Upflow

22ND JULY 2025

Xphiles Project Update

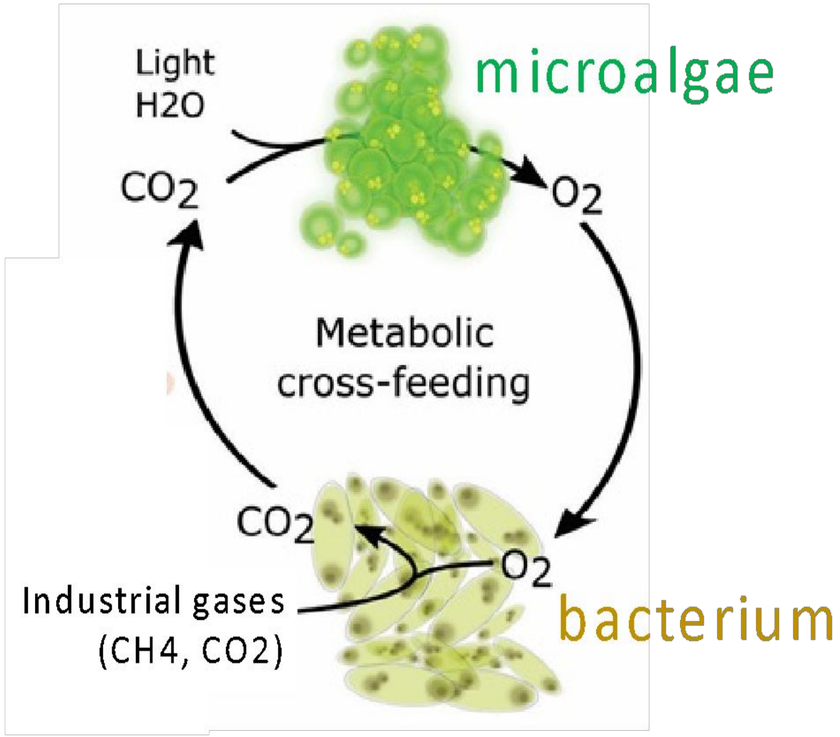
PRESENTED BY

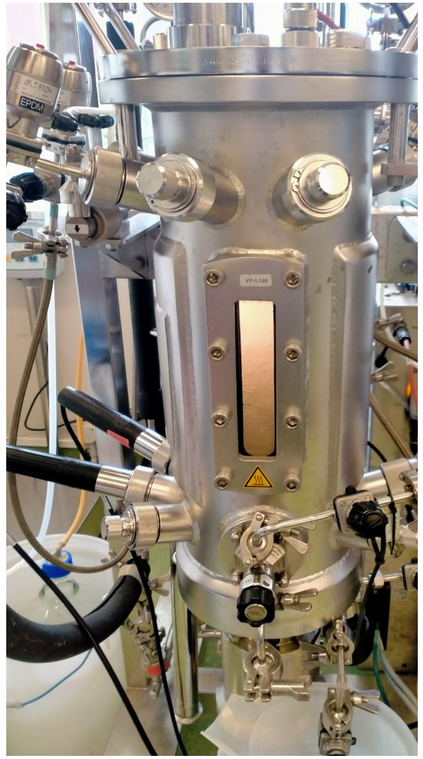
Andy Blair

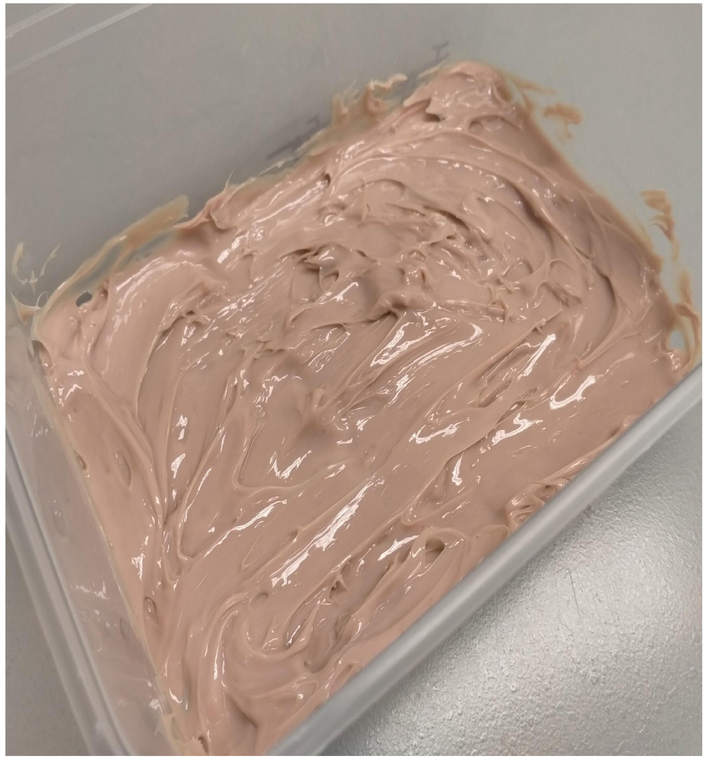
"Doing cool stuff, with great people for the good of the world"

Xphiles

Xphiles - Biomass

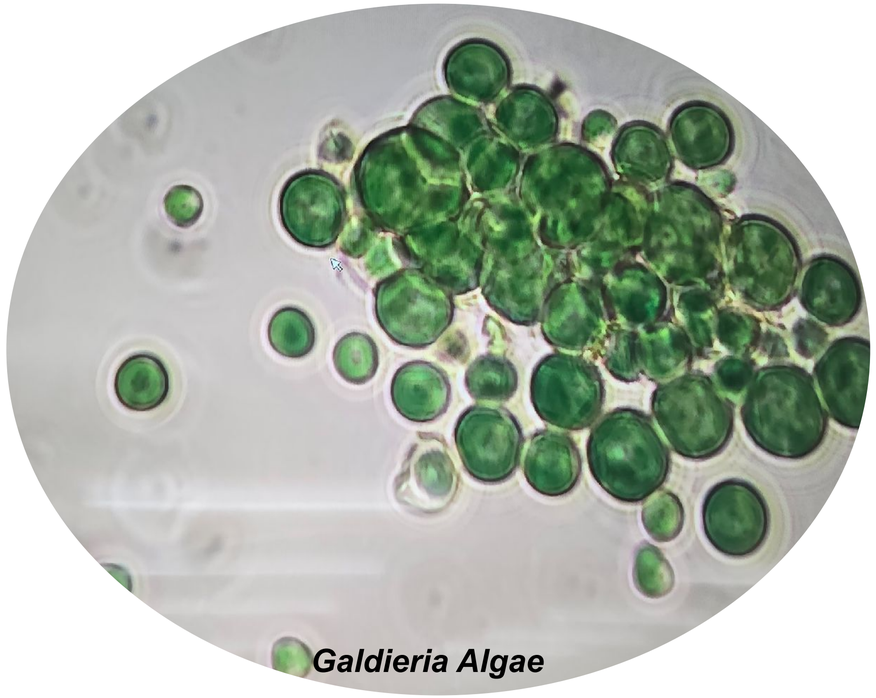






Develop a viable bio-feedstock suitable to supplement animal feed using local extremophiles sourced from Māori-owned geothermal ecosystems.

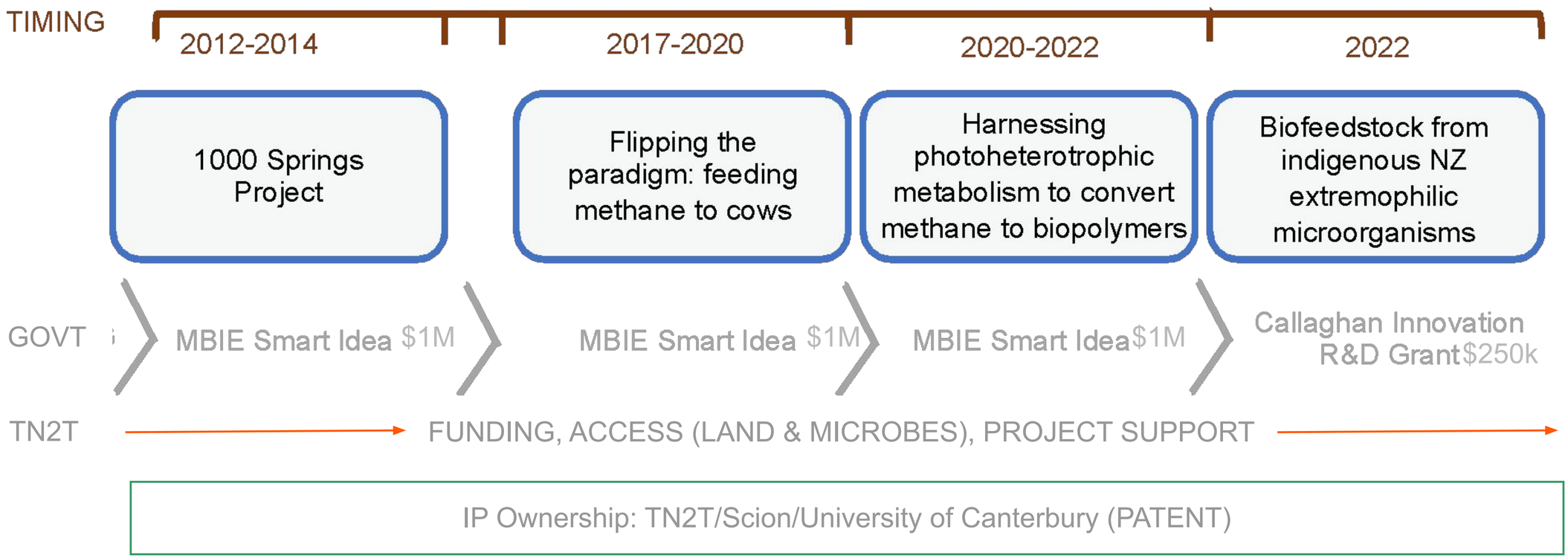
A New Biomass



Galdieria Algae

- Uses inputs readily available at a geothermal operation
- Consumes industrial greenhouse gases
- Produces a protein-rich biomass (+other components)
- Resilience to protein market volatility
- Decarbonises food production (Scope 3 emissions)
- Creates new industry & employment
- Long-term alignment with TN2T aspirations
- NZ climate and economic target alignment
- Groundwork for microalgae at scale – first kids on the block

R&D to Date


TIMING
2012-2014
2017-2020
2020-2022
2022
1000 Springs Project
Flipping the paradigm: feeding methane to cows
Harnessing photoheterotrophic metabolism to convert methane to biopolymers
Biofeedstock from indigenous NZ extremophilic microorganisms
GOVT
MBIE Smart Idea $1M
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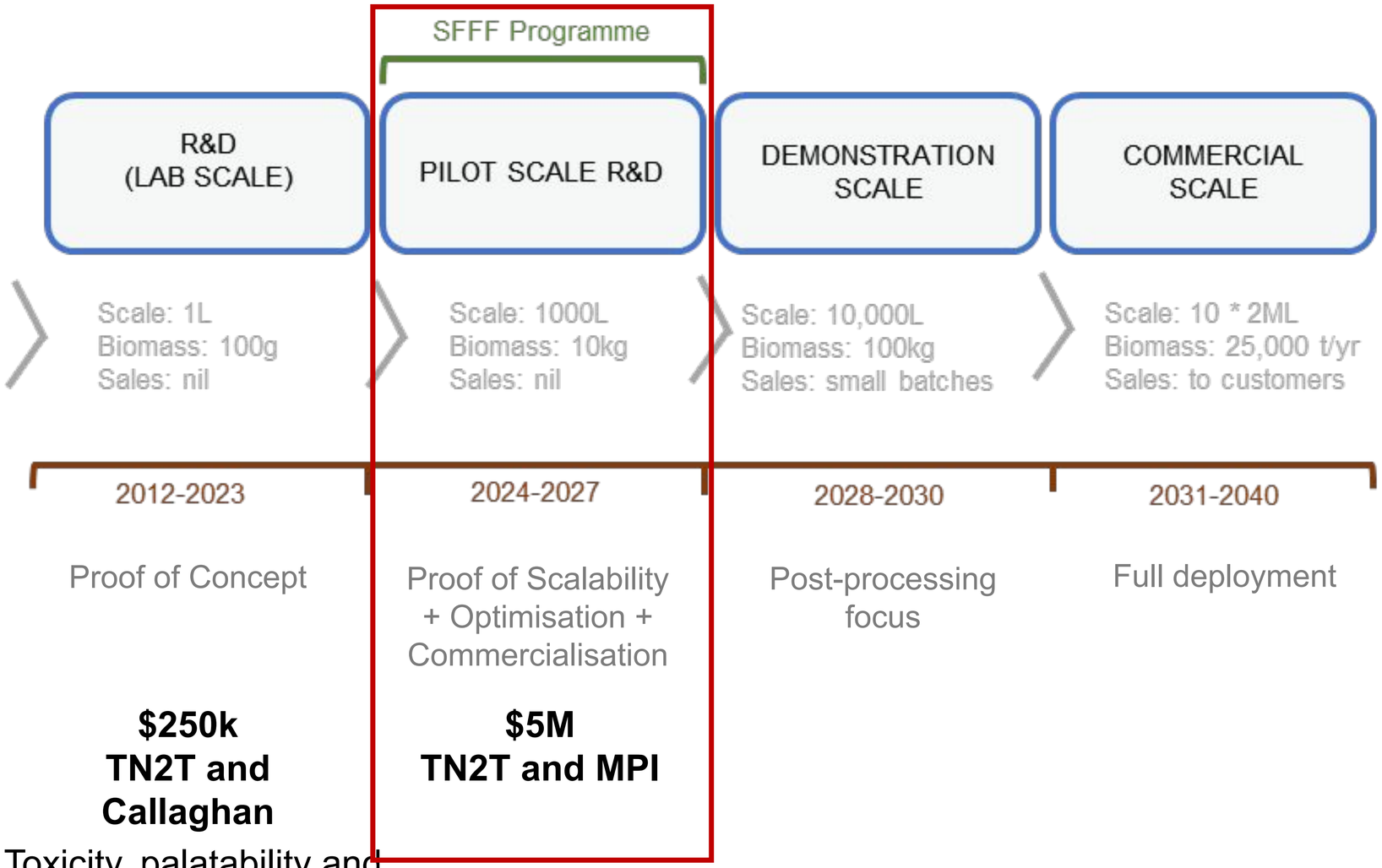
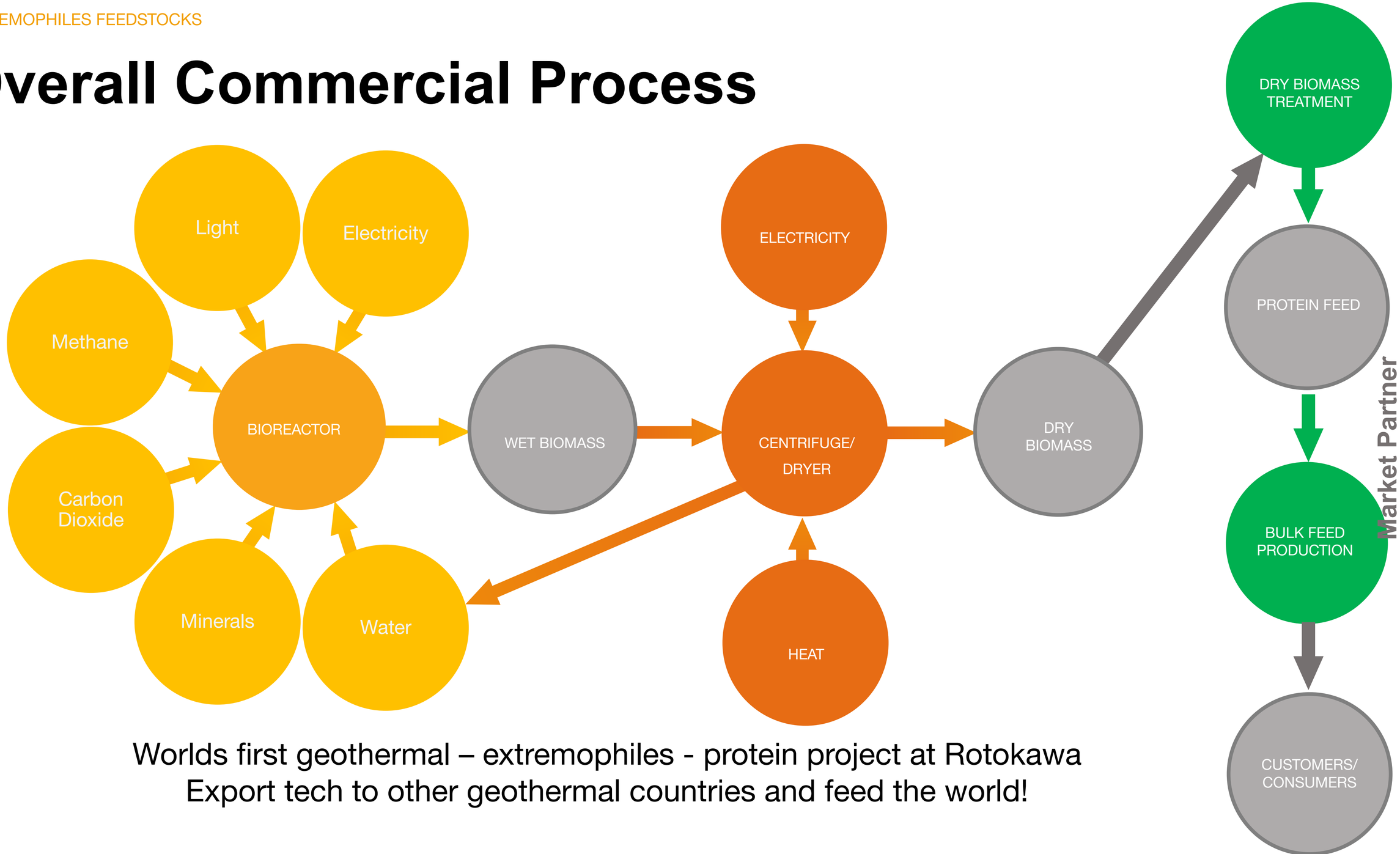
Callaghan Innovation R&D Grant $250k
TN2T
FUNDING, ACCESS (LAND & MICROBES), PROJECT SUPPORT
IP Ownership: TN2T/Scion/University of Canterbury (PATENT)

Commercialisation Pathway



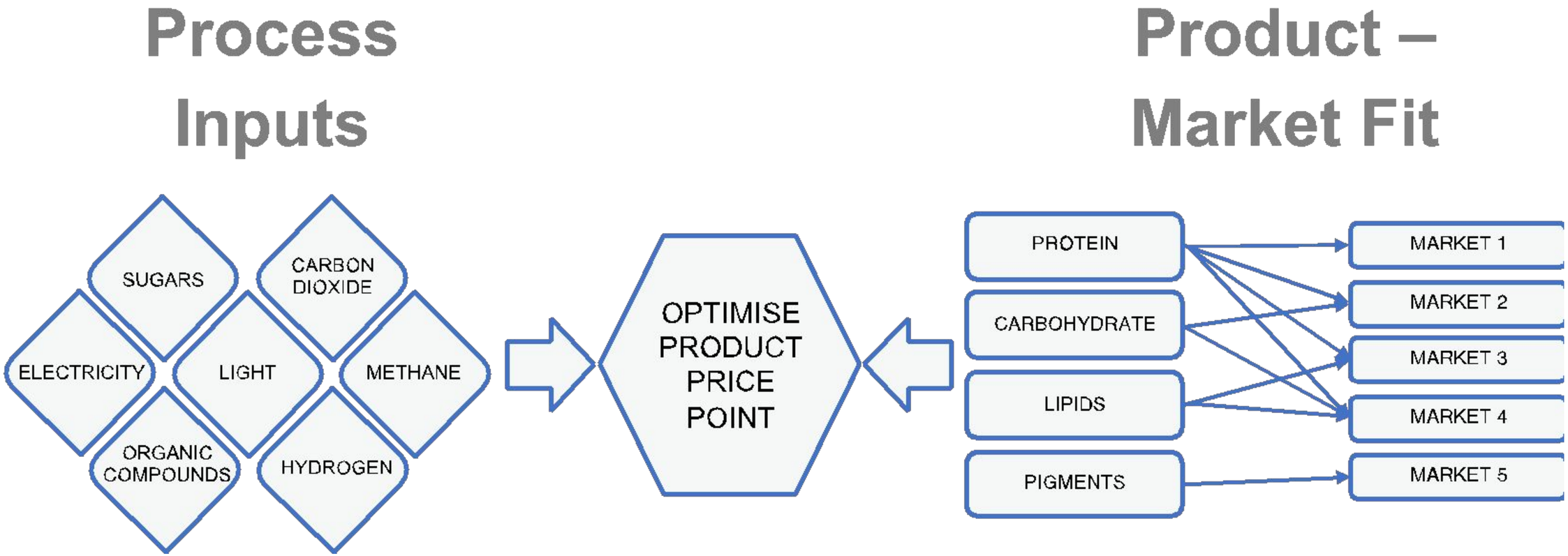
Deployment

Overall Commercial Process



Worlds first geothermal – extremophiles - protein project at Rotokawa
Export tech to other geothermal countries and feed the world!

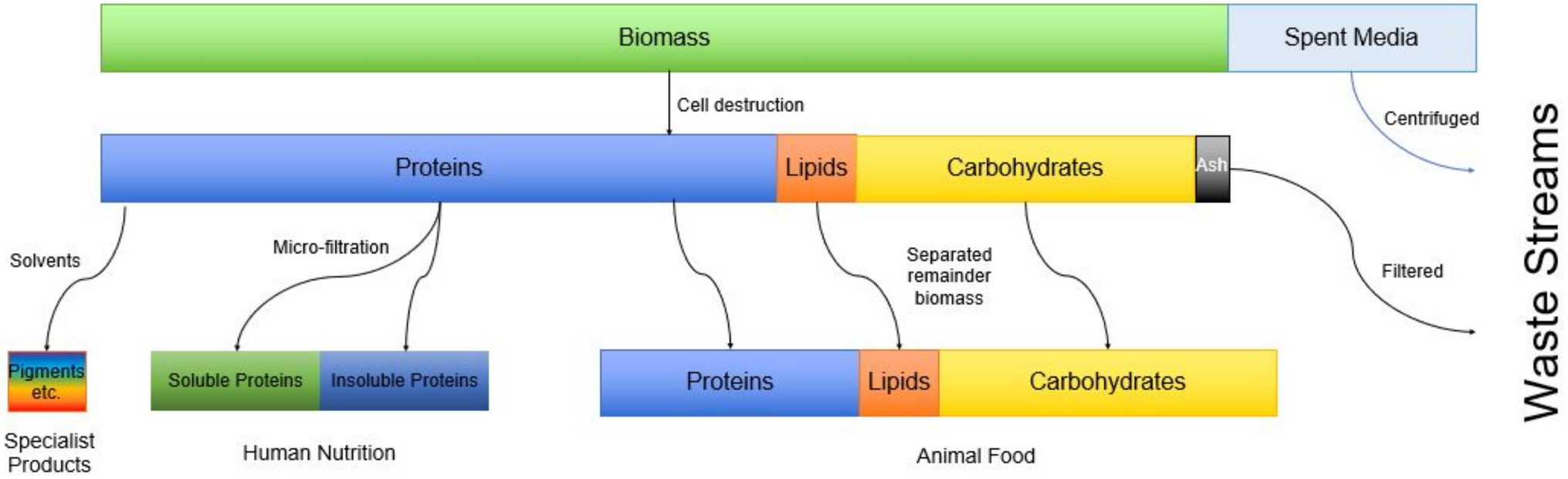
Optimization



Biomass Components

Galdieria and Methylacidiphilum: protein, amino acids, fats, sugars.
Niche chemicals like:

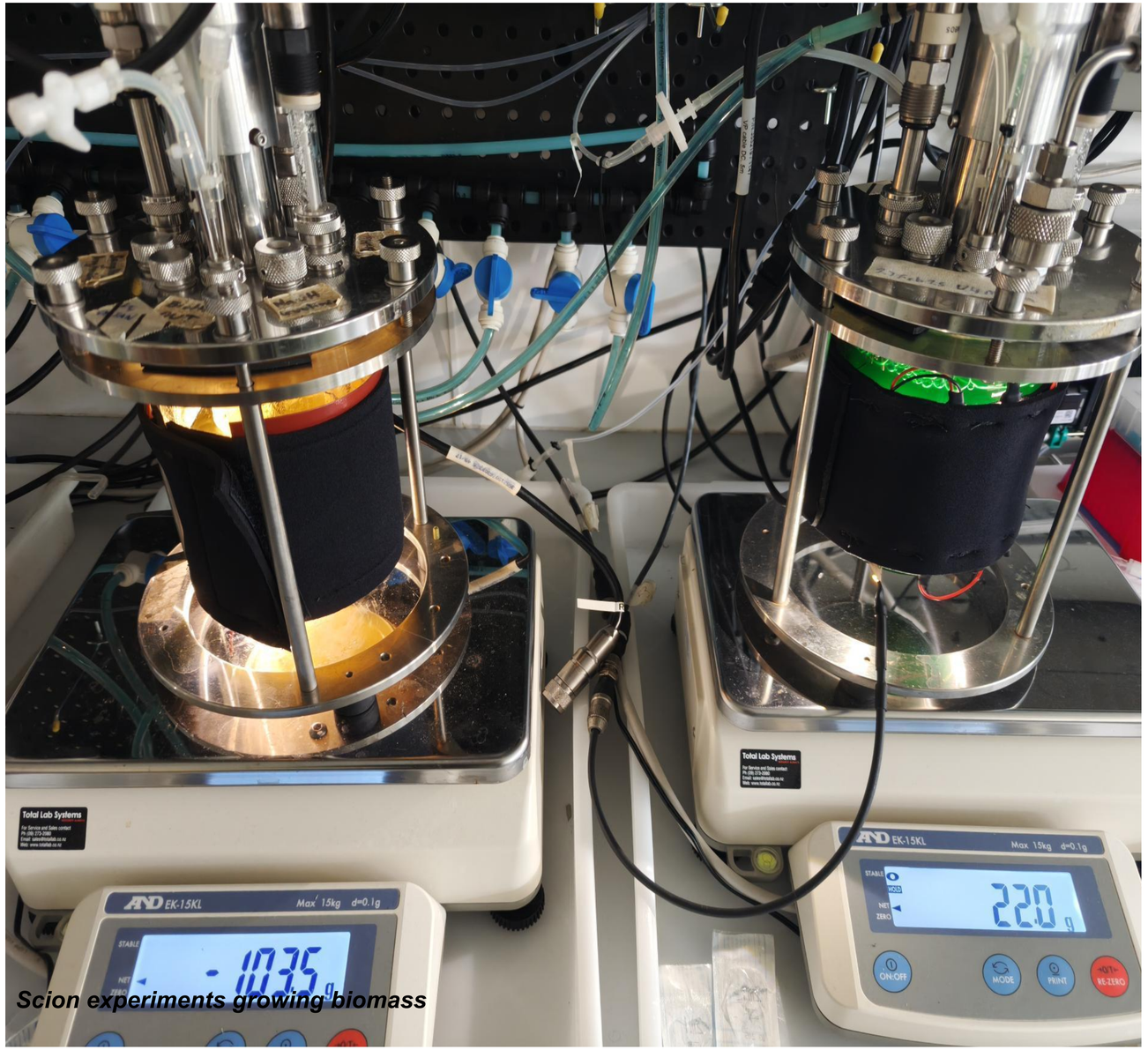
- Polyhydroxyalkanoates (PHA): bio-based and biodegradable polymer that can replace traditional plastics
- Ecotine: As an antioxidant, it protects against free radicals and thus against premature skin aging. Prevents skin damage from UV
- Phycoporphyrin (Heme): Iron atom that reversibly binds oxygen as the blood travels between the lungs ad tissues. Colouring for foods.



Gas Management

- CH_4 : CO_2 ratios
- Purification of gases e.g. H_2S removal – approach depends on gas composition
- Gas dissolution and uptake by microbes
- Utilisation of all gases not venting lots of oxygen and methane – advantage of methanotrophs
- Some gases are not toxic to microbes so don't need to be removed – more work to be done

NZ Geothermal Workshop: Purification of Geothermal Gases for Use in Pilot and Demonstration Scale Facilities, Wiseman et al



Scion experiments growing biomass

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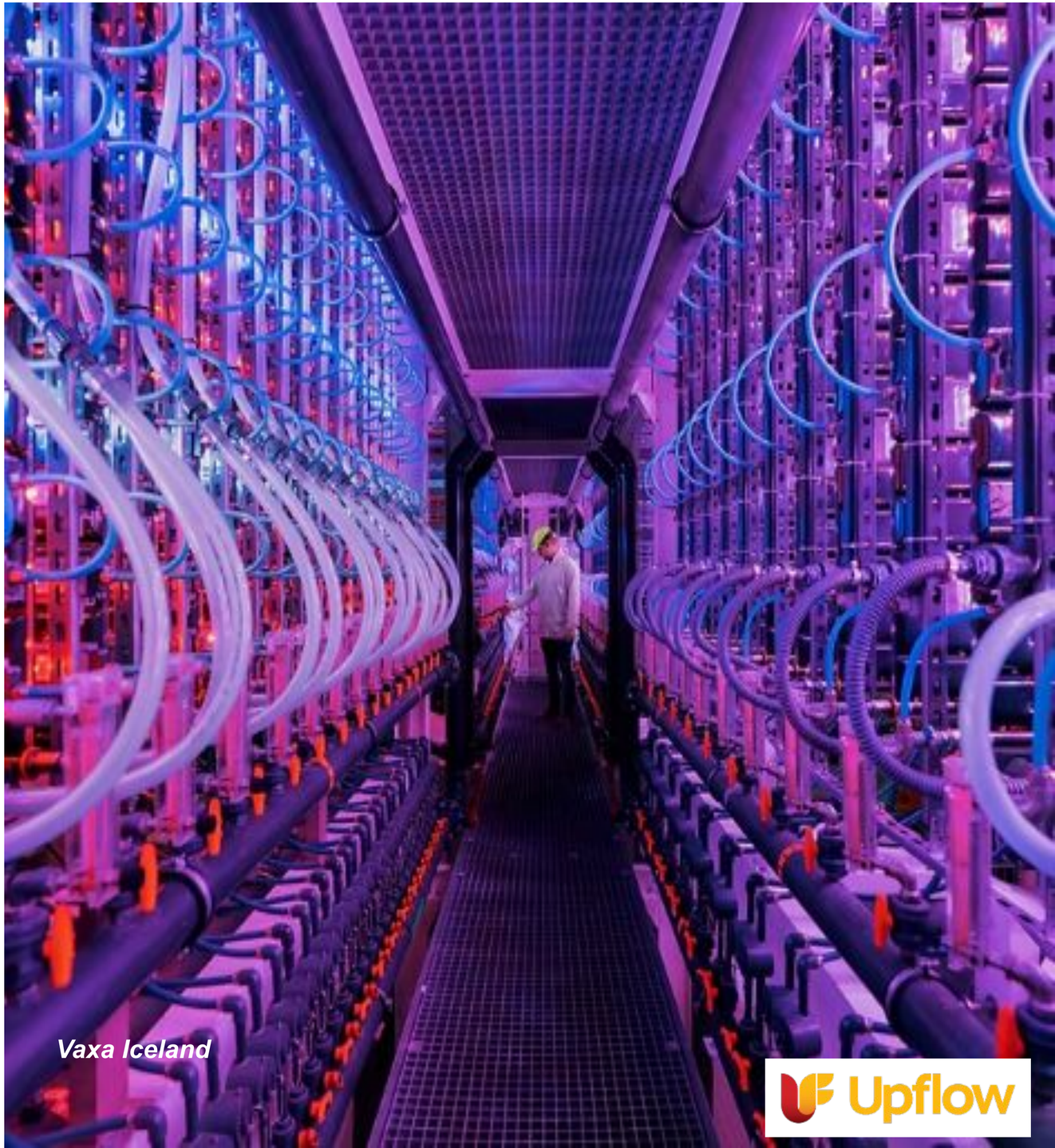
Commercial

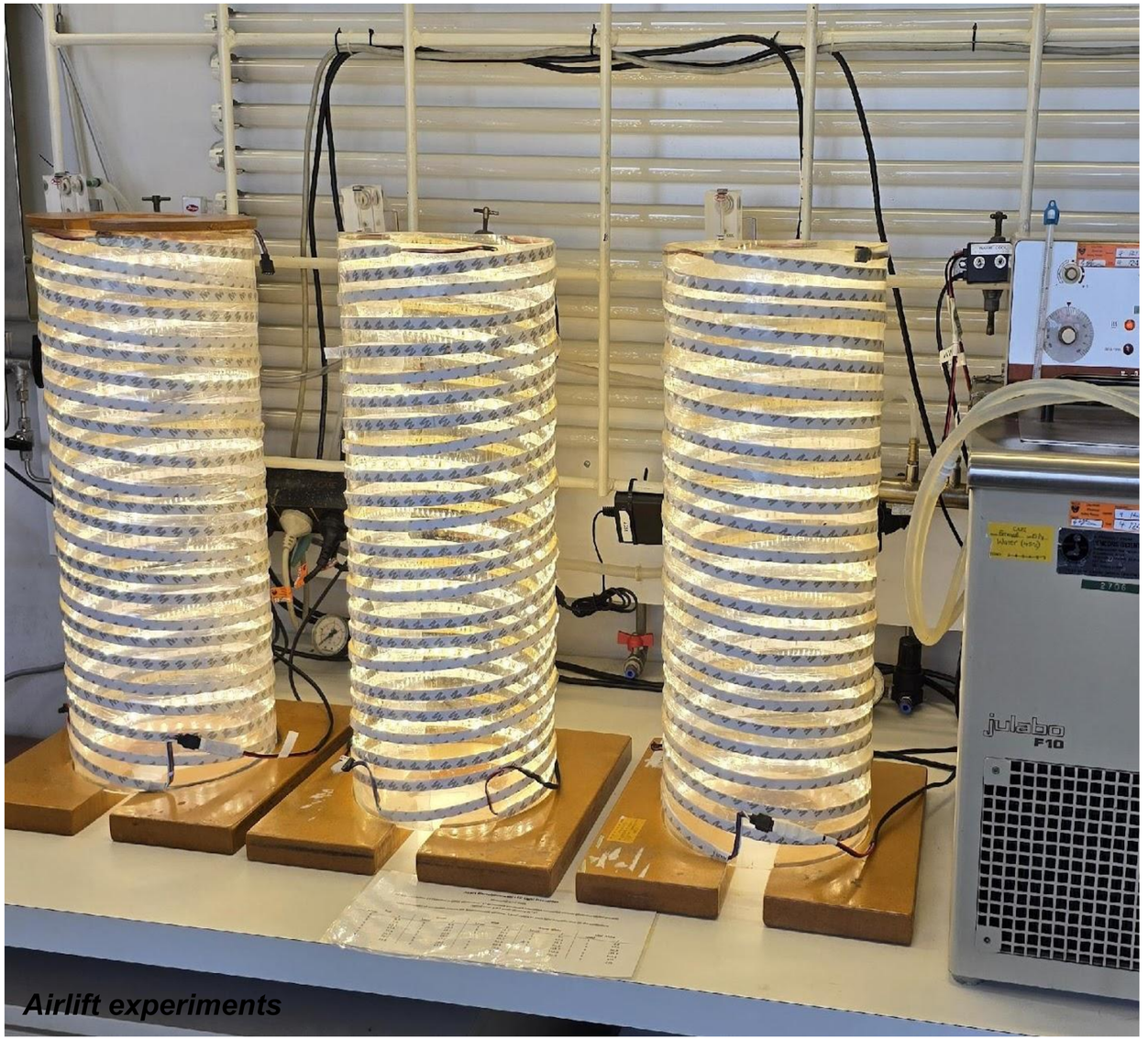
- Microbial product market expected to reach $350B by 2027
- Valuable commercial insights from experts
- Seeking high value products not just bulk food option eg Axastanthin, carotenoid
- $2.5M from the government is a huge enabler that tech firms typically don’t get – this is the place where projects fail
- Create a platform for Xphiles commercialization to capitalize on the lessons learned in this project



Next Steps

- Halfway - 2 years to go
- Setup 80L bioreactor at Scion
- Gas management focus
- Finalisation of pilot plant design
- Commercial pathway development
- Collaborative work with market partners
- Platform focus

NZ Geothermal Workshop: Biological transformation of geothermal gases to biomass: a case study, Mitchelmore et al



Airlift experiments

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Scientists because engineers need heroes too.

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