



## The Financial Impacts of PV and PHEV on customers who do not have them

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### Presentation outline

1. Previous work on the impacts of PV and EV
2. Ways that PV and EV affect people's bills
3. Model data
4. Types of impacts
5. Impacts of PV and PHEV on 'Responsible & Other customers'
6. Summary
7. Comments



## Impacts of PV and EV

- Much analysis on the cost impacts for owners of photovoltaics (PV) and electric vehicles (EV)
- Also analysis of impacts on electricity industry (generators, networks, retailers)
- Very little, if any, analysis of impacts on 'Other customers'
- Lots of claims made by various parties ...
  - PV-owners free-riding because they don't pay their fair share of network charges
  - EV owners will result in massive network augmentation costs because of their increases to demand peaks
- In fact, quite complex to determine real impacts ...



## How do PV and EV affect people's bills?

### Complex interaction

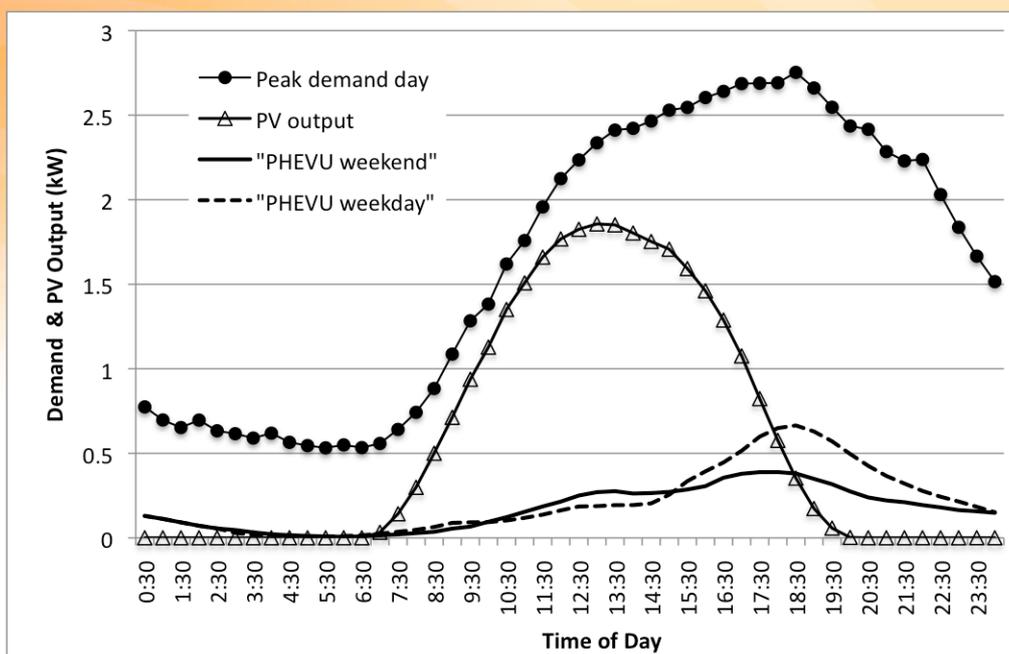
PV and EV affect the bills of 'Responsible customers' as well as 'Other customers' in two ways:

1. **Demand peaks:** Demand during peaks increases augmentation costs, which are passed on to customers.
  2. **Electricity use:** Increased electricity use increases income for networks, BUT, what happens next depends on:
    1. WAPC: networks keep extra income (all except Qld)
    2. Revenue cap: extra income goes back to customers via lower tariffs (only Qld)
- We developed a model that assesses the combined impact of these two effects
    - (not looking at costs/benefits of technical impacts)

## Model data

- Load and PV data from 271 houses in the Greater Sydney Area, 1 July 2010 to 30 June 2011. Scaled to NSW average (19kWh/day)
- Demand peaks
  1. Transmission, 4-4.30pm, Tues 1 Feb – \$80/kW/yr
  2. Distribution, 6-6.30pm, Sat 5 Feb - \$175/kW/yr
- PV generation – assume average 2.5kW, start at 20% penetration, increase to 40%
- PHEV demand - transport survey data of 216,566 vehicle trips
  - 20% uptake, Uncontrolled charging: whenever at residential address >10 min
- EA's Domestic All Time tariff, and Controlled Load Tariff
  - Can also do
    1. EA's PowerSmart Home TOU tariff
    2. Custom designed Demand charge tariff

## Model data





## Types of impacts

First order:

- The initial cost impacts when the 'Responsible customers' take up technologies and/or tariffs

Second order:

- The subsequent cost impacts in the following year, when TNSP/DNSP tariffs are adjusted
- Affected by WAPC or Revenue cap

Third order:

- The cost impacts due to changes in demand peaks and network augmentation costs

Quantified impacts for:

- 'Responsible customer'
- 'Other customers'
- TNSPs, DNSPs, retailers



## Results: 'Responsible customers' bill

**Table 4. Residential Annual Bill, 'Responsible customer', Standard tariff (incl. GST)**

	Variable (AUD\$)	Fixed (AUD\$)	Total (AUD\$)	Percentage of total bill
<b>Transmission</b>	298		298	14.9%
<b>Distribution</b>	569	175	744	37.1%
<b>Retail</b>	835	128	963	48.0%
<b>Total</b>	1702		2005	

## Results: Impacts PV on ‘Responsible customers’

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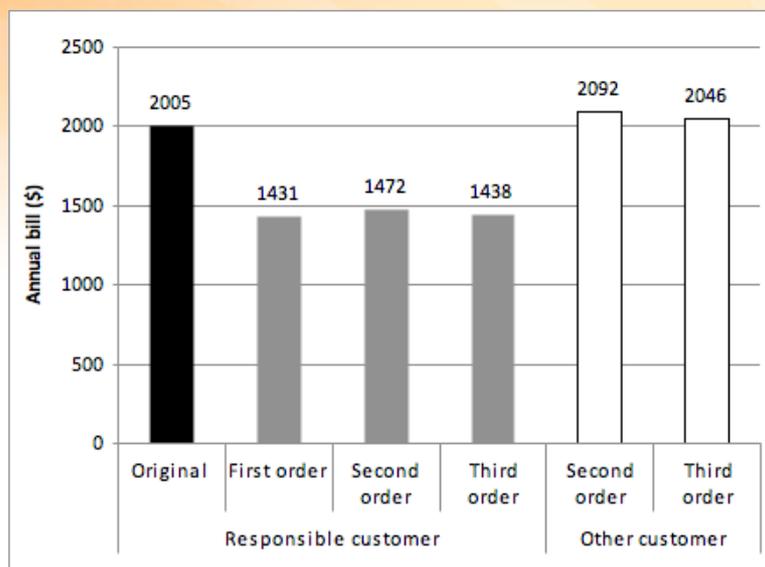
**Table 5. Annual Bill, Additional 20% take up PV, ‘Responsible customers’ – First order impact**

	Variable		Fixed (AUD\$)	Total	
	(AUD\$)	% change cf Standard tariff		(AUD\$)	% change cf Standard tariff
<b>Transmission</b>	87	-70.7%		87	-70.7%
<b>Distribution</b>	468	-17.8%	175	643	-13.6%
<b>Retail</b>	608	-27.2%	128	736	-23.6%
<b>Total</b>	1163	-31.7%		1466	-26.9%
<b>PV export</b>	35				
<b>Total minus PV</b>				1431	-28.6%

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## Results: PV Impacts on ‘Responsible’ & ‘Other customers’

- Previous work: 20% PV penetration, WAPC, very little impact
- Going from 20% to 40%, revenue cap

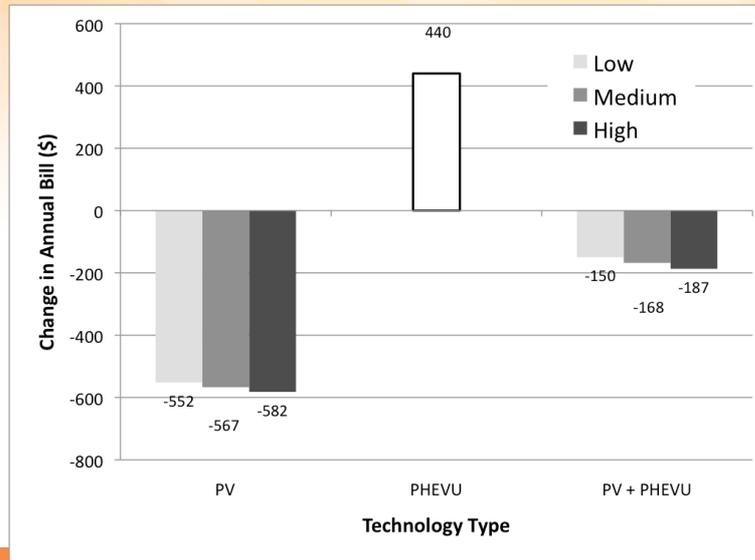


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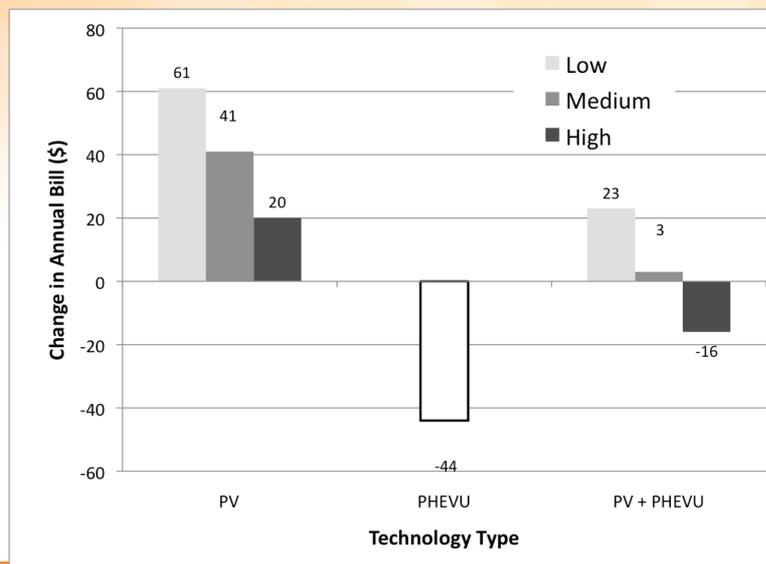
## Results: Impacts of PV and PHEVU on 'Responsible customers'

- PV availability during network peaks:
  - Transmission: 30%, 50% and 70%
  - Distribution: 10%, 20% and 30%



## Results: Impacts of PV and PHEVU on 'Other customers'

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## Summary

- PV
  - Responsible customers
    - From 20% to 40% penetration: decrease approx \$AUD 550/year
  - Other customers
    - From 20% to 40% penetration: increase approx \$AUD 40/year
- PHEVU, 20% penetration
  - Responsible customers
    - Increase approx \$AUD 440/year
  - Other customers
    - Decrease approx \$AUD 44/year
- PV + PHEVU
  - Responsible customers
    - Decrease approx \$AUD 170/year
  - Other customers
    - Negligible impact



## Comments

1. Impact of technologies strongly dependent on regulatory environment
2. The type of tariff and its internal structure also strongly influence these impacts
3. The impact of PV is strongly dependent on its ability to reduce demand peaks – improved by facing west and the use of batteries
4. PHEV (and EVs) appear most likely to decrease 'Other customers' costs, especially if battery used to reduce demand peaks
5. There will be significant variation between different customers because they have different load profiles (size and shape)
6. Likely that tariffs with a demand charge component will distribute costs and benefits most fairly



**Thank you and Questions?**

