FREE ENERGY

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≈ Gravity Turbine Engine
≈ Thermal Exchange Motor

Gravity is a Constant — A Perpetual Force
Capable of Generating Energy in Perpetuity

DEDICATION

Donald J Trump surpassed all expectations as 45th President of the United States of America. The level of knowledge, skill and attention to everything domestically and internationally was overwhelming. Thank you for your service and sacrifice. Here is a small gift in return.

INTRODUCTION

Perpetual Motion is a dirty phrase. Only re-branded as *Free Energy* can it be discussed without immediate rejection. The truth is, Nature already does it. Otherwise, Niagara Falls would have run dry millennia ago.

We look to water falls as a source of energy. The height and flow determine the output. Little interest is shown to the inlet beyond keeping it cleared. It does not receive security even though that is the most vulnerable part of the dam. The exit works are completely ignored. It's down stream. "Who cares?"

Turns out *down stream* is where all the magic happens. We think of gravity as a pull, but it can also push, indirectly. By executing a state change, the heavy water becomes light vapor and is squeezed upwards. It travels back to the river's source, condensing out as dew, rain or snow to begin the journey again. A molecule of water just went over the Falls for its thousandth time.

One device will be described that exploits the state change shown by Nature. Another device will be explained as a consequence of the first. Both are perpetual barring maintenance, just like Niagara Falls. Lacking a geologic change, it will flow forever because **Gravity is Limitless**.

These devices work because Nature is an Obsessive Compulsive, everything must be in its proper place, and a **State Change** disrupts the balance. Nature must fix it, and does it for free.

GRAVITY TURBINE ENGINE

The concept is easy enough to understand. Instead of water flowing through a turbine to produce electricity, a tethered turbine is dropped into the ocean. The first reaction is recognizing the turbine has to be hoisted back to the surface to repeat the process and that action consumes more energy than was produced during the Drop. While true, it does not prevent re-engineering the hoist mechanism into something not just more efficient but that produces more energy than the Drop.

Ignored is the ocean resource of Elevation. The process to be explained next can work in the atmosphere, but water is one thousand times denser than air and thus far more efficient. The ocean is also far less violent. The deeper you go, the calmer it becomes. At the bottom, miles down, you would not know a CAT5 hurricane was passing over head.

Nature showed us the way. A small amount of energy transformed the water into vapor. It was then freely transported thousands of miles to rejoin the flow. We do the same with the turbine by piggybacking a canister of compressed air. The Drop torpedo now consists of an electrical tether to extract electrical power from the flow and a canister of compressed air which gets activated at depth.

The torpedo changes direction. Its weight now has net buoyancy and up it comes. As it rises the surrounding water pressure decreases which results in an increasing bubble from the released compressed air. More displacement means more force to generate more and more power. The blades of the turbines will need to be engineered to handle that stress. The Drop produces enough energy to feed the system. The Rise becomes surplus.

The next question becomes, "How much energy is required to compress the recovery air?" An off the self five thousand PSI three phase compressor will consume thirty-six thousand kilowatts per gallon of compressed air. It is now just a matter of sending down enough compressed air to flip the turbine's weight. However, that weight, which is a composite of multiple elements, can be controlled with fixed displacement bladders, like children's floaties. Only the surplus down weight needs to be reversed.

Data of real products for the principle component parts follows. However, the recovery air cost can be more efficient by removing the compressor. It can be greatly reduced by using liquefied air because it is easier to produce. Air is spongy. It has a strong resistive spring force. A compressor runs hot because it is fighting that repulsive force. Ultimately, a lot of energy is expended to accomplish a small amount of work, that being to compress the air. Liquefying air also involves compression, but only a small amount to heat it up. That heat is blown off, the air expands to a colder state, and the process repeats. The cost of producing a half gallon of liquefied air is under one thousand watts. A 97% reduction in energy consumption compared to the compressor.

The liquefied air travels down with the Drop torpedo and exploits another ignored resource of the ocean. It is an infinite heat sink. During the liquefying process the ocean absorbs heat. During the pressurizing phase it provides heat. The liquefied air quickly returns to a gaseous state. Both compressed and liquefied air canisters reach five thousand PSI. However the compressed air is hot and cools in transport, reducing its efficiency. The liquid air heats up at a controlled pace allowing greater pressure at depth, thus reduced weight and drag concerns for greater performance.

DATA

Power computations are based on a one mile turbine drop. Electrical losses through the tether are negligible pending the transfer voltage which can be 0.5% for transmission cables over one hundred miles. A one mile insulated tether will use far lower voltage, but testing is required to determine marine animal affects along with an acoustical analysis of the system. We don't need to attract jellyfish schools to clog the turbines nor negatively affect the fishing industry.

Water pressure at one mile ocean depth is 2289 psi. A standard gas cylinder is rated for 7000 psi. The added pressure at depth means a liquid air filled cylinder can safely achieve higher pressures as the system descends due to the increasing surrounding pressure. While a fully heated half liquid air filled container can reach 5300 psi, only 5000 psi was considered in the computations due to thermal transfer deceleration and the Drop time. Pressure can be managed by introducing more liquefied air during the reload phase with minimal impact on power consumption.

A 3-phase 5000psi compressor consumes ~36KW per gallon produced, consuming ~46ft^3 of air. Liquefied unseparated air has a typical production rate of 70 gallons per minute with a power consumption of 1700 Watts per gallon for a large production plant. Only a half gallon of liquefied air is required for each resultant gallon of compressed air once the contents are warmed back to standard temperature.

A typical bladed turbine was tested along with two Savonius models, one in operation as a large river flow turbine and the other as a small windmill. The later was converted to a water turbine equivalent based on air-water density difference with a loss factor. Even though the small modified air Savonius worked well, only output for the large river Savonius is shown, because I want to present actual production data and not theoretical approximations.

SINGLE UNIT			Turbine Type	
			Bladed	**Savonius**
Weight (lb)			838	4,570
Power Rating (kw)			5	8
Terminal Velocity (ft/s)			9.1	5.85
Recovery Costs	**Theory (kw)**		1,035	5,650
	Compressor (kw)		1,821	9,934
	Liquefier (kw)		43	234
	gal·LN_2		25.29	137.98
	Air Volume (ft^3)			
	Surface		2,300	12,547
	Depth		14.76	80.55
Pressure at Depth (psi)			2,289	
Output	**Drop**	**kw**	2,901	7,220
		s	580	902
	Rise	**kw**	2,872	7,111
		s	667	1,036
Net Output (MWH/yr)			36.59	57.91
Cycle Time (h:m:s)			0:20:47	0:32:18
Desalination (k·gal/yr)			2,349	3,718

MULTI·UNIT SYSTEM (4x6 Models)			Turbine Type	
			Bladed	**Savonius**
Units in Model			16	6
Annual Output	**Model**	**MWH**	585.44	347.47
		M·gal	37.58	22.3
	System	**MWH**	14,050	8,339
		M·gal	901.92	535.44

Note: Rise force grows linearly as surrounding water pressure drops, allowing more released air expansion resulting in more water displaced. The resultant buoyancy force was restricted in these computations to maintain roughly the same Drop speed due to turbine blade stress limitations. Rise power can greatly exceed Drop power with properly designed turbine blades.

All model configurations featured a canopy of turbines resembling a parachute with weighted passenger dragging it downwards and buoyancy passenger tethered above to aid in the return to the surface. Only a single parachute layer was considered. Multiple layers would increase output with the added concern of drag flows disrupting turbine efficiency. With proper spacing, that issue is taken care of.

VISION

Implementation of this technology involves deep sea oil rigs. Tens of thousands of these ugly boats used for offshore drilling, make perfect mothership platform. Hundreds of smaller ships surround it, each resembling a lillypad. The boats drop a half mile anchor with multiple tethers that reach back to the boat. With long trolling arms common to fishing boats, these lillypads juggle multiple turbines in one mile deep water.

The smaller boats are tethered to the main platform which is connected to shore to deliver electrical power and fresh drinking water. The gold rush of this millennium is clean water. When the electrical power is not being used to capacity, the excess is diverted to flash-evaporators to produce drinking water. Peak output is reported in the tables in millions of gallons (M·gal).

Motherships surrounded by hundreds/thousands of lillypads is not realistic, weather being biggest obstacle. The next perpetual cycle is better suited for large scale production. However the mothership can still manage dozens of lillypads that can be detached and rerouted to provide disaster aid in hard hit coastal areas.

THERMAL EXCHANGE MOTOR

An overlooked aspect of the Gravity Engine is the stored energy in the compressed air recovery tank. By replacing the compressor with a liquefier, the investment energy was greatly reduced. The question becomes, "How much work can the recovery tank perform?"

The compressor costs 36kw per gallon of 5000psi air produced. Theory and experiment confirm a tank so pressurized can perform 1HP of work for every 7HP that went into it, roughly 5kw output per gallon. The cost ratio is based on air compression solely by human means, 36kw in and 5kw out. However, the investment price is reduced 97% to under 1kw by pressurizing the recovery tank using an air liquefier and letting Nature heat it back up. Liquified air achieves the same 5000psi containment with Nature doing the heavy lifting yielding the same 5kw output but with only 1kw input.

DATA

The overall process is similar to an internal combustion engine. In a four tank system, the first is filled with liquefied air. The next is heated naturally, which slows over time. To reach operating temperature and pressure quickly, the heat from the cooling phase to fill tank-one is applied to the third tank. The fourth tank performs useful work through the expulsion of the contained air. Each tank trails in the cycle like cylinders in an engine. All heat transfer is contained within the system but can interact with the outside environment to supplement needs and speed up process.

While the 14.3% efficiency of the feasibility study is used in computations, the theoretical expected efficiency is 50% and achieved by some systems. Air is expelled through an impeller (air vane motor) at 70% and then converted to electricity at a further 70%. (*Pneumatic → Mechanical → Electrical*) Energy is converted from compressed air to mechanical rotary motion of an electric generator at an efficiency range of 15% to 50%. Reality and Academia are in constant struggle with each other. This is why real product data was used in the computations.

Thermal Cycle			
Unit (1 gallon)	**kw-IN**	**kw-OUT**	**s**
	1	5.44	623.6
Configuration	**MWH/yr**		**M·gal/yr**
Module (80 Units)	4.99		0.32
Strand (26 Modules)	129.74		8.33
Field (2704 Strands)	350,817		22,522

Note: One gallon tanks were used in the computations of the individual unit. Seven gallon tanks are more common and would fill the operating space better. It is very reasonable to use eight ten gallon tank Units to create a single Module, or Pod. Further, each Pod can be pressurized to ten atmospheres to dramatically increase output or reduce product size without much impact on internal efficiency.

VISION

While individual or clusters of Pods could be used to make homes and businesses energy independent, building an energy grid along the coastline at over one mile depth will avoid turbulent waters and not disturb sea life since most ocean life exists above a half mile. The grid can be managed by floor drones with recharging stations. Pods can be replaced and repaired by surface drones. A single oil platform could house the people and equipment to manage many square miles of grid.

The grid will be composed of thousands of Pods, eight foot diameter power Modules. Many Pods will be connected with a one hundred foot gap to create a half mile strand, looking like sea grass growing out of the ocean floor. A one hundred foot gap between strands creates the power Field which could produce enough electrical power to keep over a thousand square miles of earth water saturated.

SUMMARY

Ocean power sources include: wave, tide, current, biomass, methane plumes, deep sea vents, solar, thermal transfer, geothermal/nuclear cooling, oil and marine life. Elevation is an overlooked power resource. It is key to tapping Nature's limitless gravitational field by executing very inexpensive state changes.

Fresh drinking water is gold rush of this millennia. With rising concerns of Global Warming, justified or not, an ocean grid could produce enough clean water to turn a territorial mass twice the size of United States green. Imagine re-establishing Sea of Africa which is currently Lake Chad. This ends world hunger.

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UNITS

		Air	Water	Loamy Sand (Water Capacity)
9.80665 **m/s^2**	**PI** 3.1415926535897	1.275 **kg/m3 @1atm**	999.972 **kg/m^3**	1.15 **in/ft**
32.174 **ft/s^2**	14.69595 **psi/atm**	.0765 **lb/ft3 @15^c**	62.4 **lb/ft^3**	165.6 **in^3/ft^3**
2.204622 **lb/kg**	3.785411 **liter/gallon**	1.225 **kg/m3 @15^c**	27.67990 **in^3/lb**	31,228 **gal/acre-ft**
1.466667 **fps/mph**	7.480519 **gallon/ft^3**		0.036127 **psi/in**	19,986 **K·gal/mile^2**
1.609344 **km/mile**			2289.025 **psi/mile**	