

Draft Framework for

Evaluation of the Australian Energy Efficiency Standards and Labelling Program

Report to the Australian Greenhouse Office and the
National Appliance and Equipment Energy Efficiency Committee

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22-Feb-2002

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Reference Document

A EUROPEAN EX-POST EVALUATION GUIDEBOOK FOR DSM AND EE
SERVICE PROGRAMMES - March 2001

PDF version available from EES on request.

1 Introduction

The Australian standards and labelling program (SLP) has been running in various degrees since 1986 and it has undergone a number of evaluations in that time. These have ranged from highly focussed assessments of particular aspects of the program to comprehensive evaluations of its entire operation and impacts¹. The AGO and NAEEEC wishes to integrate future evaluations strategically. The purpose of this document is to set out a draft evaluation framework for the standards and labelling program, stimulate discussion on how this may be done and to assess what areas of the program should be evaluated and at what frequency. The document also contains a brief synopsis of the evaluations so far undertaken on the Australian SLP.

2 The Australian Standards and Labelling Program

2.1 Appliances covered under the SLP

As a “mature” program, the program’s core activity is now concerned with the registration and check testing of appliances once they have entered into the Australian market. A listing of residential products currently included in the program and subject to either MEPS or labelling is shown in Table 1. Gas appliances are not shown as they currently fall under a voluntary, industry regulated labelling program and hence are not, at present, part of the program proper.

Table 1: Residential appliances currently covered by the SLP

| | Labels | MEPS |
|--------------------------------|---------------|---|
| Single phase air conditioners | ✓ | Under review (a) |
| Three phase air conditioners | ✓ (voluntary) | ✓ (2001) |
| Refrigerators | ✓ | ✓ (1999) |
| Freezers | ✓ | ✓ (1999) |
| Dishwashers | ✓ | Under review (a) |
| Clothes washers | ✓ | Under review (a) |
| Clothes dryers | ✓ | Under review (a) |
| Electric storage water heaters | None | ✓ (1999) |
| Electric cook tops | Under review | Under review for MEPS (c) |
| Electric ovens | Under review | AS 1549-1983 (b) under review for MEPS (c) |
| Fluorescent lamp ballasts | None | ✓ (2003) |
| Three phase electric motors | None | ✓ (2001) |

Note (a): Review of MEPS for additional appliances conducted by GWA, released February 2002.

Note (b): Although oven MEPS are contained in this standard, this is not included in regulations

Note (c): Review of MEPS and labelling for cookers conducted by EnergyConsult, released Feb 2002.

¹ Synopses of the majority of these evaluation exercises are found in Appendix A.

Many other products, both commercial and residential, are currently being considered for MEPS or labelling or some combination of the two. The issue of standby consumption is also currently under consideration. Full details can be found in NAEEEP's Future Directions Report (NAEEEP, 2001).

2.2 Supplemental program activities

There are a number of significant information programs associated with the SLP.

- Development of a website (www.energyrating.gov.au) which contains a database of all registered appliances on the Australian market. The site also contains detailed information on application requirements for manufacturers, buying tips for consumers and lists the most efficient models in each category of appliance.
- Galaxy awards. Since 1988 the most efficient models on the Australian market have been recognised in the annual galaxy awards. Through application of an award sticker at the point of sale, promotion and flagging eligible products on the website, the award creates awareness of the outstanding efficiency of award winners amongst both manufacturers and consumers.

2.3 Program evaluation to date

Evaluation of the Australian SLP can be divided into five types.

- **Tracking sales weighted efficiency trends** and measurement of program impacts on stock energy consumption. Since 1993, data on new sales of refrigerators, freezers, clothes washers, dishwashers and clothes dryers have been gathered and, using additional historical data (pre 1993), their impact on the overall efficiency of the stock estimated on an ad hoc basis. Systematic stock modelling is yet to be routinely used to estimate program impacts on consumption and CO₂ emissions now and into the future. This work is ongoing.
- **Compliance surveys.** Two retailer compliance surveys were undertaken in 1998 and 2001/2002. The objective was to obtain a representative picture of the degree of retailer compliance with the requirement to correctly display the energy label. The latter survey was specifically intended to measure the degree of compliance and conversion during the transition to the new energy label in late 2000. In theory, non-compliance can lead to fines for each appliance incorrectly labelled, although it is not known if any retailers have, as yet, been prosecuted for this offence.
- **Check testing.** To verify manufacturers claimed energy performance, the governments of Australia conduct a national checktesting program. In theory, inaccurate registration information can lead to de-registration and the removal of the appliance in question from the market.
- **Consumer attitudes and behaviour.** A number of surveys have assessed consumer attitudes to energy efficiency, label designs and usage of different appliance types.
- **General reviews.** In 1991 and 1998 comprehensive reviews of every aspect of the SLP were conducted. These included recommendations on future directions and projected impacts into the future. During 1999 work on the new energy label design and the re-grading of the algorithms took place.

Brief synopses of the majority of these evaluation exercises are found in Appendix A.

3 Evaluation theory

3.1 Evaluation goals

Australia's SLP is now 16 years old and can be considered "mature". In some senses the main battles have been won and there is less need for the kinds of evaluation that give irrefutable evidence of the program's worth when it is first introduced. Its general benefits are now accepted. Consequently, future evaluations could settle into a maintenance role: focussing on providing an ongoing source of information on the project's impacts on sales, fine tuning the various program elements with additional ad hoc evaluation to assess particular one-off initiatives, program changes or introduction of new product types into the program.

However, carefully planned evaluation offers the possibility of doing more than this. Evaluation can provide information that would allow the development of a more strategic approach to the SLP. For example, a thorough and ongoing evaluation of the appliance markets² would be a sensible pre-requisite to the development of planned sequence of minimum standards and label revisions for each product group. By measuring specific market indicators before and after implementation, the impact and mechanism of the program's effects could be assessed and further improvements to the program identified.

The literature strongly counsels for evaluations that are both focused and "theory based" (e.g. Blumstein et al, 1998, Wiel and McMahon, 2001). A theory based evaluation means that at the outset of the evaluation exercise a set of questions or hypotheses about the effects of the program are formulated. Indicators are then agreed which will measure program impacts. Following evaluation the theory is reassessed, new questions formulated and a new cycle of testing begins. In this way evaluation becomes an integral and ongoing part of the program proper - both monitoring and, through the application of its findings, changing the program.

3.2 General approaches

Evaluations of standards and labelling programs are conceptually divided into two types - evaluation of *impacts* and evaluation of *process*. Impacts refers to outcomes of the program: changes in sales, energy consumption, carbon dioxide emissions, consumer attitudes to efficiency, retailer stocking policy. Process refers to the mechanisms of the program itself: compliance rates, administrative efficiency in registration of new models, checking manufacturers claims, tracking consumer awareness. A good program evaluation should contain both types of evaluation.

Evaluation of the *impacts* of standards and labelling programs may themselves have two foci. Either a focus on resource savings or market transformation. A resource savings perspective will aim to quantify energy savings and avoided greenhouse gas emissions. If the objective is to measure market transformation, the focus will be on measuring whether sustainable changes have occurred in the marketplace as a result of the program (Wiel and McMahon, 2001) (noting, however, that such market changes are mainly desired because they are expected to have an impact on energy

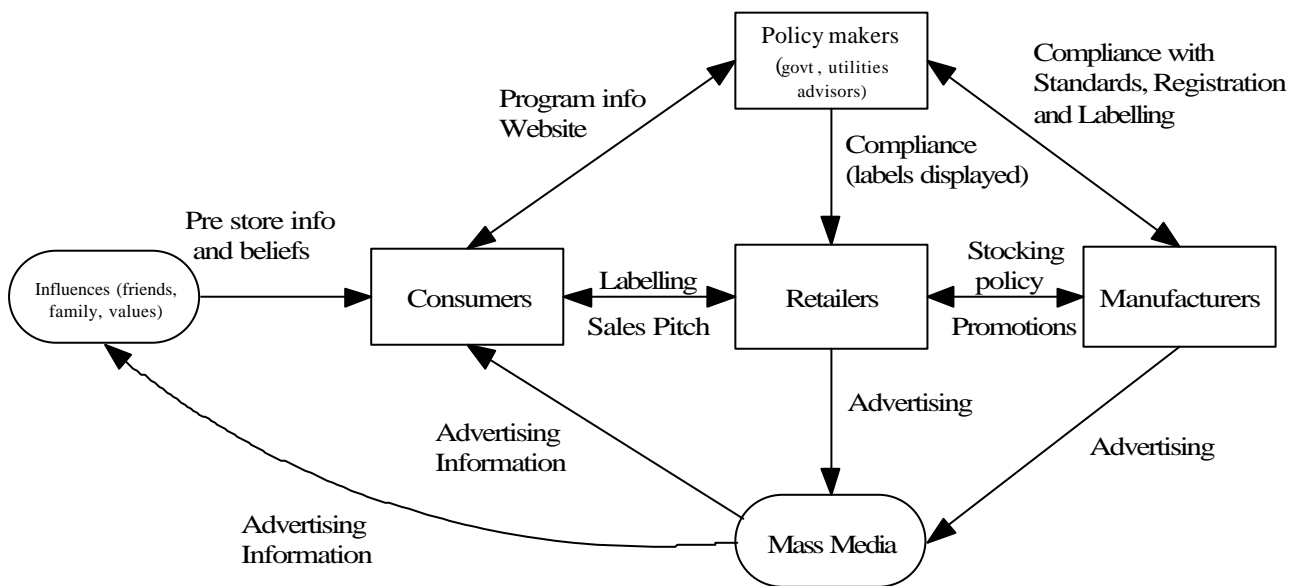
² Not only sales but relationships between market actors, orientations of manufacturers, retailers, and consumers, assessments of technical and economic potentials etc.

and emissions). This kind of evaluation may involve a mix of qualitative and quantitative methods and be concerned with identifying the relationships with market actors as much as quantifying key indicators of a shift in the market. There is no reason why both perspectives should not be deployed in the same evaluation exercise.

Indicators of changes in the market environment will tend to be of the “leading” type – that is, they will appear fairly soon after program implementation. Measures of resource saving are described as “lagging” indicators. Changes in resource saving (energy, CO₂ emissions etc.) will take place further down the causal chain – as a result of changes in the marketplace and as energy consumption characteristics of the installed appliance stock slowly change through replacements. Consequently, the period over which the evaluation exercise takes place is significant, depending on the objectives.

Figure 1 identifies the main stakeholders in a standards and labelling program and the basic relationships between them. A market transformation impact or process evaluation may aim to evaluate all or some of these relationships and their effects on the respective stakeholders. A resource savings evaluation will focus solely on the outcome of these relationships.

Figure 1: Stakeholders in the appliance standards and labelling program



Source: Adapted from Weir and McMahon (2001), page 155.

3.3 Evaluation designs

Usually the effect of the program is evaluated as the difference between program participants’ behaviour/consumption and that of some group that represents behaviour/consumption in the absence of the program. Three experimental designs are possible:

1. Participant behaviour before the program vs. participant behaviour after the program (pre-/post treatment design).
2. Participant behaviour is compared to behaviour of non-participants either after the program or both before and after (treatment/comparison group design).
3. Participant behaviour is compared to groups not exposed to the program (treatment/comparison group design).

Adapted from European Evaluation Guidebook - SRC International AIS et al (2001).

The problem with evaluating the Australian SLP is that for some appliance groups, all stakeholders are already, in some senses, “participants”. All have potentially been exposed to the labelling program for some time. All stakeholders effectively become participants. Consequently, there is no non-participant or comparison group available. This more or less rules out program designs 2 and 3. Which leaves design 1 as the most suitable. However, this too is problematic because it means that estimates of the market and efficiency profile of the stock have to be made prior to the introduction of the program. The longer the program continues the more difficult it becomes to make this kind of assessment. Design 3 would also be the best choice when assessing new initiatives which are supplemental to the core program such as a retailer training scheme or indeed MEPS or labelling requirements for products which are to be newly brought into the SLP.

3.4 Baseline determination

A stock model (developed in-house by EES for a range of purposes) has been used on an ad-hoc basis to evaluate some SLP impacts to date, but it has not been systematically used for evaluate the whole Australian SLP at this stage. Its use could be made regular and extended to include new products as they fall under the SLP. The stock model uses retail sales and appliance attribute data to estimate the average efficiency of new appliances sold in any one year and then tracks cohorts through to their eventual retirement and scrapping by making assumptions about average appliance service life. Given a knowledge of ownership³ of each appliance type plus an estimate of the total number of households this allows a calculation of the energy consumption for installed appliances of a particular type in any one year.

To measure the impact of the program since its inception using this model, a baseline estimate of the efficiency of the stock in the absence of the program would have to be developed - that is, a business as usual scenario (BAU) must be constructed against which to compare the actual and projected efficiency trends. This has been done when modelling the impacts of various energy policies on building shell performance (see AGO, 1999b) but, to the authors knowledge, no systematic attempt has yet been made to do so for all the appliances covered by the SLP. The Regulatory Impact Assessment (AGO, 1999a) for the revised energy label and the introduction of MEPS estimates impacts against baselines established from established sales data - but not back to program inception and not across the board for all appliances. Various other datasets and isolated impact assessments are in existence. Attempts could be made to

³ Average number of appliances of a particular type per household.

systematise this data with the aim of establishing baselines prior to program inception across all product groups.

Establishing a baseline estimate that can be extended into the future is essential to quantifying the program's aggregate impacts on the efficiency of new appliance sales. However, this is not a trivial task. As mentioned, the use of a comparison country similar in most respects other than in exposure to the program is questionable. A more desirable alternative is to assess efficiency trends and market conditions prior to program implementation. This may be possible for some appliance groups where either labelling or standards are still to be imposed, however accurate data on sales is usually only available for the period following introduction of labelling or MEPS, after the program has already had its largest initial impact. In all cases, establishment of baselines should be attempted; it is probably best to use a number of independent estimates and then make an informed judgement on the baseline. It has to be appreciated, however, that as the program continues, it becomes more hypothetical to compare the current level of efficiency in the market today to that efficiency that would have occurred without the program. For example, the energy labelling program for the core white goods is ubiquitous in nature and has been in place for nearly 16 years; the no label scenario is becoming increasingly difficult to establish.

3.4.1 Free rider and rebound effects

When comparing the impacts of the program versus a BAU scenario it is important to account for free-riders and rebound effects. Free-riders are those impacts currently attributed to the program would have happened in any case – sales of efficient appliances which would have happened without labelling or MEPS e.g. as a result of new technology introduced for reasons other than energy efficiency. In addition, it may be that some of the efficiency gains are taken back in the form of increased service or comfort e.g. efficiency gains in heating (e.g. through building shell improvements) are often taken back in greater service (warmer houses), especially amongst those in lower income groups who, prior to the upgrade in efficiency, could not afford to heat themselves comfortably. This is known as the rebound effect. A more accurate picture of the impact of the program will take rebound effects and free-riders into account.

Evaluation of these phenomena can be tricky. Assessment of levels of free-ridership generally require the use of surveys of appliances buyers asking what the buyer would have chosen if the label had not been there. Although this is far from ideal there are a number of techniques which can improve this kind of analysis. The alternative is to use a comparison population who have not been exposed to the Australian SLP – perhaps the New Zealand appliance buying public (although there has been some label exposure there and labelling is about to become mandatory). However the difficulties in obtaining a true control using a population in another country are probably even more intractable. Rebound studies require in-situ monitoring of appliance use and detailed analysis of household budgets. Further details of how to estimate free-rider and rebound effects are included in the European Evaluation Guidebook pp 63-72 (SRC International AIS et al, 2001).

3.5 Stages in evaluation

Evaluations should be iterative and follow a specified sequence. It seems particularly sensible to perform market impact evaluations before attempting resource impact

evaluations. This allows time for the market impacts to be expressed in changes in sales and stock and consequently energy consumption. It also allows data gaps to be identified which can then be subsequently filled. In addition it allows figures generated by the resource impact assessment to be readily interpreted. The following stages in evaluation are suggested for mature programs:

1. Conduct brief interviews with program staff to identify program changes.
2. Review and update program documentation.
3. Conduct comprehensive review of the program tracking/monitoring system
 - Review accuracy of, and trends in, data
 - Examine key performance indicators to identify program impact issues to be addressed in survey or focus group research (market/resource impact assessment)
 - Design final survey
 - Perform market impact evaluation analysis – identify (non) participating populations, segments of high and low impact etc, gaps in data.
4. Conduct limited, targeted research with targeted population to resolve lingering uncertainties. Possible areas include:
 - Free-ridership
 - Issues identified in performance indicator review and staff interviews
 - Remaining market potential and ways to increase penetration
5. After some specified period to allow market changes to work through, perform resource impact assessment
6. Estimate program impacts and cost effectiveness
7. Review evaluation results with program planners

Adapted from The European Evaluation Guidebook (pp 30-31, SRC International AIS et al, 2001)

Ultimately it is for the NAECC committee to decide what they want from any evaluation and how much effort should be put into it given the scale and objectives of the program. However, with the general theory and structure outlined above in mind, the existing evaluations of the SLP have been reviewed and a number of knowledge gaps and areas where further evaluation would be fruitful are apparent. These are examined in section 4.

4 Possible areas for evaluation of the Australian Program

4.1 Evaluating market transformation impacts

4.1.1 Comprehensive evaluation

Other than a comprehensive review in 1991 (Appendix A, item 3) evaluations of impacts on the structure and orientations of actors in the appliance market have predominantly studied isolated links in the chain of stakeholders identified in Figure 1. Given the justifiable concern to produce an effective label, many of these have focused on consumer awareness of the label (e.g. Appendix A, items 1 and 2) and reactions to various label designs (e.g. Appendix, items 6, 7 and 8).

As such, the mechanisms of the program remain in something of a black box - the program is running, there is an observed and predictable change in the efficiency of

the appliance stock but the processes which link the program elements with the observed impacts in terms of sales of efficient appliances have not been demonstrated or quantified.

For example, it is not known how much of the observed impact on sales can be attributed to:

- changes in purchasing decisions because of the label;
- changes in availability of appliance models because of MEPS (where applicable);
- factors exogenous to the program such as heightened environmental awareness in the public at large;
- technological changes that would have happened in any case;
- retailer behaviour etc.

Indeed, there may be other processes at work of which planners are unaware.

What is required is a series of studies of the market for appliances currently or potentially under the program. This would proceed in two stages. In stage one, ideally prior to implementation of the market transformation measures, a qualitative analysis is performed to identify the policies, relationships and orientations between market actors. Appropriate techniques are focus groups and one-to-one interviews. Rich qualitative data can then be used to produce an actor network such as that shown Figure 1.

Out of this work, hypotheses about how the market is, or will, change can be derived and a series of quantifiable market indicators agreed to test those hypotheses. Surveys are then conducted to measure these indicators⁴.

Following identification of the processes and mechanisms of the program and quantification of indicators, attempts can be made to quantify the relative impact of one program element or actor on one another. The statistical technique of causal analysis would be appropriate. This measures the strength and direction of relationships between elements using a succession of regression analyses.

This first market impact evaluation study provides the benchmark. A follow-up after some designated period measures the same indicators and characterises the actor network again thereby allowing changes to be measured and described. Given the time it takes for policy changes to spread through all market actors and for changes to become embedded, a 1-2 years repeat period would be appropriate for the follow up or “effect” evaluation (Suvilehto *et al*, 1997). Using this approach it should be possible to discern how the market is changing, which elements of the program are being most effective and which could be improved.

Where new MEPS or labelling requirements are to be enforced it would seem sensible to adequately characterise the market before and at some point after implementation. Whilst the RIS will undoubtedly do some of the pre-implementation work, its results

⁴ A list of possible market indicators is given in Appendix B.

could be shared and then added to, to prevent duplication of effort. The same market indicators and actors should then be assessed after some agreed time and change measured.

Detailed understanding of the market mechanisms will also reveal areas where there data collection for the resource impact evaluation could be improved. For example, it is recognised that not all appliances are sold through retail outlets. Institutional buyers such as volume house builders and government bodies may have other means of obtaining appliances. This is an area of the market is not captured in the GfK dataset currently used in the stock model.

It would be useful to evaluate how many appliances are sold through non-retail means and what their efficiency characteristics are. This kind of knowledge is best obtained through the kind of market characterisation exercise outlined above. Consequently, it makes sense to begin resource impact evaluations *after* (stage one of the) market impact evaluation – so that data gaps identified in the former can be addressed in the latter.

Labelling will only tend to impact those who buy appliances in the retail environment. In addition only a subset of those consumers in the retail environment will be influenced by the labelling information. Some specifiers of equipment have no incentive to choose efficient products. The program could usefully consider how to reach these groups. Consequently, further to a general market impact assessment the following specific aspects of the market would merit evaluation.

4.1.2 The fourth segment

Artcraft research split the appliance buying public into 4 segments - the pro-environment group, the energy efficient and/or cost conscious group, the latent pro-environment/efficiency group and the 'currently unreachable' group. This latter group “express little or no concern for the environment or energy efficiency arguments”. Evaluation could usefully characterise this group in more detail - their numbers, attitudes, demographics etc. Ways may be found to reach them through the program. For example, perhaps some of this group would respond to the label if efficiency could be linked with quality. Equally it may be found that their non-participation is insignificant or that they cannot be reached using resources within the scope of the program.

4.1.3 Non householder specification

A second group of buyers not directly addressed by the label are the institutional buyers, volume builders of new housing which include fitted kitchens and other specifiers of equipment who obtain equipment outside the conventional retail environment. For example, plumbers rather than householders will usually be the specifier when replacing water heaters. Such buyers will have different priorities to householders when choosing equipment. Most obviously, they will not be paying the energy bills. In addition, plumbers are also fairly conservative in their attitudes to equipment specification. They will tend to specify and install what they are comfortable with, what they know they have the right spares and tools for and what they know will be reliable. Efficiency may not register as a consideration at all. In the UK this has even lead to a situation whereby householders have been actively discouraged from installing certain efficient heating products (Fawcett *et al*, 2000).

Evaluation could usefully address how these types of buyer are responding to the program, if at all, and make recommendations on how to more effectively reach such groups.

4.1.4 The landlords

In Australia around 26% of all accommodation is rented, the vast majority of which is from private landlords (Australian Social Trends, 1999). At present private landlords have little or no incentive to install efficient equipment. The program could usefully assess how to reach this sizeable portion of the appliance market.

4.1.5 Label influence

It is known that a certain percentage of the population use the label in their purchase decisions (e.g. see Appendix A, item 1). What is not known is the extent of the influence. To date such quantification has not been undertaken under the Australian SLP. However, the analysis is possible. For example, a British survey of refrigerator buyers recorded actual appliance choices including the label rating and the stated degree of influence of the energy label on the purchase decision (Banks, 1999). Those stating they had been influenced by the label chose, on average, an appliance one efficiency rating unit higher than their “uninfluenced” counterparts. Such an evaluation of the Australian SLP would give useful information in disaggregating the various effects of the SLP on overall impact on sales.

4.1.6 In situ energy reductions?

The discussion of impacts has already mentioned the rebound effect. In terms of long range planning for the AGO it may be useful to examine in situ householder energy using behaviour more closely. Does, in fact, the acquisition of efficient appliances lead to less aggregate energy use? (see, for instance, Herring, 2001) It may be that efficiency gains are taken in greater levels of service or that the money saved is spent on other energy consuming behaviours leading to no net changes or even increased energy use.

The NSW electricity companies have carried out a detailed end-use monitoring project for around 300 households for one year during 1993/1994. In 2000 limited access to this dataset was negotiated. If this exercise was repeated for households equipped with efficient appliances sensible conclusions about the in-situ effects of the program could potentially be reached. Lebot *et al* (1997) have undertaken whole house monitoring in Europe with existing appliances and have undertaken bulk replacement after one year with the most efficient products on the market. This type of study, while being theoretical in that it assumes instantaneous turnover of stock, effectively quantifies the potential impact of efficient appliances and also will take into account any rebound effect that may occur from the replacement.

4.2 Evaluating resource saving impacts

Although it is theoretically possible to evaluate the aggregate effect of the SLP since its inception using a before and after design, collection of sales data prior to the introduction of labelling in 1986 is likely to prove difficult and/or expensive. Should such an evaluation be performed its main value would probably be in demonstrating the program's value for political reasons. However, as mentioned in 3.1, the project is already well accepted and its worth is no longer questioned. Nonetheless, NAECC may find it worthwhile to make a preliminary assessment of what sales data can be

picked up prior to labelling, its cost etc. If costs and effort are not excessive, ballpark estimates could be made and the exercise may prove useful.

In the meantime the SLP should continue with its ongoing assessments of the changing appliance stock. It would be make sense to perform a thorough analysis *after* market impact evaluations so that:

- gaps in data can be identified and potentially plugged (e.g. degree of non-retail sales);
- assumptions and qualifications are clear; &
- the resulting figures can be readily interpreted.

4.3 Evaluating program process

4.3.1 Compliance

The compliance evaluations reveal several areas which could be examined further.

The three Millward Brown evaluations reveal persistently low compliance rates of single phase air-conditioning units with the labelling requirement. Whilst there are some explanations for this – e.g. evaporative models do not carry energy labels, the low compliance rate remains unacceptable. Evaluation should assess whether responsibility lies with the manufacturers or the retailers and how to improve the situation.

The Millward Brown studies also point out that some brands have 100% compliance whilst others are extremely poor - one manufacturer was found to be as low as 2 % across all appliance types. Reasons for this should be examined.

In theory, non-compliant manufacturers and retailers are liable to prosecution and could be fined or, in the case of a manufacturer claiming energy consumption that does not match the results of a check test, de-registration of the offending appliance. An evaluation exercise could usefully assess how enforcement aspects of the program are running and measurement of the impact of any increased enforcement actions (e.g. issuing of spot fines).

Finally, although an overall compliance rate of 92% seems extremely high when compared to the situation in other countries (Winward *et al*, 1998) it still means that around 1 in 10 appliances are unlabelled on the shop floor. Identifying means to reach close to 100% would also seem worthwhile.

4.3.2 Retailer training programs

GWA et al (1991) find that Australian manufacturers and importers frequently express the view that whatever they do in terms of product development or labelling could easily be defeated on the showroom floor. This has been amply demonstrated elsewhere. One estimate is that the sales person affects appliance choice in 30-70% of cases (du Pont, 1998). Equally retailer incentives may not be aligned with those of encouraging the sale energy efficient appliances. Often commission schemes are based on selling the most expensive products – usually the biggest with the most energy consuming features and gadgets. Under the Australian SLP there have been ad-hoc retailer training exercises such as the Energy Smart Retailer scheme but to the

authors knowledge no evaluation of this program or other retailer programs has been conducted. The evidence suggests this is an important area to understand and, if necessary, to intervene. Evaluation of current and overseas efforts at influencing the consumer/retailer interaction would be useful. Canada have an active retailer training program with some evaluation which may prove a useful guide.

4.3.3 Galaxy awards and Energy rating website

No evaluations of these supplementary support elements have been found. Evaluation could usefully assess usage and useability of the website. It is known that hits on the website are recorded but no documented analysis has been undertaken. The galaxy awards role in both consumer decision-making and manufacturers design processes should also be assessed.

4.3.4 Segmentation

As mentioned in 4.1.2, Artcraft research segment the appliance buying public into 4 types. Their 1998 report (see Appendix A, item 7) concludes that different groups both shop differently and that the label will be used in different ways by different groups. Segmentation using measures of attitudes, values and demographics is a well established tool in both predicting the effects of energy programs and in targeting the marketing of those programs (e.g. Harrington 1997; Weber 1996). NAECC may find it to useful to characterise the consumer audience in terms of segments so that marketing strategies for the various program elements can be more accurately and effectively targeted.

4.3.5 Mass media

To the authors knowledge there have been no evaluations of the influence of the media nor the effectiveness of any supplementary information campaigns. This would also be useful in identifying which media sources are used when choosing appliances and targeting future information campaigns. It is also important to understand the effects before committing large sums of money to mass media campaigns. There have been some surveys that track general awareness of the energy label, but these are spasmodic.

5 Summary of evaluation recommendations

| Market impact evaluation | | | | |
|---|--|---|--|------------------------|
| | What's been done | What's missing | Recommendations on what should be done | Frequency |
| Comprehensive evaluation of existing program | 1991 comprehensive evaluation (GWA) | Needs updating Program processes are in black box. | 1. Systematic market impact assessment repeated at regular intervals with agreed indicators as outlined in 4.1.1 | About every five years |
| Ad hoc evaluation of impacts of new products entering program | Regulatory Impact Assessments | Follow up of RIS to measure changes in market. | 2. Alongside the RIS there should be collection of additional market indicator data as necessary and additional qualitative characterisation of the market actors. Evaluation exercise repeated after bedding in period (1-2 years) of new measures to establish changes. | As necessary |
| Ad hoc evaluation of market elements | Label awareness studies Label usage studies | Need updating Quantification of label influence 4 th segment Non-householder specification Private landlords | 3. Qualitative characterisation of all market actors for all appliance groups. Quantification of selected relationships and effects as part of recommendation 1. | About every five years |

| Resource impact evaluation | What's been done | What's missing | Recommendations on what should be done | Frequency |
|-----------------------------------|--------------------------------|--|--|---|
| | Impact evaluations | <p>1991 comprehensive evaluation (GWA)</p> <p>RIS for various products as required</p> <p>Greening whitegoods ongoing (EES)</p> | <p>No baseline determinations prior to program inception.</p> <p>No regular systematic evaluation</p> <p>No recent comprehensive program coverage</p> <p>Data gaps e.g. non-residential market for appliances</p> | <p>4. Conduct brief scoping study to assess what data sources are available and what the value of the exercise would be.</p> <p>5. Conduct resource impact evaluation following comprehensive market impact evaluation (stock modelling of Greening Whitegoods results).</p> <p>6. Data gaps should be identified following market impact evaluation (ACs, non-retail). Scoping study to evaluate data availability and costs.</p> |
| Data collection for modelling | Appliance usage patterns study | <p>Needs updating</p> <p>Accurate picture of actual energy savings (in use monitoring)</p> <p>Data on pre-implementation baselines across appliance groups</p> | <p>7. Repeat, with refined data collection.</p> <p>8. In situ survey of appliance use. Before and after evaluation of actual effects of installation of efficient appliances. Link up with current end use studies.</p> <p>See 4.</p> | <p>About every five years</p> <p>One off</p> |

| Process evaluation | What's been done | What's missing | Recommendations on what should be done | Frequency |
|---------------------------|--|---|---|---|
| | Design of elements | Label design studies | No need for further evaluation in immediate future. No evaluation of galaxy awards No evaluation of Website No evaluation of Retailer training schemes | None 9. Conduct general evaluation of supplemental process elements |
| Retailer compliance | Series of surveys 1999-2001 | Compliance surveys should be systematised and regular rather than ad hoc | 10. Conduct regular compliance survey. 11. Study to assess why not 100% compliance 12. Study to assess why air con compliance so low | Every five years or as necessary with newly labelled products One off One off |
| Manufacturer compliance | Check testing Label compliance analysis | Seems OK Further evaluation based on findings | 13. Periodically evaluate procedures 14. Brief study to assess why vastly different compliance rates amongst manufacturers | As necessary One off |
| Targeting | Nothing | Audience analysis possibly using segmentation No evaluation of media use | 15. Study to evaluate socio-demographics, attitudes and media use of different consumer segments | One off |

6 Conclusions

The NAECEC Standards and Labelling program in Australia is now mature. As such there is less need for the types of evaluation that conclusively demonstrate the programs worth, however it is clear that future evaluation could be better coordinated and that there are certain gaps in data and knowledge which could be specifically targeted.

A comprehensive review of the market using measurable indicators should be conducted every five years and prior to any introduction of further MEPS or energy labelling for a specific appliance group. Indicators should be agreed based on the theory testing approach. These same indicators should be measured at some point following a bedding in period of the new regulation – perhaps after 1 to 2 years. Change can then be measured and conclusions reached. Market evaluations should also aim to qualitatively characterise the orientations and relationships between market actors – again both before and after introduction of new regulation. This work will allow disaggregation of the various program elements on the overall outcome - changes in the sales weighted average efficiency.

Assessment of the impact on sales and consequently the efficiency profile of the stock should be made following market impact evaluations. This allows interpretation of the figures and identifies potential gaps in the data prior to the sales impact data gathering process.

Evaluation should be ongoing and cyclic with the findings continuously refining the existing program and suggesting new directions.

In addition to these basic recommendation a number of specific areas where evaluation would be fruitful have been identified. A draft evaluation plan is given in Appendix C and a list of specific recommendations in section 5.

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Appendix A: Synopses of evaluations of the Australian Standards and Labelling Program to date (not exhaustive)

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| Title: | An Evaluation of the Electricity Energy Labelling Scheme |
| Date: | November 1991 |
| For: | Demand Management Unit, State Electricity Commission of Victoria |
| By: | Quadrant Research |
| Objective: | To evaluate the effectiveness of the energy labelling scheme and the promotion associated with it. |
| Method and Scope: | Interview survey of 604 households in Victoria, 307 of whom had purchased an appliance in 1990. The remainder were selected from the white pages. Survey was conducted between March and April 1991. |
| Main Findings: | 83% of recent appliance buyers and 45% of the general public were aware of the energy label. The label appears to have played a part in well over half of the new appliance purchase decisions. Star rating system well understood. Leaflet is also viewed very positively. Fuel efficiency and running costs appears to play a significant role in decision-making. |

2

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| Title: | An Evaluation of the Gas Energy Labelling Scheme |
| Date: | August 1991 |
| For: | Business Policy and Planning Co-ordination Dept, Gas and Fuel Corporation of Victoria |
| By: | In house |
| Objective: | To evaluate the effectiveness of the gas energy labelling scheme and the promotion associated with it. |
| Method and Scope: | Door to door survey of 599 households, 299 of whom had purchased an appliance from the corporation. Of the appliance purchasers there were 150 space and water heater purchasers respectively. The remainder were selected at random from Melbourne white pages. Survey conducted between March and April 1991. |
| Main Findings: | Half of the recent appliance buyers were aware of the label. The label is less effective for hot water service sales than for space heating because hot water service buyers tend to be making a distress purchase and do not have time to |

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| | <p>shop around. A 'considerable' proportion of appliance buyers do not appear to notice the label on the appliance or do not bother to read it.</p> <p>A higher level of awareness of the gas energy label would be achieved if the label was actually stuck to the appliance. Further promotion may also be necessary. Removal of the comparative energy consumption section may make the label more accessible to a wider audience. Naming the brand and model appears to be more appropriate than a technical description as currently found. The leaflet has an important function in familiarizing potential buyers with the label.</p> |
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| Title: | Review of Residential Appliance Energy Labelling |
| Date: | Sept 1991 |
| For: | State Electricity Commission of Victoria |
| By: | George Wilkenfeld and Associates with Test Research and Artcraft Research |
| Objective: | A comprehensive evaluation of the labelling program at 1991 with recommendations on how to progress the scheme. |
| Method and Scope: | Review of key documents, focus group and questionnaire research. The report documents the state of the appliance market, the impact of labelling, major issues in the design of the label, compliance, test data, MEPS, consumer awareness, the administrative basis of labelling and makes recommendations on how to progress the program. |
| Main Findings: | This is a lengthy and detailed report with numerous conclusions and recommendations. Most significantly, the authors have "no doubt that the energy labelling of appliances has helped to change the priorities of buyers and manufacturers and has brought about an increase in the average energy efficiency of new appliances entering the stock, significantly beyond what would otherwise have occurred." |

4

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| Title: | Residential Appliances in Australia: An assessment of market and technology developments, with particular reference to energy efficiency |
| Date: | June 1991 |
| For: | State Electricity Commission of Victoria, Demand Management Unit |
| By: | George Wilkenfeld and Associates |
| Objective: | This study reviews the Australian residential appliance market over the preceding decade and projects trends in energy performance for the next five years from 1991. This was used to provide a basis for the design, monitoring and evaluation of the SECV's energy labelling and appliance standards programs. |
| Method and Scope: | Electric and gas appliances which are already labelled in Victoria and those appliances which SECV are considering either labelling of imposing MEPS upon. Methodology comprised an analysis of trends in energy efficiency, design, price and performance since 1980 using data based on Australian standards, trade publications and test data held by the Australian Consumers Association, Manufacturers and the SECV. Discussions with stakeholders. Also focus groups were used to examine consumer attitudes and preferences. |
| Main Findings: | Again a large report with many findings, most significantly the study finds that almost all appliances have become significantly more energy efficient in the preceding decade though in many cases efficiency gains have been offset by increases in size of performance. The biggest improvements have been in refrigeration products and water using appliances such as dishwashers and clothes washers. |

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| Title: | Appliance Use Survey |
| Date: | February 1995 |
| For: | NAEECC |
| By: | Test Research, A Division of Australian Consumers Association |
| Objective: | To explore consumer usage of a number of household appliances and their views on labelling |
| Method and Scope: | Postal self-completion questionnaire. 2900 returns from a random sample of 8000 households. |
| Main Findings: | Almost all the sample had seen the energy label and knew that the label was designed to show energy efficiency. Most think that the label has a |

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| | <p>maximum of 5 stars. The star scale is well understood in terms of relative efficiency - i.e. more stars is more efficient. Nearly all believe the label is a reliable source of information. Sixty percent claim that the label would be of more use if it included running costs. Refrigerators and freezers are considered to have quite low energy consumption compared to room and water heaters, air conditioners and clothes dryers. The survey also provided usage data.</p> |
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| Title: | Energy Labelling Consumer Review |
| Date: | January 1998 |
| For: | NAEEEC |
| By: | Neill Patterson, Consultant |
| Objective: | To identify improvements to the energy label from a consumer perspective. |
| Method and Scope: | Desk based review of previous evaluations of Australian consumers' attitudes and awareness to the energy label. Review supplemented by interviews with 24 stakeholders from industry, lobby groups, consumers associations and government. |
| Main Findings: | Awareness of the label steadily increasing. Good general understanding of the essential message of the label - i.e. more stars means more efficient. Most feel label information is reliable. Poor understanding of the dimensions of the star scale - only 23% aware that there are 6 stars in the scale. Inclusion of running cost would be popular but would require use of a "representative" tariff and presentation of a "table of other tariffs". KWh should not be replaced by running cost. Fractional stars would partially overcome the problem of machines which almost make a high rating being categorised down an entire star rating. Recommends focus groups to improve label design. |

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| Title: | Qualitative Market Research Study regarding Appliance Energy Rating Labels |
| Date: | April 1998 |
| For: | NAEECC |
| By: | Artcraft Research |
| Objective: | To provide a benchmark regarding current consumer use and understanding of |

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| | the existing appliance energy label. To get preliminary consumer feedback on potential changes to the labelling scheme. |
| Method and Scope: | Seven focus groups. Each focus group composed of a predefined segment of the appliance buying public. Participants in focus groups also given a short questionnaire. |
| Main Findings: | Analysis of the stages in the appliance buying process and the features that consumers look for leads to the conclusion that different groups both shop differently and that the label will be used in different ways by different segments. The report makes a number of recommendations on the label design including the following: include outlines of the six stars with those earned being emphasized. No additional text on the label - label currently contains about as much wording as is visually acceptable. A cost of running figure would be preferred over an energy use figure but only if it was accurate. |

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| Title: | Summary of Key Findings from the Second Qualitative Market Research Study regarding Appliance Energy Rating Labels |
| Date: | August 1998 |
| For: | NAEECC |
| By: | Artcraft Research |
| Objective: | To build on the previous qualitative research and provide feedback on the redesigned energy label. |
| Method and Scope: | Seven focus groups. Each focus group composed of a predefined segment of the appliance buying public. All participants must have either bought a appliance in the preceding 6 months or be contemplating buying one in the next 6 months. |
| Main Findings: | The new labels enjoy strong support from all segments. Half star ratings are easily understood as are the reasons for the “scaling back” . Indeed scaling back is considered desirable, “to leave plenty of room for the new ones”. Six stars is preferred to five stars. Unearned stars are needed and should be indicated with solid lines rather than dashed. The website guide “tests well”. Its potential is quickly grasped. A 1-800 number is not so popular. If a phone line is used it should be manned rather than a series of recorded messages accessed through punching numbers. There is considerable support for inclusion of water consumption information for clothes washers and dishwashers. |

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| Title: | Future Directions for Australia's Appliance and Equipment Energy Efficiency Programs |
| Date: | October 1998 |
| For: | Australian Greenhouse Office |
| By: | George Wilkenfeld and Associates |
| Objective: | To review the overall direction of Australia's appliance and energy efficiency program. To describe the main objectives and features of a comprehensive program and to identify gaps or opportunities in the design and delivery of program elements. |
| Method and Scope: | Desk based review of key documents. |
| Main Findings: | <p>This report is very detailed and has numerous recommendations. It contains advice on all aspects of the program at 1998 including refocusing NAECEC objectives, program structure, elements and approaches, product coverage and evaluation methodologies. Amongst the most important recommendations are the following:</p> <p>Managed revision of the star rating label. Selection of an endorsement style label for the most energy efficient products. Increased coordination between the electric and gas elements of the program. The introduction of greenhouse gas comparison information for product groups where fuel substitution is common (chiefly water and space heating). Development of non-label communication strategies for products not typically found in showrooms. Initiation of procurement programs to accelerate introduction of high efficiency appliances in key areas.</p> |

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| Title: | Energy Rating "Shadow Shop" |
| Date: | August 1998 |
| For: | NAEEEC |
| By: | Millward Brown (formerly, Yann Campbell Hoare Wheeler) |
| Objective: | An evaluation of compliance aiming to ascertain the proportion of relevant appliances displaying Energy Rating in retail premises throughout Australia. |
| Method and Scope: | Anonymous "shadow shoppers" audited 400 electrical retail sites between June 27 th and August 3 rd 1998. Shadow shoppers recorded the number, brand |

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| | and type of appliances which had energy labels correctly displayed (fridge/freezers, clothes washers, dishwashers, air conditioners, dryers). A total of 29,024 electrical appliances were examined in the metropolitan areas of all Australian states. |
| Main Findings: | Overall compliance rate for all appliance types was 92%. Air Conditioners were the only category which performed substantially below the other appliance groups with an overall compliance rating of 61%. |

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| Title: | Energy Rating Audit "Shadow Shop" - Stage One Report |
| Date: | December 2000 |
| For: | NAEEEC |
| By: | Millward Brown |
| Objective: | This study was commissioned to assess retail/manufacture compliance in the month following the mandatory introduction of the revised label. |
| Method and Scope: | As for 1998 Millward Brown study. Stratified sampling used and a total of 150 electrical retail sites viewed between the 20 th and 27 th November 2000. 14,568 appliances were included in the study spread across all labelled appliance types. |
| Main Findings: | Overall compliance to the new label change was 70.4 %. 21% had the old label and 9% were unlabelled. As per the 1998 audit, air conditioners were the only category that performed substantially worse than the other appliance groups. Bigger stores were generally more compliant than the smaller outlets. |

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| Title: | Energy Rating Audit "Shadow Shop" - Stage Two Report |
| Date: | April 2001 |
| For: | NAEEEC |
| By: | Millward Brown |
| Objective: | To obtain a more comprehensive assessment of the compliance level six months after the mandatory introduction of the new appliance label. This would assist in government jurisdictions in identifying breaches of the regulation. |
| Method and Scope: | As for the 1998 and 2000 Millward Brown studies (shadow shopper). Stratified sampling used to represent different store types, sizes and locations. A total of 401 electrical retail sites viewed between the 6 th and 28 th March 2001 giving a representative sample. 30,805 appliances were included in the study spread across all labelled appliance types. |
| Main Findings: | Overall compliance to the 6 month old label change was 78 %. 13% had the old label and 9% were unlabeled. As per the 1998 and 2000 audits, air conditioners were once again the only category that performed substantially worse than the other appliance groups with a compliance of 36%. Bigger stores were again generally more compliant than the smaller outlets. Marked differences in compliance between manufacturers were also found. |

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| Title: | Greening Whitegoods: A report into the energy efficiency trends of major household appliances in Australia from 1993 to 2000 |
| Date: | December 2001 |
| For: | NAEEEC |
| By: | Energy Efficient Strategies |
| Objective: | To assess the energy efficiency of Australian appliance sales between 1993 and 2000 inclusive. |
| Method and Scope: | Analysis of a database of retail sales data provided GfK Market Research. GfK claim to cover 99% of sales in Australia. The report covers refrigerators/freezers, dishwashers, clothes washers and clothes dryers. It does not cover single phase air conditioners nor any other appliance or equipment falling within the NAEEEC program. |

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| Main Findings: | <p>For most appliances covered by the energy labelling program in Australia, sales weighted energy consumption is decreasing. The credit for this general improvement must be attributed to the national energy labelling program. In addition the introduction of MEPS for refrigerators and freezers has made a significant impact on efficiency even before its introduction in late 1999.</p> <p>However, for clothes washers sales weighted energy consumption increased in 1999 and 2000 after falling for the previous 6 years. It appears that increases in capacity are driving up consumption faster than the counteracting effects of improvements in energy efficiency.</p> |
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Appendix B: Listing of suggested market impact indicators

Impacts on consumers

- level of awareness of the energy label, related product material and advertising
- degree of influence of the label on purchase decisions
- how does the consumer understand the label
- Increased sales of efficient equipment
- More frequent recommendation or specification of energy efficient equipment and design

Impacts on retailers

- Sales
- Attendance at training and intent to implement training
- Changes in costs of efficient equipment
- Changes in equipment stocked or displayed by retailers
- Attitudes of retailers
- Increases in private sector advertising in support of efficient technology

Impacts on manufacturers

- Sales
- Increased knowledge or awareness among planners, designers and decision-makers about energy efficient technologies
- Changes in costs of efficient equipment
- Direct and indirect costs to manufacturers (cost of production, research and development efforts to improve appliance efficiency, distribution of labels, promotion and support of labelling programs)
- Changes in production process

Appendix C: Draft evaluation plan

For process evaluations

1. Decide evaluation goals
2. Compliance Survey
 - Air conditioners
 - Manufacturers
3. Enforcement evaluation
4. Galaxy awards/Website evaluation
5. Media evaluation
6. Collate results and redesign program

For market impact evaluations

1. Decide evaluation goals, theories to be tested
2. Agree market indicators
3. Specific market information gaps
 - 4th Segment survey
 - Non-householder specification survey
 - landlords survey
 - Label influence survey
4. General survey of market for all appliance groups
5. Causal analysis, actor network characterisation
6. Repeat surveys after some pre-defined period following application of SLP
7. Measure changes
8. Apply results, redesign program

For consumption/emission impacts

1. Decide evaluation goals based on results of market impact evaluations
2. Identify data gaps
3. Collect additional data as necessary
4. Measure impacts
5. Interpret in light of market impact evaluation
6. Apply results, redesign program

Other

1. Segmentation evaluation
2. In situ evaluation