EXECUTIVE SUMMARY

The client, Growing Power, is a national nonprofit organization which educates the community on sustainable farming, specifically vertical urban farming. The organization's goal is to provide these communities with high quality, healthy, safe, and affordable food.

The integrated design team of Total Building Design (TBD) Engineering was asked to develop and submit plans for the new Growing Power headquarters in Milwaukee, WI. The headquarters will be a five-story vertical farm composed of greenhouse facilities, a market space, offices, and educational spaces for the community. Growing Power has also stressed that they plan to use the developed design as a prototype for future Growing Power facilities in other locations in the United States, namely Miami, FL. The TBD design team investigated what makes a vertical farm successful and aligned that with Growing Power's goals to establish the goals for the project:

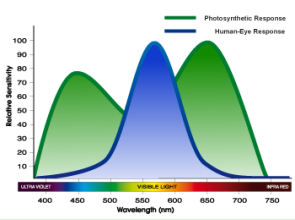
Community Outreach – The vertical farm should be an integral place of the community in which it is placed. The design team paid close attention to how decisions affected the community and how the community can benefit from the design of the systems.

Sustainability – The success of a vertical farm system relies heavily on the concept of self-sustaining technologies in order to justify the energy use associated with indoor farming. The design team therefore implemented many energy saving strategies into the design.

Flexibility – In order for the facility to successfully impact other communities throughout the country, the design implements technologies that are easily relocated and conscious of the surrounding resources. TBD strove to produce a building that will give Growing Power a strong identity.

Economy– As a non-profit organization, careful management of resources is important for success. Throughout the process, TBD designed with a goal to provide energy cost saving techniques in order to reduce energy consumption.

[LIGHTING FOR PLANTS]



Plants receive light differently than the human eye does. As a result, designing lighting systems for plants requires understanding of the PAR spectrum, in which plants have two peak wavelengths for photosynthetic absorption.

[ELECTRICAL HIGHLIGHTS]

On-Site Primary Generator Operation:
A CHP system with 2 paralleling generators offset some of the heating and electrical demand for the vertical farm site.

Greenhouse Optimization:
Plant bed design as well as roof designs were modified to optimize plant growth.

Daylight Availability Analysis:
An analysis of the available PAR levels reaching the plants were calculated to aid the greenhouse design.

Supplementary Grow Lighting Design:
A supplementary grow lighting system was designed based on target PAR levels needed for plant growth.

Façade Optimization:
Vertical fins implemented on the east and west facades provide for shading from harsh direct sunlight.

Digitally Addressable Lighting Control:
Lutron's Energi Savr Node with *Ecosystem* will control LED drivers, sensors, and shades throughout the building.

Total Building Network Design:
A total building network was designed to monitor, control, and integrate many systems implemented throughout the building.