Energy harvesting from charged conical nanopore with salinity and temperature gradient

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Introduction

Saline gradient or osmotic energy is one of the new renewable energy sources available in many countries with ocean access. Two basic concepts of power generation from salt gradients are presented. Systems with Pressure Delayed Osmosis (PRO) and Reverse Electro Dialysis (RED). Discuss the advantages and disadvantages of the salt gradient system. Basic formulas for estimating energy from salinity gradients are illustrated using similar calculations for estimating energy requirements for water desalination systems. The sizing of a PRO system is explained using an example and the latest net power density output from a recently achieved design. An example is also provided if you are interested in calculating the required membrane area for domestic applications. The chapter also discusses specific applications and locations for potential salt gradient projects. Finally, we list the limits and factors that affect performance, such as performance and cost. A simple payback time calculation for a salt gradient system is also presented using an example of a real pilot system. Large-scale utilization of salt gradients presents barriers that must be incorporated into the design. Engineers must consider suitability, sustainability, and reliability in order to be widely adopted. Salt Gradient Energy (SGE) conversion techniques are evolving rapidly, but little research has focused on assessing their potential environmental impact. This work addresses the environmental impact of his hypothetical 50 kW RED system installed in La Carbonera Lagoon, Yucatan, Mexico. Theoretical support was drawn from a literature review and analysis of the components involved in Pressure Delayed Osmosis (PRO) and Reverse Electro Dialysis (RED) techniques.

Discussion

This study was conducted in a 3 stage scheme (construction, operation, and demolition) in which stress inducers that could cause changes in environmental factors (receptors) were determined. Possible changes in the dynamics of ecosystem 'response' were assessed. Since this is a small energy system, only local effects are expected. The study showed that a well-designed SGE facility could contribute to the supply of clean, renewable energy while having a low environmental impact and benefiting local ecotourism and ecosystem protection. is showing. Furthermore, the same facility at different locations within the same system can result in significant changes in coastal lagoon water flows and residence times, causing significant damage to biotic and abiotic environments. As fossil fuel supplies dwindle, if we can switch to renewable energy sources, we can end some of the negative environmental impacts since the first industrial revolution. The ocean is an important source of renewable energy, all of which can be used, including currents and tides, wave energy, temperature, and salinity gradients.

Conclusion

Chemical energy, known as Salinity Gradient (SGE) or Salinity Gradient Potential (SGP), is available in coastal zones where two streams of water with different salinity meet. By controlling this mixture and capturing the energy before it is released, electricity can be generated with zero greenhouse gas emissions. You can use only naturally occurring water streams, but you can also use hybrid systems that use anthropogenic wastewater, such as residual water from a desalination plant. Similarly, effluent from a low-salinity wastewater treatment plant can be used as input to the SGP system. There are various ways to obtain energy from salt gradients, but the most advanced is Reverse Electro Dialysis (RED) and Pressure Retarded Osmosis (PRO), both of which have been tested outside the laboratory.

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Conflict of Interest

The author declares there is no conflict of interest in publishing this article.

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