



TRANSPOWER

Te Mauri Hiko

Energy Futures

**GAS NZ FORUM
WELLINGTON 8 NOVEMBER 2018**

DR STEPHEN JAY GM GRID DEVELOPMENT

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Transpower White Paper 2018

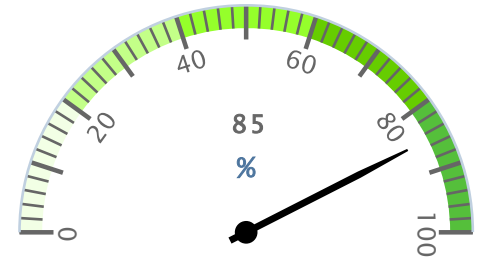
NEW ZEALAND HAS AN OPPORTUNITY AND A CHALLENGE

- **The future of energy in New Zealand will be transformed in the next 30 years**
- **To the benefit of our economy and our environment**
- **There will be significant challenges along the way**
- **Success will depend on planning, innovation and the flexibility and ability of engineers to innovate**
- **The ability to lead the transformation of New Zealand's energy sector is a once in a generation opportunity**



WHY WE BELIEVE A TRANSFORMATION IS COMING

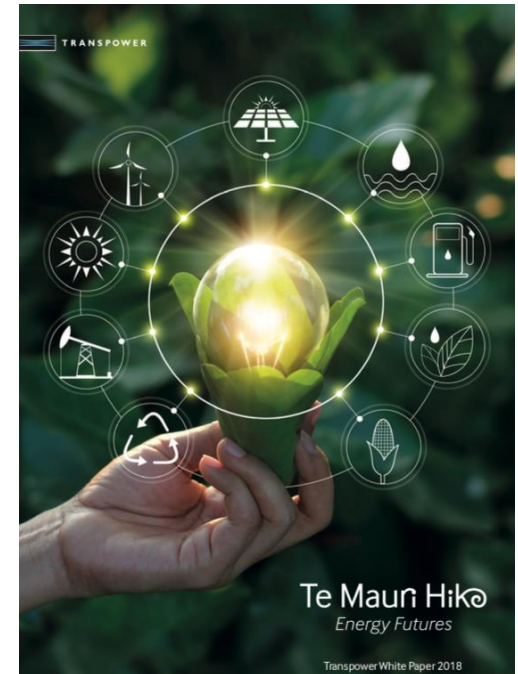
- **New Zealand has extensive renewable generation options, geothermal and hydro as well as wind and solar**
- **The electricity sector is already 85% renewable. In contrast most of our energy use in transport is met by fossil fuels**
- **The future of energy in New Zealand can be transformed by large scale electrification**
- **Impact of electrification is a doubling of electricity demand by 2050**
- **Increasing consensus and confidence around the shape of the electricity sector out to 2050.**



% Renewables Generating

FUTURE DEMAND AND SUPPLY SCENARIOS

- Our base case for 2050 is supported by three main supply and demand scenarios
- We evaluated global drivers, the flow through impacts on technology and economic growth
- We assessed the implications for New Zealand including electrification to help meet climate change goals
- We considered different generation mixes to meet this energy demand.



THE BASE CASE SCENARIO

Demand

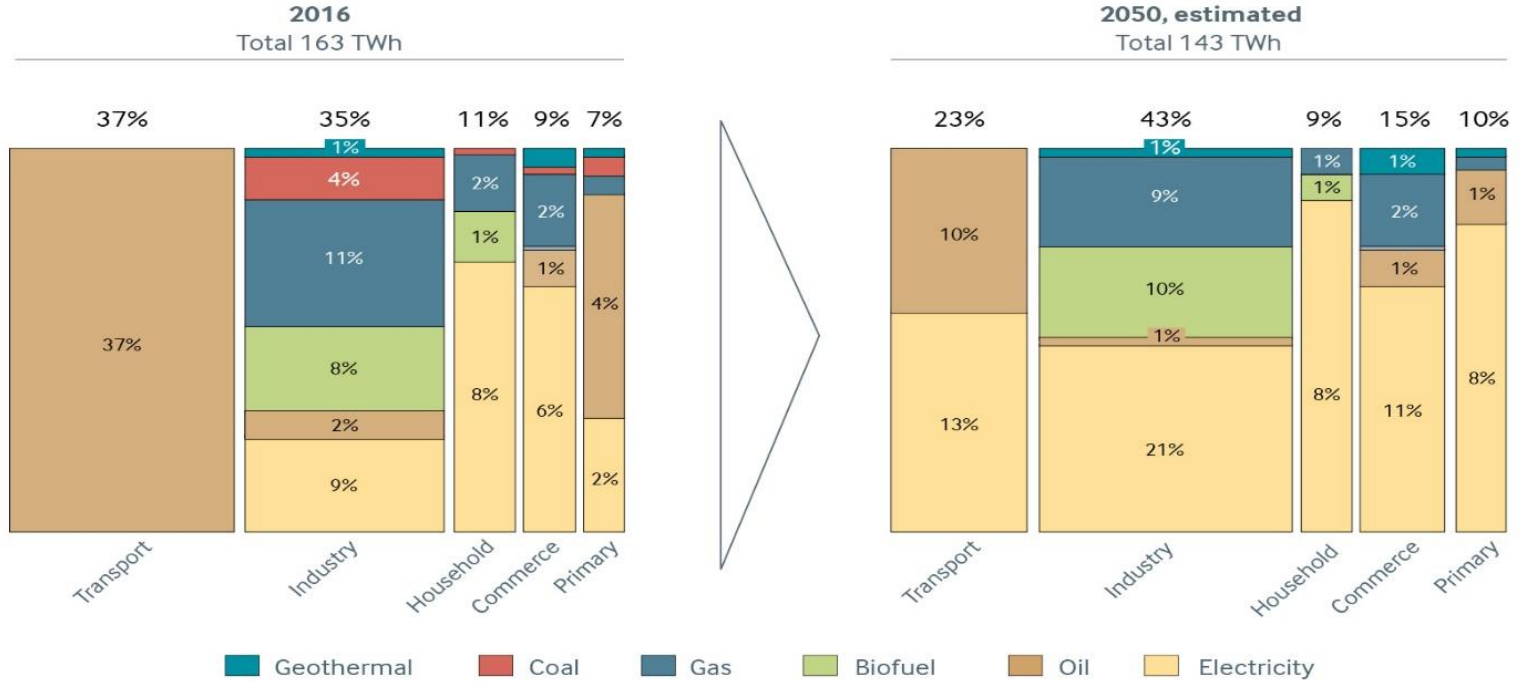
	Disruptv. climate change* avoided?	World remains integrated?	Future tech adopted?	High-level Story
NZ Inc	✓	✓	✓	A bright global situation with future technology but more climate change impacts. NZ takes a strong stance towards meeting climate change commitments and encourages industry development.

Supply base

	Amount of dist'd solar?	Peakers retired?	Main source of new util. gen?*	High-level Story
Clean NZ	Medium	Yes	Wind	A continuation of current trends which sees a large increase in distributed solar generation, the eventual retirement of our coal and gas peakers, and new utility geo and wind being provisioned to meet demand growth

WHAT WILL DRIVE THE TRANSFORMATION?

Exhibit 8: Estimated delivered energy demand share by type and sector



LITERALLY DRIVING THE TRANSFORMATION

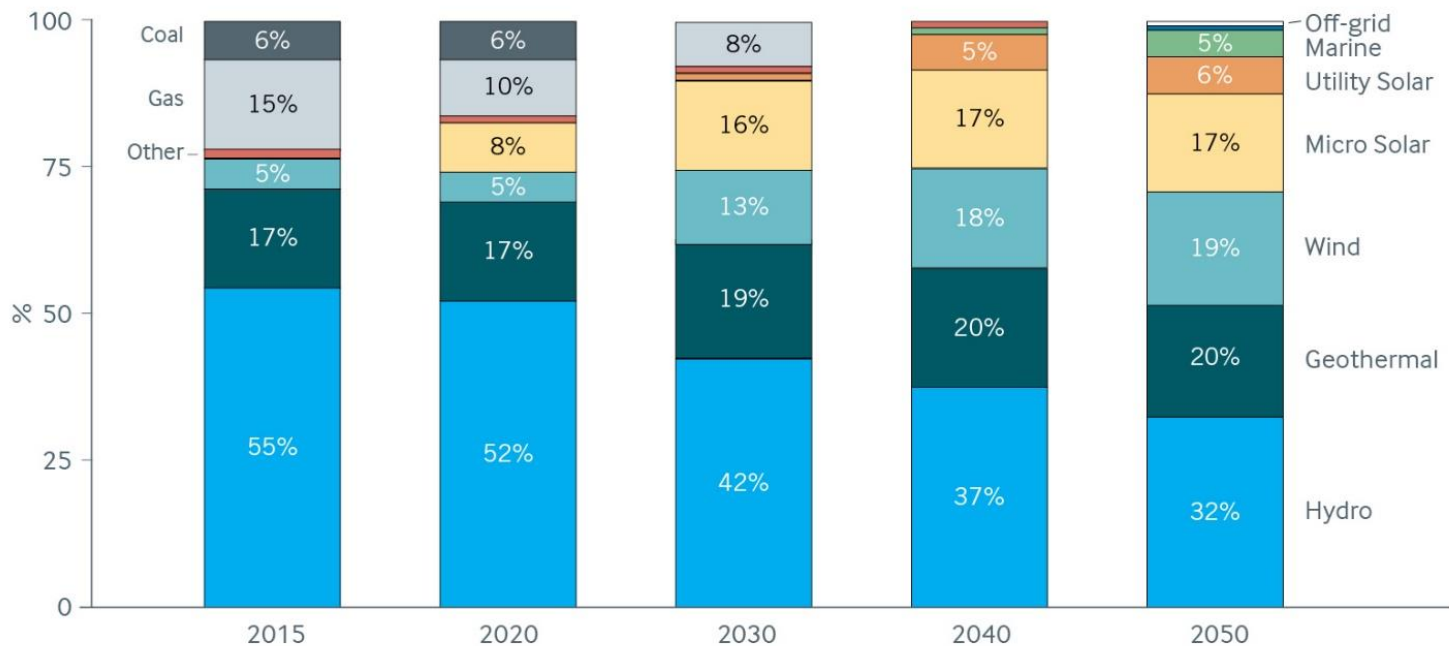
Exhibit 7: Estimated delivered energy demand by sector and type – 2016 to 2050



Note: Overall energy reduction is the result of electrical energy more efficiently converting into transportation and heating; Coal and biofuels not modelled closely.

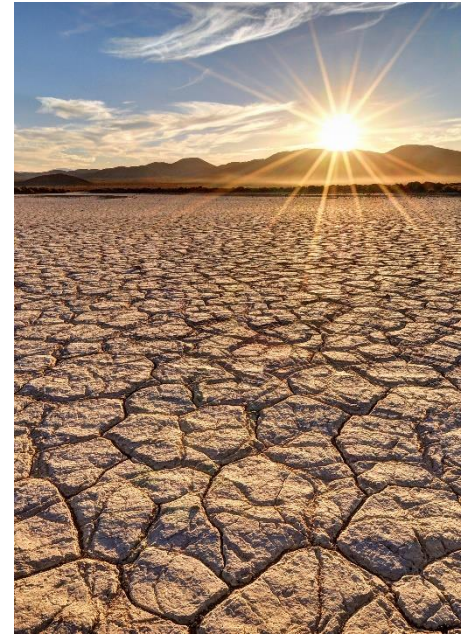
THE SHAPE OF OUR INDUSTRY IN 2050

Exhibit 11: Composition of New Zealand's electricity supply portfolio by generation type – 2015 to 2050



CHANGING GENERATION AND DEMAND MIX CREATES CHALLENGES

- **A greater reliance on variable and intermittent generation in the absence of thermal base load**
- **Distributed generation impacts on transmission and distribution network load profiles**
- **Summer energy surplus and winter energy deficit from a reliance on of solar PV and dependence on limited hydro storage**
- **Electrification targets only likely to be achieved supply is reliable – can this be achieved with 100% renewables?**



INVESTMENT, POLICY, INNOVATION WILL BE CRITICAL

Exhibit 16: Estimated additional connection requirements by 2050

Generation type	Installed capacity (MW)	Avg. MW/project	Number of projects
Wind	4670	126	37
Hydro	798	40	20
Geothermal	1455	73	20
Marine	1000	100	10
Utility solar	1370	152	9
Total	9293	97	96

WHAT IS NEEDED FOR A SUSTAINABLE ENERGY FUTURE

1. UTILITY INVESTORS MUST BE PREPARED TO DEPLOY RENEWABLE GENERATION.
2. HOUSEHOLDS AND BUSINESSES MUST BE PREPARED TO CONTRIBUTE AS SOURCES FOR DISTRIBUTED GENERATION AND STORAGE
3. PRICING POLICIES AND SIGNALS MUST ENCOURAGE RENEWABLE ENERGY SUPPLY GROWTH
4. NEW ZEALAND MUST FIND A SOLUTION TO THE GROWING WINTER AND DRY-YEAR SUPPLY DEFICITS
5. NETWORKS MUST EVOLVE TO HANDLE GREATER DEMAND AND MANAGE GROWING COMPLEXITY IN THE POWER SYSTEM
6. SKILLED PEOPLE MUST BE TRAINED AND RETAINED TO DELIVER THE FUTURE ELECTRICITY SYSTEM
7. A COLLABORATIVE, STAGED APPROACH MUST BE TAKEN TO REALISE THE MOST EFFICIENT MOVE TO A OVERALL SUSTAINABLE ENERGY FUTURE BASED ON A RENEWABLE AND RELIABLE ELECTRICITY SUPPLY

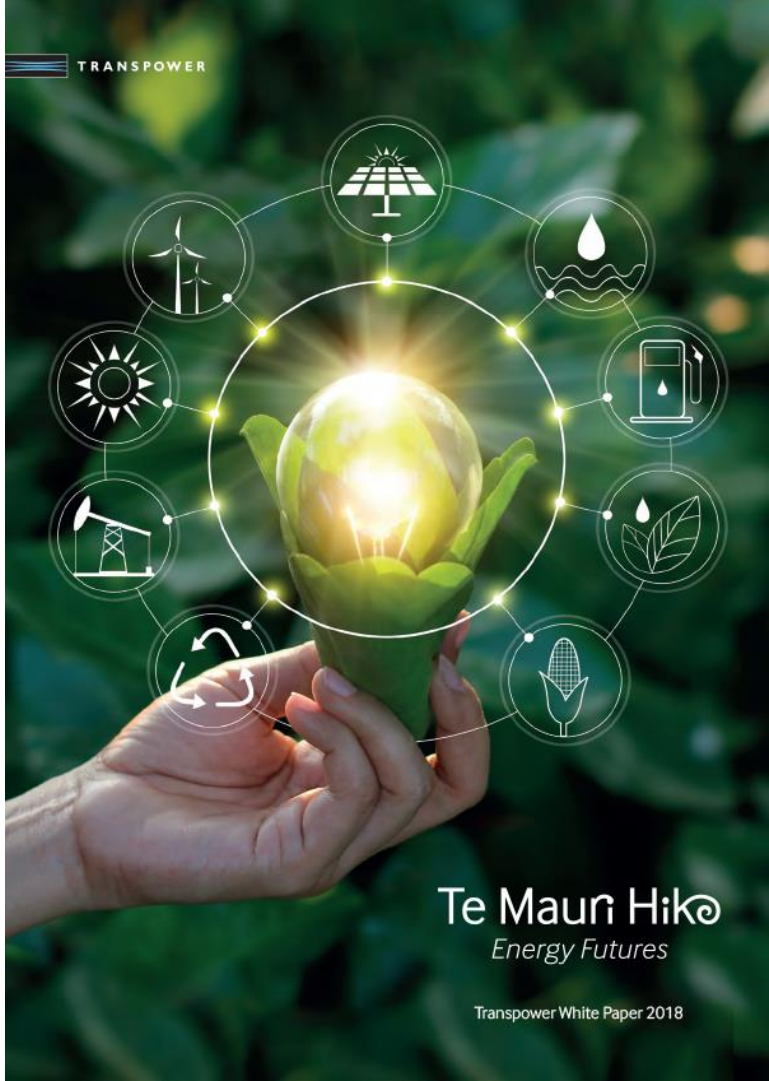


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