

The power to save: An equity analysis of the Victorian Energy Saver Incentive in Melbourne

Victoria Johnson and Damian Sullivan
Equity in response to climate change program, Brotherhood of St Laurence

Abstract: This paper presents results of an equity analysis of impacts of the Victorian Energy Saver Incentive (VESI) scheme and shows the extent to which savings are being achieved in relatively disadvantaged and advantaged areas of Melbourne. The scheme, also known as the Victorian Energy Efficiency Target (VEET) scheme, is the largest residential greenhouse gas emissions reduction scheme in Victoria and has significant influence in shaping opportunities for household energy efficiency in the State. The VESI requires energy retailers to fund emissions reductions by purchasing certificates created from energy efficiency improvements in homes, such as replacement of light globes and upgrading of hot water services.

As energy prices increase, VESI presents an important opportunity for Victorians to reduce emissions and exposure to rising energy prices. It is, however, crucial that disadvantaged households are treated equitably and have opportunities to participate fully in the scheme, particularly as households that implement measures covered by the scheme will reduce energy bills by more than those that do not (DPI, 2011b, p.52). Clearly, this has both social and environmental implications. Until now, no such analysis has been undertaken.

Using VEET data, this research examined the distribution of VEET certificate creation under the scheme in postcode areas as ranked by the Australian Bureau of Statistics' Index of Relative Socioeconomic Advantage and Disadvantage in metropolitan Melbourne.

Analysis produced mixed results with important implications for the scheme into the future; for the Victorian scheme and in the context of the imminent development of a National Energy Savings Initiative.

1. Introduction

The Victorian Energy Saver Incentive (VESI) is the largest residential energy efficiency incentive in Victoria. It is designed to improve the energy efficiency of tens of thousands of Victorian homes. Ideally, all Victorian households should benefit from lower energy bills as a result of the scheme. Those households that participate directly in the scheme by installing subsidised energy efficiency measures will receive additional benefits. At the lower end of the scale, participating households may receive free light globes; at the higher end, households may receive incentives worth hundreds of dollars for the installation of a solar hot water system¹. Many of the high-end measures will lead to significant reductions in household energy bills, as well as greenhouse gas savings.

Understanding the extent to which the benefits of the scheme are shared across all sections of the community is therefore important. Until now, no such analysis has been undertaken.

This research sought to address this knowledge gap by identifying whether the benefits flowing from the VESI scheme have been equitably distributed between relatively disadvantaged and more advantaged areas. The scheme operates state-wide, but this analysis is limited to greater Melbourne. It examines the distribution of carbon savings under the scheme in relation to postcode areas as ranked by the Australian Bureau of Statistics' Index of Relative Socioeconomic Advantage and Disadvantage (IRSAD).

This research was conducted for the period 1 January 2009 to 1 July 2011; the first phase of the scheme. Findings have implications for future phases and for the proposed National Energy Savings Initiative.

2. Background

2.1 Energy use and energy efficiency

Average dwelling energy use in Australia is 123.6 kWh of electricity and 661.9 MJ of gas per week (ABS, 2013). The main uses of residential energy are space heating and cooling (41 percent), followed by water heating (23 percent). Cooking and other appliances, such as television, computers and lighting account for just over one-third of energy used.

Many low income households use less energy, but generally spend a much higher proportion of their income on energy, than higher income households (ABS, 2013). Residential energy efficiency resulted in a reduction in energy use in Australia of 17 petajoules between 1989/90 and 2007/08 (Petchey, 2010). Household energy efficiency can improve affordability (OMH, 2013), increase home comfort (Grimes et al 2012) and is a key aspect of a transition to more sustainable urban settlements. However, low income households are being left behind. For example, people on low incomes, in all states with data available, are less likely to have insulation than wealthier households (ABS, 2010a, b, c) and in Victoria, 24 percent of concession card holder households have electric hot water (which is usually less efficient and more expensive to run than gas) compared to 18 percent of non-concession card holder households (Roy Morgan, 2008).

2.2 Victoria's Energy Saver Incentive

The primary objective of the Energy Saver Incentive (referred to in this paper as the VESI), is to reduce Victoria's greenhouse gas emissions by mandating that energy retailers reduce the emissions of their customers.

From its first phase of operation, from 1 January 2009 to 31 December 2011, the scheme is expected to reduce Victorian household emissions by 2.7 million tonnes of carbon dioxide equivalent greenhouse gases (MtCO₂-e) each year. The emission savings are derived from an estimate of the lifetime emission reductions of the actions undertaken under the scheme. In its second phase, from the start of 2012 until the end of 2014, the obligation on energy retailers will increase, and coverage will also be expanded to include small to medium-sized businesses. In the second phase, the scheme

¹ For example, using one retailer's online quote system, an upgrade from electric hot water storage to solar with gas back-up attracts rebates of up to \$2972 from a combination of VEECs and federal government rebates. It incurs an out-of-pocket cost to householders of between \$3490 and \$3590 (Origin Energy, 2011).

is expected to generate 5.4 MtCO₂-e savings per annum. The VESI will continue until 2030, with reviews every three years (ESC, 2011d).

Similar schemes exist in other jurisdictions in Australia and overseas: they are often referred to as 'white certificate' schemes. Like other white certificate schemes, the VESI involves the Victorian Government setting a target for greenhouse gas emissions reductions, which is divided between energy retailers in proportion to the amount of energy they sell to consumers. Energy retailers must then create or purchase Victorian Energy Efficiency Certificates (VEECs) equivalent to their emissions reductions target. VEECs are created when an 'accredited person'² undertakes an approved energy-saving activity in a Victorian home. Different energy-saving activities generate different numbers of VEECs³. The number of VEECs for any given activity is based on the average calculated saving from that intervention, referred to as the 'deemed' saving. Each VEEC represents one metric tonne of carbon dioxide equivalent. The certificates can be traded.

The energy efficiency measures approved under the VESI range from low-cost interventions, such as the installation of compact fluorescent light globes, to high-value interventions, such as the installation of a solar hot water service. Businesses can provide approved measures free of charge or with a co-contribution toward the costs of installation from the householder. The more costly the individual measures, the more likely it is that a co-contribution will be required. In Phase 1 of the scheme, replacement light globes and showerheads were regularly provided free of charge to householders.

The costs and benefits of the VESI have been considered on a number of occasions, including most recently in the Regulatory Impact Statement (ACIL Tasman, 2011; DPI, 2011a, 2011b). The impact of the scheme on householders' electricity bills is particularly important in understanding its equity implications. All households ultimately pay for the VEET scheme through their energy bills, as in Victoria's deregulated energy market the energy retailers are able to pass on the full costs for implementing the scheme to customers. However, economic modelling showed that an emissions reduction target of 5.4 MtCO₂-e would lead to a reduction in total energy usage and subsequently a reduction in the average household's electricity bill (ACIL Tasman, 2011).

2.3 Equity and white certificate schemes

In this paper, *equity* is used as the basis of our assessment. While the primary objective of the Energy Saver Incentive is to reduce greenhouse gas emission, it is valuable to consider whether the costs and benefits of the scheme are distributed equitably. The definition of equity applied in our assessment is the extent to which the benefits of VESI are distributed to the least advantaged (see Culyer, 2001).

The benefits from the VESI scheme flow to households in two distinct ways: through system-wide reductions in electricity use and through direct savings from energy efficiency measures that are subsidised by the scheme.

Households that participate by implementing energy efficiency measures will receive both the system-wide reductions in energy bills and any savings from the energy efficiency measures introduced into their homes. DPI (2011b) identified the average benefit for households that take part in the scheme (based on undertaking at least two energy efficiency activities) as \$308 saving on their electricity bill over the first five years (assuming an annual household electricity bill of \$1104.50, or \$5522.50 over five years).

Non-participating households, on the other hand, only receive the benefits from any system-wide reductions in energy bills, valued at approximately \$38.80 between 2012 and 2015 (based on an average household electricity consumption of 4000 kWh per year, in a home with gas hot water and heating).

² 'Accredited persons' refers to 'individuals or companies that have been approved to create Victorian energy efficiency certificates (VEECs)' (ESC, 2011b).

³ The number of VEECs that a given activity yields depends on the amount of CO₂-e abatement that the activity will cause. The abatement is calculated by comparing the difference between (i) the energy use of the new product and (ii) the 'baseline' energy use, which refers to the amount of energy that would have been used if the new-high efficiency product had not been installed (ESC, 2011a).

3. Methods

3.1 Research questions

The aim of this analysis is to understand the distribution of the benefits of the VESI across Melbourne postcode areas identified as relatively disadvantaged or advantaged.

The research reported in this paper was guided by four questions:

- What proportion of VEECs (as measured by the rate of VEEC creations) is created in disadvantaged postcode areas, compared to more-advantaged postcode areas?
- What differences are there in the types of activities undertaken to generate VEECs in disadvantaged postcode areas, compared to more advantaged postcode areas?
- Which postcode areas benefit from VEEC creation through installations that will lead to substantial energy (and energy bill) savings?
- What could improve access to energy efficiency activities generating VEECs for underserved households in disadvantaged areas?

These questions were investigated using the VEET activity postcode report data, the ABS Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) and the 2006 Census data for the number of dwellings in each postcode area. These data sets are described below.

The VEET activity postcode report provides the only available data about the households taking part in the scheme. It shows the program activity type (e.g. water heating, insulation, lamps) and the number of installations and number of VEECs created, in each postcode area for Victoria (ESC, 2011c). The program currently operates only in residential properties, but a small amount of data pertains to small or medium enterprises that provide accommodation, for example caravan parks and hotels. Postcodes were selected as the geographic unit of analysis because the VEET activities are reported by postcode and not by local government area or other statistical area.

The Australian Bureau of Statistics' Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) summarises information about the economic and social conditions of people and households within an area, including both relative advantage and disadvantage measures⁴. It was selected as the most appropriate indicator of disadvantage and advantage for this analysis because it is:

- a continuum from advantage (high values) to disadvantage (low values)
- derived from Census variables related to both advantage and disadvantage
- recommended by the ABS 'for users who are interested in relative advantage as well as disadvantage' (ABS, 2008a).

For this analysis, postcode areas were classified by their IRSAD deciles (ten equal groups in rank order). The deciles were then aggregated into quintiles (five equal groups in rank order) which were named as shown in Table 3.1.

Table 3.1 IRSAD quintile names

IRSAD quintile	Name used in this paper
Quintile 1 – most disadvantaged / least advantaged	Highly disadvantaged
Quintile 2 – less disadvantaged / more advantaged (relative to Q1)	Somewhat disadvantaged
Quintile 3 – mid quintile	Average
Quintile 4 – somewhat advantaged / less disadvantaged (relative to Q3)	Somewhat advantaged
Quintile 5 – most advantaged / least disadvantaged	Highly advantaged

⁴ IRSAD has 25 variables relating to income, housing costs, employment, occupation, education, home crowding, car ownership, family type, marital status, disability and internet connection.

The IRSAD is a relative and composite index and as such, summary statistics on single variables do not strictly represent the index, however the data in Table 3.2 provides some sense for the reader of differences between quintiles. The mid-ranked suburb from each quintile group was chosen as the representative example.

Table 3.2 Summary Census (2006) data for an example suburb representative of each IRSAD quintile

IRSAD quintile example	Median total household income (\$/weekly)	Median housing loan repayment (\$/monthly)	Median rent (\$/weekly)	Unemployment rate
Quintile 1 example	695	1,083	160	12.1
Quintile 2 example	1,010	1,148	190	7.3
Quintile 3 example	1,084	1,430	225	8.0
Quintile 4 example	975	1,520	210	7.2
Quintile 5 example	1,058	1,517	240	3.8

Source ABS, 2008 b, c, d, e, f

3.2 Data matching

For this analysis, three sets of data were matched. The three sets do not have identical time-frames and due to some variables being available in one data set but not others, there was some data loss. While the SEIFA IRSAD data is from 2006, the VEET data is from 1 January 2009 to 1 July 2011. The VEET data was matched to the IRSAD data and the ABS 2006 Census postcode area dwelling structure data. The dwelling structure data includes a small proportion of dwelling types that would be unlikely to receive installations through VEET, such as improvised homes / tents / sleepers out and includes groups listed as 'not applicable' for the VEET such as rooming houses and aged care facilities.⁵

3.3 Calculating the VEEC rate

For this analysis, a rate of VEECs per 100 dwellings was calculated by dividing the number of VEECs in the postcode areas aggregated into the IRSAD quintiles by the number of dwellings in the same area. This was then factored up by 100, as the rate per single dwelling was too small to be meaningful (for example, 0.0000843 VEECs per dwelling).

A small number of areas for which a 'number of dwellings' is not available were excluded from the analysis. These account for just over half of one per cent of activities and one per cent of VEECs.

⁵ The Essential Services Commission (pers. comm., 2 August 2011) indicate that while the first phase of the scheme targeted residential dwellings, not commercial properties, there were a small number of installations in commercial properties that provided accommodation services (such as motels, boarding houses). Thus some of the 'not applicable' group may have benefited from VEET.

4. Results

This section presents the assessment of the equity impacts of the VESI in metropolitan Melbourne.

4.1 VEEC creation in disadvantaged and advantaged areas of Melbourne

Table 4.1 shows the rate of all VEET activities undertaken per 100 households in each of the IRSAD quintiles.

Table 4.1 Rate of VEET activities and VEECs by IRSAD quintile

Quintile	Number of dwellings	Rate of VEET activities per 100 dwellings (N=475,445)	Rate of VEECs per 100 dwellings (N=3,942,963)
Q1 Highly disadvantaged	117,459	57.07	422.59
Q2 Somewhat disadvantaged	54,600	49.00	364.28
Q3 Average	171,950	45.93	375.24
Q4 Somewhat advantaged	404,810	37.21	314.56
Q5 Highly advantaged	622,965	24.41	213.34
Total	1,371,784	34.65	287.43

In the period from 1 January 2009 to 1 July 2011, the overall rate of VEET activity and VEEC creation was highest in households in the most highly disadvantaged postcode areas in Melbourne. This suggests the program is likely to have been successful in achieving emissions reductions in low-income/disadvantaged households. However, when assessing the types of activities undertaken, a somewhat different picture emerges. This is discussed in the following sections.

4.2 Frequency of different types of VEET activities

To analyse the impact of various VEET activities, the mean number of VEECs created for each activity was derived. This provides an indicative, if imperfect estimate, of the VEECS allocated towards different VEET activities. These are listed in rank order in Table 4.2. The mean VEECs per activity provide an indication of those activities that generate higher carbon emissions reduction: the higher the number of VEECs, the larger the emissions reduction⁶. Also, the higher the mean VEECs, the higher the subsidy from the scheme to an individual household is likely to be.

The most common activities in the VESI were replacement of lighting with low-energy (or compact fluorescent) lighting (387,680 activities) and replacement of shower roses (71,987 activities). However, these are some of the lowest-return activities, generating 9.13 and 1.88 VEECs per activity respectively.

The data in Table 4.2 also clearly indicates that by far the greatest energy savings per home will be made in homes where electric space heating is replaced by a gas system (mean = 153.25 VEECs per activity). This is followed by replacement of electric water heating by a gas-boosted solar system (mean = 60.17). Households that undertake these activities are also expected to receive the largest financial subsidies, mainly reflecting the number of certificates created for each activity.

⁶ This provides an average per activity, based on the total number of activities. An alternative approach, would be to build a bottom up model of the VEETS per activity, or per installation)

Table 4.2 Mean VEECs per activity

Activity	Number of activities	Number of VEECs	Mean VEECs per activity
Water heating			
1A Decommissioning electric resistance water heater and installing gas/LPG storage water heater	710	26,645	37.53
1B Decommissioning electric resistance water heater and installing gas/LPG instantaneous water heater	456	16,534	36.26
1C Decommissioning electric resistance water heater and installing electric-boosted solar or heat pump water heater	1,248	48,265	38.67
1D Decommissioning electric resistance water heater and installing gas/LPG-boosted solar water heater	1,218	70,390	57.79
2 Installing solar retrofit kit on an electric resistance water heater	2	44	22.00
3 Decommissioning gas/LPG water heater and installing gas/LPG-boosted solar water heater	3,269	34,638	10.60
4 Installing solar pre-heater on a gas water heater	3	21	7.00
Space heating			
5 Decommissioning ducted gas heater and installing high-efficiency ducted gas heater	84	1,024	12.19
6 Decommissioning central electric resistance heater and installing high-efficiency ducted gas heater	8	1,226	153.25
9 Installing gas/LPG space heater	71	611	8.61
Insulation and weather sealing			
11 Installing ceiling insulation	688	34,291	49.84
12 Installing under-floor insulation	1	17	17.00
15 Weather sealing (external doors and windows, exhaust fans, ventilation, chimneys and flues)	133	173	1.30
Lights, showerheads, refrigerators			
16 Low-energy lamps	387,680	3,540,698	9.13
17 Decommissioning a non-low flow shower rose and installing a low-flow shower rose	71,987	135,188	1.88
18 Purchase of a high-efficiency fridge/freezer	1	1	1.00
19 Removing and destroying pre-1996 fridge/freezer	7,886	33,197	4.21

4.3 Proportion of VEECs created from different activity types

Table 4.3 shows the proportion of emission reductions, as measured by the number of VEECs created in metropolitan Melbourne, for the major energy-saving activity groups. The installation of energy efficient lighting accounts for 90 per cent of all emission reductions, followed by water heating (5 per cent) and shower roses (3 per cent).

Table 4.3 Proportion of total VEEC creation in metropolitan Melbourne by activity group

Activity	Number of VEECs	% of total VEECs created
Lighting	3,540,698	90
Water heating	196,537	5
Shower rose	135,188	3
Insulation and weather sealing	34,481	1
Removing and destroying pre-1996 fridge / freezer	33,198	1
Space heating	2,861	<1
Total	3,942,963	100

* Includes one instance of buying a new fridge or freezer

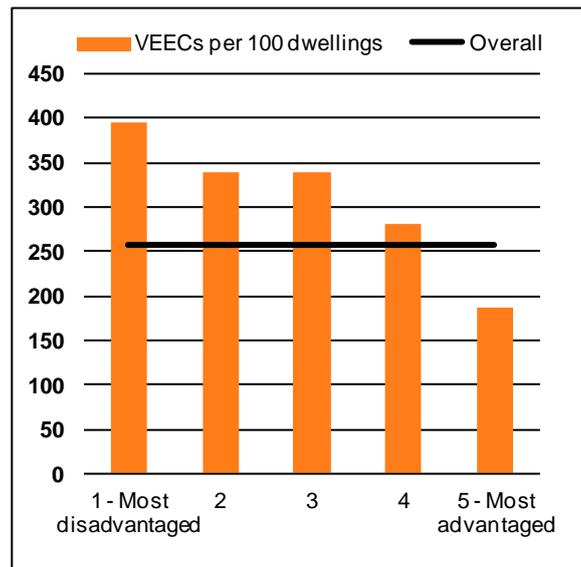
4.4 High-prevalence activities

Installing compact fluorescent light globes and low-flow showerheads are the most common activities under the VEET scheme and generate the highest and second highest totals of VEECs respectively. Results of further analysis are presented in the following sections.

Lighting

The 387,680 energy efficient lighting activities represent a total of 3,540,698 VEECs or 90 per cent of all VEEC creation in metropolitan Melbourne. Figure 4.1 shows the rate of VEEC creations per 100 dwellings, by IRSAD quintile.

Figure 4.1 VEECs per 100 dwellings by IRSAD quintile: lighting



For lighting, the overall rate of VEECs per 100 dwellings was 258 (indicated by the horizontal black line in Figure 4.1). However, the rate of VEEC creation was highest in the most disadvantaged quintile (395 per 100 dwellings) and decreased through the middle quintiles, to the lowest rate of 188 in the most advantaged areas. This suggests that people living in more disadvantaged areas, who are more likely to be on lower incomes, received the most lighting replacements.

Shower rose

The second most common upgrade was replacement of low-efficiency shower roses with more efficient units. A total of 71,987 upgrades were undertaken, creating 135,188 VEECs. The distribution of these upgrades between areas by IRSAD quintile is presented in Figure 4.2.

Figure 4.2 VEECs per 100 dwellings by IRSAD quintile: shower roses

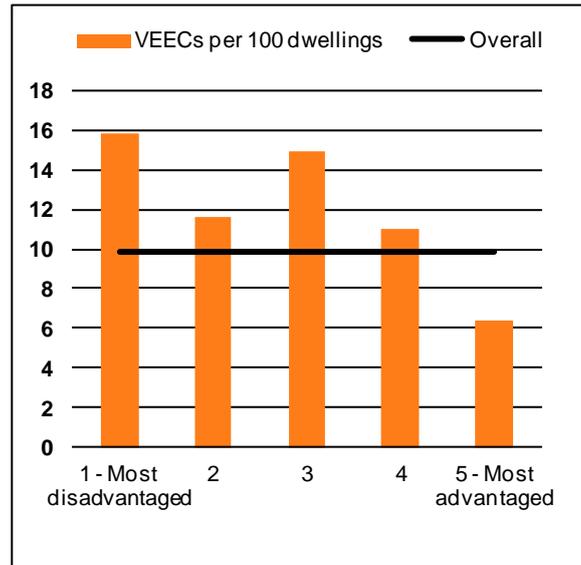


Figure 4.2 indicates a similar trend to that for lighting, with the highest rate of VEEC creation in the most disadvantaged areas (15.86 per 100 dwellings) and the lowest rate in the least disadvantaged areas (6.4). However, for shower rose upgrades, there is a dip for quintile 2.

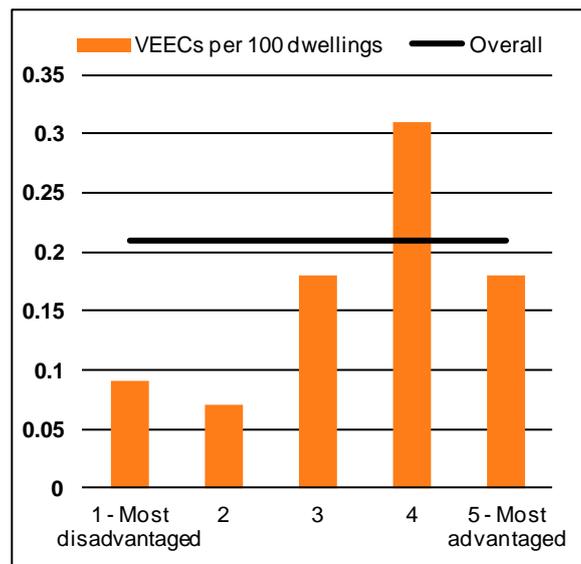
4.5 High-cost, high-impact activities

This section presents results of analysis of activities that have the highest energy-saving impact (as represented by VEEC creation) and are likely to generate the biggest savings on electricity bills.

Space heating

To understand the distribution of VEECs related to space heating, analysis was undertaken of VEEC creation through installation of, or replacement of electric systems with, high-efficiency ducted gas and flued gas space heating systems. The results are presented in Figure 4.3.

Figure 4.3 VEECs per 100 dwellings by IRSAD quintile: all space heating upgrades



Households in postcode areas in IRSAD quintile 4 received the highest rate of VEECs (0.31 per 100 households), more than three times the rates for quintile 2 (0.07) and quintile 1 (0.09).

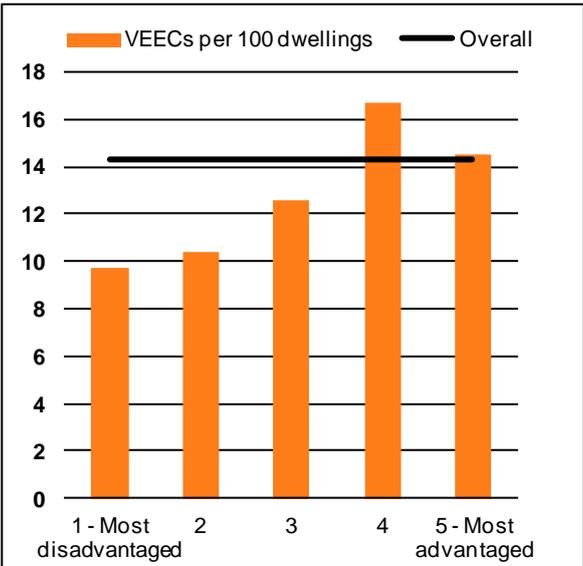
With respect to both gas replacement of electric heating and all heating efficiency upgrades, homes in advantaged areas have benefited from VESI much more than those in disadvantaged areas.

Water heating

Seven types of water heating upgrade are recognised in the VESI (see Table 4.2 above), including upgrades from electric systems to gas and solar. Mean VEECs for water heating upgrades range from 7 for solar pre-heat systems, to 57.79 for gas-boosted solar. The latter is the second-highest rate of VEECs per activity after replacement of electric space heating with a gas system.

All hot water upgrades were aggregated and analysed. The results are presented in Figure 4.4.

Figure 4.4 VEECs per 100 dwellings by IRSAD quintile: all hot water upgrades

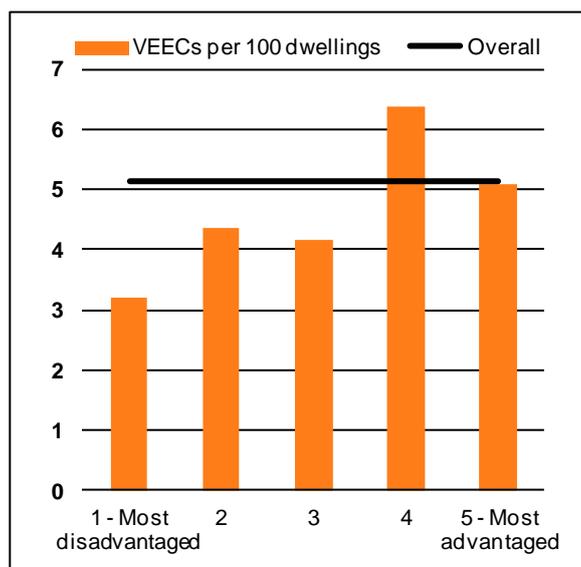


As Figure 4.4 shows, the greatest benefit from VEEC creation for hot water upgrades flowed to households in advantaged areas. The rate of VEEC creation from hot water upgrades is above the mean (14.33 per 100 households) in IRSAD quintile 4 (16.68) and quintile 5 (14.49) and below the mean in quintiles 3, 2 and 1 (12.59, 10.36 and 9.75 respectively).

The creation of VEECs from replacing electric hot water services with gas-boosted solar systems was also analysed separately, because this activity represents a high number of VEECs per installation. Figure 4.5 presents the rate of VEEC creation for decommissioning electric and installing gas/LPG-boosted solar in households in each IRSAD quintile.

There are a number of factors, which may be driving this difference, including the up-front capital needed for the co-contribution required for hot water system upgrades, the number of households renting (and therefore not the owner of the hot water service) and the incidence of electric hot water systems. See the discussion below.

Figure 4.5 VEECs per 100 dwellings by IRSAD quintile: gas-boosted solar hot water



The highest rate of VEECs (6.38) was created in households in quintile 4, the second most advantaged postcode areas. The most disadvantaged areas (quintile 1) received only 3.21 VEECs per 100 dwellings, half the rate of quintile 4 and considerably below their equal share of VEECs from this activity (mean = 5.15).

5. Discussion

A clear pattern emerged in the installation of energy efficiency upgrades in homes in metropolitan Melbourne through the Victorian Energy Saver Incentive scheme. Key results are discussed below.

5.1 Equity and overall benefits

Overall, more VEECs have been created in areas that are disadvantaged compared to those areas that are relatively advantaged. This has mostly been through light globe and shower rose upgrades. From a social equity perspective, this appears to be a positive outcome of the scheme.

While this analysis did not directly investigate *why* relatively more of these activities occurred in disadvantaged areas, it is worth considering factors that may have contributed to this outcome.

It is not surprising that the free provision of light globes and showerheads is likely to have increased the overall take-up of these measures. It is less clear, however, why these measures have been taken up significantly more by households in disadvantaged areas.

Low-income households may have had a lower initial incidence of energy-efficient light globes and showerheads. This is supported by the limited evidence that does exist, such as the Roy Morgan Research (2008) which suggests concession-card carrying households have slightly lower incidence of water-efficient showerheads and of compact fluorescent globes in bedrooms. The lower initial incidence of these measures in low-income households may reflect cost barriers, discounting of the future savings from energy efficiency, and information barriers. By calling households directly, offering information on the benefits of the measures and supplying the measures free of charge, providers may have effectively overcome the main barriers to energy efficiency in low-income households. However, the level of difference identified in the Roy Morgan research between concession-card holding and other households does not appear to be sufficient to fully explain the significantly higher take-up rates in more disadvantaged areas under the VESI scheme.

The marketing approaches employed by the energy service companies to recruit households to the scheme, such as providers going door-to-door replacing light-bulbs and providing shower-heads at no cost to the householder, may also be more successful in disadvantaged areas. Some companies may have also targeted these areas.

The VESI scheme may have been successful in addressing a nascent demand for energy efficiency measures. Householders in disadvantaged areas may have been open to energy efficiency measures, but restricted by cost, information and trust barriers.

A more problematic aspect of the marketing approach is the possibility that some low-income households, particularly those unfamiliar with their consumer rights (for example newly arrived or non-English speaking residents), may have felt obliged to participate in the program. Anecdotal reports from other energy programs indicate that some households feel obliged to accept offers where these are portrayed as a government service. Such issues are worthy of further consideration in relation to the VESI scheme.

A word of caution on the success of these high-prevalence activities is warranted. A close analysis suggests this result may actually *reduce* the opportunities for more substantial retrofitting activities within the same homes. The process is sometimes referred to as 'cream skimming'; when the more cost-effective energy efficiency measures are implemented and other, less cost-effective opportunities are left behind (ICLEI, 2008). Under the current VESI business models, the remaining energy efficiency opportunities may never be cost-effective. However, if they were offered as a whole package, with the more cost-effective opportunities subsidising the others, the household is likely to receive a better overall result. Two items for which this might apply are weather-sealing of gaps and cracks, and energy-saving advice. Further analysis is needed to understand if 'cream skimming' is reducing the medium to longer term outcomes for participating households.

5.2 Equity and high-impact benefits

Households in postcode areas in the middle and more advantaged areas of metropolitan Melbourne have received more VEECs for high-impact activities such as hot water and heating upgrades. These measures are likely to include a householder co-contribution and the items generate significantly higher savings per household than the low-cost measures like replacing showerheads and light globes. In most cases such measures also receive significantly higher subsidies per item.

This finding is problematic on equity grounds for two reasons. First, people in more disadvantaged areas are not getting their equal share of the high-impact energy efficiency upgrades occurring through the VESI. Second, people in more disadvantaged areas are more likely to have a low income and therefore to be spending a higher proportion of their income on energy than those with higher incomes (ABS, 2004). They would therefore benefit more from efficiency upgrades that affect a decrease in their energy costs.

Income or access to upfront capital may not be the primary or only factors driving the high take up in the more advantaged areas. Other factors, for example, a high incidence of electric hot water systems, related to a lack of reticulated natural gas, may make hot water upgrades in these areas more cost effective and appropriate.

Further analysis is however needed to fully understand the factors influencing the lower uptake in disadvantaged areas. In particular it will be important to consider the interaction between the availability of reticulated gas and the level of subsidies available (currently and historically) for different types of upgrades.

Qualitative inquiry may also reveal barriers to uptake in more disadvantaged areas.

6. Recommendations

The analysis leads us to the following recommendations which should be implemented to improve the overall effectiveness of the scheme and increase the uptake of higher cost measures in low-income households.

To address the up-front capital barrier to higher cost energy efficiency measures such as upgrading to a more efficient hot water service, the Victorian Government should:

1. Introduce additional financial incentives for low-income households to access higher value measures. This could be achieved by re-introducing and expanding Sustainability Victoria's rebates targeted at measures which present a substantial capital barrier, such as hot water and heating.

2. Investigate the viability of on-bill financing and low-interest loans as potentially affordable credit mechanisms to assist low-income households to access higher cost energy efficiency upgrades.

To foster equitable outcomes for the VESI scheme across different socioeconomic groups, the Victorian Government should:

3. Conduct and publish annual surveys of the distribution of VESI residential energy efficiency measures in relation to socioeconomic disadvantage. The analysis should include the distribution of specific measures (such as hot water services).
4. Develop data collection and release processes that improve opportunities to assess program impacts.
5. Investigate the effectiveness of specific targets for disadvantaged households participating in the scheme.

To maximise the overall effectiveness of the scheme, and the benefits for individual households, the Victorian Government should:

6. Introduce an additional financial incentive for providers who deliver multiple retrofit measures in one house.

In addition, the Victorian Government should:

7. Develop programs to involve landlords in the scheme. These might include information for landlords and programs to assist tenants gaining consent from landlords.
8. Promote greater links between the VESI scheme and other residential energy efficiency programs.

The results of this study also have implications for the proposed National Energy Savings Initiative (DCCEE & DRET, 2011). The Australian Government should incorporate these recommended improvements in their design for a national scheme.

7. Conclusion

This report presents evidence identifying the distribution of the benefits flowing from the VESI. This evidence reveals inconsistent results on equity grounds. Using VEET scheme data, matched to the IRSAD, we have demonstrated overall VEEC creation has benefited householders in areas of greater disadvantage. However, the highest-impact efficiency activities flowing from the scheme have gone more to households that are more advantaged.

Households on lower incomes spend a higher proportion of disposable income on energy than do those on higher incomes. If the benefits of VESI that are most likely to have the largest impacts on household energy costs flow to more advantaged households, this compounds pre-existing inequities. Furthermore, Compact Fluorescent Light (CFL) globe replacements, which accounted for the majority of lighting VEECs created in more disadvantaged areas in this research, are nearing saturation levels (DEWHA, 2008). Therefore, the equity gap identified in this paper is likely to widen if steps are not taken to address it.

References

ACIL Tasman (2011) *Energy market modelling: expansion of the ESI scheme*, Department of Primary Industries (DPI), Melbourne, viewed 4 October 2011, <http://www.dpi.vic.gov.au/__data/assets/pdf_file/0010/97462/ACIL-Tasman-report.pdf>.

Australian Bureau of Statistics (ABS) (2004) *Household expenditure survey, Australia: detailed expenditure items, 2003–04*, Cat. no. 6535.0.55.001, ABS, Canberra, viewed 16 August 2011, <<http://www.abs.gov.au/ausstats/abs@.nsf/mf/6535.0.55.001>>.

— (2008a) *Census of population and housing: socio-economic indexes for areas (SEIFA), Australia – data only, 2006*, Cat. no. 2033.0.55.001, ABS, Canberra, viewed 16 August 2011, <<http://www.abs.gov.au>>.

— (2008b) *2006 Census Community Profile: Springvale State Suburb*, Australian Bureau of Statistics, Canberra, viewed 29 October 2011, <<http://www.abs.gov.au>>.

— (2008c) *2006 Census Community Profile: Hampton Park State Suburb*, Australian Bureau of Statistics, Canberra, viewed 29 October 2011, <<http://www.abs.gov.au>>.

— (2008d) *2006 Census Community Profile: Roxburgh Park State Suburb*, Australian Bureau of Statistics, Canberra, viewed 29 October 2011, <<http://www.abs.gov.au>>.

— (2008e) *2006 Census Community Profile: Chadstone State Suburb*, Australian Bureau of Statistics, Canberra, viewed 29 October 2011, <<http://www.abs.gov.au>>.

— (2008f) *2006 Census Community Profile: Bulleen State Suburb*, Australian Bureau of Statistics, Canberra, viewed 29 October 2011, <<http://www.abs.gov.au>>.

— (2010a) *Household Water, Energy Use and Conservation Western Australia*, Australian Bureau of Statistics, Canberra.

— (2010b) *Household Water, Energy Use and Conservation Victoria*, Australian Bureau of Statistics, Canberra.

— (2010c) *Household Water, Energy Use and Conservation Queensland*, Australian Bureau of Statistics, Canberra.

— (2013a) *Household Energy Consumption Survey, Australia: Summary of Results, 2012*, Australian Bureau of Statistics, Canberra.

Culyer, A.J. (2001) Equity - some theory and its policy implications, *Journal of Medical Ethics*, vol. 27, pp. 275–83.

Department of Climate Change and Energy Efficiency (DCCEE) & Department of Resources, Energy and Tourism (DRET) (2011) *Issues paper: national energy savings initiative*, DCCEE & DRET, Canberra, viewed 31 January 2012, <<http://www.climatechange.gov.au/government/submissions/~media/publications/energy-savings-initiative/20111221-esi-issues-paper-pdf.pdf>>.

Department of Primary Industries (DPI) (2011a) *Regulatory impact statement Victorian Energy Efficiency Target regulations part 1*, DPI, Melbourne, viewed 16 August 2011, <http://www.dpi.vic.gov.au/__data/assets/pdf_file/0005/97583/VEET-RIS-22032011_part1.pdf>.

— (2011b) *Regulatory impact statement Victorian Energy Efficiency Target regulations part 2*, DPI, Melbourne, viewed 16 August 2011, <http://www.dpi.vic.gov.au/__data/assets/pdf_file/0006/97584/VEET-RIS-22032011_part2.pdf>.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008) *Energy use in the Australian residential sector 1986–2020*, DEWHA, Canberra, viewed 16 August 2011, <<http://www.environment.gov.au/settlements/energyefficiency/buildings/publications/pubs/energyuse-part1.pdf>> and <<http://www.environment.gov.au/settlements/energyefficiency/buildings/publications/pubs/energyuse-part2.pdf>>.

Essential Services Commission (ESC) (2011a) *Certificates, Victorian Energy Efficiency Target scheme*, ESC, Melbourne, viewed 4 October 2011, <[http://www.veet.vic.gov.au/Public/Public.aspx?id=Certificates\(VEECs\)](http://www.veet.vic.gov.au/Public/Public.aspx?id=Certificates(VEECs))>.

— (2011b) *Participants, Victorian Energy Efficiency Target scheme*, ESC, Melbourne, viewed 6 September 2011, <<http://www.veet.vic.gov.au/Public/Public.aspx?id=Participants>>.

— (2011c) *Summary of VEET activities by postcode*, ESC, Melbourne.

— (2011d) *Victorian Energy Efficiency Target (VEET) scheme*, ESC, Melbourne, viewed 16 August 2011, <<http://www.esc.vic.gov.au/public/VEET/>>.

Grimes, A., Denne, T., Howden-Chapman, P., Arnold, R., Telfar-Barnard, L., Preval N. and Young, C. (2012) *Cost Benefit Analysis of the Warm Up New Zealand: Heat Smart Programme*, Report to the Ministry of Economic Development, MED, Wellington.

ICLEI Local Governments for Sustainability (formerly International Council for Local Environmental Initiatives) (2008) *Profiting from energy efficiency*, ICLEI, Bonn, Germany, viewed 19 January 2012, <<http://www.iclei.org/index.php?id=1675>>.

One Million Homes (OMH) (2013) *One Million Homes Roundtable Summary report: May 2013*, Melbourne.

Origin Energy (2011) *Solar hot water order*, Origin Energy, viewed 2 November 2011, <https://www.originenergy.com.au/solar-hot-water/?_qf_p2_display=true>.

Petchey, R. (2010) *End use energy intensity in the Australian economy*, ABARE - BRS research report 10.08, Canberra.

Roy Morgan Research (2008) *Victorian utility consumption household survey*, Department of Human Services, Melbourne, viewed 16 August 2011, <http://dhs.vic.gov.au/__data/assets/pdf_file/0008/307358/VUCHS-2007-Final-Report.pdf>.