
GNS
SCIENCE
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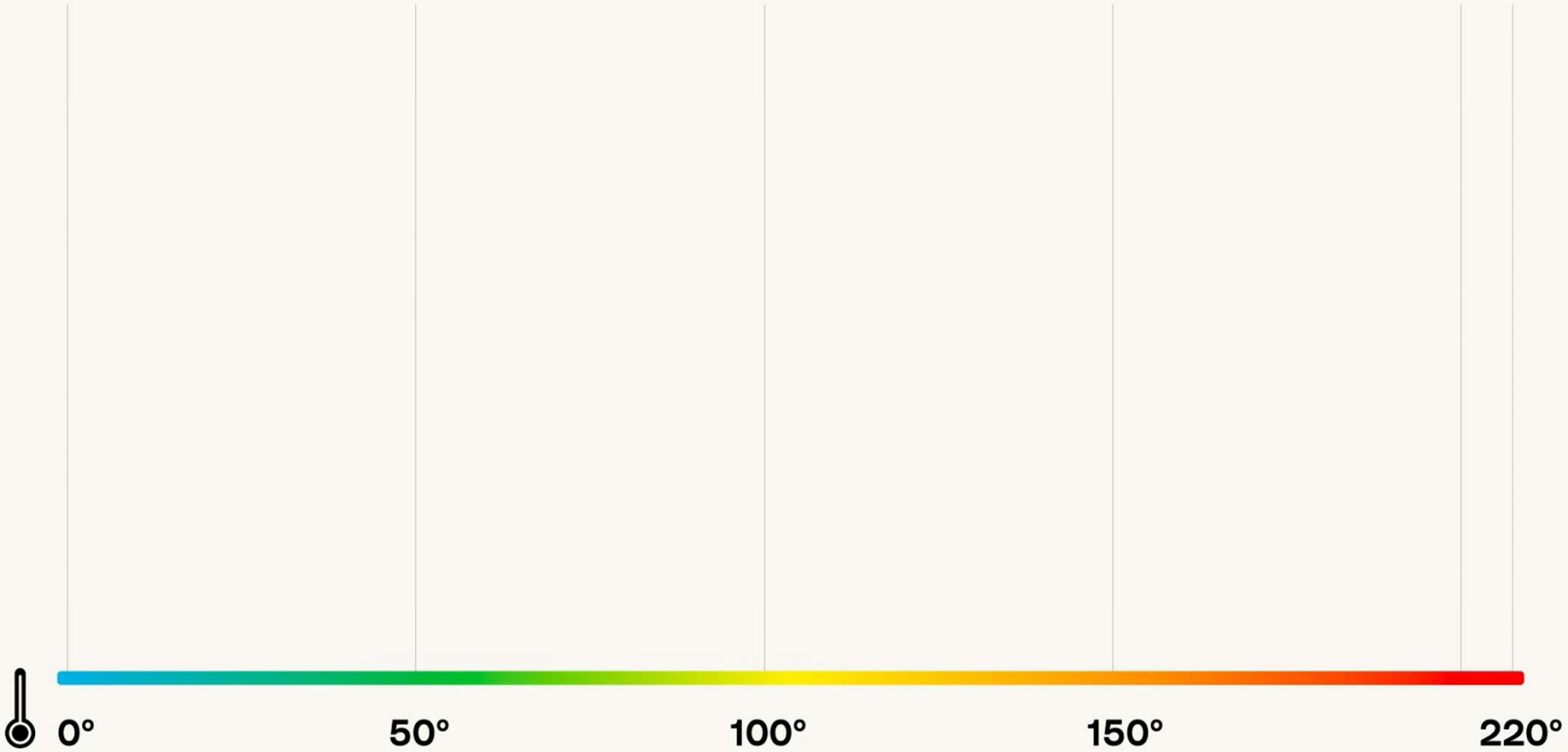
Geoheat
Every Day, Everyone, Everywhere
gns.cri.nz


0°
50°
100°
150°
220°


Heat is **energy**

We need change to...

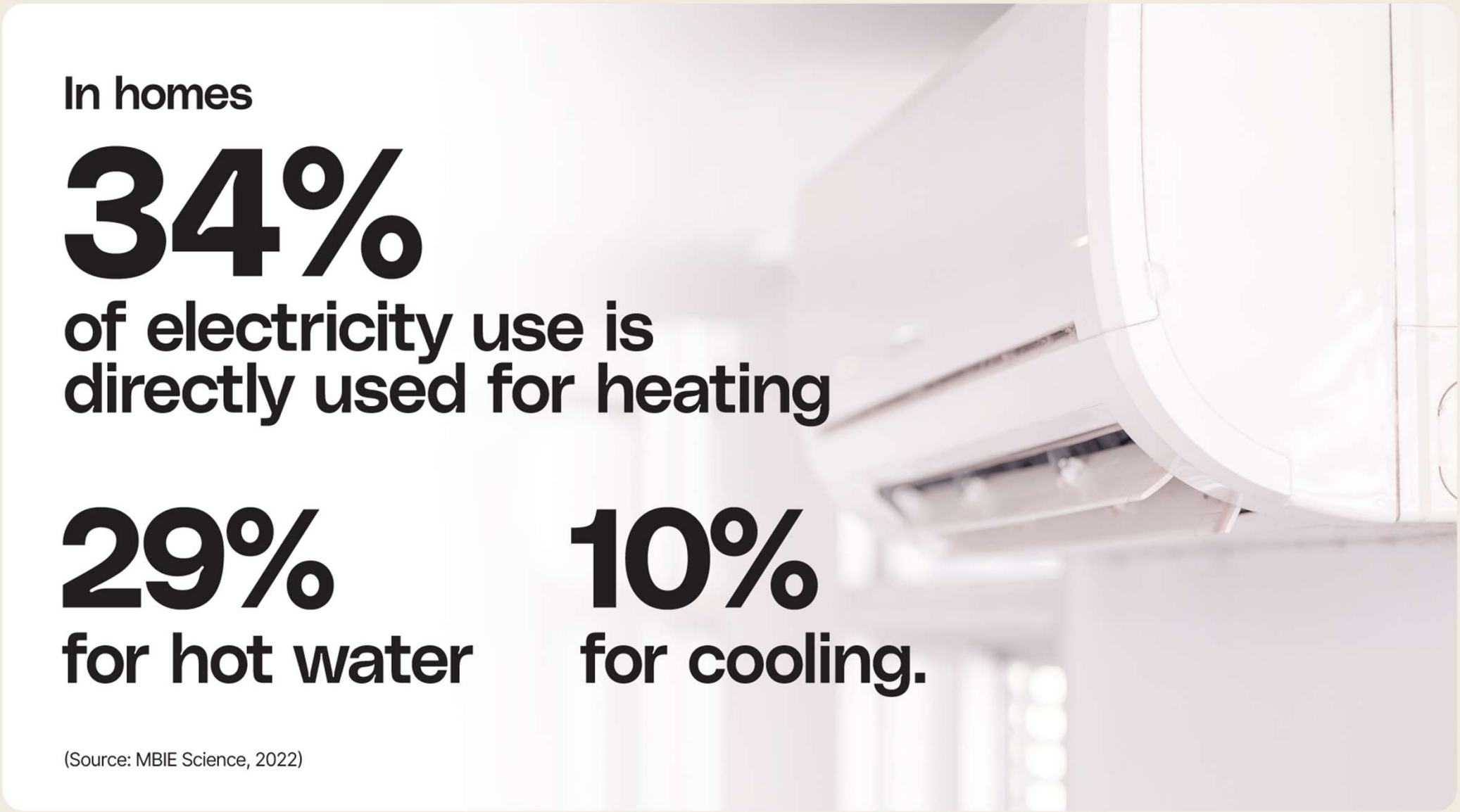
- **Become carbon neutral by 2050,**
- **Meet the growing energy demands** (19% growth between 2020-2037)
- **Ensure electricity and heat is accessible and affordable for all kiwis.**

(Source Transpower 2020)


Heat makes up
one third
of New Zealand's overall energy use.
(Source: MBIE Science, 2022)


(Source: MBIE Science, 2022)
~8% = 8
of New Zealand's gross emissions
million tonnes of CO_2 per year.
(Source: MBIE Science, 2022)


84%
for industrial processes,
56%
of that is generated by burning fossil fuels.
(Source: MBIE Science, 2022)



In homes

34%

of electricity use is directly used for heating

29%

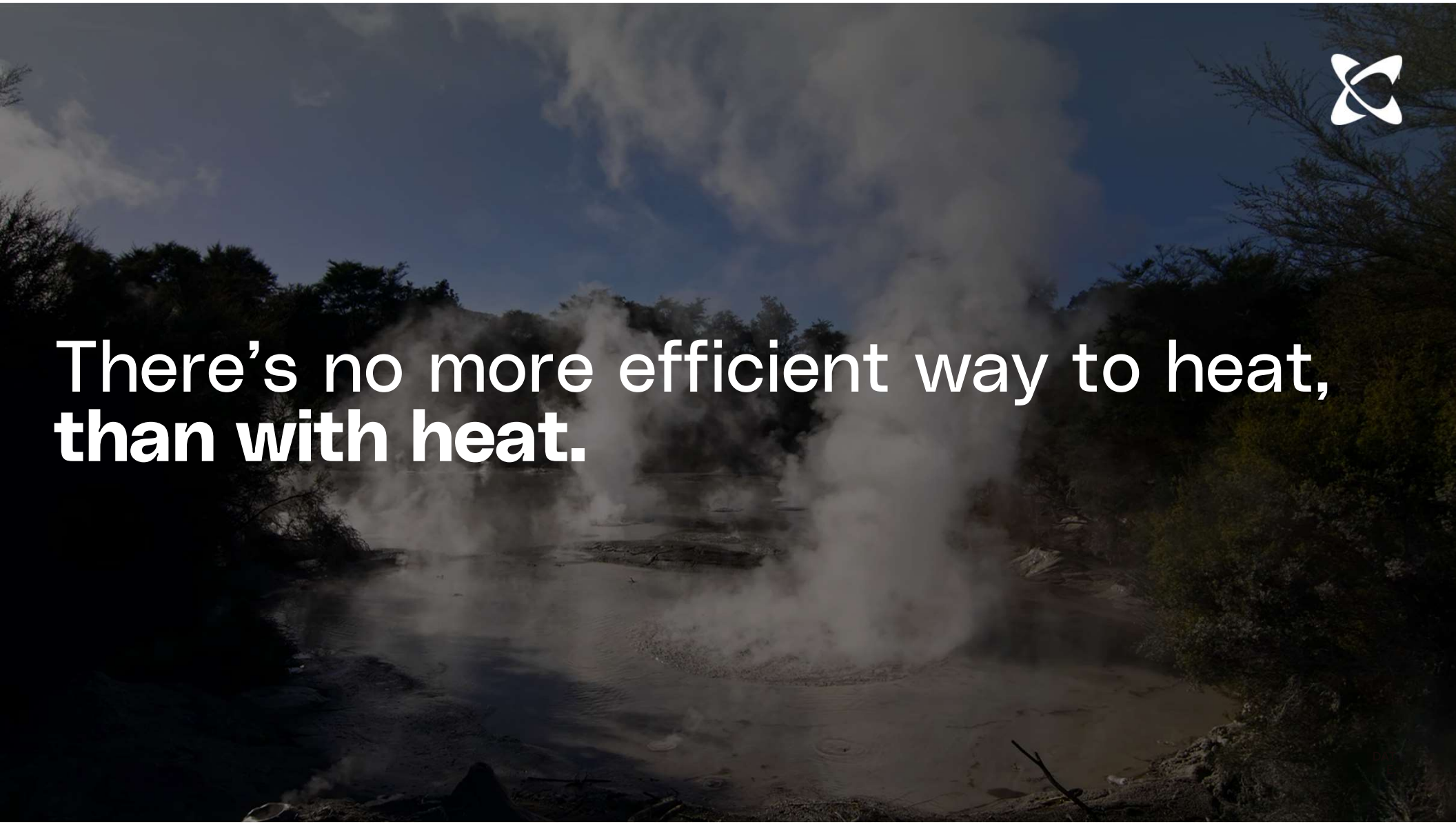
for hot water

10%

for cooling.

(Source: MBIE Science, 2022)

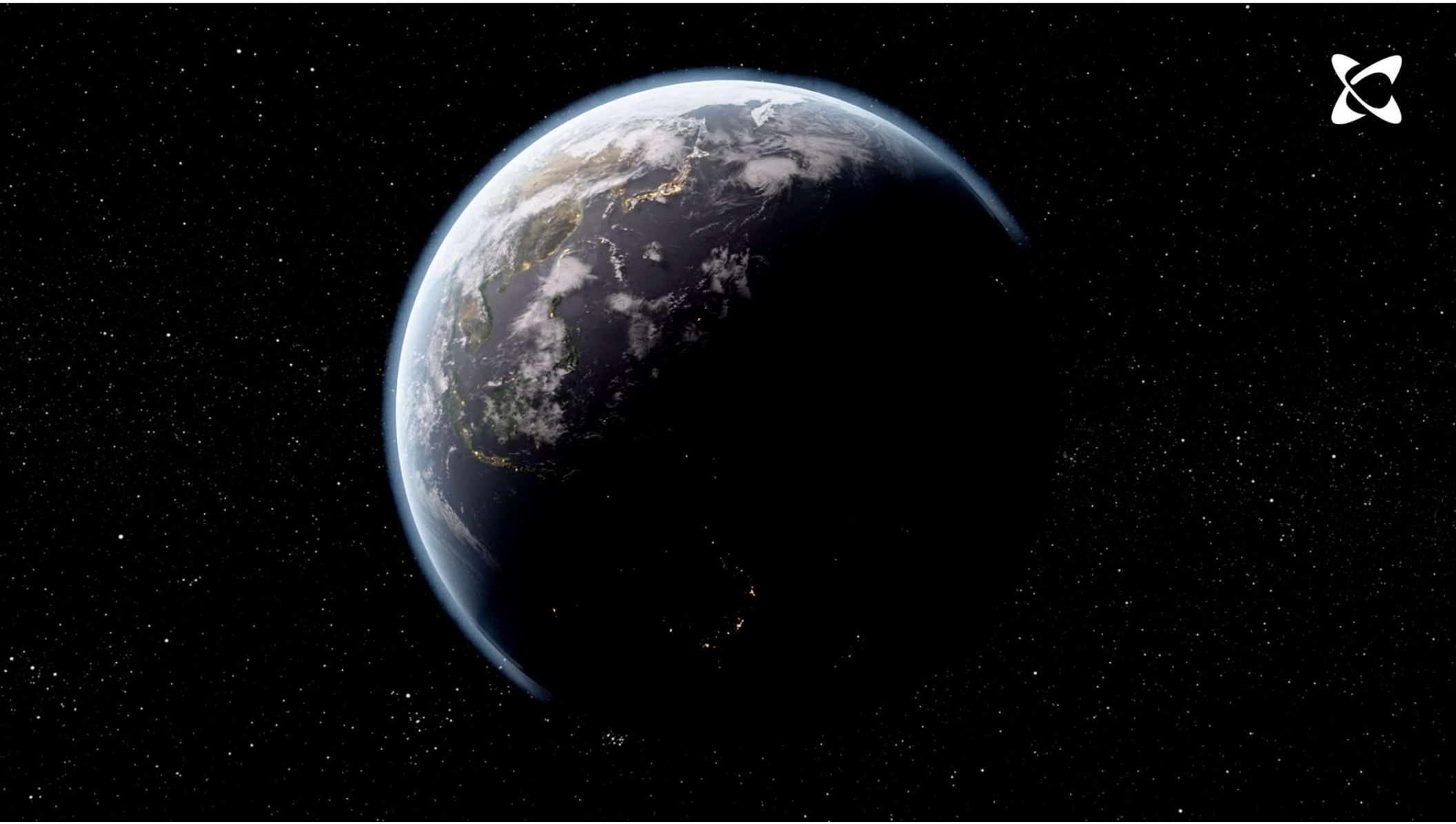
Conversion of heat energy to electricity is only ~**10-15%** efficient


There’s no more efficient way to heat,
than with heat.

Current barriers in the energy market

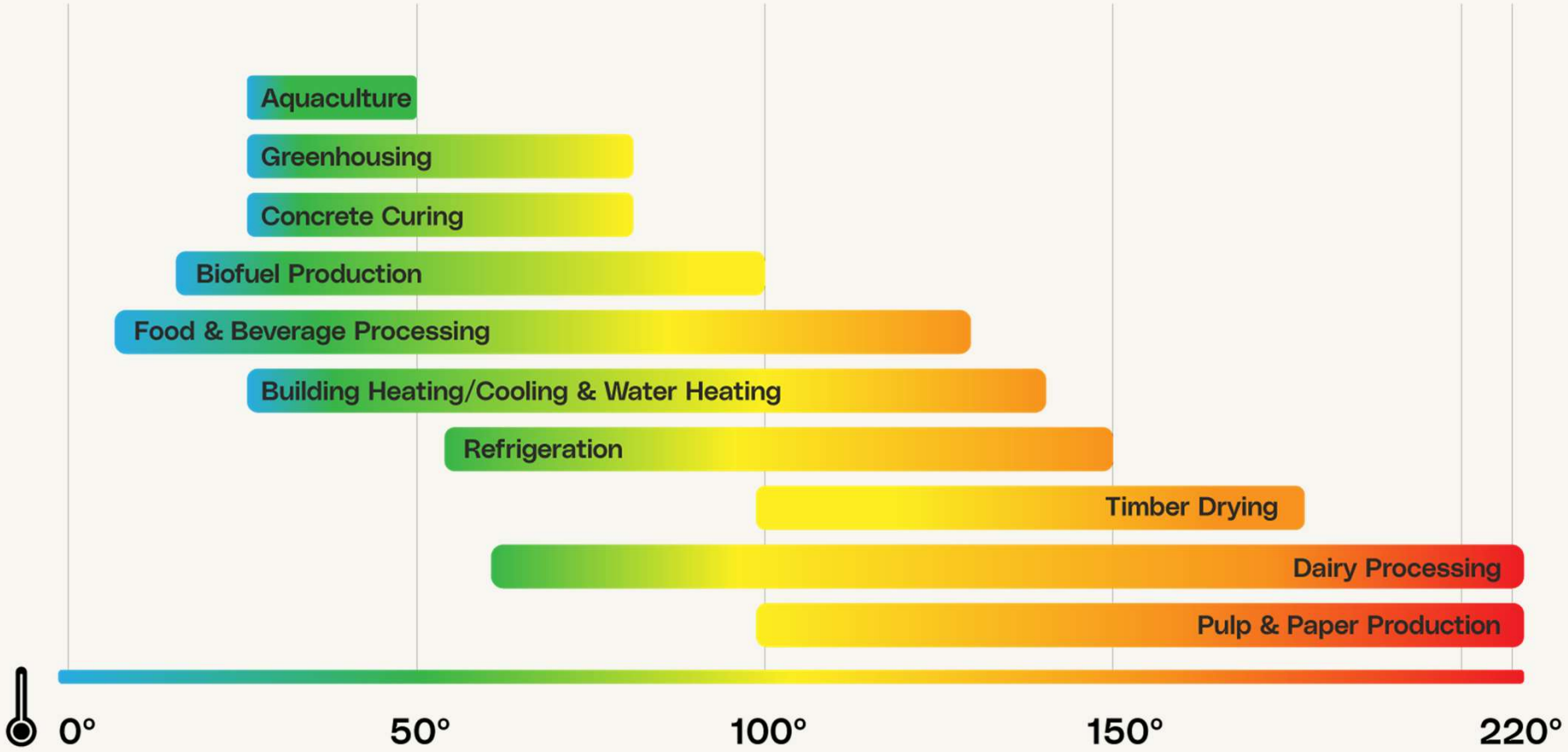
We rely on electricity and burning fossil fuels for the same reasons,

- **Transmission and transportation,**
- **they are relatively cheap,**
- **and almost instantly available.**



Is Geoheat a viable energy solution?

- Across the motu?
- Is it economically viable?
- At small, mid and large-scales?
- Across industries?


Aquaculture
Greenhousing
Concrete Curing
Biofuel Production
Food & Beverage Processing
Building Heating/Cooling & Water Heating
Refrigeration
Timber Drying
Dairy Processing
Pulp & Paper Production
0°
50°
100°
150°
220°

Geoheat has a Low Emissions Profile

Type		tCO_{2e}/t	GJ/t	tCO_{2e}/GJ	Emissions Reduction[5]	
Coal (Sub-bituminous)				0.09043[1]		
Natural Gas (National Average)				0.05573[2]	N Gas	Coal
Unabated Geothermal						
Steam	Geothermal Steam (default)	0.03[3]	2.78	0.01079	81%	88%
	Kawerau - Steam	0.0202[3]	2.78	0.00727	87%	92%
Two Phase	Tauhara - Two Phase	0.0009[4]	1.2	0.00075	99%	99%
	Mokai - Two Phase	0.0009[4]	1.6	0.00056	99%	99%
Water	Geothermal Water	0	0.4	0	100%	100%


Power Consumption
Carbon Emissions
Power Consumption
Carbon Emissions

Geoheat Delivers Cost-Effective Energy

Fuel Type	$/GJ	Emissions Factor tCO_{2e}/GJ	Carbon costs[1]	Conversion Factor[2]	Total Cost $ / GJ Delivered
Geothermal - Steam	8[3]	0.0073[4]	$0.51	0.83[5]	$10.25
Electricity - Heat Pump COP 3.5	43.34[6]	0.0206[7]	$1.44[8]	3.5[9]	$12.38
Biomass	13[10]	0	$0.00	0.8[9]	$16.25
Gas	11.57[6]	0.0557[11]	$3.90	0.85[9]	$18.20
Coal	9[10]	0.0944[12]	$6.61	0.78[9]	$20.01
Wood Pellets	18[10]	0	$0.00	0.9	$20.00
Electricity - Resistance	43.34[6]	0.0206[7]	$1.44[8]	0.99[9]	$43.78


Power Consumption
Ongoing cost
Power Consumption
Ongoing cost

Geoheat strategy goals

- **By 2025, at least 7 new Geoheat ventures or projects announced and / or completed. Ideally,**
  - One new major industrial high temperature venture
  - 3 new SME high temperature ventures
  - 3 new or fuel-switching low temperature ventures

- **By 2030, increase the uptake of Geoheat by 7.5 PJ,**
  - And create an additional 500 new jobs associated with new Geoheat projects.

What's next for Geoheat at GNS Science?


What’s next for **Geoheat?**
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