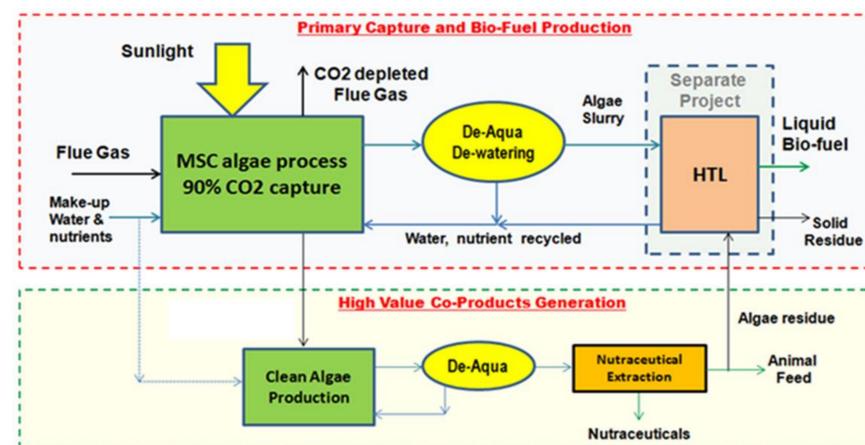


## Project Overview

### Overall Objectives

1. Develop algae technology for efficient CO<sub>2</sub> capture from coal power plant flue gas
2. Make products from algae to mitigate the cost of carbon capture

## Process Schematic

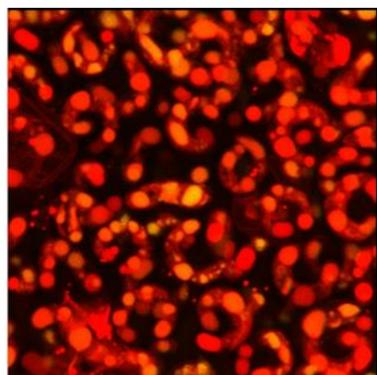


1. Complex living system
2. 12% CO<sub>2</sub> is 300x of ambient
3. Flue gas contaminants potentially harmful
4. 90% CO<sub>2</sub> capture + high productivity difficult
5. All downstream applications require dewatering

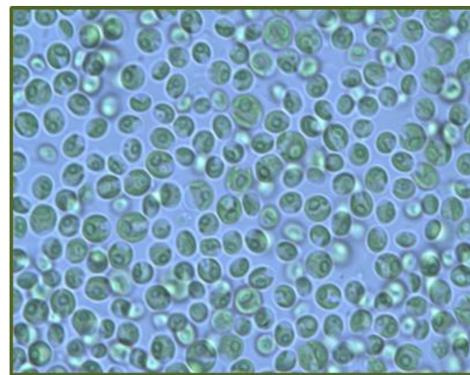
## Phase 2 Objectives

1. Validate stability & performance in natural sunlight
2. Design/build/operate first-of-a-kind MSC stage
3. Design/build interconnected MSC unit
4. Demonstrate MSC operation control in natural sunlight
5. Advance co-production of nutraceuticals
6. Advance DeAqua for dewatering

## Microalgae Strains

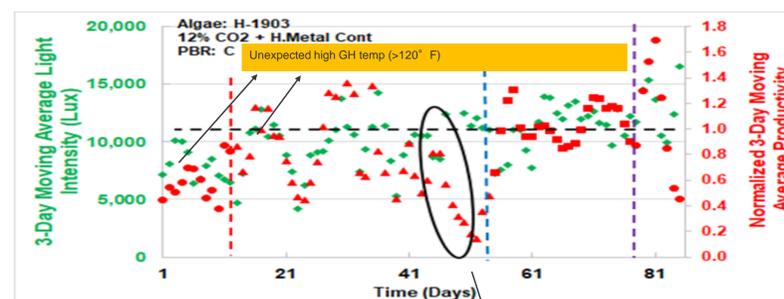


H-1903



H-0322

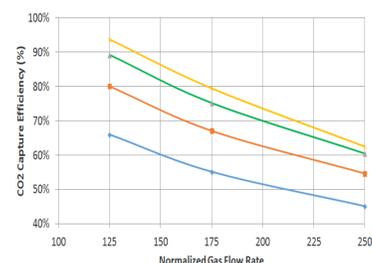
## Extended Operation in Sunlight



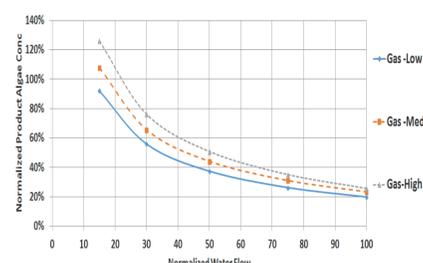
- Long-term operation - System Robustness demonstrated - recovered from unexpected setbacks
- Fluctuating light intensity results in algae growth and productivity variation

## MSC Design Considerations

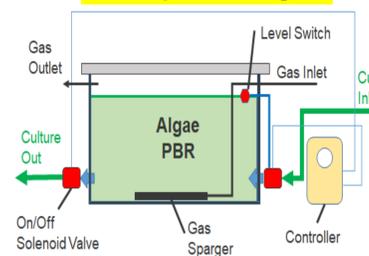
### Impact of process flows on CO<sub>2</sub> capture efficiency



### Impact of process flows on product concentration



### Conceptual Design

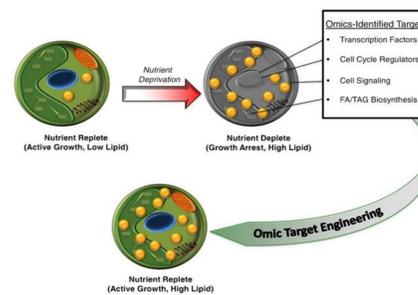
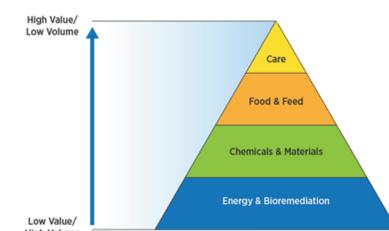


### Fabricated Unit



## Co-product Generation

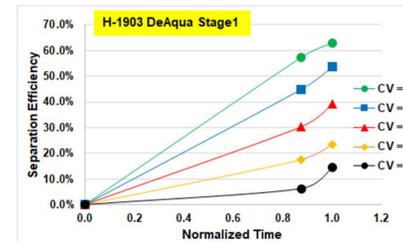
- Products for human consumption
- Products for Animal/Aquaculture Feed
- Biofuels (biocrude; biodiesel)
- Best algae strains are product dependent



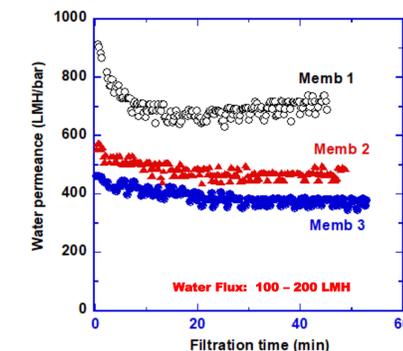
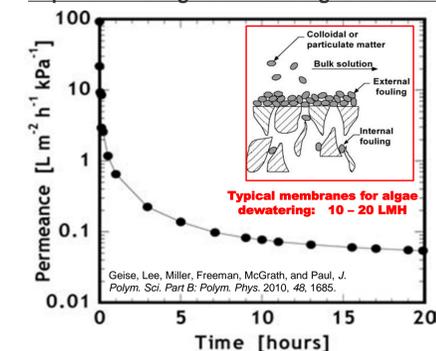
## Algae Dewatering

### Impact of Design Factors on DeAqua Stage 1

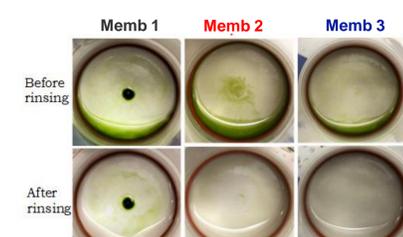
- Impact of geometric parameters studied
- Effect of chamber surface material tested
- Impact of culture and environmental conditions mapped
- Identified potential strategy to improve performance



### Impact of fouling on dewatering membrane



### Dead-end cell dewatering system



1. Continuous process
2. Advanced gravity table followed by anti-fouling membrane
3. Suitable for integrating with upstream/downstream processes

## Summary

- Stable long-term operation demonstrated
- Variability due to natural light variation quantified
- MSC stage designed and fabricated
- Co-product species selected & process being refined
- Gravity table operation improved
- High flux with antifouling membranes for dewatering

## Acknowledgement

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