New Zealand Biofuels Roadmap

Growing a biofuelled New Zealand

Large-scale biofuel production and its use within New Zealand can happen

scion
NZBiofuelsRoadmap

Informing and stimulating the debate

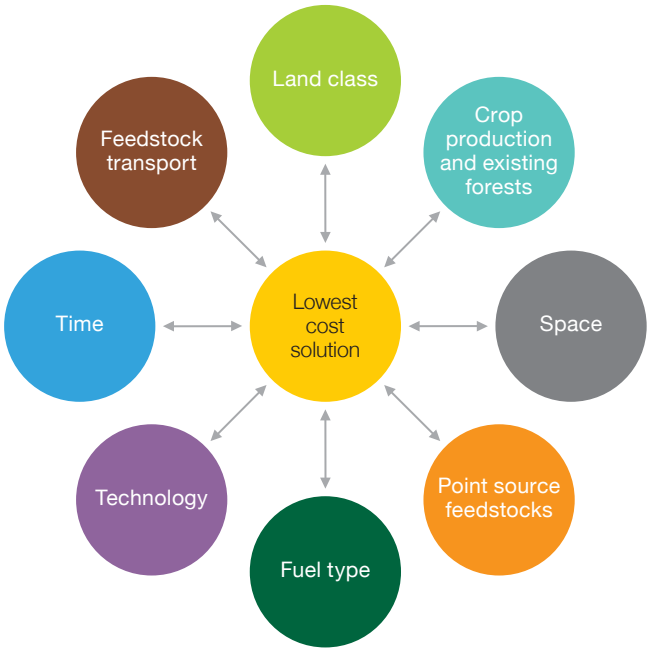
Scion carried out the Biofuels Roadmap study to inform and stimulate debate on the large-scale production and use of liquid biofuels in New Zealand.

A biofuelled future will:

- Reduce our greenhouse gas (GHG) emissions
- Help us meet our international GHG reduction commitments
- Rejuvenate regional economic and employment growth
- Make New Zealand less dependent on oil imports
- Maintain access to international markets for our goods and services

The Bioenergy Value Chain Model (BVCM)

The study looked at the entire value chain from where to grow a wide range of feedstock options, processing technologies, where to site them, and fuel mix.



The BVCM model[1], which was developed in the United Kingdom and modified for use in New Zealand, balances multiple considerations to find the lowest cost solutions for potential biofuelled futures.

Drop-in biofuels

Drop-in biofuels that can be used in current engines without modifying them are preferred for ease of distribution and use. Petrol will be needed for the foreseeable future although the growing use of electric vehicles for personal transport will decrease demand overtime. Diesel for heavy transport, marine oil for shipping, and fuel for aviation, all of which are energy-intensive and are hard to electrify, are sectors with long term need for biofuels.

Making biofuels

Pyrolysis – breaking feedstocks down with heat to produce a 'bio-oil' – followed by oil upgrading to produce drop-in petrol

[1] Licensed from the Energy Technologies Institute

and diesel was the technology option most often chosen by the model due to its low cost.

One possible future

How could New Zealand implement biofuel substitution at the relatively high level of 30% by 2050 using any combination of feedstocks, technologies and final product mix?

The BVCM predicts the lowest cost way to achieve this using all land classes would be to use canola seed, energy crops, existing and new forests and forest residues as the main feedstocks to produce drop-in petrol and diesel and biodiesel.

Using non-arable land only, the feedstocks would come from existing and new forests and forest residues to produce drop-in petrol and diesel.

The forests and energy crops would be grown mostly in Northland, the East Coast, the central North Island and Marlborough/Nelson. Processing would take place in same areas.

What would happen if 30% of the liquid fuels we use were made from plants grown on non-arable land by 2050?

We would reduce greenhouse gas emissions by 5 million tonnes per year, which is equivalent to taking half the cars in the country off the road.

We would be more energy independent cutting our oil imports by 30%.

Regional economies would grow as we plant feedstocks to turn into fuels at nearby processing plants.

Our goods and services would continue to have access to international markets.

With a forest the size of the Taranaki region, and processing as many logs onshore as we currently export, we could make 2.3 billion litres of liquid fuels annually. This is more than enough to meet all the South Island's needs for a year.

The way forward – making it happen

As a county, we need to talk! Are we serious about reducing GHG emissions, becoming more energy independent and growing regional economies? And which of the many options for a biofuelled economy would suit New Zealand's needs best? Which biofuels should we target; is it acceptable to use arable land and/or food crops for producing biofuels; which level of fuel substitution should we target and when we want to achieve this by?

A biofuelled future is unlikely to happen by itself. Leadership at a national level is needed – there has to be national commitment to do things right. The investment needed is large and stakeholder industries will need a degree of certainty when committing to feedstock and processing options, as well as taking ownership of delivering their parts of the value chain.

With the right will, Scion's study and the Bioenergy Value Chain Model, New Zealand can now explore different options and plan the way forward to a sustainable future.

Stakeholder support

This study has been carried out with multiple stakeholders from the future biofuels value chain, who provided invaluable input during workshops, interviews and webinars.

The authors of this report express their gratitude to the many stakeholders who generously contributed their time and expertise, including:

Air New Zealand

Bioenergy Association of New Zealand

Bio-Protection Research Centre, Lincoln University

Energy Efficiency and Conservation Authority

Forest Owners Association

Fulton Hogan

Interislander

KiwiRail

Lake Taupō Forest Management Ltd

Landcorp Farming Ltd

Ministry for Primary Industries

Ministry for the Environment

Ministry of Business, Innovation and Employment

Ministry of Transport

Motu Economic and Public Policy Research

National Energy Research Institute (NERI)

Norske Skog

NZ Post - Tukurau Aotearoa

Oji Fibre Solutions

Pure Advantage

Sustainable Business Network

Wood Processors and Manufacturers Association of New Zealand

Z Energy

The New Zealand Biofuels Roadmap Summary Report is available at www.scionresearch.com/nzbiofuelsroadmap

SCION
NZBiofuelsRoadmap

Contact: Dr Paul Bennett
Science Leader Clean Technologies
Email paul.bennett@scionresearch.com
Telephone +64 7 343 5601

February 2021