**WebSights Summer Climate Physics Update**

Given that several of the hottest days on record for the Earth’s daily average global surface temperature occurred this past summer and we experienced some extreme weather phenomena here in Buffalo NY, it’s time for some climate physics check-ins.

<https://climate.copernicus.eu/>

<https://www.washingtonpost.com/weather/2024/08/02/heat-wave-climate-change-united-states/>

<https://weather.com/storms/severe/video/buffalo-tornado-nursing-home-damaged>

First, Texas A&M Professor of Atmospheric Sciences and climate scientist Andrew Dressler with colleagues edits a science and data-centric substack with newsletters called “the climate brink has written a nice article “Can we air condition our way out of extreme heat?” that starts off with a very nice discussion (with sample calculations) on the theoretical and practical physics of air conditioning, and the cost associated with moving thermal energy out of our homes. TL;DR – No we can’t.

<https://www.theclimatebrink.com/p/can-we-air-condition-our-way-out>

<https://Theclimatbrink.com>

Next, retired physics teacher and OAPT activist Roberta Tevlin writes on having students use and explore the well supported and resourced En-ROADS global climate simulator from MIT. There are video overviews of the simulator at the website, and Tevlin’s online OAPT newsletter article “En-ROADS: A Powerful Simulator to Explore Solutions to Climate Change“ includes lesson ideas for Canadian HS students to explore the simulator and group role-playing a wide variety of societal stakeholders including conservative voices like Climate Hawks, Industry/Commerce and Agriculture/Land. Tevlin describes several ways the simulator has informed her own climate activism in Ontario, Canada and discusses many of the supporting resources for the simulator.

<https://tinyurl.com/WS-TevlinEnroads>

<https://newsletter.oapt.ca>

<https://www.climateinteractive.org/>

Next, German YouTube Physicist Sabine Hossenfelder continues her own excellent presentations on physics, climate change and energy storage. She does a nice job of presenting the timely developments in the physics and economics of many promising technologies and materials associated with energy systems -- generation, storage, and battery technology in particular. In the sunny parts of the US (think CA and the South West) the photovoltaic revolution has produced a problematic duck curve, satisfying sunny daytime grid demands but making even short term storage more necessary than ever. In “Renewable Energy Storage: No Wind, No Sun, Now What?” she describes how Northern European “Kalt Dunkleflaut” or cold, dark becalmed winter weather which limits solar PV and wind turbine generation also necessitates large scale transient energy storage. Sabine shows just how large the scale of the problem is and required solution must be. This is a topic where science is an emotional joyride: Real world solar PV deployment is growing explosively (yay) and real battery technology likewise (double yay) but the scale of need is truly immense and we still have embarrassing trivially wrong climate deniers who are physicists (boo). Luckily we have Sabine to help with these issues.

<https://tinyurl.com/WS-SHdunkle>

<https://www.energy.gov/eere/articles/confronting-duck-curve-how-address-over-generation-solar-energy>

<https://tinyurl.com/WS-SHnewbattery>

<https://tinyurl.com/WS-SHnobelphyclimatedenial>

<https://www.youtube.com/@SabineHossenfelder/videos>

**‘Tesla Model 3's motor - The Brilliant Engineering behind it”**

<https://tinyurl.com/WS-LesicsT3motor>

<https://www.youtube.com/@Lesics>

<https://en.wikipedia.org/wiki/Tesla_Model_3>

Recently a quora article drew my attention to another excellent animated Lesics video, this time describing how EV makers have designed unitary electric motors that can be run as both permanent magnet motors (high torque starts at low rpm but terrible Back EMF at high rpm) and high reluctance motors (low torque but high efficiency squirrel cage motors at high rpm). These IPM-SynRM or Internal Permanent Magnet Synchronous Reluctance Motors are just pretty darned cool to figure out via these great animated rotating magnetic fields.