

Upgrading the efficiency of Victorian houses

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Overview



- > Background
- > General methodology
- > Housing sample
- > Overview of results
- > Further work

1. Background

- > It is widely believed that the greatest GHG abatement potential is in existing houses
- > Few, if any, studies have looked at how inefficient existing houses actually are and the practical potential to upgrade them
- > Aim of the On Ground Assessment Project
 - Use data collected from actual houses to assess their current level of energy efficiency
 - Undertake a cost-benefit analysis of a range of practical energy efficiency upgrades
- > Progress to date
 - Initial pilot study of 15 houses in 2009
 - Expanded study of 30 houses in 2010/11

2. Methodology

- > On-Ground data collection from pre-2005 houses located in Victoria (Melbourne, Geelong, Ballarat)
 - Demographic data
 - Architectural measure up & drawings
 - Blower door test to measure air leakage
 - Collect appliance and lighting data
- > FirstRate 5 analysis – House Energy Rating
- > FirstRate 5 analysis – heating & cooling use
- > Appliance & lighting analysis
- > Upgrade analysis & cost curves

Upgrades modelled

Building shell	Lighting & Appliances
<p><i>Basic Upgrades</i></p> <ul style="list-style-type: none">Ceiling insulation (easy)Draught sealing (to 0.5 ACH)Seal wall cavityReduce sub-floor ventilationUnder-floor insulation <p><i>Advanced Upgrades</i></p> <ul style="list-style-type: none">Wall insulationCeiling insulation (difficult)Ceiling insulation top-upDouble-glazingDrapes & pelmetsExternal shading	<ul style="list-style-type: none">LightingHeatingAir conditioner (cooling)Hot water systemRefrigeratorClothes washerClothes dryerDishwasherTelevisionComputer monitor

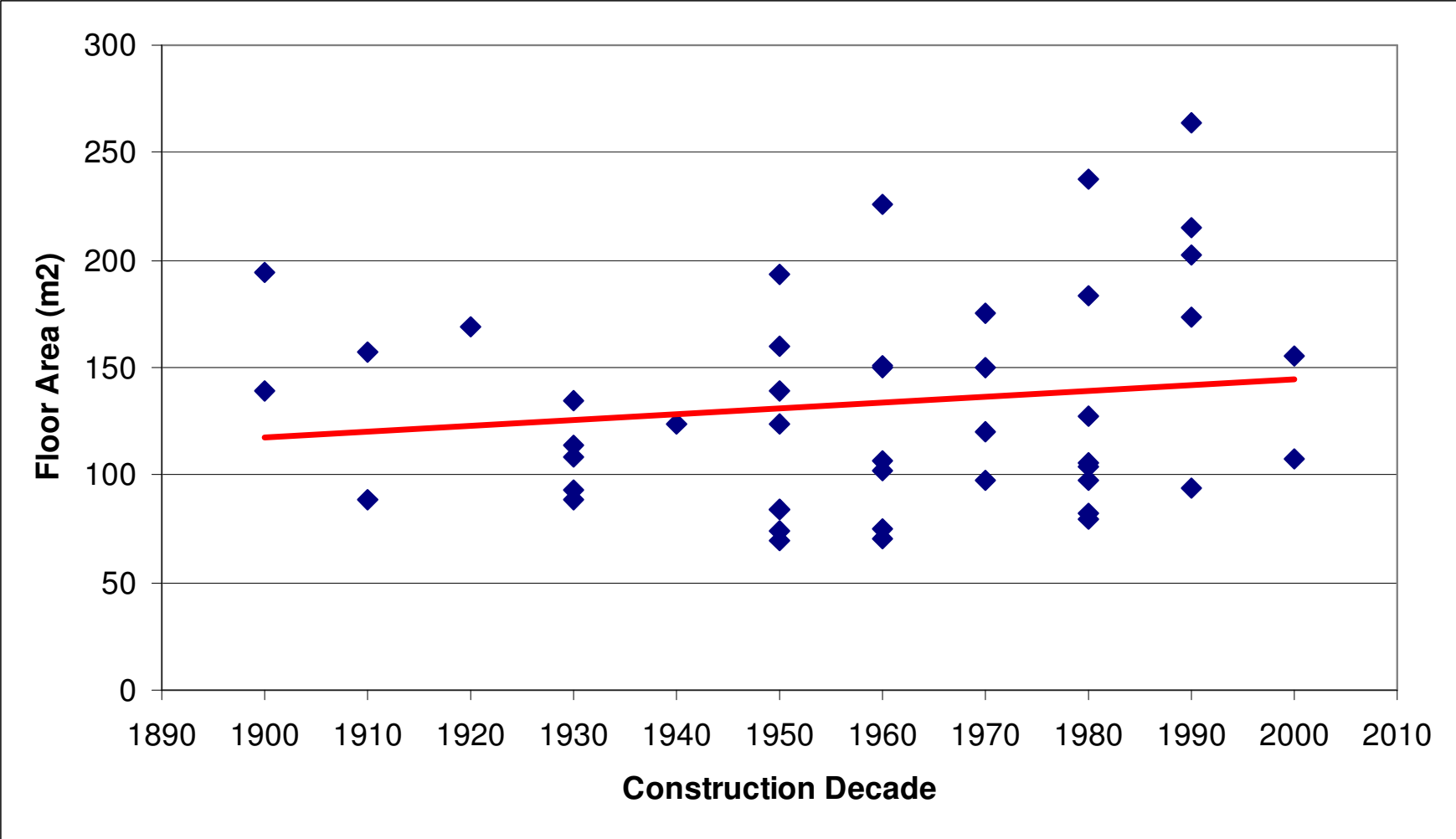
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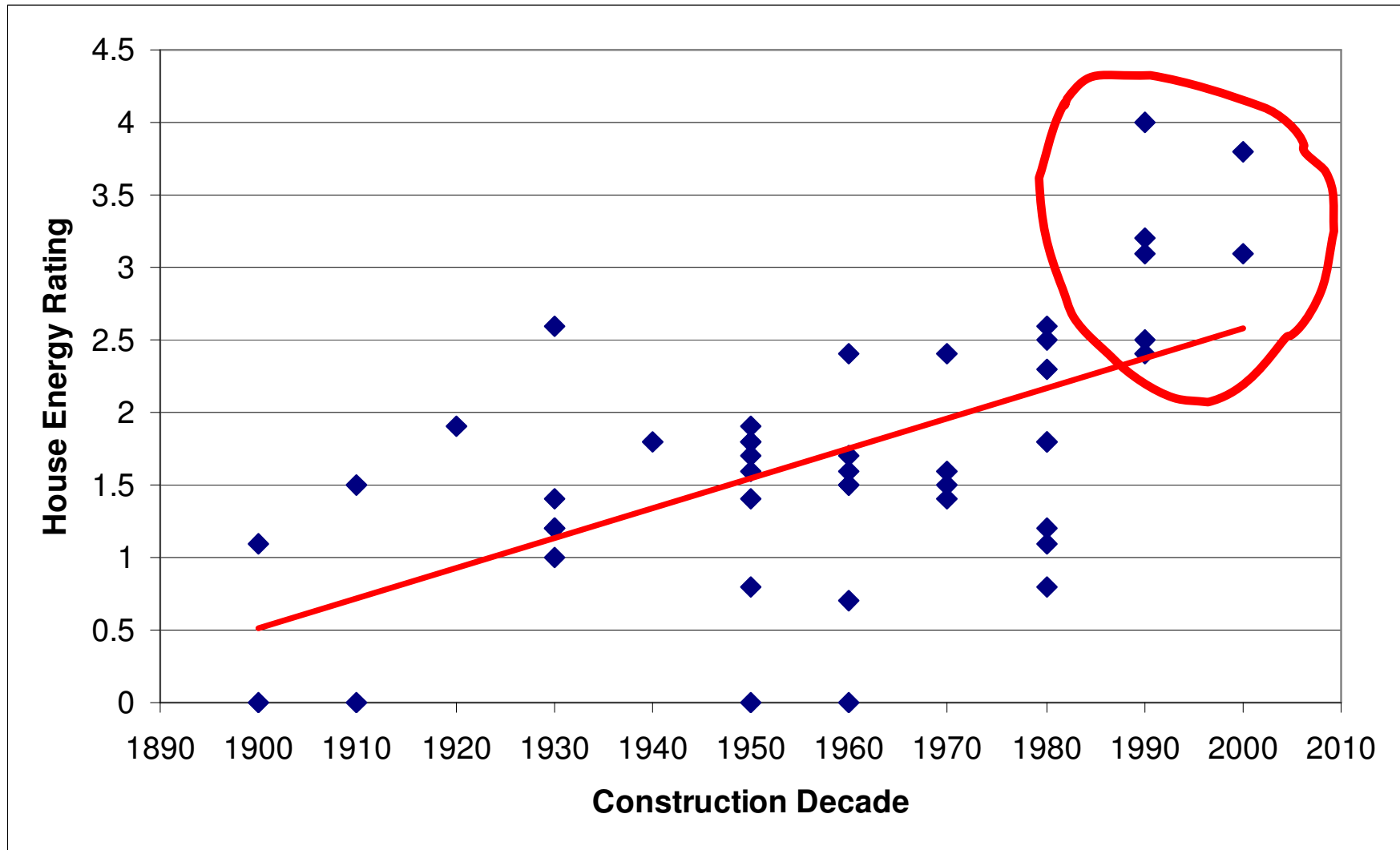
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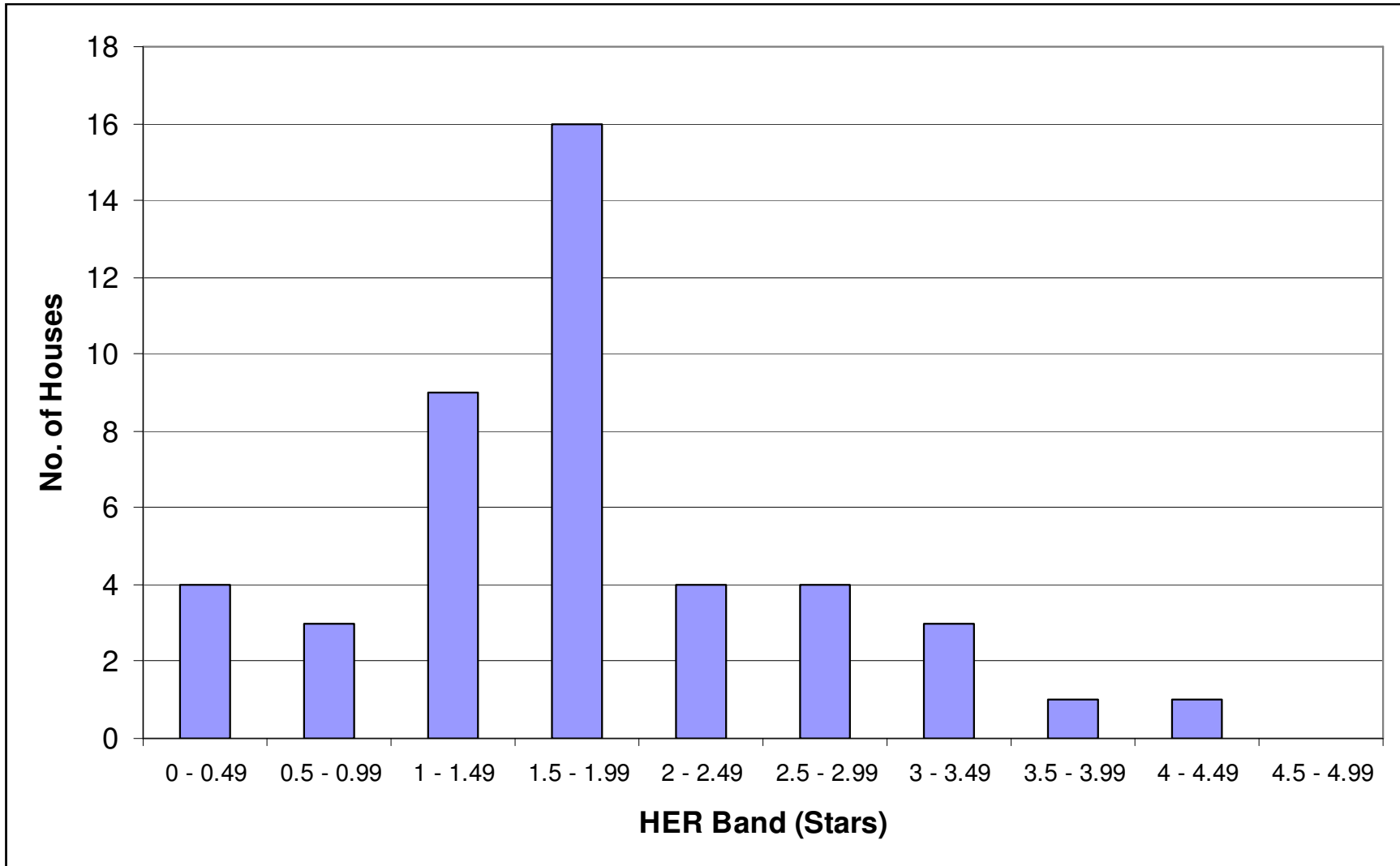
3. House Sample – Pilot & Expanded Studies



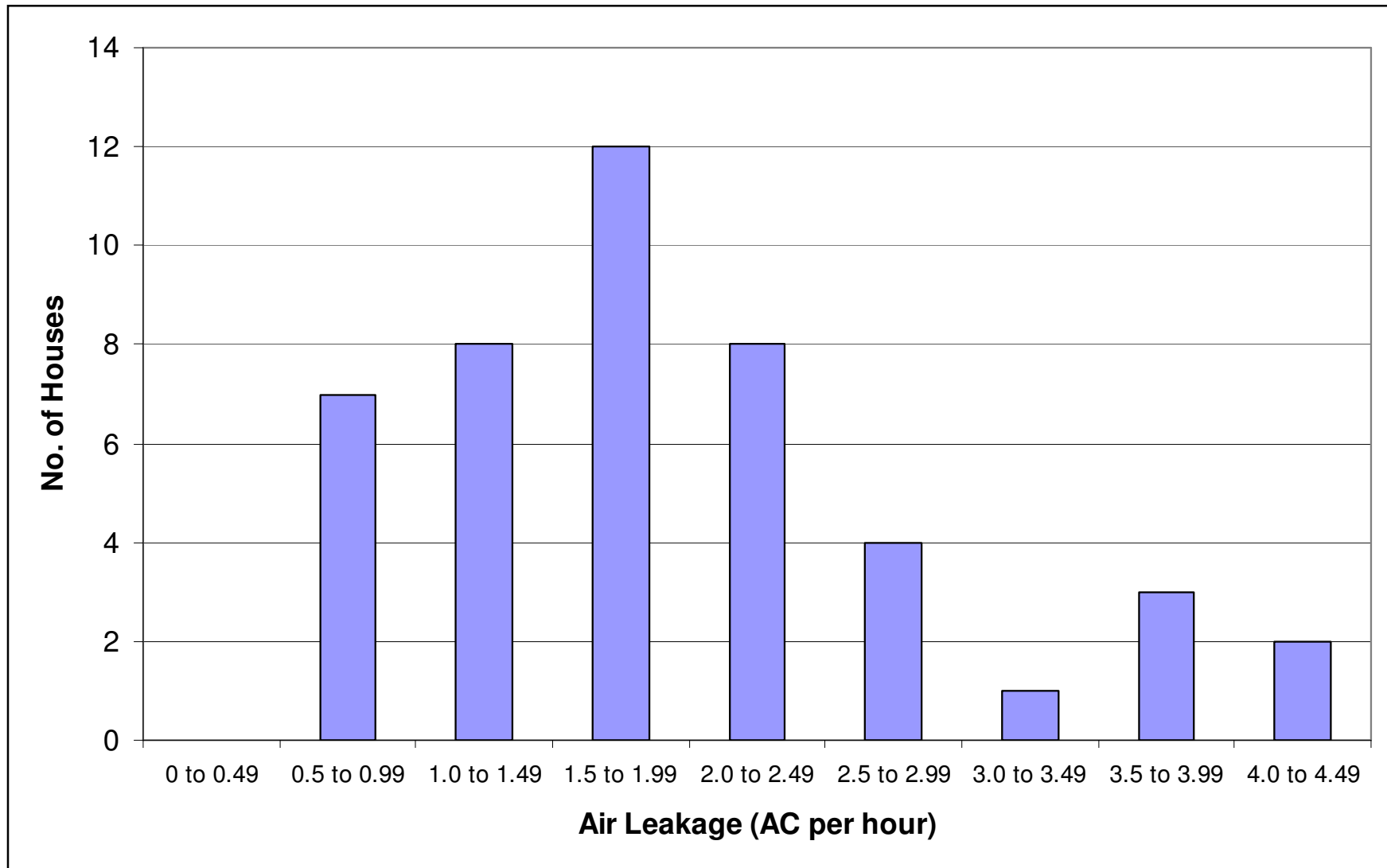
4. Results – Efficiency (HER) of existing houses



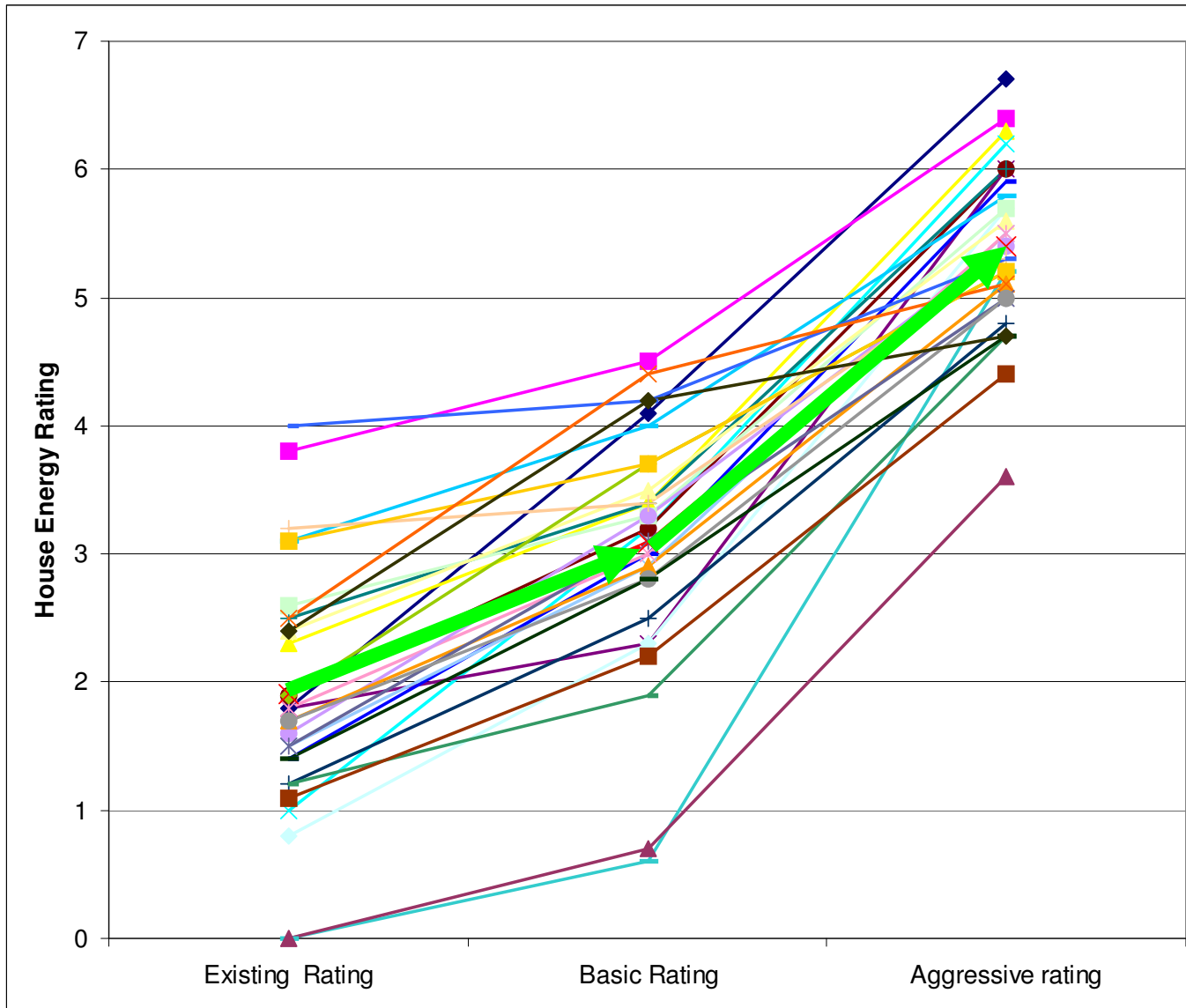
Distribution of existing House Energy Ratings



Distribution of air leakage rates



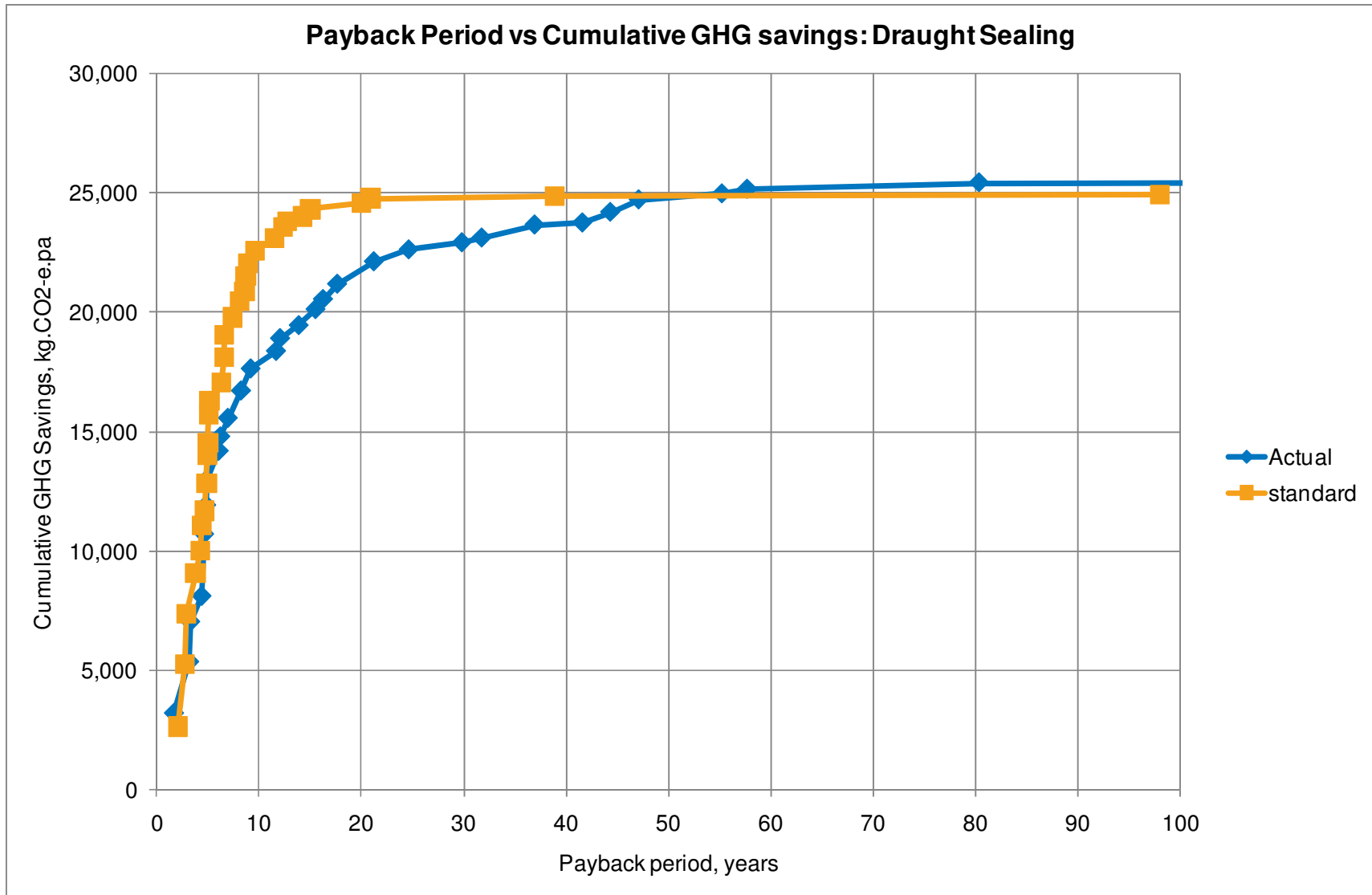
Impact of Building Shell Upgrades on HER



Comparison of Building Shell Upgrades - Weighted

Upgrade Type	Number Upgraded	Av Cost	Av Saving (\$/Yr)	Av GHG Saving (kg/yr)	Av Payback
Draught sealing	30	\$1,131	\$152	655	7.4
Ceiling insulation (easy)	3	\$55	\$6	26	9.2
Ceiling insulation (difficult)	9	\$377	\$32	135	11.8
Seal wall cavity	15	\$275	\$11	48	24.4
Underfloor insulation	16	\$883	\$29	124	30.2
Wall insulation	27	\$3,641	\$75	314	48.5
Drapes & pelmets	30	\$2,060	\$37	149	55.4
Ceiling insulation top up	15	\$685	\$11	48	60.4
Reduce sub-floor ventilation	5	\$185	\$3	11	71.8
Double glazing	30	\$11,340	\$45	187	250.8
External Shading	22	\$780	\$0	1	4779
Total		\$21,412	\$402	1,698	
Basic Upgrades		\$2,529	\$201	863	

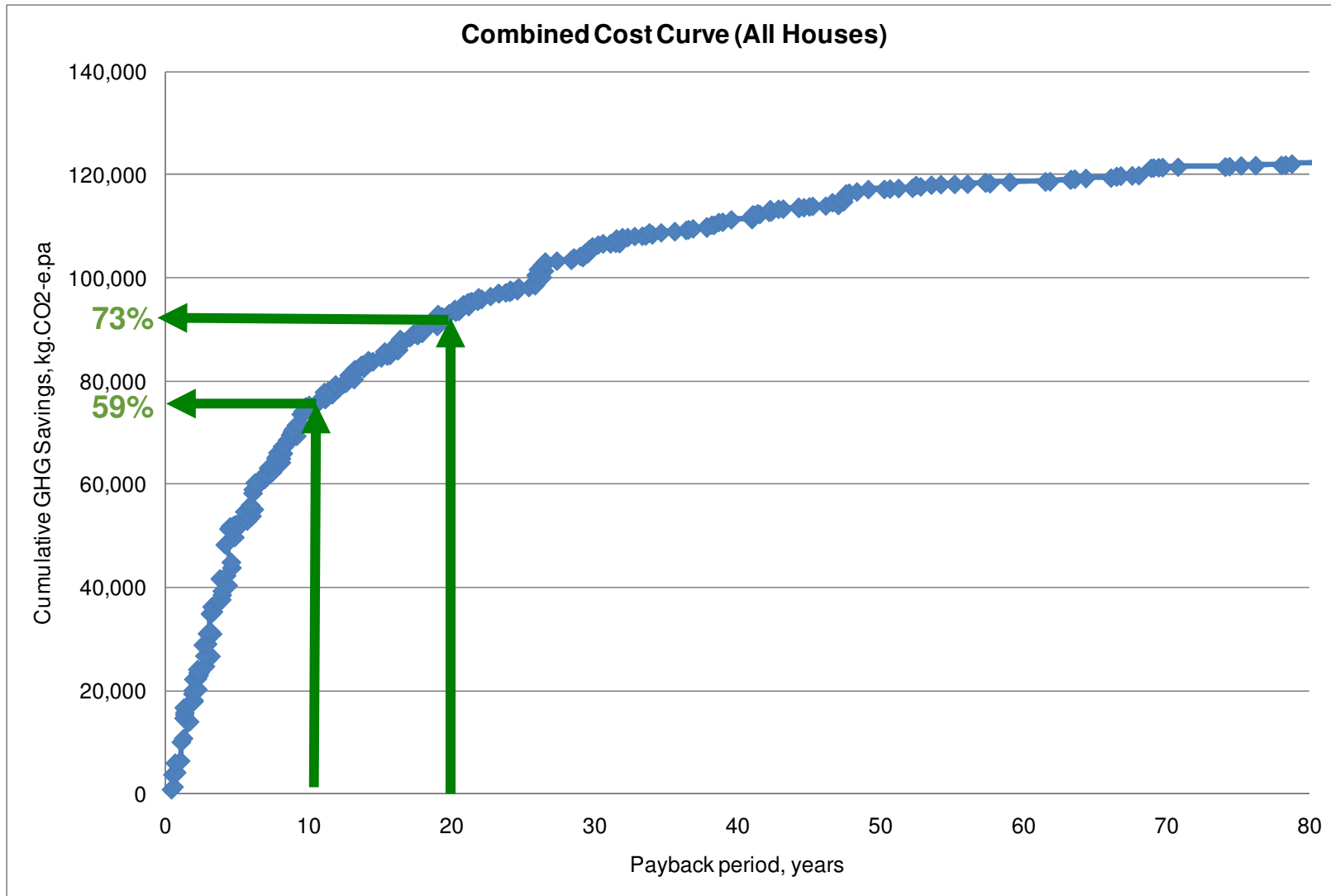
Cost curve for draught sealing



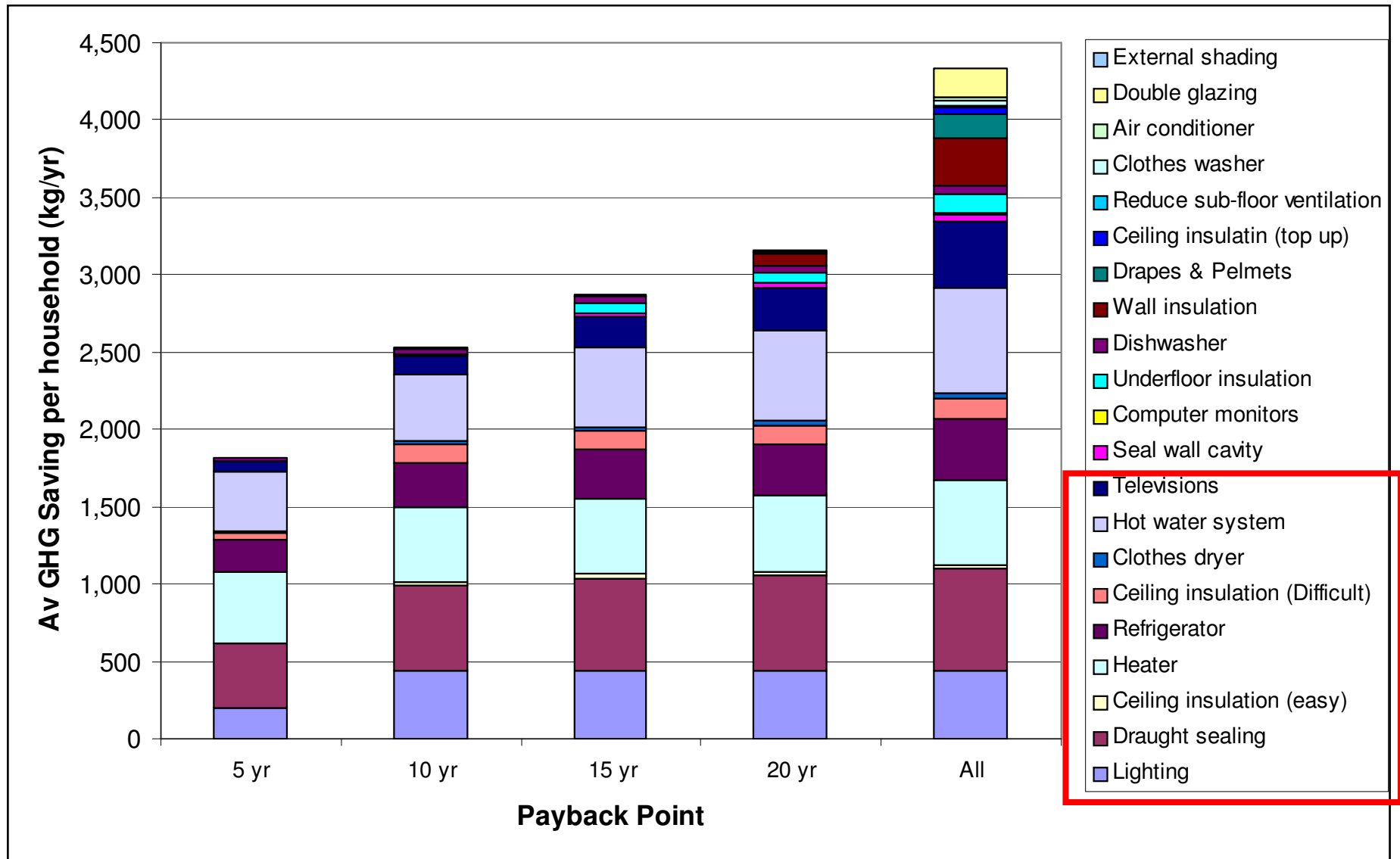
Comparison of Lighting & Appliance Upgrades - Weighted

Upgrade Type	Number Upgraded	Av Adjusted Cost	Av Saving (\$/Yr)	AV GHG Saving (kg/yr)	Av Adjusted Payback
Lighting	29	\$469	\$75.8	444	6.2
Heater	29	\$1,263	\$124.1	551	10.2
Refrigerators	29	\$594	\$53.9	316	11.0
Clothes dryers	15	\$72	\$5.4	32	13.3
Hot water	28	\$1,606	\$106.9	686	15.0
Televisions	30	\$1,567	\$73.1	428	21.4
Computer monitors	7	\$45	\$1.7	10	26.4
Dishwashers	17	\$354	\$8.6	50	41.3
Clothes washers	24	\$427	\$5.4	31	79.5
Air conditioner (cooling)	11	\$429	\$2.7	16	157.6
Total		\$6,826	\$458	2,563	

Cost curve for all upgrade measures



Comparison of upgrade options (normalised)



Further work

On Ground Assessment Project (on going)

- Publish reports on Expanded On Ground Assessment project, plus report on all 45 houses
- Compile data from all 45 houses into database of existing stock
- Build-up database over time to be more representative

> *Victorian End-Use Metering Project (in progress)*

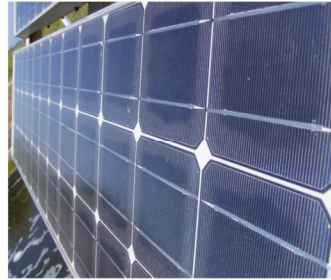
- Collecting data on key electrical end uses in Victorian houses

> *Retrofit trial (about to start)*

- Implement and assess impact of actual retrofits
- Target draught sealing, wall insulation, halogen lighting

Questions

- Ian McNicol
- Sustainability Victoria
- ian.mcnicol@sustainability.vic.gov.au



Policy measures relevant to plumbing industry

> *Plumbing standards*

- Water heaters in new dwellings
- Electric water heater phase-out

> *Minimum energy performance standards*

- Electric water heaters (1999, 2005)
- Gas water heaters (2011)
- Gas ducted, space & decorative heaters (under development)
- Heat pump & solar water heaters (under development)

> *Incentives*

- Solar & heat pump water heaters (RECs, VEET, rebates)
- HE gas to replace electric (VEET)
- High efficiency gas ducted & room heaters (VEET)
- High efficiency evaporative replacing refrigerative (VEET)
- Low flow shower rose (VEET)
- Replacement of old gas heating ductwork (VEET – coming)