Harvesting Wind Energy from Kites

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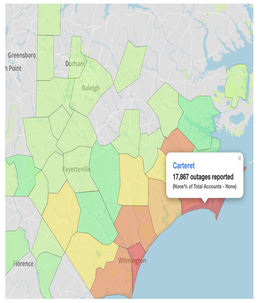
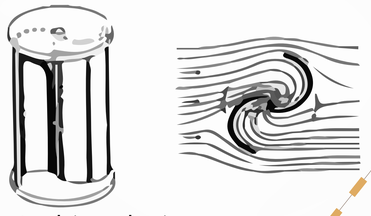
Introduction

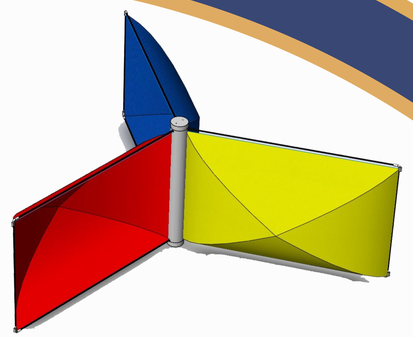
- Extreme weather events are occuring with increasing severity in coastal North Carolina.
- Strategies are needed to mediate the impacts of storm aftermath, especially power outages.
- Wind energy could solve these outages.
- Currently, there is no accessible, inexpensive way to harness wind power for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



Concept



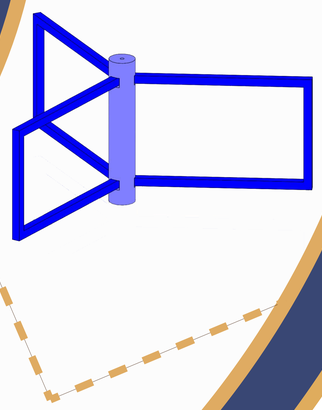
- Based on a Savonius turbine design.
- Captures wind in three spinning concave pockets.
- Kept suspended by a surf kite.
- Attached to generator at the base.



- Constructed from tent material to be durable and lightweight.
- 3D printed joints.
- Collapsible full-scale frame.

Design

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



Environmental Benefits

- Provides clean, renewable power.
  - 309g CO_2 per hour vs natural gas.
  - 766g CO_2 per hour vs hard coal.
  - 908g CO_2 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.

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.

Prototype

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

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.

Acknowledgements

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