wind generation development in the generation scenarios, the 2017 LTO scenarios also include solar generation development. In the near term, it is assumed that the Government of Alberta's RFP for solar generation will incent approximately 80–to–100 MW with additional solar support in the 2020s, altogether resulting in 500 MW of utility-scale solar generation by the end of 2030. The 2017 LTO scenarios also assume that 350 MW of hydro development(s) will be completed by the end of 2030.

Cogeneration additions are an exogenous input to the scenarios and are based on a historical ratio of cogeneration capacity to oilsands production. Based on this assumption, cogeneration projects currently under construction, plus approximately 400 MW of additional cogeneration, are assumed in the Reference Case and most scenarios over the forecast horizon. However, given the possibility that the attractiveness of cogeneration may change as a result of potential CLP or technology changes, the High-cogeneration Scenario tests this assumption.

Retirements are also a key assumption in the 2017 LTO. Generally, the coal retirements associated with the coal phase-out follow a similar assumption methodology between scenarios; however, the schedule varies within the coal-to-gas scenarios. The AESO assumes that no more than two coal-fired units retire per year, that all units shut down by 2030 if not converted, and that the order of retirement generally follows an order of oldest to newest. The assumed coal retirement schedules for the scenarios are presented in Appendix A. While these dates are assumed in the 2017 LTO scenarios, the actual retirement dates will depend on coal-unit owner decisions.

The Reference Case and other scenarios assume that the forecast generation additions are transmission grid-connected for modelling purposes. However, it is possible that generation additions, especially small-scale solar and smaller natural gas simple-cycle and cogeneration resources may connect at the distribution level. These are often referred to as Distributed Energy Resources (DERs), and include generation and other resources which are connected to the distribution network within the province; they often do not input power onto the transmission system.

With these key assumptions made, a long-term expansion model is used to simulate the wholesale electricity market and calculate market-driven capacity additions. If economical, renewables projects are added by the model. Combined-cycle and simple-cycle units are assumed to be the main sources of firm capacity additions.

6.2 GENERATION SCENARIOS

6.2.1 Reference Case Scenario

The AESO's Reference Case can be characterized as the "base" case. Against this scenario, all other scenarios will be compared to understand impacts of changing specific assumptions within the other scenarios.

The Reference Case incorporates recent information and announcements with respect to generation and supply of electrical energy in Alberta at the time of 2017 LTO development. This encompasses announcements made by the Government of Alberta, the federal government and major stakeholders.

6.2.2 Assumptions

Coal retirements and conversions to gas

The Reference Case assumes that approximately 2,400 MW of coal-fired capacity will be converted to natural gas-fired generation between 2021 and 2023. These units are assumed to operate as coal-to-gas (CTG) units for 15 years before retiring. The remaining coal-fired units are assumed to retire between 2019 and 2030 in order of vintage and at a rate of no more than two units per year. A detailed coal retirement schedule for the Reference Case can be found in Appendix A.

Generation location assumptions

For the purposes of transmission system planning and to fulfill the requirements of the EUA and T-Reg, locations are assumed for future generation units. Each technology is assigned to locations based on the likelihood of that technology developing in a particular region. Technology considerations include utilizing existing infrastructure (such as brownfield sites), fuel resources (such as the location of strong wind and solar resources), future planned transmission enhancements, and developer information. Within these regions, unit-specific locations are assigned to locations on the transmission system such that they utilize the existing transmission capability and minimize the impact to transmission reinforcement requirements, subject to resource availability and generation technology considerations.

Renewable generation additions, primarily wind generation, are split between the AESO's South and Central planning regions, with some resources anticipated to develop in the Northwest Planning Region. The actual location of future wind generation and other renewable projects, including their development timeframe, will ultimately depend upon developer decisions, REP outcomes, availability of integration capability and other factors. The locations of renewable generation stated within the 2017 LTO represent a reasonable assumption, based on where resources are available, to be used as a starting point for transmission planning purposes.

Utility-scale solar generation is assumed to locate in the South and Central planning regions. Solar resources are best in the South Planning Region, with highly suitable resources also located in the Central Planning Region.

The hydro development assumed in the Reference Case is located within the Northwest Planning Region on the Peace River. Additional potential hydro resources have also been identified at some existing hydro facilities as well as on other northern Albertan rivers.

Combined-cycle generation additions are assumed to primarily occur at brownfield coal sites and previously identified combined-cycle project locations. Brownfield sites are assumed due to development advantages including existing infrastructure and lower development costs compared to greenfield sites.

Cogeneration development is assumed to occur within the established oilsands production areas of Fort McMurray and Cold Lake.

Please see the planning region map in Appendix C.

6.2.3 Results

There are a number of relevant results derived from the aforementioned assumptions in the Reference Case. Coal generation is phased out by the end of 2030, as per provincial policy, and is replaced with firm natural gas capacity including both coal-to-gas converted units as well as combined-cycle and simple-cycle additions.

Renewable energy provides 32 per cent of energy produced in Alberta and represents 36 per cent of total installed generation capacity. By 2037, approximately two-thirds of energy generated in Alberta originates from renewables and cogeneration.

Additional details of the Reference Case generation scenario, including regional data, can be found within the 2017 LTO ***data file.***