WATER & WASTE CASE STUDY: MOROCCO

Agadir Mutualized Desalination Plant

Location
Agadir region, Morocco

Owner
Ministry of Agriculture, Fisheries, Rural Development, Water and Forests/Office National de l'Electricité et de l'Eau Potable (ONEE)

Private Partner
Abengoa and InfraMaroc (CDG Capital Infrastructures group)

PPP Model
Design-Build-Finance-Operate-Maintain (DBFOM)

Operating Term
30 years

Contract Value
EUR 309 million/USD 346 million[1]

Asset Class
Water and Waste (Water Supply)

Water stocks in the farming areas of Agadir, Morocco were seven times lower in 2008 than in 1982, and the average rainfall is expected to decline in the coming decades.

Much of the water goes to tourism and agriculture, the industries upon which the region's economy depends but which are currently being held back by water shortages. The Chtouka region employs about 100,000 people in the agricultural sector, and the tourist industry is booming, leading to ever greater demand.

Thus, Agadir is alleviating a drought crisis by building a mutualised (drinking and irrigation water) desalination plant with an initial 275,000 m^3 total production capacity of desalinated water per day, which will make it, at the time of construction, the world's largest desalination plant designed for drinking and irrigation water that will run entirely on solar energy. The project design also allows for a possible capacity expansion to up to 400,000 m^3/day. This seawater desalination plant is expected to secure the supply of drinking water for 2.3 million inhabitants by 2030, 20% of whom live in rural areas.

1 Assumed conversion rate of EUR/USD = 1.12 as at May 15, 2019.

This is a single project for two Owners; Office National de l'Electricité et de l'Eau Potable (ONEE), and the Ministry of Agriculture, Fisheries, Rural Development, Water and Forests of Morocco, which has been created by combining two projects: one for drinking water and one for irrigation.

The first one requires a 50% expansion of drinking water production capacity under the contract that Abengoa has been developing for ONEE, thereby increasing plant capacity to 150,000 m^3/d of drinking water. The second project calls for the additional production of 125,000 m^3/d of irrigation water, as well as the construction of the corresponding irrigation network for a total of 13,600 ha, promoted by the Ministry of Agriculture. Construction of the first phase started in July 2018. Works are still in progress with the anticipated commissioning date in 2020.

Output Specifications Development Approach Used

The output specification is detailed and builds on the regional experience delivering desalination projects. The specification details the type of technology and the required processes.

The "Programme fonctionnel" or specification includes general requirements for a mutualised project and requirements for sea water intake, civil engineering works, hydro-electrical and mechanical works, electrical works, and control and supervision of operation and maintenance.

Alignment to QI Focus Areas		Mechanisms used to achieve QI alignment	Market Comparison Analysis
Sustainability and longevity of an infrastructure asset. Ability of the asset to address the needs and meet the expectations of end users	An objective of the project is to provide a secure source of clean water to the farming and tourism sectors in the Agadir region. There are two main performance requirements, which are linked to payment, to support this objective: 1) water quality and 2) volume. These KPIs are output-based, allowing the Private Partner to develop a solution that they consider best balances risk mitigation and project cost. The output specification also includes redundancy requirements to minimise the likelihood that end users are impacted by outages. This also supports asset maintenance as it improves the Private Partners' access to complete planned maintenance and their ability to quickly respond to reactive requirements. The output specification achieves this by requiring a buffer equivalent to five hours at full production.	**Performance KPIs:** The volume and water quality KPIs are tracked daily from a remote service centre in Seville, Spain. Payments to the Private Partner are subject to deductions based on the KPI performance. The Private Partner is responsible for self-reporting performance on a monthly basis in order to administer the contract and payments, and calculate the deductions. The plant team (located on-site) includes the Private Partner representatives to allow for a timely response to issues. Any deviation from the production quality and quantity immediately impacts revenues. In case of repeated deviations, both in terms of gravity and of length in time, may lead to warning, and replacement of the Operator if needed. **Serious breach:** The Private Partner remuneration is partially based on the volume and quality of water produced. The Volume KPI is used to track if the plant delivered the expected daily volume as asked for by the Public Water Agency, ONEE. Moreover, any lack of production implies a lower revenue from the Authority as the variable remuneration lowers. The Quality KPI is based on a range of quality items – any deviation out of the quality ranges is penalised. This quality range is the one prescribed by the national water office, using the NM 03.7.001 standard (Moroccan Standard for the Quality of Water for Human Consumption), which clarifies water quality standards, and that was included in the tender files.	The output specifications require a mutualised desalination plant for both drinking water and irrigation water. This is a unique approach, using two production lines in parallel on the same site, compared to other desalination projects, and allows for greater redundancy, and ultimately resilience of the asset and the service it delivers.
Ability of the asset to withstand natural and other disasters, including climate change	The project provides essential infrastructure that will lead to population growth and economic development in the Agadir region. The Owner recognised the need to develop resilient infrastructure that could withstand the location-specific risks, such as flooding and sea level rise. For example: • **Flood/sea level rise:** The Owner recognised the best mitigation for flood risk was site selection. The project is therefore located on an elevated site 40 metres above sea level. The requirements also address climate change adaptation: • **Adaptation:** In the event of sea water temperature rises, the specification requires the quality of water to be maintained, however the volume can be reduced. The contract specifies a sea water temperature of 13 to 25°C (estimated average is 20°C) but doesn't detail consequences of water above 25°C, which is considered improbable, given the depth of the sea intake.	**Design Compliance:** The Private Partner is responsible for delivering a compliant design in order to receive the service payments. The Owner had the opportunity to review the design at stages throughout the design development process. Although the Owner reviews the design, they do not assume any of the risk that the design is still deemed non-compliant through the construction completion process.	Compared to other sea-side desalination plants, this plant is at a higher elevation above sea level. Strategic decisions on the approach to address resilience would typically be addressed at the business case stage and the project budget developed to reflect additional design and construction or land costs.
Environmental impacts	The Owner required that the energy to power the asset was to be generated from renewable sources, and also wanted to minimise energy consumption. Rather than including a specific requirement for energy consumption, the output specifications incentivise the Private Partner to optimise the plant and minimise energy use by linking payment to energy consumption. This approach allows the Private Partner to make trade-offs between energy costs over the term and a design solution above minimum requirements. As a result, the Private Partner decided to include an energy harvesting turbine, which reduces the overall energy use of the facility.	**Energy Performance:** A financial performance incentive links remuneration to energy consumption. The Private Partner can increase their profit by decreasing energy consumption through technology or management processes. However, if the energy consumption is greater than expected, the Private Partner is exposed to the additional costs.	The approach to use energy targets or incentive payments (as opposed to specification requirements) is a common approach across different asset classes to promote the Private Partner to reduce energy consumption.
Ability of the asset to respond to changes in resource availability, population levels, demographics and disruptive technology	The Owner considers technology risk, changing demographics and demands and new technology opportunities in the output specification. • **Proven technology:** The output specifications require only the use of Reverse Osmosis to be used for the desalination process, with relatively detailed design specifications. • **Changing demographics and demands:** An asset that provides both drinking and irrigation water provides more flexibility to respond to changing water demands. The plant has been designed, based on the output specifications, to allow a capacity increase by installing more industrial equipment. It also allows de facto a redundancy that allows for balancing both productions if need be. • **New technology:** Redundancy in the design allows for partial insertion of new desalination technology in case new and more efficient technologies come to market during the asset lifetime.	**Technology watch:** The Private Partner can propose new technologies throughout the project term to allow the Owner to incorporate new and emerging technologies. This is allowed in the Concession agreement, not in the output specifications. The Private Partner can introduce new technologies as long as it does not modify the economic equilibrium of the project, unless the technology initially used is not available on the market anymore.	For projects that have a critical technology component, such as waste projects, it is common for the Owner to require proven technology. This is often considered at the request for qualifications stage, where teams are shortlisted on the basis they have completed projects of similar scope and scale. This prevents bidders who do not have the relevant experience from proceeding to the request for proposal stage, and provides increased confidence that multiple compliant bids are received.