# POLICY ASSUMPTIONS IN THE BAU CASE FOR THE MINNESOTA EPS

## Buildings

* Energy efficiency
  + BAU data includes some endogenous improvement in equipment performance based on external market data (as described [here](https://www.nrel.gov/docs/fy18osti/70485.pdf)). It is unclear which, if any, EE policies are explicitly included. Minnesota’s EE policies are **not** explicitly modeled, included things like building rebates.

## Transportation

* Fuel efficiency
  + Includes Corporate Average Fuel Economy Standards (CAFE) including the 2021-2025 phase 2 standards. Full text from [AEO](https://www.eia.gov/outlooks/aeo/assumptions/pdf/summary.pdf): *CAFE standards are increased for model years 2011 through 2016 to meet the final CAFE rulemakings for model years 2011 and 2012 to 2016. CAFE standards are increased for model years 2017 to 2025 to meet final CAFE joint rulemakings for model year 2017 to 2021 and to meet augural CAFE standards for model year 2022 to 2025, which will undergo a midterm evaluation to finalize. CAFE standards are held constant through the end of the projection period.*
  + Includes Phase I and Phase II standards for HDVs. Full text from AEO: *HD National program Phase I and Phase II standards are modeled, with both engine and chassis technologies; compliance is modeled among 13 heavy-duty vehicle V regulatory classifications that represent the discrete vehicle categories set forth in the rule; the standards are held constant in model years after 2027.*
* EV subsidies
  + Includes federal subsidies for EVs, weighted based on available credits and model availability.

## Industry

* Non-energy emissions
  + No implementation of Kigali Amendment to the Montreal Protocol.
* Industry energy
  + Data includes some endogenous improvement in equipment performance based on external market data (as described [here](https://www.nrel.gov/docs/fy18osti/70485.pdf)). It is unclear which, if any, EE policies are explicitly included. We can assume Minnesota’s EE policies are **not** explicitly modeled, included things like building rebates.

## Electricity

* Renewable portfolio standard: Minnesota’s [Renewables Portfolio Standard](https://programs.dsireusa.org/system/program/detail/2401) is included in the BAU case
* Assume existing nuclear power plants are retired at the time their current permits expire (Monticello 2030 and Prairie Island 2033/34)
* To avoid double counting Sherco 3 retirements in the BAU and Reference policy case, we do not retire Sherco 3 in the BAU scenario

# Policy Assumptions in the Reference Case for the Minnesota EPS

The **Reference** policy scenario includes assumptions about energy efficiency and renewable energy in Xcel’s IRP.

## Xcel IRP

**Electricity:**

* Assumes nuclear power plants are extended additional 10 years: Monticello unit operates through 2040, Prairie Island through 2033 (Unit 1) and 2034 (Unit 2)
* Retire 2 coal units early: King in 2028, Sherco 3 in 2030
* We assume additional 1500 MW of demand response by 2034 above the BAU case
* Clean energy standard adds 1200 MW wind by 2034, 4000 MW of solar by 2034

**Energy Efficiency:**

* Annual BTU electricity savings were calculated based on the energy efficiency improvement forecasted in Xcel’s IRP (about 2-2.5% per year through 2034). The scenario meets these annual BTU targets through the building component and industrial efficiency and retrofit policy levers. Efficiency savings are applied to the residential, commercial, and industrial sectors. We assume efficiency requirements are held constant after 2034, at about 20% below BAU electricity consumption.

# Data Sources

| **Sector** | **Subsectors** | **Source** | **Methodology** | **Benchmarking Sources for Comparisons** |
| --- | --- | --- | --- | --- |
| ELECTRICITY | In-state capacity and generation; out of state imports | For capacity and generation: EIA’s [Form 923](https://www.eia.gov/electricity/data/eia923/) and EIA’s [Form 860](https://www.eia.gov/electricity/data/eia860/)  For imports/exports: EIA’s State Electricity Profiles [Table 10.](https://www.eia.gov/electricity/state/minnesota/state_tables.php) | No scaling needed. Added all utility-owned generation and capacity in-state. | **Emissions -** EPA “[State CO2 Emissions from Fossil Fuel Combustion, 1990-2017](https://www.epa.gov/statelocalenergy/state-co2-emissions-fossil-fuel-combustion-1990-2017)” &  AEO “[State CO2 Emissions from Fossil Fuel Combustion](https://www.epa.gov/statelocalenergy/state-co2-emissions-fossil-fuel-combustion-1990-2017)” & Minnesota’s GHG Inventory |
| BUILDING ENERGY USE | All energy use, all building components, residential and commercial buildings | [NREL Electrification Futures Study - Reference Scenario](https://www.nrel.gov/analysis/electrification-futures.html) | No scaling needed. NREL reports total energy use by fuel type and demand technology in MN for each year 2017-2050. | **Energy Use -** EIA’s “[State Energy Data Systems](https://www.eia.gov/state/seds/seds-data-fuel.php?sid=US)” 2018  **CO2 Emissions -** AEO “[State CO2 Emissions from Fossil Fuel Combustion](https://www.epa.gov/statelocalenergy/state-co2-emissions-fossil-fuel-combustion-1990-2017)” & Minnesota’s GHG Inventory |
| INDUSTRIAL ENERGY USE | All fuel use for industrial sector | [Energy Information Association’s Annual Energy Outlook tables on Industrial Energy Use](https://www.eia.gov/outlooks/aeo/tables_ref.php) &  EIA’s “[State Energy Data Systems](https://www.eia.gov/state/seds/seds-data-fuel.php?sid=US)” | Scaled down by Census Data ([County Business Patterns](https://www.census.gov/programs-surveys/cbp/data/tables.html)) employment by industrial subsector and state compared to national employment by industrial sector | **Energy Use -** NREL Electrification Futures and SEDS  **Emissions -** EPA “[State CO2 Emissions from Fossil Fuel Combustion, 1990-2017](https://www.epa.gov/statelocalenergy/state-co2-emissions-fossil-fuel-combustion-1990-2017)” &  AEO “[State CO2 Emissions from Fossil Fuel Combustion](https://www.epa.gov/statelocalenergy/state-co2-emissions-fossil-fuel-combustion-1990-2017)” & Minnesota’s GHG Inventory |
| INDUSTRIAL PROCESS EMISSIONS | Process Emissions | [EPA Global Non-CO2 Greenhouse Gas Emissions Projections & Mitigation Potential: 2015-2050](https://www.epa.gov/global-mitigation-non-co2-greenhouse-gases/global-non-co2-greenhouse-gas-emission-projections) | Scaled down US data to state data using a variety of sources, including data from EPA’s [FLIGHT](https://ghgdata.epa.gov/ghgp/main.do) tool and [EPA’s State Inventory Tool Output Dataframe](https://www.epa.gov/statelocalenergy/download-state-inventory-and-projection-tool) | **Emissions** - Minnesota’s GHG Inventory and [E3’s Pathways Report](https://www.ethree.com/wp-content/uploads/2020/01/MN_PATHWAYS_Final-Report_2019-06-26.pdf) |
| AGRICULTURE | Process Emissions | [Minnesota’s Greenhouse Gas Inventory Data](https://www.pca.state.mn.us/air/greenhouse-gas-emissions-data) | Note that for agricultural emissions we took an average of emissions for years 2005, 2010, 2015, 2016 and reallocated emissions from “cultivated histosols” to the land use sector | **Emissions** - Minnesota’s GHG Inventory and [E3’s Pathways Report](https://www.ethree.com/wp-content/uploads/2020/01/MN_PATHWAYS_Final-Report_2019-06-26.pdf) |
| LAND USE AND FORESTRY |  | [Minnesota’s Greenhouse Gas Inventory Data](https://www.pca.state.mn.us/air/greenhouse-gas-emissions-data) | Include forestry, land use sector emissions and “cultivated histosols” from the agricultural sector | **Emissions** - Minnesota’s GHG Inventory |
| TRANSPORTATION | All energy use, vehicle miles | [NREL Electrification Futures Study - Reference Scenario](https://www.nrel.gov/analysis/electrification-futures.html) | No scaling needed. NREL reports miles by vehicle type and total energy use by fuel type in MN for each year 2017-2050. | **Emissions -** EPA “[State CO2 Emissions from Fossil Fuel Combustion, 1990-2017](https://www.epa.gov/statelocalenergy/state-co2-emissions-fossil-fuel-combustion-1990-2017)” &  AEO “[State CO2 Emissions from Fossil Fuel Combustion](https://www.epa.gov/statelocalenergy/state-co2-emissions-fossil-fuel-combustion-1990-2017)” & Minnesota’s GHG Inventory |