C1 - Artificial Intelligence

#### **AI Needs a Tremendous Amount of Power. Breakthrough needed.**

**Bajraktari 24**, President and CEO of the Special Competitive Studies Project (Ylli Bajraktari, April 12, 2024, “The Future of AI will require an energy breakthrough. The answer is a fusion moonshot.” Utility Dive, https://www.utilitydive.com/news/ai-artificial-intelligence-fusion-power/712433/)

The Biden administration recently plans to work with tech firms on power usage. Technological revolutions have always come with novel challenges: building infrastructure, navigating dual-purpose applications and preparing our workforce. For the **growing** industry surrounding **AI**, this challenge is **energy**. Progress in AI will **soon face the limits** of the **power** available on the grid. As the administration now recognizes, maximizing AI’s **potential** will require an energy **breakthrough**. While the nation needs diverse approaches, the best solution is the promise of fusion. Currently, **AI** models are run from **data centers**. These models require power **to build**, or “train,” and to run, or “inference.” Both are energy-**intensive**. Combined, the vast **expansion** of AI means that the electricity **consumption** of building and running AI models may **soon match** the power generation of small **countries** — and then **grow** **beyond** that. Estimates project that a single utility in Virginia will see annual data center power demand grow by nearly — .

#### **AI will collapse if energy demand is not met**

#### **Hetzner 24**, B.A., Georgetown University, writer for Fortune (Christiaan Hetzner, April 16, 2024, “AI could gobble up a quarter of all electricity in the U.S. by 2030 if it doesn’t break its energy addiction, says Arm Holdings exec,” Fortune, https://fortune.com/2024/04/16/ai-chatgpt-sora-large-language-models-arm-chips-semiconductors-electricity/)

#### Right now generative **AI** have an “insatiable demand” for electricity to power the tens of thousands of compute clusters needed to operate large language models like OpenAI’s GPT-4, warned chief marketing officer from company Arm Holdings.

#### If generative AI is ever going to be able to run on every mobile device from a laptop and tablet to a smartphone, it will have to be able to scale without overwhelming the electricity grid at the same time.

#### “**We won’t be able to continue the advancements of AI without addressing power**,” Badani told Fortune’s Brainstorm AI conference in London on Monday. “ChatGPT requires 15 times more energy than a traditional web search.”

#### Not only are more businesses using generative AI, but the tech industry is in a race to develop new and more powerful tools that will mean compute demand is only going to grow—and power consumption with it, unless something can be done.

#### The latest breakthrough from OpenAI, the company behind ChatGPT, is . It can create super realistic or stylized clips of video footage up to 60 seconds in length purely based on user text prompts.

#### The marvel of GenAI comes at a steep cost

#### “It takes a 100,000 AI chips working at full compute capacity and full power consumption in order to train Sora,” Badani said. “That’s a huge amount.” **Data centers, where most AI models are trained, currently account for 2% of global electricity consumption, according to Badani. But with generative AI expected to go mainstream, she predicts it could end up devouring a quarter of all power in the United States in 2030.**

#### **Only Nuclear solves.**

**Wong 24** Wong, M. (2024, October 1). For now, there’s only one good way to power AI. The Atlantic. https://www.theatlantic.com/technology/archive/2024/09/ai-microsoft-nuclear-three-mile-island/679988/

Now Three Mile Island is coming back, this time as part of efforts to meet the enormous electricity demands of generative AI. The plant’s owner, Constellation Energy, [announced](https://archive.ph/o/KpTa6/https://www.constellationenergy.com/newsroom/2024/Constellation-to-Launch-Crane-Clean-Energy-Center-Restoring-Jobs-and-Carbon-Free-Power-to-The-Grid.html) yesterday that it is reopening the facility. Microsoft, which is seeking clean energy to power its data centers, has agreed to buy power from the reopened plant for 20 years. “This was the site of the industry’s greatest failure, and now it can be a place of rebirth,” Joseph Dominguez, the CEO of Constellation, [told](https://archive.ph/o/KpTa6/https://www.nytimes.com/2024/09/20/climate/three-mile-island-reopening.html%23:~:text=Three%20Mile%20Island%20became%20shorthand,a%20revival%20is%20at%20hand.) The New York Times. Three Mile Island plans to officially reopen in 2028, after some $1.6 billion worth of refurbishing and under a new name, the Crane Clean Energy Center.

Nuclear power and chatbots might be a perfect match. The technology underlying ChatGPT, Google’s AI Overviews, and Microsoft Copilot is extraordinarily power-hungry. These programs feed on more data, are more complex, and use more electricity-intensive hardware than traditional web algorithms. An AI-powered web search, for instance, could require [five to 10 times](https://archive.ph/o/KpTa6/https://www.theatlantic.com/technology/archive/2023/08/ai-carbon-emissions-data-centers/675094/) more electricity than a traditional query.

The world is already struggling to generate enough electricity to meet the internet’s growing power demand, which AI is rapidly accelerating. Large grids and electric utilities across the U.S. are [warning](https://archive.ph/o/KpTa6/https://www.cnbc.com/2024/08/28/utilities-face-looming-crunch-as-electricity-demand-from-ai-surges.html) that **AI is straining** their capacity, and some of the world’s biggest data-center hubs—including [Sweden,](https://archive.ph/o/KpTa6/https://www.bloomberg.com/graphics/2024-ai-data-centers-power-grids/) [Singapore](https://archive.ph/o/KpTa6/https://www.cbre.com/insights/reports/global-data-center-trends-2024%23:~:text=Singapore,%20the%20world's%20most%20power,challenges%20are%20impacting%20all%20markets.), [Amsterdam](https://archive.ph/o/KpTa6/https://www.datacenterdynamics.com/en/analysis/the-ongoing-impact-of-amsterdams-data-center-moratorium/), and [exurban Washington, D.C.](https://archive.ph/o/KpTa6/https://www.loudoun.gov/ArchiveCenter/ViewFile/Item/13979%23:~:text=Recognizing%20this%20rapid%20growth%20in,First,%20they%20needed%20to%20get)—are struggling to find **power** to run new constructions**.** The exact amount of power that AI will demand within a few years’ time is hard to predict, but it will likely be enormous: Estimates range from the equivalent of [Argentina](https://archive.ph/o/KpTa6/https://www.nytimes.com/2023/10/10/climate/ai-could-soon-need-as-much-electricity-as-an-entire-country.html)’s annual power usage to that of [India](https://archive.ph/o/KpTa6/https://www.bloomberg.com/professional/insights/data/ai-computing-is-on-pace-to-consume-more-energy-than-india-arm-predicts/).

That’s a big problem for the tech companies building these data centers, many of which have made substantial commitments to cut their emissions. Microsoft, for instance, has [pledged](https://archive.ph/o/KpTa6/https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/) to be “carbon negative,” or to remove more carbon from the atmosphere than it emits, by 2030. The Three Mile Island deal is part of that accounting. Instead of directly drawing power from the reopened plant, Microsoft will [buy](https://archive.ph/o/KpTa6/https://www.microsoft.com/en-us/microsoft-cloud/blog/2024/09/20/accelerating-the-addition-of-carbon-free-energy-an-update-on-progress/) enough carbon-free nuclear energy from the facility to match the power that several of its data centers draw from the grid, a company spokesperson told me over email.

Such electricity-matching schemes, known as “power purchase agreements,” are necessary because the construction of solar, wind, and geothermal plants [is](https://archive.ph/o/KpTa6/https://mashable.com/article/ai-environment-energy) [not](https://archive.ph/o/KpTa6/https://www.washingtonpost.com/business/2024/06/21/artificial-intelligence-nuclear-fusion-climate/) keeping pace with the demands of AI. Even if it was, these clean electricity sources might pose a more fundamental problem for tech companies: Data centers’ new, massive power demands need to be met at all hours of the day, not just when the sun shines or the wind blows.

**To fill the gap, many tech companies are turning to** a readily available source of abundant, reliable electricity: burning fossil fuels. In the U.S., plans to wind down coal-fired power plants are being [delayed](https://archive.ph/o/KpTa6/https://www.washingtonpost.com/business/2024/06/21/artificial-intelligence-nuclear-fusion-climate/) in [West Virginia, Maryland](https://archive.ph/o/KpTa6/https://www.washingtonpost.com/business/interactive/2024/data-centers-internet-power-source-coal/), [Missouri](https://archive.ph/o/KpTa6/https://www.bloomberg.com/news/articles/2024-01-25/ai-needs-so-much-power-that-old-coal-plants-are-sticking-around), and [elsewhere](https://archive.ph/o/KpTa6/https://www.bloomberg.com/opinion/articles/2024-09-17/ai-heralds-a-new-deal-for-old-coal-plants) to power data centers. That Microsoft will use the refurbished Three Mile Island to offset, rather than supply, its data centers’ electricity consumption suggests that the facilities will likely continue to rely on fossil fuels for some time, too. Burning fossil fuels to power AI means the new tech boom might [even](https://archive.ph/o/KpTa6/https://www.theguardian.com/technology/2024/sep/15/data-center-gas-emissions-tech) [threaten to](https://archive.ph/o/KpTa6/https://www.theatlantic.com/technology/archive/2024/09/microsoft-ai-oil-contracts/679804/) [delay](https://archive.ph/o/KpTa6/https://heatmap.news/technology/ai-additionality-framework) the green-energy transition.

Still, investing in nuclear energy to match data centers’ power usage also brings new sources of clean, reliable electricity to the power grid. Splitting apart atoms provides a carbon-free way to generate tremendous amounts of electricity day and night. Bobby Hollis, Microsoft’s vice president for energy, [told](https://archive.ph/o/KpTa6/https://www.bloomberg.com/news/articles/2024-09-20/microsoft-s-ai-power-needs-prompt-revival-of-three-mile-island-nuclear-plant) Bloomberg that this is a key upside to the Three Mile Island revival: “We run around the clock. They run around the clock.” Microsoft is working to build a carbon-free grid to power all of its operations, data centers included. Nuclear plants will be an important component that provides what the company has elsewhere called “firm electricity” to [fill in the gaps](https://archive.ph/o/KpTa6/https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RW1fApf) for less steady sources of clean energy, including solar and wind.

It’s not just Microsoft that is turning to nuclear. Earlier this year, Amazon [purchased](https://archive.ph/o/KpTa6/https://spectrum.ieee.org/amazon-data-center-nuclear-power) a Pennsylvania data center that is entirely nuclear-powered, and the company is [reportedly](https://archive.ph/o/KpTa6/https://www.wsj.com/business/energy-oil/tech-industry-wants-to-lock-up-nuclear-power-for-ai-6cb75316) in talks to secure nuclear power along the East Coast from another Constellation nuclear plant. [Google](https://archive.ph/o/KpTa6/https://www.cnbc.com/2022/07/19/google-chevron-invest-in-fusion-startup-tae-technologies.html), [Microsoft](https://archive.ph/o/KpTa6/https://www.reuters.com/technology/microsoft-buy-power-nuclear-fusion-company-helion-2023-05-10/), and several other companies have invested or agreed to buy electricity in start-ups promising nuclear fusion—an even more powerful and cleaner form of nuclear power that remains [highly experimental](https://archive.ph/o/KpTa6/https://www.theatlantic.com/technology/archive/2022/12/department-of-energy-nuclear-fusion-breakthrough-nif-livermore/672439/)—as have billionaires including [Sam Altman](https://archive.ph/o/KpTa6/https://www.reuters.com/technology/openai-ceo-altman-says-davos-future-ai-depends-energy-breakthrough-2024-01-16/), [Bill Gates](https://archive.ph/o/KpTa6/https://www.bloomberg.com/news/articles/2024-07-30/gates-backed-fusion-power-startup-type-one-raises-53-5-million), and [Jeff Bezos](https://archive.ph/o/KpTa6/https://www.investors.com/news/artificial-intelligence-ai-data-centers-demand-nuclear-energy/).

**Nuclear energy** m**i**ght not ju**s**t be a good option for powering the AI boom. It might be **the only** **clean option able to meet demand** until there is a substantial build-out of solar and wind energy. A [handful](https://archive.ph/o/KpTa6/https://www.nytimes.com/2024/09/20/climate/three-mile-island-reopening.html%23:~:text=Three%20Mile%20Island%20became%20shorthand,a%20revival%20is%20at%20hand.) of other, retired reactors could come back online, and new ones may be built as well. Only the day before the Three Mile Island announcement, Jennifer Granholm, the secretary of energy, [told](https://archive.ph/o/KpTa6/https://www.youtube.com/watch?v=Urcso_oDYp8) my colleague Vann R. Newkirk II that building small nuclear reactors could become an important way to supply nonstop clean energy to data centers. Whether such construction will be fast and plentiful enough to satisfy the growing power demand is unclear. But it must be, **for** the generative-**AI** revolution to really take off. Before chatbots can finish remaking the internet, they might need to first reshape America’s physical infrastructure.

#### **In fact, nuclear energy is the only form of energy that can power society. Ignore fear-mongering.**

David **Walters 22**, Power plant operator for 20 years at an IBEW organized facility, where he was a Shop Steward. He is a member of Socialist Organizer in Pacifica, CA, "Fighting Climate Change with Fission Energy. A Marxist Perspective… – The Left Berlin", 6-22-2022, <https://www.theleftberlin.com/fighting-climate-change-with-fission-energy-a-marxist-perspective/> - SDP

The basis of the anti-nuclear movement as it came of age in the 1970s was based on two false premises. Firstly that there is a **direct connection** between the production of **nuclear weapons** of mass destruction (WMD) and **nuclear power** generation; and secondly a fear of radiation focused largely on “**waste**” from nuclear power plants. I will address both below. However, I will start off with my views on renewable energy first.

As I have agreed to make this a short conversation…with longer replies if a debate gets going…Several things need to be addressed. Supporting evidence will follow in the discussion.

**Renewable energy** is an unmitigated failure

By “Renewable Energy” or “RE”, I mean \*specifically\* solar and wind energy. I do not mean hydroelectric energy which provides for some countries, such as Norway, almost all their generation needs. Hydroelectricity requires another discussion, well worth having, but as most hydroelectric resources are already built out leaving no available rivers at higher elevations untapped, I want to address actual RE proposals and not all and every aspect of energy generation.

A grid requires instant access to electricity. In fact, it is an aspect of the physics of generation that no electricity is actually produced until someone flips a light switch. That is, creates for demand for it. The electricity is created as needed. It is not something that sits around on the grid waiting to be used. When a person flips on a light switch this increases the load (electrical engineering terminology for “use”). When this happens generators in the system slightly increase the generators’ torque which allows the electrons to flow into the system to that light bulb energized by the light switch. RE can’t provide this sort of **generation** because there is no real flexibility in the system to allow for that. Yes, generation from **RE** does in fact power large parts of the grid for periods of time during a 24 hour period, but it has to be supplemented by **on demand** generation every instance of the day. Not just when the sun is shining and the wind is blowing. Thus, a country like Germany has to keep their coal plants firing or their new gas turbines spinning using Russian provided methane gas to make up that short fall which occurs every day (when Russia decides to sell it).

RE advocates believe “on demand” is a synonym for “fossil fuels”. It is not. The massive build out of gas turbines and continual strip-mining of coal is totally a function of being wedded to the failed policies of renewable energy.

**Battery storage** is the last great hope for RE. Examples of large, expensive set-ups in Australia and proposals to build more battery storage have been making their way around the web for some time. In every case, to really provide storage for excessively cloudy days, actually weeks at a time in some winter locations – dropping solar energy to almost nothing – **batteries** would have to power a grid at **full load** for **days** at a time. Nothing short of that is acceptable. It means building out many times the solar capacity from what is available at any given time, and building truly expensive battery storage “cities” that would run into the **multi-trillions** of Euros. Battery power can provide for some hours of power when there is enough storage (taken from RE or the grid in general which is not used for load or demand). Beyond that there is simply no financial scenario that would make this at all cheap, in fact it would make just a simply “**24 hour**” battery **prohibitive** in almost **all locations** in the **world**. Batteries can work to \*mitigate\* the rapid load swings from a large RE penetration of the grid, the little ups and downs of demand and generation. But doing so for \*all\* of peak load, the highest in the day when there usually is zero solar energy, is all but impossible. To do it for more than one cloudy day when there is almost no solar energy, is ridiculously expensive. Batteries do not generate a single watt of energy. It has to be generated and “not used” by the grid, but siphoned to the energy storage device. This lowers the capacity of generators on the grid to provide power.

It would be necessary to overbuild the amount of RE at least 3 times what it can provide the grid at any given time just to allow for storage. In Germany solar energy is only available at ‘name plate capacity’ some of the time. For example if a solar panel has ‘name plate capacity’ (think of as a maximal capacity) of 200 watts, this can only generated for around 15% of the day – when the sun is at its peak, i.e. when ideal conditions are met. In Germany, this is less the further north one goes, and more the further south. It is also much less in winter. Similar considerations apply to wind generation – wind blows adequately around 30% (range 25%-40%) of the day. Hence the grid would never get that “1 MW” capacity over any period of time.

And all of this is so unnecessary if we developed a true nuclear grid!

Military WMD and the waste…

There is a wide spread myth that the **nuclear weapons** are derived from ‘Spent Nuclear Fuel’ (**SNF**). With very few exceptions this never happens. It is far cheaper to build what is euphemistically cited “Research & Development” reactors, essentially “piles” to create the needed plutonium for nuclear weapons. Every single country with nuclear WMD uses these “R & D” reactors to make nuclear weapons. There are no exceptions. While India may of have used some SNF or what the world colloquially knows as “nuclear waste”, to make their original nuclear bomb, everyone uses the far cheaper R & D reactors, or task specific reactors to make bomb grade material.

It is impractical to make bombs from “nuclear **waste**”, nearly all “nuclear waste” (SNF) is reactor fuel that has been sitting in a reactor for 1 or 2 or more years. The plutonium 239 in it is worthless for making bombs, because it is hopelessly contaminated with Pu 240, which cannot be removed effectively by any known means. As for the U235 in spent fuel… well… yes… there is about 1% U235 in SNF, but it’s mixed with 99% U238. [SNF is about 95 to 97% overall uranium … mostly 238… and about 2% fission products… along with some plutonium and small amounts of assorted actinides of greater atomic number than plutonium, such as curium and americium.] As such, the uranium in spent fuel is 1% or so U235, a content not much different from uranium in uranium ore (which is 0.7% U235). Both require hugely expensive, complex, high tech centrifuge complexes to make the very highly enriched U235 [90% and more] to make a crude simple-to-build bomb.

**Nuclear waste** is simply too difficult to extract the needed **plutonium** (or residual U235 that is used in nuclear fuel) to garner enough to make a **bomb**. It can be done, yet no one does this. It is a false issue from this point of view.

There IS a military connection however in two areas. The closest analogy there is to this is the passenger airline. All passenger airlines can trace their ancestry back to the development of strategic bombers, most notably the WWII era B-29 and the soon developed B-52. The same is true for many of the pilots and technicians who fly and service large and small passenger airliners: many are trained by military airforces to do this. The origin and relationship from an engineering and personnel perspective is extremely close and starts with the military. The exact same relationship exists in the world nuclear industry. Primarily U.S. and Soviet era navies developed nuclear energy as a propulsion mechanism for submarines (and later surface ships). It is here where that relationship existed between the military and civilian commercial nuclear energy (though both were developed in parallel and didn’t necessarily have one flow from the other). Most **anti-nuclear activists**, simply because they really **don’t care**, always miss this latter point and often lie about the WMD issue of SNF.

and the waste thing?

So “**waste**” is the one of the first question folks ask about when first delving into the issue of nuclear energy specifically and what clean generation tools exist to address climate change.

Let us begin by understanding what nuclear waste is. There are two basic levels of nuclear waste that regulatory authorities in this area name ‘Low Level Waste’ (“LLW”) and ‘High Level Waste’ (HLW). There is also an intermediate “Medium Level Waste”. The basis of this classification is the amount of radioactive isotopes in the waste. The greatest amount of this waste is LLW and is amazingly broad in scope, basically anything that shows a higher than normal “background radiation” level. Background radiation runs from approximately 1 mSv (milisevert) to 3 mSv globally. There are places on the planet where such natural background radiation is 100 times that number and, no, there are no ill effects on human, plant or animal life because of it. I will return to this issue, obviously, perhaps in a later essay specifically on “radiophobia”.

Ergo, anything “produced by humans” that has a higher background radiation is automatically regulated as “waste” with the LLW designation. It varies from country to country but they are basically the same.

HLW comes from some medical radiation therapy and imaging facilities; usually deemed as “Intermediate Level Waste” depending on a nations regulatory regime. But in this essay, “HLW” really refers to Spent Nuclear Fuel or “SNF” produced in nuclear power plants. While regulated as “**waste**”, the term **SNF** is more accurate, because it doesn’t have to be waste – as it can be used as feedstock for **advanced** fast **reactors** currently under development in over a dozen countries.

In the US, there is approx. 80,000 tons of this waste. That is very, very little by volume. If you put all 80k tons of it together it would not fill up a giant box store like Costco or Kaufland. Nuclear fuel is very, very dense and thus the amount of it is limited. And, we know where every gram of it is at any given time. Eighty thousand tons (imperial units) is almost the same amount of coal waste generated by the brand, spanking new coal plant that the supposedly climate conscious German government allowed to be built in Cologne. That coal waste doesn’t have a half life and doesn’t get safer in time. Most SNF ceases to be significantly dangerous after 300 years and, as noted above, will be used as fuel for the generation of reactors coming on line in a few decades. SNF is solid and stored in stainless steel concrete casks. It cannot “flow” out if a crack develops (which none have).

Nuclear can provide 100% of energy needs and do so **cheaper** than all other forms of energy generation. The infrastructure baggage for other sources, be it wind or solar or natural gas, when talking about lifetime costs, are staggeringly high. Such expenses swamp needs for any industrial **society**. Even one that seeks to transform society by workers revolution, from an increasingly senile and militaristic Imperialism to one based on the freeing of the productive forces in **a socialist one**.

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#### **Three Impacts**

#### **1: Economy.**

Jim **Probasco 24**. “Generative AI and Its Economic Impact: What You Need to Know.” https://www.investopedia.com/economic-impact-of-generative-ai-7976252#:~:text=The%20use%20of%20Gen%20AI,according%20to%20Goldman%20Sachs%20Research.

AI algorithms detect fraud and identify investment opportunities in the financial industry. Generative AI has shown the potential to automate routine tasks, enhance risk mitigation, and optimize financial operations. 4 The use of **Gen** **AI** in finance is expected to increase global gross domestic product (**GDP**) by 7% or nearly **$7 trillion**. It should boost **productivity growth** by 1.5%, according to **Goldman Sachs** **Research**. 5 Gen AI is a good fit with finance because its strength is dealing with vast amounts of data and this is precisely what finance relies on to function.

#### **2: AI improves energy and makes it cleaner. Solves sustainability and is an infinitely positive cycle, but AFF is key to getting there.**

**Adallat 22** — AJ Adallat, holds a M.S. in Engineering from the University of Missouri, holds a B.S. from the University of California at Berkeley, Forbes Council Member, 2022 (“Formidable Human-AI Relations Can Accelerate Sustainability Efforts,” Forbes, May 13th, Available Online at https://www.forbes.com/sites/forbestechcouncil/2022/05/13/formidable-human-ai-relations-can-accelerate-sustainability-efforts/?sh=6041f13a11f6, Accessed 11-08-2022)

Artificial intelligence (AI), machine learning (ML) and similar digitalization solutions are modifying the way the world's most influential companies and industries — as well as entire cities — function every day. When working in harmony with humans, AI and other automation systems have the potential to make **huge impacts** on economic growth across the globe, going so far as to support solving humanity's **most** **critical roadblocks**, from **streamlining** **energy** **production** to **improving** **grid systems** and achieving **more** **sustainable operations** for nearly **every** major industry on Earth.

As the CEO of an AI company making advanced digitalization software products and solutions, the paradigm of enabling people and AI to work together on achieving more sustainable operations is always top of mind; its importance cannot be curbed. As we move into the future, I'm confident there will be plenty of jobs for both humans and AI so long as they are able to function in conjunction with one another.

Of course, humanity will likely need to understand and accept that meaningful modifications are inevitable during transition periods. It will be necessary for many to develop proficiencies and adaptable skill sets that only a human mind could perform. Flexibility around the ever-progressing capabilities of AI will be vital. The minute that humans and machines find the groove in the role they play with one another, that marriage of unlimited creativity and seamless functionality should bring about an era that propels us **beyond all limits** to solve some of our world's most important challenges, including the **climate** **crises**.

Small transformations across big industries may trigger substantial strides.

AI is advanced enough to **work in harmony** with humans, combining powers to **fast-track** large-scale efforts to make real change when it comes to **environmental** **sustainability**, **resource preservation** and **waste reduction**. From more intentional identification of potential emission impacts across energy operations to making entire cities smarter and more efficient, AI is **already taking names** when it comes to **substantial results**.

One major company taking significant steps in accomplishing this goal is BP, which is partnering with Microsoft and targeting to become net-zero by 2050. The energy giant also underscored ambitions for the near future, stating in a press release: "By the end of the decade, it aims to have developed ‎around 50 gigawatts of net renewable generating capacity—a 20-fold increase on what it has ‎previously developed, increased annual low carbon investment 10-fold to around $5 billion, and cut oil ‎and gas production by 40%."

Additional instances of how AI initiatives are confronting climate issues include:

• Implementation of AI and ML to **improve energy production** in real time.

• Automation of downstream operations to **boost plant efficiency** by 8% to 12%.

• Improved grid systems to enhance forecast ability and performance, allowing for **more** **deliberate renewable energy** strategies.

• **Transportation and navigation optimization** through AI and ML apps like Google Maps and Waze, alongside other vehicular data-collection solutions, to reduce emissions and pollution by relaying pertinent vehicle efficiency, traffic and other similar congestion data to consumers.

• The use of **robotics at the edge**, equipped with AI-infused chips, to keep our environment healthy through the prevention of catastrophic equipment failure and leaks by autonomously detecting fissures, deterioration, leaks or other potentially devastating failures within an oil pipeline, refinery or otherwise.

The trust problem and explainability solution.

According to an article from Earth.Org: "The field of Artificial Intelligence (AI) is flourishing thanks to large investments, and big companies with heavy ecological footprints can use it to make their activity more sustainable." However, one of the biggest obstacles hindering AI's pathway to solving some of our most important issues equates to a lack of trust impacting the adoption and implementation of the technology.

Most AI tools tend to operate in opaque black boxes where human users cannot perceive how they arrive at conclusions, answers and recommendations. These solutions often just spit out a remedy with no explainability, traceability or auditability — hardly building confidence. Increasing the opportunities for AI to amplify the talents and capabilities of people requires their trust. Otherwise, the ability for both parties to most effectively work together to solve our most important sustainability problems becomes severely limited.

Enter cognitive AI. This type of explainable AI works **transparently**, revealing the reasoning behind its recommendations in a straightforward manner and readily showing relevant humans the comprehensive data behind its decision-making process through clearly readable audit trails. AI should not be a substitute for human input but rather used as **a tool** **for humans** **to make more confident decisions**. In order for humans to trust AI, the solutions must not hide their processes within black-box functionality. Explainable AI explodes the black box to grant that **essential, trust-building clarity**.

The balance of knowledge-based cognition and digitalization is what can enable decision makers to identify unexpected opportunities and take immediate action in critical scenarios. Resulting process enhancements would likely **result in** **superior communication**, **reinforced cooperation** and **streamlined enterprises** where everything operates more economically and sustainably. When working in conjunction with humans, cognitive AI can grant the ability to monitor everything on a **more holistic level**. Stakeholders can then elevate procedures to both obtain additional value while shrinking waste, thus **decreasing carbon footprints** and **sprinting** **nearer** **to net-zero targets.**

AI of the future: A solution with indelible results.

Working toward a lower carbon outlook will demand that moves be made around operational efficiency, improved production tactics and minimized waste. The significance of a global initiative around a more sustainable world cannot **be downplayed**. As a software company making AI of the future, our responsibility to confront this challenge head-on by pioneering sustainability-first solutions that keep humans in the loop is of the utmost importance.

AI will be a **critical** **utility** when it comes to technologies that support businesses, industries and cities in attaining vital net-zero objectives. When AI proves itself as an explainable, human-trustable solution that works in harmony with people, a **limitless capacity** can be unleashed for unraveling some of our **most complex obstacles** in attaining a **more sustainable tomorrow** for our planet and its inhabitants.

C2 - Proliferation

#### **Proliferation prevents Western nations from utilizing their nuclear monopoly to invade and coerce other countries – ONLY the aff’s method of sabotaging institutions can bring down the Nuclear non-Proliferation Treaty decreases the propensity for imperial violence – we outweigh on magnitude – interventions have killed over 20 million people**

**Lucas 15** (James A. Lucas, Centre for Research on Globalization. “US Has Killed More Than 20 Million People in 37 “Victim Nations” Since World War II”. https://popularresistance.org/us-has-killed-more-than-20-million-in-37-nations-since-wwii/) swap

The American public probably is not aware of these numbers and knows even less about the proxy wars for which the United States is also responsible. In the latter wars there were between nine and 14 million deaths in Afghanistan, Angola, **D**emocratic **R**epublic of the **C**ongo, East Timor, Guatemala, Indonesia, Pakistan and Sudan. But the victims are not just from big nations or one part of the world. The remaining deaths were in smaller ones which constitute over half the total number of nations. Virtually **all parts of the world** have been the target of U.S. intervention. The overall conclusion reached is that the **U**nited **S**tates most likely has been responsible since WWII for the deaths of between **20** **and 30** **million** **people** in wars and conflicts scattered over the world.

#### **Intervention Lengthens Wars by more than 500%**

**Hironaka of Harvard University** [Ann Hironaka of Harvard University Press, 2005, “Neverending Wars: The International Community, Weak States, and the Perpetuation of Civil war”, https://drive.google.com/file/d/1V-74hAmsSP70-lTLypIcjgVE9hcuYSiV/view?ts=6798f621, Accessed 1/28/2025]//codexistent

**On average**, civil **wars with** interstate **intervention**, broadly defined, **are 300 percent longer** than wars without intervention**.** This effect is extremely large, suggesting that **intervention is** one of **the biggest factor**s **in lengthening** contemporary civil **wars.** The results of Model 11 separate out the impact of intervention, generally, from those cases that experience intervention on behalf of both sides of a civil war. In this model, **the presence of any third-party intervener increases war duration by** 156 percent, and the presence of twosided intervention lengthens wars by an additional 92 percent. In addition, the res**u**lts **p**resented in Model 12 suggest that the effects of interstate intervention are not simply due **to** the superpowers. On the one hand, it is the case that civil wars that involve superpower intervention tend to last 72 percent longer than civil wars without it. Conflicts in states such as Angola, for instance, which receive intervention on both sides and by the superpowers (actually, in the case of Angola, superpowers intervened on both sides) will be **538 percent longer** on average than a civil war without any intervention**.**

C3 - Climate Change

**W1: Nuclear energy doesn’t emit greenhouse gases (“carbon-free power”)**

Office of Nuclear Energy. “3 Reasons Why Nuclear Is Clean and Sustainable.” ***Energy.gov ‘21***, Office of Nuclear Energy, 31 Mar. 2021, [www.energy.gov/ne/articles/3-reasons-why-nuclear-clean-and-sustainable](http://www.energy.gov/ne/articles/3-reasons-why-nuclear-clean-and-sustainable) .

**Nuclear is a zero-emission clean energy source** It generates power through fission, which is the [**process of splitting uranium atoms**](https://www.energy.gov/ne/articles/fission-and-fusion-what-difference) to produce energy. The heat released by fission is used to create steam that spins a turbine to generate electricity without the harmful byproducts emitted by fossil fuels. According to the Nuclear Energy Institute (NEI), the **United States avoided** [**more than 471 million metric tons**](https://www.nei.org/resources/statistics/emissions-avoided-by-us-nuclear-industry) **of carbon dioxide emissions in 2020.** That’s the equivalent of removing 100 million cars from the road and more than all other clean energy sources combined. It also keeps the air clean by removing thousands of tons of harmful air pollutants each year that contribute to acid rain, smog, lung cancer and cardiovascular disease. ‌

**W2: Global nuclear capacity must double by 2050 to meet net-zero carbon goals**

**IAEA ‘21**“Nuclear Energy for a Net Zero World.” [*Www.iaea.org*](http://www.iaea.org), 12 Oct. 2021, [www.iaea.org/resources/brochure/nuclear-energy-for-a-net-zero-world](http://www.iaea.org/resources/brochure/nuclear-energy-for-a-net-zero-world) .

The use of nuclear power continues to grow, albeit more slowly than many other low carbon sources. Today, it provides 10% of the electricity produced worldwide. In 2020, the number of IAEA Member States operating nuclear power plants increased to 32 after Belarus and the United Arab Emirates connected their first reactors to the grid. Of these operating countries, 19 have projects in place to expand their nuclear power capacity. Around 30 newcomer countries are embarking on, or considering, nuclear power. Bangladesh and Turkey, for example, are already well advanced in the construction of their first nuclear power plants. These are small but encouraging steps:. The IAEA’s high case projection envisages a doubling of nuclear’s present electricity production capacity by 2050. This relies on both lifetime extensions of iexisting plants and about 550 gigawatts (GW) of new build. According to our low case scenario, however, **a lack of willingness to embrace nuclear could lead to almost no change in capacity by 2050, leading to a climate catastrophe**. While electricity generation is responsible for close to 40% of the global CO2 emissions produced by the energy sector, the other 60% or so is generated primarily through the use of fossil fuels in industry, heating in buildings and transport. Hard-to-abate areas will require us to shift to low carbon fuels such as hydrogen. Of all low carbon energy sources, nuclear power is one of the few that can generate electricity, heat and hydrogen. Many **innovative nuclear technologies,** such as small modular reactors (SMRs) and advanced nuclear reactors, **are providing plenty of options**. **Governments,** industries and international organizations **have important roles to play in supporting innovation and the early deployment of all clean energy technologies.** This is particularly critical because almost half of the emissions reductions needed to reach net zero by 2050 will have to come from new low carbon technologies, including advanced nuclear reactors. Clearly nuclear must have a seat at the table anytime energy and climate policies are discussed. As we head toward this year’s vital United Nations Climate Change Conference (COP26) in Glasgow, it is time to make evidence based decisions and ramp up the investment in nuclear. The cost of not doing so is far too high to bear.

‌**MPX1: Nuclear energy prevents deaths**

**Kharecha ‘13**, Pushker A., and James E. Hansen. “Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power.” *Environmental Science & Technology*, vol. 47, no. 9, 4 Apr. 2013, pp. 4889–4895, pubs.acs.org/doi/10.1021/es3051197, <https://doi.org/10.1021/es3051197> .

In the aftermath of the March 2011 accident at Japan’s Fukushima Daiichi nuclear power plant, the future contribution of nuclear power to the global energy supply has become somewhat uncertain. Because nuclear power is an abundant, low-carbon source of base-load power, it could make a large contribution to mitigation of global climate change and air pollution. Using historical production data, we calculate that **global nuclear power has prevented** an average **of 1.84 million air pollution-related deaths** and 64 gigatonnes of CO2-equivalent (GtCO2-eq) greenhouse gas (GHG) emissions that would have resulted from fossil fuel burning. On the basis of global projection data that take into account the effects of the Fukushima accident, we find that nuclear power **could additionally prevent an average of** 420 000–**7.04 million deaths** and 80–240 GtCO2-eq emissions due to fossil fuels by **midcentury,** depending on which fuel it replaces. By contrast, we assess that large-scale expansion of unconstrained natural gas use would not mitigate the climate problem and would cause far more deaths than expansion of nuclear power.

**MPX2: Economy boost**

“Infrastructure.” ***Nuclear Energy Institute*, 2017,** [www.nei.org/advantages/infrastructure](http://www.nei.org/advantages/infrastructure) .

Nuclear power plants produce half of the nation’s carbon-free electricity—far more than wind, solar or hydropower. Fewer emissions mean fewer air-polluting substances linked to asthma and other diseases—which is good news for public health. Nuclear power also fights climate change by enabling states to avoid significant annual carbon dioxide and greenhouse gas emissions. **With nuclear energy, states can meet emissions reduction goals** Nuclear reactors produce incredible amounts of electricity; nuclear plants represent less than one percent of U.S. power stations, yet produce nearly 20 percent of U.S. electricity. In an average year, nuclear reactors in the U.S. generate enough electricity to power over 73 million homes for the entire year. Nuclear power plants also run at an industrywide average of nearly 93 percent of their capacity, generating electricity at a much more efficient rate than other sources of electricity. Energy infrastructure assets like nuclear power plants provide far-reaching financial benefits to communities and state economies. **The nuclear energy sector supports about 475,000 jobs and produces over $12 billion annually in federal and state tax revenues**. And a single nuclear power plant creates 500-800 jobs and can operate for 60 to 80 years or more.