



# The Role for Coal



## *The Compelling Case for Coal in Light of the Needs of New Mexico, the Nation's Electric Grid & Global Energy Demand*

New Mexico Mining Association  
September 5, 2019

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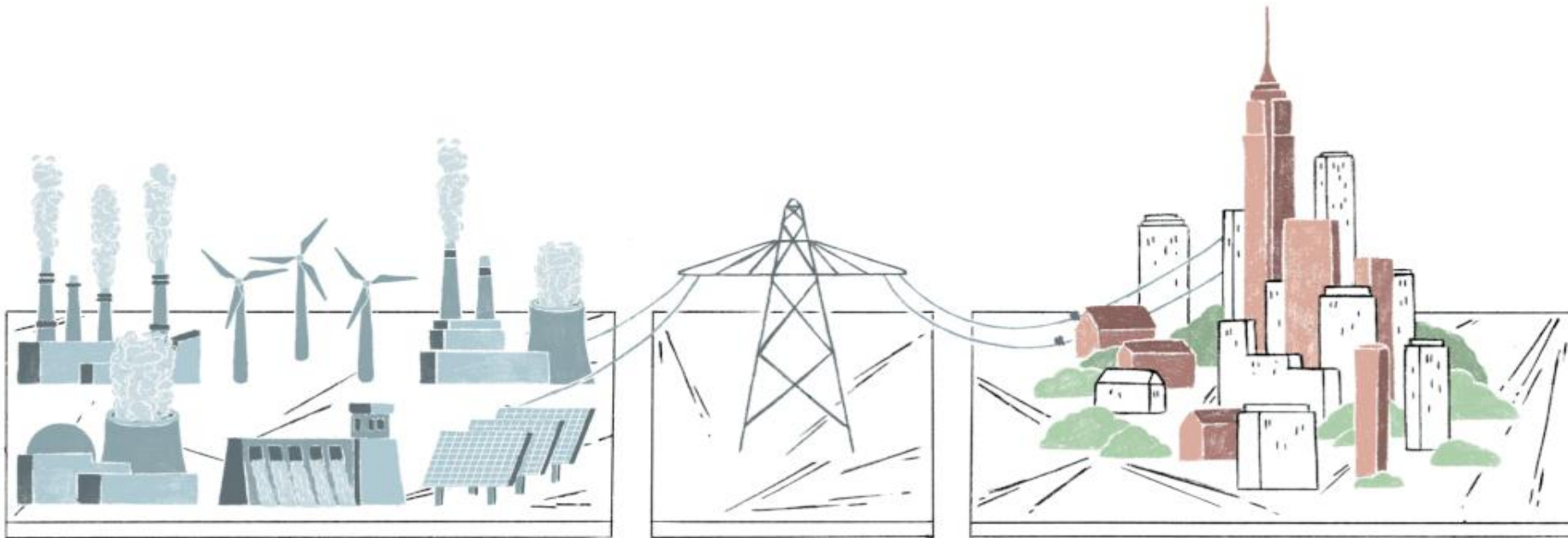
# DISCUSSION OUTLINE



- Electric Grid Fundamentals
- Global Energy Demand Reality Check
- The Environmental Context
- Business Case for CCUS
- The Case & Path Forward for New Mexico CCUS



# *Electricity Grid Fundamentals*



# **Electric Markets are Not Functioning Rationally Due to a Lack of Transparency**



- 1. Markets depend on consumers knowing the true costs of what they are buying – that is NOT happening in electricity markets.**
- 2. Subsidies are hidden from consumers in tax bills.**
- 3. All fuels receive subsidies but there is massive disparity in return on investment (in \$/MW).**
- 4. Direct/Indirect Subsidies Distorting Markets:**
  - Transmission socialized across entire markets.
  - Growing costs of balancing wind & solar.
  - Stranded costs & lack of market signals for capacity.
  - Costs escalate as RE market penetration rises

*The Lack of Transparency in American Power Markets Leads to “Grid Parity” Claims & and “100% Renewable” Mandates that Mislead Ratepayers & Endanger Grid Reliability & Resilience.*

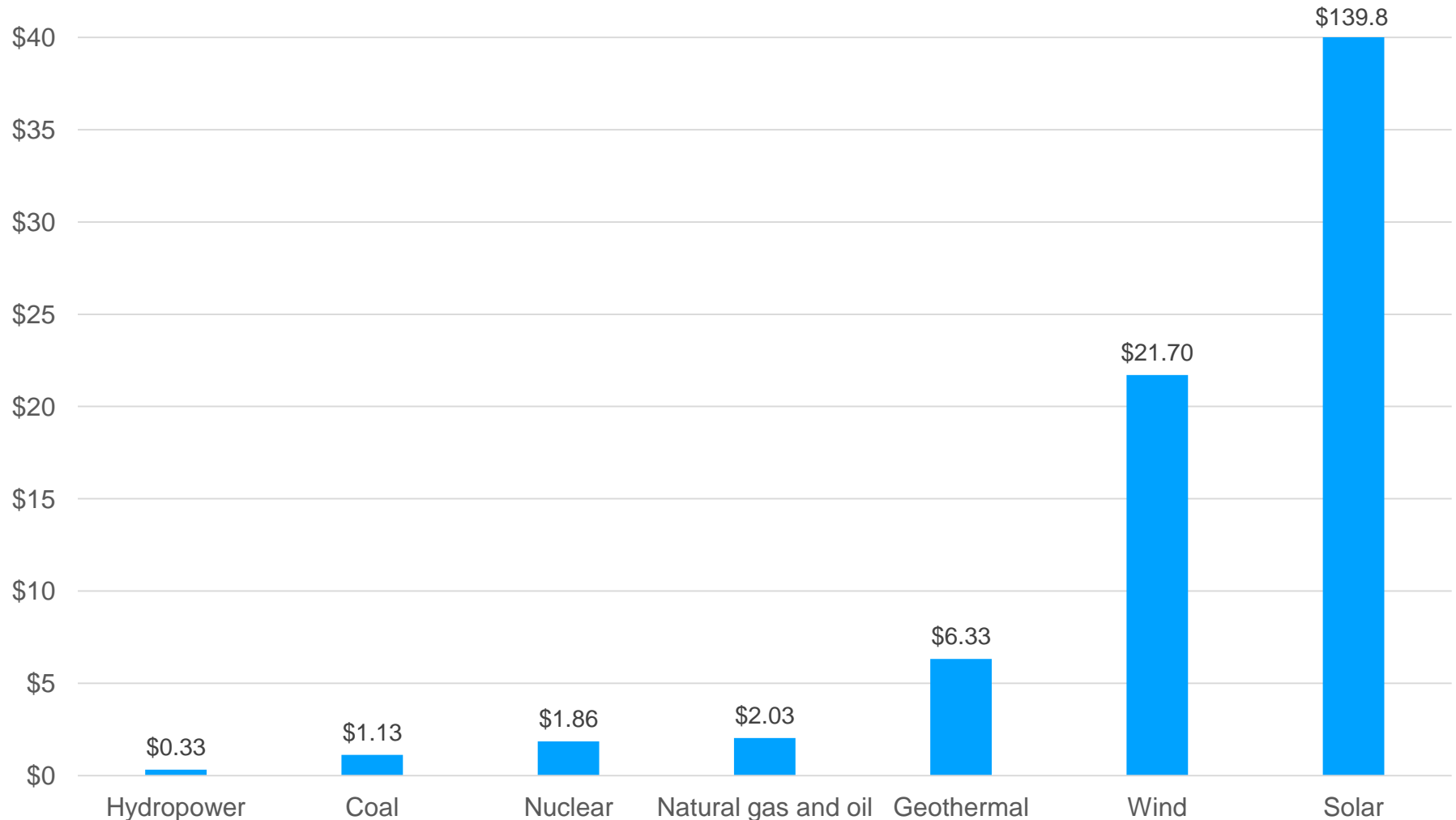
# Comparing the ROI of Federal Energy “Subsidies”

Many claim that all forms of energy receive “subsidies,” but wind & solar deliver far less return on investment (ROI).

Production tax credit subsidies for existing renewable energy technologies do not promote innovation.

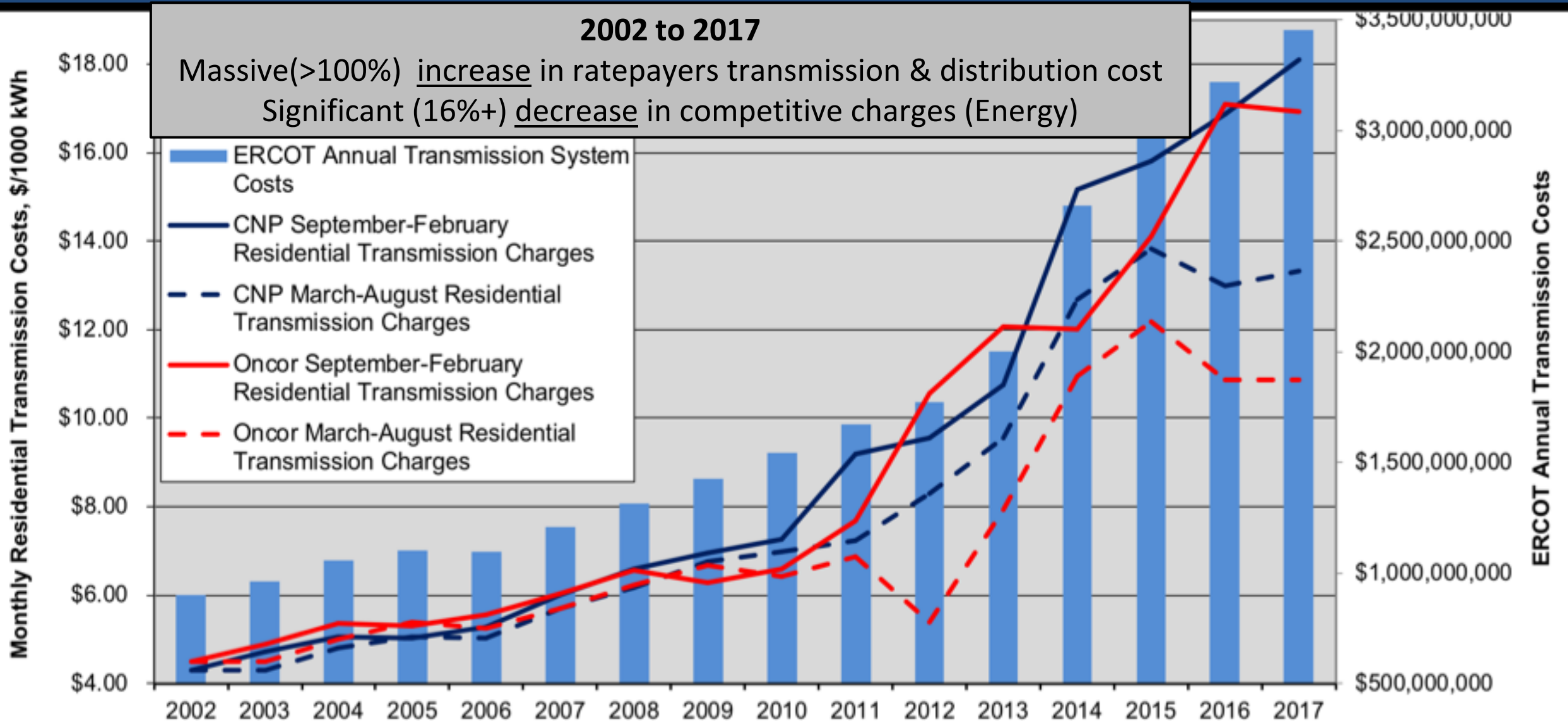
Sources: Office of Management and Budget, [Analytical Perspectives](#); Joint Committee on Taxation, [Estimates of Federal Tax Expenditures](#); Department of Energy, [Statistical Tables by Appropriation](#); Census Bureau, [Consolidated Federal Funds Report](#); Department of the Treasury, [Section 1603 List of Awards](#); Energy Information Administration, [Electricity Data Browser](#)

## Subsidies per Unit of Electricity Generated (2017 USD/MWh, 2003 - 2017 Average)



# Transmission Costs of Integrating Renewables

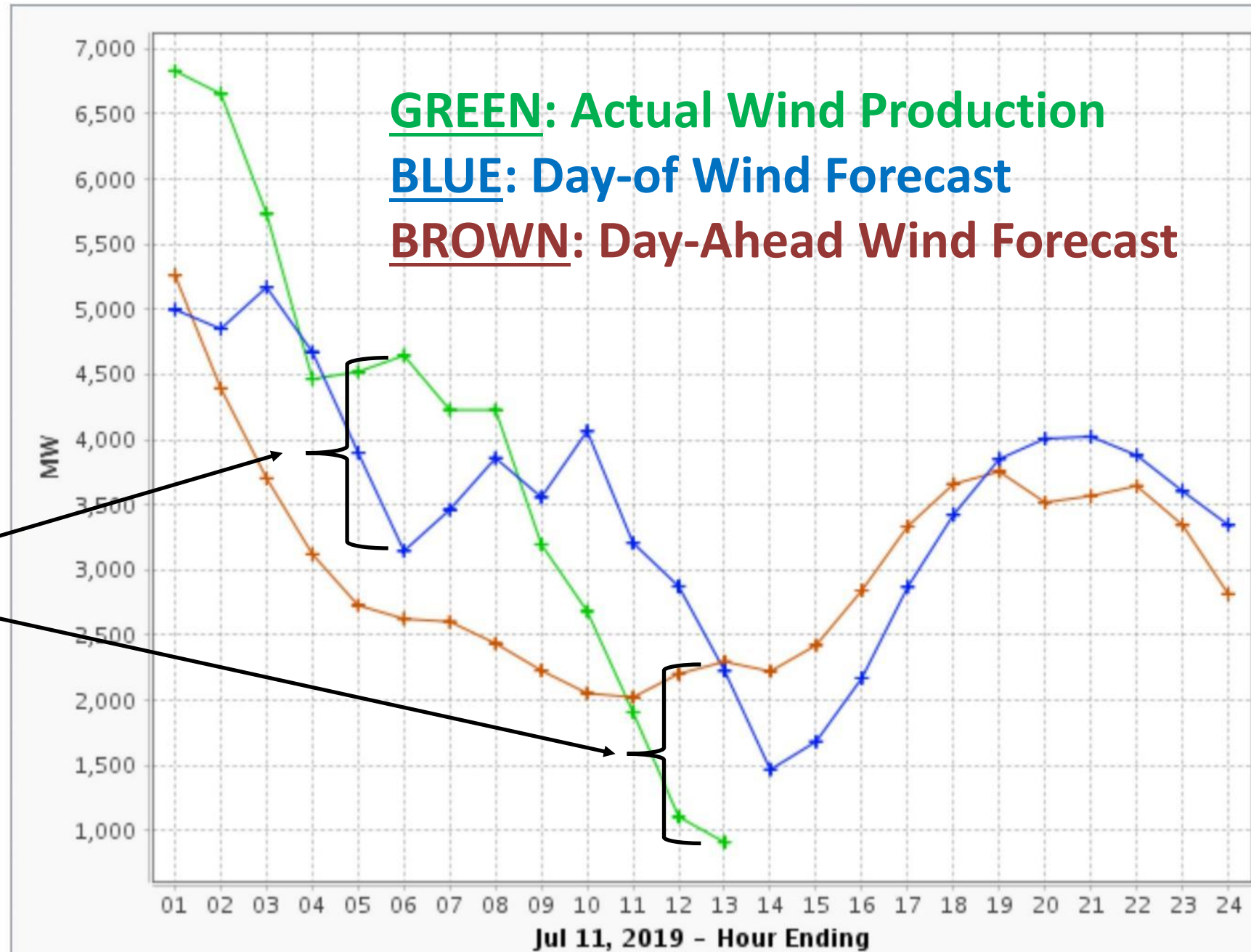
## Case Study: ERCOT



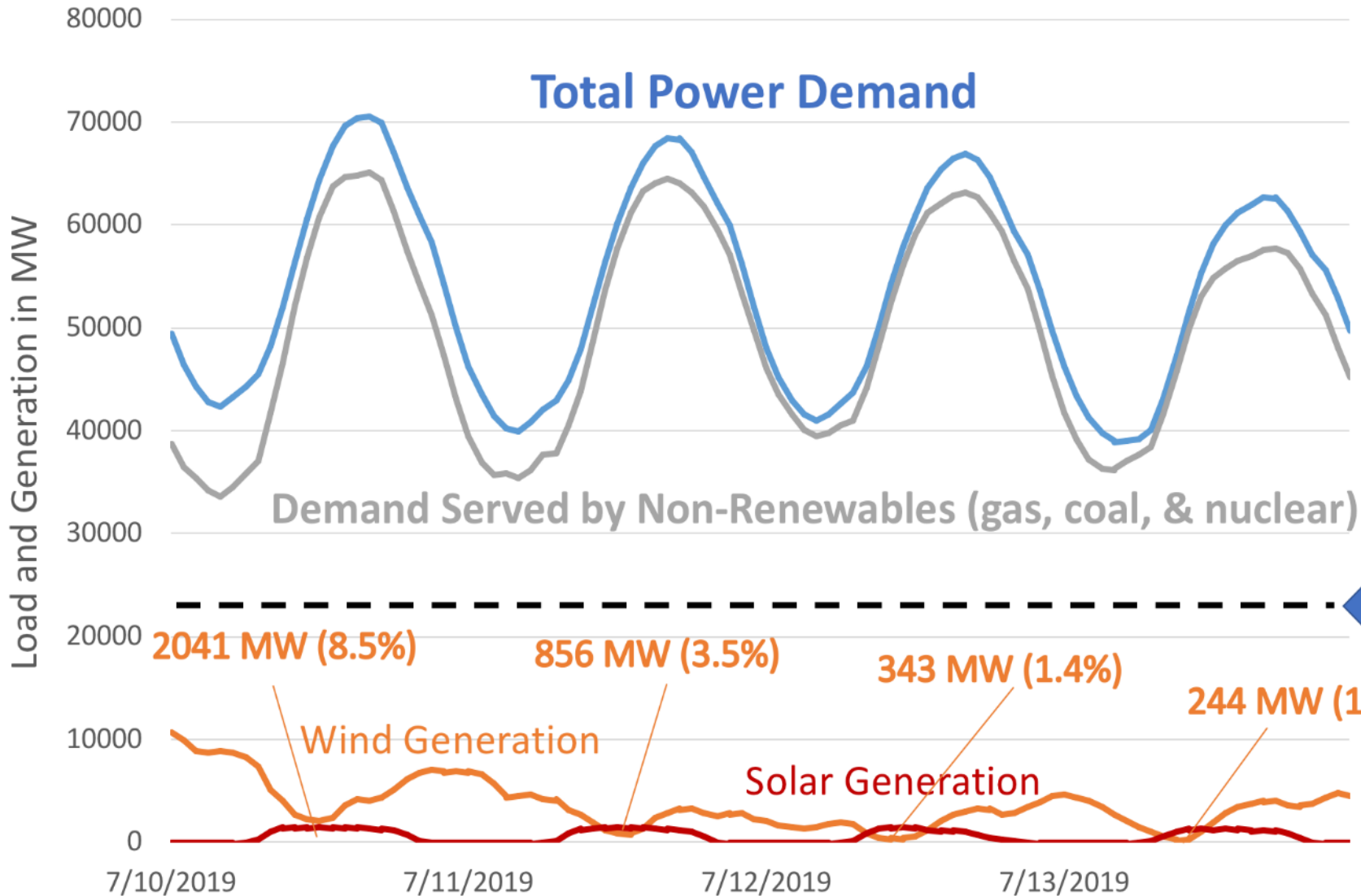
# ERCOT Experiment is Exposing Massive Imputed Cost of Wind

Note the  
Forecasting vs.  
Actual Generation

legend



# 2019 – Off-Peak Exuberance vs. Peak Reality



## OFF-PEAK EXUBERANCE:

[Houston Chronicle](#) headline, *“Texas wind generation breaks record, ERCOT reports”*  
(19,168 MW Wind on 12/14/18 when entire grid needed only 36,760)

## ON-PEAK REALITY:

Wind underperformance from 7/10-7/13/19 on & off peak.

## Installed Wind:

~24,000 MW

Average from 12 to 6 PM:

**2,704 MW (11% capacity factor)**

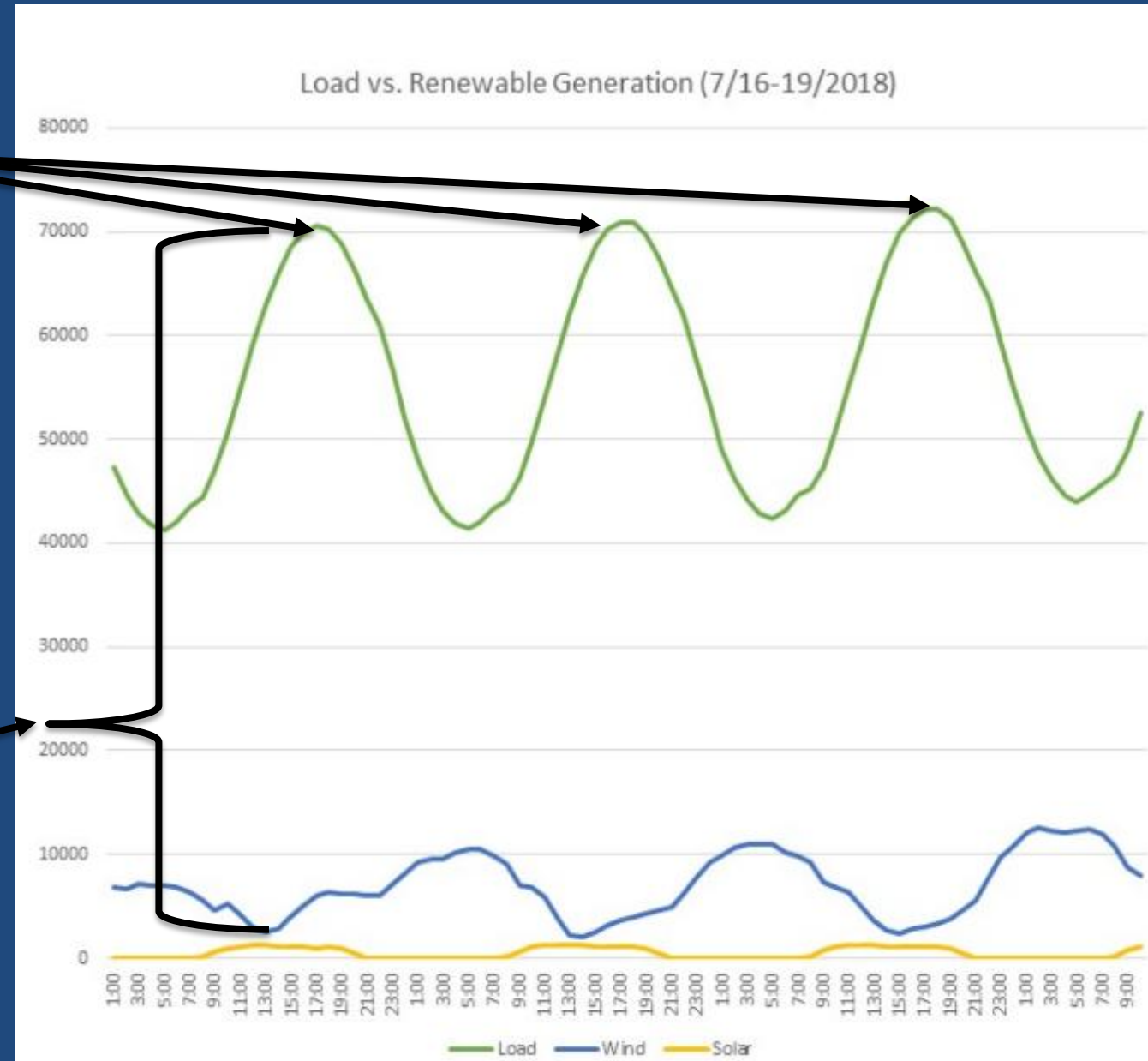


# 2018 – Off-Peak Exuberance vs. Peak Reality

## A Week in Texas (Summer of 2018)

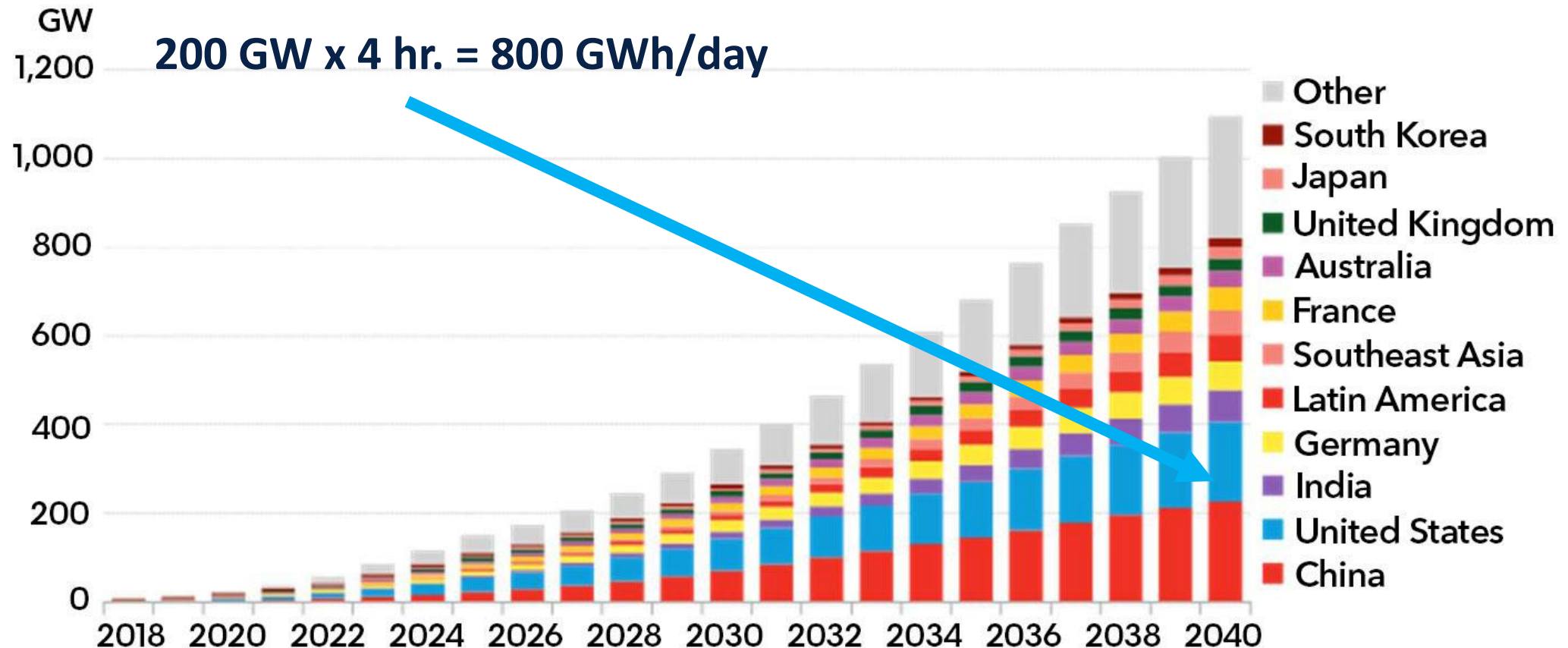
- New Record Consumption Every Day! (72-74 GW!)
- Gas, Coal, and Nuclear Meet the Challenge (69-71 GW)
- Wind No-Show & little Solar Results in < 5-8% of needs.

Gap Between Perception & Reality Remains Huge



# Even Optimistic Projections About the Coming Battery Boom Fall Short of “Closing the Peak Gap”

Global cumulative energy storage installations

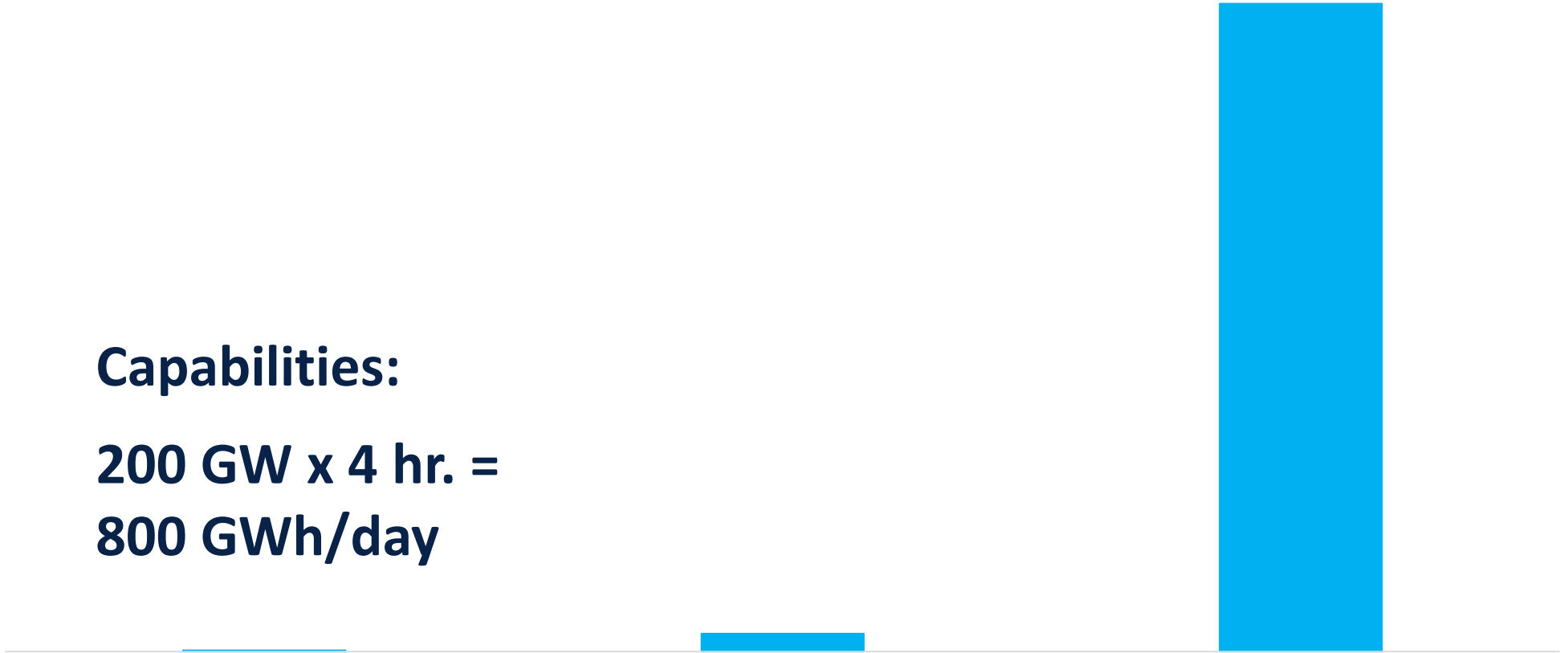


Source: BloombergNEF

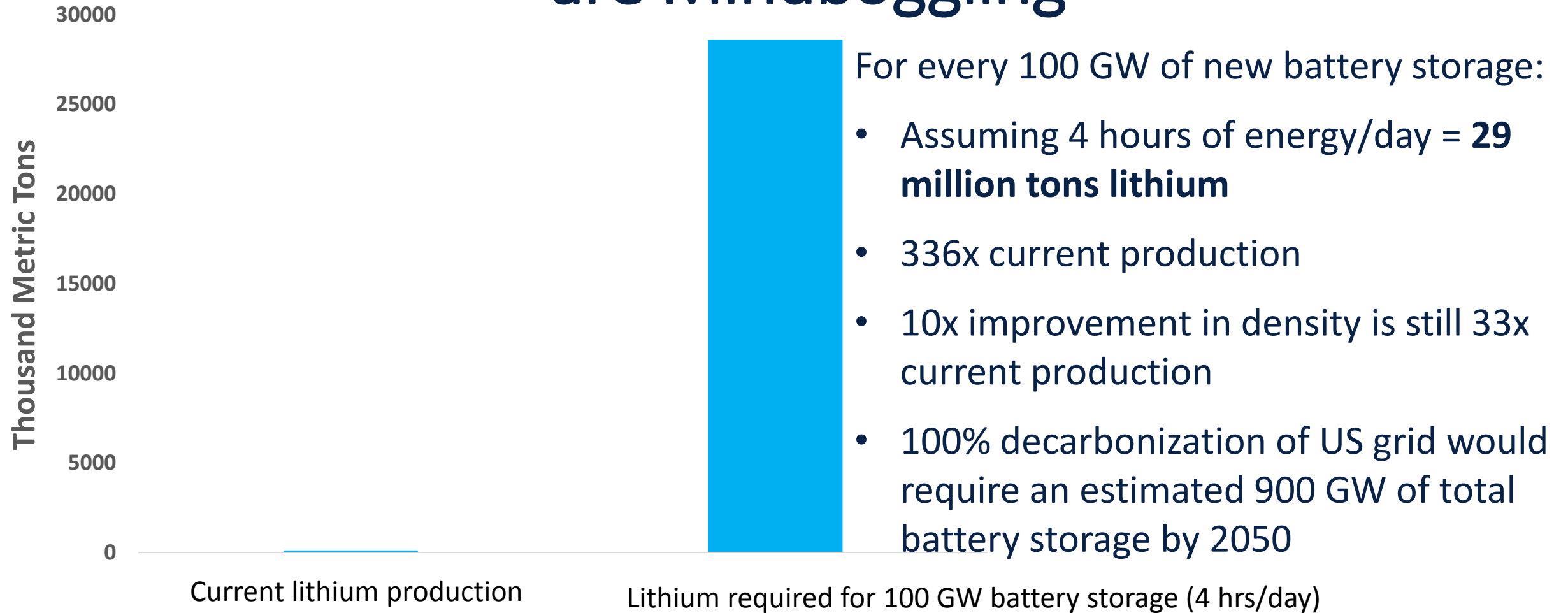
# Scale Matters: The Coming Battery Boom Cannot Close the Gap

Capabilities:

200 GW x 4 hr. =  
800 GWh/day



# The Mineral Implications of Massive Battery Storage are Mindboggling



# There are Critical Physical Limitations to the Ability to Scale-up Renewables



- ✓ Scientists have yet to discover, and entrepreneurs have yet to invent, anything as remarkable as hydrocarbons in terms of the combination of low-cost, high-energy density, stability, safety, and portability. In practical terms, this means that spending \$1 million on utility-scale wind turbines, or solar panels will each, over 30 years of operation, produce about 50 million kilowatt-hours (kWh)—while an equivalent \$1 million spent on a shale rig produces enough natural gas over 30 years to generate over 300 million kWh.

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- ✓ Solar technologies have improved greatly and will continue to become cheaper and more efficient. But the era of 10-fold gains is over. The physics boundary for silicon photovoltaic (PV) cells, the Shockley-Queisser Limit, is a maximum conversion of 34% of photons into electrons; the best commercial PV technology today exceeds 26%.

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- ✓ Wind power technology has also improved greatly, but here, too, no 10-fold gains are left. The physics boundary for a wind turbine, the Betz Limit, is a maximum capture of 60% of kinetic energy in moving air; commercial turbines today exceed 40%.

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- ✓ The annual output of Tesla's Gigafactory, the world's largest battery factory, could store three minutes' worth of annual U.S. electricity demand. It would require 1,000 years of production to make enough batteries for two days' worth of U.S. electricity demand. Meanwhile, 50–100 pounds of materials are mined, moved, and processed for every pound of battery produced.

# Expensive Energy Hurts the Poor the Worst

## Civil Rights Suit Exposes California's Regressive Green Energy Agenda

"California's climate change policies ... have caused and will cause unconstitutional and unlawful disparate impacts to California's minority populations ..."

"Since most of the world's energy is still produced from fossil fuels, energy consumption is still highly correlated to economic productivity and per capita incomes ..."

SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF FRESNO

UNLIMITED CIVIL JURISDICTION

THE TWO HUNDRED, an unincorporated association of civil rights leaders, including LETICIA RODRIGUEZ, TERESA MURILLO, and EUGENIA PEREZ,

Plaintiffs/Petitioners,

v.

CALIFORNIA AIR RESOURCES BOARD, RICHARD COREY, in his Official Capacity, and DOES 1-50,

Respondents/Defendants.

Case No. \_\_\_\_\_

**VERIFIED PETITION FOR WRIT OF MANDATE; COMPLAINT FOR DECLARATORY AND INJUNCTIVE RELIEF**

[Code Civ. Proc. §§ 1085, 1094.5, 1060, 526; Gov. Code § 12955 *et seq.* (FEHA); 42 U.S.C. § 3601 *et seq.* (FHA); Cal. Const. Art. I, § 7; Art. IV, § 16; U.S. Const. Amd. 14, § 1; 42 U.S.C. § 1983; Pub. Res. Code § 12000 *et seq.* (CEQA); Gov. Code § 11346 *et seq.* (APA); H&S Code § 38500 *et seq.* (GWSA); H&S Code § 39000 *et seq.* (CCAA); Gov. Code § 65088 *et seq.* (Congestion Management Plan)]

"... the 'net zero' GHG threshold would operate unconstitutionally so as to disproportionately disadvantage low income minorities in need of affordable housing relative to wealthier, whiter homeowners who currently occupy the limited existing housing stock..."

"CARB's VMT reduction scheme and its ongoing efforts to intentionally increase congestion are an assault on the transportation mobility of people, which disparately harm minority workers..."

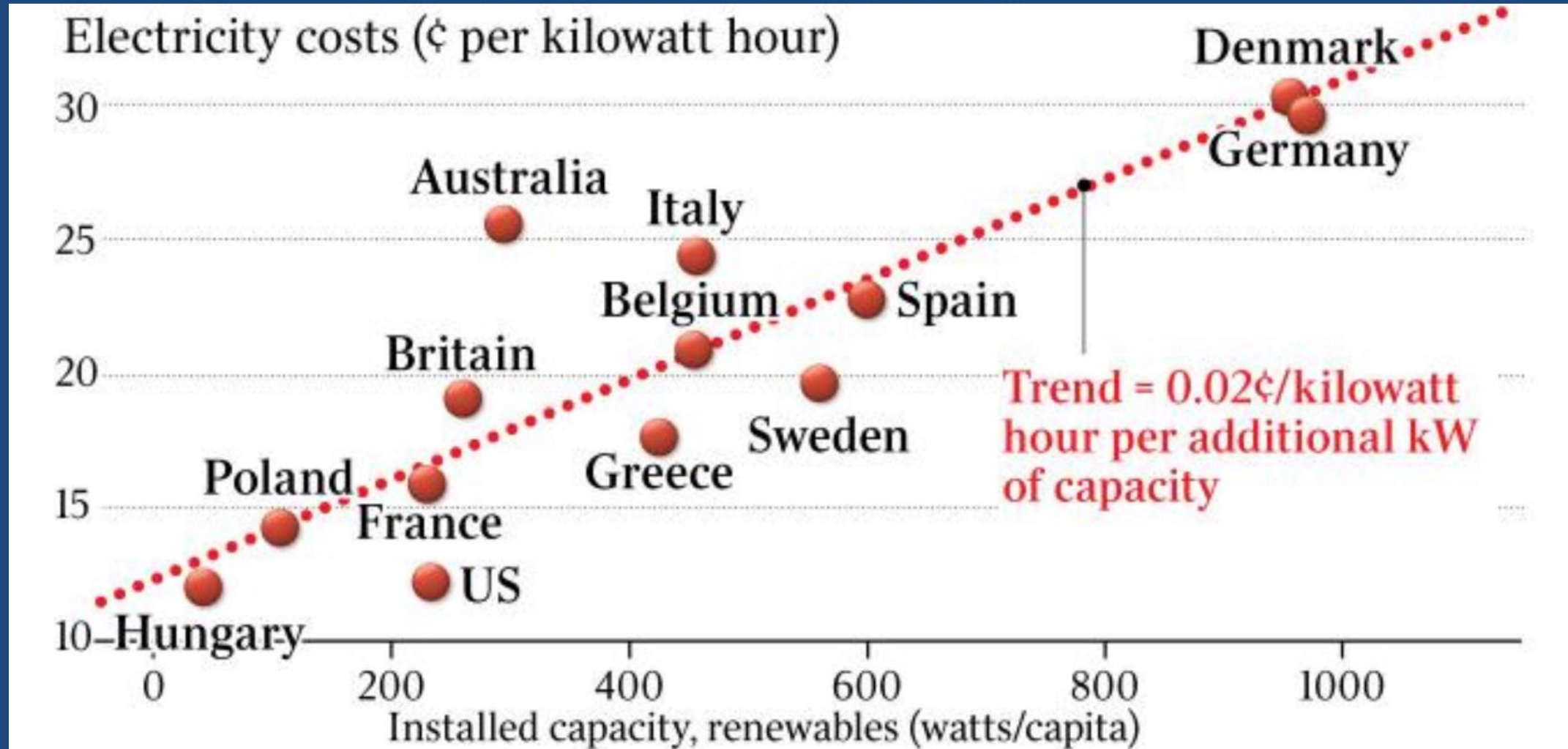
# A Video Review of the Limits of Renewables

- <https://youtu.be/ObvdSmPbdLg>



Can We Rely on Wind and Solar?

# Globally, More Renewable Energy Means More Expensive Power







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# Global Energy Demand Reality Check

1. As our history proves, human life is improved by affordable energy, and humans suffer without it.
2. U.S. fossil fuel/technology exports are critical to global efforts to eradicate energy poverty.
3. Therefore, developing nations need fossil fuels to lift 3.9 billion humans out of energy poverty.
4. International officials are misleading the world regarding the practicality of non-fossil energy.

# WHAT WE HAVE DONE & WHAT WE STILL MUST DO

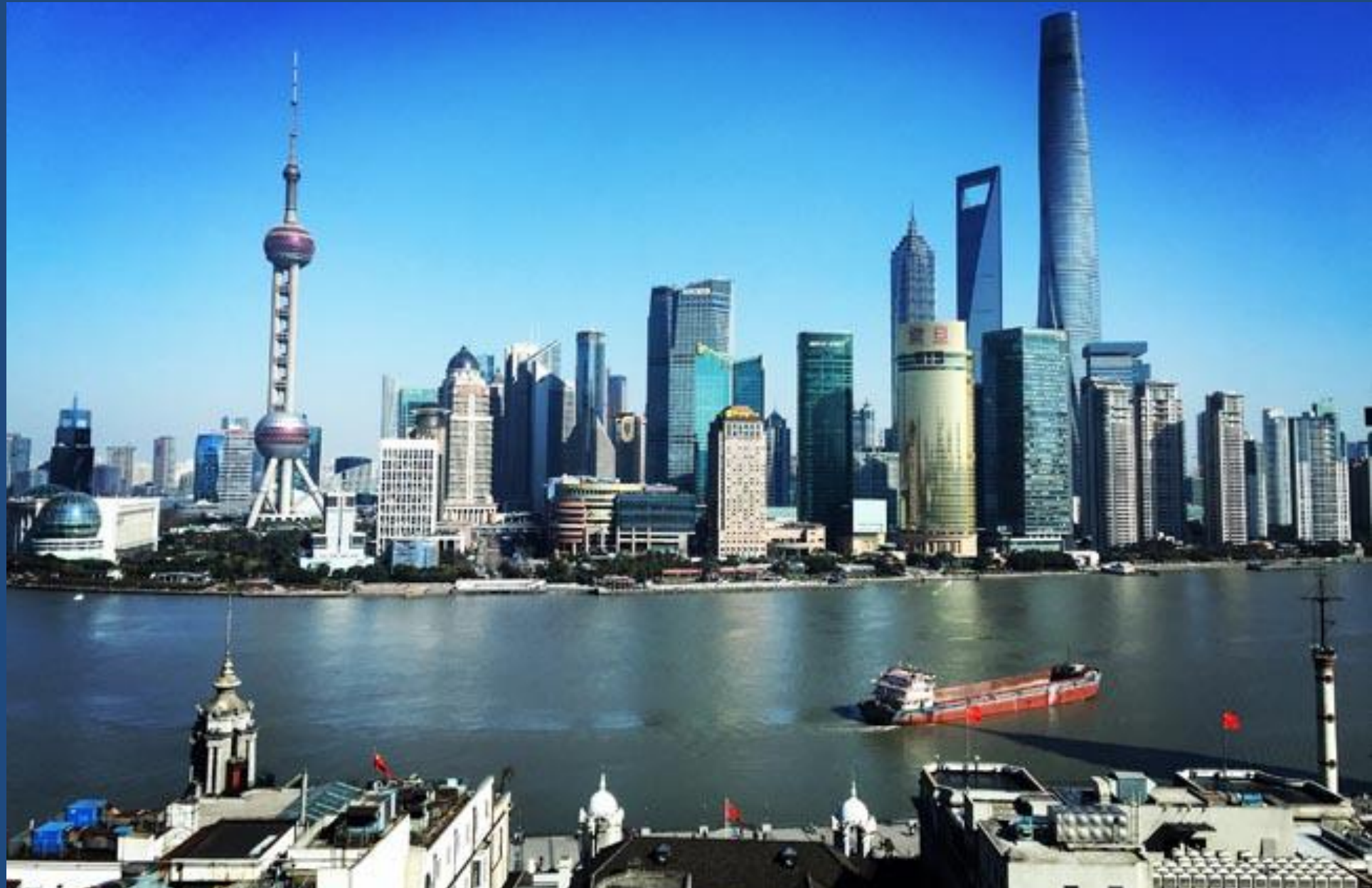
- Over Last 20 Years, 830 Million Get their First Electricity
- 1.3 Billion Still Living with no Access to Electricity



# PUDONG (Shanghai) in 1990



# PUDONG (Shanghai) Today



# “Energy Poverty” Video

<https://www.youtube.com/watch?v=nEovKjVkJUpc>





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# The World Does NOT Need Windmills in Wyoming & Texas– it Needs us to Commercialize CCUS Technology . . . NOW!

## 2050 IMPACT OF DECARBONIZING ELECTRICITY:

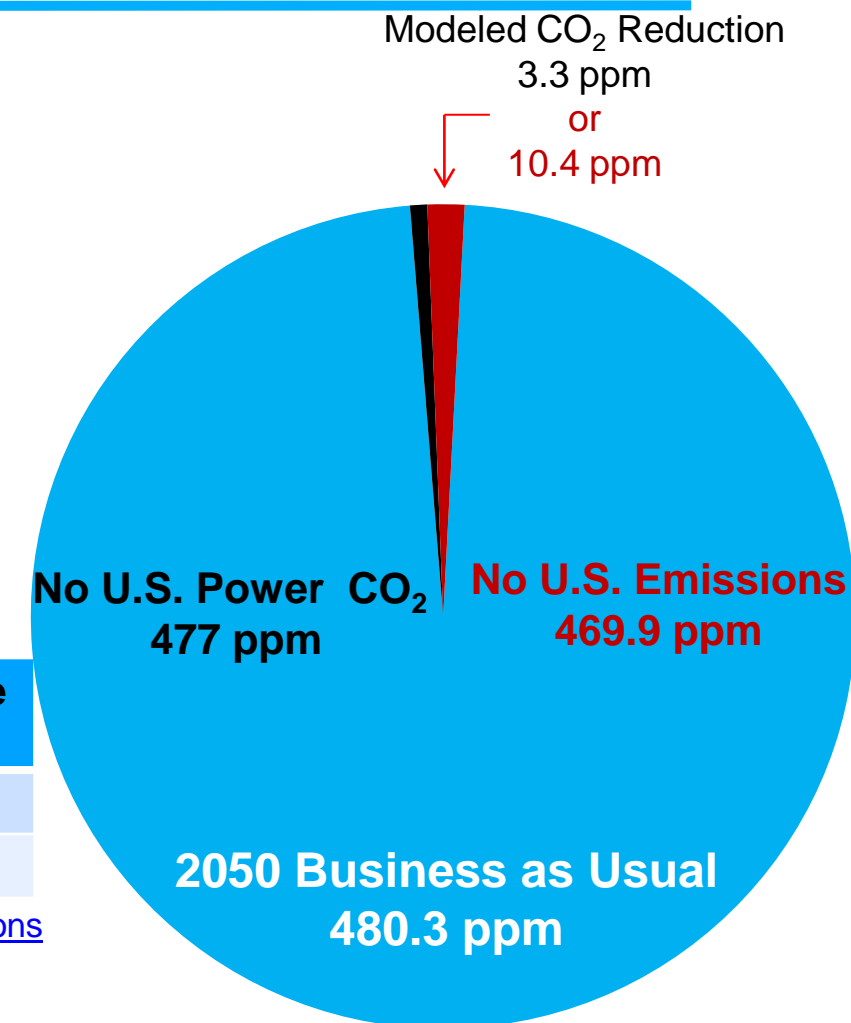
- NO COAL FLEET = 2.06 ppm (0.4%) reduction in CO<sub>2</sub> concentration.
- NO FOSSIL FLEET = 3.3 ppm (0.7%) reduction in CO<sub>2</sub> concentration.
- Modeled global temperature reduced by a mere 0.016°C.

## 2050 IMPACT OF DECARBONIZING ENTIRE U.S.:

- 10.4 ppm (2.2%) reduction in CO<sub>2</sub> concentration.
- Modeled global temperature reduced by 0.053°C.

CO2 Emissions	2010	2020	2030	2040	2050	% Change
World	30,834	34,972	36,398	39,317	42,771	+38.7%
U.S.	5,571	5,260	4,839	4,867	5,071	-8.9%

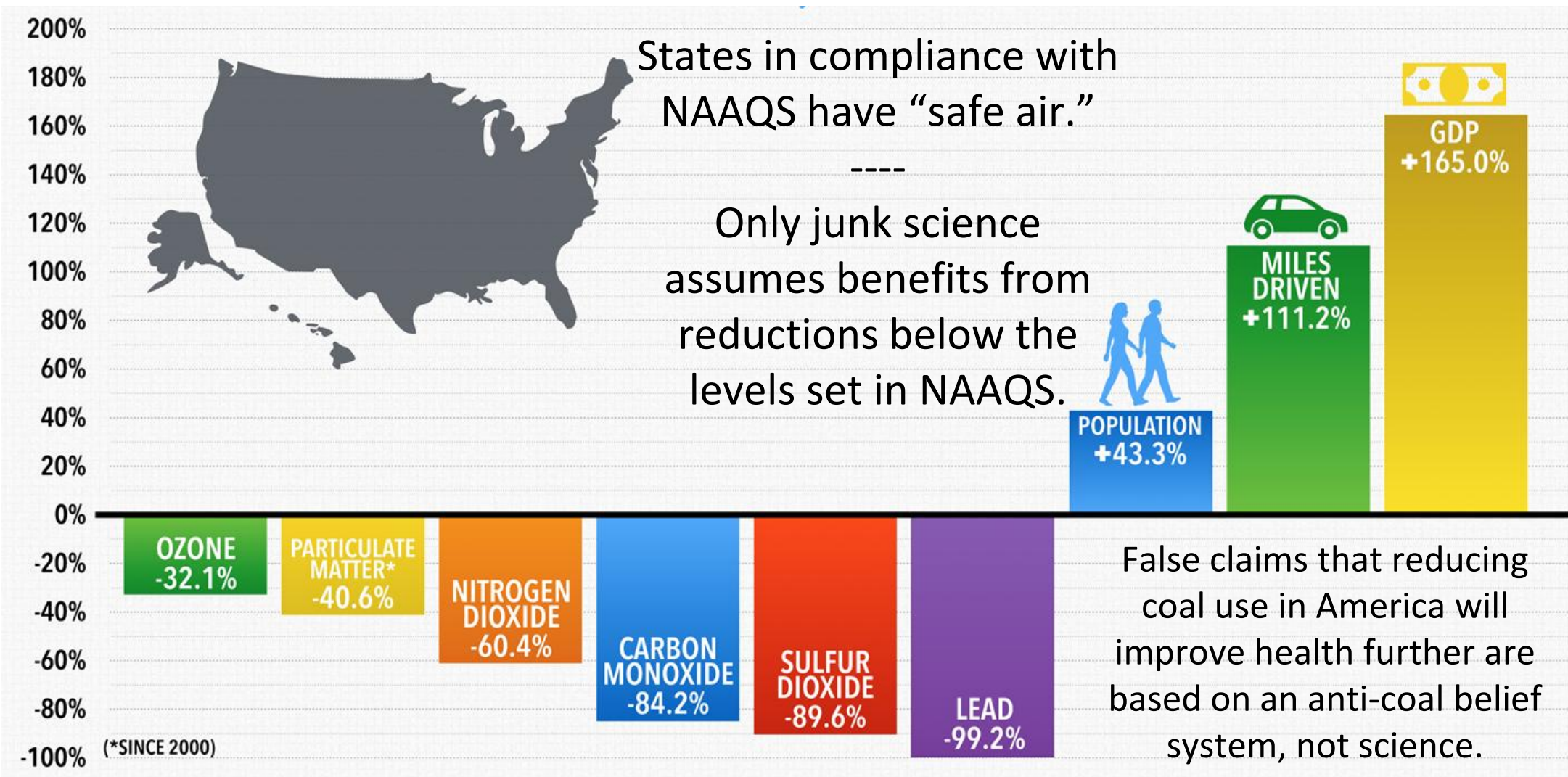
Sources: Energy Information Administration, International Energy Outlook 2017, [World carbon dioxide emissions by region](#); [MAGICC6 Model](#); Intergovernmental Panel on Climate Change Fifth Assessment Report Working Group I, [Summary for Policymakers](#); National Oceanic and Atmospheric Administration [Global Land and Temperature Anomalies](#).



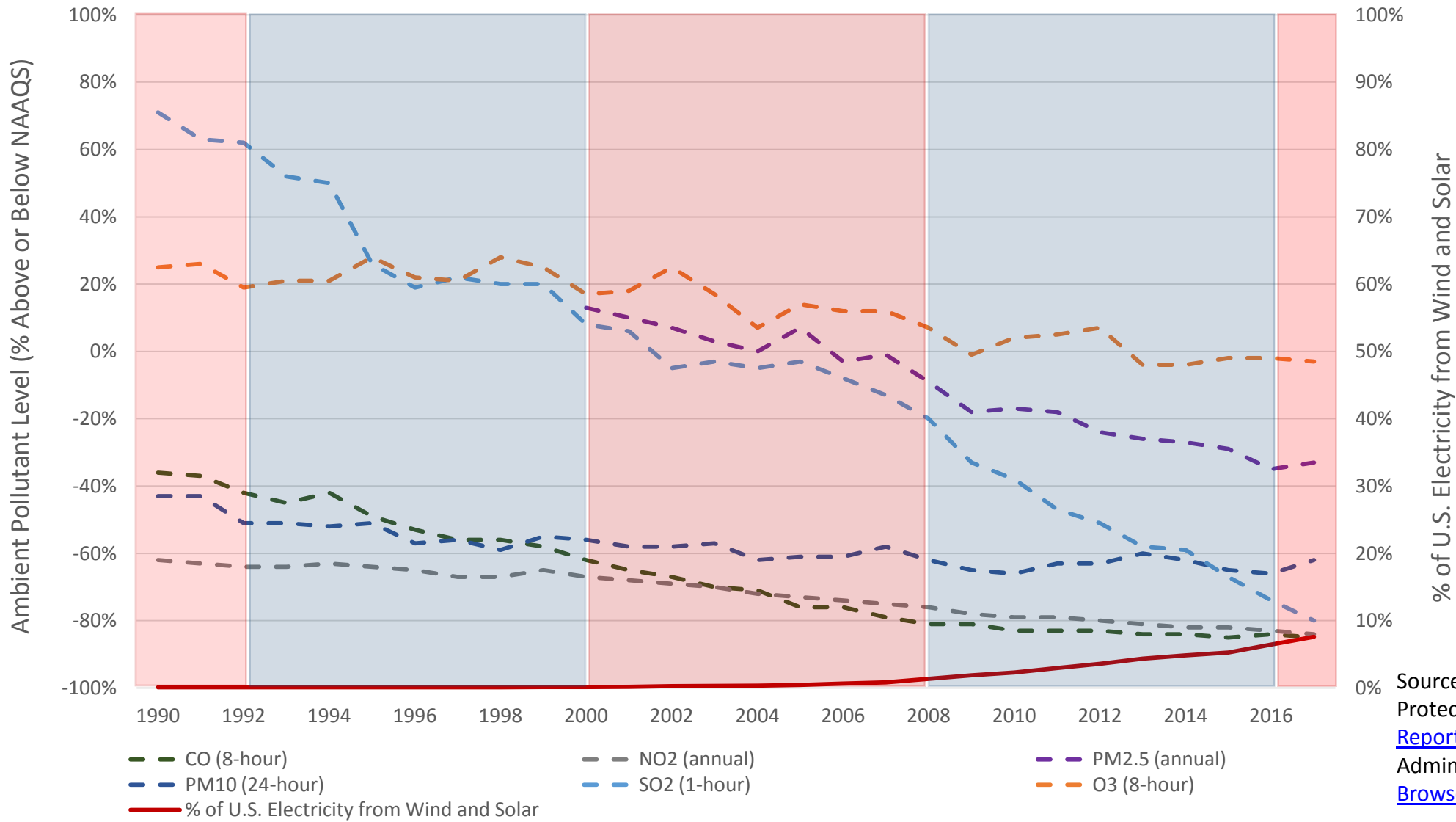


# MYTH: Shifting Away From Coal = Significant Health Benefits

# FACT: American Air & Water is Already Safe

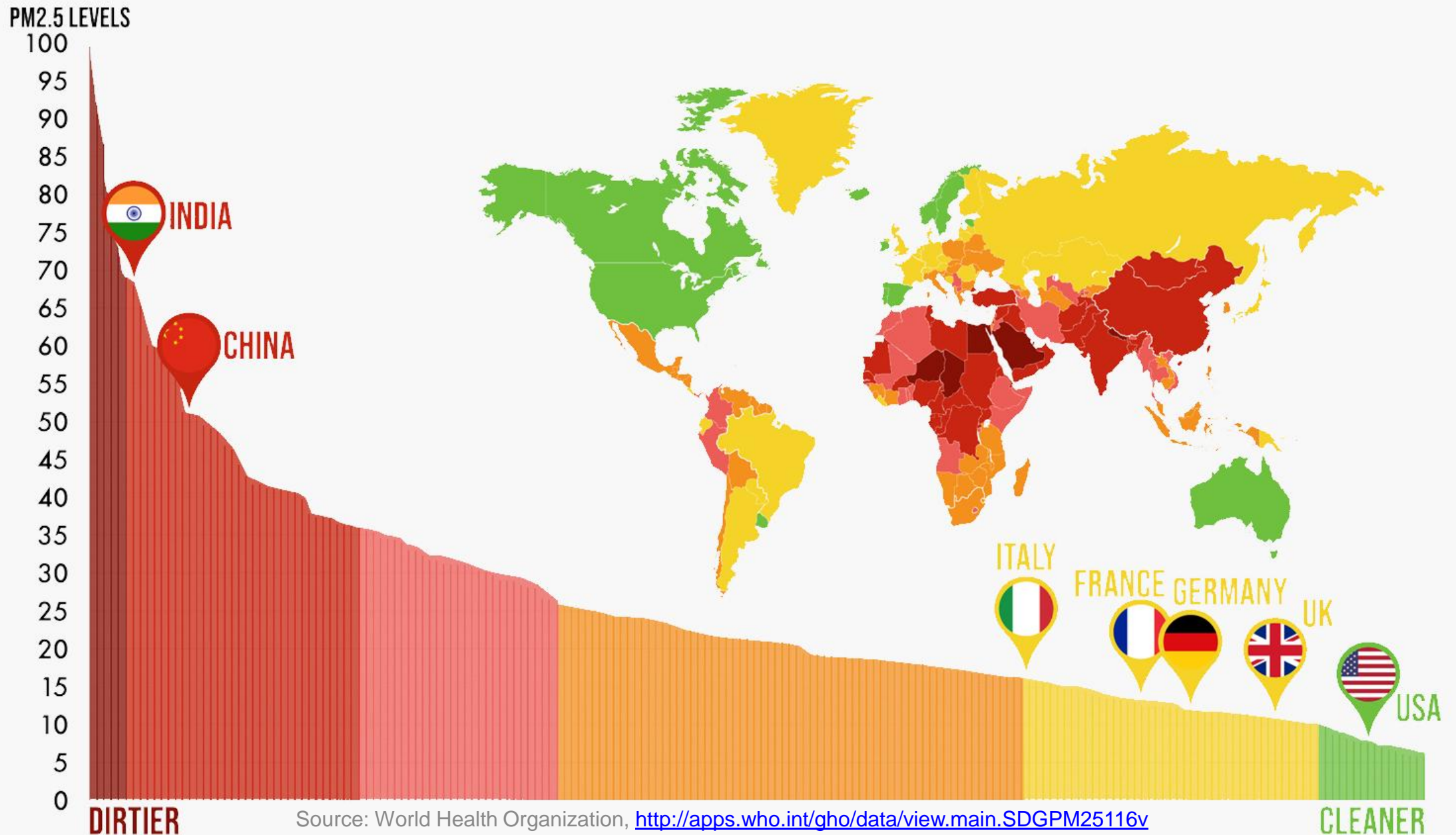


# We Made our Air Safe with Technology, Not Anti-Fossil Fuel Ideology



Sources: Environmental Protection Agency, [Air Trends Report 2018](#); Energy Information Administration, [Total Energy Data Browser](#)

# Leading the World in Cleaning the Air While Growing our Economy





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# Business Case for CCUS



1. Geopolitically, securing the long-term viability of American coal and oil production should be a national priority.
2. Many existing & potential markets for coal insist that we have a carbon mitigation strategy before committing to extending the life of existing plants or building new.
3. Rising demand for energy internationally makes any domestic decarbonization irrelevant unless commercializing and exporting CCUS technology is a central component of that strategy.

**❖ INVESTING IN CCUS IS AN INVESTMENT IN DOMESTIC ENERGY SECURITY & AN INTERNATIONAL COAL & CCUS MARKETING PLAN**

# Petra Nova:

## Power Generation:

- Gas Combustion Turbine/peaker for parasitic load

## Carbon Capture:

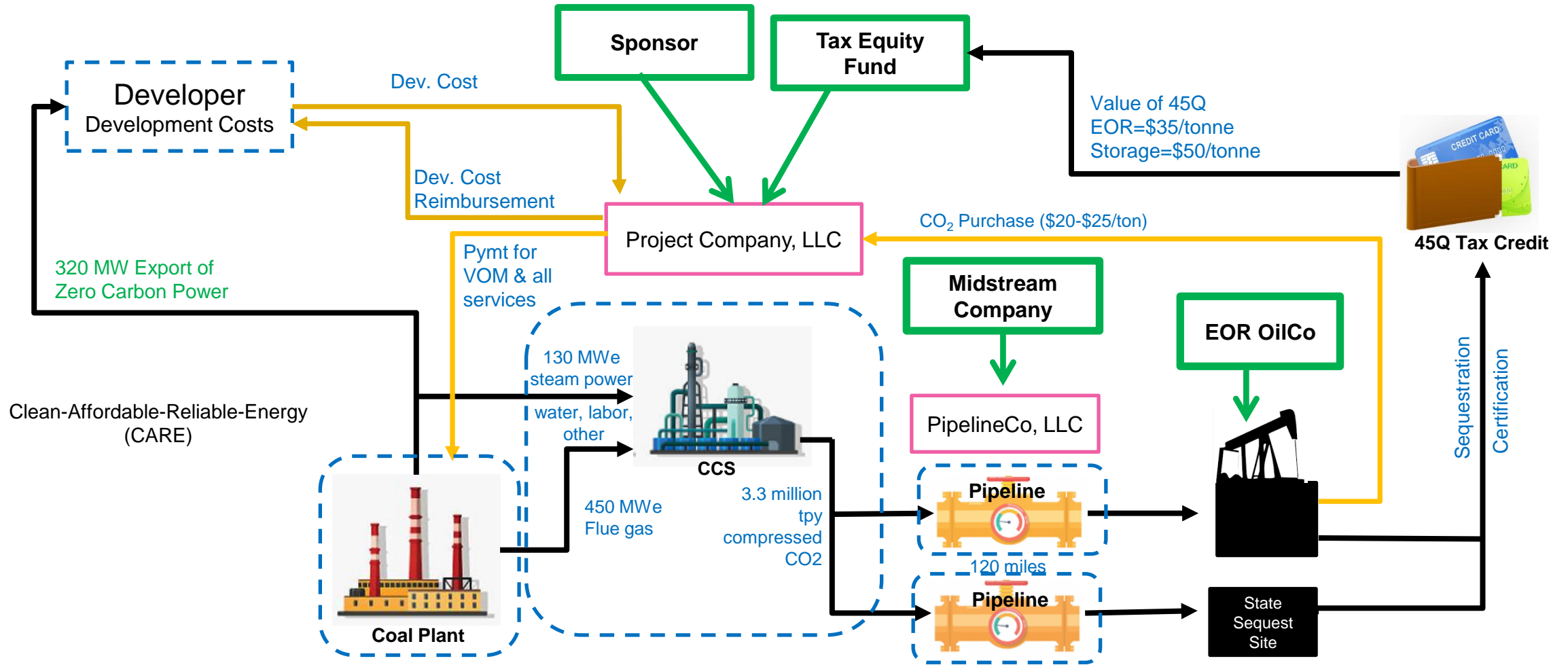
- Post-combustion amine solvent
- 90% of 250 MW slip stream
- 1.65 short tons of CO<sub>2</sub> annually

## Product Delivery & Utilization:

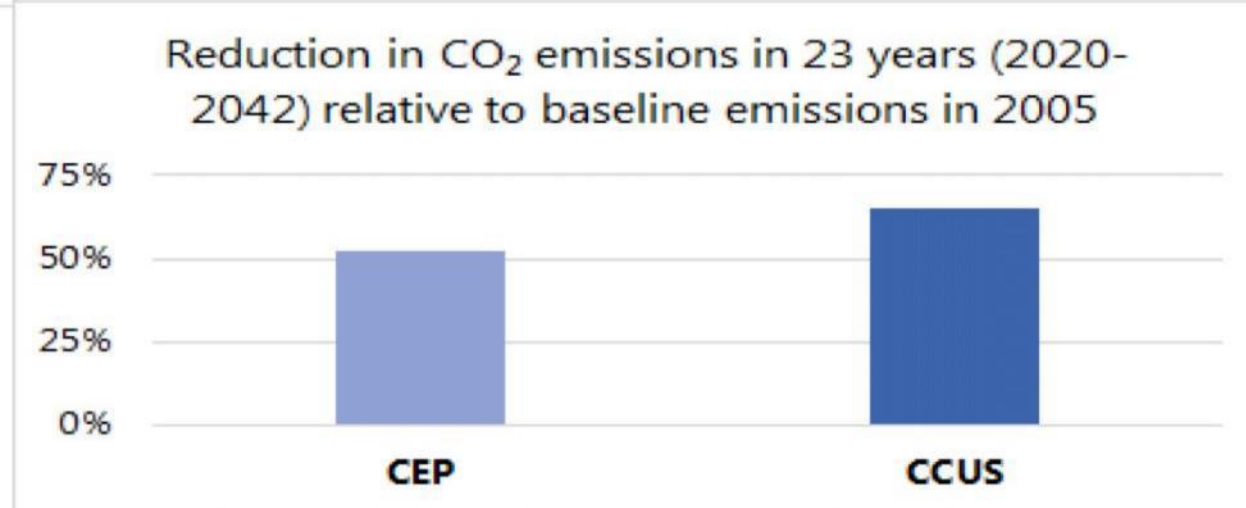
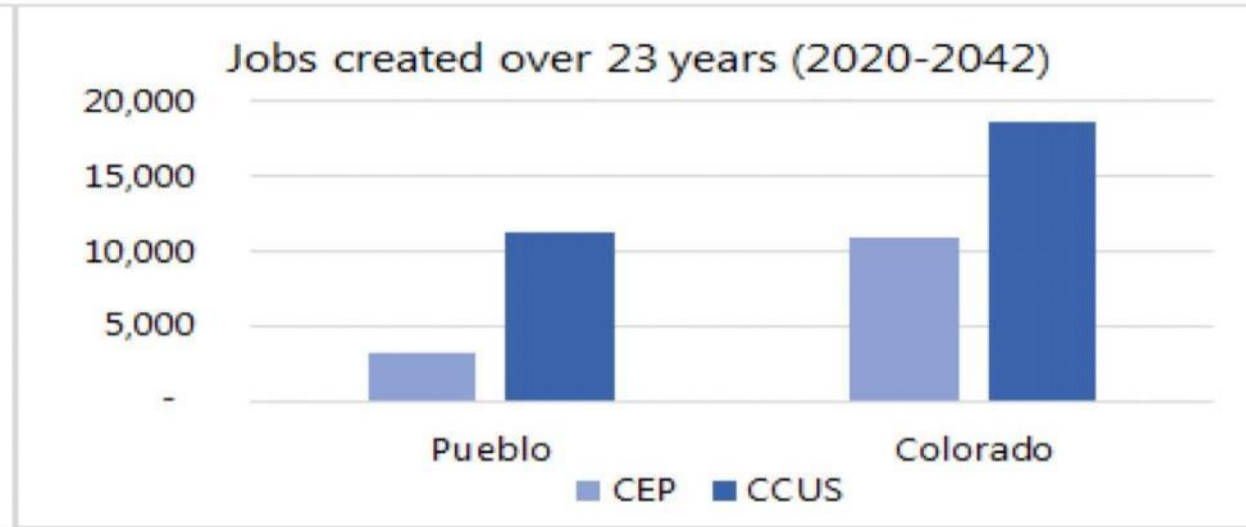
- CO<sub>2</sub> EOR via 80-mile pipeline
- West Ranch oil recovery up from 500 to 5,000-10,000 Barrels Per Day



# Example Project Structure



# DOE STUDY: Demonstrates Viability of CCUS Retrofit Rather than Retire & Replace with Wind/Solar/Storage (Tax Equity Owner reduces cost to the consumer even more!)





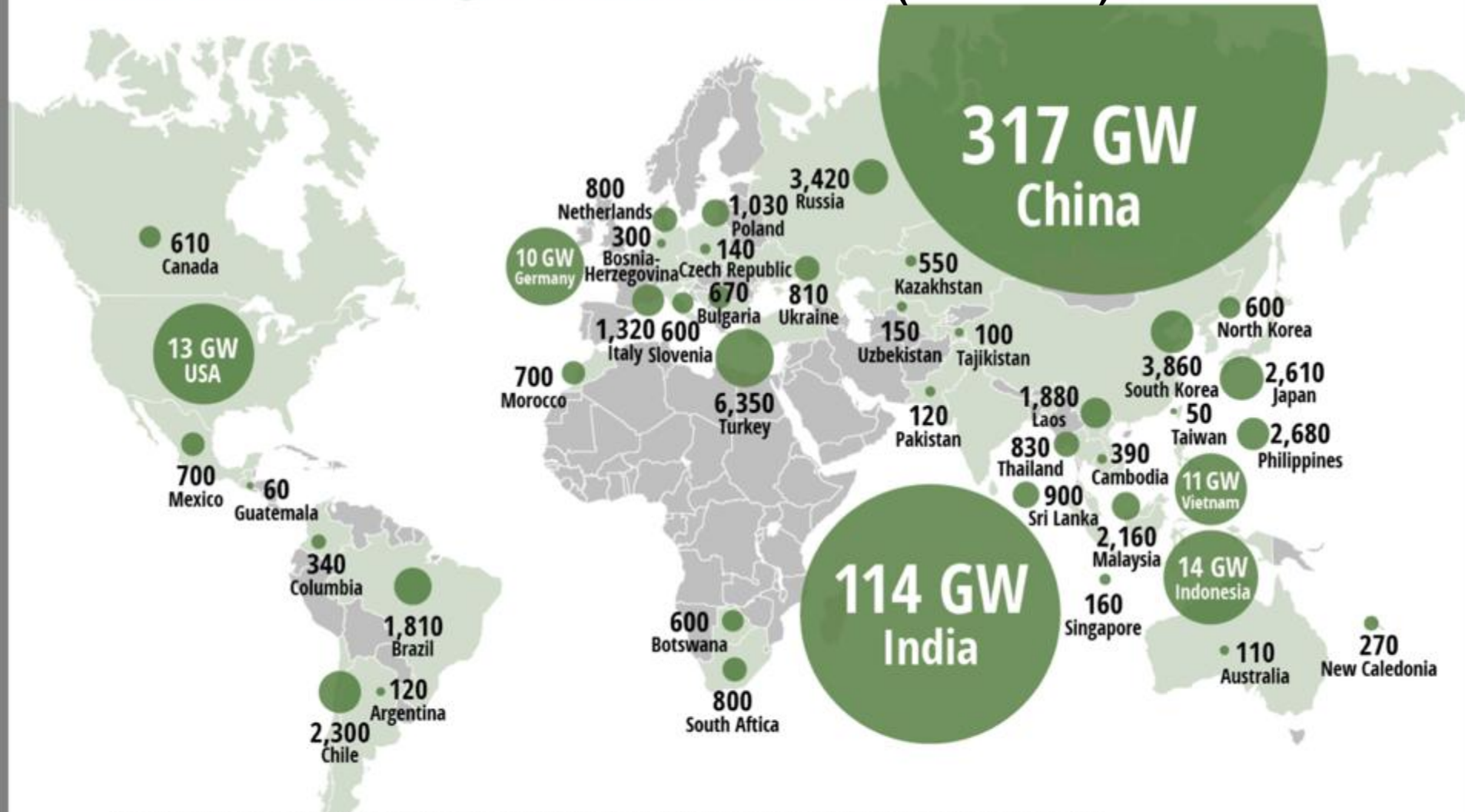
# Not All Carbon Reductions are Created Equal

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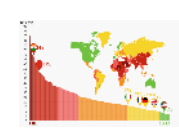
- Because carbon captured from a dispatchable fossil fuel plant innovates CCUS & provides baseload low-carbon power, it is a much more valuable low-carbon asset (to the grid & the world) than intermittent wind or solar.
- If we are serious about mitigating anthropogenic CO<sub>2</sub> & ensuring market transparency, regulatory approvals/planning must ensure that ratepayers know the true and total cost (and benefits) of their low-carbon options.

# Retrofit Technologies Should be Central to Global Climate Discussions (IPCC already concedes this)

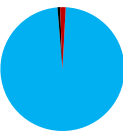
1,200+ New Generating Units Have Come Online (Since 2010)



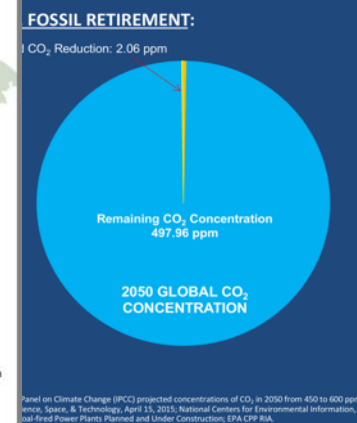
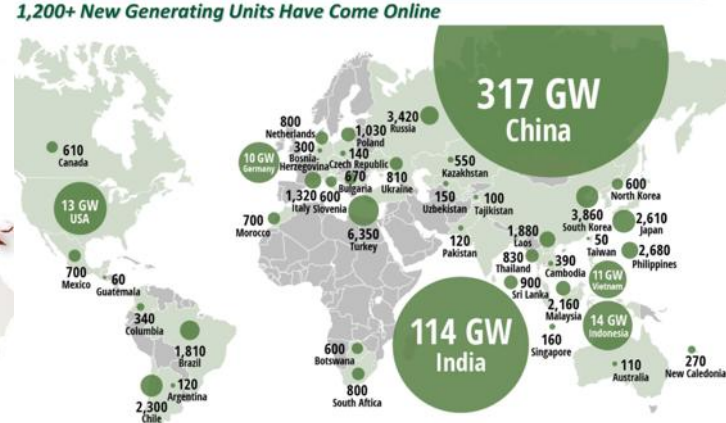
Source: Platts World Electric Power Plant database, December 2016. Generation capacity represented in megawatts, excluding China, Germany, India, Indonesia, United States and Vietnam.



# Comparing CCUS & Renewable Energy



WIND/SOLAR/STORAGE	KEY CONSIDERATIONS	CCUS RETROFIT
<ul style="list-style-type: none"><li>• Low Capacity Factors</li><li>• Transmission Additions</li><li>• Reliability &amp; Resilience Penalty</li></ul>	<b>True &amp; Total LCOE</b>	<ul style="list-style-type: none"><li>• High Capacity Factors</li><li>• No New Transmission</li><li>• High Reliability &amp; Resilience</li></ul>
<ul style="list-style-type: none"><li>• Bird Strikes</li><li>• Habitat Destruction</li><li>• Lithium/Cobalt Mining for Batteries</li><li>• Rare Earths for Turbines &amp; Solar</li></ul>	<b>Non-GHG Externalities</b>	<ul style="list-style-type: none"><li>• Air Quality Not Impacted &gt; Known “Safe” Levels (NAAQS)</li><li>• Successful &amp; Established Coal Reclamation Programs</li></ul>
<ul style="list-style-type: none"><li>• Backup Power Emissions</li><li>• Life-Cycle GHGs From Construction &amp; Land Use</li><li>• Missed R&amp;D opportunity</li></ul>	<b>GHG Externalities</b>	<ul style="list-style-type: none"><li>• No Backup Power Required – (24/7 carbon-free resource)</li><li>• R&amp;D Drives Down Future Costs (global game changer)</li></ul>
<ul style="list-style-type: none"><li>• Dependence on Minerals &amp; Products Not Mined/Made in US</li></ul>	<b>Economic Impact &amp; Geopolitical</b>	<ul style="list-style-type: none"><li>• Domestic fuels (coal &amp; gas) + export commodity (oil &amp; tech)</li></ul>



# “Converting Carbon to a Commodity” Video

<https://www.youtube.com/watch?v=TIXVvAoQBjc>





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# 2019-2022 IS NEW MEXICO'S DEFINING CCUS MOMENT:

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- THE ENTRENCHMENT OF THE OTHER SIDE CAN ONLY BE OVERCOME WITH SUCCESS STORIES – **NOW!**
- With Every Premature Retirement of an Existing Coal Plant, we Lose Resilient Power, Employment and an Opportunity to Commercialize CCUS technology . . . FOREVER.
- Electric Grid Disruption from High Renewable Penetration is a Certainty Under Established Principles of Physics & Engineering.



# 2019-2020 IS NEW MEXICO'S DEFINING MOMENT (cont.):

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## IF NEW MEXICO ALLOWS PREMATURE COAL RETIREMENTS TO CONTINUE,

- Ratepayer investments in coal plants and environmental controls are stranded
- Tribes and State gives up coal-fueled plants, mines and the associated employment
- State foregoes the opportunity for significantly expanded oil recover (from EOR)
- State gives up state royalty and tax revenues associated with all of the above
- State loses out on leveraging 45Q window of opportunity



# Busting the Myths of Anti-CCUS Advocates



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## CLAIM #1:

“It overlooks how the deployment of carbon-capture technology around coal-fired generation remains a mostly academic, unaffordable exercise.”

## FACT:

CCUS retrofits are neither academic nor unaffordable. The Petra Nova project is evidence of that and it pre-dates the extremely favorable economics of the 45Q tax credit. Ignoring Petra Nova and focusing on the Kemper project, which was a greenfield gasification project with complexities that have no relevance to New Mexico CCUS retrofits, is, at best, ignorant and, at worst, intentionally misleading spin.





# Busting the Myths of Anti-CCUS Advocates



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## CLAIM #2:

“It banks on the unlikelihood of being able to find a market in the distant Permian Basin oilfield for the carbon dioxide it would capture”

## FACT:

The Permian has a 4 decade-long, established CO<sub>2</sub> EOR market and is currently short on CO<sub>2</sub> with several operators looking for additional supply, so the premise of this claim that the market is uncertain is a a shameful fabrication.



# Busting the Myths of Anti-CCUS Advocates



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## CLAIM #3:

“It does not say where long-term project liabilities would lie.”

## FACT:

Practicing law without a license is not journalism (and illegal, by the way). Concerns about liability associated with CCUS projects are vastly overstated and reflect ignorance about the regulatory treatment of the CO<sub>2</sub> when used as a product in EOR.



# Busting the Myths of Anti-CCUS Advocates



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## CLAIM #4:

“It does not address the inevitable rise in electricity costs owing to the parasitic load created by the installation of carbon-capture equipment.”

## FACT:

There’s no proof that power prices will rise. As proven in Texas at Petra Nova, CCUS can be done with NO impact on the cost of electricity. And, remember, coal mines have load that bring down the cost of power for others.



# Busting the Myths of Anti-CCUS Advocates



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## CLAIM #5:

“It plays up the importance of using newly enhanced tax credits for carbon capture to finance the project, while leaving out the fact that the credits would be available only if and when the project is operational, a highly unlikely outcome.”

## FACT:

This claim screams out ignorance of how tax equity investment-driven project finance works. Leveraging tax credits prospectively to facilitate project finance is an established practice. If the premise of this claim were true, there would never have been investment in wind & solar projects.



# NEW MEXICO'S DEFINING MOMENT



**“Don’t Let Billionaires Tell Our State What to Do!”**



Life:Powered



**Life:Powered**  
A Project of the Texas Public Policy Foundation

To reframe the national discussion about energy sources – including fossil fuels - on the importance of reliable, abundant, affordable energy to the American quality of life and the advancement of the human condition.

# RAISING AMERICA'S ENERGY IQ

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**Energy powers life**... you can literally track the advancement of the human condition with the availability of abundant energy.

**Reliable** energy is central to our daily life.

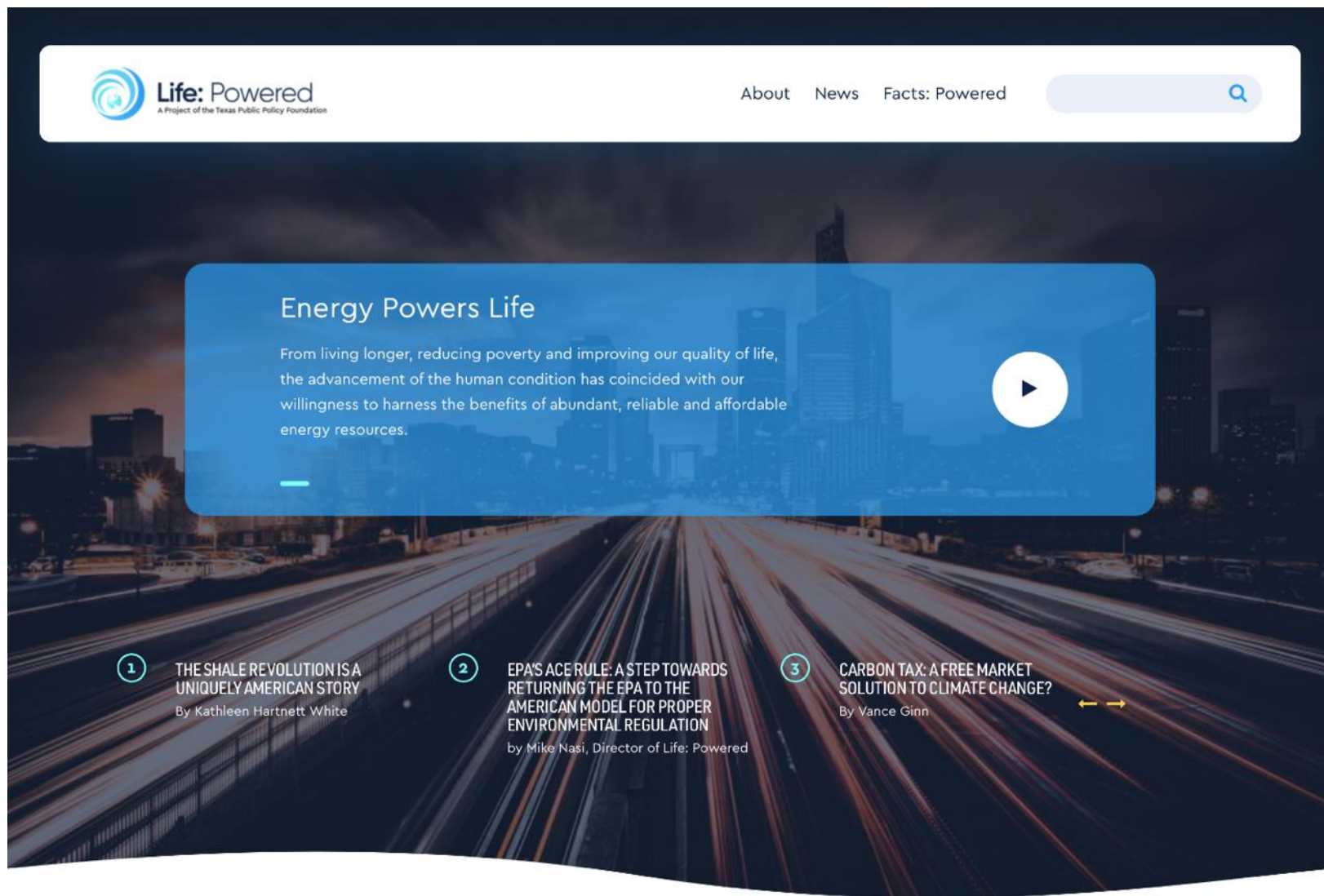
Environmental policy should serve **humanity**, not the other way around.

**Domestic fossil fuel** are increasingly **clean** and exporting that to the rest of the world will improve lives and help the environment.

**America's future** requires continued reliance on clean & abundant fossil fuel.

# CENTERPIECE OF OUR EDUCATION CAMPAIGN!

[www.LifePowered.org](http://www.LifePowered.org)



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Mike Nasi  
Director, *Life:Powered*  
Partner,  
Jackson Walker L.L.P.  
[mnasi@jw.com](mailto:mnasi@jw.com)  
512-236-2000



# REMIND EVERYONE YOU KNOW HOW MUCH THEY DEPEND UPON AMERICAN FOSSIL FUELS IN THEIR DAILY LIVES!

## *“Fossil Fuels -Essential to Every Day Life”* Video

[https://www.youtube.com/watch?time\\_continue=1&v=mclv06jR\\_e0](https://www.youtube.com/watch?time_continue=1&v=mclv06jR_e0)





# QUESTIONS?

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**VISIT & FOLLOW:**

**[www.lifepowered.org](http://www.lifepowered.org)**

# Reference Materials

ENERGY INFORMATION AGENCY ELECTRICITY & COAL MONTHLY & ANNUAL REPORTS

<https://www.eia.gov>

INTERNATIONAL ENERGY AGENCY WORLD ENERGY OUTLOOK

<https://www.iea.org/weo/>

NATIONAL COAL COUNCIL'S *POWER RESET* (2018)

<https://www.nationalcoalcoalcouncil.org/studies/2018/NCC-Power-Reset-2018.pdf>

NATIONAL COAL COUNCIL'S *COAL IN A NEW CARBON AGE* (2018)

<https://www.nationalcoalcoalcouncil.org/studies/2019/NCC-COAL-IN-A-NEW-CARBON-AGE.pdf>

DEPARTMENT OF ENERGY OFFICE OF FOSSIL ENERGY

<https://www.doe.gov/fossil>

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<https://www.lifepowered.com>

AMERICA'S POWER COAL FACTS

<https://www.americaspower.org>