Big Kinetic

turbines (wind etc)

ITP 2012 Feddersen/Energy

Axis

“Vertical” (Perpendicular to wind)

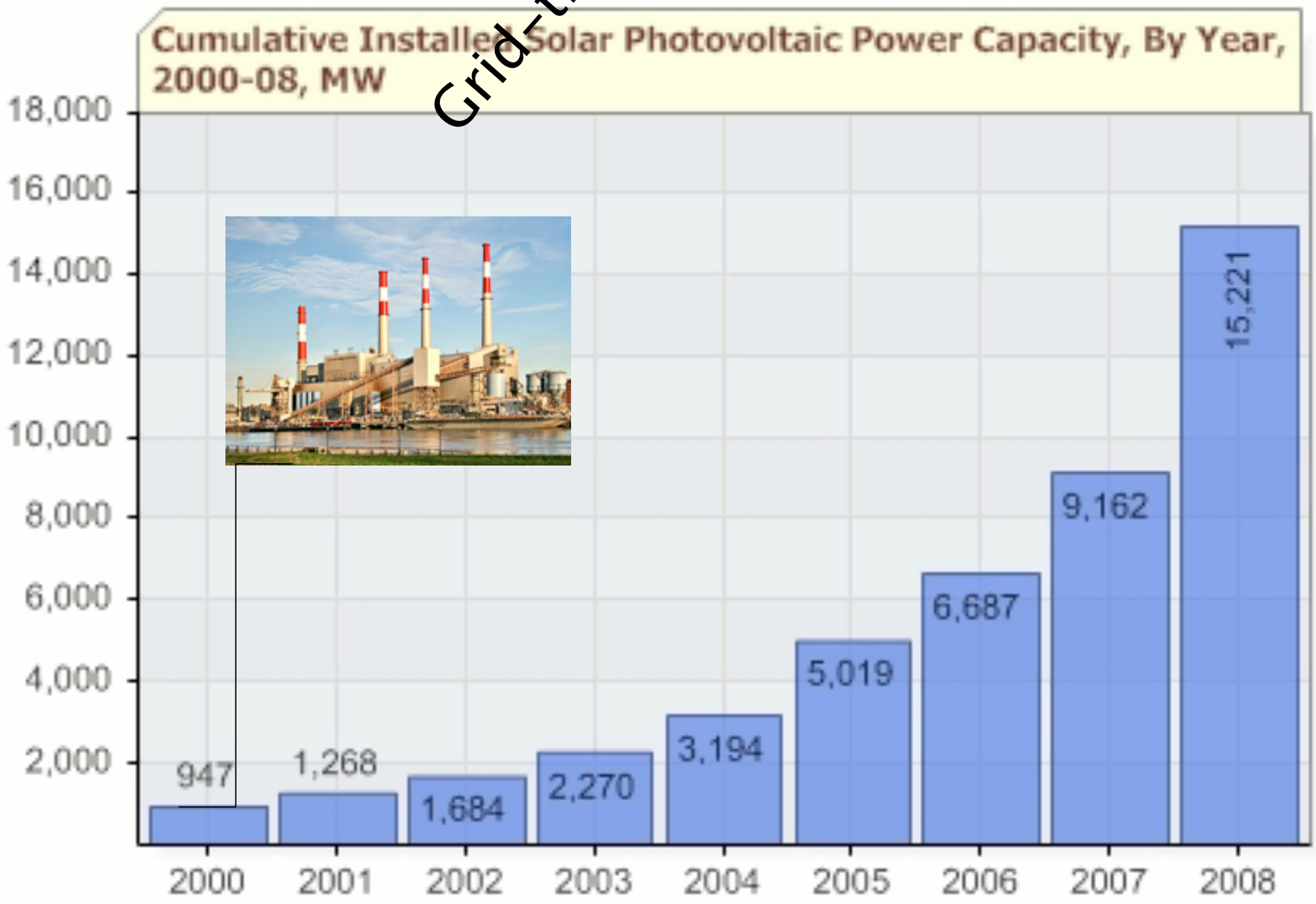
“Horizontal” (Parallel to wind)

Type

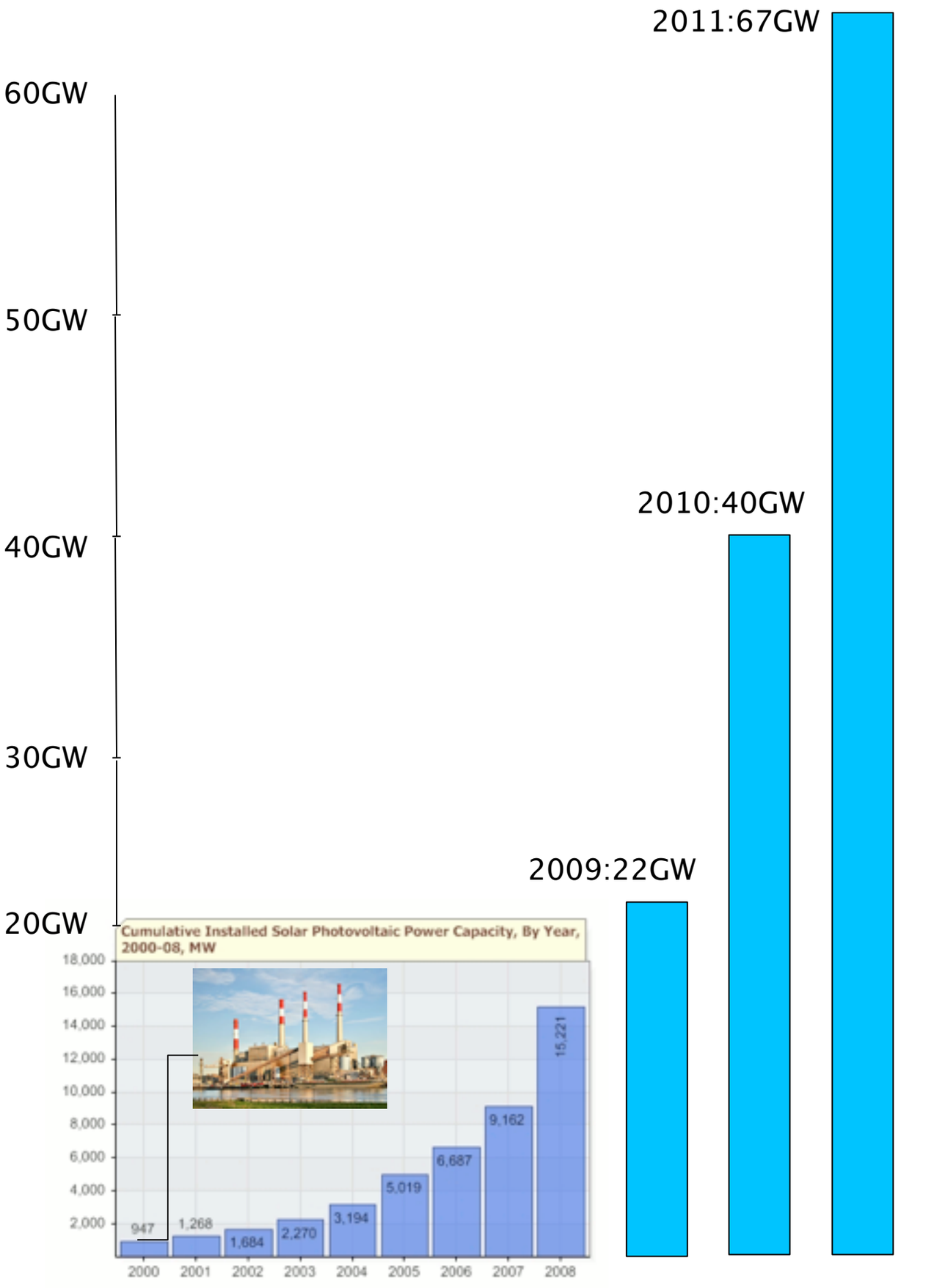
Lift

Blade

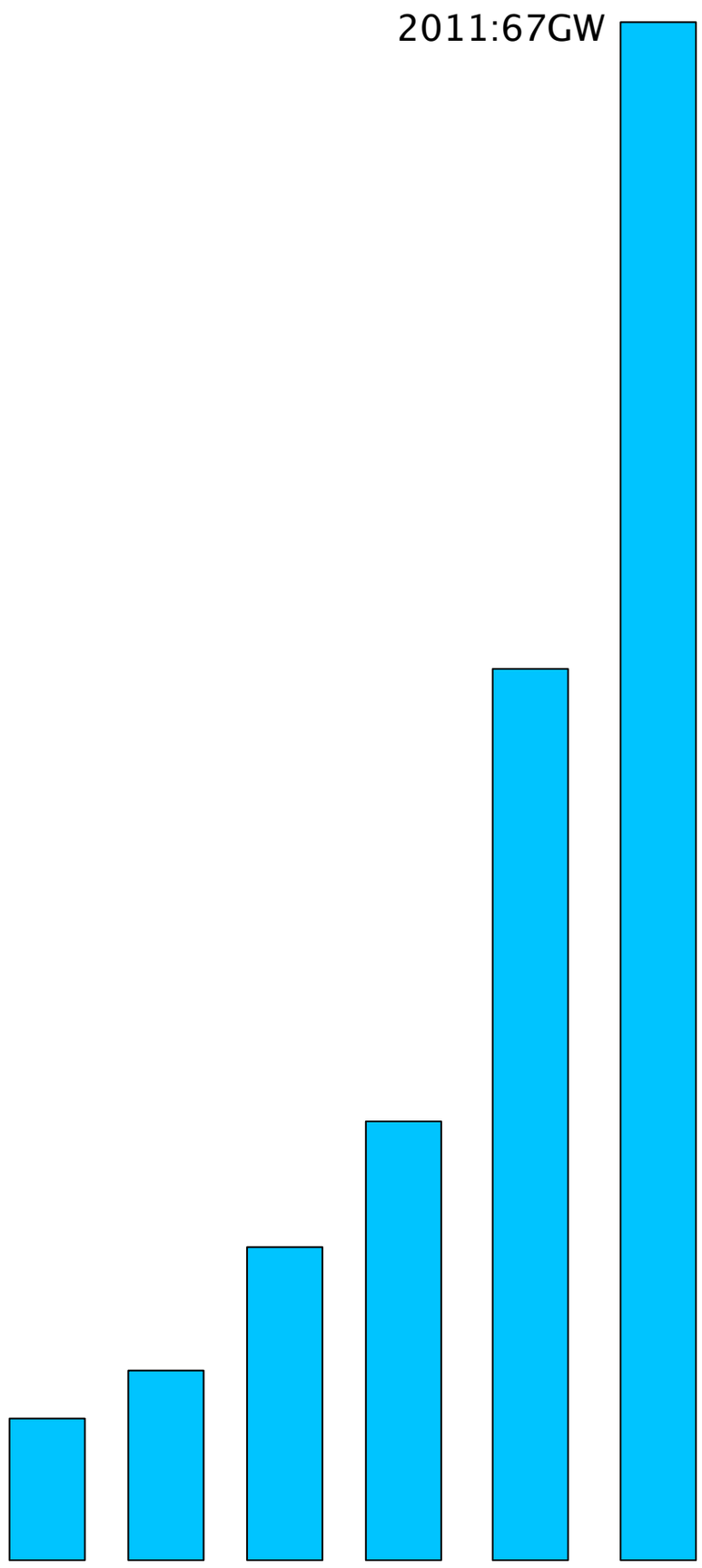
Drag

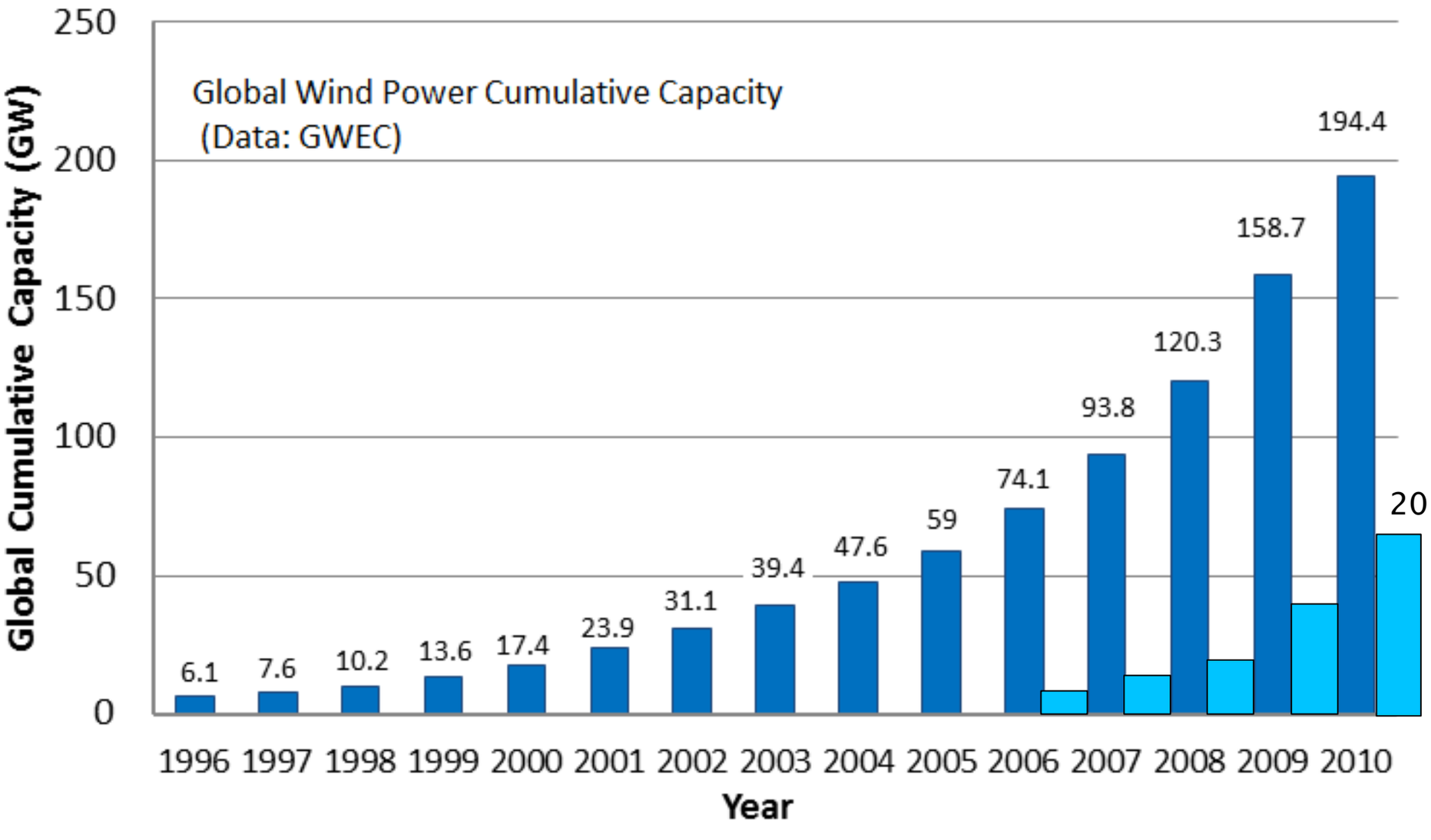


Source: http://www.energyandcapital.com/
Inset: Big Allis, first 1GW generator, in Queens.



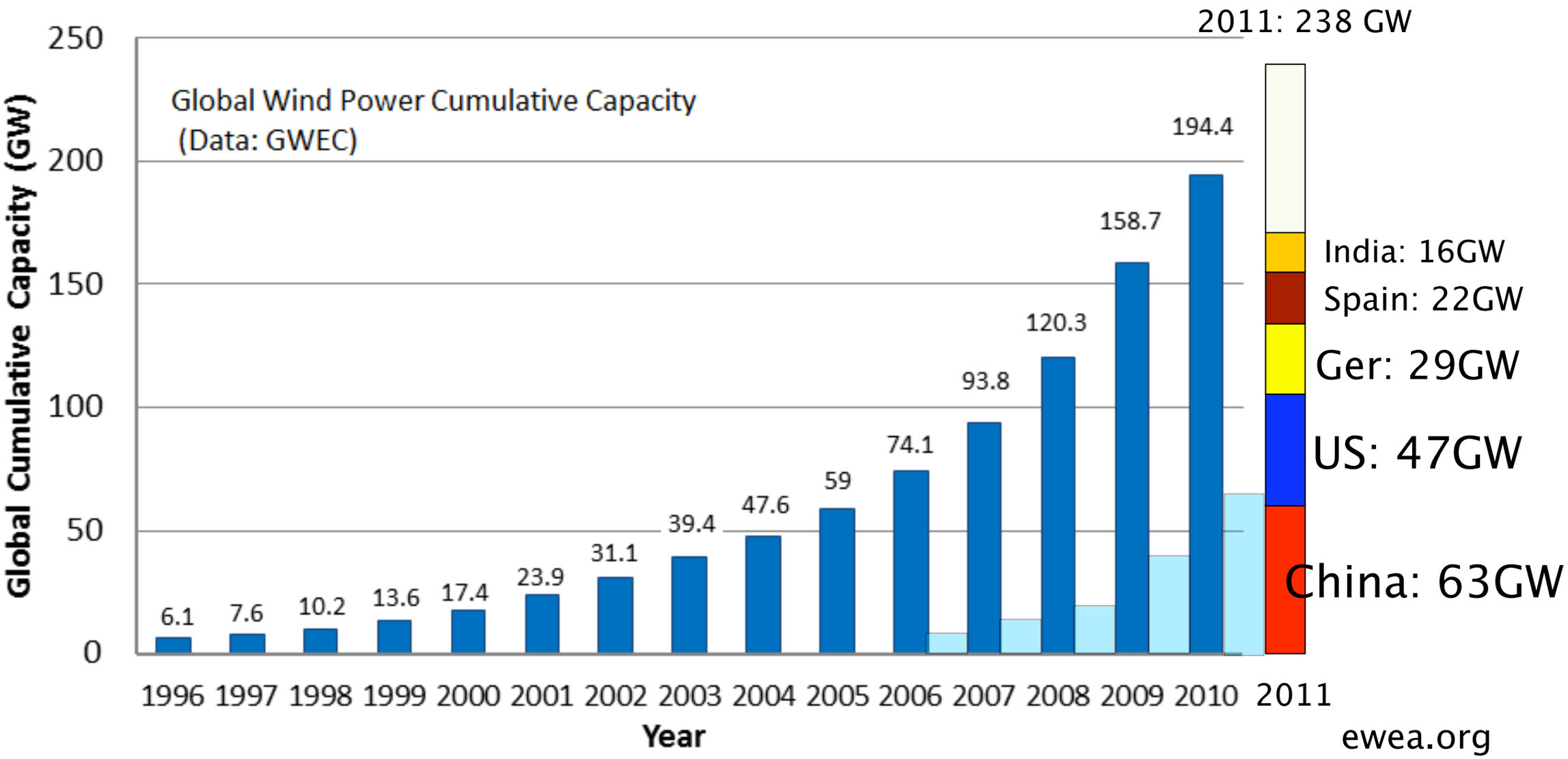
GTMedia, wikipedia


2011:67GW



2011:67G Solar

Wikipedia



Wikipedia

ewea.org

~ 2MW typical turbine size


2.3 MW
x 11,500*
*200 watt output

2.3 MW

x 22*

*140 hp output

2.3 MW

*1000 MW

Brooklyn Wind Turbine

Vestas V27
225 kW

572 m²
swept area

31m tall

13.5m blade length

Project West Wind

Siemens 2.3
2.3 MW

5,026 m²
swept area

67m tall

40m blade length

Mahinerangi

Vestas V90
3 MW

6,082 m²
swept area

80m tall

44m blade length

Enercon E126
7.58 MW

12,469 m²
swept area

135m tall

63m blade length

http://www.juwisolar.com/

Google Earth

2.2 MW solar installation for Mars Corp, Hackettstown, NJ

Capacity factor: 20 - 40%

2.3 MW × 365 days × 30% = 6 GWh

Wikipedia

Offshore wind

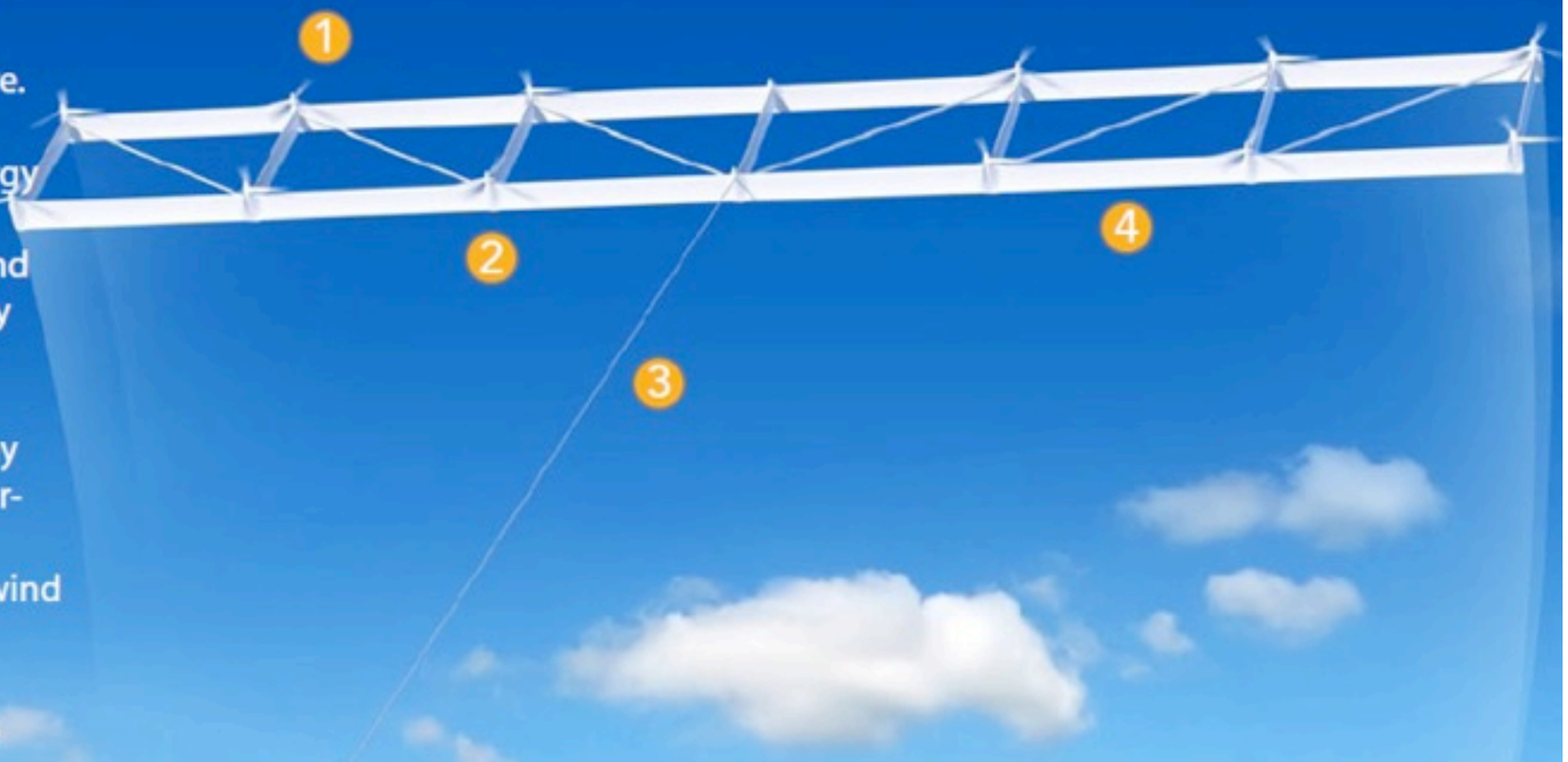
Makani M30 30kW
prototype airborne turbine

Airborne Wind Turbines

Joby Energy is developing airborne wind turbines which will operate in the upper boundary layer and the upper troposphere.

While knowledge of the tremendous energy in high-altitude wind is not new, recent advances in power electronics, sensors, and control systems now make our technology practical.

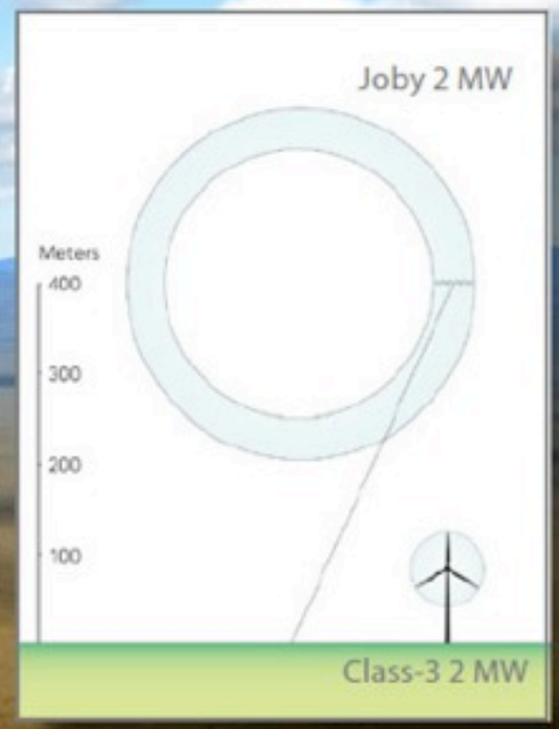
Our multi-wing structure supports an array of turbines. The turbines connect to motor-generators which produce thrust during takeoff and generate power during crosswind flight. Orientation in flight is maintained by an advanced computer system that drives aerodynamic surfaces on the wings and differentially controls rotor speeds. A reinforced composite tether transmits electricity and moors the system to the ground. The high redundancy of the array configuration can handle multiple points of failure and remain airborne.



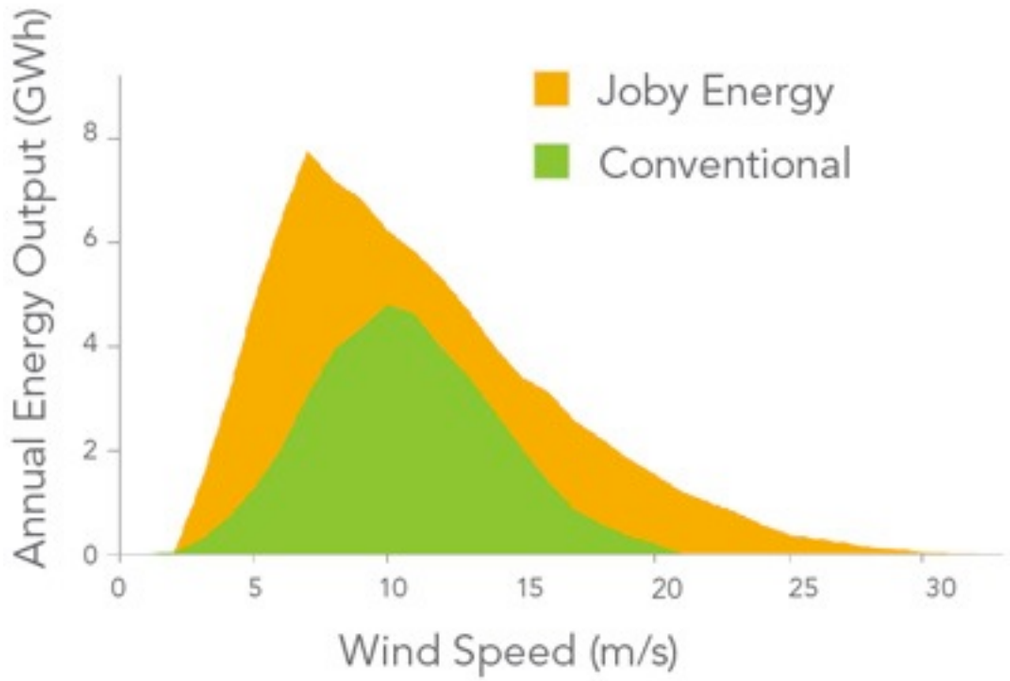
Joby turbine

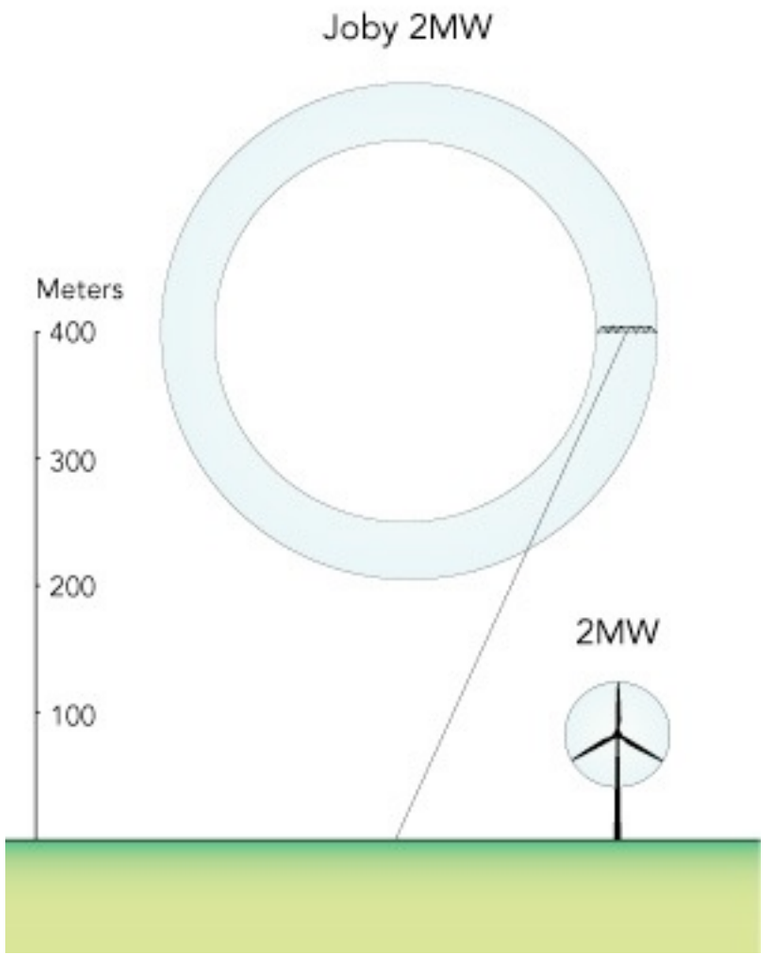
How It Operates

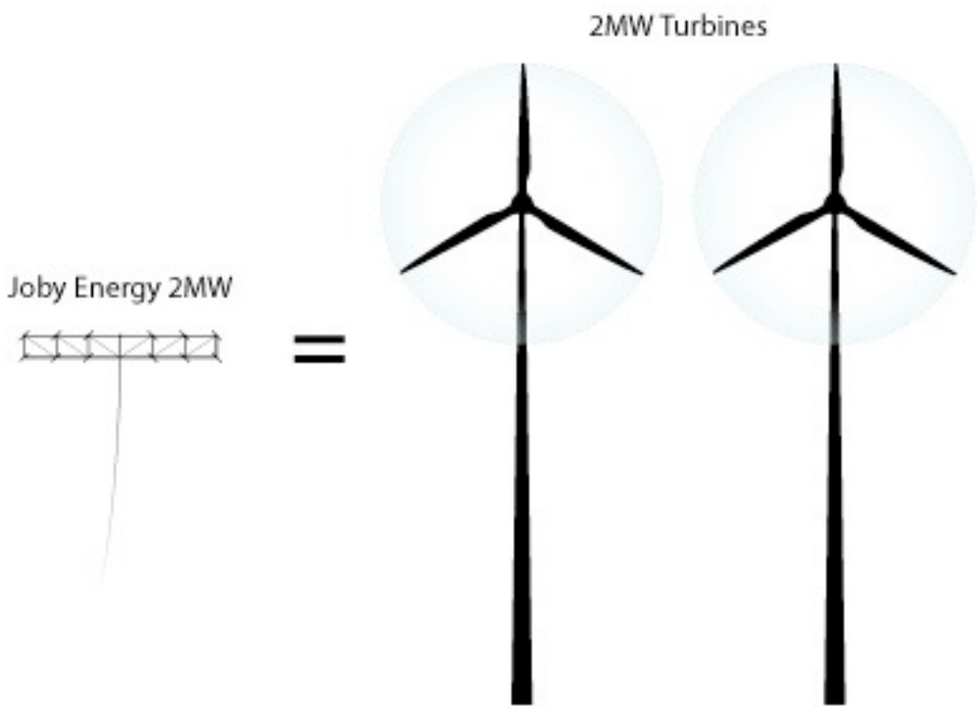
For launch, the turbines are supplied with power to enable vertical take-off. Upon reaching operating altitude, the system uses the power of the wind to fly cross-wind in a circular path. The high cross-wind speeds result in the turbines spinning the generators at high speeds, eliminating the need for gearboxes and increasing efficiency. The energy is transferred to the ground through the electrical tether. During occasional periods of low wind the turbines are powered to land the system safely.



Joby turbine data
(predicted)

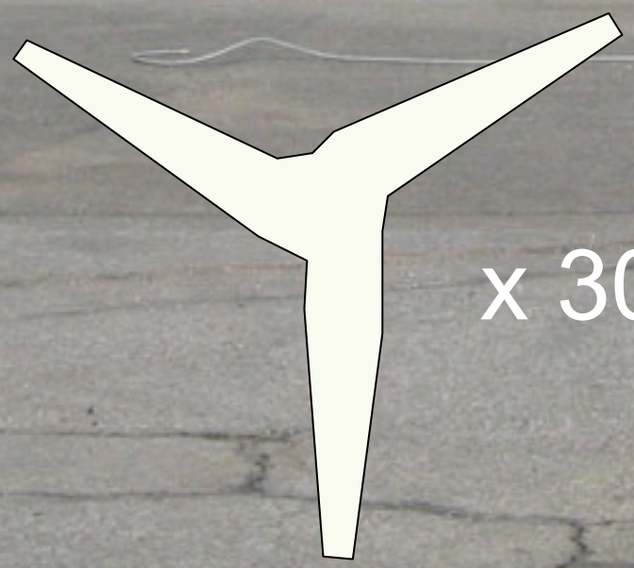






- Phase 1 (2002 – 2006): Prototype Testing
- Phase 2 (2006 – 2009): Demonstration
- Phase 3 (Current): MW-Scale Build-Out

Verdant Power East River turbines

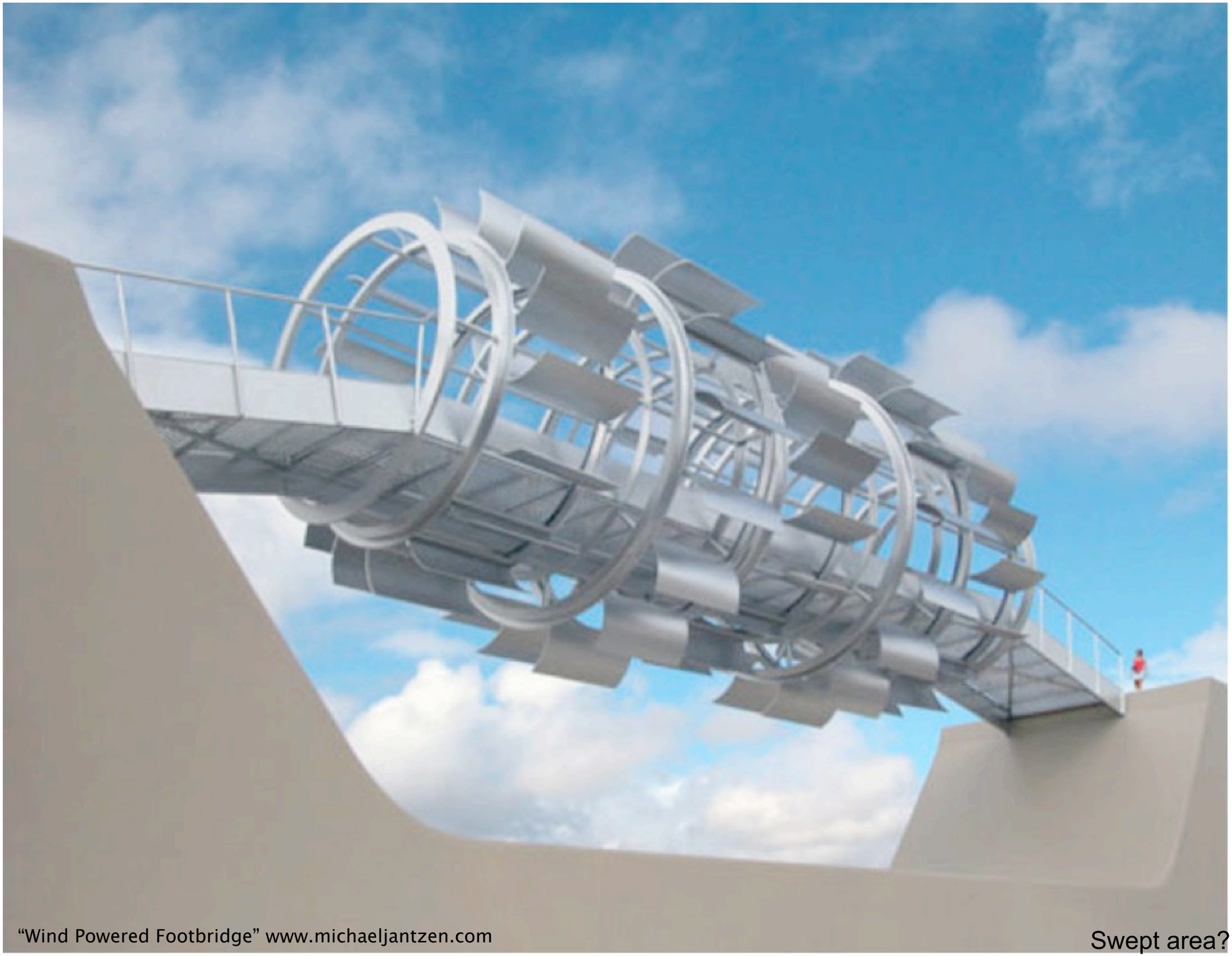


x 30 = 1 MW

Verdant Power East River turbines

Source of wind?

Source of wind?



"Wind Powered Footbridge" www.michaeljantzen.com

Swept area?