Matching World's Best Regulated Efficiency Standards: Australia's success in adopting new refrigerator MEPS

by Lloyd Harrington,
Energy Efficient Strategies, Australia
&
Shane Holt, Australian Greenhouse Office

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Outline of Presentation

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- Australia's new policy on matching world's best regulatory practice MEPS
- Australian refrigerator market
- Identifying the most stringent MEPS levels – international comparison
- Assessing the impact of refrigerator MEPS on energy consumption in Australia
- Testing issues

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MEPS in Australia

- Energy efficiency standards are currently in place for refrigerators, freezers and electric storage water heaters (October 1999), packaged air conditioners and electric motors (October 2001) with fluorescent lamp ballasts set for early 2003.
- Another 8 product groups on the "drawing board" for launch in 2002/2003, including transformers & commercial refrigeration.

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New Policy Goal

In 1999 Australian governments adopted a policy of matching world's best international practice for our national MEPS (matching means "equivalent" efficiency levels with a time lag of up to 3 years)

This turns the debate from the feasibility of meeting a proposed level to the modification of those levels to take account of technical testing considerations.

Key Elements of Australian Refrigerator Market

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- Average refrigerator sizes are 350 litres and stable (typical family unit is 450 litres)
- Total sales 600,000/year; stock 10 million;
- Around 70% made in Australia and NZ
- Products imported from US, Asia and Europe
- Strong trend towards frost free products
- 80% are 2 door refrigerator-freezers (balance are side/side, refrigerator only, small single door units – mostly small bar refrigerators)

Frost Free share has been increasing 1980-2000

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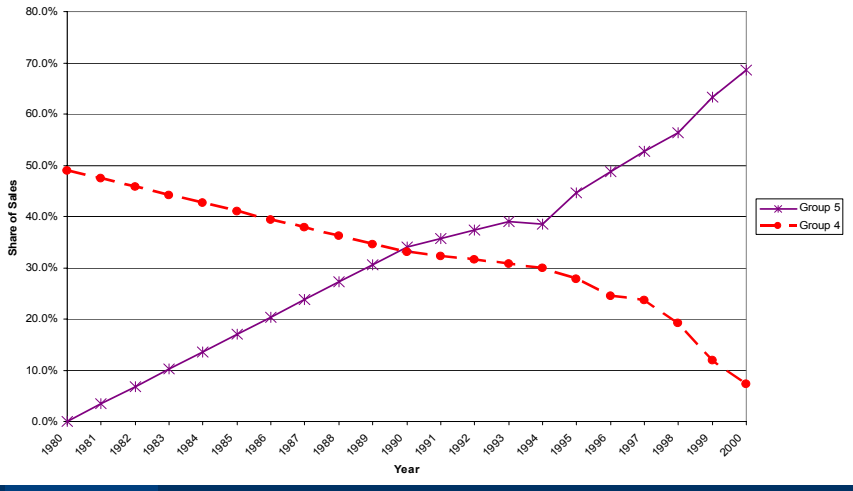

Identifying the most stringent MEPS level

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- In 1999, EES was commissioned to review a range of MEPS levels in force or proposed around the world.
- Considered Europe 1999, USA 2001, Korea 1998, Japan Top Runner, Chinese Taipei and a number of other countries
- USA 2001 appeared the most stringent that is likely to be implemented in the short term (Japan hard to assess).

Issues in Comparing MEPS levels

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- Product types vary by region (eg USA substantially frost free, Europe substantially convective cooling);
- Differences in test procedures create substantial difficulties in comparing MEPS energy;
- Some test procedures are similar (eg AS/NZS, Taiwan, Korea, USA)
- ISO quite different, Japan very different.

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Getting Equivalent Levels

- Once the most stringent MEPS level was identified (USA 2001), an equivalent level under AS/NZS was determined;
- AS/NZS and US test methods are similar, so adjustments were generally small;
- Main issues are compartment target temperatures, FZ temperature sensor positions, treatment of adaptive defrost, compartment temperature balance (controls)

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Verification of Results

- Commissioned tests on 9 refrigerator-freezers (3 units were sourced direct from US market ie 115V/60Hz)
- Wide range of other tests at an accredited lab: USA, AS/NZS, ISO;
- Modelling was undertaken on a range of units to fully understand the operation of each refrigerator;
- “Equivalent” MEPS levels under AS/NZS

Issues: Adaptive defrost

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- For frost free models, true adaptive defrost is expected to dominate Australian and North American markets within 10 years
- Most models have constant defrost operations (timer or adaptive controls)
- Problems for testing are significant as smart controls mean that time between defrosts can be highly variable and can change as the product learns to adapt to the conditions

Comparison of MEPS levels – refrigerator-freezers (convective)

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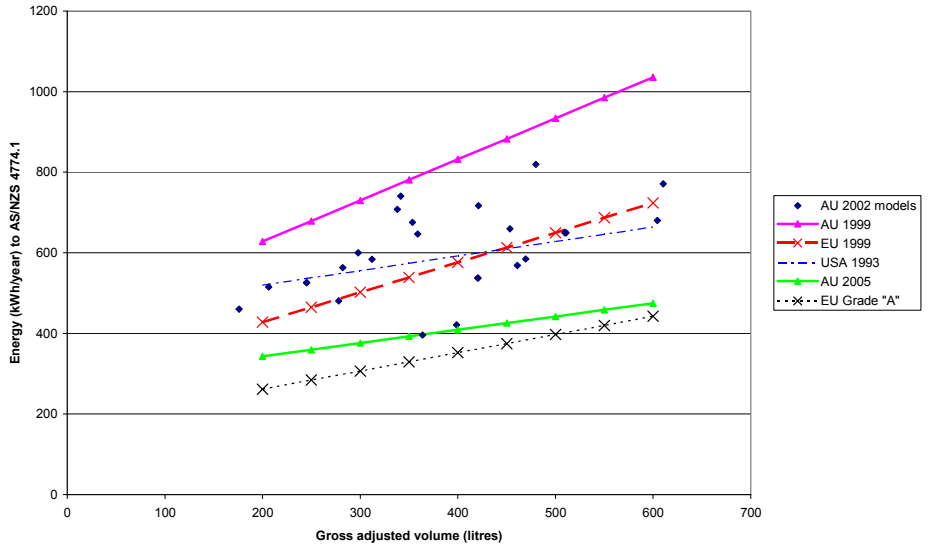

Comparison of MEPS levels – refrigerator-freezers (frost free)

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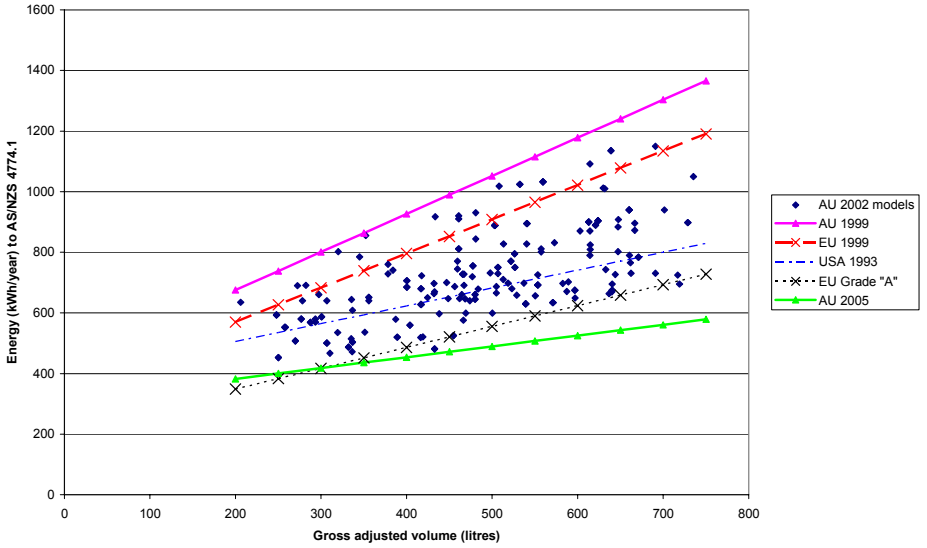

History of influences on refrigerator energy

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- Labelling first considered in early 1980's;
- Mandatory energy labelling started in 1986;
- First study on feasibility of MEPS in 1993;
- Phase out of CFCs in 1994;
- MEPS levels set in 1996 to start in 1999;
- New label and labelling algorithm in 2000;
- New MEPS levels for 2005 negotiated in 2000 (equivalent to USA 2001 levels).

Impact of Refrigerator MEPS 2004 – energy per unit

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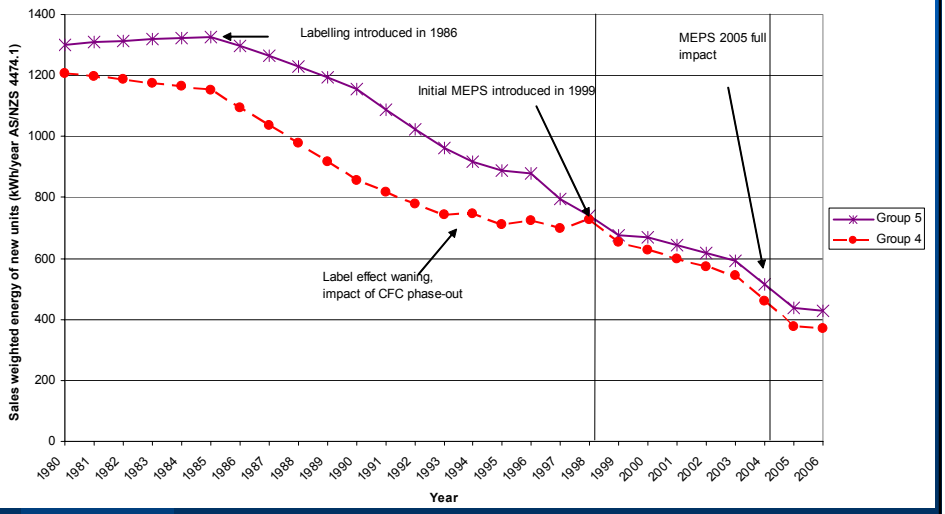

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Impact on refrigerator energy 1

- In early 1980's energy consumption was 1300 kWh/year (possibly increasing);
- Energy consumption declined 3% per annum until 1996;
- Energy reduction slowed due to CFC phase out, biggest impact on separate freezers;
- MEPS in 1999 => resulted in 20% energy reduction in 3 years;
- MEPS 2004 will result in further 40% reduction in 5 years.

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Impact on refrigerator energy 2

- Energy reductions are despite an increase in volume of around 20% from 1986-2005;
- New technology has played a role (most significant is electronic controls, adaptive);
- Technical changes mostly evolutionary;
- Difficult to attribute energy reductions to particular programs;
- Manufacturers respond to energy programs in a variety of ways (push/pull);

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Test Method Issues

- Adaptive defrost and smart technologies need some serious attention;
- Need to address special compartments;
- US part 1 and Part 2 energy method is recommended (needs some refinement);
- ISO temperature operation test good;
- Universal use of ISO test packs (operation);
- Test packs for energy test => BAD!
- Energy test to cover range of ambients

A new testing approach?

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- An ideal test procedure would develop an energy ambient temperature profile (largest impact on energy => climate)
- Additional components could then be added to simulate heat loads (food and door openings) and defrost energy (water disposal)
- Papers by Bansal and Meier explore this in more detail - algorithm (=tests + modelling)

Conclusions 1

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- Many different refrigerator test methods in use around the world, large world trade
- Trade is constrained by the use of many different methods for regulatory purposes
- None current methods ideal - especially with regard to ambient temperature and energy
- Some differences are subjective, but some elements are superior in some methods - should work to minimise differences where these make sense

Conclusions 2

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- Conversion algorithms (modelling) may be possible, but substantial work needed;
- Some initial groundwork done;
- Many countries regulate refrigerators for energy efficiency = regulatory "baggage";
- Regulators need to be convinced that a new approach will be an improvement;
- Governments need to take active interest in developing test methods if they regulate;

Conclusions 3

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- Refrigerator energy in Australia will have fallen 70% from 1985 to 2005;
- This is due to a combination of energy labelling and MEPS;
- Policy of adopting world's best practice appears to be very successful for Australia;
- However, to be effective, this policy requires major economies (eg Japan, USA, Europe) to lead the way and continue to set stringent efficiency standards.

The End

Energy Efficient Strategies

- You can find copies of reports and other information at:

www.energyefficient.com.au

under documents

Also see:

www.greenhouse.gov.au

www.energyrating.gov.au

- - thank you