Implementing The Plant Chicago

Illinois Institute of Technology
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The PLANT

The Opportunity

- Underused urban industrial areas
- Socially/environmentally responsible industry
- Toolkit for Industrial Reuse

The Team

- 21 students, 4 sub-teams, 5 disciplines

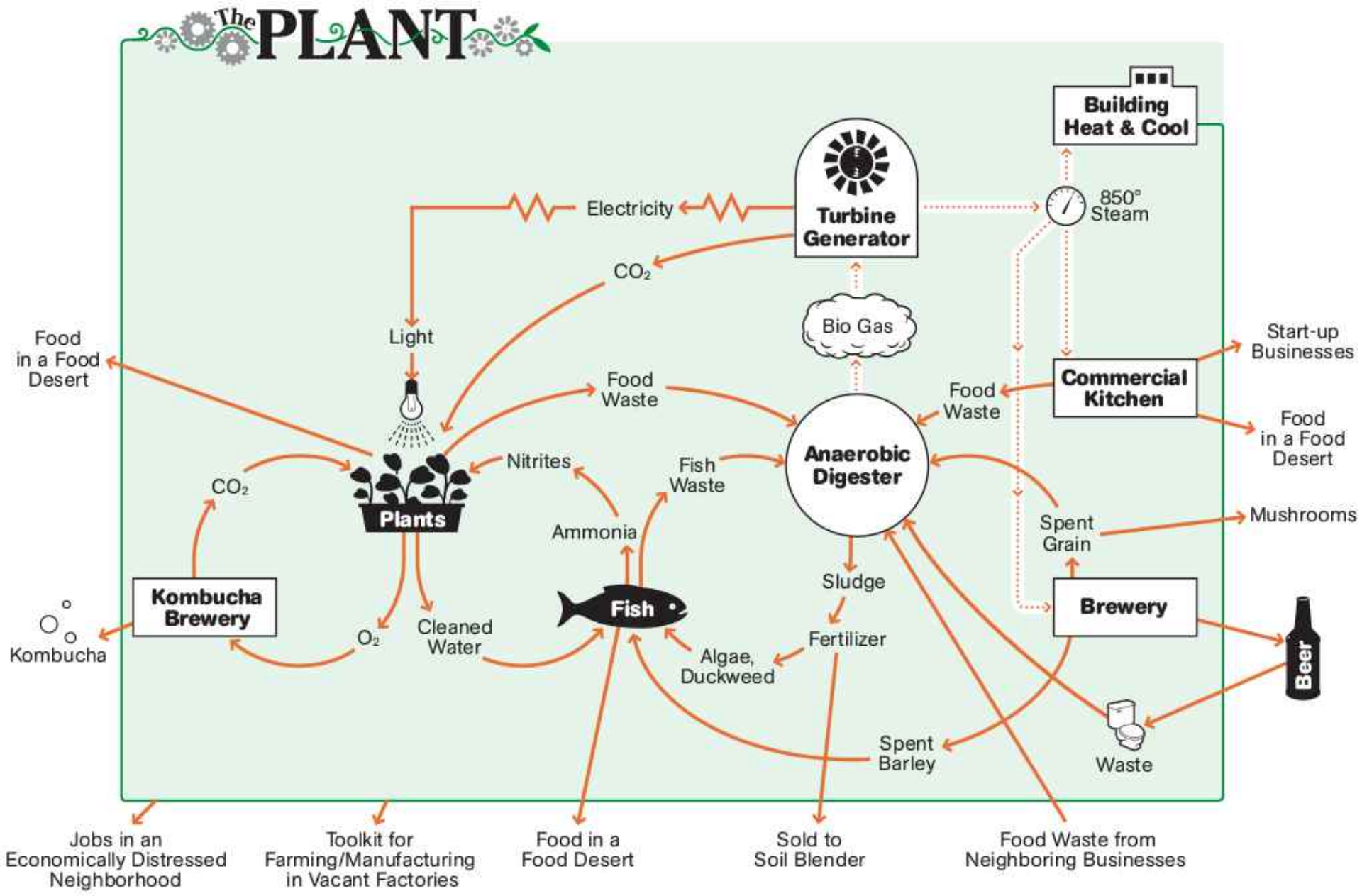
Our Mission:

Make The Plant a Reality

- Agricultural systems
- Computer Control
- Digester/Combined Heat & Power (CHP)
- Architecture

The Plant, LLC

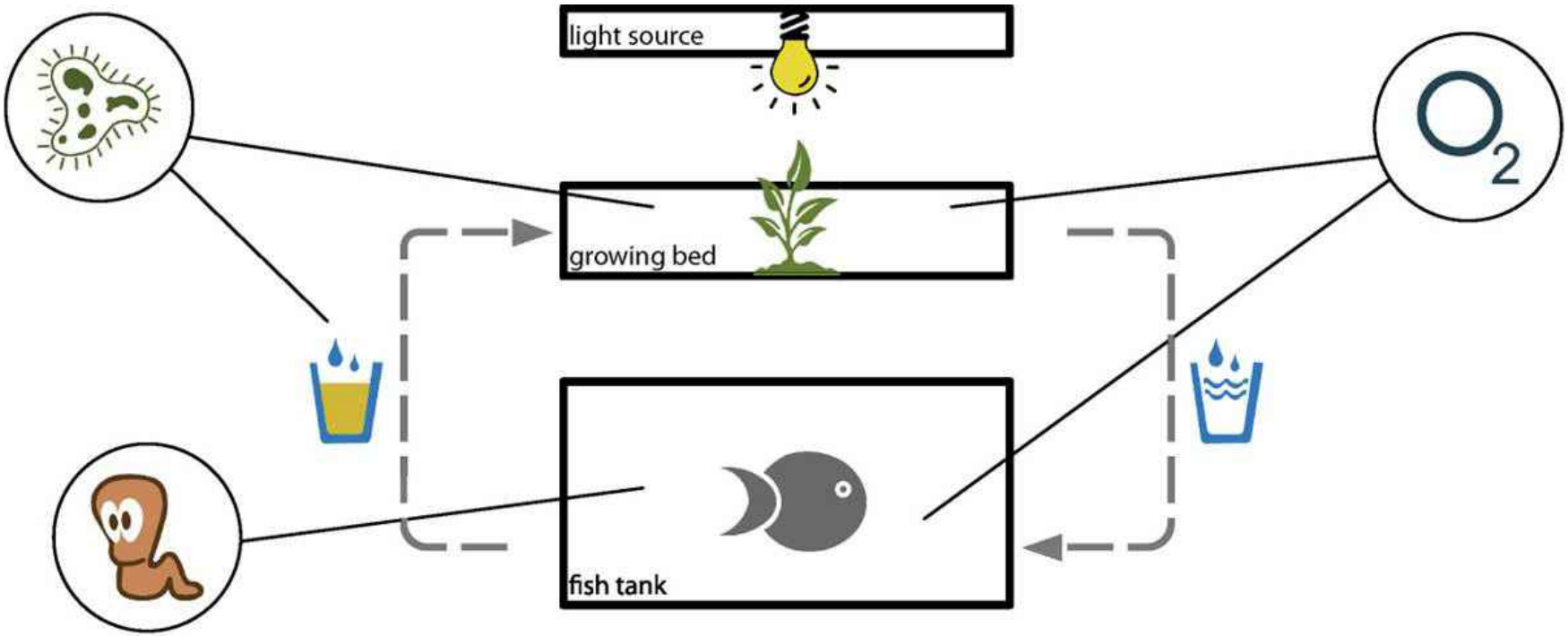
- 100,000 sq. ft.
  3 story building
  3 acres
- 50% farming operation
- 50% small food business tenants


The PLANT
Building Heat & Cool
Turbine Generator
Electricity
850° Steam
CO_2
Bio Gas
Light
Food in a Food Desert
Food Waste
Start-up Businesses
Commercial Kitchen
Food Waste
Food in a Food Desert
Anaerobic Digester
Nitrites
Fish Waste
CO_2
Plants
Ammonia
Spent Grain
Mushrooms
Sludge
Kombucha Brewery
Fish
Brewery
Kombucha
O_2
Cleaned Water
Fertilizer
Algae, Duckweed
Beer
Spent Barley
Waste
Jobs in an Economically Distressed Neighborhood
Toolkit for Farming/Manufacturing in Vacant Factories
Food in a Food Desert
Sold to Soil Blender
Food Waste from Neighboring Businesses

Semester Goals

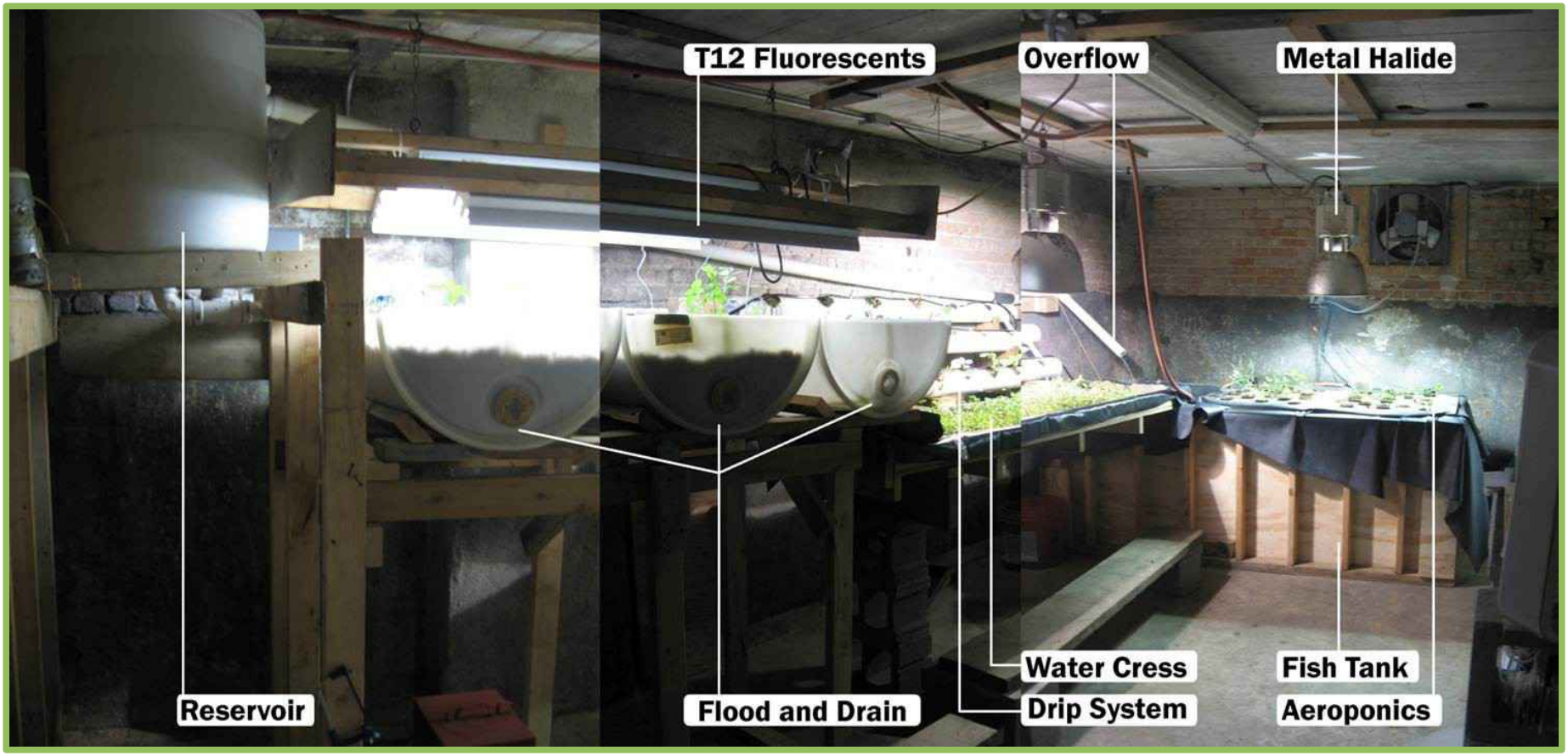
- Bring latest aquaponic system to production
- Implement control system framework
- Design rooftop greenhouse and develop entrance-way design
- Prototype anaerobic digester

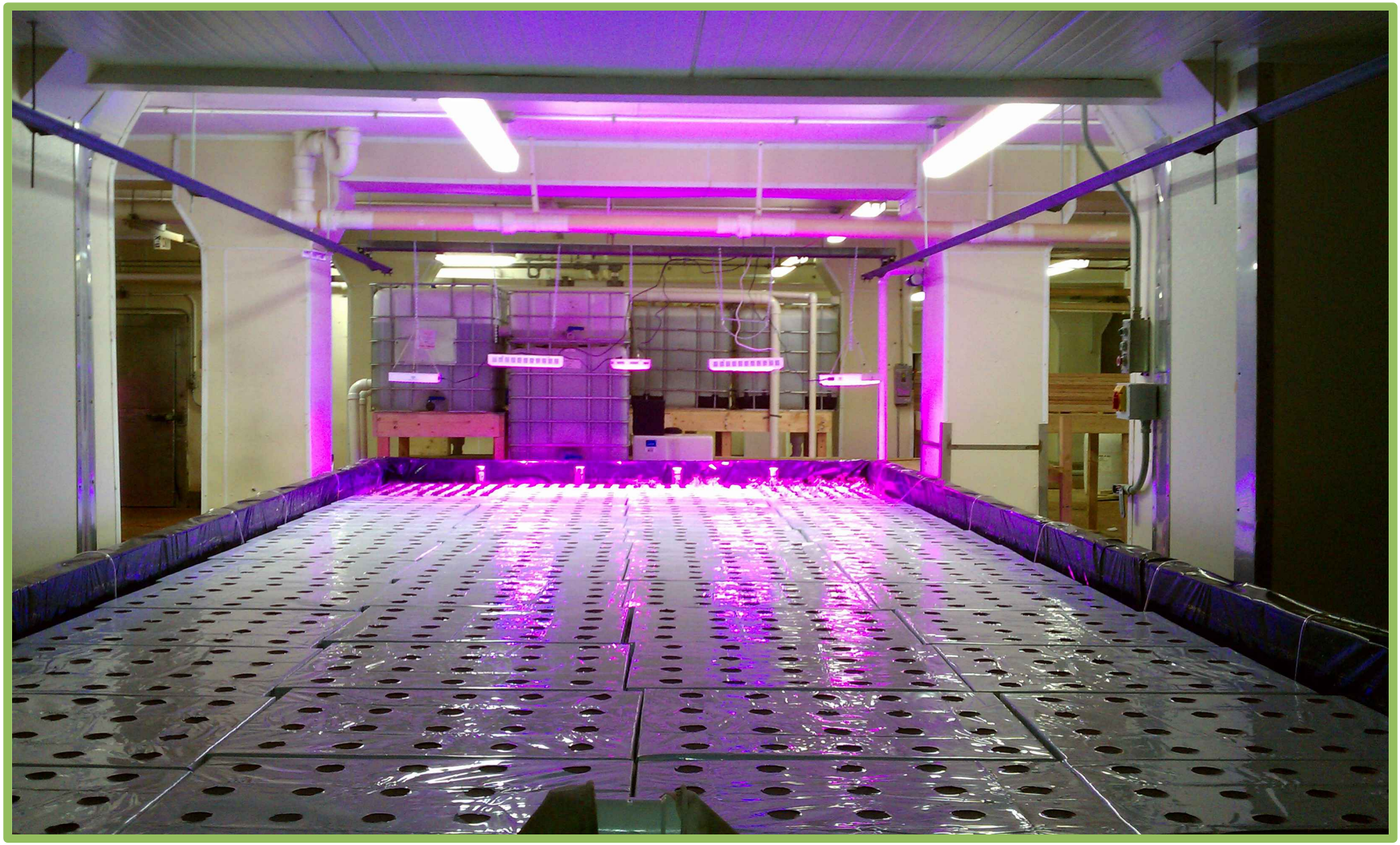
Aquaponics



Agricultural Systems

- Germination System
- Breeder System
- Gather water-quality data


T12 Fluorescents
Overflow
Metal Halide
Reservoir
Flood and Drain
Water Cress
Drip System
Fish Tank
Aeroponics




EXIT

Next steps

- Build Systems #2,#3
- Optimize systems for production
- Design vertical hydroponics component

Computer Control

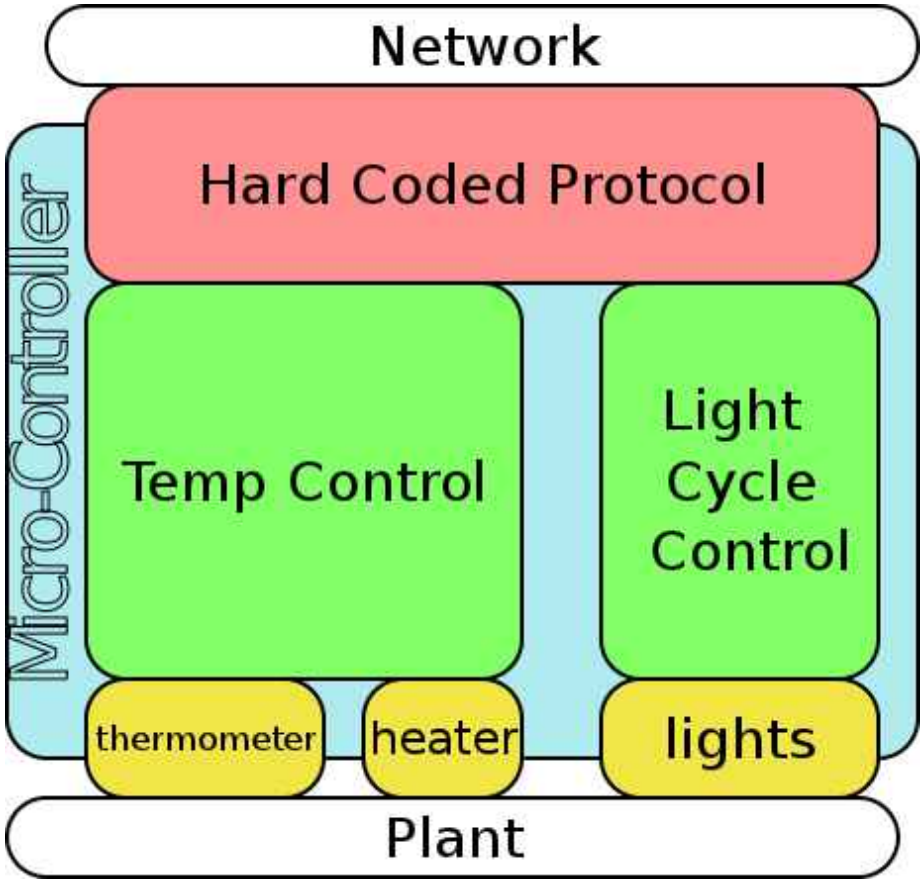
- View/change environment variables
- Minimize maintenance of farm
- Gather operational data
- Integrate with building systems

Previous Work

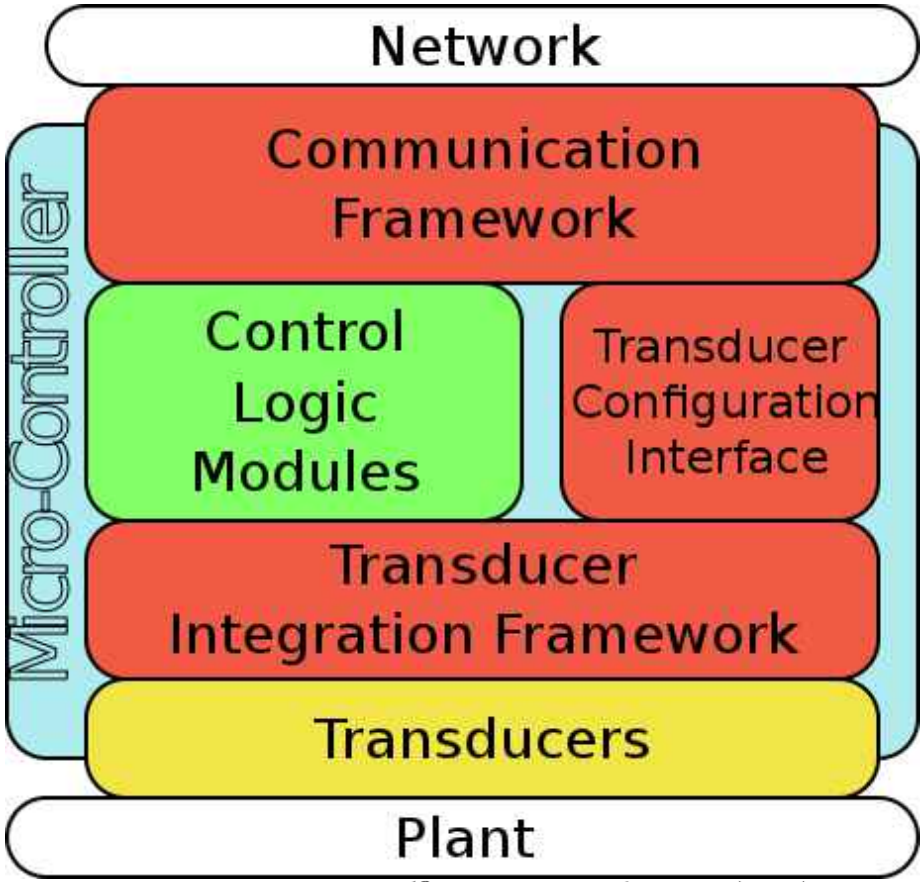
- IPRO336 Fall 09'
  - Requirements for Ag sys. control
- IPRO336 Spring 10'
  - Prototype aquaponic control system
- Independent Study Fall 10'
  - Design new control framework

Control System Framework

Old System



New System



This Semester

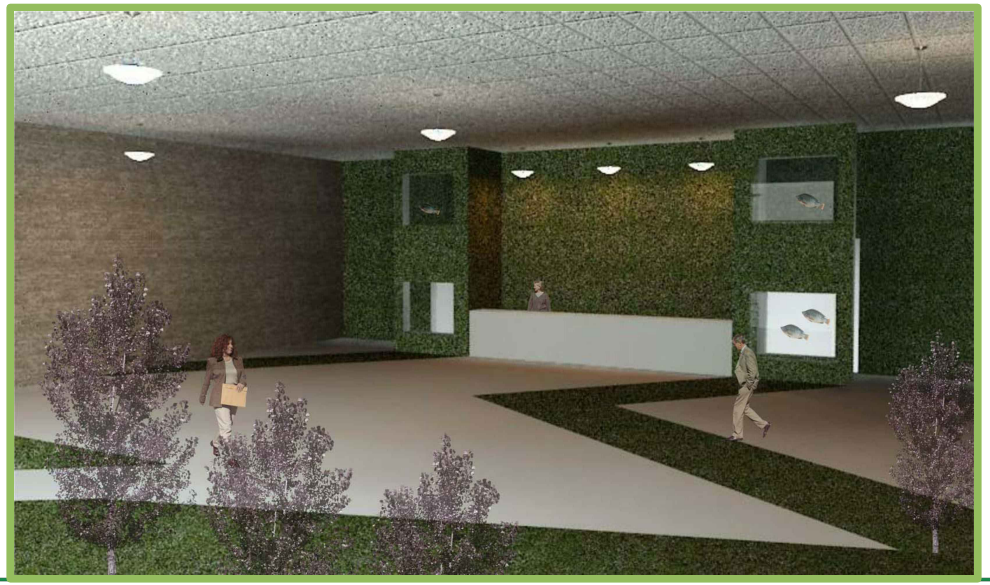
- Implement new control system framework
- Integrate temp,pH,ORP,PAR sensors
- Integrate relay and PWM actuators
- Begin deployment to system #1

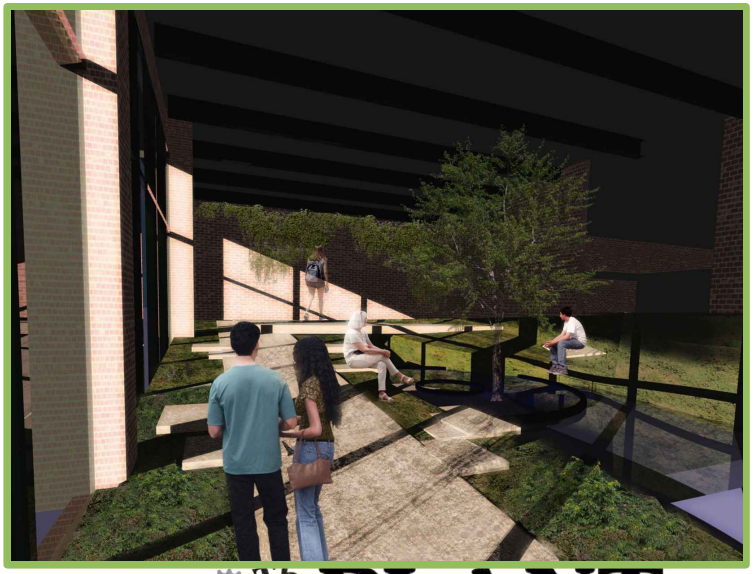
Next Steps

- Continue development of Ag. Sys. application
- Develop building security application
- Systems composition

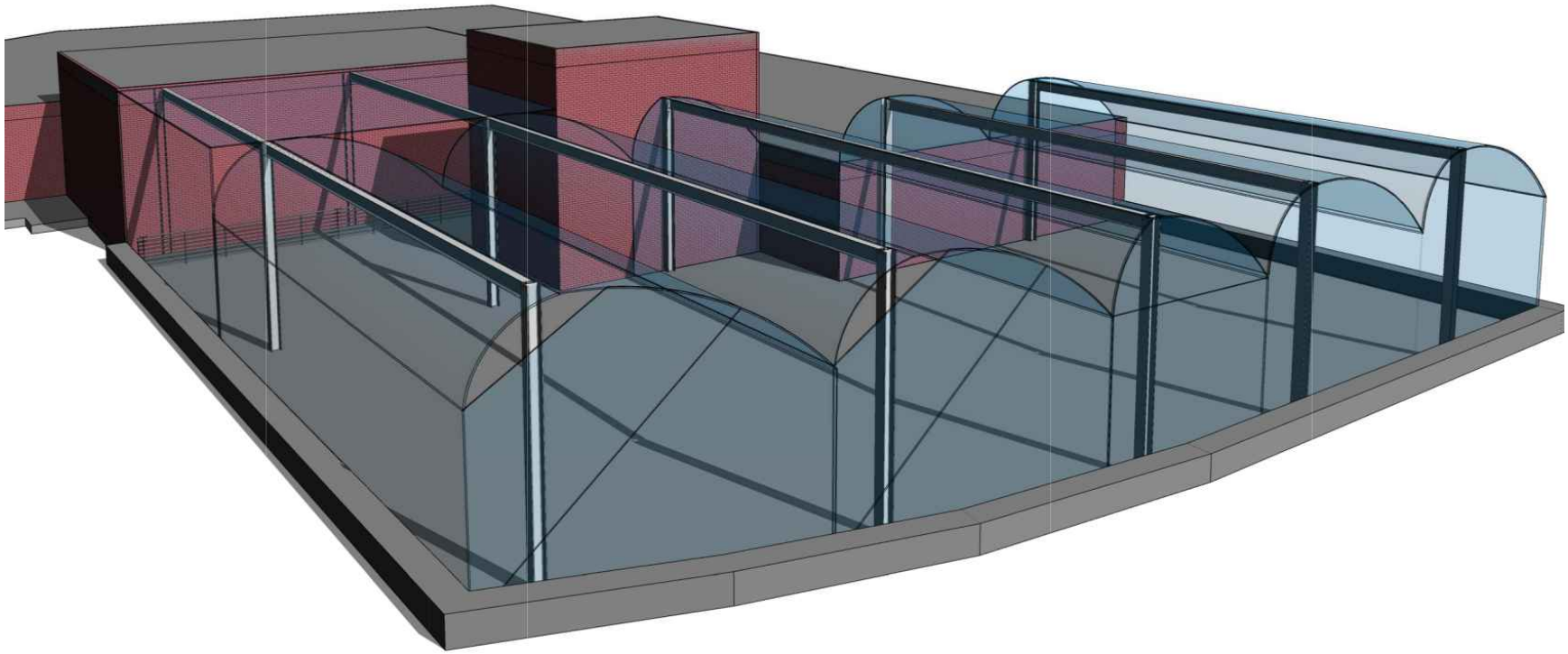
Entrance Way

The image that represents the concept behind the plant



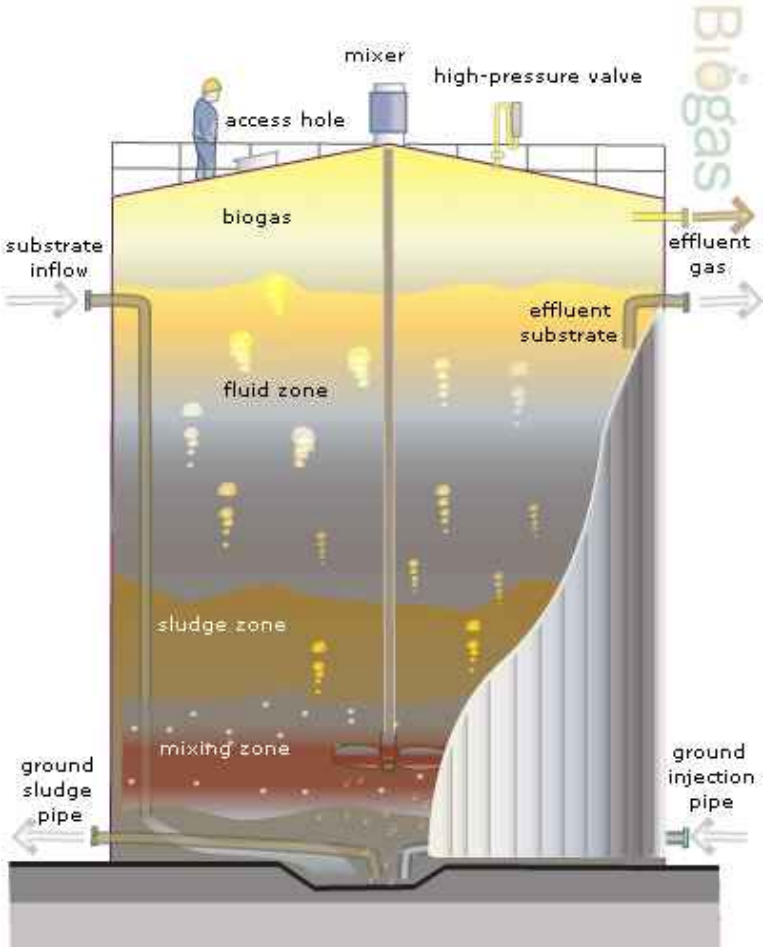


Rooftop Green House

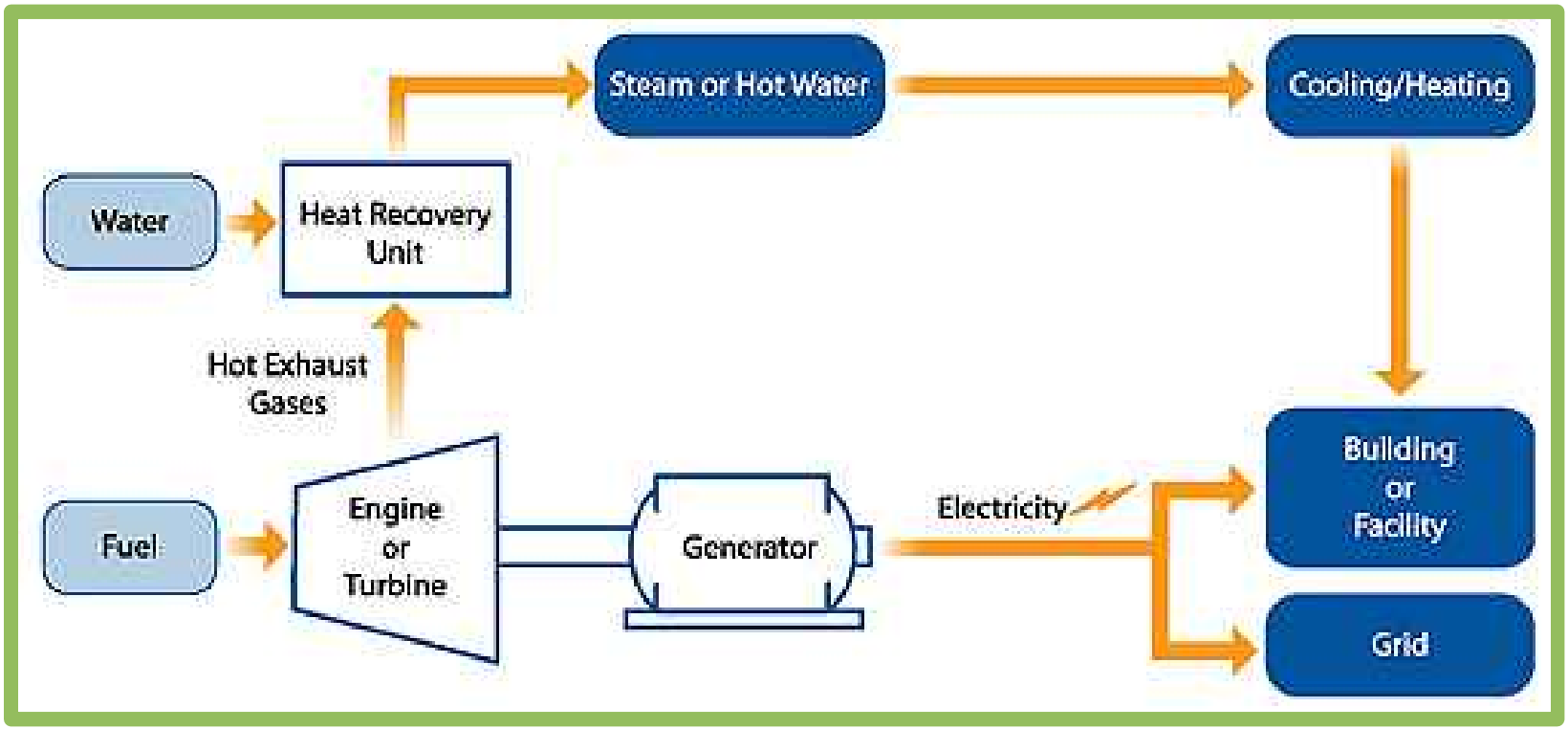


Anaerobic Digester

- Use of organic waste to generate power for the Plant.
- Efficient waste management.
- Alternative Benefits

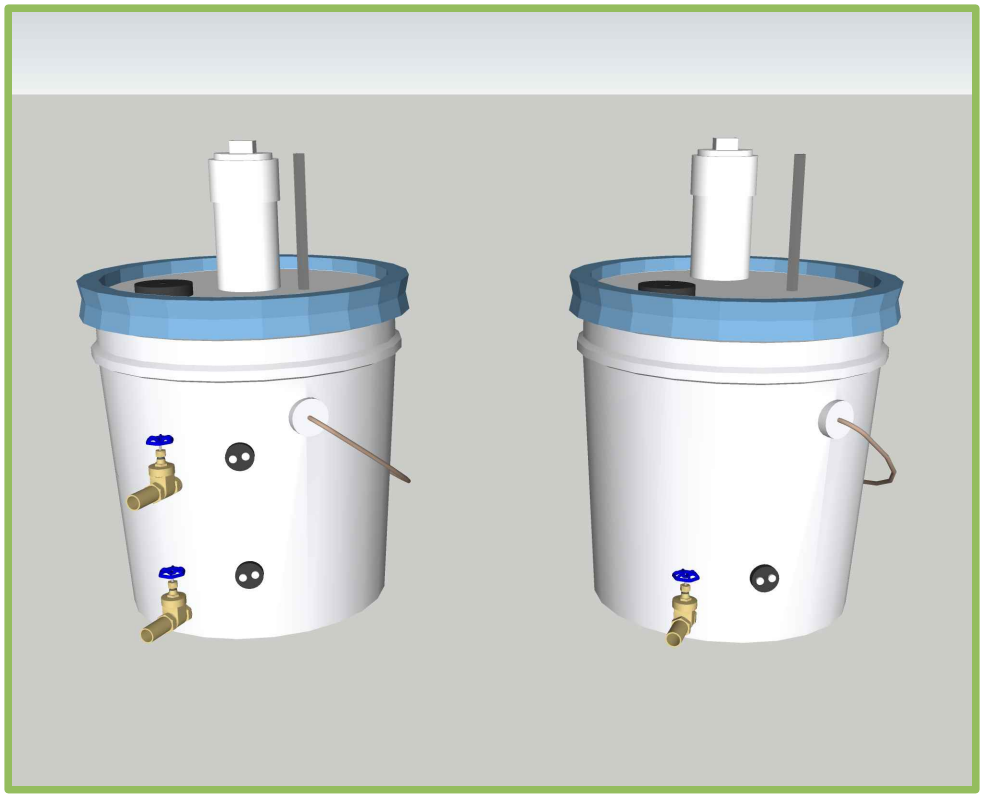


Combined Heat & Power System

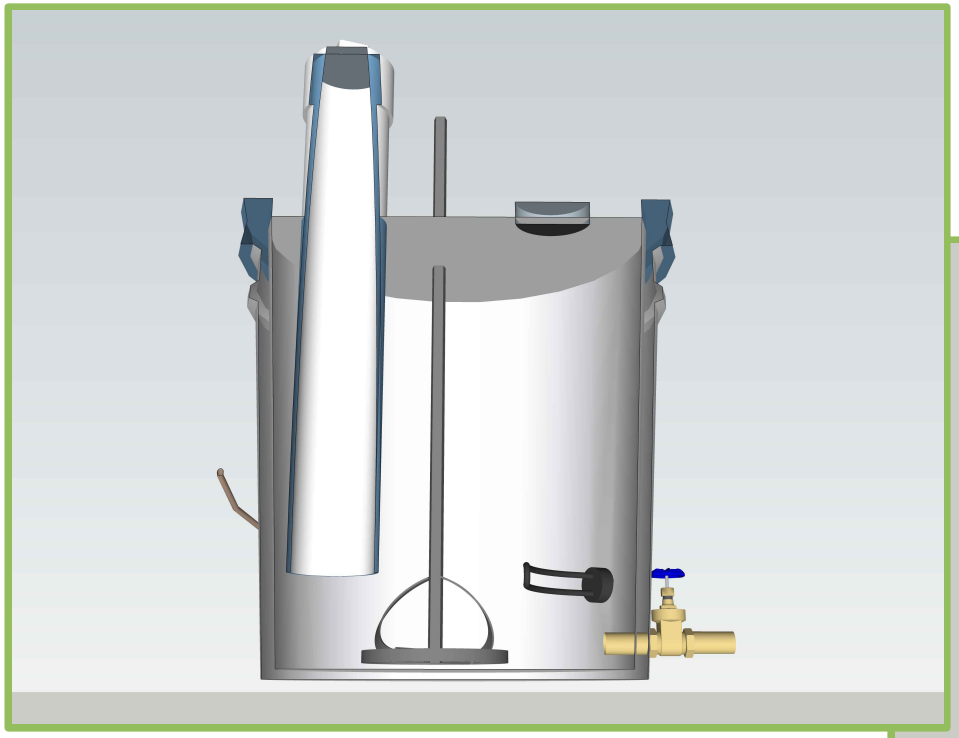


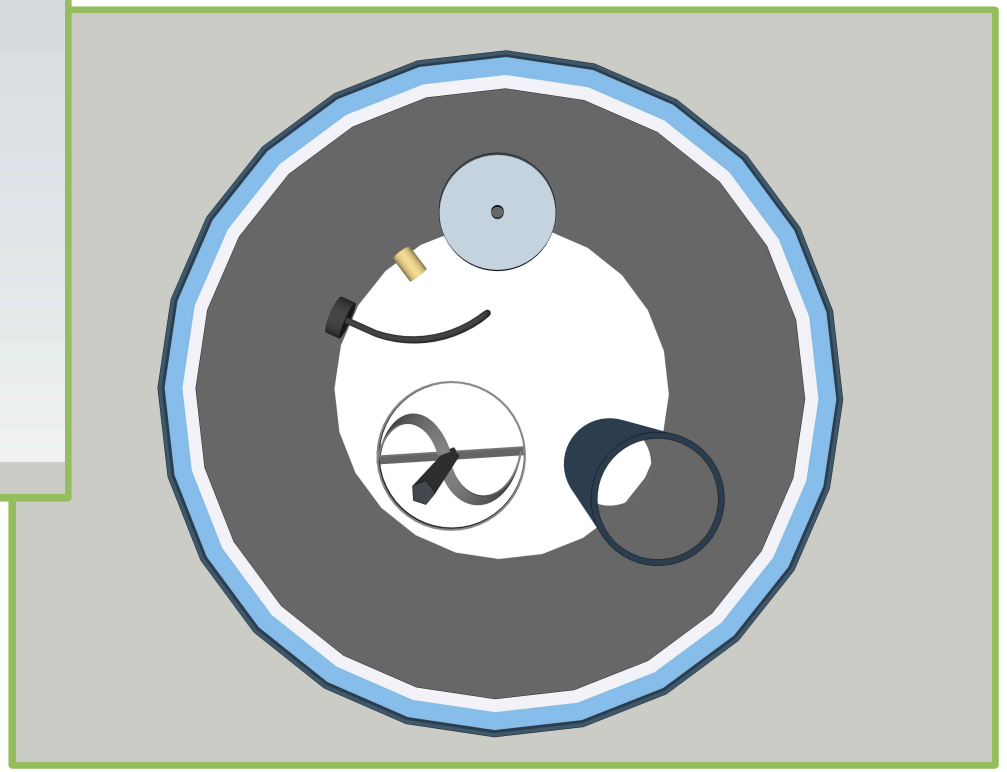
Anaerobic Digester Models

- Materials and Construction
- Model Operation
- Purpose of Models
- Expected Results

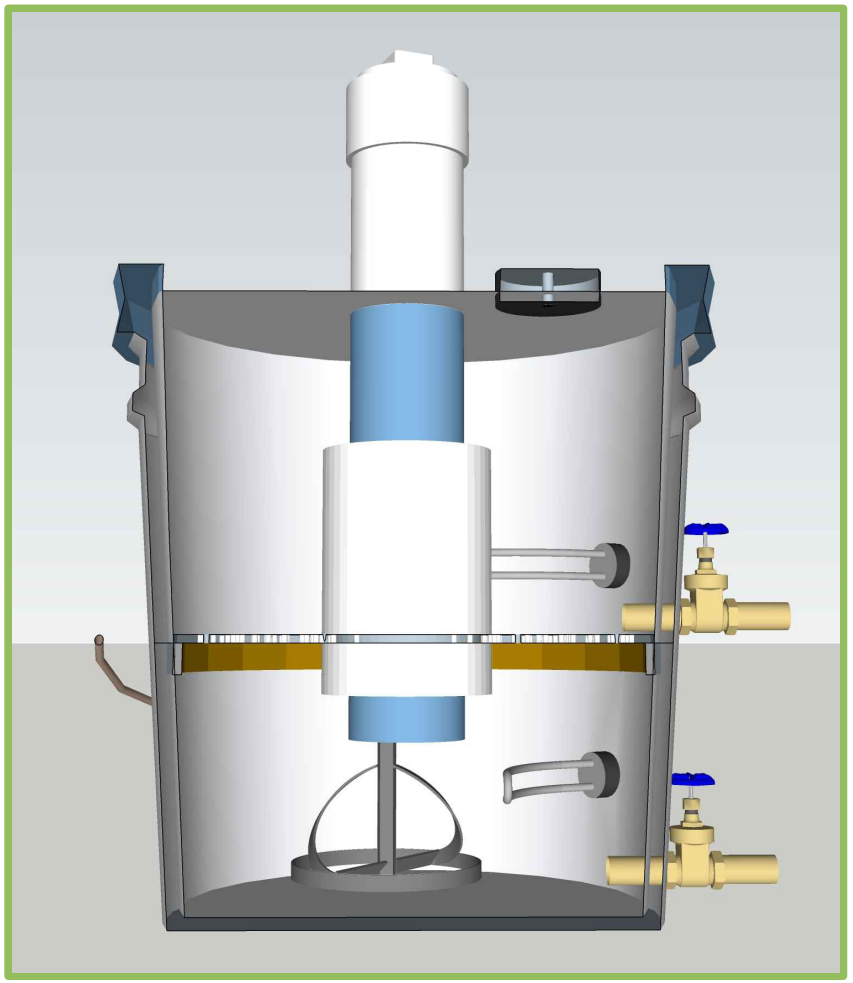


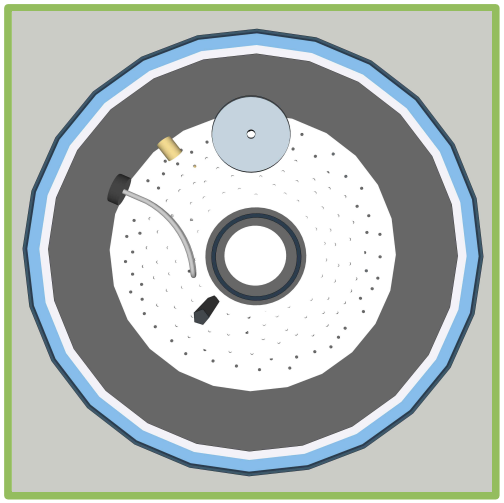
Digester Models: Single Stage

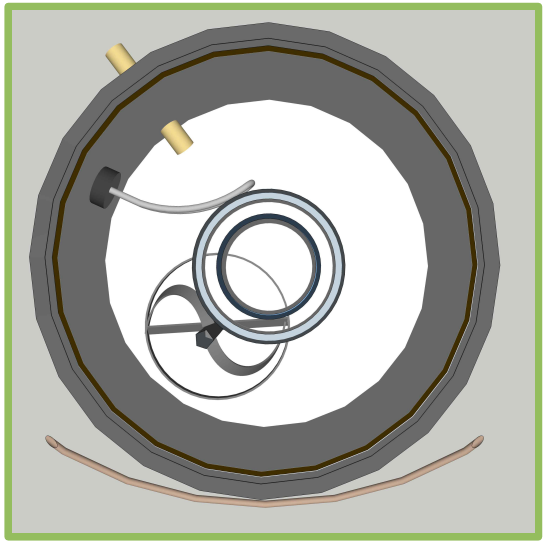




Digester Models: Double Stage







Accomplishments

- Commercial-scale aquaponic system
- Implement generalized control system framework
- Presented design proposals for green house and entry-way
- Anaerobic digester prototype

The Next Step

- Finish initial aquaponic systems build-out
- Deploy control system framework across multiple applications
- Practical design of green house and living wall
- Optimize digester feed recipe