

Regardless of our methods, the goals are the same: to see the future as multiple possibilities rather than one predetermined outcome; to identify what you do and don't know; to ask yourself, which choice gets you the best odds?

Charles Duhigg (from "Smarter, Better, Faster")

BEC2050 Energy Scenarios

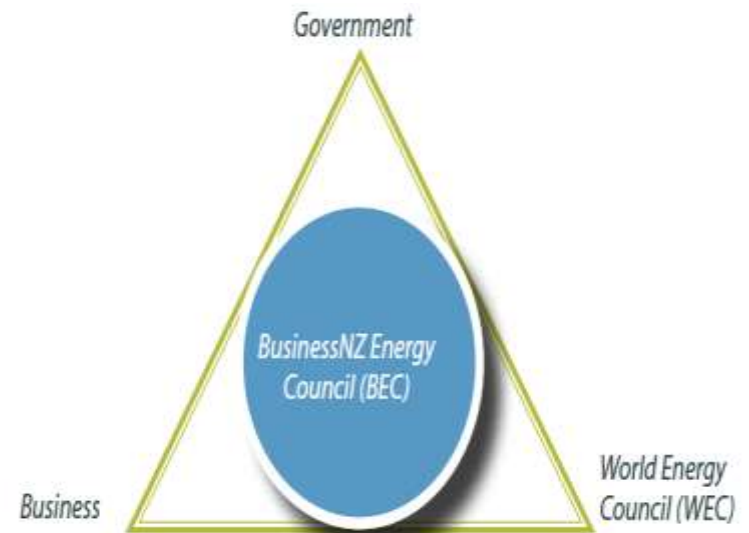
Navigating New Zealand's Energy Future

Outline

- introduce the BusinessNZ Energy Council and the World Energy Council
- overview of the BEC2050 Energy Scenarios Project
 - why we did it
 - the approach we took
 - what we were trying to achieve
- some key results
- some reflections
- extending the BEC2050 work
 - 'deep-dives'
 - BEC2060

The BusinessNZ Energy Council

- the BusinessNZ Energy Council ('BEC'):
 - is a group of New Zealand organisations taking on a leading role in creating a sustainable energy future for New Zealand
 - brings together business, Government and academia
 - is the New Zealand Member Committee of the World Energy Council

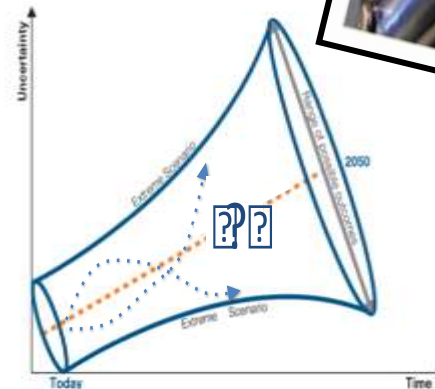


Scenarios – why?

- scenarios are stories of the future
- scenarios help us to:
 - tell more impartial stories of the future (liberate bias)
 - make areas of uncertainty transparent
 - be explicit about what drivers we can and can't control
 - road test policy and investment decisions under different worlds (trade-offs)
- and, with judicious use of modelling, we can quantify this, and bring it out of the “too hard basket”
- **this builds resilience into our future decisions**

World Energy Council scenarios study

- two scenarios “Jazz” and “Symphony” developed bottom up – input from national member committees – that are:
 - *plausible* – not a prediction, but a believable scenario
 - *distinct* – to succeed, the narratives have to be different
 - *coherent* – the narratives have to hang together as a whole



BEC 2050 scenarios study

- 18 month project, launched in November 2015
- 21 investors from across the energy sector, academia and government
- two NZ-specific versions of WEC's scenarios, quantified with WEC's model
 - Kayak (market-led)
 - Waka (government-led)
- <http://www.bec.org.nz/projects/bec2050>

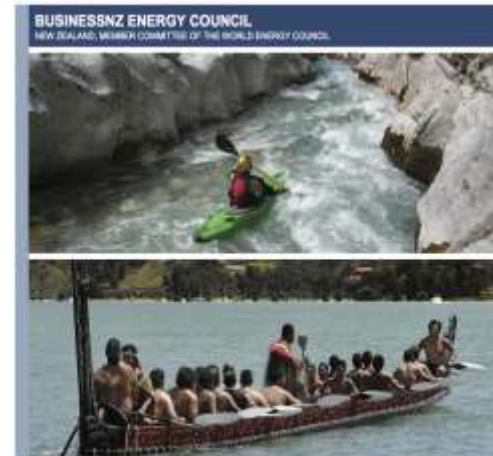


New Zealand Energy Scenarios

Navigating energy futures to 2050

Project Partners

Paul Scherrer Institute (Switzerland)
PricewaterhouseCoopers (New Zealand)
Sapere Research Group

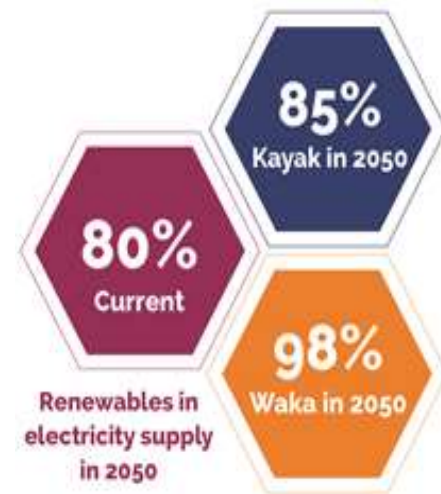


New Zealand scenario quantification

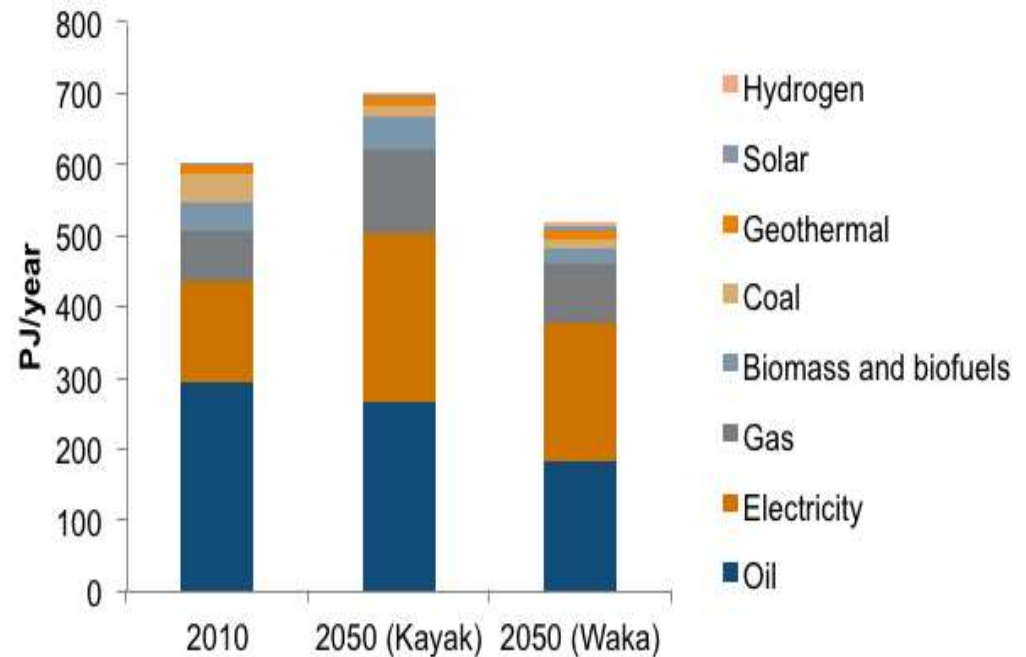
	KAYAK	WAKA
Population growth	Higher (immigration)	Lower
GDP/capita	Higher	Lower
Carbon agreements	Limited Prices (2050): NZD60/tCO ₂ -e	Stronger Prices (2050): NZD115/tCO ₂ -e
Resources	EDGS Lower cost of gas exploration Coal-to-liquids without CCS not allowed	EDGS Global exploration costs
Technology Support	None	Biofuels subsidy of 20% “Facilitation” of hydro Energy efficiency policies
Consumption behaviour	Price-based	Reduced light fleet vehicle use

BEC2050 insights

- heavy interplay of electricity, renewables, transport, emissions reductions
 - further emissions reductions in electricity possible, but.....
 - transport can leverage renewable electricity and achieve significant emissions reductions
 - relativity of oil, electricity price, carbon price and technology (battery, solar) costs crucial
- but it's more than just EVs....



Overall energy demand down?



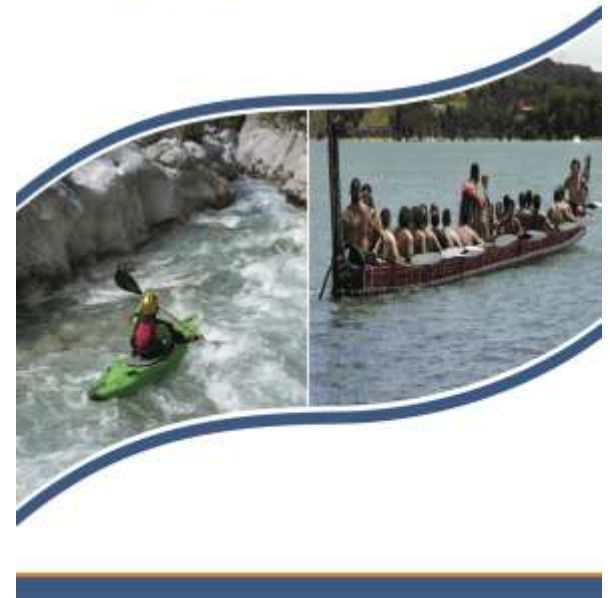
What did BEC2050 achieve?

- a robust framework for thinking about future energy system uncertainty
- trusted modelling, that has been vetted by industry, academia and government
- a platform and common vocabulary on which the industry and policy-makers can now discuss and share views about the future

BEC2050 'deep-dives'

- BEC2050 project produced incredible richness of data and understanding
- we can demonstrate the relevance of the framework and results through focusing on specific "hot topics"
- the first was the Government's 2030 energy targets for New Zealand:
 - energy intensity/productivity
 - renewables in energy
 - renewables in electricity
- <http://www.bec.org.nz/projects/deep-dive-energy-targets/>

BEC 2050: A deep dive into 2030 energy targets for New Zealand



New Zealand in 2030

KAYAK



WAKA



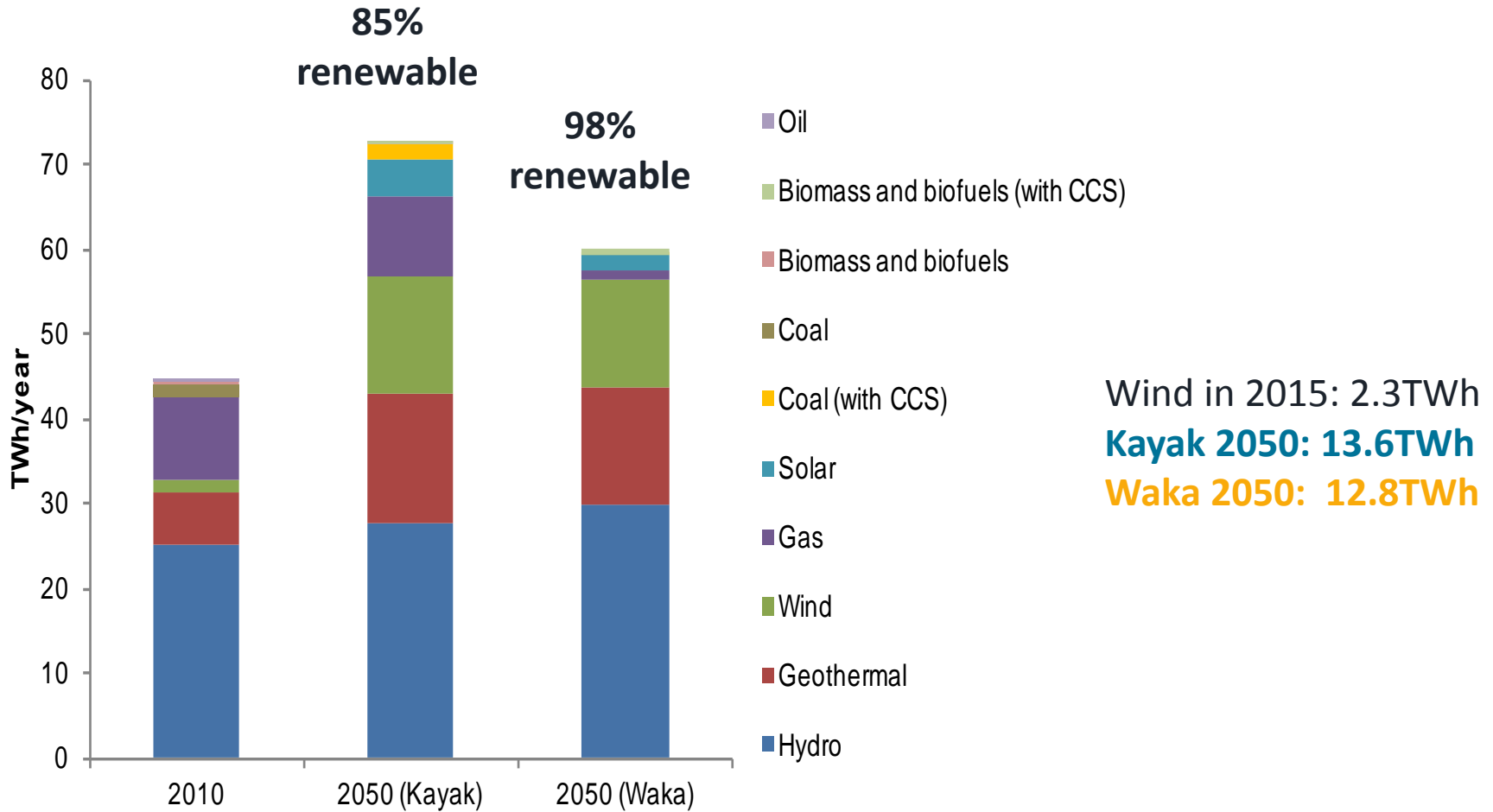
...LEADING TO ANNUAL ENERGY DEMAND CHANGES OF...



WORLD
ENERGY
COUNCIL

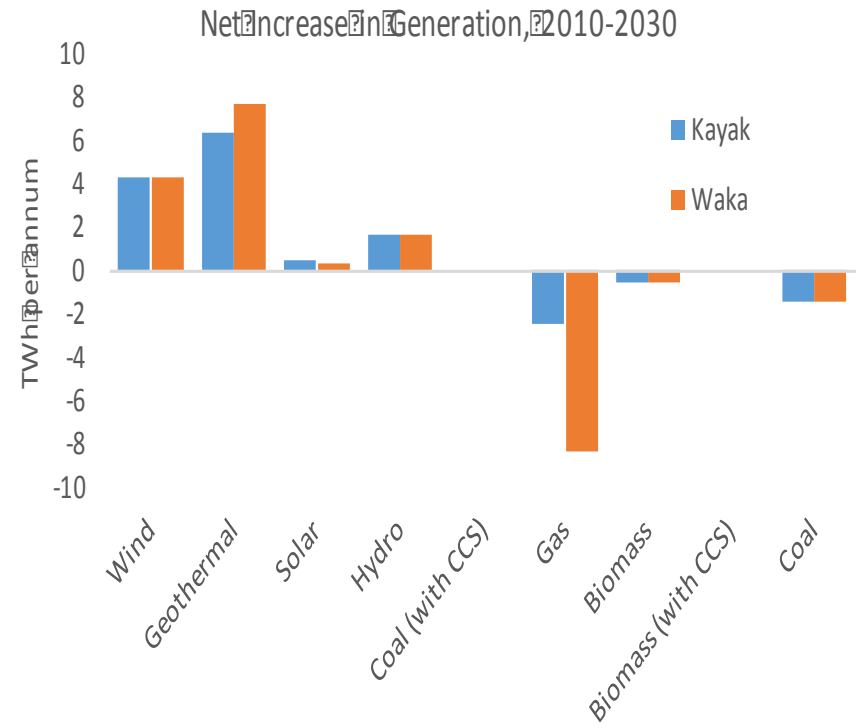
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Energy Council

The renewable transition



Wind, a key player

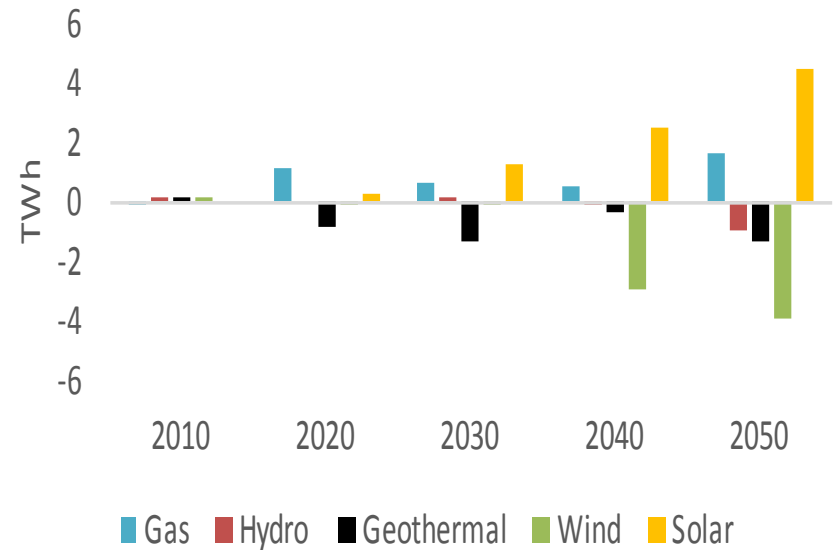
- Wind and geothermal are the primary supporters of a 12-14TWh increase in renewables to 2030
- This includes a >\$2b investment in wind alone
- Stronger demand in Kayak sees gas retained (renewable share: 85%), while weak demand in Waka has wind offsetting gas (98% renewables)



Costs, Intermittency

- Lower wind (or solar) costs highlighted a tradeoff at higher renewable penetration:
 - In later years (2030+) wind, solar and geothermal costs are all within 20% of each other, and are competing for the marginal MW of investment
 - But if wind and/or solar “win”, there is a feedback loop – greater intermittency requires flexible gas (once hydro is exhausted)
 - => hard to increase % renewables with lower wind costs alone

Change in production with 20% lower solar costs, Waka scenario



Targets under Kayak and Waka

Energy Productivity



\$0.37/MJ
TODAY



\$0.45/MJ
in 2030



\$0.49/MJ
in 2030

Greater improvements in intensity under Waka; combination of efficiency, reduced transport demand and slowed industrial activity

Proportion of renewables in electricity



80%
TODAY



86%
2030



97%
2030

Huntly closes in both scenarios; gas remains prominent in Kayak but contracts to security role in Waka. Renewable investment in geothermal and wind

Proportion of renewables in energy



40%
TODAY



46%
2030



55%
2030

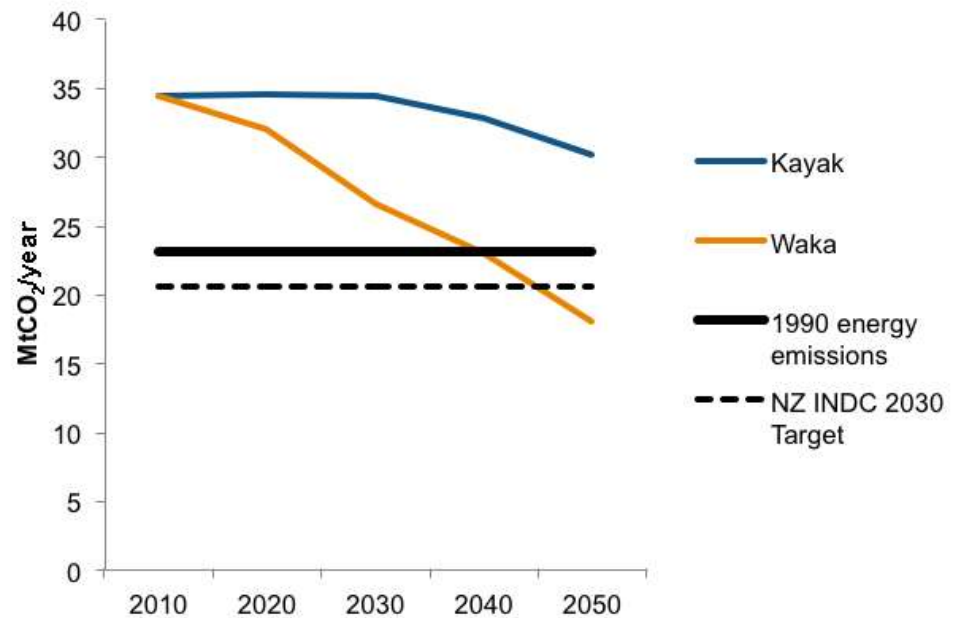
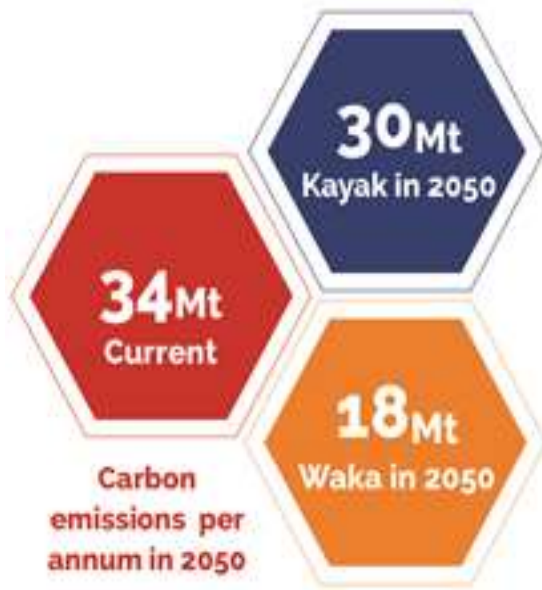
Increase under Kayak, but Waka sees additional electricity effect, plus dramatic reduction oil (transport), gas (electricity, heat) and coal (heat)

Insights/Questions

- **Energy productivity:** While Waka improvements look attractive...how will this happen? Will a high CO₂ price drive out intensive businesses? Should policy chase efficiency or structural change?
- **Renewables in Energy:** EVs are important, but high penetration must be supported by behaviour change. And why no bio-energy (fuels or biomass for heat)? What are we missing here?
- **Renewables in Electricity:** Kayak is within our grasp under current market design. Waka...what's the role of thermal, and how does that work commercially?



BEC2050 emissions 'deep-dive'



What next: BEC2060

- WEC released new scenarios report out to 2060
- three scenarios
 - Modern Jazz - a 'digitally disrupted,' innovative, and market-driven world
 - Unfinished Symphony - a world in which more 'intelligent' and sustainable economic growth models emerge as the world drives to a low carbon future
 - Hard Rock - a more fragmented scenario which explores the consequences of weaker and unsustainable economic growth with inward-looking policies





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Thank you

John Carnegie
jcarnegie@businessnz.org.nz

<http://www.bec.org.nz>

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