

## Hannah: PROJECT SPARK

**Hannah:** Project Spark was exciting! We looked at several energy challenges. Some of the challenges we identified are wind turbine blades freezing, solar panels only work during the day, batteries corrode and generators fail. Our team talked about creating solutions for these challenges like lunar panels, sidewalks becoming rechargeable cement batteries and heating elements on the wind turbine blades. But we decided to settle on a current real problem that existed with back up energy. One that lives depend on.

**Maggie:** The Game has an Energy Storage Mission that lead us to research backup energy storage.

But, what happens when the Power can't be delivered to you on a grid?  
-Some of us experienced this during the ice storm back in 2021. Our electricity was out for almost a week and as result there wer 246 deaths in Texas. People lost their food storage, homes could not be heated and alternate fuel supplies such as propane and wood ran out.

## Isaiah: THE PROBLEM WE FOUND

**Isaiah:** There are many reasons your power might go out like high winds, lightning, freezing rain, ice, falling branches, fires or even a car accident. Many businesses and homes have generators but what if they don't work?

One of the main buildings that rely on back up power is a hospital. Hospitals are important to the community. They provide life saving services.

## Levi: WE DID THE RESEARCH

We interviewed engineers from a local hospital to find out more about how generators work and what happens when they fail. We did 2 different Q & A presentations where hospital Engineers, an engineer student, and a professional market researcher for back up power attended.

We also, got online to discover causes for generators to failing and what preventative systems are out there.

Two of the biggest reasons back up generators don't work is low fuel and bad fuel.

**Jessica:** Our dad experienced this at the hospital that he works at when there was an accident. The equipment malfunction prohibited the building from receiving power from the grid.

We looked at the effects of power loss at a hospital and why generators are so important.

- Surgeons losing power in the middle of surgery
  - Breathing equipment failing
  - Health and heart monitoring systems failing
  - Power to fridges, freezer and morgues failing that keep
    - Organ tissue transplants
    - Medicines
    - Cultures
    - Blood
    - and more
  - Heat & Cooling going out
  - People getting stuck in elevators
- All of which could lead to people dying

**Elijah:** The amount of generators needed to support the US is anticipated to continue to grow at 7.4%. With more generators being relied upon there is an increase in generator failures. We are seeing more vulnerability with the power stations due to disasters caused by changing weather conditions across the region.

Low fuel, no fuel or bad fuel are the most common reasons a generator fails.

Human error lends its hand in this because the generators aren't maintained or tested often enough.

## **Abigail: OUR SOLUTION: A Healthy Fuel System**

**Abigail:** A Healthy Fuel System monitors the fuel by taking samples & readings of the health & levels of the fuel.

The sensor is looking for the following contaminants:

- chemical breakdown (Fuel chemicals not in their best state)
- fuel separation (Fuel starts to settle with sediment at the bottom)
- water (which turns into steam which is non condensable and can ruin a generator by rust)
- bio film growth (sludge up your generator)
- lack of fuel additive (which causes fuel to gel in cold weather situations)

**Jesse:** The main fuel isn't kept inside the generator, but rather in a reservoir waiting to be pumped into the generator only if it is good & when it is needed.

The readings of the health of the fuel are sent to an app where it notifies the managers or owners of the fuel condition based on the settings they choose.

If the fuel in the reservoir is low, a notification is sent to the app, which automatically orders more fuel

**If the fuel needs to be filtered, a notification is sent to the app and it automatically pumps it through the filters.**

**Fuel burn rate, building load, fuel additive information and last fuel order along with other additional options and data, provided at engineers request, can all be tracked with the app.**

**We have gone through many revisions and discovered in our research and presentations where we could improve our design and added functions to the original model. This increased the performance and data that was given back to managers and owners within the app in real time.**