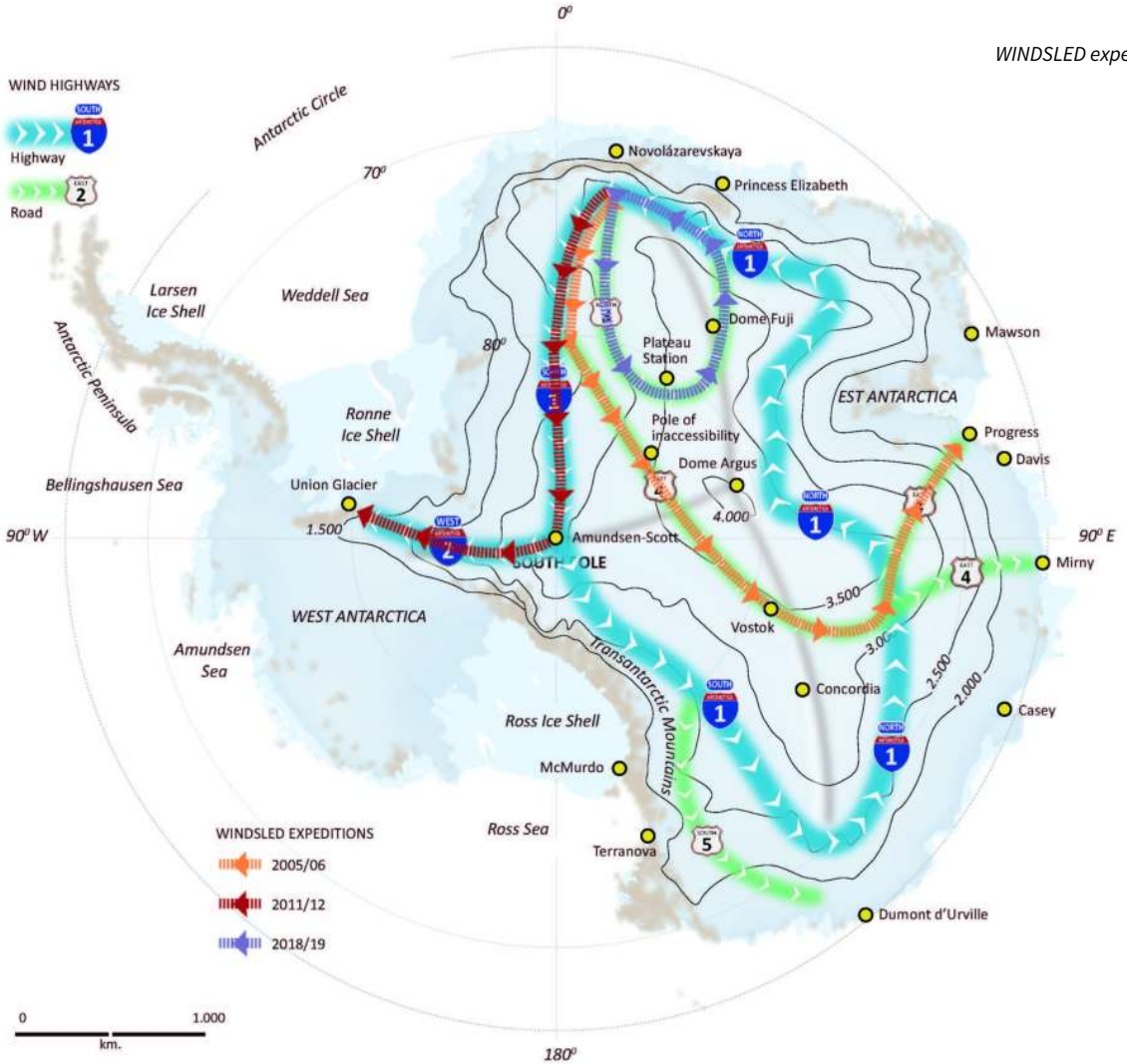

WINDSLED expeditions 2005–2018.

Rotary Kite Turbine Development

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Rudimentary Kite Turbine systems were first analysed in [1]. Kite Turbines extract wind energy using one or more autogyro rotors connected through a Tensile Rotary Power Transmission (TRPT) to a ground-based generator. The study [1] characterised the torsional rigidity of TRPT and basic Kite Turbine operation.

Windswept and Interesting recently attracted project funding from Shell GameChanger, HIE & SIC to develop and test a 10kW Kite Turbine System. The project will assess Kite Turbine automation, scaled performances, operational factors, manufacturing options, market potential, offshore options, and scalability.

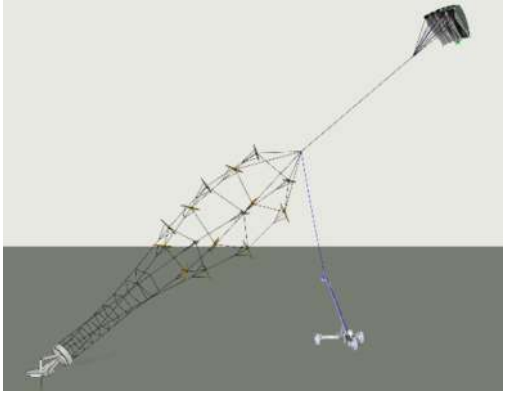
An extended failure mode and effects analysis of previous Kite Turbine prototypes as seen in [2] and company risk analysis identified autonomy as a key need for our systems development.

Autonomous systems are being developed for:

- Coordinating the operations of Lift-Kite, Back-line and Ground-Station devices, with condition monitoring, weather services and operator input.
- Safer deployment of both Lift-Kite and Kite Turbine, via a backline handling field robot.
- Ground station axial alignment tracking.
- Turbine steering via Lift-Kite steering and Back-line and ground anchor handling.
- Generation control based on sensing TRPT rotational lag, turbine compression and more.

Our test & specification validation schedule is designed to increase reliability in scaled systems and to collect detailed techno-economic performance data.

We will present our design reasoning, our plans for high resolution data collection, control methods and our Kite Turbine performance validation plans.



Concept sketch for a 10kW automated Kite Turbine System with a back-line handling device.

References:

[1]Tulloch, T: Modelling and analysis of rotary airborne wind energy systems : a tensile rotary power transmission design University of Strathclyde (2021) [Available online]

[2] Read, R: Kite Networks for Harvesting Wind Energy, Ch21, in Schmehl, R: Airborne Wind Energy Advances in Technology Development and Research