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Abstract:
The main purpose of my project is to refurbish and maintain the Energy Lab's club carts. I plan to get two carts running in optimal fashion and would like to install a regenerative braking system on one to further these carts for future projects, as well as, learn about electric motors myself.

Introduction & Goals:
This project was decided to be put forward by Mr. H, Dr. Bill, and I to refurbish the club carts for future projects as my project to learn more about electric motors and mechanics. My main goal for this project is to get all of the carts operational and my second goal is to install a regenerative braking system on one of the carts. The essential question of my project is basically: with a basic understanding of electric motors and wiring will I be able to repair all of these carts as a means to further HPA's independent science program?

Implementation and Challenges:
This project is a challenging one because of the limited tools available and the fact that I will have to diagnose all the problems of the club carts. To achieve my goals with this project I would start off by setting my goal of one or two carts and diagnose the problems that need to be fixed in each. From there I could repair, clean, and refurbish the carts into project or transportation carts that can be used by other students in future independent science research projects. As a added bonus and challenge for this project I would go about talking to Dr. Bill about ordering a regenerative braking conversion kit to help make the carts more efficient. I have learned mostly about how the club carts work and their basic layout and functions. I believe I will have to look harder into diagnosis and regenerative braking to finish off the research to this project. Several online forums, manuals, and sites have the information needed to complete this project. I believe the most challenging part of this project will be to diagnose the problems of the carts, however, they are fairly simple machines making them easier to work on. Another challenge will be installing and obtaining a regenerative braking system for the carts. This is because the kit does cost a fair amount of money and would be a complex installation process compared to other parts.

Impact & Legacy:
I believe this project will help me grow as an individual by learning about basic electrical motors and discover more about wiring and electric vehicles. I also believe this project will help me set realistic goals and teach me how to better plan and look ahead for the future. I believe that my project will help future independent science research students with their projects involving the carts. Fixing the carts will add another option and path for students to grow and go down with independent projects. A logical follow up project would to install solar panels on the carts, making them fully solar powered. I will learn more about electric vehicles, which, is a large aspiring field currently and is predicted to be more so in the future. This is why I believe this project will benefit both me and the independent science research team.

Appendix A: Key Research Sources:

http://www.clubcar.com/content/dam/cc-corp/documents/pdf/pdf/ownersmanuals/DS-Manuals/102252002%200801D0202A.pdf
This link provides a path to an online owner's manual of a 2002 club cart, which, is almost identical to the ones at the Energy Lab.

https://www.golfcarcatalog.com/products/48V-AC-Power-Conversion-System,-Many-Golf-Carts.html
This link provides a look into the conversion kit that could be used to transform these carts into much more efficient and powerful machines. This as well as cheaper options are available.

https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjLgrOh2efOAhUY7WMKHV4CC64QjRwIBw&url=http%3A%2F%2Fwww.51guakao.net%2F1985%2F1985-club-car-battery-wiring-diagram&psig=AFQjCNHmrOG4Ci58tbdOkHLIo9gWt9I4wg&ust=1472596939151565
This link provides a small insight into the basic electrical layout of the carts.

https://www.youtube.com/watch?v=Wxm3y0r4lQQ
This link is a video on how to install the upgraded motor and regenerative braking system that is a possibility for this project.

Appendix B: Tools & Materials:

Critical:
-Socket set
-Torque wrench
-Replacement parts(yet to be determined)

Necessary:
-Screw set
-Hammer
-Replacement dash panels and switches

Optional:
-Regenerative braking conversion kit
-Cart painting supplies