DESIGN OF A SUSTAINABLE GREENHOUSE
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THE PROBLEM
Creating a sustainable greenhouse is something that could revolutionize the way that food is produced. Greenhouses are able to provide a productive environment for plant growth through all of the seasons of a year, but doing this requires massive amounts of energy. The energy is often provided through the burning of fossil fuels which contribute carbon-dioxide and other pollutants into the atmosphere.

Our client is Val Eylands, the owner of Ozark All Seasons. His business produces lettuce through the use of aquaponics systems and it currently relies on a mixture of wood and propane burning, and electrical power to keep the greenhouse running at optimal conditions. The client is currently planning to renovate his existing greenhouses to make them more environmentally friendly and efficient.

THE PROJECT
The first step to completing the project was to determine the overall goals of the client. The client wishes to bring the carbon footprint of his business down, with a long term goal being zero carbon footprint. They also wish to grow lettuce faster and more efficiently by increasing water temperatures during the winter.

Once the goals were determined, the project team began to generate and evaluate solutions for the client’s problems. Different methods of energy production were studied to determine if they could replace current fuel sources with environmentally friendly sources. The flow of water in the system was determined to size a heater that could provide an effective amount of warm water to the plants. Energy flow through the greenhouse’s walls were also modeled to show the client the savings that different renovations could provide.

SUSTAINABILITY
This project is a small part of the effort to make humanity’s food supply sustainable for years to come. As populations grow, more and more food will need to be produced on less land. Showcasing the benefits of making a greenhouse carbon-neutral will make them an even more attractive alternative to traditional agriculture. Further advances in greenhouse technologies will allow 24/7 growth of food in places where food was previously impossible to grow. The food that is produced by these methods will also avoid contributing carbon to the atmosphere, eliminating one source of pollution that threatens the long-term ability for us to live on our planet.

This project allowed for members of the project team to test their ability to design systems with heavy constraints. The team members will be able to take these lessons from the project and apply them to future projects. The team members will be able to take these lessons from the project and apply them to future projects.