Harvesting Wind Energy from Kites

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Introduction

• Extreme weather events are occurring with increasing severity in coastal North Carolina.
• Strategies are needed to mediate the impacts of storm aftermath, especially power outages.
• Wind energy could solve these outages.
• Currently, there is no accessible, inexpensive way to harness wind power for individuals.

Social Benefits

• Can be easily stored and then set up after extreme weather events.
• Powers fridges for food or medication.
• Powers phone chargers to contact loved ones.
• Powers some emergency medical care services.
• Especially pertinent for marginalized communities.

Concept

• Based on a Savonius turbine design.
• Captures wind in three spinning concave pockets.
• Kept suspended by a surf kite.
• Attached to generator at the base.

Design

• Kite lines to base.
• Lines spin generator on the ground.
• ~700 Wh generated.

Prototype

• 8.3%, 10.4%, and 12.5% scale prototypes.
• 3D printed frame.
• Pockets sewn onto frame.
• Testing in the Duke wind tunnel.

Environmental Benefits

• Provides clean, renewable power.
• 309g CO₂ per hour vs natural gas.
• 766g CO₂ per hour vs hard coal.
• 908g CO₂ per hour vs brown coal.
• 65% less area per kW than a traditional wind turbine.
• Full lifecycle benefits.
• Potential for permanent use outside of storms.
• Promotes energy and environmental education.

Conclusions

• Our prototype demonstrates significant potential for an energy-generating kite.
• Could provide substantial relief to coastal communities after natural disasters.
• Offers an inexpensive and accessible means to harvest a clean, renewable resource.
• Looking forward, we would like to make a full-size first model.

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