

Wind & Solar Energy

The Physical Reality

<https://factsanddata.org/wind-solar/>

Wind & Solar

Facts versus Fantasy

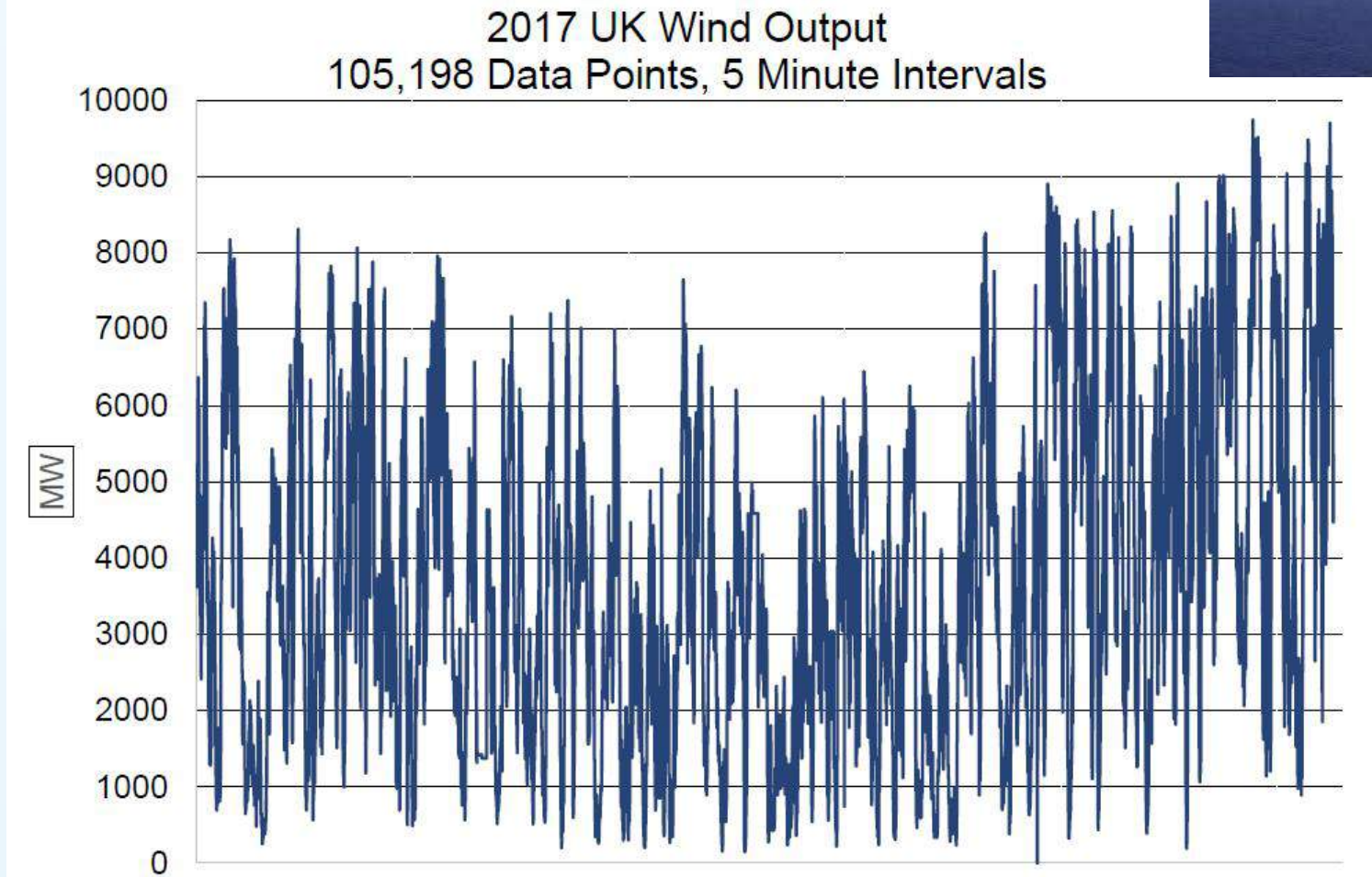
Wind & solar equals natural gas plants since mother nature doesn't care when you need power.

- Claims about a green transition to wind and solar are no match for the laws of physics.
- Wind turbines generate power only when the wind blows between certain speeds, and the power they generate fluctuates constantly as wind gusts vary.
- Solar provides no power at night or when solar panels are covered by snow or ice, and only reduced power on cloudy days, during storms, when dirty, or when the Sun is lower in the sky. During overcast days solar produces virtually no power as it does during winter locations far from the equator.
- Since neither wind nor solar can be relied upon for either baseload or peaking power, wind and solar farms are gas plants. Inefficiently run gas plants due to the need to accommodate erratic inputs of wind or solar-generated electricity. The facts are in the data that follows in [Germany](#), [Greenwashing](#). and this section.

UK Wind Energy Roller Coaster

Power Output in 5 min intervals

Wind energy for an entire country collapses daily



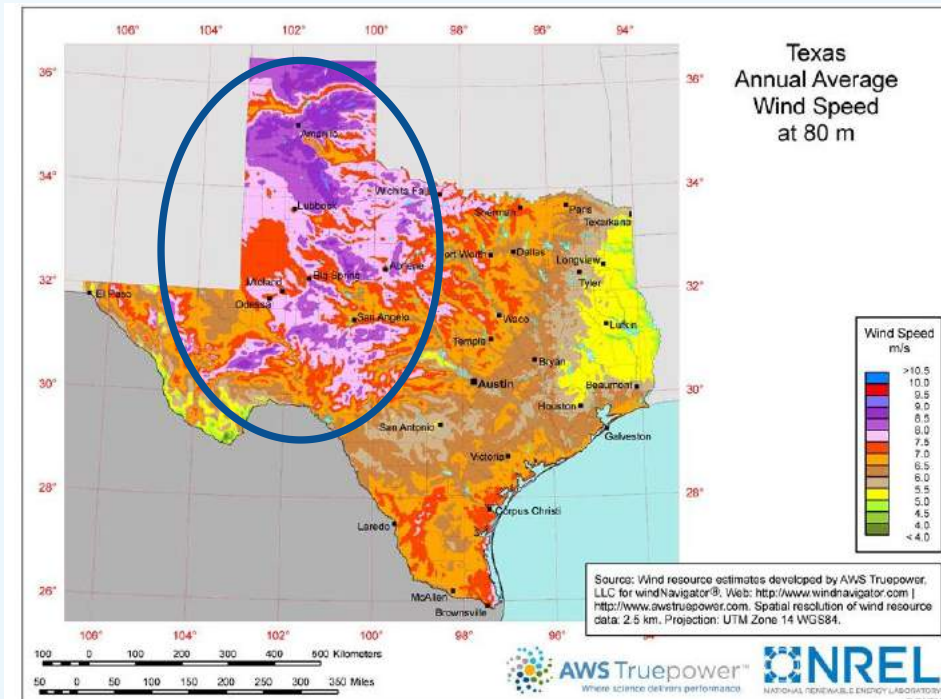
Texas Wind Energy Collapses Every Week of the Year

Texas shows the unreliability for one of the best locations in the world for wind power generation

Wind energy constant threat to grid stability due to variability

% Load Met by Wind

Week	min	max
• 1/15/21	2.8	57.9
• 3/15/21	5.9	62.8
• 6/15/21	.3	43.4
• 9/15/21	1.2	42.8
• 12/15/21	2.2	58.8



Electric Reliability Council of Texas (ERCOT) data shows weekly collapse of wind energy production for entire state

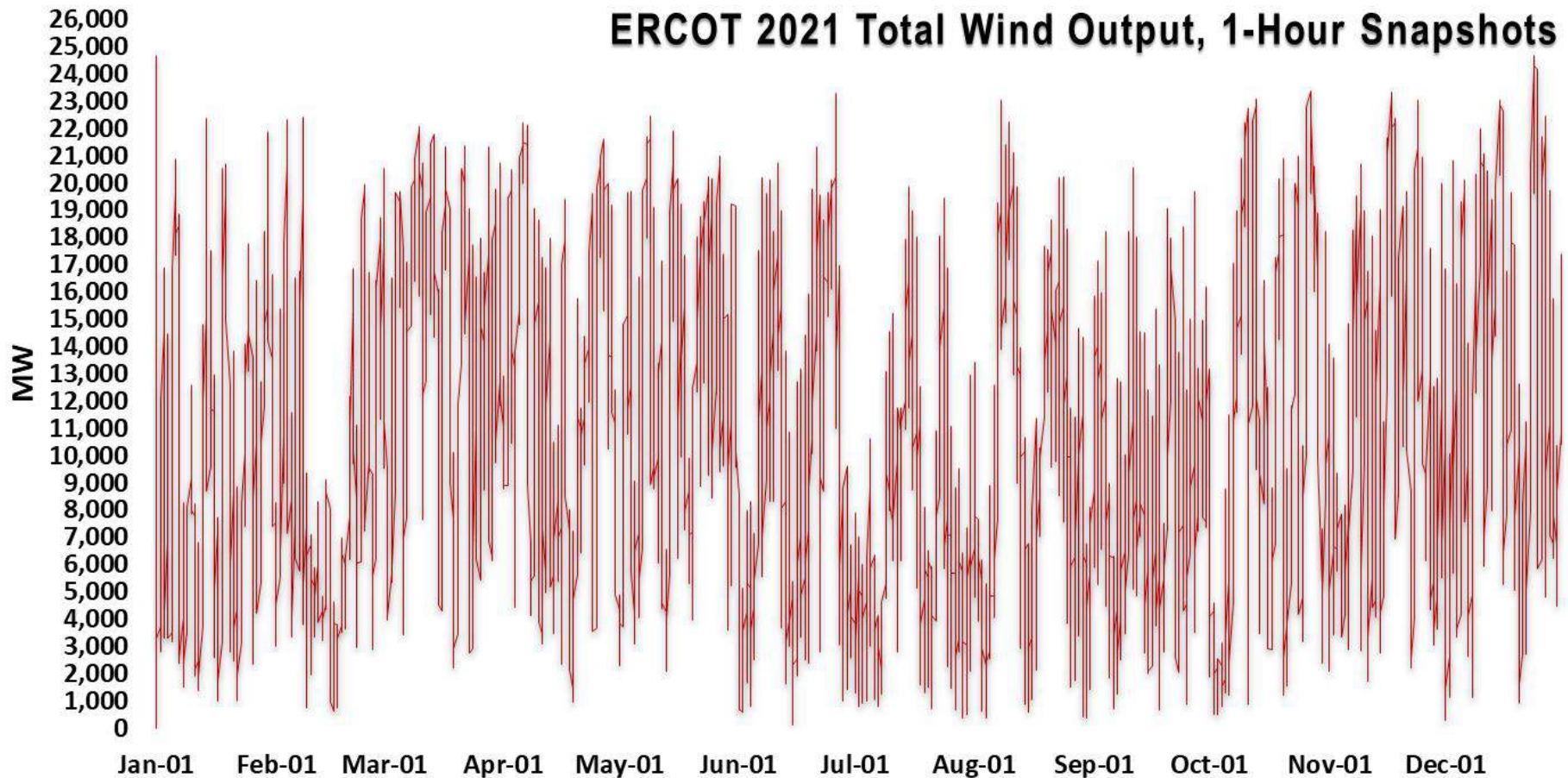
- “WINDExchange: Texas 80-Meter Wind Resource Map.” [Windexchange.energy.gov](http://windexchange.energy.gov), windexchange.energy.gov/maps-data/122.
- “Hourly Aggregated Wind and Solar Output.” www.ercot.com, Electric Reliability Council of Texas (ERCOT), www.ercot.com/mp/data-products/data-product-details?id=PG7-126-M. Accessed 2 Aug. 2022.

Texas Wind Energy Production

A Year of Unreliability in 1 Hour increments

Wind energy production collapses daily for entire state of Texas

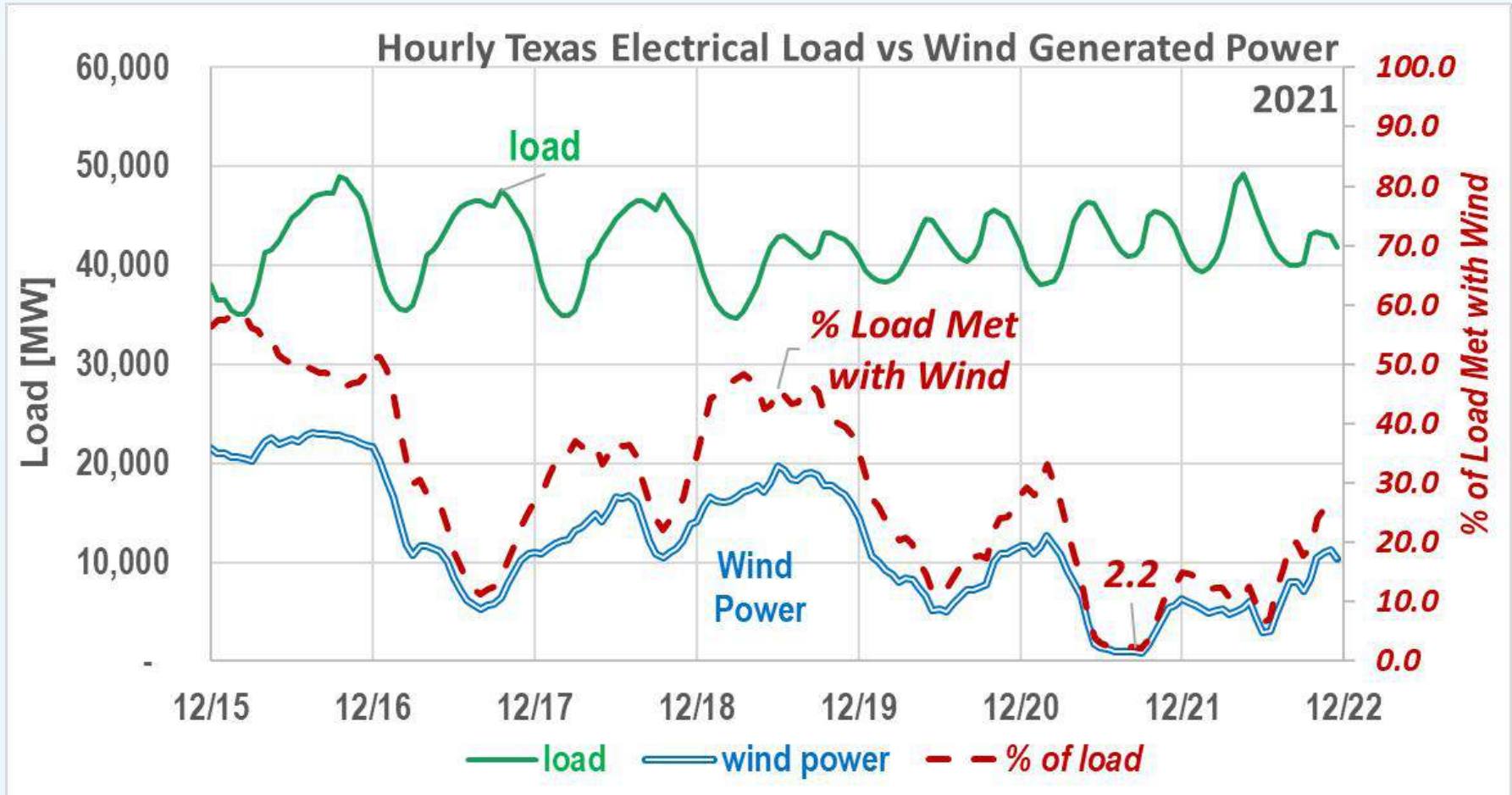
- Modern society requires reliable power production that matches consumption



“Hourly Aggregated Wind and Solar Output.” www.ercot.com, Electric Reliability Council of Texas (ERCOT), www.ercot.com/mp/data-products/data-product-details?id=PG7-126-M. Accessed 2 Aug. 2022.

Texas Wind Energy Unreliability Drives Natural Gas Use and/or Power Blackouts

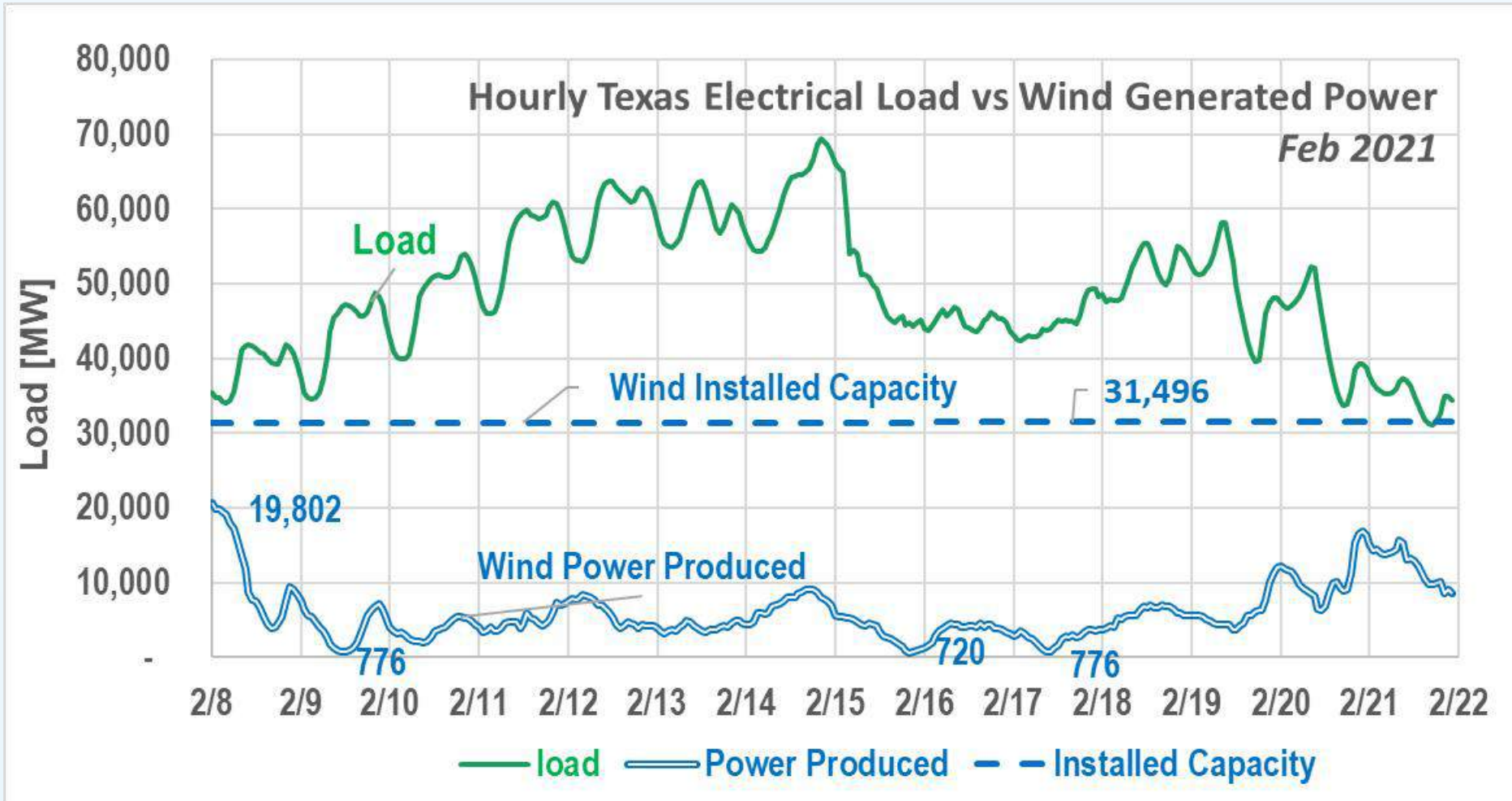
Wind power production drops 96% to 2.2% of load



"Hourly Aggregated Wind and Solar Output." www.ercot.com, Electric Reliability Council of Texas (ERCOT), www.ercot.com/mp/data-products/data-product-details?id=PG7-126-M. Accessed 2 Aug. 2022.

Texas Feb 2021 Power Grid Collapse

Wind Power Drops to less than 2.5% of Capacity



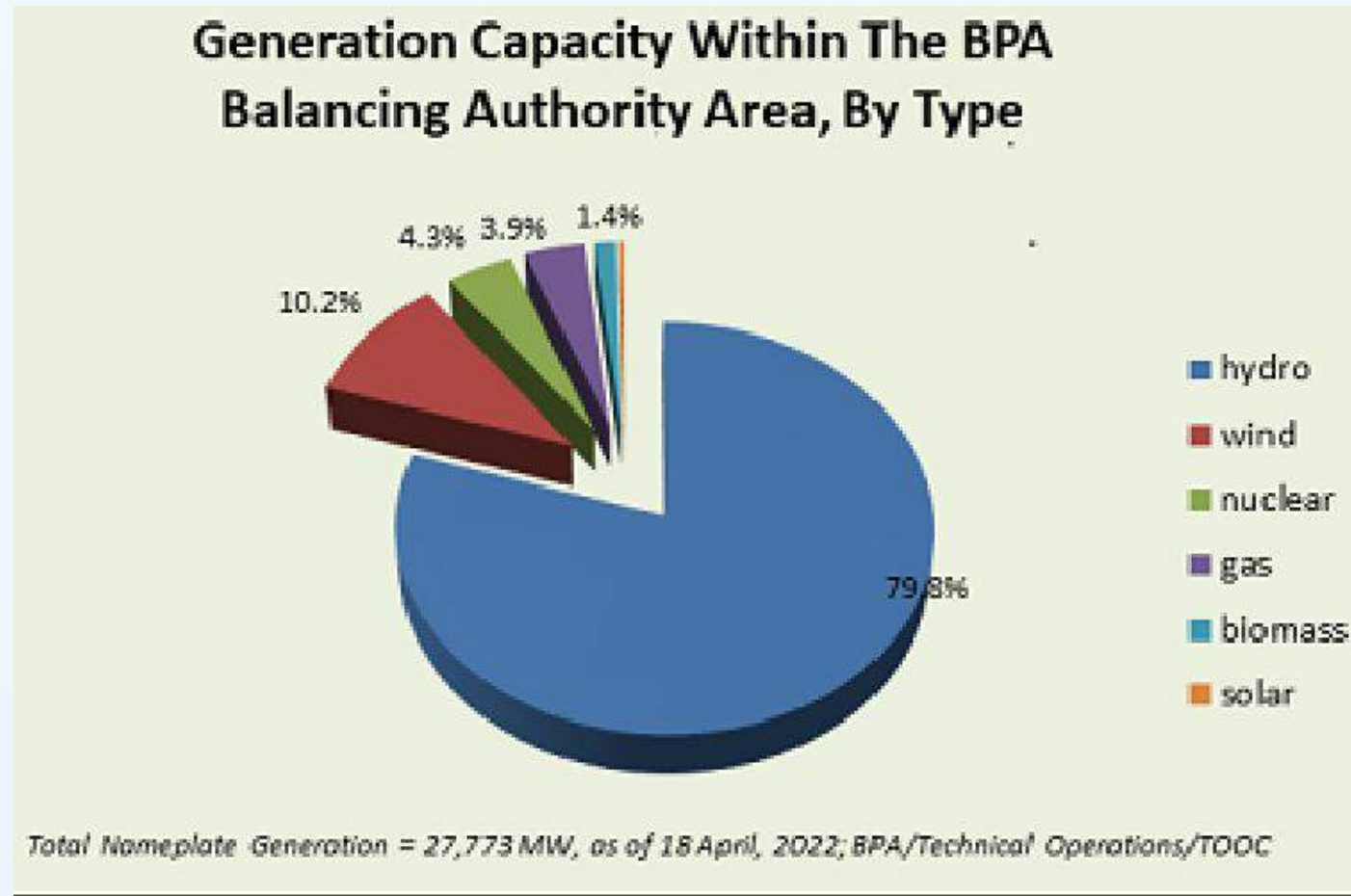
“Hourly Aggregated Wind and Solar Output.” www.ercot.com, Electric Reliability Council of Texas (ERCOT), www.ercot.com/mp/data-products/data-product-details?id=PG7-126-M. Accessed 2 Aug. 2022.

Wind & Solar & Hydro in the Pacific Northwest

BPA Generation Capacity

Bonneville Power Authority (BPA) generation capacity

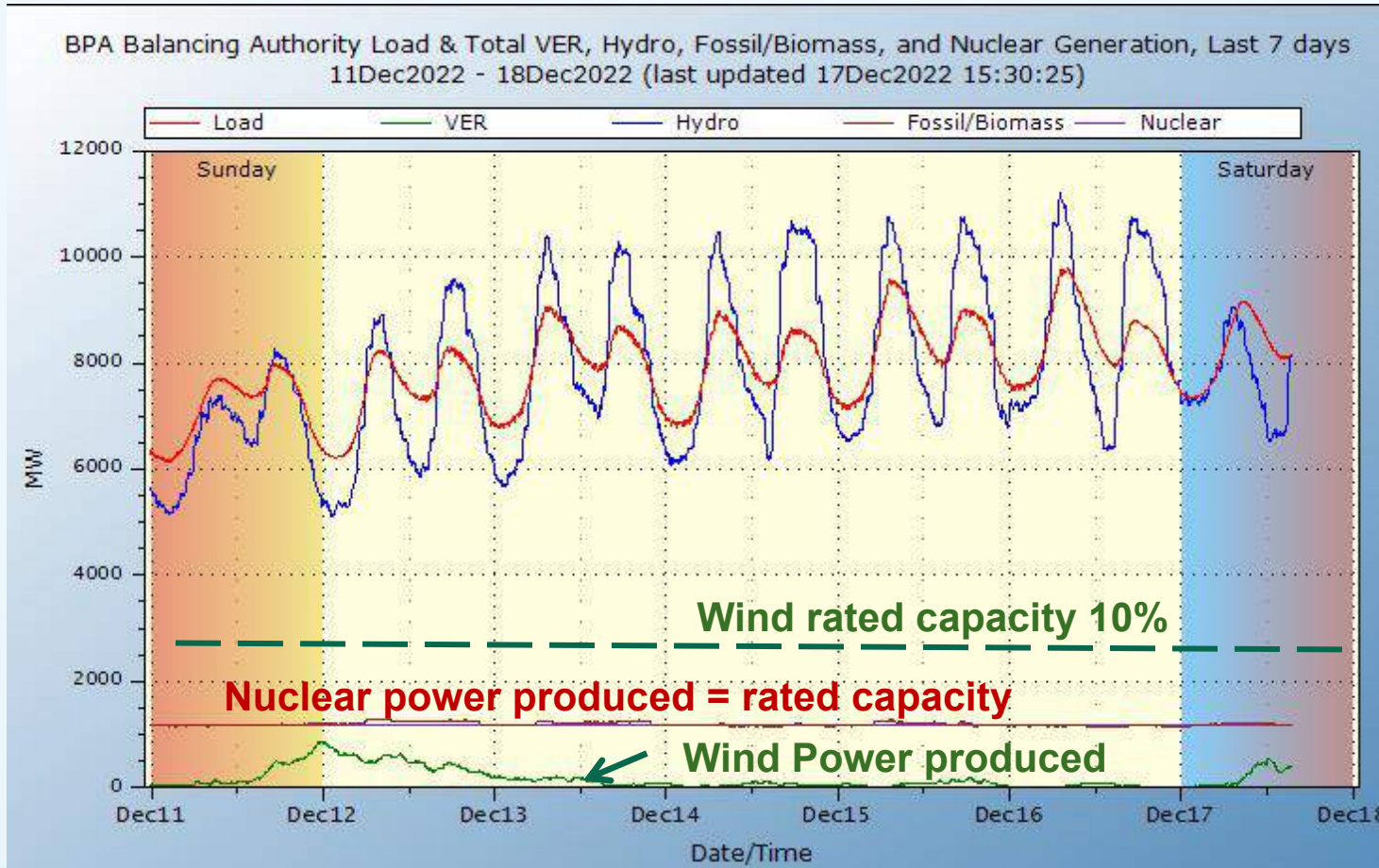
- 10% Wind
- 4.3% Nuclear
- 1.4% Solar
- 3.9% Gas
- 79.3% Hydro



How Wasteful are Wind Turbines in WA State

No Power During Coldest or Warmest Weather

Wind turbines produce NO Power for days in a row when air temperatures drop driving peak electrical power needs



“BPA Balancing Authority Load and Total VER.” Transmission.bpa.gov, transmission.bpa.gov/Business/Operations/Wind/baltwg.aspx.

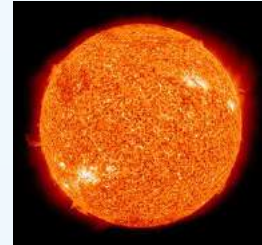
Solar

Cheap Panels, Costly Implimentation

Our Sun

A hot sphere of gas emitting energy from nuclear fusion

- Hydrogen isotopes fuse to form helium
- Motion of charged particles transfer radiant energy outward



Incident solar load reaching Earth surface varies with

- Location on Earth
 - larger seasonal variation further from the equator
- Time of day
 - Solar load follows sinusoidal wave
- Day of year
 - Summer Solstice = longest day, highest solar load unless offset by cloud cover
 - Winter Solstice = shortest day, lowest solar loading
- Atmospheric Conditions
 - Clouds dramatically decrease solar load, high humidity has less of an effect
- Altitude
 - Solar load increases with altitude

Solar Photovoltaic Technology Basics

Electrons to Electricity

Photovoltaic (PV) panels based on photovoltaic effect

- Convert light (photons) to electricity (voltage)
- Bell Laboratories created first working solar cell in 1954
- First used in satellites

PV cell types

- Silicon Solar Cells
 - Primary cell used today (95% market penetration)
 - Reasonable prices and good efficiency
- Thin-Film Solar Cells
 - Made from very thin layers of semiconductor material
 - Flexible and lightweight, ideal for portable applications
- III-V Solar Cells
 - Named after the elements that compose them
 - Very high efficiency & cost limit use to satellites



PV Panels: Cheap to Make *Insanely Expensive to Implement*

Photovoltaic Panels (PV) are incredibly cheap to buy due to China

- Cheap Uyghur forced labour helps
- Technology improvements by Chinese brainiacs

Costly to impliment due to seasonal & weather dependence

- **9 fold** variation in monthly power production in Germany
- NO power during peak demand hours (evening meal time)
- NO power at night to charge electric powers
- TOO MUCH power near solar noon on clear summer afternoons
- Minimal power during overcast days
- Erratic power as clouds pass over

Duplicate reliable power (usually gas) hides cost

Massive material consumption

Turning the Desert into a Dead Sea

Destroying Nature for Unreliable Power

California deserts are ground zero for Solar projects

- Riverside East Solar Energy Zone = 150,000 acres of BLM land



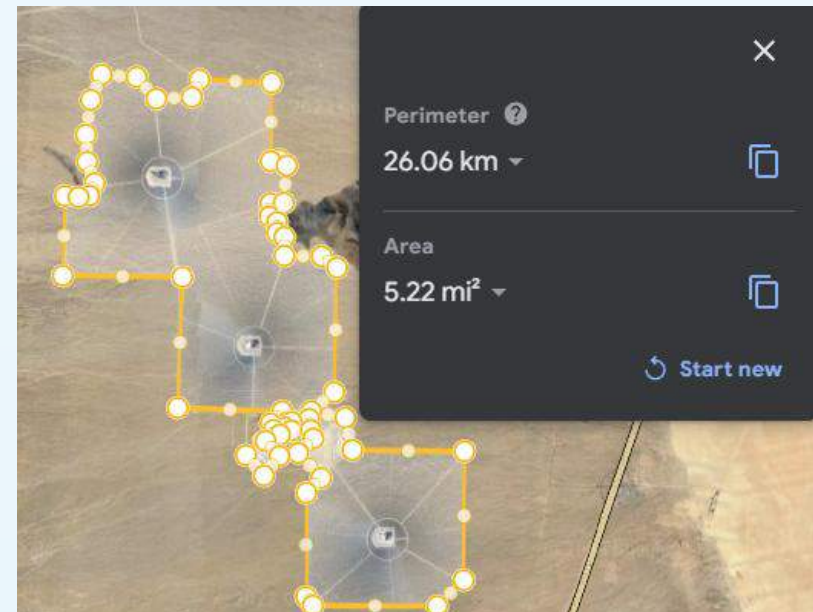
xWainwright, Oliver. "How Solar Farms Took over the California Desert: "an Oasis Has Become a Dead Sea." The Guardian, 21 May 2023, www.theguardian.com/us-news/2023/may/21/solar-farms-energy-power-california-mojave-desert.xx

Solar is a Land Hog

Destroying More of Nature

Solar takes 431-times the land of nuclear for the sunniest location

- Power produce [MWh/year] Land disturbed [sq. miles]
 - Ivanpah Solar 816,000 MWh/year on 5.22 sq miles (3340 acres)
 - Diablo Canyon Nuclear 16,165.000 MWh/year on 0.24 sq miles (158 acres)
- Ground underneath Ivanpah mirror field is scrapped free of vegetation
- Land area around nuclear plants are left undisturbed for nature



"Diablo Canyon Power Plant." Wikipedia, 14 July 2023, en.wikipedia.org/wiki/Diablo_Canyon_Power_Plant#References. Accessed 6 Aug. 2023.

"Google Earth." Earth.google.com, earth.google.com/web/search/Diablo+Canyon+Power+Plant. Accessed 6 Aug. 2023.

"Ivanpah Solar Power Facility." Wikipedia, 25 July 2023, en.wikipedia.org/wiki/Ivanpah_Solar_Power_Facility#cite_note-33. Accessed 6 Aug. 2023.

"Google Earth." Earth.google.com, earth.google.com/web/search/Ivanpah+Solar+Electric+Generating+System. Accessed 6 Aug. 2023.

Sacrificing Nature for Solar

Solar vs Nuclear

Footprint relative to power produced: Nuclear vs. Solar

- Solar is a disaster for nature



Diablo Canyon Nuclear Powerplant

Ivanpah Solar Power Plants

Diablo Canyon Power Plant." Wikipedia, 14 July 2023, en.wikipedia.org/wiki/Diablo_Canyon_Power_Plant#References. Accessed 6 Aug. 2023.

"Google Earth." Earth.google.com, earth.google.com/web/search/Diablo+Canyon+Power+Plant. Accessed 6 Aug. 2023.

"Ivanpah Solar Power Facility." Wikipedia, 25 July 2023, en.wikipedia.org/wiki/Ivanpah_Solar_Power_Facility#cite_note-33. Accessed 6 Aug. 2023.

"Google Earth." Earth.google.com, earth.google.com/web/search/Ivanpah+Solar+Electric+Generating+System. Accessed 6 Aug. 2023.



Unreliable Renewables in California (CA)

Summer vs. Winter Solstice

Wind & solar are unreliable in sunny CA

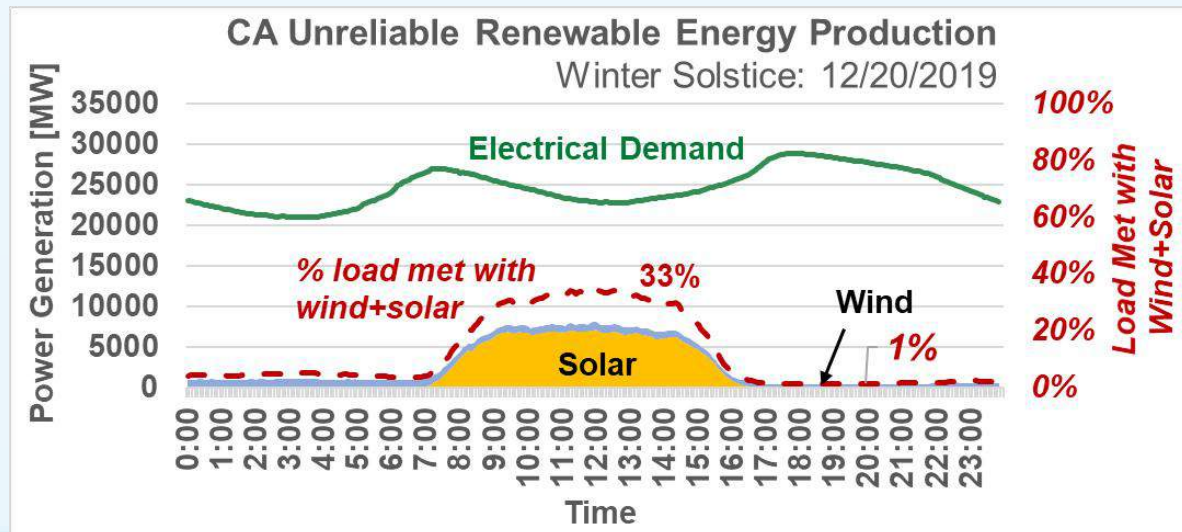
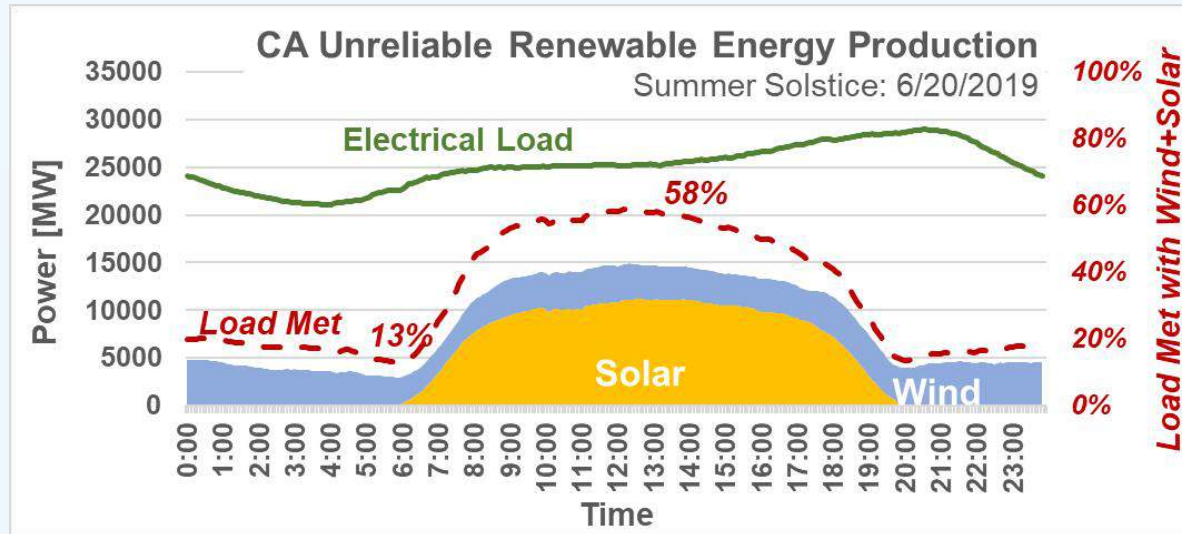
4-fold seasonal variation in power produced

- Less sun AND wind occur during winter solstice

Winter solstice

- **1% to 33% of demand met with wind & solar**
- **Less than 2% of demand met 43% of day**

No solar power when electricity need peaks



"Supply.", California ISO, www.caiso.com/TodaysOutlook/Pages/supply.html.

"Current and forecasted demand.", California ISO, www.caiso.com/TodaysOutlook/Pages/supply.html.

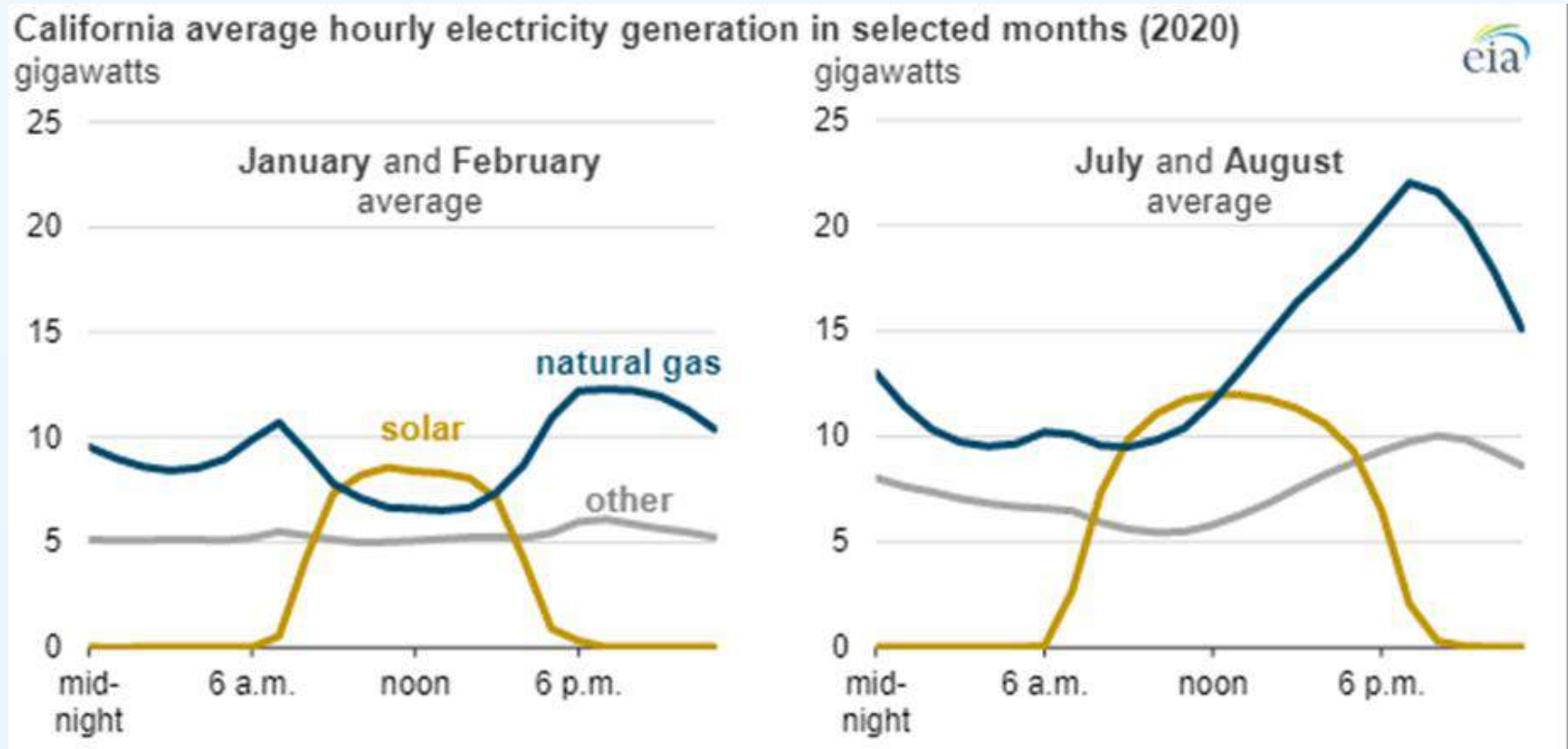


Solar in California

The Best it Gets in the US

California has some of the best solar resources in US

- Statewide capacity factor **28%** compared to **12%** for ideal Edmonds rooftop
- **Solar drives natural gas** use even in in **sunny California**



“United States - U.S. Energy Information Administration (EIA).” www.eia.gov, www.eia.gov/beta/states/states/wa/data/dashboard/electricity. Accessed 4 Apr. 2021.

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How Rooftop Solar PV Works

Everyone Pays for a Few to Dabble in Solar

Direct subsidies: Tax credits

- **Federal: 35%** of installation costs
- State & Local: subsidies: Homeowner paid 10 cents per kW-hr generated

Utility costs for rooftop solar as surplus power is pushed to grid

- Homeowner receives **electricity credit for mid-day** power against much **costlier evening and night electricity** purchases
- **Utility** must pay:
 - Homeowner **inflated rate** for surplus rooftop power
 - Cost of **getting rid of surplus power**
 - Costs of maintaining a **backup system** (gas turbines)
 - **Earnings lost** from **expensive evening power** homeowner receives
- **Environment** pays: mining, manufacture, & waste disposal

Utility & direct subsidies are *paid by those who don't install solar*

Solar Energy to Heat

Concentrating Solar-Thermal Power (CSP)

How Concentrated Solar-Thermal (CSP) works

- Mirrors reflect sunlight unto a receiver
- Concentrate sunlight heats fluid creating thermal energy
- Heat used to spin a turbine to generate electricity or in industrial processes

Power Towers

- Mirrors arranged around central tower
- Deadly for birds



Linear Systems

- Rows of mirrors concentrate sunlight unto parallel tube receivers



Single Dish Systems

- Produce 5 to 25 kw peak power
- Stirling engine generates power



Solar Process Heat

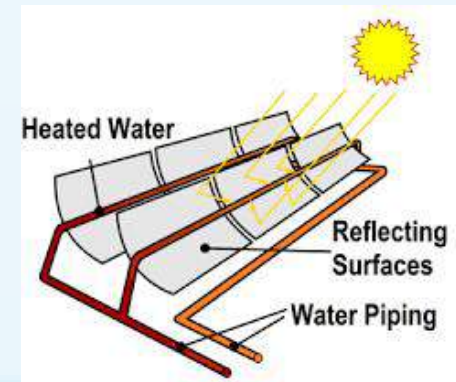
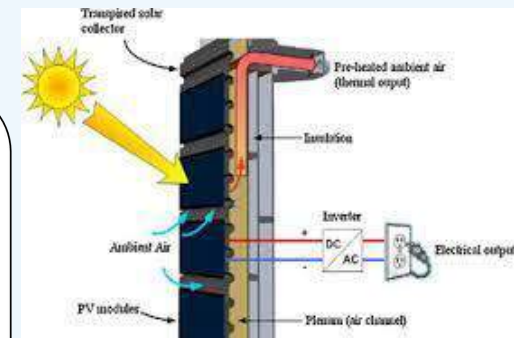
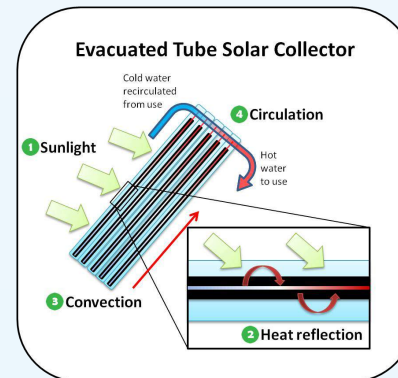
Commercial & Industrial Buildings

Solar Ventilation Air Preheating: Transpired Collector

- Thin, black metal panel mounted on a south-facing wall absorb's Sun's heat
- Small holes allow air to enter gap between panel and building
- Preheat building makeup air during sunny skies

Water Heating System

- Evacuated tube solar collector
 - double-walled, glass tubes and reflectors heat the fluid inside the tubes
 - vacuum between the two walls insulates the inner tube, retaining the heat
- Linear collectors
 - long, rectangular, curved (U-shaped) mirrors tilted to focus sunlight on tubes that run along the length of the mirrors
- Pumps
- Storage tank



Residential Solar

Space Heating & Hot Water

Active Solar Water Heating Systems

- Direct circulation systems
 - Pumps circulate household water through the collectors and into the home.
 - Work well in climates where it rarely freezes.
- Indirect circulation systems
 - Pumps circulate a non-freezing, heat-transfer fluid through the collectors and a heat exchanger.
 - Popular in climates prone to freezing temperatures.

Passive Solar Water Heating Systems

- Typically cheaper & more reliable than active
- Integral collector-storage passive systems
 - storage tank covered with a transparent material to allow the sun to heat water
 - Water from the tank then flows into the plumbing system
 - Work best in areas where freezing temperatures rarely occur
- Thermosyphon systems
 - Water is heated in a collector on the roof and then
 - Flows through the plumbing system when a hot water faucet is opened

