

# Residential Sector EEI Potential

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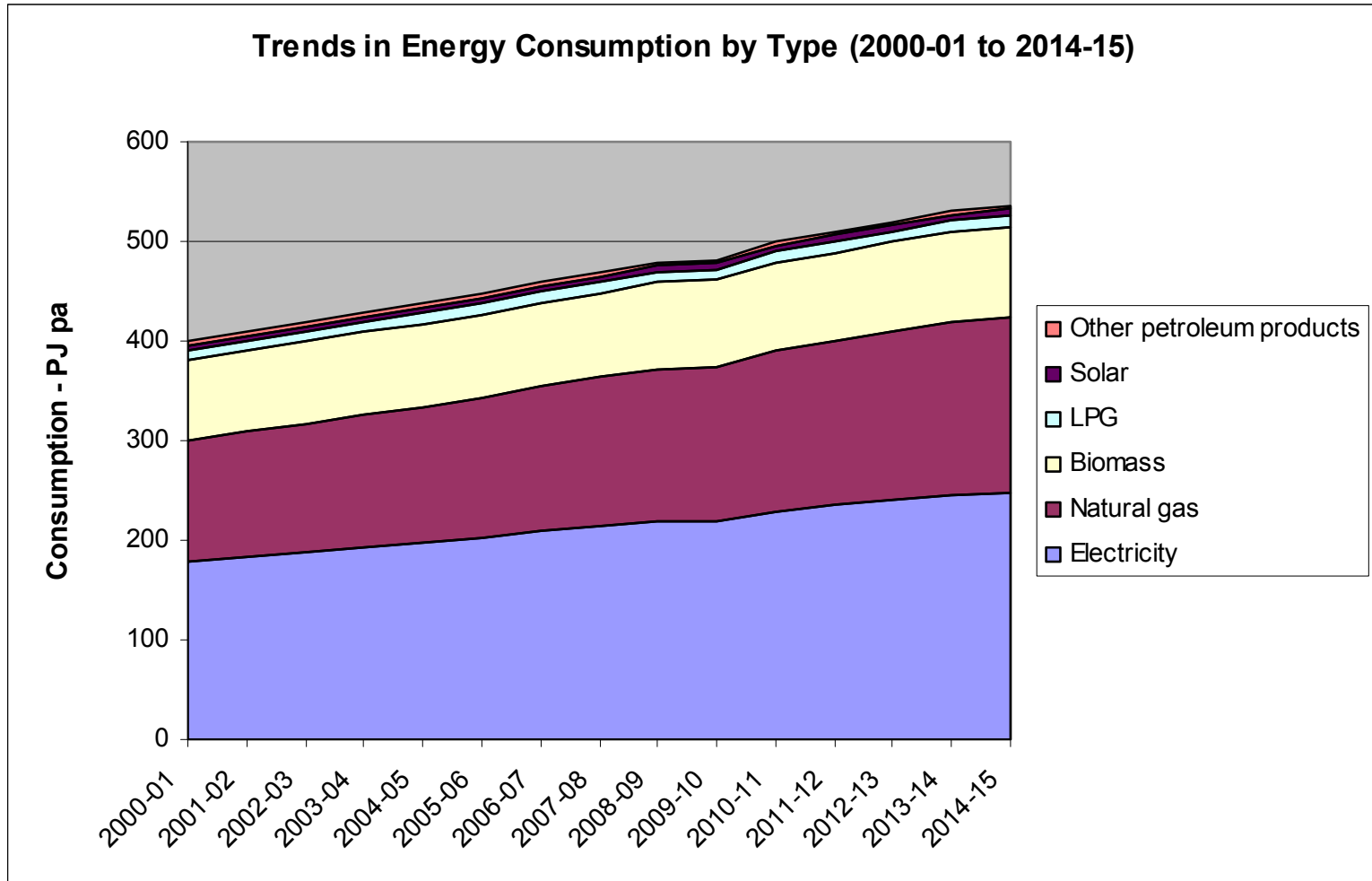


# Introduction

- SEAV commissioned two separate studies to estimate EEI potentials in the Residential Sector:
  - EMET Consultants undertook study covering most residential energy services except water heating
  - George Wilkenfeld (GWA) undertook a study of water heating

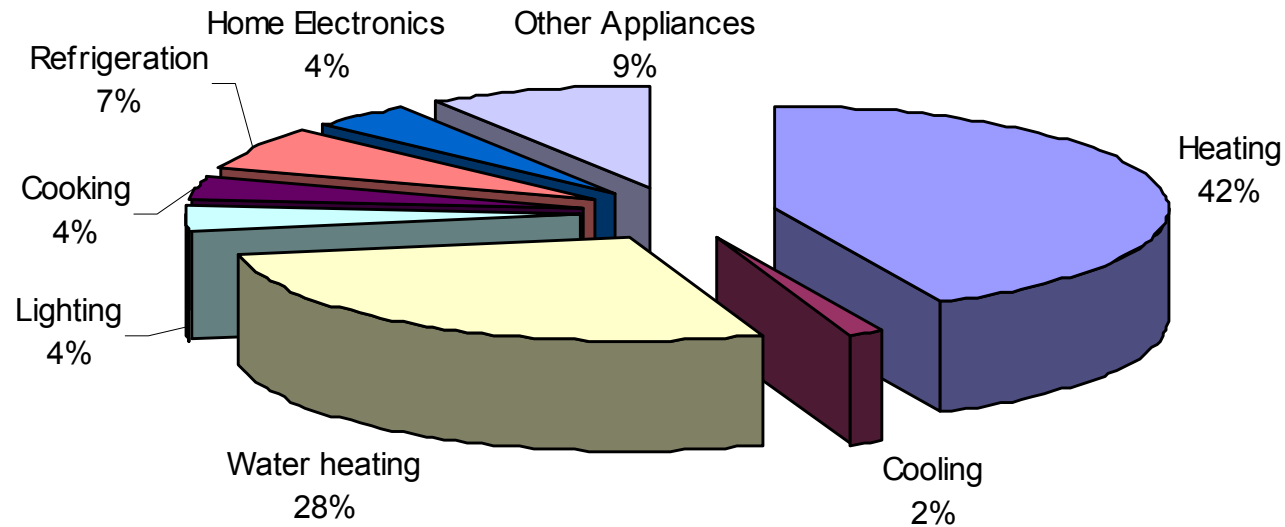


# Residential Sector – Energy End Use



# Energy End Use by Energy Service

Breakdown of Energy Consumption by Application (Year 2005)



# Resources used for analysis

- **EMET Consultants:**

- ABARE residential energy consumption trends
- ABS data on population & households, environmental issues
- EES / AGO residential greenhouse emissions study
- Study for MEU on NSW Electricity Demand
- Recent studies for new MEPS levels

- **GWA:**

- ABS data on population & households
- Recent studies on electric and gas water heating, and water efficiency labelling
- Price data from suppliers

# Energy efficiency measures

- **EMET's residential EEI study:**
  - Building shell + heating & cooling systems
  - Lighting systems
  - Refrigeration systems
  - Cooking systems
  - Dishwashers & clothes washes (ex WH)
- **GWA water heating EEI study:**
  - Water heating systems
  - Water efficiency measures

# EMET residential EEI studies - methodology

- **Estimate BAU energy consumption for specific energy service over the study period**
  - Account for effect of any MEPS (building, appliances)
  - Changes in appliance penetration taken into account
- **Estimate annual savings and costs from applying EEI measures over the study period**
  - Extent to which measure can be applied taken into account
  - Calculate paybacks and eliminate measures < 6.5 yrs
- **Existing and new dwellings treated separately**
- **Data from different States / climate zones analysed separately where applicable**
- **Account for impact of ‘additionality’ where applicable**

# EMET – Building shell + heating & cooling EEI

- **Building shell measures**

- Increase ratings of new homes in all States to 5-Stars
- Insulation of existing houses
- Weather stripping & sealing of existing houses

- **Appliance related measures**

- Improve efficiency of RACs
- Improve efficiency or replace gas & solid fuel heaters
- Improve efficiency of ducted heating & cooling systems
- Replace electric heating with RACs

# EMET – Building shell + heating & cooling

EEI Measure	Energy Savings (PJ pa)	Energy Savings (%)	Energy Savings (\$M)	Total Cost (\$M)	Payback (Yrs)
Weather stripping & sealing	7.3	3.0%	\$81.2	\$423	5.2
Increase all States to 5-Star	8.8	3.6%	\$173.8	\$1,132	6.5
Insulate existing houses	3.0	1.2%	\$34.1	\$639	18.8
Improve efficiency of or replace gas & solid fuel heaters	20.7	8.5%	\$162.4	\$483	3.0
Improve efficiency of ducted heating and cooling systems	3.0	1.2%	\$41.4	\$136	3.3
Improve efficiency of RACs	1.2	0.5%	\$41.9	\$1,000	23.9
Replace electric heating with RACs	2.6	1.0%	\$91.8	\$1,171	12.7
<b>Total (all measures &lt; 6.5 years)</b>	<b>39.9</b>	<b>16.4%</b>	<b>\$458.8</b>	<b>\$2,175</b>	<b>4.7</b>



# EMET – Appliance related EEI measures

- **Lighting systems**
  - Improved lighting efficiency
  - Improved lighting controls
- **Refrigeration systems**
  - Increase efficiency of new refrigerators
  - Retrofit/maintain existing refrigerators
- **Cooking systems**
- **Dishwashers (ex water heating)**
- **Clothes washers (ex water heating)**



# EMET – Appliance related EEI measures

EEI Measure	Energy Savings (PJ pa)	Energy Savings (%)	Energy Savings (\$M)	Total Cost (\$M)	Payback (Yrs)
Building shell + heating & cooling	37.7	16.4%	\$458.8	\$2,175	5.0
Lighting systems	2.7	12.4%	\$97.6	\$384	3.9
Refrigeration	3.5	10.9%	\$126.4	\$439	3.5
Cooking systems	3.9	17.7%	\$100.4	\$330	3.3
Dishwasher	0.3	8.0%	\$10.5	\$63	6.0
Clothes washer	0.2	13.5%	\$8.5	\$35	4.1
<b>Total (all measures &lt; 6.5 years)</b>	<b>48.3</b>	<b>9.0%</b>	<b>\$802.2</b>	<b>\$3,426</b>	<b>4.3</b>



# GWA – water heating EEI methodology

- ABS data used to project number & size of households
  - Segmented into small, medium & large HH's
- Develop BAU projections for hot water use, taking water efficiency trends into account
- Develop water heater stock and energy use model
  - Takes MEPS, market share and efficiency trends into account
- Apply EEIs to BAU to estimate annual costs and savings
  - Water efficiency measures applied before appliance efficiency measures



# GWA – Household hot water use

Category	Characteristics (2005)			Kilolitres/HH/yr indoor water use (a)			
				Showers	Clothes Washers	Other	Total
Small HH (1 and 2 persons)	Share total HH	57.0%	Water	33.8	25.4	41.9	101.0
	Avg persons	1.5	Hot water	23.6	5.1	13.1	41.8
Med HH (3 and 4 persons)	Share total HH	32.0%	Water	78.8	54.9	97.7	231.4
	Avg persons	3.5	Hot water	55.1	11.0	30.6	96.7
Large HH (>4 persons)	Share total HH	11.0%	Water	117.5	75.8	145.8	339.1
	Avg persons	5.2	Hot water	82.3	15.2	45.6	143.0
All HH	Share total HH	100.0%	Water	57.4	40.4	71.2	168.9
<b>Persons/HH (2005)</b>		<b>2.55</b>	<b>Hot water</b>	<b>40.2</b>	<b>8.1</b>	<b>22.3</b>	<b>70.5</b>
<b>Share of hot water use</b>				<b>57%</b>	<b>11%</b>	<b>32%</b>	<b>100%</b>

# GWA – water heating EEI measures

- **Water efficiency**
  - Low flow shower roses
  - More water efficient clothes washers
- **Water heating system efficiency**
  - Lower heat losses from pipework
  - More efficient gas water heaters
  - More efficient electrical water heaters

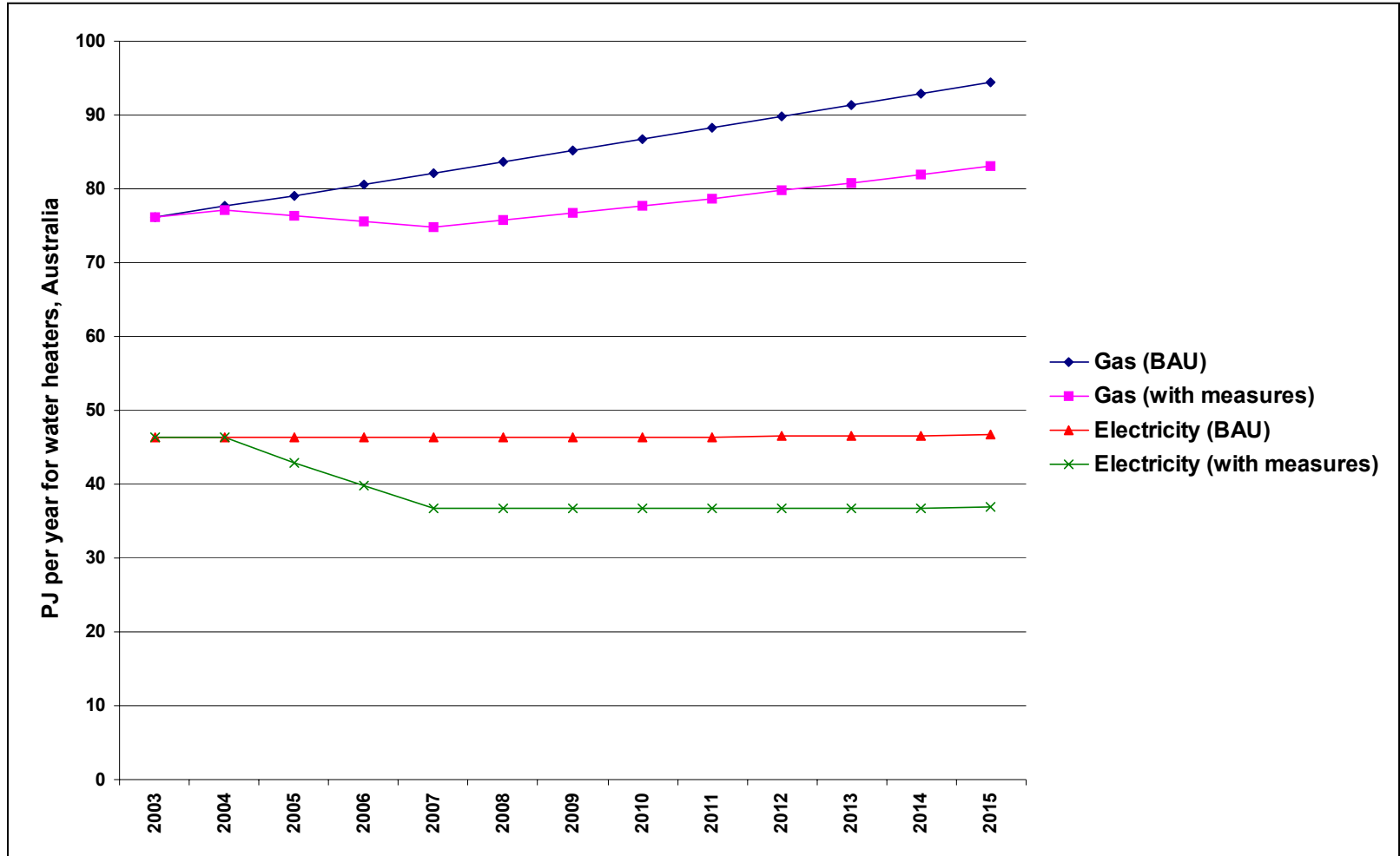


# GWA – gas water heater measures

EEI Measure	Sub-Measure	HH Type	4-yr Payback
<b>Gas water heaters – substitute Inst. for Storage types</b> <i>In 90% of cases where SWH would be purchased</i>		S	Yes
		M	No
		L	No
<b>Gas water heaters – substitute HE model for BAU model</b>	Storage	S	Yes
		M	Yes
		L	Yes
	Instantaneous	S	No
		M	No
		L	No
<b>Electric water heating – substitute more highly insulated unit for BAU model</b> <i>Takes into account higher MEPS levels to be introduced in 2005</i>	Day rate	S	Yes
	Day rate	M	Yes
	Off Peak 2	M	Yes
	Off Peak 1	M	No
	Off Peak 1	L	No
<b>Electric water heating – substitute heat pump for storage water heater</b>	Day rate	S	No
	Day rate	M	No
	Off Peak 2	M	No
	Off Peak 1	M	No
	Off Peak 1	L	No



# GWA – Water Heater EEI savings



# Residential EEI Potential - Summary

EEI Measure	Energy Savings (PJ pa)	Energy Savings (%)	Energy Savings (\$M)	Total Cost (\$M)	Payback (Yrs)
Building shell + heating & cooling	37.7	16.4%	\$458.8	\$2,175	5.0
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Dishwasher	0.3	8.0%	\$10.5	\$63	6.0
Clothes washer	0.2	13.5%	\$8.5	\$35	4.1
<b>Water heating</b>	<b>21.2</b>	<b>14.9%</b>	<b>\$427.3</b>	<b>\$1,038</b>	<b>3.1</b>
<b>Total (all measures &lt; 6.5 years)</b>	<b>69.5</b>	<b>13.0%</b>	<b>\$1,229.5</b>	<b>\$4,464</b>	<b>3.6</b>



# Residential EEl potential estimates

- Questions?