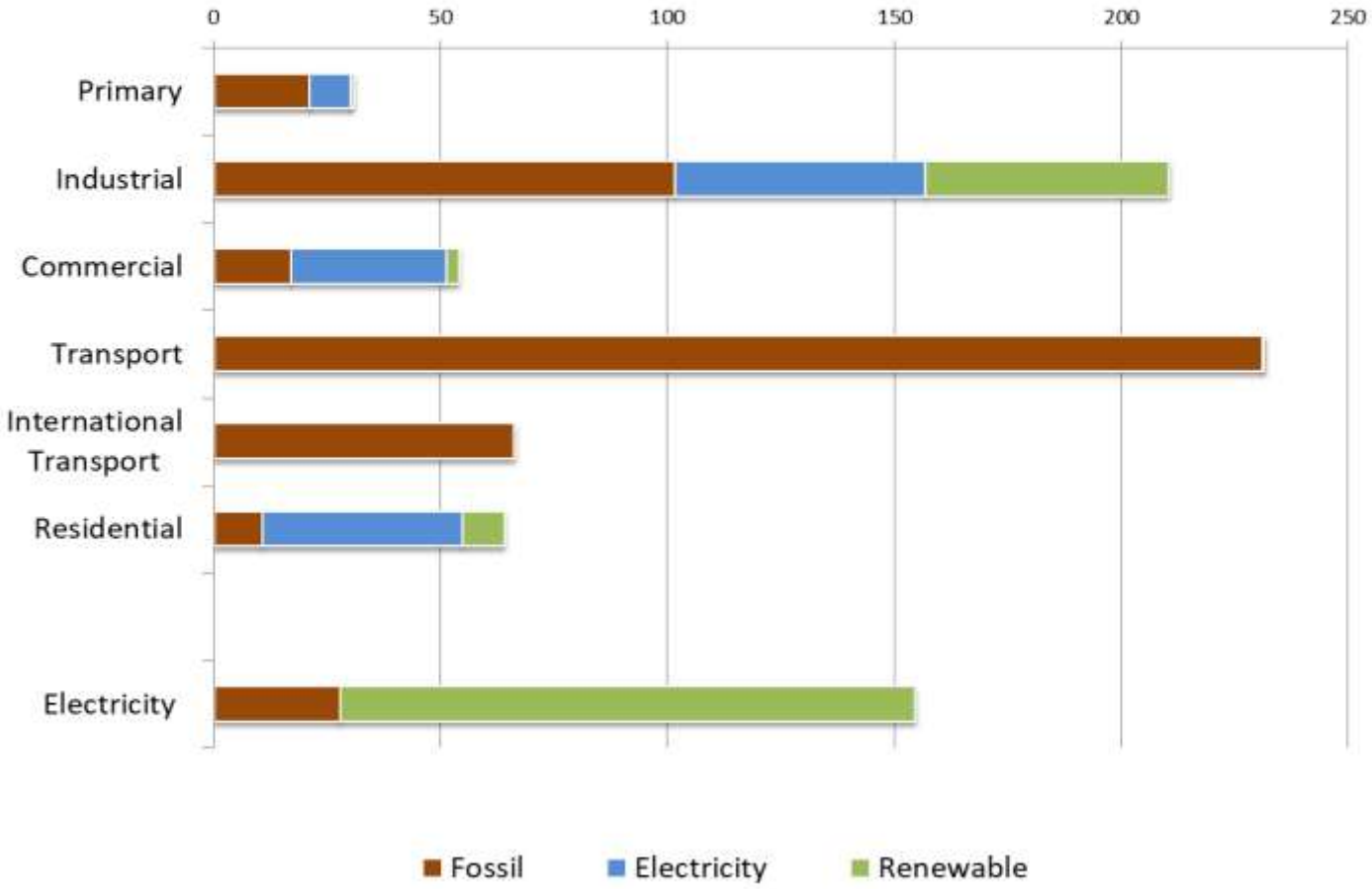
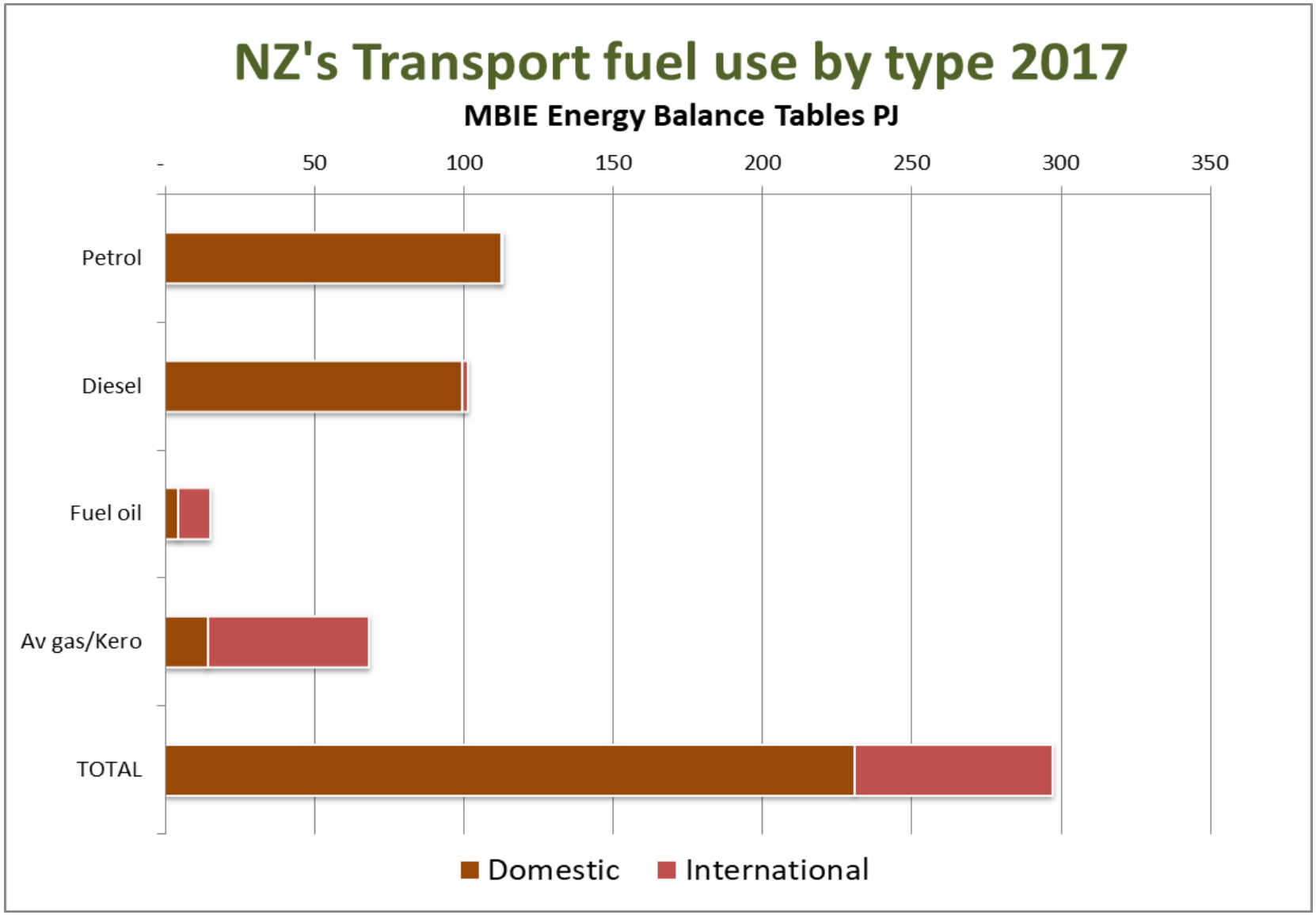
The low emission transport opportunities and constraints

Simon Arnold, Convener Liquid Biofuels Interest Group

Approximate NZ Energy Use by Sector 2017

MBIE Energy Balance Tables PJ




NZ's Transport fuel use by type 2017
MBIE Energy Balance Tables PJ
-
50
100
150
200
250
300
350
Petrol
Diesel
Fuel oil
Av gas/Kero
TOTAL
Domestic
International

GHG 2030: trends

- Short haul land
  - Demand flatish?
  - TAS => faster fleet turn over
  - EVs
- Long haul land
  - Logistics changing, ICT, last km, owner operators, EV charging/batteries getting better
  - Alternative fuel options?
- Marine
  - 2020 Sulphur cap – costs ↑
  - Long haul ships can consume anything, but cleaner fuel options emerging
- Aviation
  - Demand ↑, pressures on GHG ↑
    - but telepresence etc could ameliorate (or not)
  - High priced, tight spec fuel. Bio-Avgas entering market
  - Regional hybrid aircraft emerging, fuel 40% ↓

Biofuels: what we know

- Scion: NZ Biofuels Roadmap (2018)
- Some limitations in scope (but now have the tools):
  - Primarily focussed on the end game (i.e. 30% substitution by 2050)
    - Scenarios only
    - Further work on the short-term could help transitions
  - Focuses on drop in fuels
    - Limited on alcohols, gaseous fuels and clean synfuels
    - Also needs wider look beyond forest products to industrial chemicals/bio-refineries
      - Both as co-products and inputs to biomass upgrading
  - Our current resource base pushes to forestry
    - Need a deeper look at optimised energy crops
      - Crops, shorter rotation and land use, algae?
      - Assess fit with a billion trees and sequestration policies
  - Need to look at imports/exports and international competition
- Need to extend roadmap to these
  - incl. alternative vehicle options

Risks: Fossil fuel prices

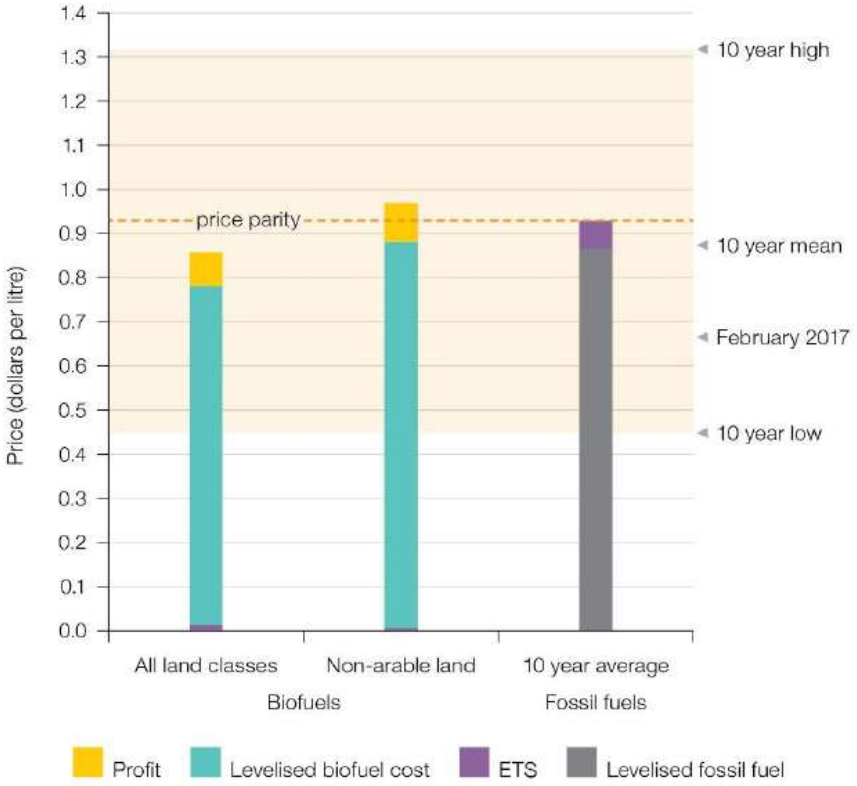
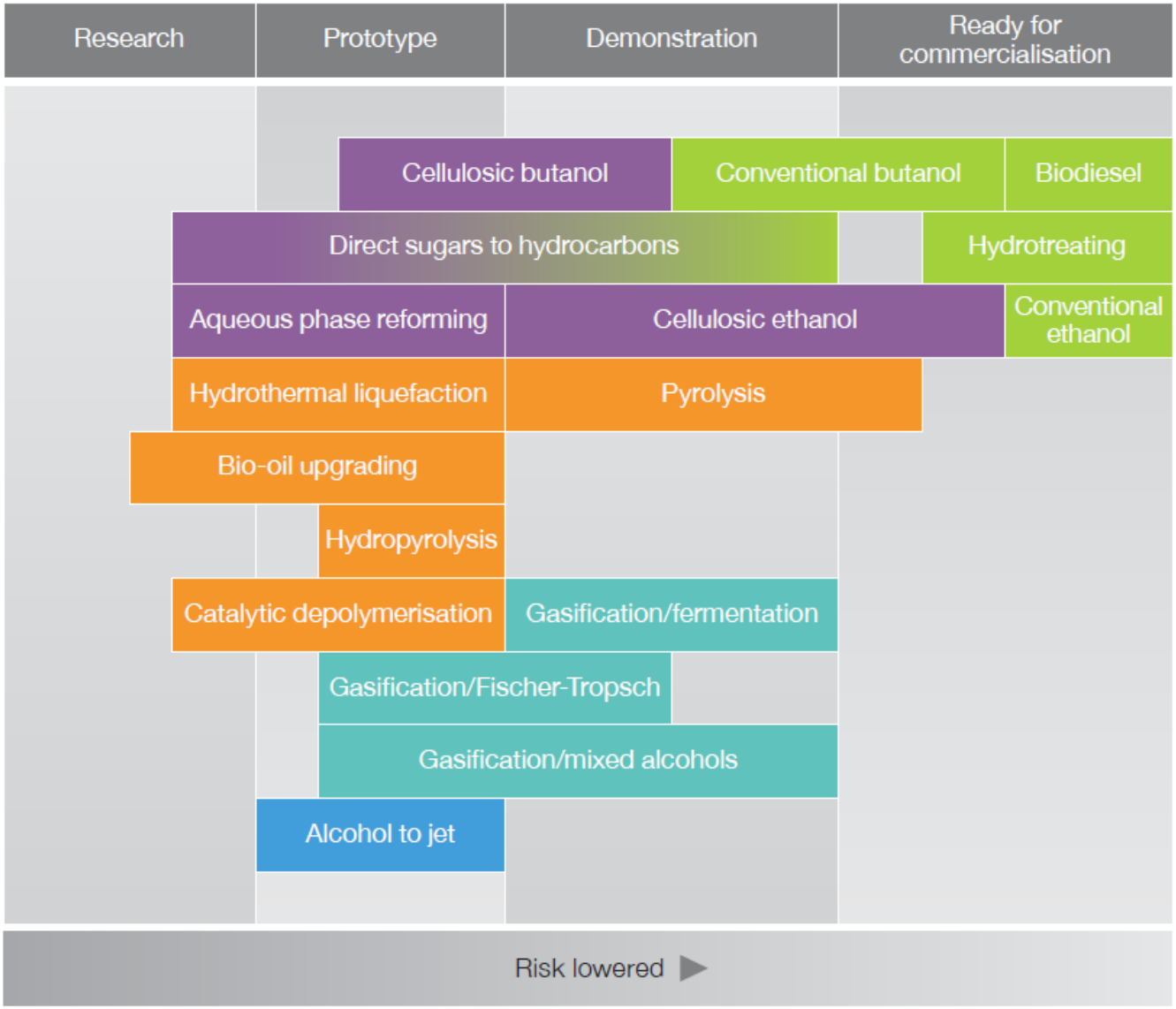


Figure 4.18: Comparison of levelised biofuel cost for the two 30% substitution scenarios against the levelised displaced fossil fuel costs.[84] The range for fossil petrol prices over the last 10 years is indicated for comparison.

- Range in fuel prices > ETS of NZ$300/t CO_2-e

Risk: Technologies



Source: International Renewable Energy Agency 2016

Risk: Feedstock/Land use

- Early opportunities require arable land (e.g. Canola, Sugar Beet)
- Using only non-arable land to produce 30% of 2015 use by 2050 would require:
  - forest the size of the Taranaki region, and
  - processing as many logs onshore as we currently export
- Significant lead times for some crops

Risks: Other

- Significant up-front investment, uncertain returns
  - Incl. infrastructure
- Industry coordination and timing
  - right along the supply chain
- Significant regional social, economic and environmental changes

BAU

- Only driver ETS, so the only investments will be in low cost feedstocks (residuals and by-products)

Table 5.4: Maximum potential of residuals and by-products.

	Amount produced (thousand odt/yr, 2015)	Substitution potential (% of total 2015 liquid fuel demand)
Tallow	178	2.2
Municipal solid waste	2358	0.7
Wood waste	229	0.8
Forest residues	1,240	4.5
Total		**8.2**

- But everyone will be looking to use this
- Might substitute 1% by 2030, barrel price dependent
- EV uptake etc will reduce demand

Transition

- No real policies supporting moves to address long haul transport fuels
  - Some even work against them e.g. EV promotion and Paris chasing
- Without any change the transition will be through sequestration
  - Unclear if this is the most efficient use of land or the most cost effective strategy, and
  - In the end we'll still need something more permanent

Transformation

- Credible large-scale biofuels production and pathway scenarios exist for NZ
  - E.g. Scion Roadmap 30% of 2015 by 2050.
- Role of fuel imports (and exports) significant
- Need to even better understand options and de-risk attractive ones (e.g. R&D)
- Encourage short-term experimentation with niche opportunities (e.g. GIF)
- Progressively under-write investments in a selected portfolio of options incl. infrastructure
  - E.g. a billion trees vs. shorter rotation energy crops

Options example

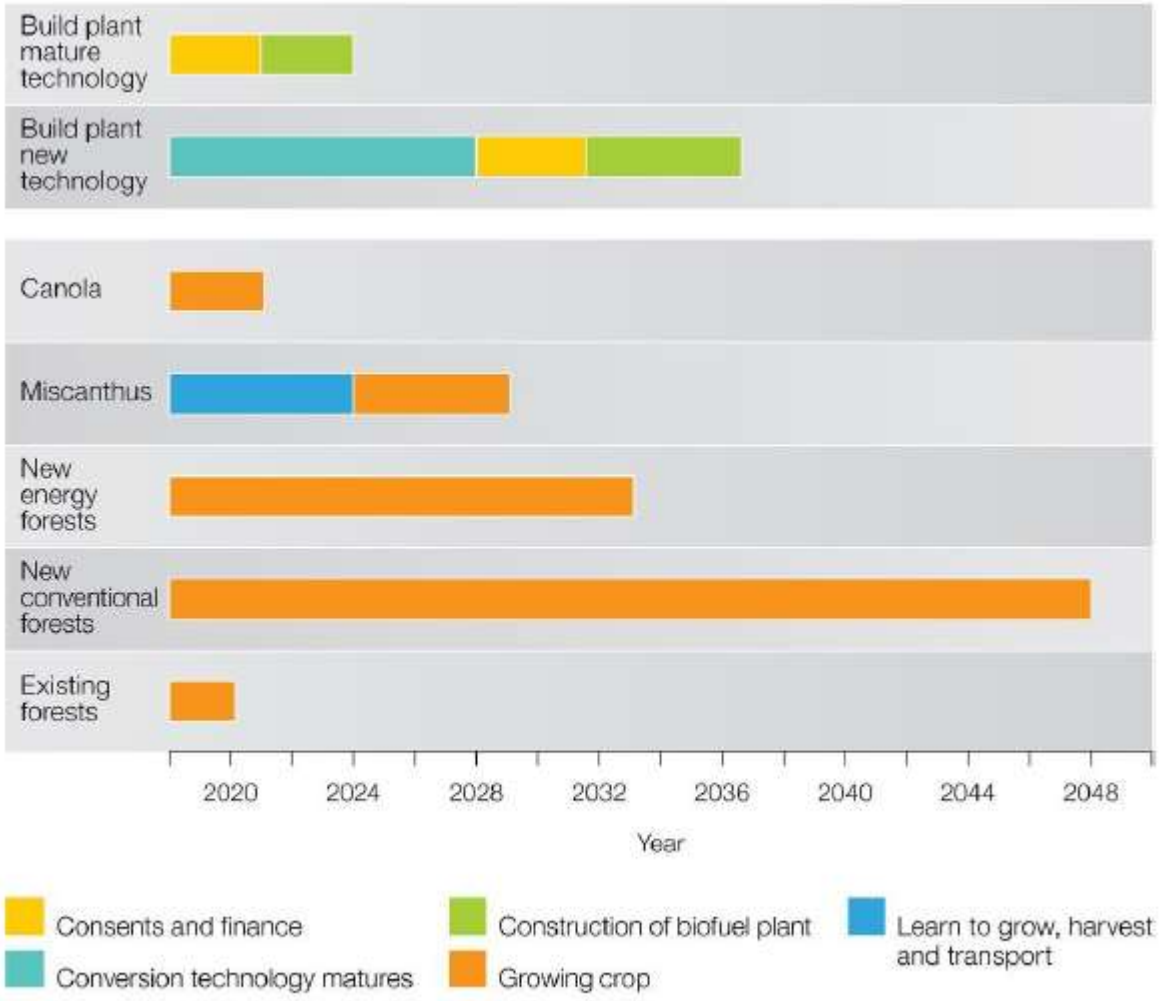


Figure 6.2: The impact of timing on biofuel implementation, assuming we start now.