

Agrovoltaico[®] REM Tec

June 2023



www.remtec.energy



GREENPOWER TO THE PEOPLE

Summary



REM Tec at a glance



Technology and service portfolio



Agriculture



References



Appendix



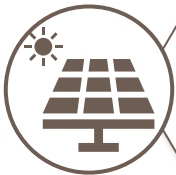
Borgo Virgilio (Italy) - 2011

REM Tec is a globally leading photovoltaic technology company, having developed its own, innovative, patented solutions, allowing to combine energy production & agriculture

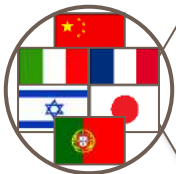
REM Tec in a Nutshell



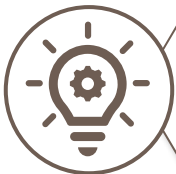
Spinoff and foundation in 2015, based on a technology having its roots back in 2009



Having a >12 years track record of agrivoltaic plant operation, with combined agriculture and PV production on > 45 ha



Technology deployed in 6 different countries on different crops and fruits in different climate zones



Constant innovator with approx. 15 active patents and trademarks



Agrovoltaico

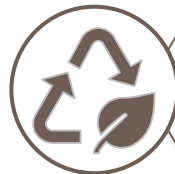
REM Tec's Target



Preservation of agricultural reality and land for food production



Sustainable, carbon-free electricity production supporting society's energy transition



Integration of energy production and agriculture creating a win-win situation for all relevant project stakeholders and society



Summary



REM Tec at a glance



Technology and service portfolio



Agriculture



References



Appendix

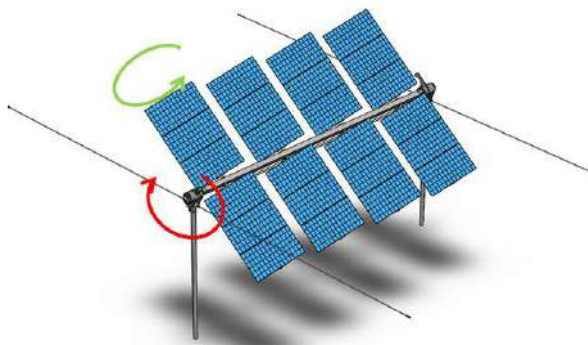


Borgo Virgilio (MN) - 2011

REM Tec's Agrovoltaico[®] Tracker technologies include biaxial (3D) trackers as well as mono axial (2D) trackers for high slopes

3D Tracker

- Biaxial rotation
- 24 PV modules, 78 cells per tracker (Mono – or bi-facial)
- Tracker length: 14 m
- Height: 4 - 6m
- Up to **45% more energy production** than a fixed system
- Ideal for flat surfaces with a maximum **slope of 3%**
- Completely dynamic shadow



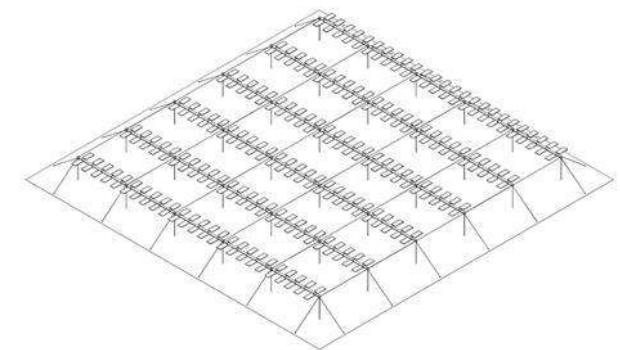
2D Tracker

- Monoaxial rotation (**either primary or secondary**, depending area geography)
- 24 PV modules, 78 cells per tracker (Mono – or bi-facial)
- Tracker length: 14 m
- Height: 4 - 6m
- **Up to 25% more energy production** than a fixed system
- Ideal for flat surfaces with a maximum **slope of 12%**
- Partially dynamic shadow



Tensile Structure

- Tracker system is hold together through a tensile structure
- Distance between rows: 12 - 20m
- Advantages of the tensile structure:
 - Increased wind resistance
 - Decreased foundation loads, leading to smaller foundations (and thus less impact on the ground)
- Tensile structure is used to fix electrical cables to increase security

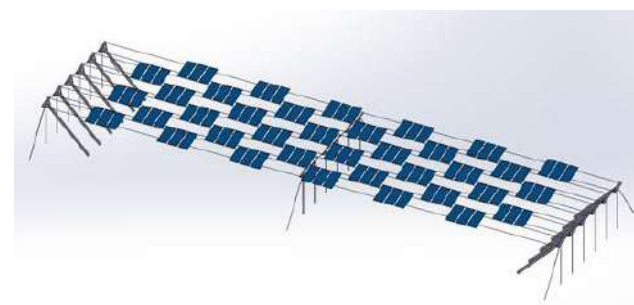


REM Tec's Agrovoltaico[®] fixed technologies is based on a system with PV modules mounted on suspended wire ropes

Fixed System: Technical Specifications

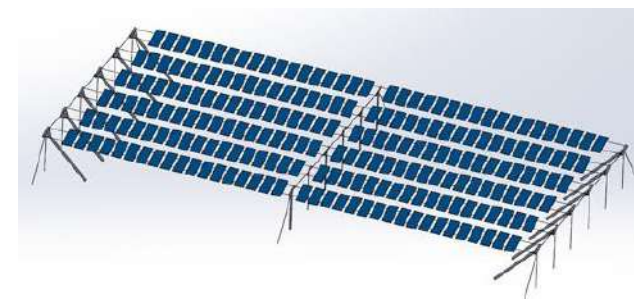
- **Height:** 4 - 5 m allowing agricultural machinery to work underneath
- **Support structure:** 2 inclined poles with a distance between 15 – 25 m (variable)
- **PV modules:** up to 700 Wp bifacial modules which are placed almost continuously along the row or with misalignment between the rows in order to create a chessboard design
- **PV modules tilt:** up to 20°
- **Distance between rows:** 3 m for chessboard configuration, 6 m for linear configuration
- **Shadow:** Slow moving depending from sun position
- **Land topography:** Ideal for flat surfaces and max slope of 15%
- Lower initial investment required compared to tracking systems but also lower electricity production

Fixed System: Illustrations



Chess Board Configuration












Linear Configuration



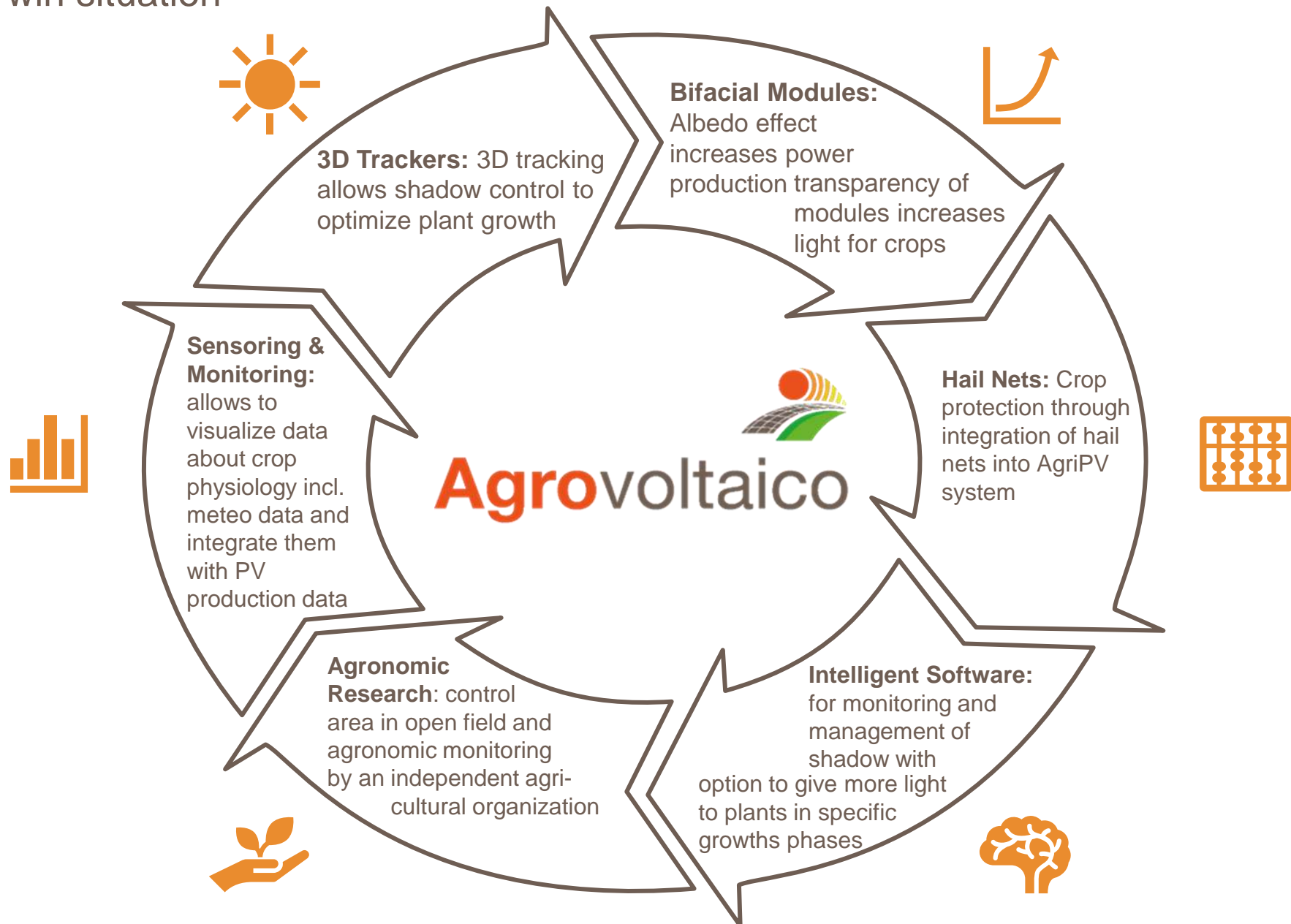
REM Tec's site of Beaucaire

Increasing the degree of freedom (e.g. 3D vs. fixed system) of the Agrovoltaico® will generally lead to a better and more sustainable integration of agricultural needs

Technology comparison

	3D Agrovoltaico®	2D Agrovoltaico®	Fixed Agrovoltaico®
Plant Orientation	No restrictions 	Needs East-West or North-South 	Needs North-South 
Agricultural rows adaptation			
Parcel slope	Up to 3 %	Up to 12 %	Up to 15%
Power production (compared to GM)	Up to 145% 	Up to 120% 	100% 
Shadow behavior (normal tracking)	Fast moving, very dynamic	Moving, semi dynamic	Slow moving depending from sun position
Shadow modification	Full shadow management	Limited shadow management	No shadow management possible
Adaptation to landscape	Distance and orientation of tracker row can be adapted to environment	North / South or East / West orientation of parcel required	North / South orientation of parcel required
	 Degree of Freedom of System 		

Overview of features promoting the integration of AgriPV plants and agriculture to create a win / win situation



The bi-axial Agrovoltaico[®] system allows the most precise management of the shadow generated on the ground

The knowledge of crops' behavior in response to certain shading scenarios allows to optimize electricity and agricultural production and to create a symbiosis between the two business models

Shadow management

The Agrovoltaico[®] system allows to:

- Guarantee a sufficient solar irradiation for the underlying crops, varying the percentage of shading on the ground, even making it zero if necessary, in order to optimize agricultural production
- Manage the tracker movements in order to maximise the energy production



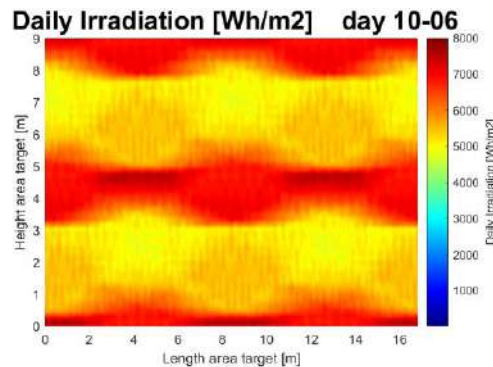
The choice between fixed vs. tracking systems depend on various factors, with irradiation reduction and shadow management being one of the most important ones

The graphs show the cumulative irradiation on the ground on a summer day under different configuration of Agrovoltaico® plants

The area considered is the target area, which is representative of the irradiation over the entire plant. The dimension of the target area varies with the distance between the rows

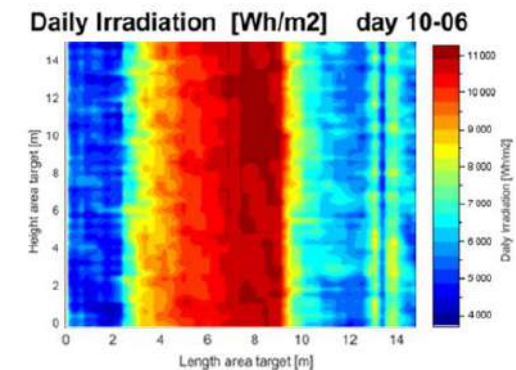
Fixed Chessboard

The chessboard configuration of the fixed AGV allows all part of the ground to receive high amount of irradiation



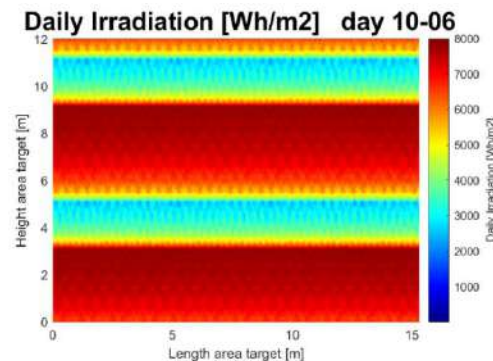
2D Tracker

The 2D tracker configuration produces a semi dynamic shadow on the ground with limited shadow management



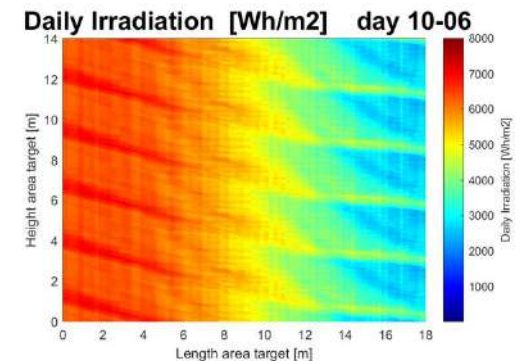
Fixed Stripe

The linear configuration of the fixed AGV produces a very static shadow on the ground. Therefore, the gradient of irradiation is marked



3D Tracker

The 3D tracker configuration produces a dynamic shadow on the ground and allows the highest level of shadow management, up to full light on the ground



Irradiation control leads to more moisture and humidity in the soil – Thus less irrigation is required for agriculture, lowering the water consumption of up to 60%

Summary



REM Tec at a glance



Technology and service portfolio



Agriculture



References



Appendix



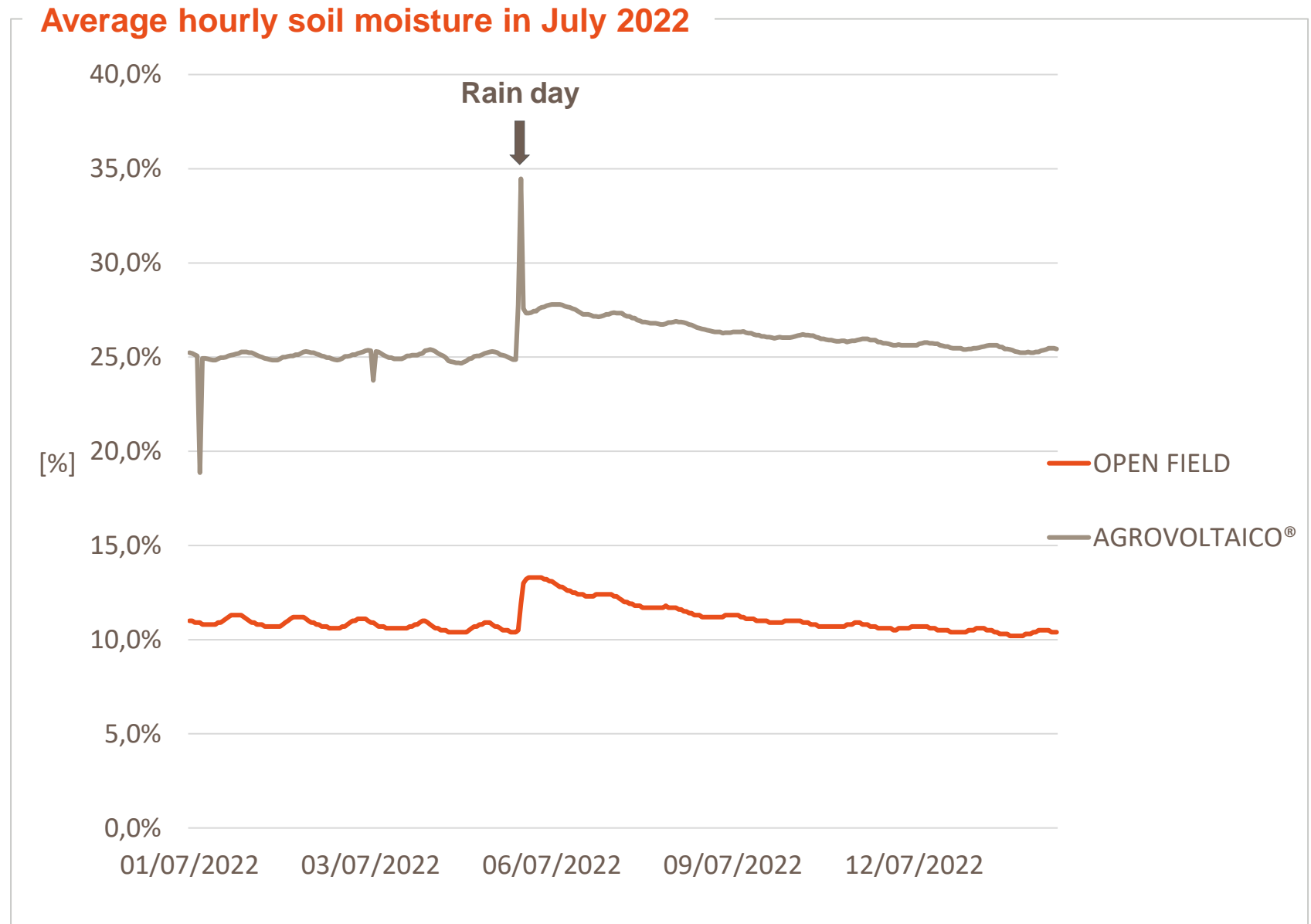
IGA (Japan) - 2021

Agricultural research conducted by REM Tec in Mantua (Italy) have shown a significant positive impact of REM Tec's Agrovoltaico[®] system on soil moisture

The graph compares the soil moisture in July at 15 cm depth

Relative soil moisture is always higher due to a significant reduction of evapo-transpiration under the Agrovoltaico[®] system

Significant reduction of irrigation (up to 50%) can be achieved through the usage of Agrovoltaico[®] systems



The experience gained by REM Tec gives us a deep knowledge on the behavior of several crops and their interaction with Agrovoltaico[®] systems

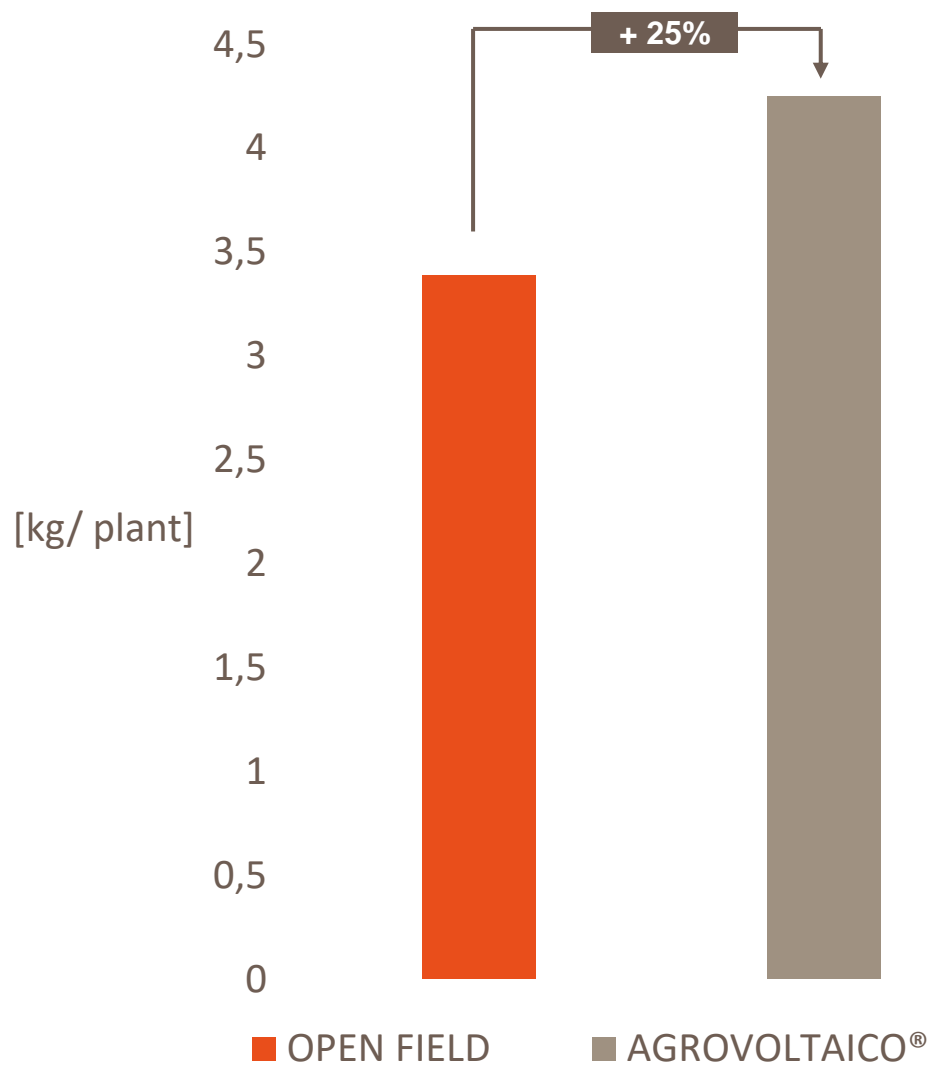
Crops examples

- Salad
- Cabbage
- Chard
- Ornamental plants
- Maize
- Wheat
- Tomato
- Pumpkin
- Melon
- Rice
- Alfalfa
- Soybean
- Berries
- Hemp
- Potato
- Grapevine



Field trials have shown a significant increase in grapes weight under Agrovoltaico®

Wine: average weight of grapes per plant

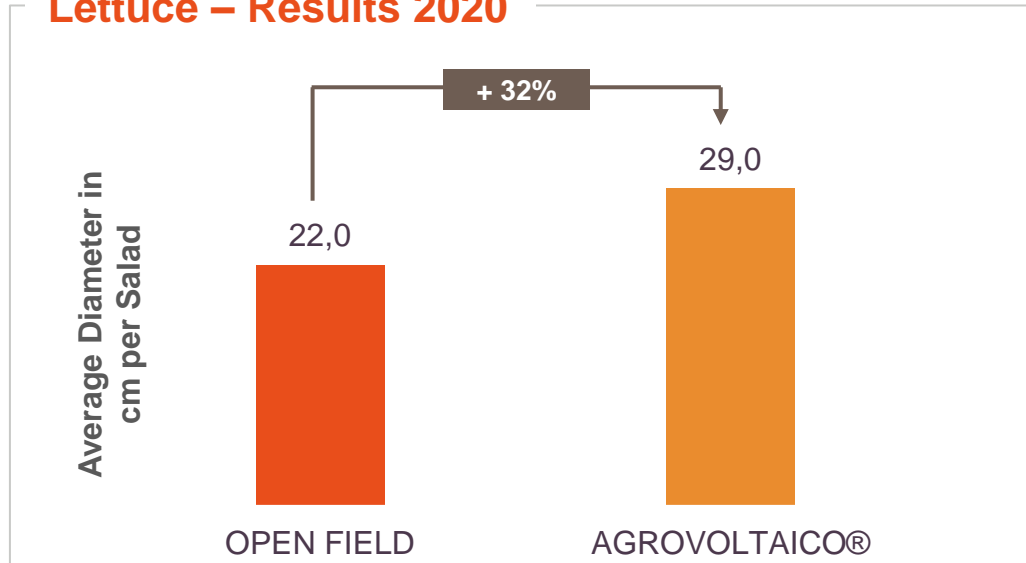


2021: 1st Agrovoltaico® wine worldwide

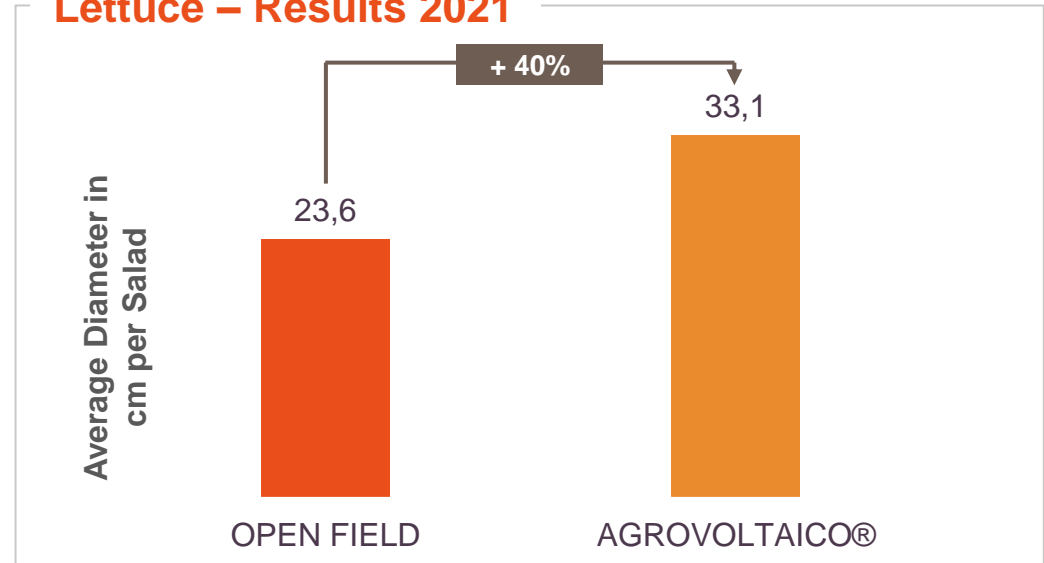


Research shows a up to 40% increase of average lettuce diameter and up to 60% decrease in water consumption for tomatoes and pumpkin

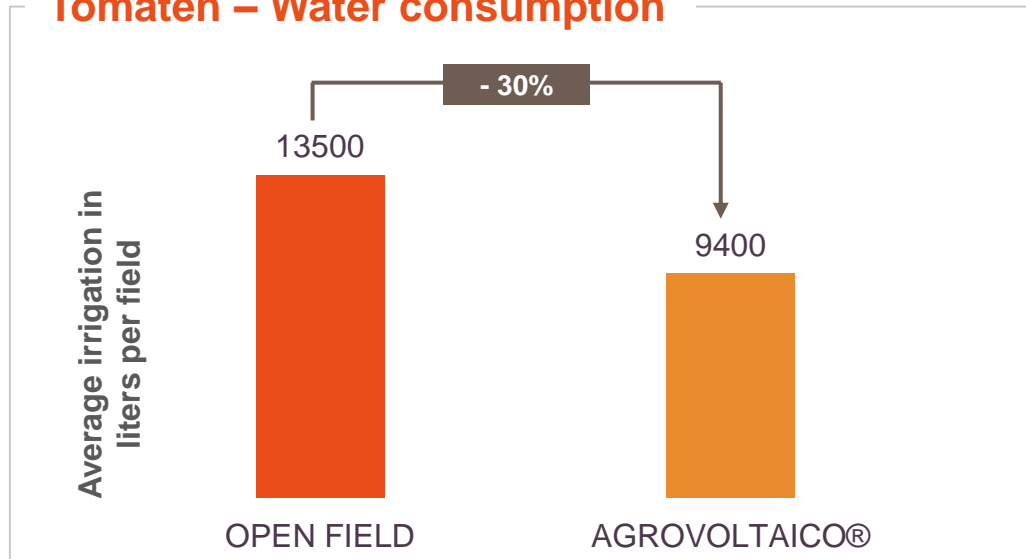
Lettuce – Results 2020



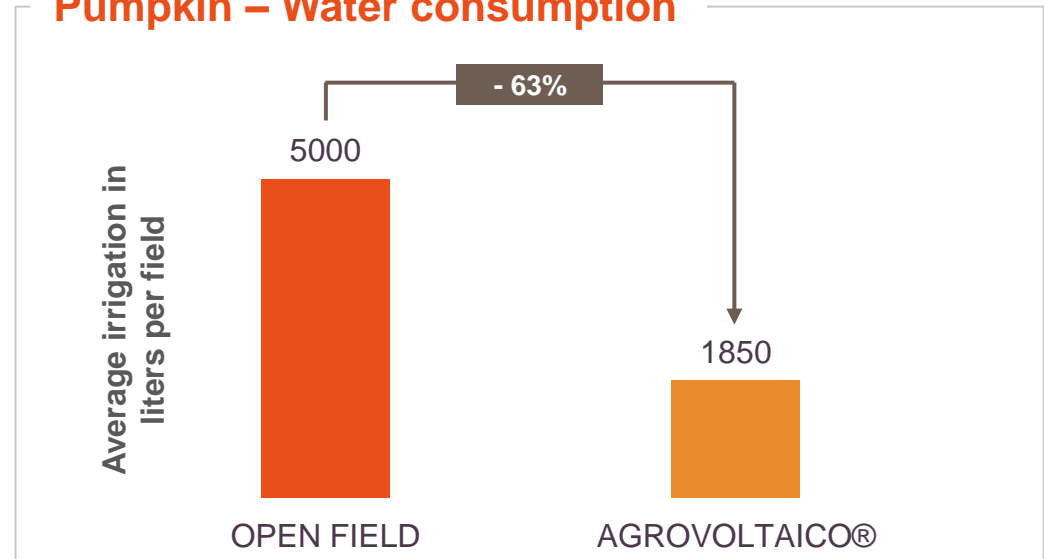
Lettuce – Results 2021



Tomaten – Water consumption



Pumpkin – Water consumption



Summary



REM Tec at a glance



Technology and service portfolio



Agriculture



References



Appendix

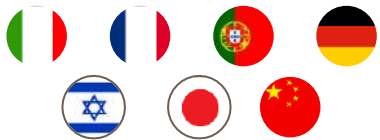


Beaucaire (France) - 2023

Selection of References: With a track record of more than 12 years, REM Tec has the longest experience in the Agrivoltics' market

REM Tec operates directly in Europe on a project base and in the world through dedicated cooperation

Currently REM Tec has ongoing project developments based on fixed, 2D (new technology for high slopes currently developed) and 3D:



Projects comprise different types of agriculture such as:

- Vineyards, Kiwis...
- Lemons, Oranges, Apples, Hazelnuts...
- Alfalfa and Cereals...
- Potatoes, Salads, Tomato...

Monticelli (PC) - 2011

- Technology: First generation 3D¹⁾ Trackers
- Nominal Power: 3.2 MWp
- N° Trackers installed: 1154
- Plant surface: 17.1ha
- Ground cover ratio: 14%
- Crops utilized by farmer: Corn, Ryegrass



Forli – Q2 2023

- Technology: Second generation 3D¹⁾ Trackers
- Nominal Power: 1.0 MWp
- N° Trackers installed: 60
- Plant surface: 1.6ha
- Ground cover ratio: 30%
- Crops utilized by farmer: existing Vineyard



Beaucaire - 2023

- Technology: Fixed Chessboard
- Nominal Power: 0.2 MWp
- N° Trackers installed: -
- Plant surface: 0.5 ha
- Ground cover ratio: 27%
- Crops utilized by farmer: Rice



Summary

REM Tec at a glance

Technology and service portfolio

Agriculture

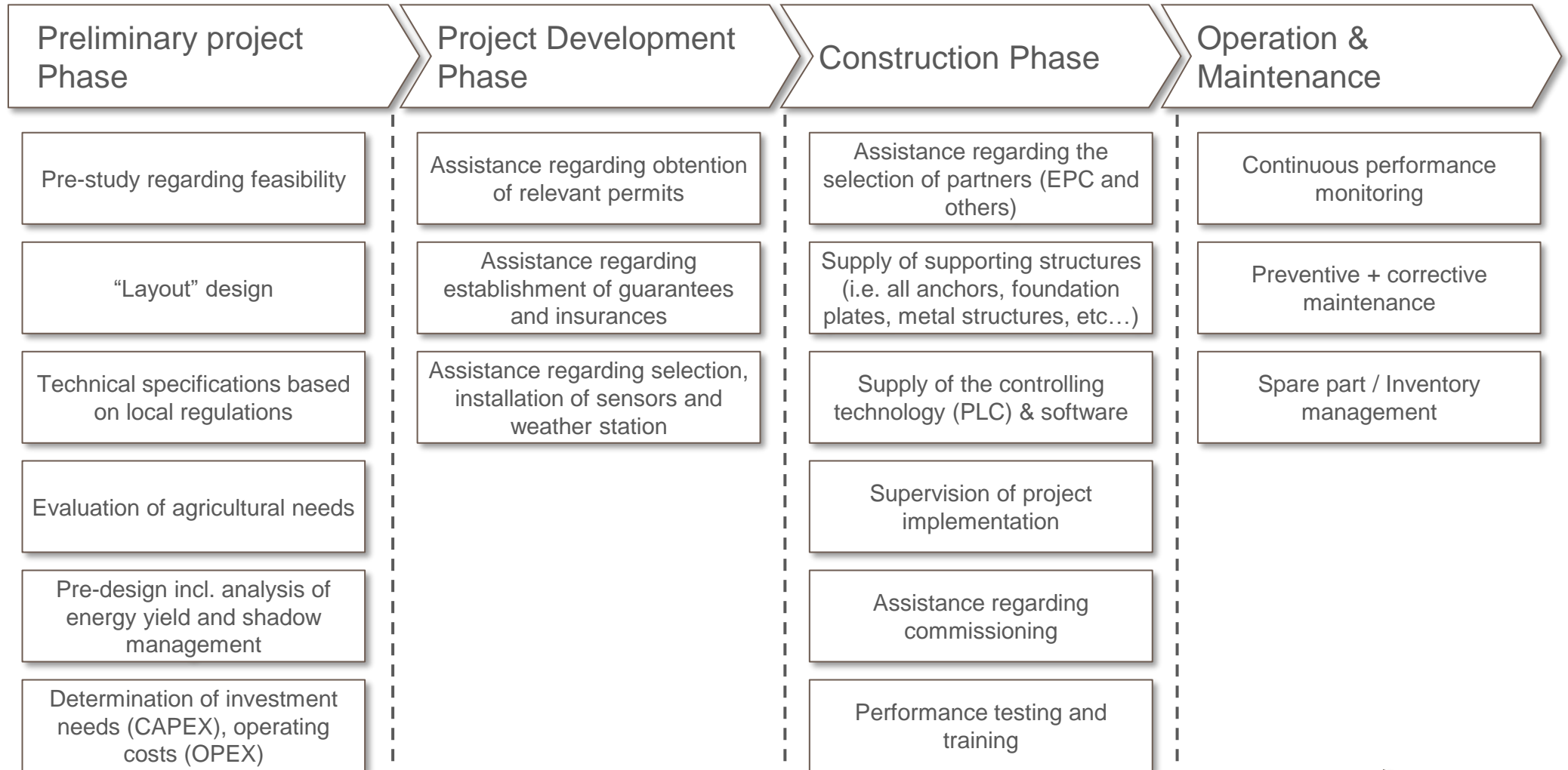
References

Appendix



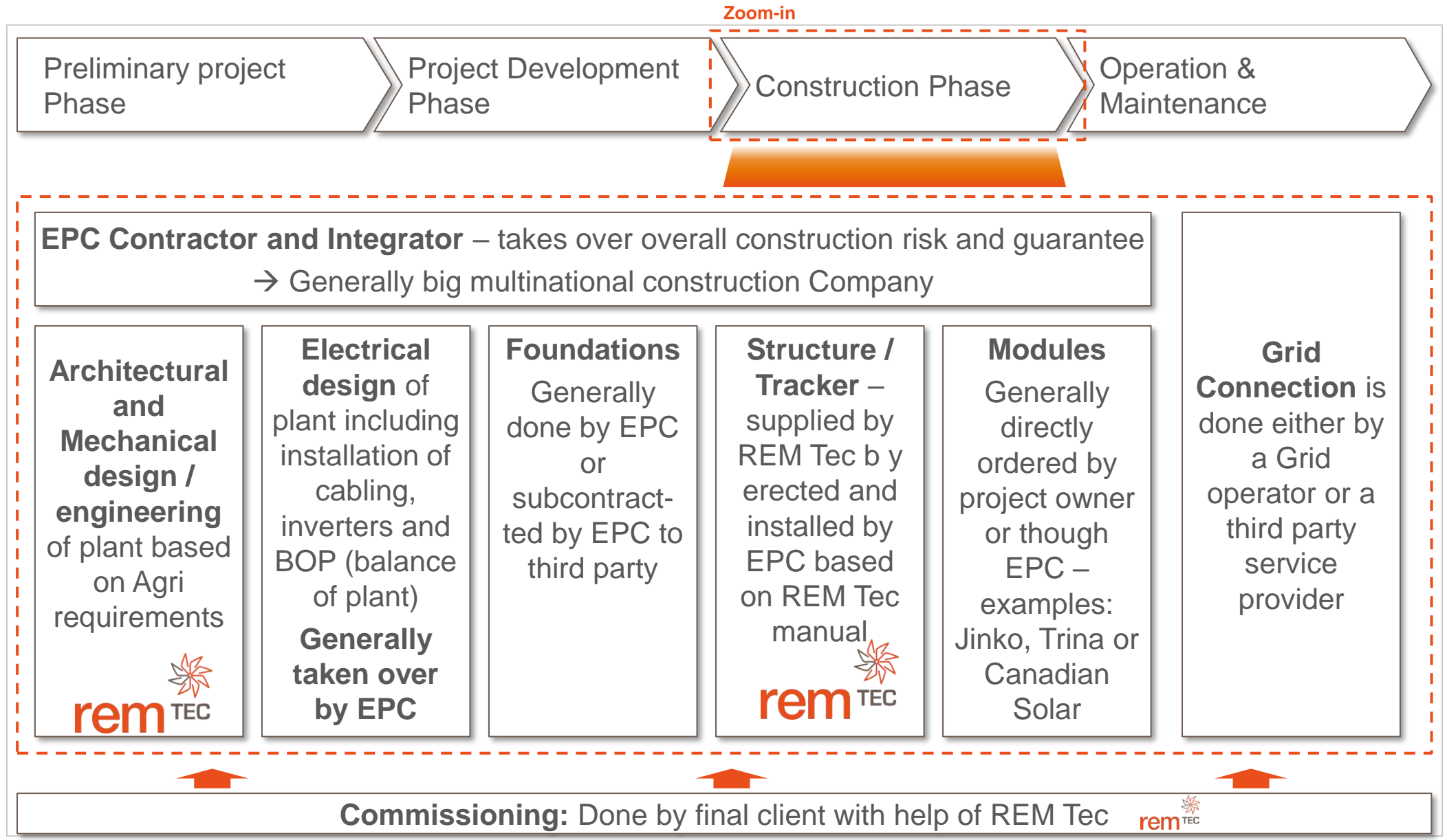
Monticelli (Italy) - 2011

REM Tec’s services provide a one-stop-shop solution tailored to assist project developers and asset managers in all relevant project phases



REM Tec can support its customers in every project phase, from project development to operations

Overview of Rem Tec's tasks during construction phase of projects



REM TEC

REM Tec s.r.l.

Via Cremona, 62/O
46041 Asola (MN)
Italy

t: +39 0376 261 314

m: info@remtec.energy

REM Tec SAS

2, Rue du regard
92380 Garches
France

www.remtec.energy

