Follow the money

The impact of rooftop solar PV on the energy market and other consumers

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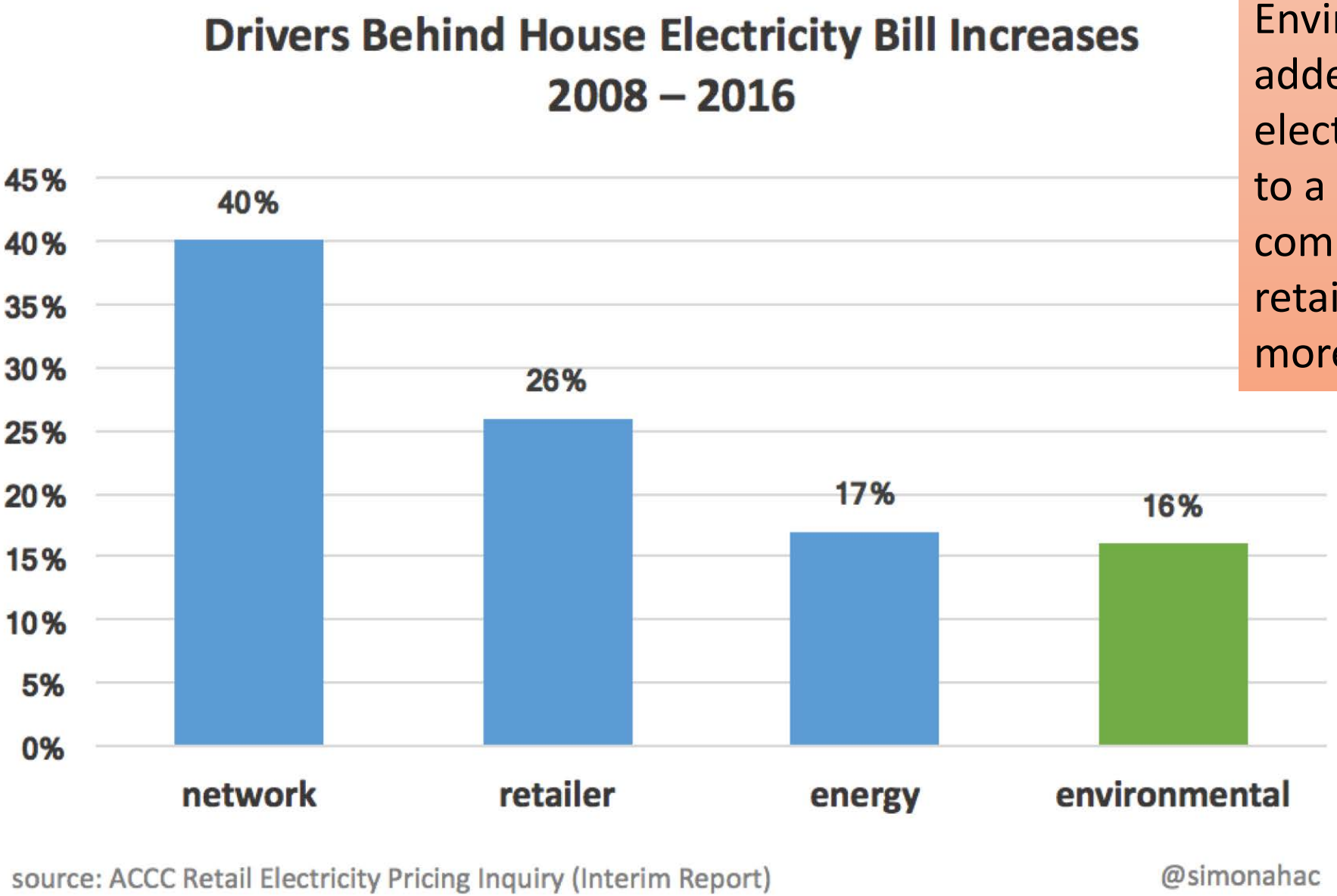
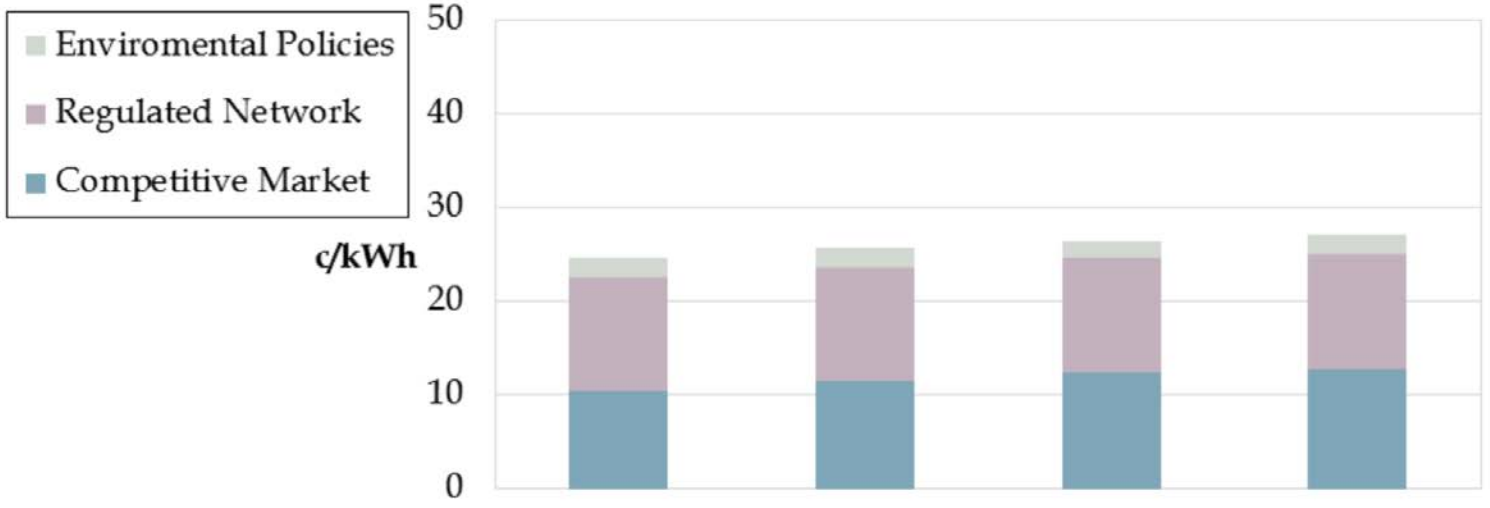


Environmental policy has added contributed to in electricity bill increases, but to a lesser extent than other components. Networks and retail costs have been far more significant.

Figure I.1 National summary of supply chain cost components



	2015/16 Base Year			2016/17 Current Year			2017/18			2018/19		
	c/kWh		$/yr	c/kWh		$/yr	c/kWh		$/yr	c/kWh		$/yr
Environmental policies	**2.08**	**$**	**109**	**2.18**	**$**	**114**	**1.87**	**$**	**98**	**2.02**	**$**	**106**
LRET	0.64	$	33	0.81	$	42	0.74	$	39	0.86	$	45
SRES	0.46	$	24	0.40	$	21	0.37	$	20	0.36	$	19
FIT Schemes	0.84	$	44	0.79	$	41	0.58	$	31	0.60	$	32
Other state schemes	0.15	$	8	0.18	$	10	0.18	$	9	0.19	$	10
Regulated networks	**12.24**	**$**	**642**	**12.07**	**$**	**633**	**12.20**	**$**	**640**	**12.38**	**$**	**649**
Transmission	2.32	$	122	2.18	$	114	2.07	$	108	2.08	$	109
Distribution	9.92	$	520	9.89	$	519	10.14	$	532	10.29	$	540
Competitive market	**10.38**	**$**	**545**	**11.55**	**$**	**606**	**12.41**	**$**	**651**	**12.71**	**$**	**667**
Wholesale and retail												
Total	**24.71**	**$**	**1,296**	**25.80**	**$**	**1,353**	**26.49**	**$**	**1,390**	**27.11**	**$**	**1,422**

Environmental policy is a material part of the bill cost stack, but far smaller than other components. Environmental policies have also reduced costs elsewhere in the stack; so their absence would not remove all of the cost they represent.

(They are also helping with the transition to a cleaner energy system, which will avoid financial, health, and social costs in the future)

Energy bills *are* inherently regressive. Low income households pay disproportionately for networks, retailers, and generation infrastructure as well as environmental costs. Changing this would be a good thing.

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Energy Policy

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Retrospective modeling of the merit-order effect on wholesale electricity prices from distributed photovoltaic generation in the Australian National Electricity Market

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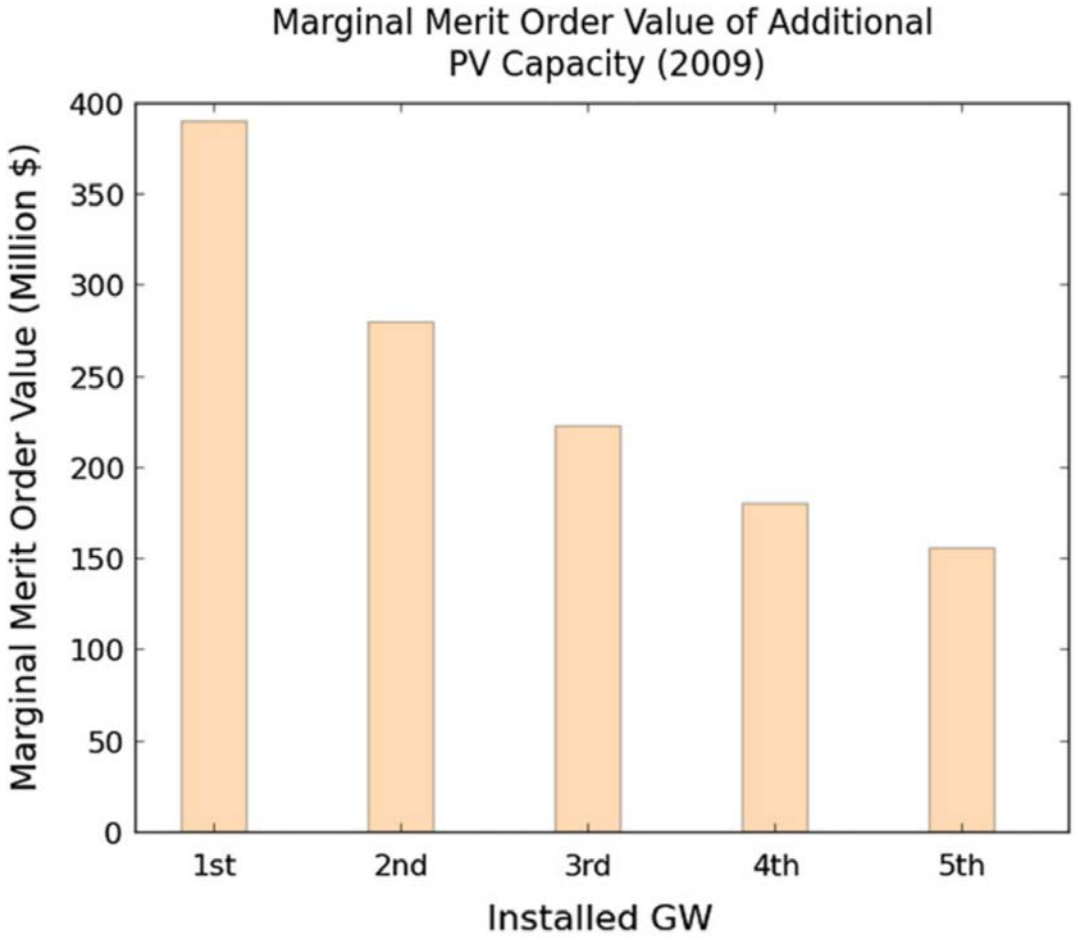
HIGHLIGHTS

- We model the impact of photovoltaic generation on the Australian electricity market.
- Photovoltaic generation depresses electricity prices, particularly in summer peaks.
- Over the course of a year, the depression in wholesale prices has significant value.
- 5 GW of solar generation would have saved $1.8 billion in the market over two years.
- The depression of wholesale prices offsets the cost of support mechanisms.

Research and modelling by Melbourne University, ANU, and others found significant cost reductions in the wholesale market caused by rooftop solar generation. This is why conventional generators' submissions to the Renewable Energy Target review warned of the "transfer of wealth from generators to consumers" caused by the RET.

ABSTRACT

In electricity markets that use a merit order dispatch system, generation capacity is ranked by the price that it is bid into the market. Demand is then met by dispatching electricity according to this rank, from the lowest to the highest bid. The last capacity dispatched sets the price received by all generation, ensuring the lowest cost provision of electricity. A consequence of this system is that significant deployments of low marginal cost electricity generators, including renewables, can reduce the spot price of electricity. In Australia, this prospect has been recognized in concern expressed by some coal-fired generators that delivering too much renewable generation would reduce wholesale electricity prices. In this analysis we calculate the likely reduction of wholesale prices through this merit order effect on the Australian National Electricity Market. We calculate that for 5 GW of capacity, comparable to the present per capita installation of photovoltaics in Germany, the reduction in wholesale prices would have been worth in excess of A$1.8 billion over 2009 and 2010, all other factors being equal. We explore the implications of our findings for feed-in tariff policies, and find that they could deliver savings to consumers, contrary to prevailing criticisms that they are a regressive form of taxation.

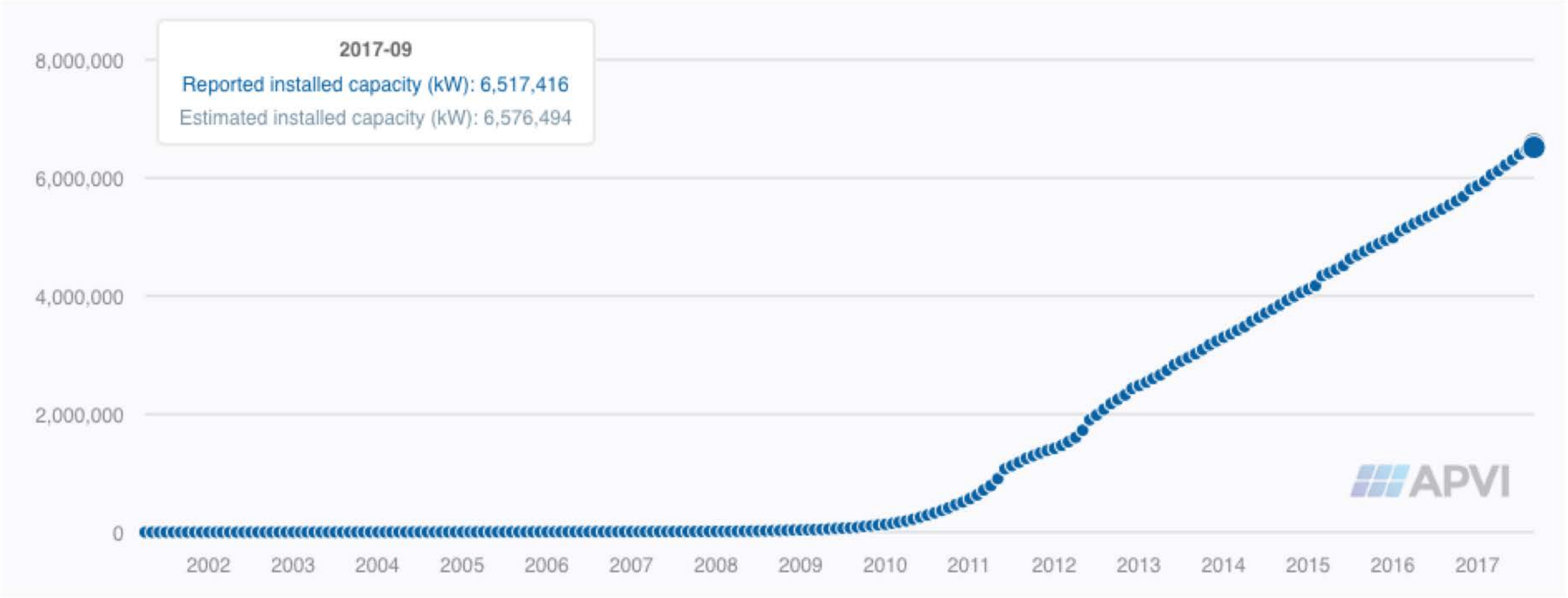


The more PV installed, the less each additional unit of capacity affects the wholesale price. But there is still an effect and it is cumulative.

Table 7
Impact of PV generation on the wholesale weighted price, in solar production times.

PV installation (GW)	Average wholesale value (c/kW h)
1	5.3
2	4.9
3	4.7
4	4.6
5	4.4

Rapid growth in rooftop PV has defied all expectation and at over 6 GW is now bigger than the merit order effect study modelled. This provides a great opportunity to revisit the modelling and update it. Improved ability to forecast solar generation in recent years will probably have increase the magnitude of the effect, since the spot market operates on forecasts.



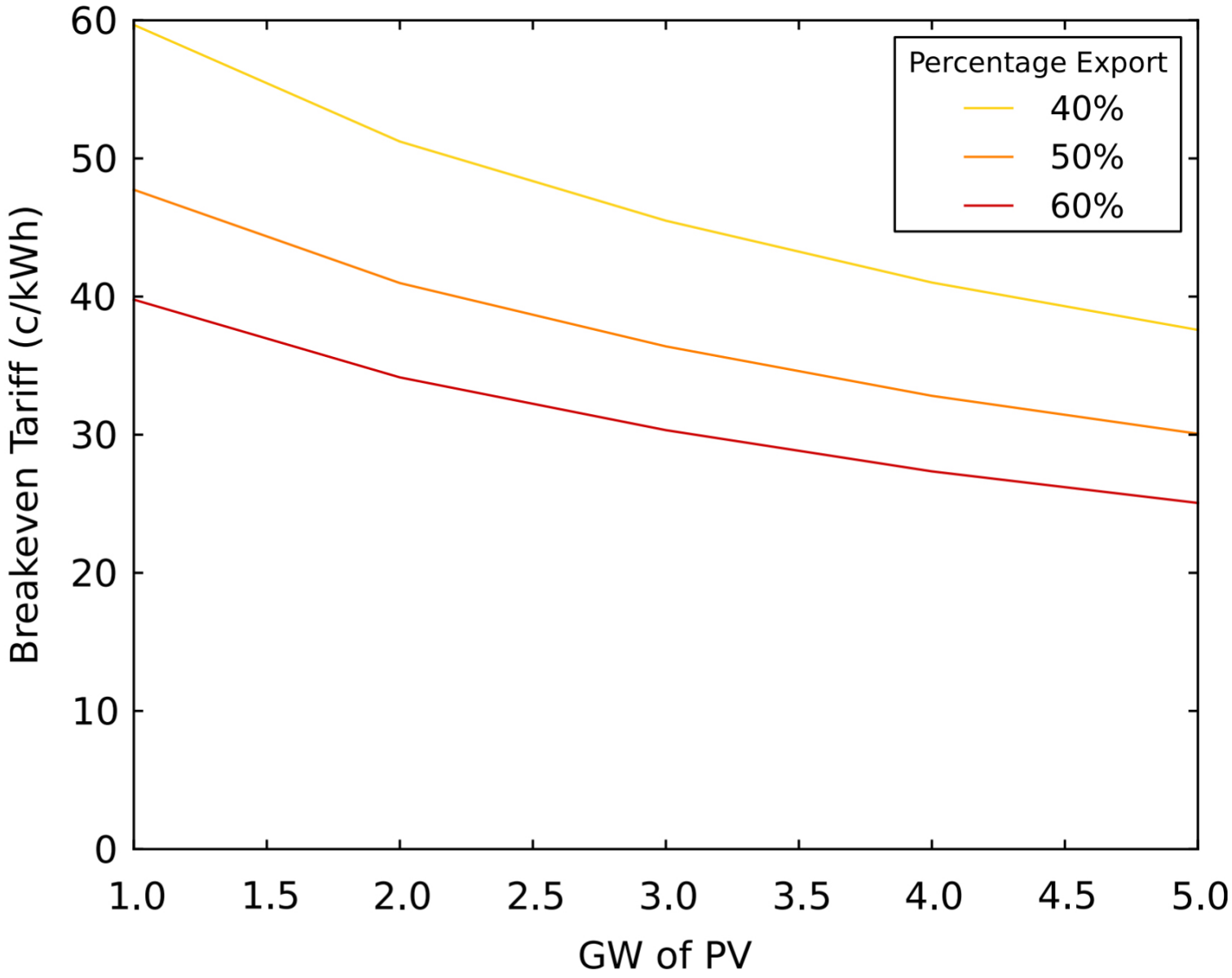


Fig. 13. Breakeven tariff as function of installed capacity and percentage exports.

The 'breakeven tariff' shows the maximum level a Feed-in Tariff could be without passing costs onto other consumers. It considers both the energy value of the exported energy, and an allowance for the effect on wholesale prices. (This is not to argue that FiTs should be at this level: only that this is the ceiling price to avoid passing costs on.)

Type	Flat tariff	ToU tariff	Demand tariff	Demand only tariff	Annual usage (kWh)	Peak demand (monthly)
Low income	$595.25	$461.15	$620.28	$578.22	4630	3.3
Med income	$665.54	$510.36	$681.52	$613.21	5240	3.6
High income	$852.43	$605.74	$821.79	$671.79	6790	4.2
Solar	$567.60	$405.92	$622.86	$610.10	4443	3.6

Tariff modelling shows that:

a) Solar households on average have similar peak demand to average non-solar households
b) Demand tariffs see solar households paying a fair share of network costs
c) Demand tariffs without volumetric rates can benefit low-income households on average, (as can time-of-use tariffs). More analysis should be done here. (It's coming!)