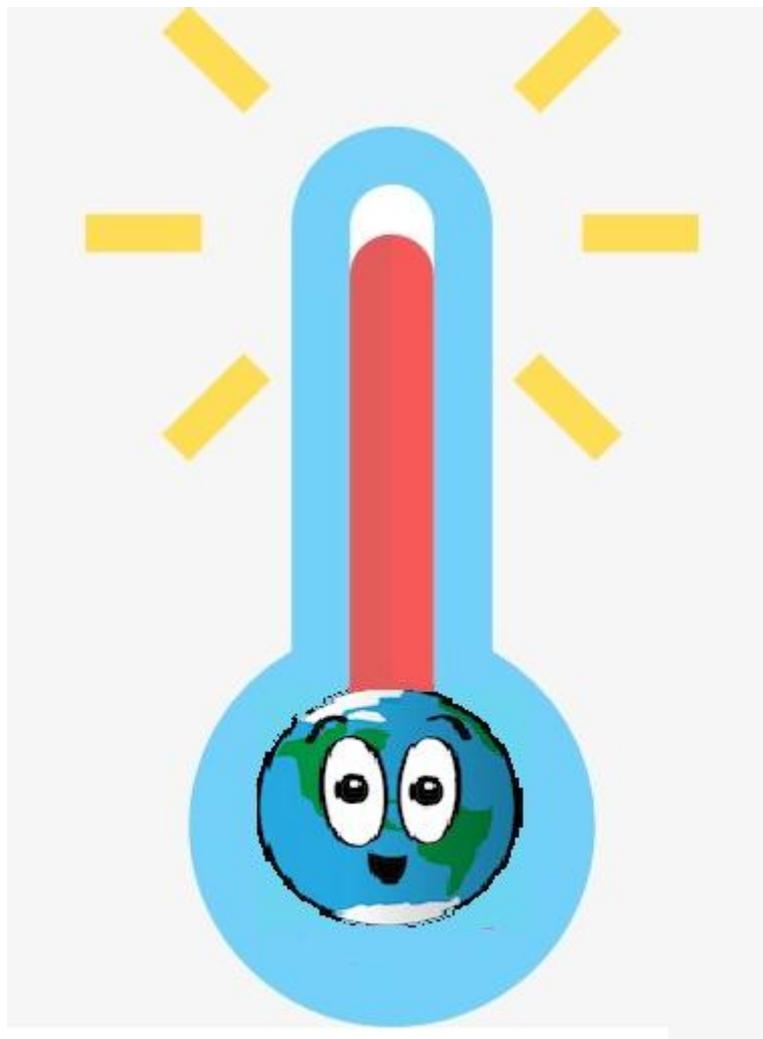


PROJECT DIG DEEP :

Tunnel into Earth's Vast Energy For
A Greater Good!



PRESENTED BY:-

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GEO-THERMAL ENERGY

Geothermal energy is thermal energy generated and stored in the Earth. Thermal energy is the energy that determines the temperature of matter. The geothermal energy of the Earth's crust originates from the original formation of the planet and from radioactive decay of materials in the Earth's Core.

Source:

https://en.wikipedia.org/wiki/Geothermal_energy

GEO-THERMAL POWER

Geothermal power is power generated by geothermal energy. Technologies in use include dry steam power stations, flash steam power stations and binary-cycle power stations. Geothermal electricity generation is currently used in 24 countries, while geothermal heating is in use in 70 countries.

Source:

https://en.wikipedia.org/wiki/Geothermal_power

GEO-THERMAL GRADIENT

Geothermal gradient is the rate of increasing temperature with respect to increasing depth in the Earth's interior, which simply means, the Deeper you go, the Hotter it gets. Away from tectonic plate boundaries, it is about 25–50 °C/km of depth near Earth's upper crust, in most of the world.

Source:

https://en.wikipedia.org/wiki/Geothermal_gradient

GEO-THERMAL HEAT PUMP

A geothermal heat pump or ground source heat pump is a central heating and/or cooling system that transfers heat to or from the ground. It uses the earth all the time, without any intermittency, as a heat source or a heat sink.

Source:

https://en.wikipedia.org/wiki/Geothermal_heat_pump

References:

https://youtu.be/C18Eg_IZWME

https://youtu.be/mCRDf7Qx_jDk

<https://youtu.be/KE3SvNRmwcQ>

<https://youtu.be/Uv8bTAGr0tU>

<http://www.renewableenergyfocus.com/view/12469/drilling-10-000-m-deep-geothermal-wells/>

MY INSPIRATION >

https://youtu.be/hQDvSJz_jn_jM

<https://youtu.be/aqx1Weoa53s>

2. Heat Transfer Fluid (HTF - Biodegradable Oil) is pumped through the Manifold collecting the heat and carrying the heat to the Evaporator.
3. Inside the Evaporator HTF transfers this heat to a Working Fluid (WF - Acetone, Boiling-point 56 °C). This causes the working fluid to flash vaporize, which then drives the turbines, that intern spins a generator, producing clean renewable electricity.
4. After the vaporized working fluid passes through the turbine, it flows to the Condenser, where it is cooled down and turns back liquid.
5. To cool down the working fluid in the Condenser, Cold Transfer Fluid (CTF - Water Glycol mixture) is pumped into the Condenser, removing the heat from the working fluid and moving it to the copper pipes dug 10 meters below the surface, where the shallow ground acts as a heat sink.

Source:

<https://en.wikipedia.org/wiki/Acetone>

GTEC Works on the Principle of **Binary-Cycle Power Conversion**.

Binary-Cycle Power Stations are the most recent development in geothermal energy, and can accept low temperature fluids. This is the most common type of geothermal electricity station being constructed today.

HEAT PIPES:

A heat Pipe is a heat-transfer device that combines the principles of both thermal conductivity and phase transition to effectively transfer heat between two solid interfaces.

Sources:

https://en.wikipedia.org/wiki/Heat_pipe

<https://www.1-act.com/resources/heat-pipe-resources/>

<https://youtu.be/2vk5B6Gga10>

Specifically for GTEC application standard Heat Pipes will be coated with a layer of lightweight thermal insulation material (like ceramic fiber - <http://www.nutec.com/ceramic-fiber>) to prevent heat losses; after the insulation layer, will be a layer of shock absorbing material (like a Bouncy Ball or D3O Smart Foam - <https://youtu.be/uXlFiuBltxY> , <https://youtu.be/F6I5A5VB5zY>) to absorb the shock waves of an earthquake.

Each Heat Pipe is stacked on top of each other and the bottom most heat pipe transfers heat from the Earth to the heat pipe above it and so on, till the heat reaches the surface. This works similar to a **Relay Race** in which athletes run a pre-set distance carrying a baton before passing it onto the next runner.

Benefit of using Heat pipes, is that they are the most energy efficient way to transfer heat from point A to Point B, avoiding the need for high energy consuming water pumps, currently being used in geothermal power plants, to bring heat from deep geothermal wells to the surface.

POWER CONVERSION OPTIONS & ADDITIONAL USES

POWER CONVERSION OPTIONS:

These Heat Engine Options can be used for 'Captive' GTEC Power Plants for heavy/medium industries to full fill there own in-house power requirements. In the Future these Heat Engines can be made big enough to run Multi-MW Power Plants, too.

- **Organic Rankine Cycle (ORC) -**

The working principle of an Organic Rankine Cycle power plant is similar to the most widely used process for power generation, the Clausius-Rankine Cycle. The main difference is the use of organic substances instead of water (steam) as working fluid.

Sources:

https://en.wikipedia.org/wiki/Organic_Rankine_cycle

<http://www.exergy-orc.com/orc>

<https://youtu.be/7nFALSwszlg>

<https://youtu.be/HUjAvWM1mUs>

● **STIRLING ENGINES (Low Temperature Difference - LTD):**

A Stirling engine is a heat engine that operates by cyclic compression and expansion of air or other gas (the working fluid) at different temperatures, such that there is a net conversion of heat energy to mechanical work. LTD Stirling Engines work with a temperature difference of just 5 °C, between Hot-side and Cold-side!

Sources:

https://en.wikipedia.org/wiki/Stirling_engine

<https://www.stirlingengine.co.uk/Howtheywork.asp>

<https://youtu.be/ARD3ctp80ac>

https://youtu.be/EtF3-YmHp_0

● **NITINOL HEAT ENGINES:**

Nitinol Heat Engine is driven by the temperature difference between hot and cold water. It uses the unique property of Nitinol alloy to generate mechanical motion from heat.

Sources:

https://en.wikipedia.org/wiki/Nickel_titanium

<https://www.imagesco.com/articles/nitinol/09.html>

<http://free-energy.ws/nitinol-engines/>

<https://youtu.be/oKmYqUSDch8>

<https://youtu.be/7BA8-Md08so>

<https://youtu.be/AVCX5BfPn6A>

<https://youtu.be/k1G49KAcb3M>

<https://youtu.be/9hlaxJkBsHw>

COMBINED POWER and DESALINATION (CPD):

In coastal areas, GTEC based CPD operates by utilizing the heat removed from the Condenser of a GTEC Power Plant and using this Heat for Thermal Desalination (converting seawater into portable fresh water, using heat energy), thus recovering & efficiently using the 'Waste Heat'

from a GTEC Power Plant and thus not requiring this Heat to be rejected into Shallow Ground.

Sources:

<https://youtu.be/KSVxJefUUik>

<https://youtu.be/MOMpDUqGyKk>

<https://youtu.be/AUQXA0IqkR0>

<https://youtu.be/V297r8XfGv8>

<https://www.terrawater.de/terrabasic-description/?lang=en>

<https://www.terrawater.de/zero-liquid-discharge/?lang=en>

COMBINED POWER and HEATING/COOLING (CPHC):

GTEC based CPHC operates by utilizing the heat removed from the Condenser of a GTEC Power Plant and using this Heat for Space Heating/Cooling or Low Temperature Industrial Heating, thus recovering & efficiently using the 'Waste Heat' from a GTEC Power Plant and thus not requiring this Heat to be rejected into Shallow Ground.

Source:

<https://youtu.be/1Y3oG1gZRgI>

<https://youtu.be/p2zHfrVtgvM>

<https://youtu.be/NiNPhFqxODU>

ADVANTAGES & BENEFITS

1. It is limitless, pollution free, Renewable energy source.
2. It is consistent, reliable, predictable, renewable energy source.
3. It is not affected by weather or seasons i.e. it is available 24/7, 365 days a year.
4. Heat energy is continually emitted from Earth's core, thus providing continuous power output for GTEC power plants.

5. These benefits (points 1 to 4) make it Base-load Renewable Power source, free from intermittent energy issues plaguing other renewable sources like wind & solar. This makes it at par with Nuclear & Hydroelectric, the next best choices. Also it does not require expensive energy storage that is a must have for other renewable source to meet grid demand.
6. It is location independent i.e. GTEC power plants can be located anywhere around the world, unlike Wind, Solar, Hydro power plants that have specific geographic requirements.
7. GTEC power plants would require a much smaller land footprint, when compared to Solar (both PV & Thermal), Hydroelectric Dams and even coal-fired power plants, thanks to the fact that borewells are drilled vertically not horizontally.
8. Due to this fact (point 7) GTEC power plants can be located much closer around population centers, like on the outskirts of a Megapolis/Megalopolis (a big metropolitan city with very large population), thus reducing electricity transmission losses & cost, to a great extent.
9. Since GTEC power plants produce huge quantities of base-load electricity, this would definitely create an exponential growth in Mass Market Electric Vehicles (bikes, cars, buses, trucks, trains, hyperloop, and even small/medium size ships & aircraft, all powered by electricity) thus drastically reducing the need for fossil fuels.
10. GTEC power provides 'Energy Security' for All Nations and gives independence from importing highly priced coal/oil/natural gas. Also all nations around the world will have a perfect tool in their energy tool kit to equally contribute to combat Climate Change and meet the Paris Agreement targets.
11. Unlike Nuclear power plants, GTEC power plants produce no radioactive waste (that remains toxic for thousands of years), also unlike coal-fired power plants there are no giant steam boilers with very high temperatures, GTEC power plants operate at much lower temperatures, thus GTEC power plants are far more safer to operate.

12. Over the years, thanks in part to oil industry, Oil companies are already drilling down to 5000 m where temperatures reach 170 °C. I believe, the cost of drilling borewells to 1500 m to 3000 m would come out to be significantly less than, the expense incurred on safety precautions & measures taken to make a Nuclear power plant safe! With improvement in drilling technologies and Economies of Scale provided by constructing large number of GTEC power plants the costs will come down further, over a period of time (proven by the growth of smart-phones and solar panels).
13. GTEC heat source is easier to access as it is available in almost equal quantities worldwide, than traditional geothermal which is only available in certain geographic locations. GTEC does not require pumping water down a borewell, as GTEC uses Heat Pipes to transfer heat from deep underground to the surface, which is far more efficient, when compared to pumping water in traditional geothermal wells which is highly energy intensive, so there is no risk of steam explosions, geothermal wells running dry or toxic substances / unwanted minerals being brought to the surface. Thus GTEC is far better than traditional geothermal.
14. GTEC comprises of various proven off-the-shelf parts/tools/machinery/Tech combined together in a unique sequence, this further reduces the amount of work and money required for R&D.
15. Current Drilling technology, developed after years of research, is now field proven and drilling industry has gained a lot of expertise (working with oil & gas and even geothermal sector), to a point where with today's drilling tech we can efficiently drill 100 m per day, at that rate as an e.g. it would take just 30 days to drill a 3000 m deep borewell. Five to Eight Drilling Rigs working together on 5 to 8 borewells at the same time, with simultaneous constructions going on in modular fashion for rest of the power plant (like the way modern ships are built in modular, Lego block type construction), GTEC power plants can be built in far less time (& cost) than it would take a traditional coal power plant or nuclear power plant, of the same capacity to be built. Once that GTEC power plant is commissioned it will continue providing Cheap Clean Electricity for 40 to 50 years, with little maintenance.

CONCLUSION

GTEC answers our biggest energy question i.e. Is there a clean renewable energy source that has the scale & reliability of nuclear/hydroelectricity without the baggage of pollution & intermittency, that could be the silver bullet solution for the world's energy problems?

Now that we know the answer to that question, the next question is, How 'soon' can we implement IT to make a significant difference to drastically reduce global carbon emissions (36 gigatons - global CO₂ emissions in 2018) , before it is too little, too late ?

What price in ignorance & oversight, is Humanity willing to pay for seeing our 'only' Home (planet Earth) being destroyed bit by bit, year after year, by rising global CO₂ emissions and Climate Change ?

OR

Can WE muster the collective will to Say NO to Fossil Fuels and are WE willing to Change our ways in Time to save our Home from sure shot destruction, by embracing green technologies (GTEC, recycling, EVs, energy efficiency, new battery tech etc.) today for a safer, habitable Earth for us and our coming generations tomorrow ?

Think... The answers lie within each of us... Choice is ours today, it may not be available tomorrow...

"It always seems impossible until it's done." – Nelson Mandela

"One small step for man, one giant leap for mankind."
– Neil Armstrong

"Without passion, you don't have energy. Without energy, you have nothing." – Warren Buffett

THANK YOU