



ClearVue^{PV}

CLEARVUE TECHNOLOGIES LIMITED

Clear – Energy Producing – Energy Saving

Advanced Glazing & Energy Solutions

Company & Technology Overview

Smart Building Technology Company



Creating smart building materials that are:

- Sustainable
- Energy Efficient
- Positive environmental outcomes

Part of the solution for achieving:

- Zero net energy
- Zero net carbon
- Reducing carbon footprint
- *Autonomous* clear functional windows

Technology & Product



A clear glass panel that is:

- Energy saving/producing
- Highly insulating
- Reduces carbon footprint
- Scalable

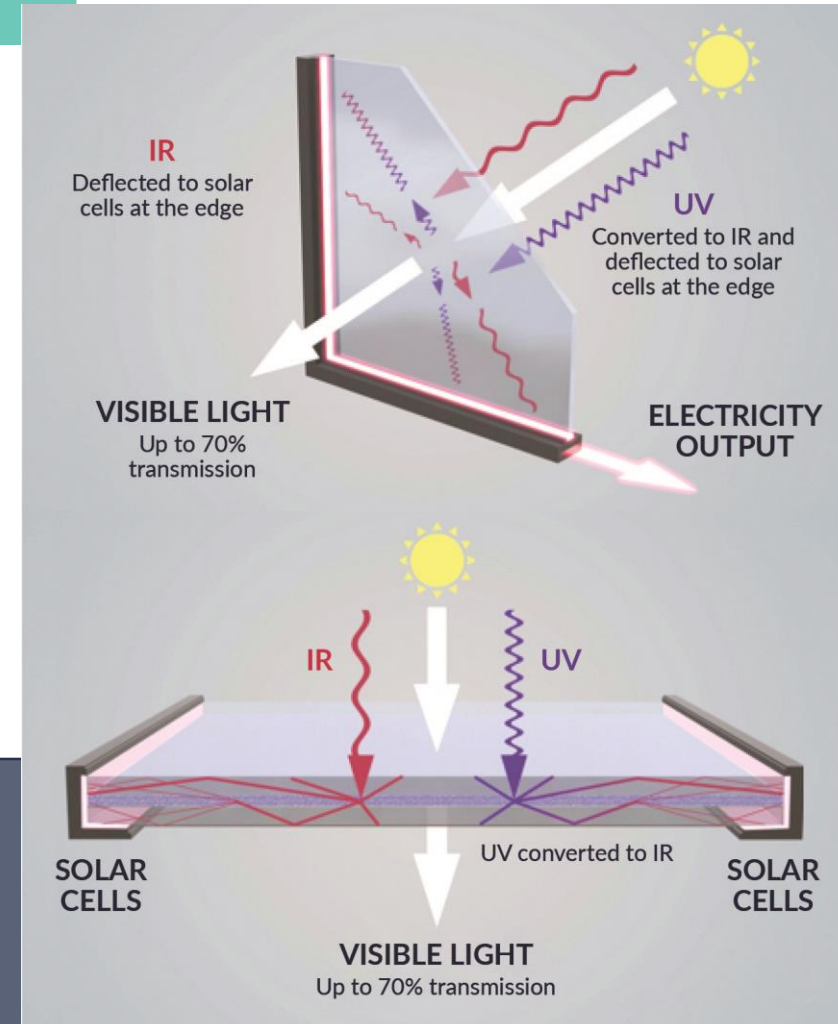
The ClearVue product can be used to achieve:

- *significant energy cost savings*
- *prevent unwanted solar radiation* (UV and IR) from entering a building; and
- then *converting the unwanted radiation into electricity.*



ClearVue's Technology – An Overview

- ❑ ClearVue's patented technology sits within an activated interlayer between two panes of glass.
- ❑ Visible light (VIS) passes through the glass
- ❑ **Micro & nano particles** interact with Ultraviolet (UV) radiation which is down-converted to longer wavelengths and scattered along with Infrared (IR) light to the edges of the glass and is collected by Photovoltaic (PV) cells and **produces electricity**
- ❑ Turns damaging UV and IR radiation into energy
- ❑ Insulation properties reduce heating and cooling costs
- ❑ ClearVue has extensive IP protection on its technology and products - **85 granted patents** and 40 patent applications throughout the World



Core Clear Solar PV Window Products

Large Sizes

3 +m high x 3 +m wide (>3 sqm)

Size Range

ClearVue can create varying IGU panel side lengths of between 600mm up to 3000 mm and provide for more than **45 different IGU panel size combinations** catering for most window use-cases and applications.

The ClearVue glass/window product is both **CLEAR** and **FUNCTIONAL**

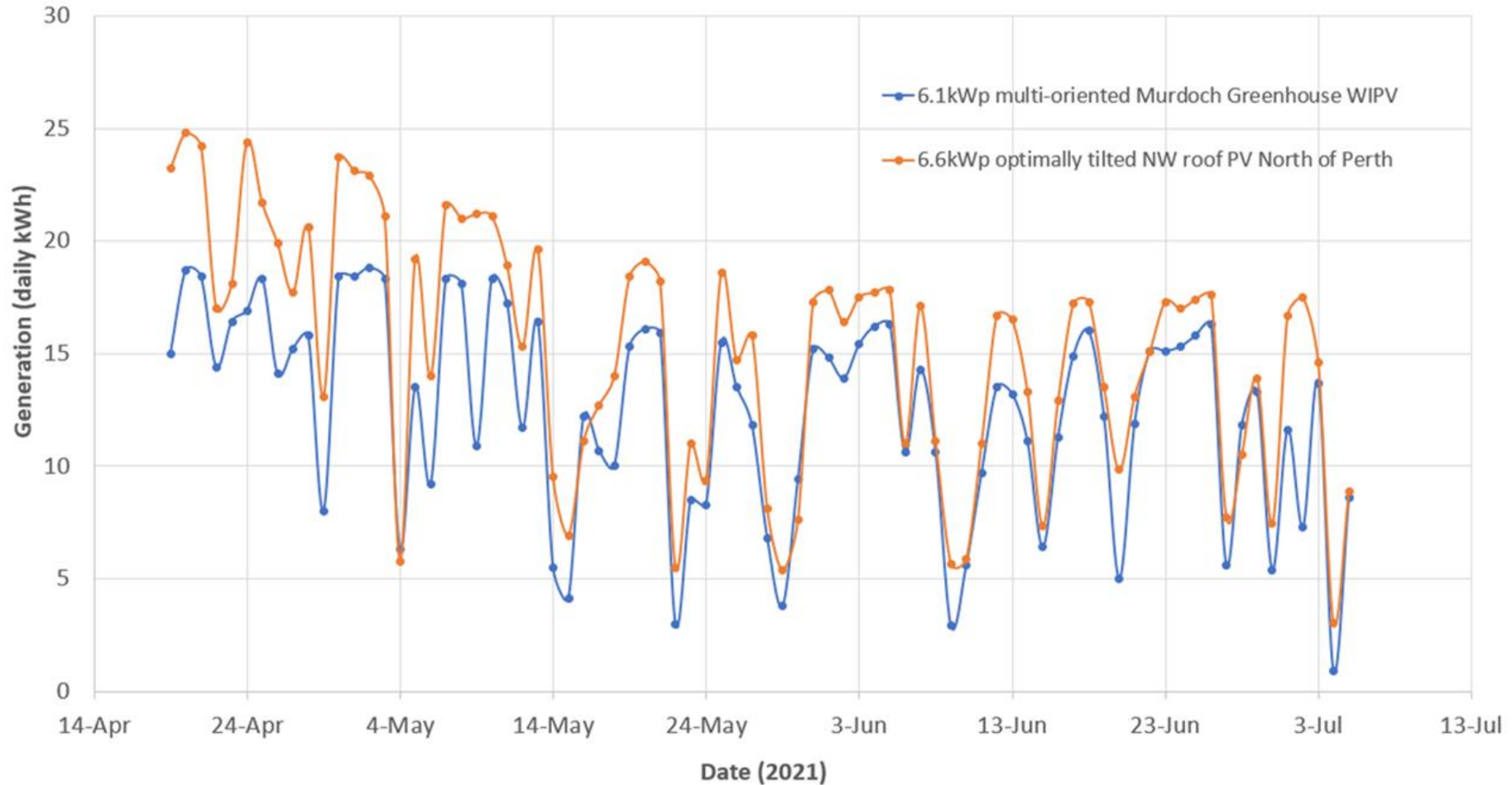
SCALABLE PRODUCT - In both scalable in size ($\frac{1}{4}$ sqm, $\frac{1}{2}$ sqm, $\frac{3}{4}$ sqm, 1sqm , 1.2sqm , 1.4sqm already) - **up to 3sqm**



How does ClearVue Solar Glass Compare?

Roof top PV

Winter energy generation trends - Murdoch Greenhouse WIPV vs standard optimally roof-mounted PV



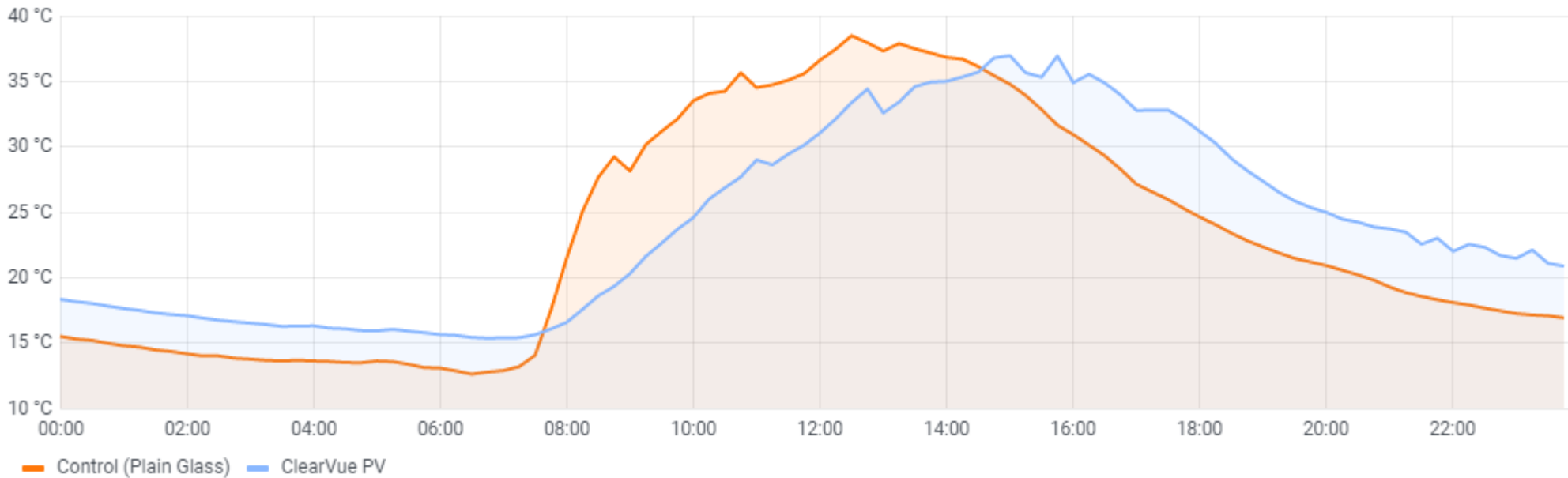
How does ClearVue Solar Glass Compare?



Thermally

- ☐ Comparative to 4 mm Laminated Glass
- ☐ Fenestration Rate over 70 %
- ☐ No Thermal break framing
- ☐ No Gas Injection
- ☐ Data Set from completed building
- ☐ No HVAC

Greenhouse Mean Temperatures by room



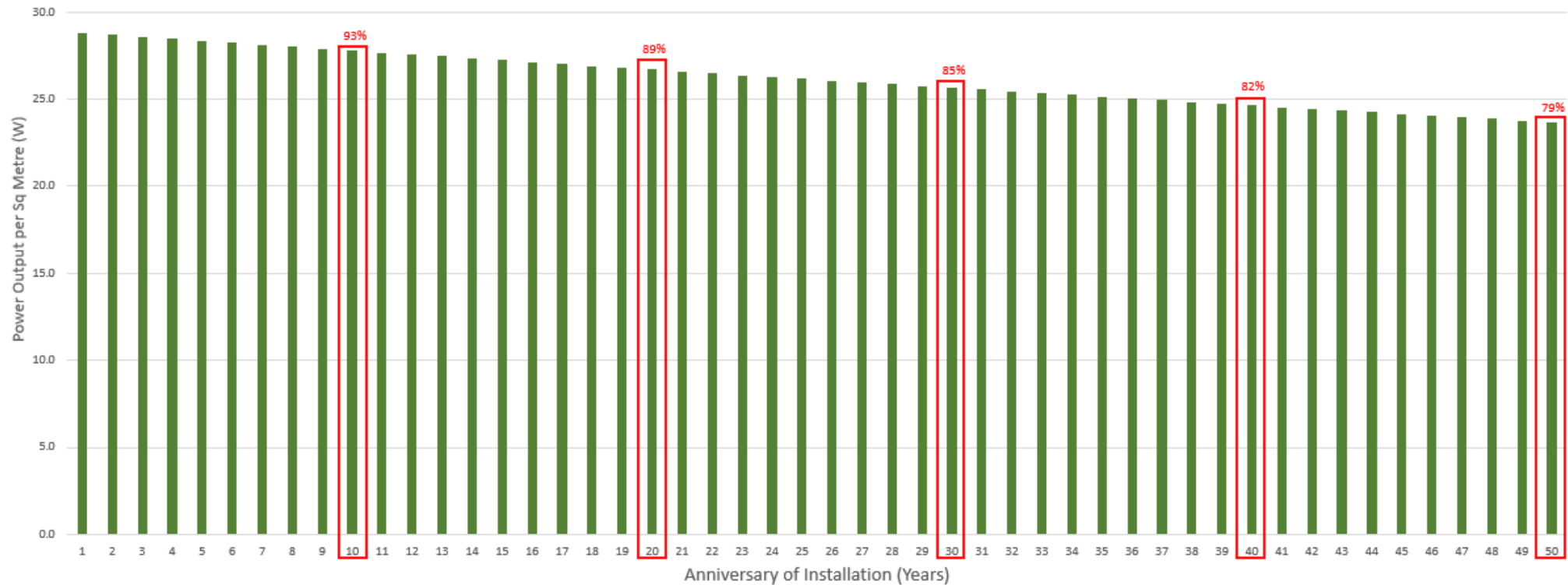
How does ClearVue Solar Glass Compare?



Longevity

- ❑ Degradation rate from 30w per sqm 4% Year 1 and 0.4% per year thereafter. Similar to standard roof top PV Panels
- ❑ **85% of Initial Output at Year 30**

CPV Rated Output M2 (W) over 50 Years



How does ClearVue Solar Glass Compare?

Specifications

TECHNICAL PROPERTIES

Electrical, Optical & Thermal Parameters

For a 1.2m X 1.2m ClearVue standard solar unit

Parameters	Values
Energy produced per unit	40 Watts at peak
Voltage open circuit V_{OC}	61.5V DC
Amperes short circuit I_{SC}	0.835 A
Maximum power voltage V_{mp}	52 V
Maximum power current I_{mp}	0.77A
Tolerance	±5%
Fill Factor (FF)	Up to 78%
Visible transmission	Up to 70% ($T_{direct} + T_{diffused}$)
U-Value	1.4 W / (m ² ·K), with air 1.16 W / (m ² ·K), with Argon
SHGC * subject to coating selection	< 0.67

Mechanical & Structural Properties

For a 1.2m X 1.2m ClearVue standard solar window

Parameters	Values
Wind pressure for deflection	800 Pa
Ultimate strength	3000 Pa
Water penetration test pressure (EN)	900 Pa
Air infiltration test	150 Pa
Height of load impact test (EN)	450mm
Sound test (acoustic insulation)	37dB

Smart Options driven by Clear Solar

*This self-powering automatic casement window can be **retrofit into existing buildings.***

*It will learn the optimum **temperature and airflow** requirements of the building occupants.*

*The window will **automatically open and close** to optimise building temperature and airflow. The rain sensor allows the window to close in wet weather.*



**AUTOMATICALLY
OPENS & CLOSES WITH
CHANGING WEATHER**

*These smart facades utilise **electrochromic technology.** This enables our glass to automatically tint and therefore adjust building **temperature and lighting** comfort.*

*The panels can be **retrofit** into existing buildings with **no need for cables**, as they are completely self-powering.*

*Light sensors and learning algorithms give these windows intelligence to **optimise occupant health and wellbeing.***



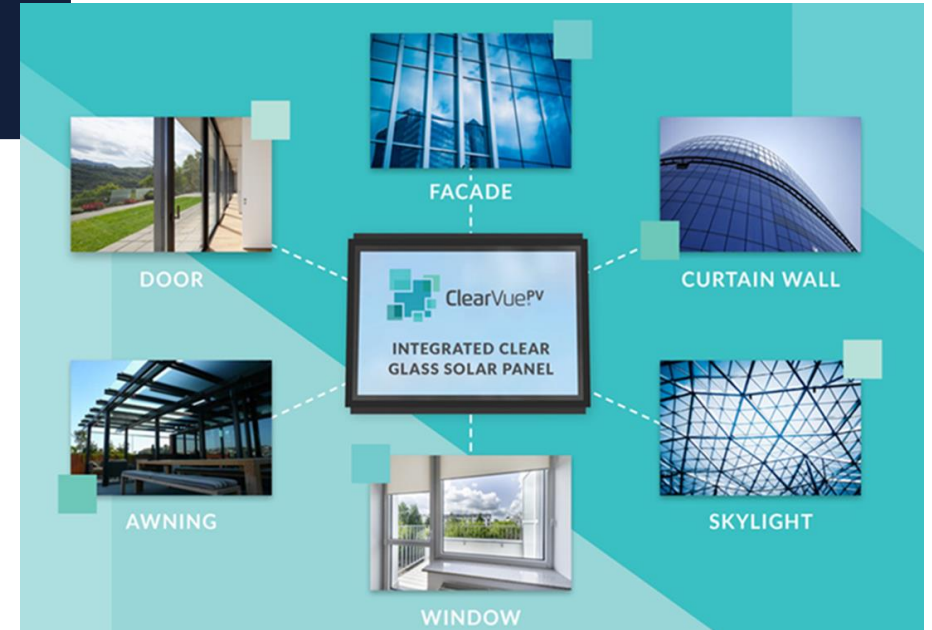
**WINDOWS AUTOMATICALLY
TINT TO ADAPT TO LIGHTING
CONDITIONS**

The Clear Advantage

- ❑ **Clear and Functional** – fits multiple applications
- ❑ Efficient – 3 to 4% conversion of radiance to energy
- ❑ Scalable – Large Sizes Available
- ❑ Certified - USA – UL; Europe - MEA & IEC; Australia under AGWA & Intertek

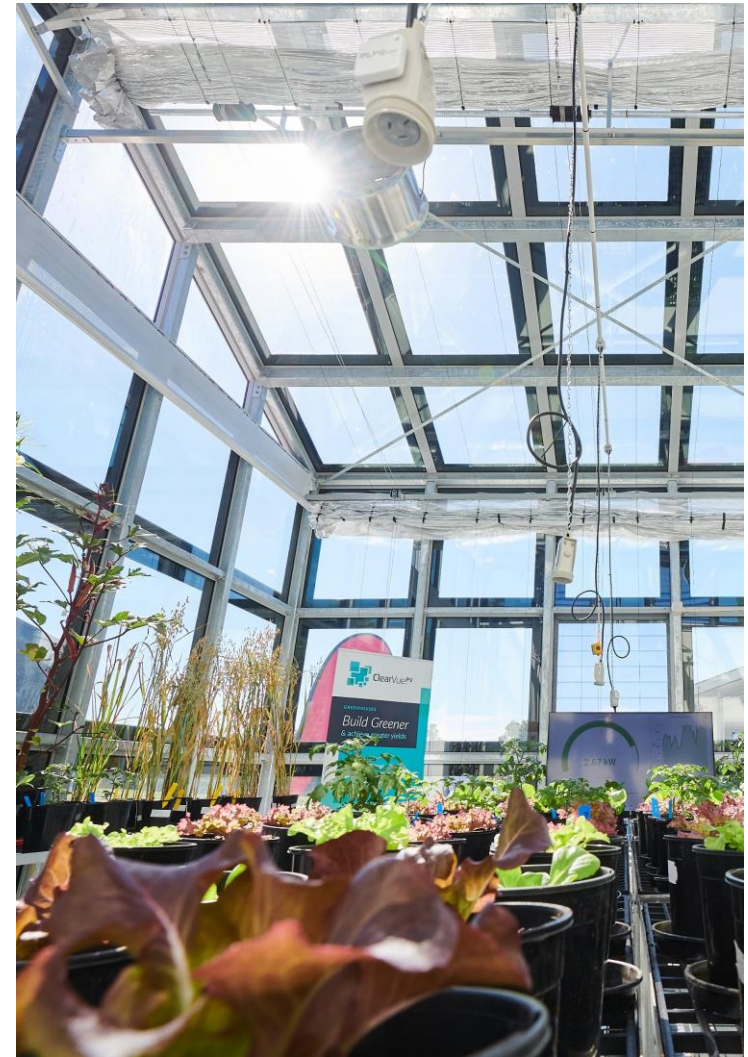
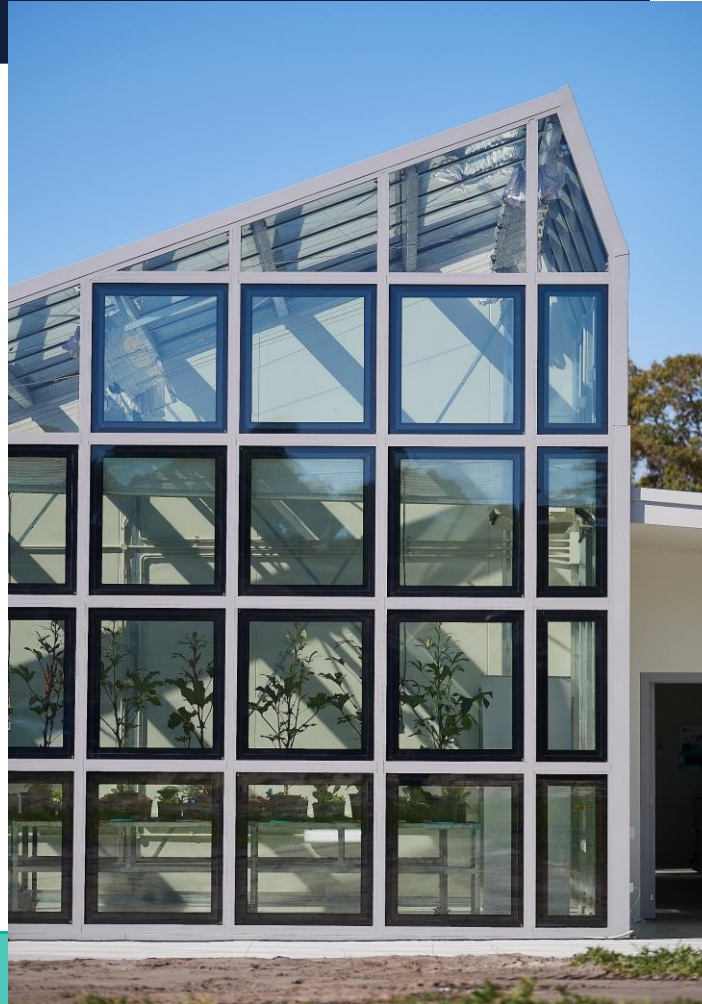


- ❑ Cost Effective - Competitively priced, short payback periods
- ❑ Ready to Deploy - Commercialisation commenced



Murdoch University Solar Glass Greenhouse

- ❑ Officially opened 19 April 2021
- ❑ World first clear solar glass greenhouse
- ❑ Why is it so significant?
 - ❑ Renewable Energy produced
 - ❑ High Insulation means less energy use
 - ❑ Lower Water Use
 - ❑ Higher crop yields
 - ❑ Resistant to weather damage
 - ❑ Lower Carbon Emissions
 - ❑ High Security for Cannabis or medicinal production



Murdoch University Solar Glass Greenhouse



Key Data

Greenhouse

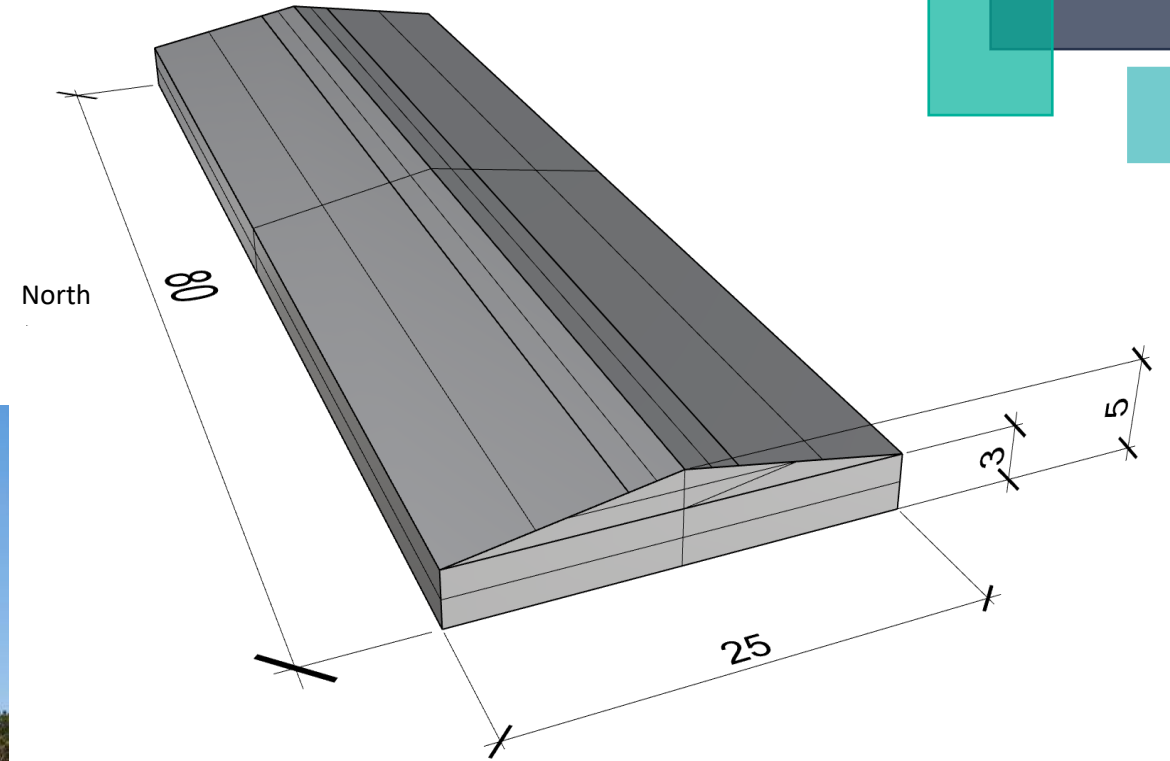


- ❑ ClearVuePV allows up to 70% of the visible light spectrum through to the crop canopy.
- ❑ Photosynthetically active radiation (PAR)
 - ❑ Light in the 400-700 nanometre wavelength range.
- ❑ Photosynthesis reaches peak levels when plants are exposed to optimised PAR specific to plant type and growth season.
- ❑ The PAR typically measured in our grow rooms coincides with values reported as optimum for growing many species.

Greenhouse Modelling

Modelling demonstrates the thermal properties of a ClearVuePV greenhouse.

- ❑ Located in Manjimup, WA
- ❑ Temperate Zone (34 S Lat)
- ❑ Footprint area of 2000 m²
- ❑ Developed using an industry standard design
- ❑ Venting system located roof and sides



Greenhouse Modelling

Manjimup, WA - Latitude 34.2404° S Longitude, 116.1471° E

Temperature set points 25°C during the day and 19°C at night.

	ClearVuePV	Standard Glass	Twin-wall Polycarbonate
Total HVAC Energy Use in MWh/yr	161.8	430.8	254
Total Yearly HVAC Cost	\$ 17,293.90	\$ 39,848.58	\$ 25,114.91

Temperature set points 25°C during the day and 23°C at night.

	ClearVuePV	Standard Glass	Twin-wall polycarbonate
Total HVAC Energy Use in MWh/yr	245.37	635.45	682.16
Total Yearly HVAC Cost	\$ 24,494.59	\$ 57,536.62	\$ 35,940.63

Energy use was calculated using gas boiler system for heating, and a mist evaporation, fans and venting method for cooling.

Gas Price	0.024	\$AUD/MJ
Electricity Price	0.28	\$AUD/kWh

Greenhouse Modelling

Estimated Total Energy Generation (kWh/Year)	80,000 kWh
Greenhouse Gas Emissions Avoided (in Kg of CO ₂ equivalent)	361,900 Kg

Energy generated, and energy saved, combined result in significant reductions in GHG emissions.

Calculated using [PVWatts Calculator \(nrel.gov\)](https://www.nrel.gov/pvwatts/) and [JRC Photovoltaic Geographical Information System \(PVGIS\) - European Commission \(europa.eu\)](https://ec.europa.eu/jrc/en/pvgis)

Shopping Centre at Warwick Grove WA

- ❑ ClearVue has **successfully deployed** its technology at the Vicinity Group's **Warwick Grove Shopping Centre** in Western Australia.
- ❑ The atrium entry glass includes 18 of ClearVue PV's triple-glazed, low-e, power-generating Integrated Glass Units .
- ❑ The PV glass charges a battery for energy storage and is providing power for lighting and outside signage.
- ❑ Live data of power being generated is being publicly displayed on site inside the centre to provide centre management an insight into energy management and cost savings.
- ❑ **Peer-reviewed high-impact paper** published on the performance and efficacy of the Warwick Grove installation **confirms power performance and commercial importance** of the ClearVue product and technology. Paper has reached **top 5% readership of all published research papers globally** since publication.¹



Upcoming Developments | Next 60-90 days

- ❑ Sydney Park Shelter powering all Light Features
- ❑ Japanese Solar Greenhouse Project
- ❑ Multi Storey Tower Test Installation
- ❑ Shopping Centre Skylight Install



Upcoming Modelling Data Available Soon

- ❑ 6 Story Wood lightweight Construction Near Net Zero Office Building Archetype (North America)
- ❑ Heritage Building Retrofit (Europe) maintain the look and reduce carbon footprint



Register your interest to receive data updates on deployments and modelling data

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 www.clearvuepv.com

Partner with ClearVue

Let us show you the benefits of ClearVue Technologies

Partner with us and we will assess your project and present you a feasibility study

Working cooperatively and early in a project's life will enable us to provide specific tailored advice to reduce building operating carbon footprint .

We will provide you with information on what government assistance is available in your jurisdiction to promote low carbon building.

Contact us. We are here to help .



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