Utility Transition Hub Methodology

This document explains the underlying data sources, methodology, assumptions and caveats for the data powering the *Utility Transition Hub* *("Hub").* The document uses the *Portal's* dashboards as an organizing feature.

Contents

Scope of *Hub* data

The *Hub* includes all FERC Form 1 respondents. This comprises 50% of CO2 emissions (0.82 out of 1.63 GT), 57% of coal capacity (140 out of 245 GW), and 14% of utility-scale wind & solar capacity (19.4 out of 141.8 GW) compared to the entire US electricity sector in 2019. The set of respondents includes:

- 95 vertically integrated or restructured utilities
- 82 wires-only utilities
- 4 municipal utilities
- 43 cooperative utilities
- 24 independent power producers
- 102 other (or defunct) utilities.

Because the *Hub* does not include the entire US electricity system, data for parent companies is an aggregation of FERC-reporting (usually regulated) subsidiaries, not actual total values for the parent company. The *Hub* does not currently include the unregulated subsidiaries of parent companies.

The *Hub* includes data from 2005-2019 for all metrics, with annual resolution.

Utility categories

The *Hub* categorizes FERC respondents into the following six groups, based on a combination of FERC data, 10-Ks, company websites and regulatory filings.

- *Vertically Integrated*: vertically integrated, investor-owned utilities. They exist in the rate-regulated structure and own most or all power supply assets along with transmission and distribution assets to supply service to customers.
- *Restructured*: investor-owned utilities that exist in the rate-regulated structure and have moved from *Vertically Integrated* by sold or dispose of most power generation assets. They continue to own and operate some generation assets while operating the transmission and distribution systems.
- *Wires Only*: investor-owned utilities that exist in the rate-regulated structure but own zero (or near-zero) power generation assets. These can be former *Restructured* utilities that have disposed of power generation assets (nearly) completely. Some states allow renewable assets to be owned by "Wires Only" utilities.
- *Independent Power Producers*: companies that exist outside the rate-regulated structure and own power generation assets.
- *Munis & Coops*: municipal utilities and cooperatives. Typically, these organizations are member-owned or owned by governments.
- *Other*: a "catch all" category for companies that do not clearly fit into other categories. Companies in this category may have changed business models, disposed (or acquired) a new class of assets, or own power generation assets for industrial purposes. This group includes Telecommunications companies that own(ed) electricity utility assets, independent system operators, power traders, retailers and markets, and other historical companies whose assets have been split or merged

Investments Dashboard

Original data sources for this dashboard
FERC Form 1, EIA-860, state rate case proceedings

Description of metrics on this dashboard
Assets on Utility Books [$]

- **Definition**: this metric represents the net book value (i.e. cumulative investments net of depreciation) of all assets estimated to be in electric utility rate base
- **Methodology**: Assets on Utility Books were compiled from FERC Form 1 Comparative Balance Sheet and detail tables and categorized by RMI. The assets for the "other renewables" category were calculated using original cost from FERC Form 1 plant-level tables and an estimate of depreciation expense. The assets for the "other fossil" category were estimated as the remaining net plant balance reported under the FERC classification of "other production plants."

Assets on Utility Books per Watt [$/W]

- **Definition**: applicable to power production assets, this metric is the remaining undepreciated net plant balance divided by nameplate capacity.
- **Methodology**: *Assets on Utility Books* divided by utility owned capacity of the corresponding technology. This technology-specific capacity is determined from aggregations of EIA-860 capacity data in the following manner:
    i. Steam capacity – sum of following EIA-860 technology categories:
        a. Conventional Steam Coal
        b. Coal Integrated Gasification Combined Cycle
        c. Natural Gas Steam Turbine
    ii. Other Fossil capacity – sum of following EIA-860 technology categories:
        a. Gas Fired Combined Cycle
        b. Gas Fired Combustion Turbine
        c. Gas Internal Combustion Engine
        d. Petroleum Coke
        e. Petroleum Liquids
        f. Oil
        g. Other Gases
        h. Other Natural Gas
    iii. Nuclear capacity – from EIA 860's Nuclear category
    iv. Hydro and Storage capacity – sum of following EIA-860 technology categories:
        a. Conventional Hydroelectric
        b. Hydroelectric Pumped Storage
    v. Renewables and Storage capacity – sum of following EIA-860 technology categories:
        a. Onshore Wind Turbine
        b. Offshore Wind Turbine
        c. Solar Photovoltaic
        d. Solar Thermal Without Storage
        e. Municipal Solid Waste

f. Flywheels
g. Batteries
h. Landfill Gas
i. Wood/Wood Waste Biomass
j. Geothermal

Utility Earnings [$]

- **Definition**: impact of assets in electric utility rate base on utility shareholder earnings
- **Methodology**: *Assets on Utility Books* multiplied by authorized rate of return on equity (ROE). Authorized ROE was taken from the most recent rate case for each utility. For multi-state utilities, an average ROE, weighted by rate base in each state, was used. Where utility-specific ROE could not be found, the national median ROE was used.
    - S&P's Global Market Intelligence Platform is used to gather returns on equity (approved and requested) and calculate earnings impact estimates. No proprietary S&P data is displayed on any dashboard in the Portal

Utility Earnings per Watt [$/W]

- **Definition**: applicable to power production assets, this metric is the earnings impact divided by nameplate capacity.
- **Methodology**: *Utility Earnings* divided by utility owned capacity of the corresponding technology. This technology-specific capacity is determined from aggregations of EIA-860 capacity data, similar to the calculations for *Assets on Utility Books per Watt*

Additional information for this dashboard

- As the methodology for estimating earnings relies on authorized return on equity (ROE), earnings are not calculated for municipal utilities, cooperatives, independent power producers and companies in the *Other* utility category
- For both assets and earnings, the "Other" category includes:
    i. Asset Retirement Obligations (AROs)
    ii. Asset Retirement Costs (ARCs)
    iii. Net Regulatory Assets
    iv. Net Accumulated Deferred Income Taxes (ADIT)
    v. Construction Work in Progress (CWIP)
    vi. Other Deferred Debits & Credits
    vii. Net Working Capital
    viii. Other physical & intangible assets related to utility operations
- The "generation" vs. "total" toggle allows you to choose whether all owned assets or just generation assets are displayed.
- The "show #" vs "show %" toggle allows you to show either actual data values or the fraction that each asset category makes up of total assets or earnings.

Operations dashboard

Original data sources for this dashboard
EIA-860, EIA-923, EIA-861

Description of metrics on this dashboard
Nameplate Capacity [GW]

- **Definition**: the maximum rated output of a generator, prime mover, or other electric power production equipment under specific conditions designated by the manufacturer
- **Methodology**: Generator-level capacity in EIA-860, multiplied by ownership fractions (the "Percent Owned" metric from EIA-860), aggregated for each utility. The final technology-specific capacities are determined from aggregated groupings of EIA-860 capacity categories – similar to the groupings done for *Assets on Utility Books per Watt*

Net Generation [TWh]

- **Definition**: The amount of gross generation less the electrical energy consumed at the generating station(s) for station service or auxiliaries.
- **Methodology**: Generator-level net generation data from EIA-923, multiplied by ownership fractions (the "Percent Owned" metric from EIA-860), aggregated for each utility. The final technology-specific generation is determined from aggregated groupings of EIA-860 capacity categories – similar to the groupings done for *Assets on Utility Books per Watt*

Capacity Factor [%]

- **Definition**: ratio of actual annual net generation to potential annual net generation
- **Methodology**: *Net Generation* divided by potential net generation. Potential net generation was calculated by multiplying *Nameplate Capacity* by the number of hours in the year (or if the plant came online in a specific month that year, it is assumed to come online midway through the month; the number of hours in that case are the sum of half the hours in that month and the hours through the rest of the year)

Additional information for this dashboard

- "EE and DR" (or Energy Efficiency and Demand Response) capacity and generation data is shown if the "Total" toggle is selected. This data was collected from utility-level EIA-861 data.
- "Purchased Power" generation data is shown if the "Total" toggle is selected. This data was collected from utility-level EIA-861 data, and includes power purchase agreements, wholesale power purchases, power exchanges, and wheeled power.
- Please note that negative net generation denotes that electric power consumed for plant use exceeds gross generation

Emissions dashboard

Original data sources for this dashboard
EIA-860, EIA-923, EPA Air Markets Program Data (AMPD)

Description of metrics on this dashboard
Emissions [MMT]

- **Definition**: scope 1 carbon dioxide emissions from fossil fuel combustion at utility-owned power plants.
- **Methodology**: plant-level fuel consumption [mmbtu] from EIA-923, allocated to generators in EIA-860, multiplied by generator-level ownership fractions (the "Percent Owned" metric from EIA-860), multiplied by national average emissions factors by fuel type from EPA [tons/mmbtu], aggregated for each utility and technology.

NOx Emissions [metric tons]

- **Definition**: scope 1 nitrogen oxide emissions from fossil fuel combustion at utility-owned power plants.
- **Methodology**: plant-level NOx emissions from EPA AMPD, multiplied by plant-level ownership fractions (the "Percent Owned" metric from EIA-860), aggregated for each utility and technology.

SOx Emissions [metric tons]

- **Definition**: scope 1 sulphur oxide emissions from combustion of fossil fuels at utility-owned power plants.
- **Methodology**: plant-level SOx emissions from EPA AMPD, multiplied by plant-level ownership fractions (the "Percent Owned" metric from EIA-860), aggregated for each utility and technology.

CO_2 Emissions Intensity [metric tons/MWh]

- **Definition**: emissions per MWh of owned net generation.
- **Methodology**: *CO_2 Emissions* divided by *Net Generation* by fuel type.

Additional information for this dashboard

- The "Other Fuels" category on this dashboard includes blast furnace gas, other gas, petroleum coke, propane gas, coal-based synfuel, synthesis gas derived from coal, synthesis gas derived from petroleum coke and tire-derived fuels.
- In the stacked bar charts on the left hand side of the dashboard, emissions intensity is calculated with the total owned net generation of the utility as a denominator. This means that the values in the bars are each fuel's contribution to the utility's overall emissions intensity, not that fuel's actual emissions intensity (which is shown in the charts in the main middle section of the dashboard when the "CO2 intensity" toggle is selected).
- Emissions intensities might be negative in certain instances when the corresponding net generation is negative. Negative net generation denotes that electric power consumed for plant use exceeds gross generation

Policy & Regulation Dashboard

Original data sources for this dashboard

EIA Monthly Energy Review, National Conference of State Legislatures (NCSL), EIA 861, ACEEE State and Local Policy Database, State Regulatory Filings, SEC Regulatory Filings, RMI desktop research, FERC Form 1

Description of metrics on this dashboard

- *Company Emissions [MMT]*
  - This is the *Emissions* metric from the *Emissions* dashboard, aggregated at the operating and parent company levels
- *Statewide Emissions [MMT]*
  - These are state-wide CO_2 emissions across all sectors, including electricity and others, from EIA Monthly Energy Review
- *GHG Targets*
  - This indicates whether Greenhouse Gas Reduction Targets exist in the state of interest; these targets are set by state policymakers either through statutes or executive orders
- *RPS Targets*
  - This indicates whether Renewable Portfolio Standards exist in the state of interest; these targets are set by state policymakers either on a mandatory or voluntary basis
- *Securitization*
  - This indicates whether securitization – a refinancing mechanism enabled by state legislation – exists in the state of interest for the purpose of accelerating the early retirement of fossil fuel plants
  - For an overview of the current securitization landscape, see here
  - For more detailed resources on the topic, visit the *Hub Insights* page.
- *Market Indexing*
  - This indicates whether market indexing – a mechanism enabled by state legislation – exists in the state of interest for the purpose of allowing regulated utilities to fully utilize renewable tax credit incentives.
  - For more information, see here
- *Governor Party*
  - This indicates the political party the governor of the state of interest, is currently affiliated with
- *Legislative Majority*
  - This indicates which political party currently holds the majority in the legislature of the state of interest
- *Revenue Decoupling*
  - This indicates whether revenue decoupling is enabled in the state and company of interest. Please note that this only includes traditional revenue decoupling mechanisms and excludes Lost Revenue Adjustment mechanisms, Straight Fixed Variable rates, formula rates and cost trackers.

    - For an overview of revenue decoupling and other performance-based regulation mechanisms, see here
    - For other resources on the topic, visit the *Hub Insights* page.
- *Company Emissions in State [MMT]*
    - This is an estimate of how *Company Emissions* for a specific utility are distributed across the states it operates in
    - This was determined by allocating the *Company Emissions* for each utility to the relevant states according to the total final customer sales (MWh) of that utility in a specific state; the total sales were determined from EIA-861
- *Effective Federal Tax Rate [%]*
    - This was determined by dividing federal tax expenses with pre-tax net income (both sourced from FERC Form 1), and was organized by utility
- *Federal Tax Liability [$]*
    - This was collected from the federal tax expenses in FERC Form 1, and was organized by utility

Additional information for this dashboard

- Operating and parent companies were associated with specific states based on where the companies had total customer sales (MWh), determined from 2018 EIA-861.

Customers & Community Dashboard

Original data sources for this dashboard
FERC Form 1, EIA 861, EIA-176, EIA SEDS, Census SAIPE, EIA-860, EIA-923, State rate case proceedings

Description of metrics on this dashboard
Residential Customer Bill [$/month]

- **Definition**: average residential customer monthly energy bill
- **Methodology**: this estimate of residential customer bills was determined by – i) estimating revenue requirement by utility, ii) allocating revenue requirement to estimate average residential bill
    i. Developing a utility-specific revenue requirement estimate – this estimate was developed by calculating a) utility returns, b) utility expenses and c) adjusting for tax credits
        a. Utility returns – this was determined by multiplying *Assets on Utility Books* by authorized rate of return.
            - Note - S&P's Global Market Intelligence Platform is used to gather rates of return. No proprietary S&P data is displayed on any dashboard in the Portal
        b. Utility expenses – this includes utility and technology-specific depreciation, operation, and maintenance expenses, sourced from FERC Form 1. Actual expenses from FERC are used as an estimate for allowed expenses here.
        c. Adjusting for tax credits – an estimate for adjustments related to the Production Tax Credit (PTC) and Investment Tax Credit (ITC) is determined by utility and by year.
            - The PTC adjustment was calculated by applying the PTC value for a specific year to the corresponding *Net Generation* from wind in that year and grossing up for federal taxes.
    ii. Allocating revenue requirement to estimate average residential bill
        a. After determining a total revenue requirement estimate by utility, the estimate was multiplied by the fraction of total sales residential customers are responsible for. This provided an estimate of revenue requirement for residential customers, by utility. This annual estimate was then divided by the number of residential customers and the number of months in a year, to give a final estimate of residential customer bill on a monthly basis.

Residential Energy Burden (%)

- **Definition:** percentage of household income spent on energy bills
- **Methodology:** this estimate of residential energy burden was determined by – i. starting with energy expenditure and income data from DOE LEAD, ii. Matching housing units to utility service, iii. extrapolating values to other years, iv. applying technology breakdown of electricity expenditures.
    i. Starting with energy expenditure and income data from DOE LEAD. DOE LEAD provides electricity, gas, and other fuel expenditures, as well as

number of housing units and income per household for 2018. We used the income group classifications from DOE LEAD below:
    a. 0-30% AMI: Extremely low-income
    b. 30-60% AMI: Very low-income
    c. 60-80% AMI: Low-income
    d. 80-100% AMI: Moderately low income
    e. 100%+ AMI: Non-low income

ii. Matching housing units to utility service territories – we matched housing units within a county to their respective utility service territory based on FIPS codes from DOE LEAD and EIA 861. To avoid double counting for overlapping utility service territories, we scaled all housing units for each utility to match its total number of residential customers in EIA 861.

iii. Extrapolating values to other years – we applied a scaling factor for each data field to other years using the following values relative to 2018:
    a. Electricity expenditure – extrapolated to other years using residential revenues from EIA 861.
    b. Fossil Gas expenditure –extrapolated to other years based on utility (if available) or state revenues from EIA 176.
    c. Other Fuels expenditure – (primarily wood, propane, and fuel oil) extrapolated to other years based on state revenues from EIA SEDS.
    d. Income – extrapolated to other years based on average household income from Census SAIPE.
    e. Housing Units – extrapolated to other years based on number of residential customers in EIA 861.

iv. Applying technology breakdown of electricity expenditures– using each technology's relative fraction of Residential Customer Bills (e.g., steam, transmission, hydro, etc.)

Number of Customers

- **Definition**: number of customers, as defined by the number of meters, broken down by customer class – residential, commercial and industrial.
- **Methodology**: collected directly from FERC Form 1.

Number of Employees

- **Definition**: number of employees directly employed by a utility at large power plants. Large plants are steam plants with nameplate capacity of 25MW or more, gas-turbine and internal combustion plants of 10 MW or more, and nuclear plants.
- **Methodology**: number of employees listed in FERC Form 1 plant-level tables, aggregated for each utility and technology

Additional information for this dashboard

- The *Number of Employees* metric is accurate for individual utilities as it displays what the utilities reported to FERC Form 1. However, RMI anticipates some duplication when this metric is aggregated beyond the operating company level.
- The revenue requirement estimate for customer bills includes fuel costs associated with owned utility plants and purchased power transactions that pass through to customers.

Comparisons dashboard

Original data sources for this dashboard
FERC Form 1, State rate case proceedings, EIA-860, EIA-923, EPA Air Markets Program Data (AMPD), EIA-861

Description of metrics on this dashboard
Assets [$B]

- This metric is *Assets on Utility Books* from the *Investments* dashboard

Capacity [%]

- This metric is *Nameplate Capacity* from the *Operations* dashboard, expressed in relative terms

Generation [%]

- This metric is *Net Generation* from the *Operations* dashboard, expressed in relative terms

Earnings [%]

- This metric is *Utility Earnings* from the *Investments* dashboard, expressed in relative terms

Res. Customer Bill [%]

- This metric is *Residential Customer Bill* from the *Customers & Community* dashboard, expressed in relative terms

Emissions [MMT]

- This metric is *Emissions* from the *Emissions* dashboard

Emissions Intensity [metric tons/MWh]

- This metric is *CO_2 Emissions Intensity* from the *Emissions* dashboard

Climate Alignment Dashboard

Original data sources for this dashboard
EIA-860, EIA-923, EPA Air Markets Program Data (AMPD), SEPA Utility Carbon Reduction Tracker

Description of metrics on this dashboard
Historical Emissions [MMT]

- This metric is *Emissions* from the *Emissions* dashboard

Emissions Target [MMT]

- **Definition**: projected emissions based on company's publicly stated target.
- **Methodology**: Stated company emissions targets were collected from SEPA's Utility Carbon Reduction Tracker. These targets were applied to *Historical Emissions* in the baseline year used in the company's stated target. All parent company targets are assumed to be applied in the same proportion across all regulated subsidiaries.

Emissions of a 1.5C aligned pathway [MMT]

- **Definition**: projected emissions for a given utility if it followed the national emissions trajectory found by the RMI Carbon Calculator to be necessary to limit global warming to 1.5 degrees C.
- **Methodology**: The methodology of the RMI Carbon Calculator in generating a national-level emissions trajectory is documented here. This national-level trajectory for the electricity sector is applied to each company by multiplying the national level trajectory by a factor of (2019 company emissions/2019 total electricity sector emissions).

2020-2030 Emissions above 1.5C [MMT]

- **Definition**: cumulative projected emissions from utility targets, above a 1.5C pathway, from 2020 to 2030.
- **Methodology**: the difference between the sum of emissions projections based on utility emissions targets, and the sum of emissions corresponding to a 1.5C emissions pathway for that utility, from 2020 to 2030

Additional information for this dashboard

- All data on this dashboard corresponds to CO2 only, not all greenhouse gases. For company targets that only refer to greenhouse gas writ large (vs. a CO2 target), the same targets are assumed to apply for CO2 emissions trajectories.
- All data on this dashboard corresponds to scope 1 emissions. Stated emissions targets are assumed to apply equally to scope 1, scope 2, and scope 3 emissions.
- When the "intensity" metric is selected, CO2 emissions per net generation [metric tons/MWh] are displayed. Projected generation is based on 2019 generation and a compound annual growth rate from IRP data.