Methodology for calculating Corporate Carbon Risk

State regulations often mandate utility companies to file forward-looking investment plans (i.e. Integrated Resource Plans or IRPs) to meet state carbon emission reduction requirements. The utilities examined here represent a variety of carbon target types (e.g. internally set targets vs. state-mandated targets) and different achievements, or lack thereof, of targets. We reviewed a wide range of publicly available documents on a utility company's historic carbon-reduction targets and investment plans (in order of priority):

a. Operating company's Integrated Resource Plan (IRP)

   The IRP provides information on future carbon targets, investment plans, and net present value (NPV) for each plan.

b. Public disclosures (e.g. CDP, Mandatory Greenhouse Gas Reporting Regulation, Bloomberg Terminal)

   The CDP provides information on carbon targets and emissions and investments related to energy or emission reduction for the reporting year. The Bloomberg Terminal, while a proprietary database, compiles its data from other public disclosures.

c. SEC 10k

   The SEC 10k discloses a company's capital resources and load, amongst other operating and financial results for the fiscal year. This data source is valuable as it provides us insight into the investments of non-regulated utility companies.

d. Press releases and/or Sustainability Reports

   Press releases provide information on historic and forward-looking data on carbon targets, carbon emissions, and total capital expenditures (with no differentiation or specificity). Sustainability reports often report historic carbon emissions but focus on past and planned actions for carbon reduction.

e. Investor Presentations

   Most public companies discuss their investment plans at a high level during their quarterly earnings call and at their annual meetings with major investors. In many cases, these presentations are posted or reported by Wall Street analysts who follow the company.

From this data we collected historic emission levels for each examined company, which are either reported in the aggregate or by emission source (i.e. by generator, transmission line leaks, purchased electricity, etc.). The dates of historic emissions are dependent on what is reported by the utility company, but usually covers a period between 2010 and 2020. Historic emissions data are derived from the above sources without alteration. However, carbon emission targets are sometimes reported in RPS percentage of emissions intensity, rather than absolute emission

levels. The absolute emissions associated with these targets were calculated in one of two ways, depending on available information:

1. By multiplying reported emissions intensity values against the predicted load (in MWh, reported in IRPs). The equation for this calculation is:

   $$Equations(MMT) = Emissions\ intensity(MMT\ per\ MWh)\ *\ Predicted\ Load(MWh)$$

2. By subtracting calculated absolute emissions saved by adherence to a RPS target

   $$Absolute\ emissions\ (MMT) = Absolute\ emissions\ (MMT) - (RPS\ percentage * Absolute\ emission)$$

Data on past carbon targets were also collected: the year the target was established, the target completion year, the absolute amount of emissions reduction, and whether the target was changed or adjusted before the completion year. Carbon target years vary by utility, although target years are typically set every 5-10 years. Future carbon targets cover the same scopes as those of past carbon targets.

All of the utilities examined here have made public commitments to achieve specific levels of carbon emissions in the future. In order to determine the likelihood that the analyzed utility companies will meet their future targets, we analyzed data on a utility company's publicly announced carbon-reduction and investment plans. The planned actions address either a reduction in electricity demand (e.g. energy efficiency or demand-side projects), a reduction in carbon emissions due to the closure of a fossil fuel-based generation plant, or an addition of a new energy generating plant, typically sourcing from natural gas or renewable sources. These reductions are outlined in the utility companies' IRPs and/or in their CDP reports. Based on these reported plans, we estimate the change in emission levels due to the implementation of these plans. Using the technology type and the capacity of the generation asset, the capacity factor of the technology and emission factor of the fuel (based on EIA averages), we can estimate the emissions reduction due to a retirement of a unit, and the emissions addition due to the opening of a unit. We then calculate the anticipated net emissions change for a given year. In our calculations, we assume that the generation units run for 24 hours, 7 days a week or 8760 hours a year. A summary of the data we looked for can be found in Table 1.

Table 1. Summary of Examined Information

Data	Type of Information
Historic emissions	Absolute emission levels per year

Carbon targets (past and future)	Year target was established Target completion year Absolute amount of emissions reduction What year and by how much a target was adjusted before the completion year, if any (for past targets)
Investment plans	Retirements of fossil-fuel generating plants, additions of energy generating plants (typically natural gas or renewable), divestitures of business, acquisition of clean technology, forecasted load size by year

Depending on the business structure of the utility, historic emission levels and targets (both past and future) may be reported for the holding company and/or for the operating company. Further, the reporting entity may report Scope 1, 2, or 3 emissions, or some combination of them. In our dashboard, we ensured that the scopes of reported emissions align with those of past and future carbon targets.