

# BEC2050 Energy Scenarios

Informing New Zealand Energy Future

BusinessNZ  
Energy Council



Member of the  
World Energy Council



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NZWEA Conference  
Wellington

1 April 2015



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# Outline

- introduce the BusinessNZ Energy Council and the World Energy Council
- outline the World Energy Council scenarios
- summarise the BEC2050 Energy Scenarios Project
  - why we are doing it
  - what are we trying to achieve
- provide early insights



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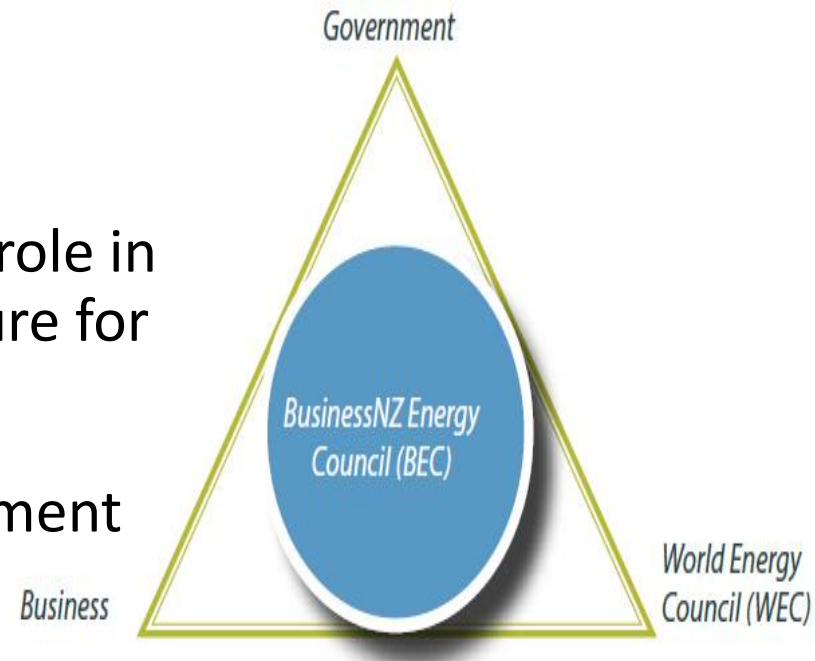


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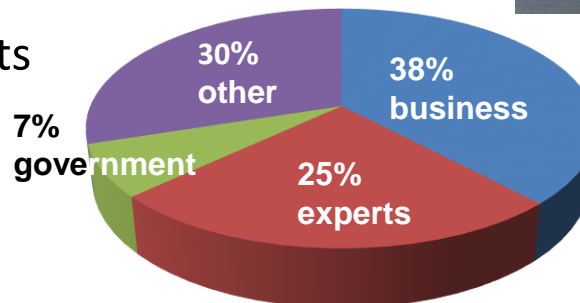
# The BusinessNZ Energy Council

- 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



# The World Energy Council (WEC)

- the principal international network of energy leaders and practitioners
- promoting an affordable, stable, and environmentally sustainable energy system for all since 1923
- UN accredited
- truly global
  - 90+ country member committees
- inclusive and impartial
  - OECD & non-OECD
  - 3000+ member organisations from governments, industry, academia, & NGOs
- Informs global, regional, national strategies
  - authoritative studies
  - high-level network & events



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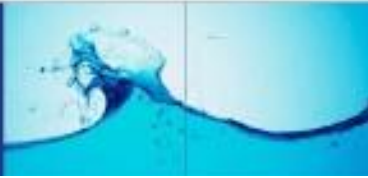


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# WEC Analytical Insights

World Energy  
Insight 2013

Official Publication of the  
World Energy Council  
to mark the 50th World Energy  
Congress, Chicago, June



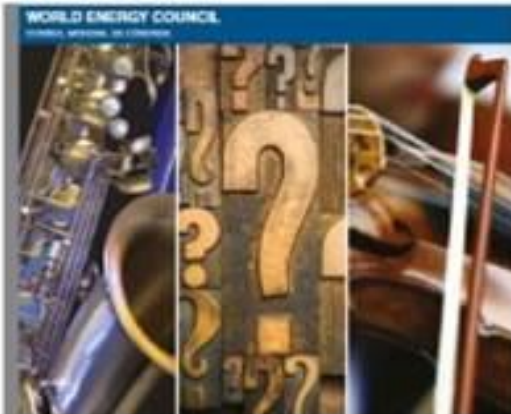
## World Energy Resources

2013 Survey Summary

## World Energy Scenarios

Composing energy futures to 2050

Project Partner Paul Scherrer Institute (PSI, Switzerland)



## World Energy Perspective

Energy Efficiency Policies – What works and what does not

Key messages

## World Energy Perspective

Cost of Energy Technologies

## World Energy Trilemma

Time to get real – the agenda for change

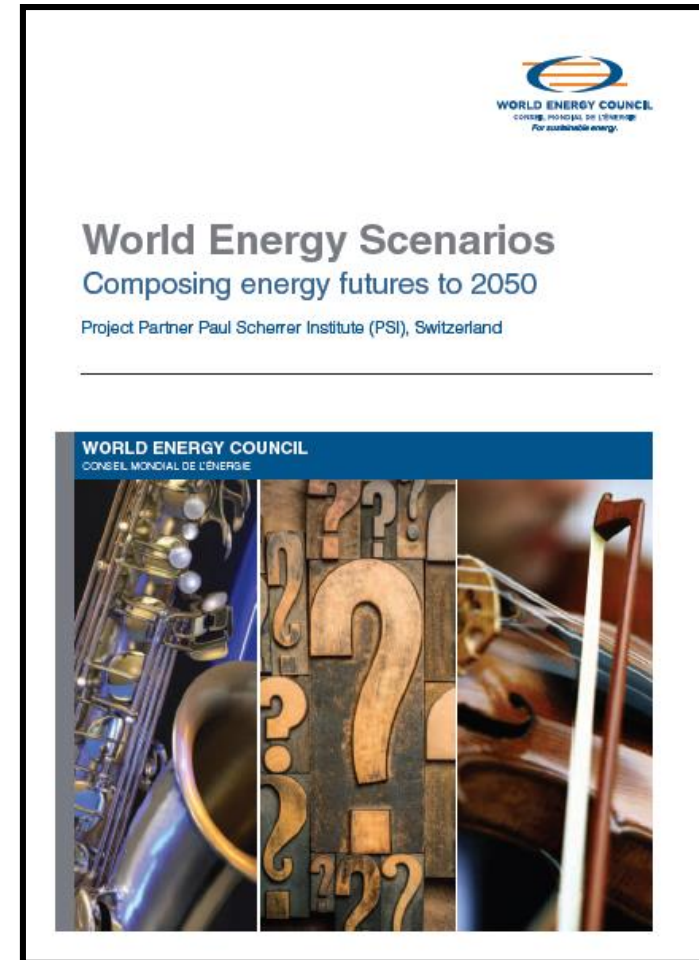
Project Partner GLOBE Institute





# WEC's Scenarios Study

- two scenarios designed to help a range of stakeholders address the
  - increasing sector uncertainty and complexity
  - 'energy trilemma' – of achieving environmental sustainability, energy security and energy equity
- bottom up – input from national member committees



# The WEC Scenario Outlines

- two scenario stories

- **Jazz:**

Market & trade based, consumer driven, focussed on access and affordability, achieving growth through low cost energy, Governments facilitate GHG actions by businesses

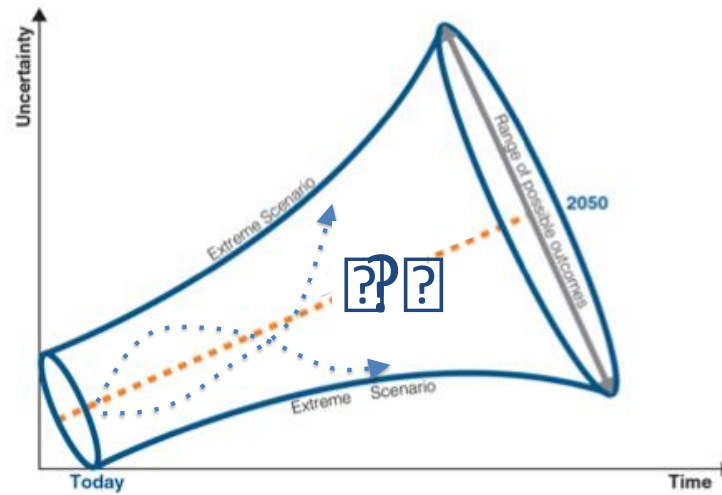
- *Symphony:*

Government led “orchestrated”, voter driven, focussed on environmental goals and energy security, national and regional measures to increase share of renewables in energy mix, binding international agreement on GHG emissions



# The WEC Approach

- the WEC approach was to develop two scenarios that are at the same time
  - *plausible* – not a prediction, but a believable scenario
  - *distinct* – to succeed, the narratives have to be different
  - *coherent* – the narratives have to hang together





# BEC2050: Unique Characteristics

- the BEC2050 scenarios are:
  - explorative (what might be), rather than normative (what ought to be)
  - not forecasts
  - based on what's actually happening in the real world and the range of relevant critical uncertainties
- being able to test policy and investment choices against different potential states of the world is more insightful than a single-point prediction of the future



# BEC2050: the Project Opportunity

- saw benefits of applying the Jazz and Symphony scenario framework in New Zealand
  - using WEC scenarios to grow domestic understanding
  - scenarios can be a powerful business tool.
- the novelty of WEC/BEC approach
  - an ability to integrate unique New Zealand scenarios into global model
  - to explore the critical uncertainties that we face in New Zealand's energy future

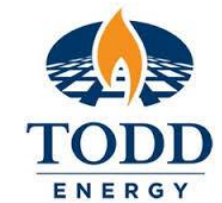


# BEC2050 Energy Scenarios Project Sponsors

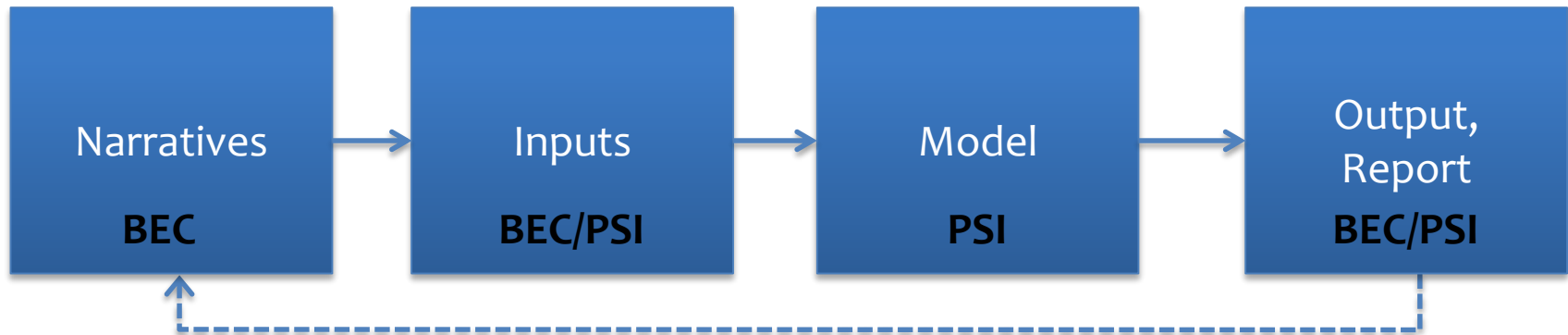
## PLATINUM SPONSORS



## GOLD SPONSORS



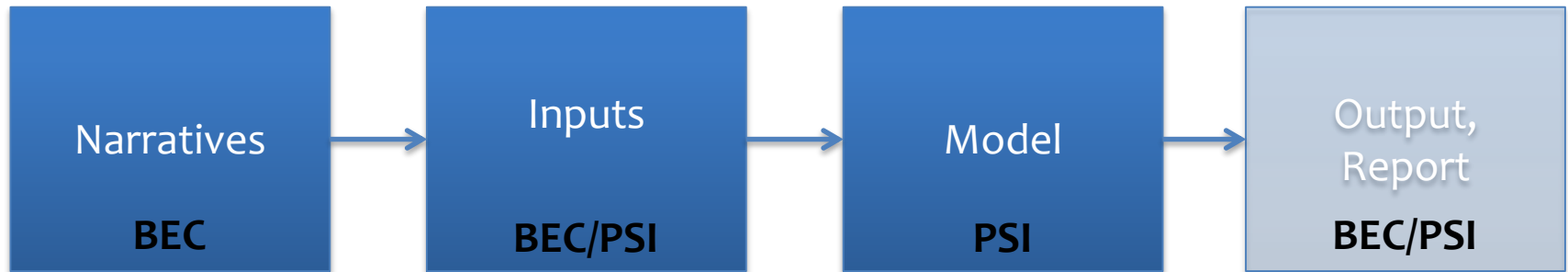
# Overview of Approach



- created two narratives, unique to NZ, via workshops
  - Narrative 1 » NZ in a “rest-of-world Jazz”
  - Narrative 2 » NZ in a “rest-of-world Symphony”
- need to satisfy consistency check (“boundary conditions”) in each
  - some inputs are determined for us (e.g. global trade of oil, most technology costs, carbon price)



# Overview of Approach [cont]



- modelling undertaken by Paul Scherrer Institute (PSI)
- model used is the Global Multiregional MARKAL model (GMM)





# Modelling: GMM

- developed by the IEA in the 1970s; widely used
- “fundamental” model (no prices, just costs and quantities)
- full energy sector model (transport, heat, electricity)
- global integration (energy trade)



# Modelling Approach

- need to balance
  - international factors (technology and trade) with
  - uniquely Kiwi resources, costs and behaviours
- hugely complex model
  - two cracks at the modelling
  - “steady as she goes”; initial modelling run had gentle assumptions



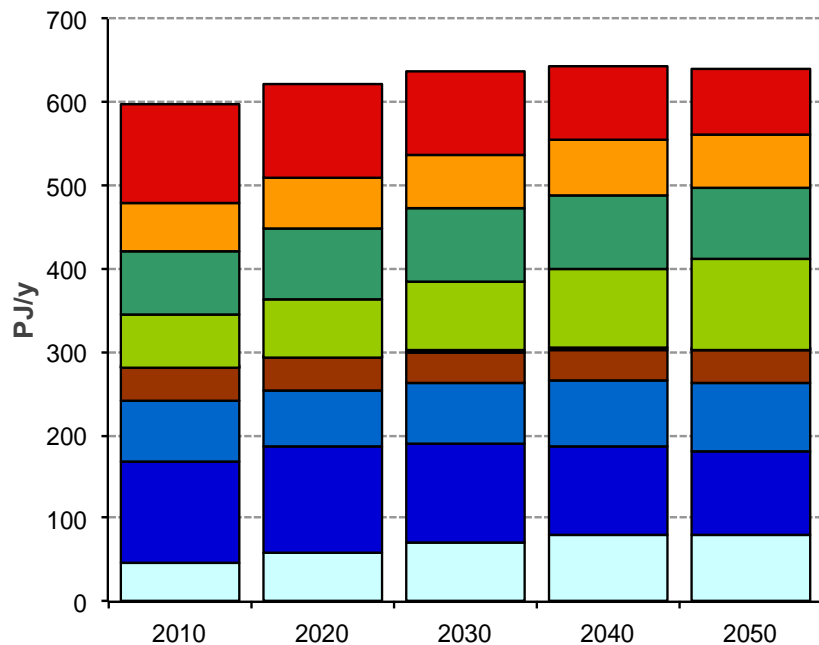
# NZ Scenario Quantification - #1

	RoW Jazz	RoW Symphony
<b>NZ Philosophy</b>	Price based, market driven	Higher government co-ordination invited
<b>Population</b>	<b>Higher</b>	<b>Lower</b>
<b>GDP</b>	<b>Higher</b>	<b>Lower</b>
<b>Energy Intensity</b>	<b>Declining slower</b>	<b>Declining faster</b>
<b>Carbon agreements</b>	<b>Limited</b> Prices (2050): 23-38 USD/tCO <sub>2</sub> -e	<b>Stronger</b> Prices (2050): 75-80 USD/tCO <sub>2</sub> -e
<b>Resources</b>	EDGS	EDGS
<b>Technology Support</b>	None	Biofuels subsidy of 20%

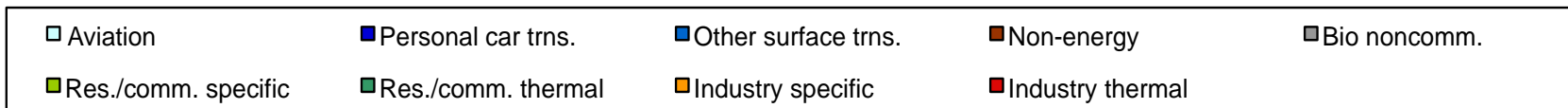
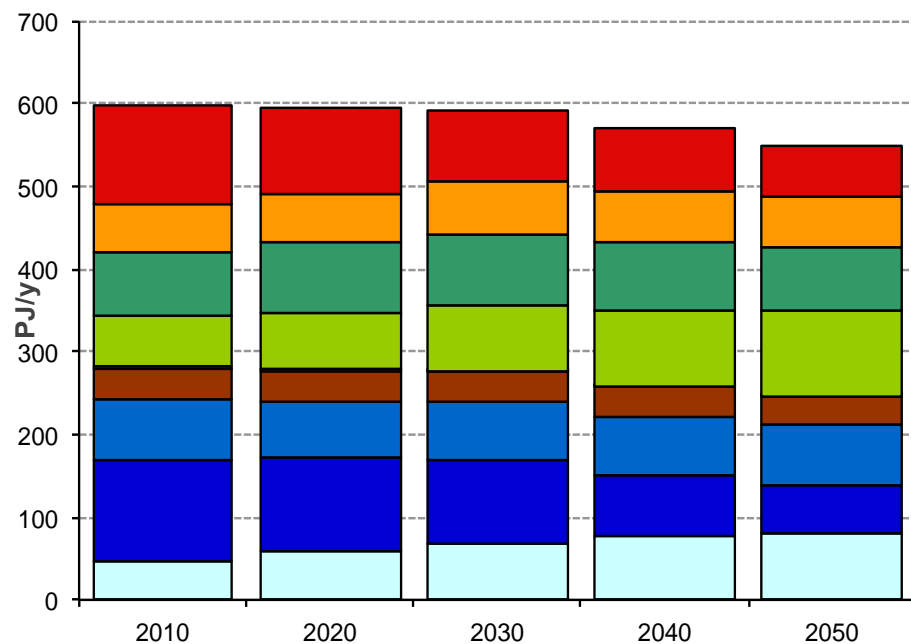


# Total Fuel Consumption

RoW Jazz



RoW Symphony



*Demand Growth (CAGR):*

- 0.16% in RoW Jazz
- -0.21% in RoW Symphony

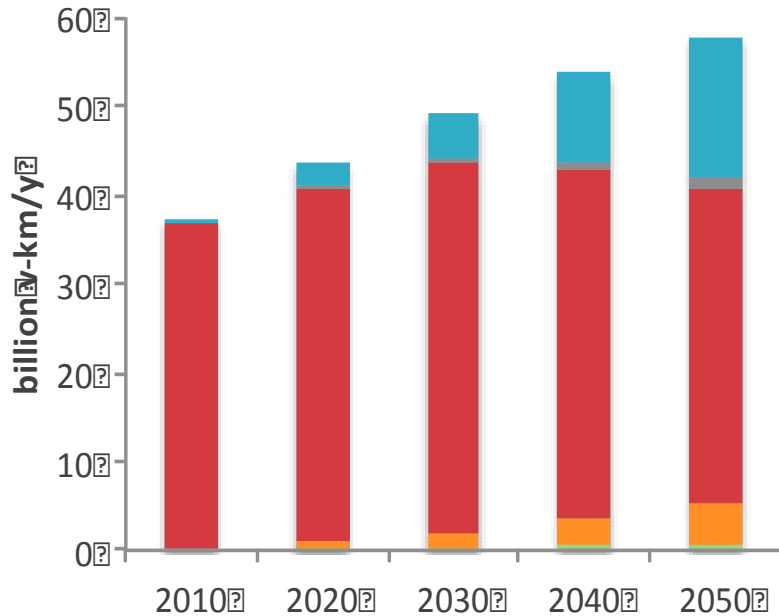


# Transport Fleet

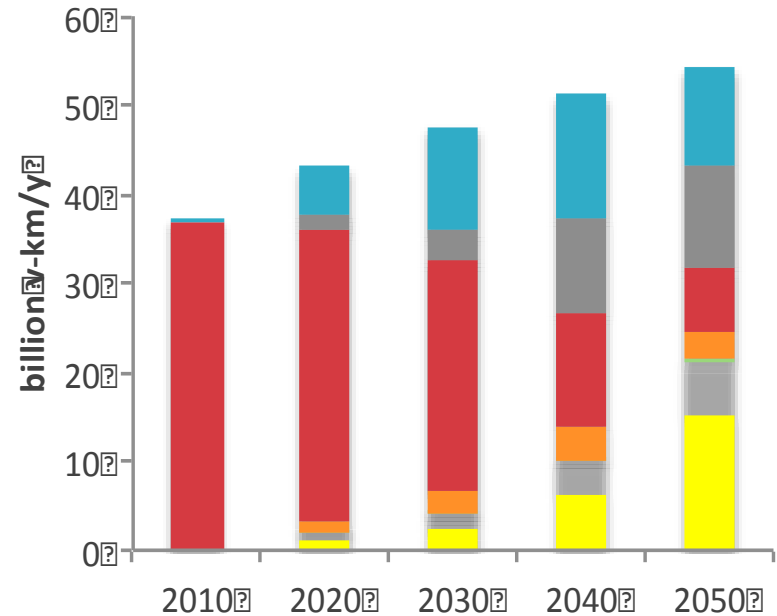
*Non-plug-in hybrids are strong contenders in both scenarios*

*Hydrogen, gas, and electric vehicles all in the mix*

## RoW Jazz



## RoW Symphony



■ Electric Vehicle    
 ■ Hydrogen Fuel Cell    
 ■ Hydrogen Hybrid    
 ■ Gas Fuel Hybrid  
■ Liquid Fuel ICEV    
 ■ Liquid Fuel Plug-in    
■ Liquid Fuel Hybrid



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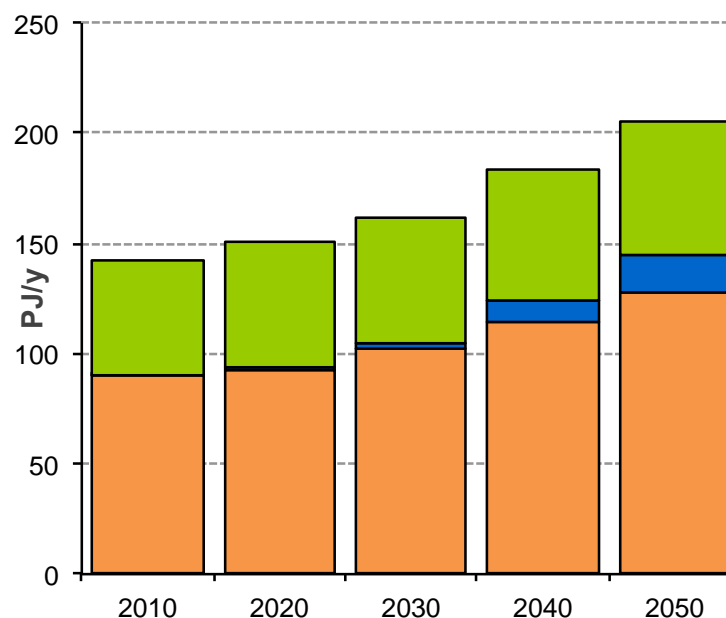
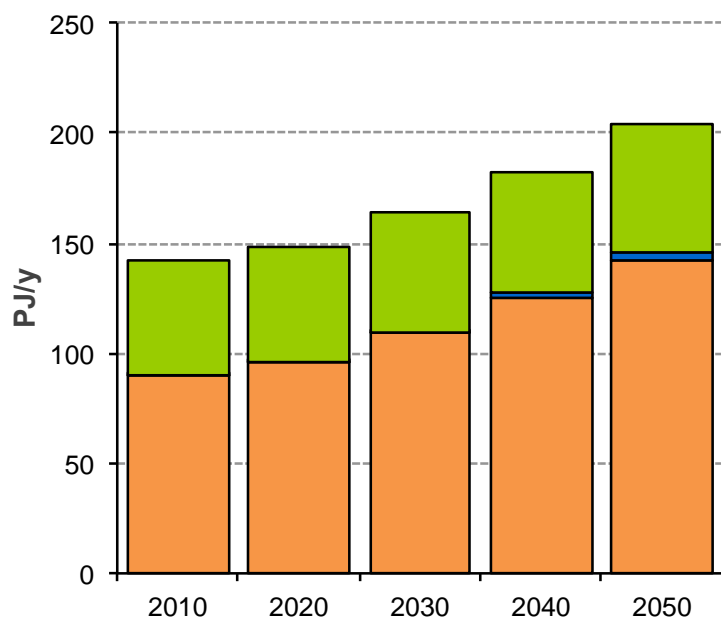
# Electricity Consumption

*Consumption trajectories remarkably similar in both scenarios*

*Flatter residential commercial demand, but higher transport*

RoW Jazz

RoW Symphony



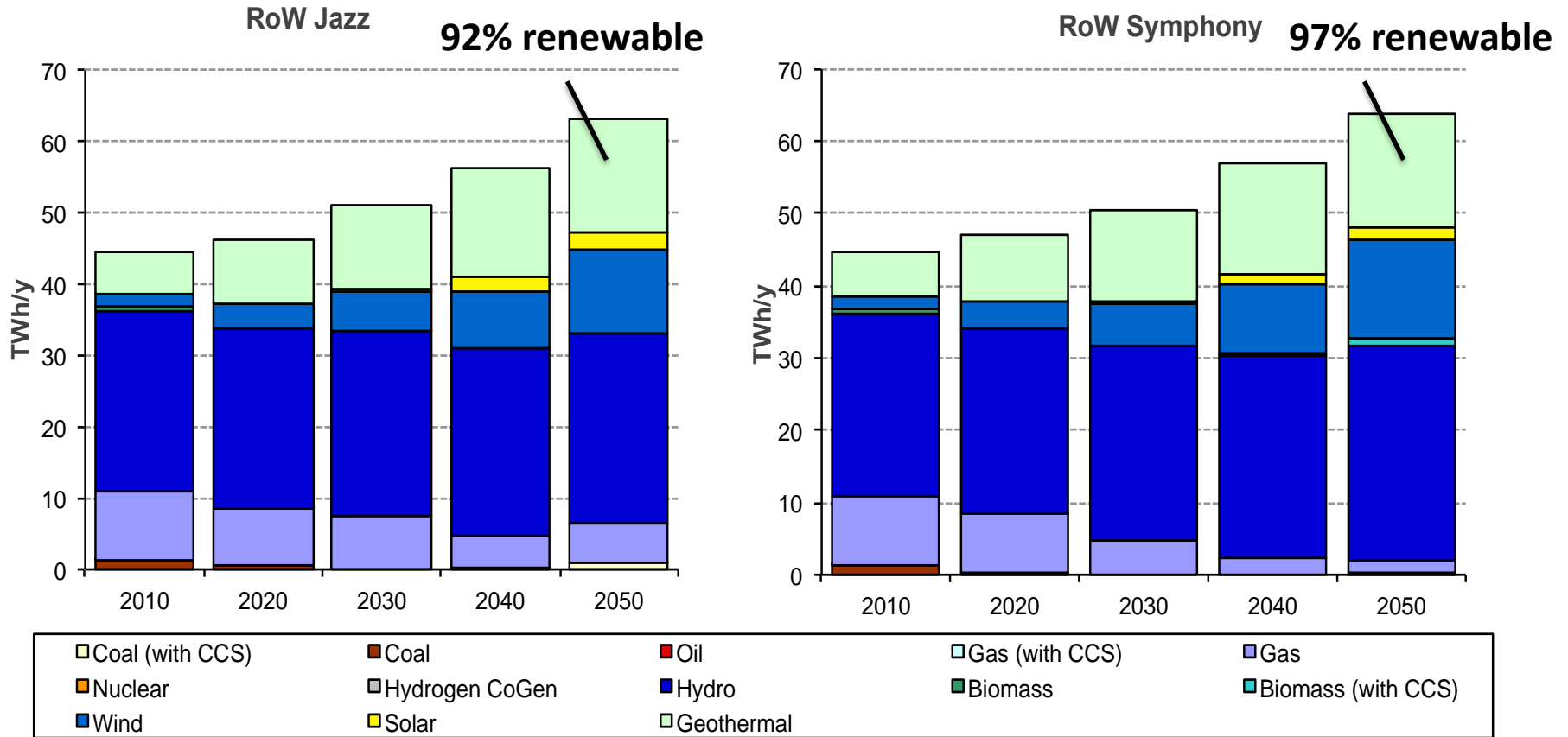
■ Res./Comm. 
 ■ Transport 
 ■ Industry

*Demand Growth (CAGR):*

- *0.9% in RoW Jazz*
- *0.9% in RoW Symphony*



# Electricity Supply



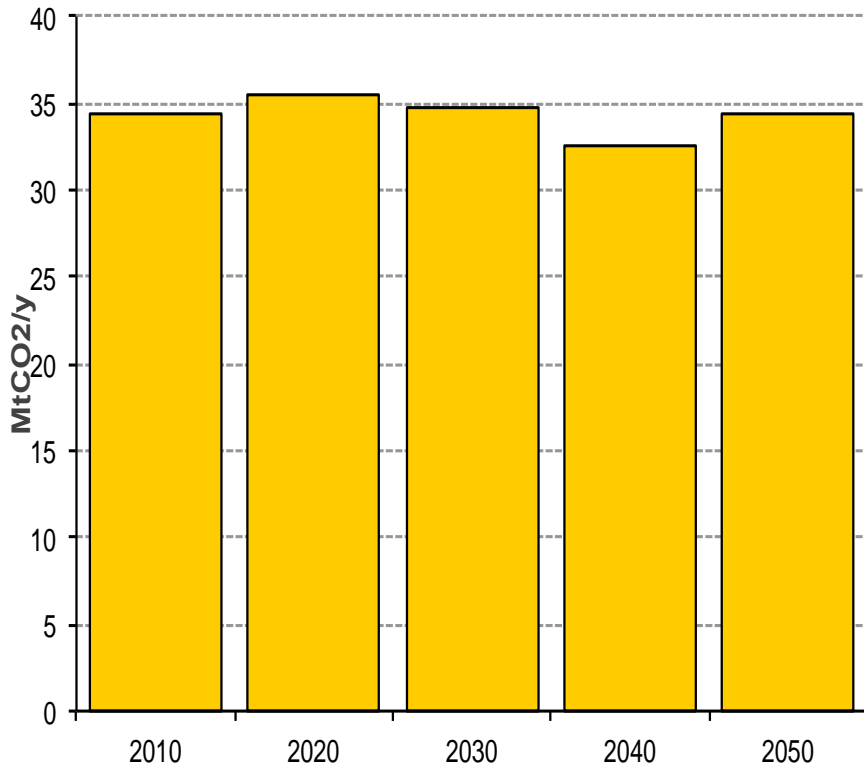
## 90% Renewables:

- By 2040 in Jazz
- By 2030 in Symphony

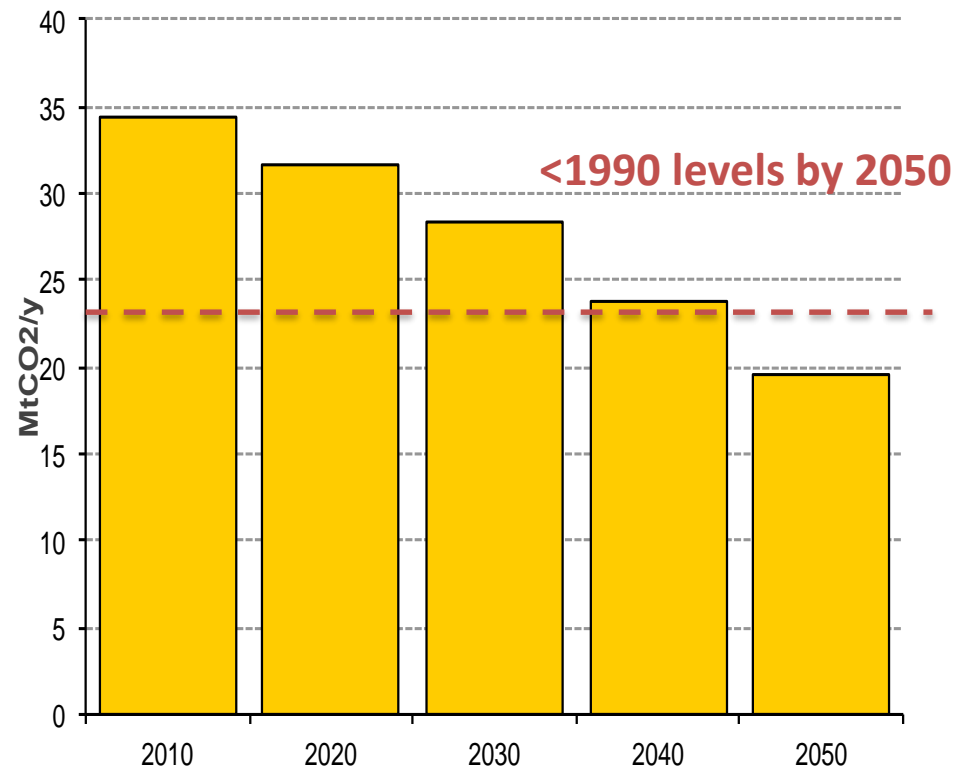


# Gross Energy Sector Emissions

RoW Jazz



RoW Symphony



# Reflections/Challenges

- what are the preconditions to achieving a high degree of renewables (97%+)?
- have we tested the extent to which efficiency will impact residential/commercial demand?
- would New Zealand fund the infrastructure for gas, electric and hydrogen vehicles?
- impact of higher carbon price in RoW Symphony on greater afforestation and energy intensive industry?
- what of the energy-water-food nexus?



# Project Timeline

	Time	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15
Downscale Jazz/Symphony to Aust NZ	2m		■	■										
Develop NZ inputs with PSI	2m			■	■									
Implementation and model quantification	3m				■	■	■							
Downscale to NZ	1m							■						
PSI Present preliminary results to BEC	1m								■					
Refine scenarios/inputs with PSI	1m									■				
Second model run	2m										■	■		
Downscale to NZ	1m												■	
PSI Present Final Results, finalise narratives	1m													■

- Key process milestones
  - project commenced July 2014
  - two modelling rounds, sense check
  - produce final report July 2015





# Summary

- reality check – we look at the future to help us make better decisions today
- scenarios are helpful as they:
  - challenge us to move outside of our own ideological biases and anchoring
  - force us answer the question “how could this play out differently, and what impact could that have?”
- results not about having the ‘answer’, but about allowing us to ask the right questions



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# Thank you Questions?

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