

- A local and abundant source of renewable thermal energy
- There's no more efficient heat than heat (pers. comm. Anya Seward)
- Heating is half of global energy consumption and 38% of CO₂ emissions in 2022 (IEA)
- Geoheat readily replaces fossil fuel boilers
 - Refer the EECA RETA BOP report for a green house and hospital in Whakatane
- Low electrical energy use when coupled with a heat pump
- Simple paybacks for ambient heat pump systems from months to a few years

On the TRL scale it is 9/9 Proven systems in Operation



Buckingham Castle, England



Riverstone Castle, Oamaru



Sydney Opera House

- The Bay of Plenty and Waikato regions have ready access to **ALL TYPES** of geothermal
 - Ambient, Low and High Temperature

- Recall direct and indirect use of geoheat?

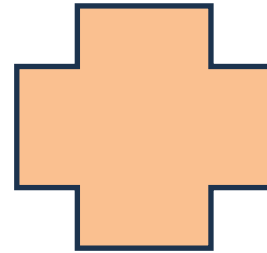
- If no geothermal influence... use ambient temperatures with a geothermal / ground source heat pump

- Ambient temperature with heat pumps can:
 - Also cool; and
 - Use the Ground for thermal storage (Samantha Alcaraz will talk to this).

- The energy transition considers technology solutions that:
 - Prioritise efficiency and demand management
 - Are optimised on a site specific basis;
 - Substantially reduce carbon emissions
 - Consider the full thermal energy system (eg heating, cooling, hot water, pools etc); and
 - Consider integration with the electrical energy system (eg annual usage, peak loads, more renewables).

- Potential exists to:
 - Remove all fossil fuel boilers;
 - Reduce grid upgrade requirements of BAU electrification; and
 - Integrate heating and cooling.

A geothermal balance to energy supply and demand



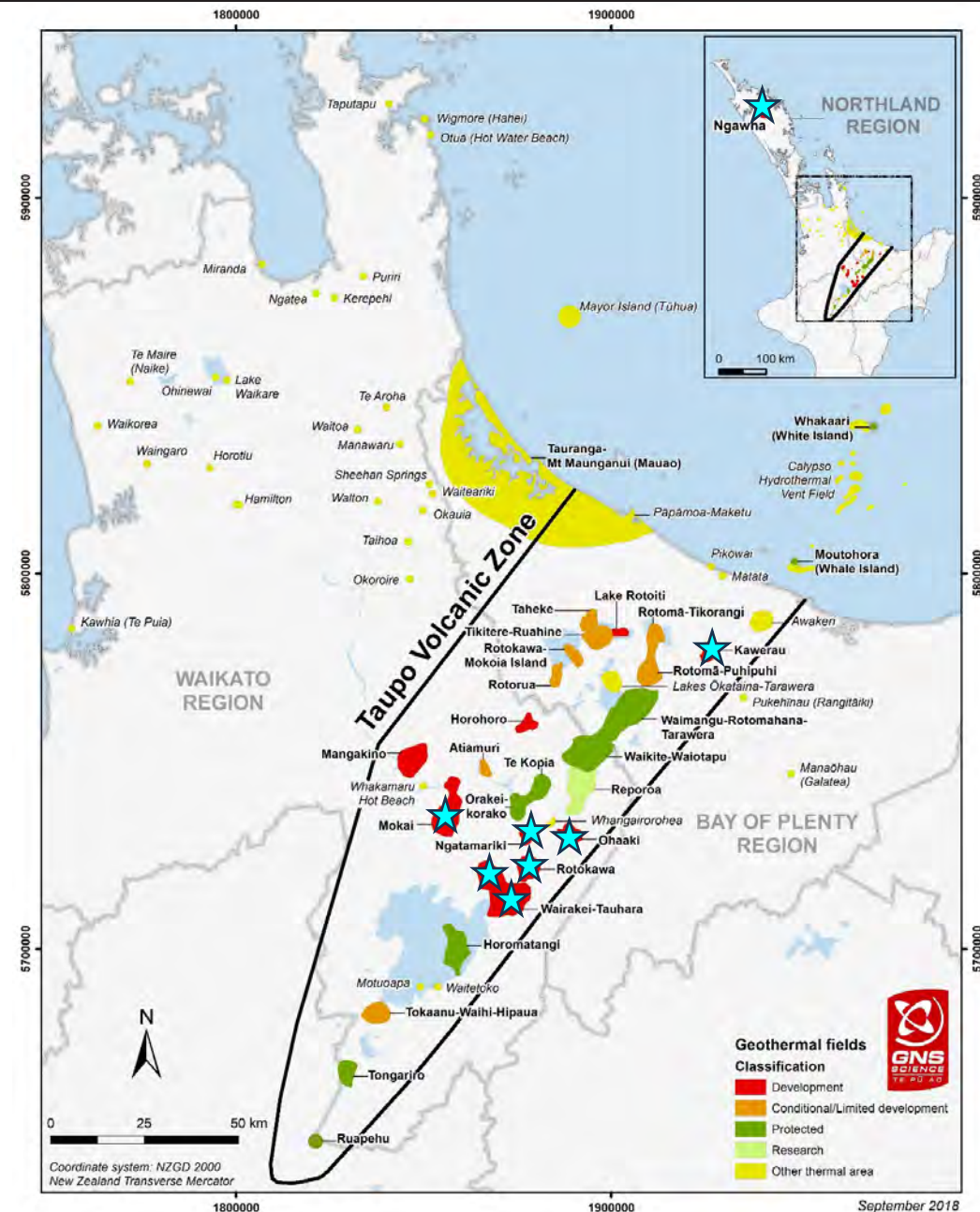
Yale Carden
GeoExchange NZ Limited
ycarden@geoexchange.nz



Conventional Geothermal Potential New Zealand

- Definition – electricity generation using binary and flash plant technology.
- Generally, reservoirs over 120°C.
- **Where is it now**
- Existing power stations on the fields marked with ★
- So where is the potential?
 - Brownfields – expanding existing operations.
 - Greenfields – completely new fields.

Field	Existing plants	Installed net capacity (MWe)	
Wairakei	Wairakei A&B	120	
	Wairakei binary	14	
	Te Mihi	166	
	Poihipi	53	
Ohaaki	Ohaaki	41	
Tauhara	Te Huka U1&2	27	
	Tauhara	174	
Rotokawa	Rotokawa	34	
	Nga Awa Purua	138	
Mokai	Mokai	111	
Nga Tamariki	Nga Tamariki U1-4	82	
	Kawerau	KGL	100
	TOPP1	24	
	TAOM	26	
Ngawha	GDL	9	
	Ngawha U1-3	25	
	Ngawha U4	32	
TOTAL		1176	

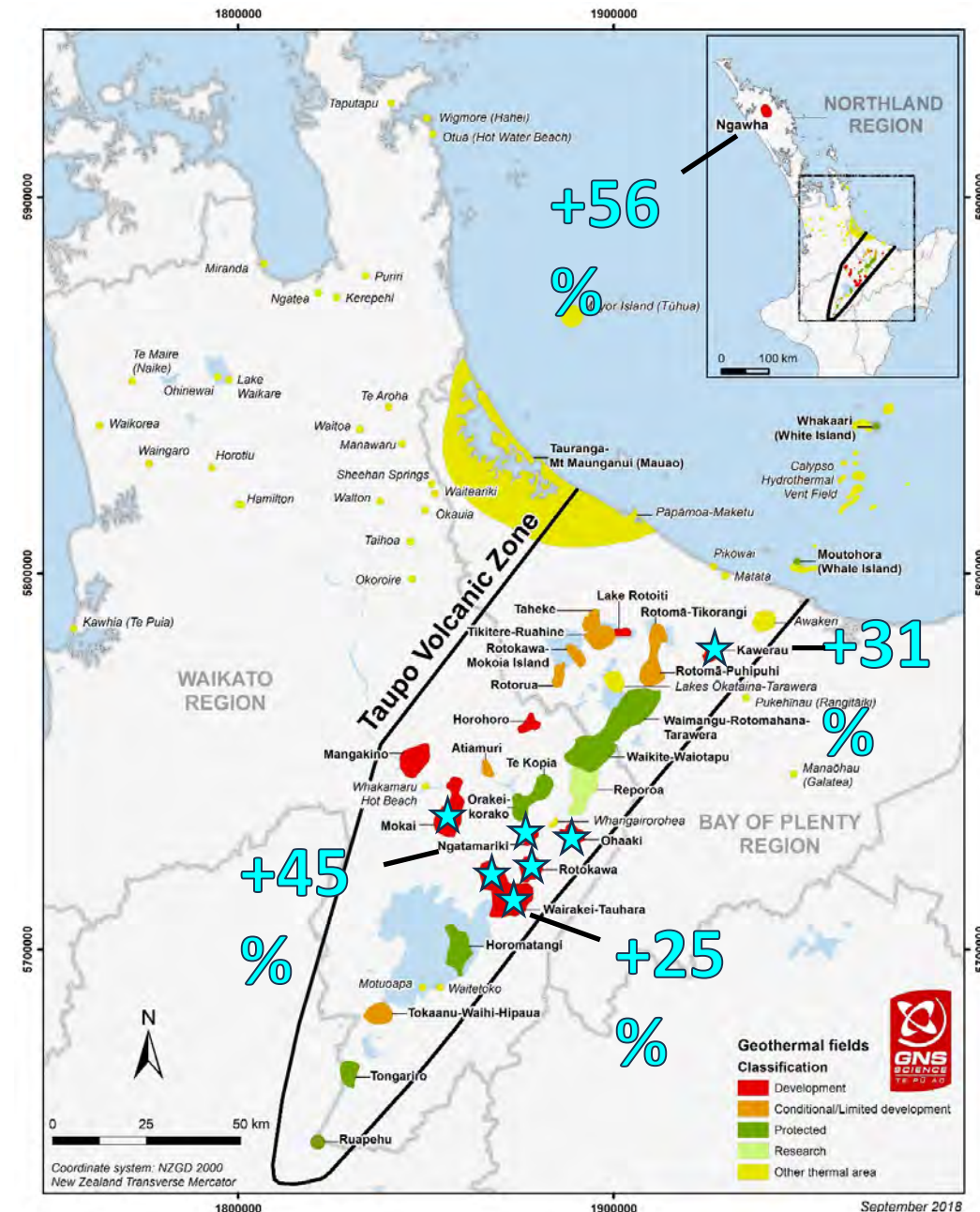


- **Expansions (brownfields)**
- Consented, and either under construction or planned **+%**
- **+169 MWe**

Field	Expansions	Planned capacity (MWe)
Tauhara	Te Huka U3	51
Nga Tamariki	Nga Tamariki U5	37
Kawerau	TOPP2	49
Ngawha	Ngawha U5	32
TOTAL		169

- Other potential future expansions, from Lawless et al., 2020:
- **+225 MWe**

Field	Estimated capacity (MWe)
Mokai	25
Rotokawa	100
Tauhara	50
Ngawha	50
TOTAL	225



- **Exploration - greenfields**
- Could be any of the untouched red (development) or orange (conditional development) fields. Even potentially light green (research).★
- Estimates of MWe of undeveloped fields are uncertain and there is no consensus.
- Potential in the BOP (Lawless et al., 2020) ~200 MWe:
 - Taheke – 75 MWe
 - Tikitere – 100 MWe
 - Rotoma – 25 MWe
- Potential in Waikato (Ussher et al., 2023) ~240 MWe:
 - Tokaanu – 120 MWe
 - Mangakino – 15 MWe
 - Atiamuri – 15 MWe
 - Horohoro – 23 MWe
 - Reporoa – 66 MWe – but might be connected to Waiotapu which is protected.

