

A black and white photograph of an Agilent 34970A Data Acquisition/Switch Unit. The device has a digital display showing 'MUX' and 'T/E 303'. Below the display are several buttons labeled 'Sto/Rcl', 'Scan', 'Measure', 'Interval', 'Configure', and 'Control'. The background is blurred, showing a person in a white shirt. A large, dark, semi-transparent arrow points from the left towards the right, partially covering the text.

Appliance Electricity Use in NZ Houses

Household Energy End-use Project (HEEP)

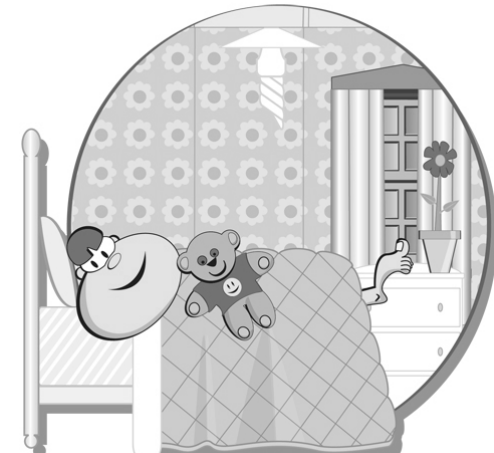
Michael Camilleri, BRANZ Ltd.

People use many appliances



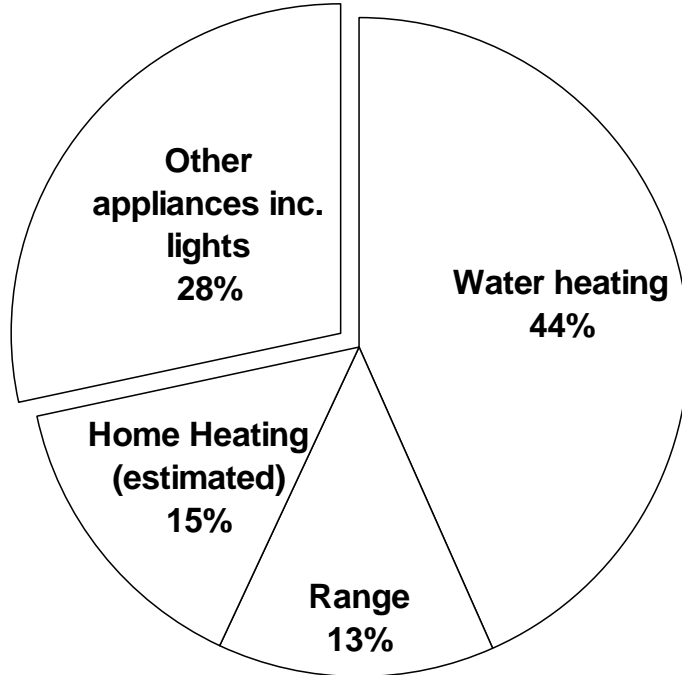
Electricity Use

- **Electricity is a critical residential fuel**
 - 69% of 'official' residential energy use
 - 63% house energy = low temp. (water, air)
 - Most electricity NOT used for heating
- **So where do we use electricity ?**

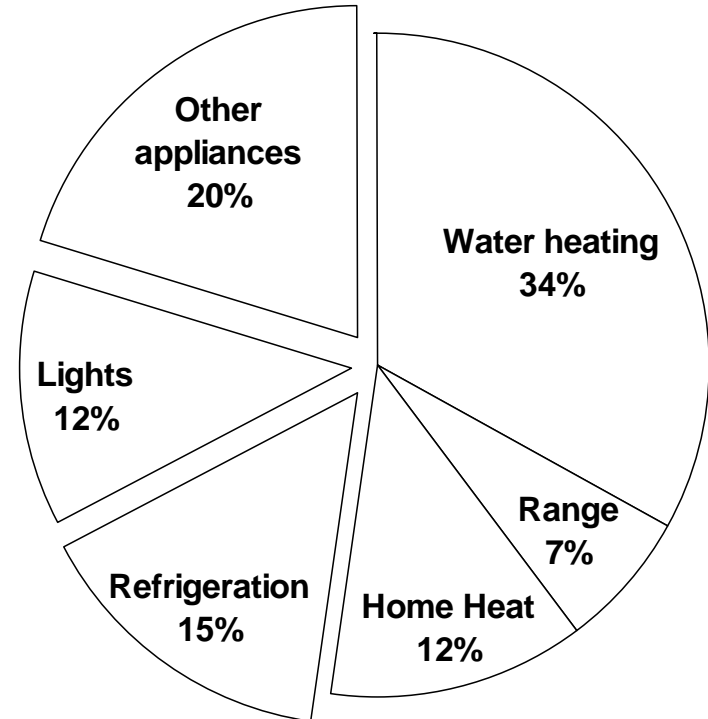


What was/is electricity used for?

**1971/72 Electricity Study
(not all-electric houses)**



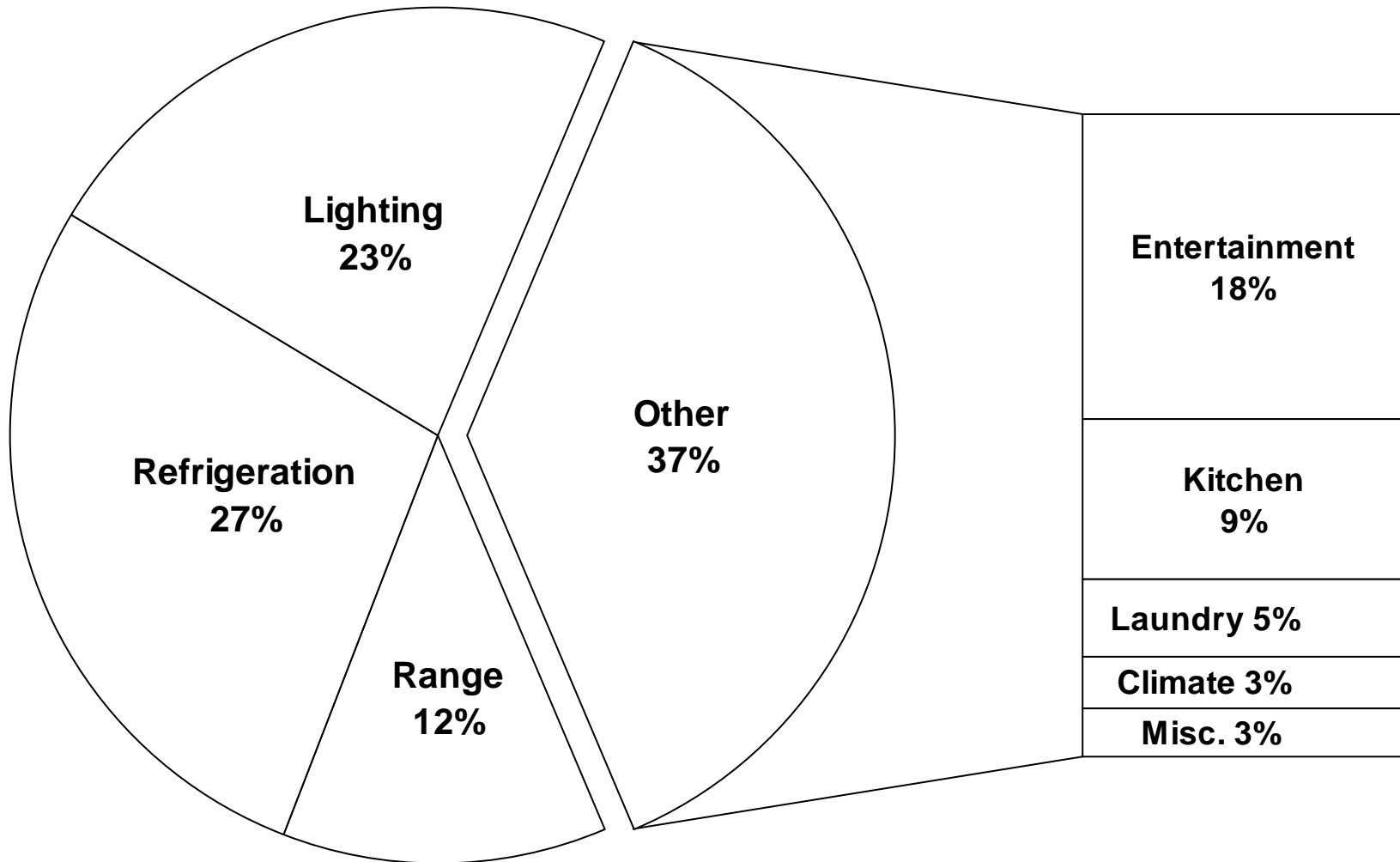
**HEEP NZ Average
2004**



Average per house = 8,400 kWh/yr
(Statistics NZ & NZ Electricity Dept)

Average per house = 7,750 kWh/yr
(HEEP Yr 10)

Non-heating Electricity

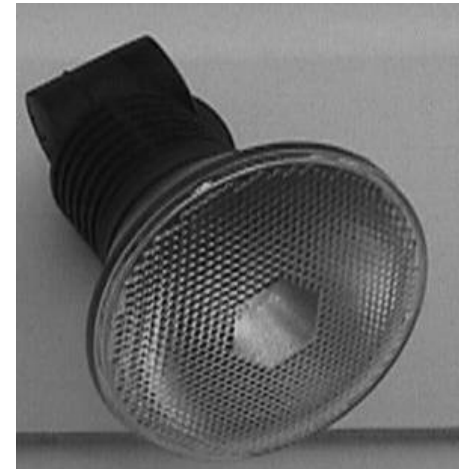
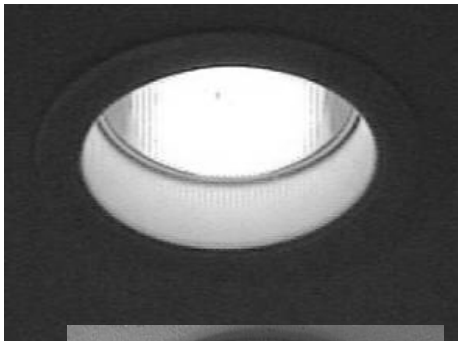
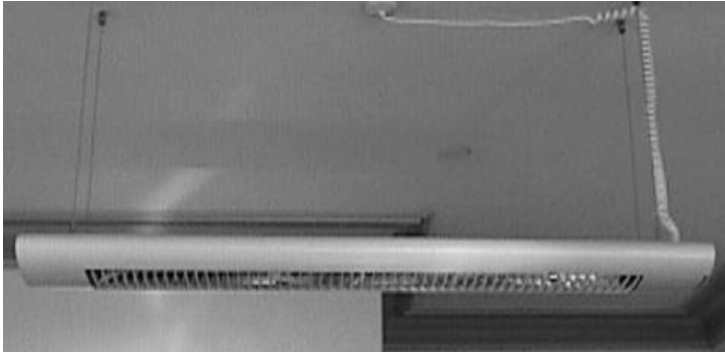


Note: Excludes Domestic Hot Water & Space heating

Overview

- **Lighting**
- **Refrigeration**
- **Range**
- **Entertainment**
- **Other Appliances**
- **Standby and Baseload**
- **Drivers Overview**
- **Into the future**

Lighting

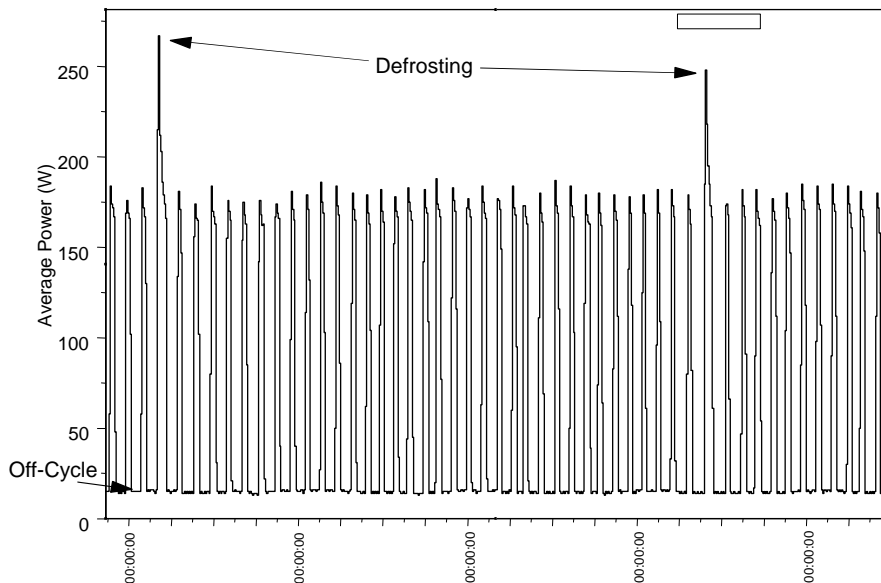


Lighting

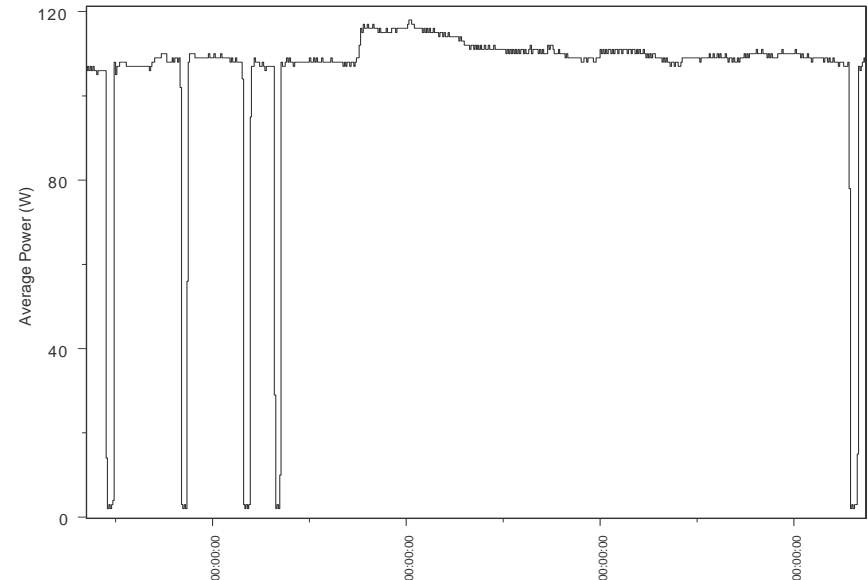
- **12% of electricity consumption**
- **Important peak load**
- **Still mainly incandescent**
- **Large improvement with CFL and future lighting technologies**
- **What drives lighting consumption?**
 - Floor area and number of occupants

Refrigerators

Healthy Refrigerator

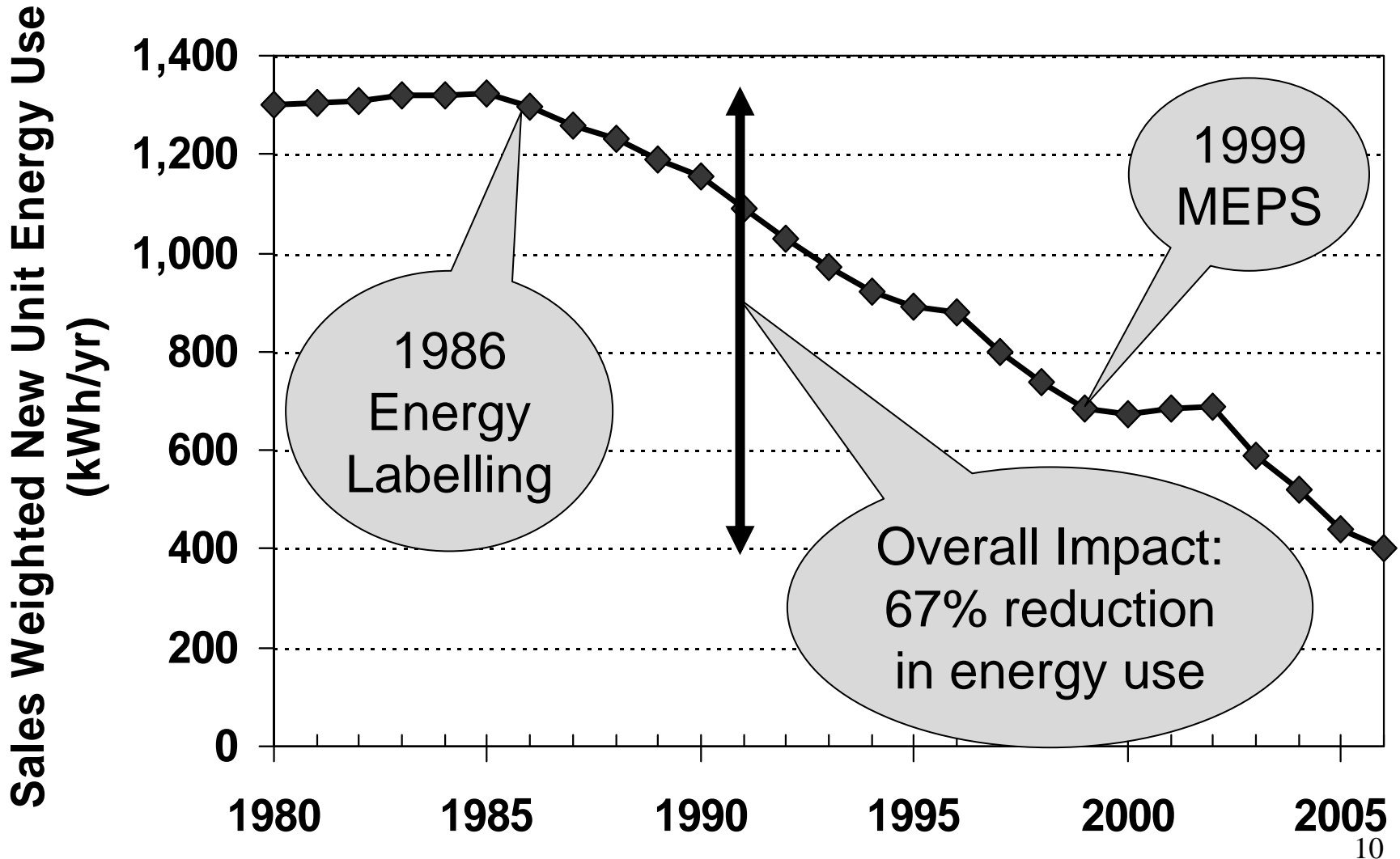


Unhealthy Refrigerator



- Refrigerators ~ 15% of household electricity
- Type and age (CFC refrigerants stopped 1994):
 - Fridge Freezer: 50% older than 1994
 - Fridge: 55% older than 1994
 - Freezer: 80% older than 1994
- 1 in 6 are a problem (9% faulty + 7% marginal) ~ 450,000

Energy Use of New Frost-free Fridge-Freezers in Australia



Garage Fridge – Gladiator series by Whirlpool ~\$US900

BRANZ

CHILLERATOR® GARAGE REFRIGERATOR ENERGY COMPARISON

TOTAL SAVINGS OVER 15 YEARS

20* **SAVE \$58
PER YEAR** **\$870**

15* **SAVE \$43
PER YEAR** **\$645**

10* **SAVE \$20
PER YEAR** **\$300**

***YEAR OLD PRODUCT**

SOURCE: AHAM'S INDUSTRY ENERGY DATA

ESTIMATED ENERGY SAVINGS OF REPLACING YOUR 10, 15, AND 20 YEAR OLD REFRIGERATOR WITH A NEW GLADIATOR® CHILLERATOR® GARAGE REFRIGERATOR; 2004 NATIONAL AVERAGE RESIDENTIAL ENERGY COST OF 8.60 CENTS PER KWH.



Refrigeration Model

- **Electricity consumption only depends on the refrigerator**
 - Type
 - Size
 - Age
- **Type, size, age and number of refrigerators depends on the occupants**
- **~2 refrigerators per house**



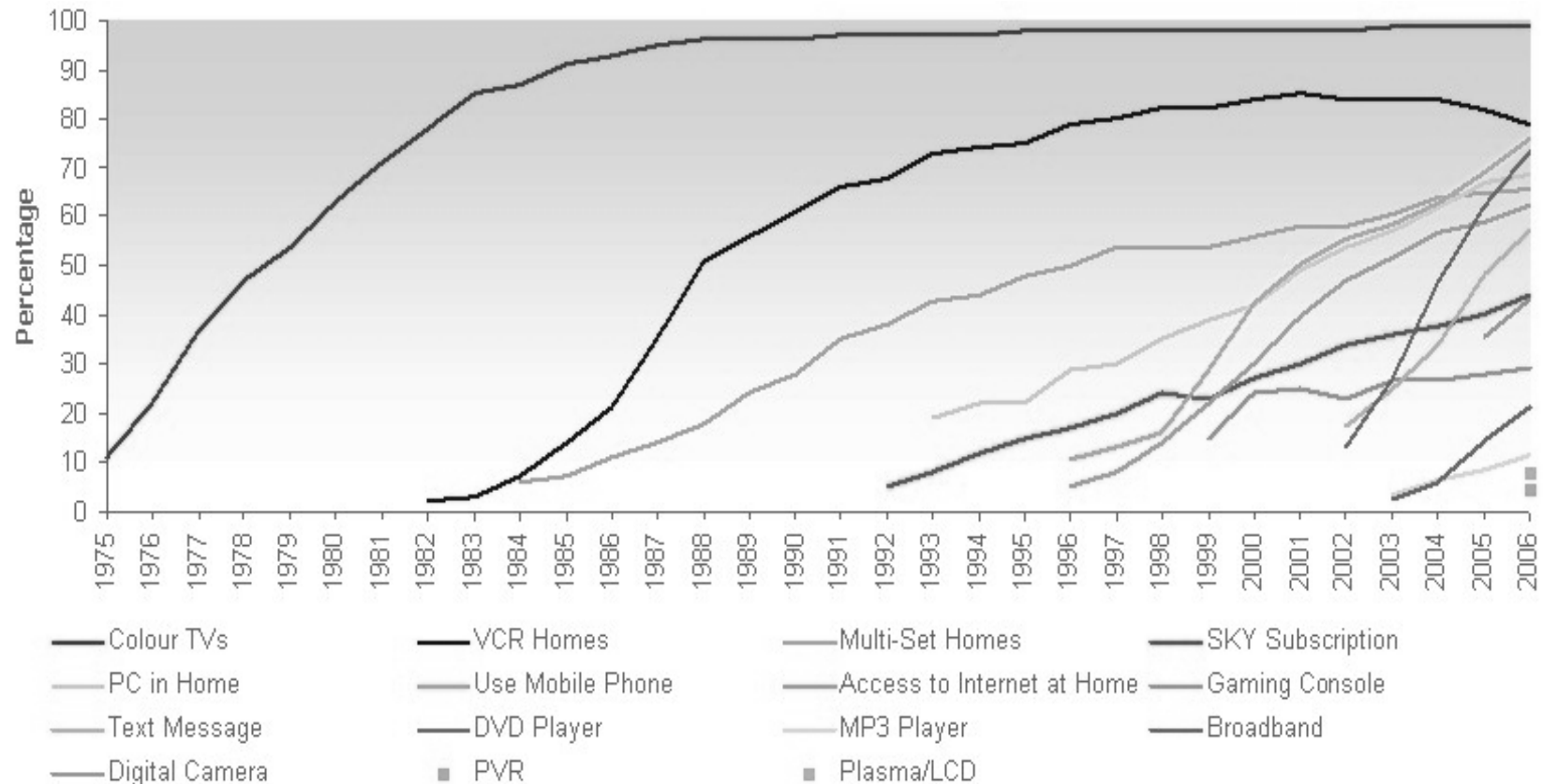
Range

- **Reduced over the last 35 years**
- **Less home cooking, smaller families, fewer appliances connected to range**
- **Little scope for energy efficiency**
- **Range use affected mainly by the number of occupants and floor area (-ve)**
- **Use of microwave reduces range use**
- **No overall reduction partly due to standby**

Entertainment

- Includes TV, video, DVD, computers etc
- Rapid proliferation of new types – e.g. DVD recorders, hard disk recorders
- FreeView TV will increase consumption
- Fast uptake of large LCD and Plasma
- Most appliances not covered by MEPS
 - Satellite decoders - raised by HEEP in 2001
- Rapid growth in electricity consumption

Appliance Growth



Source: Nielsen Media Research for NZ TV Broadcasters Council.
www.nielsenmedia.co.nz/MRI_pages.asp?MRIID=37

Other 19%

- **Dishwashers, dryers, and washing machine already dealt with by MEPS and labelling**
- **Widespread use of cold water washes**
- **Is energy efficiency being countered by convenience?**
- **Lots of small appliances each consuming little energy**

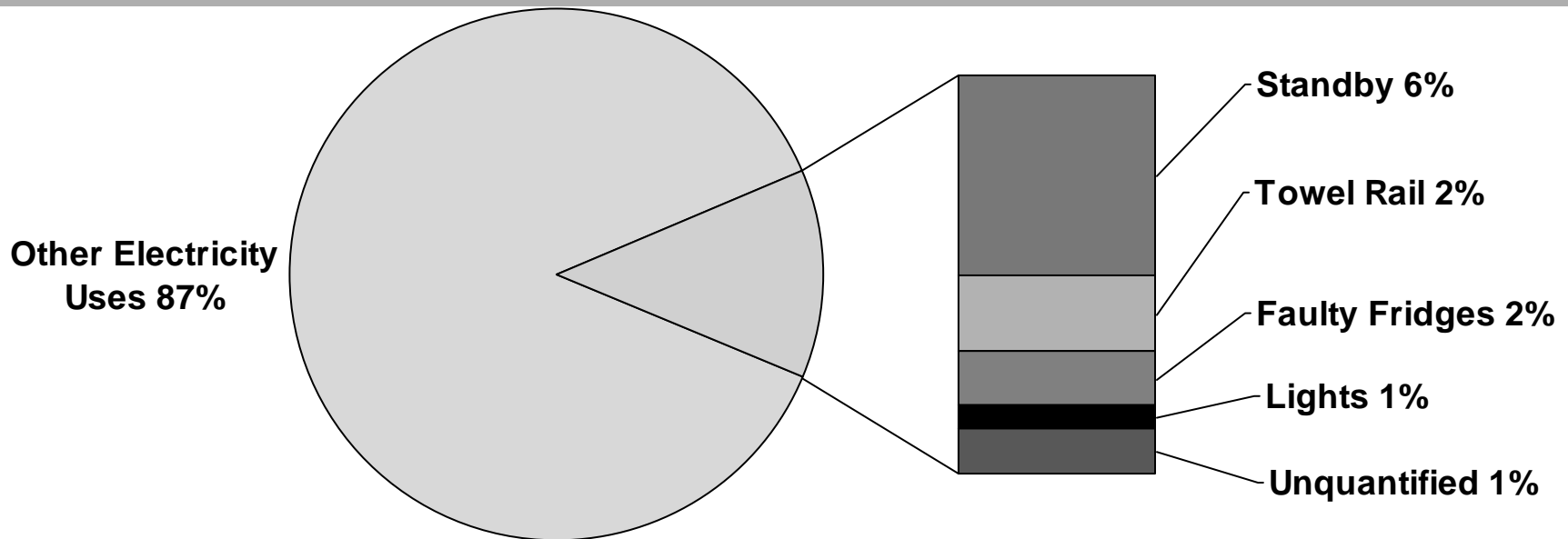
Other 19%

- Alarm Clock
- Answerphone
- Audio Component
- Bench top mini-oven
- Breadmaker
- Burglar Alarm
- Ceiling Mechanical Ventilation
- Cellphone Charger
- Charger
- Coffee Maker
- Computer
- Computer Monitor
- Cordless Phone
- Crockpot
- Cupboard Heater
- DVD Player
- Dehumidifier
- Dishwasher
- Dryer
- Electric Blanket
- Electric Fence
- Electric Hobs
- Electric Lawnmower
- Electric Organ
- Electric Oven
- Electric Power Tool
- Extractor Fan
- Fan
- Fax Machine
- Food Processor
- Freezer
- Freezer
- Fridge
- Fridge Freezer
- Frying Pan
- Games console
- Garage Door Opener
- Hairdryer
- Halogen Lights-fixed
- Heat Pump Hot Water
- Heated Fish Tank
- Heated Towel Rail
- Heatlamp
- Intercom
- Iron
- Jug
- Juicer

Other 19%

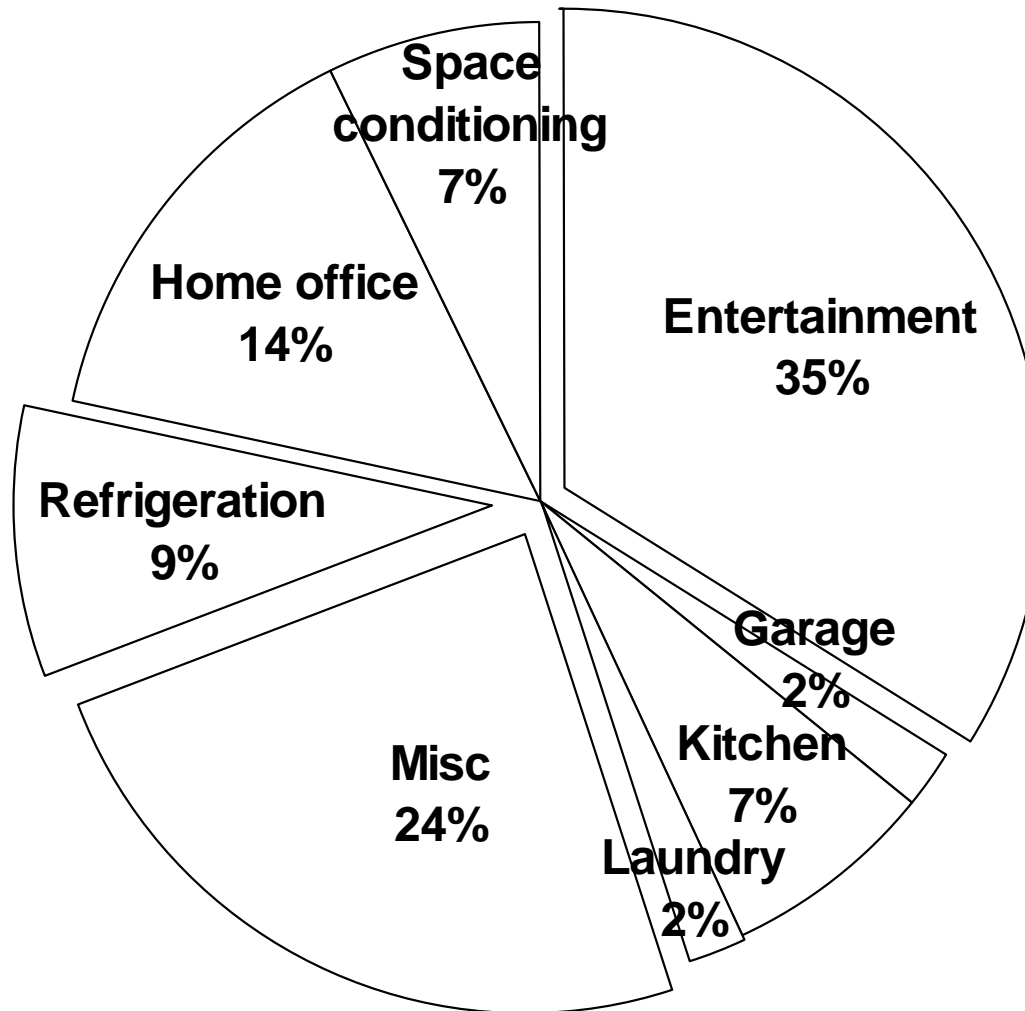
- Kiln
- Lamp
- Microwave
- Misc Entertainment
- Misc Gear
- Misc Household Appliance
- Misc PC Peripherals
- Misc Personal
- Mixer
- Plug Ins
- Pool Pump
- Printer
- Radio
- Rangehood
- Rice Cooker
- Separate Electric Grill
- Separate Radio Cassette
- Sewing Machine
- Shaver
- Sky/Saturn Decoder
- Small Kitchen appliance
- Spa Bath
- Spa Pool
- Stereo
- Television
- Toasted Sandwich Maker
- Toaster
- Toothbrush
- Vacuum
- Video
- Washing Machine
- Wastemaster
- Water Pump
- Waterbed
- Weedeater

Standby & Baseload



- **Average (~ \$150/yr) (13% elect.) 112 W**
 - Standby – common appliances 57 W
 - Baseload – heated towel rails 21 W
 - Faulty refrigeration (~1 in 6) 15 W
- **NZ Electric heating (for 8,670 hr yr) 105 W**

Standby Energy Consumption

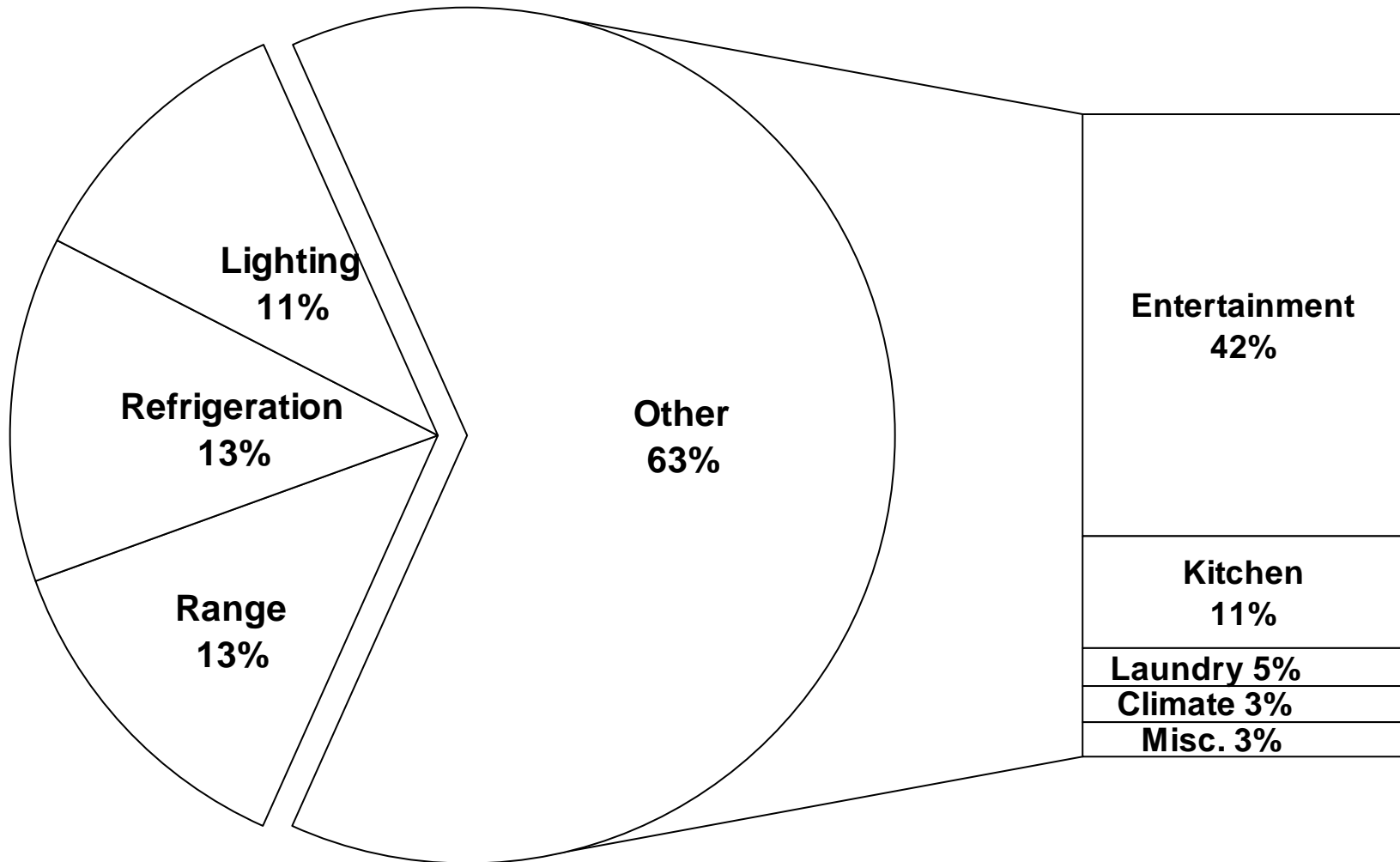


Energy Consumption Drivers

	Floor Area	No. Occupants	Income	Other
Lighting	Y	Y		
Range	Y	Y		
Refrigerators				Y
Other	Some	Some		Y

- Income not an important driver of appliance energy consumption, but does influence ownership
- Floor area on its' own explains little
- No. occupants on its own explains a bit more

A possible future ??



Key points

- **Non-heating appliances main use of electricity**
- **Possible appliance efficiency improvements**
- **House not major driver of appliance energy**
- **Entertainment electricity use = electric heating**
- **Entertainment demand rapidly increasing**
 - May become ***the*** major use of electricity
 - Unless heat pumps get there first!
- **MEPS need to catch up**
 - New appliance classes appear and decline rapidly
 - Performance levels need regular revision