



# Energy Use in the Home

## Household Energy End-use Project (HEEP)

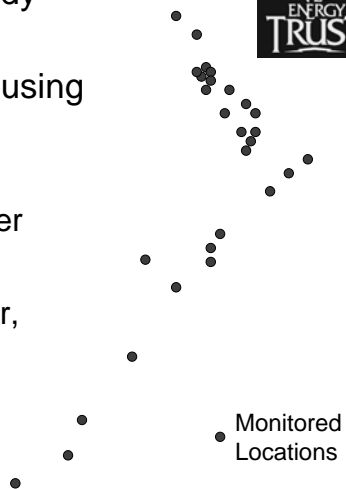
Nigel Isaacs  
Principal Scientist,  
BRANZ Ltd.



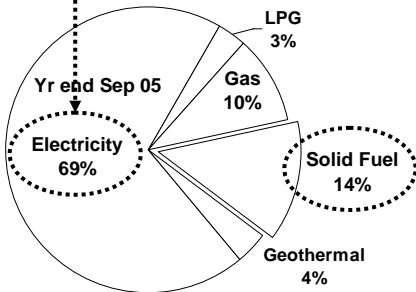
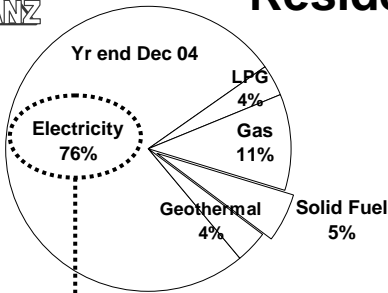
## HEEP – Household Energy End-Use Project



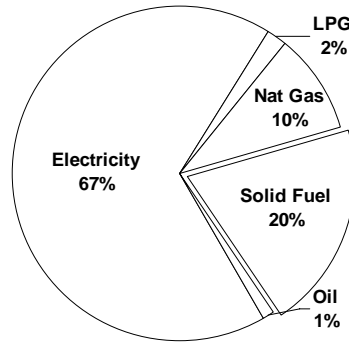
- ❑ Multi-year, multi-disciplinary study
  - ❑ Monitoring completed 2005
- ❑ Goal – **Energy model** of NZ housing
- ❑ **All fuel types**
  - ❑ Electricity, natural gas, LPG, solid fuel, oil, solar water heater
- ❑ **Energy services**
  - ❑ Space temperatures, hot water, appliances etc



# Residential Fuels

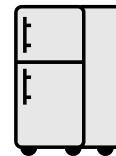
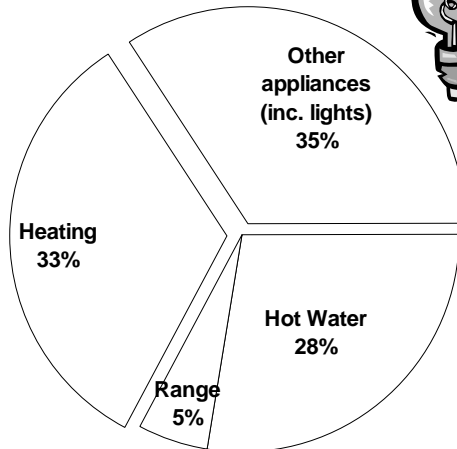
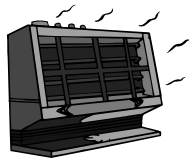


MED Energy Data File (2005 & 06)



HEEP data  
(Year 10 - not yet published)

# 2004 Residential end-uses



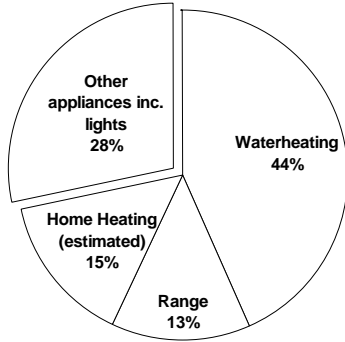
Includes electricity, natural gas, LPG, coal & wood ('solid fuel')  
Source: HEEP Estimate 2006



# What is electricity used for?

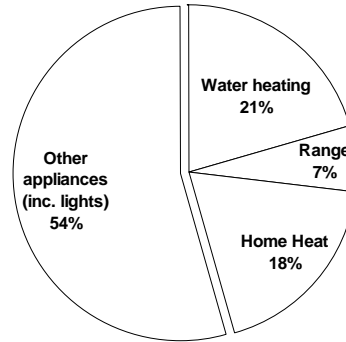


## 1971/72 Electricity Study (not all-elect. houses)



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

## HEEP Auckland 2001



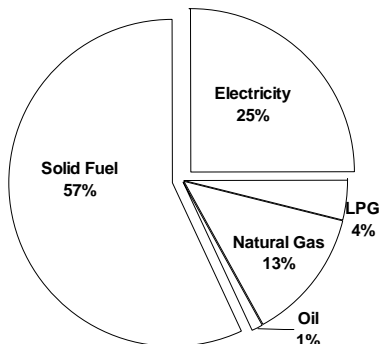
Average per house = 7,500 kWh/yr  
(BRANZ)



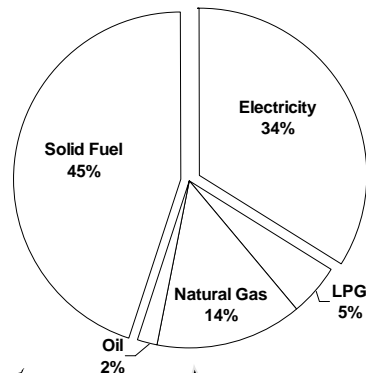
# Space heating fuels ?



## Gross (as delivered to house)



## Net (allow for efficiency)



## Fuel type is important

Coollest



Warmest

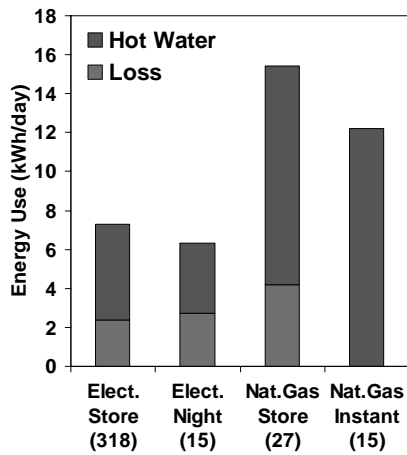
Main fuel & heater type	Temp (°C) ± 1 SD	Sample Count
Open fire (wood or coal)	16.0 ± 0.5	12
Portable Electric	16.9 ± 0.3	83
Portable LPG	17.1 ± 0.2	54
Fixed electric	17.8 ± 0.3	19
Gas	18.0 ± 0.5	26
Heat pump (elect)	18.0 ± 0.4	4
Central gas	18.3 ± 0.7	7
Enclosed solid fuel (wood)	18.9 ± 0.2	138

Winter = June to August; 5 pm to 11 pm

## NZ houses are getting warmer

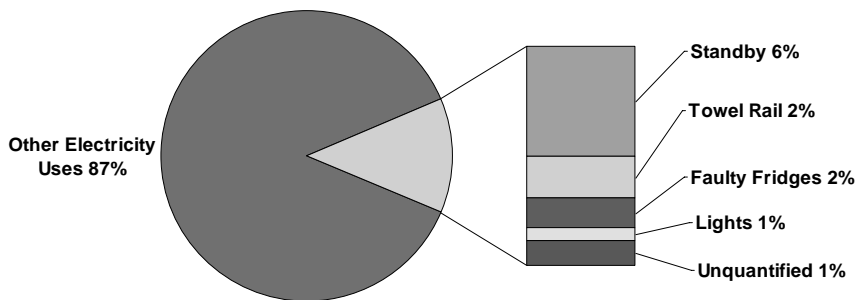
- ❑ Thermal insulation required since 1978
  - ❑ Other materials also changed
  - ❑ Architectural styles have changed
- ❑ Warmer winter temperatures – **good**
  - ❑ Based on winter (June to Aug) evening (5 pm to 11pm)
  - ❑ Living rooms 1°C warmer (18.6°C)
  - ❑ Bedrooms 1.3°C warmer (14.5°C)
  - ❑ Newer, insulated houses seem to use less **energy** (electricity, natural gas, LPG, coal, wood, oil)
  - ❑ But still warmth deficit in older houses
- ❑ Warmer summer temperatures – **not good?**
  - ❑ Reason unclear at present – may relate to design
  - ❑ How will occupants deal with climate variability/change?

# Domestic hot water



- Total = Water + Standing Losses  
                   Social                    Technical
- Household Analysis
  - Elect. Storage (318): 33% loss
  - Elect. night store (15): 43% loss
  - Nat Gas Storage (27): 27% loss
  - Nat Gas Instant (15): 0% loss
- Fuel type & service
  - 78% low pressure (electric)
  - 22% 'mains' (gas) (self selected?)
- Higher pressure = higher flow rate  
                           = higher volume  
                           = more energy

# Standby & Baseload Electricity



- Average (~ \$150/yr) (13% elect.) 112 W
  - Standby – common appliances (~½ from 'entertainment') 57 W
  - Baseload – heated towel rails 21 W
  - Faulty refrigeration (~1 in 6) 15 W
- Digital TV 'boxes' = new power station (~70 MW)
- Electric heating (over 8670 hr year) 111 W

- ❑ ~60% house energy is used for low grade heat
  - ❑ Space or water heating
- ❑ Electrically heated houses are not warmest
  - ❑ Coolest: Open fire, Resistance electric heaters
  - ❑ Warmest: Central gas, Solid fuel burners
- ❑ Official market share (Energy Data File, April 2006)
  - ❑ Electricity: down **75%** to **69%** Solid fuel: up **5%** to **14%**
  - ❑ Statistics are now more accurate
- ❑ Solid fuel is THE most important space heating fuel
  - ❑ What is impact of shifting to electricity (e.g. heat pump)?
- ❑ Energy efficiency opportunities do exist
  - ❑ Faulty refrigeration, stand-by power,
  - ❑ Hot water flow management & cylinder insulation
- ❑ **Where is electricity the most valuable?**
  - ❑ Do other fuels provide the same service for lower cost?
  - ❑ Where are your next most profitable investments?

- ❑ BRANZ (Data collection & analysis)
  - ❑ Michael Camilleri, Lisa French, Nigel Isaacs,  
(Lynda Amitrano, Andrew Pollard, Albrecht Stoecklein)
- ❑ CRESA (Social science)
  - ❑ Ruth Fraser, Kay Saville-Smith
- ❑ CRL Energy Ltd (Modelling)
  - ❑ Pieter Rossouw
- ❑ John Jowett (Statistical support)

**HEEP reports available from: [www.branz.co.nz](http://www.branz.co.nz)**