

ENERGY MATTERS

Soundbite summaries of the energy news you need to know

AN OFFICIAL PUBLICATION OF



AMERICAN ENERGY SOCIETY

July 10, 2023

The Power Read

- **Fossil fuels:** The Permian is now out-producing Saudi Arabia's Ghawar Field.
- **Low-carbon:** Iowa produces the most renewable energy in the US.
- **Policy:** The EPA extended and increased biofuel blending obligations.
- **Climate:** The world set a heat record on July 3.
- **Electricity:** California's duck is getting fatter in the belly.

News from the Society

- The energy sector is hiring! There are thousands of unfilled jobs. [Contact us](#) if you're curious about new professional opportunities, including openings at Schneider Electric. Or, [join the SE talent community](#) to hear about more job opportunities.

- Members can share this issue of *Energy Matters* with colleagues; we would appreciate it if they joined as Members too, or they can sign up as a [Friend](#) (*free*) of the Society.



In Memory:

[John Bannister Goodenough](#)

b. 1922, Jena, Germany

d. June 25, 2023, Austin, Texas

In 2019, John B. Goodenough won the [Nobel Prize](#) in Chemistry (jointly, with M. Stanley Whittingham and Akira Yoshino) for the development of lithium-ion batteries. In the 1970s, Dr. Whittingham created the first functional lithium battery with a titanium cathode and lithium anode (the lithium metal made it explosive and unsafe). In the 1980s, Dr. Goodenough switched from titanium to cobalt oxide for the cathodes, doubling the battery's voltage. (Yoshino replaced the lithium anode with petroleum coke, which lead to [commercial lithium-ion batteries](#) in 1991.)

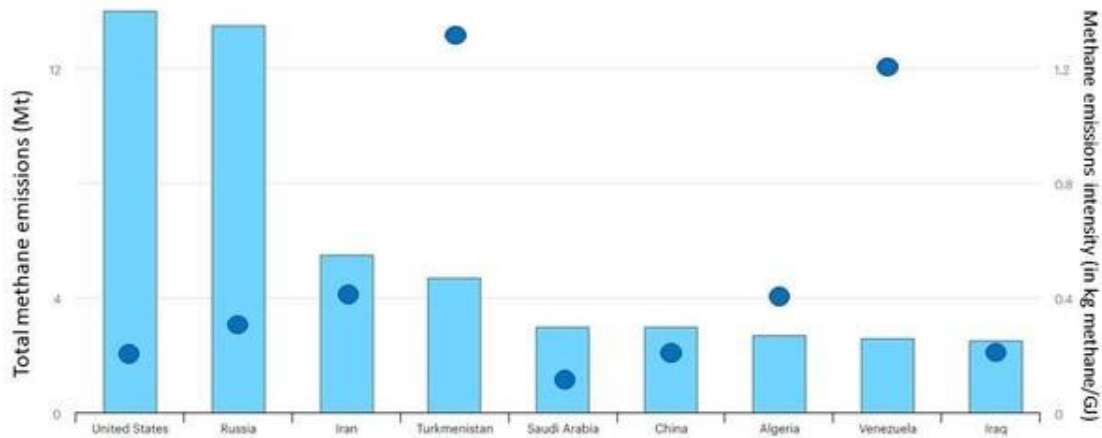
Fossil Fuels

- Oil -

- DUC inventory (aka, oil wells drilled but uncompleted) in the Permian Basin is [down 45%](#) over the past three years and is now at its lowest level in about a decade. Nevertheless, **the Permian is now out-producing Saudi Arabia's Ghawar Field**. The production increase is due almost entirely to greater efficiencies with older finished (aka "drilled") wells; eventually, rig count will have to [increase](#) for oil production to continue increasing.

- Natural Gas -

- *Insert:* Oil and gas [methane emissions](#), by [total \(bar\)](#) and [intensity \(dot\)](#) of production.



- Coal and Mining -

- **Case Lake in Canada is the only new cesium play in the world.** (Note: a low-carbon economy requires a lot of cesium.) Immediately after cesium was discovered in [Case Lake](#), the Canadian government replaced Chinese investors with "low-risk" investors from Australia. The Case Lake property is owned by [Power Metals Corp](#).

- Carbon Capture -

- **Top-10 ocean carbon removal companies**, in alphabetical order:

[Brilliant Planet](#)

[Captura](#) (Caltech spinout)

[Ebb Carbon](#) (featured in [Energy Today](#))

[Equatic](#) (UCLA spinout)

[Ocean-Based Climate Solutions](#)

[Planetary Technologies](#) (XPrize winner)

[Running Tide](#)

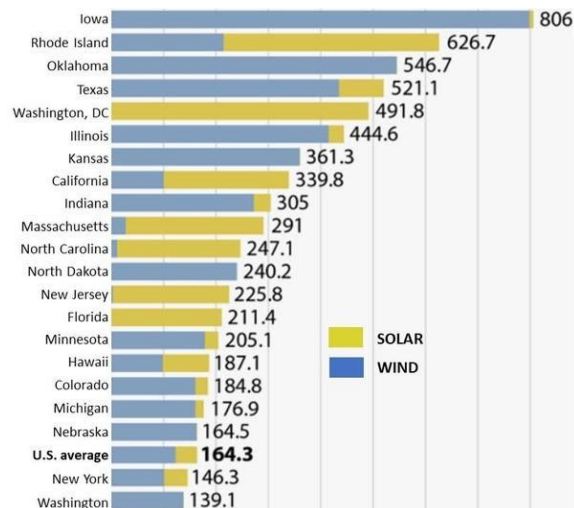
[Seafields](#)

[SeaO2](#) (AES "best name" winner)

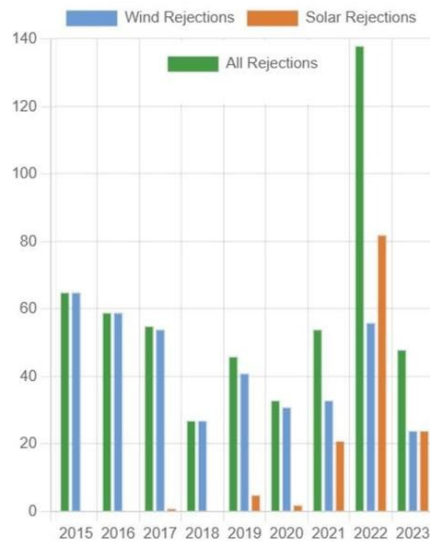
[Vesta](#) (coastal carbon capture)

No- / Low- Carbon and Renewable Energy

- *Insert: Total US wind and solar electricity generation, in megawatt-hours per square mile of land area, [ranked](#) by individual states and combined solar+wind totals.*



- *Insert: Total number of [rejected](#) solar and wind projects in the US since 2015, (methodology: crowd sourced).*



- "**Fourth power formula**" *noun*, def: a mathematical formula used by US Department of Transportation engineers to assess the relationship between the weight of a vehicle and the damage it causes to road surfaces. According to the formula, if weight on a vehicle's axle is doubled, it does [16 times](#) more damage to the road. *Note:* the average electric car puts [2.24 times more stress](#) on roads than its gasoline-powered equivalent, and 1.95 more than diesel, because an EV weighs on average about 687lbs (or 312kg) more than a similar ICE version (primarily due to the weight of the EV battery).

- LG, the South Korea battery manufacturing company, currently has one factory in the US (Holland, Michigan) that produces 5 gigawatt-hours' worth of batteries each year. It is adding more facilities to [increase production to about 280 gigawatt-hours' worth of batteries](#) in Ohio, Arizona, and Tennessee.

Energy Policy & Geopolitics

- Beltway Buzz -

The US Congress is in its scheduled District work period throughout most of July.

- **The US EPA released the final 2023 – 2025 biofuel blending obligations under the Renewable Fuel Standard (RFS).** The rules establish biofuel volume and percentage requirements for cellulosic biofuel, biomass-based diesel (BBD), advanced biofuel, and total renewable fuel. It also completes EPA’s response to a 2016 court remand to replace a supplemental volume requirement of 250 million gallons of renewable fuel for 2023.

<u>Volume targets (billion RINs)</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>
Cellulosic biofuel	0.84	1.09	1.38
Biomass-based diesel	2.82	2.82	3.35
Advanced biofuel	5.94	6.54	7.33
Total renewable fuel	20.94	21.54	22.33
Supplemental standard	.025	-	-

- *Advice for AES Members and Friends:* federal grants that have summer application due dates typically receive fewer submissions than offerings during the rest of the year. To face slightly less competition, **AES Members and Friends should consider submitting applications that have summer deadlines** even if there is limited time to complete the application. (Note: AES will provide **Members** with no-cost strategic assistance on any applications of interest.)

- DoE Office of Indian Energy Policy and Programs offers \$15M for Tribal Colleges and Universities (TCUs) to support [clean energy technology curriculum](#) (deadline July 27).
- The ERA [program](#) is offering \$500K-\$5M awards to support energy projects that will improve the resilience, safety, reliability, and availability of energy systems in rural or remote areas. Pre-applications are due July 13. NREL will provide no-cost [technical assistance](#) to anyone interested applying for funding.
- The Inflation Reduction Act (IRA) offers [bonus ITC and PTC \(tax credits\)](#) to support domestically-produced steel, iron, and manufactured materials.
- The Department of Commerce via the National Oceanic and Atmospheric Association (NOAA) will [provide](#) \$575M to help coastal and Great Lakes communities become more resilient.
- The DoE announced a \$125M [program](#) to support battery recycling, a \$60M Advanced Battery R&D Consortium to convene stakeholders, and \$5.5M Lithium-Ion Battery Recycling in [prizes](#).
- Ready!, Set!, and Go! are [three different solar contests](#) with up to 20 \$50K winners and a \$25K JEDI bonus award; applications are due by September 27.
- The DoE Office of Fossil Energy and Carbon Management is [offering](#) \$3M to support Point Source Carbon Capture and Carbon Storage, including: carbon conversion technology, carbon dioxide removal technology, point source carbon capture technology, and carbon storage technology. Pre-applications are due by July 18.

- **Wilson Sonsini has updated its Clean Energy and Climate Solutions Federal Funding database**, including new funding opportunity announcements (FOAs).

- State Spotlights -

- **Kentucky:** Climate crises is an insurance crisis. For instance, in September 2022, Hurricane Ian caused significant flooding throughout much of the southeast US. In Florida, residents whose homes were flooded received an average of \$91,000 in aid, while the average [payout](#) in eastern Kentucky was \$49,000, even though flood insurance premiums tripled from \$1,200 to \$3,500.

- **Georgia:** Georgia is becoming the epicenter of the US "battery belt," and one of the main reasons is the success of [Georgia Quick Start](#), a customized workforce training program for the clean energy manufacturing industry. (Note: the IRA of 2022 will create about 900,000 manufacturing jobs over the next decade.)

- **Arizona:** Homes, farms, businesses, and public programs in Arizona use a massive amount of water, but few can match [Maricopa County](#) (Phoenix), which uses about 2.2 billion gallons of water per day and has about 4.5 million people. (See the most recent issue of *Energy Today*, "[The Water, Food, Energy Nexus](#).")

- Global Spotlights -

- **Africa:** About 900 million people in Africa [rely on](#) solid biomass fuel (like wood and charcoal) and kerosene for cooking. These energy sources are highly polluting, inefficient, and unsafe. (Note: For more information about the use of biomass for food preparation, AES recommends the work of [Dan Kammen](#) and, among others, the [Gyapa Cookstove Project](#).)

- **Asia:** The [Kela power plant](#) in Sichuan, China, a massive hybrid solar-hydro facility is generating 1 GW solar (peak) + 3 GW hydropower (baseload) for 100 million households.

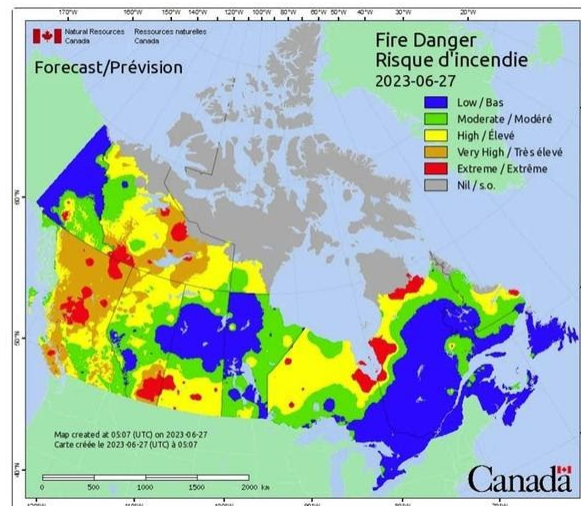


- **C/S America:** [Mexico](#) is buying 13 power plants from the Spanish company Iberdrola for an estimated \$5.94 billion in an attempt to nationalize more of the Mexican electricity sector.

- **Europe:** The EU failed to make a decision on whether to continue paying [subsidies](#) to coal power plants to keep capacity on standby to avoid blackouts. Sweden proposed the subsidies with Poland's support, but Austria, Belgium, Germany and Luxembourg objected.

Climate and Sustainability

- **Wildfires are widespread throughout Canada** (2,956 wildfires in the [first six months](#) of 2023), although eastern provinces like Quebec (currently, 117 fires), Ontario and Nova Scotia have been hit particularly hard. Related, Canada has already set its [record](#) for annual carbon emissions; more than half the total is due to the wildfires.



- "**Green colonialism**", *adjective* def: sometimes, investments in or development of renewable energy and other conservation activities come at the expense of marginalized communities. For example, a conservation group wants to enshrine a forest as protected so that corporations cannot log it; however, there may be an indigenous community that has long relied on the forest for medicine, cultural, or hunting purposes that is now no longer able to conduct these activities and are often forcibly removed. Other example are when a renewable energy company needs to clear land for wind turbines, or when mining for rare earth elements occurs on protected federal lands (aka, [Thacker Pass](#)).

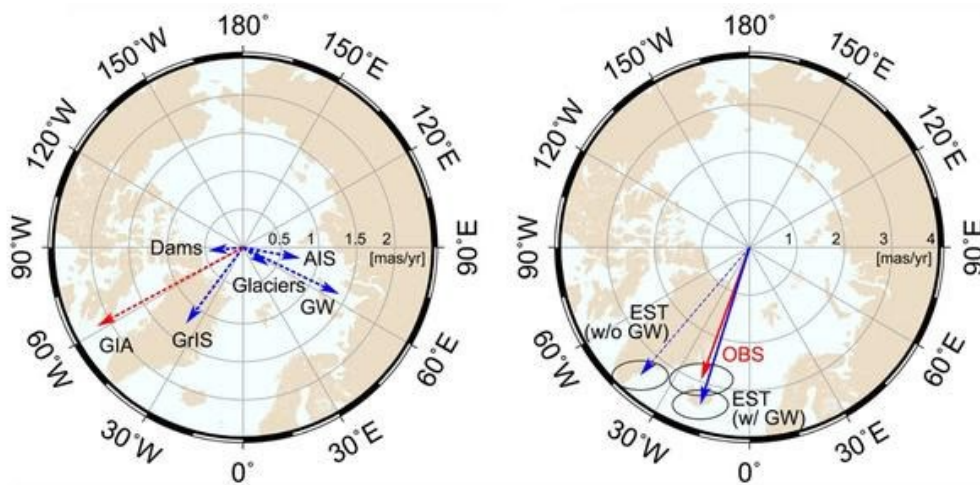
- **Parts of the North Sea are experiencing a category 4 marine heat wave** defined as "extreme" by the National Oceanic and Atmospheric Administration. In some areas, water temperatures are up to 5 degrees Celsius (9 Fahrenheit) hotter than usual.



- **Monday, July 3, 2023, was the hottest day ever recorded globally.** The average global temperature reached 17.01 degrees Celsius (62.62 Fahrenheit), surpassing the August 2016 record of 16.92C (62.46F). Also of note, on July 6, 2023, Adrar, Algeria (Africa) recorded the hottest night in history.

- The southern US has been experiencing an intense "[heat dome](#)."
- China has had a long-lasting heatwave, with temperatures often above 35C (95F) and temperatures in North Africa have reached 50C (122F).
- Antarctica, currently in its winter, set its July temperature record with 8.7C (47.6F).

- **Earth's tilt has changed by 31.5 inches (80 cm)** between 1993 and 2010 because of the amount of [groundwater](#) humans have pumped from the planet's interior.



Research, Development and Market Deployment

- **KoBold Metals**, a mining company that uses artificial intelligence to mine for rare earth elements, closed a **Series B US\$195 million funding round**, bringing the company's valuation to over US\$1 billion.

- **The Biden administration offered a record-breaking \$9.2 billion conditional loan commitment to a Ford Motor Co. joint venture** (with BlueOval SK of South Korea) to help [scale up](#) domestic lithium-ion battery production for the US electric vehicle market. The production facilities will be located in Tennessee and Kentucky.

- A technical review of Siemens Gamesa's installed wind turbine fleet determined that there are **substantial failure rates for many of its manufactured components**, which is the primary reason for the wind division's loss of 1 billion euros (\$1.1 billion USD).

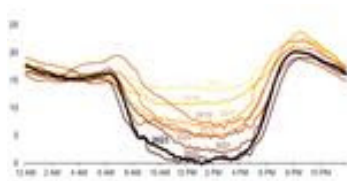
- China restricted export of some EV and semiconductor products that have gallium and germanium rare earth metals. The controls do not mean that China will ban exports of the metals; rather, it offers the [opportunity to reject](#) export applications if the products undermine China's security and interests.

- **Energy trade between the US and Mexico is \$81.9 billion y/y, an all-time high.**

- **Tesla will open its charging networks to other electric cars** for the first time; the company has more than 25,000 "supercharger" locations, making it the [largest](#) charging network in the world. The plan will start with 10 locations in the Netherlands, then open 3,500 new and existing Superchargers to non-Tesla customers in 2024 followed by 4,000 more slower chargers at private locations like hotels, restaurants, and museums.



Electricity, Power and Efficiency



As [more](#) solar capacity comes online in California, net load continues to drop in the middle of the day (the demand remaining after subtracting variable renewable generation), when solar generation tends to be highest. In other words, **California's duck is getting fatter in the belly**. When graphed for a typical day, the pattern created by the midday [dip](#) in the net load curve, followed by a steep rise in the evenings when solar generation drops off, looks like the outline of a duck, so this pattern is often called a [duck curve](#).

- **A survey of risk among US electricity markets for the summer 2023:**

1. **ERCOT.** Resources are adequate for normal peak summer demand in ERCOT; however, dispatchable generation (natural gas- or coal-fired power plants) may not offer sufficient capacity to meet electricity demand during an extreme heat wave with unusually low winds. *Note:* ERCOT is already asking residents to voluntarily curb electricity use as Texas struggles with a prolonged heatwave.
2. **NPCC-New England.** Although New England has less available capacity this summer than it had last summer, NPCC still has sufficient capacity to meet normal peak summer demand. However, more extreme demand or low resource conditions will require drawing emergency electricity supply from neighboring areas.
3. **SPP and MISO.** These two Midwest markets have a significant amount of wind power. The intermittent nature of wind power (wind turbines only generate electricity if the wind is blowing) present operational challenges for grid operators. Low wind and high demand periods could result in energy emergencies.
4. **US Western Interconnection.** Resources in the Western Interconnection are sufficient to support normal peak demand; however, widespread heat waves could put the area at elevated risk because this region relies on local electricity transfers to meet peak demand, a flawed backup system because heat waves do not accommodate arbitrary borders that divide local markets (two neighboring communities will likely struggle with the same heat wave).
5. **SERC-Central.** The electricity market for all of Tennessee and parts of Georgia, Alabama, Missouri, and Kentucky, has sufficient supply for normal peak summer demand, and utilities are ready to deploy demand-side management and encourage consumers to modify electricity usage in case of above normal peak summer demand or high outage conditions.

- **There are 29 states (plus Washington, DC) that have Renewable Portfolio Standards (RPS)**; of those, 16 states have RPS targets of at least 50% of retail sales, and 17 states have a 100% RPS target. Roughly half of all renewable energy generation additions in the US is associated with or is in response to state RPS requirements (though that percentage declined to 30% in 2022). AES recommends the Berkeley Lab [report](#) on RPS (and CES).

- **American manufacturing companies (auto, steel, etc.) are starting to incorporate digital twins** to improve energy efficiency and lower emissions.

University Spotlight

- AES applauds the **UC Berkeley** [Energy Resource Group](#) for a variety of reasons, including but not limited to, its minor degree and certificate programs in sustainability.

- AES applauds the new [Initiative for Sustainable Energy](#) at **Brown University**, which conducts research across three themes: Renewable Energy, Sustainable Fuels/Materials and Energy Efficiency.

- The Energy Institute at **West Virginia University** has a new name! [WVU Institute for Sustainability and Energy Research](#).

- The College of Science and Mathematics at **Georgia Southern University** has launched a new School of Earth, Environment and Sustainability ([SEES](#)), which blends several science disciplines to serve growing student demand for sustainability and environmental science.

- **Cal Poly Humboldt**, the Yurok Tribe, and College of the Redwoods have partnered on an initiative to create a [local workforce](#) for the proposed development of floating offshore wind projects along California's North Coast.

- **University of Florida** (and its partner Synhelion) received [award funding](#) to support large-scale development and deployment of concentrated solar thermal power (CSP) technology to produce green hydrogen for industrial decarbonization and electric power generation and storage.

- Faculty from the Ralph O'Connor Sustainable Energy Institute at **Johns Hopkins University** developed the City-Heat Equity Adaptation Tool ([City-HEAT](#)), a decision tool that offers cities individualized, optimized strategies for reducing the urban heat island effect and its health impacts.

Quotes

A Canadian conundrum: mining for REMs

"It's hard to know if the benefits of mining will outweigh its costs." — Teresa Kramarz, professor and co-director of the Environmental Governance Lab, University of Toronto

"If I have to hop on a bulldozer myself, we're going to start building roads [to support mining] in the Ring of Fire." — Ontario Premier Doug Ford

"Indigenous groups don't want to see a repeat of environmental messes on their traditional lands." — Tom Hoefer, Director of the Northwest Territories and Nunavut Chamber of Mines

- Bulletin Board -

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- SPOTLIGHT: Schneider Electric is hiring [Project Development Managers](#), [Senior Account Executives](#), [Automation Engineers II](#), and [Performance Assurance Consultants](#).
- #SolarAPP+, a free online [platform](#) developed in partnership between Sunrun and the US DoE, helps local governments navigate the solar permitting process.
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