

A few Thoughts on GHG / CO2 Emissions



Geoheat for Horticulture Workshop

25th July 2023

Mavericks, Taupo

Presenter Brian Carey

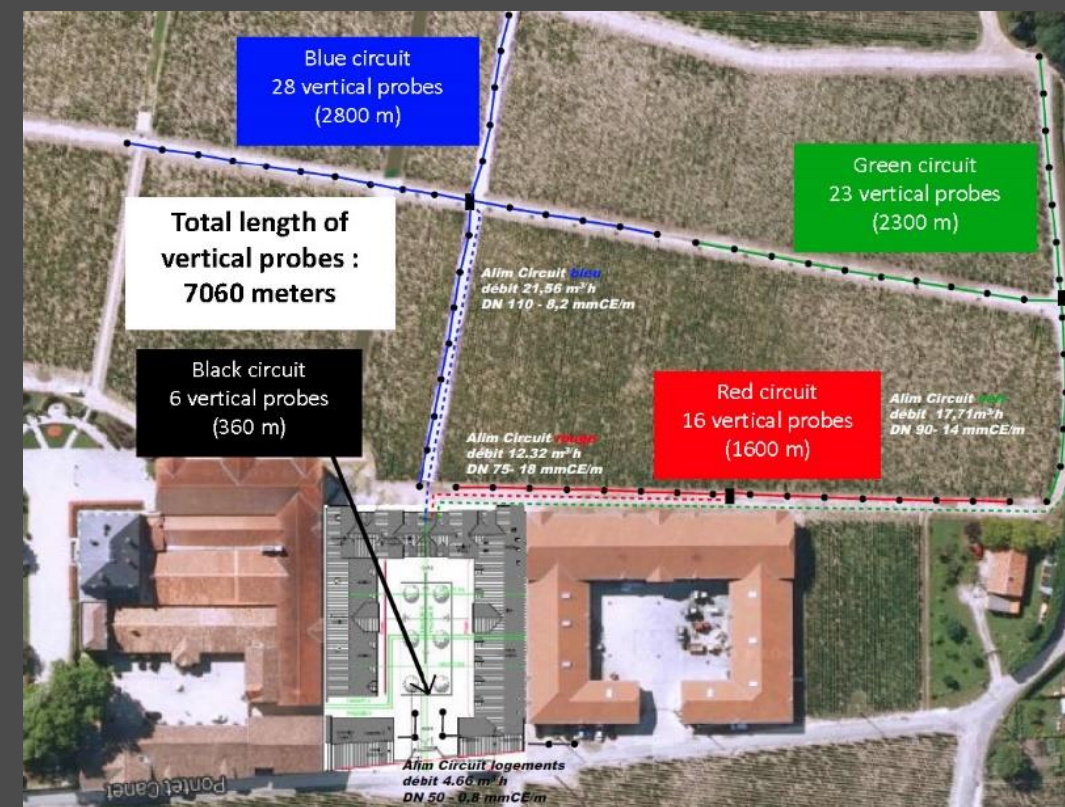


French Winery - Château Pontet-Canet



Shallow Geothermal 67 Probes in four circuits

- bored holes with tubing loops in them



Use of the ground to seasonally balance heating and cooling reducing energy input to the facility

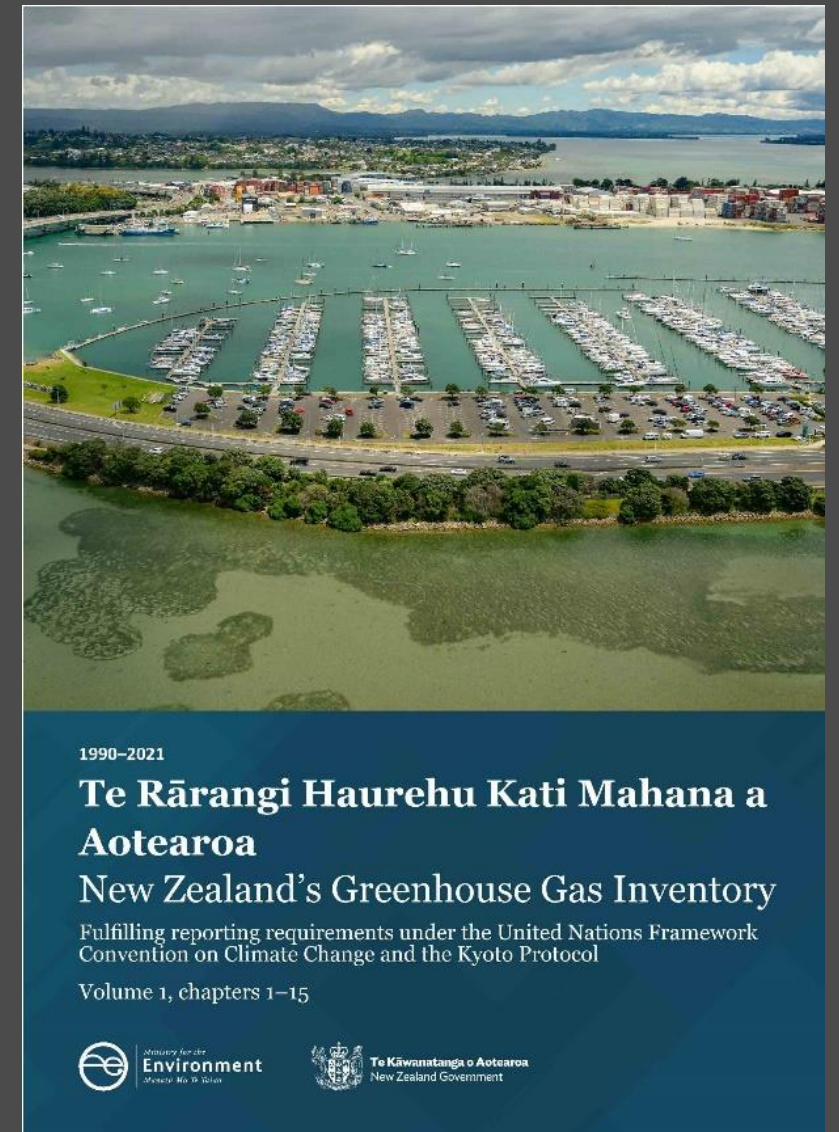
Only carbon is associated with the electricity to run the system

Technology choice influences operational emissions

- **Ground sourced / geothermal heat pump systems**
 - Probes or ground fields – no operational carbon emissions
 - Ground water aquifer waters – some waters contain gases
 - Naturally effervescent waters
 - If kept pressurised using pumps the gas remains dissolved
- **Low temperature geothermal**
 - Water above 30 C (RMA) – some contain gases
- **High temperature geothermal**
 - Steam – gas present – mostly CO₂, some CH₄
 - Two Phase (mixture of steam and liquid water) – gas present
 - Geothermal water – if kept as liquid gas stays dissolved

New Zealand Greenhouse Gas Inventory

- **Regularly updated**
 - most recent report uses data from two years ago
 - As per United Nations Framework Convention on Climate Change reporting requirements
- **Most recent is**
 - New Zealand Greenhouse Gas Inventory 1990 – 2021 (MfE 2023)
- **Note Geothermal carbon emissions are not all recorded in the inventory**



Excerpt from page 101

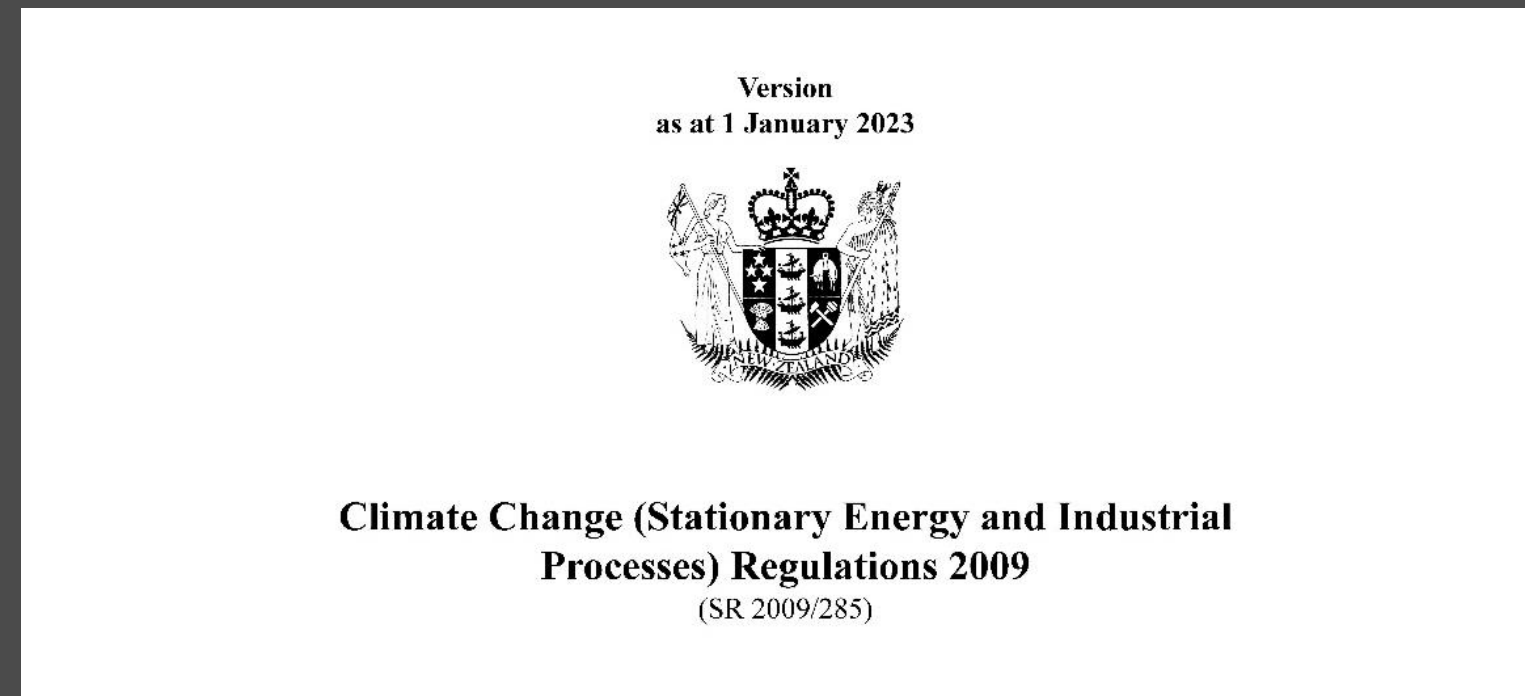
The *Oil and natural gas* category also includes estimates for emissions from geothermal operations. While some of the energy from geothermal fields is transformed into electricity, emissions from geothermal electricity generation are reported in the *Fugitive emissions* category because they are not the result of fuel combustion. Geothermal facilities supplying geothermal fluid for generating electricity or industrial heat are subject to the Climate Change (Stationary Energy and Industrial Processes) Regulations 2009, and are required to participate in the NZ ETS. Geothermal sites whose geothermal steam is not used for energy production have been excluded from the inventory. Operations falling outside the scope of the regulations are not included in the inventory due to a lack of data, methodology and emission factors. Besides this, such sites – rather than using high-temperature geothermal steam – use low-temperature hot water, which does not carry high levels of dissolved gases, and any emissions are considered insignificant. Naturally occurring sites do not contribute any anthropogenic emissions.

Positioning your business in the low carbon world

- **Accounted / non-accounted emissions ?**
- **So what are you working on**
 - How much operational carbon your business emits annually, or
 - NZ Inventory (accounted emissions), or
 - Emissions Trading Scheme (ETS) emissions.
- **Irrespective customers will want to know your overall operational carbon footprint**

ETS and Geothermal

- Applies to Industrial and Trade premises
- Geothermal steam and two phase are included under the regulations
 - Geothermal fluid kept as liquid water is excluded
- Default emissions factors are in the regulations

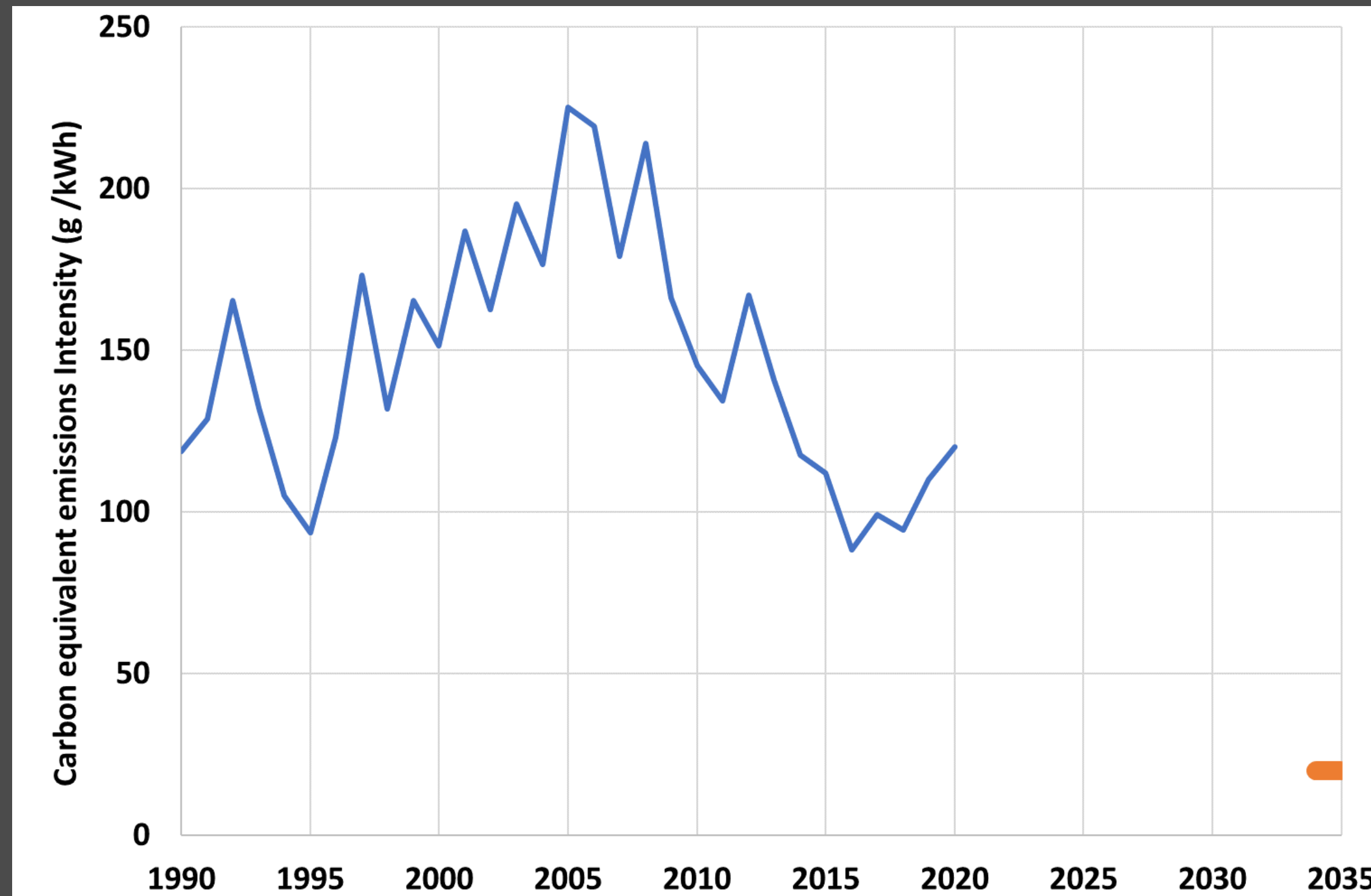


- Fuel type and emissions comparisons on the next slide

Comparative Table

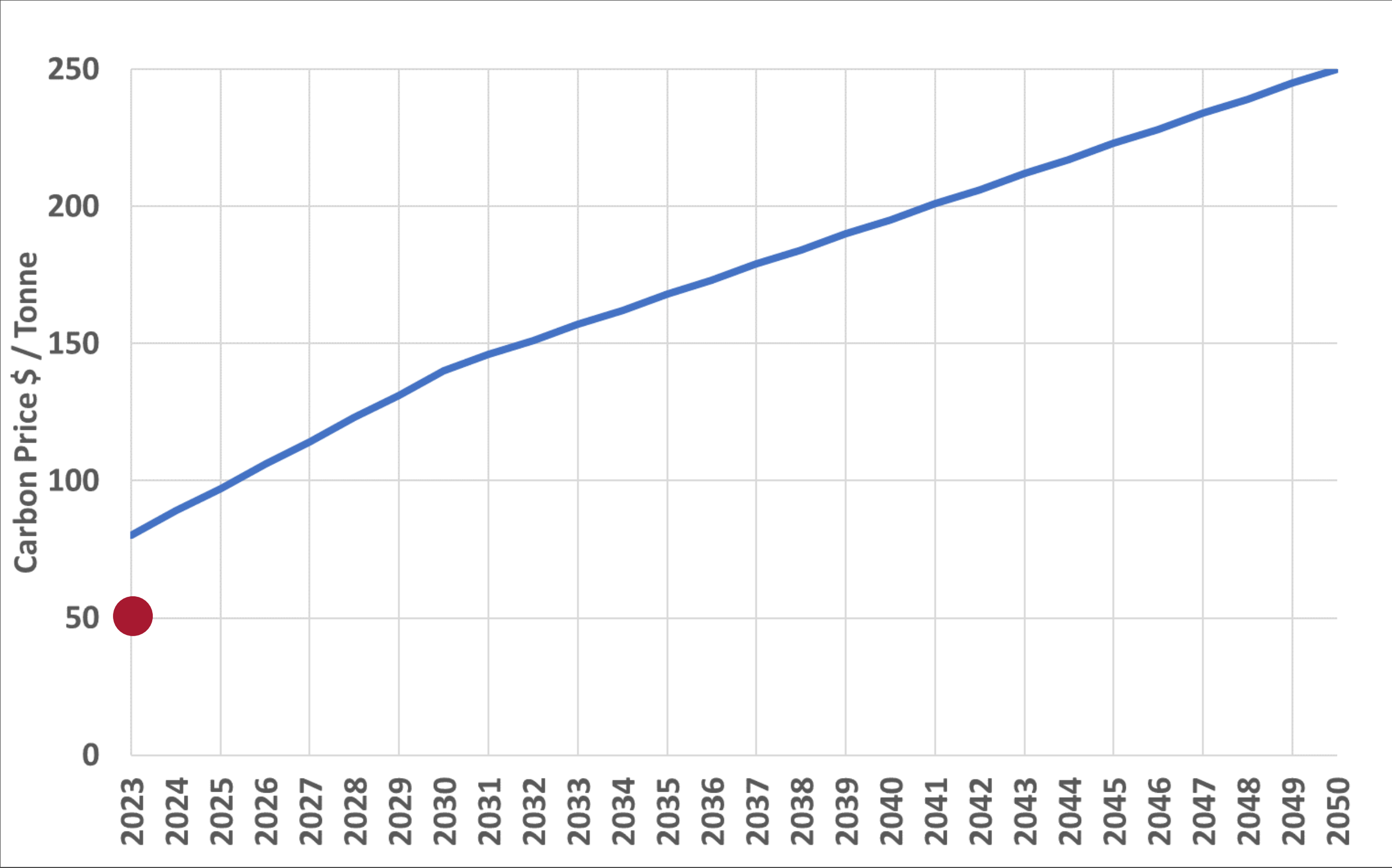
Type	tCO ₂ e/t	GJ/t	tCO ₂ e/GJ
Coal (sub-bituminous)			0.09043
Gas (national average)			0.05573
Geothermal steam (default)	0.03	2.78	0.01079
Rotorua - two phase	0.0009	0.66	0.00136
Tauhara - two phase	0.0009	1.2	0.00075
Mokai Greenhouse - two phase	0	1.6	0

Grid Electricity – carbon equivalent emissions intensity (g/kWh)



Likely Grid Electricity will have some associated carbon emissions going forward

Climate Change Commissions Carbon Price Path to 2050



Just something else to be aware of

- **MfE have promulgated under the RMA (1991)**
 - A **National Policy Statement** for GHG Emissions from Industrial Process Heat
 - A **National Environmental Standard** for GHG Emissions from Industrial Process Heat
- **Focus is on reducing fossil fuel use**
 - Activity restrictions and prohibitions
- **Scope includes ... indoor horticulture activities**
- **If your facilities emit more than 500 tonnes of CO₂-e per site per year (more than what are called a low-emissions site).**
 - Need to have resource consent permitting the discharge
 - That is a fuel burn of Gas 8.9 TJ or for Coal 5.5 TJ / annum
- **Then you will need a consent**
- **Takes effect 27 July 2023**



Horticulture - Austria

91



Frutura, East Styria, Austria

Started using geothermal heat in 2016
26 Hectares

[URL to CEO Katrin Hohensinner-Häupl
insights chats](#)

New Zealand Geothermal Association

- Geoheat Action Plan
- Might be interested

