Residential Efficiency Scorecard
Tropical Pilot Evaluation Report

March 2020

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Executive Summary

The Residential Efficiency Scorecard (Scorecard) was piloted in three tropical locations as part of work for the National Energy Productivity Plan (NEPP), measure 5. This follows on from Scorecard pilots in capital cities (Adelaide, Perth, Canberra, Hobart, Sydney and Brisbane) that were carried out in 2019. The results from that pilot can be found in the Residential Efficiency Scorecard Research Pilot Evaluation Report.

A customised version of the Scorecard tool was developed for tropical climate zones across northern Australia and includes energy efficient design features important for housing in this zone. The customised tool was tested in the following tropical locations:

- Cairns in Queensland (QLD)
- Broome in Western Australia (WA), and
- Darwin in Northern Territory (NT).

Accredited Scorecard assessors were selected for the pilot through an open tender and undertook the on-ground testing in each location. The assessors had a strong understanding and experience in the use of the Scorecard tool and undertaking house energy assessments, and also possessed a good knowledge of specific household performance issues for the tropical locations. An additional benefit was that three different assessors delivered the pilot, which ensured a diversity of approaches and perspectives for testing the tropical version of the Scorecard tool. The selected assessors were:

- Danielle King – Darwin pilot.
- Dr Clyde Anderson – Cairns pilot.
- Lucinda Flynn – Broome pilot.

All three assessors have extensive knowledge and understanding of housing design for the tropical climate, as well as substantial experience in conducting assessments in Victoria or QLD. One assessor, Danielle King, has been heavily involved with the Scorecard for a number of years. She led this project.

The Scorecard tool was adjusted to include key features that are important to tropical housing design, such as ventilation, shading, roof colour and ceiling fans.

Existing homes were recruited and were filtered to ensure housing styles represented the common built form for the tropics as much as possible. A total of 31 assessments were delivered, these being in:

- Darwin - 11 assessments in August 2019,
- Broome – 10 assessments in September 2019, and
- Cairns – 10 assessments in October 2019.

Each assessor completed a survey for each assessment and provided detailed feedback for their pilot location. In summary their view was that ‘the Scorecard Tool has substantial merit in the tropical zone and with some minor tweaks, would provide an excellent guide to householders looking to make informed decisions to improve the comfort and operating energy cost of their homes.’

This was also reflected by the feedback provided from the householder surveys with over 90% (12 out of 13) of householders who submitted feedback found ‘the Scorecard assessment and the advice provided by the assessors is of value and interest’ and ‘many were highly engaged throughout the process and likely to take on at least some of the recommendations provided’ (for future upgrades).
Next steps from the tropical pilot will be delivered as part of the development of NEPP measure 5. This will include consideration of:

- Any agreed Scorecard tool fixes and updates identified from the pilot of the Scorecard tool in tropical locations.
- The opportunities available to jurisdictions in the future given the tool has been shown to work in both temperate and tropical locations.
Introduction

Purpose

The purpose of this document is to provide an overview of the results of the NEPP project – *N4 Residential Efficiency Scorecard Research – Tropical pilot project element* and to evaluate whether the Scorecard can be used as a house energy performance tool in a tropical environment.

Context – national

All state and territory governments are working together to facilitate energy efficiency through the Council of Australian Governments’ (COAG) Energy Council’s NEPP that was released in December 2015.

This specific project supports NEPP measure 5, which is to “improve residential building energy ratings and disclosure”. It also supports the Council’s subsequent position statement, the ‘National Collaborative Approach to Residential Building Ratings and Disclosure – Principles’ (issued 14 December 2016)¹.

In 2017 a version of the Scorecard tool was developed by Victoria with expanded climate coverage for capital cities in other jurisdictions and this enabled jurisdictions to test the tool. The expansion of the climate coverage was funded by all jurisdictions through the NEPP.

In 2018-2019 further funds were provided to pilot the Scorecard for the tropical climate zones - the activity reviewed by this project report.

Context – policy foundation

Market gap

Energy bills for many Australian households, particularly for low-income households, are generally high compared to other developed countries. The majority of existing homes are poor performing as they were built before energy performance standards for residential buildings were implemented. Solutions to improving their energy performance can be complex, and households:

- are often uncertain why their home is poorly performing
- either do not know what the improvement options are and their associated costs or may have conflicting information about the range of options available
- are unclear which improvements to prioritise
- are uncertain where to find this information, and
- seek a trusted source.

Research from the Low Carbon Living Cooperative Research Centre (CRC)², and other studies, have found that there is a gap to be filled for a voluntary assessment of existing homes - a reputable,  


² Adams, H, Clark, M & Potts, J 2016, Enhancing the market for energy efficient homes: implementing a national voluntary disclosure system for the energy performance of existing homes, Low Carbon Living, date viewed 16/3/20 < http://builtbetter.org/node/2598>
robust, fit-for-purpose program, targeting existing homes (as well as new homes), delivered by accredited assessors with government quality control. The CRC research also found that around 50% of households indicated a preparedness to pay for this information.

In addition to potential energy bill savings (a result of upgrades made from information provided by the Scorecard assessment), there are broader impacts to improving house thermal performance, as better internal comfort can also lead to reduced hospital admissions and reduced deaths from heat and cold related illnesses.  

**Scorecard development**

The Scorecard program is a new resource for households and shows how a home rates on a 10-star scale – the more stars, the lower the energy bill is likely to be. The rating represents the cost of energy for the assessed home.

Households that want to understand more about their home’s energy performance, are able to contact an accredited Scorecard assessor to arrange an assessment. The assessor will collect data during a site visit and discuss the star rating and certificate during the assessment.

To enable a meaningful comparison between houses, the Scorecard focuses on the home’s design and construction (the building shell or building envelope) as well as its fixed appliances such as the heating and cooling systems, hot water and any on-site renewable energy supply. The Scorecard also provides further information on the performance of key elements of the house, suggests potential improvements, and also rates the performance of the house for times of very hot conditions with a ‘hot weather rating’ (on a scale between 1 to 5, with 5 being the best performing).

The Scorecard program allows households to investigate options to reduce their energy bills and improve the comfort of their home. Rated homes can be compared with each other or compared before and after a renovation or improvement.


**Context – tropical development**

The Scorecard was designed and developed primarily for temperate climates in Victoria, however consideration has always been given to possible use nationwide. Therefore, the fundamental algorithms were designed to be able to be extended to accommodate tropical climates. In discussions about future policy needs, jurisdictions that have tropical climate zones prioritised further development of the Scorecard to cover dwellings located in tropical climate zones.

Calculation aspects that were developed for tropical climates include the impact of:

- indoor air movement in improving comfort and reducing the need for mechanical conditioning
- ceiling fans to provide the physiological cooling effect of air movement
- light colours for external surfaces (roof and walls) to minimise potential heat gains
- shading of external walls, and
- roof ventilation on heat flow through the roof/ceiling space.

---

In the Scorecard’s tropical tool, algorithms that addressed these features were developed along with an updated user interface. This project was delivered to test their function and evaluate the effectiveness of the Scorecard for the tropical climate.

The Scorecard has been designed to allow for an appropriately accurate outcome with a limited amount of objective data entry. The objectivity of data is important for repeatable assessments and limiting the data entry is required to enable fast, low-cost assessments. The current Scorecard interface (temperate climate zones) and data entry fields have been developed over many iterations by trialling the Scorecard in the field, as field trials are the best way to understand the potential difficulty in obtaining objective data. It should be expected that several iterations of the Scorecard tool will be required to achieve the correct balance between accuracy and data collection for tropical climate zones.

Development of these features for tropical climate zones will also assist with further development of the Scorecard for temperate climate zones. For example, inclusion of the cooling impact from ceiling fans will be beneficial to both tropical and temperate climate zones.

**Project Delivery**

**Detailed delivery schedule**

<table>
<thead>
<tr>
<th>Project output</th>
<th>Acceptance or verification criteria</th>
<th>Responsible for delivery</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical tool released (v1)</td>
<td>Teleconference with relevant jurisdictions</td>
<td>Vic</td>
<td>March 2019</td>
</tr>
<tr>
<td>Recruit homes for tropical pilot</td>
<td>Homes recruited in selected locations</td>
<td>Vic</td>
<td>May-September 2019</td>
</tr>
<tr>
<td>Assessors selected to deliver tropical pilot</td>
<td>Contract assessor(s)</td>
<td>Vic/Jurisdictions</td>
<td>May-June 2019</td>
</tr>
<tr>
<td>Pilot of Scorecard - tropical</td>
<td>Scorecard assessments completed in three tropical locations, with examination of results and potential tool modifications between each city pilot</td>
<td>Vic</td>
<td>June-October 2019</td>
</tr>
<tr>
<td></td>
<td>Cairns - Darwin - Broome</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7–10 houses per location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final report on tropical pilot</td>
<td>Jurisdictions accept report</td>
<td>Vic</td>
<td>Nov-Feb 2019</td>
</tr>
</tbody>
</table>
Method

Supplier selection – Green Moves Pty. Ltd.

The supplier for this project was Green Moves Pty Ltd. Green Moves was selected by the DELWP Scorecard team evaluation panel after evaluation of responses to a tender process that was made available to all accredited Scorecard assessors. Given the specialist skills required to deliver the tropical pilot, this tender process was made available to Scorecard assessors only, as they have a thorough working knowledge and experience using the Scorecard.

Eight responses were received. After evaluation following DELWP procurement policy, Green Moves was selected as the preferred supplier. The evaluation panel assessed that the following combination of reasons separated the preferred supplier from other responses:

- Consortium of energy efficiency professionals who individually all have experience delivering Scorecard assessments, and
- A good local knowledge of all three tropical locations.

The following assessors delivered the pilot:

- Danielle King (Darwin assessments) – a former Darwin resident who is familiar with the tropical environment and its impact on housing design and comfort. Danielle is a Melbourne-based assessor who has conducted a large number of residential and commercial building assessments.
- Dr Clyde Anderson (Cairns assessments) – a Brisbane-based assessor who has strong knowledge and experience with the tropical environment and its impact on housing design and comfort. Clyde took part in the capital cities pilot assessing Brisbane houses in 2019.
- Lucinda Flynn (Broome assessments) – an experienced assessor based in Victoria. Lucinda has experience and knowledge of tropical climates and understands the differences in advice and guidance required for households in these regions.

All three assessors have extensive knowledge and understanding of housing design for the tropical climate, as well as substantial experience in conducting assessments in Victoria or QLD. One assessor, Danielle King, has been heavily involved with the Scorecard for a number of years. She led this project.

House recruitment

House recruitment for the three tropical locations was completed in collaboration with the local jurisdictional representatives. An email was sent to all potential households, which explained the opportunity to participate and the potential benefits for households (see Appendix A – Invitation letter to households).

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of houses recruited</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwin</td>
<td>16 expressions of interest</td>
<td>Local NT representatives provided leads to internal staff member houses.</td>
</tr>
<tr>
<td>Broome</td>
<td>10 expressions of interest</td>
<td>Householders were recruited from a variety of sources – WA representative links, DELWP-sourced participants and additional leads provided by households to the assessor during assessment delivery.</td>
</tr>
<tr>
<td>Cairns</td>
<td>10 expressions of interest</td>
<td>Variety of leads sourced by DELWP, QLD representatives and assessors.</td>
</tr>
</tbody>
</table>
Given the small sample size of the pilot and the need to maximise the volume of data collected, all property leads were evaluated by DELWP to ensure that houses to be assessed did not fall significantly outside what would be considered a “normal” dwelling for the local area. The most likely reasons to be unable to participate were:

- Unusual or non-standard dwelling construction or design e.g. open walled houses
- Property significantly larger than an average house i.e. floor area larger than 300m².

During the recruitment process for two of the locations (Broome and Cairns), there was a slight delay with finalising the assessment expression of interest process due to some difficulty in finding suitable houses. For future pilots of a similar type, the recruitment pathway should be clearly established to facilitate a smoother delivery process.

**Delivery**

Green Moves contacted individual households via email and telephone in each location, prior to their arrival. They provided details about the opportunity, time investment and to arrange suitable appointment times with the assessors. Each of the assessors completed an evaluation survey post-assessment to provide additional detail to DELWP. Households were also sent a feedback survey for completion.

Each assessor provided feedback on the Scorecard tool for their location, which was fed back into the Green Moves report. They also provided any comment on the functioning of the Scorecard tool directly to DELWP to be remediated.
Results

This section is a summary of the assessment results, assessor feedback and household survey results.

Assessment results

Darwin

Assessments in Darwin were completed in August 2019. There were 16 expressions of interest received, which resulted in 11 completed Scorecard assessments.

Notes about the properties:

- Houses assessed ranged in floor area of between 71m$^2$ and 177m$^2$, with an average size of 119m$^2$.
- Scorecard star ratings ranged from 2 to 10-stars, with an average of 4-stars. All properties without solar PV received 2 or 3 stars.
- An average of 62% of the calculated energy was attributed to cooling.
- Lighting efficiency was high - all houses except one had less than 5% energy use for lighting.
- Three houses dedicated over 40% of their energy usage to hot water heating, as they had electric hot water systems with no solar boost.
- Pools and spas, when present, were a high draw on energy, with 30% of the energy use.
- Four of 11 houses had solar PV installed.
- The building shell and hot weather rating of all assessed houses was averaged to be slightly above medium, relative to modelled tropical houses (noting a rating of 3 is considered ‘medium’ given its scale is between 1 to 5).

The assessment summary data is presented in Table 1: Darwin assessment results.
Assessments in Broome were completed in September 2019. There were 11 expressions of interest received, and all resulted in assessments.

Notes about the properties assessed:

- Houses assessed ranged in floor area of between 84m$^2$ and 211m$^2$, with an average size of 115m$^2$.
- Scorecard ratings were between 1 and 5-stars, with an average of 2.3-stars. Four out of the ten houses scored 1-star.
- Cooling was the biggest fixed appliance energy user - all houses except one allocated over 50% of their energy use to cooling.
- Lighting in eight out of ten of the houses was rated as highly efficient.
- All houses had a highly-efficient hot water system.
- As in Darwin, pools and spas (if present) were a high draw on energy (around 30%) and generally resulted in a low Scorecard rating (1 and 2 stars).
- None of the properties had solar PV installed. This is likely due to the installation restrictions on solar PV that has existed until very recently in Broome.
- The building shell and hot weather rating of all assessed houses, except one, was averaged at ‘very low’, relative to modelled tropical houses.
- It was noted that some houses in Broome are designed to be comfortable with no air conditioning use. None of the houses assessed in this pilot were operated in this way. The assessment summary data is presented in Table 2: Broome assessment results:

### Table 2: Broome assessment results

<table>
<thead>
<tr>
<th>Suburb</th>
<th>Postcode</th>
<th>Star rating</th>
<th>House area (m$^2$)</th>
<th>Cooling %</th>
<th>Lighting %</th>
<th>Hot water %</th>
<th>Spa and pool %</th>
<th>Solar PV %</th>
<th>Hot Weather Rating</th>
<th>Building Shell Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moulden</td>
<td>0830</td>
<td>7</td>
<td>97</td>
<td>55</td>
<td>3</td>
<td>42</td>
<td>0</td>
<td>77</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Zuccolli</td>
<td>0832</td>
<td>10</td>
<td>113</td>
<td>79</td>
<td>7</td>
<td>14</td>
<td>0</td>
<td>100</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Fannie Bay</td>
<td>0820</td>
<td>2</td>
<td>125</td>
<td>49</td>
<td>4</td>
<td>47</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Wagaman</td>
<td>0810</td>
<td>3</td>
<td>123</td>
<td>90</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Fannie Bay</td>
<td>0820</td>
<td>5</td>
<td>166</td>
<td>65</td>
<td>5</td>
<td>5</td>
<td>25</td>
<td>66</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Millner</td>
<td>0810</td>
<td>3</td>
<td>71</td>
<td>51</td>
<td>3</td>
<td>46</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Wanguri</td>
<td>0810</td>
<td>2</td>
<td>122</td>
<td>65</td>
<td>4</td>
<td>12</td>
<td>19</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Jingili</td>
<td>0810</td>
<td>6</td>
<td>103</td>
<td>45</td>
<td>5</td>
<td>8</td>
<td>42</td>
<td>50</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Nightcliff</td>
<td>0810</td>
<td>2</td>
<td>177</td>
<td>65</td>
<td>5</td>
<td>4</td>
<td>26</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Parap</td>
<td>0810</td>
<td>2</td>
<td>104</td>
<td>46</td>
<td>3</td>
<td>3</td>
<td>48</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Anula</td>
<td>0812</td>
<td>2</td>
<td>111</td>
<td>69</td>
<td>3</td>
<td>6</td>
<td>22</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td><strong>4.0</strong></td>
<td><strong>119.3</strong></td>
<td><strong>61.7</strong></td>
<td><strong>4.2</strong></td>
<td><strong>17.5</strong></td>
<td><strong>16.5</strong></td>
<td><strong>26.6</strong></td>
<td><strong>3.3</strong></td>
<td><strong>3.3</strong></td>
</tr>
</tbody>
</table>
Cairns assessment results

Assessments in Cairns were completed in October 2019. There were ten expressions of interest received, and all resulted in assessments.

Notes about the properties assessed:

- Houses assessed ranged in floor area between 48m² and 177m², with an average size of 108m².
- Scorecard ratings were between 1 and 10 stars, with an average of 4.5-stars. Most houses achieved mid-band scores of 3 to 5-stars.
- Cooling was the biggest fixed appliance energy user - all houses except two allocated over 50% of their energy use to cooling.
- Lighting in nine out of ten of the houses was rated as highly efficient.
- Hot water heaters showed an opportunity for upgrade, as three of the assessed properties presented with high energy use hot water systems. These were serviced by off-peak hot water systems, or by LPG instantaneous systems.
- As in Darwin and Broome, pools and spas, if present, were a high draw on energy at about 30% of energy use.
- The installation of solar PV was quite high, with seven out of the ten properties having a system. Two of the remaining three houses were small apartments and did not have the capacity to add solar PV.
- Building shell and hot weather performance rated as high or very high in all except two assessments.

The assessment summary data is presented in Table 3: Cairns assessment results:
### Table 3 - Cairns assessment results

<table>
<thead>
<tr>
<th>Suburb</th>
<th>Postcode</th>
<th>Star rating</th>
<th>House area (m²)</th>
<th>Cooling %</th>
<th>Lighting %</th>
<th>Hot water %</th>
<th>Spa and pool %</th>
<th>Solar PV %</th>
<th>Hot Weather Rating</th>
<th>Building Shell Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Hill</td>
<td>4870</td>
<td>10</td>
<td>82</td>
<td>64</td>
<td>24</td>
<td>12</td>
<td>0</td>
<td>100</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Manoora</td>
<td>4870</td>
<td>4</td>
<td>60</td>
<td>48</td>
<td>5</td>
<td>47</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Manoora</td>
<td>4870</td>
<td>4</td>
<td>60</td>
<td>33</td>
<td>5</td>
<td>62</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Kamerunga</td>
<td>4870</td>
<td>1</td>
<td>146</td>
<td>90</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>16</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Trinity Park</td>
<td>4879</td>
<td>3</td>
<td>159</td>
<td>55</td>
<td>5</td>
<td>14</td>
<td>26</td>
<td>46</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Kewarra Beach</td>
<td>4879</td>
<td>5</td>
<td>124</td>
<td>38</td>
<td>5</td>
<td>26</td>
<td>31</td>
<td>65</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Redlynch</td>
<td>4870</td>
<td>3</td>
<td>125</td>
<td>51</td>
<td>6</td>
<td>43</td>
<td>0</td>
<td>33</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Whitfield</td>
<td>4870</td>
<td>3</td>
<td>98</td>
<td>51</td>
<td>3</td>
<td>21</td>
<td>25</td>
<td>53</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Redlynch</td>
<td>4870</td>
<td>2</td>
<td>177</td>
<td>73</td>
<td>9</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Goldsborough</td>
<td>4865</td>
<td>10</td>
<td>48</td>
<td>80</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>100</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td><strong>4.5</strong></td>
<td><strong>107.9</strong></td>
<td><strong>58.3</strong></td>
<td><strong>7.5</strong></td>
<td><strong>26.0</strong></td>
<td><strong>8.2</strong></td>
<td><strong>41.3</strong></td>
<td><strong>4.0</strong></td>
<td><strong>4.0</strong></td>
</tr>
</tbody>
</table>

**Household feedback**

The opportunity to provide feedback on the Scorecard assessment was provided to all participating households. Thirteen of 31 households (40%) provided feedback, with five each from Darwin and Cairns, and three from Broome. The feedback survey probed the following:

- Why they were interested in the Scorecard assessment
- How long the assessment took
- The customer service provided by the assessor
- Satisfaction and usefulness of the information provided by the assessor
- Satisfaction with the information provided by the Scorecard program and certificate, and
- Upgrade opportunities suggested and whether the householder has/will act on them.

Assessment feedback provided by the respondents was positive. A summary of some of the feedback received showed:

- Most participants who provided feedback (12 out of 13) indicated the reason they participated in the pilot was that they were curious about their home’s energy performance.
- Five respondents indicated that they were seeking to make improvements to their homes to improve its comfort and/or reduce energy costs.
- 12 respondents indicated that the assessment met or exceeded their expectations.
- All of the respondents indicated that the assessor was friendly, professional and on time, that they were satisfied with the information provided by the assessor and that the assessor provided valuable advice about household improvement opportunities.
- Most households found the assessment certificate easy to understand and the upgrade advice relevant.
- All except one household indicated that they had a better understanding of their homes energy performance since having the Scorecard assessment completed.
• Seven households indicated that they will or have completed some upgrades since their assessment. The actions included installing shower flow restrictors, increasing the level of ceiling insulation and fixing shading over exposed windows.

• Of the three households that indicated that they would not be taking any further action, one indicated that the recommended upgrades were too expensive, another did not consider they could undertake upgrades as they are renting and the other will be selling their home soon.

It was noted by the assessors that ‘a majority of households found the assessment relevant and of value’. The assessor thought that approximately 80% of the Darwin households ‘were very interested in the process and the recommendations for improving the comfort and cost to run their homes.’ Broome households seemed less engaged. Cairns households were ‘interested and engaged, particularly at the end of the process for the discussion regarding the findings and recommendations being made to improve the home.’ It was thought by the assessors that many of the households were ‘likely to take on at least some of the recommendations provided.’

During the pilot, some bugs were found in the software that affected the output star ratings, as well as hot water energy use and air conditioner ratings. These were corrected during the pilot, and households were notified of the changes. All households received corrected certificates and recommendations prior to the pilot concluding, and the results shown in this report represent the corrected results.

**Assessor feedback**

Green Moves provided comprehensive feedback on the following delivery components:

• Occupational Health & Safety considerations when delivering assessments in tropical locations. A specific tip sheet was developed.

• Connectivity issues (whether there were problems with internet connection)

• Scorecard Tropical assessment tool function and appropriateness

• The ease of data entry for the new tropical data inputs

• Pilot delivery

Additional feedback was provided to facilitate improved calculations and assessment methodology in tropical areas (refer to Appendix B – Improvements to Scorecard Tool Tropical Version), such as:

• Improved tool inputs to allow identification of multiple cooling units

• The inputs and modelling of ceiling fans

• Hot water use specific to tropical environments – i.e. solar systems with the booster turned off

• Roof space and ceiling insulation peculiarities specific to dwellings in tropical areas

• Assessment of underfloor insulation in elevated homes like a traditional ‘Queenslander’ home

• Suggestions for evaluating and assessing the ability to open windows and glazing specific to tropical locations (recommending double glazing may not be appropriate)

• Suggestions for evaluating zones (rooms) using the Scorecard for houses that consist of stand-alone rooms connected by a passageway

• Some minor adjustments to recommendations (building shell, cooling and hot water) would be required to tailor better for tropical zones.
It was thought that these minor adjustments of the tool would allow the Scorecard to provide a comprehensive guide to households for making informed decisions to improve the comfort and operating costs of their homes. These recommendations have been evaluated by the Scorecard team and would be relatively simple to implement, and can be actioned before further tropical assessments are carried out.

This feedback provides on-ground verification of the tool calculations developed to evaluate tropical houses, as well as upgrade advice and certificate feedback for tropical regions.

**Conclusion**

Overall feedback of the Scorecard pilot for the tropical climate was positive.

Assessors found the Scorecard’s tropical tool functions easy to administer. They did not identify any major barriers for its use in tropical locations. Some minor bugs were fixed during the pilot, with additional suggestions provided to improve the applicability and usefulness for tropical houses.

Households provided positive feedback on the information received during their Scorecard assessments. They found the assessment and star rating valuable, as well as the recommendations for future upgrades.

The assessors thought that the tropical tool has ‘substantial merit in the tropical zones’ and provides an ‘excellent guide to households looking to make informed decisions to improve the comfort and operating cost of their homes’. It was noted that, after minor modifications that have been mentioned in this report, the ‘Scorecard tool would be appropriate for use in the tropical regions.’

**Recommendations**

Given the learnings gained from this pilot and the previous capital city pilot, it is recommended that further exploration of the Scorecard’s use as a viable tool across multiple jurisdictions and other tropical locations should be tested (as part of NEPP measure 5).

An extension of the Scorecard pilot would also be able to further inform issues relating to the balance between data collection and accuracy of the assessment for time, effort and costs. Other recommendations for future consideration include:

- Determine responsibility for household recruitment early to facilitate a smoother delivery process.
- Further exploration of tropical houses to finesse the recommendations, calculations and inputs of the tool.
- Integrating feedback from both the capital city and tropical climate zone pilots to enhance the household and assessor experience.
Appendices

Appendix A – Invitation letter to households

Dear [name],

[The Department/Organisation title] is seeking volunteers in the Broome area to participate in a ‘Residential Efficiency Scorecard’ (Scorecard) assessment of their home and providing feedback on the experience.

The Scorecard program has been running successfully in Victoria for the past two years and has been used to assess the energy performance of over 2000 properties. There is now a research trial underway to test the Scorecard in other parts of Australia, including tropical regions.

What is the Scorecard

The Scorecard has been developed by the Victorian Government to help households better understand the energy performance of their homes and to make informed choices about improving the quality of their living environment, while saving money on their electricity and gas bills.

This trial is to evaluate the Scorecard in tropical locations. A short video explaining the assessment can be viewed here and more information about the national pilot can be found here.

What’s in it for me?

You receive a free Scorecard assessment, valued approximately $400. The Scorecard will provide a report into your household’s energy efficiency and tips on how to make your home more energy efficient.

What is the process?

An accredited assessor will visit your house and collect data on-site, then calculate its star rating through the Scorecard tool on the spot. Once the assessor has completed the rating, the householder receives:

• An overall rating that represents the average cost of energy for your house
• Information about the performance of key elements of your house
• Information about performance of your house in hot conditions
• A range of options about how you could improve the rating of your house.

Who they are seeking?

The Scorecard team is looking for ‘standard’ houses, rather than ones that have been upgraded to be more energy efficient. Owner-occupiers, investment property owners and tenants are welcome to apply, as well as those living in apartments and units.

All participating households must be willing to take part in a 2-hour Scorecard assessment in August (exact date to be arranged with you if you are selected). This will involve an assessor visiting and assessing your home, explaining its energy features and ways to make improvements to its running cost and comfort. All participating households must also be willing to complete a customer evaluation survey of their experience which will be through a phone or email survey, taking approximately 15 minutes.

If you are interested in taking part in this trial please visit:
https://www.surveymonkey.com/r/FGTPFX8
## Appendix B – Improvements to Scorecard Tool Tropical Version

The following table provides a summary of suggested updates to the Tropical Version of the Scorecard tool as identified from the pilot by Green Moves. It is primarily for the use of the Scorecard technical team to assist in analysing suggested changes.

<table>
<thead>
<tr>
<th>What</th>
<th>Why</th>
<th>Suggestions on how</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offline version of the tool should be available</td>
<td>Many remote areas in tropical regions (and others) do not have internet connectivity and the tool currently requires internet connection to use.</td>
<td>Create offline version.</td>
</tr>
<tr>
<td>A low percentage of homes in the tropics are ‘Free running homes’, and not catered for in the tool.</td>
<td>A small number of homes in the tropics are specifically designed for passive cooling and do not have air conditioners. Algorithms in the tool are based on a level of active cooling, not appropriate for these homes.</td>
<td>Investigate if worthwhile to include in the tool.</td>
</tr>
<tr>
<td>Separate roof and ceiling insulation so they can be separately accounted for</td>
<td>Assessors feel that reflective insulation is more important in the tropics and should have more impact than in cooler areas.</td>
<td>Investigate separate acknowledgement of reflective and bulk insulation.</td>
</tr>
<tr>
<td>Remove recommendation to insulate floors on elevated homes.</td>
<td>Assessors and many local householders consider that insulating floors in elevated homes is unlikely to be beneficial when the main consideration should be ventilation and air flow.</td>
<td>Remove adding floor insulation recommendation for elevated floors.</td>
</tr>
<tr>
<td>Adjust window recommendations to simplify (remove double glazing, U value/SHGC recommendations).</td>
<td>Assessors and local householders felt this was an unnecessary expense and those in tropical households are unlikely to install double glazing to cater for the low use of air conditioners.</td>
<td>Remove double glazing recommendations. Simplify the recommendations and focus on external shading of glazing.</td>
</tr>
<tr>
<td>Adjust wall insulation to remove recommendation for installing insulation on concrete panel and block walls.</td>
<td>Not practical</td>
<td>Investigate options. Potentially check wall type and if ‘un-insulatable’ change to heat reflective coating or shading.</td>
</tr>
<tr>
<td>Add ‘All external walls in this room’ to wall options</td>
<td>Some homes have separate rooms connected with open breezeways. In this case all walls are external walls.</td>
<td>Investigate adding ‘All external walls in this room’ and adjusting external wall values accordingly</td>
</tr>
<tr>
<td>Include identification ‘notes’ for cooling units into tool and zone cooling selection screens.</td>
<td>Tropical homes often have several cooling units (up to six different cooling units found in one household). Selecting the right unit for the right zone is difficult for the assessor and may impact the overall rating.</td>
<td>Include a short (10-15 character) free text ‘note’ or ‘name’ field for each cooling unit. Ensure that name is shown when assessors selecting cooling units for the zone.</td>
</tr>
<tr>
<td>Move ‘Adding ceiling fans’ recommendation into Cooling section</td>
<td>Does not belong in Building Shell recommendation section</td>
<td>Move to Cooling section and delete from Building Shell recommendations.</td>
</tr>
<tr>
<td>What</td>
<td>Why</td>
<td>Suggestions on how</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Remove ‘Ceiling Fans’ from Additional items</td>
<td>Fans are catered for under cooling section. Duplication and causes confusion.</td>
<td>Remove from Additional items</td>
</tr>
<tr>
<td>Revise cooling assumptions in line with feedback on use of active cooling in the tropics.</td>
<td>Check and adjust cooling assumptions to fit better with actual tropical home use.</td>
<td>Review and adjust assumptions accordingly</td>
</tr>
<tr>
<td>Hot water – add ‘Solar booster’ option to HWS</td>
<td>Homes in tropics often don’t use the electric boosters and the solar would be sufficient &gt;90% of the time.</td>
<td>Investigate adding a new field ‘Solar booster’ and link to low electricity use for tropical homes.</td>
</tr>
<tr>
<td>Pool and spas – some pools/spas only 2m x 2m</td>
<td>Approx 40% of pools or spas were significantly smaller than standard pools and would cost less to run.</td>
<td>Investigate adding a size option to the pool and spa area – ie Small / standard. Clarify sizes in manual.</td>
</tr>
<tr>
<td>Renewable energy – investigate the need to adjust recommendation for installing solar to suit the home and local situation</td>
<td>Need to be able to remove recommendation for solar PV or more solar PV in inappropriate situations.</td>
<td>Investigate adding a tick box to Renewable Energy section called ‘No solar potential’ or similar. Checking this box removes ‘Add solar PV’ or ‘Add more solar PV’ from the recommendations.</td>
</tr>
<tr>
<td>In the Building Shell section add recommendation to draft proof conditioned zones only</td>
<td>Many homes only air condition the bedrooms or specific areas. Draft proofing the whole home is not generally beneficial in the tropics.</td>
<td>Investigate adding a recommendation to zones with AC units to draft proof the door/windows.</td>
</tr>
<tr>
<td>Hot weather rating field could be confusing for householder</td>
<td>Where the hot weather rating was 5/5 it should not need further improvements</td>
<td>Update to ‘No improvements needed’ if rating is 5/5</td>
</tr>
<tr>
<td>Remove Solar room heating from Additional features</td>
<td>Not appropriate in the tropics</td>
<td>Remove the field from Additional features.</td>
</tr>
</tbody>
</table>