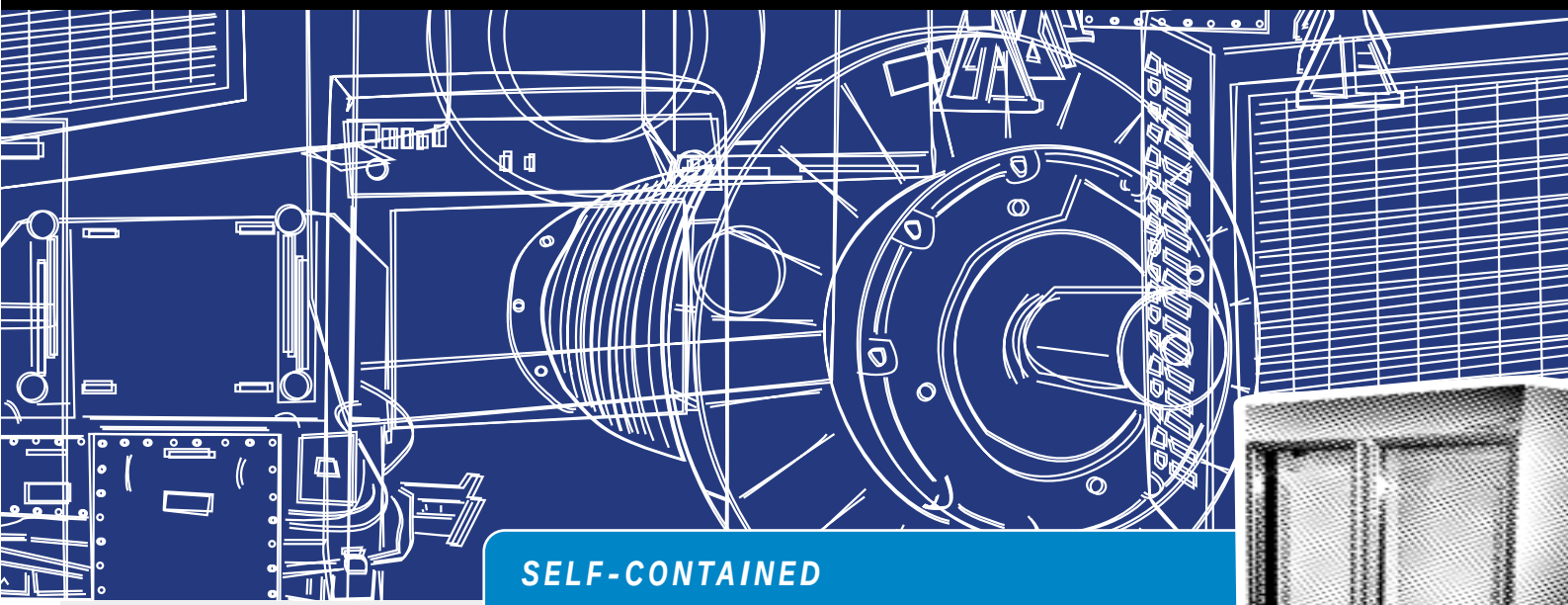
NATIONAL APPLIANCE AND EQUIPMENT ENERGY EFFICIENCY PROGRAM

Minimum Energy Performance Standards



SELF-CONTAINED COMMERCIAL REFRIGERATION

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: Self-Contained Commercial Refrigeration

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 self-contained commercial refrigeration 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 self-contained commercial refrigeration. At its essence, 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 January 2004 that match the relevant Canadian standards currently in place for the following self-contained products:
  - commercial refrigerated display cabinets and merchandisers;
  - food service refrigerators and freezers;
  - refrigerated vending machines;
  - ice making and ice storage equipment.
- promoting and marketing the best-available products in 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 self-contained commercial refrigeration plan plays an important role in the ANZMEC process, communicating the potential levels and timetable for regulatory 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.

SELF-CONTAINED COMMERCIAL REFRIGERATION

'Self-contained' commercial refrigeration products are mass produced units which have integral components and are designed to plug into an available electricity supply. This category includes the following:

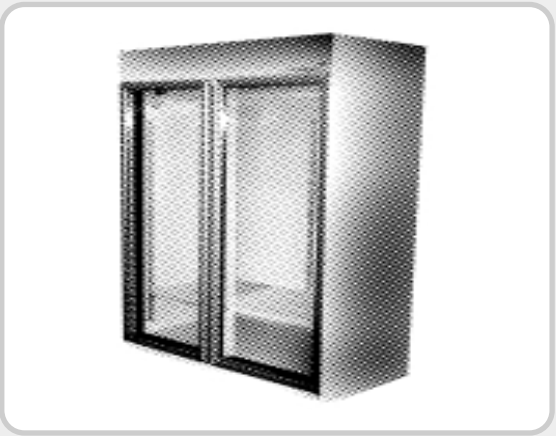
- self-contained display cases in food retail, preparation and service industries;
- glass door merchandisers;
- reach in freezers and refrigerators;
- refrigerated food displays;
- ice making and ice storage equipment;
- refrigerated vending machines;
- ice cream displays;
- cold water dispensers.

This category does not include remote refrigeration systems, or industrial refrigeration equipment such as that used in food processing, abattoirs and dairies. NAEEEC proposes to deal with remote systems in a separate plan.

The following table shows the estimated annual sales and the existing population of self-contained refrigeration technologies in Australia.

NAEEEC understands that a substantial proportion of components and finished products are imported. While some assembly may be required, the Australian industry is best characterised as importing from overseas suppliers.

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



PRODUCT	ANNUAL MARKET	EXISTING STOCK	LIFE SPAN (YEARS)
Self-contained Display Cases	6,000	36,000	6
Glass Door Merchandisers	10,000	170,000	8
Reach in Refrigerators	3,500	32,000	9
Reach in Freezers	4,000	36,000	9
Ice Making Equipment	4,500	45,000	10
Refrigerated Vending Machines	13,300	120,000	9
Ice Cream Displays	10,000	60,000	6
Cold Water Dispensers	32,000	300,000	9

WHY ARE SELF-CONTAINED REFRIGERATION TECHNOLOGIES BEING CONSIDERED FOR MEPS?

The main reasons for considering minimum energy performance standards (MEPS) for self-contained refrigeration technologies are:

- Self-contained refrigeration technologies are estimated to consume 2,200 GWh of electricity in 2000, resulting in greenhouse emissions of 2.2 Mt CO_2-e. In a 'business as usual' scenario, consumption is estimated to grow by an average of 3.3% per annum from 2000 to 2015.
- 72% of this energy consumption is shared over 55,000 end-users.
- Many self-contained refrigeration products are purchased by third parties who are not responsible for the running costs and therefore have little incentive to buy efficient units. These products, which include most vending machines, beverage merchandisers, ice cream displays, ice storage and cold water dispensers, use over 70% of the total energy consumed in commercial refrigeration.
- Most users have little market power and little awareness or information of the savings potential available.
- Technically feasible improvements with a payback under 5 years could save approximately 40% of self-contained commercial refrigeration consumption, with large savings available at very small additional costs to the manufacturer.
- Most self-contained technologies are already subject to minimum energy performance levels in one or more other countries, and MEPS are being actively considered in Europe and the US. The strong international trade in commercial refrigeration products suggest that the levels of energy performance adopted by Australia should be approximately equivalent to those used of our major trading partners.

Given the growing contribution to greenhouse emissions made by commercial refrigeration, NAEEEC considers that there is reason for regulation to play a role in this sector.

As there is a significant Australian refrigeration manufacturing and assembly industry, implementation of new standards should have sufficient lead times to allow existing suppliers to re-design products and adjust assembly manufacturing processes, to minimise potential economic impacts and arbitrary changes in market share.

NAEEEC initially proposed a significantly longer period to implement MEPS but representatives from key suppliers and major customers sought accelerated implementation. NAEEEC now proposes a fifteen month development stage to publish the MEPS levels in the Australian Standard and a further eighteen months formal notice period for local industry to adjust to the MEPS proposals. Some sections of industry advocate a 12 month notice period and NAEEEC is very interested to resolving this issue during this consultation.

ELEMENTS OF THE PLANNED PROGRAM

Regulatory

NAEEEC proposes to regulate the efficiency of the following self-contained technologies. The proposed Australian MEPS are targeted to commence in January 2004.

Commercial Refrigerated Display Cabinets and Merchandisers

NAEEEC proposes to match the MEPS levels contained in Canadian standard C657-95, which prescribes the maximum energy consumption per unit length for a range of refrigerated cabinet types.

Food Service Refrigerators and Freezers

NAEEEC proposes to match the MEPS levels contained in Canadian standard C827-98, which prescribes the annual energy consumption for a range of products, based on the refrigerator volume.

Refrigerated Vending Machines

NAEEEC proposes to match the MEPS levels contained in Canadian standard C804-96, which prescribes the maximum daily energy consumption for a range of products, related to the machine's capacity.

Ice-Makers and Ice Storage Bins

NAEEEC proposes to match the MEPS levels contained in Canadian standard C-742-94, which prescribes the maximum input energy per kg ice produced or stored.

NAEEEC is not aware of any country that has introduced MEPS for cold water dispensers, and at this time, does not intend to introduce regulations for these products. NAEEEC may take a different view if MEPS are adopted overseas.

MEPS negotiations for these products are well underway in the USA and Europe. Should these negotiations result in stronger MEPS levels being announced in either of those economies (stronger than the Australian levels based on Canada) before July 2002, Australia will consider using these stronger levels as a target for any endorsement program targeting "best practice" commercial refrigeration. The Australian Standard would be amended to reflect these higher efficiency levels as well as the MEPS levels proposed above. Should the USA or European negotiations culminate in MEPS instituted after July 2002, they could well form the target for the next round of MEPS in Australia commencing not earlier than January 2008.

Voluntary

NAEEEC considers that there is a role for the refrigeration industry to provide information to consumers on the performance of refrigerated display cases, food service refrigerators and freezers, ice making and ice storage equipment and cold water dispensers. This may be achieved through a public listing on a website. NAEEEC is interested to hear whether parts of the industry are interested in operating and promoting such a facility, supported by government.

Alternatively NAEEEC will consider industry calls for a voluntary program that helps identify and endorse the better products within these categories on the market, such as an endorsement program or even some form of labelling of "high efficiency" display cabinets.

NAEEEC also wants to work with stakeholder organisations to consider initiating a best practice information program for refrigerated beverage vending machines. Industry assistance is sought to ensure the development of appropriate materials and their dissemination to key sectors.

PROPOSED AUSTRALIAN MEPS LEVELS

The MEPS implemented in Canada forms the basis for those proposed for Australia.

Experts advised NAEEEC that the MEPS levels used in Canada should be adjusted to take account the different voltages of electricity supply (Canada-115V, Australia- 240V). The Australian MEPS proposals have therefore been reduced by 6%, compared to the Canadian standard, which NAEEEC believe makes them equivalent. Some industry sources suggest the 6% allowance is not required.

A stakeholder working group has been formed to determine appropriate product classes in the Australian market, and to consider whether the test methodology should be simplified to include only one climate class (for display cabinets). NAEEEC is also interested to receive the views of this group on any adjustments required for Australian circumstances.

The following tables show the proposed standards for each product category.

Commercial Refrigerated Display Cabinets and Merchandisers

The following table shows the proposed standards tested using Australian Standard test methodology (AS 1731-1983) for one climate class (class 3).

PRODUCT CLASS	DESCRIPTION	EVAPORATING TEMP.(˚C)	SPECIFIC ENERGY CONSUMPTION Proposed Australia (kWh/m/day)
Class 1:	low temperature multideck, two or more air curtains	-35	36.3
		-30	35.7
Class 2:	medium temperature multideck, length of air curtain 1.0-1.5m. Cabinet height 1.9-2.1m and depth 0.8-1.2m.	-10	21.3
		-5	18.4
Class 3:	medium temperature multideck, length of air curtain 0.8-1.0m. Cabinet height 1.0-1.4m and depth 1.0-1.2m.	-10	14.6
		-5	12.0
Class 4:	low or medium temperature closed multideck, single air curtain behind glass door. Cabinet height 2.0-2.1m and depth 1.0-1.2m.	-30	21.2
		-5	16.7
Class 5:	low temperature, well type self service cabinet, open or closed, with horizontal air curtain, length of air curtain 0.75-0.85m or 1.0-1.2m.	-35	19.6
		-30	16.4
Class 6:	medium temperature single deck self service cabinet, length of air curtain 0.75-0.9m. Cabinet height 0.8-1.01m	-10	11.0
		-5	8.7
Class 7:	medium temperature single deck wall / island type cabinet with a perforated product shelf. Width of the display area:		
	a. narrow: 0.75-1.02m	-10	11.6
		-5	9.0
	b. medium: 1.03-1.27m	-10	16.3
		-5	13.7
	c. wide: 1.28-1.65m	-10	17.3
		-5	14.4
Class 8:	low or medium temperature cabinet with a flat or curved front glass. Height 1.25-1.4m, depth 0.95-1.2m.		
	a. fan coil,	-25	17.5
		- 5	6.0
	b. gravity coil.	-10	6.4
		-5	3.2

FOOD SERVICE REFRIGERATORS AND FREEZERS

The following table prescribes the maximum Annual Energy Consumption for a range of products, where V is the refrigerator volume measured in ft^3. The adjusted volume (AV) is equal to the refrigerator volume plus 1.63 times the freezer volume.

DESCRIPTION	ANNUAL ENERGY CONSUMPTION (AECmax), kWh/y
Refrigerators – Solid Doors	
Reach-in	55V + 949
Reach-in Wine Cooler	48V + 282
Milk or beverage type	29V + 423
Worktop table/undercounter	82V + 733
Refrigerators – Glass Doors	
Reach-in	111V + 1899
Reach-in Wine Cooler	96V + 564
Milk or beverage type	58V + 846
Worktop table/undercounter	164V + 1466
Freezers – Solid Doors	
Reach-in	162V + 874
Ice-cream cabinet	81V + 1194
Worktop table/undercounter	345V + 2068
Freezers – Glass Doors	
Reach-in	314V + 1748
Ice-cream cabinet	162V + 2388
Worktop table/undercounter	690V + 4136
Refrigerator-Freezers – Solid Doors	
Reach-in	87V + 1786

ASHRAE 117 will be used as the basis for the test methodology, with the following test conditions.

AMBIENT TEMP	INITIAL PRODUCT TEST TEMP (C)
24 C dry-bulb	Refrigerator, fresh food: 3.3 C
10 C wet bulb	Freezer: -17.8 C Reach-in wine cooler: 7.2 C Ice cream cabinet: -20.6 C

VENDING MACHINES

The following table prescribes the maximum Daily Energy Consumption for a range of products.

CLASS	DESCRIPTION	MAX DAILY CONSUMPTION (E_{dmax}) kWh	PRODUCT TEMP UNDER TEST (C)
A	Packaged beverage	Edmax < 8.14 + 0.008 x Capacity	1 +/- 1
B	Post-mix beverage	7.5	1 +/- 1
C	Chilled non-perishable food	13.2	16 +/- 2
D	Cold perishable food		
	Gross Volume <300L	9.9	4 +/- 1
	Gross Volume >300L	13.2	4 +/- 1
E	Frozen food	13.2	-19 +/- 1
F	Hot food that is stored cold	16.0	-9 +/- 1
G	Frozen food or snack	11.3	-19 +/- 1
H	Cold beverage or snack	7.5	1 +/- 1
J	Cold perishable food/snack	9.9	4 +/- 1
K	Hot beverage	0.0	
	<10L	4.2	94.5 +/- 2
	>10L	5.6	94.5 +/- 2

The Canadian standard C804-96 and ASHRAE 21.1–1997 will be used as the basis for the test methodologies. Product tests are conducted at an ambient temperature of 32ºC +/- 1 for Types A-J, and at 10ºC +/- 1 for Type K. Internal temperatures for different product types under test conditions are shown in the table above.

AUTOMATIC ICE-MAKERS AND ICE STORAGE BINS

The following table prescribes the maximum Input Energy per kg ice produced, for a range of product sizes, where the capacity is defined as 0.8 X Vm X 481 and Vm is the internal volume (m^3) ignoring baffles.

ICE-MAKERS	BATCH AUTOMATIC ICE-MAKERS (CUBERS)	INPUT ENERGY
Air-cooled	23 < capacity < 150 kg/d	1532.2 - (5.648 x capacity), kJ/kg
	150 < capacity < 1000 kg/d	758.8 - (0.4915 x capacity), kJ/kg
Water-cooled	23 < capacity < 150 kg/d	1160 - (4.118 x capacity), kJ/kg
	150 < capacity < 1000 kg/d	584.5 - (0.2806 x capacity), kJ/kg
	CONTINUOUS AUTOMATIC ICE-MAKERS (FLAKERS)	
Air-cooled	23 < capacity < 300 kg/d	822.7 - (1.055 x capacity), kJ/kg
	300 < capacity < 1000 kg/d	506.3 kJ/kg
Water-cooled	23 < capacity < 300 kg/d	696.1 - (0.8976 x capacity), kJ/kg
	300 < capacity < 1000 kg/d	442.9 kJ/kg

Canadian standard C-742-94 and ASHRAE 29 – 1998 will be used as the bais for the test methodologies. Product tests are conducted at an ambient temperature of 32°C, with a condenser inlet temperature for ice-makers of 32°C and an initial ice temperature of 0°C for ice storage bins.

The following table prescribes the minimum storage efficiency, for products with a range of storage capacities.

ICE STORAGE CAPACITY	MINIMUM STORAGE EFFECTIVENESS (%)
< 70 kg	60
70 kg to 99 kg	70
100kg to 200 kg	75
> 200 kg	80

Storage effectiveness (es) is defined over a 24 hour period as $(W_1 - M_2 - 6M_4)/(W_1 - M_2)$ x 100%, where;

M_2 = melted ice weight from hour 0 to 2 (kg)
M_4 = melted ice weight from hour 2 to 6 (kg)
W_1 = initial weight of ice (kg)

GREENHOUSE REDUCTION POTENTIAL

Commercial refrigeration in Australia consumes approximately 6,400GWh of electricity per year, and is projected to increase by 4.8% per annum. Greenhouse emissions of over 6.3 Mt CO_2-e per annum are expected in 2000, rising to a projected 11.6 Mt CO_2-e per annum in 2015.

Self-contained commercial refrigeration technologies are estimated to consume approximately 2,200 GWh of electricity in 2000, with greenhouse emissions of nearly 2.2 Mt CO_2-e per annum. By 2015, consumption will increase to 3,600 GWh, and emissions to 3.2 Mt CO_2-e per annum.

The proposed introduction of minimum energy performance standards for lighting ballasts in 2002 will have some impact on direct and in-direct consumption in display cases. It is estimated to lead to a 6% reduction in self-contain refrigeration energy consumption by 2015.

Based on available information concerning the stock and performance of Australian self-contained refrigeration products, the proposed MEPS level would reduce greenhouse emissions by approximately 450 kt CO_2-e per annum in 2015.

ECONOMIC IMPLICATIONS

Information received from suppliers of refrigeration systems and units indicates a very low demand for the higher energy efficient equipment from the market. Manufacturers are reluctant to invest resources to obtain further efficiency gains without some clear market signal for energy efficient equipment. Until demand is stimulated, business-as-usual advances in energy efficiency are likely to be small and much lower than Governments' desire.

At the same time, considerable energy savings are available from high efficiency equipment, often with minimal additional cost and in short payback periods. As a result, Australian businesses and consumers are disadvantaged by having to bear considerable energy costs over and above those which could be expected in an efficient market.

These circumstances justify market intervention in the form of minimum energy performance standards for various types of commercial refrigeration equipment stipulated in regulation.

In view of the fact that a large proportion of products are imported, (either as components or finished products), and the international trend towards greater efficiency in refrigeration products, manufacturers and assemblers should be able to meet the proposed MEPS given sufficient lead times to adapt.

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 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 January 2004 (ie 18 months notice)
3. Duration Stage This is the 'stability period' in which no changes to regulations are made (ie MEPS levels unchanged).	Commenced from January 2004 and scheduled for reconsideration not earlier than January 2008 (ie fixed for at least 4 years)

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 commercial refrigeration 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. The whole process provides more than 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 throughout the process to the Australian Greenhouse Office and other bodies. 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 commercial refrigeration.

COMMENTS SOUGHT

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