



## *An energy analysis of New Zealand's Net Zero 2050 transition pathways*

New Zealand is planning to transition to a new economy in which net greenhouse gas emissions are reduced to zero by 2050.

The plan was developed using economic modelling by Vivid Economics (London) commissioned by the parliamentary working group GLOBE-NZ. It includes a partial shift in our energy sources from fossil fuels to renewable alternatives, primarily wind, solar PV, biofuels, and geothermal. It also assumes continued economic growth, with our national GDP (gross domestic product) doubling between now and 2050.

Energy Return On Investment (EROI) is an analytical method drawn from thermodynamics (physics) in the field of biophysical economics. It establishes a ratio (outputs:inputs) of energy produced by a system relative to the energy required to create and maintain that system. For example how much energy a wind turbine puts out during its lifetime relative to the energy input required to obtain the raw materials, manufacture the turbine, maintain it, and eventually decommission and recycle it.

Many scientific papers have collectively established general EROI values for the main fossil based and renewable energy sources. They have also established that these ratios are higher from fossil fuel based systems than from renewable systems.

In this analysis the EROI for the New Zealand economy was compared between the present day and 2050 with net zero emissions and more reliance on renewable energy.

The EROI for our national energy system drops from 20.3:1 to 15.7:1. For context, this is a drop in per capita energy consumption of 37% from 16.5 GJ/person/yr today to 10.4 GJ/person/year. Our energy consumption in 2050 will be equivalent to what we used 40 years ago in the early 1980s.

Financial economies are fueled by energy. Energy to manufacture products, maintain systems, and deliver services to our society. This is what provides the quality of life we enjoy today. Constricting the energy supply to our society will also constrict the economy. Financial modelling does not detect this fact. Indeed no consideration is given to it in our transition plan at this stage.

Planning for a 'low emissions' transition by any country must include both biophysical (eg EROI) and economic dimensions. The alternative risks a major shortfall in physical resources required to achieve economic aspiration.

Solis Norton

[solinsnorton1@gmail.com](mailto:solinsnorton1@gmail.com)

The author would like to acknowledge the support of a Nuffield International Farming Scholarship which enabled him to undertake this work.