

## **Applications of Renewable Energy for Water Operations**

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### **Summary**

Global water and wastewater facilities have made increasing use of sources of renewable energy for operations primarily to reduce emissions of greenhouse gases but also to meet local environmental goals and standards. This paper presents an overview of wind, solar, biomass, and hydropower renewable energy sources along with a summary of economics and incentives for application of each source. Case studies of renewable energy are presented for four utilities in California (USA), for the 270 ML/day Yuma Desalting Plant in Arizona (USA), and for the Thames Tidal Estuary Energy Project (UK).

### **Keywords**

Water, wastewater, energy, economics, desalting, tidal energy.

### **Sustainable Energy For Water Operations**

An estimated four per cent of the energy used in the United States is consumed by the Water Sector. In addition, 35 per cent of the total operational costs for water and wastewater utilities is associated with the cost of energy. Energy requirements for water production range from 300 to 500 kWh per megaliter.

A variety of factors are motivating water utilities to evaluate the use of sources of renewable energy for their operations. The primary driver is to minimize their carbon footprint by replacing fossil-fueled energy with energy generated by wind, solar power, biomass fuels, or hydropower. Another factor in the increased use of renewable energy is anticipated regulations that will mandate that utilities obtain certain percentages of power from renewable sources. A summary of the renewable energy options evaluated is presented showing advantages, disadvantages, and costs associated with each option.

### **Case Studies**

Case studies are presented on the use of wind power at the Palmdale Water District (California, USA), solar power by the San Francisco Public Utilities Commission (California, USA), in-system hydropower by the San Diego County Water Authority (California, USA), and multiple renewable sources by the Yuma Desalting Plant (Arizona, USA). An additional overview of the evaluation of development of tidal power in the Thames Estuary (UK) is also provided.

### **References**

Evaluation of the Applicability and Use of Renewable Energy Sources for Water and Wastewater Plants in California. Black & Veatch, 2008.

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