After the Fact | Keeping the Lights on in the Age of AI

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TRANSCRIPT

Pat Wood III, CEO, Hunt Energy, and member, Distributed Energy Resources Advisory Council: Electricity demand from the late ’90s to COVID was basically flat.

Jennifer Hiller, energy reporter, *The Wall Street Journal*: The ask that AI is making of the grid is really enormous.

Carter Harns, officer, energy modernization, The Pew Charitable Trusts: We are seeing this conversation pick up around demand growth,

Jennifer Hiller: Data centers are being talked about that would need power that is equal to Manhattan, as much as Miami.

Pat Wood: It's really an existential issue for our economy,

Emily Chow, cohost “After the Fact” podcast: Welcome to “After the Fact” by The Pew Charitable Trusts. I'm Emily Chow.

Giuliana Pence, cohost, “After the Fact” podcast: And I'm Giuliana Pence.

Emily Chow: Today we're talking about the electric grid and how artificial intelligence and increasing energy demand is putting strain on the system. Giuliana, have you ever used any generative AI platforms in your day-to-day at work or at home?

Giuliana Pence: I do use it for recipes, trip planning. I've found it to be super helpful.

Emily Chow: I really like it for brainstorming ideas for projects for work, maybe some episode titles for the podcast. It can be a great tool, but I don't know that we really think about the impact that it has on our broader system.

Giuliana Pence: Before doing research for this episode, I actually hadn't realized the footprint that it leaves. People are talking about blackouts, rising electric bills, and the grid being totally overwhelmed. So, what's happening?

Emily Chow: Honestly, Giuliana, we talked to a bunch of experts who say that we're pushing our electric grid way past what it was built to handle.

Giuliana Pence: Because of AI?

Emily Chow: So, AI is one of the big reasons. Experts predict that energy consumption in American homes will keep growing. In fact, the U.S. Energy Information Administration has forecast that power consumption in the U.S. will reach record levels in 2025 and 2026, which could create real ripple effects for people, including higher bills and an increased risk of power outages.

Giuliana Pence: What are we doing about it? Is there a fix?

Emily Chow: There are solutions that Pew and other experts are working on that could give the grid a new life. For this story. I traveled to the epicenter of the energy industry in the United States, Houston, Texas.

Emily Chow: I visited NRG Energy's Smart House.

Giuliana Pence: OK. Now I'm picturing this futuristic setup.

Emily Chow: This house had smart lighting, an electric vehicle, a smart toaster with a touchscreen,

Giuliana Pence: This reminds me of “Smart House.” Did you see that movie?

Emily Chow: I kept thinking about that when we were going through the house. They had this room above the garage that was this control center. So, you could see energy usage in the house live, and then also compare that to the state of the grid in Texas.

Giuliana Pence: You were literally watching the house adjust its energy use.

Emily Chow: There was one part where we unplugged completely from the grid and we're running energy just through the electric vehicle.

Giuliana Pence: That’s incredible.

Emily Chow: Welcome to the future.

Emily Chow: The smart house really suggests that every American household is using more energy. Coupling that with artificial intelligence, the collective demand across the United States is just rapidly increasing.

So, the last time I was in Houston, it was only for 36 hours. It was just like airport, hotel, conference, raining, airport. So, I'm glad to see it on, like, a nice sunny…

Jennifer Hiller: Yes. It's just that, it's like, uh oh, it's hot.

Emily Chow: The first person I spoke to was Jennifer Hiller. She's an energy reporter with The Wall Street Journal and a lifelong Texan.

Jennifer Hiller: This week in Houston and actually throughout Texas, we're breaking records for heat in May. Everybody is gonna be cranking their air conditioners today, and we'll start to test the system.

Emily Chow: You've been covering the energy beat throughout your career. So, tell us what you've seen throughout your reporting and where we are today.

Jennifer Hiller: So, power demand has been flat for pretty much all of this century. It's been a no-growth industry. So even when you've had the economy growing, just more efficient buildings and more efficient light bulbs have chipped away at that demand. And now we have real demand in.

Emily Chow: Yeah. It seems like there's a lot more at play now that's leveling up that energy demand. What are some of those factors that are placing more strain on the grid?

Jennifer Hiller: We're seeing a lot of calls for just really enormous data centers to be built to serve artificial intelligence. There's data centers being talked about that would need five gigawatts of power, that is equal to entire large cities. So that can be as much as Manhattan, that's as much as Miami. It's five nuclear reactors' worth of power. We also have a lot of manufacturing returning to the U.S. Those facilities need a lot of electricity. You've got EVs coming in. A lot of building heat is switching over to electric. A lot of these factors are driving electricity demand higher.

Emily Chow: How does that connect to the ratepayer? Are folks seeing rates go up?

Jennifer Hiller: Generally, electricity prices are going up. The cost of delivering the electricity is a big part of what it costs to make the system work. So actually a lot of your utility bill is that transmission and distribution, what it takes to get it to you.

There's just a lot of stress on the system as a whole. There's a lot of weather events. You've got hurricanes and wildfires. You need to either maybe replace equipment or harden it a little bit to make it more resilient for weather challenges.

Giuliana Pence: It kind of feels like we're at a crossroads: Either we keep patching up an outdated system or we throw everything we've got at making some serious changes. But based on what I've heard so far, it sounds like neither option is simple.

Emily Chow: It's a delicate balancing act. If we build too much new infrastructure, it's costly, and even the best solutions can have environmental impacts.

Giuliana Pence: That makes sense. Because building more means using more land and materials.

Emily Drop in: There are a lot of experts thinking deeply about how to thread that needle. And one of those people is Carter Harms from Pew's energy modernization team.

Carter Harms: The grid is the largest manmade machine in the world. It's a feat of human ingenuity that we're able to provide consistent, reliable electricity to fuel our economy and to power people's lives.

Emily Chow: How does the grid actually function?

Carter Harms: So, I'm gonna throw out two terms that I think will be helpful for the conversation, and it's transmission and distribution systems. The transmission system is the interstate highway, so that's moving a large amount of energy over long distances, that's what the transmissions lines do.

And then to get it to individuals, homes, and businesses, you can take the distribution byways and roadways. So those are the smaller poles and towers that you see in your neighborhood connecting your home to the overall big system.

Emily Chow: Talk to us a little bit about how this current level of demand is outpacing the ability of our infrastructure.

Carter Harms: The group that looks at reliability for the entire system just put out a long-term forecast at the end of 2024 and said that there's explosive growth coming in demand. So, it is a real issue and that's really getting a lot of policymakers and people in the energy space to pay attention to: How are we gonna meet that growing demand?

But in the immediate, it's not that we are necessarily experiencing these resource adequacy problems or that we're not able to meet demand. People's lights are still turning on across the country. We know that this is such an important part of our economy and how people go about their daily lives, that we want to make sure we're really prepared well for what's coming down the road.

Emily Chow: And I guess taking a step back, all these innovative technologies, the issues of increased energy demand, our aging infrastructure… What would happen if folks chose to just do nothing?

Carter Harms: Everyone is interested in meeting this rising demand, because if we do nothing, that's a problem for powering businesses. That's a problem for keeping the AC on in the hot summer. You know, this is, in some ways, matters of life and death.

Jennifer Hiller: We had a huge cold snap come in. Really unusual polar vortex. Does happen about every 10 years that we have a cold snap and may have to go

into rolling blackouts. But on the one in 2021, it was just very severe. It lasted for several days and all sorts of things went wrong.

Emily Chow: Jennifer told me about how during Winter Storm Uri in 2021, Texas was hit especially hard.

Jennifer Hiller: So, Texas has its own grid in its own grid operator.

Emily Chow: Technically, the Texas power grid has some connections to other grids, but not many.

Jennifer Hiller: So, we are kind of a little island of our own. There was issues across the system, and resources of all kinds were coming offline. We have a lot of natural gas power in Texas, and that is definitely what we rely on in cold weather.

Emily Chow: The blackout lasted for days in much of the state. Equipment was freezing. Power plants of all kinds failed. Some natural gas plants couldn't get enough fuel.

Jennifer Hiller: The grid came really close to the edge of damage that would have taken, potentially, weeks to months to repair. They were able to save the system, but it was just a mess. And hundreds of people died in this. Some people were literally freezing to death.

Emily Chow: And since then, it's changed the conversation across Texas about this being an issue that needs to be prevented in the future.

Jennifer Hiller: Yeah. Because the system in Texas is really designed to meet that summertime peak. Because that's usually our issue: We need the AC on those hot days. But there was definitely a lot of effort made towards getting power plants to weatherize better and make tweaks in the market that would make the system more resilient. And we've been OK the past few winters, and hopefully that remains to be the case.

Emily Chow: The freeze in Texas is an example of what could go wrong when there isn't enough power to go around, especially during severe weather. But while that kind of event is devastating, it's still pretty rare. What's more common is the challenge of getting power to the right places.

Giuliana Pence: So, it's not just about making enough power, it's also about moving it.

Emily Chow: That's called deliverability, and it's becoming a growing concern because so much of the grid infrastructure is outdated.

Carter Harms: If you think of those big transmission towers running along the highways, the lines going in between them are called conductors. The technology for those is 75 years old.

Emily Chow: You know, antique and vintage things are, are cool, but…

Carter Harms: You should see my apartment. I love antique and vintage things, but you know, we want a grid that is modernized.

Emily Chow: Absolutely.

Carter Harms: We have really faltered in our building of transmission lines in the last couple years. So, the latest statistic I have from 2023 is only 55 miles of high-voltage lines were built, and that was down from a peak of 4,300 miles in 2013. So, we were building over 4,000 miles in 2013. A decade later, we weren't even building a hundred miles. We were building 55 miles. And this is at a time where we see energy demand growing, right? So we know we need to be building more, but we're building less.

In the U.S. there's currently an estimated 2,600 gigawatts of projects that are stuck in that interconnection queue that could be providing to power homes and businesses but instead can't even connect to the system and be powered on; 95% of it is solar, wind, and battery storage.

Emily Chow: What does 2,600 gigawatts actually look like?

Carter Harms: 2,600 gigawatts is more power than the current system already has on it.

Emily Chow: Oof.

Carter Harms: Yeah, exactly. There's enough power That could double or more the existing system in the U.S. So, we have a lot of power that's on the sidelines that we could get online.

Pat Wood: The rocket has relaunched, certainly, in my home state of Texas, but across the country, we're seeing huge upticks in demand. So, we had this system in this mindset and the whole industry, all the professionals, haven't lived in a growth environment. And so, we're all just dealing with the buffeting winds that come from standing out in that hurricane. It's exciting, but it's scary at the same time.

Emily Chow: To help make sense of what's happening and where we go from here, I spoke with someone who's been at the center of the energy conversation throughout his long career. Pat Wood is the former chair of both the Federal Energy Regulatory Commission and the Public Utility Commission of Texas, and he's currently the CEO of Hunt Energy Network. These days, he's helping lead

conversations about how to modernize our electric grid as part of Pew's Distributed Energy Resources Council.

Pat Wood: When you think about the strength of a grid, historically it's been a big, robust transmission grid with a lot of big, you know, 500,000-megawatt power stations of nuclear and coal and gas. It's like, OK, that's good. And again, I'm not raining on that parade. I'm just saying the parade needs a few more floats in it, right? And so that would be all these assets that I'm on the front wave of, which are batteries.

Emily Chow: When we had spoke previously, we had the luxury of being on video, so we got to see this fantastic model of this battery that you all are building out, I think, in West Texas. And it for me was just, I didn't know how large a battery could be.

Pat Wood: So, think about driving down 95 and seeing a big tractor trailer. So, three of those is a 10-megawatt battery plant. We can put it on an acre. And we sell into the power market. A lot of that technology that started with phones and portable equipment moved into cars, then came to fixed asset storage for utility scale. That just was not economic before about 2018.

And so, in 2018, we decided let's move this out of kind of our R&D section and start a business. So we raised money to build some batteries in Texas. When we came in, like I said, there was nobody there. Now there are 10,000 megawatts of batteries. I've got 300. We're just a fraction of that big amount. But it's fun to be in that world. It's fun to solve problems with your own technology.

I wish Spain had those when they went out of power, but they have 60 megawatts of batteries on a grid as big as Texas. And I'm like, 60? We have 10,000 megawatts of batteries in Texas. But they have 60, and I'm like, that battery would've totally just handled Spain's problem beautifully.

Emily Chow: Batteries, which help with energy storage, are one piece of this puzzle. Carter Harms told me about another solution that helps get power where it's needed faster.

I don't remember the full acronym, so help me out.

Carter Harms: At a high level, what advanced transmission technologies do, or ATTs, is it makes the grid more efficient and squeezes more power out of the existing infrastructure. So, a couple examples I like to use. One is dynamic line rating.

So dynamic line rating is putting sensors on the transmission lines and giving grid planners real-time information as to what's happening on those lines. And with that

real-time information, grid planners are able to get better estimates of how much power they can be putting through those lines.

And we've seen they're able to increase the amount of power they're putting through those lines by 10 to 30%. Also, material scientists and other electrical engineers have created new wires essentially that go between the towers that use a better material and better design, and it gets 50 to 110% more power that you can put through those lines. We know we have the ability to generate the energy needed, it's a question of: Do we have the system, the grid, to be able to meet that demand and get the energy from where we're generating it to people in a cost-effective way?

A really big benefit of ATTs is that they can be deployed so quickly, in as little as three months and up to three years. But where it comes to building new transmission lines, those can take around 10 years. So if you already have some of the infrastructure built, squeezing more capacity out of that is like a low-hanging, really smart move to get more capacity to connect more projects.

Emily Chow: And recently, you and the project team have had some wins.

Carter Harms: Yeah, some breaking news on the podcast.

Emily Chow: We love it.

Carter Harms: Ohio actually included policy language on this issue in their big energy package, House Bill 15, that was passed last week. So, Ohio joins Utah and Indiana in passing ATT policy to encourage the deployment of these technologies on their states' grids. And Indiana is also having their utility commission do a study of the benefits of these technologies for their systems. So, momentum's really picking up and it's picking up in these diverse political environments

Emily Chow: While interest is growing across the political spectrum on finding a solution to our increased energy demand, Pew is leading an effort to create a roadmap, if you will, of how people, localities, and states can be a part of an innovative solution. Pat Wood is part of that effort known as the DERs Advisory Council. The name stands for distributed energy resources.

Emily Chow: You are the CEO of Hunt Energy Network, but you are part of Pew's DERs Advisory Council. Tell us a little about that.

Pat Wood: So distributed energy resources, which we call DERs, are the small quiet transformers of our future that you don't know much about. And so, the problem is, a lot of the people in the utility industry, and in the government, don't understand what a transformative potential we have just sitting there ready for us. Every state in the nation benefits from having disaggregated, dispersed energy resources all around the grid, and not just these great big central stations in the middle of grids. We like the disaggregated part.

Emily Chow: Traditional large power plants generate energy and transmit it over long distances. Instead, DERs generate and deliver energy close to where it's needed

Pat Wood: The new world says not just the big grid, but on the little grid, that you see in your backyard and through your neighborhood and behind the school.

Emily Chow: When demand is high, DERs can help provide more energy to the entire grid or limit the amount of energy used.

Pat Wood: That distribution system has a lot of untapped potential as well. And so that's what we are looking at here at Pew is, let's figure out how to unlock all that treasure that's on the little grid. And so that's really, for me, where I want to spend the balance of my career is in what I call the little grid. Because my first part of my career is really facilitating the growth of the big grid, the big transmission backbone that covers the United States. But we haven't spent enough time and mental energy and just muscle on the little grid.

Emily Chow: So we're here today in the Heights neighborhood, in Houston. While I was in Houston, I visited NRG Energy's Smart House to see for myself how that works.

Jim Nye, NRG chief product officer: I am Jim Nye. I'm the chief product officer for the NRG Consumer Group.

Mark Parsons, senior vice president, NRG's consumer energy business in Texas: I'm Mark Parsons. I'm the head of our energy consumer business here in Texas.

Emily Chow: NRG is one of the largest power companies in the U.S. They're an electricity provider and have more recently expanded into cleaner energy and technology.

Jim Nye: As we walk into the home…

Emily Chow: The AC is feeling great. The AC feels really good.

This house had new tech everywhere. When I walked into the bathroom, the window shade automatically dropped down for privacy. A refrigerator with a camera so that you could remotely check what you had in the fridge, at the grocery store. Not everything in the smart house is an NRG product.

Jim Nye: We're experimenting with new technologies. Out in the garage we have different EV charging and battery technologies.

Giuliana Pence: So how does a house give back to the grid?

Emily Chow: These homes are part of what experts call distributed energy resources.

Giuliana Pence: Right, what Pat Wood was talking about.

Emily Chow: Exactly.

Jim Nye: This thermostat is also tied to the system, it's tied to automations. The customer can set it up any way they want.

Emily Chow: This is a benefit not only to the individual, but there's a bigger connection out to the community.

Jim Nye: That's absolutely right. It creates a benefit for the energy grid by intelligently managing energy consumption. The cleanest megawatt of energy is the one that's never used. When you connect enough thermostats then you really start to have a smarter energy consumption.

Emily Chow: And we're talking even just two to three degrees of a difference, right?

Jim Nye: Absolutely. Through those little shifts, one or two degrees for a shorter amount of time, they really do have an impact.

Mark Parsons: In the home, if you've got an electric vehicle that stores energy, you've got the batteries on the wall that store energy, and you also have the thermostats that actually consume a lot of energy. So, any combination of turning those things on and off can basically create energy for the grid.

Emily Chow: And, when you're visioning for the future, we kind of want folks to get to this battery level to kind of ramp up capacity?

Mark Parsons: Yeah, ideally. There's so much capacity in those batteries. And an EV is really just a battery with wheels.

Emily Chow: One thing that stood out was this big electric truck parked in the driveway. The battery in that thing had enough energy to power the whole house.

Giuliana Pence: Just the truck?

Emily Chow: Yeah. And if the system's set up right, that truck can actually send power back to the grid. Or if there's a blackout or a storm, it could power the house for a few days.

Giuliana Pence: Did they show you how it all works?

Emily Chow: So there's this room above the garage that's basically the control center for the whole house. There were TV screens on the wall showing real-time data.

Mark Parsons: We're looking at these two things, is how is supply and demand, and how it's pricing.

Emily Chow: One screen showed the entire Texas power grid live, so you could see how much energy was being used and where.

Mark Parsons: And as pricing starts to go up into the thousands-of-dollars range per megawatt, it is in everyone's best interest for us to bring that demand down,

Emily Chow: And the other screen showed exactly what the house was doing, how much power it was using,

Mark Parsons: This is this home in virtually real time. You can see a flat line of energy consumption with a home. And this is when you plugged in the EV, you can see that tremendous spike getting that EV going. That's basically how much energy is coming into the house.

Jim Nye: In an event when we want to reduce the demand in the home, we can press that button and it'll show how it reduces significantly the usage of the home.

Emily Chow: We turned off the AC at one point. You could see the graph of like the energy usage plummet down on the screen. We unplugged completely from the grid and we're running energy just through the electric vehicle.

Mark Parsons: And so, it'll show it going back out to the grid. So not only is this house not consuming energy; it's actually become a power plant. When there is a need to curtail energy, we would dispatch the air conditioner as well as turn on the batteries. And this could be happening in Houston downtown across all of our customers, across the state, and really across the country,

Emily Chow: Consider a community that has multiple electric vehicles. Battery storage, if set up correctly, electric grid operators can basically tap into that.

Pat Wood: I think we all have a common goal, is we want this country to be the foundation for the AI future. It's really an existential issue for our economy, that we've got to make sure this works here and that this has a steady and deep root here. That's what motivates me.

Jennifer Hiller: If you don't keep up you could just see economic growth grind to a halt. But if you overbuild, then you've cost customers a lot of money for no reason. So, it’s a balance.

Carter Harms: It's been encouraging to see that message start to resonate with policymakers to think about: How are we going to plan to build out our system? And to understand what demand growth is going to look like so we can be able to meet it.

Giuliana Pence: Thanks for listening. And make sure you're subscribed to “After the Fact” wherever you get your podcasts to hear all of our latest episodes. For The Pew Charitable Trusts, I'm Giuliana Pence.

Emily Chow: And I'm Emily Chow. And this is “After the Fact.”