Desalination and Renewables Energies
MENA is the most water-scarce region in the world. With approximately 5% of the world’s population, it possesses just 1% of the world’s renewable water resources.
In little more than 25 years, between 1975 and 2001, the amount of available fresh water per citizen fell by half, from 3,000 m³/inhabitant to 1,500 m³/inhabitant. **Today** the average is just over **1,000 m³/inhabitant** while the world average is 7,000 m³/inhabitant.
Currently, water supply entails extremely high energy consumption. Fossil fuels are almost the only source of energy for both water generation through desalination (which in some countries accounts for up to 95% of the water consumed) and for transport from the production to the consumption point.
Desalination technology has progressed dramatically over the last two decades, with a reduction of power consumption. In the case of membrane-based desalination, consumption has dropped from 7kw-h/m3 two decades ago to the average current figure of 3kw-h/m3.
Membrane-based technologies, especially reverse osmosis (RO), have advanced rapidly and are now competitive with distilling. Advances in technology and processes that reduce costs and improve pretreatment efficiency, flow enhancement, resistance to fouling, higher replacement rates and lower manufacturing costs.
This means that today there is no realistic competitive alternative to reverse osmosis.
Even so, between 20 and 35% of the production cost of desalinated water is attributed to energy costs.

Figure 2 - Desalination cost breakdown

Source: Desalination – Past, Present and Future. International Water Association - Nikolay Voutchkov
This power demand can be met by **renewable energy sources** which have showed that they are capable of providing **viable competitive solutions**. There are proven technologies with competitive prices at the same level as those of gas or petroleum.
Desalination and Renewable Energies

In less than one year we have seen the prices of photovoltaic electric power per kWh fall below the 3-cent threshold, a very competitive rate well below the average values quoted by the World Bank in 2009:

• May 2016 Masdar-ALJ consortium DEWA 800 MW in Mohammed bin Rashid Al Maktoum: 2.99 cents of a $ per kWh.
• August 2016 Chile 120 MW Solarpack in Pozo Almonte: 2.91 cents of a $ per kWh.
• April 2017 JinkoSolar–Marubeni DEWA 350 MW consortium in Sweihan: 2.42 cents of a $ per kWh.
The use of renewable power sources for production and distribution of water is therefore a reality we will face in coming years, either indirectly by injecting them into the grid and later to the production plants or directly, depending on how the technology develops.

**LEC of CSP and Other Technologies**

<table>
<thead>
<tr>
<th>Energy source</th>
<th>CSP (US$/MWh)</th>
<th>Wind</th>
<th>PV</th>
<th>Combined cycle gas turbine</th>
<th>Simple cycle gas turbine</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEC (US$/MWh)</td>
<td>196</td>
<td>102</td>
<td>100</td>
<td>80</td>
<td>116</td>
</tr>
</tbody>
</table>


Note: LEC (levelized electricity cost) calculation is based on 25 years of plant economic life and a 10 percent discount rate.
Solar energy in MENA has a potential 1,000 times greater than all other renewable sources combined and is greater than the current world energy demand. MENA's solar radiation potential per square kilometer per annum is the equivalent of the energy generated by 1-2 million barrels of oil.
Desalination requires a constant power supply and photovoltaic solar energy, having achieved competitive production costs, faces availability challenges that will have to be addressed through the development of storage systems. The alternatives under study revolve around storage batteries that are already a reality.
Almar Water Solutions is leveraging synergies with Fotowatio Renewable Ventures (FRV) studying the development of combined water and solar photovoltaic energy projects where geographical conditions make this a viable proposition, such as GCC countries.
These innovations will change the water production scenario that we have been familiar with until now.