Image copyright©: www.celsia.com Celsia S.A.
Granja Solar Yumbo | Foto: Santiago Vergara – LaPic S.A.S.

Celsia

A **marketplace** for buying and selling energy between **small-scale generators and consumers.**

CELSIA
La energía que quieres

ceiba

Client:
Celsia

Industry:
Energy

Segment:
Renewable Energy and Energy Efficiency

Country:
Colombia

Type of project:
Innovation and Technological Development

Components:
Blockchain (Hyperledger Fabric), Cosmos DB, AKS, KeyVault, Service Bus, HLF Operator, Smart Meter Integration.

02

Project development time:
Three months

Measurable **Impacts:**

- Validation of Blockchain Use: Validation of using blockchainto support a P2P marketplace for electric power.
- Technical Validation of the Platform: Measure blockchain's ability to handle secure and efficient transactions between prosumers.
- Integration Capacity with Existing Systems: Assess integration with existing systems, including Celsia's technological infrastructure.
- Understanding Legal and Regulatory Impact: Review current legal and regulatory barriers that prevent the large-scale implementation of such a platform.
- Identification of Market Opportunities: Analyze new business models, such as a blockchain-based energy marketplace.

Our project's primary objective is to streamline energy trading for consumers, fostering a secure environment for both consumers and generators to engage in the purchase and sale of clean energy. **This innovative approach**, powered by blockchain technology, holds the promise of revolutionizing the energy industry, **offering a more efficient and transparent marketplace.**

Celsia and Colciencias: transforming energy in Colombia with blockchain

The Blockchain DER project, driven by Celsia in collaboration with Colciencias, focuses on developing an innovative software solution to revolutionize the retail energy market, primarily aimed at small-scale self-generators. It also explores the possibility of offering prosumers access to more attractive offers and competitive prices.

This project is a critical component of Celsia and Colciencias' strategy to promote the use of blockchain technologies in the field of clean energy in Colombia, committing to creating two pilots based on this technology.

The initiative allows users to register on the platform, facilitating their participation in transactions and registration of their energy surpluses in the blockchain. In addition, a digital marketplace has been developed that enables the buying and selling of energy between registered users.

The developed P2P transactional platform provides the necessary tools to purchase and sell surplus energy generated during a given period. Thanks to blockchain technology, direct energy negotiation and transactions between consumers and producers are promoted, allowing the efficient acquisition of renewable energy. The platform is designed to automatically calculate the amount due after each energy transaction, with the corresponding payments managed externally.

Platform+ architecture

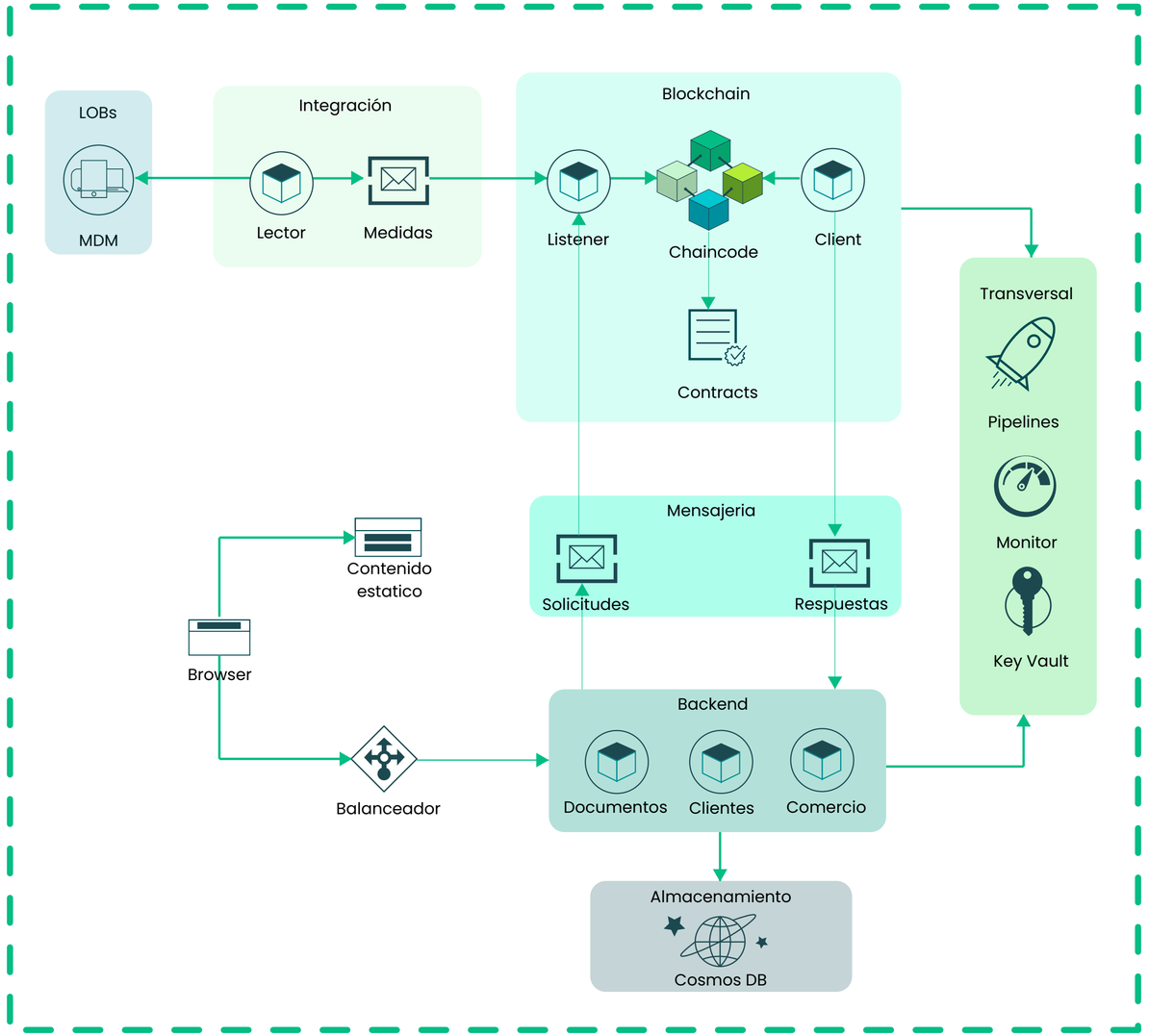
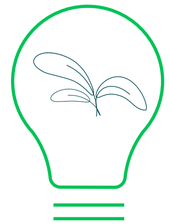


Image copyright©: www.celsia.com

Ceiba offers a solution for a **secure energy ecosystem**



The Blockchain DER platform is based on a microservices architecture, designed to ensure a smooth interaction through a choreography of events and asynchronous communication. Each microservice, dedicated to specific functions such as business management or customer subscription, operates autonomously, thus providing flexibility and scalability to the system. Asynchronous communication is facilitated by a messaging layer and the use of listeners on the blockchain, which capture and react to specific events without interrupting the flow of energy transactions, ensuring efficient and continuous operation.

In addition, smart contracts are fundamental to the platform, as they define rules and execute business logic in response to events in the blockchain network. These contracts ensure that peer-to-peer energy transactions are conducted reliably and according to agreed terms, eliminating the need for intermediaries and underscoring the decentralized and secure nature of the platform. The combination of these elements forms a robust ecosystem for energy transactions, characterized by modularity and efficiency, allowing the platform to adapt and scale according to the needs of the distributed energy market.

Main components used

- **Azure Kubernetes Service (AKS):** to host and manage the microservices and nodes of the blockchain network, providing an agile and scalable infrastructure to run the different components of the system.[1]

- **Service Bus:** transmission of messages and events between the different system components, guaranteeing reliable and asynchronous communication between them.[2]

- **Cosmos DB:** stores and manages transactional data related to energy purchase, sale and balance operations of producers and consumers, ensuring fast and reliable access to information at all times.[3]

- **Hyperledger Fabric:** development of blockchain applications or solutions with a degree of privacy, scalability and security that companies need. It is one of the projects within Hyperledger, a global collaboration, hosted by The Linux Foundation, that includes leaders in finance, banking, Internet of Things, supply chain, manufacturing and technology.

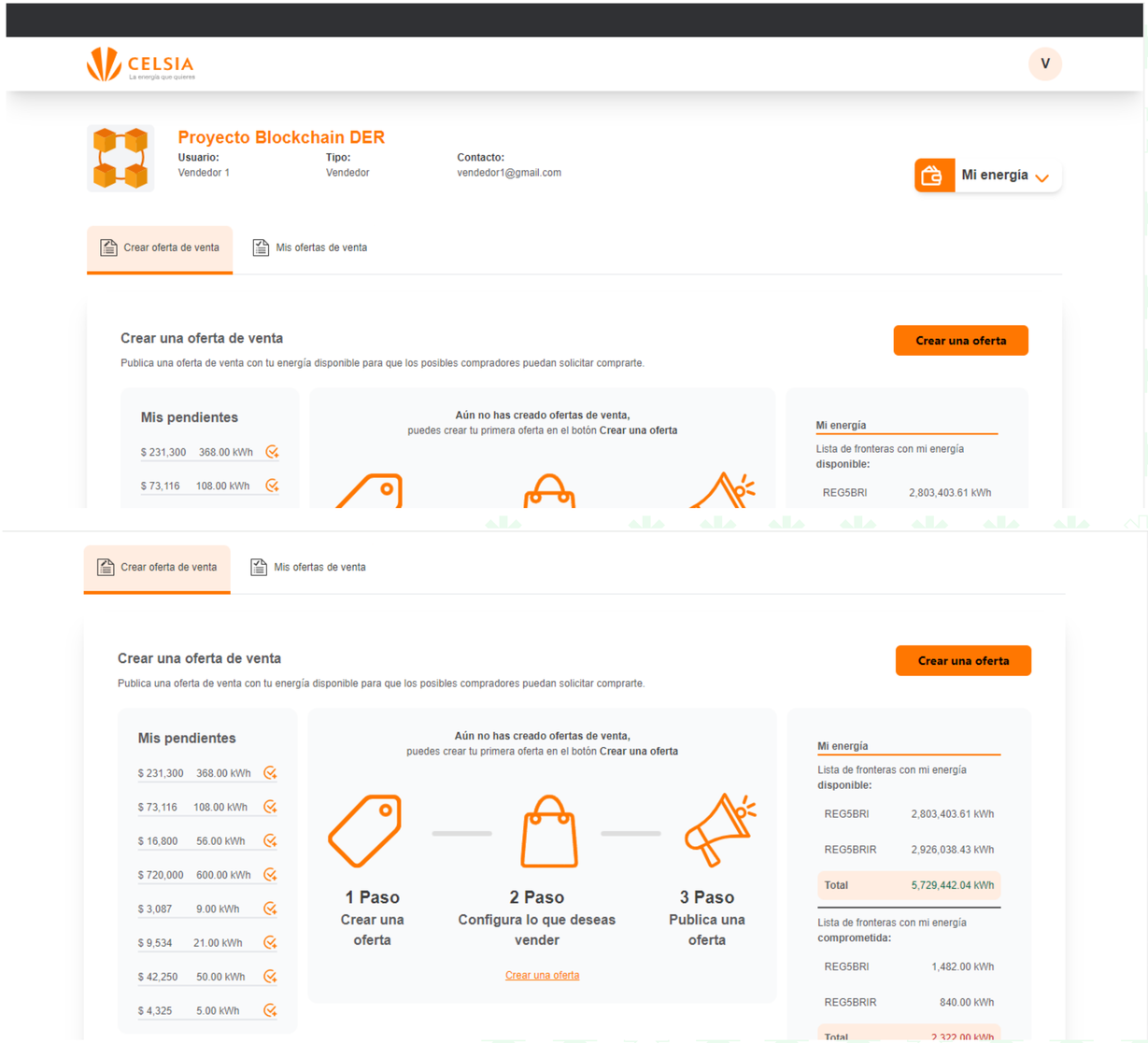
- **HLF Operator:** facilitated the automation and management of the infrastructure required to run an HLF network, simplifying complex administration and operations tasks.

- **Key Vault:** storage and management of secrets and certificates necessary for the deployment and operation of the system and blockchain network, reducing the risk of exposure of sensitive data and simplifying audit and compliance processes.

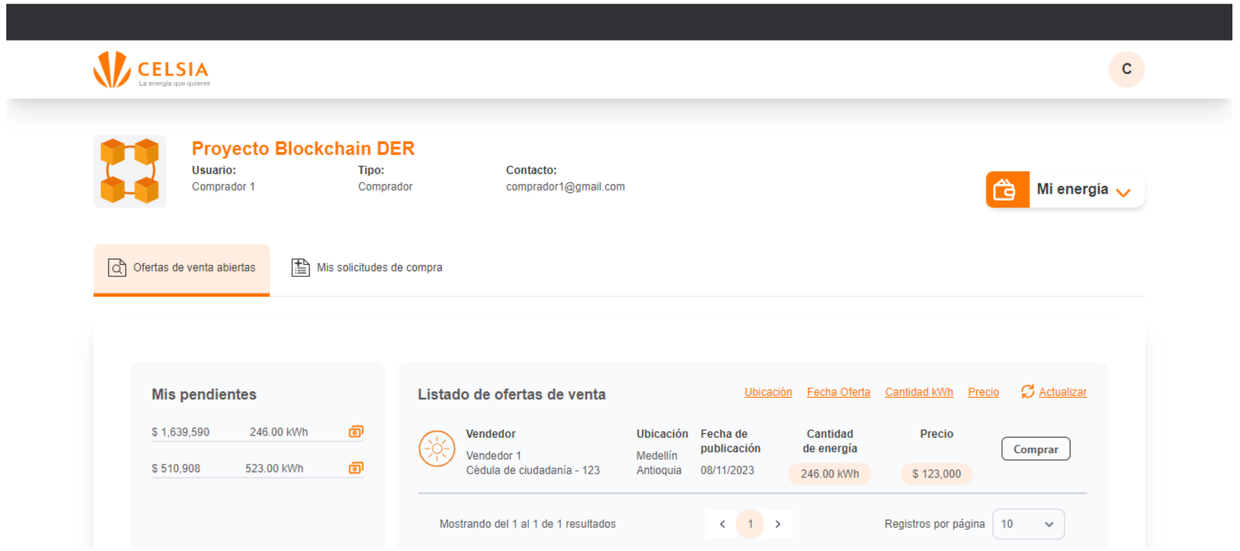
1 AKS is chosen because it can facilitate the management of distributed applications, improve resource utilization, and simplify automatic operations.
2 Service Bus is crucial for microservices architecture. It allows decoupling services, improves scalability, and ensures message delivery.
3 Cosmos DB is ideal for applications requiring global performance, data distribution and horizontal scalability.

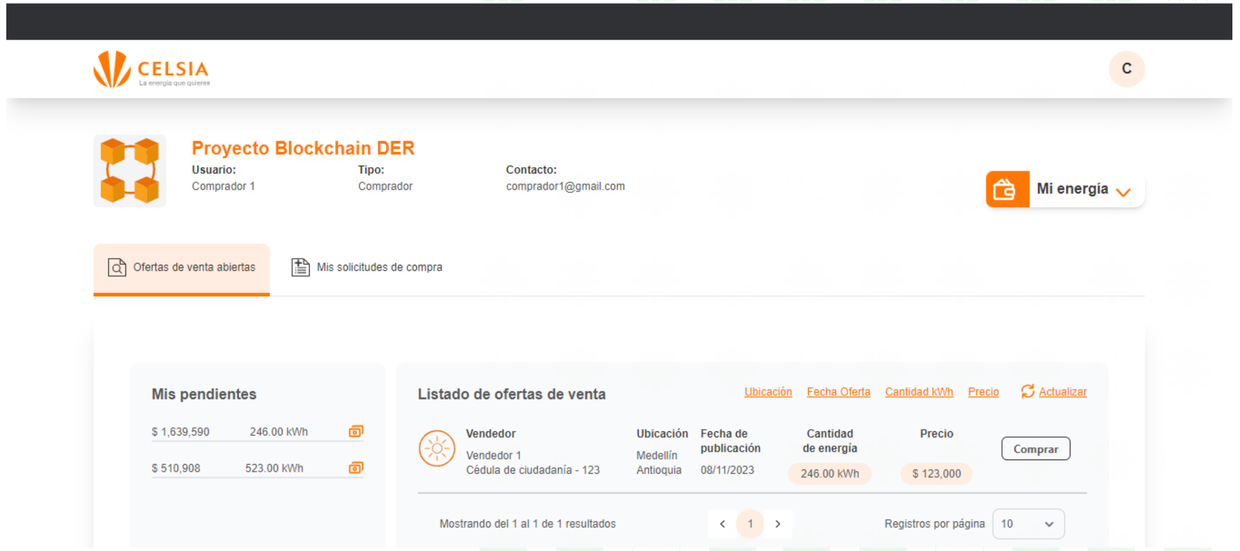
Image copyright©: www.celsia.com

Application interface



Application interface





ceiba.com.co