



## Making strong strides in solar powered glass

ClearVue Technologies (ASX: CPV) is a smart building materials technology company, that is manufacturing and commercialising its patented solar PV electricity generating glazing. ClearVue is well positioned to service a global market for solar windows and façades due to its product innovation, seamless at-scale manufacturing capability, flexible product use potential and collaborative customer partnerships.

### Distinct advantages offered by ClearVue<sup>PV</sup>

ClearVue<sup>PV</sup> is a first in class product with a strong IP portfolio and represents a paradigm shift in the way the glass will be used in building construction, automobiles, agriculture and specialty products. ClearVue's clear Generation II (Gen-2) is the only solar glass (with an integrated smart façade) capable of being produced at an industrial scale without any modifications to production lines meeting industry standards. In October 2023, the testing of the ClearVue<sup>PV</sup> glass technology by Singapore Building and Construction Authority (BCA) through its Skylab facility resulted in better-than-expected results with the product outperformed the comparable product (a control cell deployed with Singapore BCA's Greenmark Platinum certified double glazed low-e windows) in terms of solar control and energy performance.

### ClearVue to benefit from significant potential for the BIPV sector

ClearVue operates exclusively in the building-integrated photovoltaic (BIPV) sector. The BIPV sector represents a dynamic approach to incorporating solar energy technology into the fabric of buildings. Unlike standalone solar panels, BIPV integrates photovoltaic materials directly into various building elements, including roofs, windows, façades, and skylights. This integration helps in the generation of electricity and serves as a key part of the building's design and structure. The global BIPV market is likely to grow from US\$23.7bn in 2023 at a CAGR of 21% to US\$89.8bn in 2030.

### Valuation of A\$1.16-1.47 per share

Using a blended valuation approach (using separate Discounted Cash Flow and Relative Valuation approaches and applying equal weighting to each), we have valued ClearVue Technology at A\$1.16 per share in our base case and A\$1.47 per share in our optimistic/bull case. Please see p.19 for more details on our valuation rationale and p.22 for more details on the key risks to our thesis which include competitive, licensee, and personnel risks.

Share Price: A\$0.53

ASX: CPV

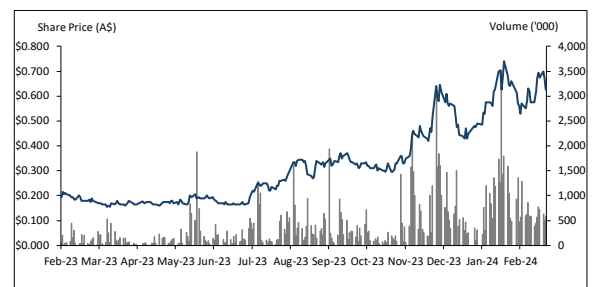
Sector: Technology

5 March 2024

Market cap. (A\$m)	122.2
# shares outstanding (m)	230.1
# shares fully diluted (m)	263.4
Market cap. ful. dil. (A\$m)	139.9
Free float	82.4%
12-months low/high (A\$)	0.78 / 0.145
Avg. daily volume ('1000)	428.2
Website	<a href="http://www.clearvuepv.com">www.clearvuepv.com</a>

Source: Company, Pitt Street Research

### Share price (A\$) and avg. daily volume (k, r.h.s.)



Source: Refinitiv Eikon, Pitt Street Research

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## Introducing ClearVue Technologies

ClearVue Technologies (ASX: CPV) is a Perth based pure play smart building technology company. The company was founded in 2012. It was spun out of Edith Cowan University and was listed in 2018 (in a deal valuing the company at \$18m).

ClearVue is making a positive contribution to the climate crisis through its clear solar glass technology product. This technology can be a part of the solution for achieving low energy consumption, near or Net Zero energy buildings, improvement in the thermal envelope and clear functional windows.

## Meet ClearVue<sup>PV</sup>

ClearVue's technology and product is ClearVue<sup>PV</sup>, a unit of glass (an Insulated Glass Unit such as a double or triple glazed unit) that features a layer of micro and nano-particles that reflect the sun's UV (downconverted to near-IR) and IR light towards embedded solar cells. The rays are converted to energy while allowing up to 70% of the visible light to pass through.

ClearVue's patented technology sits within an activated interlayer between two panes of glass. The interlayer complements the existing glazing industry lamination and manufacturing processes; and requires limited infrastructure investment. Solar PV cells are incorporated around the edges of an Integrated Glass Units (IGU) used in windows. The company's advanced glazing system combines proprietary nano and microparticles dispersed into an interlayer, a clever internal design and its custom-shaped PV cells. The patented proprietary nano and microparticles interact with UV radiation which is down-converted to longer near-IR wavelengths. The system can also incorporate spectrally selective coatings within the IGU.

*ClearVue's patented technology complements the existing glazing industry lamination and manufacturing processes*

## ClearVue<sup>PV</sup>'s integration into glass and building surfaces is likely to be a stepping stone for bigger things to come

ClearVue's solar photovoltaic (PV) glazing technology integrates solar technology into glass and building façades, thereby generating electricity on site. This aids owners to reach Net Zero and also improves energy efficiency of the building. All buildings and other surfaces become solar PV collection sources, with ClearVue<sup>PV</sup> Window Integrated Photovoltaics, glass PV and smart façade solutions forming an integral part of the future. The advanced glass technology aims at preserving transparency of glass to maintain building aesthetics and electricity generation through windows.

## ClearVue<sup>PV</sup> Gen-2 IGUs have demonstrated mass-scale production and surpass Greenmark Platinum in BCA tests

In September 2023, solar glass technology demonstrated that the design of its Gen-2 IGU can be produced at mass-scale on an unmodified industry-standard production line. The company's ability to mass produce the Gen-2 IGUs provides a confirmation of the commercial viability of the company's product for both large commercial and small-scale bespoke product.

In October 2023, testing of the ClearVue<sup>PV</sup> glass technology was completed with Singapore's Building and Construction Authority (BCA) through its Skylab facility. The performance of a West-facing test cell fitted with ClearVue's Gen-



*Testing of the ClearVue<sup>PV</sup> glass technology resulted in better-than-expected results for several considerations*

2 PV IGU system was compared against a control cell deployed with Singapore's BCA Greenmark Platinum certified double glazed low-e windows.

The testing resulted in better-than-expected results with the products being better than the comparable product in terms of solar control performance, better comfort levels on the inside and lower temperatures. The technology is likely to deliver even better energy performance in more favourable climatic zones with expectations of improved carbon outcomes in cities with higher grid emission factors providing greater potential CO2 savings and accelerated carbon paybacks from ClearVue's PV IGUs.

## **Partnership agreements significantly boosts ClearVue's scale**

A key part of ClearVue's strategy has been to look out for and engage with strategic partners. These range from partners that bring their own glass insulating facility to partners that have big R&D capabilities. They are also likely to have good access to markets either in the greenhouse sector or the construction sector.

ClearVue has entered into manufacturing and distribution agreements in Singapore, South Africa, Australia and the US. One of the most notable agreements have been with 8G Solutions in the US. In January 2024, 8G Solutions brought ClearVue together with LuxWall to develop a combined prototype which is likely to be the most energy-efficient and energy-generating window on the market. ClearVue also entered into a collaboration with LuxWall, a vacuum insulator glass supplier to develop and commercialise a world's first window they have called the 'Zero Window'. The Zero Window is likely to be appealing to progressive architects as well as help the construction sector achieve sustainability targets.

The company landed its first commercial contracts in the US and Australia, thereby opening initial markets in solar greenhouses and commercial façades. The contracts were secured following validation of its technology by Singapore's BCA.

## **ClearVue's business model has distinct competitive advantages**

ClearVue is a deep technology company built around a highly scalable licensing model. The company's technology licensing model enables ClearVue to meet the growing demand for building integrated photovoltaic windows and related environmental products as the building sector reduces its carbon footprint to meet clean energy targets.

The company also has a key deployment, manufacturing development and commercialisation strategy. The deployment strategy includes the supply of completed IGUs, continued testing and certifications, partnerships with industry innovators and a focus on obtaining the first commercial building deployment. ClearVue is also taking a pragmatic approach to its commercialisation strategy. The company's commercialisation strategy entails exploration of Joint Venture (JV) opportunities, focus on licenses, scalability, and continued development of its new product using its core IP platform.



## Ten reasons to look at ClearVue

- 1) **The company has a superior product with unique technology** – ClearVue<sup>PV</sup> is a patented glazing technology that utilises a smart building material which uses clear glass to convert sunlight into energy. The technology allows visible light to pass through a pane of glass, while the invisible wavelengths of light are deflected to the edges of the glass where they are converted into electricity. ClearVue's offerings are better than competing products because they are more transparent, can generate approx. 30 watts of electricity per square metre, can be customised to suit all climatic conditions, and operate autonomously.
- 2) **There's extensive Intellectual Property (IP) protection backing the technology** – ClearVue expanded its IP Portfolio from Vision Glass Gen-1 – Core IP to a fully integrated building envelope solution. The company has extensive IP protection on its technology and products across multiple jurisdictions worldwide by over 150 patents.
- 3) **CPV's continuous R&D efforts** – The continuous R&D by ClearVue have born substantial fruit in respect of the size, cost and performance of its ClearVue units. The Gen-2 units are 48.5% thinner, have 30% less embedded carbon and are 40% lighter than Gen-1. Compared to previous generation clear vision glass, the cost per watt is down by over 70% when compared to previous generation clear vision glass. Furthermore, the investment into R&D is evident from the performance uplift of other products in the portfolio.
- 4) **CPV already has a significant geographical footprint** – The company expects to derive the majority of its revenue from its key target markets in the US, Europe, Asia and the Middle East. It has further expanded its geographic footprint by entering into several manufacturing and distribution agreements. In November 2023, ClearVue expanded its footprint in the US through the appointment of 8G Solutions as a new distributor, and entered the African and Singaporean markets, boosting the company's growth plans.
- 5) **The license business model means a lower risk for investors** – ClearVue is a deep technology company built around a highly scalable licensing model. The company's technology licensing model enables ClearVue to meet the growing demand for building integrated photovoltaic windows and related environmental products as the building sector reduces its carbon footprint to meet clean energy targets. The business model entails licensing its core IP to existing glass fabricators across the globe. This would enable the company to scale quickly without significant infrastructure investment requirements, headcount, and operational costs.
- 6) **A recently secured ATM facility will boost ClearVue's growth prospects** – In October 2023, ClearVue secured a \$30m 'At the Market (ATM)' facility with Alpha Investment Partners to support the execution of its market entry and expansion plans. The ATM facility provides the company with standby equity capital over the next five years, providing the company with additional flexibility to conduct capital raising activities by closely aligning its capital needs and operational activities. In January 2024, the company used the ATM facility to raise A\$1.725m through the deemed issuance of 3m fully paid ordinary shares at an issue price of A\$0.575 per

*In January 2024, ClearVue secured its first commercial order in Australia to supply Gen-2 ClearVue<sup>PV</sup> solar windows in Melbourne*



share. The share placement reinstates the company's financial flexibility as it scales its business to bring its solar glass technology to customers globally.

- 7) **There are several multidimensional end-market opportunities** – ClearVue operates in the building-integrated photovoltaic (BIPV) sector that represents an innovative approach to incorporating solar energy technology into the fabric of buildings. Unlike standalone solar panels, BIPV integrates photovoltaic materials directly into various building elements, including roofs, windows, façades, and skylights. ClearVue is strategically targeting several high-growth markets, such as commercial BIPV, the skylight market, community infrastructure, greenhouse, and the home improvement markets. Additionally, the company is also focusing on prefabricated homes, building spandrel glass, and the cladding systems markets.
- 8) **The decarbonisation trend acts as a major tailwind** – ClearVue is set to benefit from the ongoing decarbonisation trend. The company supplies glazing products to meet the global need for decarbonisation as buildings and construction contribute nearly 42% of global carbon emissions. The integration of ClearVue<sup>PV</sup> glass with solar spandrel and cladding solutions presents a whole-of-building approach to deliver Net Zero building target obligations. The company is focussed on creating smart building materials that are sustainable, energy efficient and environmentally friendly. Furthermore, the change in global policies such as a Net Zero Economic target adopted by 149 countries so far and the government stimulus (the US Inflation Reduction Act in particular) will play a big part in the transition to renewable energy and substantially boost ClearVue's growth prospects.
- 9) **Strong leadership team in place** – The company has a strong leadership team with significant experience in the glass and the international façade industry. The CEO, Mr. Martin Deil has over 30 years of experience in international façade and architectural envelopes business. The Non-Executive Directors, Mr. Gerd Hoenicke and Mr. Chuck Mowrey also have substantial experience in the international façade industry, and the commercial glass and glazing industries respectively. The leadership team is focused on execution of growth strategy and generating returns.
- 10) **Undervalued** - We believe the stock is undervalued at its current market value. We value the company at A\$1.16 per share in a base case scenario and A\$1.47 per share in an optimistic (or bull) case based on DCF and relative valuation approaches, modelled separately and weighted equally in our final valuation. In our view, the stock should re-rate as the company expects to attain first commercial revenue by the end of FY2024. There are other potential catalysts too including the addition of new projects to its pipeline across target markets and/or of new target markets.





*ClearVue operates in the BIPV sector, supplying glazing products in response to the global need for decarbonisation*

## ClearVue Technologies – a gamechanger in solar powered glass

ClearVue Technologies (ASX: CPV) is a pure play smart building technology company. The company is based in Perth and specialises in the manufacturing and commercialisation of solar-powered glass. The company operates in the building Integrated Photovoltaic (BIPV) sector, and supplies glazing products to meet the global need for decarbonisation as buildings and construction contribute nearly 43% of global greenhouse gas emissions. **The company is well positioned to service a global market for solar windows and façades due to its product innovation, seamless at-scale manufacturing capability, flexible use and collaborative customer partnerships.** It also has extensive IP protection on its technology and products. The IP in the technology system and components of the system are comprehensively protected across multiple jurisdictions worldwide by over 150 patents.

### A brief history

ClearVue in its current form started life in around 2010. The technology was developed in conjunction with Edith Cowan University in Western Australia and was listed in 2018, in a deal valuing the company at \$18m.

Initially, ClearVue's technology was a frame that sat between two independent glass panels. Additionally, there was a lot of emphasis on the core IP. ClearVue's technology is now a glass unit in its own right and relies on a wide range of IP developed in subsequent years.

Since listing the company has made several small non-commercial trials (Melbourne – bus shelter, China – residential, NY – office building) and a number of small further commercial pilots (Canberra – residential, Japan – greenhouse project, Austria – small officewith manufacturing and distributor appointments over the next few years across multiple continents. A significant project for the company was completion of its greenhouse at Murdoch University funded through an Australian federal government CRC-P grant. The greenhouse has been used for extensive data collection on its panels over the years and also on plant yield performance under its glazing.

### What is ClearVue<sup>PV</sup>

ClearVue's technology and product is ClearVue<sup>PV</sup>, a frame of glass (an Insulated Glass Unit) that features a layer of micro and nano-particles that reflect the sun's rays towards embedded solar cells. The solar rays are converted to energy and the system allows up to 70% of the light to pass through, without obstructing the view. The company evolved from producing small prototypes of ClearVue glass in 2011 to producing glass products that can generate up to 33W peak of electric output per square metre of glass. The clear glass can also be customised to suit all climatic conditions and operate autonomously. It is compatible with most global industry framing and glazing standards, thereby providing flexibility in application. The ClearVue glass technology can transform a glass building into a solar PV array generating power, thereby reducing the transmission of power that needs to be sourced from larger distances.

*ClearVue's product is ClearVue<sup>PV</sup> which is a frame of glass containing a layer of nano-particles that reflect the sun's rays towards embedded solar cells*



## How does ClearVue<sup>PV</sup> work

ClearVue's patented technology sits within an activated interlayer between two panes of glass. The interlayer complements the existing glazing industry lamination and manufacturing processes; and requires limited infrastructure investment. Visible light passes through the glass equivalent to about 70% Visible Light Transparency (VLT). Solar PV cells are incorporated around the edges of an IGU used in windows. The company's advanced glazing system combines proprietary nano and micro particles dispersed into an interlayer, a clever internal design and its custom-shaped PV cells. The patented proprietary nano and microparticles interact with UV radiation which is down-converted to longer wavelengths. The combined solution prevents heat and unwanted UV and Infrared solar radiation from entering a building. The solar radiation is then redirected to the edges of the glass pane for harvesting through standard crystalline PV cells to create clean energy – all while allowing natural visible wavelength light to pass through unaltered to provide maximum natural daylighting. The lamination interlayer also incorporates a spectrally selective coating on the rear external surface of the IGU (Figure 1 and Figure 2).

Figure 1: ClearVue's technology overview

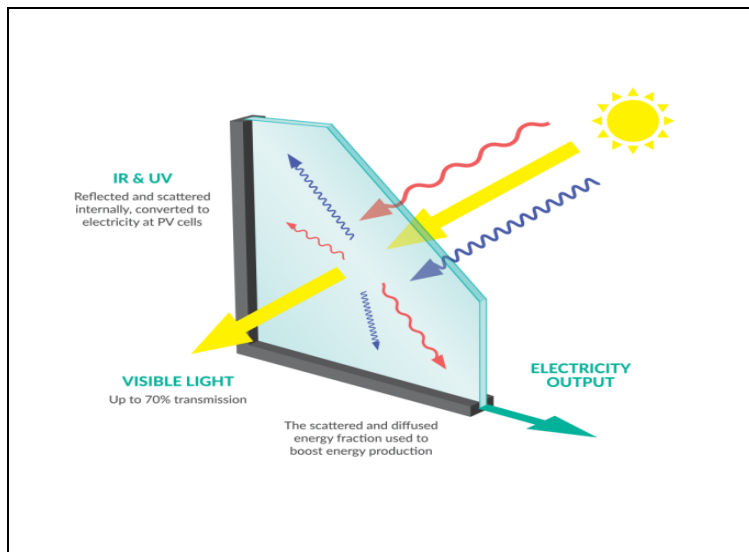
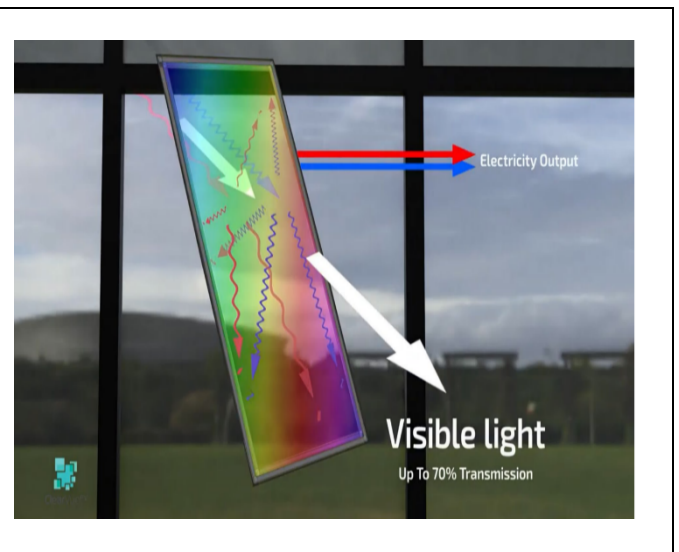


Figure 2: Technology explainer



Source: Company

**ClearVue's IGUs provide a host of benefits such as a high thermal envelope performance, visual light transmissions and carbon neutrality**

## ClearVue has robust product offerings

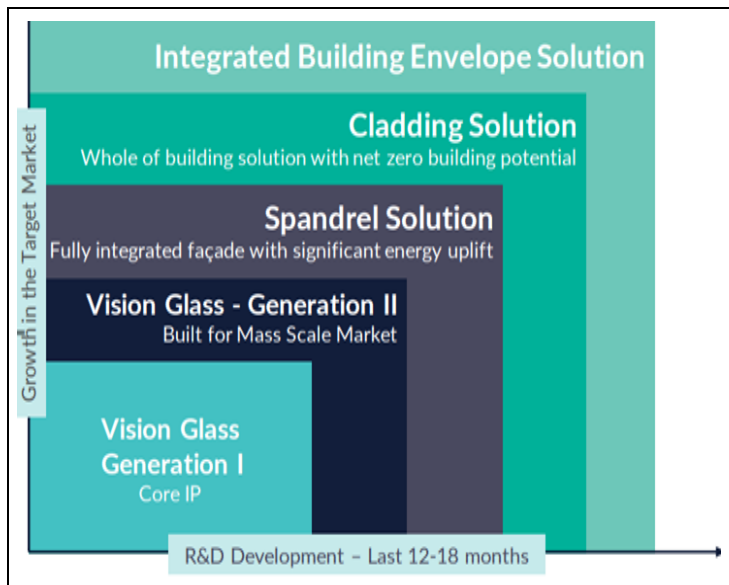
The company is incorporating the components of ClearVue<sup>PV</sup> technology into Integrated Glass Units (IGUs). The second generation of IGUs (hereafter referred to as Gen-2 units), unveiled in mid-2023, are 48.5% thinner, have 30% less embedded carbon and are 40% lighter than the previous generation (Gen-1). A range of features can be added to the ClearVue photovoltaic (PV) glazing units including various IoT-enabled-mechanisms powered by the energy generated by the glass itself. Recently, ClearVue has also expanded its product portfolio to include a new range of products, including Building Envelope solutions, signage, and infrastructure and greenhouses. The integration of ClearVue<sup>PV</sup> glass with solar spandrel and cladding solutions presents a whole-of-building approach to deliver Net Zero building target obligations.





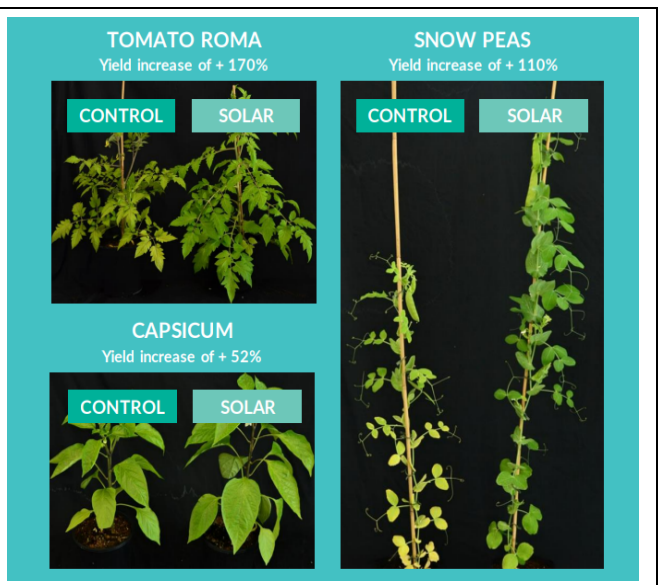
ClearVue has different product lines where it can install greenhouses comprised of clear solar power generating windows. The greenhouse test facility at Murdoch University in Perth, Western Australia, has delivered results surpassing expectations. The results include substantial energy production, significant water savings, and higher crop yields. This leads to higher returns on investment. ClearVue’s PV interlayer impacts certain crop yields’ performance, highlighting that a ClearVue<sup>PV</sup> greenhouse is more than just energy output (Figure 3 and Figure 4).

Figure 3: ClearVue’s expanded product portfolio



Source: Company

Figure 4: Images from Murdoch University study on ClearVue<sup>PV</sup> greenhouse performance



***Incorporation of light sensors and learning algorithms is likely to provide the required intelligence to autonomous windows, boosting the well-being of occupants***

### Intelligent self-powered façade systems - a key offering

ClearVue glass can be used on casement windows as part of a unitised façade system. The casement windows can be controlled by the application on the phone allowing them to open or close at the push of a button. Such smart façades constructed in glass can automatically tint glazing or adjust automated blinds with the sun’s rotation. In order to complement the company’s energy generating glass, ClearVue<sup>PV</sup> is developing a smart façade controller that combines learning, remote management and automated functionality based on inputs from a range of sensors. An intelligent panel embedded with sensors can control ventilation and light levels and offer an optimum working environment that minimises eye strain, drowsiness and headaches. ClearVue<sup>PV</sup> has also demonstrated how incorporating electrochromic and Polymer-Dispersed Liquid Crystals (PDLC) technology can enable the glass to automatically tint and adjust building temperature and lighting comfort. The smart façades also include multiple features such as LED lighting systems which can be integrated into the frame, ventilation responding to CO<sub>2</sub> levels inside the building, internal blinds and a security camera.

In short, not only will the technology be more environmentally friendly and energy efficient for the building – It will give the buildings a new lease of life and also aid the health and well-being of occupants.



## ClearVue<sup>PV</sup> solar glass technology's performance and scalability

In September 2023, ClearVue demonstrated that the design of its Gen-2 IGU can be produced at a mass-scale on an unmodified industry-standard production line. The company's licensed OEM manufacturer in China conducted a commercial production run on a standard manufacturing line with continuous production of 80 IGUs. Inclusion of the components to produce a fully assembled and sealed IGU added only five minutes to the production cycle time compared to non-solar IGU fabrication.

We believe that the announcement of mass-scale manufacturing on the company's industry standard production line is an important milestone for its industry-leading Gen-2 IGUs and façade solutions which integrate solar technology into construction glass and building façades to provide renewable energy. ***The company's ability to mass produce the Gen-2 IGUs provides a confirmation of the commercial viability of the company's product for both commercial and small-scale bespoke products.***

## Gen-2 IGUs surpass Greenmark Platinum in Singapore BCA tests

In October 2023, ClearVue<sup>PV</sup> glass technology was installed in the Singaporean government attested facility Building and Construction Authority (BCA) through its Skylab facility. Over a four-week period in July-August 2023, BCA Skylab directly compared the performance of a West-facing test cell fitted with ClearVue's Gen-2 PV IGU system against a control cell deployed with Singapore's BCA Greenmark Platinum certified double-glazed low-e windows.

The testing confirmed independent, third-party verification of the real-world performance of ClearVue's high energy-output clear solar glass technology benefits for tropical climates. The testing resulted in better-than-expected results with the products being better than the comparable product in terms of solar control performance, better thermal comfort levels and lower temperatures in terms of energy. The technology is likely to deliver even better energy performance in more favourable climatic zones with expectations of improved carbon outcomes in cities with higher grid emission factors providing greater potential CO<sub>2</sub> savings and accelerated carbon paybacks from ClearVue's PV IGUs.

***We believe that these results validate ClearVue<sup>PV</sup> as an outstanding product delivering thermal and energy outcomes and establishes that the Gen-2 clear windows are positioned for growth of the company.***

***BCA's testing programme shows the advantages of ClearVue's PV glazing technology both as an energy generator and a passive design solution***



## ClearVue<sup>PV</sup> technology offers multidimensional benefits

Some of the benefits of the technology are listed below (Figure 5).

Figure 5: The benefits of ClearVue<sup>PV</sup>

Benefits	Details
First in class product	<ul style="list-style-type: none"> <li>ClearVue<sup>PV</sup> is a first in class product with a strong IP portfolio and represents a paradigm shift in the way glass will be used in building construction, agriculture, automobiles, and specialty products.</li> </ul>
Scalable	<ul style="list-style-type: none"> <li>With Gen-2, CPV offers the only clear solar glass (optionally with an integrated smart façade) capable of being produced at an industrial scale without any modifications to production lines meeting industry standards.</li> </ul>
Improved solar glass performance	<ul style="list-style-type: none"> <li>ClearVue<sup>PV</sup> provides a sustainable and innovative new power generation capacity. It is fantastically suited to reduce solar gain considerably without materially reducing the visible light coming through.</li> </ul>
Reduction in power loads	<ul style="list-style-type: none"> <li>The proprietary combination of micro and nano particles coupled with spectrally selective coatings, permit maximum tolerable visible daylight into a building during operating hours. This reduces the power load of the building and need for artificial lighting resulting in health and safety benefits.</li> </ul>
Lower greenhouse gas emissions	<ul style="list-style-type: none"> <li>The BCA test results highlighted that the technology’s potential to deliver meaningful and long-lasting reductions in emissions supporting efforts to mitigate climate change across the construction and property sectors.</li> </ul>
Impact on production time	<ul style="list-style-type: none"> <li>ClearVue<sup>PV</sup> produces minimal impacts on production time meeting commercial architectural requirements. Its integration into the existing fabricator production line has been proven with minimum time interruptions.</li> </ul>
Pushing buildings down the cost curve	<ul style="list-style-type: none"> <li>CPV’s advanced glazing technology drives IRR by pushing a building down the operational cost curve. These include 20-30% cost savings with insulation properties delivering material cost savings on heating and cooling costs, generation of up to 33W peak of energy per square metre of glass, quantifiable improvements in building cash flows, a carbon balance sheet and better tax outcomes.</li> </ul>
Pricing and payback period	<ul style="list-style-type: none"> <li>ClearVue<sup>PV</sup> has a competitive price with payback period along with a technological development pipeline.</li> <li>The Gen-2 PV IGU provides an estimated 4.75-year carbon payback period, while also accounting for emissions offset through solar power generation.</li> </ul>

Source: Pitt Street Research

**Acquisition of Lusoco’s IP and assets is likely to add its ink and printing solution onto ClearVue’s solar façades and IGUs as a new complementary product line**

### Last year’s acquisition of Lusoco BV was a big step

In May 2023, the company signed an asset purchase agreement with Netherlands-based Lusoco BV to acquire the latter’s IP and associated assets. The IP acquisition includes Lucoso’s extensive library of proprietary visible and invisible fluorescent inks that can be printed onto compatible plastics, the PVB interlayer used in glazing as well as other interlayers and materials for various applications. Lusoco’s technology deploys the principles of luminescent solar concentration to redirect light rays that are efficient for the solar cells attached to the edge of a panel (of glass, acrylic, polycarbonate or any other transparent material) for the collection and conversion of solar radiation to power that is stored in a small battery.

**We believe that there are significant synergies between ClearVue and Lusoco not only in terms of cross-pollination of technology (thereby improving upon each other’s technology and product offerings), but also in**



**terms of new business development opportunities.** This in turn results in significant value creation for ClearVue’s customers and shareholders which is what has made it a valuable and unique opportunity.

## Current activities undertaken by ClearVue

ClearVue has received several grants and tenders for studies on solar glass and has entered into manufacturing and distribution agreements with companies in Singapore, Australia, South Korea and the US as well as Israel. (Figure 6).

**Figure 6: Grants and orders secured to lend a significant boost to ClearVue**

Orders secured	Benefits of orders secured
Tender from Hong Kong government	<ul style="list-style-type: none"> <li>In March 2023, ClearVue secured a tender from the Hong Kong government to undertake a Solar Glass study with Hong Kong’s Electrical and Mechanical Services Department.</li> </ul>
Financial assistance agreement with the WA State Government	<ul style="list-style-type: none"> <li>In May 2023, ClearVue signed a financial assistance agreement with the West Australian government to receive a grant of up to A\$2m to provide assistance in the development of a Western-Australia based photovoltaic and nanoparticle components manufacturing facility.</li> </ul>
Limited exclusive distribution agreement with Greendustrial Global Ltd.	<ul style="list-style-type: none"> <li>In September 2023, ClearVue signed a new limited 5-year exclusive distribution agreement with Greendustrial Global Ltd. in Tel Aviv, Israel.</li> <li>The latter was established to distribute ClearVue’s products in Israel for use in curtain wall or façade glass applications in projects up to 20 stories high.</li> </ul>
Commercial order for solar façade in Australia	<ul style="list-style-type: none"> <li>In January 2024, ClearVue secured the first commercial order in Australia from Kapitool Group (a construction company) for a new commercial building project for the Construction, Forestry, Maritime and Employees Union (CFMEU) in Melbourne.</li> <li>The CFMEU will incorporate Gen-2 ClearVue solar windows into the façade of its new Training and Wellness Centre in Carlton.</li> </ul>
Commercial order for solar Greenhouse in the US	<ul style="list-style-type: none"> <li>ClearVue entered the US market with its first commercial order for the supply of ClearVue’s clear solar glass solutions for greenhouses valued at A\$252K.</li> <li>The project is likely to be eligible for incentives created by the US Inflation Reduction Act – this will lead to a market opportunity in global solar greenhouse glass.</li> </ul>

Source: Pitt Street Research

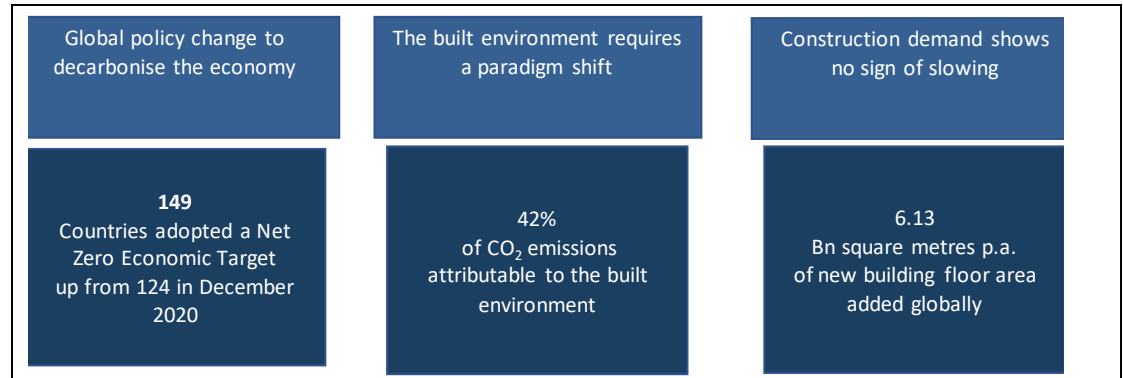
## ClearVue has been doing a lot of work on essential energy

ClearVue operates in a quasi-mandated change environment and is likely to benefit from the decarbonisation of the economy. This requires innovative solutions that can substantially reduce carbon emissions with minimal disruptions. Renewable energy solutions, including solar energy, will play a big part in it and the building and construction sector will be one of the biggest sectors reducing its emissions given it is responsible for up to 42% of global emissions, around 11% coming from the embodied carbon in new builds (Figure 7). The balance being attributed to the operation of the building during its lifetime.

**ClearVue is moving steadfastly on the path for built environment to comply with a country’s Net Zero policy and compliance standards**



**Figure 7: Quasi Mandated Change Environment supports changes in buyer behaviour**



Source: Company, Pitt Street Research

ClearVue presents a path for the built environment to comply with a country's Net Zero policy and compliance standards through energy producing glass. Glass is important and there is no obvious replacement for it. In glass, solar control is a major issue as some incentives could be rolled back in case of changes to the political landscape. The good thing is that it is an easy commodity to calculate its financial costs and payback and prices do not fluctuate anywhere near as much as minerals.

### Key partnerships justify ClearVue's wide reaching scale

ClearVue has expanded its geographic footprint by entering into various manufacturing and distribution agreements globally (Figure 8).

**Figure 8: Partnership agreements signed by ClearVue enhance its geographic footprint**

Partnerships	Benefits for ClearVue
MS Glass	<ul style="list-style-type: none"> <li>In January 2024, ClearVue secured a nationwide manufacturing and distribution agreement with Melbourne Safety Glass and Victorian glass processing specialist, MS Glass. The agreement marks ClearVue's first licensee in Australia.</li> <li>Through the partnership, solar glazing product will be available to the Australian market and is likely to aid further development of energy efficient glass products for the Australian construction industry.</li> </ul>
Luxwall	<ul style="list-style-type: none"> <li>In January 2024, ClearVue entered into a collaboration with LuxWall, a vacuum insulator glass supplier to develop and commercialise the world's first window.</li> <li>The window, called the Zero Window, combines ClearVue's PV solar glazing and LuxWall's advanced vacuum insulated glazing (VIG) products and technologies into one product focussed on assisting the construction sector to reach net zero energy consumption.</li> </ul>
8G Solutions	<ul style="list-style-type: none"> <li>In November 2023, ClearVue expanded its footprint in the US through the appointment of 8G Solutions as a new distributor for its products and technology.</li> <li>The partnership agreement strengthens the company's presence in the US (the company's primary market for growth). It further builds upon the growing network of manufacturers and distributors throughout the US.</li> </ul>
Concept Business Solutions	<ul style="list-style-type: none"> <li>In November 2023, ClearVue entered the African market by appointing Concept Business Group in South Africa as a new distributor.</li> </ul>





	<ul style="list-style-type: none"> <li>The agreement aligns well with South Africa’s incentives to help businesses contribute to a more sustainable energy future and transition to renewable solutions.</li> </ul>
HT Glass	<ul style="list-style-type: none"> <li>In November 2023, ClearVue entered the Singaporean market through a manufacturing and distribution agreement with glass processing specialist, HT Glass.</li> <li>With the agreement, the company is likely to benefit from the expanding market for clean renewable solutions in Southeast Asia. The market expansion is driven by regulations, mainly in Singapore which has one of the world’s most stringent net zero policies including a carbon tax that has been increasing since 2024.</li> </ul>

Source: Pitt Street Research

## ClearVue’s business model lends to fast geographic expansion

**Licensing of ClearVue’s core IP and know-how to existing glass fabricators enables the company to scale quickly without significant investment**

ClearVue is a deep technology company built around a highly scalable licensing model. Its low capital-intensive manufacturing through multiple licensed manufacturing partners presents significant opportunities for the company to scale rapidly. ClearVue’s technology licensing model enables the company to meet the growing demand for building integrated photovoltaic windows and related environmental products as the building sector reduces its carbon footprint to meet clean energy targets. The company’s business model entails licensing of its core IP and know-how to existing glass fabricators around the world. This would enable the company to scale quickly without significant infrastructure investment requirements, headcount, and operational costs.

ClearVue derives revenue from potential for upfront and renewal license fees, royalty fees on square metres of glass sold, component sales (integrating core IP) in the distribution and license model, cross-selling and upselling smart façade solutions (commercial ready products in development) and margin on the nanoparticle interlayer, PV strips, connecting components and spandrel and façade components supplied to the licensee. Direct sales conducted by the ClearVue team also contribute to revenue generation. All sales sourced directly by ClearVue will be made under Original Equipment Manufacturing (OEM) arrangements in China and other territories. Payments for direct sales are received under agreed production or installation milestones.

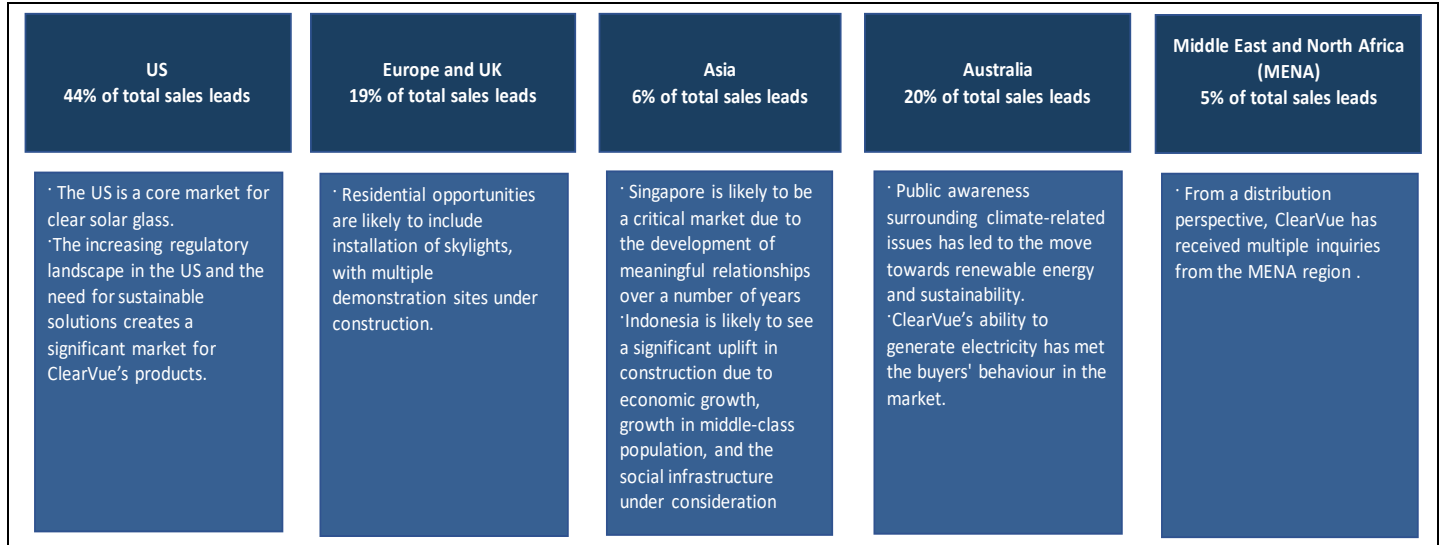
ClearVue is currently deriving the majority of the revenue from the US, followed by Europe, Asia, Middle East and North America. ClearVue is currently focusing on sales and marketing opportunities in the US, with 44% of sales originating in the country (Figure 9).

ClearVue has a key deployment, manufacturing development and commercialisation strategy. The deployment strategy includes supply of completed IGUs, continued testing and certifications, partnerships with industry innovators and focussing on obtaining first commercial building deployment. The manufacturing development strategy includes integration of the system into the manufacture of traditional IGUs. The manufacture of traditional IGUs entails incorporation into the partner’s preferred IGU manufacturing assembly lines, capability to manufacture worldwide, increase the current volume capacity and reduced production costs.





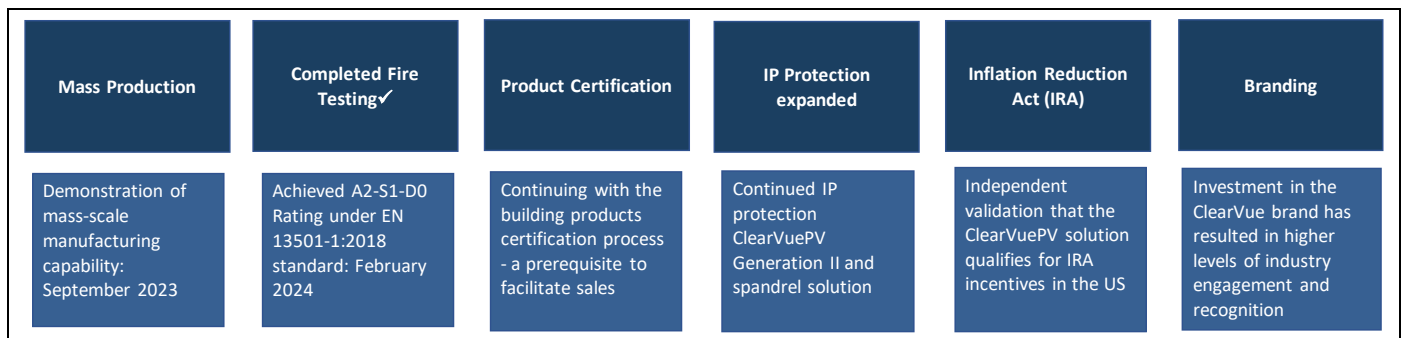
**Figure 9: ClearVue’s current business pipeline by geography**



Source: Company, Pitt Street Research

ClearVue is also taking a pragmatic approach to its commercialisation strategy. The company’s commercialisation strategy entails the exploration of Joint Venture (JV) opportunities, a focus on licenses, scalability, continued development of the company’s new product using its core IP platform and engagement of the industry in discussions on ESG and CSR mandates. A key to the commercialisation strategy is the speed and leverage without the need for significant capital investment (Figure 10).

**Figure 10: To sell globally, ClearVue has to comply globally**

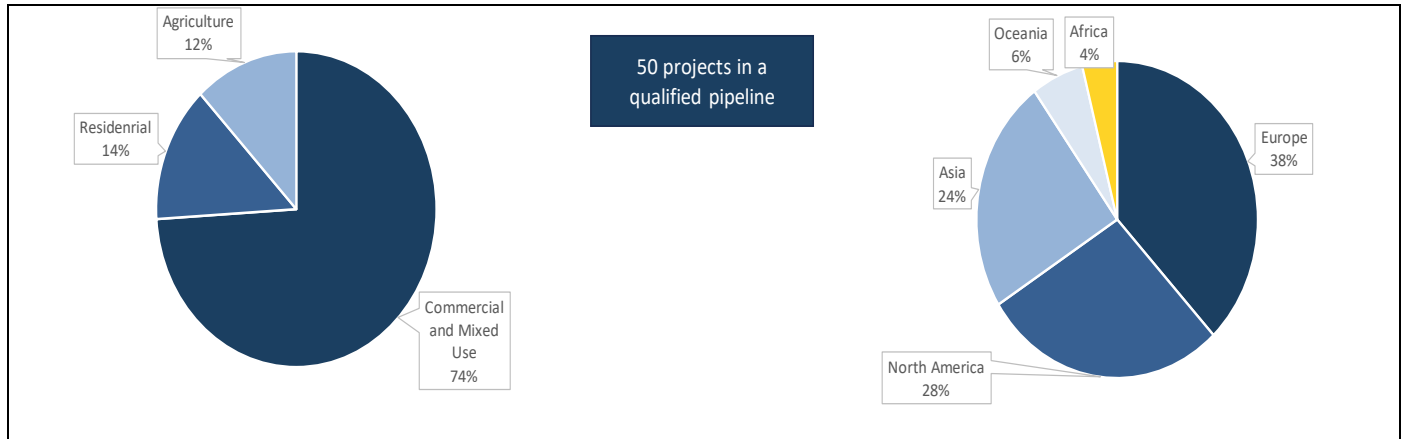


Source: Company, Pitt Street Research

ClearVue is also working on a range of projects at various levels of engagement, employing one or more of the company’s products. They are geographically spread across key markets with the majority representing commercial construction projects (Figure 11).



**Figure 11: ClearVue’s business pipeline**

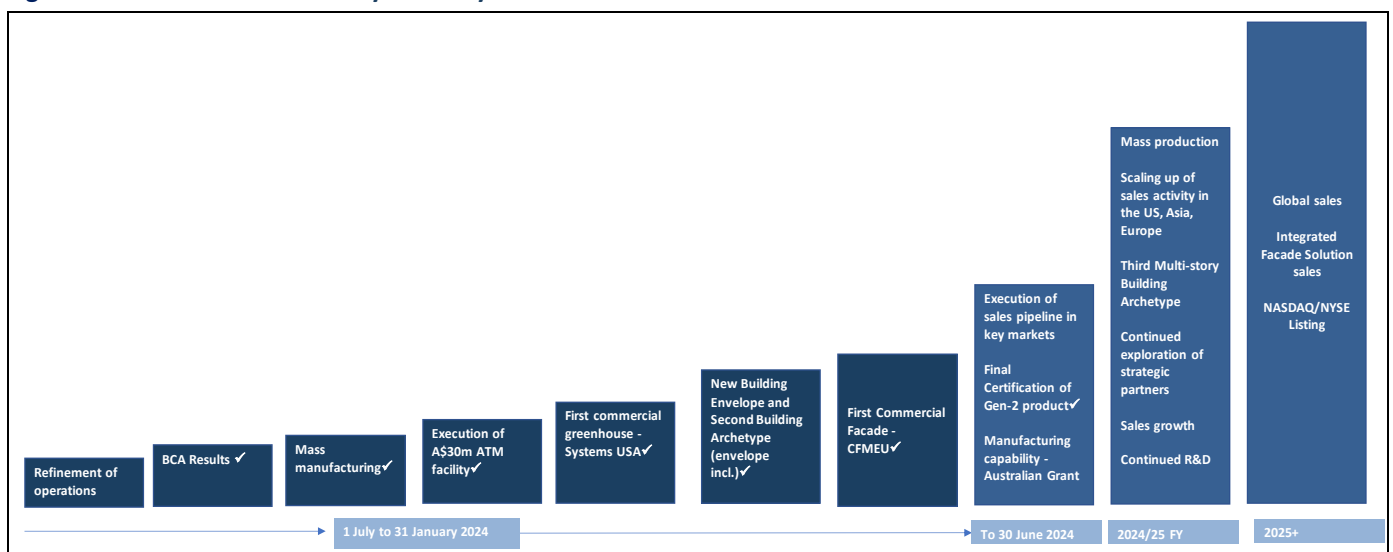


Source: Company, Pitt Street Research

In October 2023, ClearVue also secured a \$30m on-call ‘At the Market (ATM)’ facility with Alpha Investment Partners. The ATM provides the company access to cost-effective standby equity capital over five years to support the company’s growth plans. In January 2024, the company also used its ATM facility to raise A\$1.725m by agreeing to a deemed issuance of 3m fully paid shares to Alpha Investment Partners at an issue price of A\$0.575 per share. We believe that the share placement to Alpha Investment Partners through the ATM subscription agreement reinforces the company’s financial flexibility as it scales its business to bring the company’s unique clear solar glass technology to customers globally. The additional funds will also enable the company to support the important acquired projects in Australia, the US and Singapore and commercial pilots such as the CFMEU Wellness Centre and a solar greenhouse in California.

The milestones achieved by the company till date have been critical to the company’s transformation. This, in turn puts ClearVue on track for scaled commercialisation and getting the product into the market (Figure 12).

**Figure 12: Milestones achieved by February 2024**



Source: Company, Pitt Street Research



## There's significant untapped market potential for ClearVue

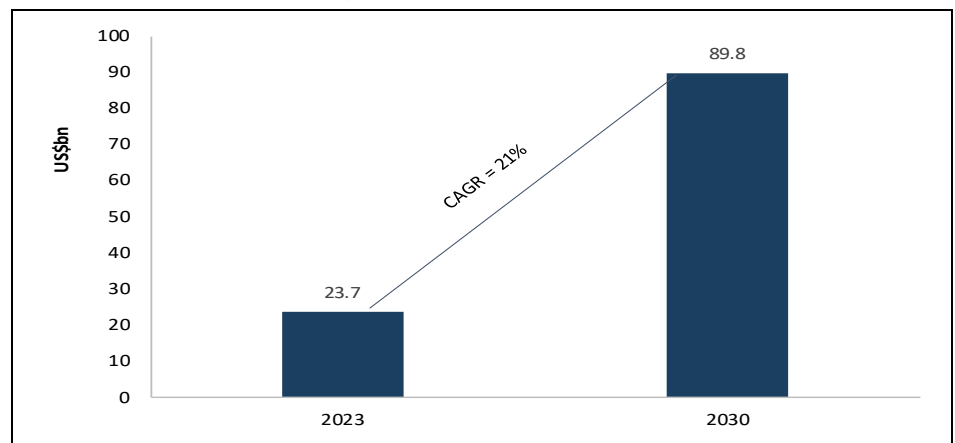
ClearVue operates in the building-integrated photovoltaic (BIPV) sector. The BIPV sector represents a dynamic and innovative approach to incorporating solar energy technology into the fabric of buildings. Unlike standalone solar panels, BIPV integrates photovoltaic materials directly into various building elements, including roofs, windows, façades, and skylights. This integration not only generates electricity but also serves as an integral part of the building's design and structure. ClearVue is strategically targeting several high-growth markets, such as commercial BIPV, the skylight market, community infrastructure, greenhouse, and the home improvement market. Additionally, the company is also focusing on prefabricated homes in the US, building spandrel glass, and the cladding systems markets.

*Expanding PV capacity, rising demand for renewable energy, supportive government regulations, global emission reduction commitments, and ongoing innovation are likely to drive BIPV market growth*

## BIPV market is set to grow significantly

As per estimates of Grand View Research, the global BIPV market is likely to grow from US\$23.7bn in 2023 at a CAGR of 21% to US\$89.8bn in 2030 (Figure 13). This growth is expected to be driven by expanding photovoltaic installation capacity, growing demand for renewable energy, energy security awareness, favourable government regulations, and global commitments to reduce greenhouse gas emissions. The ongoing innovation in the domain is also anticipated to enhance the operating efficiency of these products, further contributing to market growth. Rising disposable incomes and a growing preference for integrated installations in residential and commercial buildings are expected to boost the demand further.

Figure 13: BIPV market share growth



Source: Grand View Research, Pitt Street Research

## Roof installations, growing industrial demand to drive the BIPV market share

BIPV is predominantly utilised in roof installations, which constituted over 60% of the market share in 2021. The integration of photovoltaics with building roofs enhances efficiency by optimising light incidence on the roof surface. The market is poised to record solid growth through the evolution of interlocking roof systems that employ tiles designed for interlocking, ensuring both high conversion efficiency and a substantial reduction in the weight of building-integrated roofs.



A steady growth is expected in other segments as well. Superior efficiency of solar walls due to strong incident sunlight is expected to drive the demand for BIPV in walls. Introduction of advanced low-weight solar panels is expected to facilitate the demand for building integrated walls. BIPV façades are also expected to experience high demand, primarily in the developed economies that have a well-established electricity distribution system. The demand for integration of photovoltaics with façades is likely to be driven by their increasing installation in the commercial sector. Glass integrations are expected to grow on account of high transparency of integrated systems coupled with superior integration of glass and BIPV cells. ***The glass façade market is ClearVue's key focus area, and the company expects it to be an important long-term revenue driver.***

In terms of end-users, the industrial segment leads the BIPV market, representing approximately 40% of the market share in 2021. The demand for BIPV in industrial establishments is projected to increase, as consumers in this segment prioritise cost reduction. Furthermore, many industries adopt these solutions to project an environmentally friendly image to their consumers.

Examining the technology, building-integrated solar modules utilise either crystalline silicon solar cells (c-Si) or thin films such as cadmium telluride (CdTe), amorphous silicon (a-Si), and copper indium gallium selenide. The crystalline silicon segment dominated the market in 2022, holding a market share of over 70%. It must be noted that ClearVue does not use either the current conventional silicon or the thin-film solar approach to BIPV. ClearVue's solar concentrator is a selective polyvinyl butyral interlayer sandwiched between two panes of glass that drives light to PV strips which currently use silicon based PV but these could be interchanged with thin-film, perovskite or other solutions as applicable or as they become available.

### **Demand for BIPV skylights is likely to soar, especially due to growth observed in the construction sector**

BIPV skylights are specialized skylights that incorporate photovoltaic technology to generate solar energy. These skylights serve a dual purpose by allowing natural light to enter a building while simultaneously capturing sunlight and converting it into electricity. BIPV skylights are becoming increasingly popular in the construction industry due to the growing focus on energy efficiency and sustainability. According to Allied Market Research, the global BIPV skylight market was valued at US\$1.25bn in 2020 and is anticipated to reach US\$5.3bn by 2030, increasing at a CAGR of 15.3% from 2021 to 2030. Increase in construction activities in various regions such as Asia-Pacific & Europe and rise in demand for high appealing designs for buildings are behind the growth of this market. ***ClearVue has recognised the skylight segment as a short-term revenue driver.***

### **BIPV integration in greenhouses is likely to further boost demand**

The integration of BIPV in greenhouses offers a sustainable and energy-efficient solution for the agricultural sector. It protects crops from extreme heat and cold, wind and pests, while minimising energy use and utilising the structure to generate clean electricity. According to Grand View Research, the greenhouse market is expected to grow at a CAGR of 9.9% between 2023 and 2030, reaching a value of US\$53.5bn. Rapid urbanisation, which is accelerating the adoption of modern agricultural techniques, and population growth, which is leading to increasing demand for food, are the key factors driving this growth. In addition, issues such as the global decline in arable land

***Surge in construction activity and rising importance of energy efficiency are key factors influencing market demand for BIPV skylights***



and government interventions such as export subsidies, tariffs, or import levies are further supporting the growth of the market. While plastic greenhouses dominate the market, accounting for around 58% of the market share in 2022, glass greenhouses are expected to grow at the highest CAGR of 10.3% between 2023 and 2030. Therefore, as a result of the increasing demand for greenhouses, the BIPV sector is also likely to witness a solid surge in demand.

### Attractive opportunities in the Public Infrastructure market

Public infrastructure such as bus shelters, street furniture and public artwork that use laminated glass or plastic surfaces and that need to be lit at night represent attractive opportunities for ClearVue. ***The company has recognised the small scale commercial, social infrastructure projects as a medium-term revenue driver as it sees opportunity in the Public Infrastructure market.***

## Our valuation of ClearVue

We have used a combination of Discounted Cash Flow (DCF) and Relative Valuation (50:50) methods to arrive at the intrinsic value of the company. Our blended approach (modelling both approaches separately then deriving a value per share weighting both approaches 50-50) yields a valuation of A\$1.16 per share in our base case and A\$1.47 per share in our optimistic/bull case.

### DCF calculation and assumptions

Our DCF approach values ClearVue at A\$1.38 per share in the base case and A\$1.89 per share in the bull case (Figure 14 on page 20). Our key assumptions are as follows:

#### Top-line growth

We derived the company's future revenue using a market share-based approach based on global solar greenhouse market. Although the company has various other target markets and 50 projects in its pipeline across various markets, we have considered global solar greenhouse market as the basis of our forecast as this is the short-term target market of the company.

As per our estimates, we estimate ClearVue's market share to reach 5% in our base case and 6% in our bull case by FY2030. By this time, the global solar greenhouse market is A\$20.6bn in both cases. We have further assumed that ClearVue undertakes a licensing model and receive royalty revenue from the share in global market, assuming a rate of 15% on sales.

The growth in revenues will occur because of:

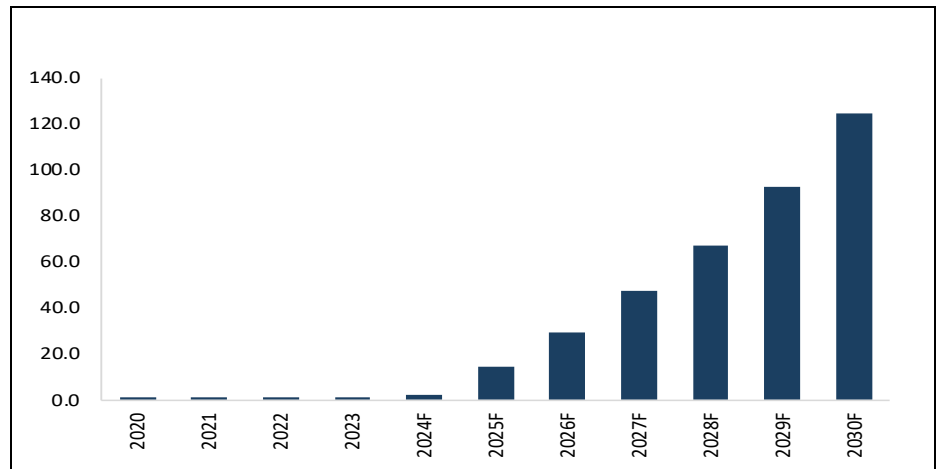
- Growth in the greenhouse market which is estimated to grow at 7.5% CAGR for 2022 to 2029.
- Growth in royalties revenues, driven by increased take up.

As a result of our assumptions, the company's overall top line is expected to grow at a CAGR of 93.8% in our base case and 95.1% in our bull case for the time period of FY2023-30.

***We expect the group's top-line growth to outpace the industry growth in the forecast period***



Figure 14: Solid revenue growth trajectory (base case) (A\$m)



Source: Pitt Street Research

### Profitability growth

We have assumed high gross margin as the company is entering license business model and will earn royalty revenue. The business is likely to experience margin expansion resulting from the economies of scale, plus the uplift from ongoing licensing fees increases beyond FY2027/28. Other operating costs, such as consulting and other expenses, have been calculated as percentage of revenues. We assume an EBITDA breakeven to happen in FY2027 in our base case and by FY2026 in our bull case scenarios. However, we have modelled to achieve net profitability only by FY2027 across both our scenarios. We have arrived at a net margin of 2.1% in our base case and 7.1% in our bull case for FY2027. Our basis is that the margins will improve on the back of economies of scale as the company continues to scale and enter the target markets.

### Capital Structure (additional shares have been assumed)

The group has secured a A\$30m ATM Facility Agreement with Alpha Investment Partners. This agreement aims to support the continued execution of its market entry and expansion plans over the next five years. The company has utilised its ATM facility, raising A\$1.725m through a deemed issuance of 3m fully paid ordinary shares to Alpha at an issue price of A\$0.575 per share. There will be dilution in the capital structure over time as options across a variety of strike prices are assumed to be exercised in the FY2024 and 2025. In terms of future "new" capital injections, the group is expecting to go to the market progressively to limit unnecessary dilution of the existing share register.

**Tax:** We assume 30% corporate tax rate, equivalent to the local tax rate for companies based in Australia.

**Discount rate and terminal value growth rate:** We have used a WACC of 14.3%. This is derived from a risk-free rate of 4.1%, a beta of 1.2, and an equity premium of 8.5%. Considering that the company (with increasing demand for green buildings and reduction of carbon emissions to net zero) has excellent growth prospects in future, we have assumed terminal growth rate of 2% (Figures 15 and 16).





Figure 15: ClearVue technologies DCF valuation

ClearVue Valuation (A\$m)	Base case	Bull case
<b>Enterprise value</b>	<b>365.6</b>	<b>501.3</b>
Net (debt) cash	0.2	(1.6)
Provisions	(0.2)	(0.2)
<b>Equity value</b>	<b>365.6</b>	<b>499.5</b>
Diluted shares (m)	263.9	263.9
<b>Implied price (A\$)</b>	<b>1.39</b>	<b>1.89</b>
Current price (A\$)	0.530	0.625
Upside (%)	161.4%	202.9%

Source: Pitt Street Research

Figure 16: Sensitivity analysis of target price for varied WACC and terminal growth rate (base case)

		WACC							
		1.125	12.8%	13.3%	13.8%	14.3%	14.8%	15.3%	15.8%
Terminal Rate	1.25%	1.626	1.515	1.413	1.321	1.236	1.159	1.088	
	1.50%	1.656	1.541	1.436	1.341	1.255	1.175	1.102	
	1.75%	1.686	1.568	1.460	1.363	1.274	1.192	1.118	
	2.00%	1.718	1.596	1.485	<b>1.385</b>	1.293	1.210	1.134	
	2.25%	1.752	1.625	1.511	1.408	1.314	1.228	1.150	
	2.50%	1.787	1.656	1.539	1.432	1.336	1.247	1.167	
	2.75%	1.824	1.689	1.567	1.457	1.358	1.267	1.185	

Source: Pitt Street Research

*The company's strong market and financial position warrants a premium versus peer valuation*

## Peer group valuation and assumptions

ClearVue's peers include large as well as small size companies which are into building integrated photovoltaic solutions. We have considered six peer companies globally. These include: ML System S.A. (WSE:MLS); SolarBank Corporation (CNSX:SUNN); Umbrella Solar Investment, S.A. (BME:USI); Atrato Onsite Energy plc (LSE:ROOF); Enerside (BME:ENRS); Westbridge Renewable Energy Corp (TSXV: WEB).

By using the average EV of A\$190.5m and applying suitable premium, we arrive at a valuation of A\$0.936 per share in the base case and A\$1.041 per share in the bull case (Figures 17 and 18). **This premium (25% in the base case and 40% in the bull case) is the key difference between the base and bull cases in our relative valuation.** We believe that the company is in a better position to grow in future due to its growing projects in its pipeline and hence should trade at a premium to the average peer multiple.



Figure 17: Peer Group Valuation

Company Name	Ticker	M-Cap <sup>^</sup> (A\$ m)	EV <sup>^</sup> (A\$ m)
ML System S.A.	WSE:MLS	133.0	176.0
SolarBank Corporation	CNSX:SUNN	223.0	219.0
Umbrella Solar Investment, S.A.	BME:USI	206.0	234.0
Atrato Onsite Energy plc	LSE:ROOF	210.0	138.0
Enerside	BME:ENRS	183.0	237.0
Westbridge Renewable Energy Corp	TSXV: WEB	104.0	139.0
<b>Average</b>		<b>176.5</b>	<b>190.5</b>
<b>Median</b>		<b>194.5</b>	<b>197.5</b>

Note: <sup>^</sup>21 Feb 2024

Source: Refinitiv and Pitt Street Research

Figure 18: Clear Vue's Relative Valuation

(A\$m unless specified)	Base Case	Base Case
Sector Average EV	197.5	197.5
Discount/ Premium	25.0%	40.0%
<b>Implied EV</b>	<b>246.9</b>	<b>276.5</b>
Net (debt) cash	0.2	(1.6)
Provisions	(0.2)	(0.2)
<b>Equity/Book value</b>	<b>246.9</b>	<b>274.8</b>
Diluted Shares (m)	263.9	263.9
<b>Implied price (A\$)</b>	<b>0.936</b>	<b>1.041</b>
Current price (A\$)	0.530	0.530
Upside (%)	76.5%	96.4%

Source: Refinitiv and Pitt Street Research

## Blended valuation

We arrive at a final valuation of A\$1.16 per share in the base case and A\$1.47 per share in the bull case. We have considered the global greenhouse market in our estimates and believe that if the company gets contracts into other target markets, this will help gain investors' confidence in the stock. The target price range represents a substantial upside to the current price, thus providing enough cushion for potential investors (Figure 19).

Figure 19: Aggregate Valuation

ClearVue Valuation (A\$m)	Base case	Bull case
<b>Enterprise value</b>	<b>306.2</b>	<b>308.7</b>
Net (debt) cash	0.2	1.6
Provisions	(0.2)	(0.2)
<b>Equity value</b>	<b>306.2</b>	<b>387.1</b>
Diluted shares (m)	263.9	263.9
<b>Implied price (A\$)</b>	<b>1.16</b>	<b>1.47</b>
Current price (A\$)	0.530	0.530
Upside (%)	118.9%	176.8%
<b>Mid-point Target Price</b>	<b>1.314</b>	
Upside (%)	147.9%	

Estimates: Pitt Street Research



## Catalysts for a re-rating

ClearVue is currently trading below our valuation range. We believe the following factors can contribute to the re-rating of the stock in the direction of our valuation range:

- ClearVue’s business model to license its core IP and know-how to existing glass fabricators would enable the company to scale quickly without significant infrastructure investment requirements, headcount, and operational costs. The company has signed its first commercial order in US for a greenhouse project and has also collaborated with LuxWall, 8G Solutions and MS Glass to scale its business.
- The company’s first revenues attained with a strong pipeline bolstered by global strategic manufacturing and distribution partnerships. The company has 50 projects in its pipeline spread across various geographies and sectors. The projects majorly represent commercial construction projects. These can be a potential catalyst for the company.
- ClearVue’s building envelope (Solar Cladding, Vision Glass, Solar Spandrel) expands its target market to the Cladding systems market and Building Spandrel glass market. This market opportunity is a potential catalyst for re-rating.
- The company is set to benefit from the decarbonisation of the economy. Government stimulus (the United States Inflation Reduction Act, the EU Green Deal and RePower EU) will play a big part in the transition to renewable energy. The company also obtained final certification of its Gen-2 product. These certifications and government support are potential catalyst for re-rating.

## Risks

We foresee following key risks to our investment thesis for ClearVue:

- **Competitive risk:** ClearVue is in a highly competitive market. There is risk of major competitors obtaining the market share through development of superior technology in the race to achieve net zero emissions.
- **Licensee risk:** There is risk that the company will not be able to engage licensees to manufacture and distribute its products, or that the actions of ClearVue’s licensees may impact the final products and the company’s reputation.
- **Supply chain risk:** ClearVue’s ability to commercialise its technology will depend heavily on its ability to source underlying products and to manufacture them to an acceptable quality. Any disruption to supply chains will impact the delivery of its products.
- **Cost inflation risk:** There is the risk that the company could be hit by cost inflation that could erode company margins.
- **Key personnel risk:** ClearVue’s performance is highly dependent on its management team and the staff. There is a risk that the company might lose these individuals and might be unable to replace them and/or their contribution to the business.



## Appendix I: Comparable Companies

In order to provide an idea of the broad competitive landscape for ClearVue, we have screened companies using the following criteria:

- 1) Companies based in developed markets with market capitalisation lower than US\$500m.
- 2) Public companies operating in the building integrated photovoltaic solutions market.

**ML Systems S.A. (WSE: MLS)** produces and distributes photovoltaic solutions in Poland. The products offered by the ML System are used in both classic roof and ground photovoltaic installations, in sustainable construction, in land and water transport, and in the automotive industry. The company was incorporated in 2007 and is headquartered in Poland, Europe.

**SolarBank Corporation (CNSX: SUNN)** operates as a full-service renewable and clean energy project developer and asset operator in Canada and the United States to focus on commercial, industrial, community solar and utility-scale solar opportunities. The company was incorporated in 2013 and is based in New York, US.

**Umbrella Solar Investment, S.A. (BME: USI)** operates as a vertically integrated company in the photovoltaic solar energy value chain in Europe and Chile. The company generates renewable electricity as well as produces advanced equipment for residential solar self-consumption. The company is headquartered in Valencia, Spain.

**Atrato Onsite Energy plc (LSE: ROOF)** provides onsite clean energy generation services in the United Kingdom and the Republic of Ireland. It offers a complete renewables solution to handle everything from planning and grid connection to installation and lifetime maintenance. The company was founded in 2021 and is headquartered in London.

**Enerside, S.A. (BME:ENRS)** is engaged in the development, construction, and maintenance of renewable energy projects. It is developing approximately 6.8 GW of solar photovoltaic generation projects in Europe and Latin America. The company was incorporated in 2007 and is headquartered in Barcelona, Spain.

**Westbridge Renewable Energy Corp (TSXV: WEB)** is engaged in the originating and developing solar PV projects in Canada, US and the UK. The company was incorporated in 1956 and is based in Vancouver, Canada.

**Onyx Solar Group LLC** is a manufacturer of transparent photovoltaic (PV) glass for buildings. Onyx Solar uses PV Glass as a material for building purposes as well as an electricity-generating material, with the aim of capturing the sunlight and turn it into electricity. The company was founded in 2009 and is based in Avila, Spain.

**Polysolar Ltd.** Is a developer, designer and installer of architectural solar solutions. The company developed and commercialised a range of transparent photovoltaic glazing materials for integration into an extending variety of integration solutions. The company was founded in 2007 and is based in Cambridge, England.

**Hanergy** is a clean energy and a thin-film solar power company, engaged in the integration of the entire photovoltaic industry chain, covering R&D, high-end equipment manufacturing, PV module production and construction of photovoltaic power plants. The company was founded in 1989 and is based in Beijing, China.



**Viasolis** is a manufacturer of PV glass and provider of solar energy solutions; Via Solis PV modules are ideal for both conventional roof-mounted, façade-mounted, ground-mounted PV installations as well as non-standard PV installations and Building Integrated projects. The company was founded in 2009 and is based in Lithuania, Europe

**Next Energy Technologies:** is a developer of transparent energy harvesting window technology. The technology is designed to offer windows that generate energy from the sun. The company's technology offers transparency and efficiency, even under high-angle and low-light conditions. It offers coatings that are integrated directly into dual-pane windows and eliminate encapsulation costs, enabling clients to transform windows and glass façades into producers of low-cost, on-site, renewable energy for buildings.

**Ubiquitous Energy:** develops transparent photovoltaics to eliminate the battery life limitations of mobile devices and power smart glass for buildings. It offers ClearView Power technology, a solution that transmits the light visible to the human eye and selectively captures and converts ultraviolet and near-infrared light into electricity to power devices and extends its battery life. The company was incorporated in 2011 and is based in Redwood City, California.



## Appendix II: Seasoned Leadership Team in place

ClearVue has a seasoned leadership team in place with extensive experience in the pharmaceutical, biotech and healthcare industries (Figure 20).

Figure 20: ClearVue’s management and board members

Name and Designation	Profile
<b>Victor Rosenberg</b> Non-Executive Chairman & Founder	<ul style="list-style-type: none"> <li>Victor Rosenberg has 25 years of glass industry experience and is a serial entrepreneur. He brings extensive senior executive sales and management experience to ClearVue, having led multiple start-ups in the pharmaceutical and food manufacturing industries.</li> <li>Trained in pharmacy, Mr Rosenberg started and exited a generic drug company before moving into food technology and since emigrating to Australia, has been involved in the glass industry through the establishment of ClearVue.</li> </ul>
<b>Martin Deil</b> CEO	<ul style="list-style-type: none"> <li>Martin Deil has over 30 years of experience in international façade and architectural envelopes business.</li> <li>Mr Deil holds a Bachelor of Science (Honours) Degree in Management and Systems from City University London.</li> </ul>
<b>Jamie Lyford</b> Executive Director	<ul style="list-style-type: none"> <li>With over two decades of experience, Jamie Lyford has worked extensively in the areas of Intellectual Property, commercialisation and technology both as a lawyer and commercialisation specialist.</li> <li>Mr Lyford holds Master of Laws (LL.M.) in Intellectual Property from Murdoch University and The University of Western Australia.</li> </ul>
<b>Harry Miller</b> Company Secretary	<ul style="list-style-type: none"> <li>Harry Miller has over 8 years of experience in corporate, compliance, and accounting.</li> <li>He is Company Secretary to several ASX-listed and private organisations and has been involved in various corporate transactions.</li> <li>Mr Miller holds a Master of Professional Accounting and a double major in Finance and Economics from The University of Notre Dame Australia.</li> </ul>
<b>Geoff Edwards</b> CFO	<ul style="list-style-type: none"> <li>Geoff Edwards is a qualified Certified Public Accountant with over 30 years of experience in CFO, senior financial, and commercial roles across various service organisations.</li> <li>He has held key positions at various organisations such as Mest Management Services, Bossair, Engage Marine, Condor Energy Services, Brierty Limited and Neptune Marine Services.</li> </ul>
<b>Earle Harper</b> Chief Commercial Officer	<ul style="list-style-type: none"> <li>Earle Harper has over 25 years of corporate and federal government experience.</li> <li>Mr Harper has held key responsibilities of stakeholder engagement, investor relations, and business strategy and worked with multiple financial services and corporate clients.</li> <li>He has a double major in Banking &amp; Finance and Marketing from the Monash University.</li> </ul>
<b>Clifton Smyth</b> Chief Business Development Officer	<ul style="list-style-type: none"> <li>Clifton Smyth has over 20 years of experience in the façade, architectural &amp; construction sector, with extensive experience in global supply chain management, risk management and securing projects across Europe and the Middle East.</li> </ul>





- |  |                                                                                                                                               |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>• Mr Smyth has a master's degree in business administration from the University of Liverpool.</li></ul> |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------|

Source: Pitt Street Research

## Appendix III – Glossary

**Building Envelope** – A building envelope includes all building components that separate indoors from outdoors. Building envelopes include exterior walls, foundations, roofs, windows and others.

**Building Intergated Photovoltaic (BIPV)** – BIPVs are solar power generating products or systems that are seamlessly integrated into the building envelope and part of building components such a façades, roofs or windows.

**Cladding** – Cladding is the application of one material over the other to provide a skin or layer. In construction, cladding is used to provide a degree of thermal insulation and weather resistance and improve the appearance of buildings.

**Greenhouse** – Greenhouse is a building designed for the protection of tender or out-of-season plants against excessive cold or heat. As glass became cheaper and more sophisticated forms of heating became available, the greenhouse evolved into a roofed and walled structure built of glass with a minimal wooden or metal skeleton.

**Electrochromic** – Electrochromic glazing has the potential for the improvement in energy efficiency and occupant comfort afforded by architectural windows. These smart windows can dynamically control light transmission by windows in buildings, automobiles, and aircraft.

**Façade system** – Façade systems comprise the structural elements that provide lateral and vertical resistance to wind and other actions, and the building envelope elements that provide the weather resistance and thermal, acoustic and fire resisting properties.

**Insulated Glass Units** – Insulated glass units (IGUs) prevent heat loss through your glass doors and windows. The units consist of two panes of glass separated by an inert gas.

**Nano-particles** – Nanoparticles are spherical, polymeric particles composed of natural or artificial polymers. The particles have a wide range of potential applications due to their spherical shape and high surface area to volume ratio.

**Net Zero** – Net zero refers to the balance between the amount of greenhouse gas (GHG) that is produced and the amount that's removed from the atmosphere. It can be achieved through a combination of emission reduction and emission removal.

**PDLC** – PDLC is a smart glass technology indicating that its needs electricity to turn on and off. When a low voltage is applied, the molecules into a formed manner allowing light to pass straight through and making the glass transparent. As electricity is turned off, The LC molecules scatter randomly again, breaking the passage of light and turning the glass opaque.

**Photovoltaics** – Photovoltaic technology most commonly known as solar panels generate power using devices that absorb energy from sunlight and convert it into electrical energy through semiconducting materials.

**Solar spandrel** – Spandrel glass is the opaque glass that conceals structural building components such as columns, floors, HVAC systems, vents, electrical wiring and plumbing, preventing these from being visible from the exterior of



the building. Curtain wall and structurally glazed designs often require the use of spandrel glass to achieve an architect’s vision of the finished project.

**Zero Window** – A Zero Window is a net-zero focused window, reducing operational carbon through both thermal insulation and power generation.

## Appendix IV – Major Shareholders

Investor Name	Ownership (%)
Luminate Pty	8.84%
Rosenburg B.D.S, C, Dent, F.D, H.Dip, R,S, Ian Former Director	8.81%

Source: S&P Capital IQ, Pitt Street Research

## Appendix V – Capital Structure

Class	In millions	% of fully diluted
Quoted Securities		
Ordinary shares on issue	230	87.3%
Unquoted		
Options and performance rights	33.4	12.7%
<b>Fully diluted shares</b>	<b>263.4</b>	

Source: Application for quotation of securities

## Appendix VI – ClearVue has a long list of patents

For example:

**WO 2013, 003890**, *A spectrally selective panel*, priority date 29 June 2012, invented by Victor Rosenberg, Mikhail Vasiliev and Kamal Alameh

- The patent discloses a spectrally selective panel comprising a diffractive element (such as a phase grating) etched/embossed on the panel. The panel comprises an air-filled gap, wherein the diffractive element is placed. The element is made from a partially light-transmissive material and features grooves filled with epoxy containing luminescent scattering powders and pigments. The panel allows transmission of visible light while deflecting infrared light to cool interior spaces without the need for energy-intensive cooling systems.
- Applications for the patent were filed in the US, Japan, Europe, Denmark, Spain, Mexico, South Korea, Portugal, Poland, Malaysia, China, Canada, Brazil, Australia, Norway and South Africa. It has also been filed as a WIPO application.
- The patent has been granted in multiple geographies, such as the US, Canada, Europe, South Korea and Japan.

**WO 2015, 024046**, *A device for generating electric energy*, priority date 15 August 2014, invented by Mikhail Vasiliev, Kamal Alameh and Victor Rosenberg

- The patent pertains to a device (in the form of a window, etc.) for generating electricity from light using photovoltaic (PV) elements. The



device comprises a partially light-transmissive panel featuring multiple PV elements placed on the edges to convert incident light into electric energy. The panel redirects the incident light to the PV elements for energy conversion that are further coated with an optically transmissive material for protection.

- Applications for the patent were filed in the US, Europe, Canada, Japan, China, Mexico, Malaysia, Denmark, Lithuania, Portugal, Spain, Australia and South Korea. It has also been filed as a WIPO application.
- The patent has been granted in multiple geographies, such as the US, Europe, Australia, Japan and South Korea.

**WO 2020, 010385**, Device for generating electricity, priority date 12 July 2018, invented by Jamie Lyford, Victor Rosenberg and Kim Harmer

- The patent discloses a device (for installation into window frames, etc.) to generate electricity using PV panels. The device comprises 3 glass panels with PV elements arranged in the cavities between the panels to convert incident light into electrical energy. The device prevents overheating of the building interiors while generating renewable energy, addressing major environmental concerns.
- Applications for the patent were filed in the US, Europe, Australia and China. It has also been filed as a WIPO application.
- As of now, the patent has been granted only in Australia.

**WO 2021, 022316**, *Self-powered building unit*, priority date 21 May 2020, invented by Jamie Lyford, Victor Rosenberg, Christopher Cole and Steven Coonan

- The patent relates to a building unit comprising 2 light transmissive panels with a cavity in between. The cavity features PV cells and electrical devices powered by the electricity generated by the PV cells. The electrical devices can be air dampers, fans, LCDs, e-inks or pumps equipped with sensors and controlled via autonomous or remote means. The building unit allows transmission of visible light and capturing of heat to generate electrical energy, helping achieve significant savings.
- Applications for the patent were filed in the US, Europe, Japan, China, South Korea, Australia and Canada. It has also been filed as a WIPO application.
- The patent is recent and has not been granted in any geography yet.



## Appendix VII - Analysts' Qualifications

Stuart Roberts, lead analyst on this report, has been an equities analyst since 2002.

- Stuart obtained a Master of Applied Finance and Investment from the Securities Institute of Australia in 2002. Previously, from the Securities Institute of Australia, he obtained a Certificate of Financial Markets (1994) and a Graduate Diploma in Finance and Investment (1999).
- Stuart joined Southern Cross Equities as an equities analyst in April 2001. From February 2002 to July 2013, his research speciality at Southern Cross Equities and its acquirer, Bell Potter Securities, was Healthcare and Biotechnology. During this time, he covered a variety of established healthcare companies, such as CSL, Cochlear and Resmed, and numerous other emerging companies. Stuart was a Healthcare and Biotechnology analyst at Baillieu Holst from October 2013 to January 2015.
- After 15 months over 2015–2016 doing Investor Relations for two ASX-listed cancer drug developers, Stuart founded NDF Research in May 2016 to provide issuer-sponsored equity research on ASX-listed Life Sciences companies.
- In July 2016, with Marc Kennis, Stuart co-founded Pitt Street Research Pty Ltd, which provides issuer-sponsored research on ASX-listed companies across the entire market, including Life Sciences companies.
- Since 2018, Stuart has led Pitt Street Research's Resources Sector franchise, spearheading research on both mining and energy companies.

Nick Sundich is an equities research analyst at Pitt Street Research.

- Nick obtained a Bachelor of Commerce/Bachelor of Arts from the University of Sydney in 2018. He has also completed the CFA Investment Foundations program.
- He joined Pitt Street Research in January 2022. Previously he worked for over three years as a financial journalist at Stockhead.
- While at university, he worked for a handful of corporate advisory firms.

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