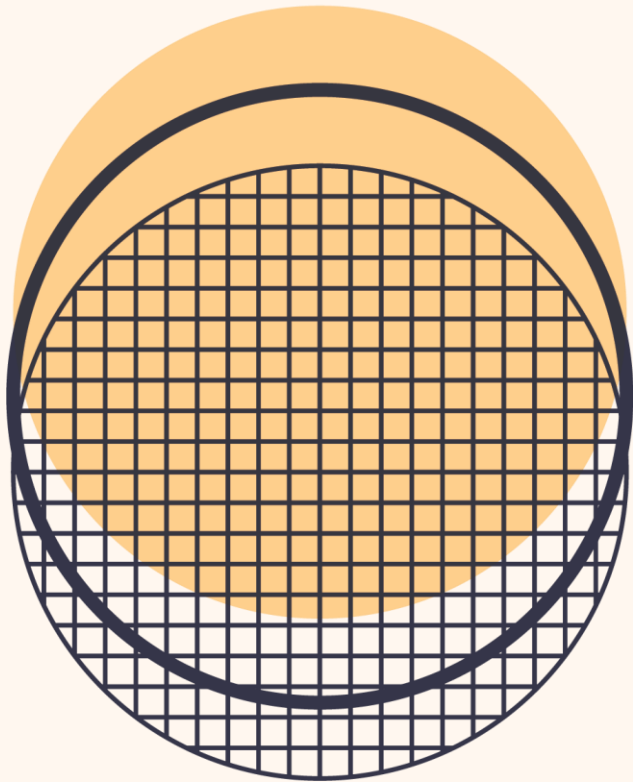




Making
quality
visible.



Modules in Australia:
What are we really buying?'

December, 2019

PV Lab Australia

An independent and specialised laboratory for PV modules

- Focus: Quality assurance and risk assessment for PV modules
- Founded: late 2013, acquired equipment, setup space 2014, small-scale tests 2015, large volume tests 2016
- Managed by: Dr. Michelle McCann and Lawrence McIntosh
- Location: The Australian National University, Canberra



Our Equipment / Tests

- Sun simulator (AAA h.a.l.m.)
 - STC measurement
 - Low light power measurement
- Electroluminescence
- Wet leakage
- Insulation test
- Visual inspection
- PID
- Thermographic imaging



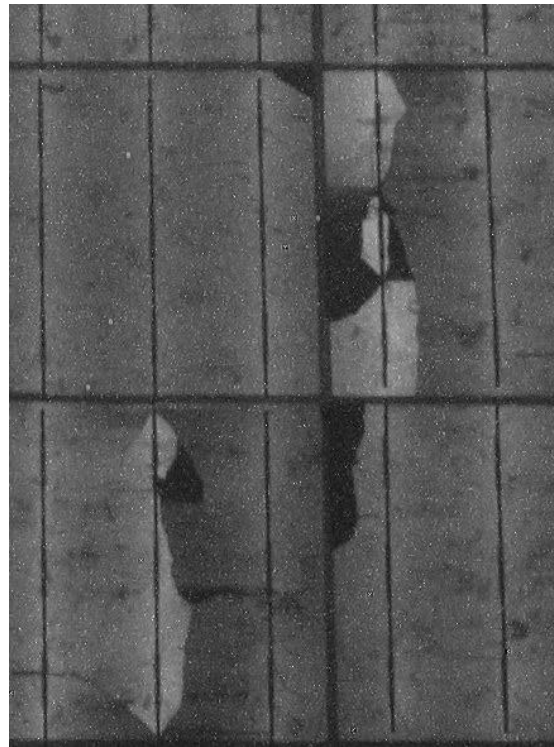
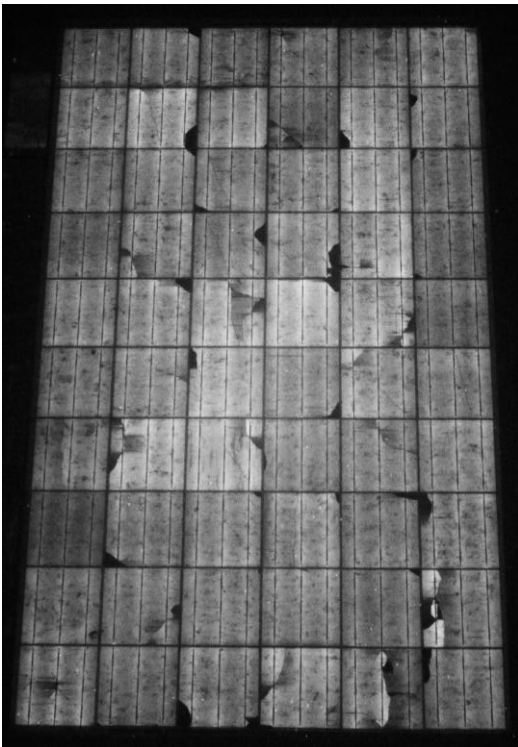
Outcomes of Module Testing - CEC

- Testing for the Clean Energy Council
 - 6 of 15 found substituted materials outside certification
 - 5 of 15 tested below their stated power rating
 - Round Robin testing at CSIRO and SERIS showed P_{max} at STC within 1%.



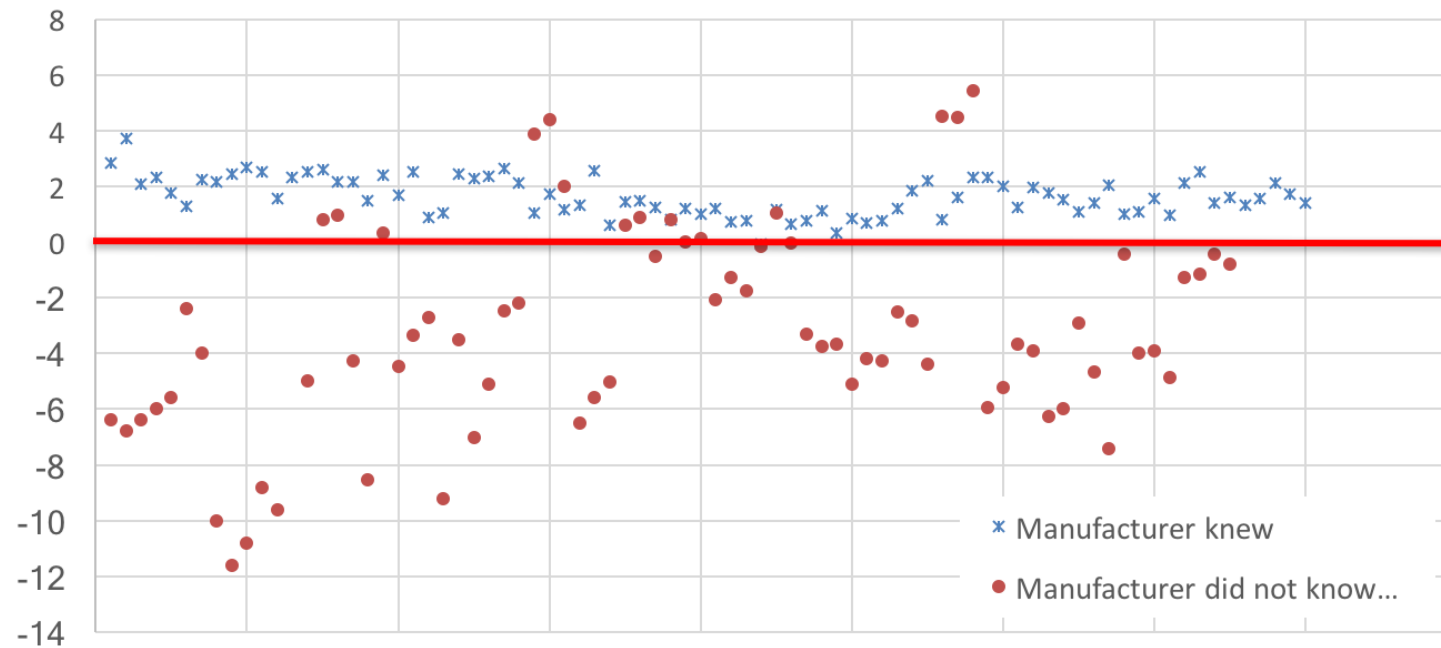
Electroluminescence test

- Shows micro-cracks and other features not visible to the naked eye



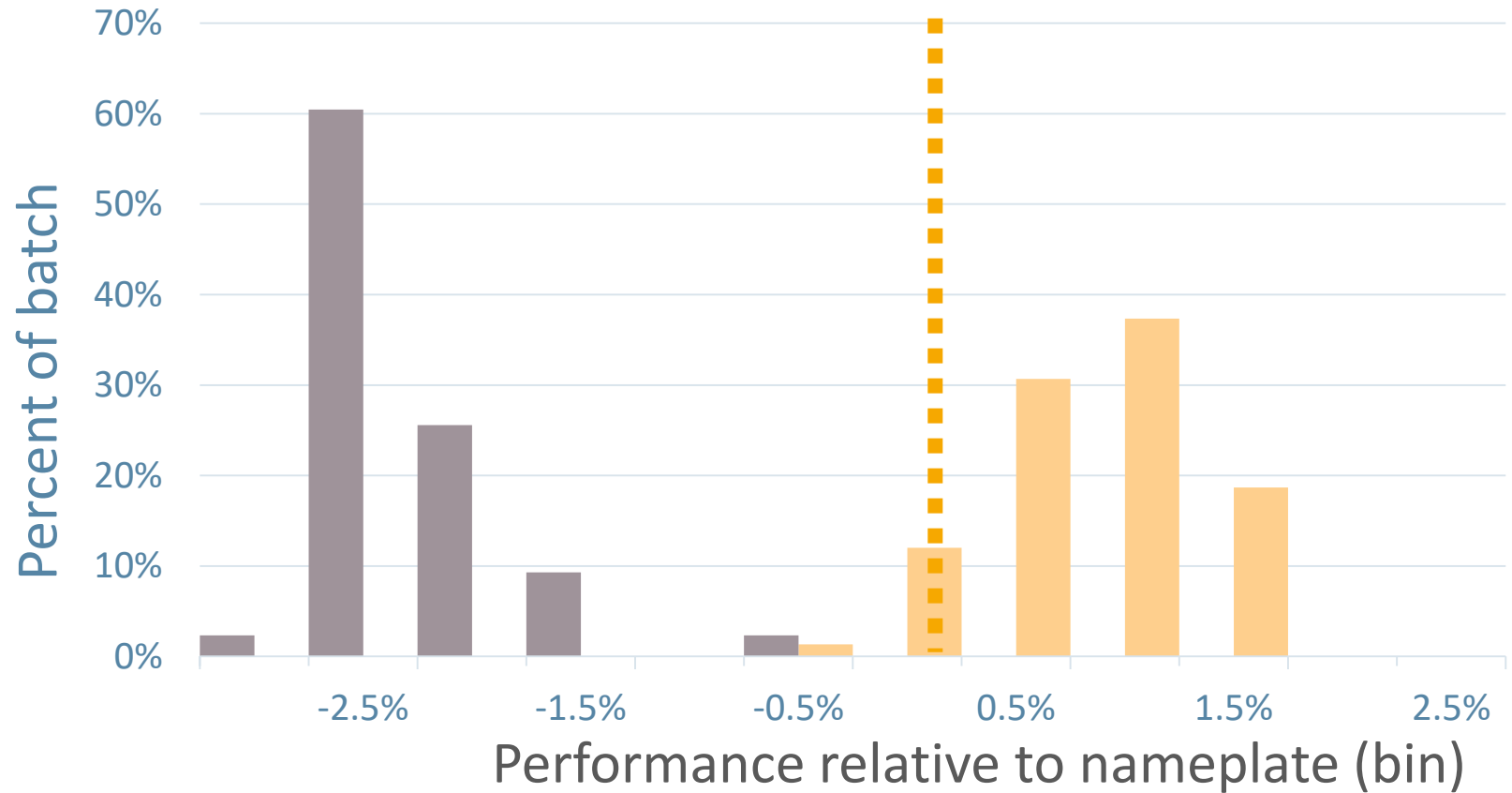
STC - Sample Results

- Measures power output under standard test conditions
- % Deviation from nameplate power

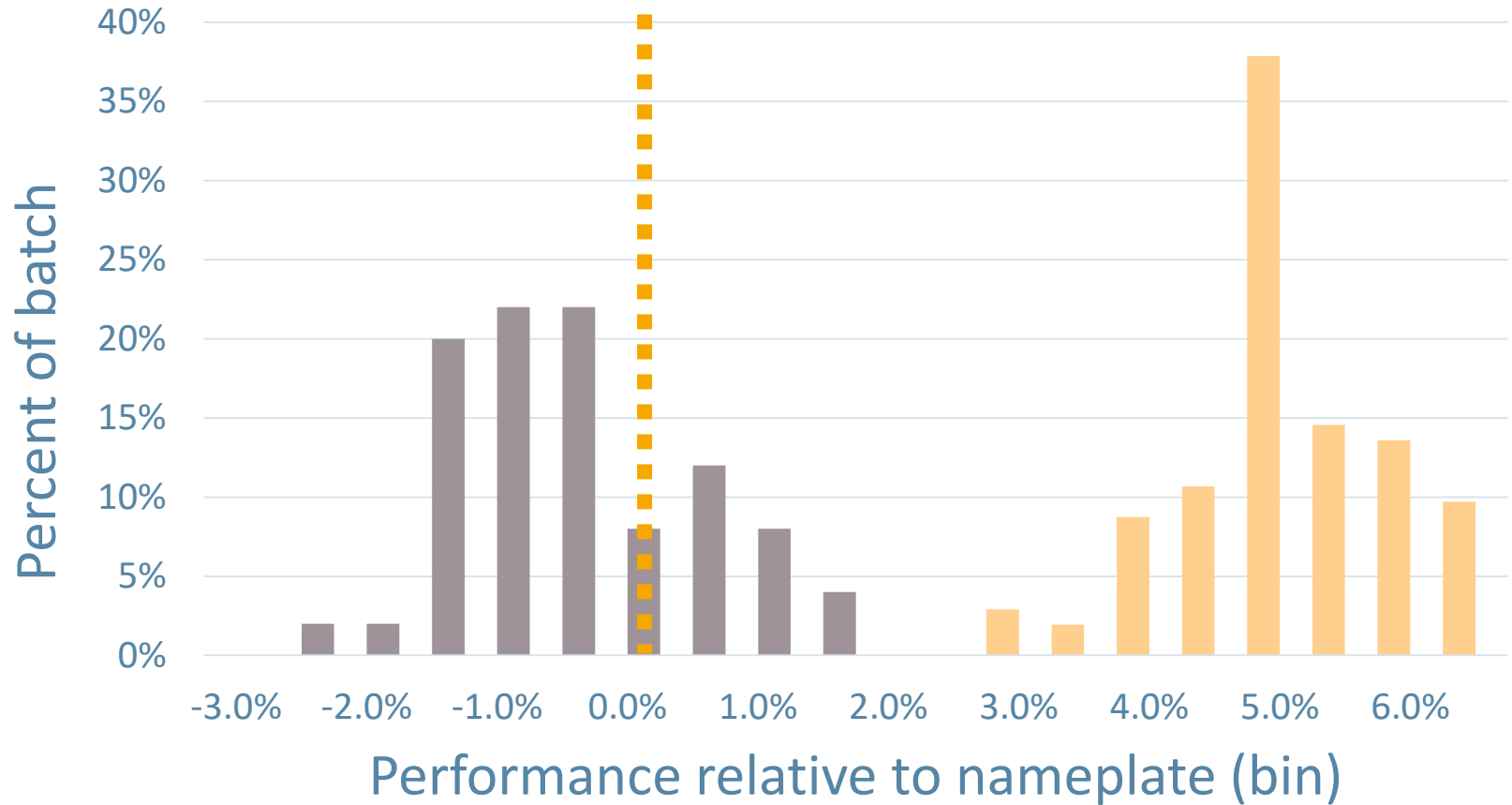


- Manufacturers can choose where to ship certain product
- Quality in Australia reflects lack of culture of testing
- How you buy seems to be important

Case Study #1




Case Study #2



Blue Reports

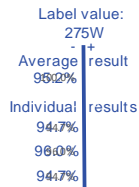
TALESUN
October 2018

Model: Talesun TP660P-275
Power: 275W Power class: 0~+3%
Polycrystalline 60 Cells



Power Measurement

MEASURED POWER VS LABEL



The power output of three solar panels from Talesun, shown as % relative to the manufacturer's labeled value.

AVERAGE MEASURED POWER

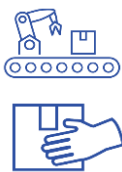
262W

AVERAGE RESULT
% Relative to label value

95.2%

A result of 100% means the average power output of the panels matches manufacturer's stated power.

Manufacturing and Shipping Defects



AVERAGE GRADE

B

INDIVIDUAL GRADES

Panel 1: **A**
Panel 2: **D**
Panel 3: **A**

This grading, from A to E, assesses the panel for defects which are likely to have originated in the manufacturing process and/or during shipping and handling.

Visual inspection

PASSED



PASS: There were no visual defects that may cause a risk of reliability loss or power output.


Wet leakage test

SAFETY TEST: PASSED



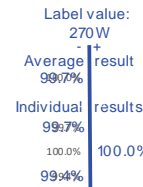
QCELLS
October 2018

Model: Q-Cells
Power: 270W Power class: +0 to +5W
Polycrystalline 60 Cells



Power Measurement

MEASURED POWER VS LABEL



The power output of three solar panels from Qcells, shown as % relative to the manufacturer's labeled value.

AVERAGE MEASURED POWER

269W

AVERAGE RESULT
% Relative to label value

99.7%

A result of 100% means the average power output of the panels matches manufacturer's stated power.

Manufacturing and Shipping Defects



AVERAGE GRADE

A

INDIVIDUAL GRADES

Panel 1: **A**
Panel 2: **A**
Panel 3: **A**

This grading, from A to E, assesses the panel for defects which are likely to have originated in the manufacturing process and/or during shipping and handling.

Visual inspection

PASSED



PASS: There were no visual defects that may cause a risk of reliability loss or power output.

Wet leakage test

SAFETY TEST: PASSED



Thank you for listening!



Making quality visible.