Sowing Solar, Reaping Subsidies - The Renewable Energy Hustle Behind Data Centers and Electric Vehicles

Data centers are the unseen beasts gobbling up energy to fuel the modern digital economy—think of them as giant, energy-hungry computer barns that house cloud computing, artificial intelligence, and big data operations. But don't worry, they're being sold to you as "green" because they use some solar panels and wind turbines. Let's unpack how these energy hogs work, how renewables are roped into the narrative, and what's really happening behind the curtain.

Now, when I say "unpack" or "dig in," let me just clarify—I'm from Ohio. That means I'm overworked, under-caffeinated, and, let's be honest, probably daydreaming about laying on a tropical beach with an adult beverage (or three). It's a coping mechanism, I promise. Sorry for the silly tangent—let's get back to the energy talk.

A quick heads-up: this article may come off as a bit "dry," quite technical, and stuffed with citations. Why? Because I want you, the reader, to have a strong foundational base to build your knowledge upon. The technical details and references are here so you can perform your own due diligence and see through the polished sales pitches



that dominate the renewable energy conversation. If you're going to form an opinion, let's make sure it's an informed one.

Understanding Data Center Energy Consumption and Electric Vehicle Impacts

To grasp the scale of energy needed by data centers and electric vehicles (EVs) and estimate the massive profits flowing to developers, we first need to understand some basic information. Let's dive into the essentials:

1. Energy Use and Staffing by Data Center Size

Not all data centers are created equal. Some are more like a backyard shed, while others are the size of your county fairgrounds. Here's the breakdown:

Small Data Centers

- Size: Less than 5,000 square feet.
- Energy Use: 0.5–3 megawatt-hours (MWh) daily (that's about what a family farm uses in a year).
- **Staffing:** Specific data is limited, but smaller facilities often operate with a lean team, typically ranging from 5 to 20 full-time employees, depending on the extent of automation and operational requirements.

Medium Data Centers

- Size: 5,000–25,000 square feet.
- Energy Use: 3–10 MWh daily (enough to power a small town).
- **Staffing:** Medium-sized data centers may employ approximately 20 to 50 fulltime employees, depending on the complexity of operations and services provided.

Large Data Centers (aka Hyperscale)

- Size: 50,000–1,000,000+ square feet (or bigger than your local mall).
- Energy Use: 50–100 MWh daily. That's 18,250 to 36,500 MWh annually—talk about a utility bill!
- **Staffing:** Reports indicate that large data centers operated by companies like Microsoft, Yahoo, and Intuit each employ around 50 workers at their facilities. Google's data centers are reported to employ approximately 200 people per facility. (<u>https://www.datacenterknowledge.com/data-center-career-development/the-economics-of-data-center-staffing</u>)

2. Electric Vehicles: The Other Energy Guzzler

Electric vehicles are often heralded as the saviors of the environment—zipping along highways with zero tailpipe emissions while smugly waving goodbye to gas guzzlers. But here's the kicker: powering these vehicles isn't as "green" as advertised, and the energy demand they create is anything but negligible.

How Much Energy Does an EV Consume?

- A typical EV consumes about 30 kilowatt-hours (kWh) per 100 miles driven. For context, that's roughly equivalent to the daily electricity usage of an average household.
- According to the U.S. Department of Energy, the average American drives about 13,500 miles annually. For an EV, that translates to 4,050 kWh per year—over double what a refrigerator uses annually. (https://afdc.energy.gov/)

The Big Picture: Nationwide EV Energy Demand

- If the goal of 90% electrification for light-duty vehicles in the U.S. by 2050 is achieved, approximately 350 million EVs will be on the road. Let's calculate how much energy these vehicles will consume:
 - Daily: 350 million EVs × 30 kWh ÷ 100 miles × (average of 37 miles driven per day) = 3.9 billion kWh/day.
 - **Monthly:** 3.9 billion kWh/day × 30 days = **117 billion kWh/month**.
 - Annually: 3.9 billion kWh/day × 365 days = 1.423 trillion kWh/year.

How Many Solar Panels Would Be Needed?

A typical 500-watt solar panel generates approximately 2 kWh of energy per day under optimal conditions. To meet the annual energy needs of 350 million EVs:

- **Total energy needed annually:** 1.423 trillion kWh.
- Energy generated by one panel annually: 2 kWh/day × 365 days = 730 kWh/year.
- Number of panels required: 1.423 trillion kWh ÷ 730 kWh/panel = 1.95 billion 500-watt solar panels.

That's nearly 2 billion solar panels, just to power EVs. This doesn't include other growing energy demands, such as powering data centers or maintaining the existing grid.

Charging Infrastructure: Who Pays the Price?

- EV charging stations are proliferating, but they don't operate in isolation. Each fast-charging station requires about 500 kW of power—enough to supply electricity to 200 homes. Scaling this infrastructure to meet growing EV demand adds significant stress to an already overburdened grid. (https://www.eia.gov/)
- While urban areas benefit from this electrification boom, rural communities often bear the environmental and financial burdens of building the renewable facilities needed to power them.

Ambitious Goals, Unseen Challenges

Environmental advocates have set lofty goals to electrify the U.S. light-duty vehicle fleet, aiming to make 90% of cars electric by 2050. That's roughly 350 million EVs on the road. This goal, published in the journal *Nature Climate Change*, is seen as necessary to align the transportation sector with climate mitigation targets. (https://www.scientificamerican.com/article/ninety-percent-of-u-s-cars-must-be-electric-by-2050-to-meet-climate-goals/#:~:text=Published%20in%20the%20journal%20Nature%20Climate%20 Change,sector%20in%20line%20with%20climate%20mitigation%20targets)

Battery Production: What They Don't Tell You

- Producing EV batteries is an energy-intensive process requiring significant mining of lithium, cobalt, and nickel. The environmental cost? Massive land degradation and water consumption, often occurring in developing nations with minimal environmental protections.
- Worse yet, disposing of EV batteries at the end of their lifecycle remains an unsolved challenge, with few sustainable recycling solutions in place.

3. Renewable Energy: The Shiny Distraction

MW vs. MWh: The Utility-Scale Renewables Glossary

- MW (Megawatts): A snapshot of power generation at a specific time.
- MWh (Megawatt-hours): Total energy generated or consumed over time.

Capacity Factors vs. Actual Output

Here's where it gets tricky: Just because a renewable facility is rated at, say, 10 megawatts (MW), doesn't mean it actually generates that much.

- Solar Farms: Typically hit 20–25% of their design capacity. A 10 MW solar farm averages just 2.5 MW, assuming the sun cooperates (spoiler: it doesn't always).
- Wind Farms: Slightly better at 35–50%, depending on whether you're talking onshore or offshore.

And let's not forget weather hiccups, maintenance delays, and good old-fashioned inefficiency. It's like buying a fancy new tractor that only works half the time.

Conversion and Reliability Challenges:

Renewables sound great until you realize energy conversions are about as efficient as duct-taping a leaky bucket.

- Solar Panels: Produce direct current (DC).
- Wind Turbines: Produce alternating current (AC)—but at variable frequencies.
- The Catch: All this energy needs conversion to be grid-compatible. It's expensive, inefficient, and prone to breakdowns.

The Sciencey Stuff (with a Dash of Snark):

- **Shockley-Queisser Limit** The theoretical max efficiency for single-junction solar cells is 33.7%.
- Multi-Junction Solar Cells: The new-and-improved model boosts efficiency to 40–50% in real-world use. Better, but still not miracle tech.

And then there's the hype—those "scientists" constantly claiming record-breaking efficiencies without ever explaining how they'll exceed these limits, when the tech will be ready, or what it will cost. Are these breakthroughs real, or just a way to raise research money?

Renewable Energy Costs vs. Wholesale Energy Costs

Renewable energy developers strike power purchase agreements (PPAs) with data center operators and utilities, offering renewable energy at average rates that have been rising. As of the third quarter of 2024:

Solar PPAs are priced at \$56.58 per MWh, and wind PPAs at \$65.63 per MWh. (<u>https://www.utilitydive.com/news/ppa-power-purchase-prices-wind-solar-levelten-ascend-analytics/730245</u>)

In contrast, the **average wholesale electricity price** in the U.S. was **\$36 per MWh** in 2023. (https://emp.lbl.gov/news/exploring-wholesale-energy-price-trends-renewables-and-wholesale-electricity-prices)

The difference? Renewable developers capitalize on inflated pricing in these agreements, plus generous taxpayer-funded subsidies like the Production Tax Credit (PTC) and Investment Tax Credit (ITC). This allows them to charge above-average rates while enjoying significant financial breaks.

4. Why This Matters

For rural communities and farmers, utility-scale renewable projects promise the moon but often deliver headaches. They hog land, disrupt ecosystems, and come with miles of red tape—while barely delivering consistent power. Meanwhile, data centers and EV's gobble up energy faster than a combine at harvest.

Here's the kicker: When a developer claims their shiny new solar or wind farm will "generate enough energy to power XX,XXX homes," they frequently skip a crucial detail—was that number based on the facility's design capacity (the perfect, pie-in-the-sky scenario) or its actual operating capacity (the reality of intermittent energy generation)? Odd, huh? It's almost like they're trying to sell you a half-baked idea and hoping you won't notice.

And how about this one? When a developer or their cheerleaders ask if you'd prefer a renewable energy facility over, say, a hog barn next door, let's cut to the chase: A hog barn may not be glamorous, but a hog raised is a hog sold. At least that's a transparent, honest business model. You know what you're getting, and it's contributing to the economy in a tangible way—unlike a wind turbine that might sit idle half the time while claiming to save the planet.

The same holds true for electric vehicles. Advocates tout them as a clean alternative to traditional cars, but they don't mention the massive mining operations needed to produce the batteries, the strain they place on the electric grid, or the looming question of how to dispose of these batteries when they're no longer useful.

Sure, renewables and EVs are painted as the saviors of the digital age, but when you scratch the surface, it's clear they're just high-maintenance solutions to a problem nobody asked for in the first place. Balancing energy demands with reality—not lofty promises—should be the priority.

Conclusion

Data centers along with "green schemes" such as electric vehicles and renewable energy facilities disproportionately affect rural communities, prioritizing profits over people—a practice that is not just economically exploitative but socially unjust. These projects rely on the land, resources, and sacrifices of rural areas to sustain urban conveniences.

Social justice demands fair treatment, transparency, and equitable distribution of benefits. If the energy transition is truly about a sustainable future, it must also be about sustaining the communities that make it possible. Rural voices must be heard, and their contributions respected—not exploited.