POWERING AGAINST BLACKOUTS (PART 2) (LEVEL 2)
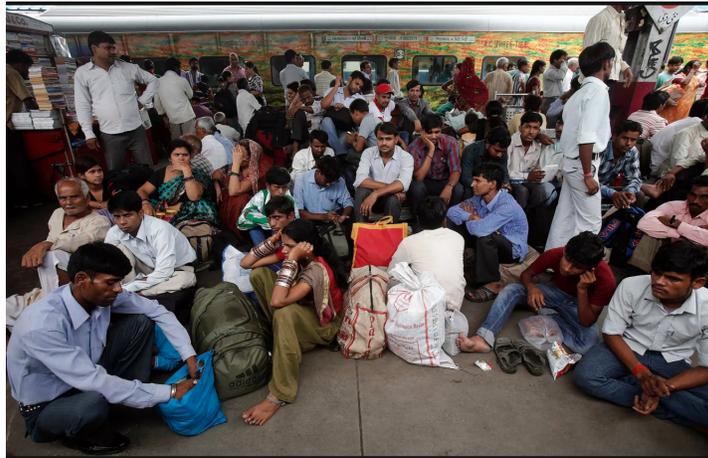
Description	In this project, learners will explore the environmental and sustainability tensions around the generation of electricity and craft recommendations for local officers who are trying to address the issue of blackouts.
Leading Question	What can you do to minimize blackouts?
Total Time Required	5.5 hours over 5 days
Supplies Required	Paper, pencils, post-it notes (if available)
Learning Outcomes	**Language:** - Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text. - Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent. - Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **Science/Environmental Studies:** - Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. - Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem
Previous Learning	We recommend learners to work on "Powering Against Blackouts-Part 1" before engaging with this project.

DAY 1

Today, we will learn about how blackouts affect communities all over the world.

Suggested Duration	Activity and Description
5 minutes	1. If you have worked on "Powering Against Blackouts-Part 1," begin by recalling some important concepts of electricity, current, circuit, and

	power grid. Share one thing that you learned from working on that project. 2. The goal of the new project is to understand how blackouts affect their communities and to write a newspaper article to share and to craft recommendations to solve the problem.
15 minutes	Read and look closely at some of these resources. You can choose **ANY 2 or 3** of resources to focus on for Day 1. Since you will be asked to write a newspaper article, make sure you include at least one of these in the list of resources. When contextualizing the project, you can include an article from a local newspaper that addresses the issue of blackouts too. **Resource #1: 2nd Day of Power Failures Cripples Wide Swath of India** (Taken from from: https://www.nytimes.com/2012/08/01/world/asia/power-outages-hit-600-million-in-india.html)) **Resource #2**: **2nd Day of Power Failures Cripples Wide Swath of India** (Taken from from: https://www.nytimes.com/2012/08/01/world/asia/power-outages-hit-600-million-in-india.html)

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Resource #3:. Venezuela blackout: Power cuts plunge country into darkness.
(From: https://www.bbc.com/news/world-latin-america-49079175)

Traffic lights lost power causing a massive gridlock in Caracas

AFP

Resource #4: Photograph of a woman who ran her restaurant by candlelight during a blackout. (Credit: Nic Bothma/European Pressphoto Agency)

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Resource #5: Map of power grids around the world

(Taken from **https://engineering.fb.com/2019/01/25/connectivity/electrical-grid-mapping/**)

15 minutes	Write down three details that stand out for them from each resource, two reactions that they have, and one question you want to ask. This is an example of what you should do:

	3 details that stand out -In the map, I see that India has many power grids. -Low Monsoons can cause blackouts -Blackouts bring frustration and anger **2 Reactions** (i) I'm surprised by how much is affected by blackouts (ii) The map has sparked my curiosity about the differences between countries **1 Question** I wonder if the situation in my community is similar to the one described in the article about India?
15 minutes	Share what you found out loud.
10 minutes	Write a caption or give a title to two of the images so that they summarize the impact of blackouts on their communities. As we have seen, blackouts affect people and the environment in different ways. What are the criteria for a good solution to this problem? In this project, we will come up with a set of **recommendations to solve this problem that are cost effective, sustainable, just, and scientifically sound**. To get to this point, we will explore the following questions: ● How would an electrical grid look like in your community and why? (Based on Powering Against Blackouts Part 1) ● What are the consequences of blackouts in your own community? ● What are the environmental costs of energy production? After this exploration, you will have to give advice to local officers and community leaders to help them make good decisions around generating energy in a sustainable way.

DAY 2

Today, we will begin prepare the questions and interview a person to learn more about power outages.

Suggested Duration	Activity and Description

15 minutes	1. Imagine that you have been hired by their local newspaper to create a new article on power outages in your community. The article will spotlight the experience of someone in the community and how they have been affected by blackouts.
	
	   a. You can choose to spotlight a family member, a neighbor or a close friend who has been affected by the blackouts. If you can't find anyone in their community, you can ask people about the potential consequences that a power outage would have for them.
	
	Before you start interviewing, consider the following questions:
	
	<table><tr><td>Whom would you profile and why?</td><td>What things would you try to collect evidence of?</td></tr><tr><td>What questions would you ask to know more about this person's experience?</td><td>What questions would you ask to collect data to show the impact or scope of the problem?</td></tr></table>
	● You develop your own "interview protocol." On a piece of paper, write down their set of 10 or so questions that are specific to your community.
	● Here are a few examples of questions that can get you started:
	   ○ How have the power outages affected you?
	   ○ What do you do when there's a power outage?
	   ○ What would you want people in other communities across the world to understand about the impact of the energy cuts where you live?
	   ○ How well do you think local officials handle this problem?
	   ○ What are some potential solutions to this problem?

15 minutes	**Reviewing and Adjusting the Questions.**
	Reflect on you questions by thinking about the following:
	   ● Are the questions clear enough for anyone to understand them?
	   ● Are there enough questions for a 10-15 minute conversation? Are there too many? Do you need to add or remove some questions?

	- To what extent are the questions allowing you to understand who the person is? - To what extent are the questions allowing you to understand their experience with blackouts? - To what extent are the questions allowing you to begin to think about solutions for this topic? Rewrite their interview questions based on their reflection.
30 minutes	Interview one person in their community. The interview should take around 15 minutes. Make sure to ask permission if they plan to share the person's name publicly. They can also do this virtually or remotely if locked down; you can call, text, mail or email respondents to interview them. It is important that you write down the answers and collect as much evidence as you can because you are going to use it to write the article on Day 4.

DAY 3

Today, we will be writing a rough draft of the newspaper article.

Suggested Duration	Activity and Description
10 minutes	You will begin by writing a thank you note for the person(s) you interviewed. You should include in the note their major takeaways from the interview. *This will help you reflect on what you learned from the interviews.* For the writing process, you should have available their interview notes. Remember that you will be writing a newspaper article to be read by the people in their communities in which you will explain - through the experience of the person that you interviewed - how blackouts are affecting their community.
10 minutes	Brainstorm for 10 minutes and note ideas. At this point, the ideas do not have to be in complete sentences. (Ex: "A big problem," "People find solutions," "it affects businesses," "candles are dangerous.")
15 minutes	Once done, you should work to group your ideas. You should try to have three general categories *Ex: "A big problem," "candles are dangerous," and "it affects businesses" can be grouped under a heading of "Negative consequences.*

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40 minutes	1. Write an outline from the main points from your brainstorming. Select the data, quotes, and details that will back your main points (the three general categories). You should try to use data from your interview, but you can also draw on the material you have engaged with on other days of the project.
	2. Before you begin the writing process. Make sure that you fully understand each of the aspects that should be a part of your writing.
	
	Assessment criteria for Newspaper Article
	
	● **Formatting**
	  ○ Include formatting (e.g., headings), illustrations, and multimedia when useful or possible to aid comprehension.
	  ○ Between 100 and 200 words
	● **Explanation of ideas and information:**
	  ○ Uses details, quotations, and examples to support descriptions
	  ○ Uses facts to support claims and arguments.
	  ○ Use precise vocabulary to inform about or explain the topic.
	● **Organization and structure:**
	  ○ Clearly states a main idea
	  ○ Has an introductory sentence and a conclusion.

DAY 4

Today, we will be learning about sustainability.

Suggested Duration	Activity and Description
20 minutes	1. Think about sustainability and our current environmental concerns. Ask someone to tell you about it if you want more information. Brainstorm the meaning of "sustaining." What are some ideas that this concept makes you think about? **Note:** To sustain means "give support to", "to hold up", "to bear" or to "keep up". So sustainable is an *adjective* - a descriptive word- for something that is able to be sustained, i.e, something that is "bearable" and "capable of being continued". 2. What do you think is something non-sustainable? **Note**: the word describes a situation in which human consumption or

	activities exceed the ability of the ecosystem to replenish or continue living over time.

20 minutes	1. What do you think is wrong with non-sustainability? Why is sustainability important for the environment?
	2. Go around their house, grab 5 objects, and think about "the history of the object". For example, if you grab a banana, think about where and how that banana came from, how it was produced, how it was packaged, etc.
	
	3. Consider the following sources of electricity: hydroelectric power, coal power, nuclear energy, wind, and solar power. Choose the source that interests you the most and draw/illustrate the steps of the process that you think/know can be used to generate electricity.
	    a. If you have worked on "Powering Against Blackouts- Part 1," you will be familiar with some of the steps through which they generate electricity, otherwise, you can use this information to help:
	
	    ● *Water or **hydroelectric power** is created using dams and, obviously, water. Water that is stored up behind the dam causes high-powered turbines (engines) to spin which in turn creates electricity. Because rain and snow runoff continually fill the reservoir behind the dam with water, dams are considered a source of renewable energy.*
	
	    ● *In a **coal power plant**, coal is mined and then transported to a boiler where it is burned. The heat released from coal boils water to make steam, which then passes through a turbine (engine) to make electricity. Much research has been done to determine the effectiveness of using coal for energy. Coal is inexpensive to use. However, for a typical coal power plant, large amounts of toxic (bad for our health) things like sulfur dioxide, carbon dioxide and mercury are released into the air, causing acid rain, greenhouse gases and other side effects that are harmful to people and the environment. Another concern is what we will use for energy when we run out of coal — there is*

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estimated to be between 100- and 300-years' worth of coal supply remaining in the Earth.

- **Nuclear energy** comes from enriched uranium and provides more energy than the same amount of gasoline. Nuclear power plants use the power stored in the nuclei (the center) of uranium atoms to heat up and boil water, and subsequently, to create steam. A steam turbine then generates electricity. There is not much pollution associated with nuclear power plants; however, the use of nuclear power is quite controversial, as there are risks to the environment and humans through the mining and transportation of uranium, as well as the storage of used uranium.

- **Wind**. Blowing wind turns enormous blades, which turns an electric motor and makes electricity. There is a disadvantage with wind turbines that is similar to solar energy. You need to store the electricity that is created because it is not guaranteed that the wind will blow (to turn the blades) precisely when the power is needed. With each of these three types of renewable energy sources, there is little pollution to worry about cleaning up afterwards.

- **Solar power** uses photovoltaic (PV) panels to change sunlight into electric current to create electricity. One difficulty associated with PV panels is that power is still needed when the sun is not shining (i.e., having your lights or other electrical devices on at night); therefore, the electricity needs to be stored during the day for use at night, which is often expensive.

| **20 minutes** | Compare these resources based on their cost-effectiveness (how expensive - in terms of time, amount of resources, availability of the resources needed, infrastructure, technical requirements- it is to generate electricity using that source) and their sustainability. You may use this worksheet: |

Type of Power Plant	Requirements (Ex: fuel, sunshine, etc.)	Cost (high or low)	How Sustainable is it? (sustainable, not very sustainable, etc.)
Hydroelectric			
Solar			
Wind Turbine			

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Nuclear				
Coal				
Natural Gas				

What do think is most important:

> Providing inexpensive power that puts out emissions (pollution) that affect the environment and people's health but allows the community to have more reliable electric grids
> **or**
> Focusing on the development of clean energy at the expense of other improvements.

Provide a good reason for choosing each of the alternatives.

DAY 5

Today, we will be thinking of solutions to power outages and we will be giving recommendations to local officers.

Suggested Duration	Activity and Description
10 minutes	1. Rank in order the three most important consequences of blackouts in the community. 2. Explain what is the criteria that you are using to say that one consequence is more important than the other one. a. For example, you might be using as your criteria "The community's economic well being" or "risks for the environment" or "it affects me and the people that I love the most.".

20 minutes	Begin to think about recommendations to solve these three consequences. Here are some questions to think about:
	    a. Based on your interviews and your learning so far,
	       i. Where and when does the community have more demand for energy?
	       ii. Based on this, are there ways that will help local officials balance **supply** and **demand**? What individual or group behaviors should be encouraged?
	       iii. Are the blackouts affecting some people more than other ones?

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	iv. Can everyone's problem be addressed at the same time? v. Who should be **prioritized** in offering a solution? b. How can the power grid and power plants be **sustainable**? c. Can you think about **alternative sources** of energy in their community?
10 minutes	Write down 3 recommendations for local officers who are willing to solve blackouts in your community.

10 minutes	Present to you family and/or classmates the recommendations and elicit feedback regarding:
	     a. In what ways are they cost-effective?
	     b. In what ways are they sustainable?
	     c. In what ways are they scientifically sound?

10 minutes	Use the feedback to polish the recommendations and, if possible, share the recommendations with local officials (they can present them, send them a message, etc.). Attach their newspaper article to back the recommendations.

ASSESSMENT CRITERIA

- Write a short newspaper article
- Interpret text, images, and graphical displays of data to describe some of the consequences of blackouts across the world.
- Construct, use, and present arguments to support a series of problem solving criteria.

ADDITIONAL ENRICHMENT ACTIVITY

"Some 30 years ago, Buckminster Fuller came up with a plan to plug all the world's continents into the same electrical grid. The idea was to let power flow between countries. Energy companies then proceeded to build such a grid. To get the most use of their generation capacity and to maintain an emergency reserve, power companies found it efficient to connect their grids to their neighbor's, who then connected to their neighbor's.

"The result, according to Peter Meisen of the Global Energy Network Institute, is that the electricity grids of all the nations of North and South America should be interconnected within the next 10 years.

"...Once the [international] grid is fully functional, the only excuse for power shortages will be greed. When demand is high in one region, it's almost certain to be low in another. By making electric power as easily transferable as data, analysts expect a global grid to smooth the market spikes out of the world's most useful commodity."

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What will be the advantages and disadvantages of such a system? Should we be concerned that "...the only excuse for power shortages will be greed"?

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