The Importance of Energy Analysis and Strategic Planning

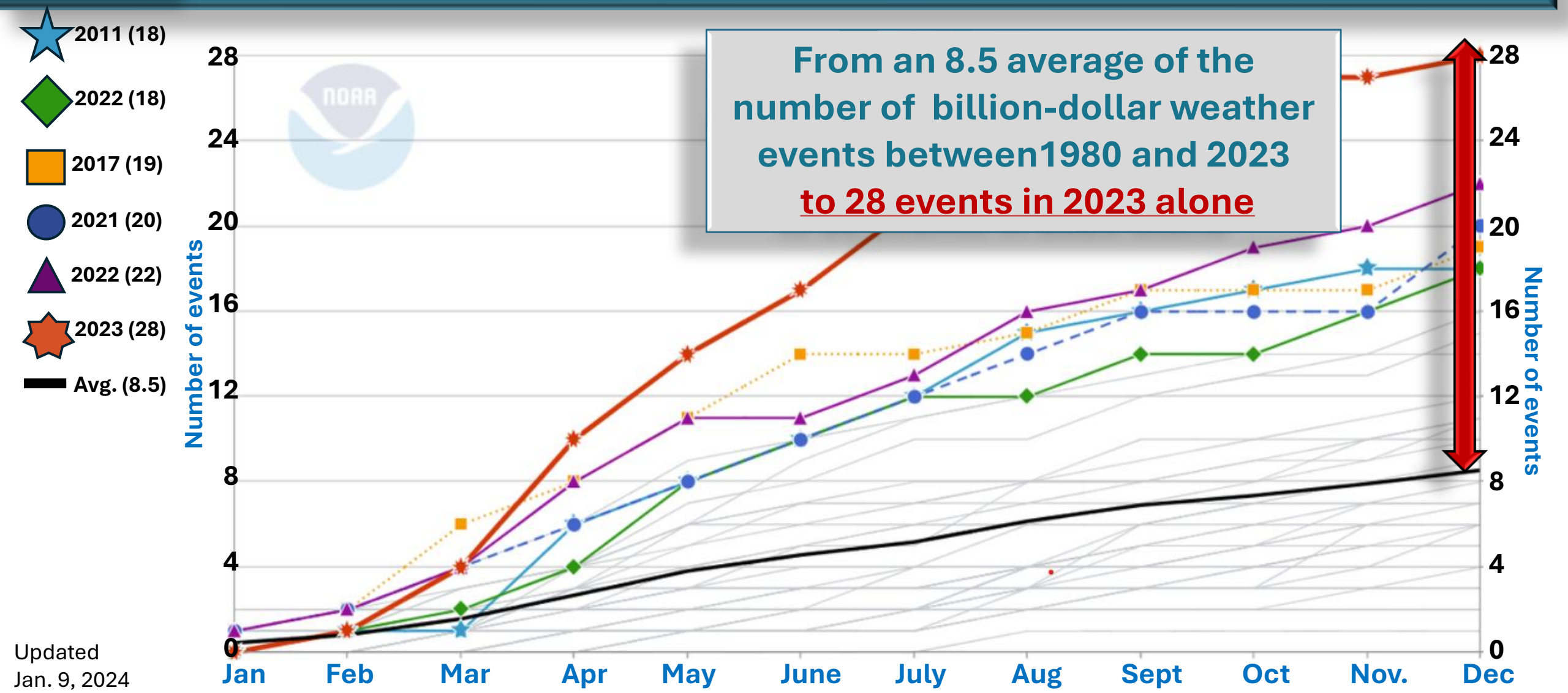
Melanie Kenderdine

September 24, 2024

Albuquerque, New Mexico

NASA Satellite Photos, Elephant Butte Reservoir, New Mexico, My Home State

US Billion Dollar Weather and Climate Disasters, 1980 -2023 (CPI adjusted)

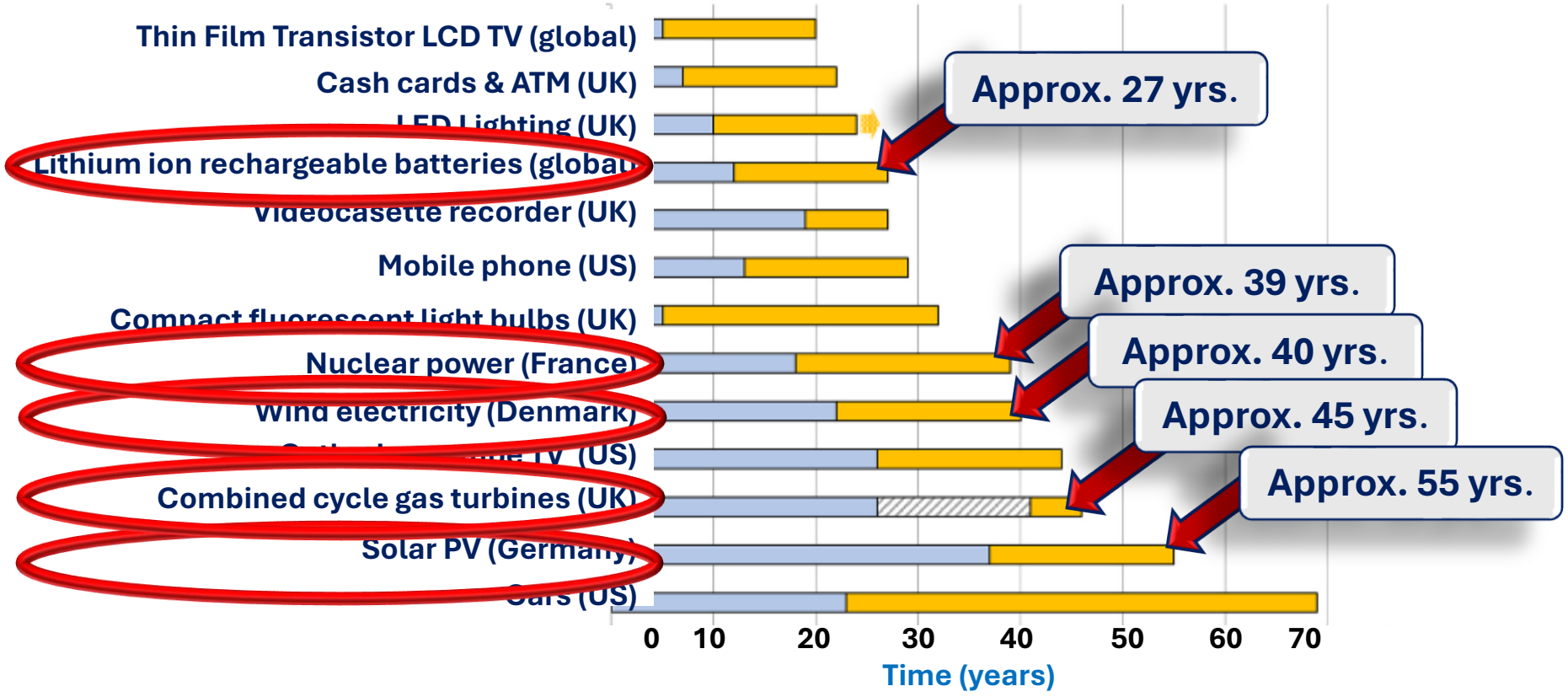


Updated
Jan. 9, 2024

Event statistics are added according to the date on which they ended

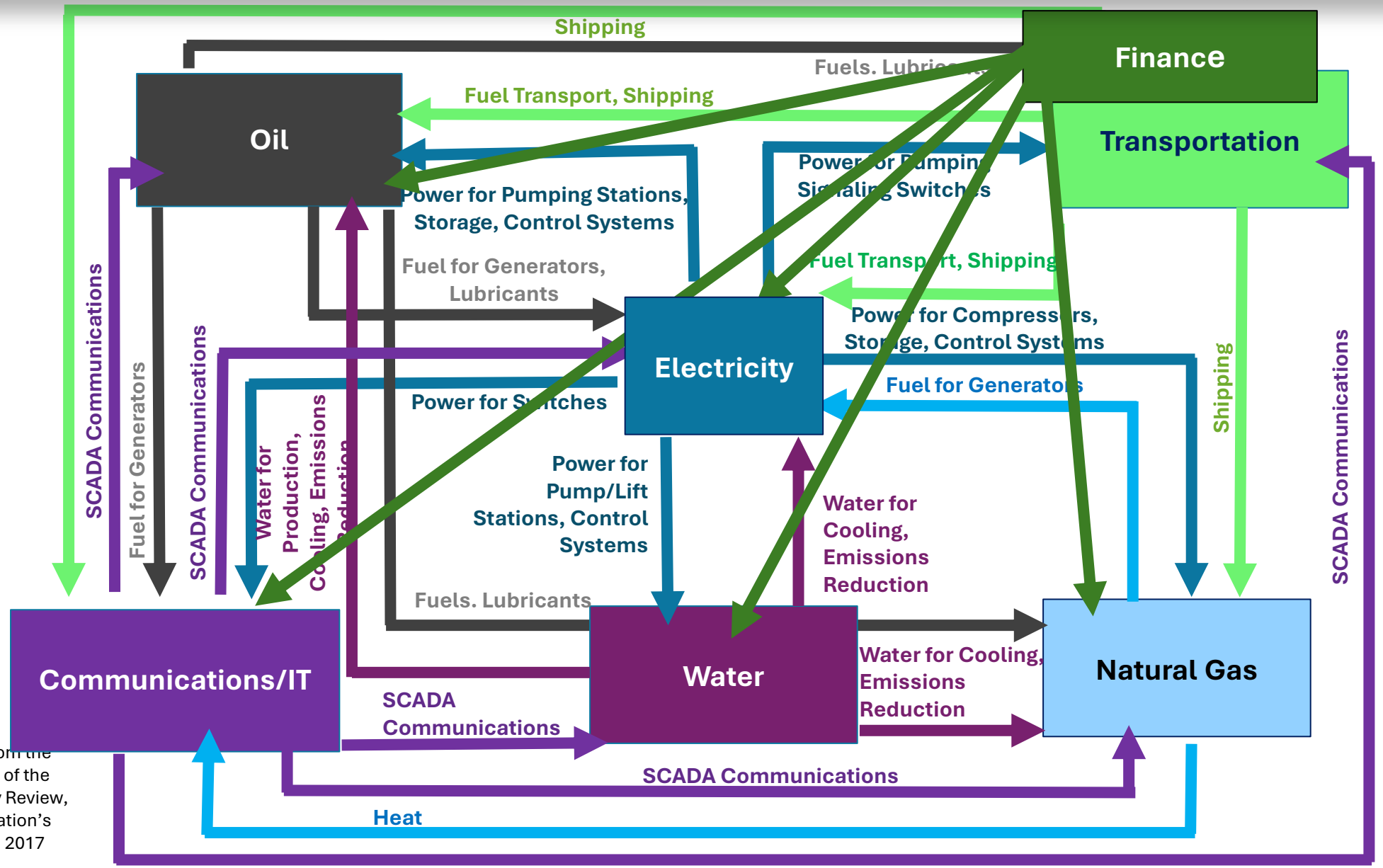
https://www.climate.gov/news-features/blogs/beyond-data/2023-historic-year-us-billion-dollar-weather-and-climate-disasters

Development/Deployment Timelines for Key Technologies



Francehttps://reader.elsevier.com/reader/sd/pii/S0301421521000240?token=875F291C875B56A06A22FF61D6E0AFD903726134EEA017D8914E90A9DB516318501601DD1CDF1A5072CFFED060D141A1&originRegion=us-east-1&originCreation=20210715180413

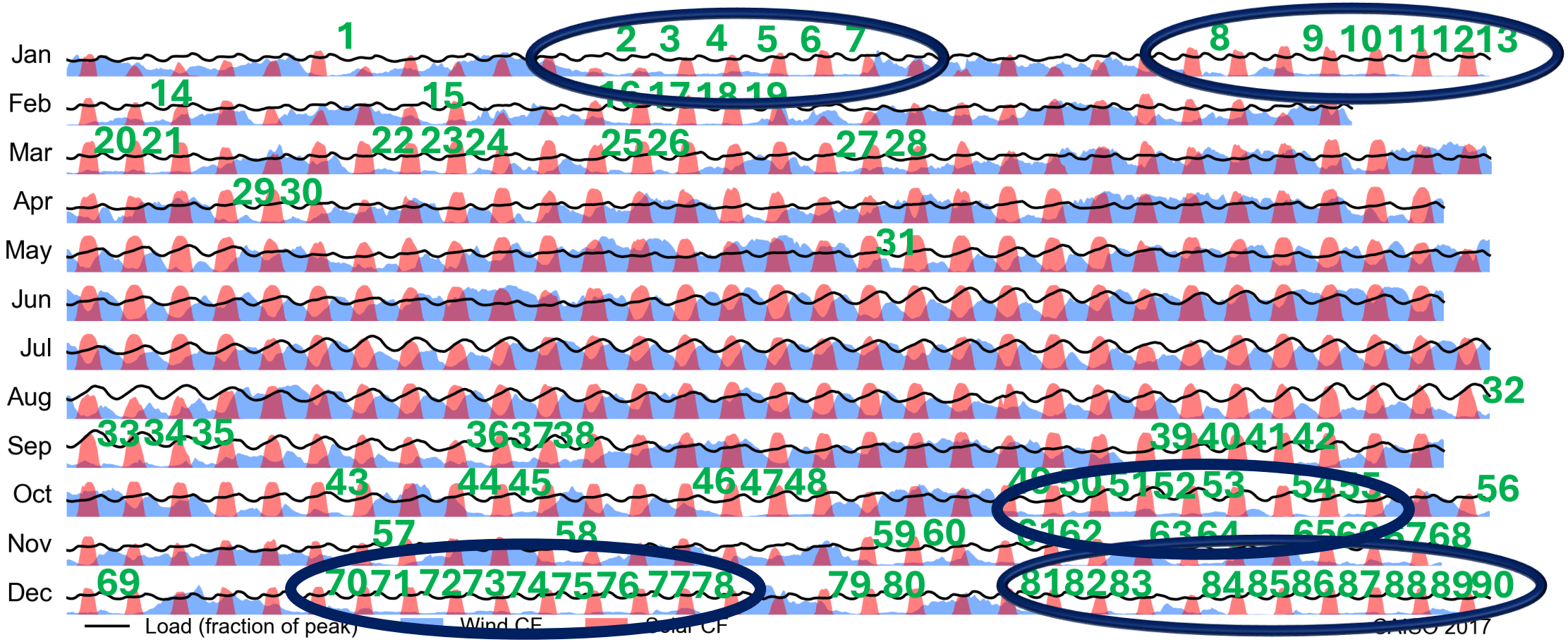
Electricity and Lifeline Network Interdependencies



Source: Modified from the Second Installment of the Quadrennial Energy Review, Transforming the Nation's Electricity Systems, 2017

The Challenges of Integrating Intermittent Renewables

Over the course of a year large-scale dependence on both wind and solar will result in significant periods requiring very large-scale back-up options



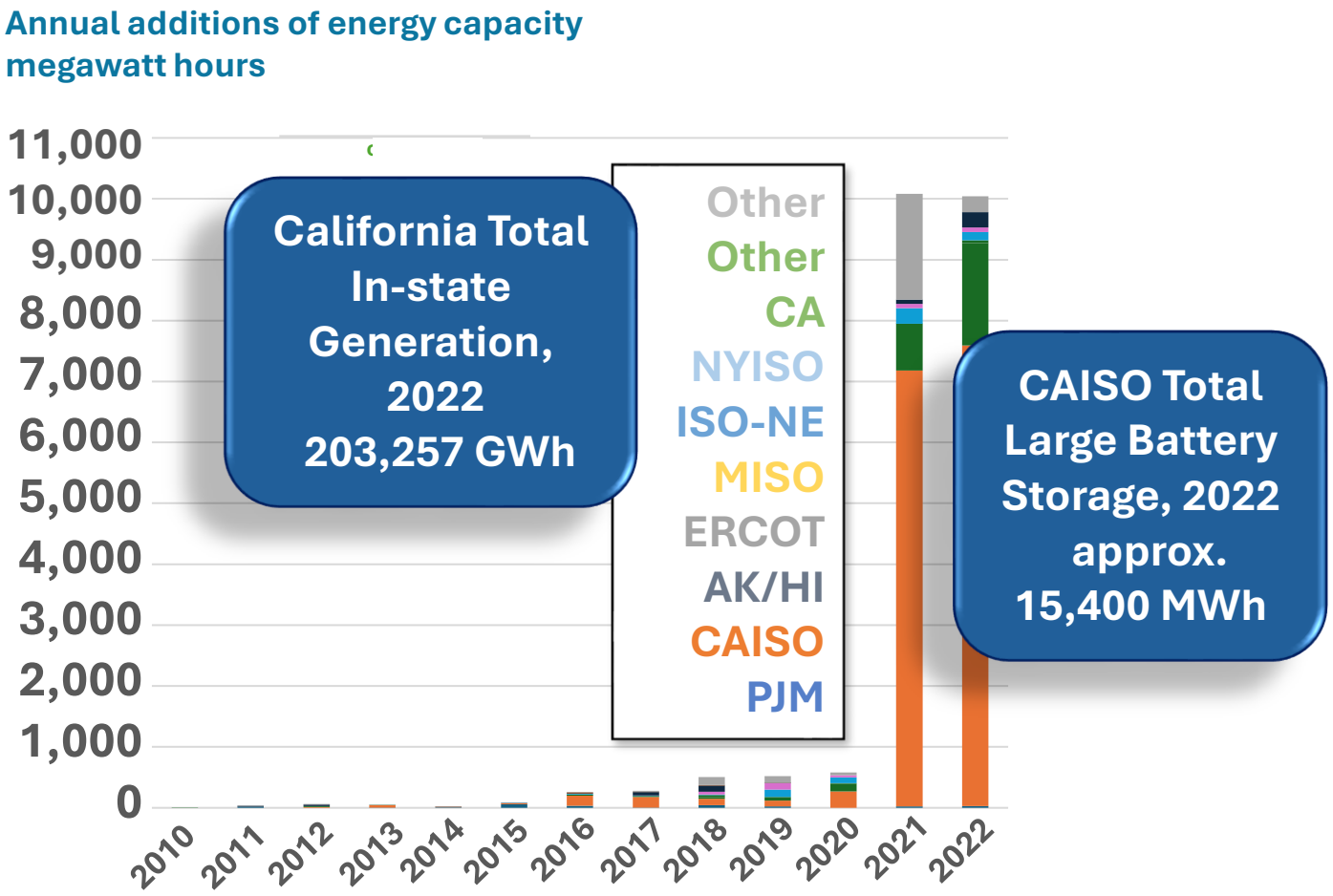
Hourly trends in solar and wind capacity factors in CA for 2017 aligned to normalized variation in hourly load relative to peak daily load

Source: CAISO data, EFI analysis

Source: EIA, 2020

The Challenges of Integrating Intermittent Renewables

Large-scale battery storage additions by region (2010-2022)



Data source: U.S. Energy Information Administration, *2022 Form EIA-860 Early Release, Annual Electric Generator Report*

Levelized Cost of Electricity (LCOE) & Storage (LCOS) for Plants Entering Service in 2027

NEW MEXICO emnrd Energy, Minerals and Natural Resources Department

USC Coal → **$82.61**

$52.11

85%

Combined Cycle → **$39.94**

$9.36

87%

Advanced Nuclear → **$88.24**

$60.71

90%

Battery Storage → **$128.55**

$64.03

10%

Combustion Turbine → **$117.86**

$53.78

10%

Geothermal → **$39.82**

$22.04

90%

Capacity Resource Technologies

Dispatchable

Onshore Wind → **$40.23**

$29.90

41%

Offshore Wind → **$136.51**

$103.77

44%

Solar Standalone → **$36.49**

$26.60

29%

Hydroelectric → **$64.27**

$46.58

54%

Resource Constrained Technologies

Total system LCOE or LCOS (2020 $/MWhr)

Levelized capital cost

Capacity factor

"Energy "too cheap to meter" has long been a sci-fi dream. But as the cost of solar power plummets toward zero, it might just become a reality."

NYT Magazine, 09/01/24

https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

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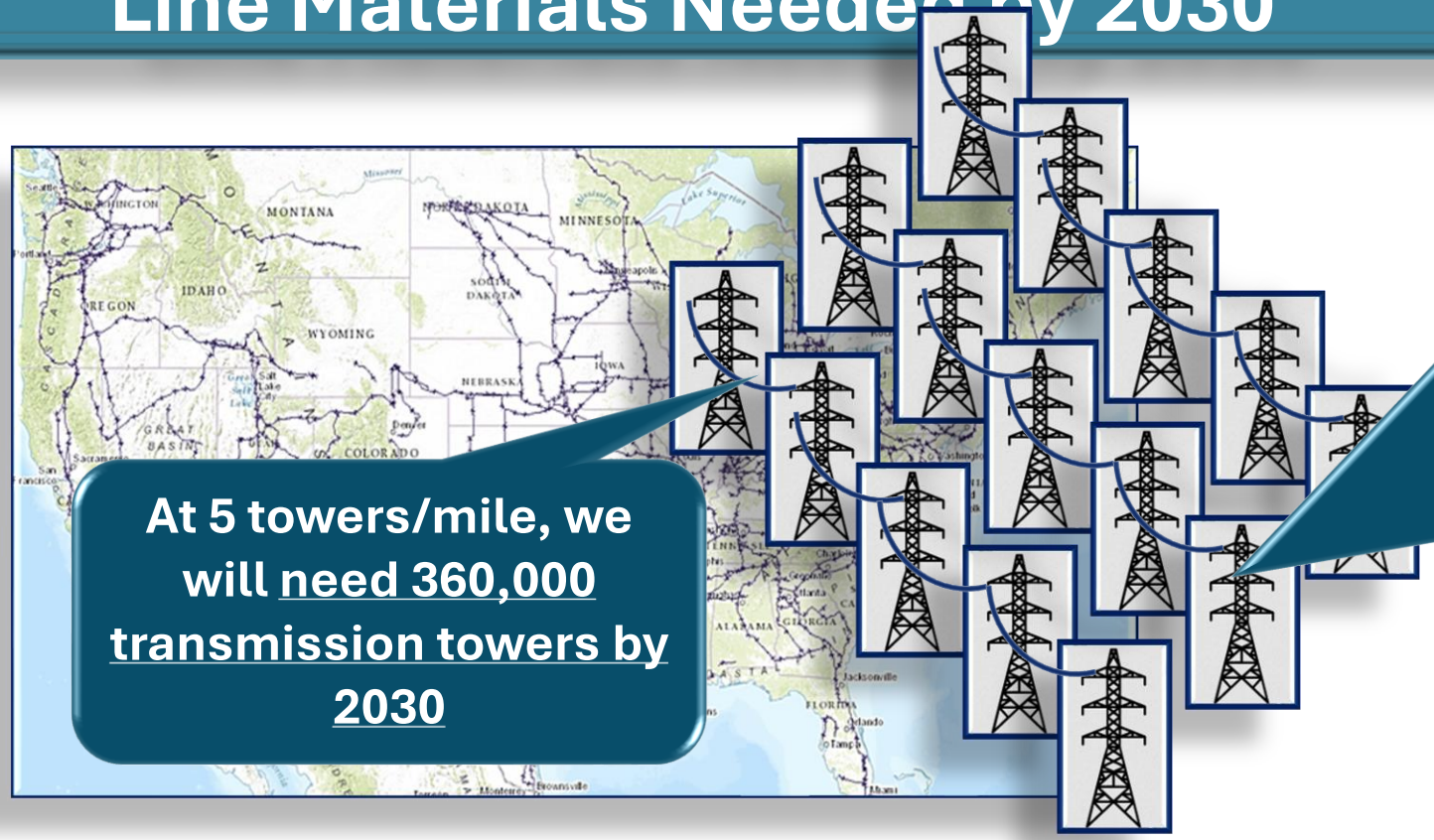
Reference Frame: High Voltage Transmission Line Materials Needed by 2030

EIA: In 2016, there were 160,000 miles of high voltage transmissions lines

Princeton NZA (E+RE pathway with base land availability): The US will need a 75% increase in transmission capacity by 2030 to meet net zero targets

Assume 60% of that capacity is achieved by adding new miles (the other 40% is met with technology improvements)



At 5 towers/mile, we will need 360,000 transmission towers by 2030

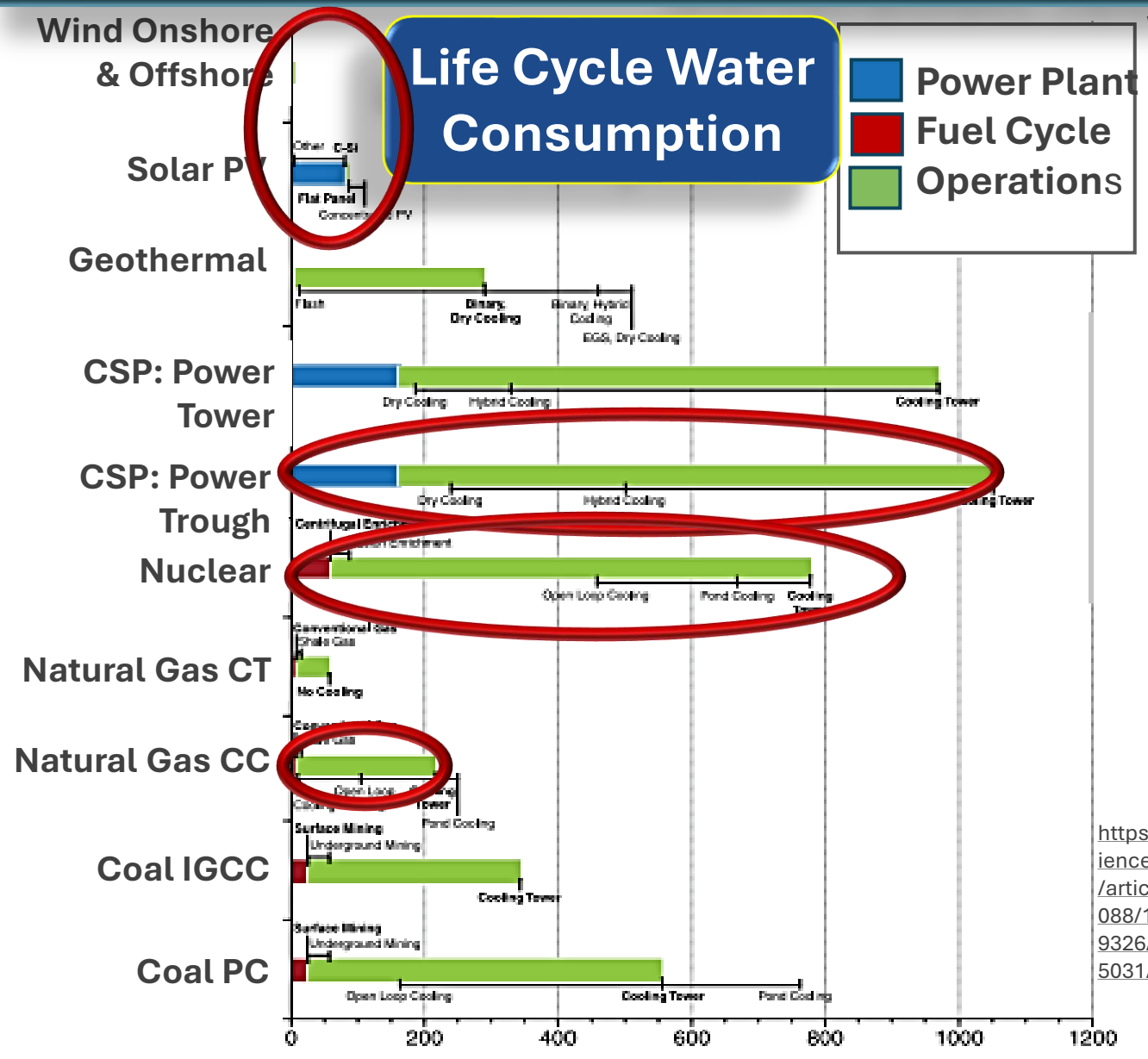
60% of 96,000 translates to 72,000 miles of new high voltage transmission lines by 2030

There are between 5 and 5.6 towers per mile on a high voltage transmission line (credible numbers range from 5 to 5.6)

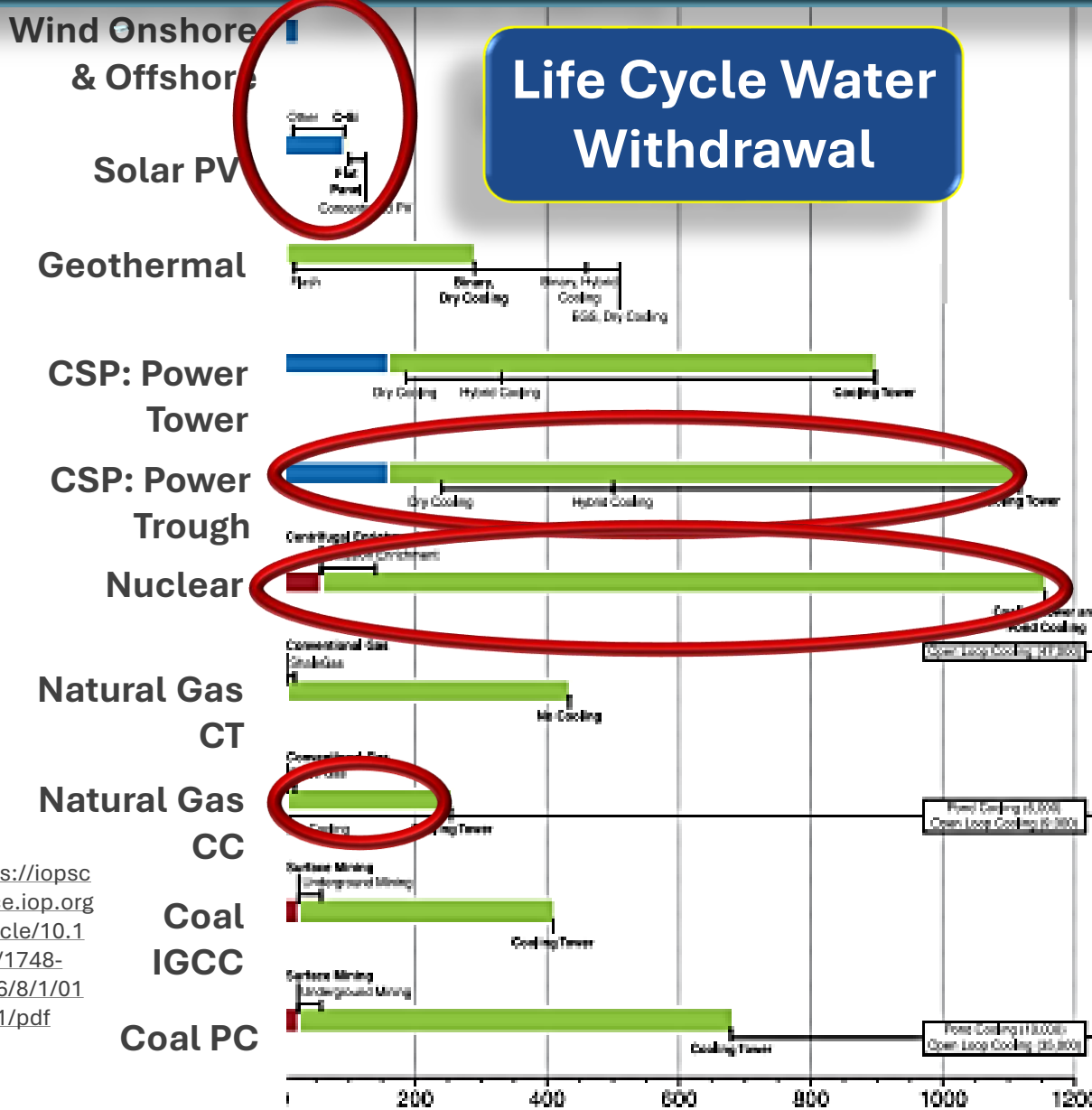
Transmission towers are made of steel, aluminum and copper, among other materials. So are transmission lines. So are wind turbines. So are cell towers. So are EVs. So are EV charging stations

https://www.eia.gov/todayinenergy/detail.php?id=27152

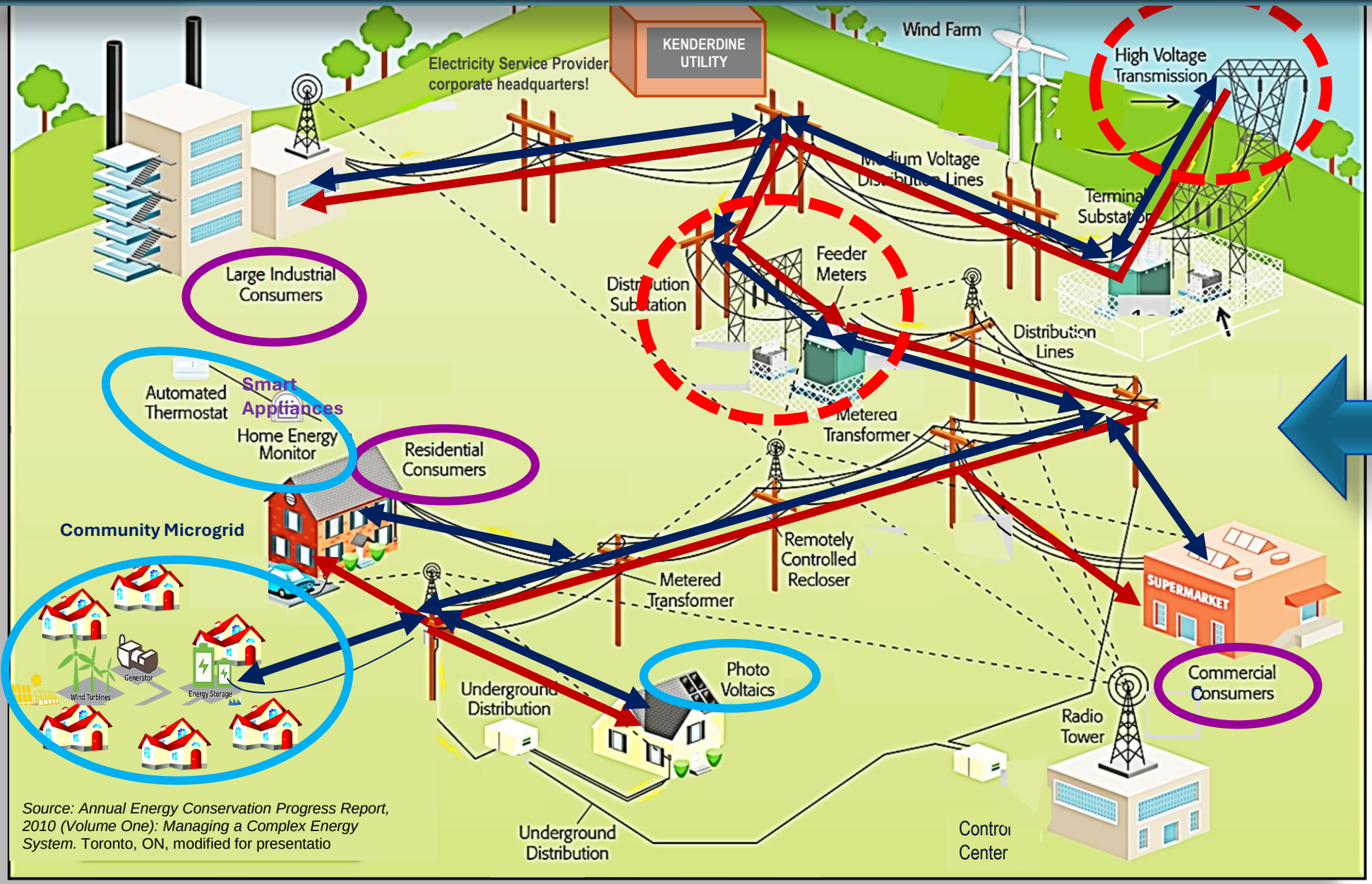
Life Cycle Water Consumption and Withdrawal by Generation Technology (gal/Mwh)



https://iopscience.iop.org/article/10.1088/1748-9326/8/1/015031/pdf



Two Way Electricity Flows and Grid Security

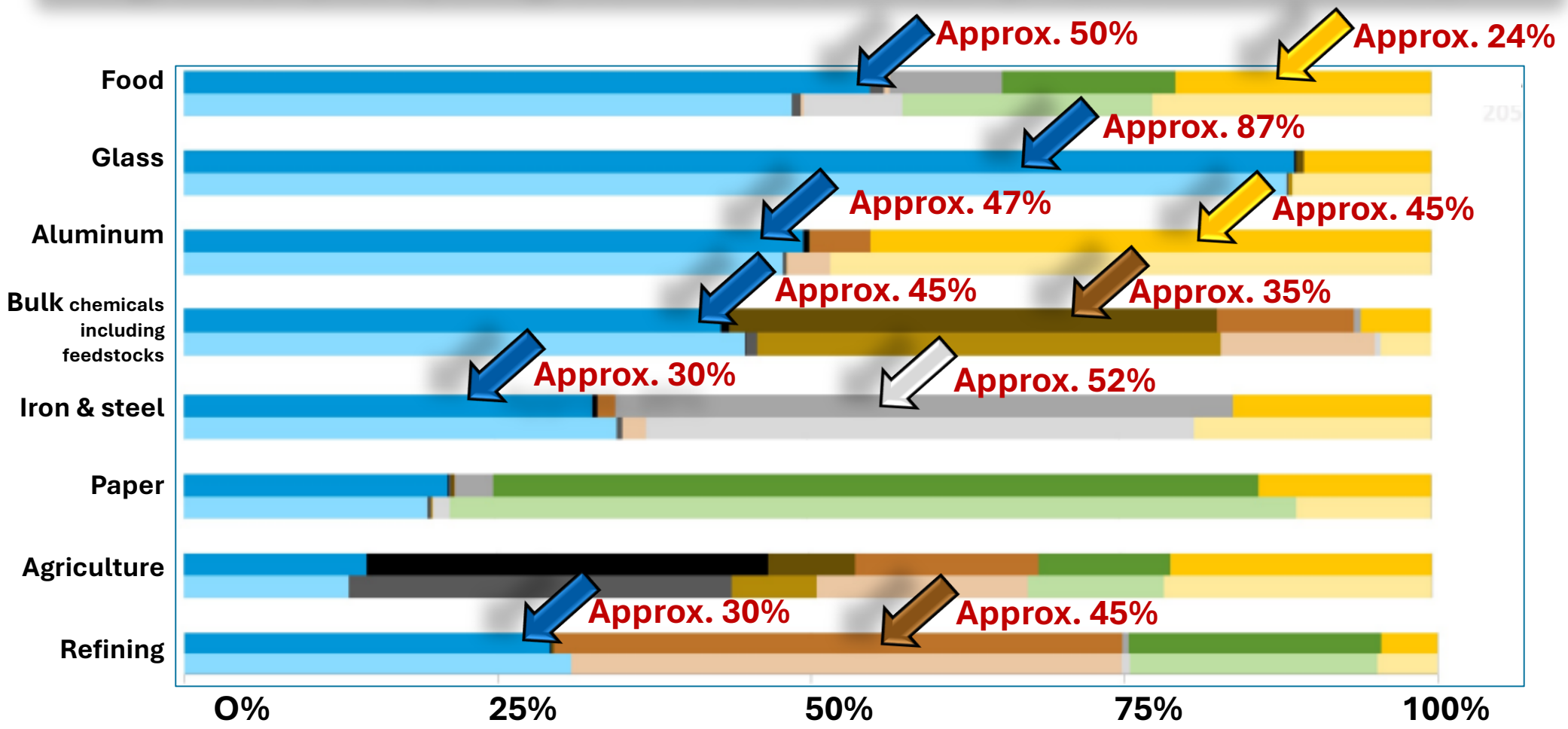


Source: Annual Energy Conservation Progress Report, 2010 (Volume One): Managing a Complex Energy System. Toronto, ON, modified for presentatio

"…emerging advancements in … smart grid technologies, cloud computing services, grid-cyber vulnerability & assessments, and distributed energy resources represent significant cybersecurity threats to the continuity of delivered power. " (Sandia National Laboratory)

US Industrial Uses of Energy

Energy Consumption by Energy Source Shares and Industry, % (EIA AEO2020 Reference Case)

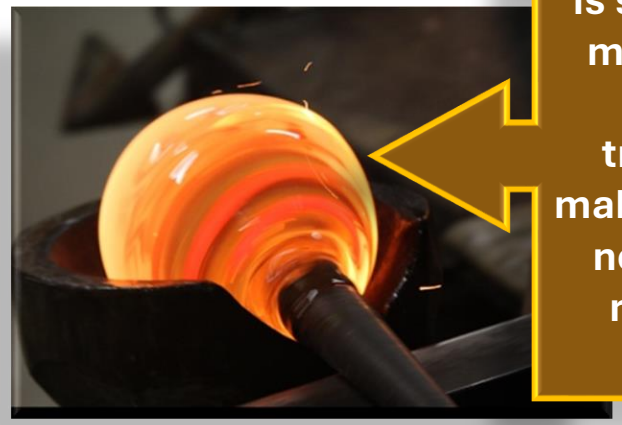


https://www.eia.gov/outlooks/aeo/pdf/AEO2020%20Full%20Report.pdf

Source: US EIA, 2020 AEO

Electricity Inadequate for Key Industrial Processes

Metallurgical and ceramic processes require high heat… 99.5% aluminum melts at 1,214°F (657 °C), and carbon steel begins melting at 1,425°F (734°C). Ceramics require kiln temperatures from 2,124°F to 2,264°F



At a high level, glass is sand that's been melted down and chemically transformed. To make sand melt, you need to heat it to roughly 1700°C (3090°F)

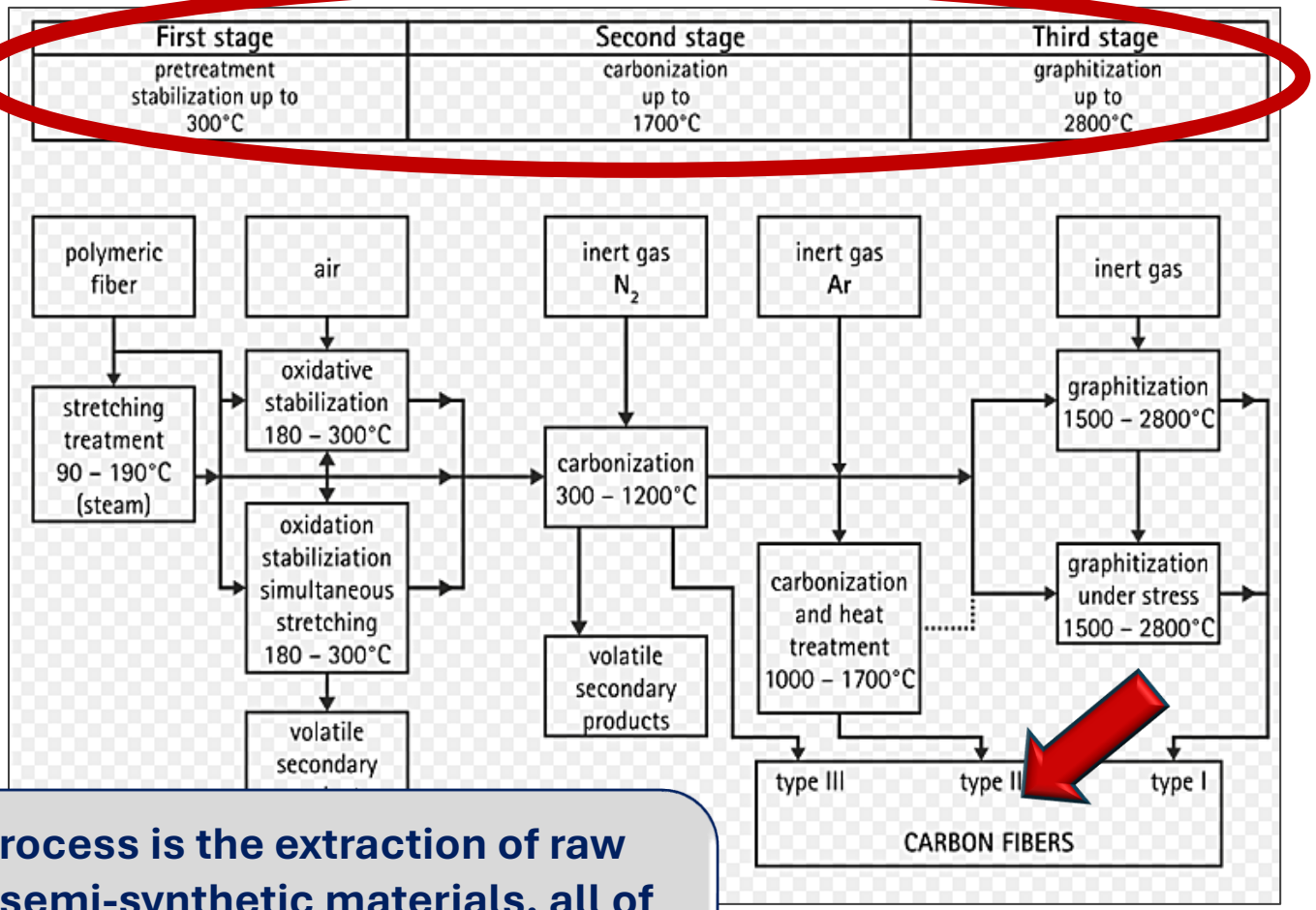
Forging and shaping steel is typically done at temperatures from 1400 F – 2000 F. And forge welding is done at temperatures above 2000 F.

Concentrated solar collectors: approx. 32 - 400 degrees
Deep geothermal energy: approx. 175 - 380 degrees
Woody biomass: approx. 32 - 400 degrees

…approximately 32 percent of key industry processes require very high temperatures (>1000 °); another 16% require high temperatures (400-1000 °). Technologies for achieving high heat other than from fuel combustion are still in the research or pilot phases. These processes currently require a fuel such as natural gas to affordably achieve the levels of heat needed.

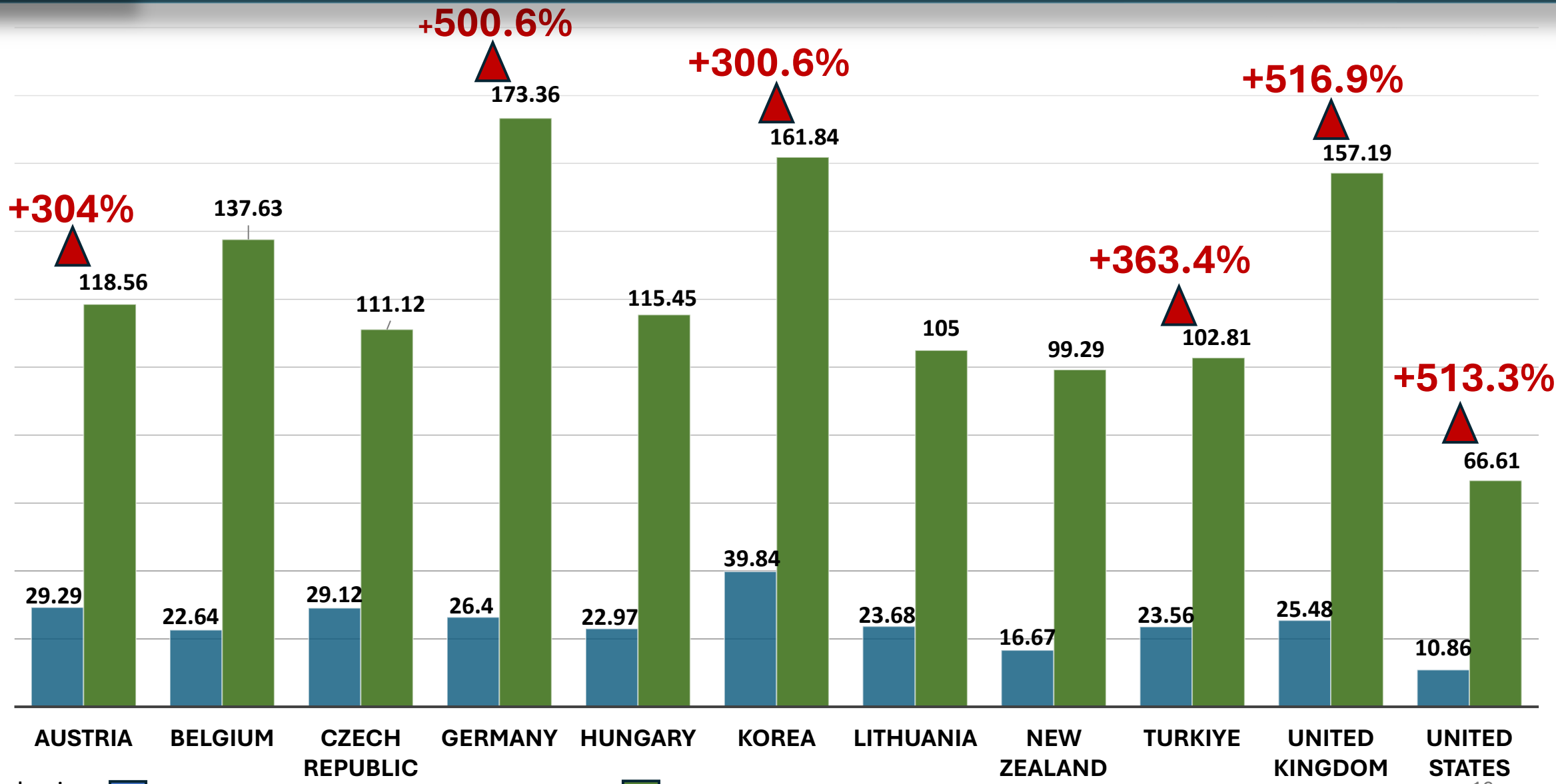
Key Technology Needs Both Heat and Oil

Wind turbine blades are manufactured using a composite mix of glass, carbon fiber, and plastic. It's a unique material that gives the blades the strength and durability to do its job.



The first step in the plastic manufacturing process is the extraction of raw materials…plastic is made from synthetic or semi-synthetic materials, all of which are derived from fossil fuels. The most common ones include natural gas, crude oil, and coal. These fossil fuels are extracted from the ground and then refined to create hydrocarbon-based feedstocks used to make plastic.

Natural Gas and Electricity Prices, Select OECD countries, 2021 (MWhr*)

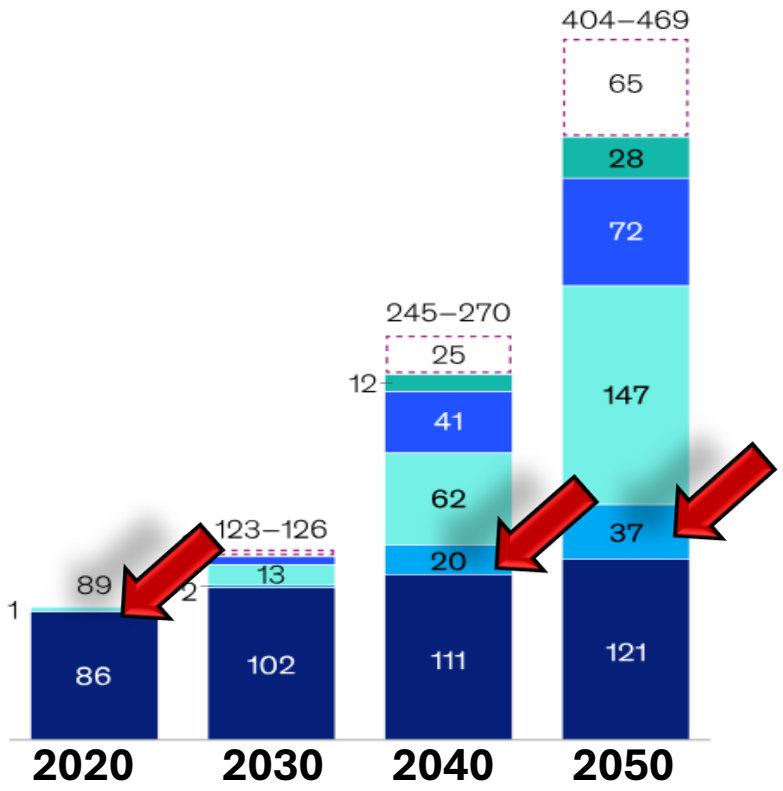


*natural gas is MWhrCVG; CVG is gross calorific value

Global Hydrogen Demand by Sector/Forecasts

Total Hydrogen Demand by Sector, Further Acceleration Scenario

Mt/yr of hydrogen equivalent

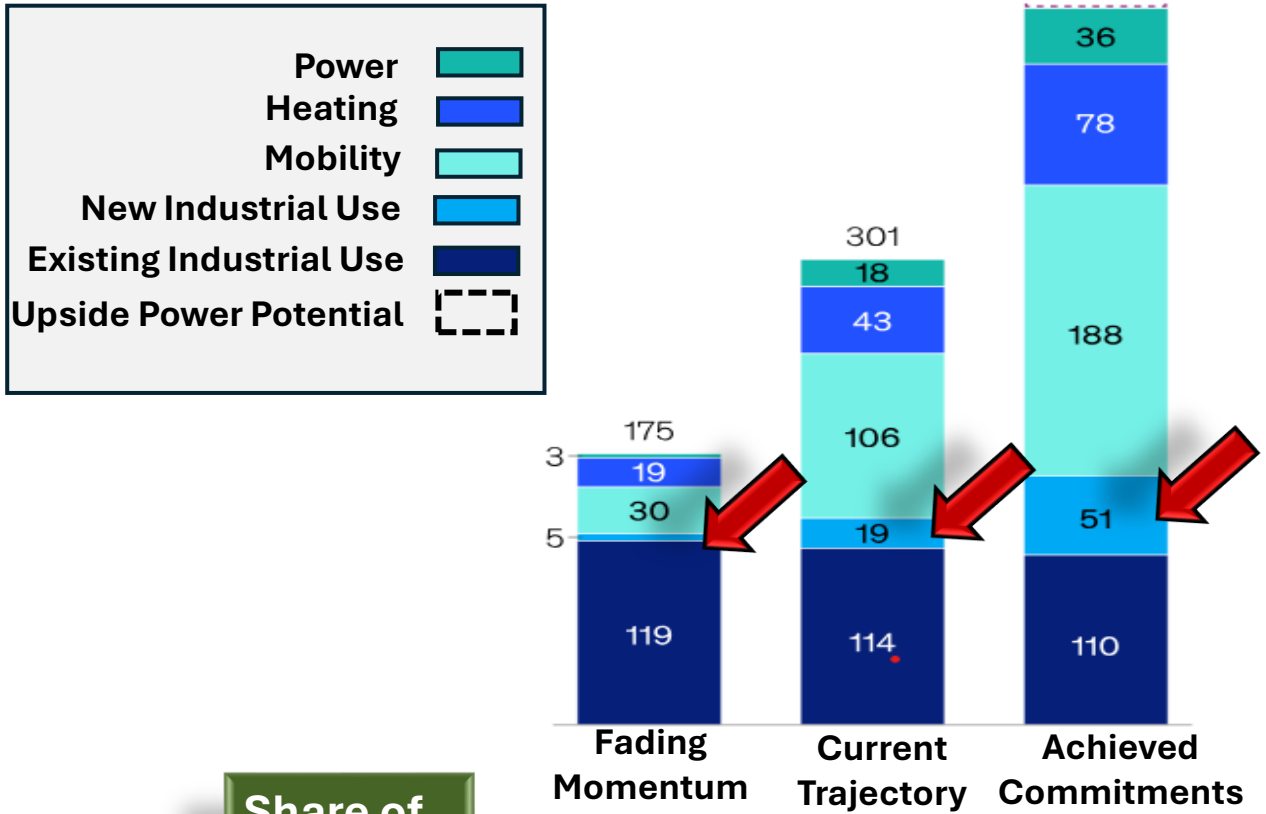


https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2023-hydrogen-outlook

Share of clean hydrogen → <1 | ~30 | ~77 | ~93

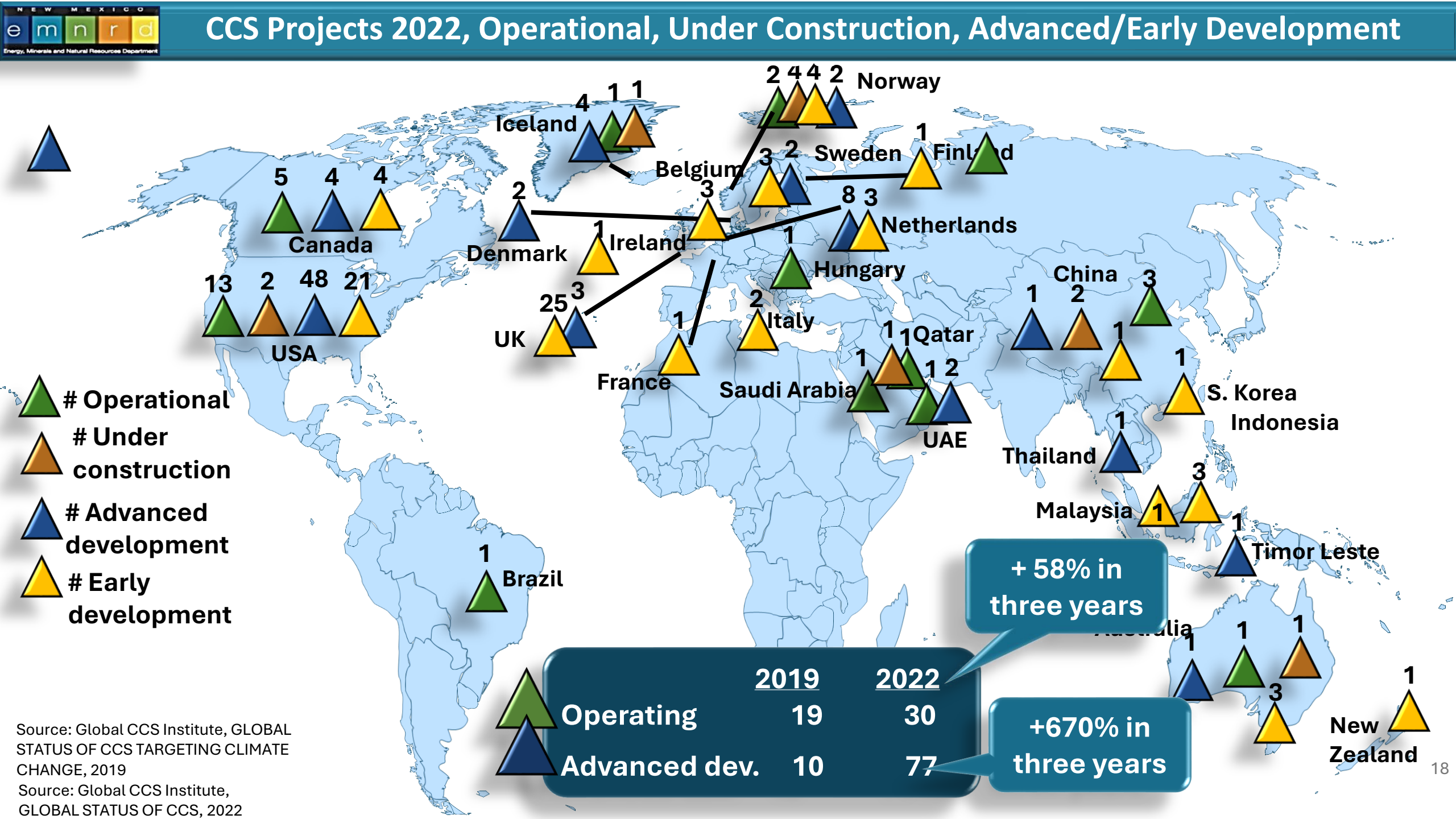
Total Hydrogen Demand by Sector, Other Scenarios

Mt/yr of hydrogen equivalent, 2050



Share of clean hydrogen → ~73 | ~89 | ~98

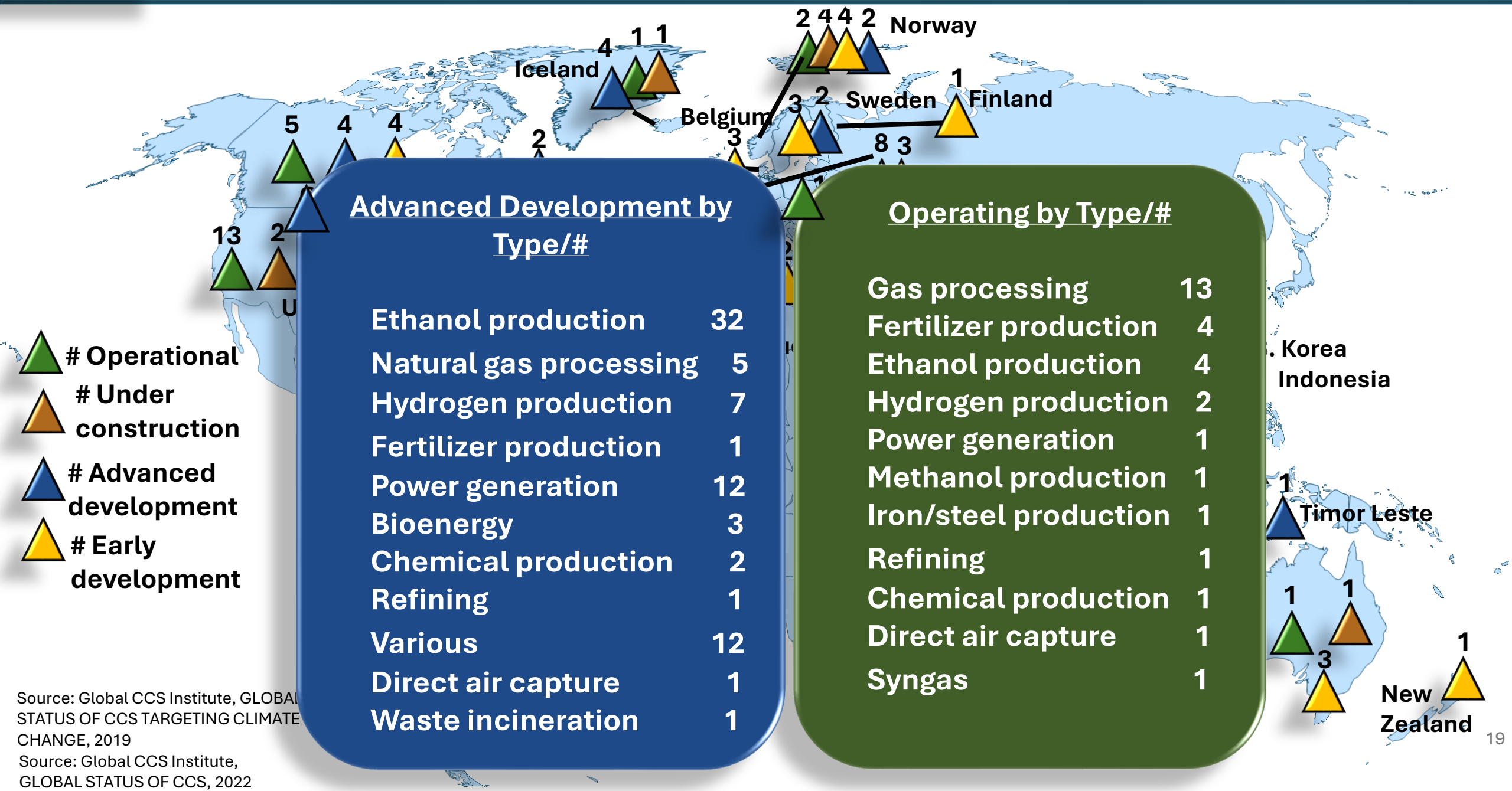
CCS Projects 2022, Operational, Under Construction, Advanced/Early Development



Source: Global CCS Institute, GLOBAL STATUS OF CCS TARGETING CLIMATE CHANGE, 2019

Source: Global CCS Institute, GLOBAL STATUS OF CCS, 2022

CCS Projects 2022, Operational, Under Construction, Advanced/Early Development



Advanced Development by Type/#

Ethanol production	32
Natural gas processing	5
Hydrogen production	7
Fertilizer production	1
Power generation	12
Bioenergy	3
Chemical production	2
Refining	1
Various	12
Direct air capture	1
Waste incineration	1

Operating by Type/#

Gas processing	13
Fertilizer production	4
Ethanol production	4
Hydrogen production	2
Power generation	1
Methanol production	1
Iron/steel production	1
Refining	1
Chemical production	1
Direct air capture	1
Syngas	1

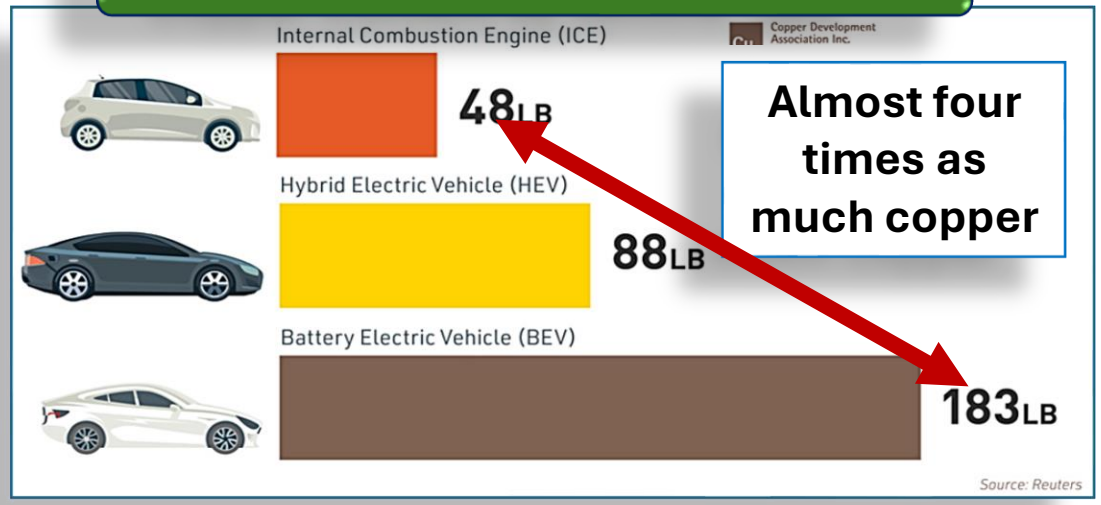
Source: Global CCS Institute, GLOBAL STATUS OF CCS TARGETING CLIMATE CHANGE, 2019

Source: Global CCS Institute, GLOBAL STATUS OF CCS, 2022

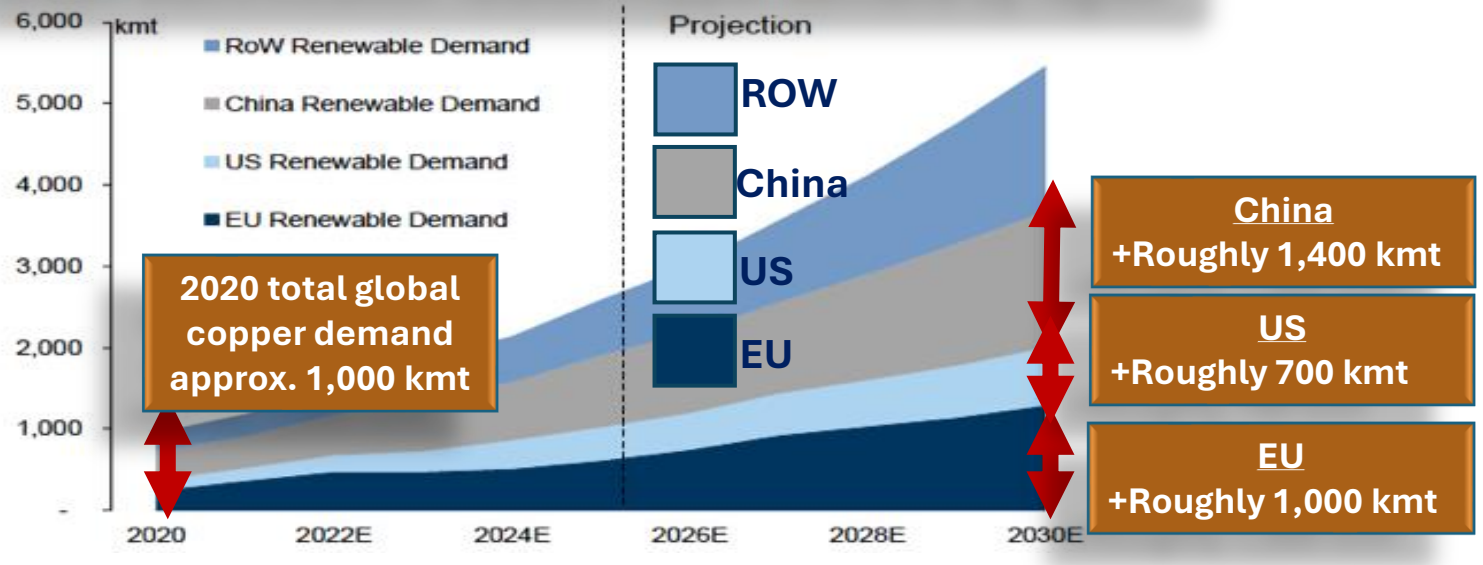
Demand for Electrification/Transportation = $10,000 per ton Copper

Copper, 5 Year Price Chart

Copper Content by Vehicle Type



Green electrification related copper demand by region



140 M EVs by 2030 in IEA's SDS X 183 lbs. of copper/EV = 11.6 million Mt of copper for EVs

Global production, 2020: approx. 20 million Mt

US uses (%): building construction, 43%; electrical and electronic products, 21%; transportation equipment, 19%; consumer and general products, 10%; and industrial machinery and equipment, 7%.

Metals/Minerals 2022 % US Import Dependence, Key Uses

100% Import Dependent

Arsenic	Lumber preservatives, pesticides, lead acid batteries, solar cells
Tantalum	Electronic components, gas turbine alloys
Strontium	Pyrotechnics, ceramic magnets, drilling fluids
Scandium	Alloys, fuel cells, electronics
Rubidium	Electronics, glass
Rare Earths	Catalysts, ceramics, glass, alloys, metallurgy
Niobium	Steel alloys
Manganese	Steel production
Indium	LCD screens, electrical components
Graphite	Lubricants, batteries, fuel cells
Gallium	steel making Integrated circuits, optical devices (LEDs)
Fluorspar	Aluminum manufacturing, gasoline, uranium fuel, refrigerants
Cesium	Oil/gas well drilling, fuel cells
Yttrium	Catalysts, ceramics, metallurgy, jet engines
Asbestos	Oil industry, rubber sheet, vehicle friction products
Mica (sheet)	Oil drilling, roofing, rubber products

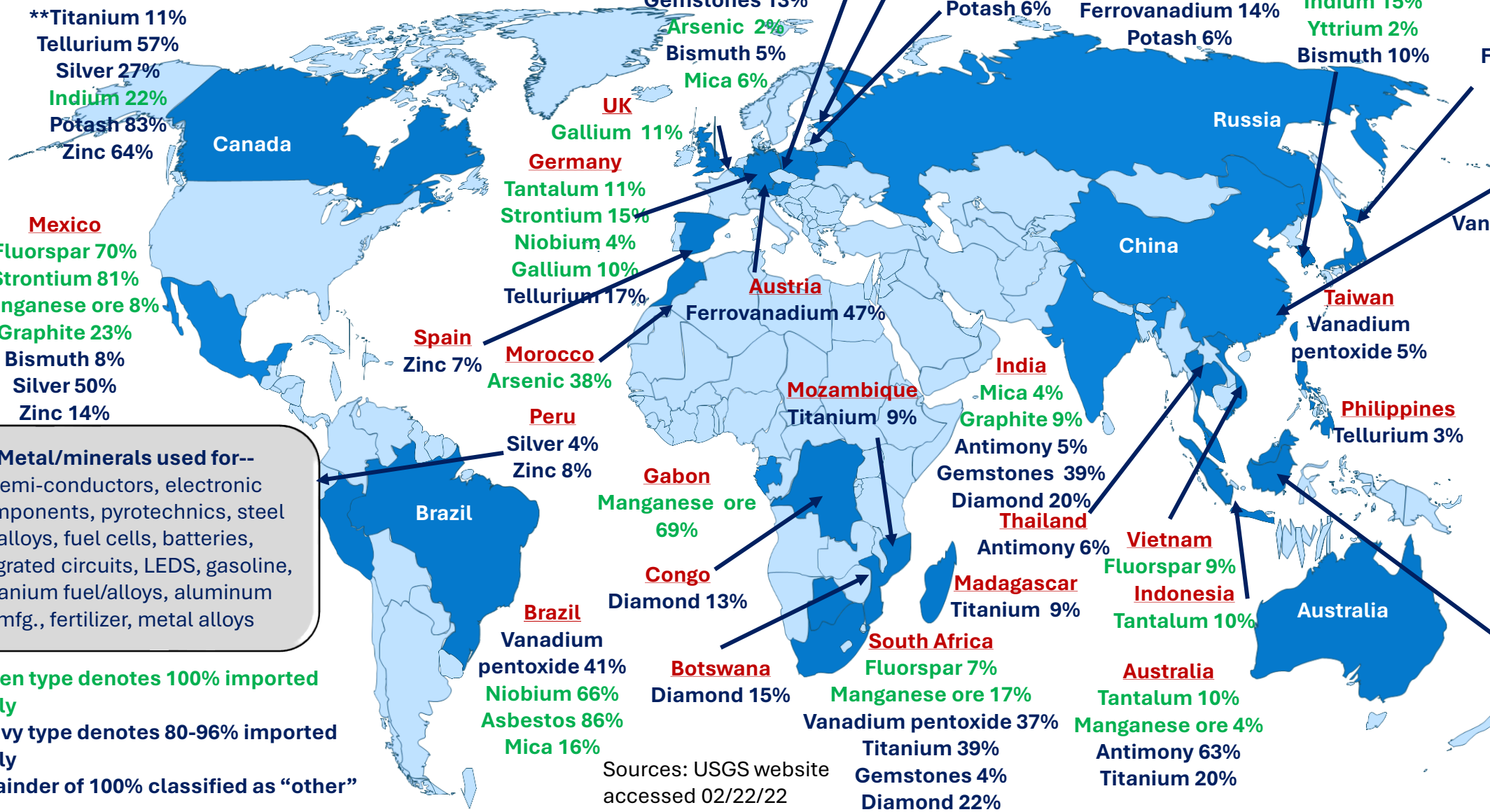
96 - >50% Import Dependent

Vanadium	96%	Metal, steel, uranium alloys
Tellurium	>95%	Cooling, energy production, solar cells, cast iron production
Bismuth	94%	Used in medical/ atomic research
Potash	90%	Fertilizer, chemical, & industrial apps
Titanium*	>88%	White pigment, metal alloys
Diamond	84%	Computer chips, O&G drilling, transportation
Zinc	83%	Metal galvanizing
Antimony	81%	Flame retardants, metal products, ceramics, glass
Silver	80%	Electricity, electricity conductivity, batteries, plastics
Platinum	79%	Catalytic agents
Rhenium	76%	Lead-free gasoline, super alloys
Cobalt	76%	Rechargeable batteries, superalloys
Barite	>75%	Oil/gas drilling
Bauxite	>75%	Cement, petroleum industries
Iron Oxide	>75%	Concrete, construction materials
Tin	75%	Coatings & alloys for steel
Chromium	75%	Stainless steel, other alloys
Gold	>52%	Electrical/electronics
Tungsten	>50%	Wear-resistant metals
Germanium	>50%	Fiber optics, solar cells
Lithium	>50%	Batteries, EVs
Nickel	>50%	Steel alloys

Note: Navy type indicates on USGS Critical List 2022
Red type highlights some key energy uses

Sources: USGS; Methodological Note to the Inventory of Export Restrictions on Industrial Raw Materials
*Titanium mineral concentrates

US Metals, Minerals on Which the US 80 to 100% Import Dependent, Country Suppliers of US Market/% Total Imports from Country



Canada
*Graphite 17%
Ferrovanadium 25%
Niobium 22%
**Titanium 11%
Tellurium 57%
Silver 27%
Indium 22%
Potash 83%
Zinc 64%

Mexico
Fluorspar 70%
Strontium 81%
Manganese ore 8%
Graphite 23%
Bismuth 8%
Silver 50%
Zinc 14%

Metal/minerals used for--
semi-conductors, electronic components, pyrotechnics, steel alloys, fuel cells, batteries, integrated circuits, LEDS, gasoline, uranium fuel/alloys, aluminum mfg., fertilizer, metal alloys

* Green type denotes 100% imported supply
** Navy type denotes 80-96% imported supply
Remainder of 100% classified as "other"

Belgium
Antimony 7
Gemstones 13%
Arsenic 2%
Bismuth 5%
Mica 6%

Poland
Silver 4%

Estonia
Rare earths 5%

Belarus
Potash 6%

Russia
Asbestos 14%
Niobium 3%
Ferrovanadium 14%
Potash 6%

S.Korea
Indium 15%
Yttrium 2%
Bismuth 10%

Japan
Rare earths 4%
Yttrium 1%
Ferrovanadium 5%

UK
Gallium 11%

Germany
Tantalum 11%
Strontium 15%
Niobium 4%
Gallium 10%
Tellurium 17%

China
Tantalum 26%
Rare earths 80%
Graphite 33%
Vanadium pentoxide 11%
Antimony 63%
Gallium 55%
Yttrium 94%
Fluorspar 8%
Strontium 2%
Arsenic 58%
Indium 34%
Mica 56%
Bismuth 69%
Tellurium 21%

Austria
Ferrovanadium 47%

Spain
Zinc 7%

Morocco
Arsenic 38%

Taiwan
Vanadium pentoxide 5%

India
Mica 4%
Graphite 9%
Antimony 5%
Gemstones 39%
Diamond 20%

Mozambique
Titanium 9%

Philippines
Tellurium 3%

Peru
Silver 4%
Zinc 8%

Gabon
Manganese ore 69%

Thailand
Antimony 6%

Vietnam
Fluorspar 9%

Indonesia
Tantalum 10%

Congo
Diamond 13%

Madagascar
Titanium 9%

Malaysia
Rare earths 4%

Brazil
Vanadium pentoxide 41%
Niobium 66%
Asbestos 86%
Mica 16%

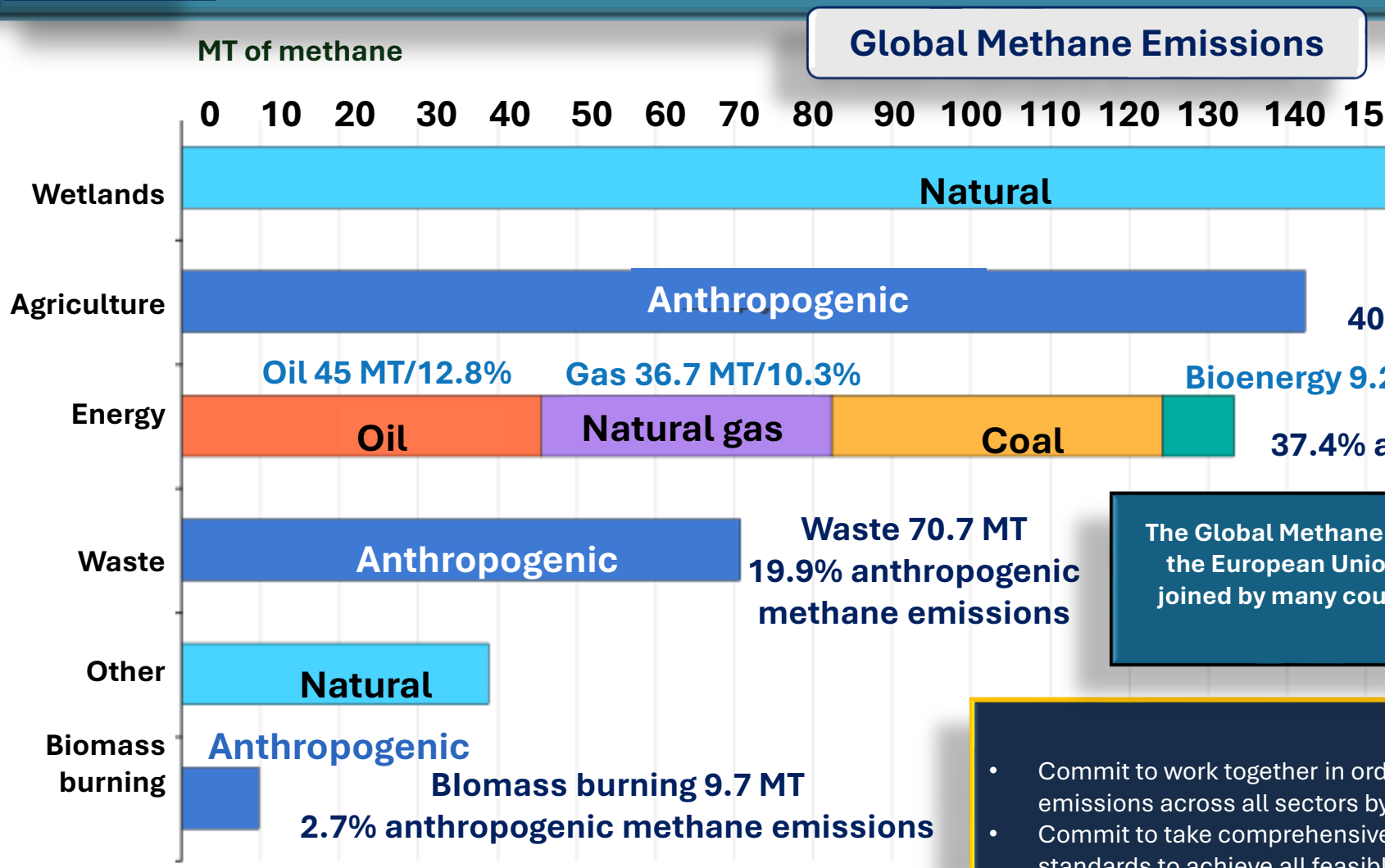
Botswana
Diamond 15%

South Africa
Fluorspar 7%
Manganese ore 17%
Vanadium pentoxide 37%
Titanium 39%
Gemstones 4%
Diamond 22%

Australia
Tantalum 10%
Manganese ore 4%
Antimony 63%
Titanium 20%

Sources: USGS website accessed 02/22/22

Amounts/Sources of Global/US Methane Emissions (Global 2022, US 2021)



Agriculture 143.3 MT
40% anthropogenic methane emissions

Energy 133.3 MT
37.4% anthropogenic methane emissions

Waste 70.7 MT
19.9% anthropogenic methane emissions

Biomass burning 9.7 MT
2.7% anthropogenic methane emissions

The Global Methane Pledge (GMP) was launched at COP26 by the European Union and the United States who have been joined by many countries. In March 2024, GMP counted 158 participants.

- Commit to work together in order to collectively reduce global anthropogenic methane emissions across all sectors by at least 30 percent below 2020 levels by 2030.
- Commit to take comprehensive domestic actions to achieve that target, focusing on standards to achieve all feasible reductions in the energy and waste sectors and seeking abatement of agricultural emissions through technology innovation as well as incentives and partnerships with farmers.
- Commit to moving towards using the highest tier IPCC good practice inventory methodologies, consistent with IPCC guidance, with particular focus on high emission sources, in order to quantify methane emissions

https://www.iea.org/reports/global-methane-tracker-2023/understanding-methane-emissions

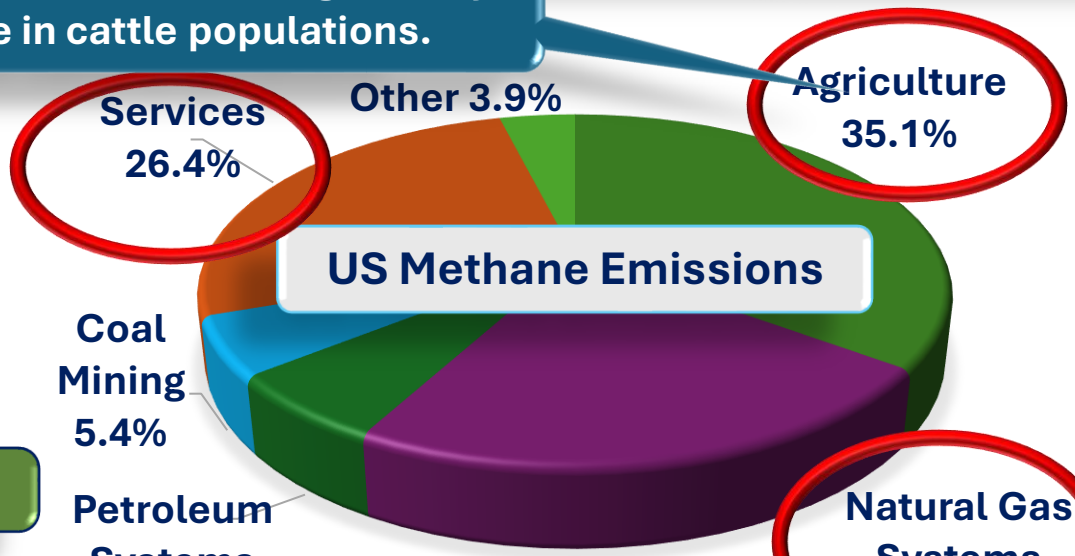
https://www.globalmethanepledge.org/#pledges

Amounts/Sources of Global/US Methane Emissions (Global 2022, US 2021)

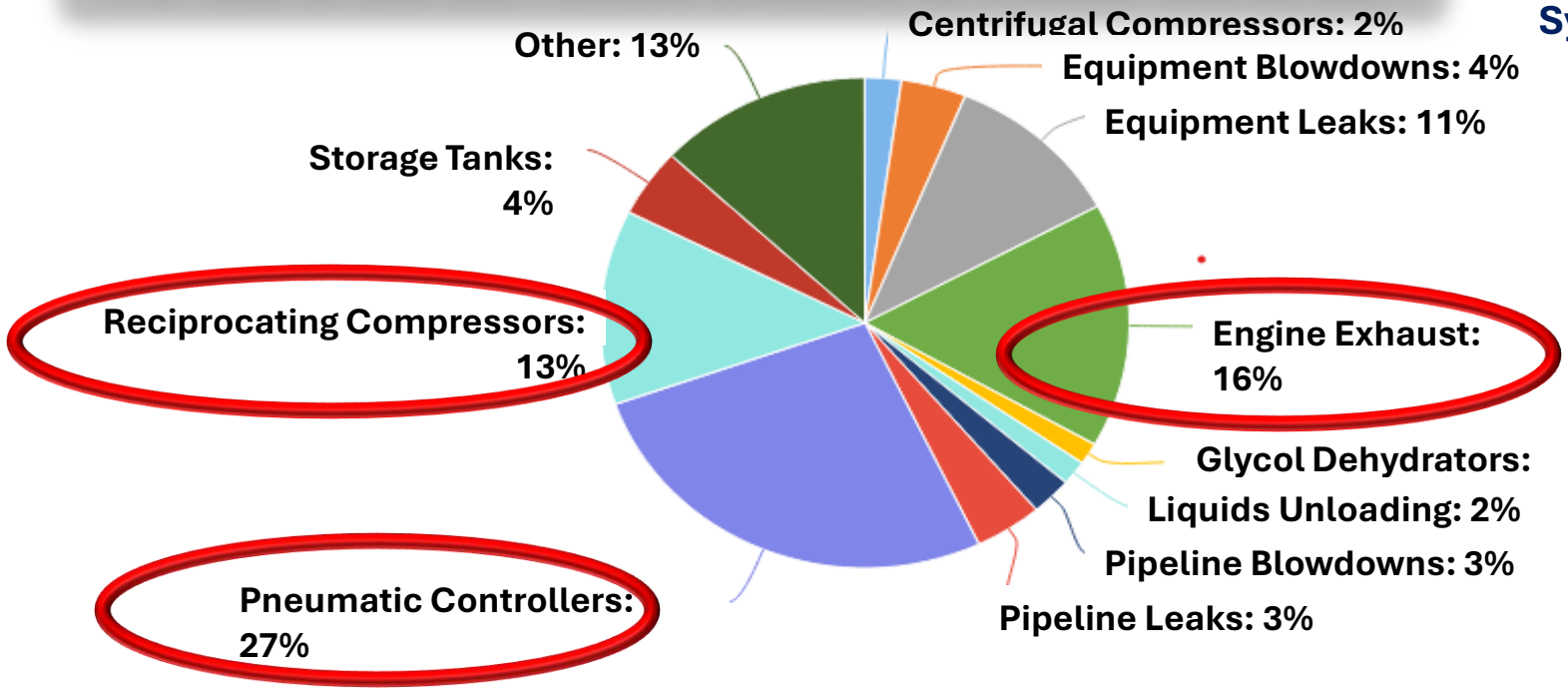
Emissions increased by 6.5% since 1990 generally following the increase in cattle populations.

Between 2008 and 2021, **methane emissions from oil and gas systems declined by 13.4%***

Between 2008 and 2021, **US natural gas consumption rose by 38.7%***



% of Total Oil and Gas Methane Emissions by Emission Source, 2021



Emissions decreased by 15.7% since 1990 largely due to decreases in emissions from distribution, transmission, and storage.

https://www.iea.org/reports/global-methane-tracker-2023/understanding-methane-emissions

https://www.globalmethanepledge.org/#pledges

Example of Strategic Energy Plan: The Obama Administration's Quadrennial Energy Review (QER)

Presidential Memorandum -- Establishing a Quadrennial Energy Review

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

Affordable, clean, and secure energy and energy services are essential for improving U.S. economic productivity, enhancing our quality of life, protecting our environment, and ensuring our Nation's security. Achieving these goals requires a comprehensive and integrated energy strategy resulting from interagency dialogue and active engagement of external stakeholders. To help the Federal Government better meet this responsibility, I am directing the undertaking of a Quadrennial Energy Review…

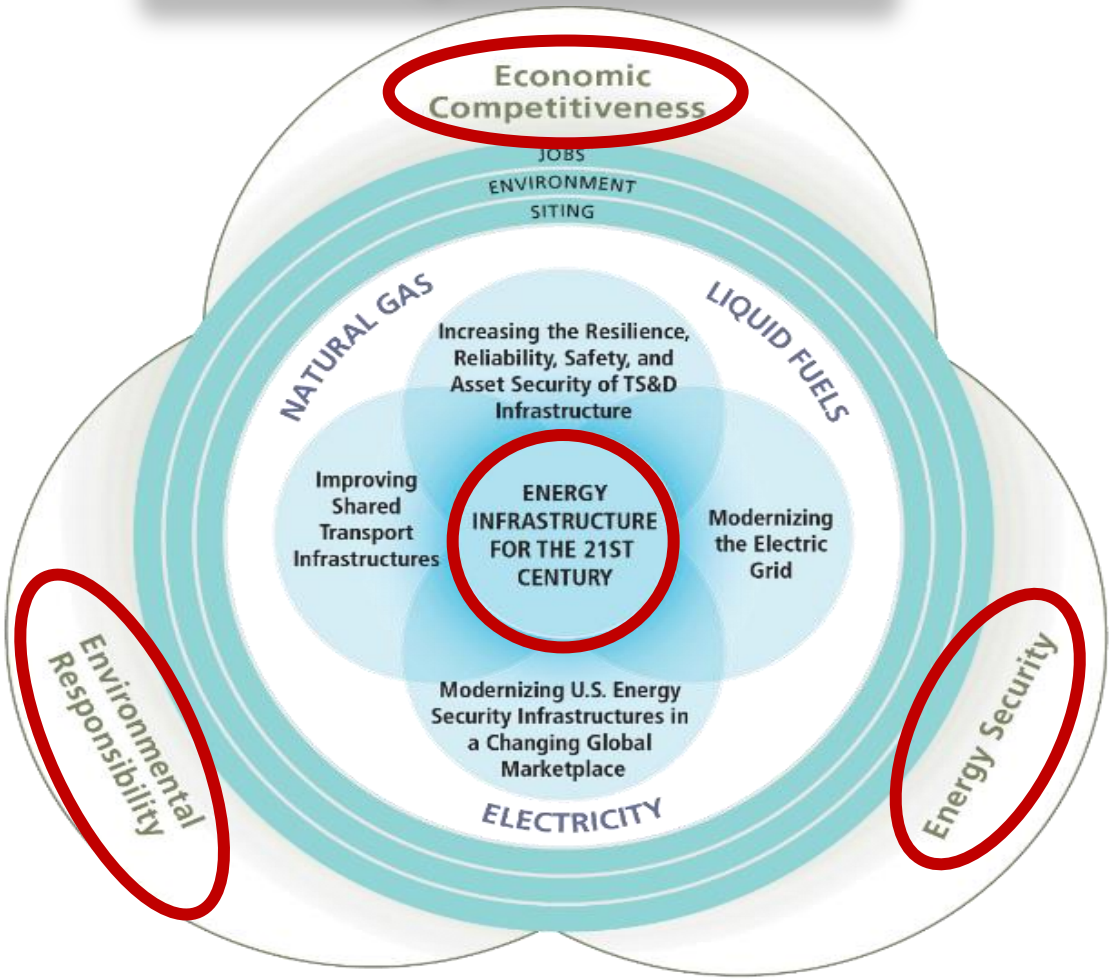
Establishing the Quadrennial Energy Review Task Force…

(a) There is established the Quadrennial Energy Review Task Force (Task Force), to be co-chaired by the Director of the Office of Science and Technology Policy and the Director of the Domestic Policy Council, which shall include the heads of each of the following, or their designated representatives:

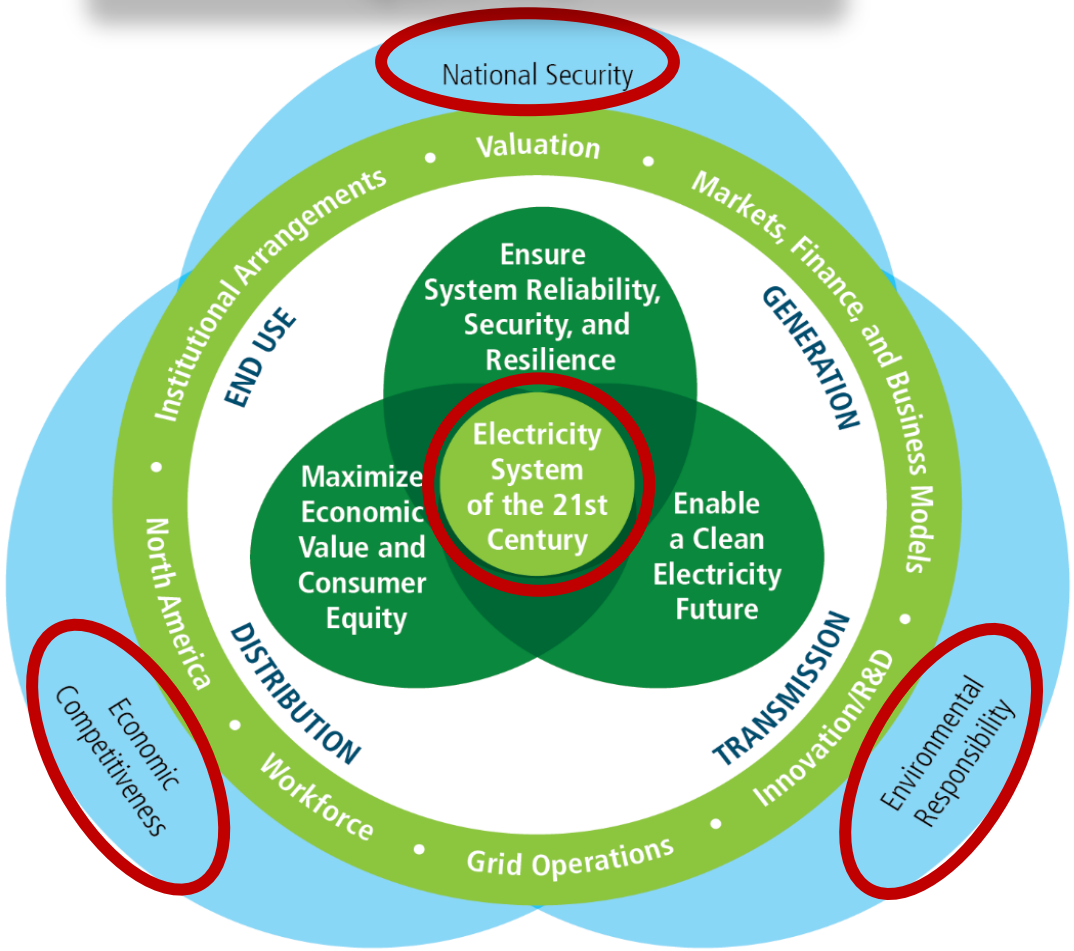
(i) the Department of State;
(ii) the Department of the Treasury;
(iii) the Department of Defense;
(iv) the Department of the Interior;
(v) the Department of Agriculture;
(vi) the Department of Commerce;
(vii) the Department of Labor;
(viii) the Department of Health and Human Services;
(ix) the Department of Housing and Urban Development;
(x) the Department of Transportation;
(xi) the Department of Energy;
(xii) the Department of Veterans Affairs;
(xiii) the Department of Homeland Security;
(xiv) the Office of Management and Budget;
(xv) the National Economic Council;
(xvi) the National Security Staff;
(xvii) the Council on Environmental Quality;
(xviii) the Council of Economic Advisers;
(xix) the Environmental Protection Agency; QER Report: Energy Transmission, Storage, and Distribution Infrastructure | April 2015 **v**
(xx) the Small Business Administration;
(xxi) the Army Corps of Engineers;
(xxii) the National Science Foundation; and
(xxiii) such agencies and offices as the President may designate.

Obama Administration's Quadrennial Energy Review: Installments "QER1.1" and "QER 1.2"

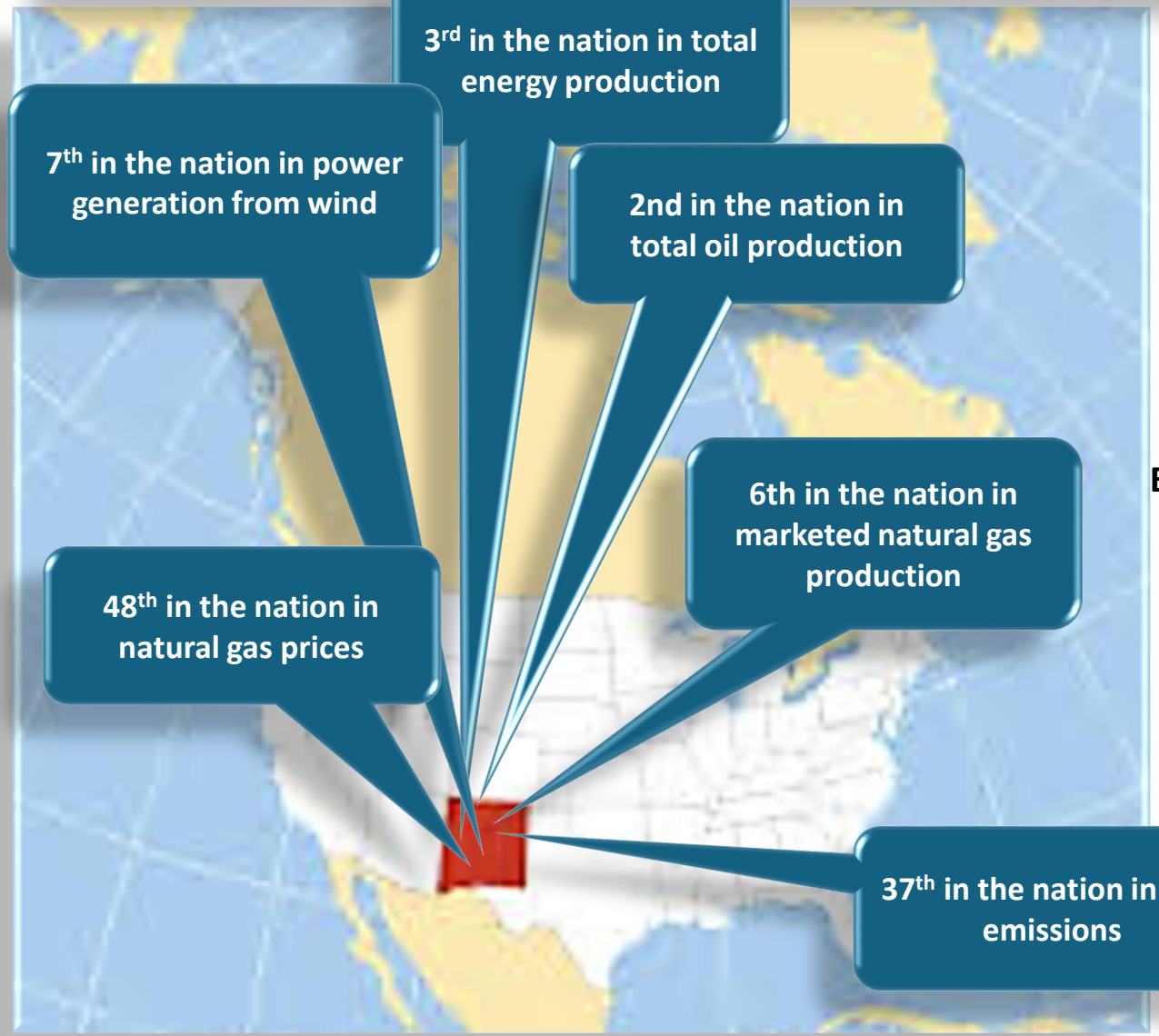
QER 1.1



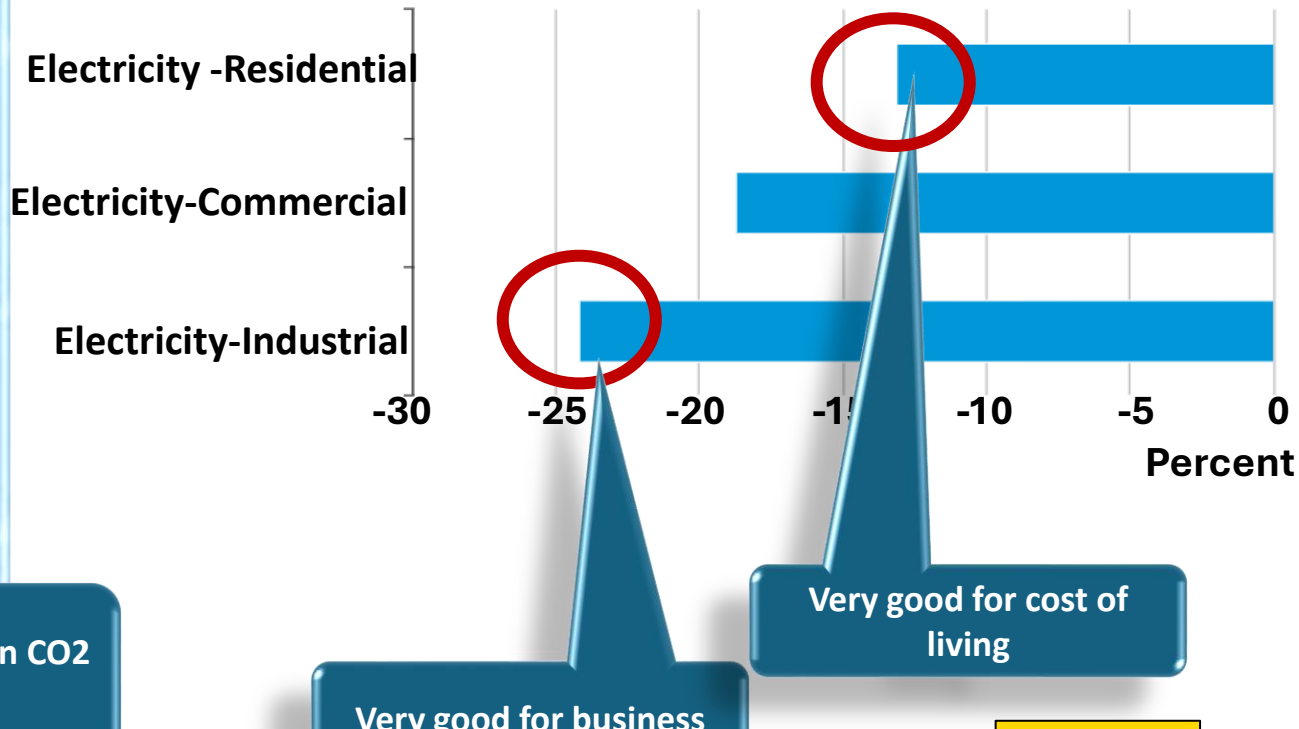
QER 1.2



New Mexico Energy Rankings

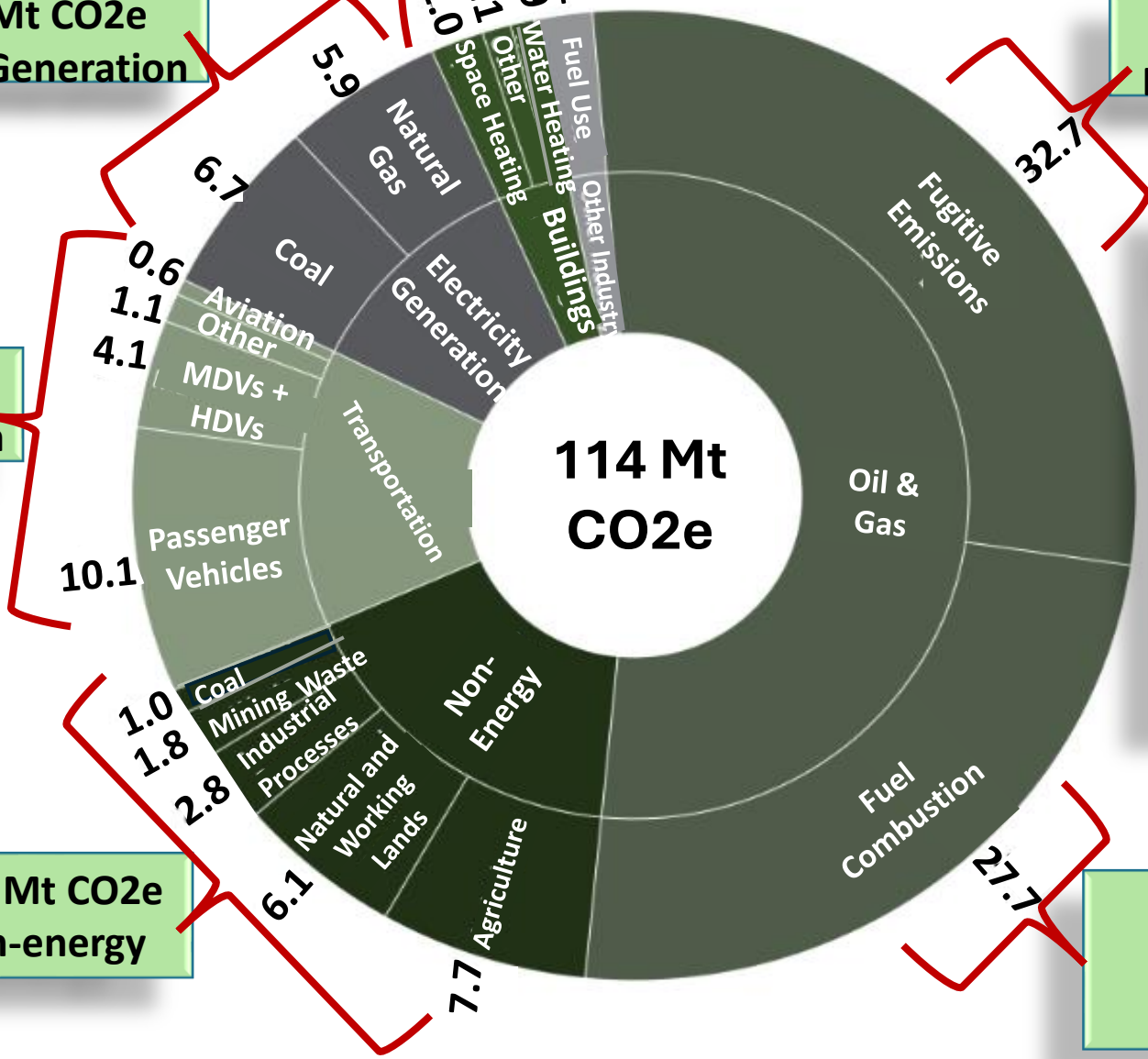


NM Price Differences from US Average (most recent monthly)



https://www.eia.gov/state/?sid=NM#tabs-5

New Mexico GHG Emissions Sources, 2020 (Mt CO2e)



6.1 Mt CO2e Buildings

12.6 Mt CO2e Power Generation

15.9 Mt CO2e Transportation

19.4 Mt CO2e Non-energy

32.7 Mt CO2e Fugitive Emissions from Production

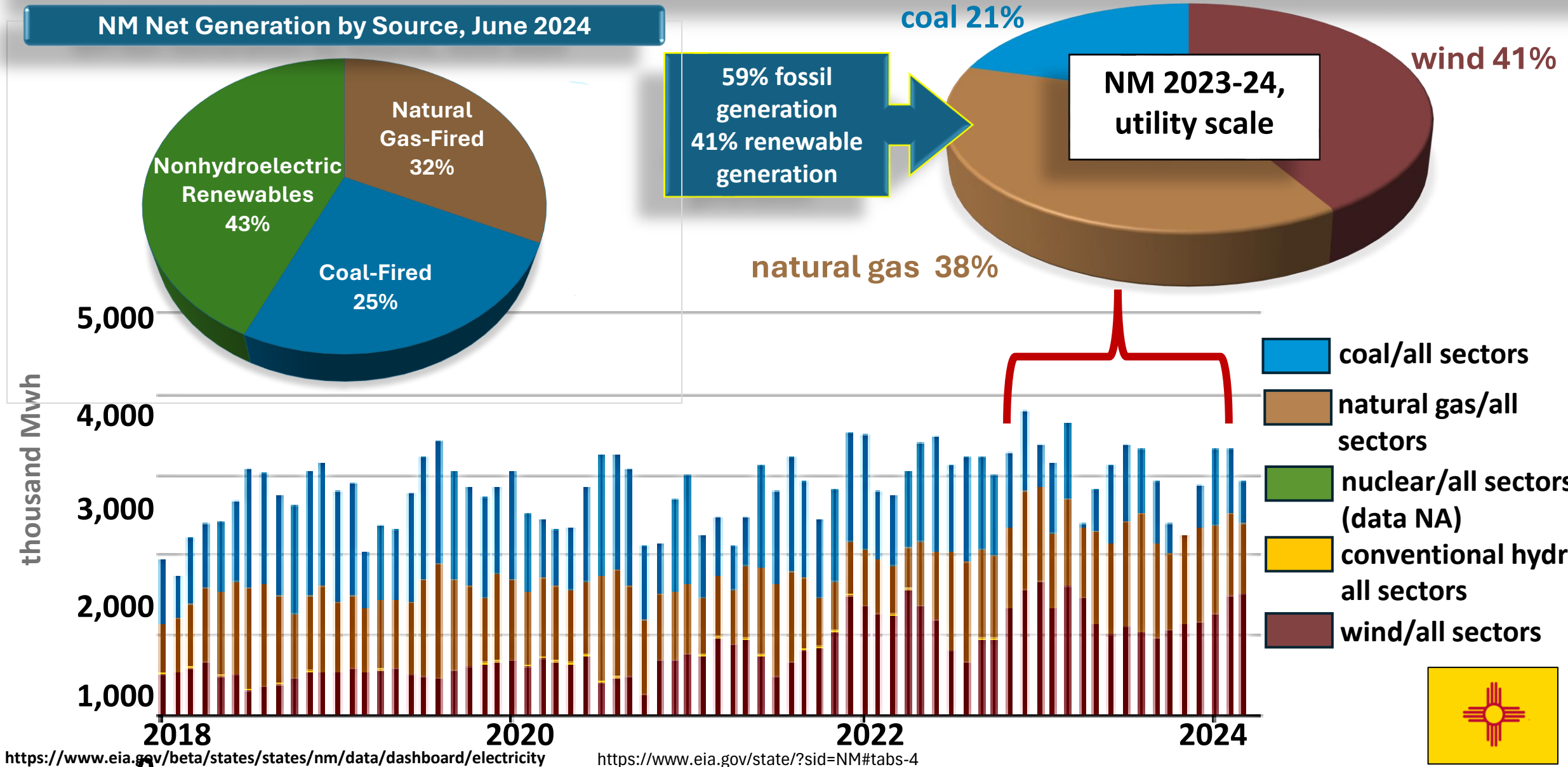
27.7 Mt CO2e Fuel Combustion from Production

NM GHG Emissions Sources, 2020

- 5.1% from buildings/industry
- 11% from power generation
- 13.8% from transportation
- 17% from non-energy sources
- 53% from oil and gas production

Source: Defining and Envisioning a Clean Hydrogen Hub for New Mexico March 2022

New Mexico 2023 Net Electricity Generation (utility scale) by Energy Source (thousand Mwh)



https://www.eia.gov/beta/states/states/nm/data/dashboard/electricity

https://www.eia.gov/state/?sid=NM#tabs-4

NM Climate Policy Targets

2030

- Greenhouse gas emissions reductions of at least 45 percent by 2030 from a 2005 baseline

2050

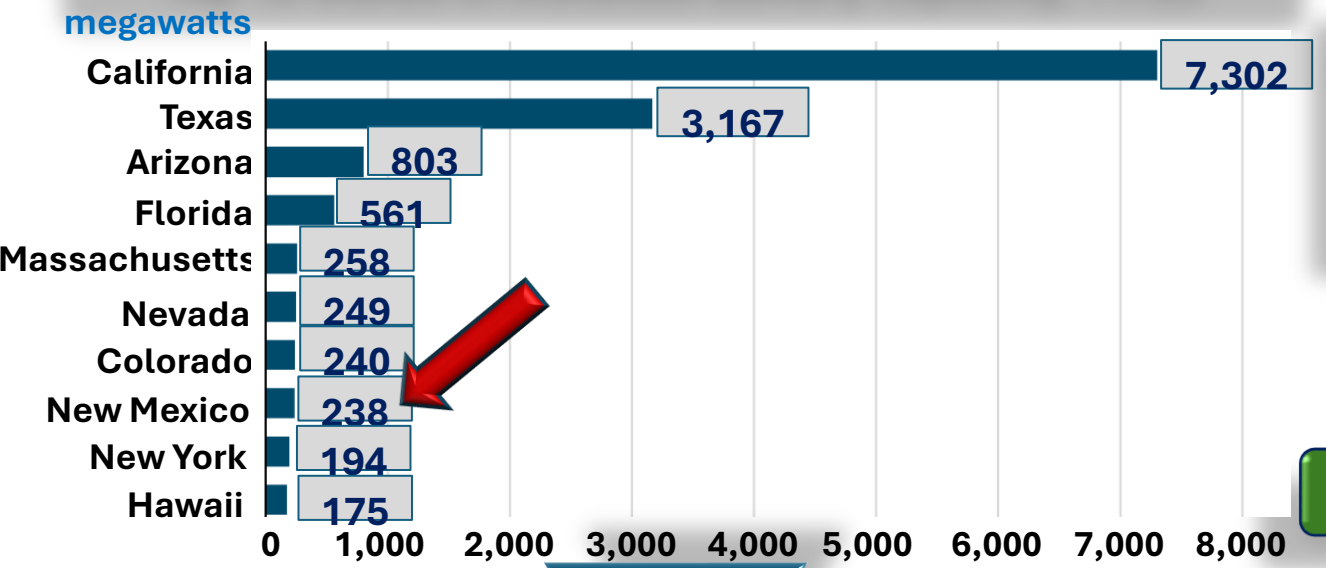
- Net zero

Actions have included...

- Clean I-40 Transportation Corridor
- Clean Truck Incentives
- Efficient and Clean Operations for Schools
- Community Mobility
- Methane Response Project
- Pre-Weatherization for Low-Income New Mexicans
- Community Energy Efficiency Development Block Grant Program
- Clean and Resilient Energy for Local Governments
- Integrated and Wholistic Low-Income and Disadvantaged Building-Sector
- Organic Waste Diversion Program
- Solar for All Program
- HER and HEAR incentives

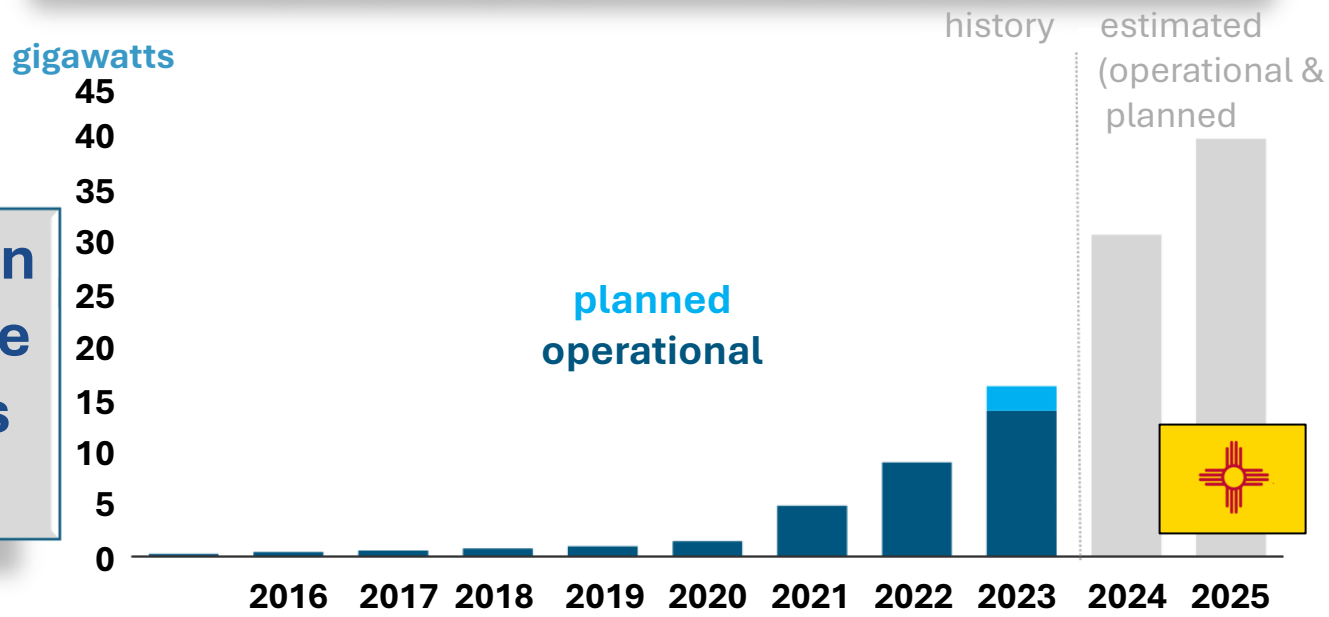
US Battery Storage: 2023 State Rankings, Forecasts of Capacity 2024/25

Top 10 states in installed battery capacity, 11/23



Operational battery storage in the US went from virtually zero gigawatts in 2016 to 15 gigawatts by 2023

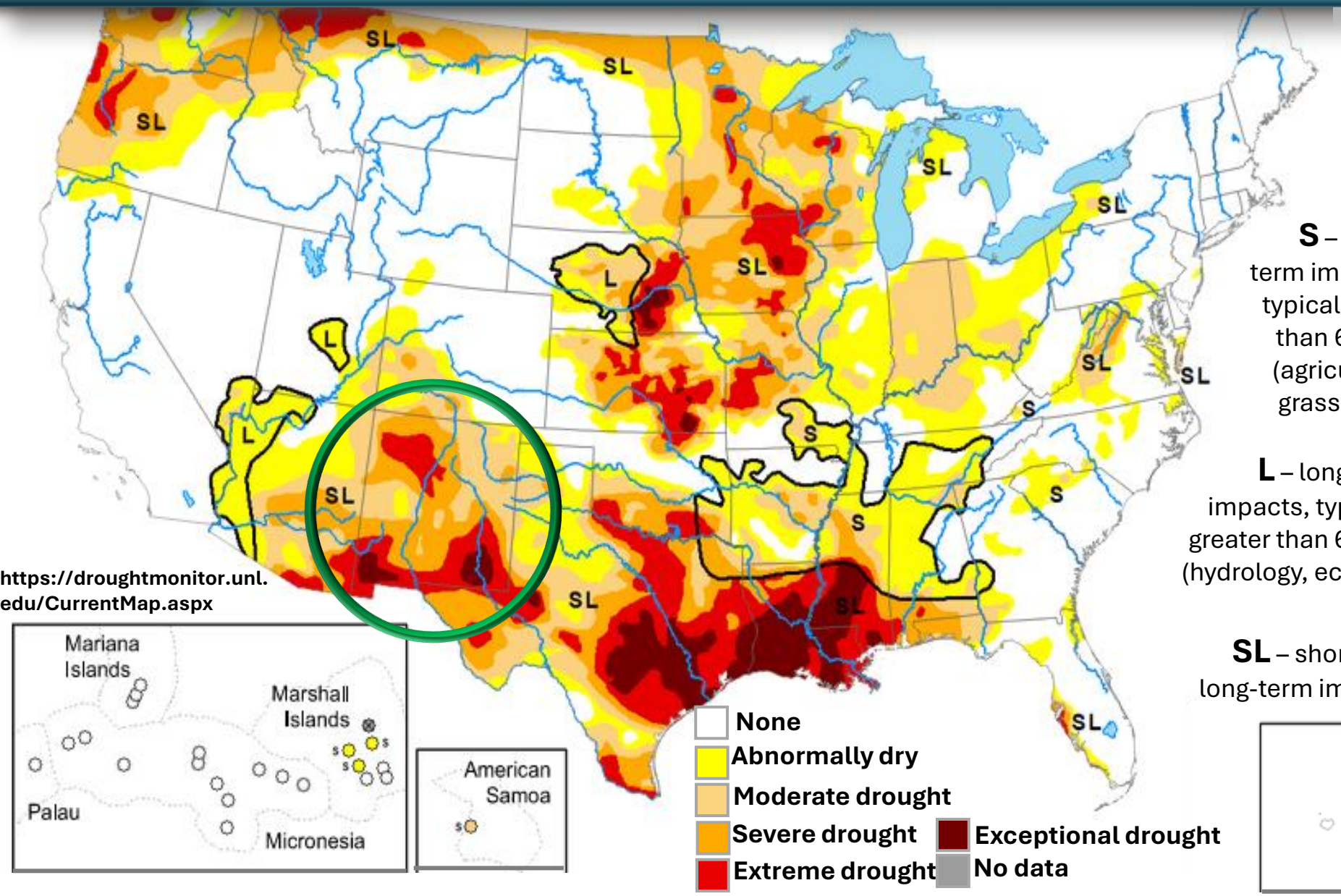
US Battery Capacity: Operational, Planned, Forecasts

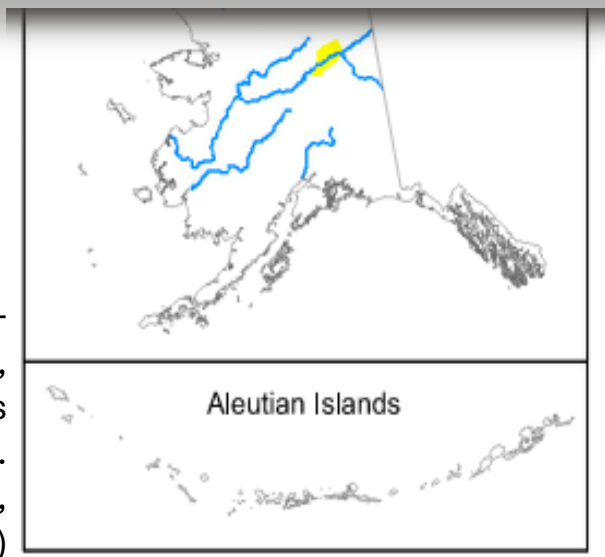


13,187 Mw of installed battery capacity in top 10 US states in 2023. Net utility scale generation in these states that year was 1,403,453 thousand Mwh.

Data source: US EIA, Preliminary Monthly Electric Generator Inventory, based on Form EIA-860M
EIA Electricity Data Browser, Net Generation, accessed 09/15/24

U.S. Drought Monitor (map released 09/26/23)

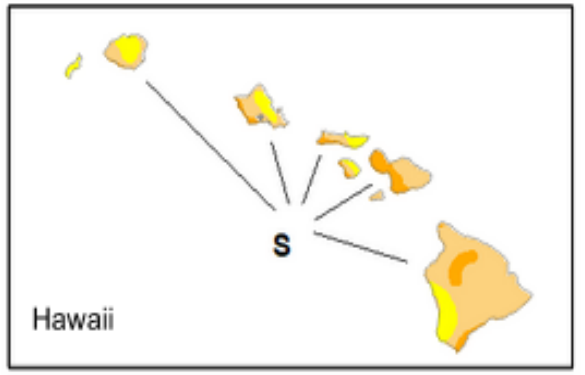




S – short-term impacts, typically less than 6 mos. (agriculture, grasslands)

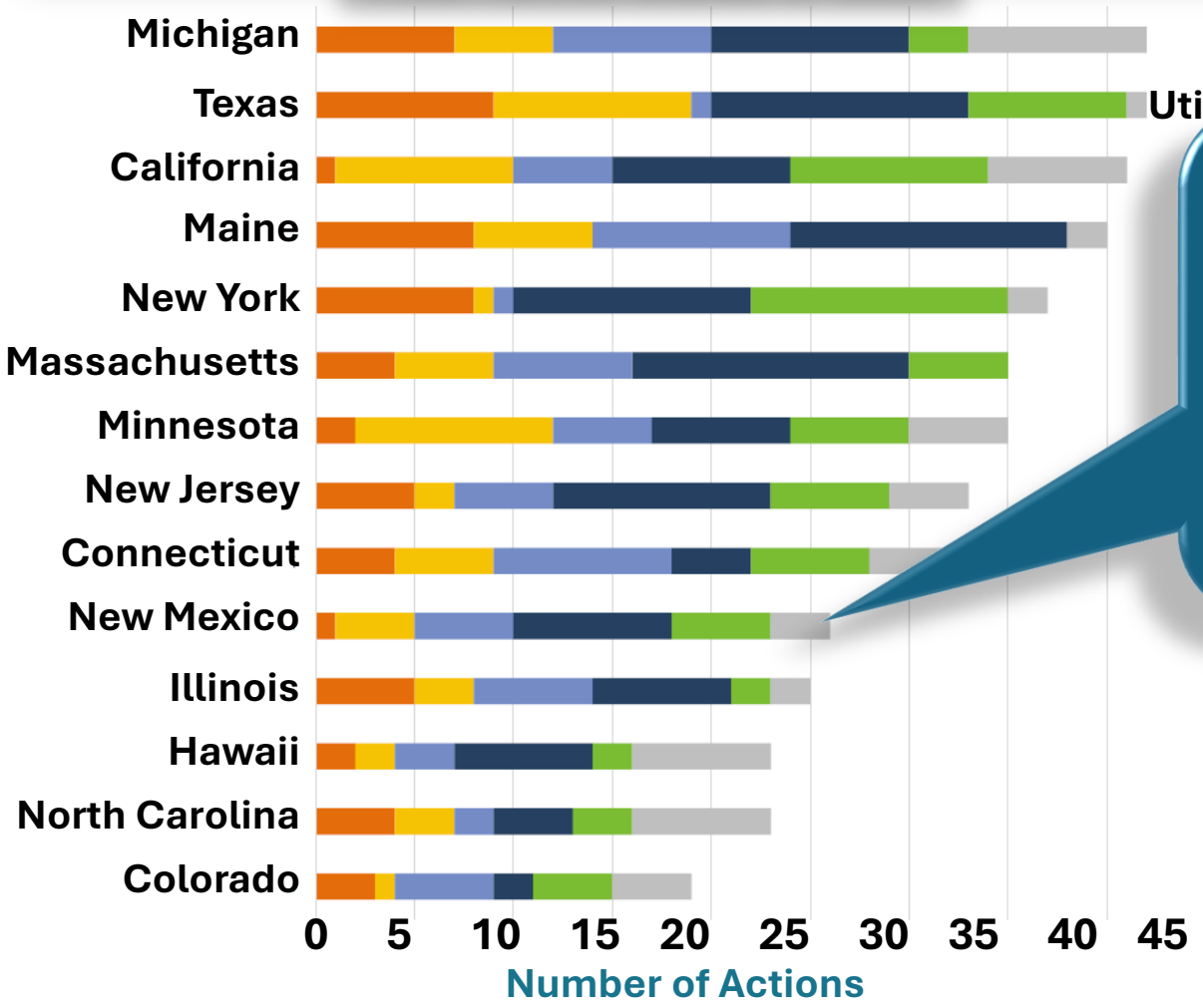
L – long-term impacts, typically greater than 6 mos. (hydrology, ecology)

SL – short- and long-term impacts

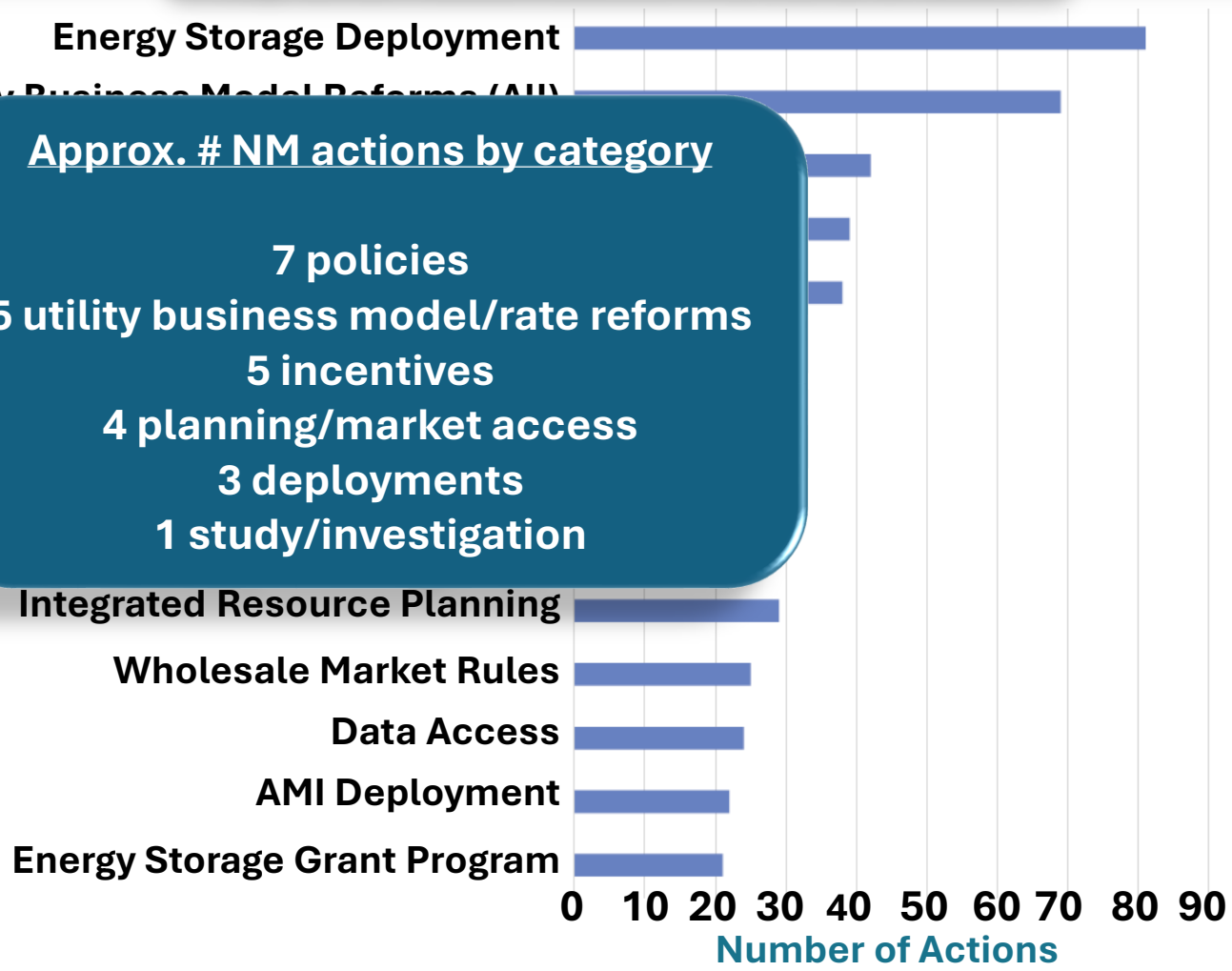


State Actions on Grid Modernization, 2023

Most Active States of 2023



Top Grid Modernization Actions of 2023



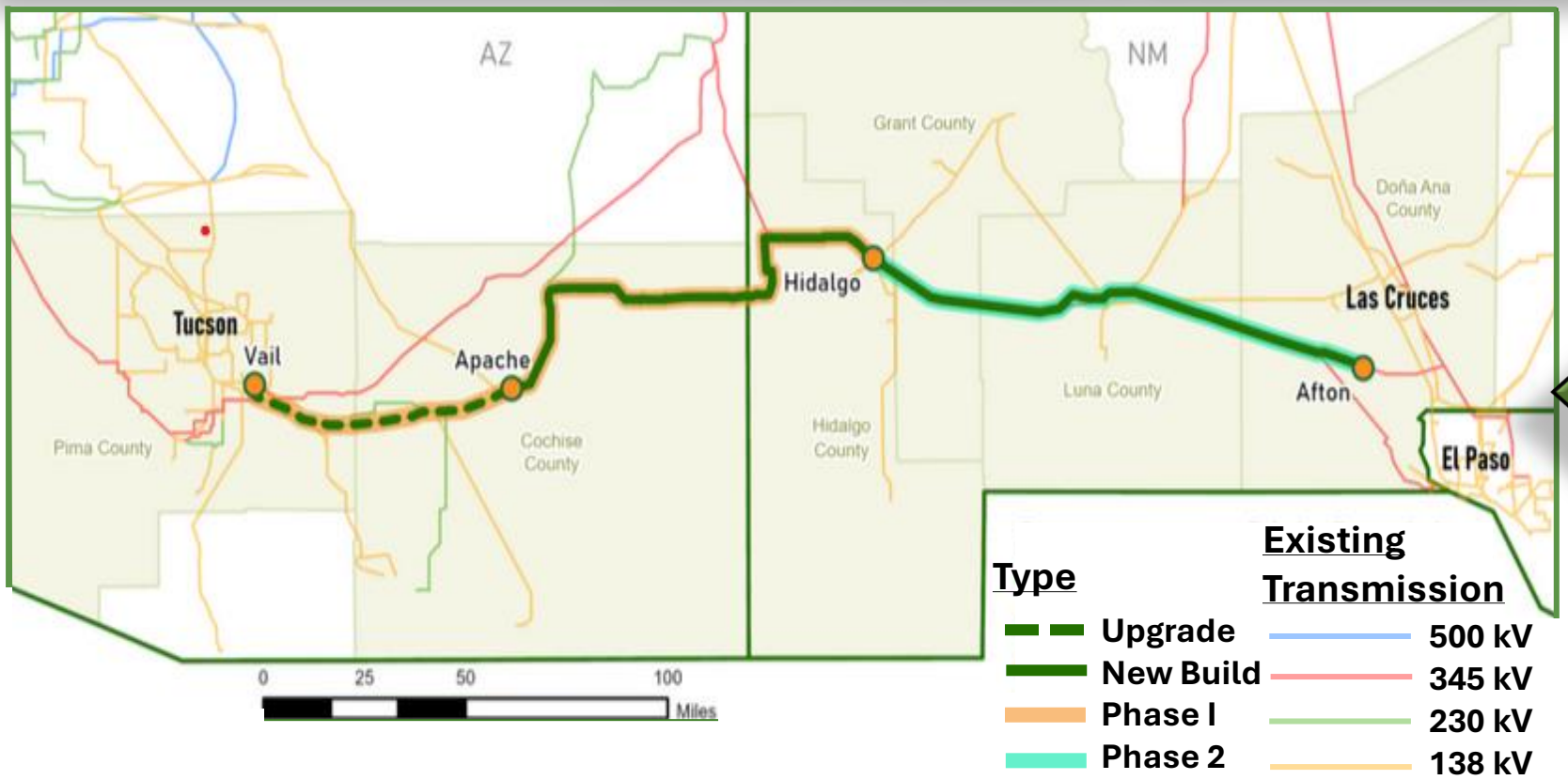
Approx. # NM actions by category

7 policies
5 utility business model/rate reforms
5 incentives
4 planning/market access
3 deployments
1 study/investigation

Studies & Investigations
Planning & Market Access
Incentives
Policies
Utility Business Models & Rate Reform
Deployment

Source: 50 States of Grid Modernization: Q42023 Report and 2023 Annual Review, NC Clean Energy Technology Center

NM/AZ Project Funded at $1.3 billion Under DOE's Transmission Facilitation Program (2021 BIL)

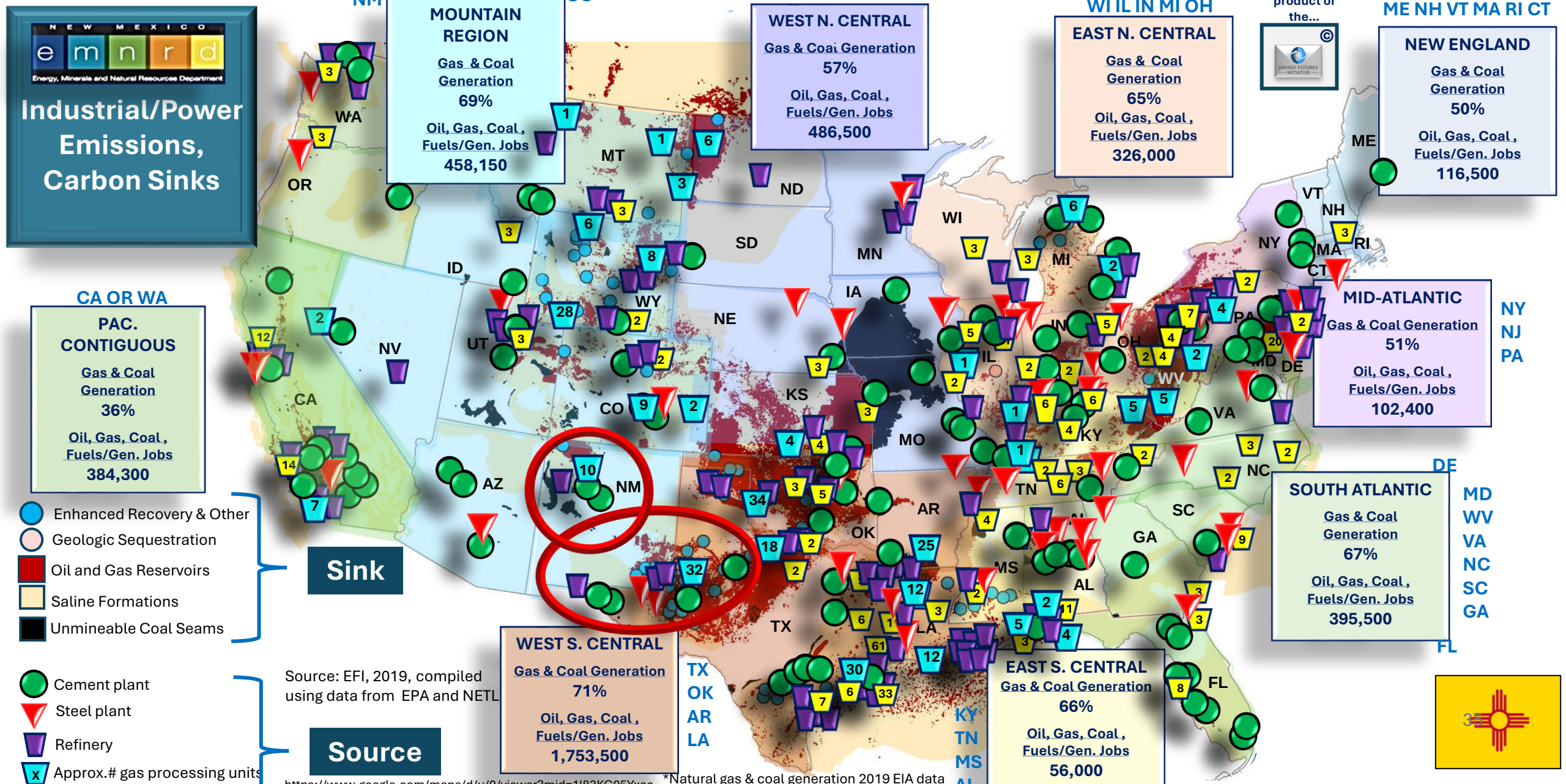


- **Project:** Southline Transmission Project
- **Applicant/Selectee:** South line Transmission LLC (Grid United LLC, Black Forest Partners LP, Hunt Transmission Services LLC)
- **Type of Financial Assistance:** Capacity Contract
- **Project Size:** 1000 MW (full line capacity), 175 miles (for phase 1)
- **Project Location:** NM to AZ

"Southline will be approximately 280 miles long, connecting the electrical systems of El Paso and Tucson metropolitan areas via the Afton, New Mexico, Apache, Arizona, and Vail, Arizona substations. The project will enable substantial renewable development opportunities and be an outlet for abundant generation by providing access to new markets."

https://southlinetransmission.com/
https://www.powermag.com/three-key-transmission-links-get-1-3b-boost-with-federal-capacity-contracts/

Industrial/Power Emissions, Carbon Sinks



Source: EFI, 2019, compiled using data from EPA and NETL

Source

https://www.google.com/maps/d/u/0/viewer?mid=1l83KG05Yxac2ZL9CaqwJO1oahUk&ll=35.78235042370692%2C-88.7570173125&z=6

https://earthjustice.org/sites/default/files/map-refineries2_800.png

*Natural gas & coal generation 2019 EIA data

** Natural gas, coal generation, fuels jobs, assumes induced jobs of 3.5X, rounded to nearest 100

*** Locations of facilities are proximate

EPA website accessed 02/04/21

NM Metals, Minerals on Which the US is 75-100% Import Dependent, Country Suppliers of US Market/% Total Imports from Country

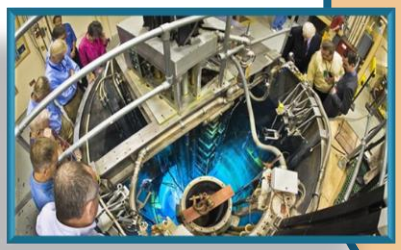
All are on the 2022 USGS Critical List

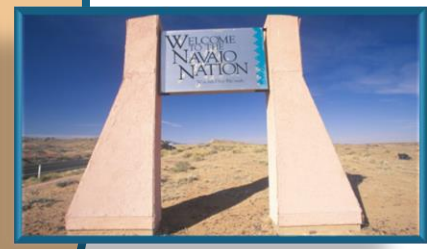
Found and/or Produced in NM

Mineral	% Import Dependent	% Suppliers	Key Uses
Antimony	81	63% China	Ceramics, glass
Arsenic	100	58% China	Lumber preservatives
Bismuth	94	69% China	Medical, atomic research
Gallium	100	55% China	LEDs
Graphite	100	9% India 33% China 23% Mexico 7% Canada	Batteries, fuel cells
Indium	100	34% China 22% Canada 15% S. Korea	Electrical components
Manganese	100	69% Gabon	Steel production
Niobium	100	22% Canada	Steel alloys
Rare earths	100	80% China	Metallurgy, glass, wind turbines
Scandium	100	China, Japan Europe (% NA)	Aluminum, fuel cells electronics
Tellurium	95	57% Canada	Solar cells, cooling
Titanium	75	39% South Africa 20% Australia 11% Canada	Steel alloys
Vanadium	95	37% South Africa 14% Russia 11% China	Steel
Zinc	83	64% Canada 14% Mexico	Metal galvanizing

What NM Brings to the Table on Hydrogen

- ✓ State revenue and many jobs in New Mexico depend on the fossil industry. Hydrogen is an energy carrier of the future that aligns with the skills of the fossil energy workforce
- ✓ Major oil, gas, refined products, and CO2 pipelines cross the state some of which are at low utilization, and some abandoned providing opportunities for retrofit
- ✓ The top three GHG point sources in New Mexico (excluding electricity generation, oil and gas production) are refineries, cement (Tijeras), and mining (major mining operations with several large potash and copper mines)
- ✓ Innovation assets in the hydrogen industry including Sandia and Los Alamos National Labs; and a focus on energy related research and work force development at universities, colleges and technical schools
- ✓ Significant existing pipeline rights of way and the strong potential for blending are being researched by Sandia National Laboratory
- ✓ The largest population of Native Americans is in the Navajo Nation and Native Americans also have a history of energy production and other restorative justice considerations





The Value of NM's Produced and Brackish Water

According to Mike Hightower with the New Mexico Produced Water Research Consortium at NMSU --

- NM is estimated to generate of 4 million barrels of producer water per day. Much of this is disposed of through deep well injections
- Up to 150,000 acre feet of produced water is available on an annual basis (3X the water used by ABQ)
- Treatment and reuse is an avoided cost for oil and gas companies. This could lower costs to consumers
- NM also has two billion acre feet of brackish water that could utilized for green hydrogen production

According to a Dec. 2023 press release announcing Governor Lujan Grisham's strategic water supply initiative, "Diverting just 3% of the produced water disposed of in injection wells to make hydrogen could result in enough energy to fully power over 2 million homes annually."

https://nmbizcoalition.org/nm-oil-and-gas-producers-making-progress-on-produced-water/

https://nmbizcoalition.org/nm-oil-and-gas-producers-making-progress-on-produced-water/
https://nmpwrc.nmsu.edu/_assets/public_information/Water-Needs-for-Hydrogen-Development.pdf

New Mexico's Regulation of Methane Emissions from Oil and Gas Systems

On May 25, 2021, New Mexico approved new rules proposed by the Energy, Minerals and Natural Resources Department (EMNRD) that form a key part of the state's methane strategy of creating a statewide, enforceable regulatory framework for reducing oil and gas sector Emissions.

The 2021 rules require oil and gas operators to attain a natural gas capture rate of 98% by the end of 2026. They apply to both upstream (production) and midstream (gas gathering and boosting) operations—encompassing wells, pipelines and gathering stations—within New Mexico. The rules define venting and flaring of natural gas as waste and, as such, prohibit these activities except in limited circumstances (e.g. venting is allowed only when flaring is technically unfeasible or in emergency situations).

Governor Lujan Grisham's Executive Order issued on 01/29/19 instructs the New Mexico Departments of Environment and Energy, Minerals and Natural Resources to--

"jointly develop a statewide, enforceable regulatory framework to secure reductions in oil and gas sector methane emissions and to prevent waste from new and existing sources and enact such rules as soon as practicable."

"Oil and gas production in Texas is spewing out double the rate of methane…than in the regulated state of New Mexico…Satellite imaging of methane leaks across the Permian basin, a vast geological feature at the heart of the US oil and gas drilling industry, show that sites in Texas have emitted double the amount of [methane] than in New Mexico, per unit of production since 2019."

The Guardian, 11/08/22

https://storage.googleapis.com/pcf_sb_5_1502721041588477880/pdf/art%253A10.1038%252Fs41586-024-07117-5.pdf?GoogleAccessId=1024785622573004480 66&Expires=1725208660&Signature=PrIbb2l7K0gUKT%2FbtBAZHu0TrkaTVLFDddBKDmzmg4AYRjP15vzZ4cszREWZYNBHFt%2B6EpMR3GIbHXLAxgik2f8NlnQup%2Fxp5yAH02qfMbpuckfWIxesIHcwOmKUFu0RnnFmiZFIefYpqzT0CAGA7JQ%2F5h6nDFlQMibtWuRT8XISAuXnDNRCDc2mShAK5uycRfC15ilBsAL191VNDFvydcN%2F2AgSwaw9kORDFMEF0M%2FfuiC2Ai2bOwgprSrkz9xSk1ItI5ePdB4BTYZ9Y7QItbCd2EVmfQeyJeoPfKREBGCHG4vjdC7Q8QY71E6Yhfsa7uHO53hCE0TIl9YxCYDYiQ%3D%3D

Source: CCAC based on the methodology of the Global Methane Assessment.

https://methaneguidingprinciples.org/wp-content/uploads/2023/09/case-study_New-Mexico-Waste-Rule-GTI-Energy.pdf