

# CARDIAL:

## A GEOTHERMAL SUCCESS STORY IN ALMERIA REGION, SPAIN

January 2021

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## 1.1 Who we are

- **Cardial Recursos Alternativos** is a Spanish **energy company**, founded in Almeria a decade ago with the purpose of exploring, assessing and exploiting the **deep geothermal resources of the region**.
- Cardial has **mining concessions for research and for exploitation** over a **16,000 hectares** surface which is right close to an old **volcanic area** with a temperature gradient greater than **8 °C /100 meters**.
- Cardial's main objective is to build a **network of distributed power plants** across the region and supply **thermal, or even electric, power** to **agricultural and industrial clients**.

## 1.2 Where we are

- Almería is a Spanish province localized in the South-East of Spain, inside the bigger region of Andalusia.
- Thanks to the sunny weather, and despite the lack of large surface water bodies, Almería has seen an **overwhelming growth of its agricultural sector** for the last decades, and currently has more than **35,000 hectares of crops inside greenhouses**.
- Nowadays, agricultural companies in Almería have **incomes superior to 2,500 M€ per year**, and a dynamic and **innovative ecosystem is being created** around this economic driver.

## 1.3 What we want to achieve

- Cardial expects to be **involved with this vibrant and growing agricultural sector** and become the **main supplier of thermal power** for its neighbors.
- We strongly believe in the advantages of using deep geothermal energy, **completely renewable and carbon-free**, instead of other sources. So, our mission is to become **pioneers in Spain** and lay the first stone for the **development of deep geothermal in our country**.



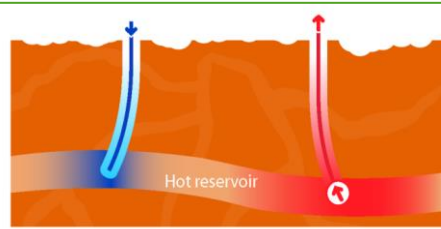


Our development team, composed by expert geologists and mining engineers, **explores the surface within the research permits**, looking for the best spots for a geothermal production well.



We also **meet regularly with the agricultural and industrial companies** of our surroundings, so we can understand their **energy needs** and explain our project to them.

### Exploration Phase



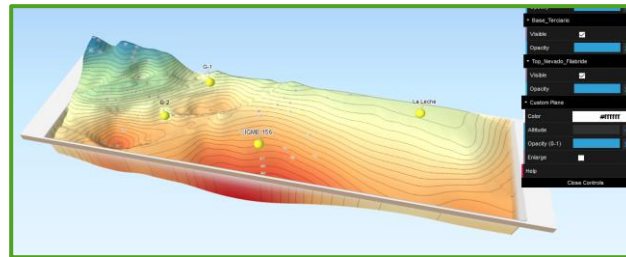
The best place for extracting heat from the underground is the one which gives the highest **temperature** and the highest **flow rate**.

However, the best place for developing a profitable plant must consider a third new variable: **clients' proximity**.



The process of getting all the environmental authorizations and building permits can **take several years**, as **geothermal energy is new to Spanish regulation**.

But, after getting the permits, it is time to get our hands dirty and drill a well!



All the data collected by Cardial during the drilling and testing of the wells will be used by our consulting team to create a **dynamic 3D model**, capable of **simulate the long-term behavior of the water reservoir**. The accuracy of this model is critical for improving the performance of the whole power network.

### Development Phase



Each power plant consists of at least **one production well**, at least **one injection well**, and an industrial building where the **heat exchangers** are allocated.

The size and typology of the heat exchangers depends on the well characteristics: temperature, flow rate and water composition.

### Operational Phase



We offer to our clients the chance of signing a **medium-term contract** (5-10 years), during which they will pay a **fixed price** for the energy they consume.

In addition, Cardial commits to install the pipelines required for the power delivery in our clients' facilities.

### Commercial Phase

CURRENTLY, CARDIAL HAS  
AUTHORIZATION TO EXPLOIT A  
SURFACE OF 457 HECTARES

- The first plant, which is being built, will have a **nominal power of 14 MW<sub>th</sub>**
- The first three plants could be **partially financed by FEDER**, assuring their profitability despite being first versions of our exploitation model.
- Cardial is taking the necessary step to obtain the authorization for more power, for what will become our second developing phase.

CARDIAL HAS FINISHED THE FIRST  
AND DEEPEST GEOTHERMAL WELL  
OF SPAIN: 2.000 METRES DEPTH

- This **record** has been achieved by collaborating with a **local drilling company**.
- First tests show **promising data**: temperatures around 110 °C and a flow rate of 35 l/s
- This first well will let us calculate the **size of the underground geothermal reservoir** and design the optimum exploitation strategy.

SOME OF THE BIGGEST LOCAL  
PRODUCERS HAVE ALREADY  
SIGNED A PRE-AGREEMENT TO  
SHOW THEIR GREAT INTEREST IN  
USING GEOTHERMAL

- Using our future client data, we have created an **energy model**, which allows to size the energy needs of their greenhouses, either heat or cold.
- We have carefully **chosen the place of the first plants** regarding the level of interest of the nearest producers.
- We have also assessed the possibilities of **supplying industrial clients**, all of them linked to the agricultural sector.

# 4 POTENTIAL CLIENTS OF CARDIAL



## 4.1 Local producers interested in improving their greenhouse throughput



- It is well proven that implementing weather control system inside the greenhouse **increases the quantity and quality of the crops**.
- By using geothermal, instead of gas boilers, allows to sell the product with an **ECO label**, which increases the market price.
- Our middle-term fixed prices **reduce the risk** of being exposed to **gas market variability**.

## 4.2 Industrial companies with big heating necessities



- There are several industrial processes with demand a huge amount of heating power, therefore **emitting tons of CO<sub>2</sub>** and also paying the **price of those emissions**.
- Geothermal power is a **steady carbon-free source of thermal power**, which could cover a significant proportion of this heating demand.

## 4.3 Electric grid\*\*



- Although the first and second deployment phases of Cardial are mainly focused on thermal power, it is predicted that some drilling spots could be **optimum for electric generation**.
- A geothermal electric plant has an annual **load factor superior to 90%** and low OpEx, becoming a great alternative for developers and investors.



Founded in Madrid in the early 90s as a familiar construction company, Grupo Cyopsa is now a diversified investor group with several renewable plants and concession businesses across Spain.

**DUE TO THE SATURATION OF THE RENEWABLE MARKET IN SPAIN, WITH HUNDREDS OF PLAYERS COMPETING FOR FINDING THE BEST SOLAR/WIND SPOTS, CYOPSA HAS DECIDED TO TAKE A CHANCE ON AN INNOVATIVE PROJECT AS THIS ONE:**

- ✓ About 1.5 M€ invested so far
- ✓ Planning to invest more than 50 M€

### 5.1 Strengths of Cardial

- ❖ Pioneering project in Spain → Low competition sector
- ❖ Expected project returns superior to 15%
- ❖ Decision power over our sales price.
- ❖ Well established clients. Almeria agricultural sector is one the strongest across Europe.

### 5.2 Drawbacks of Cardial

- ❖ Pioneering project in Spain → At this moment, there is no bank willing to finance this kind of project with a traditional Project Finance structure.
- ❖ Lack of specific regulation for geothermal. Public administration is still developing a legal framework which takes into consideration the differences between geothermal and other renewable energy sources.

THANKS FOR YOUR  
ATTENTION

**It's time for Q&A!**