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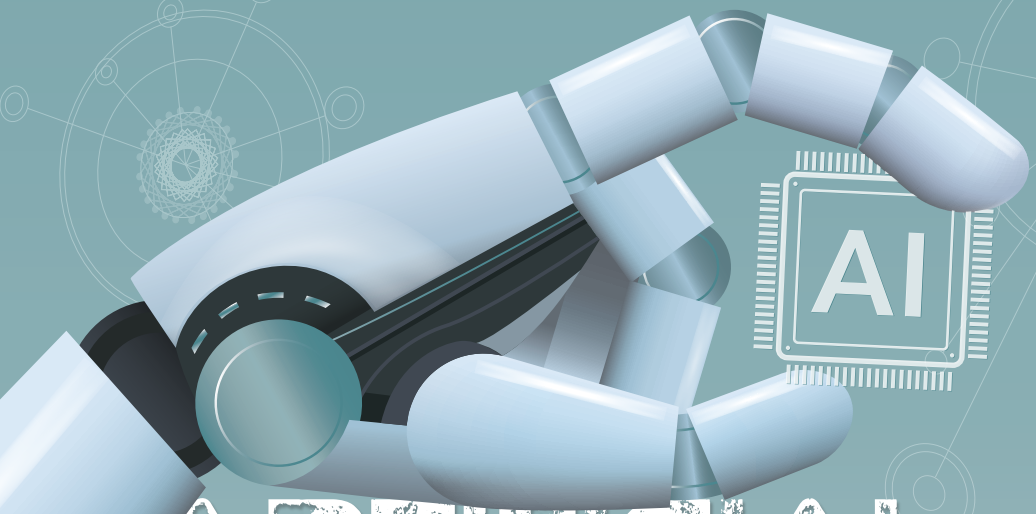
TRANSACTIONS

2024 Q4



ARTIFICIAL INTELLIGENCE

The Moment It's Been Waiting For

Artificial Intelligence (AI) is having a moment—actually, it's having the moment. Like a wildfire spreading across a dry prairie, its influence is touching every industry and reshaping the way we work, live, and consume energy. From virtual assistants like ChatGPT to image creators like DALL-E, AI is revolutionizing our digital lives and moving us toward a future that looks more like those imagined by some of the best directors and science fiction writers of the 20th century. But what about its impact on the systems that power our homes and businesses? Let's explore how AI is reshaping the US electrical grid and the challenges it brings to the table.

THE AI RENAISSANCE: Generative AI's Rise

Imagine a painter with infinite colors and brushstrokes who has studied every masterpiece in human history. That's essentially what generative AI is—a creative engine trained on vast amounts of data, capable of producing text, art, and even code with remarkable precision. Tools like ChatGPT and Microsoft's Copilot are no longer just sci-fi concepts; they're shaping the way businesses communicate, solve problems, and innovate. And it is the rise of generative AI that is reshaping the energy landscape before our very eyes.

LOOK FOR US
Upcoming Conferences

JANUARY 28-30
NAEMA's East Meets West 2025
Vail, CO

MARCH 9-12
NRECA PowerXchange
Atlanta, GA

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INDUSTRY ISSUES & STANDARDS

JANUARY 14
Motor Starting

FEBRUARY 11
Stray Voltage Investigations

BASIC ELECTRIC DISTRIBUTION SYSTEMS

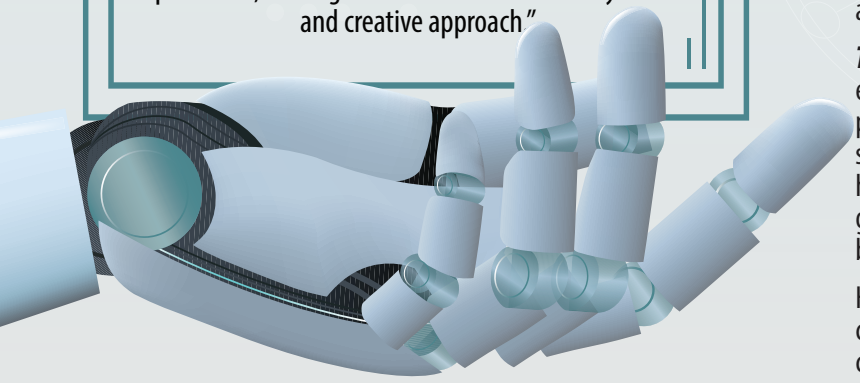
FEBRUARY 11
Generation to Distribution

MARCH 18
The Transmission System

Note *All webinars are recorded & available for viewing post-presentation*

But just what is the difference between traditional and generative AI? Let's let the AI algorithm in Google tell us:

> ***"The main difference between AI and generative AI is their functionality:***
>
> **TRADITIONAL AI.** Solves specific tasks using predefined rules and algorithms. Traditional AI is good at pattern recognition and excels at tasks like data analysis, predictive analytics, and natural language processing.
>
> **GENERATIVE AI.** Creates new content and data based on patterns and structures learned from existing data. Generative AI is good at pattern creation and can generate original content like images, text, music, or software code. Generative AI can also mimic artistic styles and compose original music.
>
> ***Additional differences between AI and generative AI:***
>
> **TRANSPARENCY.** Traditional AI models are more transparent and interpretable than generative AI models, which are often less transparent and function as "black boxes".
>
> **PERFORMANCE AND EFFICIENCY.** Traditional AI is more efficient than generative AI, especially for well-defined tasks. Generative AI models often require a lot of computational resources and training time.
>
> **PROBLEM-SOLVING.** Traditional AI uses rule-based algorithms to solve problems, while generative AI uses a more dynamic and creative approach."



Take ChatGPT, for an example of how generative AI is spreading through our lives—it reached a million users faster than any blockbuster movie sells out its opening weekend. Its growth reflects a wider trend: AI is no longer confined to research labs or niche industries. It's leaping into the mainstream with applications in healthcare, finance, and, yes, energy.

AI'S APPETITE FOR POWER

If AI were a car, it wouldn't be an efficient little hybrid—it would be a powerful sports car guzzling fuel at breakneck speed. Training models like ChatGPT requires colossal energy inputs. For instance, GPT-4's training is estimated to consume between 51,773 megawatt-hours (MWh) and 62,319 MWh over a 90- to 100-day period, comparable to the annual energy usage of approximately 1,000 US households[1]. This dramatic increase from GPT-3's energy usage of approximately 1,287 MWh—equivalent to 120 households—stems from the model's vastly expanded size and complexity[2].

And the energy demand doesn't end with training. Every query you type and every image you generate relies on electricity, as data centers hum 24/7 to keep AI accessible. Estimates are that a single ChatGPT query requires ten times the amount of power as a regular Google search. As adoption skyrockets, the question isn't just "Can the grid keep up?" but also "How can we make it smarter and greener?"

KEEPING THE LIGHTS ON: AI and Grid Demand

Think of the US electrical grid like a highway system. For decades, it's been a reliable, albeit aging, piece of infrastructure. But with AI's meteoric rise, it's starting to resemble LA rush-hour traffic on a network designed for Sunday drivers. The global electricity demand for data centers is expected to more than double between 2022 and 2026, climbing from an estimated 460 terawatt-hours (TWh) to over 1,000 TWh[3]. This surge is driven by AI advancements, as these technologies require enormous computational power to train and operate.

The implications are clear: as data centers consume more electricity, the strain on existing energy infrastructure mounts, posing significant challenges to climate goals and energy sustainability. Companies like Google and Microsoft, which have committed to ambitious carbon-neutral initiatives, are grappling with how to meet AI's energy appetite without backtracking on their environmental promises.

However, innovation is paving the way for solutions. Some companies are turning to nuclear power as a reliable, carbon-free energy source. Microsoft, for instance, is working with Constellation Energy to reopen the Three Mile Island nuclear plant to provide steady and sustainable power for its data centers[4]. Distributed nuclear reactors—small, modular

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power plants—are also emerging as a promising technology[5]. These "fast lanes" on the grid could offer localized, carbon-neutral energy for AI's growing ecosystem, easing the burden on traditional infrastructure while aligning with environmental goals. One opinion that was printed in the Wall Street Journal some months ago espoused the view that AI will need to solve its own energy need conundrum.

SILVER LININGS: AI's Benefits for Energy

AI isn't just an energy hog—it's also an energy savior. By analyzing massive datasets, AI can forecast energy demand with uncanny accuracy, helping utilities prevent outages and manage resources more efficiently. Smarter grids, powered by AI, can optimize energy distribution, reducing waste and making room for renewables like wind and solar. For example, AI-driven systems can predict fluctuations in renewable energy production, ensuring grid stability even when the sun isn't shining or the wind isn't blowing.

On the consumer side, AI enhances customer service, making it easier for individuals to manage bills or troubleshoot outages. Imagine calling your energy provider and, instead of navigating endless menus, speaking with an AI assistant that immediately understands your issue. It's not just a dream—AI is turning this into reality.

THE ROAD AHEAD

AI and the electrical grid might seem like an odd couple, but together, they're shaping the future. It's a symbiotic relationship: AI needs energy to thrive, and the grid needs AI to evolve. As tech companies, policymakers, and energy providers work hand-in-hand, we're inching closer to a world where innovation and sustainability walk side by side.

The road isn't without bumps. Scaling solutions like nuclear power involves high costs and public skepticism, while integrating renewables requires significant infrastructure updates. But the destination is worth the effort. ***Whether it's harnessing nuclear power, crafting smarter regulations, or reimagining grid systems, the journey of AI and energy is just beginning.***

As we watch this partnership unfold, one thing is certain: the lights will shine brighter, and the world will move smarter. Together, AI and the grid are building the future—one watt at a time. ■

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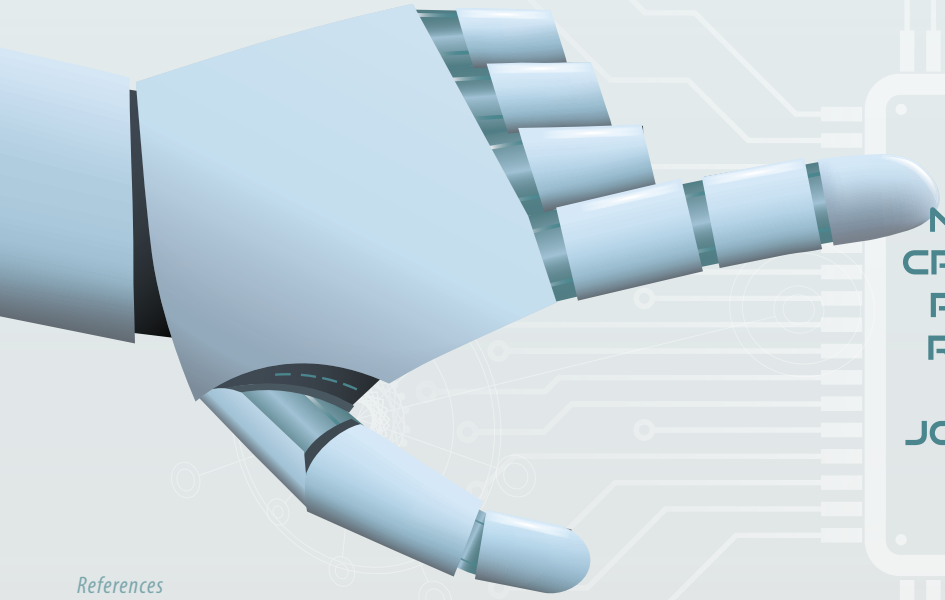

WHETHER IT'S HARNESSING NUCLEAR POWER, CRAFTING SMARTER REGULATIONS, OR REIMAGINING GRID SYSTEMS, THE JOURNEY OF AI AND ENERGY IS JUST BEGINNING.

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FEDERAL GRANT FUNDING OPPORTUNITIES

For Agriculture and Rural Small Businesses

Did you know that federal grants are available to farms and rural small businesses for installation of energy efficient equipment and renewable energy systems? Did you also know that these grants can be combined with state and utility program incentives to make a project increasingly cost effective? The federal farm and rural small business programs fund projects that use both utility-provided energy sources such as electricity and natural gas, as well as non-utility energy sources such as liquid propane (LP), wood, and diesel fuel.

The two primary programs available to farms include:

1. **NATURAL RESOURCES CONSERVATION SERVICE (NRCS) ENVIRONMENTAL QUALITY INCENTIVE PROGRAM (EQIP)**
2. **UNITED STATES DEPARTMENT OF AGRICULTURE (USDA) RURAL ENERGY FOR AMERICA PROGRAM (REAP)**

For an applicant to be considered agricultural they must be directly engaged in the production of agricultural products, including crops (including farming); livestock (including ranching); forestry products; etc., whereby 50% or greater of their gross income is derived from those products. Additionally, rural small businesses can apply for grants through the USDA-REAP program. ***A business is considered a small business if they are located in a rural area as defined by the USDA and meet the Small Business Administration's (SBA) small business size standards by the North American Industry Classification System (NAICS).*** Let's take a deeper look into each of these programs.

The NRCS-EQIP program is available to agricultural producers and aims to cover up to 75% of new equipment costs. The program requires a farm to have an energy audit completed by a qualified auditor. The farm can then use the results from that energy audit to apply to EQIP for payments to cover any of the energy efficiency improvements recommended in the energy

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audit report as long as it has a reasonable payback and has a payment offered by the program. Additionally, if the farm owner is not in a rush to get new equipment installed, EQIP offers payments that will cover about 75% of the cost of the energy audit. Typically, the energy audit is completed in one fiscal year and the recommended improvements are completed during the next fiscal year. The payment offerings and rates will vary by state, and NRCS typically offers one funding round per fiscal year. The EQIP program offers payments on equipment such as, but not limited to:

- ***LED lighting, poultry and swine house heating systems***
- ***Insulation***
- ***Thermal curtains***
- ***Irrigation systems***
- ***High efficiency fans for barns***
- ***High efficiency milk cooling equipment***
- ***Variable frequency drives***
- ***Dairy barn alley scrapers***
- ***Maple syrup evaporators***

The application deadlines are posted online and can vary by state. Interested farm producers should reach out to their local NRCS office to determine next steps and available offerings. **Figure 1** provides links to each state's NRCS contacts.

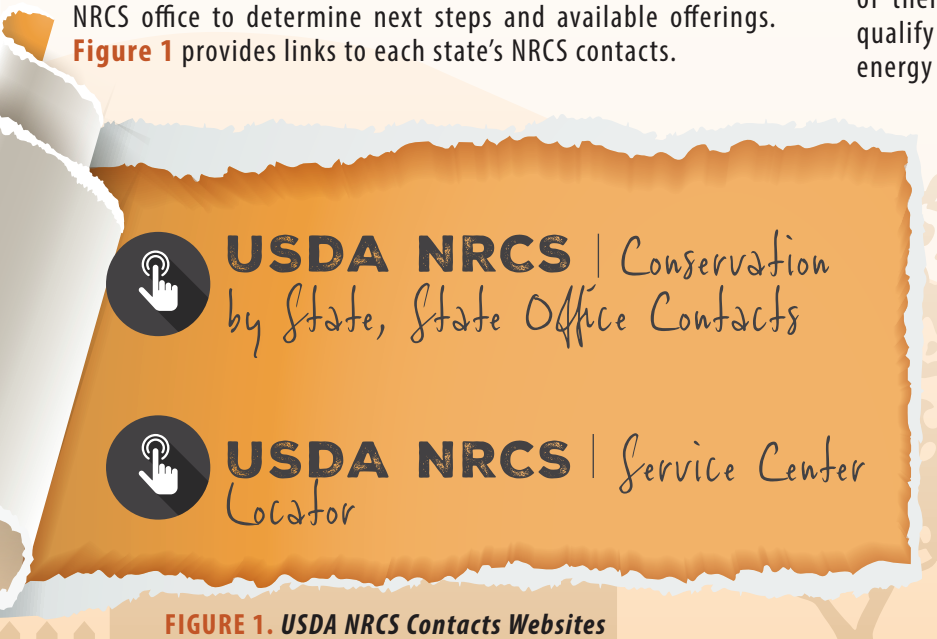

FIGURE 1. ***USDA NRCS Contacts Websites***

The USDA-REAP program is available to both agricultural producers and rural small businesses. **Figure 2** includes a direct link to the USDA-REAP website to determine location eligibility for rural small businesses.

FIGURE 2. ***USDA-REAP Program Location Eligibility Website***

Historically, the REAP program offered grants of up to 25% of total eligible project costs bi-annually. However, in April of 2024, with increased funding from the Inflation Reduction Act (IRA), the USDA increased grant application periods to quarterly rounds (3 per year) and increased the allowable grant to up to 50% of eligible project costs. For energy efficiency projects, an applicant can request 50% of their project cost up to a maximum of $500,000; and for renewable energy projects an applicant can request up to 50% of their project costs, up to a maximum of $1,000,000. To qualify for the 50% project cost reimbursement for renewable energy projects the projects must not emit greenhouse gas emissions at the site. ***Example renewable energy projects that would qualify for the credit are: solar, wind, hydro, and geothermal projects.***

Projects that emit greenhouse gases at the site, such as biogas and biomass projects, are limited to 25% of eligible costs, up to the maximum of $1,000,000. The REAP application deadlines fall on December 31st, March 31st, and September 30th of each year with a final application deadline set for September 30th, 2027. After the final application deadline, the REAP program will then be re-evaluated and is subject to change based on the regulations set forth in the USDA Farm Bill current at that time.

Unlike NRCS-EQIP, the USDA-REAP program does not have an annual list of specific equipment that is eligible for funding. Instead, USDA-REAP is open-ended, allowing a vast variety of project types. All equipment must be commercially available, and an energy audit, energy assessment, or technical report must show that the new equipment will save energy over the existing equipment. Some examples of projects that have been funded through REAP include, but are not limited to:

THE USDA-REAP PROGRAM DOES NOT HAVE AN ANNUAL LIST OF SPECIFIC EQUIPMENT ELIGIBLE FOR FUNDING.

- *LED lighting*
- *Robotic feed pushers and manure removal equipment for dairy barns*
- *Electric powered stationary dairy feed mixers to replace PTO driven feed mixers*
- *High efficiency irrigation systems*
- *Variable frequency drives*
- *Poultry house insulation*
- *Dairy anaerobic digester energy efficiency improvements*
- *Grain dryers*
- *Solar PV*
- *Wind turbines*
- *Anaerobic digesters*
- *Geothermal systems*

It is important to note that NRCS-EQIP and USDA-REAP cannot fund the same project.

USDA-REAP allows a farm or rural business to apply for one energy efficiency project and one renewable energy project per federal fiscal year (October 1 – September 30). The current Notice of Funding Opportunity (NOFO), published on October 16, 2024, has provisioned approximately $180,000,000 per fiscal year to the IRA REAP program, with an additional $20,000,000 set aside for underutilized renewable energy technologies. For the purposes of the current NOFO, an underutilized technology is defined as technologies which do not produce greenhouse gases at the project level and make up less than 20% of the total grant dollars obligated at the end of the fiscal year, two (2) years prior to the current year.

All federal grant/payment programs are competitive, thus not all applicants will be awarded funding. It is recommended that a farm or business not purchase equipment or begin construction until they have received notification of funding approval and are contracted, or told by the NRCS or USDA that they may begin their project. If a farm starts a project ahead of approval that may jeopardize the payment or grant award.

In summary, there are many federal grant and funding opportunities available for farm owners that wish to enhance the efficacy of their operations. The grants and payments can be made using multiple government programs, but only one award per program is allowed. To maximize the awards for energy efficiently the planned solutions must not produce greenhouse gasses and need to be supported by an energy audit or assessment. ■

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