

# Renewable Energy Opportunities for NZ Heavy Engineering

Nick Inskip: General Manager Industry Development



## Opportunity Drivers

- What's driving clean energy?

Environmental protection



Energy costs


Security of energy supply

Responding with  
carbon taxes,  
renewable energy  
certificates and  
obligations and  
feed in tariffs

The Energy Trilemma [Qiu et al., 2011]



## Renewable Energy Market

- One of the fastest growing markets for emerging technologies
- \$330 Billion
- Shift to growth in developing countries
- 22% Global energy consumption
- Geothermal 78TWh in 2014  104TWh in 2020

## Many Opportunities

From an Industry Development perspective:

- Less about individual opportunities and more about developing broad new industries where a number of companies can find opportunities.

## Two key focus areas:

- Marine energy (wave and tidal)
- Geothermal and waste heat



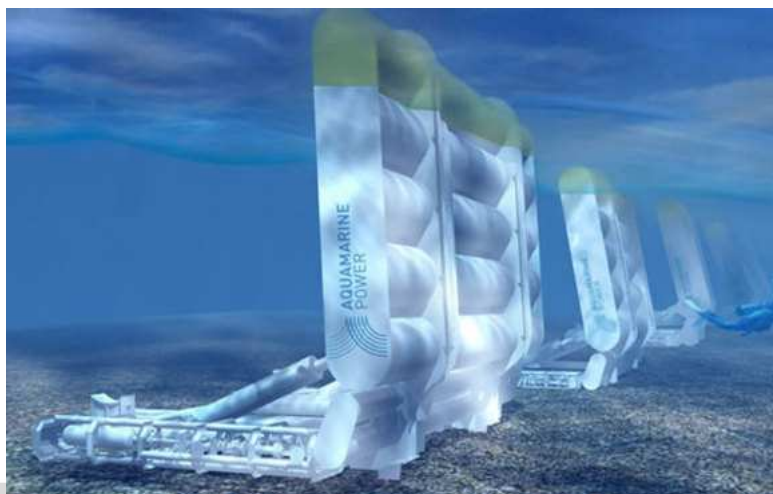
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## Marine Energy: Tidal



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## Marine Energy: Wave



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## Not just about the device



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## Gearboxes



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## Wave Powered Offshore Fish Farms

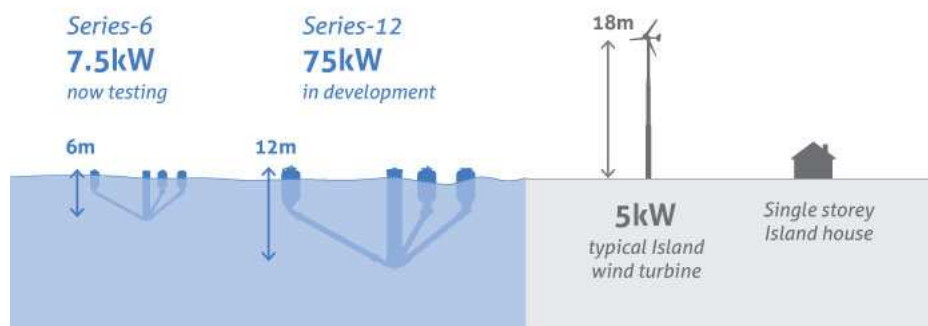


**TRITON**

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## Energy for Remote Communities



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## Albartern



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## Albartern Unloading



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## Albartern Deployed



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## NZ MARINE ENERGY CENTRE BUSINESS CASE



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### Benefits of EMEC (GVA): 2003-2011

- Orkney: \$115M
- Highland & Islands: \$139M
- Scotland : \$234M
- UK : \$299M
- **Total:** **\$787M**

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## Marine Energy: 2035

- Asia Pacific: \$8B p.a.
- New Zealand: \$1B p.a.

## Geothermal and Waste Heat

In the beginning....



Meeting New Zealand's Energy Needs  
Exploiting a Natural Opportunity  
Innovation Through Necessity  
Learning by doing

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And now....



Market Driven  
Export Focused  
Niche Oriented  
AGGAT Technology Commons  
Innovation by Application

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# Geothermal

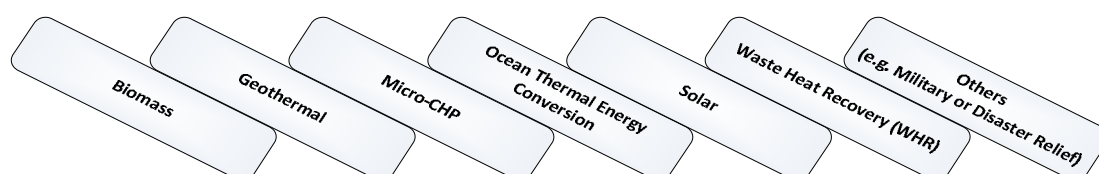
- Geothermal is a broad category
- High and low temperature
- Utility scale
  - Outside current capability
- Lots of opportunities in low temperature
  - Typically Organic Rankine Cycle

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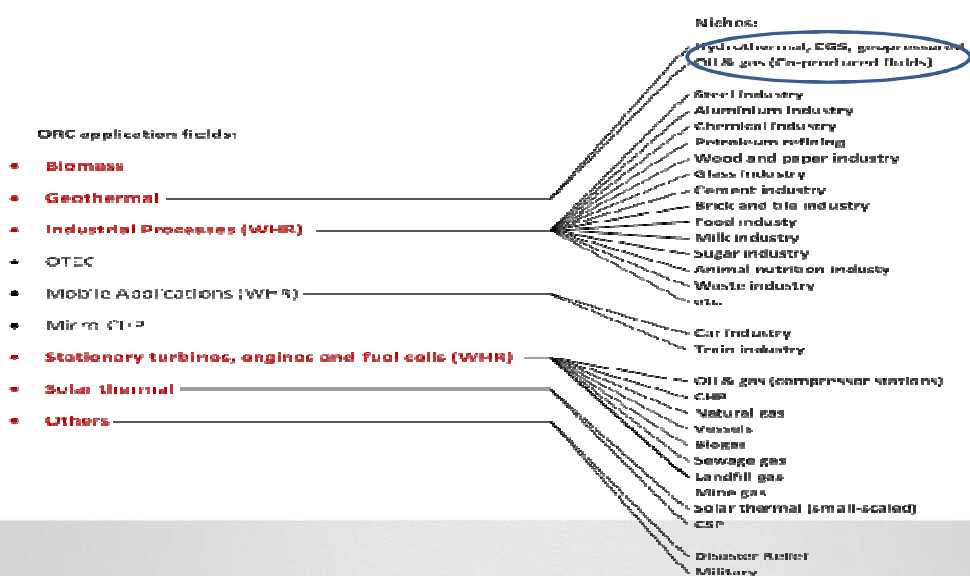


# Where is the Market?

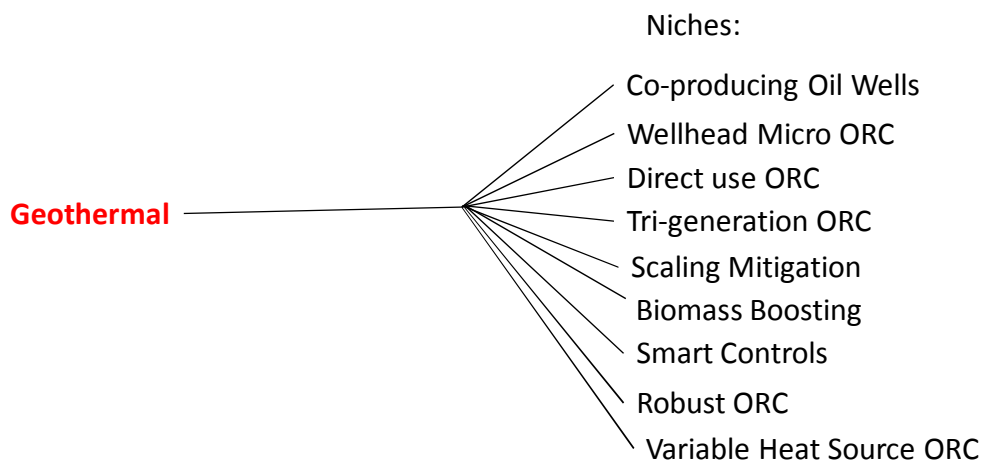
## Potential Fields of ORC Application



# Potential Markets and Niches



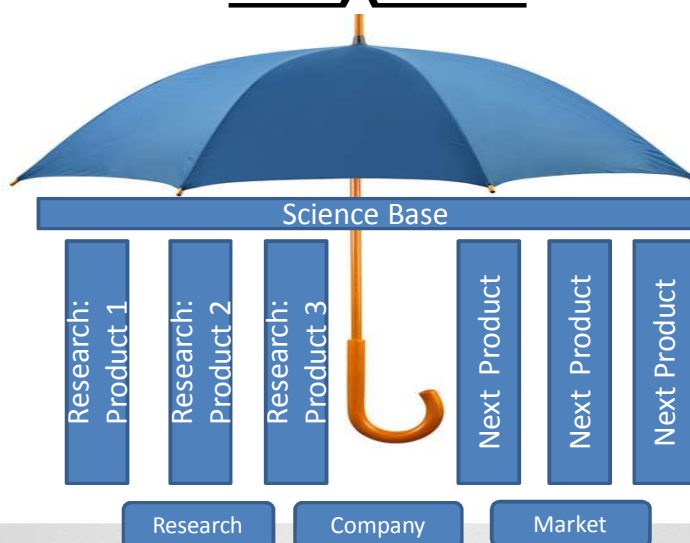
# Potential Markets and Niches



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## ABOVE GROUND GEOTHERMAL & ALLIED TECHNOLOGIES

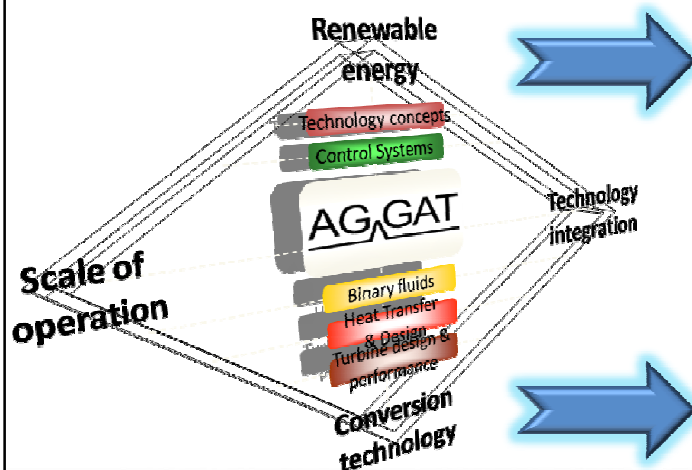
# AGGAT



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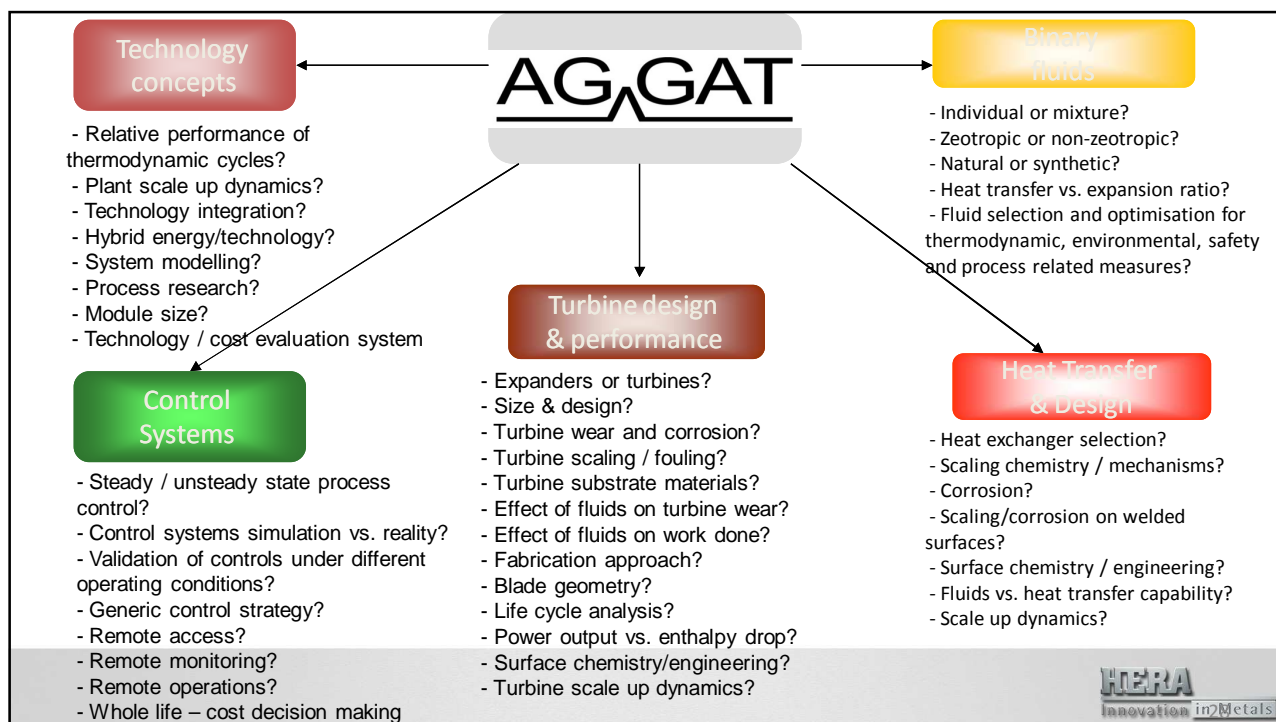


# AGGAT Science Programme

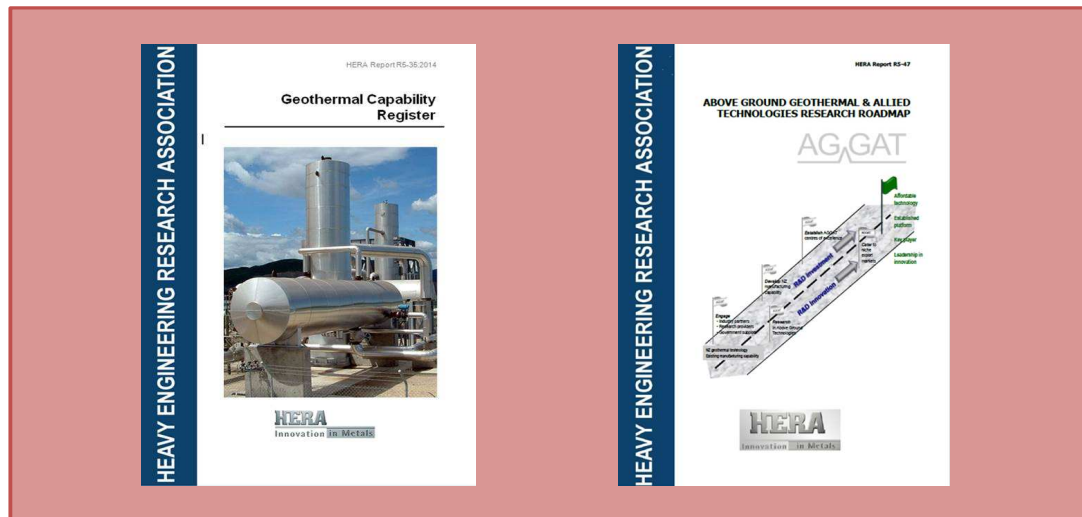


Research Theme	Research Aim	Research Areas
Technology Concepts	IS1-1, IS2-1	Cycles, Design Tools, Materials, Modules
Heat Transfer & Design	IS1-2, IS1-3, IS1-4, IS2-2	Heat transfer, Materials, Fluids
Turbine design & Performance	IS1-5, IS2-3	Turbines, Materials, Fluids
Control Systems	IS1-6, IS2-4	Control Systems, Cycles
Binary Fluids	IS1-3, IS1-5	Fluids, Materials

Innovation in Metals

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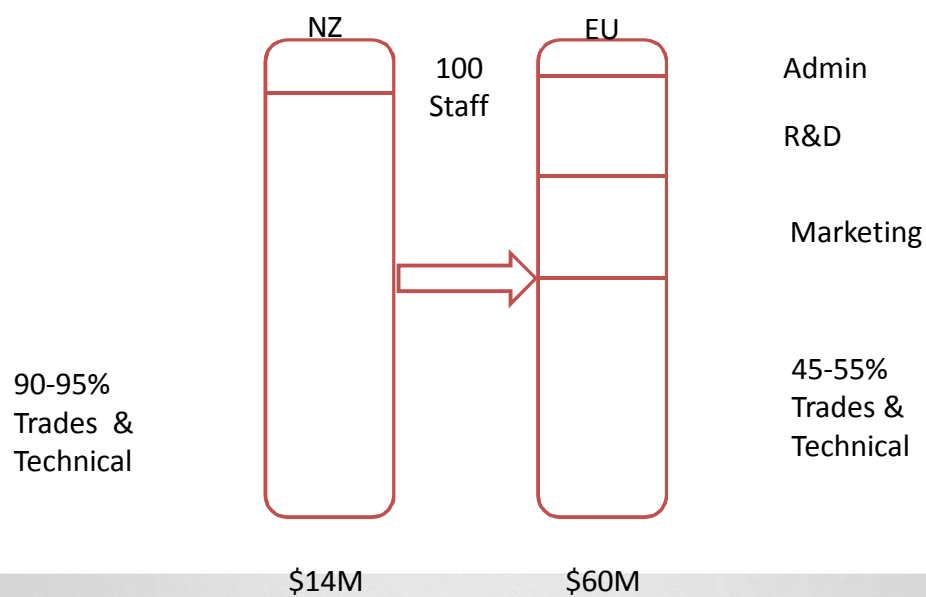
## Allied Activities



## Why Renewables?

- Many niches
- Global market
- Expanding market
- High value

## Two Companies: A Comparison



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Innovation is not the result of chance, it's the result of action.

*Phil McKinney*

# Thank You

Nick Inskip: General Manager Industry Development

