



# **NSW Energy Efficiency Programs**

## **2012 Evaluation Report**

**Final Report to**

**Office of Environment and Heritage,**

**NSW Department of Premier and Cabinet**

August 2012

Includes OEH responses at June 2013

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Prepared by ARTD Consultants for the Office of Environment and Heritage.

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ISBN 978 1 74359 386 8

OEH 2014/0052

February 2014

## Acknowledgments

This work was completed with the assistance of the Data and Evaluation Team in the Office of Environment and Heritage, Department of Premier and Cabinet.

We would also like to thank the OEH managers and staff for their time and insights and trust that their views are adequately represented in this report.

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### **OEH Comment Boxes**

The Office of Environment and Heritage (OEH) has provided comment boxes at the end of each section in this report.

These comment boxes:

- provide details on the status of OEH energy efficiency programs since the completion of the report up to June 2012; and
- comment on the evaluation findings.

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## Acronyms and glossary

ACP	Accredited Certificate Provider under the ESS that create tradeable energy savings certificates (ESCs)
CALD	Culturally and Linguistically Diverse
DEAS	DECCW Energy Assessment System
DEC	NSW Department of Education and Communities
DECCW	NSW Department of Environment, Climate Change and Water (until 2011, then OEH)
DTRIS	Department of Trade and Investment, Regional Infrastructure and Services
EEAP	Energy Efficiency Action Plan, the NSW Government approach to energy efficiency proposed from 2012
EECAP	Energy Efficiency Community Awareness Program, NSW government program
EES	Energy Efficiency Strategy, the NSW Government's approach to energy efficiency 2008-2012
EESBP	Energy Efficiency for Small Business Program, NSW government program targeting small businesses
ESC	Energy Savings Certificate, a tradable certificate created through the ESS from the measurement of energy savings
ESP	Energy Savings Program, NSW government program targeting medium to large businesses
EETP	Energy Efficiency Training Program, NSW government program
EEGSP	Energy efficiency component of NSW Government Sustainability Policy
ESS	Energy Savings Scheme, NSW government white certificate scheme
FY	Financial Year
HPSP	Home Power Savings Program, NSW government program targeting low income households
HVAC	Heating, Ventilation and Air-conditioning
IAB	Internal Audit Bureau, NSW government trading enterprise that provides audit services
IPART	Independent Pricing and Regulatory Tribunal
IRA	Institute for Rural Affairs
ISF	Institute for Sustainable Futures
KPI	Key Performance Indicator
M&V	Measuring and Verification the process of using measurement to reliably determine actual energy savings by comparing measured use before and after implementation of a project
NGO	Non-government organisation
NABERS	National Australian Built Environment Rating System
OEH	Office of Environment and Heritage, NSW Department of Premier and Cabinet
PD4VET	Professional Development for Vocational Education and Training practitioners
RTO	Registered Training Organisation
VET	Vocational Education and Training

## Executive summary

This report is the 2012 evaluation of seven programs managed by the Office of Environment and Heritage (OEH) that were part of the former NSW Energy Efficiency Strategy (ESS). It assesses the programs at an interim point to June 2012 and is based on evaluation findings available by June 2012.

### Scope of the programs

The NSW Government has an ongoing commitment to improving energy efficiency across the household, business and government sectors. These seven programs commenced in 2009 and represent an investment in energy efficiency by OEH of \$161.4 million. There are other NSW Government and OEH energy efficiency programs which are not part of this evaluation.

Three of these programs are direct energy saving programs (HPSP, ESP, and EESBP) targeting specific sectors (low income households; small businesses; medium and large businesses) and account for 61 per cent of the OEH expenditure (HPSP accounts for 39 per cent). Two are broader capacity building programs that address community awareness (EECAP) and the workforce for energy efficiency (EETP). EEGSP is a policy mix targeting the government sector through five programs.

The uncertainty around energy savings from energy efficiency programs, highlighted by the 2007 Owen Inquiry into Electricity Supply in NSW, was an important driver for evaluation, and led the establishment of the Data and Evaluation Program (DEP).

The design of the EES was influenced by the approach in California, considered the world leader in energy efficiency policy, which has a mix of programs targeting multiple market sectors; programs for education, training and state-wide marketing; and a substantial evaluation program.

### The 2012 evaluation

This evaluation assesses the programs at an interim point to June 2012. It examines

- how effectively programs are being delivered and reaching their target groups
- the outcomes produced by the programs to date including reduced energy use and increased capacity for managing energy use across the sectors

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#### The programs

- Home Power savings Program (HPSP)
  - Energy Efficiency for Small Business Program (EESBP)
  - Energy Saver Program (ESP)
  - energy efficiency component of NSW Government Sustainability Policy (EEGSP)
  - Energy Efficiency Community Awareness Program (EECAP)
  - Energy Efficiency Training Program (EETP)
  - Data and Evaluation Program (DEP)
-

- improvements in the reliability of energy savings estimates

The evaluation is based on a synthesis of evaluations and reports on the programs. Quantitative data on reach, uptake and energy savings was collected by the programs and analysed by the OEH Strategy and Analysis team. Each program undertook a range of evaluation and reporting. Methods to verify energy savings were developed and implemented through the Data and Evaluation Program.

We are confident that the findings of this evaluation represent the overall patterns of delivery and outcomes to date. The findings from different sources were consistent, and more reliable data on energy savings was available (see below). Some caution is needed as some of the evaluations and the measurement projects are works in progress at this stage and some uncertainties remain.

## Overall finding

These energy efficiency programs are largely being delivered effectively. This has required many adaptations within programs which have led to increasingly strategic and effective approaches. All the evidence indicates that the programs are generally well received by participants.

OEH now has more reliable measures of energy savings, with the application of new methods substantially improving estimates over the period.

Energy savings are being achieved and these are expected to increase. All direct energy savings programs have delivered substantial energy savings, though there is still variation in the reliability of estimates. These energy savings are cost-effective, delivered at a lower cost than the cost of providing the same amount of electricity.

## **OEH Comment**

The Council of Australian Governments (COAG) called on jurisdictions to review the complementarity of climate mitigation programs, including NSW energy efficiency programs, with the Commonwealth's Clean Energy Future package.

In December 2012, the Premier announced decisions to cease, reform and retain NSW energy efficiency programs as a result of this complementarity review.

The NSW Professional Services Action Plan and draft NSW Renewable Energy Action Plan committed the Minister for the Environment to bring forward an Energy Efficiency Action Plan with an improved suite of energy efficiency programs.

Both the findings of this independent evaluation and government decisions on the complementarity review informed the NSW Energy Efficiency Action Plan.

## **Energy savings are being achieved**

### **Expectations at the interim stage**

Most of the programs started in their current form in 2009 and are funded until 2013 or 2014. They are being delivered in a context of change and uncertainty around electricity costs, energy efficiency and climate change within governments and the wider community. Most of the programs are new for NSW—HPSP and EESBP are the first time low income households and small businesses have been directly targeted in this way. In these circumstances evidence of initial outcomes and effective implementation is critical.

### **OEH has more reliable measures of energy savings**

The estimates of energy savings have substantially improved over the period, progressing from projected deemed savings to verified estimates based on measures of actual energy use. A significant achievement has been the development of methods to estimate actual energy savings in line with international best practice. OEH reached agreements with energy distributors to access large-scale billing data for households (HPSP) and small businesses (EESBP)—the first time such comprehensive data has been available to a government agency in Australia—which formed the basis for independent studies using rigorous statistical analysis. For medium to large sites (ESP, EEGSP) OEH developed a guide for measurement and verification (M&V) based on the international protocol and has commissioned a range of independent studies.

At this stage the evidence for HPSP and EESBP is based on actual measures of energy use, and for ESP on engineering estimates, with M&V projects to be underway later this year. While the scope for measurement has varied between the programs (depending on the numbers and characteristics of participants as well as on technologies installed), this work has and will continue to provide increasingly reliable measures. With more robust

evidence and reduced uncertainty around energy savings, OEH has an increasingly sound basis for assessing effectiveness and cost-effectiveness, for refining delivery and for planning future energy efficiency programs.

### **Energy savings are being achieved and expected to increase**

All direct energy savings programs have delivered substantial energy savings, though as described above the reliability of estimates varies. Total annual energy savings are 118,834 MWh of electricity and 187,716 GJ of gas, leading to an estimated reduction in participants' energy bills of \$28,496,340 to end of June 2012 (this includes the Government Building Retrofit Program for small sites). The estimated energy savings would result in 136,697 tonnes of avoided CO<sub>2</sub> emissions. Each of the programs has been a significant source of energy savings, with ESP contributing 38% of electricity savings, EESBP 32% and HPSP 27%.

For the ESP the savings at this interim stage are expected to accelerate over the next few years. It is clear that the program has a model that can achieve substantial energy savings and cut energy bills at medium to large sites. The extent of savings is likely to be clearer as more businesses implement audit recommendations over time, and the program measures and reports on this, with increasingly reliable data from M&V.

For EESBP the high level of reach provides a strong foundation for savings (17,185 small businesses registered to end of June 2012 compared to the initial target of 6,000). The key challenge has been lifting the rate of conversion from registration to the implementation of recommendations, and major refinements to the program design are being successful in addressing this, with evidence of an increasing conversion rate and most actions are attributable to the program.

HPSP has been a unique program for OEH in several ways. It is a very large-scale in terms of budget and number of participants, and began with relatively untested assumptions. It is complicated by having social as well as energy efficiency objectives, which focus on low income households, specific target groups (CALD and Aboriginal households), and geographic equity of access. Initial results for HPSP have been promising. With extensive reach across its target group of low income households (115,508 completed assessments to June 2012), it has a firm basis to deliver savings. Energy savings were estimated with a high level of reliability by the billing data analysis conducted with DEP in May 2012. It found average savings of 0.22 megawatt-hours of electricity per annum (or 4 per cent reduction) for each participating household, but differed with the kit items received (households receiving the showerhead achieve on average 6 per cent savings). The energy savings are encouraging given the limited possible impact of the small kit items. Further, the electricity saving from the largest item installed by HPSP (efficient showerheads) matched the measured savings from Sydney Water's efficient showerhead retrofit projects. In addition the program has achieved these savings while effectively addressing its social objective of targeting low-income households.

While the energy savings presented in this report are primarily limited to the direct energy saving programs and measured by OEH, there are likely to be more diffuse impacts. For example there is evidence that the direct programs lead to wider energy savings within their sectors through multiplier effects as individuals and businesses promote energy efficiency more broadly. The capacity building programs (EETP and EECAP) are also expected to have positive but more diffuse impacts on energy savings now and into the future.

The ESP has had an important positive impact for NSW by positioning participating organisations to attract funding for their energy efficiency activities. For example in June 2012 four ESP participants won grants in the first round of the Commonwealth Clean Technology Investment Program (CTIP), receiving 86% of the national allocation, and a further 20 ESP sites are applying. A key success factor was the comprehensive ESP audit.

### **OEH Comment**

The complementarity review informed government decisions to merge the EESBP into ESP to improve administrative efficiency and to retain HPSP as it met all of the complementarity principles.

NSW 2021 includes a target to support 220,000 low income households to reduce energy use by “up to 20%” by 2014. The Energy Efficiency Action Plan seeks to increase the energy savings of participating households.

### **Energy savings are being produced at a lower cost than the cost of providing the same amount of electricity**

On the current evidence all the direct energy savings program are proving to be cost-effective over their lifetime when the cost per megawatt-hour is compared with the benchmark retail cost of providing electricity to each customer group.

OEH calculated cost-effectiveness using the method in the 2009 IPART review of NSW Climate Change Measures. Based on the savings estimates described above for each program to end of June 2012, cost-effectiveness is expressed as the levelised cost per megawatt-hour that reflects the present value of costs over the lifetime of projects, taking into account the varying persistence factors of the retrofits, equipment installed and behaviour changes. On this basis the levelised cost of one megawatt-hour saved is \$138 for HPSP, \$66 for EESBP, \$34 for ESP and \$179 for GBRP.

Comparison of cost-effectiveness between these programs gives limited insight because they have different objectives and in particular target different sectors and customer groups. It is more relevant to compare the cost of a megawatt-hour saved for each program to its relevant benchmark cost, in this case the retail cost in resources of providing electricity for the same type of customers. This benchmark cost varies from \$184 for Government contracts to \$281 for households. On this basis all the direct energy savings program are cost-effective over their lifetime.

## **Community awareness is increasing**

The Save Power mass media campaign television advertising in its final phase reached almost two-thirds of NSW adults (63 per cent), with most (77 per cent) finding it convincing and a third feeling motivated to the actions in the messages. Approval of the campaign has been positive and research suggests that it is contributing to improved knowledge of energy efficiency and has positively influenced energy use behaviours. The wide reach of the campaign offers great potential for energy savings from behaviour change at this scale.

## **Implementation has been effective**

### **Adaptive and increasingly effective implementation**

A key achievement to this point is that the programs are largely being delivered as intended, are reasonably in line with delivery targets, and have developed increasingly strategic and effective approaches. For the direct energy savings programs in particular this has required many adaptations to their initial settings and delivery processes, summarised in this report.

### **High participant satisfaction and positive stakeholder engagement**

All the evidence indicates that the programs were generally well received by participants. High levels of participant satisfaction have been recorded for the direct energy saving programs. The programs have also been effective in engaging external stakeholders including participants as ‘multipliers’ to promote the program. Assessors have been a key asset not just in delivering assessments but in contributing to promotion and further recruitment of participants.

### **Regional focus achieved**

The programs have had a significant regional focus in line with the Government’s commitment to support regional communities. HPSP is addressing an explicit target for geographic equity of access, and the other two direct energy savings programs have over 50% of participating businesses from outside Sydney.

### **Working with the government sector had mixed results**

Effectiveness of implementation of the five programs under the NSW Government Sustainability Policy varied significantly: some had some good results like the Government Retrofit Building Program, while some others had little impact. Common barriers to engage effectively with agencies included their lack of technical knowledge, and time and resources to apply for the support offered.

### **Community awareness and workforce capacity for energy efficiency is being developed**

Two programs addressed the enablers and barriers for greater energy efficiency, and have both been largely implemented as intended. The EETP targets key industry sectors

and occupations which are able to implement energy efficiency opportunities, the education and training workforce, and policy makers and program managers. It has developed clear formal partnership arrangements with the Department of Education and Communities (DEC) that now provides a sound platform for shared program delivery. A major achievement has been engaging 5,290 participants in energy efficiency training, networking or professional development between July 2009 and April 2012.

The EECAP successfully implemented a comprehensive, multi-strategy and ongoing social marketing campaign over three years. The Save Power mass media campaign was delivered in five phases of advertising activity over two winters and two summers, supported by two phases of qualitative research and seven rounds of tracking research.

The EECAP effectively delivered a range of other educational programs to reach different segments of the NSW community. Bi-lingual educators were trained and delivered 57 energy workshops delivered to CALD participants. The CSIRO's Energymark project was trialled with 112 groups to April 2012. Save Power library kits were borrowed by 6,400 households in twelve months with evidence of positive impact on their knowledge and behaviour. Major electrical appliance retailers were successfully engaged with training delivered to staff in 142 stores to assist customers to consider energy efficiency in their purchase decisions. The experience of these programs, the tracking research and the evaluations are providing OEH with a substantial evidence base to inform future social marketing for energy efficiency.

### **OEH Comment**

The complementarity review informed government decisions to cease the vocational training elements of EETP as they duplicate funding from the Commonwealth. The non-duplicative aspects of EETP are to be merged into the ESP.

The EECAP ended in 2012 as planned.

### **Cross-impacts of programs have been limited**

There have been only limited cross-program impacts at this stage. The delivery of the direct energy savings programs and the EEGSP were relatively separate and focussed on their specific target groups. Linkages between these programs and the NSW Energy Savings Scheme (ESS) have been limited.

The two capacity building programs have scope to support the other programs to some degree through increasing awareness across the state, and building the energy efficiency workforce. The Save Power campaign and the EES website delivered provided common branding for the programs and influenced attitudes in the community. EETP is planning for more emphasis on customising existing courses and resources and complementing implementation of ESP projects. In practice cross-pollenisation has been limited by the different timeframes. Long-term impacts of EETP on the energy efficiency workforce will be more discernible in the future.

Most OEH managers involved with these energy efficiency programs wanted a more systematic and structured process for overall governance and information sharing, while recognising the need to avoid process burdens and to maintain program flexibility.

# 1. The programs and the evaluation

## 1.1 The programs in scope

The NSW Government has committed to improving energy efficiency across the household, business and government sectors. In June 2008 it launched a suite of eight programs known as the NSW Energy Efficiency Strategy. Not all NSW Government or OEH energy efficiency programs were included in the EES. This evaluation covers the programs under the EES to June 2012 but does not include the NSW Energy Savings Scheme (ESS) which is not managed by OEH and has not been fully evaluated to date.

The programs represent an investment in energy efficiency by OEH of \$161.4 million, with the Home Power Saving Program (HPSP) accounting for 39 per cent. Most of the programs started in their current form in 2009 and are currently funded until 2013 or 2014 (Table 1-1).

**Table 1-1. The programs by approach, sector, completion and allocated OEH expenditure**

Program	Sector/ initial target	Funded until	\$ million	%
Home Power Saving Program (HPSP)	Households - 220,000 low income households	June 2014	\$63	39%
Energy Efficiency for Small Business Program (EESBP)	Small businesses - 6,000	December 2012	\$15	9%
Energy Saver Program (ESP)	Medium and large sites - 800	June 2014	\$20	12%
Energy efficiency component of NSW Government Sustainability Policy (EEGSP)	NSW Government agencies	December 2012	\$26.4	16%
Energy Efficiency Community Awareness Program (EECAP)	NSW community - domestic and workplace	June 2012	\$15	9%
Energy Efficiency Training Program (EETP)	Education and training organisations	June 2013	\$20	12%
Data and Evaluation Program	Energy efficiency programs	June 2013	\$2	1%
<b>Total</b>			<b>\$161.4</b>	<b>100%</b>

The rationale for the strategy included a focus on intensive and highly visible programs that would kick-start energy efficiency actions in NSW, and would complement the anticipated national emissions trading scheme. An initial influence was the approach in California, considered the world's leader in energy efficiency policies and programs, although at a much larger scale and with a very different history, regulatory setting and market context from NSW. Like NSW, California has a mix of programs targeting

multiple market sectors (residential, commercial, industrial and agricultural), monetary incentives and other programs such as education and training, state-wide marketing and a substantial evaluation program.<sup>1</sup>

## 1.2 Direct energy saving programs are the major component

For this evaluation it is useful to group the programs based on their main strategies for change and their governance arrangements (Table 1-2):

- Three direct energy saving programs target different sectors, all managed by OEH, aim to delivery energy and cost savings for program participants. Together they are the most significant component of the programs and account for 61 per cent of OEH expenditure.
- Two programs address the underlying capacity for change towards greater energy efficiency. One is managed by OEH, the other is a formal partnership between OEH and NSW Department of Education and Communities (DEC).
- The energy efficiency component of NSW Government Sustainability Policy involves multiple agencies and has distributed governance arrangements where OEH has policy responsibility but no direct management role.
- The OEH Data and Evaluation Program which aims to improve capacity for measuring energy efficiency across the programs and to provide evaluation.

**Table 1-2. Programs grouped by approaches and governance**

Direct energy saving programs managed by OEH	
<p>Three OEH programs aim to achieve outcomes at two levels (1) participants with increased capacity (assessments, retrofit rebates, energy efficient items), skills and awareness for managing their energy leading to (2) energy savings and the associated savings in participants' energy bills. They use an assessment of energy use where assessors provide participants with advice and tools to improve their energy efficiency using an 'assess-plan-act' model.</p>	<p>The programs target energy users in different sectors and have distinctive strategies for engaging with participants and supporting household or organisational behaviour change.</p> <ul style="list-style-type: none"> <li>▪ Home Power Saving Program (HPSP) offers free assessment and a save power kit to low income households.</li> <li>▪ Small Business Energy Efficiency Program (EESBP) offers a subsidised energy assessment to small businesses and matched funding to support the implementation of recommendations. Up to 4 hours of support is also available assist the businesses with their upgrades.</li> <li>▪ Energy Saver Program (ESP) provides medium to large businesses with subsidised energy assessments, including business cases for investment in energy efficiency. Up to 20 hours of technical and project support is also available to assist with the installation of equipment.</li> </ul>

<sup>1</sup> See Californian Public Utilities Commission, Energy Division (2010) 2006-2008 Energy Efficiency Report.

### Capacity building programs

Two programs address underlying community and workforce capacity for addressing energy efficiency. One is managed by OEH (EECAP); the other is a formal partnership between OEH and DEC (EETP).

- Energy Efficiency Community Awareness Program (EECAP) uses mainstream and below-the-line communications campaigns under the “Save Power” banner.
- Energy Efficiency Training Program (EETP), multiple strategies to improve the capacity of the workforce for energy efficiency

### OEH supporting a program implemented by other government agencies

OEH coordinates the energy efficiency component of NSW Government Sustainability Policy, which covers several programs that are ultimately the responsibility of the individual agencies

Targets for the whole of government were set in the Policy. The energy efficiency component of NSW Government Sustainability Policy (EEGSP) covers five programs: the Schools Energy Efficiency Program, NABERS rating of office building, Green lease schedules, Treasury Loan Fund-Sustainable Government Investment Program and the Government Building Retrofit Program. OEH is providing support to participating agencies through facilitation, technical support and information resources.

### Data and evaluation

This OEH program is building capacity to measure and evaluate energy efficiency.

Data and Evaluation Program (DEP) has projects to improve capacity for measuring and verifying energy efficiency, for evaluating programs and for assessing overall benefits.

## 1.3 The policy context for energy efficiency in NSW

Energy efficiency is a major aspect of NSW Government 10-year strategic plan ‘NSW 2021’; it flows across several goals, especially those related to the cost of living and the natural environment. Rapidly increasing electricity prices are highlighting the value of energy efficiency for the public and the government.

In the wider policy context, energy efficiency is receiving more and more attention across Australian states and territories and at the national level, especially in the context of the Commonwealth Government’s carbon tax. As part of the Clean Energy Future plan, the Commonwealth Government has developed energy efficiency initiatives that may impact on NSW programs in this area.

The context for these programs over recent years has been change and uncertainty. They are mainly new programs with some approaches being implemented for the first time in NSW and even Australia. They have involved OEH in new strategies, increased scales of delivery and new stakeholder relationships. They are being delivered in a

policy and program context for energy efficiency and climate change characterised by uncertainty within state and Commonwealth governments.

## 1.4 Program logic

An Evaluation Framework was developed for the EES in 2010 and revised with the EES Evaluation Advisory Group. It is summarised in the program logic diagram in Figure 1-1. The evaluation framework and program logic helps to communicate the programs' objectives, formulate evaluation questions, assess the extent of implementation at different levels of implementation, and form the basis of evaluative arguments about the overall effectiveness of the programs.<sup>2</sup>

The program logic shows how the EES is based on the successful delivery of the programs to the targeted sectors (the vertical dimension), to achieve the intermediate outcomes of improved capacity to manage energy use in that sector. The direct energy savings programs are expected to deliver energy savings for their participants. Ultimately the programs are expected to contribute to the intended environmental, economic and social benefits to NSW. One of these outcomes is reliable information on energy savings and costs.

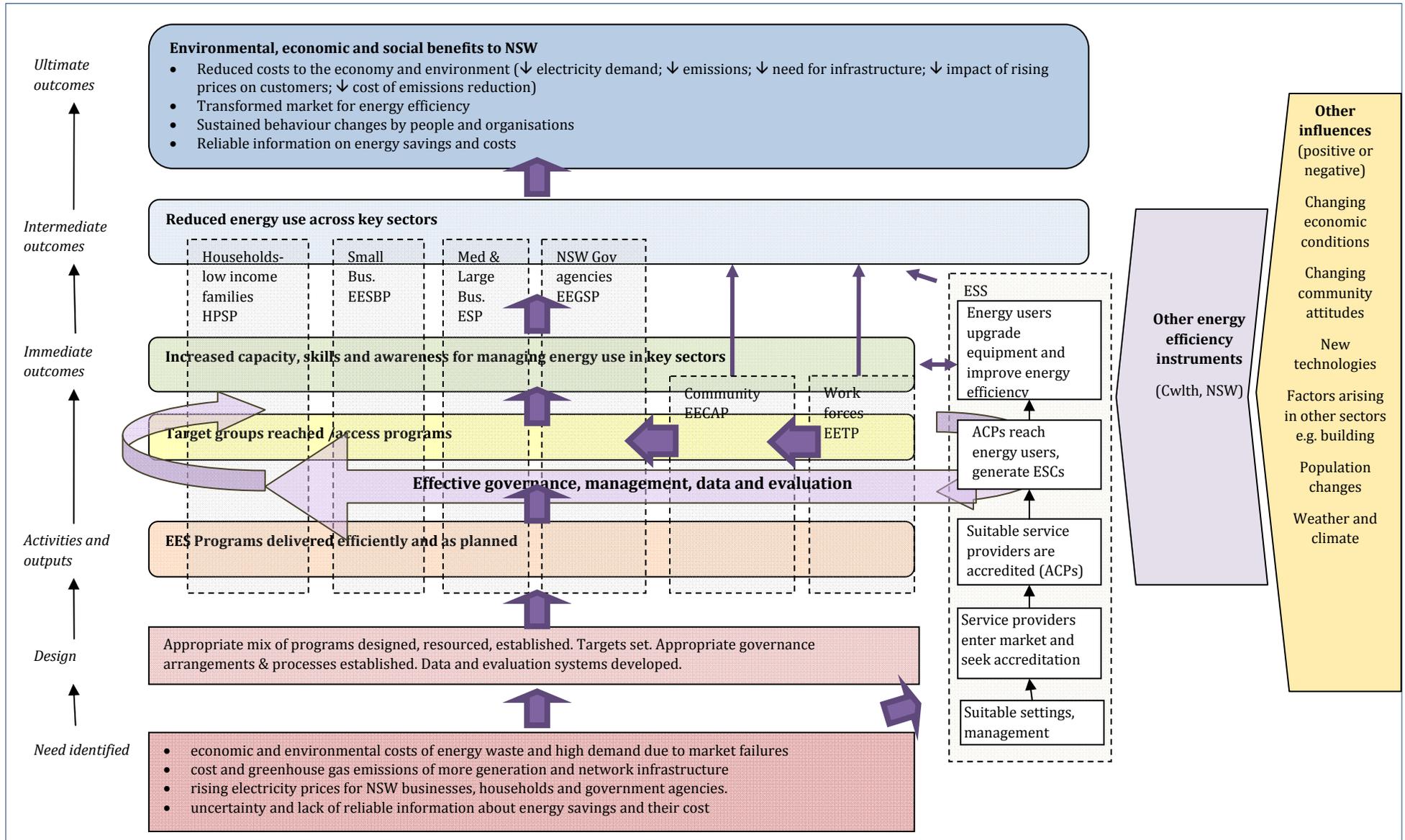
The program logic also shows the assumed horizontal influences: two programs (EECAP and EETP) are to build wider capacity within the community and the industry that will support the outcomes of the other programs, and the performance of the whole strategy is influenced by effective governance and management processes, and the Data and Evaluation Program (DEP).

The logic illustrates how the Energy Saving Scheme is outside of OEH and runs parallel with the other programs. It also highlights the role of other factors that may impact upon the potential achievements of the EES and influence the intended outcomes.

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<sup>2</sup> Identifying the program logic is important in the evaluation of energy efficiency programs because it represents the underlying theory of change, assumptions and intermediate outcomes— see Reed, J. H., Jordan, G., & Vine, E. (2007). Impact evaluation framework for technology deployment programs, US Department of Energy [http://www.cee1.org/eval/impact\\_framework\\_tech\\_deploy\\_2007\\_main.pdf](http://www.cee1.org/eval/impact_framework_tech_deploy_2007_main.pdf); Mirjam Harmelink, Lars Nilsson and Robert Harmsen (2008), *Theory-based policy evaluation of 20 energy efficiency instruments*, Energy Efficiency Volume 1, Number 2, Springer

Figure 1-1. Program logic of the initial Energy Efficiency Strategy



## 1.5 Evaluation of the energy efficiency programs

An important driver for evaluation of energy efficiency programs in NSW was the uncertainty around reported energy savings, highlighted by the 2007 Owen Inquiry into Electricity Supply in NSW.

*Enhanced energy efficiency could delay the need for new baseload capacity, but it would not be prudent to rely on this being the case, particularly in view of the lack of reliable information about the actual electricity savings to date from existing energy efficiency programs, and the uncertainties surrounding future electricity savings from existing and potential energy efficiency measures.*

This has led to a focus on better measurement of energy savings and evaluation, and the establishment of Data and Evaluation Program (DEP) in 2009 (see section 3.7).

OEH developed the evaluation framework based on the program logic (above) and an evaluation strategy where each program collects data on implementation and outcomes and conducts its own evaluation activities. This is complemented by data analysis by the Strategy and Analysis unit and the measurement and evaluation projects under the DEP.

The 2012 evaluation (this report) is a DEP project undertaken by ARTD Consultants in collaboration with OEH. The evaluation is part impact evaluation and part implementation evaluation<sup>3</sup>, and examines

- how effectively programs are being delivered and reaching their target groups
- the outcomes produced by the programs to date including reduced energy use and increased capacity for managing energy use across the sectors
- improvements in the reliability of energy savings estimates

This evaluation has been conducted as a synthesis of the available evaluation information structured around the program logic. The main sources were:

- evaluations and reports from the programs. Each program conducted evaluation and research activities, including comprehensive independent evaluations or evaluation activities like participant surveys, and/or internal evaluation reports (see Appendix 1).
- data from the Strategy and Analysis team collected for Climate Change Fund reporting

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<sup>3</sup> For a comprehensive overview of evaluation for energy efficiency in the US that is relevant to NSW, see Reed, J. H., Jordan, G., & Vine, E. op cit; and National Action Plan for Energy Efficiency (2007) Model Energy Efficiency Program Impact Evaluation Guide. Steven R. Schiller, Schiller Consulting, Inc. [www.epa.gov/eeactionplan](http://www.epa.gov/eeactionplan)

- reports from the DEP measurement and verification projects
- interviews with OEH managers by ARTD in May-June 2012 to collect feedback on the approach to governance, coordination and information sharing
- feedback from OEH stakeholders on earlier reports.

We are confident that the findings of this evaluation represent the overall patterns of delivery and outcomes to date. The data from different sources were consistent. At this interim stage, some gaps and uncertainties remain, particularly where evaluation reports focussed on initial phases of the program or were still in draft form. Similarly the estimations of energy savings are still being developed and applied.

## 2. Overall outcomes and achievements

Most of the programs started in their current form in 2009 and are currently funded until in 2013 or 2014. At this interim point this chapter examines the overall outcomes and achievements in mid-2012, drawing upon the findings from the evaluations of the individual programs summarised in chapter three.

### 2.1 Program outcomes

#### 2.1.1 Estimates of energy savings are increasingly reliable

Since the programs started OEH has substantially improved the reliability of estimates of energy savings achieved by programs directly supporting participants to reduce their energy use. In the early phase of each program, energy savings estimates were desktop calculations based on target uptake and planning assumptions. These initial estimates were informed by the available information in each area which varied between programs. For instance limited information was available about energy savings achieved through distribution of small energy efficiency items to households, whereas numerous studies had already tested assumptions to estimate the impact of retrofitting buildings and equipment.

OEH has progressively refined these calculations firstly based on actual uptake of programs and secondly based on refined engineering estimates as new evidence available about the target group or the types of changes recommended (retrofit, new equipment or behaviour change). In particular, they include the persistence of energy savings. For example with HPSP persistence is assumed to vary with the equipment installed (e.g. 10 years savings from showerheads, 5 years from other kit components) and with behaviour change (one year persistence).

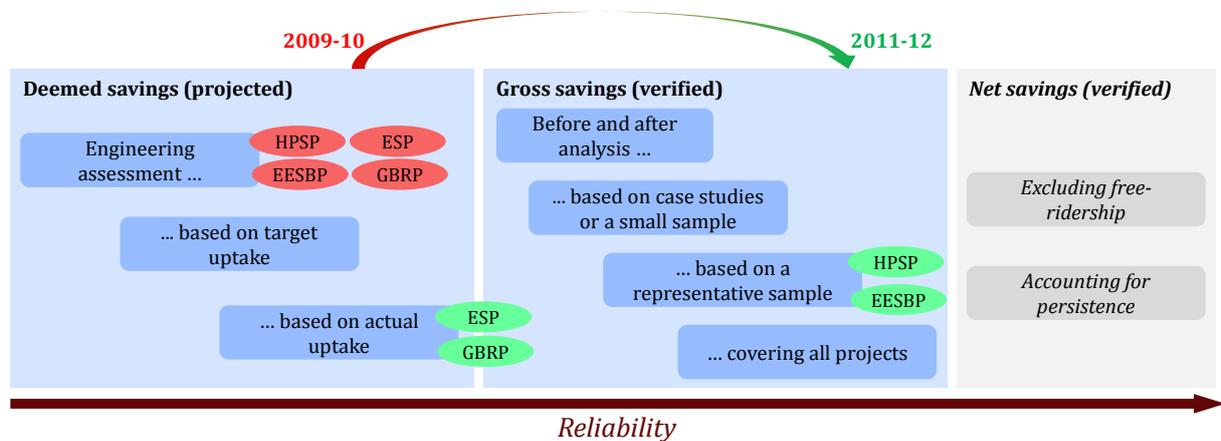
As represented in Figure 2-1 below the main achievement has been to move from projected to verified energy savings based on 'before-and-after' analysis in line with international best practice. The Data and Evaluation Program has provided all energy efficiency programs with various tools for rigorous estimation of energy savings: after 1.5 years of negotiations agreements were reached with energy distributors to access large-scale billing data for households (HPSP) and small businesses (EESBP); DEP developed a guide for measurement and verification (M&V) based on the international protocol<sup>4</sup> that has been used by EESBP, ESP, GBRP and the ESS; a range of independent

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<sup>4</sup> Measurement and verification is the process of using measurements to reliably determine actual savings created for an individual facility or project. IPMVP is the International Performance Measurement and Verification Protocol (<http://www.evo-world.org>).

studies have been commissioned to analyse measurement data collected. Section 3.7 provides detailed information on methods used to estimate gross savings for each program.

**Figure 2-1. Improved reliability of energy savings estimates**



Source: OEH and ARTD based on US National Action Plan for Energy Efficiency (2007)

At this stage estimates of energy savings are based on actual measures of energy use from representative samples for HPSP and EESBP; reporting for GBRP and ESP still relies on deemed savings based on actual uptake, with M&V projects on-going or planned for 2013. The differences in methods and timeframe for measurement mainly depend on the participants' characteristics and the project timeframe. In particular ESP and GBRP projects are of much bigger size and have longer timeframes which leads to delays in 'before-and-after' analysis. As a result monitoring the implementation of these projects over time is a key challenge.

The next step in this continuum towards more reliable energy savings estimates is to assess net savings, or the portion of energy savings that is attributable to the program. Estimating net savings involves excluding free-riders and rebound effects. Some of the methods used in this evaluation already assess net savings. All 'before and after' analysis of energy use (e.g. for EESB) includes any rebound effect after the energy efficiency action. Further, the verification of energy savings from HPSP included use of a non-participant control group. This showed gross reductions in energy use for program participants of 10%, with 4% net energy savings after removing community wide effects evident in the control group.

The work initiated by DEP has reduced uncertainty around energy savings from these programs and established a sound basis to assess the effectiveness and cost-effectiveness of the programs. This can inform improvements to program delivery and design of future programs. DEP results have been incorporated in estimates of projected savings over the lifetime of projects that are informing the design of the Energy Efficiency Action Plan.

### 2.1.2 Energy savings are being achieved and expected to increase

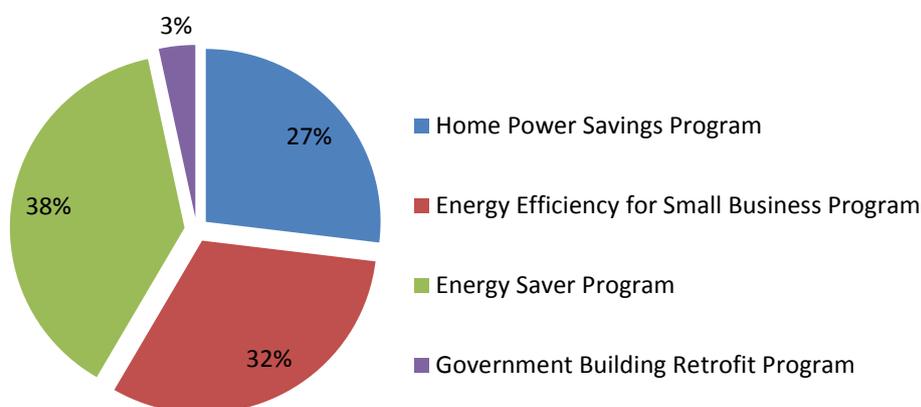
The direct programs aim to achieve energy savings and the associated savings in participants' energy bills through providing them with increased capacity (energy assessments, retrofit rebates, energy efficient items) skills and awareness for managing their energy use.

On the best available estimates, all the direct energy savings programs have either demonstrated or indicated substantial energy savings to date. Across all four programs (including the Government Building Retrofit Program for small sites, a direct energy savings component of the NSW Government Sustainability Policy), total estimated annual energy savings are 118,434 MWh of electricity and 187,716 GJ of gas, leading to a reduction in participants' energy bills of \$28,496,340 per year. The estimated energy savings would also result in 136,697 tonnes of avoided CO<sub>2</sub> emissions (Table 2-1).

The programs will produce benefits over the lifecycles of the installed technologies while they remain in place and operable. These savings will vary with the technologies and with underlying technical, market and economic changes in each sector.

Each of these programs has contributed to the energy savings, with at this stage most savings coming from the medium to large business sector through the ESP.

**Figure 2-2. Allocation of overall electricity savings achieved to end of June 2012 across programs**



**Table 2-1. Energy efficiency programs – estimated annual savings from activities implemented to June 2012**

Funding to date \$	Reach	Electricity saved (MWh) pa	Gas saved (Gj) pa	CO2 tonnes saved	Participants \$ savings electricity bills pa	Participants \$ savings gas bills pa	Total Participants \$ savings pa
<b>Home Power Saving Program</b>							
\$23,924,019	115,508 completed assessments	31,595		32,346	\$8,372,675		\$8,372,675
<b>Energy Efficiency for Small Business Program (EESBP)</b>							
\$17,958,385	17,185 businesses registered	37,396		39,640	\$9,124,627		\$9,124,627
<b>Energy Saver Program</b>							
\$11,095,056	366 audits	45,432	186,155	60,357	\$7,996,068	\$2,345,552	\$10,341,620
<b>Energy efficiency component of NSW Government Sustainability Policy (Government Building Retrofit Program)</b>							
\$5,249,631	105 sites, 567 projects	4,011	1,561	4,354	\$637,749	\$19,669	\$657,418
Total		118,434	187,716	138,273	\$26,131,119	\$236,5221	\$28,496,340

Source: Strategy and Analysis, OEH based on program data

Notes:

Methods for calculating savings are based on the most recent data from evaluation reports and the DEP measurement and verification projects, using conservative estimates. Details are in notes to the individual program tables in section 3.

The bill savings use the tariffs developed for the 2010-11 Climate Change Fund annual report.

For the ESP the 31,595 MWh of estimated energy savings at this stage are expected to accelerate over the next few years. It is clear that the program has a model that can achieve substantial energy savings and cut energy bills at participants' sites. Case studies have demonstrated energy savings of up to 70 per cent for industrial refrigeration at various sites, and similar results for lighting retrofits. The extent of savings is likely to be clearer as more businesses implement audit recommendations over time, and the program measures and reports on this. The increased use of M&V should provide firm evidence of energy and cost savings and allow ESP to more accurately extrapolate findings across participating businesses and sub-sectors.

EESBP has achieved a high level of reach (17,185 small businesses registered to June 2012 compared to the initial target of 6,000) and generated an estimated 37,400 MWh of annual electricity savings leading to a savings in participants electricity bills of over \$9.1 million. The key challenge has been lifting the rate of conversion from registration to rebates for retrofits. Major refinements to the program design have increased the conversion rate to over 50 per cent to the end of June 2012, with evidence that most actions are attributable to the program. The scale of energy savings was demonstrated through findings from measurement and verification analysis conducted by DEP over 331 projects (accounting for around 17% of all the rebates at that time). On average each business saved 5.64MWh or 9.3 per cent relative to its baseline for the first year.

Initial results for HPSP have been promising. It has achieved extensive reach across its target group of low income households (115,508 completed assessments to June 2012), and has delivered 31,595 MWh of annual electricity savings leading to a savings in participants' electricity bills of almost \$8.4 million. These energy savings were measured with a high level of reliability through the billing data analysis conducted in May 2012 where average savings of 0.22 megawatt-hour of electricity per annum (or 4 per cent reduction) for each participating household were found. Savings differed according to the kit items received (households receiving the showerhead achieve on average 6 per cent savings). The energy savings are encouraging given the limited possible impact of the small kit items. Further, the electricity saving from the largest item installed by HPSP (efficient showerheads) matched the measured savings from Sydney Water's efficient showerhead retrofit projects. In addition the program has achieved these savings while effectively addressing its social objective of targeting low-income households, equity of access across the state, and working with specific target groups in CALD and Aboriginal households.

### **2.1.3 Other benefits are emerging**

The energy savings presented in this report are primarily limited to the direct energy saving programs. However there are likely to be more diffuse impacts. For example there is evidence that these programs lead to wider energy savings within their sectors through multiplier effects as individuals and businesses promote energy efficiency more broadly.

Furthermore the capacity building programs will also have a positive impact on energy savings. While EETP has no direct measurable energy savings outcomes, at this stage the limited pre and post training data shows training participants reporting changed organisational practices, operations and/or technologies, and a number estimated or measured resulting energy savings attributed to the program. The EECAP social marketing campaign focussed on wider awareness raising and capacity building but a number of components indicated direct energy savings. People who had raised awareness from the mass media campaign reported increased energy saving behaviours, sustained over time. Participants in the Energymark project reported reductions in their household's carbon emissions and electricity use.

Another longer term benefit for NSW is improving the capacity of organisations to further achieve energy savings. For example the ESP has had an important positive impact by positioning participating organisations to attract funding to implement their energy efficiency activities. In June 2012 four ESP participants won grants in the first round of the Commonwealth Clean Technology Investment Program (CTIP), receiving 86% of the national allocation, and a further 20 ESP sites are applying. A key success factor was the comprehensive ESP audit. Another example is linking each site to an Accredited Certificate Provider (ACP) within the ESS, the NSW energy efficiency trading scheme, to generate funds for businesses to implement projects.

#### **2.1.4 The direct energy savings programs are cost-effective over the lifetime of savings**

OEH assessed the cost-effectiveness of its energy-efficiency programs using the method set out in the 2009 IPART review of NSW Climate Change Measures on the basis of complementarity to the Commonwealth carbon price scheme. Under the recommended framework, a cost-effective energy saving program is defined as one that delivers its savings at a lower cost than if the same benefits were made under the Carbon Pollution Reduction Scheme (CPRS). The benchmark cost is defined as the future carbon-inclusive retail price of electricity that is relevant to the targeted customer group, which reflects not only the usage component but the full cost in resources of providing electricity.<sup>5</sup>

Cost-effectiveness was calculated by:

1. Expressing the estimated costs and savings in present value terms using a 7 per cent discount rate
2. Converting the present value of the costs and benefits into an average cost per unit—levelised cost—in this case the cost per megawatt-hour
3. Calculating the relevant benchmark cost according to the target customer group.

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<sup>5</sup> IPART, Review of NSW Climate Change Mitigation Measures, May 2009

The Table 2-2 below presents the results of this cost-effectiveness analysis for the four programs producing direct energy savings. The key part of this analysis is to estimate savings achieved by participants based on the date they entered the program, assumptions for annual savings and life of savings according to the retrofit, equipment installed or behaviour change.

**Table 2-2. Cost-effectiveness for the direct energy savings programs**

	HPSP	EESBP	ESP	GBRP
Discount rate	7%	7%	7%	7%
Program costs to end of June 2012 (real costs, \$m)	\$27.296	\$18.794	\$11.622	\$5.381
Electricity savings per year (MWh)	31,595 MWh	37,396 MWh	45,432 MWh	4,011 MWh
Lifetime electricity savings	252,763 MWh	373,960 MWh	454,322 MWh	40,110 MWh
<b>Calculated levelised cost</b>	<b>\$138/MWh</b>	<b>\$66/MWh</b>	<b>\$34/MWh</b>	<b>\$179/MWh</b>
<i>Benchmark levelised cost</i>	<i>\$281/MWh</i>	<i>\$245/MWh</i>	<i>\$187/MWh</i>	<i>\$184/MWh</i>

Source: OEH, Water and Energy Program Division, Strategy and Analysis section, August 2012

On this basis all four programs prove to be cost-effective, with lower cost per megawatt hour saved than their relevant benchmark cost (Table 2.2). Each program is delivering energy savings at a lower cost than the cost of providing the same amount of electricity. Comparing cost-effectiveness between these programs gives limited insight because programs have different objectives and in particular target different customer groups.

The accuracy of these results is subject to the reliability of energy savings estimates as described in section 2.1.1 with higher reliability for HPSP and EESBP where estimates are based on verified savings.

### 2.1.5 Market transformation and economic benefits will be assessed

A fuller picture of the longer term impacts of the programs will be available by 2013, with two studies conducted by the DEP. A market transformation study has commenced to evaluate the impact of the programs on the energy efficiency product and service markets (see section 3.7). Second DEP is commissioning a project to establish cost-benefit metrics of the energy efficiency programs as a whole for the electricity market and the state economy, covering public as well as private cost. It will involve energy market and economy-wide modelling and will transfer some of the modelling capacity to OEH at the completion (currently under procurement).

## 2.2 Achievements and issues with implementation

### 2.2.1 Direct energy saving programs are adaptive and being delivered effectively

The three direct energy saving programs (HPSP, EESBP, and ESP) are the most significant component of the programs and account for 61 per cent of OEH expenditure. They aim to directly produce energy savings, and use broadly similar strategies to work with energy users in their target sectors, low income households, small businesses and large energy using sites. Each program has methods to assess the participants' energy use and offer support for improving their energy efficiency.

HPSP and EESBP were new programs for NSW and the first time low income households and small businesses had been directly targeted in this way, while ESP was a development of the pre-existing Sustainability Advantage Program. HPSP in particular is a very large-scale program that began with relatively untested theories and assumptions. HPSP is further complicated in that in addition to its energy efficiency objective, it also has a social equity objective to focus on low income households, reach specific target groups (CALD and Aboriginal households), and to ensure geographic equity of access by making the program available across all of NSW at all times. This has had significant implications for program delivery.

A strength of the design phase for these programs was the development of robust IT systems to manage delivery and record implementation of assessments. Each program developed and refined assessment tools for use by assessors. The programs also established robust auditing processes, to tackle potential risks to implementation as highlighted by the Commonwealth's home insulation program.

For each program, a major achievement was establishing large-scale contractual arrangements with service providers, overcoming initial challenges and capturing a large part of the energy efficiency contracting market. The programs contributed to the up-skilling of auditors/ assessors and job creation (the extent will be assessed through the market transformation study, another component of the overall evaluation).

Challenges in implementation included finding the best channels to promote the program, getting the signals right for the different target groups, and engaging with participants in the longer run to support sustained behaviour change. Another challenge has been using data. Programs collected a wealth of data on implementation and while some programs made limited use of this for the analysis of implementation, it has been increasingly used this to guide improvements.

The programs underwent many adaptations to reach and better respond to their target groups (see chapter 3) and by 2012 were on more strategic footings. Programs had to expand and refine staffing to address the emerging range of delivery tasks. The programs had the flexibility to change their settings within overall targets and objectives. While HPSP and ESP had initial slow uptakes, all three programs have had their

timeframes extended, and are all now on track to reach their delivery targets. As the volume of delivery has increased, efficiency of implementation has improved over time.

The programs made changes to manage both the demand for and the supply of energy efficiency services. All three programs shifted focus from using the assessment to identify practical measures to improve energy efficiency, to supporting the implementation of recommendations, whether it was HPSP householders installing kit items or ESP businesses making decisions about investing in new technology. EESBP further refined the process to have assessors to put more focus on supporting implementation and less on delivering an assessment only, resulting in a dramatic lift in businesses proceeding to rebate.

Data from program delivery is being increasingly used to guide strategies to target higher potential for savings. For example, EESBP is targeting business types like butchers, poultry farmers, small supermarkets and fast food outlets as high energy users, with approaches are being put in place in partnership with peak industry. EESBP is also developing industry benchmarking based on the data collected to date. For example in the dairy industry, data from 440 assessments has established a benchmark of energy use per 1,000 litres of milk.

### **2.2.2 High participant satisfaction and positive stakeholder engagement**

All the evidence indicates that programs were generally well received by participants. The three direct energy saving programs have recorded high levels of participant satisfaction. HPSP monitors satisfaction through its reporting and audit processes, which found over 95% of households highly satisfied with the program, especially with the free kit items and the tailored assessments that help them to save energy. For EESBP independent survey research in May-June 2012 found that 78 per cent of businesses were satisfied or very satisfied with the assessor and 80 per cent with the recommendations (n = 301), in line with similar findings in 2010. Similarly for ESP, independent survey research in 2011 found participating businesses very satisfied with the ESP (80 per cent with auditors, 92 per cent with the ESP team). More broadly approval of the Save Power advertising campaign has been positive (over 80 per cent of people approved or strongly approved).

A key achievement of delivery of the direct energy saving programs was engaging external stakeholders including participants as 'multipliers' to promote the program through their networks, and using early adopters as advocates. Assessors were also a key asset not just in delivering assessments but also in contributing to promotion and further participant recruitment. Programs built this in to their delivery in different ways such as developing training or including incentives in their payment model. The programs developed strong supply chain relationships with assessors and other providers to build partnerships, using methods such as forums, required attendance at program updates, webinars and email communication.

### **2.2.3 Regional focus achieved**

The programs have had a significant regional focus in line with the Government's commitment to support regional communities. HPSP is addressing an explicit target for geographic equity of access, while EESP and ESP have over 50% of participating businesses from outside Sydney.

### **2.2.4 Working with the government sector had mixed results**

The five programs under the energy efficiency component of NSW Government Sustainability Policy (EEGSP) had varying success in reaching the government agencies and effectively engage them in the program rationale. Setting targets was not sufficient. 'Out clauses' included in the policy, such as "where practical" or "where relevant" meant target were not mandatory. Based on feedback from agencies, OEH staff identified that having a clear policy mandate, agency-specific targets and accountability requirements possibly with public reporting would support the successful implementation of programs.

Effectiveness of implementation of the programs varied significantly: some had some good results like the Government Retrofit Building Program, the direct energy savings component, where the small sites component had generated estimated savings of 4,011MWh of electricity and 1,561 GJ of gas leading to a savings in participants' energy bills of over \$.657 million. Others such as the Green Lease program did not produce any impact. All programs had common barriers to engage effectively with agencies: the lack of technical knowledge, time and financial resources for audits to apply for the support offered.

### **2.2.5 Awareness and capacity for energy efficiency is being developed**

Two programs addressed the enablers and barriers for greater energy efficiency, targeting the wider community, key industry sectors and occupations which are able to implement energy efficiency opportunities, the education and training workforce, and policy makers and program managers. Each of these programs has been largely implemented as intended, and summaries are in chapter 3.

The Energy Efficiency Training Program (EETP) uses multiple strategies to improve the capacity of the workforce for energy efficiency. A key feature of the EETP is cross-agency governance between OEH and NSW Department of Education and Communities (DEC). EETP has developed clear formal partnership arrangements and while the partnership faced some challenges in its development, it is now valued and supported by internal stakeholders across both agencies and provides a sound platform for shared program delivery. Industry and training stakeholders also valued the partnership arrangements between different government agencies and found this contributed to the success of the program.

A major achievement of EETP has been engaging 5,290 participants in energy efficiency training, networking or professional development between July 2009 and April 2012, including

- 2,695 committed places in the Vocational Education and Training (VET) system
- 179 participants in the Professional Development for VET Practitioners (PD4VET) workshops
- 629 participants in other VET Professional Development (PD) training or networking events
- 1,233 participants in 30 Industry Partnerships projects
- 544 participants in Higher Education courses

The Energy Efficiency Community Awareness Program (EECAP) is a communication and education program targeting the broad community to improve community knowledge, understanding and motivation to act in relation to energy efficiency. It used a comprehensive, multi-strategy and ongoing approach that reflects best practice in social marketing to reach a range of different audiences through mainstream and below-the-line communications campaigns under the “Save Power” banner, and specific education projects. The EECAP mass media campaign targeted an overall population of 5.8 million persons (approximate NSW adult population)

The Save Power mass media campaign television advertising in its final phase reached almost two-thirds of NSW adults (63 per cent), with most (77 per cent) finding it convincing and a third feeling motivated to the actions in the messages. Tracking research demonstrated that approval of the campaign remained high over time, from winter 2009 to summer 2010: more than 80 per cent of people approved or strongly approved government advertising with messages about saving power. Research suggests that it contributed to improved knowledge of energy efficiency issues and has had an influence in changing energy use behaviours. The wide reach provides great potential for energy savings from behaviour change at this scale.

The EECAP effectively trialled a range of other educational approaches to reach different segments of the NSW community. In partnership with the Ethnic Communities Council, bi-lingual educators were trained and then delivered 57 energy workshops delivered to 1,044 participants. A new program in 2012 will recruit 20 Energy Champions and 50 Leaders from across CALD communities to encourage participation and action to reduce energy. The CSIRO’s Energymark project was trialled in NSW, with 112 groups and 517 participants to April 2012 (another 19 were still in progress). Save Power library kits (841) were placed with 62 Central Library Services in NSW (with up to 260 branch libraries) and borrowed by 6,400 households in twelve months with evidence of positive impact on their knowledge and behaviour. The Retailer Engagement Project successfully engaged major electrical appliance retailers and provided training to staff in 142 stores to assist customers to consider energy efficiency in their purchase decisions.

### 2.2.6 Cross-impacts of programs have been limited

The overall structure and design has not focussed on cross-program links or lent itself to more integrated delivery, and there have been only limited cross-program impacts at this stage. This is further discussed in chapter 4 on coordination and governance.

The delivery of the three direct energy savings programs and the EEGSP were relatively linear, separate and focussed on their different target groups sectors. However, ESP and EESBP that work out of the same branch have collaborated in several ways: recommending businesses to the other program, developing technology and sector reports, designing sector approaches that cover businesses of different sizes, and utilising the same panels of service providers.

The two capacity building programs (EECAP, EETP) were expected to support the other programs to some degree (through increasing community awareness, and building the energy efficiency workforce). The Save Power campaign and website developed through EECAP provided common branding for the strategy. EECAP made grants to 36 councils to promote the HPSP and awareness of Save Power.

In practice cross-pollination has been limited by the different timeframes. For example, long-term impacts of EETP on the energy efficiency workforce will be mainly discernible into the future. The DEP market transformation study will assess progress with changes in energy efficiency services in NSW. For this evaluation, very little if any data was collected by the programs on the influence of EECAP (or potentially EETP) on their participants.

The NSW Energy Savings Scheme (ESS) offers a synergy with the three direct energy saving programs and the EEGSP, where participants can use Energy Savings Certificates (ESC) to fund energy efficiency developments. Recently each of these programs has been developing these opportunities directly with IPART as administrator of the ESS. However, coordination is needed to avoid risks such as inconsistent market signals, oversubscription, and shortages of capacity from service providers.

#### OEH Comment

The complementarity review informed government decisions to merge the EESBP and the non-duplicative aspects of EETP into ESP and to increase use of the Energy Savings Scheme (ESS) to fund energy efficiency actions.

These decisions provide the basis for more integrated delivery e.g. practical training linked to low-cost tools to access the ESS for specific technologies and sectors.

## 3. Progress of individual programs

This chapter assesses how the programs have been designed and delivered, the adaptations made to address barriers and changing contexts, and the initial evidence of energy efficiency outcomes. The source is the evaluations and reports from each program, and interpretive interviews with program managers.

### 3.1 Home Power Savings Program (HPSP)

#### 3.1.1 Program design and development

HPSP aims to help 220,000 low-income households reduce their power use and bills by the end of June 2014. The free program includes three main components: a kit of energy efficient items, a home power assessment and a tailored action plan identifying free and low-cost ways for the household to save power. The program is managed by OEH, and Fieldforce is the contractor delivering energy assessment services.

From the initial policy brief in June 2008 to the end of December 2011, HPSP has been through a long journey, with changes made along the way to better fit circumstances and the target audience. The initial policy design was very broad and did not specify a clear strategic framework for a program that was unique for OEH in its objectives as well as its size with a \$63 million budget. As a consequence, two of the five years initially planned for delivery of the 220,000 energy efficiency assessments were used to develop a more robust program design and run three pilots. The program has also an equity objective that has significant implications for program delivery. This objective means not only reaching specific target groups (CALD and Aboriginal households), but also ensuring geographic equity of access by making the program available across all of NSW as split into postcode clusters (PCC)—specific geographic areas created to manage the delivery of the program—at all times.

In the development phase, OEH initiated what have proven to be some of the program's key strengths. These included: involving external stakeholders from the beginning, paving the way for their strong engagement in the promotion of the program; developing comprehensive IT systems, such as the assessment tool and the related assessments database (DEAS), to support the delivery of assessments; and establishing robust audit and reporting systems to ensure proper monitoring and accountability.

The initial delivery model, however, did not properly cope with all of the challenges raised by the program implementation to meet the program objectives. The main challenges faced in the initial stages of implementation were generating enough demand to reach the quantitative target and clarifying responsibilities for marketing and communication between OEH and Fieldforce. The HPSP team did not have the numbers and skills to fully support the promotion of the program in the initial phase. Increased

staffing and improved processes with Fieldforce helped to leverage the promotional efforts of all stakeholders through a newly established marketing strategy.

### 3.1.2 Delivery and reach

Assessments are arranged by Fieldforce through an effective scheduling process and delivered by assessors in the field. Assessors are at the forefront and the main asset of the program; their skills and engagement are highly valuable. However, the original pricing model established through the tender process undervalues their key role in program promotion through lack of clear and sufficient incentives.

By June 2012 HPSP had completed 115,508 assessments or 58% of its final target. Now that the program has been extended for another year to June 2014 (in the context of *NSW 2021*) and with the success of the mini-campaigns that focus intensive promotion on a few postcode clusters (PCCs) for a limited timeframe, the program appears to be in reach of its ambitious target.

Uptake in some PCCs has been more successful than others, but there is no clear pattern in the success factors that could be valid across NSW. Some PCCs with similar characteristics perform differently. In this context, there is no ‘one-size-fits-all’ approach: local promotional strategies must play a key role in successful uptake. These strategies should be designed according to the main features and challenges of each PCC, for example, stalls in malls may work in PCCs with a high proportion of seniors, and partnering with CALD community organisations for PCCs with a high proportion of these households.

Overall, participants are highly satisfied with the program. HPSP monitors satisfaction through reporting and audit processes. Fieldforce conducts a monthly post-assessment phone survey of 100 randomly selected participants – in December 2011, 95 per cent said they were extremely satisfied and 5 per cent satisfied with the service. IAB audit results for the last quarter of 2011 found 97 per cent reported a positive experience (n = 153). Participants were especially pleased with the kit items because they were free but also because they made the idea of savings concrete, and with the tailored assessments that would help them to save energy. The main criticism from participants was that the action plan may not give a realistic view of the changes and savings they can achieve. Anecdotal evidence of inconsistencies in the way assessments or items are delivered indicates a risk of negative perceptions and frustration when not properly justified (e.g. no showerhead installed for Housing NSW tenants).

Program costs are lower than budgeted with an average cost per assessment of \$270 predicted for the end of the program compared with the \$286 initially budgeted, reflecting the constant attention given to efficient program delivery.

### 3.1.3 Outcomes

By June 2012 the program had generated an estimated 31,595 MWh of annual electricity savings leading to a savings in participants' electricity bills of almost \$8.4 million. The energy savings have also resulted in 32,346 tonnes of avoided CO<sub>2</sub> emissions in one year (Table 3-1). Based on these savings estimates the levelised cost per megawatt-hour compares very positively with the benchmark cost in resources for providing retail electricity to households. Taking into account different persistence factors for savings from kit items and behaviour change, the cost of megawatt-hour saved by HPSP participants is \$138 compared to \$281 resources cost for retail electricity.

**Table 3-1. Home Power Savings Program – estimated annual savings from activities implemented to June 2012**

Reach	Electricity saved (MWh) pa	CO <sub>2</sub> tonnes saved	Participants \$ savings electricity bills pa	Participants water savings per year (ML)
115,508 completed assessments	31,595	32,346	\$8,372,675	92.4

Source: Strategy and Analysis, OEH

Notes:

The savings were calculated by applying the preliminary results of regression analysis of billing data undertaken by independent consultants in May 2012 through the DEP measurement and verification project; estimating savings by assigning savings to households based on whether the household received a showerhead or not; and assigning a persistence factor of 10 years to savings from showerheads, 5 years to savings from other kit components and 1 year to savings from behaviour change

This estimate is conservative because it adopts the lower estimates of savings from the draft HPSP evaluation report; applies very low persistence factors to savings from behaviour change; and applies lower bound estimates of persistence factors savings attributed to kit items.

The bill savings use the tariffs developed for the 2010-11 Climate Change Fund annual report (\$265/MWh), and used throughout 2011-12.

Electricity savings from a sample of 23,500 homes were measured by the billing data analysis conducted with the DEP measurement and verification project in May 2012. The analysis provided preliminary findings in May 2012 with average savings of 0.6 kWh per household per day (or 0.22 megawatt-hours (MWh) per year, a 4 per cent saving), This represents a total first year saving of 8979 MWh from the 41,000 households that had participated in the program by June 2011. Savings varied according to the kit items received: 6 per cent savings for participants that received the whole saving kit against 3.5 per cent for householders that received all items except showerheads, which highlights the substantial impact of showerheads on energy savings. Saving from lighting refit was also estimated from the billing data analysis to be 0.35 kWh per household per day (or 2.3 per cent reduction).

These results are encouraging in that they proved the hardware components of the program i.e. showerhead and CFL realised the expected savings under realistic use conditions. For example, the electricity saving from the largest item installed by HPSP

(efficient showerheads) matched the measured savings from Sydney Water’s efficient showerhead retrofit projects<sup>6</sup>. It highlights the distribution and installation of showerheads as a major factor for energy savings. One issue is that the majority of existing participants, including non-social housing tenants, are already equipped with energy efficient showerheads.

Further opportunities exist to increase energy savings especially through the tips in the action plan, that have very broad scope from taking shorter showers to substantial retrofits like a hot water system. The evaluation recommended a follow-up survey of participants to better understand their behaviour and the resulting outcomes. HPSP is also developing a strategy to engage participants in a continuous relationship that should be informed by research on behaviour change, learning from good practice in areas like preventive health.

### 3.1.4 Conclusion

HPSP has been a very challenging program to implement based on an ambitious policy brief and both energy efficiency and social objectives. Despite initial difficulties in defining appropriate settings, the program is on track to reach the target of 220,000 participants by June 2014 with 115,508 completed assessments at the end of June 2012. The energy savings are encouraging given the limited possible impact of the small kit items, and anecdotally are consistent with comparable programs. The main challenge for the next phase of the program will be to enhance the savings achieved by participants, and to ensure the sustainability of behaviour change.

#### OEH Comment

The complementarity review informed government decisions to retain HPSP as it met all of the complementarity principles.

The NSW Energy Efficiency Action Plan incorporates these government decisions and evaluation findings. For example, the evaluation showed that small, low cost items deliver verifiable energy savings in households of around 6%. New mechanisms are required to enable low income households to invest in larger, higher cost items that produce more significant energy saving.

Low income households value face-to-face advice provided through energy assessors, although effectiveness can be improved by better targeting of actions to the specific needs of the household and efficiency could be improved by use of market delivery.

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<sup>6</sup> Sydney Water Corporation, Institute for Sustainable Futures (ISF), 2004, ‘Every Drop Counts’ Residential Retrofits - Analysis of Water Savings Study Report, April 2004, ISF  
ISF, 2001, Evaluation of the Shellharbour Residential Retrofit Program: Part 2 (draft), June 2001

The Energy Savings Scheme has the potential to both partially fund small and large energy efficiency items and provide a business case for third parties to conduct assessments of households.

Energy savings from a one-off behaviour change action do not last so the Energy Efficiency Action Plan will seek new ways to deliver sustained savings from behaviour change through the Energy Savings Scheme.

## **3.2 Energy Efficiency for Small Business Program (EESBP)**

### **3.2.1 Design and development**

The EESBP was launched in February 2009 and targets small and medium sized businesses (that use electricity up to about \$20,000 per year or 160 megawatt-hours; or have up to 10 full time staff). The \$15 million program had an initial target of at least 6,000 small to medium sized businesses to make energy efficiency improvements. The EESBP was originally due to be completed in June 2011 but has been extended to December 2012 with an additional \$6.6 million in funding.

The EESBP provides a participating business with a subsidised energy assessment that identifies where electricity is being used, and a tailored action plan with electricity and cost saving recommendations and the information needed to claim rebates. Businesses that implement recommendations with greater than a two-year payback period have access matched funding to cover half of the retrofit costs for lighting, HVAC, motors, air compressors, commercial refrigeration, boilers, hot water systems or insulation. Four hours of free support from the assessor is also provided to assist with the installation of new equipment.

From the initial policy brief to date the program has significantly evolved in response to challenges emerging from the early stages of the program implementation, especially the low conversion rate from assessments to rebates. According to feedback from program staff the timeframe to develop the program design was very short. A program manager was hired only in September 2008. Formative research on businesses knowledge and attitudes and some pilot assessments were conducted to test the concept.

Various research, monitoring and evaluation activities informed changes to the program design, in particular regular monitoring of assessments data, external audits of services provided by assessors and participants surveys. OEH contracted Databuild to conduct two participants survey, one in November 2010 (230 participants) and one in June 2012 (around 300 participants) to assess businesses' satisfaction, identify barriers to implement recommendations and finally estimate to what extent decisions to retrofit businesses can be attributed to EESBP. The second participants' survey includes

interviews with program stakeholders (program staff, assessors, service providers and external auditors).

### 3.2.2 Delivery and reach

Although EESBP was originally intended to be a 30 month program, it reached its target of 6,000 participating businesses in May 2010, only 15 months from the offering of assessment in February 2009. By June 2012 EESBP had 17,185 registered businesses, 15,214 Action Plans prepared and around 2,510 retrofits implemented. The main changes to the program design have since focused on increasing the conversion rate from assessments to rebate.

Changes were also made in the approach to recruiting businesses. For reasons of equity EESBP was initially advertised by OEHL and through councils. The approach then moved to assessors mainly responsible for the program promotion, using communication material provided by OEHL. Fixed price services provided by organisations selected by competitive tender (and placed on a NSW Panel) means that assessors are guaranteed a \$600 or \$300 assessment for every business they recruit. This innovative approach ensures that assessors have a 'profit motive' to recruit businesses to EESBP and it has been a foundation of the outstanding participation numbers.

During the first and subsequent years assessors were offered further guidelines and training. The assessment tool was refined on four occasions to improve the quality of data entered and offer more reporting functionalities. Further risk assessment identified additional recommendations, including contracting out audits to improve the quality of assessments, implemented from January 2011.

Program staff identified the key challenge as the lower than expected conversion rate from assessment to the implementation of 'rebateable' recommendations. Program data showed a two per cent cumulative conversion rate in mid-2010. A facilitation pilot was conducted in early 2010 where businesses were provided with four hours of assistance to implement recommendations from their action plans, which showed an increase in conversion rate to 51 per cent. In response, significant changes to program design (Phase 2) were made from July 2010:

- reduction of assessments cost for businesses with a simplified one-off fee
- four hours of free support to help registered businesses to implement the action plan (facilitation time paid to assessors)
- option for businesses to pay only 50 per cent of the retrofit costs upfront, OEHL paying the remaining 50 per cent
- 50 per cent conversion rate target for assessors before being allocated more businesses to assess.

A new panel of assessors was contracted in August 2010 to align with these requirements, especially having assessors that had relationships with suppliers so they could coordinate more effectively the retrofit component. Those changes appear to have

significantly improved the conversion rate which progressively increased to around 30 per cent in early 2011 and did not fall below 50 per cent from August 2011.

Since that time there has been an improvement in the conversion rates as a result of the program. The recent independent survey of participants (Databuild, June 2012, n= 301) examined this in detail. It found that 93% of businesses had at least partially implemented one or more recommendation of any type in both phases of the program, dominated by the high level of action for no cost/ low cost recommendations. The proportion of businesses taking no cost/low cost actions has fallen from 93 per cent in Phase 1 to 84 per cent in Phase 2 but this shortfall has been made up by increased action in the other two categories:

- Just under two thirds of businesses (62%) have at least partly implemented rebate eligible recommendations compared to 40 per cent in Phase 1.
- 47 per cent of businesses receiving worthwhile low cost recommendations at least partially implemented one or more of these in Phase 2 compared to 37 per cent in Phase 1.

The study assessed the attribution of these actions to the program and found that while this has not increased overall, the proportion that is fully attributed has increased from 64 to 83 per cent. For no cost/low cost recommendations attribution overall has increased from 55 to 78 per cent. For worthwhile low cost recommendations the level of attribution has not changed.

Participant satisfaction has been high. Independent survey research by Databuild in May-June 2012 found that 78 per cent of businesses were satisfied or very satisfied with the assessor and 80 per cent with the recommendations (n = 301). This is in line with similar findings for phase 1 of the program in November 2010 (n = 230) where at least 90 per cent of respondents were satisfied with each aspect of the program (the assessor, the action plan recommendations and the follow-up support). The 2010 research showed that the majority of interviewed businesses (68 per cent) were motivated to take part in the program by the potential energy cost savings. Barriers to implementing recommendations occurred in some cases where they were not seen as appropriate by the businesses themselves, or the lack of up-front capital for more costly measures. As a result program changes were made to improve the appropriateness of recommendations in the action plan and develop better communication to businesses about financial assistance.

Audits of assessments conducted since mid-2011 have also contributed to improve quality and accuracy of energy assessments as well as verifying retrofits. To end of March 2012, 367 assessments across 33 assessor companies have been audited and findings provided to assessors to adopt correcting measures if needed. The overall quality of assessments improved from 'average (70)' to 'above average (75)' on the 100 points audit scale. Interestingly the assistance of local councils (in less than 5% of cases) improved the quality of the facilitation for implementing recommendations.

EESBP is increasingly using quantitative analysis of the data on participating businesses to identify patterns of uptake and conversion across industries, size or location that may guide strategies to target businesses with higher potential for savings. This is underway with key business types like butchers, poultry farmers, small supermarkets and fast food outlets. In these cases high energy users are being targeted for specialist action, such as cool rooms in butchers and other forms of refrigeration in supermarkets. In the case of poultry farmers, common opportunities are being identified, with implementation support to focus on these opportunities. In all cases, these location and sector wide approaches are being put in place in partnership with industry associations such as NSW Farmers or the Australian Meat Industry Council, and franchises such as Foodworks.

To encourage best practice, industry benchmarking is being established based on the EESBP data collected to date. In the dairy industry for example, data from 440 assessments across NSW has enabled the establishment of a benchmark of energy use per 1,000 litres of milk. This enables dairy farmers to compare their energy efficiency against farmers with similar sized herd. Anecdotal feedback suggests it is proving to be an important motivator for action.

### 3.2.3 Outcomes

By June 2012 the program had generated an estimated 37,400 MWh of annual electricity savings leading to a savings in participants electricity bills of over \$9.1 million. The energy savings have also resulted in 39,640 tonnes of avoided CO2 emissions (Table 3.2). Considering the program costs to end of June 2012, the program is proving to be very cost-effective with a cost per megawatt hour saved by program participants at \$66 compared to a benchmark cost of \$245 (cost in resources for retail electricity to small businesses).

**Table 3-2. Energy Efficiency for Small Business Program – estimated savings for one year from activities implemented to June 2012**

Reach	Electricity saved (MWh) pa	CO2 tonnes saved	Participants \$ savings electricity bills pa
17,185 businesses registered 15,214 Action Plans	37,396	39,640	\$9,124,627

Source: Strategy and Analysis, OEH

Notes: The savings were calculated by extrapolating the known rate of rebate claims (16.5% of businesses) and average savings per rebate (5.2 MWh per business) to the total number of participant businesses; and estimating implementation of non-rebate actions using the rates from the 2012 Databuild survey and extrapolating the average savings per business (5 MWh) from non-rebate actions to the total number of participant businesses (32% of worthwhile low cost actions are fully implemented due to the intervention of EESBP, based on 37% of worthwhile low cost actions fully implemented, with 87% of those can be attributed partially or fully to the EESB Program). This estimate is conservative because the 2012 Databuild survey shows that businesses have only claimed rebates for 51% of implemented rebatable actions. This suggests that the savings from the rebates could be as high as 200% of those claimed. The bill savings use the tariffs developed for the 2010-11 Climate Change Fund annual report (\$244/MWh), and used throughout 2011-12.

EESBP is taking part in a ‘before-and-after’ project coordinated by DEP to measure actual savings achieved by participants. The latest results (August 2012) provided findings based on 331 projects that were subject to M&V analysis. On average 5.64 megawatt-hour or 9.3 per cent energy savings were achieved from each project. This analysis also identified significant differences in the amount of savings according to the technology: lighting retrofits resulted in the biggest saving (13 per cent) compared to refrigeration that had the lowest (3.2 per cent). Because of the broad basis these estimates can be considered as representative for all EESBP participants. They confirm previous estimates of savings that were used to inform the review of deemed savings as presented in Table 3-2.

Anecdotal evidence from program staff shows that better results in implementing recommendations are achieved for some types of businesses like hairdressers, cafes, dairies or franchises.

Feedback from program stakeholders suggests that other impacts are being achieved for participating businesses, including increased knowledge and expertise in the energy efficiency area, but these are more difficult to measure.

### 3.2.4 Conclusion

EESBP has developed an effective approach for working with the small business sector. It began as a new program for NSW and the first time small businesses had been directly targeted in this way. Its reach has exceeded expectations with 17,185 registered businesses to end of June 2012 compared with the initial target of 6,000 participants, suggesting that it has reached beyond the early adopters. In its early stages a key challenge was the low conversion rate from participation to rebates for retrofits. However, significant changes to the program design had a very positive impact on the cumulative conversion rate that went from 2 per cent of registered businesses requesting rebates as at the end of June 2010 to 15 per cent to the end of June 2012, with evidence of cost-effective energy savings. The program has proved to be effective and cost-effective in working with the small business sector, with the potential for generating similar results on a larger scale.

#### OEH Comment

The complementarity review informed government decisions to reform the EESBP by merging it with the ESP and ceasing rebates for energy efficiency actions. The review emphasised greater use of the ESS as a financial incentive for small businesses to implement energy efficiency actions.

The NSW Energy Efficiency Action Plan incorporates these decisions and evaluation findings. For example, implementation rates increase dramatically when audits are followed up with technical support and financial incentives. The Energy Savings Scheme will need simple methods to streamline access for service providers to small businesses,

as site-specific engineering measurement of energy savings is not feasible for small businesses.

Based on the 15,000 assessments undertaken by June 2012, the types of energy usage and opportunities for energy efficiency within sectors are known to be relatively consistent. Hence, identification of opportunities and calculation of savings can be streamlined.

A key finding is that verified bill savings across a large number of small businesses deliver equivalent or greater peak demand savings. Future programs can build on this finding to improve alignment between energy efficiency programs and management of peak demand.

### **3.3 Energy Saver Program (ESP)**

#### **3.3.1 Design and development**

The ESP targets medium and large sites using between 160 megawatts-hour to 10GWh per annum in electricity. It is positioned between the Small Business Program (EESB) that targets businesses that use below 160 megawatts-hour (where most electricity meters cannot record interval data) and large sites using above 10GWh that are obliged to take part in the NSW Energy Savings Action Plan (ESAP) program.

The ESP had an original target of 800 site audits by June 2013, now extended to June 2014. The ESP budget is \$20 million over the five years 2008/09 to 2013/14.

The ESP provides subsidised energy audits and facilitation to guide, promote and prepare business cases for investment in energy efficiency. It also set up a panel of energy efficiency auditors who recommend upgrades and improved procedures, identify potential Energy Saving Scheme funding and support businesses to act on the recommendations.

Over the period to date, the story of the ESP has been a continuous adaptation of the initial settings to address challenges with reach, delivery, timeliness and turning audits into energy savings. This has been informed by program experience and research commissioned by ESP on other energy auditing programs (Institute for Rural Futures 2011), and on the engagement of businesses in the ESP (Databuild 2011).

#### **3.3.2 Reach and delivery**

The program began in early 2009 and had a slow start-up, but by June 2012 it reported tracking well to target with 366 audits completed, approximately 50 per cent at regional or rural sites (Table 1). Program expenditure of \$11.1 million was on forecast for the June 2014 completion.

**Table 3-3. ESP uptake and implementation over time to end of June 2012**

		2009	2010	2011	2012 *
Audits Completed	Yearly	14	82	119	151
	Cumulative	14	96	215	366
Organisations implemented one or more projects	Yearly	6	40	15	-
	Cumulative	6	46	61	-
Implementation rate (implemented savings/total estimated savings)	Yearly	5.5%	11.3%	4.6%	-
	Cumulative	0.3%	5.0%	7.5%	-

Source: OEH, ESP monitoring database, June 2012; \* to end of June 2012

An early adaptation was the easing of requirements for Energy Saver participants to undertake the wider Sustainability Advantage Program, which included replacing the \$2,000-\$3,000 joining fee with a \$500 fee at sign-up. In 2010 eligibility was widened to include government sites. To address barriers to implementing energy efficiency projects, the ESP added Implementation Support in 2010 (below). Marketing materials were constantly improved and good relations built with industry bodies. One of the largest delays with an energy audit is the collection of energy data, so in early 2010 ESP added a 'kick-off' meeting, facilitated by the energy auditor, and made this a payment milestone for the auditor.

A major adaptation was moving the focus from targeting businesses in general to also including a sector transformation approach for 1) *selected technologies* (lighting, HVAC and industrial refrigeration, and in 2012 multi-generation and sub-metering); and 2) *key industry sectors* (aged care, registered clubs, hotels, food processors, schools). This allows more specific marketing, targeting high energy users, and specialised audits for similar businesses or technologies. In 2012 ESP is further focussing technology projects by offering training on technological solutions, and has reported a high demand.

In 2011, ESP formed a collaboration with City of Sydney for the Smart Green Apartments project (target 30 audits) and the medium business pilot (12 audits – to be evaluated 2012).

On the supply side the ESP has almost doubled the audit panel to 46 organisations with over 300 individual auditors, a significant proportion of energy auditing consultants in NSW. ESP leverages off the auditors through granting exclusive rights where an auditor brings a business to the program, providing pricing is consistent with their tender application and in line with the average price for similar audits. Businesses recruited by auditors now accounts for the majority of new audits.

According to the 2011 Databuild survey, most participating businesses have been satisfied to very satisfied with the ESP process (auditors 80 per cent, ESP team 92 per cent, n = 38-39). This study also found that while businesses saw substantial barriers to

investing in energy efficiency projects, the important features of ESP were: (i) credibility of a government program (ii) subsidised audits; and (iii) the resulting business case that was needed to secure a budget for investment.

Sites within the target group can vary in energy use by a factor over around 60, so while the number of audits is a Key Performance Indicator (KPI) it does not reflect the degree of uptake, the megawatt-hour value of energy assessed or likely savings. The ESP can provide more detailed data by industry sectors on reach and delivery for different project types from the ESP database, but no further analysis has been contracted yet.

### 3.3.3 Outcomes

By June 2012 the program had generated estimated annual savings of 45,432 MWh of electricity and 186,155Gj of gas leading to a savings in participants energy bills of over \$10.3 million. The energy savings have also resulted in 60,367 tonnes of avoided CO2 emissions for one year (Table 3.4).

**Table 3-4. Energy Saver Program – estimated savings for one year from activities implemented to June 2012**

Reach	Electricity saved (MWh) pa	Gas saved (Gj) pa	CO2 tonnes saved	Participants \$ savings electricity bills pa	Participants \$ savings gas bills pa	Participants \$ total savings pa
386 entities audited	45,432	186,155	60,357	\$7,996,068	\$2,345,552	\$10,341,620

Source: Strategy and Analysis, OEH

Notes: The savings were calculating by: identifying a cohort of 113 audits that were completed more than 18 months earlier (data set extracted 19 June 2012) and have reported at least once were taken as conservatively indicative of implementation under the program. Including businesses that reported no implementation, this group achieved reported average electricity savings of 5% and natural gas savings of 6% against their baselines (note: the 6% figure includes businesses that had no natural gas use, this was done to allow the figure to be applied to all businesses that had participated). The average baseline for all audits completed more than 6 months earlier was taken to be the average baseline for all participants (average baselines are 2,401 MWh and 8,477 GJ). The 5% and 6% savings were extrapolated to all businesses that have received an audit under the program (366 at 30 June 2012). This figure is conservative because: the implementation rate is taken from earlier in the program from businesses that did not provide multiple reports. It does not reflect the impact of implementation support, other improvements to audit layout, audit management processes and business case quality, or the introduction of Commonwealth funding for implementation. The bill savings use the tariffs developed for the 2010-11 Climate Change Fund annual report (natural gas, business - \$12.60/GJ; electricity, businesses with medium size baselines - \$176/MWh).

The ESP evaluation report uses data from the current projects and assumes a 45 per cent implementation rate to estimate savings in electricity use of 122,400 megawatts-hour per year across all the businesses, equivalent to savings over the 10 year life of the implemented projects of 1,224,000 megawatts-hour, leading to a cost-effectiveness of \$16.33 per megawatt-hour of energy saved.

Case studies demonstrate that the ESP approach can deliver substantial energy savings. The ESP evaluation report describes the success of the Industrial Refrigeration Technology Project where savings up to 70 per cent energy consumption for refrigeration were identified at various sites. For example two large projects (Tamburlaine Wines and Swire Cold Storage) are saving a total of over \$123,500 per year. Similarly the Lighting Technology Project has already led to two major businesses (Sydney Masonic Centre & Diageo) committing over \$500,000 in capital investment for lighting projects which will save over \$275,000 annually. The M&V case study of the lighting retrofit project in Sydney Masonic Centre is in the Appendix 2.

It is clear that the program has developed a model that can achieve substantial energy savings and cut energy bills at participants' sites. But at this stage there is a low reported rate of implementation after an audit (10 per cent at March 2012, 13 per cent at June 2012), compared with the expected rate of between 40 and 50 per cent achieved on completion by other auditing programs (ISF 2011). One factor is greater support for implementation, which the ESP addressed by adding up to 30 hours for the audit teams to assist businesses in implementing the audit recommendations.

More importantly the low rate is largely an artefact of reporting due to the lag time for energy efficiency projects which take between 6-24 months or more to implement (for example projects under the NSW Energy Saving Action Plans took 3 years for maximum implementation of audit opportunities). Around half of the 250 completed ESP audits had only finished within 6 months of the 2012 ESP report. The ESP expects that the implementation rate will rise dramatically over the coming 12 months as businesses act on the existing audits, and it is on track to reach the 40-50 per cent achieved by other programs. Reporting on implementation is a related challenge. Participants commit to report progress post-audit but it is a voluntary self-report with no external verification of costs or savings. OEH created a Relationship Officer role within the team in mid-2011 to fill in this gap, and gather post-audit information. The 95 organisations who have submitted reports 12 months after the 'sign-off' of their audit reveal average annual savings of \$45,800. This is expected to rise considerably over the next 1-2 years as the time and capital is found to implement additional cost-effective energy efficiency measures.

ESP is also developing more robust data on savings using M&V, with a pilot in early 2011 at 10 sites. In mid-2012 ESP used the OEH M&V guide and an independent specialist at 10-20 sites to confirm implementation, actual energy and cost savings, and compare real savings with initial findings in the audit reports. The expected findings should allow ESP to more accurately extrapolate findings across participating businesses and sub-sectors.

A significant positive impact of the ESP has been positioning NSW businesses to attract funding for further energy efficiency activities. For example in June 2012 four ESP participants won grants in the first round of the Commonwealth Clean Technology Investment Program (CTIP), receiving 86% of the national allocation, and a further 20 sites are applying. According to AusIndustry a key factor was the comprehensive ESP audit that covered the CTIP criteria and determined the best options. Another example

is linking each site to an ACP within the Energy Savings Scheme to generating Energy Saving Certificates (ESCs) for businesses which implement projects.

### **3.3.4 Conclusion**

The ESP program has been operating effectively despite a slow start-up; growth and program participation has been steady and estimates indicate that the program is on track to cost-effectively meet targets. Many changes have been made to make the program more strategic and targeted.

It is clear that the program has a cost-effective model that can achieve substantial energy savings and cut participants' energy bills. The extent of savings is likely to be clearer as more businesses implement audit recommendations over time, and the program measures and reports on this. The increased use of M&V should provide firm evidence of energy and cost savings and allow ESP to more accurately extrapolate findings across participating businesses and sub-sectors.

#### **OEH Comment**

The complementarity review informed government decisions to reform the ESP by integrating it with the EESBP and the non-duplicative components of the EETP. The review also emphasised greater use of the ESS as a financial incentive for all businesses to implement energy efficiency actions.

The NSW Energy Efficiency Action Plan incorporates these decisions and evaluation findings. Some of these are similar to the findings for small business, for example, the consistency of energy savings opportunities within business sectors and the opportunity to streamline access to the Energy Savings Scheme. Streamlined methods also provide an opportunity to overcome the delays in project implementation following stand-alone audits without financial incentives.

An important difference to the small business sector is that a greater use of measurement and verification (M&V) is required to provide evidence of energy savings and an ongoing business case for investment in energy efficiency.

## **3.4 Energy efficiency component of NSW Government Sustainability Policy (EEGSP)**

### **3.4.1 Design and development**

The EEGSP is different from other energy efficiency programs in that it is not a program but a policy covering a range of programs that set targets for NSW Government agencies for: greenhouse gas emissions from building energy use, water, environmental performance of buildings, cleaner government fleet, waste, recycling and purchasing.

Five programs relating to energy consumption were considered to be part of the overarching Energy Efficiency Strategy:

- The Schools Energy Efficiency program
- NABERS rating of office building
- Green lease schedules for tenanted buildings
- Treasury Loan Fund – Sustainable Government Investment Program (TLF-SGIP)
- Government Building Retrofit Program (GBRP)

While individual programs were developed to address specific purposes and differ in settings, target group, timeframe and requirements, they had some common features and were grouped under the EEGSP umbrella with coordination and facilitation through OEH. All five programs are targeting NSW Government agencies that were required to meet whole of government targets to reduce greenhouse gas emissions. OEH provided expert technical advice to government agencies, to help them take cost effective actions to meet the targets.

This synthesis of findings for EEGSP programs is mainly based on a self-assessment report drafted in March 2012 by OEH. While informed by stakeholders' feedback and monitoring data available for each program this mainly reflects an internal perspective on the strengths and weaknesses. There would be benefit in a more comprehensive independent evaluation that could build up existing monitoring and evaluation information existing at program level.

### **3.4.2 Progress of individual programs**

#### ***Schools Energy Efficiency Program***

The Schools Energy Efficiency Program provides funding to help reduce greenhouse gas emissions from NSW public schools (primary and secondary). The \$20 million program is open to 225 NSW public schools until 2012. The program offers lighting retrofit for each participating school and up to \$18,000 per school for students to select and fund their own energy efficiency projects through the Student Savings Fund.<sup>7</sup> Implementation is coordinated by the Department of Education and Communities (DEC) with the assistance of OEH. Delivery is conducted through sub-contractors.

The design is a turnkey program to address the ageing lighting infrastructure in NSW Government schools, particularly for light fittings with lamps no longer manufactured. Participating schools were chosen by the DEC, based on their need for a lighting upgrade, though those already earmarked for upgrades through forward capital programs were excluded.

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<sup>7</sup> <http://www.environment.nsw.gov.au/grants/ssep.htm>

According to OEH feedback, the program was delivered in-time and on budget. A total of 126 schools will have received lighting retrofits by June 2012, which represents half of targeted schools. Delivery faced some difficulties, especially in relation to the installation of new lights. Installation had to occur during school holidays and at the beginning of the program it was not possible to use the first set of holidays because a number of approvals had to be sought beforehand. For the final year (2012) the program made sure to obtain stakeholder approval earlier than funding approval in order to be able to start installation during the first school holidays. Feedback from participating schools suggests that participants are satisfied with the program. One barrier was where implementation overlapped with the Commonwealth's Building the Education Revolution program which resulted in some sites being partially retrofitted by each program. Improved communication between Commonwealth and State program deliverers reduced this overlap.

In terms of outcomes, estimated annual savings across the 126 schools are \$1,330,000 off power bills (schools are only in use 200 out of 365 days a year, which increases the project payback period), 6,150 megawatts-hour of electricity and more than 6,500 tonnes of carbon pollution. However no evidence is available on actual savings.

#### **OEH Comment**

The Schools Energy Efficiency Program is now completed. Results from it will inform the Department of Education and Communities on the viability of future school energy efficiency projects to be funded under the SGIP or through capital expenditure.

#### ***NABERS ratings of office buildings***

The EEGSP set clear targets in relation to environmental performance of buildings for government owned or tenanted office buildings over 1000m<sup>2</sup> to

- obtain a NABERS rating by 31 December 2008,
- achieve and maintain a NABERS rating of 4.5 stars for energy and water by 1 July 2011, where cost effective, and
- where new or refurbished, achieve and maintain 2011 targets from 18 months of the first occupancy, where cost-effective.

OEH identified offices requiring NABERS rating (National Australian Built Environment Rating System) but each agency was responsible for obtaining their NABERS ratings. To meet those targets, agencies were offered support. The State Property Authority (SPA) established a panel of two NABERS assessors through a tender, which was accessible to all the sites, and OEH provided advice and facilitation. According to OEH feedback, efforts remained focused on having all the sites obtain a NABERS rating. However at the end December 2011 only 77 per cent of the site had done so despite continuous improvement from 2007/08 (see figures across financial years until end of June 2011 in

Table 3-5). OEH staff identified several reasons that could explain the slow uptake in required sites to obtain ratings.

- Delays in the initial release of the EEGSP including the NABERS target meant that the deadline was unrealistic.
- A number of agencies initially believed that SPA was going to organise their ratings. Clear and early communication directly with the sites required to obtain a rating would have mitigated this.

**Table 3-5. NABERS ratings obtained from 2007/08 to 2010/11**

NABERS ratings	2007/08	2008/09	2009/10	2010/11
Number of ratings - cumulative	35	66	75	100
Proportion of eligible sites NABERS rated	18%	40%	45%	69%

Source: OEH, NABERS extract, June 2012

OEH identified some key success factors that contributed to improve the uptake according to the sites characteristics.

- Local site contacts have proven to be the most effective at facilitating NABERS ratings for small agencies
- Central contacts were the key contact for large agencies such as NSW Police
- Letters to executives of agencies who had failed to obtain ratings resulted in an increase in activity.

When considering the second target that should have been achieved by July 2011, only 37 per cent of the 100 rated sites had met or exceeded the 4.5 star target as of December 2011.

There is very little evidence of outcomes in terms of reduced energy consumption. The rating may have provided motivation for each site to reduce their energy consumption but anecdotal evidence suggests that the rating alone doesn't provide a pathway for improvement.

### ***Green Lease Schedules (GLS) for tenanted buildings***

The EEGSP included another target related to environmental performance: all government tenanted buildings had to include a Green Lease Schedule in all new or negotiated leases or when exercising a lease option, where practical. A Green Lease Schedule is a formal commitment to energy efficiency and sets a minimum ongoing operational building energy performance standard measured by the NABERS.

The State Property Authority (SPA) had responsibility under the EEGSP to 'implement' Green Lease Schedules at those tenancies in which SPA was the head lessee. Other tenanted sites were able to access the Green Lease schedule.

At March 2012, no Green Lease Schedules had been attached to the lease of a NSW Government tenant. OEH staff identified some key reasons for this.

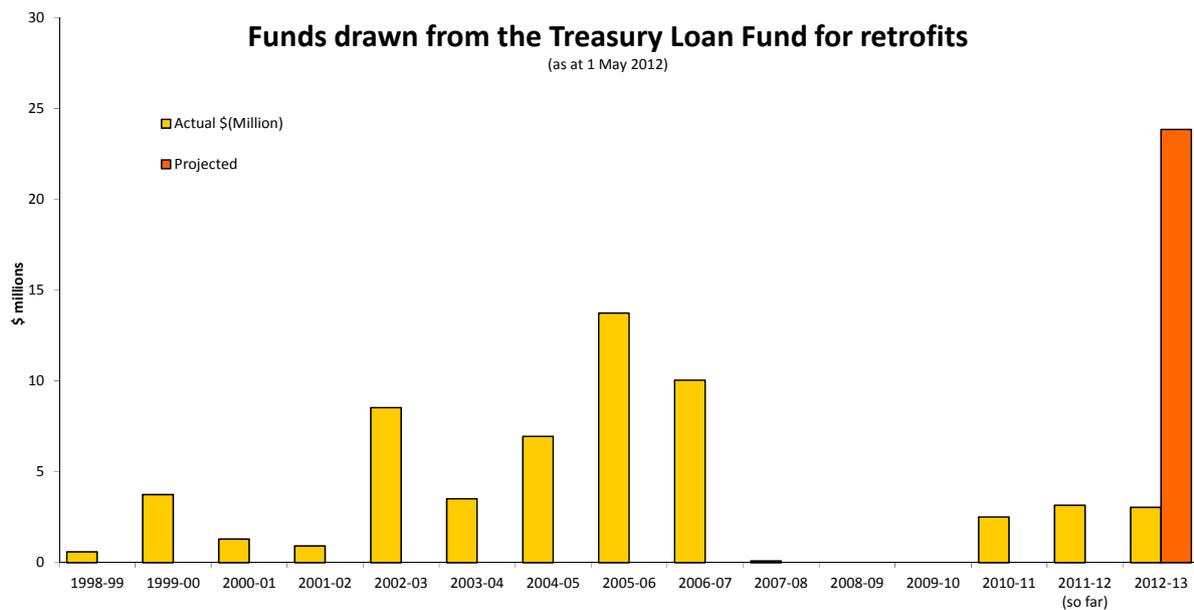
- Again delays in the initial release of the EEGSP including NABERS targets meant that the deadline was significantly condensed. This was also due to the development of a National Green Lease Schedule at the same time. SPA delayed the release of the NSW schedule to ensure it aligned with the National Green Lease Schedule, which in the end had lower requirements than the NSW schedule.
- The Green Lease suffered from the competing goal of reducing rents for contract managers: because building owners perceived GLS as a source of additional costs they dropped it early in lease negotiations.
- In late 2011, SPA sent a letter to OEH saying that by creating the Green Lease Schedule it had fulfilled its commitment to ‘implement’, although no Green Lease Schedules had been attached to NSW Government leases.

According to OEH staff an important area for improvement for this program is the communication and collaboration with the SPA that could have been better to ensure an appropriate program design and effective implementation.

### ***Treasury Loan Fund – Sustainable Government Investment Program (TLF-SGIP)***

The Treasury Loan Fund has been designed to help agencies to meet the up-front costs of implementing energy efficiency measures. It provides government agencies access to funding to implement cost effective energy and water efficiency upgrades with borrowings from the fund repaid with the savings generated. Eligible agencies are budget dependent agencies with building upgrade projects totalling \$10,000-\$500,000 (\$1,000,000 for NSW Health).

OEH provides support to agencies in the form of technical assistance to identify cost effective actions, audits and business case development. OEH organises workshops and one-on-one assistance to agencies. A contractor was also engaged in 2009 to make the application form easier to follow. TLF-SGIP applications rose slightly from 2010-11 as shown in the Figure 3-1 below.

**Figure 3-1. Treasury Loan Fund uptake**

Source: OEH, TLF expenditure, May 2012

Feedback from agencies identified two main barriers to loan take up: the lack of technical knowledge (engineering and financial) and time or staff to prepare the complex application form, but especially the lack of resources to identify appropriate opportunities to be funded. To address this OEH developed the Government Building Retrofit Program from July 2010 to support this first step for agencies. Uptake of the TLF-SGIP by NSW Government agencies for building retrofits went from less than \$84,000 over July 2007-June 2010 to over \$2.5 million in 2011/12 as a result of the GBRP. According to financial data from projects that were at an advanced stage of planning in May 2012 it is expected that agencies will draw \$23.9 million from the fund in 2012/13 (Figure 3-1).

OEH staff identified another key requirement to improve the uptake of the Treasury Loan Fund: the agency finance approval chain has to be activated as early as possible to ensure that projects identified in a financial year can progress in that same year.

### ***Government Building Retrofit Program (GBRP)***

In 2010, the Minister for the Environment approved the 2 year Government Building Retrofit Program (GBRP). The program has two streams, one that covers audit costs for large sites on the provision the agency agrees to apply to TLF funding; and the other that cover both audit and implementation costs for small front line service delivery sites (that has been piloted in the Lower Hunter, Illawarra and Circular Quay precinct until the end of June 2012). Under the large sites stream, OEH coordinates and funds an audit to identify cost-effective projects. The resulting audit report provides the agency with the specifications and business case required in the TLF-SGIP application form.

Facing the risk that participating agencies may not progress to implementation, OEH learned from the experience of the Water and Energy Saving Action Plan (WESAP) that was compulsory for large energy and water consumers in NSW from 2007. Fifteen NSW agencies were required to develop a WESAP; they identified 77 cost-effective actions but only 8 were implemented. The main reason was that there was no requirement to implement those actions and annual reporting requirements could still be met by reporting no activity. To avoid such results OEH changed the initial program design to require the agency to commit to apply for a TLF –SGIP loan to receive the audit. The program also initially underestimated the time required for agency approvals which resulted in some delays in commencing works and implementation. This process is now launched as early as possible.

As at the end of March 2012, 112 small sites had been audited, but seven audits did not progress to approved retrofits; implementation had commenced or been completed in 7; 20 applications for large sites were also in the application process for the Treasury Loan Fund at that time. Feedback from agency representatives is very positive: they appreciated the expertise and funding provided to undertake building retrofits and ultimately save the organisation money.

Key success factors of this program have been to provide agencies with a turnkey program in order to compensate their lack of technical knowledge, time and budget for audits as well as to focus only on a small number of actions offering opportunities for greater savings. Identifying the key site contact has also greatly contributed to successful implementation as they have the site knowledge such as maintenance and contract requirements.

The Government Retrofit Program is the only EEGSP program that has results available on actual savings achieved by participants and verified through s before and after measurement. Measurement and Verification (M&V) has been applied to two projects, chiller retrofit in Westmead Hospital and lighting retrofit in Sydney Opera House. Savings for the Westmead Hospital represented 12.4 per cent reduction in chilled water plant energy use and a 3.6 per cent reduction of total site electricity use. Total electricity savings for the Sydney Opera House was estimated in the range of 3 to 5 per cent overall by adding up savings achieved from six specific areas. The Central Passage is one of these areas and it has saved 32 per cent in electricity consumption as confirmed in the M&V trial. While the examples are not representative of all GBRP projects, they provide an indication of savings participating agencies can achieve.

By June 2012 the small sites component of the Government Building Retrofit Program had generated estimated savings of 4,011MWh of electricity and 1,561 GJ of gas leading to a savings in participants' energy bills of over \$.657 million. The energy savings have also resulted in 4,354 tonnes of avoided CO<sub>2</sub> emissions (Table 3.6).

**Table 3-6. Government Building Retrofit Program–small sites component - estimated savings for one year from activities implemented to June 2012**

Reach	Electricity saved (MWh) pa	Gas saved (Gj) pa	CO2 tonnes saved	Participant s \$ savings electricity bills pa	Participant s \$ savings gas bills pa	Participant s \$ total savings pa
105 sites, 567 projects	4,011	1,561	4,354	\$637,749	\$19,669	\$657,418

Source: Strategy and Analysis, OEH, from program data provided 22 June 2012

Notes: The savings were calculated for the 105 government owned sites received a site assessment and detailed specifications for works and potential energy savings. Site assessments identified 567 energy saving measures. Implementation is underway/ expected for all identified measures. The bill savings use the tariffs developed for the 2010-11 Climate Change Fund annual report (natural gas, government - \$12.60/GJ; electricity, government - \$159/MWh).

### 3.4.3 Overall learnings

From the perspective of coordinator and facilitator, OEH staff identified overall lessons from the implementation of the Government Sustainability Policy as an ensemble of energy efficiency programs targeting government agencies.

The design of the five programs under this umbrella proved to be not equally appropriate to reach the government agencies and effectively engage them in the program rationale. Setting targets was not sufficient. ‘Out clauses’ included in the policy, such as “where practical” or “where relevant” means target were not mandatory. Based on feedback from agencies, OEH staff identified that having a clear policy mandate, agency-specific targets and accountability requirements possibly with public reporting would support the successful implementation of programs.

Effectiveness of implementation of the programs varied significantly: some had some good results like the Government Retrofit Building Program while some others did not produce any impact like the Green Lease program. All programs had common barriers to engage effectively with agencies: the lack of technical knowledge, time and financial resources for audits to apply for the support offered. Some strategies proved to be more successful.

- Target and engage with the right contacts on each site and within the financial chain has been a key requirement for program’s uptake.
- Get early approval from decision makers at each level is essential for smooth delivery. The approval processes can take a long time and should be anticipated in the program delivery timeframe.

EEGSP management identified another key area for improvement: EEGSP programs would benefit from better coordination and alignment with other NSW energy efficiency programs, for example the Green Skills Training Program, to build capacity of agencies

staff or the Energy Savings Scheme to minimise the program's upfront costs for participating agencies.

### **OEH Comment**

The complementarity review informed government decisions to retain the EEGSP. The GBRP and School Energy Efficiency Program were ceased as planned in 2012.

The NSW Energy Efficiency Action Plan incorporates these decisions and evaluation findings.

The findings highlighted barriers that may slow uptake of government energy efficiency projects. For instance, while the Treasury Loan Fund can provide finance for government energy efficiency projects, it only applies to a small number of agencies, has rules that force agencies to repay loans before projects are implemented, and has complex administrative procedures.

The findings indicated that uptake of energy efficiency within government could be improved through early communication between government agencies to ensure internal approvals are obtained and that there is executive buy-in for projects. Existing programs that have no mandated targets or penalties also suffer from significant non-compliance, indicating that agencies need a clear driver for project implementation.

As with the Energy Saver Program, the findings indicated that there is a need for strong measurement and verification of energy efficiency projects in the government sector to establish evidence of financial benefit for ongoing participation.

## **3.5 Energy Efficiency Training Program (EETP)**

### **3.5.1 Design and development**

The EETP is jointly managed and implemented by OEH and the NSW Department of Education and Communities (DEC). The EETP has a budget of \$20 million across five years and commenced in July 2009. The program aims at building the knowledge and skills of key tradespeople and professionals who facilitate and deliver energy efficiency practices, products and services in NSW. Like the Community Awareness program, EETP is also intended to support the delivery of other NSW energy efficiency programs in ensuring that the appropriate skilled workforce will be available to deliver those programs into the future.

The program was designed to address skills shortages that could contribute to bottlenecks in the market for energy efficiency services and create upward cost pressures and supply delays, obstructing the uptake of energy efficiency measures in NSW. EETP was intended to tackle further key issues.

- The current training offer for energy efficiency is fragmented, and supply and demand are mismatched.
- Energy efficiency training content is often not industry-relevant or reaching quality standards.
- Industry awareness of and support for new market opportunities associated with energy efficiency are limited.

To address such issues EETP targeted priority sectors, roles and professions as identified by national research (National Centre for Sustainability, 2009, *Matching Energy Efficiency Policy and Training and Jobs*). These industry sectors, roles and professions have been confirmed as key to improving energy efficiency (The Allen Consulting Group, 2012 *Review of Energy Efficiency Skills Demands and Training Provision across the Trades and Professions*). As a result of the national research and consultation, the Energy Efficiency Training Program is structured around five components:

- Vocational Education and Training (VET)
- Professional Development for VET educators and trainers
- Industry Partnership Projects
- Higher Education projects
- Research and Evaluation.

The program contracted Urbis to conduct a comprehensive independent evaluation over three years. Year one evaluation report (July 2011) focused on the development of the evaluation framework and the assessment of EETP partnership arrangements. Year two evaluation report (draft version in June 2012) presents findings and recommendations about the program delivery and outcomes to date. The main methods used were strategic workshops with program staff, interviews with external stakeholders, documentary review and analysis of data provided by OEH and DEC.

### 3.5.2 Delivery and reach

The first nine months of the program involved developing the partnership arrangement between OEH and DEC as a sound platform for shared program delivery. In this initial stage EETP experienced challenges, especially in relation to differences between the two managing agencies in program focus and operating philosophy. As an example, DEC's central mandate is to support accredited training that leads to recognised qualifications, whilst OEH has sought to target direct training to meet business requirements. Extensive discussions and negotiations resulted in a shared understanding and agreed priorities for the Program.

Internal stakeholders now agree that the partnership arrangement has contributed key strengths of the program: combined capability, expertise and networks, formal structure to focus opportunities, resource sharing and capacity building, strengthened relationships and understanding across agencies, as well as economic and strategic

benefits such as good will and cooperation in government, or access to funding and resources that would not have been available otherwise.

By April 2012 stakeholders reported that the program had increased the capacity of the education sector to provide energy efficiency training to priority sectors, trades and professions. Funding support has facilitated the development of a suite of training courses and materials, and the Professional Development component has targeted skills development for the education workforce to deliver the training. The program assisted in the development of a number of pilot courses and training resources that have been successfully taken up by industry associations, individual companies/ employers and the vocational training sector for ongoing delivery and/or integration into existing training courses. Through well-designed dissemination and knowledge-sharing strategies, including placing on the OEH website, EETP resources have become available across industry groups, individual companies/employers, Registered Training Organisations (RTO) and practitioners not directly involved in pilot training.

EETP management noted the large effort needed to ensure high levels of quality, but limited control on implementation. The biggest impact on the quality of courses was the level of involvement and expertise by industry and trainers and energy efficiency content specialist and industry / business consultation. This varied strongly from low to very high commitment, expertise and resources.

Between July 2009 and April 2012, a total of 5,290 participants had undertaken energy efficiency training, networking or professional development, including:

- 2,695 committed places in the VET system
- 179 participants in the PD4VET workshops
- 629 participants in other VET PD training or networking events
- 1,233 participants in 30 Industry Partnerships projects
- 544 participants in Higher Education courses

The following table gives an overview of the reported level of interest and demand for the trainings and courses as summarised in the EETP year 2 evaluation.

**Table 3-7. Reported demand and uptake compared to expectations**

Component	Reported demand and uptake
VET	<ul style="list-style-type: none"> <li>▪ Demand appears to have grown strongly in a number of courses, such as carbon accounting (105 courses from July 2009 to April 2012) and carbon management (499 courses).</li> <li>▪ Instability in regulatory drivers and government programs has reduced the ongoing level of demand in other courses (such as solar PV).</li> <li>▪ Spend and enrolment data shows strong growth over the last two years, with DEC managing to exhaust the full budget for training subsidies.</li> </ul>

Component	Reported demand and uptake
VET PD	<ul style="list-style-type: none"> <li>▪ Demand for subsidised places in the Vocational Graduate Certificate at Swinburne has outnumbered the available places.</li> <li>▪ Uptake and use of the PD4VET resources by practitioners and RTOs may not have been as strong as anticipated.</li> </ul>
Industry Partnerships	<ul style="list-style-type: none"> <li>▪ The level of industry and employee interest in the training projects has varied.</li> <li>▪ A number of projects reported high levels of industry engagement and participation.</li> <li>▪ Others indicated that filling the course had proved challenging, including cases where those who initially signed up but were unable to attend due to work commitments.</li> </ul>
Higher Education	<ul style="list-style-type: none"> <li>▪ A number of the engineering PD courses have been delayed due to insufficient enrolments.</li> <li>▪ Demand has been highest among undergraduate and postgraduate students (even for courses designed primarily for working engineers)</li> <li>▪ The first set of accounting courses piloted have had reasonably strong uptake, with flexible delivery modes (interactive seminars) reported to be more popular than the longer course.</li> </ul>

Source: Urbis, Evaluation of the Energy Efficiency Training Program – Year 2 Annual report, Draft report, June 2012

The evaluation identified the time required to be away from work as the main barrier for uptake and participation. Instability in the regulatory environment and other government programs has also reduced the demand in some sectors. Program staff and project partners developed strategies to address those challenges, especially in developing flexible modes of training like online modules or through close engagement with the industry to align the courses to the existing industry culture and training mechanisms, e.g. accredited training or Continuing Professional Development (CPD) requirements.

The program started with a broad approach and at this interim stage is looking to have more control over the delivery mechanisms and more strategic focus with the stakeholders that have been involved in the program.

### 3.5.3 Outcomes

The evaluation found that the Industry Partnership and University Projects have contributed towards a structural change within industry and the education sector with respect to awareness and understanding of the opportunities presented by energy efficiency. Feedback from participants on the relevance and quality of training delivered was largely positive for Industry Partnership projects and mixed for VET courses.

The majority of participants for both types of projects intend to apply their learning in practice. A commonly noted core training outcome across all EETP components is participants' increased confidence to engage with energy efficiency and capacity to work with energy efficiency technical experts to ensure advice is applied appropriately to their business.

Some barriers to the application of learning across VET and Industry Partnerships have been identified: lack of management support in the form of commitment from senior levels of the organisation and prioritisation of energy efficiency initiatives; time and resourcing limitations; challenges to demonstrate the business case for change; and a short-horizon for business decision-making. Possible mechanisms to address such barriers have been identified such as ensuring sufficient customisation to the business context, including workplace projects in the training, involving directly the management in the training, continuing a systems approach to training (targeting both technical skill and decision-making requirements), and providing end-to-end training and implementation support.

The evaluation did not report on the extent that EETP has at this stage been able to support a development of a skilled workforce involved the delivery of other NSW energy efficiency programs as it takes years to increase skills and see the results in the workforce.

At this stage, while many of the new training courses were only delivered in the past 18 months, there is some evidence that a number of training participants have demonstrated changed organisational practices, operations and/or technologies and some were able to estimate or measure resulting energy savings. For example one Industry Partnerships project proponent said *'We're in the process of measuring savings – nominally expect these to be around \$1,200 a month but might actually realise a lot more than this. We're then hoping we can expand this to other plants around NSW.'*

Other examples of savings have been documented in case studies, for example the GPT training and that conducted for Commercial Kitchens (on the OEH website). Outcomes from more recent projects have highlighted the energy efficiency initiatives undertaken and the resulting energy reductions e.g. University of Wollongong reported saving almost \$200,000 per annum from an IT shut down procedure; Compass Housing education for tenants and staff led to lighting upgrades and tenants installing shades and fans; and the Casino Club reported power usage down by almost 20% as a result of monitoring appliances. These organisations reported that the training was crucial to these equipment and behaviour changes.

### 3.5.4 Conclusion

The program's partnership and its strategic approach to stakeholder engagement have put energy efficiency on the skills development agenda of the industry. Based on a strong framework for collaboration between government, industry and the education sector, EETP has contributed to strengthen the quality and relevance of energy efficiency training for priority sectors. Participants reported that training was useful, relevant to their role and contributed to growing confidence and engagement with energy efficiency. There is emerging evidence of energy savings from the training projects. The longer term savings from changed practices resulting from the training will only become discernible in future years.

### OEH Comment

The complementarity review informed the government decision to cease the vocational training elements of the EETP as it duplicated funding from the Commonwealth for energy efficiency vocational training as part of the Clean Energy Future package.

The non-duplicative components of the EETP have been merged into the ESP.

## 3.6 Energy Efficiency Community Awareness Program (EECAP)

### 3.6.1 Design and development

The EECAP is a communication and education program targeting the broad community to improve community knowledge, understanding and motivation to act in relation to energy efficiency. Initial research indicated that NSW consumers lacked information on how their choices of technologies and behaviours relate to their electricity use. The program was designed to address this and to support the broader objectives of the Energy Efficiency Strategy using a comprehensive, multi-strategy and ongoing approach that reflects best practice in social marketing. The design drew upon the experience of previous NSW Government behaviour change programs, such as road safety, health and waste. It aimed to reach a range of different audiences including households, culturally and linguistically diverse communities, small businesses, and young people, and undertook formative research to understand their needs and wants and how best to pitch the behaviour change message. The campaign design also had to account for a number of issues: starting from virtually a zero base (there had been no prior mass education relating to energy efficiency); energy use was complex and seasonal (requiring two phases per year); sustained and regular engagement was needed to begin to establish a new social norm.

This \$15 million program had three main components with multiple projects:

- Mass media communication (80 per cent of the budget) using the Save Power mass-media advertising campaign (black balloons) through a variety of communication channels (both above and below the line) and public relations, sponsorship, online media and public engagement activities. The website was designed to be an ongoing information hub for energy efficiency tips, a pledge tool, e-news, SMS tips subscription and a portal to other energy efficiency initiatives such as the EESBP, EETP and Energy Saver and HPSP.
- Education and training (15 per cent) covered three key initiatives:
  - The NSW Energymark project, a partnership with CSIRO that gathered small groups of householders each week in people's homes to learn about the environmental impacts of energy usage, and how to be more energy efficient in their lives.

- The Save Power library kits which enabled borrowers to self-assess their household energy use, costs and greenhouse gas production.
  - The Retailer Engagement Project (REP), a partnership with major appliance retailers that included training of their sales staff and provision of point of sale information to assist customers to include consideration of energy efficiency in their purchasing decision making processes
- Research and evaluation (5 per cent). This component was critical to inform the initial program design. It also contributed to refine the program delivery along the way, in particular the mass media campaign through tracking research.

Under the research and evaluation component OEH contracted Instinct and Reason to conduct comprehensive monitoring and tracking research for the mass media campaign. In 2011 OEH commissioned Databuild to undertake a comprehensive evaluation of all the program components with the broad aim of ascertaining the impact of EECAP on the knowledge, attitudes and behaviours of the NSW community, drawing upon the tracking research. The Databuild report is not complete at the time of writing, however, preliminary findings have been obtained and are presented below. The methods being used by Databuild in the report include a telephone survey of 200 NSW residents identified through the tracking research and an online follow-up survey. OEH also had the final report by the CSIRO on NSW Energymark as well as internal evaluation reports for the Save Power Kits project and the Retail Engagement Project.

The preliminary results indicate that the rationale for EECAP and the holistic program logic was clear, logical and aligned with good practices drawing upon previous experience and extensive research. The \$15 million budget over three years was considered comparable with budgets for similar programs (e.g. \$5-6 million annually for the Victorian Government's 'black balloons' energy efficiency campaign), although resources were one of the key challenges in the delivery of the program. While there were some issues in managing partners and the CSIRO work for the Energymark project, EECAP engaged effectively with a very broad range of stakeholders. EECAP program managers mentioned two difficulties with implementation, firstly the different timeframes of the components and secondly the dual program structure with two managers, one for program support and one for community education.

### **3.6.2 Reach and delivery**

The mass-media campaign achieved a high level of reach. It targeted an overall population of 5.8 million persons (approximate NSW adult population), and over the five campaigns the tracking research estimated over 15 million adult viewings of the advertising on television at least once (depending on the phase, between 35 and 53 per cent of those who saw it say they saw the advertising six or more times). At the final measure (post summer, 2010/11), 3.7 million adults or 63 per cent of the NSW population had seen the Save Power ad on television, and of these, 44 per cent saw it six or more times.

The Save Power website also achieved a substantial level of exposure. In three years it had over 246,750 unique visitors (72% from NSW); over 1 million pages viewed (1,040,267) and over 3,500 Save Power website members; 650 SMS subscribers for seasonal tips; and over 3,800 subscribers to information updates. Over 9,000 actions were promised from 819 individuals, with potential to save \$966,600 off power bills and 4,935 tonnes of carbon. EECAP report that it was ranked in the top 10 of environmental websites in January 2011.

In addition to the mainstream advertising, the campaign achieved a range of media exposure and engagement, through features in consumer lifestyle and home publications and radio; the Save Power Challenge partnership with News Limited; direct engagement with consumers through e-news, SMS and other media; distribution of promotional tools; grants to 36 councils to promote the HPSP and awareness of Save Power; and grants to nine councils to promote the message with a focus on Aboriginal and CALD communities.

An illustration of outreach under Save Power is the work through the Sustainable Living Program, a partnership with the Ethnic Communities Council. 15 bi-lingual educators received training on the kit, and 13 received the 1½ days training program, resulting in 57 energy workshops delivered to 1044 participants. A new resource (flip chart) is being finalised with Save Power information and messaging designed for educators, council staff, and migrant centre staff. A new program in 2012 will recruit 20 Energy Champions and 50 Leaders from across CALD communities to encourage participation and action to reduce energy.

The Energymark project was a NSW trial of a national program developed and managed by the CSIRO. Since active commencement in November 2010, 112 convenors completed groups (with another 19 convenors and groups still in progress). With an average of five people in each group, 517 participants had completed a group by April 2012. The NSW Energymark Final Report (CSIRO, June 1012) noted that the program disproportionately attracted middle-aged, university-educated, professional women, and most participants already held positive attitudes towards the environment, typical of Australians in general. Even with this more aligned and receptive group, the program was able to achieve energy savings.

The reach of other EECAP projects were also very encouraging. Save Power library kits (841) were placed with 62 Central Library Services in NSW (with up to 260 branch libraries). Over 6,400 households borrowed a kit in the twelve months between March 2011 and March 2012, and 2,200 people attended a local library workshop on how to use it. The borrowers were satisfied with the kits (96 per cent of the respondents to the online borrower survey) and there was evidence of positive impact on their knowledge and behaviour (e.g. 75 per cent of the respondents said that since borrowing the kit they will now purchase an electrical appliance that uses less power, compared with only 31% before using the kit).

The Retailer Engagement Project has successfully engaged major electrical appliance retailers (Harvey Norman, The Good Guys, David Jones, Myer). It has been in the field for 18 months and provided training to staff in 142 stores through 1,282 store visits, resulting in 78 per cent of store staff trained and 92 per cent satisfaction from store managers.

### 3.6.3 Outcomes

People reached by the mass media and educational components of EECAP have reported raised awareness, positive responses and in many cases increases in their energy saving behaviours.

Tracking research demonstrated that approval of the campaign remained high over time, from winter 2009 to summer 2010: more than 80 per cent of people approved or strongly approved the NSW Government advertising with messages about saving power. The campaign appears to have some success in raising awareness of issues involving environmental concerns about energy use and motivating behaviour change.

Those who have seen the campaign are more likely to have changed behaviour to save electricity compared to those who have not seen the campaign (46 per cent versus 36 per cent). Tracking research found significant increases in many of the behaviours portrayed in the Save Power campaign compared with the 2009 benchmarks (such as installing thick curtains, blinds or shutters to reduce heat; checking the fridge is working efficiently). At the final measure (Post summer, 2010/11), almost two-thirds of NSW adults (63 per cent) had seen the television advertisement, with 77 per cent finding it “very” or “fairly” convincing, and a third feeling motivated to the energy saving actions in the messages.

At the same time issues around energy efficiency and particularly rising electricity costs were featuring widely in the media. To examine the extent behaviour changes related to the campaign, the Databuild telephone survey (N = 200) examined the attribution of the changed behaviour, and found that the campaign had an influence upon half of those who have taken action since the campaign and recall it. Respondents tended to cite Save Power initiatives as being a strong influence on behaviour related to electrical appliances and air conditioning, less so washing clothes (most respondents who carried out these behaviours said they had always done so).

The tracking research also suggests that the behaviour changes are sustained over time and that the campaign is building social norms around energy efficiency. Not only do people perceive their own mindfulness about electricity use increasing but they note others around them are also becoming more mindful over time. Almost six in ten (58%) claim they were ‘very’ or ‘extremely’ mindful about their electricity use (in post-summer 2010/11 measure).

While the focus of EECAP was wider awareness raising and capacity to lead to changing behaviours and longer term energy savings, a number of components indicated direct

impacts on energy savings. In particular the Energymark program appeared to induce positive changes in individual behaviour, and reported reductions in carbon footprint, and electricity consumption compared to pre-project levels. Preliminary billing analysis by CSIRO indicates an average reduction in electricity use of 12.3 per cent. OEH is in the process to obtain more comprehensive data to substantiate the estimates. CSIRO estimates a broader reduction in carbon emissions of 6.4% on average for electricity and natural gas use (combined), petrol and diesel consumption (combined), extent of air travel, use of wood fires, household expenditure on consumer goods and services, and food consumption. Interestingly the report notes that among participants exposed to the Energymark experience, even those who came out of the process without enhanced understanding and support of sustainability, generally reduced their emissions and electricity consumption as much as those whose 'green' preferences and knowledge had been greatly augmented. This finding has been replicated in a number of different Energymark trials.

The Save Power campaign may also have impacted on the participants in the other energy efficiency programs. There may be scope to explore this collecting feedback from participants; and through analysing the pattern of hits on pages related to specific programs on the website.

### **3.6.4 Conclusion**

The EECAP successfully implemented a comprehensive, multi-strategy and ongoing social marketing campaign over three years. In its final phase the Save Power television advertising reached almost two-thirds of NSW adults (63 per cent), with most (77 per cent) finding it convincing and a third feeling motivated to the actions in the messages. Approval of the advertising campaign has been positive among the NSW population and research suggests that it contributed to improve knowledge of energy efficiency issues as well as some influence in changing energy use behaviours. The power of the mass media campaign comes from the wide reach which offers great potential for energy savings from behaviour changes at this scale.

The EECAP effectively trialled a range of other approaches to reach different audiences. The experience of delivery, the tracking research and the evaluations are providing OEH with a substantial evidence base to inform future social marketing in this area.

#### **OEH Comment**

The EECAP was ceased in June 2012 as planned.

## 3.7 Data and Evaluation Program (DEP)

### 3.7.1 Design and development

In 2009 OEH established the Data and Evaluation Program (DEP) to report on energy savings and benefits of the programs and inform future directions. The DEP directly addresses the lack of reliable information on energy savings from energy efficiency programs that were highlighted by the 2007 Owen Inquiry into Electricity Supply in NSW. The \$2 million DEP is ground-breaking in Australia—no other jurisdiction has applied such a clear commitment to energy efficiency measures.

The design came from the 2010 Evaluation Framework and Project Plan for the EES but now aims more broadly to inform policy and decision making for the future programs including the Energy Efficiency Action Plan (EEAP). It has four main elements that are in line with best practice in the area (see box at the end of this section on the evaluation of energy efficiency in California):

- Measurement and verification of actual energy savings
- Collection of program delivery information and program evaluations (process and impact)
- Assessment of market and economic benefits
- Integration, interpretation and reporting.

### 3.7.2 Measurement and verification of actual energy savings

This project aims to provide reliable measures of energy savings directly achieved through home, business and government programs by using evidence of actual electricity use to complement estimates based on deemed savings.<sup>8</sup> Current findings on energy savings for programs are in previous sections.

When these direct energy savings programs were designed the expected savings were usually deemed using engineering calculations and assumptions about the extent of uptake and effectiveness of the uptake in realising savings. Deemed savings are

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<sup>8</sup> The biggest challenge in evaluating energy efficiency programs is a lack of direct measurement. Energy savings are what did not happen, but energy consumption is actually what is measured. The difference between energy consumption and what energy consumption would have been had energy efficiency measures not been installed provides a measure of energy savings. Savings computation therefore involves comparing measured energy data and a calculation of “adjustments” to convert both measurements to the same set of operating conditions (i.e. a baseline). Both measurement and adjustment processes introduce uncertainty. These processes produce statistical “estimates” with reported or expected values and some level of variability. National Action Plan for Energy Efficiency (2007). Model Energy Efficiency Program Impact Evaluation Guide. Steven R. Schiller, Schiller Consulting, Inc. [www.epa.gov/eeactionplan](http://www.epa.gov/eeactionplan)

uncertain because their accuracy depends upon the initial assumptions which can be undermined by many real-world factors.

The program addressed barriers related to measurement of energy savings such as:

- no measurement no management - financiers, decision-makers and administrators of energy efficiency projects are hindered by lack of evidence showing savings
- high transactional cost - for an energy efficiency project to source finance from the market place (e.g. through ESS), the lack of a consistent and agreed methods to claim and certify savings incurs high transactional costs
- lack of skills – businesses involved in energy efficiency projects generally lack of M&V skills which in turn exacerbates previous barriers.

In the following box are listed the three main methods used to determine gross program energy savings as described in 2007 by the U.S. Environmental Protection Agency.

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#### **The three major methods to estimate gross energy savings**

- One or more M&V methods from the International Performance Measurement and Verification Protocol (IPMVP) are used to determine the savings from a sample of projects, and these savings are then applied to all of the projects in the program.
  - Deemed savings based on historical, verified data are applied to conventional energy efficiency measures implemented in the program.
  - Statistical analyses of large volumes of energy meter data are conducted.
- National Action Plan for Energy Efficiency (2007). Model Energy Efficiency Program Impact Evaluation Guide. Steven R. Schiller, Schiller Consulting, Inc. [www.epa.gov/eeactionplan](http://www.epa.gov/eeactionplan) page 98.
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As energy efficiency programs in NSW are relatively new, the necessary energy savings data, measurement and verification methods and tools have had to be developed. The actual savings can only be adequately estimated using “before and after” approaches, in which a saving is determined as the difference of the energy use measured after the intervention took place and a baseline representing the energy use if the intervention had not taken place. This approach relies on two factors (1) the availability of measurement data, and (2) a counterfactual baseline which can be only established through statistical modelling with historical measurement data. Both factors posed a challenge to the DEP.

Measurement data could either come from metered energy use (billing data) regularly collected by the energy network service providers, or from task-oriented on-site data logging. OEH does not own and possess billing data, while data logging incurs significant cost and needs technical skills / qualification for wiring. To address this DEP has negotiated arrangements with NSW network service providers to secure participants billing data that had never been released previously.

The second factor—establishing a counterfactual baseline—requires statistical and regression modelling, and these specialist skills were not available within program staff

or participants. To address this gap, DEP developed program-specific measurement and verification approaches that best fitted the situations of each program, taking account of robustness, capacity building, and cost-effectiveness.

The following table presents a summary of the methods used for measuring savings as per June 2012. Details of the methods for each program are provided in the following paragraphs.

**Table 3-8. Summary of methods used to estimate energy savings for each program to end of June 2012**

	Deemed savings		Gross savings	Net savings
	Based on target uptake	Based on actual uptake		
Case study			GBRP	
Small sample			ESP	
Representative sample			HPSP EESBP	HPSP
All projects		ESP GBRP		

Source: OEH, Data and Evaluation Program, August 2012

Two primary methods have been developed and trialled:

- Analysis of billing data for relatively small users such as households and small businesses
- Measurement & Verification (M&V) that uses industrial measures and is most suited for medium to large sites.

**Billing data analysis** is a method to measure participants' energy use based on statistical analysis of billing data provided by energy distributors. This low cost method is most suitable for relatively small and homogeneous users such as households and small businesses where moderate savings are expected, typically over large numbers of users.

Negotiations between DEP and NSW energy distributors for data sharing took 1.5 years, with the need to satisfy their concerns about customer privacy and provide them with business benefits. This resulted in arrangements for various energy savings quantification tasks to access the most comprehensive energy use data ever made available to a government agency in Australia. The applications include:

- **Home Power Savings Program** - the high participant numbers and diversity in household characteristics make house data logging inadequate. Participants billing data is used to determine savings through comparing energy use with a control group using rigorous statistical methods. Preliminary savings analysis for has been completed and full analysis for 2012 is underway
- **EESBP** - projects typically have relatively low investment, straightforward technology, lack of interval meter data, lack of time and higher priority issues. While comprehensive M&V is not feasible, the specificity of each business makes it hard to identify a suitable control group. The approach developed by DEP uses estimated savings from participants billing data and regression methods under the rigorous principles of M&V. This proves a cost-effective methodology to verify savings and assisting small businesses to source finance from the ESS.

Quantification of actual savings is also underway for the Housing NSW's Home Insulation Program (a CCF project), and under planning for the completed NSW Home Rebates Program.

**Measurement & Verification (M&V)** - this method uses best industrial practice to verify savings, and is most suited for medium to large sites where energy use is heterogeneous, measures are complex and relatively high cost, and large savings are expected.

- **Guide for large business and government agency programs (industrial projects in ESS, ESP, EEGSP)** - heavier investment, complex technology, and accessibility to interval meter data calls for robust site-specific M&V for these large participants programs. This requires special skills and consistent approaches, so DEP developed an Operational Guide for M&V for practitioners to standardise approaches aligned with international best practice. The draft Guide was tested using supervised trials with selected retrofit projects in each of the three large participants programs. The projects will provide case studies in the revised Guide, which is due to be web-published in August 2012. The project with ESP has been extended for a full M&V aiming at creation of Energy Savings Certificates.
- **Energy Savings Scheme** – while ESS is legislated and administered outside the OEH, DEP took the initiative to work with IPART to develop a technical guidebook for the ESS Rules accreditation procedure, based on the M&V Guide. This approach benefits OEH evaluation but also IPART's certificate accreditation which has been hampered by the lack of standard and easy-to-follow guidelines;
- **Energy Saver Program** –participants act on energy saving measures identified in energy audits largely on a voluntary basis without government financial support, so an M&V requirement would be viewed as an extra burden. The ESP team started with an M&V project for a small sample of businesses using the least costing option. DEP is planning to follow this with a more comprehensive M&V trial tuned to help claim savings from the Energy Savings Scheme;
- **Government Sustainability Policy** – This program comprises of a cluster of fund schemes differing in setting, target group, timeframe and requirement. The funding and the investment scale make those schemes particularly suitable to M&V and

some schemes have M&V in the contractual conditions. The challenge to commitment is mainly resource constraint and lack of technical knowledge. Apart from the trial projects above, DEP is planning to help project managers take up M&V by providing expert supervision and assistance for more demonstration projects;

### 3.7.3 Collection of program delivery information

This component facilitates the collection of reports, data, views and lessons from programs, and complements quantitative program reporting. A key element is facilitation of evaluation reports from the seven programs.

The direct energy saving programs and the capacity building programs record detailed implementation data in databases and IT systems. The Strategy and Analysis Unit built comprehensive databases, analysed trends and provided reports for the programs, as well as the broader Climate Change Fund Annual Reports that include these programs. Three programs have commissioned multi-stage independent evaluations (HPSP, EECAP, EETP) with draft or interim reports available in June 2012 which have each provided a sound basis for conclusions about the program's achievements and lessons. ESP and EESBP have commissioned various studies and surveys and in June 2012 provided internal evaluation reports which capture some of the program's experience, achievements and barriers, with scope for more detailed analysis of trends and patterns from their data.

In June 2012 ARTD collected the views and experience from managers on coordination and governance across the energy efficiency programs to inform continuous improvement.

### 3.7.4 Assessment of market & economic benefits

DEP is using market studies and economic modelling to assess impacts of the programs as a whole on energy efficiency market, the national electricity market and the state economy.

**Market benefits** – the project aims to evaluate the impact of the energy efficiency programs as a whole on the energy efficiency product and service markets. It started in 2011 with a baseline analysis assuming no program in place, and will undertake a final analysis incorporating all the energy efficiency programs. DEP is to supplement this desktop study with a market survey into energy efficiency service and product market.

**Economic benefits** - this project is to establish cost-benefit metrics of the energy efficiency programs as a whole for the electricity market and the state economy, covering public as well as private costs. It involves energy market and economy wide modelling and will transfer some of the modelling capacity to OEH at the completion (currently under procurement).

### 3.7.5 Integration, interpretation and reporting

The project was designed to integrate and interpret program information and evaluation findings of the seven energy efficiency programs and other projects into an overall assessment.

**Integration and reporting-** the project has evolved to focus on annual overall reports on the progress and outcomes of the programs and interpreting the findings into policy messages. DEP engaged ARTD in 2010 as the evaluation partner to undertake this role.

The present report is a key output of this project, integrating findings at the program level into an assessment of the delivery of the initial Energy Efficiency Strategy. This will be part of the evidence base for consultation and planning on future directions with energy efficiency policies and programs. **Evaluation Advisory Group (EAG)** - the group was set up to coordinate and review evaluation processes across four branches, and comprises program managers of the seven energy efficiency programs, with DEP as secretary to the Group. Six EAG meetings have been held since December 2010 with the seventh in June 2012. A satisfaction survey by ARTD in 2011 found members largely satisfied with sharing information but suggested improvements for meeting preparation, scheduling and location,

### 3.7.6 Other data development for energy efficiency

OEH and CSIRO have a collaborative project aiming to develop broad-based energy use data and energy efficiency scenario modelling to support evidence based policy development in the residential sector, in parallel with the evaluation of the energy efficiency programs. It commenced in 2010 in partnership with Ausgrid, Endeavour Energy, Essential Energy, Jemena Gas Network, Housing NSW and Department of Planning. Phase 1 is a granular NSW home energy use data development project completed in June 2011. CSIRO is currently finalising Phase 2 due July 2012– modelling for three pilot scenarios: solar photovoltaic (PV) uptake, hot water system replacement and high star wash machine uptake.

### 3.7.7 Conclusion

The DEP is providing more reliable information on energy savings and telling the story of the OEH investments in energy efficiency, leading to less uncertainty and better information to inform future directions.

DEP has made significant progress in developing and applying best practice methods to produce more reliable energy savings estimate through billing data analysis for small users and M&V for medium to large sites based on the international protocol. While the process has been relatively slow—owing largely to the engagement of external participants on a voluntary basis—it is resulting in highly credible measures that will increasingly generate more reliable data on actual energy savings.

The individual programs are recording detailed delivery data in comprehensive databases, supported by the analytical capacity of the Strategy and Analysis Unit. Programs are increasingly using this data to inform implementation and for evaluation. The programs with multi-stage independent evaluations (HPSP, EECAP, EETP) have provided comprehensive assessments of their progress and lessons. Other programs undertook internal evaluation reports, supported by independently collected participant data.

The integration and reporting of evaluation findings across the seven energy efficiency programs—as per the present report—appears to be filling a gap in the OEH evidence base and can provide OEH with a formal record of progress and achievements as well as a source of information for planning future directions. The 2012 evaluation process has generated greater interest in and commitment to ongoing evaluation of the programs, and provides a number of lessons for considering the future evaluation strategy for investments in energy efficiency.

### **Evaluation of energy efficiency in California**

The DEP program has many similarities with the evaluation program for energy efficiency in California, though at much smaller scale. California is a leader in energy efficiency and sets the benchmark for evaluation. Relevant features of the 2006-2008 evaluation completed in 2010 by the Energy Division (with a budget of \$97 million) were:

- the strong focus on verifying reported energy savings
- use of evaluation tools and measures to apply across multiple programs and sites
- a set of robust independent evaluations covering all the programs
- focus on impact evaluations supported by process evaluations
- use of program theory (program logic) for evaluation frameworks
- including cost-effectiveness and market transformation studies
- increasing the focus on behavioural issues in energy efficiency programs
- production of a state-wide overall evaluation synthesis report with aggregated results

The 2010 evaluation report made some recommendations in line with findings of this evaluation, for example:

- program implementers improve program tracking data collection
- results from the evaluations are used for continuously improving savings estimates and informing future program design.

Sources: Californian Public Utilities Commission, Energy Division (2010) 2006-2008 Energy Efficiency Report.

<http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/2006-2008+Energy+Efficiency+Evaluation+Report.htm>

## 4. Cross-program coordination and strategy-wide governance

This section reviews the strategy-wide governance and the cross-program coordination and information sharing for the NSW energy efficiency strategy in order to identify lessons for the future. It is based on a review of the program evaluation reports; and interviews in May-June 2012 with managers involved in the EES about their experience with the internal governance arrangements and their views about its strengths and weaknesses.

Effective governance processes are always a challenge. They need to balance formal and informal arrangements, and the time and resources for strategy-wide governance with those for program management. The ideal approach will vary with the stage of the strategy, issues around integration, and the structure and culture of the organisation.

### 4.1 The initial design had limited scope for integration

The Energy Efficiency Strategy is a cross-organisation and to some extent cross-agency set of programs and policies. The initial design allowed for a degree of cross-impact: direct energy saving programs with similar approaches that targeted distinct sectors (low income households, businesses, and government); programs providing capacity-building support to the industry and the community; and the market-based instrument of the Energy Savings Scheme (ESS). There were expectations that the direct energy saving programs would utilise the ESS over time, and that the capacity-building programs—EECAP, EETP would contribute indirectly to the delivery of other programs by providing a favourable environment for energy efficiency initiatives.

In practice the scope for integration was limited. The EES itself was developed and approved quickly, before a detailed understanding of how programs would function. Not all OEH energy efficiency programs were included, and internal stakeholders had difficulties with the rationale for which programs were in and which programs were not. Programs in the strategy rarely had direct links to other programs embedded in their respective objectives and settings. In particular the ESS was managed by IPART not OEH and involvement with the OEH programs has only commenced recently. The two capacity building programs (EECAP, EETP) were expected to support the other programs to some degree, but in practice this has been limited as their timeframes did not always match the implementation timeframe of the other programs. EETP in particular which is supporting the development of a skilled workforce for energy efficiency will takes many years to fully realise these results.

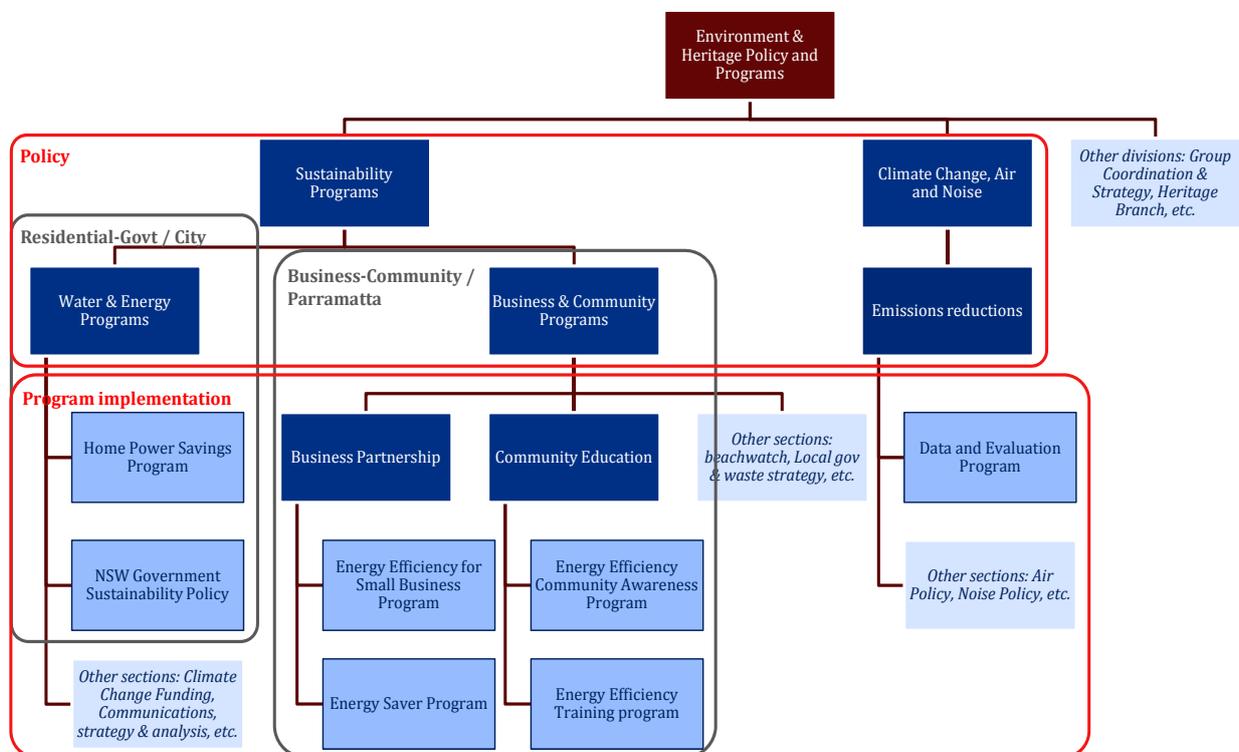
## 4.2 Organisational silos were a barrier to integration

An important point is that the EES sat on top of the existing OEH program management and reporting arrangements and these existing arrangements were largely relied upon for the governance of the strategy. The policy and operating environment over this period was a major factor, with a very volatile policy context, the organisation with a continuing history of structural change, and the transition of many senior managers.

In this context a key constraint on strategy-wide coordination identified by a number of managers was the organisational structure that had silos for management of energy efficiency programs. As represented in the Figure 4.1 below, two silos were the two main branches where energy efficiency programs were sitting—Water and Energy programs on the one hand and Business and Community programs on the other. This was heightened by the geographic split between the first branch located in the City and the other in Parramatta. In the absence of more formal arrangements, coordination and information sharing relied heavily on informal and personal relationships where physical proximity is a key factor.

The other silos were the split between policy and program implementation. Some program managers regretted the lack of feedback down the reporting line that would have offered opportunities for learning from other programs.

**Figure 4-1. Organisational chart of OEH units involved in energy efficiency**



Source: ARTD according to OEH organisational chart, June 2012

### 4.3 Coordination would have been improved by more structured opportunities

EES had a number of arrangements to support strategy-wide coordination and information-sharing including:

- Save Power campaign (black balloons) and the EES web site
- Program data collection and reporting through the Climate Change Fund
- An information-sharing forum for OEH programs in 2010
- Comprehensive EES evaluation framework
- DEP activities and the meetings of the Evaluation Advisory Group (EAG)

The DEP in particular has an explicit mandate for cross-program support and integration. OEH staff welcomed the opportunity offered by EAG meetings to share learnings from other programs. However coordination of evaluation activities did not feed into a wider structure for coordination or governance.

According to managers there was little attention to cross-program coordination or information sharing during the initial development and delivery phase, where each program was largely focused on refining its methods and delivering its outputs,

However programs identified opportunities for coordinated activities along the way. For example HPSP and EECAP had coordinated initiatives, for instance in regard to a common CALD strategy and council grants. While developing these initiatives took time and could have gone further, both programs acknowledged the benefits and wished there were more similar initiatives. In the residential sector, an internal household reference group was created to promote coordination including a research component that provided some key insight into behaviour changes issues, but this has not continued.

Other examples of successful coordination include cross-program initiatives within the business sector between EESBP and ESP, both working out of the same branch. They collaborated on the panels of service providers used for retrofits and technology seminars. EETP has also worked collaboratively with the ESP program and the development of technology guides. The two business programs also have arrangements for businesses that fall in the 'grey' area between them. These programs are working to develop synergies with the Energy Savings Scheme which is a potential source of project capital for participating businesses through the generation of ESCs. Program staff regretted the lack of formal arrangements for coordination with the ESS though recently programs have been developing these opportunities.

One of the consequences of limited coordination has been risks such as inconsistent market signals from different initiatives or market saturation. There were also cases when different programs worked quite separately with the same external stakeholders such as government agencies, councils or NGOs.

At the same time managers highlighted the good will of their colleagues and the instances of informal sharing that occurred. For instance EEGSP has called on the two business programs to assist it to address implementation issues experienced by participant agencies. But in practice, most managers saw lost opportunities for working more closely together and sharing information, resources, and even staff. Feedback from program managers highlighted the potential for improving implementation through a more structured approach to coordination.

#### **4.4 Managers seek more overarching governance**

The Energy Efficiency Strategy did not have an overall governance framework or a cross-program management group. The main management focus was on delivery by each program, through the normal program management controls, and reporting through the Climate Change Fund data system.

Managers had mixed views about the communication of the overall direction for the strategy, with senior managers more positive than the others. Program managers wanted more information on the overall strategic agenda, how the programs were positioned, and likely future developments, particularly in the rapidly changing environment.

Overall most managers wanted a more systematic and structured process for strategy-wide governance and information sharing at the strategic and program delivery levels. They also recognised the potential burden associated with excessive governance arrangements and the value of retaining program flexibility.

##### **OEH Comment**

OEH has established the Energy Efficiency Steering Group to coordinate energy efficiency policy development, program delivery and evaluation.

Improved governance and coordination is also a feature of OEH's new corporate structure as of early 2013.

## Appendix 1. Evaluation reports used for the synthesis

Each NSW Energy Efficiency program has been conducting evaluation activities as part of the overall evaluation strategy and/or their own evaluation strategy. To inform the present report ARTD requested information from each program about the main achievements to early 2012, progress towards and likely success in meeting its objectives and targets, and the story of how the program has adapted to overcome barriers and make improvements.

In line with their respective evaluation arrangements, programs provided this information as an independent evaluation report or as an internal report based on feedback and data collected over the course of the program, including in some cases independent evaluation activities such as surveys of stakeholders.

The following table presents an overview of program evaluations and reports that ARTD has used as input for this evaluation. For each programs it specifies main data collection methods.

**Table 4-1. Evaluation reports and main data collection methods for each report**

Program	Evaluation reports	Main data collection methods
Home Power Savings Program (HPSP)	2012 Interim Evaluation of the Home Power Savings Program (ARTD 2012)	<ul style="list-style-type: none"> <li>▪ Review of program documentation, monitoring and audit data</li> <li>▪ Quantitative analysis of the assessments database</li> <li>▪ Assessors' survey</li> <li>▪ 3 focus groups with households</li> <li>▪ Interviews with internal and external stakeholders</li> <li>▪ One pilot case study</li> </ul>
Energy Efficiency for Small Business Program (EESBP)	Internal interim evaluation report (ISF 2012) Evaluation of the Program Phase I (Databuild November 2011) Evaluation of the Program Phase II (Databuild June 2012)	<ul style="list-style-type: none"> <li>▪ Analysis of assessments and retrofit databases</li> <li>▪ Audit findings</li> <li>▪ participants survey and interviews (Databuild)</li> </ul>
Energy Saver Program (ESP)	Internal interim evaluation report (2012) Evaluation of the DECCW ESP II (Databuild March 2011)	<ul style="list-style-type: none"> <li>▪ Analysis of the projects database</li> <li>▪ Participants survey (Databuild)</li> </ul>
NSW Government Sustainability Policy (GSP)	Internal interim evaluation report (2012)	<ul style="list-style-type: none"> <li>▪ Regular review of monitoring and audit data</li> <li>▪ Informal feedback from programs' participants</li> </ul>

Program	Evaluation reports	Main data collection methods
Energy Efficiency Training Program (EETP)	Evaluation of the Energy Efficiency Training Program – Year 2 Annual report (draft) (Urbis June 2012)	<ul style="list-style-type: none"> <li>▪ Review of program documentation</li> <li>▪ Workshops and discussions with program staff</li> <li>▪ Interviews with external program stakeholders</li> <li>▪ Analysis of project data</li> </ul>
Energy Efficiency Community-Awareness Program (EECAP)	Preliminary findings to inform the evaluation of the Energy Efficiency Community Awareness Program (Databuild June 2012)	<ul style="list-style-type: none"> <li>▪ Literature and documentary review</li> <li>▪ Interviews with internal and external stakeholders</li> <li>▪ Telephone survey with 200 NSW residents</li> </ul>
	NSW Energymark Final Report (CSIRO June 2012)	<ul style="list-style-type: none"> <li>▪ Pre-Project, Interim and Post-Project Questionnaires (knowledge, attitudes and behaviour)</li> <li>▪ Pre-Project and Post-Project Carbon Footprint Questionnaires</li> </ul>

## Appendix 2. Estimates of actual energy savings - preliminary results

### *Home Power Savings Program (HPSP)*

Savings were estimated using two methods from 7,000 homes which account for about 18 per cent of the total program participants at the time of commencing the analysis. Two analysing methods were used: paired comparison with a control group, and regression. The result is summarised in the following table.

**Table 4-2. HPSP billing data analysis preliminary results**

	Paired comparison with a control group	Regression
Average savings across all homes	0.6 kWh/home/day (or 4.0% reduction)	0.57 kWh/home/day (or 3.8% reduction)
Average savings from homes that received the whole saving kit	0.9 kWh/home/day (or 6.0% reduction)	1.1 kWh/home/day (or 7.3% reduction)
Average savings from homes that received the saving kit items except showerheads	0.52 kWh/home/day (or 3.5% reduction)	0.45 kWh/home/day (or 3.0% reduction)

Relatively speaking, the result from Paired Comparison with a Control Group tends to be more reliable. However the regression method has greater power to probe in details.

The analysis was unable to detect any statistically significant saving attributable to behavioural change.

### *Energy Savings Scheme*

The following table is a case-study from the M&V Guide Development project showing the savings from a major retailer verified using International Performance Measurement & Verification Protocol Option B/C<sup>9</sup> for the purpose of claiming Energy Savings Certificates (ESC) under the ESS. As no projects under OEH programs have claimed ESC, this case study was provided by Energetics.

<sup>9</sup> Option A – Key parameter measurement for the retrofit measure, Option B – Full parameter measurement for the retrofit measure, Option C – Measurement at the boundary of the whole facility

**Table 4-3. ESS Measurement & Verification preliminary results**

Program	Energy Savings Scheme	Site	Major Retailer			
<b>Project Description</b>	A range of retrofits to store lighting, HVAC and refrigeration systems.					
<b>M&amp;V Methodology</b>	IPMVP Option B/C – Regression based analysis of whole facility, analysing input electricity use against ambient temperature (in form of cooling degree days).					
<b>Baseline Period</b>	12 month periods between 2007 and 2010.					
<b>Savings analysis Period</b>	Latest 12 months to August 2011					
Store	BAU Usage (kWh)	Actual Usage (kWh)	Energy Savings (kWh)	GHG Savings (@ 0.89kgCO <sub>2</sub> -e/kWh)	Cost Savings (\$@ \$0.125/kWh)	Savings % against BAU
Store 1	4,013,657	3,535,775	477,882	425,315	\$59,735	12%
Store 2	3,058,474	2,870,810	187,664	167,021	\$23,458	6%
Store 3	2,629,012	2,408,866	220,147	195,931	\$27,518	8%
Store 4	2,886,362	2,808,521	77,841	69,278	\$9,730	3%
Store 5	3,059,178	2,808,955	250,222	222,698	\$31,278	8%
Store 6	2,831,738	2,707,505	124,233	110,568	\$15,529	4%
Store 7	3,008,221	2,823,100	185,121	164,757	\$23,140	6%
Store 8	3,259,854	2,886,208	373,646	332,545	\$46,706	11%
Store 9	3,274,362	2,517,750	756,612	673,385	\$94,577	23%
Store 10	2,747,018	2,534,275	212,743	189,341	\$26,593	8%
Store 11	3,108,976	2,724,971	384,005	341,764	\$48,001	12%
Store 12	2,511,443	2,303,222	208,221	185,316	\$26,028	8%
Store 13	2,208,725	2,045,200	163,525	145,537	\$20,441	7%
Store 14	2,212,504	1,812,628	399,877	355,890	\$49,985	18%
Store 15	2,767,678	2,622,685	144,993	129,044	\$18,124	5%
Store 16	2,964,527	2,753,039	211,488	188,224	\$26,436	7%
Store 17	2,506,977	2,454,609	52,368	46,608	\$6,546	2%
Store 18	2,332,957	2,100,988	231,969	206,452	\$28,996	10%
Store 19	3,034,522	2,419,343	615,180	547,510	\$76,897	20%

Store 20	2,163,252	1,579,611	583,641	519,441	\$72,955	27%
Store 21	2,415,475	2,339,668	75,808	67,469	\$9,476	3%
Store 22	3,055,294	2,693,323	361,970	322,154	\$45,246	12%
Store 23	2,330,794	2,000,496	330,299	293,966	\$41,287	14%
Store 24	2,283,027	1,972,611	310,417	276,271	\$38,802	14%
Store 25	2,033,274	1,685,498	347,776	309,521	\$43,472	17%
Store 26	1,083,103	980,395	102,708	91,410	\$12,838	9%

### ***Energy Saver Program (ESP)***

The following table is a case-study from the M&V Guide Development project showing the savings from a major lighting retrofit project in Sydney Masonic Centre. The project was provided by Energy Saver as a trial project for M&V.

**Table 4-4. ESP Measurement & Verification preliminary results**

<b>Program</b>	<b>Energy Saver</b>	<b>Site</b>	<b>Sydney Masonic Centre</b>			
<b>Project Description</b>	Lighting upgrade from incandescent to LEDs within Grand Lodge Room and Banquet Hall function rooms. The old and retrofitted lighting systems can be dimmed from 0 to 100 per cent.					
<b>M&amp;V Methodology</b>	IPMVP Option A 1. Conduct load test to measure input power draw (amps) for each lighting circuit and measure the corresponding light output (lux). 2. Develop baseline and post-retrofit models for power draw. 3. Estimate operating hours from function data between January and May 2012. 4. Extrapolate savings across 12 months.					
<b>Baseline Period</b>	December 2011					
<b>Savings analysis Period</b>	01 January 2012 to 31 May 2012 (5 months) of functions data June 2012 for post retrofit power draw/light level readings					
<b>Actual Savings</b>	<b>Electricity (kWh)</b>	<b>Cost (\$)</b>	<b>Greenhouse Gas Emissions (t.CO<sub>2</sub>-e) (@0.89 kgCO<sub>2</sub>/kWh)</b>		<b>Savings %</b>	
Grand Lodge Room	35,310	\$5,296	31		78%	
Banquet Hall	27,253	\$4,088	24		66%	
<b>Total</b>	<b>62,563</b>	<b>\$9,384</b>	<b>56</b>		<b>72%</b>	

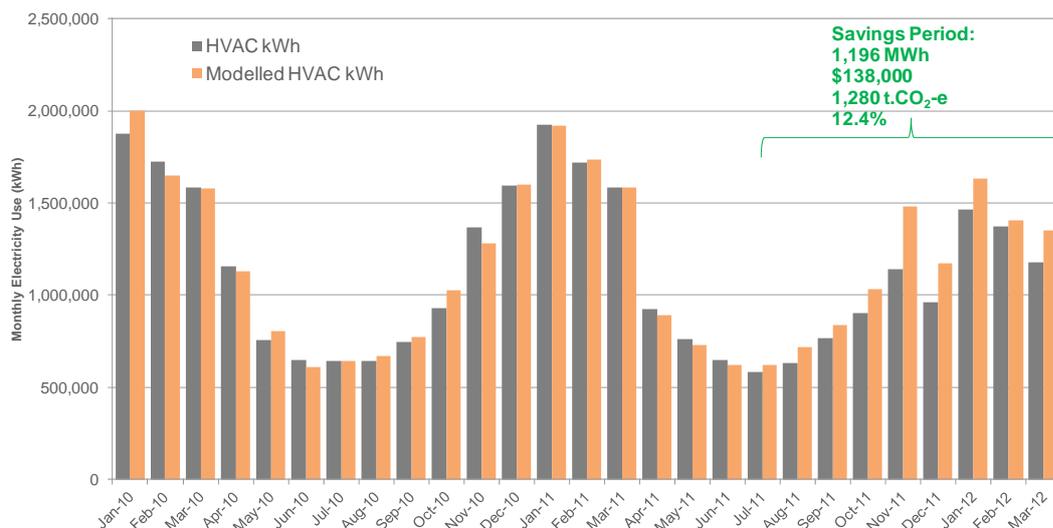
<b>Context</b>	Savings analysis was based on the assumption that the retrofitted lighting system is controlled using similar steps as with the old system. However, as lighting levels have significantly improved, different control steps may be used which may affect the savings estimates.
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### **Government Sustainability Policy (EEGSP)**

The following table is a case-study from the M&V Guide Development project showing the savings from chiller retrofit in Westmead Hospital. This project was provided by the Government Sustainability Program as a trial project for M&V.

**Table 4-5. EEGSP Measurement & Verification preliminary results for the Westmead Hospital case study**

Program	Government Building Retrofit Program	Site	Westmead Hospital	
<b>Project Description</b>	Upgrade of two existing chillers (installed 1978 and 1983) to 2 x 4000kW variable speed drive centrifugal chillers. Additional two cooling towers to meet increased capacity and provide improved condenser water temperature control. New condenser water and chilled water pumps with variable speed drives. New integrated control system with automatic system optimisation capability.			
<b>M&amp;V Methodology</b>	IPMVP Option B/C – Regression based analysis of chilled water plant (chillers, pumps and cooling towers), analysing input electricity use against ambient temperature (in form of cooling degree days).			
<b>Baseline Period</b>	1 July 2010 to 30 June 2011 (12 months)			
<b>Savings analysis Period</b>	01 August 2011 to 31 March 2012 (8 months)			
<b>Actual Savings</b>	Electricity (kWh)	Cost (\$)	Greenhouse Gas Emissions (t.CO <sub>2</sub> -e) (@0.89 kgCO <sub>2</sub> /kWh)	Uncertainty (%) at 95% confidence
	1,196,680	\$138,760	1,065	±29%
<b>Context</b>	Savings represent a 12.4% reduction in chilled water plant energy use (measurement boundary) and a 3.6% reduction of total site electricity use.			



The following table is a case-study from the M&V Guide Development project showing the savings from a starting phase of the Central Passage of Sydney Opera House lighting retrofit. This project was provided by the Government Sustainability Program as a trial project for M&V.

**Table 4-6. EEGSP Measurement & Verification preliminary results for the Central Passage of the Sydney Opera House case study**

<b>Program</b>	<b>Government Retrofit Program</b>	<b>Site</b>	<b>Sydney Opera House, Central Passage</b>		
<b>Project Description</b>	Lighting upgrade involving lamp/fixture replacement and introduction of controls.				
<b>M&amp;V Methodology</b>	IPMVP Option B 1. Measure baseline and post-retrofit energy use using a data logger for the "Central Passage". 2. Determine savings for post-retrofit period by aligning days and adjusting for changes in Sunrise/Sunset times due to photoelectric cell control of lighting. 3. Determine average hourly usage and savings for day and night periods. 4. Use annual data for sunrise/sunset to extrapolate the 2 weeks of data across 12 months. 5. Assume steady state operation on every day of the year.				
<b>Baseline Period</b>	12th to 24th July 2011 (12 days)				
<b>Savings analysis Period</b>	25th October to 6th November 2011 (12 days). Savings extrapolated using 2011 solar data.				
<b>Actual Savings</b>	<b>Electricity (kWh)</b>	<b>Cost (\$)</b>	<b>Greenhouse Gas Emissions (t.CO<sub>2</sub>-e) (@0.89 kgCO<sub>2</sub>/kWh)</b>	<b>Saving %</b>	

	58,087	\$8,713	52	32%
<b>Context</b>	The savings calculated above apply to the Central Passage part of the upgrade.			

### ***Energy Efficiency for Small Business Program***

Of the 1,259 rebated businesses in the Ausgrid and Essential Energy's network areas, 509 were matched with billing data for over 12 months both before and after the retrofit. Of the 509 businesses, 331 were successfully modelled to establish a baseline which enabled an M&V analysis under the Option C (whole building) of the IPMVP (International Performance Measurement & Verification Protocol).

For the 331 businesses included in the M&V analysis, a total of 1,867 MWh has been saved in the first year, or 8.3% relative to the baseline. On average, every business saved 5.64 MWh or 9.3% relative to its baseline for the 1<sup>st</sup> year. This is highly comparable to the initial estimated saving by the auditors of 5.2 MWh per business per year. The following tables show the projects grouped by business types and retrofit technology, respectively.

**Table 4-7. EESBP Measurement & Verification preliminary results by business activity**

<b>Business Activity</b>	<b>Number</b>	<b>Actual Usage (kWh)</b>	<b>Energy Savings (kWh)</b>	<b>Cost Savings (\$@ \$0.20/kWh)</b>	<b>Energy Savings % (to BAU)</b>
<b>Accommodation</b>	12	1,363,717	158,488	31,690	10.4%
<b>Agriculture, forestry, fishing</b>	16	905,360	61,240	12,248	6.3%
<b>Café / Restaurant</b>	90	7,155,684	314,870	62,974	4.2%
<b>Communication</b>	2	112,483	-1,579	-319	-1.4%
<b>Construction</b>	1	25,970	3,496	699	11.9%
<b>Cultural / Recreational Service</b>	7	774,476	14,606	2,921	1.9%
<b>Education</b>	2	31,257	2,969	594	8.7%
<b>Electricity, gas &amp; water</b>	2	13,314	951	190	6.7%
<b>Finance / Insurance Services</b>	3	41,369	9,578	1,916	18.8%
<b>Health / Community service</b>	23	1,183,512	143,246	28,649	10.8%
<b>Manufacturing*</b>	7	607,952	-145,537	-29,107	-31.5%
<b>Personal / Other services</b>	34	952,225	130,863	26,173	12.1%

<b>Property / Business services</b>	9	131,723	24,038	4,808	15.4%
<b>Retail trade</b>	105	5,592,693	753,109	150,622	11.9%
<b>Transport / Storage</b>	15	1,700,393	365,616	73,123	17.7%
<b>Wholesale trade</b>	3	62,278	30,843	6,169	33.1%
<b>Grand Total</b>	<b>331</b>	<b>20,654,406</b>	<b>1,866,739</b>	<b>373,348</b>	<b>8.3%</b>

\* One of the manufacturing site has seen a 74% increase in consumption. This increase is most likely to be related to some non-EESBP factor e.g. production growth. However, without further investigation, it is better to leave it in to observe the objectivity of M&V.

**Table 4-8. EESBP Measurement & Verification preliminary results by technology**

<b>Technology summary</b>	<b>Number</b>	<b>Actual Usage (kWh)</b>	<b>Energy Savings (kWh)</b>	<b>Cost Savings (\$@\$.20/kWh)</b>	<b>Savings %</b>
<b>Air compression</b>	2	65,904	11,236	2,247	14.6%
<b>Boilers</b>	4	284,955	28,417	5,683	9.1%
<b>Hot water</b>	21	966,406	68,615	13,723	6.6%
<b>HVAC</b>	56	2,921,560	245,469	49,094	7.8%
<b>Insulation</b>	3	86,777	-78	-\$16	-0.1%
<b>Lighting</b>	124	6,865,519	1,030,375	206,075	13.0%
<b>Motors and VSDs</b>	5	344,493	49,272	9,854	12.5%
<b>Refrigeration</b>	86	7,670,508	254,056	50,811	3.2%
<b>Multiple</b>	30	1,447,847	179,379	35,876	11.0%
<b>Grand Total</b>	<b>331</b>	<b>20,654,406</b>	<b>1,866,739</b>	<b>373,348</b>	<b>8.3%</b>

### *Estimates outside the current OEH programs*

Billing data analysis was undertaken for 1,000 low income homes with ceilings insulated by the Housing NSW. Unfortunately the program did not collect participant consents for disclosing their billing data. The analysis had to use the data obtained for HPSP. As the insulation date and HPSP assessment data are entirely dis-aligned, it significantly degraded the quality of the data for analysis. As a result, no significant result could be established.

## Appendix 3. Key references

California Public Utilities Commission, Energy Efficiency Evaluation Report, July 2010

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