*AVE*tec Energy Corporation

presents

The Atmospheric Vortex Engine

Use PgUp and PgDn
or arrow keys
or mouse wheel
to scroll ↑ and ↓

Everyone talks about the weather…

but no one does anything about it…

Until now!

Nature finds it very easy to produce a vortex

… in water

Whirlpools

… or in the atmosphere:

Hurricanes

Tornados

Water Spouts

Dust Devils

There is plenty of energy in an atmospheric vortex.

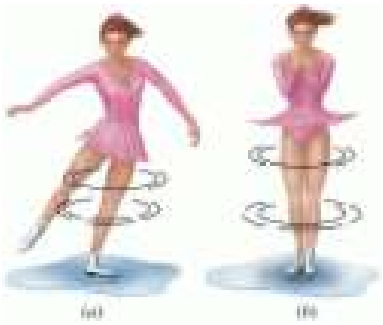
- a large hurricane has more energy than humans consume in a year
- one tornado has as much energy as a large power plant

We can harvest that energy if we can create and control an atmospheric vortex.

So the question is:
Can we create and control an atmospheric vortex?

There is nothing complex or mysterious about creating a vortex.

It's like figure skaters speeding up when they bring in their arms.



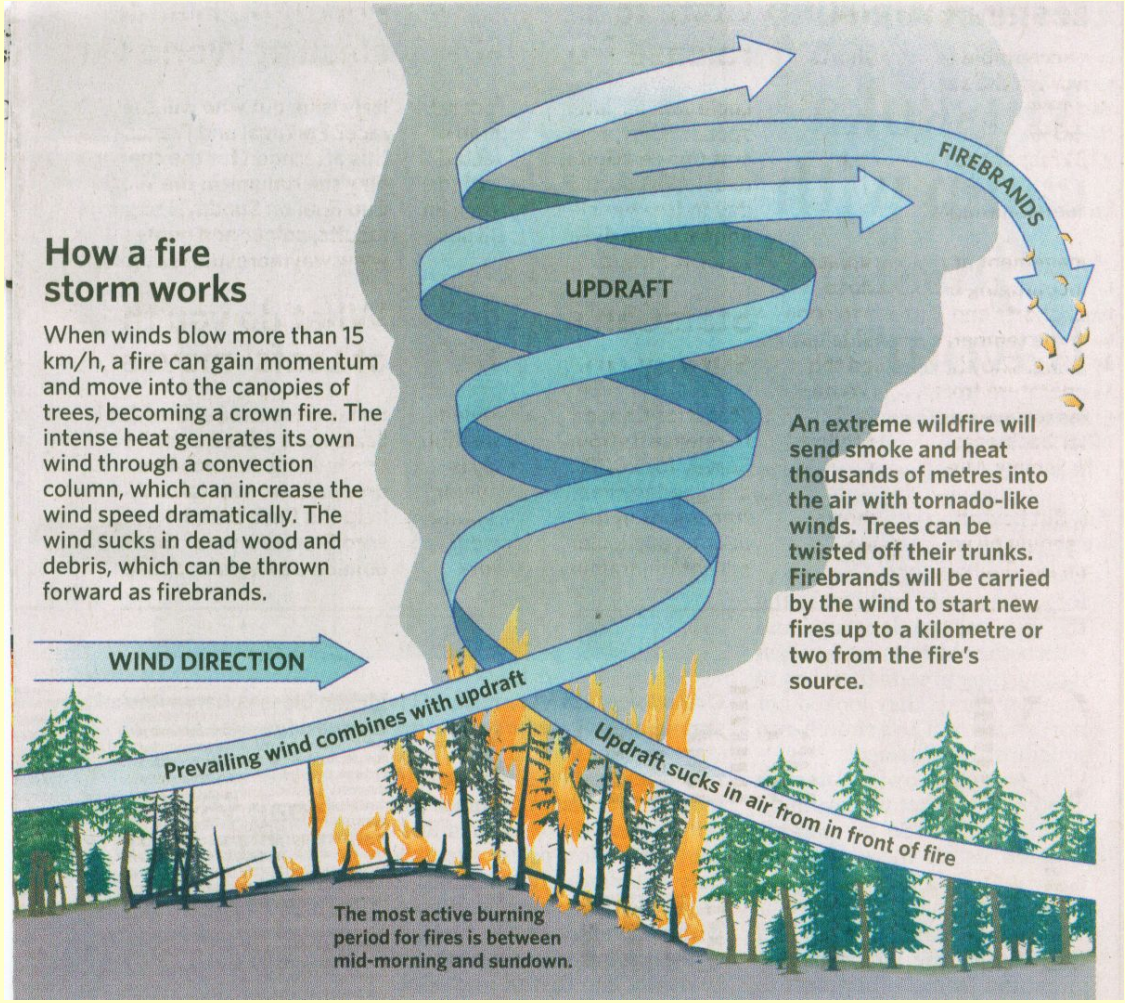
You create a vortex in water every time you pull the drain plug …

or flush your toilet.

Similarly, any source of hot air can create an atmospheric vortex.

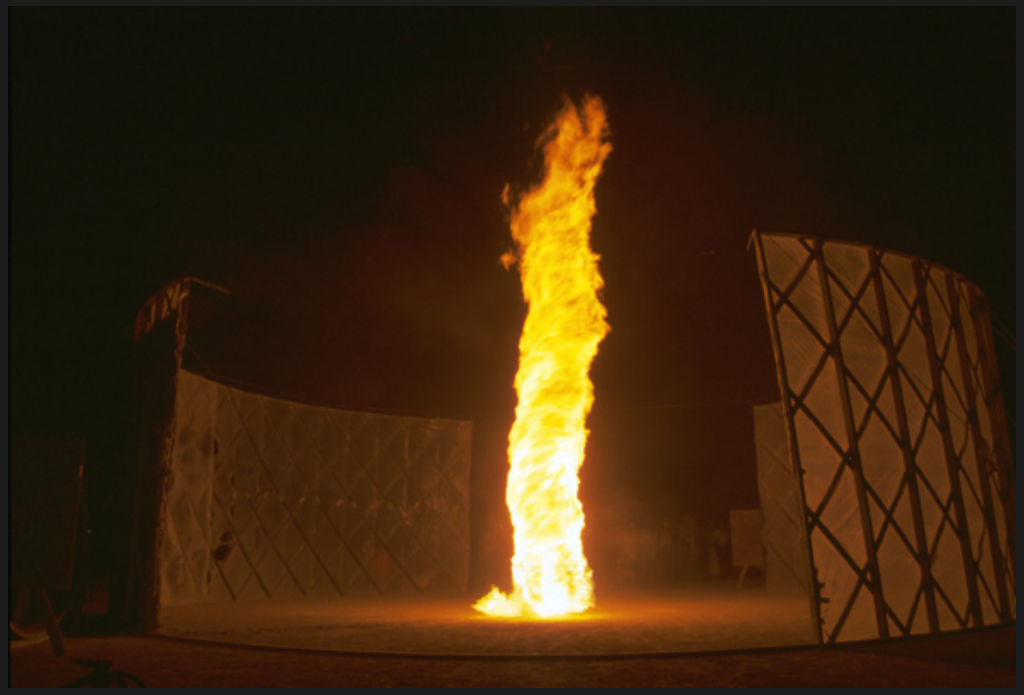
Forest fires,
urban fires,
volcanoes,
large fuel fires and
even burning haystacks
create spontaneous atmospheric vortices that are well documented in the literature. Link

All that is required is a rising mass of warm air …and a bit of spin added at the base.

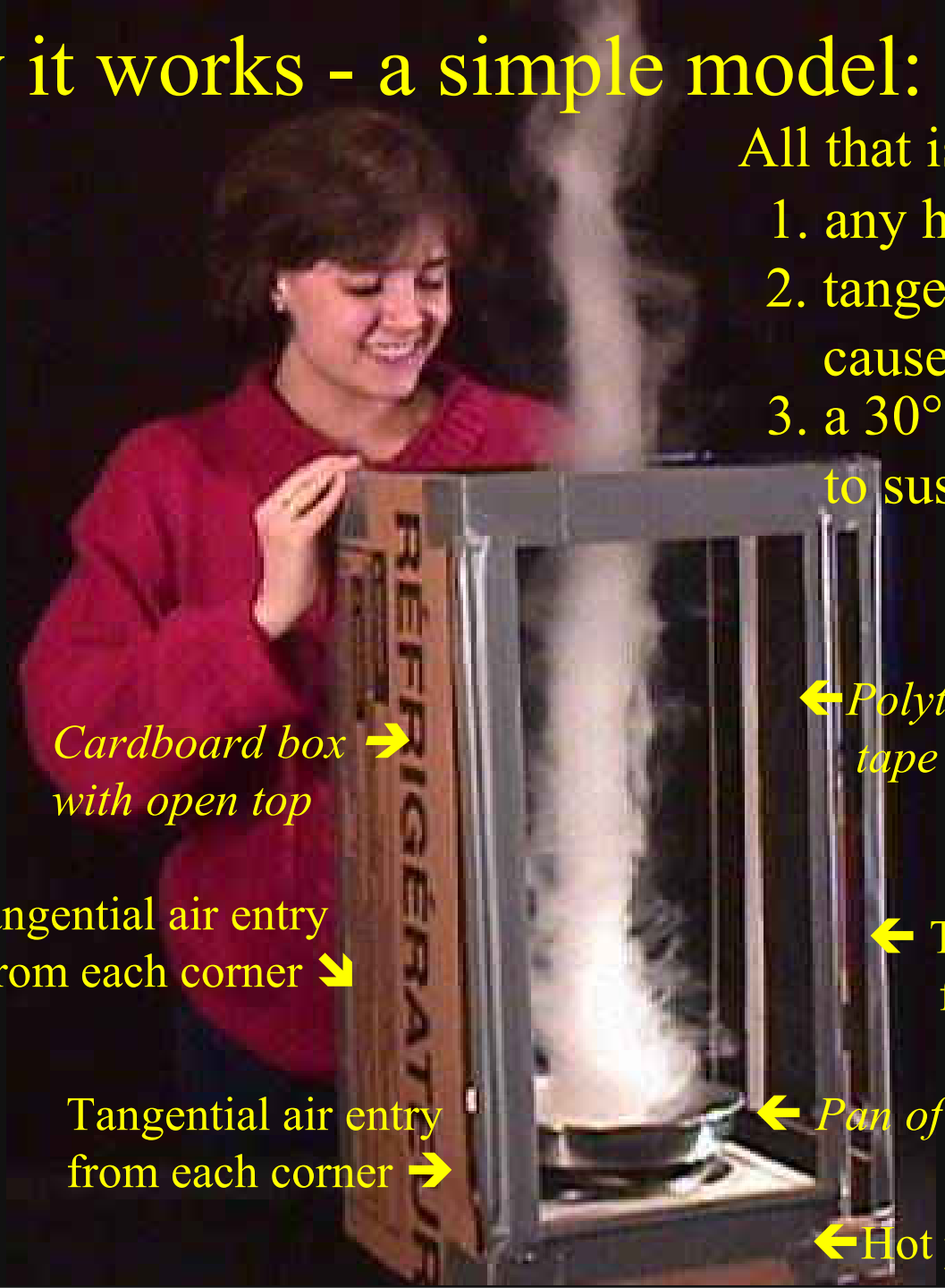


It is so simple and predictable that a US entertainer regularly creates atmospheric vortices for a fire-art show. Link

This shows that an artificial atmospheric vortex can be created and controlled.



How it works - a simple model:



All that is required is:

1. any heat source for updraft
2. tangential air entry ducts to cause spin
3. a 30° temperature differential to sustain vortex

Cardboard box ➔ with open top

Tangential air entry from each corner ➘

Tangential air entry from each corner ➔

🡐 *Polythene/duct tape windows*

🡐 Tangential air entry from each corner

🡐 *Pan of water for visible steam*

🡐 Hot plate as heat source

By imitating nature, we can create a vortex using low temperature heat sources.

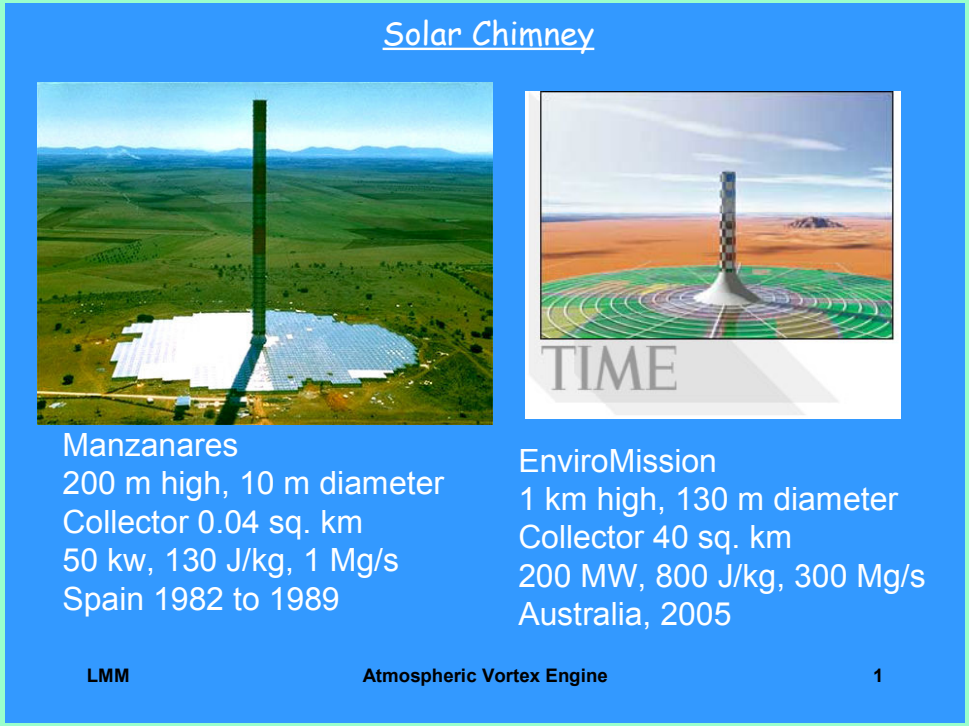
"If Mother Nature produces spontaneous vortices from 30° seawater, then we ought to be able to use 40° waste water to create an artificial vortex and extract energy."

Louis Michaud, inventor of the AVE Atmospheric Vortex Engine

The Solar Chimney proves that electricity can be extracted from low temperature updrafts.

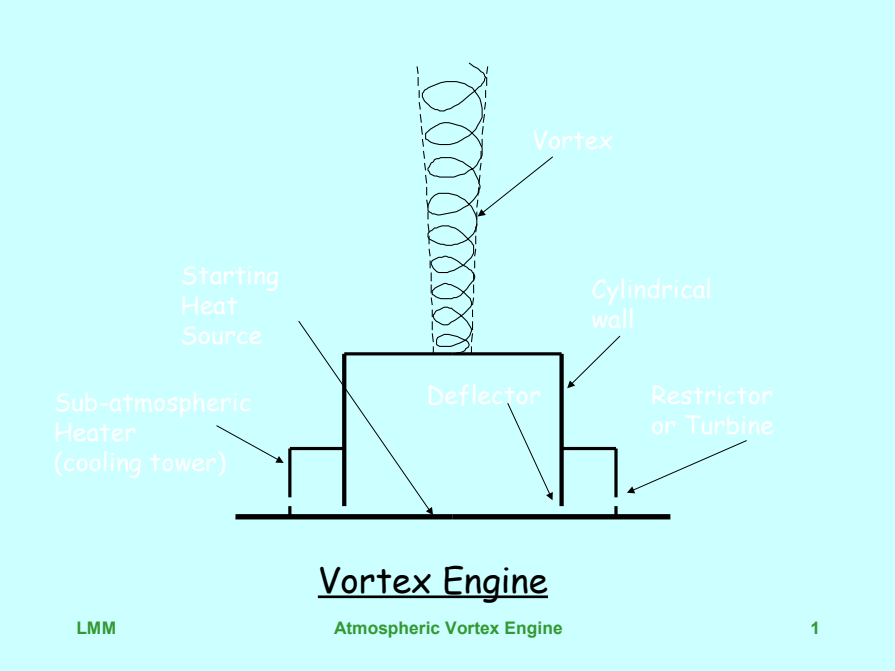
Spain operated a 200 meter tall 50 kW solar chimney for eight years Link

Australia is developing a 1 km tall 200 MW solar chimney Link



In the simplest terms, our business is about replacing a very tall and very expensive chimney with a vortex.

Like the solar chimney, we use ***updrafts*** to create wind and we harvest that wind with ***turbines***, but we replace the chimney with an artificial vortex.



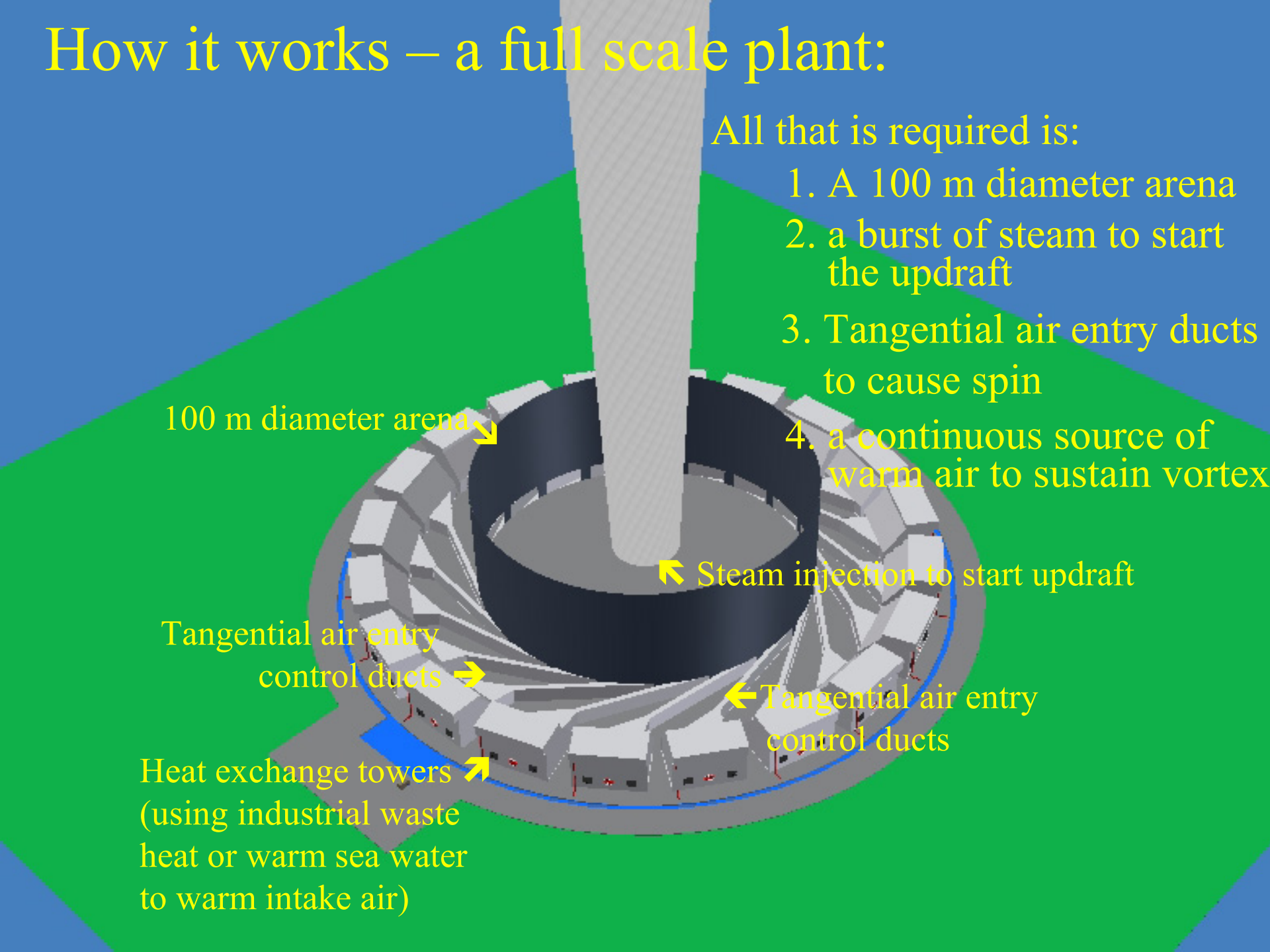
Our ***very tall*** and ***very inexpensive*** vortex lets us use the upper atmosphere with its -30ºC to -60ºC temperatures as the cold sink.

The temperature differential between +30ºC oceans or waste heat and the -30°C upper atmosphere lets us extract plenty of energy.

How it works – a full scale plant:

All that is required is:

1. A 100 m diameter arena
2. a burst of steam to start the updraft
3. Tangential air entry ducts to cause spin
4. a continuous source of warm air to sustain vortex



Enormous market opportunities

The Pain:

There is an urgent need to increase energy supplies and reduce greenhouse gasses, yet ***abundant sources of low-temperature heat are being wasted***.

The Solution:

We create value from low temperature waste heat by imitating nature.

By adding spin to the rising plume from an array of cooling towers, we create a vortex that serves as a virtual chimney and lets us harness energy from low-temperature waste heat. We call this the ***AVE*** **Atmospheric Vortex Engine.**

The Products:

1. The ***VCT*** **Vortex Cooling Tower** is a much more efficient cooling tower that costs less and can save 1% of the output of a thermal power plant.

2. The ***VPG*** **Vortex Power Generator** goes a step further and uses the vortex to produce 'green' electricity, increasing power output by up to 40% without any increase in emissions. (Alternatively, the ***VPG*** can use warm sea water or a solar greenhouse as the energy source.)

3. Numerous **'de-polluting' environmental by-products**.

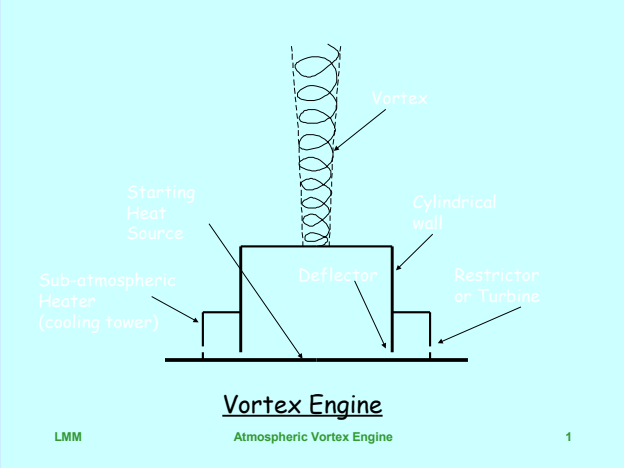
1. Cooling Tower Business Case: The *VCT* Vortex Cooling Tower:

- delivers the performance of a $60 million natural draft tower at the cost of a $15 million mechanical draft tower
- eliminates need for fans, saving 1% of the energy produced by a power plant
- eliminates need for tall chimney, saving 2/3 of the capital cost
- replaces conventional cooling towers
- delivers the heat to the upper atmosphere where it radiates into space
- solves problem of re-circulation
- solves problem of fogging

The US cooling tower industry is a **US$1 billion** per annum market.

Here is our competition:

$15 million 40 m tall mechanical draft tower uses 1% of power produced to drive fans



Vortex as virtual chimney allows $15 million 40 m tall *VCT* to function like a natural draft tower

A natural draft tower doesn't need fans but is 150 m tall and costs $60 million

2. Electrical Energy Business Case:

The ***VPG* Vortex Power Generator** produces cheap, clean 'de-polluting' electric energy

- converting 20% of the waste heat from a thermal power plant increases power output by 40%. (500 MW →700 MW)
- first energy source to contribute to global cooling, not global warming
- no tall physical chimney
- no solar collector
- no fuel and no combustion once started
- no harmful by-products
- only green by-products such as clouds, rain and smog removal
- add-on to any thermal power plant, replacing conventional cooling towers
- stand alone power plant in tropics: 'wind energy' in tropical doldrums using warm sea water as fuel

The US electricity industry is a **US$270 billion** per annum market. Note

Here is our competition: Note

Capital Cost 2004 US$/kW		**Variable Operating Cost** 2004 US$/kWh		**Fixed Operating Cost** 2004 US$/kW	
Nuclear	2,014	Hydro	.0320	Nuclear	61.82
Hydro	1,452	Diesel	.0289	Coal	35.21
Coal	1,443	Coal	.0265	Wind	27.59
Wind	1,167	Gas	.0188	Hydro	12.72
Gas	584	Nuclear	.0045	Gas	11.37
Diesel	385	Wind	.0000	***VPG***	**10.00**
VPG	**300**	***VPG***	**.0000**	Diesel	9.59

*The **VPG** has the <u>lowest capital cost</u>, and among the <u>lowest operating costs</u> for production of electricity.* Note

3. By-products Business Case:

De-polluting environmental products and by-products include:

- production of clouds and precipitation
- moving stagnant air
- potential to clean and vent stack gasses
- removing polluted surface air
- reduction of local surface temperature
- global cooler
- reduction of cooling water outlet temperature

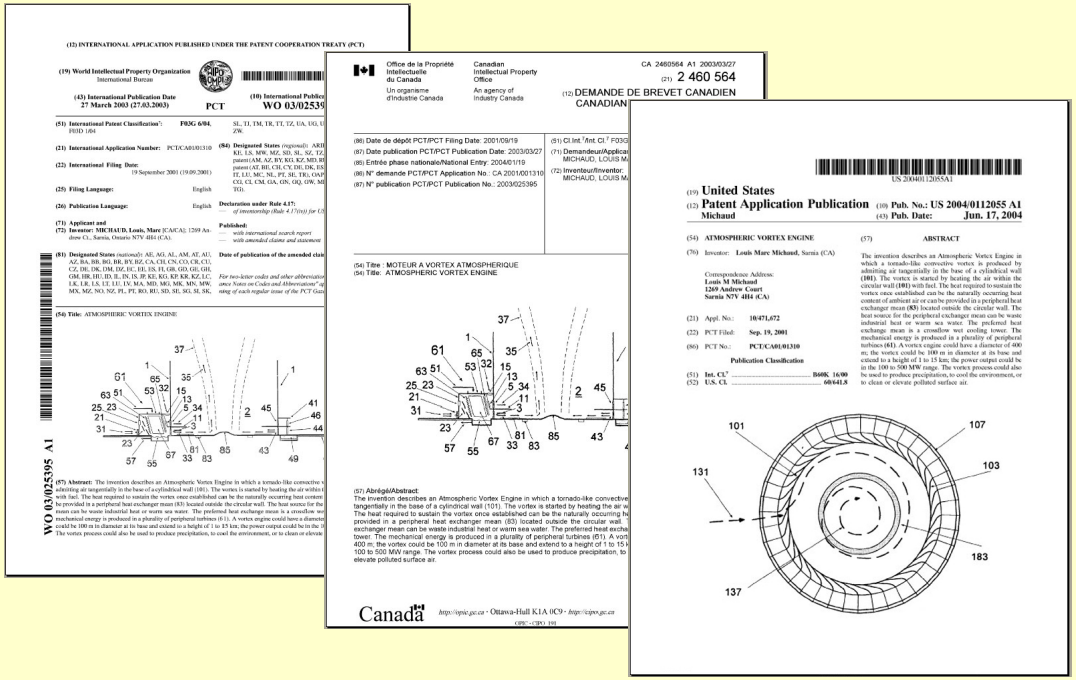
"The thermoelectric power generation industry is the largest consumer of water in the U.S., using about 50% of the nation's water withdrawals for high purity boiler feed water and water for cooling condensers and reactors." Note

The ***VCT*** and ***VPG***:

- reduce water withdrawals by 95% compared to once-through cooling
- have clouds and precipitation as free by-products
- cause precipitation that returns water to local water table
- can function as a large scale water-making or desalination plant
- contribute to global cooling, reduction of smog and reduction of outlet water temperatures
- have potential to earn Kyoto-type subsidies or credits in future.

Our business is protected by issued patents.

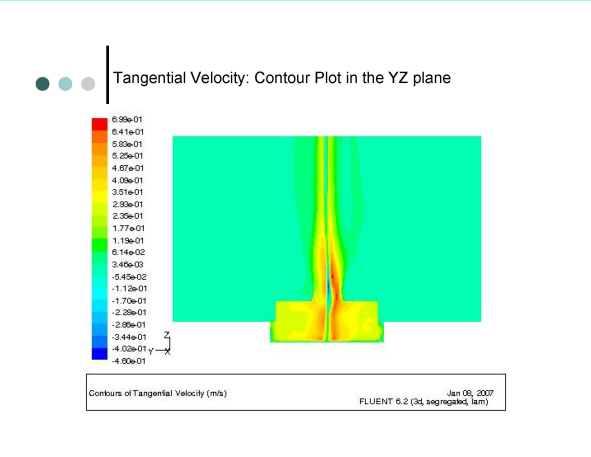
Canadian and US patents issued for producing and using an artificial atmospheric vortex for production of energy or other environmental benefits. Link International protection in progress.



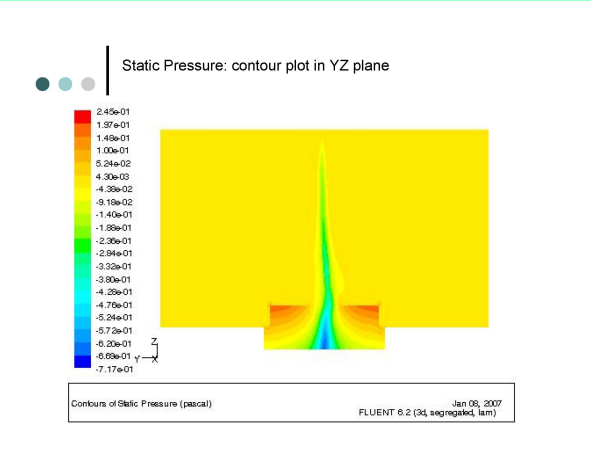
Our progress to date:

- 30 years R&D to develop and refine the concepts
- Canadian and US patents issued Link
- publication of nine peer reviewed technical papers Link
- many models built and tested Link
- over $1,000,000 in free publicity (*Economist*, TV, etc.) Link
- a $150,000 prototype 15m tall built and tested in 2005 Link
- government funded Ontario Centres of Excellence CFD computer modeling study underway at UWO Boundary Layer Wind Tunnel Laboratory Link

1m diameter model



Tangential Velocity
CFD image



Static Pressure
CFD image

Leading experts recruited for Advisory Committee including:

Prof. Kerry Emanuel, Massachusetts Institute of Technology, Department of Earth, Atmospheric and Planetary Sciences, Program in Atmospheres, Oceans, and Climate. Dr. Emanuel is widely recognized as a leading expert on hurricanes and atmospheric thermodynamics and sea to air heat transfers. Link *Time Magazine* calls him "The Man Who Predicted Katrina" for an article he published in the journal *Nature*. Link

Dr. Stephen Ramsay is a professional engineer and mathematician specializing in engineering meteorology and risk assessment with Sandwell Engineering, Vancouver, B.C. Dr. Ramsay's Ph.D. thesis at Cambridge University pertained to atmospheric vortices, and he was assistant professor and Research Director of the Boundary Layer Wind Tunnel Laboratory at the University of Western Ontario from 1990 to 1996. Link He developed and presented a course on risk assessment for NATO and advised on major projects such as the Mackenzie Valley Pipeline and the Hibernia Oil Fields.

Prof. Nilton Renno is University of Oxford, England, Visiting Scholar, Atmospheric, Oceanic & Planetary Physics and an associate professor in the Department of Atmospheric, Ocean and Space Sciences at the University of Michigan. Dr. Renno specializes in atmospheric convection and climate and the transport of aerosols and water vapour and has studied the role of convective vortices in aerosol transport in both the terrestrial and Martian atmospheres. Link

Development Plan

Phase 1: Physical Model with Instruments

Design and engineering	$ 100,000	
Computer modeling	$ 30,000	
Physical modeling and testing	$ 170,000	
Less government grants	($ 200,000)	
Net cost / Equity required		**$ 100,000**

Phase II: ***VCT Vortex Cooling Tower*** **Prototype**

20 m arena with steam as heat source	$ 2,000,000	
Addition of instrumentation and testing	$ 2,000,000	
Addition of cooling tower cells	$ 1,000,000	
Less government grants	($ 3,000,000)	
Net cost / Equity required		**$ 2,000,000**

Phase III: ***VPG Vortex Power Generator*** **Prototype**

100 m arena with steam as heat source	$ 7,000,000	
Addition of cooling tower cells and testing	$ 8,000,000	
Addition of turbines and generators	$45,000,000	
Less government grants	($20,000,000)	
Less vendor financing	($30,000,000)	
Equity required		**$10,000,000**

We believe that the vortex engine is:

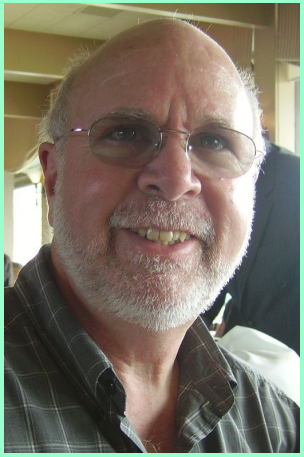
- the first truly green energy source
- a means for improving the health of our environment
- the most significant invention of the 21st century

Join us to make history!

We need:

- partners
- Funding
- your help and support

Louis Michaud, P.Eng.
Inventor



Brian Monrad, M.A., LL.B., C.A.
V.P. Finance & Admin

We can help save the environment…
…by creating and controlling vortices!

Links:

Our website	http://www.vortexengine.ca
Technical	Technical process description
Publications	Technical publications
US Patent	US PTO #20040112055
Canadian patent	CIPO #2460564
PCT patent	PCT Europe #W003025395
Other links	Other links

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