Marshalls Building Tomorrow's World







Viridian Solar



Agenda

Session 1

Welcome Company History and Strategy Clearline fusion Roof Integrated Solar Supply Chain and Customer Support The Market Opportunity Matt Pullen Stuart Elmes Jamie Berryman Bruce Hill Stuart Elmes

Q&A

Break and Product Demonstration

Session 2

Human Rights Due Diligence ArcBox Solar Fire Safety Product Q&A Wrap Up KT Tan Stuart Elmes

Matt Pullen

ArcBox Product Demonstration

Close



Our Transform & Grow strategy requires each part of our business to deliver against core strategic imperatives



Marshalls



Today's team



Stuart Elmes Chief Executive Viridian Solar



Jamie Berryman Chief Sales Officer Viridian Solar



Bruce Hill Operations Director Viridian Solar



Dr K T Tan Chief Technical Officer Viridian Solar





Viridian Solar

How We Got Here Where We're Going

Stuart Elmes

CEO



The Start-up Years



The business was founded in 2004, starting off with the development of a roof integrated solar heating panel for new build housing. The original team remains in place today, as excited as ever about the future potential for the business.

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Product Evolution



Clearline Roof integrated solar thermal panels

Clearline PV Roof integrated solar photovoltaic panels



Clearline fusion Roof integrated solar photovoltaic panels

2010

The solar water heating product was launched in 2007 and quickly established a strong position in social housing new build driven by energy efficiency regulations (Code for Sustainable Homes). The cost of solar PV panels rapidly decreased from 2010, and this technology replaced solar thermal as the housebuilder's go-to renewable technology. In 2015 the company updated its solar PV product to combine a more cost-effective (mass produced) standard panel size with its proven roof integration system.



Accessories





After the solar panels the most valuable component of a solar system is the inverter, which converts the direct current power generated by the solar cells to alternating current suitable for use in the building or export to the grid.

We launched an own-brand inverter in 2023 and it has been well received by developers who appreciate single sourcing the whole system. Also launched in 2023 is ArcBox, a solar safety product. This will be covered in much more detail later in the session.



Scale and Mix



Market leading position in UK roof integrated solar

Serving markets in new build housing and social housing retrofit

Accessories growing as a share of revenue



Strategic Priorities







Optimise share and margin from new build roof integrated solar

Our number one strategic priority is to keep giving our customers good reasons to continue to choose our roof integrated solar systems as the demand for solar on new homes scales up.



2 Grow revenue and profit from solar accessories

You're also going to hear about a new product invented here that we are just as excited about. The ArcBox solar connector enclosure is a safety product for all kinds of solar installations – whether on residential or commercial property or even for utility scale solar farms.





Clearline fusion

Jamie Berryman CSO

Strategic Priority





Why Roof-Integrated?



- Bird Infestation, nuisance and sanitation
- Sequencing on site
- Subsequent roof maintenance
- Offset roof covering cost

Very few housebuilders use above-roof solar PV for pitched roofs. Roof integrated brings many benefits including better sequencing of trades, offset costs and maintenance benefits.







Aesthetics



And of course, since the homes are to be sold, the aesthetics plays a big part. Roof integrated solar sits lower on the roof looking like an intentional part of the design and not a bolt-on.

Housebuilders

UK







We work with all of the UK's major housebuilders. We have group deals with many, and some of these are solus deals. Many of our group deals are longstanding, for example - Persimmon (2017), Bloor (2018), Keepmoat (2018), Bellway (2019), and Newland Homes (2020). More recently we added group deals with Crest and Miller.

Routes to Market

The housebuilder purchases as part of a supply and fit package with a subcontractor, which may be from an electrical, roofing or renewables specialism. Marley has strong links into the roofing channels and also specification selling into Social Housing RMI.





Renewable and electrical channels and via Marley into roofing

Demand generation with housebuilders

Social housing RMI customers value full roof system from Marley Low exposure to private housing RMI which favours on-roof solar

Clearline



Clear compliance with building regulations for fire safety from proprietary full system



The highest rated wind loading of any roof integrated solar system



Genuine Staubli MC4 connectors as standard for fire safety and standards compliance



Simple, error free order fulfilment



BBBA APPROVAL INSPECTION CERTIFICATE 24/100 CERTIFICATE 24/100

3rd Party Confirmation of Product Durability 17



Design Service

Currently > 6,000 plots/month for

- Group Deal Customers
- Installation Partners
- Private Householders

Our group deal customers particularly value our wrap-around technical support service offering site assessments, and plot by plot roof layout designs.

We believe that we are holding share as the building regulations transition drives demand for more solar on new homes.







Ready for More



The Future Homes Standard and innovative approaches such as the Octopus Zero Bills package for new homes are driving demand for even higher power from each roof – exemplified by the image in the right where every roof elevation used for solar.

Our latest panel, launched this month has 10% more power and positions the company for future success.





Supply Chain and Customer Service

Bruce Hill, Operations Director





Key Suppliers





We will look in more detail later at how China dominates the solar supply chain.

Solar panels and roofing kits are manufactured by high tech subcontract factories in China to our patented designs. Roofing kit manufacture is completely separated from solar panels, giving protection from suppliers becoming competitors.

Within the constraint of having to buy from China for the solar we minimize the risk of disruption with widely spread locations.



ΗQ



Products are warehoused on site here in Papworth and at the Marshalls Sandy site for the UK market. For EU customers we can import direct, with a legal presence in the Netherlands

Viridian Solar BV

Tilburg, Netherlands Registered office

Ruurlo, Netherlands EU Warehouse & Training Centre

Maintaining a Reputation for Quality





Local Training and Technical Support



On-site Training

Experience Centre Netherlands

Experience Centre UK

Another way we are supporting the achievement of our strategic objective is to support installers in achieving high quality, error-free installations On site, and here in our Experience Centre we have trained hundreds of solar installers in the last two years as they scale up to support increased demand for solar.

TRAINED IN LAST 2 YEARS 263 Businesses 892 Individuals



Most new build homes must have solar panels - Miliband



Ed Miliband: Solar panels on new homes is just common sense

FINANCIAL TIMES

Most new build homes in England to be required to have solar panels

Ministers want to amend building regulations to promote renewable power



The Future Homes Standard will require all new build homes to have solar panels and low-carbon heating — such as heat pumps — as well as high levels of energy efficiency. © Anna Barclay/Getty Images



UK Building Regulations

Stuart Elmes CEO





UK Building Regulations Driving Uptake

£50 £45 £40 £35 £30 £25 £20 £15 £10 £5 2020 2021 2022 2023 2015 2019 2016 2017 2018 2024 LTM (April) 2021 Regulations 2015 Regulations England Scotland

Viridian Solar Revenues (£m)

England's Building Regulations Transition is now well Underway



When new building regulations come into force, there is a transition while sites or buildings started under the previous regulations get finished and new sites/buildings under the new regulations are started.

The 2015 regulations in Scotland took until 2021 to reach their terminal rate, the demand for roof integrated solar grew in response and this is evident on the left-hand chart showing annual revenues. Being part of a bigger organization helped with the scale up

The new regulations in England are also driving solar adoption by housebuilders, and with faster transition rules to those in Scotland are forecast to cover 100% of new homes completed by the end of this year.



2015

• Solar on around 10% of new homes prior to 2015



- Annual housebuilding

England and Wales





2021



• 2015 regulations in Scotland resulted in around 80% solar penetration

Scotland

Houses with solar

- Annual housebuilding

England and Wales



2026

• Solar on around 10% of new homes prior to 2015

- 2015 regulations in Scotland resulted in around 80% solar penetration
- Ongoing transition to similar regulations in England and Wales is driving a rapid expansion of demand

Scotland

Houses with solar

Annual housebuilding

England and Wales





- Solar on around 10% of new homes prior to 2015
- 2015 regulations in Scotland resulted in around 80% solar penetration
- Ongoing transition to similar regulations in England and Wales is driving a rapid expansion of demand
- Around 80% are roof integrated = 64% of new homes with roof integrated solar



2026 Per 100,000 homes built

80% with solar

- Solar on around 10% of new homes prior to 2015
- 2015 regulations in Scotland resulted in around 80% solar penetration
- Ongoing transition to similar regulations in England and Wales is driving a rapid expansion of demand
- Around 80% are roof integrated = 64% of new homes with roof integrated solar

64% with roof integrated solar

64,000 homes x 2kWp x £600/kWp Opportunity = £77m/year for each 100,000 homes built



The Future Homes Standard – As Announced

 FHS
 Per 100,000 homes built

 90% with solar

- Solar to be a Functional Requirement
- Solar Energy UK estimates 10% may be exempt
- kWp = 40% of ground floor area/4.5
- 85m² average house size
- 42.5m² ground floor area
- 42.5 x 0.4 / 4.5 = 3.75kWp/house
- More solar on more homes

72% with roof integrated solar

72,000 homes x 3.75kWp x £600/kWp

Opportunity = £162m/year for each 100,000 homes built



Q&A

• 10 minutes



Break & Installation Demonstration

• 45 minutes with coffee/cake





Human Rights Due Diligence

Dr K T Tan CTO



Human Rights Concerns Emerge





Media articles and research reports increasingly appeared from 2021 raising concerns that parts of the solar supply chain might be tainted with forced labour.

The focus of the reports has been the supply chain for polysilicon (tier 5 and upwards), with 40% share of Chinese production located in areas of higher risk. The allegations- which cover many other industries (electronics, agriculture, textiles, automotive) are backed up by UN and Parliamentary reports, but denied by the Chinese government.



The Solar Supply Chain

Tier	Tier	Tier	Tier	Tier	Tier	Tier	Tier
8	7	6	5	4	3	2	1
Quartz	Silicon	Metallurgical Grade Silicon (MGS)	Solar Grade Polysilicon	Silicon Ingot	Silicon Wafer	Solar Cell	Solar Panel
				Tomas and			
High silica content Quartz is mined or quarried	Quartz is smelted to extract purified Silicon (99% pure)	Silicon is ground and impurities removed by magnet and centrifuge	MGS powder is converted to polysilicon, a higher purity material by chemical reactions (99.9999% pure)	Cylindrical monocrystalline ingots are formed from melted polysilicon	Ingots are squared and cut to a thickness of 130 to 150 microns	Doping Surface passivation Screen printing of top contacts convert the wafer to a solar cell	The solar panel is assembled – by cell stringing, encapsulation, addition of junction boxes and framing

Silicon dioxide can be found in abundance in sand and rock but quartz is preferred for solar manufacturing due to its high purity. Silicon is extracted by smelting - the quartz is placed an arc-furnace with coke which strips the oxide away and silicon drips from the base of the furnace to solidify below.

A number of steps then increase the purity of the silicon until it reaches "6-9's", that is 99.9999% pure and ready to cast into ingots – cylindrical pillars of pure silicon as a single crystal. The ingots are sliced into wafers, and these are then converted to solar cells using processes similar to those used in the semiconductor industry . Finally, the cells are electrically connected and encapsulated behind a glass coversheet with an aluminium frame to make a solar panel.



Concentration in China



Marshalls PLC Track Record





Marshalls PLC has a strong track record in Human Rights due diligence stemming from its work on the responsible sourcing of sandstone from India.

The group has a dedicated ESG team including a Human Rights specialist who has been assisting Viridian Solar with this challenge.

Risk Analysis Process



Our sixth annual Modern Slavery Risk Analysis report features more detail and more countries than ever before, reflecting developments within the wider Marshalls Group

Last April, Marshalls bought pitched roof systems manufacturer Marley Group plc which owns photovoltaic specialist Viridian Solar. This report brings together analysis based on procurement data from all three companies. The number of sourcing countries analysed has increased from 21 to 26.

For the first time, we are also publishing analysis of second tier supplier locations. In coming years, we expect to increase reporting on lower tier suppliers as part of our ongoing commitment to mapping product journeys back to raw materials.

In another first, we have also included the percentage of spend on first tier suppliers by country.

The Marshalls Modern Slavery Risk Analysis report should be read alongside our annual Modern Slavery Statement and End Modern Slavery report which are focused on bringing wider systemic change and eradicating modern slavery for good.

Two Three Four Five Six

Our processes for due diligence on parts of supply chain most affected







Panel ansembly Solar



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solar

The Challenge

If each of your suppliers has two or three suppliers and this carries on up the chain the numbers quickly become enormous, as shown in this figurative diagram.

Most businesses only know their immediate suppliers, and possibly those one tier further up the chain – for example those marked in red.

The concerns about the solar supply chain a relate to the manufacture of polysilicon, many layers further up at tier 5 and beyond. It is a huge challenge to prevent materials from some suppliers in that layer making their way through the web and into your products.







Our Approach

Since 2022 we have been working our way back through the tiers of our solar supply chain. The further up the tiers you go, the less direct influence you have with suppliers as you represent less and less of their trading. Our long and trusting relationships with tier 1 suppliers, some of which we have traded with for more than 10 years, helped overcome this challenge by enlisting their support to unlock site visits further up the supply chain.

EXTENDING UPSTREAM

At each level we identify and locate the suppliers at the next level down. In this way we painstakingly worked our way back upstream.



Alongside this work, we engaged a 3rd party audit company to undertake social and environmental audits based on the principles of SA8000 with all tier 1 and 2 suppliers in the solar panel supply chain including our inverter and mounting system manufacturers.

This resulted in some corrective actions at supplier companies including record keeping on working hours and improvements to emergency exits and welfare provision.

Inspection Visits





In four separate trips to China over this period, our team has visited six Chinese provinces and inspected production facilities in all eight tiers of production – most recently visiting a quartz mine.

Locations

We have identified every producer in the first seven tiers of our supply chain.

The map shows the location of every identified producer, all of which are outside the XUAR.

This year we visited our first mining site (tier 8), and mapping continues.



Our Approach

We have now signed sourcing agreements with our suppliers that specifies that materials can only enter our supply chain via these agreed manufacturing locations.

These agreements cover the first five tiers – and ensure that the polysilicon used to make Clearline fusion solar panels is not sourced from the XUAR.

We plan to continue our work and aim to complete our mapping and extend our contracts extend further into the supply chain in future.



ArcBox

solar connector enclosure



Strategic Priority



Context - Solar is a Very Safe Technology

Fires per year per million appliances (England 2010-21)



But in Sufficient Numbers...

But...a low probability event, when multiplied by a large number of installations can still happen.



Commercial Flat Roof



Lidl Distribution Centre, Waterworth Road in Peterborough 23/02/2024

And because of the extensive nature of solar installations, the results can be devastating.



2025 St Michael's Hospital, Bristol



St Michael's Maternity Hospital, Bristol 22/05/2025

This recent example made national news as it forced an evacuation from a busy maternity hospital in Bristol



Potential Causes of Connector Failure

The solar panel electrical connectors have been linked to a high proportion of fires.	Panel connectors are assembledSite made connectors are considered higher riskin the factory, but the connectorsconsidered higher riskfor the cables that go back to the inverter are assembled by the installersite made connectors are considered higher risk	Panel Connectors	Site-Made Connectors
	Not Fully Engaged, Cable Under Tension	×	×
	Assembled Wet – with potential for corrosion	×	×
	Damage – post or pre installation	×	×
Manufacturer A Manufacturer E	Cross-mated Connectors	×	×
	Poor Quality Assembly & Crimp	×	×

ArcBox



We came up with ArcBox - a simple, low-cost connector enclosure that protects a connector from some of the external risks and prevents an arc fault developing into a fire should a faulty connector start arcing.



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Coverage Options

Every DC Connector in Installation

Maximum reduction of associated risks

Higher-Risk Connectors Only

The solution favoured by many solar installers as balancing risk reduction and cost





Effectiveness Confirmed in Independent Tests





FRISSBE

fire-safe sustainable built environment



Tests of ArcBox with combustible plastic tray roof integrated solar PV at the Kiwa BDA Testing B.V. Fire Safety and Security Laboratory. Arcing connectors without ArcBox quickly spread to a roof fire while those with ArcBox were safely contained.



Flat roof solar without ArcBox – rapid spread of fire from arcing connector to roof. There was no fire in same test with ArcBox

3rd Party testing has shown the effectiveness of the product in preventing fires on both roof integrated solar and above-roof solar.



ArcBox – Sizing the Opportunity



Current Revenue Split



EU Addressable Market Estimate

£92m

65GWp installed in 2024, 59% Rooftop (Solar Power Europe) 500Wp/panel = 77m panels Assume only rooftop and only high-risk connectors (10%) 7.7m units at £12 each

In less than two years since we launched the product the ArcBox business has reached £2.2m in revenue (last twelve months), almost exclusively from the UK, a market which represents less than 0.5% of the world market for solar panels. Our patent protection on ArcBox is in countries that cover more than 95% of the market for solar PV. The first patent has been granted (in the UK) and more should be following along. The sales approach is to focus on nearby European markets to begin with, finding distribution partners in territories and building demand from solar installers with local representation. Simultaneous with this we are receiving enquiries from further afield based on word of mouth and social media promotion. 54





Strategic Priorities







Optimise share and margin from new build roof integrated solar

I hope that in today's presentation we have been able to convey some of the excitement that the team here at Viridian Solar feel about the future opportunities in front of the business. Medium term revenue growth target

Construction market outperformance

2 Grow revenue and profit from solar accessories

The two strategic priorities we have gone through in detail today will support the group Transform and Grow strategy by providing a significantly above market growth rate.



ArcBox Demo

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