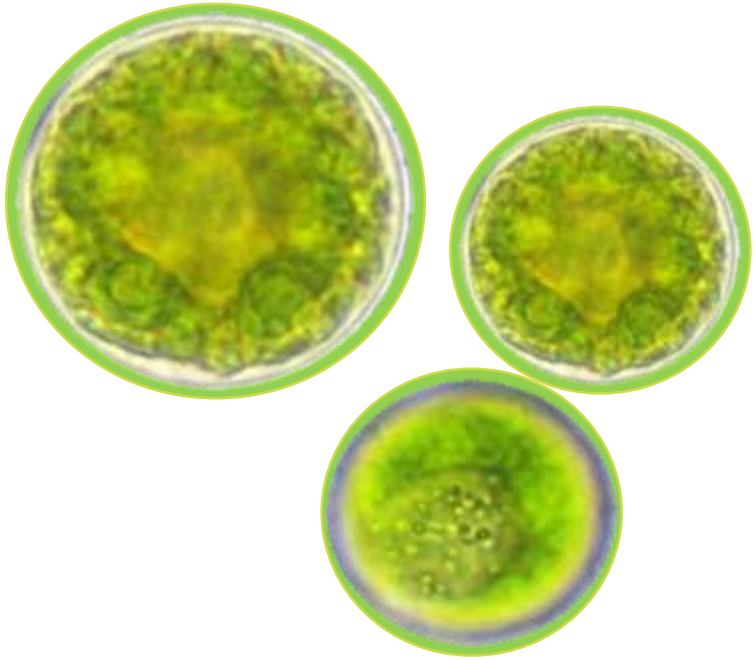
Carbon Dioxide Utilization Efficiency in Microalgae Systems:
Evaluating the use of flue gas to grow microalgae



Brittany Denzer

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Akamai Workforce Initiative

Cellana

Mentor: Emily Knurek

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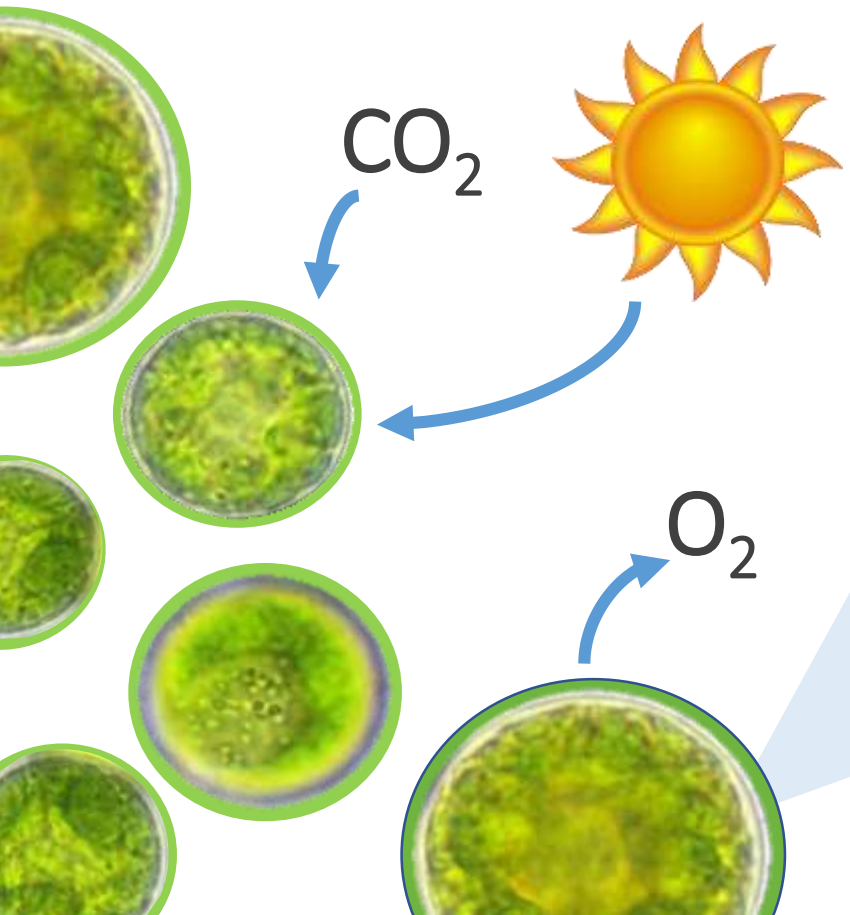
AKAMAI Workforce Initiative
BUILDING HAWAII'S SCIENTIFIC & TECHNICAL WORKFORCE

Algae cultivation



CO_2

O_2

- Carbohydrates
- Proteins
- Fats

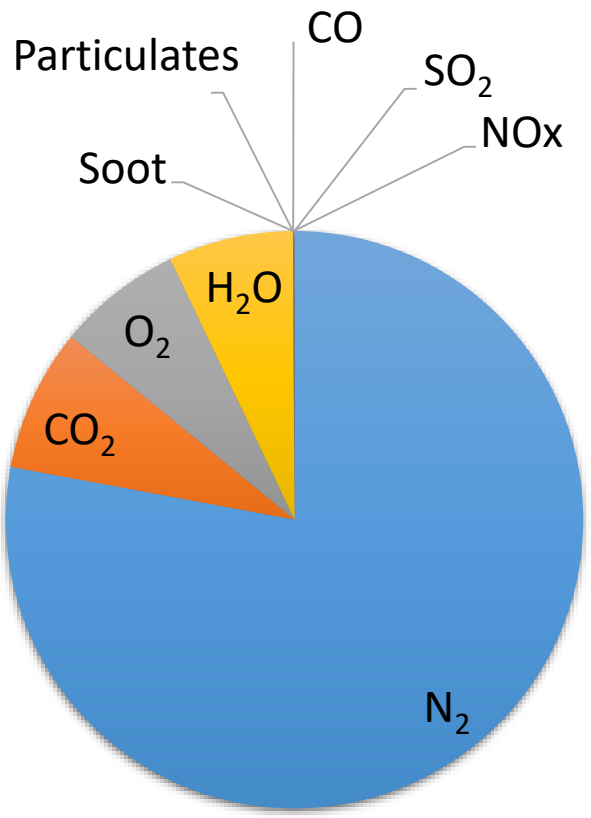
Aquaculture feed

Nutraceuticals

Biofuels

Livestock feed

Flue gas as an alternative CO_2 source



Flue Gas

Flue Gas: exhaust from fossil fuel combustion

- 5-10% CO_2
- Primary contributor to CO_2 emissions

Benefits

- Mitigates CO_2 emissions
- Reduces operational cost

Challenges

- Toxins and heat
- Low CO_2 concentration
- Requires capture and delivery system

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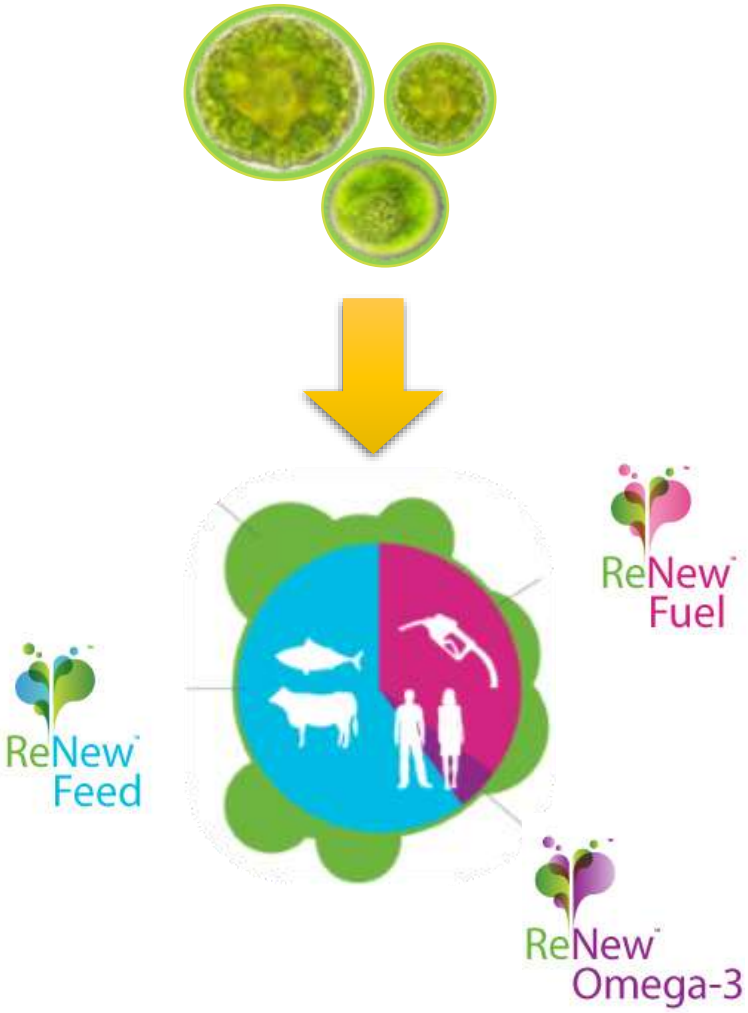

Cellana Kona Demonstration Facility

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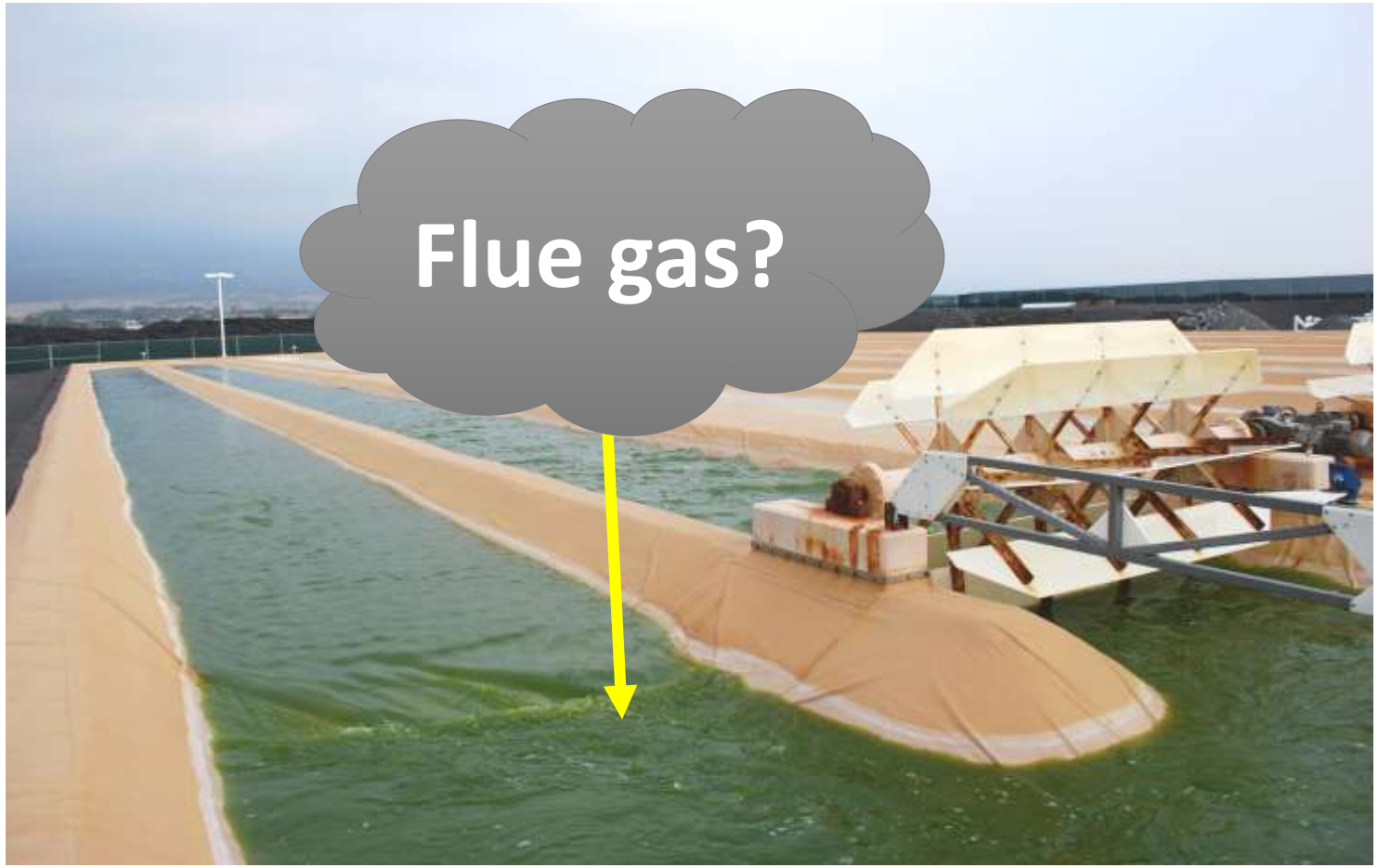
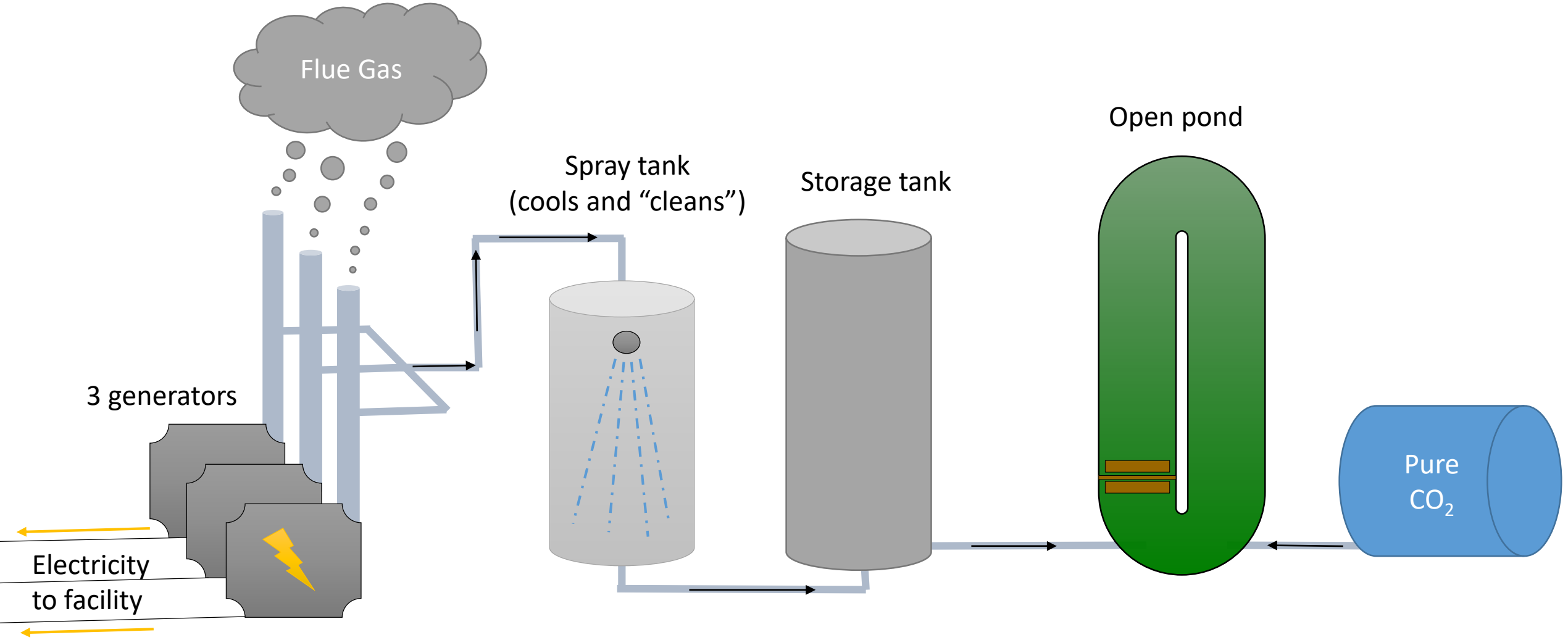


Open Ponds

Cellana's flue gas treatment and delivery system



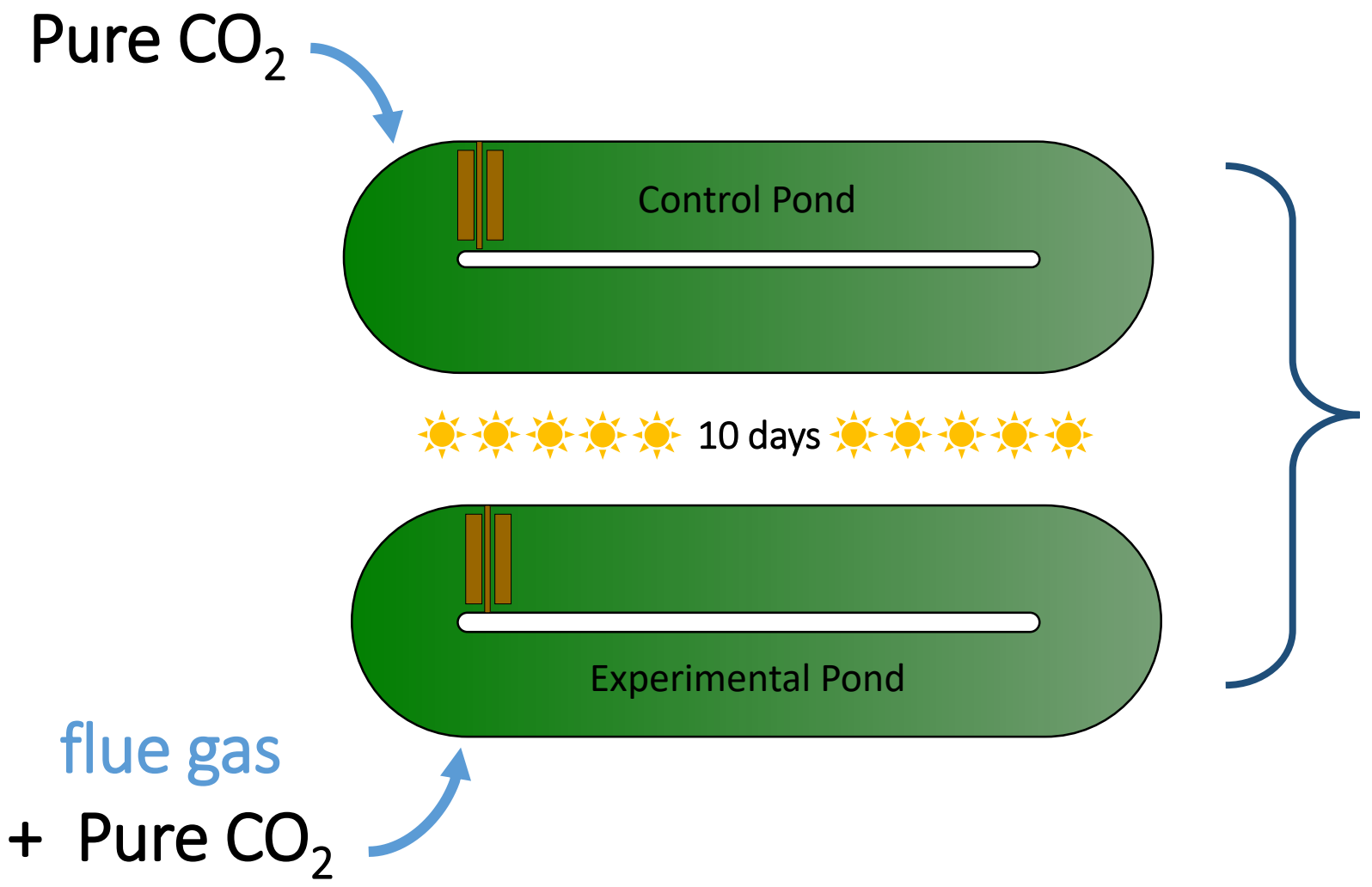
The BIG questions and objectives

Is Cellana's flue gas system, when supplemented with CO_2, effective in the large scale cultivation of algae?

- Does the flue gas system offset CO_2 usage?
- Algae grown with flue gas vs algae grown with pure CO_2
- How much CO_2 is used for each system/what is the cost?

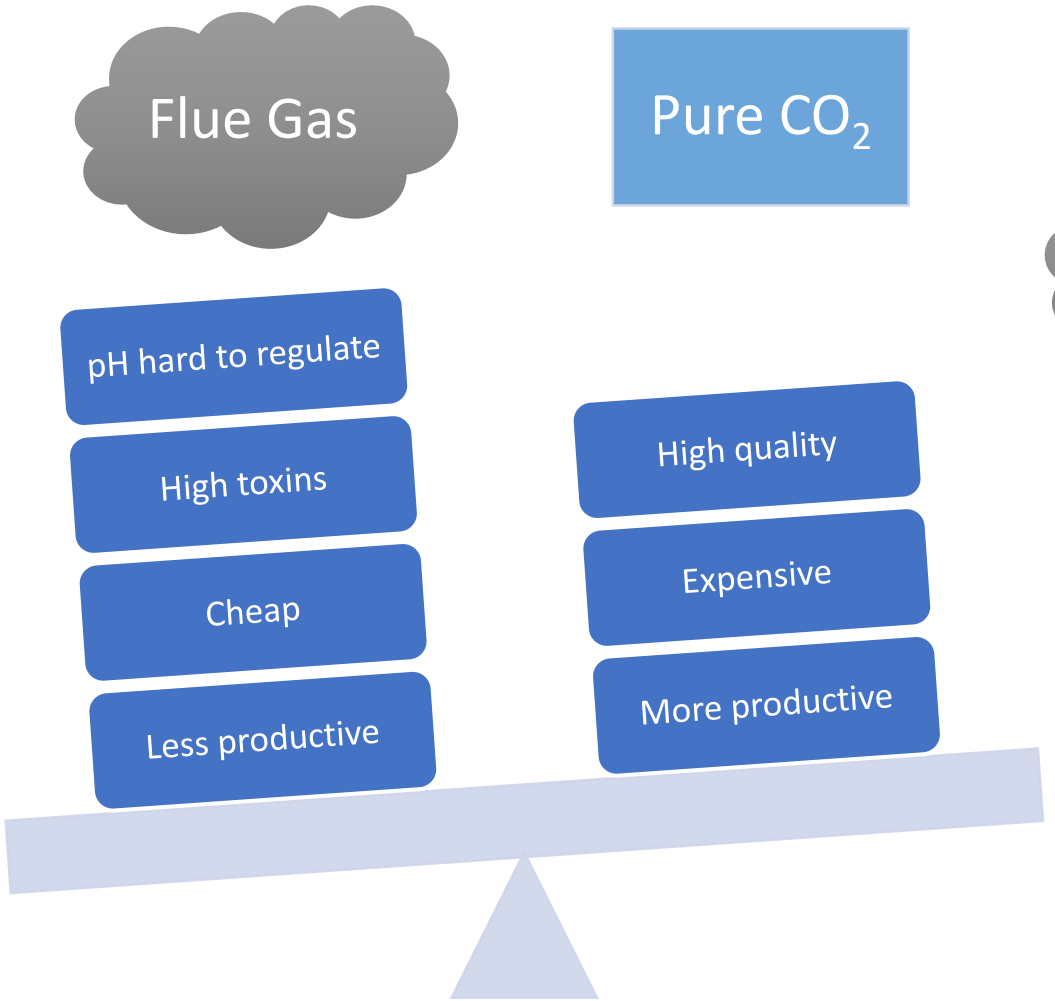
What is the baseline CO_2 usage through the open pond growth cycle?

Methods

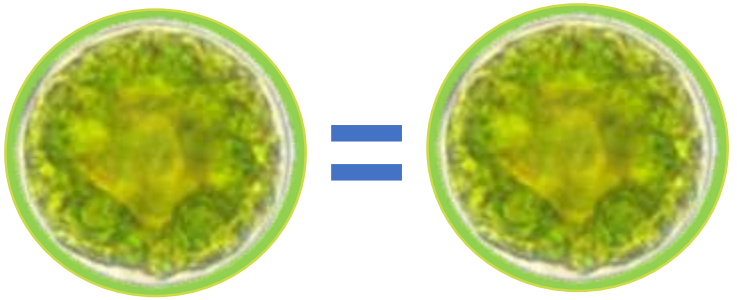


- Growth Rate
- Biomass productivity
- Biomass composition
- Nutrient use
- pH
- CO_2 usage
- Cost

Balancing the outcomes

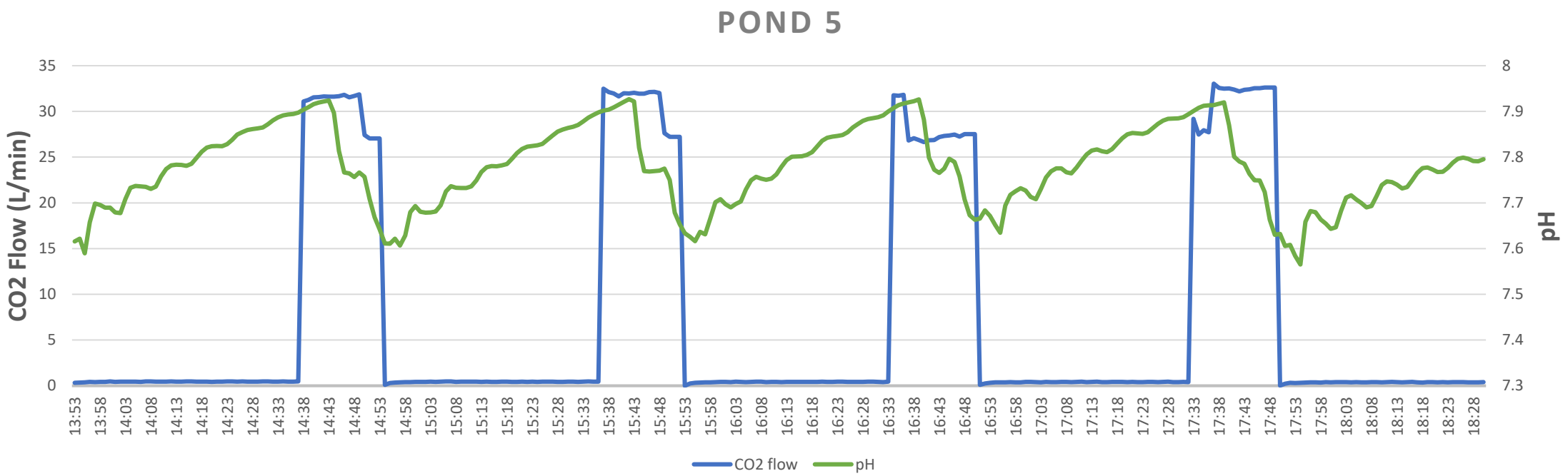


Flue Gas = Less pure CO_2 needed = $$$



Flue Gas = Pure CO_2 (control)

Major milestones



Completed: System to collect flow data installed, preliminary data collected

Future: First cycle of flue gas experiment to be completed

Acknowledgments

Mentor: Emily Knurek

Thank you to all Cellana employees for all the support and assistance throughout my internship!

Thank you to the Akamai staff and Akamai sponsors!