

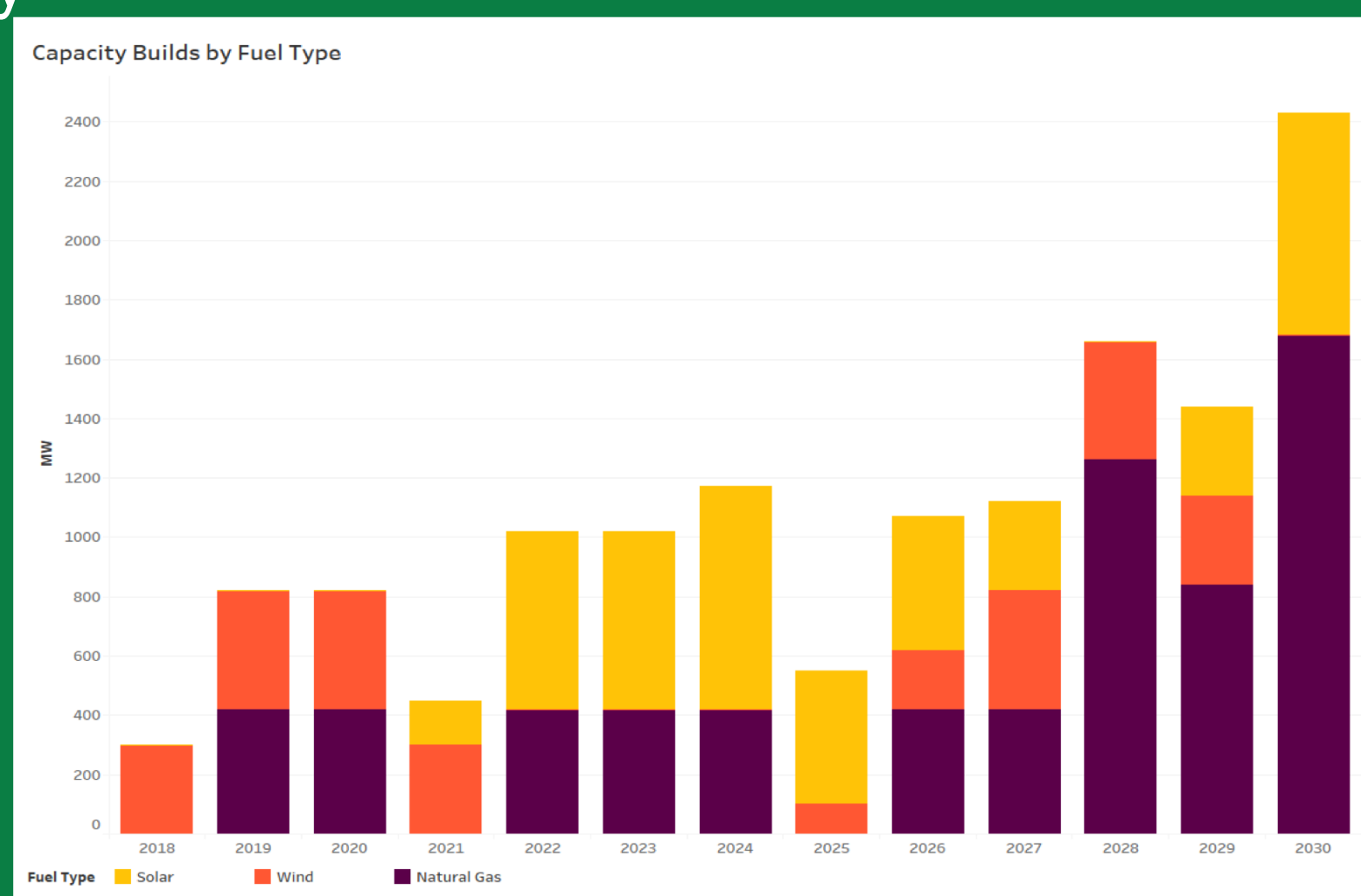
# Alberta's Future Grid Under Policy Direction and Market Transition

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## BACKGROUND

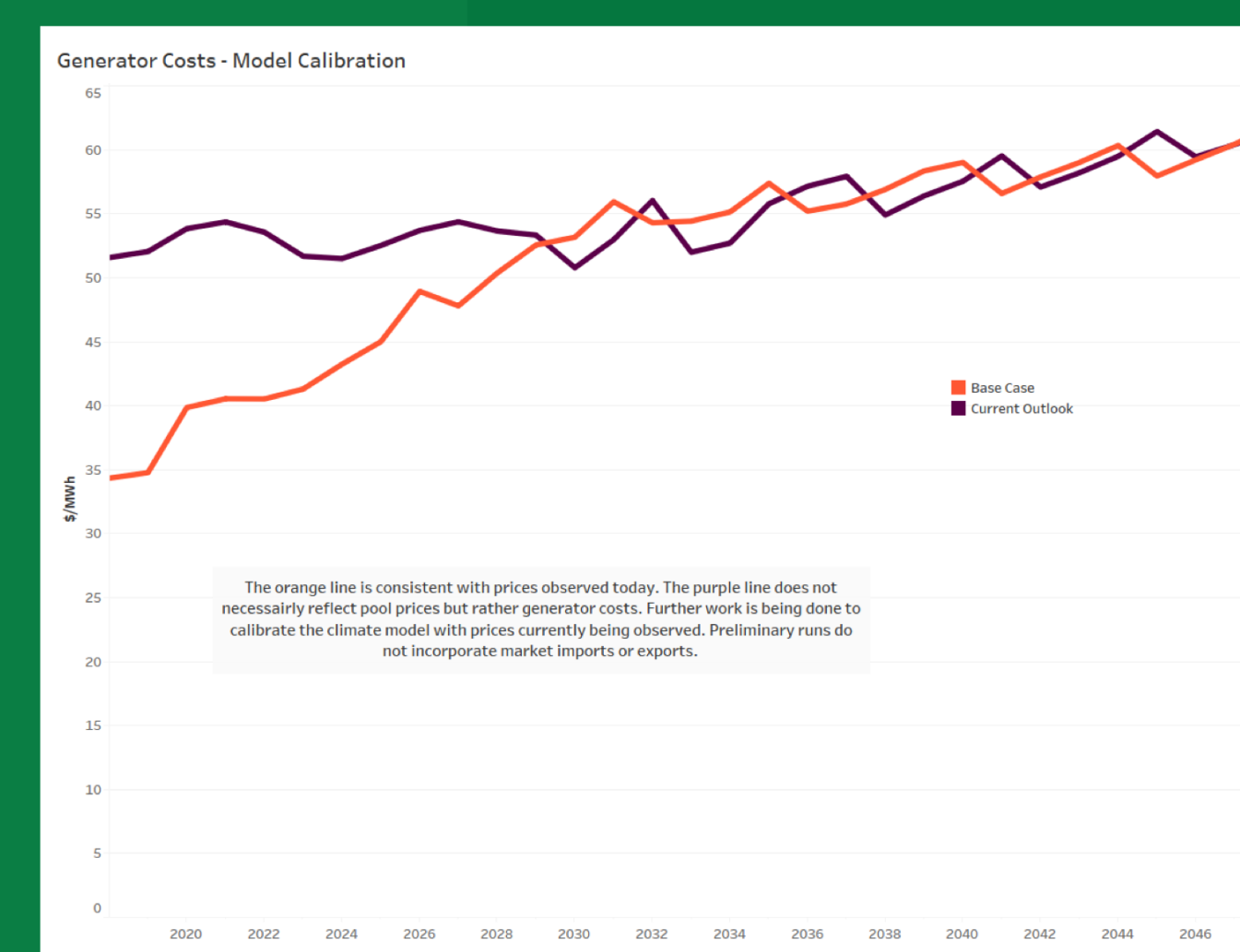
Alberta's electricity system is undergoing a fundamental shift from coal-based generation, towards a mix of natural gas with an increasing use of renewable energy. This shift is being driven actively by provincial and federal climate change policies as well as by private investment decisions that are increasingly favouring renewables.

To make this transition Alberta's electricity market is also evolving from an "energy-only" market to include a "capacity market". These changes, combined with increased carbon pricing pose significant market challenges and planning to manage reliability, prices, investment opportunities and emissions.



## AIMS AND OBJECTIVES

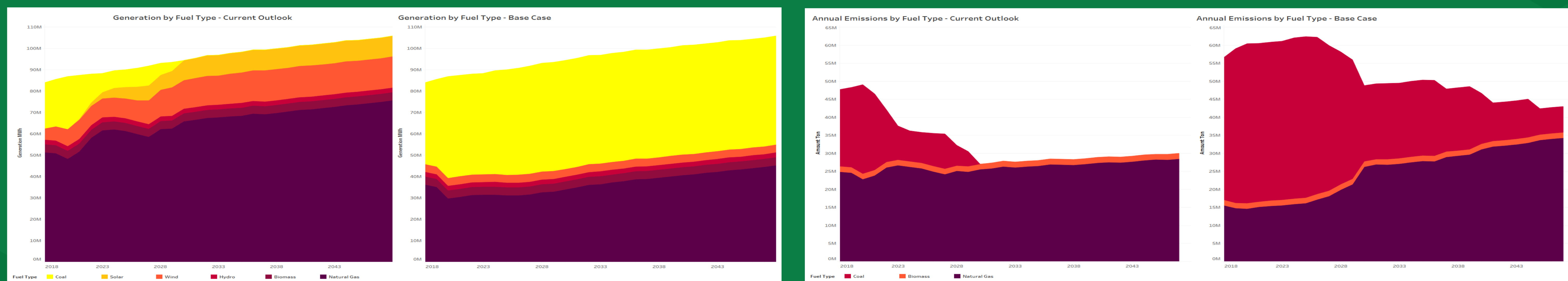
Carbon pricing and low cost renewables fundamentally change Alberta's market outlook, sometimes in potentially counter-intuitive ways as illustrated below. This research understanding market price signals and technological choices will illuminate future market as well as technological challenges and opportunities ranging from ensuring supply adequacy to the role for new technologies such as energy storage.



## RESULTS

### GREENHOUSE GAS EMISSIONS

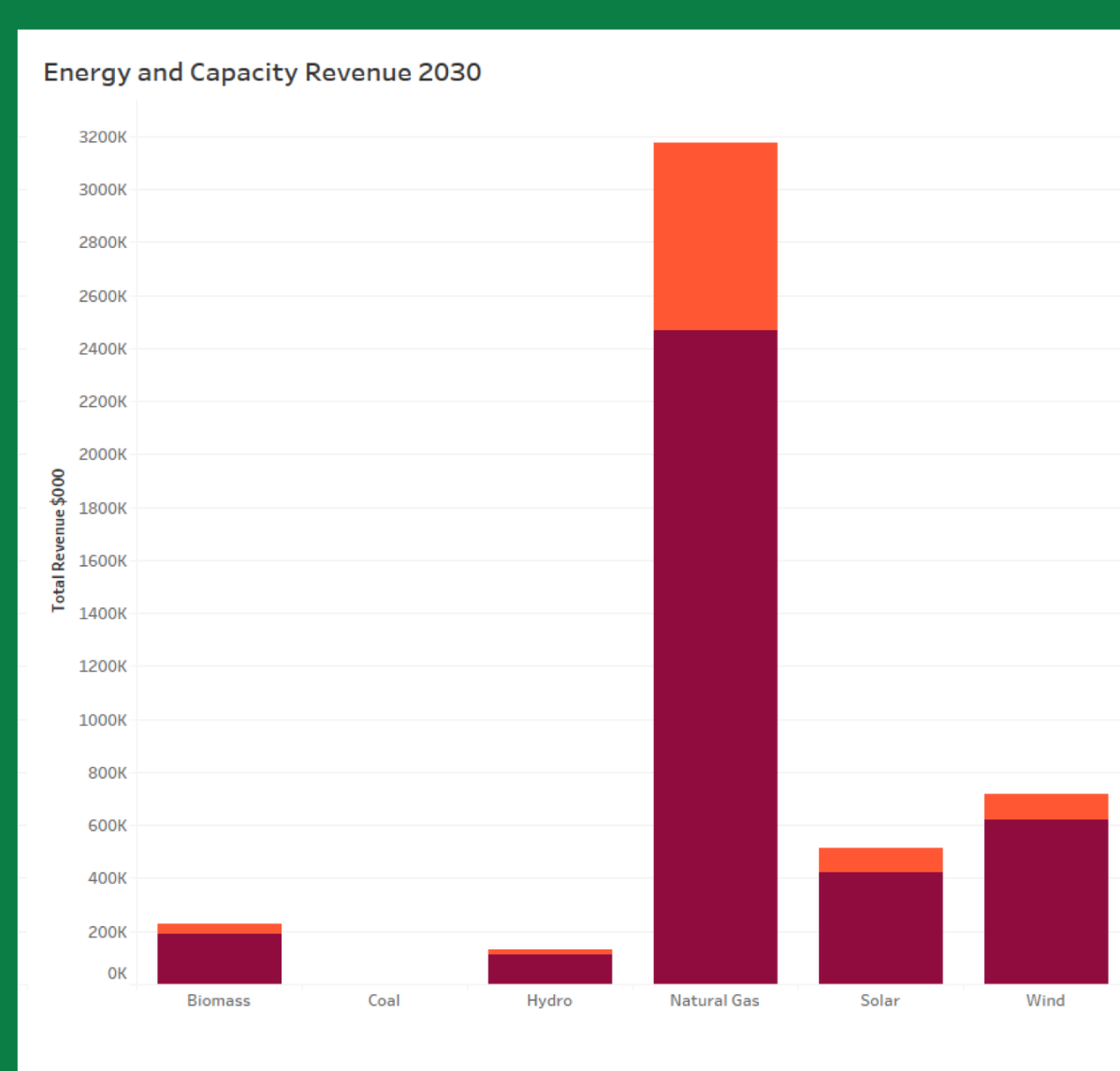
The goal of this project is to examine the interplay between the economics of the electricity market and climate change policies. Our initial goals include modelling the introduction of the Climate Leadership Plan (CLP) policies in Alberta including: the coal phaseout, coal-to-gas conversions, carbon tax, renewable energy targets, and introduction of the capacity market. This will provide us with insight on the costs of electricity in Alberta, and the generation mixes we could expect going forward. The cost of electricity for a consumer will be reflected in a pool price and charge for capacity payments, not including costs of transmission and distribution. Generation mix information can tell us about the expected changes to the province's power generation emissions profile as policies are rolled out.



## FUTURE DIRECTIONS

### CAPACITY MARKET

We expect that our Alberta-wide, hourly-resolution electricity model, once fully developed and tested, will enable us to assess the impacts of ongoing market design changes as they develop and materialize in 2021. Our focus investigates the underlying economics of the future of Alberta's power market. This entails the energy mix brought on by policy targets and the transition to a new market structure. A capacity market creates an additional revenue stream for generators to capture their contributions to the grid during periods of system stress and the availability at which they are able to do so. We are interested in finding the interactions between long term resource adequacy, incentivization of new market entrants, efficient pricing, and the de-carbonization of the grid.



## PARTNERS

The project is still in development, but early opportunities for collaboration have already presented themselves with companies engaged in the renewable energy and utility space in Alberta.



## FES PROJECT OVERVIEW

New technologies enable us to exploit renewable energy resources, but truly harnessing their energy requires the ability to control and adapt to the complex interaction between multiple sources and users. Smart grid technology will enable systems that can adapt to the variation in supply that is common from renewable sources, while new storage technologies will make it possible to retain energy generated at during peak times to be withheld for later use. Developing hybrid grids that can accommodate both AC and DC power, accommodating distributed generation, and effectively interfacing with legacy grid systems will be essential to our energy future.

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