



# EMERALD

EMERALD (Electricity Market Emissions Reduction Accounting for Long-term Decisions) is a long-term capacity expansion model for planning New Zealand's 100% renewable energy target. The model is formulated in an event tree spanning up to 30 years. Each node in the event tree represents a "state of the world" that lasts for a five-year interval after which the node evolves randomly into one its children representing a (possibly) different state of the world. Decisions on investment/shutdown of generation capacity are made in each state of the world. The event tree ensures that these decisions do not anticipate future states of the world (as scenario solutions would) i.e. they use only the information encapsulated by the history of events encoded in the path from the root node of the tree to the current state of the world. The tree enables decisions to be based on contingent events, which preserves many of the real options that are present in this problem.

EMERALD was developed by researchers at the Electric Power Optimization Centre at the University of Auckland. It is coded in Julia and solves using the JuDGE.jl package.

## References:

A. Downward, R. Baucke and A.B. Philpott – JuDGE.jl: a Julia package for optimizing capacity expansion, [http://www.optimization-online.org/DB\\_HTML/2020/11/8086.html](http://www.optimization-online.org/DB_HTML/2020/11/8086.html).