**Customer Statements**

The customer stated that the main objective is to develop a way to acknowledge issues with pad mounted equipment. By using a sensor on the equipment, the design would integrate with an image recognition system to detect errors from air or ground. The sensor will easily and securely attach to the pad mounted equipment. The customer elaborated that this entails not altering the standard operations of the pad mounted equipment.

| **Customer Needs Analysis**  **Team 304** | | |
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| **Questions/Prompt** | **Customer Statement** | **Interpreted Need** |
| What is the budget for the beacon? | “Beacon cost is under $100” | Be made of inexpensive yet durable materials. |
| What is an ideal duration for installation of the beacon? | “Straight forward process of installation.” | Beacon hardware installation takes less than an hour. |
| Do we need to diagnose the issue with the equipment | “No, the hardware will be told via binary signal if there is a problem.” | Our team will only be working off of a binary signal. |
| Is there any progress we will be building off of for the beacon? | “You will be starting from scratch” | Our team will generate the idea and the complete hardware implementation for the beacon. |
| Can the beacon be installed inside the pad mounted equipment? | “Beacon cannot negatively impact the pad mounted equipment” | Beacon cannot affect the operations/purpose of the pad mounted equipment. |
| How will the beacon be powered? | “It will be powered via Current Transformers that are used to measure current” | Beacon will use the electricity already provided by the transformer. |
| What hardware will the potential image recognition system be able to run on? | “The software can run on standard FPL laptop or web-enabled service” | FPL employees will have convenient access to the software. |
| How will the results from the pad mounted equipment be interpreted? | “Assume internal system logic within FPL team will interpret these results to determine where the crew needs to be sent” | Results will be interpreted by the internal system logic. |
| What environmental conditions will the beacon be able to withstand? | “The beacon will be able to withstand typical Florida weather conditions and corrosive salt environments” | Harsh environments will not deteriorate the beacon’s performance. |
| How close to the pad mount will the drones be able to get? | “The drones will be given the latitude and longitude of the padmount accurate within a few feet” | The design doesn’t account for locating the beacons or controlling the drone. |
| What is the targeted success rate of the image recognition system? | “The image recognition system will have a success rate around 80%” | YOLOv5 (or other model) confidence level over 80%. |
| Can we drill into the padmount to install from the outside? | “You can drill into the padmount but it cannot be very big and it needs to be watertight.” | Drilling only used for critical modifications and completely sealed after installation |
| What is the main objective? | “The main goal of this project is to develop an Image Recognition methodology for automatically identifying faulted pad mount equipment” | A process for acknowledging issues with pad mounted equipment will be developed for further uses. |
| How long will the solution be expected to last? | “The beacon and other hardware will be installed and not touched for another 30 years” | The beacon and installation will utilize materials and a design durable in Florida’s environment. |
| What is the basic configuration of the underground equipment? | “Underground distribution equipment is traditionally installed in a “loop” configuration” | Beacons are located on each individual transformer within the loop. |
| What type of hardware do we have to work with on the drones? | “The drones have Percepto next gen drones that are equipped with a FLIR thermal camera and a 4k camera” | The image recognition system will use high quality thermal and RGB images. |
| Will the cameras be taking pictures or video of the transformers? | “Drones have the capability of taking video or pictures, but the pictures would probably be at a certain rate” | The image recognition system will have the option to process images or videos. |
| How will we model the beacon on a pad mount to take images? | “You will create a model pad mount exterior using sheet metal or other materials available” | Create a prototype of the pad mounted equipment for testing. |

**Explanation of Results**

All questions were thought of by the team prior to the meeting with Troy Lewis from FPL. These questions were brainstormed based off of the information given to us prior to the meeting and information that we were still wanting to know. The team made sure to address hardware and software issues to make sure we covered all of the required ground. The questions were sent to Troy almost a week in advance to give him time to write up the corresponding answers. Once we were in the meeting, we made sure to confirm that all questions were answered. Some questions were elaborated on. Troy also gave the team more information than what we asked for in the form of background information, requirements, assumptions, and minimum viable product.