NATIONAL APPLIANCE AND EQUIPMENT ENERGY EFFICIENCY PROGRAM

Minimum Energy Performance Standards

DISTRIBUTION TRANSFORMERS

The March 2001 plan by the National Appliance and Equipment Energy Efficiency Committee to improve product energy efficiency

AN AUSTRALIAN AND NEW ZEALAND MINERALS AND ENERGY COUNCIL INITIATIVE FORMING PART OF THE NATIONAL GREENHOUSE STRATEGY

Minimum Energy Performance Standards: Distribution Transformers

OVERVIEW

The National Appliance and Equipment Energy Efficiency Committee (NAEEEC) is collecting information for consideration by the Australian and New Zealand Minerals and Energy Council (ANZMEC). NAEEEC is exploring the benefit of mandating minimum energy performance standards (MEPS) for electricity distribution transformers and supporting MEPS with a range of other measures.

MEPS is a government regulatory program stipulated in state and territory law that excludes from the market products which do not meet the minimum energy performance levels. NAEEEC comprises energy efficiency officials and regulators that implement the MEPS program in Australian and New Zealand. ANZMEC comprises the Minister of State from each Australian jurisdiction and New Zealand responsible for energy matters.

This plan for Australia represents the first stage of a public process to develop nationally consistent standards for distribution transformers. NAEEEC seeks community and stakeholder comment on proposals to improve the energy efficiency of these products by:

- mandating MEPS within relevant state and territory legislation commencing in or around July 2003 that match the Canadian standards currently proposed to take effect early 2001;
- exploring stakeholder support for developing energy performance standards for products to be marketed as "high efficiency" distribution transformers, possibly at a level that matches US levels to come into force by approximately mid 2003;
- helping stakeholders to promote and market the best-available products to the Australian marketplace.

PUBLIC COMMENTS INVITED

NAEEEC seeks comment on the proposals contained in this plan from any interested person or organisation. Please address you comments in writing to:

AUSTRALIAN Greenhouse Office

Energy Efficiency Team
Australian Greenhouse Office
GPO Box 621
CANBERRA ACT 2601

Facsimile: (02) 6274 1884
Email: energy.efficiency@greenhouse.gov.au

Comments received by 1 July 2001 will help NAEEEC shape the future program.

INTRODUCTION

Program goals

Energy consumed by equipment and appliances is a major source of greenhouse emissions. Codes and performance standards programs are amongst the most effective and widely used measures throughout the world to reduce greenhouse emissions attributable to this source. In 2000 for example, 25 of the 29 OECD countries had such programs and, within our region, New Zealand has announced plans to institute a similar program in the near future.

The Australian Appliance and Equipment Energy Efficiency Program provides an important stimulus for the development of world-class energy efficient products. Benefits can flow through to the general community in the form of monetary savings from lower operating costs and increased employment levels resulting from Australian industry's ability to exploit potential export markets.

Under the 1998 National Greenhouse Strategy, responsibility for this program rests with ANZMEC. It is committed to improving this national program and has authorised NAEEEC to develop and publish plans for those products targeted for MEPS. These plans represent a transparent way for government agencies to explore community and stakeholder support (for both mandatory and voluntary measures) to reduce greenhouse gas emissions produced by these types of equipment.

1999 Expansion

In 1999, ANZMEC accepted proposals from NAEEEC to include in its program any items of industrial or commercial equipment identified as a significant contributor to the growth in energy demand or greenhouse gas emissions. Each product proposed for MEPS will be subject to both a feasibility assessment and public consultation before any final decision is made. These assessments will include technical and economic cost-benefit analyses as well as consideration of all supervisory measures available (voluntary, mandatory or a combination of both) to ensure that the most appropriate energy efficiency regime for that specific product is chosen.

The NAEEEC work program contains a list of all products scheduled for consideration and is available at the Australian Greenhouse office website.

This transformer plan plays an important role in the ANZMEC process, communicating the potential levels and timetable for regulatory and voluntary initiatives in general terms. It also demonstrates the extent to which Governments want all stakeholders to participate in the development of policies to meet the challenge of reducing the climatic affects of energy intensive products.

DISTRIBUTION TRANSFORMERS

In simple terms, transformers (excluding those used in small appliances) can be divided into three groups: generation; transmission and distribution. The first two types are used in the transmission network linking electric generators with the distribution network, which provides power to end users. Distribution transformers are by far the most numerous and convert high-voltage electricity to lower voltage levels for use in homes and businesses.

A more detailed description of these products can be found in a report commissioned by NAEEEC held at www.greenhouse.gov.au/energyefficiency/

WHY ARE TRANSFORMERS BEING CONSIDERED FOR MEPS?

The main reasons for considering minimum energy performance standards (MEPS) for transformers are:

- The large number and the fact that all power generated in Australia passes through transformers means even small improvements in transformer efficiency can result in substantial energy and greenhouse gas savings.
- Electricity distribution transformers have a relatively long life (estimates range from around 30 years to as much as 50 years for lightly loaded or refurbished transformers), and therefore individual transformers accumulate substantial losses over their working life.
- In Australia the electricity networks are responsible for purchasing most of the transformers, while the cost of transmission and distribution losses are passed on to consumers. As a result, there is little market incentive to purchase efficient transformers. In such circumstances MEPS can be a very effective tool to address energy losses.
- Although suppliers believe most distribution transformers purchased by Australian electricity networks and larger customers would meet the proposed MEPS levels without regulation, regulators and other stakeholders believe most of the units installed privately (around 15% of the market) would not meet those standards. Little market incentive exists to change that situation and there is evidence to suggest less efficient transformers will gain greater market share over the next decade. The benefit of regulation lies in preventing this trend.
- Cumulative savings by 2015 resulting from the introduction of MEPS in 2005 are estimated to be at least 346 thousand tons of carbon dioxide equivalent (kt CO_2-e) and could be as high as 950 kt CO_2-e.
- In 1999, an expert estimated that 688,000 transformers were in use in Australia with an approximate capacity of 243,000 million volt amps (MVA). This figure includes those owned and operated by electricity utilities, generator transformers and those privately owned. The total number of distribution transformers in Australia is estimated to be 590,000, of which maybe 90,000 are privately owned. Although the majority of distribution transformers are liquid filled, most privately owned transformers are dry-type.

Industry sources suggest that around 80% of sales are manufactured in Australia. Almost all of the larger transmission and distribution transformers are manufactured in Australia, because their bulk makes them difficult and expensive to transport. Currently, most imported product is purchased for private use by industry, and is generally sourced from Southern Asia.

As most transformers are locally manufactured, the implementation of new standards in Australia should have sufficient lead times to allow existing suppliers to allocate capital to pay for re-designing products and adjusting manufacturing processes, to minimise potential economic impacts and arbitrary changes in market share. NAEEEC initially proposed an extended notice period for local industry to adjust to the MEPS proposals but the Australian Electric and Electronic Manufacturers Association advocates only a 12-month notice period. As importers should be able to meet this shortened period, NAEEEC has revised its timetable accordingly.

ELEMENTS OF THE PLANNED PROGRAM

Regulatory

NAEEEC proposes to regulate liquid type distribution transformers with power ratings from 10kVA to 2,500kVA and an input voltage of more than 5kV. NAEEEC proposes to regulate dry type transformers from 15kVA to 2,500kVA.

NAEEEC proposes to match the MEPS levels contained in the Canadian standards CSA-C802.1 and CSA-C802.2 commencing in 2001. The proposed Australian MEPS (equivalent to the Canadian levels) are targeted to commence in 2003.

NAEEEC also seeks feedback on the idea that marketing claims about "high efficiency" product should also meet an agreed standard. NAEEEC proposes to monitor the current debate in the United States of America and its potential to generate better levels of efficiency. Scheduled to commence in 2003 (with the levels possibly available this year), the United States debates could lead to appropriate levels for Australia to mandate for products claiming to be "high efficiency" transformers in mid 2003.

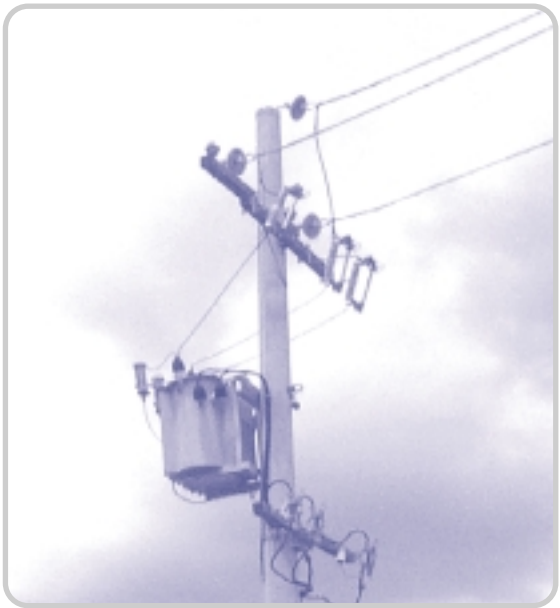
Voluntary

NAEEEC does not propose to require mandatory energy efficiency labeling of transformers (as is mandated for some domestic household appliances). NAEEEC, however, proposes to explore whether suppliers are interested in a voluntary endorsement scheme (and even possibly an endorsement label used under license) to identify "high efficiency" product. Products that meet the specified high efficiency performance levels could be labelled with this agreed logo and identified in promotional literature as meeting the government requirements for high efficiency products.

NAEEEC wants to explore with the Electricity Suppliers Association of Australia whether an arrangement can be reached to apply to its members' future transformers purchases. Regulators want assurances that the major users of generation and transmission transformers will agree to voluntarily meet or exceed the MEPS for the largest transformers. In the absence of such an undertaking, NAEEEC will have to explore other options.

NAEEEC also wants to work with stakeholder organisations like the Australian Electric and Electronic Manufacturers' Association to develop projects that support their members addressing the challenge of MEPS. Although not intended to be exhaustive, options could include:

- Support for the reform of the current network regulatory regime so that appropriate market signals are provided in order to up-grade transformers and purchase efficient units.
- Develop training and education programs for delivery by private sector partners to assist purchasers to correctly size transformers to actual tasks.
- Web base training and education programs for network operators.
- Promote advice from energy experts either within government agencies (where they already exist) or identify and promote services available in the private sector and utilities.
- Promote innovative finance packages offered by the private sector where energy savings over time are used to finance the initial cost of purchasing more efficient equipment.



PROPOSED AUSTRALIAN MEPS LEVELS

MEPS can deliver a better rate of improvement for energy efficiency of transformers in Australia than market forces. MEPS can demonstrably improve the energy efficiency of appliances and equipment, particularly where the purchaser is able to pass on inefficient running costs to third parties.

The Canadian MEPS being implemented in 2001 form the basis for the MEPS proposed for Australia. However, it is necessary to adjust these levels (and any high efficiency levels based on US proposals) to take into account the different frequencies used in the power systems in North America (60Hz) and Australia (50Hz). An expert from the University of New South Wales has examined the impact of these differences and has proposed MEPS levels in Table 1 as representing a fair “translation” of those levels.

In 2000, these MEPS levels were "tested" with a selection of key industry players and received some support. However, there is an industry view that the recommended MEPS levels should acknowledge the difficulty in achieving the equivalent efficiencies as North America at the lower frequency used in Australia. A working group will be established to determine whether less rigorous levels should be adopted for reasons not yet apparent to regulators.

At this stage, it would be premature for NAEEEC to propose "high efficiency" levels while the USA proposals are being finalised. Once the working party has resolved a position on the accuracy of the above MEPS levels, and following the announcement of US proposals in 2001, NAEEEC should be in a position to recommend appropriate levels for "high efficiency transformers".

LIQUID-FILLED DISTRIBUTION TRANSFORMERS		DRY-TYPE DISTRIBUTION TRANSFORMERS	
Power Rating [KVA]	**Efficiency Proposal** % [50 HZ OPERATION]	**Power Rating** [KVA]	**Efficiency Proposal** % [50 HZ OPERATION]
Single phase units [50% load] [+ SWER Transformers]		Single phase units [50% load]	
10	98.5	15	97.9
15	98.7	25	98.3
25	98.9		
Three phase units [50% load]		Three phase units [50% load]	
25	98.4	25	97.6
50	98.7	50	98.0
100	98.9	100	98.3
200	99.1	200	98.6
300	99.1	300	98.7
500	99.2	500	98.9
750	99.3	750	99.0
1000	99.4	1000	99.0
1500	99.5	1500	99.1
2000	99.5	2000	99.1
2500	99.5	2500	99.2

GREENHOUSE REDUCTION POTENTIAL

Distribution transformers in the Australian electricity system account for around 25% of transmission and distribution losses, equivalent to 5,450 GWh or approximately 5.4Mt CO_2-e in 1998. Electricity consumption is predicted to grow steadily and distribution losses may increase as a result of the change to single-phase voltage of 230 volts (AS 60038–2000). These factors are likely to outweigh the estimated decrease in the greenhouse intensity of electricity, so that by 2015 losses due to distribution transformers are estimated to be at least 6 Mt CO_2-e.

Discussions with the industry suggest that the large majority of distribution transformers currently purchased by utilities would comply, or very nearly comply, with the proposed MEPS levels in this report. The area where most benefit would arise is in the private ownership market where the least efficient products are typically installed. This tends to be the largest market for dry-type transformers where lower efficiency levels are found.

Based on available information concerning the stock and performance of Australian distribution transformers, the proposed MEPS level in 2005 would reduce greenhouse emissions by approximately 32kt CO_2-e per annum, with a successively larger impact in subsequent years. Cumulative savings from MEPS in the years to 2010 and to 2015 are estimated to be 185kt CO_2-e and 346kt CO_2-e, respectively.

If, as regulators believe likely, the trend continues towards the purchase of lower efficiency transformers in Australia, greenhouse savings as a result of MEPS would be substantially larger. Indicative estimates suggest that total savings in 2015 would be in the region between 650 kt CO_2-e to 950 kt CO_2-e.

Economic Implications

Since Australian manufacturers can supply a wide range of high efficiency transformers, MEPS should not unduly disadvantage any single supplier nor represent a trade barrier. There is, however, a capital cost premium for efficiency in transformers reflecting increased material costs and, in some cases, handling costs. For example, industry claim that the approximate cost difference between the "low loss" transformers and the "industrial" range is in the region of 5–10%.

Without regulation, the increasing pressure on purchasers to reduce capital costs is likely to result in a growth of inefficient transformers sold on a "first-cost" basis by importers. This would have ramifications for Australian manufacturers as well as broader economic and greenhouse impacts.

TIMETABLE AND IMPLEMENTATION

NAEEEC proposes to recommend to ANZMEC the following target timeframe for the introduction of MEPS, giving industry an appropriate period of notice to undertake any necessary modifications to production procedures. This proposed timeframe might be modified to take into account specific circumstances that may arise:

1. Development Stage Following the publication of the desk-top review (the full report is available upon request) of the energy impacts of mandatory and / or voluntary measures, the following steps will occur ► A steering committee will work to refine the initial MEPS proposals. ► Cost/benefit analysis of potential legislative options. ► Industry and stakeholder consultation on potential legislative proposals. ► Development of Australian and New Zealand Standards for inclusion in regulations. ► Ministerial approval required before introduction of any new regulations.	***Timetable*** Commenced from April 2001 and completed by July 2002
2. Notification Stage Period of notification will depend on the level of manufacture undertaken in Australia. Longer periods would apply if Australian industry required to undertake substantial development or re-tooling	The Australian standard will be published by July 2002 containing the MEPS levels and the MEPS will come into effect from around July 2003
3. Duration Stage This is the 'stability period' in which no changes to regulations are made (ie MEPS levels unchanged)	Commenced from July 2003 and scheduled for reconsideration not earlier than July 2007

This timetable provides only 15 months rather than the 24 months usually allowed for the first stage of developing MEPS. NAEEEC has accelerated that stage because of the significant consultation that occurred prior to the release of this plan involving key stakeholders, especially transformer suppliers. While this timetable cannot accommodate any unforeseen delays, NAEEEC believes the development stage for this product can be completed in that time with the goodwill of all stakeholders.

Key industry sources will have had almost three years notice of the MEPS debate (from initial contact to commencement).

In addition to commenting on this paper, stakeholders will have further opportunities to comment through the process to the Australian Greenhouse Office and others. Two examples are when Standards Australia seeks public views when circulating discussions drafts of Standard and when the draft regulatory impact statement provides stakeholders with an opportunity to comment on the detailed cost benefit studies and the draft regulation for distribution transformers.

COMMENTS SOUGHT

The Australian Greenhouse Office would like to hear your views on these proposals. The contact details are contained on the inside cover of this plan.