ENERGY EFFICIENCY

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Guide to Preparing Regulatory Impact Statements for the National Appliance and Equipment Energy Efficiency Program (NAEEEP)

Prepared for the

Australian Greenhouse Office

by

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Executive Summary

The purpose of this guide is to aid those parties involved in the development of energy efficiency programs, which include mandatory elements such as Minimum Energy Performance Standards (MEPS) or mandatory energy labelling or performance disclosure. It sets out a consistent, succinct and robust method for preparing Regulation Impact Statement (RIS) to meet the requirement of the Council of Australian Governments (COAG) and the Ministerial Council on Energy (MCE).

This document *Guide to Preparing Regulatory Impact Statements (RISs) for the National Appliance and Equipment Energy Efficiency Program (NAEEEP)* has been prepared by George Wilkenfeld and Associates Pty Ltd for the National Appliance and Equipment Energy Efficiency Committee (NAEEEC) for use by consultants as the main reference for writing a RIS for Ministerial Council on Energy (MCE) initiatives.

The primary objective of regulation proposed under the NAEEEP is to minimise the social, economic and environmental costs of the energy services supplied by appliances and equipment that consume energy. One way to achieve this objective is to set MEPS for the target sector. In pursuing this objective NAEEEC has followed a policy of adopting 'world's best regulatory practice', which involves setting MEPS at levels broadly comparable with the most demanding MEPS adopted by Australia's trading partners. This is usually one of the MEPS options to be tested in a RIS, but other MEPS options, voluntary approaches and the no new action, or 'business as usual' option should also be analysed.

A RIS must be prepared whenever new mandatory measures are proposed for the NAEEEP, if it is proposed to make existing mandatory measures more stringent, or if existing regulations are to be retained beyond their 'sunset'. The document must be prepared (or commissioned) by the department, agency, statutory authority, or board responsible for a regulatory proposal it must set out the costs and benefits of each option and make recommendations

The Guide consists of three distinct parts as followed:

Part 1 describes the process of preparing a RIS, and the purpose and structure of the RIS document.

Part 2 describes a general method for projecting costs and benefits, and comparing them with the business-as-usual projections. It sets out the requirements for presenting the results for each State and Territory and for New Zealand. It specifies the cost elements that need to be incorporated and clarifies the differences between the consumer and societal perspectives. It suggests approaches to the assessments of impact on various groups of customers ('distributional factors'), and on suppliers and market intermediaries..

Part 3: Appendices, which incorporates information necessary for the production of an effective and efficient document, and includes:

- Regulation Impact Statements prepared for NAEEEP;
- Energy prices

- Greenhouse gas emissions factors;
- Population and household numbers; and
- Standard formats for output data.

One important reason for standardising the RIS approach in this way is to assist NAEEEC in comparing and aggregating the projected impacts of different measures, and to tests prior assumptions in post-implementation evaluations.

NAEEEC expects those undertaking future regulatory impact work for the NAEEEP and related programs to take this guide into consideration. . Any comments and suggestions about the content of this guide are welcome and should be directed to NAEEEC. Users of this document should feel free to contact NAEEEC at any stage for more information or for any assistance in preparing a RIS.

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Preface

The National Appliance and Equipment Energy Efficiency Program (NAEEEP) embraces a wide range of measures aimed at increasing the energy efficiency of products used in the residential, commercial and manufacturing sectors in Australia and New Zealand.

Some of these measures are backed by regulations mandating the energy labelling of products at the point of sale, or specifying Minimum Energy Performance Standards (MEPS) that products must achieve to be lawfully sold. Such mandatory measures impose new obligations and hence costs on consumers, suppliers and other stakeholders, and are only adopted if the benefits for the community as a whole are likely to outweigh the costs.

Regulation Impact Statements (RISs) are prepared whenever new mandatory measures are proposed for the NAEEEP, if it is proposed to make existing mandatory measures more stringent, or if existing regulations are to be retained beyond their 'sunset'. The RISs must meet Guidelines adopted in 1997 by the Council of Australian Governments, recently updated (COAG 2004). The Commonwealth Office of Regulation Review (ORR) certifies that RISs are consistent with the COAG Guidelines before they are submitted to the Ministerial Council on Energy (MCE) for its decision on the proposed regulation.

Since 1999 some 14 RISs have been prepared for NAEEEP measures, endorsed by the ORR and accepted by MCE (see Appendix 1). Several have been selected by ORR as examples of best practice.

The work program for the NAEEEP anticipates the introduction of several new mandatory measures over the coming years, covering both electrical and gas products. The AGO has develop these guidelines for NAEEEP RISs which, while consistent with the COAG Guidelines, give additional guidance on matters specific to energy efficiency measures, in order to:

- Streamline the preparation of future NAEEEP RISs;
- Ensure that they continue to meet international best practice;
- Ensure consistency with arrangements between Australia and New Zealand; and
- Facilitate projections of the impacts of the NAEEEP as a whole.

In 2003, as part of AGO's continuing review of the RIS process, it engaged Lawrence Berkeley National Laboratory (LBNL) to review a selection of NAEEEP RISs. LBNL, which carries out all the analyses for the US minimum energy performance standards program, is considered the foremost authority on cost-benefit analyses of this type. LBNL concluded that the Australian approach is basically very sound, but made some suggestions for improvement (McMahon 2004). LBNL's suggestions have been incorporated in this document.

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Glossary

ABS	Australian Bureau of Statistics
ANZ	Australia and New Zealand (as a unified region for economic analysis)
AS/NZS	joint Australian and New Zealand Standard
BAU	Business as Usual
B/C	Benefit/cost ratio
CBA	Cost-Benefit Analysis
COAG	Council of Australian Governments
EEWG	Energy Efficiency Working Group
GAEEEC	Gas Appliance and Equipment Energy Efficiency Committee
GAEEEP	Gas Appliance and Equipment Energy Efficiency Program
HH	Household
MEPS	Minimum Energy Performance Standards
NAEEEC	National Appliance and Equipment Energy Efficiency Committee
NAEEEP	National Appliance and Equipment Energy Efficiency Program
NPV	Net Present Value
ORR	Office of Regulation Review
PC	Productivity Commission
P/E ratio	the ratio between changes in product price and energy efficiency
RIS	Regulation Impact Statement
SCO	Standing Committee of Officials
TOU	Time of use (electricity tariffs)
TTMRA	Trans Tasman Mutual Recognition Agreement

The RIS

Process

A RIS is required whenever governments propose to introduce new mandatory requirements, increase the scope or stringency of existing mandatory requirement or retain existing regulations beyond their 'sunset'. In Australia, the first large-scale government intervention in the market for energy-using products was the introduction of mandatory appliance energy labelling by the NSW and Victorian state governments in 1986. Between 1986 and 1999 most State and Territory governments introduced legislation to make energy labelling mandatory, and agreed to co-ordinate labelling and minimum energy performance standards (MEPS) via the council of Australian, State, Territory and New Zealand energy ministers.

The Ministerial Council on Energy (MCE) oversees the National Appliance and Equipment Energy Efficiency Program (NAEEEP), which covers all national programs aimed at increasing the energy efficiency of electric (and now gas) using products. On a day-to-day basis the program is managed by a committee of officials, the National Appliance and Equipment Energy Efficiency Committee (NAEEEC), reporting to MCE via MCE's standing committee of senior officials (SCO). As the NAEEEP impacts on wider energy efficiency matters, proposals are also considered by MCE's Energy Efficiency Working Group (EEWG).

In 1994 the Council of Australian Government (COAG) decided that all proposals for regulation put forward by ministerial councils should be subject to a RIS conforming to COAG guidelines (COAG 1995, amended 1997 and 2004). The Office of Regulation Review (ORR) in the Productivity Commission is closely involved in RIS preparation and must report on whether the RIS meets COAG guidelines.

There is now a well-established process for considering whether mandatory intervention in the market for a particular energy-using product is warranted, and if so what type of intervention would be in the national interest. Table 1 lists the main stages in the process. There are several research stages before NAEEEC decides on the approach (Stage 5), and in some cases the recommendation may be for no mandatory measures – or not for the time being – in which case there is no need for a RIS.

If NAEEEC recommends mandatory labelling or MEPS, and MCE gives approval in principle to proceed with further investigations, it is then necessary to prepare a technical standard describing the measures in detail, and the draft RIS. Mandatory appliance efficiency measures are given effect under State, Territory and New Zealand legislation, which makes compliance with the technical standard (usually a joint Australian and New Zealand Standard) a condition for lawful sale of that product. Therefore the content of the technical standard is in effect the technical content of the regulation, so it is necessary to have at least a draft of the Standard in order to prepare the RIS.

For internationally traded products the policy of the MCE is to adopt the most stringent MEPS level of the countries with which Australia has significant trade in that product. The preliminary analysis (stages 1 to 5 in Table 1) will establish what that MEPS level is, and the draft standard will incorporate it, with whatever adjustments are needed for differences in test procedures and other factors. The RIS must then establish whether the proposed MEPS levels, and the proposed implementation schedule, are cost-effective for Australia. In effect, the RIS evaluates a single mandatory option, although a range of non-mandatory alternatives (including the 'no new action' alternative) must also be considered.

For MEPS affecting products with limited international trade (eg electric water heaters) and for comparative energy labelling, where Australia and New Zealand have their own well established program, the task of the RIS is often to evaluate a range of mandatory options, rather than just a single option. The option cost-effective mandatory option (provided it is preferable to the non-mandatory alternatives), is the one that is then incorporated in the product Standard. In such cases the preparation of the draft Standard will follow the preparation of the RIS, rather than precede it.

Table 1 Milestones in implementation of a mandatory energy efficiency program, highlighting RIS stages

Stage	Milestone
1	Initial feasibility or scoping study
2	Inclusion of product in the NAEEEC forward plan
3	Technical report (ownership, review of technology, energy efficiency potential)
4	NAEEEC MEPS or labelling profile released for public & stakeholder comment
5	NAEEEC considers comments and decides labelling or MEPS approach
6	MCE gives approval in principle to progress mandatory measures and prepare RIS
7	NAEEEC advice to create a standards committee (or use existing committee)
8	Publication of draft or final standard including MEPS or labelling requirements (a)
9	Preparation of draft national Regulatory Impact Statement (RIS)
10	ORR refers draft RIS to the Regulatory Impact Analysis Unit of the New Zealand Ministry for Economic Development
11	Clearance of DRAFT RIS by ORR for public comment
12	Release of DRAFT RIS for public comment
13	Preparation of summary report of submissions on RIS for ORR – prepare FINAL RIS
14	Clearance of FINAL RIS by ORR (not public)
15	Approval by EEWG
16	Approval by SCO
17	Approval by MCE
18	Circulation of model regulation and drafting instruction to states
19	States enactment of regulation
20	Regulations take effect (i.e. MEPS or labelling become mandatory)
21	Effectiveness of MEPS or labelling reviewed after a period

(a) Usually precedes RIS, but in some case RIS needs to establish the optimum measures for inclusion in the standard

Purpose of this Guide

The *Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard-Setting Bodies* (COAG 2004) is the main reference for writing an RIS for MCE initiatives. The present document expands on those aspects of the *Principles and Guidelines* most relevant to the issues that, experience has shown, regularly arise in the preparation of RISs for mandatory energy efficiency measures. It also recommends a document structure that has been found to be useful for such RISs.

However, there is no obligation on those preparing RISs to follow this structure if another approach is preferable.

The *COAG Guidelines* sets out three main analytical approaches to evaluating the case for government intervention: Risk Analysis, Cost-Benefit Analysis (CBA) and Cost-Effectiveness Analysis. RISs for energy-efficiency measures lend themselves to a combination of risk analysis and cost-benefit analysis. The present document focuses on these approaches. However, it is possible that some RISs for energy-efficiency measures might be better suited to a combination of Risk Analysis and Cost-Effectiveness Analysis.

Another reason for producing this Guide is to achieve consistency in the underlying cost and benefit calculations for each NAEEEP RIS, so that:

- Key input values (eg population, energy price and greenhouse gas intensity) are consistent between RISs;

- Key assumptions such as projection periods and discount rate are consistent between RISs; and

- Outputs are in a consistent format, so that they can be combined with the outputs of other RISs for the purposes of projecting and evaluating the impacts of the NAEEEP as a whole.

Therefore NAEEEC requires the use of the input Factors in Appendix 2 and the completion of all output forms in Appendix 3 in all future RISs prepared for the NAEEEP, unless there is prior written agreement to use other inputs, assumptions or outputs.

Up to now, all RISs prepared for the NAEEEP have covered the cost and benefits Australia alone, although the impacts on products originating in New Zealand, and the implications for the Trans Tasman Mutual Recognition Act have also been covered.

It is possible that future RISs may cover costs and benefits for both countries. It is not clear at this stage how proposals that are cost-effective and feasible in one country but not both would be dealt with.

It is also a requirement that each RIS, worksheets and spreadsheets that are relevant are to be posted on the energy rating website when the document is finalised.

Structure of the RIS Document

The following structure is recommended for full RISs. RISs should be self-contained, so if a draft RIS is subsequently revised or extended the essential information from the original document should be repeated, rather than referenced.

PRELIMINARY SECTIONS

Executive Summary

A stand-alone section summarising the entire document, including the main costs and benefits and the recommendations.

Glossary

Acronyms used more than once should be included in the Glossary, spelled out in full where first introduced in the Executive Summary and where first used in the main text, and then used as an acronym.

1. THE PROBLEM

Statement of the problem: *why is government action being considered in the first place? What is the problem being addressed? For example, this should state the market failure that the proposal seeks to remedy* (COAG 2004).

1.1 Energy and Greenhouse Gas Emissions

Sets the policy context for the proposal by referring to national greenhouse gas reduction objectives and energy efficiency objectives. Recounts any specific COAG, Ministerial or Ministerial Council documents or policy statements referring to the type of measure (eg MEPS or labelling) or the specific product. Relates proposal to the NAEEEP work plan.

1.2 Contribution of the Product to National Energy Use and Emissions

Ideally the current and projected national energy consumption of the product being investigated should be calculated for the CBA, and compared with projected energy consumption for its sector (eg residential, commercial etc) or its end use (cooling, water heating, information technology etc).

It can then be said, for example, that "product X accounted for A GWh (B% of household electricity use) in 2004, and under business-as-usual conditions, energy use is projected to grow to Z GWh (Z% of household electricity use) by 2020." This gives decision-makers a context for the relative significance of the measures proposed for product X later in the RIS.

However, there may not always be possible sufficient data to make such statements confidently, for a number of reasons:

- The market for the product is relatively immature at present, and growth rates are uncertain – this is typically the case for many novel information technology devices;

- The data on product ownership and sales is uncertain – in the past, the adoption of mandatory measures has itself often led to better product and market data;

- The growth in product ownership is far greater than envisaged under currently available projections of energy demand – eg household air conditioning.

The scope of the energy consumption estimate should be related to the scope of the proposed measure. For example, if a measure is intended to impact on the standby-mode energy consumption of a product, not the on-mode, then the standby energy consumption should be separately estimated as part of total operating energy.

For products likely to be installed in air-conditioned spaces, both direct energy use and the indirect impact on the energy consumption of air conditioners should be estimated.

1.3 Product Technology and Energy Efficiency

The basic technology of the product should be described in general terms, especially if there are distinct technology types in the market which could be impacted in different ways (eg top loader vs. front loader clothes washers).

Estimate the range between the most and least energy efficient types on the market, and assess whether the energy efficiency range is more or less continuous, or whether there are discrete bands or clusters of different efficiency.

The rate of change in average energy efficiency is also important – in some products efficiency improvements tend to occur only in response to mandatory measures (eg water heater heat loss) whereas in others continuous improvement is part of BAU, and the proposed measure is intended to accelerate it.

Describe the standards, programs or measures (if any), which influence the energy efficiency of the product now. These could include:

- Australian or AS/NZS standards
- International standards
- Energy labelling in other countries
- Energy labelling in Australia (voluntary or mandatory).

1.4 The Product Market

This section describes the supply and suppliers of the product in Australia (and in NZ, if NZ is covered by the scope the RIS.) It should cover:

- Annual sales, by number and by value, and how these have been changing and are projected to change.
- Average or typical product price
- The share of the market that is supplied by local manufacturers and by imports (by country of origin)
- Names and locations of major manufacturers and importers, the main brand names they control, and some indication of the degree of concentration or competition in the market (eg the total share of the market held by the 5 or 6 largest suppliers)

The methods of sale and distribution may also be important in facilitating or restricting the impact of the proposed measures, and will help identify other stakeholders and market intermediaries, possibly including wholesalers, retailers, engineers, building designers, builders, installations contractors, plumbers, electricians or energy utilities.

Analysis of the demand side of the product market is equally important. Demand factors include:

- Number of households or businesses actually or potentially owning the product;

- Average number of products present in each at each location;

- Proportion of purchases made by end users (who pay the energy bills), builders, owners of rental property.

- Relative priority given to first cost, running cost and lifetime ownership cost by different purchasing groups.

1.5 Assessment of Market Deficiencies and Failures

Under ideal market conditions, purchasers would have full information about the energy consumption of alternative models and alternative ways of obtaining comparable services (eg thermal comfort). Those who wished to minimise life cycle cost by purchasing an efficient (and perhaps more expensive) product would have ready access to the additional capital, repayable from lower running costs over the product lifetime. In the event that they were not able to fully realise the benefits – eg because they sold or rented out their house – they could recover the remaining value through higher sale prices or rentals.

Of course very few markets operate ideally. The aim of this section is to assess how far from ideal is the product market covered by the RIS might be, and whether this amounts to market failure that justifies intervention. It will probably be necessary to review a range of indicators, including:

- The share of lifecycle costs made up by first costs (purchase and installation) vs. operating costs (energy, water and other). For household water heaters and industrial electric motors, for example, the net present value (NPV) of energy costs typically amounts to 80 to 90% of the lifetime cost, so rational decision-makers would base their product selections largely on energy efficiency. For some complex appliances (eg dishwashers) and for most electronic products, energy price is a much smaller share of lifetime costs;

- Whether information on product energy efficiency and energy operating costs is available at all, and if so whether it is accessible, reliable and credible;

- The extent to which other aspects of performance might swamp awareness of or concern for energy costs;

- Whether energy costs, though significant, are swamped by other operating costs (as is typically the case in the commercial sector, where energy represents a far smaller share of costs than in manufacturing);

- The extent to which products are selected or purchased by intermediaries rather than by the parties responsible for energy costs;

- The extent to which energy costs are masked or cross subsidised, so the social cost of supply is higher than the retail price faced by decision-makers (as is typically the case with household air conditioning).

This section should conclude with an assessment of the extent of any market failures.

2. OBJECTIVES OF THE REGULATION

Objective*: the objective that the regulation is intended to fulfil must be stated in relation to the problem. The objectives of a regulation are the outcomes, goals, standards or targets which governments seek to attain to correct the problem.* (COAG 2004)

2.1 Objective

The primary objectives of all regulations proposed under the NAEEEP are to minimise the social costs (economic and environmental) of supplying and consuming energy services, and to bring about reductions in Australia's greenhouse gas emissions below what they are otherwise projected to be (i.e. the "business as usual" case), in a manner that is in the community's best interests.

2.2 Assessment Criteria

The primary assessment criteria are usually the extent to which an option meets the primary objectives expressed both qualitatively (eg 'not meeting objective' or 'significantly meeting objective') and quantitatively (eg projected benefits are $X and projected costs are $Y, with X/Y >1) .

Secondary assessment criteria may also be adopted, eg:

1. Does the option address market failures, so that the average lifetime costs of obtaining the energy service that is the subject of the RIS are reduced, when both capital and energy costs are taken into account?

2. Does the option minimise negative impacts on product quality and function?

3. Does the option minimise negative impacts on manufacturers and suppliers?

4. Is the option consistent with other national policy objectives, such as reduction in the emissions of ozone depleting substances and the objectives of the National Appliance and Equipment Energy Efficiency Program to match "world best practice" standards?

If the proposed measure follows, replaces or builds on an existing mandatory NAEEEP measure (eg the introduction on MEPS for a product previously subject to labelling) it should be stated why the previous measures alone are insufficient.

3. PROPOSED REGULATION AND ALTERNATIVES

Statement of the proposed regulation and alternatives: *this should describe the proposed regulation and distinct alternatives in sufficient detail to allow comparative assessment and evaluation in the rest of the RIS.* (COAG 2004)

3.1 Status Quo (BAU)

Quantifying in detail the product energy consumption under BAU conditions is an essential first step in Cost-Benefit Analysis.

The status quo means no new government intervention. In some cases this could mean the cessation of existing intervention after sunset provisions in regulations run out (an RIS is usually necessary when renewal of intervention is proposed).

For many energy-using products there has historically been an underlying trend to greater energy-efficiency through the normal processes of technological change, and through the import of technology from countries with higher energy prices or more stringent MEPS. This may mean that even if no new action is taken, the average energy-efficiency of the product sold in Australia will rise even in the BAU case.

Conversely, the BAU case may include an expectation that some of the present drivers of energy efficiency will be relaxed or removed, as would have been the case if mandatory energy labelling regulations had been allowed to lapse.

For products less subject to competition and/or not traded internationally, it is often the case that regulation is the main or sole driver of increases in energy efficiency, so it is reasonable to assume that the status quo will lead to no changes in product design, although there may still be changes in the average energy efficiency or energy use of products sold due to changes in consumer purchase preferences or household size.

In some cases there is projected to be a nationally significant increase in the total energy consumption of a product group, because ownership is expected to rise steeply or because patterns of use are expected to shift from intermittent to more continuous (eg air conditioners, set top boxes).

3.2 Mandatory Proposal/s

The RIS may examine a single mandatory proposal (eg incorporation of a particular MEPS level into a standard at a proposed date) or a range of options, eg

- Mandatory labelling vs. MEPS;

- MEPS levels of varying degrees of stringency;

- Alternative implementation dates and phasing (eg one larger step or two smaller steps);

- Alternative compliance regimes (eg every unit produced having to comply vs. the average of all units sold having to comply).

3.3 Other Options

Even if governments accept that there is market failure of sufficient significance that national policy objectives require that it be addressed, the alternatives to regulation need to be considered. These may include:

- Trying to achieve the same outcomes without regulation (COAG 2004 calls this ‘suasion’), by encouraging industry self-regulation or by using other forms of leverage such as government purchasing power;

- Economic measures affecting product price: differential duties, taxes or charges for products according to their energy-efficiency;

- Economic measures affecting energy price: eg reducing price-cross-subsidies and internalising environmental and other costs that may be externalised, so that purchasers are exposed to the more of the actual costs of their energy consumption.

3.4 Selecting Alternatives for Further Analysis

This section reviews the alternatives in the light of the objectives set out in Section 2, rejects those that are not feasible and selects those to be subject to full Cost-Benefit Analysis in Section 4.

The reasons for not proceeding further with an option may include:

- The approach has been tried in the past and found to be unsuccessful or to have unforseen negative consequences;

- There is no framework to give effect to the proposal (eg no industry association with sufficient authority for workable self-regulation, or no regulatory powers under which energy ministers could advance economic measures).

- One or more of the proposed approaches would be unworkable, or so close in effect to another that separate analysis is unnecessary.

4. COSTS, BENEFITS AND OTHER IMPACTS

Costs and benefits: *there should be an outline of the costs and benefits of the proposal(s) being considered. This should include direct and indirect economic and social costs and benefits. There should also be analysis of distinct alternatives (including ‘do nothing’) to the proposed regulation.* (COAG 2004)

4.1 Benefits and Costs of Mandatory Proposal

This section often represents the largest and most complex part of the RIS. Its elements are described in detail in a separate section of this Guide.

4.2 Industry, Competition And Trade Issues

Industry issues

This section reviews the impacts of the proposal/s on suppliers. In many industries manufacturers, importers, distributors and retailers vary greatly in size, from transnational corporations to small family businesses. Clearly these groups have different capacities to respond to the costs that the proposed regulations will place on them. Product energy testing costs are more or less fixed for each model, so suppliers with many models will have higher costs, and will be at a further disadvantage if average sales per model are low.

Not all industry impacts are negative. Most energy efficiency regulations envisage an increase in average production costs due to increased quantities and/or higher quality of materials – although the envisaged price increases are rarely realised in practice. Price increases would increase product supplier revenues at the expense of energy suppliers, whose revenues would be lower than under BAU. (Energy supplier impacts are not usually analysed in detail since the energy consumption of the product in question usually represents a very small part of their market. For customer segments where energy costs are under-recovered, a reduction in energy sales could actually increase the profitability of the energy supplier.)

Trade

Mandatory energy efficiency regulations apply to all products sold, whether locally manufactured and imported, and irrespective of country of origin. Nevertheless it is useful for decision-makers to know whether the proposals are likely impact on the balance between local manufacture and imports, eg by affecting one group of suppliers more than another.

The RIS should comment in general on whether there appears to be any apparent inconsistency between the proposals and Australia's obligations under formal trade agreements, particularly with the World Trade Organisation (WTO) and the bilateral agreements such as the United States Free Trade Agreement – although specialist legal advice may also be necessary if and when regulations are drafted.

TTMRA

The Trans-Tasman Mutual Recognition Agreement (TTMRA) states that any product that can be lawfully manufactured in or imported into either Australia or New Zealand may be lawfully sold in the other jurisdiction. If the two countries have different regulatory requirement for a given product, the less stringent requirement becomes the defacto level for both countries unless the one with the more stringent requirement obtains an exemption under TTMRA.

As the ANZ appliance and equipment markets are closely integrated, TTMRA issues arise if one country proposes to implement a mandatory energy efficiency measure but New the other does not, if the planned implementation dates are different, or even if the administrative approaches are different (for example, Australian governments may require products sold locally to be registered with regulators, whereas New Zealand may not, so changing administrative and compliance verification costs).

Conclusions regarding competition

The main objective of reviewing likely impacts on industry is not so much to assess whether the proposal might impact negatively on individual firms – indeed it is very difficult to ascertain whether this is likely to be the case - but to assess whether competition between suppliers is likely to be materially reduced. This could happen if the low-cost suppliers are forced out, say, or if one particular product category is excluded.

Mandatory energy efficiency measures need not necessarily reduce competition, even if they cause some firms to exit the market for this product. It is possible that new suppliers could enter or re-enter the market because a measure advantages their products (eg energy labelling would advantage more efficient products).

To reach conclusions, it is possible to draw on a considerable body of experience with the impacts on prices, product ranges and competition when similar measures have been implemented in the past, both in Australia and other countries. These indicate that observed price increases are lower than projected beforehand, almost without exception.

5. CONSULTATIONS AND COMMENTS

***Consultation**: a RIS must outline who has been or will be consulted, and who will be affected by the proposed action. On a case-by-case basis, this may involve consultation between departments, with interest groups, with other levels of government and with the community generally.* (COAG 2004)

5.1 Consultations

The RIS must summarise the stages of the proposal's development, going back at least to Stage 1 in Table 1, with emphasis on when the details of the proposal were made public and the range of stakeholders contacted. This information is necessary to give decision-makers confidence that stakeholders have been given reasonable opportunity to hear about the proposal and to register their concerns.

Where the product is already subject to labelling or MEPS, previous RISs should have the full history of public discussions and industry involvement, often going back to the early 1990s, and this should be included in the RIS.

It is important to list, in the Draft RIS:

- Dates and titles of NAEEEC publications dealing with the product and with the proposal

- The industry, standards and consumer organisations and individual firms involved in meetings or discussions (but any confidentiality needs to be preserved, since the RIS is a public document).

- The dates of relevant public meetings and discussions (including NAEEEP Annual Forum sessions dealing with the proposal).

The Final RIS should also detail the efforts made to publicise the Draft RIS and to elicit comment from stakeholders. The NAEEEC usually advertises the RIS in the national press, and places it on the www.energyrating.gov.au website. The comment period is usually 6 weeks, and at this stage all submissions must be in writing. The AGO often organises information sessions during the comment period.

5.2 Summary of Comments

The Draft RIS should summarise any significant views on the proposal that the industry and other stakeholders may have made known during the consultations.

The Final RIS must also summarise the main points from submissions on the draft RIS. It is not necessary to report each submission in detail, provide that all views are fairly summarised and there is some indication of the extent of support for the views.

5.3 Responses to Comments

The Final RIS should include responses - not rebuttals - to the points raised in submissions on the Draft RIS. In some cases additional quantitative analysis will need to be undertaken between the Draft and Final RISs to address particular points.

6. EVALUATION AND RECOMMENDATIONS

6.1 Assessment

Review the advantages and disadvantages of each of the options covered in the RIS, and assess each against the criteria proposed in Section 2. Summarise the assessments in a table. Summarise costs, benefits and impacts where these have been quantified.

6.2 Conclusions

There should be a clear statement of the author's conclusions on whether the proposed mandatory measure and/dor any other options are likely to meet the stated objectives.

6.3 Recommendations

The recommendations should address the intended audience for the RIS (i.e. the Ministerial Council and its Senior Officials). They should cover:

- What general action should be taken (eg no action, implementation of the measure as proposed, implementation with modifications);

- The precise action, including product categories and relevant MEPS levels, usually tabulated in the same format as will be included in the relevant A/NZ product standard. Inclusion of these details in the recommendations avoids the possibility of misunderstanding by stakeholders;

- How the action should be implemented. Many mandatory energy efficiency measures for appliances and equipment are implemented by calling up A/NZ product standards in State and Territory regulations, but some measures may require other means of implementation;

- Target date for implementation, taking into account lead times from publication of standards and the extent of prior industry awareness.

7. IMPLEMENTATION AND REVIEW

Review*: there should be consideration of how the regulation will be monitored for amendment or removal. Increasingly, sunset provisions are regarded as an appropriate way of ensuring regulatory action remains justified in changing circumstances.* (COAG 2004)

Most NAEEEP measures for appliances and equipment are implemented by calling up A/NZ product standards in State and Territory regulations, which generally have a 5-year sunset provision.

Compliance with the measures is monitored by NAEEEC, using Commonwealth-State funded label surveys and product check tests. The details of the compliance regime are set out in the *Administrative Guidelines* (NAEEEC 2000). There are agreed rules for 'grandfathering'- the period during which non-complying products may still be sold.

The impact of measures, once implemented, is monitored by NAEEEC using a range of methods, including the compliance rate, the sales-weighted trend in the efficiency of the product as determined by market surveys, and, for labelling, surveys of consumer awareness and use of labels.

This section of the RIS should:

- Describe the proposed review and implementation framework (which will usually be as described above);

- Assess whether the framework is suitable and adequate for the product and the measure in question;

- If not, propose adjustments or changes (which should be included in the main recommendations).

ADDITIONAL SECTIONS

References

All documents referenced in the text of the RIS should be listed, preferably in the format used in this *Guide*. Page references are not usually necessary.

Appendices

As one of the objectives of the RIS is to make it readable for a general audience, highly technical material should be contained in appendices rather than the main text.

The following material should be included in appendices:

- Technical details of products, beyond what is contained in the text, if essential to the understanding of the recommendations. Extracts from product standards may be necessary.

- Energy prices, greenhouse factors and other essential inputs (see Appendix 2 in this *Guide*).

- Detailed workings of cost-benefit analysis.

- Output data for each region (State, Territory and New Zealand), in standard formats (see Appendix 4 in this *Guide*).

Projections of Benefits and Costs

Modelling approach

Modelling Regions

All NAEEEP RISs must analyses the costs and benefits for Australia as a whole, and some will cover costs and benefits for New Zealand as well.

The analysis needs to be undertaken for each State and Territory separately (i.e. at least 8 distinct regions plus whole of Australia – if NZ is included it is one additional region), because:

- The rate of ownership of energy consuming products by households and businesses tends to differ from region to region;

- Energy form, installation and usage preferences tend to differ from region to region: eg some states have high natural gas connection rates and hence greater use of gas rather than electric water heating;

- The average energy consumption of products tends to differ from region to region, especially for products where energy use depends on climatic factors;

- Energy and water production costs and retail prices differ from region to region;

- The greenhouse gas emissions and other environmental impacts associated with energy supply differ from region to region.

Consequently, the impacts, costs and benefits of a proposed measure usually differ significantly from region to region, both in total and per capita terms. State and Territory governments require detailed information about the projected impacts, costs and benefits in their own area in order to make an informed decision about a proposal, even one that is shown to be in the overall national interest.

In most cases the proposed measure encompasses a number of distinct product types or segments, and these will also need to be analysed separately. For example, the Standard for refrigerators and freezers (AS/NZS 4474) distinguishes ten product 'groups' according to door configuration, defrost mode and compartment temperature, and each group has a different MEPS level and average energy consumption.

It is preferable to construct equally detailed cost-benefit models (usually embodied in separate worksheets) for each region and product segment and to sum the results to the national total, rather than to undertake the modelling at the national level and then break the results down to the regional or segment level.

For household products, if there are no reliable data on regional or segment energy use, State, Territory and New Zealand energy consumption may be estimated from the Australian national values using the following formula:

Regional energy use = Australian energy use x population ratio x ownership ratio x climate ratio x adjustment factor

Where:

- Population ratio is the ratio of the regional population to the Australian population, based on published forecasts;
- Ownership ratio indicated the relative ownership rate of that appliance or end use technology compared with the Australian average; eg a ratio of 0.5 indicates that the product is half as likely to be present;
- Climate ratio represent the higher energy required for heating applications and lower energy required for cooling applications due to the region's climate being cooler or warmer than the national average; and
- The adjustment factor is set so that the total of States and Territories adds back to the Australian total (this factor is not necessary for New Zealand).

There is an example of the application of the above formula in GWA (2005).

For equipment used in the commercial sector and for equipment widely used in the manufacturing sector (eg motors) national energy estimates may be broken down to regions according to that region's share of national Gross Domestic Product in the services and manufacturing sectors respectively, as indicated in the ABS National Accounts. For equipment where use is concentrated in specific industries (eg dairy or aluminium), there is no alternative to regional analysis.

Even if formulae are used to break down national energy consumption estimates, separate energy price and greenhouse gas emissions factors need to be applied to complete the impact and cost-benefit analyses at the regional level.

Modelling period

All cost-benefit modelling should cover the period 2000 to 2020 (preferably financial years, but the use of calendar years is acceptable), as follows:

- The starting point in the past (i.e. 2000) is used so that the modelled trend in BAU consumption of that product can be compared with observed data;

- All projected costs incurred due to the measure, up to the end of the financial year 2020 should be taken into account;

- All benefits incurred for products sold up to the end of the financial year 2020 should be taken into account. If a product entering service in a given year is more energy-efficient due to the measure, that efficiency advantage will persist as long as the product remains in use, i.e. for the average service life. Therefore the benefit of each cohort of products sold should be accruing over the average service life, even if that horizon extends beyond 2020. For example, if a product has a service life of 15 years, the benefits should be calculated as far forward as 2020 + 15 = 2035.

BAU scenario

For products not currently subject to labelling or MEPS, the 'business as usual' (BAU) scenario is no labelling or MEPS. For products already subject to MEPS or labelling, the BAU scenario is continuation of the same arrangements, until such time as they are expected to lapse due sunset provisions unless renewed.

Depending on the specific product and market circumstances, the BAU scenario might indicate:

- A continuing increase in product energy efficiency: this is typically the case if the products are imported from, or use technology imported from countries with high energy prices and/or stringent energy efficiency programs;

- No change in product energy efficiency: this is typically the case with products where MEPS levels have historically determined energy efficiency (eg electric storage water heaters), so it is reasonable to assume that in the absence of further market intervention there will be no further increase;

- A reduction in product energy efficiency, eg if there is a market shift toward lower price but lower-technology or lower-quality producers, or in the event that products are diverted to Australia from countries which increase their MEPS levels.

The BAU scenario should indicate the projected energy consumption of the product in the absence of the proposed measure. This encompasses not only the trend in energy efficiency, but also the number of the units expected to be in service, their capacity and their extent of use.

Stock and sales modelling

A mandatory energy efficiency measure will only impact on the energy-efficiency of products sold after the measure takes effect, not on the energy efficiency of products already in use. Strictly speaking it is only necessary to model the number and energy consumption of the units to be installed after the measure takes effect ('new units'), not of units already in use ('existing' units).

However, it is usually necessary to estimate the impacts of the measure not only on new units but on the stock as a whole, since decision-makers will want to know, for example, 'what is the impact of this proposal on energy use for home air conditioning?', not just 'what is the impact on the energy use of *new* air conditioners?'

For products new to the Australian market or where sales since 2000 have been very low (eg digital set top boxes), and where the expected service life is at least 15 years, it is reasonable to treat post-implementation sales as the entire stock in use, and the total energy consumption of the stock as the cumulative consumption of each cohort sold. This will not be strictly true in the later years of the period, once units sold in the early years begin to retire and their energy use is removed from the stock, but if present sales are low, the number of annual retirements even by 2020 will be negligible and may be excluded from the analysis.

However, if the measure addresses a product where penetration is already high (eg any of the major appliances subject to energy labelling) and/or product service lifetimes are relatively short (eg lamps or mains pressure water heaters) the modelling of sales, stocks and energy consumption is more complex, because most units installed early in the modelling period will drop out of the stock by the end.

For household appliances, the stock in any given year given by the formula:

Stock = HH x penetration x ownership

Where:

- Stock is the total number of units in use.[1]
- HH = number of households in that year (see Appendix 3 of this Guide for standard household number projections);
- 'penetration' in that year is the ratio of households where the appliance is present (the ratio cannot exceed 1.0); and
- 'ownership' in that year is the average number of units in each household where the appliance is held. There is no upper limit to this value; eg the ownership of television sets in Australian households is around 2 (penetration is around 0.98).

These terms are sometimes used interchangeably or imprecisely, leading to unnecessary confusion. For consistency, NAEEEP RISs should use the above terminology. The term 'saturation' is sometimes used to indicate the highest penetration rate that an appliance is expected to reach. For example, historical data suggest that is most unlikely that every household in Australia will acquire a dishwasher or clothes dryer, i.e. the saturation rates for those products are likely to be well below 1.

For detailed and internally consistent stock and sales modelling it is necessary to 'backcast', or construct series of annual sales and stocks starting at least one average service lifetime before 2000. In this method the underlying longer term trends should be distinguished from observed annual sales, which may be 'lumpy' or variable, especially for products where demand is sensitive to economic conditions or weather factors (eg very hot conditions early in the summer drive air conditioner sales above the longer term trend line). Forecasts should be based on smoothed or 'trend' projections.

Energy use per unit

Once stocks and sales are projected, it is possible to project both BAU and 'with-measure' energy consumption. The BAU energy projection should allow for expected changes in energy efficiency (whether increasing or decreasing), capacity (eg trends to larger units), frequency and patterns of use (eg trend to washing clothes in cold water).

[1] Sometimes ABS survey data report frequency of product use, or distinguish between units 'held' or owned by households and those 'in regular use'. These distinctions may be important in cost-benefit analysis, since product use may need to exceed a threshold level for an increase in energy efficiency and product cost to be cost-effective. Also, a high proportion of infrequently used products in the stock may distort sales estimates, because the observed sales are much lower than would be expected from the total stock and service life.

It is generally assumed that the introduction of a measure will not affect the total sales of the product, because the cost impacts will be relatively small or the demand for the product is fairly inelastic (eg water heaters). Nor should it affect capacity, frequency of use or patterns of use. Therefore the only differences in energy consumption between the BAU case and the with-measure case should be due to the impact of the measure on the average energy-efficiency of new units.

Where all products are designed to meet the same MEPS level, and the proposal is to raise the MEPS level, the post-MEPS efficiency level may be predicted with high confidence, since one discrete efficiency level will be replaced by another. For most products however buyers select from a number of discrete efficiency levels (eg lamp ballasts) or from a continuous range, so the average energy efficiency of products sold lies somewhere between the most and least efficient on the market at the time.

The imposition of a MEPS level somewhere along the efficiency range will ensure that no products below that level are sold. However, it is not always clear how suppliers of the excluded models will respond. Average post-measure energy efficiency will be higher if suppliers replace excluded models with products that exceed the MEPS level than if they introduce models that just meet MEPS.

For energy labelling the range of potential responses is even wider. Suppliers tend to respond first, often introducing more efficient models and removing the least efficient even before labelling takes effect. The second wave of response is by consumers, who use labels to change their preferences, from the average of what is on the market to somewhere close to the higher end.

RISs will need to project how these mechanisms are likely to operate, in order to estimate how the with-measure energy efficiency trend will diverge from BAU.

Example

Figure 1 illustrates the projected electrical energy supplied to cover heat lost from the small electric water heaters installed new in Australia from 2000 to 2020, under business-as-usual (BAU) assumptions and under each of two MEPS options (30% and 50% reduction in heat loss). It is estimated that about 2.77 million units will be installed over that period. The energy represents heat losses only, not the total electricity consumed by small water heaters, since the electricity embodied in the useful hot water delivered from water heaters is not affected by MEPS. (The curve does not represent the total stock, since it does not show the heat loss of small water heaters installed prior to 2000; this will decline to near zero by 2008 as those units retire).

The first part of the projection curve rise steeply as additional and ever-larger cohorts of new water heaters are added in successive years. After the eighth year (corresponding to the average service life of the water heaters) the energy saved each year by the retirement of previous cohorts largely offsets the energy added by new cohorts, and the growth in total consumption is much slower. The projection takes in the purchase costs and lifetime energy consumption costs of units sold up to 2020: total energy declines after that year as units installed earlier reach the end of their service life.

Figure 2 illustrates the energy savings under each MEPS option – in effect the difference between the BAU trend line and the trend line for that MEPS option in Figure 1. Savings commence in fiscal year 2006, the first full year in which water heaters affected by revised MEPS levels are sold.

Figure 1

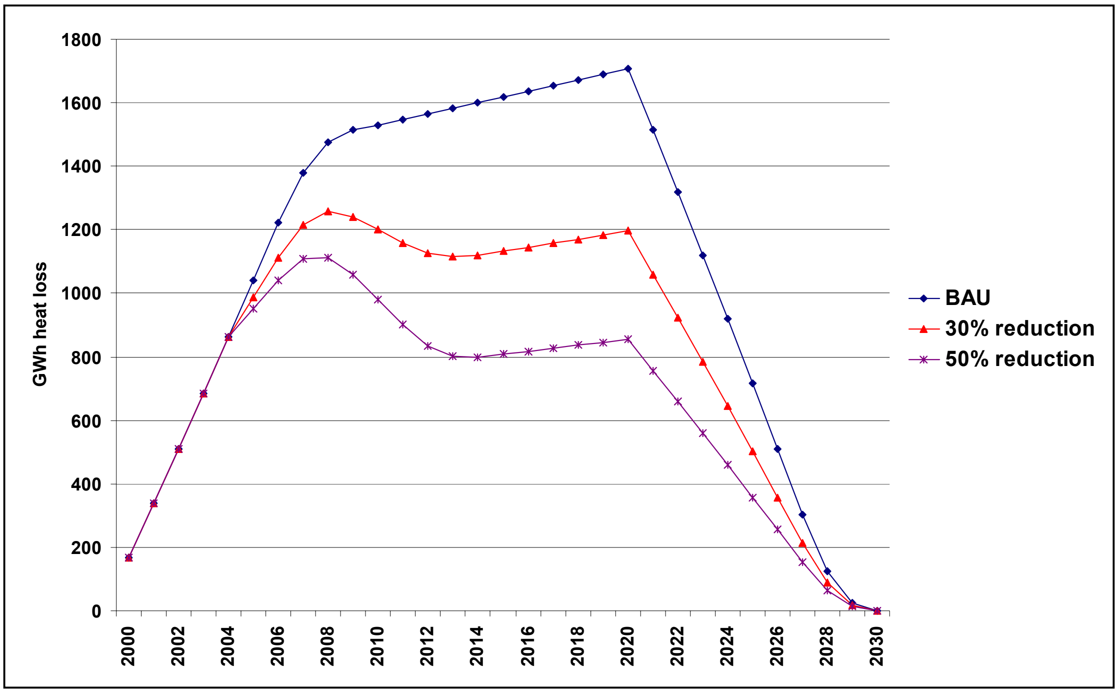
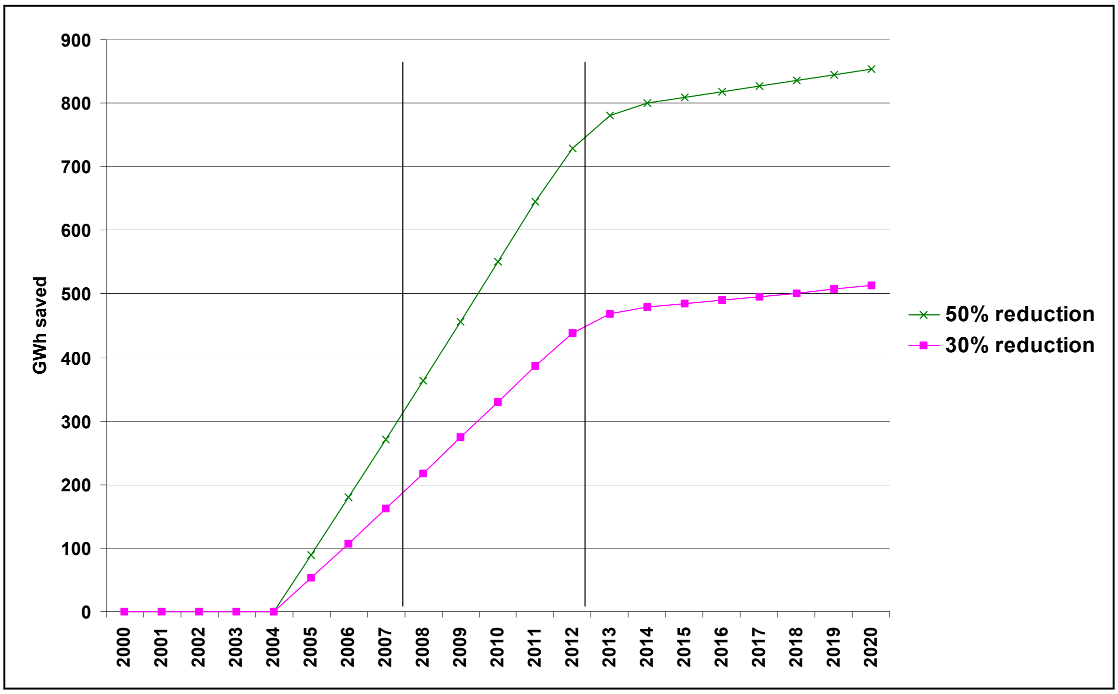


Figure 2



Benefits to be included

There are usually three classes of benefit:

- Quantified and 'monetised' (assigned a monetary value): typically reductions in energy and water use;

- Quantified but not monetised: typically reductions in greenhouse gas emissions and other quantifiable environmental impacts (eg reductions in use of ozone-depleting substances);

- Any other benefits.

The energy, greenhouse or other impacts 'embodied' in product materials and construction are not taken into account, unless there are significant and quantifiable differences between options.

Energy

Direct Energy

Direct energy use is the electricity, natural gas, LPG or wood consumed in the appliance itself. Some devices use more than one form of energy: eg many gas instantaneous water heaters also use electricity for gas ignition and for combustion air fans. A proposed measure may impact on only one of the energy forms used, or more than one. For example, MEPS for gas water heaters may only specify minimum efficiency levels for gas use, but not electricity use, whereas energy labelling for gas water heaters may take both into account, so leading ultimately to reduction in electricity as well as gas use if buyers prefer models with higher ratings.

Many products use only electricity, but use it for different 'modes' of operation. For example:

- Television sets may have a number of 'standby' modes (where no picture is showing, but the set is capable of responding to signals from the remote control or other sources) as well as an 'operating' mode.

- All the electricity that electric water heaters consume heats water, but some of the energy is lost as 'standby' or 'standing heat loss', and the balance is delivered as useful hot water.

If the product in question uses more than one form of energy and/or has more than one mode of operation, it is unusual for a measure to impact on all energy uses or modes equally, so it is essential to quantify the energy use in the mode that will be impacted.

Also, many products are widely used in the commercial as well as the residential sector. It is necessary to estimate the impacts separately, since energy prices and hence the value of the benefits will differ.

Indirect energy

Sometimes a proposal impacts on the energy use of other products as well as the targeted product. Such 'indirect' energy should also be taken into account, eg:

- For measures impacting clothes washers and dishwashers, the energy in hot water imported from the house water heater should be taken into account;

- For products installed in air conditioned spaces (typically lighting and office equipment) the effects on heat load, and hence on air conditioning energy consumption, should be taken into account (keeping in mind that heat load that displaces space heating demand is useful, but that most commercial buildings are cooled for most of the year);

In some cases (eg lighting products) the energy consumption of the targeted product will not fall due to the measure, but energy efficiency will increase. Consumers could choose to take the benefit either as a higher level of service (i.e. brighter lighting) or as a reduction in energy consumption (i.e. by having fewer of the more efficient lamps). In practice, the benefit is likely to be split, and the RIS should take account of this.

Energy Prices

Once energy consumption impacts (both direct and indirect) are estimated, it is possible to calculate the savings in energy costs to consumers.

The appropriate energy price is usually the marginal price faced by consumers – i.e. after all standing charges and high-cost initial tariff blocks are taken into account. The great majority of household consumers in Australia are on 'day-rate' energy tariffs, where charges are unrelated to time or season of use. For electric water heating, many householders are on controlled load or 'off-peak' tariffs. As most States are supplied by more than one electricity retailer, it requires some judgement to estimate the average day-rate and off-peak tariffs in each State and Territory.

The current estimates are summarised in Appendix 2. If an appliance reduces energy consumption more or less all year round, the value of the energy saved can be calculated using this value. South Australia has introduced a summer tariff loading, and the higher value should be used for measures, which save air conditioning or other summer-specific energy in SA.

Given recent decisions on metering by some State energy regulators, the proportion of household with time of use (TOU) meters and tariffs will rise in the coming years. Appendix 2 gives an example of a simple TOU tariff structure. Depending on the load profile of the product in question, TOU pricing could increase or reduce the value of the energy saved. However, unless the product in question has an unusual load factor (eg air conditioners), it is simpler to use the marginal day-rate and off-peak tariffs, as appropriate, to estimate the value of electricity saved.

Many commercial and industrial sector energy users are already on TOU tariffs or contracts, so choice of a single average marginal energy price is a necessary approximation.

If the impact of a measure focuses on specific areas within States, or on equipment with unusual load factors and times of use, the energy prices could diverge considerably from the averages in Appendix 2. If this is likely to be a critical factor in the cost-benefit analysis, marginal electricity prices for each State (indeed any bulk supply point) and any load factor can be calculated with a set of spreadsheets published by the AGO (www.greenhouse.gov.au/ggap/round3/emission-factors.html).

Water

For products, which consume both energy and water, measures that increase the efficiency of energy use will often also lead to an increase in the efficiency of water use.

If so, the water savings should be calculated and monetised using the marginal water supply tariffs and wastewater disposal tariffs (some jurisdictions charge separately, with the wastewater quantities calculated from metered water delivered). Water tariffs have not been included in this *Guide*, but if required thy may be extracted from publications of the Water Services Association of Australia, as described in GWA (2004).

Greenhouse gas emissions

The greenhouse gas emissions avoided can be calculated directly from the quantity of energy saved, using the coefficients in Appendix 2. These take into account the mix and merit order of electric power stations in each State and Territory, and the sources and distribution arrangements for natural gas.

Energy efficiency measures that target gas appliances are also likely to reduce the consumption of LPG, since variants of the same appliances are used for both types of gaseous fuels. The greenhouse coefficient for LPG is the same in all States: 67.2 kg CO_2-e/GJ (AGO 2004).

For measures that reduce the consumption of wood fuel, the greenhouse impact depends on a number of factors, including the type of wood, the source of the wood (whether sustainably harvested or from the clearing of land) and the combustion technology.

Ozone-depleting substances

Some energy efficiency proposals will have implications for the use and possible release of refrigerant gases and insulation foaming agents. In some cases the most likely route to greater energy efficiency is more thermal insulation, and hence use of more foaming agents or different foaming agents. If product manufacturers are in the course of changing foaming agents because of obligations under the Commonwealth *Ozone Protection Act 1989* (which gave effect to Australia's ratification of the Montreal Protocol on Substances that Deplete the Ozone Layer) the imposition of mandatory energy efficiency requirements adds a further level of risk and uncertainty.

On the other hand, if the foaming agents or refrigerating agents used in the product are known, their properties should be considered. If the agents have no ozone depleting potential (ODP) and no global warming potential (GWP) then there are no further issues, but if this is not the case, then:

- The ODP implications should be considered in light of the current phase out provisions of the *Ozone Protection Act 1989*; and

- Any GWP implications should be weighed against the projected greenhouse reductions from greater energy efficiency.

Because most mandatory energy efficiency measures specify a level of performance, but do not prescribe the technological routes for achieving it, it is not necessary to carry out a full analysis of the implications for suppliers who choose to follow a route that involves increasing the ODP or GWP of product components. However, if there are implications for this or other significant issues (environmental or otherwise) this should be acknowledged.

Other Benefits

An increase in energy efficiency that leads to a reduction in the energy consumption of a product (as distinct from an increase in its output of energy services) will by definition lead to a reduction in its average power demand. However, it does not necessarily follow that there will be a useful reduction at the time of peak demand on the network (electric or gas).

In most cases it should be assumed that the marginal energy price would reflect all supply costs, including those related to the network, so no further analysis of peak load effects should be necessary.

However, if there is evidence that the energy price is not cost-reflective, and under-recovery of the supply distorts the cost-benefit analysis, then it would be justifiable to undertake a parallel analysis using societal or shadow prices of energy, and societal costings for any efficiency-related increase in product costs.

This may apply to products with highly seasonal load patterns (eg air conditioners) in jurisdictions without seasonal or TOU pricing (see Energy Prices).

Costs to be included

The costs of energy efficiency measures can be categorised in a number of ways. Table 2 presents a categorisation according to whether the cost is:

- Fixed, i.e. independent of the number of products sold or of the extent to which consumers may respond to the measure); or

- variable with the number of products sold and/or the incidence of unknowns such as installation difficulties: variable costs typically account for over 90% of total costs.

In mandatory energy efficiency measures all costs, even those initially borne by product suppliers, are usually passed on to the buyer in higher product prices. Unlike a voluntary measure, where non-participating suppliers might gain a price advantage and so place pressure on participants to absorb their costs of participation, a mandatory measure imposes costs on all, so there is less pressure for any supplier to absorb them. Therefore it is reasonable to assume that all costs borne by suppliers, retailers or other market intermediaries will be passed on to consumers.

The exception to this is government charges. The costs of setting, managing and evaluating programs is usually borne by governments (i.e. taxpayers), but some of these costs (eg registration charges) may be fully or partially recovered from suppliers, and hence passed on to consumers.

For household equipment it is an acceptable simplification to assign all costs to product purchasers, given that the household products subject to energy efficiency measures are usually widely used in the community, so the benefits are also widely distributed.

Even though the cost-benefit analysis can be carried out by assigning all costs and all benefits to the same group (product purchasers) it is important to also identify where the initial cost impacts fall and to quantify their magnitude.

Table 2 Categorisation of costs of proposed measure

Category	Initial impact	Examples	Ultimate impact
Fixed	Government	Program administration	Taxpayers or product purchasers
	Product Suppliers	Product energy testing, product redesign	Product purchasers
	Contractors, Retailers	Staff training, stock control	Product purchasers
Variable	Product Suppliers	Fixing labels to all products	Product purchasers
	Product purchasers	Higher prices, installation costs	Product purchasers

Fixed Costs

Government

Most new NAEEEP energy efficiency measures would be handled by the existing NAEEEC administrative framework, so there is no need to establish a management infrastructure, registration capabilities or program supports such as websites. However, there would be additional costs for communication with stakeholders, registration of models, random check testing of product performance, monitoring of labels (for a labelling program), monitoring of sales and program evaluations. The extent to which these costs are recovered from suppliers will depend on government policy.

Product Suppliers

Manufacturers and importers may be forced to undertake product energy tests that they would not otherwise have undertaken, although if the proposal is MEPS for products already labelled, or increasing the stringency of existing MEPS, energy testing would already be universal so there would be no extra costs. If new tests were required, the total cost would depend on both the cost per test and the number of distinct models that would need to be tested.

The adjustment costs facing suppliers of low-energy-efficiency products will need to be estimated, although the precise mode of adjustment cannot be predicted. Importers with ready access to models meeting a proposed MEPS level may have relatively low adjustment costs. On the other hand, local manufacturers may have to re-engineer models or develop completely new models to replace those excluded by MEPS. For most products the number of firms that are pure manufacturers will be low. Many ANZ appliance and equipment manufacturers also import some of their model range, and those firms may face a wider range of adjustment options and lower costs.

A MEPS program is not likely to impose costs on market intermediaries such as wholesalers, retailers or installation contractors, who may not even be aware that product energy efficiency has changed, unless it results in a major shift in the average bulk or mass of products to be handled, transported or stored.

Energy labelling programs on the other hand could involve at least some training costs for retailers, whose staff would need to understand the label information so that they could respond to queries by customers. Retailers may also be involved in other aspects of program delivery, such as in-store displays and promotions.

Variable Costs

Purchase Price

There is a presumption that all else being equal, a more energy-efficient product will cost more to manufacture and hence cost consumers more to purchase. In practice this relationship is most likely to be true only for products of relatively simple design, such as electric water heaters or ferro-magnetic ballasts for fluorescent lamps, where energy efficiency is clearly related to quality or quantity of materials.

For more complex products such as refrigerators, redesign for greater energy efficiency will often reveal opportunities for offsetting savings in manufacturing costs or in the number or capacity of components. For electronic equipment energy consumption can often be reduced with very low cost hardware changes and virtually zero-cost software changes.

A further difficulty in estimating the cost impact of efficiency improvements is the fact that the real price of most manufactured products has been steadily declining since the 1980s, with greater productivity, greater economies of scale resulting from industry consolidation, growing international competition and a shift in manufacture to countries with lower labour costs.

The NAEEEP has been tracking movements in the average price and energy efficiency of major appliances in Australia since 1993 (EES 2003). All of the products tracked are subject to mandatory energy labelling, and refrigerators and freezers are subject to MEPS as well. Energy efficiency has been steadily increasing at the same time as current prices have remained constant, i.e. inflation-adjusted prices have declined. Studies of the impacts of MEPS in the USA have returned similar findings (Dale et al 1993). It could of course be argued that prices would have declined more rapidly, and efficiency not improved as quickly, without the mandatory programs in place, but it is very difficult to test this hypothesis.

The extent to which there are price increases associated with increased in energy efficiency will depend on:

- The complexity of the product

- The position along the efficiency improvement curve: the first tranche of improvement from a low efficiency base will be less costly than further improvement after many years of development, i.e. each tightening of MEPS levels is likely to be more closely linked to cost increases than the previous;

- The scope for streamlining of manufacture and inventory: if a MEPS proposal results in a manufacturer making, say, two model lines instead of three, there is likely to be a saving from greater economies of scale and reduced inventory costs;

- The existence of a market premium: some models command a market premium because of their higher overall quality and level of features, including energy efficiency. If all products required having higher energy efficiency then this feature alone will no longer command a market premium. Also, the unit costs of the energy-efficient technology will fall if it is installed in lower cost, higher sales volume models as well as premium products.

Therefore the estimation of the relationship between energy efficiency and product cost to be used in the RIS will require a degree of judgement. It is often useful to characterise the relationship as the ratio between changes in average efficiency (which will have been calculated in accordance with 'Energy use per unit') and changes in average price. For example, a P/E ratio of 1.0 would mean that for every 1% increase in efficiency there would be a 1% increase in price, whereas a P/E ratio of 0.3 would indicate that for every 1% increase in efficiency there would be a 0.3% increase in price.

The USA and the European Union have energy efficiency programs very similar to the NAEEEP, and their markets use similar technologies - in fact, many of the products on the Australian market are sourced from Europe or North America. Therefore US, Canadian and EU studies of a product will often yield useful information on P/E ratios for use in RISs.

Installation

In most cases there will be no difference in installation costs between products of different energy efficiency levels, so this element can be ignored. In some cases however the more efficient models may be larger or heavier, and some existing buildings or enclosures will need to be modified to accommodate them.

The RIS for small electric water heaters estimated the proportion of enclosures that would need modification in the event that higher MEPS levels led to water heaters with larger external dimensions. The RIS included the costs of enclosure modification (or water heater relocation) in the cost-benefit analysis, and recommended a flexible compliance mechanism that could reduce the incidence and hence the costs.

Consumer and Societal Perspective

Consumer Perspective

The monetised benefits of a proposal should be projected forward to 2020 as a total $ saving in each year. The stream of benefits will begin to as soon as the 'with-measure' efficiency trendline begins to diverge from the BAU projection, which could be a year or two preceding the proposed implementation date. Suppliers with a range of models will usually begin to change their model mix as soon as they are convinced of government's intention to implement the measure, rather than change all models immediately before implementation.

The stream of costs is also likely to begin before actual implementation. Any energy testing (if required), product redesign work and product registration must take place before. Suppliers may also increase average prices as they change the model mix, although price increases may be delayed until formal implementation because firms cannot be certain of their competitors' adjustment strategies and pricing until then. The variable costs of the measure, the sum of increases in product prices plus any increase in installation costs, if any, will be incurred as products are sold in each year.

The net present value (NPV) of the stream of costs and the stream of benefits should be calculated from the point in time when the RIS is being carried out (in practice this means the beginning of the following year, eg if a RIS is prepared in May 2005 the first year of the NPV series should be 2006).

The stream of costs ceases in 2020, but the stream of benefits ceases one average service lifetime after 2020, in order to capture the energy savings from the cohort installed in 2020.

NPV should be calculated using real discount rates of 0%, 5%, 7.5% and 10%. There is no need to separately account for inflation, since all energy price and product price projections should be in real terms. The 'reference discount rate' to be emphasised in the RIS conclusions and recommendations is 7.5%. This rate was adopted in early 2005 in place of the 10% reference rate previously used in NAEEEP RISs, to reflect a reduction in risk, due to greater confidence in the methods of analysis (with 14 NAEEEP RISs now completed) and in the light of evidence of the realisation of benefits from measures previously implemented. However, the other discount rates should be retained to allow comparison of program impacts with earlier RISs. Table 3 illustrates the standard format for summarising estimates of benefits and costs. The proposal is cost-effective if the B/C ratio at 7.5% discount rate is greater than 1.

Table 3 Standard summary table for benefits and costs

Discount rate	NPV Benefits B ($M)	NPV Costs C ($M)	Net benefit (B-C) ($M)	B/C ratio
0%				
5%				
7.5%				
10%				

Societal, or Resource Perspective

Analysis from the perspective of the consumer, or product purchaser involves the use of retail product prices and marginal retail energy prices. Since the objective is to assess whether product buyers as a group would be better off, transfer payments such as taxes are included.

If the aim is to assess the cost to the economy of manufacturing more efficient products then only the resources diverted from other activities, valued at the marginal cost of those resources, should be included. As such, only the extra *costs* involved in the manufacturing and distribution processes — such as extra materials, handling and storage costs — should be counted, and the benefits should be valued at the marginal cost of electricity production, not the retail price. Price components not related to costs, such as retail mark-ups and taxes, are transfers from consumers to intermediaries and should not be counted.

Clearly, the dollar value of both costs and benefits will be lower from the resource perspective than from the consumer perspective, but if both fall in the same proportion then the benefit/cost ratios will be much the same. Carrying out a separate cost-benefit analysis from the resource perspective is only necessary if the ratios of private to public costs are significantly different for costs and benefits, eg if retail energy prices do not reflect the actual costs of supply for the product in question or intermediaries are in a position to command a high mark-ups on production costs.

Sensitivity analyses

The robustness of the conclusions should be tested by sensitivity analysis of the main variables. If there are no other ways to set the limits to be tested, one-way is to select an arbitrary variability range, say ± 10%. Another way is to identify the value at which the benefit/cost ratio would fall below 1.0, and then assess whether that value lies within the range of what is considered probable or possible.

Energy Impacts

If the energy savings projections are constructed in accordance with the Modelling approach, with assumptions documented, the energy savings projections should be fairly robust. However, the effect of lower levels of energy savings should also be tested. rates should be tested. Given that the majority of costs is usually variable, if a program such as energy labelling is less successful in shifting consumer preference toward higher efficiency products than expected, the costs will fall almost as much as the benefits. Even if total savings fall (or rise) significantly, the benefit/cost ratios may change only slightly.

Service life

Estimated service life is an important variable, because for the program to be cost-effective the NPV of energy savings over the service life must exceed any increases in purchase and installation cost. It is useful to determine the minimum life required for cost recovery.

Allocation of benefit

Some energy efficiency measures, especially those impacting on space heating, cooling or lighting, will enable some or all of the benefit to be taken as higher levels of service rather than as lower energy use. An assumption about the allocation will need to be made in order to estimate energy savings, and the sensitivity of the conclusions to different allocation assumptions should be tested.

Fixed and variable costs

The sensitivity of the outcomes to higher fixed and variable costs should be tested. for variable costs this is usually done most conveniently by repeating the analysis with different P/E ratios.

Distributional issues

The main cost-benefit analysis will indicate costs and benefits in each region (State, Territory, Australia as a whole and New Zealand, if included). The main criterion is that the proposal is likely to be cost-effective (i.e. have a B/C ratio of greater than 1) for Australia as a whole. If so, then by definition households will be better off on average.

However, neither costs nor benefits are likely to be evenly distributed, and it would be desirable to assess impacts for different groupings, if the data can support this. For example, a proposal may have a disproportionately negative (or positive) impact on low-income households, renting households, single-person households or those with greater energy use. Authors of RISs should at least assess the impact of the proposal on households with higher than average and lower than average energy use for the product in question, and consider the possibility of other segment analysis if data are available.

One of the findings of a recent review by the US Lawrence Berkeley National Laboratory of the NAEEEP approach to RIS analysis (McMahon 2004) was:

> The Life-Cycle Cost methods are similar, but the USA has statistical surveys that permit a more detailed analysis. Australia uses average values, while the US uses full distributions. If data and resources permit, Australia may benefit from greater depth here as well. If implemented, the changes will provide more information about the benefits and costs of the program, in particular identifying who benefits and who bears net costs so that programs can be designed to offset unintended negative consequences, and may assist the government in convincing affected parties of the justification for some MEPS. However, without a detailed and statistically representative national survey, such an approach may not be practical for Australia at this time.

The ABS, which is often the only source of appliance penetration, ownership and use data, usually does not disaggregate data other than by State and Territory. However, other disaggregations are occasionally used, such as household structure. It is also sometimes possible to infer impacts indirectly – eg an ABS energy or Environmental Issues survey may state incidence of insulation by dwelling type (detached, semi-detached, multi-unit dwellings) and a Housing survey may link the same dwelling types to income levels.

Criteria for preferred options

Benefit/Cost Ratios

If there is a range of options, all with benefit/cost ratios of 1 or more, then the preferred option is the one with the highest net benefit, 'subject to consideration of [government] budget constraints, intangibles and distributional issues' (COAG 2004).

The intangibles include the assessment of risk. If option B has a significantly higher risk than option A, but only moderately higher net benefit, this should be considered in the ordering or priorities in the final recommendations.

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References

AGO (2004) *AGO Factors and Methods Workbook for use in Australian Greenhouse Office Programs including the Greenhouse Challenge Program*, 2004 edition.

COAG (2004) *Principles and Guidelines for National Standard Setting and Regulatory Action by Ministerial Councils and Standard-Setting Bodies,* Council of Australian Governments (endorsed April 1995, amended November 1997 and June 2004).

Dale et al (2003) Retrospective Analysis of Appliance Efficiency and Retail Price Trends, Larry Dale, Michael McNeil, Camille Antinori, and James E. McMahon, Lawrence Berkeley National Laboratory, in P. Bertoldi, P. Bertoldi, F. Conti and R Pagani (eds.) *Energy Efficiency in Household Appliances and Lighting, Proceedings of the Third International Conference on Energy Efficiency in Household Appliances,* Turin, October, 2003.

DTF (2005) *Victorian Guide to Regulation, incorporating Guidelines made under the Subordinate Legislation Act 1994*, Department of Treasury and Finance, Victoria, February 2005

EES (2003) *Greening Whitegoods: A third report into the energy efficiency trends of major household appliances in Australia using data from 1993 to 2001 inclusive*, Energy Efficient Strategies, for NAEEEC, February 2003.

GWA (2004) *Regulation Impact Statement: Proposed National System of Mandatory Water Efficiency Labelling for Selected Products.* George Wilkenfeld and Associates, for the Department of the Environment and Heritage, May 2004.

GWA (2005) *National Appliance and Equipment Energy Efficiency Program: Projected Impacts, 2005 – 2020,* George Wilkenfeld and Associates, for the Australian Greenhouse Office, January 2005.

McMahon (2004) *Comparison of Australian and US Cost-Benefit Approaches to MEPS*, James E. McMahon, Ph.D, Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, April, 2004.

NAEEEC (2000) *Administrative Guidelines for the Appliance and Equipment Energy Efficiency Program of Mandatory Labelling and Minimum Energy Performance Standards for Appliances.*

Appendix 1 Regulation Impact Statements prepared for the NAEEEP

The following are all published at www.energyrating.gov.au

GWA (1999) *Regulatory Impact Statement: Energy Labelling and Minimum Energy Performance Standards for Household Electrical Appliances in Australia.* George Wilkenfeld and Associates with assistance from Energy Efficient Strategies, for Australian Greenhouse Office, February 1999.

GWA (1999a) *Regulatory Impact Statement: Energy Labelling and Minimum Energy Performance Standards for Household Electrical Appliances in Australia. Supplementary cost-benefit analysis on transition to a revised energy label.* George Wilkenfeld and Associates, for Australian Greenhouse Office, November 1999.

GWA (2000) Draft for Public Comment: *Regulatory Impact Statement: Minimum energy performance standards and alternative strategies for electric motors* George Wilkenfeld and Associates for Australian Greenhouse Office, September 2000.

GWA (2000a) Draft for Public Comment: *Regulatory Impact Statement: Minimum energy performance standards and alternative strategies for airconditioners and heat pumps* George Wilkenfeld and Associates for Australian Greenhouse Office, September 2000.

GWA (2001) *Regulatory Impact Statement: Minimum energy performance standards and alternative strategies for fluorescent lamp ballasts: Final.* George Wilkenfeld and Associates for Australian Greenhouse Office, August 2001.

GWA (2001b) Draft for Public Comment: *Regulatory Impact Statement: Revised minimum energy performance standards for household refrigerators and freezers,* George Wilkenfeld and Associates with Energy Efficient Strategies, for Australian Greenhouse Office, October 2001

GWA (2002) Draft for Public Comment: *Regulatory Impact Statement: Minimum energy performance standards and alternative strategies for electricity distribution transformers,* George Wilkenfeld and Associates with Energy Efficient, for Australian Greenhouse Office, January 2002

GWA (2003) *Revised Regulatory Impact Statement: Minimum energy performance standards and alternative strategies for small electric storage water heaters,* George Wilkenfeld and Associates for Australian Greenhouse Office, July 2003

MEA (2003) *Regulatory Impact Statement: Minimum Energy Performance Standards and Alternative Strategies for Linear Fluorescent Lamps* Mark Ellis and Associates for AGO, Draft for Public Discussion, December 2003

MEA (2004) *Regulatory Impact Statement: Minimum Energy Performance Standards and Alternative Strategies for Commercial Refrigeration Cabinets in Australia and New Zealand*, Mark Ellis and Associates with Steve Beletich Associates for AGO, Draft for Public Discussion, February 2004

Syneca (2003) *MEPS for Electric Motors: Regulatory Impact Statement* Syneca Consulting for Australian Greenhouse Office, Draft, December 2003

Syneca (2003b) *MEPS for Air Conditioners: Regulatory Impact Statement* Syneca Consulting for Australian Greenhouse Office, Draft, August 2003

Syneca (2004) *MEPS for Miscellaneous Electric Water Heater: Regulatory Impact Statement* Syneca Consulting for Australian Greenhouse Office, April 2004

Syneca (2005) *Proposal to Increase MEPS for Room Air Conditioners: Regulatory Impact Statement* Syneca Consulting for Australian Greenhouse Office, February 2005

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Appendix 2 Energy prices and factors

Consumer energy prices

Table 4 Marginal Energy Tariffs, 2005

	c/kWh Household (day rate)	c/kWh Household (off peak)	c/kWh Commercial	c/kWh Industrial	C/MJ Natural gas (household)
NSW	11.0	4.8	14.0	7.2	1.42
Victoria	15.6		16.0	7.8	1.00
Queensland	11.6		15.0	8.5	1.41
SA	14.8/18.0 (a)		16.0	8.5	1.17
WA	14.7		15.0	10.7	1.26
Tasmania	12.5		14.0	4.6	1.40
NT	15.4		17.0	14.5	1.17
ACT	9.8		14.9	7.2	1.37
Australia (weighted)	**12.7**		**14.9**	**8.0**	**1.14**
New Zealand	**12.0 (b)**		**16.0**	**9.0**	**1.40**

Source: Household estimates from *Electricity Australia* 2004, except (a) 14.8 for year-round energy use; 18.0 for energy use in summer (eg air conditioning) (b) Advised by NZ Ministry for Environment, November 2003. Other sector estimates by author.

Table 5 Typical household time-of-use tariff profile

	Period	Hrs	Workday c/kWh	Weekend c/kWh
Shoulder	7am-2pm	7	9.32	9.32
Peak	2pm-8pm	6	17.60	9.32
Shoulder	8pm-10pm	2	9.32	9.32
Off-peak	10pm-7am	9	4.83	4.83
24-hr average			9.71	7.64
Day rate			12.36	12.36

Source: EnergyAustralia, January 2005

Greenhouse gas emissions factors

There are two ways of calculating the greenhouse gas intensity of electricity systems:

- average intensity: total annual emissions divided by total annual electricity produced, sent out, or delivered; and
- marginal intensity: the additional emissions that would be created (or avoided) by adding or saving an additional kWh.

The marginal intensity takes into account the merit order of generators. A measure that reduces overall electricity demand – such as MEPS - will tend to reduce the operation of power stations at the margin, so the CO_2-intensity per kWh avoided should be calculated using the marginal coefficients.

The marginal electricity system CO_2–e intensities for Australia used in the RIS, illustrated in Figure 3 were calculated from data spreadsheets published by the AGO (www.greenhouse.gov.au/ggap/round3/emission-factors.html). The marginal coefficient for New Zealand (0.600 kg/kWh in all years) was supplied by the NZ Ministry for Environment (personal communication, November 2003). The coefficients embody assumptions about the scheduling of future generation and transmissions projects. For example, the completion of Basslink after 2006 will harmonise the marginal coefficient for Tasmania, Victoria and SA. The marginal coefficients for NSW, ACT and Queensland are also projected to converge.

The marginal coefficients for natural gas are illustrated in Table 6. These cover combustion emissions at the point of use as well as emissions at the gas field and in gas treatment and transmission. Although the values are for 2000, they may be used for all years to 2020.

Table 6 Marginal greenhouse gas coefficients, natural gas (all years)

	kt CO_2-e/PJ (<100 TJ/yr)	kt CO_2-e/PJ (>100 TJ/yr)
NSW	71.3	68.0
VIC	63.6	63.4
QLD	68.8	64.2
SA	73.8	71.2
WA	60.7	60.0
TAS	60.0	60.0
NT	53.6	53.5
ACT	71.3	68.0
New Zealand	60.0	60.0

Source: AGO (2004), except Tasmania and NZ values (estimated by author)

Figure 3 Projected marginal emissions-intensity of electricity supply by State 2000-2020

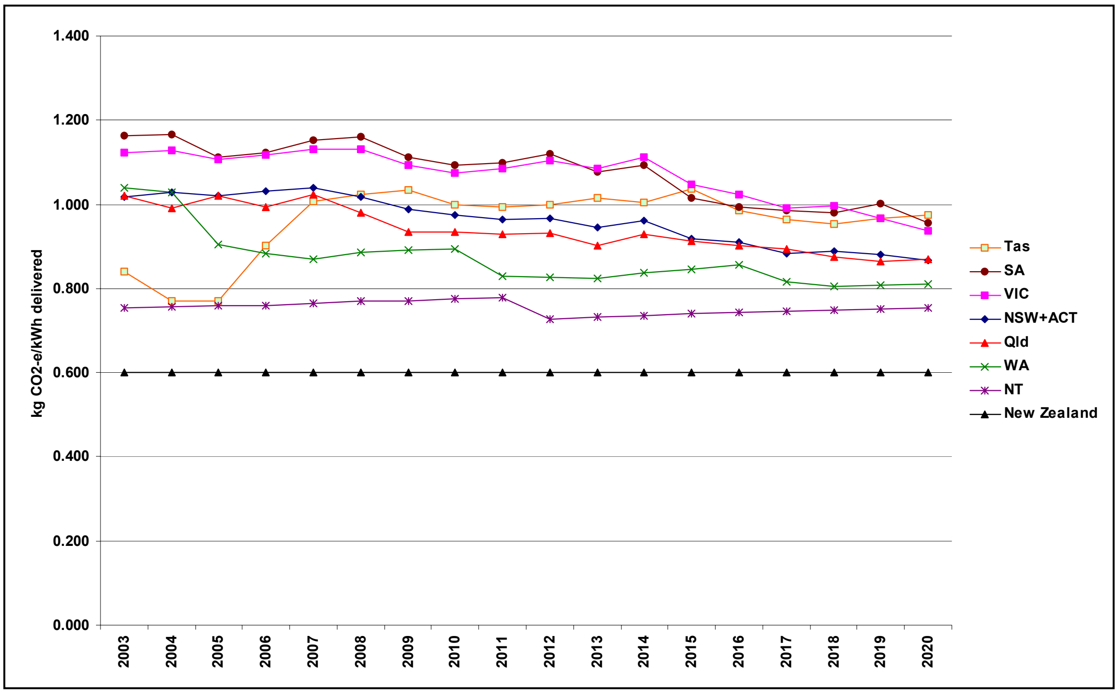

Table 7 Projected marginal emissions-intensity of electricity supply by State 2003-2020

Region	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
NSW+ACT	0.950	0.950	0.958	1.018	1.027	1.021	1.031	1.039	1.018	0.987	0.975	0.963	0.965	0.945	0.961	0.919	0.910	0.883	0.888	0.881	0.866
VIC	0.988	0.988	0.992	1.122	1.128	1.106	1.117	1.130	1.130	1.094	1.075	1.086	1.105	1.085	1.112	1.048	1.023	0.992	0.995	0.965	0.936
Qld	1.053	1.053	1.035	1.021	0.991	1.020	0.994	1.022	0.979	0.935	0.935	0.929	0.932	0.901	0.929	0.912	0.901	0.894	0.874	0.864	0.869
SA	1.020	1.020	1.003	1.163	1.167	1.112	1.123	1.153	1.161	1.113	1.093	1.099	1.120	1.078	1.093	1.014	0.993	0.986	0.979	1.000	0.955
WA	1.040	1.040	0.996	1.038	1.029	0.906	0.884	0.868	0.885	0.890	0.894	0.830	0.826	0.823	0.838	0.845	0.855	0.817	0.804	0.808	0.810
NT	0.008	0.008	0.008	0.754	0.757	0.760	0.760	0.764	0.770	0.769	0.775	0.779	0.727	0.732	0.735	0.739	0.743	0.747	0.750	0.752	0.754
Tas	0.651	0.651	0.663	0.840	0.769	0.769	0.902	1.007	1.024	1.033	0.998	0.993	1.000	1.016	1.005	1.038	0.984	0.965	0.954	0.966	0.976
New Zealand	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600

Source: www.greenhouse.gov.au/ggap/round3/emission-factors.html: see separate emissions factor file for each State. Regional weightings by GWA

All values statewide average kg CO_2-e per kWh delivered, taking into account transmission and distribution losses (combustion emissions only). See text for other factors.

Appendix 3 Population and household numbers

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NSW	HH ('000)	2489.1	2523.5	2557.8	2591.9	2625.7	2659.6	2692.2	2724.6	2756.8	2789.2	2821.4	2852.1	2882.6	2912.7	2942.9	2972.5	3001.7	3030.3	3058.4	3086.0
	Persons	6513.2	6566.2	6619.7	6673.5	6727.8	6782.6	6830.1	6878.0	6926.1	6974.6	7023.5	7067.8	7112.3	7157.1	7202.2	7247.6	7288.8	7330.3	7372.0	7413.9
VIC	HH ('000)	1836.1	1859.4	1882.6	1905.5	1928.1	1950.6	1971.6	1992.4	2012.9	2033.6	2053.8	2072.6	2091.1	2109.3	2127.5	2144.9	2162.1	2178.7	2194.9	2210.7
	Persons	4756.5	4786.0	4815.7	4845.6	4875.6	4905.9	4930.5	4955.1	4979.9	5004.9	5029.9	5051.2	5072.6	5094.1	5115.6	5137.3	5155.7	5174.2	5192.8	5211.4
QLD	HH ('000)	1410.9	1443.6	1476.9	1510.1	1543.5	1577.3	1609.9	1642.8	1675.8	1709.3	1742.9	1775.2	1807.4	1839.6	1872	1904.2	1936.0	1967.7	1999.0	2030.1
	Persons	3645.6	3705.5	3766.4	3828.3	3891.2	3955.1	4013.0	4071.8	4131.5	4192.0	4253.4	4310.6	4368.5	4427.3	4486.8	4547.1	4608.9	4671.6	4735.1	4799.5
SA	HH ('000)	617.8	623.7	629.5	635.3	640.9	646.5	651.3	655.9	660.6	665.1	669.5	673.2	676.7	680.2	683.6	686.7	689.8	692.7	695.4	697.9
	Persons	1502.4	1506.5	1510.7	1514.8	1519.0	1523.2	1525.5	1527.8	1530.1	1532.4	1534.7	1535.9	1537.1	1538.4	1539.6	1540.8	1541.0	1541.2	1541.5	1541.7
WA	HH ('000)	750.3	767.1	784.0	801.1	818.1	835.4	852.0	868.8	885.3	902.0	918.8	934.6	950.4	966.1	981.9	997.5	1012.8	1028.1	1043.2	1058.2
	Persons	1920.1	1948.7	1977.8	2007.2	2037.1	2067.5	2095.5	2123.8	2152.6	2181.7	2211.2	2238.8	2266.8	2295.2	2323.9	2352.9	2379.8	2407.0	2434.5	2462.4
TAS	HH ('000)	192.2	193.4	194.6	195.8	196.9	198.0	198.7	199.4	200.1	200.7	201.3	201.5	201.6	201.8	201.8	201.7	201.6	201.3	201.0	200.5
	Persons	470.3	469.2	468.2	467.1	466.1	465.0	463.3	461.6	459.9	458.2	456.5	454.3	452.2	450.0	447.9	445.8	443.1	440.5	437.8	435.2
NT	HH ('000)	69.1	70.9	72.6	74.3	76.1	77.9	79.6	81.4	83.2	85.0	86.9	88.8	90.6	92.5	94.3	96.2	98.1	100	101.8	103.7
	Persons	204.7	208.5	212.3	216.2	220.2	224.2	228.0	231.9	235.8	239.8	243.9	247.9	251.9	256.0	260.2	264.4	268.5	272.7	276.9	281.2
ACT	HH ('000)	123.6	125.6	127.6	129.6	131.5	133.5	135.2	137	138.7	140.5	142.2	143.8	145.3	146.8	148.3	149.8	151.3	152.7	154.0	155.3
	Persons	319.8	322.4	325.1	327.8	330.5	333.2	335.5	337.8	340.2	342.5	344.9	347.0	349.1	351.2	353.3	355.4	357.3	359.1	361.0	362.9
AUST	HH ('000)	7489.1	7607.2	7725.6	7843.6	7960.8	8078.8	8190.5	8302.3	8413.4	8525.4	8636.8	8741.8	8845.7	8949	9052.3	9153.5	9253.4	9351.5	9447.7	9542.4
	Persons	19333	19513	19696	19881	20068	20257	20421	20588	20756	20926	21098	21253	21411	21569	21729	21891	22043	22197	22352	22508
	Persons/HH	2.58	2.57	2.55	2.53	2.52	2.51	2.49	2.48	2.47	2.45	2.44	2.43	2.42	2.41	2.40	2.39	2.38	2.37	2.37	2.36
NZ	HH ('000)	1441.0	1461.8	1482.9	1504.3	1526.0	1548	1566.2	1584.6	1603.1	1622.0	1641	1659.0	1677.2	1695.6	1714.2	1733	1749.7	1766.5	1783.5	1800.7
	Persons	3880.0	3924.8	3970.0	4015.8	4062.1	4109	4136.4	4164.0	4191.8	4219.8	4248	4273.9	4299.9	4326.1	4352.5	4379	4404.1	4429.3	4454.7	4480.2
	Persons/HH	2.69	2.68	2.68	2.67	2.66	2.65	2.64	2.63	2.61	2.60	2.59	2.58	2.56	2.55	2.54	2.53	2.52	2.51	2.50	2.49
ANZ	HH ('000)	8930	9069	9208	9348	9487	9627	9757	9887	10017	10147	10278	10401	10523	10645	10766	10887	11003	11118	11231	11343
	Persons	23213	23438	23666	23896	24130	24366	24558	24752	24948	25146	25346	25527	25710	25895	26082	26270	26447	26626	26806	26988
	Persons/HH	2.60	2.58	2.57	2.56	2.54	2.53	2.52	2.50	2.49	2.48	2.47	2.45	2.44	2.43	2.42	2.41	2.40	2.39	2.39	2.38

Source: ABS 3236.0 Household and Family Projections Australia 1996 to 2021; Statistics New Zealand

Appendix 4 Standard formats for output data

All RISs must have a separate output table in the following format, covering the full period 2000-2020, for each of the following regions:

New South Wales, Victoria, Queensland, South Australia, Western Australia, Tasmania, Northern Territory, ACT and Whole of Australia

If the RIS covers New Zealand as well, there needs to be a similar output table for New Zealand.

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
BAU Energy use	GWh/yr																					
With-program energy use	GWh/yr																					
Energy savings	GWh/yr																					
Value of energy saved	$M																					
Emissions saved (marginal)	kt CO_2-e																					
Additional appliance cost	$M																					