NAVIGANT

1. CO_2 PRICE FORECAST

1.1. Methodology

The CO_2 price forecast is based on Navigant's Mid-Year 2017 Energy Market Outlook, finalized in July of 2017. Navigant's market modeling approach relies on a multifaceted approach for modeling and simulating the energy market and studying the performance of energy assets in the marketplace. Navigant's approach relies on the involvement of numerous subject matter experts with specific knowledge and understanding of several fundamental assumptions, such as fuel pricing, generation development, transmission infrastructure expansion, asset operation, environmental regulations, and technology deployment. From our involvement in the industry, Navigant has specific and independent views on many of these fundamental assumptions based on our knowledge and understanding of the issues. Provided below is an overview of the modeling process.

Navigant's proprietary Portfolio Optimization Model (POM) is a linear optimization model used for capacity expansion. POM simulates economic investment decisions and power plant dispatch on a zonal basis subject to capital costs, reserve margin planning requirements, RPS, fuel costs, fixed and variable operations and maintenance costs, emissions allowance costs, and zonal transmission interface limits. This model incorporates the same generation base, demand forecasts, fuel prices, other operating costs, and plant parameters that are utilized throughout the market simulation modeling process. The model simultaneously performs least-cost optimization of the electric power system expansion and dispatch in multi-decade time horizons. POM can perform multivariate optimization, which can consider value propositions other than cost minimization, such as sustainability, technological innovation, or impacts on other sectors, such as natural gas. POM was used to determine the CO_2 prices that would result from a likely CO_2 emission reduction policy.

Navigant also uses GPCM to develop our Reference Case Gas Price Forecast. GPCM is a commercial linear-programming model of the North American gas marketplace and infrastructure. Navigant applies its own analysis to provide macroeconomic outlook and natural gas supply and demand data for the model, including infrastructure additions and configurations, and its own supply and demand elasticity assumptions. Forecasts are based upon the breadth of Navigant's view, insight, and detailed knowledge of the U.S. and Canadian natural gas markets. Adjustments are made to the model to reflect accurate infrastructure operating capability as well as the rapidly changing market environment regarding economic growth rates, energy prices, gas production growth levels, demand by sector and natural gas pipeline, storage, and LNG terminal system additions and expansions. To capture current expectations for the gas market, this long-term monthly forecast is combined with near-term New York Mercantile Exchange (NYMEX) average forward prices for the first two years of the forecast.

1.2. Assumptions

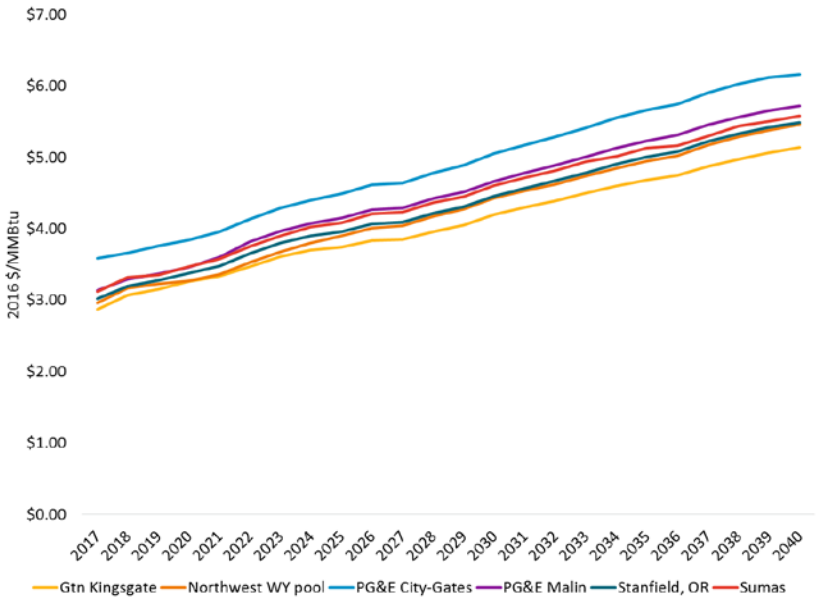
Two major assumptions tied to CO_2 emissions are natural gas prices and capacity additions and retirements. Both assumptions discussed in this section relate to the entire Northwest Power Pool[1] (NWPP) sub-region of WECC, in which the majority of Montana is located. The gas price is taken directly from Navigant's Mid-Year 2017 Energy Market Outlook; the capacity additions are based off the Navigant Energy Market Outlook with slight revisions made to align with the Northwestern base case.

[1] The Northwest Power Pool does not include the Basin sub-region.

Natural Gas Prices

Forecasted natural gas prices for major gas hubs in NWPP are shown in Figure 1. Gas prices are approximately $3.00 per MMBtu in 2017 and reach prices between $5.00 and $6.00 per MMBtu by 2040. Historically, the PG&E City-gate price has been one of the highest and most traded prices in the region; this trend is expected to continue through the forecast, with significantly higher prices than the other gas hubs in the region. All prices are in real 2016 dollars.

Figure 1. NWPP Natural Gas Prices

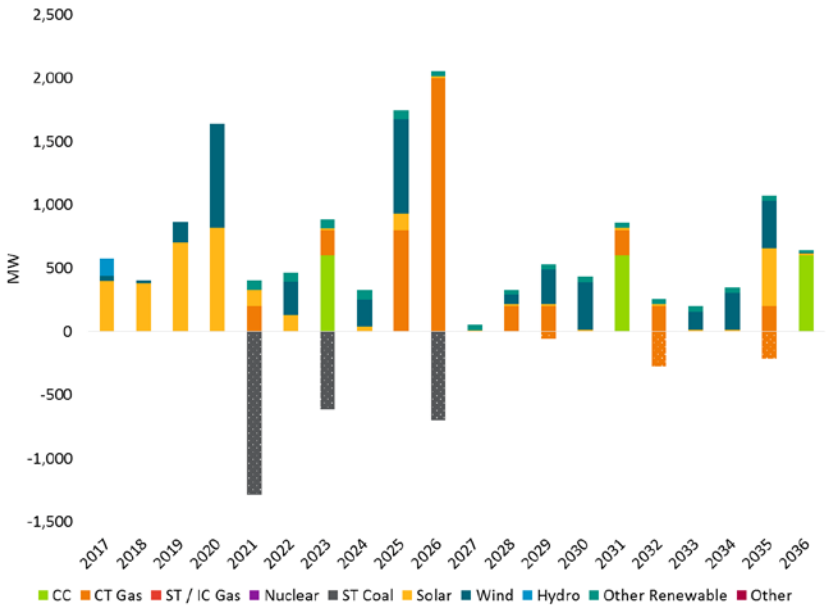


Source: Navigant Mid-Year 2017 Forecast

Additions and Retirements

Capacity additions and retirements of all types for the Northwest Power Pool are shown in Figure 2. Resource additions in the region consist of some near and mid-term natural gas combined-cycle capacity, substantial renewable resource additions, and assumed generic simple-cycle capacity needed to maintain generation reserves. There are significant coal retirements included in the first half of the forecast, driven primarily by the EPA's regional haze determinations; these coal retirements lead to significant reduction in CO_2 emissions.

Figure 2. Capacity Additions and Retirements



Source: Northwestern CO_2 Price Case

CO_2 Policy

Navigant assumed a cap-and-trade policy that targets 28% reductions of CO_2 emissions from the power generation sector from 2005 levels in 2028, ramping up 1% each year to 50% in 2050. As a comparison, under the Paris Agreement, the United States agreed to reduce overall emissions (i.e. not just the power sector) by 26% to 28% from 2005 levels by 2025. This cap-and-trade program would apply to the entire WECC region, except for California, whose current program targets getting to 1990 emission levels overall by 2020 and 80% below 1990 levels by 2050.

Extrapolation for 2041 through 2050

POM is currently set up to run through 2040, so Navigant extrapolated the CO_2 price results from POM from 2041 through 2050. There is a direct relationship between the annual emissions-to-generation ratio (total CO_2 emissions in tons divided by total generation in kWh) and the CO_2 price. Navigant linearly extrapolated the emissions-to-generation ratio for 2041 through 2050, based on the results from POM.

Navigant then used the relationship between the emissions-to-generation ratio and the CO_2 price to calculate the CO_2 price for 2041 through 2050, based on the extrapolated emissions-to-generation ratio.

1.3. Results

Table 1 shows forecasted annual CO_2 prices through 2050; prices are in real 2016 dollars per short ton.

Table 1. Annual WECC CO_2 Price[2]

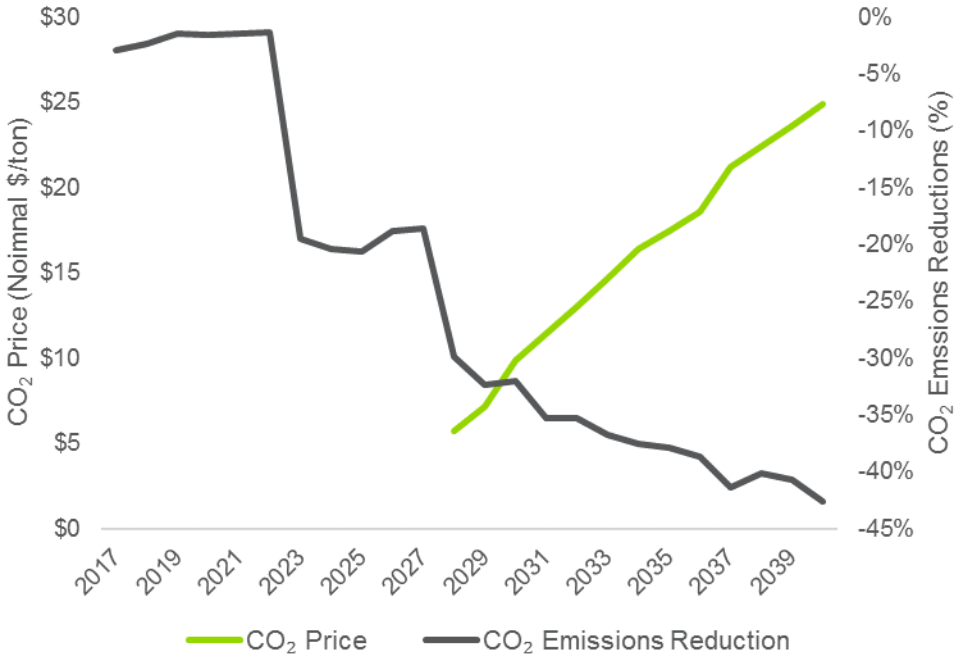
	CO_2 Price (2016 $/ton)	CO_2 Price (Nominal $/ton)
2017	-	-
2018	-	-
2019	-	-
2020	-	-
2021	-	-
2022	-	-
2023	-	-
2024	-	-
2025	-	-
2026	-	-
2027	-	-
2028	$4.50	$5.71
2029	$5.50	$7.11
2030	$7.50	$9.90
2031	$8.50	$11.44
2032	$9.50	$13.04
2033	$10.50	$14.70
2034	$11.50	$16.42
2035	$12.00	$17.48
2036	$12.50	$18.57
2037	$14.00	$21.22
2038	$14.50	$22.42
2039	$15.00	$23.65
2040	$15.50	$24.93
2041	$17.15	$28.14
2042	$18.05	$30.21
2043	$18.95	$32.34
2044	$19.85	$34.55
2045	$20.74	$36.84
2046	$21.64	$39.20
2047	$22.54	$41.65
2048	$23.44	$44.17
2049	$24.34	$46.78
2050	$25.23	$49.48

Source: Northwestern CO_2 Price Case

[2] Nominal prices determined using a 2% annual inflation rate based on a 20-year average inflation escalation for Gross Domestic Product, provided by the U.S. Bureau of Economic Analysis.

Figure 3 shows the relationship between the carbon price and reduction in emissions relative to the 2005 level. The sharp drop in emissions reduction that occur prior to the implementation of the carbon price correspond to years in which significant amounts of coal capacity retire. The relationship between carbon price and emissions reduction is also evident in Figure 3.

Figure 3 . CO_2 Price and CO_2 Emissions



Source: Northwestern CO_2 Price Case