ENERGY MATTERS

Soundbite summaries of the energy news you need to know

AN OFFICIAL PUBLICATION OF AMERICAN ENERGY SOCIETY

April 8, 2024

- News from the Society -

- ***DevCo DNA:*** **What Makes A Renewable Energy Project Development Company Great.** Our latest AES report uncovers the DNA—traits, characteristics, strategies, and approaches—that are strongly linked to the most successful renewable energy DevCos. Get ***DevCo DNA*** for free.

- *Attention academic faculty:* UN SDSN invites academic faculty to express their interest in participating in an in-person Regional Decarbonization Pathways Workshop at the US Conference of Mayors this June. Academics with a background in energy-related policy, technology, modeling, and/or economics are welcome. Please respond by **April 19, 2024**. All travel and workshop expenses will be covered. Contact Elena Crete at the UN SDSN or **AES** with any questions.

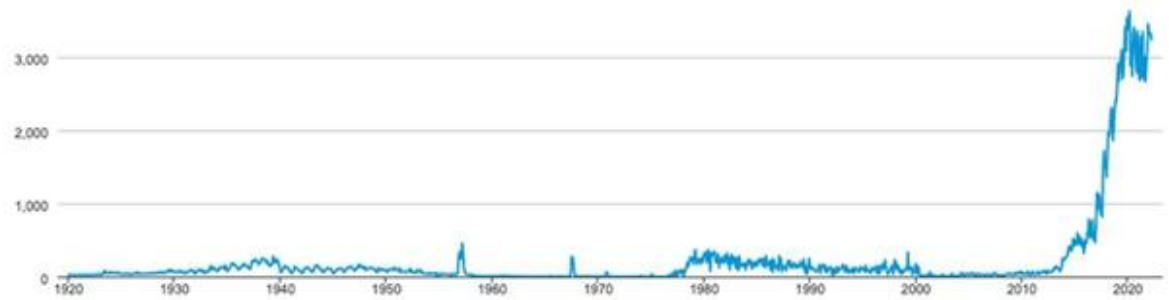
- The Power Read -

- **Gas**: Spotlight on ammonia.
- **Coal:** Spotlight on global records set by coal markets.
- **Policy**: Spotlight on LNG producers in Africa.
- **Research**: Spotlight on solid oxide fuel cells - the hottest energy technology.
- **Markets**: Spotlight on "energy in the US at 30,000 feet."
- **Electricity**: Spotlight on the AI-generated US grid crisis.

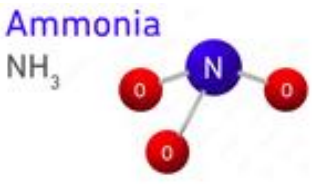
- Fossil Fuels -

- Oil -

- **US crude oil exports** set another record **in 2023,** about 4.1 million barrels per day (b/d), 13% more than the previous record set in 2022. Except for 2021, crude oil exports have increased every year since 2015, when the US ban on most crude oil exports was lifted. *Note*: unconventional shale oil E&P is the reason for the increase in US crude oil exports. *Insert*: annual US crude oil exports in the last century, by million barrels per day.



- Gas -



- *Spotlight on ammonia*: A century ago, the world faced a food crisis because farmers didn't have enough fertilizers. Fritz Haber and Carl Bosch developed a process to react hydrogen and atmospheric nitrogen under pressure to make **ammonia**, which farmers adopted in place of natural fertilizers. The Haber-Bosch process is still responsible for nearly all the world's ammonia. Ammonia is now being considered for capture, storage, and transport of hydrogen for use in emission-free fuel cells, power plants, and ship engines. In other words, now there is a market that values the hydrogen portion of the molecule.

- **Grey** ammonia: Also called brown ammonia, the conventional method used to make ammonia since the Haber-Bosch process 100 years ago. The hydrogen usually comes from the steam reformation of methane, a process that emits CO2.
- **Blue** ammonia: The same conventional method, but the by-product CO2 is captured and stored, reducing climate impact compared with gray ammonia; many fertilizer makers are beginning to use this process.
- **Green** ammonia: Made with hydrogen that comes from water electrolysis powered by alternative energy.
- **Turquoise** ammonia: Uses pyrolysis to convert methane into pure carbon and hydrogen, which is reacted with nitrogen to make ammonia (hence, turquoise ammonia is somewhere between green and blue).

- Coal and mining -

- Coal market *spotlight*:

- Global coal production (both thermal and metallurgical) set annual records.
- Thermal coal prices are trading at about the same record levels as 2022.
- Coal futures are trading at their highest level in more than a decade ($130/ton).
- New coal power plants are being built in China, India and Indonesia (~59 gigawatts).

Coal's momentum is due almost entirely to demand in Asia (mostly China and India, which make up more than 70% of total global consumption).

- Carbon capture and removal -

- T**he DoE awarded $50 million to the Project Cypress direct air capture hub and announced the selection of another winner, 1PointFive**, that will develop the South Texas DAC hub. There were many qualifying large-scale DAC projects, but these two hubs won because they included "community engagement" as part of their application, also known as a **community benefits plan** (CBP).

- No- / Low-Carbon and Renewable Energy -

- Finland opened **Onkalo, a deep cave to bury spent nuclear fuel rods for long-term storage.** The vault is capable of holding about 6,000 tons of nuclear waste. The technological advantage of Onkalo is its KBS-3 multi-barrier system that stores the rods in copper canisters encased in clay and buried deep within stable bedrock. IEA says it's the most advanced and safest nuclear waste storage facility in the world.

- *Trend-spotting* **manufacturing capacity of electroyzers for the green hydrogen industry** (*source*: BNEF and the Global H2 Newsfeed):

- 2023: 2GW of factory capacity to assemble electrolyzers
- Current: 31GW of factory capacity
- EOY 2024: 54 GW factory assembly capacity

- Related, AES recommends the **2024 hydrogen innovation report, "H2 Innovation Trends**," a comprehensive dataset that surveys 388 early-stage US hydrogen companies, 932 investors, all DOE hydrogen hubs, a summary of researchers and publications, and all relevant patent filings (*Editor's note*: the subscription fee is $3,000).

- **The "Lithium Valley" initiative in the Salton Sea region in California is operating at only 2.4% capacity.** AES recommends a new report from New Energy Nexus, including an interactive **map**.

- **The Phillips 66 Rodeo refinery in California will soon convert from crude oil processing to produce sustainable aviation fuel (SAF)** blendstocks from renewable sources. The refinery had been processing 115,000 b/d of crude and other feedstocks before undergoing this multi-year conversion to renewable fuels.

- During the eclipse, **the loss of solar generated power equals the percentage of the sun's coverage.**

- Energy Policy & Geopolitics -

- Beltway buzz -

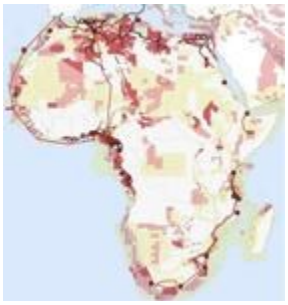
- The DoE is offering Energy Future Grants (EFG), $27 million in financial assistance for at least 50 projects (ideally 3-4 or more state, local, and tribal government partners) that will advance clean energy affordability and access for disadvantaged communities.

- **EPA rolled out a new heavy-duty truck rule** (1,155 pages). The new rule for model years 2027-2032 allows manufacturers to use a variety of technologies to reduce emissions in their fleets, including electric vehicles, hybrids, and hydrogen fuel cells. The EPA Phase 3 rule does not specify any particular emissions solution, maintaining its promise of a "technology-neutral" approach; however, it will be difficult to hit emissions benchmarks without some integration of either hybrid, battery-electric, or hydrogen-electric trucks. (*Note*: more than 98% of all heavy-duty vehicles sold in 2023 were diesel-powered.)

- **The USDA will award $1.5 billion of IRA funds to support** conservation, or "solutions to natural resource challenges on agricultural lands." Note: the department must hurry and spend the remaining $20 billion by the end of fiscal 2031.

- Wilson Sonsini updated its **Clean Energy and Climate Solutions Federal Funding** database for, among other categories: clean ports, advanced manufacturing for industry and also for small businesses, and clean energy development on tribal lands.

- Global Energy -

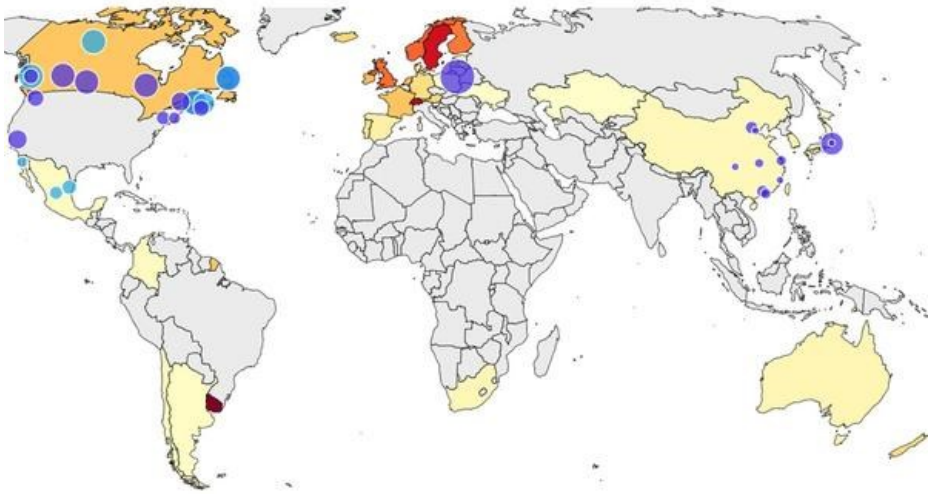


- **Africa**, *map insert (left)*: location of major gas fields and recent significant discoveries; actual and planned LNG (liquefaction and regasification) facilities are also shown. The sector is growing the fastest in the western and Central African coastal regions, from Côte d'Ivoire to Equatorial Guinea and Cameroon.

- Climate, Sustainability, and Resiliency -

- **West Texas is dealing with "zombie wells."** Underground waterflow perhaps caused by the injection of wastewater into unconventional oil and gas wells is causing toxic water flow and sinkholes. Underground water is so prevalent that one leak created a 60-acre body of water, Lake Boehmer.

- Carbon pricing is a market mechanism designed to account for the external costs of GHG emissions. **AES recommends the interactive map "Visualizing Energy."** (*Below insert*: carbon prices in 2023; circles represent either an ETS or carbon tax and the size is proportional to the amount of the tax, by jurisdictions.)



SO2F2

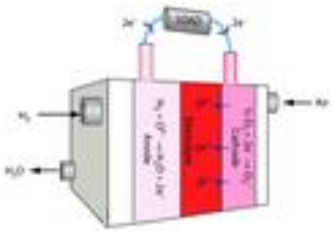
- Sulfuryl fluoride — also known as Vikane, by Dow Chemical Co. — is a common treatment for drywood termites, bedbugs, cockroaches, and other pests. It is also **a more potent greenhouse gas than carbon dioxide or methane**. Almost all SO2F2 emissions in the US come from the greater Los Angeles region; the rest of the country releases barely any.

- **Tourism to Yellowstone National Park produces 1.03 megatons (or 2.3 billion pounds) of CO2 emissions each year.**

- In the last ten years, **57 entities were responsible for 80% of total global CO2 emissions**. *Below table*: global emission contributions of the top-5 investor and state owned groups, by percent of the total.

Investor owned (% of total)	State-owned
ExxonMobil (1.4%)	Saudi Aramco (4.8%)
Shell (1.2%)	Gazprom (3.3%)
BP (1.2%)	Coal India (3%)
Chevron (1.2%)	National Iranian (2.8%)
TotalEnergies (1%)	Rosneft (2.1)

- Research and Markets -



- Spotlight on "**solid oxide fuel cells**": the hottest energy technology right now. Solid oxide fuel cells are an energy user's dream: an efficient, combustion-less, virtually pollution-free power source, capable of being sited in downtown urban areas or in remote regions that runs almost silently and has few moving parts.

- **GE split itself into three companies.** At its height, GE was a titan that touched nearly every part of the economy: refrigerators, X-ray machines, jet engines, wind turbines ...; financed car loans and credit cards; it owned NBC and Universal studio. Its remaining parts — healthcare, energy, and its legacy aerospace business — are worth about one-third of what the company was at its peak.

- **Researchers are using salt crystals to increase cloud cover in the San Francisco Bay.** The experiment, which organizers didn't widely announce to avoid public backlash, marks the acceleration of a contentious field of research known as solar radiation modification, otherwise known as geoengineering.

- *TIME* and *Statista* list the **Top Cleantech companies in the US**; below are the top-11:

1. ZeroAvia - California (Mobility)
2. Ohmium - California (Resources)
3. Turntide Tech - California (Built Enviro)
4. Arcadia - Washington, DC (IIoT)
5. Brimstone - California (Circular)
6. Streamline - Texas (Circular)
7. Emrgy - Georgia (Renewable)
8. Antora Energy - California (Storage)
9. Air Protein - California (CCUS & FoodTech)
10. Ascend Elements - Mass (Circular)
11. Redwood Materials - Nevada (Circular)

- Special report: ***Energy in the US at 30,000 feet.*** The US produced 103 quadrillion British thermal units (primary production sources, or quads), the **highest total on record** and a 4% increase from 2022.

- Crude oil production increased 9%
- Natural gas liquids production increased 8%
- Dry natural gas production increased 4%
- Renewable energy production increased 1%
- Nuclear electric power production was virtually unchanged
- Coal production decreased 2%.

US primary energy consumption totaled 94 quads, a 1% decrease from 2022.

- Renewable energy consumption increased 2%
- Natural gas and petroleum consumption each increased 1%
- Nuclear electric power consumption was virtually unchanged
- Coal consumption decreased 17%.

US primary energy exports equaled 30 quads, a 9% increase from 2022 and the highest total on record.

- Electricity & Power -

- *AES special report:* **Is the US facing a grid crisis due to the growth of data centers? Probably yes.**
The entire grid system is built to support peak demand (*source*: Jigar Shah), which is why the current grid cannot adapt quickly to rapid growth. In other words, data centers are being built faster than grid infrastructure.

- Amazon is building a data center every 3 days.
- Google is building a data center every 4 days.
- Microsoft is building a data center every 5 days.
- AT&T is building a data center every week.
- Each data center requires about 100 MW capacity (*source*: Sec. Steven Chu).
- At this rate Amazon alone will need 1 full GW of additional power each year.

- South Carolina legislators are racing to override the state utility commission to fast-track construction of new gas power plants to support growth of data centers, and others (like Virginia) are going to follow.

Meanwhile, US consumers demand more computational power to do important things, like using AI to design photos of Jesus doing flips over a table (the most popular AI search this month). Right now the grid is not threatened. In most regions where demand for computational power is highest, demand spikes are short-duration "needle peaks," which are easier to tax (*source*: S&P Global).

- Universities in the Spotlight -

- If you are considering an advanced (Masters) degree in an energy-related field, AES strongly recommends the M.S. Energy Systems Management at the **University of San Francisco.**

- The Methane Emissions Technology Evaluation Center (METEC) at **Colorado State University** received $25 million from the DoE.

- **LSU** faculty are studying the effects of energy justice efforts on local communities.

- **MSU** researchers are sending seeds into space to improve plant resilience.

- Related, there are internship openings at a conservative clean energy group. **ClearPath launched its Conservative Climate Leadership Program.** Individuals interested in an energy policy internship in DC are encouraged to **apply.**

- Quotes -

This is what energy optimism looks like...

“There’s this huge shift that I don't think is very well appreciated.... So many other countries just wish they could be in the position of the United States when it comes to energy, being able to do all these things at the same time.”
- Dan Yergin, Pulitzer Prize winner and AES Energy Writer of the Year, 2020

"If this all seems like tremendous news for America, that's because it is. And yet, you probably haven't heard anything about it."
- Geopolitical analyst Ian Bremmer on the "greatest energy boom you've never heard of" ... America as the top producer of energy

“I expect generation to continue increasing significantly [in the US]."
- API Head Mike Sommers

- Bulletin Board -

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- Orrick has published its 2024 Offshore Wind Report. The report is an update on the current OSW market and trends in 20+ key jurisdictions with some forward looking analysis.

- ClearPath has excellent primer resources on Ag-Tech, CCUS, Water-Tech, Industrial Fuel...

- Honeywell's Sustainable Building Technologies (SBT) is hiring for a global Senior Director Solutions Architect.

- **Ubiquitous Energy**, a leader in transparent solar technology, is developing energy generating windows and door products.

- **Sunrun**, a residential solar and battery storage installer in the US, has partnered with Ford to launch a new home electric vehicle (EV) charger compatible with any EV model.

- Gratitude -

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