Godesburg's Haven Investment Letter

Garrett **BALDWIN**

5 STOCKS WITH NUCLEAR

FUSION POWER EXPOSURE

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5 Stocks With Nuclear Fusion Power Exposure

By Garrett Baldwin
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Godeburg's Haven Investment Letter

Nuclear fusion power could be a panacea to the world's energy problems.

Fusion - the reaction which powers the Sun - releases four times as much energy as the fission reaction which powers conventional nuclear plants, and nearly *four million* times as much as coal combustion.

Perhaps more importantly, fusion is a carbon-free energy source that uses easily-attainable materials for fuel. It produces much less harmful radiation than fission - and *no radioactive waste*.

Yet for decades, researchers have grimly joked that fusion power is "only 30 years away - and *always will be* only 30 years away."

Though commercial-scale fusion power is not yet attainable, a number of American companies have made substantial progress in the last year on clearing those obstacles.

And the potential for early investors in this space is staggering.

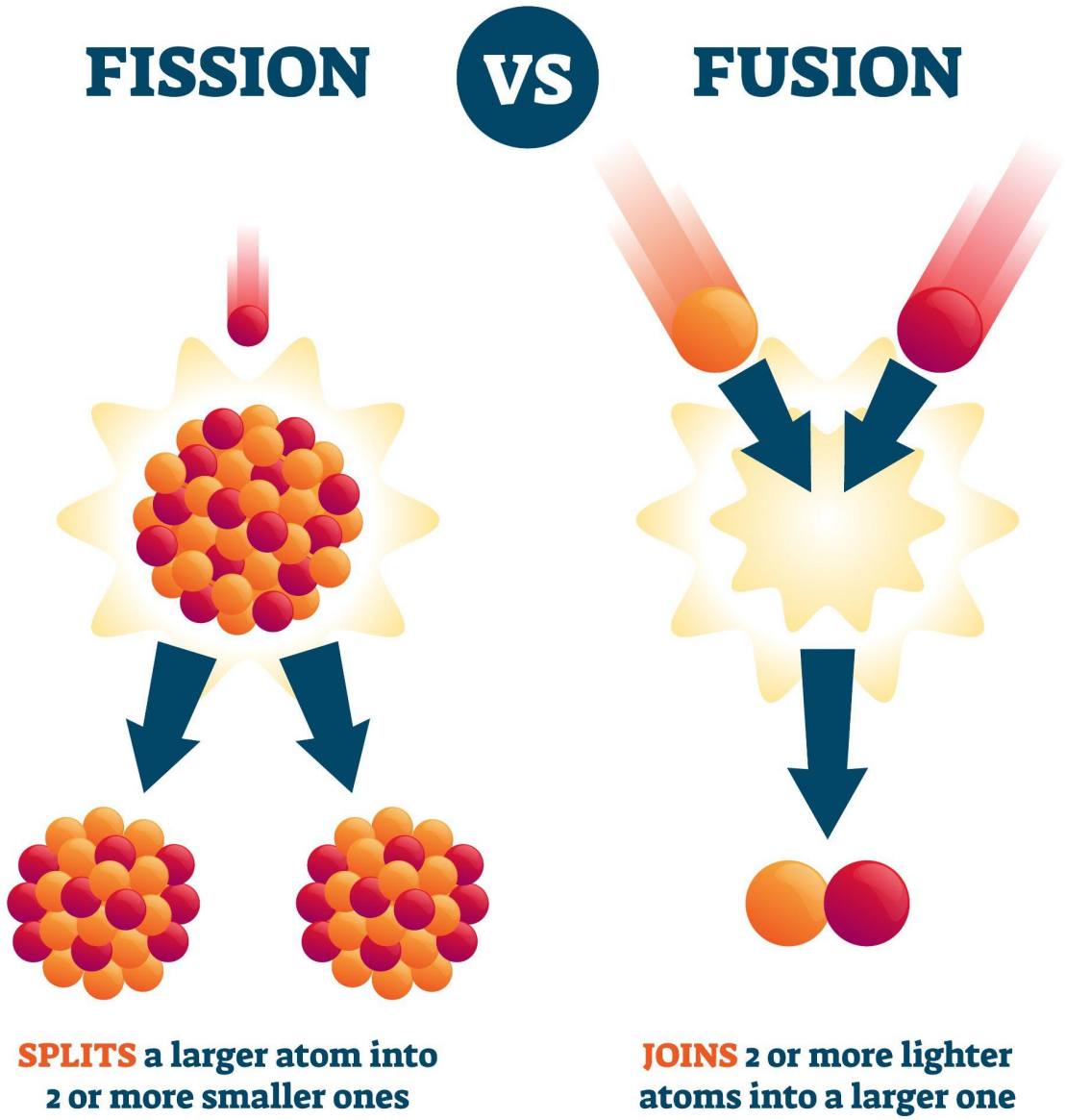
In this report, we'll profile some of those firms - and the publicly-traded companies that own stakes in them.

But first, we should answer the technical question at the heart of this topic…

What's The Hold-Up With Fusion Power?

It's not that we don't know how to achieve fusion. In fact, one way to describe the fundamental problem with fusion power is that we're *too good* at releasing massive amounts of energy through fusion reactions.

Without getting too deeply into the science, one can understand the basics of the fusion and fission processes with this image…



The U.S., Russia and other major nuclear powers have been building and testing fusion weapons - otherwise known as thermonuclear warheads or hydrogen bombs - since the early 1950s.

These two-stage weapons use a conventional nuclear fission bomb “starter” to compress and heat lithium deuteride fusion fuel into a Sun-like plasma, causing a runaway fusion blast thousands of times more powerful than the fission bombs dropped on Hiroshima and Nagasaki.

Mushroom cloud from Castle Bravo*, an early U.S. fusion weapon test at Bikini Atoll in 1954.*
Source: https://www.atomicheritage.org/sites/default/files/Castle%20Bravo.jpg

The problem is that we’re *only* good at producing instantaneous, runaway fusion reactions capable of leveling cities.

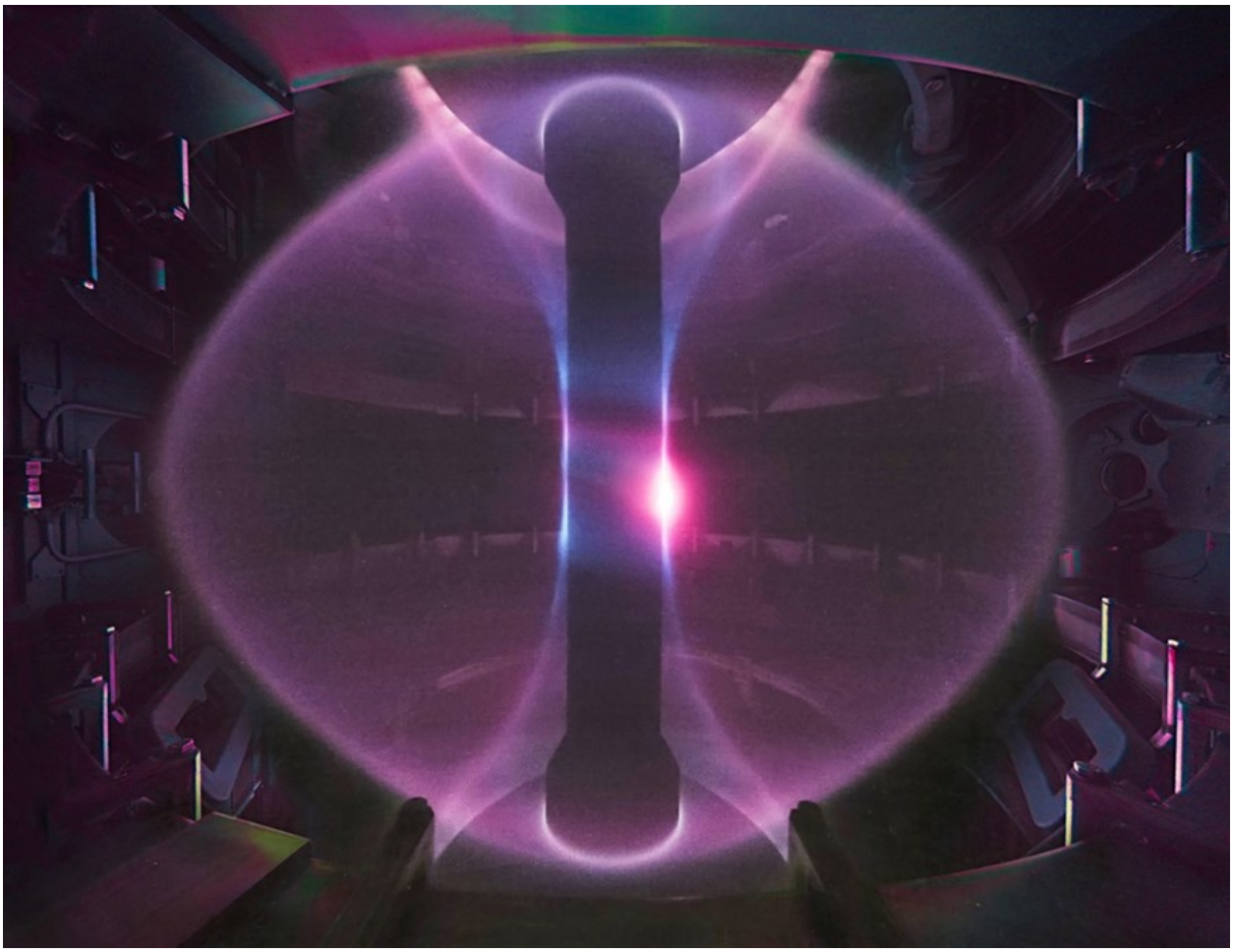
We have trouble doing it efficiently on a smaller and more-contained scale.

After all, nuclear weapon designers don't have to worry about containing fusion reactions. Their job is to produce reactions that are as uncontained as possible.

But in *nuclear power plant* design, containment is everything - and containing the kind of energy source pictured above is no small feat.

Several countries have built experimental reactors which are capable of achieving controlled fusion, using high-energy lasers to heat a small pellet of fusion fuel containing deuterium (hydrogen-2) and tritium (hydrogen-3) into a fusile (fusion-prone) plasma state.

These reactors use powerful electromagnets to contain the plasma inside of a heat-shielded, donut-shaped enclosure called a *tokamak* (a Russian-language abbreviation for "toroidal magnetic chamber").



Plasma undergoing fusion in the tokamak at the U.K.'s Culham Centre for Fusion Energy.
Source: https://www.iter.org/doc/www/content/com/Lists/WebText_2014/Attachments/1/plasma_in_mast.jpg

The idea is to use strong magnetic fields to prevent the plasma from expanding or touching anything, and to compress it to a density where fusion can occur.

But here's the thing about powerful electromagnets: they use a *lot* of electricity.

And to date, no fusion reactor has ever been able to produce more electricity than it uses for containment.

In summation, the main hurdle in viable fusion reactor design is actually quite simple...

We know how to achieve fusion, and we know how to control it at power plant scale.

We just need electromagnets which are energy-efficient enough to use less electricity than their power plants produce. That's the last engineering hurdle standing between us and commercially-viable fusion reactors.

And late in the summer of 2021, a private company in Massachusetts made a huge step toward developing such electromagnets…

Commonwealth Fusion Systems' September 2021 Fusion Breakthrough

Cambridge, Massachusetts-based Commonwealth Fusion Systems (CFS) is a privately-held company which was spun off from the Massachusetts Institute of Technology (MIT) in 2018.

CFS develops experimental fusion reactor components as part of a public-private partnership with the U.S. Department of Energy, and specializes in containment magnets.

In early September, CFS tested an electromagnet at MIT's Plasma Science and Fusion Center (MIT-PSFC) which created a 20-tesla magnetic field.

That figure is 12 times stronger than the magnetic field generated by a magnetic resonance imaging (MRI) machine, and strong enough to contain plasma in a full-scale fusion reactor.

Engineers working on the new CFS magnet at MIT-PSFC.
Source: https://www.cnbc.com/2021/09/08/fusion-gets-closer-with-successful-test-of-new-kind-of-magnet.html

But more important than the strength of the magnet was its power usage. It produced this super-strong magnetic field while consuming only 30 watts of electricity - less than the average laptop.

For reference, the second-most efficient magnet tested at MIT-PSFC used *200 million watts,* which is more like what a small town uses.

The CFS team claims that its new magnet is strong enough and energy-efficient enough that a tokamak built with it will be able to achieve “net energy.”

That means it’ll be able to produce more energy than it consumes.

Before the test, many researchers estimated that the world was at least a decade away from this breakeven point - but now, that timeline is a whole lot shorter.

CFS itself now expects to have a working net-energy fusion reactor up and running by 2025.

The problem for interested investors is that CFS is private.

But like many private companies, CFS is partially owned by its financial backers - *and some of those backers are publicly-traded companies.*

Below, we'll take a look at five of these publicly-traded companies with stakes in or partnerships with CFS and similar fusion companies nearing commercial viability.

Equinor (EQNR) And CFS

In May 2020, CFS raised $84 million in series A2 funding, bringing its total funding to more than $200 million.

One of the biggest investors in the A2 round was the Norwegian energy conglomerate Equinor.

Founded in 1972 and based in Stavanger, Norway, Equinor is a partially state-owned multinational energy company that focuses on oil and gas exploration and production.

It also has substantial investments in alternative energy sources including wind power and biofuels.

Here's what CTO Sophie Hildebrand had to say in a press release announcing the CFS series A2 round:

> *"Equinor is a broad energy company and we will continue to invest in promising and potentially game-changing zero-carbon energy technologies. We are investing in fusion and CFS because we believe in the technology and the company."*

The firm has a relatively heavy debt-to-equity ratio of 95.8% and a relatively steep trailing-twelve-month price-to-earnings (P/E) ratio of 24.27 at the time of writing.

Equinor may not be a deep-bargain value stock in its current state, but it has a uniquely-heavy investment in the CFS electromagnet technology which could unlock net-energy fusion reactors in the next few years.

In other words, it's closer to booking actual fusion power revenue than any other publicly-traded company - and that could be worth tolerating a lofty debt burden and high valuation.

It has maintained impressive topline growth. In the most recent quarter, revenue increased by 129.8% year over year.

Equinor also pays a dividend of $0.56 per share, currently equal to a 2.12% yield. Shares were up 83.62% in the year prior to this report.

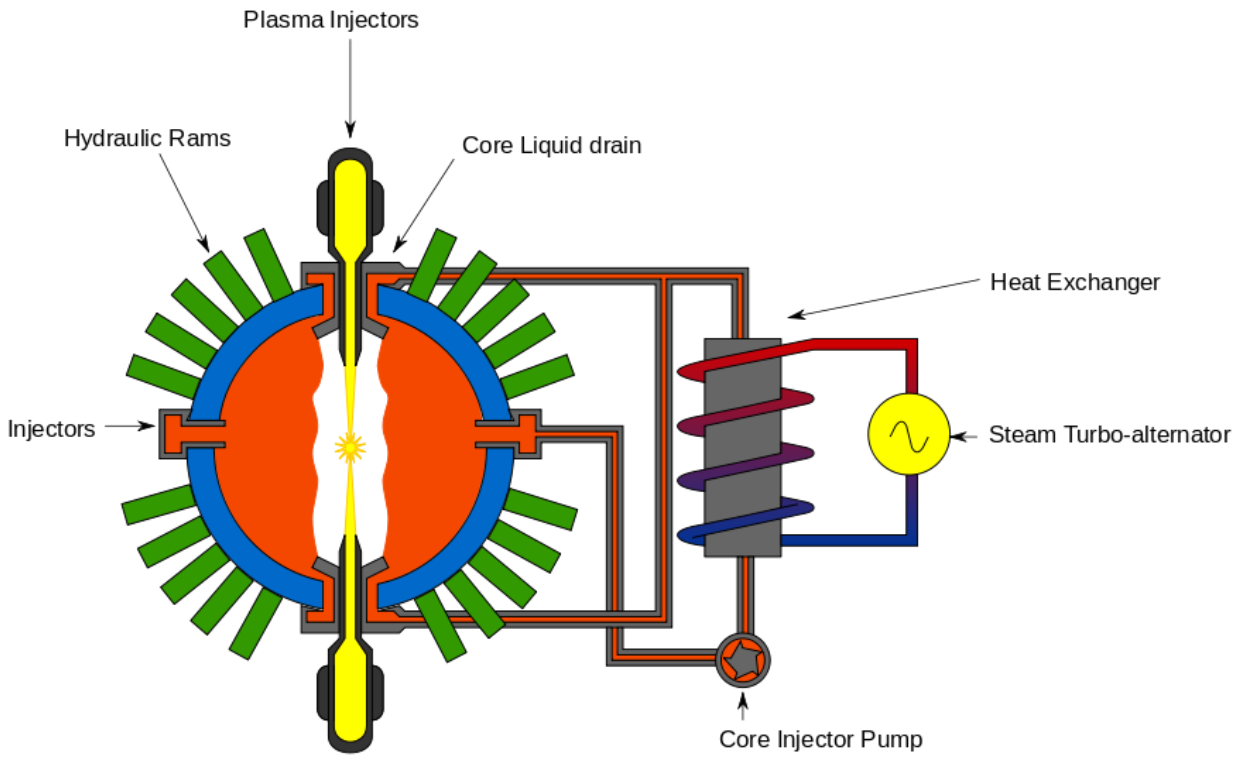
Its average 12-month price target among equity analysts is $34.00 - a premium of more than 15% above its current price level.

But CFS isn't the only game in town.

Microsoft (MSFT), Cenovus Energy (CVE) and General Fusion

General Fusion is a privately-held, British Columbia-based developer of experimental fusion reactors founded in 2002.

Its reactors are based on a magnetized target fusion (MTF) design, in which fuel is heated and compressed into fusile plasma by a “cocoon” of magnetically confined molten metal that circulates around it.



The General Fusion reactor design, in which a contracting vortex of molten lead and lithium (orange) is used to compress and heat fuel (yellow) into fusion conditions. This molten metal captures heat from the fusion reaction and is subsequently pumped through a heat exchanger which boils water into steam, which in turn spins turbines and generates electricity.
Source: https://en.wikipedia.org/wiki/General_Fusion#/media/File:General_Fusion_Reactor.svg

This is a slightly different concept than CFS’s magnetic confinement design, in which fuel is compressed *directly* by strong magnetic fields and heated to fusion temperatures by lasers.

MTF reactors are theoretically less efficient than magnetic confinement reactors, as the heat exchanger mechanism shown above inevitably saps some energy.

But they don't require the kind of super-strong, super-efficient electromagnets needed for pure magnetic confinement fusion.

This factor would theoretically make it easier to build with current technology.

General Fusion expects to have a prototype reactor complete by the end of next year.

Back in 2017, General Fusion began a collaboration with Microsoft to build applications on its Azure cloud computing platform.

These apps analyze data from reactor design experiments and suggest improvements.

Microsoft is lending members of its Developer Experience Team to General Fusion as part of the collaboration.

And Microsoft will receive valuable reactor design data in return.

Founded in 1975 and based in Redmond, Washington, Microsoft is a multinational software company.

Besides its well-known Windows operating system and Microsoft Office suite, the company offers specialized services to the energy industry like the aforementioned Azure.

Power plant operators including ABB and Eaton use its Energy Core cloud software product.

Through its collaboration with General Fusion, Microsoft is positioning itself as an important source of fusion reactor software for the nascent fusion industry.

The company has a much more manageable debt-to-equity ratio than Equinor (57.95%), but it also currently has an even higher trailing-twelve-month P/E ratio (36.38).

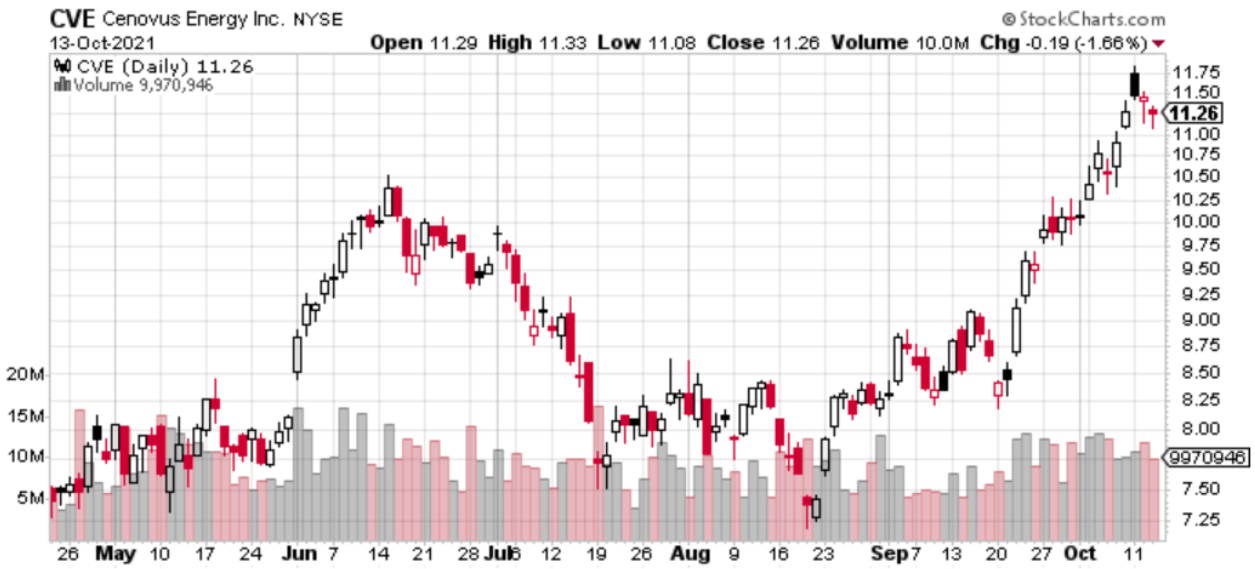
In the most recent quarter, however, it grew earnings per share (EPS) by 46.9% on a 21.3% increase in revenue.

The company pays a $2.24 dividend, equal to a 0.76% yield at the time of writing. Shares are up 34.16% in the last year.

Analysts give it an average 12-month price target of $342 per share - implying double-digit upside from its current price in the next year.

General Fusion has received more than $300 million in funding - much of which came from Calgary, Alberta-based oil and gas firm Cenovus Energy.

Since its foundation in 2009, Cenovus has invested in a variety of new energy technologies outside of its core hydrocarbon operations, including solar power and - as we've discussed - fusion power.



The firm has a relatively-high debt-to-equity ratio and P/E ratio at the time of writing (69.93% and 27.02, respectively), but saw revenue soar 386.5% year-over-year in the most recent quarter.

It pays a $0.04 dividend, currently equal to a yield of 0.31%.

Shares are up by an impressive 187.98% in the last year.

The consensus 12-month price target on Cenovus shares is $13.98 - more than 15% higher than current levels.

Goldman Sachs (GS), Alphabet (GOOG) and TAE Technologies

TAE Technologies, formerly known as Tri Alpha Energy, is a California-based fusion reactor developer which was founded in 1998 and is privately-held.

The company's reactor design is based on field-reversed configuration (FRC) technology. FRC is basically a variant of CFS-style magnetic confinement which replaces the donut-shaped tokamak with a long cylindrical chamber - another potential way to simplify construction.

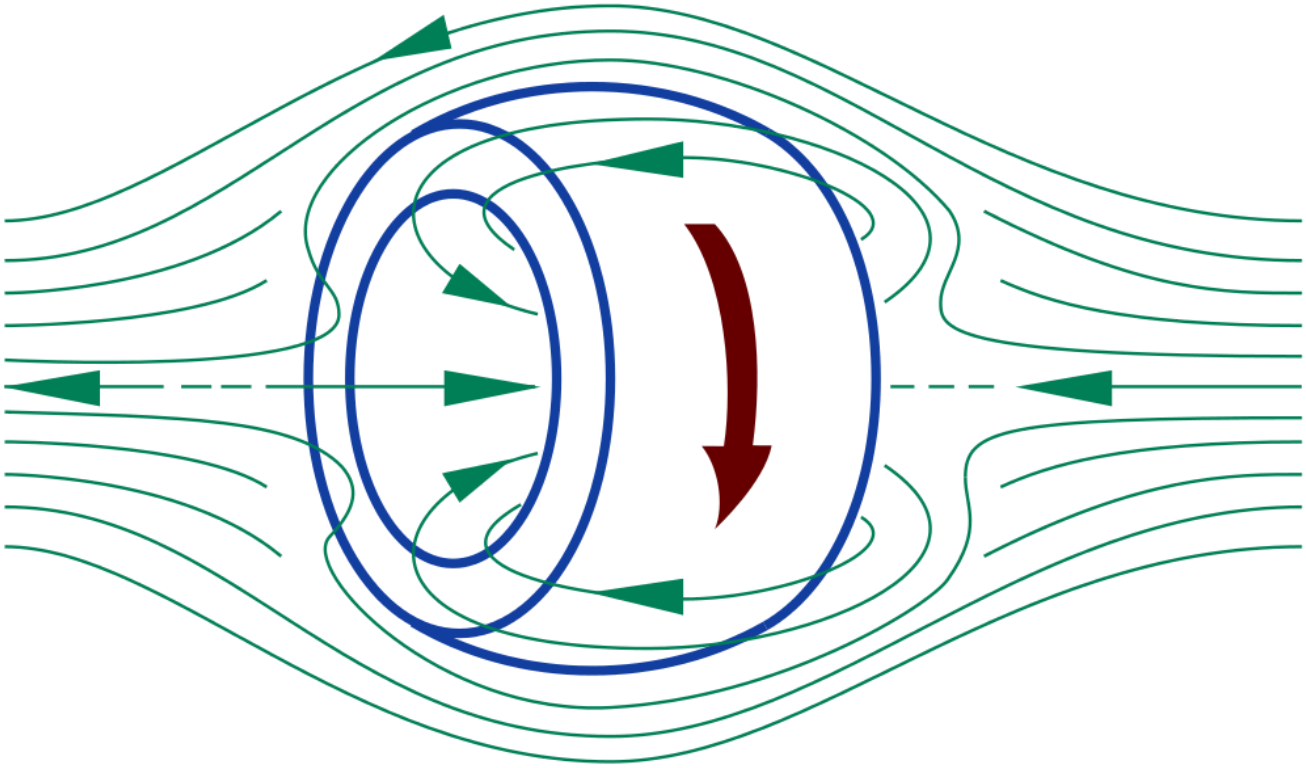


Diagram illustrating FRC technology, in which multiple magnetic currents (one shown by green lines, another shown by the blue-and-red spinning donut shape) compress fuel to fusile density inside of a non-toroidal chamber.

Source: https://en.wikipedia.org/wiki/Field-reversed_configuration#/media/File:Field-Reversed_Configuration.svg

TAE expects to have a working commercial fusion reactor built by 2030.

Since 2014, TAE has had a data analysis partnership with Alphabet subsidiary Google which is similar to Microsoft's partnership with General Fusion.

Google builds cloud applications which collect data from TAE's reactor design experiment and use AI to suggest improvements.

In 2017, its "Optometrist Algorithm," a fusion reactor data analysis program, discovered a series of reactor design improvements which were published as a research paper in the *Scientific Reports* journal.

Founded in 1998 (as Google) and based in Mountain View, California, Alphabet is a multinational software and internet services company best known for the Google search engine and Android operating system.

However, Google is also a prolific investor in renewable energy.

It plans to run entirely on carbon-free electricity by 2030.

And the valuable fusion reactor IP it is gaining from its partnership with TAE should help it become a leader in renewable energy tech in the years ahead.

Like the other companies we've discussed in this report, Alphabet has a lofty P/E ratio (30.14 at the time of writing), but it has a very low debt burden (just 11.83% of equity).

In the most recent quarter, it grew EPS by 166.2% on a 61.6% increase in revenue.

It does not pay a dividend.

The average 12-month Alphabet price target among analysts is $3,155.44 - a premium of more than 10% above its price at the time of writing.

Shares have risen by 75.88% in the year prior to this report.

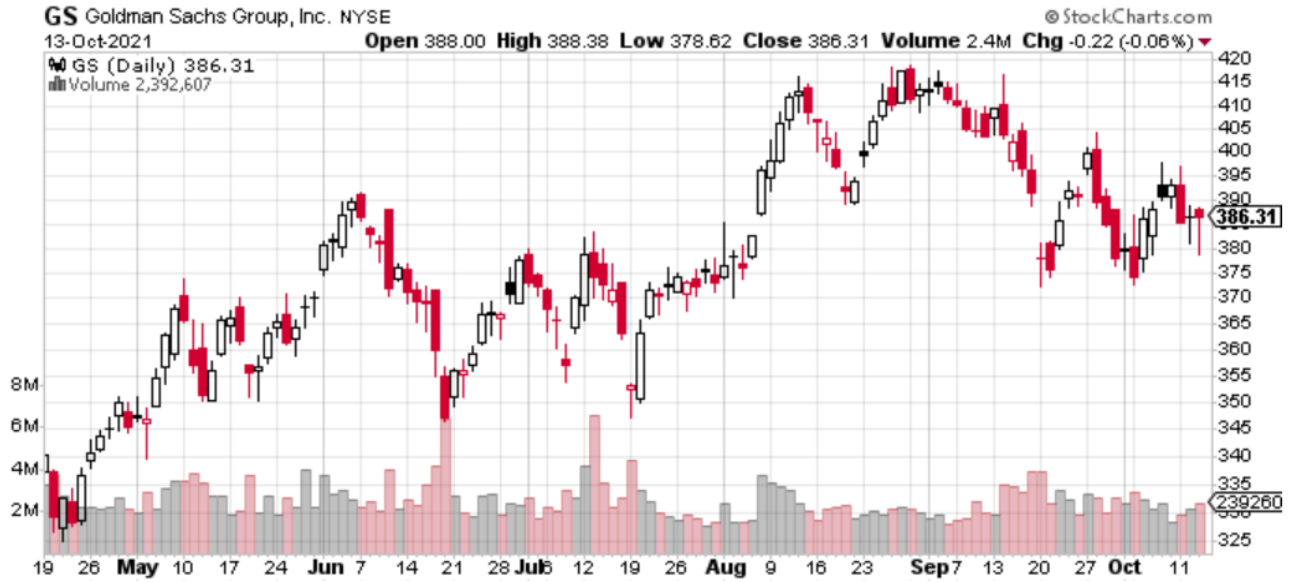
Back in the early 2010s, TAE raised nearly half a billion dollars in early-stage fundraising from a consortium of venture capitalists - and Goldman Sachs. Today it has more than $800 million in total funding.

Founded in 1869 and based in New York City, Goldman Sachs is best known as one of the "bulge bracket" investment banks.

But it's more heavily involved in the nuclear power industry than most of the big Wall Street players.

Earlier this year, Goldman invested $200 million in a SPAC merger to take nuclear power equipment maker Mirion Technologies public by combining it with GS Acquisition Holdings Corp II, an entity created and backed by the investment bank.

The newly-public company started trading under the ticker symbol "MIR" in late October at a valuation of roughly $2.6 billion. And as discussed, it's sitting on a big chunk of equity in fusion pioneer TAE Technologies.



Goldman Sachs currently has a much lower P/E ratio than the other companies we've discussed in this report (7.04), but also has a much higher debt-to-equity ratio (549.78%).

In the most recent quarter, EPS soared 1370.8% on a modest 32.3% increase in revenue.

The company pays a $5.00 dividend, equal to a 1.29% yield at the time of writing.

Shares have risen 82.89% in the last year.

Analysts give it an average 12-month price target of $459.08, yet another 10%+ premium above current levels.

Our Nuclear Fusion Stock Watchlist: Equinor (EQNR), Cenovus Energy (CVE), Microsoft (MSFT), Goldman Sachs (GS) and Alphabet (GOOG).

The Other Obstacle To Nuclear Fusion Power

Thanks to the work of public-company-backed startups like CFS, General Fusion and TAE Technologies, the world is on the brink of developing net-energy-producing fusion reactors which could supply the world with abundant, safe and carbon-free power.

But as we discussed at the beginning of this report, a few simple obstacles stand in the way of commercial-scale fusion power.

The electromagnet efficiency problem is arguably the biggest - and the only remaining *engineering* problem - but it's not quite the only potential impediment to plentiful fusion power.

We mentioned earlier that fusion reactors run on fuel made of deuterium and tritium - two rare isotopes of hydrogen which are especially useful for nuclear fusion.

Hydrogen is the most abundant element in the universe, and for most of history, sourcing it hasn't been much of a problem.

But our research indicates that another hydrogen-consuming green energy technology is set to explode in prominence in the coming years, to the point where it could potentially put a strain on the global hydrogen supply.

It's too early to predict whether this could pose a significant problem for fusion power.

But what we can envision is the potential impact on another energy resource.

These two green energy technologies should soon drive up the demand for hydrogen - and make shareholders in a few hydrogen companies very wealthy.

We'll be talking more about hydrogen's potential in upcoming issues of *Godesburg's Haven Investment Letter*.

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