Into the mix: Harnessing the energy when freshwater meets the sea

September 21 2015

Credit: Tiago Fioreze / Wikipedia

Harnessing the energy created from salinity gradients—for example, when freshwater meets the sea—could provide a renewable source of power able to mitigate climate change impacts, reduce reliance on fossil fuels and improve processes within the desalination industry, according to new research from Griffith University (Queensland, Australia).

In a paper published in the journal *Renewable and Sustainable Energy Reviews*, Dr Fernanda Helfer and Professor Charles Lemckert, from Griffith's School of Engineering, review investigations into the potential of salinity gradient energy, which is released when waters with different salinities mix.

In particular, the paper explores the efficacy of Pressure Retarded Osmosis (PRO) as a carbon emission-free process to extract and implement this energy.

PRO technology comprises a semi-permeable membrane that separates water flows with different salt contents, creating a solution that, once depressurised via a turbine, produces electrical energy.

Broad implementation of PRO has long been hampered by issues of cost and quality, but rising energy prices and growing acknowledgment of the potential impact of climate change have brought PRO and salinity gradient energy into renewed focus.

In their paper, The power of salinity gradients: an Australian example, Professor Lemckert and Dr Helfer contend that Australia is particularly suited to osmotic power production.

"Australia has various sources of saline solutions that could be used as draw solutions for PRO plants. These include salt lakes, brine from desalination plants and saline ground water," says Dr Helfer.

"The largest Australian urban centres are located near the ocean and close to river mouths, ideal conditions for the construction of osmotic power plants."

A unique aspect of the study is the suggestion of the use of brine-which is rejected during the desalination process—as a source of osmotic energy.

"Even taking into account the current inefficiencies of PRO, and based on the power generated under laboratory conditions and published by other institutions, a mixture of seawater and brine could generate power in a PRO plant adjacent to a desalination plant," says Dr Helfer.

"This power would be used in the desalination process while the PRO plant, in turn, would use the reject brine as the draw solution and seawater as the feed solution."

Dr Helfer and Professor Lemckert agree that significant technical and economic improvements are required to ensure the commercial viability and credibility of PRO membrane technology.

However, they also consider PRO-assisted desalination a promising alternative for the industry worldwide, one that provides power to the desalination process—thus reducing the industry's reliance on fossil fuels—and the opportunity to minimise environmental impacts caused by the discharge of concentrated brine into the sea.

Provided by Griffith University

Citation: Into the mix: Harnessing the energy when freshwater meets the sea (2015, September 21) retrieved 19 April 2024 from https://phys.org/news/2015-09-harnessing-energy-freshwater-sea.html