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Thermoelectric energy harvesting for Polar instrumentation

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This paper details the design of a novel thermoelectric energy harvesting device, capable of powering sea-ice instrumentation during the polar winter, when other sources of energy are either unavailable or unreliable. The current device employs no moving parts and exploits both the Seebeck Effect and the temperature differential across the sea-ice interface to convert a flow of heat into electrical energy. Fundamental limitations are discussed and thermodynamic modelling is extensively employed to ensure a reasonable device efficiency. Test results on a prototype reveal a typical power output of several hundred mW for a temperature differential of thirty degrees Celsius.