

**“What drives
renewable energy?
Sun, wind, rain,
waves, tides –
NIWA’s expertise”**

Dr Murray Poulter
Chief Scientist – Energy

What are New Zealand's future energy options?

Imagine you're in the Beehive, or Transpower, or an energy or transport sector regulator, or a local authority, or an electricity company. You have to make tough decisions which will shape New Zealand's energy future. You face bewildering options with complex linkages.

NIWA and its partners in the Energy Research Alliance (see 'Collaborators' opposite) have constructed a tool to help identify future energy options. 'EnergyScape' has compiled information about resources, demand, conversion, and distribution across all energy sectors. All this information is now in a common format so we can compare the costs, risks, and environmental impacts of various energy futures.

EnergyScape covers such elements as:

1. What are our resources, and what fraction is realisable?
The team developed maps of New Zealand's energy resources.
2. What will future demand look like?
Demand is described in terms of so-called 'energy services', such as the amount of goods transported over a certain distance, products manufactured, or houses heated. Changing demand behaviour may be an effective option in some cases.
3. What 'pathways' should be used to deliver energy services?
EnergyScape enables us to compare the efficiency of different pathways. For example, we might harness wind through turbines to charge electric-car batteries or we might gasify biomass into synthetic fuel.

Analysts can use EnergyScape to test potential outcomes from a range of policy settings or scenarios, like 'how much electricity generation investment is required if 50 000 more homes had solar hot water systems, and 20 000 electric vehicles are introduced?'

"EnergyScape shows us the pros and cons of different energy uses and pathways, including the impact on greenhouse gas emissions," explains NIWA's Chief Energy Scientist, Dr Murray Poulter. "And it highlights research gaps." EnergyScape output can also be fed into economic analyses.



This map shows total energy demand, distribution, and some aspects of hydro and marine energy supply. It was compiled by NIWA scientists for EnergyScape.

An EnergyScape Asset Review concluded that New Zealand has plenty of energy options for electricity generation and heating, but provision of energy for transport is significantly more difficult. New Zealand's transport opportunities include early introduction of electric vehicles, biomass-derived fuels, and advanced urban planning (e.g., walkable cities).

Separate programmes on biofuels (led by Scion) and hydrogen (led by CRL Energy) are designed to slot into EnergyScape.

The team are now developing EnergyScape further to help answer regional questions, such as 'how might Southland use its lignite (brown coal) resources in a low or zero emissions future?'

As EnergyScape project leader Rilke de Vos says "hopefully, this tool will stimulate people to visualise and debate alternative energy futures – this is what planning is all about."

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