

## **Harnessing Sustainable Energy from Artificial Black Holes and Hawking Radiation**

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### **Summary:**

Fossil fuels have been killing planet Earth for nearly 200 years, and recent events have illustrated the detrimental effects of unclean energy sources. Creating efficient ways to extract usable energy has always been a difficult situation, however, Free For All has made groundbreaking advancements. Free For All is a project attempting to create an artificial blackhole in order to extract an abundance of energy for the world. With this, we plan on using the radiation and thermal energy produced by black holes and converting it into electrical energy. As an environmentally friendly and cost-efficient source of power, we are looking to revolutionize our society in a way never done before. This process will take approximately two years to complete and distribute to the masses, and will use funding from a series of non profit organizations and academic grants.

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## **Key Terms**

Accretion Disc: a disc of superheated gas that flows rapidly around the black hole. The immense speed of the accretion disc emits electromagnetic radiation in the form of x-rays, infrared rays, and radio waves.

Event Horizon: the center-most radius of the black hole where objects that enter cannot escape.

Hawking Radiation: a form of black-body radiation that is caused by half of a phonon pair being pulled into the black hole's event horizon, and the other half being radiated outward.

## **Introduction**

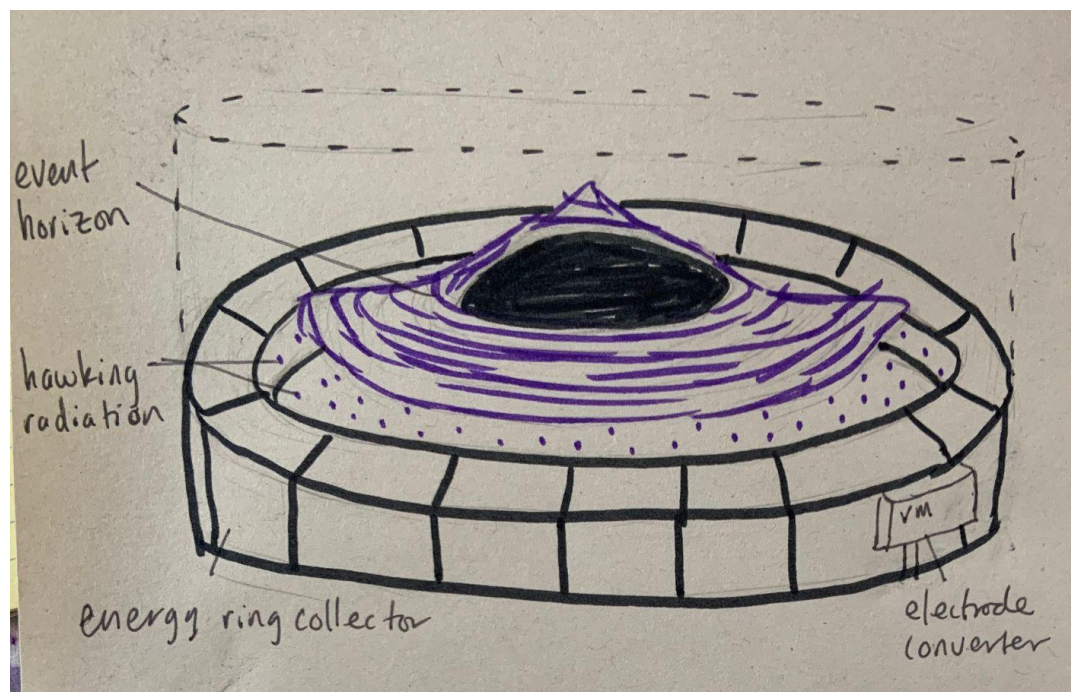
Creating an artificial black hole has been deemed as science-fiction for the past years, until 2020 the Israeli Institute created an artificial black hole by colliding photons together going at light speed. It was an extraordinary event - the nearest black hole is millions of millions of light years away from us, yet humanity has created one in our own backyard. Now there is the question at hand: is creating a black hole safe? The answer is yes; artificial black holes are constantly monitored and are so small, they can barely deal any significant damage. To put this in perspective, if Earth was turned into a black hole, it would be the size of a penny. All of Earth's mass and energy would be crushed into a single penny, photons are even smaller than atoms. Artificial black holes event horizon would hold a tremendous amount of usable energy that will be extracted from the Free For All project.

A black hole is formed from the death of a star, and consumes anything in its path. Free For All is looking to focus on two particular parts of the black hole - the event horizon and the accretion disc. The event horizon is surrounded around the core of a black hole and holds the majority of the black holes energy, and the accretion disc is a ring of gas that emits

electromagnetic radiation (*Black Holes - Introduction*, 2016). We plan on creating a machine capable of absorbing Hawking radiation, converting it into electrical energy, and sourcing it out to the world. Today, one of humanity's greatest threats is global warming, which is a direct product of the current energy sources we have been using for the past hundreds of years. While it is very efficient, however, fossil fuels have been destroying our planet in the meantime - if society continues burning crude oil, natural gas, and other fossil fuels at the same rate, scientists predict that global temperatures may rise up to 10°C, which will drastically affect sea levels, cause droughts and forest fires, and ruin current ecosystems (Tochukwu Nwokike, 2019). It is imperative that we find a more efficient replacement for fossil fuels that has a better impact on the Earth, which is the prime motivator for Free For All's project. Our energy converter will serve as a clean, reliable energy alternative to fossil fuels, and will additionally provide low-cost electricity to populations in need.

## Proposed Program

### General diagram



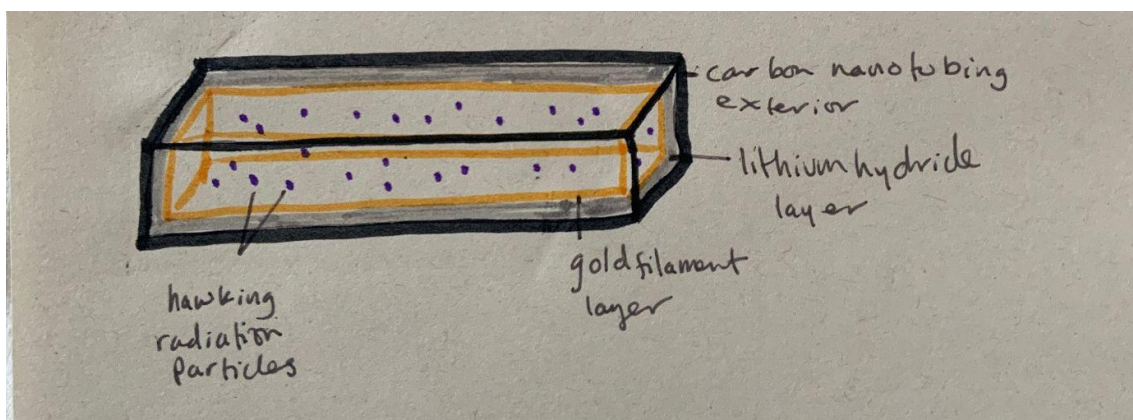
The basis of the machine is an energy ring collector, designed to match the size of an artificial blackhole. The energy converter is a cylinder that stands 25 centimeters tall and has a radius of 15 centimeters. The energy ring collector harnesses the hawking radiation from the accretion disc of a blackhole, as well as Hawking radiation formed at the event horizon.

### Elements of the Machine:

- Hawking radiation: sourced from the black hole, Hawking radiation contains both negative and positive particles; the negative particles are sucked into the event horizon, while the positive particles are pushed out to create thermal radiation and heat energy.
- Energy ring collector: container that absorbs thermal energy and free electrons created from the Hawking particles reacting with the gold filament.

- Electrode converter: the machine used to store the thermal energy and free electrons and convert into usable electrical energy.

### Inner Workings of Energy Ring Collector:



- Gold filament layer: area where radiation photons will collide in order to increase thermal energy, as well as go under reduction to form free electrons. After forming ample energy, the free electrons and photons created will pass through to the lithium hydride layer.
- Lithium hydride layer: an aqueous solution that allows the energy absorbed from the black hole to transfer to the electrode. The solution increases mobility among the electrons and photons, while additionally preventing overheating.
- Carbon tubing: holds the interior together and prevents escape of electrons and radiation

### Innovation Process

Cost: The material cost to make one rendition of the artificial black hole technology will be approximately \$751. We will be building off of the machinery built by Jeff Steinhauer, so the cost of the black hole simulator is void, but given there will be multiple trials to make the converter, we will need enough gold filament, lithium hydride, and carbon tubing for multiple

renditions. When allowing for three trials to be created, our budget is approximately \$1853. Although this may seem expensive, it dramatically lessens in comparison to the annual cost of energy harnessed from fossil fuels. Recent studies have projected that U.S. fossil fuel spending is likely to reach approximately \$23 trillion between 2010 and 2030 (The High Cost of Fossil Fuels, 2011). The price will not be as exorbitant due to the microscopic size of the black hole; while materials such as gold and lithium hydride may be rare, the machine itself will not be large, and the amount necessary to create the machine will be miniscule. Additionally, the machine itself will build upon the artificial black hole containers previously built, which makes the building process much easier. The Free For All team will cover miscellaneous expenses such as travel, lab fees, and other minor costs.

Labor Power: For this project, we are building upon the work of previous astrophysicists and providing a method of harnessing energy from the machinery built to create black holes in a laboratory. The experimental process will be conducted by the Free For All team as well as lab technicians at the Israeli Institute. We will work in partnership with Jeff Steinhauer, who successfully formed the lab-made black holes in question.

Free For All will receive funding from a number of nonprofits, scholarships, and grants to cover the costs of production. Any other costs will be covered by loans or other financial stipends. The experimental process and production will be conducted by the Free For All team in partnership with nonprofit organizations such as Ceres, Global Green USA, and U.S. Partnership for Renewable Energy Finance. These corporations would provide assistance with initial finances, developing the machinery, and testing to ensure stability. We will then source our product to the major industries for global approval and further replication with the assistance of

the Smart Electric Power Alliance (SEPA), which promotes upcoming projects involving sustainable energy (US EPA, OAR, 2017).

Materials and Descriptions For One Trial:

- Carbon tubing:  $8630 \text{ cm}^2$ 
  - Description: Used to store the Hawking radiation emitted by the black hole and transfer to the electrode for electrical conversion.
  - Base cost: \$150.00
- Gold filament:  $8630 \text{ cm}^2$ 
  - Description: Placed within the inner layer of the machinery; the Hawking particles will pass through the foil and collide with the gold particles, creating thermal energy and giving the gold a positive charge. The free electrons from the gold filament will then travel through the lithium hydride and pass to the electrode.
  - Base Cost: \$250.00
- Lithium hydride: 150 g
  - Description: Lithium Hydride is an alkali metal hydride that is commonly used as a reducing agent in generators and other machinery. It originates in a powder form, but will be held in an aqueous solution. The ability to undergo reduction allows the free electrons from the gold filament to move to the electrode with the photons from the black hole, where they will be converted to electrical energy.
  - Base cost: \$151.00
- Electrode: 1 unit
  - Description: Used to convert the electrons and Hawking radiation from the black hole into usable electricity.
  - Base cost: \$200.00
- Black hole simulator: 1 unit
  - Description: The black hole simulator is a machine that uses
  - Base cost: \$0 - We will work in partnership with Jeff and have access to the laboratory that contains the simulator.



- Lab access/basic materials: miscellaneous
  - Description: Basic lab materials such as tools, mechanical parts, electrical workings, etc...
  - Base cost: \$0 - Materials will be present at the laboratory being used/brought by the Free For All team.

Time: This is an intricate process, and will take time to perfect. We will market for funding for approximately 6 months, and after receiving support from nonprofits and other energy companies, the building process will amass to one year. While finishing the energy converter, part of our team will contact manufacturers such as SEPA to promote our creation to be marketed and sourced around the world. Confirming proper promotion will take place about 3 months after the converter is finished, resulting in about a time span of 1.75 years.

### **Appendices**

Our presentation is to propose a solution for the unfortunate ones in this world that lacks energy. With this being a real world issue for a period of time, no one seems to realize it since the people who can talk about energy shortage all have plenty of it. The pandemic only makes it worse for everyone; beyond the immediate impact on health, Covid also has major implications for energy use. Free For All has decided to form an answer to this endless issue. The objective was made, and we split up the group into individual work for a week, communicating with each other via Discord to make this presentation possible.

### **Work Split**

Introduction/Summary - Hussian

Technical Description - Zi

Background/Appendices - Kai

Innovation Process/Diagrams/Editing- Hannah

### Timeline

- Decide for group leader/assign roles April 10, 2021
- Create powerpoint/start research April 20, 2021
- Draft and merge April 27, 2021
- Revise Draft/work on powerpoint May 2, 2021
- Finalize proposal/create presentation May 10, 2021

### Rules and Guidelines

- Free For All is for all but with specific priorities
  - Sponsors come first since we are a non-profitable organization
    - If we reach our annual financial goal before the year ends, the people comes first
  - Initial sourcing and population distribution
    - After meeting the needs of our sponsors, our team looks to support those in higher need of sustainable, low-cost, and reliable electrical energy, and will source to wealthier populations afterwards.
- Limited amount of energy given out to each individual client.
  - Our goal is to reach out to as many people as possible.
  - Every family and corporation counts as one client.
    - Energy distribution may vary depending on client size.

## **References**

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