

Each member prepared a one-page summary of their pet project idea, discussing the feasibility, cost, risks, and logistics related to each. After each member explained their ideas, the group asked questions, clarified points, and brought up their own concerns.

Jacob suggested that we harness **gravity** as a power source. He would have a funnel at a height which flowed water at a certain rate over a water wheel and then through the treatment apparatus. The hope is that this would eliminate the need for the pump (2W) and add some power from the water wheel so the power needed from the hand crank would be much less. Through discussion of OTS-ness of the funnel, we realized that a funnel could be anything with a hole in the bottom.

We also came against the problem of making sure the water had enough time in the treatment apparatus to be fully treated. This led us to the addition of 'control flow rate' to our function decomposition.

We had to wonder, as well, what would happen if the energy being produced was no longer enough to power the bulb. Would there still be water in the system that hadn't been treated? How would we deal with that

It would also be difficult to hook up the electrical component from the water wheel to the existing electrical component from the crank, especially since there will have to be a water-travelling mechanism, too, in about the same place.

At the end, we figured it might be worth trying to get the water higher, to lessen the load on the pump, but it probably wasn't worth working with the water wheel for the small amount of power it might provide, and it would probably be best to maintain the current pump, if only for its flow rate regulation.

Jess looked into the possibility of replacing the entire crank system with a **Photovoltaic** Solar Panel. We like this because it is super-simple. There is always the concern of cost with PV panels, and though we were able to find some as cheap as \$50, we are worried about the long-term availability. It would be placed on some sort of simple positioning system so the user could point it approximately toward the sun.

It might be difficult to explain that positioning to non-English-speakers...

If there is no sun, there is no power! So we might look into incorporating a battery, but that brings its own problems. If it's a typical lead acid battery, would we have to tell the users how to add the acid to the battery?? dangerous. can we even ship batteries to Africa? plus they stop working eventually, would the user be able to find/order another one? Could we just require that they purchase their own battery?

We are also a little worried about the fragility of the panels.

Admittedly, this design would not work well in areas (like Rochester....) that are not very sunny in general, but for the vast majority of the areas in which this is used, sun exposure would not be an issue. (except at night..)

We would need to change the AC produced to DC.

Erika suggests that we could simply add some **supplemental** power generation to the current system. She looked into peltier tiles, but found that they are far too expensive and low-yield for

our application. What looked more promising was Photovoltaic solar panels. In general, a small one would be attached simply to the seat-bucket and tied in to the existing crank.

This is a good idea because it incorporates everyone's favorite energy source (!), but does not lose the reliability/flexibility that a pure PV panel system loses due to night-time.

The downside is that they will have the same old system when the sun is not available. Also, when considering the cost of this option, it generally will add cost to the existing system without subtracting any. That being said, a smaller PV panel will avoid some of the worry that it would become a target for theft and generally costs less than a large panel.

Although we are unsure about the costs with this specific iteration, we like the idea that there could be multiple systems incorporated. (though we're worried that this might add complexity and make it harder to learn/understand and easier to break)

Kyle found that it might improve efficiency to **remove one of the DC motors**. This would not likely be implemented on its own, but it could be added to almost any other design. He had all sorts of graphs.. It looked like the efficiency might depend on the RPM put into the thing, and that would depend heavily on the design. (a bike pedal will have higher RPM than a hand crank)

Liz looked into spring-based generation, utilizing **solenoids** as the electricity generators.

Essentially, the user would actuate the solenoid plunger and electricity would be created from that. Springs would be used to return the plunger and user to the original position. This could be interpreted as a seat/tile to bounce/jump on, a small treadle-type pedal, or any number of different things. The nice thing about this idea is that it is very simple.

There is concern about the wear on the springs and the solenoid.

There is concern about whether or not a solenoid can really be used in this way and how electricity would be produced, the shape of the wave.

It is likely that we would need a rectifier to change the AC produced to DC.

There is concern that the solenoid and/or the rectifier would be fragile.

Liz found appropriate springs for \$3-8, and solenoids for \$15-30.

This would be a very easy concept to make fun.

Chris looked into the possibility of a **bicycle** pedal-type crank system. He found an excellent resource research paper about the improvement of leg-power over arm-power. We like this because it is fairly simple, the parts are highly available, and it is a familiar concept.

The worry is that the parts are heavier than many of the other ones considered, and there would have to be a fairly heavy-duty seat to support the user and place them in a comfortable position to pedal. That seat might end up being expensive and complicated to assemble.

We would probably be able to reuse a lot of the components already used in the current crank.

We thought we might be able to incorporate a fan and/or LEDs to make it more fun.