RoboRater

Would you like a million design options with that?

Jim Woolcock – Director, Sustainability House

A²SE Summer Study on
Energy Efficiency 2013

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What is a residential rating?

- Residential energy ratings are required for energy efficiency compliance with some parts of the Building Code of Australia (BCA) Volume 2*, which aims to reduce greenhouse gas emissions of new houses and renovations
- The rating depends on:
  - the layout of the home;
  - the construction of its roof, walls, windows and floor;
  - the orientation of windows and shading to the sun's path and local breezes; and
  - how well these suit the local climate.
- When the rating is achieved and other BCA requirements are met the documentation is submitted for building approval, as illustrated in the following graph.

* State and territory variations apply

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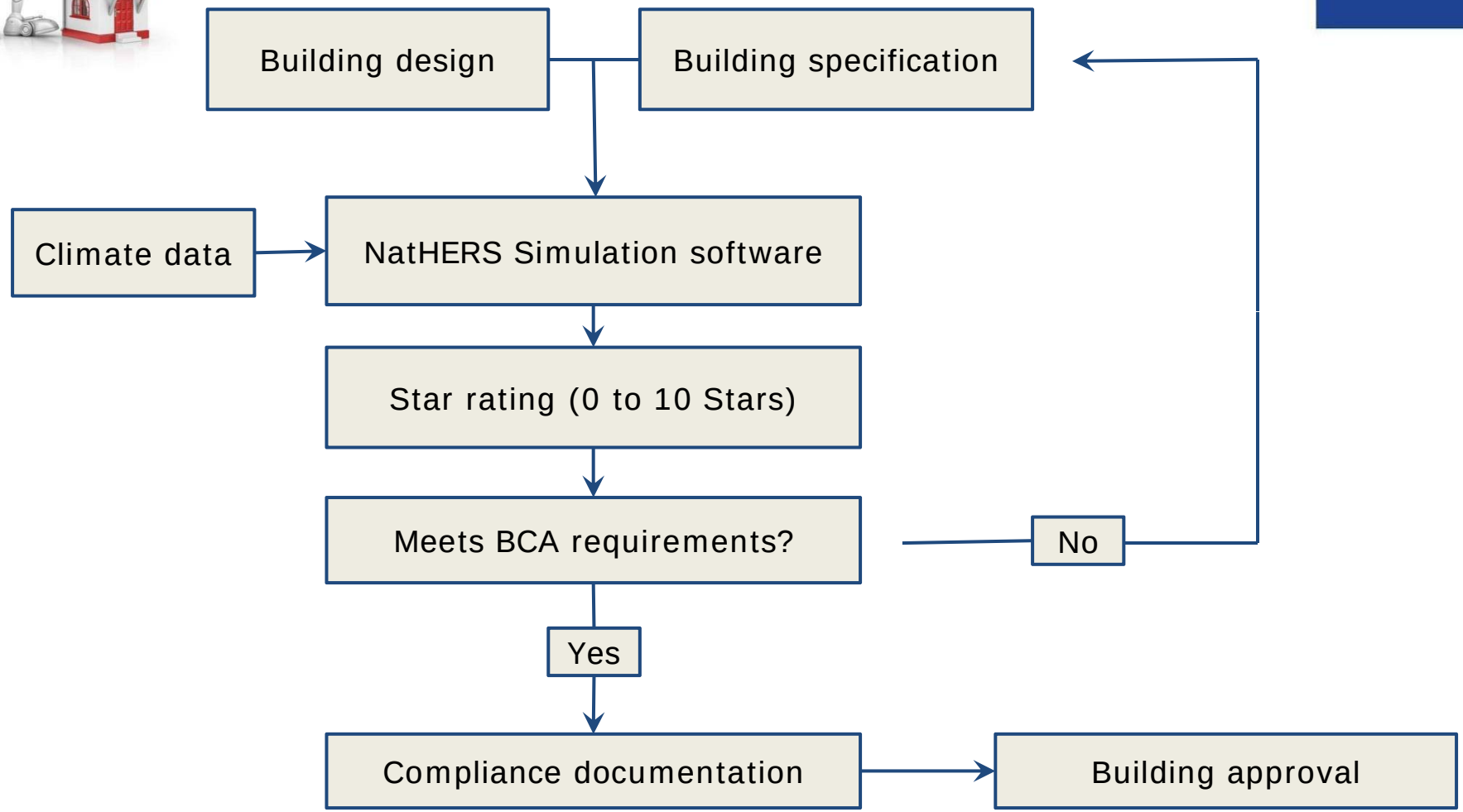
What is a residential rating?



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What is a residential rating?

- The National House Energy Rating Scheme (NatHERS) provides a framework that allows various computer software tools to rate the potential energy efficiency of Australian homes.

- House energy rating through the NatHERS uses computer simulations to assess the potential thermal comfort of Australian homes on a scale of zero to 10 stars.

- The more stars, the less likely the occupants need cooling or heating to stay comfortable and the less energy use that is required.

What does the rating mean?

- **Zero stars** means the building shell does practically nothing to reduce the discomfort of hot or cold weather.
- A **5 star rating** indicates good, but not outstanding, thermal performance.
- Occupants of a **10 star home** are unlikely to need any artificial cooling or heating.
- To illustrate this point the following graph is an example of the number of solar PV panels that may be required to offset poor building performance for a given design in a given location vs. a high performing 10 star house of the same size.

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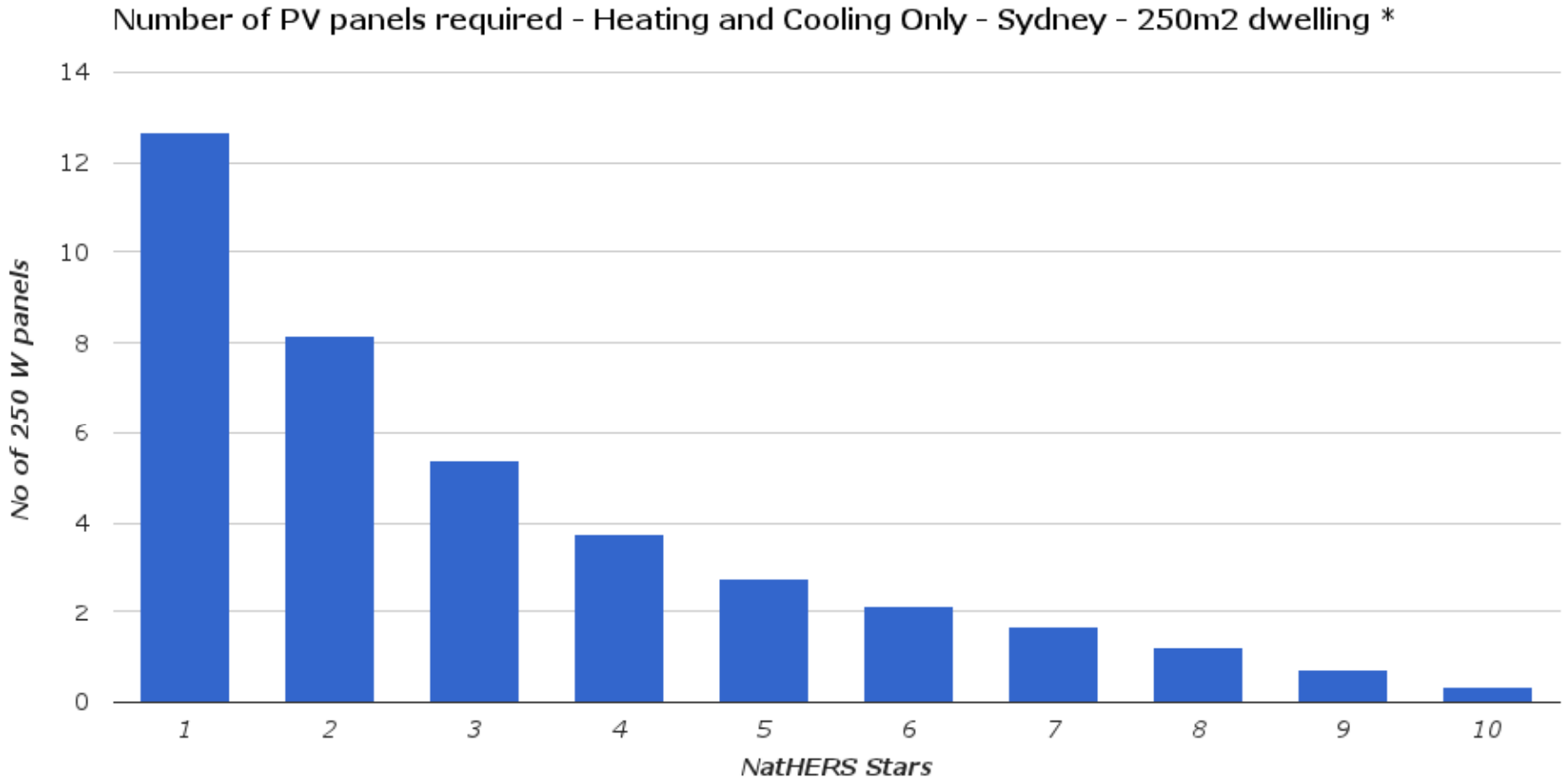
What does the rating mean?



* Various assumptions – NatHERS building occupancy & comfort , HVAC COP, panel efficiency

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Challenge 1 – Too Many Options To Assess

- Typically an assessor may only suggest 3 to 4 compliant options for each failing NatHERS rating.
- The *actual* number of options for the client often number in the **millions.**
- The assessor is limited by the software, time, skill and market prices.
- Complexity of a house energy rating demands a high degree of skill and knowledge of the assessor about passive design, thermodynamics, material costs and building construction.
- Even with this skill houses respond differently and it is not possible to predict the best design options.

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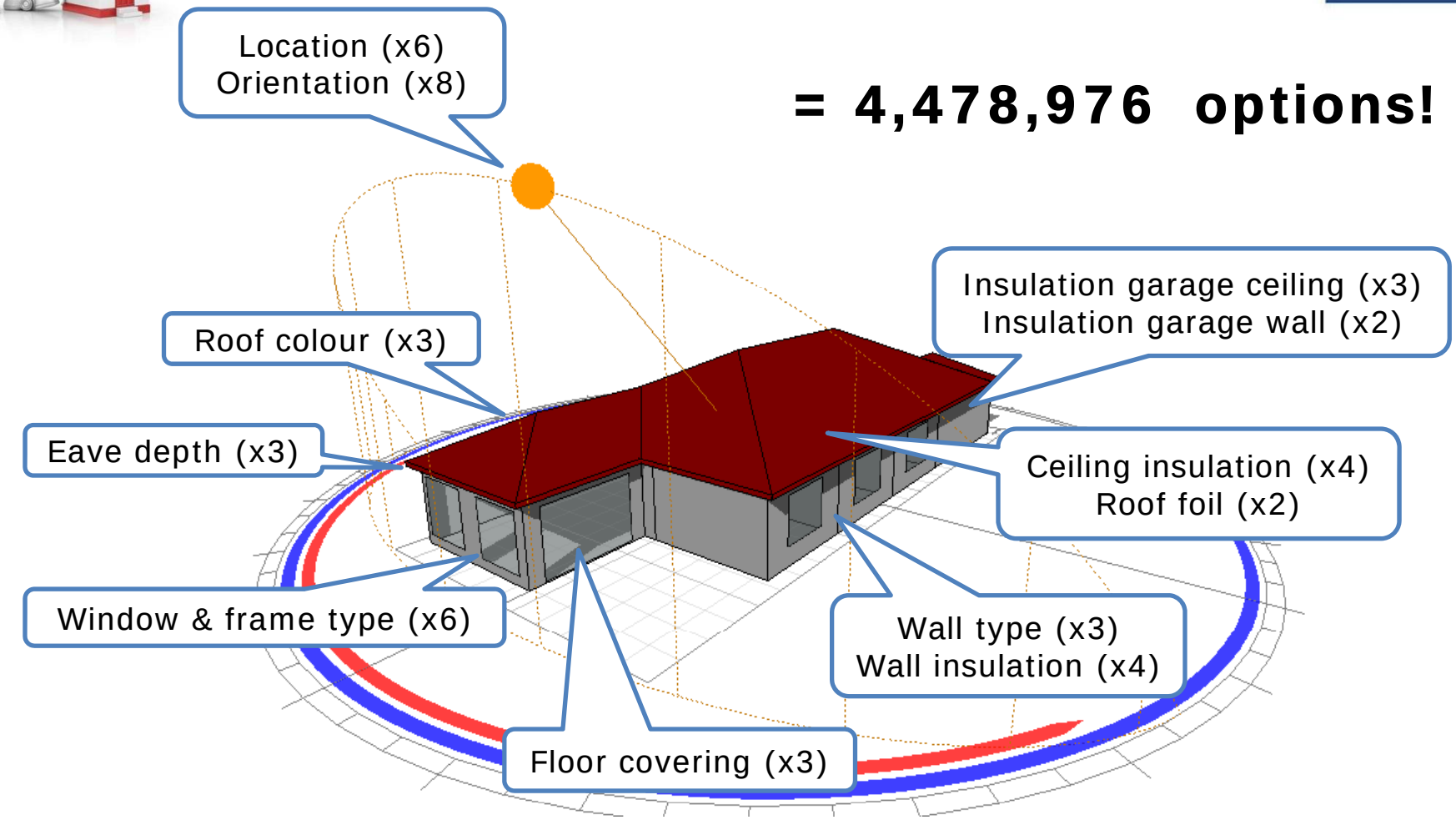
Challenge 1 – Too Many Options to Assess

= 4,478,976 options!



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What is RoboRater™?

- Iterative simulation tool developed by Sustainability House.
- Compatible with all NatHERS thermal performance software.
- Rapidly explores thermal performance scenarios by changing building construction and conditions.
- 10,000+ simulations per minute.

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RoboRater Applications

Complexity Problem
- Too many options

RoboRater
= all the options with costs

Auditing

Collect assessments

Meta-analysis

Policy development

Building specification

Embodied energy

Zero carbon buildings

Cost effective energy efficiency

Existing buildings

New Building Compliance

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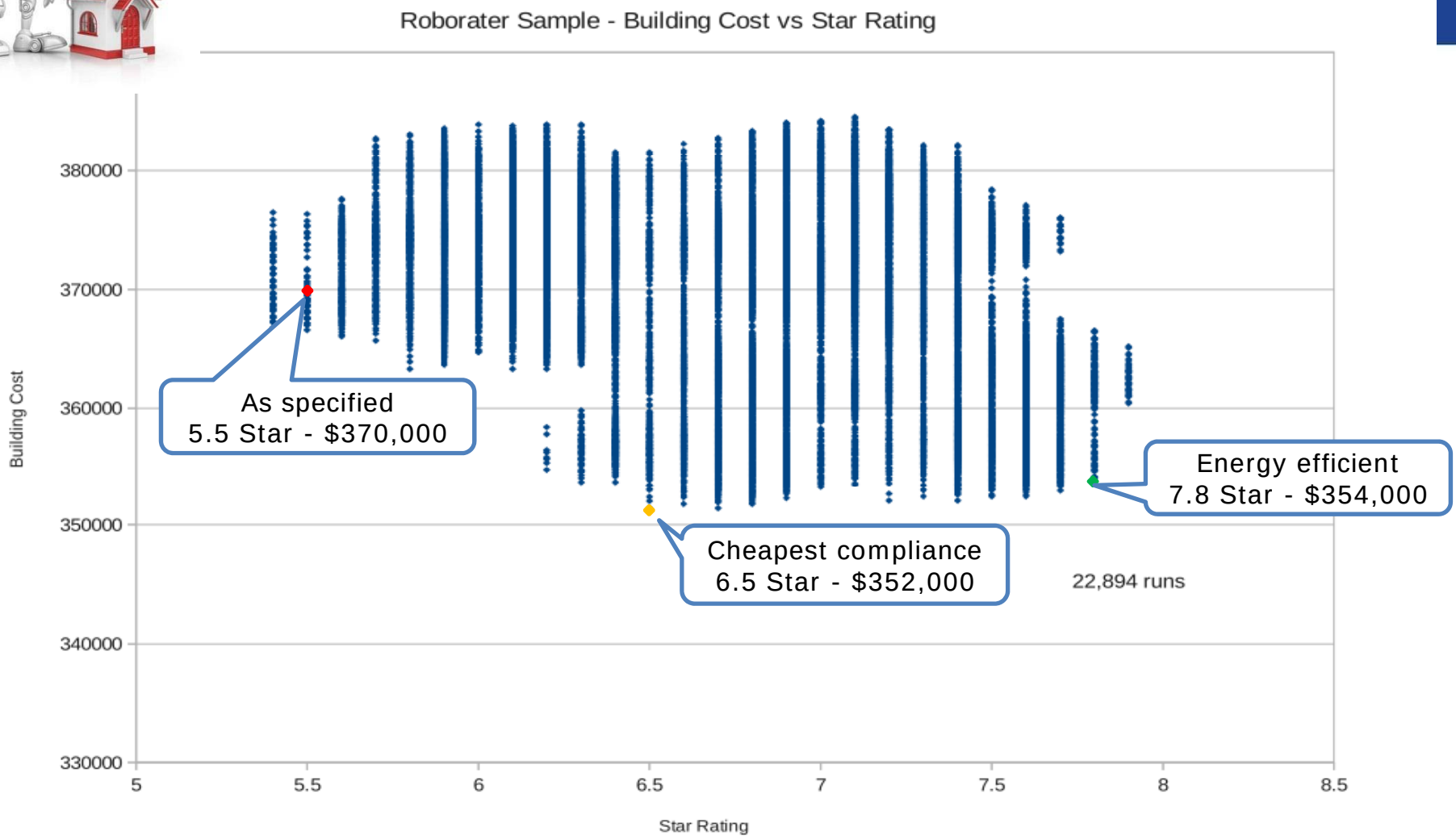
RoboRater Output



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RoboRater Output

- RoboRater optimises the NatHERS software to identify many outcomes.
- RoboRater outputs a spread sheet that can be filtered by:
  - Cost
  - Performance
  - Specification
  - Location
  - Orientation
- The previous RoboRater Output graph - each dot represents one of the 22,894 options:
  - As specified 5.5 Star - $370,000
  - Cheapest compliance 6.5 Star - $352,000
  - Cost effective and Energy efficient 7.8 Star - $354,000

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Challenge 2 - The Life of a House

2010

2018

Land purchased

Sketch on the back of a napkin

Builder engaged

Dream design finalised

Assessed : Fails Compliance

Redesigned / respecified to achieve energy compliance

Assessed : Compliance Achieved

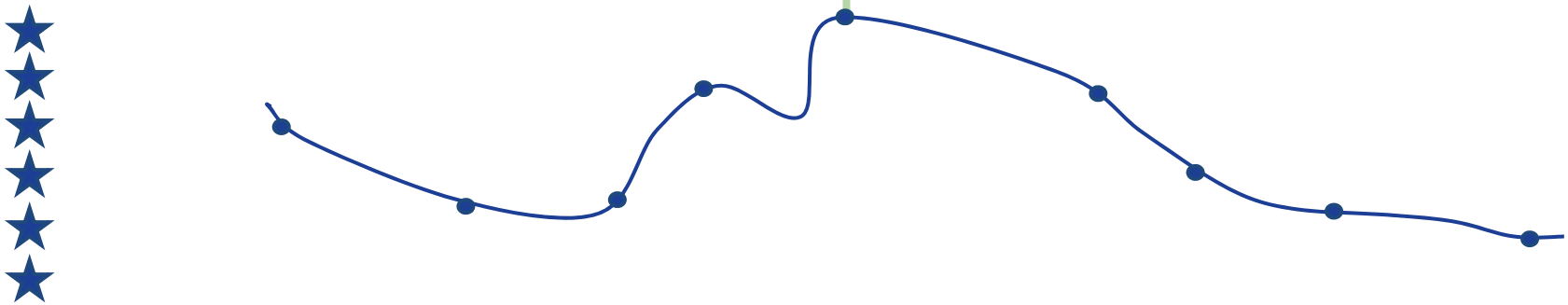
House Built

Outdoor Patio added

Doors removed between living and dining room

Some insulation removed to install downlights in living room

Doors replaced and dining room is now used as 4th bedroom



Modelled Thermal Performance

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Challenge 2 - The Life of a House

- Compliance is only a moment in time in house design, as shown in the previous graph.
- Achieving minimum energy efficiency compliance is generally only required for building approval for a new dwelling and certain additions or alterations.
- Consideration should be given to the Design-Build-Operate model.
- It is important to design good buildings, build them properly, operate them well to maximise performance over their lifecycle and changing use.

Take Home Message

Rating is part of building compliance.

The challenges of residential rating are:

- Too many compliance options; and
- Design assessed for building approval not as design-build-operate framework throughout the life of the building.

RoboRater multi-simulation tool adds value to current rating software to find the most energy efficient and cost effective solution for residential buildings.

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FURTHER INFORMATION

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