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THE A.I. KEYSTONE

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The A.I. Keystone

A Matter of National Security

How U.S. Defense Technology Will Supercharge the AI Industry

Quinnebago Outdoors is closed for good.

After two years of slow sales in his Panora, Iowa, sporting goods store – and around $25,000 in lost rental revenue for canoes and kayaks – store owner (and clever namesake) Quinten Pfeiffer auctioned off his inventory, and in November 2023 put his store up for sale.

There's nothing wrong with Quinten's business model. It's just that the Middle Raccoon River – where most of his customers swim, row, and float – has dried up.

It's pretty hard to paddle a canoe on mud.

Central Iowa is in the middle of a three-year-long drought – its worst in 20 years. Major tributaries, like the Raccoon and Skunk Rivers, are so low they're at wading level. The city of Des Moines is suffering "abnormally dry conditions," according to the U.S. Drought Monitor.

Unfortunately for Quinten and Quinnebago – and other Iowans' homes and businesses – the dry spell isn't likely to end anytime soon.

And it's not just because of the weather. The Drought Monitor reports that overall dryness in the state is improving... and in fact, October 2023 saw above-average rainfall.

So why are the rivers around west Des Moines still only ankle-deep?

For a surprising reason... ChatGPT.

Sometime in 2020, Microsoft quietly built a cluster of million-square-foot data centers in the cornfields of Iowa, in order to "train" the powerful artificial intelligence ("AI") program on human speech patterns and vocabulary. They were "pretty secretive on what they're doing out there," said Des Moines Mayor Steve Gaer. But eventually, residents realized that the company was siphoning off immense amounts of Iowa water to cool down ChatGPT's super-hot supercomputers.

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Several rivers' worth, in fact.

It's no secret that the AI boom is energy-intensive. Since 2010, the processing power required to train AI went from doubling every 20 months, to doubling every six months. That's a 16-*trillion*-percent increase over the last 13 years alone… and it shows no signs of slowing down. Research institute Epoch AI warns that the

> *"amount of [computing power] developers use to train their systems is likely to continue increasing at its current accelerated rate."*

That means in one year, the amount of computing power required to train AI systems will increase by 300%… in three years, by 6,300%… and in five years, by a staggering 102,300%.

Along with that unimaginable amount of energy comes an unquenchable need for water to keep data processing centers from overheating.

And the more we rely on ChatGPT… and Bard… and DALL-E… and Midjourney… the more water we use. Just one plant – Microsoft's 102.5-acre ChatGPT processing center in Quincy, WA – diverts 121,000 gallons of river water *per day* for each of the three data servers on the campus.

It's not hard to guess where all the river water in Quinten Pfeiffer's neighborhood has gone.

As Virginia Tech researcher Abu Bakar Siddik told Futurism magazine, the "increased number of data centers that ramp up the water demand in the [Des Moines] region… could lead to high water stress in the region. Iowa can be disrupted by these events because there are already a high number of data centers compared to other states in the Midwest."

Microsoft used almost 1.7 billion gallons of additional water – increasing the company's global water consumption by about 34% – in 2022, largely due to the energy-intensive computer programs needed for its ChatGPT model. That's equivalent to over 2,500 Olympic-sized swimming pools. (Much of that water came from rivers in the already drought-burdened Des Moines area, where Microsoft had set up its data centers near cheaper power sources.) The same year, Google used *5.6 billion* gallons of extra water while "training" its Bard AI.

For perspective, every five to 50 questions you ask ChatGPT use up the equivalent of around a 16-ounce bottle of water. Right now, ChatGPT receives an average of 10 million queries per day (or 250,000 gallons of water). That's roughly 300 million queries (or around 7.5 million gallons of water) per month.

Research from the University of Washington shows that it costs around one gigawatt-hour of energy to answer these queries. One gigawatt-hour is roughly the same energy consumed by 33,000 households!

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And that's for only one AI program. ChatGPT handles only about 60% of overall AI queries. And the field is still in its infancy.

The resources needed to sustain the AI boom – not just water, but energy itself – are staggering. And they are demands that, soon, we'll be unable to meet.

The Only Way to Generate Enough Power for AI

By 2027, *The New York Times* reported, AI servers are predicted to consume as much as 134 terawatt hours annually.

So, in less than three years, AI will have the same annual energy consumption as countries like Argentina, the Netherlands, and Sweden.

These energy demands are simply not sustainable.

Especially when AI adoption is at 1% of where we'll be in the next few years, according to industry insiders.

When AI adoption penetrates 10% or 20% of the market, we're looking at it consuming unprecedented amounts of energy.

Now, those on the frontier of the artificial-intelligence industry are aware of this problem, and they have started to sound the alarm.

> *"If you really want to make the biggest, most capable super intelligent system you can, you need high amounts of energy." - Sam Altman, CEO OpenAI*

> *"The world is actually headed for a really bad energy crisis because of AI unless we fix a few things." - Arijit Sengupta, founder Aible*

> *Elon Musk predicts that by 2045 the power demand in the U.S will have tripled from current levels – largely driven by AI's needs.*

They know that unless the insatiable energy demands of AI are met, the industry will never go mainstream.

And right now, there is no solution.

Fossil fuels are the primary energy source used to train and operate AI systems and could continue to meet the growing energy demands.

But that would require the woke Silicon Valley tech companies and progressive politicians to turn their backs on the religion of climate change.

And with the activists already up in arms about the environmental impact of AI, this is untenable to the ruling class.

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So they'll argue that renewables like wind and solar should be used to meet the energy demands of AI. But the reality is that there is zero chance of these renewables producing enough low-cost energy to meet AI's needs.

Says a report from a New York City-based think-tank The Manhattan Institute: thinking that wind and solar can ever replace fossil fuels is nothing but an "exercise in magical thinking."

The projected energy consumption of artificial intelligence we discussed earlier is 134 terawatt hours (TWh) annually. To generate this amount of energy from wind power alone would require almost 17,000 wind turbines… taking up roughly 900 square miles, about 1.5 times the size of Houston – the fourth largest city in the U.S.

It's obvious that renewables like wind, solar, and hydro will never meet the energy demands of AI. And this has created a unique situation…

Bluntly, the economic, social, and geopolitical incentives behind AI are far too powerful to be stopped.

Even the Biden administration is not incompetent enough to halt the progress on A.I development and cede power to our rivals like China and Russia.

However, for AI development to continue and reach its full potential, vast amounts of energy will be required.

And there's only one viable solution: **nuclear energy**.

Just as the Keystone in an arch is required to hold the structure together, I believe the entire AI market will rely on nuclear power as a new Keystone technology.

Without this tech, I don't believe the industry will ever scale or achieve its full economic potential.

In short: nuclear energy is the future of the entire AI sector.

And – fascinatingly – right now, the nuclear opportunity we're recommending is being spearheaded, and funded, by the U.S. military.

No Snowflakes Allowed

When actual lives are on the line, it's interesting how priorities come into stark relief.

War, for instance, requires efficient energy that works. Full stop. Sorry, snowflakes. Grab a rifle or shut up.

During the height of the U.S. wars in Iraq and Afghanistan from 2001 to 2010, more than half of U.S. combat casualties were sustained during transport missions. And over 80% of these stemmed from demand for two critical battlefield resources: water and fuel.

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Running a military requires a lot of energy. The Department of Defense (DoD) consumes 10 million gallons of fuel per day, and 30 TWh of electricity per year (one terawatt-hour is enough to power roughly 1 million households).

As military technology continues to advance, the energy demands of the modern battlefield will only increase. That spells more opportunities for the enemy to strike vulnerable fuel supply chains, leading to more American lives lost. To address this growing vulnerability, the DoD established the Task Force on Energy Systems for Forward/Remote Operating Bases to find a solution. In August 2016, the task force released a report detailing its findings.

The report began by crossing out the solutions that don't work:

> *"The study found alternative energy sources, such as wind, tidal, solar, and other sources, were unlikely to comprehensively meet current or future energy demands for forward operating bases, remote operating bases, and expeditionary forces."*

Let's pause for a moment to appreciate the irony here. While U.S. politicians squander trillions of taxpayer dollars trying to overhaul America's formerly robust electric grid with unreliable wind and solar power, the DoD is running in the opposite direction.

To address the needs of military commanders tasked with winning on the battlefield with a minimal loss of life, snowflake economics and feel-good fantasies like solar and wind power need not apply.

That's how the task force settled on the most reliable, high-density energy known to man: nuclear energy.

Nuclear power is one of mankind's most remarkable achievements – offering a virtually limitless source of reliable, cheap, carbon-free baseload power. If environmentalists were actually moral scientists, using technology to build a better life for more people, they would be pounding the table on nuclear power. That they abhor nuclear power above all other solutions tells you all you should need to know about their real purposes.

They aren't saints. They are Nazis, determined to end human civilization as we know it.

Sure, it's a hobby horse for us – calling environmentalists Nazis. But what wouldcause the deaths of more people? The Nazis, who are largely responsible for World War II, and who are definitely responsible for murdering millions of Jews, caused the deaths of something like 30 million people. If the environmentalists could end coal-fired electricity tomorrow, upon which most humans on this planet depend?

Billions would die.

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Nuclear power starts with the uranium-235 isotope. Scientists learned to "split" this atom in the 1940s through nuclear fission. The fission reaction unleashes unimaginably larger (1.5-2.5 million times more) amounts of energy per unit of mass compared to coal, oil, or natural gas. The fission of a 10-gram (a peanut weighs about a gram) uranium pellet releases as much energy as burning 4,350 gallons of oil... 22 tons of coal... or 590,000 cubic feet of natural gas!

For the DoD, a pebble or so of uranium-235 could replace thousands of fuel-hauling vehicle convoys, potentially saving the lives of countless American troops. It could also be used to power water purification and recycling, and other energy-intensive battlefield requirements. And of course, the civilian applications of this kind of technology – though less imminent – are beyond mind boggling.

So, why aren't we using nuclear energy everywhere?

Here's the problem – this powerful, efficient energy source is usually chained to unwieldy, giant nuclear power plants that take 10 to 15 years to build and billions of dollars of investment.

Building a full-sized 500 megawatt (MW) nuclear power plant in a battle zone isn't an option. But what could make sense is harnessing nuclear energy at 1/100th of that scale, providing power to supply the roughly five MW required to run the forward operating bases (FOB).

FOBs are small, makeshift military bases used in areas where a physical presence is needed, but where a full-scale military base is impractical. For example, during the war in Afghanistan, the U.S. military built FOBs in areas staffed by a few dozen troops on an isolated mountainside. A reactor to support an FOB would need to be able to be deployed by rail, truck, or cargo plane, and small enough to fit inside a 20-by-20-foot shipping container.

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The 2016 task force concluded that such a reactor design was possible, and DoD's Strategic Capabilities Office moved to the next phase – building a prototype

Project Pele

Project Pele brought together an alphabet soup of government agencies, including the Department of Energy (DoE), NASA, the Army Corps of Engineers (USACE), the Nuclear Regulatory Commission (NRC), and the National Nuclear Security Administration (NNSA). The project's aim: develop a nuclear microreactor for deployment "by road, rail, aircraft, or sea" that was also capable of "quickly being brought on land" and was "inherently safe." Success would be "a strategic game-changer for the United States, both for the DoD and for the commercial sector," according to Project Pele manager Jeff Waksman.

To make this ambitious plan a reality, the DoD enlisted help from the private sector. In March 2020, the DoD launched a two-year design competition for a prototype of the Project Pele microreactor, soliciting bids from a group of top nuclear engineering design firms.

In June 2022, the DoD selected a prototype developed by a public company that's poised to reap a windfall by developing the next phase of nuclear power – one that could revolutionize global electricity production around the world.

Before we talk about the massive new opportunity, let's review this company's highly profitable core business that offers the ultimate recession-proof play. After all, there's one trend we can count on through thick and thin… the growth in the U.S. military budget.

20,000 Leagues Under The Sea

The company tasked with building America's first commercial microreactor also built the world's first portable nuclear reactor… 70 years ago.

Just nine years after testing the first atomic bomb, America harnessed the awesome power of nuclear energy in a portable underwater reactor on board the U.S.S. Nautilus – the world's first nuclear submarine, launched on January 21, 1954 (and named after Captain Nemo's famous science-fiction submarine in *20,000 Leagues Under the Sea*).

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USS NAUTILUS Launching Ceremony
January 21, 1954

Before the revolution in naval war unleashed by the Nautilus, submarines ran on diesel-electric power trains. These vessels were powered by a large bank of lead-acid batteries, which were charged by diesel engines. The batteries lasted only about two to three days before needing a recharge. The diesel engines that charged the batteries required oxygen – which meant that when the batteries depleted, submarines would need to surface in order to draw atmospheric oxygen. Going up to the surface, and emitting hot exhaust fumes, is the last thing that submarines should do if they want to remain undetected.

The Nautilus's S2W Thermal Nuclear Reactor reactor solved these problems. It required no oxygen, generated no external waste, and could travel an almost unthinkable 62,000 miles (that's like circling the earth twice, with 10,000 miles to spare) before needing to replenish its nuclear fuel. Food supplies, rather than fuel, became the limiting factor for submarine voyages. What's more, the nuclear engine generated a monstrous 13,400 horsepower, making it significantly faster and more maneuverable than its diesel-electric peers.

On May 10, 1954, the Nautilus made naval history when it traveled 1,400 miles from Connecticut to Puerto Rico, fully submerged, in less than 90 hours – an evening short of four days. This shattered records for the longest and fastest submarine cruise, and it rendered obsolete the entire playbook on anti-submarine warfare tactics developed throughout World War II. It also set the stage for America's undisputed naval supremacy for the next 70 years.

The importance of controlling the seas – the conduit for 80% of global trade – has been known since ancient Greek statesman Themistocles famously declared, "He who controls the sea controls everything."

The company that designed and built the components for Nautilus's nuclear reactor was **BWX Technologies (NYSE: BWXT)**. Since then, BWXT has cemented

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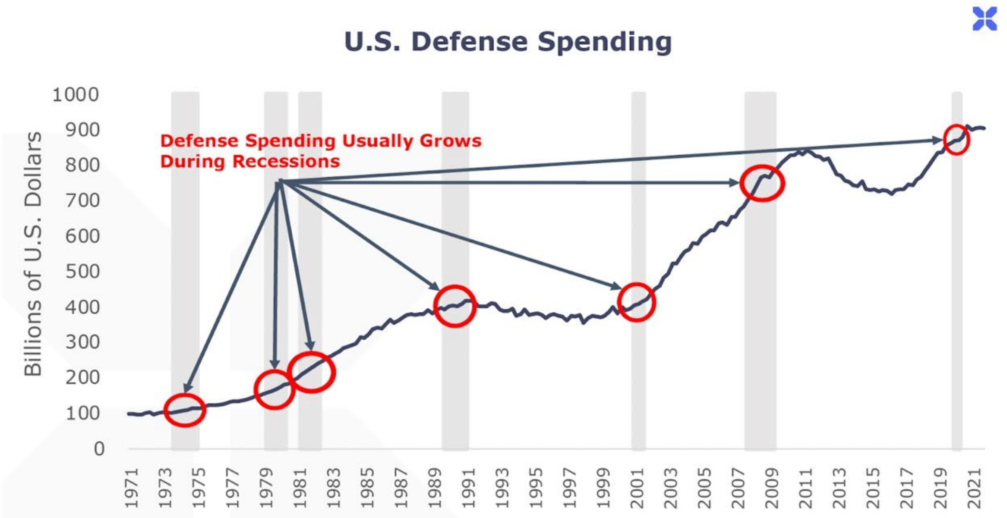
itself as the key supplier of reactor design, components and fuel for America's nuclear navy.

Mr. Monopoly

U.S. defense spending grows even – or especially – during recessions, which makes this defense supplier stalwart a great investment for our current **Minsky moment**.



Source: Federal Reserve Bank of St. Louis

BWXT has been at the forefront of nuclear technology since the birth of the industry. Today it operates four main nuclear business units in the U.S. (BWXT Power, BWXT Nuclear Energy, BWXT Nuclear Operations Group, and BWXT Technical Services Group), as well as the only two commercial plants in the U.S. that process uranium.

Most importantly, BWXT is the sole manufacturer of nuclear reactors and fuel for U.S. military aircrafts and submarines. It's also one of only two providers licensed to store and process HEU (highly-enriched uranium) for these reactors.

The government sector accounts for 80% of BWXT's revenue. And nearly all of its deals with Uncle Sam are carried out via long-term contracts, resulting in a very stable and predictable business and revenue flow.

As a monopoly manufacturer, BWXT can set prices (within reason), and lock in steady profit margins. If a project incurs unexpected cost overruns, BWXT can charge the Navy back fees to make sure it hits its target profit margins. That's how BWXT posts stable profit margins, with very little exposure to swings in the economy from recessions, inflation, or other external factors.

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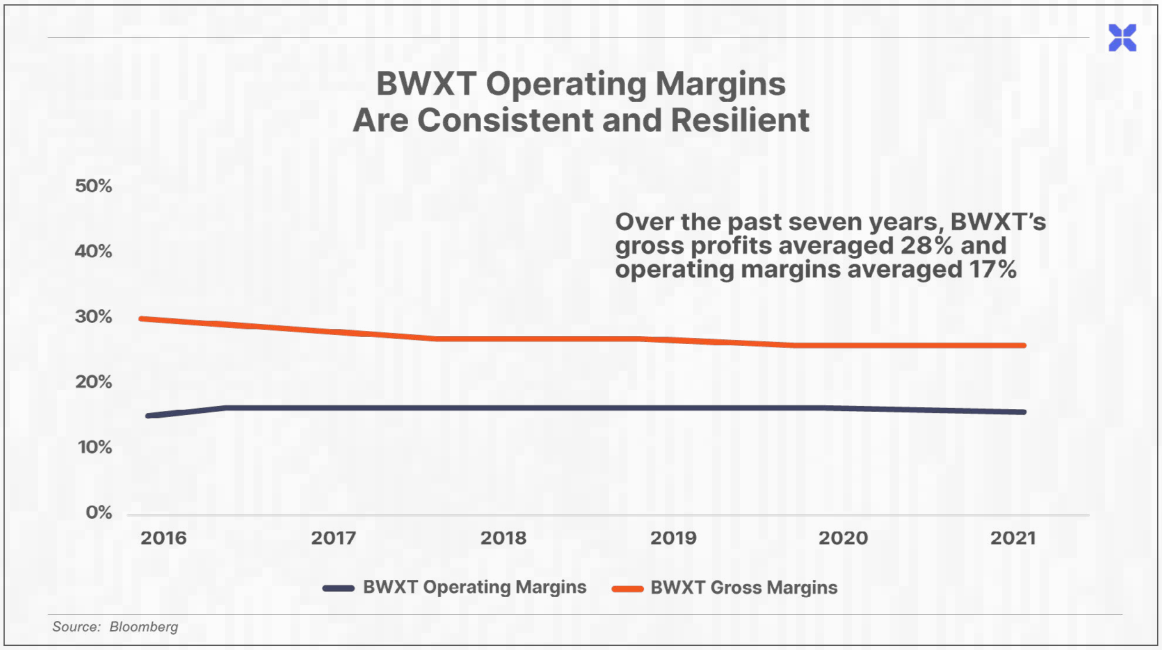
Over the last five years, the economy suffered through a devastating pandemic and economic shutdown, followed by the hottest inflation in the last 40 years. During one of the most turbulent macroeconomic periods in U.S. history, BWXT's business has chugged along with remarkable stability with profit margins:



The business also provides a clear line of sight into the future, based on the full slate of projects BWXT has lined up...

BWXT Is The Navy's "Main Squeeze"

With around 290 active, deployed ships, the U.S. Navy is not the largest in the world by ship count. It is, however, the most powerful naval force thanks to its unmatched fleet of nuclear-powered vessels, including 50 attack submarines, 18 strategic submarines equipped with nuclear warheads, and 11 aircraft carriers.

BWXT is responsible for powering the Navy's submarines and its aircraft carriers. It delivers nearly all of the mechanical equipment in the engine room for the Navy for their nuclear platforms. Below is the fleet of Naval nuclear platforms, as well as the status (number of orders left to fulfill) and the contribution value of each ship when serviced or refueled.

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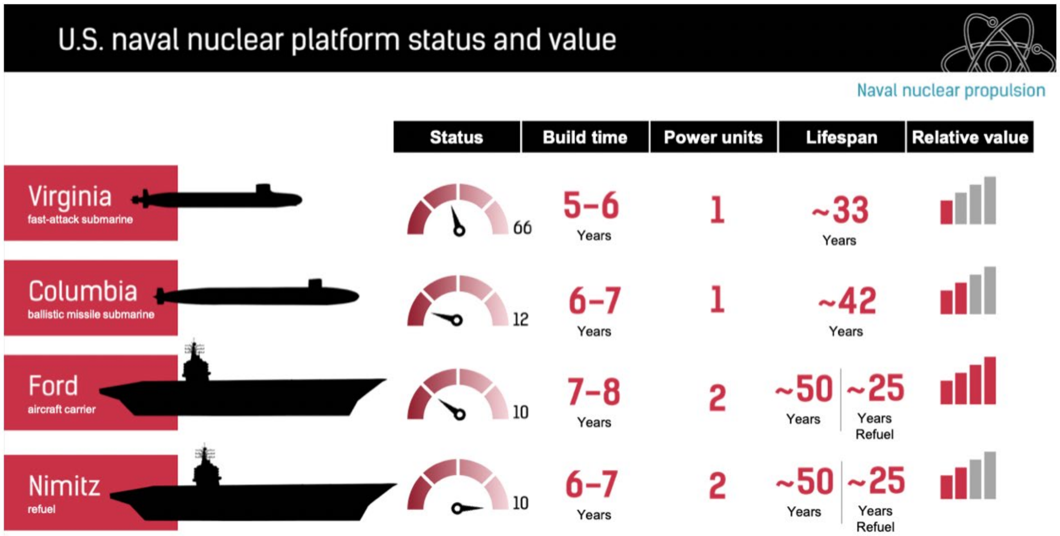

Source: BWXT 2021 Investor Day Presentation

The Virginia and Columbia submarines, as well as the Ford and Nimitz aircraft carriers, depend on BWXT, allowing for a long runway of growth for the company over the next five to eight years.

The Virginia and Columbia have life-of-ship power units (meaning they only need one reactor for the life of the vessel), while the Ford and Nimitz have half-life-of-ship power that need to be replaced once after 25 years. The Ford, as seen above in the chart, has the highest relative value followed by the Nimitz and the Columbia.

These contracts provide BWXT visibility into future orders, which BWXT receives two years prior to the shipbuilders' receiving their order. Below are the scheduled programs which BWXT released at its 2021 Investor Day.

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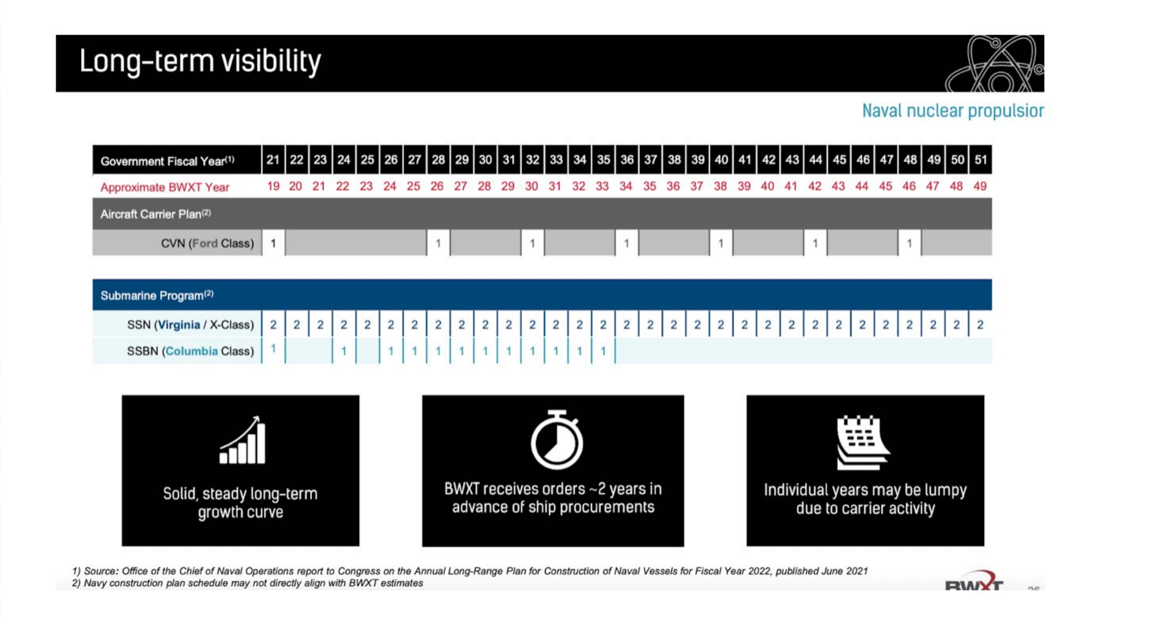

Source: BWXT 2021 Investor Day Presentation

Orders from the Ford and the Columbia ramp up in the middle of the decade, which directly correlates with future revenue and earnings for BWXT. With the Ford having the greatest impact on BWXT's top and bottom lines, and the Colombia receiving one expected order per year between 2024 and 2033, BWXT's roadmap over the next decade is promising, and poised to translate to growth in earnings.

BWXT's margins increase over the time of a contract as it typically realizes cost underruns and optimizes the manufacturing costs over the lifespan of naval nuclear-reactor contracts.

Very Stable Genius

The predictability and stability of BWXT's business is unmatched. It has a near-lock on supplying the Navy with critical nuclear inputs. And demand for new carriers and submarines is based largely on the retirement of the existing fleet, so it's easy to map out what the business will do next. And it's growing apace…

Revenue grew from $1.6 billion in 2016 to $2.2 billion over the last 12 months, while earnings rose from $184 million to $313 million. The company generates roughly $90 million in free cash flow ("FCF") and spends between $100 and $200 million in capital expenditures ("capex") each year. This FCF goes toward a steady buyback program, which has reduced the outstanding share count by 14%, from 105 million in 2016 to 91 million by the end of 2022. (Share buybacks are a tax-efficient way of returning value to shareholders.)

The combination of growing net income and a falling share count has boosted earnings per share ("EPS") from $1.79 in 2016 to $2.79 in 2022.

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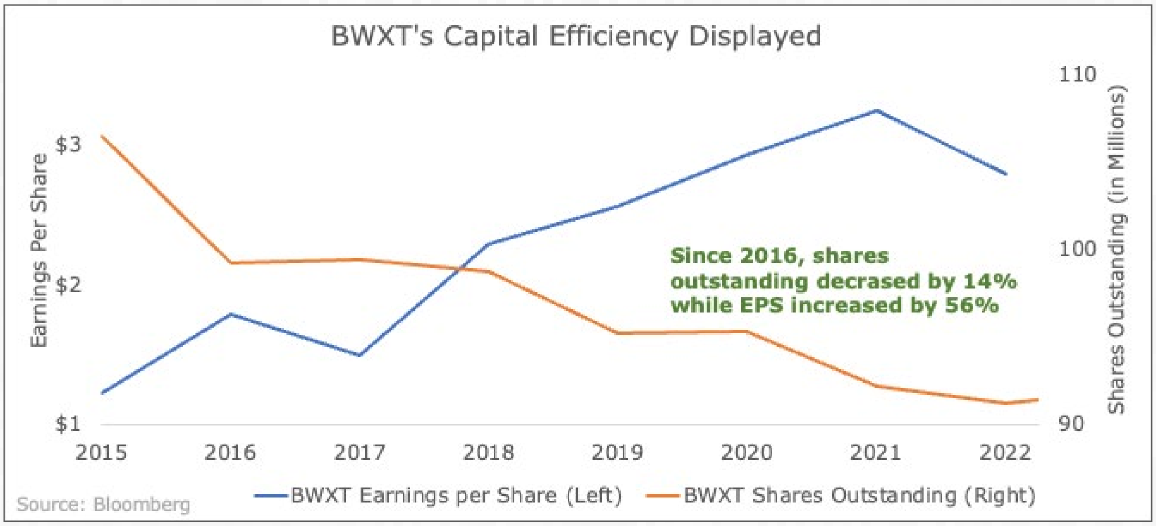

The company's balance sheet is conservatively managed, with $1.3 billion in long-term debt, supported by roughly $400 million in annual operating income. So BWXT offers investors a very stable, recession-proof business that's well-positioned to thrive in an uncertain economy.

But by far, the most exciting part of this story will come from BWXT's work on the Project Pele reactor, and its huge upside potential. In June 2023, BWXT won the design competition for the Project Pele reactor prototype, and received a $300 million contract to build a full-scale version.

BWXT's vertically integrated approach gives it a leg up over companies that depend on other countries – like TerraPower, Bill Gates' pet nuclear project, which also features more compact nuclear reactors but unfortunately relies on Russian-produced HALEU fuel. In 2021,TerraPower announced that it will halt operations for two years due to the Ukraine invasion.

BWXT is pioneering "bring-your-own-nuclear" energy, which could rip up the playbook of energy as we know it today.

The Project Pele microreactor received an initial contract of $300 million to deliver up to 5 megawatts of electrical power. But the DoD uses 30 terawatts – that is, 30 million megawatts – of electricity per year, opening the door to enormous revenue growth.

The DoD Strategic Capabilities Office (SCO) partnered with BWXT to build the first advanced nuclear reactor of its kind and further engrains BWXT's role as a critical military supplier, while bolstering BWXT's position as a nuclear power pioneer.

Assuming the first full-sized prototype meets all required specifications (to bedetermined in 2024), the initial use case for the DoD involves deployment of these reactors in forward operating bases. There's additional potential for these reactors to be deployed in disaster-relief zones, both domestically and abroad.

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The reactor could also serve as a "pathfinder" for commercial adoption of such technologies, DoD said.

Explained SCO director Jay Dryer:

> *"The DoD has a long history of driving American innovation, with nuclear power being one of many prominent examples. Project Pele is an exciting opportunity to advance energy resilience and reduce carbon emissions while also helping to shape safety and non-proliferation standards for advanced reactors around the world."*

And maybe beyond earth too. NASA is in the process of developing a human base on the moon, as a precursor to manned Mars exploration. NASA chose BWXT to develop the nuclear-based propulsion systems for that program, called Artemis.

Since the beginning of Europe's energy crisis, it's been obvious that the world will eventually vastly increase its use of nuclear power. Technology and humanityconsistently evolve toward more dense forms of energy. And with each evolution of power technology, human wealth grows exponentially.

The next 50 years will almost certainly be the age of nuclear power. There are virtually unlimited applications for the small, safe, and portable reactors that BWXT builds – and we believe the enormous energy demands of AI will be foregrounded.

For now though, BWXT offers a stable business model that's recession-resistant, a durable competitive advantage, and the upside kicker of advancing small modular nuclear reactors, first to the military, and potentially to the world.

Just how big of an upside kicker?

The first reactor will cost $300 million. But BWXT will benefit from economies of scale that cut costs over time. A rough estimate suggests BWXT could get costs down to anywhere between $100 and $200 million. If BWXT sells 100 reactors at $100 million to $200 million apiece, that translates into $10 billion to $20 billion in new revenue. For a company with a current market capitalization of $5.7 billion, that's a powerful upside catalyst.

BWXT plans to complete construction and deliver the first full-sized Pele reactor sometime in 2024. It will then undergo a series of tests at the Idaho National Laboratory to ensure it meets DoD specifications. Until these test results come in, we can't know exactly how much future demand will exist, if any. But if the reactor does meet the ambitious DoD requirements, then the sky's the limit.

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In the meantime, BWXT's core business offers the ultimate safe haven against the economic storm clouds gathering on the horizon. With years of backlogged demand, and a dominant competitive position generating rock-solid profit margins, we feel comfortable recommending this stock based on its existing business today. Plus, we're getting plenty of potential upside from Project Pele.

We suggest watching BWXT closely in the near future.

Porter Stansberry

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Stevenson, MD

P.S. If you'd like to learn more about the Porter & Co. team – all of whom are real humans, and many of whom have Twitter accounts – you can get acquainted with us **here**. You can reach me (Porter) via:

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