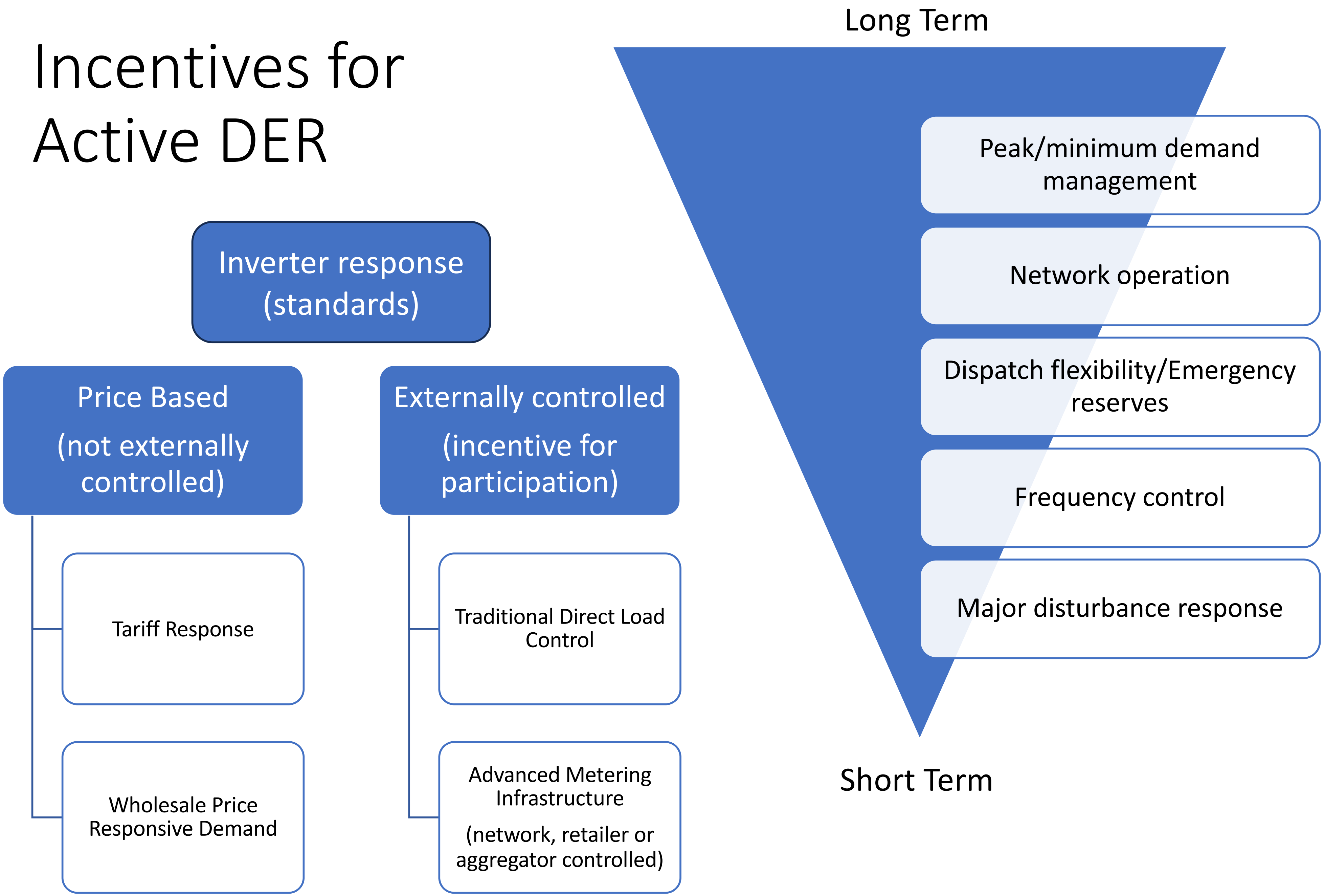
IFC 2021

Distributed Energy Resources & Demand Side Participation

Distributed Generation	Distributed Storage	Energy Efficiency	Demand Response
Distributed generation from renewable sources – primarily PV	Devices that store electrical energy locally for use during peak periods or as backup	Any service or device that allows for the reduced energy use while providing the same service	Technology that enables control of energy usage



Incentives for Active DER



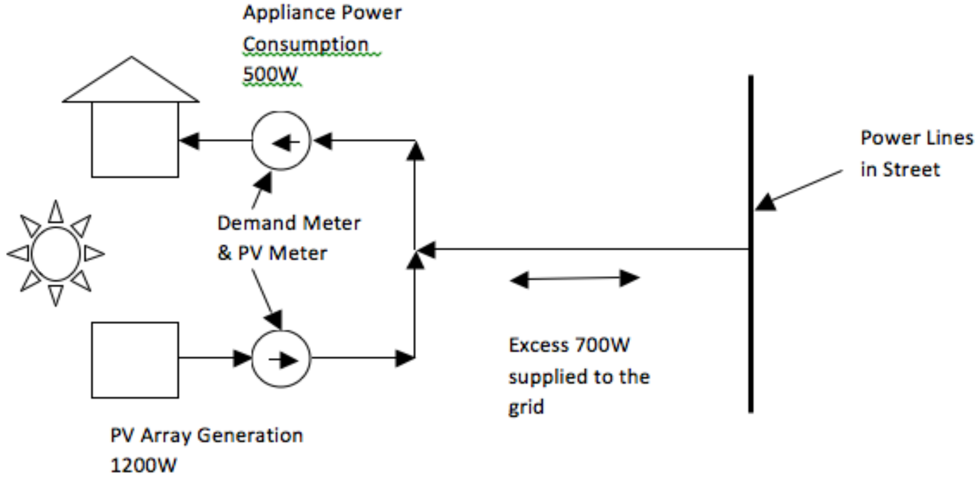
DER Opportunities and Challenges

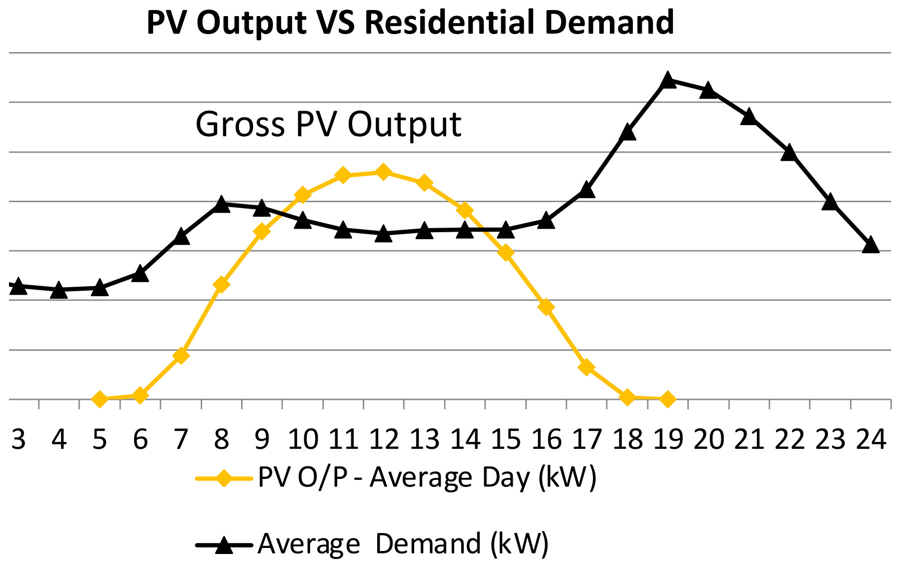
- Opportunities
  - Consumer investment in low cost capacity
  - Increase RE percentage
  - Reduce network peak demand investment
  - Voltage, reactive power support through inverters

- Challenges
  - Utility revenue loss
  - Challenges and costs of integrating DER (V management, phase unbalance, minimum demand/reserves)
  - Equity for non-solar customers

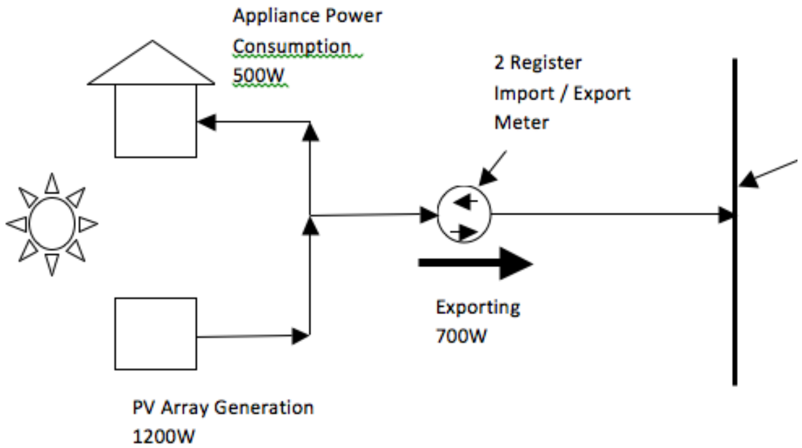
Feed in Tariffs

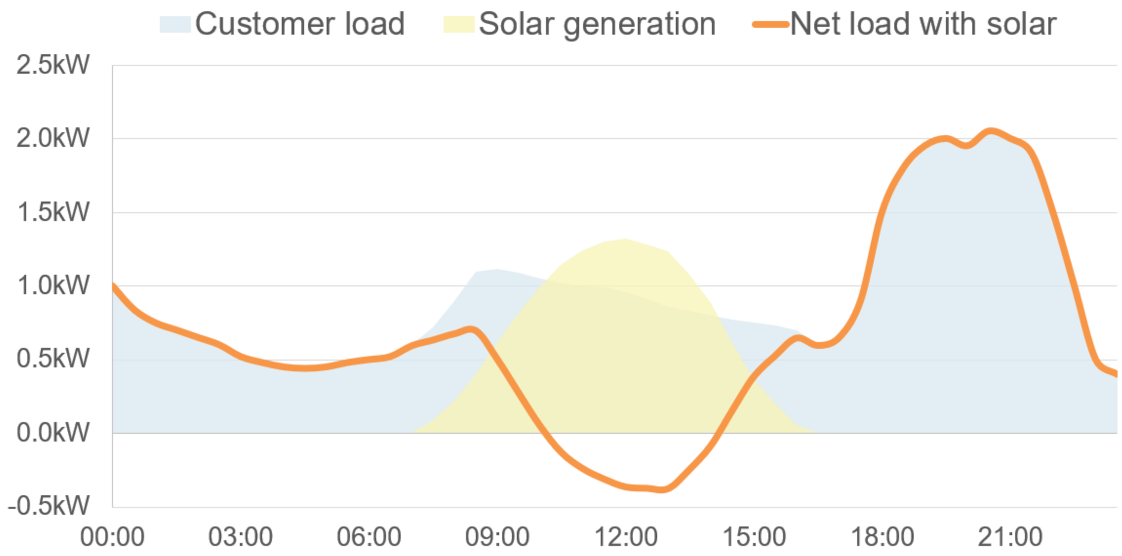
Gross FiT





Net FiT

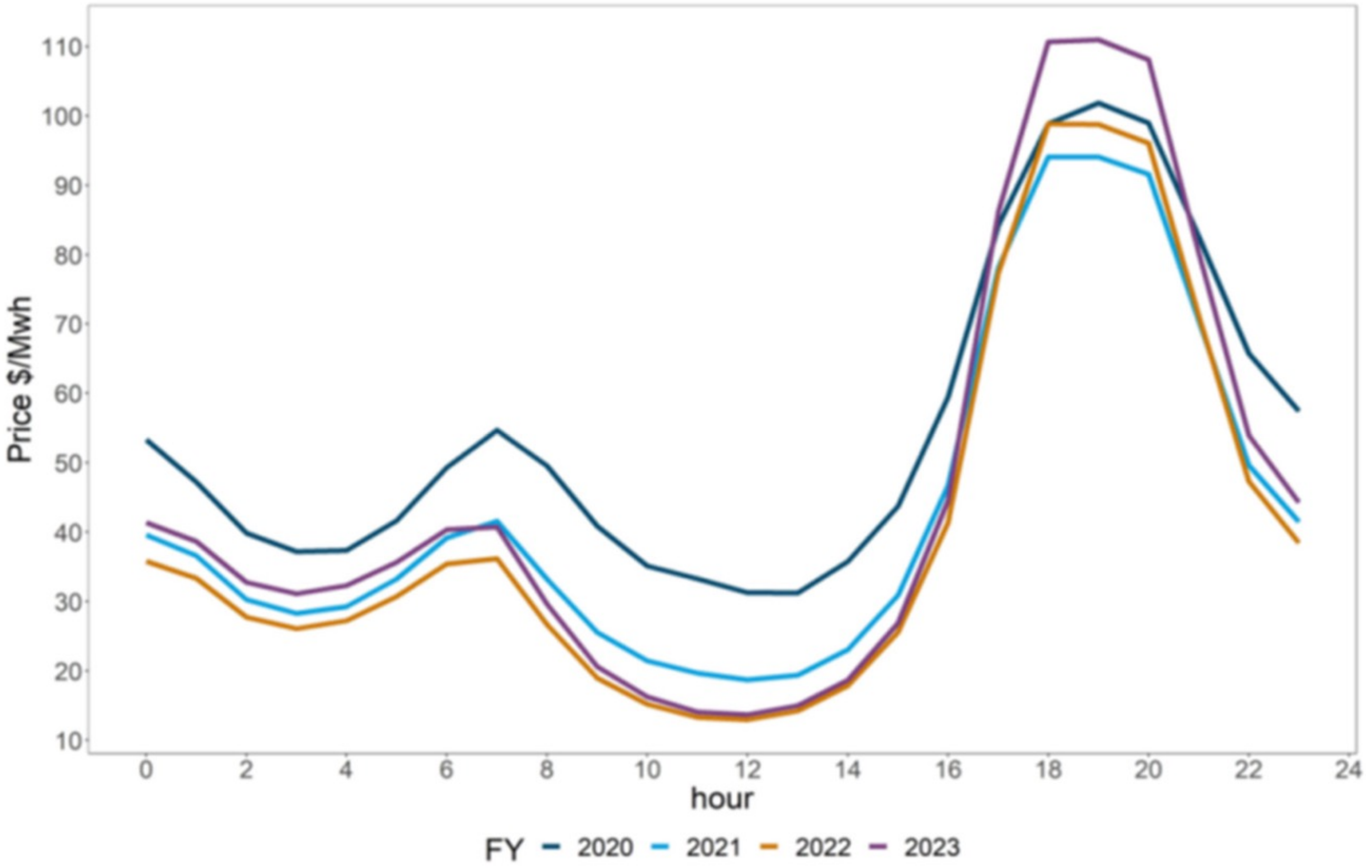




Gross FiT	Net FiT
Avoids loss of income for the utility if FiT payments are less than or equal to avoided (fuel) costs.	Loss of income for the utility associated with behind the meter consumption of solar.
Would require either new meters or changes to existing ones that would require site visits, increasing costs.	May be able to use existing meters (although may require changes to allow export of excess solar electricity).
Customer can't directly offset their consumption by using their own solar electricity. Therefore not compatible with BTM Batteries that can minimse impact of solar.	Allows customer to directly offset consumption with their own solar electricity and therefore provides an incentive to maximise self consumption (e.g. by shifting loads to the solar period) and minimise less valuable solar exports.

Australian Experience

Figure 4-9 Average wholesale electricity prices by hour of day in QLD

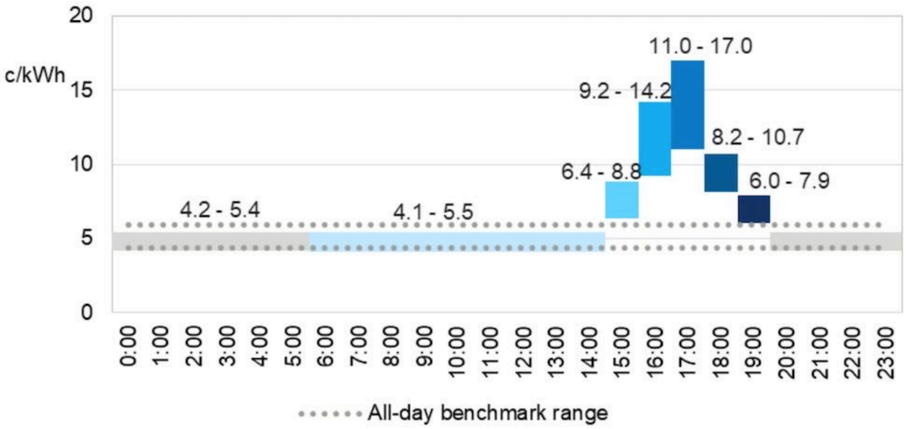


Source: AEMC (2020) Residential Electricity Price Trends 2020

Modern FiTs Reflect the Value of PV

- Australian FiTs reflect energy value (avoided purchase of energy from the wholesale market by retailer) + avoided energy losses
- Network value/costs?

Figure 2 **Draft time-dependent feed-in tariffs (c/kWh)**

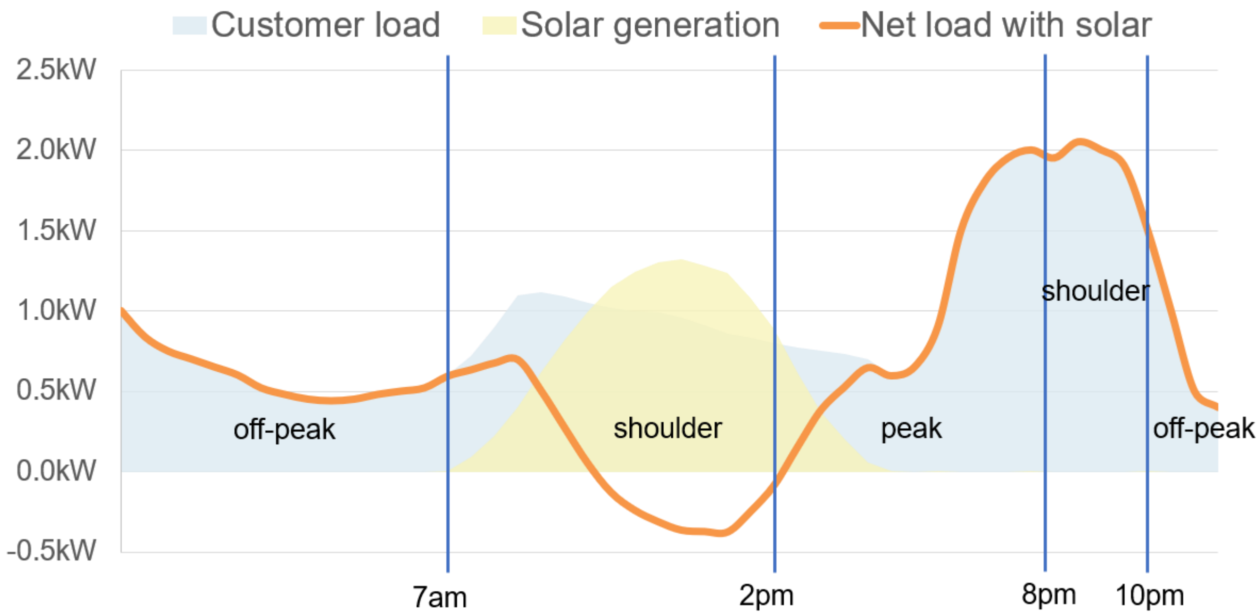


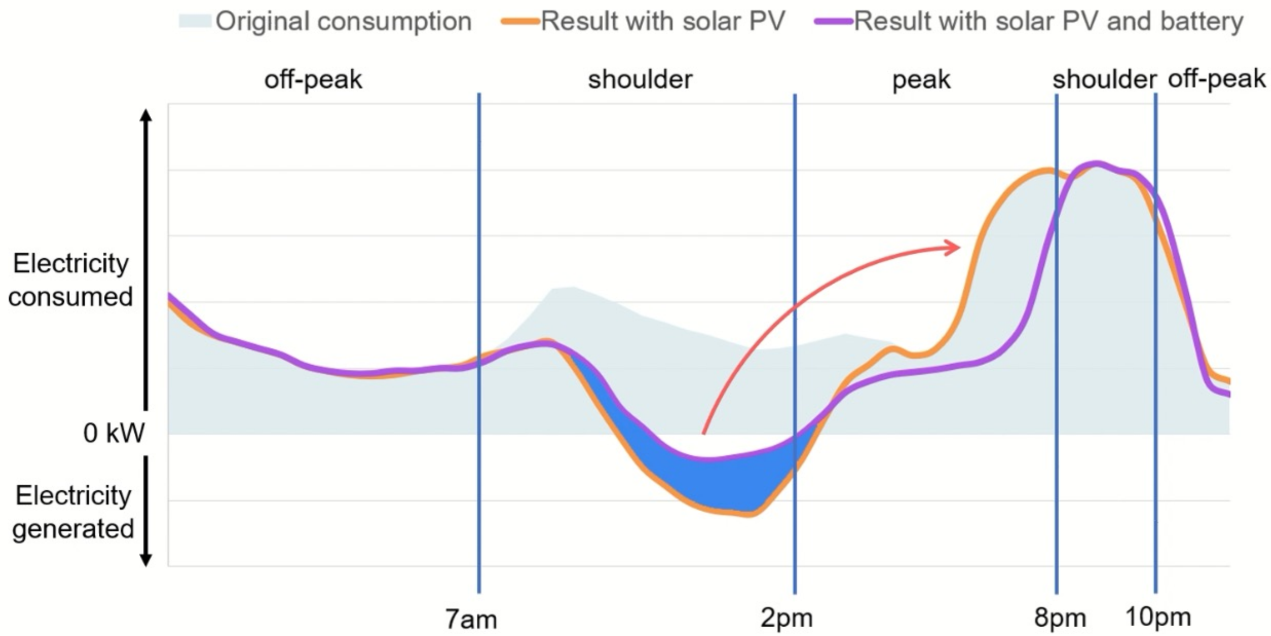
Data source: IPART calculations.

All times	Overnight Weekdays: 10pm-7am Weekends: 10pm-7am	Day Weekdays: 7am-3pm, 9pm-10pm Weekends: 7am-10pm	Early Evening Weekdays: 3pm-9pm Weekends: n/a
5.2	7.1	5.0	6.9

ToU Consumption Tariff Incentives

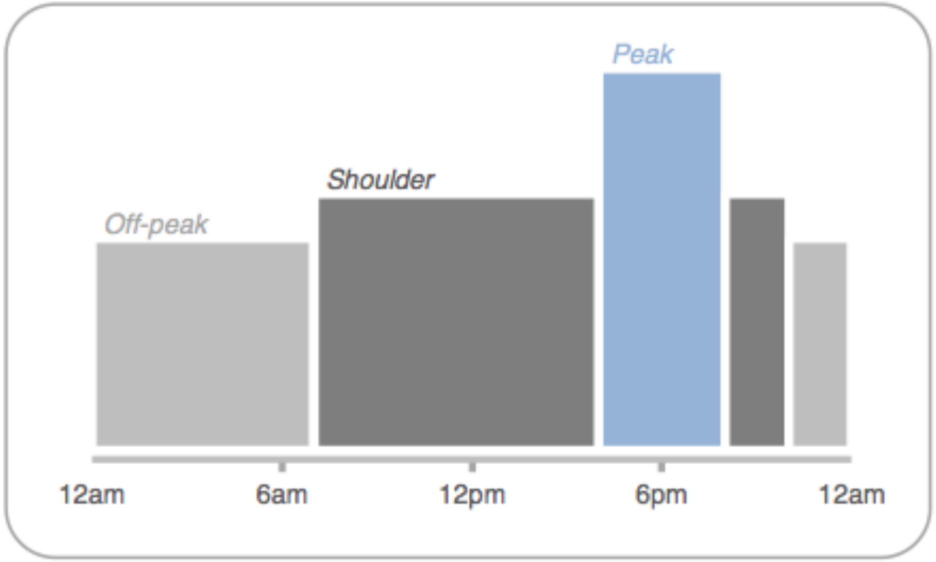
- Net FiT is much smaller than Peak tariff.
- Incentive to use battery to shift solar exports
- Customers with flexible loads e.g. EVs also shift load to soak up solar



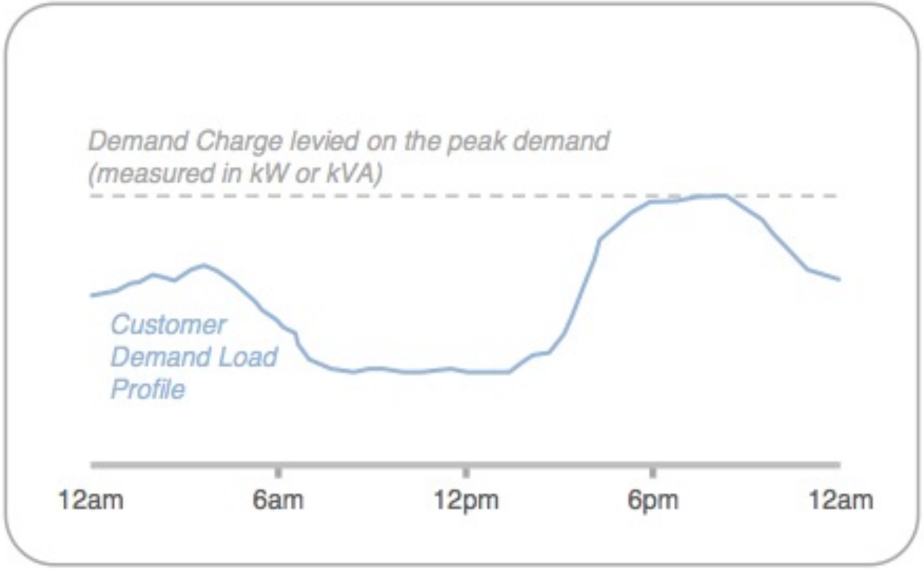


Australian Cost-Reflective Tariff Experience

- Initial focus on peak demand -> now minimum demand
- Utility concern around PV-related revenue loss
- Balancing revenue certainty, incentives, equity challenging
- Consumer appetite for complex tariffs limited
- Large cross subsidies remain necessary for remote customers



ToU Tariff



Demand charge Tariff

Evolution of Tariffs

SAPN Solar Sponge Network Tariff

SAPN Solar Sponge
10am-3pm

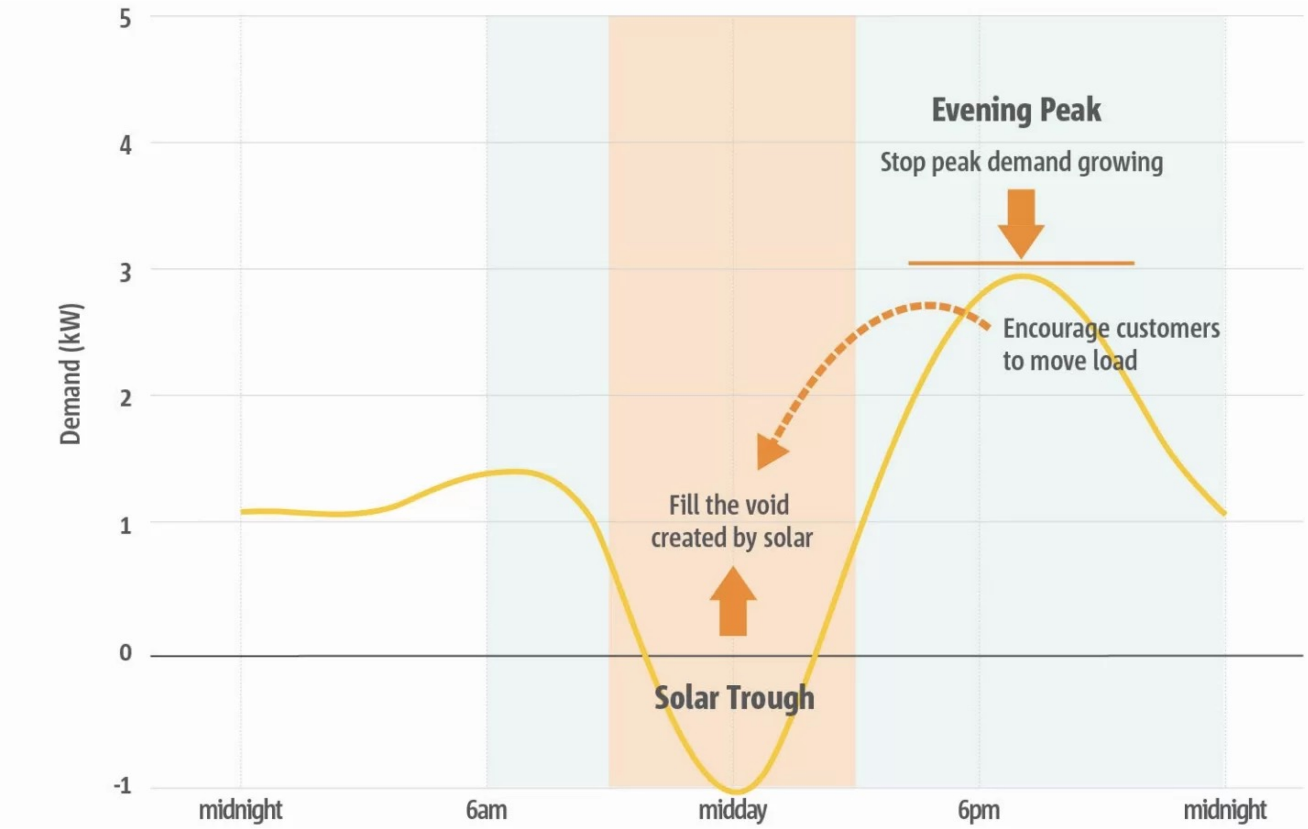


Table 17.8: Residential tariffs 2020-21 NUoS Forecast

			$pa	$/kW pa	c/kWh			
Residential tariff	**Tariff structure**	**Metering**	**Supply charge**	**Peak demand charge**	**Peak usage charge**	**Off-peak usage charge**	**Solar sponge usage charge**	**Usage charge**
Residential – Single rate	Supply charge + flat usage rate	Accumulation meter (Type 6)	166	-	-	-	-	14.4
Residential – ToU	Supply charge + peak, an off-peak and solar sponge usage rates	Interval meter, either: - remotely read (Type 4); or - manually read (Type 5).	166	-	18.0	7.2	3.6	-
Residential	Supply charge	Remotely read	166	* 110	10.2	4.1	2.0	-

Evolution of Tariffs

Solar Export Charges

Regulator outlines "solar tax" rules, says onus on networks to prove they need it

Sophie Vorrath 20 January 2022 35

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AAP Image/Dan Himbrechts

A "solar tax" can only be charged to households if their host distribution network operator can demonstrate that supporting additional rooftop PV exports is increasing the costs of operating the network, the Australian Energy Regulator has warned.

In a set of draft guidelines published on Wednesday evening, the AER has stressed that network companies will have to meet strict guidelines and keep consumers well and truly in the loop before acting on last year's rule change allowing for two-way grid distribution charges.

This will include ensuring that customers assigned to export tariffs have access to a "basic" solar export level, which would act as a threshold below which power may be exported to the grid without any additional charge.

Flexible solar export trial set to soak up savings for South Australians

Posted by Kelseigh Wrigley 15/09/2021

A new trial will allow solar customers in South Australia to export more power into the state's grid.

"Until now, the problem has been that in order to manage voltage and stability issues that occur only some of the time, networks around the country have had to impose exports limits that apply all the time."

Through this trial, SAPN will begin offering small-scale solar customers either a reduced fixed export rate of 1.5 kilowatts (kW) or a flexible export option that allows up to 10kW of power to be sent back into the grid at least 98 per cent of the time.

Conclusions

- Tariff design is extremely challenging due to long-term investments in shared assets, but also need to reflect location and time-specific costs
- Efficiency often conflicts with simplicity, predictability and equity requirements … tariffs as a social construct
- Effective regulation is critical and requires data sharing and clearly defined methodologies
- Opportunity to reduce costs and achieve goals with RE and DER
- Efficient tariff design can evolve with resource mix. Solar soak tariffs, solar export tariffs, net FiTs might better incentivise DER.
- New metering/control and business models (aggregators, sharing models) may be needed to interface with customers.
- Utilities and policymakers must bring consumers on the journey.

Collaboration on Energy and Environmental Markets

Questions?

Anna Bruce
a.bruce@unsw.edu.au

Questions

- What are the main tariff design challenges for PICTs' utilities
- What role might Board directors have in setting appropriate tariffs?
- Do you see distributed energy resources such as rooftop solar and batteries as an opportunity or a threat?