

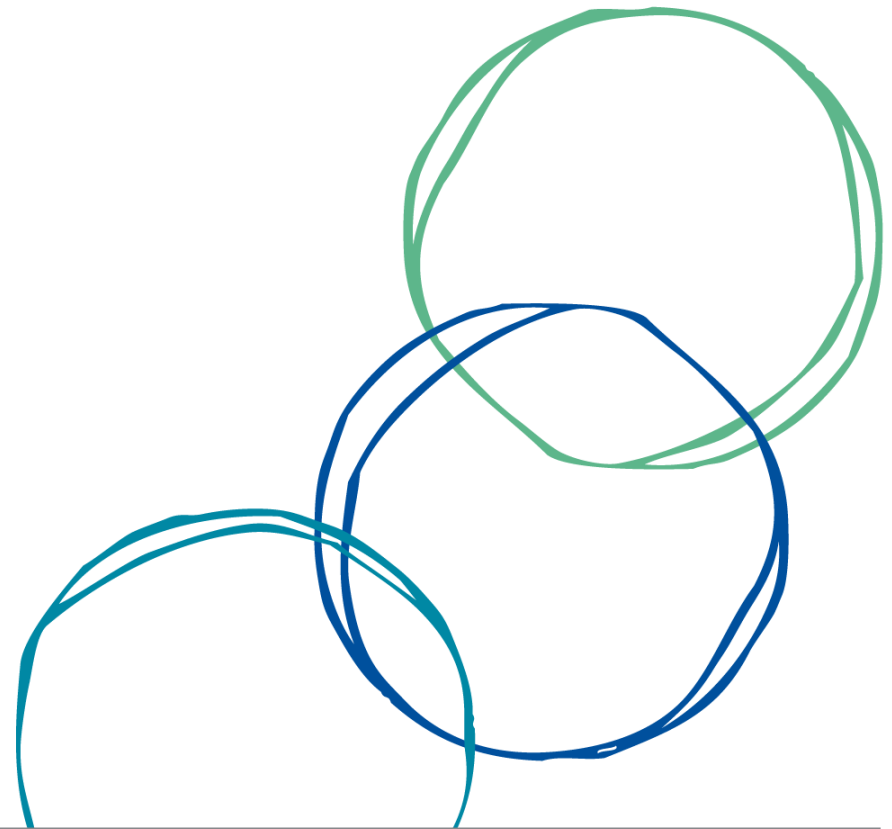
2015 Participants Annual Forum:

- *Mid-Point Progress Report*



Scientia Professor Deo Prasad AO
CEO: CRC for Low Carbon Living

Thursday 26 November 2015



National Innovation Hub for a Sustainable Built Environment

Our purpose is to enable reduction of carbon emissions of the built environment sector by working collaboratively with industry and governments and engaging with communities. We do this by providing the highest quality end user driven research which also underpins the global competitiveness of the Australian industry.

Our research will deliver social and technological solutions, evidence base for design, planning and policy innovations and once in a generation national capacity build for the sector

WHAT WE DO

We are committed to three integrated research programs for our research activity and projects:

1. Integrated Building Systems

Developing new low-carbon products and services, and finding ways to communicate best practice design through rating tools, standards and display homes.

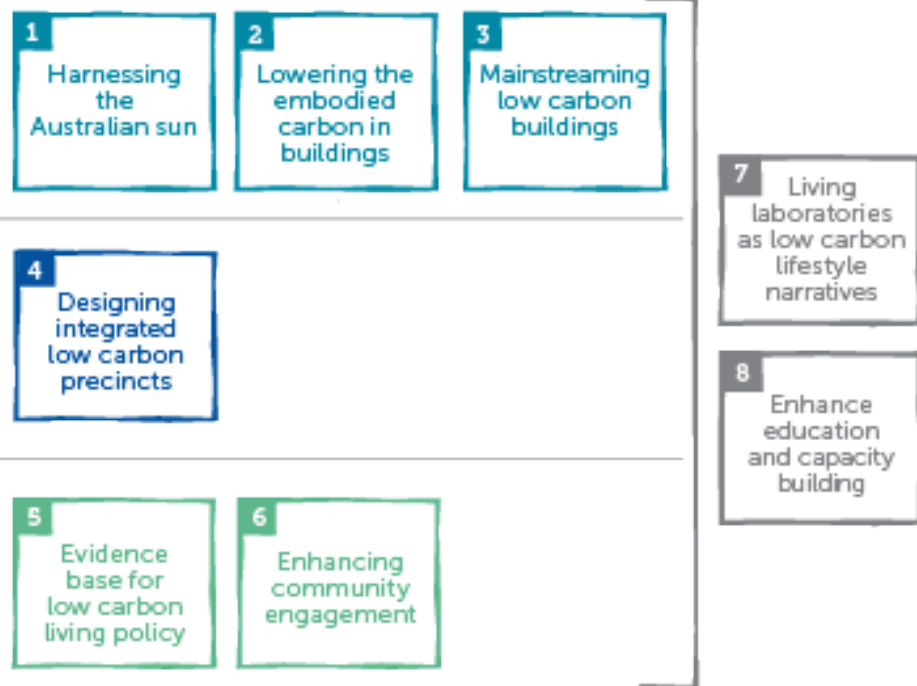
2. Low Carbon Precincts

Creating new planning techniques, models and data for delivering low carbon developments at a precinct scale. Communicating best practice in sustainable city planning through precinct design and assessment tools.

3. Engaged Communities

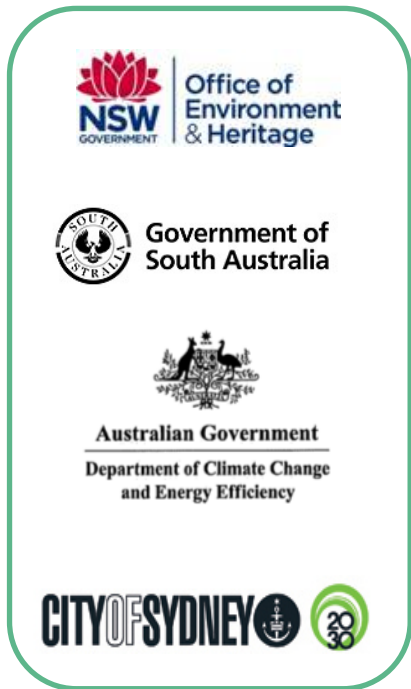
Creating a new community appetite for low carbon living, through strategies for social networking, education and media. Communicating the vision of a prosperous, liveable and sustainable society to business and government through living laboratories and economic modeling.

Our projects and activities translate across these eight impact pathways, a journey towards a low carbon economically viable built environment.



How: Integrating end user response

Government



Manufacturing



Development



Professionals



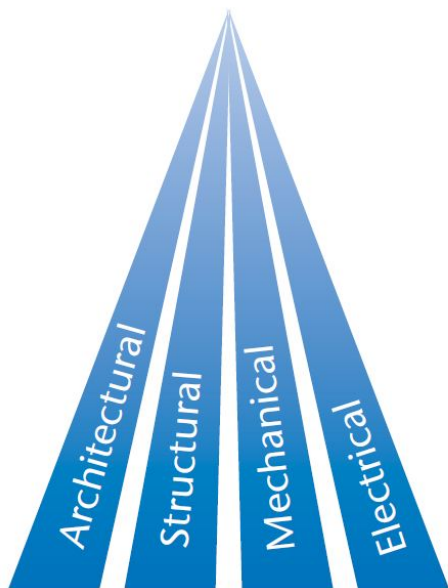
Evidence base for ~\$1billion/yr investment in government programs

Incubating next generation multi-purpose building products

Enabling world class low carbon property development

Tools for Australia's building design services industry

.....In a fragmented industry



+



=



Professional and Trade
Responsibilities
(Functional gaps)

Building Delivery Process
(Management
discontinuities)

Operational Islands
(Ineffective coordination;
poor communication)

A POWERFUL INDUSTRY NETWORK



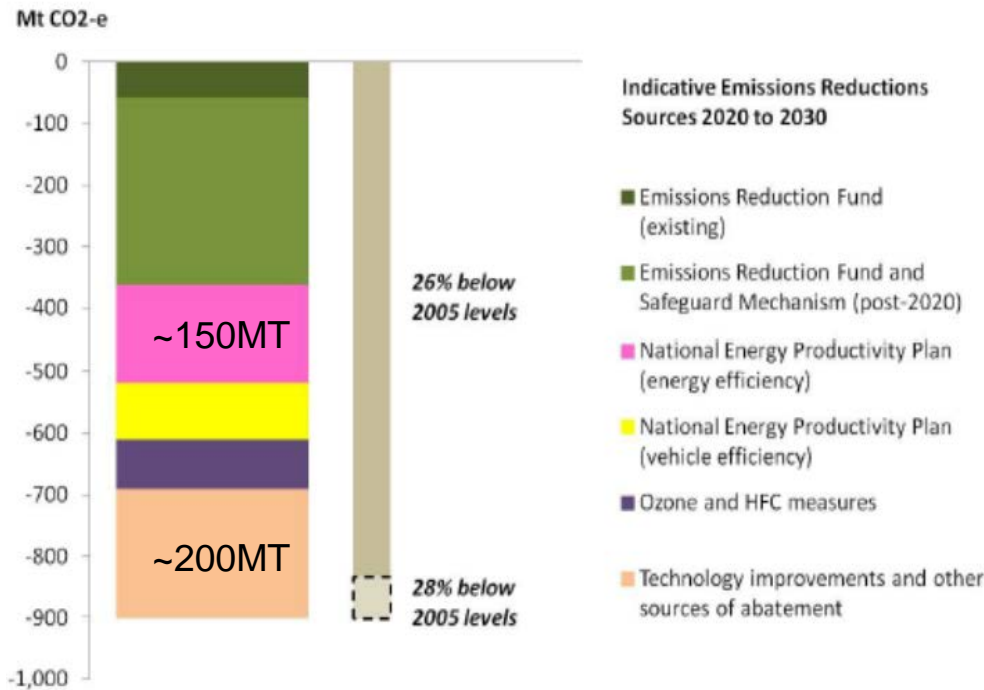
- ✓ CRC engages with many thousands of SMEs through industry bodies
- ✓ Two way communication: end user advice, vehicle for implementation
- ✓ Led by **Professor Ken Maher** – Gold Medal winning architect and Chair of ASBEC

So how have we been progressing broadly ...

- **75 Approved Projects**
 - 19 Completed projects
 - 56 Active projects
 - Within these projects, we have 11 Living Laboratory projects
 - 6 projects are in commercialisation/utilisation stages
- **We have completed 74 Commonwealth Milestones out of a possible 85**
 - This includes completing 15 utilisation milestones

Australia's Post-2020 Emissions Reduction Target: Australia can achieve the 2030 target by improving productivity, reducing costs and through technology

CRCLCL projected estimates of 87-116MT (Ave 102MT) of Carbon Emissions Reductions by 2030 from its current research activities.



Source: Cwth 2030 Carbon Target presentation, 11 Aug 2015

- **National Energy Productivity Plan (energy efficiency)** – Commonwealth target carbon abatement of around 150MT by 2030.

The CRCLCL recently wrote to Minister Macfarlane, citing examples of how the CRC’s research activities support the actions articulated in the Energy White Paper “Increasing energy productivity to promote growth”.

With around 50% of our projected carbon saving relate to energy efficiency, the CRCLCL might be able to contribute as much as one third towards this source of emission reduction by 2030.

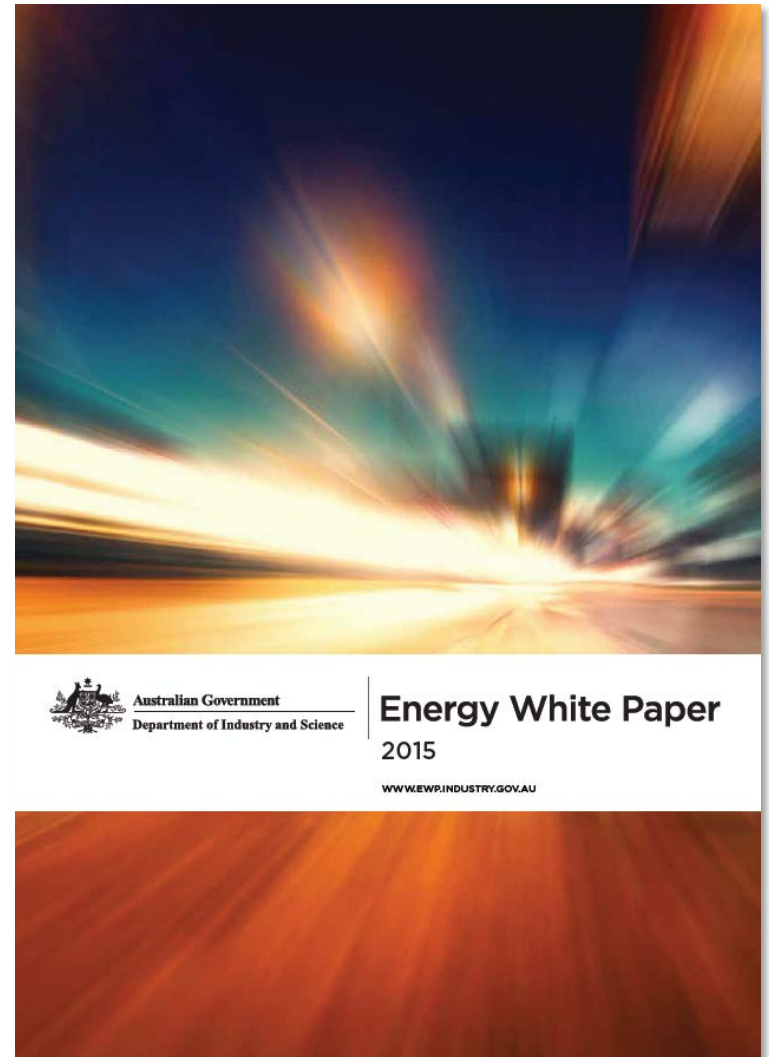
- **Technology improvements and other sources of abatement** – Commonwealth target abatement of about 200MT by 2030.

The other half of the CRC’s projected carbon reductions are linked to our research activities in technology improvements, recycling and lowering the embodied carbon in building materials.

Therefore the CRCLCL might be able to contribute as much as one quarter towards this source of emission reduction by 2030.

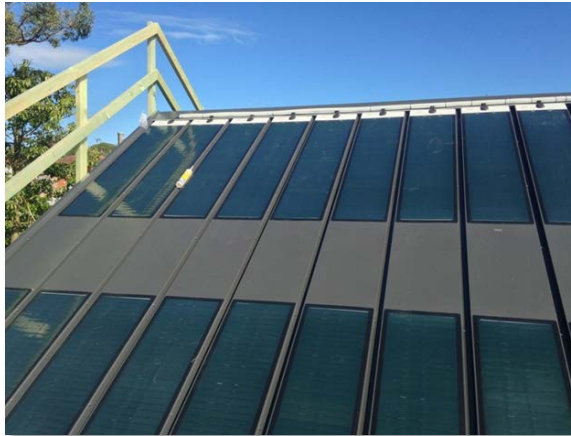
Supporting Energy White Paper

- Projects which support the Energy White Paper
 - **RP1008 Industry support mechanisms for renewable heating and cooling**
 - **RP1020: Reducing Barriers for Commercial Adaptation of Construction Materials with Low-Embodied-Carbon**
 - **RP1024: Creating 3rd Generation NatHERS Design Tools**



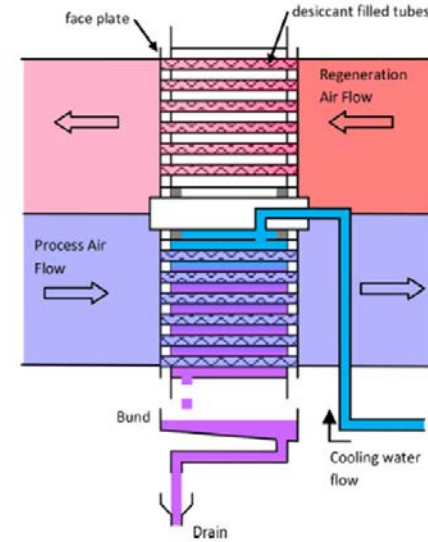
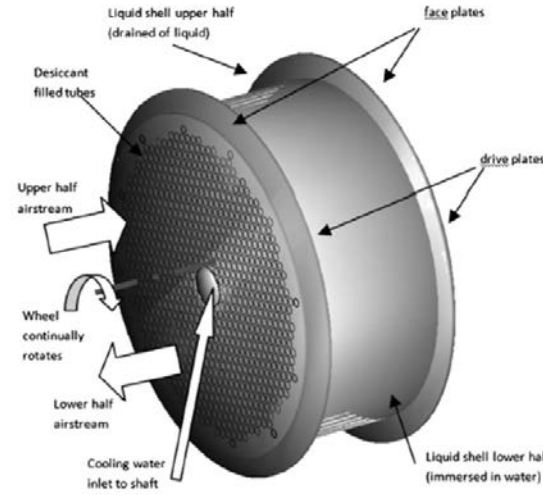
RP1001 Air handling solutions, integration approaches and building design considerations for Photovoltaic Thermal (PV-T) roofing

- Determination of appropriate cost-effective solutions for thermal integration.
- Trial the thermal integration of a PV-T system based on the optimised design, as part of a Living Laboratory.
- Development of a methodology to group the building typologies, operational (thermal supply and demand) situations, and macro- and micro- climates.



RP1015 - Combining a building integrated PVT system with a low temperature desiccant cooler to drive affordable solar cooling

- This project aims to integrate BlueScope PVT roofing system with desiccant cooling systems.
- The motivation here is that as the price of PV continues to fall, rooftop PV becomes a very cost effective option.
- BIPV/T cannot produce temperatures high enough to drive an absorption cooling cycle.
- However BIPV/T in many Australian climates can potentially produce thermal energy at a temperature that can drive a low temperature desiccant cycle



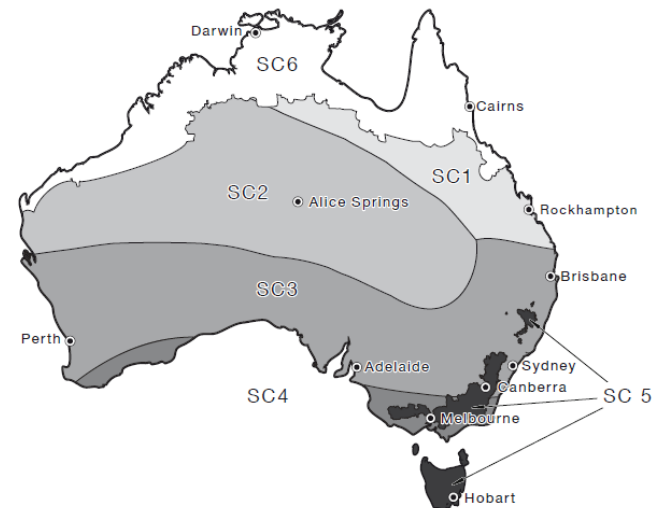
RP1008 Industry support mechanisms for renewable heating and cooling

Research Challenge

- Building heating and cooling accounts for 7% of total GHG emissions & 50% of electricity peak demand.
- New technologies can help solve this but are under-utilised due to lack of clear consumer information & the difficulty of displacing incumbent technology.
- A standardised method of comparing product performance would give consumers confidence, industry a level playing field, and provide a mechanism for performance based incentives based on the actual energy and GHG savings these products deliver.

Objectives

- i) Extend the Interim AS5389 Australian Standard to include new airconditioning technology classes relevant to the low carbon products being commercialized by industry partners.
- ii) Develop a Rule to enable these new technologies to receive incentives under the NSW Energy Savings Scheme



RP1007 – Intelligent automated monitoring of commercial photovoltaic (PV) systems & RP1023 – Forecasting and home energy analysis in residential energy management solutions

Project Summary: RP1007

Owners of residential and commercial buildings with a PV system installed need to be able to answer two key questions:

1. “Is my PV system generating as much energy as it should?”.
2. “How can I reduce my electricity consumption?”

This project developed a series of algorithms to model, monitor and diagnose underperformance of PV system performance.



RP1023

Residential and small commercial energy consumers need to be able to answer two key questions:

1. “What can I change to reduce my electricity consumption/bill?”.
2. “How can I make the most of my investments in energy efficiency, RE generation and storage?”

This project aims to develop intelligent algorithms which will take local load, weather and energy generation inputs to automate the analysis of electricity production and consumption

The objective is to forecast energy supply and demand and provide energy modelling algorithms that inform and enable on-site storage and demand management at the residential and small commercial level.

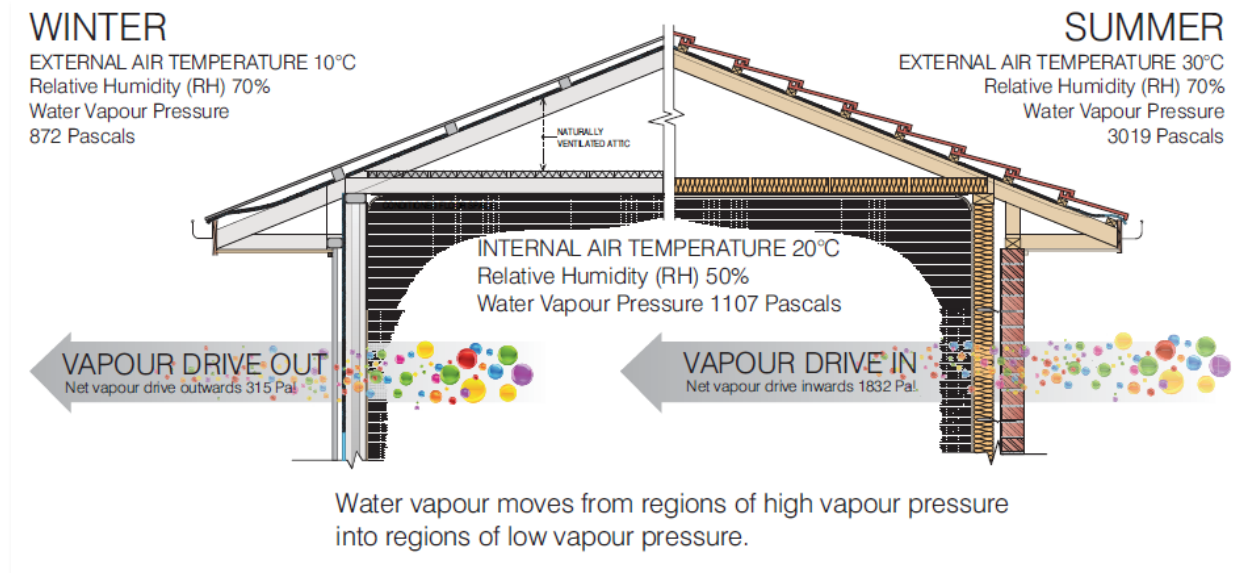
RP1012 Next generation low-emissivity pliable membranes for moisture management in building construction (Stage 1 of 3)

PROJECT SUMMARY

The project addresses emerging moisture management and condensation risk in Australian buildings. The potential moisture damage to homes is on a national scale and has been closely identified with increased standards for home insulation. Without adequate moisture management, the energy-efficiency gains from increased thermal insulation cannot be realized as the performance of most insulation is compromised by dampness.

PROJECT OUTCOMES

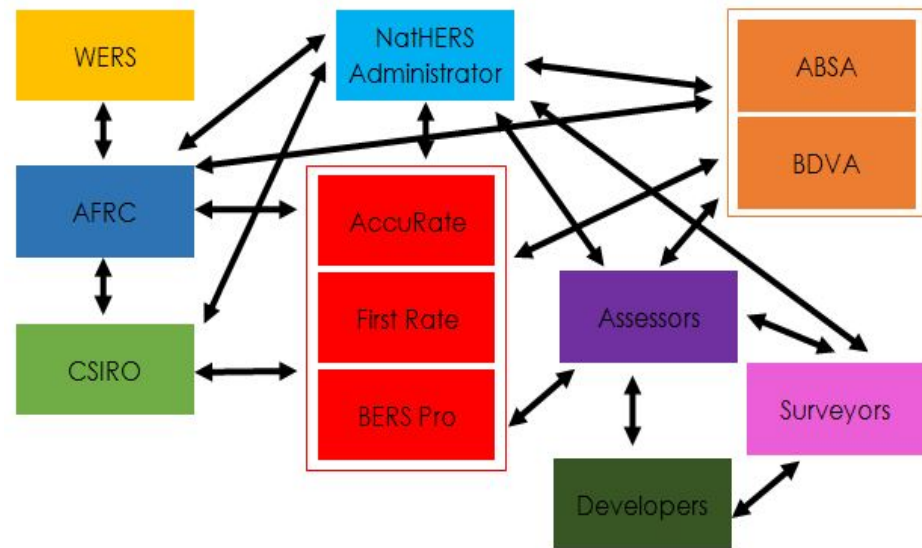
The research outcome will include development of the next-generation of low-emissivity pliable membranes for moisture, both liquid and vapour management. Without adequate moisture management in design and construction, the energy-efficiency gains from increased thermal insulation cannot be realized as the performance of most insulation is compromised by dampness. This project aims to provide the necessary technical evidence and design guidelines for the Australian building industry to incorporate appropriate moisture management systems in high performance, low carbon buildings in order to deliver long lasting, low carbon outcomes.



RP1024 Creating 3rd Generation NatHERS Design Tools

Project Objectives

- To review and update all NatHERS software assumptions for contemporary lifestyles in all Australian climates.
- To develop and incorporate comfort metric and economic outputs.
- To broaden the scope of rating software to include all major energy end-uses.
- To incorporate solar energy, energy storage technologies, and other demand management technologies.
- To incorporate advanced construction and mechanical ventilation systems
- To improve usability through the development of CAD/BIM interoperability.
- To thoroughly validate and trial the design tools to ensure the accurate assessment of energy and carbon impacts in all Australian climates.
- To investigate the suitability of the tool for assessing disclosure and best practice performance standards.



RP2007: Integrated Carbon Metrics Project



Research Challenge:

One third of global GHG gas emissions are emitted from the building sector. While more work has been done on decreasing direct emissions from the operation of buildings, embodied emissions of construction materials and processes receive little consideration, even though they constitute a significant additional proportion of emissions. Estimating embodied emissions is complicated, and there are uncertainties as there is yet to be developed a universally accepted methodology.

Project Objectives:

- Enable the analysis of the **carbon fabric of the built environment**
- Build detailed, economy-wide **database** of embodied carbon flows
- Help assess the carbon performance of **precincts by delivering tailored PIM tools**
- Quantitatively evaluate low-carbon **scenarios at PIM and economy-wide level**
- Contribute to the process of defining universal carbon accounting **principles, guidelines and standards**
(such as 'low-carbon', 'carbon-neutral', 'zero-carbon', etc.)

Carbon Neutral Adelaide

C embodied in services

C embodied in electricity

C embodied in materials

Operational C

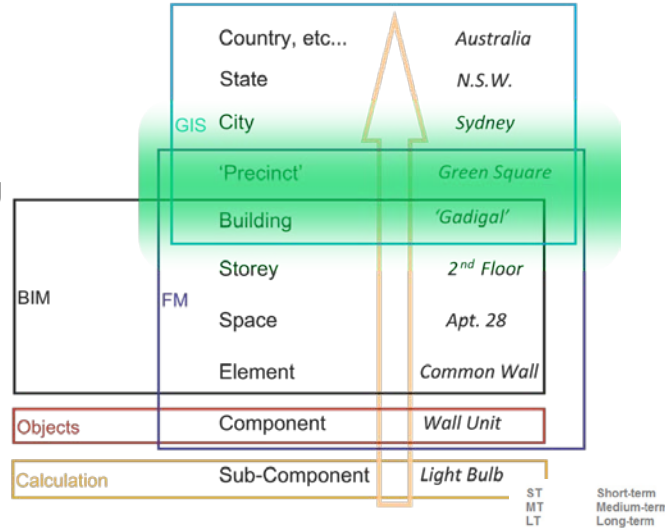
C embodied in equipment (capital goods)

C embodied in transport

Projects - RP2011 PIM: An open digital information standard for the exchange of precinct information supporting carbon management throughout the urban development lifecycle

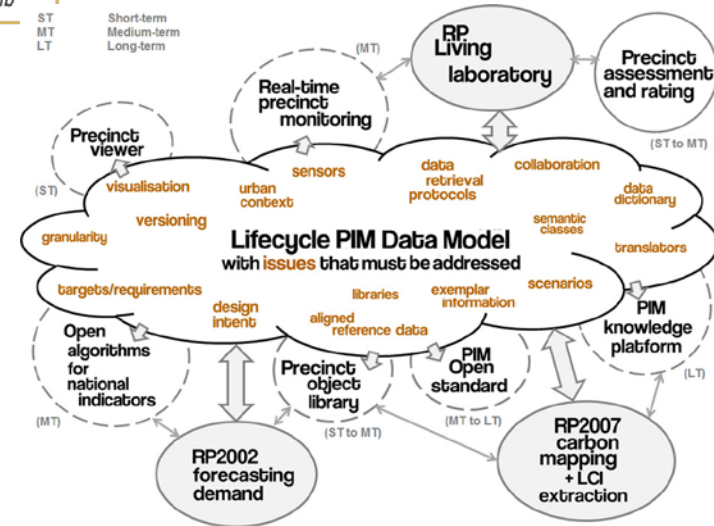
PROJECT SUMMARY

The PIM project will deliver an open data model that defines how information is structured for precinct-scale digital modelling across the breadth of the CRC initiatives.



PROJECT OUTCOMES

This will facilitate the delivery of accurate, timely, consistent and relevant information to inform decision-making throughout the life-cycle of an urban precinct. The beneficiaries of this work range from an urban designer/planner wishing to measure projected carbon costs during precinct planning, a utility company endeavouring to optimise their operations to reduce carbon impact, a manufacturer managing the carbon efficiency of their building product or a householder seeking to understand the carbon impact of their decisions.



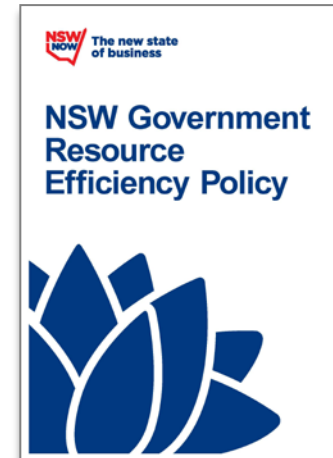
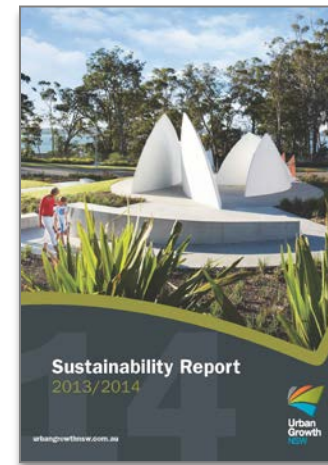
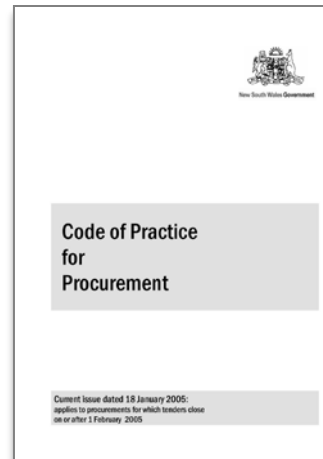
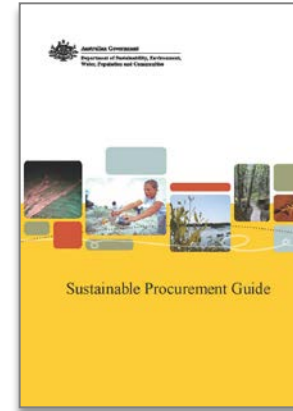
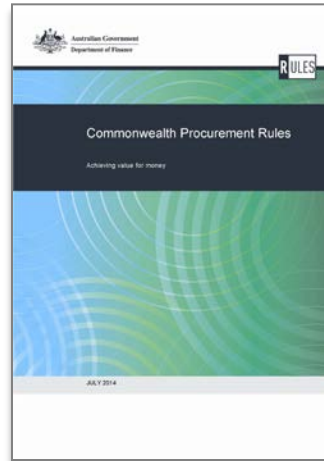
RP2010 Informing and trialing the inclusion of Low Carbon requirements in State Government Built Environment Sector Tenders

PROJECT SUMMARY

This project aims to reduce the carbon intensity of infrastructure projects by trialing the inclusion of carbon reduction constraints in the tender requirements of various State Government agencies responsible for development of the built environment.

PROJECT OUTCOMES

The living laboratories will focus on identifying suitable potential new tender clauses and road-testing these with the supply chain to identify barriers and benefits to enhance their uptake. The project will then assist the trialing of such clauses, and the response from the supply chain, to increase low carbon outcomes of projects. The project will be a valuable showcase of the use of tender requirements to support low carbon procurement and provide insightful and operational 'living laboratories'.



RP3002 - A Framework for Government Low Carbon Living Policy & Program Development

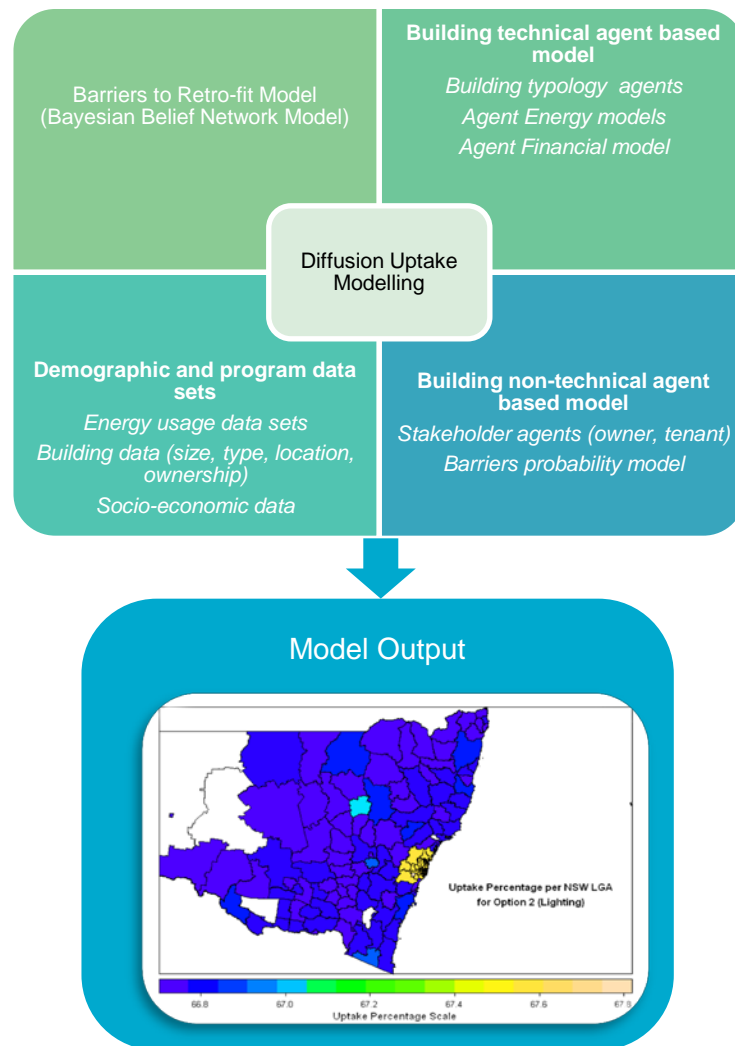
Research Challenge

The low uptake of cost effective, energy efficient retrofits for commercial buildings suggests that economic considerations are not the sole determinant for their adoption. Socio-psychological segmentation studies provide additional determinants of consumption behaviour reflecting important lifestyle, attitudinal, risk, familiarity of technology, cultural and other forms of demographic preferences.

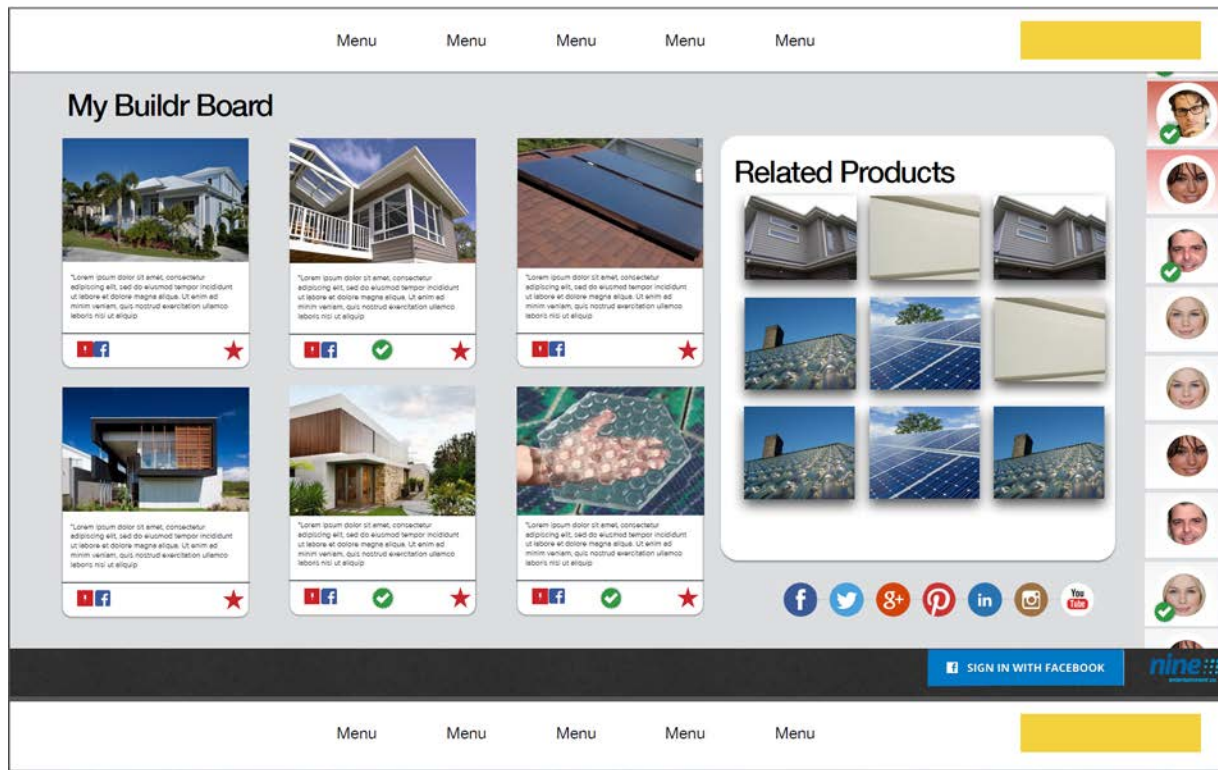
Project Objectives

This project aims to:

1. Develop an Agent-Based Modelling (ABM) framework to identify and understand the network relationships between building owners/tenants in different locations and their complex response to intervention options.
2. Develop a decision-support tool (DST) to help assess the impact of interventions/programs for promoting building energy efficiency retrofits.



RP3029: Driving a National Social Media Conversation on Energy Efficient Housing



MyBuildR is a trusted web platform that inspires and enables people to pursue their desired sustainable home and lifestyle.

It provides **a palette of interactive features that allow people to create, learn and connect** with products and services essential to a more comfortable, healthy and affordable home *(which also happens to be a sustainable home)*.

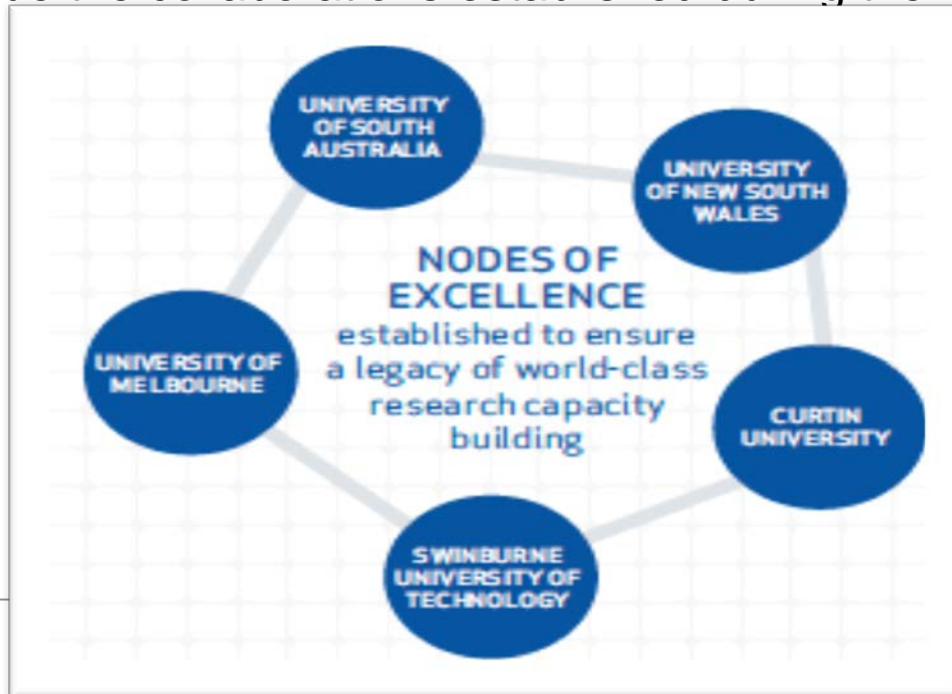
Once in a Generation Capacity Building

- Currently have enrolled 68 PhD students
- 7 enrolled Masters students
- Target is 88 HDR Students
- Resources for vocational training
- Post-Professional capacity building
- Research strengths...



Nodes of Excellence – national capacity for research

- CRCLCL's five Nodes of Excellence were established at Curtin University, Swinburne University of Technology, University of South Australia, University of New South Wales and University of Melbourne, with strong support of these institutions. The Nodes exemplify strong collaboration between researchers, industry and governments at local level and will form a legacy of the CRCLCL beyond 2020. The extension of the CRCLCL's work to the Nodes has the potential to engage a wide range of partners through increased outreach, and continue the collaborations established during the life of the CRCLCL's projects.



BIG IDEAS - sandpits

Scale up and capture
value
Impact happens here!

Conduct research
and development
Address core research
questions

Implement

Test

Empathise

**Collaborative
Innovation**

Prototype

Define

Ideate

Opportunity hunting
Active listening
Observation
A day in the life of a customer

Focus statement
Define boundaries
and scope
What will success look like?

Creative thinking
Individuals and teams
Define validation tests
Shortlist ideas

Test assumptions
Validate with customers
and end users
Scope R&D project



Future Projects – Pipeline

Remaining CA Milestones

- *111 Milestone, 16 projects*
- *Check website for current ideas.....*

Big Ideas

- *Modular Construction*
- *Transport – Design and planning impact on cities of massive uptake of driverless EV/Hybrids*
- *Knowledge Hub: credible knowledge and evidence*



National Roadshows: enabling utilisation

- 2 in Sydney
 - City of Sydney
 - Pittwater City, UrbanGrowth NSW and Dept of Planning NSW
- 1 in Melbourne
 - City of Melbourne and Vic Govt Depts
- 1 in Adelaide
 - SA Government and City of Adelaide
- Perth to be planned along with more targeted Roadshows nationally



National Forums: on priorities for change

- First National Forum: *‘International Collaborations – squeezing value for Australian Industry’* (June’15)
- Carbon Neutral Cities / Precincts (underpinning with good science and evidence)
- Urban Micro Climates (development of evidence based policy outcomes)
- Next Generation Carbon reduction tools (residential sector)
- Engaging communities in low carbon behaviour change – the evidence

Research Workshops

- In June 2015, the CRCLCL hosted its first two-day research workshop
- The workshop included:
 - Progress updates on current projects
 - Update on the CRCLCL and its
 - Plans for the remainder of its term.
- The workshop focused on collaboration and how researchers could share tools, data, information and expertise to strengthen and bring together projects.



Enhanced Communication

- During the reporting period, there were more than 70 mentions of the CRCLCL and its research projects in the media, with significant coverage achieved across publications such as *Sustainability Matters* (3 articles), *The Fifth Estate* (17 articles), *Architecture and Design* (8 articles), *Sourceable* (3 articles) the *Australian Financial Review*, *The Australian* and *The Sydney Morning Herald*. CRCLCL researchers have also been interviewed by radio stations, including 3RRR/702ABC plus more.
- The CRCLCL has been active in preparing peer-reviewed papers for journals and conferences, and there was a significant increase in journal publications and end-user reports compared to the previous reporting period with many projects being completed or reaching the end of the research phase.

Publication Type	No of Publications
Journal Article	34
Conference Paper/Presentation	56
Report	40
Blog	18
Newsletters	4
Media Release	71
Grand Total	223



PARTNERS 2015



Thank you

To find out more, contact:

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Australian Government
Department of Industry,
Innovation and Science

Business
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