# DIY WIND TURBINE

Steven Fahey

AREA Presentation

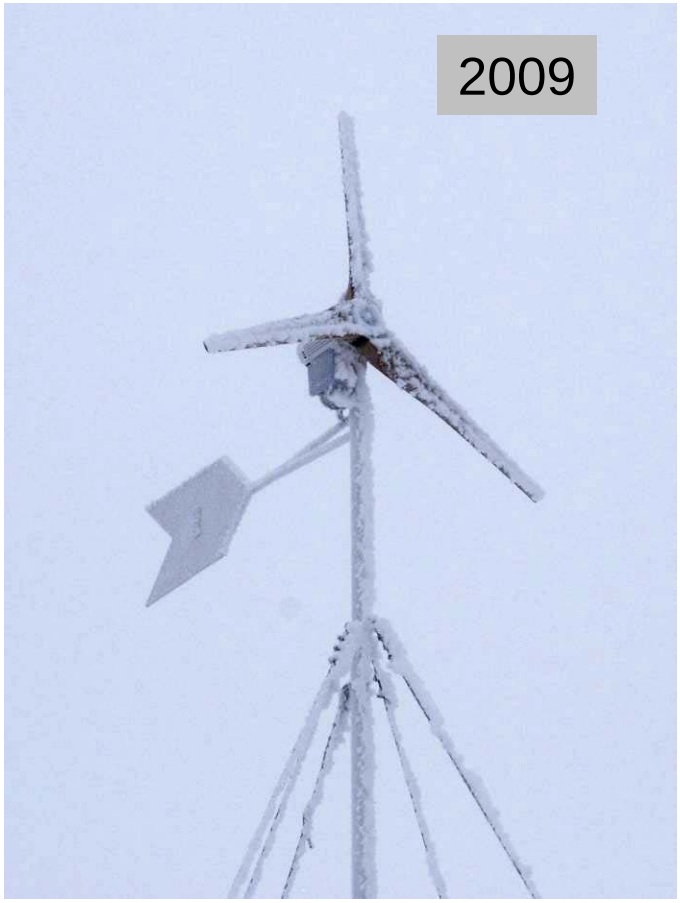
15 February 2020


2006

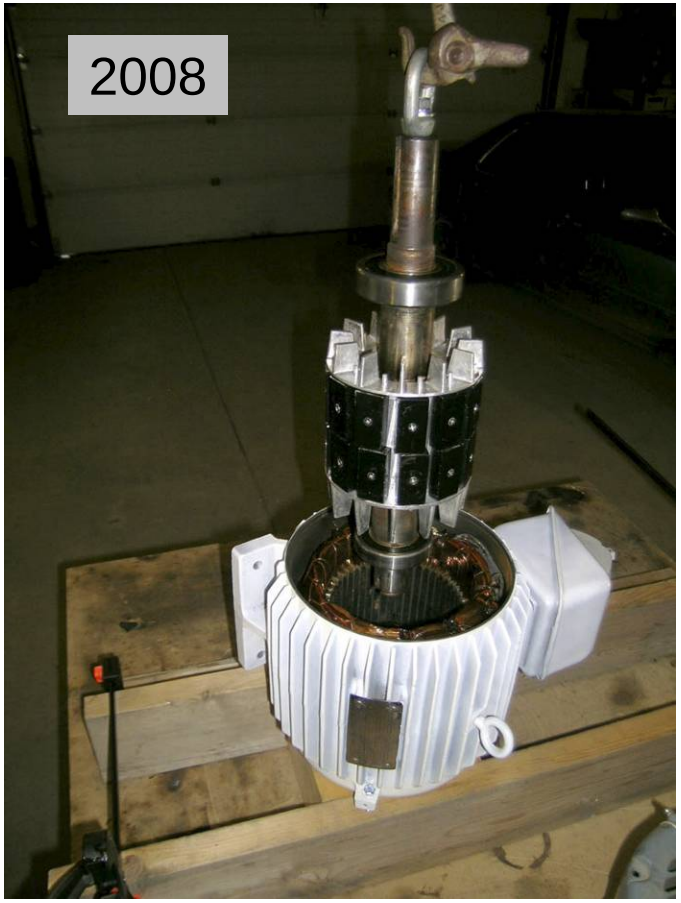

2007


2007


2009


2009


2010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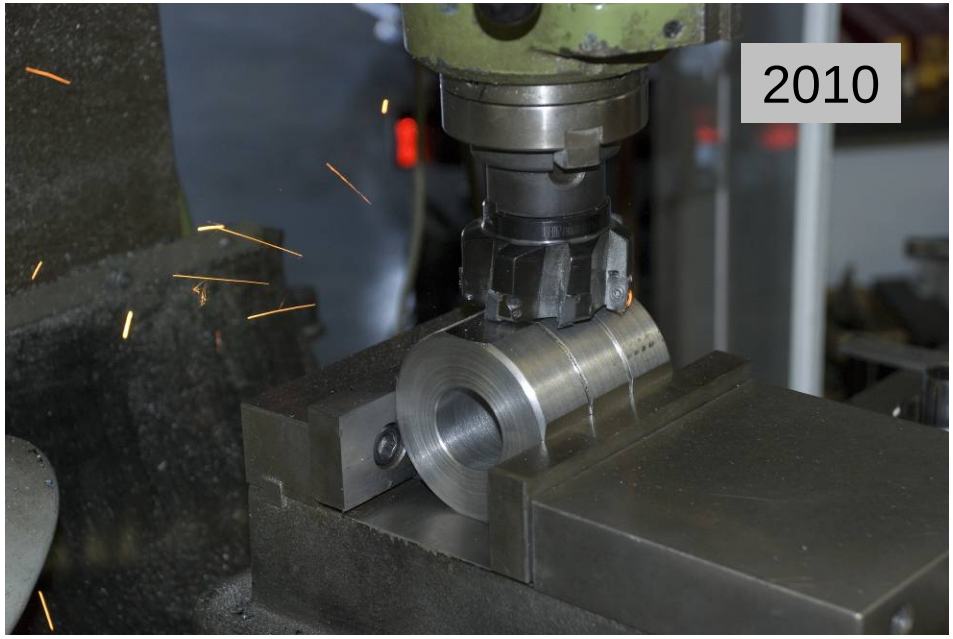
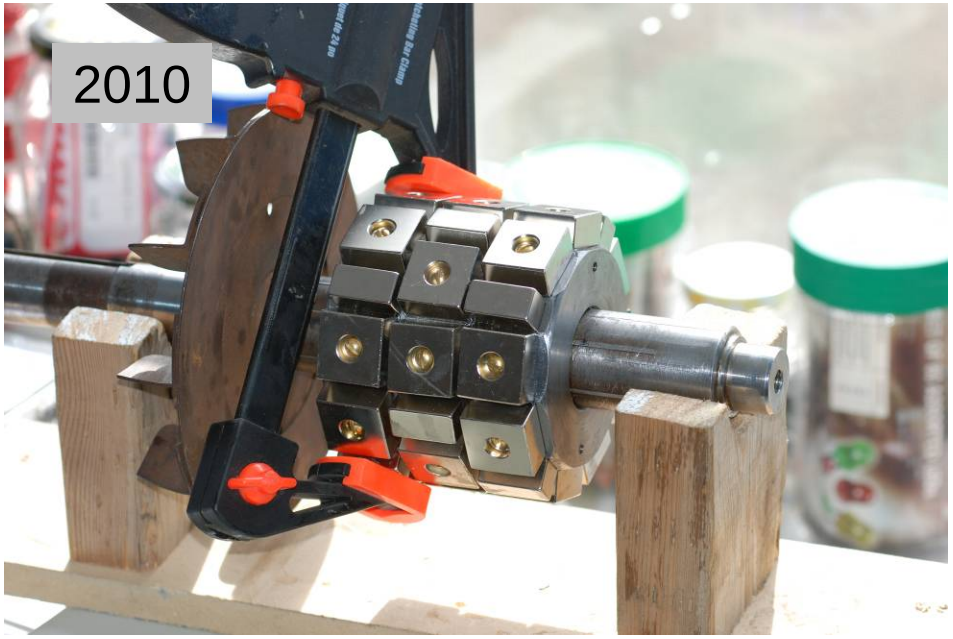
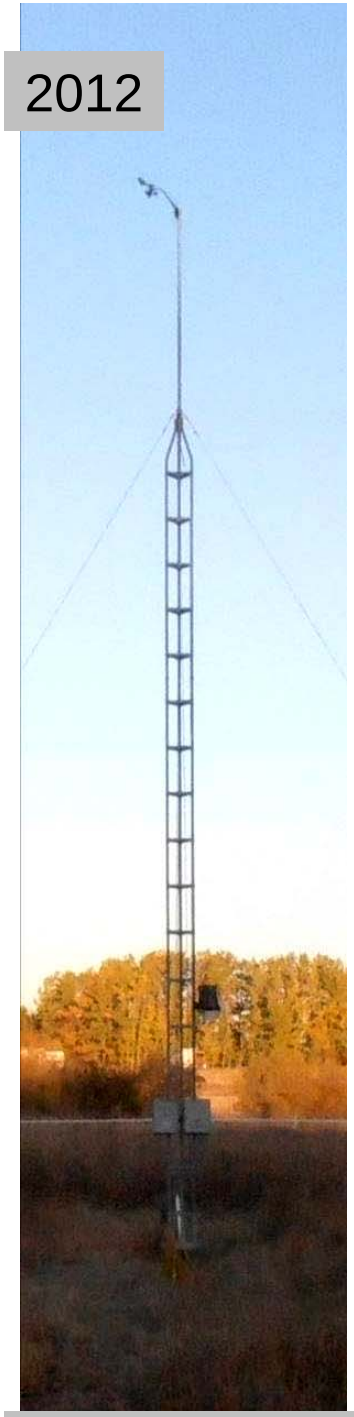

2010


2010

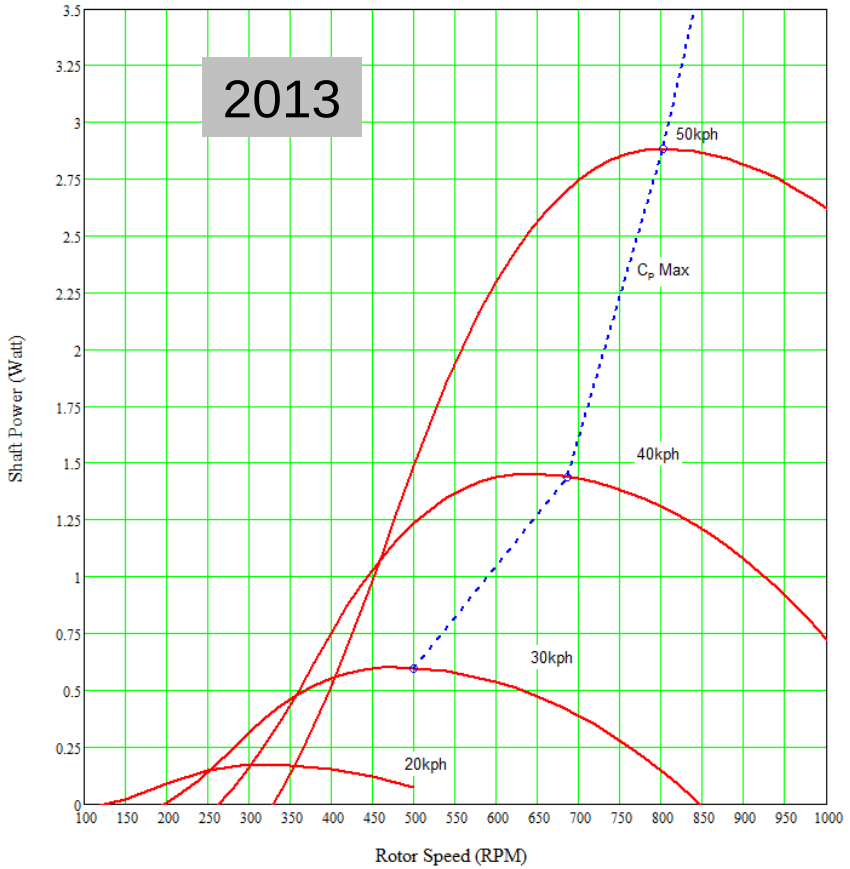
2012



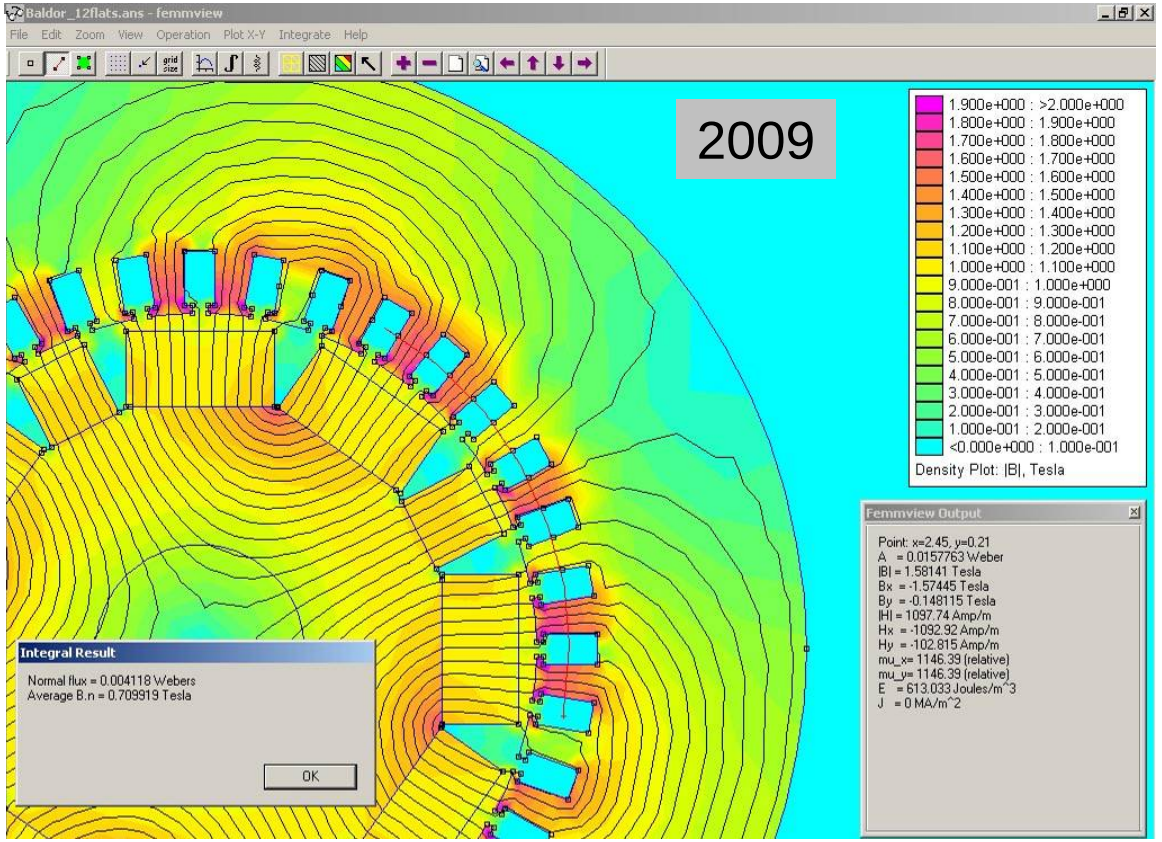
2014

https://www.wunderground.com/dashboard/pws/IALBERTA147

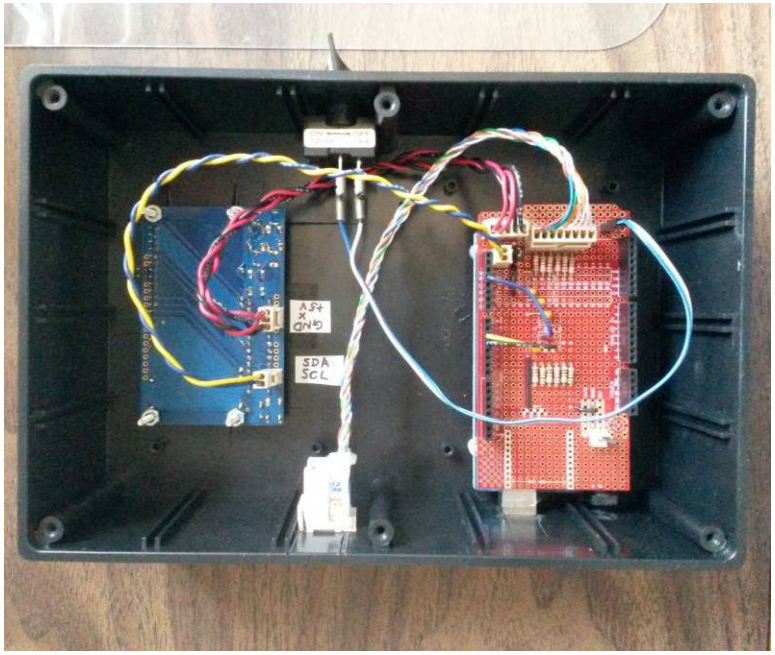
2013



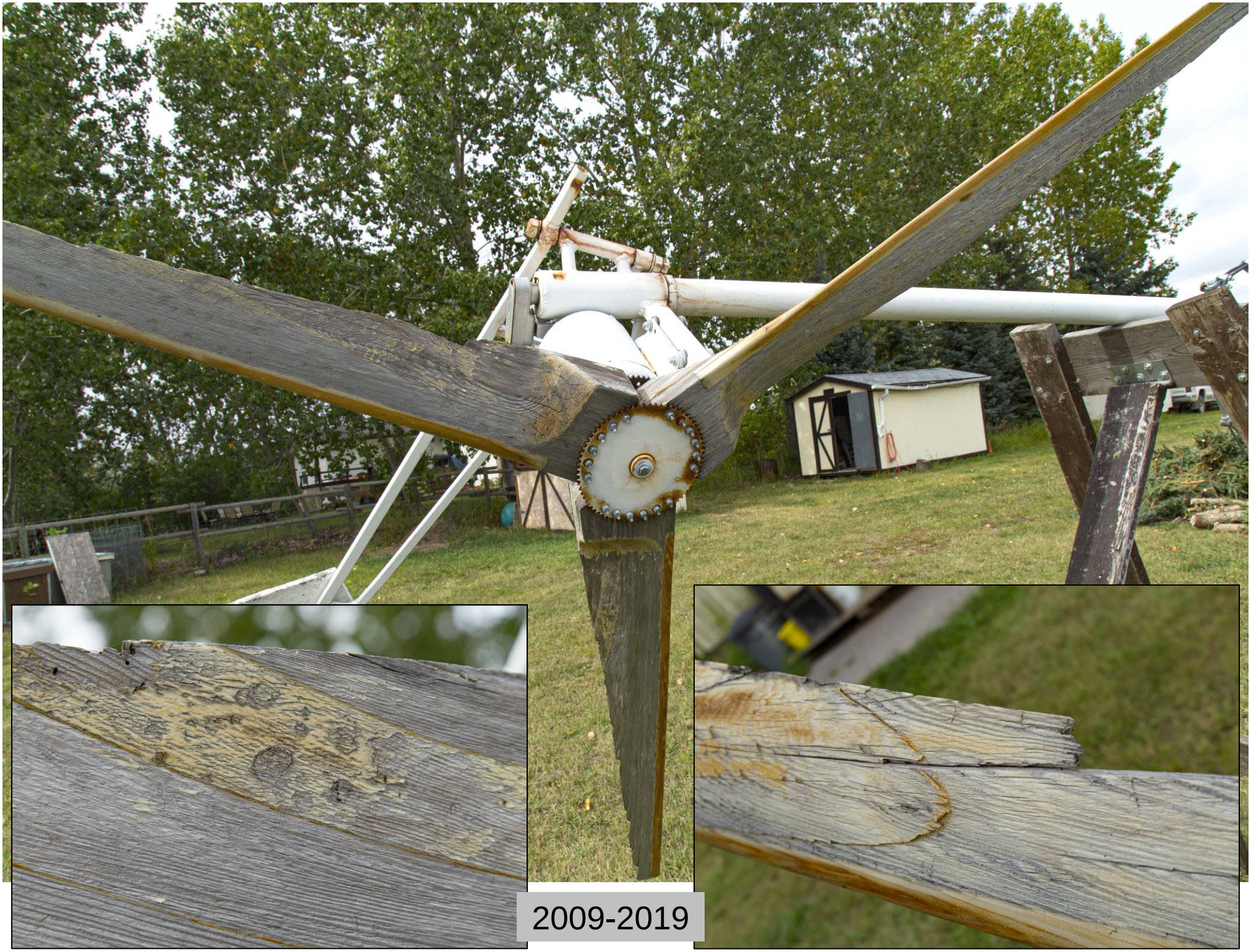

2009

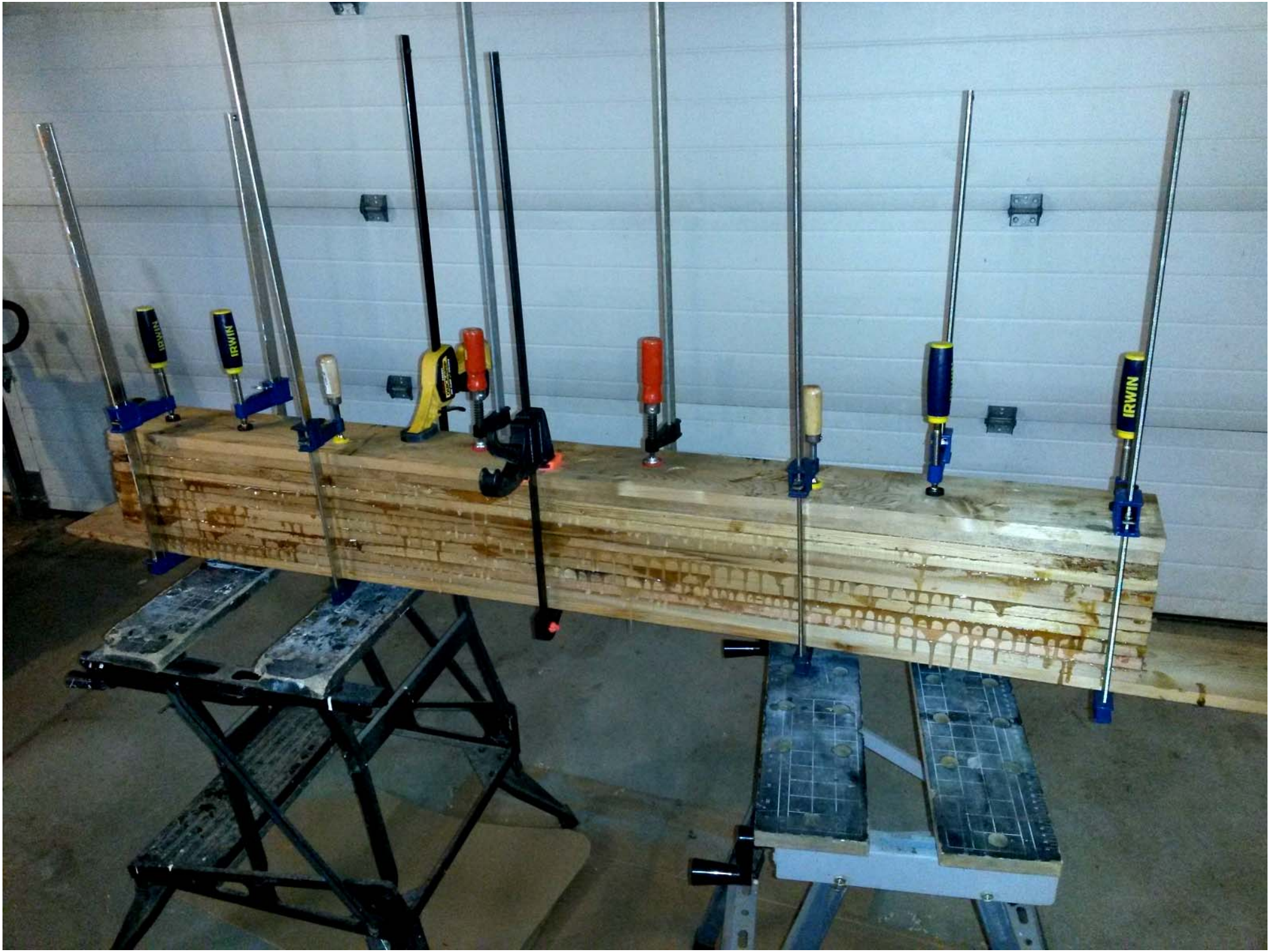



2017




2017


2009-2019


IRWIN
IRWIN
IRWIN

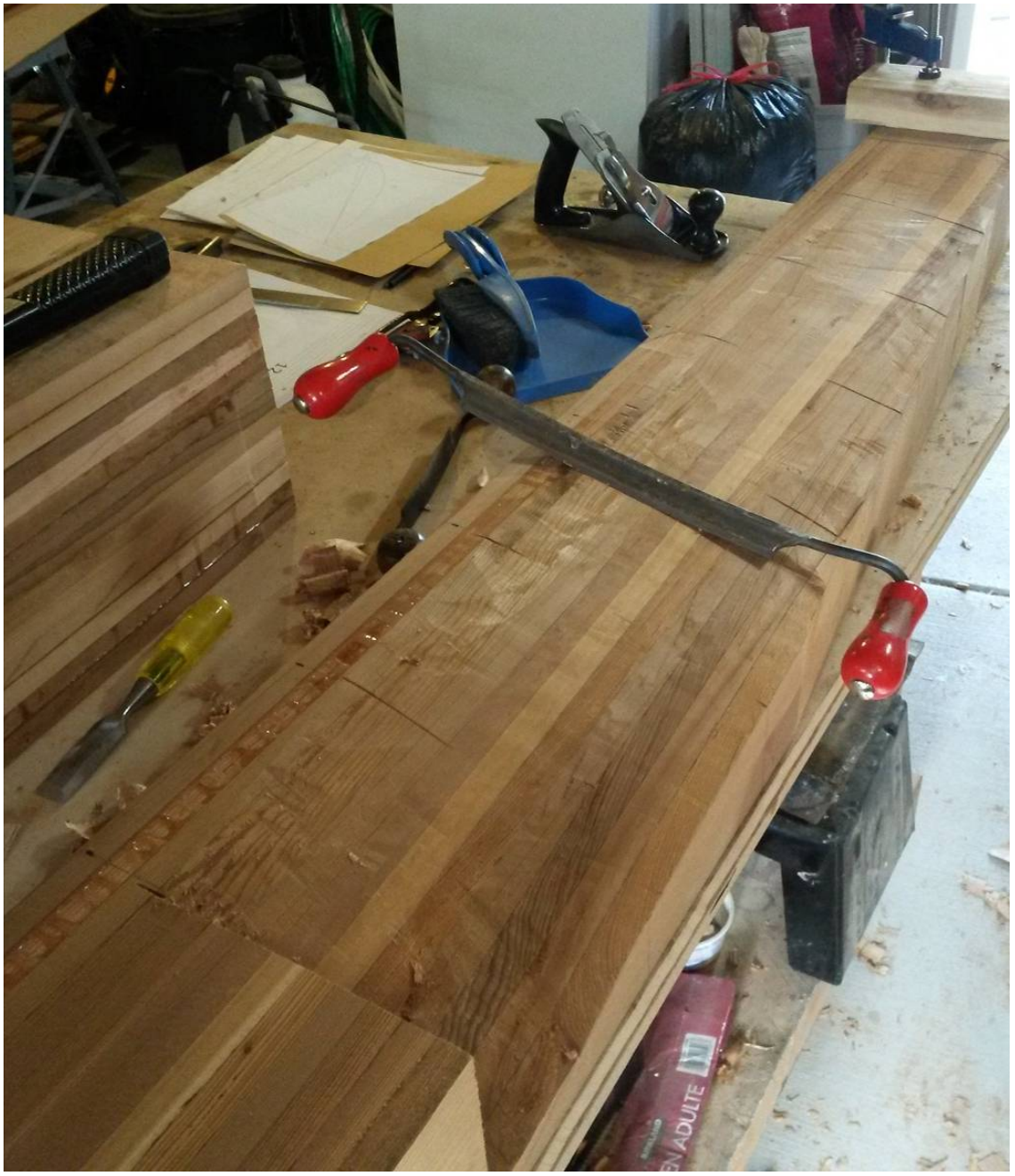

KNOT DOESN'T
MATTER.
IT'S CUT OFF.


RIDGID


TE
LE
TIP


TRAILING
EDGE LINE

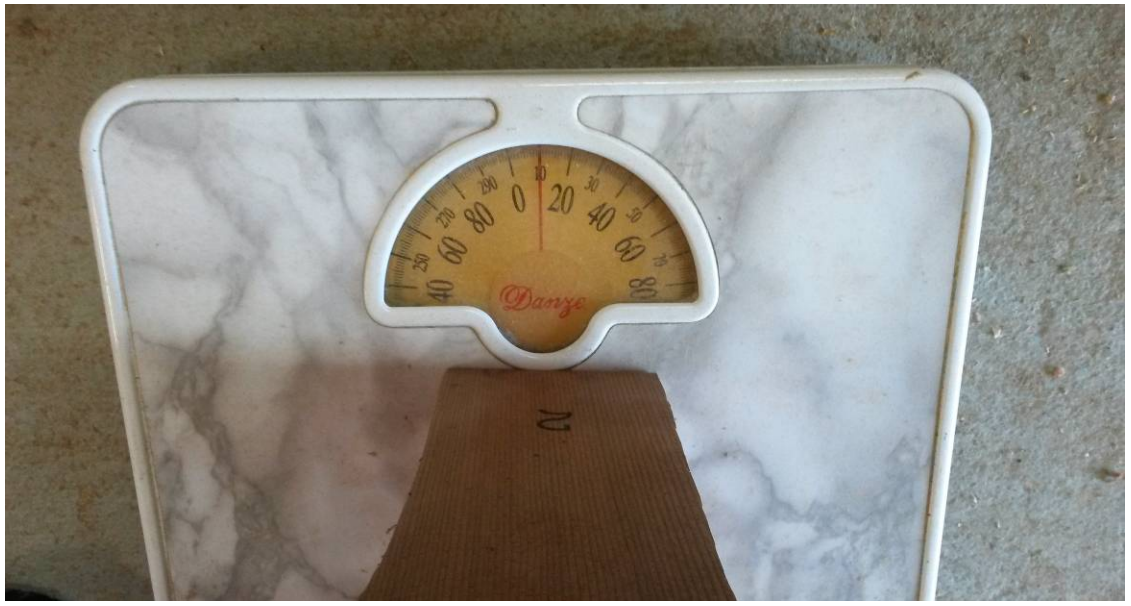

STANLEY
IRWIN
CRAFTSMAN
MotoMaster


ADULTE

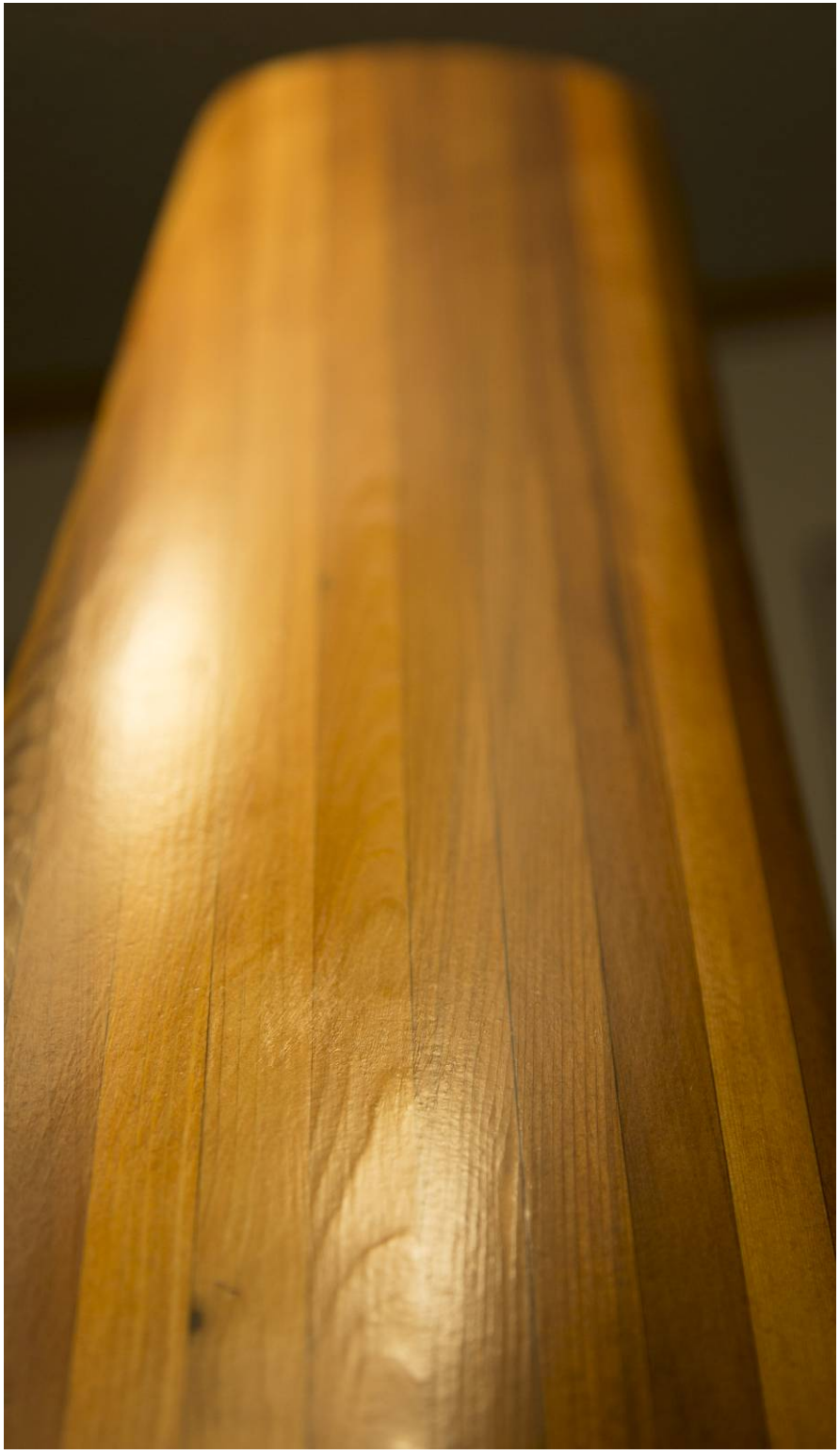

37
09

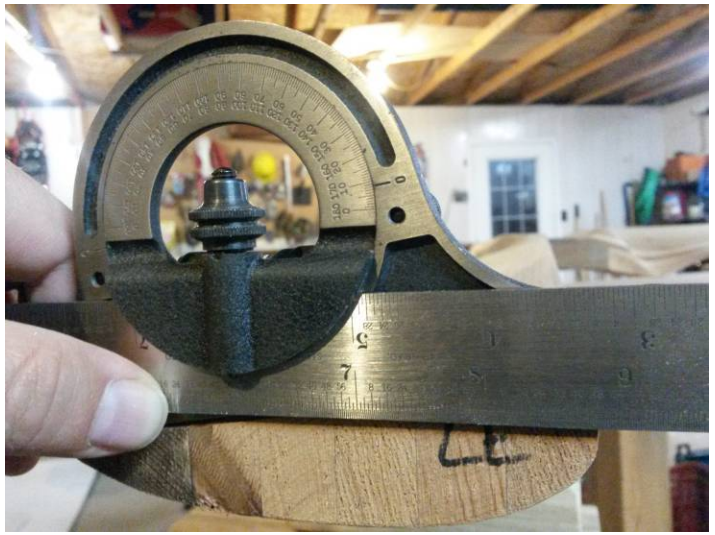

CRAFTEX

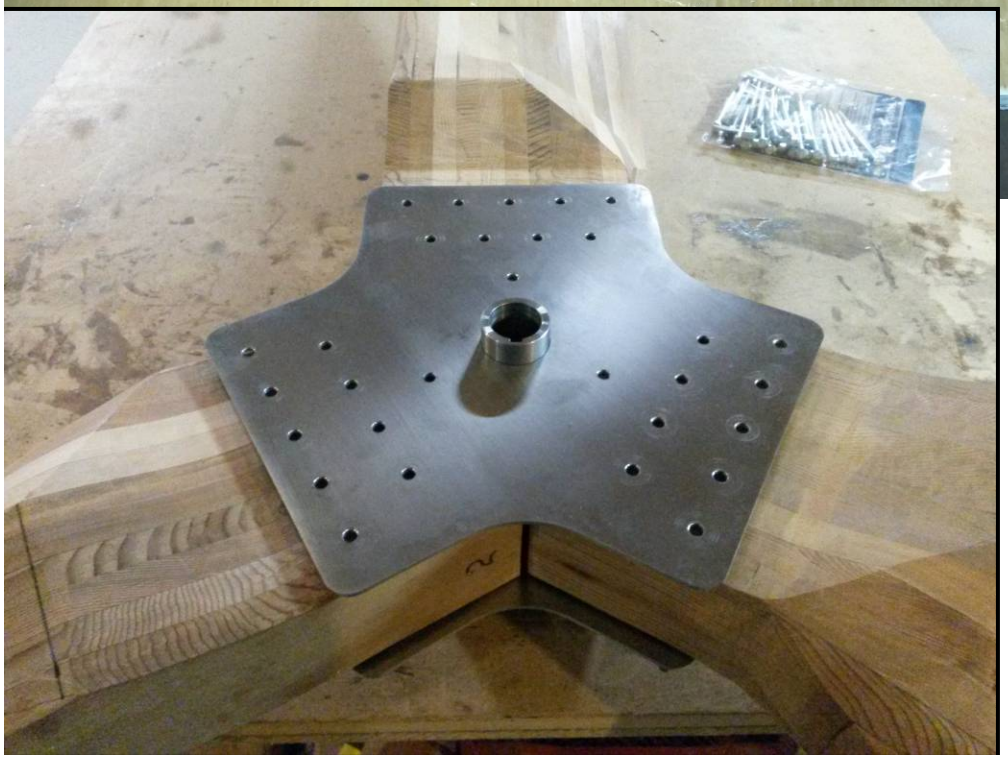

CHECKED MAY 2019
100%
X V O


Danze


LE







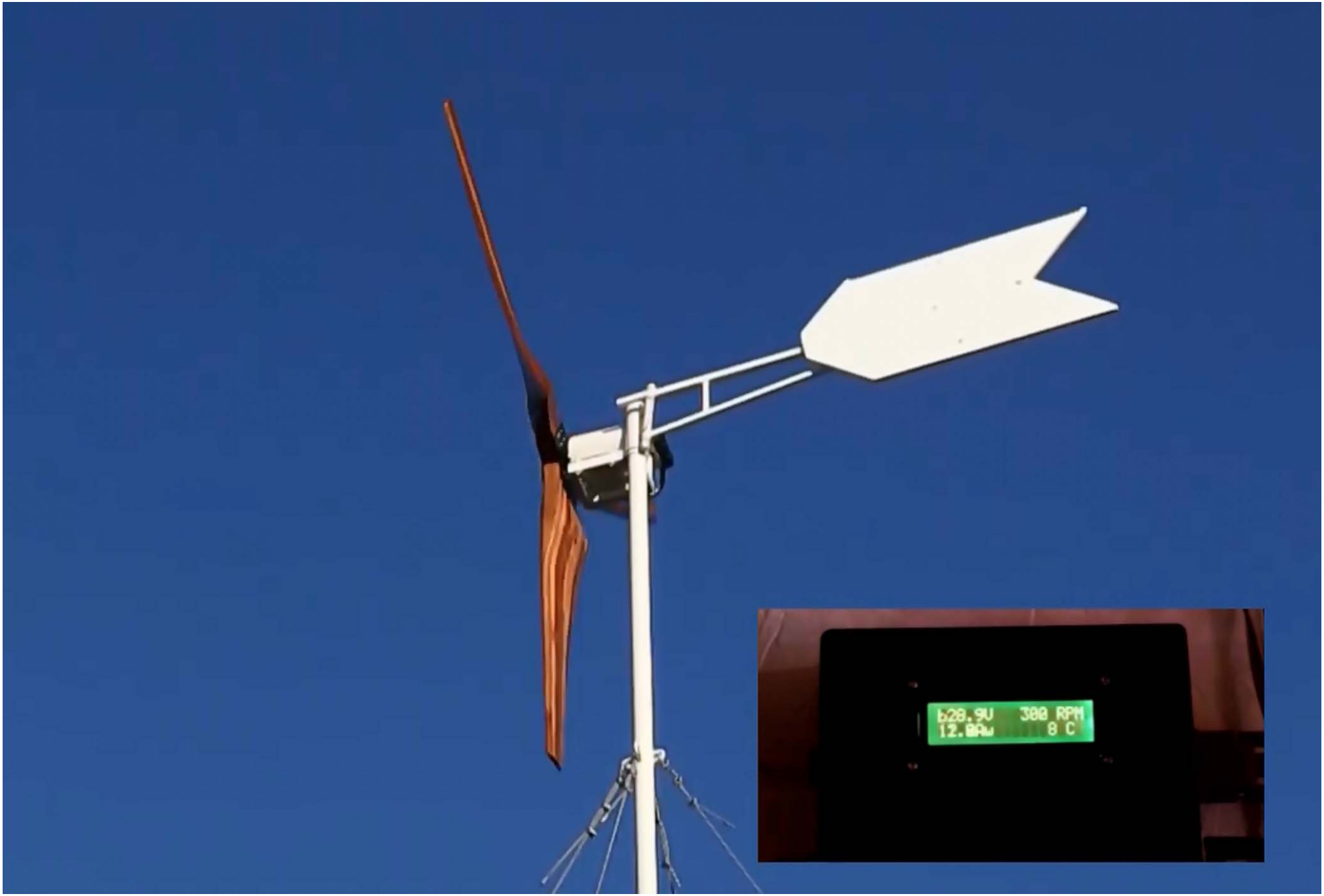

UFA

# PART 2

# OPTIONAL

# PERFORMANCE EVALUATION AND COMPARISON


WIND TURBINE GENERATOR
CHARGE CONTROLLER
2 YEAR WARRANTY
NEXT DAY SHIPPING
CE
700W
WHAT DO WE NEED?
MORE POWER!
24V
3BLADES




https://www.youtube.com/watch?v=VVhAKhYnYpo

How can I accept a wind turbine that makes a measly 300-400 Watts, when I could buy one that offers 700 – 1000 – **1500** Watts? **More Power!**

The answer is that I'm not looking for peak power.

Power is only a part of producing energy.

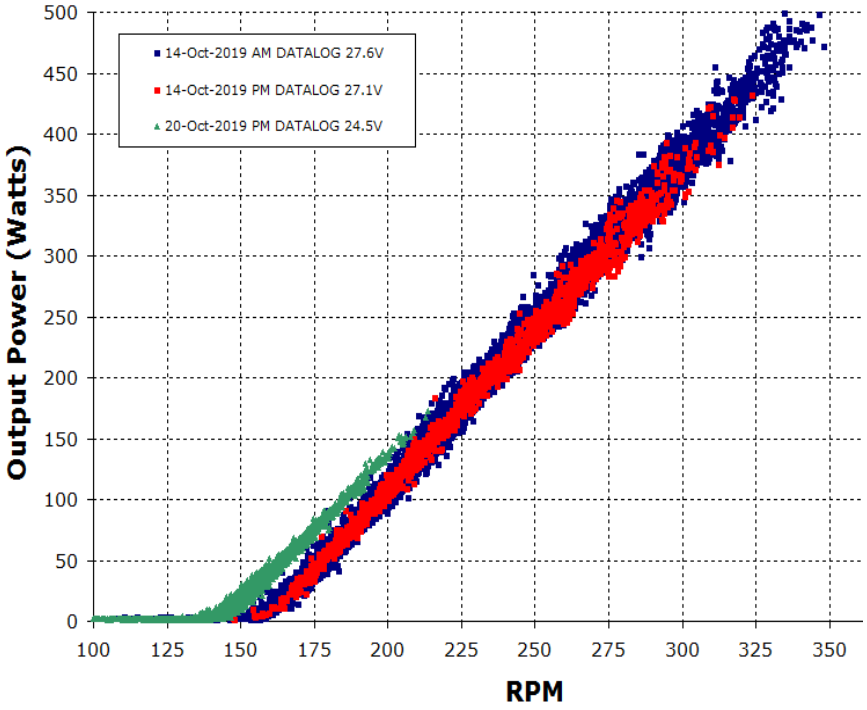
When the power is produced is more important.

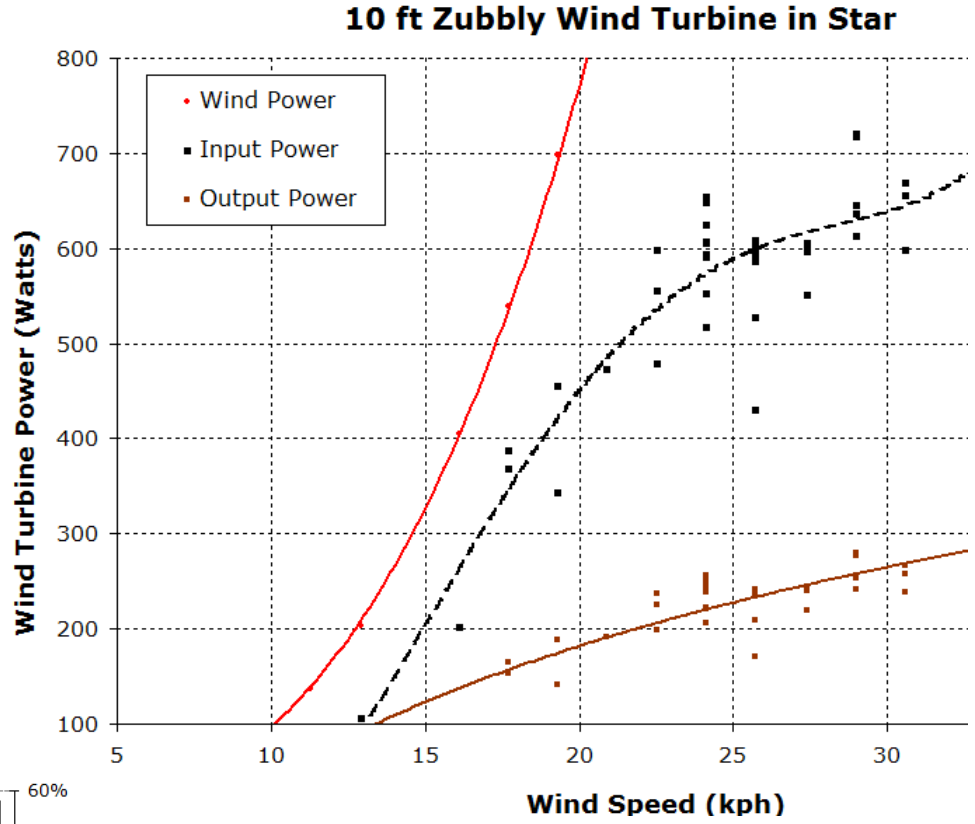
Let's use an analogy:

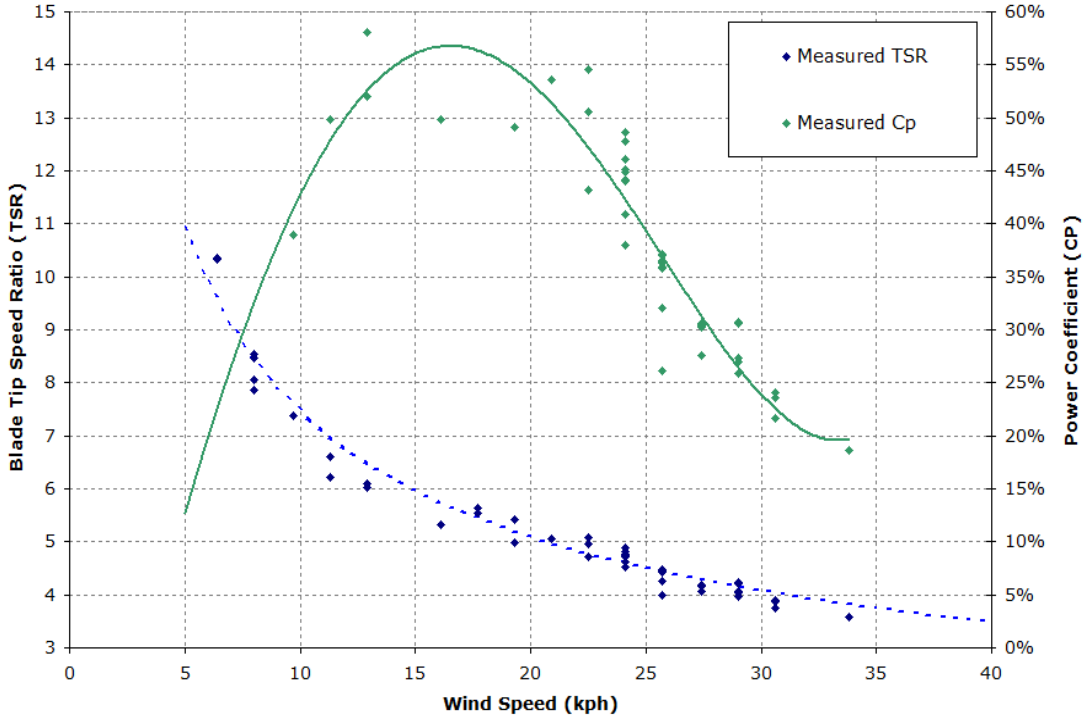
I can jump off the ground, and it takes about 2 kW for my body to do that. My feet leave the floor at 16 kph.

So… that means I can run up the stairs of the Calgary Tower in 35 seconds.

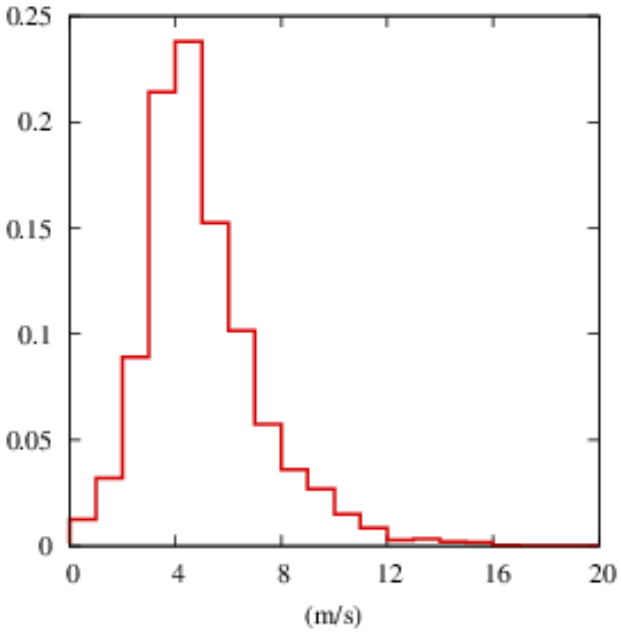
…Right?

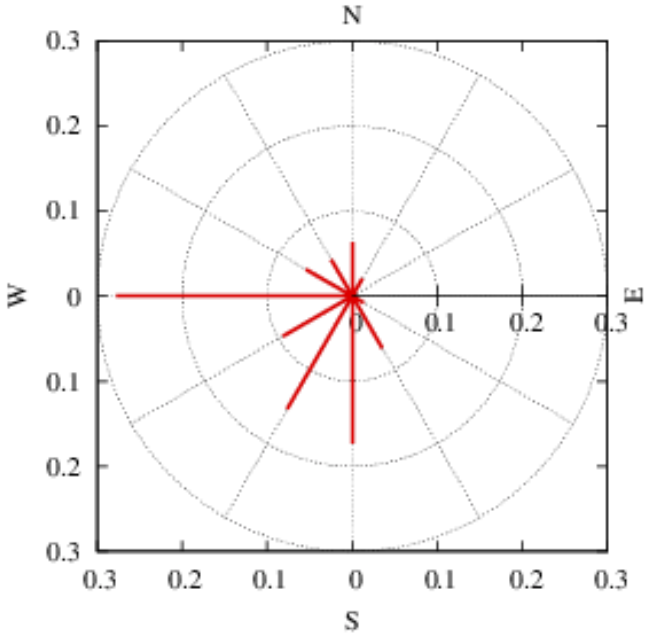

14-Oct-2019 AM DATALOG 27.6V
14-Oct-2019 PM DATALOG 27.1V
20-Oct-2019 PM DATALOG 24.5V
Output Power (Watts)
RPM
0
50
100
150
200
250
300
350
400
450
500
100
125
150
175
200
225
250
275
300
325
350

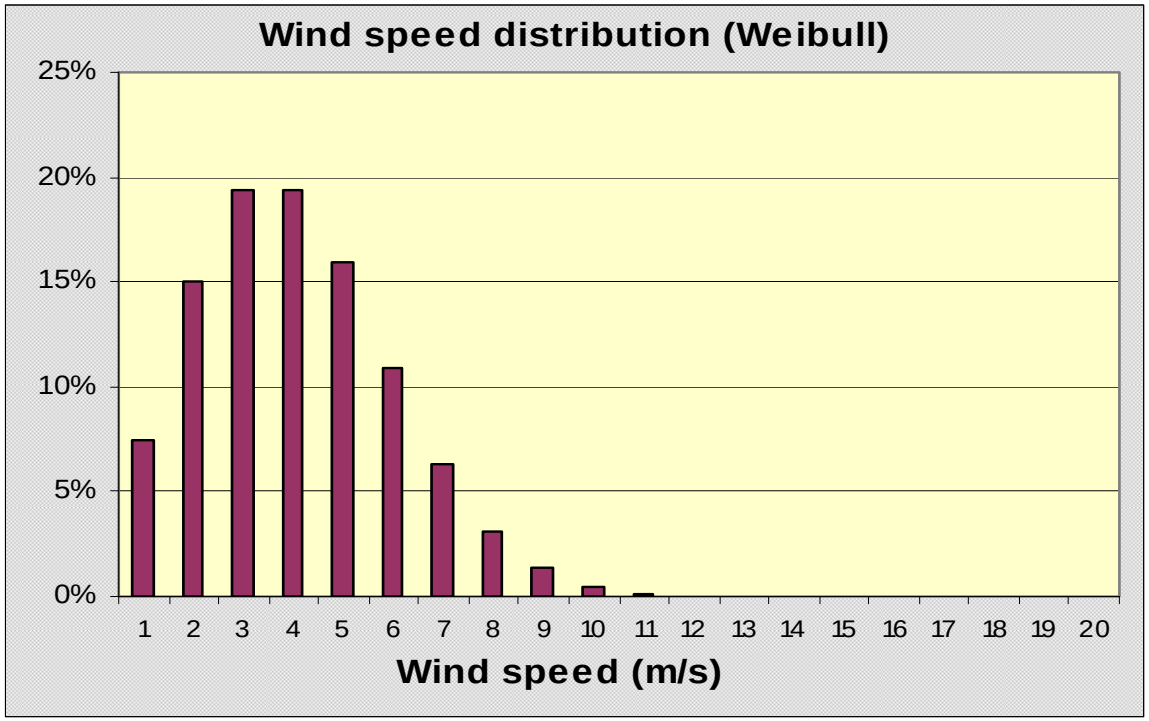

10 ft Zubbly Wind Turbine in Star
Wind Power
Input Power
Output Power
Wind Turbine Power (Watts)
Wind Speed (kph)
100
200
300
400
500
600
700
800
5
10
15
20
25
30


Measured TSR
Measured Cp
Blade Tip Speed Ratio (TSR)
Power Coefficient (CP)
Wind Speed (kph)
3
4
5
6
7
8
9
10
11
12
13
14
15
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
50%
55%
60%
0
5
10
15
20
25
30
35
40

# WIND SPEED & ENERGY IN THE CALGARY AREA




http://www.windatlas.ca/maps-en.php

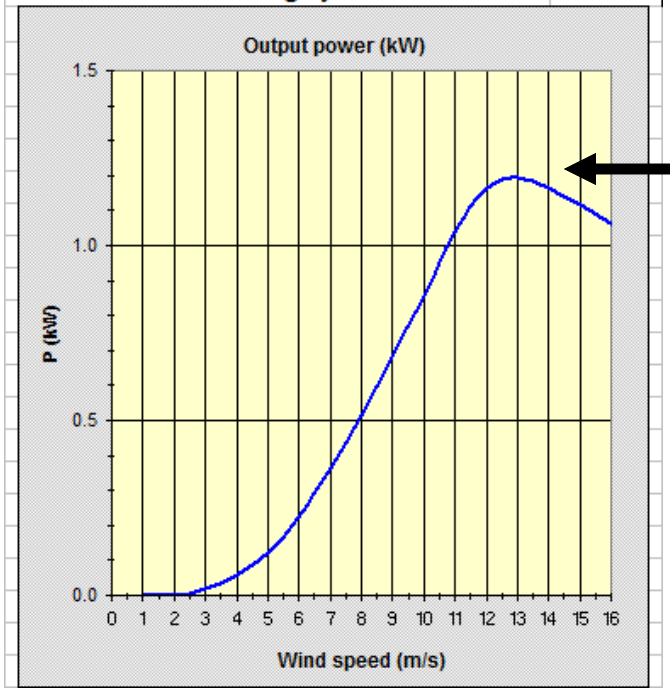
| | |
|---|---|
| **Atlas Average Wind (m/s) =** | 5.0 |
| **Site Altitude (m) =** | 1,000 |
| **Anemometer Height (m) =** | 30 |
| **Tower Height (m) =** | 15 |
| **Wind Shear Exponent =** | 0.290 |
| **Weibull shape factor K =** | 2.2 |
| **Turbulence Factor =** | 20% |

# Compare 2 Wind Turbines

## Bergey XL-1 (2.5 m diameter)

| | |
|---|---|
| Daily Energy Output (kWh) = | 2.1 |
| Monthly Energy Output (kWh) = | 64 |
| Annual Energy Output (kWh) = | 773 |
| Average Output Power (kW) = | 0.09 |
| Hub Average Wind Speed (m/s) = | 4.09 |
| Air Density Factor = | -9% |
| Percent Operating Time = | 77.1% |

Bergey XL-1

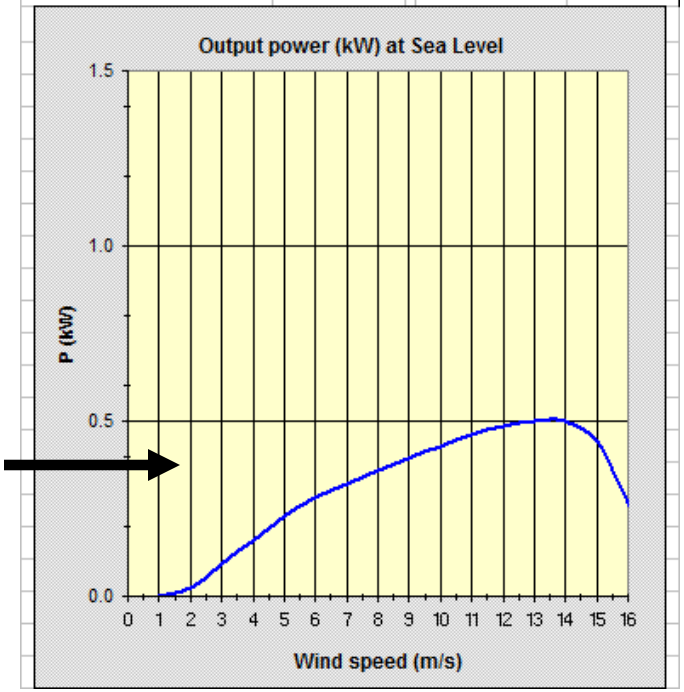



More Power!

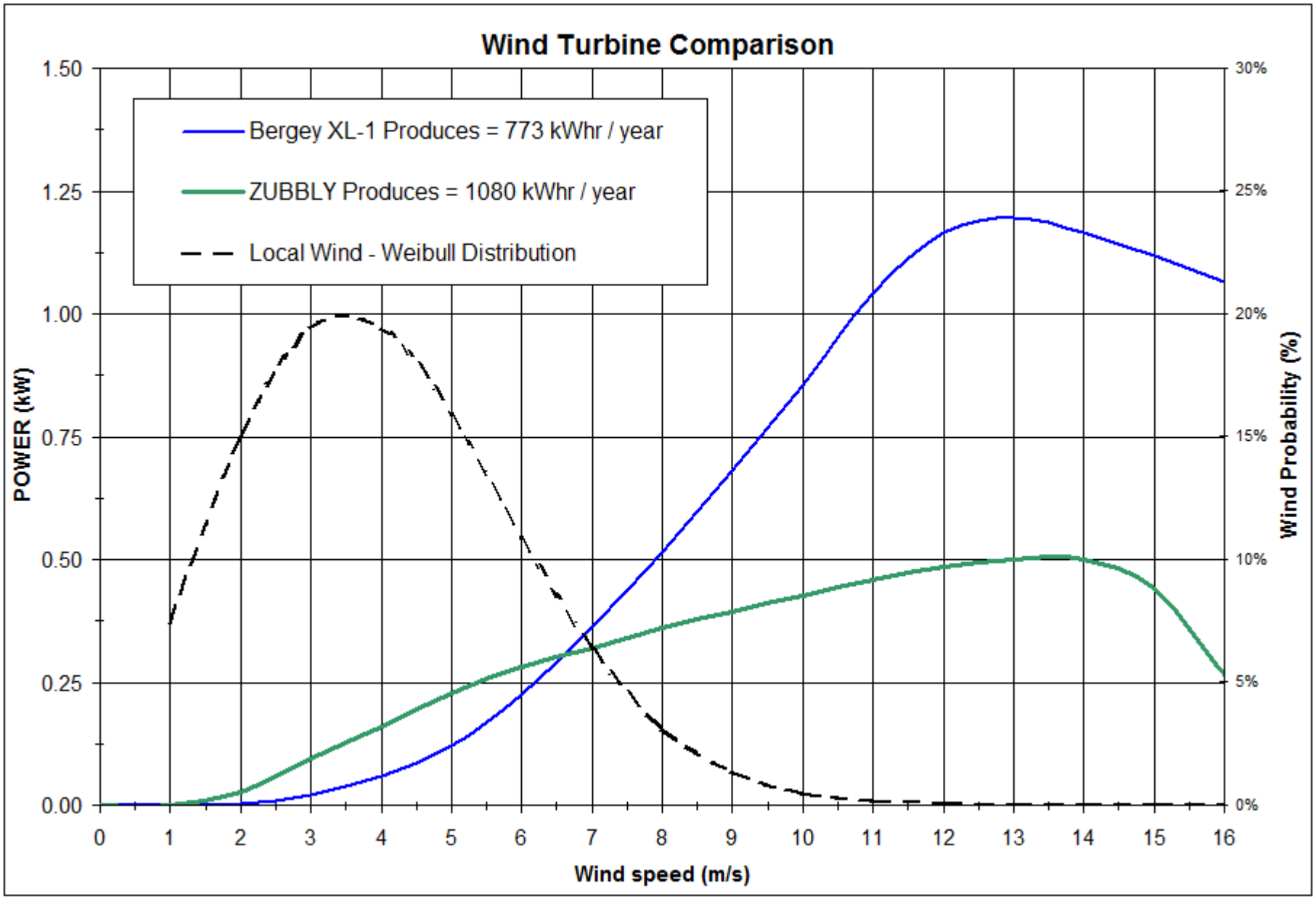
## My Project (3.0 m diameter)

| | |
|---|---|
| Daily Energy Output (kWh) = | 3.0 |
| Monthly Energy Output (kWh) = | 90 |
| Annual Energy Output (kWh) = | 1,080 |
| Average Output Power (kW) = | 0.12 |
| Hub Average Wind Speed (m/s) = | 4.09 |
| Air Density Factor = | -9% |
| Percent Operating Time = | 77.1% |

ZUBBLY




Corrected to Sea Level

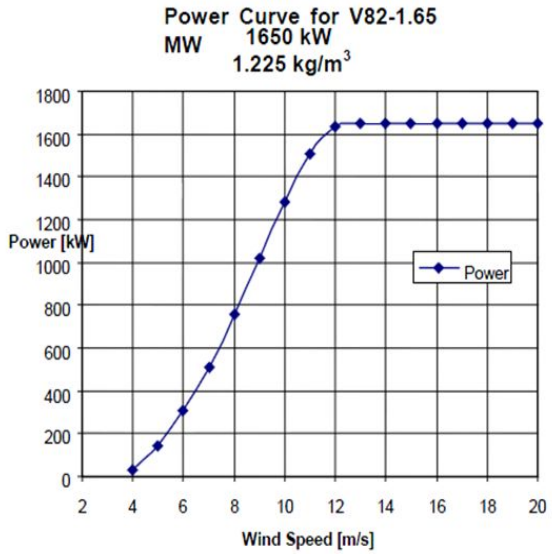



**Bergey XL-1 Produces = 773 kWhr / year**

**ZUBBLY Produces = 1080 kWhr / year**

More Energy!

## How can we use this information?

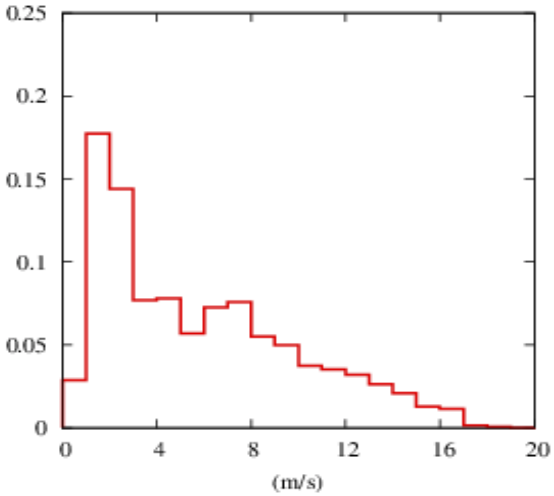
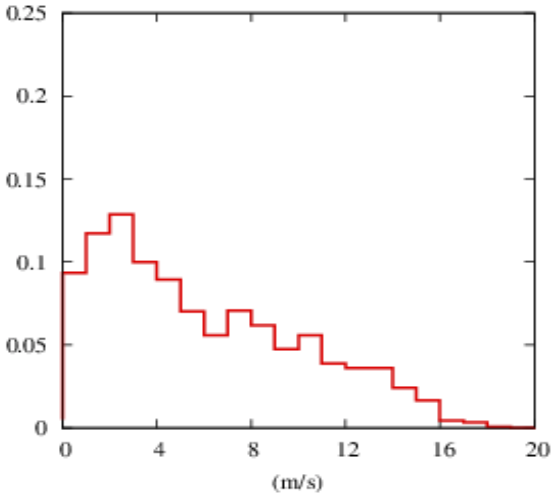
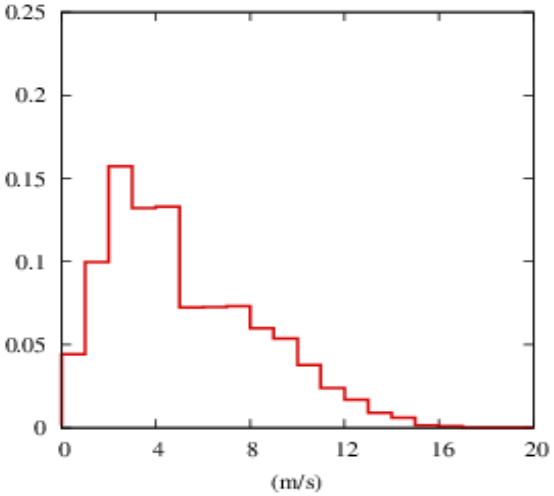



- Estimate the potential production of a W.T.
- Compare different sites
- Compare different wind turbines

As citizens, landowners, and taxpayers:

- Figure out if a developer is *over-promising*
- Estimate the real value of a project *(big or small)*

## Compare three sites:

| Brocket | Oyen | Magrath |
|---|---|---|
|  |  |  |
| 3.5 GWhr / year | 4.1 GWhr / year | 3.0 GWhr / year |