Desalination and Renewables Energies

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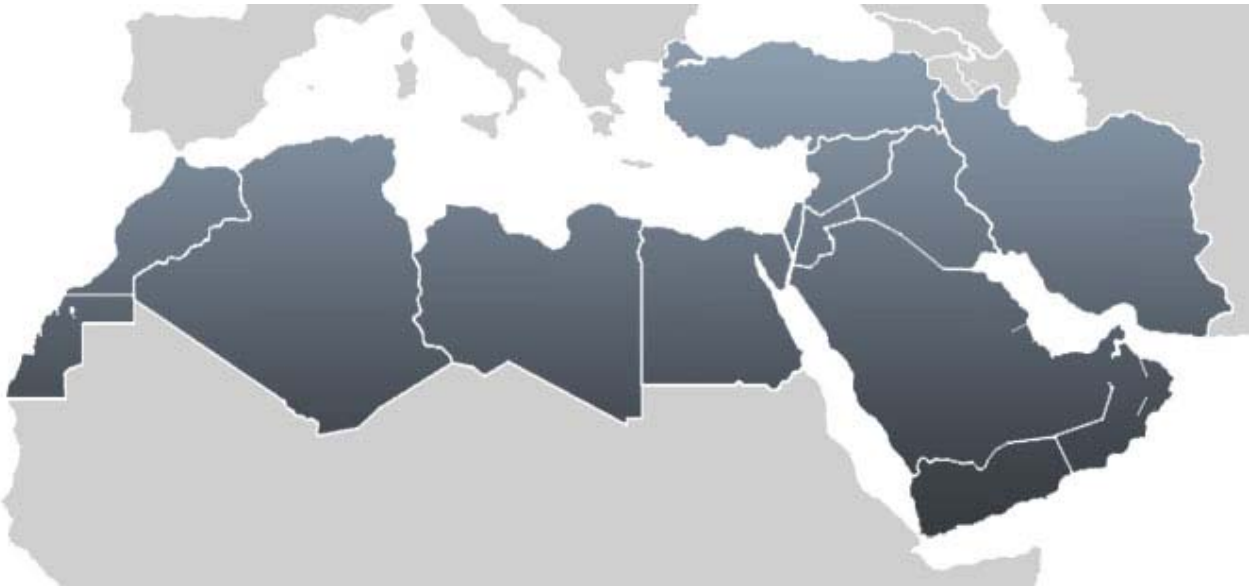
Desalination and Renewable Energies

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**



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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.

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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.

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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**.

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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

Rabigh desalination plant

600,000 m3/d

Jubail desalination plant

1,170,000 m3/d

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This means that today there is no realistic competitive alternative to reverse osmosis

Total Annualized Cost of Desalinated Seawater *(US$ per m³)*

	MSF	MED	SWRO
Mediterranean Sea	—	1.36–1.59	1.08–1.32
Red Sea	—	1.28–1.43	1.06–1.23
Gulf water	0.84 (1.6)	1.21–1.34	1.23–1.36

Sources: Fichtner and DLR 2011; United Arab Emirates' Regulation and Supervision Bureau 2009.
Note: MSF costs are based on actual contracted prices and electricity price in United Arab Emirates of US$0.068 per kWh (UAE). The number in parentheses is the equivalent cost of desalination based on unsubsidized energy cost. For MED and seawater reverse osmosis (SWRO), the costs are based on feasibility studies for large projects by Fichtner and DLR 2011 (assuming project life of 25 years, discount rate of 6 percent and unsubsidized energy cost). In this volume, energy costs were calculated based on the opportunity cost of fuel at the international price and fuel escalation cost of 5 percent per annum (see appendix C). Unit costs under MSF and MED or SWRO for the Gulf region are not comparable as they do not correspond to the same desalination plant. — = not available.

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Even so, between 20 and 35% of the production cost of desalinated water is attributed to energy costs.

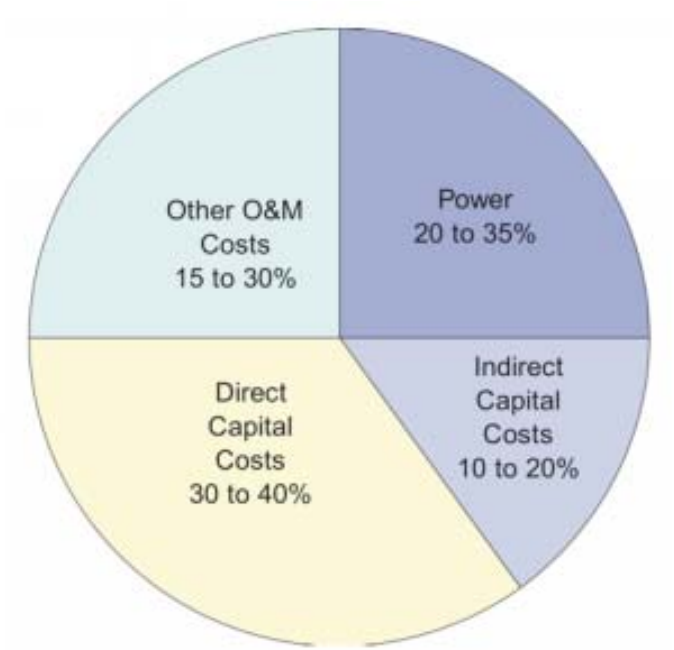

Figure 2 – Desalination cost breakdown

Source: Desalination – Past, Present and Future.
International Water Association - Nikolay Voutchkov

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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.

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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**.

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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.

LECs of CSP and Other Technologies

Energy source	CSP	Wind	PV	Combined cycle gas turbine	Simple cycle gas turbine
LEC (US$/MWh)	196	102	100	80	116

Source: World Bank 2009.

Note: LEC (levelized electricity cost) calculation is based on 25 years of plant economic life and a 10 percent discount rate.

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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.

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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.

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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.

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These innovations will change the **water production scenario** that we have been familiar with until now.





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