



UniSA

INTELLIGENT GRID IN A NEW HOUSING DEVELOPMENT

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Project Team

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University of
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Institute for
**Sustainable Systems
and Technologies**

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Intelligent Grid in a New Housing Development

A CSIRO Intelligent Grid Cluster Project



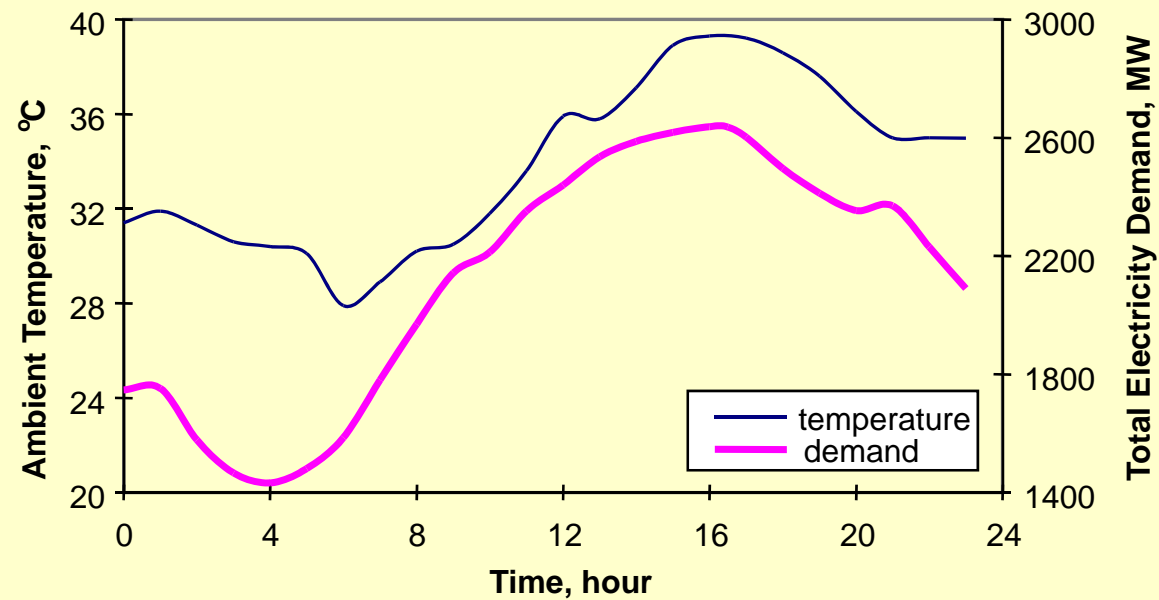
- **Background**
- **Lochiel Park Green Village**
- **Project components**
- **Project progress and outcomes**
- **The case for net zero energy housing**

Background



- We will have 10 million homes in Australia by 2020-an increase of 4 million and 56% in energy consumption from 1990
- Residential buildings represent 20% of Australia's greenhouse gas emissions (30-40% heating & cooling)
- Residential buildings are responsible for escalating peak demand
- Difficulty in justifying and valuing energy efficiency features
- Lack of hard evidence of the impact of demand side management/distributed generation on the electrical grid
- Lack of integrated technical/socioeconomic evaluation

Adelaide peak electrical demand is dominated by air conditioning



Lochiel Park Green Village

- SA Government initiative with “a clear objective of building ecologically sustainable homes within a natural bush and parkland settings ..”
- Master plan finalised 2005
- 106 dwellings including social housing
- Released to market, November 06, mostly sold
- 23 homes are being built



Location

8 kms NE of the Adelaide CBD adjacent to the River Torrens Linear Park





Lochiel Park: Masterplan



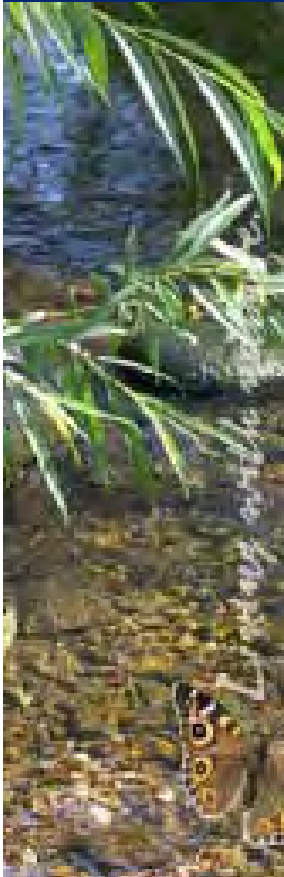
- Total Site Area
14.71 Ha
- Open Space
10.51 Ha
- Residential/Housing
4.20 Ha



Lochiel Park: Team & Participants

- Project Manager: Land Management Corporation
- Builder Partners
 - Alpine Constructions– Anthony Donato Architects
 - Charterhouse by Hickinbotham Homes– Max Pritchard
 - Rossdale Homes – Goostree Smith Design
- Housing SA– Social Housing Project
- SA Sustainability and Climate Change Division
- UniSA, Sustainable Energy Centre, Institute for sustainable Systems and Technologies

Energy and Emission Reduction



The development aims to achieve:

- 66% reduction in energy
- 74% in greenhouse gas emissions
against the Adelaide average

This is being achieved through considering energy use in all project stages (site planning, dwelling design, construction and monitoring)

The urban design guidelines include:

- Specific requirements
- Advisory sections
- Preferred and precluded technologies

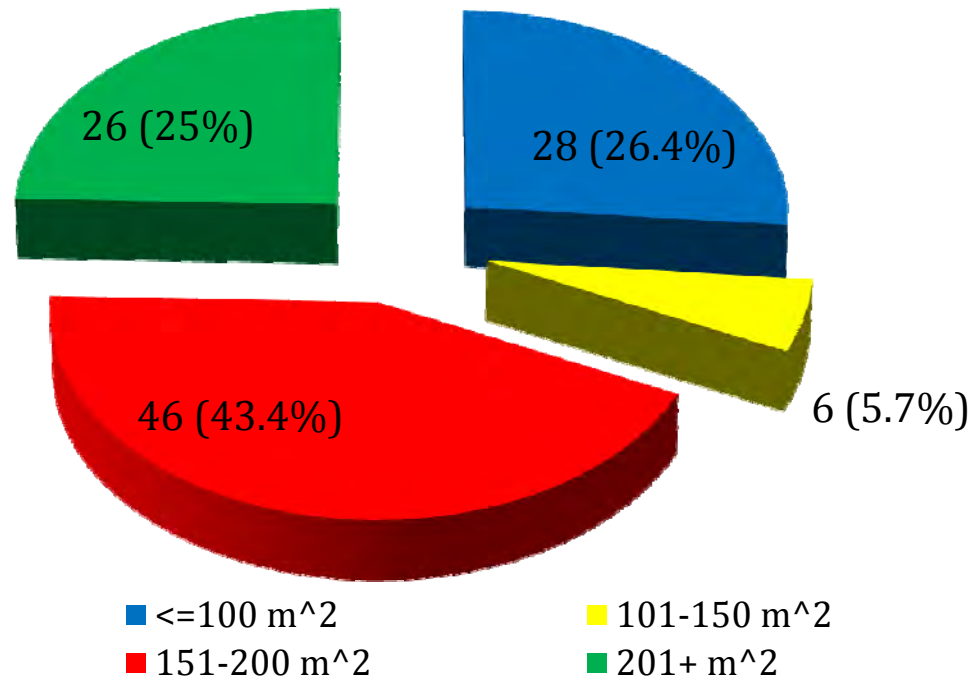
Energy and Emission Reduction

Major features:

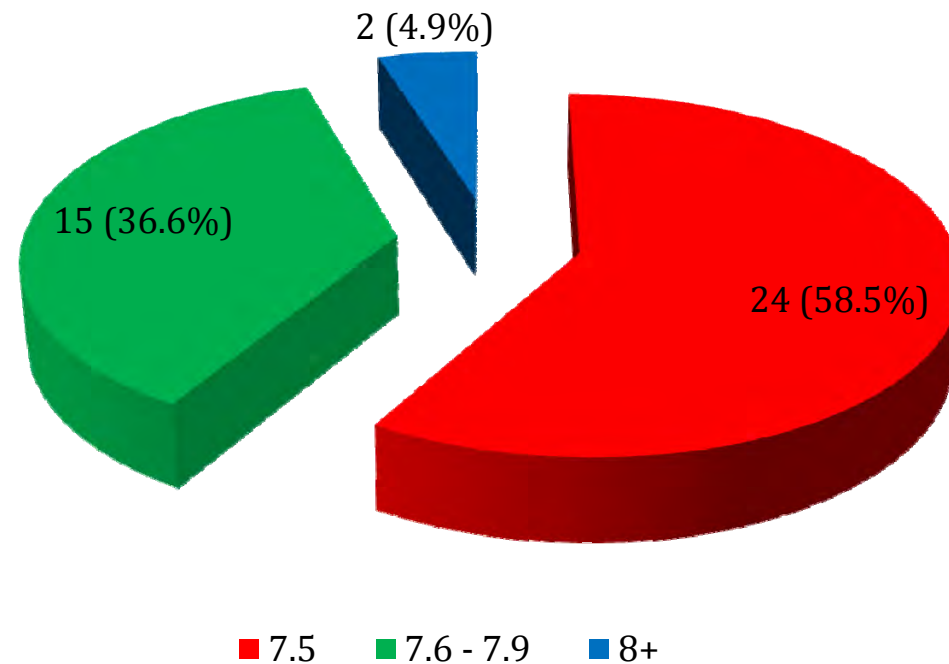
- 7.5 star rating, minimum, using AccuRate
- Use low embodied energy building materials
- Solar hot water systems (gas boosted, minimum 70% solar contribution)
- Best available energy and water efficient appliances
- Day lighting, skylights and energy efficient lights
- Use of solar electricity (1kW per 100m² of living area)
- Installing electrical load limiting devices (3, 4 or 5 kVA)
- smart metering and energy usage display



Lochiel Park Snap shot: Built Floor Area



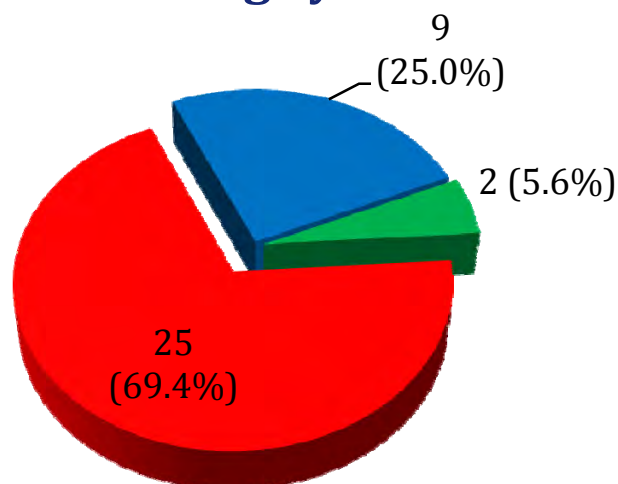
Lochiel Park Snap shot: Energy Star Rating



* 41 dwellings rated so far

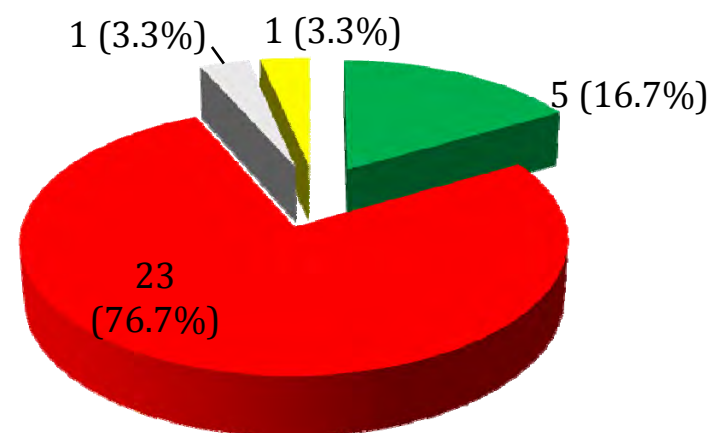
Lochiel Park Snap shot: Heating& Cooling Systems

Cooling System



■ None
■ RC (incl. Actron)
■ Evaporative Cooler

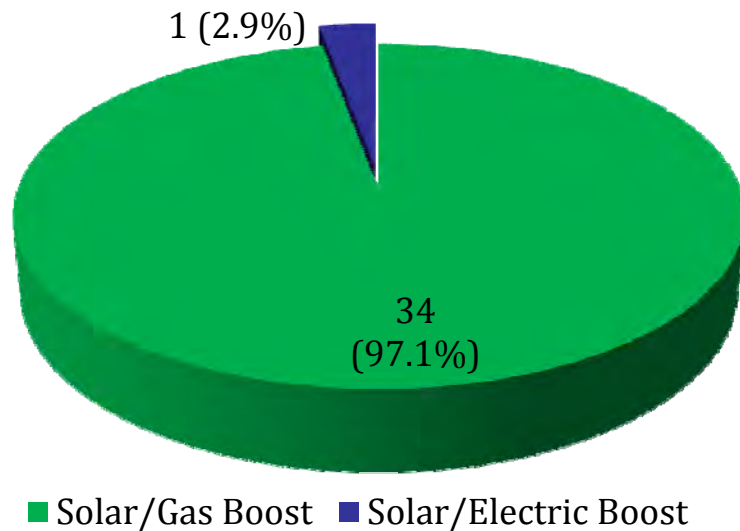
Heating System



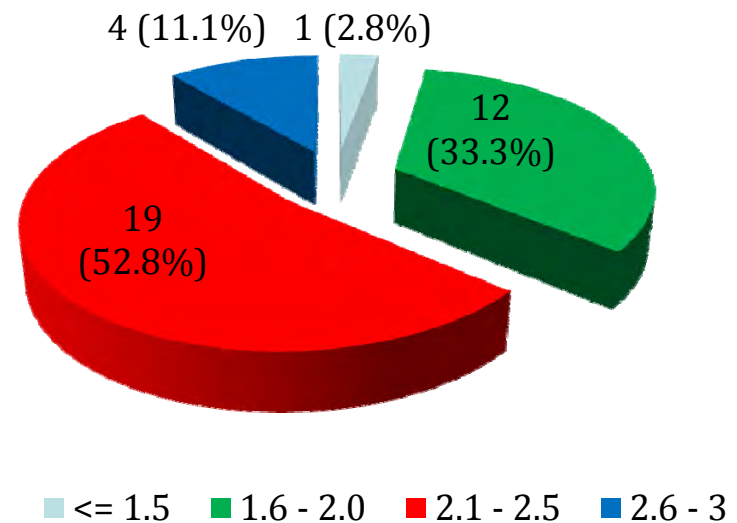
■ None ■ RC ■ Gas ■ Hydronic

Lochiel Park Snap shot: Solar Systems

Hot Water



Solar PV Capacity Provided, kWp



- General enthusiasm
- Initial issues in complying with the energy star rating
- Tight specifications for heating and cooling systems
- Use of “industry” rules of thumb for heating and cooling systems
- Withdrawal of the PV rebate for high income earners

Monitoring Program

- nominated dwellings are to be monitored for energy (electrical circuits and gas), water (rain water, recycled water and mains water) and temperature (living rooms and bedrooms)
- total household energy (electricity and gas) and water (mains drinking water and recycled water) monitoring from billing data on all homes in the village
- network monitoring of total energy (electricity and gas) and water (mains drinking and recycled water) at subdivision metres.
- Weather monitoring station to be established on site

Anticipated outcomes

- How much energy and power is actually used by houses and consequent greenhouse gas emission
- Monitored performance of individual energy saving/distributed generation features and comparison with anticipated performance
- Evaluation of user interaction with energy saving/ distributed energy features
- Interaction of the green housing development with the local electrical grid
- Input to economic, social and environmental models to develop realistic rating/planning tools.

Towards a Net Zero Energy Home

**Energy Consumption (MJ) and Emissions for 2 star, 5 star and 7.5 star homes,
Area 213 m², Adelaide climate**

Star Rating	7.5	5	2
Water Heating	38000	38000	38000
Space Heating	1582	5077	11965
Space Cooling	5	1333	6104
Cooking	1872	2246	2527
Lighting	408	890	1551
Other including Standby	6691	9029	12033
Emission, kg-CO ₂ -e	3832	5370	9852

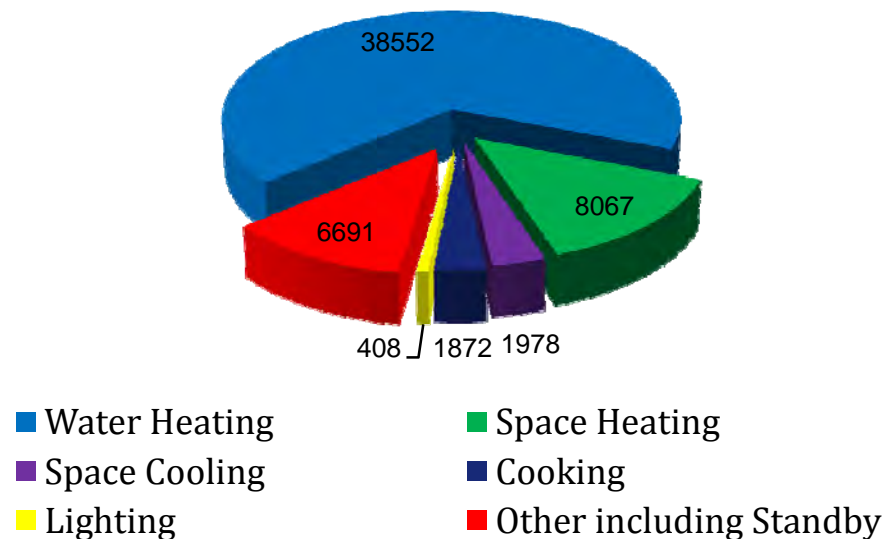
7.5 Star Dwelling

- Total floor area: 213 m²
- External walls: reverse brick veneer with R2.5 insulation
- External windows: double glazed
- Roof: colorbond with R4 insulation
- Water heating: gas instantaneous solar
- Heating and cooling: 6 star reverse cycle
- Lighting: compact fluorescent

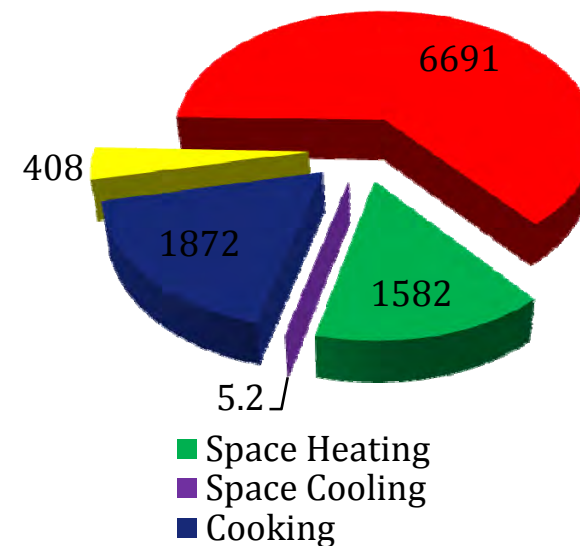
Towards a Net Zero Energy Home

7.5 Star Dwelling

Energy Requirements, MJ



Electrical Energy Consumptions, MJ





Towards a Net Zero Energy Home

The electrical energy required by this 7.5 star home can be produced by 3 kWp Solar PV system

Towards Zero Energy homes



View from North East



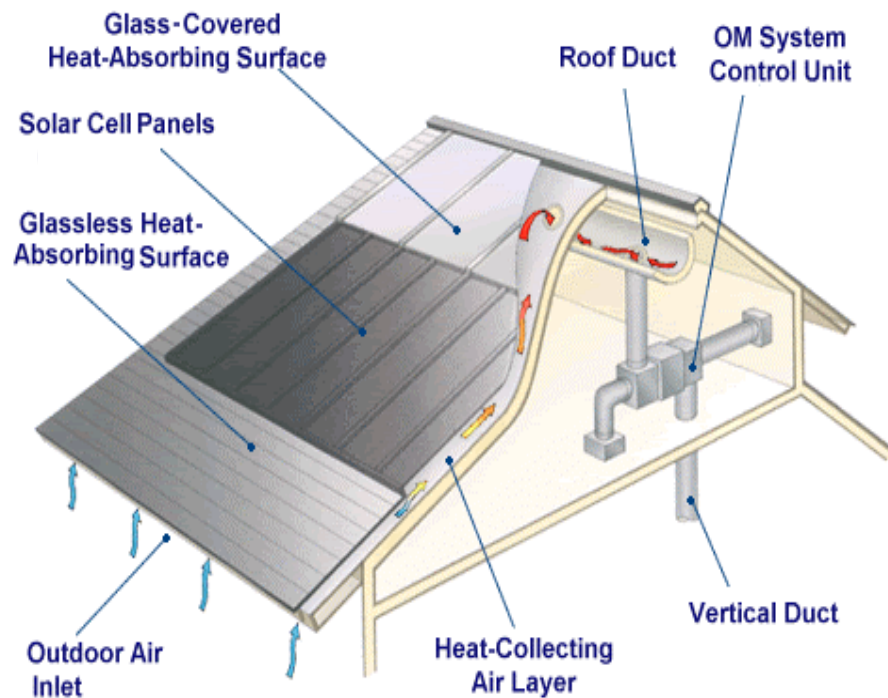
View from North West



View from North

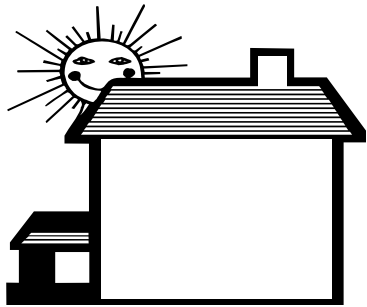
- 8.0 star rating
- Integration of solar elements
- Solar heating and hot water
- Energy neutral outcome with 3.7kW photovoltaic system

Towards Zero Energy homes

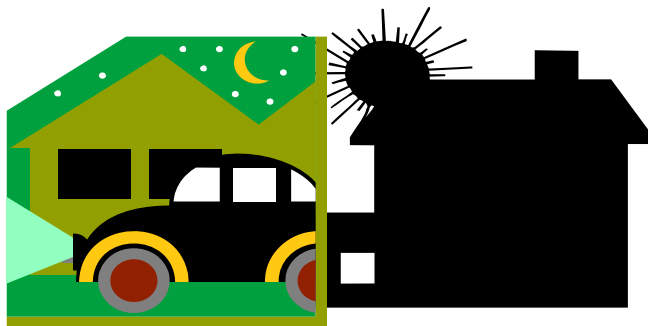


- Cogeneration of electricity and heat integrated into roof
- Solar thermal hot water heating and cooling
- Grid-integration

Towards Zero Energy homes



The sun generates heat for hot water, heating and cooling, and electricity for other requirements



The electric/hybrid car is charged from the house during the night and provides peak storage capacity during peak demand periods



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THANK YOU

www.unisa.edu.au/sec

www.lochielpark.com.au

