



I can communicate a recommendation to improve the electrical system that meets the greatest number of design criteria by obtaining and evaluating information from different sources.



Lessons 4.4

Gathering Evidence



Focus on SEL:

I can listen actively and respect other people's perspectives



I can communicate a recommendation to improve the electrical system that meets the greatest number of design criteria by obtaining and evaluating information from different sources.



Quickwrite/Discussion Prompt:

The electrical grid is one part of the larger electrical system. What happens to the electrical system if the electrical grid is not functioning?



What have you determined are the possible causes of the blackouts?



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To: System Engineers

From: Mayor Joules, City of Ergstown

Subject: Improvements to the Electrical System

Thank you for working on our town's blackout problem. Now I understand that there could be many different reasons why our town has had frequent blackouts.

I would like you to propose the best solutions for improving Ergstown's electrical system. There are a lot of improvements that I wish we could make, but due to the cost, we can only choose two. I am hoping that as system engineers, you will argue for the two solutions that best meet the criteria I have provided.



I can communicate a recommendation to improve the electrical system that meets the greatest number of design criteria by obtaining and evaluating information from different sources.

Criteria for Ergstown System Improvements

- They aren't too expensive.
- They are safe for the environment.
- They save energy or convert more energy.
- They are reliable—they will work most of the time.
- They won't bother the people of Ergstown.



Shared Listening Question

Which criteria do you think are the most important to meet? Why?



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GRID IMPROVEMENT

Possible Solutions for Improving Ergstown's Electrical System Grid Improvements

Possible Solution	Description	Cost	Energy Saved	Limitations	Additional Evidence
Add backup wires	If one wire breaks, the other wires will still work.	\$\$\$	none	Storms can still damage backup wires above the ground.	
Strengthen grid connections	Stronger grid connections will help wires stay up even in storms.	\$\$	none	Stronger connections will not help if there is a problem with the wires.	
Move the grid underground	This will protect the wires from storms.	\$\$\$\$	none	It is more difficult to fix wires that break underground.	

Possible Solutions for Improving Ergstown's Electrical System: Saving Energy

Possible Solution	Description	Cost	Energy Saved	Limitations	Additional Evidence
Encourage people to switch to newer LED lightbulbs.	LEDs are energy efficient. They save people money on their electrical bills. Most businesses already use these bulbs. Most homes do not.	0	a little	LED lightbulbs are more expensive than regular lightbulbs.	
People could limit the use of air conditioners.	Reward people and businesses who use their air conditioners less.	\$	some	People will have to put up with warmer buildings during hot weather.	
Shut down the electrical system from 2-3:00 a.m.	Many places in the world save energy by shutting down the system for an hour or more each night.	0	a lot	Electric clocks without batteries would have to be reset every day.	

ENERGY SAVING

Possible Solutions for Improving Ergstown's Electrical System: Energy Source and Converter Solutions

ENERGY SOURCES

Possible Solution	Description	Cost	Energy Saved	Limitations	Additional Evidence
Install more wind turbines near Ergstown.	Ergstown is often windy so turbines would work well near the city.		none		
Install new solar panels near Ergstown.	Ergstown could build solar panels to convert light energy into electrical energy.		none		
Build another fossil fuel plant close to Ergstown.	Power plants near Ergstown already convert fossil fuels to electrical energy.		none		
Build a hydroelectric power plant near Ergstown.	A hydroelectric power plant could be built on a nearby river.		some		



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Choose Your Self-Reflection Tool

Can I?	Expert	Proficient	Apprentice	Novice
<i>Gather and evaluate evidence from multiple sources to support possible solutions to the blackout problem</i>	Clearly record specific evidence from multiple sources	Record evidence from one source	Record some evidence	Little to no evidence recorded
<i>Participate in group/partner reading and discussions</i>	Completely participate and take turns with focused discussion	Participate and take turns in discussion and tasks;	Participate somewhat and take turns in discussion	Participate a little; no real turn taking.
<i>Use science vocabulary appropriately</i>	Use multiple new vocabulary words	Use at least two new vocabulary words	Attempt to use new vocabulary	Little to no new vocabulary used.
<i>Prepare criteria based argument to present</i>	Clearly address criteria and specific evidence as well as limitations	Address criteria and evidence; may include limitations	Address some criteria and evidence; little to no reference to limitations	Little to no criteria or supporting evidence addressed
<i>Focus on SEL: I can listen actively and respect other people's perspectives</i>	Listen to partners completely and attentively during discussions and classwork	Listen to partners completely during discussions and classwork	Sometimes listen to partners during discussions and classwork	Do not yet always listen to partners during discussions

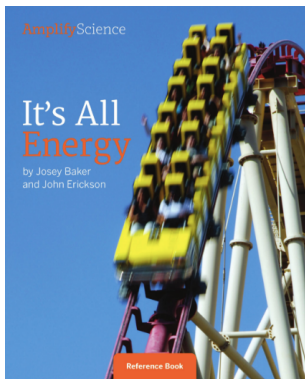


I can	Definitely	Maybe	Not Really
Gather and evaluate evidence from multiple sources to support possible solutions to the blackout problem			
Participate in group/partner reading and discussions			
Use science vocabulary appropriately			
Prepare criteria based argument to present			
Focus on SEL: I can listen actively and respect other people's perspectives			



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Use your
reference
book to
find evidence



What are
some
keywords
you can
look for?

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ENERGY SAVING

ENERGY SOURCES

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Use the SIM
to find evidence
about energy
efficiency

GRID IMPROVEMENT

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Grid Improvements**

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ENERGY SOURCES

Simulation

1

Energy Conversions





I can present my ideas about the best solutions for improving Ergstown's electrical system by supporting my claim with evidence.



Lessons 4.5

Presenting Arguments



Focus on SEL:

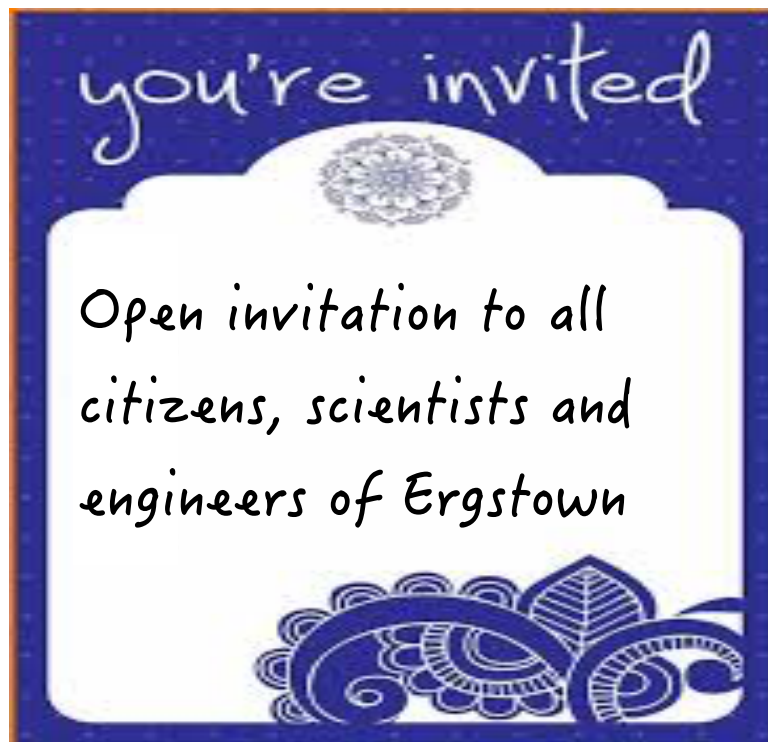
I can listen actively and respect other people's perspectives



I can present my ideas about the best solutions for improving Ergstown's electrical system by supporting my claim with evidence.



**Join Us at
Our Town Hall
Meeting**





I can present my ideas about the best solutions for improving Ergstown's electrical system by supporting my claim with evidence.



Criteria for Ergstown System Improvements

- They aren't too expensive.
- They are safe for the environment.
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What Is a Design Argument?

1. It answers a question with a claim about which solution best meets the criteria.
2. It connects evidence to each of the criteria. Evidence can be:
 - information from testing
 - ideas from texts and experiences
3. It describes any limitations.
4. It is written for an audience.
5. It uses scientific language.





I can present my ideas about the best solutions for improving Ergstown's electrical system by supporting my claim with evidence.

Let's prepare for our town hall

Preparing for the Town Hall Meeting

1. Refer to your completed Possible Solutions for Improving Ergstown Electrical System chart.
2. Read the question below.
3. Pick two solutions that you want to propose in response to the question.
4. For each solution, write what part of the system should be improved and how. Next, explain how the solution meets the criteria and provide evidence for that. Then, explain one way the solution does not meet the criteria very well.

Question: What are the best solutions for improving Ergstown's electrical system and why?

Solution 1: I think we should improve the _____
by _____

This solution meets the criteria because:

My evidence is:

Preparing for the Town Hall Meeting (continued)

This is one way the solution does not meet the criteria very well:

Solution 2: I think we should improve the _____
by _____

This solution meets the criteria because:

My evidence is:

This is one way the solution does not meet the criteria very well:





I can present my ideas about the best solutions for improving Ergstown's electrical system by supporting my claim with evidence.



Meet with your team to discuss the evidence that you have for one group of solutions.

Pick the one that you think is the best and prepare your own argument to present at the meeting



I can present my ideas about the best solutions for improving Ergstown's electrical system by supporting my claim with evidence.



Town Hall Meeting



Town Hall Meeting Guidelines

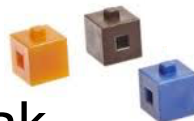
1. Students will take turns sharing their solutions and their evidence.
2. When it's your turn to speak:
 - State a claim about a solution.
 - Share your evidence and explain how it meets the criteria.
3. When it's your turn to listen:
 - Listen actively.
 - Once the speaker is finished, you may agree or disagree.
 - If you agree, you must add evidence.
 - If you disagree, you must present a different improvement and your evidence for it.
4. All students are free to change their ideas if they hear strong evidence from a peer.



Focus on SEL:

All engineers are expected to participate at least once but not more than 3 times

Put a cube in the cup each time you have a turn to speak





I can present my ideas about the best solutions for improving Ergstown's electrical system by supporting my claim with evidence.



Use your prompts to help you participate in the Town Hall Meeting



Preparing for the Town Hall Meeting

Scientific Language for the Town Hall Meeting

The best solution for Ergstown is _____.

This solution meets the criteria of _____ because _____.

The evidence for this is _____.

The limitation of this solution is _____.

Follow-up Questions in the Town Hall Meeting

Which solutions are not very expensive?

Which solutions are safe for the environment?

Which solutions save energy or convert more energy?

Which solutions are the most reliable?

Which solutions will not bother the people of Ergstown?



I can present my ideas about the best solutions for improving Ergstown's electrical system by supporting my claim with evidence.



Town Hall Meeting



Support an argument to answer this question for Ergstown:

What are the best solutions for improving Ergstown's electrical system and why?



**I can present my ideas about the best solutions for improving
Ergstown's electrical system by supporting my claim with evidence.**

Can I?	Expert	Proficient	Apprentice	Novice
<i>Actively participate in the discussion by offering my ideas, building on others ideas or respectfully disagreeing with another viewpoint</i>	Completely participate by taking turns, asking questions and also allowing others to speak	Participate by taking turns and allowing others to speak	Participate somewhat by speaking once or twice during discussion; mostly listens to others	Does not participate; only listens
<i>Provide evidence to support my proposal, add on or alternative solution</i>	Clearly cite evidence from multiple sources and address limitations	Cite evidence from one source; may address limitations	Limited evidence offered; no reference to limitations	Little to no evidence offered
<i>Use science vocabulary appropriately</i>	Use multiple new vocabulary words	Use at least two new vocabulary words	Attempt to use new vocabulary	Little to no new vocabulary used.
<i>Focus on SEL: I can listen actively and respect other people's perspectives</i>	Listen completely and attentively; respects others perspectives even if they are different from theirs	Listens to discussion; respects other perspectives	Sometimes listens to discussion; some respect for other perspectives	Does not yet always listen

Choose your
self-reflection tool

I can	Definitely	Maybe	Not Really
Actively participate in the discussion by offering my ideas, building on others ideas or respectfully disagreeing with another viewpoint			
Provide evidence to support my proposal, add on or alternative solution			
Use science vocabulary appropriately			
Focus on SEL: I can listen actively and respect other people's perspectives			

