

Heat pumps in New Zealand homes

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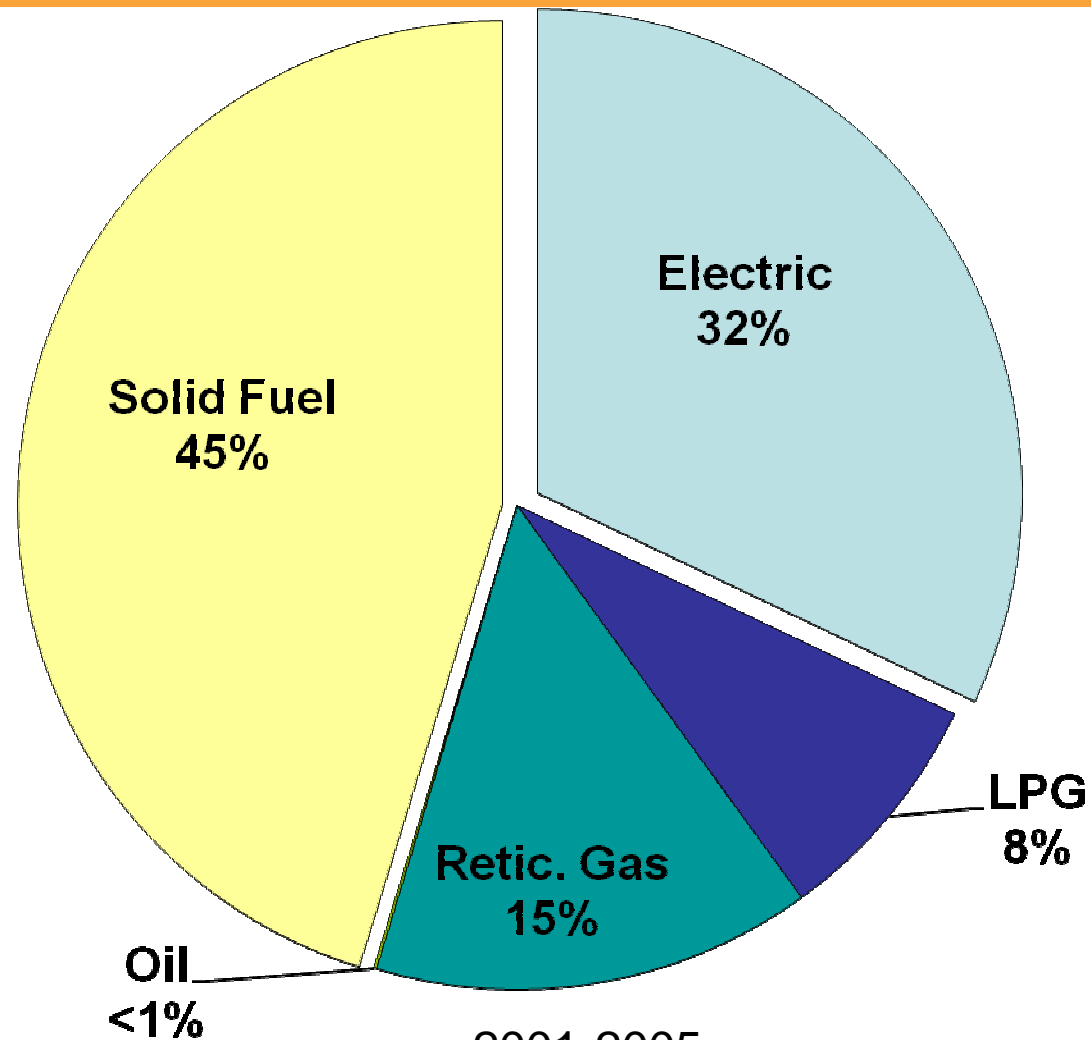
Introduction



- ▶ **Background**
 - ▶ **Base study – Household Energy End-use Project (HEEP)**
- ▶ **Heat pump research**
- ▶ **Heat pump, heating and cooling**
- ▶ **National impacts of heat pumps**

Space heating energy use

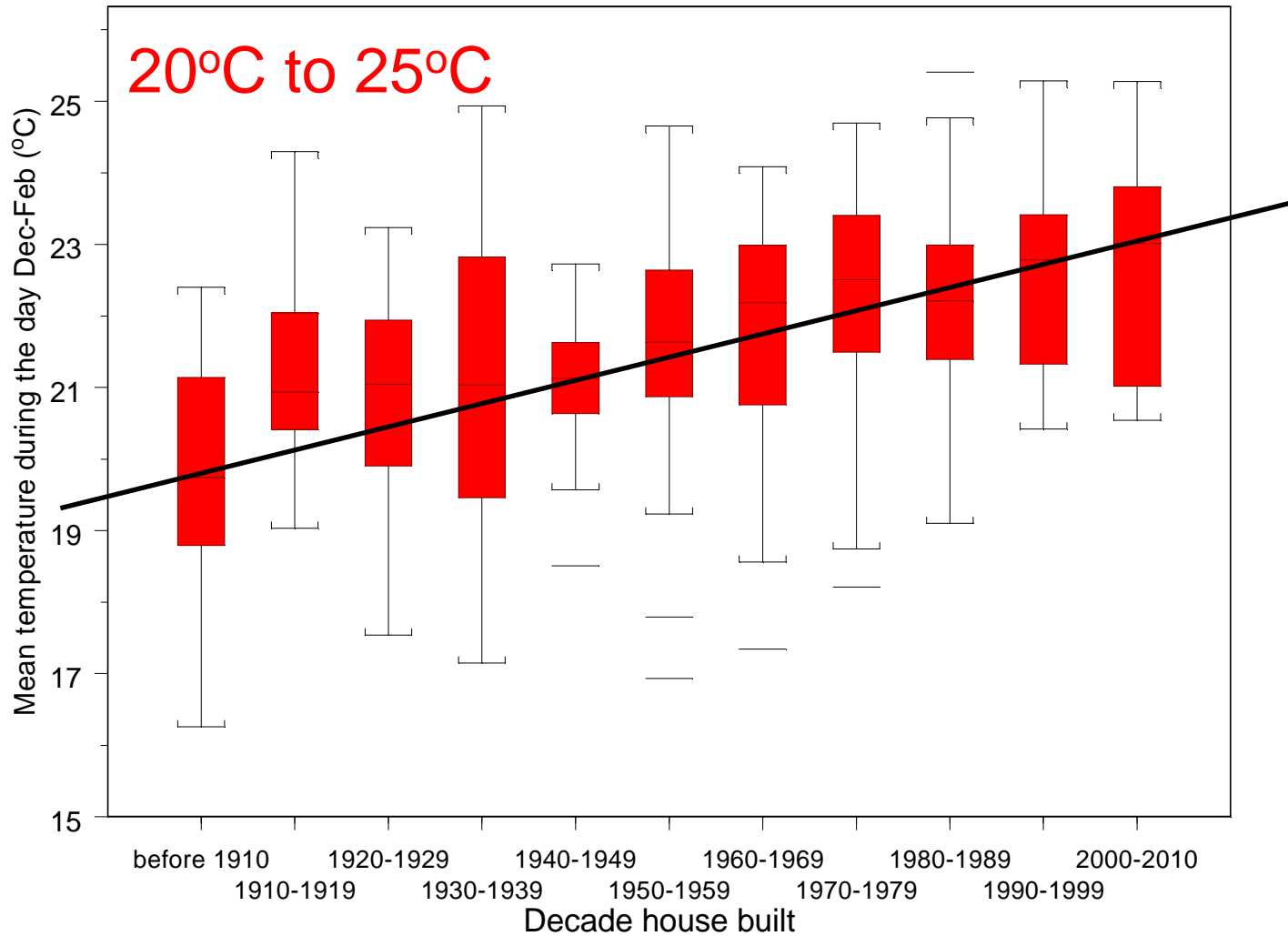
4% of HEEP houses had a heat pump



2001-2005

Space heating energy (net)

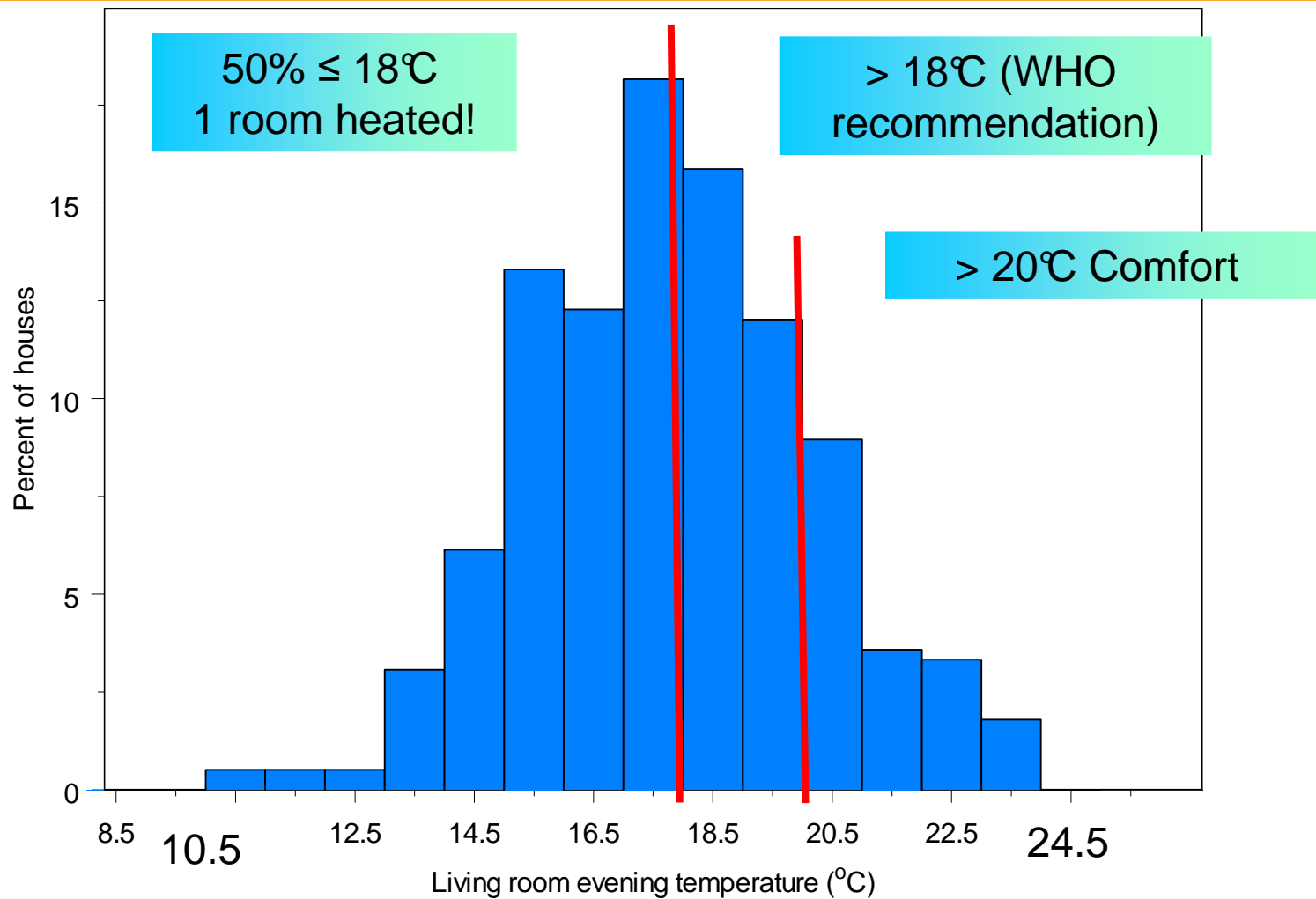
Summer temperatures – too warm



HEEP

Old New

New Zealand homes are cold



Cold in winter, hot in summer



- ▶ **20°C to 25°C comfortable (international)**
- ▶ **18°C to 24°C optimum (WHO)**
- ▶ **Winter**
 - ▶ **Mean temperatures**
 - Living room evening 17.9°C
 - Bedroom night 13.6°C
- ▶ **Summer**
 - ▶ **Mean temperatures**
 - Living room day 21.8°C
 - 20% spend more than 2 hours above 25°C

Heat pump research



- ▶ **Postal survey in August 2007**
 - ▶ **How many heat pumps?**
 - ▶ **How are they being used?**
- ▶ **Transpower survey in March 2009**
 - ▶ **How many heat pumps?**
- ▶ **Monitoring of heat pumps 2009-2011**
 - ▶ **Energy use, installation quality, how they are being used...**

High number of heat pumps

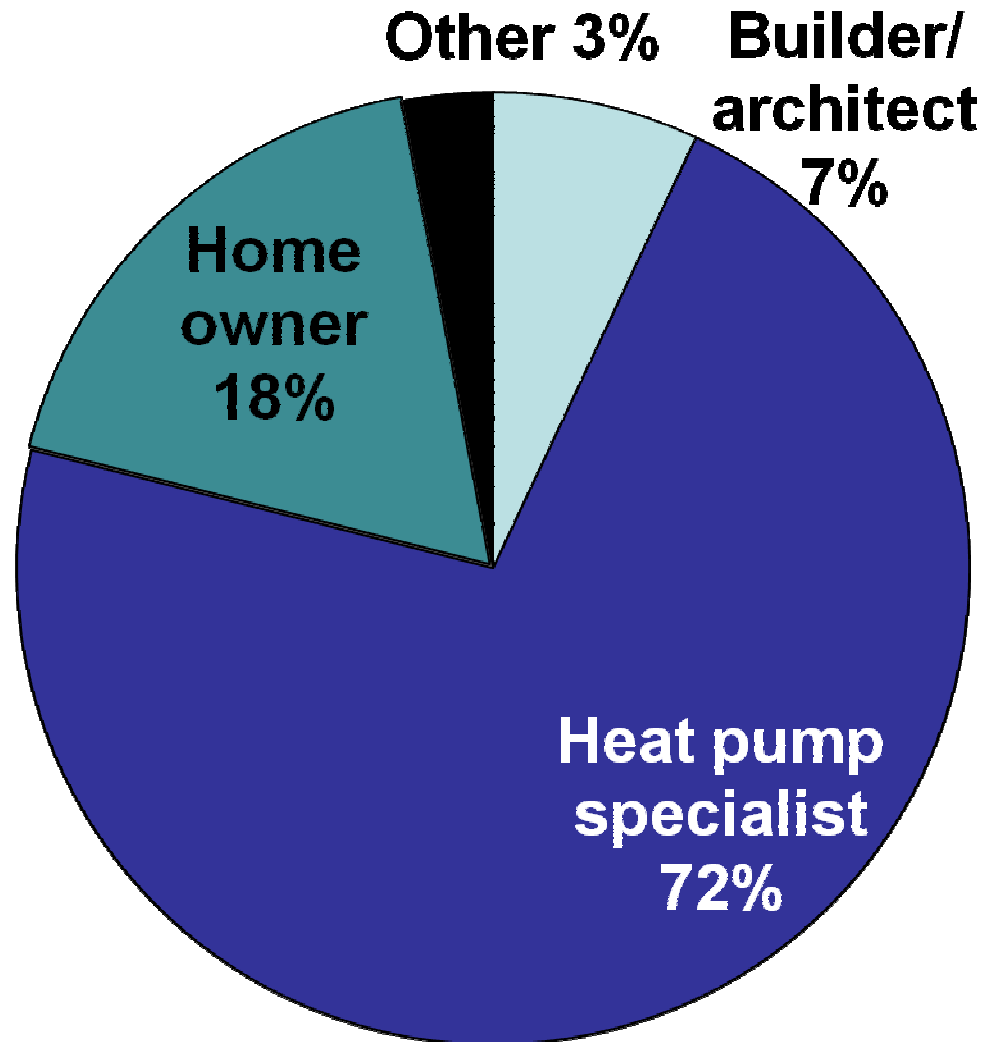


- ▶ **Approximately 21% of houses**
- ▶ **Higher in colder areas**
- ▶ **Nearly 50% of new houses have heat pumps across New Zealand**



- ▶ **Split system, air to air**
- ▶ **Primarily installed for heating**

Installation quality - efficiency



Ensuring efficiency of a heat pump



- ▶ **Coefficient of Performance (COP)**
- ▶ **Control – remote control is not always easy to use**
- ▶ **Thermostat – confusion over use for efficiency**
- ▶ **Maintenance – cleaning filters and outdoor unit**
- ▶ **Installation and sizing – correct size for the room(s) and climate**

No.1 reason for a heat pump - convenience



1. Convenient

Timers, safe with kids

2. Energy efficiency

3. Warmer temps - lines up with HEEP

4. Cheap to run

5. Able to cool

Change in conditioning

- ▶ **Strong sales of heat pumps**
- ▶ **HEEP – 4% heat pumps**
- ▶ **Policy – clean heating**
- ▶ **Strong marketing**

- ▶ **Change in heating/cooling behaviour?**
- ▶ **Electricity saving?**

62% of houses are cooling



- ▶ **4% of HEEP houses could cool - now 21%**
- ▶ **62% of houses are choosing to cool**

▶ **Reasons for cooling:**

- 1. Speed**
- 2. Humidity**
- 3. Too much sun**
- 4. Not enough air movement – Security?**



Education needed?

- ▶ **Understanding of thermostats**
- ▶ **Potentially higher energy use**

Set-point	Percentage
Below 18°C	39%
18–25°C	61%
Above 25°C	0%
Total	100%

Reducing cooling needs

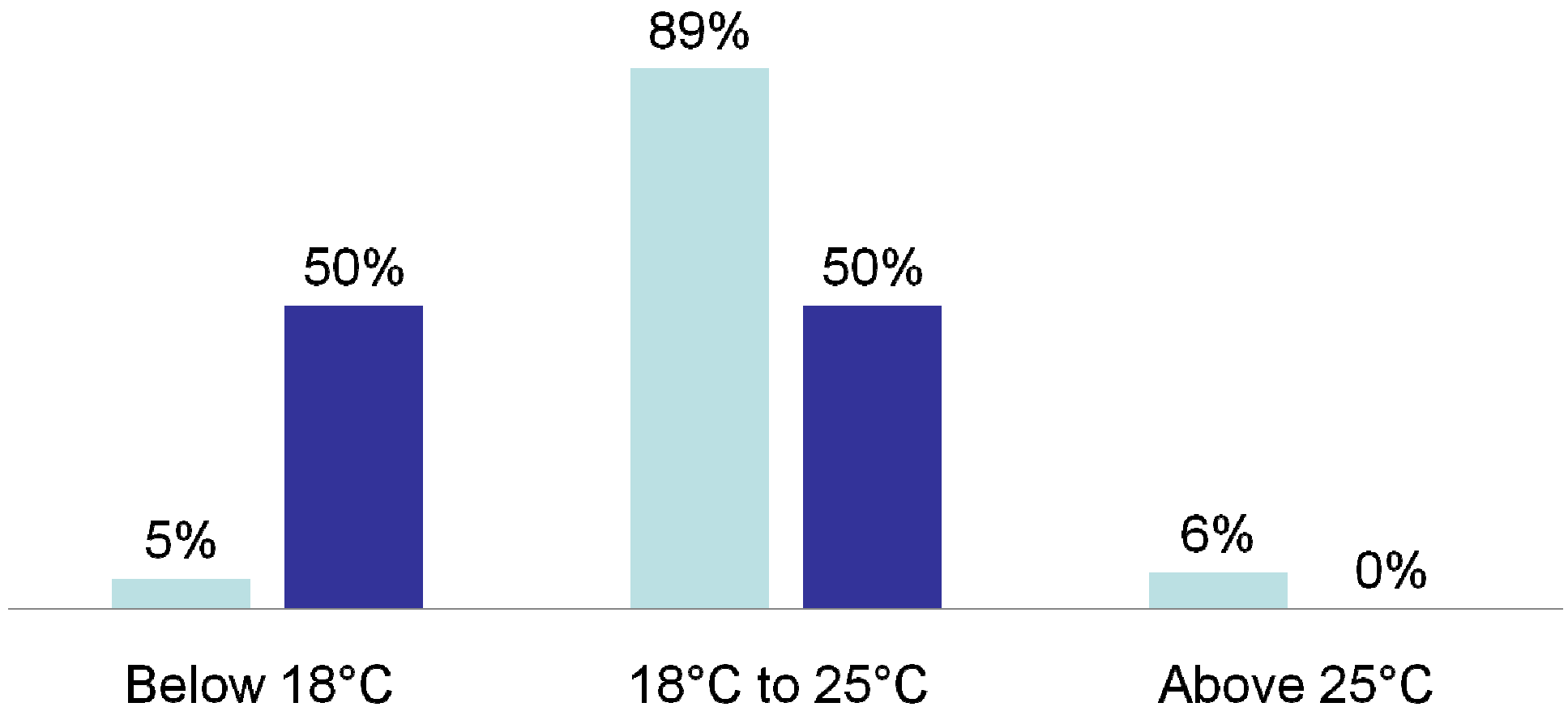


- ▶ **Before cooling – house improvements**
 - ▶ **Open windows (security latches)**
 - ▶ **Increase external shading**
 - ▶ **Use fans**
- ▶ **When cooling**
 - ▶ **Close windows**
 - ▶ **Thermostat temperature**

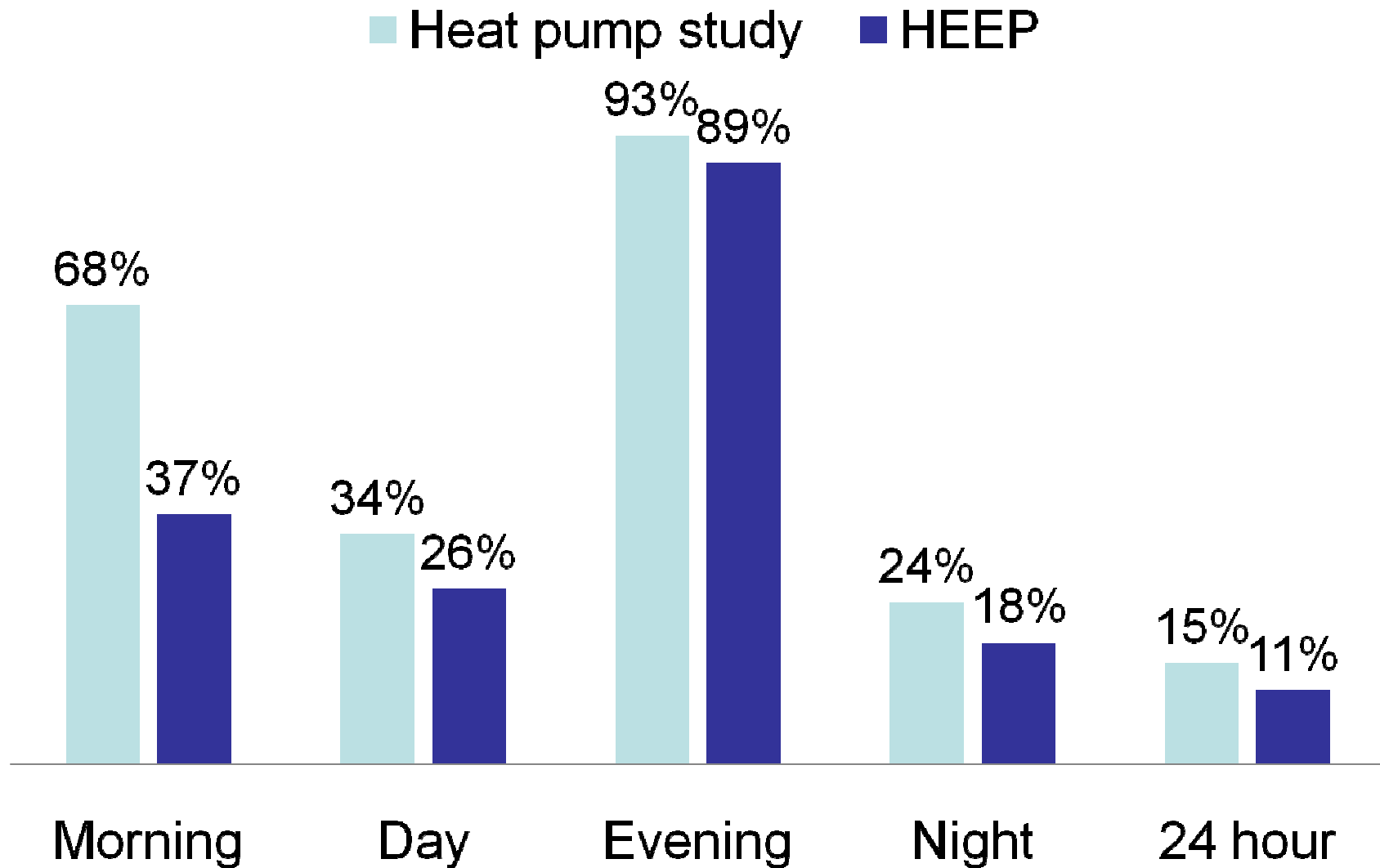
Winter - Warmer temperatures desired



■ Heat pump study ■ HEEP



Heat pumps = more heating



Reducing heating required



- ▶ **Improve the house**
 - ▶ **Insulation, draught stopping**
- ▶ **Quality of installation and maintenance**
- ▶ **Thermostat temperature**
 - ▶ **Set to the temperature desired**

However encourage people to heat when required

Heating – link to user needs



- ▶ **Electric heating**
 - ▶ **Panels heaters – low cost, low maintenance, easy to operate**
- ▶ **Gas heating – flued or water**
 - ▶ **Central heating – warms the whole house (radiators or under floor)**

**So what are the impacts of
more heat pumps for
electricity use in New
Zealand?**

Extra electricity needed

- ▶ **Heat pumps are:**
 - ▶ **Replacing another heater – 50%**
 - ▶ **Additional heater – 50%**

- ▶ **When replacing:**
 - ▶ **45% – electric heater**
 - ▶ **55% – another fuel**

Impacts – replacement of electric heaters



- ▶ **In HEEP 30% of houses had an electric main heater - heating to 16.9°C**

Replacing resistance heaters with heat pump

- ▶ **Heat pumps are more efficient**
 - ▶ **The houses are able to heat to a higher temperature (18.9°C) without using more electricity**
 - ▶ **IF:**
 - The heating schedule is the same
 - The rooms heated are the same

Impacts - Solid fuel replacement



- ▶ Replacing a direct use of fuel
- ▶ 6% increase in electricity
- ▶ ~60% increase in peak loads
- ▶ Currently heating in some areas is 80% solid fuel



Cooling impacts

- ▶ **New load**
 - ▶ **Any load is an increase**
- ▶ **We do not understand it yet**

New Zealand key concerns



- ▶ **Minimum energy performance standard (MEPS) for cooling only**
 - ▶ **Joint standard testing with Australia**
- ▶ **Off the shelf purchase**
- ▶ **Specialist not required for installation**
- ▶ **Coefficient of Performance (COP)**
- ▶ **Peak load**
- ▶ **Summer increase**

**Heat pumps could benefit
many elderly,
but they need to be well
managed, installed correctly
and maintained**