# LAND BASED NATURAL GAS COMBINED CYCLE (NGCC) MAY BE

## MORE RELIABLE, REDUCE MORE CARBON DIOXIDE AND BE MORE COST EFFECTIVE

#### THAN

# OFF SHORE OCEAN BASED WIND POWER SYSTEMS (EITHER WITH OR WITHOUT NGCC BACKUP)

by

John Stamberg PE, retired former Vice President and Owner of Energy Ventures Analysis Inc

for

Public Comment Period September 9, 2024



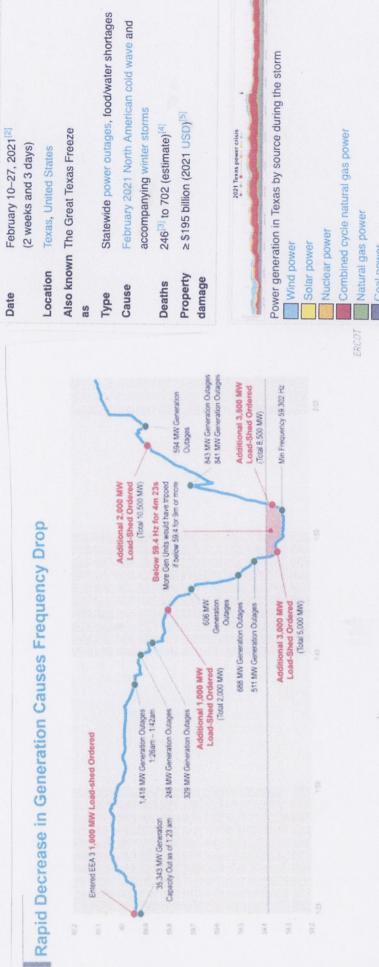


#### PURPOSE

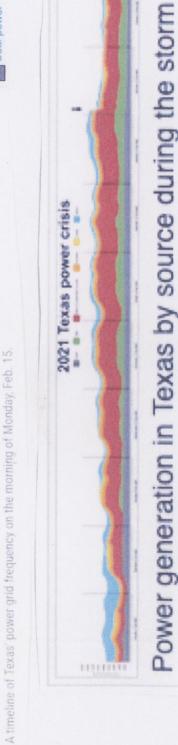
The purpose of my effort is to document the quantifiable characteristics and analyze the offshore wind project which has a proposed goal to reduce use of fossil fuels at all costs. The project is an incomplete project because it has no proposed backup to make this project reliable. In February 2021 the ERCOT electrical grid in Texas misused the intermittent and highly variable wind and solar projects as if they were reliable. This resulted in a major disaster as shown in Display 1. The deaths were between 246 to 702 and the damage cost was greater than or equal to \$195 billion. The Federal Energy Regulatory Commission (FERC) and the National Renewal Energy Lab (NREL) are both pursuing how to regulate wind and solar to best fund an approach to handle reliability of wind and solar to avoid another Texas disaster..

The offshore windmill project should provide electricity reliably under the FERC/NREC legal requirements.. The project should provide FERC/NREL reliability and not save fossil fuels at all costs.

4







weather; natural gas, coal, nuclear and wind energy sources were all failing. Equipment and pipelines were freezing up. At 12:15 a.m. Monday, ERCOT went to its first level of Meanwhile, power plants across the state were going offline because of the cold energy emergency alert.

#### **APPROACH**

First I considered all potential projects that were capable of RELIABILITY of the electric system and as required by FERC/NREL rules.

Second I used an apples to apples source that could be used to compare potential projects without using isolated differently based information. The US Electric Information Administration (EIA) prepared such documents in 2022 which are based on the 2021 dollar value - Display 2. In my calculations I did not adjust the cost for inflation or floating towers. That can be done if and when there is agreement on the impact of the calculations. I based my calculations on a 100MW size facility at 100% capacity. This assumption favors ocean offshore economics because the very high initial capital cost of the windmills is diluted by maximum production of wind electrical wind power.

The projects I selected to evaluate are:

#### **Natural Gas Combined Cycle (NGCC)**

This technology uses a natural gas fired turbine (like a jet engine) to power a generator and the turbine hot exhaust is used to produce steam to run another power generator. This system produces a kilowatt hour (KWH) of electricity at a real rate of 6600BTU/KWH.

#### **Natural Gas Combustion Turbine**

This technology is similar to the NGCC described above but the turbine exhaust does not make steam based electricity. The capital cost is lower but it has a higher heat rate of 10,000BTU/KWH.

#### Ocean Offshore Wind Turbines

With NGCC to make the system FERC/NREL reliable.

#### Ocean Offshore Wind Turbines

With CT to make the system FERC/NREL reliable.

#### Ocean Offshore Wind Turbines

Without any backup to be FERC/NREL reliable

All of the wind conditions in the United States are best in the ocean offshore - Display 3. The dark blue areas of the coast are superior to most land based areas but the ocean windmills are costly. Wind turbine technology has evolved - Display 4. Modern wind turbines need to use exacting control to get maximum electricity production from ideal wind speeds of about 14mph to 25mph. Even more controls are needed to get electricity from lower wind speeds of 5mph to 14mph – Display 5. Wind shifts can be a land breeze, an ocean breeze or from various directions. Funding for this control equipment and personnel may not be recognized in the cost of the proposed offshore windmill project.

Table 1b. Estimated unweighted levelized cost of electricity (LCOE) and levelized cost of storage (LCOS) for new resources entering service in 2027 (2021 dollars per megawatthour)

Plant type	Capacity factor (percent)	Levelized capital	Levelized fixed O&M <sup>a</sup>	Levelized variable cost	Levelized transmis- sion cost	Total system LCOE or LCOS	Levelized tax credit <sup>b</sup>	Total LCOE or LCOS including tax credit
Dispatchable technologie	s							
Ultra-supercritical coal	85%	\$52.11	\$5.71	\$23.67	\$1.12	\$82.61	NA	\$82.61
Combined cycle	87%	\$9.36	\$1.68	\$27.77	\$1.14	\$39.94	NA	\$39.94
Advanced nuclear	90%	\$60.71	\$16.15	\$10.30	\$1.08	\$88.24	-\$6.52	\$81.71
Geothermal	90%	\$22.04	\$15.18	\$1.21	\$1.40	\$39.82	-\$2.20	\$37.62
Biomass	83%	\$40.80	\$18.10	\$30.07	\$1.19	\$90.17	NA	\$90.17
Resource-constrained tec	chnologies							
Wind, onshore	41%	\$29.90	\$7.70	\$0.00	\$2.63	\$40.23	NA	\$40.23
Wind, offshore	44%	\$103.77	\$30.17	\$0.00	\$2.57	\$136.51	-\$31.13	\$105.38
Solar, standalone <sup>c</sup>	29%	\$26.60	\$6.38	\$0.00	\$3.52	\$36.49	-\$2.66	\$33.83
Solar, hybrid <sup>c,d</sup>	28%	\$34.98	\$13.92	\$0.00	\$3.63	\$52.53	-\$3.50	\$49.03
Hydroelectric <sup>d</sup>	54%	\$46.58	\$11.48	\$4.13	\$2.08	\$64.27	NA	\$64.27
Capacity resource techno	logies							
Combustion turbine	10%	\$53.78	\$8.37	\$45.83	\$9.89	\$117.86	NA	\$117.86
Battery storage	10%	\$64.03	\$29.64	\$24.83	\$10.05	\$128.55	NA	\$128.55

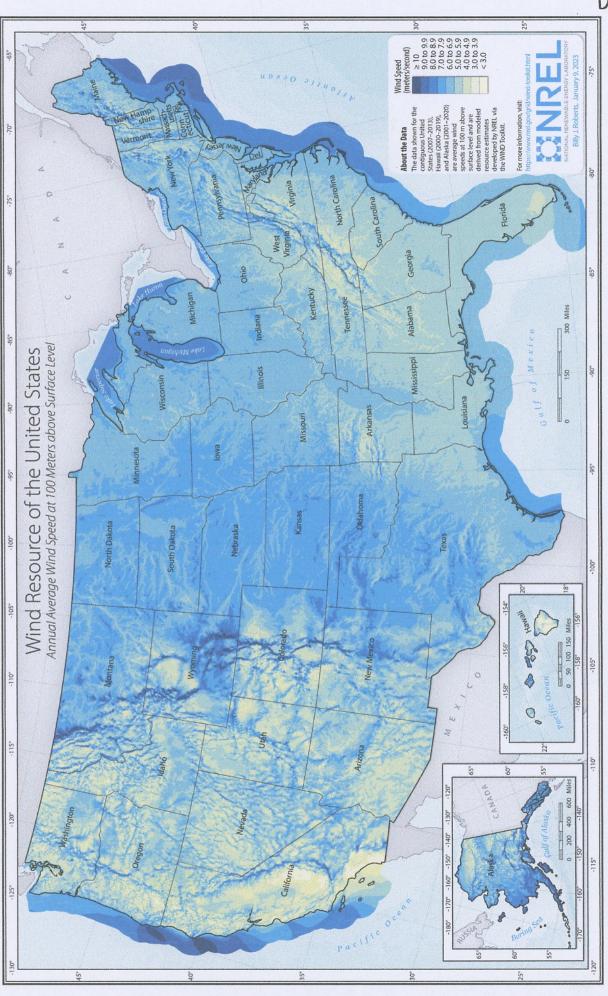
Source: U.S. Energy Information Administration, Annual Energy Outlook 2022

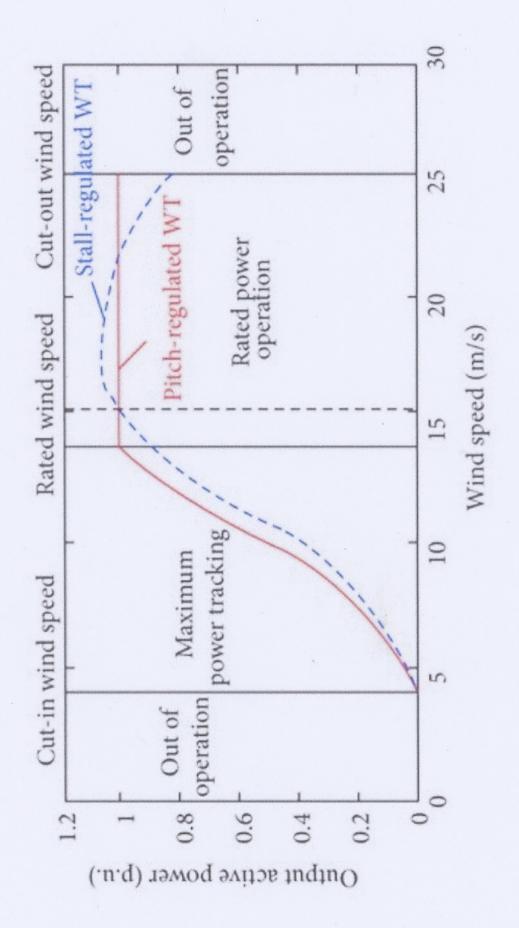
<sup>&</sup>lt;sup>a</sup>O&M = operations and maintenance

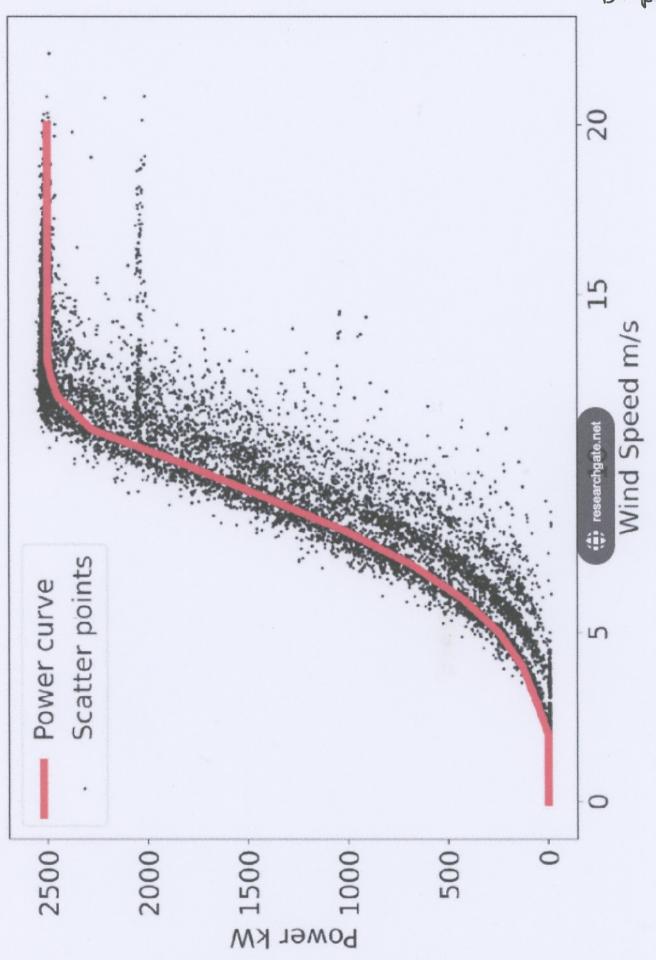
<sup>&</sup>lt;sup>b</sup> The tax credit component is based on targeted federal tax credits such as the Production Tax Credit (PTC) or Investment Tax Credit (ITC) available for some technologies. It reflects tax credits available only for plants entering service in 2027 and the substantial phaseout of both the PTC and ITC as scheduled under current law. Technologies not eligible for PTC or ITC are indicated as *NA*, or *not available*. The results are based on a regional model, and state or local incentives are not included in LCOE and LCOS calculations. See text box on page 2 for details on how the tax credits are represented in the model.

<sup>&</sup>lt;sup>c</sup>Technology is assumed to be photovoltaic (PV) with single-axis tracking. The solar hybrid system is a single-axis PV system coupled with a four-hour battery storage system. Costs are expressed in terms of net AC (alternating current) power available to the grid for the installed capacity.

<sup>&</sup>lt;sup>d</sup> As modeled, we assume that hydroelectric and hybrid solar PV generating assets have seasonal and diurnal storage, respectively, so that they can be dispatched within a season or a day, but overall operation is limited by resource availablility by site and season for hydroelectric and by daytime for hybrid solar PV.







In my approach the goals of the project should focus on the issues listed below which are prioritized in order of importance.

- 1. RELIABILITY per FERC/NREL to avoid another ERCOT Texas catastrophe.
- 2. COST AND COST EFFECTIVENESS per the financial cost/cost effectiveness when "pay check to pay check" is now one word and inflation has become daily news. People, commerce and industry need to be cost conscious.
- 3. REDUCE FOSSIL FUEL USE AT ALL COSTS needs to be questioned and not based on media, political and governmental rhetoric, non fact based information or weather reports declaring that a state or city is hot today. Terminology such as <u>existential</u> may be <u>trivial</u> or even a <u>hoax</u>. Information leads me to question this goal Display 6. References that I used to make my statements:

Display 6 History of the Earth's Evolution

Display 7 Glacial or Interglacial Periods over the last 400,000 plus years with global glacial cooling at 65% of the time versus, interglacial warming of 37% of the time conditions, years of melting

Display 8 Atmospheric CO2 over millions of years

Display 9 Relative Photosynthetic Rates vs CO2 concentrations

Display 10 Two Princeton, MIT Scientists Say EPA Climate Regulations Based on Hoax

Subjective values for health, air quality, recreation, fishing days, surfing days, boating days or swimming days etc are not quantified in this analysis.

#### EARTH HISTORY EVOLUTION

Earth Formed 46 billion years ago First Photosynthesis Bacteria Found 3400 million years ago First Cyno Bacteria Found 2700 million years ago First Evidence of Atmospheric Oxygen Found

2300 million years ago

Red & Brown Algae Found

1200 million years ago

Green Algae Found

750 million years ago

First Vascular Plants Found

423 million years ago

Dinosaurs Emerge

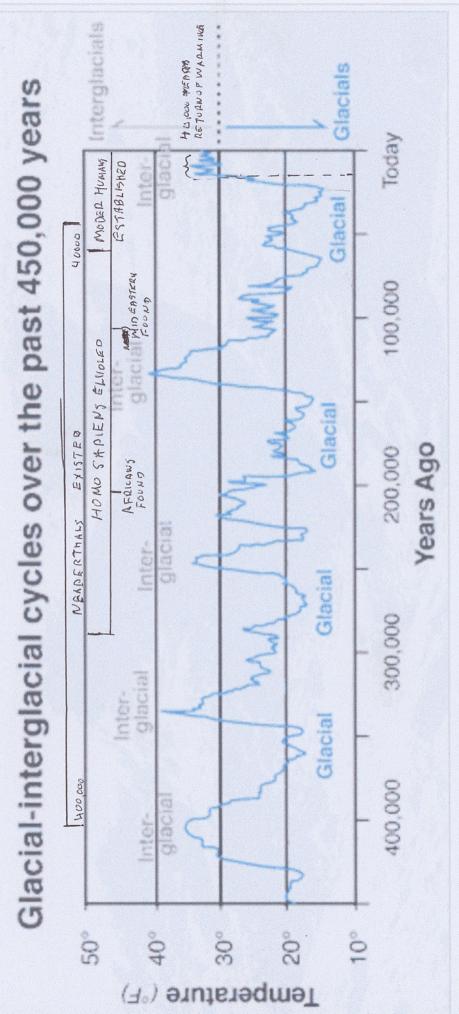
175 million years ago

Dinosaurs Extinct

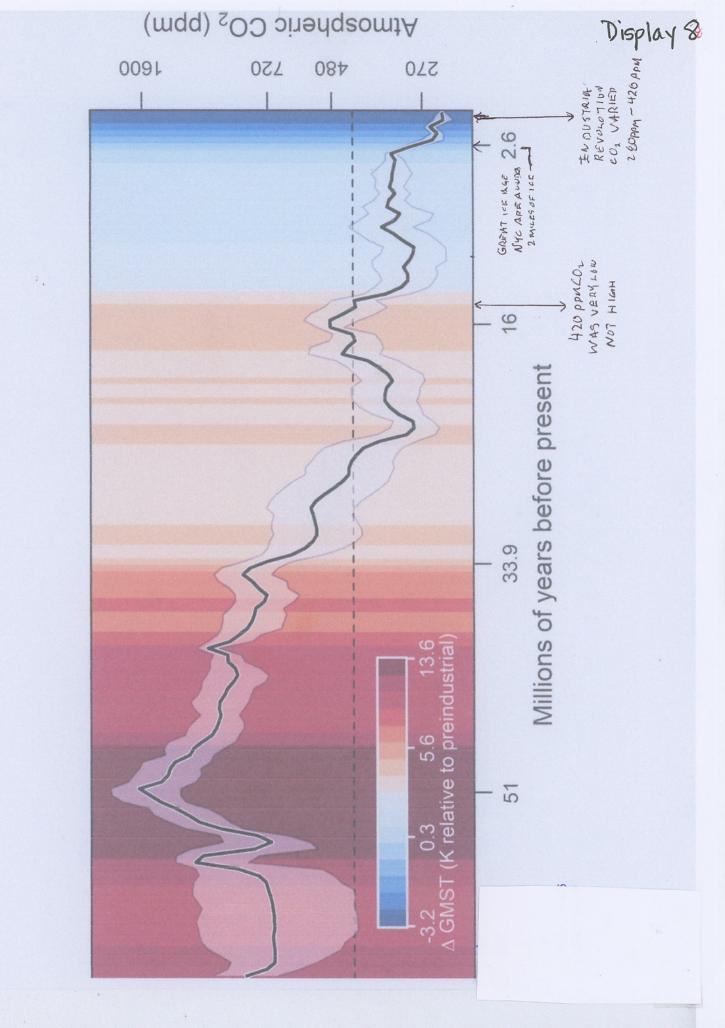
65 million years ago

#### THE EARTH COMES ALIVE THANKS TO PHOTOSYNTHESIS & SUNLIGHT This occurred at the end of the Cenozoic Era when earth tectonics matured

		- 420,000 years ago	
Fadu Na and adhala	400 000		400,000 years of cooling
Early Neanderthals	400,000 years ago	-380,000 years ago	55,000 years of warming
		-325,000 years ago ————	oo,ooo jaab oi mammig
Early Homo Sapiens	315,000 years ago		185,000 years of cooling- except 30,000 years of warming@ 240,000 years ago
Early African Humans	200,000 years ago		
		-140,000 years ago	
		-140,000 years ago	30,000 years of warming
Early Mid Eastern Humans	100,000 years ago	-110,000 years ago	
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	70,000 years of cooling
		-40,000 years ago	
Modern Humans Prevail	50,000 years ago		40,000 years of warming Note: 5 mini cycles of warming & cooling occurred
TODAY	0 years ago	£*	NOW



Glacials historically last anywhere from 7 to 9 times longer than interglacials.[7] Figure 2: Glacial-interglacial cycles over the past 450,000 years to present.



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300 & 550 600 1.15 = 17.69 mease int current 320-750 910 pm.
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Why

Market process

Display 9

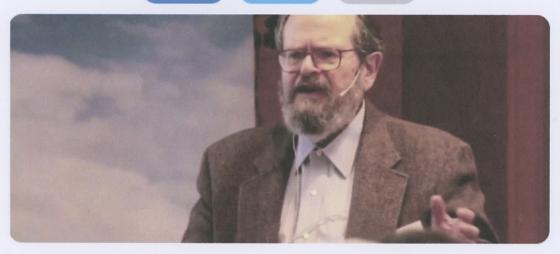
08.14.2023

# Two Princeton, MIT Scientists Say EPA Climate Regulations Based on a 'Hoax'









Physicist, meteorologist testify that the climate agenda is 'disastrous' for America

Published first at the Epoch Times

By Kevin Stocklin

8/12/2023

#### I. Summary.

X

#### A. EPA Failed to Consider Important Aspects of Climate Change.

In our opinion, the EPA's Proposed Rule entirely fails to follow the *State Farm* mandate (and that of the scientific method) to consider each important aspect and relevant data on the issue of climate change.

A cornerstone of modern administrative law, the Supreme Court's *State Farm* decision defines as arbitrary and capricious an agency rulemaking where, *inter alia*, "the agency has ... entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency." 463 U.S. at 42.

Time and again, courts have applied *State Farm*'s principles to invalidate agency rules where the agency failed to consider an important aspect of the problem, or cherry-picked data to support a preordained conclusion. *See, e.g., Dep't of Homeland Sec. v. Regents of the Univ. of Calif.*, 140 S. Ct. 1891, 1913 (2020) (an agency official "entirely failed to consider ... [an] important aspect of the problem." and that "omission alone renders ... [the official's] decision arbitrary and capricious"); *Am. Clinical Lab'y Ass'n v. Becerra*, 40 F.4th 616, 625 (D.C. Cir. 2022) (agency rule deemed arbitrary and capricious where "the agency, without adequate explanation, exempted a sizable portion of the laboratories covered by the statute from data reporting requirements"); *Natl. Lifeline Ass'n v. FCC*, 921 F.3d 1102, 1112 (D.C. Cir. 2019) (agency rule deemed arbitrary and capricious where agency departed from its "prior forbearance policy without reasoned explanation and failing to consider key aspects of the program").

The Proposed Rule flunks this basic requirement by entirely failing to consider several important aspects of climate change and relevant data:

First, Carbon Dioxide Is Essential to Life Social Benefits. Carbon dioxide is essential to life, creating via the process of photosynthesis the food we eat and the oxygen we breathe. Without carbon dioxide, there would be no human life or other life on earth.

Further, increased levels of carbon dioxide in the atmosphere create more food for people worldwide, including more food for people in drought-stricken areas. To illustrate, increases in carbon dioxide over the past two centuries since the Industrial Revolution, from about 280 parts per million (ppm) to about 420 ppm, <sup>3</sup> caused an approximate 20% increase in the food available to people worldwide, as well as increased greening of the planet and a benign warming in temperature.

Second, Fossil Fuel's Extraordinary Social Benefits. Fossil fuels also have extraordinary social benefits. They are indispensable in creating nitrogen fertilizer and pesticides that feed nearly half the world; their combustion releases carbon dioxide and thus increases plant growth via increased CO<sub>2</sub> fertilization effect, creating more food worldwide; and they provide the most reliable, efficient and low-cost energy for many uses, including the production of 61% of the nation's electricity.

Third, The Consequences of Net Zero Are Disastrous. Corresponding to these benefits are the disastrous consequences that would flow from "net zeroing" fossil fuels and carbon dioxide and eliminating the enormous social benefits they provide, including the disastrous consequences of eliminating 61% of the nation's electricity provided by fossil fuel power plants.

The number of people worldwide who are moderately or severely food insecure is 2.3 billion, including over 900 million who face severe food insecurity. Each ton of carbon dioxide emissions eliminated reduces the amount of food available worldwide. "Net zero" would reduce carbon emissions by over 40 gigatons (Gt) every year, and consequently would proportionally reduce the amount of food produced.

As to fossil fuels, one of us (Happer) has made clear that without the "use of inorganic [nitrogen] fertilizers" derived from fossil fuels, the world simply "will not achieve the food supply needed to support 8.5 to 10 billion people," resulting in widespread starvation.

Fourth, The Scientific Method Proves There Is No Risk That Fossil Fuels and Carbon Dioxide Will Cause Catastrophic Warming and Extreme Weather.

- All of the models that predict catastrophic global warming fail the key test of the scientific method: they grossly overpredict the warming versus actual data.
- 600 million years of data prove that today's CO<sub>2</sub> level of 420 parts per million (ppm) is very low, not high.
- 600 million years of data show that higher levels of CO<sub>2</sub> do not cause or even correlate with higher temperatures.

<sup>&</sup>lt;sup>3</sup> CO<sub>2</sub> levels cited in this comment vary between 400 and 420, depending on when, between 1900 and present day, the levels were measured according to the cited material.

<sup>&</sup>lt;sup>4</sup> United Nations, The State of Food Security and Nutrition in the World, xvii (2022).

<sup>&</sup>lt;sup>5</sup> William Happer, et al., Nitrous Oxide and Climate, CO<sub>2</sub> COALITION (Nov. 10, 2022), at 39 (emphasis added).

A blank chart of the non quantified or potential not yet identified information that has not been made or revealed is provided in Display 11. Examples are: demolition of the windmills, fossil fuel, transmission equipment at end of use. Performance bonds for construction and end use are needed so that the citizens are protected from bankruptcy or abandonment of the project, operation and maintenance costs (O&M), fuel costs, quid offered or paid to towns, their fire or police companies and NGO's.

#### Non Quantified or Potential Not Yet Identified Information that have Not Been Made or Revealed

	A		С			В	С		С
End of Use o	r Demol	ition Costs	Performance	Bonds	Quid	pro Quo	Inform	ation	Change Order
Wind Equipment	Fossil Fuel Equip	Transmission Equipment	Construction	End of Use	Quid	Quo	ОЗМ	Fuel	??
			THIS INF MU EVELOPED ORE ANY DE	ST BE & MAI	DE PUE		E		
Footnote A			Footn	ote B			Footno	ote C	
Define equipment to be "end of use" if equipment unused or in disrepair for 1 year or other reasonable period.			Feder Govt Taxin	Include: Federal or State Govt Funding or Taxing Change			should annual	be upo	lated
				or Citie Dept fun					
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			Other	S					

#### **FINDINGS**

Display 12 entitled "Sample Calculation to Compare Reliability, Cost and Cost Effectiveness" of five technologies shows my findings. Two land based technologies and three ocean based technologies are evaluated. The findings are:

- 1. Funding just ocean based windmills without a backup system is unwise at best:
  - It is not reliable per FERC/NREL guidelines.
  - It is too expensive at \$594 million for electricity production only 20% of the time.
  - It only saves 101,790 tons of CO2 emissions.
  - It results in a ridiculous cost of \$5843 to remove one ton of CO<sub>2</sub>.
  - It is intermittent, highly variable for an electricity production of only 20%.

This project should focus on the much lower cost of the remaining 80% electricity needed.

- 2. Ocean based technologies with either NGCC or CT should not be selected:
  - These technologies are too costly, \$91 million for NGCC backup and \$78.4 million for CT backup.
  - Land based technologies are much lower in cost without ocean based technologies, solely land based NGCC costs \$29.2 million annually. The lower heat rate at 6600BTU/KWH removed 1.73 times as much CO<sub>2</sub> (176,533 tons removed by land based vs 101,790 tons removed by ocean based). Land based CT only has a lower initial cost because of the high heat rate of 10,000BTU. The annual cost is \$50.3 million per year.

- 3. Land based technologies are cost effective for saving CO2.
  - Land based NGCC eliminates CO<sub>2</sub> at \$165/ton and 173% more CO<sub>2</sub> is eliminated than ocean windmills.
- Land based technology footprint is measured in acres. Ocean based technology is measured in square miles.
- 5. Land based technologies avoid installation of permanent ocean transmission lines, windmills and substations on at or near undisturbed beaches and wildlife habitats which will have an impact on the beach ecology. East coast wind projects may burden Delaware citizens for the benefit of Maryland and other wind projects – Display 15.
- 6. Land based projects take 3 years to design and build. Ocean based projects take 4-6 years or more to design and build per EIA.
- Take a year to select which technology to pursue.
- 80% to 100% of the project can be more cheaply built with a lower final cost and with a 1.73 CO<sub>2</sub>
   emission reduction.
- Pursue land based technology first and see if costly ocean based technology can compete with land technologies in the future.
- My calculations are in line with Display 13 "New Yorkers pay \$155 per Megawatt hour for Wind Power, Current Rate is \$36 per Megawatt hour".

7. The environmental impact of land based technology is less than ocean based technology.

Land based technology lets construction workers and facility workers drive to work rather than swimming or boating to work.

This report was sponsored by the whales.

# BASED ON EIA TABLE 1B ESTIMATED UNWEIGHTED COST OF ELECTRICITY - LCOE IN 2021 AND FOOTNOTES BELOW SAMPLE CALCULATION TO COMPARE RELIABILITY, COST AND COST EFFECTIVENESS

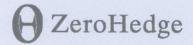
CO <sub>2</sub> SAVED PER TON CO <sub>2</sub>	\$165	base for comparison purposes	\$289	\$377	\$5843
	ò	žą d			
CO <sub>2</sub> SAVED TONS/YEAR	176.553	NONE base for purposes	n 101,790 wind 268,726 NGCC 370,516 Total	101,790 wind 106,300 CT 101,790 Total	101,790 wind NOT RELIABLE
ANNUAL COST	\$29.2 million	\$50.3 million	Wind \$68.7 million @ 80% NGCC \$23.4 million 92.1 million Total	Wind \$68.7 million @ 20% CT \$9.7 million @ 80% @ 80% Thillion @ 80% Thillion total	\$594 million @ 20% capacity
ANNUAL CO <sub>2</sub> EMISSIONS	335,907 tons/year	512,460 tons/year	268,726 tons/year	407,160 tons/year	NONE
COST PER KW	3.33 ¢	5.74 ¢	11.59 ¢	12.07 ¢	13.65 ¢
RELIABILITY	Reliable @ 100% capacity @ 6600 BTU/KWH	Reliable @ 100% capacity @10,000 BTU/KWH	Reliable @ \$10.92/KWH wind @ 20% \$.06/KWH NGCC @ 80% \$11.59/KWH Total	Reliable @ \$10.92/KWH wind @ 20% \$ 1.15/KWH CT @ 80% \$12.07/KWH Total	Not Reliable 5% capacity at rated capacity 15% rated at 50% capacity
TECHNOLOGY RELIABILITY	LAND BASED NGCC	LAND BASED CT	OCEAN BASED NGCC BACKUP	OCEAN BASED CT BACKUP	OCEAN BASED NO BACKUP

Notes:

Low wind 10% below 5 mph 0 wind electricity
Very high wind 10% over 25mph 0 wind electricity
Ideal wind 20% (14-25mph) 5% rated capacity recovered
Transitional wind 60% (5-14 mph) 15% half of rated capacity recovered

New York To Pay \$155 Per Megawatt Hour For Wind-Power, Current Rate Is \$36 Per MWH | ZeroHedge

8/27/24, 2:54 PM



ZeroHedge On a long enough timeline the survival rate for everyone drops to zero.

## New York To Pay \$155 Per Megawatt Hour For Wind-Power, Current Rate Is \$36 Per MWH



BY TYLER DURDEN

SATURDAY, AUG 24, 2024 - 03:10 PM

#### Authored by Mike Shedlock via MishTalk.com.

It currently costs NY about \$36 per MWH for energy. But the state demanded wind. Let's discuss the amazing bottom line results.



So Much for So Little

LOGIN

Display 13

G Log in with Goog	le
OR	
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LOGIN

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GOLD CORE

The Wall Street Journal asks Why Is New York Paying So Much for Wind Power?

New York state signed a contract in June to buy electricity generated by two large wind farms, Empire Wind 1 and Sunrise Wind, off the coast of Long Island. The projects are expected to begin in 2026 and 2027, with power delivered to Brooklyn (Empire) and Long Island (Sunrise). The state will pay \$155 and \$146 per megawatt-hour, respectively. These prices are steep, at least four times the average grid cost paid over the past year.

States agree to pay wind-power operators—known as the "offtake price"—based on a project's "breakeven cost," the estimated bill for building and operating the wind farm over its useful life. That is undoubtedly part of the problem. The offshore wind business off the East Coast is in turmoil. Operators have canceled

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OF TWO MINDS
OIL PRICE

EXPAND

projects from Massachusetts to Display 13 Maryland that were due to be constructed in the next four years. Some have been delayed, while others have renegotiated their contracts at prices 30% to 50% higher than originally promised.

Two widely quoted sources of breakeven costs are the U.S. Energy
Information Administration and Lazard,
an investment bank. In its most recent
estimates, the EIA suggests the
average break-even cost of offshore
wind farms, adjusted to 2024 prices, is
\$131 per megawatt-hour, not counting
government subsidies, and \$101 per
megawatt-hour after allowing for basic
tax credits. The latter figure is what
matters, because every offshore wind
farm expects to take advantage of
investment or production tax credits
under the Inflation Reduction Act.

## EIA Says Wind is Not Economical

Let's pause right there because wind is absurd by any measure.

The cost of wind is \$131 per MWH without credits and \$101 with \$30 in tax credits according to the EIA.

A handout of \$30 is an 83 percent subsidy (30/36) and the deal still is still nearly 100% per MWH in the red, losing \$35 per MWH over the cost of buying energy at market rates.

### A Sweetheart Deal

The deal (thank you team Biden and New York), will pay \$155 and \$146 per megawatt-hour, respectively to Empire Wind 1 and Sunrise Wind.

Display 13

The owner-operators of the two farms—Equinor for Empire and Orsted for Sunrise—are two of the top five global wind-farm investors and operators. Equinor is Norway's state oil company, while Orsted previously was Denmark's.

With a break even cost of \$101 (thanks to subsidies), Equinor will make \$54 per MWH and Orsted will make a mere \$45 per MWH on something whose total cost should be \$36 per MWH.

The Journal calculates Equinor and Orsted (foreign corporations) will each receive a total subsidy of more than \$3 billion courtesy of U.S. taxpayers.

The Journal asks "Did New York sign an agreement that allows large wind-farm operators to earn unreasonably high after-tax profits at the expense of its residents?"

I believe the math speaks for itself.

Not only will New Yorkers pay over four times the going rate for energy, the US will send \$3 billion to foreign companies to do so.

Congrats team Biden and New York State.

## Another Green Energy Company Declares Bankruptcy

Meanwhile, Another Green Energy Company Declares Bankruptcy, Thank Biden's Tariffs

And in case you missed it Ford Loses \$132,000 on Each EV Produced, Good News, EV Sales Down 20 Percent