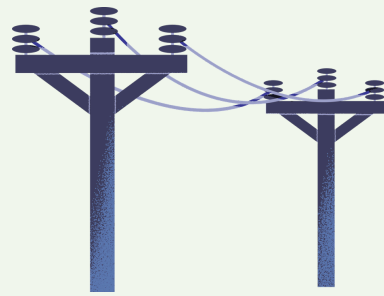
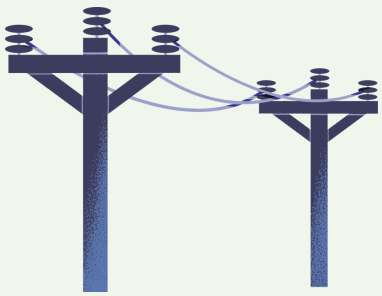


FEBRUARY ISE STUDENT CHAPTER NEWSLETTER

Happy spring semester! This newsletter is focused on some of the trending topics in energy, **Distributed Energy Resources (DERs)**, and **Virtual Power Plants (VPPs)**.

Keep reading to learn about upcoming events and how these innovations are supporting the sustainable energy transition.

UPCOMING EVENT: UNDERSTANDING THE ELECTRIC GRID



Ever heard “the US grid is outdated” or “the grid can’t handle the extra load of EVs or data centers” and wondered why?

Learn about it at the Student Initiative for Sustainable Energy (ISE) event

March 17th, 12 - 1 pm in ERC 250

Snacks will be provided

Recommending listening before:

Volts Podcast - What is PJM and why is everyone so mad about it?

Volts Podcast- Making the electricity grid work like the internet

**UPCOMING EVENTS:
ELECTROCHEMICAL SOCIETY
AT BROWN**

Electron Transfer Kinetics

ECS Former President - Noel Buckley

Monday, March 2nd at 2 PM in ERC 125.

**Learn how to make impactful graphics for
your publications.**

Deputy Editor for Advanced Materials and
Advanced Functional Materials - Bill Odette

Thursday, March 5th at 10:30 AM in ERC 125

UPCOMING EVENTS: CLIMATE WEEK

March 2-7 2026

Monday at 12 PM (online and in person):

The State of Decarbonization at Brown.

Monday at 2 PM: **Where Climate Meets**

Education Policy and Practice.

Wednesday at 12 PM: **Creating Your Path to
a Climate Career.**

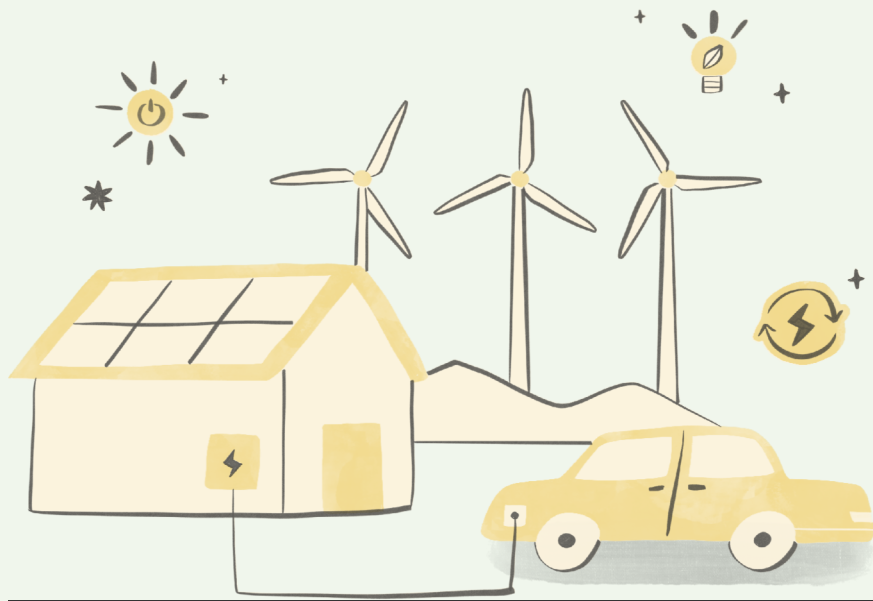
Thursday from 11 AM - 2 PM: **Climate
Career Fair**

Learn more: ibes.brown.edu/climate-week

DISTRIBUTED ENERGY RESOURCES (DERs)

Energy access near energy use

DERs are energy generation and management technologies that are easily deployed close to the energy consumption.



Versus centralized power

Traditional energy resources, such as oil and natural gas, are burned at large power plants to produce electricity. These facilities are often far away from where the oil and NG were extracted and far from the electricity consumers.



Distributed energy generation

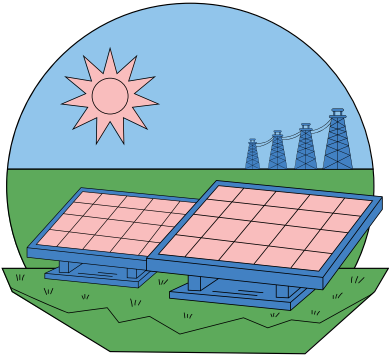
Solar PV current capacity
in the USA

Residential rooftop:

~42 GW

Solar farms:

~174 GW



W. So, Statista Jan 20 2026

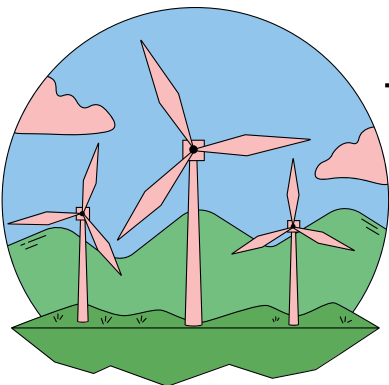
Onshore wind current capacity
in the USA

Total onshore wind:

~155 GW

Distributed wind:

~1.1 GW



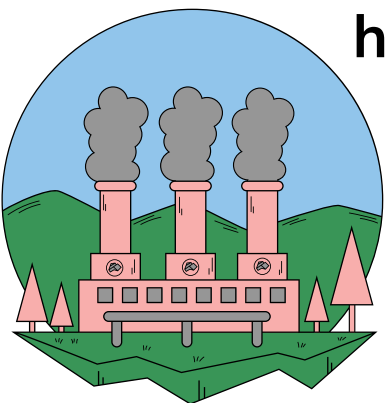
EOE. Distributed Wind Market Report 2024 Edition

**Cogeneration or combined
heat and power (CHP)**

current capacity

in the USA

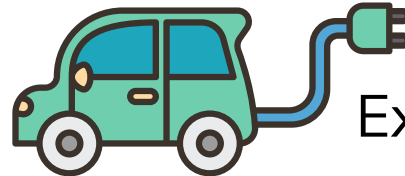
~82 GW



EPA. Combined Heat and Power: Frequently Asked Questions

Distributed energy management

**Battery Energy Storage
Systems**



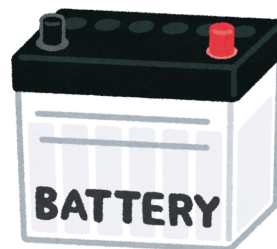
Excess electricity can be
stored in batteries storage

facilities or in consumer

EVs. This energy is

available for use at the

facility or on the local grid.



Smart Buildings

Adjusting the power
draw from appliances,

thermostats, and

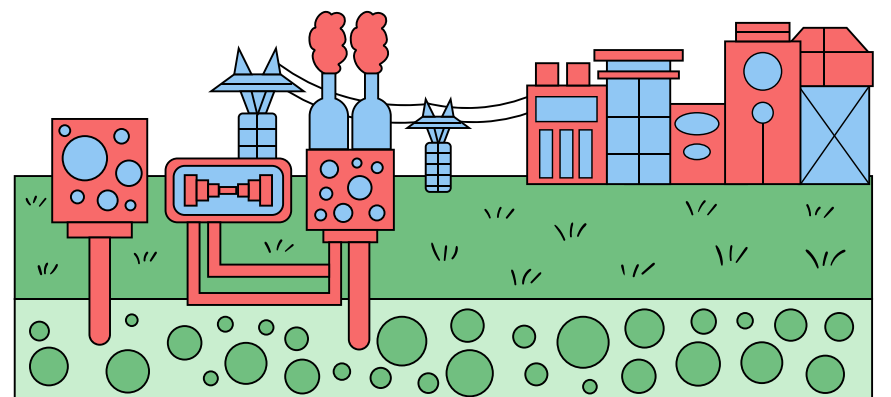
lighting for electricity

demand management.



Virtual Power Plants (VPPs)

Keep reading to learn more!



PERMISSIONLESS DERS: PLUG-IN BALCONY SOLAR IN GERMANY



Over 1 million plug-in solar panels have been added to Germany's electric grid in the past three years

Plug-in solar panels can be plugged directly into the household electric sockets without any permanent installation. They are being termed a permissionless DER because they lack any formal approval process. Each system can supply up to 800 W (enough to charge a laptop) of distributed electricity directly for use within the home or to the grid.

To accomplish this, Germany created grid safety standards and guidelines for plug-in solar systems. These regulations have allowed for a booming balcony solar industry.

PERMISSIONLESS DERS: PLUG-IN BALCONY SOLAR IN GERMANY



***Is balcony solar coming to the US?
It's likely yes!***

Plug-in solar has been introduced in recent state legislatures in 24 states in the US. Utah has led the way to become the first state to create a separate category for portable small solar devices. This permissionless DER category removes the interconnection and permitting requirements typical for larger rooftop and utility systems.

Virtual Power Plants

What is a VPP?

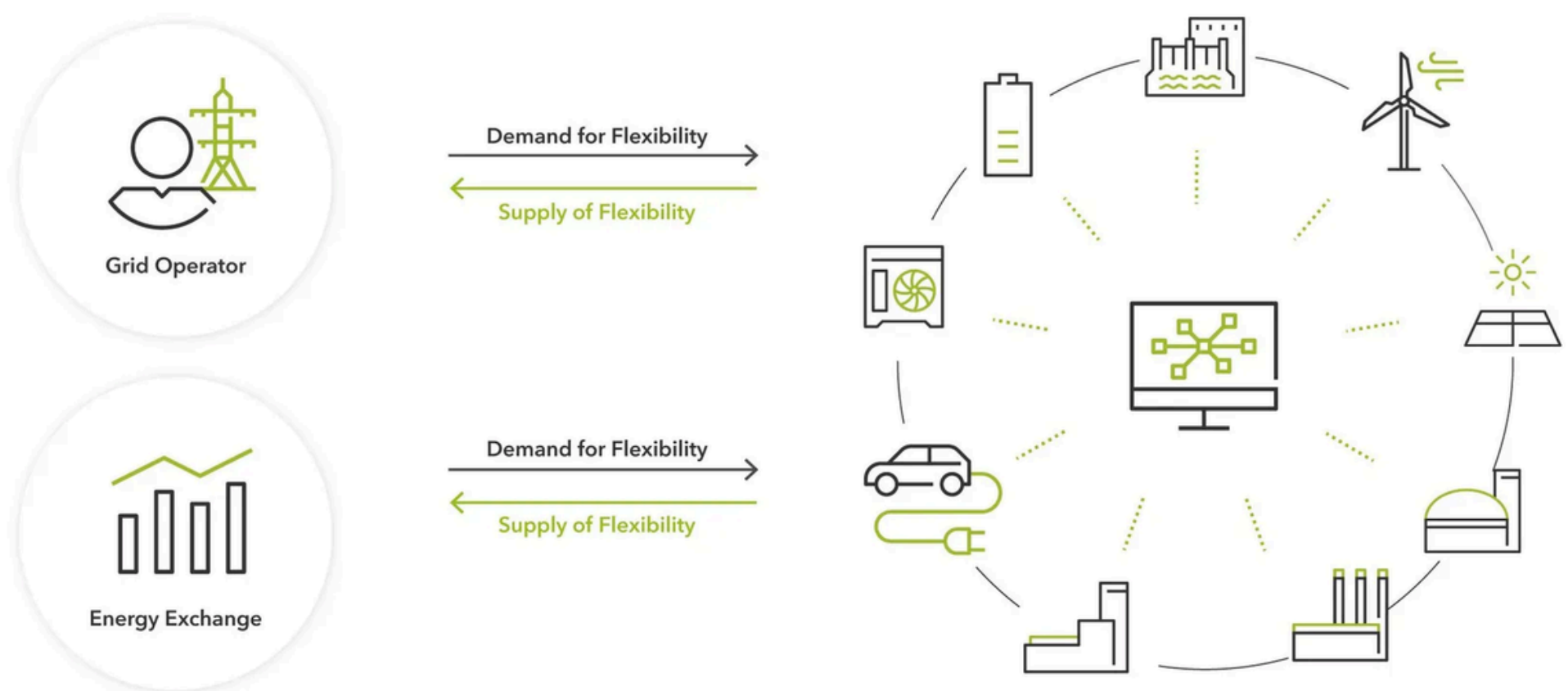
A Virtual Power Plant is a **digitally coordinated network of DERs** like those mentioned in the previous sections that **operate like a single large power plant**. VPPs offer deeper integration of renewables and demand flexibility, which can provide cleaner and more affordable power.

Technical Design

Five main technical layers:

1. Physical Devices (DERs)
2. Communication Layer
3. Aggregation & Control Platform (The Brain)
4. Market & Grid Integration Layer
5. Cybersecurity Layer

Virtual Power Plant



Virtual Power Plants: Financing

3 Prominent financing models:

1. Customer-Owned Assets + Aggregator Platform:

This is the most common model. Here, homeowners own the DERs (ex. solar + EV + smart thermostat), and a VPP company aggregates them, sharing the revenues.

2. VPP-Owned Assets:

In this model, the VPP company installs and owns the DERs, providing grid reliability services.

3. Utility-Sponsored VPP:

Here, electric utility companies (like PG&E, Duke Energy, or Eversource) aggregate DERs to act as a single, large-scale power plant

How do VPPs create revenue?

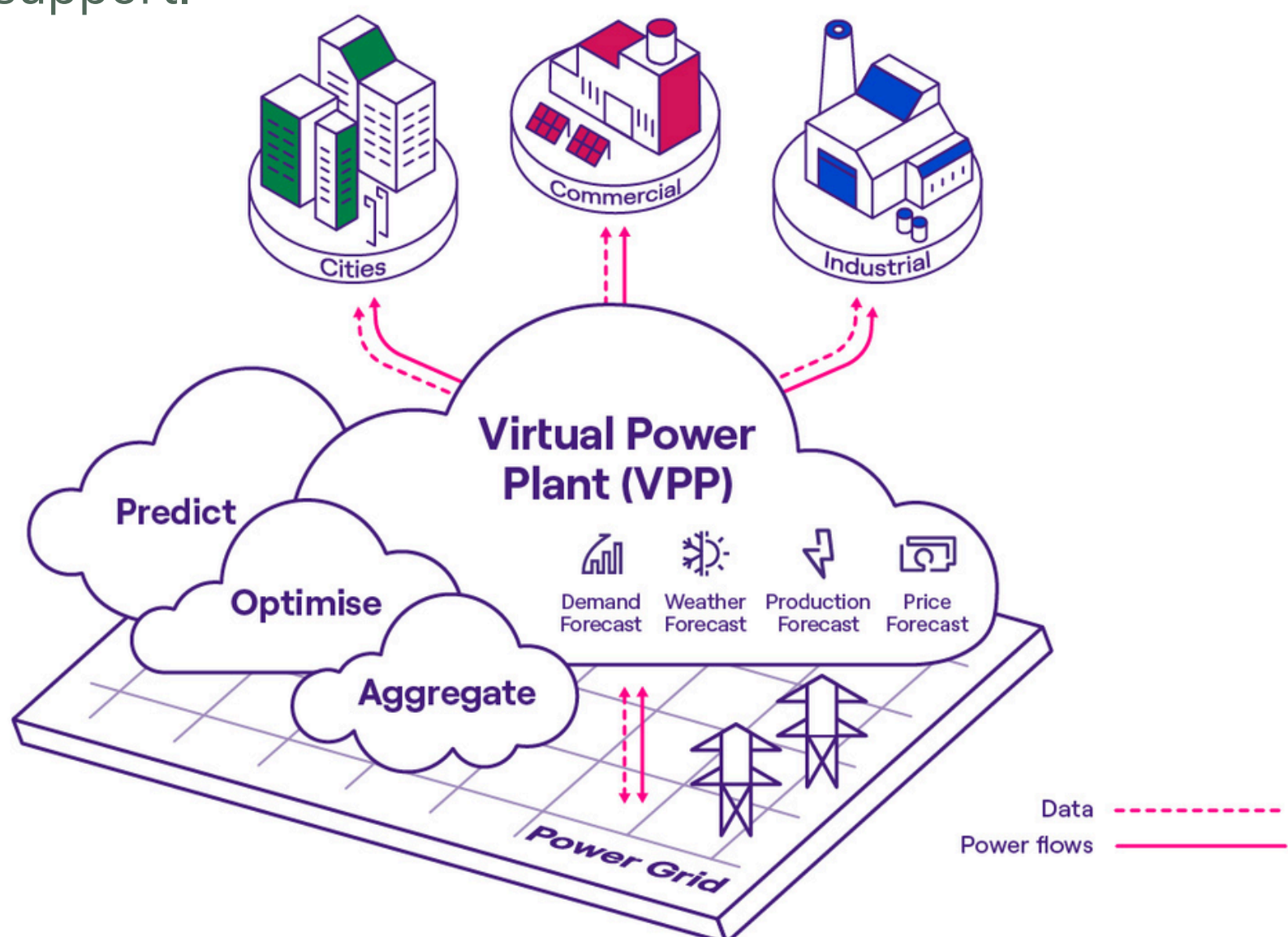
The core of the financing mechanism of VPPs is the electricity markets. VPPs can participate in day-ahead markets, electricity reserve markets, ancillary services markets, real-time balancing markets, futures and forward markets, and bilateral contracts (PPAs).

Virtual Power Plants

How do they connect?

A VPP connects via the internet through a cloud-based software platform. VPP's transmit and collect real-time electricity consumption and production data. The software controls the DERs in response, acting as a single flexible power plant for use as grid support.

Startups within the VPP space



Virtual Power Plants: Recent Policy

FERC Order 2222

Issued by the Federal Energy Regulatory Commission, this policy removes barriers that previously prevented small energy assets from joining major power markets



Aggregation: It allows many small devices (e.g., 1,000 home batteries) to be "bundled" into a single 100 kW+ resource to satisfy market size requirements.



Wholesale Market Access: These bundles can now sell energy and grid-stabilizing services (like frequency regulation) directly into markets run by regional grid operators (RTOs/ISOs).



Double Counting Protections: The policy includes strict rules to ensure a single battery isn't paid twice for the same kilowatt of energy in both a local utility program and the wholesale market.

Energy Policy in the US



Energy Policy Act of 2005 (EPAct):

Remains a foundational law, providing the base authority for the Loan Programs Office (LPO) and setting many of the mandatory reliability standards for the national electric grid

Federal Energy Regulatory Commission (FERC)

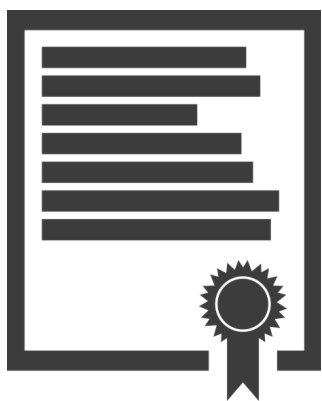
FERC is an independent government agency that oversees the economic and legal aspects of the energy industry.

North American Electric Reliability Corporation (NERC)

NERC is a non-profit international regulatory authority designated by FERC as the Electric Reliability Organization (ERO) for North America

State & Regional Regulation

While the federal government oversees interstate matters, states have "exclusive jurisdiction" over the energy landscape within their borders.



Public Utility Commissions (PUCs): Every state has a Public Utility Commission (or similar body) that approves the rates you pay on your monthly bill. They ensure utilities provide reliable service at "just and reasonable" prices.

Generation Mix (Portfolio Standards): States decide which fuels are used to generate power. More than two dozen states use Renewable Portfolio Standards (RPS) to mandate that a certain percentage of electricity comes from wind, solar, or nuclear.



Siting and Permitting: States, not the federal government, typically have the final say on where a new wind farm, natural gas plant, or transmission line can be built.

Example Federal Energy Policies

Residential Credit Phase-Out: Most federal tax credits for homeowners, including those for solar panels (Section 25D), energy-efficient HVAC (Section 25C), and electric vehicles, expired on December 31, 2025.

Nuclear and Hydrogen Investment: The Department of Energy (DOE) recently awarded over \$2.7 billion to jumpstart domestic uranium enrichment and \$720 million for hydrogen production and transport.

Critical Minerals Focus: A new Office of Critical Minerals and Energy Innovation was established in early 2026 to secure domestic supplies of minerals like lithium and rare earths essential for batteries.

Clean Fuel Production Credit (45Z): New proposed IRS regulations released in February 2026 provide a "technology-neutral" tax credit for any transportation fuel with low greenhouse gas emissions