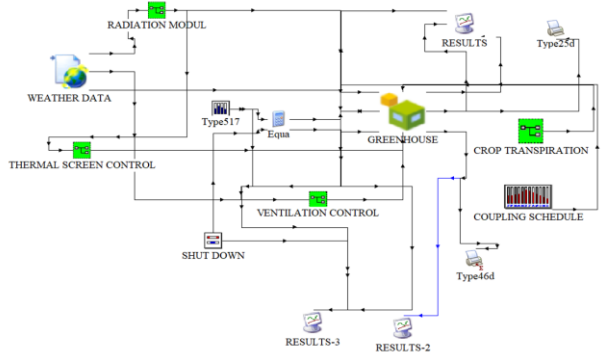


Next-Gen Amplified Sustainable Agriculture (NASA) – It’s About Space

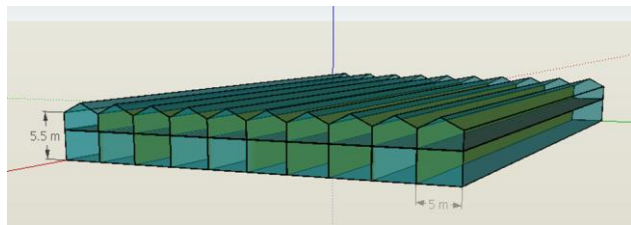
Rupp Carriveau, David Ting, Lindsay Miller, Jill Urbanic, Chris Patterson, Sadaf Ekhtiari, Matt Davison, Dani Way, Lucas Semple, Niki Bennett, Xiuming Hao, Quade Digweed, Fadi Al-Daoud, Haris Ahmadzai

The NASA project is being advanced to radically rethink how CEA should be developed, built, and implemented at small scales, large scales, and worlds beyond our own through:

Transforming the energy efficiency, resiliency, and sustainability of existing and future CEA operations.

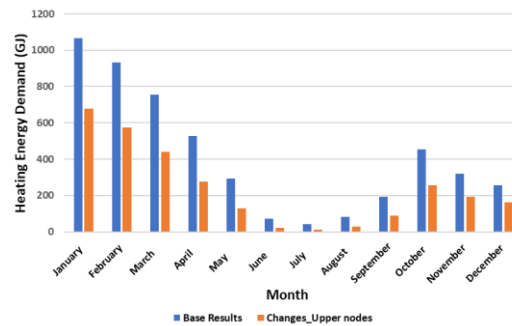


Modelled Thermal System Components



Unit Acre Representation of Modeled Greenhouse

A comprehensive machine-learning, Transient Energy System Simulation Tool (TESST) was developed to simulate the thermal and electrical energy dynamics within CEA operations. Modeled thermal demand was benchmarked against actual measured demand. Scenarios were created by varying window to wall area with various wall material types, to evaluate the potential for heating demand reduction.



Energy Demand Reduction With Earthen Walls

Increasing global access to the advantages of CEA.



3D Printed PETG Greenhouse

TESST is being applied to design CEA building/energy solutions driven by target ambient environmental conditions and resources in remote locations such as Kugluktuk, Canada. Building geometry, material selection, and growing environment management systems will be designed to maximize production capacity and minimize energy costs for a variety of crops.

Laboratory scale prototypes with appropriate indicator crops are being instrumented for influential environmental variables like irradiance, humidity, temperature, and CO2 concentrations. Irrigation and growth media will also be monitored. These systems will be tested in biomes that will mimic the target locations. Advanced additive manufacturing (AAM) techniques have been employed to build prototypes for physical validation.



3D Printed Planter

AAM will also be utilized to develop complete CEA “design-build-operate-maintain” kit prototypes for remote regions. The instrumented, lab-scaled physical models will have a unique opportunity to be tested in Western University’s advanced Biotron Biome Simulator.