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Optimising VRE plant capacity in Renewable Energy Zones

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Abstract Australia's National Electricity Market experienced significant growth in variable renewable energy (VRE) investment commitments over the period 2016-2021. A subset of projects experienced material entry frictions which stemmed from inadequate network hosting capacity. In this article we examine the development of non-regulated Renewable Energy Zones (REZ) as a means by which to help guide forward market commitments and produce greater coordination between generation and transmission plant investments. Using an optimisation model comprising 1500MW of transmission network infrastructure, we explore various definitions of a 'fully subscribed REZ' given the portfolio benefits associated with complementary wind and solar plant in Southern Queensland. We also examine the conditions by which various proponents would sponsor a non-regulated REZ. When maximising output forms the objective function, full subscription is achieved by developing ~3400MW of solar and wind in roughly equal proportions, accepting that some level of curtailment is an economic result. Conversely, full subscription in which the combined cost of the REZ and VRE plant is minimised is achieved at ~1800MW of VRE. If maximising net cashflows forms the objective function, VRE plant development is complicated by the dynamic nature of spot prices. Specifically, in early stages of VRE development solar is preferred but as its market share rises and value of output falls, wind investments dominate holding technology costs constant.

Keywords Renewable Energy Zones, renewable generation, transmission investment.

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