1.4 Target Summary

Highlighted Targets Overview: The targets for the team's product that most interest the customer needs were established from benchmarking various designs for hydroelectric energy generation systems at various scales. From the benchmarking analysis the most important parameters to be considered in the team's design are the device's voltage, current, and power rating outputs that would be delivered to the user. The desirable target quantities for the device's voltage, current, and power output for the team's initial prototype would be a minimum of 12V, 2.2A, 26.4W for the voltage, current, and power outputs, respectively. These ratings would accommodate a large range of electronic devices including smart phones, laptops, etc and would certainly satisfy customer needs for such a product. For the portability aspect of the design the product weight and volume of the device will greatly affect accomplishing the customer needs for portable energy generation. However, for a device meant for larger capacities in terms of power output weight and volume of the device may be less important but still includes some sort of functional portability unlike a completely stationary hydroelectric power plant. For the team's initial prototype the target weight and volume will reflect the smallest possible device that will be able to accomplish the above electrical ratings that can achieve the greatest level of portability. Another important target parameter is the energy storage capacity the device will provide. Essentially the target to satisfy the customer needs would be an energy storage device that could deliver the above specifications for voltage, current, and power while the device is in use and for some time after being removed from the water source. It would ideally have a large enough capacity to maintain the greatest conversion efficiency from generated energy from the turbine or waterwheel to delivered energy to the user.

Base Price: The base price of competitor products were analyzed to understand an affordable price range for potential customers. By reviewing these different hydroelectric generators ranging from the small HyrdoBee to the large Portugal F15 Hydropower Plant comparing them together can be used to gauge a price range for our design that will be competitive in the market while still being affordable.

Conversion efficiency: The conversion efficiency of one of the most important targets that was reviewed in this target catalog. It examines how effective the device can convert flowing water in electricity. Despite this being an important parameter few of the developers of these analyzed products described the efficiency of their device; probably due to their device having a low efficiency.

Weight: Along with generating clean energy from flowing water the device that Team 32 is creating needs to be light enough for the average person to carry with relative ease. For this target parameter all of the devices except for the two dams will be compared to determine an acceptable weight. Out of the four smaller scale hydroelectric generators Idenergie's River Turbine generates the most power but it is the heaviest model weighing in at 131 Kg. Despite the device's high energy output its weight makes it cumbersome and inconvenient for the operator to set up and use. The HydroBee is the lightest device on the target catalog weighing 0.368 Kg, but it generates the least power. From this data it would be ideal to create an efficient device that falls in the middle of that range; preferably under 60 Kg.

Energy output: The output energy was reviewed, because it will be a strong factor on how customers will view the product's feasibility. For the device that this team is creating it should generate enough energy to sustain those living in areas where power is not reliable for larger

scales. For the team's initial prototype the target energy output will fall in a range necessary to operate most common electronic devices. Using the products from the target catalog this range is from 12 kWH to 365900000 kWh.

Flow rate rating: The safe operating flow rate of these portable hydroelectric generators play a strong factor on where they can be implemented. It's ideal to have a versatile hydroelectric generator that can operate at both low and high flow speeds. From the device's reviewed in the target catalog potential customers will want a device that can operate in rivers that flow up to 3.5 m/s.

Voltage rating: Output voltage rating was examined as it will play a major role in product demand. For the various applications that the team plans to use the generator for, ranging from off-grid communities to travelers, specific voltages will be required. The primary voltage target range potential consumers will be 12-220V, or standard global outputs. The majority of benchmarked products were within this range, with only one rated to produce 5V (phone charging).

Current rating: Coupled with output voltage, desirable current output is essential for a successful generator. Producing a continuous current of 2.2A, used to charge most electronic devices, would be a minimum essential output for potential consumers. All devices benchmarked produced this minimum, with many far exceeding it (powering entire grids).

Operating water depth: Potential sources water-power can be limited by a required operating depth for a generator. Consumers desire a device that may be employed in as many movingwater sources as possible, with the smallest operating depth possible. Many benchmarked products required relatively large rivers to be employed, or even entire reservoirs, limiting their usability is various environments.

Energy storage capacity: Onboard storage is essential to account for the natural ebbs and flows of a moving water source. Maximizing storage potential with minimal weight and space consumption, along with producing ‘smooth,’ continuous power is essential for a reliable, consumable product. Each benchmarked product employed power storage/conditioning devices which accounted for natural inconsistencies, ranging from small batteries to large capacitor banks, based on generator size.