ELECTRICAL APPLIANCES

The energy performance of many types of equipment which contribute to building energy use are regulated by MEPS (Minimum Energy Performance Standards) and energy rating labels. These schemes are discussed in Part 2. Energy performance of some important electrical appliances is described below. Energy use data in this section otherwise indicated. Throughout this section 'BAT' refers to *best-available technology*.

The modelling of residential energy consumption under this plan assumes normal rate of turnover of electrical appliances, and that new and replacement appliances will perform at a level corresponding to today's best-available. For more information on the, see Appendix 1.

FIGURE 3.27

An induction cooktop with a wok [Electrolux]

Televisions

Technology Description

The power usage of television sets depends to a large degree on screen size (measured as a diagonal on the screen). Taking typical screen sizes as being in the range 70-130 cm and assuming 10 hours viewing per day, the annual energy consumption is as shown in Table 3.15.

Table 3.15 shows that the larger screen size model consumes twice the energy of the smaller model.

Note that each of the sets in Table 3.15 has the same basic screen technology type – LCD screen with LED backlighting. On the government energy rating website this is called LCD (LED). The best plasma technology models give substantially higher energy consumption. For example, in the 90-110cm range, the most efficient plasma model consumes 322 kWh/annum (almost three times the consumption of the best LCD (LED) model).

From October 2012, the MEPS maximum energy figure is 90.1 + (0.1168 x screen area [cm^2]) based on standard AS/NZS62087.2.2. For example, the 70-90 cm best model in Table 3.15 has an energy consumption of 110 kWh/annum. The MEPS limit for its screen size would be 409 kWh/annum. This suggests that the MEPS limit will be considerably higher than the best models, but somewhat lower than the worst of the present models.

Standby energy use is relatively insignificant. Using a typical value of less than 0.3 W, this translates to about 2.6 kWh/annum, which is less than 3% of the total energy consumption of the best performing model.

Technology Benefits

Energy efficient TVs have the benefit of lowering the household's electricity bill and greenhouse gas production. As listed above the median model in a range consumes over twice as much energy as the corresponding BAT model.

Costs

The costs of televisions vary widely, depending upon the screen size and type.

Household Refrigerators/Freezers

Technology Description

Refrigerators come in many shapes and sizes and their usefulness may depend on the makeup and personal preferences of the household. For example, whether the freezer box is at the top or the bottom of the appliance may be largely a matter of preference. What may be of more concern is their energy usage and the attributes of the refrigerants used namely, their Global Warming Potential (GWP) and their Ozone Depletion Potential (ODP). Another aspect of refrigerator use is the effect on building heating and cooling.

Taking typical refrigerator sizes as being in the range 200-500 L, the annual energy consumption of one-door and two-door models is as shown in Table 3.16.

Interestingly, in the two-door models, the best energy consumption actually goes down slightly as the size increases. The one-door models consume somewhat less energy for a given size than the two-door models. This is most marked in the 200-300L range, where the best one-door model uses 57% less energy.

Technology Benefits

Modern fridges with low-GWP and low-ODP refrigerants have benefits for the environment, as it is inevitable that some refrigerant escapes into the atmosphere over the life of the product. Also, there is the issue of making sure that all appliances are handled appropriately after the end of their working life. Lower energy usage also has benefits in lower running costs and lower greenhouse gas emission from the electricity generation. As demonstrated in Table 3.16, the average model consumes between 12% and 51% more energy than the BAT model.

TABLE 3.15
TV Energy consumption

Screen size range (cm)	Annual energy consumption (kWh/annum)		Excess of Median over the BAT
	Best model	**Median model**	
70-90	110	310	182%
90-110	194	470	142%
110-130	220	563	116%

TABLE 3.16
Refrigerator energy consumption

Capacity (L)	**Doors**	**Annual energy consumption (kWh/annum)**		**Excess of Median**
		BAT model	**Median model**	**over the BAT**
200-300	1	213	310	46%
300-400	1	226	310	37%
400-500	1	250	279	12%
200-300	2	338	394	17%
300-400	2	329	415	26%
400-500	2	318	480	51%

Note that the one-door models have limited freezer capabilities (either none, or with an ice maker, or with a short-term freezer compartment).

Implementation Recommendations

As mentioned above, there will need to be a recycling process for old appliances to ensure that the refrigerants do not escape after the end of their working life.

In-home re-purposing of old refrigerators, say as a drinks fridge, should be avoided.

Costs

The average costs for a 400-500L fridge is between $1200 and $1700.

Domestic Washing Machines

Technology Description

Front-loading washing machines are regarded as more efficient than top-loading machines. Load capacity can vary from 4.5 to 10 kg, and this choice may be governed by the size of the household. If the machine size is too big for the household, it may be inefficient as a lot of washes may be with partly full tubs. A machine size that is too small may lead to multiple time-consuming washes. How environmentally friendly the machines are depends upon the amount of energy and hot and cold water they use. Further, there are many options and cycles that may complicate the comparison of energy and water usage between models. For example, some machines allow a delayed start option which may help consumers avoid critical electricity pricing periods. Also, many machines have automatic load sensing and water-level adjustment which save both water and energy. Finally, many machines do not have a cold wash option and may not take in hot water, but instead use internal heating to obtain wash temperatures (even on "cold" wash cycle).

The best performers in the 7-8 kg load range usually do not allow a cold wash option. Presumably manufacturers argue that this gives superior wash quality. The best machine that does allow this in the 7-8 kg size range uses 130 kWh of energy (cold wash) and uses of 68 L of water per wash.

(In this case the star rating index is a combination of the energy used, the machine's spin efficiency and the load size, and so is limited in its ability to encapsulate the machine's relative merits.)

Technology Benefits

Energy efficient washing machines have the benefit of lowering the household's electricity bill and production of greenhouse gases. Lower water consumption is also a benefit as it will save on the building of dams and desalination plants. Also, if the input water is hot, energy and greenhouse gases have been expended in the production of that water and in many cases the maintenance of that water's temperature. It is estimated that between 80% and 90% of a machine's energy use is expended in heating the water [111].

Domestic Dishwashers

Technology Description

The performance of dishwashers depends upon their capacity. Environmental performance depends upon both the energy and water used.

Technology Benefits

Energy efficient dishwashers have the benefit of lowering the household's electricity bill and production of greenhouse gases. Lower water consumption is also a benefit.

Source: http://decarboni.se/publications/zero-carbon-australia-buildings-plan/4-electrical-appliances-and-services