

Electromagnetic Pulses
they are real
they are dangerous

They do happen

Better prepared than caught unaware

Imagine you, your family and your constituents
without electricity for weeks, months or longer

Chaos and death on a mass scale will happen

Paying for full-time, on-demand electricity used part-time & Part-time, undependable wind and solar causes electricity costs to skyrocket

Reliability plummets without enough on-demand power

In addition to protecting your electric grid from EMPs, you must also protect it from electricity shortages

It is recommended that you have 115% on demand power for estimated peak demands – You must count wind and solar as zero as they can't be relied on

Peak demand is when it is very hot or very cold, and from 5-9 pm during the week

Blackouts during peak demand can kill hundreds or thousands



Electric demand must be met with electric supply immediately

IF NOT: Blackouts and curtailments are the result

Capacity = $3 \times$ Demand w/ CH_4 backup

Capacity = $10 \times$ Demand w/o CH_4 backup

Paying for part-time weather dependent wind and solar & Paying for full-time on demand, natural gas, coal, and nuclear electricity is expensive

Part-time undependable power
Only when the wind blows
Or the sun shines



Full-time on demand
energy dense power



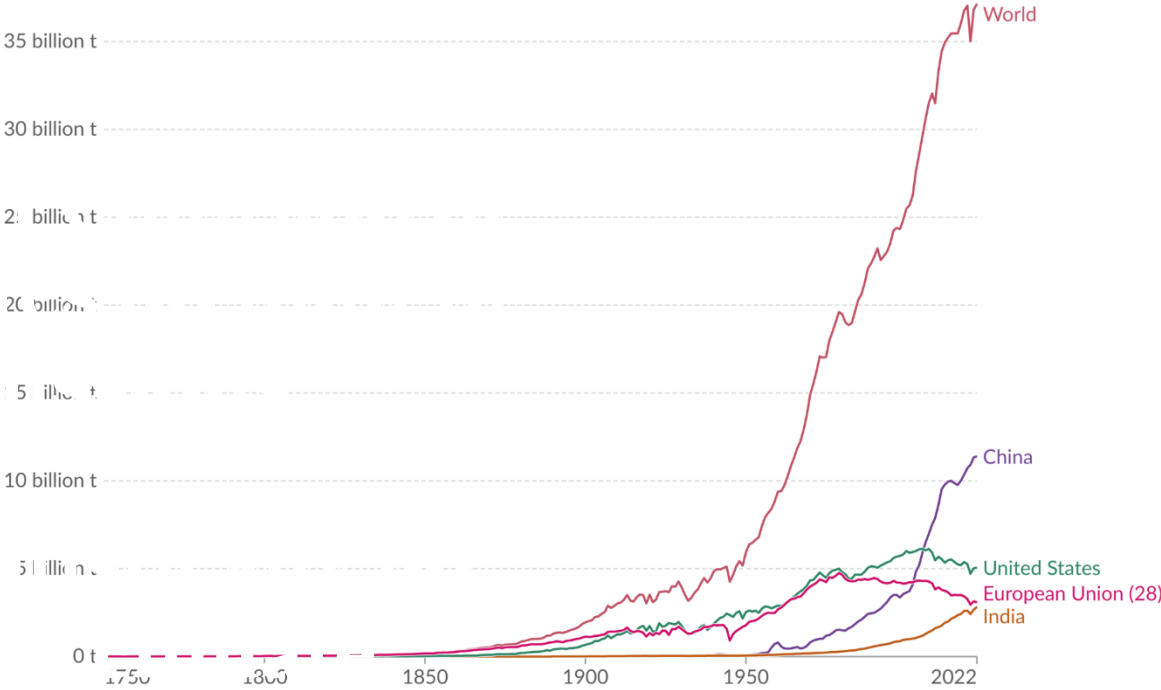
Worldwide CO2 Emissions Continue to Rise

US and Europe decline,

China and India ramp up!

Annual CO₂ emissions

Carbon dioxide (CO₂) emissions from fossil fuels and industry¹. Land-use change is not included.



Data source: Global Carbon Budget (2023)

OurWorldInData.org/co2-and-greenhouse-gas-emissions | CC BY

1. **Fossil emissions:** Fossil emissions measure the quantity of carbon dioxide (CO₂) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO₂ includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.

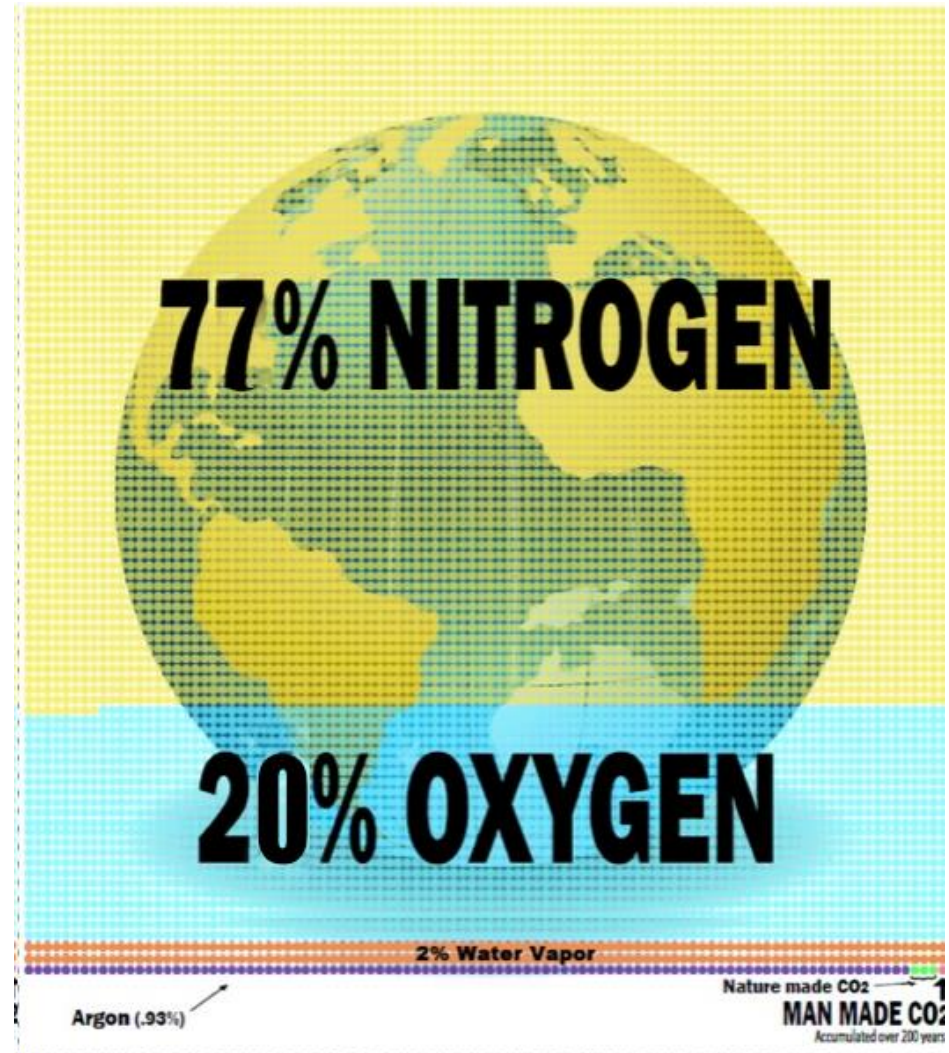
Greenhouse Gas Science

Water vapor is the most abundant Greenhouse gas

Water vapor is about 2% of the atmosphere

CO₂ is about .04% of the atmosphere

Water vapor and CO₂ Infrared Radiation (IR) (radiated heat) absorption overlap by about 50%



What is 10 trillionths?

$$1,000,000,000,000 \text{ drops} \left(\frac{1 \text{ ml}}{20 \text{ drops}} \right) \left(\frac{1 \text{ liter}}{1000 \text{ ml}} \right) \left(\frac{1 \text{ olympic pool}}{2,500,000 \text{ liters}} \right)$$
$$= 20 \text{ Olympic Pools of drops}$$

10-trillionths = 10 drops in 20 Olympic-sized pools of drops

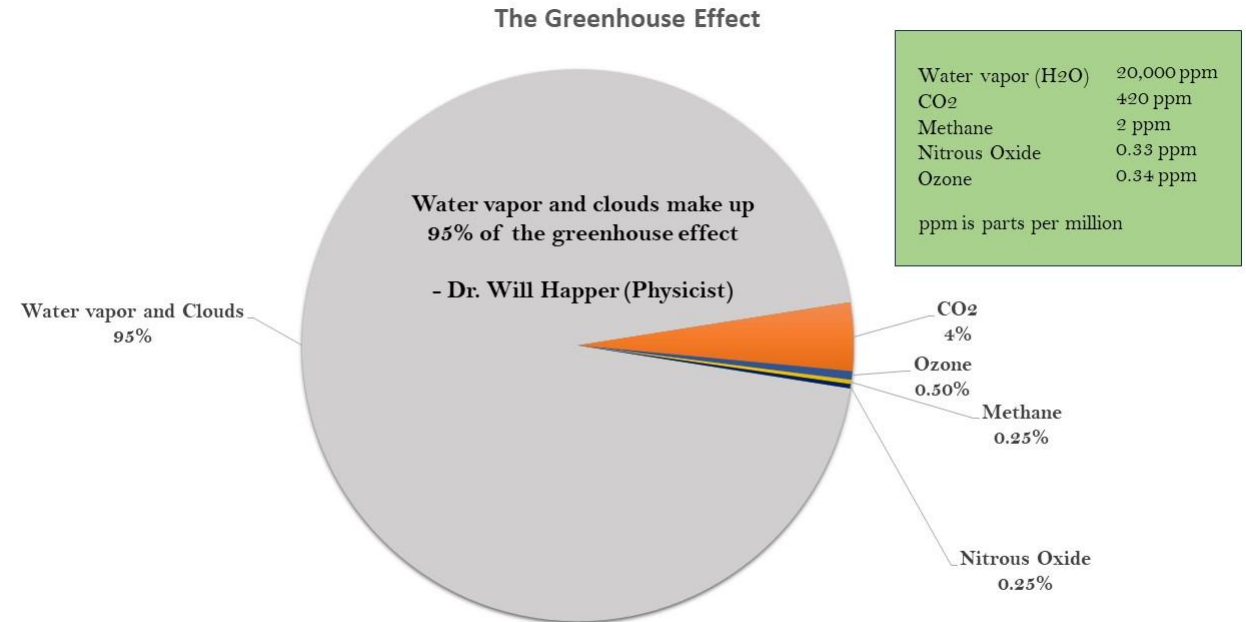
Greenhouse Gas Science

Water vapor is 50 times more abundant than CO₂

Water vapor is 10,000 times more abundant than methane

Water vapor is 60,000 times more abundant than nitrous oxide

They all absorb and reemit IR from the earth's land mass



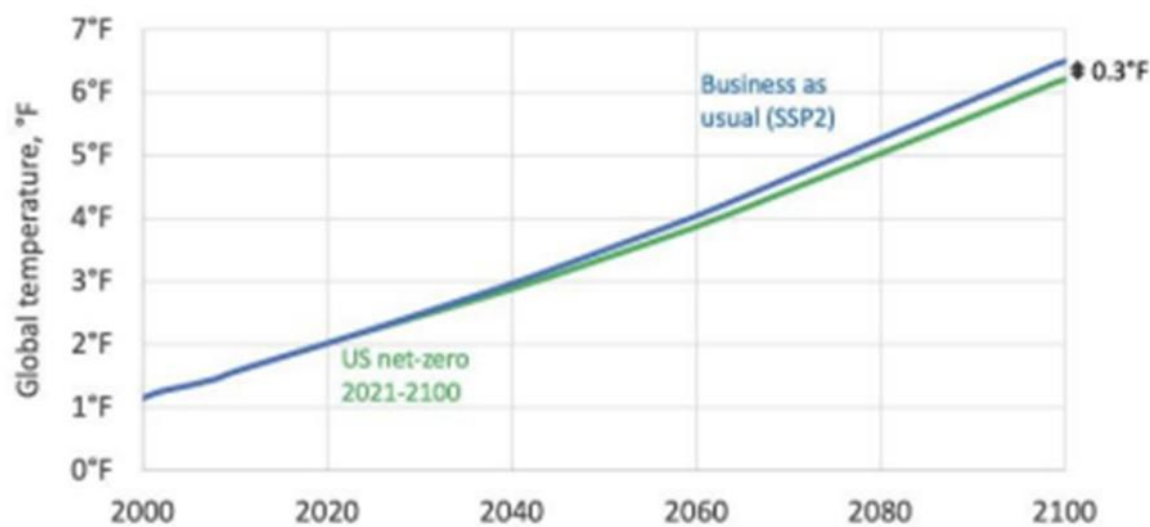
Note: Clouds cool the earth during the day and warm the earth during the night

“Water vapor and clouds make up about 95% of the greenhouse effect”

Dr. Will Happer Physicist - Princeton

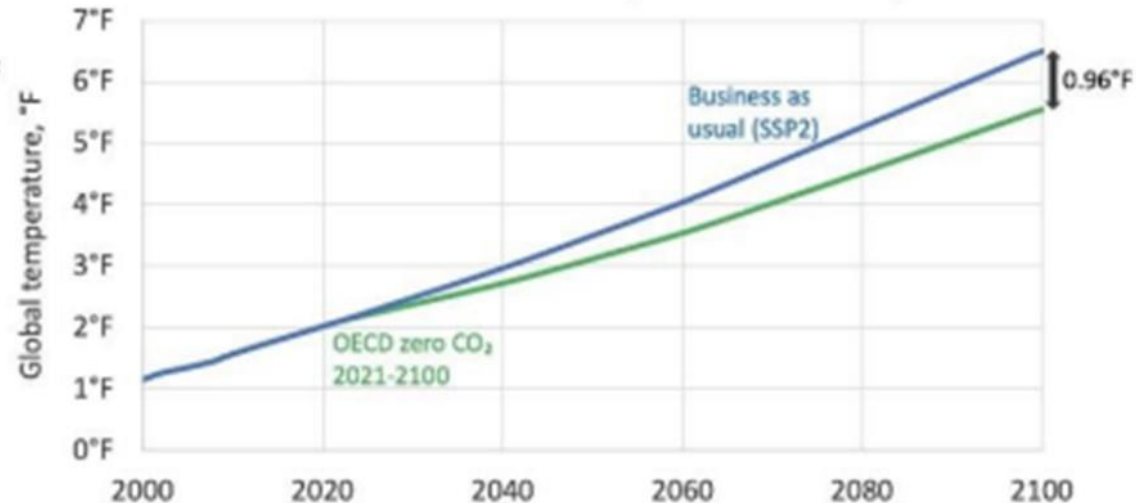
Bjorn Lomborg on [Twitter](#): "Even if entire US went net-zero today and stayed net-zero for the rest of the century impact rather small, reducing temperature rise in 2100 by 0.3°F (0.16°C) Because vast part of 21st century emissions come currently poor world Using UN climate model MAGICC ([magicc.org](#))"

If US goes net-zero today and stays net-zero for the rest of the century UN Climate Model: temperature reduced by 0.3°F



Model is MAGICC, <http://live.magicc.org/>, used by UN Climate Panel for all of their reports. Baseline SSP2, the UN's middle-of-the-road scenario, <https://tntcat.iiasa.ac.at/SSP0b>, and deducting total 2019 US emissions of 5,769 million metric tons CO₂e every year from 2021-2100, <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>, EIA estimate energy GHG emissions to be about unchanged until 2050 with no policy, <https://www.eia.gov/energyexplained/energy-and-the-environment/outlook-for-future-emissions.php>, twitter.com/bjornlomborg

If rich world net-zero today If the entire rich world goes net-zero today and stays net-zero for rest of the century – USA, EU, UK, Canada, Australia, Japan, New Zealand, Turkey etc. — standard UN Climate Model: temperature reduced by 0.96°F



Model is MAGICC, <http://live.magicc.org/>, used by UN Climate Panel for all of their reports. Based on SSP2, the UN's middle-of-the-road scenario, with and without rich world emissions, <https://tntcat.iiasa.ac.at/SSP0b>; rich world is OECD90 plus EU and candidates: Albania, Australia, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Guam, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, New Zealand, Norway, Poland, Portugal, Puerto Rico, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, North Macedonia, Turkey, UK and USA, twitter.com/bjornlomborg

World's top climate scientists told to 'cover up' the fact that the Earth's temperature hasn't risen for the last 15 years

- Leaked United Nations report reveals the world's temperature hasn't risen for the last 15 years
- Politicians have raised concerns about the final draft
- Fears that the findings will encourage deniers of man-made climate change

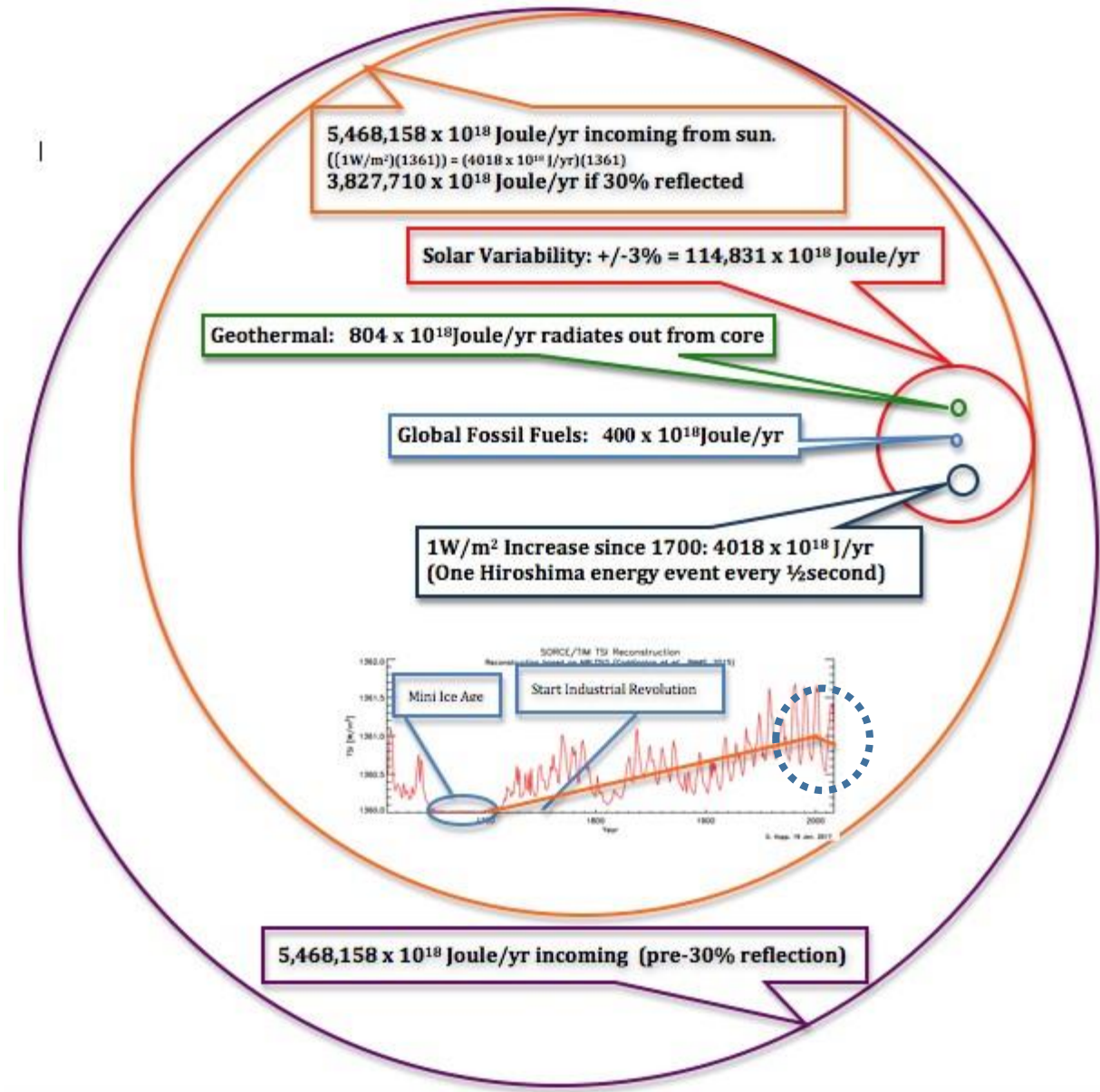
By TAMARA COHEN, POLITICAL CORRESPONDENT

PUBLISHED: 20:40 BST, 19 September 2013 | UPDATED: 07:47 BST, 20 September 2013



865
View comments

Scientists working on the most authoritative study on climate change were urged to cover up the fact that the world's temperature hasn't risen for the last 15 years, it is claimed.

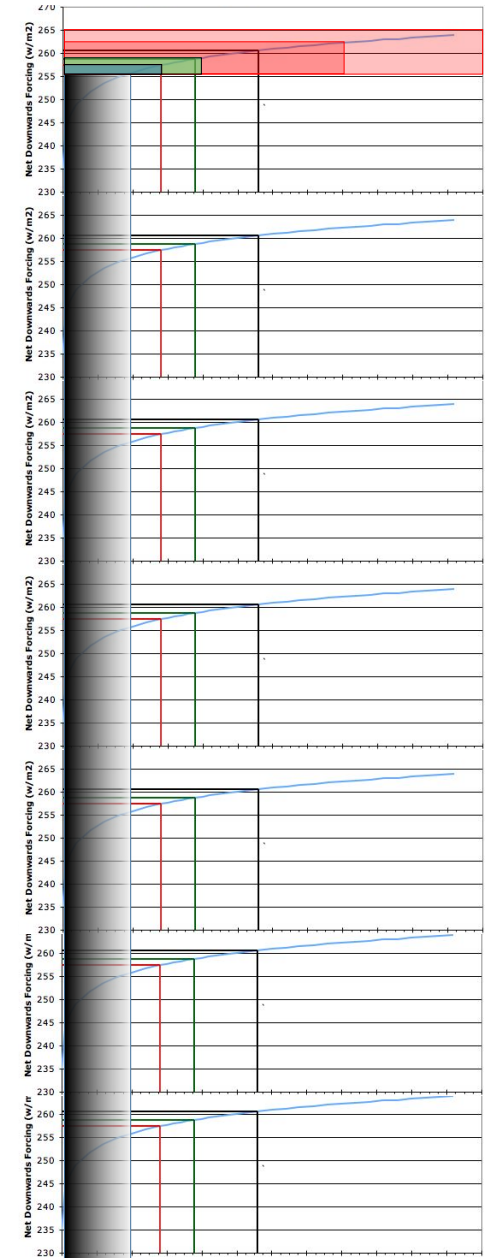
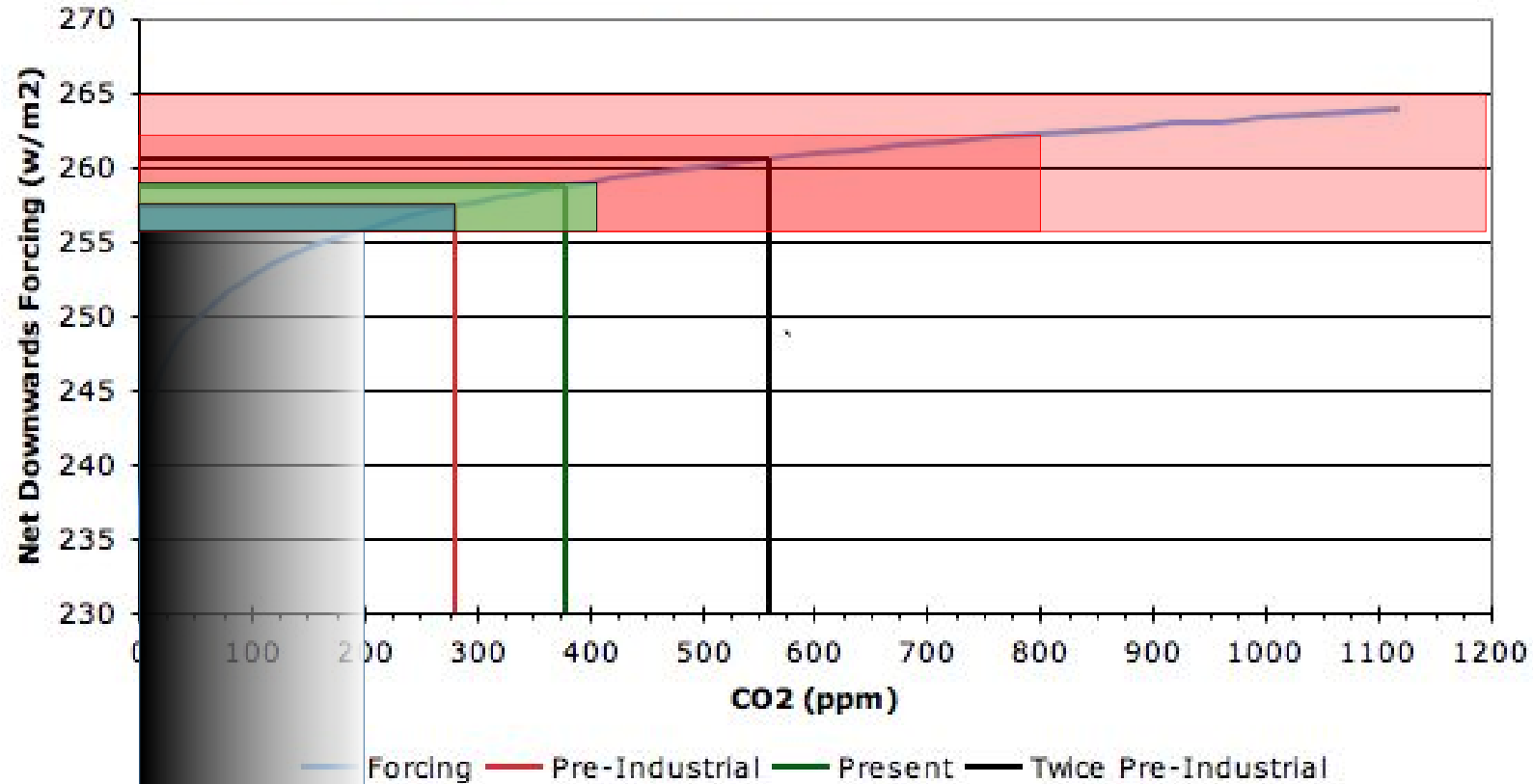


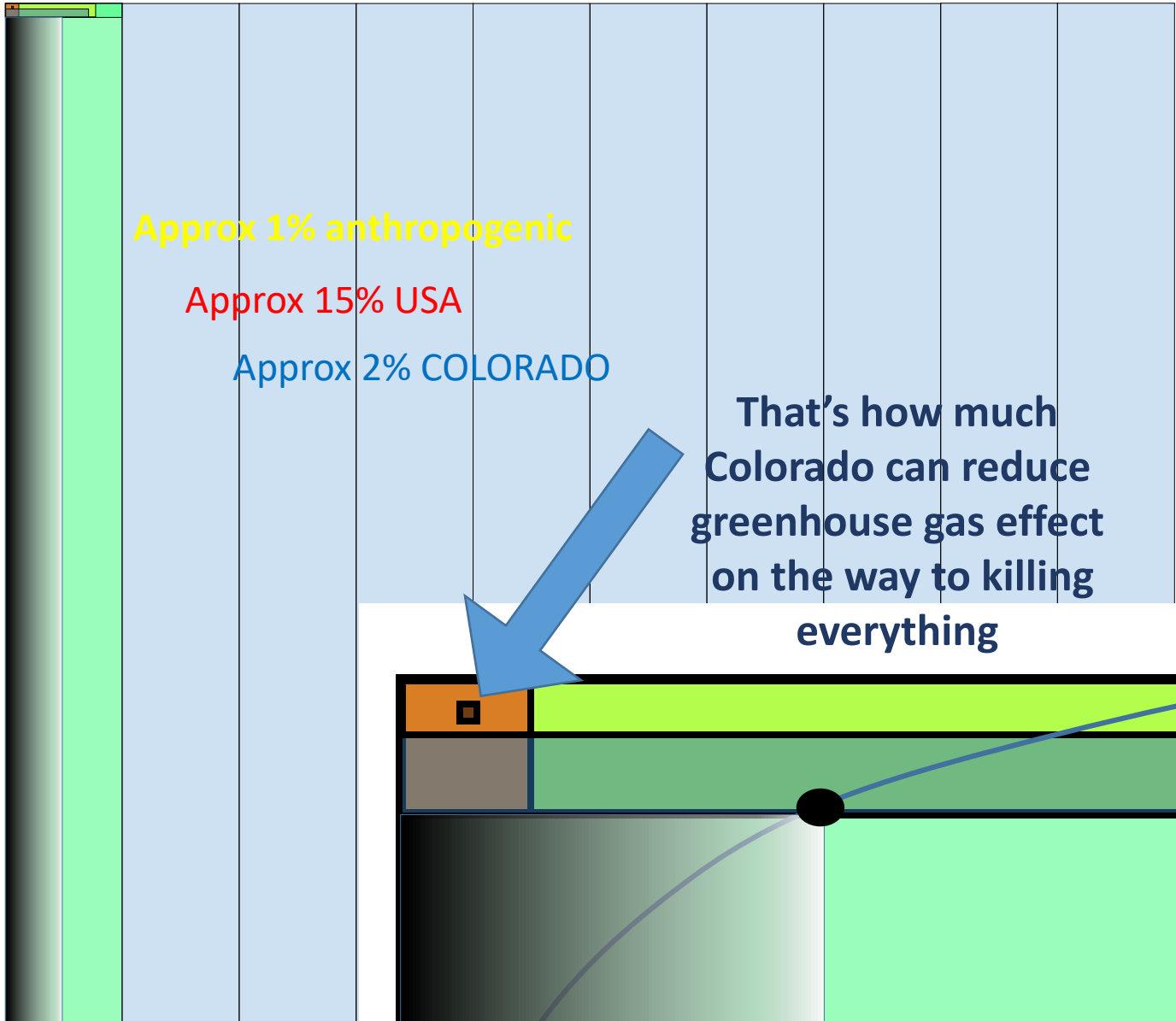
IPCC (2001, 14.2.2.2)

In climate research and modelling,
we should recognize that we are dealing with
a coupled non-linear chaotic system,
and therefore that the long-term prediction
of future climate states
is not possible.

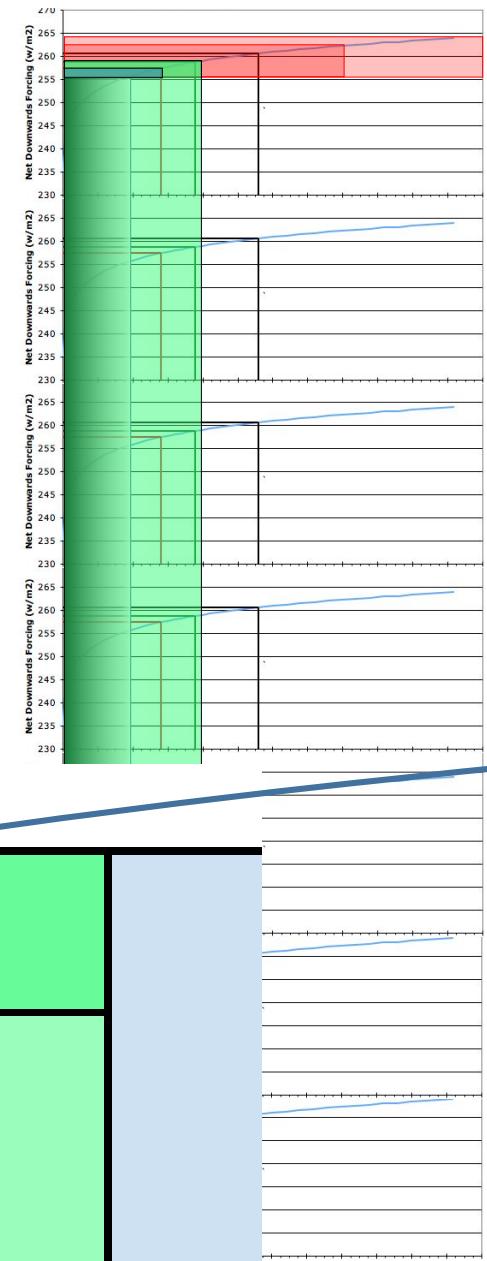
Modtrans Results

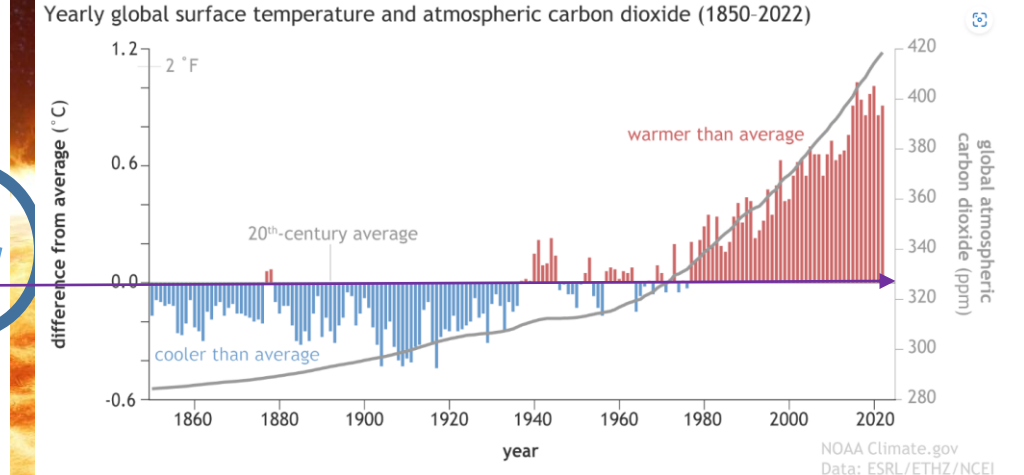
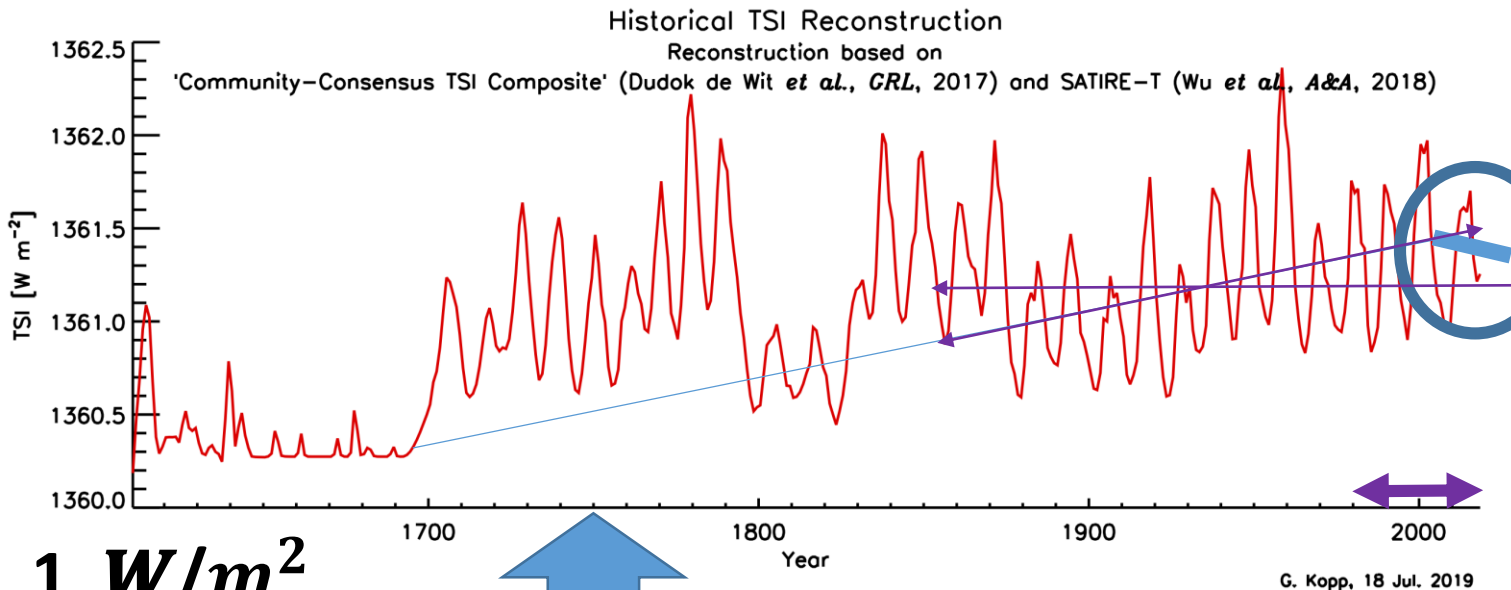
$$\text{Forcing} = 2.94 \text{ Log}_2(\text{CO}_2) + 233.6 \quad (R^2=.997)$$





<10%





1 W/m^2

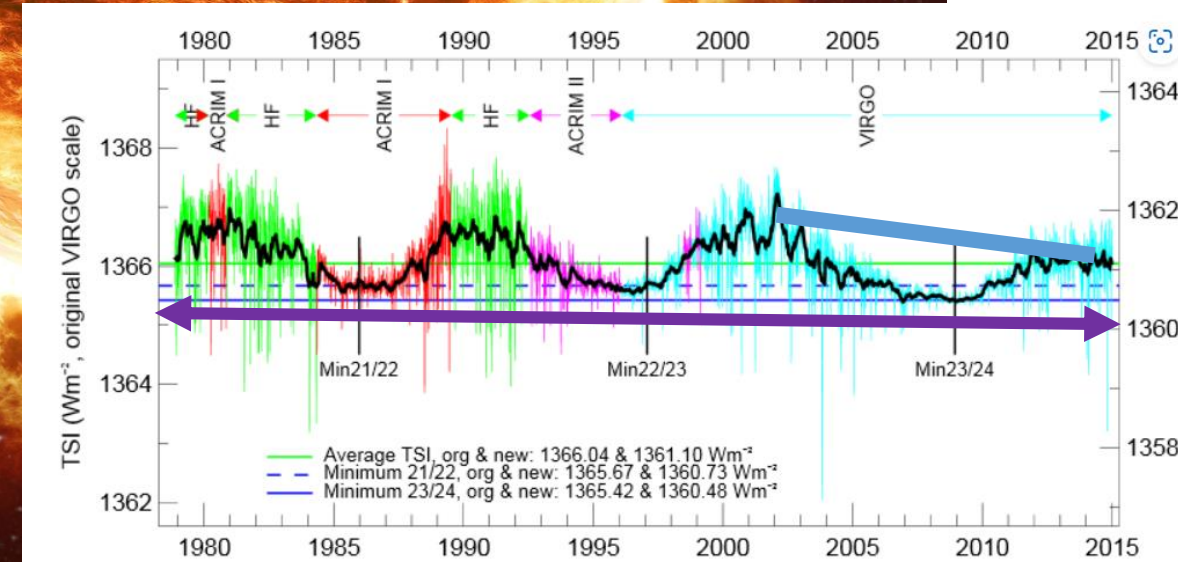
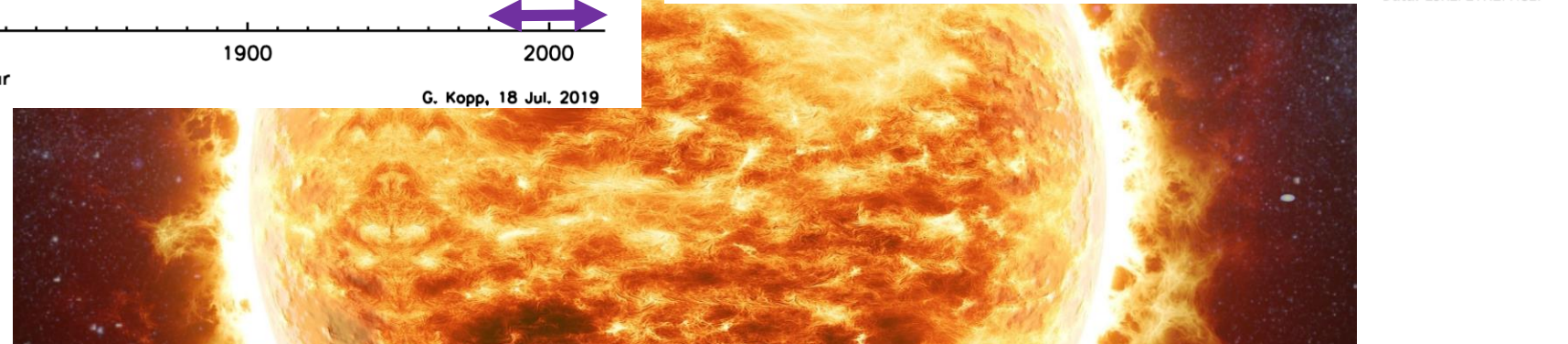
6,378,137m radius of earth
 = 127,792,714,086,000 m^2 surface

= 127,792,714,086,000J/s
 for 31,600,000 seconds / year =
 4,038,249,765,117,600,000,000Joules/yr

Divided by total energy use / yr:
 580,000,000,000,000,000,000 Joules/yr

1 $W/m^2 = 7x$ TOTAL

= 21,000 barrels of oil / sec
 = 2 Hiroshima Events / sec

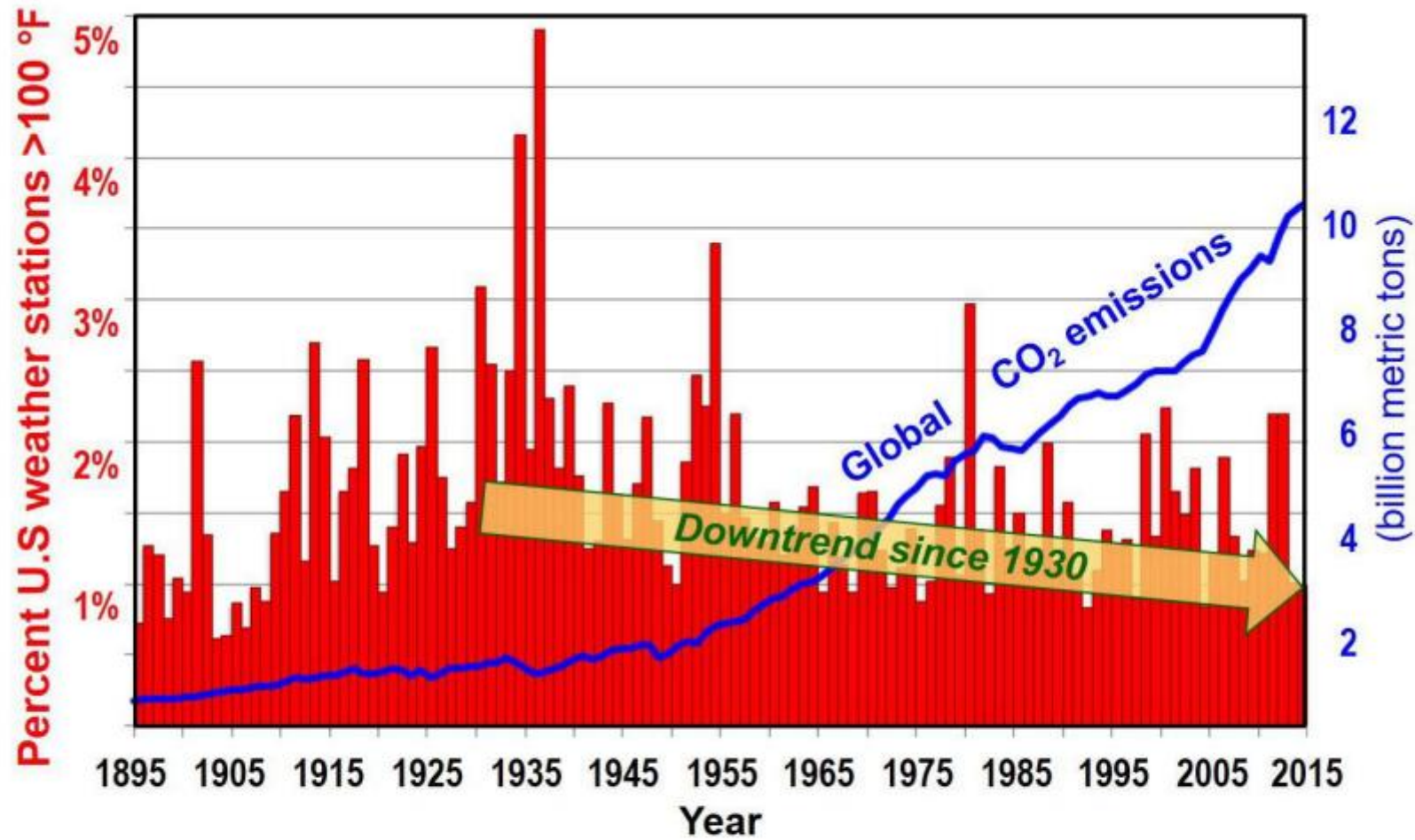


Geneva, 4 February 2010 – The IPCC is an intergovernmental body sponsored by UNEP and WMO. The main decision-making body is the “Panel” which meets at regular intervals in plenary sessions at the level of government representatives of all 194 IPCC member countries. Its role as defined in the “Principles Governing IPCC Work” is “to assess on a comprehensive, objective, open and

human-induced climate change,

mitigation. IPCC reports should be neutral with respect to policy, although they may need to deal objectively with scientific, technical and socio-economic factors relevant to the

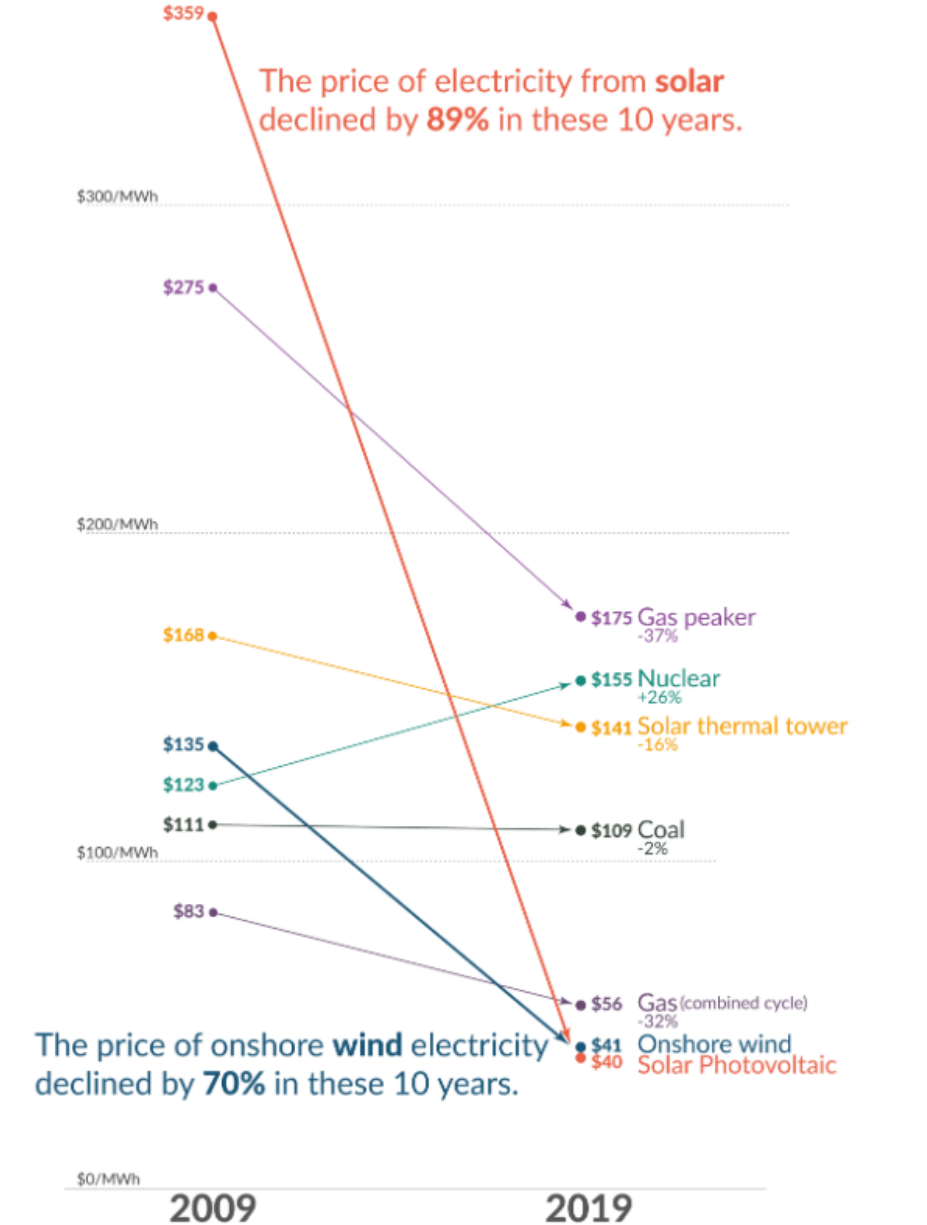




Note in the above chart that there is often an opposite relationship between temperature and CO₂ with the highest temperatures, e.g., in 1935, at low levels of CO₂ and lower temperatures after 1955 in spite of the large increase in CO₂.

The price of electricity from new power plants

Electricity prices are expressed in 'levelized costs of energy' (LCOE). LCOE captures the cost of building the power plant itself as well as the ongoing costs for fuel and operating the power plant over its lifetime.



The price of electricity from solar declined by 89% in these 10 years.

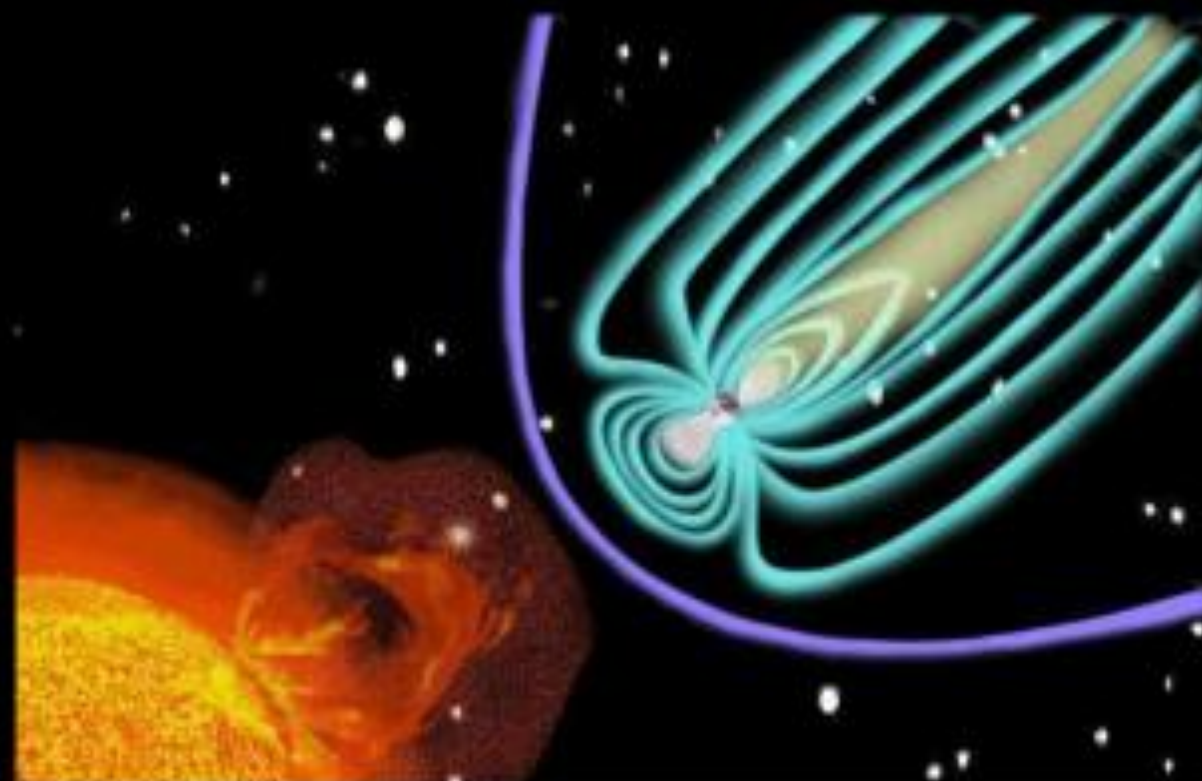
The price of onshore wind electricity declined by 70% in these 10 years.

Earth Scale



Solar Disturbance –E3 Pulse

U.S. Rep Yevette Clark, "The likelihood of a geomagnetic disturbance Event crippling our electric grid affecting the United States is **100%**."



Impacts Earth's magnetic Field

Geomagnetic induced currents (GIC) flows into power lines and transformers causing transformer saturation, overheating, false relay trips, harmonics increase, voltage drops, cascading damage, grid collapse.....

- 1859 Carrington Event
- 1989 Quebec electric grid
- July 2012 Super storm

NOT IF, BUT WHEN"

Geo-Magnetic Storms

- Geomagnetic storms are major disturbances of Earth's magnetosphere that occur when there is a very efficient exchange of energy from the solar wind into Earth's environment. The storms transfer energy into the Earth's magnetosphere, resulting in major changes in currents, plasmas, and fields. They are often caused by coronal mass ejections (CMEs) which are massive eruptions of plasma expelled from the sun's corona.
 - CMEs often occur with solar flares, but each can also take place in the absence of the other. Solar flares emit radiation in all bands of the electromagnetic spectrum, affect little more than radio communication, and arrive in 8 minutes. CMEs take several days to reach Earth.
 - The result of geomagnetic storms is that electric current is generated in the magnetosphere and ionosphere which generates electromagnetic fields at the ground level. The movement of magnetic fields around a conductor induces an electrical current. **The excess current can cause voltage collapse or permanent damage to large transformers.**
 - Geomagnetic storms are classified G1-5:
 - **G5** – Extreme (Kp = 9) (expected 4days/11yrs)– widespread voltage control problems and protective system problems can occur. Some grid systems may experience complete collapse or blackouts. Pipeline currents can reach hundreds of amps.
 - **G4**—Severe (Kp = 8) (60days/11yrs)– possible widespread voltage control problems and some protective systems will mistakenly trip. Induced pipeline currents may effect preventive measures.
 - **G3**—Strong (Kp=7)(130days/11yrs)—voltage corrections may be required, & false alarms triggered
 - **G2**—Moderate (Kp=6)(360days/11yrs)—long duration storms may cause transformer damage,
 - **G1** –Minor (Kp = 5)(900 days/11yrs)—May induce weak power-grid fluctuations.

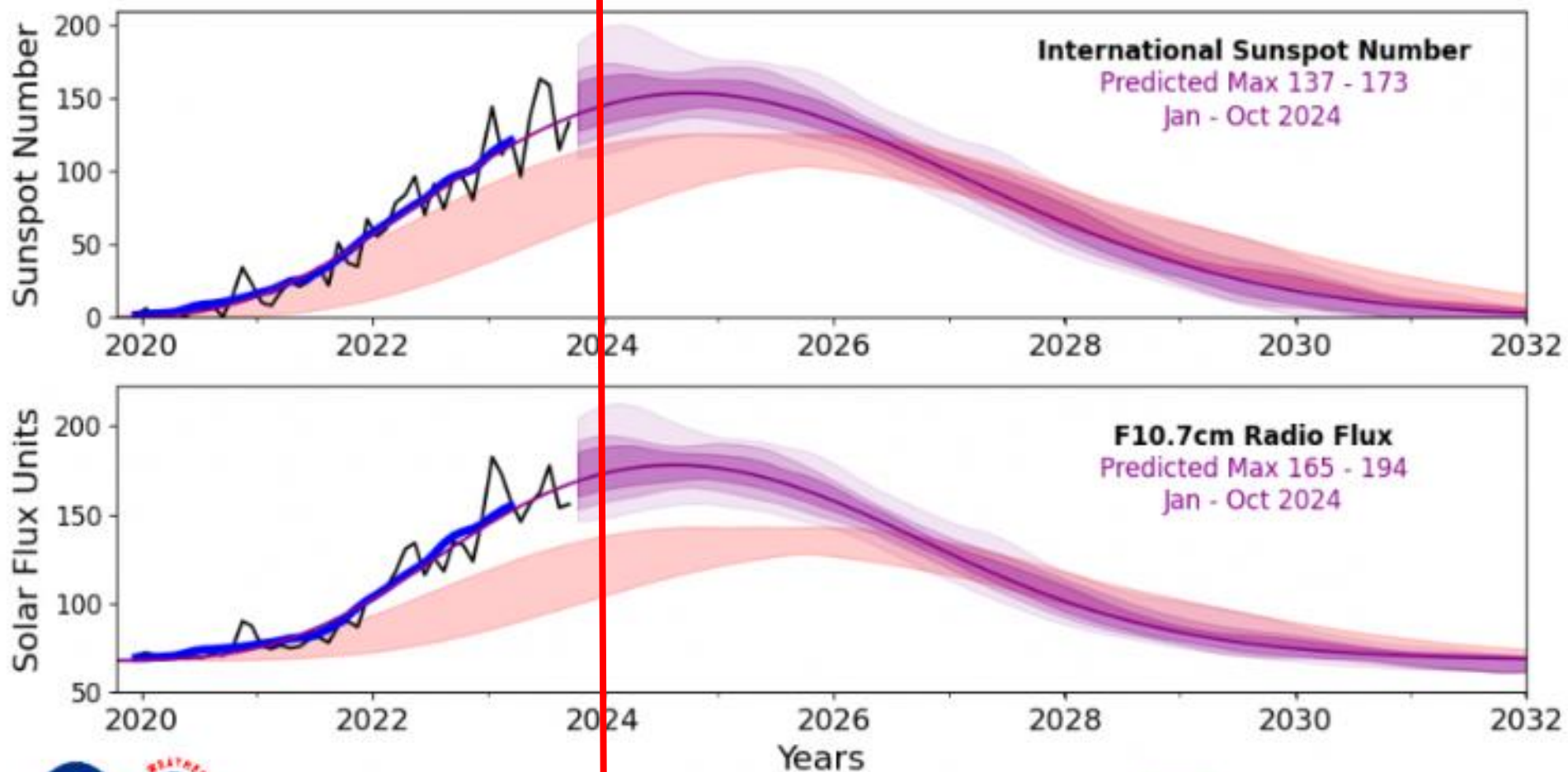
Historicity of Geomagnetic Storms

- Historicity of geomagnetic storms
 - The largest recorded geomagnetic storm occurred Sept 1-2, **1859** – the **Carrington event**. Telegraph wires transmitted electric shocks to operators and ignited fires.
 - **1921**, there was another great geomagnetic disturbance, **the Railroad Storm**. The National Academy of Sciences estimates that if that storm occurred today, it could cause **1-2 trillion dollars** of damage and full recovery could take **4-10 years**. It is based on analysis that predicts it could destroy over 300 transformers in the US and leave 130 million people without power. In a worst-case scenario, it could instantly create a loss of over 70% of the national's electrical service.
 - In March **1989**, a geomagnetic storm caused **the collapse of the power grid in Quebec**, leaving 6 million without power for 9 hours. It is believed to be caused by the simultaneous tripping of seven relays followed by a rapid voltage collapse within about a minute and a half. The same storm destroyed a major transformer at the Salem nuclear plant in New Jersey. This storm was **about 1/10th the intensity of the 1921 Railroad Storm**.
 - On July 23, **2012** a solar storm predicted to be comparable to the Carrington event missed Earth by approximately **nine days**.

A GLANCING-BLOW CME IS COMING (MAYBE): A CME might graze Earth's magnetic field on **March 13th**, according to [a NASA model](#). It was hurled into space two days ago by a strong [M7.4-class solar flare](#) from sunspot AR3599. The glancing blow (if it occurs) will probably cause no more than a minor [G1](#)-class geomagnetic storm. **Aurora alerts:** [SMS Text](#)

NOAA FORECASTS QUICKER, STRONGER PEAK OF SOLAR ACTIVITY

Experimental Solar Cycle 25 Prediction



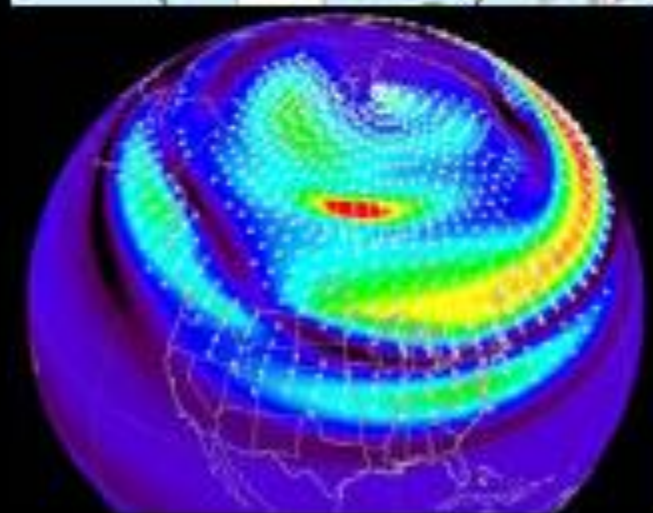
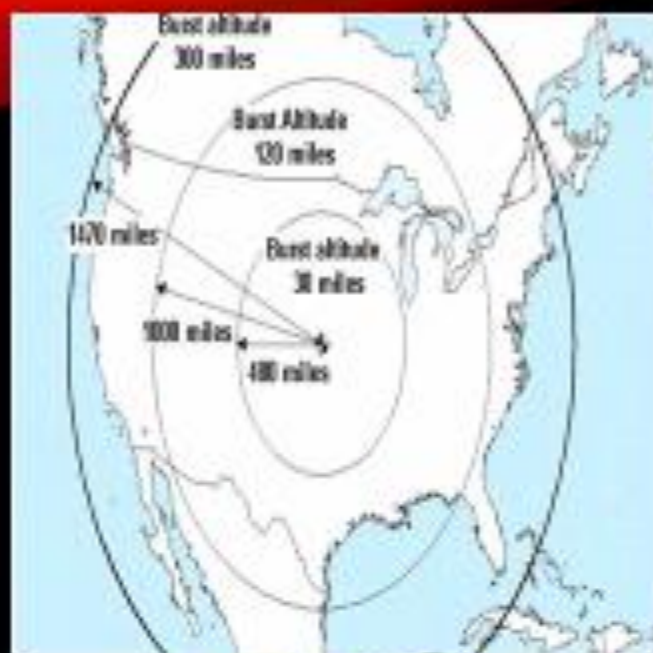
pace Weather Prediction Testbed
issued 19 Oct 2023




- Monthly observations
- Smoothed monthly observations
- 2019 NOAA/NASA/ISES Panel Prediction (range)

- Experimental Prediction
- 25% quartile
- 50% quartile
- 75% quartile

Electro-Magnetic Pulse

- **1. What is an EMP.** An Electromagnetic Pulse (EMP) is a short burst of high magnitude electromagnetic energy. **It may originate from a natural occurrence such as a Coronal Mass Ejections (CME), solar storm causing a geomagnetic disturbance (GMD)** or a hostile state from a nuclear or non-nuclear detonation that creates radiated transient high-magnitude electric and magnetic fields and induced currents in the earth and in the electrical grid.
- **2. Types of EMP.** EMPs are characterized as having three events, E1, E2, and E3
 - **E1** pulse event is by far the most devastating, resulting from gamma radiation Compton electron scattering that is emitted from a nuclear detonation in the upper atmosphere. This event can destroy the functioning of an interconnected electric grid as well as electronics in cars, airplanes, computers and control systems. It is much larger than that of typical lightning.
 - **E2** events follow the initial E1 event within a fraction of a millisecond, and are similar in magnitude to lightning strikes, so electronics can be protected by some surge protectors.
 - **E3** event is different in nature from the previous two in that it results from a time-varying distortion of the Earth's magnetic field, and would continue until the magnetic field stabilizes already stressed electronic systems for seconds or minutes. It produces harmful transients in grid electrical transmission lines, either buried or above ground, as well as communication systems, pipelines, railway transportation tracks. By generating odd harmonics in high voltage transformer cores, saturation occurs with subsequent overheating and failure.



THREAT	Environments	Susceptible Systems	Effects / Duration
High Altitude Nuclear Burst	Gamma-induced EMP (E1)	All electrical, electronic systems	Component Damage / Indefinite 
	Magnetohydrodynamic EMP (MHD EMP or E3)	Long-line network systems incl. Electric Power Grid, Terrestrial Comm. Lines, Pipelines	Component Damage / Indefinite 
	Ionosphere Electrical Properties Perturbation	Radio communication systems and GPS	Wave path degradation / 10's of hours
Solar Tsunamis	Geomagnetic Perturbation (GMP)	Long-line network systems incl. Electric Power Grid, Terrestrial Comm. Lines, Pipelines	Component Damage / Indefinite 
	Ionosphere Electrical Properties Perturbation	Radio communication systems and GPS	Wave path degradation / 10's of hours



“This is like the Maginot Line from World War II: strong, but easily bypassed.”

BLOGS > UNFETTERED BLOG

The U.S. electric industry is not responding to cyber-vulnerable Chinese equipment

“In May 2020, **Presidential Executive Order 13920** was issued to address the discovery of hardware backdoors in a large Chinese-made transformer installed in a critical substation. Concerns of what might have been installed led to a Chinese power transformer being sent to the U.S. Department of Energy (DOE)’s Sandia National Laboratory (SNL) for detailed inspection.

Chillingly, the results of the SNL inspection report were highly classified.”

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”

- Brundtland Commission 1987

“what is not secure, is not sustainable”

- Karthik Krishna 2021

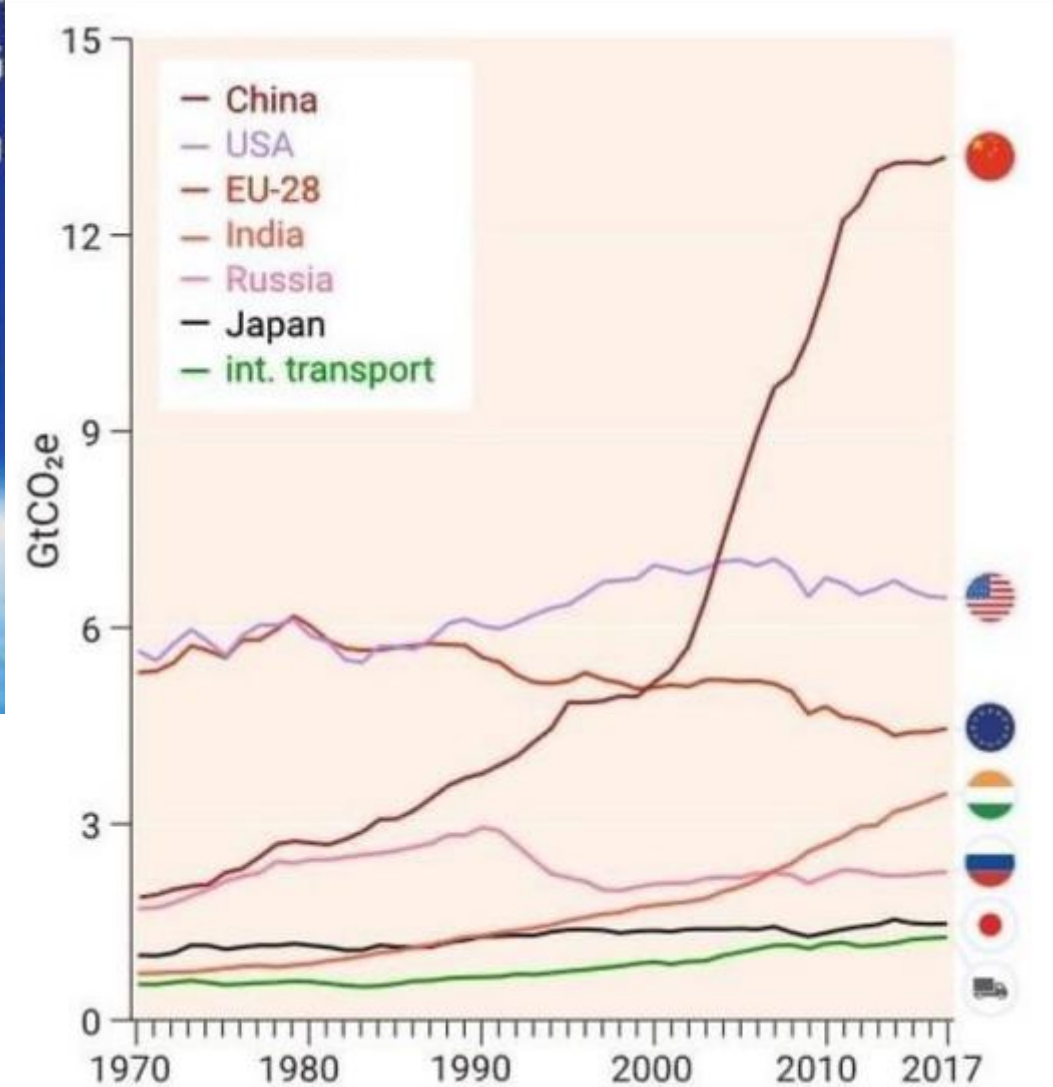
从巴黎到杭州 应对气候变化在行动

FROM PARIS TO HANGZHOU, CLIMATE RESPONSE IN ACTION

气候变化《巴黎协定》批准文书交存仪式

DEPOSIT OF INSTRUMENTS OF RATIFICATION OF THE PARIS AGREEMENT

中国·杭州 2016年9月3日 HANGZHOU CHINA SEPTEMBER 3, 2016



Air Pollution

- Delhi's air quality is 15 times worse than WHO guidelines
- This has damaged the lung function of half of Delhi's 4.4 million children so severely that they **will NEVER FULLY RECOVER**



NEWS • LIVE TV INDIA TODAY
APP MAGAZINE

HOME MY FEED INDIA WORLD BUSINESS TECH MOVIES

BEST UNIVERSITIES News / SCIENCE / New WHO air quality guidelines show almost all of India is polluted

New WHO air quality guidelines show almost all of India is polluted

WhatsApp icon

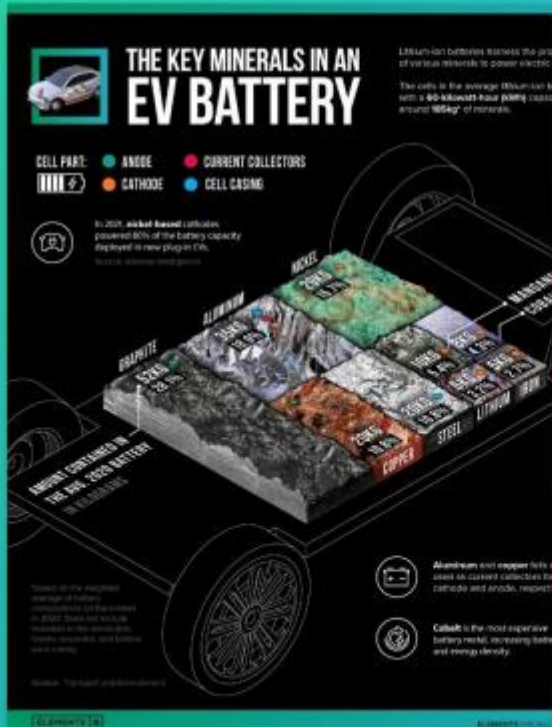
Dubious distinction

Fifteen cities from India figure among the 20 most polluted places across the globe

Rank	City	2018*
1	Gurugram	135.8
2	Ghaziabad	135.2
3	Faisalabad, Pakistan	130.4
4	Faridabad	129.1
5	Bhiwadi	125.4
6	Noida	123.6
7	Patna	119.7
8	Hotan, China	116
9	Lucknow	115.7
10	Lahore, Pakistan	114.9
11	Delhi	113.5
12	Jodhpur	113.4
13	Muzaffarpur	110.3
14	Varanasi	105.3
15	Moradabad	104.9
16	Agra	104.8
17	Dhaka, Bangladesh	97.1
18	Gaya	96.6
19	Kashgar, China	95.7
20	Jind	91.6

*Average PM2.5 in $\mu\text{g}/\text{m}^3$

Electric Vehicles - “Green Champion”



- Tesla was ranked 22nd in the “Toxic Air Polluters Index”
- China is the leading country for processing key minerals and electric vehicles battery production
- Mining has been known to cause pollution of water systems, deforestation, and the displacement of native fauna and flora



Electric Vehicles - The Bad

- Manufacturing, charging, operating, and disposing of electric vehicles **produces more of every major category** of pollutants when compared to conventional cars
 - 26% increase in fine particulate matter formation
 - 20% increase in human carcinogenic
 - 39% increase in freshwater ecotoxicity

NO It's NOT A Transition From Fossil Fuel Energy To Renewable Energy

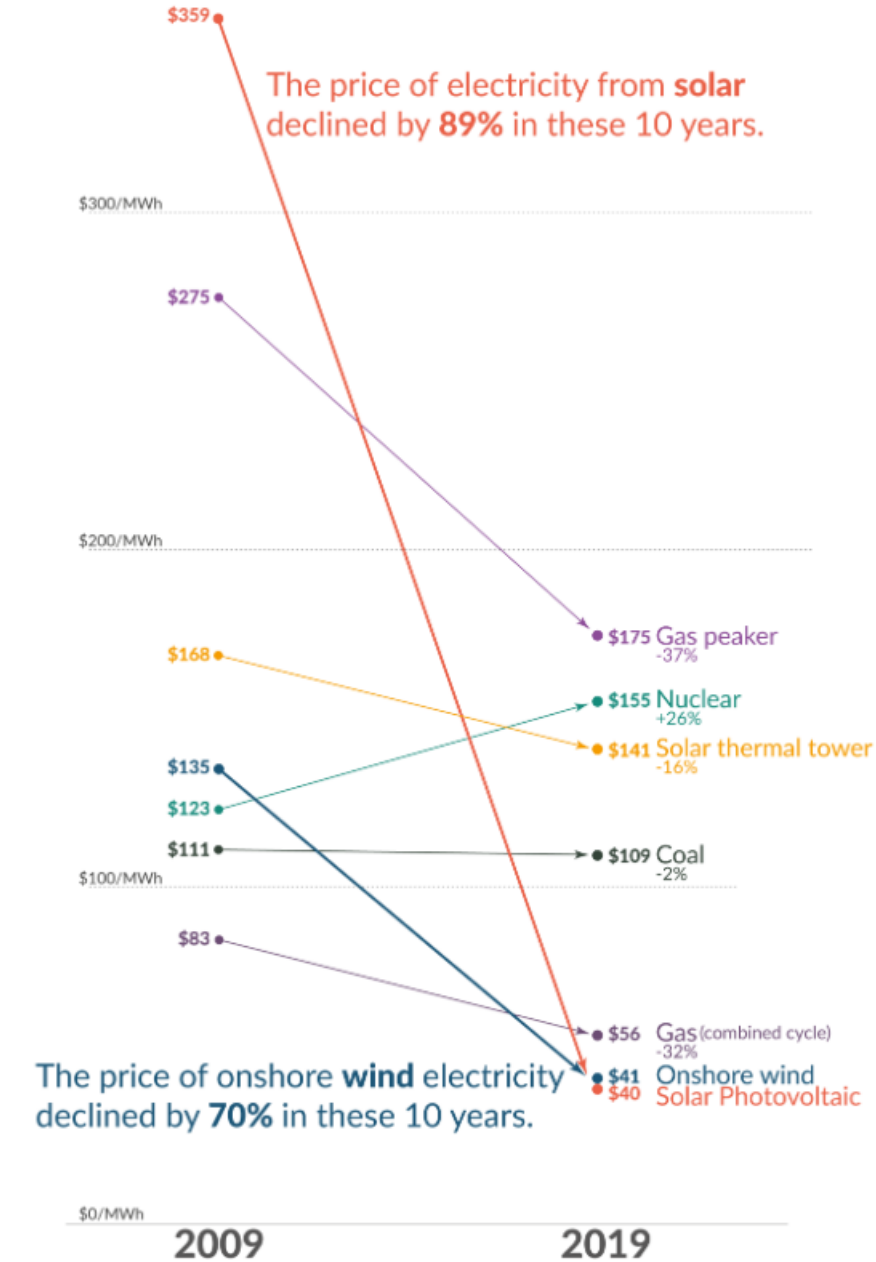


It's A Transition From Fossil Fuel Extraction To Minerals Extraction



The price of electricity from new power plants

Electricity prices are expressed in 'levelized costs of energy' (LCOE). LCOE captures the cost of building the power plant itself as well as the ongoing costs for fuel and operating the power plant over its lifetime.



Carbon Brief's Paris climate pledge tracker : INDC database

Country	Date	Summary of the I/INDC	Link to I/INDC	Share of 2012 GHG
China	30/06/2015	A peak in carbon dioxide emissions by 2030, with best efforts to peak earlier. China has also pledged to source 20% of its energy from low-carbon sources by 2030 and to cut emissions per unit of GDP by 60-65% of 2005 levels by 2030, potentially putting it on course to peak by 2027.	http://www4.unfccc.int/ndcre	23.75%
USA	31/03/2015	[The US plans to withdraw from Paris and not meet this pledge] 26-28% domestic reduction in greenhouse gases by 2025 compared to 2005, making its best effort to reach the 28% target. This includes the land sector and excludes international credits at this time. Carbon Brief has a more detailed article on the US INDC.	http://www4.unfccc.int/ndcre	12.10%
EU	06/03/2015	At least a 40% domestic reduction in greenhouse gases by 2030 compared to 1990 levels. Carbon Brief has a more detailed article on the EU INDC.	http://www4.unfccc.int/ndcre	8.97%
India	01/10/2015	A 33-35% reduction in emissions intensity by 2030, compared to 2005 levels. Also pledges to achieve 40% of cumulative electricity installed capacity from non-fossil fuel based resources by 2030. Will also increase tree cover, creating an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent by 2030. India intends to cover the \$2.5 trillion cost of its pledge with both domestic and international funds. Includes information on adaptation.	http://www4.unfccc.int/ndcre	5.73%



Ask MIT Climate

The Earth's natural carbon cycle moves a staggering amount of carbon dioxide (CO₂) around our planet, says Daniel Rothman, MIT professor of geophysics. Some parts of the planet, such as the oceans and forests, absorb carbon dioxide and store it for hundreds or thousands of years. These are called natural carbon sinks. Meanwhile, natural sources of CO₂ such as undersea volcanoes and hydrothermal vents release carbon. Altogether the planet absorbs and emits around 100 billion metric tons of carbon through this natural cycle every year, Rothman says.

That's equivalent to over 350 billion tons of CO₂.

Over thousands or millions of years, the creeping movement of our planet's tectonic plates brings those fossil fuels back to the Earth's surface and slowly emits the CO₂ into the air. But mining those fossil fuels and then burning them in cars or factories shortcuts nature's method. "That full [natural] process would eventually bring it all up—but very slowly," Rothman says. "What we're doing with taking oil and gas out of the ground is essentially speeding up the natural process."