

AVEtec Energy Corporation



We produce perfectly green electrical energy from low temperature heat.

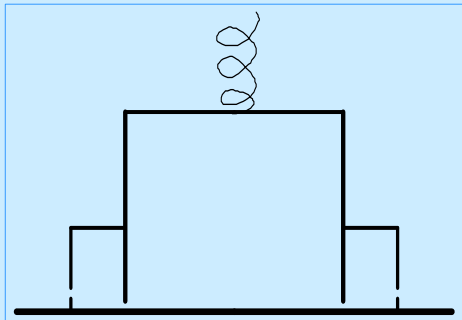
For more information visit:
<http://vortexengine.ca>

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Atmospheric Vortex Engine

- Work is produced when heat is carried upward by convection in the atmosphere because more work is produced by the expansion of a warm gas than is required to compress the same gas after it has been cooled.
- The Atmospheric Vortex Engine harnesses work of convection to produce electricity.



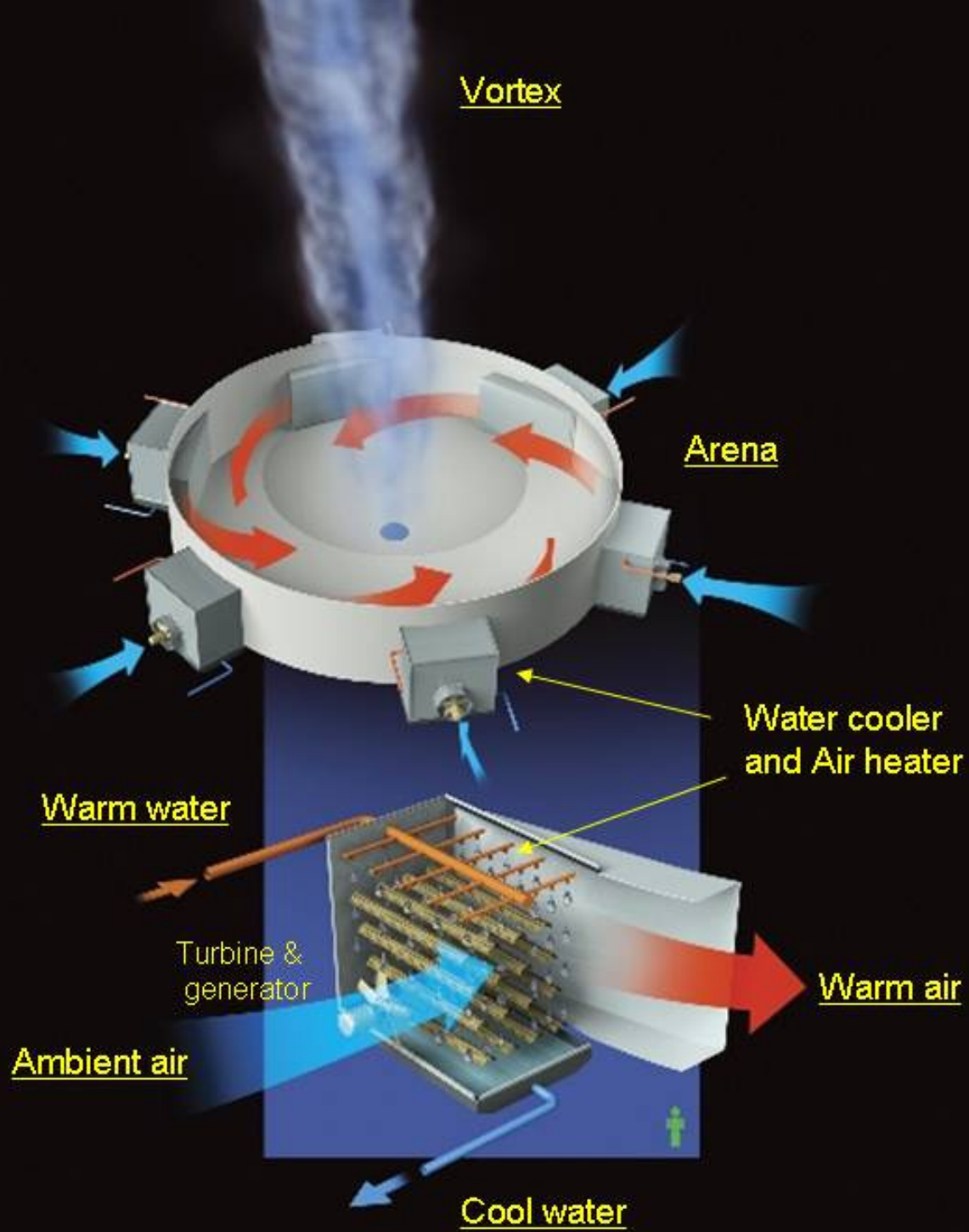
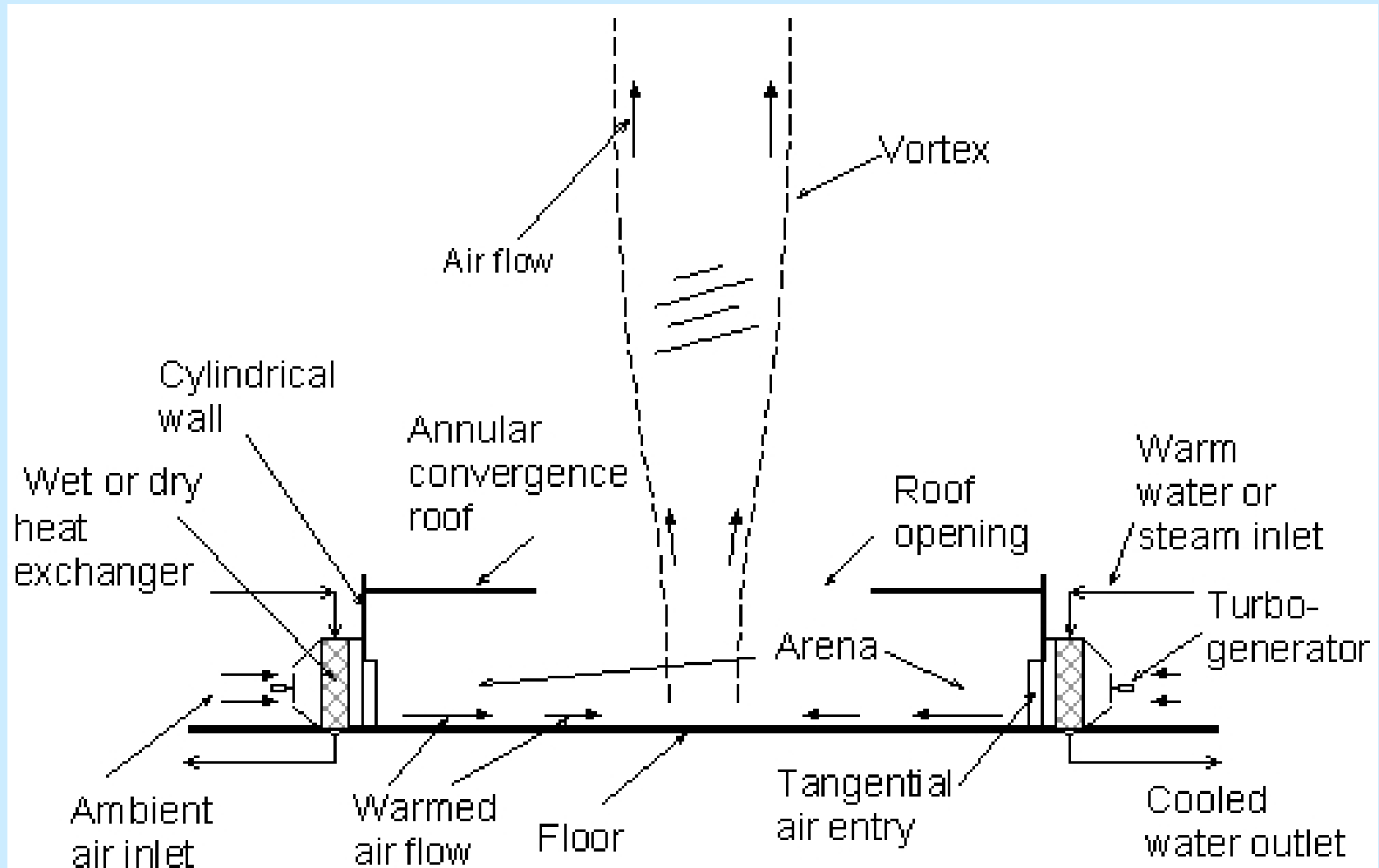
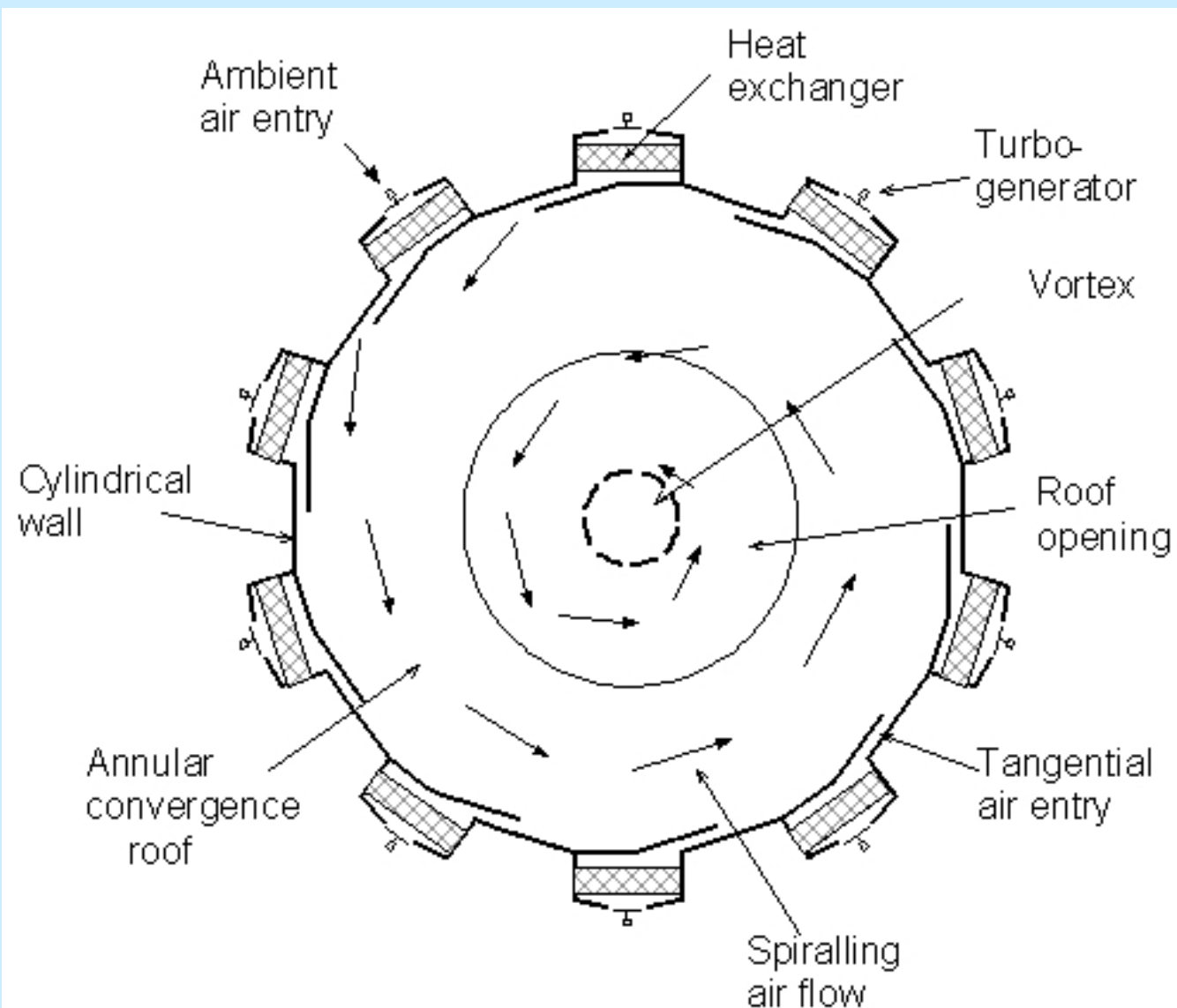


Illustration by:
Charles Floyd



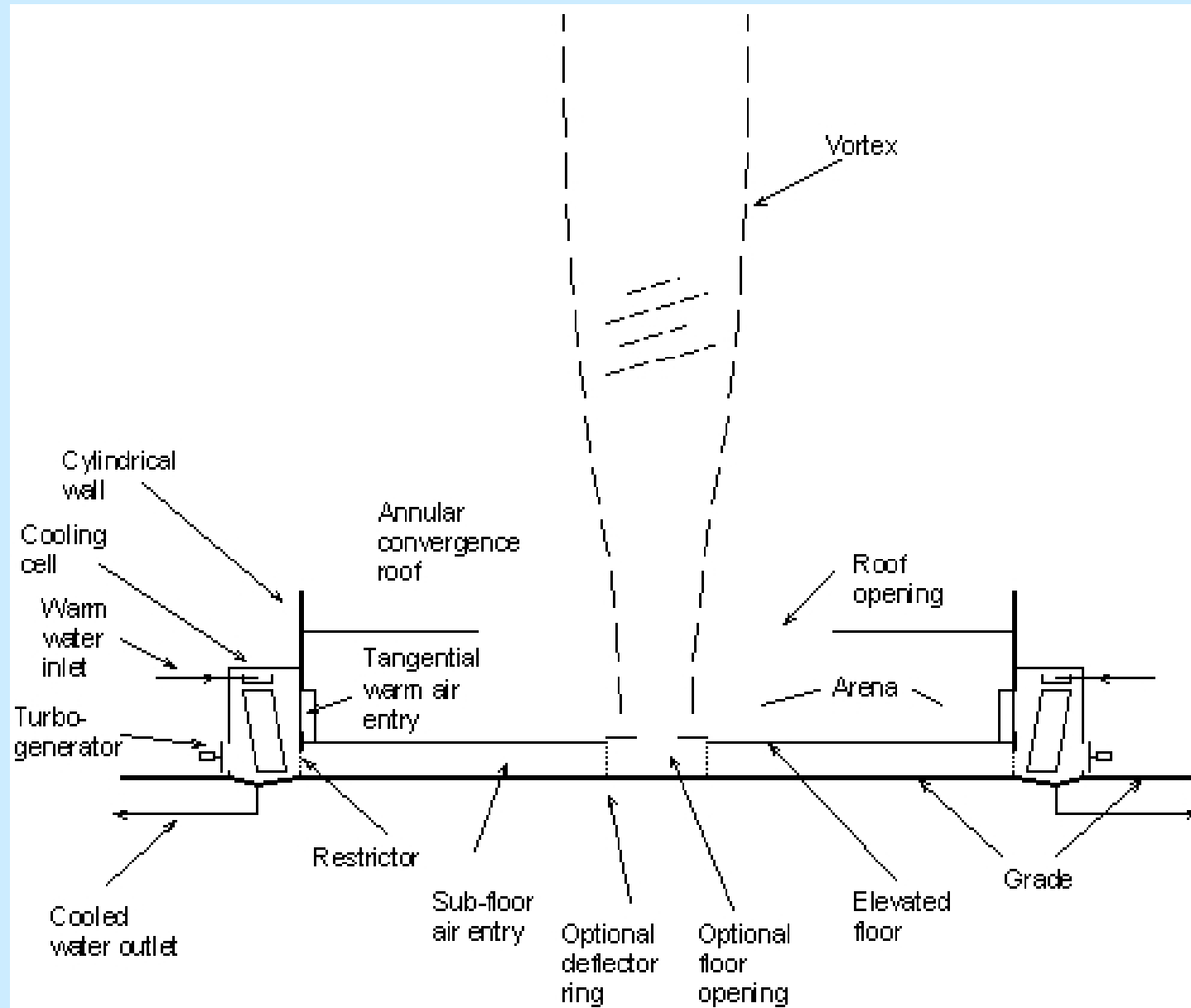
Atmospheric vortex engine side view



Atmospheric vortex engine plan view

Wet cooling tower AVE – Side view

Capacity approximately 200 MW



Typical Vortex Engine Size

- Circular wall diameter 50 to 200 m
- Circular wall height 30 to 80 m
- Vortex base diameter 20 to 100 m
- Vortex height 1 to 20 km
- Heat input 1000 MW. 20, 50 MW cooling cells
- Electrical output 200 MW. 20, 10 MW turbines
- Specific work 1000 to 20000 J/kg
- Air flow 20 to 100 Mg/s
- Water flow 40 to 200 Mg/s

Electricity from Atmospheric Convection



Manzanares Solar Chimney

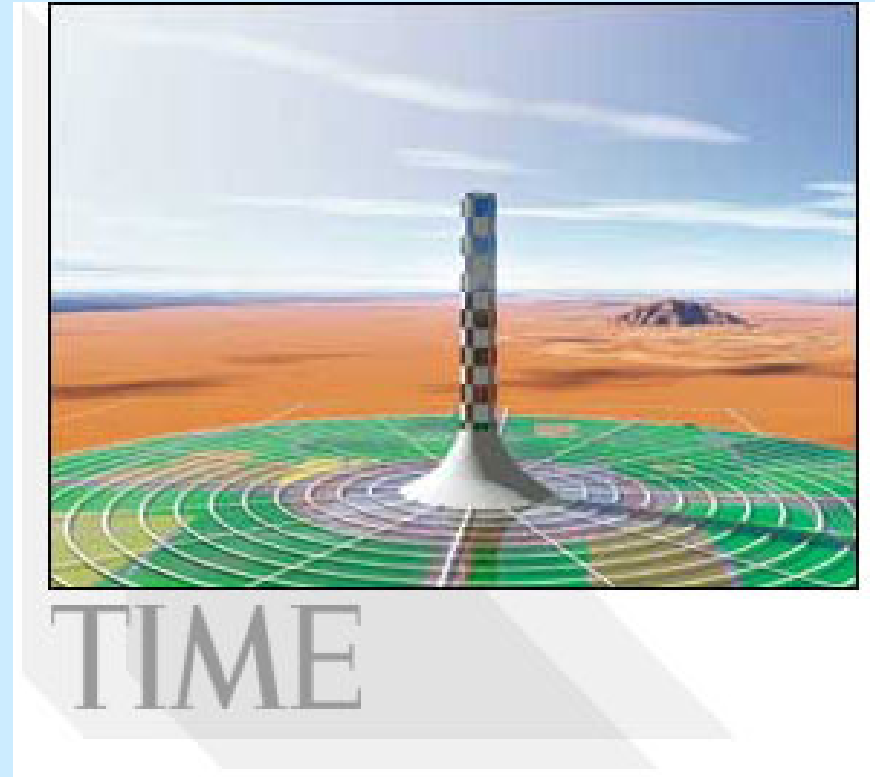
200 m high, 10 m diameter

Collector 0.04 sq. km

50 kW, 130 J/kg, 1 Mg/s

Efficiency 0.2%

Spain 1982 to 1989



EnviroMission Solar Chimney

1 km high, 130 m diameter

Collector 40 sq. km

200 MW, 800 J/kg, 300 Mg/s

Efficiency 1.5%

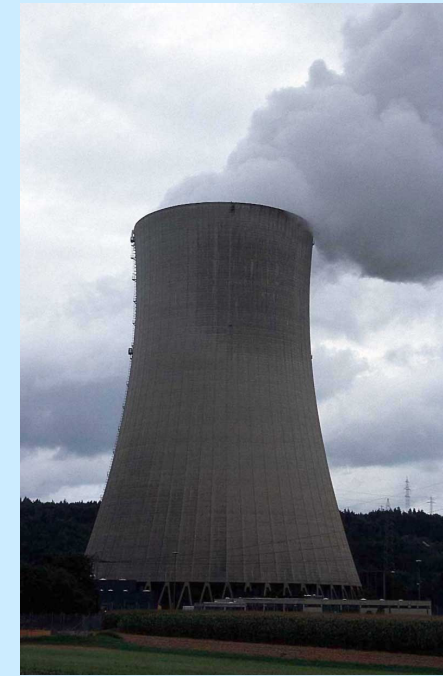
Australia, 2008+

- The AVE replaces the physical chimney with centrifugal force in a vortex.
- The AVE eliminates the solar collector by using waste heat or natural low temperature heat sources.

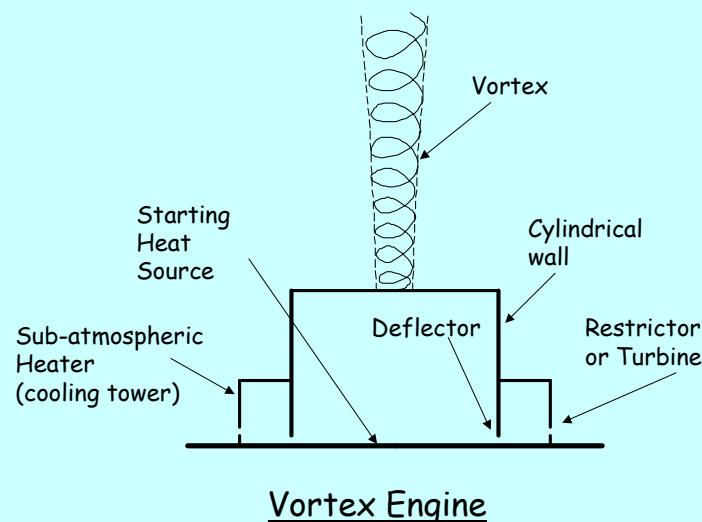
Cooling Towers



Mechanical Draft: \$15 million 40 m tall mechanical draft tower uses 1% of power produced to drive fans.
(uses energy)



Natural Draft: doesn't need fans but is 150 m tall and costs \$60 million.
(saves energy)



Vortex Cooling Tower: \$15 million 40 m tall to function like a natural draft tower. (produces energy!)



Vortex in 1 meter diameter physical model

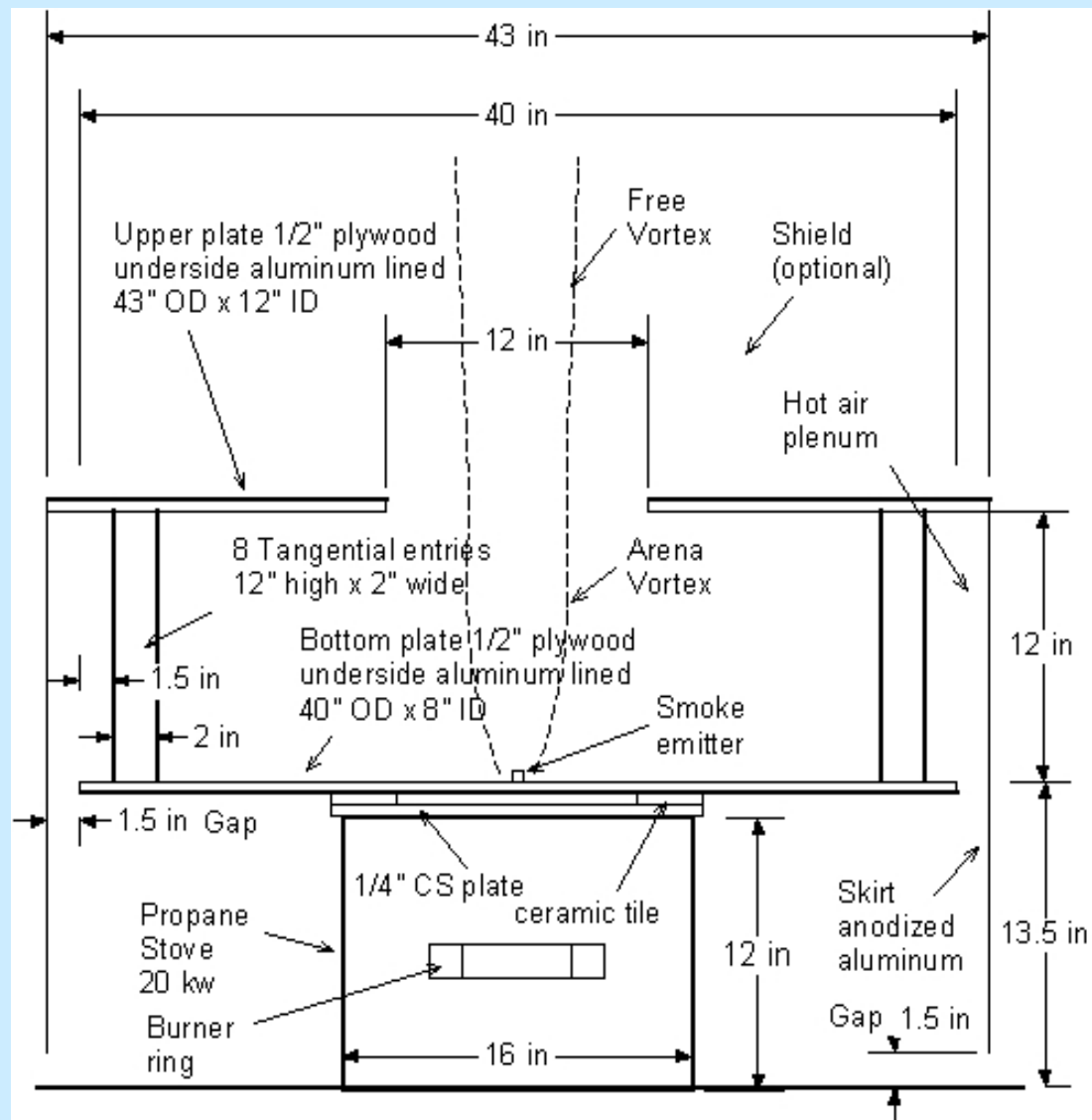
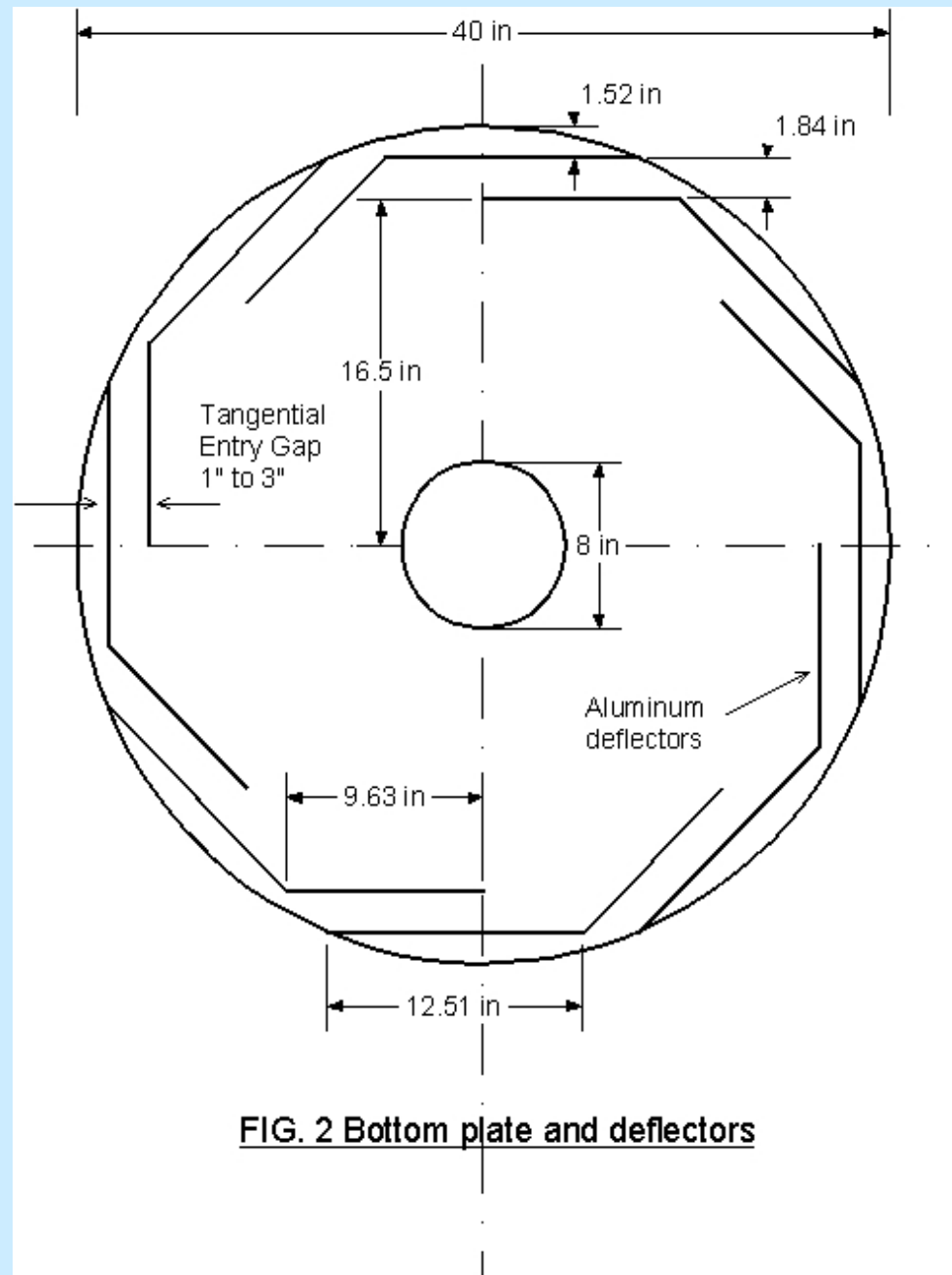


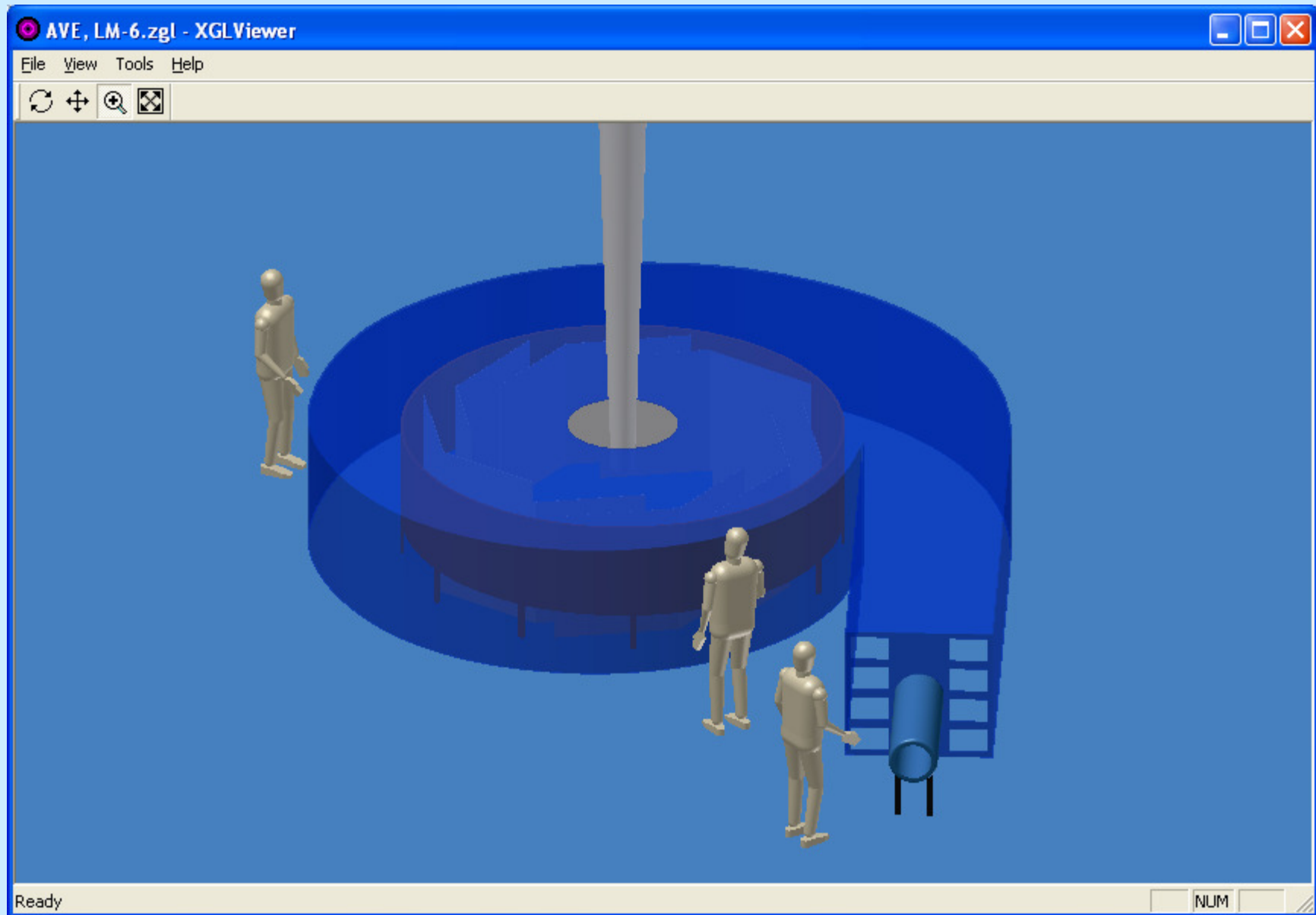
FIG. 1 Model Side

1 meter diameter physical model – side view



1 meter diameter physical model – top view

Proposed 4 m diameter prototype transparent wall view



Petrolia

4 m prototype
vortex

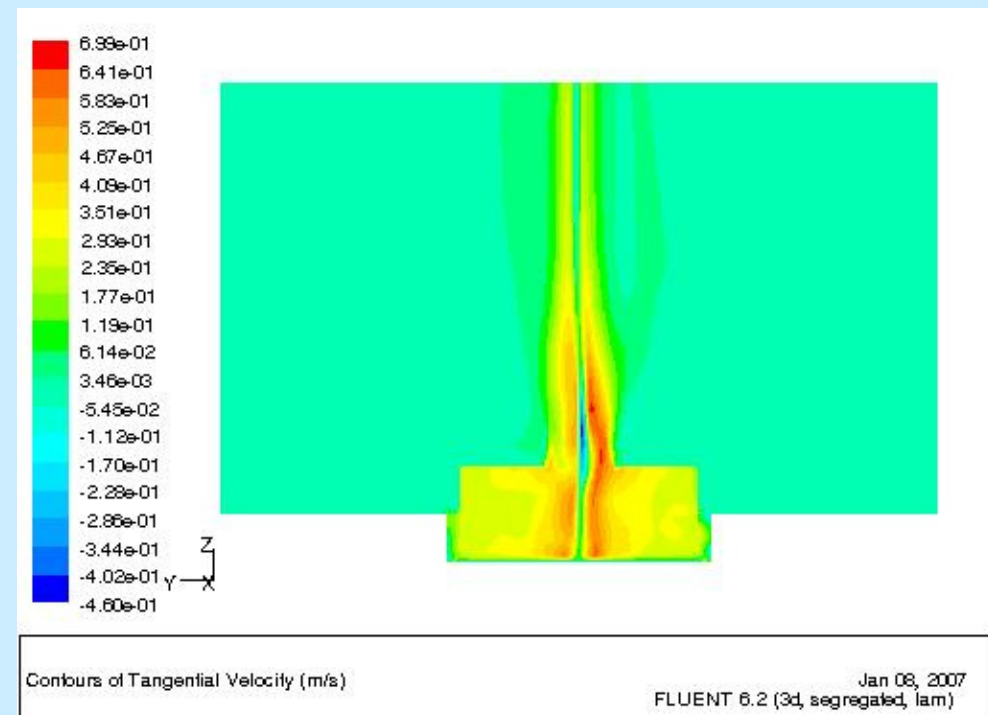
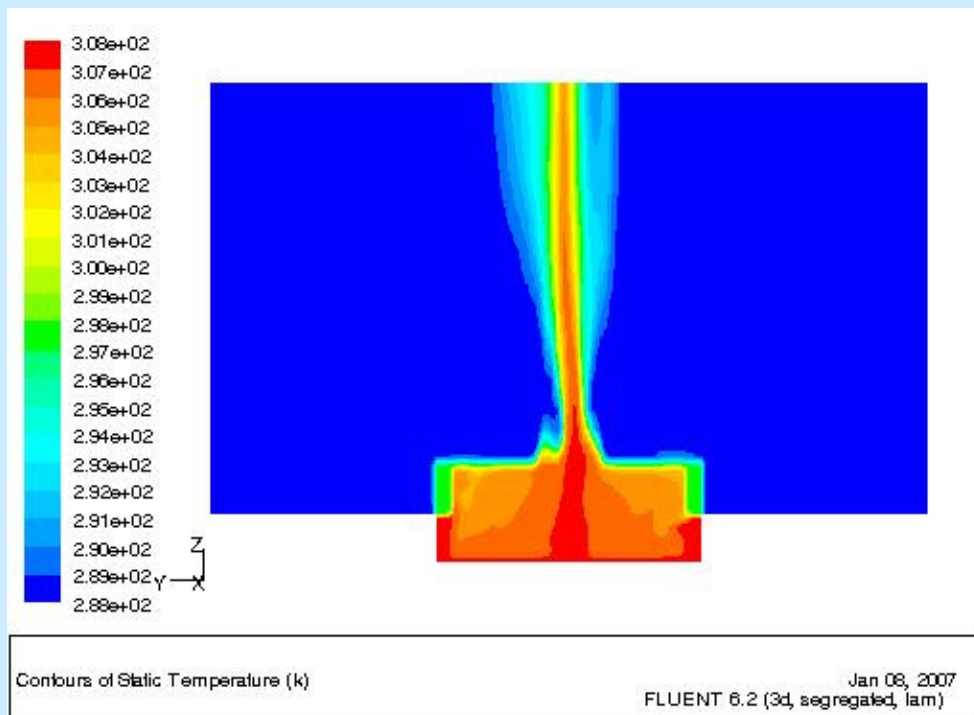


Video available at:

<http://vortexengine.ca/LM6/20080925155414-1.mpg>

CFD Results

- Ontario Centre of Excellence (OCE) and the University of Western Ontario (UWO) Boundary Layer Wind Tunnel Laboratory (BLWTL) recently completed a Computational Fluid Dynamics (CFD) study of the AVE
- Results for a 1 m diameter model simulation with a domain height of 2 m are shown below



Natural Vortices

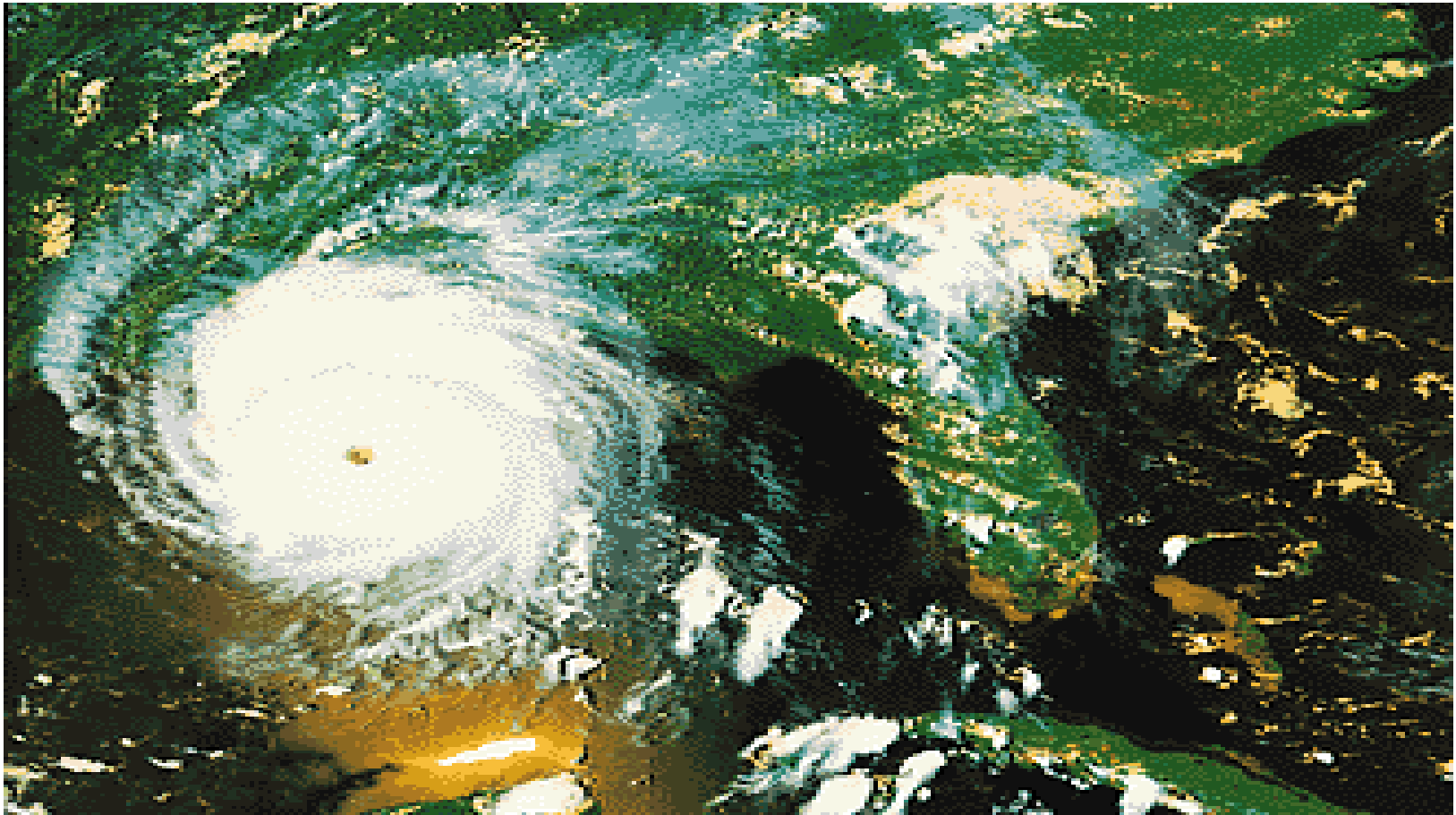


Tornado



Waterspout

Hurricane



NASA

Fire whirls

Accidental ←

Deliberate ↓



Source: Nate Smith

Courage



Source: Nate Smith

Energy Production Potential of the Atmospheric Vortex Engine

Atmospheric Vortex Engine
mechanical energy production
potential = 6,000 TW (Ref 3)
(Carnot Efficiency 12% X 52,000
TW = 6,000 TW)

Total incoming
solar radiation =
174,000 TW
(Ref 1)

Atmospheric
upward heat
convection =
52,000 TW
(Ref 1)

Total global energy production rate = 15 TW (Ref 2)

Total global electrical energy
production rate = 2 TW (Ref 2)

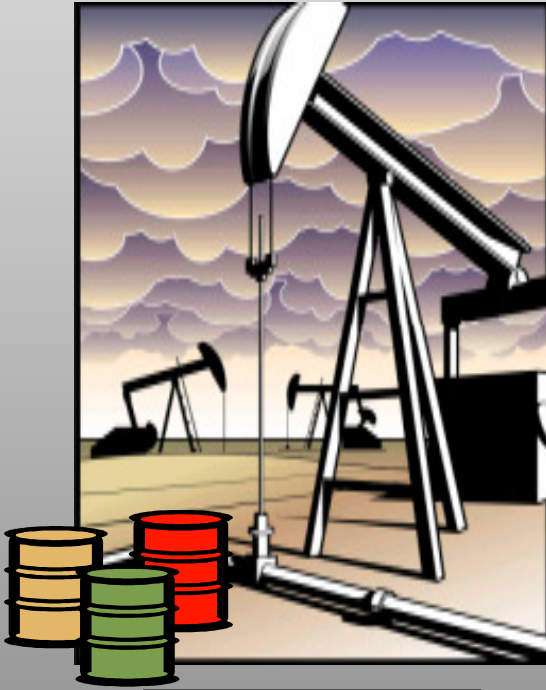


References:

- (1) Tremberth and NASA
- (2) US Department of Energy
- (3) L.M. Michaud

A Comparison of the Earth's Stored Energy Resources

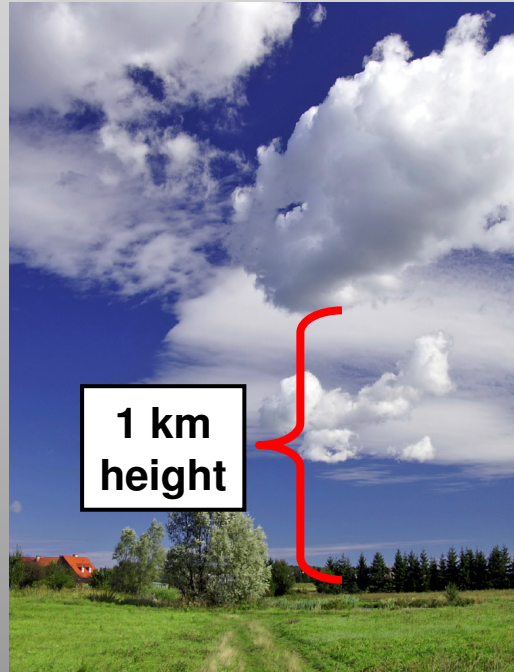
Crude Oil Reserves



$7.3 \times 10^{21} \text{ J}$



Latent heat of water vapor in the bottom kilometer of the atmosphere

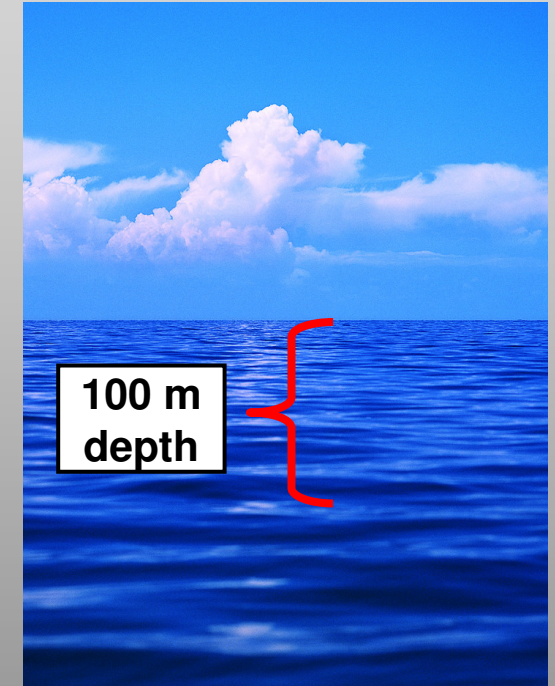


$13 \times 10^{21} \text{ J}$

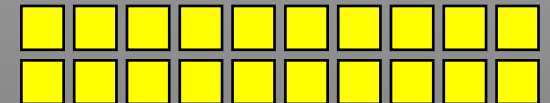


Heat content of tropical ocean water

100 m layer, 3°C



$130 \times 10^{21} \text{ J}$



Replenishment times

10^9 years

10 days

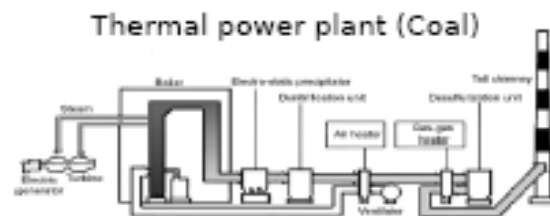
100 days

Cold Source – upper troposphere



AVE – Atmospheric
Vortex Engine

AVE heat source
EQUALS
waste heat rejected from
thermal power plant at
condenser temperature



Hot Source - superheated steam

$T_c = -23\text{ }^\circ\text{C}$
(250 K)

Q_{OUT}
780 MW

Heat
Engine

W_{OUT}
195 MW

Q_{IN}
975 MW

$T = 50\text{ }^\circ\text{C}$
(323 K)

Q_{OUT}
975 MW

Heat
Engine

W_{OUT}
525 MW

Q_{IN}
1500 MW

$T_H = 540\text{ }^\circ\text{C}$
(813 K)

Stage 2: Atmospheric Vortex Engine

Carnot Efficiency
 $\eta_c = 1 - T_L/T_H = 1 - 250\text{K} / 323\text{K} = 23\%$

Typical Efficiency (Estimated)
 $\eta \approx 20\%$

Overall Efficiency

(Thermal Power Plant + Atmospheric
Vortex Engine combined)

$W_{TOTAL} = 525 + 195 = 720\text{ MW}$

$\eta = (525 + 195) / 1500 = \mathbf{48\%}$

Stage 1: Thermal Power Plant (Coal)

Carnot Efficiency
 $\eta_c = 1 - T_L/T_H = 1 - 323\text{K} / 813\text{K} = 60\%$

Typical Efficiency (Real-world)
 $\eta = 35\text{-}38\%$

It is all about upward heat flow.

- Energy is produced when water is lowered.
- Energy is produced when heat rises.
- The energy produced in a large hurricane is more than all the energy produced by humans in a whole year.
- A mid size tornado can produce as much energy as a large power plant.
- Atmospheric upward heat convection has an enormous energy production potential.
- There is no need for a dedicated solar collector.
The solar heat collector is the earth's surface in its unaltered state.