Feasibility of renewable energies in Antarctica

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The Antarctic environment with its katabatic winds and its plunge into darkness for six months of the year is uninhabitable without the aid of modern technology. This article showcases the practicability of implementing a range of efficient and renewable energies in Antarctic research stations; it was done by examining the existing studies on the topic and assessing the current use of renewable technologies and the benefits of implementation. Under its harsh and frozen climate averaging -50℃, creating an environment in Antarctica that is suitable for working and living requires a significant amount of energy; fuel still stands as the most commonly used technology in Antarctica. The transportation and containment of these fuels entails environmental risks and considerable costs. These issues associated with fuel generated energy have created a growing use of solar and wind energy. Implementing renewable energy generation faces challenges such as a high transportation cost for building materials, but with the lower power requirement in Antarctic bases, the long-term savings of using such technologies make it a more sustainable and economical investment. Renewable energy is already being included in many Antarctic bases. For example Ross Island has been partly powering power the McMurdo Station and Scott Base since 2010, by operating three 330KW wind turbines, it is expected to reduce diesel fuel use by about 463,000 liters and cut CO2 emissions by 1242 tonnes a year. Ross station aims to eventually provide 100% of the power needed for these two bases, using the diesel generators only as backup. The Princess Elisabeth station is the world's first carbon neutral base on the continent. It was built with an air-tight design, using a U-values system made to keep a lower ventilation system making it easier to supply warm fresh air and humidity. The base is entirely run in the summer with nine wind turbines and over 300m^2 of solar panel. Other bases hold the potential to become completely carbon neutral such as Cape Bird. This could be achieved using a polycrystalline, BP Solarex solar panel, combined with an MX60 MPPT charge controller and a FX2024 sine inverter. This would save over 700 liters of AN8 aviation fuel per season. Throughout the last three decades the wider application of these technologies has demonstrated that the harsh climate of Antarctica has not been a barrier. As demonstrated in multiple case studies focusing on bases that have already implemented renewable energies, it has been clearly demonstrated that it is possible to apply these technologies in one of the harshest and most remote areas of the world where the availability of energy can mean the difference between life and death. Therefore the application and use of sustainable energies should be encouraged and applied across the continents.