

## Appendix B: IRP Characteristics

Company	Region/Area	Customer Classes	Forecast Period	Econometrics	Economic Source
<b>Avista</b>	2 divisions (WA/ID, OR); 5 service territories (WA, ID, Roseburg/Medford, Klamath Falls, La Grande); 11 demand areas according to available pipeline capacity.	Residential, commercial, industrial.	20 years	Separate forecast for customers and use per customer. Key drivers: Population growth, service area residential permitting; U.S., California, and service area employment growth; U.S. industrial production; U.S. GDP growth; non-weather seasonal factors; and real natural gas prices.	IHS Global Insight; Bureau of Labor Statistics; Oregon Employment Department; Washington Employment Security Department; Idaho Department of Labor; U.S. Census; Bureau of Economic Analysis; NOAA; University of Oregon Economic Indicator; Construction Monitor; U.S. Federal Reserve; The Economist; Wall Street Journal; IMF; World Bank; Bloomberg; Blue Chip Consensus; Washington Office of Financial Management.
<b>Cascade</b>	CNGC forecasts at its city gates in the 2018 IRP. 6 regions; West, Central and East for market share; by county for economic forecasting.	Residential, commercial, industrial, core interruptible.	20 years	Customer counts, population growth, employment rates, weather, natural gas price and other regional economic market intelligence.	Woods & Poole, SNL, Federal Reserve, Schneider Electric, Wood Mackenzie and other regional economic market intelligence.
<b>Dominion Energy</b>	Utah and Wyoming (Idaho rolled into Utah).	Residential by state; small commercial by state; large commercial, industrial, and electric generation gas demand all together; firm customer and transportation. All rate classes are forecasted by state, but non-GS (all but residential and small commercial) is only presented systemwide in the IRP document.	10 years for demand forecast; 30 years for SendOut model.	Rate of natural gas service, housing starts, and unemployment rate are used in forecasting by state.	University of Utah's Kem C. Gardner Policy Institute Research, U.S. EIA, U.S. Census Bureau, IHS.
<b>FortisBC</b>	Lower Mainland; Vancouver Island; Northern BC; Southern Interior, Whistler.	Residential, commercial, industrial, LNG service.	20 years	Forecasts based on third-party housing starts forecast and market capture. New dwellings, commercial floor space and industrial plant capacity added based on account growth rates. Anticipated "natural" efficiency improvements incorporated in both existing buildings and new construction. Anticipated changes in the saturation and gas shares for specific end-uses also included.	Conference Board of Canada, user surveys.
<b>Inter-mountain</b>	6 regions (includes an "all other" category); West, Central, and East for market share rates; by county for economic forecasting.	Residential, commercial, and industrial (potato processors, other food processors, chemical and fertilizer, manufacturers, institutions, and all other).	5 years	Forecast based on household growth forecast in counties served. Key drivers include historical market penetration rate of county-wide building permits, residential conversion rates and commercial acquisition rates as a function of total historical sales. Market intelligence based on regional economic development activity and large customer's specific growth projections.	Church 2019 Household Growth Forecast; industrial customer survey.
<b>NW Natural</b>	11 regions based on topology of the gas distribution system.	Residential, commercial, and industrial.	20 years	Customer growth drivers: population, housing starts, nonfarm employment. Daily demand drivers: weather variables, time trend, customer count, day of the week, snow depth, water source temperature.	Oregon Office of Economic Analysis; Oregon Employment Department; U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; U.S. Census Bureau; Northwest Economic Research Center.
<b>Pacific Power</b>	By state (California, Oregon, Washington, Idaho, Utah, and Wyoming) which is allocated to 37 "bubbles," including 10 load bubbles.	Residential, commercial, industrial, irrigation, and Public Street and Highway Lighting.	20 years (2019-2038), but IRP discussion focuses on first 10 years with a near-term two- to four-year action plan. 2020-2050.	Forecast by state and customer class. Key drivers: New technologies/end use, demographics, employment, income, weather, DSM, and energy efficiency mandates.	PacifiCorp's 2019 IRP Conservation Potential Assessment conducted by Applied Energy Group.
<b>Portland General Electric</b>	Single contiguous service area.	Industrial customers comprise slightly less than 25% of demand with the remainder approximately split between residential and commercial.		Forecast for residential customers and use per customer. Non-residential modeled by sector. Key drivers: Regional population and demographics, building permits, gross domestic product, and sector level employment including regional industrial trends and outlook. A trended, gradually warming, normal weather assumption.	Primarily Oregon Office of Economic Analysis economic forecast and IHS Global Insight.
<b>Puget Sound Energy</b>	Single contiguous service area.	Firm: residential, commercial, industrial, large volume commercial, large volume industrial. Interruptible: commercial and industrial.	20 years	Regional and national economic growth, demographic changes, weather, prices, seasonality, housing starts, and DSM for customer growth and use per customer forecasts; stochastic approach for developing Low and High growth scenarios.	Moody's Analytics U.S. Macroeconomic Forecast, PSE's regional and economic forecasts, U.S. Bureau of Economic Analysis, U.S. Bureau of Census, Washington State Employment Security Department, Washington Office of Financial Management.

**Appendix B: Continued**

Company	Scenarios Developed	Price Forecast	Weather Design
<b>Avista</b>	Average Case, Expected Case, Expected Case with Low Price, High Growth with Low Price, Low Growth with High Price, and an Alternate Weather Standard.	NYMEX & 2 proprietary 20-year forecasts.	Coldest day on record, historic peak, and average weather data for each demand region.
<b>Cascade</b>	Low, Medium, High, High Growth with Low Price, Low Growth with High Price, Moderate CO <sub>2</sub> costs, High CO <sub>2</sub> costs.	A blend of public and private sources (U.S. EIA 20 yr, Wood Mackenzie, NYMEX strips, NPCC) based on Cascade's general portfolio mix.	System-weighted 56 HDD, based on coldest day in past 30 years.
<b>Dominion Energy</b>	Stochastic modeling yielding mean, median and base cases; normal weather case also reported to inform quarterly variance reporting and pass-through cases.	Means and standard deviations associated with historical data from 9 area price indices; average of 2 price forecasts including PIRA (19 months) and IHS CERA (252 months) as basis for stochastic modeling inputs.	1-in-20-year weather occurrence: 70 HDD at SLC coincident across service territory.
<b>Fortis BC</b>	Reference Case, High and Low (driven by customer addition forecasts); scenarios by region.	Henry Hub forecasts using GLJ, Wood Mackenzie and U.S. EIA along with NYMEX futures.	1-in-20-year day determined through extreme value analysis based on weather data from the last 60 years; result may vary from the actual coldest day in last 20 years.
<b>Inter-mountain</b>	Low, Base and High combined with other variables to yield 6 demand scenarios.	3 proprietary 5-year forecasts.	78 HDD for total company, weighted by customers in each district; several distinct laterals and areas of interest are assigned unique HDDs.
<b>NW Natural</b>	Supply Infrastructure (3 sensitivities); Economic Growth (2 sensitivities); Environmental Policy (4 sensitivities).	IHS CERA	99th percentile of highest demand day in a given year.
<b>Pacific Power</b>	2019 IRP studies included coal unit economic studies, regional haze scenarios, portfolios, and sensitivities.	PacifiCorp subscribes to expert third-party natural gas forecasting services to receive base and scenario forecasts. These forecasts form the basis of PacifiCorp's low, medium, and high natural gas fundamental forecasts for key Western natural gas hubs, as input to AURORAxmp® (Aurora). Aurora <sup>1</sup> , a production cost simulation model for the Western interconnect, produces a consistent electricity price forecast for key Western power hubs and unique price projections.	1-in-20 weather occurrence included in sensitivity load forecast to determine resource type and timing impacts.
<b>Portland General Electric</b>	Futures examined changing CO <sub>2</sub> costs, gas costs, load, capital costs, renewable generation and critical hydro.	PGE forward trading for near-term prices (2020-2023); Wood Mackenzie gas forecast for the years 2025-2040, with linear interpolation applied in 2024 to transition from the PGE forward trading curve. PGE escalates the fundamentals forecast at inflation for dates after 2040.	For resource adequacy assessment, extensive load and weather data used to capture variability of weather from 1980-2017, with older years "trained" to more recent history.
<b>Puget Sound Energy</b>	Base, Low, High, High + Low Demand, Base + Low Gas Price, Base + High Gas Price, Base + Low Demand, Base + High Demand, Base + No CO <sub>2</sub> , Base + Low CO <sub>2</sub> with CPP, Base + High CO <sub>2</sub> .	Prices for 2018 through 2021 represent 3-month average forward marks. Beyond 2021, natural gas forward prices represent the long-term forecast per Wood Mackenzie. Also generated Low and High gas prices using Wood Mackenzie forecasts. CO <sub>2</sub> prices between 2018 and 2021 are based on Wood Mackenzie's estimated CO <sub>2</sub> price for California AB32 under CAR. The CO <sub>2</sub> price between 2022 and 2037 is based on California CO <sub>2</sub> prices under the Clean Power Plan and is applied WECC-wide.	52 HDD daily average.

<sup>1</sup> PacifiCorp is a licensed user of the AURORAxmp® model, developed by EPIS, LLC.