



Reflections on Wind Energy in Greenland

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Background

Student project at Center for Arctic Technology.

Topic: Wind resources in Greenland

- 1) Identify existing wind measurements**
- 2) Initiate wind resource measurement at Sarfanngvad, Sisimiut**
- 3) Investigate wind-diesel substitution**
- 4) Economical analysis for wind implementation**

Available wind resource measurements from Greenland

- "Dumpen", Sisimiut, 2004- (DTU)
- Sarfannguaq, Sisimiut 2003-2004 (DTU)
- Sisimiut, 1987-1992 (Risø)
- Sisimiut, 2002 –2003 (ASIAQ)
- Sisimiut, 2000-2003 (GLV)
- Kangerlussuaq, 2000-2003 (GLV)

Installation of a 10 m NRG meteorological mast at Sarfannguaq near Sisimiut.



Instrumentation:

- Cup anemometer 10m
- Wind vane, 10 m
- Thermometer, 9.5 m

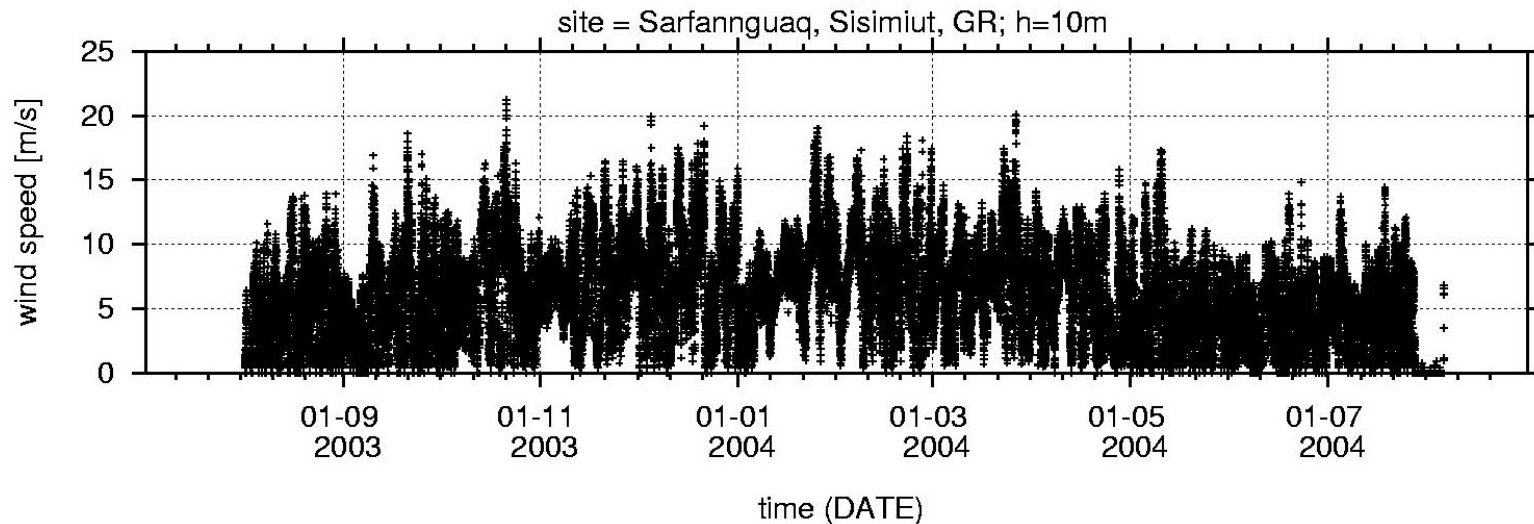
Measurements were made during one year, July 2003- August 2004



Sarfannguaq



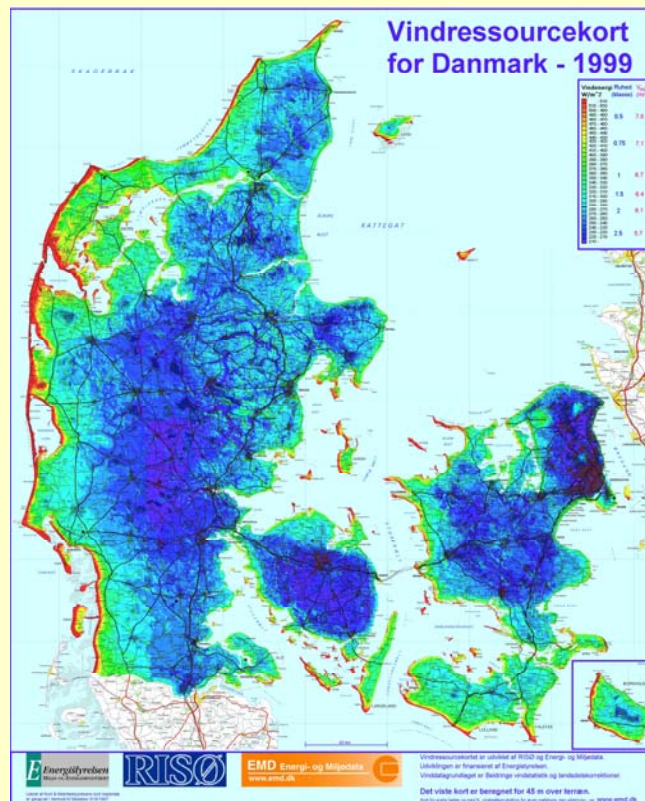
10 min average wind speed, Period: 1/8 2003 – 31/7 2004



A mean wind speed of 6.25 m/s was measured at 10 m a.g.l
All statistics are available at WindData.com

Qualitative comparison.

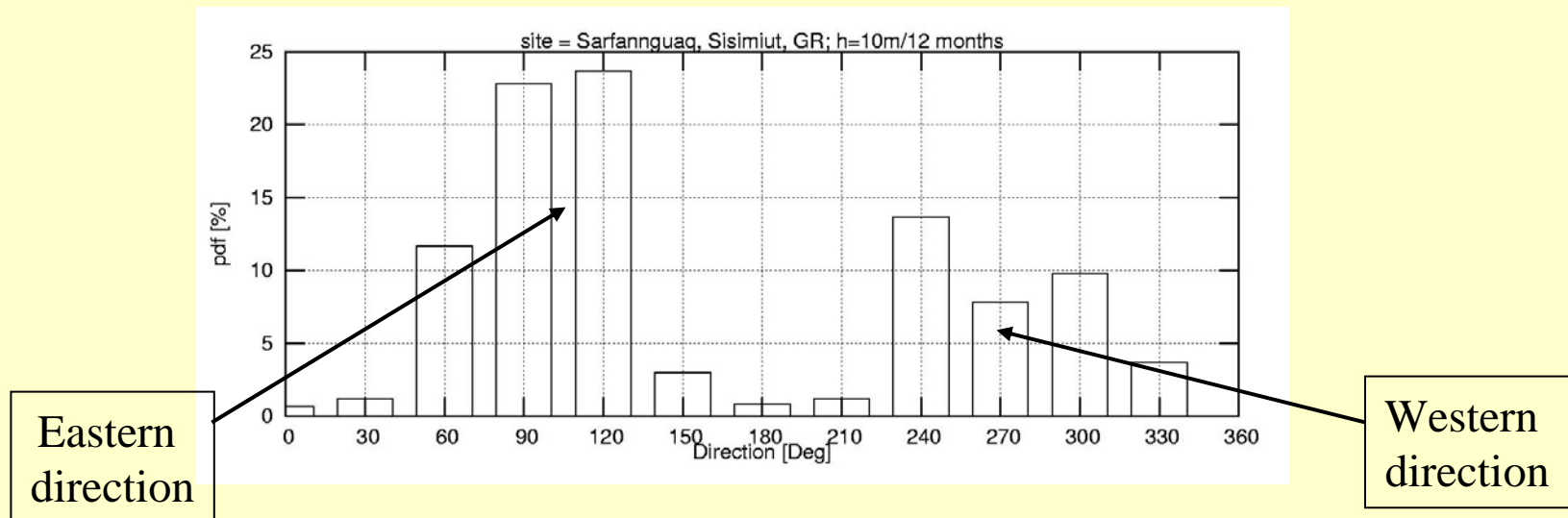
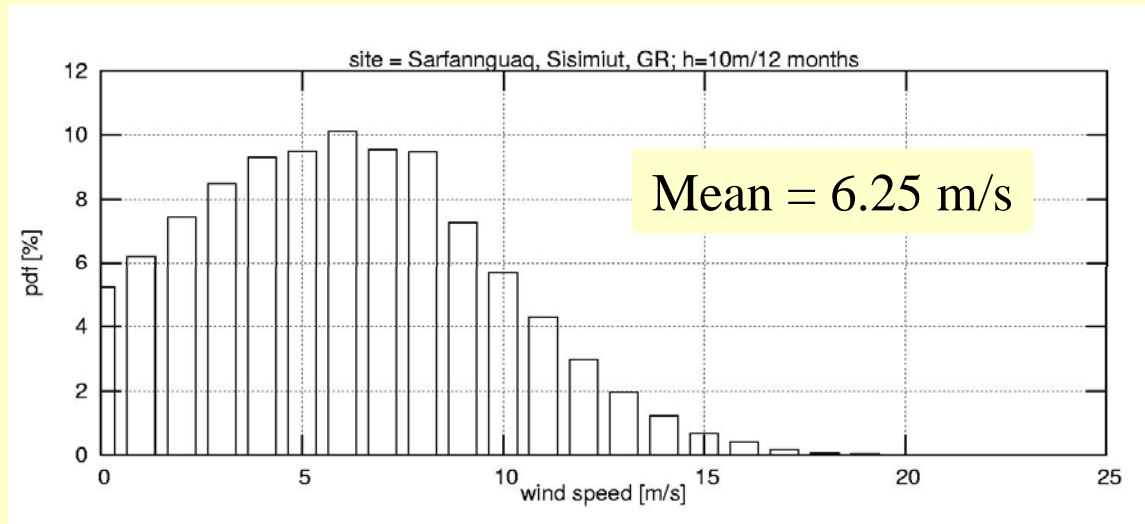
Corresponds to a reasonable Danish site (in between blue and green)



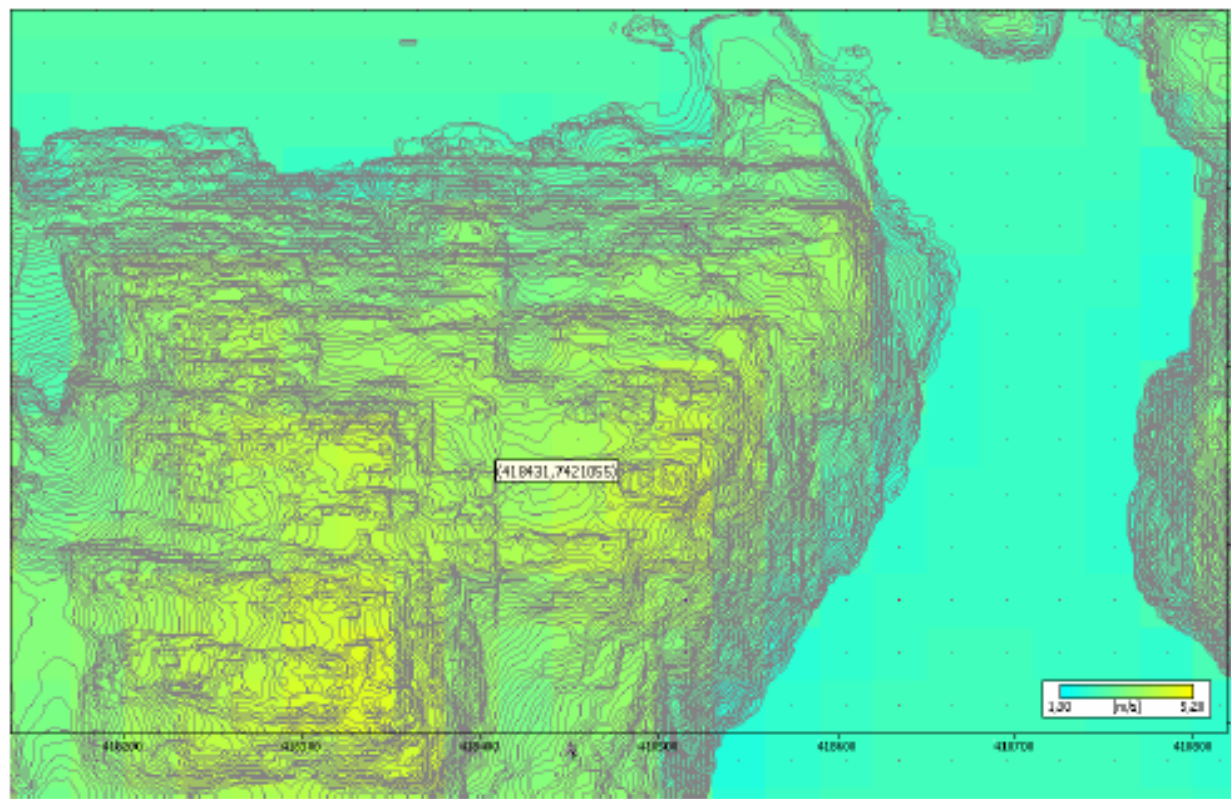
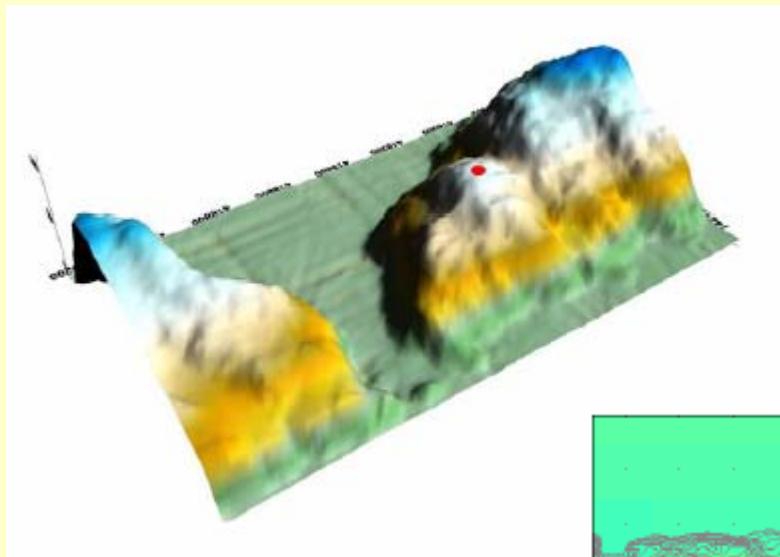
Wind resources i Greenland maybe not so bad as often claimed.

Department of Mechanical Engineering, Technical University of Denmark

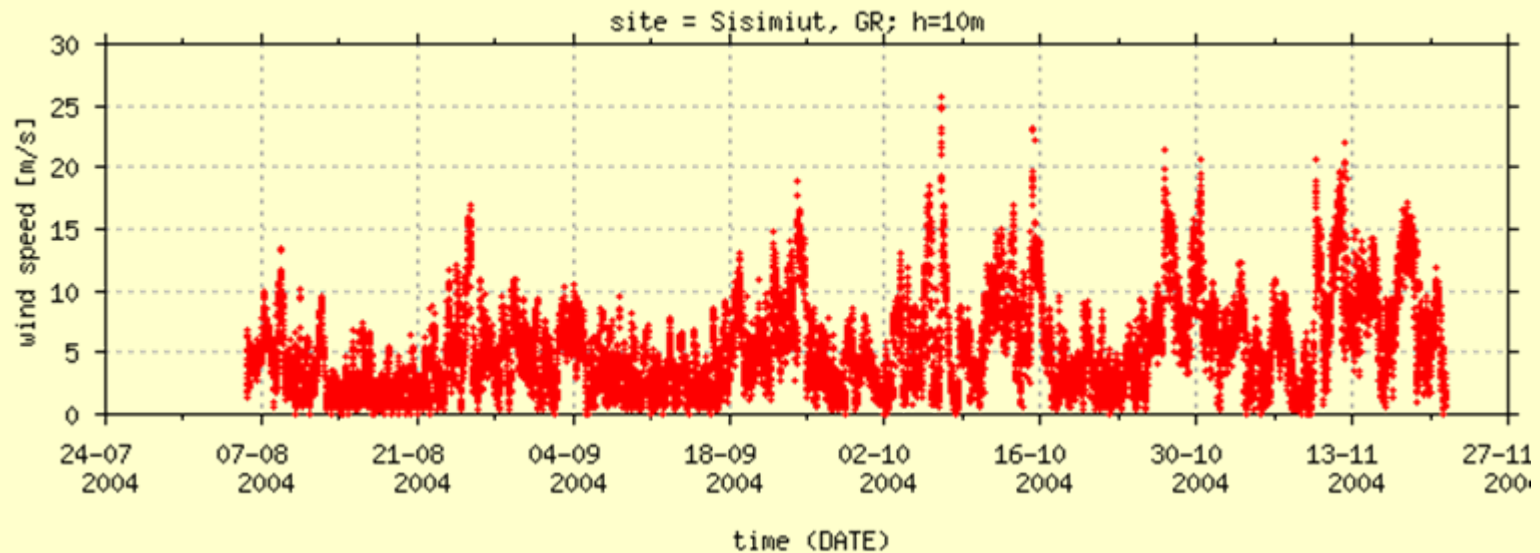
Distribution of wind speed and direction



Estimation of local wind resource maps, based on WAsP analysis and measured wind data.



The met.mast is presently located
at "Dumpen", Sisimiut



Initial period: 7/8 – 21/11 2004
Average wind speed = 5.4 m/s

Problems using wind turbines in Greenland

Small villages have a low consumption compared to modern wind turbine size ($\approx 1-5$ MW) production.

Remote electrical grids are operated as standalone grids.

Coupling with diesel driven generators is not straight forward and (small) integrated systems are missing.

Possible use of wind turbines in Greenland

Desalination – storing the energy as fresh water.

Driving refrigeration plants for fishing industry. Cold-storage have long time constants to warm up due to insulation.

Remote water pumping stations – storing the energy as fresh water in reservoir.

Heating water pipes during winter time.

Future use of wind energy in Greenland

When fuel cells become further developed, it would be ideal to produce hydrogen from water using wind turbines.

Can completely replace the diesel plants making clean energy and one can become much more independent of imported oil.

Conclusions

Measurements at Sarfannguaq indicate some wind resource in Greenland.

New measurements being done in Sisimiut.

Difficult to presently integrate wind energy in Greenland due to small villages, which are not connected to a larger grid.

Possible use now: Desalination plants and cold-storages.

Future use: Produce hydrogen for fuel cells producing heat and electricity.