Can Osmotic Power Replace Diesel in Bella Coola, BC?

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What is osmotic power?

Osmotic power is an application of salinity gradient energy. It works by harnessing the free energy created from the mixing of water with two different salt concentrations.



Why is diesel reliance problematic?

- Communities reliant on diesel are more susceptible to black outs.
- Diesel must be trucked, flown, or shipped into communities which can increase chances of spills.
- Exhaust from diesel generators can have negative health affects on residents such as worsen asthma and cause risk of heart problems



Determine the LCOE of

osmotic power and

compare that to the

current LCOE for

diesel in Bella Coola

X Diesel is also quite expensive and depending on the community, residents can end up paying twice what an average Canadian pays for a kWh of electricity even after subsidies

Diesel generators also produce significant CO₂ and NO₂ emissions



176 communities in Canada are still reliant on diesel generators 144 are Indigenous communities 11 of them are located on the British Columbia coastline

Determine the osmotic energy potential of the selected watersheds with and without the proposed Nooklikonnik Creek hydroelectric facility projected to reduce diesel use by 80% in Bella Coola

Determine potential environmental impacts from osmotic power in Bella Coola

Current and optimal LCOE for osmotic power

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Current Power	Current Cost	Current	Optimal	Optimal	Optimal	7
Density	$(\$/m^2)$	LCOE	Power	$Cost(%/m^2)$	L COE	•
(kW/m^2)		(\$/kWh)	Density		(\$/kWh)	
			(kW/m^2)			•
0.0016-0.0029	18-54.1	0.32-2.13	0.005	3.6-9	0.045-0.11	

Environmental Impact of Osmotic Power

Construction	Operation	Decommission
Noise	Noise	Similar if not the same as

Assumptions

- Membrane is 10% the capital cost of the entire osmotic power facility
- Osmotic power facility will be operational for 330 days/year
- Osmotic power facility has a 20-year lifespan with membranes needing to be replaced every 5 years
- LCOE of diesel in Bella Coola is \$0.13/kWh

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Site Selection

- Bella Coola is in the Great Bear Rainforest located on British Columbia's west coast.
- Six watersheds in the region were chosen based on available flow rate data

350000

300000

250000





tnarko River

Osmotic energy potential of selected watersheds

The graph on the left shows the osmotic energy potential of the selected watersheds if the entire volume of freshwater was used. However, it is recommended that only 25% of the minimum multiannual monthly flow rate is used to reduce impacts to the environment.



Future Research

- Include salinity and temperature seasonal variations
- Collect flow rate data on the 16 outstanding watersheds
- Site specific research on seasonal variations of species present in the region
- Improved membrane efficiencies
- Pre-treatment methods



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