NPUC
National Public Utilities Council

Annual Utility Decarbonization Report 2022

BROUGHT TO YOU IN PARTNERSHIP WITH

motivepower × VISUAL CAPITALIST

The State of Utility Decarbonization for the Top 30 U.S. Investor-Owned Utilities

Table of Contents

SECTION 01

Preface

The Next Generation of Energy

Clean energy technologies are central to limiting the impacts of climate change as the world shifts away from emissions-intensive energy sources.

Embracing clean energy alternatives means fundamentally changing the way we produce and consume energy—in all its forms.

While electric power has been pivotal to our growth as a society, the industry is one of the largest contributors to global greenhouse gas (GHG) emissions. Decarbonization is the reduction and eventual removal of GHG emissions resulting from human activities, including the generation of electricity. It can be achieved by switching from fossil fuels to low-carbon energy sources across all sectors.

From the transportation and manufacturing sectors to households and offices, all cogs of the economy rely on electric power to operate and produce goods and services.

Therefore, decarbonizing the generation of electricity can simultaneously help reduce emissions from all adjacent industries. Electric utilities have a powerful opportunity to not only enable but also spearhead decarbonization at an economy-wide level. And even though utilities have been making strides to decarbonize for decades, dramatically reducing emissions in the next decade to reach net-zero by 2050[1] will take a paradigm shift.

The State of Decarbonization

While the ecological, economic, and social risks of human-caused climate change are well established, the solutions are still taking shape. In collaboration with Visual Capitalist, the National Public Utilities Council (NPUC) has developed the 2022 Annual Utility Decarbonization Report, serving as a comprehensive and viable ranking system for public utilities that will drive the decarbonization conversation forward.

The report uses data-driven analysis to provide utilities, administrators, investors, and utility customers an insight on the status of decarbonization among U.S. utilities.

More specifically, the report highlights the decarbonization progress and efforts of the 30 largest investor-owned utilities (IOUs) in the United States. Based on these utilities' overall progress, they have been assigned a score between 1 (lowest) and 5 (highest), indicating whether they are trailing or leading in decarbonization respectively.

The decarbonization score is based on six individual metrics relating to factors such as the utility's fuel mix, amount of CO_2 emissions, and the intensity of emissions per unit of electricity, in addition to their decarbonization targets.

This report also sheds light on the obstacles that utilities face on their road to decarbonization, and provides adaptable alternatives over the short- and long-term to help ease the transition to cleaner sources of energy.

It illustrates the power of collaboration and enterprise in developing business-led solutions, as well as the role of utilities in advancing decarbonization.

Through the knowledge, enthusiasm, and willingness of industry leaders, the NPUC intends to bring significant change to practices within the electrical power sector, leading to decreased GHG emissions, informed policies on both the state- and federal-levels, and a sustainable ecological economy.

SECTION 02

The Need for Climate Action

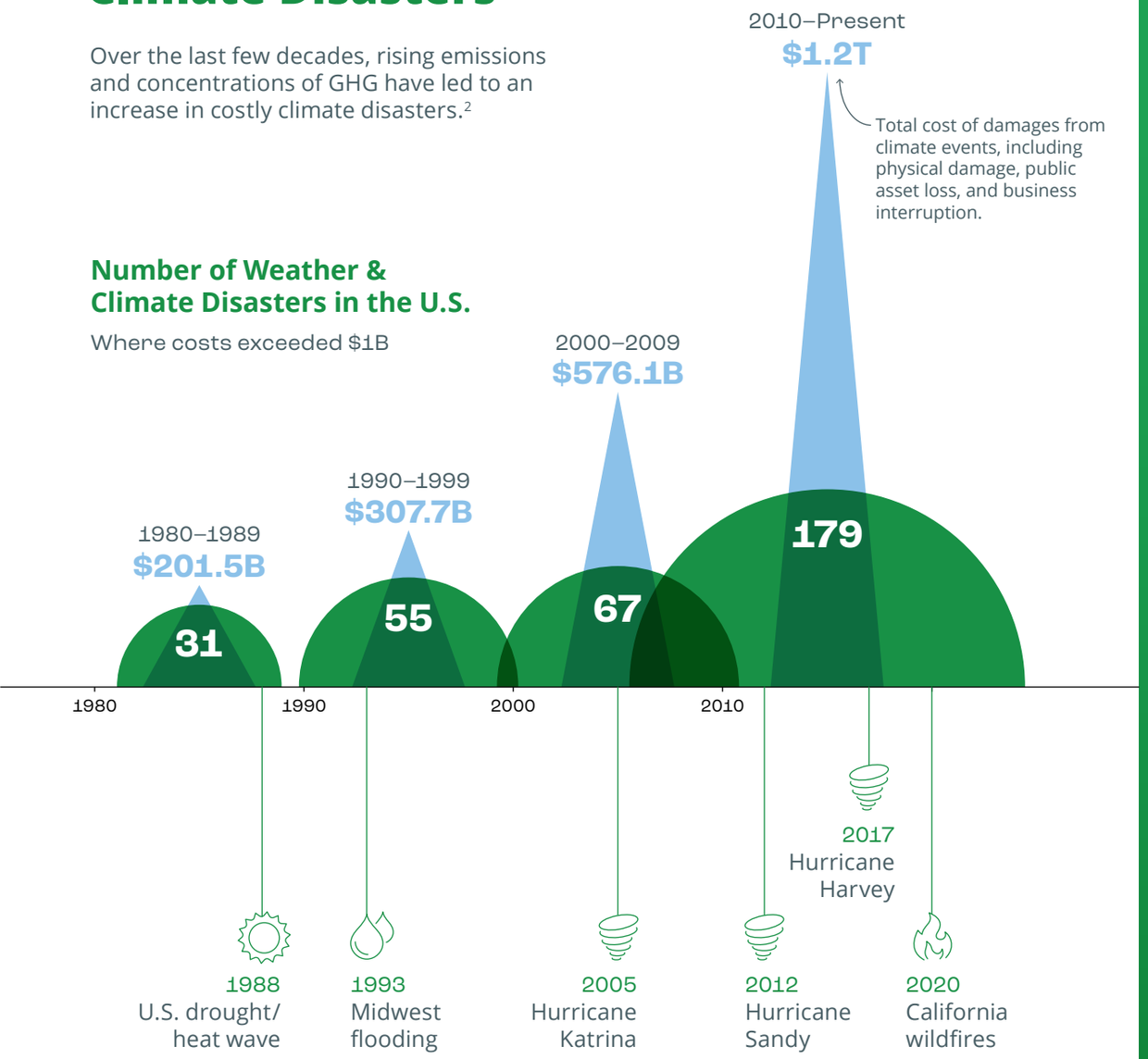
IN THIS SECTION, WE COVER:

Compounding Climate Disasters

Over the last few decades, rising emissions and concentrations of GHG have led to an increase in costly climate disasters.[2]

Number of Weather & Climate Disasters in the U.S.

Where costs exceeded $1B

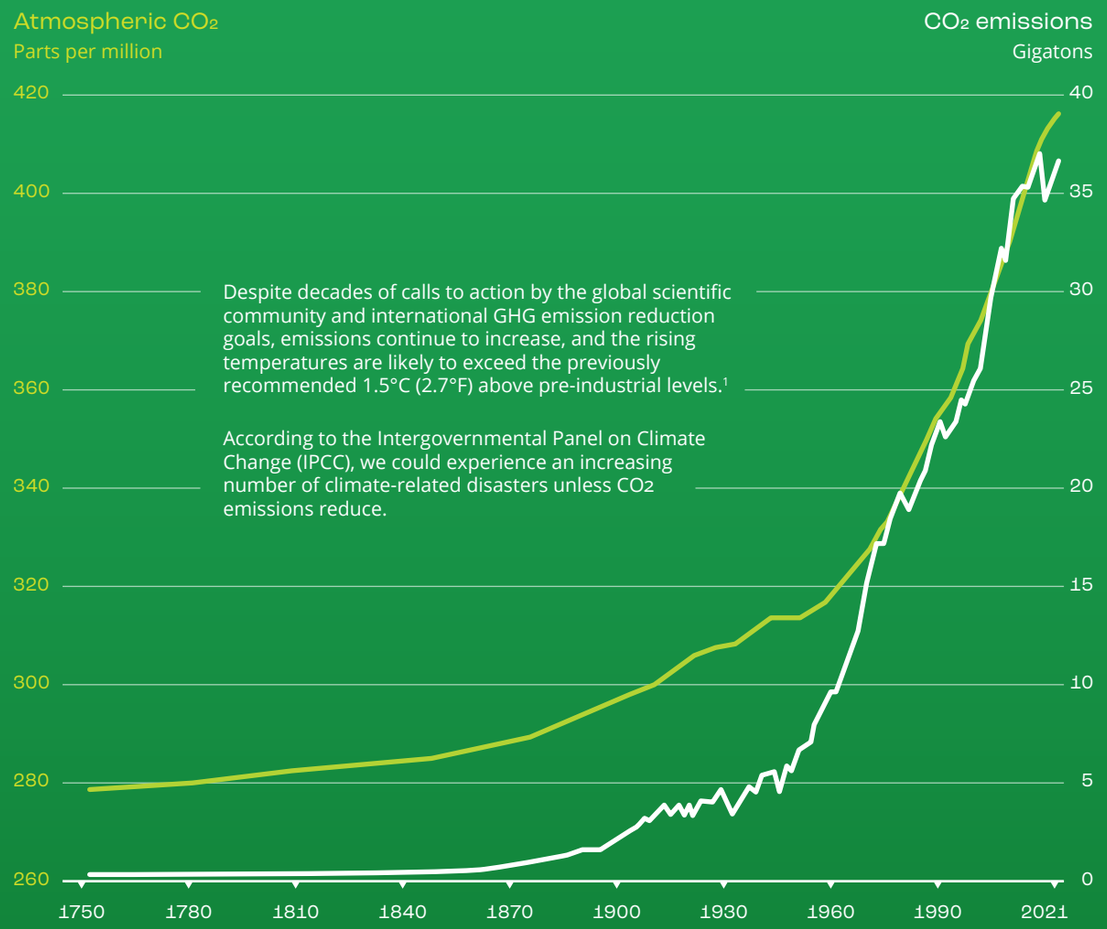


Source: NOAA[2]

From the beginning of the Industrial Revolution in the 1750s, human activities—like the burning of fossil fuels including coal, oil, and gas—have been the primary reason for increased GHG emissions in the atmosphere.

Atmospheric concentrations of CO_2 are now 50% more than pre-Industrial Revolution levels, comparable to concentrations last seen around 4 million years ago.[3] Since the late 19th century, the Earth has become about 1.1°C (2°F) warmer.[4]

CO_2 Emissions and Atmospheric Concentration 1750–2021



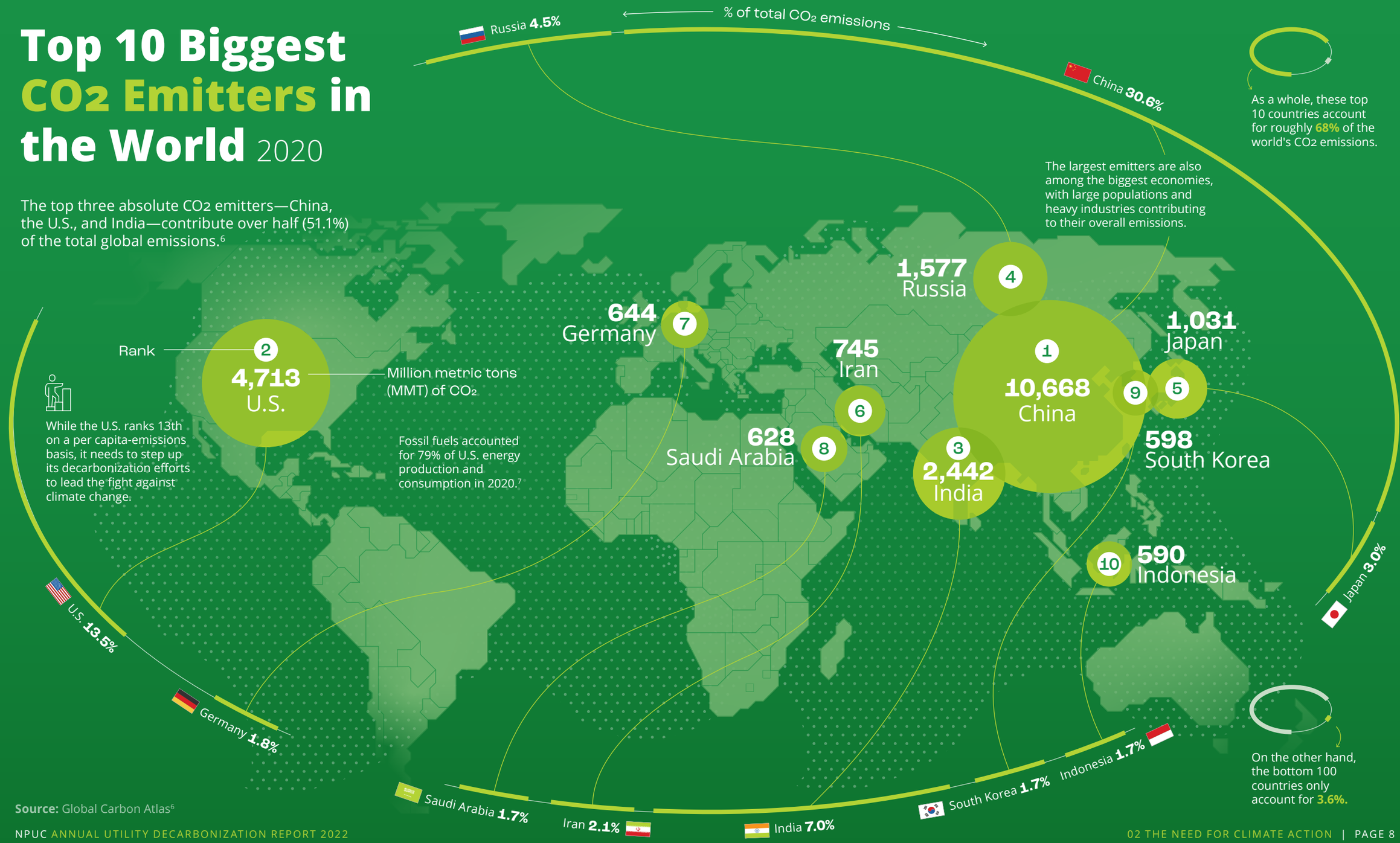
Despite decades of calls to action by the global scientific community and international GHG emission reduction goals, emissions continue to increase, and the rising temperatures are likely to exceed the previously recommended 1.5°C (2.7°F) above pre-industrial levels.[1]

According to the Intergovernmental Panel on Climate Change (IPCC), we could experience an increasing number of climate-related disasters unless CO_2 emissions reduce.

Source: NOAA[5]

Top 10 Biggest CO_2 Emitters in the World 2020

The top three absolute CO_2 emitters—China, the U.S., and India—contribute over half (51.1%) of the total global emissions.[6]



While the U.S. ranks 13th on a per capita-emissions basis, it needs to step up its decarbonization efforts to lead the fight against climate change.

Fossil fuels accounted for 79% of U.S. energy production and consumption in 2020.[7]

The largest emitters are also among the biggest economies, with large populations and heavy industries contributing to their overall emissions.

As a whole, these top 10 countries account for roughly **68%** of the world's CO_2 emissions.

On the other hand, the bottom 100 countries only account for **3.6%**.

Source: Global Carbon Atlas[6]

Breaking Down U.S. Emissions by Sector

MMT of CO_2-equivalent, 2020

1,628
Transportation
27% of total CO_2 emissions

As the transportation sector continues on its path toward electrification, its carbon emissions could effectively merge with electricity generation.

1,426
Industry
24%

Emissions from the industrial sector are attributed to the industrial production of goods, raw materials, and chemicals.

1,482
Electricity
25%

Since all other sectors use electricity, reducing emissions from power generation can help reduce economy-wide emissions.

787
Residential & Commercial
13%

635
Agriculture
11%

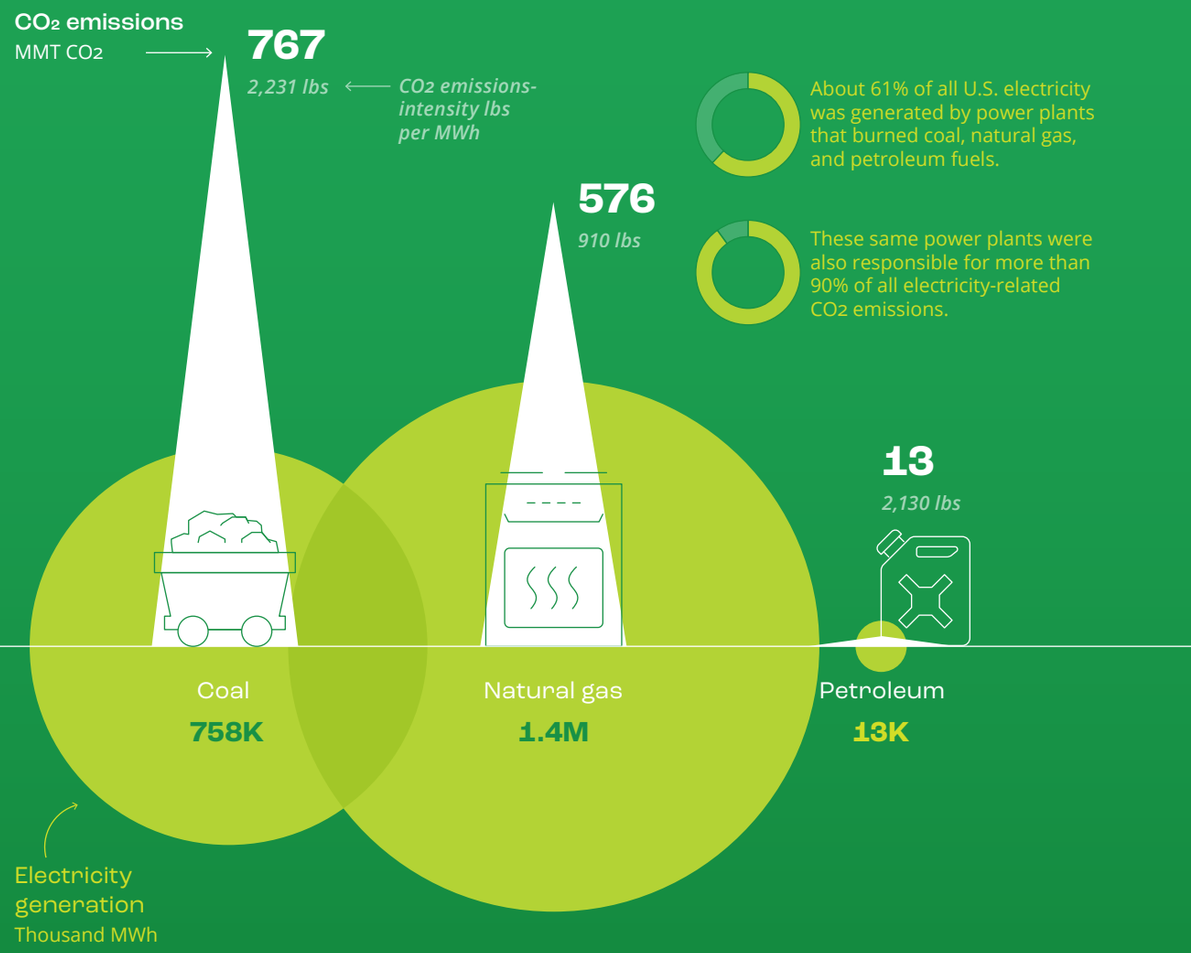
Excludes emissions from U.S. Territories (0.4% of total).

Source: U.S. Environmental Protection Agency (EPA)[8]

U.S. Electric Power Emissions by Fuel*

2020

In 2020, despite dampened consumption (-2.5%) due to the pandemic,[9] the U.S. electric power industry generated 4 billion megawatt-hours (MWh) of electricity. The resulting emissions exceeded 1.5 billion metric tons of CO_2—over 850 pounds per MWh of electricity.[10]



About 61% of all U.S. electricity was generated by power plants that burned coal, natural gas, and petroleum fuels.

These same power plants were also responsible for more than 90% of all electricity-related CO_2 emissions.

Electricity generation currently emits tremendous quantities of CO_2.

Consequently, electric and gas utilities have a major role to play in the economy's decarbonization efforts.

*Data only shows emissions from electric utilities and independent power producers from coal, natural gas, and petroleum, and not all sources of electricity.

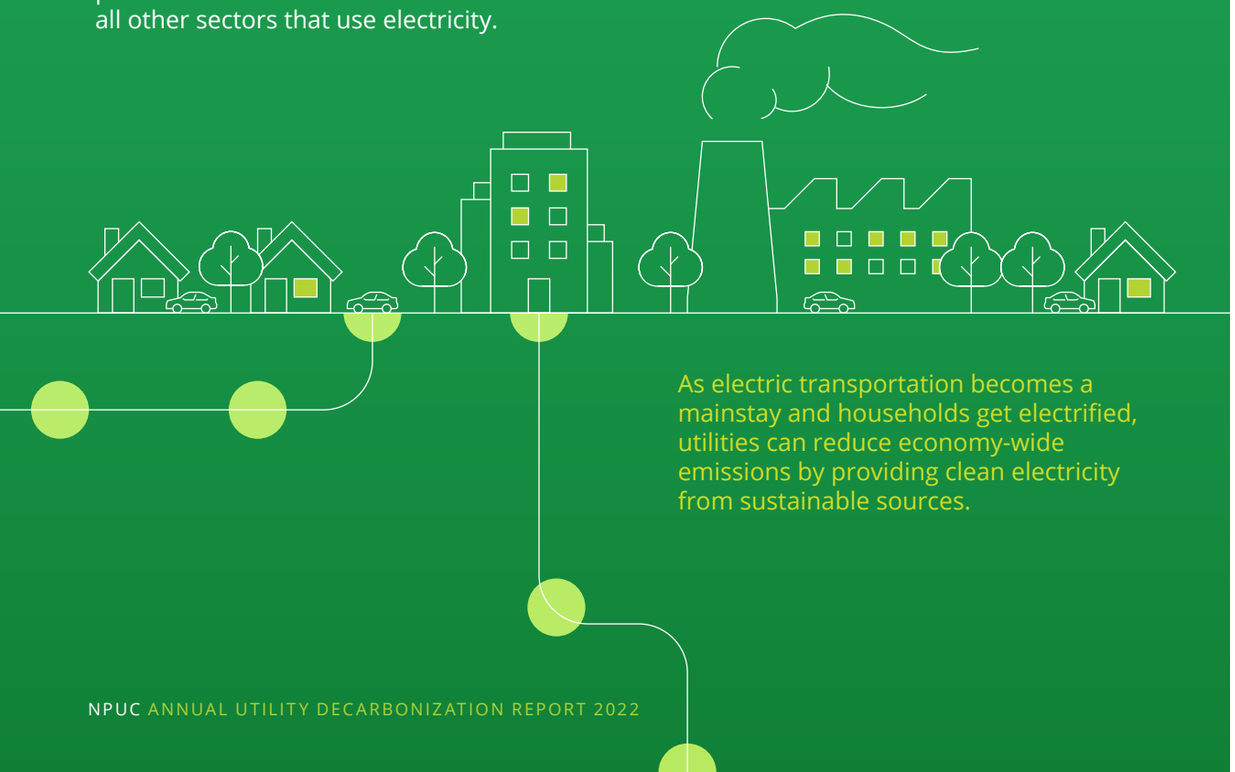
Source: U.S. Energy Information Administration (EIA)[10]

At the Forefront of Decarbonization

Reimagining the Role of Utilities

One of the challenges of decarbonizing the power sector is sufficiently reducing emissions while guaranteeing energy reliability, security, and affordability. Despite this, the country's biggest utilities have the opportunity to facilitate economy-wide decarbonization by being proactive in achieving climate goals.

This is mainly because the decarbonization of utilities and electric power will advance decarbonization in all other sectors that use electricity.



As electric transportation becomes a mainstay and households get electrified, utilities can reduce economy-wide emissions by providing clean electricity from sustainable sources.

In addition, an increasing number of investors are now considering the impact of a company's economic activities on ecological well-being and sustainability. By leading the decarbonization charge, utilities can position themselves to attract investment from climate-conscious investors.

A strengthened focus on reducing dependency on coal and natural gas, and a shift towards renewable sources, must be made.

Electricity from low-carbon sources like solar, wind, hydro, and nuclear can help limit the devastating impacts of climate change.

SECTION 03

The Obstacles to Utility Decarbonization

IN THIS SECTION, WE COVER:

Roadblocks to the Net-zero Transition

Utilities face six obstacles on the path to decarbonization.

The ongoing energy transition is like no other—it requires a complete fossil fuel fade within the three decades to 2050, compared to previous energy transitions that occurred over centuries.

For utilities, this presents an unprecedented challenge. It entails divesting existing fossil fuel-fired power plants (which may still be in service), scaling up carbon-free generation, and modernizing the grid, all while meeting rising electricity demand from electrification and a growing population.

01 Lack of Transmission Infrastructure

02 Funding and Regulatory Needs

03 Technological Costs

04 Intermittency of Renewables

05 Socio-Economic Divide

06 Workforce Development

Obstacle 01

Lack of Transmission Infrastructure

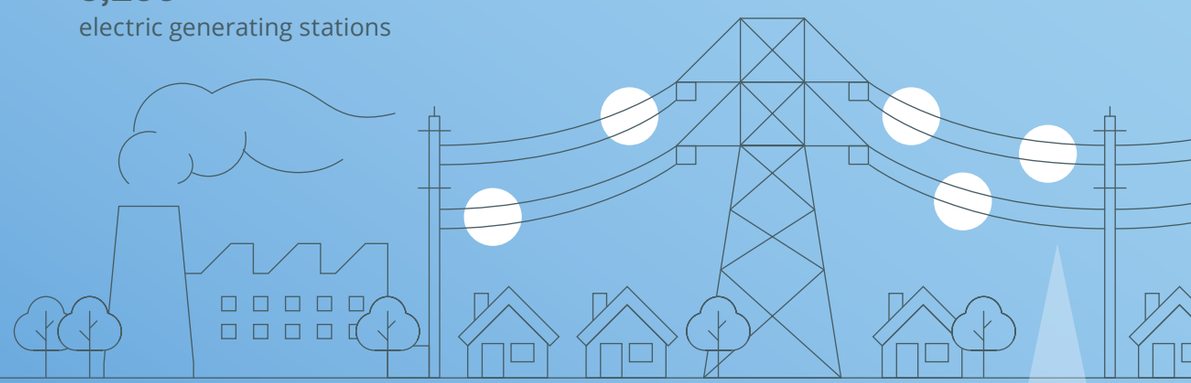
Decarbonizing the U.S. economy requires the electrification of the majority of sectors. This includes replacing gas cars with EVs and gas-powered heating with electric pumps.

Ultimately, electrification will result in higher electricity consumption. While utilities can ramp up generation capacity to meet this rising demand, new installations will be rendered impractical by decaying grid infrastructure.

The U.S. Electric Grid

Over 9,200
electric generating stations

Over 600,000 miles
of transmission lines and 5.5M miles of distribution lines[11]



The majority of high-voltage transmission lines are in densely populated regions. However, different forms of renewable energy are most efficient in different regions of the U.S., some of which are relatively remote.

Current age: 70% of lines are **over 25 years old**

Expected life: **50 years**

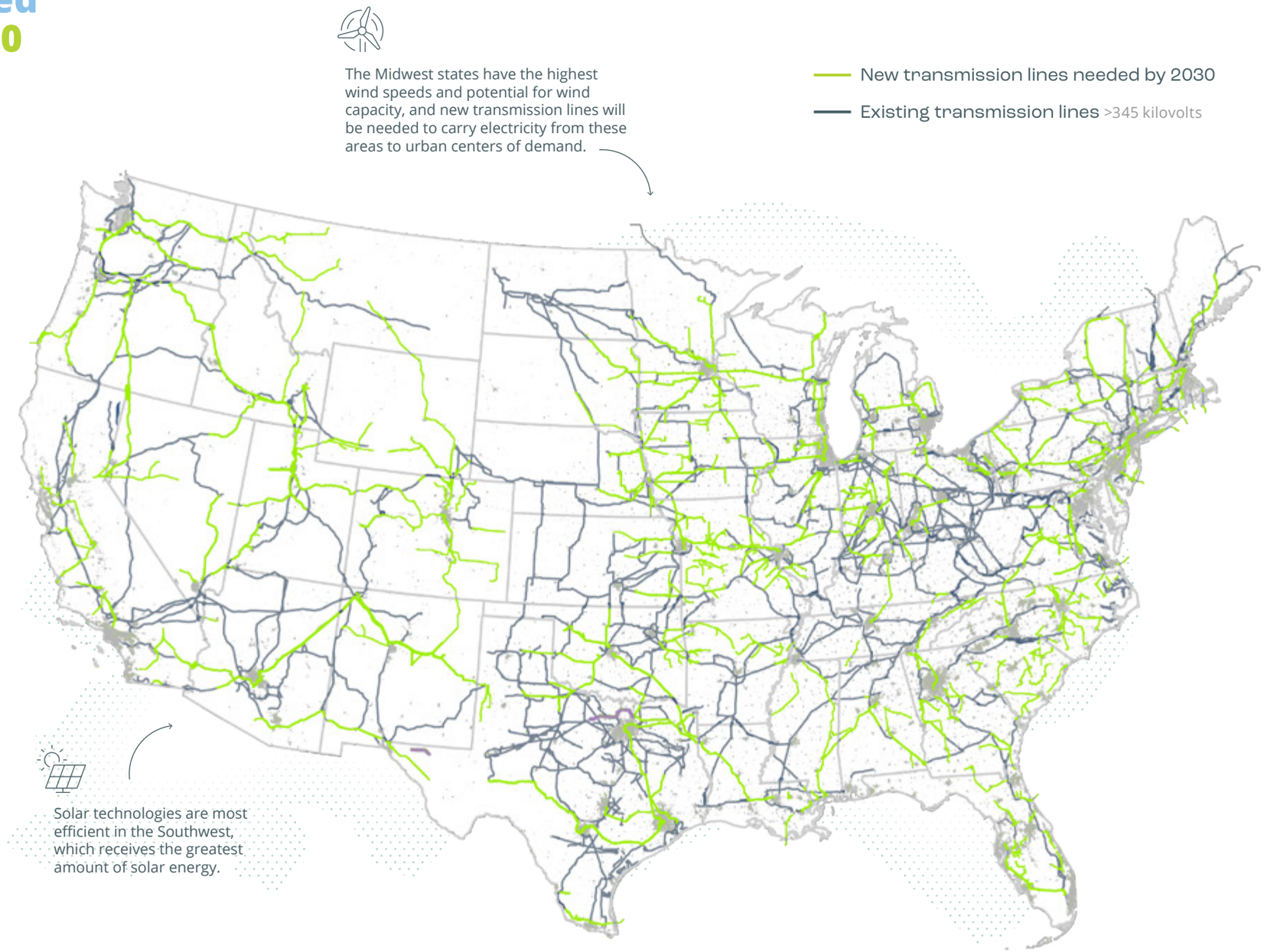
Source: American Society of Civil Engineers[11]

Transmission Lines Needed for Wind and Solar by 2030

Achieving net-zero in a high electrification scenario will require 200,000 gigawatt-kilometers (GW-km) of new transmission capacity by 2030. This requirement rises to 637,000 GW-km by 2050, representing a 210% increase in transmission capacity relative to 2020.[12]

This interstate grid of the future resembles the Interstate Highway System, which received $114 billion in federal funding (90% of its cost) to connect the 48 contiguous U.S. states via road.[13]

Similar to the interstate highways, interstate gridlines are vital to national goals and will need investment from both the government and the private sector.



Source: Princeton, Net-Zero America (2021)[12]

Obstacle 02

Funding and Regulatory Needs

Utilities are under pressure to fund decarbonization while providing an uninterrupted supply of electricity to consumers—an unrealistic task without substantial financial and regulatory support.

Decarbonization expenditures for utilities include, but are not limited to:

- Investments in new generation
- Fossil fuel plant retirements
- Research and technology development
- Clean energy replacement costs
- Disaster-resilient grid infrastructure

Additionally, utilities are also expected to fund grid modernization and transmission expansion, which is not only an economic burden but also a regulatory one.

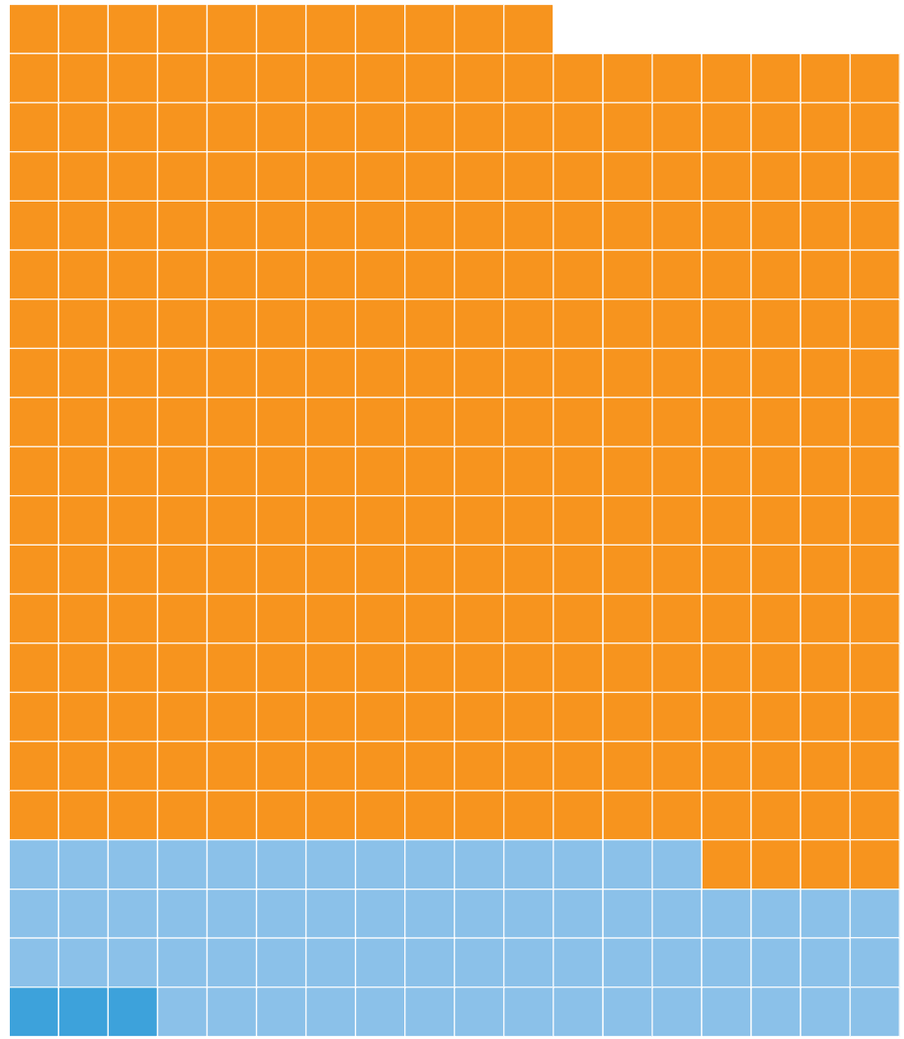
Since the grid is interconnected and transmission lines are shared across the nation, utilities face changing regulations from different states and local municipalities. Upgrading the grid and advancing decarbonization on a national scale requires government support through streamlined regulations and funding.

The Biden Administration's grid and infrastructure bills provide $68 billion for new grid infrastructure,[14,15] but it's only a fraction of the capital needed by 2030, let alone the $2.2 trillion needed by 2050.

This funding is volatile in nature and is dependent on the administration in power over the next few years.

$68B Funding provided

Funding the Net-zero Grid



$330B Investment needed by 2030*

The investment needed rises to $2.2T by 2050, averaging $79B annually from 2023 to 2050.[12]

Inflation Reduction Act **$3B**

Bipartisan Infrastructure Bill **$65B**

*Investment needed for transmission expansion for wind and solar generation in a high-electrification scenario with base siting availability. Includes both capital required for 200,000 GW-km of transmission expansions and for end-of-life line replacements.

Source: Congressional Research Service,[15] Utility Dive,[14] Princeton[12]

Obstacle 03

Technological Costs

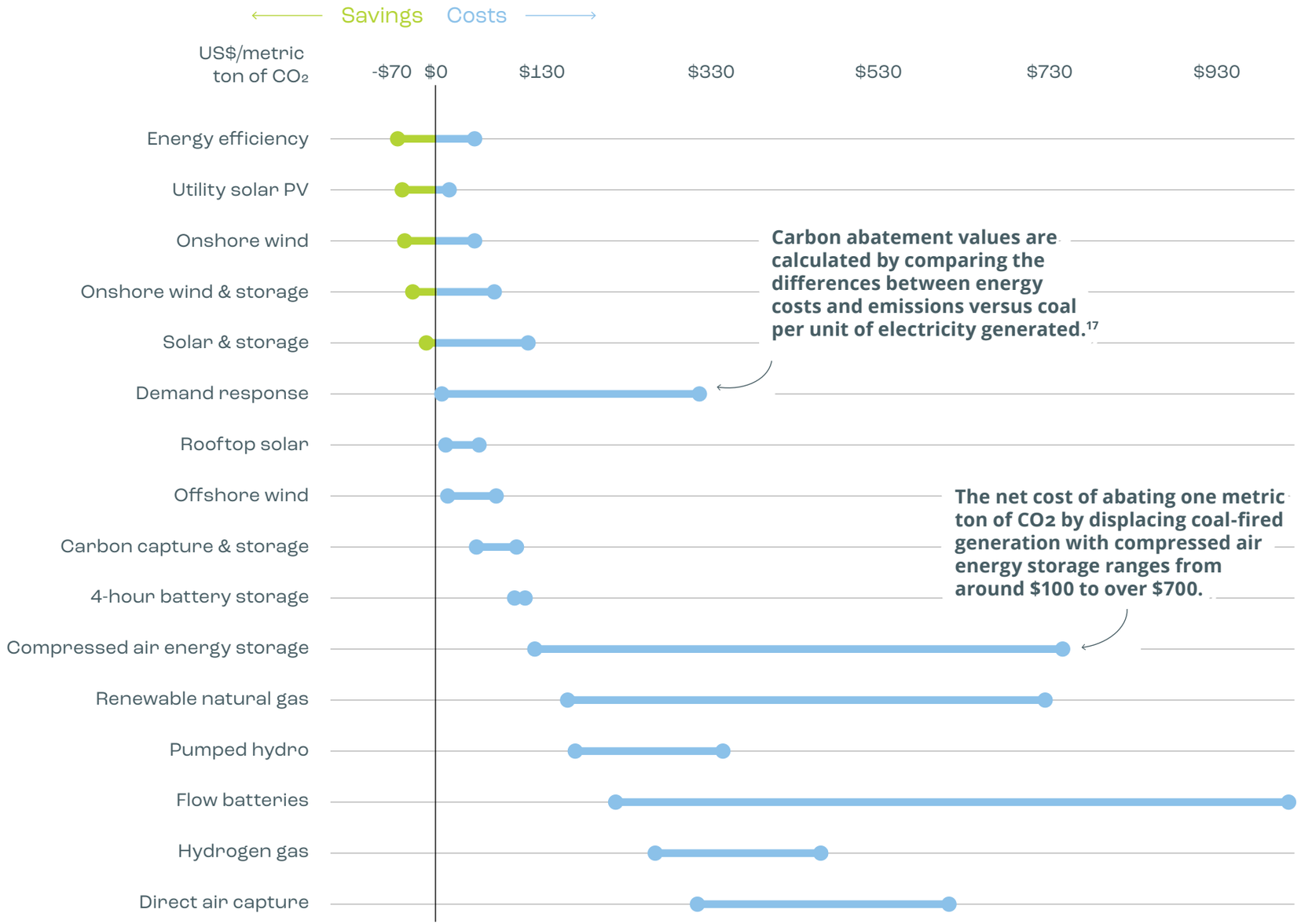
Fossil fuels have been the dominant source of electricity for decades, and both public and private infrastructure are currently well-suited to older technologies.

As a result, it is expensive for utilities to adopt new technologies at the pace required to achieve net-zero emissions. Technology adoption among utilities typically occurs in a 10-year cycle due to safety, reliability, and regulatory issues.

Furthermore, innovating and developing new technologies that support decarbonization requires heavy investment in research and development. Short-term mitigation technologies like carbon capture, utilization and storage (CCUS) technologies also remain expensive for the power sector, which produces "dilute" streams of CO_2 that are not highly concentrated.[16]

Carbon Abatement Values by Technology

Cost of (or savings from) abating one ton of CO_2 as compared to coal



Sources: International Energy Agency,[16] Deloitte[17]

Obstacle 04

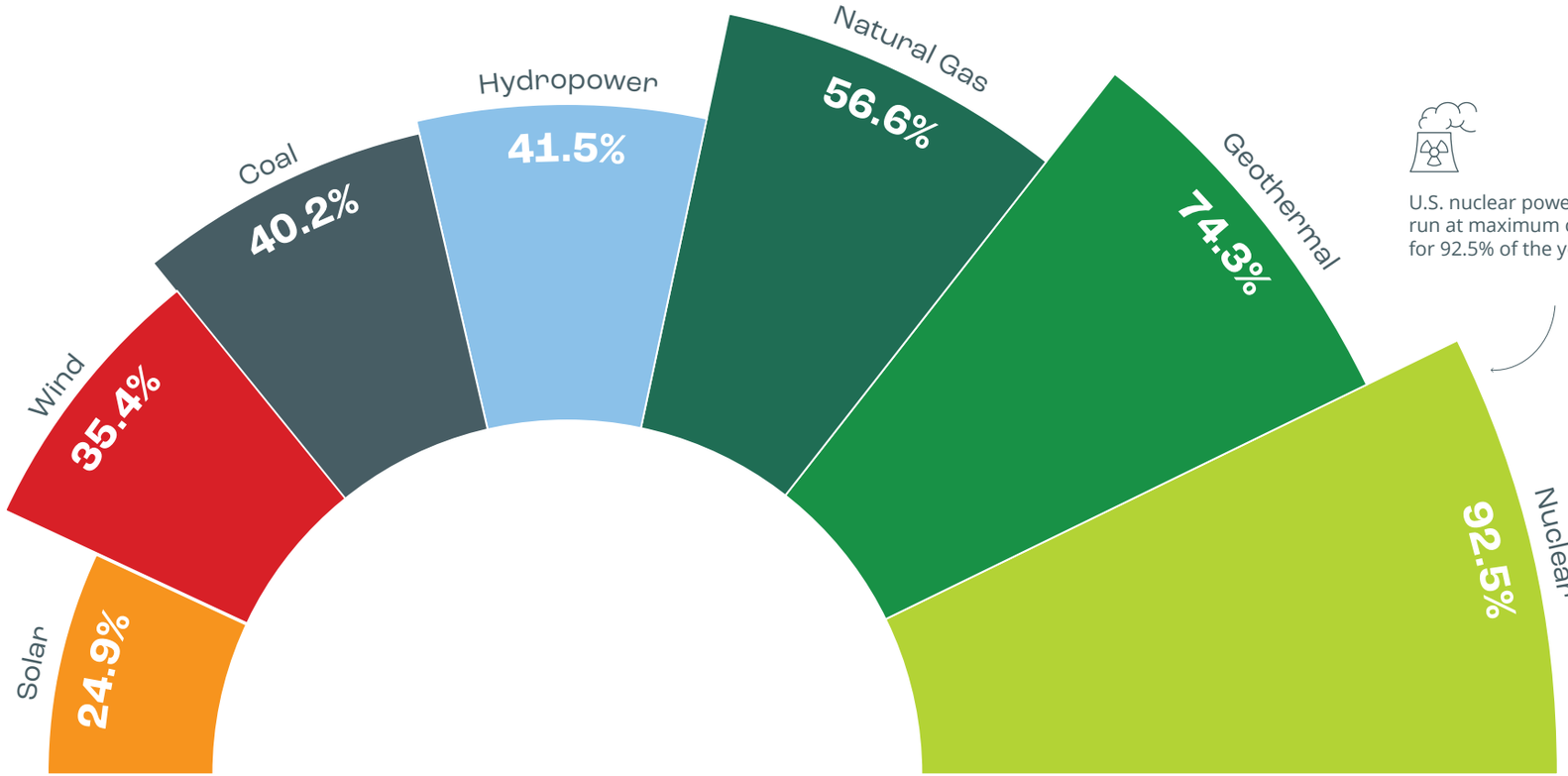
Intermittency of Renewables

Solar and wind farms are considered "intermittent" due to their inability to supply power consistently. This is because solar power relies on the availability of sunlight, and wind generation depends on wind speeds.

As a result, although solar and wind farms generate a tremendous amount of energy, their capacity factors—which measure how often power plants are running at maximum capacity—are relatively low.

Capacity Factor by Energy Source 2020

In a scenario where electricity demand is rising from electrification, the intermittent nature of wind and solar—two of the fastest-growing sources of energy—presents a roadblock for utilities.



U.S. nuclear power plants run at maximum capacity for 92.5% of the year.

Source: U.S. Department of Energy[18]

Obstacle 05

Socio-Economic Divide

While transitioning to a net-zero economy, the economic, social, and technological inequalities between different regions and population groups within the U.S. will need to be addressed.

Income and Technology Gaps

Decarbonizing electricity generation requires the adoption of smart and energy-efficient technologies among utility customers to help reduce the load on the electric grid, while allowing utilities to better manage their resources.

However, not all utility customers live in urban areas with access to smart technologies, and those living in remote regions may not have access to the internet. Therefore, utilities adopting customer-centric technological solutions to decarbonize may risk alienating some customer groups, which is a barrier to reaching 'economy-wide' levels of decarbonization.

Awareness Gaps

In order to support decarbonization, utility customers need to understand and be aware of the technological changes required in the average household.

Closing these awareness gaps will require educational campaigns, targeted marketing, and knowledge dissemination from both utilities and administrations. Since not all customers are online, utilities also need to set up different channels of communication for different socio-economic groups.

Utilities will also need to have two-way communication with their customers to better understand their needs.

Obstacle 06

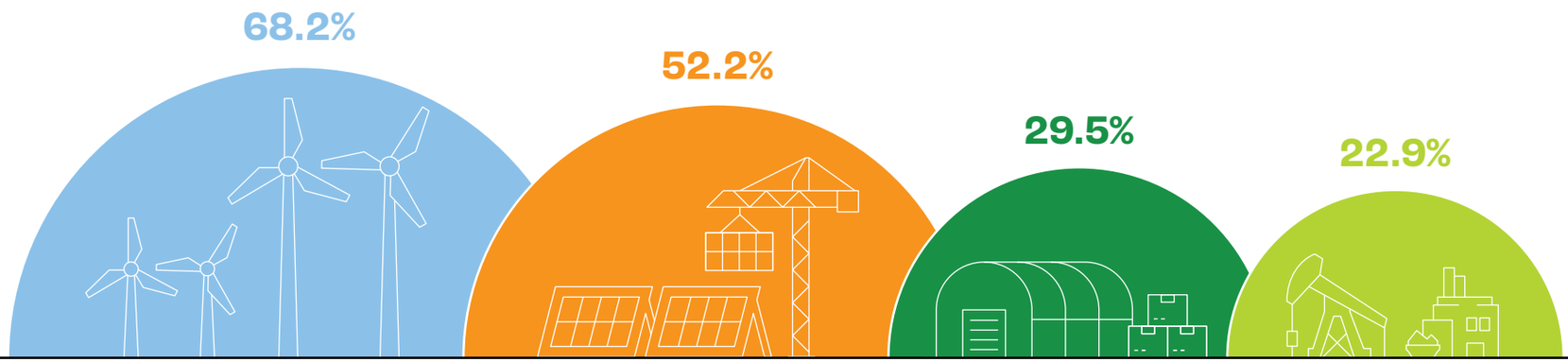
Workforce Development

As new technologies emerge and sectors transform or become obsolete, workers will need to be retrained to perform new tasks. Similarly, utilities will need a new and technically-trained workforce to deploy modern technologies on a commercial scale.

Not to mention, by decommissioning fossil fuel plants, utilities risk displacing communities and what their economy is based on. Educating and training fossil fuel plant employees to prepare them for new clean energy jobs will require significant investment from both utilities and the government, in addition to private investment.

The Demand for Green Jobs

Projected growth rate 2020-2030



Wind turbine service technicians have the fastest growth rate among all jobs in the U.S. through 2030.

Source: Bureau of Labor Statistics[19]

The Path Forward

While these obstacles are significant they are not insurmountable given that the industry is already moving forward with changes underway. There are solutions for utilities to overcome these obstacles through cross-industry collaboration, public-private partnerships, technological development, and community-specific solutions.

With this context, the 2022 Annual Utility Decarbonization Index highlights the current status of decarbonization for the largest utilities in the U.S..

SECTION 04

Tracking Climate Action

The U.S. Utilities Decarbonization Index

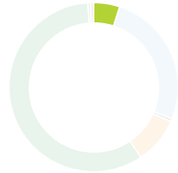
IN THIS SECTION, WE COVER:

The 2022 Annual Utility Decarbonization Index, the first of its kind, tracks the decarbonization progress of the 30 largest investor-owned utilities (IOUs) in the U.S.

This index allows for direct comparison and evaluation of decarbonization efforts by the most prominent players in the energy sector.

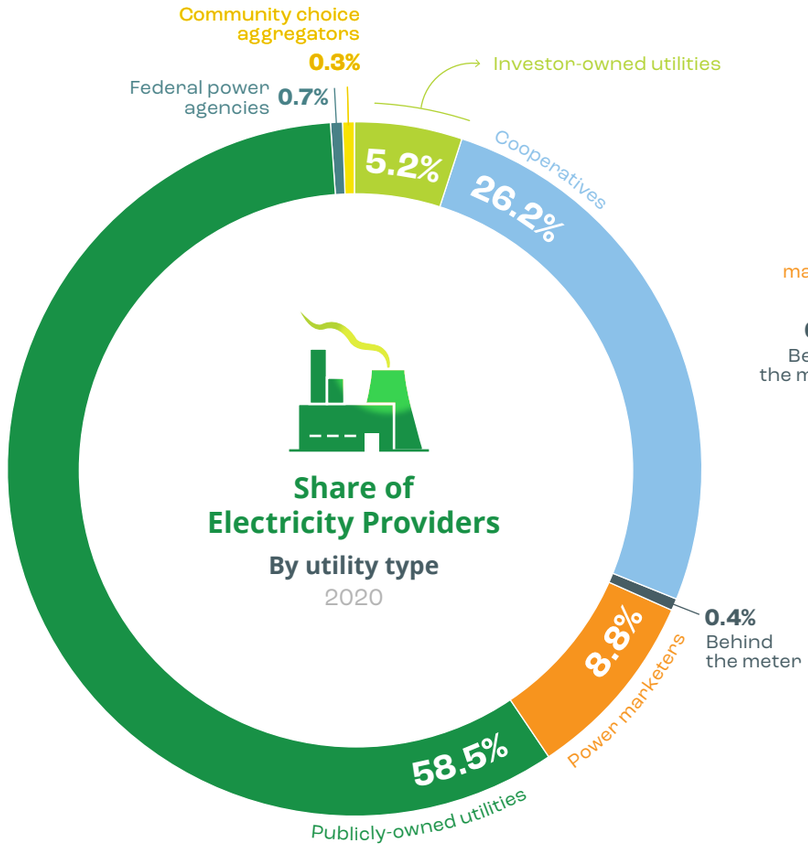
What Are IOUs?

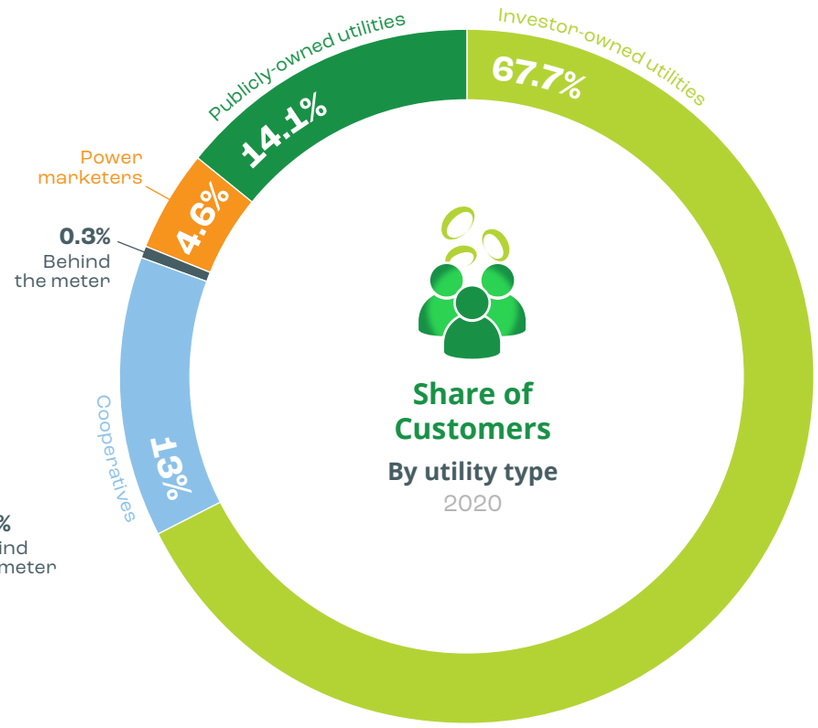
Investor-owned utilities are electric utilities that have publicly traded stock.



Of the **3,422** U.S. electric utilities, just **179** are IOUs.

Yet those 179 IOUs serve nearly **109 million,** or **68%** of all, U.S. electric customers.



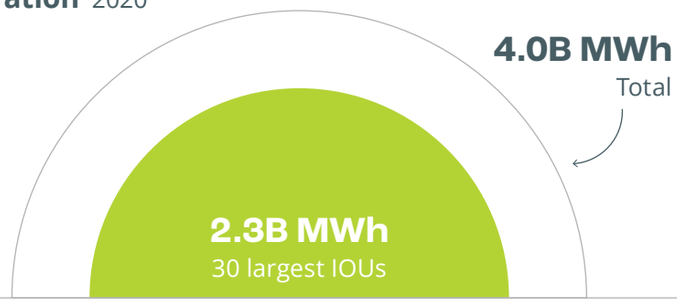


Source: EIA Form 861-2020 via APPA[20]

The 30 Largest Investor-Owned Utilities

In 2020, the 30 largest IOUs accounted for roughly 58% of the country's net electricity generation, after taking purchased power into account.

U.S. net electricity generation 2020



U.S. number of electric customers 2020

90.3M
30 largest IOUs

161.0M
Total

Source: EIA Form 861-2020 via APPA[20]

30 Largest IOUs by Electricity Generation

Total owned & purchased net generation, MWh

1. exelon — 261.3M
2. DUKE ENERGY — 210.0M
3. Southern Company — 183.6M
4. VISTRA — 175.8M
5. Berkshire Hathaway Energy — 134.8M
6. Dominion Energy — 133.2M
7. FPL — 130.8M — *Florida Power and Light*
8. entergy — 123.8M
9. aes — 115.6M
10. Xcel Energy — 98.0M
11. American Electric Power — 94.5M
12. NextEra Energy Resources — 77.7M
13. **54.3M** — *Public Service Enterprise Group*
14. **48.5M** — *Evergy*
15. **48.4M** — *Ameren*
16. nrg — **45.0M** — *NRG Energy*
17. OG&E — **36.1M** — *OG&E*
18. Fortis Inc. — **36.0M** — *Fortis Inc.*
19. Consumers Energy — **34.6M** — *Consumers Energy*
20. **33.2M** — *Emera*
21. DTE — **32.6M** — *DTE Energy*
22. **32.5M** — *WEC Energy*
23. **31.1M** — *Alliant Energy*
24. ppl — **30.5M** — *PPL Corporation*
25. PG&E — **29.3M** — *Pacific Gas and Electric*
26. transalta — **29.0M** — *TransAlta*
27. **22.1M** — *Avangrid*
28. PGE — **17.6M** — *Portland General Electric*
29. **14.2M** — *Consolidated Edison*
30. **10.6M** — *PNM Resources*

Methodology

How the Utility Decarbonization Index Is Scored

The NPUC uses six metrics to track utility decarbonization.

Companies are scored on a scale of 1 (lowest) to 5 (highest) for each metric, and their overall decarbonization score is an average of these six metrics.

The Utility Decarbonization Index uses data from 2020, which was the latest available across the 30 largest IOUs as of June 2022.

A small number of utilities did not report adequate data for some of the above metrics. In such cases, we have excluded those utilities from our analysis for those metrics, which means they were ranked on five or fewer metrics.

01

Fuel Mix

The share of low-carbon sources in the company's owned generation mix.

= *Owned net generation from low-carbon sources* / *Total owned net generation*

02

CO2 Emissions Intensity

The amount of CO2 emitted per megawatt-hour of electricity generated and purchased.

= *Total CO2 emissions from owned and purchased generation* / *Total owned and purchased net generation*

03

Total CO2 Emissions

The absolute CO2 emissions from owned and purchased electricity generation of each company.

= *Sum of CO2 emissions from owned and purchased generation*

04

CO2 Emissions Per Capita

CO2 emissions from owned and purchased electricity generation per retail customer.

= *Total CO2 emissions from owned and purchased generation* / *Total number of retail customers*

05

Decarbonization Goals

An evaluation of the company's interim greenhouse gas reduction and net-zero targets.

= *Comparison of the company's climate goals against a baseline of 50% GHG emissions reduction by 2030 and net-zero by 2050*

06

Low-carbon Investment

The share of planned capital expenditure (CAPEX) for electricity generation dedicated to low-carbon sources.

= *Planned CAPEX for low-carbon generation* / *Total planned CAPEX for generation*

The score indicates where they stand in reducing CO2 emissions, incorporating low-carbon generation, and setting climate targets in alignment with those set by the federal government.

The scores are based on the range of figures for each metric divided into five equal buckets. For instance, if the lowest reported CO2 emissions intensity is zero metric tons per MWh and the highest is one metric ton per MWh, companies that emit less than 0.2 metric tons per MWh will receive the highest score of 5. Those that emit between 0.2 and 0.4 metric tons of CO2 per MWh will receive a 4, and so on.

However, it's important to note that these scores are relative, and compare the top 30 utilities to each other. Therefore, a score of 5 does not indicate net-zero emissions—instead, it suggests that the utility is doing particularly well relative to its peers.

The 2022 Utility Decarbonization Index

Leading The Way

Public Service Enterprise Group

has the most ambitious decarbonization goals among the top 30 IOUs, aiming to achieve net-zero emissions from its operations by 2030.

NextEra Energy Resources

is the world's largest producer of solar and wind energy and generated 97% of its net electricity from low-carbon sources.

NextEra Energy Resources does not serve retail customers, so its CO_2 emissions per capita cannot be calculated.

Pacific Gas and Electric

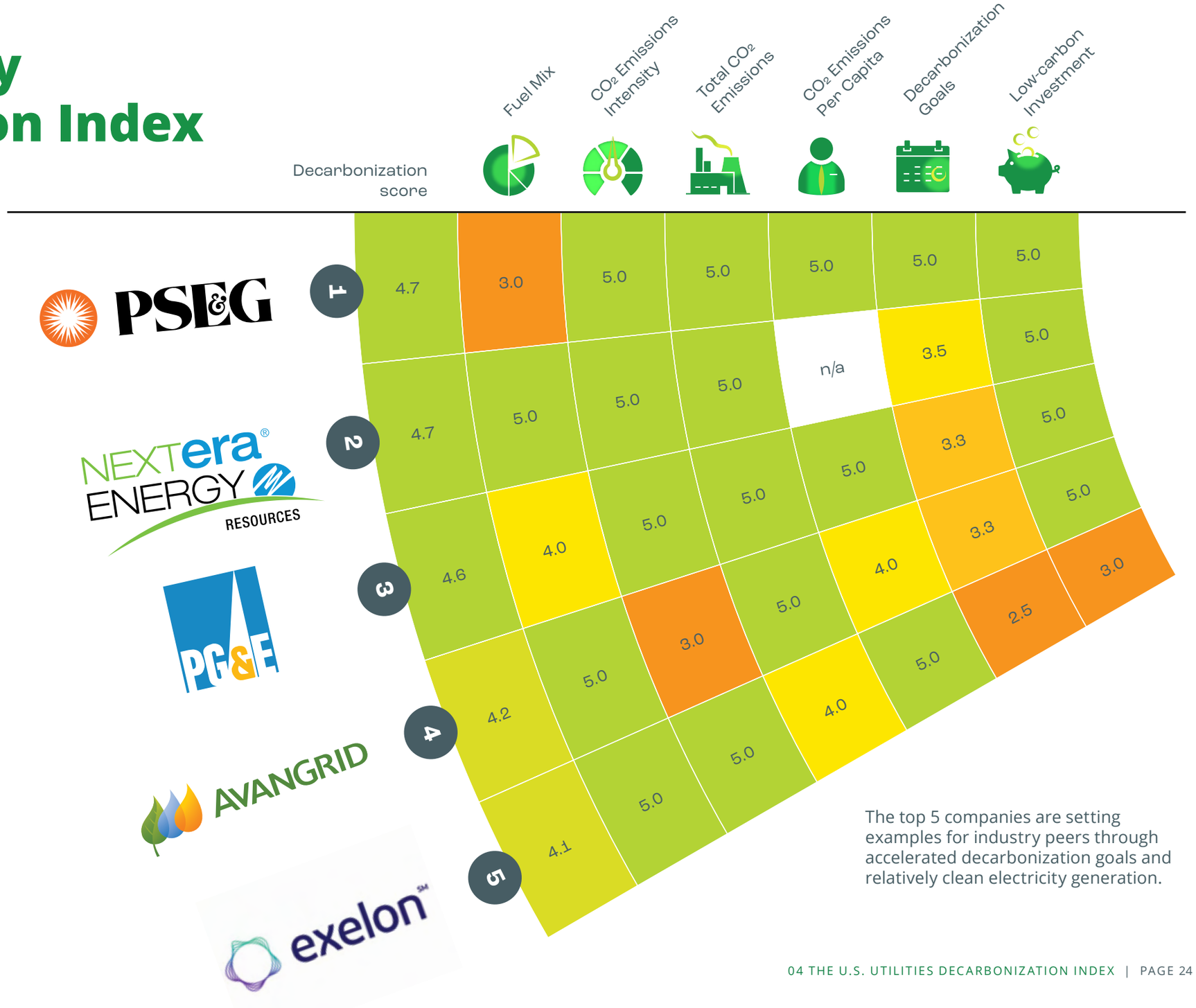
is California's largest utility and had the lowest emissions per customer among the top 30 IOUs.

Avangrid

had one of the cleanest fuel mixes of the 30 utilities, generating 86% of its net electricity from wind power.

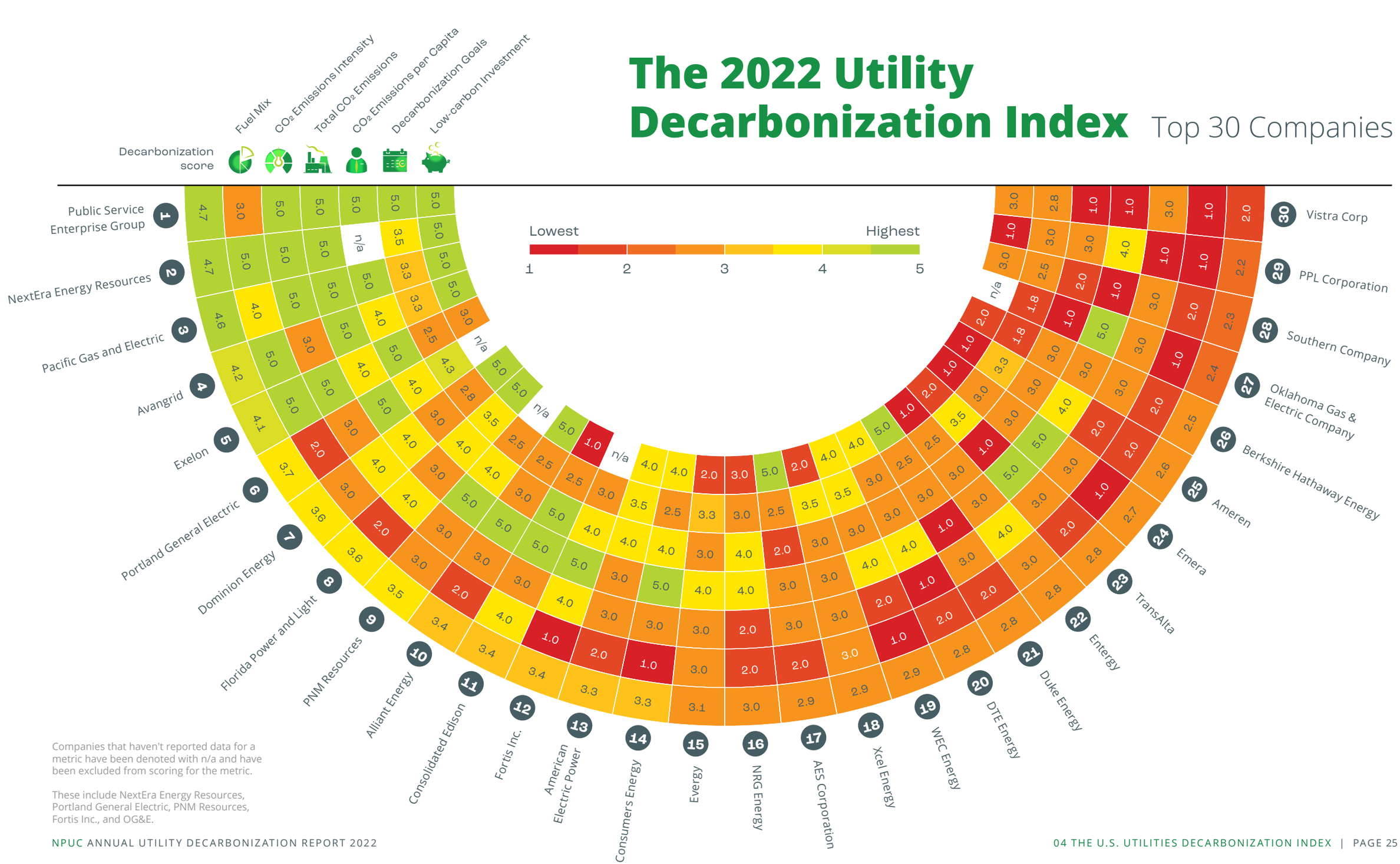
Exelon

is the country's largest producer of emissions-free power, and the largest of the top 30 utilities by net electricity generation.



The top 5 companies are setting examples for industry peers through accelerated decarbonization goals and relatively clean electricity generation.

The 2022 Utility Decarbonization Index Top 30 Companies



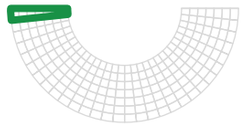
Companies that haven't reported data for a metric have been denoted with n/a and have been excluded from scoring for the metric.

These include NextEra Energy Resources, Portland General Electric, PNM Resources, Fortis Inc., and OG&E.

KEY TAKEAWAYS

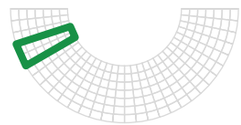
- Five of the 30 utilities scored higher than 4, while 20 scored 3.3 or lower.
- Public Service Enterprise Group (PSEG) tops the chart and is aiming to achieve net-zero emissions by 2030, five years ahead of any other utility on the list based on announced goals.
- Only three utilities—NextEra Energy Resources, Avangrid, and Exelon—scored a 5 on the fuel mix metric for generating more than 80% of their electricity from low-carbon sources.
- Exelon's high score is partly due to its large-scale, low-emission electricity generation from nuclear power.

Top of the Chart



Public Service Enterprise Group (PSEG), the thirteenth-largest IOU by electricity generation, ranks highest due to its low-emissions profile, ambitious climate goals, and planned capital allocation for low-carbon electricity generation. The company aims to achieve net-zero emissions from its operations by 2030—at least 10 years ahead of any other utility on the list based on announced goals.

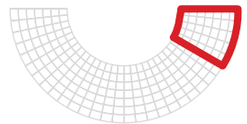
Following PSEG closely is NextEra Energy Resources, the clean energy-focused subsidiary of NextEra Energy Inc. The company is the largest provider of wind power in the U.S., with 63% or nearly 50 million MWh of its owned generation coming from wind operations. Similarly, Californian utility Pacific Gas & Electric (PG&E) generated 78% of its electricity from low-carbon sources and has a relatively low emissions profile.



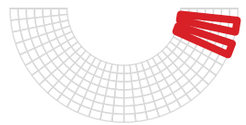
Avangrid, a subsidiary of the Iberdrola Group based in Spain, has one of the cleanest fuel mixes and the lowest emissions per capita, propelling it to the fourth spot. Exelon, the largest utility in the index by electricity generation, generates the bulk of its electricity through nuclear power. The company's owned and purchased net generation totals over 261 million MWh—higher than the other top four companies combined—serving over 8.9 million electric customers.

Room for Improvement

On the other end of the index, heavy reliance on fossil fuel-powered generation and, consequently, high CO_2 emissions intensity rates are a notable trend.



In the bottom five, some of the country's largest utilities by generation, including Southern Company, Berkshire Hathaway Energy, and Vistra Corp, are among the biggest per capita CO_2 emitters. On average, these three utilities emitted roughly 14 metric tons of CO_2 per retail customer in 2020 (higher than the overall average of 10.8 metric tons). This could be due to fossil fuels accounting for more than 80% of their owned electricity generation, with natural gas and coal being the largest sources.



PPL Corporation and Oklahoma Gas & Electric Company (OG&E) are the smallest utilities in the bottom five. OG&E's emissions intensity score reveals that the company emits high CO_2 per MWh of electricity generated due to its reliance on fossil fuels, namely coal.

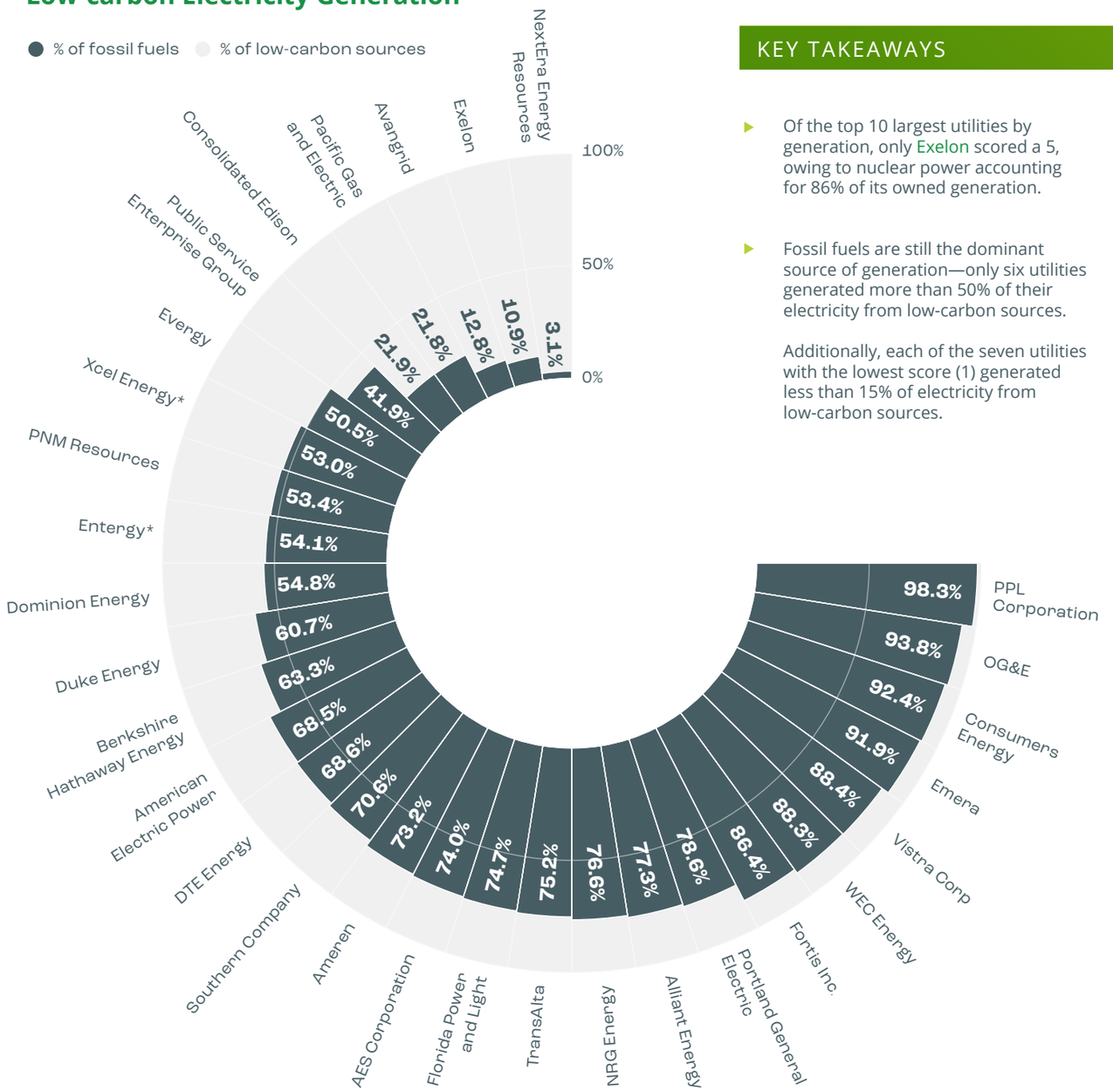
Overall, utilities at the bottom end of the index have plenty of room for decarbonization progress, especially relative to their peers that are advancing low-carbon electricity. The following sections highlight some of the key takeaways from the results for each metric.

Metric 01

Fuel Mix

The fuel mix score is based on the share of low-carbon sources in a utility's owned net generation. Low-carbon sources include renewables, nuclear power, and fuel cells, while fossil fuels include coal, natural gas, petroleum, and petroleum coke.

Top 30 Utilities by Share of Low-carbon Electricity Generation

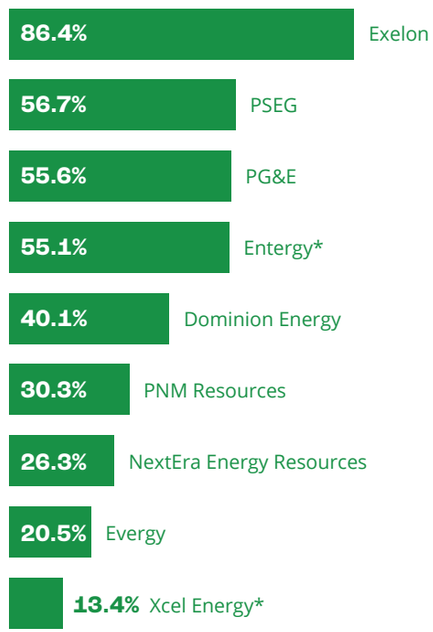


KEY TAKEAWAYS

- Of the top 10 largest utilities by generation, only Exelon scored a 5, owing to nuclear power accounting for 86% of its owned generation.
- Fossil fuels are still the dominant source of generation—only six utilities generated more than 50% of their electricity from low-carbon sources.

  Additionally, each of the seven utilities with the lowest score (1) generated less than 15% of electricity from low-carbon sources.
- Nuclear was the largest source of low-carbon electricity generation overall, accounting for 30% of the total generation of the top 30 utilities. Wind was the second-largest source with an 11% share.
- Among utilities that scored 3 or more, a larger share of nuclear generation was a common theme:

Share of Nuclear in Owned Net Electricity Generation



SCORE CRITERIA

Share of low-carbon sources in owned electricity generation	Fuel mix score
Less than 20%	1
20–40%	2
40–60%	3
60–80%	4
More than 80%	5

*Xcel Energy and Entergy did not report owned net electricity generation separately. Therefore, their fuel mix includes purchased power.

Metric 02

CO2 Emissions Intensity

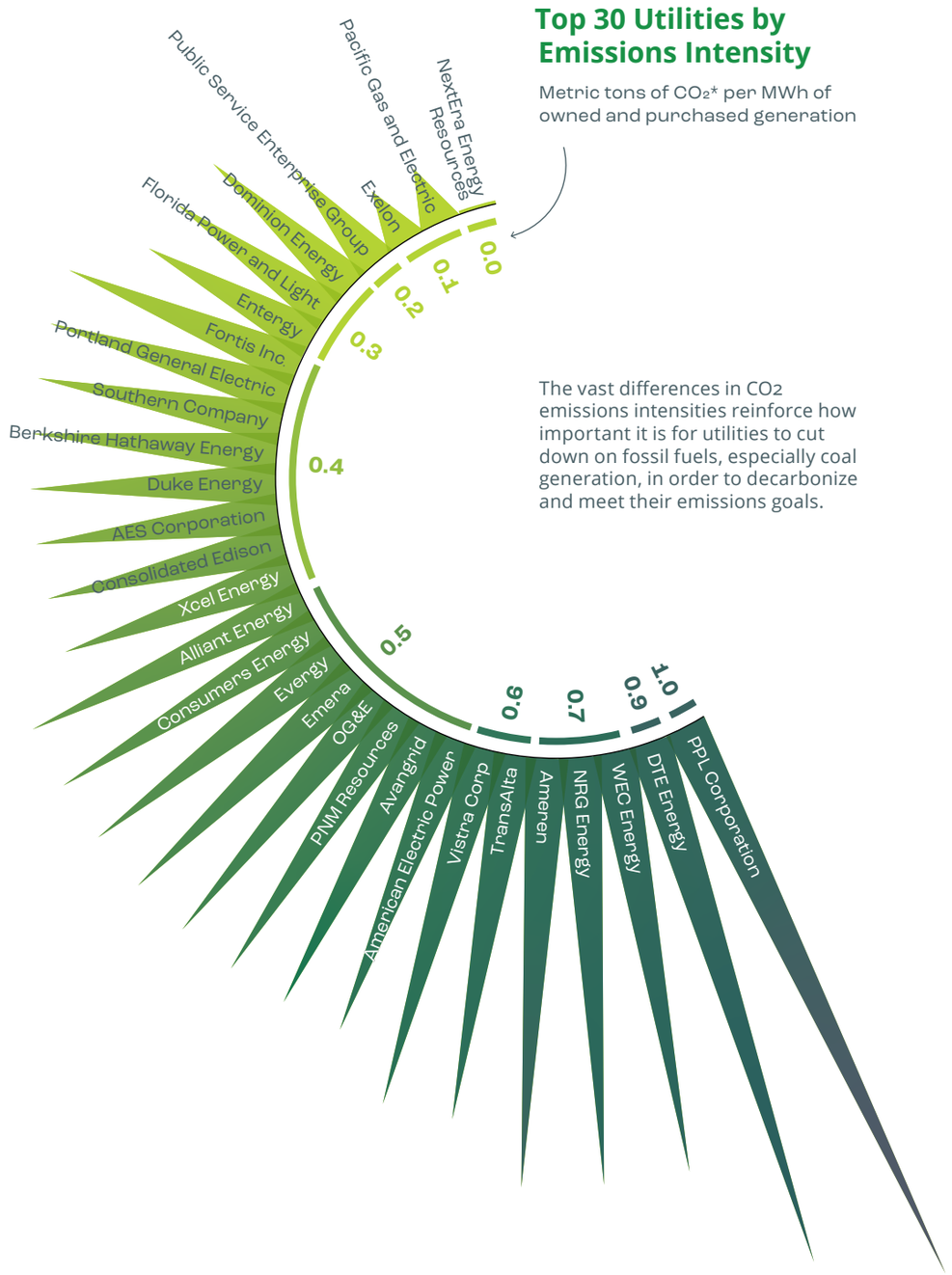
The emissions intensity rate measures how many metric tons of CO_2 a utility emits for every MWh of owned and purchased net electricity generation. Therefore, it accounts for the varying sizes of the top 30 utilities.

While emissions intensity could be measured solely for owned generation, some utilities had higher emissions from purchased power than their owned generation. We've included purchased power emissions as part of this metric to account for this.

SCORE CRITERIA

Metric tons of CO_2 from owned and purchased generation per MWh	CO_2 emissions intensity score
More than 0.77Mt	1
0.77–0.57Mt	2
0.57–0.38Mt	3
0.38–0.19Mt	4
Less than 0.19Mt	5

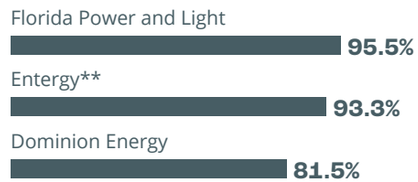
*Based on CO_2-equivalent emissions for companies that didn't report CO_2 emissions separately.



KEY TAKEAWAYS

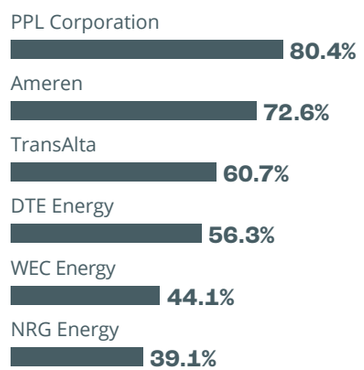
- Dominion Energy, Florida Power and Light (FPL), and Entergy were less emissions-intensive despite fossil fuels making up over 50% of their net generation.

Share Of Natural Gas In Fossil Fuel-fired Owned Net Generation



- The six utilities with the lowest scores had a relatively high share of coal (the most emissions-intensive fuel) in their owned net generation:

Share of Coal in Owned Net Generation



**Entergy did not report its owned generation mix separately. Therefore, its share of natural gas is based on both owned and purchased generation.

Metric 03

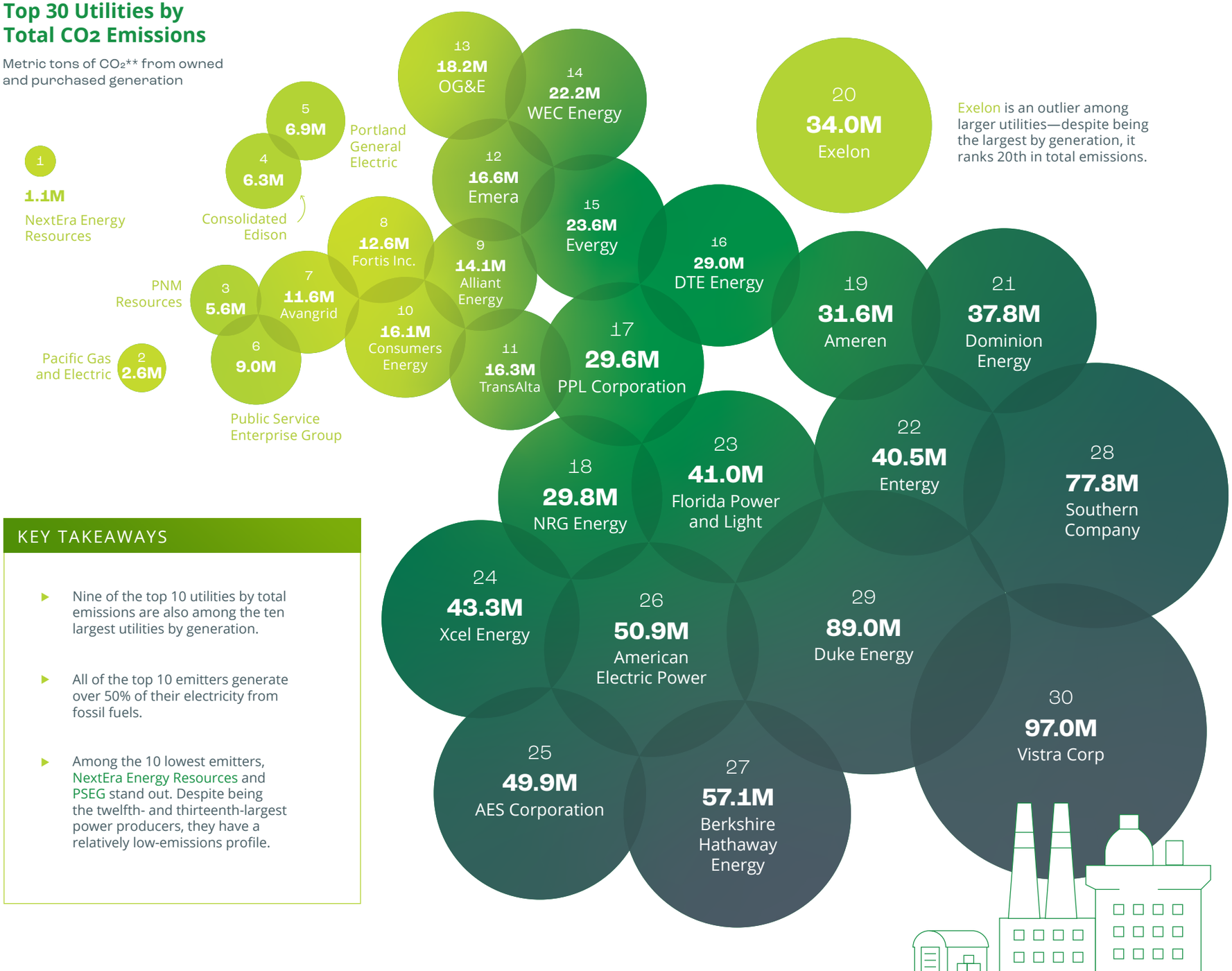
Total CO_2 Emissions

The total CO_2 emissions metric measures each company's absolute emissions from owned and purchased generation. However, it's important to note that it does not account for the differing sizes of utilities, which is the focus of the CO_2 emissions intensity and emissions per capita metrics.

The rationale behind this metric is that smaller utilities and unconsolidated subsidiaries may find it easier to decarbonize than larger consolidated parent utilities.

Top 30 Utilities by Total CO_2 Emissions

Metric tons of CO_2** from owned and purchased generation



Exelon is an outlier among larger utilities—despite being the largest by generation, it ranks 20th in total emissions.

SCORE CRITERIA

Total CO_2 emissions from owned and purchased generation*	Total CO_2 emissions score
More than 77MMt	1
77–58MMt	2
58–38MMt	3
38–19MMt	4
Less than 19MMt	5

*Million metric tons

**Represents CO_2-equivalent emissions for companies that didn't report CO_2 emissions separately.

KEY TAKEAWAYS

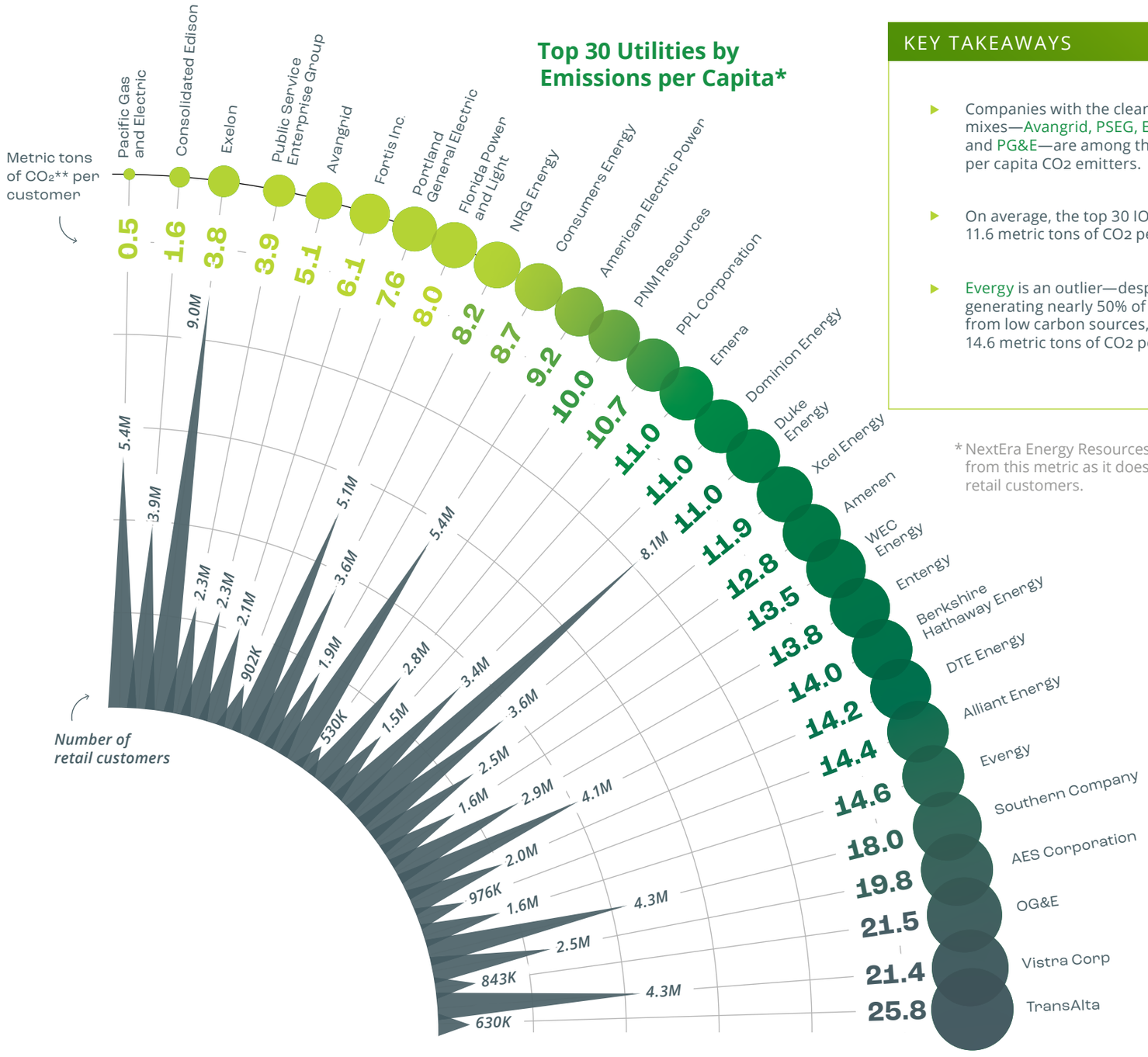
- Nine of the top 10 utilities by total emissions are also among the ten largest utilities by generation.
- All of the top 10 emitters generate over 50% of their electricity from fossil fuels.
- Among the 10 lowest emitters, NextEra Energy Resources and PSEG stand out. Despite being the twelfth- and thirteenth-largest power producers, they have a relatively low-emissions profile.

Metric 04

CO2 Emissions per Capita

The CO_2 emissions per capita metric measures how many metric tons of CO_2 a utility emits for every retail customer served, accounting for the differences in sizes of the 30 largest IOUs.

For context, the number of customers served ranges from around 530,000 for the smallest utility to over nearly 9 million for the largest. However, it's also important to note that some of these customers are industrial and consume much more energy than the average household.



KEY TAKEAWAYS

- Companies with the cleanest fuel mixes—Avangrid, PSEG, Exelon, and PG&E—are among the lowest per capita CO_2 emitters.
- On average, the top 30 IOUs emitted 11.6 metric tons of CO_2 per capita.
- Evergy is an outlier—despite generating nearly 50% of its electricity from low carbon sources, it emitted 14.6 metric tons of CO_2 per capita.

*NextEra Energy Resources is excluded from this metric as it does not serve any retail customers.

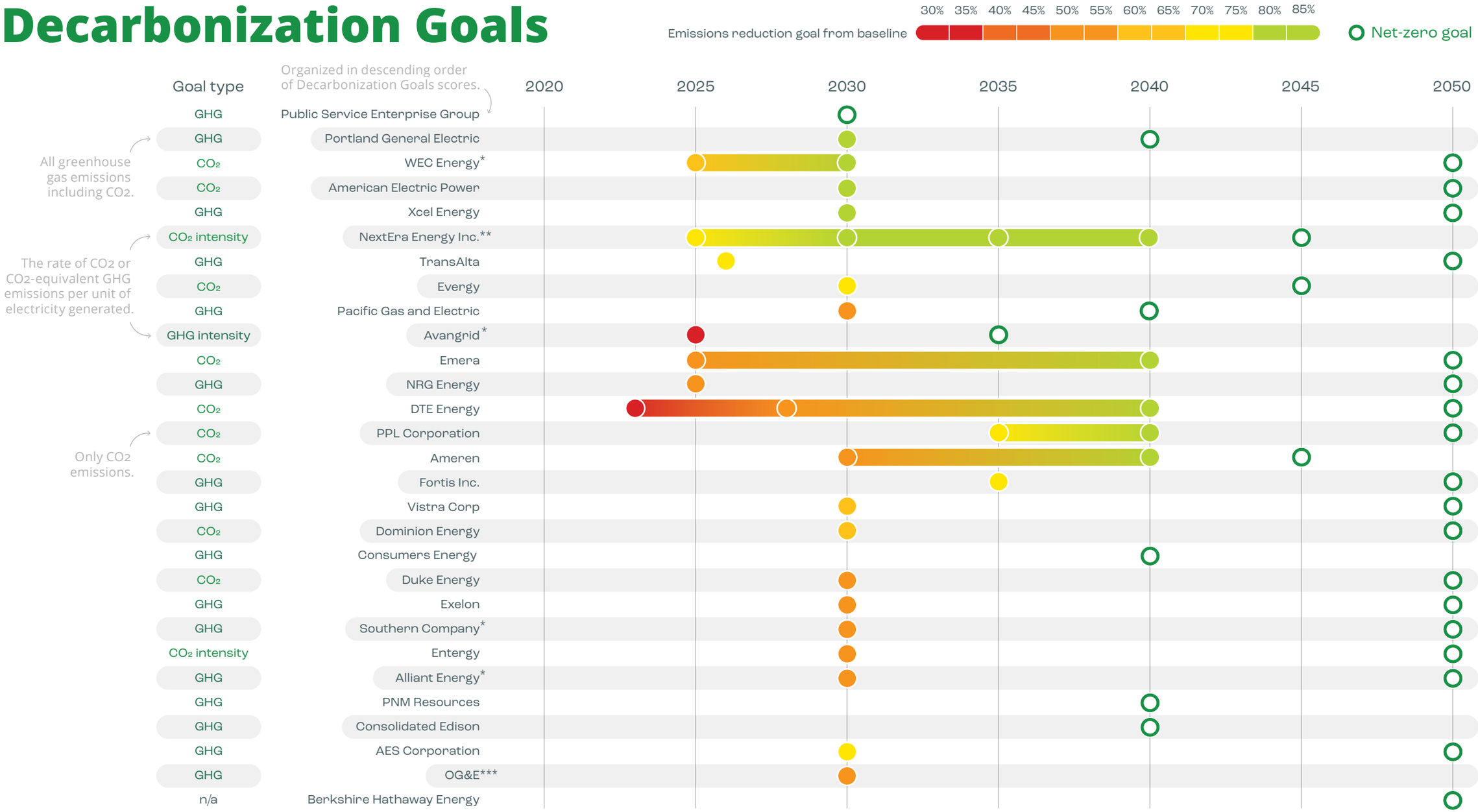
SCORE CRITERIA

Total metric tons of CO_2 emissions per customer	CO_2 emissions per capita score
More than 20Mt	1
20–15Mt	2
15–10Mt	3
10–5Mt	4
Less than 5Mt	5

**Based on CO_2-equivalent emissions for companies that didn't report CO_2 emissions separately.

Metric 05

Decarbonization Goals



* Refers to direct emissions (power generation and other scope 1 categories) only.
** Represents both NextEra Energy Resources and Florida Power & Light.
*** At the time of writing, Oklahoma Gas & Electric Company has not published a net-zero goal for 2050 or earlier.

Metric 06

Low-carbon Investment

To achieve long-term emissions targets, utilities may need to strategize and allocate funds toward expanding their clean electricity generation.

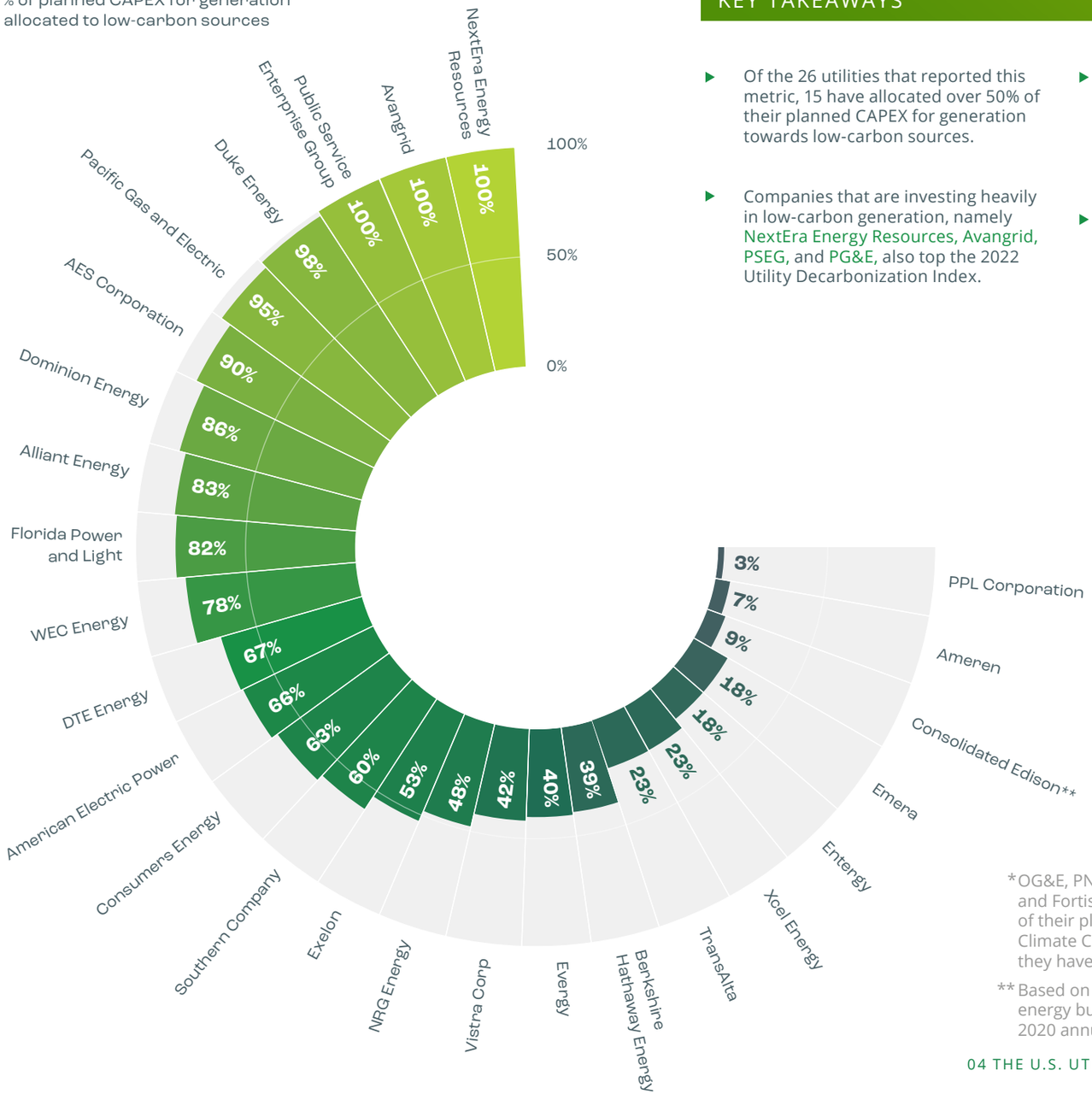
The low-carbon investment metric measures the share of each utility's planned capital expenditure (CAPEX) for electricity generation dedicated to low-carbon sources. It uses data from annual reports and the Climate Disclosure Project's (CDP) climate change questionnaire for 2021, where utilities provide a breakdown of their planned CAPEX.[21]

SCORE CRITERIA

Share of planned generation CAPEX for low-carbon sources	Low-carbon investment score
Less than 20%	1
20–40%	2
40–60%	3
60–80%	4
More than 80%	5

Top 30 Utilities by Low-carbon Investment*

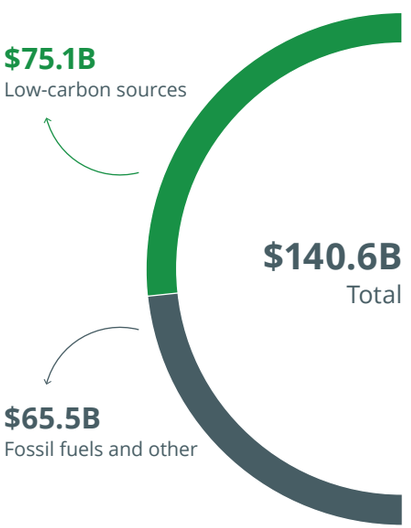
% of planned CAPEX for generation allocated to low-carbon sources



KEY TAKEAWAYS

- Of the 26 utilities that reported this metric, 15 have allocated over 50% of their planned CAPEX for generation towards low-carbon sources.
- Companies that are investing heavily in low-carbon generation, namely NextEra Energy Resources, Avangrid, PSEG, and PG&E, also top the 2022 Utility Decarbonization Index.
- Several utilities that are lagging in other metrics, like WEC Energy, DTE Energy, and Southern Company, are dedicating the majority of their planned expenditure to low-carbon sources.
- By contrast, 11 utilities have dedicated over 50% of their planned generation CAPEX toward fossil fuels, either for expansion or maintenance of existing assets.

Total (30 IOUs) Planned CAPEX for Generation through 2026



*OG&E, PNM Resources, Portland General Electric, and Fortis Inc. either did not provide breakdowns of their planned CAPEX or did not submit the CDP Climate Change questionnaire. For this reason, they have been excluded from this metric.

**Based on the amount allocated to clean energy businesses in Consolidated Edison's 2020 annual report.

SECTION 05

The U.S. Utilities ESG Report Card

IN THIS SECTION, WE COVER:

More than ever, investors are factoring Environmental, Social, and Governance (ESG) metrics in their investment decisions.

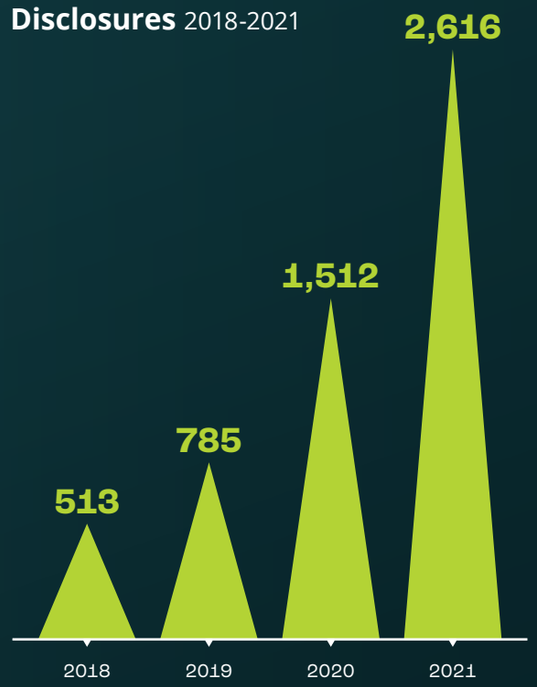
Once seen as optional, ESG and sustainability reports have become mainstream for publicly traded companies.

Between 2018 and 2021, the number of organizations supporting climate disclosures under the framework by the Task Force on Climate-related Financial Disclosures (TCFD) grew five-fold.[22]

As of 2021, over 2,600 organization supported TCFD disclosures, including 1,000 financial institutions responsible for $194 trillion in assets.

Strong ESG reporting practices can encourage investment from climate-conscious investors while also building transparency with customers.

Number of Organizations Supporting Task Force on Climate-related Financial Disclosures 2018-2021



However, the parameters that make up ESG criteria are often subjective to industries. It's essential to define what these three factors mean for U.S. utilities in the context of decarbonization.

Source: TCFD Status Report (2021)[22]

The Three Pillars of ESG for U.S. Utilities

Environmental

The contribution of a utility to the fight against climate change through benchmarking its greenhouse gas emissions to a stated target, in addition to investment in low-carbon technologies to reduce emissions.

Social

Accounting for, and disclosure of, GHG emissions from supply chains, community offerings, internal initiatives, and the socio-economic impact of not decarbonizing. Consideration for the effects of decarbonization practices on disadvantaged communities.

Governance

Regular reporting of the utility's decarbonization progress to shareholders, customers, and the government; disclosure of lobbying expenditures and political contributions.

What Are the 3 Scopes of GHG Emissions?

There are three scopes of GHG emissions that make up a company's carbon footprint, as defined by the Greenhouse Gas Protocol.

Scope 1

Direct emissions that come from sources owned or controlled by the company, such as:

- Boilers
- Furnaces
- Chemical production
- Power plants

Scope 2

Emissions from the generation of purchased electricity consumed by the company for purposes like:

- Heating
- Computers
- Cooling
- Operating machinery

Scope 3

Indirect value chain emissions from upstream and downstream operations of the company, including emissions from:

- Purchased power
- Waste generated in operations
- Employee commuting
- Use of sold products
  Such as consumption of gas by customers

While the 2022 Utility Decarbonization Index provides an in-depth analysis of the 'E' in ESG, we also need to consider the transparency of the utilities in reporting on the other factors.

How do the top 30 utilities compare in ESG reporting?

ESG Report Card for the Top 30 IOUs

27 of the 30 utilities reported Scope 2 emissions associated with the purchase of electricity for internal use.

Reported | Partially reported

	Scope 1 Emissions	Scope 2 Emissions	Scope 3 Emissions	Current Energy Mix	Projected Energy Mix	Internal Energy Consumption	Water Withdrawal	Waste Generation	Political Contributions	Electric Vehicle Plans
Exelon					n/a					
Duke Energy										
Southern Company					n/a					
Vistra Corp									n/a	n/a
NextEra Energy*										n/a
Entergy										
Dominion Energy										
Berkshire Hathaway Energy		n/a	n/a		n/a	n/a		n/a	n/a	
AES Corporation										n/a
American Electric Power										
Xcel Energy			n/a		n/a					
Public Service Enterprise Group					n/a					
Evergy		n/a	n/a							n/a
NRG Energy					n/a					
Ameren										
DTE Energy					n/a	n/a				n/a
WEC Energy						n/a				
PPL Corporation					n/a					
Pacific Gas and Electric					n/a					
Emera					n/a				n/a	n/a
TransAlta					n/a				n/a	n/a
Alliant Energy			n/a			n/a			n/a	
Avangrid					n/a	n/a			n/a	
OGE Energy			n/a		n/a				n/a	n/a
Fortis Inc.					n/a	n/a				n/a
Consumers Energy										
Consolidated Edison					n/a	n/a				
Portland General Electric					n/a	n/a				
PNM Resources		n/a	n/a		n/a	n/a				

Metrics like Scope 1 emissions, current energy mix, water withdrawal, and waste generation were reported consistently across the board.

Unavailable or unreported data for specific sections by companies has been denoted as n/a.

Transparency with stakeholders is a critical part of net-zero planning. While 13 utilities published their projected energy mixes, the majority did not.

As a measure of governance, 23 utilities publicly reported their annual political contributions. Some utilities even broke down the portion of these funds contributing to lobbying.

* NextEra Energy represents both Florida Power and Light (FPL) and NextEra Energy Resources.

Source: Climate Disclosure Project, Company sustainability reports[21]

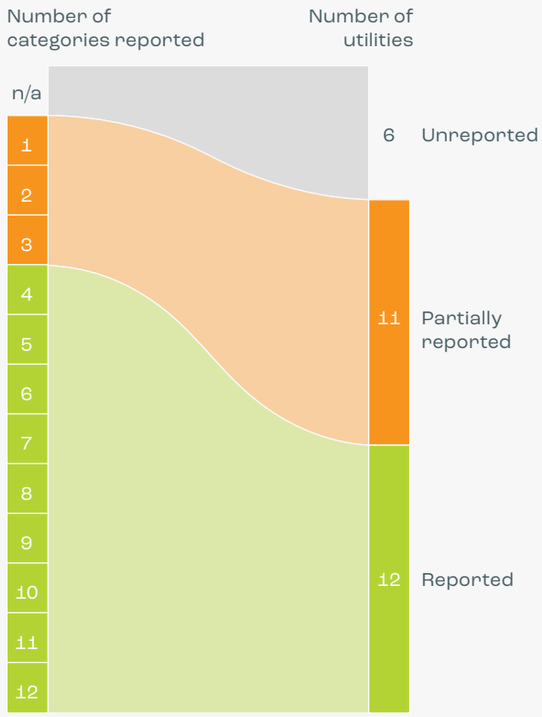
Filling the Gaps in Scope 3 Reporting

In reporting scope 3 emissions, metrics considered "relevant" by some utilities were left out by others. Many cited that they were working on methods to calculate value chain emissions.

Of the 17 Scope 3 categories listed in the Climate Disclosure Project questionnaire, utilities reporting on four or more categories were considered to have tracked their Scope 3 emissions. Those with three or fewer responses were given a 'partial' remark.

	Scope 3 Emissions
Exelon	12
Duke Energy	3
Southern Company	6
Vistra Corp	5
NextEra Energy*	2
Entergy	3
Dominion Energy	2
Berkshire Hathaway Energy	n/a
AES Corporation	4
American Electric Power	6
Xcel Energy	n/a
Public Service Enterprise Group	8
Evergy	n/a
NRG Energy	2
Ameren	5
DTE Energy	4
WEC Energy	2
PPL Corporation	2
Pacific Gas and Electric	6
Emera	2
TransAlta	11
Alliant Energy	n/a
Avangrid	5
OGE Energy	n/a
Fortis Inc.	3
Consumers Energy	6
Consolidated Edison	3
Portland General Electric	1
PNM Resources	n/a

Number of Scope 3 categories reported from a total of 17



Nearly half of the utilities reported on more than four categories, with Exelon topping the list with 12 categories in total.

In addition, 11 companies disclosed at least one Scope 3 metric, with room for improvement. The discrepancy in reporting shows that while accounting for Scope 3 emissions is inconsistent, some utilities have found methods to calculate portions of their value chain emissions.

Through the findings of this report, IOUs can benchmark their reporting practices against each other and collaborate to promote consistent ESG reporting across the industry.

*NextEra Energy represents both Florida Power and Light (FPL) and NextEra Energy Resources.

CASE STUDY

PG&E

ESG Reporting: PG&E's "Scope 4" Emissions Goals[23]

In a bid to enable emissions reduction in other sectors, PG&E has set goals to reduce overall emissions from customers, industries, and the transportation sector.

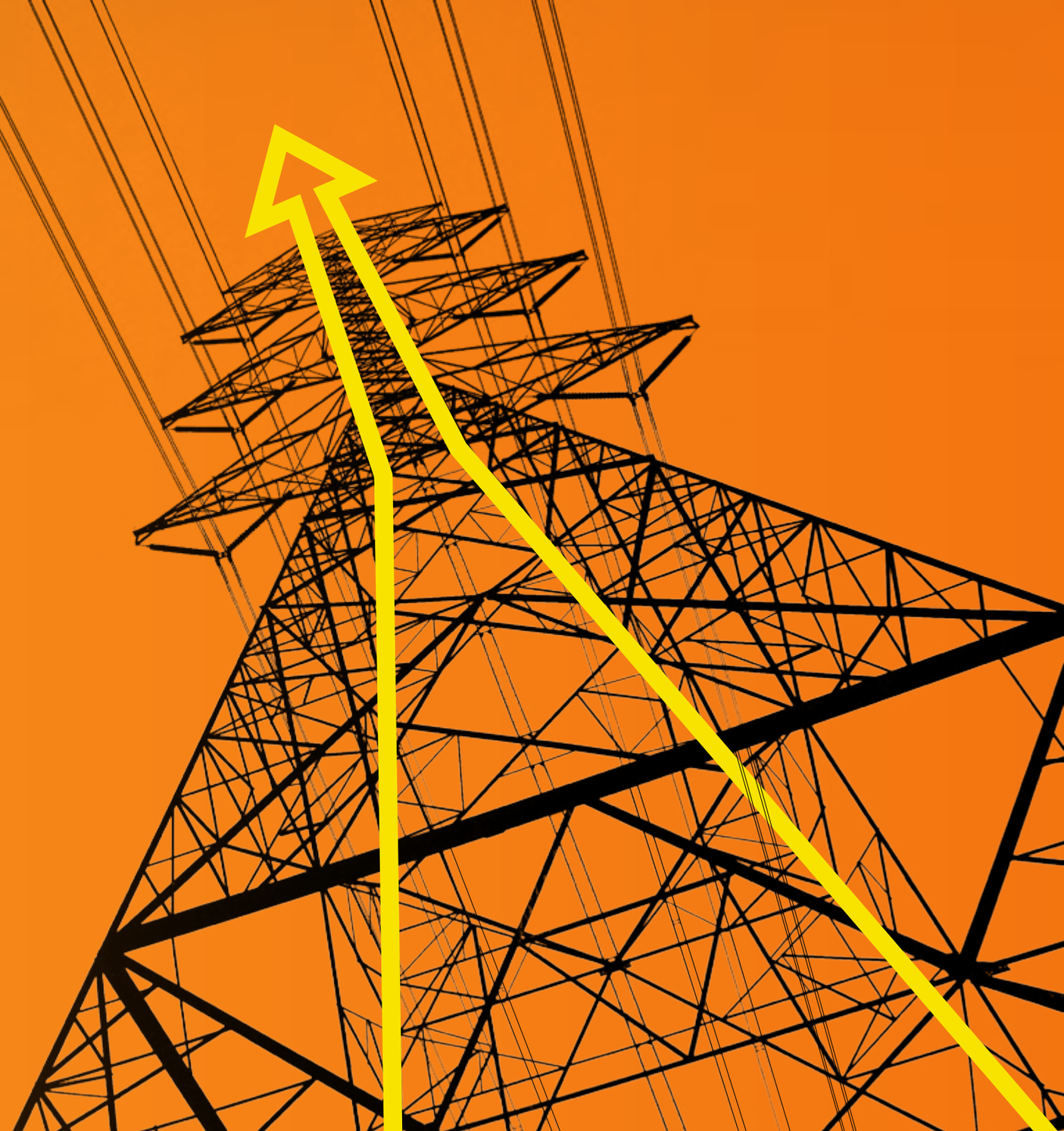
To achieve these goals, the company is offering energy efficiency and electrification programs to customers. By doing so, it will reduce both the load on the grid as well as household emissions in its service area. Additionally, PG&E has also set a goal to avoid emissions by converting unable-to-electrify industrial customers from more emissions-intensive fuels to natural gas.

The company is also supporting nationwide electrification goals by aiming to charge at least 3 million EVs by 2030—equivalent to reducing 58 million metric tons of GHG emissions.

SECTION 06

Solutions and Strategies

A Utilities-led Decarbonization Revolution



IN THIS SECTION, WE COVER:

Solutions to Obstacles

A Multi-stakeholder Approach

There are four key stakeholders that can help overcome the obstacles to utility decarbonization:

Utilities have the opportunity to lead economy-wide decarbonization in the U.S. and set a positive precedent for other sectors.

Just as utilities revolutionized the world by bringing power to a nation over a century ago, they can lead the way to a clean energy economy.

However, achieving decarbonization goals and conquering the obstacles that utilities face will require support from all stakeholders, from the government to the end consumer.

The following section presents a multi-stakeholder approach to solving the obstacles that utilities face and uses these solutions to draw possible decarbonization strategies for utilities.

01 Utilities

- Cross-industry collaboration
- Fleet electrification
- Pilot testing programs
- Nuclear power

02 Government

- Retraining programs
- Grid planning and permitting
- Funding

03 Investors

- Capital allocation
- Decarbonization advocacy
- Public-private partnership (PPP) programs

04 Customers

- Education and awareness
- Smarter households
- Net-metering programs
- Resourceful communication

Stakeholder 01

Utilities

Utilities can take up various initiatives to conquer some of the technological and socio-economic hurdles on the road to decarbonization.

Cross-industry collaboration

Collaboration with companies from different industries like telecommunications and battery manufacturing can help accelerate utility decarbonization through synergies.

For example, utilities can collaborate with data-analytics companies to identify customers living in remote areas, and to better understand their customers to build tailored solutions. Similarly, partnerships with telecommunications companies can help utilities in informing customers about decarbonization practices.

While cross-industry collaboration can be complex for industries that have been historically independent, utilities now have the opportunity to find support in new places to renew, rebuild, and revitalize the country's infrastructure.

CASE STUDY

DUKE ENERGY & Honeywell

Duke Energy & Honeywell Collaborate to Improve Energy Resiliency[24]

To help combat outages induced by extreme weather conditions due to climate change, Duke Energy Sustainable Solutions (DESS) and Honeywell partnered up to create municipal microgrids for certain U.S. communities.

Municipal microgrids are self-sufficient subsystems of the electric grid that serve as a means of backup power for local communities. In case of outages, micro-grids can disconnect from the larger grid and operate autonomously, providing communities with additional energy security.

Honeywell will lead solutions development using its smart cities expertise, and will use its IoT platform to build technologies and control systems. DESS will own and manage the energy assets, leveraging its competency in designing and implementing distributed energy solutions for communities.

CASE STUDY

PG&E & TESLA

PG&E and Tesla Build one of the World's Largest Energy Storage Facilities[25]

Californian utility PG&E, in collaboration with Tesla, has built an operational 182.5-megawatt lithium-ion battery storage facility in Monterey County. The facility is expected to be one of the largest battery storage systems in the world, with 256 of Tesla's Megapack battery packs set to relay over 730 MWh of energy to the electrical grid.

The additional energy storage is expected to provide PG&E and the State of California with enhanced grid reliability and integration of intermittent renewable energy sources. The project also has an option to boost power supply to the grid during peak hours.

Tesla and PG&E's energy storage facility in Moss Landing, Monterey County, California
Source: Tesla

Fleet electrification

Electrifying vehicle fleets can help reduce emissions from on-site travel and employee commuting, both of which contribute to a utility's carbon footprint.

Switching to electric vehicles for business operations will not only advance decarbonization within the company but also help achieve federal EV goals.

CASE STUDY

PG&E & GM

PG&E and GM Collaborate on EV Technology[26]

PG&E and GM are testing how GM EVs can be an on-demand power source for customers in PG&E's service area.

The companies plan to use GM EVs to test vehicle-to-home connections on a small group of customers, allowing them to receive power from the EV in the absence of grid electricity. This will demonstrate how EVs can be used to safely power homes during outages, increasing resiliency and reliability.

The partnership also supports California's EV adoption goals and PG&E's 2030 fleet electrification goals.

Pilot testing programs

Utilities can partner with early-to-advanced stage technology companies to engage in pilot testing programs for technologies that are not currently available at scale.

Through pilot programs, utilities advance decarbonization research and development for the entire industry and can also play an important role in breakthrough innovations. Simultaneously, utilities can also include customers and communities in the decarb-onization conversation by incentivizing them to participate in pilot programs.

CASE STUDY

DUKE ENERGY & Honeywell

Duke Energy Tests Honeywell's New Flow Battery Storage Technology[27]

Honeywell has developed a new flow battery technology that stores energy from intermittent renewable sources like wind and solar. The stored energy can then be used when wind and sunlight are absent.

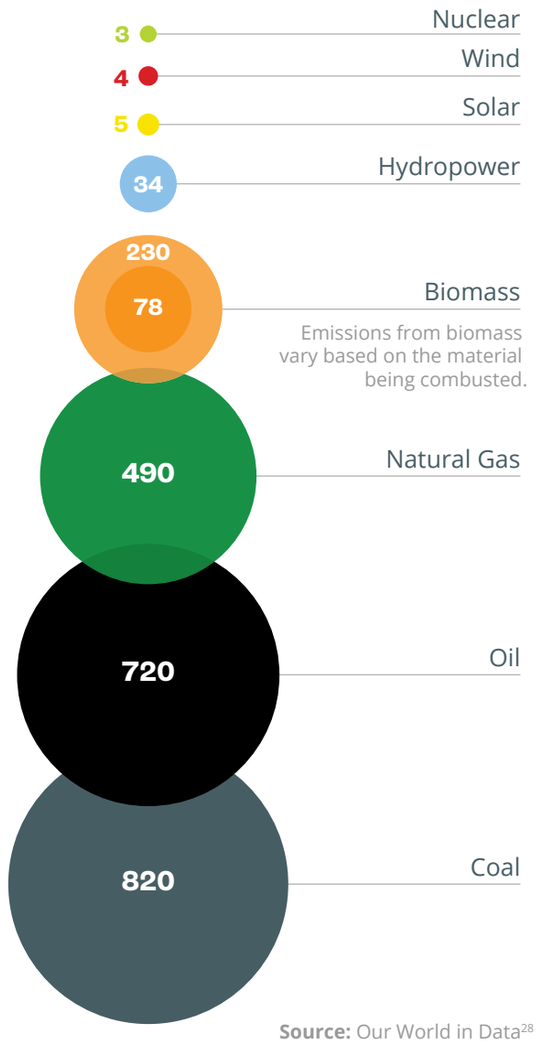
Duke Energy is testing this technology at its Mount Holly facility in North Carolina, and if successful, it will allow for greater flexibility and reduced dependence on fossil fuels for power generation. The testing begins with a 400 kWh unit to be delivered to Duke Energy in 2022. By 2023, this will be scaled up to a 60 MWh pilot project.

Nuclear power

Nuclear power is an emissions-free source of reliable electricity, offering several advantages provided the problem of nuclear waste is addressed. To fill in the gaps left behind by intermittent renewable generation, utilities can incorporate more nuclear power, either through owned reactors or purchased power agreements.

The Most Efficient Source of Low-Carbon Energy

CO_2-equivalent emissions per GWh of electricity over the lifecycle of the power plant (metric tons)



Source: Our World in Data[28]

CASE STUDY

exelon™

Exelon's Source of Clean Energy

Exelon is the largest IOU by energy generation and ranks highly in this year's decarbonization index. The company scored a 5 in both the fuel mix and the emissions intensity metrics, suggesting that it primarily generates clean energy and emits relatively less CO_2 per MWh.

The company's nuclear power plants—the largest fleet of reactors in the U.S.—account for 60% of its owned net energy generation. Since nuclear power plants do not generate any emissions during generation and run on their maximum capacity for over 90% of the year, they play a key role in keeping Exelon's emissions low for the amount of energy it generates.

Stakeholder 02

Government

The federal, state, and local governments have a critical role to play in supporting utility decarbonization, and they can do so in several ways.

Retraining programs

Administrative efforts to retrain and upskill existing employees will be critical in helping both utilities and at-risk workers in the shift to clean energy. Local and state administrations can also collaborate with utilities to create training programs for employees.

CASE STUDY

nationalgrid & NYSERDA

National Grid and NYSERDA: Heat Pump 101 Training Program[29]

To support workforce development for clean energy, National Grid developed the Heat Pump 101 training program in partnership with the New York State Energy and Research Development Authority, heat-pump installation company Bloc Power, and New York Edge, the city's largest provider of on-site afterschool programs.

The heat pump 101 program provides skilled training and employment opportunities for young adults from underserved and economically challenged communities in New York. The program summarizes the benefits of heat pumps for electrification, incentives to switch to clean heating and cooling technologies, and the environmental impact of carbon emissions. The program will teach participants about heat pump components, quality installation, system configurations, and their applications.

Grid planning and permitting

The permitting and regulatory differences from state to state make grid expansion inefficient. The federal administration can ease the expansion by streamlining permitting processes at the federal, state, and local levels, especially since the grid is interconnected and shared across the nation.

Funding

The deployment of additional federal funding is necessary to facilitate utility decarbonization by 2035 and a transition to net-zero emissions by 2050.

Utilities require funds to invest in research and development, accelerate technological adoption, and build a resilient and modern transmission network to meet the rising demand for clean electricity.

Stakeholder 03

Investors

As shareholders of publicly-traded utilities, investors hold the power to influence which utilities are given access to additional capital, and how it is allocated.

Capital allocation

Investors can support decarbonization by making it a part of their due diligence.

Capital can be directed to utilities that are making measurable efforts to decarbonize and divested from those that aren't meeting their targets. By funding companies that meet high ESG standards, investors will motivate other utilities to "follow the money".

Decarbonization Advocacy

Investors can encourage peers and other investor groups to fund decarbonization by advocating for utilities that are transparent about their pathways and plans to achieving net-zero emissions and are making active efforts to reach these goals.

Public-private partnership (PPP) programs

Private investors, in collaboration with the government, can stimulate PPP programs to finance, build, and operate decarbonization projects.

Financing utility decarbonization will accelerate economy-wide emissions reduction while also helping investors achieve their ESG investment goals.

Stakeholder 04

Customers

Although effective decarbonization must happen at the level and scale of utilities, electric customers can aid the process by making more informed and environmentally-forward choices.

Education and awareness

The first step utility customers can take to assist in decarbonization is understanding what it is, why it is essential, and the benefits it can bring through lower electricity bills, energy independence, and lower individual carbon footprints.

With that information, consumers can not only make conscious choices themselves but also spread awareness in their local communities.

Smarter households

Reducing overall electricity demand is one way to ease the utilities' transition to clean energy sources. Smart, energy-efficient appliances like digital thermostats allow customers to use more electricity when demand is low, reducing the load on utilities as well as their own electric bills.

Net-metering programs

Proactive climate-conscious customers that have residential solar panels can take decarbonization efforts one step further by participating in net-metering programs. These programs allow customers to supply and sell any excess electricity to the grid, reducing how much utilities need to generate.

Resourceful communication

To support decarbonization, utilities need to solicit feedback from customers and similarly, customers need to actively communicate about their needs and challenges owing to decarbonization. Utilities can host town hall meetings and conferences where customers from a particular community are invited to voice their concerns and work with utilities to address them.

CASE STUDY

PG&E & TESLA

Customers Join PG&E and Tesla's Virtual Power Plant[30]

PG&E's pilot Emergency Load Reduction Program (ELRP) allows customers with a Tesla Powerwall to earn compensation for supporting the grid.

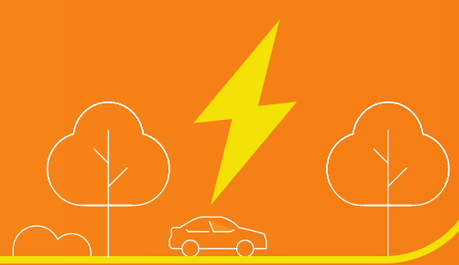
The Tesla "Virtual Power Plant" is the largest distributed battery storage system in the world, wherein customers' Powerwall systems can be used to draw power for the grid during emergencies. Through the ELRP, customers receive $2 for every kWh of power delivered from their Powerwall during an event.

This pilot program has several benefits, especially in making California's power grid more reliable as the state transitions to renewables and the nation collectively faces more climate disaster-related outages. It also illustrates the potential for collaboration between utilities and customers in achieving a shared communal goal.

Tesla Powerwall+
Source: Tesla

Strategies for the Utilities' Road to Net-zero

Informed by the multi-stakeholder approach, here are six strategies that can help accelerate decarbonization for electric utilities:



01 Adapt Climate Strategies and Goals Across Utilities

Achieving industry-wide decarbonization will be made more efficient if utilities collaborate to get there.

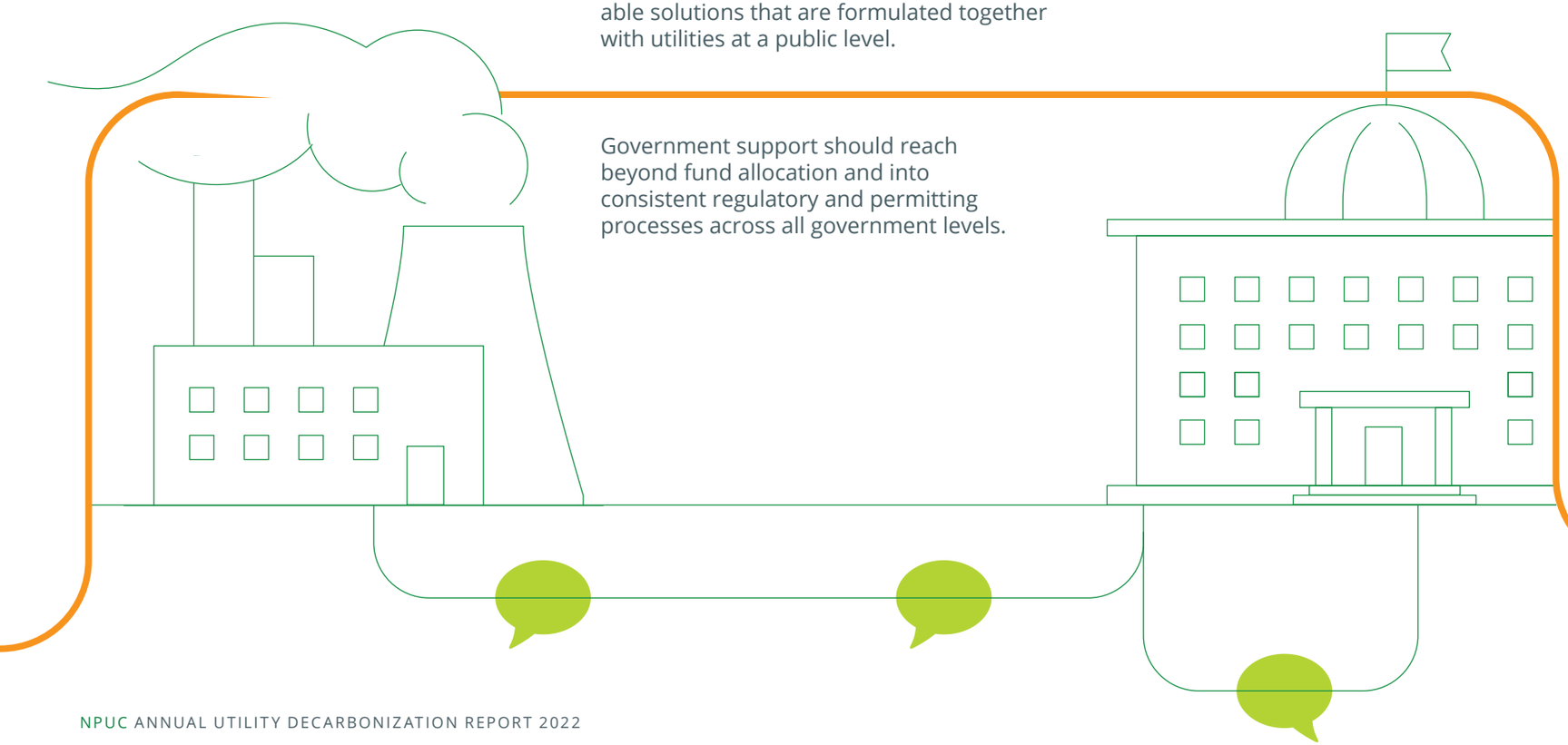
Utilities are at different stages of decarbonization, with some far ahead of their peers. Similarly, there is no single decarbonization solution that benefits every utility. Consequently, peer discussions and roundtable conferences can be an effective way for utilities to identify proven decarbonization methods that have worked for others that they can apply themselves.

By agreeing on industry-level decarbonization goals, and working with peers to identify each utility's role in an industry-wide decarbonization plan, utilities can pool their resources to accelerate overall climate action.

02 Initiate Collaboration With Governments

Government support is essential to enabling and streamlining utility decarbonization. Therefore, collaborative planning and decision-making between governments and utilties can help accelerate decarbonization through policies that make the process more efficient. It can also help drive forward action-able solutions that are formulated together with utilities at a public level.

Government support should reach beyond fund allocation and into consistent regulatory and permitting processes across all government levels.



With new climate-related bills like the Inflation Reduction Act being signed into law, collaboration between utilities and governments can ensure that federal funds are allocated to solving the biggest obstacles to decarbonization.

For example, funds could also be allocated to establishing local and state-level retraining programs for at-risk workers and educational programs for customers.

Such initiatives would not only advance workforce development for utilities but also engage and protect the local economy.

03 Establish Community Outreach

It's important for utilities to be proactive in building a community presence and in spreading awareness.

Given that consumers and their communities will be at the receiving end of the changes needed for decarbonization, taking part in community outreach will help utilities identify potential gaps in the knowledge and perception of their customers.

Simultaneously, it also provides an opportunity for utilities to highlight their role in creating jobs and economic value for the community, thereby garnering more support for the energy transition.

CASE STUDY

Seattle City Light

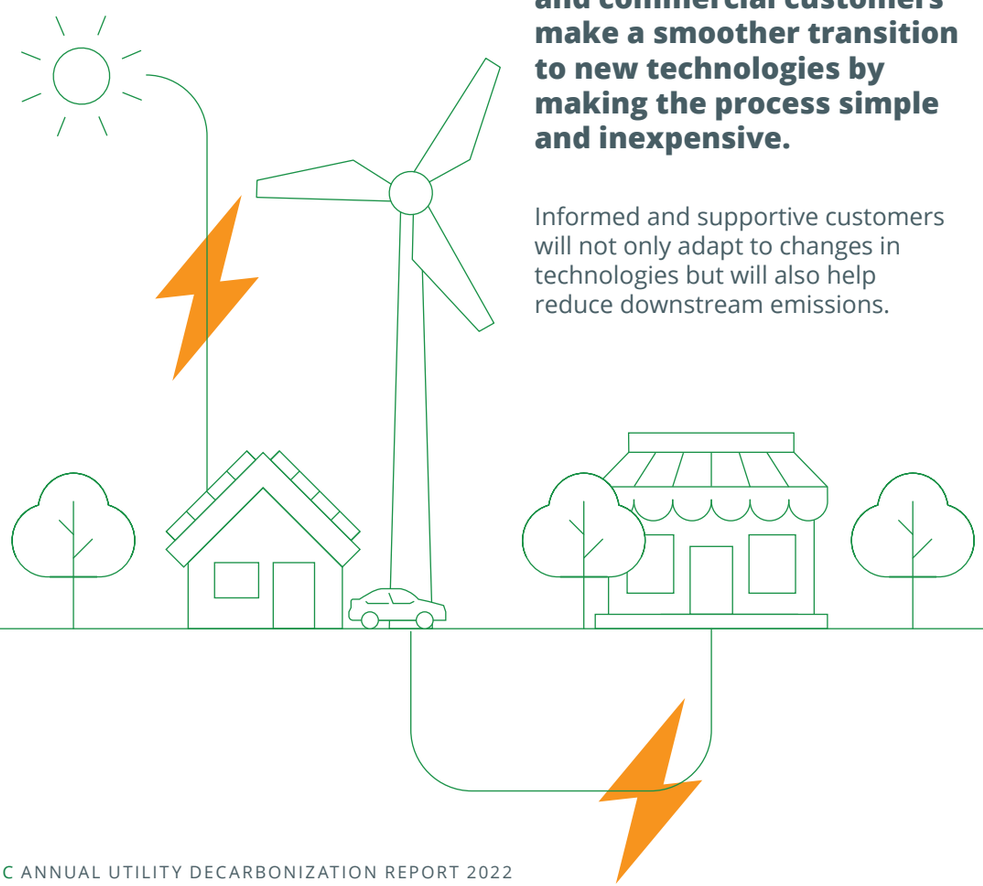
Seattle City Light's Involvement In the Community[31]

Seattle's public power corporation, Seattle City Light (SCL), is engaging in direct communication with its customers to influence its decision-making for local energy solutions.

By initiating an open discourse with customers, they are able to listen to them and identify the solutions that the community needs. Additionally, SCL also has the opportunity to educate the community about upcoming expectations, climate impact, and new generation technologies.

SCL also provides guided educational tours to customers, helping them better understand how renewable energy sources work and facilitating environmental stewardship in the community.

04 Support Technology Transitions



Utilities can help residential and commercial customers make a smoother transition to new technologies by making the process simple and inexpensive.

Informed and supportive customers will not only adapt to changes in technologies but will also help reduce downstream emissions.

There are several ways to support customers in the energy transition, including:

- Informing customers in advance about the changes that need to occur in homes across specific communities.
- Providing financial incentives to install energy-efficient technologies through discounted rates.
- Reducing technology switching costs by increasing convenience and accessibility.

As the end-users of electricity, customers have a crucial role to play in enabling deep decarbonization, and helping them transition to new ways of living is in the utilities' best interest.

CASE STUDY

conEdison

ConEd's New York City Energy Efficiency Upgrade[32]

Con Edison retrofitted energy-efficient upgrades in a 53-story New York skyscraper, helping cut the building's carbon emissions and easing demands on the local power grid.

The upgrade improved the entire building's heating, ventilation, and air conditioning (HVAC) systems, and will reduce its energy consumption by an estimated 20%. Additionally, it also reduced the building's peak power demand, strengthening the reliability of the grid as overall electricity demand increases.

Given that 70% of New York City's GHG emissions come from buildings, the upgrade is a step forward in expanding energy efficiency measures that support decarbonization.

05 Encourage the Small Utility Model

Due to their smaller scope of operations, small utilities and clean-energy focused subsidiaries of IOUs have demonstrated a better chance of making giant leaps in the decarbonization fight. When IOUs serve a more focused group of people, they can develop solutions that work for their particular communities rather than relying on a one-size-fits-all solution.

With that in mind, larger IOUs may find it easier to decarbonize if they divide their operations and create smaller subsidiaries that focus on decarbonization in specific communities.

CASE STUDY

General Electric to Split Into Three Parts[33]

U.S. industrial giant General Electric, once one of the world's largest companies, is dividing into three separate companies as the conglomerate simplifies its business.

Starting in 2023, the spin-offs will each focus on one of the healthcare, energy, and aviation sectors. According to GE, each of the smaller companies can benefit from increased focus and tailored capital allocation, while leading in the three growth sectors of precision health, the energy transition, and the future of flight.

The company's clean energy division, GE Renewable Energy, is the world's largest wind turbine manufacturer. The new energy-focused spin-off is expected to combine GE Renewable Energy, GE Power, and GE Digital into a business positioned to steer the energy transition.

06 Act Now

With climate-related disasters rising at an alarming rate, climate change has evolved from being a phenomenon to a global emergency.

To achieve net-zero by 2050, global CO_2 emissions need to decrease by 38% by 2030 relative to 2020 levels. But in 2021, CO_2 emissions rose by 6% to their highest level ever.[34]

While the obstacles to utility decarbonization have been decades in the making, the transition to net-zero will only happen if utilities continue to drive the process. The faster the transition, the closer the world will be to a sustainable ecological economy.

Proactive utilities will not only be spearheading decarbonization but will also be well-positioned in the new energy marketplace of the future. As utilities embark on this journey, the support and collaboration of multiple stakeholders across the board are going to be essential for the successful execution of their decarbonization goals.

Toward Brighter Possibilities

In this new era of energy, we face a momentous opportunity for U.S. utilities to disrupt the status quo and become the flag bearers of this massive economic and cultural shift toward achieving net-zero emissions—and create a brighter future for us all.

By championing industry-wide improvements, reshaping the customer experience, and pioneering effective net-zero emission solutions, utilities can not only build back better but also set an example for other sectors to follow.

The road to net-zero carbon emissions will be truly revolutionary.

SECTION 07

About Us

The world is in desperate need of prominent industry leaders to advocate for sustainable solutions that mitigate against increasing carbon emissions and help lower the barriers to decarbonization.

In 2020, CEO and Founder Angel Lance created NPUC for that very reason.

What is the Purpose of NPUC?

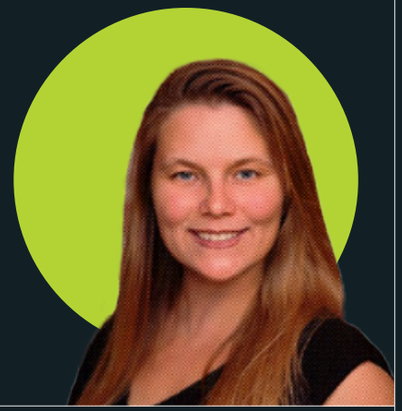
The National Public Utilities Council (NPUC) intends to spark meaningful discussions between utilities and their peers to establish viable decarbonization practices. This passion and pursuit is part of a family of companies catering to bolster the pro-climate experience for utilities, government entities, investors, and the customer.

As a result, NPUC has become a leading expert in the decarbonization space.

"True progress begins at the intersection of critical thinking and collaboration."

Angel Lance

CEO Motive Power & Founder NPUC



NPUC's Goals

01 Bring together industry leaders to discuss bottlenecks and best practices on the road to decarbonization.

02 Create a unified voice of the industry through benchmarking activities to drive solutions and strategies.

03 Work with partners to create a valuable learning experience for all stakeholders to drive collaboration in achieving net zero.

NPUC's Main Activities

From championing practical solution-based roundtable discussions to being a repository of knowledge and research for utilities, NPUC is pioneering the decarbonization movement and forging new paths for utility decarbonization efforts.

Furthermore, they are planning a solutions oriented onsite forum that will include more than 80 participants, with a different utility hosting and leading the discussion each time.

Annual Reports

NPUC has worked with market research company Zpryme to produce multiple reports in the past, including the Utility Decarbonization Uncertainty report and Progress and Pitfalls on the Road to Net-Zero.

They are now working with 80-100 utility representatives to showcase data regarding utilities decarbonization progress beyond what is publicly available.

VISUAL CAPITALIST

In partnership with data-driven media company Visual Capitalist, NPUC has embarked on a journey to create the world's first annual utility decarbonization progress report targeting utilities, investors, governments, and the general public to drive the climate conversation forward each and every year.

Visual Capitalist is one of the fastest growing online publishers in the world, with an impressive audience of approximately 85 million readers. Their mission is to simplify complex and dense data to help people become more knowledgeable about the things that matter.

The two companies have joined forces to provide a data-driven view of the state of decarbonization both in this report and also other content. The website will live on the Visual Capitalist homepage and launch toward the end of 2022.

Roundtables

In collaboration with various industries, stakeholders, and beneficiaries, NPUC is determined to provide decarbonization pathways, solutions, guidance, and assistance to utilities.

NPUC plans to hold bi-monthly roundtable discussions with major utilities spanning the United States to facilitate an open debate on their decarbonization goals and the road to a net-zero future.

Participants from 32 states currently attend these roundtables with numbers growing steadily every year.

Conferences

NPUC aims to regularly host conferences where industry leaders and climate change experts present their thoughts and ideas on achieving decarbonization.

As thought leaders in the decarbonization space, NPUC plans to make every effort to consistently share its findings with peers in an unbiased and action-oriented way.

Sponsorships

NPUC has also been a significant supporter of the Edison Energy Institute and the ETS, both of whom are committed to finding utility-first solutions to decarbonization roadblocks and obstacles.

The road to net-zero is long and arduous, but with the support of utilities, industry leaders, and media partners, NPUC aims to achieve a collective goal that will impact the world significantly.

Here is a look at NPUC's partners in this mission:

motivepower

- Motive Power
  is a consulting firm that champions sustainable business practices for their clients and the planet, offering expert-level services in Organizational Development, Change Adoption, and Data Innovation.

- 10/6 Professional Services
  provides Motive Power's clients with personnel solutions that meet their technical personnel needs, connecting businesses with experts like project managers, control analysts, and schedulers.

- The Gulch Environmental Foundation
  is a collaboration of entrepreneurs, business leaders, academics, and conservationists, working together to fund projects that help to solve long-term issues facing our environment.

- Zpryme
  is a research, media, and events agency with a focus on energy—providing digital and in-person solutions that influence the grand energy transition.

Join the conversation.
decarbonizationreport.com

SECTION 08

Bibliography

PAGE 4 AND 7

1 “Climate Change 2022: Impacts, Adaptation and Vulnerability.” IPCC: Intergovernmental Panel on Climate Change, Cambridge University Press, 2022, https://www.ipcc.ch/report/ar6/wg2/.

PAGE 7

2 NOAA National Centers for Environmental Information (2022, January), Billion Dollar Disaster Report 2021, https://www.ncei.noaa.gov/access/monitoring/billions/

3 “Carbon Dioxide Now More than 50% Higher than Pre-Industrial Levels.” National Oceanic and Atmospheric Administration, 3 June 2022, https://www.noaa.gov/news-release/carbon-dioxide-now-more-than-50-higher-than-pre-industrial-levels

4 “Is the Climate Really Changing?” Google, The United Nations, https://artsandculture.google.com/story/iwXRDGelnamb2g.

5 Lindsey, Rebecca. “Climate Change: Atmospheric Carbon Dioxide.” NOAA, NOAA, 23 June 2022, https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide.

6 “Global Carbon Atlas - CO_2 Emissions.” CO_2 Emissions | Global Carbon Atlas, BNP Paribas, 2021, http://www.globalcarbonatlas.org/en/CO2-emissions.

PAGE 8

7 “Total Energy Annual Data - Annual Energy Review.” Total Energy, U.S. Energy Information Administration, 2022, https://www.eia.gov/totalenergy/data/annual/.

8 “Overview of Greenhouse Gases.” EPA, Environmental Protection Agency, 2022, https://www.epa.gov/ghgemissions/overview-greenhouse-gases.

PAGE 9

9 “Sales and Direct Use of Electricity to Ultimate Customers.” EIA, U.S. Energy Information Administration, 2021, https://www.eia.gov/electricity/annual/html/epa_02_02.html.

10 “How Much Carbon Dioxide Is Produced per Kilowatthour of U.S. Electricity Generation?” Frequently Asked Questions (FAQs) , U.S. Energy Information Administration (EIA), 4 Nov. 2021, https://www.eia.gov/tools/faqs/faq.php?id=74&t=11.

PAGE 13

11 “Report Card For America's Infrastructure.” ASCE's 2021 Infrastructure Report Card, American Society of Civil Engineers, December 2021, https://infrastructurereportcard.org/cat-item/energy-infrastructure/.

PAGE 14

12 “Net-Zero America Project.” Net-Zero America, The Trustees of Princeton University, Oct. 2021, https://netzeroamerica.princeton.edu/the-report.

13 “Highway History - Interstate Frequently Asked Questions.” U.S. Department of Transportation, Federal Highway Administration, https://www.fhwa.dot.gov/interstate/faq.cfm.

PAGE 15

14 Howland, Ethan. “Biden Signs $1.2 Trillion Infrastructure Bill with Funding for Evs, Transmission, Hydrogen.” Utility Dive, Industry Diver, 8 Nov. 2021, https://www.utilitydive.com/news/congress-approves-infrastructure-bill-funding-transmission-hydrogen-ev/609649/.

15 Lawson, Ashley J. “Electricity Transmission Provisions in the Inflation Reduction Act of 2022.” Congressional Research Service, 23 Aug. 2022, https://crsreports.congress.gov/product/pdf/IN/IN11981.

PAGE 16

16 Baylin-Stern, Adam, and Niels Berghout. “Is Carbon Capture Too Expensive? – Analysis.” International Energy Agency, International Energy Agency, 17 Feb. 2021, https://www.iea.org/commentaries/is-carbon-capture-too-expensive.

17 “Utility Decarbonization Strategies.” Deloitte Insights, Deloitte LLC, 21 Sept. 2020, https://www2.deloitte.com/us/en/insights/industry/power-and-utilities/utility-decarbonization-strategies.html

PAGE 17

18 “Nuclear Power Is the Most Reliable Energy Source and It's Not Even Close.” Energy.gov, U.S. Department of Energy, Mar. 2021, https://www.energy.gov/ne/articles/nuclear-power-most-reliable-energy-source-and-its-not-even-close.

PAGE 19

19 “Fastest Growing Occupations.” Employment Projections, U.S. Bureau of Labor Statistics, Apr. 2022, https://www.bls.gov/emp/tables/fastest-growing-occupations-alt.htm.

PAGE 21

20 “2022 Public Power Statistical Report.” Public Power Statistical Report, American Public Power Association, 2022, https://www.publicpower.org/resource/public-power-statistical-report.

PAGE 32 AND 36

21 “CDP Climate Change 2022 Questionnaire.” Climate Change - CDP, Climate Disclosure Project, 2022, https://guidance.cdp.net/en/guidance?cid=30&ctype=theme&idtype=ThemeID&incchild=1µsite=0&otype=Questionnaire&tags=TAG-646%2CTAG-605%2CTAG-600.

PAGE 34

22 “TCFD Status Report 2021.” Task Force on Climate-Related Financial Disclosures - 2021 Status Report, Task Force on Climate-Related Financial Disclosures, Oct. 2021, https://assets.bbhub.io/company/sites/60/2021/07/2021-TCFD-Status_Report.pdf.

PAGE 37

23 PG&E's Climate Strategy Report, Pacific Gas and Electric Company, June 2022, https://www.pge.com/en_US/about-pge/environment/what-we-are-doing/pge-climate-goals/pge-climate-goals.page.

PAGE 40

24 McGovern, Megan. “Honeywell and Duke Energy Sustainable Solutions Will Help Improve Energy Resiliency in Select U.S. Communities.” Honeywell, Honeywell, 8 Mar. 2022, https://www.honeywell.com/us/en/press/2022/03/honeywell-and-duke-energy-sustainable-solutions-will-help-improve-energy-resiliency-in-select-u-s-communities.

25 “PG&E, Tesla Break Ground on Landmark Battery Energy Storage System.” PG&E Corporation, Pacific Gas and Electric Company, July 2020, https://investor.pgecorp.com/news-events/press-releases/press-release-details/2020/PGE-Tesla-Break-Ground-on-Landmark-Battery-Energy-Storage-System/default.aspx.

PAGE 41

26 “PG&E and General Motors Collaborate on Pilot to Reimagine Use of Electric Vehicles as Backup Power Sources for Customers.” GM Corporate Newsroom, General Motors, 8 Mar. 2022, https://news.gm.com/newsroom.detail.html/Pages/news/us/en/2022/mar/0308-pge.html.

27 “Honeywell Introduces New Flow Battery Technology to Provide Safer, Durable Solution for Large-Scale Renewable Energy Storage.” Duke Energy | News Center, Duke Energy, 6 Oct. 2021, https://news.duke-energy.com/releases/honeywell-introduces-new-flow-battery-technology-to-provide-safer-durable-solution-for-large-scale-renewable-energy-storage.

PAGE 42

28 Ritchie, Hannah. “What Are the Safest and Cleanest Sources of Energy?” Our World in Data, Our World in Data, 10 Feb. 2020, https://ourworldindata.org/safest-sources-of-energy.

PAGE 43

29 “National Grid Partners with Bloc Power & New York Edge to Launch Clean Energy Workforce Development Training ProgramNational Grid Partners with Bloc Power & New York Edge to Launch Clean Energy Workforce Development Training Program.” National Grid Newsroom, National Grid, Nov. 2021, https://www.nationalgridus.com/News/2021/11/National-Grid-Partners-with-Bloc-Power-New-York-Edge-to-Launch-Clean-Energy-Workforce-Development-Training-Program.

PAGE 46

30 “Join Tesla & PG&E to Create a Virtual Power Plant.” Tesla Support, Tesla, 2022, https://www.tesla.com/support/energy/powerwall/own/tesla-pge-virtual-power-plant-pilot.

PAGE 49

31 “In the Community.” Seattle City Light, City of Seattle, https://www.seattle.gov/city-light/in-the-community.

PAGE 50

32 “Queens Skyscraper Cuts Emissions and Costs with Energy-Efficiency Upgrade.” ConEdison, Con Edison Media Relations, 23 July 2021, https://www.coned.com/en/about-us/media-center/news/20210723/queens-skyscraper-cuts-emissions-and-costs-with-energy-efficiency-upgrade.

PAGE 51

33 Sharett, Luke. “General Electric to Split into Three Public Companies.” The Wall Street Journal, The Wall Street Journal, 10 Nov. 2021, https://www.wsj.com/articles/general-electric-to-split-into-three-public-companies-11636459790.

PAGE 52

34 IEA. “Global CO2 Emissions Rebounded to Their Highest Level in History in 2021.” IEA, International Energy Agency, 8 Mar. 2022, https://www.iea.org/news/global-co2-emissions-rebounded-to-their-highest-level-in-history-in-2021.

Collaborators

Developing the first ever Utility Decarbonization Index, as a part of the NPUC Annual Utility Decarbonization Report 2022, presented a unique and rewarding challenge—to offer a comprehensive and viable ranking system for public utilities in the U.S. and drive the decarbonization conversation forward.

A special thank you to the team members at, and friends of, the National Public Utilities Council, Motive Power, and Visual Capitalist, who have contributed their time and expertise to create this body of work.

Author/Research

Govind Bhutada	Author

Design

Melissa Haavisto	Creative Director
Amy Kuo	Designer
Miranda Smith	Designer
Zack Aboulazm	Designer

Editors

Katie Jones	Managing Editor
Salina Vuong	Account Director
Omri Wallach	Editor

Executive Direction

Angel Lance	Executive Director

With Thanks

Ally Luckhardt	NPUC Marketing
Irfan Mujeebuddin	NPUC Project Manager
Stephanie Shkolnikov	NPUC Marketing
Aviva Rossi	NPUC Researcher
Jason Rodriguez	Zpryme CEO
Zpryme	
Motive Power Review Team	