Sustainable Energy Project II

Team #1 - Ngo ISYE 380
Vincenzo Torre
Taylor Bongiovanni
Thunder Braun
Ben Iwan

The Situation

- El Cercado, Dominican Republic
- Rural area
- Majority of population live in poor conditions
- Limited clean water and energy access
- Electricity access limited to a few hours each day
- High Fuel costs
    - Limited Electricity
    - Limited Propane Gas
    - Limited Firewood
- Forced Cold Showers
    - Bad for sick and elderly
    - Disease by lack of showers
- Power grid inconsistent/powers one section at a time

Project Objective

To develop alternative, affordable energy generation method for residential uses to supplement the grid electricity source when it is not available or unaffordable.

Potential Solution Concept

- Design and Assemble a community charging station with portable power capabilities
- Charging station would be pedal operated
- Portable battery recharged via charging station
- System that would benefit young and old
- Developed for center of town or for each individual household depending on budget/donations

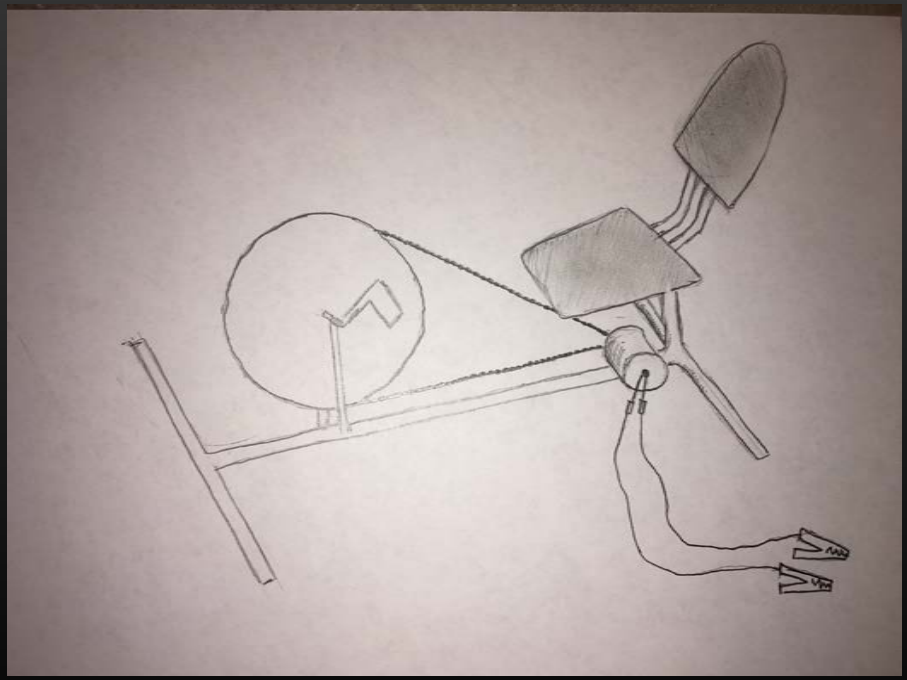
PROS

- Simplicity in design and use
- Anyone with leg power can run the charging station
- Power supplied would benefit all
- Battery is portable which provides mobility of power
- Provides affordable, sustainable alternative energy source

Charging Station

Design Concepts

- Recumbent bike seat.
- Power generated through DC motor via pedaling
- DC motor voltage output spliced into car jumper cables
- Adjustability
- Simple design, basic maintenance



Portable Battery

Design Concept

-2 compartment box

-Simple construction

-Size is based off the size of the inverter and battery

-Can be made out of available materials in surrounding area

Cost Estimated

CHARGING STATION

- Base support - apx $15-$50 depending on materials used
- Chain ring - $60 + depending on size
- 24V DC motor with chain sprocket - $60
- Attachable seat - $45
- Jumper cables - $20
- Crankset - $30
- Pedals - $15
- Bike Chain - $10

apx $280

PORTABLE BATTERY

- 400W inverter 45$
- 300W inverter 35$
- Standard car battery 50-120
- Premium car battery 90-200
- 2 2x4’s 3$ each
- Nails 1.5” box 3-8

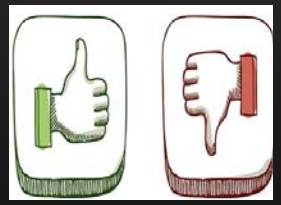
Apx 100-250

TOTAL COST = 380-530

Green Engineering Design Considerations

Green Engineering Principles:

- #1 Inherent Rather than circumstantial
  - non-hazardous
- #4Maximize efficiently
  - Maximize energy space
  - Time efficient
- #5 Output pulled vs. input pushed
  - Use of energy and materials minimal
- #7 Durability Rather than immortality
  - Durable to last up to 10 years and replaceable (moving parts)
  - Not immortal, could be better tech in future
- #9Minimize Material Diversity
  - Only using minimal supplies
- #12 Renewable Rather than depleting
  - Function only produces clean energy, no backlash to environment



Considerations:

- Dependent on community funds/investors
- Accessible parts when Ready
- Availability of parts at the Capital City
- Problem if the power source fails
  - Side bad: possibly make 2 if one goes down
- # of people to obtain use at a time
- # of people who can fix and learn about machine if the parts break down

Potential Impacts

Environmental

- Relatively no environmental impact
- Most materials non hazardous
- Potential impact in battery malfunction/disposal

Economical

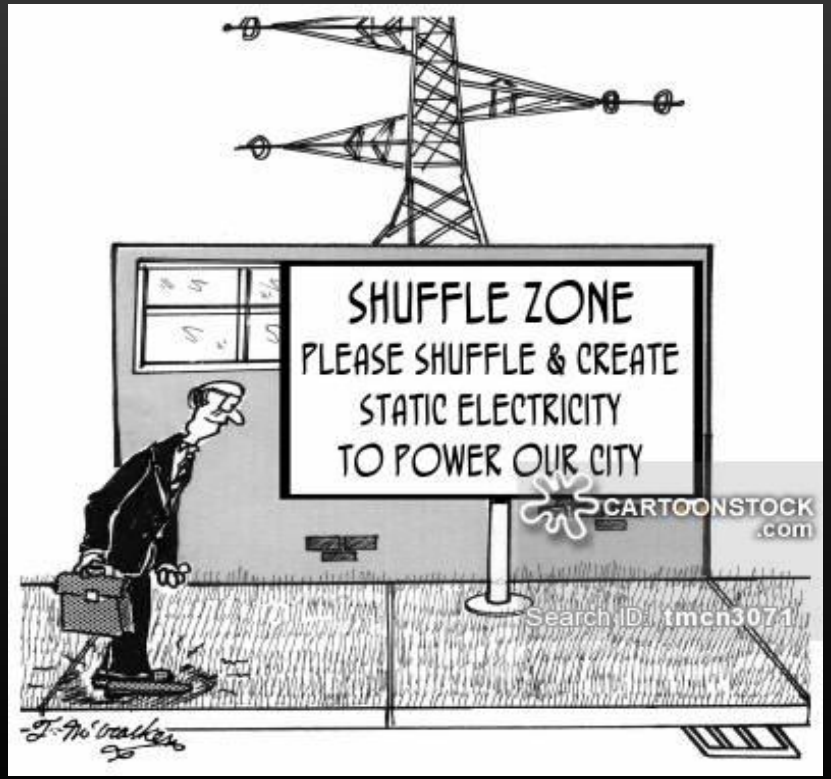
- Increase activity - more power more options
- Inherently improve conditions

Social

- Having power brings sense of security
- Access to power will help improve conditions
- Give the user a sense of empowerment/connectivity

Key Implications - Product Development (environmental, community, local economy, society)

- Lifestyle Changes
- Economic growth in clean energy
- Knowledge sharing Concept
- Easy to understand
- Society benefit clean energy



Proof of Concept

Battery has a capacity of 100 amp hours, and you just want to use a laptop that uses 45 watts, you can see that you'd be able to get about 11 hours out of your battery:

(10 x (100 AH) / (45 Watts)) / 2 = 11.11 hours