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New York Solar Energy Society

Monthly Digest for July 2022

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Upcoming Events

Join us at the American Solar Energy Society's 51st ANNUAL NATIONAL SOLAR CONFERENCE on August 18-20, 2022 in Denver, Colorado.

SOLAR 2022 is designed to serve and advance the solar energy industry by providing a forum for the exchange of information and ideas. It is the premier event in the solar and renewable energy industries to explore solutions, network, and learn about the latest research, technologies, and policies. **NYSES members, Board Members and Staff receive** 25% off using the

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Due to the flooding in Yellowstone and surrounding areas resulting terrainal rains, caused, in no small measure, by changing Earth's climate, SOLARFOCUS Eric Lewis, Kristin Lewis, Kristin Lewis, Kathleen Lewis, Kathleen Lewis, Kathleen

times faster than the global average. It is likely that by the middle of this century, more than 40 days a year will exceed 95F, according to the U.N. Intergovernmental Panel on Climate Change. Water shortages will increase and crop productivity will decline. washingtonpost.com/

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OPINION

When looking is dangerous: How solar radiation management research can harm. By *Aaron Tang*, PhD Scholar in climate governance at the Fenner School of Environment & Society at the Australian National University, and a research affiliate at the Centre for the Study of Existential Risk at the University of Cambridge.

Solar radiation management involves deliberately reflecting sunlight back into space to cool the Earth. It's intended to avoid the worst impacts of global warming and buy time for implementing renewable energies and removing greenhouse gases from the atmosphere.
Research into solar radiation management can lead to effective decision-making, But it also can harm.

A 2023 open letter in favor of research emphasized transparency and independence, but not the risks of misrepresentation or normalization.

That research is already underway—sometimes field testing without sufficient oversight.

Idealized climate models, in particular, can erroneously misrepresent stratospheric aerosol injection as technology that can be centrally "designed" and easily deployed.

Yet the design of stratospheric aerosol injection is often Panglossian. The models investigate the impacts of injection if implemented in a consistent manner over decades, sometimes flawlessly coordinated. In these highly optimistic outlooks lie assumptions that there would be perfect international coordination on how much, how quickly, and where to inject what substance *and* that these decisions would be consistent over many decades. thebulletin.org/

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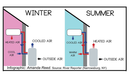
ICYMI / FYI

Heat Pumps

According to the U. S. Energy Information Agency, **(5) in 2021 70.2 quadrillions BTU*, 67.2% of the total energy, was produced from fossil sources** (natural gas, crude oil, and coal), primary contributors of GHG in the atmosphere. Energy sources not contributing to or having reduced impact on the GHG emissions (nuclear, natural plant liquid, geothermal, solar, wind hydro) were the source of 27.5 quadrillions BTU, 32.8%.



A University of Michigan Fact Sheet reported that in 2021 (6)

- the residential sector used 3.79 trillion kWh of electricity, 96% of U.S. total electricity sales.
- the U.S. residential sector consumed 20.9 quadrillion Btu of primary energy, 22% of U.S. primary energy consumption.
- miscellaneous loads consumed more electricity than any other residential end use (lighting, HVAC, water heating, and refrigeration), accounting for 37% of primary energy and 50% of electricity consumption.
- core residential functions (HVAC, lighting) consumed 63% of total household energy and 50% of electricity.
- Wasteful energy uses include heating and cooling of unoccupied homes and rooms, inefficient appliances, thermostat oversetting, and standby power loss. Together, these uses account for at least 43% of the total energy use in the residential sector.

There are essentially two approaches to cutting GHG emissions. One is reducing demand for energy, the other is supplying energy from cleaner sources. (2)

Among the former, for example, building energy management systems display energy use via in-home monitors or mobile applications and enable remote control of devices. Home energy management systems can reduce a house's energy use by an estimated 4-7%.

Among the latter, renewable sources - solar, wind, hydro generated power - have been at the forefront of the fight to reduce greenhouse gas emissions and to stop and, in fact, reverse planet warming and climate change.

Replacing the standard air-conditioning and heating systems with heat pumps, particularly those powered by renewable clean energy, may be some of the most effective tools to further the goal. (1) Heat pumps are essentially air conditioners that work both to heat and cool homes rather than just cool them, it's relatively simple to install them in place of existing one-way AC systems. (And because increasingly harsh heat waves are driving demand for air conditioning in places that haven't needed it before — and making cooling not just a comfort but a public-health necessity in hotter climates.

While companies that make furnaces may oppose regulations that restrict their future market, many of the world's leading HVAC equipment manufacturers make both AC systems and heat pumps,

Heat pumps, which move heat from the environment to inside buildings, are significantly more efficient than other kinds of electric heating—plus, they double as air conditioners during the warmer months by moving hot air outside. Because soil temperatures stay relatively constant year-round, "ground source" or "geothermal" heat pumps that draw their heat from underground can be especially efficient ways to heat and cool homes.

Properly selecting the right heat pump to both heat and cool homes in colder climates may be tricky. Heating loads are typically larger than cooling loads in those circumstances. That means homeowners who want to replace their AC with a heat pump might have to choose between a system that's oversized for their cooling needs to cover their heating needs, which will drive up costs, or pick a smaller, cooling-load-optimized heat pump and rely on alternative heating sources for the coldest parts of the winter — what's called a "hybrid heating" approach.

There are three main types of heat pumps connected by ducts: air-to-air, water source, and geothermal. (4) They collect heat from the air, water, or ground outside your home and concentrate it for use inside.

* The most common type of heat pump is the air-source heat pump, which transfers heat between the house and the outside air.

* For homes without ducts, air-source heat pumps are also available in a ductless version called a mini-split heat pump.

* **Geothermal** (ground-source or water-source) heat pumps achieve higher efficiencies by transferring heat between your house and the ground or a nearby water source. Although they cost more to install, geothermal heat pumps have low operating costs because they take advantage of relatively constant ground or water temperatures. (3)

* **Absorption heat pumps**. aka gas-fired heat pumps, use heat or thermal energy as their energy source, and can be driven with a wide variety of heat sources such as combustion of natural gas, steam solar-heated water, air or geothermal-heated water, and therefore are different from compression heat pumps that are driven by mechanical energy.

- *70.2 quadrillion BTUs = 20.6 quadrillion watthours*
- *1 quadrillion = 1,000,000,000,000,000 or 10^{15}*

Sources:

1. canarymedia.com/articles/heat-pumps/
2. cleanenergywire.org/news/
3. climate.mit.edu/explainers
4. energy.gov/energysaver/heat-pump-systems
5. eia.gov/energyexplained/us-energy-facts/
6. umich.edu/publications/

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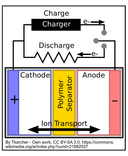
Lithium-Ion Batteries (A Short History)

The potential benefits of electric cars as quieter and less polluting than those using the petrol-fired internal combustion engine had been recognized since their inception. But the lead-acid batteries used as starter batteries and the power source for vehicle electronics were utterly unequal to the task of supplying the motive power: they were too heavy and offered too little power.



The key was to find the right materials for the battery electrodes. Lithium metal looked attractive because it is lightweight and capable of delivering high voltages. The idea was that lithium at the positive electrode would provide electrically charged ions that travel to the negative electrode, where they could be trapped between the layers of atoms in materials called intercalators.

The British chemist Stanley Whittingham working at the Exxon laboratories in New Jersey found a suitable intercalator called titanium disulfide in 1976. Four years later, John Goodenough in Oxford identified the intercalator material – a form of cobalt oxide – that became the industry standard, offering a higher voltage and greater power density.

Early lithium batteries tended to to catch fire because of the high chemical reactivity of pure lithium. The Japanese researcher Akira Yoshino, of the Asahi Kasei Corporation in Tokyo, replaced lithium electrodes with graphite-like carbon made from petroleum coke, which also intercalates lithium so that the ions merely shuttle back and forth between the two sets of layers, making them easily rechargeable. Mr. Yoshino patented his invention in 1985. The lithium-ion battery was commercialized in 1991 by the Sony Corporation and now commands an estimated $92bn market. Without it, there could have been none of today's handheld electronics – laptops, smartphones, and tablets. Elon Musk's Tesla electric cars depend on them.

Messrs. Goodenough, Whittingham, and Yoshino shared the Nobel Prize in Chemistry in 2019. theguardian.com/

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The New York Solar Energy Society (NYSES)

a Chapter of the American Solar Energy Society (ASES)

prepares consumer knowledge handouts about energy conservation and renewable energy, and distributes Green Energy Times, a resource publication, to the public throughout eastern New York State. NYSES analyses legislation and state programs and visits with the staff of legislators in New York City, New York State, and Washington, DC. NYSES is a volunteer, grassroots, membership organization serving the children, families, engineers, architects, and teachers of New York State since 2007.

Our Mission:
To encourage the understanding and use of solar energy technologies through public outreach, to be a source of sound technical knowledge, and to provide a forum to address critical regional and state issues relating to solar energy solutions. We address the energy usage of all segments of society by increasing awareness of the benefits of renewables: solar, wind, biomass, geothermal ground source, tidal/wave energy, and energy efficiency.

For more information, please contact:

New York Solar Energy Society
5270 Sycamore Avenue, Bronx, NY 10471
www.nyses.org
917 974 4606

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Thank you!

Please send your comments/suggestions via Contact-Us

The Board of Directors of the New York Solar Energy Society meets on the fourth Tuesday of odd-numbered months via teleconference. Please contact us **if you wish to attend.**

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Monthly Update is compiled & edited by Yuri Kalina

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