Our team began by brainstorming ideas. The first ideas were primarily related to heat efficiency and resulted in the Smart Blind product. Smart Blinds are built similarly to regular blinds and operate using the same mechanisms. The most important difference is that one side reflects solar energy to avoid heating the house, and the other side absorbs solar energy in the form of heat. The absorbent side would be black and could either be painted or be made of black plastic. The absorbent side could be made reflective with white paint, reflective paint, mirror panels, or simply be made of white plastic. Additionally, a high roughness on the dark side would allow more heat energy to be captured because of the resulting increase in surface area. The light side would want to be smooth because it would cause more heat energy to reflect. These different approaches all achieve the same goal, just to different extents and at different price points. Although circumstances didn't allow us to test our ideas, we believe that the most heat efficient method would be to use actual mirrors on one side and black plastic on the other. However, this is likely not the most practical solution, which we believe would be to use smoothly applied reflective paint on textured (rough) black plastic. The Smart Blinds are intended to connect to a Smart Home that automatically instructs them to reflect or absorb heat based on the current and intended temperature. Additionally, they would feature a switch that opens and closes the blinds as the user manually chooses. The switch could be virtual, physical, or both and an app could even have the ability to schedule times that the window would open every week at times the user generally intends to use their windows during. This product could easily be implemented on a small scale by refitting preexisting blinds. Simply painting black on one side of white, plastic window blinds would allow for most of the benefits of the Smart Blinds to be obtained. Motorizing preexisting blinds should also be reasonable, but there could be some difficulties in connecting them to smart home apps, like Google Home. A small-scale effort to fabricate them might require their controls to be less convenient as they would likely need to be accessed from an app that most consumers wouldn't already have, but if they were marketed appropriately and not built shabbily, a company would be able to test if there was a consumer demand for them, and if successful, expand into a larger production, possibly partnered with a company like Google that has a large share of the smart home market. We do not believe that anything like this is currently commercially available, which has caused us to feel that it could have a large impact on home efficiency. We believe the product would likely cost the consumer between 50 and 100 dollars, depending on the size of the production run and quality of materials. This would make the primary audience be American middle-class homeowners because they have enough money to own their home and are less likely to move out before the energy savings would pay off but are not wealthy enough for the cost of their energy consumption to be negligible. While this would be the primary target audience, it also has a wide range of appeal that could include businesses, schools, and other socioeconomic classes.

We then started thinking of another smart home product that could reduce energy usage by reducing the run time of heating and air conditioning while a house was unoccupied. Unfortunately, this had already be implemented by products like the Google Nest Thermometer. We did, however, decide to broaden this idea to include water heaters, which we do not believe has been implemented for induvial households yet. We began to think of more ideas: automated fans that turn on and off to circulate air of desired temperatures where occupants are, ways to check efficiency of energy between the breaker and the outlet, ways to make light dim and brighten with and against the ambient light in rooms, etc.

The blinds we had originally designed primarily fall under the branch of one of our members major, mechanical engineering, with a nod to our teams electrical and computer engineering disciplines, so we decided to widen our product to also include our computer science majors and more heavily involve our electrical and computer engineers. This allowed us to play on our individual specializations while contributing to one central goal. We made this change by adding a software side to our smart home and proceeded to name our hypothetical company Smart Saver. This company encompasses all of the products we had designed while also fighting the biggest issue in the market: the inconvenience of different smart appliances using different apps.

Our Smart Saver app aims to be compatible with as many brands and models of smart home items as possible and would feature the ability to manually add items that weren't already on the compatibility list. Accomplishing this feat would require multiple ways to communicate with the various existing smart home items. Some would need to be hard wired, others would need to be communicated to wirelessly, and there would be numerous different languages to interface with. We believe this goal would be attainable, but it would be achieved in steps as progressively more products could be configured.

While developing product ideas, it became clear that a visual aid would be very helpful during the presentation to demonstrate the connection between hardware and software through Internet of Things (IoT). A model hardware system was designed with an Arduino, power supply, and LEDs. The Arduino is programmed to measure the voltage and current within the circuit and determine the energy efficiency within the circuit based on the actual output power versus the theoretical output power. The LEDs illuminate at a certain brightness, depending on how efficient the circuit is. The more efficient the circuit is, the brighter the lights illuminate. This system demonstrates the computer hardware analyzing the efficiency of an appliance, and changing its output, which would theoretically be connected to a mobile phone using the app.