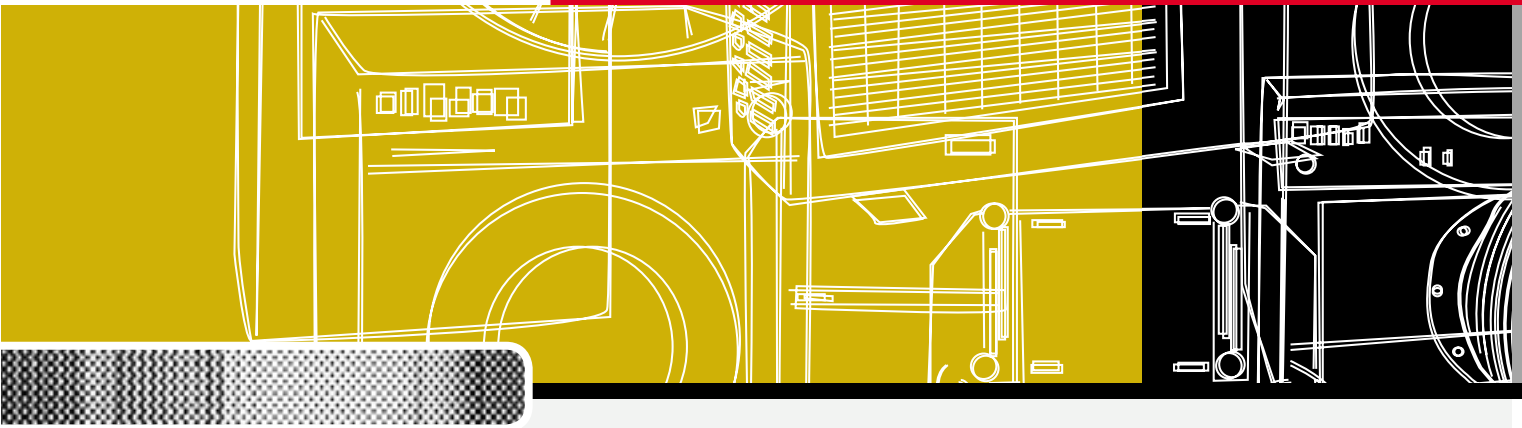


*NATIONAL APPLIANCE AND EQUIPMENT  
ENERGY EFFICIENCY PROGRAM*

*WHEN YOU CAN MEASURE IT,  
YOU KNOW SOMETHING ABOUT IT*

*PROJECTED IMPACTS 2000-2020*



## **EXECUTIVE SUMMARY**

AN INITIATIVE OF THE MINISTERIAL COUNCIL  
ON ENERGY FORMING PART OF THE  
NATIONAL GREENHOUSE STRATEGY

JUNE 2003

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June 2003

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The Hon Pete Hodgson  
Minister of Energy

### PAPUA NEW GUINEA

Hon Sir Moi Avei KBE MP  
Minister for Petroleum and Energy

## **ACKNOWLEDGEMENTS**

Prepared by George Wilkenfeld and Associates Pty Ltd under contract to the National Appliance and Equipment Energy Efficiency Committee

## FOREWORD

The National Appliance and Equipment Energy Efficiency Program (NAEEEP), under the direction of the Ministerial Council on Energy, has been actively engaged in developing and implementing national mandatory minimum energy efficiency standards and electrical appliance energy labelling of a range of appliances for several years.

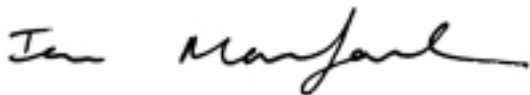
In 2000, results of a consulting economist's report on the effectiveness of the program and net benefits to the consumer community were released which predicted cost effective savings of 81 million tonnes of carbon dioxide equivalent (CO<sub>2</sub>-e) greenhouse gasses over the period 2000-2015.

In late 2002, another review of the program effectiveness was commissioned by the Australian Greenhouse Office to re-affirm the continuing effectiveness of the program and evaluate any change in predicted savings taking into account the expanded range of appliances and equipment placed under the program.

Today, I am happy to report that this latest review of the NAEEEP has not only reaffirmed the effectiveness of the program, but now revises upward the anticipated savings under measures now in place or in implementation phases to 134 million tonnes of CO<sub>2</sub>-e over the period 2003-2018, benefiting consumers about \$31/tonne CO<sub>2</sub>-e, and with a total consumer benefits of over \$4 billion (Net Present Value, 10% discount rate).

The analyses and figures in the report have been summarised in a new NAEEEP publication "*National Appliance and Equipment Energy Efficiency Program – Projected Impacts 2000-2020 (If you can measure it, you know something about it)*". The new report clearly demonstrates NAEEEP's effectiveness to industry and other stakeholders of the major contribution the program measures are making to keeping Australia on track to meet Kyoto commitments.

I commend this new report to you and I am proud to recognise that the NAEEEP continues to prove to be one of the most cost-effective greenhouse gas abatement measures, and that the program still has scope for very substantial further savings.



**The Hon Ian Macfarlane, MP**

CHAIR

MINISTERIAL COUNCIL ON ENERGY



## EXECUTIVE SUMMARY

This is a report on measuring the effectiveness of the National Appliance and Equipment Energy Efficiency Program (NAEEEP). A Ministerial Council on Energy initiative, the NAEEEP comprises a range of end-use energy efficiency measures best conducted in a nationally consistent format by Commonwealth, State and Territory authorities.

The NAEEEP comprises both mandatory and voluntary energy efficiency programs aimed at improving the energy efficiency of household appliances and commercial and industrial equipment. Most of the improvement in efficiency comes from regulatory programs such as minimum energy performance standards (MEPS) and mandatory energy labelling (the “star” rating label for electrical appliances). While voluntary industry programs also operate within the NAEEEP, the impact of these complementary programs is generally not included in the projection.

The substantive report, printed under separate cover, contains the detailed explanation of current projections. The summary reproduces in this synopsis:

- Documents the expected impact of the program on abating national greenhouse gas emissions in the period 2003-2018;
- Estimates the monetary costs and benefits of the program;
- Compares these results with those of a previous study of the NAEEEP completed about 3 years ago, which contained abatement and cost effectiveness projections for the period 2000-2015;
- Identifies some other measures of the NAEEEP.

## HISTORICAL CONTEXT

In 1998, the National Greenhouse Strategy (NGS) encouraged the expansion and acceleration of the existing national end-use energy efficiency program for appliances and equipment. The original national scheme, which commenced in 1992, had been successful in introducing mandatory labelling to a range of household electrical appliances, building on individual state and territory appliance labelling initiatives commencing as far back as 1986.

With a substantial increase in Commonwealth resources delivered through the Australian Greenhouse Office and the Department of Industry, Tourism and Resources and the support of all State and Territory governments, the expanded nationally consistent regulatory program sought to:

- Expand its regulatory tools beyond labelling to include minimum energy performance standards specifying the minimum level of energy efficiency for products to be lawfully sold in Australia;
- Expand the range of products falling within the regulatory national program, from just six labelled appliances by the mid 1990's to cover:
  - five product types under MEPS by 2002;
  - an additional five product types expected to be under MEPS by 2005;
- Expand from the principally regulatory nature of the program to include a more holistic approach, integrating complementary voluntary measures with regulatory initiatives, covering for example:
  - Twenty additional products by the end of 2003, under the ten-year Standby Power Strategy announced in 2002 (NAEEEP 2002g)
  - A further twenty products under the Standby power Strategy by 2004
- Accelerate the processes of regulation and drive abatement through new policies delivering world-class appliances and equipment to Australian consumers.



## MEASURING THE PROGRAM'S IMPACT

The national program operates with a common budget, in 2002/03 of \$1.24 million, as well as dedicated staffing resources supplied by member agencies. It is axiomatic that a program of this scale and duration (it commenced in 1992) should be measured to demonstrate its effectiveness.

While most countries around the world report on aspects of their end-use codes and standards programs, Australia is the first to regularly measure and report on the overall impact of its national program. Under the Council of Australian Governments' directive, national mandatory measures making like MEPS and labelling require the satisfactory completion of detailed cost benefit studies and public consultations before regulations can be introduced. Product end-use efficiency laws are only created if demonstrably in the community interest.

In 2000, Ministers responsible for energy efficiency authorised the release of the first report of this type, *Projected Combined Impacts from an Extended and Enhanced Program*. This second report, completed at the instruction of the Ministerial Council on Energy builds on that earlier work, by maintaining the 16-year time horizon to project abatement and assess effectiveness.

## 2003 PROJECTIONS

The projections presented in this study cover those programs that are implemented on a mandatory basis, like minimum energy performance standards and mandatory appliance energy labelling; and also - unlike the 2000 projections - parts of the complementary programs like the Standby Power Strategy that can be accurately projected.

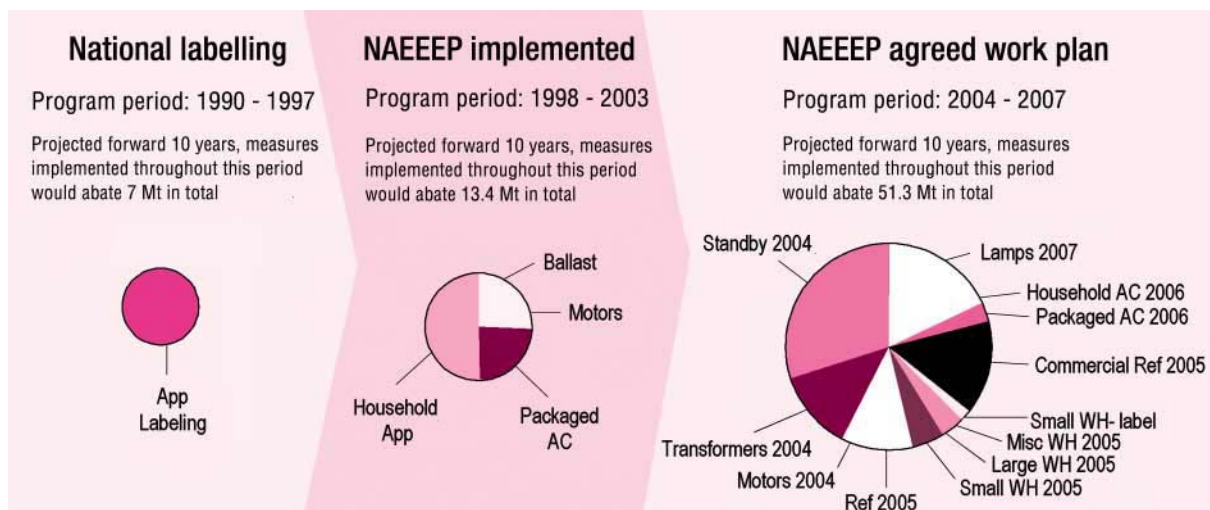
Some of the regulatory measures have been implemented, some are at advanced stages of development with target implementation dates, and some are still being developed for implementation in the next few years. The standby power initiative is also included as Australian Governments have committed to achieving specific goals for products initially by voluntary means but, if necessary, by mandatory measures.

This second report reviews the specific impacts of MEPS and labelling for a wide range of household, commercial and industrial appliances and equipment and then aggregates them to report on the effectiveness of the entire program. The following figure illustrates the projected greenhouse gas impact of all measures covered in this study during various phases of the program and illustrates how savings are growing rapidly as the program matures.

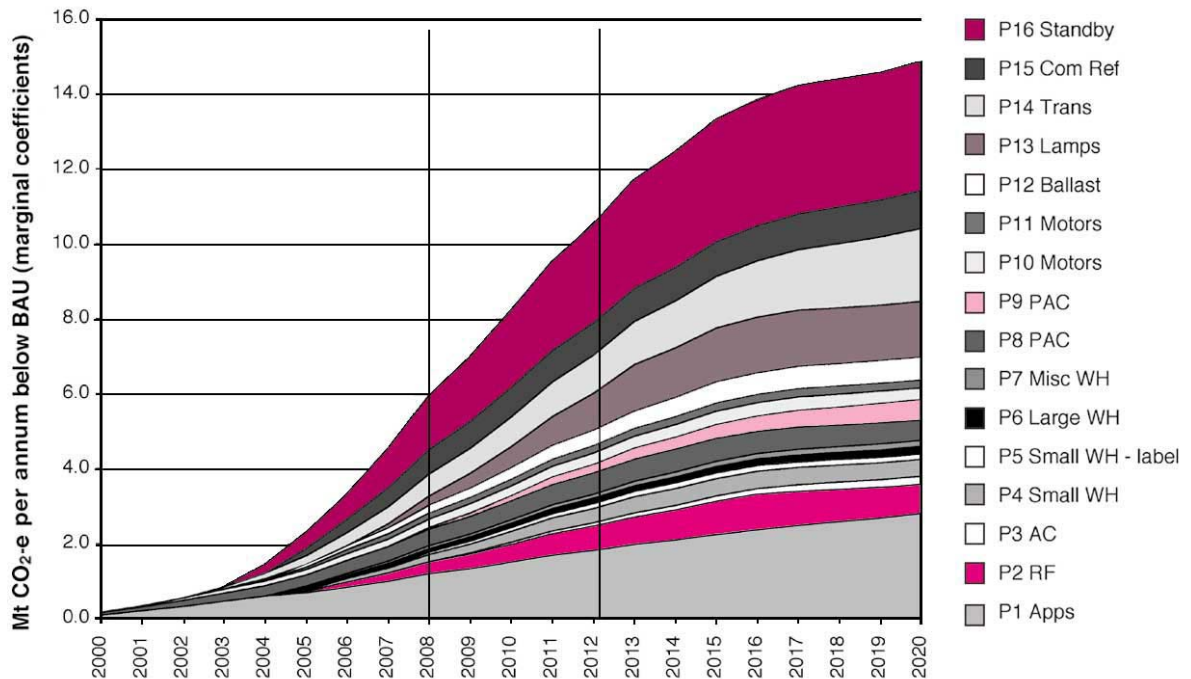
## GREENHOUSE ABATEMENT

The following figure illustrates the projected greenhouse gas impact of all measures covered in this study during various phases of the program and

Figure S1 Projected greenhouse impacts of NAEEEP measures by phase



**Figure S2 Projected greenhouse savings of NAEEEP measures to 2020**



Note: Legend numbers refer to the program number listed in Table 1. Economic data on cost and benefits for each program can be found in Table 4

illustrates how savings are growing rapidly as the program matures.

Greenhouse gas emission savings grow most rapidly through the Kyoto period 2008 to 2012, but savings continue to accrue over the very long term to 2020 and beyond. Although the most significant contributions are from standby and major household appliances, savings also accrue from programs that affect a wide range of products.

This figure shows that the NAEEEP will:

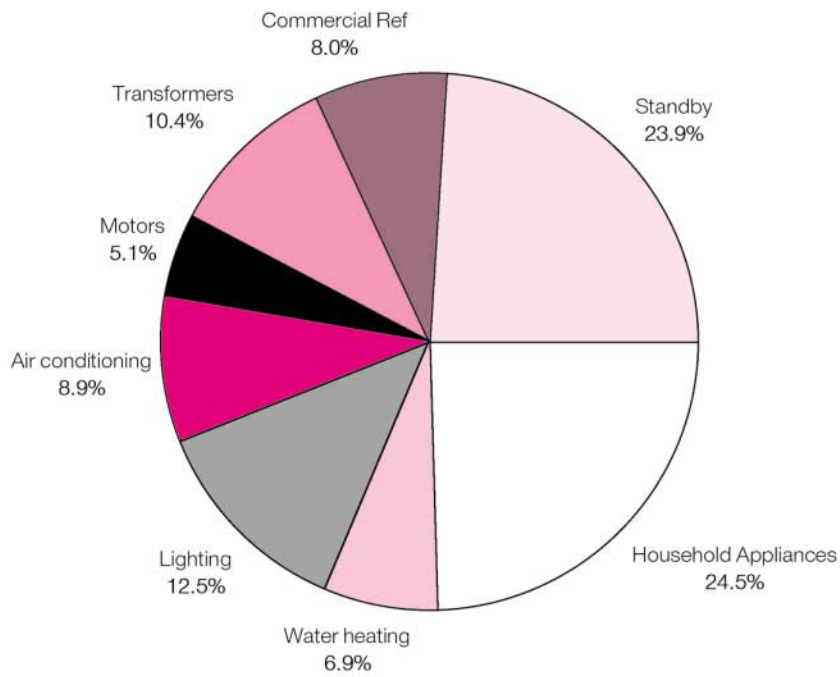
- Reduce greenhouse gas emissions by a cumulative total of **134 million tonnes** carbon dioxide equivalent (Mt CO<sub>2</sub>-e) over the period 2003-2018.
- Reduce average emissions in each year of the Kyoto Protocol Commitment period 2008 to 2012 by **8.2 Mt CO<sub>2</sub>-e per annum** below business-as-usual.
- Reduce emissions by 13.3 Mt CO<sub>2</sub>-e per annum by 2015 and 14.9 Mt CO<sub>2</sub>-e per annum by 2020.

In the period 2003 to 2018, measures targeting household appliances are projected to contribute about 25% of the savings, standby power about 24%, lighting 12%, transformers 10%, airconditioners 9%, commercial refrigeration 8%, water heaters 7% and motors 5%.

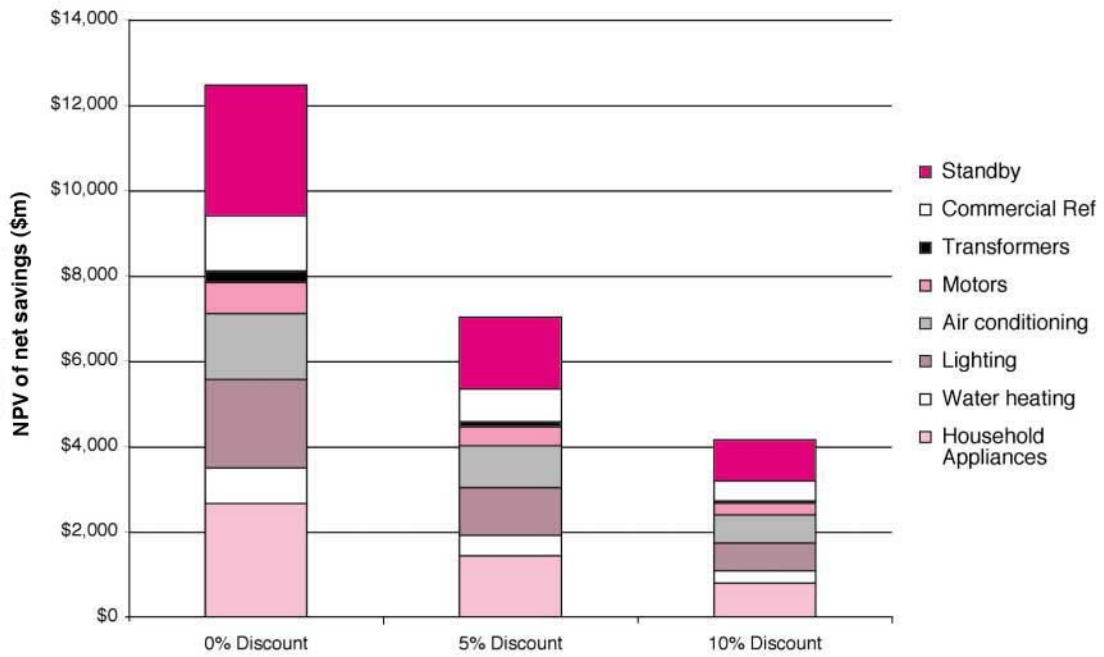
### ENERGY ABATEMENT

The costs of these emissions reductions are calculated to be negative – ie the value to energy users of the electricity they will save is likely to significantly exceed any additional costs from purchasing more efficient products. For the programs that have been modelled in detail, the consumer benefit of emission reductions is estimated at Australian \$ 28 net present value per tonne CO<sub>2</sub>-e, and the combined benefit/cost ratio is 2.4 (at 10% discount rate). The program has benefits for the purchasers and users of appliances and equipment, benefits for industry by enhancing export potential and recouping development costs, and benefits for energy efficiency and the environment.

**Figure S3 Projected share of cumulative reduction in emissions by product type, 2003 to 2018**



**Figure S4 Projected net savings from product types**



Using only energy savings as a benefit (that is allocating no monetary value to the environmental benefits), the NAEEEP is projected to deliver almost \$4.2 billion dollars to the community (after the projected \$2.6 billion costs are deducted from the \$6.8 billion energy savings NPV at 10 % discount rate by 2018.

## BENCHMARKING NAEEEP AGAINST ITSELF

Another measure of the effectiveness of the current program is to compare the current program's abatement projections with earlier forms of the program, especially:

1. abatement achieved by appliance labelling prior to the introduction of mandatory standards immediately before 2000; and
2. abatement projected by the MEPS and appliance labelling program for the sixteen years, 2000 to 2015.

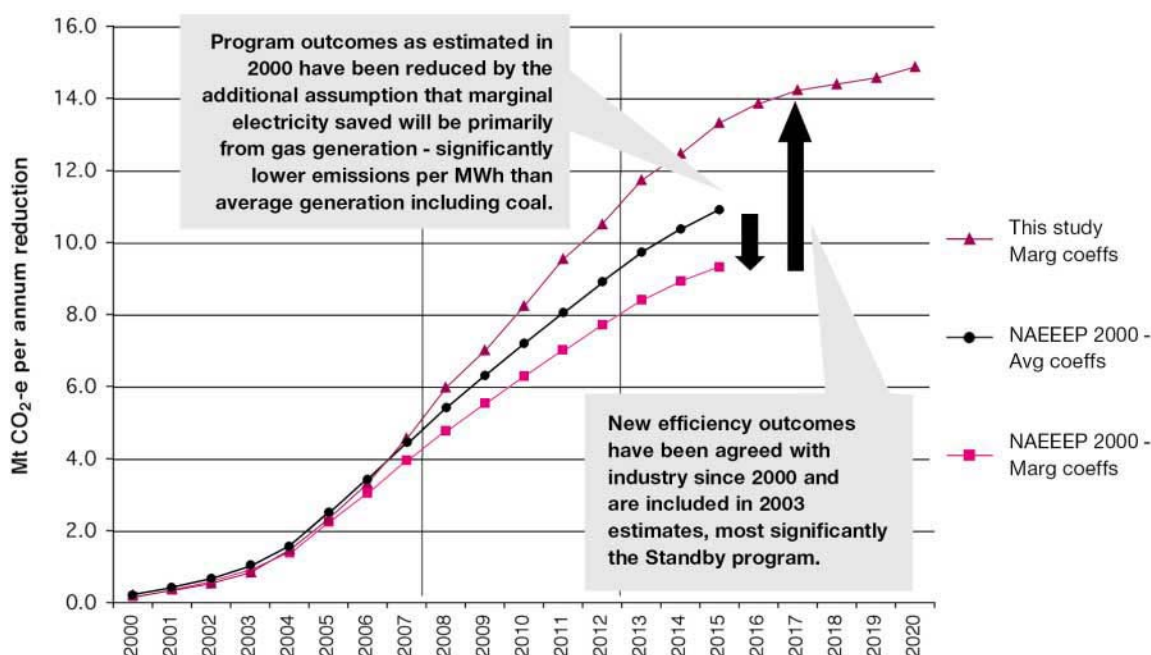
Figure S5 compares the projections in the present analysis with the previous NAEEEP evaluation undertaken in 2000. It also illustrates the estimated

impact of the original energy labelling program.

The previous 2000 evaluation projected cumulative greenhouse gas reductions of 69.5 Mt CO<sub>2</sub>-e over the 16 year period 2000-2015. The estimate for the same period has now increased by 31% to 91.2 Mt CO<sub>2</sub>-e, and the moving 16 year estimate has nearly doubled, from 69.5 Mt CO<sub>2</sub>-e (2000-2015) to 133.7 Mt CO<sub>2</sub>-e (2003-2018). About half the increase in projected greenhouse savings is due to the addition of standby power measures.

It is important to note that the original 2000 projections above have been revised to take account of more conservative abatement assumptions used in this study: it has been assumed that energy savings are off against marginal electricity generation greenhouse coefficients (which means energy savings tend to be offset against gas generation - see Appendix 1). The previous 2000 projections used average electricity generation greenhouse coefficients which result in an estimated abatement of 80 Mt CO<sub>2</sub>-e from 2000-2015. Estimates using the marginal coefficient used in this study (69.5 Mt CO<sub>2</sub>-e) are about 13% lower for the same measures and period. These effects are illustrated in Figure S5.

**Figure S5 Annual greenhouse reductions – Original labelling program, NAEEEP 2000 and NAEEEP 2003**



Yet another measure is the cost effectiveness projections for the program:

- a. the net present value of the energy savings (offset by all compliance and development costs) for the appliance labelling and MEPS program from 2000 to 2015; and
- b. the net present value of the energy savings (offset by all compliance and development costs) for the enhanced appliance and equipment labelling and MEPS program from 2003 to 2018.

These projected benefits dramatically show the expansion of the program. The net benefit projection of \$4.2 billion compares very favourably with the 2000 estimate of \$1.3 billion benefit.

In the 2000 evaluation, the NAEEEP measures that could be analysed in detail indicated a community benefit of A\$ 31 net present value per tonne CO<sub>2</sub>-e avoided, and a combined benefit/cost ratio of 2.4 (at 10% discount rate). Using that same criteria, the new projections estimate a slightly lower benefit per tonne CO<sub>2</sub>-e avoided, of \$28 per tonne - though the combined benefit/cost ratio remains constant at 2.4.

A gradual reduction in community benefit per tonne of emissions avoided is to be expected as the NAEEEP matures. This is because the program targets the most cost-effective opportunities as its priority. Once the most obvious candidates are included within the regulatory umbrella, the inclusion of additional products probably will not offer the same degree of community benefit.

Most importantly, however, these figures suggest that regulating minimum standards and mandatory labelling to drive efficiency improvement still has tremendous scope. When cost-effectiveness of greenhouse abatement is the sole factor, the measure is superior to other government sponsored abatement activities. The NAEEEP achieves reductions with a significant monetary *benefit* to the community, whereas most other greenhouse gas abatement programs achieve reductions at a net monetary cost.

In another comparison, the expansion of the program in accordance with the Ministerial instruction in the 1998 National Greenhouse Strategy might be shown as going beyond its historic base of just household appliance labelling

in 2000 to a maturing program encompassing a widening array of commercial and industrial equipment: this is reflected in these changing impact estimates.

## OTHER MEASURES OF NAEEEP

In addition to this overall evaluation of abatement and cost-effectiveness, the NAEEEP uses other benchmarking and measurement studies to more closely monitor the effectiveness of the program. Those other studies are the subject of separate reports but are useful to illustrate the efforts taken by all jurisdictions to properly monitor and measure effectiveness:

- *Study of greenhouse gas emissions from the Australian residential building sector to 2010*, report by Energy Efficient Strategies and others February 1999. This report examines current and future energy consumption (all major fuels) and related greenhouse gas emissions for residential appliances from 1990 to 2010 and examines the potential impact of a range of building shell programs on future greenhouse gas emissions. Extensive stock modelling is undertaken for appliances, equipment and residential buildings at state level.
- *Energy End-Use Analysis of Australia's Greenhouse Gas Emissions 1999* by George Wilkenfeld & Associates analyses the energy consumed, and associated emissions, from various end-use activities, equipment types and by energy form. This report released in 2002 goes further than the National Greenhouse Gas Inventory to allocate stationary energy-related emissions to specific end uses and equipment types for 1999.
- *Greening Whitegoods* – uses market-collected appliance sales data to assess energy consumption and performance trends of major household appliances in the Australian market. Annual reports are available from 1993 to 2000, prepared by Energy Efficient Strategies. These reports examine in detail the sales weighted trend for major household appliances (refrigerators, freezers, clothes washers, clothes dryers and dishwashers) in Australia.

- **Quantification of residential standby power consumption in Australia:** provides results of recent survey work of an intrusive survey where measurements on 2,500 appliances were undertaken in 64 houses in Melbourne, Sydney and Brisbane. The report also includes results of measurements on 531 new appliances in retail outlets and results of a telephone survey of 801 households in Australia to document information on appliance ownership, age and usage patterns. The report was prepared by Energy Efficient Strategies and EnergyConsult in 2001 and updated with another retail survey in 2002. Further surveys will occur each year with the reports adding to the information on this topic.
- **Benchmarking the Energy Star program in Australia** by Mark Ellis & Associates identifies the elements necessary for evaluating the Energy Star program in Australia, including the development of a methodology for assessing the greenhouse savings resulting from the uptake of Energy Star products. The study released in 2002 has two components: (a) establishing baselines for energy consumption and greenhouse emissions from office equipment and home electronic goods, and (b) identifying the means to provide on-going quantified assessments of emission savings.

The NAEEEP also must comply with the Council of Australian Governments' guideline for national rule making as a precursor to regulating any product. Individual regulatory impact statements are published modelling the precise impact of the regulatory measure and demonstrating why it is in the community's best interest. These cost benefit analyses are shared with stakeholders in public consultations to test their accuracy and to engage support. This very open and inclusive process allows Ministers to take the final regulatory decision confident in the rigour of the analysis and the support of key stakeholder groups.

In the last three years, the NAEEEP has completed economic analyses of the cost-effectiveness of regulation for:

- labelling of major appliances (household refrigerators and freezers, clothes washers, clothes dryers, dishwashers and air conditioners) – ie placing the pre-existing state-based program on a nationally

coordinated mandatory basis including the introduction of a revised label design and re-grading of the star rating equations

- MEPS for household refrigerators
- MEPS for electric storage water heaters
- MEPS for three-phase electric motors
- MEPS for three-phase commercial air conditioners
- MEPS for lighting ballasts
- MEPS for distribution transformers

Regulatory impact statements for other products will be released in 2003. The Commonwealth Office of Regulation Review recently advised that it would use two of the NAEEEP's regulatory impact statements as examples of good practice to showcase to other agencies similarly required to comply with the guideline.

## FUTURE MONITORING

*When you can measure what you are talking about, and express it in numbers, you know something about it: but when you can not measure it, when you can not express it in numbers, your knowledge is of a meagre and unsatisfactory kind*

Lord Kelvin

Within the NAEEEP Charter, the program is charged with monitoring program performance and achievements. The program is directed by governments to focus on cost-effective energy efficiency improvements that also results in the environmental benefit of greenhouse abatement.

This report demonstrates the projected impact of the various regulatory parts of the program until 2020. The NAEEEP will continue to monitor its performance and measure the impact of not only its regulatory programs but, over time, it will endeavour to provide more accurate measures of the associated voluntary programs as well.

This Executive Summary and the full report are available from [www.energyrating.gov.au](http://www.energyrating.gov.au)



## NAEEEC MEMBER ORGANISATIONS

The Commonwealth, New Zealand, each State and each Territory are represented on NAEEEC and participate in its deliberations. Representatives are drawn from officials within Government departments, agencies and statutory authorities or from persons appointed to represent those bodies. Representatives are usually a senior officer directly responsible for energy efficiency. The membership is currently under review and may expand to include other agencies working in these fields.

The *Australian Greenhouse Office* is the lead Commonwealth agency for greenhouse matters. The Australian Greenhouse Office (AGO) is responsible for monitoring the National Greenhouse Strategy in a cooperative effort with States and Territories and with the input of local Government, industry and the community. An AGO officer is the chair of NAEEEC and others provide support for its activities.

The NSW *Ministry of Energy and Utilities* provides policy advice to the NSW Government and operates a regulatory framework aimed at facilitating environmentally responsible appliance and equipment energy use. The Ministry is represented on the Energy Efficiency and Greenhouse Gas working group through which the appliance and equipment related elements of the National Greenhouse Strategy will be progressed.

The NSW *Sustainable Energy Development Authority* was established in February 1996 with a mission to reduce the level of greenhouse emissions in New South Wales by investing in the commercialisation and use of sustainable energy technologies.

The *Office of the Chief Electrical Inspector* is the Victorian technical regulator responsible for electrical safety and equipment efficiency. Its mission is to ensure the safety of electricity supply and use throughout the State. The corporate vision of the Office is to demonstrate national leadership in electrical safety matters and to improve the superior electrical safety record in Victoria. The Office's strategic focus is to ensure a high level of compliance is sustained by industry with equipment efficiency labelling and associated regulations.

The *Sustainable Energy Authority* was established in 2000 by the Victorian Government to provide a focus for sustainable energy in Victoria. The Authority's objective is to accelerate progress towards a sustainable energy future by bringing together the best available knowledge and expertise to stimulate innovation and provide Victorians with greater choice in how they can take action to significantly improve energy sustainability.

The *Electrical Safety Office, Department of Industrial Relations*, is the Queensland technical regulator responsible for electrical safety and appliance and equipment energy efficiency. The office ensures compliance with electrical safety and efficiency regulations throughout Queensland.

The *Environmental Protection Agency*, a Division of Sustainable Industries, is Queensland's lead agency in the promotion of energy efficiency, renewable power, and other initiatives that reduce greenhouse gas emissions throughout the State. The key aim of the unit is to achieve increased investment in sustainable energy systems, technology and practice.

*Energy Safety WA* seeks to promote conditions that enable the energy needs of the Western Australian Community to be met safely, efficiently and economically.

The *Western Australian Sustainable Energy Development Office* promotes more efficient energy use and increased use of renewable energy to reduce greenhouse gas emissions while increasing jobs in related industries.

The *Office of the Technical Regulator* seeks to ensure the coordinated development and implementation of policies and regulatory responsibilities for the safe, efficient and responsible provision and use of energy for the benefit of the South Australian community.

The Tasmanian Government's interest is managed by the *Office of Energy, Planning and Conservation*.

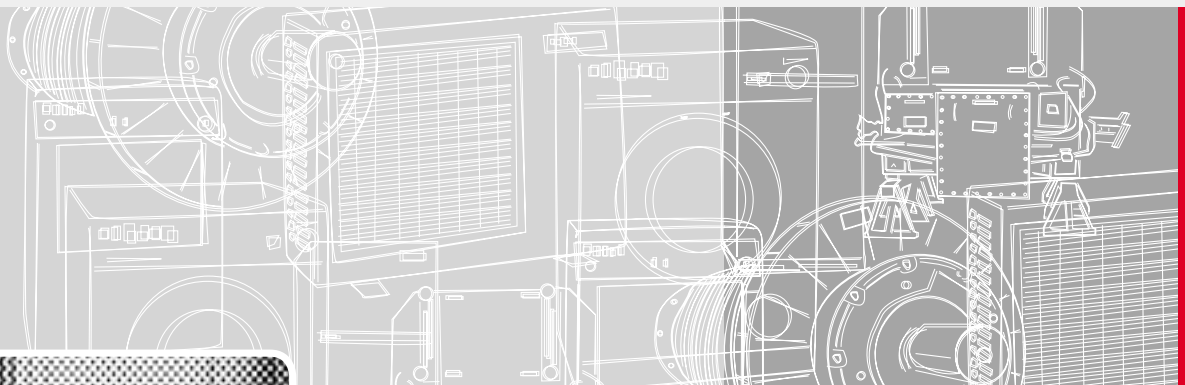
The Australian Capital Territory's interest is managed by the *Energy Policy Unit, Economic Management Branch, ACT Department of Treasury*. (<http://www.treasury.act.gov.au/energypolicy>)

The *Department of Employment, Education and Training* is responsible for the administration of regulations in the Northern Territory regarding various aspects of safety, performance and licensing for goods and services including electrical appliances.

The *Energy Efficiency and Conservation Authority (EECA)* is the principal body responsible for helping to deliver the New Zealand Government's extensive sustainable energy future. EECA's function is to encourage, promote and support energy efficiency, energy conservation and the use of renewable energy sources.

The *Ministry for the Environment (MfE)* is the lead environmental policy agency in New Zealand and is the government policy agency which advises the Minister of Energy on energy efficiency and renewables policy. MfE administers the Energy Efficiency and Conservation Act 2000, and energy efficiency regulations made under the Act.





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or any member organisation working  
on the National Appliance and Equipment  
Efficiency Program.