

Australian PV Association

ABN 91 006 005 190 www.apva.org.au

IMPACTS OF PHOTOVOLTAIC SYSTEMS AND FEED-IN TARIFFS ON AUSTRALIAN RESIDENTIAL ELECTRICITY CONSUMERS

By the Australian PV Association

May 2011

Acknowledgements

The authors would like to offer their sincere appreciation for all the people who provided information through the online survey. It became clear that this was a very difficult survey to complete, and often required many hours of work to collate the billing data into the format required by the survey.

The authors would also like to thank the Alternative Technology Association for sending the survey out to their members, as well as providing valuable input into the survey design.

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Disclaimer

This project was funded by the Consumer Advocacy Panel (www.advocacypanel.com.au) as part of its grants process for consumer advocacy projects and research projects for the benefit of consumers of electricity and natural gas.

The views expressed in this document do not necessarily reflect the views of the Consumer Advocacy Panel or the Australian Energy Market Commission.

1 SUMMARY OF OUTCOMES

One of the most significant findings of this project is that it is very difficult to obtain quality data for PV system output and export as well as energy use. Although electricity retailers and network service providers have ready access to this sort of information for all their customers, they have so far been unwilling to make this information available, even for research purposes, on the basis that such information is confidential. As a result, researchers need to use survey methods to elicit the information, which is not nearly as accurate because few people keep detailed energy information to hand, whilst electricity accounts can be difficult to interpret, or even in error.

The following summarises the main outcomes of this research project. Note that given the small number of respondents (48 data sets), care should be taken when interpreting these results.

System sizes

Respondents' PV system sizes ranged from 0.9kW to 35kW, with the average being 2.2kW, and 85% of the systems being less than 3kW. In most years, respondents' systems were between 1kW and 2kW, with higher average system sizes in some years due to some very large systems being installed.

Installer's quotes for output

In 73% of the cases where installers provided quotes for system output that could be compared to actual output, actual output was less than 95% of quoted output – meaning that in only 27% of cases could the quotes be considered reasonable. Actual output ranged from 40% to 140% of quoted output, with nearly half in the 75% to 100% range.

System costs

Installed system costs for respondents (including all connection and metering costs and after all rebates) have decreased from just over \$9/W (1997-2006) to about \$3.80/W (2010). 36.9% of respondents had paid additional costs for metering and connection to the grid, with the average cost being \$401 with a range between \$100 and \$4,360. 15.9% had paid additional costs for metering that would enable them to receive the relevant FiT, with the average cost being \$295.59 with a range between \$8 and \$995. 12.5% had paid for other items not directly related to connection to the grid or to FiT metering.

Electricity use

Electricity use could only be determined for systems where total generation of the PV system was metered separately to electricity use, and for these systems, (i) the average daily electricity use varied greatly between households, and (ii) in all but one case, electricity use declined after the installation of a PV system (and associated gross meter) – with on average a 13.6% decline. The average electricity use of the owners of these systems was well below the Australian average.

Total generation

Total generation could only be determined for systems where total generation of the PV system was metered separately to electricity use. The ACT average generation of respondents (3.8 kWh/day) appears to be close to what could reasonably be expected (according to PVSyst) while the NSW generation (3 kWh/day) is significantly less. Respondents to this survey are ATA members and so are likely to take extra steps to maximise output, and as a result have higher output than

average. Hence, if these results are replicated across the wider set of PV system installations, estimates on the costs of FiT schemes that assume maximum theoretical output are likely to overestimate the scheme costs.

Net export

Where total generation of the PV system was not metered separately to electricity use, only net export could be measured. Because the amount of export depends on the load, at time of use, respondents' export per kW also varied greatly – with the lowest export being 24% (for a 4kW system) and the highest being 94% for a 1.95kW system. With the average electricity use of respondents in NSW and the ACT being less than the Australian average, and assuming the respondents with net FiTs have similarly low electricity use, they would be expected to have a higher degree of export than the average Australian household. As PV systems move beyond the 'early adopters' to the broader population who have higher electricity use, the recent government estimates of percentage export for net FiTs (17% to 28% for systems of 1 to 1.5kW) are likely to be more accurate than earlier estimates (50% export for a 1.5kW system).

Export after a net FiT

One of the supposed benefits of net FiTs is that they should encourage system owners to decrease their electricity use in order to maximise net export. However, all but one of the respondents' systems showed decreased electricity export after the system owner started receiving the FiT – with the average decrease being 18.6%. This decrease did not appear to be due to decreased insolation.

Financial outcomes

The financial value of systems in NSW and the ACT was determined based on the gross FiT revenue. These systems had simple payback times (SPTs) that ranged from 5.2 to 15.4 years, with the average being 8.1 years (NSW) and 10 years (ACT). There was no clear correlation between SPT and system size, presumably mainly because of system-specific insolation differences and differences in rebates and FiTs.

The financial value of systems in other jurisdictions was made up of the financial value of the net FiT (which can be measured) and the financial value of offset electricity (which was estimated based on theoretical generation). These systems had a far greater range in SPTs than the systems on gross FiTs – from 0.7 to 26.9 years – which is to be expected because the value obtained through the FiT is based on the difference between generation and use at any specific time, which can vary greatly. Interestingly, the average SPT for these jurisdictions (11.6 years), is only 26% higher than it is for NSW and the ACT (9.2 years). This is most likely because the average electricity use of respondents is less than the Australian average (increasing their export FiT income), and because the assumed generation for the net export systems is likely to be greater than actual (increasing their estimated income earned from offsetting electricity use).

Impacts on electricity use

- A total of 86% of respondents who answered the questions regarding behavioural change said they had taken steps to reduce their electricity use since buying a PV system. As discussed above, although both being more aware of energy use and wanting to maximise net export were important reasons for reducing electricity use, it was not possible to correlate these reasons with a particular type of FiT.
- Just over half of respondents (52%) thought that their energy efficiency measures had reduced their total electricity use, while 13% thought it had only been shifted to

a different time of day, and 35% though it had been both reduced and shifted. However again, these could not be attributed to a particular type of FiT – in part because the measures had been taken at various times (not only after a PV system was installed) and in part because some of the measures reported would reduce electricity use at times when a PV system was not producing electricity. Where electricity use was thought to have been reduced, the range in reduction was 5% to 68% with an average 22%. Of the respondents who thought that their energy efficiency measures had *shifted* their electricity use, the average was an 11% shift to the morning and a 15% shift to the evening. Again, there was a significant range in the estimates, from 2% for both morning and evening, up to 50% for the morning and 70% for the evening.

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1 INTRODUCTION

The uptake of residential photovoltaic (PV) systems has increased significantly in recent years, with government support provided via capital cost rebates, Solar Credits and, more recently, State-based Feed-in Tariffs (FiTs). SA, QLD, the ACT, NT (Alice Springs), NSW, Vic and WA have all implemented FiTs for PV systems. All except the ACT, NSW and NT (Alice Springs Solar City) have implemented schemes where the FiT is paid only on net exported electricity. There has been much discussion on the likely impacts and value to the system owner provided by a net FiT – with the outcome being uncertain because it is dependent on the quantity and timing of both the system output and the household load. The value of a gross FiT is determined only by the system output, although in practice, this can also vary from expectations.

Some argue that a net FiT would drive energy efficiency as householders seek to increase net export from their systems. Conversely, it has been argued that it may just result in load shifting from the middle to the beginning or end of the day – possibly making the current residential morning and evening load peaks even greater, further straining distribution networks. The financial impacts of FiTs could also differ between the different States/Territories because they have different characteristics eg. solar resources, size of tariff, maximum allowable system size, limits on payments, length of time paid and scope (residential or broader).

Thus, this project aimed to use actual system data, as well as electricity bills, to quantitatively assess the financial impact of different FiTs for the system owner. The data were provided by system owners through an online survey.

Section 3.1 and 3.2 summarise basic information regarding system location, installation date and size.

Section 3.3 compares actual system performance with any quoted estimates provided by installers, because it is the expected outcomes that influence the purchase decision.

Section 3.4 presents data on system cost, including all connection and metering costs.

Section 3.5 discusses differences in household electricity use before and after the installation of the PV system and/or introduction of the FiT.

Section 3.6 discusses PV system output, including total generation (gross metered systems), total export, export as a percentage of generation and export before and after the FiT (net metered systems).

Section 3.7 presents the financial value of that electricity, including standing charges, and so assesses the financial viability of residential PV systems.

Section 3.8 finally qualitatively assesses householders' perceptions of changed behaviour regarding reduced versus rescheduled electricity use before and after the installation of the PV system and/or introduction of the FiT.

2 METHOD

The primary source of data for this report was an online survey (through Survey Monkey) that was sent out to about 5,500 members of the Alternative Technology Association, the members of the Australian PV Association, and was posted on the Argon Forum¹. A follow up email was also sent out towards the end of the time the survey was available. The survey is given in Appendix A.

The quantitative assessment used data from PV system owners' electricity bills, as well as the costs of system installation and any grid-connection/metering arrangements. The qualitative assessment involved short answer questions. The method relevant to particular survey questions is provided in the Results section below in order to provide context to the responses to these questions.

2.1 Discussion of method

There was a general, and entirely understandable, feeling that the quantitative component of the survey was extremely complex, and it often took respondents many hours/days to complete. This was mainly due to the time spent on the questions relating to the operation of the PV system and the amount of electricity used by the household. This part of the survey required respondents to add data from their electricity bills into a preset format in the online survey. However, in part due to the many different formats used by utilities and in part due to the mistakes made by utilities when incorporating PV system output into bills (which then needed to be corrected in later bills), for many respondents this was very difficult. The survey also had to be completed over a long time frame as successive electricity bills were entered. This required respondents to come back to the survey a number of times over a long period (up to a year).

As a result of these difficulties, although 380 people started the survey, only 53 responses included at least 1 year of data. Of the 53 responses, 47 were then contacted to clarify their responses and/or obtain more data. As a result, 48 sets of data were suitable for detailed analysis.

Figure 1 shows the number of responses for each page of the survey, and it can be seen that at page 5, where the billing data are required, the numbers drop rapidly. The continued drop from page 9 onwards is in part because these questions were redundant for a particular respondent if all their billing data had already been entered. Many more responses were received to the earlier questions that related to much simpler information, such as the PV system's location, size, installation date and cost. The spike in responses on the last page is because this contained the qualitative questions related to behavioural change.

There was also some confusion with what was considered a FiT. The FiT rate provided by respondents was sometimes most likely the standard retail rate, and some respondents put start dates that were earlier than the relevant government FiT program commenced. These dates sometimes corresponded to the system installation date, but often did not. While most included GST, others appeared not to.

¹ ARGON (Australian Renewable Grid-interactive Owners Network), is a forum for the exchange of information between Australians who own, or are otherwise interested in, grid-interactive renewable-energy systems; in particular, those intended to generate electricity primarily for the owner's use.



Figure 1 Number of responses for each page of the survey

Respondents entered their billing periods in a standard format so that the data could be more readily analysed and compared. However, despite this, there were still considerable difficulties in effectively using the data. The main difficulties were:

- Billing periods were generally of different lengths, not only between different households but sometimes also quite different for the one household,
- Installation of PV systems and initiation of FiTs most commonly occurred part way through billing periods,
- Systems were installed, or the FiT came into operation for a particular system (WA and in some cases NSW because of the delay in meters), within a year of this report, so less than 1 year of post-installation data were available,
- Where systems were installed many years ago, obtaining data both sides of the installation date is difficult,
- Separate metering of the system's output (either net export or total generation) often only occurred when the FiT was introduced, and so there were no pre FiT data for the PV system,
- Where systems were installed after the FiT there were of course no pre FiT data for the PV system (and so the impact of a net FiT on net export could not be evaluated),
- After a PV system has been installed, unless the PV system output is metered separately from electricity use (ie. as it is for a gross FiT), the household electricity use cannot be determined (because output from the PV system will be used on site and so reduce the metered electricity use).

3 RESULTS

3.1 Location of surveyed installations

As can be seen from Figure 2, Victoria had the highest number of respondents (presumably because the ATA is based in Victoria and has more members there), followed by NSW then Qld, WA, SA, the ACT, Tas and the NT.



Figure 2 Location of surveyed installations

3.2 Installation date and system size

As expected with the advent of the \$8/W rebate, then the Solar Credits multipliers and State FiTs, installations suddenly increased from 2007 onwards – see Figure 3, which also shows the annual capacity installed by respondents.

The sizes of respondents' systems ranged from 0.9kW to 35kW, with the average being 2.2kW. This is almost twice the size of the 1.18kW 10 year average system size for the PV Rebate Program and the Solar Homes & Communities Program, reflecting perhaps the environmentally committed demographic of ATA, APVA and ARGON members. Figure 4 shows all the respondents' system sizes arranged in increasing order. It can be seen that very few systems are very large, with 85% of the systems being less than 3kW.

Figure 5 shows the average system size each year, which in most years varies between 1 and 2kW. The higher average system sizes in 2000, 2007 and 2010 are in part due to some very large systems (up to 35kW) being installed in those years (see Figure 6) – although when these systems are stripped out, 2010 still has an average system size of 2.5kW.

A total of 14.6% of respondents had increased their system's size, with the average increase being 2.3kW and the range being from 0.03kW to 24kW.



Figure 3 Capacity and number of systems installed each year



Figure 4 System sizes



Figure 5 Average system size



Figure 6 Installation date (each system's capacity)

3.3 Quoted versus actual output

The predicted annual electricity generation is an important consideration for householders when considering a PV system purchase because this affects the system's payback period and financial viability.

Respondents were asked whether their installed PV system had lived up to the quoted generation levels and to give reasons for any difference between actual and quoted output. In 73% of the cases where respondents provided enough data to make an accurate comparison, actual output was less than 95% of quoted output – meaning that in only 27% of cases could the quotes be considered reasonable. Actual output ranged from 40% to 140% of quoted output, with nearly half in the 75% to 100% range. Figure 7 compares actual output with quoted output.



Figure 7 Quoted versus actual output

The reasons listed for the actual output differing from the quoted output are in Figure 8. Shading was stated as the most common factor in reducing output (sometimes due to trees increasing in height since installation), followed by orientation and weather. This indicates a general trend for installers to overestimate output from systems, particularly in cases where panels will be shaded. Installers should be able to accurately predict the effects of orientation and shade on PV system performance.



Figure 8 Reasons for less than optimum performance

3.4 System cost

Figure 9 shows how the relationship between system costs and system size has changed over time. It should be noted that the three very large outlying systems have not been included in this graph. The average capital cost to respondents (after all rebates) in each year from 1997 to 2010 is given in Table I.

System costs have decreased over time while the number of systems being installed per year has increased. In part this is because the actual system cost (without rebates) has decreased over time due to improved manufacturing processes, economies of scale, increasingly streamlined delivery and novel business models. It is also influenced by the various government rebate programs that have run during this time (Photovoltaic Rebate Program, Solar Homes and Communities, and local government incentives), as well as REC prices.

Connection, metering and other non-PV system costs added a considerable amount to the overall PV system installation cost for many respondents. This is an aspect not often discussed when PV support programs are instigated. It is unclear whether these extra costs were flagged in the original PV system quotes.

Year	Cost (\$/W)
1997-2006	9.26
2007	6.36
2008	6.12
2009	3.86
2010	3.79

Table I Installed cost to respondents from 1997 to 2010



Figure 9 System costs versus size for different years

3.4.1 Connection costs

Of the respondents who answered this question (211) 36.9% had paid additional costs for metering and connection to the grid associated with installation of the PV system. The average cost was \$401 with a range between \$100 and \$4,360. Given that PV systems connected to the grid need to interact with existing distribution infrastructure and use equipment that is compatible with the utility companies established systems, some level of connection cost is not unusual. However, unusually high connection costs can significantly increase the system's payback period.

3.4.2 FiT metering costs

Of the respondents who completed this question (201) 15.9% had paid additional costs for metering that would enable them to receive the FiT. The average costs paid by householders for this was \$295.59 with householders paying between \$8 and \$995 to access the FiT.

3.4.3 Other costs

Of the respondents who completed this question (208), 12.5% had paid for other items not directly related to connection to the grid or to access FiT metering. Products and services that had been paid for include:

- Electrician services to relocate meter box, replace wiring, switchboard or fuse box
- PV system framing
- Tree removal
- Legal fees
- Utility company fees to visit site or become power supplier

The rates paid for these services ranged from \$169 to \$3,150 with electrical services being the most common cost.

3.5 Electricity use

The primary aim of this section was to see if electricity use changed after a PV system was installed and/or after a FiT started. However, unless the PV system output is metered separately from electricity use (eg. as it is for a gross FiT), the electricity use cannot be determined (because output from the PV system will be used on site and so reduce the metered electricity use). Thus, the only comparison that can be made is between the period before a PV system was installed and the period after a gross meter has been installed for that system. Of all the systems that provided data, only one in NSW and 4 in the ACT met this criterion – see Figure 10.

It can be seen that (i) the average daily electricity use varied greatly between households, and (ii) in all but one case, electricity use declined after the installation of a PV system (and associated gross meter) – with on average a 13.6% decline. However note that, given the small sample sizes, care should be taken when interpreting these results. The difference in electricity exported before and after the introduction of a net FiT is discussed in Section 3.6.2.3.



Figure 10 Electricity use before and after installation of a PV system with a gross FiT

In addition to the above households, it was possible to obtain data from other households for either before a PV system was installed (2 households in NSW) or after a gross meter was installed (2 in NSW and 2 in the ACT). The average daily electricity use for these households, as well as for the households in Figure 10, is shown in Figure 11 below. It can be seen that most are well below the 2008 Australian average of 18.3kWh/household/day (DEWHA, 2008). As discussed in Section 3.6.2, assuming these respondents are representative of the respondents from other states, this low electricity use has implications for the amount of electricity likely to be exported to the grid under a net FiT regime.



Figure 11 Average electricity use before and/or after installation of a PV system with a gross FiT

3.6 PV system output

The primary aim of this section was to assess the output of real life systems in different jurisdictions. Gross metering occurs in NSW and the ACT (and in Alice Springs Solar City) and so in these jurisdictions the total generation from the PV system can be measured. Net metering occurs in Qld, Vic, Tas, SA, WA and the NT, and so in these jurisdictions only export to the grid can be measured. In order to account for seasonal variations, at least a year's data were required for each system.

3.6.1 NSW and the ACT

Figure 12 and Figure 13 show the average daily generation for respondents' PV systems in NSW and the ACT respectively. Figure 14 shows the combined results. The theoretical annual average generation (according to PVSyst) assuming optimal orientation of the panels for Sydney is 4.07 kWh/day and for the ACT is 4.24 kWh/day. With suboptimal orientation (say 30 degrees west of north) they are 3.95 kWh/day and 4.12 kWh/day respectively. Roof slope is also a factor, with a typical house in the range 20-25 degrees, compared to the NSW optimum of around 30 degrees.

Given the small sample sizes, care should be taken when interpreting these results, however the ACT average generation of respondents (3.8 kWh/day) appears to be close to what could reasonably be expected while the NSW generation (3 kWh/day) is significantly less. The most common reason given for reduced output by respondents was shading, with unusually cloudy weather also being mentioned. However, it is unlikely the low generation occurred because of low insolation because, according to the Bureau of Meteorology's 'Monthly mean daily global solar exposure readings',² the locations of the systems had above average annual insolation in the years the data were collected.

A report recently released by the NSW government that calculated the cost of the Solar Bonus FiT scheme assumed average generation of 4.5 kWh/day in Sydney (and higher in other areas of the state) (AECOM, 2010). If the systems surveyed here are indicative of the average, it is likely the AECOM report overstated the scheme's costs. The system owners surveyed here are most likely members of the ATA, and are likely to have an above average interest in their PV system. As such they would be more aware of the factors that may reduce output, take extra steps to maximise that output, and so have higher output than average.



Figure 12 Average daily generation – NSW

a: Red dot indicates the average





a: Red dot indicates the average

² http://www.bom.gov.au/climate/data/



Figure 14 Average daily export – Gross meter combined

a: Red dot indicates the average

3.6.2 Qld, Vic, Tas, SA and WA

3.6.2.1 Average daily export

Figure 15 shows the average daily export for respondents' PV systems in Qld, Vic, SA, WA and Tas combined. Table II shows the average export per kW and the average system size in each of these jurisdictions. Again, given the small sample sizes, care should be taken when interpreting these results.



Figure 15 Average daily export – Net meter (combined)

Jurisdiction	Average system size (kW)	Average export (kWh/kW/day)
Qld	2.1	2.6
Vic	2.6	2.1
SA	2.2	2.8
WA	1.6	2.8
Tas	1.9	2.0

lable II Average export per kw per average system siz	able II Averag	e export	per kW	per average	system	size
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3.6.2.2 Percentage export

Figure 16 through to Figure 20 show the respondents' average daily export as a percentage of theoretical generation³ for respondents' PV systems in Qld (4.06 kWh/kW/day), Vic (3.52 kWh/kW/day), SA (4.13 kWh/kW/day), WA (4.58 kWh/kW/day) and Tas (3.35 kWh/kW/day) respectively. On average, the amount of export per kW should increase with system size. However, because the amount of export depends on the load, which as shown in Section 3.5 varied greatly, respondents' export per kW also varied greatly. For example, the lowest export was 24% for a 4kW system, while the highest was 94% for a 1.95kW system.

As discussed in Section 3.5, the average electricity use of respondents in NSW and the ACT was less than the Australian average, and if the respondents with net FiTs have similarly low electricity use, they would be expected to have a higher degree of export than the average Australian household. The export of the 'average PV system owner' is likely to decrease over time as interest in PV systems continues to extend beyond the 'early adopters' to the broader population who have higher electricity use. The SA Government FiT Discussion paper assumed that a household with a daily use of 13.7kWh (which is mid way between the NSW and ACT average discussed above) and a 1.5kW PV system would export 50% of their generation to the grid (GSA, 2007). The Vic government cited the SA government's 50% export assumption as a key reason for supporting a net FiT (PLRS, 2009). Based on the findings presented here, it is likely that the 50% export assumption for a 1.5kW system is far too high. More recent government estimates are likely to be more accurate, being 17% for a 1kW system (WA; Collier, 2010), about 20%⁴ for a 1.44kW system (SA; Miley, 2010) and 17%-28% for a 1.5kW system depending on the location (NSW; AECOM, 2010). This is in line with earlier APVA calculations (PVPS/CEEM, 2007).

³ Theoretical generation is for capital cities and assumes suboptimal orientation of 30 degrees west of north as discussed above.

⁴ 1.16MWh/year



Figure 16 Average daily export as a percentage of theoretical generation – Qld

a: Theoretical generation assumes suboptimal orientation of 30 degrees west of north as discussed above.



Figure 17 Average daily export as a percentage of theoretical generation – Vic

a: Theoretical generation assumes suboptimal orientation of 30 degrees west of north as discussed above.



Figure 18 Average daily export as a percentage of theoretical generation – SA

a: Theoretical generation assumes suboptimal orientation of 30 degrees west of north as discussed above.



Figure 19 Average daily export as a percentage of theoretical generation – WA

a: Theoretical generation assumes suboptimal orientation of 30 degrees west of north as discussed above.





a: Theoretical generation assumes suboptimal orientation of 30 degrees west of north as discussed above.

3.6.2.3 Export before and after FiT

One of the supposed benefits of net FiTs is that they should encourage system owners to decrease their electricity use in order to maximise net export. As discussed in Section 3.5, unless the PV system output is metered separately from electricity use, it is not possible to determine the electricity use of a household with a PV system and net meter. However, if they already had a PV system under a net-metered arrangement, it is possible to see whether their export has increased after their net FiT started. Figure 21 to Figure 24 show such respondents' average daily export before and after the FiT was introduced. It can be seen that all but one of the systems shows decreased electricity export after the system owner started receiving the FiT – with the average decrease being 18.6%.

For a particular system, it is possible export decreased because there was less insolation after their FiT started than there was before. The postcodes of respondents have been used to assess the average daily insolation for the periods before and after their FiT started⁵ – according to the Bureau of Meteorology's 'Monthly mean daily global solar exposure readings' 6 – see Table III. It can be seen that although the insolation did vary slightly, it often increased when export decreased, and where they both decreased, is unlikely to explain the degree of drop in export. Thus, the reason for the decrease in export is unclear. Although the small number of respondents means this finding should be treated with caution, this decrease is still inconsistent with the claim that a net FiT decreases electricity use in order to increase exports. This is an interesting outcome when compared to the results in Section 3.5, which showed that in NSW and the ACT, electricity use decreased after the PV system was installed for 5 out of the 6 respondents. However, with such small sample sizes, it is not possible to draw wider conclusions from these results.

 $^{^{5}}$ This is taken according to when the system owner started receiving the FiT, not just when the FiT scheme started.

⁶ http://www.bom.gov.au/climate/data/

Jurisdiction	Export after FiT cf before FiT	Difference in insolation
Qld	-1.8%	-4%
	-17.5%	+6%
Vic	+5.5%	-1%
	-18.6%	+2%
	-16.4%	-3%
	-28.6%	-6%
	-28.6%	+2%
	-16.4%	-3%
SA	-25.8%	+3%
	-36.6%	-13%
WA	-38.7%	0%
	-18.8%	-4%

Table III Average export and insolation before and after FiT



Figure 21 Average daily export before and after net FiT – Qld



Figure 22 Average daily export before and after net FiT – Vic



Figure 23 Average daily export before and after net FiT – SA



Figure 24 Average daily export before and after net FiT – WA

3.7 Financial value of PV electricity

The primary aim of this section was to assess the financial outcomes of real life systems in different jurisdictions. In NSW and the ACT the financial value can be measured from the gross FiT revenue. In Qld, Vic, Tas, SA and WA, the total financial value is made up of the financial value of the net FiT (which can be measured) and the financial value of offset electricity (which must be estimated). Again, given the small sample sizes, care should be taken when interpreting these results.

3.7.1 NSW and the ACT

Table IV shows the annual income and simple payback time (SPT) for systems in NSW and the ACT for which sufficient data were available, along with the year of installation. To calculate the SPT the cost of the system included all metering and connection costs, and was reduced by the Commonwealth Government rebates received. The average SPT ranged from 5.2 to 15.4 years, and for NSW was 8.1 years and for the ACT was 10 years.

It can be seen that none of the systems has a particularly short payback time, which would of course be longer if the value of the FiT income over time was reduced through discounting.⁷ Beyond that, there are no clear correlations. Larger systems could be expected to have a longer SPT because a smaller proportion of their costs would have been covered by rebates, and similarly, older systems could be expected to have a longer SPT because they would have been more expensive. However, these correlations didn't necessarily hold, possibly because older systems may also have received a higher rebate and the positioning of systems can make a big difference to output and therefore SPT. Correlations may have been clearer if there was a much larger number of respondents.

⁷ When discounting, the value of future revenue streams are reduced to account for the fact that money received in the future is worth less than money received now (which could be invested elsewhere, for example, paying off a home loan at say 7%).

Year of installation	System size (kW)	Annual income	Simple payback time (yrs)
NSW			
2007	1.8	\$1,328	11.5
2007	2.64	\$2,672	9.0
2009	1	\$465	5.2
2010	2.8	\$2,119	6.6
Average	2.1	\$1,646	8.1
АСТ			
2005	1.125	\$786	9.2
2008	2.1	\$1,574	9.8
2008	2.1	\$1,558	15.4
2008	1.44	\$1,137	6.2
2009	1.7	\$1,195	9.6
2009	1.075	\$750	9.6
Average	1.6	\$1,167	10

Table IV Average annual income and payback time (after rebates): NSW & ACT

3.7.2 Qld, Vic, Tas, SA and WA

Table V shows the export income, estimated income from offsetting electricity use, total annual income and simple payback time (SPT) for systems in Qld, Vic, Tas and WA for which sufficient data were available, along with the year of installation. To estimate the income from offsetting electricity use, a representative electricity tariff was multiplied by the difference between the theoretical generation minus the actual export. The representative electricity tariffs were based on the current offerings from a range of retailers in each jurisdiction ie. Qld (21.5c/kWh), Vic (24c/kWh), SA (27c/kWh), WA (21c/kWh) and Tas (20c/kWh). The theoretical generation was calculated for a suboptimal system as in Section 3.6.2.2 ie. Qld (4.06 kWh/kW/day), Vic (3.52 kWh/kW/day), SA (4.13 kWh/kW/day), WA (4.58 kWh/kW/day) and Tas (3.35 kWh/kW/day). To calculate the SPT the cost of the system, including all metering and connection costs, was used. As discussed in Section 3.6, the actual generation was most likely less than the theoretical generation used here and so the annual income would be less and the SPT more. Counteracting this effect would be the likely increase in electricity use tariffs over time, which would decrease the SPT. Because of these various assumptions and influences, the values calculated here are only approximate.

It can be seen that these systems have a far greater range in SPTs than the systems on gross FiTs – from 0.7 to 26.9 years (excluding Tas, which does not have a FiT). As discussed in Section 3.6.2.2, this is to be expected because the value obtained through the FiT is based on the difference between generation and use at any one time – which can vary greatly. Interestingly, the average SPT for these jurisdictions (11.6 years), is only 26% higher than it is for NSW and the ACT (9.2 years), which have gross FiTs. This is most likely because, as discussed in Section 3.5, the average electricity use of respondents is less than the Australian average (increasing their export FiT income), and because the assumed generation for the net export systems is likely to be greater than actual (increasing their income earned from offsetting electricity use).

Year of installation	System size (kW)	Export income	Offset elec. income	Annual income	Simple payback time (yrs)
Qld					
2001	1.52	\$401	\$57	\$458	21.9
2007	3.78	\$1,727	\$401	\$2,128	11.8
2008	2.4	\$1,282	\$177	\$1,459	20.6
2009	1.02	\$329	\$189	\$518	0.7
2009	2	\$799	\$286	\$1,085	7.2
2009	2	\$406	\$434	\$840	10.1
2009	2.1	\$981	\$308	\$1,289	9.7
2009	1.845	\$923	\$190	\$1,114	3.1
Average	2.08	\$856	\$255	\$1,111	10.64
Vic					
2005	1.92	\$1,227	\$215	\$1,442	13.1
2005	2	\$416	\$965	\$1,381	10.1
2007	4.5	\$2,692	\$635	\$3,327	12.1
2008	1.95	\$1,396	\$143	\$1,539	9.4
2008	2.04	\$397	\$295	\$692	19.4
2008	2.1	\$872	\$421	\$1,293	14.9
2008	1	\$163	\$234	\$397	3.8
2008	1.53	\$625	\$303	\$928	14.3
2009	4.814	\$2,174	\$971	\$3,145	11.1
2009	1	\$133	\$227	\$360	4.2
2010	4.67	\$3,064	\$575	\$3,639	7.6
2010	1.5	\$496	\$362	\$858	4
Average	2.42	\$1,138	\$396	\$1,534	10.33
SA					
2003	2.5	\$912	\$539	\$1,451	13.8
2005	2.07	\$808	\$344	\$1,152	26.9
2007	1.05	\$743	\$81	\$824	5.8
2008	1.98	\$1,196	\$104	\$1,300	10.5
2008	1.1	\$361	\$253	\$614	11
2009	2	\$1,080	\$277	\$1,357	9.4
2010	4.8	\$3,250	\$300	\$3,550	5.7
Average	2.21	\$1,192	\$271	\$1,464	11.87
WA					
2007	1.7	\$757	\$148	\$905	11.8
2008	1	\$322	\$100	\$422	2.6
Average	1.35	\$539	\$124	\$663	7.20
Tas					
2008	2.8	\$430	\$344	\$774	28.4
2010	1	\$107	\$186	\$293	7.5
Average	1.90	\$268	\$265	\$533	17.95

Table V Average export and income before and after FiT: Qld, Vic, Tas and WA

3.8 Behavioural changes

Respondents were asked:

- i) if they had reduced their electricity use since installing their PV system, then whether they had done so to maximise export of PV electricity (assuming they were on a net FiT) and/or simply because they were more aware of their electricity use;
- ii) what they had done to reduce their electricity use;
- iii) whether this had resulted in a general reduction and/or shifted the load to a different time of day; and
- iv) to estimate the percentage reduction and/or shift of load.

Questions ii, iii and iv would have been more useful if the questions had specified that they referred only to measures that had been undertaken to increase net export. This would have enabled some estimation of the effectiveness of a net FiT in reducing total electricity use, as opposed to just shifting it to different times of the day. As it was, responses included those actions taken that would not increase net export of a PV system, such as turning off appliances and lights at night, installing efficient lighting, solar water heaters etc. Some respondents confused minimising electricity costs with minimising electricity use, for example, only using appliances during low TOU tariff rates and moving electric hot water to off-peak rates.

3.8.1 Reasons for reducing electricity use

Respondents were asked if they had taken steps to reduce their electricity use since they bought their PV system, and if so, was this because they became more aware of their electricity use (and so wished to reduce their electricity costs) or because they wanted to maximise their net export. Of the respondents that answered this question (106), 86% said they had taken steps to reduce their energy use.

As can be seen from Figure 25, in jurisdictions that had net export FiTs, most respondents (66%) said they reduced their electricity use because they were both more aware of their electricity use and wanted to maximise their net export. A total of 10% said they reduced their electricity use only because they were more aware of it, and 9% said they reduced their electricity use only in order to maximise their net export. The results in jurisdictions that had gross FiTs were similar to those with net FiTs – except that a greater percentage said they reduced their electricity use because they were more aware of it (with a concomitant reduction in other reasons given).

The fact that a large percentage of people in a gross FiT jurisdiction said they reduced their energy use to either increase net export (4%) or because they were both more aware of their electricity use and wanted to increase net export (59%), is problematic. This is because none of the jurisdictions with gross FiTs had a net FiT prior to the gross FiT (they only had net billing where exported electricity earns the same amount as electricity used on site), so it is unclear (from a purely financial perspective) why they would wish to increase net export. Of course, they may have wanted to maximise export simply in order to contribute more emission-free electricity to the grid. However, it probably means that this question was not clearly understood by respondents.

This means the reasons for reducing electricity use cannot be reliably attributed to a particular type of FiT. In addition, respondents may have bought their PV system before the FiT came into operation in which case any change in energy behaviour could be due to their PV system, not the FiT.



Figure 25 Reasons for reducing electricity use

3.8.2 Steps taken to reduce electricity use

Respondents were then asked what steps they had taken to reduce their electricity use. Table VI summarises the measures that respondents took that may have reduced electricity use specifically during the time when the PV system was operating. Table VII summarises the respondents' measures that would have reduced electricity use in general (including when the PV system may be operating).

Table VIII summarises the respondents' measures that reduce electricity use when PV systems are unlikely to be operating. A number of respondents said that they had done everything they could to reduce their electricity use even before installing a PV system, and so had not taken any additional measures. This is consistent with the low electricity use of respondents compared to the Australian average, as discussed in Section 3.5.

Table VI Measures taken by respondents that could specifically reduce electricityuse when PV operating

Reflective white roof paint (assuming have an air conditioner (AC), but could increase electricity use for daytime heating in winter)

Run appliances only at night, especially those that use a lot of electricity, such as dish and clothes washers, water heater and pool filter. Timers help automate this.

More careful with use of AC during day

Use of fans instead of AC

Avoid using electric stove in middle of day

Switching the entire house over to a second stand-alone PV system!

Table VII Measures taken by respondents that reduce electricity use in general

Table VIII Measures taken by respondents that reduce electricity use when PVunlikely to be operating

More efficient lights, use dimmers and make sure are turned off when not needed, remove extra globes in some lights
Conversion to gas stove
Turn off appliances at night
Don't use dishwasher
Buy a more efficient TV (although this could reduce daytime load also)
Double glazing on all windows including the skylight

3.8.3 General reduction or a shift in load?

Respondents were asked whether their measures to reduce electricity use resulted in a net reduction in total electricity use and/or just shifted the load to a different time of day. As discussed above, the answers to this question cannot be solely attributed to the type of FiT but may have been in response to installing a PV system, or may have been undertaken as part of an overall process of reducing electricity use.

As shown in Figure 26, just over half of respondents (52%) thought that their energy efficiency measures had reduced their total electricity use, while 13% thought it had only been shifted to a different time of day, and 35% though it had been both reduced and shifted.



Figure 26 Outcomes of energy efficiency measures

Respondents were asked to estimate the percentage of their total electricity use that had been reduced, shifted to the morning or shifted to the evening. On average, of the respondents who said that their energy efficiency measures had *reduced* their total electricity use, the estimated reduction was 22%. There was a significant range in the estimates, from 5% up to 68%.

It is possible to compare the actual change in electricity use of the respondents in Section 3.5 (Figure 10, electricity use before their PV system was installed compared to after the gross FiT started) with their responses to this question. As shown in Table IX, for the three that undertook energy efficiency measures, they match up reasonably well, indicating that the attempts to reduce electricity use did in fact reduce electricity use about as much as expected. Possible reasons for the difference include slightly different periods used for the assessment and that the qualitative question in this section relates to whether their energy use reduced compared to what it would have been, not what it was in the past.

Respondent	Estimated reduction	Actual reduction
2	25%	23.5%
7	no measures	-34.3%
9	no measures	8.0%
10	20%	14.6%
11	17%	27.0%

Table IX Estimated versus actual reduction in energy use before and after PV/FiT

Of the respondents who thought that their energy efficiency measures had *shifted* their electricity use, the average was an 11% shift to the morning and a 15% shift to the evening. Again, there was a significant range in the estimates, from 2% for both morning and evening, up to 50% for the morning and 70% for the evening.

4 CONCLUSIONS

A more detailed summary of the findings of this research project is presented in the *Summary of Outcomes* on page 3. The main findings of this project are:

- Electricity bills often do not provide clear information for customers. This can make it difficult for them to understand their energy use and PV system performance.
- Electricity output from PV systems appears to be lower than estimates, which should be noted by installers when designing and quoting systems, as well as by governments when estimating PV program costs and outcomes.
- Installed system costs have decreased substantially over the last few years, which in part explains the high rate of uptake in many states.
- Electricity use varies greatly between households, and, even for systems under a gross FiT, appears to decrease once a PV system is installed, presumably because system owners become more aware of their energy use.
- Export under a net FiT varies even more greatly than energy use, because it is dependent on the correlation between energy use and PV output at any one time.
- In our relatively small sample, net export decreased after a net FiT was implemented, and this did not appear to be due to decreased solar insolation.
- The simple payback time (SPT) under a gross FiT varied from 5.2 to 15.4 years, with the average being 8.1 years (NSW) and 10 years (ACT).
- The SPT under net FiTs varied from 0.7 to 26.9 years, and the average was 26% higher than the average for NSW and the ACT.
- 86% of respondents said they had taken steps to reduce their electricity use since buying a PV system, however it was not possible to correlate their perceived behaviour change with a particular type of FiT or even necessarily with the purchase of a PV system.

5 REFERENCES

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6 APPENDICES

6.1 Appendix A: Survey

1. Introduction

This survey is to assess the impacts of different types of Feed-in Tariffs (FiTs) in Australia. It focuses on the financial impacts (how much money you get) and the energy impacts (whether the FiT changes your energy use).

Responses remain confidential and only aggregate results will be made public.

Please let other people with PV systems know about this survey. It can be accessed via the APVA (www.apva.org.au) and ATA (www.ata.org.au) websites.

You'll need to complete this survey over a period of time (until Feb 2011) as you receive your electricity bills. You'll also need access to your electricity bills for a year before you start (or started) receiving your FiT.

So at this stage, just complete what you can now, save the survey, then come back to the same weblink to add more data. The survey will remember who you are so you can just pick up where you left off.

We'll send you a copy of the completed report that collates and analyses all the results.

Thank you for your input!

* 1. Which state or territory do you live in?

* 2. What is your postcode?

Postcode

3. What is your email? This is optional but could be very useful if we need to followup on any of your answers. It will also mean we can send you a copy of the report summarising the survey findings.

4. Do you wish to go directly to the last page of the survey?

() Yes

No

2. System information					
* 1. What is the size of your system in Watts?					
System size					
★ 2. What date was it originally installed?					
DD MM YYYY					
Original installation / / / / date					
3. Has the system size changed since the original installation?					
No					
⊖ Yes					
If yes, what was original size (kW)					
4. If the system size changed, what date did it change?					
Date of change					
5. Do you wish to go directly to the last page of the survey?					
Yes					
\bigcirc No					

3. System information (cont.)						
1. What was the quoted output (in kWh) from the PV installer of expected generation						
each year?						
Quoted output (kWh)						
2. If the actual generation is lower than the quoted estimate k	2. If the actual generation is lower than the quoted estimate by your PV installer, are					
there any reasons for this (e.g. shading, suboptimal orientati	there any reasons for this (e.g. shading, suboptimal orientation etc)?					
* 3. What was the total cost to you of the system including inst any rebate and any BECs etc. just the actual amount of mon	tallation? (This is after					
Total cost (\$)	cy you puld.					
Comment						
4. Have you paid any costs for metering to connect your sys	tem to the grid?					
Here we're not asking about metering costs to get a FiT, that	is in the next question.					
No						
◯ Yes						
If yes, how much? (\$)						
5. Have you paid any costs for metering to be eligible for a Fi	iT?					
No						
Yes						
If yes, how much? (\$)						
6. Have you paid any other costs?						
No						
Yes						
If yes, please describe						
7. Do you wish to go directly to the last page of the survey?						

4. FiT information

The FiT terminology differs between states, but here, a FiT means that you get a high rate for either all electricity exported to the grid (a net FiT), or a high rate for all electricity your system produces (a gross FiT). Where you are just receiving the standard electricity retail rate for electricity exported to the grid, this is called net billing ie. it is not counted as a FiT.

NSW customers: You should be on a net FiT from the 1 Jan 2010 until you have the appropriate type of meter installed, at which time you will be on a gross FiT.

***** 1. What is the FiT rate (per kWh)? Please include GST.

FiT rate (c/kWh)	
Comment	

2. What is the date your retailer or network service provider began crediting you the FiT? If it has not yet started to do so (eg. if you are in NSW or WA), then only answer this question once they have.

NSW customers: Just use the date when you had the appropriate FiT and so started receiving the gross FiT.

	DD	MM	Y١
Date	/	/	

3. Do you wish to go directly to the last page of the survey?

Yes
 Yy
 Yy

() No

5. System operation

From your electricity bills, please provide the following quarterly data. We'd like it from 1 year before you start (or started) receiving your FiT to 1 year after the FiT came into effect.

Thin	first man	. :		ماد الثماد	a	h:11 : n			~ ~ ~ ~ ~		
Ins	tirst nade	a is toi	r the tirs	t nili tn	e nexi	DIII IS	on the	next na	de and	SO	on
11110	mot page	, 10, 101			0 110/11	0.00	011 010	none pu	go ana	00	U 11.

* 1. For the first bill, what dates does it cover?
DD MM YYYY Start date / / End date / /
* 2. If you have a net FiT, we are interested in the electricity imported from the grid as well as your net export during this billing period.
If you have a gross FiT, we are interested in the electricity consumed by you as well as the electricity generated by the PV system during this billing period.
Please don't enter units (kWh), just enter a number. Electricity imported/consumed (kWh) Electricity exported/generated (kWh) Comment * 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here. Please don't enter any units (eg. c/kWh or c/day), just enter a number.
Please include GST.
Retail tariff (c/kWh)
Connection charge (c/day) Comment

* 4. For this billing period, what is the total financial value of the electricity imported
(from the grid) as well as the electricity exported (to the grid)?

Please don't enter any units (eg. \$), just enter a number.

Please include GST.

Value of electricity imported/consumed	
Value of electricity exported/generated	
Comment	

***** 5. Do you wish to add another billing period?

\bigcirc	Yes
------------	-----

🖸 No

6. System operation - next bill

From your second electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD		MM		YYYY
	1		1	
	1		1	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please Include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

★ 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?				
Please don't ente	r any units (eg. \$), just enter a number.			
Please include G	ST.			
Value of electricity imported/consumed				
Value of electricity				
Comment				
≭ 5. Do you wish to	add another billing period?			
Yes				
◯ No				

7. System operation - next bill

From your third electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD		MM		YYYY
	/		1	
	/		1	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

★ 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?
Please don't enter any units (eg. \$), just enter a number.
Please include GST.
Value of electricity imported/consumed
Value of electricity
Comment
★ 5. Do you wish to add another billing period?
Yes
No

8. System operation - next bill

From your fourth electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD		MM		YYYY
	/		1	
	/		1	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

★ 4. What is the total fin electricity exported/get	ancial value of the electric enerated?	city imported/consumed as well as	the
Please don't enter any	y units (eg. \$), just enter a	number.	
Please include GST.			
Value of electricity imported/consumed]	
Value of electricity]	
Comment]	
≭ 5. Do you wish to add	another billing period?		
Yes			
◯ No			

9. System operation - next bill

From your fifth electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD	MM		YYYY
/		1	
/		1	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

* 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?			
Please don't enter any units (eg. \$), just enter a number.			
Please include GST.			
Value of electricity imported/consumed			
Value of electricity			
Comment			
★ 5. Do you wish to add another billing period?			
Yes			
No			

10. System operation - next bill

From your sixth electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD		MM		YYYY
	/		1	
	/		1	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

★ 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?		
Please don't enter any units (eg. \$), just enter a number.		
Please include GST.		
Value of electricity		
Value of electricity		
Comment		
★ 5. Do you wish to add another billing period?		
Yes		
No		

11. System operation - next bill

From your seventh electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD		MM		YYYY
	1		1	
	1		1	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please Include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

★ 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?					
Please don't enter any units (eg. \$), just enter a number.					
Please include GST.					
Value of electricity imported/consumed					
Value of electricity					
Comment					
★ 5. Do you wish to add another billing period?					
Yes					
No					

12. System operation - next bill

From your eighth electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD	MM		YYYY
/		/	
/		/	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

* 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?					
Please don't enter any units (eg. \$), just enter a number.					
Please include G	ST.				
Value of electricity imported/consumed					
Value of electricity					
Comment					
* 5. Do you wish to	add another billing period?				
Yes					
No					

13. System operation - next bill

From your ninth electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD		MM		YYYY
	/		1	
	/		1	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

* 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?					
Please don't enter any units (eg. \$), just enter a number.					
Please include G	ST.				
Value of electricity imported/consumed					
Value of electricity					
Comment					
* 5. Do you wish to	add another billing period?				
Yes					
No					

14. System operation - next bill

From your tenth electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD		MM		YYYY
	1		1	
	1		1	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

* 4. What is the tota electricity export	al financial value of the electricity imported/consumed as well as the ed/generated?
Please don't ente	er any units (eg. \$), just enter a number.
Please include G	ST.
Value of electricity imported/consumed	
Value of electricity	
Comment	
* 5. Do you wish to	add another billing period?
Yes	
No	

15. Copy of page: System operation - next bill

From your eleventh electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD		MM		YYYY
	1		/	
	1		/	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.		
Retail tariff (c/kWh)		
Connection charge (c/day)		
Comment		

* 4. What is the tota electricity export	al financial value of the electricity imported/consumed as well as the ed/generated?
Please don't ente	er any units (eg. \$), just enter a number.
Please include G	ST.
Value of electricity imported/consumed	
Value of electricity	
Comment	
* 5. Do you wish to	add another billing period?
Yes	
No	

16. Copy of page: Copy of page: System operation - next bill

From your twelfth electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD	MM		YYYY
1		/	
/		/	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.	
Retail tariff (c/kWh)	
Connection charge (c/day)	
Comment	

★ 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?		
Please don't ente	er any units (eg. \$), just enter a number.	
Please include G	ST.	
Value of electricity imported/consumed		
Value of electricity		
Comment		
* 5. Do you wish to	add another billing period?	
Yes		
No		

17. Copy of page: Copy of page: Copy of page: System operation - next bill

From your thirteenth electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.

This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.

* 1. For the next bill, what dates does it cover?

Start date	
End date	

DD		MM		YYYY
	1		1	
	1		1	

***** 2. Here the terminology depends on whether you have a net FiT or a gross FiT.

For net FiTs, we are interested in the electricity imported and exported during this billing period.

For gross FiTs, we are interested in the electricity consumed and generated.

Please don't enter any units (eg. kWh), just enter a number.

Electricity	
imported/consumed (kWh)	
Electricity	
exported/generated (kWh)	
Comment	

* 3. What is your electricity retail tariff (i.e. c/kWh for consumption) and your connection charge (c/day)? If these have changed during the billing period or if you have a TOU or stepped tariff, then please describe here.

Please don't enter any units (eg. c/kWh or c/day), just enter a number.

Please include GST.	
Retail tariff (c/kWh)	
Connection charge (c/day)	
Comment	

★ 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?			
Please don't enter any	y units (eg. \$), just enter a	number.	
Please include GST.			
Value of electricity imported/consumed]	
Value of electricity]	
Comment]	
≭ 5. Do you wish to add	another billing period?		
Yes			
◯ No			

18. Copy of page: Copy of page: Copy of page: Copy of page: System operation
From your fourteenth electricity bill, please provide the following quarterly data. Keep adding bills until you have reached 1 year after your FiT came into effect.
This survey will finish on the 31 Jan 2011 so you may not be able to enter a whole year of bills after your FiT has started.
* 1. For the next bill, what dates does it cover?
Start date / End date /
* 2. Here the terminology depends on whether you have a net FiT or a gross FiT.
For net FiTs, we are interested in the electricity imported and exported during this billing period.
For gross FiTs, we are interested in the electricity consumed and generated.
Please don't enter any units (eg. kWh), just enter a number.
Electricity
Electricity
exported/generated (kWh)
have a TOU or stepped tariff, then please describe here.
Please don't enter any units (eg. c/kWh or c/day), just enter a number.
Please include GST.
Retail tariff (c/kWh)
Connection charge (c/day)
Comment

★ 4. What is the total financial value of the electricity imported/consumed as well as the electricity exported/generated?			
Please don't enter any	y units (eg. \$), just enter a	number.	
Please include GST.			
Value of electricity imported/consumed]	
Value of electricity]	
Comment]	
≭ 5. Do you wish to add	another billing period?		
Yes			
◯ No			

19. Behavioural changes

Last page! Here we want to see if owning a PV system or getting a FiT has affected either how much energy you use, or when you use it.

* 1. If you have taken steps to reduce your energy since you bought a PV system, was this because you simply became more aware of your energy use or because you wanted to maximise your net export?

) Wanted to maximise net export

Both

I have not taken steps to reduce my energy use

2. If you have taken steps to reduce your energy use, what were they?

3. Do you think they have resulted in a net reduction in your total energy use or just shifted the load to a different time of day, or both?

Reduced energy use

) Just shifted load to different time of day

Both reduced and shifted

4. If it has resulted in a reduction of your energy use (below what it would have been otherwise, not necessarily below what it used to be), please estimate the percentage reduction.

Please don't add the % symbol.

Percentage reduction	
Comment	

5. If it has resulted in your energy use shifting to a different time of day, please write the percentage of your total energy use that has shifted to early morning or evening.

Please don't add the % symbol.

Early morning	
Evening	

6. If you haven't already answered Question 2 on Page 4, then what is the date your retailer or network service provider began crediting you the FiT?

Date you started receiving the FiT

DD		ММ		YYYY
	1		/	

7. Please add any other comments you think might be relevant

