DIY LENZ Vertical Axis Wind Turbine

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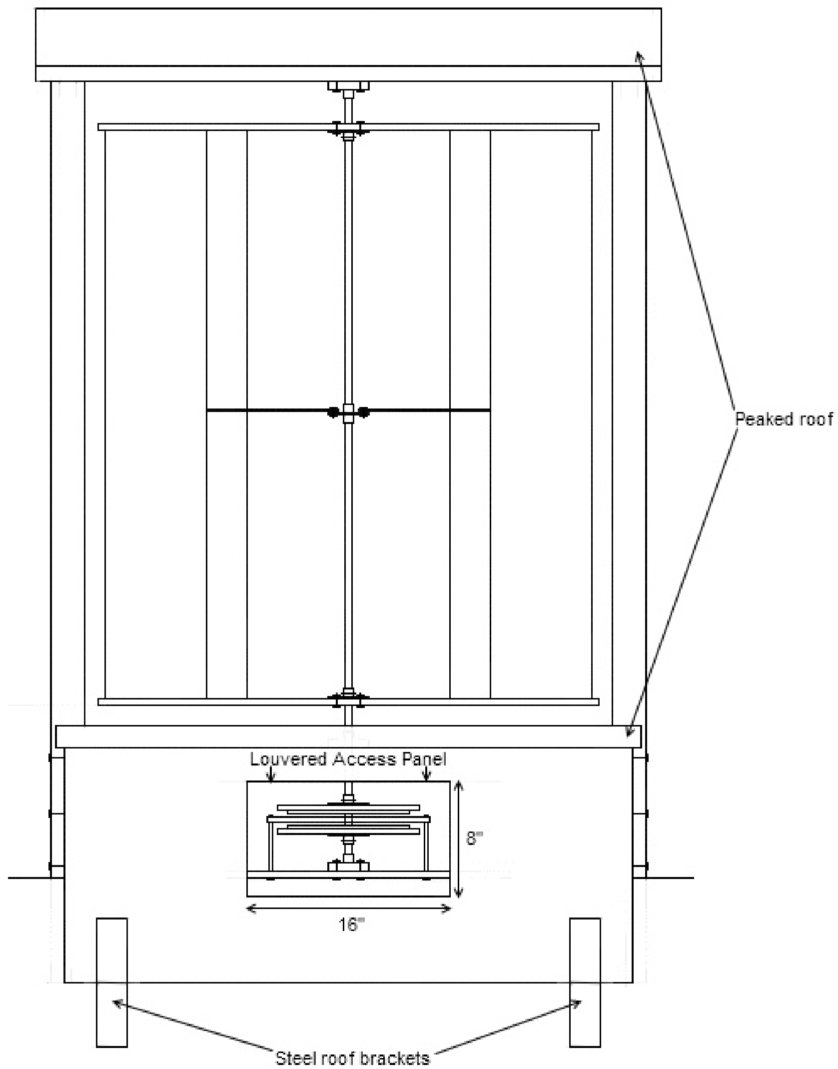
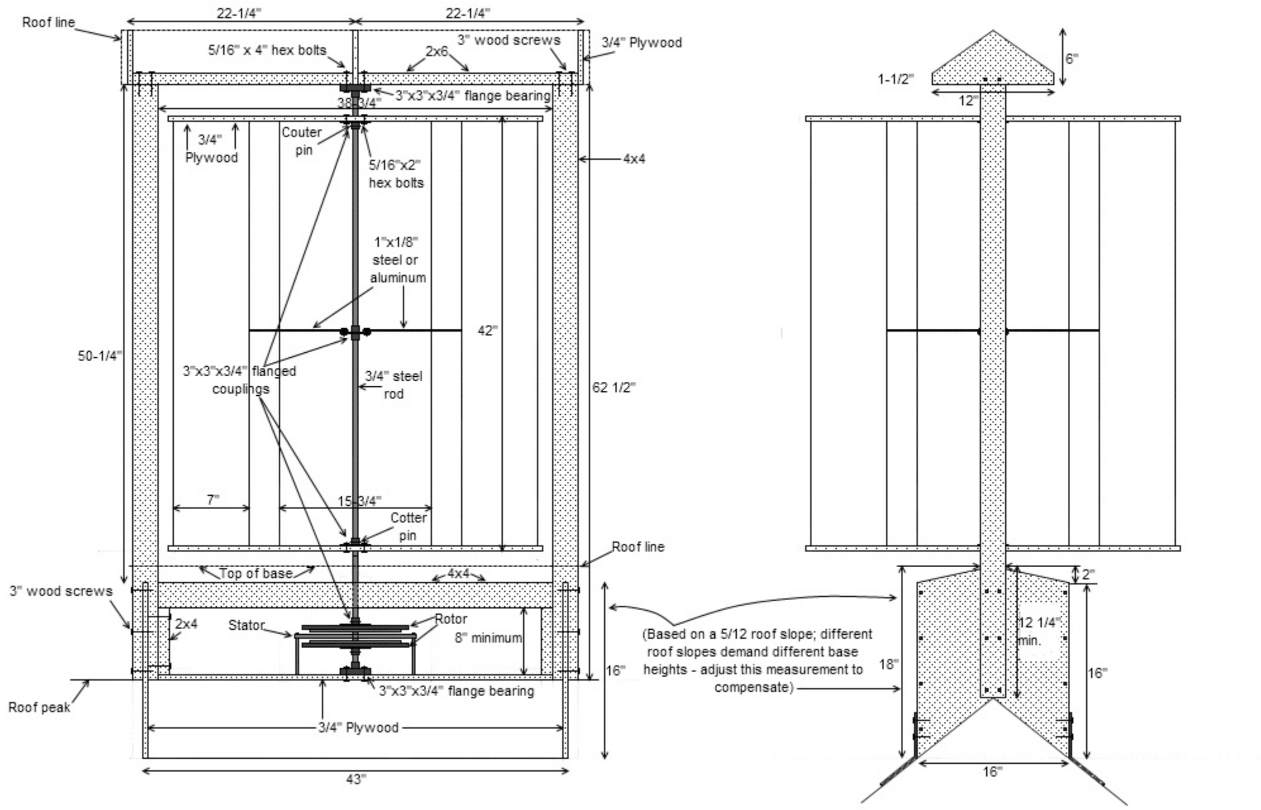
Vertical Axis Wind Turbine

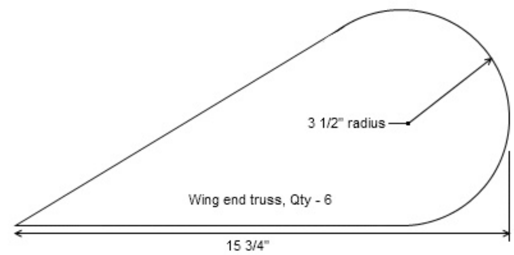


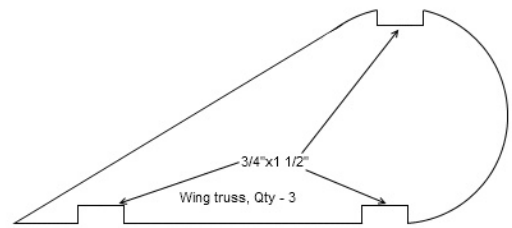
VAWT Detail

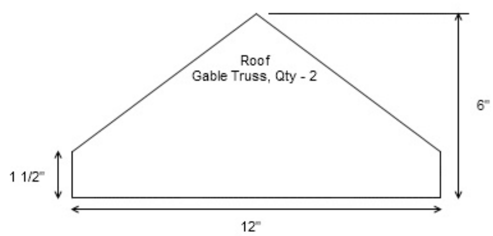


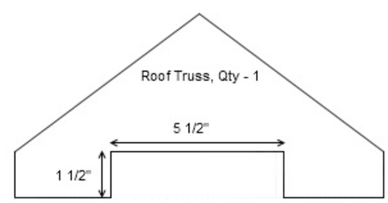
Roof line
22-1/4"
22-1/4"
5/16" x 4" hex bolts
2x6
3" wood screws
3/4" Plywood
3"x3"x3/4" flange bearing
38-3/4"
3/4"
Plywood
Couter
pin
5/16"x2"
hex bolts
4x4
1"x1/8"
steel or
aluminum
42"
50-1/4"
3"x3"x3/4" flanged
couplings
3/4" steel
rod
62 1/2"
7"
15-3/4"
Cotter
pin
Roof line
Top of base
4x4
3" wood screws
2x4
Stator
Rotor
8" minimum
16"
Roof peak
3"x3"x3/4" flange bearing
3/4" Plywood
43"
6"
1-1/2"
12"
2"
12 1/4"
min.
(Based on a 5/12 roof slope; different
roof slopes demand different base
heights - adjust this measurement to
compensate)
18"
16"
16"

Wing/Roof Detail



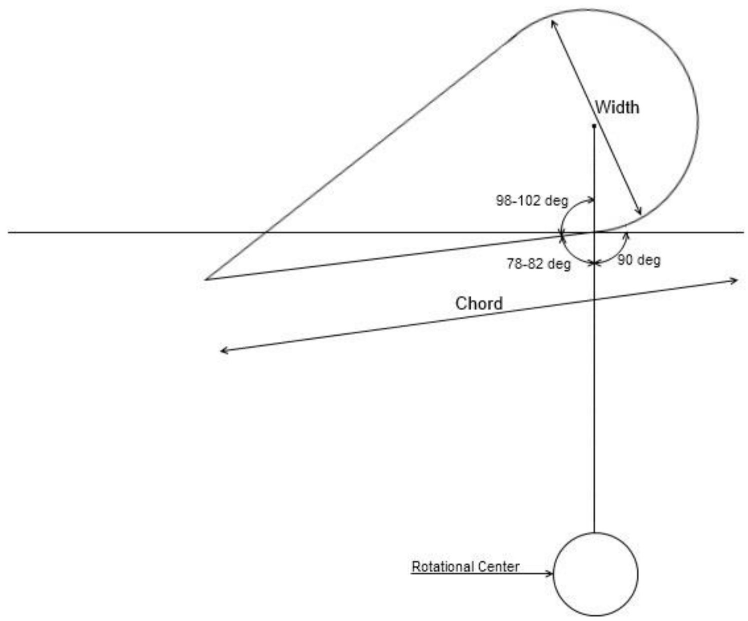




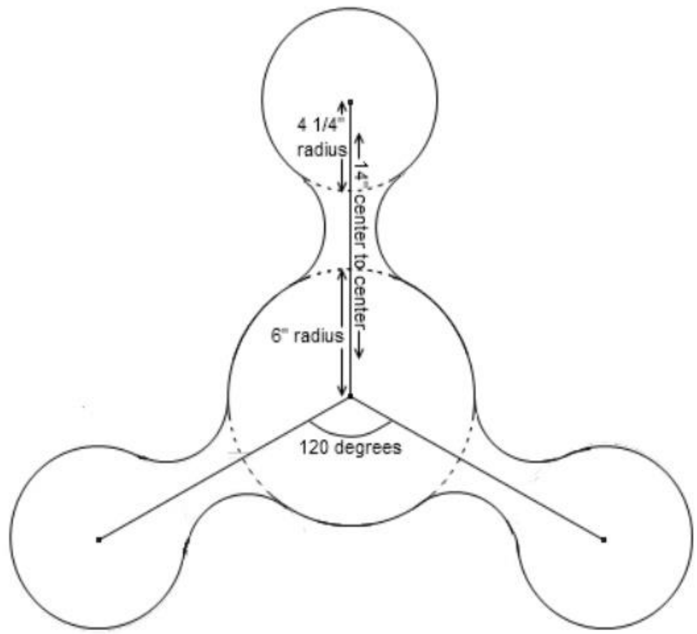


Wing Angle

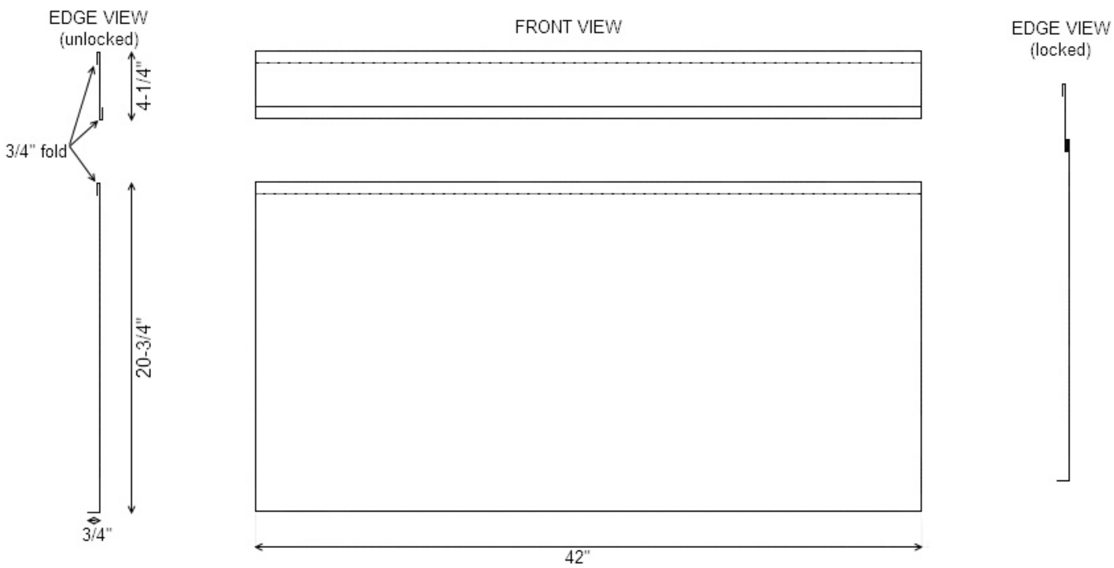
Wing width = diameter of swept area x 0.14
Wing chord = circumference of swept area x 0.09



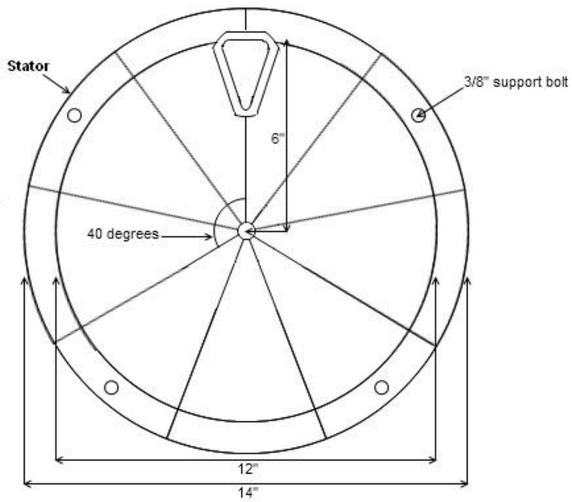
Wing Support Detail

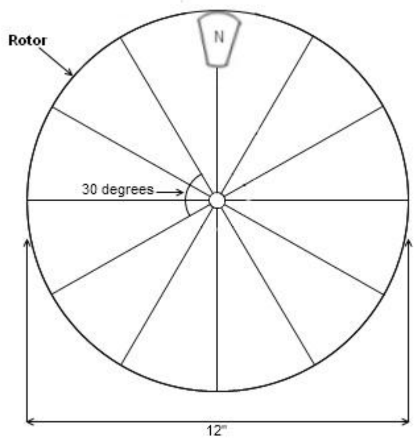


Blade Covering
(Aluminum Flatstock)



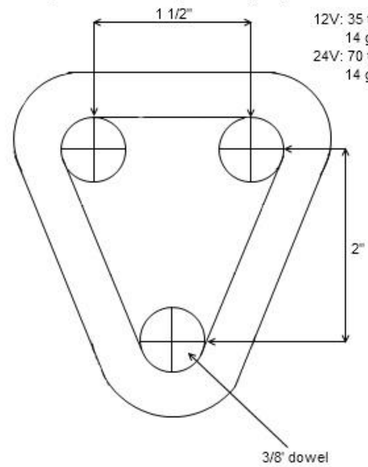
Rotor/Stator/Coil Detail



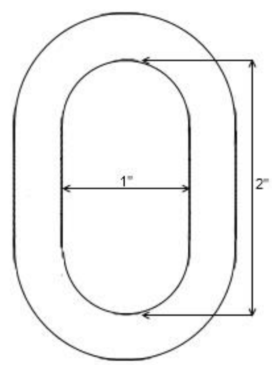


(for 2"x1"x1/4" 'Swept Arc' Magnets)

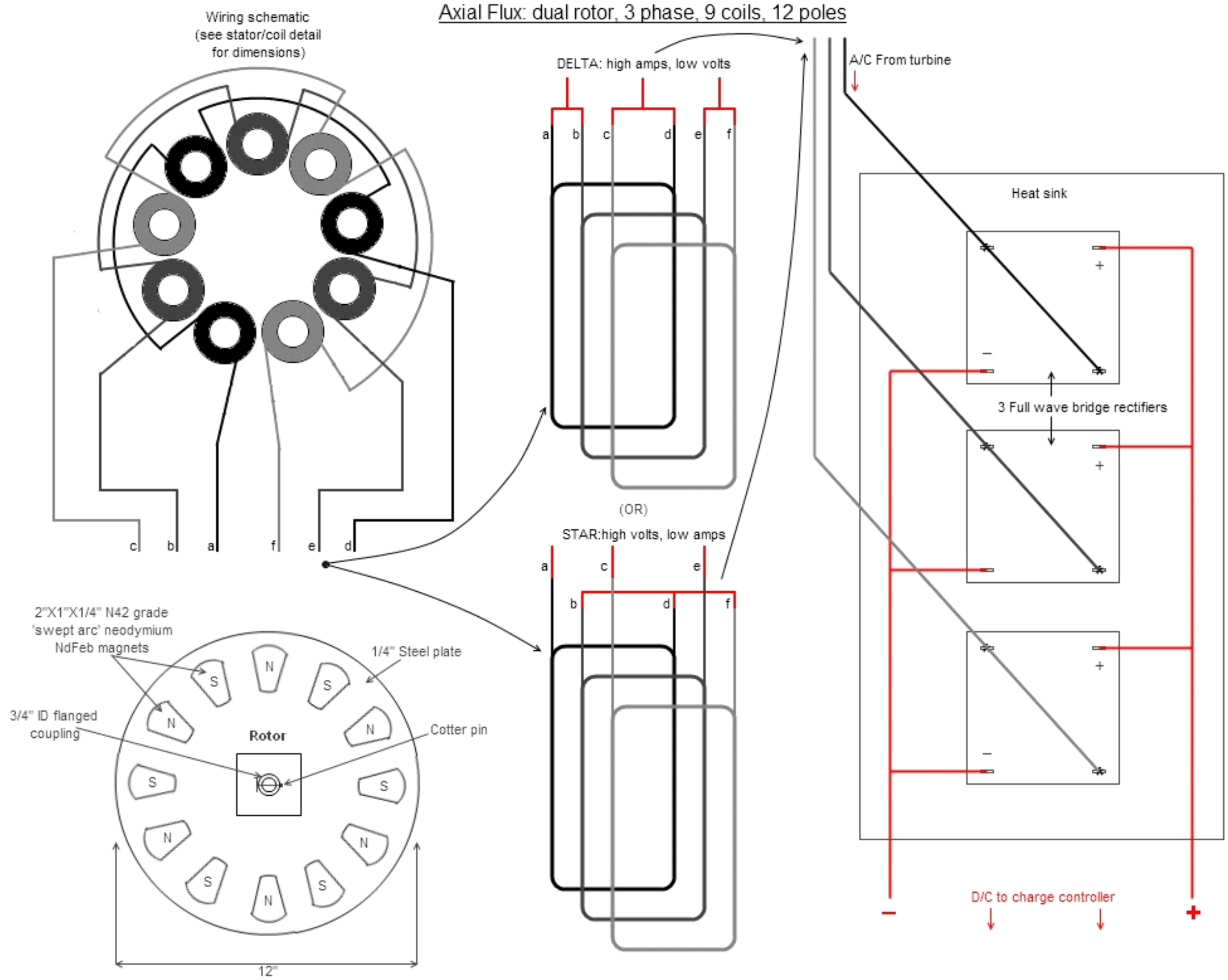
12V: 35 turns of double parallel strand
14 gauge enameled copper wire
24V: 70 turns of single strand
14 gauge enameled copper wire

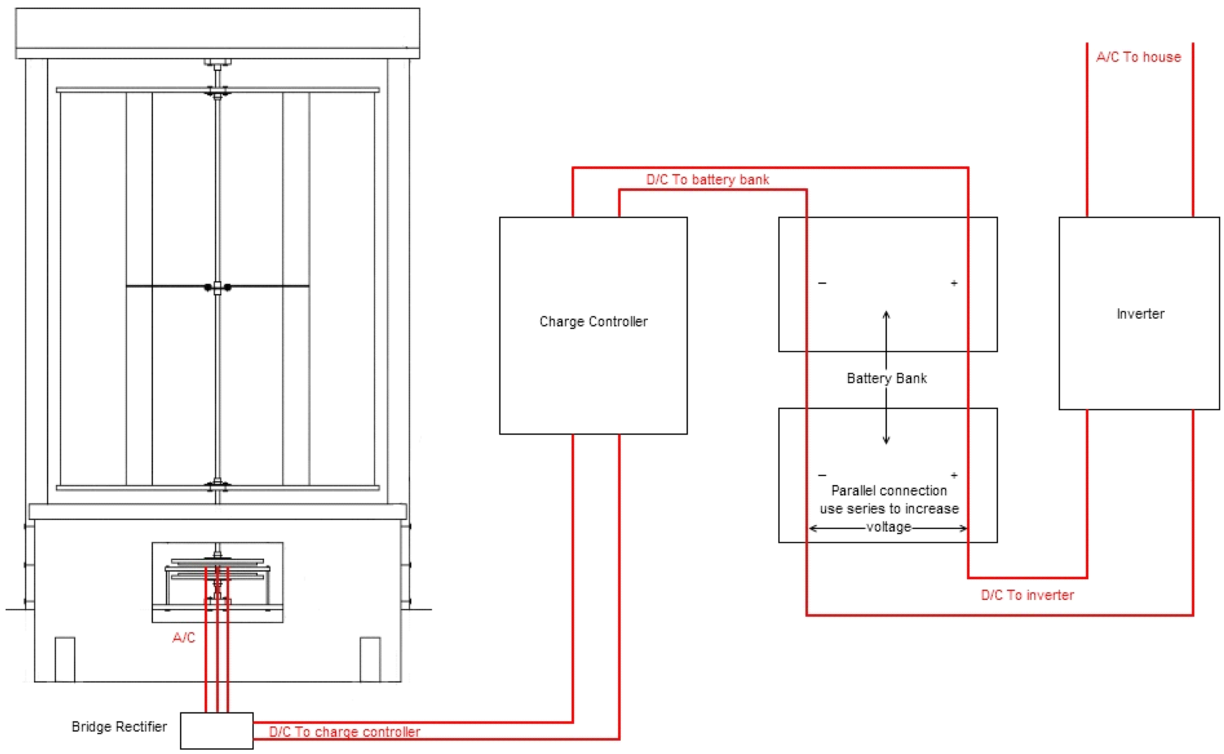


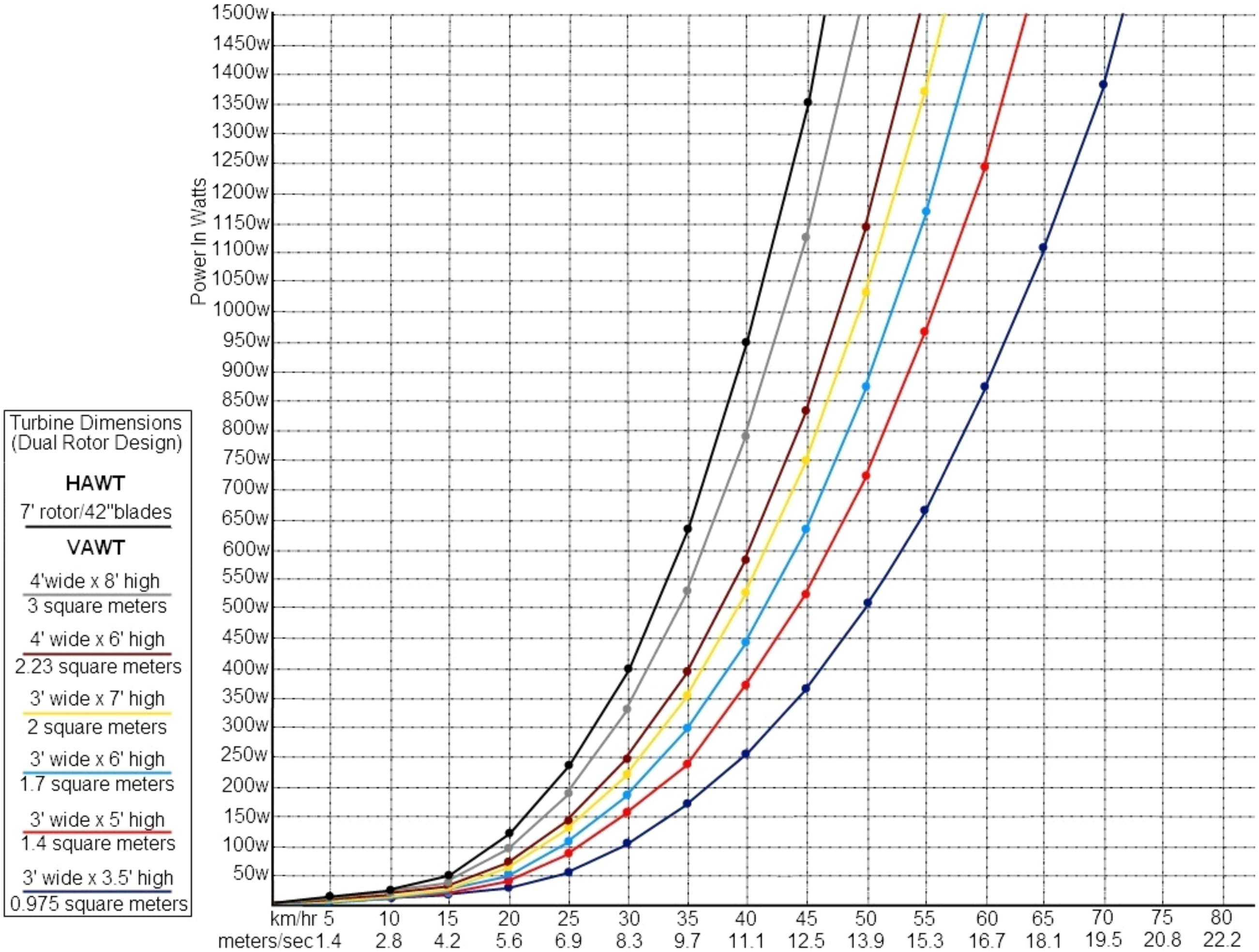
(OR: square 2"x1"x1/2" magnets)



Axial Flux: dual rotor, 3 phase, 9 coils, 12 poles




A/C To house
D/C To battery bank
Charge Controller
Inverter
Battery Bank
Parallel connection
use series to increase
voltage
D/C To inverter
A/C
Bridge Rectifier
D/C To charge controller


Turbine Dimensions
(Dual Rotor Design)
HAWT
7' rotor/42"blades
VAWT
4'wide x 8' high
3 square meters
4' wide x 6' high
2.23 square meters
3' wide x 7' high
2 square meters
3' wide x 6' high
1.7 square meters
3' wide x 5' high
1.4 square meters
3' wide x 3.5' high
0.975 square meters
Power In Watts
1500w
1450w
1400w
1350w
1300w
1250w
1200w
1150w
1100w
1050w
1000w
950w
900w
850w
800w
750w
700w
650w
600w
550w
500w
450w
400w
350w
300w
250w
200w
150w
100w
50w
km/hr 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
meters/sec 1.4 2.8 4.2 5.6 6.9 8.3 9.7 11.1 12.5 13.9 15.3 16.7 18.1 19.5 20.8 22.2

Turns per Coil:

$$N = \frac{\epsilon}{N'} \qquad (3)$$

where ϵ= expected system voltage

and $$N' = \frac{(2)(P)(T_E)(A_M)(T)}{C} \qquad (3a)$$

where P= total number of magnets
T_E= magnet surface field strength in tesla[1]
A_M= coil airspace in square meters
T= rotor velocity in seconds
C= total number of stator coils.

Coil Wire Gauge:

$$\rho = \sqrt{\frac{A}{4869.48}}$$

where ρ= bare wire diameter
A= current in amps

Total Expected Power:

P=1/2pAV^3CtCa

where P= total expected power in watts
p= air density @ sea level and 20deg.C = 1.2kg/m^3
A= swept area of turbine blades in meters^2
V= wind speed in meters/sec
Ct= typical turbine coefficient = %40
Ca= typical dual rotor axial flux pma coefficient = %80

ex: 3'x5' VAWT with a swept area of 1.4m^2 and a 20kmhr or 5.6m/sec will produce:
P=1/2(1.2)(1.4m^2)(5.6m/sec^3)(%40)(%80)
= 1/2(1.2)(1.4)(171.5)(0.4)(0.8)
= 1/2(92.2)
= 46.1watts@20kmhr