Estimation of solar energy resources for low salinity water desalination in several regions of Russia

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Access to fresh water becomes more and more crucial in modern world both for domestic and agricultural needs. For some southern agricultural-oriented regions of Russia the problem of poor water and energy infrastructure exists. Therefore, many of these regions possess local low salinity ground water and huge amount of sunny days. Reverse-osmosis desalination is suitable technology for local water desalination especially at low salinities. Usually under poor energy infrastructure conditions this technology is coupled with solar or wind energy in a case of sufficient renewable energy potential. Using regional data on ground water salinity from different sources and empirical dependence of specific energy consumption on salinity and temperature based on experimental results [1], estimations for demanded photovoltaic (PV) array area and capital expenses to feed reverse osmosis desalination unit (1 m$^3$/h fresh water production rate) have been made for different regions of Russia. The most optimal results were obtained for Kalmyk Republic, Crimea Republic and Astrakhan region. Combination of salinity, temperature and solar radiation level there makes reverse osmosis coupled with photovoltaics very attractive technology to solve infrastructure problems in rural areas. Estimation results are represented as maps showing PV array area and capital expense level for the selected regions.