Mackinaw City Wind Project

Amount of turbines:	2
Manufacturer Turbines	NEG-Micon 900/52
Hub height:	237ft (72 mtr)
Rotor diameter:	170ft (52 mtr)
Total height:	322ft (98.4 mtr)
Type Rotor:	Upwind, Stall regulated.

The turbines are manufactured with conventional technologies:

Tower

3-section, bolted tower, 1.5 inch thick steel.
Height: 230ft (70 mtr), Diameter bottom: 13.7ft (4.2 mtr), Diameter top: 5.7ft (1.75 mtr).
Weight 94 Mtons.

Rotor

Spherical Hub, diameter: 5.9ft (1.8 mtr), Weight: 3.8 Mtons
3 LM Glassfiber 25.5 mtr Stall regulated blades, Length: 25.5 mtr, Weight: 4.2 Mtons
Air brakes for slowing speed in case of shutdown last 10ft rotate in the wind.
Hydraulics designed fail-proof (brakeds deployed when power down or problems.

Nacelle

Length: 20.3ft (6.2 mtr), Height: 10.6ft (3.42 mtr), Width: 7.2ft (2.2 mtr).
Weight: 25 Mtons.
Nacelle is steel platform width fiberglass housing.
This houses the Main Shaft, Gearbox, Generator and a lot of the needed equipment and controls.

Main shaft

Almost solid, painted steel, diameter: 2.9ft (0.9 mtr), Length: 6.9ft (2.1 mtr) Weight: 2.4 Mtons

Gearbox

Helical-Planetary Gear Box, Ratio 1:81, Length: 6.2ft (1.9 mtr), Width: 5.9ft (1.8 mtr), Weight: 5.6 Mtons

Asynchronous Generator

Watercooled stator, Air cooled windings, 200kW + 900kW generator
Low windspeeds (below approx. 4 m/s) 14.9 rpm is 1200 rpm with 200kW generator
High windspeeds (above approx 4 m/s) 22.4 rpm is 1800 rpm and 900kW generator

Turbines spin only driven by wind until approx. 1000 rpm.
Computer 'reads' how fast it is speeding up and how high and consistent the windspeed is.
Based on those criteria it selects the small generator (200kW)or big generator (900kW).
Just before the 1200 rpm or 1800 rpm, the contactors connect the generator with the grid.
The generator 'follows' the grid to match the sinewave AC electricity to synchronize.
If there is no grid available, the generator cannot follow grid, so generator shuts down.
All generators need the grid to generate electricity.
The generator needs to follow the grid AND it needs to deliver the energy somewhere.

The project generates 2468 MWh on average, each year.
Crystal Flash Renewable Energy has recently partnered with the Kalamazoo Valley Community College to maintain the wind generators according to industry standards, with their technicians classes, as part of their training.