

# ENERGY MATTERS

Soundbite summaries of the energy news you need to know

AN OFFICIAL PUBLICATION OF



AMERICAN ENERGY SOCIETY

August 8, 2022

## - The Power Read -

- **Fossil fuels:** Energy markets have created precarious global geopolitics.
- **No-/Low-Carbon:** Heat pumps are hot, but nuclear (especially SMRs) is hotter.
- **Policy:** The Inflation Reduction Act of 2022 is close to passing.
- **Climate:** The Great Barrier Reef in Australia is healthier.
- **Markets:** 8 hot energy technologies for oil and gas CVCs.

## - Fossil Fuels -

### - Oil -

#### - When oil and geopolitics collide:

1. Russia has [reduced](#) exports of natural gas and oil to Western Europe.
2. Germany is [desperate](#) for fuel; customers are already hoarding energy resources before the government implements rationing; runs on energy resources will also happen in other Western European countries.
3. A new or revived nuclear deal with Iran is [unlikely](#); thus, sanctions on the country will not be lifted and Iranian oil will not be flowing into world markets.
4. Saudi Arabia (and United Arab Emirates) will [not](#) increase oil production and will not release spare capacity.
5. China's demand for oil has been significantly reduced by its "zero-COVID" lockdowns; however, when restrictions are lifted, consumption and demand will [increase](#).
6. US refineries are operating at [maximum capacity](#) while most of the rest of the world is at about 70% or less (China, India, Russia, etc). *Note:* Canada is ramping up production.

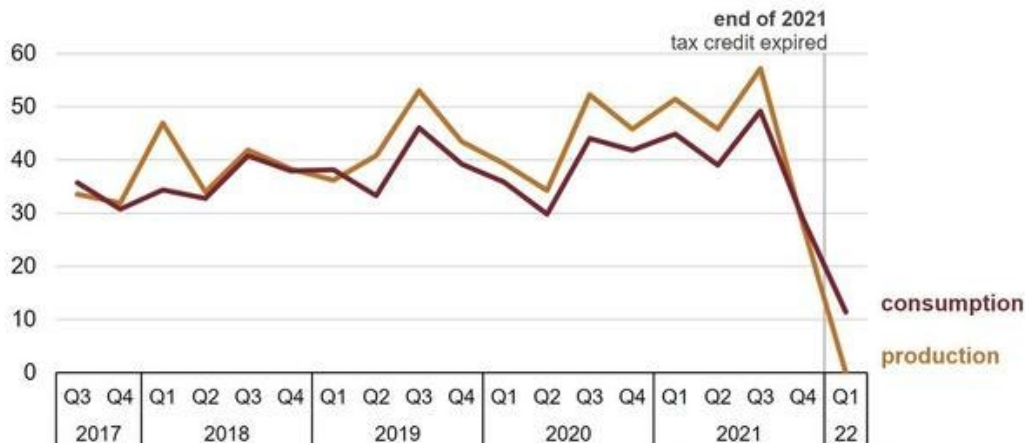
**Conclusion: the global energy market is fragmented, vulnerable and precarious;** for the next six months watch for accidents (spills), poor policy [decisions](#) (especially among petro-states that run NOCs), and extreme weather (like a hurricane knocking out refineries on the US Gulf Coast).

## - Gas -

- **The US is the world's largest LNG exporter.** (Note: countries in Europe are increasing imports of LNG from the US to compensate for lower pipeline imports from Russia and to fill historically low natural gas storage inventories.) The US set its [record](#) in early 2022 when Sabine Pass LNG added a sixth train and Calcasieu Pass LNG added 18 new mid-scale trains (both facilities are in Cameron Parish, Louisiana). Thank you [Satori Energy](#) for the suggestion and interest.

## - Mining, Minerals and Coal -

- Proprietary additives can be added to feedstock coal to produce "[refined coal](#)" that helps capture or reduce emissions when coal is burned. The American Jobs Creation Act of 2004 offered tax incentives to increase the production and use of refined coal. **The tax credit for refined coal expired last year; as a consequence, no one is producing refined coal in the US this year.** *Insert:* quarterly production and consumption of refined coal in the US by million short tons.



## - Carbon Capture -

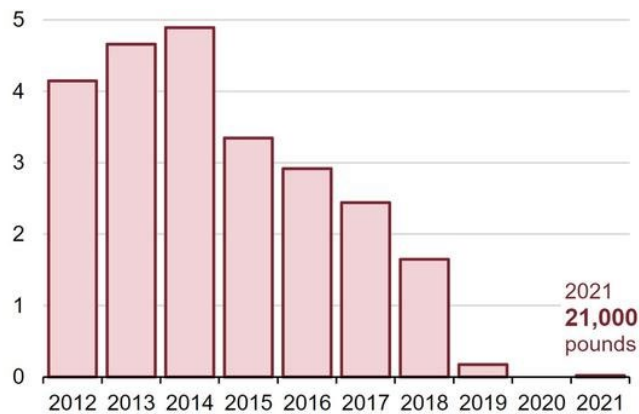
- **In 2021, the world's 27 CCS plants scrubbed and stored a few thousand metric tons of CO2.** (Note: to get to net zero, about 1 billion to 2 billion tons of CO2 need to be removed every year.)

## - No- / Low-Carbon -

- According to AES trend-spotting, **the hottest energy technology right now is small modular nuclear reactors (SMRs)**, led in the main by the US Department of Defense:

- The US DoD has selected BWX Technologies to build "[Pele](#)," the nation's first advanced nuclear microreactor;
- The Department of the Air Force has selected the Eielson Base in [Alaska](#) as the site of its first stationary micro-reactor;
- In 2019, Congress passed the National Defense Authorization Act ([NDAA](#)), which is just now beginning to pilot programs that will build and operate micro-reactors;
- Executive Order 13972, "Promoting Small Modular Reactors for National Defense and Space Exploration" outlines a [pathway](#) for micro-reactor development by the DoD.
- Meanwhile, **Germany is giving nuclear power a [second look](#).**

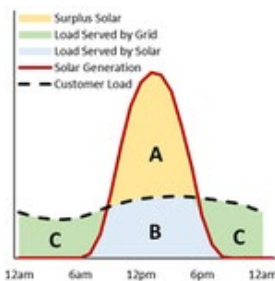
- However, **Uranium concentrate ( $U_3O_8$ ) production in the US is at an all-time [low](#)**. *Insert: in million pounds of  $U_3O_8$*



- Six years past the projected completion date and \$16 billion over budget, **the NRC has finally [authorized](#) the Vogtle Unit 3 in South Carolina to load nuclear fuel and begin operation.**



- **The second hottest (and coolest!) energy-tech topic right now is [heat pumps](#)**. Adoption of the proven energy-efficient technology has been slow in the US probably because Americans are more familiar with gas furnaces, cheap natural gas, etc. The recent surge of interest in heat pumps has been spurred by a Cold War-era law used by the Biden Administration to [boost](#) domestic production of the appliance and a proposed \$8,000 rebate offer to consumers. (*Note: according to AES trend-spotting data, the 3rd most popular energy-tech topic is "hydrogen" and the 4th is offshore wind. [AES Members](#) can contact us with questions about our analytics.*)



- **Q. Does it make financial sense to purchase a self-storage unit (aka go "off-grid" by purchasing a Tesla Powerwall)?** (Note: this is the most frequently asked question of AES.)

A. Under typical conditions, it is **not** economical for customers to use a battery storage device to maximize solar generation for self-consumption. (*Note: in the insert, the yellow section labeled "A" represents the time of the day when a self-storage device is charging. The following is a summary of the conclusions of [a peer reviewed](#) journal article about residential battery storage:*

- Even under relatively optimistic conditions, the savings from using storage in this manner are not nearly enough on their own to justify the current up-front cost of residential battery storage (\$14-27 per kWh of storage capacity);
- Storage used for solar self-consumption offers no benefits for the bulk power system;
- Storage used for solar self-consumption also yields virtually no value in terms of reduced peak-related costs, such as those related to generation, transmission, and distribution system capacity.

- **Clean energy installations declined about 25% in the first half of this year;** in [Q2 2022](#), renewable energy projects beginning construction were down 55% compared to the same quarter last year, while projects in the advanced phase of development — those with agreements in place but not yet under construction — were down 43%. The primary reason: the [Auxin Solar tariff investigation](#) and the uncertainties it caused.

- In-place or active state residential energy efficiency [programs](#) (aka existing policies) are almost **3X less effective in the US Southeast than the rest of the country.**

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## - Energy Policy & Geopolitics -

- *Beltway buzz:* The surprise release of the [Inflation Reduction Act of 2022](#) from Senator Joe Manchin and Senate Majority Leader Chuck Schumer represents a striking turnaround for Democrats' prospects of passing major energy legislation. Manchin's continued opposition to climate spending in a budget reconciliation bill that requires all 50 Senate Democrats' support to pass has stymied progress on this key Biden administration goal, with the latest setback coming only two weeks ago. However, **Manchin agreed to work with Democratic Senate colleagues to quickly pass a climate and health bill that could direct nearly \$370 billion over 10 years toward clean energy, electric vehicles, pollution reduction and energy security.** [AES Members](#) have access to a detailed Excel sheet offering a section-by-section summary of the entire Act.

- The [CHIPS Act](#) passed by Congress dedicates \$52 billion for domestic semiconductor production. (Note: AES expert members say that this Act should be viewed as just one step toward catching up with China.)

- The 4 major industries that contribute the most emissions (transportation, power-generation, industry/manufacturing, agriculture) receive about **\$1.8 trillion/year in subsidies from world governments.**

- **Nigerian politician Mohammad Barkindo, secretary-general of OPEC, died at the age of 63, just days before he was set to finish his term as leader of the oil cartel.**

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## - Climate and Sustainability -

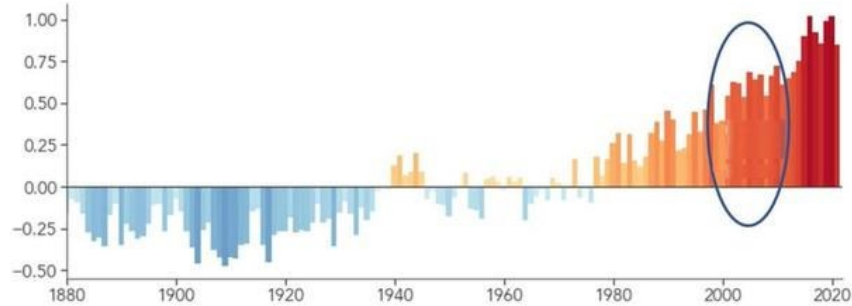
- Oil supermajors like BP, ExxonMobil, and Shell emit or contribute to enormous amounts of emissions; however, state-owned oil companies (aka NOCs) are responsible for significantly [more](#) emissions (except for Norway's Equinor). **AES Members have access to the NOC emissions dataset.**

- Of the top 20 companies with the greatest emissions, 12 are NOCs;
- 3 of the top 5 biggest emitters are NOCs (Saudi Arabia's Aramco is the biggest, Russia's Gazprom is third, and the National Iranian Oil Company fifth);
- 1 in 3 NOCs report some emissions data while the rest publish [nothing](#) and do not account for any of their own emissions;
- Since most NOCs are [not](#) in democratic states, they tend to ignore public pressure and are quick to engage in geopolitical conflict.

- **3 different ways to think about, organize or categorize emissions:**

1. Traditional: energy/power, industry/manufacturing, agriculture, and transportation.
2. [The United Nations](#): Energy (8.2 Gt); Industry (5.4 Gt); Ag, Food (6.7 Gt); Waste and Waste Treatment (5.9 Gt); Transport (4.7 Gt); Buildings and Cities (5.9 Gt)
3. Bill Gates/[Deanna Zhang](#): growing things; things plugged in and/or keeping warm and cool; making things; and, getting around ... or "F.E.S.T."
  - Food and agriculture (19% or 9.7Gt)
  - Electricity & heating / cooling (34% or 17.3Gt)
  - Stuff like consumer goods (31% 15.8Gt)
  - Travel and Transport (16% or 8.2Gt)

- The period with **the highest percentage of articles claiming that climate change was false or fabricated:** (Insert: annual global temperature anomalies as compared with the 1950-1980 average.)



- For every thousand people alive on earth, **973 are regularly inhaling toxins and 27 are not.** Meanwhile, China's pollution has declined year-on-year since declaring a "war against pollution" in 2013.



- When President Donald Trump announced that he would remove the US from the Paris climate accord, **25% of all tweets about climate change were written and published by bots;** a vast majority of those tweets denied global warming and/or rejected climate science (38% mentioned "fake" science and 28% were about Exxon).

- Fences surrounding very large utility-scale solar projects (like Ivanpah in Southern California and Sweetwater Solar Farm in Wyoming) disrupt and destroy all the wildlife habitats inside. [AES Members](#) have access to the peer-reviewed research.



- The north and central portions of the Great Barrier Reef — one of the world's most fragile ecosystems — has taken a turn for the **better** and currently has the highest levels of coral cover in decades.

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## - Research and Markets -

- **8 "hot" energy technologies** that oil and gas CVCs want to fund right now:

- Methane detection systems (or other pollutants)
- Power management machines and systems
- Technologies that economically convert waste heat sources
- Carbon capture, utilization, and storage (CCUS) technologies
- Low cost digital oilfield sensors and actuators
- Novel materials or chemicals with no or fewer hazardous chemicals
- Large-scale battery storage solutions (including geothermal)
- Hydrogen and hydrogen infrastructure

- Scientists from Lawrence Berkeley National Laboratory have developed [a custom-designed material](#) called **polydiketoenamine** — PDK — that could replace [plastic](#).

- **China has more influence over the electric vehicle supply chain** than it does the rare earth metals market (**80%**). Below is a sample of midstream refining markets for EV components that are essentially controlled by China (*source*: Benchmark Mineral Intelligence):

- 92% of cathode capacity
- 91% of anode capacity
- 79% of lithium ion battery cell capacity

- Related, **Turkey has discovered the second largest reserve of rare earth metals in the world** (10 of 17 total rare earths). [The mine](#), located in central Anatolia, contains about 700 million tons of 10 of the 17 rare earth metals; however, the quality or "grade" of the rare earths in Turkey has not been verified. (*Note*: the largest single deposit of rare earths is 800 million tons in the Bayan Obo region in Northern China.)

- **Kodak is repurposing some of the expensive, high-tech machines used for manufacturing its photography film to produce [batteries](#) coatings for electric vehicles (EV)**. "Supercell" batteries require coating and engineering services used to manufacture 35mm film. So, with minimal retooling, Kodak's \$70 million machines can produce materials needed to create batteries.

- Recommended resource: a list of [all](#) EVs to be manufactured in the next five years.

(*Note*: [EdgeEnergy](#) has developed a single-phase direct current fast charging (Level-3) station that will be available this year.)

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## - Electricity, Power, Efficiency, and the Grid -

- **A sample of countries and regions that have underperforming power grids:**

- **India**: Outages due to glitches; power generation shortages
- **Iraq/Iran**: Chronic power outages and recurring regional blackouts
- **Pakistan**: Occasional nationwide blackouts due to technical faults at power plant
- **Kuwait**: Rolling planned partial outages due to insufficient supply
- **Brazil**: Frequent blackouts due to substation failures
- **Argentina**: Frequent blackouts due to substation failures and fires
- **South Africa**: Frequent load shedding due to insufficient maintenance and repairs
- **Sri Lanka**: Nationwide blackouts due to technical glitches at power plants
- **Malaysia**: Frequent double circuit tripping
- **Lebanon/Kuwait**: Regularly planned rolling outages and recurring blackouts
- **Philippines**: Regional blackouts due to grid frequency violations
- **Taiwan**: Frequent plant outages due to grid failures
- **Europe**: Major price increases due to gas market tightness
- **Mainland China**: Increased load and insufficient generation due to extreme demand (industry and residential)
- **United States**: Outages and blackouts in Texas, Louisiana, California, Washington, Oregon, New York, New Mexico, Arizona, Illinois, Missouri, Michigan, Hawaii....

- **A sample of grid-enhancing technologies (or [GETs](#)) that expand or improve the capacity of the existing power grid:**

- [Dynamic line-rating systems](#) - reveals which high-voltage power lines have the capacity to safely carry more electricity than previously known.
- [Topology optimization software](#) - discovers ways to configure transmission grid networks to ease power flow bottlenecks that are preventing power from reaching customers.
- [Power flow routing devices](#) - actively directs the flow of electrons from overloaded to underutilized power lines in real time.

- Manufacturing has become more fuel efficient in the US in the last 25 years; in that time, manufacturing gross output grew by 12%, while its fuel consumption decreased by 16%. **The [top-6 manufacturing subsectors that consume the most energy](#):**

1. Chemicals
2. Petroleum and coal products
3. Paper
4. Primary metals
5. Food
6. Nonmetallic mineral products

- In spite of Russia's invasion, **Ukrenerg** (Ukraine's power company) is now [exporting](#) electricity to **neighboring countries** (max. 150 MW per hour).

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## - Universities in the Spotlight -



- AES applauds the [publication](#) of The 50 States of Grid Modernization by the NC Clean Energy Technology Center (NCCETC) at **NCSU**.

- **Coastal Carolina University** has joined a newly-formed consortium to study [hydrology](#).

- **University of Southern Mississippi** is offering new Sustainability BA & BS [degrees](#).

- **Binghamton University** received a [grant](#) from NSF to study sodium batteries.

- The Energy Policy Institute at the **University of Chicago** is looking to hire a [communications/digital media manager](#).

- The Institute of Gas, Innovation, and Technology (I-GIT) at **Stony Brook University** designs [policies](#) that support the development of technologies in natural gas infrastructure

- The **University of Michigan** Western Forest and Fire Initiative studies the [relationship](#) between wildfire, forests, and communities in a changing climate.

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## - Quotes -

*A crystal ball for energy and global geopolitics?*

“Social and economic problems worsening in Europe will split their societies and inevitably lead to populism ... and a change of the elites in the short term.”

- Russian President Putin at the St. Petersburg International Economic Forum in June

“A Lehman-style contagion.”

- Robert Habeck, Vice-Chancellor of Germany, comparing the 2008 financial crisis with the current energy crisis



"Corrections to previous sanctions."

- Bloomberg, describing the EU relaxing its own sanctions against Russia

"The president needs to go to Houston, not Riyadh."

- Thomas Friedman, New York Times journalist, on Biden searching for a strategy to address the energy crisis

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- Apply now for the 2022 US C3E Symposium Poster [Competition](#).

- Applications are now open for the [Mária Telkes Fellowship](#), a 2-year program for mid-career cleantech professionals from underrepresented communities.

- **ClearPath** is looking for either an upcoming graduate or undergraduate with relevant experience to join its [policy](#) team as a 2022-2023 Policy Fellow. The fellow will work to advance the entire suite of clean energy technologies.

- **Ubiquitous Energy** has developed windows that can capture [solar energy](#).

- If you have [data](#) but not the talent or staff to make it valuable, please consider the **proSkale** platform - it helps organizations manage and invest their data ... like cash.

- [Free eBook](#), *Ground Robots for Autonomous Operations in Oil & Gas*.

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