World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:9, No:06, 2015

Indirect Solar Desalination: Value Engineering and Cost Benefit Analysis

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Abstract : This study examines the feasibility of indirect solar desalination in oil producing countries in the Middle East and North Africa (MENA) region. It relies on value engineering (VE) and cost-benefit with sensitivity analyses to identify optimal coupling configurations of desalination and solar energy technologies. A comparative return on investment was assessed as a function of water costs for varied plant capacities (25,000 to 75,000 m3/day), project lifetimes (15 to 25 years), and discount rates (5 to 15%) taking into consideration water and energy subsidies, land cost as well as environmental externalities in the form of carbon credit related to greenhouse gas (GHG) emissions reduction. The results showed reverse osmosis (RO) coupled with photovoltaic technologies (PVs) as the most promising configuration, robust across different prices for Brent oil, discount rates, as well as different project lifetimes. Environmental externalities and subsidies analysis revealed that a 16% reduction in existing subsidy on water tariffs would ensure economic viability. Additionally, while land costs affect investment attractiveness, the viability of RO coupled with PV remains possible for a land purchase cost < $ 80/m2 or a lease rate < $1/m2/yr. Beyond those rates, further subsidy lifting is required.

Keywords : solar energy, desalination, value engineering, CBA, carbon credit, subsidies
Conference Title : ICDRE 2015 : International Conference on Desalination and Renewable Energy
Conference Location : Copenhagen, Denmark
Conference Dates : June 11-12, 2015