

Visionary's Guides to Fusion Energy Production



Volume 1: Executive Overview

by Matthew R. Wood
EnergyMadeCleanly.com

This free Special Report is not to be sold under any circumstances. Please pass it along in its original form to anybody who expresses an interest in practical fusion power, reducing carbon dioxide emissions, alternative energy enthusiasts, and anybody who just plain wants to slash their energy bills.

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Email mwood@energymadecleanly.com to schedule speaking or consulting engagements.

Let's get down to business.

Although the calendar puts us in the 21st century, the attitudes and practices of government, the science it funds, business, and society in general are still stuck in the 20th century mindset. They attempt to solve big problems by throwing large amounts of money at individual problems that fail to address the systemic, inter-related nature of the real problems that would yield the greatest results with the least investment of all resources.

This Special Report is about building a network of micro-investors at the \$100 to \$1,000 level with a pressing need to solve a number of problems without waiting for the niceties of "peer-reviewed scientific confirmation" which can take years in fusion research.

This network will work closely with one or more Alumni Relations offices in their communities to leverage entire campuses in some cases to fund, experiment, confirm, and publish truly peer-reviewed science to the established Journals in real time. This can ideally happen in less than a week, although monthly or quarterly cycles may tend to be the norm.

The bigger the challenge, the more opportunity for the networked mind to find potential solutions, or at least parts that other members can build on using open databases of problems to solve, theoretical development and debate, experiment design (serial or parallel), experimental results, and published papers.

The key here is that one problem could have several thousand teams working in parallel. Each campus would be able to see what's worked how well and find potential solutions without duplicating others' experiments verbatim.

Except for the Eureka Papers requesting confirmation.

Since many programs and experiments will be peer-rated as having a high probability of success, many teams can be expected to have confirmation experiments ready to execute in a timeframe that resembles calling for an air strike.

Big Science will sneer, of course, but the entire campus approach coupled with the networked mind can be developing tooling and manufacturing processes in parallel as well, since the most time and effort is expended in computer time rather than building and testing hardware.

This is the key to large scale rapid prototyping and the resulting low product costs, which will in turn make smaller production runs profitable. Compensating contributing students on the winning projects can effectively eliminate tuition for many engineers and scientists who don't have the years and classes required for graduation.

These people, like collegiate athletes, are the most motivated people we can find anywhere on the planet. Moreover, they're less likely to be hindered by hidden assumptions, and more likely to phrase their word problems in terms of the real problems to be solved.

Applying the networked mind to developing the Focus Fusion reactor

I rate Lawrenceville Plasma Physics Inc.'s work developing the Focus Fusion-1 (FoFu-1) as having at least a 90% probability of reaching at least energy break-even on schedule in 2010 because they've been developing their theory and testing it with scaling experiments for over 30 years now. They've received a total of \$800k in funding, so this team is not gravy train science. This is about a Mission.

Of their 2 main contributions to DPF development, the Angular Momentum Inducing Coil (AMC) and investigation of McNally's Magnetic Field Effect (MFE), the AMC showed an immediate 8:1 improvement just by energizing it.

Therefore, if they don't make history in 2010, I rate their probability of doing it in 2011 as 99.9%.

Peer-reviewed scientific confirmation is expected to take a year or more. The next major hurdle is engineering the X-ray to electricity converter, known as "the onion" due to the thousands of very thin foil and insulator layers that it takes to fabricate.

The onion's development is made to order for the network we've been discussing, or vice-versa. The needs for parallel experiments and rapid confirmation are what led me to develop the network approach.

The onion will need to develop its own specialized tooling, based on the semiconductor industry's Chemical Vapor Deposition (CVD) technology to help with making all of the cooling and electrical connections in an automated manner which may take a week or more for production-grade 5MW versions.

The first beneficiary of this tooling is going to be solar panel manufacturers, who may be cost-competitive without subsidies in only a few years. Thousands of those machines will be needed to mass produce DPF generators, which I call Aquarius, after the 5th Dimension song "Age of Aquarius". Cheap, clean energy will certainly usher in the Age of Aquarius, once the bubbles have burst and stock valuations return to realistic prices.

The biggest hurdle of all would normally be exposed 5 to 10 years from now, after the science has been confirmed and the sole investigator has demonstrated an operational prototype that makes over 1MW of net, salable electricity as well as heat. That challenge is Nuclear Regulatory Commission regulation.

If Aquarius were to apply for a license today, it would be treated just like it would if it split atoms and made radioactive waste. To be built in quantity, a new NRC licensing category for DPF-based Aneutronic Fusion Reactors has to be established.

This means they need experience observing this type of machine in order to learn what it can and can't do, so that manuals and procedures can be developed.

Now here's where it can get dicey- the NRC works for Congress. The obvious route is to get a bill through Congress directing the NRC to begin developing said licensing category. I'm sure you can already see the political wrangling, expense, and delay. And the mangled, meaningless legislation that we just watched with the Health Care Bill. Then another lag while the legislation is implemented in the form of regulations and procedures.

Here again, there's strength in numbers. A privately-funded network of 2,500 or more DPF labs as local as community colleges, funded at \$1M each represents roughly 25 million to 250 million donors, many of whom wield substantial influence. The combined capital would be around \$2.5G. This guarantees the financial community's full attention and participation, for better or worse. Cheap, clean energy will make the dot com bubble look like nothing once the word gets out.

At this scale, we can hope that the special interest groups will realize that they can make a lot more money and good will by helping rather than hindering aneutronic DPF development and licensing. The more energy a company uses, the more attractive an Aquarius, or an array of them, becomes.

Thus the network has the ability to eliminate pork barrel politics for its projects as well as all of the other benefits that we've discussed so far in return for contributing anywhere from \$100 to \$1,000 to one or more of your community colleges or universities and earmarking it for a DPF-based Aneutronic Fusion Energy lab and research program.

This and all other projects that you may or may not wish to invest in will likely be tax-deductible, to boot. We'll take a look at the DPF's ability to generate jobs in the next section.

Job Creation Potential:

Here's a partial bill of materials required to assemble and market 1 million DPF Aneutronic Fusion Power Plants per year, which can result in a near monopoly for the prepared mind that isn't afraid of a little risk.

- * 12 million high energy, high voltage, high speed pulsed power supply capacitors. These are bulky, heavy, expensive, and cantankerous to work with. The industry has plenty of room for expansion, especially for companies who can progressively minimize one or more of these problems.

- * 12 million HE/HV/HS capacitor switches. This sleepy little niche is getting away with reliability and price/performance problems that only the R&D world will put up with due to the current lack of competition.

- * 1 million PLC-based ignition systems and firmware. Look for controller firmware to be the opportunity, since so many companies already make PLCs for demanding mass production applications.

- * 8 million stamped steel HV delivery plates. Again, look for established tool and die shops to own this niche. But cheap, clean heat and electricity could change this and many other industries.

- * 1 million water jacket tanks and frames. This is a relatively low-precision part that can be manufactured by local fabricators and/or installers.

- * 1 million base plates. This is a precision machined part built mainly using automated laser sintering and machine tools, **which will soon become immense markets in their own right**. The real winners in this niche will be the tool builders who can make these machines do ever more for ever less money and energy. The metals listed for these parts are currently preferred, but not absolutely required. Look for differing architectures to specify differing metals.

- * 1 million beryllium/copper anodes. This part can be built using laser sintering and/or traditional lost foam casting and machining, depending on the anode geometry. Expect geometries to become ever more complex, like apartment building rooflines over the last 30 years, as DPF numeric modeling software tools become more refined and computer prices fall.

- * 16 million beryllium/copper cathodes. See anode, but expect more price pressures due to much larger volume. There is an option for the cathode to be one continuous ring, however. This will allow cathode vendors to specialize by which company's architecture they wish to align with.

- * 1 million stainless steel vacuum chambers about the size of a 5 gallon bucket. Pretty much the same as the electrodes, except using thick walled stainless steel.

- * 1 million vacuum pumps. Again, this is currently a sleepy little specialty market whose

price/performance ratios are about to be turned on their ear. As with all of these mentions to machinery, the toolmakers's supply and training chains will also be great places to find opportunity since they're well hidden from the spotlight.

- * 1 million turbo-molecular pumps. These glorified vacuum pumps remove the last few traces of atmosphere, hence contamination, before the fuel gas is injected. These manufacturers are also in for a brawl.

- * 1 million stainless steel inductive converter tubes. An extension of the vacuum chamber, these may or may not be integrated into the body design.

- * 1 million copper tubing coils with cooling and electrical connectors for the inductive recovery subsystem. This part is essentially a wave guide. Expect the cost of wave guides to fall and the market for their tool makers to explode.

- * 1 million heat exchangers and associated plumbing. Come and get it! This is one of the key areas for the ongoing size, weight, and price reductions that will define the more mature DPF marketplace.

- * Countless fasteners and sensors, etc.

- * 180 million photovoltaic converters for generator applications. The X-ray to electricity converter is much simpler in theory than engineering or production. It's known as the onion due to its thousands of thin foil and insulator layers. It's expected to be made on leading edge and next-generation chip making machinery, so once again, **this is a tool maker's paradise**. Cooling around 2MW of electrical power in a package this small and complex, along with the X-ray physics requirements, are going to keep the onion makers in challenges and profits until the DPF is replaced by an even better technology. Hard to believe, but that's the way innovation has played out down the millennia.

- * 1 million cap bank controllers may or may not be integrated into the PLC controller package. Each capacitor is charged and monitored individually, but generally fired in unison. Since this type of capacitor is currently a very finicky and quirky device that needs a lot of pampering, any firmware/hardware that can improve cap bank reliability and delivered charge repeatability is going to clean up.

- * 1 million output power conditioning modules. These translate the very high voltage, high current pulses of only a few tens of billionths of seconds into commercially useful voltages, frequencies, and currents. Clever design may be able to justify the cost of the entire DPF generator module by eliminating the transmission transformer(s), especially in larger arrays.

- * 1 million transmission transformers for commercial power applications. As noted above, this will have to integrate the power conditioning module in order to earn it's spot on the team. "That's the way its always been done" can be financially suicidal in the 21st century business environment.

- * Thousands, perhaps tens of thousands of skilled and semi-skilled workers. Also mentioned above, the tool makers for a number of industries will also need designers, engineers, technicians, assemblers, installers, service teams, and so on.

- * All of these people need to be trained, and many will need to be certified. This offers opportunities

in the education and regulation fields. ***And what better creds than real-world hardware doing realworld research, where every day is another chance to make history?***

The real market potential is revealed by the automotive, PC, and cel phone industries' ability to churn markets that should be saturated on paper. This is why the schools with reps for power density and shielding effectiveness (smaller, lighter designs), energy storage density and switching prowess will always be in high demand by employers and students alike.

The bottom line is that while none of us can make this happen as isolated individuals, the tasks involved become much, much more manageable when 100 million or more people raise their collective voice that they've had their fill of the governments' tease tactics regarding clean energy and are taking action to force practical fusion into the very near future.

This is Just in time for the 2010 State Officer and 2012 Presidential elections, by the way. This time around, we can vote for *meaningful* change. Any candidate who talks clean energy but has no detailed Aneutronic Fusion Integration Plan should be seen as being out of touch and therefor unfit for 21st century leadership.

What you can do right now is call your local college(s) and start inquiring about building the Network; Make sure you're on my mailing list at <http://energymadecleanly.com> so you can stay up to date in energy and Network development;

Tell everybody you know that the world doesn't have to suck anywhere near as much as it sometimes seems. One of the problems with "reality" is that there are so many marketing messages brainwashing us into believing that we're screwed, we've always been screwed, and we're always gonna be screwed, because that's how they make their money.

I prefer Hope, fortified with Action. That's what made America great last century. We can make the world as cool as we want it to be.

Best Regards,

Matthew R. Wood
Hastings, MI.
March, 2010