

# Reestablishing Earth's Carbon Cycle Balance

## Defining the Problem

Approaches to carbon capture technology that do not include a clean, high efficiency, concentrated primary energy source miss the point. The focus on climate disruption, sea-level rise, and other environmental issues is a distraction. They are symptoms of a much more serious problem: Energy Depletion. Dr. DeLuze is an inventor and sincerely believes his company Fusion Energy Solutions of Hawaii, Inc. (FESH) has workable solutions. Further elaboration on the problem will help to understand the solution.

Like a car, the Earth has an energy storage battery. A battery is a chemical means of storing electric energy in the configuration of molecules. Only the molecular configuration of the atoms changes, not the atoms themselves. In a charged state a car battery is composed of lead and sulfuric acid. In a discharged state a car battery is composed of lead sulfate and water. Charging a car battery returns the composition back to lead and sulfuric acid.

Earth has a hydrocarbon oxygen battery. In a charged state this battery is composed of free oxygen and hydrocarbons. In a discharged state this battery is composed of water and carbon dioxide. Charging Earth's battery reverts these accumulations of carbon dioxide and water back into free oxygen and hydrocarbons.

We have more people and an advanced technology energy demand greater than plant life and sunlight can accommodate. This high energy demand exceeds the ability of photosynthesis to replenish energy taken from the battery. As a result, the state of charge of Earth's battery has been in steady decline for over a 1000 years and it's now about 99.2% dead. Most don't realize that water is also a greenhouse gas, for it safely collects in the ocean. Carbon dioxide of itself is not bad, it is just a component part of this accumulating discharged battery. Charging Earth's battery reverts these accumulations of carbon dioxide and water back into free oxygen and hydrocarbons. That this battery is nearly dead is our environmental problem, not the carbon dioxide! Earth's battery just needs to be recharged.

Attempts at using solar or wind energy for this process will not overcome the problem due to the low energy density of such sources. Given the current magnitude of this problem, the only reasonable energy answers are nuclear, with fusion being the most desirable.

Approaches attempting CO<sub>2</sub> storage are dangerous, for CO<sub>2</sub> is a deadly poison in significant concentrations. The CO<sub>2</sub> must be converted to a higher energy hydrocarbon and then processed into a stable form such as oil for safe storage, including in the ground.

## Significance of the problem

Like a car, the Earth has an energy storage battery, and it's nearly dead as of 2021. A 2015 PNAS study estimates this battery may become fully discharged in approximately 2046, see <https://doi.org/10.1073/pnas.1508353112>. The state of battery charge reported above is approximated by the  $\Omega$  value in Fig. 5. The slope from 1980 to 2000 is about  $-\Delta 22.3 \Omega/\text{year}$ . From this slope  $\Omega$  is calculated to approximate 0 in 2046. There is uncertainty with these figures, but most studies have similar findings showing energy depletion within 100 years.

Over the last 2000 years humanities rate of energy use has exponentially exceeded the rate that it is replenished by photosynthesis. The components of the 99.2% discharged battery have accumulated in our atmosphere and oceans resulting in the symptoms of climate disruption, sea-level rise, and other environmental issues. At the present rate of energy consumption, the Earth's energy battery becomes

dead as shortly as in 25 years. Humanity and civilization then go extinct. Only high rate recharging will be able to stop the discharge and then start a gradual recharge of the Earth energy battery. This will normalize the carbon balance, eliminating the symptoms of climate disruption, sea-level rise, and other associated environmental issues.

## **Solution to the Problem**

The solution is to energize low energy molecules  $\text{CO}_2$  and  $\text{H}_2\text{O}$  into high energy molecules  $\text{CH}_4$  (natural gas) and  $\text{O}_2$ . We call our process of energizing of these molecules Fusionsynthesis. Shell Oil Company has patented a PurePlus® Technology which makes motor oil from natural gas. This oil is a hydrocarbon form that is safely storable. FESH is globally most likely the only firm attempting to provide a complete solution to energize greenhouse gases to fuel and an oxidant. We have patents and patent pending on the major two first steps of this technology, and are ready to patent and research the remaining parts.

## **Key Elements of Solution to the Problem**

The most important element is a hot hydrogen fusion clean energy source. It needs to be an efficient source of concentrated primary energy. The  $\text{CO}_2$  end product of burning fossil fuel will take tremendous amounts of energy to recycle. The energy density of wind and solar is just too low and they both require fossil fuel for construction. A 6 MW offshore wind turbine needs about 32 years to break even on the  $\text{CO}_2$  emitted by just the manufacture of the 100 tons of concrete comprising its tower. The issues are complex, and the environmental cost of manufacturing this “green” equipment is just not considered. We need a primary energy source that has high power density, operates 24/7, 365 days a year, is easily transportable, is sustainable into the long-term future, is clean and reliable, and is safe. Only fusion fits this specification.

Direct-air carbon capture of  $\text{CO}_2$  with a partial pressure at about 0.04% of atmospheric pressure must be done with means allowing capture rates feasible for such operations in an economic manner. Processes using chemical capture and then subsequent  $\text{CO}_2$  release from a substrate will not be suitable in process magnitude and will not be suitable economically. What is needed is a filter with sufficient selectivity and capacity to directly filter  $\text{CO}_2$  from a mixture of gases or an atmosphere.

## **Relevant FESH Technology**

An AC driven, concentric velocity impact hot hydrogen fusion nuclear reactor as disclosed in our US Patent US 8,090,071 B2. This reactor promises very high gain with a theoretical power gain calculating up to a billion times, yet we initially propose a conservative gain of only 10-1000. The foremost competing technology represented by the \$27B ITER project which is struggling to just reach ten times gain. However, they face too many engineering contradictions to actually succeed.

A high “Q” molecular bandpass filter (HQMBF) is disclosed capable of selecting a species of a predetermined AMU mass from a group of gases as disclosed in international PCT Application PCT/US2019/037324 filed and pending as of 1/26/2021 in the USA, China, Japan, India, the Russian Federation, and the European Union. The US application issued August 23, 2022 as utility patent US 11,420,152 B2 to Dr. DeLuze. The selected species AMU value is adjustable. With  $\text{CO}_2$  having two major isotopic species with AMU=44 comprising 99% and AMU=45 comprising 1%. The selectivity and “Q” of this bandpass filter is such that it would be possible to filter species AMU=45 without removing species AMU=44 though it be about 100 times more prevalent.

Fusionsynthesis comprises two or more steps. With fusion energy  $\text{H}_2\text{O}$  is split with discharge of  $\text{O}_2$  to the atmosphere and transmission of  $\text{H}_2$  onto the next step in the sequence. This  $\text{H}_2$  and HQMBF captured

CO<sub>2</sub> are combined using energy from fusion to form CH<sub>4</sub> (natural gas) and H<sub>2</sub>O by the Sabatier process and/or pending FESH processes. The CH<sub>4</sub> is sent to oil companies for synthetic oil and H<sub>2</sub>O production using fusion energy. Shell Oil Co has patented a PurePlus technology whereby Pennzoil synthetic motor oil is now produced from natural gas. The H<sub>2</sub>O is sent back to step three for splitting. FESH is prepared to do research and file patents on remaining processes. The first two processes of fusion and HQMBF, patented and patent pending by FESH, comprise the most difficult parts of this overall sequence to solve.

### **Steps to Solving Problem**

Performing proof of concept (POC) testing of the FESH Phase I reactor.  
Obtaining and outfitting a R&D lab and facility for FESH and its operations on Oahu of Hawaii.  
High power testing of Phase I reactor variants.  
POC testing of Phase II reactor.  
High power testing of Phase II reactor variants.  
POC and R&D of bandpass filter on various AMU isotopic species.  
Prototype R&D on CO<sub>2</sub> isotopes.  
All these steps to run sequentially and concurrently as appropriate.

### **Estimated Budget**

FESH has a 7-year, \$570 million project budget which leads to over \$88 trillion of energy wealth over the 20 years following the project. This business plan is available on request. This project involves a proof of concept (POC) followed by construction of an operational on line 20MW commercial fusion power plant. The power plant is \$320M with the remaining portion being the \$250M first stage comprising: proof of concepts, R&D, 10 world wide patents, Hawaii lab and facility, FESH corporate budget, and contingency reserve. The initial \$250M budget period is for 3 years and the additional \$320M power plant will extend the project out to a total of 7 years. It is paramount to not use US federal funding until a fusion online power plant is operational thus proving this technology. This will secure FESH from US march in rights and intellectual property seizure. Department of Energy funds will then become available for constructing an online demonstration fusion power plant of up to \$1B in cost without losing intellectual property rights.