

A Review of "A Green Sun", by Charles Grey.

We now have the first fictional novel about the polywell. "A Green Sun" was published digitally on Amazon.com by Charles Grey. It came out in the middle of March 2012 and I had a chance to read it. It was a quick read. Mr. Grey has created a story which touches on many of the issues associated with the polywell. Is this a dream for the environmentalists, or a quick way to get rich? Who would endeavor to make such a machine work? How would the US and other world governments react? Just how fragile is our current energy system? It was a nice book and I recommend it Polywellers out there. Warning: if you plan to read it, this review will spoil the story.

Summary:

The novel follows James McConnell, a wealthy oil executive. The book opens with an oil spill. Standing on the beach, surrounded by dead animals, James decides it is time for a change. Luckily, he has a former girlfriend with a dream, and a startup. The startup is a San Francisco based firm named Prometheus limited. The woman is named Joliene Wu, an Asian PhD with a purple stripe in her hair. Joliene cannot raise the cash needed to build a full scale, PB11 polywell reactor. James decides to take a small chance on her and McConnell Refining invests 400 million dollars into the project.

The story moves ahead several months, to the spring of 2013. Joliene and her team are assembling the full scale reactor when disaster strikes, Ghawar runs out of oil. Ghawar is the worlds' largest oil field. Regular gasoline shoots to over 7.75 a gallon and life everywhere starts to get very hard: food prices rise, water prices rise and home prices rise. Many families are forced to gobble up their savings to maintain their living standards. Families are kicked out of their homes and the stealing of gas becomes widespread. The police cannot protect individuals because they cannot operate their police cruisers. The Prometheus company is forced to hire mercenaries.

This all culminates in July 2013, when riots breakout. Finally fed up, people start looting, rioting, killing and setting fire to every major city across America. The public takes out their anger on McConnell Refining and destroys a billion dollar oil facility. The book follows Joliene through a battle in the streets of chaotic San Francisco. The full scale polywell is finally finished. When they run the test, it works. In fact, they start supplying the city with 100 MW of continuous power. The company holds a press conference announcing to the world the existence of a new source of energy. James states that with so much excess power, it is now cost effective to extract CO2 from the air for making \$5 gasoline. This announcement helps to quell the nationwide riots.

Governments around the world react by starting their own Polywell programs. Joliene asses this in the book: "Oh, it will not be easy, but I'd bet a competent R&D group could get their own machine up in running in a year or so." The oil industry decides it is in their best interests to back the Polywell. This is for public relations reasons. The public is mad. They focus their anger on the oil industry. In response, the government threatens to nationalize big oil. The companies decide to support the Polywell to shift the blame and reinvent their image. The public likes it because it stabilizes gas prices, is environmentally friendly and creates American jobs. The politicians like it because it cuts off America from foreign oil, making our country energy independent. Excitement about this new technology grows and Joliene is featured on late night talk shows and in TV interviews. Interestingly, both Greenpeace and the Sierra club are reluctant to endorse the idea.

James and Joliene travel the White House to sell the idea. In the novel, a 500 MW machine costs 250 million dollars. The pair sells the president on investing in a national program to build Polywells in every major city. With loans from the government, the program aims to make the US completely energy independent and restart the US economy. A nationwide Polywell system is projected to stabilize gas prices to below 5 dollars a gallon, removing all uncertainty from gas markets.

General Impressions:

It was a nice book to read. You can download a copy through Amazon. It goes by quick, and has some nice character development. Mr. Grey cleverly opens each chapter with passages demonstrating the ripple effects from this invention. One chapter opens with commentary from a fictitious BBC documentary on the Polywells' effect on global politics. Another chapter opens with quotes from a 2024 history book on energy tipping points. The author is weaving the Polywell into the context of our current world. For example, the closing of Ghawar was first announced on Wikileaks. Invariably, Mr. Grey's story will conflict with your own personal narrative. Many in the Talk-Polywell community have their own visions for how this reactor will play out in society. Some of us have invested years into those ideas. The location; why would this play out in San Francisco? Why does it have to be in the US at all? The organization; why a startup? People have envisioned this reactor built by many different groups. These include university labs, pioneering individuals, military black projects, defense contractors and foreign governments. The team; why would it be led by an Asian female? In actuality - odds favor an Asian male being the lead researcher. In advanced sciences, males outnumber females more than 2 to 1 and foreigners tend to outnumber US citizens. And why does it have to be someone with an advanced degree? They are plenty of smart people out there without formal educations who can pick up this material. In reality, the Polywell is just out there, ready for a wide variety of people to work on it.

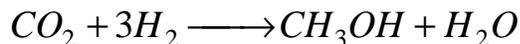
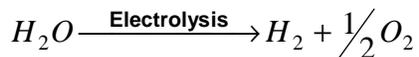
Technical Criticism:

There are a couple technical points in the story that cannot be ignored. Under no circumstances is this reactor radioactive free. The idea of a zero waste operating Polywell is not true. The reactor with the lowest radioactivity is a machine burning P-B11. That reaction is classified as aneutronic, but side reactions will make neutrons[4]. Aside from this there are other mechanisms for making neutrons [5] and neutrons make metal radioactive. We also loved how the problem of energy extraction was solved by referring to a "Dr. Gupta" who by his very presence solves that problem. All in all, the story marginalizes the technical problems this is facing.

Methanol Production:

In the novel, James uses the excessive energy from the Polywell to extract CO₂ to make methanol. "With enough energy we can create gas from the air.." Let us subject this claim to technical scrutiny: how much energy would it take to generate methanol from air and water? Water and carbon dioxide are very stable. Hence, converting them into methanol, by any means, will cost lots of energy. This is why methanol is normally produced from natural gas. There are a variety of methods for methanol production other than the method illustrated here. The first step is to freeze air to -57 C. Condensed CO₂ would liquify out and could be collected. Luckily, this is the first major gas to come out. Assuming constant pressure, the energy needed to do this step can be found by using the heat capacity of CO₂. The next step is to generate hydrogen. This can be done by splitting water by passing current through it. It takes a minimum of 237 kJ to split 1 mole of water [2].

$$\frac{\text{CO}_2 \text{ Condensing Energy (kJ)}}{\text{Mole}} = ([\text{Room T}(293\text{K}) - 216\text{K}]) * \text{Cp} (0.0371 \frac{\text{kJ}}{\text{Mole} * \text{K}}) = 2.86 \frac{\text{kJ}}{\text{Mole}}$$
$$\frac{\text{H}_2\text{O Splitting Energy [kJ]}}{\text{Mole}} = \frac{237 \text{ kJ}}{\text{Mole}}$$



To make one gallon of methanol, you need to make 337 moles of hydrogen gas and 112 moles of CO₂. This takes a minimum of 80.2 MJ under this method. That is prohibitory high. Most of the cost comes from making the hydrogen; and there must be simpler methods for doing that. However, based on price calculations from this blog [3], under the worst case scenario, a boron fusing polywell would make methanol at 3.68 a gallon. That is when the machine is 1% efficient and burning 20 percent of the boron fuel. It may be able to do much

better. If the Polywell is fusing 35 percent of the boron and catching 5% of the energy, methanol would be at 42 cents a gallon. That price would kill Exxon Mobil.



Citations:

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4. "Aneutronic Fusion." *Wikipedia*. Wikimedia Foundation, 07 June 2012. Web. 28 May 2012. <http://en.wikipedia.org/wiki/Aneutronic_fusion>.
5. Rider, Todd H. "A General Critique of Inertial-electrostatic Confinement Fusion Systems." *Physics of Plasmas* 6.2 (1995): 1853-872. Print.