Business Plan 2015-2020

AUTHOR(S)	:	Ricard Pardell
DOCUMENT NUMBER	:	000000001
VERSION	:	5
SOURCE	:	Valldoreix Greenpower
STATUS	:	Approved
DOCUMENT DATE	:	8/2/2015
NUMBER OF PAGES	:	59
EDITED BY	:	Ricard Pardell

Index

Change list

VERSION	DATE	DESCRIPTION	AUTHOR
2	12/1/2015	Corrected error on R&D activation in P&L sheet	R. Pardell
3	14/1/2015	Corrected error on duplicated sales in P&L sheet. Increased sales costs for CPVRS in 2016-2020.	R. Pardell
4	8/2/2015	TAM reduction and business plan adaptation, corrected error in depreciation calculations.	R. Pardell

1 Introduction

1.1 Document Presentation

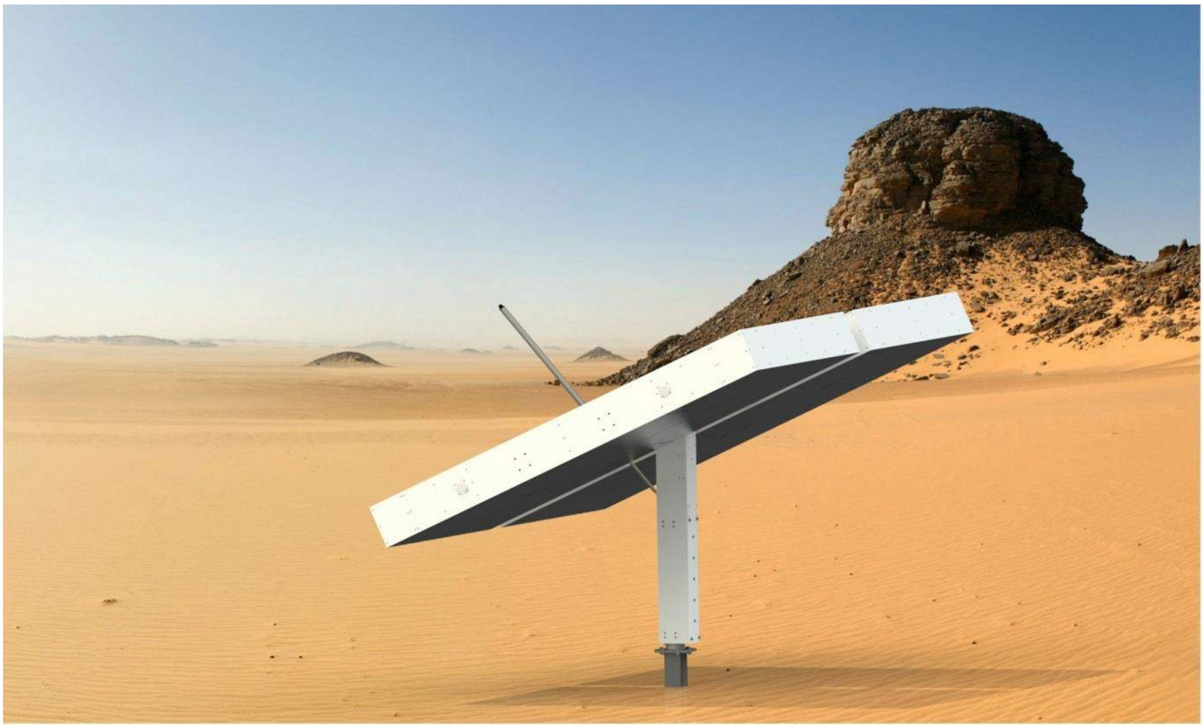
This document is Valldoreix Greenpower's business plan for the period 2015-2020.

1.2 Audience

This document is strictly confidential, exclusively addressed to potential investors or financial institutions who have signed a mutual NDA with Valldoreix Greenpower.

Any information contained in this document cannot be disclosed to third parties without previous written consent from Valldoreix Greenpower.

Our new "Lawrence of Arabia": the CPVRS v2 system.



1.3 Origins

Valldoreix Greenpower (VGP onwards) was founded by Ricard Pardell in 2010 by renaming and changing the activity of Valldoreix Consulting, founded in 2003 and dedicated to IT consultancy and renewable energy engineering services.

Ricard Pardell founded Sol3g, a CPV pioneering company, in 2004, together with other partners. This was sold to Abengoa in 2010, and at this moment it was decided to discontinue the IT business and focus solely on renewable energy technology and business.

VGP has developed since then the new CPVRS (www.cpvrs.com) system based on lessons learned at Sol3g and four new patents. CPVRS stands for CPV Reference System, which is heavily related to the first patent which enables decentralized manufacturing of CPV systems at low tech facilities, thus enabling a new business model.

VGP has other activities in renewables (PV plant engineering and installations, PV products distribution and retail) that have provided an income which has been dedicated to invest in CPV technology.

1.4 Mission

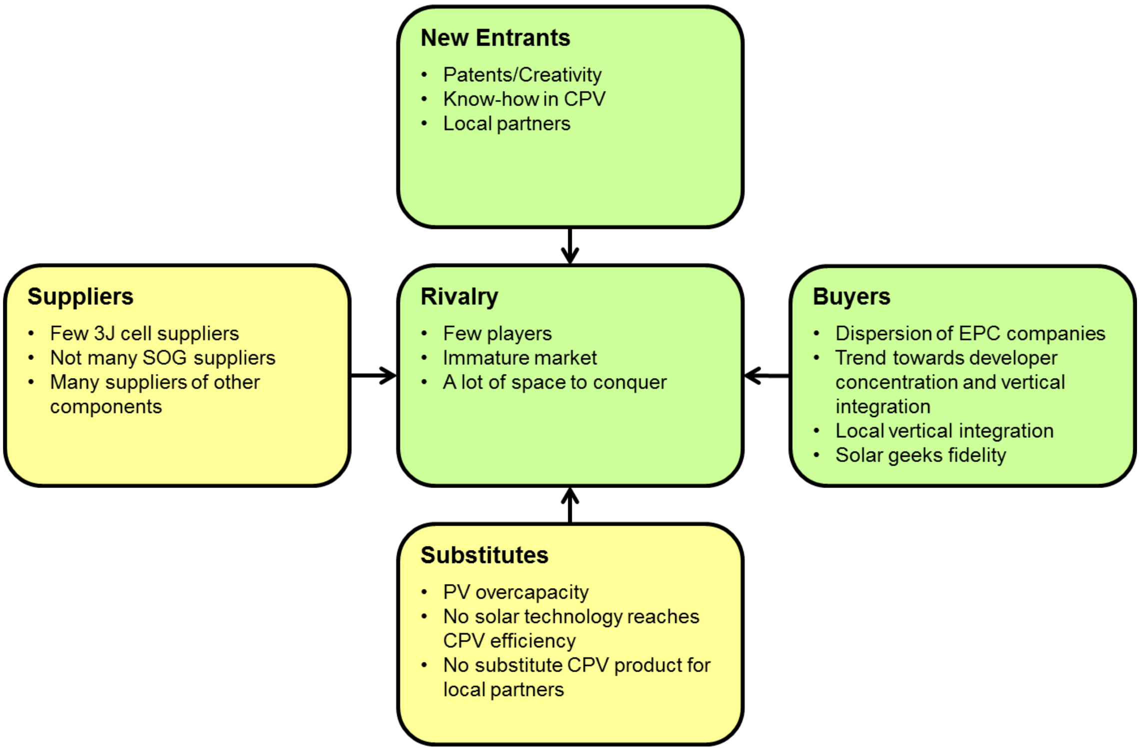
“To develop advanced technology for the solar industry”

1.5 Vision

“To innovate in technology enabling new business models”

2 Context

2.1 Porter's 5 forces analysis



2.1.1 New entrants: low risk

- **Patents**: The CPVRS system is protected by four patents: CPVRS, MISPS, CPVLIS and ICPVS. We also are going to register a fifth patent related to a new slewing drive concept which is used in CPVRS 072 v2.
- **Know-how**: We concentrate very specialized know-how on advanced solar tracking and CPV systems. We also aim at being a future player in the CSP heliostat market. Our proprietary tracking technology in particular puts an important barrier for new entrants and competitors.
- **Creativity and innovation**: Our small company is very creative and we will always keep a technological lead. CPV leaves a lot of field for innovation when compared to non-concentrated PV, and therefore our creative force is a big advantage. This creativity will also help us enter new fields, like what we are doing with the Cleandrone system.
- **Local partners**: By relying on a franchising network of local partners we aim also at having very motivated people to defend our protected IP in each country. Our competitors in CPV would need an alternative technical solution to be able to reply our business model, and it is clear that the cost of setting up a PV assembly line is much higher.

2.1.2 Bargaining power of suppliers: moderate risk

- **Few 3J cell suppliers**: We will counterweight this risk by having a strategic partnership, probably with Solar Junction and Taqnia. We are also in talks with Soitec.

- **SOG suppliers**: There are not many SOG Fresnel lens panel suppliers at the moment. We are working in a cooperation agreement with Dr. Ralf Leutz, a world reference scientist in CPV concentration optics, for the development of our own primary optics, using some new advanced concepts. We can switch to PMMA primary optics if necessary, and there are many potential suppliers in this case.
- **Many suppliers of other components**: As CPV systems are very complex and multi-disciplinary in nature, we have many different suppliers in different areas (electronics, optics, DBC substrates, motors, sensors, copper ribbon, EVA, PET, metal-sheet, etc.) but none of them is a dominant player and we can change very easily, so their bargaining power is null.

2.1.3 Bargaining power of customers: low risk

- **Dispersion of EPC companies**: There are many EPC companies executing solar plants around the world. They have small bargaining power and can be attracted to our local franchise schema.
- **Trend towards developer concentration and vertical integration**: Examples like Sun Edison show that for very large projects there is a strong trend towards market concentration and vertical integration, which will give a lot bargaining power to a few developers in the very large projects market.
- **Local vertical integration**: Local partner bargaining power will be kept under control by conditioning the franchise contract to fulfilment of business plan targets. We should have substitute partners ready in case of partner underperforming.
- **Solar geeks and scientists market**: We have developed a specific CPV product for solar geeks and scientists around the world, which we hope will give us traction, market recognition and, who knows, may be the beginning of a residential CPV market. In this new market we expect the customer to base their purchase decision on the desire to learn and experiment.

2.1.4 Rivalry among competitors: low risk

- **Few players and immature market**: At the moment only two CPV companies are really executing significantly large projects above 10 MW, these are Soitec and Suncore. The CPV market is in its infancy, and we expect it to boom by around 2020, when a good track records and very high efficiencies would make it the most attractive for large projects in the sunbelt. There are several potential new players like Morgan Solar, Semprius or VGP with good concepts which will benefit from any traction created by the leaders. For us, the more these leaders grow the better, because they are wining credibility for all the CPV players. We hope to streamline behind them and one day in the future to overtake them! At his moment you can fell in the industry more a spirit of mutual cooperation than actually rivalry.
- **A lot of space to conquer**: When we reach our target of 0,04 €/kWh, the technology will be unbeatable in all regions having DNI > 1.800 kWh/year. New applications will become feasible substituting nuclear and fossil power.

2.1.5 Substitutes: Moderate risk

- **PV overcapacity**: We don’t expect the costs of PV to be able to continue its downhill trend. The market will recover from overcapacity and our product will keep a competitive edge in LEC.

- **No solar technology reaches CPV efficiency**: At the end of the day it will be efficiency combined with cost reduction what will make CPV the reference product for solar energy in high DNI areas.
- **No substitute CPV product for local partners**: By having a franchise of local partners we will create the loyalty in every country that will work towards our interests. Given our low investment business model, they will not be able to substitute their production capacity with other technologies without incurring in high investment levels.

2.2 PESTEL analysis

2.2.1 Political

Global warming issues will continue to provide impulse to the adoption of renewable energy systems, and now we can see very significant positive signs in developing countries and places of the world that had been until now giving their back to this reality. Countries as diverse as China and Saudi Arabia are coming to the same conclusions, and the negationism claims supported by obscure lobbies seem now to be fading away. Therefore the political climate is definitely favorable for renewable energy companies like VGP.

We have a business model based on decentralized manufacturing and local content creation: meaning stable jobs in assembly factories instead of temporary pinpoint jobs on field installations.

So our product is green and social. This should give us opportunities to find specific political support to our business model which could translate into grants, tax reductions or specifically favorable legislation for our local partners.

2.2.2 Economical

Cheap renewable energy is needed everywhere but global market instability, an specific economic problems in potentially very strong solar markets can generate a rise in interest rates, and this is actually a big risk for investments in renewables, were almost all goes to CAPEX and having long term returns,

2.2.3 Social

We will create most needed jobs in developing countries.

2.2.4 Technological

Our system has a clear innovative approach, with four patents involved (CPVRS, MISPS, ICPVS and CPVLIS) and several others under development.

2.2.5 Environmental

Our technology has a particularly low impact installation method, requiring no concrete foundations or interconnection trenches, thus minimizing civil works.

In the same way its decommissioning cost will be low, and even moving one installation from one place to another is perfectly feasible and economical using the CPVRS system.

Our systems are of much lower profile than our competitor’s, which tend to solve problems the way dinosaurs used to do in the Jurassic era. Permitting with our systems will be possible in many places where Soitec will be banned.

2.2.6 Legal

We don’t foresee any legal issues. CPVRS is not potentially dangerous like other CPV or CSP systems, and will be inherently easy for permitting, for the same environmental friendly and local content creation reasons that we have mentioned before, we think that in each country it will be easier that legislation moves in our favor than otherwise.

2.3 Main industry agents

2.3.1 Utilities

Utilities are clearly not within our scope.

2.3.2 Developers

That should be the best target to become a local partner, obtaining local vertical integration. If we succeed in having some good reference local partners it will be then much easier to convince larger local partners in countries with highest potential.

2.3.3 EPCists

This agent would be our second choice in the future, but they won't be easy to convince neither while we don't have references and a track record..

2.3.4 Distributors, Manufacturers

We can also try to convince players which are outsiders to the solar industry giving them a good opportunity to enter a booming market. In many countries around the world this is happening right now, and these companies who try to grow quickly with a different product would be the ones more prone to take risk.

3 Problem Description

The CPVRS aims at optimizing the CPV value chain, trying to reduce CPV installed costs, maximize power yield and therefore finally reduce LEC.

Up until now it has been difficult for companies like Soitec to profit of all existing niche opportunities around the world, because they have to rely on localized facilities which have involved huge investments in manufacturing automation.

By using our high tech critical components and low tech decentralized assembly system, we are able to grow our capacity without incurring in large capital investments upfront.

This gives us more flexibility and creates the opportunity to obtain huge profits if we can really execute our business plan and have a manufacturing and sales capacity of 20 MW by 2017.

Also we have innovated in the way CPV systems are deployed on the field. Our machines are relatively small (currently 2.100 Wp STC), and are assembled at decentralized assembly facilities created by franchised local partners to whom we will sell the components to be assembled.

CPVRS systems are assembled and tested at a local partner assembly facility, also characterizing them under the sun, knowing before delivering to the field the exact power rating at system level, as CPV modules and tracking system are integrated in a single indivisible unit which is then shipped to the field in trucks.

With the CPVRS assembly system we improve the logistics and transfer labor costs in the following way:

- By selling critical components in kits to be assembled by franchised partners, labor costs intensive activities are transferred to destination market, and the volume of material to be shipped is reduced.
- Field deployment process is hugely simplified, because complete CPV systems previously tested at the assembly facility are delivered to the field, their design allowing for a truly plug and play operation.
- The EPC company can install 2 kWp each five minutes, meaning you only need 500 minutes for 1 MW. The amount of work to be done on the field is drastically reduced and there is actually a net transfer of labor from the field to the assembly factory, the most optimal location. Labor cost per hour on the field (transport, lodging, etc) is significantly higher than in a factory. Work can be better organized and therefore be more efficient when executed in a factory.

4 Customer Needs

There are two market agents whom we can consider our customer: the final customer and the local partner.

4.1.1 Final Customer

The final customer is the EPC or developer company, who will sell the plant to an operator. They have to take buying decisions regarding the equipment and their objective is always to offer the best financial return to the plant operator.

4.1.2 Our Local Partner

Our franchisee or local partner will be buying components from us and assemble systems that will be then sold to EPCists or developers. In a first instance these players will be separated but at the medium term we should try to recruit developers or EPC companies as local partners, following a local vertical integration strategy.

At the short term the “Solar outsider” is the best local partner target. Maybe they are an industrial company with a languishing product and they see a big solar opportunity in their country, or maybe they are just a group of politically well-connected people who think can profit from the local content creation leveraging arguments.

In any case at the short term the need we identify is:

- **Grasping a big opportunity in a suddenly growing renewable energy market, with low investment and low risk.**

We offer them a clear schema to tackle this opportunity but then we have to put our conditions:

- **Local partner must perform and fulfil business plan or they will lose their license.**

This way, either the local partner grows and then naturally moves into first an EPCist and then a developer, or he fails and then gives us the opportunity to look for a larger partner in that market.

Using this mechanism we can start now with small outsider companies in secondary markets, the smaller the better, like Colombia or Tunisia, in order to create a track record, and grow incrementally from there without compromising a large market, like US or Egypt.

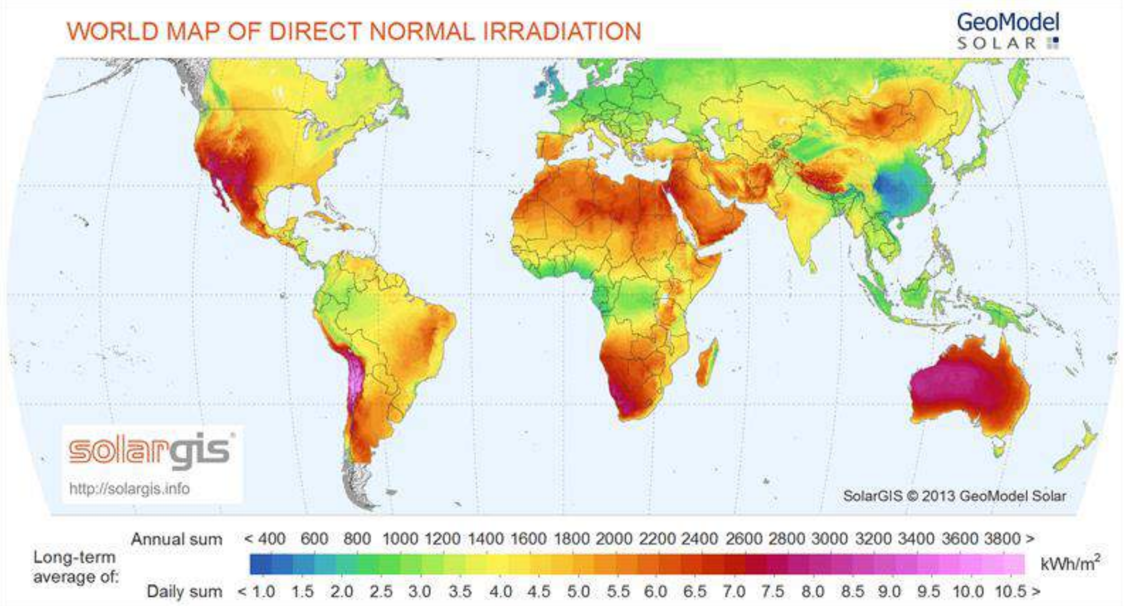
Of course if a very large company in a very important market, like Taqnia in Saudi Arabia, becomes one of our first partners, this process would suddenly accelerate.

From a technological point of view there is no problem to grow as soon as we have large orders, and we really don’t need too much money to grow if we follow our decentralized manufacturing schema.

5 Characteristics of the solution & Unique Selling Proposition

5.1 Our objective

We aim at having the lowest LEC (0,04 €/kWh) by 2020 in countries having DNI > 1.800 kWh/m2.



This should provide us the base for a very strong business, based on an innovative product and a unique business model.

5.2 What makes us Unique

5.2.1 Decentralized manufacturing and franchising business model

A technical innovation allows decentralized assembly of CPV systems, enabling a franchise business model. We keep the manufacture of critical components and subcontract the remaining, with the possibility of localizing non critical components manufacturing to the destination market, increasing local content creation. This allows our company to grow very much in sales without growing in personnel and organizational complexity.

This business model provides a big fast growth opportunity to our local partners requiring minimal investment from them.

Benefits:

- Optimized value chain reduces installed system cost.
- Provides an attractive business model to local partners, leveraging sales.
- Creates local content, which enables political levers.
- Allows VGP to grow in sales without having to grow so much in structure.

5.2.2 All-in-one CPV system: easy and cheap deployment

Up until now CPV systems have lacked of flexibility in their applications. Reference companies in CPV like Soitec or Amonix have a very rigid business model, requiring having very complex and costly facilities for the manufacturing of logistically difficult to transport systems.

Our product will be assembled by local partner in convenient low cost facilities, and will be then transport as already tested and commissioned units to the installation sites.

Benefits:

- Small size and transportability opens new applications for CPV.
- Reduced installation and commissioning costs and lead time.

5.3 SWOT Analysis

5.3.1 Strengths

A differential business model and a transportable CPV system, easy and quick to deploy, reducing the global installed cost and also opening new applications for CPV like small industrial installations.

5.3.2 Weaknesses

The product has been jointly developed with Azur Space, who has obtained a limited license on the four patents and the v1 and v2 design. But they cannot license the license, and therefore they cannot apply our same business model. In any case it's not a desirable situation and we will have to keep improving the CPVRS product in order to increase our competitive edge.

5.3.3 Opportunities

The global renewable energy market will keep growing in the following years and by increasing their efficiencies and lowering their cost, CPV systems will grab an important stake on those countries were DNI is high. The CPV market is expect to grow to between 2,5 and 5 GW per year by 2020. If we get just 10% of that the business is huge.

If we can grab a strong local partner with a large project pipeline, like Taqnia in Saudi Arabia, then we have the perfect jumping platform to accelerate our company. In the meantime we will have to grow step by step and a lot of work has to be done on marketing and business development in order to recruit the right local partners across the world.

5.3.4 Threads

A disruptive technological change in CPV or PV may yield our ideas obsolete, this is a unavoidable threat, but what we are sure is about the bright future for high efficiency conversion technologies, If we keep innovating and close to the leading pack, we will always be able to leverage some of our investments.

We have already diversified by off springing a heliostat for CSP and two PV trackers for normal c-Si modules, and a niche micro-tracker for scientific and DBNI resource assessment applications.

5.4 CPVRS 072 v1 Features

5.4.1 Main characteristics

- CPVRS super-module assembly system, allowing for decentralized manufacturing in low tech facilities, enabling an optimized value chain and business model as systems are shipped as kits to local assembly partners.
- Receiver panels using CPVLIS laminated interconnection system, offering a very high insulation level (50 GΩ and above) and a complete water-tight encapsulation of CPV receivers and interconnectors.
- Pole mounted tracker using high accuracy actuators and stepper motors. Continuous tracking system. Using hybrid tracking strategy and MISPS module integrated sensor, offering both a broad acceptance angle and high sensitivity to deviation. Plug and play system doesn't need calibration during commissioning. Relaxes tolerances on foundations verticality and orientation.
- Advanced ICPVS tracking technology: Horizontal internal fixed tube and maintenance free polymer bearings. Possibility of aerial electrical connection.
- Can be installed by driving pole into the ground. Very cheap process for large installations, as it is done using automated equipment. Low environmental impact as can be dismantled using the same machines. Very efficient and cheap to install in multi MW solar farms. For small installations concrete foundations can also be used. Due to its relatively small size, CPVRS 072 can also be easily installed on top of flat rooftops.
- Available in low voltage (LV) and high voltage (HV) configurations.
- CPVRS, MISPS, CPVLIS and ICPVS are patented technologies.

5.4.2 CPVRS 072 v1 Specifications

The following specifications based on current 38% STC cell efficiency.

Solar aperture:	7,2 m2
Concentration ratio:	744x
Cell size:	5,5 mm square
Focal length:	233 mm (F 1,1).
Lens size:	150 mm square
Lens composition:	SOG panel composed of 4x5 lenses, 620x770 mm.
Panels per system:	16
Cells per system:	320
Elevation span:	0/90 degrees
Azimuth span:	0/360 degrees

Performance	**CPVRS-072-LV**		**CPVRS-072-HV**	
	STC	NOC	STC	NOC
Isc:	5,36 A	4,89 A	2,68 A	2,44 A
Voc:	500 V	469 V	1000 V	939 V
Impp:	4,93 A	4,45 A	2,46 A	2,22 A
Vmpp:	440 V	412 V	879 V	824 V
FF:	79 %	79 %	79 %	79 %
Pmpp:	2.162 W	1.833 W	2.162 W	1.833 W
Efficiency:	30 %	28 %	30 %	28 %

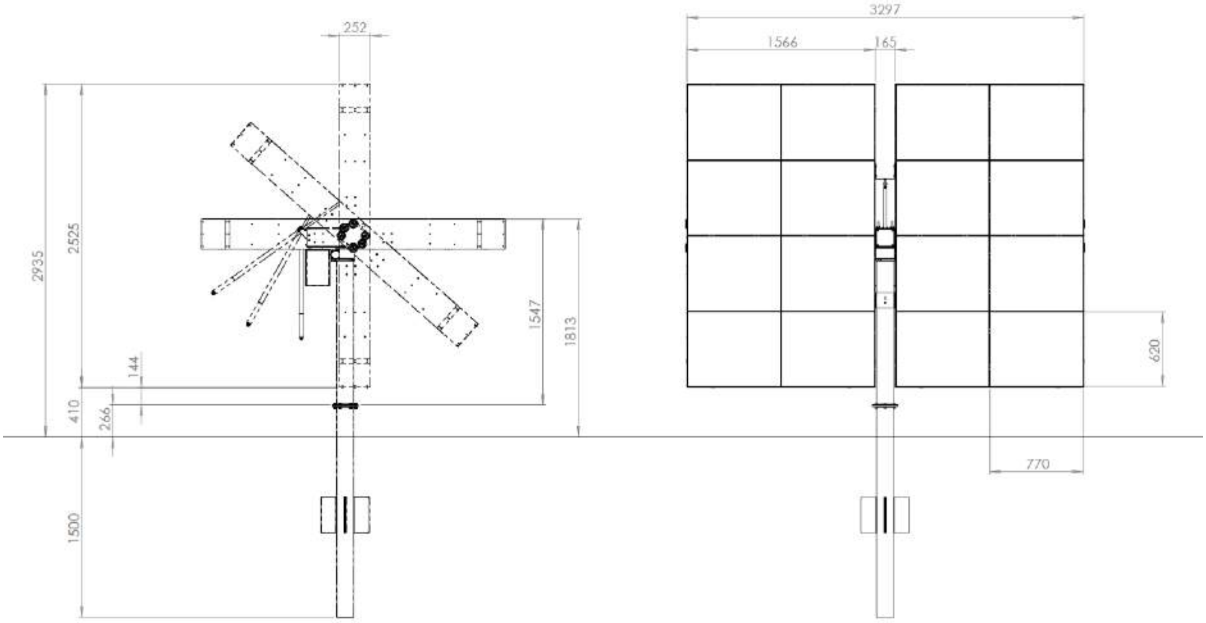
Dimensions

Width:	3.297/3.297 mm
Depth:	1.317/2.525 mm
Height:	2.935/1.813 mm
Weight:	406 kg

Land requirements

	Minimum	Typical
Footprint:	18 m2	30 m2
Power density:	120 W/m2	72 W/m2
1 MW plant size:	0,83 Ha	1,39 Ha

5.4.3 Drawings

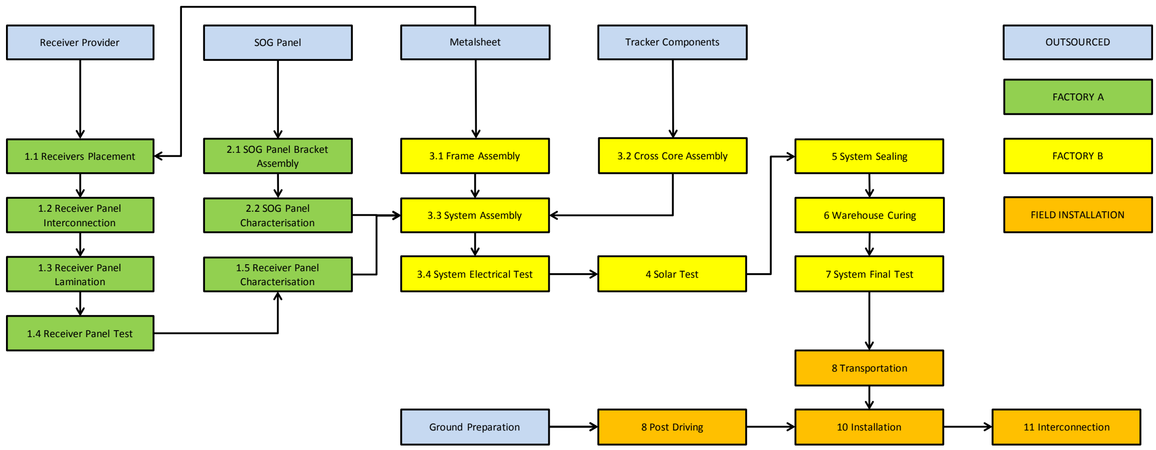


5.4.4 Other Specifications

Name	Value	Comments
Glass thickness	3,2 mm	
Geometrical concentration	744x	
Optical efficiency	0,85	
Optical concentration	680x	
Operational WS	60 km/h	Operational wind speed.
Protection WS	80 km/h	Wind speed at which the system must go into stowed position.
Survival WS	140 km/h	Wind speed the system must withstand without damage at any position.
Extreme WS	180 km/h	Wind speed the system must withstand without damage in stowed position.
Min temperature	-40 C	
Max temperature	60 C	
Delta T	46 C	At 900 W/m2 DNI and 0 m/s wind speed

5.5 Decentralized manufacturing of CPV systems

Our business model is unique. The following diagram depicts our CPVRS system manufacturing workflow:



5.5.1 Critical hi-tech processes and components

In green we show those processes which require sophisticated robotic equipment and a high level of organization, know-how and quality in order to guarantee a durable and homogeneous product. We aim at keeping full control of these processes.

The critical components which these high tech processes manufacture are: SOG panels (optical concentrating devices), CPV receivers (where the energy conversion to electricity takes place) and tracking control electronics and sensors (which allow our systems to track the sun with high accuracy but in a reliable, cheap and plug and play way). Our local partner will only be able to source these critical components from us. CPVRS, MISPS and CPVLIS patents are involved in these. The new slewing drive will be another exclusive component that only VGP will sell.

5.5.2 Decentralized assembly process

Our local partners must execute processes in yellow, which are basically labour intensive assembly processes requiring no special machinery, tooling or jigs. The amount of money to invest will be very low. Local partners can start a 20 MW assembly facility investing less than 200 K €. This creates a huge business opportunity for them.

5.5.3 Industrialized installation process

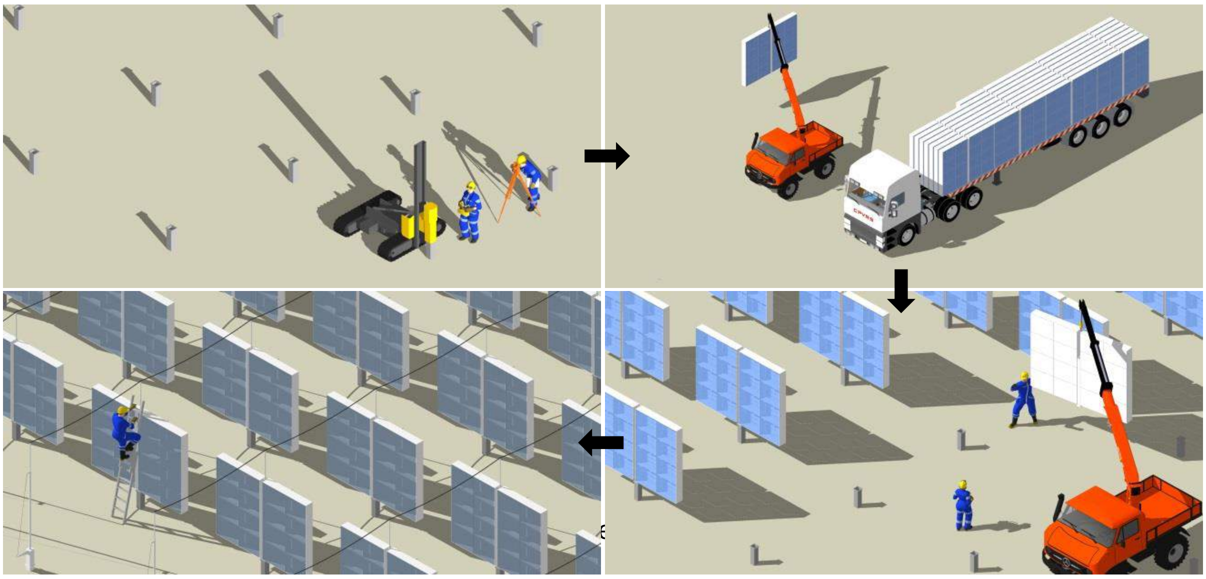
Installation processes are depicted in orange.

Our product is design to make field installation and commissioning a children's game. Machines are assembled, tested and characterized at the local partner facilities and then transported to the field as already tested and characterized units. This is very important regarding guarantee uncertainties. Our partner will exactly now the real peak power delivered by each unit.

Foundation tubes are driven into the ground using 20pecialized pole driving machines which can drive a pole every two minutes into the ground, with the possibility to use GPS equipped machines which can reply CAD provided field layout.

CPVRS systems can be very quickly deployed as they are assembled in clean facilities strategically located in each destination market and transported to the field in trailer trucks which can hold 36 machines per transport. We estimate that a 10 people team can install 1 MW per day. Also, the patented aerial connection option helps significantly reduce the amount of work and material costs required for round preparation.

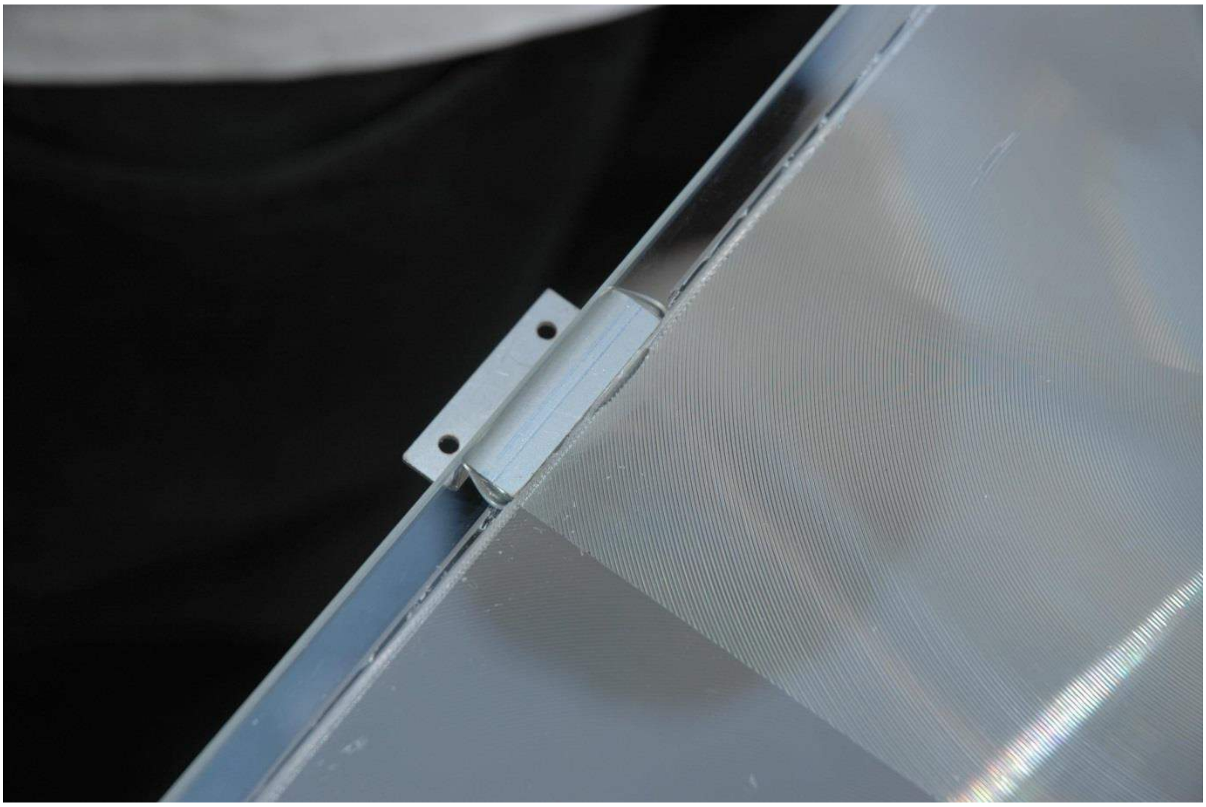
The following images depict main activities in CPVRS system installation:



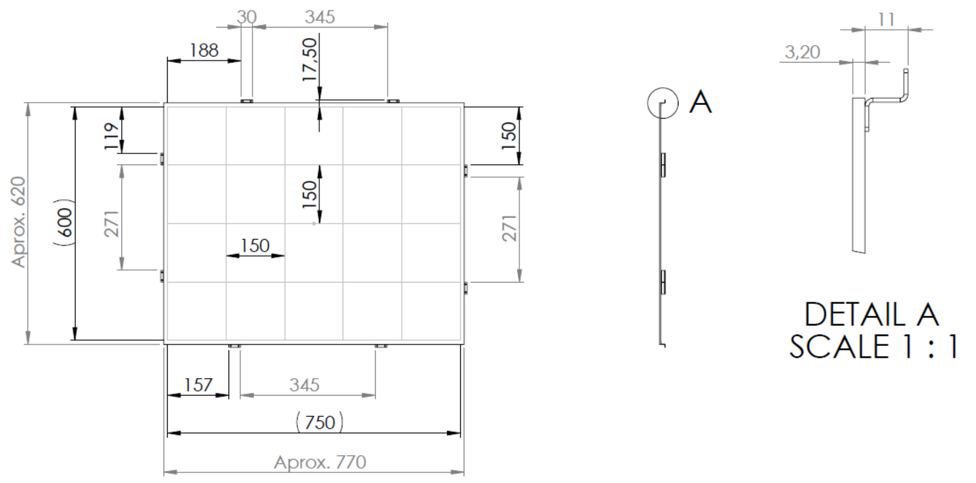
5.6 Critical Components

5.6.1 SOG panels

SOG panels include an array of 4x5 individual 150x150 mm Fresnel lenses stamped in silicone on a hardened solar glass 3,2 mm thick substrate.



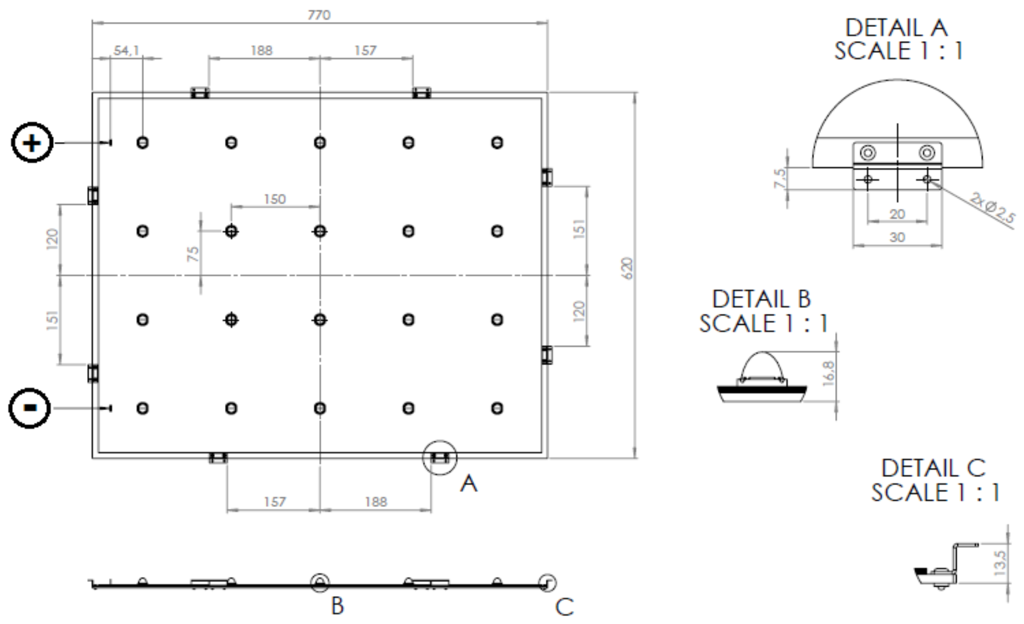
Each SOG panel incorporates 8 glued mounting brackets, positioned taking as reference the optical lens centers. SOG panels are riveted through two holes on each bracket to the super-module frame. The bracket assembly method is part of the CPVRS patent. This allows a replicable geometrical construction which can be assembled later using low tech tooling, so that high accuracy automated assembly offering a high quality product is executed at our “factory A” facilities, while final system assembly takes place at decentralized low tech “factory B” facilities requiring no special tooling.



SOG panel performance is highly dependent on lens temperature, but the super-modules have been designed to keep the optics warm and at the same time allowing for the receiver panels to say as cold as possible.

5.6.2 Receiver panels

Receiver panels include 20 CPV receivers each, arranged in 4 rows of 5 receivers. At the end of the first and last row there is a fast-on connector which allows series connection with other receiver panels.



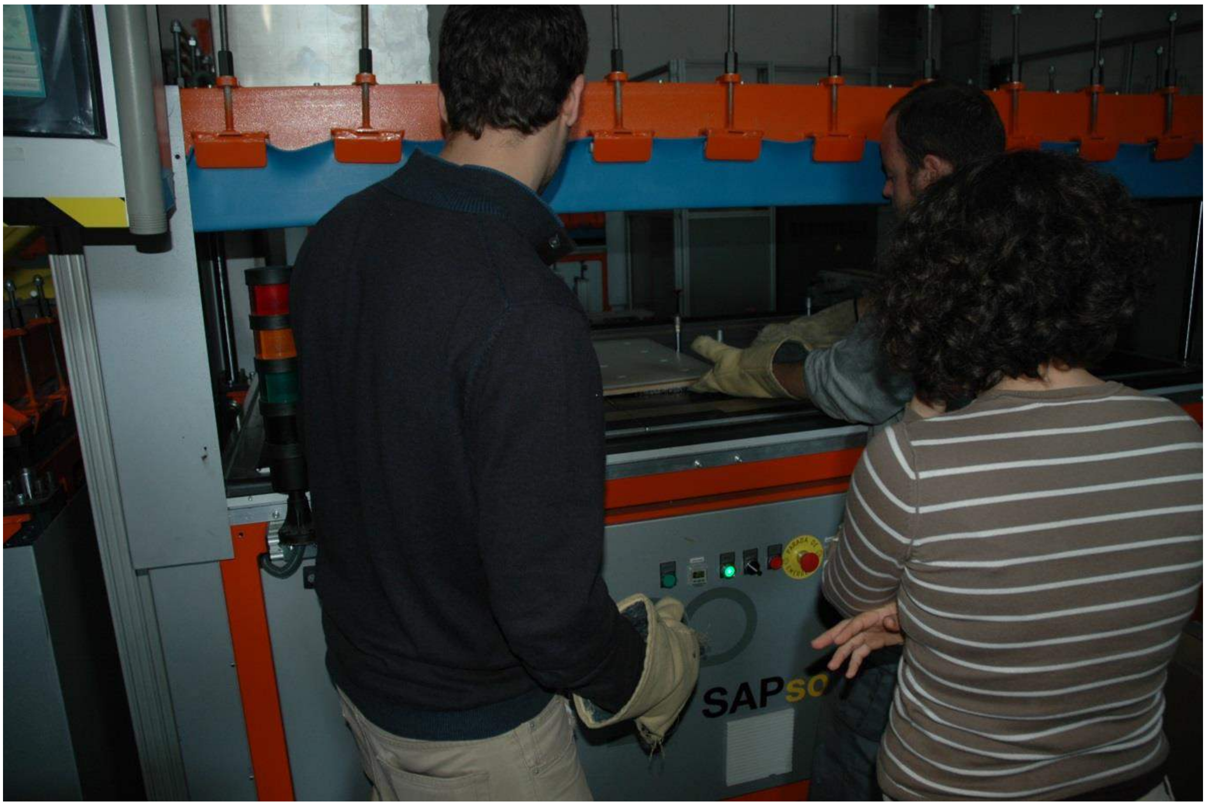
Receiver panels are laminated following the CPVLIS technology, consisting in attaching receivers on an aluminium back plate which doubles as structural member and heat sink. Receiver interconnectors are sandwiched between two layers of insulating material, offering the solution a very high electric insulation and water-tightness. Please refer to the CPVLIS patent for a detailed description.

Receivers are attached using thermal interface materials offering both good performance and high throughput processing. Precision tooling guarantees receiver positioning accuracy below 100 microns. Receivers are interconnected using CU ribbon resistance welded to pre-soldered pads.

Receiver panels also incorporate eight mounting brackets each, directly riveted to its front side, being these also the means to assemble the receiver panels into the super-module frames, following the CPVRS technique. This assures 100 micron tolerance in the positioning of frame attachment points, which together with 100 microns positioning tolerances for all holes in frame members and positioning of mounting brackets to primary optics, assure a maximum deviation below 0,1 degrees due to mechanical cumulative deviations.

A basic objective in receiver panel design has been to attain a very high insulation level. All panels manufactured in the first pre-series batch (10 systems, so 160 receiver panels) have shown an insulation level above 50 Gohm, several orders of magnitude above the requested 10 Mohm by IEC 62108.

This result is obtained by vacuum heat lamination of several layers of EVA and PET, with a final top layer of fluoropolymer, being the CPV receivers and CU ribbon interconnectors encapsulated by the insulation layers.



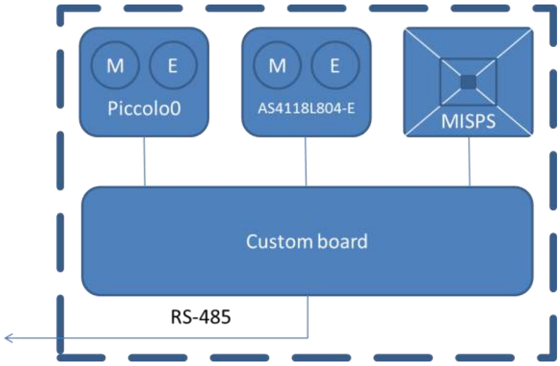
Heat lamination is at 110 C, 5 minutes vacuum and 1 minute pressure cycle. We use a standard PV module lamination machine.

5.6.3 Tracking System

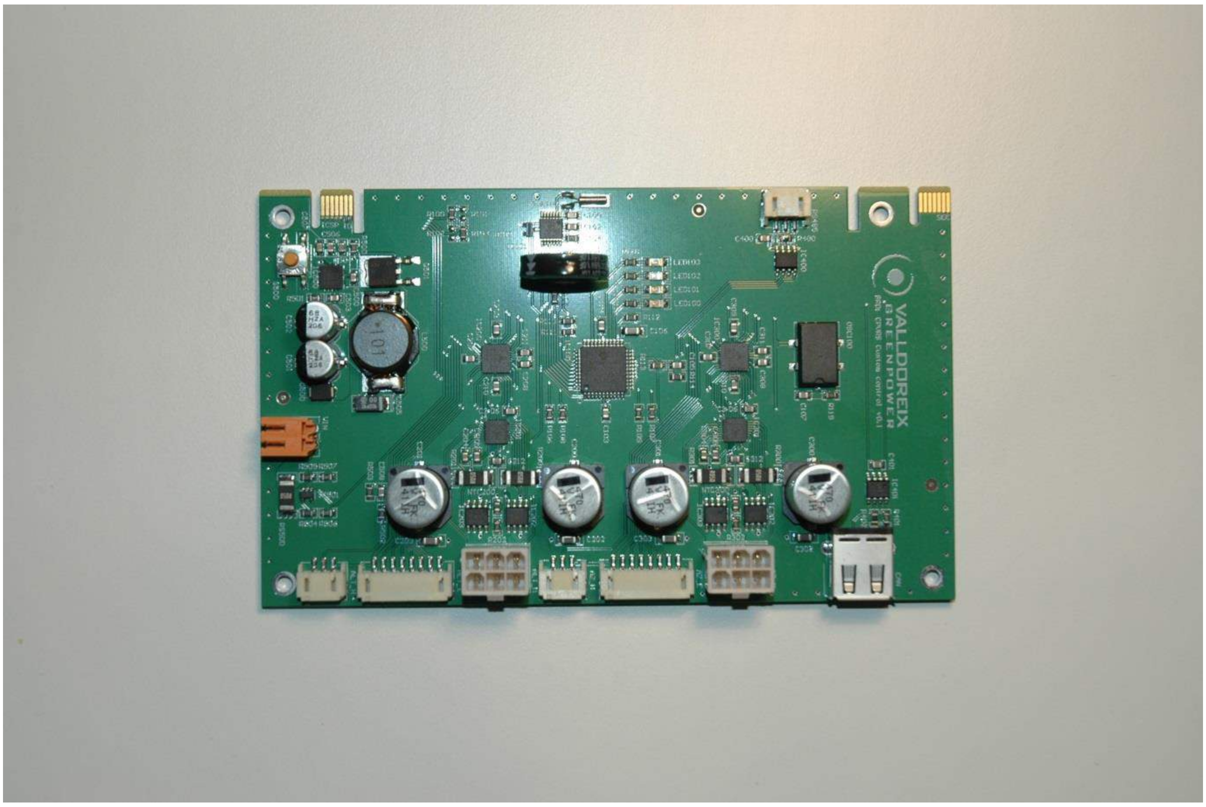
The control electronics includes:

- Microcontroller board with two closed loop stepper drives, able to optimize motor current.
- 24V and 5 V DC power supplies.

- ADCs for data acquisition (optional).
- MISPS sensor.



The following picture shows our custom electronic control board:



Our tracking system is very advanced, as we run the stepper motors at very low continuous speed when tracking the sun, at an average speed of 4 steps per second, but the system also can execute very fast slewing operations, being able to rotate 360 degrees in azimuth in just 9 minutes. This wide speed range allows us to execute relatively fast stowing and end of day operations and at the same time minimizes tracking dead angle losses in those locations below the tropics, as only 4 minutes of production time would be lost on those days where the sun passes the zenith.

Running the motors this way is very challenging, as steppers have a very large consumption at low speeds if current is not properly managed. We use an encoder directly attached to each motor in order to detect stalling conditions, and we adjust the current continuously, in order to have a smooth ride.

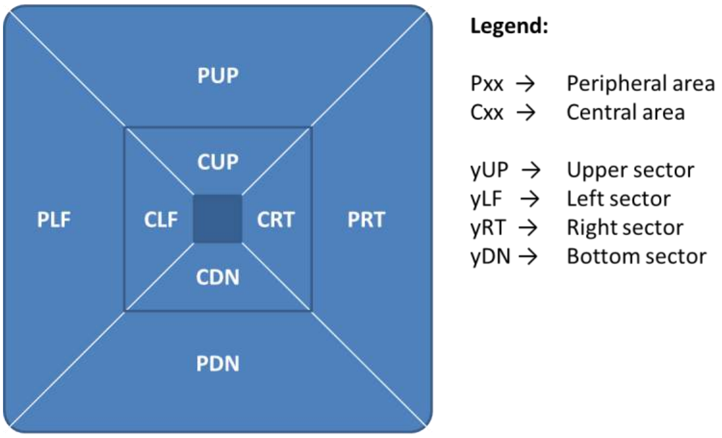
The solar tracking algorithm is hybrid, using astronomical sun speed calculation based on geographical location and date and time when the MISPS sensor is not activated.

5.6.4 MISPS sensor

This sensor fine positions the tracker when the direct radiation is above a certain threshold. As soon as enough radiation reaches any of the sensor cells within the MISPS sensor, the tracking algorithm is retrofitted with this information, increasing or decreasing tracking speed for the involved axis.

It is composed by eight crystalline silicon sensor cells arranged in two concentric areas. The central area is for fine tuning of the tracking algorithm and the peripheral area for coarse corrections.

We map different sectors directly on different solar cell segments present on the sensor following the next schema:



Name of different sensor sectors

The sensor provides information that is directly mapped onto the speed control algorithm in order to track the sun correctly. The use of two different areas ensures a wide acceptance and possibility to track the sun using coarse movements (peripheral area), and, at the same time, a very sensitive central section for fine tuning of the tracking algorithm in order to have the best possible performance by using the central area. Thanks to this feature, trackers can be installed and commissioned without needing any calibration procedures.

Please refer to patent document for a basic understanding on how the MISPS sensor works.

Previous image depicts one of the early prototypes of the MISPS sensor.

5.7 Product Cost Structure

5.7.1 Cost, BOM by 2020

id	component	u	€/u	€	C	Tu	T€	Wp	€/Wp
1	**system**	**1,00**	**1.955,46**	**1.955,46**				**3.009,60**	**0,6497**
1.1	**super-module**	**2,00**	**621,40**	**1.242,80**				**1.504,80**	**0,4129**
1.1.1	**receiver panel**	**8,00**	**43,13**	**345,06**				**188,10**	**0,2293**
1.1.1.1	receiver	20,00	1,47	29,49				9,41	0,1568
1.1.1.1.1	glass ball 12 mm	1,00	0,18	0,18	1	320,00	56,32		0,0187
1.1.1.1.2	optical adhesive	0,00	50,00	0,04	1	0,27	13,68		0,0045
1.1.1.1.3	DBC circuit	1,00	0,10	0,10	1	320,00	32,00		0,0106
1.1.1.1.4	3J cell	1,00	0,90	0,90	1	320,00	287,85		0,0956
1.1.1.1.5	receiver assembly	1,00	0,20	0,20	1	320,00	64,00		0,0213
1.1.1.1.6	bypass diode	1,00	0,02	0,02	1	320,00	6,40		0,0021
1.1.1.1.7	mounting ring	1,00	0,04	0,04	1	320,00	11,52		0,0038
1.1.1.2	Al back plate	1,00	6,44	6,44	1	16,00	103,12		0,0343
1.1.1.3	Radiation shield	1,00	2,11	2,11	1	16,00	33,70		0,0112
1.1.1.4	EVA layers	2,00	1,35	2,70	1	32,00	43,20		0,0144
1.1.1.5	thermal tape	20,00	0,02	0,31	1	320,00	4,99		0,0017
1.1.1.6	receiver attachment	0,01	15,00	0,08	1	0,09	1,33		0,0004
1.1.1.7	Cu interconnects	19,00	0,07	1,32	1	304,00	21,07		0,0070
1.1.1.8	end connector plate	2,00	0,04	0,08	1	32,00	1,28		0,0004
1.1.1.9	brackets	8,00	0,05	0,40	1	128,00	6,40		0,0021
1.1.1.10	lamination	0,01	15,00	0,13	1	0,13	2,00		0,0007
1.1.1.11	interconnection	0,01	15,00	0,08	1	0,08	1,27		0,0004
1.1.2	**SOG panel w brackets**	**8,00**	**13,81**	**110,50**				**188,10**	**0,0734**
1.1.2.1	SOG panel	1,00	11,66	11,66	1	16,00	186,56		0,0620
1.1.2.2	brackets	8,00	0,05	0,40	1	128,00	6,40		0,0021
1.1.2.3	UV curing adhesive	8,00	0,19	1,50	1	128,00	24,04		0,0080
1.1.2.4	SOG bracket assembly	0,02	15,00	0,25	1	0,27	4,00		0,0013
1.1.3	**super-module frame**	**1,00**	**99,56**	**99,56**				**1.504,80**	**0,0662**
1.1.3.1	long external wall	2,00	6,00	12,00	1	4,00	24,00		0,0080
1.1.3.2	short external wall	2,00	3,30	6,60	1	4,00	13,20		0,0044
1.1.3.3	long vertical profiles	3,00	9,60	28,80	1	6,00	57,60		0,0191
1.1.3.4	long traverse profiles	2,00	6,00	12,00	1	4,00	24,00		0,0080
1.1.3.5	short traverse profiles	6,00	3,00	18,00	1	12,00	36,00		0,0120
1.1.3.6	long internal channel plates	12,00	0,45	5,40	1	24,00	10,80		0,0036
1.1.3.7	short internal channel plates	8,00	0,36	2,88	1	16,00	5,76		0,0019
1.1.3.8	external corners	4,00	1,60	6,40	1	8,00	12,80		0,0043
1.1.3.9	internal corners	4,00	0,60	2,40	1	8,00	4,80		0,0016
1.1.3.10	external rivets	86,00	0,05	4,54	1	172,00	9,07		0,0030
1.1.3.11	internal rivets	44,00	0,01	0,54	1	88,00	1,08		0,0004
1.1.4	**super-module other**	**1,00**	**66,28**	**66,28**				**1.504,80**	**0,0440**
1.1.4.1	vent	2,00	6,95	13,90	1	4,00	27,80		0,0092
1.1.4.2	exit cables	2,00	0,29	0,58	1	4,00	1,16		0,0004
1.1.4.3	exit pasthroughs	2,00	0,15	0,30	1	4,00	0,60		0,0002
1.1.4.4	panel rivets	384,00	0,03	11,43	1	768,00	22,86		0,0076
1.1.4.5	silicone	3,48	2,00	6,96	1	6,96	13,92		0,0046
1.1.4.6	PE foam extrusion	0,43	1,00	0,43	1	0,86	0,86		0,0003
1.1.4.7	bearings	2,00	6,00	12,00	1	4,00	24,00		0,0080
1.1.4.8	bearing housings	2,00	10,09	20,19	1	4,00	40,38		0,0134
1.1.4.9	o-rings	1,00	0,50	0,50	1	2,00	1,00		0,0003
1.2	**tracker**	**1,00**	**279,70**	**279,70**				**3.009,60**	**0,0929**
1.2.1	stepping motor/encoder	2,00	10,00	20,00	1	2,00	20,00		0,0066
1.2.1	gearbox	2,00	15,00	30,00	1	2,00	30,00		0,0100
1.2.2	slew drive	1,00	50,00	50,00	1	1,00	50,00		0,0166
1.2.3	internal linear actuator	1,00	20,00	20,00	1	1,00	20,00		0,0066
1.2.4	core box	1,00	65,00	65,00	1	1,00	65,00		0,0216
1.2.5	horizontal tube	1,00	37,70	37,70	1	1,00	37,70		0,0125
1.2.6	MISPS sensor	1,00	25,00	25,00	1	1,00	25,00		0,0083
1.2.7	power supply 24V	1,00	12,00	12,00	1	1,00	12,00		0,0040
1.2.8	integrated control	1,00	20,00	20,00	1	1,00	20,00		0,0066
1.3	**inverter**	**1,00**	**300,96**	**300,96**	**1**	**1,00**	**300,96**		**0,1000**
1.4	**system intregration**	**1,00**	**132,00**	**132,00**				**3.009,60**	**0,0439**
1.4.1	system assembly	8,00	12,00	96,00	1	8,00	96,00		0,0319
1.4.2	system test 1	0,25	12,00	3,00	1	0,25	3,00		0,0010
1.4.3	sealing preparation	0,50	12,00	6,00	1	0,50	6,00		0,0020
1.4.4	system sealing	2,00	12,00	24,00	1	2,00	24,00		0,0080
1.4.5	system test 2	0,25	12,00	3,00	1	0,25	3,00		0,0010
TOTAL							1.955,46		

5.7.2 CPV installation costs by 2020

type	component	u	€/u	€	€/Wp
components	CPVRS 072 v3	410	2.005,81	822.381,44	0,67
shipment	Containers to assembly facility	3	1.500,00	5.125,00	0,00
assembly	Local assembly and testing	410	132,00	54.120,00	0,04
transport	Trucks to installation site	11	500,00	5.694,44	0,00
transport	Systems	410	8,25	3.382,50	0,00
installation	Driving pole	410	40,00	16.400,00	0,01
installation	Systems	615	12,00	7.380,00	0,01
installation	Crane	68	50,00	3.416,67	0,00
transfos	Transformers	1.110.542	0,10	111.054,24	0,09
services	Engineering, Project Management	1.110.542	0,01	8.884,34	0,01
installation	Civil work	1.110.542	0,01	9.994,88	0,01
installation	Grid connection	1.110.542	0,05	55.527,12	0,05
integration	EPC mark-up	1.103.361	0,22	242.201,11	0,20
TOTAL				**1.345.561,74**	**1,09**

5.8 Competitiveness

5.8.1 Comparison with PV fixed and 1 axis tracking horizontal, average scenario

Taif, Saudi Arabia		
Loan/Investment	0,00%	
Feed-in tariff	10	c€/kWh
EPC margin	18,00%	

concept	**CPVRS072**	**PV Fixed**	**PV Single**	unit
Module price	N.A.	0,35	0,35	€/Wp
Peak power	1.233.936	1.125.000	1.192.500	Wp
CAPEX	1.345.562	1.449.496	1.752.960	€
per Wp	1,09	1,29	1,47	€/Wp
Production	2.300.896	1.890.000	2.404.080	kWh/y
Revenue	230.090	189.000	240.408	€/y
OPEX	13.334	8.315	9.094	€/y
LEC	3,54	4,29	4,04	c€/kWh
NPV	3.961.097	2.110.903	2.807.303	€
IRR	15,98%	10,77%	11,60%	

By 2020 we expect our systems to be 42% DC efficient and to be the most competitive technology in Saudi Arabia and countries of similar DNI and ambient diurnal temperatures, even if the cost of c-Si modules continues a declining trend and reaches 0,35 €/Wp.

5.8.2 Comparison with PV fixed and 1 axis tracking horizontal, worst case scenario

Taif, Saudi Arabia		
Loan/Investment	0,00%	
Feed-in tariff	10	c€/kWh
EPC margin	18,00%	

concept	**CPVRS072**	**PV Fixed**	**PV Single**	unit
Module price	N.A.	0,20	0,20	€/Wp
Peak power	1.233.936	1.125.000	1.192.500	Wp
CAPEX	1.345.562	1.243.704	1.534.820	€
per Wp	1,09	1,11	1,29	€/Wp
Production	2.300.896	1.890.000	2.404.080	kWh/y
Revenue	230.090	189.000	240.408	€/y
OPEX	13.334	8.315	9.094	€/y
LEC	3,54	3,75	3,59	c€/kWh
NPV	3.961.097	2.314.658	3.023.283	€
IRR	15,98%	13,06%	13,66%	

Even if prices for c-Si go down to level of 0,20 €/Wp, we will still remain competitive. At this level our local partner, if vertically integrated into EPC activities, will obtain a 18% operational margin.

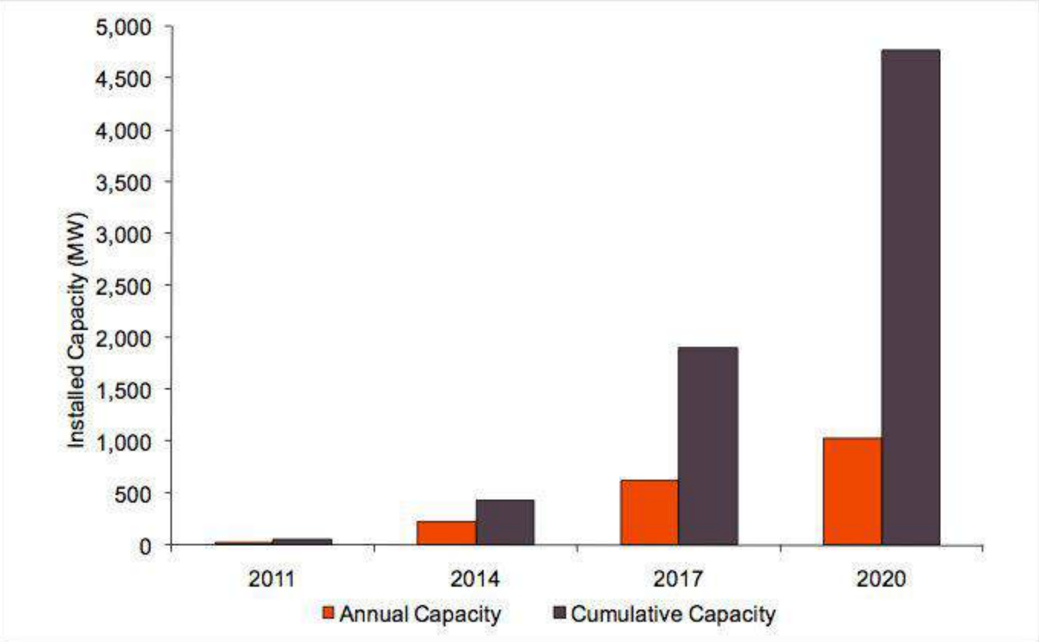
6 Potential Market

- By 2020 the TAM will depend on the cell efficiency reached by our providers. If 50% is reached, then we expect the CPV market to take at least 20% of total PV market in countries having DNI > 1.800 W/m2. Given the fact that the product will be the most competitive but that adoption will be relatively slow.
- Under this assumption, after analyzing PV market reports from several sources, we expect the global CPV installed capacity to reach 5 GWp by 2020, and to be growing by then at a rhythm of 1 GWp per year.
- At that time we expect to be able to sell our product to local partners at a price of 0,65 €/Wp EXW, with a 10% operational margin.

TAM = 1 GWp * 0,65 €/Wp = **650 M€**

- From this 1 GWp per year a 12% CPV market share would generate a turnover from CPVRS sales of 80 M€, yielding a gross profit around 5 M€.

Concentrated PV Market, Global, Installed Capacity, MW, 2011-2020



Source: GlobalData; Primary research with C (Chief) - level marketing and technical experts in Italy, the UK, Spain, China and the US

6.1 References

Please see:

http://www.businesswire.com/news/home/20110418005752/en/Research-Markets-Concentrated-Photovoltaic-CPV---Global#.VJFxLGctCpp)

http://cleantechnica.com/2013/04/11/cpv-market-by-2020-to-hit-4-7-gw-globaldata-report/

http://www.semiconductor-today.com/news_items/2014/MAR/GLOBALDATA_180314.shtml

http://www.pv-magazine.com/news/details/beitrag/global-cpv-capacity-expected-to-reach-1-gw-by-2020_100014547/#axzz3MFLpv3iX

7 Competitors and substitutes

7.1 Competitors

Competitor	Strength	Weakness	Position respect VGP
Soitec	They have an integral system approach. They are the market leader and have more field experience than all the others put together. They have the best engineering resources in CPV, with support from Fraunhofer ISE.	Their whole manufacturing process is heavily automated and their manufacturing plant at San Diego has cost 150 M$. They are burdened by huge investments and therefore debt. Their systems are very expensive in installation and commissioning. Have lost several projects in the US which are forcing a complete restructuring of the company.	We have a much more flexible value chain and business model.
Suncore	Based in China, huge pipeline of projects and governmental support.	They have based their strategy in buying products from failed CPV start-ups, therefore the products don't seem to be the best. They almost only work in China, their modules are very voluminous. Their systems are very expensive in installation and commissioning. A lot of fine calibration is required for their flat trackers.	We have higher system DC efficiency.
Arzon Solar	Long track record from Amonix, holistic system design, competitive.	Very large systems, difficult permitting, big demands on foundation, not easy to industrialize abroad. Their systems are very expensive in installation and commissioning. PMMA primary optics have a negative customer perception.	We have higher system DC efficiency.
Morgan Solar	Very flat design, without any air cavities, which is a great advantage. Interesting tracking concept. It seems it can be low cost.	Very poor efficiencies attained so long. Very prone to soiling on its back side. Very difficult to clean also.	They are an enigma at the moment. We must keep watching them very closely. We have much higher system DC efficiency.

Semprius	Very nice flat compact modules. Highest module efficiency so long, at 35%.	No system concept, they rely on third party trackers. Their technology seems to be very expensive. System DC efficiency unknown.	As they don't have a tracker, if they really succeed in lowering their module cost It may be worth trying to sell them our tracking technology.
REhnu		Weird concept. Field danger to people inherent to big mirrors. High installation and commissioning costs.	We should not worry about them.
Raygen	New concept based on tower CPV/T system with ray splitting at the receiver. It seems they use a secondary silicon receiver and that they capture the waste cooling heat and have the intention to use to improve CAES efficiency. They have announced 40% receiver efficiency, but its not clear to what scale.	Only suitable for installation sizes above 200 kWp. High permitting costs due to central tower height. Dangerous technology due to mirror concentration. Security issues will be posed by authorities. They will be only competitive if the CAES system is taken into account.	Their technology is revolutionary and we don't play in the same field, also there is a very good personal relationship between John Lasich, their CTO, and our CEO. Therefore we should try to find synergies with them.
Solar Systems	They have a long pioneering experience.	They lost their founder and CTO: John Lasich. Too large. Very high installation and commissioning costs. Permitting problems. Dangerous for people. Not competitive enough.	We should not worry about them.
Magpower		They have just copied what Sol3g did, and we now very well their technical limitations.	We should not worry about them.
Cool Earth Solar		Absolutely weird concept. Can never be reliable.	We should not worry about them.
VGP	CPVRS solves some traditional CPV shortcomings. Its small and can be used in situations where Soitec cannot be used. Eventually can be used on flat rooftops or industrial scale applications without problems associated with other CPV players.		

7.2 Substitute products

Our primary target market segment is: large PV plants in high DNI countries. Here the substitutes will be:

- Other CPV products
- c-Si modules mounted on fixed structures
- c-Si mounted on single axis horizontal trackers.

7.2.1 Other CPV products

CPV should be particularly difficult to substitute when the cost of land would be an issue, where we have a clear competitive edge over PV.

Given our business model, local partners will have strong reasons to keep loyal, as we offer a unique business opportunity and once they get into the system it will be not possible for them to switch to another supplier and keep the same schema. The main risk may be for them to develop their own products and learn step by step from us.

Also, given our differential all-in-one concept, providing such easy transportation, installation and commissioning, we will have access to market segments which will be inaccessible for our main competitors, like Soitec.

7.2.2 c-Si modules mounted on fixed structures

For very large and industrial plants we are convinced that our solution will be markedly more competitive by 2020, as it can be seen in the comparative analysis at 5.5.

We will also have an advantage for small installations when the cost of land is important (due to our higher efficiency).

Also in these situations were tracking provides an important advantage our position will be more favorable. This is the case for instance in water pumping off-grid applications, an important niche market in developing countries, particularly in the MENA region.

7.2.3 c-Si mounted on single axis horizontal trackers.

In principle our cost analysis tells us that this is our main thread for very large installations in our target regions, as it can be seen in the comparative cost analysis in point 5.5.

Their main advantage is that they offer the benefits of single axis tracking (about 20% increase in production) without creating too much maintenance cost risk perception, because these systems rely on multiple units mechanically linked, in such a way that a single electrical or hydraulic actuator can move more than 100 kWp of modules.

To use large horizontal east-west trackers is already a clear trend in high DNI areas like Chile or the SW US states.

7.3 Business Model

7.3.1 B2B

It has been already explained.

Our business model for large and industrial CVPRS installations is based on a franchise model country by country.

We must recruit local partners and do a careful selection based on an agreed business plan which can eventually be used as exit option.

7.3.2 B2C

It's clear the attractiveness of the residential market, having potentially much higher margins than B2B and a higher capacity to attract customers by other reasons other than pure cost.

During 2015 we will give it a try with the CPVGOGO campaign (see chapter 11). As we have the product, we don't risk anything.

8 Financial forecast

8.1 CPVRS Business

Our main focus in this business plan is on the CPVRS system, and the following table details the main figures behind our financial forecast:

CPVRS	2014	2015	2016	2017	2018	2019	2020	
TAM CPV	100	140	200	325	500	700	1.000	MW
market share	0%	0%	1%	5%	8%	10%	12%	
cell efficiency	0,38	0,40	0,42	0,44	0,46	0,48	0,50	
optical efficiency	0,85	0,85	0,86	0,87	0,88	0,89	0,90	
other efficiency	0,93	0,91	0,92	0,92	0,93	0,93	0,94	
system efficiency	0,30	0,31	0,33	0,35	0,38	0,40	0,42	
power per system	2,16	2,23	2,39	2,54	2,71	2,86	3,05	kW
units sold	10	200	1.000	6.000	15.000	25.000	40.000	u
power sold	0,02	0,4	2,4	15,2	40,7	71,5	121,8	MWp
components cost/unit	5.592	3.895	2.586	2.280	2.128	1.975	1.823	€/u
labour cost/unit	240	120	64	21	16	13	12	€/u
direct cost/unit	5.832	4.015	2.650	2.301	2.144	1.989	1.835	€/u
mark-up	160%	25%	18%	15%	14%	12%	10%	
unit price EXW	15.163	5.019	3.127	2.647	2.444	2.227	2.018	€/u
price per Wp EXW	7,01	2,25	1,31	1,04	0,90	0,78	0,66	€/Wp
sales	151.632	1.003.750	3.127.000	15.879.200	36.656.700	55.682.667	80.728.267	€
direct cost	58.320	803.000	2.650.000	13.808.000	32.155.000	49.716.667	73.389.333	€
gross profit	93.312	200.750	477.000	2.071.200	4.501.700	5.966.000	7.338.933	€
R&D	180.000	300.000	330.000	363.000	399.300	439.230	483.153	€
% activation	90%	90%	80%	80%	80%	80%	80%	€
R&D activated	162.000	270.000	264.000	290.400	319.440	351.384	386.522	€
R&D assets	162.000	408.000	639.600	848.400	1.039.920	1.221.624	1.400.162	€
R&D depreciation	24.000	32.400	81.600	127.920	169.680	207.984	244.325	€
factory A investment	40.000	600.000	800.000	270.000	2.000.000	1.000.000	800.000	€
factory A assets	102.000	696.000	1.475.600	1.606.400	3.311.280	3.990.000	4.127.744	€
factory A depreciation	6.000	20.400	139.200	295.120	321.280	662.256	798.000	€
total depreciation	30.000	52.800	220.800	423.040	490.960	870.240	1.042.325	€
sales cost	0	200.000	160.000	180.000	240.000	300.000	500.000	€
other cost	70	0	0	0	60.000	60.000	60.000	€
total indirect cost	30.070	252.800	380.800	603.040	790.960	1.230.240	1.602.325	€
total cost	88.390	1.055.800	3.030.800	14.411.040	32.945.960	50.946.907	74.991.658	€
profit	63.242	-52.050	96.200	1.468.160	3.710.740	4.735.760	5.736.609	€

8.2 Revenues

The following revenues are a forecast for 2015-2020 and include other VGP products and services.

Sales	2014	2015	2016	2017	2018	2019	2020	
sales CPVRS	151.632	1.053.750	3.177.000	15.929.200	36.706.700	55.732.667	80.778.267	€
sales engineering	35.000	210.000	315.000	472.500	708.750	1.063.125	1.594.688	€
sales HST	0	45.000	180.000	450.000	1.575.000	4.725.000	12.757.500	€
sales PVAST	0	63.750	98.813	247.031	864.609	4.323.047	15.130.664	€
sales Cleandrone	0	29.000	120.000	180.000	3.000.000	4.500.000	5.400.000	€
sales distribution	27.700	500.000	750.000	1.125.000	1.687.500	2.531.250	3.796.875	€
total sales	214.332	1.901.500	4.640.813	18.403.731	44.542.559	72.875.089	119.457.993	€

8.3 P&L

P&L	2014	2015	2016	2017	2018	2019	2020	
sales	214.332	1.901.500	4.640.813	18.403.731	44.542.559	72.875.089	119.457.993	€
provisioning	-60.000	-1.357.675	-3.573.431	-15.412.078	-36.313.773	-60.831.263	-102.706.379	€
contractors	-9.000	-54.000	-81.000	-121.500	-182.250	-273.375	-410.063	€
salaries	-120.000	-204.000	-304.000	-388.000	-500.000	-653.333	-849.333	€
social security	-18.000	-40.800	-60.800	-77.600	-100.000	-130.667	-169.867	€
rentals	-15.600	-15.600	-15.600	-46.800	-46.800	-85.000	-85.000	€
marketing	-7.740	-280.000	-210.000	-262.500	-393.750	-590.625	-885.938	€
other	-12.000	-72.000	-108.000	-162.000	-243.000	-364.500	-546.750	€
EBITDA	**-28.008**	**-122.575**	**287.981**	**1.933.253**	**6.762.986**	**9.946.326**	**13.804.664**	**€**
depreciation	30.000	52.800	220.800	423.040	490.960	870.240	1.042.325	€
earnings	-58.008	-175.375	67.181	1.510.213	6.272.026	9.076.086	12.762.340	€

8.4 Balance Sheet

Blance Sheet	2014	2015	2016	2017	2018	2019	2020	
fixed assets	234.000	966.000	1.739.600	1.896.800	3.630.720	4.341.384	4.514.266	€
inventory	3.000	113.140	297.786	1.284.340	3.026.148	5.069.272	8.558.865	€
accounts receivable	52.000	158.458	386.734	1.533.644	3.711.880	6.072.924	9.954.833	€
cash	44.000	-173.277	-507.972	-1.515.305	391.501	2.632.663	4.986.952	€
total assets	**333.000**	**1.064.321**	**1.916.148**	**3.199.479**	**10.760.249**	**18.116.243**	**28.014.916**	**€**
capital	3.006	3.340	3.340	3.340	3.340	3.340	3.340	€
premium	0	399.666	399.666	399.666	399.666	399.666	399.666	€
retained earnings	181.558	123.550	-51.825	1.920	1.059.069	3.567.880	6.290.705	€
earnings	-58.008	-175.375	67.181	1.510.213	6.272.026	9.076.086	12.762.340	€
short term liabilities	171.444	113.140	297.786	1.284.340	3.026.148	5.069.272	8.558.865	€
long term liabilities	35.000	600.000	1.200.000	0	0	0	0	€
total equity + liability	**333.000**	**1.064.321**	**1.916.148**	**3.199.479**	**10.760.249**	**18.116.243**	**28.014.916**	**€**

8.5 Fundraising needs

- We will need about 1,5 M € in the period 2015/2016.
- We look for a capital fundraising round of 400 K € in Q1 2015.
- We are considering different strategies, like capital expansion with 4 M € company valuation pre-money. Also are in the process of requesting several grants and soft loans.

8.6 Ownership structure

Shareholder	Capital	%
R. Pardell	3.006 € (equity 246.000 €)	100,00 %
Total	3.006 €	100,00 %

9 IP Rights

CPVRS systems are based on four patented technologies: CPVRS, MISPS, CPVLIS and ICPVS. We also expect to patent the new slewing system introduced in CPVRS 072 v2.

A limited license has been given to our partner Azur Space, who has co-financed the development and has bought a first batch of 10 CPVRS 072 v1 systems in 2014.

9.1.1 CPVRS

Low cost assembly system allowing for de-centralised manufacturing at low tech sites.

The protected technology is important for our business model.

Fig. 2

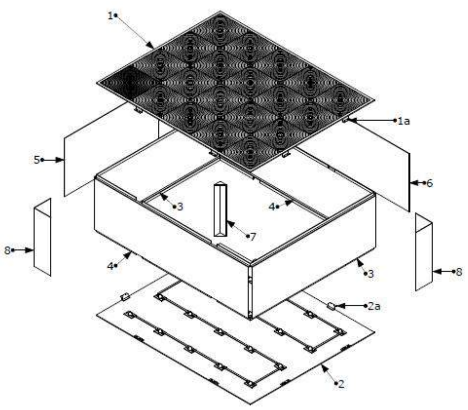
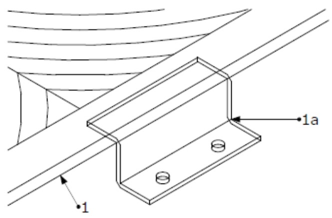


Fig. 3

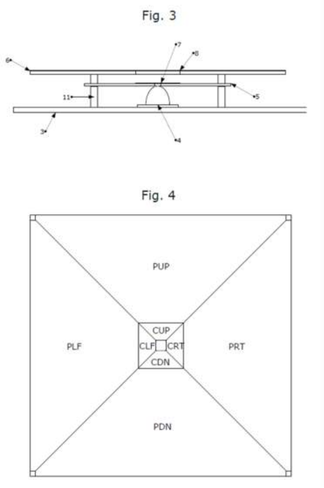


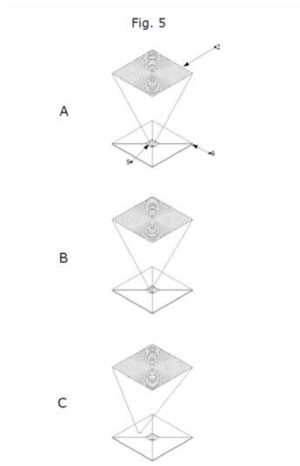
This patent got examination objections which were cleared after asking for an international patentability report.

In national phase: US and Europe.

9.1.2 MISPS

Module integrated solar position sensor.





A basic characteristic of our solar tracking system, based on a hybrid algorithm which combines astronomical speed calculation with a correction feedback using singals generate by the MISPS sensor.

The characteristics of the MISPS sensor enable the plug ang play unique characteristic of our CPVRS systems, because they avoid the need for calibration during the commissioning process. Also they reduce installation costs by relaxing the requirements on verticality and orientation on foundations.

Clean patent.

In national phase: US and Europe.

9.1.3 CPVLIS

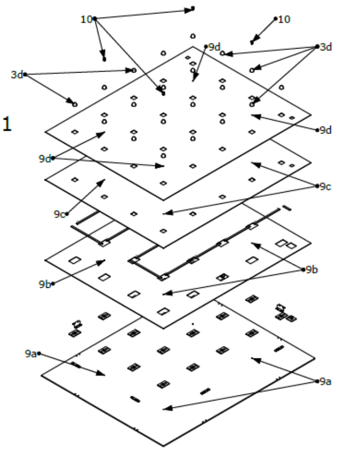
CPV laminated interconnection system.

This patent covers the main characteristics of our CPV receivers panel: its complete water-tightness, receiver encapsulation and very high insulation level.

In PCT process.

Entering national phase in May 2015.

Fig. 11



9.1.4 ICPVS

Integrated CPV advanced tracking system.

Here the main feature protected is the fixed horizontal tube penetrating both super-modules.

This feature enables tracker transportability.

Fig. 2

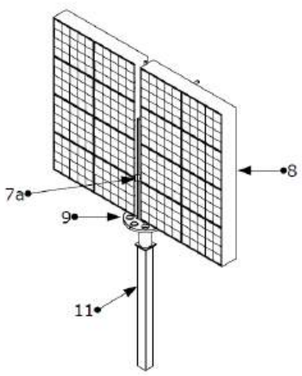


Fig. 3

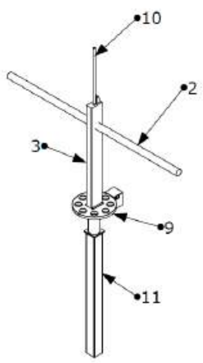
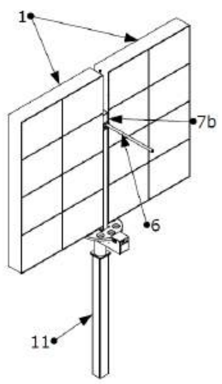


Fig. 4



In PCT process and entering national phase in May 2015.

9.1.5 New slew drive concept

We expect to register a patent for the new slew drive system beginning 2015.

10 Current Status and Achievements

10.1 Technological

The CPVRS 072 v1 product is fully developed, it can be sold for pilot installations by local partners. CPVRS 072 v2 will be ready in Q1 2015.

10.1.1 First module prototype

In April 2012 we manufactured our first CPVRS module prototype, which was showcased at CPV-8 in Toledo and later tested at CREA, Universitat de Lleida.

We achieved 27% efficiency on this first module. Cells were provided by Azur Space and SOG Fresnel panels by Concentrator Optics, both partners giving their support for free, but apart from this the project was completely financed by VGP.

Azur joined in the development of the system in October 2012, giving financial support, and then we moved to a small office in a business center, with a team of four people. At this moment the CPVRS detailed design was already almost completed, but it took a lot of effort to refine the receiver panel design and improve electrical insulation. In April 2014 we started assembling the first CPVRS full system in the CEO’s home garage. So, we can say we are a truly garage company!

10.1.2 First CPVRS 072 v0 prototype

We installed our first complete CPVRS 072 (v0) prototype in June 2013 at ETSAV, Sant Cugat del Vallès. The result was very satisfactory but for the efficiency which was lower than expected due to detail design errors and poor performance of first batch of SOG Frensel panels.

10.1.3 New facilities

We moved to new facilities having 300 m2 in the industrial outskirts of Valldoreix, close to Rubí.

There we have our engineering offices, our pilot receiver panels and SOG panel manufacturing line, an assembly workshop, and a front esplanade facing to the south which allows us to commission and test our machines before shipping them abroad.

WE have thoroughly improved tooling and the manufacturing process is now fully documented and refined.

10.1.4 Receiver panel insulation

In the first prototype we certainly had a problem in reaching the insulation degree required by IEC 62108 qualification standard. We had an attrition rate of 50%.

We finally solved the problem by improving several aspects of the receiver panel design and the tooling, and the result is excellent: 100% yield on the pre-series batch: so 0 rejects from 160 receiver panels manufactured.

All panels yielded more than 50 GΩ insulation level, meaning that we are more than 1000 times about IEC requirement of 10 MΩ.

We moved there in December 2013. Preparing the new facilities and improving the tooling for the pre-series manufacturing was very time consuming and we experienced a significant development delay. Also CPV receivers from Azur arrived quite late.

10.1.5 First CPVRS pre-series and new testing site at Rubí

CPVRS v0 was decommissioned from ETSAV in December 2013 and moved to the new facilities. All this time we demonstrated the transportability of the CPVRS system, a basic concept allowing our franchising business model. It also allows new usages for CPV systems, like temporary usage in construction sites (see later potential project with Acciona).

We have then manufactured a pre-series batch of 10 machines, together with Azur Space who provided CPV receivers (cell assemblies) for free and partially financed the development and manufacturing costs.

A demonstration site at Rubí has been executed, with 9 systems installed between June and October 2014. Another machine has been installed at Bühl, Germany, at a testing site owned by Azur Space.

Our systems can be delivered with low voltage or high voltage configurations (see previous description), and we are testing one system at low voltage connected to an ABB PVI 3.0 single phase inverter and the remaining 8 systems are configured at high voltage and parallel connected to an ABB PRO 33 three phase inverter.

Inverters are from ABB (http://www.abb.com/solarinverters). VGP is an ABB distribution partner

This is important as we want to see the pros and cons of working with central inverters versus having one dedicated inverter per CPVRS system.

In this pre-series of 10 machines we have obtained the following results:

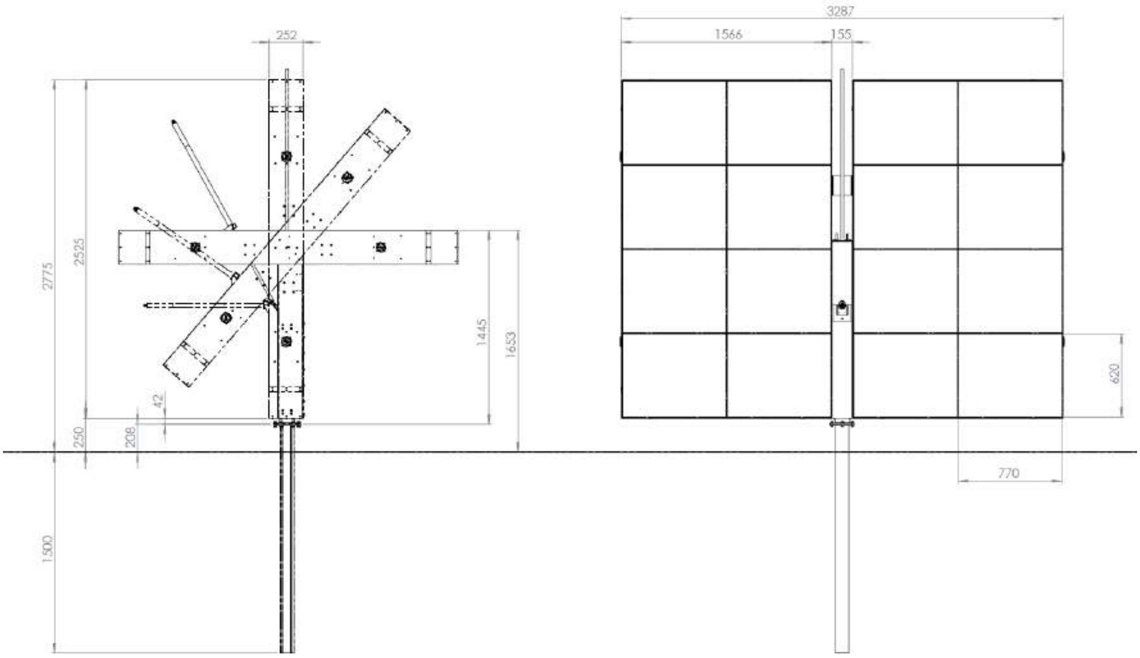
CPVRS072V1	EFA Lot	Supermodule 1	Supermodule 2	Eff.
SN000002	1	A1 to B1	B1 to C2	30%
SN000003	2, 3	A3 to B2	B3 to C2	30%
SN000004	4	A2 to A3	A3	29%
SN000005	4	A3 to B1	B1	27%
SN000006	4	B1	B1 to B2	28%
SN000007	4	B2	B2	28%
SN000008	4	B2 to B3	B3 to C1	28%
SN000009	5	A1 to A2	A2	26%
SN000010	5	A3 to B1	B2	24%
SN000011	5	B2 to B3	C1 to C3	26%

As the table shows, in this first pre-series batch the efficiencies obtained have been quite irregular, showing a string correlation with cell batch number. The number of cells provided by Azur Space was just too small to be able to do a proper current matching classification and selection and therefore the mismatch losses have been high.

10.1.6 New control electronics

Another very important milestone has been finishing the development of a new electronics tracking control system which downsizes the initial control electronics of v0 and v1 systems. With this improvement the system is really commercial as it has brought down the costs, enabling us to be competitive as long as we increase our production capacity.

10.1.7 CPVRS 072 v2

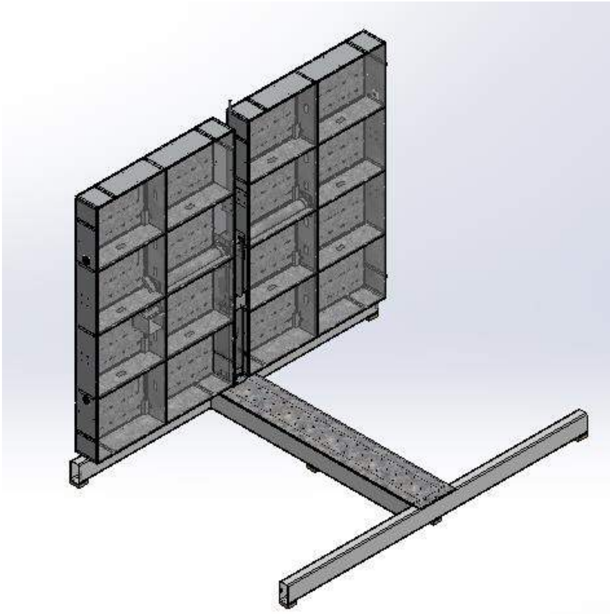


It incorporates a novel maintenance-free slewing drive concept which reduces costs and also simplifies the number of structural and mechanical components and delivers a much more compact system which can really fulfill a logistic optimization.

The new slew drive prototype is being cycled tested since several weeks ago, having already completed more than 1.500 cycles.

10.1.8 New transport system

A transport system adapted to CPVRS 072 v2 has been developed, which allows 36 systems to be transported on a truck trailer.

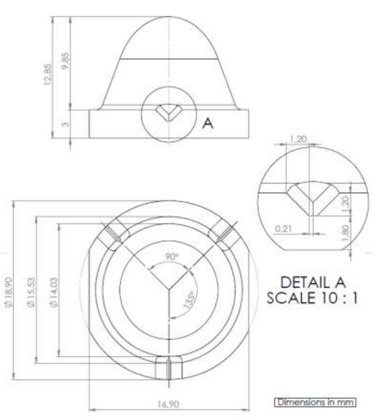


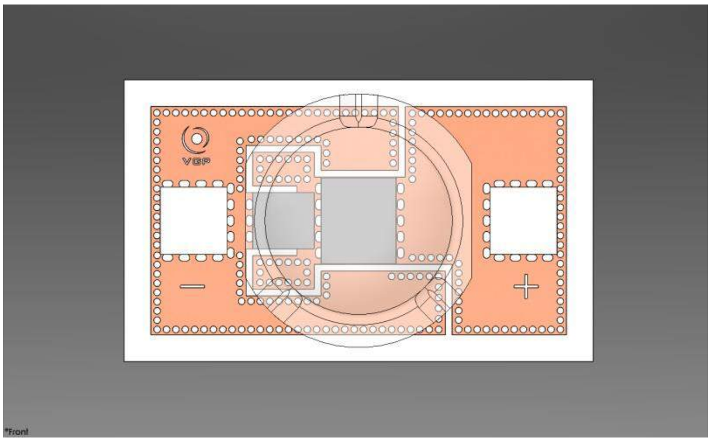
Systems are transported in groups of 9 CPVRS 072 machines supported by a transport bed. Each truck holds four transport beds.

Transport beds with 9 systems each can be transferred directly from the assembly facility to the truck and from the truck to the field.

10.1.9 CPV receiver

Up until now we have been obtaining receivers (cell assemblies) from Azur,





We are developing our own receiver, having a very similar DBC substrate to that one from Azur Space, but combined with new secondary optics design and material, as Azur Space was providing fused silica secondary optics and we are working on B270 optics based on a slightly different design principle.

This is a conservative approach, almost replicating Azur Space design. We are working with Hybtronics, Vitoria (former BERU micro-electronica) as a microelectronics assembly contractor. They were already receiver assembly providers for Sol3g.

10.2 Commercial

10.2.1 Solar Junction / Taqnia RFP Partnership

Since several weeks ago we have been in intensely interacting with Solar Junction / Taqnia. Taqnia is a Saudi Arabia state owned development company, which has decided to bet for CPV by first buying Solar Junction straight away.

Solar Junction has a very powerful triple junction cell based on a GaAs substrate and a bottom epitaxial GaInAsNSb 1 eV cell. This allows them to reach 44% efficiency, and they expect to reach 50% by 2020. This will allow our systems to reach 40% ceteris paribus, but as we expect also to refine our system we think that we will be able to reach 42% system efficiency by then. And please take into account that we talk on system, not module efficiency, which clearly makes a difference with our competitors.

We have been initially invited by SJ/Taqnia to a RFBP (request for budgetary proposal) process, and we have passed this first cut successfully. As a consequence, we have been invited to an RFP process in order to submit a 100 kW formal proposal.

We expect to close this deal during Q1 2015.

If we win this project it will give a tremendous boost to our company for several reasons:

1) Because it's exactly the right kind of next step, after having manufactured a pre-series of 10 machines, now we could be manufacturing 50 machines starting March 2015. Being this above our commercial expectations for beginning next year.
2) It will be the first step towards a very powerful partnership at least for Saudi Arabia, with a governmental company with huge political support and pipeline of projects, exactly the kind of local partner we look for. If they get convinced the acceleration of our company can be tremendous, because with a larger budget we can have the 20 MW capacity by the end of 2015 and can increase it very easily as much as desired.
3) The probability of Taqnia buying VGP will be very high, also because they have shown a lot of interest in the Cleandrone system, which solves the cleaning problem, one of the principal concerns for the development of utility scale solar in desert countries, CSP and CPV being more affected than PV in this respect. This is a clear exit option for our potential investors.

10.2.2 Other Opportunities

We are very close to signing a local partnership agreement for Egypt with El Didi Group (http://www.eldidigroup.com/). There is a new feeding tariff schema in Egypt. They will set up a small pilot plant for demo purposes.

We have already sold one pilot system to SENAI/SC (http://sc.senai.br/), a technological and professional training center in Jaraguá do Sul, Brazil. This will be a good showroom which can spread the message in South-America and attract potential local partners and final customers. The system will be a v2 and it is expected to be delivered first quarter of 2015, after an initial trial at our testing site. The price of the system is well above market price, proving that pilot systems can be sold at premium price and therefore contributing already with a margin to the company finance.

We are in talks with CDER, in Algeria (http://www.cder.dz/), for the installation of pilot CPVRS systems at two different sites. They have also shown their interest in putting us through in contact with potential industrial local partners.

We are in talks with Enerside (http://www.enerside.com/) for a local partnership agreement for Chile and Brazil.

We are also conducting negotiations with potential local partners in the following countries: Saudi Arabia, Colombia, Chile, Lebanon, Tunisia, Jordan, US, Australia and Argentina.

VGP is also in talks with Acciona (http://www.acciona.es/) R&D department for the evaluation of CPVRS systems in temporary power generation locations in construction sites, to lower dependency from diesel gensets.

10.3 Team

10.3.1 Ricard Pardell, CEO and CTO

See entrepreneurial team.

10.3.2 Eric Martinez, Responsible for Mechanical Engineering and Manufacturing

Eric was recruited at the end of 2012.

He is an excellent mechanical engineer and a very committed hard working professional who loves his job. He has very high proficiency in using CAD software and FEA tools. He has also learnt a lot on CPV while working together with Ricard.

In the development process we have had some temporary interns helping Eric in manufacturing process documentation, FEA thermal and mechanical simulations and other auxiliary engineering tasks.

Eric holds a MSc in Industrial Engineering (300 ECTS) – Major in Machinery, Manufacturing and Materials Selection. IQS – School of Engineering, Ramon Llull University

10.3.3 Daniel Bernal, Responsible for Electronics and Software Engineering

Eric was recruited at the end of 2012.

He is a very multi-disciplinary electronics and telecom engineer, covering from electronics design to software engineering on Linux systems. He has previously worked for HP and at Funitec, a La Salle University spin-off.

Daniel holds a B.Sc. Technical Engineering in Telecommunications, Major in Electronic Systems, and he is presently validating M.Sc in Telecommunications and M.Sc. in Electronics Engineering.

In this picture we can see the core engineering team of VGP: Daniel Bernal, Ricard Pardell and Eric Martínez from left to right, standing in front of our first CPVRS 072 prototype installed in June 2013 at ETSAV, Sant Cugat del Vallès.

10.3.4 Benjamí Vera, Responsible for PV Projects

He has a lot of experience on PV plant design and execution. He has a degree on Electrical Engineering by the University of León.

He has developed large PV plants in the UK, Spain and Italy. He also has worked in Australia. His previous employment was at Bester Generación.

10.3.5 Diego Muñoz, Robotics Engineer

He works under the direction of Daniel.

Diego has a degree in Industrial Engineering and he is now studying a master in robotics by the UPC.

His main task is to develop the Cleandrone system.

10.3.6 David Beltran, Software Engineer

He works under the direction of Daniel.

He is doing an internship, with which he will obtain his Computer Science Image Processing degree by the UPC.

He is a hard worker and has adapted very well to the company, so we think that we will keep him when he finishes his internship.

10.3.7 Marina Garcia, Marketing

She works under the direction of Ricard.

Marina has a degree in Marketing and Communication at UAB and has attended post-grade on-line marketing course at La Salle.

She has worked previously as online marketing manager and community manager, SEO positioning end content management at MB Marketing, a small on-line marketing agency. Previously she has made internships at TV and Barcelona TV.

10.3.8 Hector Acedo, CPV Assembly and Installation Technician

He works under the direction of Eric or Benjamí, depending on the tasks assigned.

Hector has a tittle on photovoltaic and solar thermal systems installation by Censolar.

10.3.9 Juan José Moya, CPV Assembly and Installation Technician

He works under the direction of Eric or Benjamí, depending on the tasks assigned.

Juan José holds a medium FP degree on vehicle electro-mechanics.

10.4 Financing

At the moment we are evaluating several ways to finance the project, basically:

- **Grants**: SME instrument phase 2.
- **Soft loans**: CDTI, RETOS, ICO, ICF
- **Capital expansion**: Equity crowdfunding (crowdcube, Mynvest)
- **Reward crowdfunding**: Indiegogo campaign based on the CPVGOGO product, aiming at selling 2.000 units at 600 euros each, with a 50% margin, helping raise funds and rollout manufacturing capacity as it will be equivalent to selling 300 kW of critical components for CPVRS systems.

But we basically hope on convincing KIC InnoEnergy to help us define how to get there.

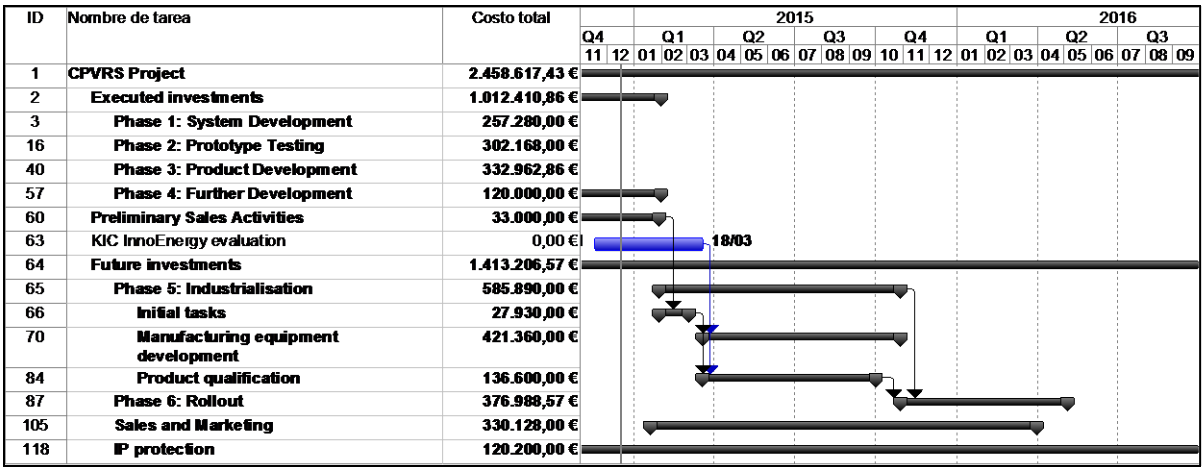
11 Development Needed

We need around one year and a half to be able to have a break even reachable structure by end of 2016 with a manufacturing capacity of 20 MW per shift of CPVRS critical components and an initial network of local partners in place.

In order to reach this goal we have to invest in three fronts:

- Product industrialization, development and qualification
- Marketing and business development
- Factory rollout
- IP protection

The investments required and its timing is shown in the subsequent Gantt chart:



Phase 5: Industrialization, product qualification and product development (v3)	584.890,00 €
Phase 6: Factory rollout	376.988,57 €
Sales and Marketing	330.128,00 €
IP protection (this is actually an estimate for 10 years)	120.200,00 €
Total investment estimated 2015-2016	**1.413.206,57 €**

11.1 Technological

11.1.1 Product Industrialization

There are three critical processes which need to be fully automated and are now executing using jigs and tooling used by hand:

- Receiver placement.
- Receiver interconnection.
- SOG panel processing.

The automation has the objective to reduce our tact time to one receiver panel and SOG panel per minute, reduce labor utilization and increase product quality.

We also need to purchase a lamination machine, but we think that for this phase we will be able to use a second hand machines at a bargain price.

11.1.2 Product Certification

We have budgeted estimated cost to complete IEC 62108 CPV module certification with CENER and additional specific tests on the tracking system based on CENER own standards.

11.1.3 Development of CPVRS 072 v3

A further development of our new azimuth slew drive, bringing costs down by simplifying and reducing the number of components in the drive. We will also evaluate a new solution for the elevation axis.

We expect this to take about six months in parallel with product industrialization. No changes expected on receiver panels and SOG panels in principle.

11.1.4 New receiver and secondary optics

A new SOE concept and optical assembly system will be evaluated for a drastic cost reduction, as one of the problems with Azur Space design was that its cost is well above expectations. At the same time we are developing a new substrate concept which we expect will significantly improve thermal management and therefore increase NOC performance without affecting cost.

11.1.5 New primary optics

We want to evaluate a new Fresnel lens concept which will greatly reduce one of main SOG drawbacks: high temperature dependence.

This new kind of optics, if it works successfully, would give us an additional competitive edge in front of other CPV players using SOG panels.

11.2 Commercial

11.2.1 Marketing

In 2015 we must make an effort to divulgate knowledge of our CPVRS product and our achievements

A key milestone will be our CPVRS product launch at CPV-11 (http://www.cpv-11.org/, Aix-les-Bains, France, April), this year being organized by CEA-INES. We plan at actually moving a pre-series system there.

After this we should be present at the main industry events: EUPVSEC (https://www.photovoltaic-conference.com, Germany, September), Solar Power International (http://www.solarpowerinternational.com, US, September) and Intersolar (http://www.intersolar.de, Germany, June); and at some regional events like Menasol (http://www.csptoday.com/menasol, Dubai, May) or specialized events like CSP Today (http://www.csptoday.com/southafrica, South Africa, April)

We have already a new web site dedicated to the CPVRS system (www.cpvrs.com)

11.2.2 Recruitment of Local Partners

For 2015 our focus must be marketing and partner business development. We need a senior business development professional.

Our objective should be to identify potential local partners in the target markets and to close partnership agreements which should provide a minimum pipeline of pilot installations that should be the basis to sell around 200 CPVRS systems in 2015 at a premium price.

11.2.3 Energy as a Service Business Model

Following Acciona opportunity, it is possible that for some markets an energy service model based on CPVRS mobility may be a tool to accelerate introduction of our CPV systems.

Regarding this possibility, we have already initiated contacts with Jigar Shah (former founder and CEO of Sun Edison), Generate Capital (http://www.generatecapital.com/).

11.3 Collateral Products

Besides the CPVRS system, in 2015 we will start commercialization of several new products very closely related to it:

11.3.1 HST 098 CSP and CPV/T Tower Heliostats

We have developed a 10 m2 heliostat derivative of the CPVRS system, having heavy parts commonality with CPVRS 072 v1. This will help us enter the CSP market, which in the future will develop towards large tower systems using molten salt receivers and storage, and smaller CSP and CPV/T applications. We are already in conversations with Sunfish (http://www.sunfishsolar.com/), a CPV/T player, and are also considering a cooperation project for a novel desalination system with CIMNE (http://cimne.upc.edu/).

11.3.2 PVAST 098 and PVAST 196 PV Trackers

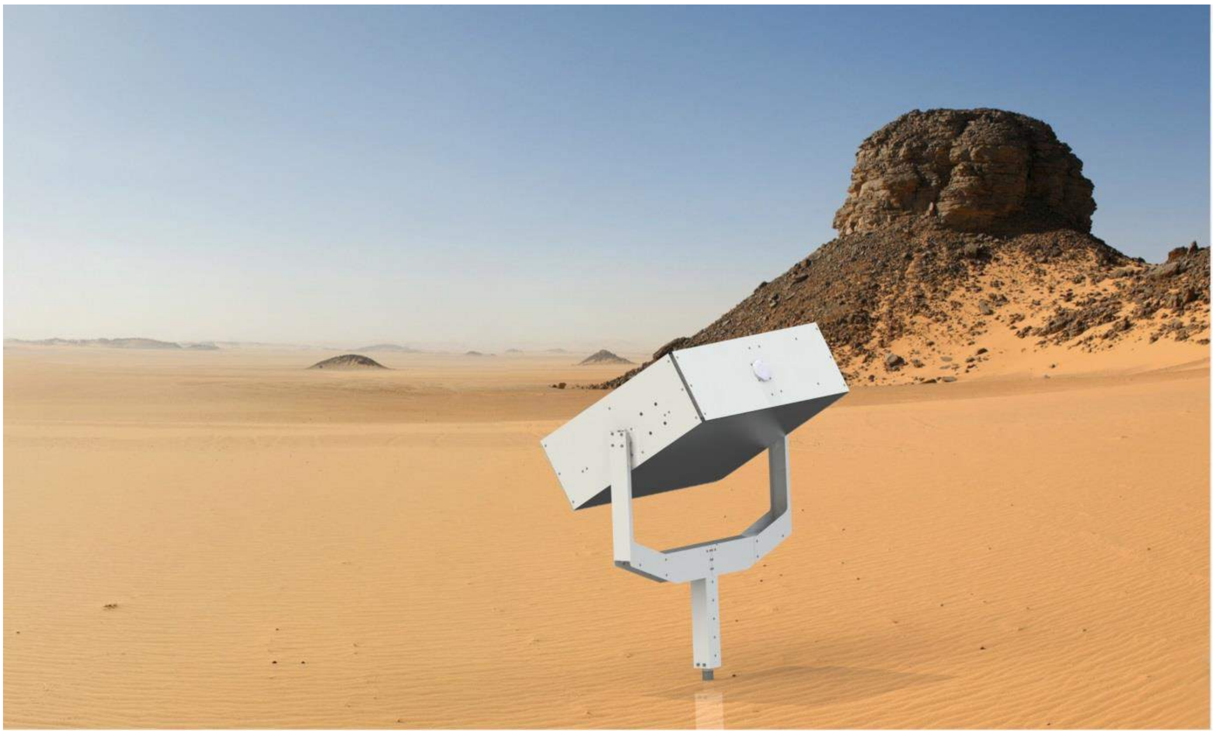
Also as a very low development cost offspring of the CPVRS system, we have developed two dual axis trackers (10 and 20 m2), having the unique feature of being optimized for REC PE series photovoltaic modules (http://www.recgroup.com/).

VGP is already a REC distribution partner.

We will start 2015 by targeting the self-consumption market in Spain and Portugal. Tracking systems are particularly suitable to increase self-consumption as it equalizes the power along the day and reduces the amount of batteries needed in both off-grid and hybrid systems. There is a strong trend towards self-consumption and off-grid installations, and the requirements are very different from that of traditional FiT full grid injection models.

11.3.3 CPVGOGO

Again a CPVRS spin-off, this time having the same optics, receiver panels and tracking electronics and MISPS sensor, but in a minimal package, aiming at having an ultra-high efficient solution by using new anti-reflective coatings, improved primary optics and the best multi-junction cells available.



The idea here is to recruit the solar geek around the world, and we plan to use for its promotion the reward crowdfunding platform Indiegogo (https://www.indiegogo.com/). In the same campaign we may also be offering the CPVRS 072, but this has not yet been decided.

The design development is finished and we are now going to manufacture the first prototype for initial testing and campaign launch support. We expect to be able to launch the Indiegogo campaign by February 2015.

If successful, the campaign will give us a lot of traction in the internet and other media, which may help us in fund raising activities during 2015. If unsuccessful we don't see a potential harmful effect. The cost of trying is very low.

11.3.4 DNI Station

This is a special version of the CPVGOGO micro CPVRS system. It will be targeted to another market: as basis for a meteorological station including DNI (direct normal irradiation) measurement capacity. This is a very lucrative high-margin niche market dominated by Kipp and Zonen (http://www.kippzonen.com/) and EKO (http://eko-eu.com/). The micro-trackers provided by these companies cost about 12.000 €.

Our product will offer the same functionality for a much lower cost, and with this we will open a new market because many research centers and universities will be able to buy it, and also it will enable CPV and CSP developers to place these units at a low cost for preliminary site evaluation. We have already talked about this product with CIEMAT, which is interested in using it to expand its network of measurement stations.

We will make the necessary design changes to avoid the geek oriented product to be used on the scientific and CSP/CPV development prospection applications.

11.3.5 Cleandrone

This is a new product for the cleaning of CPV modules and CSP heliostat mirrors. It is in its initial development stages but we expect to have a working demo prototype during Q2 2014. We have registered a provisional US patent on it.

11.4 Team

11.4.1 Engineering

We need to recruit a CPV test engineer, as product qualification will be a priority task during 2015. We already have identified a perfect candidate who is willing to join the company during the first quarter of 2015.

Also, we will need to recruit a manufacturing engineer and an industrialization engineer, in order to improve respectively the manufacturing process and the degree of manufacturing automation.

11.4.2 Finance

We are looking to incorporate a part time expert in fundraising and grants management, as this is really an area in which our CEO underperforms.

11.4.3 Sales

A business development person should join us second half of 2015 if we want to fulfil our commercial objectives.

11.5 Financing

We need about 1.4 M€ of investment in order to develop our business plan, technology roadmap and manufacturing capacity during 2015 and 2016.

That will leave us beginning 2017 on a break even position, having a 25 MW capacity and 32 M € CPVRS sales and growing.

After this milestone we expect the CPV market to grow exponentially, and therefore we should migrate to a larger factory and enlarge our capacity by investing around 3 M between 2018 and 2020, in order to reach a 500 MW capacity by 2020.

12 Entrepreneurial Team

12.1 Ricard Pardell, CEO and CTO

Founder, CEO and CTO of VGP. Former founder and CEO of Sol3g and Valldoreix Consulting. Previously having several management positions in IT engineering and consultancy companies.

He studied Telecommunications Engineering at La Salle University and Economics and Business Administration at Univeristy of Barcelona.

For many years he was a pioneer and passionate IT professional, being this passion for computer science the main reason to drop his university education. He started when he was fourteen years old with a Commodore 64. It was really the beginning of personal computing, and he worked on CP/M and MS/DOS systems, but his most interesting software developments were after 1986, on UNIX platforms, in companies like Sistema, Origin (now Atos) and Marketing Technology. He was a pioneer of object oriented software analysis and design, introducing this technique in Origin. He later lead the development of database cleaning software based on fuzzy logic techniques and progressively evolved into management positions which parted him from actual technology development.

He finally became an expert consultant and business unit manager on CRM systems at Origin and then Aspective, finally founding Valldoreix Consulting in 2001 as a CRM consulting company.

But he got bored of IT and particularly CRM systems, and fell in love with solar energy and CPV. In 2003 he entered the solar business in order to execute his own CPV concept: the gira-sol system, founding Sol3g in 2004, but this is another story.

Ricard is a creative person. He holds seven patents, five of them on CPV technology, one for a rooftop PV mounting system and the last one is related to the Cleandrone system.

In this picture Ricard with his wife Elisa Reyes, who helps sometimes in administration but basically gives full time support and coaching to the CEO, and Lulú, our almost human security manager. We are looking through the camera towards a bright common future with you.

12.2 Contact

For any additional information on this business plan or any questions related to our company please contact:

Ricard Pardell

CEO

Valldoreix Greenpower, S.L.

mailto:rpardell@valldoreix-gp.com

Telephone: +34 93 583 61 53

Mobile: +34 626 243 989

Skype: ricard.pardell

Carrer Segre, 2, nau 11

Polígon Industrial Can Calopa

08174 Valldoreix

Spain

http://www.valldoreix-gp.com

http://www.cpvrs.com

13 Annexes

The following documents are available:

- CPVRS Technology Overview
- CPVRS Partner Program
- CPVRS patent documents
- MISPS patent documents
- CPVLIS patent documents
- ICPVS patent documents
- Cleandrone patent documents
- CPVRS O&M Manual
- CPVRS Control Architecture
- CPVRS System Assembly
- CPVRS 072 datasheet
- HST 098 datasheet
- PVAST 098 datasheet
- PVAST 196 datasheet
- CPV GOGO datasheet
- DNI Station datasheet