Waterise®

Waterise Project Dossier

Deep seawater desalination (subsea desalination)

22th March 2021

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Executive Summary

Executive Summary
Project Description

Objectives

The **Waterise Project** consists of **producing drinking water** through **subsea desalination:**

- using the **latest technological developments** of the oil and gas industry
- radically decreasing **environmental impacts**
- drastically reducing **production costs and energy consumption**, and getting a **quality product** at a **much lower price** than other unconventional drinking water sources.

DESCRIPTION OF OUR PROJECT

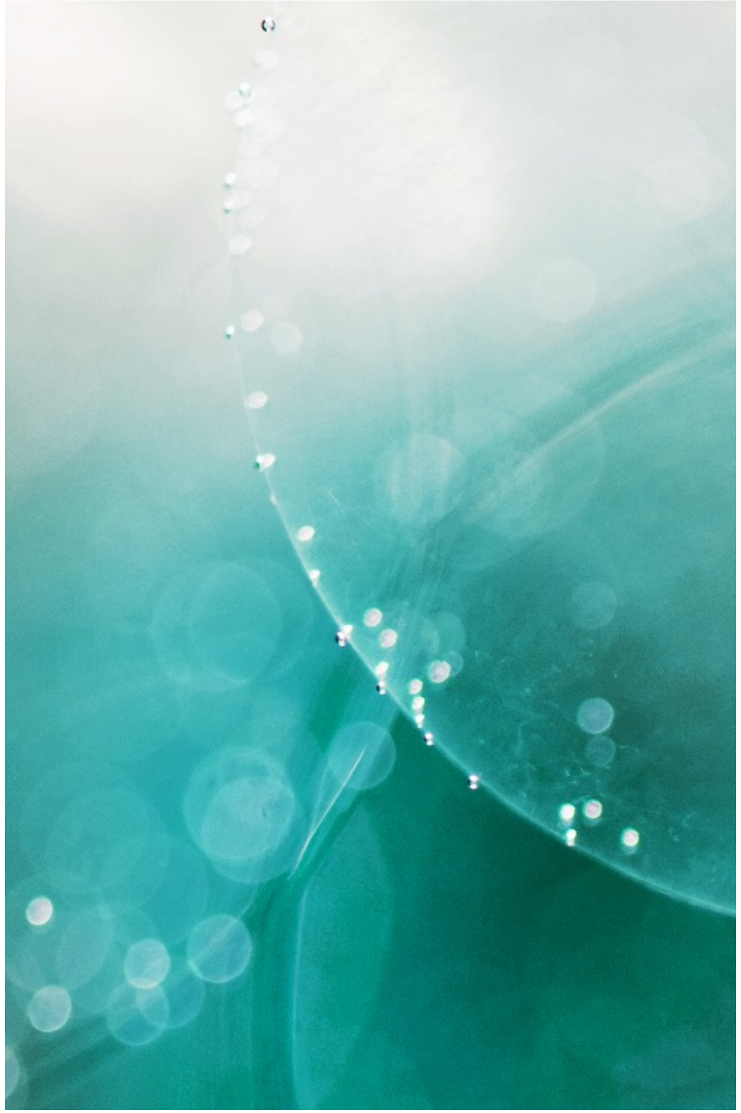
The project involves desalination of subsea water (submarine desalination) by **desalination modules installed at 400 meters below sea level**. As a result:

- costly pre-treatments of supply water are eliminated
- energy to apply osmotic pressure for desalination is obtained cost-free

The solution is based on standardized submarine modules with a **production capacity of 50,000 m3/day**, **connected to land** by an umbilical cable that provides energy and communications, and a pipe for the transportation of product water from seabed to land.

This technology has additional advantages:

- The water produced is of **very high quality**
- The plant features **reliability and availability levels that are equal to or greater than** those of a conventional plant



Executive Summary

Links with the National Recovery, Transformation and Resilience Plan

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RELATIONSHIP WITH PRTR'S PILLARS

Digital Transformation

- Development and implementation of the latest technology on DMSA (*Data Management Solutions for Analytics*) to optimize the management of operational processes and the marine environment with intelligent and automated systems.
- These developments will act as a driver for digital transformation and competitive improvement of the blue economy and maritime activities. In addition, they will offer technological solutions which can be transferred to other assets and sectors.

Ecological Transition

- Connection with the objectives of the green transition programme with regard to improving water resources planning and management, the protection of marine biodiversity and the preservation of coastlines.
- In addition, the use of desalination plants implementing this technology will reduce the stress on conventional and unconventional sources of supply (such as aquifers or transfers between hydrographic basins of different Autonomous Communities) in a cost-effective and sustainable manner.

Equality

- Promoting women's employment among new jobs, promoting a greater representation of women in the water management sector, their career development within organizations and occupation of managerial and leadership roles.

Social Cohesion and Inclusion

- Through the use of Waterise desalination plants, the guaranteed water supply in regions lacking water resources allows urban development and helps maintaining the economic activity in these areas at competitive levels of development compared to regions with higher water availability.
- In addition, our business model promotes social inclusion through our diversity policies, training programs and equal employment opportunities.

PROJECT IMPACT

Economic and social impacts:

- 296 direct jobs and 200 indirect jobs during the execution of the project, thanks to the tractor effect on the rest of the economy.
- Increased supply of drinking water in regions of Spain with high water resource shortages.

Environmental impact:

- Reduction of energy consumption by 40%.. This is equivalent to 25 million tons of CO_2 per year, for each plant producing 100,000 m3 of desalinated water per day.
- Elimination of pre-treatment chemicals, thus protecting the biodiversity.
- Reducing the impact of brine, since this is poured at high depth, thus respecting the marine ecosystem.
- Reduction of noise generated at the plant, thus improving employees and local habitants health.

Technological impact

- Keeping Spain's international leadership in desalination technology.
- Implementation of innovative systems for intelligent asset management and integral environmental management.

Impacts on the value chain:

- Production costs of drinking water reduced by 20%
- Capex reduction between 20% and 30%
- 98% service time (equal to or greater than conventional desalination plants)
- Adaptation to economies of scale thanks to modular installations 50,000 m3/day

Executive Summary
Project Planning

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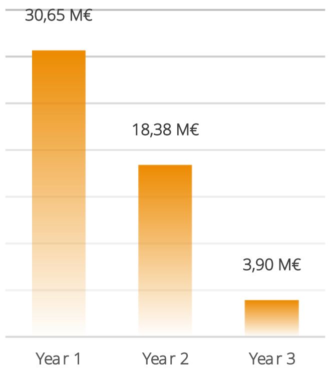
INVESTMENT PROGRAM

The estimated budget for a subsea plant of 50,000m3/day amounts to approximately **€52.93 million** on a 26-month project schedule.

- In Execution Year 1, the estimated budget is **€30.65 million**, of which 20.7 million euros would relate to investments in production equipment and machinery.
- In Year 2, the investment amounts to **€18.38 million**, of which almost €9 million are also budgeted for plant facilities and equipment.
- In Year 3, the budget amounts to **€3.9 million**, mainly driven by the investment in external collaborations, digitization and subsea installation works.



Schedule

The project would be completed in **26 months.** Planned activities include project drafting, detail engineering, equipment procurement, construction and installation of the subsea plant, in addition to building the aftertreatment system to be installed on land.

The **critical milestones** project are:

1. **Completion of the design at 60% (month 8) and 90% (month 11):** This enables to start the construction of the land plant and the construction of the subsea plant.
2. **Procurement of critical equipment (month 14):** These equipments have a long manufacturing period and therefore need to be procured as soon as possible so as not to delay the construction works.
3. **FAT of the subsea plant (month 17) & Mechanical completion of the terrestrial plant (month 22):** They are two critical milestones that lead to the transport and installation of the subsea plant, as well as the start of the pre-commissioning tests of the land plant.
4. **Production of desalinated water (month 24):** This is the last and most critical milestone that marks the end of the construction phase and the start of the operation and maintenance of the desalination plant.

Collaborators

waterise®	**Waterise** Leading company proposing this Project, providing it with technological contributions: effective subsea technology along with reverse osmosis technology for the production of desalinated water
lantania	**Lantania SAU** Project Management: Engineering, design, construction, procurement, installation, commissioning, operation and maintenance of facilities and civil works on land.
GHENOVA ingeniería	**Ghenova SL Engineering** Development of the Digital Twin of the desalination plant, the autonomous cognitive system supporting the design, the construction and management of the plant and the Intelligent System for Integral Environmental Management
Aqua Advise	**Aqua Advise Sl** Support in the regulatory, technical and liaison aspects with critical suppliers of the value chain. Liaison with the administrations involved, both state, regional and local affected.
ECOS	**ECOS Environmental and Oceanic Studies SL** Assessment of environmental effects and benefits, calculation of the carbon footprint, and improvements proposal to reduce the impacts of the technology and the desalination process in the environment.

02

Current situation of the desalination industry

Current situation of the desalination industry

Market

Global market and evolution

The desalination geography extends around the World, being of particular importance in countries such as Saudi Arabia, the United Arab Emirates, China, Australia, Israel, the United States and Europe, specially Spain.

Global production exceeds 118 million cubic meters of desalinated water per day, which would be enough to supply a population of more than 500 million people, thus suggesting the importance of this system.

The global water market is estimated to be worth US$850 billion worldwide. The value of the desalination sector in 2019 amounts to around US$16 billion (4.1% higher than 2018).

The main desalination markets are established in the Middle East, North Africa, the United States, Europe, China, India, Australia and Latin America. Currently the largest market is the Middle East which has 43% of the total installed capacity in the world.

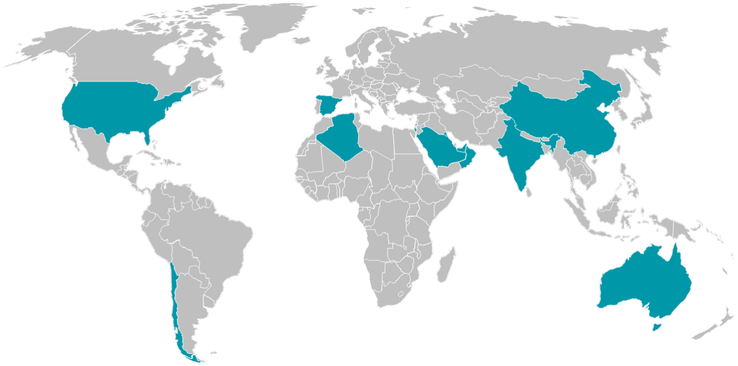
2019 matched 2007 as the best year ever recorded for desalination by awarding new contracts, and the market is expected to remain strong despite the struggles caused by the COVID-19 global crisis. The sector is currently dominated by a small number of projects in the Middle East, especially in the Persian Gulf, with capacities greater than 300,000 m3/day. The procurement of these projects has proven to be resistant to COVID-19, with most projects having suffered delays of up to six months. Municipal demand beyond the Gulf has also proven resilient, but industrial desalination has had a greater impact.

In addition to megaprojects in Israel and the Gulf, there are significant project opportunities in Latin America, India, China and the United States. Desalination in these regions does not occur on such a large scale, and projects rarely exceed 150,000 m3/day.

In the European Union, Spain is the largest and most mature market. There are also opportunities throughout the Mediterranean basin for larger projects in Cyprus, Malta, Italy, Greece, and small desalination plants of both seawater and brackish water in the rest of the EU countries.

It is estimated that by 2021-2025 the worldwide sector size will reach US$33.1 billion. Engineering services, marine equipment and infrastructure sales (sectors on which Spain is one of the leading countries) with experience the greatest investment and growth potential in the world. In terms of installed capacity, an additional production of around 27 million m3/day of desalinated water will take place in the same period worldwide.

Countries with a higher presence of desalination



Evolution in the last 5 years of the world market (thousands of m^3/day)

Year	2015	2016	2017	2018	2019
Cumulative installed capacity	97,355	101,813	107,340	111,543	116,230
Capacity increases*	4,480	4,458	5,527	4,203	4,687
Seawater Desalination	3,421	3,125	4,529	3,431	3,706
Brackish water Desalination	911	949	884	597	668

** Considering the balance between new installations and uninstallations*
Source: Global Water Intelligence

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Global production of desalinated water exceeds **118 million m^3 per day**, which would be enough to supply a population of more than 500 million people

By 2021-2025 the size of the sector worldwide will reach **$33,100 million**

Addittional **27 million m^3 of desalinated water per day** will be added in the same period around the world

Current situation of the desalination industry

Market

Market In Spain And Evolution

Spain is one of the countries in the world where more desalnated water is produced. It is currently the fifth largest country in installed capacity (production capacity of all desalination plants), behind Saudi Arabia, China, the United States and the United Arab Emirates.

According to the most up-to-date data, Spain currently produces around 6 million m3 / day of desalinated water for municipal supply, irrigation and industrial use.

Currently, in Spain a total of 991 desalination plants with productions greater than 100 m3 / day are installed. Out of these, 435 are seawater desalination plants and 556 are desalination plants of brackish water or other water sources. In Spain, the desalination activity in the Mediterranean basin, managed by Acuamed (Waters of the Mediterranean Basins) as well as the Balearic Islands and the Canary Islands.

Of all the desalination plants in the Mediterranean, the most significant ones are Torrevieja (Alicante, 240,000 m3/day), Sant Joan Despí (Barcelona, 206,064 m3/day), El Atabal (Malaga, 165,000 m3/day), Valdelentisco (Murcia, 136,000 m3/day), Águilas (Murcia, 180,000 m3/day) and Carboneras (Murcia, 120,000 m3/day).

The first seawater desalination plant in the Canary Islands and Spain was installed on the island of Lanzarote in 1964. It produced 2,500 m3/day of drinking water using Multi-Stage Flash distillation (M.S.F.). The efforts of the various public administrations and private initiatives have allowed a current production of 588,057 m3/day, throughout the archipelago. The economic growth experienced in the eastern islands would not have occurred without the desalination of seawater. As a result, water is no longer a limiting factor for their development.

As a technology developer, Spain is considered one of the world's leading powers in the water sector and more specifically in the desalination of seawater and brackish water. With several technology companies among the most cutting-edge companies in the world, Spain invests large sums in R&D&I in the sector, setting the benchmark for the rest of international companies. The market trusts Spain to remain a leading country in this industry and champion new innovative and environmentally friendly technologies in desalination.

Main regions with desalination plants in Spain

Evolution in the last 5 years of the market in Spain (thousands of m^3/d)

Year	2015	2016	2017	2018	2019
Cumulative installed capacity	5.969	5.973	6.020	6.067	6.071
Capacity increases*	15	3	48	47	3
Seawater Desalination	7	2	31	36	36
Brackish water Desalination	8	1	17	11	11

** Considering the balance between new installations and uninstallations*
Source: Global Water Intelligence

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Spain is currently the **5th country with the highest production** of desalinated water

6 million m3/day are produced for municipal supply, irrigation and industrial use

Spain is regarded as one of the **top world powers** on seawater and brackish water desalination

The market expects Spain to remain a **technological benchmark** and champion new innovative and sustainable desalination technologies

Current situation of the desalination industry

Main players In Spain

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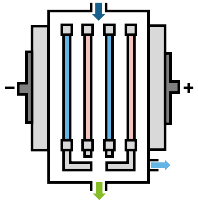
PUBLIC ENTITIES	TOP TECHNOLOGY PROVIDERS	ASSOCIATIONS AND PROMOTERS
Ministry of Ecological Transition and Demographic Challenge	acciona	AEDyR – Asociación Española de Desalación y Reutilización
General Directorate for Water	ABENGOA	iagua
General Directorate of the Coast and the Sea	GS Inima	hispagua
	aqualia	agoa
	sacyr	European Desalination Society
	cadagua	IDA – International Desalination Association
	Tecnicas Reunidas	
	Facsa – ciclo integral del agua	

Current situation of the desalination industry

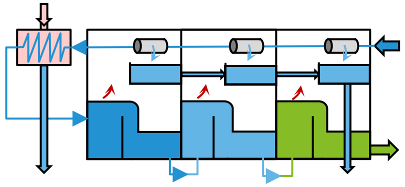
Current Technologies

There are different technologies for desalination that have evolved over the years. Historically, different technologies such as electrodialysis and thermal desalination have been used, but for more than 10 years the vast majority of desalination plants developed in the world have been using Reverse Osmosis membrane technologies.



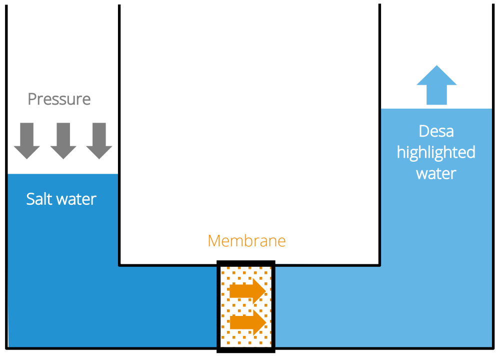
Electrodialysis:

It is an electrochemical separation process, in which ions are transferred through selective membranes from a less concentrated solution to a more concentrated solution as a result of a potential difference between two electrodes.



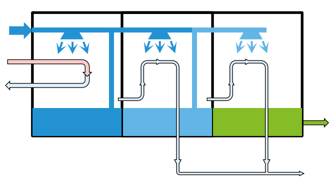
Multi-step desalination:

This method consists of evaporating seawater by applying a heat source and then condensing it. The operation is repeated several times by adding in some cases elements to the process that help capture some substance present in the impure water that you want to extract.



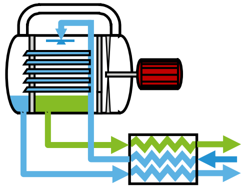
Reverse Osmosis:

This process allows to separate in a concentrated solution the ions and molecules present in a solvent, so that a certain pressure achieves the passage of the solvent through a semipermeable membrane that retains the solutes dissolved in it. To achieve an effective result, the pressure applied must be greater than the osmotic pressure (which is the one exerted on the semi-permeable septum the substances between which osmosis is produced), and the higher the pressure applied will proportionally increase the permeation flow.



Multi-effect Desalination:

Incoming water is sprayed into pipes that are then heated to generate steam. The steam is then used to heat the next batch of incoming seawater. To increase efficiency, steam used to heat seawater can be taken from nearby power plants. Although this method is the most thermodynamically efficient among heat-fed methods, there are some limitations such as maximum temperature.



Mechanical steam compression:

It involves the use of a mechanical compressor or jet stream to compress the steam present on the liquid. The compressed steam is then used to provide the heat needed for the evaporation of the rest of the seawater.

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The **Reverse Osmosis** is the desalination technology that currently has the highest acceptance and market share (close to 80%), and it is the technology implemented in **Waterise**'s solution

Current situation of the desalination industry

Challenges And Opportunities of the Industry In Spain

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Challenges

1 Attend the increasing water demand...

Promotiong the use of unconventional water sources is of particular interest to Spain, as it contributes to several of the country's strategic policies: ecological transition support, combating climate change, demographic challenge, agriculture policy and sustainable rural development.

Population growth, comfort habits, desertification and the effects of climate change make the desalination of seawater and brackish water one of the most appropriate alternatives to ensure water supply.

2 ... In a cost-effective and efficient way...

The market prices of desalinated water produced at traditional plants remains high, especially because of their high energy consumption. For price improvement, it is necessary to reduce the costs of both investments and operations.

Efficiency improvements must be achieved through technological developments, both in desalination technology and new digital technologies.

3 ... And in a sustainable way

Despite the improvements achieved in previous decades in reverse osmosis desalination, the high energy consumption of terrestrial desalination plants continues to result in a high volume of CO_2 emissions, which hinder the fight against climate change.

They also have a significant environmental impact on the coastal environment from brine spills into the sea, the use of pre-treatment water generation, noise generation and its occupation of land in coastal areas of Spain.

Opportunities

1 Encouraging Territorial Cohesion

Access to water resources is essential to promote conditions and factors that foster growth and lead to true convergence between regions with different levels of development and availability of drinking water for urban, agricultural or industrial use.

2 Managing Water Resources with Greater Flexibility

Desalination allows to release the stress on surface and underground water resources, which in many cases come from overexploited sources, as well as reduce the need for transfers between hydrographic basins.

In addition, desalination can adapt very easily and quickly to demand changes by implementing modular solutions.

3 Pushing the competitiveness of the tourism and agricultural sectors

Tourism increases the demand for water in a concentrated and seasonal way (especially on coasts and islands). Water supply is essential for its competitive development. In turn, the revenue generated can be invested to improve the supply and sanitation systems of local populations.

4 Promoting Public-Private Collaboration

Public-private collaboration will enable the mobilization of financial resources and the necessary investments to ensure the levels of well-being, economic growth and competitiveness of sectors highly dependent on water resources.

To this end, the partnership with companies will strengthen the defense of the general interest, allowing to maintain the economic activity and strengthen measures for vulnerable groups.

03

Description of the Waterise Project

Description of the Waterise Project
Objectives

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FINAL OBJECTIVES OF THE PROJECT

- Expansion of the desalination capacity in different regions of Spain, thus reducing the overexploitation of aquifers and transfers between hydrographic basins.
- Improved price of desalinated water, as a result of the reduction of both investment and operation costs.
- Reduction in the coastal land required to build desalination plants, up to 80%.
- Implementation of improvements through capacity expansion projects, especially in old plants where there are no planned expansions.
- Addition of unconventional water sources to water management plans, achieving a significant reduction in environmental impacts (reducing CO_2 emmissions, impact of brine discharge, and eliminating pre-treatment chemical residues)

Intermediate goals

- Project drafting
- Fully built and dry-tested subsea desalination plant - FAT
- Post-treatment: Land plant built and tested – "Mechanical completion"
- Development of the Digital Twin of the desalination plant and marine environment.
- Cognitive autonomous system to support design, construction, monitoring, operation and maintenance.
- Intelligent System for Integral Environmental Management.

Project Results

- Production of desalinated water within the agreed quantity and quality parameters
- Feedback and conclusions for future implementations and extrapolations at other locations

Description of the Waterise Project
Description of the Technical Proposal

About us

Waterise is a company that combines a great experience in the subsea oil and gas industry, along with the experience and competence of the conventional membrane desalination industry. The Company has developed a patented subsea desalination system that combines solutions from both sectors.

Our subsea desalination solution

The solution consists of a design of standardized subsea modules with a production capacity of 50,000 m3/day each, connected to land by an umbilical cable that provides energy and communications and a pipe for the transport of desalinated water. With this solution, economies of scale can be achieved by deploying multiple modules in the same site for greater capabilities.

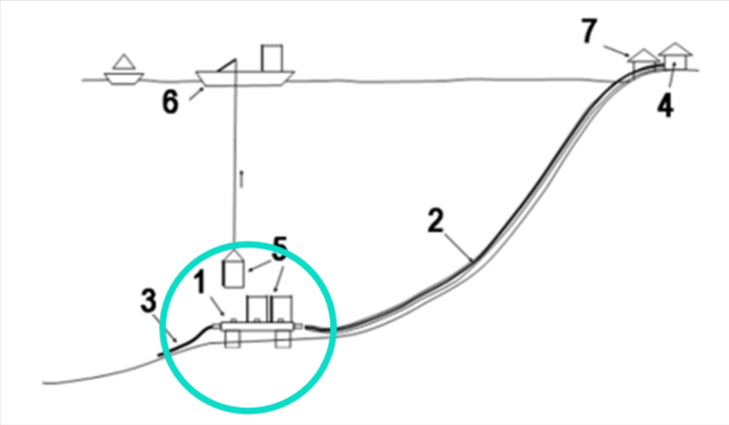
For the Waterise engineers, working at 400 meters deep, 40 bars of pressure, and pumping desalinated water to land, is a much simpler goal than the oil and gas projects on which their experience is based. The subsea desalination system uses components tested and proven for years in both desalination and subsea gas and oil systems. Therefore, this system combines the advantages of subsea desalination, mainly cost-free energy and very high quality supply water, with the reliability and availability of a conventional plant, providing safe and clean access to fresh water in regions with water stress.

Differential Features

Waterise presents unique features of the subsea oil industry
- Extremely high reliability, based on simplicity and redundancy
- Fully automated remote plant operations
- Modularity in designs to facilitate future optimizations
- Optimized costs dependent solely on required water quality and energy cost. The cost of the plant is independent of specific factors such as location, land purchase cost, feed water quality and pre-treatment needs

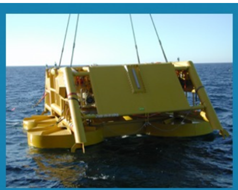
Waterise's subsea desalination system changes the game rules:
- Waterise uses hydrostatic pressure to feed reverse osmosis membranes, reducing energy requirements by approximately 40%
- Subsea operations drastically reduce the required coastal terrain compared to a traditional land-based desalination plan, approximately 80%
- In-depth captured water has a much lower organic content and more stable operating properties throughout the seasons than surface water. As a result, water fed to a subsea plant requires significantly less pretreatment than land installations.
- Subsea desalination significantly reduces environmental footprint and emissions by eliminating brine discharge concentrated in coastal Waters.

Conceptual outline of the Waterise solution



Examples of subsea structures in Norway for oil and gas


Tune Template 2001


Garn West 2001


Laminaria 1998

Today and for more than two decades, especially in Norway where 100% of oil and gas are produced *off-shore*, subsea structures anchored to the seabed ared used. They extract fluids, treat them and pump them ashore, working at depths of up to 2 km, with working pressures of up to 600 bar and handling high corrosive capacity fluids (e.g. H_2S).

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The **Waterise** solution consists of a design of submarine desalination modules, connected to land by an umbilical cable that provides energy and communications, and a pipe for the transport of fresh water.

Waterise presents **unique features of the subsea oil industry** to improve the safety and efficiency of desalination

The advantages of this solution are mainly the **energy reduction** desalination and **environmental footprint**, with the **reliability** of a conventional plant, and a very **high quality**

Description of the Waterise Project

Technology

Subsea Desalination Technology

In recent years, technological advances in water desalination have focused on technical improvements in terrestrial desalination plants, such as the reverse osmosis process, seawater intake and their prefiltered, as well as pretreated in conventional desalination plants.

However, the development required to be able to design a subsea desalination plant did not exist before. Although the concept of desalinating seawater at a certain subsea depth is not new, it has traditionally presented significant technical difficulties, which are successfully resolved with the new development owned by Waterise.

The technology of Waterise consists of a new technological development in the desalination market that combines developments in reverse osmosis desalination with developments in subsea technology, mainly oil and gas-oriented.

Our concept consists of standardized subsea modules with a capacity of 50,000 m3 per day. Economies of scale can be achieved by deploying multiple modules at the same site to achieve greater capabilities to meet customer needs and requirements over time and at any time

Digital Technologies for Intelligent Plant Management

In addition to the desalination technology itself, the efficiency improvements of our underground plant concept are strongly linked to the use of highly technological systems, easily replicable in assets in other industries.

During the execution of the project, as technological development will be implemented the latest technology in DMSA (*Data Management Solutions for Analytics*) for all processes to be managed during the operation and maintenance of the plant, maximizing its efficiency, as well as monitoring the marine environment.

The implementation of this project therefore includes the development of three main systems:

1. Digital Twin of the subsea system
2. Cognitive autonomous system to support design, construction, monitoring, operation and maintenance.
3. Intelligent System for Integral Environmental Management

Technological solutions

Digital twin of the desailing plant and marine environment.

Software that reproduces a virtual replica of the desalination plant and surrounding environment, including the different systems and processes and interactions with the environment.

The tool will be able to learn, understand and solve complex problems, and connect and communicate with the real plant. This allows performing diagnosis, improving performance and efficiency, extending asset life, predicting operation and maintenance needs by offering continuous optimization, and establish incremental AI algorithms that enable autonomous operation.

Cognitive autonomous system of design assistance, construction, monitoring, operation and maintenance.

This system will be based on the Digital Twin developed in the previous point.

Its role will be to support decision-making in site selection, design and construction of desalination plants depending on the site. It will also support decision-making in operations and prescriptive maintenance using artificial intelligence techniques, intelligent diagnosis, and predictive algorithms.

Intelligent System for Comprehensive Environmental Management

This system will include a system of sensorization and data capture of environmental conditions that, through predictive models based on AI and *Machine Learning*, report the energy performance of the desater, the control of emissions and discharges, and the health of the marine environment, among other environmental aspects.

Description of the Waterise Project

Companies Involved in the Project

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	lantania	GHENOVA ingeniería	Aqua Advise	ECOS
Main activity	Engineering, supply, construction, commissioning, maintenance operation of water treatment plants and hydraulic infrastructures	Engineering and Consulting Studies.	Seawater desalination consulting and engineering	Marine environmental consultancy
Operating sectors	• Public sector: EDAR, ETAP, EDAM, EB. • Private sector: water treatment (purification and food/process waters)	• Naval • Defense • Industrial • Energy • Tic	• Seawater desalination • Wastewater reuse • Water treatment • Water purification	• Seawater desalination • Water treatment • Renewable energy
Role in the Project	• Engineering/design of water treatment plants: desalination plants, water treatment plants, etc. where reverse osmosis and/or other membrane technologies are involved, as well as possible pretreastions.	• Chain Value Shipbuilding, Industry and Energy, Industrial Auxiliary partner in the sector in the fields of design and digitization	• Engineering and consulting for the identified projects. • Relationship with affected institutions and agencies. Obtaining licenses, permissions, and any administrative needs of the project.	• Environmental impact and sustainability assessment
Participation in the Project	• Project Management of the project • Engineering and construction of the part corresponding to civil works on land • Engineering/design, supply, installation and commissioning of equipment and installations on the ground. • Operation and maintenance of the equipment and facilities on the ground	• Development of the Digital Twin of the desailing plant and marine environment. • Development of the autonomous cognitive system of design assistance, construction, monitoring, operation and maintenance. • Development of the Intelligent System for Integral Environmental Management	• High value consultancy in the desalination sector, more specifically in Spain. • Support to the project from a regulatory, technical and liaison point of view with critical suppliers of the project value chain • Relationship with the administrations involved in the project of both the State, Regional and Local affected.	• Assessment of the environmental effects that the solution may have on the environment, assess the environmental benefits and the calculation of the carbon footprint. • Proposal for improvements to reduce, as far as possible, the impacts of technology and the desalination process in the environment.

Description of the Waterise Project

Need and competitive advantage

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IDENTIFIED CHALLENGES

WATERISE PROJECT

1 Attend the increasing water demand…

- With Waterise's subsea desalination technology, drinking water production capacity will be able to meet water supply needs in those regions of Spain with a shortage of water resources, with cheaper prices and more sustainably than traditional desalination plants.
- Waterise's technology can be integrated with current plants, operating in parallel and providing flexibility to the production volume thanks to its modular operation.
- New plants can also be created for regions that require new sources of desalination water production. These new plants can be both hybrid (with reverse osmosis desalination on land and subsea desalination of Waterise), or independent subsea desalination machines.

2 … In a cost-effective and efficient way…

- Investment costs can be reduced by 20% - 30% compared to traditional plants, thanks to the lower requirements of facilities for water feed, pre-treatment, pumping and recovery of energy, transport and brine disposal.
- Operating costs are also reduced by 20% to 30%. The main difference is energy consumption, which is reduced by up to 40%, thanks to the solution of Waterise it takes advantage of the natural hydrostatic pressure of water at 400 meters deep, and therefore at no cost to all membrane feed pressure requirements for subsea desalination. Consequently, the cost of producing desalination water would be reduced from approximately 0.80 €/m3 with terrestrial desalination plants to 0.60 €/m3 with our solution.
- Other operational efficiencies include:
  - Personnel: Activities are centralized in a remote control room to monitor subsea desalination modules, with a high level of operational automation.
  - Chemical removal: only required for membrane cleaning and post-desalinated water, which are made on land. No chemicals are used at sea.
  - Consumables, overheads, fees and other expenses would be similar to those of traditional desalination plants.
- Availability above 98%. Improved expected availability of typical terrestrial desalination plants.

3 … And in a sustainable way

- The Waterise solution eliminates or reduces the environmental impacts of traditional desalination plants:
  - Uptake and discharge are done in deep water, away from coastal and surface waters where there would be a greater impact on biodiversity.
  - The salinity of the discharge is only 1.3 times the salinity of the sea and is poured to high depth, where the impact on biodiversity is less.
  - The total absence of chemicals in subsea desalination also respects the marine ecosystem.

Description of the Waterise Project

Need and competitive advantage

OPPORTUNITIES IDENTIFIED

WATERISE PROJECT

1 Encouraging Territorial Cohesion	• The Waterise solution responds to the opportunity to achieve greater territorial cohesion through the safe supply of water resources in regions where water is essential to create conditions for competitive economic growth and development compared to other regions of Spain. The more desalination plants our technology has, the greater the chance of convergence there will be between agricultural, industrial and urban development between the different regions.
2 Managing Water Resources with Greater Flexibility	• Our cost-effective and sustainable saltwater production solution reduces stress on other surface and underground water resources in our geography, as well as reducing the need for transvases from watersheds between Autonomous Communities. • In addition, the modularity of the desalination system Waterise adapts the volume of production according to the needs of demand flexibility (such as the seasonality of tourist activity, etc.)
3 Pushing the competitiveness of the tourism and agricultural sector	• Our solution has the potential to become a great ally of these key sectors in Spain, since they are highly dependent on water availability. The lower price of drinking water produced with our technology, the lower need for coastal land to build facilities, the reduced environmental impact and adaptation to economies of scale are very valuable characteristics to meet the needs of populations and peak demand in the tourism and agricultural sectors.
4 Promoting Public-Private Collaboration	• For Waterise and its partners in this proposal, the success of this initiative will have a greater scope and impact from collaborations with key companies and entities in the sector. • Our business model (Build, Own, Operate and Maintain) is ideal for developing high-impact desalination projects in the national territory. These projects can be developed by building partnerships with both public entities (and Acuamed) as with private sector companies (such as Acciona, Abengoa or GS Inima), collaborating in the design, construction and operation of desalination plants (new or existing) with our new technology.

04

Expected impacts

Expected impacts

Economic and Social Impact

Impact on the market

The investment of €52.93 million for this project is estimated to have an impact on Gross Added Value close to €52 million from 2021 to 2023.

The implementation of Waterise seawater desalination solutions will result in substantial savings in the cost of producing drinking water. The current cost of conventional plants is around 0.80 €/m3, while with our subsea desalination technology we estimate that the cost would be reduced to 0.60 €/m3.

This reduction in costs and the consequent improvement in the efficiency of desalination plants will increase drinking water production in regions where there is increasing demand, under conditions of higher profitability, greater efficiency and lower ecological impact.

Alternatives for the implementation of our technology:

- **Current plants ("Brownfield"):** The technology of Waterise can be integrated into systems running in parallel. In addition, its capacity is easily expandable, with the addition of modules as the demand for drinking water production increases.
- **New plants ("Greenfield")**: Hybrid plants (reverse osmosis desalination on land + subsea desalination), or independent subsea desalination.

Collaborations with other companies and entities.

Waterise and its partners in this proposal see its emergence in the Spanish market from collaborations with companies and key entities in the sector. Our business model (*Build, Own, Operate and Maintain*) is ideal for developing high-impact desalination projects in the national territory, for example:

- Partnership with **public entities** Mediterranean Waters, S.M.E., S.A., (Acuamed)
    - Collaboration in the improvement of existing plants in the watersheds of Segura, Júcar, Ebro, Andalusian Mediterranean Basin and Internal Basins of Catalonia
    - Collaboration in the planning of new desalination plants in these regions
- Partnerships with major **technology-suppliers** desalination of seawater and brackish water (Acciona, Abengoa, GS Inima, Aqualia, Sacyr, Cadagua, Reunited Techniques, etc.)
    - Collaboration in the design, construction and operation of desalination plants (new or existing) with our new technology.

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The investment of €52.93 million for the project is estimated to have an impact on **Gross Added Value** close to the **€52 million** from 2021 to 2023

The cost of producing desalinated water would be reduced from **€0.80/m^3** on terrestrial desalination plants to **€0.60/m^3** with **Waterise** subsea desalination technology

Expected impacts

Economic and Social Impact

Impact on Employment

The implementation of subsea desalination technology Waterise would have a positive impact on job creation. This impact would not only be reflected in direct employment, but also indirect employment, as sustained water supply to territories facilitates the maintenance of economic activity in multiple other sectors (industry, agriculture, tourism, etc.).

During the implementation of the project it is estimated that the economic activity generated by the implementation of the plan supports 296 jobs on average per year until 2023 directly. These jobs would be created in three sectors directly impacted by direct investment, which are suppliers of equipment (70 jobs), construction (196) and consulting services (25) and technology (5) with those jobs budgeted in the project.

Along with direct impacts, an additional impact (indirect and induced impacts) on the employment of 200 jobs has been quantified through the tractor effect of direct investment on the rest of the economy.

With regard to indirect employment, as set out by the United Nations World Organization in the World Water Development Report 2016, it is estimated that more than 1.4 billion jobs (42% of the world's workforce) are heavily dependent on water. An estimated 1.2 billion jobs, or 36% of the world's workforce, are moderately water dependent. These are sectors that do not require access to significant amounts of water resources to carry out most of their activities, but for which water is, however, a necessary component in one or more parts of their value chains. Examples of sectors with moderately water-dependent jobs include construction, leisure and transportation. In short, 78% of the jobs that make up the world's workforce depend on water.

In the agriculture sector, a regular and sufficient water supply is essential to ensure the quality and quantity of employment in the agri-food sector, agricultural production and income stability.

The energy sector, with water extraction on the rise, provides direct employment. Energy production as a requirement for development makes it possible to create jobs directly and indirectly in all sectors of the economy. Growth in the renewable energy sector leads to an increase in the number of green and non-water-dependent jobs.

The industrial sector is an important source of quality employment worldwide and accounts for approximately 4% of global water extractions. By 2050 manufacturing alone could increase water consumption by 400%.

There are also a number of auxiliary work that allows employment in water-related sectors. These include positions in public administration regulatory institutions, infrastructure financing, real estate, wholesale and retail trade and construction.

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296 direct jobs will be created during the implementation of the project, in addition to other **200 indirect jobs**, thanks to the tractor effect on the rest of the economy

Expected impacts

Economic and Social Impact

Impact on the Society

This initiative to adopt Waterise's desalination technology will have a direct short-term impact on the national economy by encouraging employment support through the development and implementation of the project itself. It is estimated that the investment and reforms to be carried out will lead to a positive effect on the economy, which is expected to generate a boost to the sectors most impacted by the supply of drinking water, as well as a multiplicative effect to other sectors, thus generating a direct and indirect impact on the economy estimated to increase the Gross Added Value by about €52 million over the next three years.

In recent years, the trend in Spain is a progressive increase in water scarcity, aggravated by very negative forecasts of the impact of climate change, as well as competition between agriculture, industry and populations due to the limited water resources available, as shown by recent analysis by the CEDEX Hydrographic Studies Centre. Therefore, having a safe water supply allows the activity in the area where the plant is installed not to decline and maintain a constant and sustained level of development.

The population is the main pressure factor on natural sources of drinking water. Desalination makes it possible to significantly increase the guarantee of supply in drinking water supplies, especially in the areas of use closest to the coast, where the implementation of new urban developments requires additional water resources and diversification of supply sources as a basic drought management strategy.

In terms of agricultural and industrial use, the high cost of producing desalinated water with today's traditional plants introduces a high social scarcity that prevents widespreading its use. Therefore, from an economic and environmental point of view, traditional desalination processes could be seen more as an alternative and as a strategic resource to address future water scarcity scenarios and resolve social, environmental, territorial and institutional conflicts. With Waterise's desalination technology, drinking water generation would be achieved with a very significant improvement in energy efficiency and production costs. Therefore, its implementation would reduce water scarcity problems in the regions of the Spanish Mediterranean coast and the archipelagoes more economically efficiently and with greater social acceptance.

The indirect social benefits of an economically and ecologically efficient desalination are equally relevant. By increasing the amount of water available in water-scarce territories, an increase in investment in these territories is almost immediately generated, and therefore greater wealth in the environment. Agricultural land is prevented from being abandoned, also creating new farming options. In addition, ensuring the maintenance of economic activities in these regions creates direct and indirect jobs in multiple sectors (industry, agriculture, tourism, etc.)

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With **Waterise's** desalination technology, water scarcity problems would be reduced more **economically** and with **greater social acceptance**

Expected impacts

Environmental Impact

One of the main impacts of climate change to which Spain has to adapt is the reduction of precipitations and increased water stress. Desalination, as an unconventional source of water, is one of the most technologically developed and safest options for adapting to water scarcity.

Subsea desalination is presented as an alternative within existing desalination technologies with the advantages in reducing environmental impact, reducing the cost of production and adapting tool to predictions of the impact of climate change in the most vulnerable areas of Spain.

Reduced energy consumption

The maximum energy efficiency currently achieved in terrestrial desalination, using the latest membrane technologies and energy recuperators, is 3 to 3.5 kWh per m3 of desalination water. The terrestrial desalination plant requires seawater uptake (typically in coastal surface waters), intense pretreatment, high-pressure pumping of 100 units of seawater to produce approximately 45 units of desalinated water (45% conversion), and an energy recovery that avoids wasting that energy. Each of these steps has its inefficiencies and energy losses.

Subsea desalination takes advantage of the hydrostatic pressure of the water column to generate permeability through the membranes, so that all the pressure pre-membranes is cost-free. The system only pumps the product water (desalinated) to land, achieving an energy consumption of between 1.8 and 2.0 kWh per m3 of desalinated water.

Assuming a plant of 100,000 m3 water production and an energy price of €70 per MW (7 cents per kWh), the subsea plant would save €3,832,500 per year only in energy, equivalent to an emission reduction of almost 25 tons of CO2 each year (assuming 0.45 Kg CO2/kWh).

Total absence of chemicals

The subsea desalination plant works without any chemicals, unlike terrestrial desalination plants. Membrane cleaning shall be carried out on land, neutralizing the waters used and with zero discharge.

The Intelligent System for Integral Environmental Management will allow to monitor the marine environment and make forecasts of evolution and condition being able to carry out environmental monitoring and, where appropriate, recommend mitigation and compensation measures if necessary.

This will monitor potential environmental impacts and follow in real time to avoid conditions to the abiotic and biotic environment.

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Compared with a land plant of 100,000 m3 water production at an energy price of €0.07 per kWh, the subsea plant would save **€3.8 million** on energy consumption per year, equivalent to a reduction in emissions of almost **25 tons of CO2** every year

The subsea desalination plant works **without chemicals**, in unlike terrestrial desalination plants

Expected impacts

Environmental Impact

Less salinity in the discharge

The subsea desalination plant seeks to optimize energy consumption, working at the lowest possible pressure (deep equivalent). To do this, and since the pressure pre-membranes is cost-free, this system has been designed so that it works at a low level of membrane conversion and allows permeability to approximately 40 bar of pressure (in contrast to the usual 65 bars in terrestrial desalination plants).

As a result of this low membrane conversion, the salinity of the discharge is only 1.3 times the salinity of seawater, while usually the brine of terrestrial desalination plants approximates twice as much salinity. In this way, the dispersion and dilution of the discharge of the desailing plant is much simpler and its impact much less, in addition to being produced in waters with less biological significance.

Transition to the circular economy

The basis of water resource management is based on the water cycle, taking into account conventional sources and unconventional sources. Currently, given the situation of exploitation of resources in certain geographies in Spain, the search for unconventional sources of water is critical for good planning of the circular economy related to water.

Desalination is generally considered an unconventional source of water, along with other sources such as wastewater reuse, and subsea desalination is considered to be another source to consider in the water cycle, and therefore in the circular economy, which seeks to increase efficiency in use and reduces stress in other sources considered conventional.

Noise mitigation

The elimination or mitigation of noise in terrestrial desalination plant environments has a positive impact on the health and well-being of workers and residents in these areas. These plants generate noise levels close to 100dB mainly in motors, pumps and energy recoverers. These noise levels can produce physiological, psychic and social impacts on the workers of these plants and rejection of the inhabitants in adjoining areas. The Waterise subsea plant would completely eliminate this kind of impact.

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The salinity of the discharge is only **1.3 times** salinity of seawater, compared with almost **2 times** on terrestrial desalination plants

The **Waterise** subsea plant eliminates the noise levels generated in traditional plants (close to **100dB**) impacting the health and well-being of workers and residents in the environment

Expected impacts

Technological and Digital Impact

The development of the project and the technology implemented in it will boost digital transformation and competitive improvement in the blue economy sector and maritime activities, as it offers a replicable technological solution in other assets and sectors, which will allow, depending on environmental and oceanographic conditions, as well as system operations, to make optimal decisions in real time.

Digital Twin

The project will develop the first digital twin of a subsea system that will analyze both critical data from both oceanographic conditions and the plant's own systems. This Digital Twin is a disruptive innovation that will enable:

- Support in decision-making in the selection of sites, the design and construction of desalination plants depending on the location.
- Support for decision-making in operations to improve the efficiency and efficiency of the system.
- Performing prescriptive maintenance using artificial intelligence techniques, intelligent diagnosis and predictive algorithms.

Cognitive autonomous system to support design, construction, monitoring, operation and maintenance.

This unprecedented system has a module that contemplates the integration of the chain of suppliers and installers that coordinate the work from design to dismantling based on the information generated by the Digital Twin, in which alternatives are analyzed according to the location and their conditions.

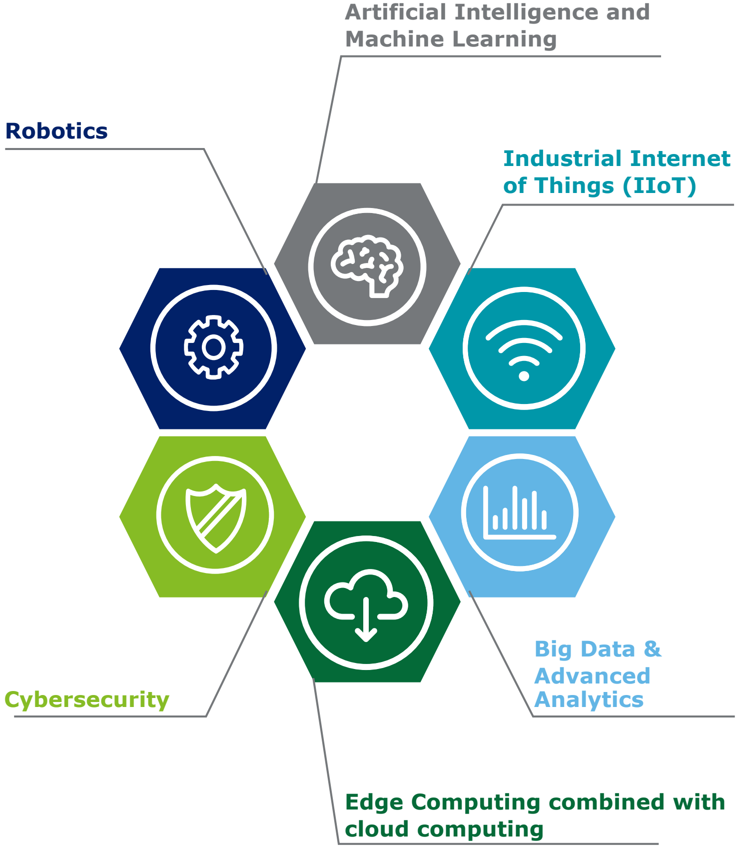
In addition, it includes integrated maintenance and logistics management to carry out maintenance and service operations to the installation in the most efficient way prioritizing in the units based on weather forecasts and thresholds and local demand.

Intelligent System for Integral Environmental Management

It is another unprecedented system that allows to monitor the marine environment and make forecasts of its evolution and condition, being able to carry out environmental monitoring and, where appropriate, recommend mitigation and compensation measures if necessary.

This will monitor potential environmental impacts and follow in real time to avoid conditions to the abiotic and biotic environment.

Technologies used in project systems



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The project will develop the **First Digital Twin** of a subsea system that will analyze both critical data from both oceanographic conditions and the desailing system itself

Smart systems will be used for the communication and supervision of operations and asset maintenance, as well as environmental monitoring

Expected impacts

Technological and Digital Impact

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Systems based on Artificial Intelligence (AI) and Industrial Internet of Things (IIoT)

Having technologies that allow automated remote operation at high depths is not only an improvement, but also an essential requirement. The operation at more than 400 meters deep, 41 atmospheres is a challenge that has been addressed in other industries, such as Gas and Oil, but new technologies and AI offer significant improvements that will allow, through the Digital Twin and the Autonomous Cognitive System of design assistance, construction, monitoring, operation and maintenance, to predict the operation and anticipate possible failures , improving system efficiency and performing intelligent operation based on external and asset conditions, as well as production demand.

The Digital Twin would consist of a system IIoT it would be installed in the desater to connect the cyber world to the physical system obtaining the required operating information and critical parameters that are established. Technologies would be used to process information on-site *Edge Computing*. Depending on the predictions and recommendations of the intelligent system, the desater could understand complex problems and make its own decisions that, through robotic actuators, would allow it to operate autonomously at high depths.

In addition, the different functional, predictive or degradation models include the following:

- Generation forecast model (based on oceanographic, weather data history, etc.)
- Demand forecast model (based on node demand history)
- Functional model of systems and processes.
- Component and system degradation model.
- Predictive failure models

New digital services demanded by society

The main digital services associated with the project will be:

- Intelligent generation of drinking water according to conditions and demand.
- Intelligent energy management to reduce production costs based on natural production, demand and oceanographic conditions
- Extension of plant life and reduction of maintenance costs.

Thanks to the **functional systems and intelligent forecasting models**, the plant can make its own decisions which, through robotic actuators, would allow **autonomous operations** at high depths

Expected impacts

Impact In the Value Chain

Main Value Chain

Entry logistics

Unlike traditional desalination plants, water is taken 400 meters deep, achieving (1) higher raw water quality and saving costly pretreations, and (2) free energy in the form of natural hydrostatic pressure to obtain the pressure needed for desalination. In this sense, the need to use chemicals for water pre-treatment is also eliminated.

Operations

The main impact is a 40% reduction in energy costs compared to traditional desalinated water generation plants, as demonstrated in recent Waterise pilot projects. Such a significant reduction in energy cost is key to the total cost of drinking water production (20% lower than conventional methods).

Simplifying pretreatment processes also leads to a reduction in total maintenance costs. In addition, this system involves a significant optimization of the workforce needed to operate the plants, thanks to a high level of automatization.

External logistics

One of the most critical factors in the conventional desalination process (with seawater pumping and reverse osmosis pressure application in onshore installations) is the generation of residual brine, which is poured back into the sea, creating a potential environmental impact on the coastal environment. However, the solution Waterise remove brine on the seabed and with less salinity or concentration of dissolved solids ("Total Dissolved Solids" or TDS).

While conventional terrestrial desalination plants produce brine with TDSs of almost 2 times the salinity of the sea, the solution of Waterise produces a reject water with salinity only 1.3 times greater than seawater, greatly facilitating its dispersion and dilution. In addition, when the desailing plant is located in deep water, it is not necessary to install pipes from the coast to the sea to pour the brine, and it avoids causing a noticeable environmental impact.

Service

The Waterise solution guarantees more than 98% service time. This calculation considers annual downtime due to mechanical failures and maintenance of each system, including uptake, pre-treatment, reverse osmosis process, brine discharge and water transport.

This high availability is achieved through integrated redundancy of backup pumps and reverse osmosis modules (SWRO, "Sea Water Reverse Osmosis") backup installed. In addition, there is no annual activity loss due to seawater quality problems, thanks to better water quality at 400 m deep and not being affected by the proliferation of algae, red tides, jellyfish or hydrocarbon spills that often reduce the availability of terrestrial plants.

In addition, this system allows to adapt to economies of scale, thanks to a design in modular installations that allow to gradually expand the water processing capacity (modules of 50,000 m3 per day).

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Greater raw water **quality**, saving costly **pre-treatments** and **Energy** to obtain the osmosis pressure

Reduction of energy costs by **40%** and the production costs by **20%** compared to traditional terrestrial plants

Subsea plants Service Time **98%**

Adaptation To Economies Scale thanks to modular design (**50,000 m3/day modules**)

Expected impacts

Impact In the Value Chain

Secondary Value Chain

Company infrastructure

The Waterise solution implies a 20% to 30% reduction on CAPEX, thanks to not needing the systems and equipment for collection, discharge, pretreatment, high pressure pumping and energy recovery that are necessary in conventional desalination plants. These investment savings can facilitate the financing of desalination plant projects, which would have more barriers if they were conventional plants.

Human Resources Management

The proposed system has a high level of automation of operations, which implies an improvement in labour efficiency compared to the amount of drinking water produced.

In addition, the system requires employees to have more sophisticated training and training than conventional plants, especially in technological and operational management aspects, which is an improvement in working conditions. In addition, since desalination occurs 400 m deep, resources (internal or external) are required to perform inspection and maintenance interventions of reverse osmosis modules and other system components located on the seabed.

Technological Development

The Waterise system is a state-of-the-art technological solution for the generation of drinking water compared to conventional solutions used in Spain.

In addition to technological advances and good practices in the Oil and Gas industry, subsea desalination plants benefit from modern asset monitoring and management systems, using sensors and "Internet of Things“ Technology, real-time monitoring of the correct operation of the plants, as well as predictive maintenance of equipment and facilities.

Shopping

Savings on components (water pre-treatment machinery and equipment) and supplies (chemicals) unlike conventional plants.

Reduction of **20% - 30%** CAPEX, by dispensing certain water processing systems and equipment

More sophisticated staff **training** compared with conventional plants, especially in **technology** and **operational management**

Opportunity to **develope state-of-the-art systems for** asset monitoring and management

Elimination of machinery and chemicals supply costs unlike conventional plants

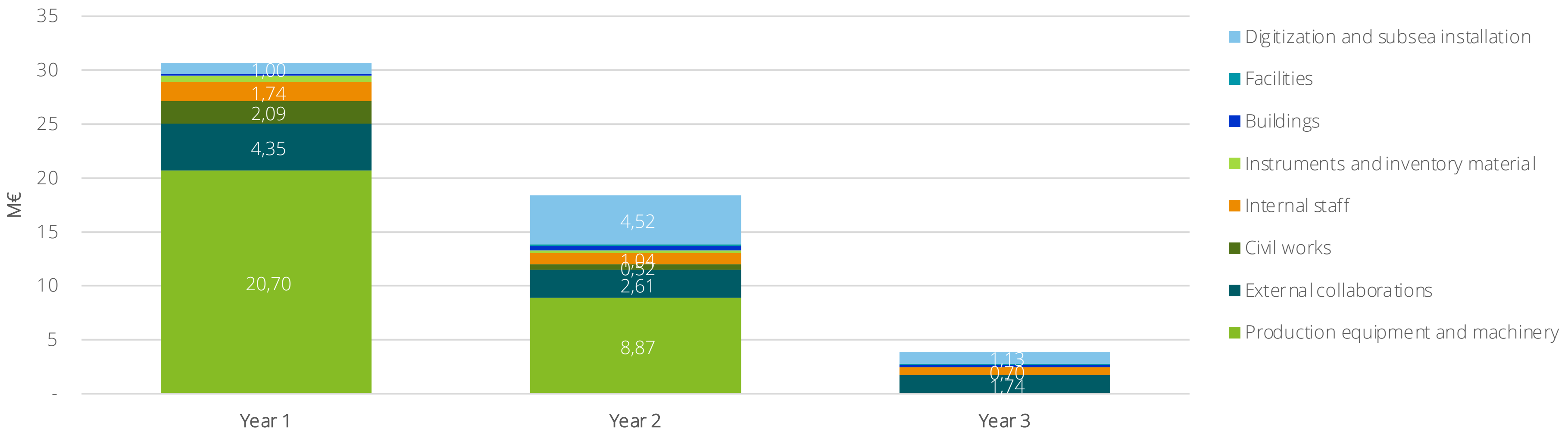
05

Financial plan and milestone schedule

Financial Economic Plan

Estimated Budget for a Subsea Plant

Total budget estimated at approximately €52.93 million



Annual budget by item	Year 1	Year 2	Year 3	Total
Production equipment and machinery	20.695.652,17	8.869.565,22	-	**29.565.217,39**
Buildings	156.521,74	391.304,35	234.782,61	**782.608,70**
Facilities	-	156.521,74	104.347,83	**260.869,57**
Civil works	2.086.956,52	521.739,13	-	**2.608.695,65**
Internal staff	1.739.130,43	1.043.478,26	695.652,17	**3.478.260,87**
External collaborations	4.347.826,09	2.608.695,65	1.739.130,43	**8.695.652,17**
Instruments and inventory material	620.869,57	266.086,96	-	**886.956,52**
Digitization and subsea installation	1.000.000,00	4.521.739,13	1.130.434,78	**6.652.173,91**
Annual Total	**30.646.956,52**	**18.379.130,43**	**3.904.347,83**	**52.930.434,78**

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The estimated budget for an subsea plant of 50,000m3/d would amount to approximately **€52.93 M** 26 months of project implementation

In the **Year 1**, the estimated budget is **€30.65 million**, of which **€20.7 million** would correspond to the investment in **production equipment and equipment**

In Year 2, the investment will be **€18.4 million**, of which almost **€9 million** are also budgeted for **plant facilities and equipment**

In Year 3, the budgeted total is **€3.9 million**, highlighting investment in **external collaborations,** In The **Digitization** and in the **subsea installation**

Milestone Calendar

Planta desaladora 50,000 m3/dia	No.meses	M0	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26
Principales milestones																												
Cierre financiero	-																											
Notificación de continuación " Notice to proceed"	-																											
Comienzo de la construcción	-																											
FAT - Planta submarina	-																											
Mechanical Completion - Postratamiento, Planta Terrestre	-																											
Energization	-																											
Producción de agua desalada	-																											
Contingencia	-																											
Diseño																												
Diseño planta desaladora submarina																												
Redacción del proyecto submarino	3 meses																											
Diseño al 30%	3 meses																											
Diseño al 60%	3 meses																											
Diseño al 90%	2 meses																											
Diseño al 100% incluyendo información vendor	1 mes																											
Diseño post-tratamiento terrestre																												
Redacción del proyecto terrestre	3 meses																											
Diseño al 30%	3 meses																											
Diseño al 60%	3 meses	1																										
Diseño al 90%	2 meses																											
Diseño al 100% incluyendo información vendor	1 mes																											
Contratos y Compras																												
Contratos de construcción	3 meses																											
Compra de equipos principales (Long lead items)	9 meses	2																										
Compras finales y visita de suministradores	3 meses																											
Construcción																												
Construcción planta desaladora submarina																												
Construcción de la planta submarina	9 meses																											
Transporte de la planta submarina	3 meses																											
Instalacion de las tuberias y cables de la planta submarina a la planta terrestre	6 meses																											
Construcción post-tratamiento terrestre																												
Mobilización e instalaciones temporales	3 meses																											
Movimiento de tierras y construcción de caminos	4 meses																											
Construcción de los edificios necesarios	4 meses																											
Instalación de los equipos mecanicos y electricos	6 meses																											
Instalación del sistema de control	4 meses																											
Precomisionamiento y comisionamiento																												
FAT - Planta submarina	2 meses	3																										
Mechanical Completion - Postratamiento, Planta Terrestre	2 meses																											
Energization	1 mes																											
Producción de agua desalada	1 mes	4																										
Contingencia	2 meses																											

Critical milestones

1. 60% and 90% design completion
This gives rise to starting with the construction of the land plant and the construction of the subsea plant

2. Purchase of critical equipment
These equipments are those that have a long manufacturing period and therefore need to be purchased as soon as possible so as not to delay the completion of the construction

3. *Mechanical completion* of the ground plant & FAT of the subsea plant
They are two critical milestones for the progress of the project that lead to the transport of subsea plant and the beginning of the tests of pre-commissioning of the terrestrial plant

4. Production of desailed water
It is the last and most critical milestone that completes construction and starting operation and maintenance

06

Links with PRTR criteria and other associated plans

Links with the Pillars of the Recovery, Transformation and Resilience Plan

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Digital transformation

With a view to achieving high levels of efficiency and sustainability of the desalination plant, the latest technology at DMSA (*Data Management Solutions for Analytics*) will be implemented for all processes that must be managed during the operation and maintenance of the plant.

Specifically, 3 innovative systems in the desalination industry will be implemented:

- Digital twin of the desalination plant
- Autonomous cognitive system to support design, construction, monitoring, operation and maintenance
- Intelligent System for Integral Environmental Management

With regard to the technology of smart systems, these will be based on Artificial Intelligence (AI), Industrial Internet of Things (IIoT), Big data and Data Analytics, Cloud Computing and Machine Learning.

The development of the Digital Twin of the desalination plants and systems previously proposed will boost digital transformation and competitive improvements in the blue economy sector and maritime activities.

In addition, these developments offer a replicable technological solution in other assets and sectors other than desalination.

Equality

- Promoting women's employment among new jobs: our project promotes greater representation of women in the desalination sector, their professional advancement within organizations and occupation of managerial and leadership positions.

National Recovery Transformation and Resilience Plan (PRTR)

Ecological transition

Our project is linked to the objectives of the green transition programme in terms of improving water planning and managementThe protection of marine biodiversity and the preservation of coastlines.

The subsea desalination plant brings together a number of characteristics that dramatically improve its environmental impact on traditional plants:

- Energy consumption is reduced by 40% compared to terrestrial desalination. This is equivalent to approximately 3.8 million energy savings per year and 25 tons of CO2 per year eliminated per plant 100,000 m3/day of production
- The uptake and discharge are done in deep water, more than 400 meters deep, away from coastal and surface waters where there would be a greater impact on biodiversity.
- The Salinity download is of Only 1.3 times the salinity of the sea and poured at high depths, where the impact on low biodiversity is less.
- The total absence of chemicals in subsea desalination also respects the marine ecosystem.
- The absence of noise in the environments of subsea desalination plants is a positive impact on the health and well-being of workers and residents of those areas

In addition, the use of desalination plants reduces stress from conventional and unconventional sources of supplyAs Aquifers Or Transfers watersheds of different Autonomous Communities.

Cohesion and social inclusion

From the point of view of territorial cohesion, thanks to the Waterise desalination plants, safe water supply in regions with limited water resources allows urban development and economic activity in these areas keeping a level of development without disadvantage compared to regions with higher water availability.

Regarding the social inclusion, our business model promotes its promotion through our diversity policies, training programmes and equal employment opportunities.

Links to Policies of the Recovery, Transformation and Resilience Plan

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COMPATIBILITY LEVEL

1	**Urban and rural agenda**, combating the depopulation and development of agriculture	Sustainable, safe and connected mobility shock plan in urban and metropolitan environments.	Housing rehabilitation and urban regeneration plan	Transformation and digitization of the logistics chain of the agriculture and fishing ecosystem		
2	**Resilient infrastructures and ecosystems**	Conservation and restoration of ecosystems and their biodiversity	Preserving coastal space and water resources	Sustainable, safe and connected mobility		
3	**Energy transition** fair and inclusive	Massive deployment of the renewable generation park aimed at energy development	Electrical infrastructures, promotion of smart grids and deployment of flexibility and storage.	Renewable hydrogen roadmap and its sectoral integration.	Fair Transition Strategy	
4	**An Administration for the 21st Century**	Digitization of management	Cybersecurity Reinforcement Plan for Public Admin	State General Administration energy transition	Plan to modernize Public Admin.	Comprehensive Reform and Modernization Plan for the Justice System
5	**Modernization and digitization of the industrial fabric and SMES,** recovery of tourism and boost to an enterprising Spanish nation	Industrial Policy Spain 2030	Boosting SMEs	Tourism sector modernization and competitiveness plan	Digital connectivity, cybersecurity boost and 5G deployment	
6	**Pact for science and innovation.** Strengthening the capabilities of the National Health System	National Artificial Intelligence Strategy	Institutional reform and capacity building of the national science, technology and innovation system	Renewal and expansion of the capabilities of the National Health System		
7	**Education and knowledge,** continuous training and capacity building	National Digital Skills Plan (Digital Skills)	Strategic Plan to Boost Vocational Training	Modernization and digitization of the education system		
8	**New economy** care and **Employment** policies	Shock plan for the care economy and strengthening inclusion policies	New public policies for a dynamic, resilient and inclusive labour market, based on three pillars			
9	**Impulse** industry **culture and sport**	Revaluation of the cultural industry	Spain Audiovisual Hub	Promoting the sports sector		
10	**Modernizing the tax system** for inclusive and sustainable growth	Tax Fraud Prevention and Combating Measures Act	Adapting the tax system to the reality of the 21st century	Improving the efficiency of public spending	Sustainability of the public pension system within the framework of the Toledo Pact.	

Links to Policies of the Recovery, Transformation and Resilience Plan

POLICY	Project	Description	Link
1. **Urban and rural agenda**, combating the depopulation and development of agriculture	Transformation and digitization of the logistics chain of the agri-food and fisheries system	Promoting quality, sustainability and the circular economy, generating value and jobs around agriculture and fisheries, especially in rural settings, and promoting its economy by curbing depopulation.	With Waterise technology improving water production and price, barriers will be reduced to this essential resource for the competitive development of agriculture in regions where there is water scarcity and rural exodus.
2. **Resilient infrastructures and ecosystems**	Conservation and restoration of ecosystems and their biodiversity	Investment in green structures, increased biodiversity, sustainable use of forest areas, etc.	The subsea plants with Waterise technology are more respectful with the marine ecosystem, as they do not use pretreatment chemicals and the discharge of brine is carried out at great depth and lower concentration.
2. **Resilient infrastructures and ecosystems**	Preserving coastal space and water resources	Investment to reduce the impact on coastal natural areas and water resources in the face of the effects of climate change, and promote comprehensive water management.	The subsea plants with Waterise technology require less coastal land, are more energy efficient and produce fewer greenhouse gases than traditional desalination plants.
5. **Modernization and digitization of the industrial fabric and SME**	Industrial Policy Spain 2030	Boosting the modernization and productivity of the Spanish ecosystem of industry-services through the digitization of the value chain.	Our proposal seeks to promote Spain as a technological leader in desalination, also developing cutting-edge technologies for the intelligent management of plant and environmental facilities.

Links to Policies of the Recovery, Transformation and Resilience Plan

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POLICY	Project	Description	Link
5. **Modernization and digitization of the industrial fabric and SME**	Boosting SMEs 2030	SME Digitization Plan, Reform of Funding Instruments, Ecosystem Support Plan StartupsEtc.	The development of the digital twin of the subsea desalination plant, the intelligent facility management system and the environmental management system will drive the creation of a broad fabric of developers, suppliers and installers of solutions and technological components, which will also be transferable to other sectors besides the desalination industry.
5. **Modernization and digitization of the industrial fabric and SME**	Tourism sector modernization and competitiveness plan	To promote the resilience, sustainability, diversification and added value of this tractor sector of the economy throughout the national territory.	Water provision is essential for the competitive development of tourism, with a seasonal and highly geographically concentrated water demand (especially on coast and islands). The efficiency and scalability of Waterise responds to the needs of this sector.
6. **Pact for Science innovation.**	National Artificial Intelligence Strategy	In order to promote the development of AI in the productive fabric, the economy and the society of data, with a humanistic perspective that guarantees the individual and collective rights of citizens.	Smart systems will be used for communication and supervision of operations and asset maintenance, as well as environmental monitoring, using the latest advances in AI, Machine Learning neural networks for application in predictive models that improve plant operation.

Links to Policies of the Recovery, Transformation and Resilience Plan

<table>
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<tr><td>7. Education and knowledge, continuous training and capacity building</td><td>National Digital Capabilities Plan (Digital Skills)</td><td>From the digitization of the school, to the university, to the work (upskilling and reskilling) with particular attention to closing the gender gap</td><td rowspan="2">The system requires employees to have more sophisticated training than conventional plants, especially in technological and operational management aspects. This is an improvement in working conditions, as the skills and knowledge acquired will in turn be transferable to other sectors and industries.</td></tr>
<tr><td>7. Education and knowledge, continuous training and capacity building</td><td>Strategic Plan to Boost Vocational Training</td><td>Modernization and flexibility of the system through the expansion of the training offer creating opportunities in new emerging sectors such as Big Data, AI, sustainable development, etc.</td></tr>
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Links to Policies of the Recovery, Transformation and Resilience Plan

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POLICY	Project	Description	Link
8. **New economy** care and policies **Employment**	New public policies for a dynamic, resilient and inclusive labour market, based on three pillars	(1) Address structural problems in our labour market; (2) Deep reform of active employment policies; and (3) Boost to labour insertion policies articulated around the Deployment of Minimum Living Income	The implementation of subsea desalination Waterise technology will contribute to improving the labour market by creating direct and indirect jobs. For each desatruding plant project, it is estimated that 296 direct jobs will be created during the implementation of the project, in addition to another 200 indirect jobs, thanks to the tractor effect on the rest of the economy.

Thank you