ENGINEERING DESIGN CHALLENGE – Disaster Preparedness & Relief

1. Identify Problem or Need

Natural disasters can knock out power to a home and community for days and even weeks. Without power, food cannot be refrigerated or cooked using a conventional indoor stove. People may need to rely on dried goods such as rice, beans, and root vegetables.

> *CBS/AP / September 14, 2017*
> **4,000 Texas homes, facilities without power weeks after Harvey, governor says**
> Austin, Texas - An estimated 4,000 Texas homes and other facilities are still without power weeks after Harvey slammed the state, Gov. Greg Abbott said Thursday.
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> *The Washington Post/ September 13, 2017*
> **After Irma, Florida prepares for days - and maybe weeks - without power**
> Cape Coral, Fla. - Millions of Floridians grappled with the aftermath of Hurricane Irma on Wednesday, confronting a sweltering reality: More than 40 percent of Florida still lacked electricity, and for some of them, the light might not come back on for days or even weeks.
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> *USA Today/ September 30, 2017*
> **Hurricane fallout: Puerto Rico could face 6 months without power**
> After Puerto Rico was pummeled by Hurricane Maria last week, a Category 4 hurricane with 150 mph winds, the island has been left in shambles. After suffering widespread power outages thanks to Hurricane Irma the week before, 1 million Puerto Ricans were left without electricity. 60,000 still hadn't gotten power when Maria brought a total, island-wide power outage, and severe shortages of food, water, and other supplies.

2. Design brief

> **Statement**
> This research and design project will find a way for people to cook dried goods such as rice, beans and root vegetables using an oven that functions with *passive solar energy.* Label how the oven is designed to direct sunlight, absorb sunlight and convert to heat, and retain heat. Remember DARE (Direct, Absorb, Retain, Eat)
> **Specifications**
> - The oven must be made from affordable and common materials.
> - The oven must use passive solar energy.
> - The oven must have the ability to direct sunlight, absorb sunlight, convert light to heat, and retain heat.
> - The oven must cook at temperatures that are safe for food.
> - The oven must be able to cook a meal between 10:00am and 4:00pm on a sunny day.
> - Ovens cannot be used on cloudy days.
> - Materials may be difficult to obtain during a natural disaster.

3. Investigate and research

List some topics or ideas you and your team will need to investigate and research. Take notes as you conduct your research and investigation.

4. Generate Alternative Solutions

Use your investigation and research to brainstorm ideas with your team for a passive solar oven. Include materials needed.

5. Choose a Solution

Evaluate the pros and cons of each idea and then your team will choose the best solution. It is often helpful to create a matrix to compare alternative solutions.

6. Model and Prototype

With your team, design a passive solar oven model that can be built. Label how the oven is designed to direct sunlight, absorb sunlight, convert light to heat, and retain heat.

7. Test and Evaluate

Build your team's passive solar oven prototype. Once built, ovens can be tested on a sunny, cold day. Record your data and observations.

8. Redesign and improve

After testing, brainstorm with your team to determine what changes can be made to improve the oven. Identify any malfunctions and ways to deal with them.